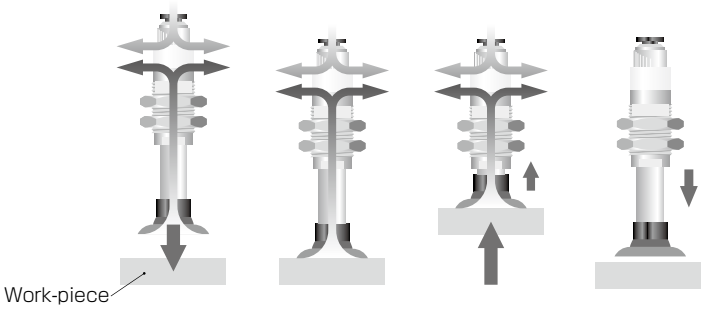
Vacuum Pad Equipped with Cylinder & Vacuum Generator

Vacuum Cylinder

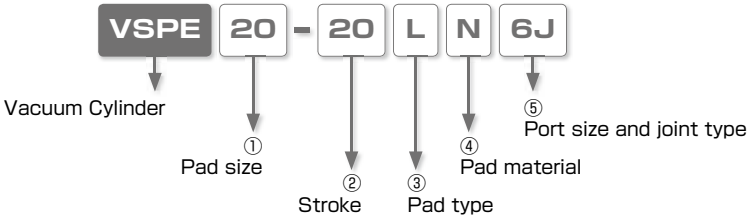
●The Cylinder with built-in Vacuum Generator self-retracts and lifts the object immediately after making contact with the object via compressed air supply.



●Various selection of pad sizes, materials and cylinder storkes.

- Pad size: ø4/6/8/10/15/20/30/40/mm
- Pad material: Nitrile / Silicon / Fluorosilicon rubber
- Cylinder stroke: 5, 10, 20 and 30 mm

Model Designation (Example)



① Pad size

Code	4	6	8	10	15	20	30	40
Dia. (mm)	ø4	ø6	ø8	ø10	ø15	ø20	ø30	ø40

② Stroke

Code	5	10	20	30
Stroke	5mm	10mm	20mm	30mm

③ Pad type

Code	L
Type	Soft

④ Pad material and application

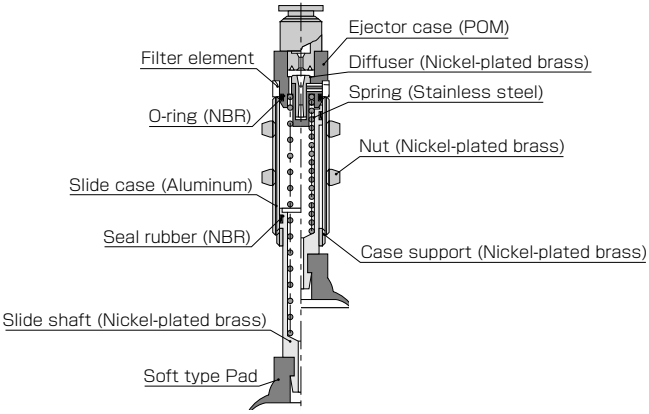
Material	Nitrile rubber	Silicone rubber	Fluorosilicone rubber
Code	N	S	FS
Application	Cardboard Plywood Iron plate Food-related Other general work-pieces	Semiconductors Taking out molded parts Thin work-pieces Food-related	Taking out molded parts

⑤ Port size and joint type

Joint type	Push-In Fitting	
Code	4J	6J
O.D. x I.D.	ø4mm (for 5/32" O.D. tubing)	ø6mm ❖ (1/4" O.D.)
Pad size	ø4mm ~ ø40mm	

❖ PISCO offers a plug--n adapter from 6mm to 1/4" O.D. tubing (PGJ6-1/4M)

Construction



Characteristics of Pad Material

Item \ Pad material		Nitrile rubber	Silicone rubber	Fluorosilicone rubber
Item	Material code	**N**	**S**	**FS**
Application		Cardboard Plywood Iron plate Food-related Other general work-pieces	Semiconductors Taking out molded parts Thin work-pieces Food-related	Taking out molded parts
Color		Black	White	Pink
Physical Properties	Surface hardness (Shore A)	50~60°	50°	50°
	Highest operating temp.	230℉(110℃)	356℉(180℃)	356℉(180℃)
	Lowest operating temp.	-22℉(-30℃)	-40℉(-40℃)	-58℉(-50℃)
	Weatherability	△	◎	○
	Ozone-proof	△	◎	◎
	Acid resistance	△	○	○
	Alkali resistance	○	◎	◎
	Oil resistance (Gasoline/ Diesel oil)	◎	△	△
	Oil resistance (Benzene /Toluene)	△	△	△
	Surface resistivity	–	–	–

Legend ➡ ◎ : Best, ○ : Suitable, △ : Good, × : NG

Note 1) The above "Physical Properties" shows the data of general synthetic rubbers.

Note 2) The highest / lowest operating temp. is for momentary usage. Carry out durability evaluation in case of continuous usage under the highest / lowest operating temp.

Suction Force

Regarding suction force of soft pad type, the calculated suction force (theoretical suction force x safety factor) may not be assured, due to the characteristics of vacuum pad, vacuum level, pad material and work-piece, etc.
Select the proper item based on "Vacuum Pad Selection Guide". Carry out any necessary evaluation with an actual system before approval.

⚠ Detailed Safety Instructions

Before using PISCO products, be sure to read "Safety Instructions" and "Safety Instruction Manual" and "Common Safety Instructions for Vacuum Pad" .

Warning

1. Minimize the load on ejector and shaft parts from the transverse direction. Vacuum cylinder may be damaged.
2. Avoid any tensile strength and twisting force on the fitting part. Vacuum cylinder may be damaged.
3. When installing bulkhead part, refer to the recommended tightening torque in "Common Safety Instructions for Vacuum Pads". Make sure that there is no looseness of the screw.

Caution

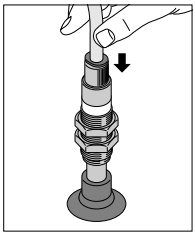
1. Silencer element is not replaceable.
2. Refer to "Common Safety Instructions for Vacuum Series" for handling the ejector and vacuum pads.

How to insert and disconnect

1. How to insert and disconnect tubes

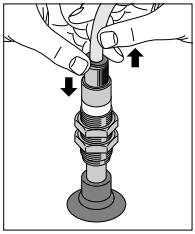
① Tube insertion

Insert a tube into Push-In Fitting up to the tube end. Lock-claws bite the tube and fix it automatically, then the elastic sleeve seals around the tube.
Refer to "2. Instructions for Tube Insertion" under "Common Safety Instructions for Fittings".



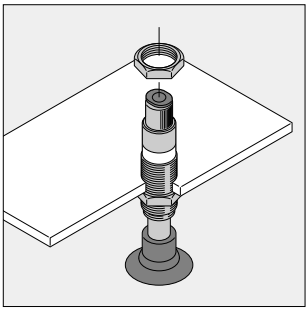
② Tube disconnection

The tube is disconnected by pushing release-ring to release Lock-claws.
Make sure to stop air supply before the tube disconnection.



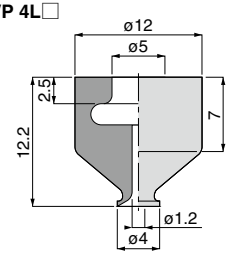
2. How to fix cylinder

In order to fix the cylinder, tighten the hexagonal nut with a spanner.
Refer to the dimensional drawings for detail.

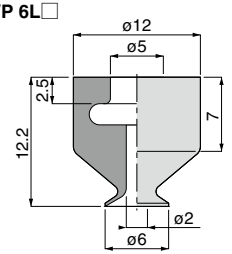


Vacuum Pad Dimension

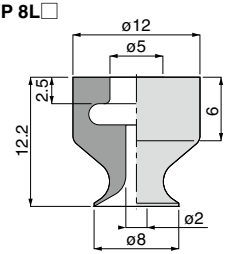
VP 4L□



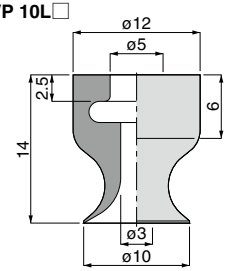
VP 6L□



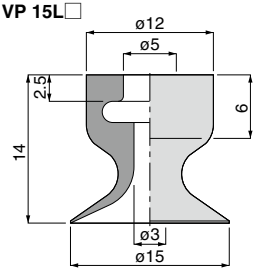
VP 8L□



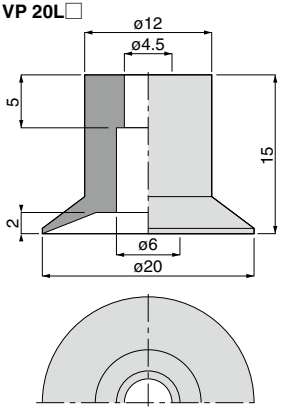
VP 10L□



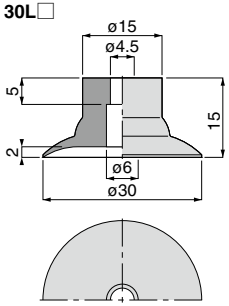
VP 15L□



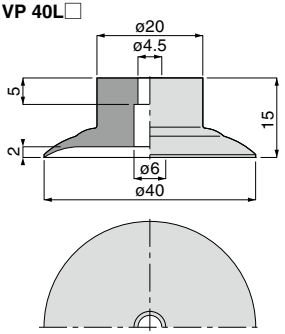
VP 20L□



VP 30L□

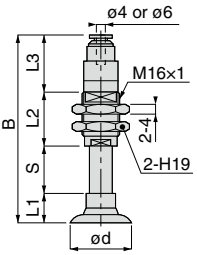


VP 40L□



VSPE Vacuum Cylinder

RoHS compliant



Unit：mm

Model code	Pad O.D.	B		L1	L2	L3		Stroke	Weight (g)		CAD
	ød	ø4	ø6			ø4	ø6	S	ø4	ø6	file name
VSPE4-5L□□J	4	62.9	64	12.2	22	23.7	24.8	5	34.1	33.8	VSPE-001
VSPE6-5L□□J	6	62.9	64	12.2	22	23.7	24.8	5	34.2	33.9	VSPE-002
VSPE8-5L□□J	8	62.9	64	12.2	22	23.7	24.8	5	34.2	33.9	VSPE-003
VSPE10-5L□□J	10	64.7	65.8	14	22	23.7	24.8	5	34.3	34	VSPE-004
VSPE15-5L□□J	15	64.7	65.8	14	22	23.7	24.8	5	34.3	34	VSPE-005
VSPE20-5L□□J	20	65.7	66.8	15	22	23.7	24.8	5	35.8	35.5	VSPE-006
VSPE30-5L□□J	30	65.7	66.8	15	22	23.7	24.8	5	37.6	37.3	VSPE-007
VSPE40-5L□□J	40	65.7	71.8	15	22	23.7	24.8	5	41.3	41	VSPE-008
VSPE4-10L□□J	4	72.9	74	12.2	27	23.7	24.8	10	36.9	36.6	VSPE-001
VSPE6-10L□□J	6	72.9	74	12.2	27	23.7	24.8	10	37	36.7	VSPE-002
VSPE8-10L□□J	8	72.9	74	12.2	27	23.7	24.8	10	37.1	36.7	VSPE-003
VSPE10-10L□□J	10	74.7	75.8	14	27	23.7	24.8	10	37.1	36.8	VSPE-004
VSPE15-10L□□J	15	74.7	75.8	14	27	23.7	24.8	10	41.6	36.8	VSPE-005
VSPE20-10L□□J	20	75.7	76.8	15	27	23.7	24.8	10	38.5	38.2	VSPE-006
VSPE30-10L□□J	30	75.7	76.8	15	27	23.7	24.8	10	40.3	40	VSPE-007
VSPE40-10L□□J	40	75.7	76.8	15	27	23.7	24.8	10	41.6	43.7	VSPE-008
VSPE4-20L□□J	4	92.6	94	12.2	37	23.7	24.8	20	41.6	41.3	VSPE-001
VSPE6-20L□□J	6	92.6	94	12.2	37	23.7	24.8	20	41.7	41.4	VSPE-002
VSPE8-20L□□J	8	92.6	94	12.2	37	23.7	24.8	20	41.7	41.4	VSPE-003
VSPE10-20L□□J	10	94.7	95.8	14	37	23.7	24.8	20	41.8	41.5	VSPE-004
VSPE15-20L□□J	15	94.7	95.8	14	37	23.7	24.8	20	41.8	41.5	VSPE-005
VSPE20-20L□□J	20	95.7	96.8	15	37	23.7	24.8	20	42.9	42.6	VSPE-006
VSPE30-20L□□J	30	95.7	96.8	15	37	23.7	24.8	20	44.7	44.4	VSPE-007
VSPE40-20L□□J	40	95.7	96.8	15	37	23.7	24.8	20	46.7	48.1	VSPE-008
VSPE4-30L□□J	4	112.9	114	12.2	47	23.7	24.8	30	46.7	46.4	VSPE-001
VSPE6-30L□□J	6	112.9	114	12.2	47	23.7	24.8	30	46.8	46.5	VSPE-002
VSPE8-30L□□J	8	112.9	114	12.2	47	23.7	24.8	30	46.8	46.5	VSPE-003
VSPE10-30L□□J	10	114.7	115.8	14	47	23.7	24.8	30	46.9	46.6	VSPE-004
VSPE15-30L□□J	15	114.7	115.8	14	47	23.7	24.8	30	46.9	46.6	VSPE-005
VSPE20-30L□□J	20	115.7	116.8	15	47	23.7	24.8	30	48.3	48	VSPE-006
VSPE30-30L□□J	30	115.7	116.8	15	47	23.7	24.8	30	48.3	49.8	VSPE-007
VSPE40-30L□□J	40	115.7	116.8	15	47	23.7	24.8	30	53.8	53.5	VSPE-008

※. Left □ in Model code : Replaced with Pad rubber material code. Right □ in Model code : Replaced with Fitting size code. Refer to page 719 for code.

Various material for suction cup PISCO offers

Item		Pad material	Nitrile rubber	Food safe NBR	Silicone rubber	Static dissipative rubber (ESD)	Urethane rubber	Fluorine rubber	Fluorosilicone rubber	Conductive rubber (low resistance)	Chloroprene rubber (sponge)
		Material code	N, NH*1	G	S	SE	U	F	FS	E	S
Application			Cardboard Plywood Iron plate Food-related Other general work-pieces		Semiconductors Taking out molded parts Thin work-pieces Food-related		Cardboard Plywood Iron plate	Chemical environment High temp. work-pieces	Taking out molded parts	General parts of semiconductors	Work-pieces with rough surface
Color			Black	Gray	White	Black	Blue	Gray	Light brown	Black	Black
Physical Properties	Surface hardness (Shore A)	Standard	50˚~60˚	60˚	50˚	60˚	60˚	50˚~60˚	—	70˚	—
		Bellows	50˚~60˚	—	50˚	60˚	—	—	—	—	—
		Multi-Bellows	50˚~60˚	60˚	50˚	—	—	—	—	—	—
		Oval	50˚~60˚	—	50˚	—	—	—	—	70˚	—
		Soft	50˚~60˚	—	50˚	60˚	—	—	50˚	—	—
		Soft Bellows	50˚~60˚	—	50˚	—	—	—	—	—	—
		Skidproof	50˚~60˚	—	—	—	—	—	—	—	—
		Ultrathin	50˚~60˚	—	—	—	—	—	40˚	—	—
	Highest operating temp.		230˚F (110˚C)		350˚F (180˚C)		140˚F (60˚C)	440˚F(230˚C)	350˚F(180˚C)	210˚F(100˚C)	80˚F (80˚C)
	Lowest operating temp.		-20˚F (-30˚C)		-40˚F (-40˚C)		-4˚F (-20˚C)	14˚F (-10˚C)	-58˚F(-50˚C)	-58˚F(-50˚C)	-49˚F(-45˚C)
	Weatherability		△		◎		○	○	○	○	○
	Ozone-proof		△		◎		◎	◎	◎	×	○
	Acid resistance		△		○		×	◎	○	△	△
	Alkali resistance		○		◎		×	×	◎	○	◎
	Oil resistance	Gasoline / Diesel oil	◎		△		◎	◎	△	×	×
		Benzene / Toluene	△		△		△	◎	△	×	△
	Surface resistivity		—		—	10^4~10^6Ω/sq	—	—	—	200Ω/sq or less	—

Legend ◎ : Best, ○ : Suitable, △ : Good, × : NG

*1. Material code "**NH**" is only available for Skidproof Series.

Note 1) The above "Physical Properties" shows the data of general synthetic rubbers.

Note 2) The highest / lowest operating temp. is for momentary usage. Carry out durability evaluation in case of continuous usage under the highest / lowest operating temp.

Select the suitable vacuum pad resin material from the table.

Item	Pad material	PEEK	POM	Conductive PEEK
	Material code	K	M	KE
Application		Semiconductors / Manufacturing machine for liquid crystal	General production lines Food-related machine Packaging machine	Semiconductors / Manufacturing machine for liquid crystal Electronic components
Color		Natural (ivory)	White	Black
Physical Properties	Highest operating temp.	480˚F (250˚C)	200˚F (95˚C)	480˚F (250˚C)
	Lowest operating temp.	-58˚F (-50˚C)	-76˚F (-60˚C)	-58˚F (-50˚C)
	Weatherability	◎	×	◎
	Acid resistance	◎	×	◎
	Alkali resistance	◎	△	◎
	Self-lubricity	○	◎	○
	Abrasion resistance	◎	◎	◎
	Surface resistivity	—	—	10^7Ω/sq or less

Legend ◎ : Best, ○ : Suitable, △ : Good, × : NG

Note 1) The above "Physical Properties" shows the data of pad resin material only. The holder of Mark-free Series is not included.

Note 2) The above "Physical Properties" shows a general properties of resin materials and not a guaranteed value. Carry out the necessary evaluation under an actual operating condition.

Note 3) The highest / lowest operating temp. is for momentary usage. Carry out durability evaluation in case of continuous usage under the highest / lowest operating temp.

⚠ SAFETY Instructions

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

Be certain to follow ISO 4414 and JIS B 8370

ISO 4414 : Pneumatic fluid power…Recomendations for the application of equipment to transmission and control systems.

JIS B 8370 : 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 serious 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 PISCO products.
   ② Due to 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 Improper use of compressed air is dangerous. Assembly, operation and maintenance of machines using pneumatic equipment should be conducted by a person with enough knowledge and experience.

3. Do not operate machine / equipment or remove pneumatic equipment until safety is confirmed.
   ① Make sure that preventive measures against falling work-pieces or sudden movements of machine are completed before inspection or maintenance of these 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.

Disclaimer

1. PISCO does not take any responsibility for any incidental or indirect loss, such as production line stop, interruption of business, loss of benefits, personal injury, etc., caused by any failure on use or application of PISCO products.

2. PISCO does not take any responsibility for any loss caused by natural disasters, fires not related to PISCO products, acts by third parties, and intentional or accidental damages of PISCO products due to incorrect usage.

3. PISCO does not take any responsibility for any loss caused by improper usage of PISCO products such as exceeding the specification limit or not following the usage the published instructions and catalog allow.

4. PISCO does not take any responsibility for any loss caused by remodeling of PISCO products, or by combinational use with non-PISCO products and other software systems.

5. The damages caused by the defect of Pisco products shall be covered but limited to the full amount of the PISCO products paid by the customer.

⚠ SAFETY INSTRUCTION MANUAL

PISCO products are designed and manufactured for use in general industrial machines. Be sure to read and follow the instructions 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 purposes.

⚠ 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, inflammable gas, chemicals, seawater, water and vapor. *
   * Some products can be used under the condition above(④), refer to the details of specification and condition of each product.
2. Do not disassemble or modify PISCO products, which affect the performance, function, and basic structure of the product.
3. 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.
4. Do not touch the release-ring of 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.
5. Frequent switchover of compressed air may generate heat, and there is a risk of causing burn injury.
6. 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.
7. 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.
8. 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 thermal oil. Other PISCO products can be damaged by heat and hydrolysis under the condition above.
9. 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.
10. 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.
11. Turn off the power supply to PISCO products, and make sure there is no residual air pressure in the pipes and equipment before maintenance. Follow the instructions below in order to ensure safety.
    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 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.
12. Take safety measures such as providing a protection cover if there is a risk of causing damages or fires on machine / facilities by a fluid leakage.

⚠ Caution

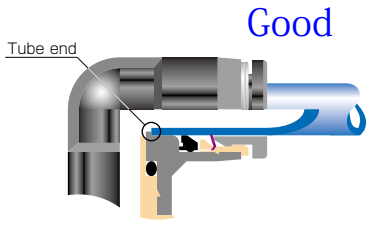
1. Remove dusts or drain before piping. They may get into the peripheral machine / facilities and cause malfunction.
2. When inserting an ultra-soft tube into push-in fitting, make sure to place an Insert Ring into the tube edge. There is a risk of causing the escape of tube and a fluid leakage without 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 is within the limits of Table 1.

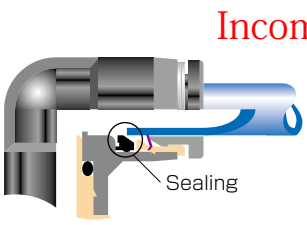
● Table 1. Tube O.D. Tolerance

mm size	Nylon tube	Polyurethane tube
ø1.8mm	—	±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	Polyurethane tube
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 right angle without a scratch on the surface and 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;
   ①Shear 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 deeply 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 the 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 recommended tightening torque. Do not exceed these limits to tighten a thread. Excessive tightening may break the thread part or deform the gasket and cause a fluid leakage. Tightening thread with tightening torque lower than these limits may cause a loosened thread or a fluid leakage.
   ③ Adjust the tube direction while tightening thread within these limits, since some PISCO products are not rotatable after the installation.

● Table 2: Recommended tightening torque / Sealock color / Gasket materials

Thread type	Thread size	Tightening torque	Sealock color	Gasket materials
Metric thread	M3 × 0.5	0.7N·m	—	SUS304 NBR
	M5 × 0.8	1.0 ~ 1.5N·m		
	M6 × 1	2 ~ 2.7N·m		
	M3 × 0.5	0.5 ~ 0.6N·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	7 ~ 9N·m	White	—
	R1/4	12 ~ 14N·m		
	R3/8	22 ~ 24N·m		
	R1/2	28 ~ 30N·m		
Unified thread	No.10-32UNF	1.0 ~ 1.5N·m	—	SUS304、NBR
National pipe thread taper	1/16-27NPT	7 ~ 9N·m	White	—
	1/8-27NPT	7 ~ 9N·m		
	1/4-18NPT	12 ~ 14N·m		
	3/8-18NPT	22 ~ 24N·m		
	1/2-14NPT	28 ~ 30N·m		

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

9. Instructions for removing a fitting
   ① When removing a fitting, use proper tools to loosen a hexagonal-column or an inner hex bolt.
   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.

⚠ Common Safety Instructions for Vacuum Pads

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. Take safety measures in advance where a dropping work-piece can cause danger.
2. Make sure to install a vacuum pad holder securely. Looseness may cause trouble.
3. Pay special attention to the work conveyance by screwed vacuum pads, accompanied by rotary movement. There is a possibility of troubles due to the looseness of screws from the rotary movement.
4. There is a possibility of troubles due to the leakage of vacuum system, clogging, vacuum pad abrasion, crack, deterioration, the galling of slider part in the holder and the looseness in joints. Carry out maintenance inspection periodically.
5. When a work-piece is conveyed by a vacuum pad, consider the acceleration, impacts and wind pressure. Otherwise, the work-piece may drop during conveyance.

⚠ Caution

1. Thoroughly read and understand the theoretical suction force in this catalog before selecting diameter, Qty and suction place of vacuum pads. Select vacuum pads with enough margin in suction force.
2. Select the material of vacuum pad in accordance with use environment and ease of use, referring to “Selecting Method” .
3. Select the suitable pad shape (type) in accordance with a work-piece and its shape, referring to “Characteristics of Pad Material”
4. Select spring-holder type when work-pieces have different heights or are weak against an external force. Select the suitable holder type, referring to spring force and spring length in the catalog.
5. Since spring-holder type has a sliding action, minimize the transverse load. Otherwise, the life time of the holder can be reduced or malfunction of the holder can occur.
6. In replacing vacuum pads, check the structure of holders and pads in the catalog and tighten the hexagonal-column of the holder with a proper tool, referring to the following recommended tightening torque.

● Table: Recommended tightening torque

Vacuum pad holder	Standard	Small
Pad screw size (㎜)	Tightening torque	
M4×0.7	0.5 ~ 1.0N·m	0.9 ~ 1.1N·m
M6×1	2 ~ 2.7N·m	
M10×1.5	5 ~ 7N·m	–
M20×2	9 ~ 10N·m	–

7. In replacing the adapters of Soft / Soft Bellows Series, check the structure of holders, pad and adapters in the catalog and tighten the hexagonal-column of the holder with a proper tool, referring to the following recommended tightening torque.

● Table: Recommended tightening torque

Pad screw size (㎜)	Tightening torque
M4×0.7	0.5 ~ 1.6N·m
M6×1	1.5 ~ 2.0N·m

8. In installing vacuum pad holders of general and small type with bulkhead, check the structure in the catalog and tighten the hexagonal-column of the holder with a proper tool, referring to the following recommended tightening torque.

● Table: Recommended tightening torque

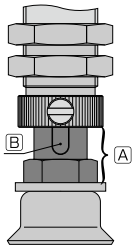
Vacuum pad holder	Standard	Small
Pad screw size (㎜)	Tightening torque	
M4×0.5	1 ~ 1.2N·m	–
M4×0.7	–	1 ~ 1.2N·m
M5×0.5	1.5 ~ 2N·m	
M6×0.75	2 ~ 3N·m	
M8×0.75	2.5 ~ 3.5N·m	
M10×1	5 ~ 7N·m	
M12×1	12 ~ 14N·m	–
M14×1	18 ~ 21N·m	–
M16×1	18 ~ 20N·m	–
M20×1	19 ~ 21N·m	–
M24×2	40 ~ 50N·m	–

9. In replacing vacuum pad rubbers of Standard Series ø80, ø100mm and Bellows Series ø80mm, check the structure of holders and pads in the catalog and tighten the hexagonal-column of the holder with a proper tool, referring to the following recommended tightening torque.

● Table: Recommended tightening torque

Screw size (㎜)	Tightening torque
M4×0.7	0.5 ~ 0.7N·m
M5×0.8	

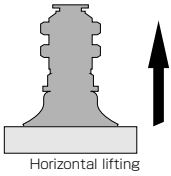
10. Check the structure of vacuum pad in the catalog before replacing a filter element.
11. Refer to “Common Safety Instructions for Fittings” for handing fitting joint parts.
12. In installing spring-holder type, do not hold the shaft Ⓐ with a spanner. In replacing vacuum pad, hold the hexagonal-column of the shaft with a spanner. If the keyway Ⓑ is deformed, there is a possibility of malfunction.

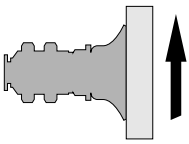


Vacuum Pad Selection Guide

Selection Guide 1 ▶ Select the diameter of vacuum pad from the formula ① and chart of the theoretical suction force ②.

The theoretical suction force is determined from pad area and vacuum level.
Calculated value is for reference only, so carry out the evaluation under an actual operating condition.
The theoretical suction force is calculated under a static condition. Obtain an enough margin, considering the weight of a work-piece and acceleration of lifting, pause and rotary movement. Enough room is needed in deciding a number of pads and arrangement position.


Horizontal lifting


Vertical lifting

① Calculation by formula

$$W = \frac{C \times P}{101} \times 10.13 \times f$$

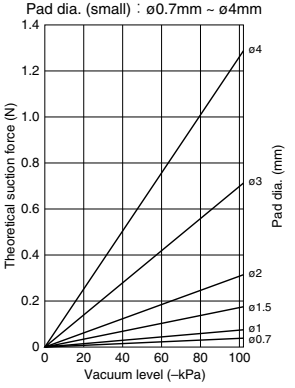
W : Suction force (N)
C : Pad area (cm²)
P : Vacuum level (–kPa)
f : Safety factor Horizontal lifting (refer to the right fig.) ▶ 1/4
Vertical lifting (refer to the right fig.) ▶ 1/8

*1. Refer to the following chart for Sponge Series. (Internal diameter is used for calculation)
*2. As for Bellows, Multi-Bellows, Soft, Soft Bellows and Ultrathin Series, their theoretical suction force may exceed the strength of pad itself, depending on the vacuum level. Carry out the evaluation under an actual operating condition.

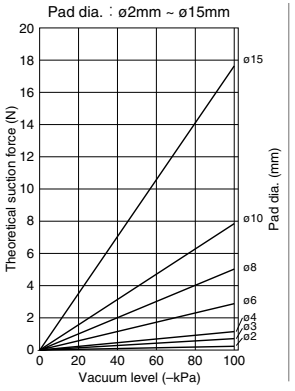
② Chart of the theoretical suction force <Add safety factor to values from the chart>

Standard / Bellows / Multi-Bellows / Soft / Soft Bellows / Skidproof / Ultrathin / Mark-free (*1)

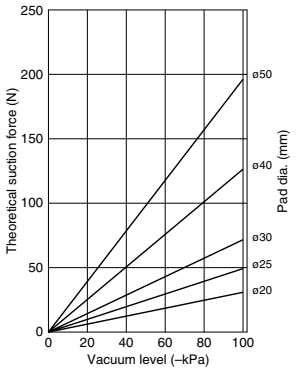
Pad dia. (small) : ø0.7mm ~ ø4mm



Pad dia. : ø2mm ~ ø15mm

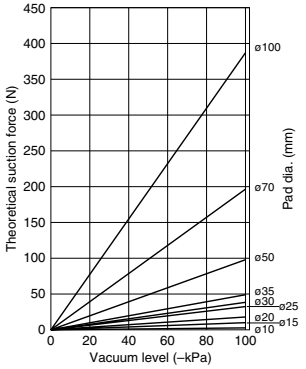


Pad dia. : ø20mm ~ ø50mm



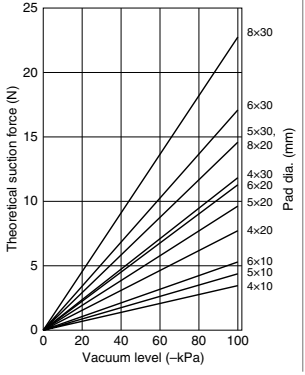
Sponge Series

Pad dia. : ø10mm ~ ø100mm



Oval Series

Pad dia. : □×10mm, □×20mm, □×30mm



*1. Some sizes are not available for some pad series. Refer to the following size list.

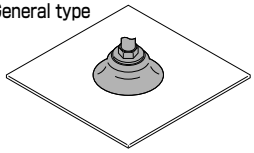
Pad size (mm) \ Pad type	Standard	Bellows	Multi-Bellows	Soft	Soft Bellows	Skidproof	Ultrathin	Mark-free
ø2	○	–	–	–	–	–	–	–
ø3	○	–	–	–	–	–	–	–
ø4	○	–	–	○	–	–	–	–
ø6	○	–	–	○	–	–	–	–
ø8	○	–	–	○	○	–	○	–
ø10	○	○	○	○	○	○	○	○
ø15	○	–	–	○	○	–	○	–
ø20	○	○	○	○	○	○	○	○
ø25	○	–	–	–	–	–	–	–
ø30	○	○	○	○	–	○	–	○
ø40	○	○	○	○	–	○	–	–
ø50	○	○	○	–	–	○	–	–
ø60	○	–	–	–	–	–	–	–
ø80	○	○	–	–	–	–	–	–
ø100	○	–	–	–	–	–	–	–
ø150	○	–	–	–	–	–	–	–
ø200	○	–	–	–	–	–	–	–

Selection Guide 2 ▶ Select a vacuum pad type according to a work-piece

Select suitable pads for your application from the following.

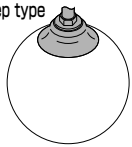
Standard Series

General type



Thick and flat work-piece

Deep type

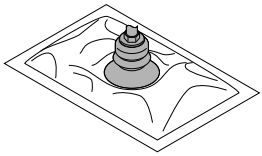


Round fruit / Ball (*1)

Small type

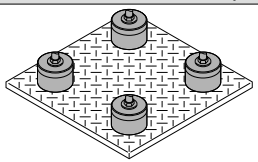
Small work-piece / Semiconductor product

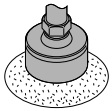
Bellows and Multi-Bellows Series



Food package

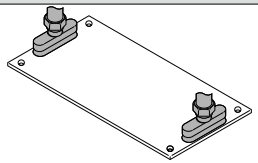
Sponge Series





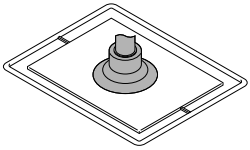
Exterior wall panel / Pebble / Seashell

Oval Series



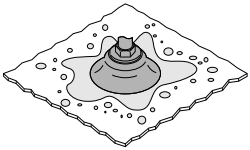
Long work-piece (e.g. Circuit board and Semiconductor product)

Soft and Soft Bellows Series



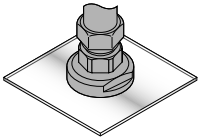
Molded parts / Fragile work-piece

Skidproof Series



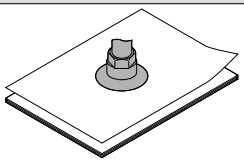
Greasy work-piece such as pressed parts

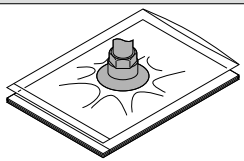
Mark-free Series



LCD glass / in Painting process / Semiconductor

Ultrathin Series



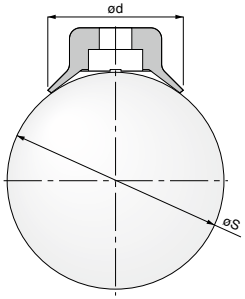


Thin work-piece such as paper or plastic bag

*1. The table below is a reference for the vacuum pad deep type and the size of round work-piece.

Spherical dia.: S (mm)	ø20	ø30	ø40	ø50	ø80	ø100	ø120	ø160	ø200
Pad dia.: d (mm)	ø15	ø20	ø25	ø30	ø40	ø50	ø60	ø80	ø100

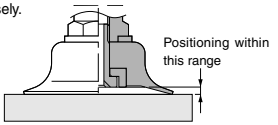
*2. Refer to the previous page for pad dia. selection except deep type. Refer to the next page for the characteristics of pad materials.



Reference Guide for Vacuum Pad

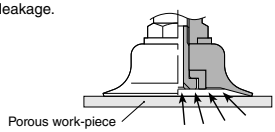
Impact on pad

Avoid an impact or a large force on a vacuum pad, when it is pressed against a work-piece. It may cause deformation, crack or abrasion at an early stage of use. Adjust the pad position so tat the lip of pad touches lightly on a work-piece. Especially a small type of vacuum pad should be positioned precisely.



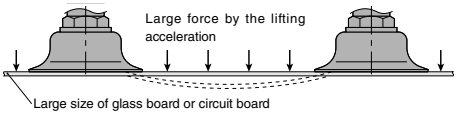
Porous or perforated work-piece

Since the suction of a porous work-piece causes a drop of suction force, select the proper specifications of vacuum system and secure a larger effective cross-section area of the piping.
Selecting a small type of vacuum pad is one of solutions to reduce the air leakage.



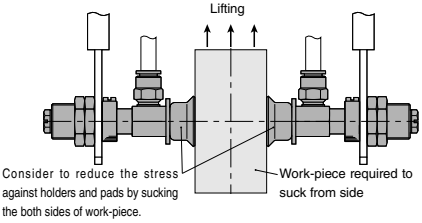
Large and wide flat plate work-piece

When lifting large size of glass board or circuit board, work-piece may bend by the lifting acceleration or the self-weight. Select a proper size of pad and positioning, considering an enough margin of suction force.



Lifting work-piece, sucking the both sides of it

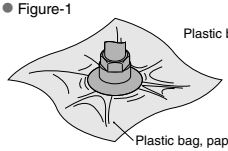
Since all vacuum pad holders are designed for horizontal lifting, consider the strength of holders and pads.



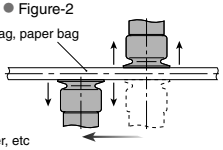
Soft work-piece

When soft work-pieces such as plastic bags, papers or thin boards are sucked, work-pieces can be deformed or shrunk by vacuum suction (Figure-1). Select smaller vacuum pads and reduce the vacuum pressure. Smaller vacuum pads are suitable for plastic bags and papers. When plastic / paper bags are opened by using vacuum pads, shift the center of two vacuum pads slightly in order to open them easily as Figure-2 shows.

● Figure-1

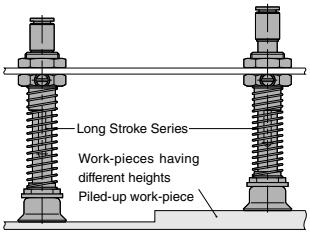


● Figure-2



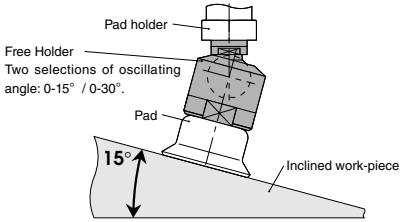
Work-piece with different heights

Select Long Stroke Series for work-pieces having different heights, or piled-up work-pieces. Its stroke can absorb the difference in height.



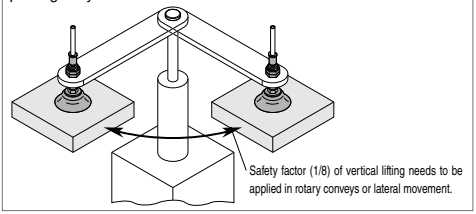
Inclined work-piece

Select Free Holder for an inclined work-piece.



Conveyance with rotary movement

When vacuum pad is fixed with a screw and has a rotary movement, the pad may drop due to the loosened screw. Pay special attention when the vacuum location of work-piece is off the center of work-piece gravity.



List of Vacuum Pad Materials and Size

Pad material / Pad dia.(mm)	N : Nitrile rubber							
	Standard Series			Bellows Series	Multi-Bellows Series	Soft Series	Soft Bellows Series	Ultrathin Series
	General type	Deep type	Small type					
0.7			●					
1			●					
1.5			●					
2	●		●					
3	●		●					
4	●		●			●		
6	●					●	●	
8	●					●	●	●
10	●			●	●	●	●	●
15	●	●				●	●	●
20	●	●		●	●	●	●	●
25	●	●						
30	●	●		●	●	●		
35								
40	●	●		●	●	●		
50	●	●		●	●			
60	●	●						
70								
80	●	●		●				
100	●	●						
150	●							
200	●							

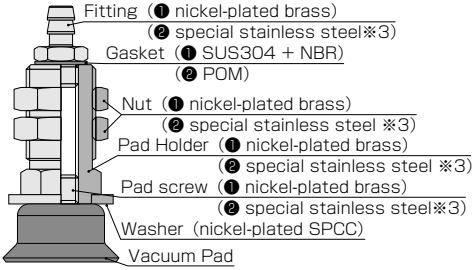
Pad material / Pad dia.(mm)	S : Silicone rubber							FS : Fluorosilicone rubber	
	Standard Series			Bellows Series	Multi-Bellows Series	Soft Series	Soft Bellows Series	Soft Series	Ultrathin Series
	General type	Deep type	Small type						
0.7			●						
1			●						
1.5			●						
2	●		●						
3	●		●						
4	●		●			●		●	
6	●					●	●	●	
8	●					●	●	●	●
10	●			●	●	●	●	●	●
15	●	●				●	●	●	●
20	●	●		●	●	●	●	●	●
25	●	●							
30	●	●		●	●	●		●	
35									
40	●	●		●	●	●		●	
50	●	●		●	●				
60	●	●							
70									
80	●	●		●					
100	●	●							
150	●								
200	●								

Pad material / Pad dia.(mm)	U : Urethane rubber			F : Fluorine rubber			SE : Static dissipative rubber				E : Conductive rubber (low resistance)	
	Standard Series			Standard Series			Standard Series		Bellows	Soft	Standard Series	
	General type	Deep type	Small type	General type	Deep type	Small type	General type	Small type	Series	Series	General type	Small type
0.7			●			●		●				●
1			●			●		●				●
1.5			●			●		●				●
2	●		●	●		●	●	●			●	●
3	●		●	●		●	●	●			●	●
4	●		●	●		●	●	●		●	●	●
6	●			●			●			●	●	
8	●			●			●			●	●	
10	●			●			●		●	●	●	
15	●	●		●	●		●			●	●	
20	●	●		●	●		●		●	●	●	
25	●	●		●	●		●				●	
30	●	●		●	●		●		●	●	●	
35												
40	●	●		●	●		●		●	●	●	
50	●	●		●	●		●		●		●	
60	●	●		●	●							
70												
80	●	●		●	●							
100	●	●		●	●							
150	●			●								
200	●			●								

Pad material / Pad dia.(mm)	G : Food safe NBR			S : Chloroprene rubber	KNH : Oil resistance NBR
	Standard Series			Multi-Bellows	Sponge	Skidproof
	General type	Deep type	Small type	Series	Series	Series
0.7			●			
1			●			
1.5			●			
2	●		●			
3	●		●			
4	●		●			
6	●					
8	●					
10	●			●	●	●
15	●	●			●	
20	●	●		●	●	●
25	●	●			●	
30	●	●		●	●	●
35					●	
40	●	●		●		●
50	●			●	●	●
60						
70					●	
80						
100					●	
150						
200						

Pad material / Pad dia.(mm)	K : PEEK	M : POM	KE : Conductive PEEK
	Mark-free Series		
10	●	●	●
20	●	●	●
30	●	●	●

Construction (Fixed type / Top port / VPA)



※1. Fixed pad holders (VPA, VPB, VPE, VPHE and VPHEW) have an optional selection "-S3" (Copper alloy free and against low ozone concentration).
※2. The above ❶ is for standard material and ❷ is for Copper alloy free specification.
※3. Equivalent Corrosion Resistance to SUS303

Construction (Spring type / Top port / VPC)