Parallel Grippers

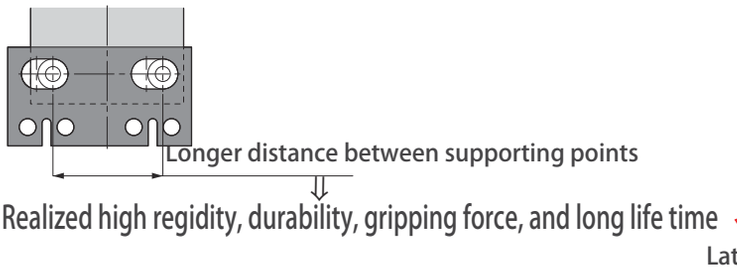
Closing Grip and Opening Grip

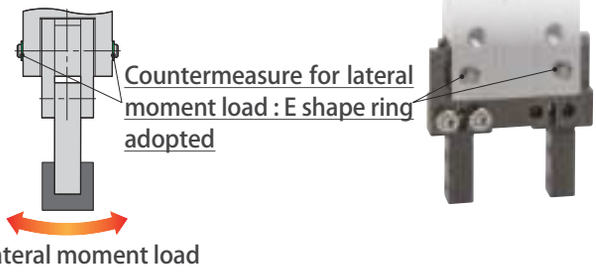
Various Gripping styles

Various gripping action : inside, outside, by air or by spring force.

Uniquely Designed Roller Guide System

The longer distance between rollers enables smooth movement and gripping.
E type (E shape retaining ring) is provided which withstands lateral moment load.

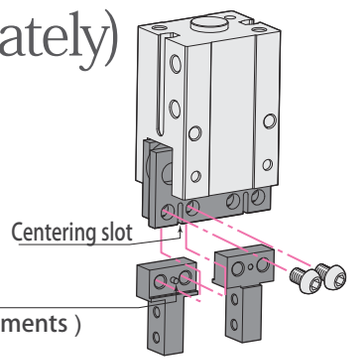




Attachedments are provided (sold separately)

Avoiding mis-placement of the attachments.

A centering slot is cut on the fingers.
Easy to locate the attachment



Multi-acting type

Extra thin body with 4 ㎜ stroke

A 10mm width body which incorporates 8mm bore cylinder enables high gripping force.
Ideal for narrow pitch/multi-station use.

Short body with 6 ㎜ stroke

Wide stroke type enable making an equipment compact

Super light weight with 8 ㎜ stroke

About 1/2 of the weight of the conventional grippers of the same class and model

Either the center port or the side port can be used as the air supply port.

Sensor switches are provided (sold separately).

Choosing from 6 types depending on the application

Model designation (Example)

CHB12E ① - N ② - ③

③. Center port (option)

Code	No code	C
Center port	No port	With port

②. Acting type

Code	N	D
Acting type	Single	Double

①. Model No.

Code	type	Body width (mm)	Countermeasure lateral load	Stroke (mm)
CHB08	Multi acting	10	N/A	4
CHB08E			E-shaped retaining ring	
CHB12		16.4	N/A	6
CHB12E			E-shaped retaining ring	
CHB18		23.6	N/A	8

Model Designation for Attachment (Ex.)

CHK ① 12 ②

②. Applicable gripper model

Code		08	12	18
Applicable model	CHB08(E)	○		
	CHB12(E)		○	
	CHB18			○

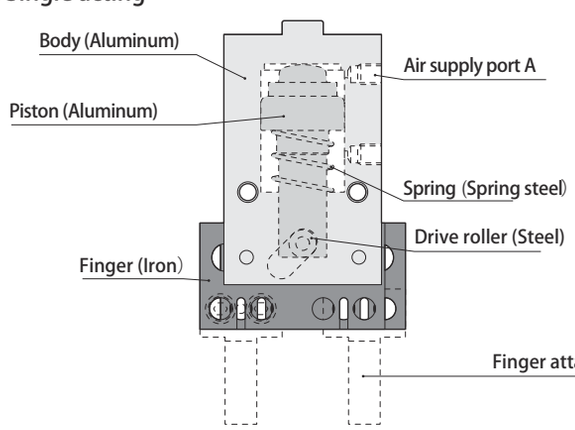
①. Attachment for parallel gripper

Specification

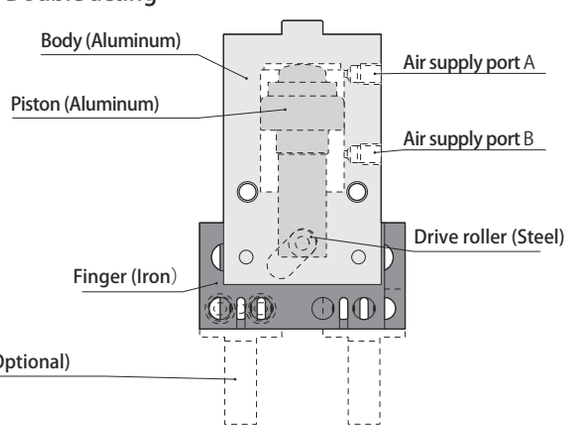
Fluid medium	Filtered air (Limted to filtered compressed air)
Operating pressure range	0.3 ~ 0.5MPa
Operating temperature range	5 ~ 50° C (No freezing)
Lubrication	No Lubrication
Maximum operating cycle	Single acting : 120cpm, Double acting : 180cpm

Structure

■ Single acting



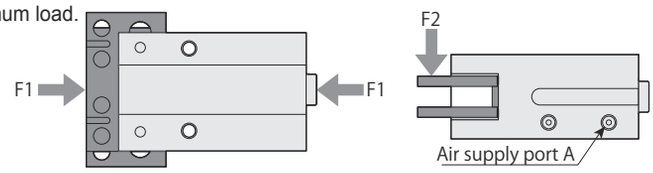
■ Double acting



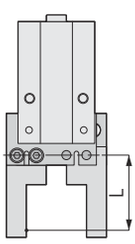
Characteristics

Type	Model code		Stroke (mm)	Effective gripping force (N)		Maximum Load (N)		Possible number of sensors
	Standard model	With E shape retaining ring (Countermeasure lateral load)		Force by air	Force by spring	F1	F2	
Single acting	CHB08-N	CHB08E-N	4	4.2	1	5	2.5	2
	CHB12-N	CHB12E-N	6	10.4	1.9	10	5	2
	CHB18-N		8	34	2.5	30	15	2
Double acting	CHB08-D	CHB08E-D	4	4.9		5	2.5	2
	CHB12-D	CHB12E-D	6	12.2		10	5	2
	CHB18-D		8	37		30	15	2
Remarks				※1, 2		※3, 4, 5		

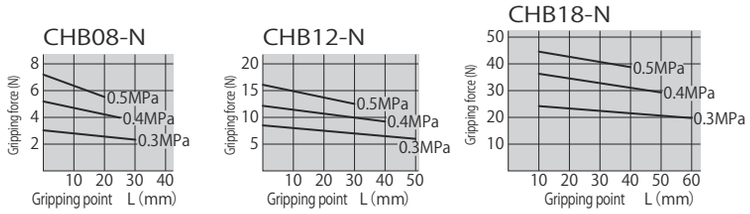
※1. The effective gripping force by air is the value at supply air 0.4MPa and gripping point L 20㎜.
※2. The values are those of supplying air to port A in case of double acting grippers. The gripping force values of port B are smaller.
※3. The maximum load means allowable static load but does not mean the whole range of finger moving.
※4. The maximum load is just reference but not guaranteed value. Please minimize external forces.
※5. See the right figure for direction of the maximum load.



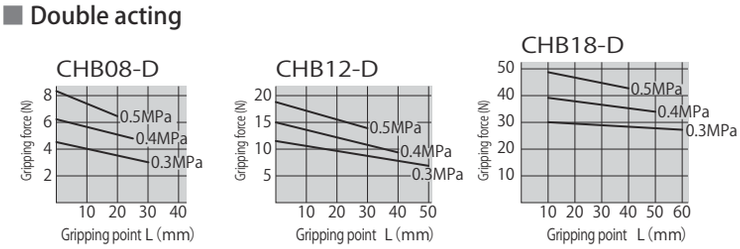
Effective gripping force



■ Single acting

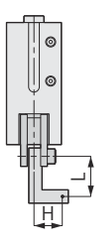


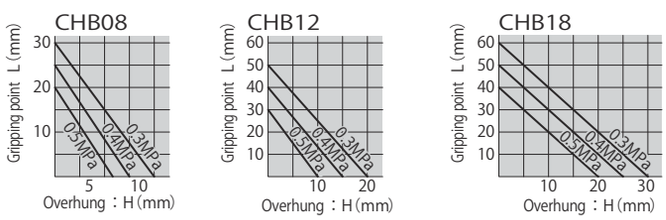
■ Double acting



※**L distance of gripping by spring** - CHB08 ：20mm、CHB12 ：30mm、CHB18 ：40mm(max.)

Maximum gripping distance



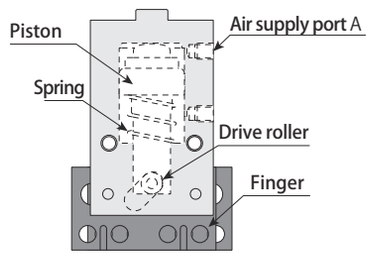


Acting and Gripping style

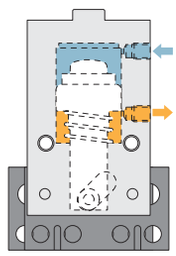
Action

Single acting

When pressurized, the piston is pushed , then the drive roller closes the fingers.



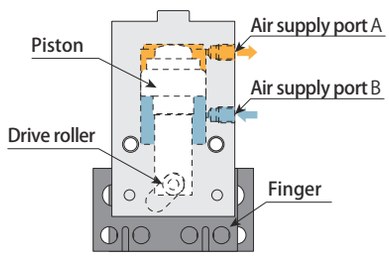
No pressure



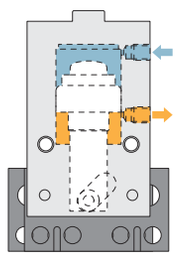
Pressurized

Double acting

When the port A is pressurized, the piston is pushed , then the drive roller closes the fingers.



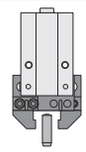
Port B pressurized



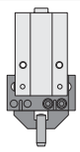
Port A pressurized

Gripping style

Outside gripping

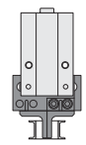


Gripping by air

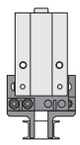


Gripping by spring

Inside gripping

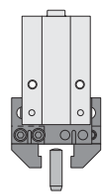


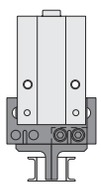
Gripping by air



Gripping by spring

Outside gripping / Inside gripping





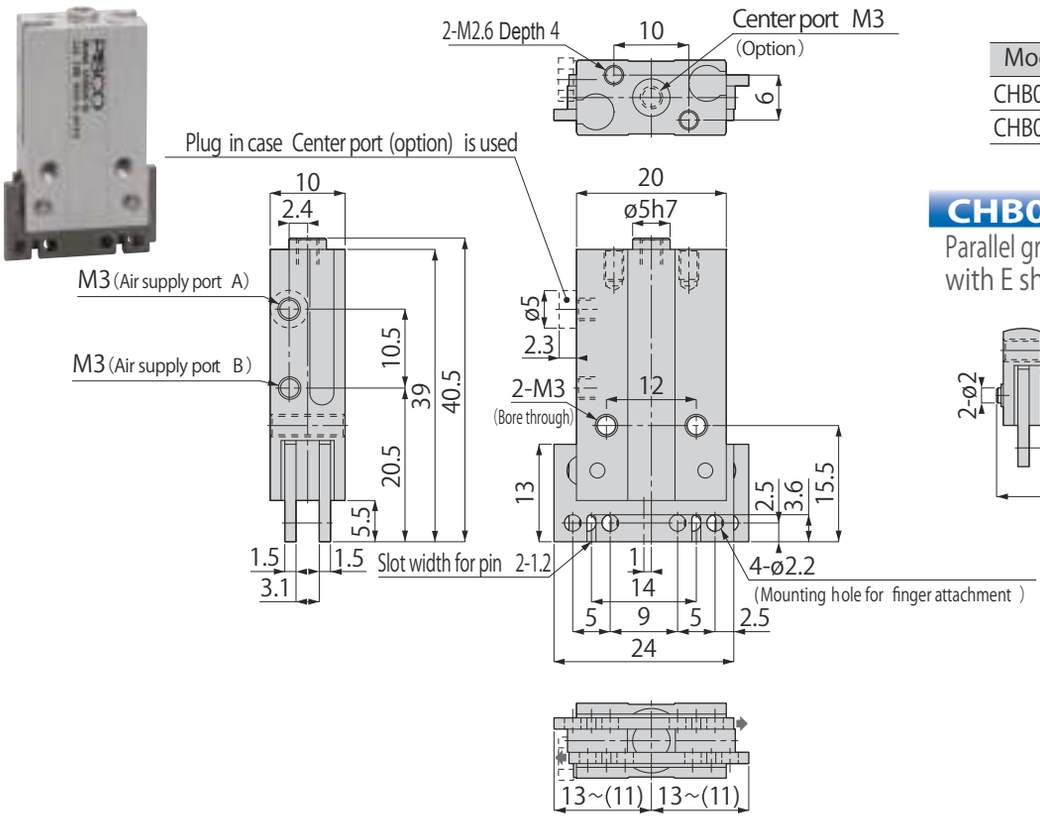
※Gripping force by B port air supply is smaller

Detailed Safety Instructions

Before using PISCO products, be sure to read “Safety Instructions” and “Common Safety Instructions for Products Listed in This Catalog” on page 42 to 44, “Common Safety Instructions for Parallel Grippers” on page 20 to 23, and “Common Safety Instructions for Actuators” on page 42.

Dimensions

CHB08 Parallel gripper Multi-acting type （Body width：10㎜）

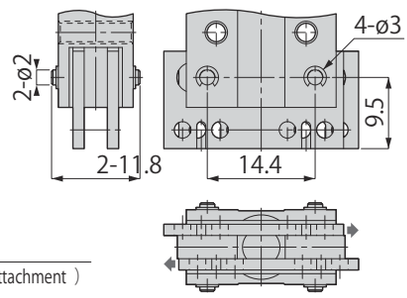


Unit：mm

Model code	Weight (g)
CHB08(E)-□	19
CHB08(E)-□-C	

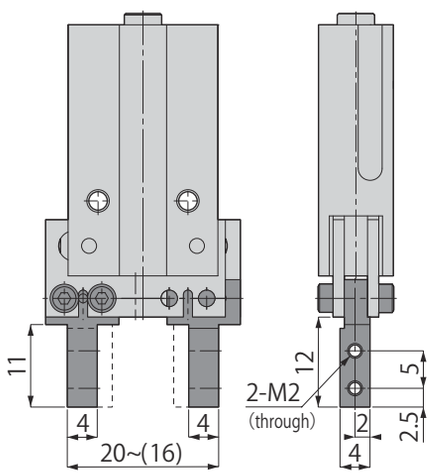
CHB08E

Parallel gripper Multi-acting type (width：10mm)
with E shaped retaining ring



※1. The drawing shows the state of no air supplied.
※2. Fingers consist of two same parts (same design).
※3. When pressurized, each finger moves 2mm towards the arrow direction respectively.

CHK08 Attachment for Parallel gripper （Body width：10㎜）

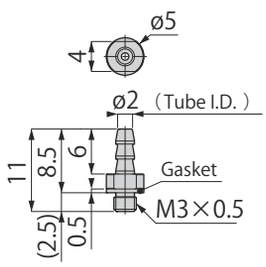


Unit：mm

Model code	Weight (g)
CHK08	6

※1. The above drawing shows Parallel gripper (Multi-acting type, 10mm width) with the attachments installed.
※2. Attachments consist of two sets of same parts (same design).

Barb fitting for CHB08(E)



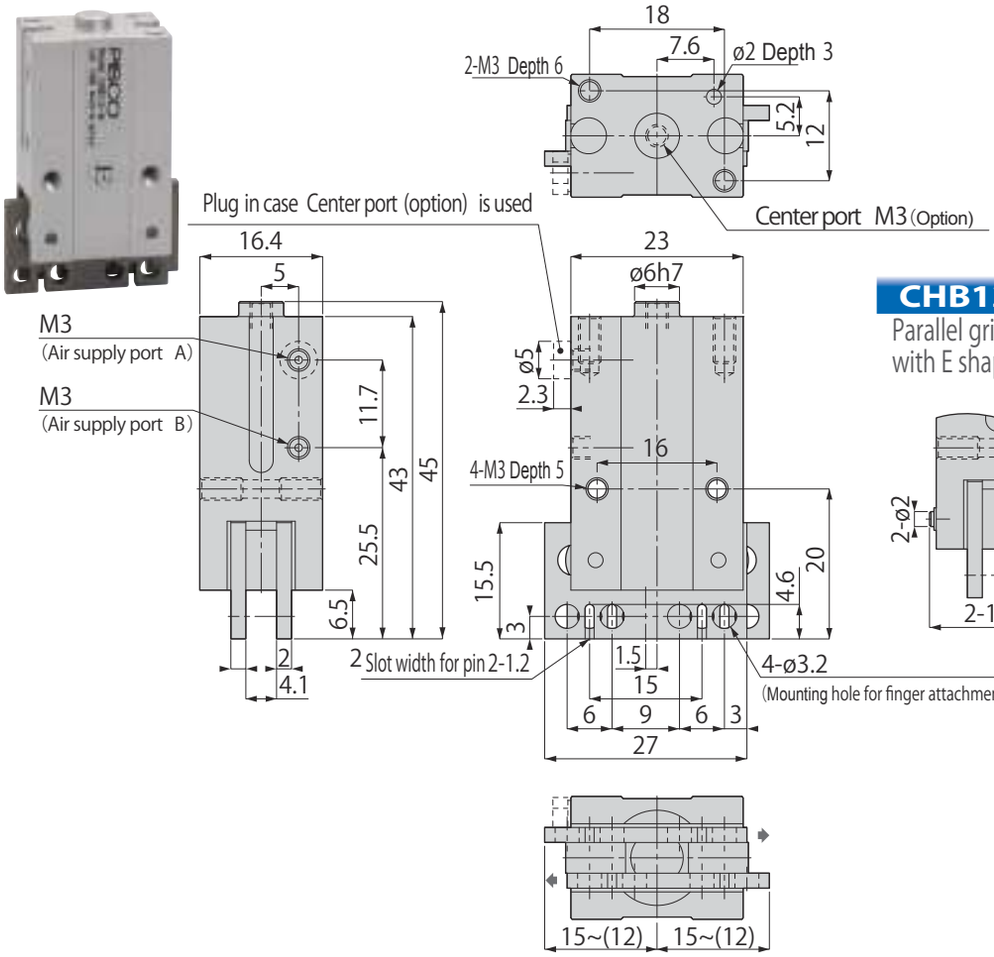
Unit：mm

Model code	Weight (g)
LC-0320-M3M	0.6

CHB12 Parallel gripper Multi-acting type (Body width：16.4㎜)

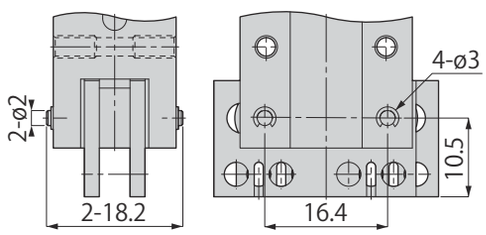
Unit：mm

Model code	Weight (g)
CHB12(E)-□	37
CHB12(E)-□-C	



CHB12E

Parallel gripper multi-acting type (width：16.4mm) with E shaped retaining rings

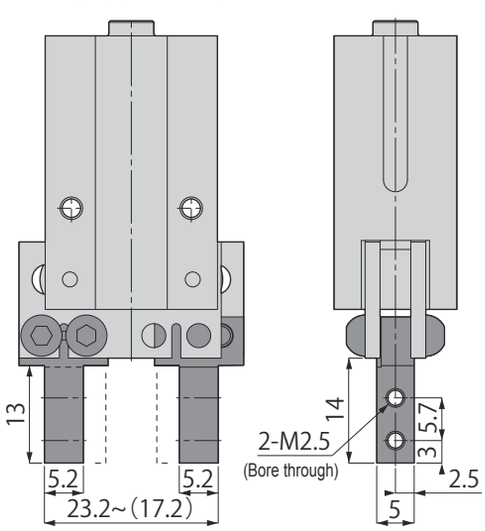


※1. The drawing shows the state of no air supplied.
※2. Fingers consist of two same parts (same design).
※3. When pressurized, each finger moves 3mm towards the arrow direction respectively.

CHK12 Attachment for Parallel gripper (Body width：16.4㎜)

Unit：mm

Model code	Weight (g)
CHK12	11



※1. The above drawing shows Parallel gripper (Multi-acting type, 16.4mm width) with the attachments installed.
※2. Attachment consists of two sets of same parts (same design).

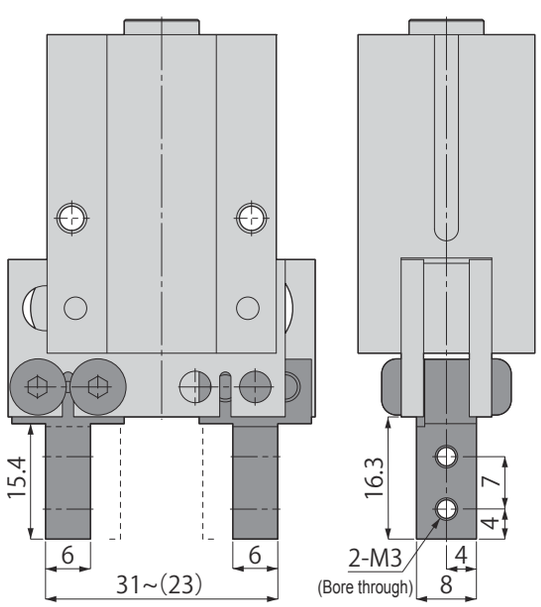
CHB18 Parallel gripper Multi-acting （Body width：23.6㎜）type

Unit：mm

Model code	Weight（g）
CHB18-[2]	90
CHB18-[2]-C	

※1. The drawing shows the state of no air supplied.
※2. Fingers consist of two same parts (same design).
※3. When pressurized, each finger moves 4mm towards the arrow direction respectively.

CHK18 Attachment for Parallel gripper （Body width：23.6㎜）



Unit：mm

Model code	Weight（g）
CHK18	24

※1. The drawing shows Parallel gripper (Multi-acting type, 23.6mm width) with the attachments installed.
※2. Attachments consist of two sets of same parts (same design).

Model designation for Senser switch (Example)

ZE ① 155 ② A ③

③. Cable length

Code	A	B	G (※)
Cable length (㎜)	1000	3000	300 with M8 connector

※Cable length：300㎜ with M8 connector is only for ZE175□ and ZE275□

②. Wiring type・Cable direction

Code	135	155	175	235	255	275
Wiring type	2 wires	3 wires		2 wires	3 wires	
		NPN output	PNP output		NPN output	PNP output
Cable direction	Side			Top		

①. Sensor switch

Non-contact type Sensor Switch Specification

Item \ Model code	ZE135□	ZE155□	ZE175□	ZE235□	ZE255□	ZE275□
Wiring	2 wires	3 wires NPN output	3 wires PNP output	2 wires	3 wires NPN output	3 wires PNP output
Cable connecting direction	Side			Top		
Voltage supply	—	DC4.5 ~ 28V		—	DC4.5 ~ 28V	
Load voltage	DC10 ~ 28V	DC4.5 ~ 28V		DC10 ~ 28V	DC4.5 ~ 28V	
Load current	2.5 ~ 20mA (at 25°C, 10mA at 60°C)	40mA Max.		2.5 ~ 20mA (at 25°C ,10mA at 60°C)	40mA Max.	
Current consumption	—	8mA Max. (DC24V)	10mA Max. (DC24V)	—	8mA Max. (DC24V)	10mA Max. (DC24V)
Internal voltage drop (※1)	4V Max.	2V Max. (0.8V Max. in case Load under 10mA)		4V Max.	2V Max. (0.8V Max. in case Load under 10mA)	
Leakage Current	0.7mA Max. (DC24V, 25 °C)	50μA Max. (DC24V)		0.7mA Max. (DC24V, 25 °C)	50μA Max. (DC24V)	
Response time	1msec Max.					
Insulation resistance	100MΩ Min. (with DC500V megger, between case and wire terminal)					
Withstand voltage	AC500V (50/60Hz) 1 min. (between case and wire terminal)					
Impact resistance (※2)	294.2m/s^2 (Non-repetitive)					
Vibration resistance (※2)	88.3m/s^2 (Peak to peak amplitude 1.5mm・10~55Hz)					
Protective structure	IP67 (IEC standard)、 JIS C0920 (watertight type)					
Indicator	ON - Red LED indicator turns on.					
Cable	PCCV0.2SQx2wires (Brown, Blue) × ℓ (※3)	PCCV0.15SQ×3 wires (Brown, Blue, Black) × ℓ (※3)		PCCV0.2SQ x 2 wires (Brown, Blue)× ℓ (※3)	PCCV0.15SQ×3 wires (Brown, Blue, Black) × ℓ (※3)	
Operating temp. range	0 ~ 60°C					
Storage temp. range	-10 ~ 70°C					
Weight	15g (Wire length code A : 1000mm)、35g (Wire length code B : 3000mm)、15g (Wire length code G : 300mm with M8 connector)					

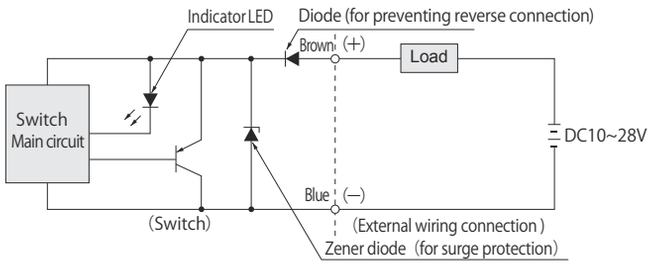
※1. Internal voltage drop is to change by the current load

※2. Manufacturer's test standard

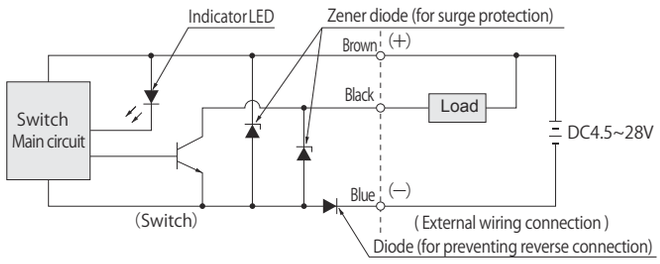
※3. Cable length ℓ : A ; 1000mm、B ; 3000mm、G ; 300mm with M8 connector only for ZE175□、ZE275□

Non-contact type sensor switch - internal circuit

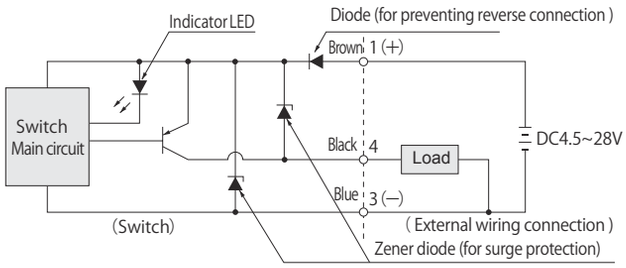
■ZE135 □、ZE235 □



■ZE155 □、ZE255 □

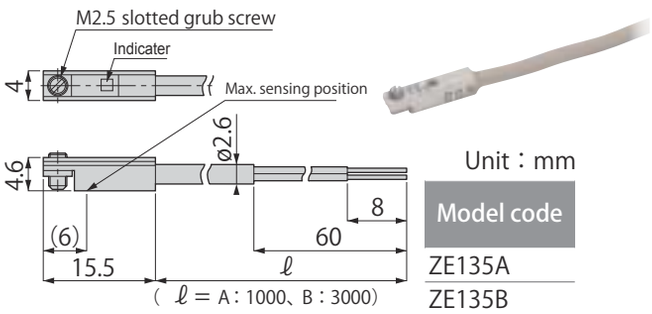


■ZE175 □、ZE275 □



Non-contact type sensor switch dimensions

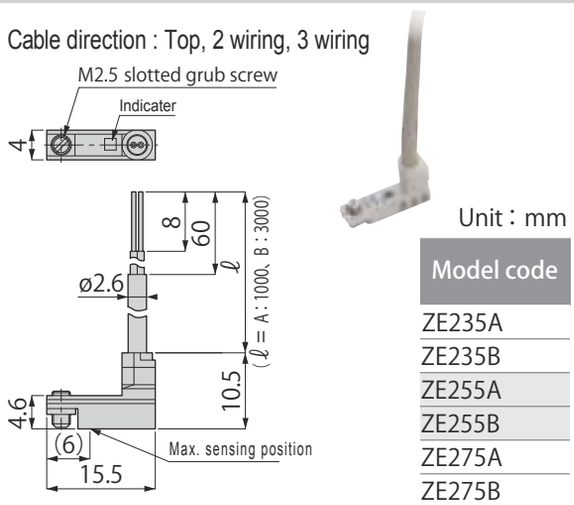
■ Cable direction : Side, 2 wiring, 3 wiring



Unit：mm

Model code
ZE135A
ZE135B
ZE155A
ZE155B
ZE175A
ZE175B

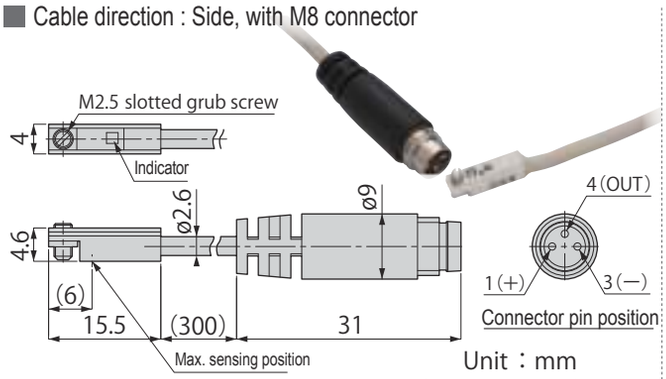
■ Cable direction : Top, 2 wiring, 3 wiring



Unit：mm

Model code
ZE235A
ZE235B
ZE255A
ZE255B
ZE275A
ZE275B

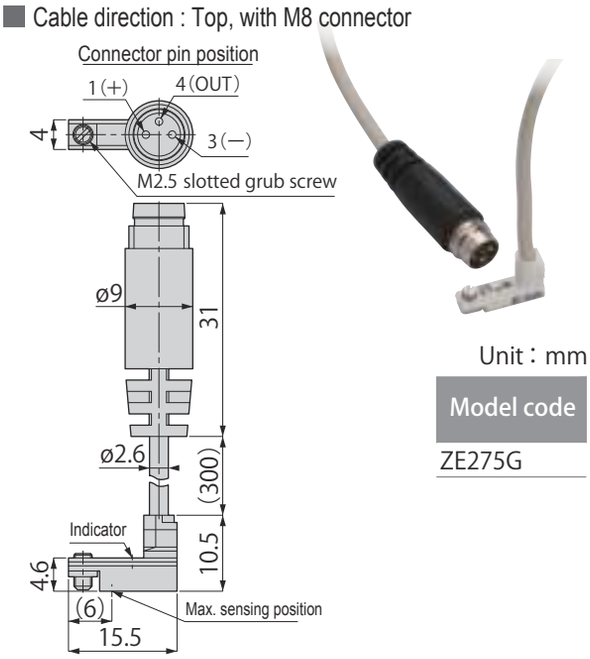
■ Cable direction : Side, with M8 connector



Unit：mm

Model code
ZE175G

■ Cable direction : Top, with M8 connector



Unit：mm

Model code
ZE275G

Handling Instructions of sensor-contactless switch

1. Connect the lead wires according to their color. Incorrect wiring will cause damage to the sensor switch.
2. With the inductive load of an electromagnetic relay, etc., the use of a surge protection diode is recommended.
3. Avoid the use of AND (series) connection because the circuit voltage will drop in proportion to the number of sensor switches.
4. When using an OR (parallel) connection, it is possible to connect sensor switch outputs directly (ex: using corresponding black lead wires). Be aware of load return errors because current leakage increases with the number of switches.
5. Because the sensor switches are magnetically sensitive, avoid using them in locations subject to strong external magnetic fields or bringing them in close proximity to power lines and areas where large electric currents are present.
   In addition, do not use magnetized materials for the mounting bracket, since this may cause erratic operation.
6. Do not excessively pull on or bend the lead wires.
7. Avoid using the sensor switches in environments where chemicals or gas are present.
8. Consult us for use in environments subject to water or oil.

⚠Common Safety Instruction for Parallel Grippers

1. Product handling

1-1. Installation Environment

The gripper has a built-in magnet. Attention is needed in case using the gripper in the environment where magnetic material should be avoided (such as piled-up iron powder, peripheral sensors or works).

※ Use Parallel gripper Single-acting type (CHA08・CHA10) in such environment.

2-2. Product Installation

Use tapped fixing holes on a gripper to install it to Pick and place unit (P&P) or Robot.

●Tighten the screws with the tightening torque shown below. Excessive tightening may cause a performance drop or shorten the product life time.

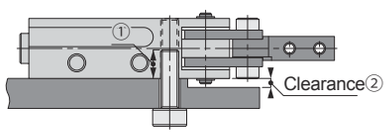
Screw size	Tightening Torque (N·m)
M2.6	0.39
M3	0.88
M4	1.7

● If the surface on which the gripper is installed is not flat, the gripper cylinder may get deformed.

● For side installation, use the tapped fixing holes on the side. Using longer screw than necessary may deform the gripper cylinder. See the table in Fig. 1 for the valid screw length. (Fig.1①)

● The portion near fingers is likely to be deformed in case of side installation. Allow for a clearance so that the components do not come in contact. (Fig.1②)

● The tapped fixing holes for side installation on the gripper are through-holes, but do not clamp the gripper body with a small diameter fixing screw. It may cause a performance malfunction, as well as an unstable installation. (Fig.2)



Screw size	Screw length①
M3	5mm or shorter
M4	8mm or shorter

Fig. 1

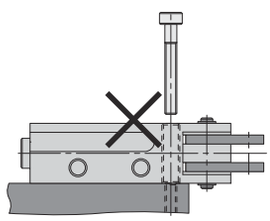


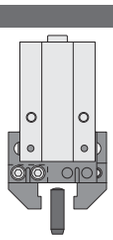
Fig. 2

2. Attachment Handling

● The installation position of the attachment to be installed onto the fingers depends on the gripping type. Check the installing direction in Fig.3-1 to Fig. 3-4.

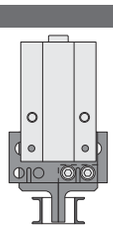
Single acting	Outside gripping by air	Refer to Fig. 3-1
	Inside gripping by air	Refer to Fig. 3-2
	Outside gripping by spring	Refer to Fig. 3-3
	Inside gripping by sping	Refer to Fig. 3-4
Double acting	Outside gripping	Refer to Fig. 3-1
	Inside gripping	Refer to Fig. 3-2

Gripping by air



Outside

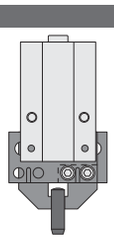
Fig. 3-1



Inside

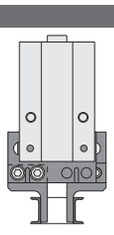
Fig. 3-2

Gripping by spring



Outside

Fig. 3-3.

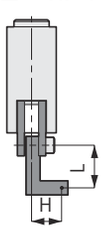


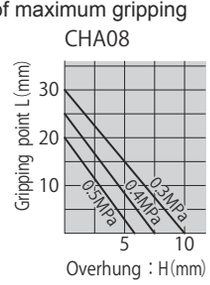
Inside

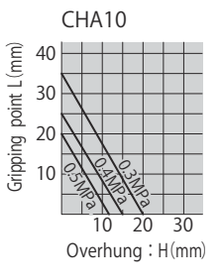
Fig. 3-4

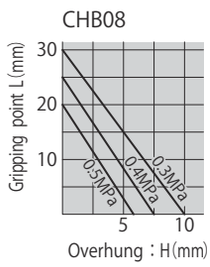
● Attachments should be as light and short as possible and not to exceed maximum gripping size. Grip a work so that the gripping point should be positioned between the fingers as much as possible.

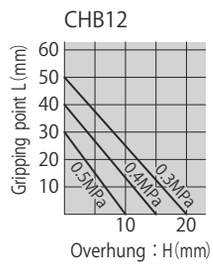
■ Distance of maximum gripping

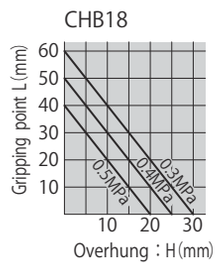












● The end of attachment fixing screw must be within the finger installing face that length is A. If the screw is longer, it will push the finger on the other side and may cause damge.

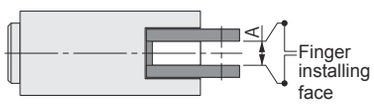


Fig. 5

Model code	A (mm)
CHA08	3
CHA10	4
CHB08	3
CHB12	4
CHB18	6

● Use finger installing face and fixing holes to install the attachment. Do not apply any excessive force on a finger. It may cause malfunction or shorten the product life time. Hold the fingers with a spanner or a vise and do not apply force to the gripper body while installing the attachment.(Fig.6)

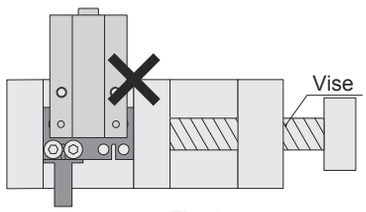


Fig. 6

● A centering slot on the finger can be used for attachment positi oning. In case an attachment is prepared by user, insert a parallel pin type B (JIS B 1354-1988) (Fig.7) into the attachment, and then fix theattachment on the finger. Avoid any impact or excessive force in the pin insersion. Pin is not equipped.

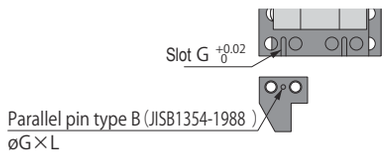


Fig. 7

Model code	G (mm)	L (mm)
CHA08	1.2	4
CHA10		
CHB08	1.2	4
CHB12		5
CHB18	1.5	8

● The finger locating faces are shown in Fig. 8. Clearance is necessary so that the attachment does not touch another finger on the opposite side. After the attachment installation, operate the gripper manually to make sure its smooth motion.

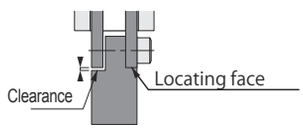


Fig. 8

●For the attachment installation, use a cap screw specified below. Apply screw lockinig adhesive to the screw. The agent may adhere to the finger or gripper body and cause malfunction, if applied too much.

Model code	Screw size	Tightening torque (N·m)
CHA08	M2	0.315
CHA10	M3	1.14
CHB08	M2	0.315
CHB12	M3	1.14
CHB18	M4	2

● When installing an end tool as shown in Fig. 9, hold the end tool with a spanner (or wrench) to avoid a load applied to the gripper body. Holding the main body to install an end tool may result in damage or malfunction.

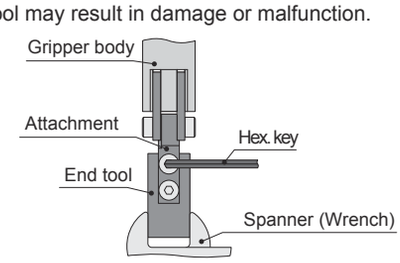


Fig. 9

3. Plumbing

3-1. Plumbing

A single-acting type has one air port, and a multi-acting type has two. For air plumbing, install a fitting as shown in Fig. 10, then connect a tube.

●Use barb fitting basically. Push-in fitting, which is larger and heavier, may touch parts on the body or sensors.

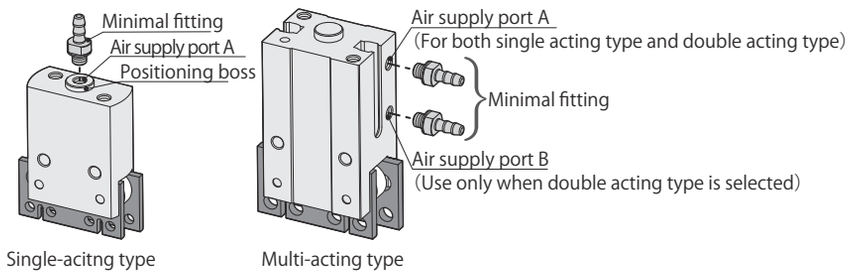


Fig. 10

Single acting type

Install a fitting to Air supply port A only. Air through port A will push the piston and the drive roller will push the fingers to close. (Fig.11)

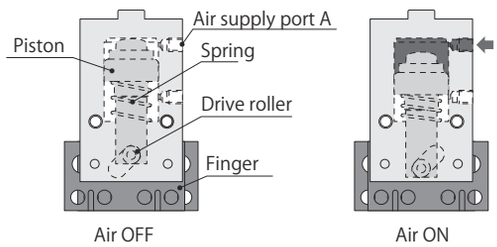


Fig.11

Double acting type

Install fittings to Air supply port A and B. Air through port A will push the piston and the drive roller will push the fingers to close. Air through port B will push back the piston and the drive roller to open the finger. (Fig. 12)

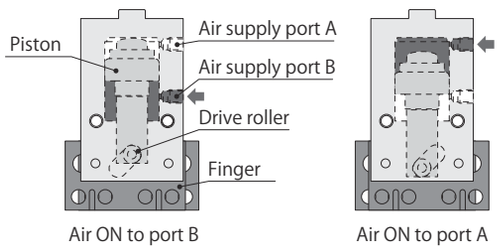


Fig. 12

3-2. Notes for plumping

- For efficient use of air pressure, keep the tube as short as possible. Make sure to install mater-in type speed controllers in case of Single-acting gripper or single ancting type of Multi-acting gripper (use mater-out type controllers for double acting type of Multi-acting gripper) close to the gripper, and adjust the gripper motion speed as slow as possible.

4. Operation

4-1. Motion check

To check the gripper motion after the installation to P&P or robot, make sure to turn off the power and air supply first and operate the valve manually. Pay attention not to get caught in fingers or so.

4-2. Operation

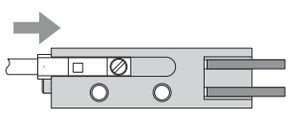
After the motion check, turn on the power and air supply to check the gripper motiono by system controller. Debug the installation and repeat the motion check if necessary.

- ●Depending on the plumping conditions, the gripping force of the spring gripper type may not go up to the expected level within the expected time. Make sure to check the motion carefully during the adjustment.
- ●Long time standby with air supply may cause a delay in the first response of the gripper. Operate the gripper for a few cycles first.

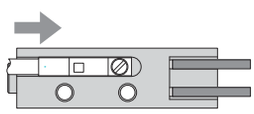
5. Installation of a sensor

●Insert a sensor into a sensor installing slot on the gripper body. Slide the sensor along the slot and tighten the screw at the central position in the sensing range.

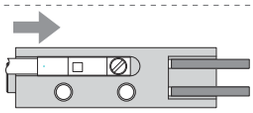
Sensor installation (Example)



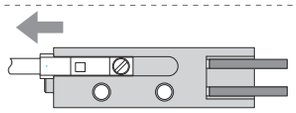
A LED turns on as sliding the sensor along the slot toward arrowed direction.



Slide the sensor 0.3mm further toward arrowed direction from the position the LED turns on, and fix it with a sensor fixing screw.



A LED turns on as sliding the sensor along the slot toward arrowed direction. Slide it further until LED turns off.



Slide back the sensor toward arrowed direction until LED turns on again. Slide the sensor 0.3mm further toward arrowed direction from the position the LED turns on, and fix it with a sensor fixting screw.

●Use a precision screw driver to fix the sensor. Tightening torque : 0.1～0.2N・m

⚠Common Safety Instructions for Actuators

Before selecting or using PISCO products, read the following instructions. Read the detailed instructions for individual series as well as the instructions below.

⚠Warning

1. Watch out for the moving parts of Actuator during operation. Provide safety means, such as a protective cover, where there is danger to human bodies.
2. Where trouble with power supply can cause performance drop, bodily injuries or damage to the equipment, provide safety means.
3. Use clean air, removing drainage and dirt. Impurities contained in compressed air cause malfunction.
4. Do not use Actuators in locations where they are exposed to water drops, oil drops or dust. Malfunction may result from such careless use.
5. Do not allow excessive external forces or shocks to act on the Actuator body. Also take care not to drop the Actuator, or damage to its body may result.

⚠Safety Instructions

This safety instructions aims to prevent personal injury and damage to properties by requiring proper use of PISCO products.

Be certain to follow ISO4414 and JIS B 8370.

ISO 4414 ：Pneumatic fluid power … General rules and safety requirements for system and their components.

JIS B 8370 ：Pneumatic fluid power - General rules and safety requirements for systems and their components.

This safety instructions is classified into “Danger”, “Warning” and “Caution” depending on the degree of danger or damages caused by improper use of PISCO products.

⚠Danger	Hazardous conditions. It can cause death or serious personal injury
⚠Warning	Hazardous conditions depending on usages. Improper use of PISCO products can cause death or series personal injury.
⚠Caution	Hazardous conditions depending on usages. Improper use of PISCO products can cause personal injury or damages to properties.

⚠Warning

1. Selection of pneumatic products
   ①. A user who is a pneumatic system designer or has sufficient experience and technical expertise should select pneumatic equipments.
   ②. Due to the wide variety of operating conditions and applications for PISCO products, carry out the analysis and evaluation on PISCO products. The pneumatic system designer is solely responsible for assuring that the user’s requirements are met and that the application presents no health or safety hazards. All designers are required to fully understand the specifications of PISCO products and constitute all systems based on the latest catalog or information, considering any malfunctions.

2. Handle the pneumatic equipment with enough knowledge and experience.
   ①. Mishandling of compressed air is dangerous. A person having enough knowledge and experiences should carry out assembly, operation, and maintenance of devices equipped with pneumatic equipments.

3. Do not operate machine / equipment or remove pneumatic equipment until safety is cofirmed.
   ①. Make sure that preventive measures against falling work-pieces or sudden movements of machine are completed before inspection or maintenance of thse machine.
   ②. Make sure the above preventive measures are completed. A compressed air supply and the power supply to the machine must be off, and also the compressed air in the systems must be exhausted.
   ③. Restart the machines with care after ensuring to take all preventive measures against sudden movements.

Warranty

When the product produces a trouble, which is caused by our responsibility, we will carry out either one of the following meas ures immediately.

①. Free-of-charge replacement of same product

②. Free-of-charge repair of the product at our factory

Disclaimer

When a cause of the trouble / malfunction applies to any of the following items, it is excluded from the coverage of the above warranty.

①. A case by a natural disaster, a fire except our responsibility, the act by the third person / party, the intention or fault of the customer.

②. A case when a product is used out of the specific range or in a method listed in the product catalog or instruction manual.

③. A case by the remodeling of the product or by a change of structure, performance, or specifications which PISCO is not involved in.

④. A case by the event that is unpredictable by the evaluations and the measures at the time on or before the initial delivery.

⑤. A case caused by the phenomenon that is able to be evaded if your machine or equipment has functions or structures that are comprised in a common sence when this product is incorporated in your machine or equipment.

Additionally, the above warranty is limited simply to the product itself. The damage induced by the trouble of the product will not be compensated.

⚠Common Safety Instructions for Products Listed in This Catalog

PISCO products are designated and manufactured for use in general industrial machines. Be sure to read and follow the instruction below.

⚠Danger

1. Do not use PISCO products for the following applications.
   ①. Equipment used for maintaining / handling human life and body.
   ②. Equipment used for moving / transporting human.
   ③. Equipment specifically used for safety purpose.

⚠Warning

1. Do not use PISCO products under the following conditions.
   ①. Beyond the specifications or conditions stated in the catalog, or the instructions.
   ②. Under the direct sunlight or outdoors.
   ③. Excessive vibrations and impacts.
   ④. Exposure / adhere to corrosive gas, flammable gas, chemicals, seawater, water and vapor.※
   ※. Some products can be used under the condition above(④). Refer to the details of specifications and conditions of each product.
2. Do not disassemble or modify PISCO products, which affect the performance, function, and basic structure of the product.
3. Do not touch the release-ring of a push-in fitting when there is a working pressure. The lock may be released by the physical contact, and tube may fly out or slip out.
4. Frequent switchover of compressed air may generate heat, and there is a risk of causing burn injury.
5. Avoid any load on PISCO products, such as, a tensile strength, twisting and bending. Otherwise, there is a risk of causing damage to the products.
6. As for applications where threads or tubes swing / rotate, use Rotary Joints, High Rotary Joints or Multi-Circuit Rotary Block only. The other PISCO products can be damaged in these applications.
7. Use only Die Temperature Control Fitting Series, Tube Fitting Stainless SUS316 Series, Tube Fitting Stainless SUS316 Compression Fitting Series or Tube Fitting Brass Series under the condition of over 60℃(140° F) water or heat medium oil. Other PISCO products can be damaged by heat and hydrolysis under the condition above.
8. As for the condition required to dissipate static electricity or provide an antistatic performance, use EG series fitting and antistatic products only, and do not use other PISCO products. There is a risk that static electricity can cause system defects or failures.
9. Use only Fittings with a characteristic of spatter-proof such as Anti-spatter or Brass series in a place where flame and weld spatter is produced. There is a risk of causing fire by sparks.
10. Turn off the power supply, stop the air supply to PISCO products, and make sure there is no residual air pressure in the pipes before maintenance and inspection.
    ①. Make sure the safety of all systems related to PISCO products before maintenance.
    ②. Restart of operation after maintenance shall be proceeded with care after ensuring the safety of the system by preventive measures against unexpected movements of machines and devices where pneumatic equipment is used.
    ③. Keep enough space for maintenance when designing a circuit.
11. If there is a possibility of damage or disaster by a fluid leakage, implement specific countermeasures such as using a protective cover in order to protect machines / facilities from damage or disaster.

⚠Caution

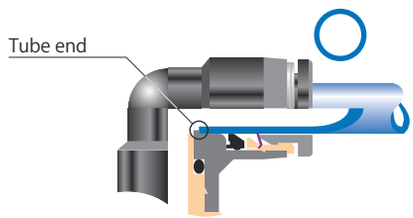
1. Remove dusts or drain before piping. They may get into the peripheral machine / facilities and cause malfunction.
2. When inserting an ultra-soft tube into a push-in fitting, make sure to place an Insert Ring into the tube edge. There is a risk of causing the escape of the tube and a fluid leakage without using an Insert Ring.
3. The product incorporating NBR as seal rubber material has a risk of malfunction caused by ozone crack. Ozone exists in high concentrations in static elimination air, clean-room, and near the high-voltage motors, etc. As a countermeasure, material change from NBR to HNBR or FKM is necessary. Consult with PISCO for more information.
4. Special option "Oil-free" products may cause a very small amount of a fluid leakage. When a fluid medium is liquid or the products are required to be used in harsh environments, contact us for further information.
5. In case of using non-PISCO brand tubes, make sure the tolerance of the outer tube diameter and tube hardness are within the limits of Table 1.

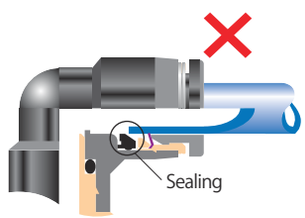
●Table 1. Tube O.D. Tolerance

mm size	Nylon tube (SHORE D63)	Polyurethane tube (SHORE A98)
ø1.8mm		±0.05mm
ø2mm		±0.05mm
ø3mm		±0.15mm
ø4mm	±0.1mm	±0.15mm
ø6mm	±0.1mm	±0.15mm
ø8mm	±0.1mm	±0.15mm
ø10mm	±0.1mm	±0.15mm
ø12mm	±0.1mm	±0.15mm
ø16mm	±0.1mm	±0.15mm

Inch size	Nylon tube (SHORE D63)	Polyurethane tube (SHORE A98)
ø1/8	±0.1mm	±0.15mm
ø5/32	±0.1mm	±0.15mm
ø3/16	±0.1mm	±0.15mm
ø1/4	±0.1mm	±0.15mm
ø5/16	±0.1mm	±0.15mm
ø3/8	±0.1mm	±0.15mm
ø1/2	±0.1mm	±0.15mm
ø5/8	±0.1mm	±0.15mm

6. Instructions for Tube Insertion
   ①. Make sure that the cut end surface of the tube is at a right angle without a scratch on the tube surface or deformations.
   ②. When inserting a tube, the tube needs to be inserted fully into the push-in fitting until the tubing edge touches the tube end of the fitting as shown in the figure below. Otherwise, there is a risk of leakage.





Tube is not fully inserted up to tube end

   ③. After inserting the tube, make sure it is inserted properly and not to be disconnected by pulling it moderately.
   ※. When inserting tubes, Lock-claws may be hardly visible in the hole, observed from the front face of the release-ring. But it does not mean the tube will surely escape. Major causes of the tube escape are the followings; ① Shear drop of the lock-claws edge ②The problem of tube diameter (usually small). Therefore, follow the above instructions from ① to ③, even lock-claws is hardly visible.

7. Instructions for Tube Disconnection
   ①. Make sure there is no air pressure inside of the tube, before disconnecting it.
   ②. Push the release-ring of the push-in fitting evenly and deep enough to pull out the tube toward oneself. By insufficient pushing of the release-ring, the tube may not be pulled out or damaged by scratch, and tube shavings may remain inside of the fitting, which may cause leakage later.

8. Instructions for Installing a fitting
   ①. When installing a fitting, use proper tools to tighten a hexagonal-column or an inner hexagonal socket. When inserting a hex key into the inner hexagonal socket of the fitting, be careful so that the tool does not touch lock-claws. The deformation of lock-claws may result in a poor performance of systems or an escape of the tube.
   ②. Refer to Table 2 which shows the tightening torque. Do not exceed these limits to tighten a thread. Excessive tightening may break the thread part or deform the gasket to cause a fluid leakage. Tightening thread with tightening torque lower than these limits may cause a loosened thread or a fluid leakage. Since the sealability is affected by the processing condition of the installing part, adjust the tightening torque or correct the installing part, according to the condition.
   ③. Adjust the tube direction while tightening thread within these limites, since some PISCO products are not rotatable after the installation.

● Table 2. Tightening torque / Sealock color / Gasket materials.

Thread type	Thread size	Tightening torque	Sealock color	Gasket material
Metric thread	M3×0.5	0.7N·m	—	SPCC+NBR SUS304+NBR
	M5×0.8	1.0 ~ 1.5N·m		
	M6×1	2~ 2.7N·m		
	M3×0.5	0.7N·m		POM
	M5×0.8	1 ~ 1.5N·m		
	M6×0.75	0.8 ~ 1N·m		
	M8×0.75	1 ~ 2N·m		
Taper pipe thread	R1/8	4.5 ~ 6.5N·m	White	—
	R1/4	7 ~ 9N·m		
	R3/8	12.5 ~ 14.5N·m		
	R1/2	20 ~ 22N·m		
Unified thread	No.10-32UNF	1.0 ~ 1.5N·m	—	SPCC+NBR 、SUS304+NBR
National Pipe Thread Taper (American standard)	1/16-27NPT	4.5 ~ 6.5N·m	White	—
	1/8-27NPT	4.5 ~ 6.5N·m		
	1/4-18NPT	7 ~ 9N·m		
	3/8-18NPT	12.5 ~ 14.5N·m		
	1/2-14NPT	20 ~ 22N·m		

※. These values may differ for some products. Refer to each specification as well.

   ④. Creep phenomenon or deformation of gasket may cause a loosened thread. Carry out maintenance inspection periodically, and re-torque the thread with the tightening torque above if necessary.

9. Instructions for removing a fitting
   ①. When removing a fitting, use proper tools to loosen a hexagonal-column or an inner hexagonal socket. When inserting a hex key into the inner hexagonal socket of the fitting, be careful so that the tool does not touch lock-claws. The deformation of lock-claws may result in a poor performance of systems or an escape of the tube.
   ②. Remove the sealant stuck on the mating equipment. The remained sealant may get into the peripheral equipment and cause malfunctions.

10. Arrange piping avoiding any load on fittings and tubes such as twist, tensile, moment load, shaking and physical impact. These may cause damages to fittings, tube deformations, bursting and the escape of tubes.

11. Instructions for handling a product
   ①. Impact caused by dropping or the like may lead to damage to the product and a fluid leakage.