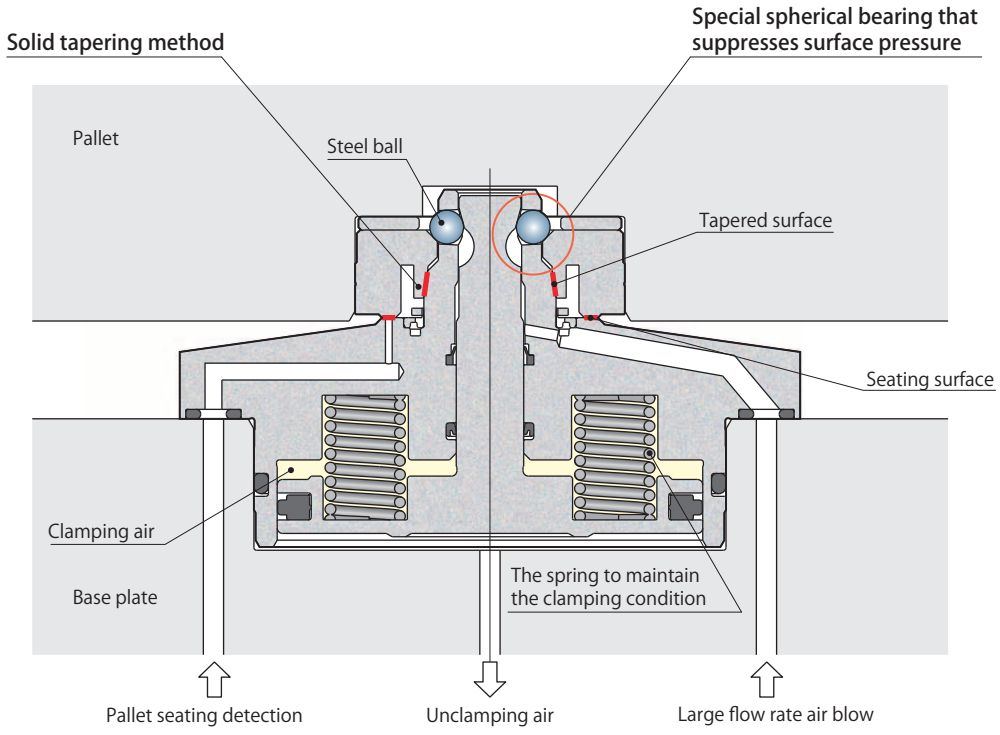
Air pallet clamp

model CPL-□□H US PAT.

Highly rigid pallet clamp and repeatability of 3 μm with dual surface contact



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Specifications

CPL — [Type] [Size] H

Type
- A : Taper cone circle
- B : Taper cone cut 45°
- C : Taper cone cut 90°
- S : Shim

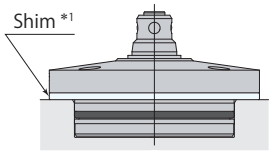
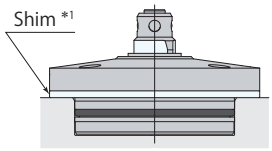
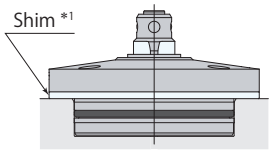
Size
40 / 50 / 63 / 80 / 100

indicates made to order.

Model			CPL-□40H	CPL-□50H	CPL-□63H	CPL-□80H	CPL-□100H
Working air pressure range		MPa	0.4~0.5 (model CPS-L)		0.4~0.5 (model CPS-E)		
			0.35~0.5 (model CPS-D、CPS-F)	0.3~0.5 (model CPS-D、CPS-F)			
Clamping force *1	Air pressure 0MPa *2	kN	0.5	0.8	1.4	1.5	2.4
	Air pressure 0.3MPa	kN	—	1.8	2.9	4.2	7.0
	Air pressure 0.4MPa	kN	1.3	2.2	3.4	5.1	8.5
	Air pressure 0.5MPa	kN	1.5	2.5	4.0	6.0	10.0
Clamping force calculation *1 (P:Air pressure MPa)			2.0×P+0.5	3.4×P+0.8	5.1×P+1.4	9.0×P+1.5	15.2×P+2.4
Cylinder capacity *1	Clamp	cm^3	5.2	8.3	13.4	21.4	38.3
	Unclamp	cm^3	5.5	8.6	13.7	22.1	39.3
Full stroke		mm	4.4	4.4	4.4	4.4	5.0
Clamp stroke		mm	2.4	2.4	2.4	2.4	3.0
Stroke margin		mm	2.0				
Max. allowable eccentricity for pallet setting		mm	±1.0	±1.0	±1.0	±1.5	±2.0
Lift stroke *3		mm	1.0				
Lift force *1*4	Air pressure 0.3MPa	kN	—	0.1	0.1	0.6	1.0
	Air pressure 0.4MPa	kN	0.16	0.3	0.4	1.1	1.8
	Air pressure 0.5MPa	kN	0.29	0.5	0.7	1.6	2.6
Lift force calculation (P:Unclamping air pressure MPa) *1*4			1.26×P−0.34	1.96×P−0.48	3.12×P−0.83	5.03×P−0.89	7.85×P−1.35
Max. allowable load (including pallet) *5	Horizontal mounting	kN	2	2.5	3	8	15
	Vertical mounting	kN	0.3	0.4	0.5	1.5	2.5
Mass *1		kg	0.5	0.6	1.0	2.0	3.5
Recommended tightening torque of mounting screws *6		N·m	3.5	3.5	7	12	12

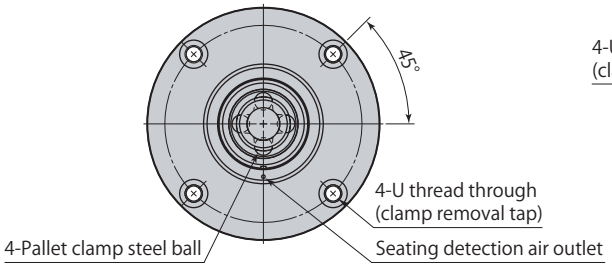
- Proof pressure:0.75 MPa
- Operating temperature:0~70 ℃
- Fluid used:Air*7
- Oil supply:Not required
- Recommended air blow pressure:0.3~0.5 MPa

*1:The figure indicates one piece of clamp.
*2:Clamping capacity for no air pressure shown.
*3:This is the amount for lifting pallet when unclamping.
*4:Adjust air pressure for unclamping so that the lift force can be more than max. allowable load. The max. allowable load can be calculated by the formula of lift force×quantity of CPL×0.8.
*5:This is maximum allowable load of pallet, regardless of how many clamps are used.
*6:ISO R898 class 12.9
*7:Use dry air that is passed through a 5 μm filter.

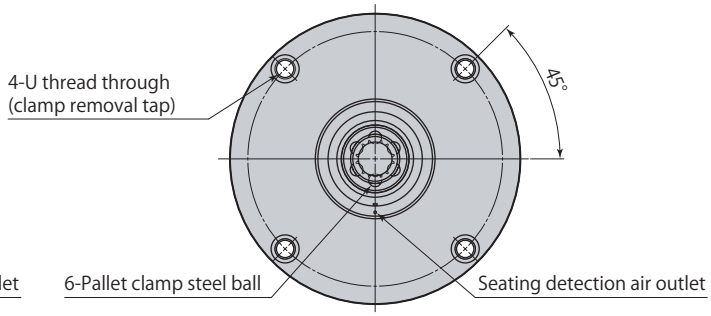
Pallet clamp type	A Taper cone circle	B *2 Taper cone cut 45°	C *2 Taper cone cut 90°
model CPL	 model CPL-A□H	 model CPL-B□H	 model CPL-C□H

*1:Shim of pallet clamp can be used when heights of mounted clamps vary. (option)
*2:Taper cone cut can be selected from B type or C type.

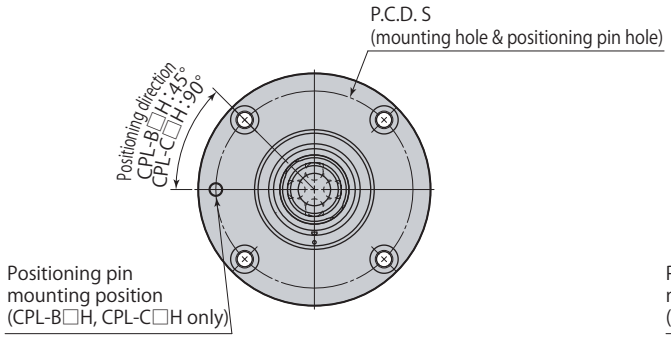
Dimensions



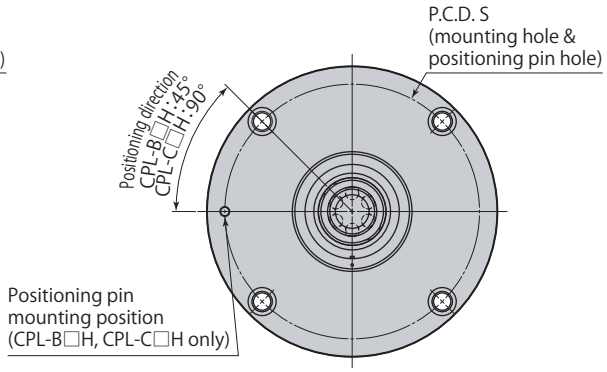
CPL-A40～63H



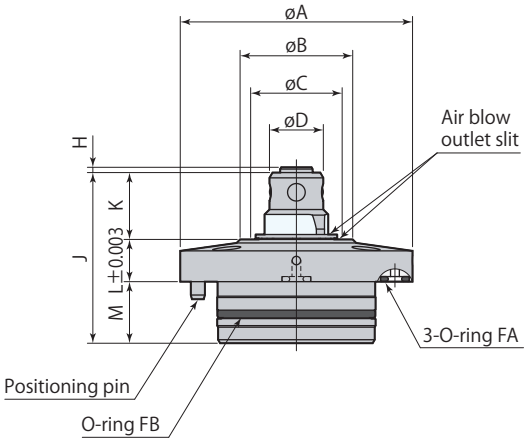
CPL-A80/100H



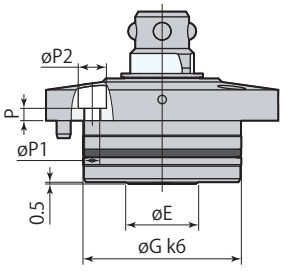
CPL-$^{B}_{C}$40～63H



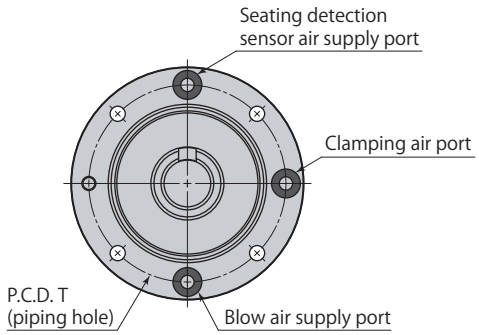
CPL-$^{B}_{C}$80/100H



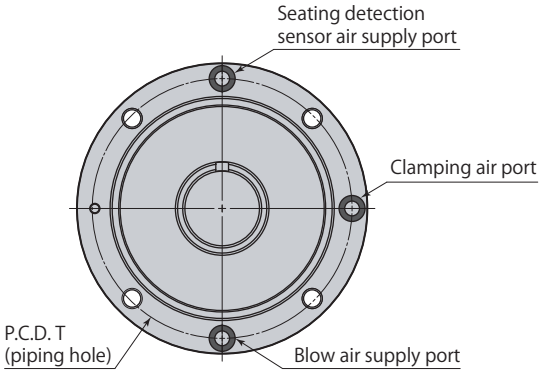
Unclamp



Stroke end



CPL-□40～63H



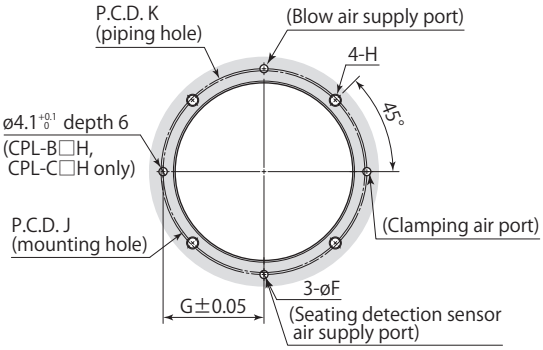
CPL-□80/100H

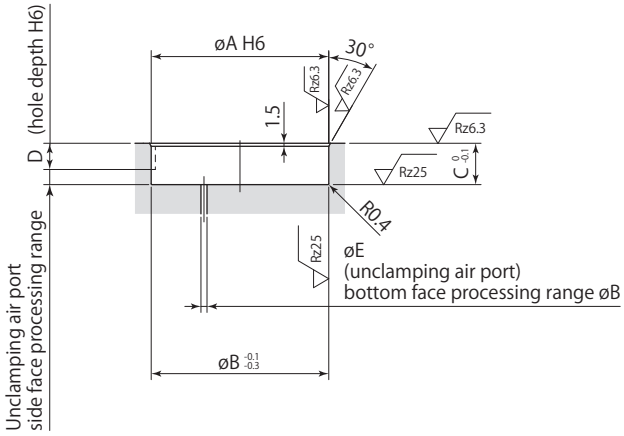
mm

Model	CPL-□40H	CPL-□50H	CPL-□63H	CPL-□80H	CPL-□100H
ø A	66	76	92	114	134
ø B	32	32	32	45	48
ø C	26	26	26	37	40
ø D	15.3	15.3	15.3	19.3	23
ø E	19	24	29	35	45
ø G	45 $^{+0.018}_{+0.002}$	55 $^{+0.021}_{+0.002}$	70 $^{+0.021}_{+0.002}$	88 $^{+0.025}_{+0.003}$	108 $^{+0.025}_{+0.003}$
H	1.5	1.5	1.5	1.5	1.3
J	48.5	49	53	60.5	75
K	19	19	19	22.5	26
L	12	12	15	18	22
M	17.5	18	19	20	27
P	3.5	3.5	4.5	6	8
ø P1	4.3	4.3	5.5	6.8	6.8
ø P2	8	8	9.5	11	11
S	56	66	80	100	120
T	56	66	82	102	122
U	M5×0.8	M5×0.8	M6×1	M8×1.25	M8×1.25
O-ring FA (fluorocarbon hardness Hs90)	P5	P5	P5	P7	P7
O-ring FB (fluorocarbon hardness Hs90)	AS568-030	AS568-033	AS568-144	AS568-152	AS568-155

- Be sure to match up phase of pallet clamp steel balls and locate ring steel ball grooves.
- Positioning direction is the direction in which tapered surface has not been cut.
- Use øA, which has been ground at the same time as tapered surface, for positioning measurement after mounting.
- Mounting screws are not included.
- Coupler (**pages →620~625**) recommended when using couplers in a set.

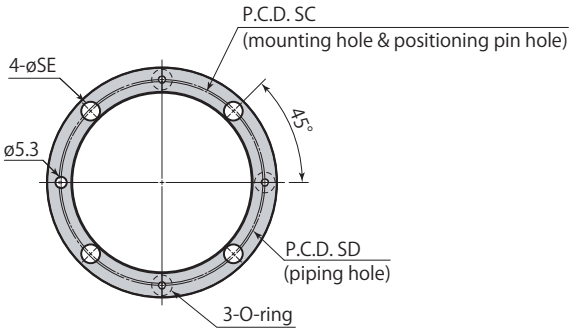
Mounting details

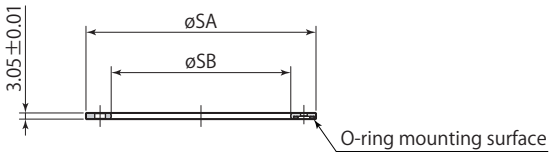




Rz: ISO4287(1997)

Shim (option)





mm

Model	CPL-□40H	CPL-□50H	CPL-□63H	CPL-□80H	CPL-□100H
ø A	45 $^{+0.016}_{0}$	55 $^{+0.019}_{0}$	70 $^{+0.019}_{0}$	88 $^{+0.022}_{0}$	108 $^{+0.022}_{0}$
ø B	45	55	70	88	108
ø E	3~15	3~20	3~25	3~31	3~40
ø F	3	3	3	5	5
G	28	33	40	50	60
H	M4	M4	M5	M6	M6
J	56	66	80	100	120
K	56	66	82	102	122
Not using shim (standard specifications)					
C	18	18.5	19.5	20.5	27.5
D	14	14	14	14	14
Using shim (shim specifications)					
C	15	15.5	16.5	17.5	18.5
D	11	11	11	11	11

- Process with shim specification dimensions when shim is attached. Processing with standard specification dimensions will result in clamp damage during full stroke.
- Process either bottom or side surface of unclamping air port.
- Recommended piping diameter for blow air supply port is ø8 or more. Having small air piping diameter does not allow full use of air blow effects.
- Be sure to match up phase of pallet clamp steel balls and locate ring steel ball grooves.

mm

Model	CPL-S40H	CPL-S50H	CPL-S63H	CPL-S80H	CPL-S100H
ø SA	66	76	92	114	134
ø SB	45.5	55.5	70.5	89	109
SC	56	66	80	100	120
SD	56	66	82	102	122
ø SE	5.5	5.5	6.8	9	9
O-ring (fluorocarbon hardness Hs90)	P5	P5	P5	P7	P7
Mass	0.04 kg	0.05 kg	0.06 kg	0.09 kg	0.1 kg

- This diagram indicates dimensions at shipping.
- Adjust thickness of shim by grinding to ensure flatness of pallet.
- Grind shim upper surface (surface without O-ring) to adjust shim.

Specifications

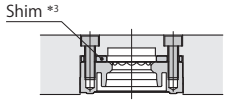
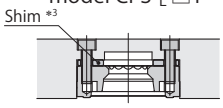
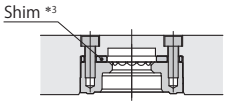
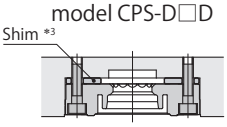
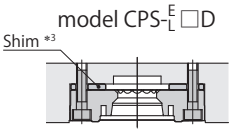
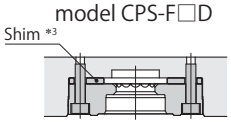
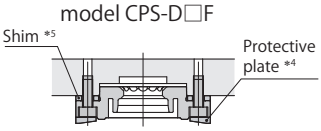
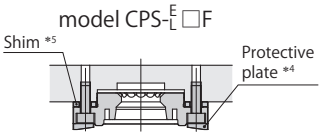
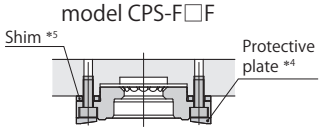
CPS –

Type	Size	Mounting method
D : Repeatability 10 μm	03	T : Pallet upper surface mounting
E : Repeatability 3 μm	06	D : Pallet lower surface mounting
L : Repeatability 3 μm*1	10	F : Flange mounting
F : Seating surface positioning (Z axis positioning)		
S : Shim		
P : Protective plate*2		

indicates made to order. .

∗1：model CPS-L (Repeatability 3 μm) is available for size 03 only. (Exclusive use for CPL-□40, CPL-□50H)

∗2：The protective plate is only flange mounting type.

Locate ring	D *1 Repeatability 10 μm	E or L *1 Repeatability 3 μm	F *2 Seating surface positioning (Z axis positioning)
T Pallet upper surface mounting	model CPS-D□T 	model CPS-$^{E}_{L}$□T 	model CPS-F□T 
D Pallet lower surface mounting	model CPS-D□D 	model CPS-$^{E}_{L}$□D 	model CPS-F□D 
F Flange mounting	model CPS-D□F 	model CPS-$^{E}_{L}$□F 	model CPS-F□F 

∗1：model CPS-D (Repeatability 10 μm) cannot be used together with model CPS-E or CPS-L (repeatability 3 μm)

∗2：model CPS-F (Seating surface positioning) needs the positioning of XY axes.

∗3：It is recommended to use a shim (option) to adjust mounting hole depth for the locate rings for pallet upper surface mounting and lower surface mounting. Grind shim to adjust thickness.

∗4：Protective plate (flange mounting only) can be used to prevent damage of seating surface, when pallet must be placed on the floor, etc. (option)

∗5：Shim of locate ring of flange mounting can be used when heights of mounted locate rings vary. (option)

Locate ring model correspondence

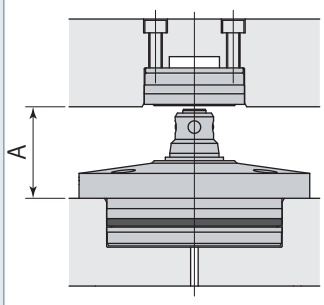
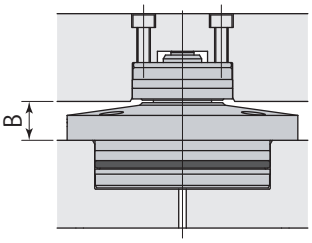
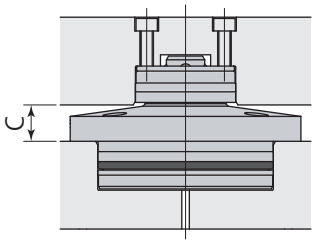
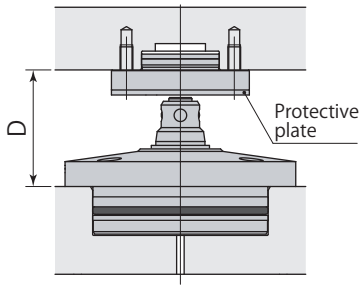
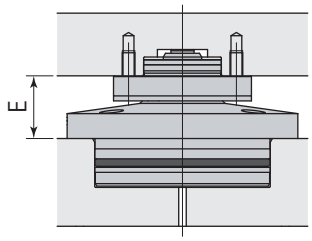
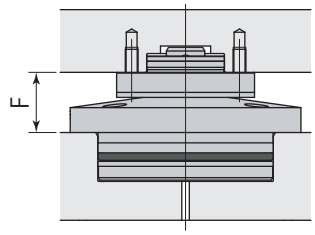
Pallet clamp		CPL-□40H	CPL-□50H	CPL-□63H	CPL-□80H	CPL-□100H
Repeatability	3 μm	CPS-L03□		CPS-E03□	CPS-E06□	CPS-E10□
	10 μm	CPS-D03□			CPS-D06□	CPS-D10□
Seating surface positioning (Z axis positioning)		CPS-F03□			CPS-F06□	CPS-F10□

Mass

kg

Locate ring		D Repeatability 10 μm			E or L Repeatability 3 μm				F Seating surface positioning (Z axis positioning)		
T Pallet upper surface mounting	Model	CPS-D03T	CPS-D06T	CPS-D10T	CPS-L03T	CPS-E03T	CPS-E06T	CPS-E10T	CPS-F03T	CPS-F06T	CPS-F10T
	Mass	0.1	0.2	0.3	0.1	0.1	0.2	0.3	0.1	0.2	0.3
D Pallet lower surface mounting	Model	CPS-D03D	CPS-D06D	CPS-D10D	CPS-L03D	CPS-E03D	CPS-E06D	CPS-E10D	CPS-F03D	CPS-F06D	CPS-F10D
	Mass	0.2	0.3	0.5	0.2	0.2	0.3	0.5	0.2	0.3	0.5
F Flange mounting	Model	CPS-D03F	CPS-D06F	CPS-D10F	CPS-L03F	CPS-E03F	CPS-E06F	CPS-E10F	CPS-F03F	CPS-F06F	CPS-F10F
	Mass	0.1	0.2	0.3	0.1	0.1	0.2	0.3	0.1	0.2	0.4

Height of pallet from base plate

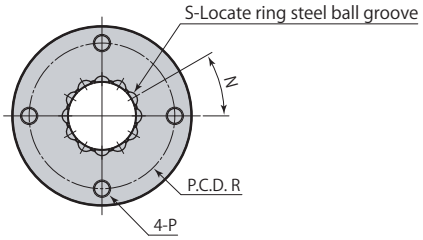
Locate ring mounting method	Pallet changing	Pallet setting (Unclamp)	Clamp
T Pallet upper surface mounting D Pallet lower surface mounting			
F Flange mounting			

mm

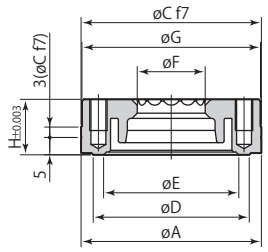
Pallet clamp		CPL-□40H	CPL-□50H	CPL-□63H	CPL-□80H	CPL-□100H
T Pallet upper surface mounting	A	Min. 33	Min. 33	Min. 36	Min. 43	Min. 51
	B	12.5	12.5	15.5	18.5	22.5
D Pallet lower surface mounting	C	11.5	11.5	14.5	17.5	21.5
F Flange mounting	D	Min. 43	Min. 43	Min. 46	Min. 53	Min. 63
	E	22	22	25	28.5	34.5
	F	21	21	24	27.5	33.5

- Pallet lift capacity for dimension A or D or more is needed to change pallet.
- The height from base plate to pallet varies when using shim for pallet clamp or locate ring (flange mounting).

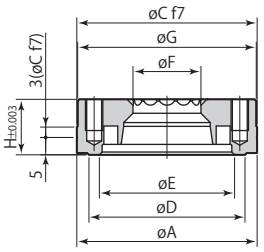
Dimensions



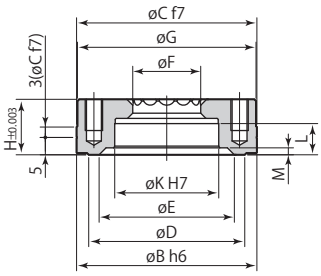
CPS-D03～10T Locate ring (D type)



CPS-E03～10T Locate ring (E type)
CPS-L03T Locate ring (L type)



CPS-F03～10T Locate ring (F type)



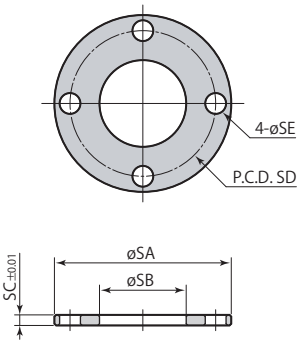
mm

Model	CPS-□03T	CPS-□06T	CPS-□10T
ø A	40 $^{+0.005}_{-0.011}$	52 $^{+0.006}_{-0.013}$	60 $^{+0.006}_{-0.013}$
ø B	40 $^{0}_{-0.016}$	52 $^{0}_{-0.019}$	60 $^{0}_{-0.019}$
ø C	40 $^{-0.025}_{-0.050}$	52 $^{-0.030}_{-0.060}$	60 $^{-0.030}_{-0.060}$
ø D	32	45	48
ø E	28	39	42
ø F	15.6	19.6	23.3
ø G	39.5	51.5	59.5
H	13	16	20
ø K	22 $^{+0.021}_{0}$	30 $^{+0.021}_{0}$	32 $^{+0.025}_{0}$
L	7	9	11
M	2	2.5	2.5
N *	45°	30°	30°
P	M5×0.8 depth 6	M5×0.8 depth 9	M6×1 depth 11
R	31	42	48
S	8	12	12

*：Be sure to match up phase of locate ring steel ball grooves and pallet clamp steel balls.

● Mounting screws are not included.

Shim (option)



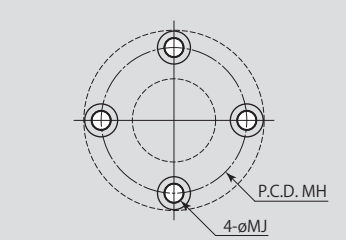
mm

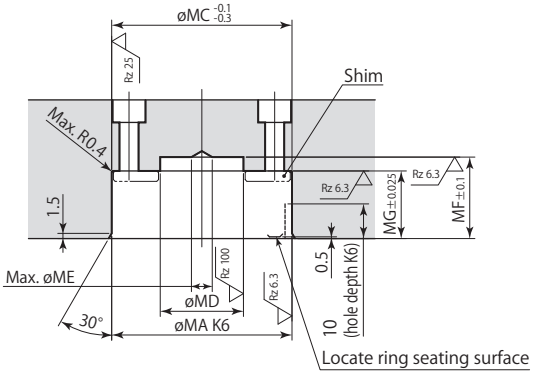
Model	CPS-S03T	CPS-S06T	CPS-S10T
ø SA	39	51	59
ø SB	21	25	33
SC	2.05	3.05	3.05
SD	31	42	48
ø SE	6	6	7
Mass	0.01 kg	0.03 kg	0.04 kg

● This diagram indicates dimensions at shipping.

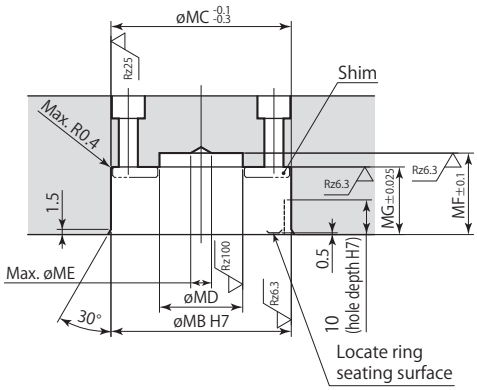
● Adjust thickness of shim by grinding to ensure flatness of pallet.

Mounting details





CPS-D03～10T, CPS-E03～10T, CPS-L03T



CPS-F03～10T

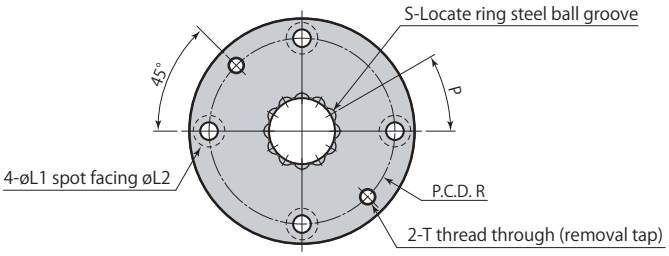
Rz: ISO4287(1997)

mm

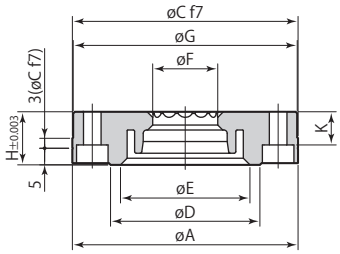
Model	CPS-□03T	CPS-□06T	CPS-□10T
ø MA	40 $^{+0.003}_{-0.013}$	52 $^{+0.004}_{-0.015}$	60 $^{+0.004}_{-0.015}$
ø MB	40 $^{+0.025}_{0}$	52 $^{+0.030}_{0}$	60 $^{+0.030}_{0}$
ø MC	40	52	60
ø MD	20	24	28
ø ME	6	6	8
MF	20	23.5	26.8
MG	15.5	19.5	23.5
MH	31	42	48
ø MJ	5.5	5.5	6.6

● Be sure to match up phase of locate ring steel ball grooves and pallet clamp steel balls.

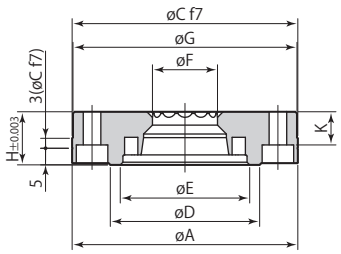
Dimensions



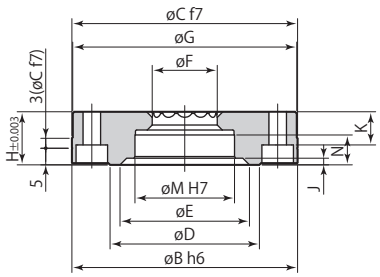
CPS-D03～10D Locate ring (D type)



CPS-E03～10D Locate ring (E type)
CPS-L03D Locate ring (L type)



CPS-F03～10D Locate ring (F type)



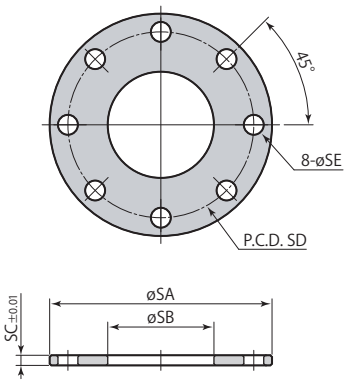
mm

Model	CPS-□03D	CPS-□06D	CPS-□10D
ø A	55 $^{+0.006}_{-0.013}$	68 $^{+0.006}_{-0.013}$	75 $^{+0.006}_{-0.013}$
ø B	55 $^{0}_{-0.019}$	68 $^{0}_{-0.019}$	75 $^{0}_{-0.019}$
ø C	55 $^{-0.030}_{-0.060}$	68 $^{-0.030}_{-0.060}$	75 $^{-0.030}_{-0.060}$
ø D	32	45	48
ø E	28	39	42
ø F	15.6	19.6	23.3
ø G	54.5	67.5	74.5
H	13	16	20
J	2	2.5	2.5
K	7	10	13
ø L1	5.3	5.3	6.8
ø L2	9.5	9.5	11
ø M	22 $^{+0.021}_{0}$	30 $^{+0.021}_{0}$	32 $^{+0.025}_{0}$
N	7	9	11
P *	45°	30°	30°
R	43	56	61
S	8	12	12
T	M5×0.8	M5×0.8	M6×1

*：Be sure to match up phase of locate ring steel ball grooves and pallet clamp steel balls.

● Mounting screws are not included.

Shim (option)



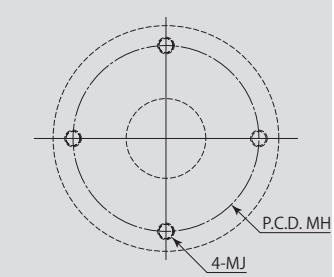
mm

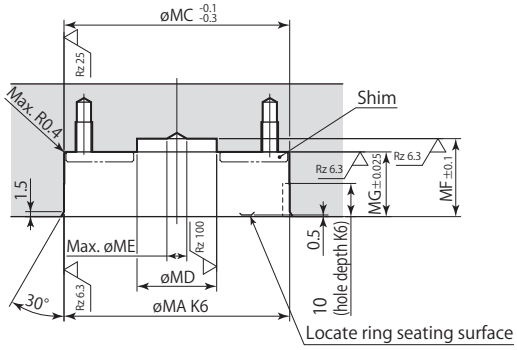
Model	CPS-S03D	CPS-S06D	CPS-S10D
ø SA	54	67	74
ø SB	24	32	39
SC	2.05	3.05	3.05
SD	43	56	61
ø SE	6	6	7
Mass	0.06 kg	0.06 kg	0.07 kg

● This diagram indicates dimensions at shipping.

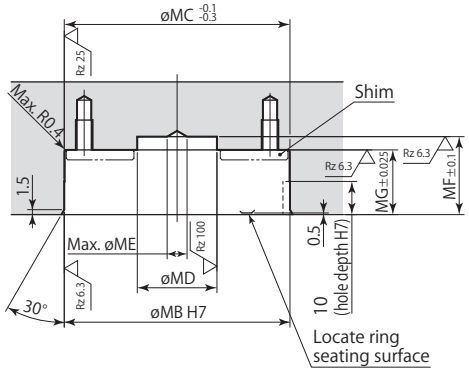
● Adjust thickness of shim by grinding to ensure flatness of pallet.

Mounting details





CPS-D03～10D, CPS-E03～10D, CPS-L03D



CPS-F03～10D

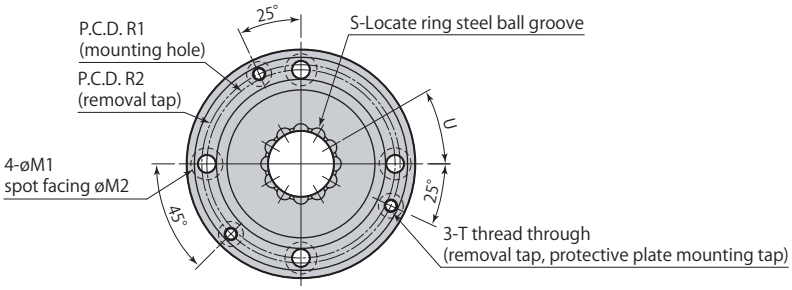
Rz: ISO4287(1997)

mm

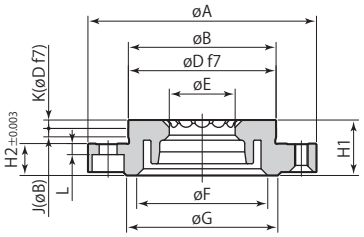
Model	CPS-□03D	CPS-□06D	CPS-□10D
ø MA	55 $^{+0.004}_{-0.015}$	68 $^{+0.004}_{-0.015}$	75 $^{+0.004}_{-0.015}$
ø MB	55 $^{+0.025}_{0}$	68 $^{+0.030}_{0}$	75 $^{+0.030}_{0}$
ø MC	55	68	75
ø MD	20	24	28
ø ME	6	6	8
MF	20	23.5	26.8
MG	15.5	19.5	23.5
MH	43	56	61
MJ	M5	M5	M6

● Be sure to match up phase of locate ring steel ball grooves and pallet clamp steel balls.

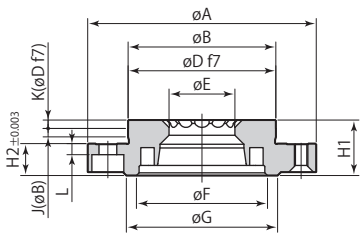
Dimensions



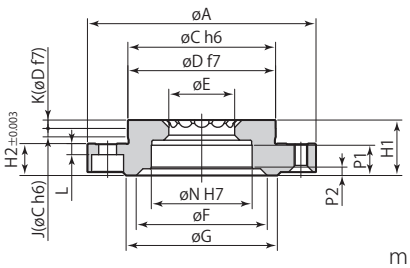
CPS-D03～10F Locate ring (D type)



CPS-E03～10F Locate ring (E type)
CPS-L03F Locate ring (L type)



CPS-F03～10F Locate ring (F type)



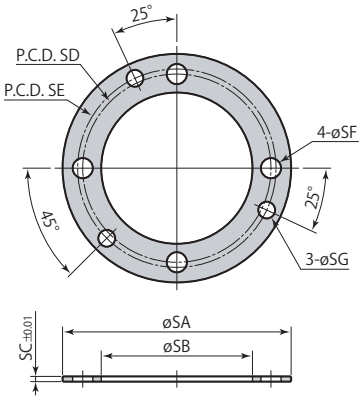
mm

Model	CPS-□03F	CPS-□06F	CPS-□10F
ø A	55	68	75
ø B	31 $^{+0.005}_{-0.011}$	44 $^{+0.005}_{-0.011}$	47 $^{+0.005}_{-0.011}$
ø C	31 $^{0}_{-0.016}$	44 $^{0}_{-0.016}$	47 $^{0}_{-0.016}$
ø D	31 $^{-0.025}_{-0.050}$	44 $^{-0.025}_{-0.050}$	47 $^{-0.025}_{-0.050}$
ø E	15.6	19.6	23.3
ø F	28	39	42
ø G	32	45	48
H1	15.5	16.5	20
H2	9	9.5	11.5
J	2.4	2.5	3.2
K	2.1	2.5	2.8
L	2.8	3.3	4.2
ø M1	5.3	5.3	6.8
ø M2	9.5	9.5	11
ø N	22 $^{+0.021}_{0}$	30 $^{+0.021}_{0}$	32 $^{+0.025}_{0}$
P1	7	9	11
P2	2	2.5	2.5
R1	43	56	61
R2	46	59	64
S	8	12	12
T	M4×0.7	M4×0.7	M5×0.8
U *	45°	30°	30°

∗: Be sure to match up phase of locate ring steel ball grooves and pallet clamp steel balls.

● Mounting screws are not included.

Shim (option)



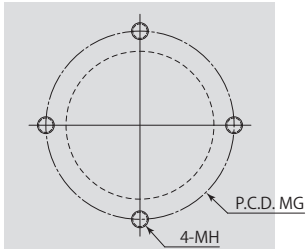
mm

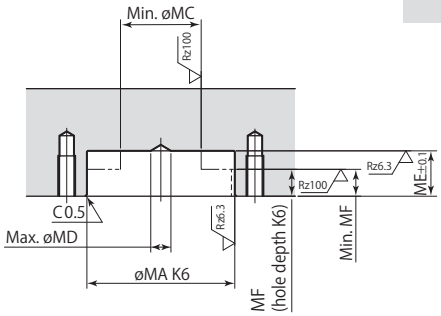
Model	CPS-S03F	CPS-S06F	CPS-S10F
ø SA	55	68	75
ø SB	32	45	48
SC	1.55	1.55	2.05
SD	43	56	61
SE	46	59	64
ø SF	6	6	7
ø SG	5	5	6
Mass	0.02 kg	0.02 kg	0.04 kg

● This diagram indicates dimensions at shipping.

● Adjust thickness of shim by grinding to ensure flatness of pallet.

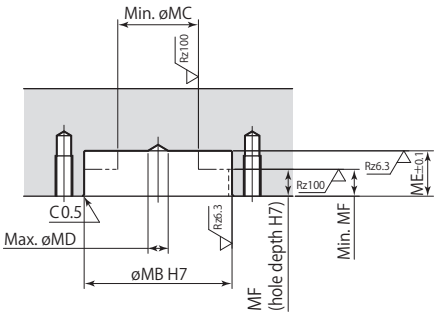
Mounting details





CPS-D03～10F, CPS-E03～10F, CPS-L03F

Rz: ISO4287(1997)

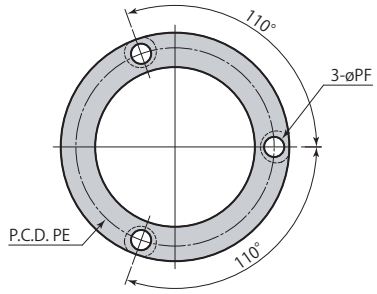


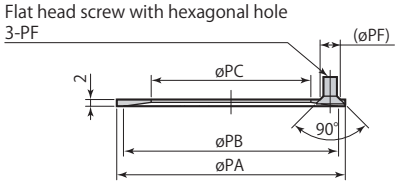
CPS-F03～10F

mm

Model	CPS-□03F	CPS-□06F	CPS-□10F
ø MA	31 $^{+0.003}_{-0.013}$	44 $^{+0.003}_{-0.013}$	47 $^{+0.003}_{-0.013}$
ø MB	31 $^{+0.025}_{0}$	44 $^{+0.025}_{0}$	47 $^{+0.025}_{0}$
ø MC	20	24	28
ø MD	6	6	8
MG	43	56	61
MH	M5	M5	M6
Not using shim (standard specifications)			
ME	10.5	13.5	14.8
MF	7.5	8	9.5
Using shim (shim specifications)			
ME	9	12	12.8
MF	6.5	6.5	7.5

● Be sure to match up phase of locate ring steel ball grooves and pallet clamp steel balls.



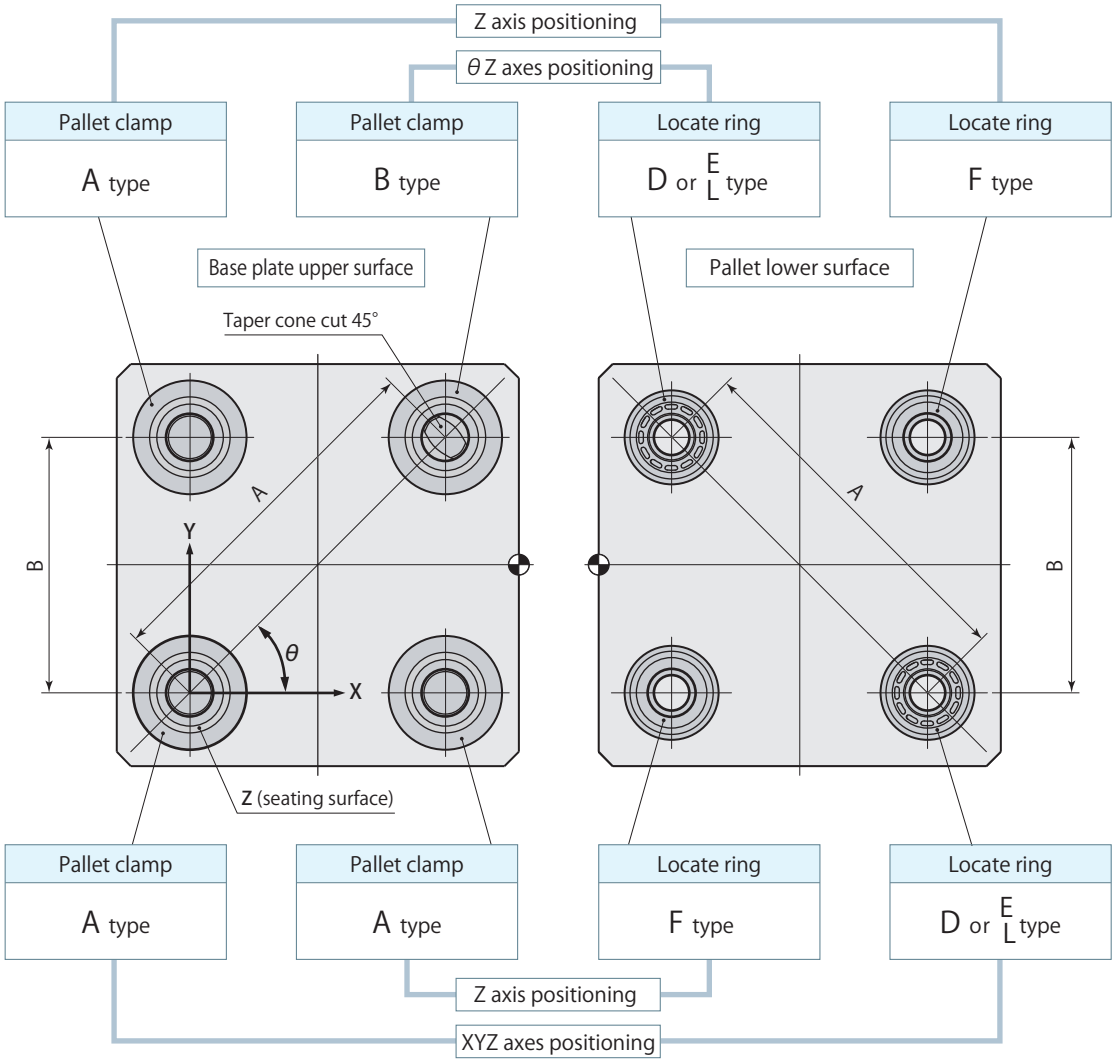


Protective plate (option)

mm

Model	CPS-P03F	CPS-P06F	CPS-P10F
ø PA	55	68	75
ø PB	51	64	68
ø PC	34.5	47.5	50.5
PE	46	59	64
ø PF	6	6	8
Mass	0.02 kg	0.02 kg	0.03 kg

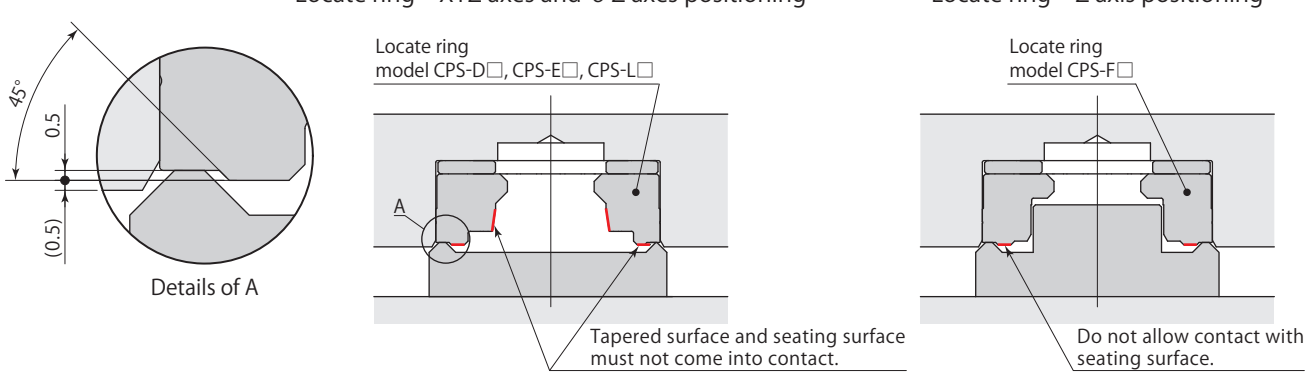
Pitch tolerance of Pal system



Pitch tolerance of A dimensions	±0.01 mm
Pitch tolerance of B dimensions	±0.03 mm

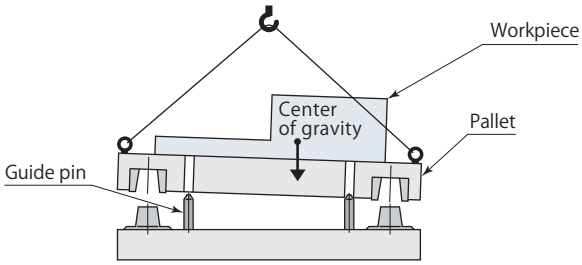
Method for positioning pallet changer setup table

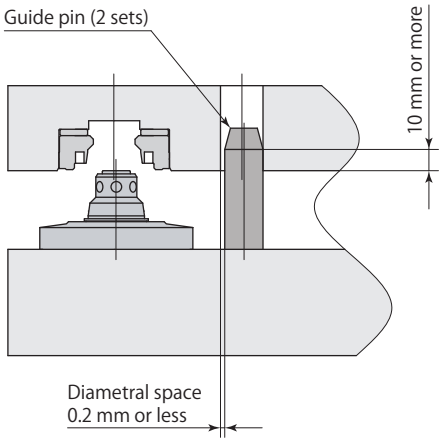
Internal hole of model CPS-F (Seating surface positioning) can be used for positioning of setup table for pallet change with pallet changer. In order to sustain accuracy, do not allow surfaces other than those of pallet clamp model CPL to come into contact with tapered surface or seating surface.



Pallet change

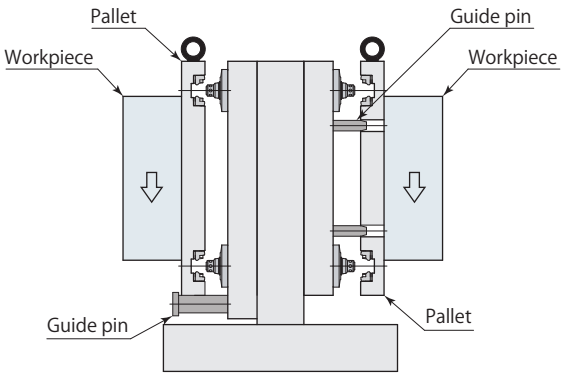
- When pallet changing, the pallet should be mounted or dismounted observing the figures shown in "Max. allowable eccentricity for pallet setting". (Refer to **page →583** for max. allowable eccentricity for pallet setting.)
- Ensure that pallet does not lean to the side when pallet mounting or dismounting. When dismounting pallet in particular, pulling while in a tilted condition can damage pallet clamp and locate ring. A guide pin is recommended to prevent the pallet from leaning.

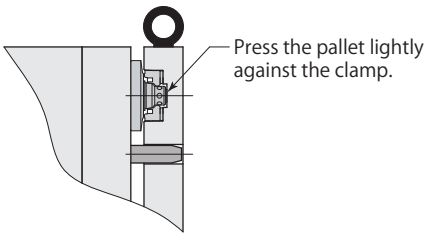




For vertical mounting of pallet

- A guide pin must be installed when mounting pallet vertically.
- Ensure spacing is set in order to ensure that mounted guide pin does not affect positioning.
- Ensure the pallet is closely contact with the base when it is clamped. Clamping with a space may cause the damage of both of clamp and locate ring.
  (Refer to **page →589** for the height of pallet from base plate when pallet setting.)





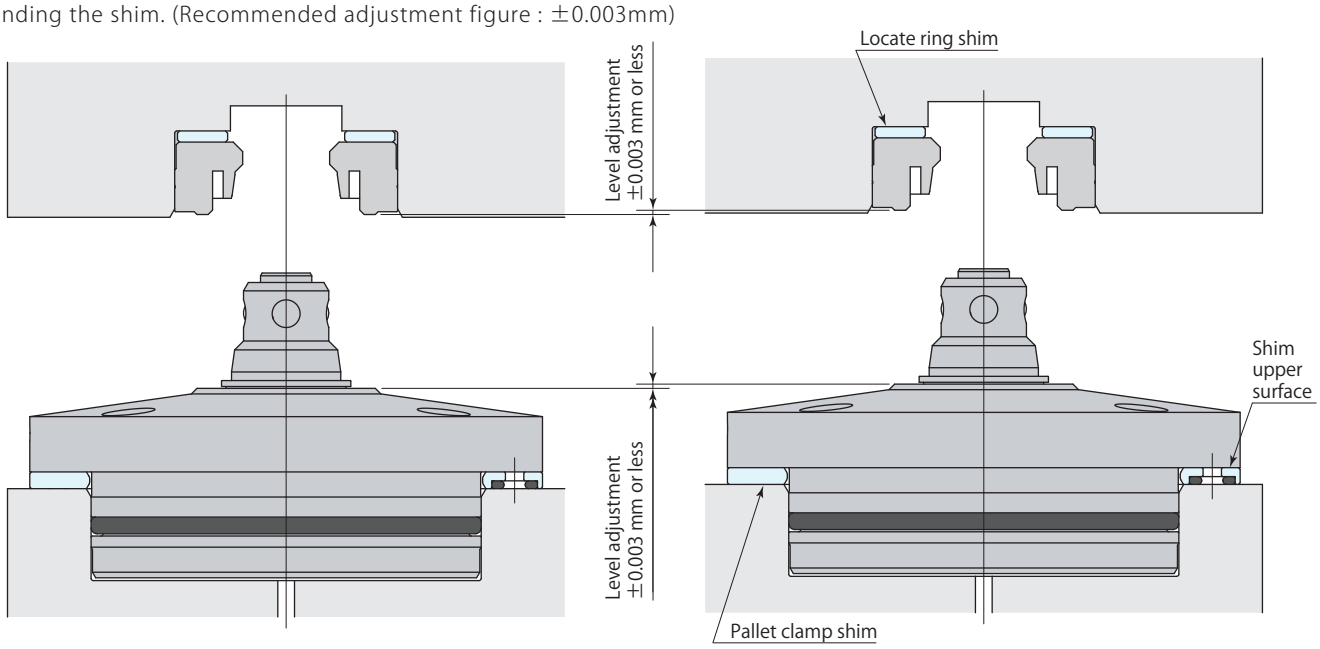
Level adjustment

Level adjustment of pallet clamp seating surface

- If level adjustment of pallet clamp seating surface is required, use pallet clamp shim (option). The level can be adjusted by grinding the shim.
- Grind shim upper surface (surface without O-ring).
- The measurement on the seating surface should be performed under the pallet clamped condition without locate rings. (Recommended adjustment figure : ±0.003mm)

Level adjustment of locate ring seating surface

- If level adjustment of locate ring seating surface is required, use locate ring shim (option). The level can be adjusted by grinding the shim. (Recommended adjustment figure : ±0.003mm)



Mounting & dismounting of clamp

Mounting of clamp

①The ring has been mounted on the clamp to avoid taking it apart during the shipment. Remove it after mounting the clamp on the base plate, supplying the air pressure for unclamping.

②The ring is an important part for dismounting the clamp. Store if for future maintenance.

Dismounting of clamp

①Mount the ring before dismounting the clamp from the base plate. Supply air pressure for unclamping to mount it.

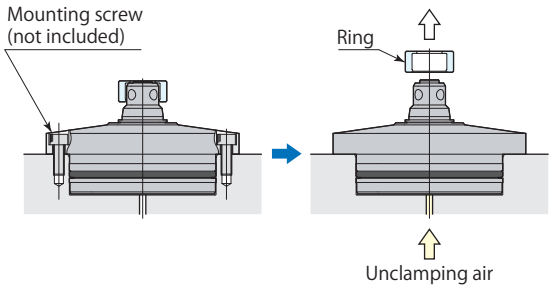
②Exhaust air in the circuit and remove the mounting screws.

③Mount the set-screws on the removal tap to protect the threads and clamp mounting surface.

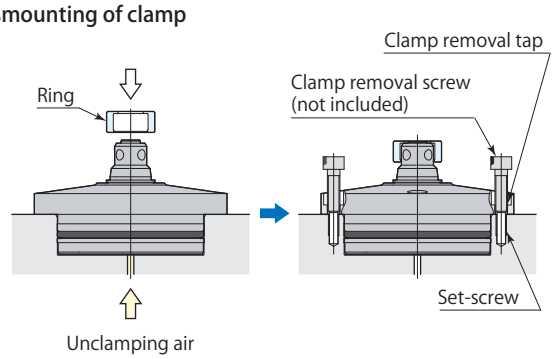
④Mount the clamp removal screw on the clamp removal tap and dismount the clamp.

⑤Retain the clamp upright condition when dismounting it.

Mounting of clamp



Dismounting of clamp



Air circuit diagram

- Be sure to make inner diameter of air blow circuit 8 mm or more except for clamp mounting surface.
- Use dry air that is passed through a 5 μm filter for supply of air.
- GPS2-05 series manufactured by CKD or ISA2-G series manufactured by SMC is recommended. (Recommended air supply pressure 0.2 MPa)
- Adjust full stroking time to be more than 1 second by a speed controller to avoid impact at the time of clamp or unclamp action.