

air Expansion clamp

Double acting 1MPa

model **CGY**



model **CGY**

Specifications

Grip inner diameter : Number of grippers

— : Air blow model **055 058 061 064 067 070A** : 2 Grippers

CGY – F22

070 073 076 079 082 : 2 Grippers

E : Non-constant air blow model **085 09 10** : 2 Grippers

11 12 13 : 3 Grippers

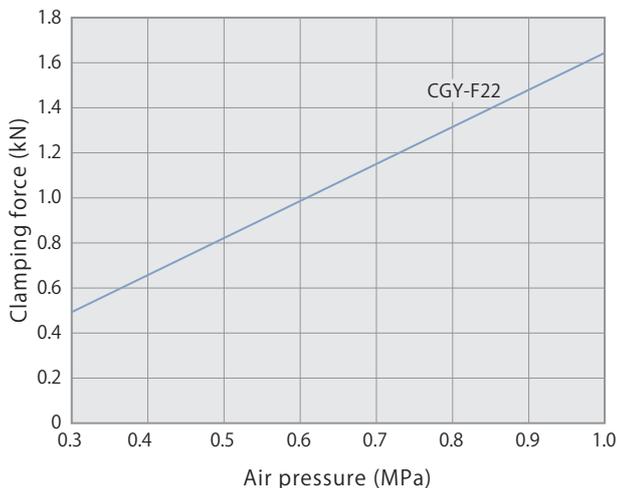
■ indicates made to order.

Model	Size	CGY-F22-						CGY-F22E											
		Grip inner diameter	055	058	061	064	067	070A	070	073	076	079	082	085	09	10	11	12	13
Number of grippers		2 Grippers										3 Grippers							
Clamping force (air pressure 0.5MPa)	kN	0.81																	
Radial expansion force (air pressure 0.5MPa)	kN	2.52					2.81					2.52							
Taper rod stroke	mm	4.0					4.8												
Clamp stroke	mm	1.2																	
Cylinder capacity	Clamp	7.2					8.7												
	Unclamp	8.1					9.7												
Allowable eccentricity*1	mm	±0.3					±0.4												
Recommended air blow pressure	MPa	0.3																	
Recommended sensor air pressure	MPa	0.2																	
Mass	kg	0.61					0.65					0.67			0.68				
Recommended tightening torque of mounting screws*2	N·m	7																	
Workpiece material		Aluminum, steel and others (HRC25 or below). Cast iron are not usable.																	
Allowable min. grip inner diameter	mm	5.2	5.5	5.8	6.1	6.4	6.7	6.7	7.0	7.3	7.6	7.9	8.2	8.7	9.7	10.7	11.7	12.7	
Allowable max. grip inner diameter	mm	5.8	6.1	6.4	6.7	7.0	7.3	7.4	7.7	8.0	8.3	8.6	9.2	9.7	10.7	11.7	12.7	13.7	
Grip inner diameter tapering angle (Draft angle)		3° or below																	
Grip inner diameter circularity		0.1 or below																	

- Pressure range: 0.3–1 MPa (CGY-F22-055, 058, 061, 064, 067, 070A: 0.3–0.8 MPa)
- Proof pressure: 1.5 MPa (CGY-F22-055, 058, 061, 064, 067, 070A: 1.2 MPa)
- Operating temperature: 0–70 °C
- Fluid used: air
- Please inquire if above terms are not applied.

*1: By the eccentric mechanism, the expansion clamp does not have a workpiece positioning function. *2: ISO R898 class 12.9

Clamping force & air pressure



Air pressure	MPa	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Clamping force F=1.617×P	kN	0.49	0.65	0.81	0.97	1.13	1.29	1.46	1.62

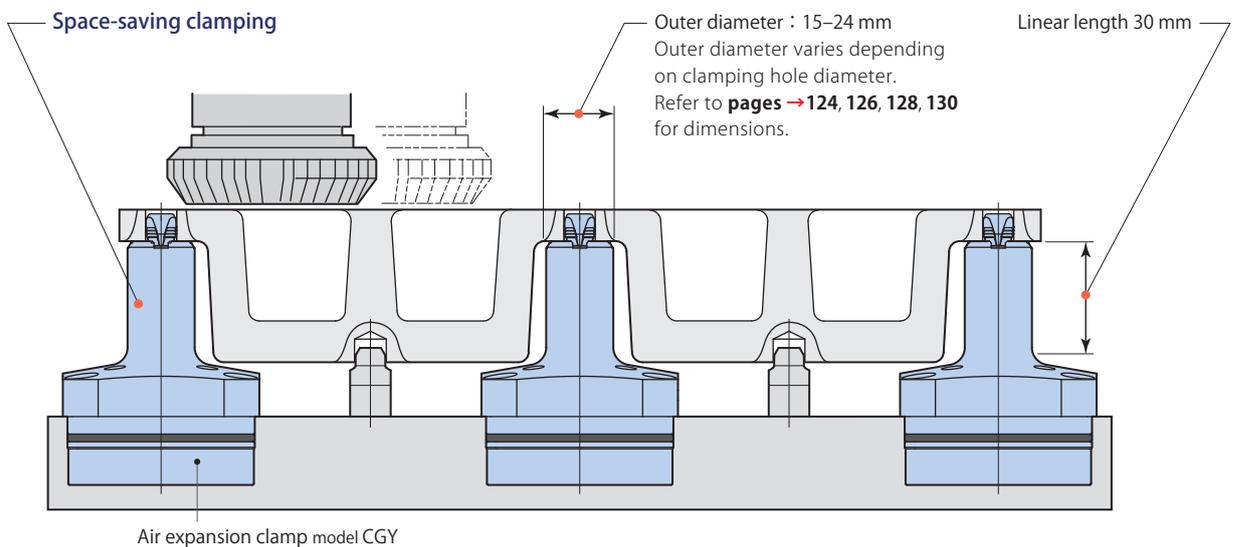
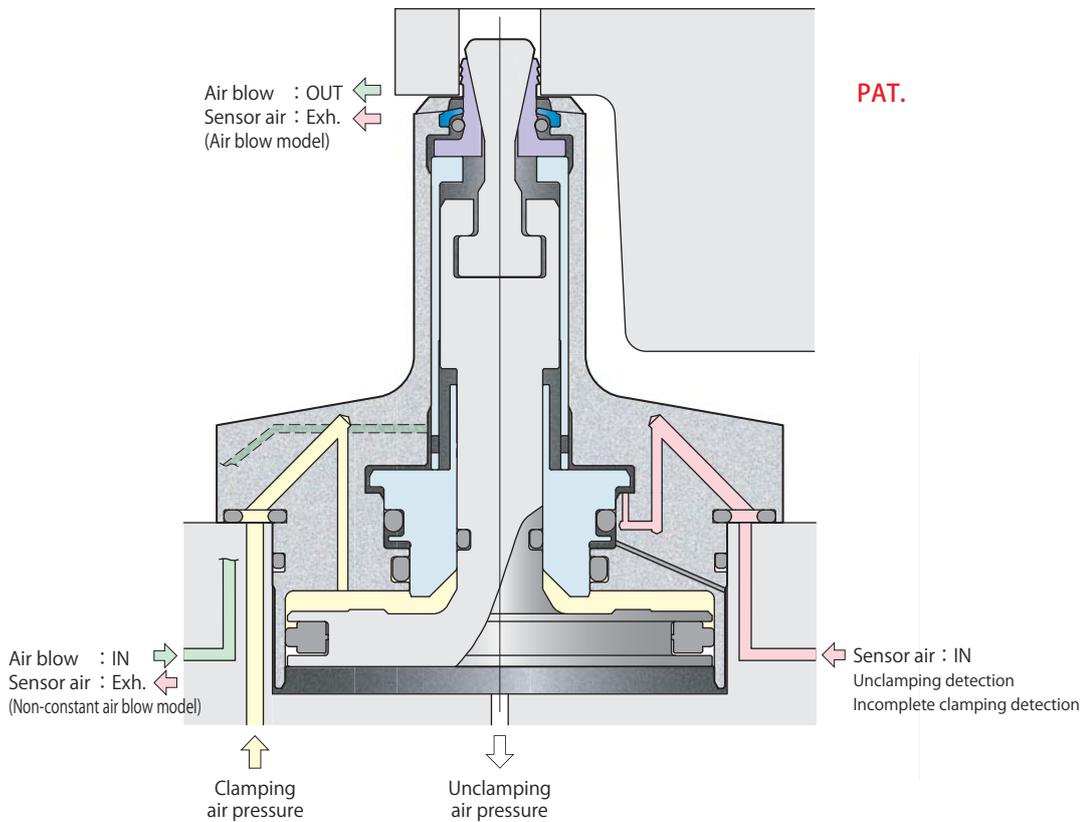
P: Air pressure (MPa)

- CGY-F22-055, 058, 061, 064, 067, 070A applicable air pressure should be 0.3 to 0.8 MPa.

Air blow model
 model **CGY-F22-**
 2 Grippers
 ø5.5 5.8 6.1 6.4 6.7 7.0

Non-constant air blow model
 model **CGY-F22E**
 2 Grippers
 ø7.0 7.3 7.6 7.9 8.2

Non-constant air blow model
 model **CGY-F22E**
 2 Grippers 3 Grippers
 ø8.5 9 10 ø11 12 13

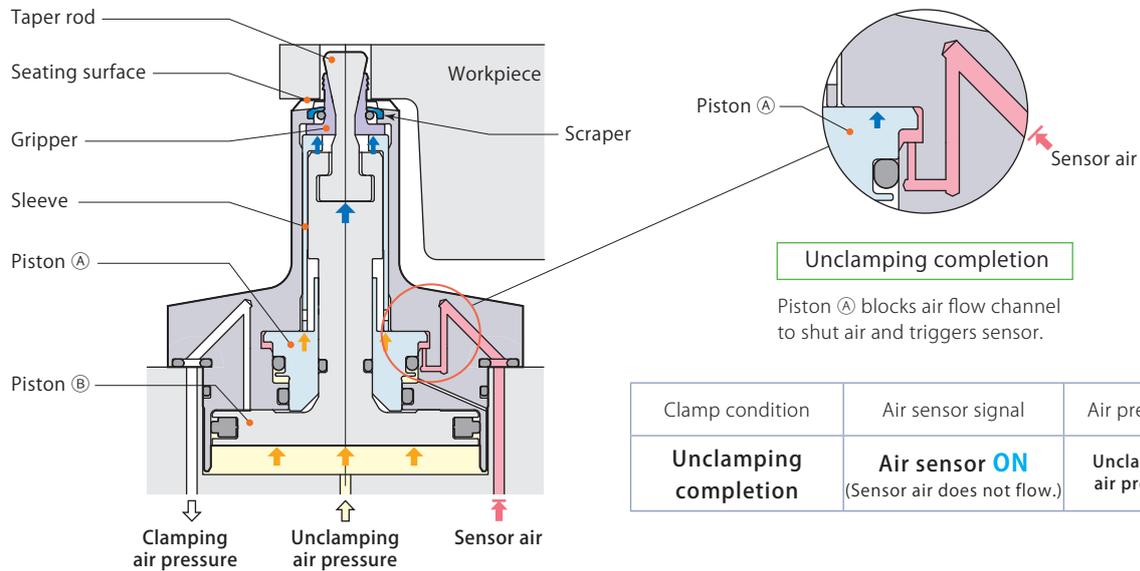


Air expansion clamp

CGY Long neck

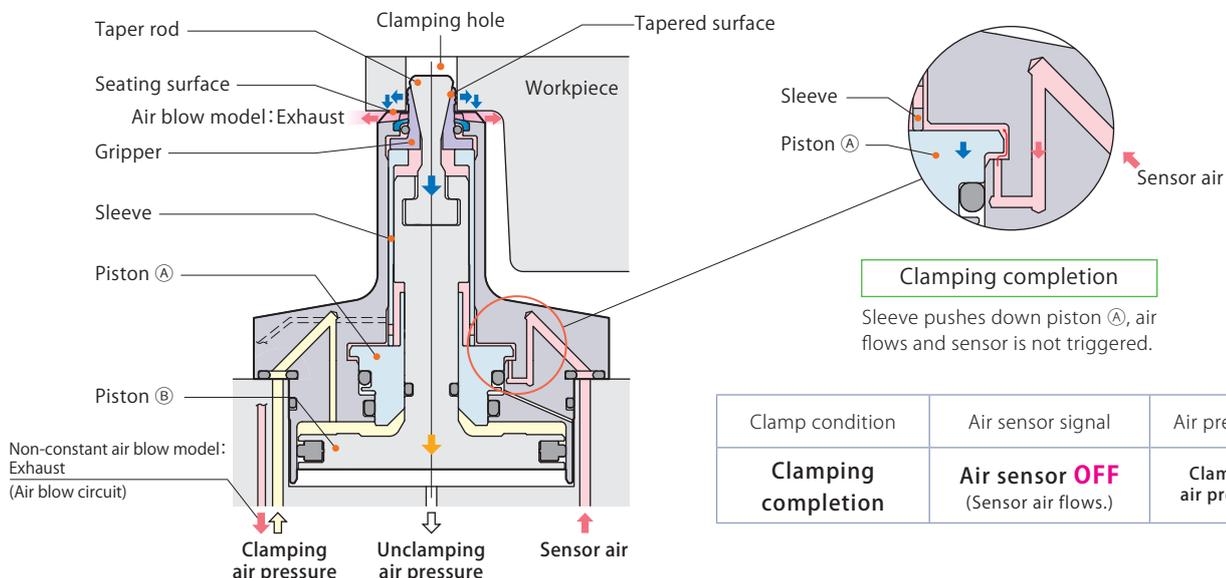
Workpiece setting (Unclamping completion)

- ① Pistons ① & ②, as well as taper rod and gripper are raised by unclamping air pressure.
- ② Workpiece unclamping is completed by the sensor air, clamping and unclamping air pressure.
- ③ Set the workpiece onto the seating surface.



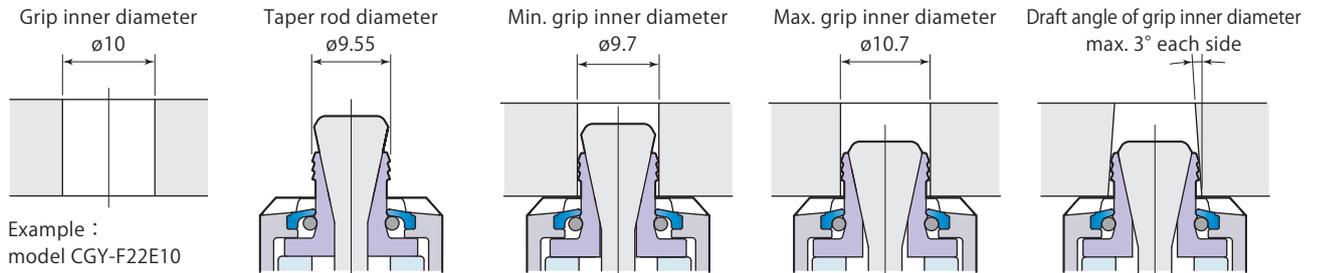
Workpiece holding (Clamping completion)

- ① Piston ② and taper rod are lowered by clamping air pressure after releasing unclamping air pressure.
- ② The gripper expands horizontally along the tapered surface to grip inner face of clamping hole.
- ③ The gripper securely grips the inner face of clamping hole and pulls the workpiece down firmly onto the seating surface.
- ④ Workpiece holding is completed by the sensor air, clamping and unclamping air pressure.



Large gripper expansion stroke

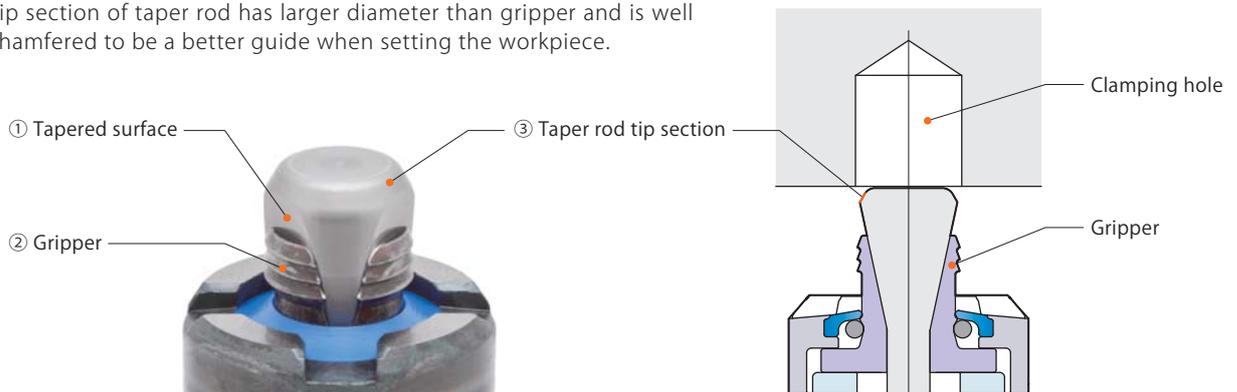
The gripper expands horizontally 1.0mm(*), which enables the accommodation of dimensional variations in diecast bore diameters and ensures workpiece is held securely.



*: 0.6mm stroke for CGY-F22-055, 058, 061, 064, 067, 070A. 0.7mm stroke for CGY-F22E070, 073, 076, 079, 082.

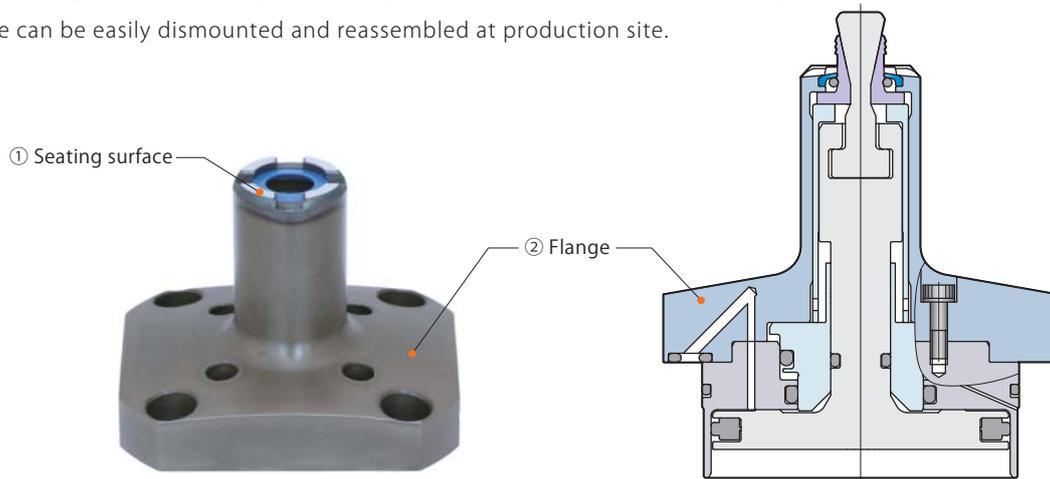
Taper rod and gripper with superior durability

- ① The holding force of expansion clamp is transmitted from tapered surface to gripper, making it possible for the gripper to hold onto inner face of clamping hole and hold the workpiece on the seating surface for secure workpiece clamping.
- ② Special steel with superior abrasion resistance is used for gripper to improve durability.
- ③ Tip section of taper rod has larger diameter than gripper and is well chamfered to be a better guide when setting the workpiece.

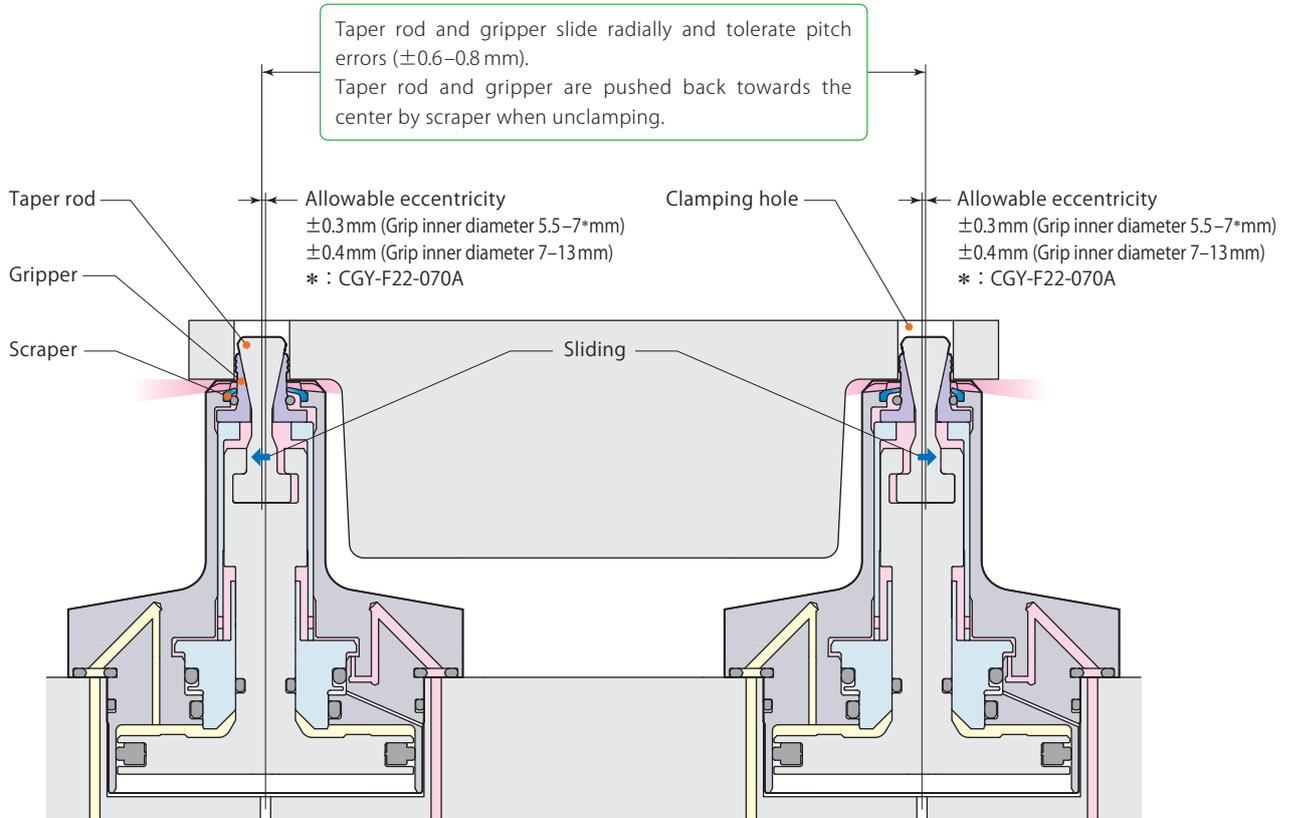


Seating surface can be reground (Max. 0.1 mm)

- ① When seating surface is damaged, the flange section can be dismantled and reground.
- ② Flange can be easily dismantled and reassembled at production site.



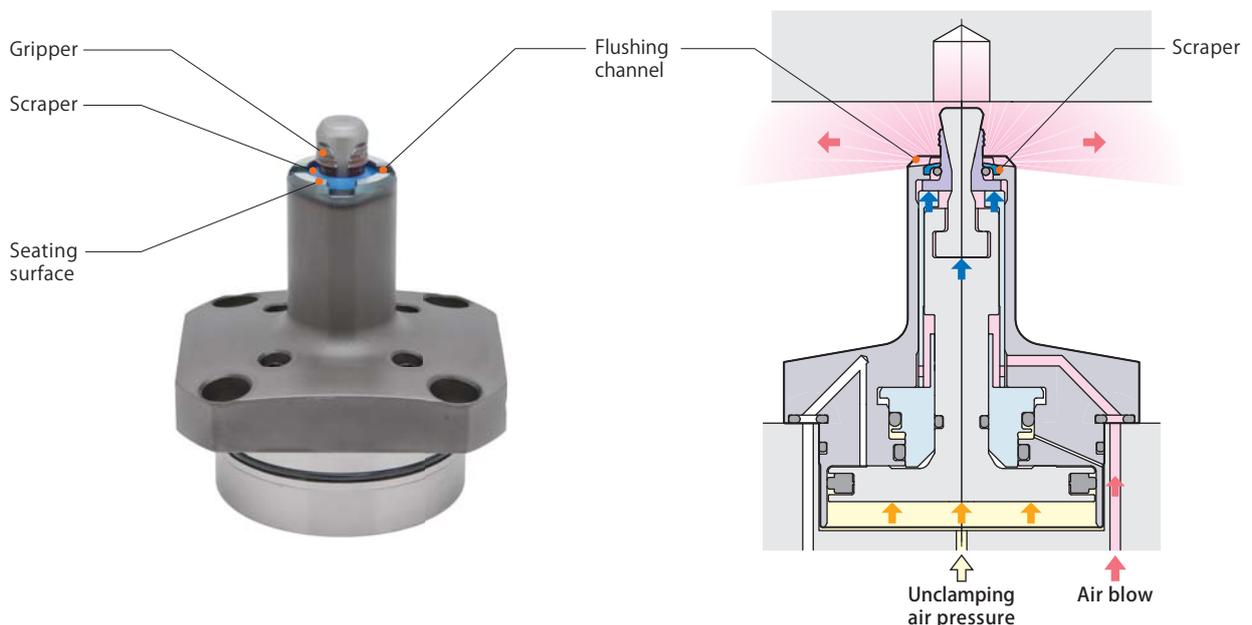
Clamping hole pitch errors can be tolerated



By the eccentric mechanism, the expansion clamp does not have a workpiece positioning function.

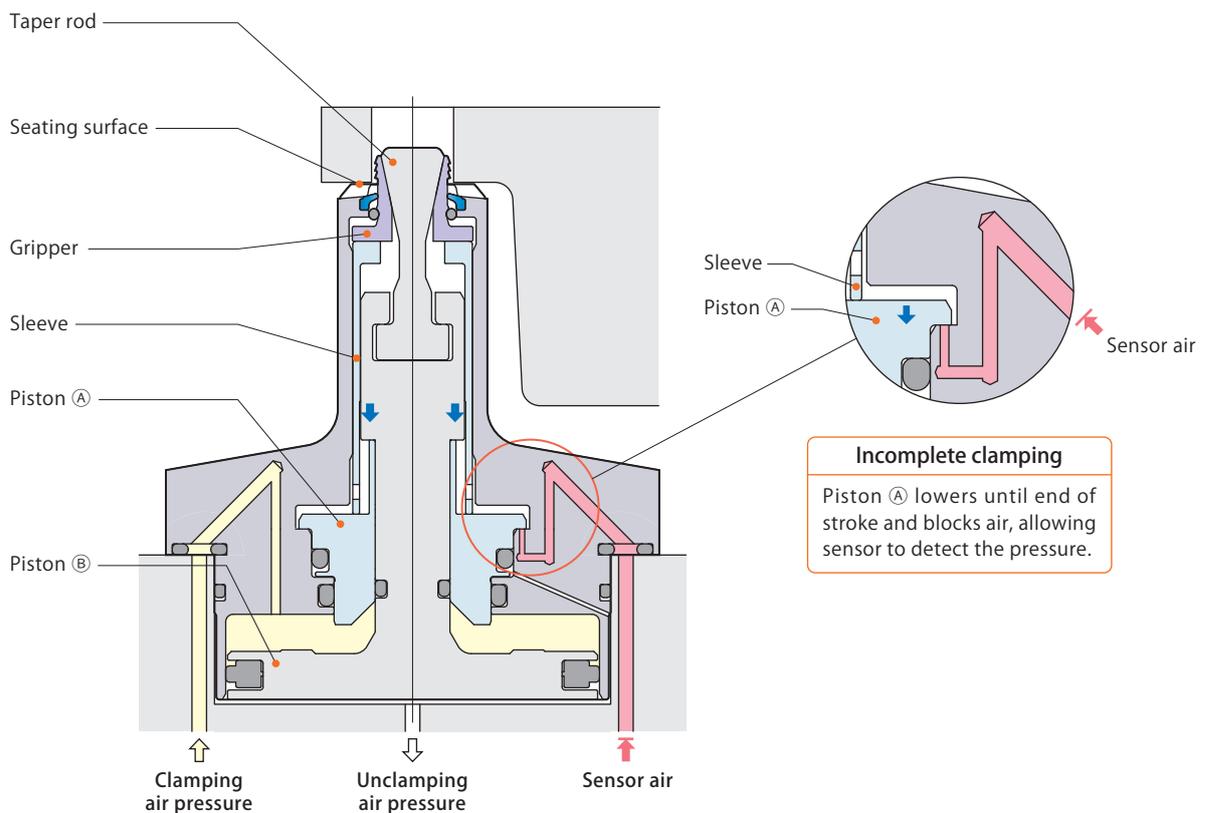
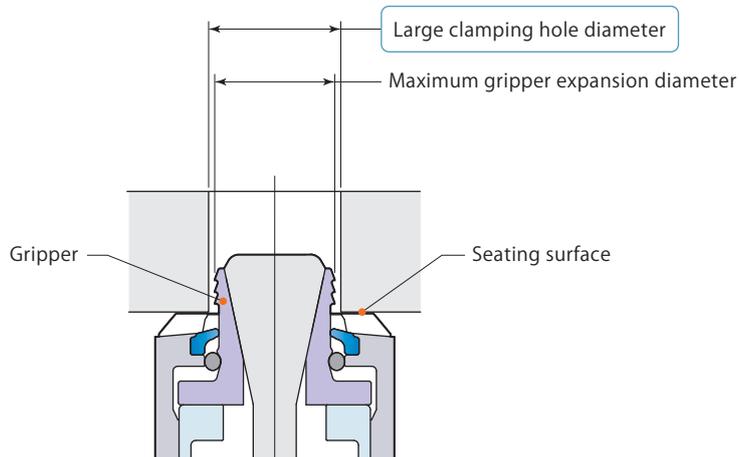
Incorporating strong air blowing circuit

Air blow from a gap between the gripper and scraper clears off metal chips and coolant that stay on the seating surface. Flushing channel is also provided on the seating surface to remove the metal chips and coolants smoothly during workpiece setting.



Detects clamping hole diameter that is too large

When the inner diameter of clamping hole exceeds tolerance value, then gripper will fail to gain grip on workpiece even when extended to maximum reach. Piston ① lowers until end of stroke as it is pushed down by piston ② and blocks sensor air, which triggers air sensor and detects incomplete clamping.

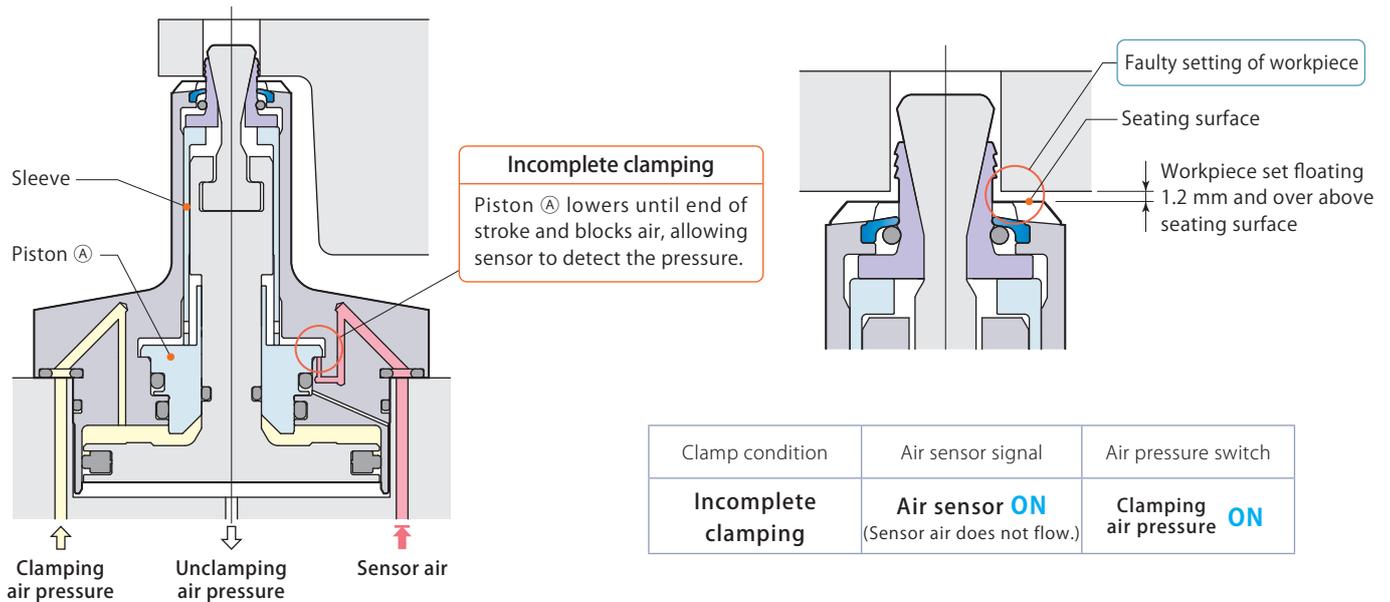


Clamp condition	Air sensor signal	Air pressure switch
Incomplete clamping	Air sensor ON (Sensor air does not flow.)	Clamping air pressure ON

CGY Long neck Air expansion clamp

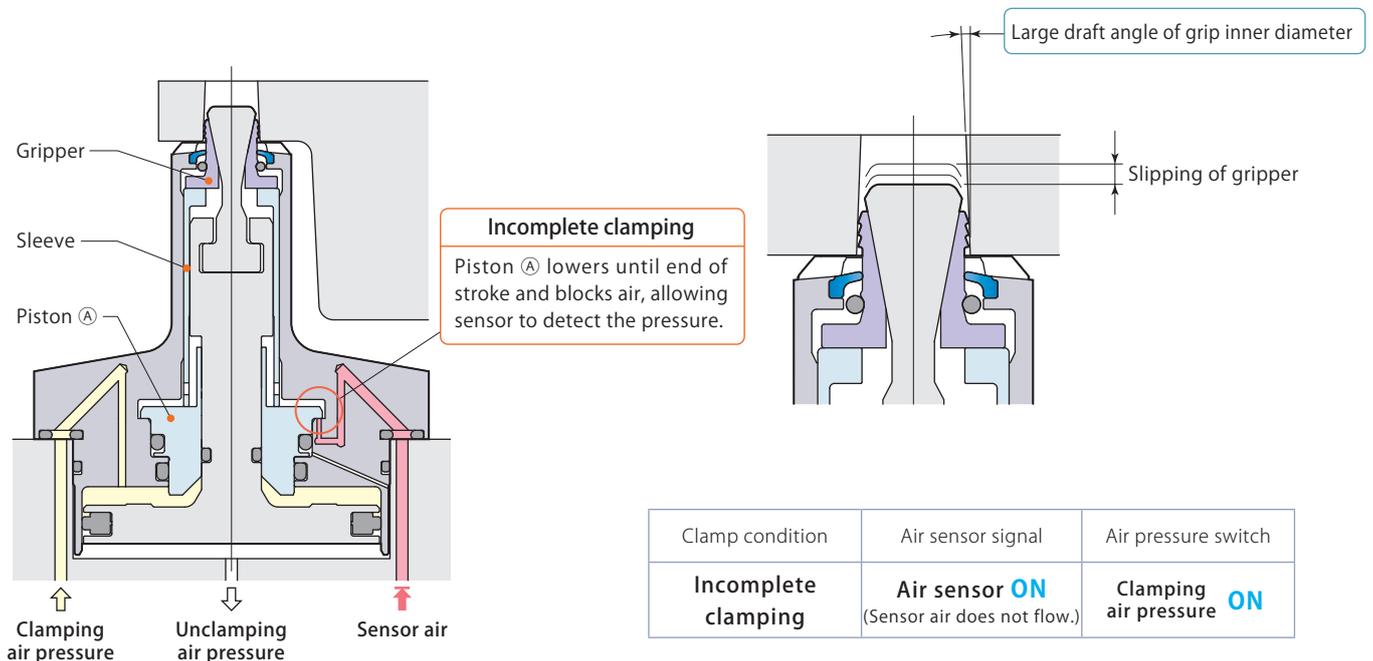
Detects deformation of workpiece and floating of workpiece

When workpiece has significant deformation or when it is set poorly with gap of 1.2 mm above seating surface, then even when the gripper lowers until end of stroke, the workpiece is not held on seating surface. At this time, piston ① lowers until end of stroke as it is pushed down by sleeve and blocks sensor air, which triggers air sensor and detects incomplete clamping.



Detects incomplete gripping

When the inner diameter of clamping hole is slightly larger than allowable value, or when the draft angle of grip inner diameter is large and results in incomplete gripping by the gripper, piston ① lowers until end of stroke as sleeve pushes it down and sensor air is blocked, which triggers air sensor and detects incomplete clamping.



With the development of the non-constant air blow expansion clamp, air consumption will be significantly decreased. The traditional model ordinarily requires 50L/min (0.3MPa) flow rate (when grip inner diameter is $\varnothing 12$). The new model can reduce

Air blow model



Number of grippers	Grip inner diameter	Clamping force	Model
2 Grippers	\varnothing 5.5 5.8 6.1	0.81 kN (Air pressure 0.5MPa)	CGY-F22- <small>Grip inner diameter</small>
	6.4 6.7 7.0		

Non-constant air blow model



Number of grippers	Grip inner diameter	Clamping force	Model
2 Grippers	\varnothing 7.0 7.3 7.6	0.81 kN (Air pressure 0.5MPa)	CGY-F22E- <small>Grip inner diameter</small>
	7.9 8.2		
2 Grippers	\varnothing 8.5 9 10	0.81 kN (Air pressure 0.5MPa)	CGY-F22E- <small>Grip inner diameter</small>



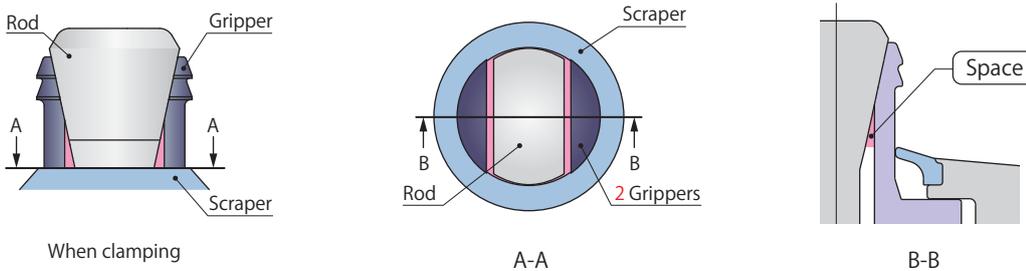
Number of grippers	Grip inner diameter	Clamping force	Model
3 Grippers	\varnothing 11 12 13	0.81 kN (Air pressure 0.5MPa)	CGY-F22E- <small>Grip inner diameter</small>

Air expansion clamp

CGY Long neck

air consumption and help promote energy conservation. However air blow at time of workpiece replacement is a must.

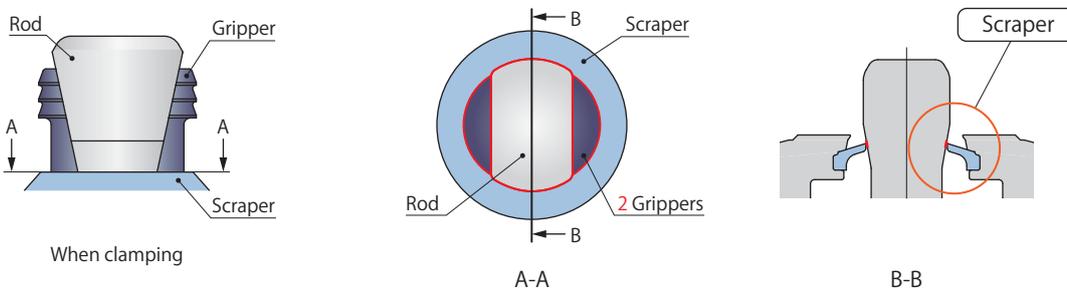
Space where metal chips can intrude is created



Pages → 124, 125

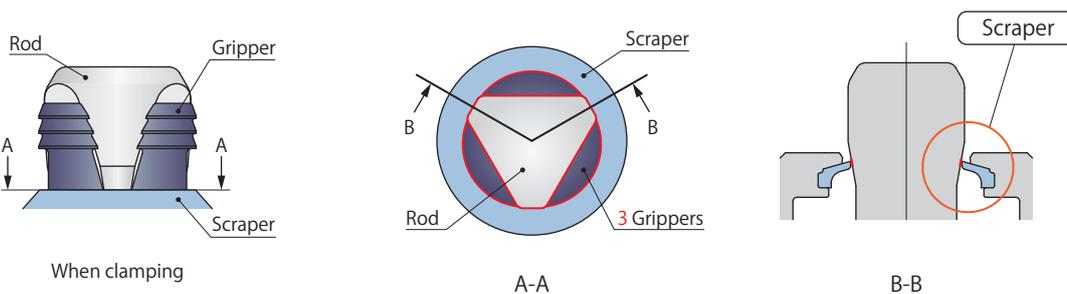
Because of space between scraper, gripper and the rod, air blow must always be performed to prevent intrusion of chips.

Secure chip protection



Pages → 126-129

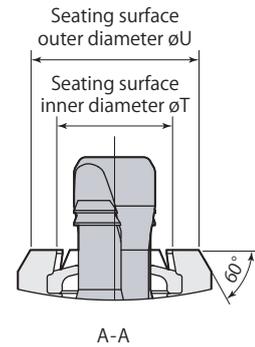
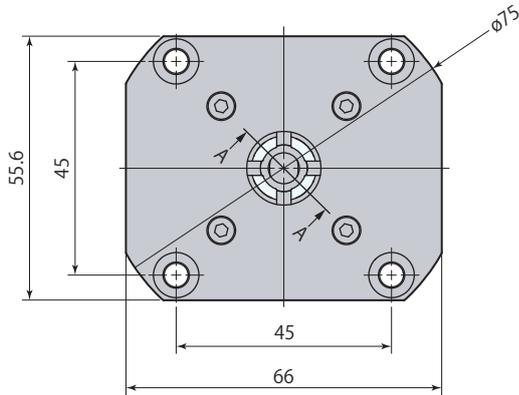
Because there is no space between scraper, gripper and the rod, it is not necessary to perform air blow during cutting process.



Pages → 130, 131

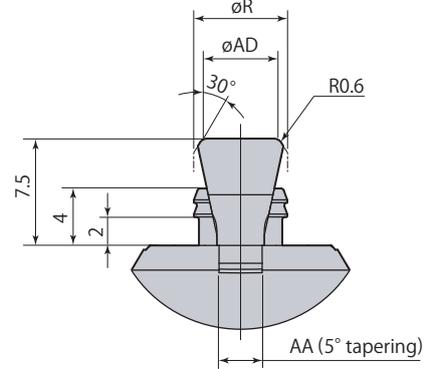
Because there is no space between scraper, gripper and the rod, it is not necessary to perform air blow during cutting process.

Dimensions

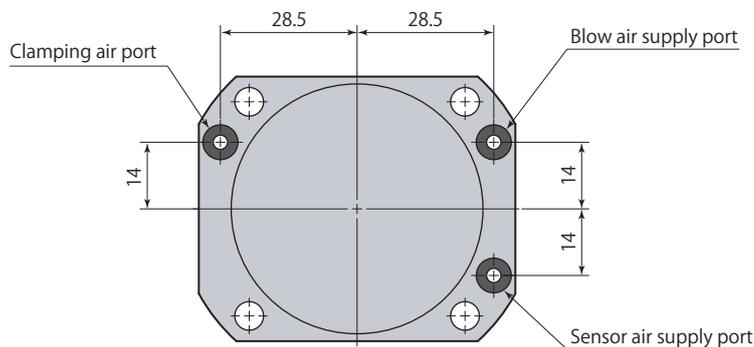
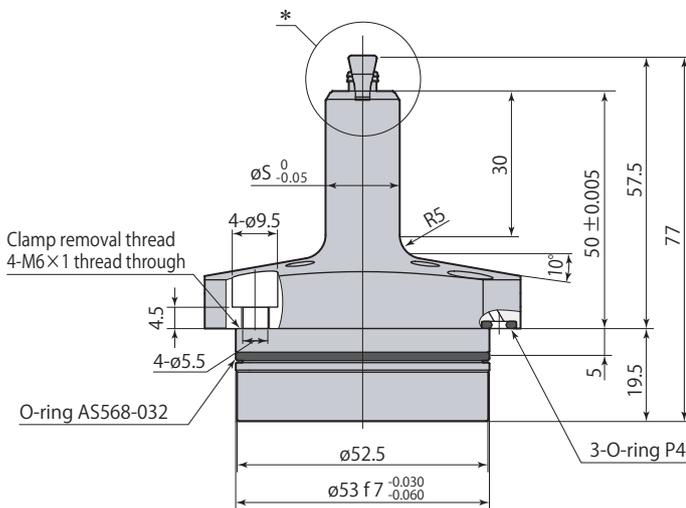
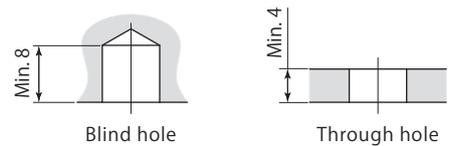


*Details

Rod outer diameter
Gripper outer diameter



Grip inner diameter usage requirements



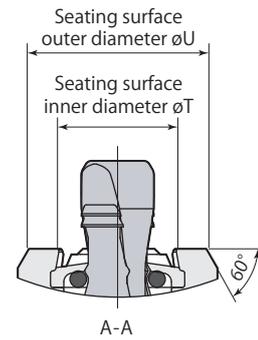
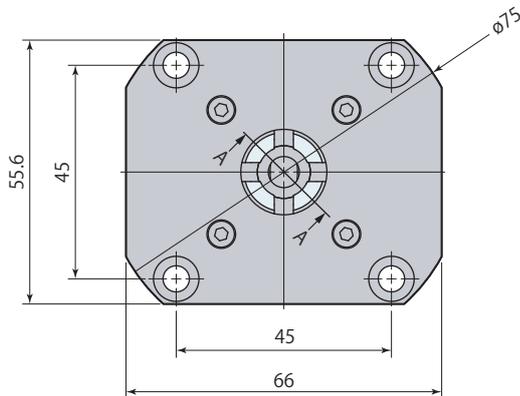
- Mounting screws are not included.
- Material used for O-ring is fluorocarbon (Hardness Hs90).
- Seating surface hardness is HRC55.
- The above diagram indicates unclamped condition.

Model	CGY-F22-□					
	055	058	061	064	067	070A
$\varnothing R$	5	5.3	5.6	5.9	6.2	6.5
$\varnothing S$	15	15	15	15	15	15.5
$\varnothing T$	7.8	8.1	8.4	8.7	9	9.3
U	11	11.6	12.2	12.8	13	13.5
AA	2.5	2.5	3	3	3	3
$\varnothing AD$	3.8	4.1	4.4	4.7	5.0	5.3

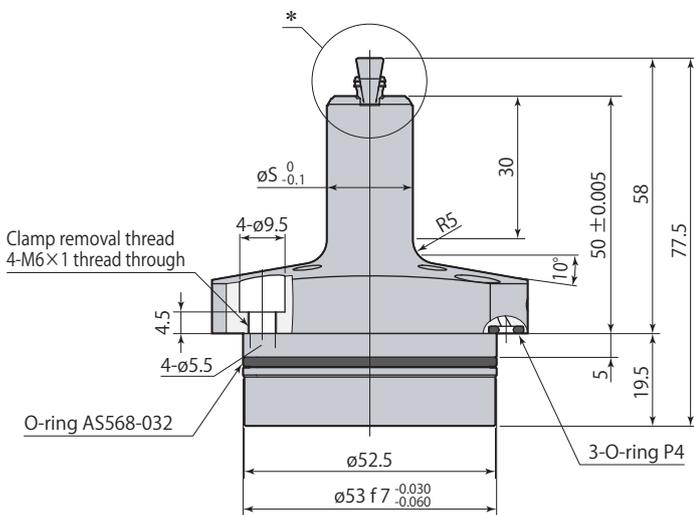
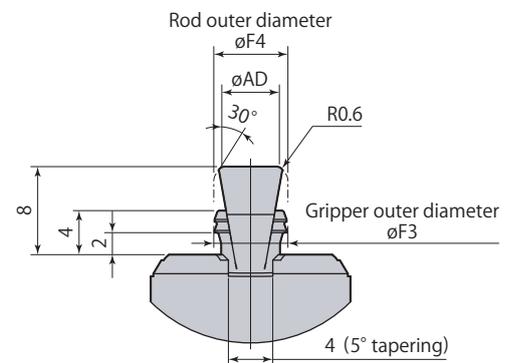
● CGY-F22-055,058,061,064,067,070A are made to order.

Air expansion clamp Air blow model
CGY Long neck

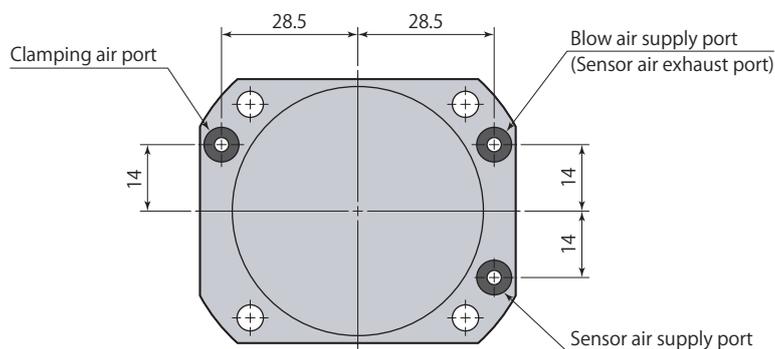
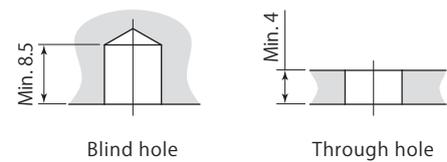
Dimensions



*Details



Grip inner diameter usage requirements

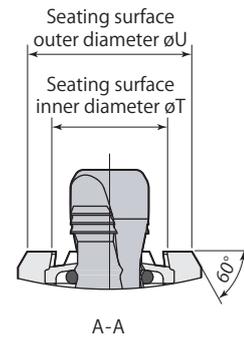
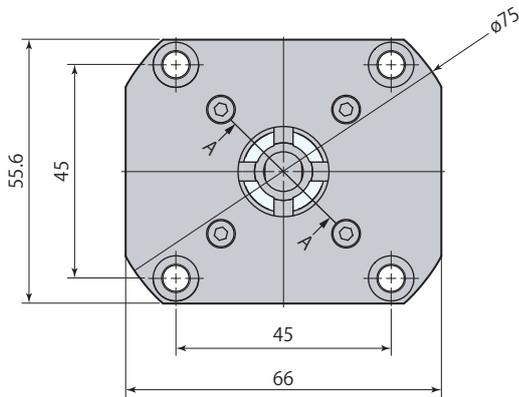


Model	CGY-F22E□				
	070	073	076	079	082
$\phi F3$	6.5	6.8	7.1	7.4	7.7
$\phi F4$	6.55	6.85	7.15	7.45	7.75
ϕS	18	18.3	18.6	18.8	18.8
ϕT	10.6	10.9	11.2	11.5	11.8
ϕU	16	16.3	16.6	16.9	17.2
ϕAD	5.4	5.7	6	6.3	6.6

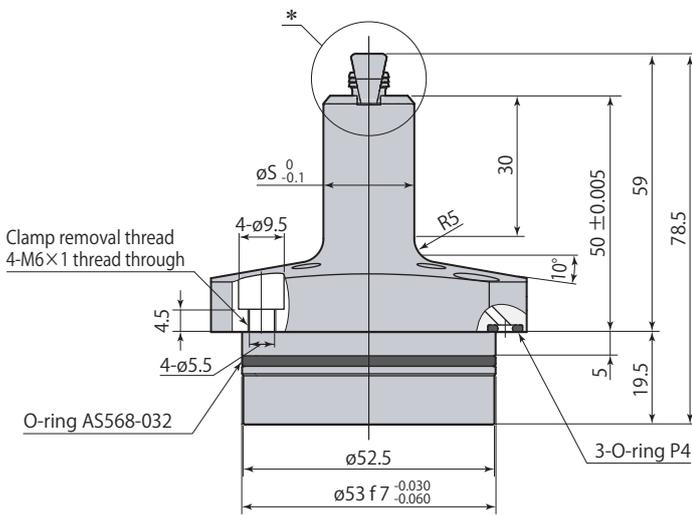
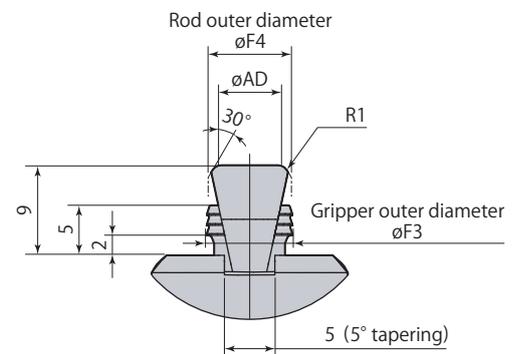
- Mounting screws are not included.
- Material used for O-ring is fluorocarbon (Hardness Hs90).
- Seating surface hardness is HRC55.
- The above diagram indicates unclamped condition.

● CGY-F22E070,073,076,079,082 are made to order.

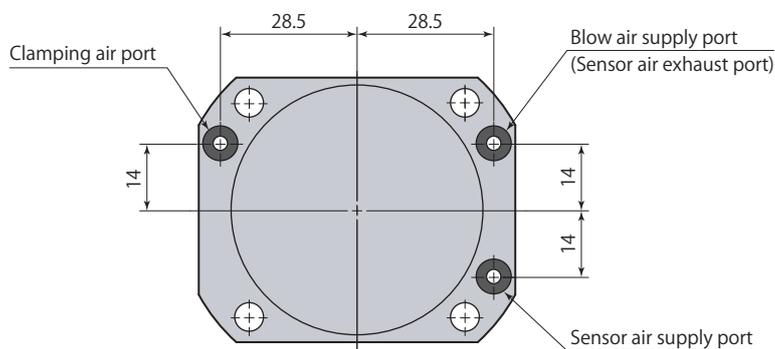
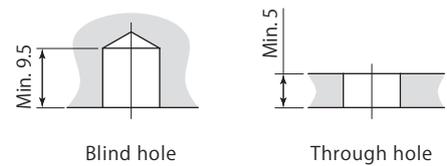
Dimensions



***Details**



Grip inner diameter usage requirements

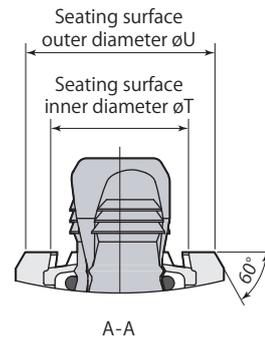
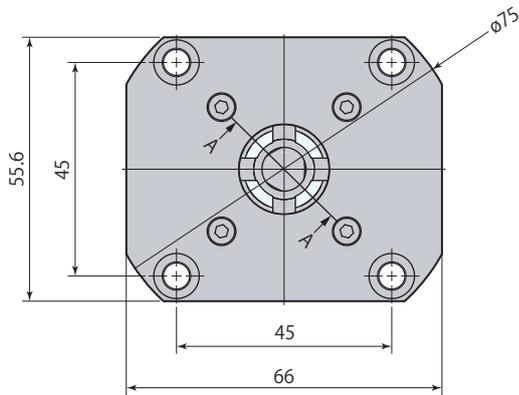


Model	CGY-F22E□		
	085	09	10
$\phi F3$	8	8.5	9.5
$\phi F4$	8.05	8.55	9.55
ϕS	19.5	20	21
ϕT	12.1	12.6	13.6
ϕU	17.5	18	19
ϕAD	6.3	6.8	7.8

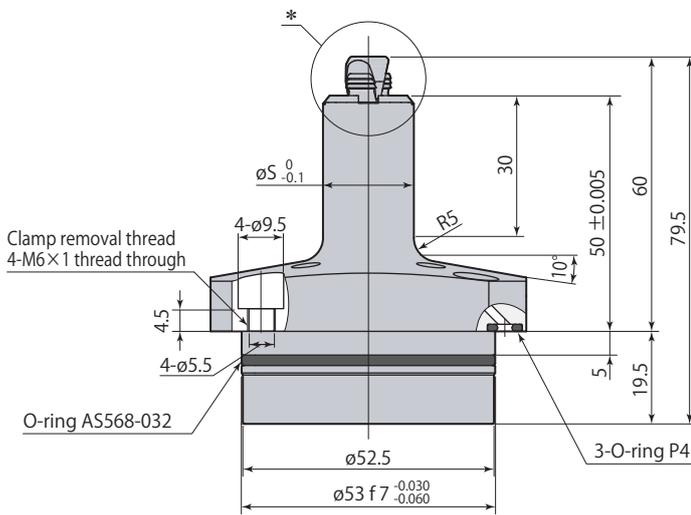
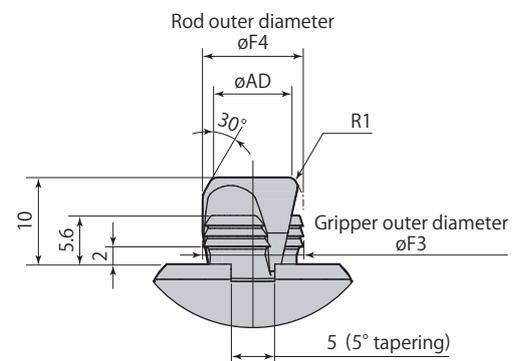
- Mounting screws are not included.
- Material used for O-ring is fluorocarbon (Hardness Hs90).
- Seating surface hardness is HRC55.
- The above diagram indicates unclamped condition.

● CGY-F22E085 is made to order.

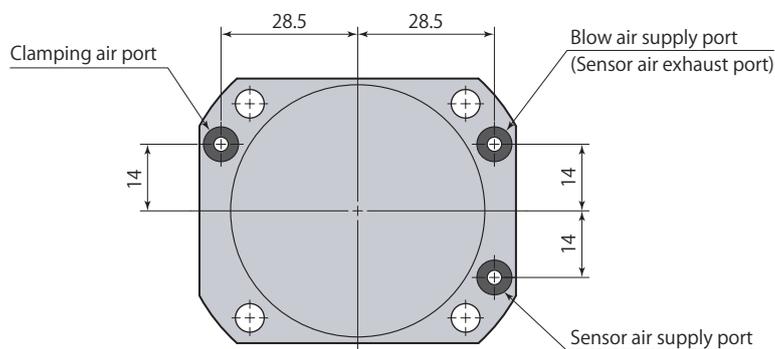
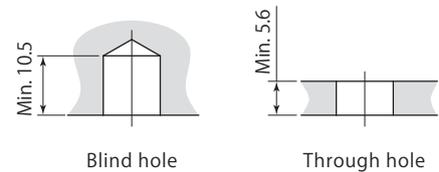
Dimensions



***Details**



Grip inner diameter usage requirements



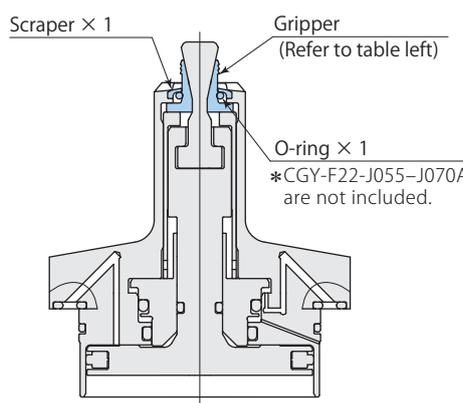
Model	CGY-F22E□		
	11	12	13
øF3	10.5	11.5	12.5
øF4	10.55	11.55	12.55
øS	22	23	24
øT	14.6	15.6	16.6
øU	20	21	22
øAD	8.2	9.2	10.2

- Mounting screws are not included.
- Material used for O-ring is fluorocarbon (Hardness Hs90).
- Seating surface hardness is HRC55.
- The above diagram indicates unclamped condition.

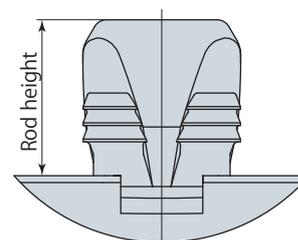
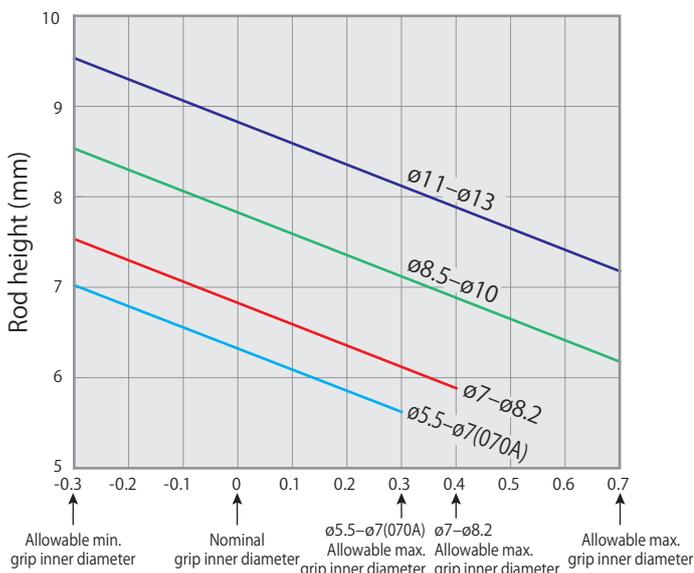
● CGY-F22E11, 12, 13 are made to order.

Air expansion clamp Non-constant air blow model CGY Long neck

Gripper set replacement

Number of grippers	Gripper set model	Clamp model	Set description
2 Grippers	CGY-F22-J055	CGY-F22-055	 <p>It is recommended that grippers, scraper and O-ring be replaced after about 200,000 operations. Replace grippers in sets and not just an individual gripper. (Refer to the table on the left for the gripper set model.)</p>
	CGY-F22-J058	CGY-F22-058	
	CGY-F22-J061	CGY-F22-061	
	CGY-F22-J064	CGY-F22-064	
	CGY-F22-J067	CGY-F22-067	
	CGY-F22-J070A	CGY-F22-070A	
	CGY-F22EJ070	CGY-F22E070	
	CGY-F22EJ073	CGY-F22E073	
	CGY-F22EJ076	CGY-F22E076	
	CGY-F22EJ079	CGY-F22E079	
	CGY-F22EJ082	CGY-F22E082	
	CGY-F22EJ085	CGY-F22E085	
	CGY-F22EJ09	CGY-F22E09	
	CGY-F22EJ10	CGY-F22E10	
3 Grippers	CGY-F22EJ11	CGY-F22E11	
	CGY-F22EJ12	CGY-F22E12	
	CGY-F22EJ13	CGY-F22E13	

Grip inner diameter & rod height when clamping



Rod height calculation formula

- ø5.5- ø7* : $6.32 - 2.35 \times$ Actual grip inner diameter and nominal grip diameter difference
- ø7 - ø8.2 : $6.58 - 2.84 \times$ Actual grip inner diameter and nominal grip diameter difference
- ø8.5- ø10 : $7.82 - 2.35 \times$ Actual grip inner diameter and nominal grip diameter difference
- ø11 - ø13 : $8.82 - 2.35 \times$ Actual grip inner diameter and nominal grip diameter difference

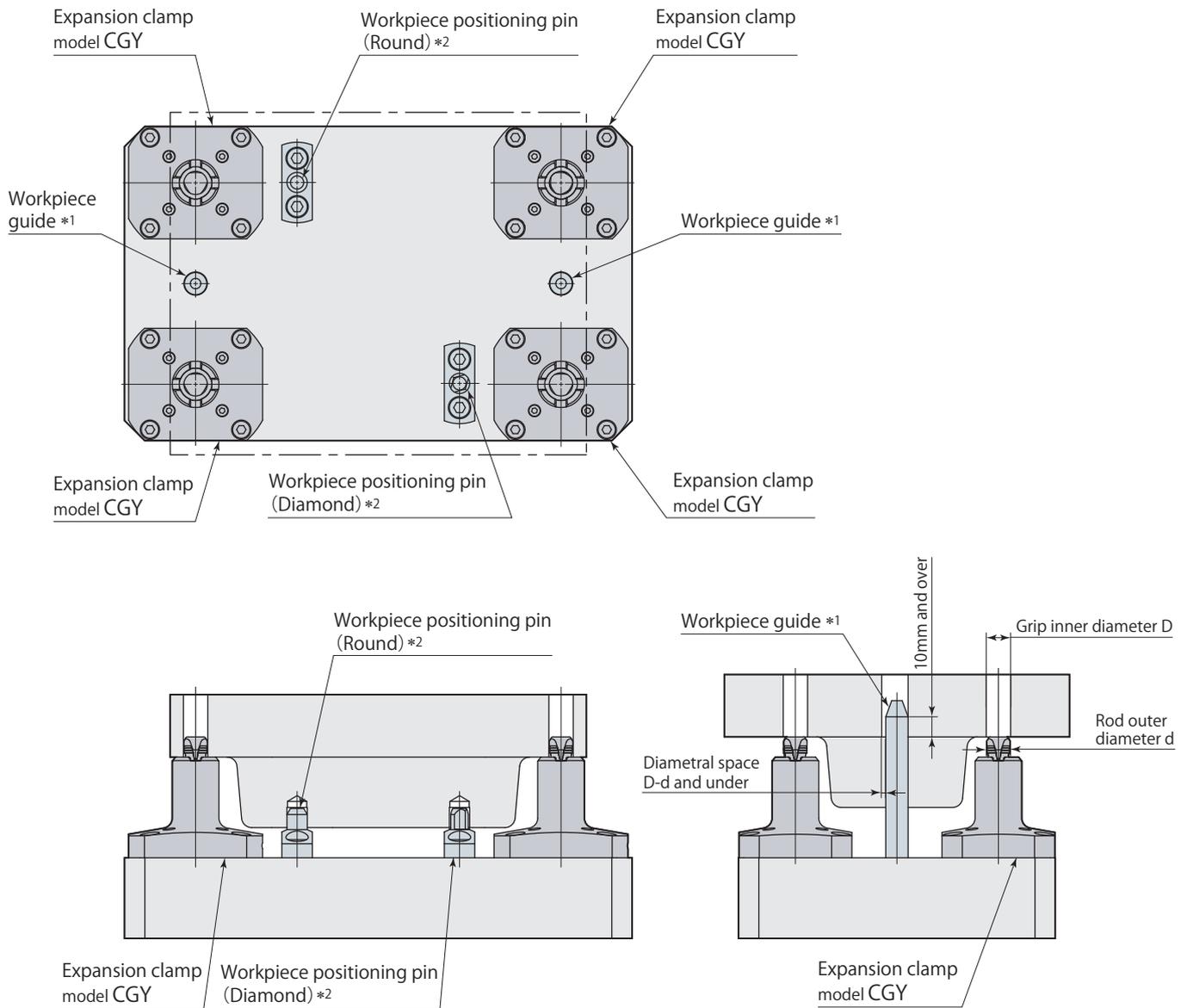
* : CGY-F22-070A

Example: When CGY-F22E10 (Nominal grip diameter : ø10) is clamping ø9.8 hole
 Rod height = $7.82 - 2.35 \times (-0.2) = 8.29\text{mm}$

Difference between actual grip inner diameter and nominal grip diameter (mm)

Air expansion clamp
CGY Long neck

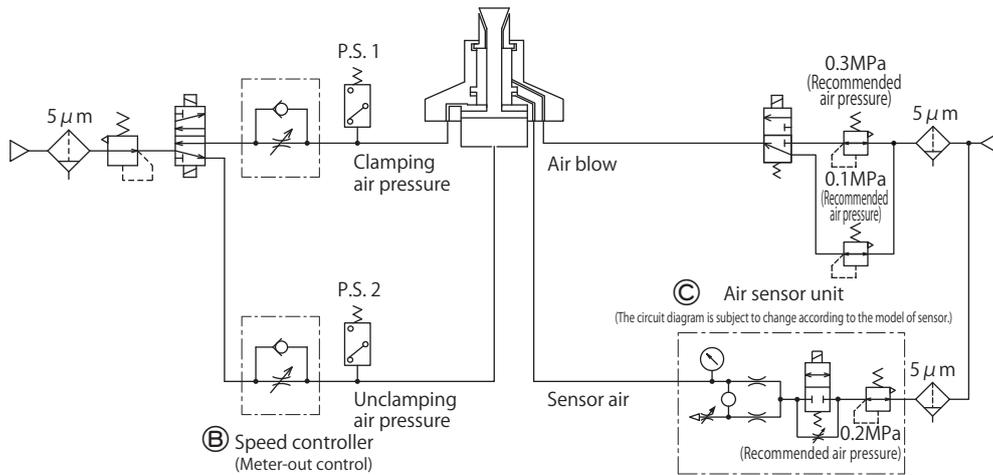
System configuration example



*1: When using automatic or robotic conveyers, prevent damage to clamp caused from impact by setting workpiece guides. Using the above guide as reference, accurately position the holes when using workpiece guides.

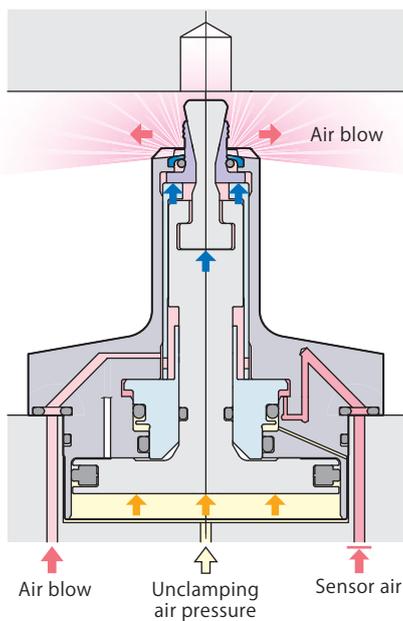
*2: **The expansion clamp does not have a workpiece positioning function.**
Install workpiece positioning pins (or similar).

Air blow model pneumatic circuit diagram

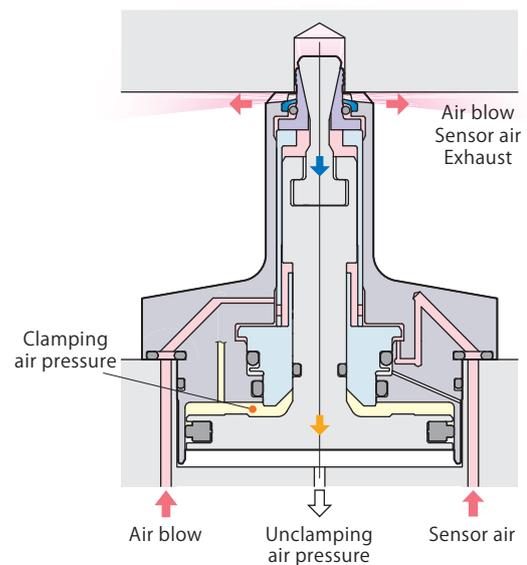


- Be sure to air blow upon loading and unloading workpiece and when clamping and unclamping. During cutting, if chips adhere to the gripper such as when going through the clamping hole, continue air blowing during processing as well.
- Air blow pressure must be set to 0.1MPa when checking the operation of the clamp with the air sensor.

Air blowing

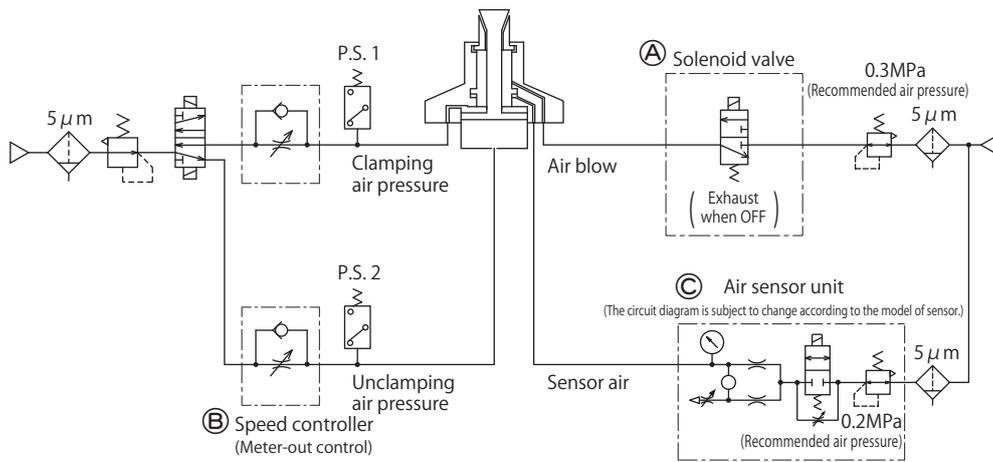


Clamping

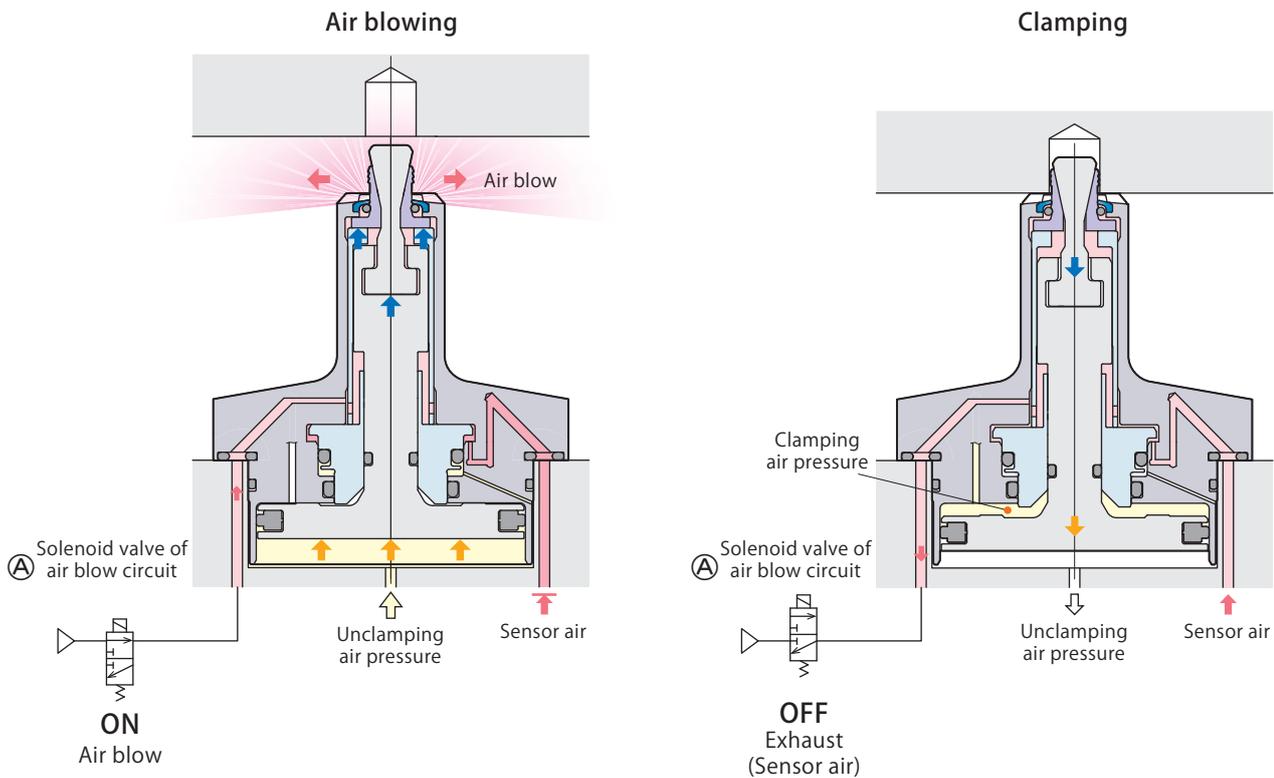


Air expansion clamp
CGY Long neck

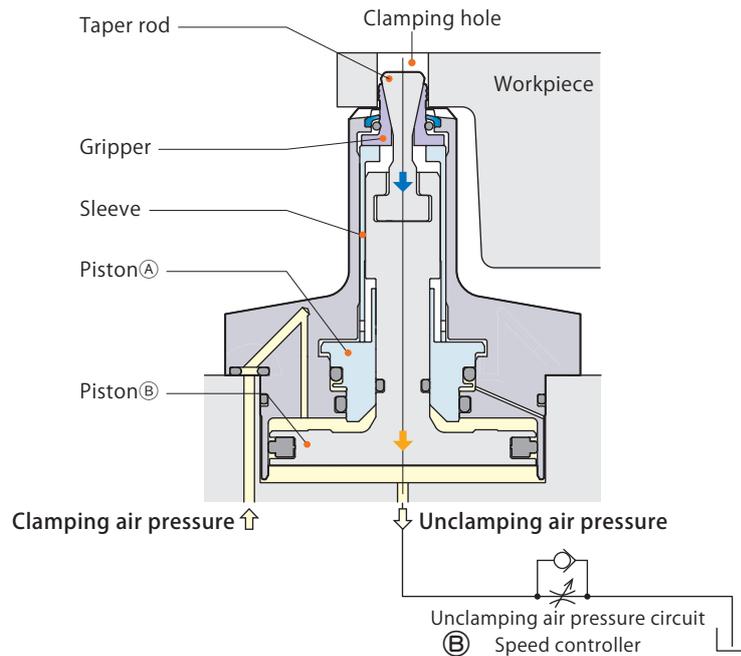
Non-constant air blow model pneumatic circuit diagram



- Air blow will not be necessary during cutting process. Be sure to air blow upon loading and unloading workpiece and when clamping and unclamping to remove metal chips and debris.
- The solenoid valve (A) must be closed when checking the operation of the clamp with the air sensor. Also 3 port type of solenoid valve must be used in the circuit. If 2 port type of the valve is used, sensing air cannot be exhausted and clamp detection function is disabled.



- Operation speed must be adjusted by a meter-out type speed controller ⑥ being provided in the unclamping circuit. By the adjustment, air flow in unclamping circuit is squeezed and back pressure is generated. The back pressure acts on the piston ④ of the clamp and makes the gripper expand first then the taper rod strokes down to clamp. If meter-in type speed controller is installed in the circuit, it dumps the air rapidly and makes the gripper move very quick which causes incomplete clamping.
- Adjust air flow when clamping to have the taper rod full stroke in 0.3 sec or over. Excessive air flow to the clamp gives impact load and may cause breakage of the parts.



Air sensor unit ③ recommended condition of use

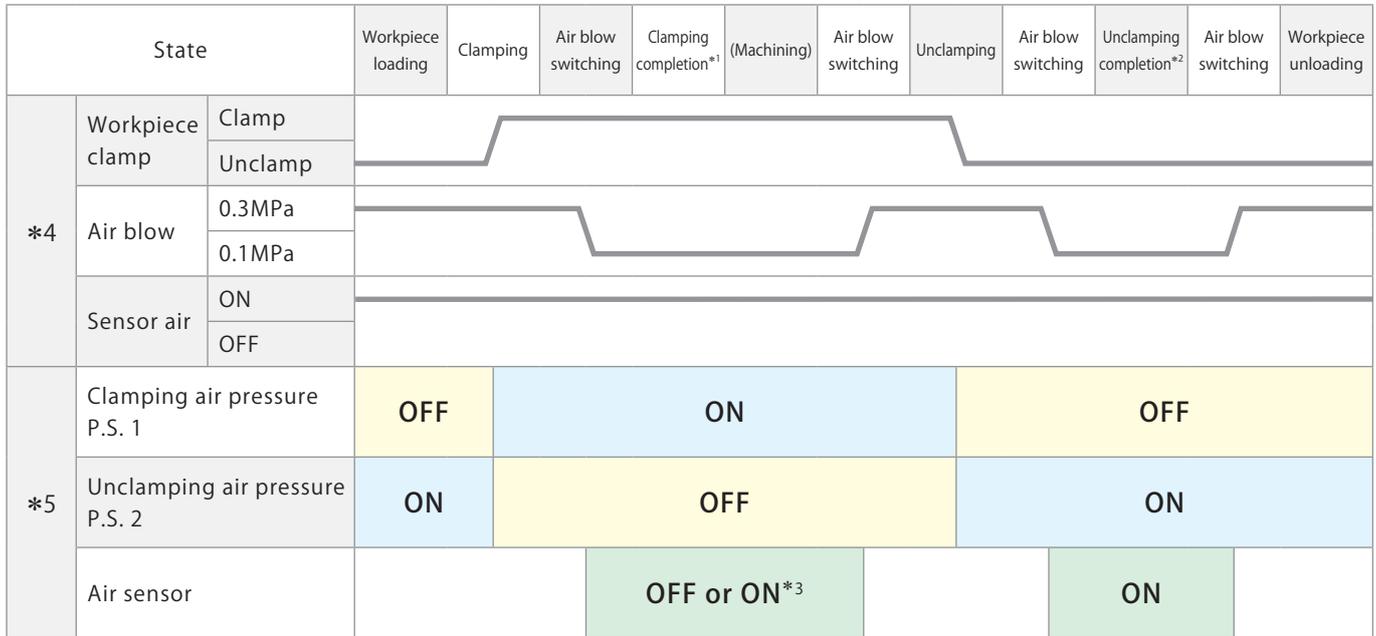
Supplier and model	ISA3-F/G series manufactured by SMC
	GPS2-05, GPS3-E series manufactured by CKD
Air supply pressure	0.2 MPa
Inner diameter of piping	ø4 mm (ISA3-F: ø2.5 mm)
Overall piping length	5 m or less

- Use a solenoid valve with needle for air sensor unit ③ 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 made successfully as designed when it is used out of the usage shown on the left. Contact Technical service center for more details.

Operation cycle

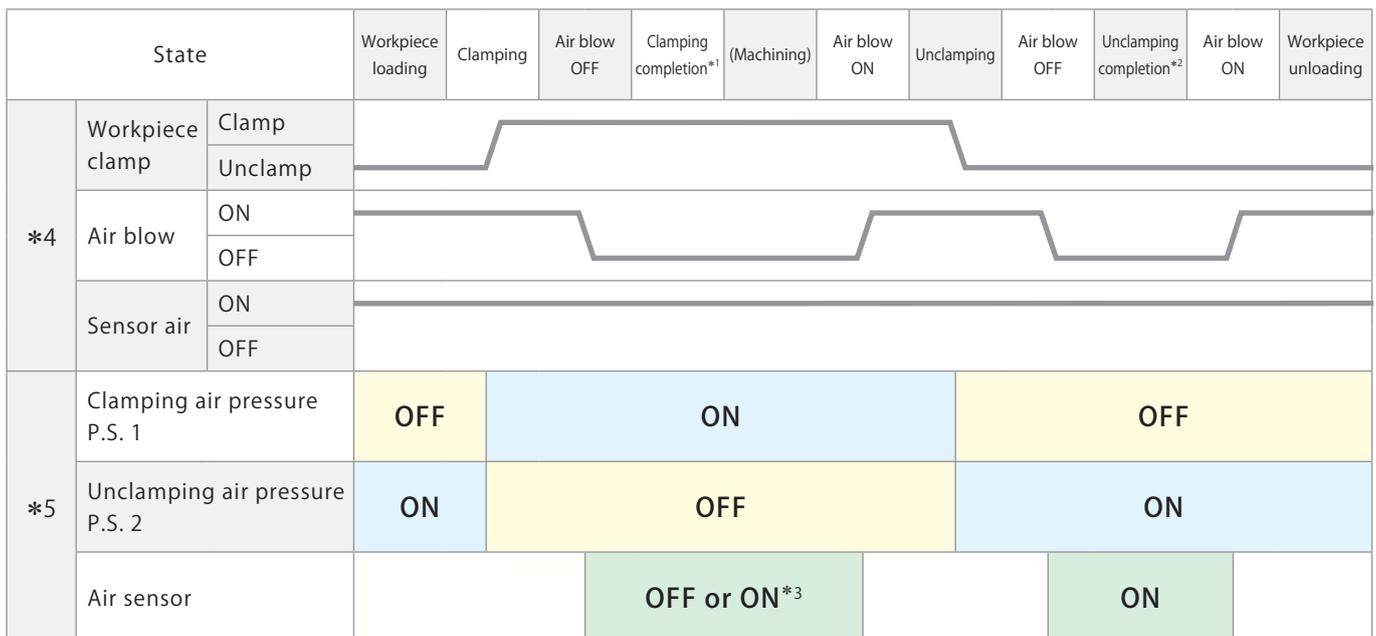
The clamp should be controlled with the cycle in the diagram shown below to detect the operation status exactly.

Case of air blow model



- *1 : Clamping completion : P.S. 1=ON P.S. 2=OFF Air sensor=OFF
- *2 : Unclamping completion : P.S. 1=OFF P.S. 2=ON Air sensor=ON
- *3 : OFF : Complete clamping ON : Incomplete clamping
- *4 : Solenoid valve control *5 : Air pressure switch, Air sensor signal

Case of non-constant air blow model



- *1 : Clamping completion : P.S. 1=ON P.S. 2=OFF Air sensor=OFF
- *2 : Unclamping completion : P.S. 1=OFF P.S. 2=ON Air sensor=ON
- *3 : OFF : Complete clamping ON : Incomplete clamping
- *4 : Solenoid valve control *5 : Air pressure switch, Air sensor signal

Caution in use

- Be sure to make inner diameter of air blow circuit 4 mm and over except for clamp mounting surface.
- Set the workpiece in such a way that the clamping hole of workpiece is perpendicular to seating surface. Clamping in tilted condition results in uneven contact of gripper with hole, which leads to concentration of load that may cause damage.
- Verify that there are no metal chips or debris on seating surface of clamping hole and clamp body before setting workpiece. Allowing intrusion of metal chips results in insecure clamping, which can lead to low grade of machining accuracy.
- Flaring (Biting) of gripper into workpiece varies depending on workpiece material or thermal processing conditions. With regards to conditions of workpiece and clamping hole, refer to **page →115**. Secure clamping is not possible when workpiece or clamping hole that does not satisfy these conditions is used.
- If clamping hole serves as taper hole (cast draft hole with gradient), then perform test clamping using applicable workpiece beforehand to verify that there are no problems with operations.
- Deformation may occur if the thickness of clamping hole section of workpiece is extremely thin. Use applicable workpiece to perform test clamping beforehand to verify that there are no deformations in thin portion.
- Supply the dry and filtered air. Particulate size 5 μm or less is recommended.
- Measure seating surface flatness with air pressure applied on clamping side, or by applying air pressure on neither clamping nor unclamping side.
- Perform unclamping completion detection, clamping completion detection and incomplete clamping detection with combination actions of pressure switch and sensor shown in table below. (Refer to the pneumatic circuit diagram on **page →134, 135** for details.)

Applications	Pressure switch 1 (P.S. 1)	Pressure switch 2 (P.S. 2)	Air sensor
Unclamping completion detection	OFF	ON	ON
Clamping completion detection	ON	OFF	OFF
Incomplete clamping detection	ON	OFF	ON