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Posted on the CKD website.

<https://www.ckd.co.jp/kiki/en/>



Precision Equipment

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Search by Product Lineup List

You can select by the appearance and product overview of each series.

Precision Equipment P. 1



Listed Page From P. 3

Air Bearing Actuator

LBC

Series	Features	Page
LBC	Achieves zero sliding resistance.	6



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Float Star

GFM

Series	Features	Page
GFM-A (Alignment Floating Pad)	A further evolved floating system for non-contact, clean, and damage-free conveyance.	18
GFM-T (High Floating Rail)		24
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Precision Suction Plate

PVP

Series	Features	Page
PVP-R (Donut Type)	Precision suction plate with 40% porosity, adopting fluororesin sintered porous material.	54
PVP-C (Round Type)		
PVP-S (Square Type)		



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Fine Buffer

FBU2

■ Fine Buffer		
Series	Features	Page
FBU2-7D (Inlay Type)	Achieves stable pressing force, low dust generation, and long lifespan through the adoption of a unique cushioning mechanism, magnetic spring.	70
FBU2-8M (Full Thread Type)		
FBU2-12D (Inlay Type)		
FBU2-12M (Full Thread Type)		
FBU2-SU (General Purpose Type)		80



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Active Fine Buffer

AFB-RB

Series	Features	Page
AFB-RB	Integrates a motor and fine buffer, enabling rotary and buffering operations. All-in-one design enables compact and lightweight multi-head configurations.	96

Vacuum Equipment P. 103



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Vacuum Equipment

Ejector System/Vacuum Pump System

	Series	Features	Page	
Ejector System	With Vacuum Break Function Type VSY	Ejector systems and vacuum pump systems, which are the core of vacuum systems. Various unit types combining various related equipment are available.	110	
	Solenoid Valve Direct Mount Type VSH		120	
	Pipe Type VSU		128	
	Square Type VSB		140	
	Pad Direct Mount Type VSC		146	
	20 mm Width Single Unit Dedicated Type VSG		158	
	16 mm Width General Type VSK / VSKM		168	
	20 mm Width General Type VSJ / VSJM		194	
	10.3 mm Width General Type VSN / VSNM		214	
	10.5 mm Width General Type VSX / VSXM		242	
	31.5 mm Width Single Unit Dedicated Type VSQ		270	
	11 mm Pitch Manifold Dedicated Type VSZM		294	
	Vacuum Pump System		20 mm Width General Type VSJP / VSJPM	318
			10.3 mm Width General Type VSNP / VSNPM	334
10.5 mm Width General Type VSXP / VSXPM		354		
31.5 mm Width General Type VSQP		382		
11 mm Pitch Manifold Dedicated Type VSZPM		392		



Listed Page From P. 407

Vacuum Equipment

Suction Pad

	Series	Features	Page
Suction Pad	Standard Type General Type VSP-□R	Attachment for direct suction of workpieces. A wide variety of materials, shapes, and pad diameters are available to match the size, weight, and characteristics of the target workpiece.	422
	Standard Type Deep Type VSP-□A		422
	Standard Type Compact VSP-□RM		422
	Sponge Type VSP-□S		508
	Bellows Type VSP-□B		570
	Multi-stage Bellows Type VSP-□W		642
	Oval Type VSP-□E		702
	Soft Type VSP-□L		770
	Soft Bellows Type VSP-□LB		830
	Anti-slip Type VSP-□K		868
	Thin Material Type VSP-□P		904
	Flat Type/Flat Suction Flow Rate Increase Type VSP-□F, □FH		936
	Suction Mark Prevention Type VSP-□Q		974
	Packaging Bag Type VSP-□PB		1008
	Metal Detector Type VSP-□BE, □BD		1020
	Mechanical Break Function Type VSP-KE□Y		1054
	Swing Holder VSP-□F1/F2/CF		1060
	Direct Mount Filter VSP-□T1 / T2		1064

Search by Product Lineup List

You can select by the appearance and product overview of each series.

MEMO

Vacuum Equipment P. 1067



Vacuum Equipment

Vacuum Related Equipment

	Series	Features	Page
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	Fall Prevention Valve VSECV		1082
	Compact Vacuum Regulator VSRVV		1088
	Vacuum Regulator VRA2000		1098
	Vacuum Break Unit VSLF		1102
	Large Capacity Union Type Vacuum Filter VSFB	Vacuum break valve, vacuum pressure switch, vacuum filter, etc., various related equipment is available according to the usage of the vacuum system.	1106
	Compact Union Type Vacuum Filter VSFU		1106
	Compact Socket Type Vacuum Filter VSFJ		1106
	Inline Filter FSL100/200/500		1118
	Vacuum Filter VFA1000/3000/4000		1124
	Vacuum Pressure Switch with Digital Display VSUS		1130
	Air Tweezers VST		1136

CKD How to use CAD data

Pneumatic valve manifold specifications and CAD data are easily available on the Web.

Free download!

This is what makes CKD's CAD great!

Comprehensive list of CKD's leading products



Japanese, English, Chinese (Simplified and Traditional), and Korean are supported.

Simultaneous with new product launch

NEW Model No. **AX1R**
ABSODEX



Supports various data formats

- + PDF DataSheet (2D)
- + CAD-DataSheet (3D)
- + SAT 7.0 (3D)
- + Solid Edge 2019 (3D)
- + Solid Edge 2023 (3D)
- + Solid Edge 2021 (3D)
- + Solid Edge 2022 (3D)

More than 25 types of 2D and more than 35 types of 3D
Supports PDF and JPEG formats!

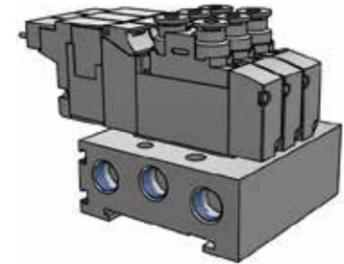
*To use 3D CAD, you must register as a CKD plus member.

Specifications are available



Manifold specifications for pneumatic valves can be prepared and shipped assembled to the customer.

Get CAD data



2D and 3D CAD data available for pneumatic valve manifold assemblies

Specifications and download method of CAD data

CKD plus How to register as a member

STEP 1

From the CKD components product top page, click "New member registration"



STEP 2

Enter your name, company name, contact information, and email address

Easy registration in 2 STEPS

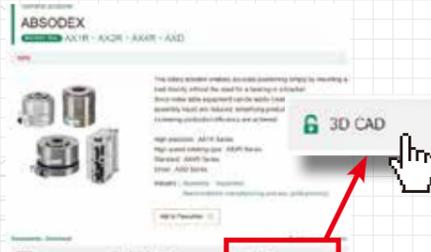
Registration complete!



How to download CAD

STEP 1

Click on "3D CAD" from the product detail page



STEP 2

Select model No.

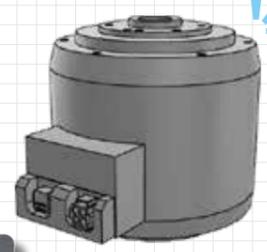
STEP 3

Specify CAD format

Generate CAD data

Download CAD

Download complete!



STEP 1

CKD components product TOP page > Product details page > Click "Manifold specifications sheet"



STEP 2

Select model No.

STEP 3

Create specifications sheet



STEP 4

Download complete!

- For specifications output, **Specification output** Click
- If downloading CAD data **2D/3D CAD** Click



Significantly reduces work time

Website Information

We provide various information on our website.
Please take advantage of it

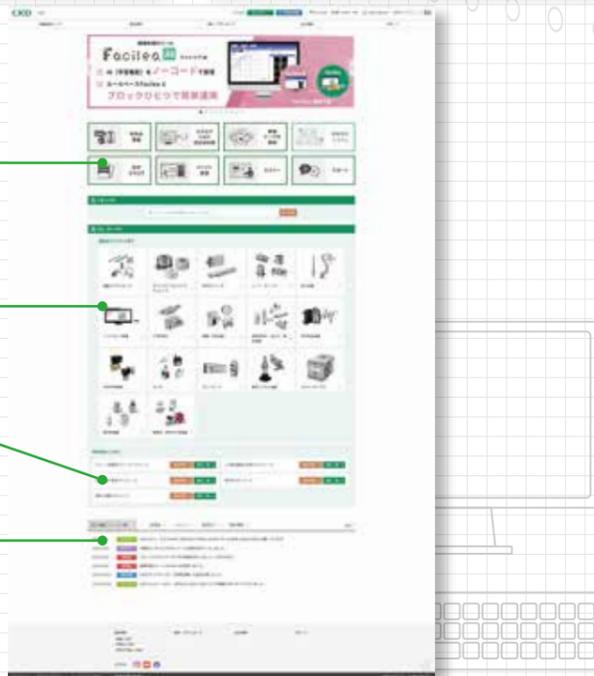
Catalog	CAD	Instruction manual
Maintenance parts	Software	Model selection
FAQ	Technical information	Product Information
Column	Event information	Seminar

You'll find the information you need here

You can find the product you want

Find the right product for each application

Stay up-to-date with the latest news



Various information is provided on each product page



Various information is available according to the product axis and application

Guide to the Model Selection System

How to use the Model Selection System

The CKD system supports selection of the following items.
Please use this information when selecting and designing models.

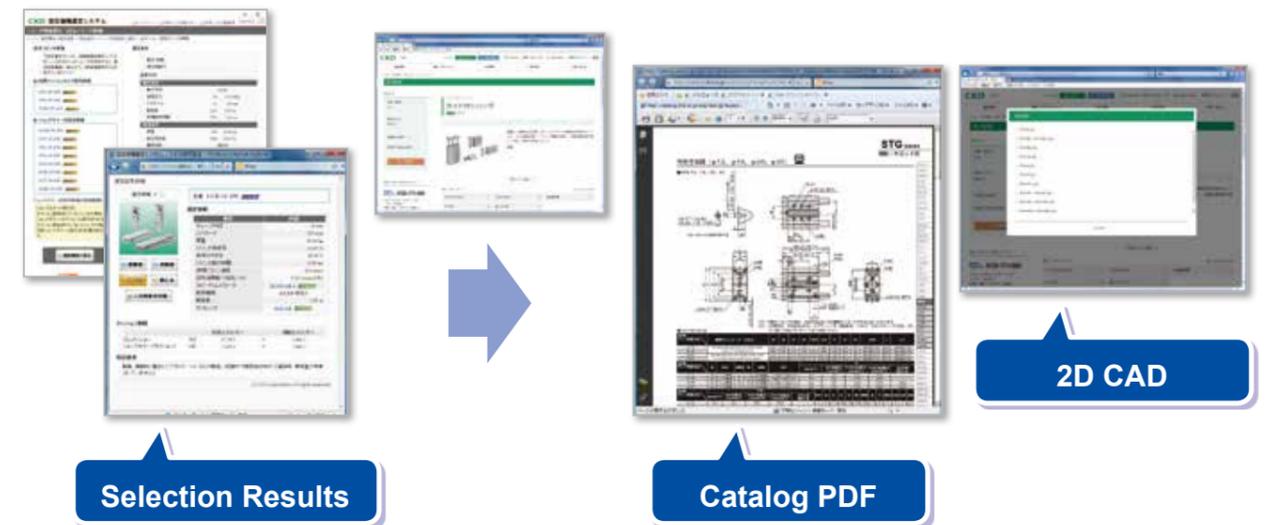
Available on our website

This is a system for selecting products according to the customer's application and working conditions.

<p>Web version</p> <p>Pneumatic components</p>	<p>Download version</p> <p>Mechanical index / Direct drive mode</p>	<p>Web version</p> <p>Electric actuator</p>	<p>Web version</p> <p>Fluid control components</p>
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*Software may not be downloadable due to your security policy. If that is the case, contact CKD.

Linked to catalog PDF and CAD data from selection results!



No registration required, available anytime!

A variety of services such as CKD product catalogs, PDF, CAD data and model selection are available.
Feel free to try it.

<https://www.ckd.co.jp/en/>

Regarding Display Method for Flow Characteristics

Effective Area of Steel Pipe/Nylon Tube and Recommended Maximum Flow Rate Table for Gas Pipe

1. Display of Flow Characteristics

The flow rate display in the catalog specifications column is shown as follows.

Applicable Components	Display	Unit	Standard
Pneumatic Components	Display compliant with New JIS	C, b	ISO 6358:1989 "Pneumatic - Components for compressible fluids - Test methods for flow-rate characteristics" JIS B 8390:2000 (ISO 6358 translated)
	Conventional Display	S	JIS B 8373:1993 'Pneumatic 2-port solenoid valves' JIS B 8374:1993 'Pneumatic 3-port solenoid valves' JIS B 8375:1993 'Pneumatic 4, 5-port solenoid valves' JIS B 8379:1995 'Pneumatic silencers'
		Cv	ANSI (NFPA)T3. 21. 3:1990

2. Explanation

Conventionally, solenoid valve flow characteristics have been displayed by the effective area S, but JIS has been revised (JIS B 8390:2000), and they are now displayed by the pair of sonic conductance C and critical pressure ratio b.

- **Sonic Conductance C:** Value obtained by dividing the Weight flow rate passing through the equipment in a choked flow state by the product of the upper limit absolute pressure and the density in the standard state. (sonic conductance) $S \square 5.0C$ (Conventional sizing is possible using C.)
 - **Critical Pressure Ratio b:** The pressure ratio (downstream pressure / upstream pressure) below which choked flow occurs.
- Effective Cross-Sectional Area (mm²)** The cross-sectional area value of an ideal orifice without friction or contraction, derived by calculation from the pressure change within an air tank when air is released in a choked flow state from equipment attached to the air tank.

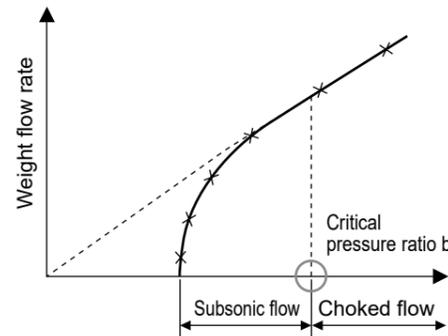


Fig. 1 Weight flow rate characteristics versus upstream pressure

*Choked flow: Flow where the upstream pressure is high relative to the downstream pressure, and the speed reaches the speed of sound in a certain part of the equipment. The gas Weight flow rate is proportional to the upstream pressure and does not depend on the downstream pressure. (Choked flow)

Flow rate calculation formula

Expressed as follows using practical units.

$$\frac{P_2+0.1}{P_1+0.1} \leq \text{When } b, \text{ Choked flow}$$

$$Q=600 \times C (P_1+0.1) \sqrt{\frac{293}{273+t}} \dots\dots\dots(1)$$

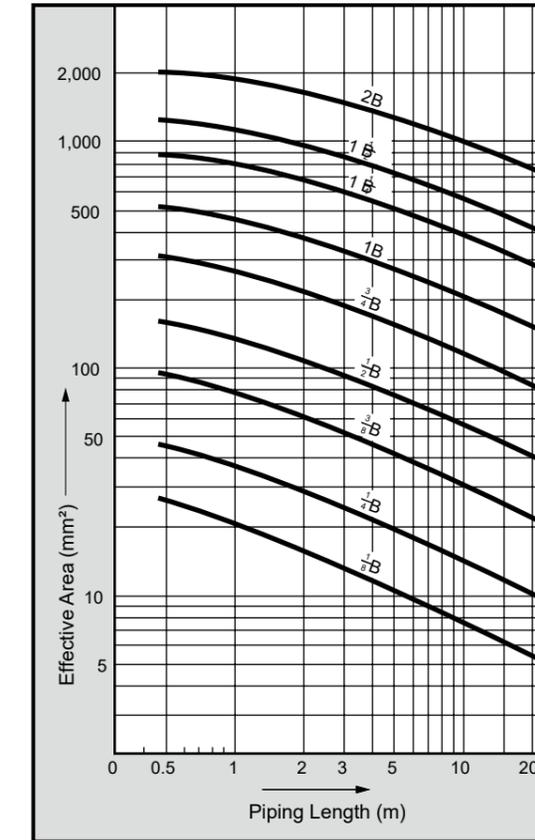
$$\frac{P_2+0.1}{P_1+0.1} \text{ When } > b, \text{ Subsonic flow}$$

$$Q=600 \times C (P_1+0.1) \sqrt{1 - \left[\frac{P_2+0.1}{P_1+0.1} - b \right]^2} \sqrt{\frac{293}{273+t}} \dots\dots\dots(2)$$

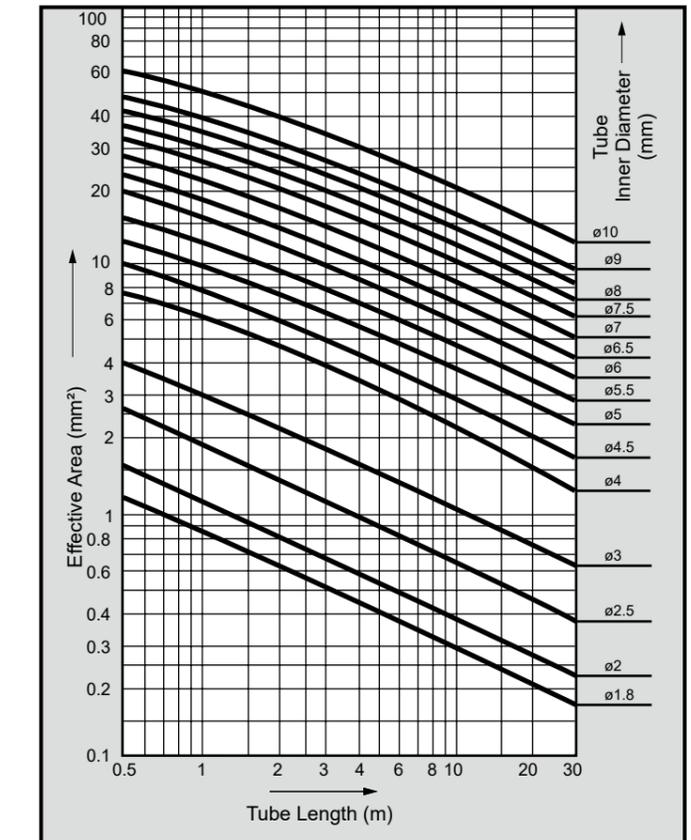
Q: Air flow rate [dm³/min (ANR)], The SI unit dm³ (cubic decimeter) may also be expressed as L (liter). 1dm³=1L
 C: Sonic conductance [dm³/(s/bar)]
 b: Critical pressure ratio [-]
 P1: Upstream pressure [MPa]
 P2: Downstream pressure [MPa]
 t: Temperature [°C]

When calculating using the effective area S, substitute the value C obtained from C = S/5 into the above formula.
 For subsonic flow, substitute b = 0.5 into formula (2).

Effective Area of Steel Pipe



Effective Area of Nylon Tube



Recommended Maximum Flow Rate Table for Gas Pipe

Nominal Size	1/8B	1/4B	3/8B	1/2B	3/4B	1B	1 1/4B	1 1/2B
Pressure Drop MPa (□)	0.124	0.0707	0.0576	0.0425	0.0276	0.0209	0.0133	0.0105
Inlet Pressure MPa	Recommended Maximum Flow Rate (L/min)							
0.05	127	244	518	838	1,465	2,460	3,870	5,150
0.1	146	282	598	965	1,690	2,828	4,460	5,950
0.15	163	314	668	1,076	1,885	3,150	4,960	6,630
0.2	179	344	730	1,180	2,060	3,450	5,430	7,280
0.3	206	395	840	1,360	2,375	3,900	6,300	8,400
0.4	230	442	940	1,520	2,660	4,450	7,000	9,360
0.5	252	485	1,030	1,660	2,920	4,875	7,700	10,250
0.6	272	523	1,110	1,800	3,140	5,250	8,300	11,050
0.7	292	558	1,185	1,920	3,350	5,620	8,870	11,800
0.8	308	592	1,260	2,035	3,560	5,970	9,430	12,570
0.9	324	623	1,325	2,140	3,745	6,290	9,900	13,220
1.0	340	654	1,395	2,250	3,930	6,600	10,400	13,880
1.2	370	717	1,510	2,450	4,280	7,150	11,250	15,040
1.4	398	763	1,625	2,624	4,590	7,700	12,100	16,200
1.5	410	790	1,680	2,710	4,740	7,930	12,550	16,780

(Note 1: Inlet Pressure = 0.5 MPa)
 Gas Pipe Length: 10 m

(Remarks)
 For main lines where the piping distance is long, it is necessary to consider the degree of pressure drop that occurs at the end of the main line when air flows. Recommended maximum flow rate means the maximum flow rate that can be recommended within a range where the pressure drop relative to the piping length is acceptable, judged from practical use. Therefore, it does not mean that a higher flow rate cannot flow, but rather that if more flows, the pressure drop will increase.



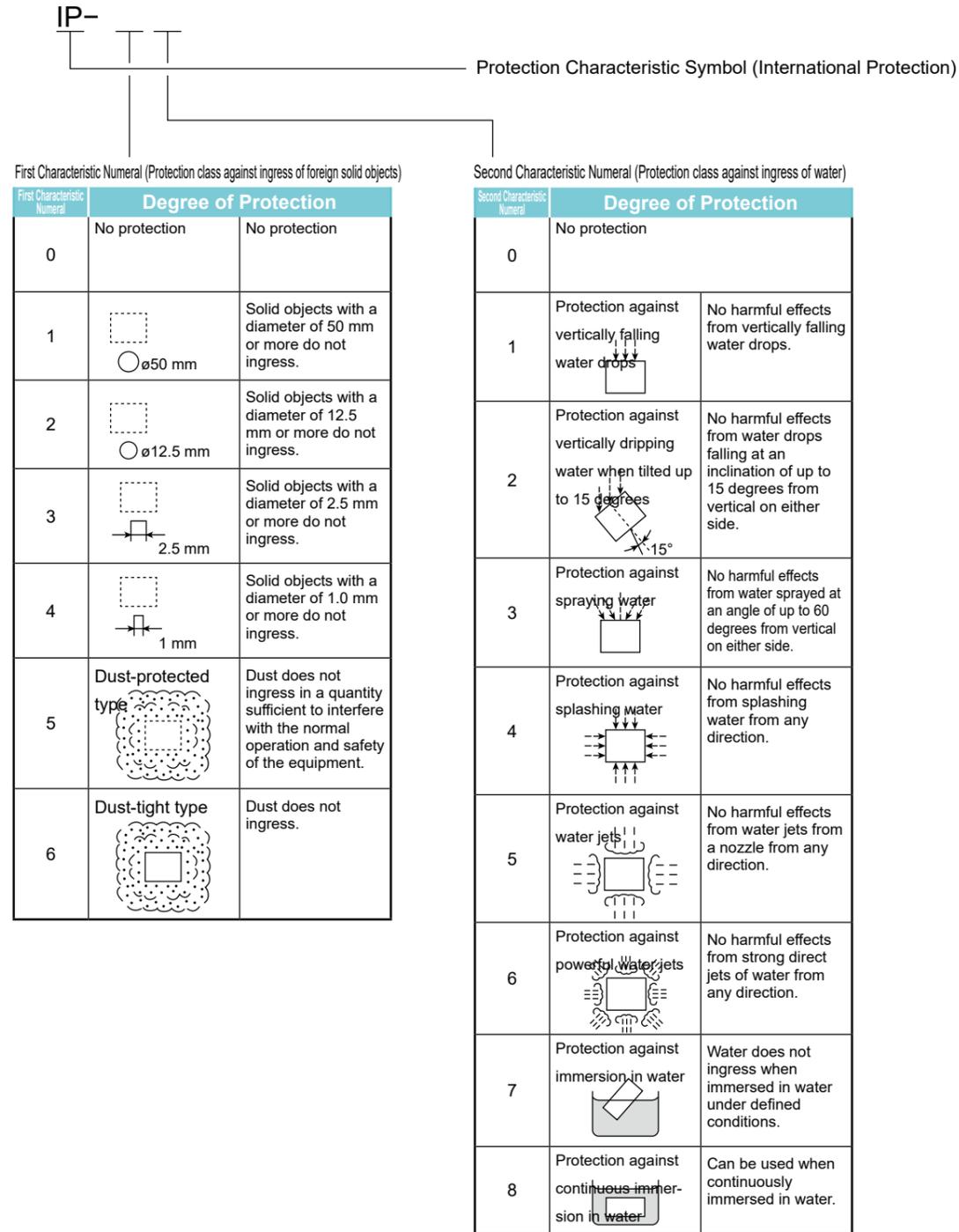
Regarding Protection Structure

MEMO

● Protection Structure

■ IEC (International Electrotechnical Commission: International Electrotechnical Commission) Standard (IEC60529)

■ JIS C 0920 : 2003





Safety Precautions

Be sure to read this section before use.

When designing and manufacturing equipment using CKD products, the manufacturer is obligated to ensure that the safety of the mechanism, pneumatic control circuit and/or water control circuit and the system that runs the electrical controls are secured.

It is important to select, use, handle and maintain CKD products appropriately to ensure their safe usage.

Observe warnings and precautions to ensure device safety.

Check that device safety is ensured, and manufacture a safe device.

WARNING

1 This product is designed and manufactured as a general industrial machine part. It must be handled by an operator having sufficient knowledge and experience.

2 Use this product in accordance with specifications.

This product must be used within its stated specifications. In addition, never modify or additionally machine this product. This product is intended for use in general industrial machinery equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments. (Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)

- ① Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
- ② Use for applications where life or assets could be significantly affected, and special safety measures are required.

3 Observe organization standards and regulations, etc., related to the safety of the device design and control, etc. ISO4414, JIS B 8370 (Pneumatic fluid power - General rules and safety requirements for systems and their components) JFPS2008 (Principles for pneumatic cylinder selection and use) Including the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.

4 Do not handle, pipe, or remove devices before confirming safety.

- ① Inspect and service the machine and devices after confirming safety of the entire system related to this product.
- ② Note that there may be hot or charged sections even after operation is stopped.
- ③ When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility. Discharge any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
- ④ When starting or restarting a machine or device that incorporates pneumatic components, make sure to secure system safety, such as pop-out prevention measures.

5 Observe the warnings and cautions on the following pages to prevent accidents.

■ Precautions are ranked as "DANGER", "WARNING", and "CAUTION" in this section.

DANGER: In the case where the product operation is mishandled and/or when the urgency of a dangerous situation is high, it may lead to fatalities or serious injuries.

WARNING: A dangerous situation may occur if handling is mistaken, leading to fatal or serious injuries.

CAUTION: A dangerous situation may occur if handling is mistaken, leading to minor injuries or property damage.

Note that some items indicated with "CAUTION" may lead to serious results depending on the conditions. All items contain important information and must be observed.

Warranty

1 Warranty period

The product specified herein is warranted for one (1) year from the date of delivery to the location specified by the customer.

2 Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified above, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.

However, following failures are excluded from this warranty:

- 1) Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or the Instruction Manual.
- 2) Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
- 3) Failure not caused by the product.
- 4) Failure caused by use not intended for the product.
- 5) Failure caused by modifications/alterations or repairs not carried out by CKD.
- 6) Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- 7) Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

Note: For details on the durability and consumable parts, contact your nearest CKD sales office.

3 Compatibility check

The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.

Precautions for export

1 Security Trade Control

The products in this catalog and their related technologies may require approval before export or provision.

For the sake of maintaining world peace and safety, there may be cases in which approval under the Foreign Exchange and Foreign Trade Control Law is required in advance, depending on the country to where the product or related technology is being exported or provided.

The scope of products and related technologies requiring approval are listed in the Export Trade Control Order Appendix Table 1 or Foreign Exchange Order Appendix Table.

The Export Trade Control Order Appendix Table 1 and Foreign Exchange Order Appendix Table contain the following two types of information.

- "List controls" specified for items 1 to 15
- "Catch-all controls" that do not indicate specifications by item, but restriction by application (Section 16)

Products that require authorization or the range of relevant technology

List control, which is specified in item 1 to 15

Listed in the "Export Trade Control Order Appendix Table 1" or "Foreign Exchange Order Appendix Table"

Catch-all control restricted by application (item 16)

Listed in the "Export Trade Control Order Appendix Table 1" or "Foreign Exchange Order Appendix Table"

An application for approval is received by the Security Export Licensing Division of the Ministry of Economy, Trade and Industry or local bureaus of the Ministry of Economy, Trade and Industry.

2 Products and related technologies in this catalog

The products and related technologies in this catalog are subject to the catch-all control of the Foreign Exchange and Foreign Trade Control Law.

When exporting or providing the products or related technologies in this catalog, ensure that they are not used for arms or weapons.

3 Contact

Contact your local CKD Sales Office for information on the Security Trade Control of products and related technologies in this catalog.

When Setting/Selecting

1. Confirmation of Specifications

Warning

Use within the product's specified operating range. Products listed in this catalog are designed for use only in compressed air systems. Do not use outside the specification range, as pressures or temperatures outside this range can cause damage or malfunction. (See specifications) If using fluids other than those specified for each device, please consult CKD.

2. Design for Safety

Warning

Take necessary precautions beforehand so that this product does not adversely affect people or objects in the event of failure.

Caution

Design pneumatic circuits understanding the characteristics of compressed air.

- If instantaneous stop holding is required during an emergency stop, functions equivalent to mechanical, hydraulic, or electrical systems cannot be expected.
- Due to the compressibility and expansibility of air, phenomena such as ejection, jetting, and leakage may occur.
- Design the circuit so that compressed air in the system can be exhausted.

Determine the lubrication method for pneumatic equipment and ensure proper maintenance can be performed.

- Lubricated type?
- Non-lubricated type?
Clearly specify and implement lubrication oil management.

Check for leakage current to avoid malfunctions due to leakage current.

- Leakage current may cause malfunctions when used in programmable control or similar applications.

3. Design by Application

Caution

Because it is for compressed air, minute leaks that do not affect performance are permitted. If leakage is not permissible for the application, please contact us.

4. Operating Environment

Warning

Install the product avoiding rain, water, and direct sunlight.

Do not use the product in an atmosphere where there is a risk of corrosion. Use in such environments can cause damage or malfunction.

Avoid using in an ozone generating environment. Ozone-resistant series are available; please consult us if ozone is present in the supply air.

If the ambient temperature is 5°C or lower, moisture in the circuit may freeze, causing malfunctions or other problems. Therefore, remove moisture and take measures to prevent freezing.

Caution

Confirm that the product can withstand the operating environment before use.

- Cannot be used in environments where functional impairment may occur. For example, special environments where high temperatures, chemical liquid atmospheres, chemicals, vibrations, humidity, water droplets, cutting fluid, gas atmospheres, etc., are present. Ozone-generating environments.

5. Securing Space

Caution

Ensure sufficient space around pneumatic equipment for mounting, removal, wiring, and piping work.

6. Specification in Instruction Manual

Caution

Clearly specify maintenance conditions in the equipment's instruction manual.

- The product's function may significantly degrade, and safety may not be ensured, depending on usage conditions, operating environment, and maintenance. Proper maintenance allows the product to fully demonstrate its functions.

Mounting / Installation / Adjustment

Caution

1. Mounting

Do not remove the pneumatic equipment packaging bag or the piping port's sealing cap until immediately before piping work.

- If the cap of the piping port is removed before connecting the piping, foreign matter may enter the pneumatic equipment from the piping port, causing malfunction, etc.

For mounting pneumatic equipment, do not use a mounting method that supports it by piping.

Do not remove the piping port's dust-proof seal until immediately before piping work.

- Removing it before piping may allow foreign matter to enter from the piping port, causing malfunction or erroneous operation.

2. Pre-operation Check

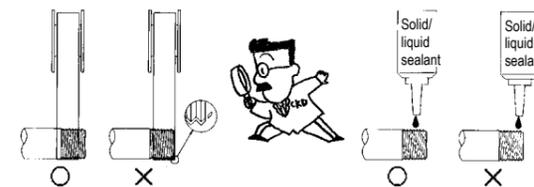
When supplying compressed air after completing pipe connections, always check all connected parts for air leakage.

- Apply leak detection fluid to the piping connection points with a brush to check for air leaks. Be careful not to let leak detection fluid adhere to the plastic bowl. The plastic bowl may be damaged, which can be dangerous.

3. Piping

When wrapping sealing tape for pipe connections, start wrapping 2 mm or more inward from the tip of the threaded part of the pipe, in the direction opposite to the thread direction.

- If the sealing tape extends beyond the tip of the threaded part of the pipe, tightening the screw may cut the tape, allowing fragments to enter the solenoid valve and cause malfunctions.



When using liquid sealant, be careful not to let it adhere to the plastic bowl. The plastic bowl may break, which is dangerous.

Ensure that piping connected to pneumatic equipment does not detach due to vibration, loosening, or tension.

- Detachment of piping creates a dangerous situation.

Please note the following when using nylon or urethane tubing for piping.

- In atmospheres where spatter occurs, use flame-resistant tubing or metal steel pipes.
- For combined oil/pneumatic piping, use hydraulic hoses.

- When using standard one-touch fittings with spiral tubing, secure the base of the tube with a hose band. Rotation may occur, reducing holding capacity.
- For high-temperature liquids, use screw fastening fittings of the inlay type. One-touch fittings cannot be used.

Route piping so that connection joints do not come loose due to equipment movement, vibration, tension, etc.

When piping, always perform flushing immediately before connecting to pneumatic equipment.

- It is important that foreign matter that entered during piping does not enter the pneumatic equipment.

Tighten with the appropriate torque during piping connection.

- The purpose is to prevent air leaks and screw damage.
- To avoid damaging the screw threads, first tighten by hand before using a tool.

[Recommended Values]

Connection Thread	Tightening Torque N·m
M3	0.3 to 0.6
M5	1 to 1.5
Rc1/8	3 to 5
Rc1/4	6 to 8
Rc3/8	13 to 15
Rc1/2	16 to 18
Rc3/4	19 to 40
Rc1	41 to 70

Note: If a tightening torque is specified for each model, follow that value.



4. Pneumatic Source

Install a pneumatic filter immediately before the circuit using the pneumatic equipment.

When supplying compressed air after completing pipe connections, supply it so that high pressure is not applied suddenly.

- Piping connections may come off, and piping tubes may spring out, causing accidents.
- Caution: If compressed air is supplied too slowly, sealing pressure may not be generated depending on the solenoid valve's internal sealing mechanism, potentially causing air leakage.

Air Quality

- Use CKD's clean air system equipment according to the application.
- Use compressed air free from oxidized oil, tar, carbon, etc., from the air compressor.
- Use compressed air that does not contain solid foreign matter.

During Use and Maintenance

Caution

1. Disassembly and Assembly

- When disassembling and assembling pneumatic equipment, ensure that the work is performed by personnel who have acquired specialized knowledge.
 - This refers to a level equivalent to Pneumatic Technician Grade 2 or higher.
- When performing disassembly and assembly of pneumatic equipment, thoroughly read and fully understand the instruction manual for the relevant product before performing the disassembly and assembly work.
 - Knowledge of the structure and operating principles of pneumatic equipment is required to ensure safety.

2. Maintenance and Inspection

- When performing maintenance, turn off the power, stop the supply of compressed air, and ensure there is no residual pressure before proceeding.
 - These are necessary conditions for ensuring safety.

Vacuum Equipment General Precautions

When Designing and Selecting

Warning

- If the adsorbed workpiece is considered to be at risk of falling, implement fall prevention measures to ensure safety.
- This product is not explosion-proof. Avoid using in flammable, explosive gases, fluids, or atmospheres. Also, avoid using it in a way that continuously applies pressure of 0.1 MPa or more to the vacuum circuit side.
- Be aware of the decrease in vacuum pressure due to problems with the supply air or power supply. There is a risk of adsorbed objects falling due to a decrease in suction force, so implement safety measures.
- If two or more pads are piped to one ejector in a vacuum circuit, if one pad experiences suction failure (leakage), the other pads may detach due to a decrease in vacuum pressure.
- Types with vacuum retention function and types with check valve function allow vacuum leakage, so if long-term vacuum retention is required, implement separate safety measures.
- When operating the valve, confirm that the leakage current is 1 mA or less. There is a risk of malfunction due to leakage current.
- If energization to the valve continues for long periods, heat is generated from the coil. There is a risk of burns due to heat and impact on peripheral equipment.
- Do not block the ejector's exhaust port or use in a way that increases exhaust resistance. This may cause vacuum not to be generated or a decrease in vacuum pressure.
- Do not use in locations with excessive vibration or shock. This may cause malfunction or failure. (Use with vibration at an acceleration of 49 m/s² or less.)

Caution

- The effective area on the ejector supply pressure side should be three times the nozzle diameter's cross-sectional area as a guideline for piping and equipment selection. Insufficient supply flow rate may cause performance degradation.

- When generating vacuum, do not operate the vacuum break solenoid valve.
- Do not use spiral hoses. Especially when used on the vacuum side, the following problems may occur due to piping resistance.
 - Delay in vacuum attainment time. Decrease in vacuum level at the suction end due to flow rate reduction. Unstable operation of vacuum switch
- Keep vacuum side piping as short as possible and make the inner diameter larger. If the piping is long or has a small inner diameter, there may be a delay in response time during suction and release, and the required suction flow rate may not be secured.
- Vacuum pressure switches and ejectors with vacuum pressure switches should be piped to the end of the vacuum piping as much as possible. If the distance between the vacuum pressure switch and the end of the vacuum piping is long, piping resistance increases, and the vacuum level at the sensor part may be high even during non-suction, which may cause malfunctions of the vacuum pressure switch.
- In manifold type vacuum ejectors, if operating ejectors and non-operating ejectors are mixed, exhaust air generated during vacuum creation may flow around to the non-operating ejectors and be output from the vacuum port. This can cause problems, such as blowing away lightweight workpieces, so do not use under conditions where this could be an issue.
 - [Applicable Models]
 - VSNM Series all types
 - VSXM Series all types
 - VSKM Series (Unit combination: G, J, L types)
 - VSZM Series all types

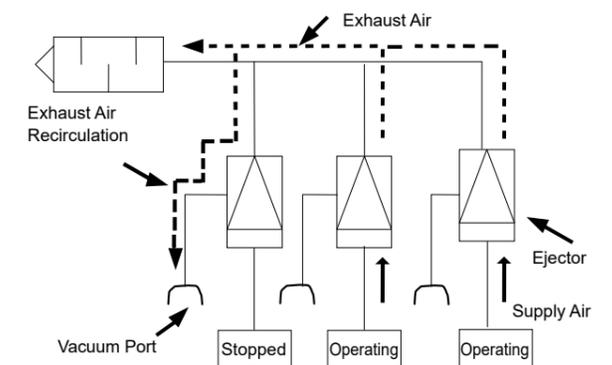


Fig. 1: Example of Exhaust Air Recirculation Phenomenon (VSXM)

■ Do not apply strong tensile force or extreme bending to the lead wire. There is a risk of wire breakage.

■ The transparent cover material of the filters FSL, VSFU-2/-3, VSG, VSK, VSJ, VSZ, and VSX are special polycarbonate resins, so avoid using them in atmospheres or locations where chemical substances (see below) are present or adhere.

Chemical Substance Name

Chemical Substance Name
All alcohols
Thinner
Carbon tetrachloride
Chloroform
Acetate ester
Aniline
Cyclohexane
Trichloroethylene
Sulfuric acid
Water-soluble cutting fluid (alkaline)

*Some substances other than those listed cannot be used, so please contact your nearest sales office.

■ Vacuum Filters (VSFU-1, VSQ Series) have transparent covers made of polyamide resin, so avoid using them in atmospheres or locations where chemical substances (see table below) are present or adhere.

Chemical Substance Name

Chemical Substance Name
Methanol
Ethanol
Nitric acid
Sulfuric acid
Hydrochloric acid
Lactic acid
Acetone
Chloroform
Aniline
Trichloroethylene
Hydrogen peroxide

*Some substances other than those listed cannot be used, so please contact your nearest sales office.

Individual Precautions: Mechanical Vacuum Pressure Switch

When Designing and Selecting

Warning

■ Do not use the mechanical vacuum pressure switch in flammable or explosive gases, fluids, or atmospheres. Since the vacuum switch is not explosion-proof, there is a risk of fire or explosion.

Caution

■ Do not use in locations where water droplets, oil droplets, dust, etc., may be present. Since the mechanical vacuum pressure switch is not drip-proof or dust-proof, there is a risk of malfunction.

■ The mechanical vacuum pressure switch does not change performance even when pressure of approximately 0.5 MPa is instantaneously applied, but during vacuum break, ensure that pressure of 0.2 MPa or more is not continuously applied. Continuous application may cause damage to the switch.

■ Use the mechanical vacuum pressure switch within the specified pressure range. Using it outside the specified pressure range may cause malfunction due to hysteresis.

■ Always turn off the power before wiring the mechanical vacuum pressure switch. Also, check the lead wire colors during wiring and be careful of incorrect wiring.

Individual Precautions: Electronic Vacuum Pressure Switch

When Designing and Selecting

Warning

■ Do not use in flammable or explosive gases, fluids, or atmospheres. Since the vacuum pressure switch is not explosion-proof, there is a risk of fire or explosion.

Caution

■ Do not use in atmospheres or gases containing corrosive substances. There is a risk of vacuum pressure switch failure.

■ Do not wire or use in a way that applies noise (surge), etc. There is a risk of vacuum pressure switch failure.

■ Do not use in locations where water droplets, oil droplets, dust, etc., may be present. Since the vacuum pressure switch is not drip-proof or dust-proof, there is a risk of malfunction.

■ Do not use in a way that may cause heat generation exceeding the operating temperature range. There is a risk of vacuum pressure switch failure.

■ In the case of a vacuum pressure switch, there is no change in performance even if pressure of approximately 0.5 MPa is instantaneously applied, but during vacuum break, ensure that pressure of 0.2 MPa or more is not continuously applied. Continuous application may cause damage to the vacuum pressure switch.

■ Make sure to turn the power OFF before wiring. Also, check the wire colors during wiring and do not short-circuit the output terminal, power terminal, and common terminal. If a short circuit occurs, there is a risk of vacuum pressure switch failure.

Individual Precautions: Suction Pad

When Designing and Selecting

Warning

■When performing swing transfer with pads fixed by screws, please be careful. Turning may cause screws to loosen, which can lead to trouble.

■When performing transport with the pad, consider the acceleration, impact and wind pressure. There is a risk of adsorbed objects detaching during transfer.

■Compact suction pad holders are smaller and lighter than conventional suction pad holders, so their load-bearing strength is inferior to conventional accessories. Set the load with sufficient margin and always confirm with the actual equipment.

■When mounting the pad holder, be sure to fix it securely. Loosening can risk causing trouble.

Caution

■For workpieces with variations in height or those easily damaged by external force, a buffer-type holder is suitable for suction. Please confirm the buffer force and stroke in the specifications section before use.

■When using a buffer-type holder, minimize lateral forces as there is a sliding part. This may cause a decrease in holder lifespan or malfunction.

■For connection port $\phi 1.8$ one-touch fittings, Air Fiber Antistatic Type UP-9402 Series and Air Fiber UP-9102 Series for barb fittings cannot be used. (Applicable recommended tubing: Use Air Fiber Clean Type EH-5802 Series or Polyurethane Tubing UB01810 Series manufactured by Nihon Pisco Co., Ltd.)

■When using conductive suction pads, consider the selection of the suction pad holder and take measures to dissipate static electricity through attached metal plates, etc. Static electricity may remain charged within the suction pad. Some holders themselves are not conductive.

■Due to the nature of rubber, additives contained in the rubber may appear as powder on the surface over time.

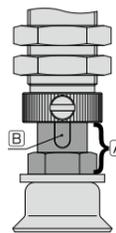
■Depending on the usage conditions, the workpiece and rubber pad may adhere tightly and not separate, so please thoroughly confirm this with the actual equipment.

■When mounting and fixing standard pad holders and compact pad holders using the partition wall, confirm the dimension drawing in the text, use the appropriate tool with reference to the recommended tightening torque below, and utilize the hexagonal part of the holder's outer diameter to ensure no loosening.

●Recommended Tightening Torque

Pad Holder Type	Standard		Compact	
	Fixed Type	Buffer Type	Fixed Type	Buffer Type
Nut Size (mm)	Tightening Torque			
M3 x 0.5	0.7 N·m	-	0.7 N·m	-
M4 x 0.5	-	-	1 to 1.2 N·m	-
M4 x 0.7	1 to 1.2 N·m	-	-	-
M5 x 0.5	1.5 to 2 N·m	-	1.5 to 2 N·m	-
M5 x 0.8	1 to 1.5 N·m	-	1 to 1.5 N·m	-
M6 x 0.75	2 to 3 N·m	-	2 to 3 N·m	
M8 x 0.75	2.5 to 3.5 N·m	1.8 to 2.4 N·m	2.5 to 3.5 N·m	
M8 x 1	-	1.8 to 2.4 N·m	-	-
M10 x 1	5 to 7 N·m	4.5 to 6 N·m	5 to 7 N·m	4 to 6 N·m
M12 x 1	12 to 14 N·m	8 to 10 N·m	-	-
M14 x 1	18 to 21 N·m	4.5 to 6 N·m	-	-
M16 x 1	-	2 to 3 N·m	-	-
M20 x 1	19 to 21 N·m	-	-	-
M22 x 1	-	16 to 20 N·m	-	-
M24 x 2	40 to 50 N·m	-	-	-
M30 x 2	-	42 to 54 N·m	-	-

■When mounting a buffer-type pad holder, do not use a wrench or similar tool on the shaft part (see figure on right) during installation. Also, when replacing the pad, fix the hexagonal bolt part of the shaft with a wrench or similar tool before replacement. The keyway part of the shaft (see figure on right) may deform, causing malfunction.



■When replacing the pad, confirm the suction pad configuration diagram in the text, use the appropriate tool with reference to the recommended tightening torque below, and utilize the hexagonal part of the holder's outer diameter to ensure no loosening.

●Recommended Tightening Torque

Pad Holder Type	Standard		Compact	
	Tightening Torque			
Pad Screw Size (mm)				
M3 x 0.5	-	0.7 N·m		
M4 x 0.7	0.5 to 1.0 N·m		0.9 to 1.1 N·m	
M5 x 0.8	1 to 1.5 N·m			
M6 x 1	2 to 2.7 N·m			
M10 x 1.5	5 to 7 N·m		-	
M20 x 2	9 to 10 N·m		-	

Individual Precautions: Rubber Surface Treatment Suction Mark Prevention Series (Optional)

When Designing and Selecting

Caution

■Common Precautions for Rubber Surface Treatment Suction Mark Prevention Series

- The degree of suction mark reduction varies depending on the environment and workpiece, so always conduct suction tests with the actual equipment to select the model.
- The suction mark reduction treatment makes the pad rubber itself slippery, which may lead to poor suction.
- It does not completely prevent suction marks. The degree of suction mark reduction varies depending on the environment and workpiece.

■Fiber Raised Type (Nylon Fiber: -NF, Silk Fiber: -SF)

- This product permits leakage due to fiber raising.
- Maximize the flow rate of the vacuum source. Also, vacuum holding usage is not possible.
- Select a sensor suitable for the working conditions.
- Suction force is significantly lower than that of normal pads, so take measures such as increasing the pad diameter or increasing the number of pads used.
- Dirt may adhere to the fibers. Clean regularly with water or a diluted neutral detergent.
- Upon delivery, the fibers are standing, and the vacuum level will not rise. Perform suction operations 5 times or more before use to stabilize the suction force, then confirm suction with the actual equipment.
- Fibers on the pad surface may come off depending on the workpiece and operating environment. Detached fibers may adhere to the workpiece, so take measures such as air blowing as needed.

■Anti-Adhesion Type (-DL)

- Pad Material: For conductive silicone rubber (SE), the suction mark prevention effect is lower compared to other materials.
- The suction mark reduction treatment makes the pad rubber itself slippery, which may lead to poor suction.
- The pad may discolor due to the treatment, but there is no performance issue.

■Suction Mark Reduction Type (-ER)

- Due to the suction mark reduction treatment, the surface hardness is higher than that of normal pads, which may lead to poor suction depending on the workpiece.

Individual Precautions: Ultra Soft Silicone Rubber (YS2, YS4) [Bellows, Multi-stage Bellows]

When Designing and Selecting

Caution

■Since the pad rubber of this product is soft, please note the following when selecting and confirm suction with the actual equipment.

- Depending on the weight of the workpiece, its posture may not be maintained, and the pad may deform.
- Durability will be lower than that of normal pads.
- Due to the material's characteristics, the bellows may stick to each other and deform depending on the usage conditions.
- Start suction with the bellows part pressed against the workpiece. If suction is performed without pressing due to the soft pad rubber, it may lead to poor suction or reduced durability.
- Due to the material's characteristics, it is prone to deformation, so pay attention to storage conditions. Note that if it deforms, it will return to its original shape after being left for a while.