Pascal

air expansion X clamp

double acting

air Double acting model CGX

Pascal

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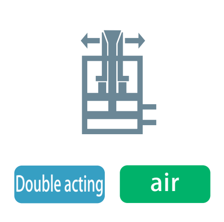
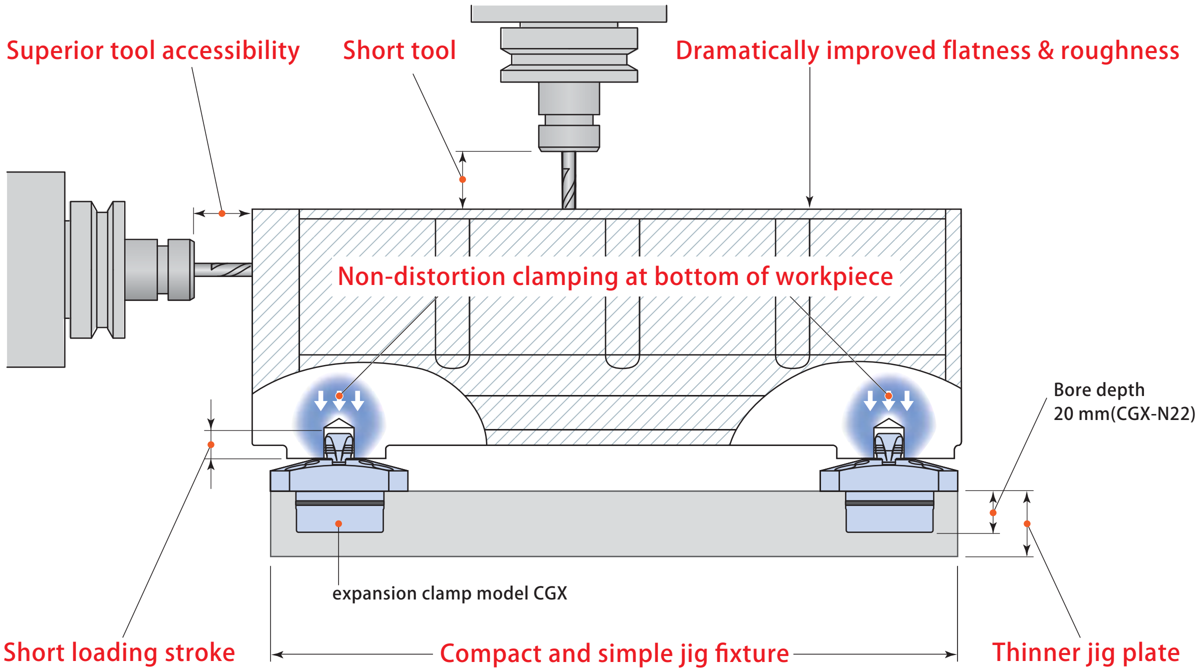
air
Expansion clamp

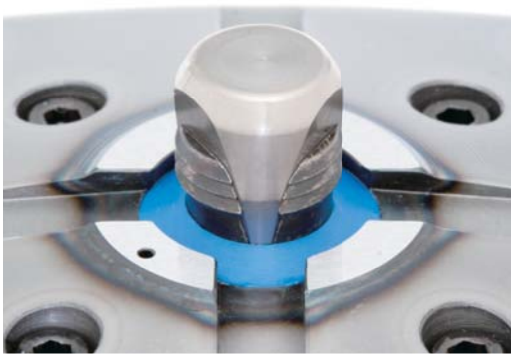
model
CGX

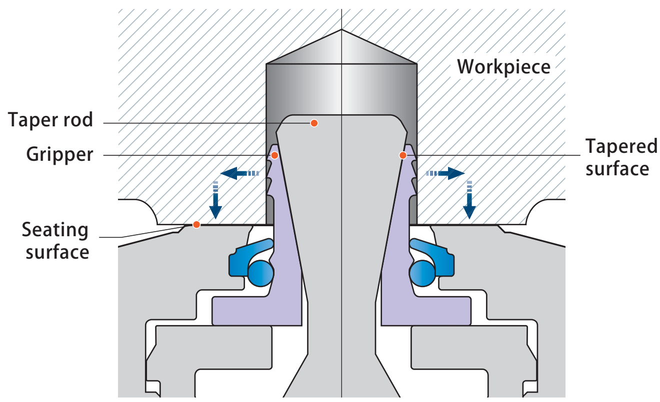


Outstanding tool accessibility



The expansion clamp holds firmly the clamping hole at the bottom of workpiece and clamps it firmly down to the seating surface by utilizing taper rod and tapered surface of gripper. Clamping force is transmitted directly to seating surface and holds workpiece in place firmly without any distortion or deflection, making high grade and stable machining possible.

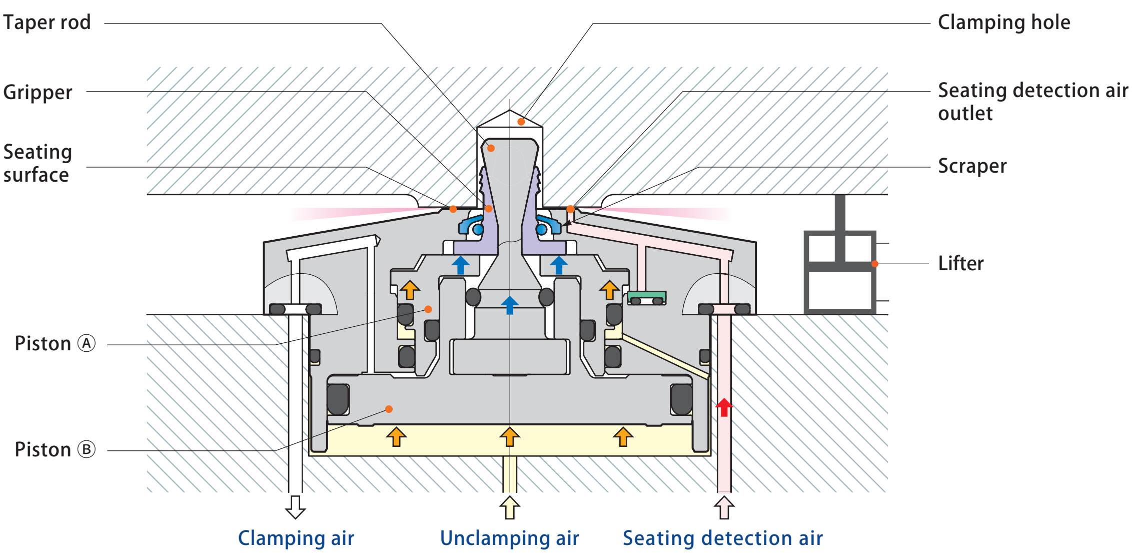




Workpiece setting

① Pistons Ⓐ & Ⓑ, as well as taper rod and gripper are raised by unclamping air.

② Set the workpiece onto the seating surface. In order detect if actual unclamping has occurred using the air sensor, allow air needed to confirm seating to flow by using cylinder (or similar) to lift work up during unclamping.



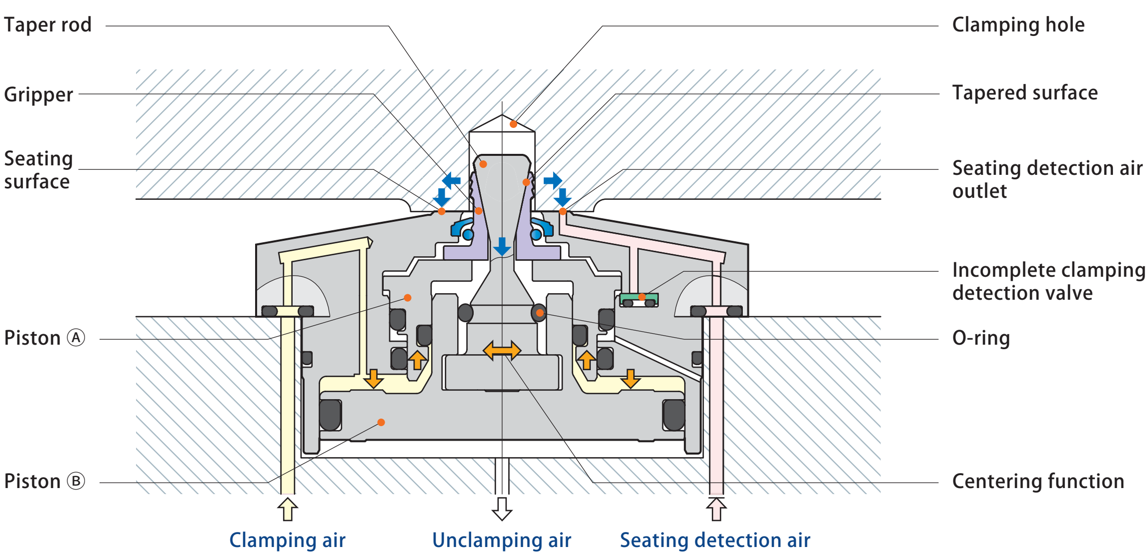
Workpiece holding

① Release unclamping air and apply clamping air pressure. Piston Ⓐ will remain in upright position as piston Ⓑ and taper rod are lowered.

② As piston Ⓐ remains in upright position, the gripper is expanded horizontally along the tapered surface of the taper rod to grip clamping holes.

③ The gripper securely grips the internal face of the clamping holes and pulls the workpiece down firmly onto the seating surface.

④ Workpiece holding is completed by the seating detection air sensor, clamping and unclamping air pressure.



Detects deformation of workpiece and floating of workpiece resulting in faulty setting

When workpiece has significant deformation or when it is set poorly with space of 1.2 mm above seating surface (Figure 1-a) or when metal chips are caught by clamp (Figure 1-b), the workpiece is not held on seating surface and air sensor is unable to detect seating and this confirms incomplete clamping.

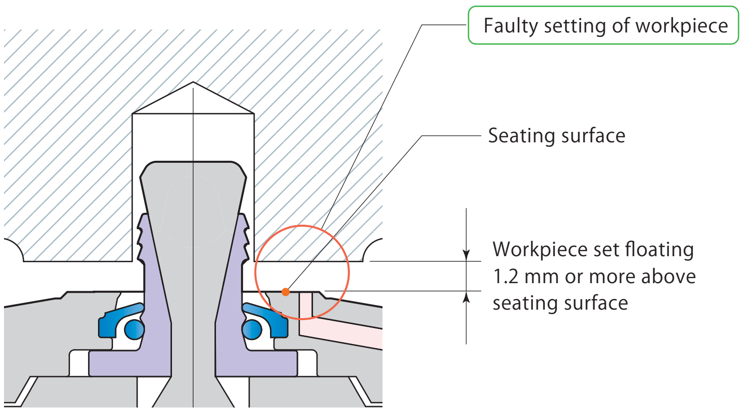


Figure 1-a

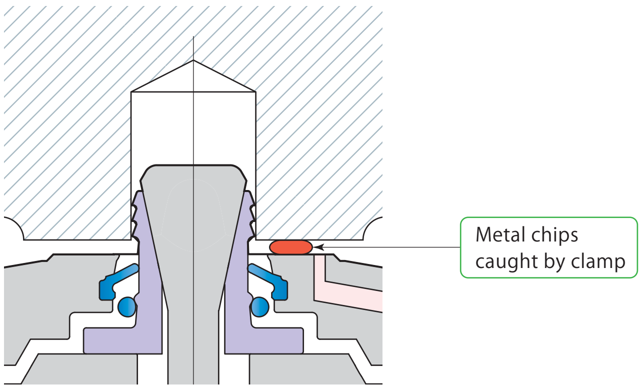
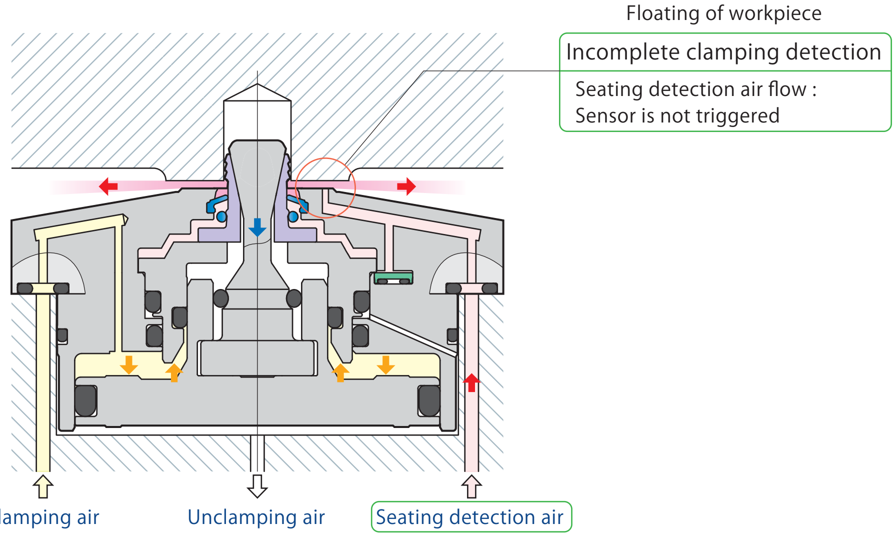


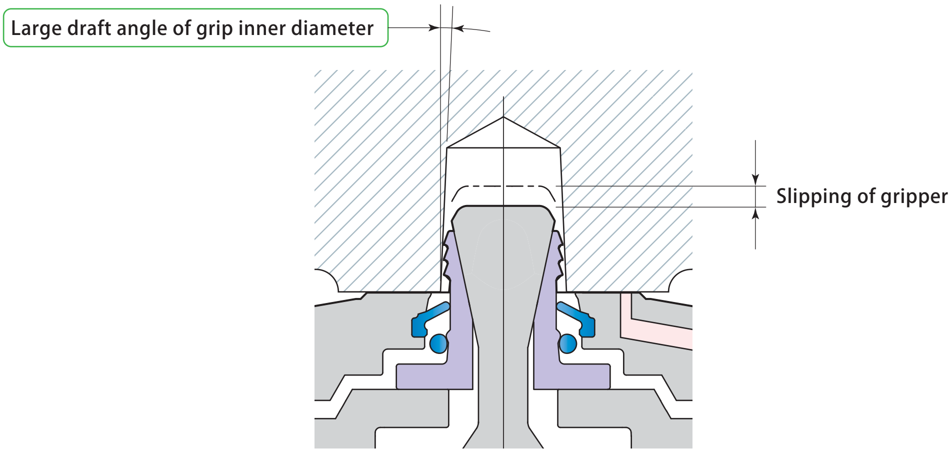
Figure 1-b

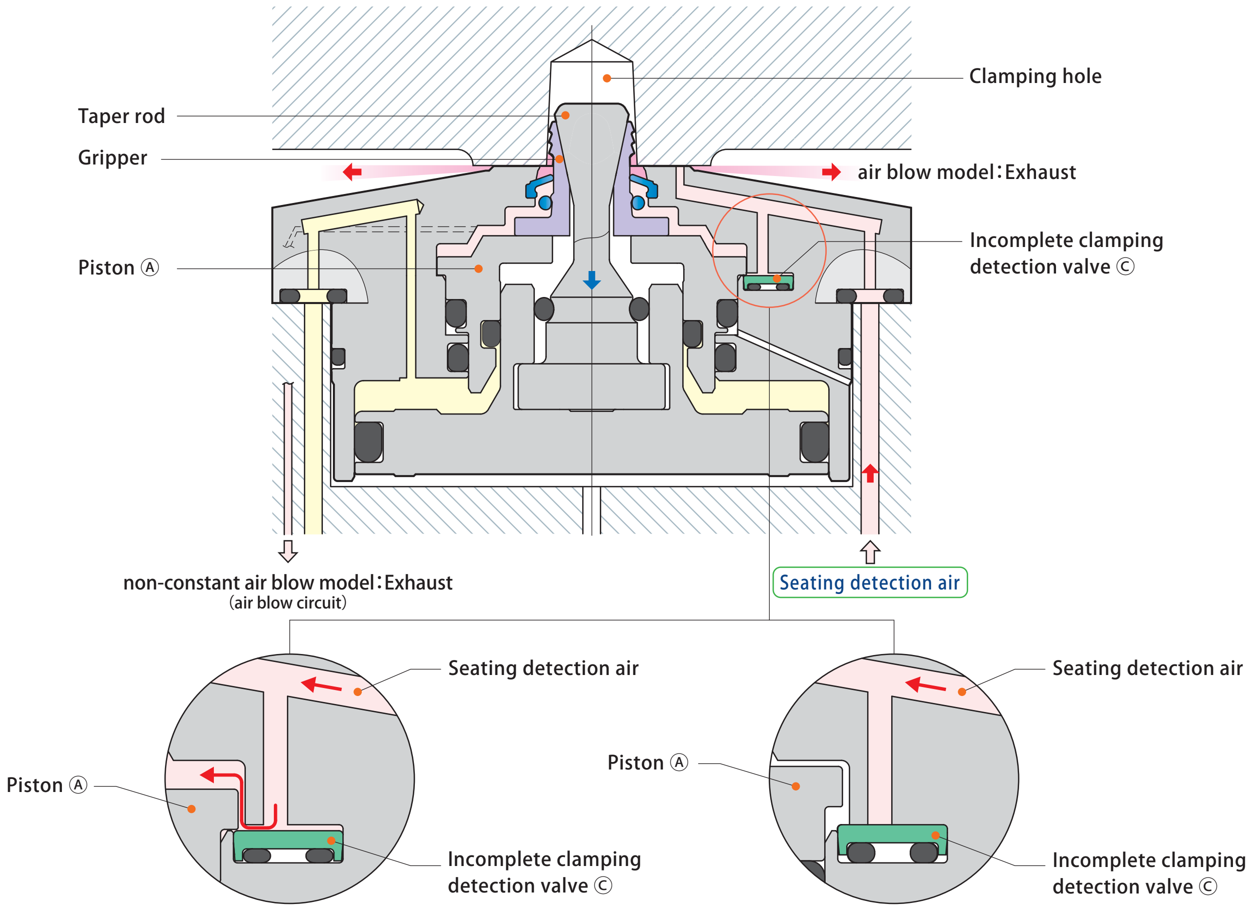


Detects incomplete gripping

PAT. JP4297511

When gripper fails to grip properly due to large draft angle of grip inner diameter, piston Ⓐ continues to stroke down until incomplete clamping detection valve Ⓒ is triggered. Since seating detection air is released, air sensor is unable to detect seating of workpiece and this confirms incomplete clamping.





Incomplete clamping detection

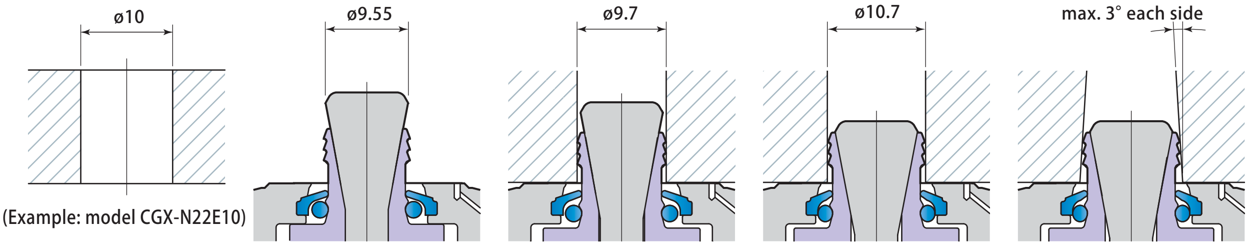
Since piston Ⓐ continues with stroke down until incomplete clamping detection valve Ⓒ is triggered, seating detection air continues to flow and sensor is not triggered.

Normal clamping

Piston Ⓐ stops in the middle of stroke and incomplete clamping detection valve Ⓒ is not triggered.

Large gripper expansion stroke

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

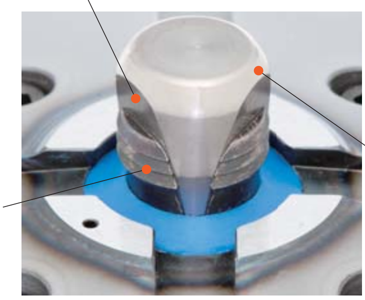


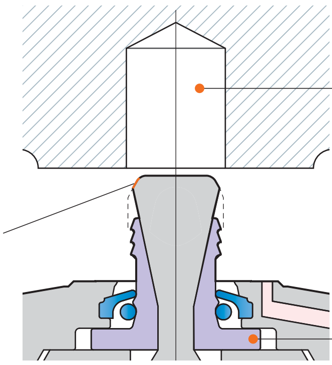
Taper rod and gripper with superior durability

① The gripping force of expansion clamp is transmitted from tapered surface to gripper, making it possible for the gripper to hold onto inner diameter of workpiece 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.

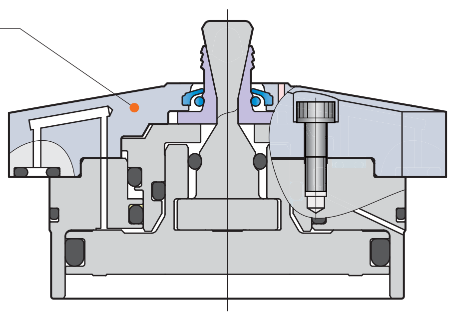




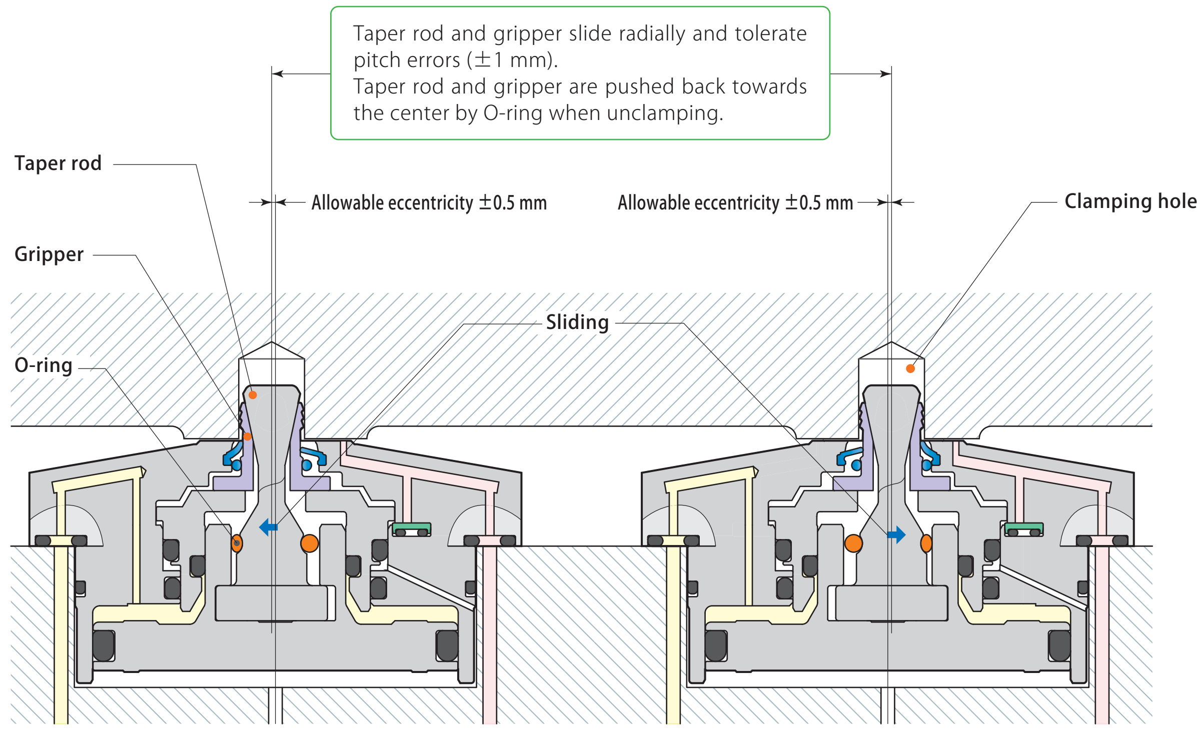
Seating surface can be reground (max. 0.1 mm)

① When seating surface is damaged, the flange section can be dismounted and reground.

② Flange can be easily dismounted and reassembled at production site.



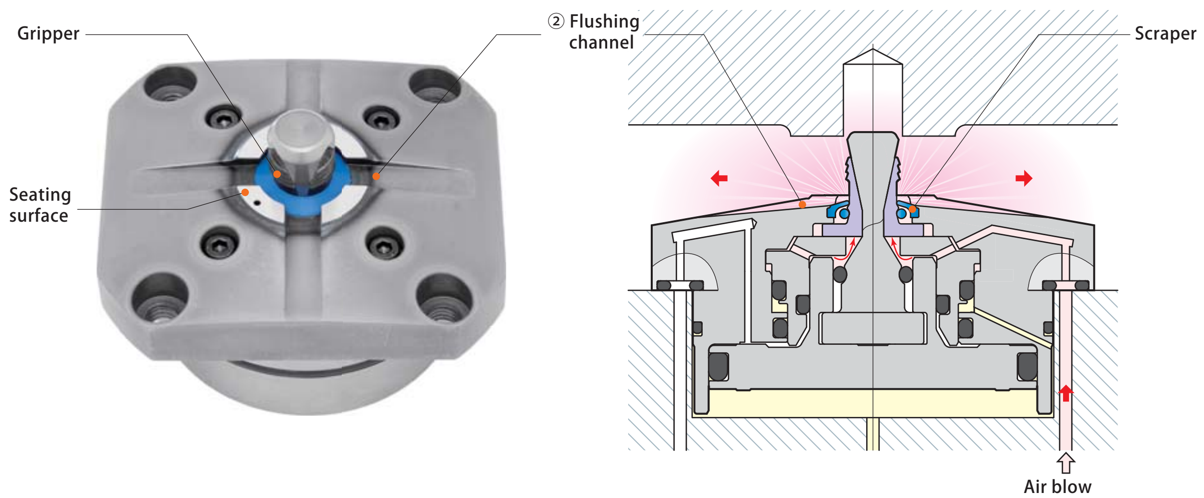
Clamping hole pitch errors can be tolerated



Incorporating strong air blowing circuit

① Air blown from a space between the gripper and scraper clears off metal chips and coolant that stay on the seating surface.

② Flushing channel is also provided on the seating surface to remove the metal chips and coolants smoothly during workpiece setting.



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 ø12).The new model

Refer to page → 9 and 10

3 Grip ø11 ~ ø13 Non-constant air blow model

Grip inner diameter	Clamping force (air pressure 0.5 MPa)	Model
ø 11 12 13	0.8 kN	CGX-N22E Grip inner diameter

Refer to page → 11 and 12

2 Grip ø9 , ø10 Non-constant air blow model

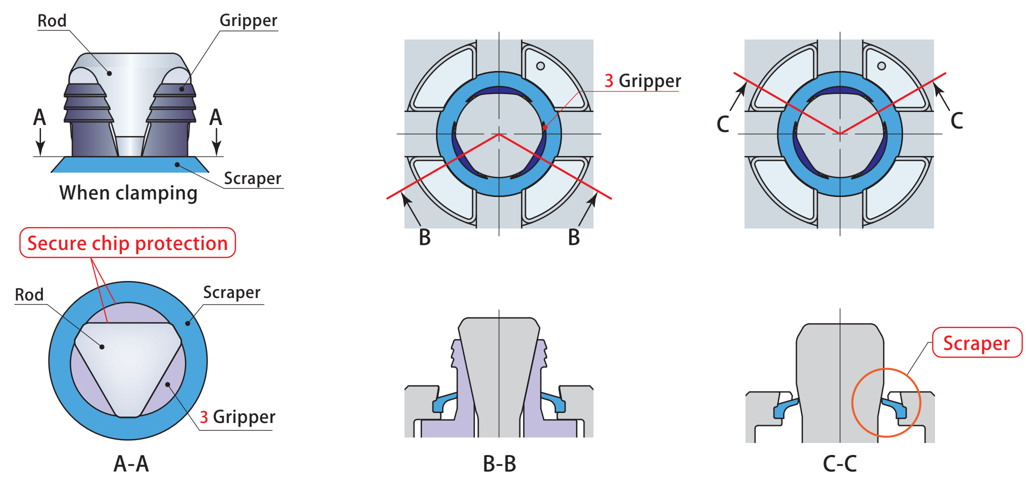
Grip inner diameter	Clamping force (air pressure 0.5 MPa)	Model
ø 9 10	0.8 kN	CGX-N22E Grip inner diameter

Refer to page → 13 and 14

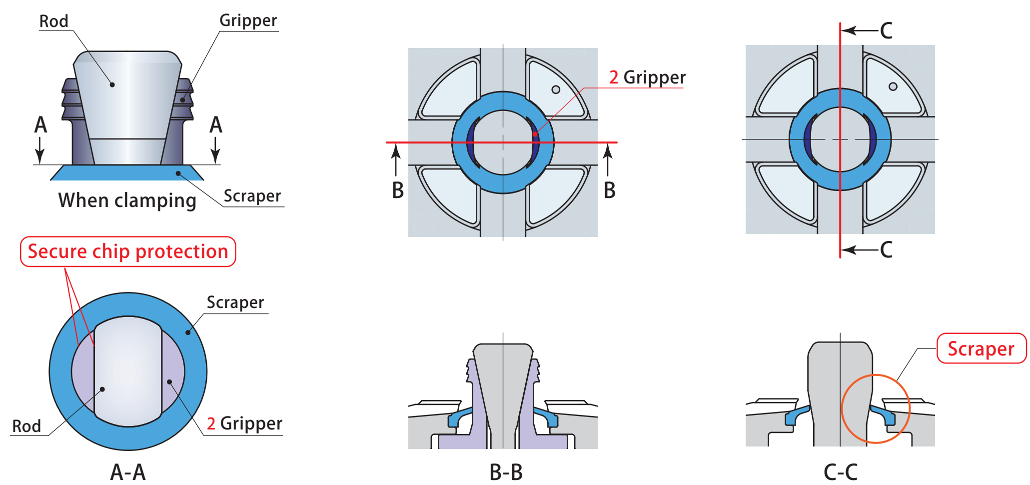
4 Grip ø6 ~ ø8 Air blow model

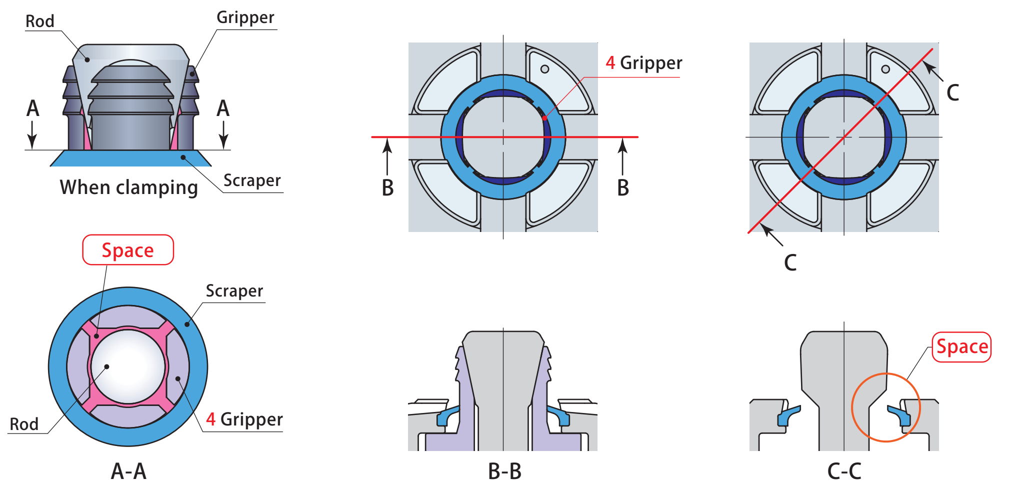
Grip inner diameter	Clamping force (air pressure 0.5 MPa)	Model
ø 6 7 8	0.8 kN	CGX-N22- Grip inner diameter

reduces air consumption and is measurably energy saving. Still, be sure to air blow at time of workpiece replacement.



Even for the areas where there is no gripper, air blow during cutting process is not necessary as chip intrusion is prevented thanks to the scraper.





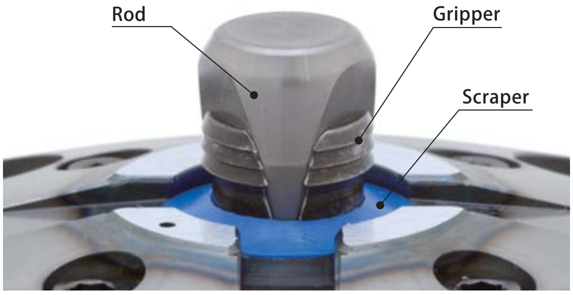
Constant air blow is necessary as sealing will not take place for the areas where there is no gripper.

3 Grip Non-constant air blow model

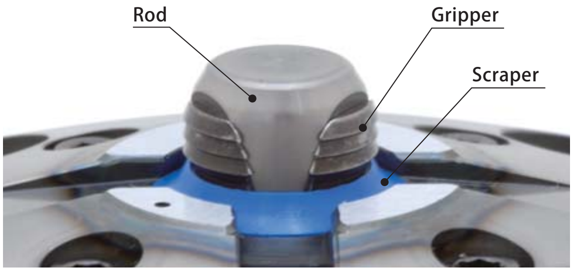
Grip inner diameter	ø11 ø12 ø13
Model	CGX-N22E Grip inner diameter (Example：CGX-N22E11)
Clamping force	0.8 kN (air pressure 0.5 MPa)
Radial expansion force	2.4 kN (air pressure 0.5 MPa)

：made to order

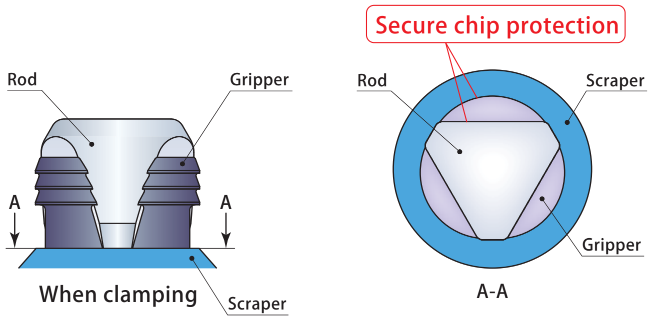
Model CGX-N22E with grip inner diameter ø11~ø13：
During clamping, rod will stroke and expand scraper. Thanks to a new mechanism, open space is removed between rod, gripper, and scraper. As chip intrusion is prevented, air blow during cutting process has been eliminated. (Air blow will only be necessary during clamping and unclamping operation.) As a result, air consumption has been significantly reduced compared to the traditional model.



Unclamp



Clamp

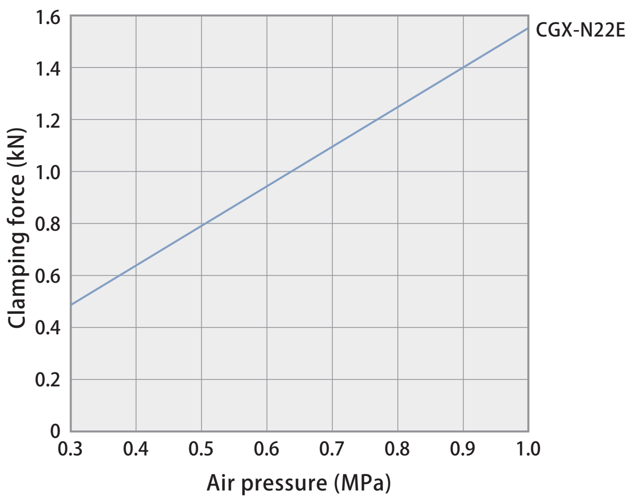


Specifications

Model		CGX-N22E Grip inner diameter
Number of grippers		3
Working air pressure range	(MPa)	0.3 ~ 1
Proof pressure	(MPa)	1.5
Clamping force*1	(kN)	0.78
Radial expansion force*1	(kN)	2.4
Taper rod stroke	(mm)	4.2
Clamp stroke	(mm)	1.2
Cylinder capacity Clamp	(cm^3)	7.6
Cylinder capacity Unclamp	(cm^3)	9.2
Allowable eccentricity	(mm)	± 0.5
Recommended air blow pressure	(MPa)	0.3
Recommended seating detection air pressure	(MPa)	0.2
Operating temperature	(℃)	0 ~ 70
Fluid used		Air
Mass	(kg)	0.65

∗1: Capacity values for air pressure of 0.5 MPa are shown.

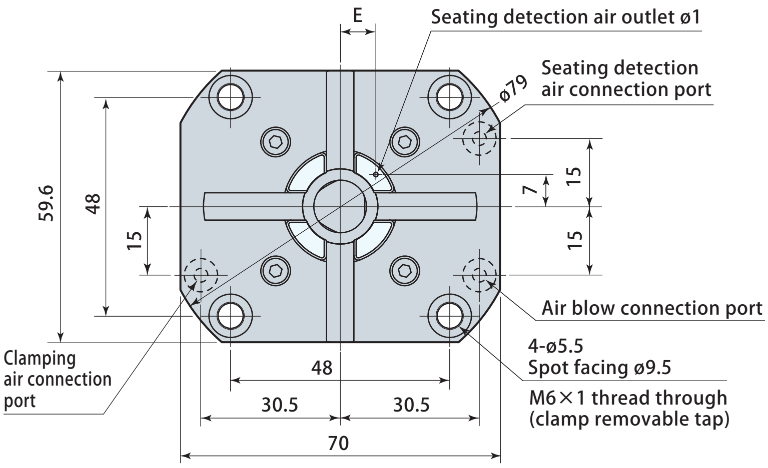
Clamping force & air pressure



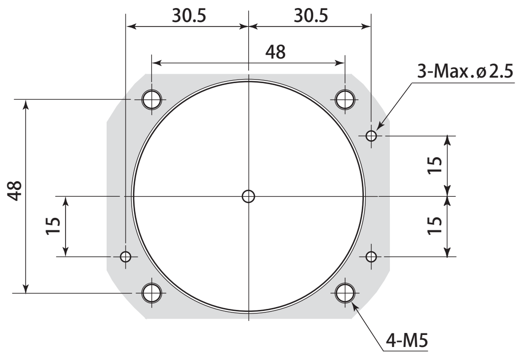
Air pressure (MPa)	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Clamping force (kN)	0.47	0.62	0.78	0.93	1.09	1.24	1.40	1.55

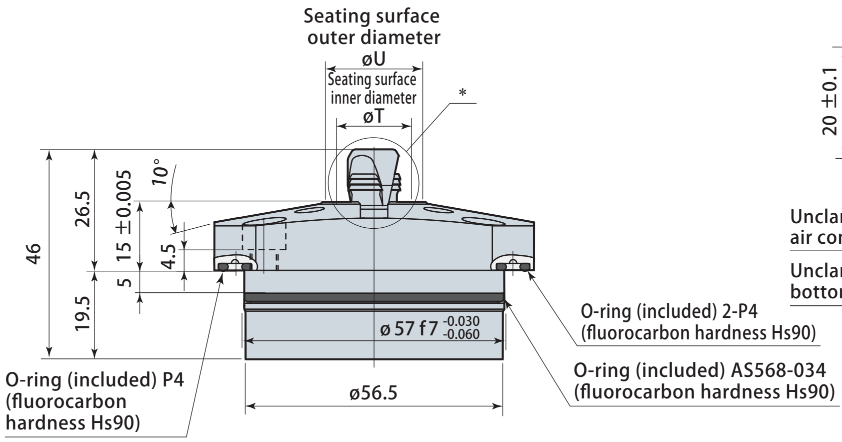
F: Clamping force (kN)＝1.551×P: Air pressure (MPa)

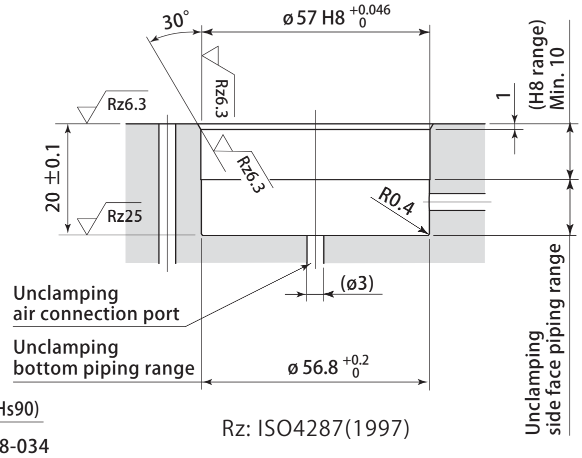
CGX-N22E 11, 12, 13



Mounting details

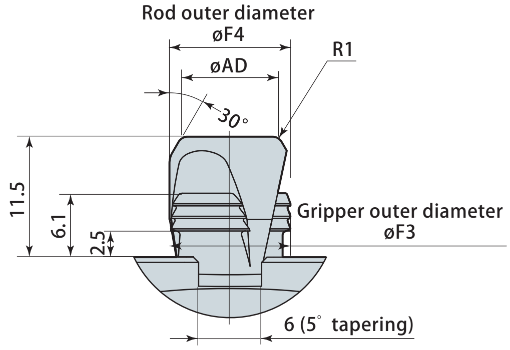






Rz: ISO4287(1997)

*details



Grip inner diameter usage requirements

Blind hole Through hole

Model	CGX-N22E Grip inner diameter		
Workpiece material (hardness)	Aluminum, steel and others (HRC25 or below). Cast iron are not usable.		
Grip inner diameter (mm)	11	12	13
Allowable min. grip inner diameter (mm)	10.7	11.7	12.7
Allowable max. grip inner diameter (mm)	11.7	12.7	13.7
Grip inner diameter tapering angle (draft angle)	3° or below		
Grip inner diameter circularity	0.1 or below		

Please inquire if above terms are not applied.

(mm)

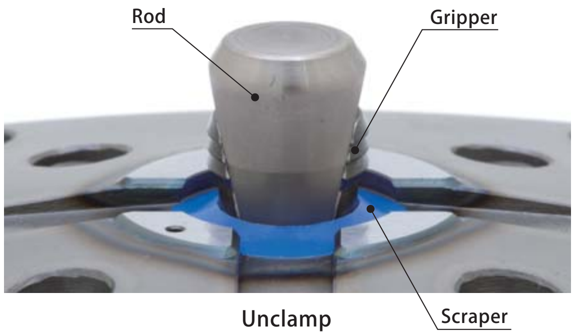
Model	CGX-N22E Grip inner diameter		
	11	12	13
E	7.1	7.8	8.5
F3	10.5	11.5	12.5
F4	10.55	11.55	12.55
T	15	16	17
U	23	24	25
AD	8.2	9.2	10.2

Note 1. Mounting screws are not included.
2. Included O-ring must be used at all times.
3. Seating surface hardness is HRC55.

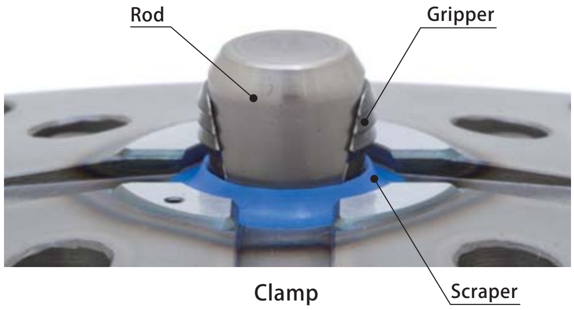
2 Grip Non-constant air blow model

Grip inner diameter	ø9 ø10
Model	CGX-N22E Grip inner diameter (Example：CGX-N22E09)
Clamping force	0.8 kN (air pressure 0.5 MPa)
Radial expansion force	2.4 kN (air pressure 0.5 MPa)

：made to order

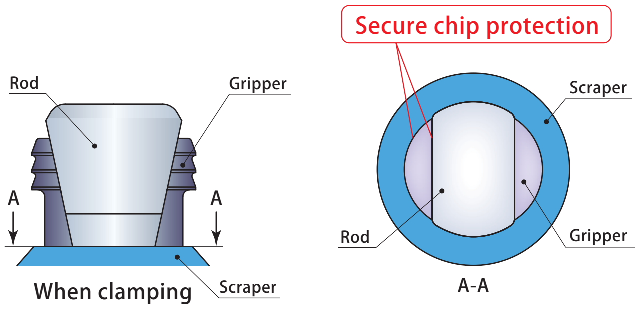


Unclamp



Clamp

Model CGX-N22E with grip inner diameter ø9 and ø10：During clamping, rod will stroke and expand scraper. Thanks to a new mechanism, open space is removed between rod, gripper, and scraper. As chip intrusion is prevented, air blow during cutting process has been eliminated. (Air blow will only be necessary during clamping and unclamping operation.) As a result, air consumption has been significantly reduced compared to the traditional model.

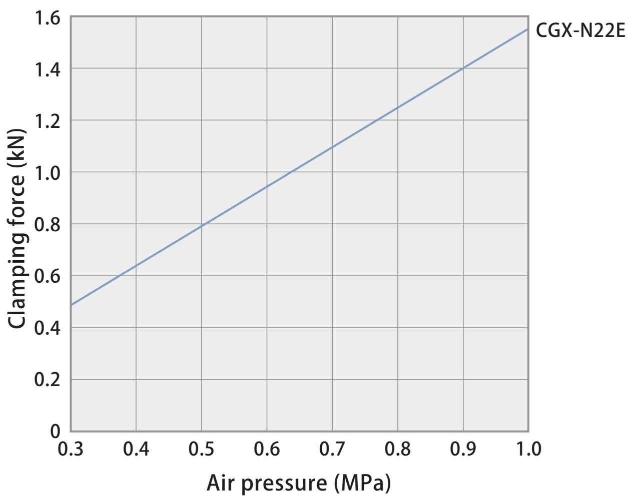


Specifications

Model		CGX-N22E Grip inner diameter
Number of grippers		2
Working air pressure range	(MPa)	0.3 ~ 1
Proof pressure	(MPa)	1.5
Clamping force*1	(kN)	0.78
Radial expansion force*1	(kN)	2.4
Taper rod stroke	(mm)	4.2
Clamp stroke	(mm)	1.2
Cylinder capacity Clamp	(cm^3)	7.6
Cylinder capacity Unclamp	(cm^3)	9.2
Allowable eccentricity	(mm)	± 0.5
Recommended air blow pressure	(MPa)	0.3
Recommended seating detection air pressure	(MPa)	0.2
Operating temperature	(℃)	0 ~ 70
Fluid used		Air
Mass	(kg)	0.64

*1: Capacity values for air pressure of 0.5 MPa are shown.

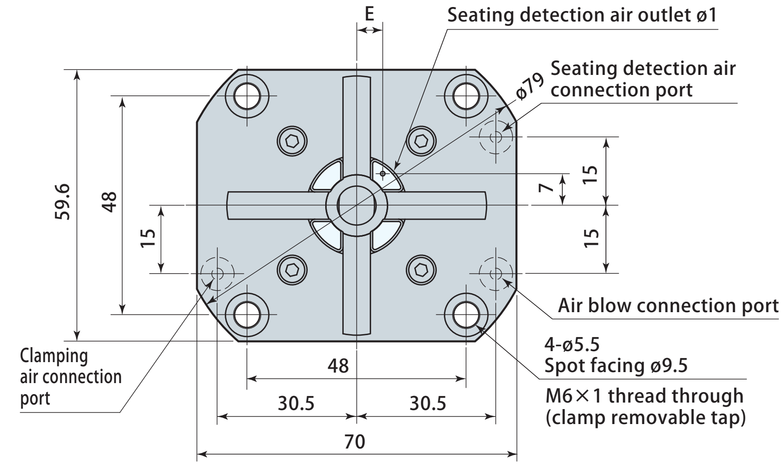
Clamping force & air pressure



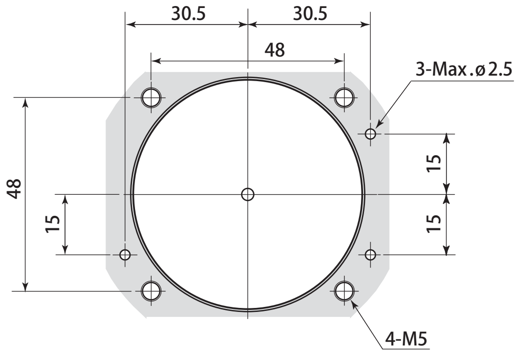
Air pressure (MPa)	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Clamping force (kN)	0.47	0.62	0.78	0.93	1.09	1.24	1.40	1.55

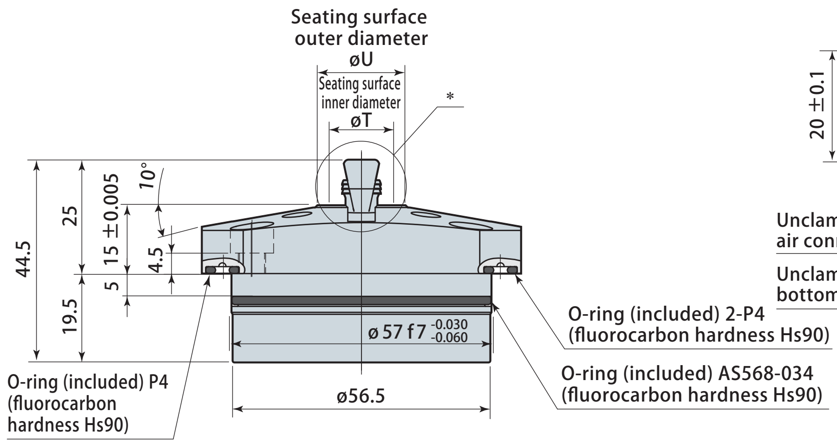
F: Clamping force (kN)＝1.551×P: Air pressure (MPa)

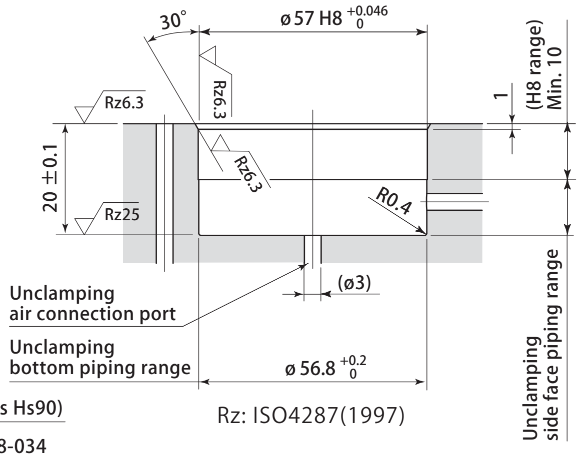
CGX-N22E 09, 10



Mounting details

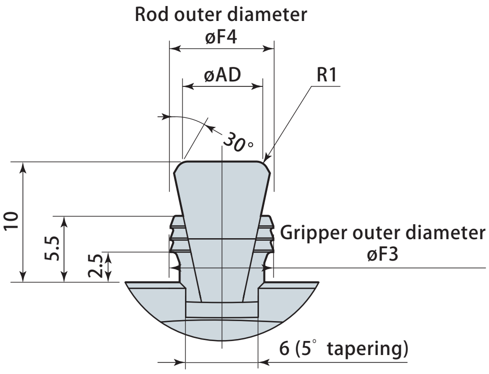




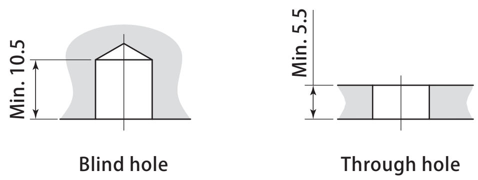


Rz: ISO4287(1997)

*details



Grip inner diameter usage requirements



Model	CGX-N22E Grip inner diameter	
Workpiece material (hardness)	Aluminum, steel and others (HRC25 or below). Cast iron are not usable.	
Grip inner diameter (mm)	9	10
Allowable min. grip inner diameter (mm)	8.7	9.7
Allowable max. grip inner diameter (mm)	9.7	10.7
Grip inner diameter tapering angle (draft angle)	3° or below	
Grip inner diameter circularity	0.1 or below	

Please inquire if above terms are not applied.

(mm)

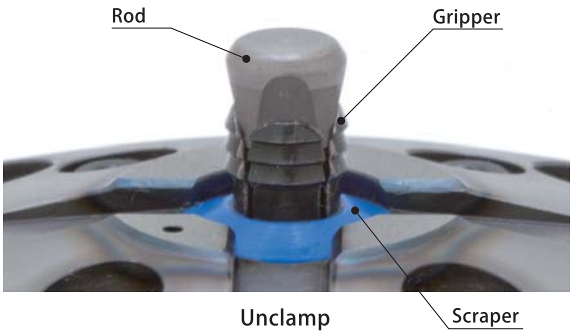
Model	CGX-N22E Grip inner diameter	
	09	10
E	5.7	6.4
F3	8.5	9.5
F4	8.55	9.55
T	13	14
U	21	22
AD	6.8	7.8

Note 1. Mounting screws are not included.
2. Included O-ring must be used at all times.
3. Seating surface hardness is HRC55.

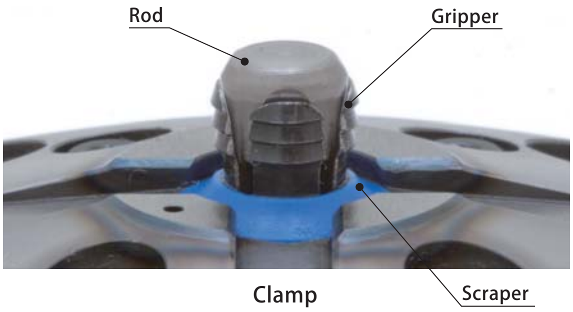
4 Grip	Air blow model
Grip inner diameter	ø6 ø7 ø8
Model	CGX-N22- Grip inner diameter (Example: CGX-N22-06)
Clamping force	0.8 kN (air pressure 0.5 MPa)
Radial expansion force	2.4 kN (air pressure 0.5 MPa)

: made to order

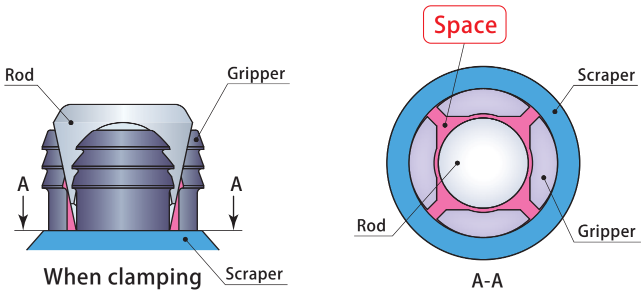
Model CGX-N22- with grip inner diameter ø6~ø8:
During clamping, a space is created between the rod, gripper, and scraper as a result of having a small diameter. Constant air blow will be necessary to prevent intrusion of metal chips during the cutting process and during clamping and unclamping.



Unclamp



Clamp



When clamping

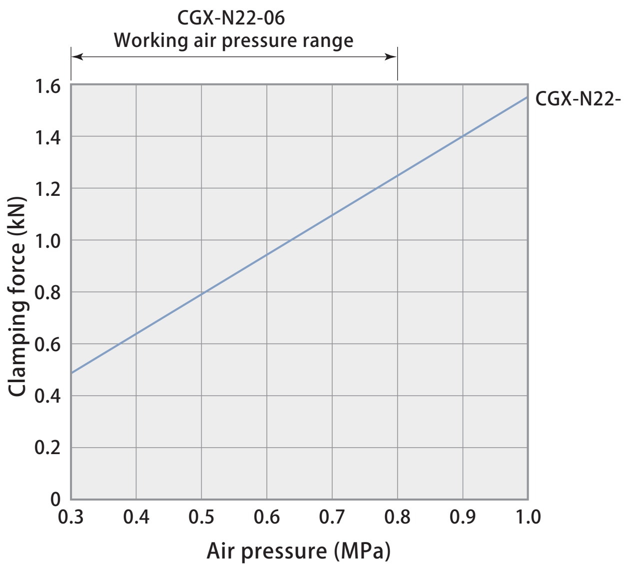
A-A

Specifications

Model		CGX-N22- Grip inner diameter		
		06	07	08
Number of grippers		4		
Working air pressure range	(MPa)	0.3~0.8	0.3~1	
Proof pressure	(MPa)	1.5		
Clamping force*1	(kN)	0.78		
Radial expansion force*1	(kN)	2.4		
Taper rod stroke	(mm)	4.2		
Clamp stroke	(mm)	1.2		
Cylinder capacity Clamp	(cm^3)	7.6		
Cylinder capacity Unclamp	(cm^3)	9.2		
Allowable eccentricity	(mm)	± 0.5		
Recommended air blow pressure	(MPa)	0.3		
Recommended seating detection air pressure	(MPa)	0.2		
Operating temperature	(℃)	0 ~ 70		
Fluid used		Air		
Mass	(kg)	0.63		

*1: Capacity values for air pressure of 0.5 MPa are shown.

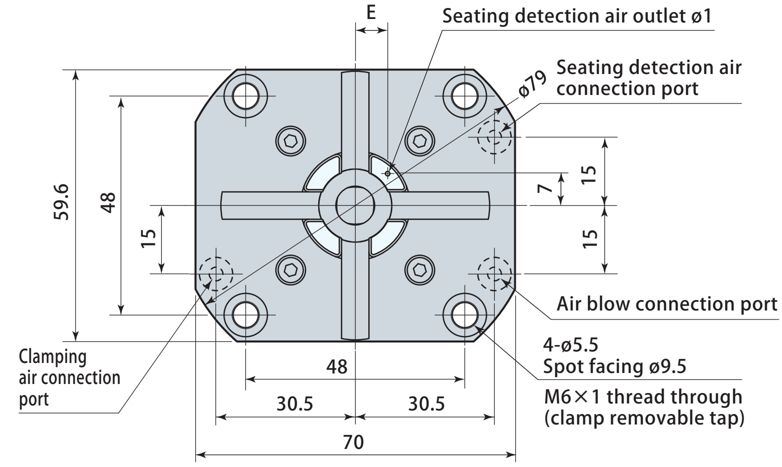
Clamping force & air pressure



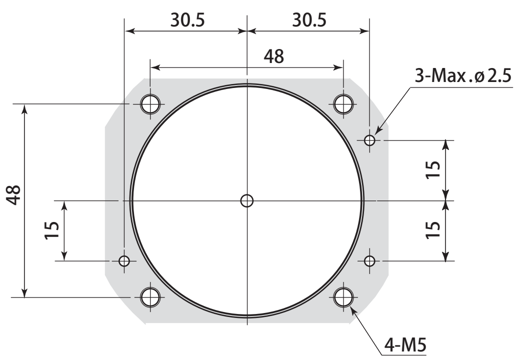
Air pressure (MPa)	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Clamping force (kN)	0.47	0.62	0.78	0.93	1.09	1.24	1.40	1.55

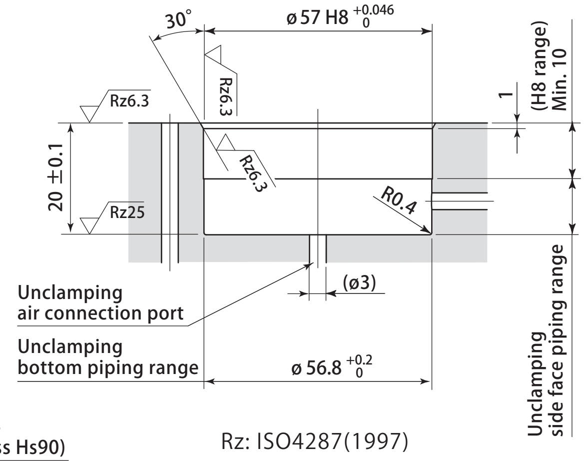
F: Clamping force (kN)＝1.551×P: Air pressure (MPa)

CGX-N22-06, 07, 08

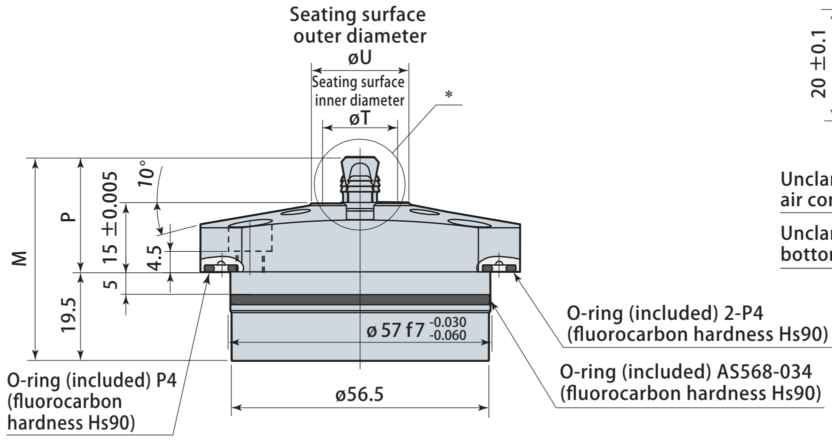


Mounting details

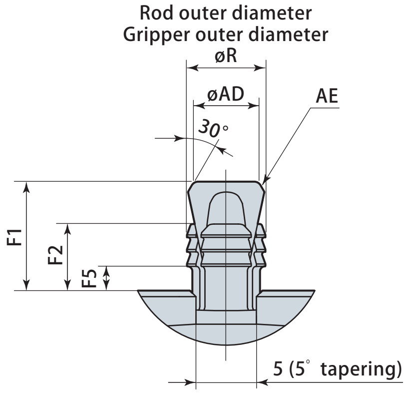




Rz: ISO4287(1997)



*details



Grip inner diameter usage requirements

Blind hole Through hole

Model	CGX-N22-Grip inner diameter		
Workpiece material (hardness)	Aluminum, steel and others (HRC25 or below). Cast iron are not usable.		
Grip inner diameter (mm)	6	7	8
Allowable min. grip inner diameter (mm)	5.7	6.7	7.7
Allowable max. grip inner diameter (mm)	6.7	7.7	8.7
Grip inner diameter tapering angle (draft angle)	3° or below		
Grip inner diameter circularity	0.1 or below		

Please inquire if above terms are not applied.

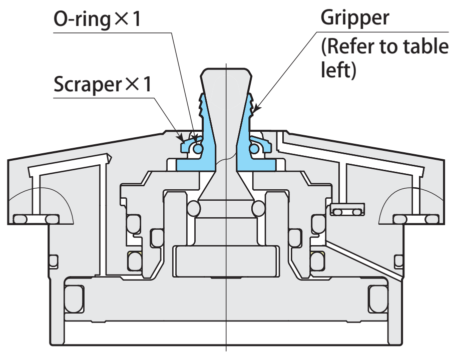
(mm)

Model	CGX-N22-Grip inner diameter		
	06	07	08
E	4.5		4.8
F1	9		10
F2	5.5		6
F5	2		2.5
M	43.5		44.5
P	24		25
R	5.5	6.5	7.5
T	10	11	12
U	19		20
AD	4.3	5.3	5.8
AE	R0.6		R1

Note 1. Mounting screws are not included.
2. Included O-ring must be used at all times.
3. Seating surface hardness is HRC55.

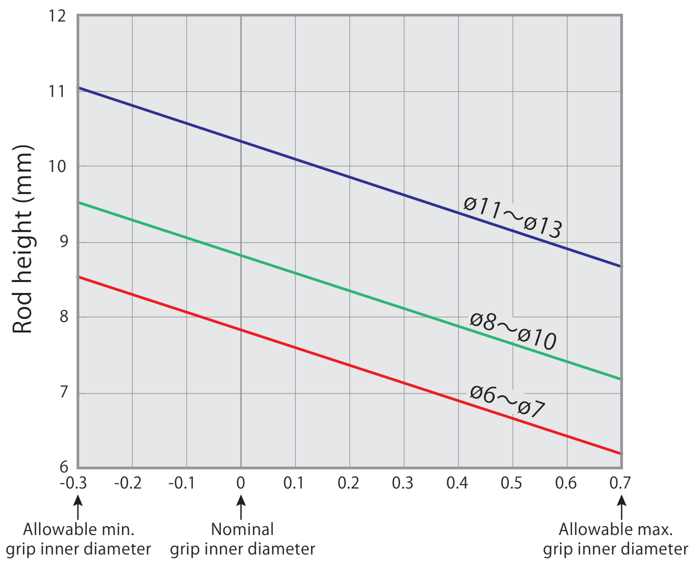
Gripper set replacement

Number of grippers	Gripper set model	Clamp model	Set description
4 Grippers	CGX-N22-J06	CGX-N22-06	
	CGX-N22-J07	CGX-N22-07	
	CGX-N22-J08	CGX-N22-08	
2 Grippers	CGX-N22EJ09	CGX-N22E09	
	CGX-N22EJ10	CGX-N22E10	
3 Grippers	CGX-N22EJ11	CGX-N22E11	
	CGX-N22EJ12	CGX-N22E12	
	CGX-N22EJ13	CGX-N22E13	

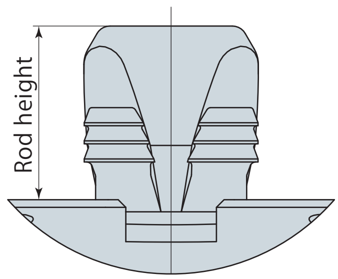


It is recommended that grippers, scrapers and O-rings be replaced after about 200,000 operations. Replace grippers in sets and not just individual grippers. (Refer to the table on the left for the gripper set model.)

Grip inner diameter & rod height when clamping



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

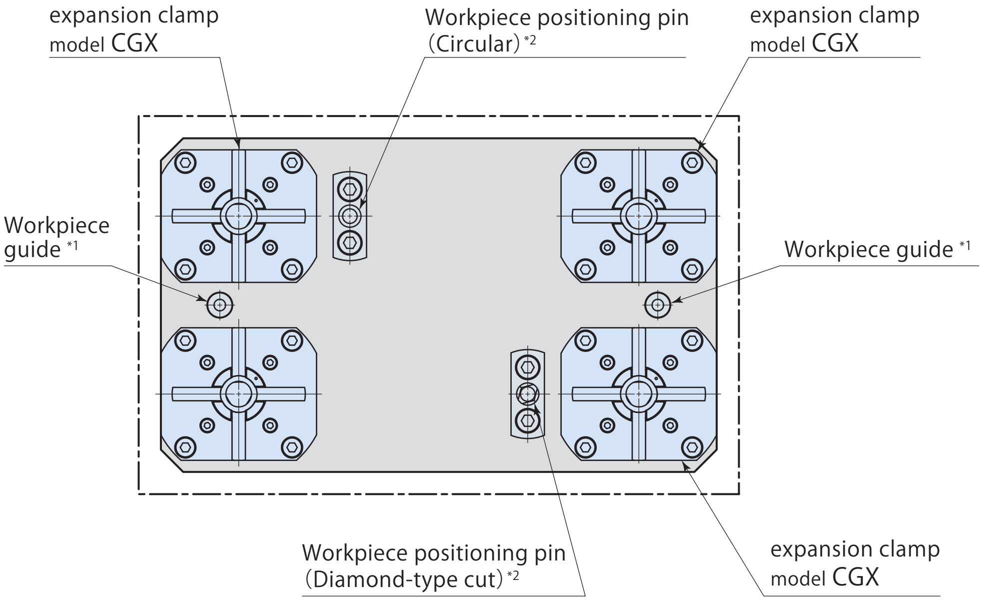


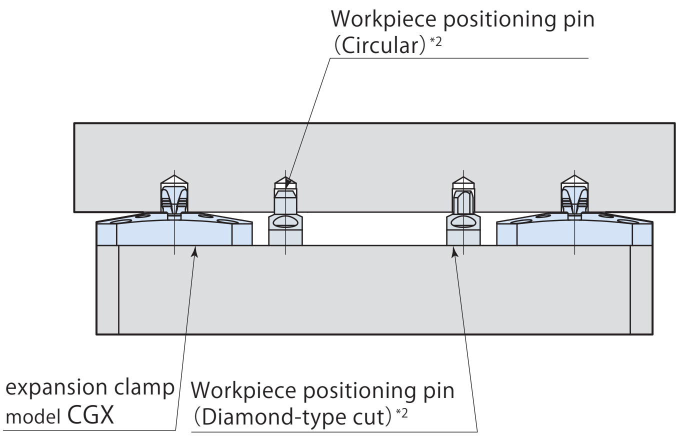
Rod height calculation formula		
ø6 ～ ø7	:	7.82−2.35× Actual grip inner diameter and nominal grip diameter difference
ø8 ～ ø10	:	8.82−2.35× Actual grip inner diameter and nominal grip diameter difference
ø11 ～ ø13	:	10.32−2.35× Actual grip inner diameter and nominal grip diameter difference

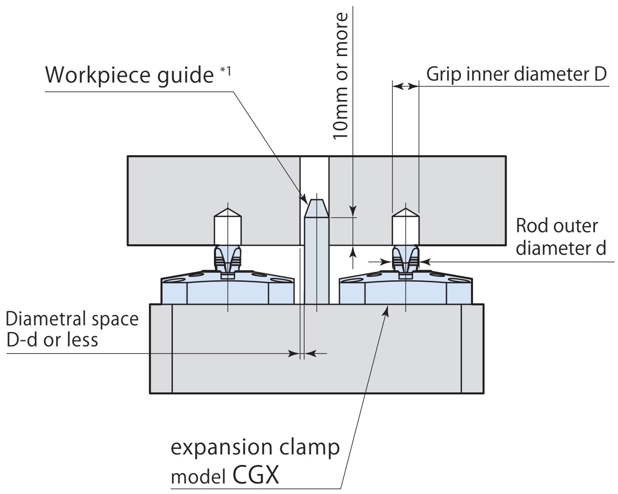
Example: When CGX-N22E10 (Nominal grip diameter: ø10) is clamping ø9.8 hole

Rod height = 8.82 - 2.35 × (-0.2) = 9.29mm

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.
Please install workpiece positioning pins (or similar).

Caution in use

- Be sure to make inner diameter of air blow circuit 4mm or more 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 →10, 12, 14** . 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.

- Set detection range of seating detection air sensor to 0.05 mm or less from seating surface. Insert a feeler gauge between workpiece and seating surface to create detection distance in order to perform setting accurately. Refer to instruction manual of air sensor for details on setting methods.

- 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 air circuit diagram.)

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	ON
Incomplete clamping detection	ON	OFF	OFF

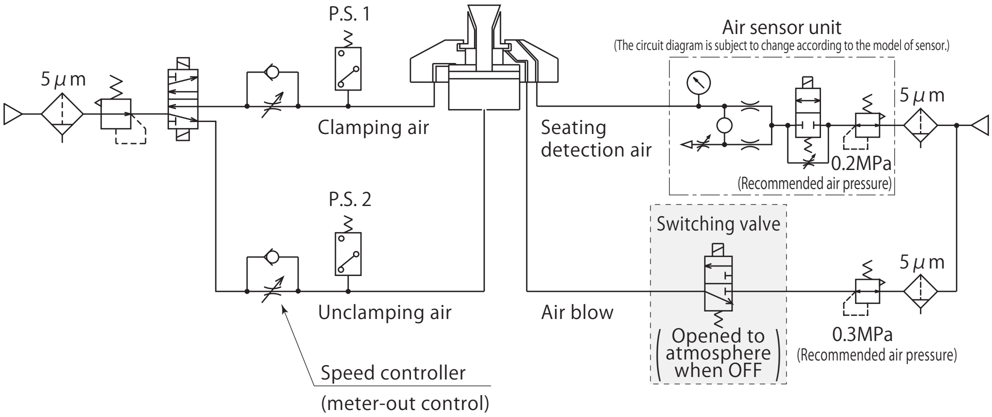
*:In case of a lightweight workpiece or the like, sensor may be OFF.

Air sensor 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

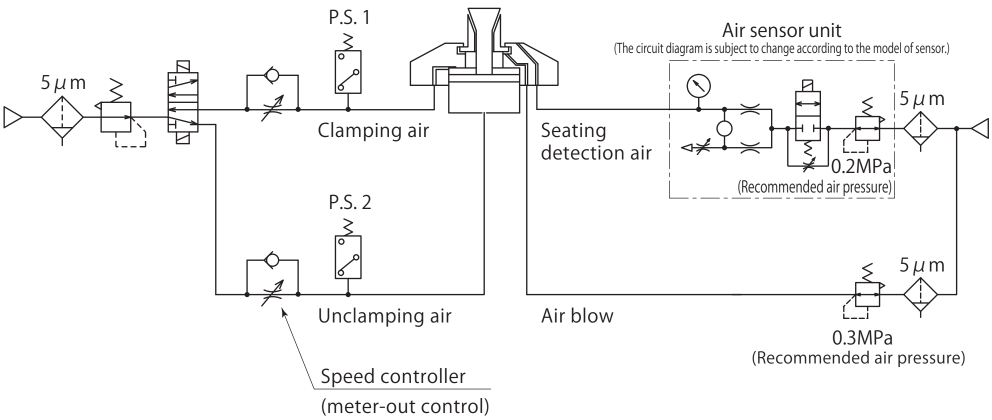
- Use a solenoid valve with needle for air sensor unit and control it supplying air all the time in order to eliminate intrusion of chips or coolant.
- There is a case that air sensing cannot be made successfully as designed when it is used out of the usage shown on the left. Contact Technical service center for more details.

Non-constant air blow model pneumatic circuit diagram



- Be sure to install a speed controller for meter-out control in unclamping air circuit and to adjust clamping speed by means of back pressure. (0.3 seconds and over when full stroking.) Immediate air pressure release of unclamping side of the clamp causes insufficient grip at wall of the clamping hole, which may result in incomplete clamping.
- 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.
- Be sure to turn air blow OFF while seating detection is occurring. Also, be sure to use an air switching valve that is opened to atmosphere when air blow is OFF. (When incomplete clamping occurs, it is used as a seating detection air exhaust path.

Air blow model pneumatic circuit diagram

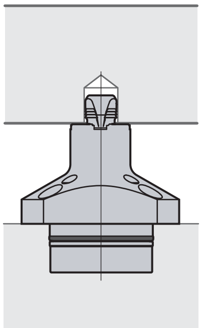
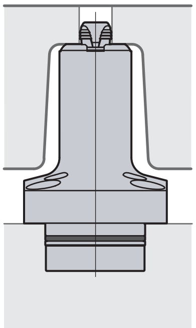
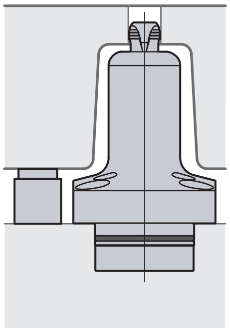


- Be sure to install a speed controller for meter-out control in unclamping air circuit and to adjust clamping speed by means of back pressure. (0.3 seconds and over when full stroking.) Immediate air pressure release of unclamping side of the clamp causes insufficient grip at wall of the clamping hole, which may result in incomplete clamping.
- 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 clamp hole, continue air blowing during processing as well.

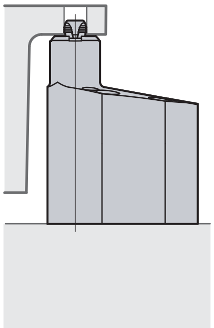
Standard	Long neck	Long neck (no seating)	Eccentric




model CGC	model CGT	model CGT-R	model CGU
Clamp 7MPa Unclamp 7MPa	Clamp 7MPa Unclamp 7MPa	Clamp 7MPa Unclamp 7MPa	Clamp 7MPa Unclamp 7MPa

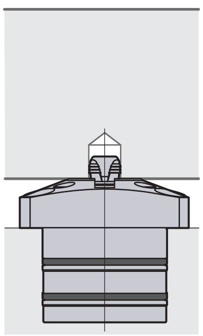
Seating surface is set apart from clamp.



Flat

model
CGS-N1

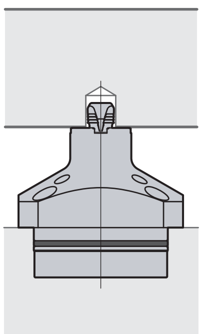
Clamp 7MPa
Unclamp spring



air
Standard

model
CGE

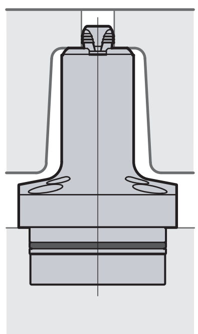
Clamp air
Unclamp air



air
Long neck

model
CGY-F2

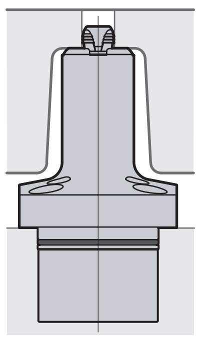
Clamp air
Unclamp air



air
Long neck

model
CGY-F3

Clamp spring
Unclamp air



Refer to separate documents for details.

Pascal

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CERTIFICATE OF APPROVAL ISO9001

CLS-40E-6
2019. 04