

Vacuum Equipment

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Vacuum Generator

- Simple type
- Complex type



External Vacuum Controller

- Complex type



Vacuum Pad

- Standard type
- Sponge type
- Bellows type (Attachment)
- Oval type
- Soft type
- Skidproof type
- Ultrathin type
- Flat type
- Mark-free type
- Vacuum pad for packaging bag



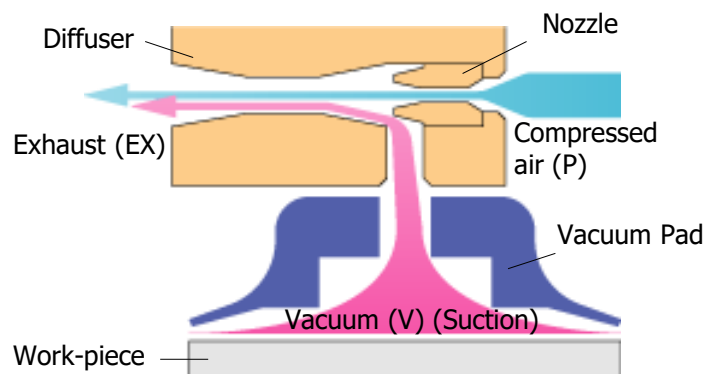
Vacuum Accessories

- Vacuum filter
- Small-sized vacuum regulator
- Fall prevention valve
- Pressure sensor
- Vacuum release unit
- Free holder

Vacuum Generator Simple Type

Mechanism of Vacuum Generator

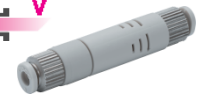
- An ejector (Vacuum generator) can generate the vacuum suction force by applying a compressed air to it. Its mechanism is explained in the below figure.
- Compressed air is squeezed by a nozzle and released to diffuser with high speed. The vacuum force is generated by a drop of pressure level due to a high-speed jet-flow, and enables to convey a work-piece.
- An ejector consists of a nozzle and a diffuser in order to obtain a high degree of vacuum level by a high-speed jet flow. Final vacuum, exhaust air flow (suction flow) and air consumption are determined by the shapes and dimensions of these components.



Pipe Type / VU



- Space saving type that is able to be installed in the middle of piping.
- Correspond to the specification suitable for solar battery and second battery production line (S3 specification).
Copper alloy free and low-level ozone resistance are necessary in the above production line.
S3 specification is available with Tube exhaust type only.



Small-sized Pipe Type / VUM

- Super small and lightweight ejector.
Outer diameter: $\varnothing 8.5\text{mm}$, Weight: Max. 7.7g
- Nozzle bore lineup: $\varnothing 0.3$, $\varnothing 0.4$, $\varnothing 0.5\text{mm}$
Meets the demands for low air consumption and space saving.

Box Type / VB



- Can be installed in the middle of piping.
- Mechanical sensor equipped type is available.

Vacuum Generator Simple Type

Valve Direct Mounting Type / VH, VS

- Best suitable for PISCO's solenoid valve, SVB.
- Correspond to the specification suitable for solar battery and second battery production line (S3 specification).
Copper alloy free and low-level ozone resistance are necessary in the above production line.
S3 specification is available with Tube exhaust type only.



Pad Direct Mounting Type / VM, VC

- Directly attach a vacuum generator to a pad holder.
- Smaller dia. nozzles: Correspond to $\varnothing 0.3$ and $\varnothing 0.4$ mm.
Meet the demands for low air consumption.
- Correspond to the specification suitable for solar battery and second battery production line (S3 specification).
Copper alloy free and low-level ozone resistance are necessary in the above production line.
S3 specification is available with Tube exhaust type only.



Blow-Off Mechanism Equipped Type / VY

- Ejector and Blow-off Mechanism are integrated.
- Realized a high cost performance.
- ※ For piping example for VY type, see page 5.





Vacuum Generator Simple Type

▪ About Vacuum Characteristics

H, L and E in the model code of vacuum generator show its vacuum characteristics.

H: High-vacuum type A type that vacuum level is high.

L: Large-flow type A type that suction flow rate is large (quickly lower the vacuum level in the volume).

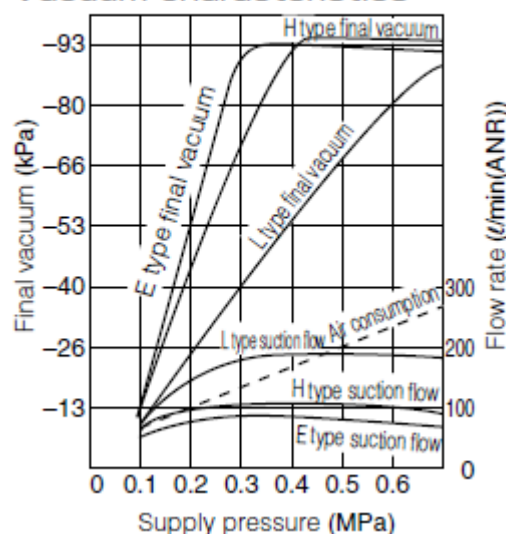
E: High-vacuum at low air supply pressure type

A type that can obtain vacuum level comparable to H type with low pressure supply.
(Compared to H type, it is energy saving, but has smaller suction flow rate.)

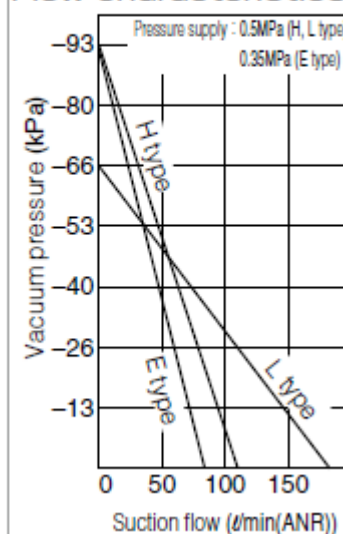
Let's propose vacuum characteristics suitable for user's application.

VCH20, VCL20, VCE20

Vacuum characteristics

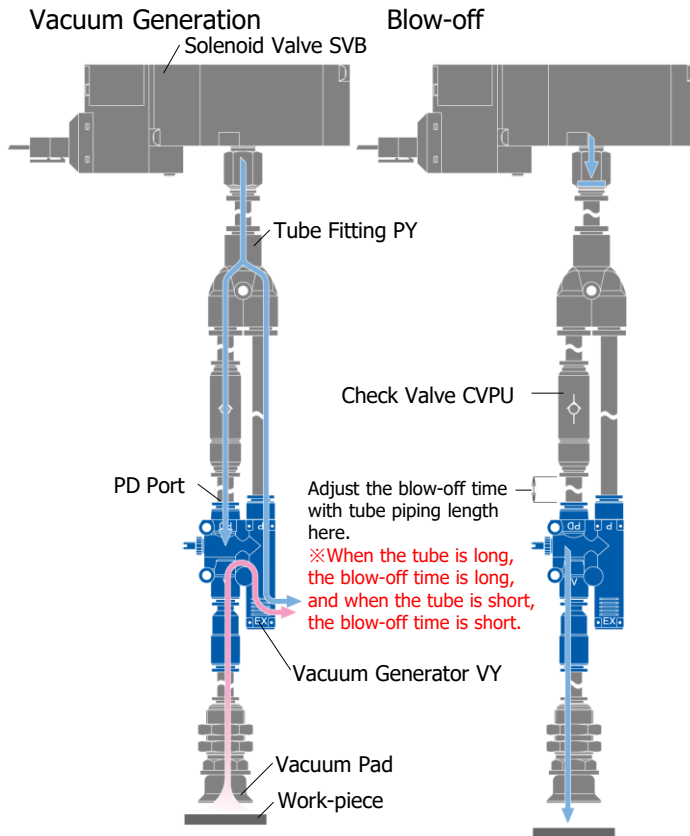


Flow characteristics



Piping Example for VY Type

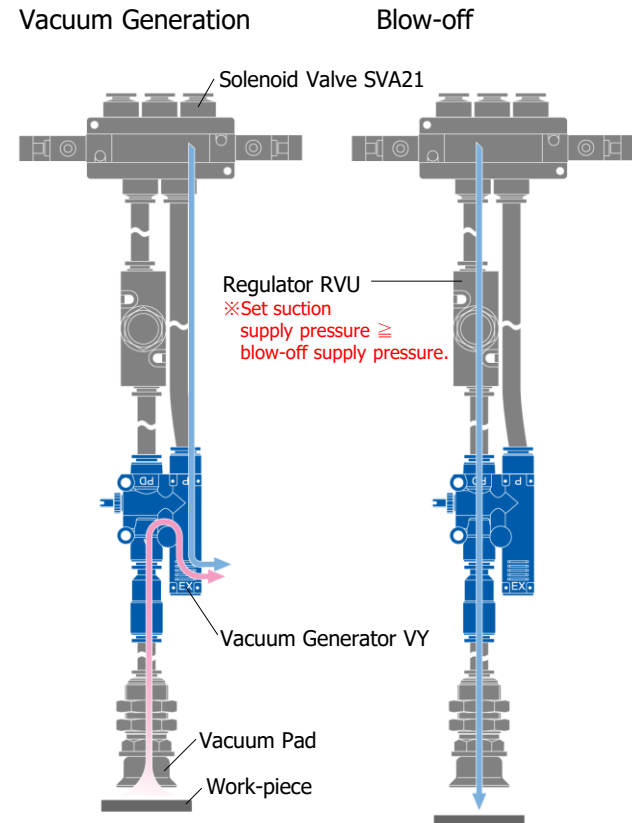
● Example 1.



Connect the P Port and PD Port with Check Valve (Purchase separately). The residual pressure between Check Valve and PD Port turns into a blow-off air. The flow rate of the blow-off air is adjusted by a release needle. Blow-off time can be controlled by the tube length between Check Valve and PD Port.

Vacuum Generator Simple Type

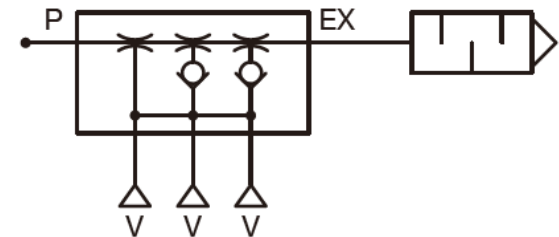
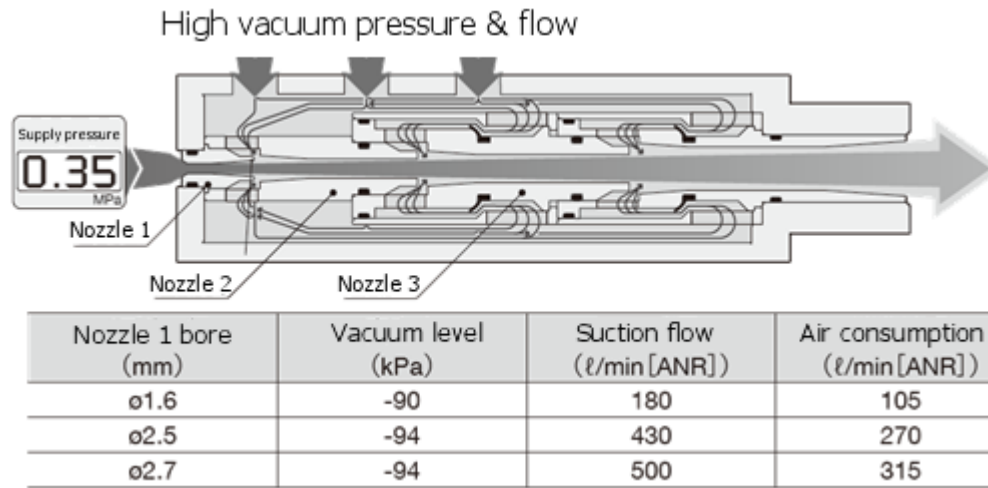
● Example 2. Usage with Twin 3-way valve (SVA21E)



Work-piece can be released instantly by adjusting a blow-off pressure and a flow rate. But it is necessary to pay attention not to blow away the work-piece. The above figure shows an example to arrange the different pressure supplies to vacuum generation side and blow-off mechanism side when a blow-off pressure needs to be controlled low (Pressure to vacuum generation side \geq Pressure to blow-off mechanism side \Rightarrow Adjusted by Regulator). A blow-off air is adjusted by the release needle. Blow-off time is controlled by the solenoid valve (SVA21 series).

Vacuum Generator VVV (Multi-stage nozzle type)

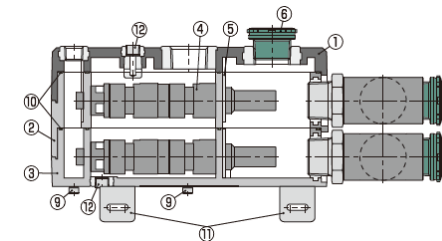
- Multi-stage nozzle ejector which realized large suction flow rate.
- Ensuring high vacuum pressure & high vacuum flow by low (0.35MPa) air supply.









- 3 vacuum ports enable easy distribution.
- Not only suction transport application but vacuum packing, deforming, or deaeration is also recommended.
Suitable for suction transport of a large & heavy work-piece in industries such as packaging or automobile, or porous work-piece.
- Easy maintenance and long life.
- Digital pressure gauge is selectable.

Vacuum Generator VLM (Multi-stage nozzle, layer type)

- Realized high vacuum of -94kPa and large suction flow rate with multi layer structure.
- A product with high extensibility, such as when you want larger suction flow rate than VVV, or when you want to adjust the flow rate by changing the quantity of nozzles.
- Rated supply pressure: 0.5MPa
- Digital pressure gauge is selectable.



Code	161	162	163	164	165	166
Layer	Single layer		Double layer		Triple layer	
Nozzle Q'ty						
Suction flow rate	290ℓ/min(ANR)	550ℓ/min(ANR)	760ℓ/min(ANR)	890ℓ/min(ANR)	1,020ℓ/min(ANR)	1,110ℓ/min(ANR)
Air consumption	110ℓ/min(ANR)	220ℓ/min(ANR)	330ℓ/min(ANR)	440ℓ/min(ANR)	550ℓ/min(ANR)	660ℓ/min(ANR)



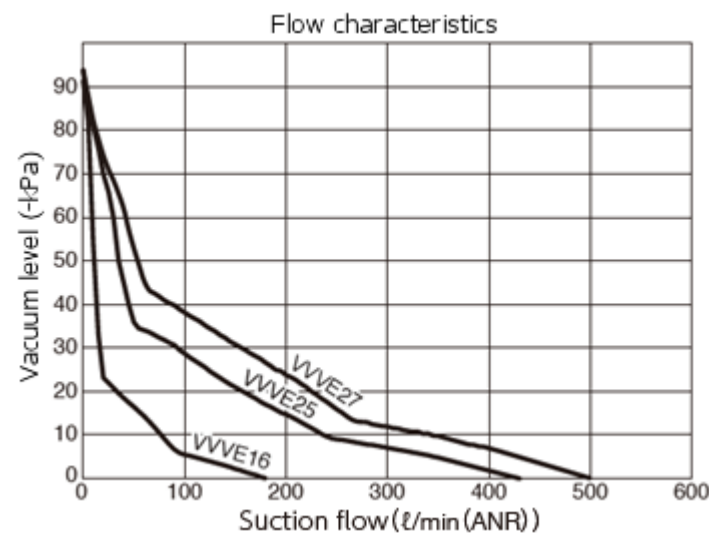
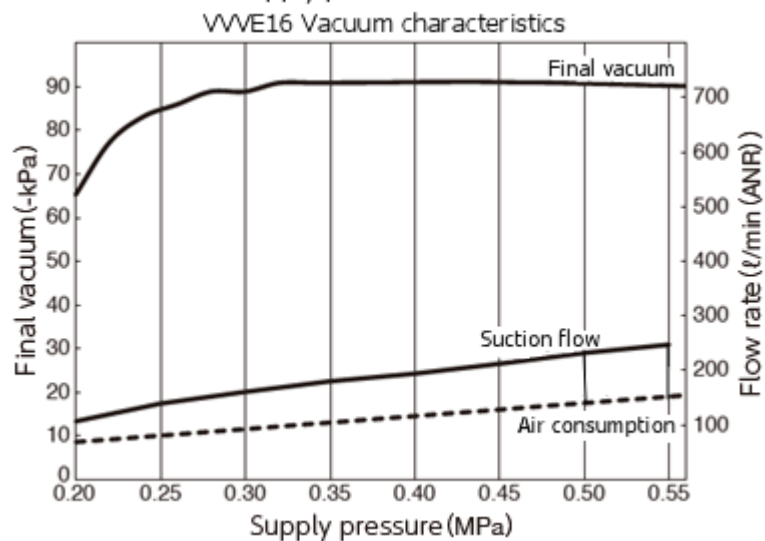
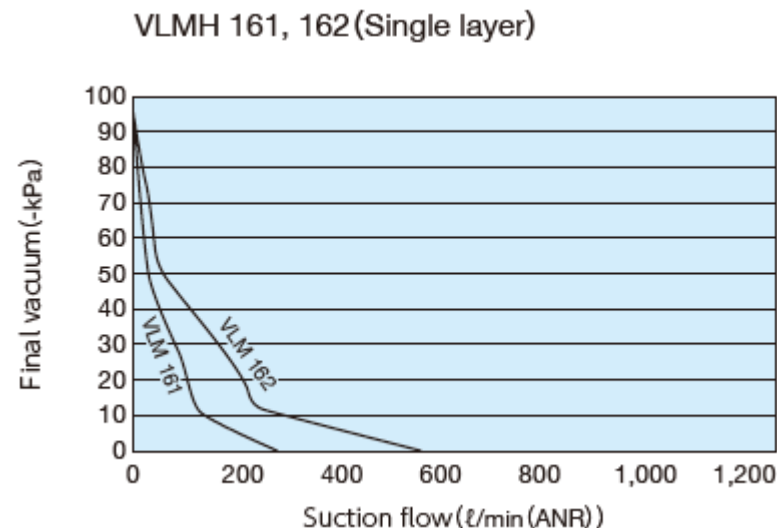
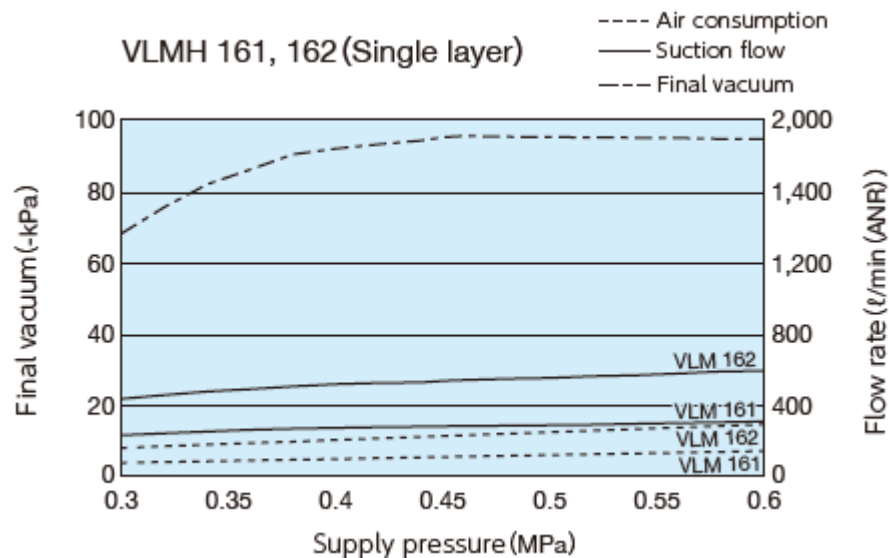
- Comparison of specifications between VLM and VVV.
(Compare with each model's minimum and maximum specification.)

	VLM	VVV
Model	VLMH161	VVVE16
Nozzle bore (mm)	1.6	1.6
Rated supply pressure (MPa)	0.5	0.35
Vacuum level (kPa)	-94	-90
Suction flow (l/min(ANR))	290	180
Air consumption (l/min(ANR))	110	105

	VLM	VVV
Model	VLMH166	VVVE27
Nozzle bore (mm)	1.6	1.6
Rated supply pressure (MPa)	0.5	0.35
Vacuum level (kPa)	-94	-94
Suction flow (l/min(ANR))	1110	500
Air consumption (l/min(ANR))	660	315

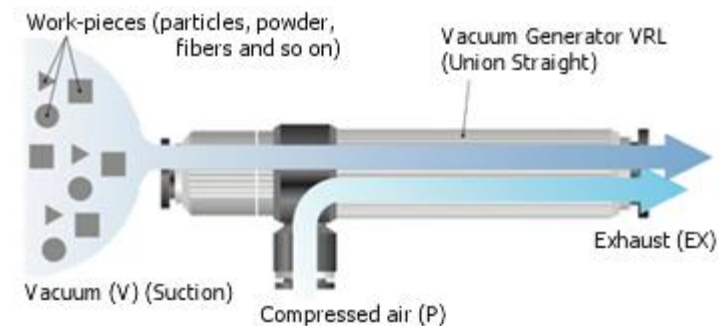


Vacuum Generator VLM



Vacuum Generator VRL (Ring blower type)

- Simple type ejector for conveying particles, powders and fibers.
- The vacuum port and the exhaust port are located in a straight line.
The works sucked in from the vacuum port pass through the inside of the vacuum generator and go out from the exhaust port. Thus the vacuum generator enables conveyance of works through a tube.

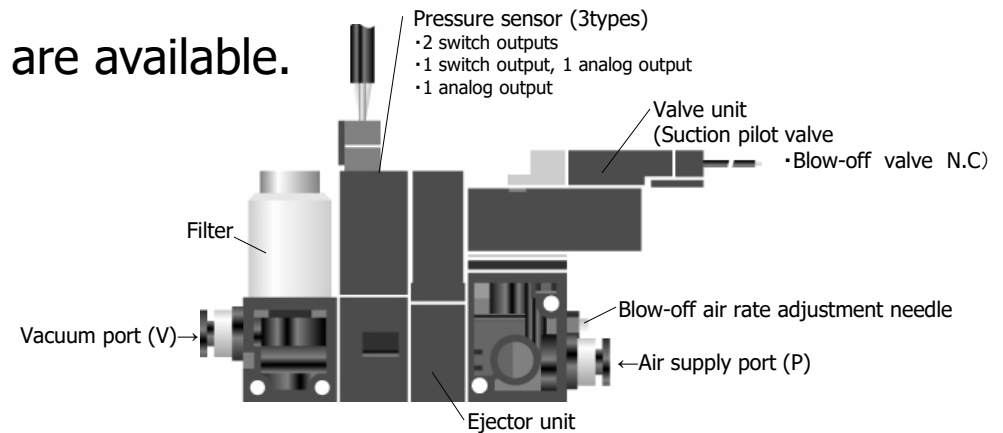


Type	Min. dia. of flow channel (mm)	Final vacuum (-kPa)	Suction flow (l/min(ANR))	Air consumption (l/min(ANR))
VRL50	2.8	53	50	50
VRL100	4.1	53	100	100
VRL200	6	53	200	200
VRL300	7.5	53	300	300

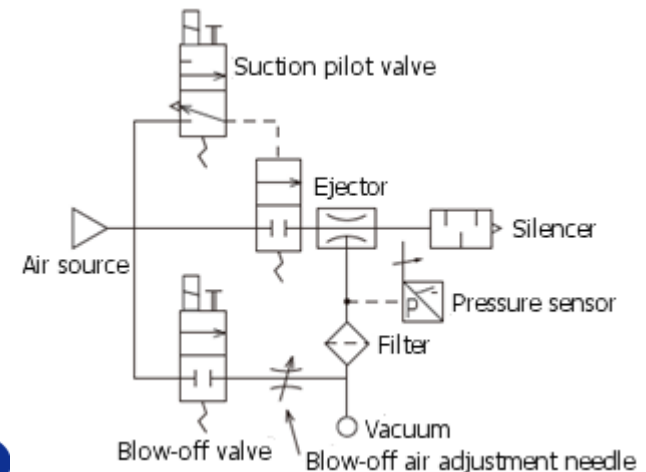
- Suitable type can be selected according to work-piece size and its amount.
- For model selection, please refer to the above table.

Vacuum Generator VG

- Complex type focusing on basic performance.
- Pressure sensor and blow-off valve are each unitized.
- Three types of pressure sensor are available.
 - Suction valve: Normally close
 - Blow-off valve: Normally close



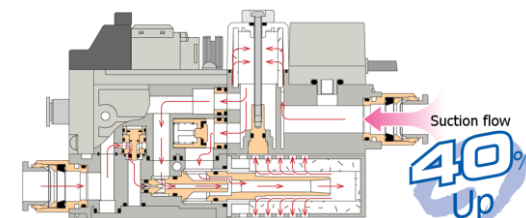
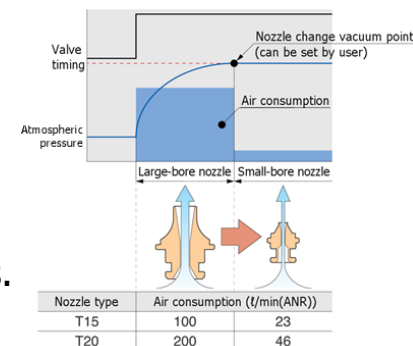
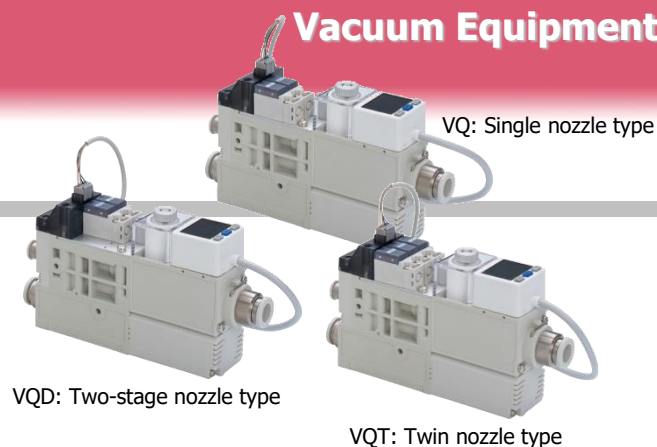
- Air circuit (Unit combination F type)





Vacuum Generator VQ

- Complex type best suitable for controlling large flow.
- 3 different types of nozzle are available.
 - Twin nozzle, Two-stage nozzle and Single nozzle type.
- Pilot valve: Negative common specification is selectable.
- The twin-nozzle type is suitable for applications with longer suction or transportation time.
 - The large nozzle controls vacuum generation from start up to a prescribed reference preset pressure level, after which the small nozzle takes over for retaining the vacuum level. This combination makes possible substantial reductions in Air consumption.
 - Only one signal is used for vacuum generation, same as conventional models.
 - Suction valve type: Normally close
 - Blow-off valve type: Normally close
- The two-stage nozzle type's vacuum suction rate has been increased by approximately 40% compared to conventional types.
 - Suction valve type: Normally close, Normally open
 - Blow-off valve type: Normally close



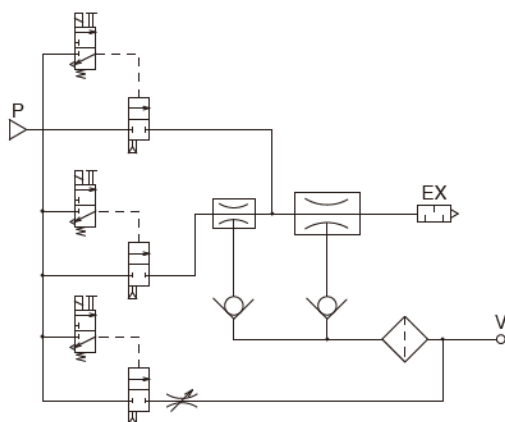


Vacuum Generator VQ

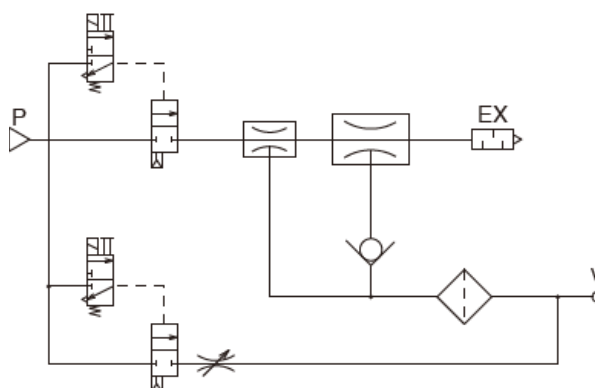
- The single-nozzle type is a basic, complex ejector designed to generate large vacuum flows.
 - Suction valve type: Normally close, Normally open, Double solenoid
 - Blow-off valve type: Normally close

- **Air circuit**

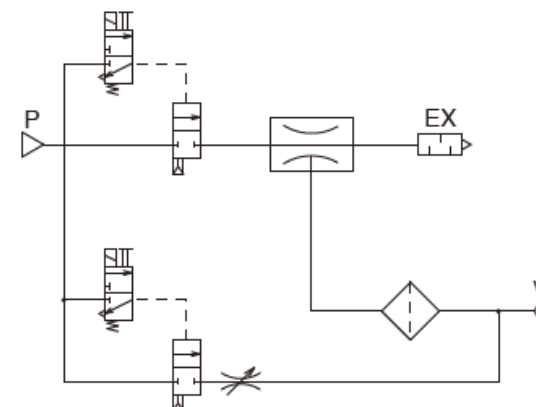
Twin nozzle type



Two-stage nozzle type



Single nozzle type



- Easily visible 3-color LCD dual display pressure sensor is mounted.
Please note that the regular pressure sensors (Large digital pressure sensor 31・32series) cannot be mounted.



Vacuum Generator VK

- Complex type with rich combinations of modularized units, which enables selection of suitable specification for your application.
(Please see the next page for 18 types of unit combination.)

- 2 pressure sensor selections:
LED display type and Mechanical type
which is reasonable and user-friendly.

- Suction valve type: Normally close, Normally open
- Blow-off valve type: Normally close

- Vacuum retention is possible even when electric power is not supplied such as blackout.
(With check valve or suction solenoid valve.

The leak is not 0.)

- Air circuit

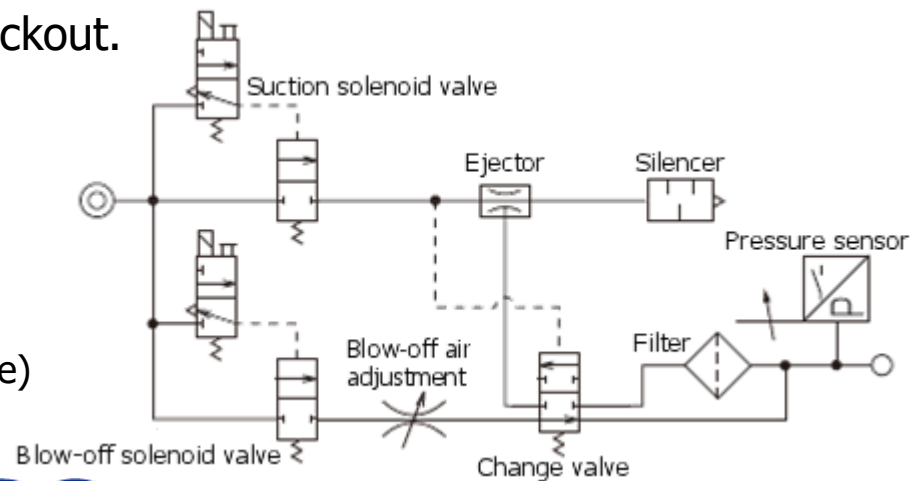
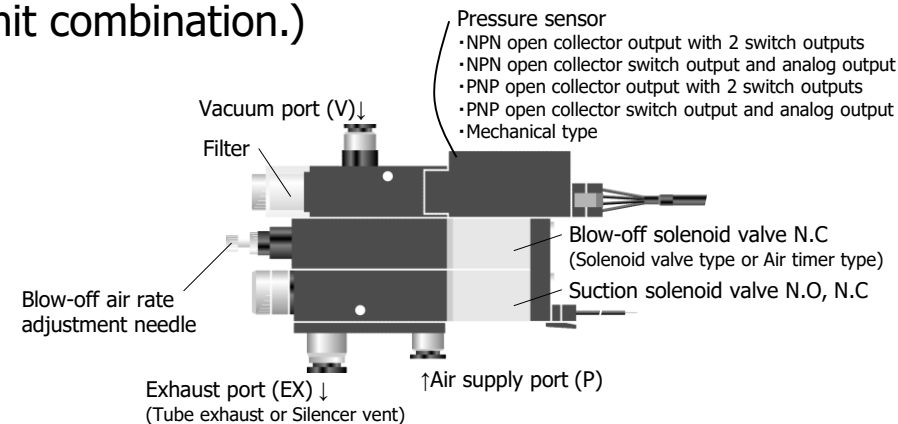
Combination type: W

(Filter, Suction solenoid valve, Pressure sensor with LED display and Blow-off solenoid valve)

Manifold type



Stand-alone type





Vacuum Generator VK

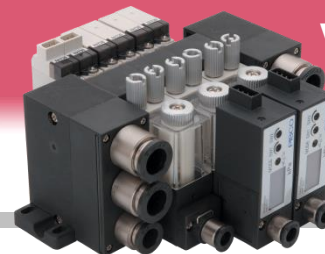
▪ Combination table (18 types)

Code	A	B	C	D	E	F	G	H	J	K	L	M	P	Q	R	S	T	W
Filter	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Suction solenoid valve	-	-	-	-	-	-	○	○	○	○	○	○	○	○	○	○	○	○
Check valve (vacuum retention)	-	○	-	○	-	○	-	○	-	○	-	○	-	-	-	-	-	-
Mechanical vacuum sensor	-	-	○	○	-	-	-	-	○	○	-	-	-	○	-	-	○	-
Vacuum sensor with LED display	-	-	-	-	○	○	-	-	-	-	○	○	-	-	○	-	-	○
Air timer type blow-off valve	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○	-	-	-
Solenoid valve type blow-off valve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○

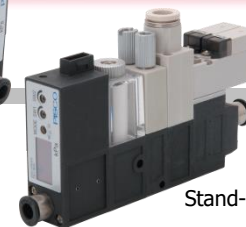


Vacuum Generator VJ

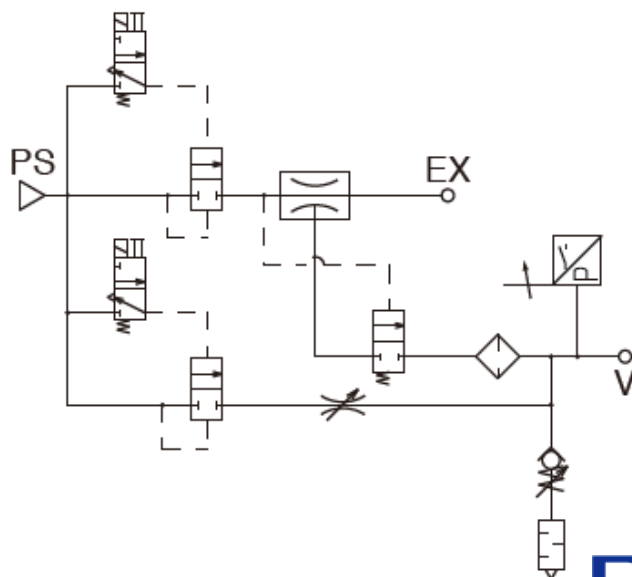
- Complex type with blow-off air and pressure adjustment needle.
- Pressure adjusting function is added to the conventional blow-off air control function to prevent work-pieces from being blown away.
- 3 different types for supply valve
 - Suction valve: Normally close, Normally open, double solenoid
 - Blow-off valve: Normally close
- Air circuit (With pressure sensor, Normally close, Tube exhaust type)



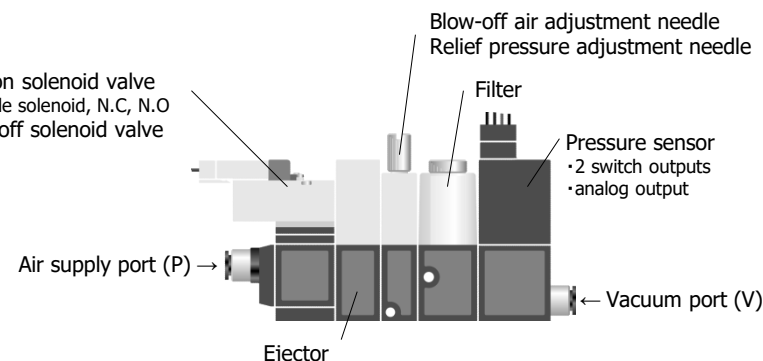
Manifold type



Stand-alone type

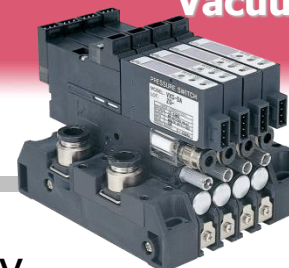


Suction solenoid valve
• Double solenoid, N.C, N.O
Blow-off solenoid valve
• N.C





Vacuum Generator VX



Manifold type

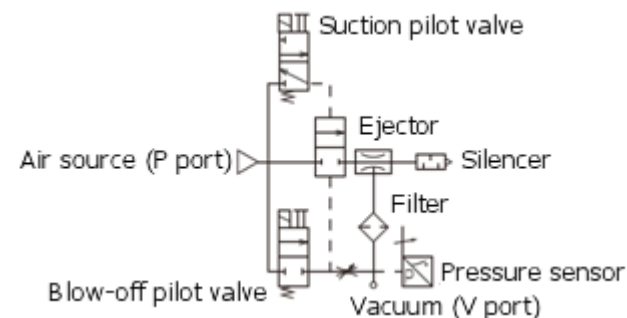
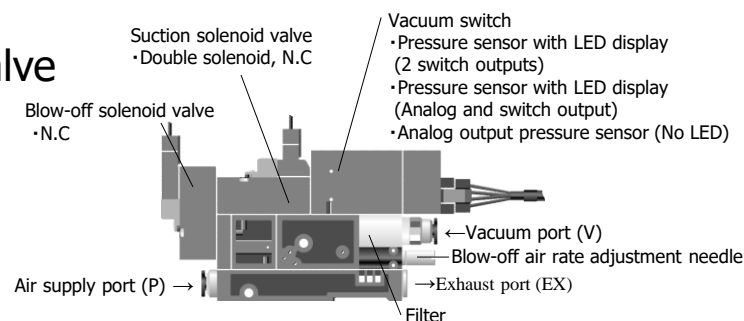


Stand-alone type

- Complex type that realized lightweight, compact body and high cycle of vacuum system.
- The fastest possible response of suction solenoid valve realized the high vacuum cycle.
 - Suction valve: Normally close, Double solenoid
 - Blow-off valve: Normally close
- 2 types of pressure sensor are selectable.
 - One with visibility improved LED display, and the one with analog output with reasonable price.
- Correspond to the specification suitable for solar battery and second battery production line (S3 specification).

Copper alloy free and low-level ozone resistance are necessary in the above production line.
S3 specification is available with Tube exhaust type only.

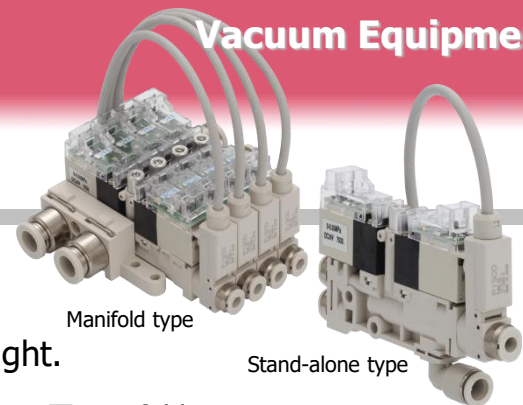
- Air circuit
(With pressure sensor, Double solenoid, Silencer vent type)





Vacuum Generator VN

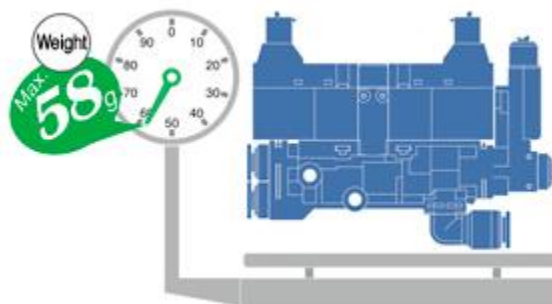
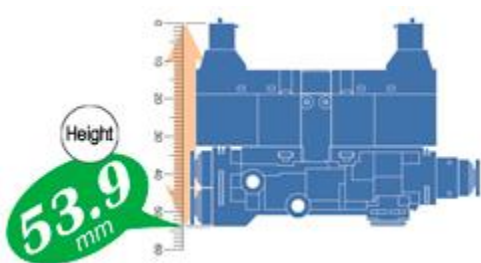
- Suitable for the applications requiring small space.
- Compact and lightweight. Particularly focused on lowering the body height.



Manifold type

Stand-alone type

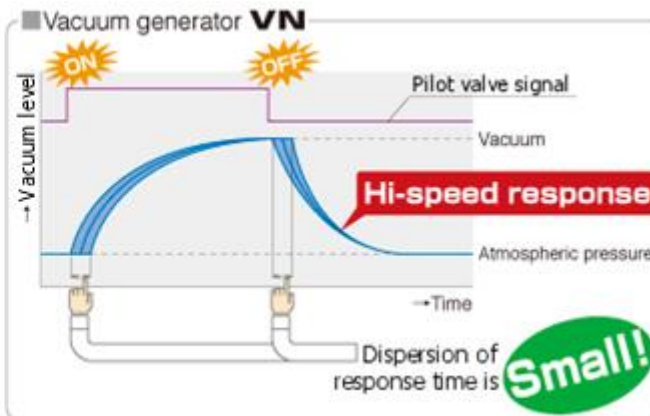
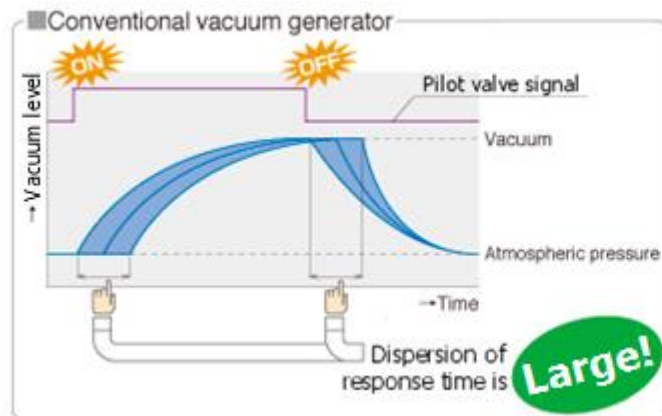
■ Stand-alone type



■ Manifold type



- High speed, yet stable response is realized. (ON/OFF=Max. 5msec)
- Direct operated solenoid valve is used for the main valve.

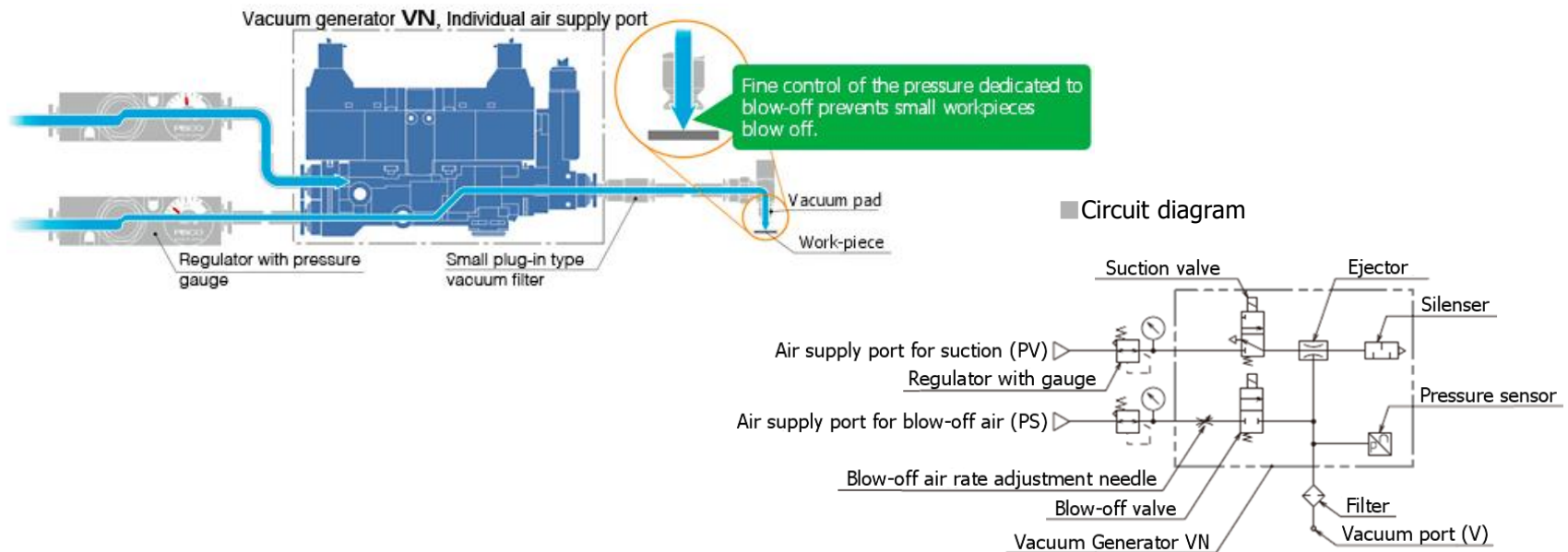




Vacuum Generator VN

- Gently release a tiny work-piece by blow-off air.

Air supply port for blow-off is independent. In addition to conventional adjustment of blow-off air rate, control by an external regulator make the fine adjustment of blow-off air easy.



- Common supply port type is also available.

※Supply port: Air supply port for suction and blow-off are common.

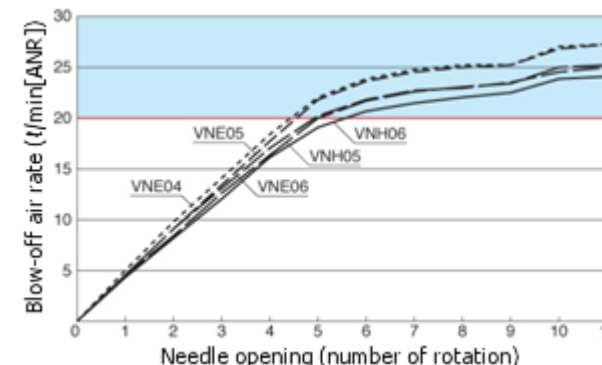
- Suction valve: Normally close
- Blow-off valve: Normally close



Vacuum Generator VN

- Securing 20 ℓ /min for blow-off air rate.

Supply pressure: 0.5MPa



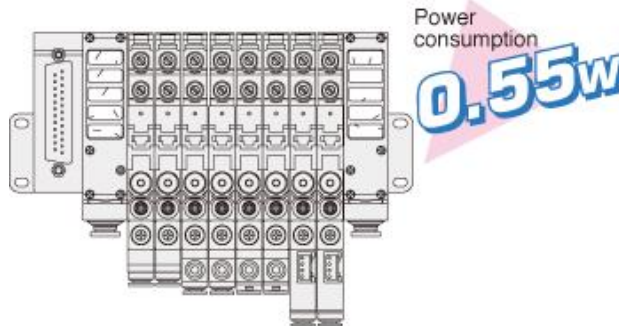
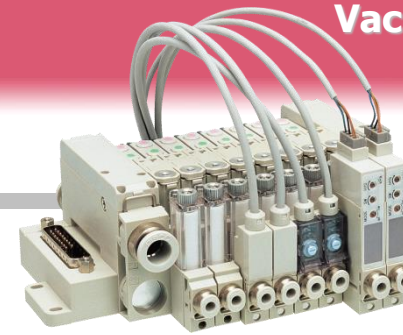
- 4 types of analog output type sensor are prepared.
 - Analog output type pressure sensor for negative pressure
Separate LED indicator + Analog output type pressure sensor for negative pressure
 - Analog output type sensor for compound pressure
Separate LED indicator + Analog output type sensor for compound pressure

Analog output type sensor		Separate LED indicator + Analog output type sensor	
Negative pressure	Compound pressure	Negative pressure	Compound pressure

- External vacuum filter (option) is prepared.
 - Inconvenience from filter replacement due to the downsizing of this vacuum generator is resolved.
 - ※ Vacuum generator VN series is not equipped with vacuum filter. Please make sure to install PISCO vacuum filter (VFU or VFJ) to the vacuum piping for long-term use.

Vacuum Generator VZ

- Complex type for manifold use only.
- Large volume of blow-off air by air pressure release valve which have achieved to reduce blow-off time.
- Realized energy saving by holding down the valve power consumption to 0.55W.



- Wiring for the suction valve and blow-off valve is efficiently concentrated in one bundle by using Sub-D connector and Flat cable connector.

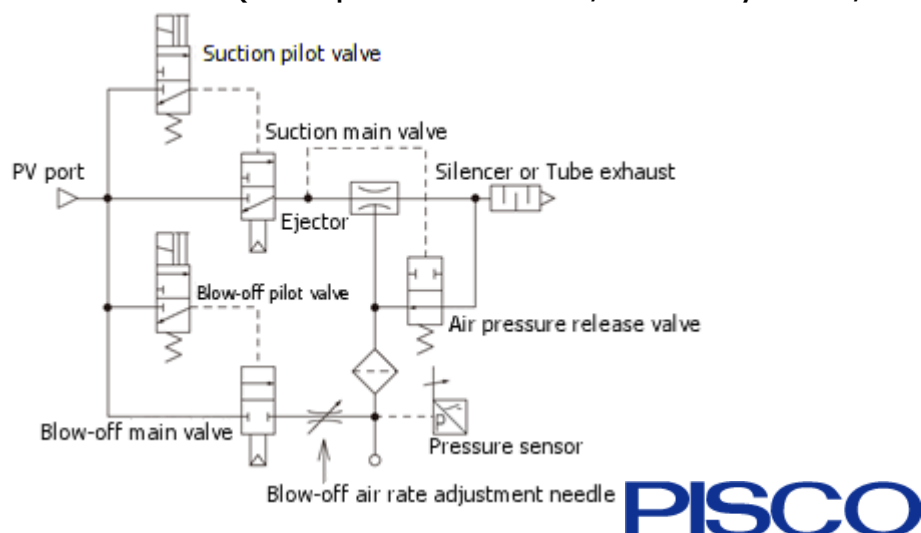


Vacuum Generator VZ

- A rich variety of pressure sensors is offered to meet the needs of a wide range of applications.

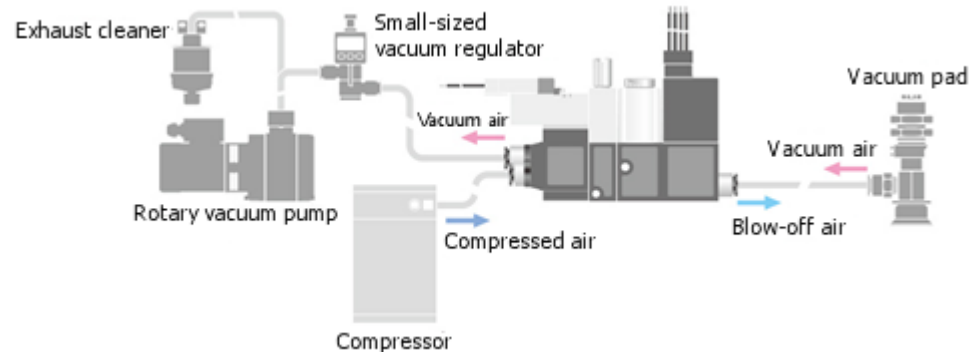
No display		Separate display	Built-in LED display	
Analog output	1 switch output	LED indicator + Analog output	1 switch output	2 switch outputs

- Air circuit (With pressure sensor, Normally close, Silencer vent type)



External Vacuum Controller VJP

- External vacuum controller with blow-off air rate and relief pressure adjustment needle.



- Improved visibility by pressure sensor with LED display.
- 2 types of pressure sensor are available:
2 switch outputs and analog output.

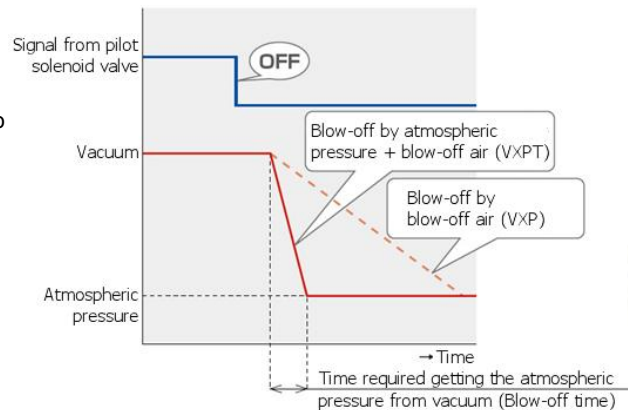
Note) Compressed air is required separately from vacuum source.
(For valve changing and blow-off air)

External Vacuum Controller

VXP, VXPT

- VXP type is 2 port valve (Vacuum retention type. Effective when electric power is not supplied.)
- By adopting 3 port valve specification for vacuum supply main valve of VXPT type, the blow-off time can be drastically shortened.

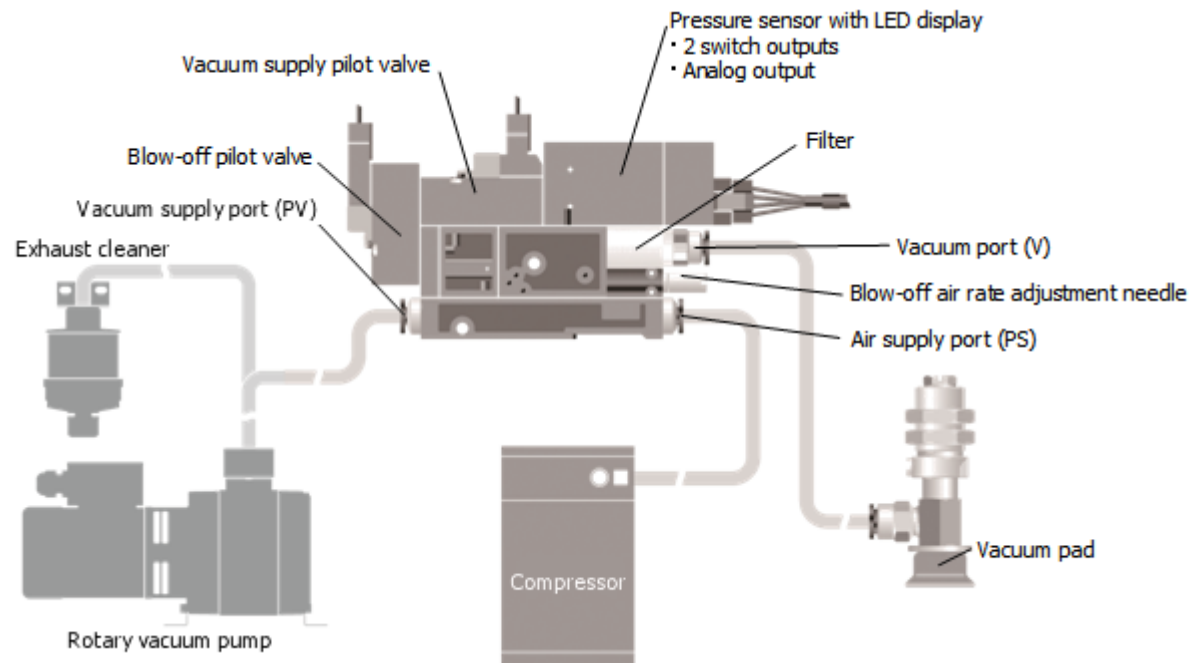
• Since the conventional two-way valve (VXP type) operates to retain the vacuum immediately after the main valve is shut off, only blow-off air contributes to releasing vacuum. However, in the three-port specification (VXPT type), the atmospheric air is introduced when shutting off the main valve to blow-off using the atmospheric pressure plus blow-off air.



- Correspond to the specification suitable for solar battery and second battery production line (S3 specification).
Copper alloy free and low-level ozone resistance are necessary on the above production line. S3 specification is available with Tube exhaust type only.

External Vacuum Controller VXP, VXPT

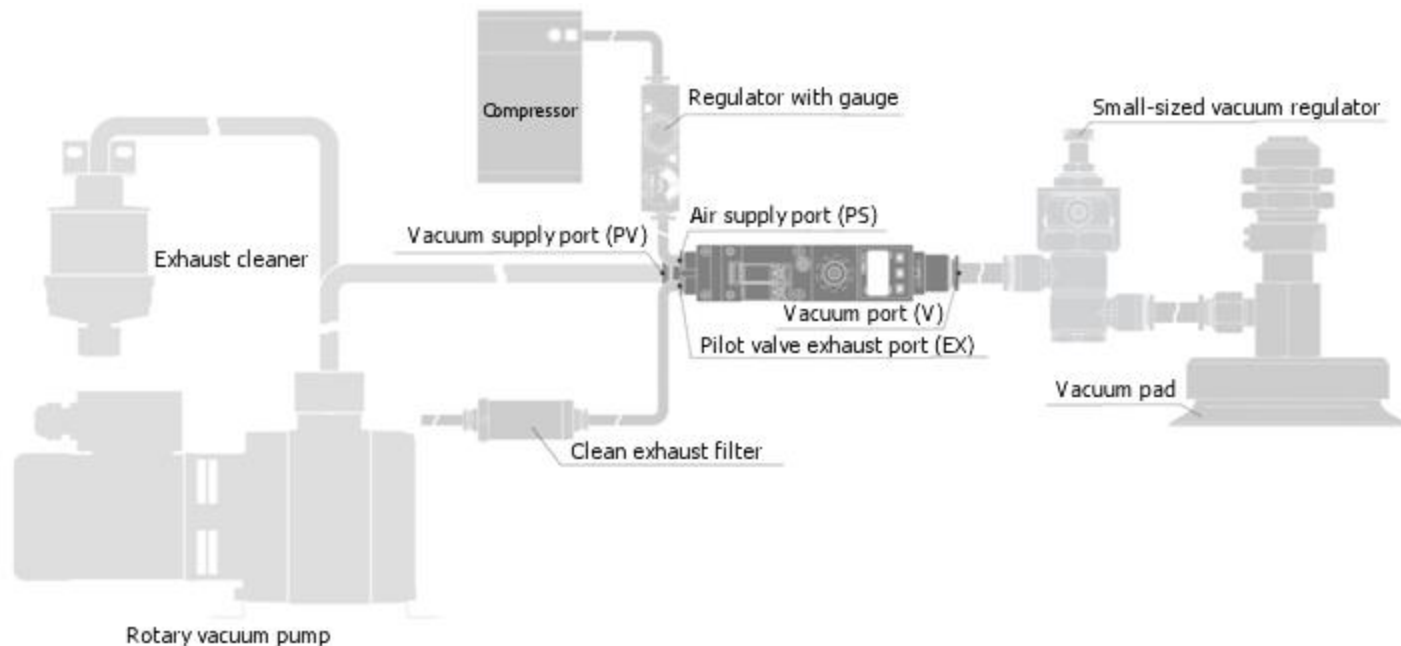
■ Piping Example



Note) Compressed air is required separately from vacuum source.
(For valve switching and blow-off air.)

External Vacuum Controller VQP

- 31.5mm wide vacuum unit designed to optimize the control of large vacuum flows.

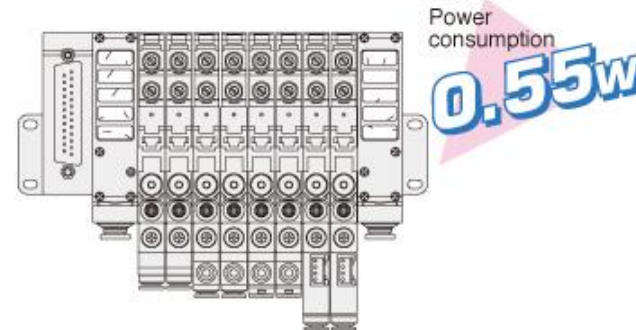


- Normally close and normally open types are available for suction valve.
 - Easily visible 3-color LCD dual display pressure sensor is mounted.
- Note) Compressed air is required separately from vacuum source.

(For valve switching and blow-off air.)






External Vacuum Controller VZP

- Compact and lightweight external vacuum controller for manifold use only.
- Realized energy saving by holding down the valve power consumption to 0.55W.



- A rich variety of pressure sensor is offered to meet the needs of a wide range of applications.
- Wiring for the suction valve and blow-off valve is efficiently concentrated in one bundle by using Sub-D connector and Flat cable connector.

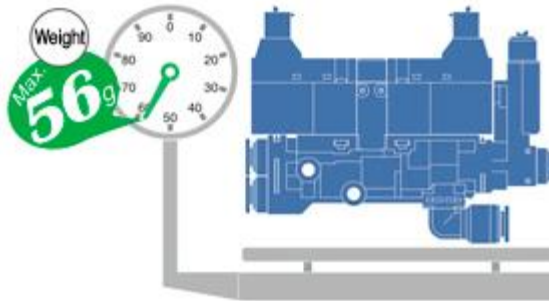
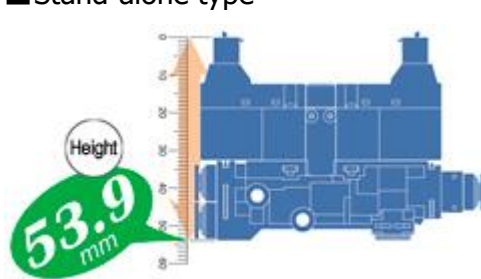
Note) Compressed air is required separately from vacuum source. (For valve switching and blow-off air.)

No display		Separate display	Built-in LED display	
Analog output	1 switch output	LED indicator + Analog output	1 switch output	2 switch outputs
				

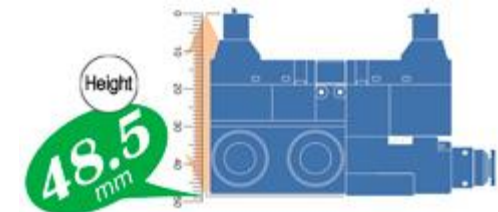
External Vacuum Controller VNP

- Suitable for the applications requiring small space.
 - Compact and lightweight. Particularly focused on lowering the body height.

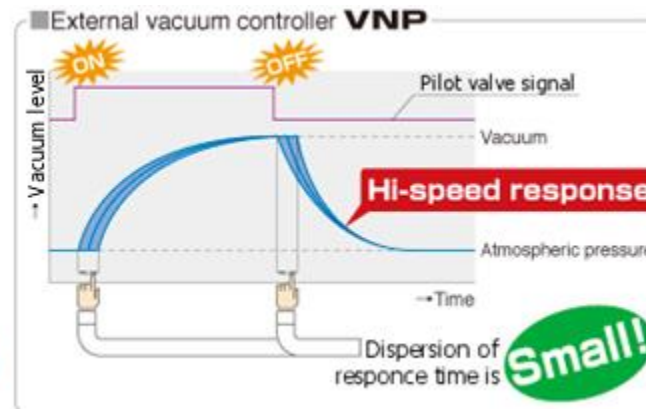
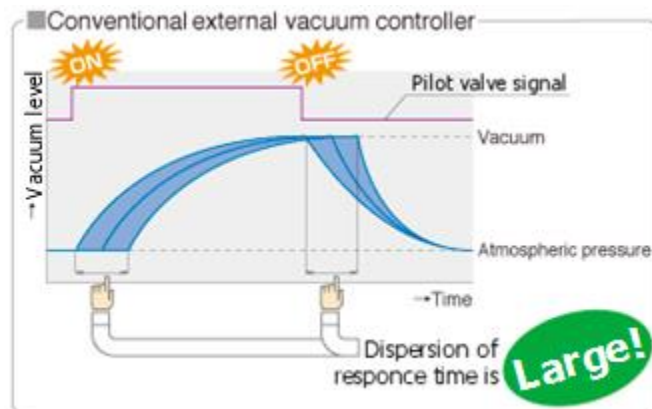
■ Stand-alone type



■ Manifold type









- High speed, yet stable response is realized. (ON/OFF=Max. 5msec)
 - Direct operated solenoid valve is used for the main valve.



External Vacuum Controller VNP

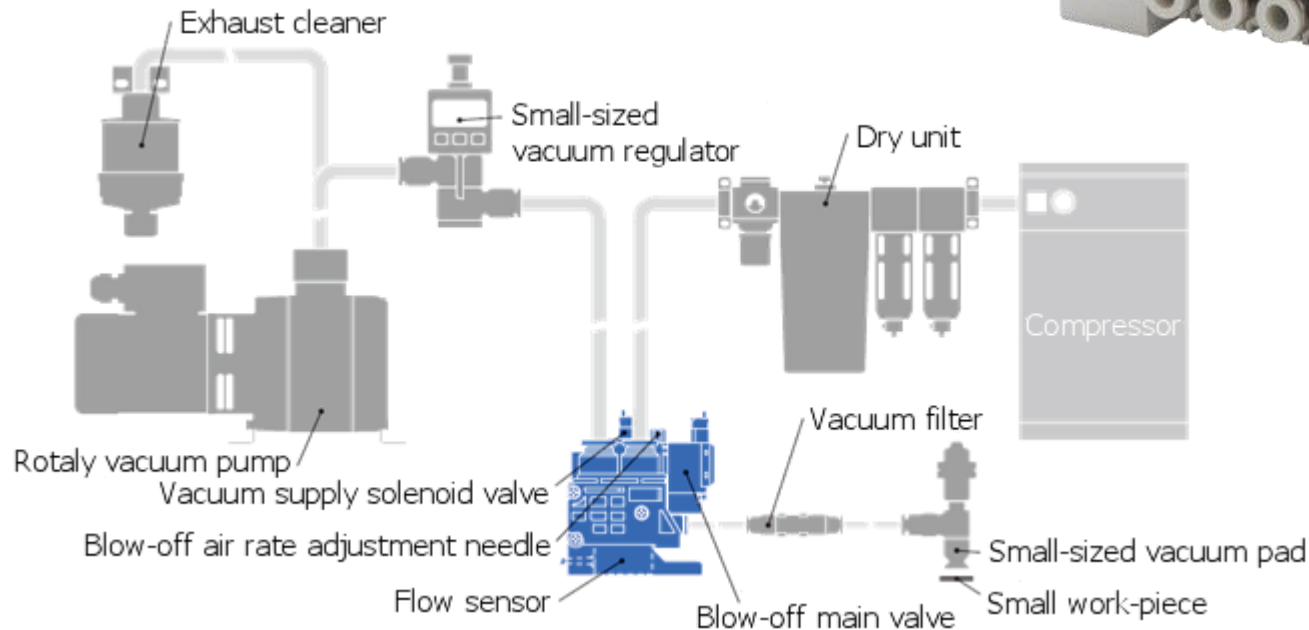
- 4 types of analog output type sensor are prepared.
 - Analog output type pressure sensor for negative pressure
Separate LED indicator + Analog output type pressure for negative pressure
 - Analog output type sensor for compound pressure
Separate LED indicator + Analog output type sensor for compound pressure

Analog output type sensor		Separate LED indicator + Analog output type sensor	
Negative pressure	Compound pressure	Negative pressure	Compound pressure
		 + 	 + 

- External vacuum filter (option) is prepared.
 - Inconvenience from filter replacement due to the downsizing of this vacuum generator is resolved.
 - ※External vacuum controller VNP series is not equipped with vacuum filter. Please make sure to install PISCO vacuum filter (VFU or VFJ) to the vacuum piping for long-term use.
- Note) Compressed air is required separately from vacuum source. (For valve switching and blow-off air)

External Vacuum Controller VIP

- In detection of suctioning a small work-piece, it is difficult to confirm the suction by differential pressure. VIP equipped with vacuum flow sensor makes it easy to detect the suctioning, and it is suitable for semiconductor related equipments such as chip mounter and handler.



Note) Compressed air is required separately from vacuum source. (For valve switching and blow-off air)

External Vacuum Controller VIP

- Built-in vacuum flow sensor model makes confirmation of suctioning a small work-piece possible.
Only VIP type can mount a flow sensor!!

Bottom face of body

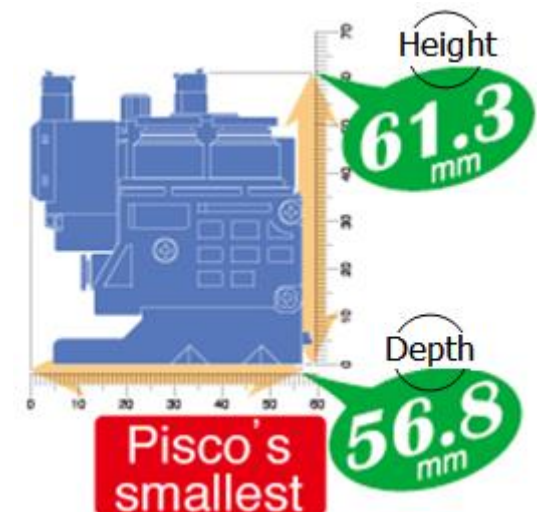
■ With pressure sensors



■ With flow sensors



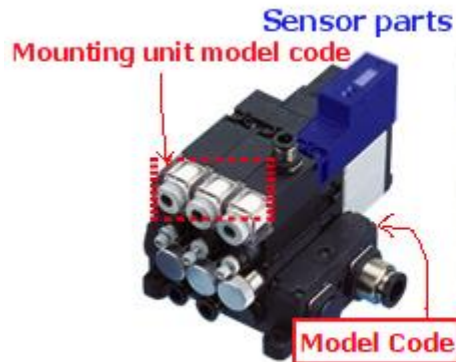
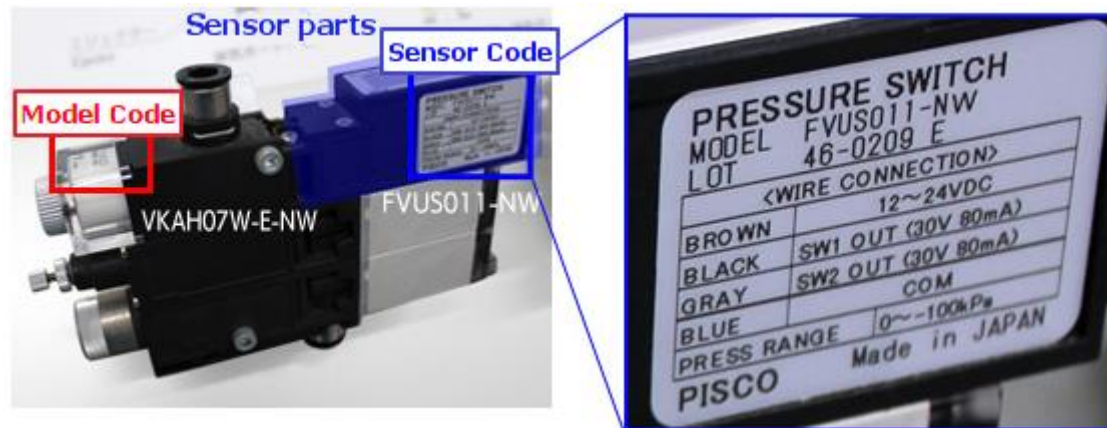
- Blow-off air rate adjusting method is selectable.
Blow-off air rate adjustable type with a needle, and fixed flow rate type.
- Ultra small body realizes vacuum switchover with large flow.
8.5ℓ/min[ANR] or more at vacuum supply pressure: -80kPa



Model code identification

- Model code marking position

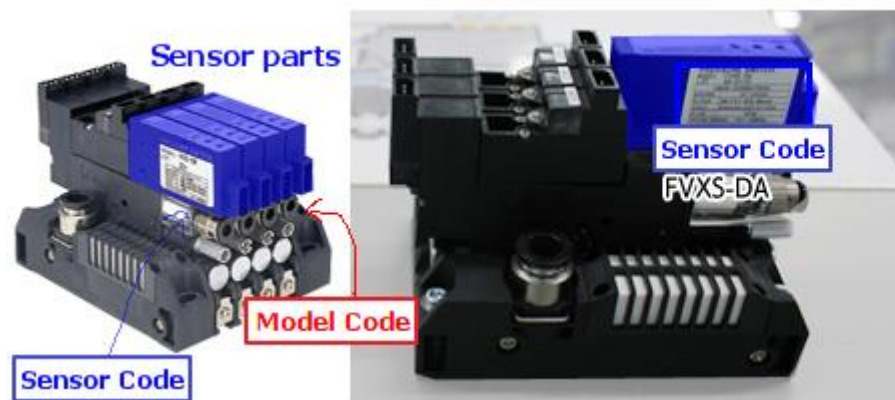
VK



VX



Front

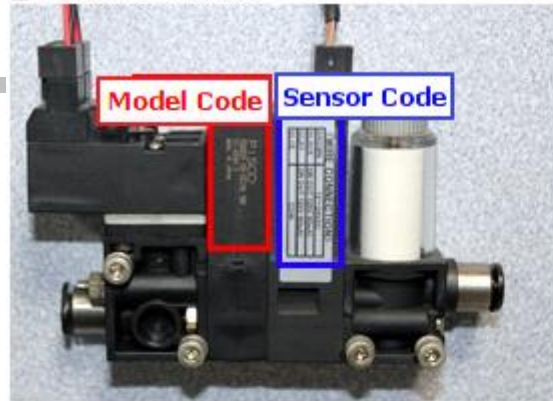


Back

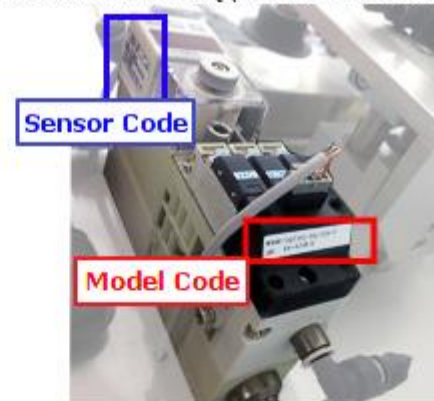


Other models

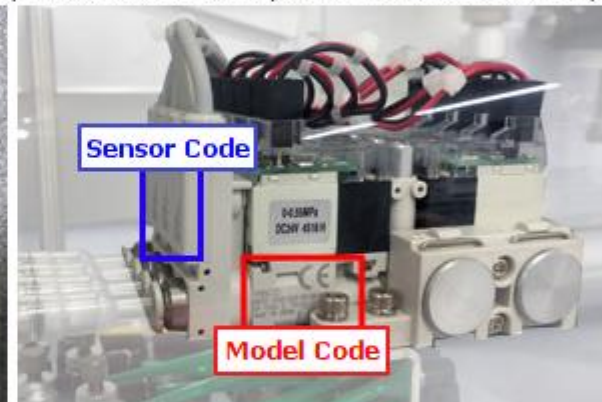
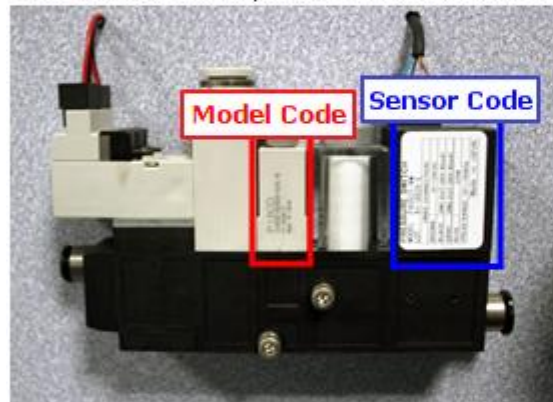
■ Vacuum Generator VG



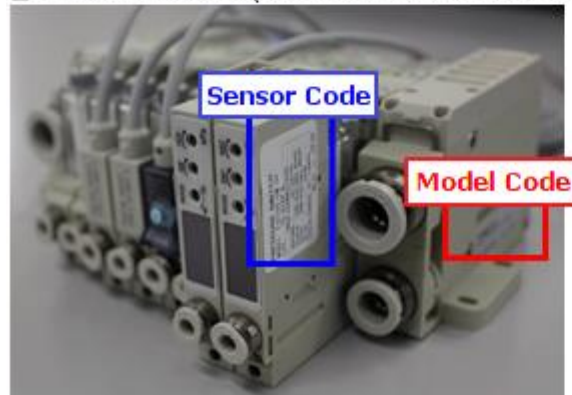
■ Vacuum Generator VQ (External Vacuum Controller VQP)



■ Vacuum Generator VJ (External Vacuum Controller VJP) ■ Vacuum Generator VN (External Vacuum Controller VNP)






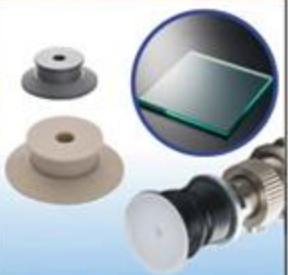








■ Vacuum Generator VZ (External Vacuum Controller VZP)



Vacuum Pad

Recommended work-piece list of vacuum pad

Standard			Sponge	Bellows/Multi-bellows	Mark-free Resin Attachment
General type  <p>■ Thick and flat work-piece</p>	Deep type  <p>■ Round fruit (apple) or round ball</p>	Small type  <p>■ Small work-piece or semiconductor manufacturing equipment</p>	 <p>■ Exterior wall panel, pebble, seashell</p>	 <p>■ Pouched food or food package</p>	 <p>■ Best suitable for transportation of glass, painting process, and taking out molded products.</p>
Oval	Soft/Soft bellows	Skidproof	Ultrathin	Mark-free	Flat
 <p>■ Long work-piece such as circuit board or semiconductor product</p>	 <p>■ Taking out molded parts or for fragile work-piece</p>	 <p>■ Greasy work-piece such as pressed parts</p>	 <p>■ Paper or plastic bag</p>	 <p>■ LCD glass, in painting process and semiconductor manufacturing equipment</p>	 <p>■ Sheet and plastic bag which is easy to be wrinkled</p>

Vacuum Pad

Size and material list of each pad 1

Pad type	Pad material or resin material	code	Pad dia. (□mm)																																				
			0.7	1	1.5	2	3	4	6	8	10	15	20	25	30	35	40	50	60	70	80	100	150	200	2x4	3.5x7	4x10	4x20	4x30	5x10	5x20	5x30	6x10	6x20	6x30	8x20	8x30		
Standard •General type: ○ •General & Deep type: ● •Small type: ◇ •General & Small type: ◆	Nitrile rubber	N	◇	◆	◇	◆	◆	◆	○	○	○	●	●	●	●		●	●	●		●	●	○	○															
	NBR suited for JPN food sanitation act.	G	◇	◆	◇	◆	◆	◆	○	○	○	●	●	●	●		●	●																					
	HNBR	HN	◇	◇	◇	◇	◇	◇																															
	Silicone rubber	S	◇	◆	◇	◆	◆	◆	○	○	○	●	●	●	●		●	●	●		●	●	○	○															
	Conductive Silicone rubber	SE	◇	◆	◇	◆	◆	◆	○	○	○	○	○	○	○		○	○	○		○	○	○	○															
	Urethane rubber	U	◇	◆	◇	◆	◆	◆	○	○	○	●	●	●	●		●	●	●		●	●	○	○															
	Fluoro rubber	F	◇	◆	◇	◆	◆	◆	○	○	○	●	●	●	●		●	●	●		●	●	○	○															
	EPDM	EP	◇	◇	◇	◇	◇	◇															○	○															
	Conductive Butadiene rubber (low resistance)	E	◇	◆	◇	◆	◆	◆	○	○	○	○	○	○	○		○	○																					
Conductive NBR (low resistance)	NE	◇	◆	◇	◆	◆	◆	○	○	○	●	●	●	●		●	●	●		○	●	○	○																
Sponge	Chloroprene rubber (sponge type)	-									○	○	○	○	○		○		○		○		○																
	Silicone sponge rubber	S									○	○	○	○	○	○	○	○	○		○	○																	
Bellows •Pad only: ○ •Corresponding resin attachment: ●	Nitrile rubber	N				○			○	○	●	●	●	●	●		○	○	○		○	○																	
	HNBR	HN				○			○	○	●	●	●	●	●		○	○	○		○	○																	
	Silicone rubber	S				○			○	○	●	●	●	●	●		○	○	○		○	○																	
	Conductive Silicone rubber	SE							○	○	●	●	●	●	●		○	○	○		○	○																	
	Urethane rubber	U				○			○	○	●	●	●	●	●		○	○	○		○	○																	
	Fluoro rubber	F							○	○	●	●	●	●	●		○	○	○		○	○																	
	EPDM	EP				○			○	○	●	●	●	●	●		○	○	○		○	○																	
	Conductive NBR (low resistance)	NE				○			○	○	●	●	●	●	●		○	○	○		○	○																	
Multi-bellows	Nitrile rubber	N									○		○		○		○	○																					
	NBR suited for JPN food sanitation act.	G									○		○		○		○	○																					
	HNBR	HN									○		○		○		○	○																					
	Silicone rubber	S									○		○		○		○	○																					
	Urethane rubber	U									○		○		○		○	○																					
	Fluoro rubber	F									○		○		○		○	○																					
	EPDM	EP									○		○		○		○	○																					
	Conductive NBR (low resistance)	NE									○		○		○		○	○																					
Oval	Nitrile rubber	N																							○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	Silicone rubber	S																						○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	Conductive Silicone rubber	SE																						○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	Urethane rubber	U																						○	○	○	○			○	○	○	○	○	○	○	○		
	Fluoro rubber	F																						○	○	○	○			○	○	○	○	○	○	○			
	Conductive Butadiene rubber (low resistance)	E																								○	○	○	○	○	○	○	○	○	○	○	○		
	Conductive NBR (low resistance)	NE																						○	○	○	○	○	○	○	○	○	○	○	○	○	○		

Vacuum Pad

Size and material list of each pad 2

Pad type	Pad material or resin material	code	Pad dia. (□mm)																																						
			0.7	1	1.5	2	3	4	6	8	10	15	20	25	30	35	40	50	60	70	80	100	150	200	2x4	3.5x7	4x10	4x20	4x30	5x10	5x20	5x30	6x10	6x20	6x30	8x20	8x30				
Soft	Nitrile rubber	N						○	○	○	○	○	○		○		○																								
	Silicone rubber	S						○	○	○	○	○	○		○		○																								
	Conductive Silicone rubber	SE						○	○	○	○	○	○		○		○																								
	Fluorosilicone rubber	FS						○	○	○	○	○	○		○		○																								
	Conductive NBR (low resistance)	NE						○	○	○	○	○	○		○		○																								
Soft bellows	Nitrile rubber	N							○	○	○	○	○																												
	HNBR	HN							○	○	○	○	○																												
	Silicone rubber	S							○	○	○	○	○																												
	Urethane rubber	U							○	○	○	○	○																												
	EPDM	EP							○	○	○	○	○																												
Conductive NBR (low resistance)	NE							○	○	○	○	○																													
	Oilproof Nitrile rubber	NH								○		○		○		○	○																								
	Silicone rubber	S								○		○		○		○	○																								
	Urethane rubber	U								○		○		○		○	○																								
	Fluoro rubber	F								○		○		○		○	○																								
Conductive NBR (low resistance)	NE								○		○		○		○	○																									
	Nitrile rubber	N							○	○	○	○																													
	Silicone rubber	S							○	○	○	○																													
	Urethane rubber	U							○	○	○	○																													
	Fluoro rubber	F							○	○	○	○																													
Fluorosilicone rubber	FS								○	○	○	○																													
	Conductive NBR (low resistance)	NE							○	○	○	○																													
	Nitrile rubber	N								○	○	○	○	○	○																										
	Conductive Silicone rubber	SE								○	○	○	○	○	○																										
	Silicone rubber	S								○	○	○	○	○	○																										
Urethane rubber	U									○	○	○	○	○	○																										
	Fluoro rubber	F								○	○	○	○	○	○																										
	Conductive NBR (low resistance)	NE								○	○	○	○	○	○																										
	PEEK	K								○		○		○																											
	POM	M								○		○		○																											
Mark-free	Conductive PEEK	KE								○		○		○																											

Vacuum Pad

Characteristics list of each pad

Pad material or resin material	Code	Pad color	Application	Physical properties																			
				Surface hardness by pad type (Shore A)									Highest operating temp.	Lowest operating temp.	Weatherability	Ozone-proof	Acid-resistance	Alkaline-resistance	Oil resistance		Self-lubricity	Abrasion-resistance	Surface resistivity
				Standard	Bellows	Multi-bellows	Oval	Soft	Soft bellows	Skidproof	Ultrathin	Flat							Gasoline /Light oil	Benzene /Toluene			
Nitrile rubber	N	Black	•Cardboard •plywood •Metal plate	50°~80°	50°	50°	40°~50°	40°	40°	50°	40°	60°	110°C	-30°C	△	×	△	○	◎	△	-	-	-
NBR suited for JPN food sanitation act.	G	Gray	•Food-related •Other general work	60°~70°	-	50°	-	-	-	-	-	-											
HNBR	HN	Black	•Cardboard •plywood •Metal plate •Food-related •Other general work •For use under a low ozone concentration environment	50°~70°	50°	50°	-	-	50°	-	-	-	140°C	-30°C	○	○	△	○	◎	×	-	-	-
Silicone rubber	S	Translucent	•Semiconductor •Molded parts eject	50°	50°	50°	40°~50°	40°	40°	50°	40°	40°	180°C	-40°C	◎	◎	○	◎	△	△	-	-	-
Conductive Silicone rubber	SE	Black	•Thin work •Food-related	60°	60°	-	50°~60°	60°	-	-	-	40°											10 ⁴ ~10 ⁶ Ω
Urethane rubber	U	Blue	•Cardboard •plywood •Metal plate	55°~70°	55°	55°	55°	-	55°	55°	55°	50°	60°C	-20°C	○	◎	×	×	◎	△	-	-	-
Fluoro rubber	F	Gray	•Chemical environment •High temp. work	60°~70°	60°	50°	50°	-	-	60°	50°	50°	230°C	-10°C	○	◎	◎	×	◎	◎	-	-	-
Fluorosilicone rubber	FS	Salmon	•Molded parts eject	-	-	-	-	40°	-	-	40°	-	180°C	-50°C	○	◎	○	◎	△	△	-	-	-
EPDM	EP	Black	•Application that requires light resistance or ozone proof •For use in a moisture containing atmosphere	50°~70°	50°	50°	-	-	50°	-	-	-	150°C	-40°C	◎	◎	◎	◎	×	×	-	-	-
Conductive Butadiene rubber (low resistance)	E	Black	•General parts of semiconductor	70°	-	-	70°	-	-	-	-	-	100°C	-50°C	○	×	△	○	×	×	-	-	200Ω or less
Conductive NBR (low resistance)	NE	Black	•Semiconductors	60°~70°	60°	60°	70°	50°	60°	60°	60°	60°	110°C	-30°C	△	×	△	○	◎	△	-	-	200Ω or less
Chloroprene rubber (sponge type)	-	Black	•Work-piece with rough surface	-	-	-	-	-	-	-	-	-	80°C	-45°C	○	○	△	◎	×	△	-	-	-
Silicone sponge rubber	S	Salmon	•Work-piece with rough surface •Food-related	-	-	-	-	-	-	-	-	-	180°C	-40°C	◎	◎	○	◎	△	△	-	-	-
PEEK	K	Translucent	•Semiconductor •Manufacturing machine for liquid crystal	-	-	-	-	-	-	-	-	-	250°C	-50°C	◎	-	◎	◎	-	-	○	◎	-
POM	M	White	•General production line •Food-related machine •Packaging machine	-	-	-	-	-	-	-	-	-	95°C	-60°C	×	-	×	△	-	-	◎	◎	-
Conductive PEEK	KE	Black	•Semiconductor, Manufacturing machine for liquid crystal •Electronic component	-	-	-	-	-	-	-	-	-	250°C	-50°C	◎	-	◎	◎	-	-	○	◎	10 ⁷ Ω or less









Legend

- ◎: Best
- : Suitable
- △: Good
- ×: NG
- : No data

Vacuum Pad

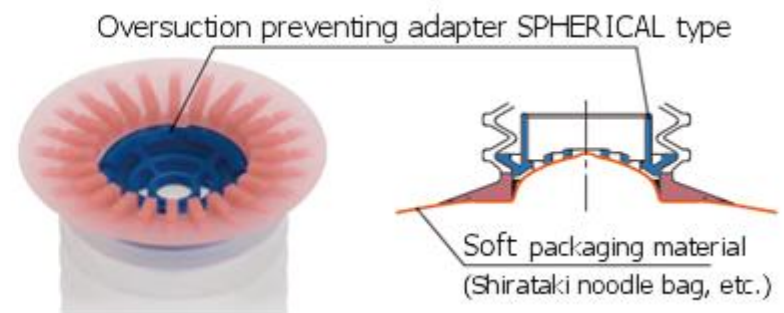
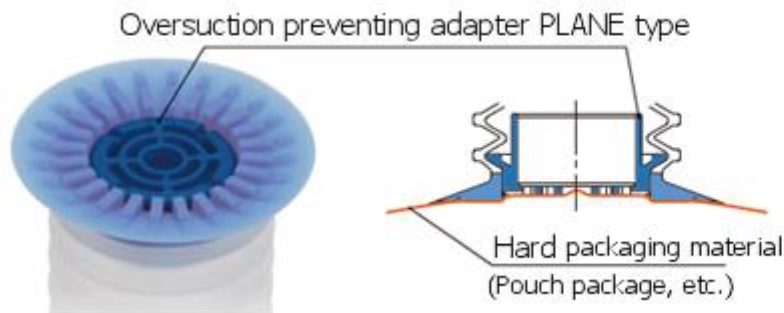
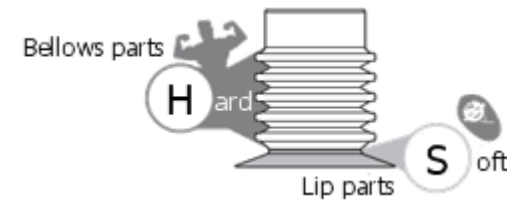
Combination list of pad and pad holder

	VPA	VPB	VPC	VPD	VPE	VPF	VPAE	VPBE	VPHC	VPHD	VPHDW	VPHE	VPHEW
Pad type	Fixed type		Spring type		Direct mount type		Standard type		Screwed type		Spring type		Direct mount fixed type
	Top port	Side port	Top port	Side port	Fixed type	Spring type	Top port	Side port	Top port	Side port	Top port	Side port	Dual side port
	Joint type: Push-in fitting, Barb fitting				M3x0.5, M5x0.8	M10x1, M14x1					Joint type: Push-in fitting, Barb fitting		
													
Standard	○	○	○	○	○	○	-	-	-	-	-	-	-
Sponge	○	○	○	○	-	-	-	-	-	-	-	-	-
Bellows	○	○	○	○	-	○	-	-	-	-	-	-	-
Multi-bellows	○	○	○	○	-	○	-	-	-	-	-	-	-
Oval	○	○	○	○	-	○	○	○	-	-	-	-	-
Soft	○	○	○	○	-	○	-	-	○	○	○	○	○
Soft bellows	○	○	○	○	-	○	-	-	○	○	○	○	○
Skidproof	○	○	○	○	-	○	-	-	-	-	-	-	-
Ultrathin	○	○	○	○	○	○	-	-	-	-	-	-	-
Flat	○	○	○	○	-	○	-	-	-	-	-	-	-
Mark-free	○	○	○	○	-	○	-	-	-	-	-	-	-
Holder -S3	○	○	○	○	○	○	○	○	○	○	○	○	○

	VPMA	VPMB	VPMC	VPMD	VPME	VPC	VPC-C	VPD	VPD-C
Pad type	Fixed type		Spring type		Direct mount type	Long stroke type			
	Top port	Side port	Top port	Side port	Fixed type	Spring type			
	Joint type: Push-in fitting, Barb fitting				M3x0.5, M5x0.8	Joint type: Push-in fitting, Barb fitting			
									
Standard	○	○	○	○	○	○	○	○	○
Sponge	○	○	○	○	-	○	○	○	○
Bellows	○	○	○	○	-	○	○	○	○
Multi-bellows	○	○	○	○	-	-	-	-	-
Oval	○	○	○	○	-	○	○	○	○
Soft	○	○	○	○	-	○	○	○	○
Soft bellows	○	○	○	○	-	-	-	-	-
Skidproof	○	○	○	○	-	○	○	○	○
Ultrathin	○	○	○	○	○	-	-	-	-
Flat	○	○	○	○	-	○	○	○	○
Mark-free	○	○	○	○	-	○	○	○	○
Holder -S3	○	○	○	○	○	-	-	-	-

Vacuum Pad (For Packaging Bag)

- Vacuum pad suitable for conveying a bag-like article.
- Soft material is used for lip part and hard material is used for bellows part to realize **followability** to work-piece and **posture stabilization** during conveyance.
- Two selections of rubber hardness for lip part. (Silicone base)
 - Pink: Hardness 20° For deformable packaging bag.
 - Blue: Hardness 40° For packaging bag which is made of thick vinyl or sheet.
- Two selections of oversuction preventing adapter.
 - Plane type (hard packaging material)
 - Spherical type (soft packaging material)
- **Food safe, FDA complied materials** are used for work-piece attachment part (Pad rubber and adapter).



Vacuum Pad (for packaging bag)

- Two types of holder can be used in common for all pad sizes.
VPA, VPE (Metric thread, Parallel pipe thread)

- Safety factor

Please note that the safety factor is determined 3 to 4 times higher than the standard type.

Standard pad

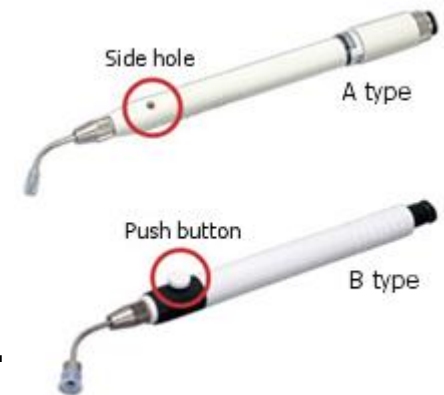
Horizontal lifting: $\frac{1}{4}$, Vertical lifting: $\frac{1}{8}$

Pad for packaging bag

Horizontal lifting: $\frac{1}{16}$, Vertical lifting: $\frac{1}{25}$

Air Pincette

- Suction conveyance of small work-piece.
Air Pincette is suitable for applications
 - grabbing a small work-piece speedily and accurately.
 - taking time if it is done manually.
 - handling fragile work-piece which can be broken with fingertips or tweezers.
- Two types of holder type are available: A type or B type.
 - A type: Without valve
Cover the side hole when using.
Vacuum is generated at the same time as air is applied.
 - B type: With valve
Vacuum is not generated unless a push button is pressed because of an incorporated valve.
- Attachable pad size and material
Standard type: ø1mm, ø2mm, ø4mm, ø6mm, ø8mm
Material: Nitril rubber, Silicone rubber, Conductive Butadiene rubber



Air Pincette

- About cost

A type: Since there is no ON/OFF function by a valve, air keeps flowing when the air is supplied. Therefore, the air consumption of compressor will increase.
Product price is lower than B type.

B type: Because of the structure that generates vacuum only when necessary by a valve, air consumption of compressor is smaller.
Product price is higher than A type.

When using under the same conditions,

Initial cost (Product price)

(Lower) A type < B type (Higher)

Running cost (Electricity cost of compressor etc.)

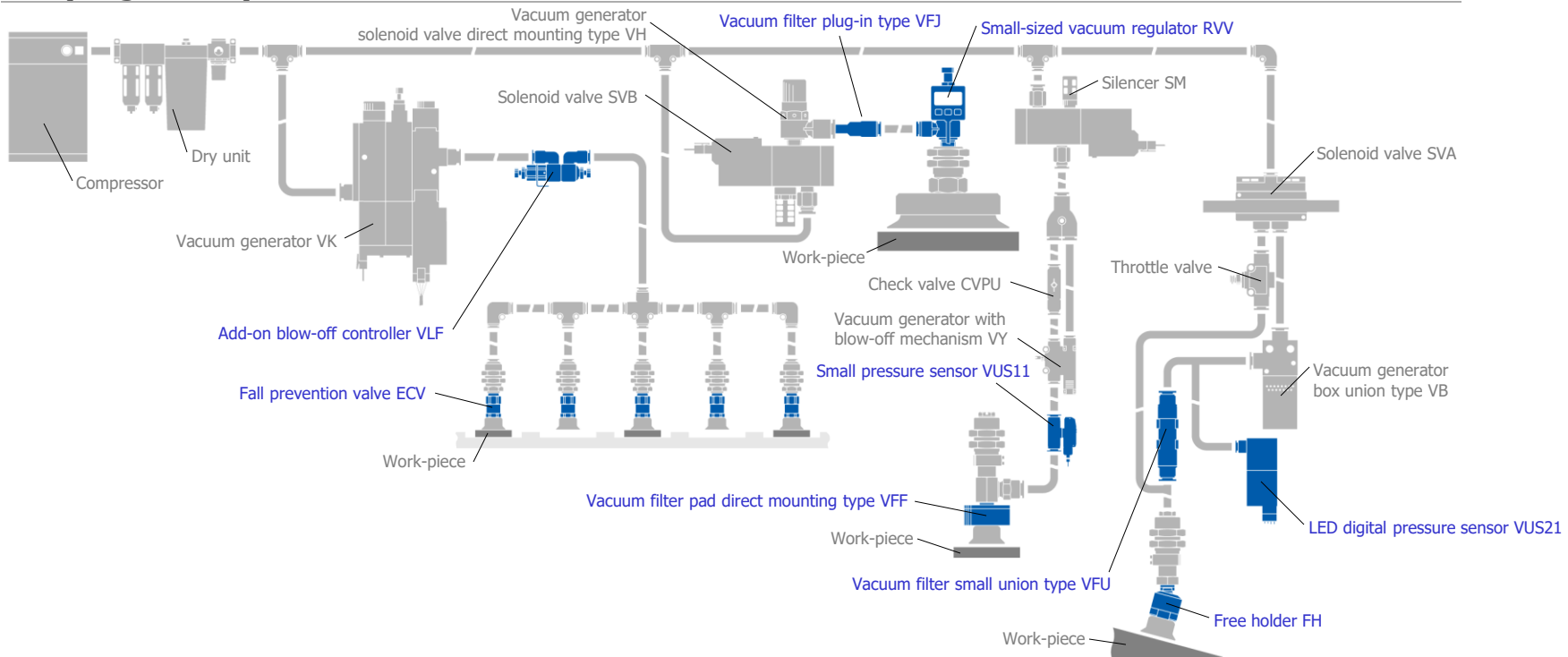
(Lower) B type < A type (Higher)

- About conveyance of work-piece

Conveying small processed parts, etc. is the major application, but recently it is also used for **conveying and sorting seeds of plants**.



■ Piping Example



Vacuum Filter

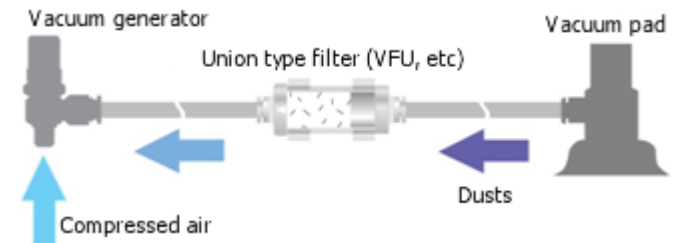
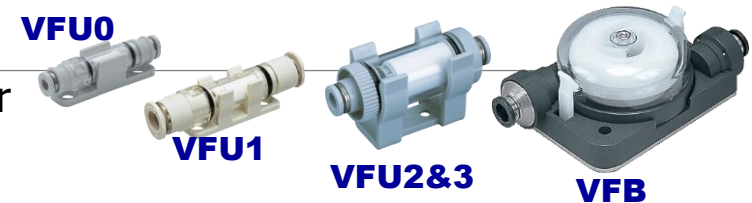
Union type (VFU, VFB)

- Place a vacuum filter between vacuum generator and vacuum pad in order to filter out dusts and prevent damage to vacuum generator.

Model code	Filter area (cm ²)	Copper alloy free product is available*
VFU0-□	1.4	-
VFU1-□-15P	2.8	○
VFU1-□-25P	4.7	○
VFU2-□P	7.5	○
VFU3-□P	12.5	○
VFB20-□-□	20	-

*Product that is marked with ○ in the column of "copper alloy free product is available" correspond to industries requiring "copper alloy free" and "low concentration ozone measures."

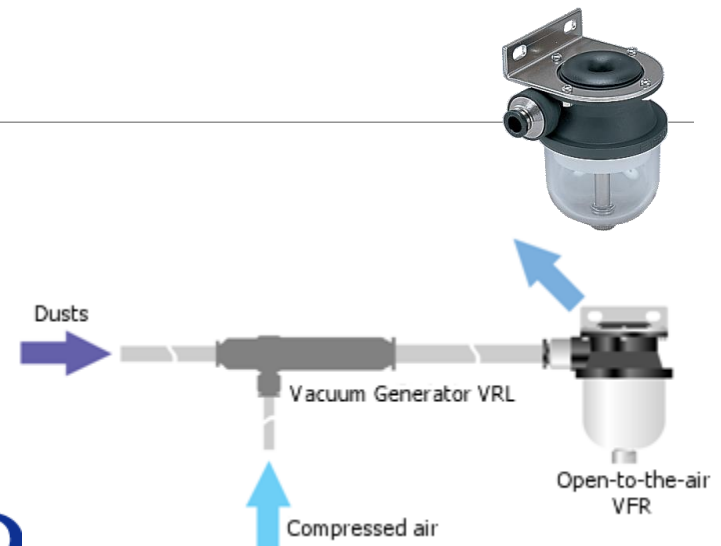
Adapted copper alloy free for metal material and HNBR for seal rubber material.



Open to air exhaust union type (VFR)

- Open to air exhaust type VFR is to be installed on the exhaust side of Vacuum generator VRL for conveying particle and powder.

Model code	Filter area (cm ²)
VFR20-□-□	20
VFR20-□	

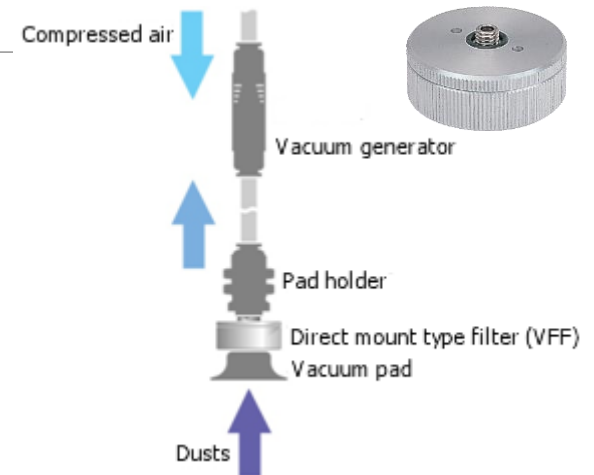


Vacuum Filter

Pad direct mounting type (VFF)

- Dusts at the time of sucking a work-piece are removed by installing Pad direct mounting type between pad and pad holder.

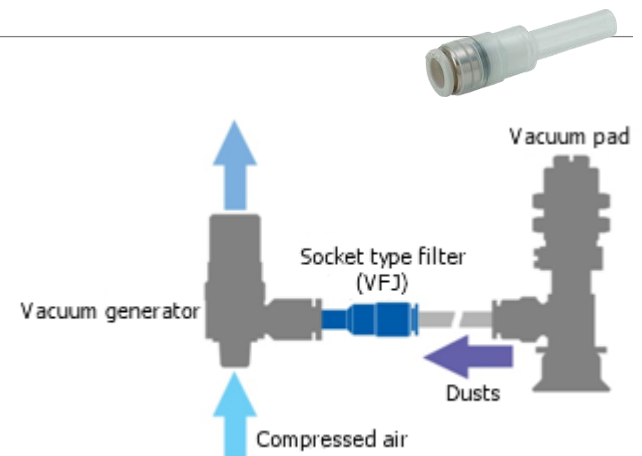
Model code	Filter area (cm ²)
VFF15-□	1.7
VFF30-□	7



Vacuum generator direct mounting type (VFJ)

- Dusts are removed by inserting directly to Vacuum generator without built-in filter. (Element cannot be replaced.)

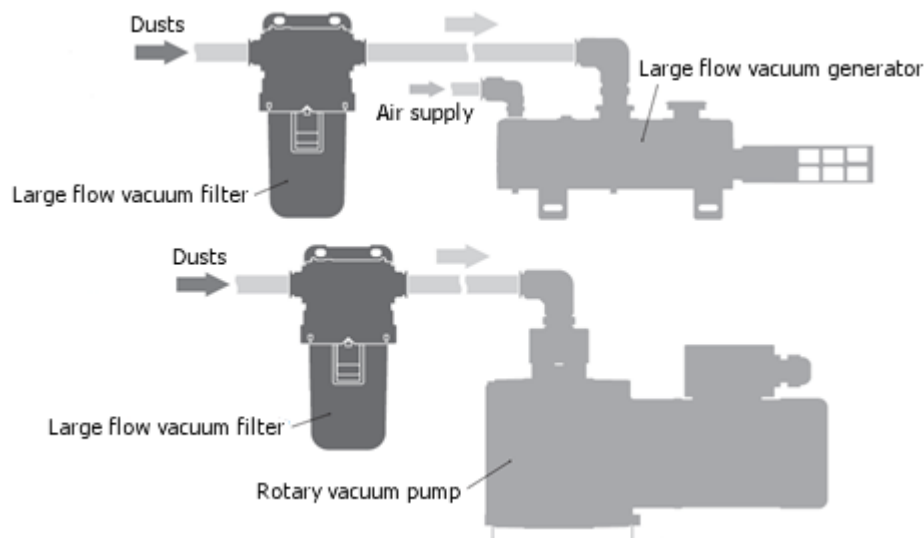
Model code	Filter area (cm ²)
VFJ33M	0.8
VFJ44	
VFJ66	1.1
VFJ1/8-1/8M	0.8



Vacuum Filter

Large flow vacuum filter (VFL)

- Vacuum filter for large flow rate (Max. flow rate: 360ℓ/min)
Place a vacuum filter between vacuum generator VVV, VLM, or rotary vacuum pump and vacuum pad in order to filter out dusts and prevent damage to vacuum generator.
- Four types of filtration accuracy can be selected according to applications.
(1μm, 5μm, 10μm, 200μm)
- Filter area: 64.4cm²





- Capacity ratio (Simple comparison by case capacity)

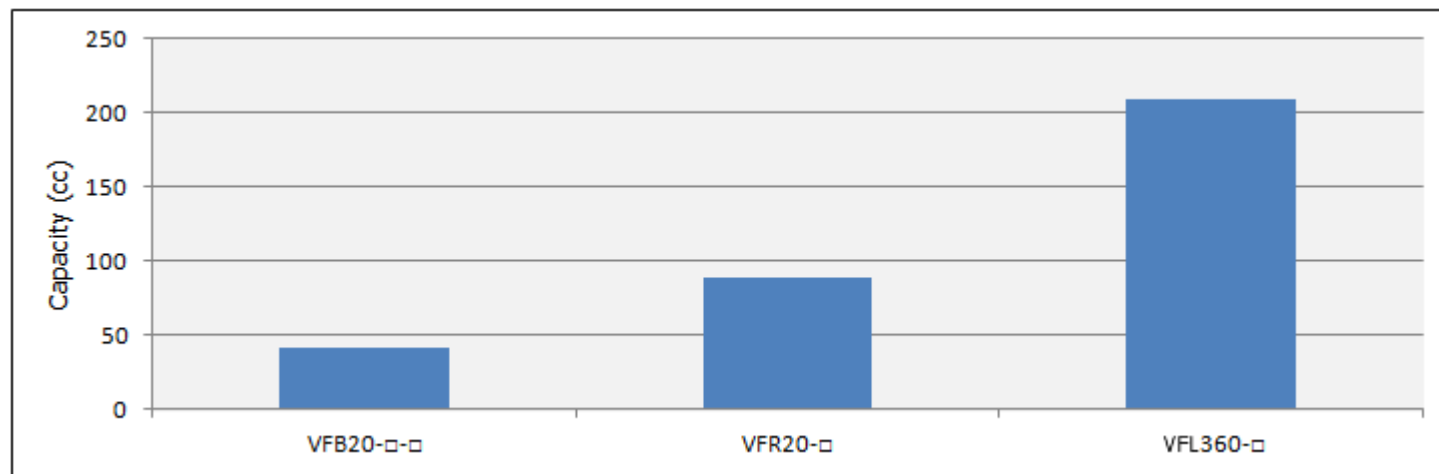
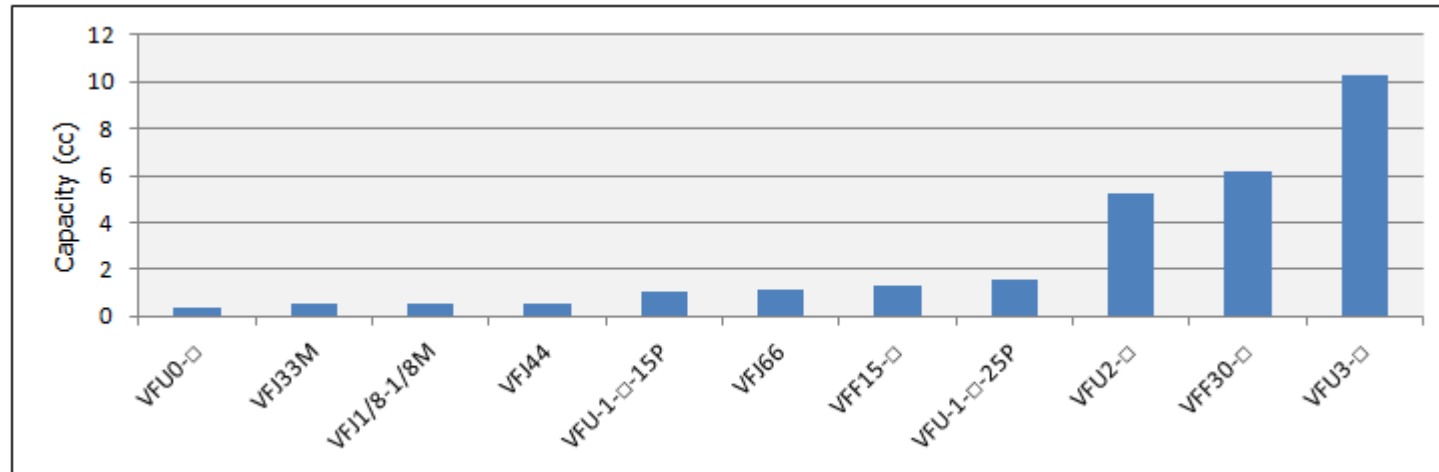
Larger capacity VFL > VFR > VFB > VFU3 > VFF30 ≐ VFU2
> VFU1-□-25P > VFF15 ≐ VFJ66 ≐ VFU1-□-15P
> VFJ44 ≐ VFJ33M ≐ VFJ1/8-1/8M > VFU0 Smaller capacity

The larger filter capacity (dust case size) is the less frequent maintenance is needed. (Depending also on the filtering accuracy)

As the capacity gets smaller, higher cycle of vacuum system can be realized.

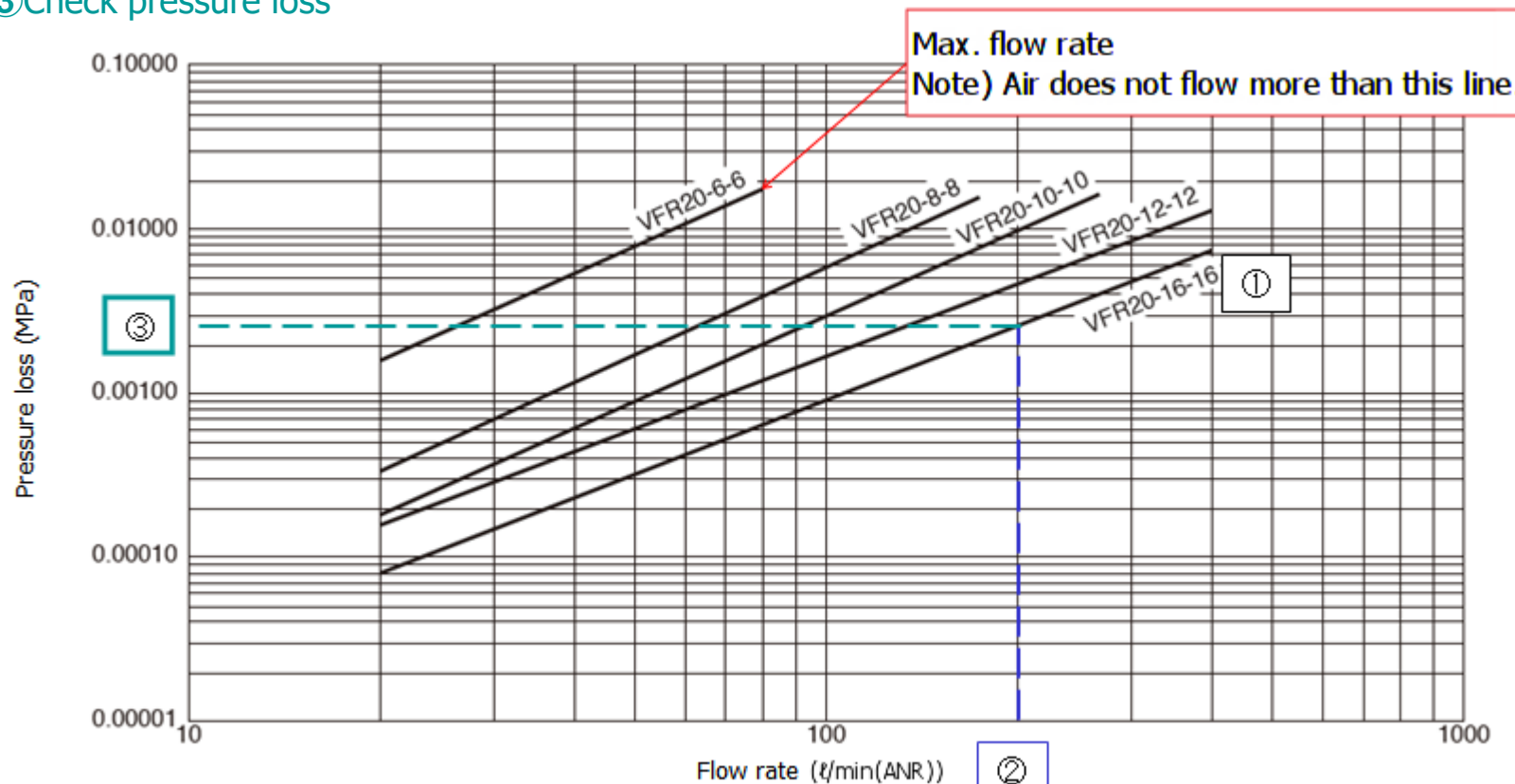
Vacuum Filter

- Capacity ratio (Simple comparison by case capacity)



- How to read a pressure loss chart (Ex. VFR)

- ① Select model
- ② Set target flow rate
- ③ Check pressure loss

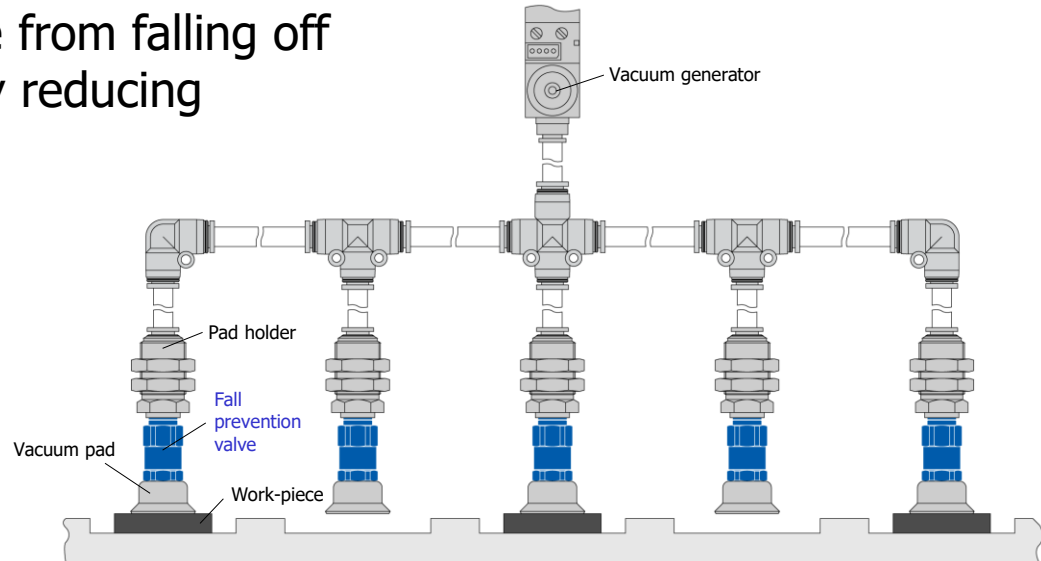


Fall Prevention Valve

- Minimize the pressure drop of other circuit when a work-piece falls down.
- Even if some vacuum pads are not operated, fall prevention valve can prevent the properly sucked work-piece from falling off the active vacuum pads, by reducing the vacuum drop.

Specifications

Fluid medium	Air
Operating pressure range	Positive pressure: 0~0.7MPa Negative pressure: 0~-100kPa
Min. working suction flow	M3-M3: 2ℓ/min(ANR) M4-M4, M5-M5: 5ℓ/min(ANR) M6-M6, 01-01: 13ℓ/min(ANR)
Operating temp. range	0~60°C



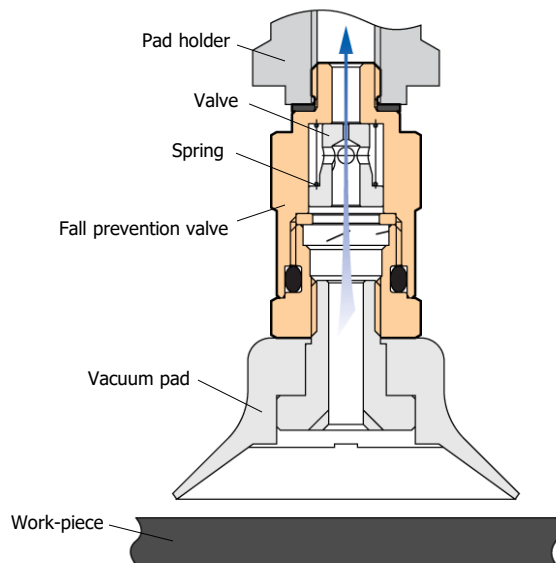
※For mechanism, please see the next page.

Fall Prevention Valve

■ Mechanism

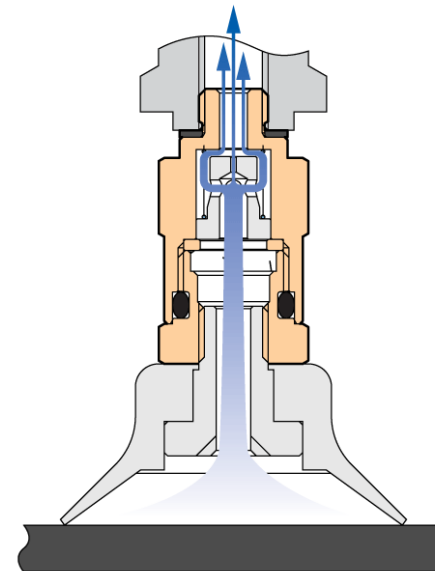
Fall Prevention

When a work-piece is apart from vacuum pad, the valve is pushed up and shuts a suction passage. Small amount of air is sucked through a small hole at the center of valve during operation.



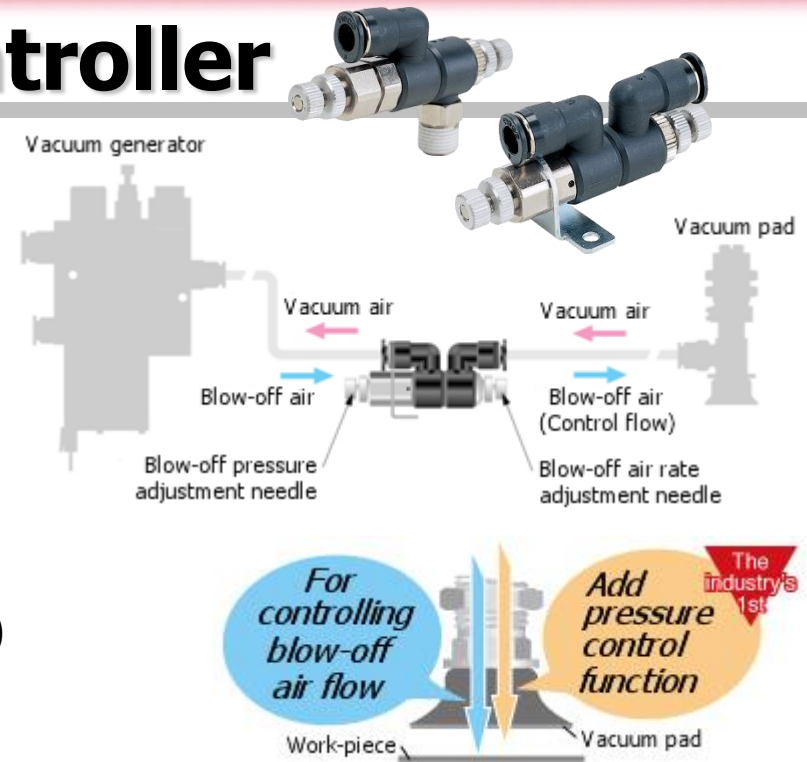
Suction State

When a work-piece adheres to vacuum pad, the valve is pushed down by a spring force due to a suction flow drop. The suction passage between the valve and the body part is open.



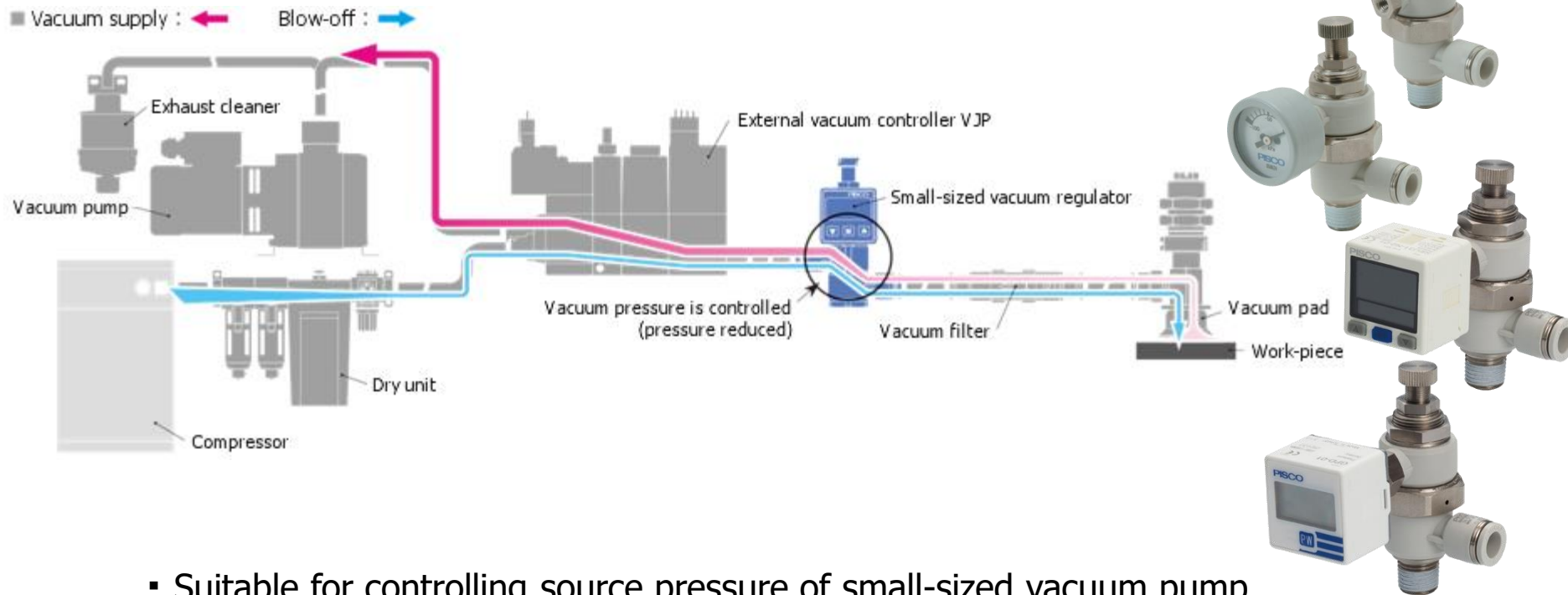
Add-on Blow-off Controller

- Controls blow-off air while maintaining vacuum characteristics of vacuum generators.
- Newly added pressure control function to conventional flow control function of blow-off air prevents lightweight (small) work-pieces from being blown away.
- Relief function (function that releases unnecessary pressure) built in blow-off circuit shortens blow-off response time.
- Rotatable body and fitting realize easy tube insertion/disconnection from any direction.



Small-sized Vacuum Regulator

- Both source pressure and terminal pressure can be controlled.



- Suitable for controlling source pressure of small-sized vacuum pump.

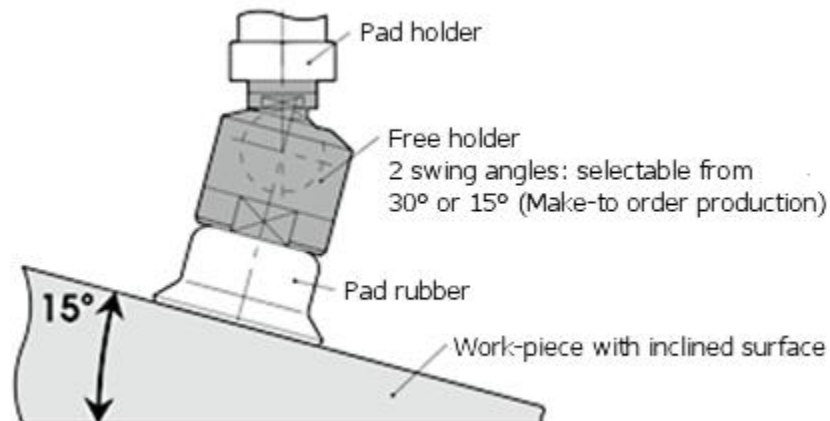
Small-sized Vacuum Regulator

- Install the regulator between vacuum valve and vacuum pad in order to control pressure level of individual pad.
- Male thread type (B) is directly connected to pad holder (pad dia: $\varnothing 150$, $\varnothing 200$ mm) and can control the pressure.
- Regulator with digital pressure gauge and with LCD Dual-display digital pressure sensor are newly added.



Free Holder

- Suitable for sucking work-pieces with non-vertical position or with unfixed angle.

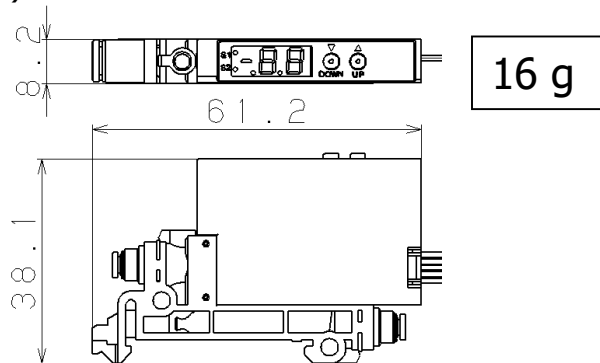


Pressure Sensor

8mm width LED Digital Pressure sensor

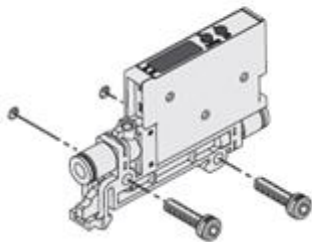
- Super slim and lightweight pressure sensor with a LED display.

Ex.) VUS8A-180180

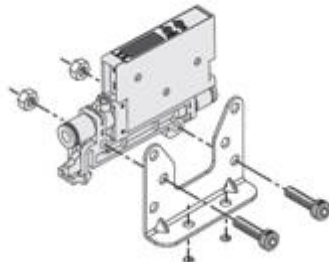


- All settings are done by two push buttons.
- Indication magnification is **fixed (kPa)**.
- Energy saving type** that is capable of reducing the amount of air consumption is available.
- Copy function**
- Three mounting options are available.

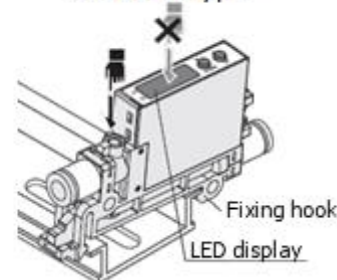
■ Screw fixing type



■ Bracket mounting type



■ DIN rail type



- Three port types are available: Female thread type (M5), Push-in fitting type ($\varnothing 1.8$, $\varnothing 3$, $\varnothing 4$ mm), and Stem type ($\varnothing 4$, $\varnothing 6$ mm).

- Two types of port lead-out are selectable.

■ Single side port



■ In-line port

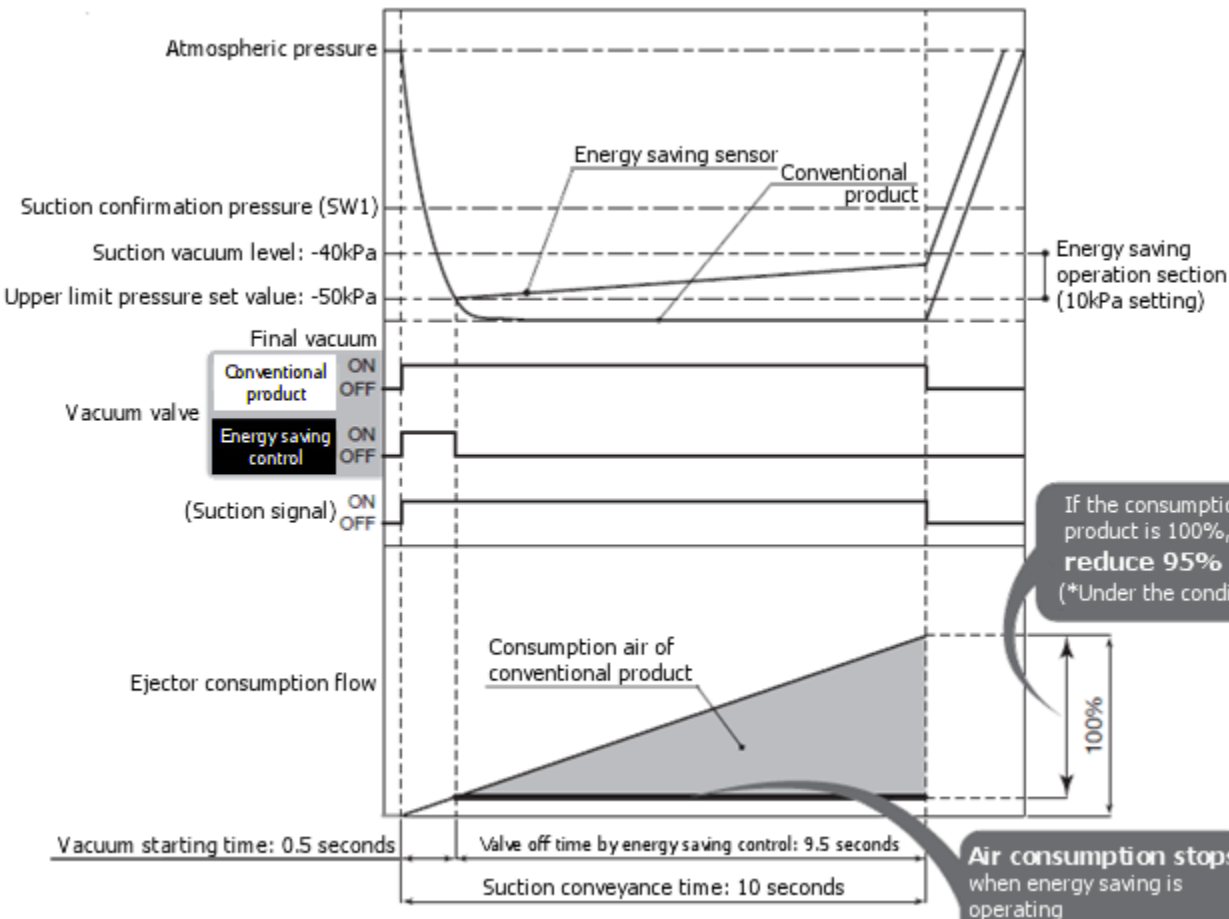




Pressure Sensor

- Data copy function
Setting value of a sensor (switch setting and display setting) can be copied to other sensors. (Max. 10 slave sensors.)

Pressure Sensor



- Energy saving type
When pressure level is reached the setting pressure, suction value turns OFF, and when vacuum level falls below the setting pressure, suction valve turns ON again, so that the consumption air can be reduced.

- Auto pre-set function
The sensor recognizes the maximum reach pressure and minimum reach pressure while operating suction and exhaust repeatedly, calculates the value of P1, P2, H1 and H2, and sets the value automatically.

Pressure Sensor

Small Pressure Sensor

- Pressure sensor that sensor head and indicator are separated.



- Sensor Head

- Using Analog output sensor head and the indicator (SED31) realizes separate display.
(Please note that SED31 cannot be used with switch output sensor head.)
- Three types of pressure range "positive pressure, negative pressure and compound pressure," and two types of output specifications "switch output and analog output" are available for each pressure range. (Totally 6 types)
- Sensor head for the industries requiring "copper alloy free in airflow path" and "low concentration ozone measures specifications" is available.

- Indicator (□30mm)

- Mounted easily visible 3-color LCD dual display.
- Connector cable enables easy attachment/detachment of cable to the display unit.



Large Digital Pressure Sensor

- Mounted easily visible 3-color LCD dual display.
- Compound pressure type can handle negative/positive pressure.
- One point setting mode and Window comparator mode can be set freely.
- Indication color for ON/OFF of the switch can be changed.



LED Digital Pressure Sensor

- Improved visibility by pressure sensor with LED display.
- Two types of pressure sensor are available: 2 switch outputs and analog output.





Revision History

2017/09 Rev.1

Words revision Vacuum switch → Pressure sensor etc.

Model addition VVV, VIP, VLM, VFL, Vacuum pad (Flat, For packaging bag)

Model revision 8mm pressure sensor

Table revision Vacuum characteristics table

PISCO: Clarification of flow rate for each port size

Other brand: Removed discontinue models

Vacuum pad in general (Model and size addition)