

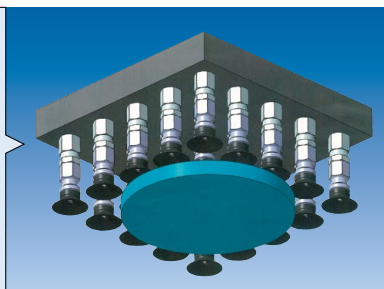
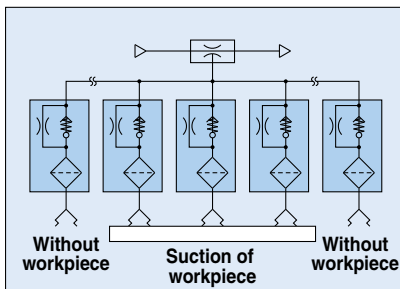
# Vacuum Saving Valve

New

## ● Can restrict the reduction of vacuum pressure even when there is no workpiece.

When multiple vacuum pads are operated by one vacuum generator, and some of them are not holding the workpiece, the reduction of vacuum pressure is restricted and the workpiece can remain held by the rest of pads.

**With One-touch fitting type available!**



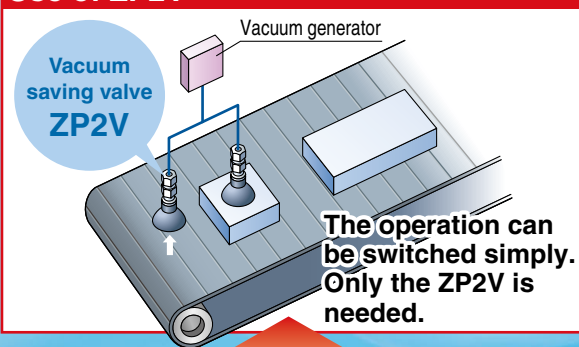
		Pad side		
		Male thread	Female thread	With One-touch fitting
Vacuum generator side	Male thread	★	●	
	Female thread	●	★	
	With One-touch fitting	★	★	★

★ New variations

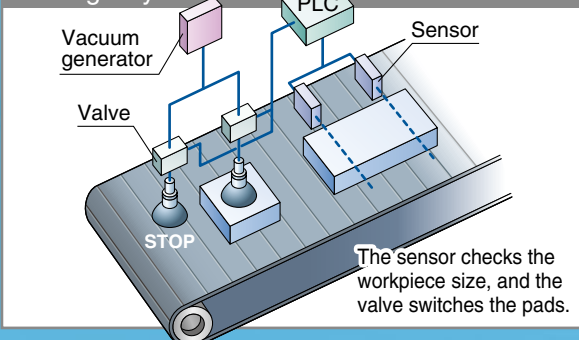
## ● No need for switching operation when changing workpieces

When the work pieces have different shapes, the control circuit can be simplified.

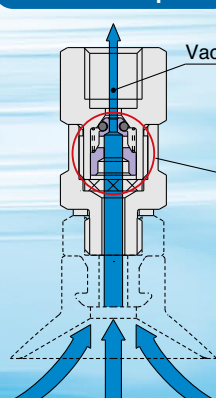
### Use of ZP2V



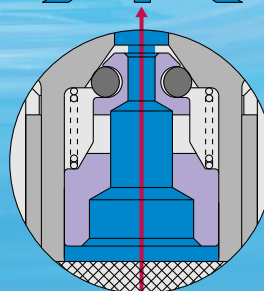
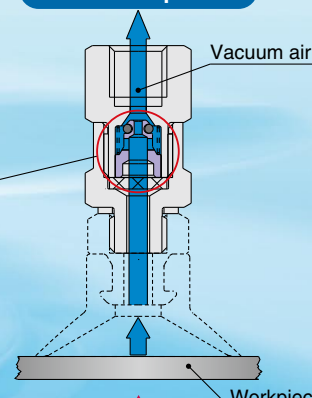
### Existing way



### Without workpiece

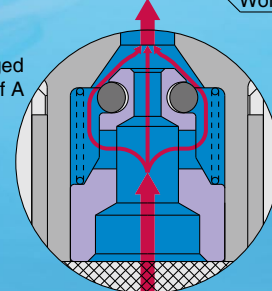


### With workpiece



### Valve closed

The valve is closed by the flow of vacuum air.



### Valve open

The suction flow reduces, and the valve is open by the spring force.

Series **ZP2V**



CAT.ES100-81B <sup>Ⓐ</sup>

# Series ZP2V Model Selection

Calculate the number of vacuum saving valves that can be used with one vacuum generator.

## Selection Conditions

**Workpiece:** No leakage and several sizes  
**Required vacuum pressure:** -50 kPa or more of vacuum pressure per vacuum pad  
**Part number of vacuum saving valve used:** ZP2V-A8-05  
**(Connection thread size for pad side: M8, Fixed orifice size: ø0.5)**

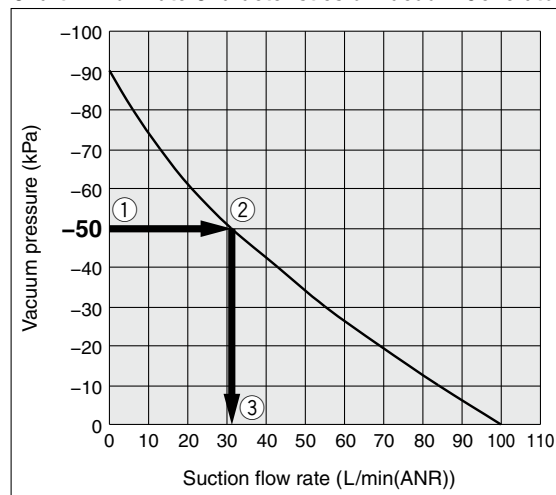
### 1 Check the flow-rate characteristics of the vacuum generator used.

From the flow-rate characteristics of the vacuum generator (**Chart 1**), calculate the **suction flow rate of the vacuum generator (Q1)** from the required vacuum pressure.

**Vacuum pressure – 50 kPa (① → ② → ③) =**

**Suction flow rate (Q1) ≈ 31 L/min (ANR).**

Chart 1. Flow-rate Characteristics of Vacuum Generator



### 2 Calculate the number of vacuum saving valves (N).

Find the **minimum operating flow rate (Q2)** and the **suction flow rate of the vacuum generator (Q1)** in the specifications on page 2, and calculate the **number of vacuum saving valves (N)** that can be used with one vacuum generator.

$$\text{Number of vacuum saving valves (N)} = \frac{\text{Suction flow rate of the vacuum generator (Q1)}}{\text{Minimum operating flow rate (Q2)}}$$

Example) Vacuum saving valve used: **ZP2V-A8-05**

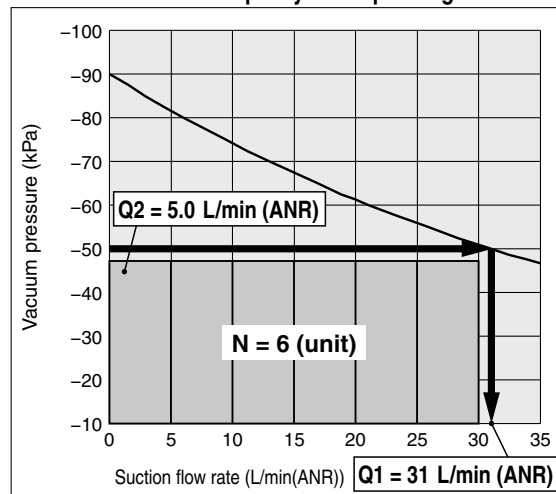
From **Table 1**, **Q2** can be calculated as **5.0 L/min (ANR)**.

$$N = \frac{31 \{ \text{L/min(ANR)} \}}{5 \{ \text{L/min(ANR)} \}} \approx 6 \text{ (unit)}$$

**Table 1. Relationship between Minimum Operating Flow Rate and Fixed Orifice Size**

Connection thread size for pad side	<b>M8</b>
Fixed orifice size (mm)	<b>0.5</b>
Minimum operating flow rate (L/min(ANR)) Q2	<b>5.0</b>

Chart 2. Selection Example by Min. Operating Flow Rate



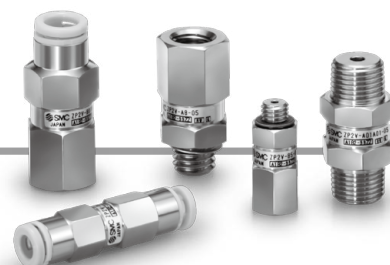
The above selection example is based on a general method under the given selection conditions, and may not always be applicable. For vacuum piping, select equipment and piping so that the "Minimum operating flow rate" in the specifications on page 2 is secured. A final decision on operating conditions should be made based on test results performed at the responsibility of the customer.

# Vacuum Saving Valve

## Series ZP2V



### How to Order

**ZP2V - A5 - 03**



Connection size (Pad side/Vacuum generator side) •



Male thread/Female thread

Symbol	Pad side	Vacuum generator side	Applicable fixed orifice size				Vacuum generator side Female thread 
	Male thread	Female thread	0.3	0.5	0.7	1.0	
<b>A5</b>	M5 x 0.8		○	○	○	—	Male thread Pad side 
<b>A8</b>	M8 x 1.25		—	○	○	○	
<b>A01</b>	R1/8	Rc1/8	—	○	○	○	
<b>AG1</b>	G1/8		—	○	○	○	
<b>AN1</b>	NPT1/8		—	○	○	○	



• Fixed orifice size

Symbol	Fixed orifice size (mm)
<b>03</b>	0.3
<b>05</b>	0.5
<b>07</b>	0.7
<b>10</b>	1.0



Female thread/Male thread

Symbol	Pad side	Vacuum generator side	Applicable fixed orifice size				Vacuum generator side Male thread 
	Female thread	Male thread	0.3	0.5	0.7	1.0	
<b>B5</b>	M5 x 0.8		○	○	○	—	Female thread Pad side 
<b>B6</b>	M6 x 1		○	○	○	—	
<b>B01</b>	Rc1/8	R1/8	—	○	○	○	
<b>BG1</b>	G1/8		—	○	○	○	
<b>BN1</b>	NPT1/8		—	○	○	○	



Male thread/One-touch fitting

Symbol	Pad side	Vacuum generator side	Applicable fixed orifice size				Vacuum generator side One-touch fitting 
	Male thread	One-touch fitting	0.3	0.5	0.7	1.0	
<b>A5W4</b>	M5 x 0.8	ø4	○	○	○	—	Male thread Pad side 
<b>A01W6</b>	R1/8	ø6	—	○	○	○	
<b>AG1W6</b>	G1/8	ø6	—	○	○	○	



Male thread/Male thread

Symbol	Pad side	Vacuum generator side	Applicable fixed orifice size				Vacuum generator side Male thread 
	Male thread	Male thread	0.3	0.5	0.7	1.0	
<b>A5A5</b>	M5 x 0.8		○	○	○	—	Male thread Pad side 
<b>A01A01</b>	R1/8		—	○	○	○	
<b>AG1AG1</b>	G1/8		—	○	○	○	



Female thread/One-touch fitting

Symbol	Pad side	Vacuum generator side	Applicable fixed orifice size				Vacuum generator side One-touch fitting 
	Female thread	One-touch fitting	0.3	0.5	0.7	1.0	
<b>B5W4</b>	M5 x 0.8	ø4	○	○	○	—	Female thread Pad side 
<b>B01W6</b>	Rc1/8	ø6	—	○	○	○	
<b>BG1W6</b>	G1/8	ø6	—	○	○	○	

Female thread/Female thread

Symbol	Pad side	Vacuum generator side	Applicable fixed orifice size				Vacuum generator side Female thread 
	Female thread	Female thread	0.3	0.5	0.7	1.0	
<b>B5B5</b>	M5 x 0.8		○	○	○	—	Female thread Pad side 
<b>B01B01</b>	Rc1/8		—	○	○	○	
<b>BG1BG1</b>	G1/8		—	○	○	○	

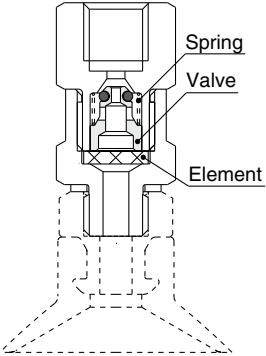
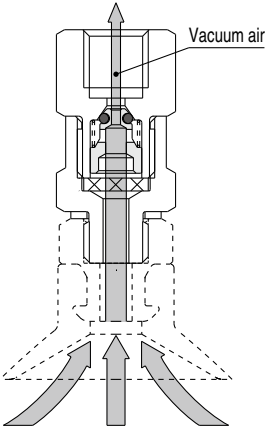
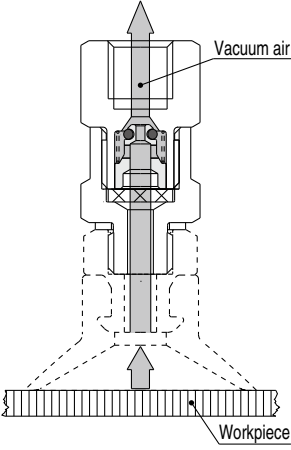
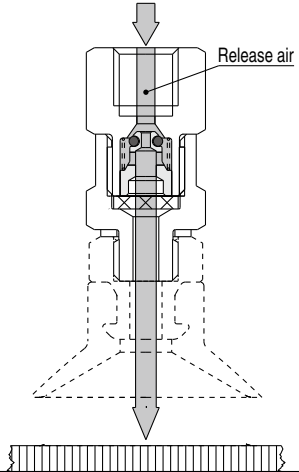
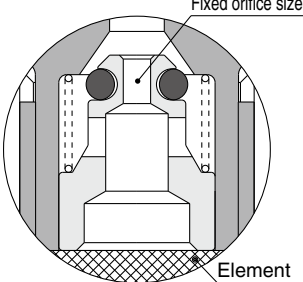
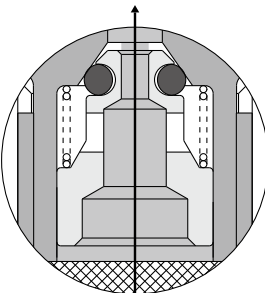
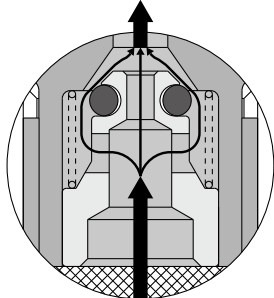
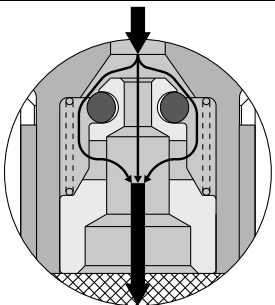
One-touch fitting/One-touch fitting

Symbol	Pad side	Vacuum generator side	Applicable fixed orifice size				Vacuum generator side One-touch fitting 
	One-touch fitting	One-touch fitting	0.3	0.5	0.7	1.0	
<b>W4</b>	ø4		○	○	○	—	One-touch fitting Pad side 
<b>W6</b>	ø6		—	○	○	○	

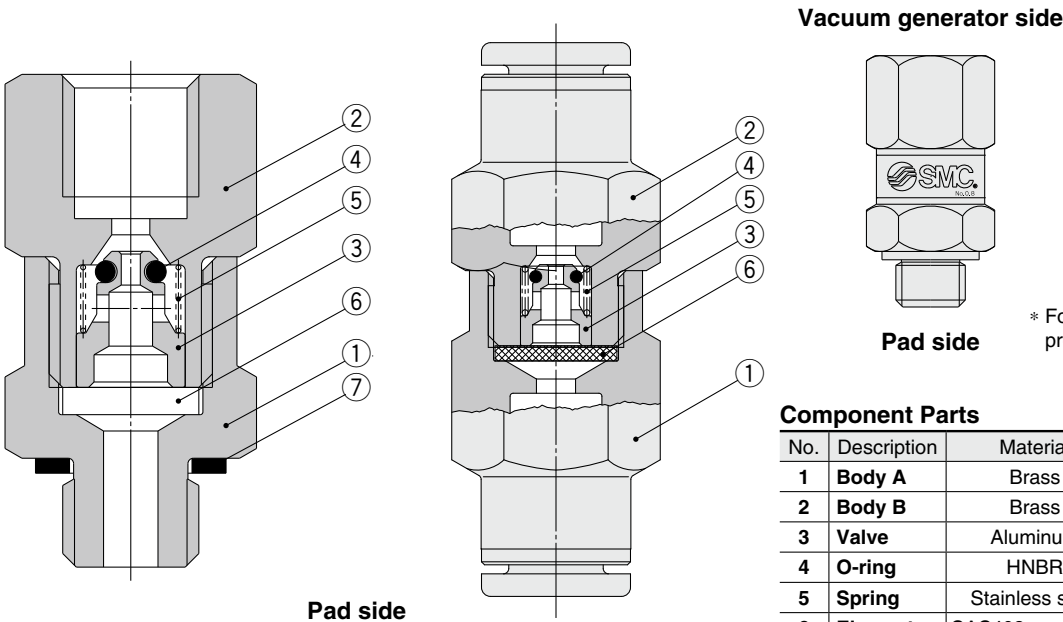
## Specifications

Connection size for pad side		M5, M6, ø4			M8, R1/8, Rc1/8, G1/8, NPT1/8, ø6		
Fixed orifice size (mm)		0.3	0.5	0.7	0.5	0.7	1.0
Effective area	When the valve is operating (mm <sup>2</sup> )	0.07	0.19	0.38	0.19	0.38	0.78
	When the valve is not operating (mm <sup>2</sup> )	1.64	1.76	1.95	1.76	2.64	3.04
Fluid		Air					
Max. operating pressure range (MPa)		0 to 0.7					
Max. operating vacuum pressure range (kPa)		0 to -100					
Ambient and fluid temperature (°C)		5 to 60 (No freezing)					
Element nominal filtration rating (μm)		40					
Min. operating flow rate (L/min (ANR))		3	5	8	5	8	16

**Working Principle**

	Initial condition	When a workpiece is sucked		When a workpiece is released
		Without workpiece	With workpiece	
Air flow				
Valve operating condition	 <p>Since there is no air flow, the valve remains open by the spring force.</p>	 <p><b>Valve closed</b> When the workpiece is separated from the vacuum pad, the valve is closed by the air flow, and the suction air can only flow through the fixed orifice. At this time, an amount of air corresponding to the fixed orifice size is sucked.</p>	 <p><b>Valve open</b> When the workpiece is sucked by the vacuum pad, the suction flow reduces, and the valve is open by the spring force, which opens the path between the valve and the body for suction.</p>	 <p><b>Valve open</b> When the workpiece is released, the valve is open by the vacuum release air, and the path between the valve and the body will open.</p>

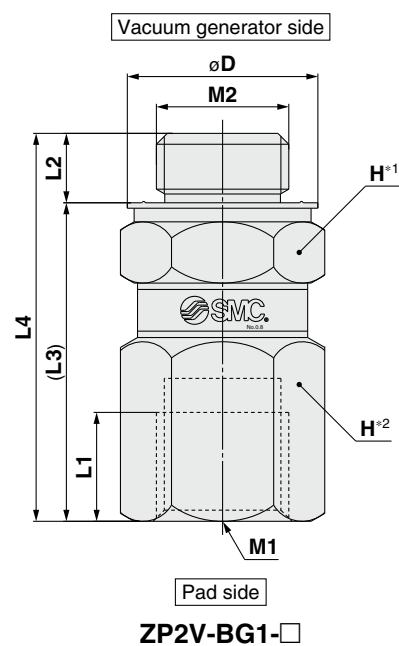
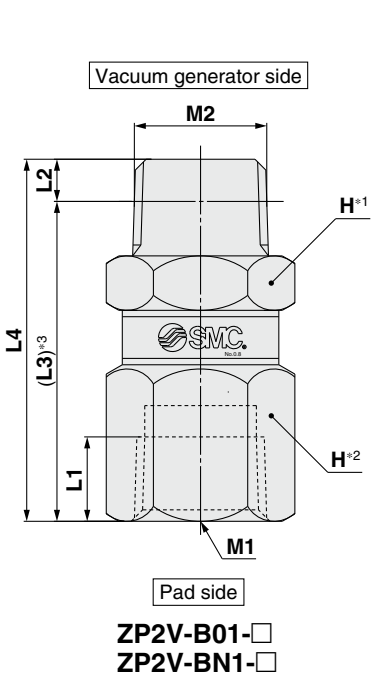
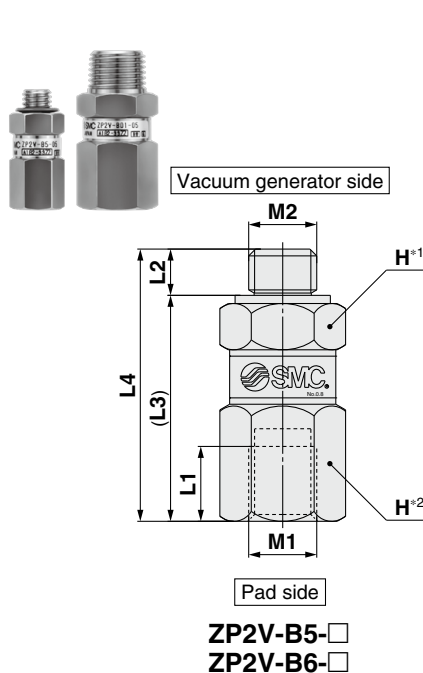
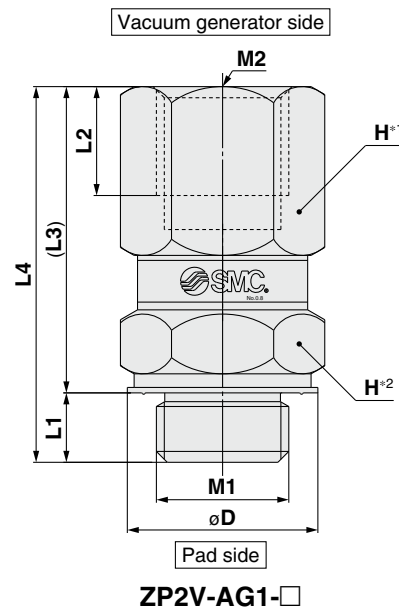
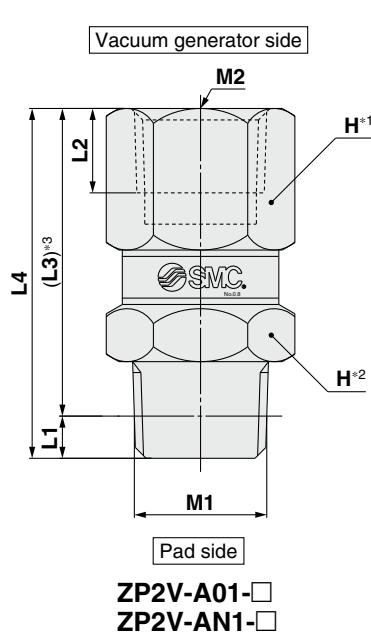
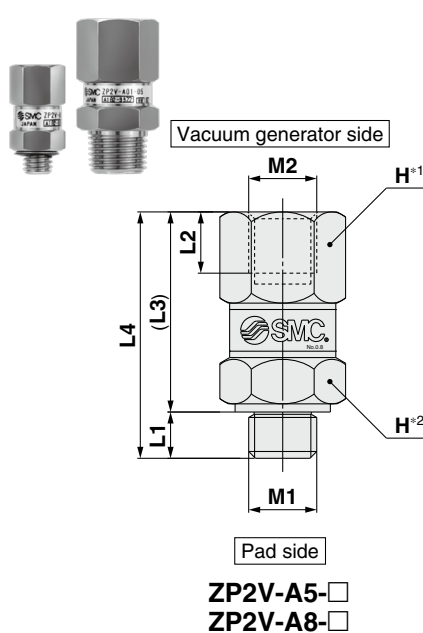
**Construction**



\* For the mounting direction of the product, refer to page 8.

Component Parts			
No.	Description	Material	Surface treatment
1	Body A	Brass	Electroless nickel plating
2	Body B	Brass	Electroless nickel plating
3	Valve	Aluminum	—
4	O-ring	HNBR	—
5	Spring	Stainless steel	—
6	Element	CAC403 equivalent	—
7	Gasket	NBR + Stainless steel	—

## Dimensions



\*1 The place at the vacuum generator side where the tool is applied.

\*2 The place at the pad side where the tool is applied.

\*3 The referential dimension after the R or NPT thread is screwed.

(mm)

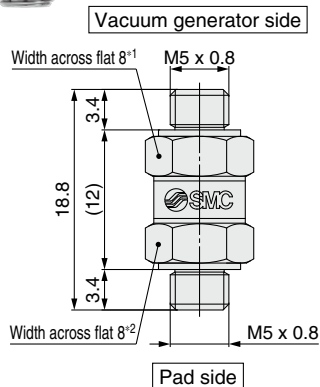
Model	M1	M2	L1	L2	L3	L4	H (Width across flat)	øD	W (g)	Tightening torque (N·m) Note
<b>ZP2V-A5-□</b>	M5 x 0.8	M5 x 0.8	3.4	4.5	14.7	18.1	8	—	6	1.0 to 1.5
<b>ZP2V-A8-□</b>	M8 x 1.25	M8 x 1.25	5.9	8	20.1	26	12	—	18	5.5 to 6.0
<b>ZP2V-A01-□</b>	R1/8	Rc1/8	3.1	6.2	22.6	25.7	12	—	18	7.0 to 9.0
<b>ZP2V-AG1-□</b>	G1/8	G1/8	5.1	8	22.5	27.6	13	14	23	5.5 to 6.0
<b>ZP2V-AN1-□</b>	NPT1/8	NPT1/8	3.2	6.9	23.3	26.5	12	—	19	7.0 to 9.0
<b>ZP2V-B5-□</b>	M5 x 0.8	M5 x 0.8	5.5	3.4	16.6	20	8	—	7	1.0 to 1.5
<b>ZP2V-B6-□</b>	M6 x 1	M6 x 1	5	4.5	16.2	20.7	8	—	7	2.0 to 2.5
<b>ZP2V-B01-□</b>	Rc1/8	R1/8	6.2	3.1	23.5	26.6	12	—	19	7.0 to 9.0
<b>ZP2V-BG1-□</b>	G1/8	G1/8	8	5.1	23.4	28.5	13	14	24	5.5 to 6.0
<b>ZP2V-BN1-□</b>	NPT1/8	NPT1/8	6.9	3.2	24.2	27.4	12	—	19	7.0 to 9.0

Note) When mounting and/or removing the product, apply a wrench or torque wrench to the place shown in Figure.

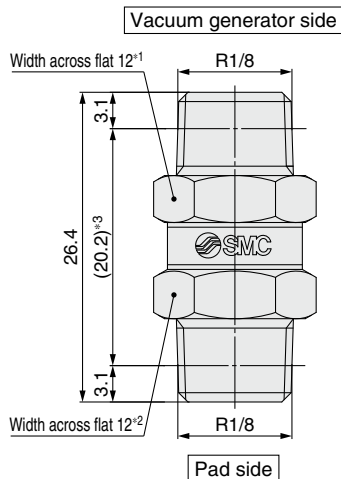
When mounting the product, tighten to the torque specified in the table.

# Series ZP2V

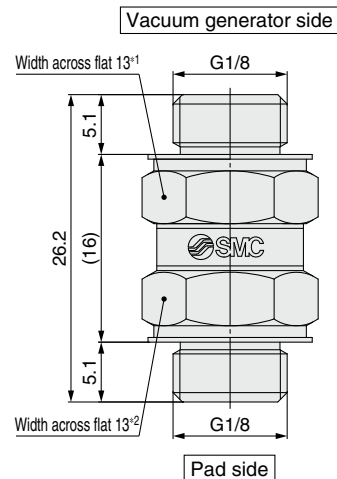
## Dimensions



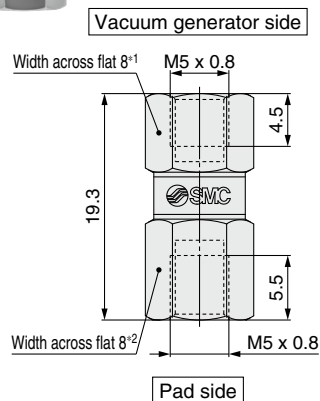
**ZP2V-A5A5-□**



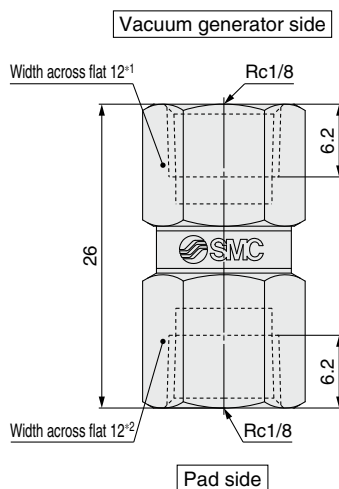
**ZP2V-A01A01-□**



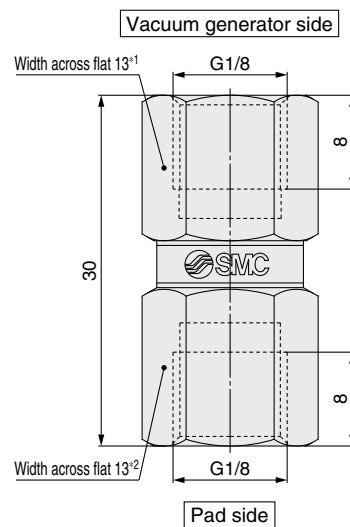
**ZP2V-AG1AG1-□**



**ZP2V-B5B5-□**



**ZP2V-B01B01-□**



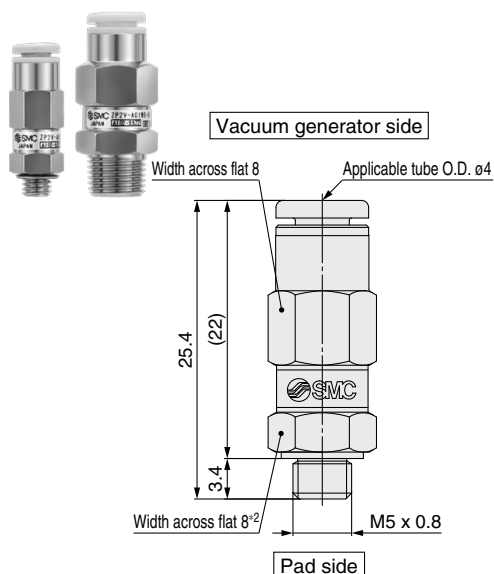
**ZP2V-BG1BG1-□**

- \*1 The place at the vacuum generator side where the tool is applied.  
 \*2 The place at the pad side where the tool is applied.  
 \*3 The referential dimension after the R thread is screwed.

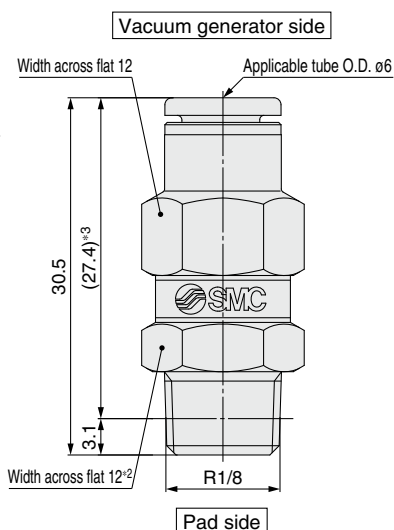
Model	Connection thread size		W (g)	Tightening torque (N·m) <small>Note</small>
	Pad side	Vacuum generator side		
<b>ZP2V-A5A5-□</b>	M5 x 0.8	M5 x 0.8	6	1.0 to 1.5
<b>ZP2V-A01A01-□</b>	R1/8	R1/8	19	7.0 to 9.0
<b>ZP2V-AG1AG1-□</b>	G1/8	G1/8	22	5.5 to 6.0
<b>ZP2V-B5B5-□</b>	M5 x 0.8	M5 x 0.8	7	1.0 to 1.5
<b>ZP2V-B01B01-□</b>	Rc1/8	Rc1/8	17	7.0 to 9.0
<b>ZP2V-BG1BG1-□</b>	G1/8	G1/8	24	5.5 to 6.0

Note) When mounting and/or removing the product, apply a wrench or torque wrench to the place shown in Figure.  
 When mounting the product, tighten to the torque specified in the table.

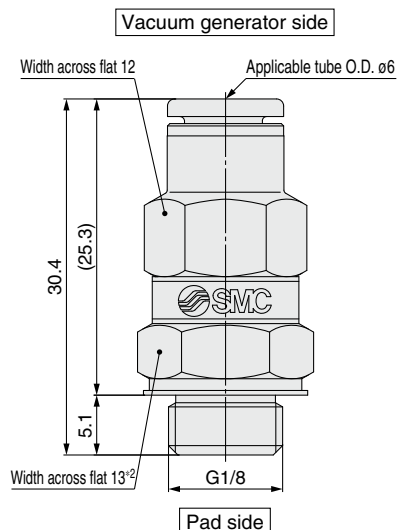
## Dimensions



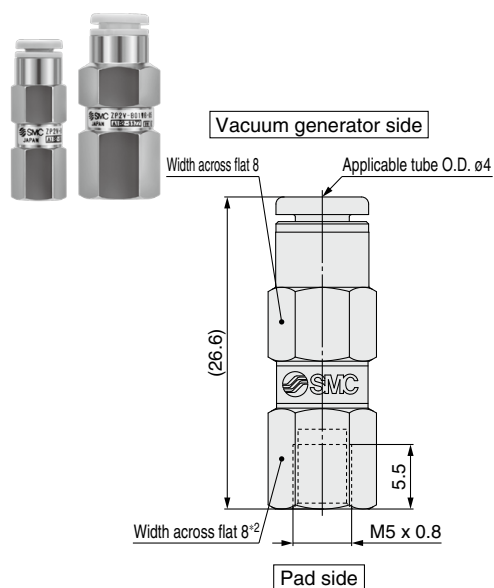
**ZP2V-A5W4-□**



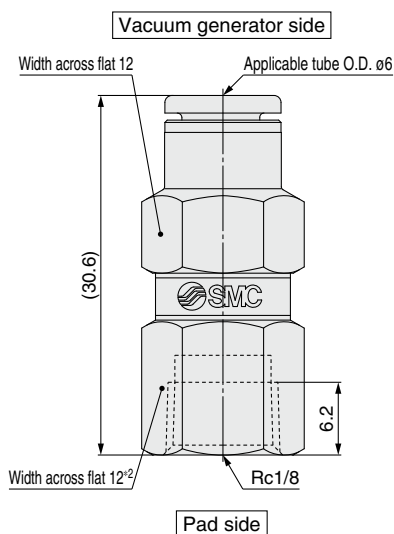
**ZP2V-A01W6-□**



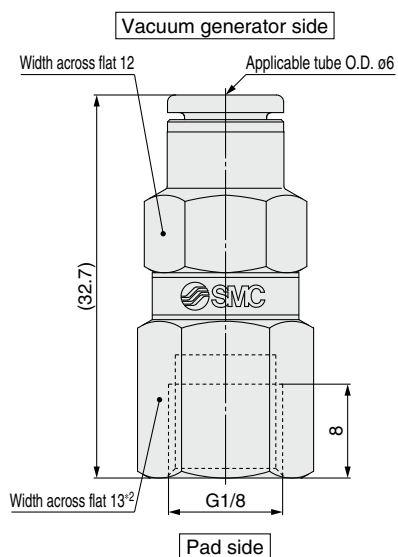
**ZP2V-AG1W6-□**



**ZP2V-B5W4-□**



**ZP2V-B01W6-□**



**ZP2V-BG1W6-□**

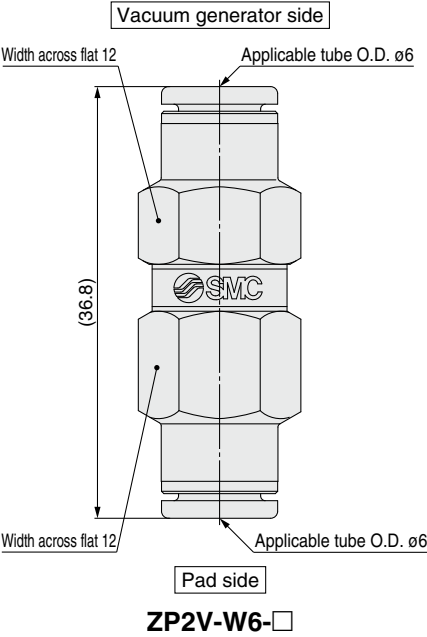
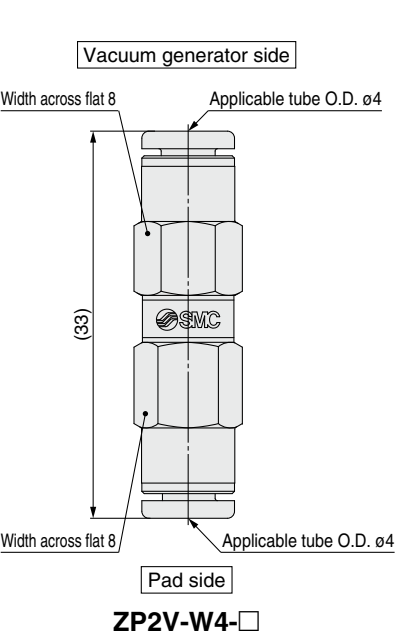
- \*1 The place at the vacuum generator side where the tool is applied.
- \*2 The place at the pad side where the tool is applied.
- \*3 The referential dimension after the R thread is screwed.

Model	Connection thread size		W (g)	Tightening torque (N·m) <sup>Note</sup>
	Pad side	Vacuum generator side		
<b>ZP2V-A5W4-□</b>	M5 x 0.8	$\phi 4$	6	1.0 to 1.5
<b>ZP2V-A01W6-□</b>	R1/8	$\phi 6$	18	7.0 to 9.0
<b>ZP2V-AG1W6-□</b>	G1/8	$\phi 6$	20	5.5 to 6.0
<b>ZP2V-B5W4-□</b>	M5 x 0.8	$\phi 4$	7	1.0 to 1.5
<b>ZP2V-B01W6-□</b>	Rc1/8	$\phi 6$	17	7.0 to 9.0
<b>ZP2V-BG1W6-□</b>	G1/8	$\phi 6$	21	5.5 to 6.0

Note) When mounting and/or removing the product, apply a wrench or torque wrench to the place shown in Figure.  
When mounting the product, tighten to the torque specified in the table.

# Series ZP2V

## Dimensions



(mm)

Model	Connection thread size		W (g)	Tightening torque (N·m) <small>Note)</small>
	Pad side	Vacuum generator side		
<b>ZP2V-W4-□</b>	$\phi 4$	$\phi 4$	7	—
<b>ZP2V-W6-□</b>	$\phi 6$	$\phi 6$	19	—



## Series ZP2V

# Specific Product Precautions

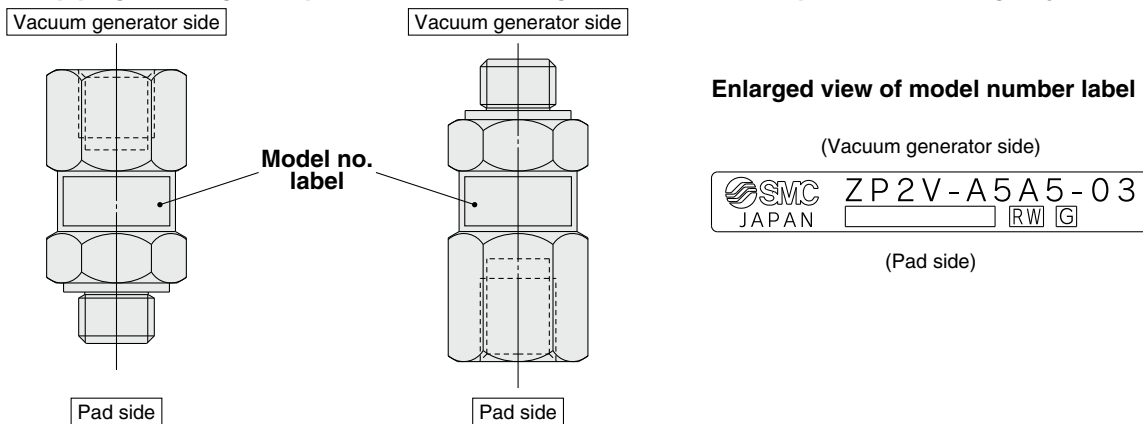
Be sure to read this before handling. Refer to the back cover for Safety Instructions. For Vacuum Equipment Precautions, refer to “Handling Precautions for SMC Products” and the Operation Manual on SMC website, <http://www.smcworld.com>

1. The product is not equipped with a vacuum holding function, and cannot be used for the purpose of holding vacuum.
2. Determine the number of products to be used by selection, and keep the recommended pad diameter per product shown in Table 1. Also, check the operation with the customer's machine sufficiently beforehand.

**Table 1. Recommended Pad Diameter per Product**

Connection thread symbol for pad side	A5	B5	W4	A8	A01	B01	AG1	BG1	AN1	BN1	W6
Thread size	M5	—	—	M8	R1/8	Rc1/8	G1/8	—	NPT1/8	—	—
Recommended pad diameter (mm)	25 or less			32 to 50							

3. Do not disassemble the product. Once the product is disassembled and reassembled, it will not be able to satisfy the original performance.
4. When piping, do not get the pad side and vacuum generator side of the product the wrong way round. (Refer to Fig. 1.)



**Fig. 1. Mounting direction**

5. For mounting and/or removing the product, strictly follow the instructions below.

When mounting and/or removing the product, use the specified places shown in pages 4 to 6 to apply tools. Also, when mounting the product, tighten to the specified torque shown in pages 4 to 6. Excessive torque or applying a tool to places other than the specified place can cause damage or loss of original performance.

6. The reduction of vacuum pressure while the workpiece is sucked and released depends on the flow-rate characteristics of the vacuum generator. Check the flow-rate characteristics of the vacuum generator before checking the operation with the customer's machine.

7. When the built-in element of the product gets clogged, replace the whole product.

8. When verifying the suction using such as a pressure sensor, check the operation with the customer's machine sufficiently beforehand.

9. If there is leakage between the pad and a workpiece, for example if the workpiece is permeable, the number of products that can be used with one vacuum generator is reduced.

Take the leakage between the pad and workpiece into account and check the operation with the customer's machine sufficiently beforehand.

10. Any mounting direction is available with this product. (Upward or lateral mounting is also available.)




11. For vacuum piping, select equipment and piping so that the “Minimum operating flow rate” in the specifications on page 2 is secured.

Make sure that there are no unnecessary restrictions or leaks, etc., along the course of the piping.

If the minimum operating flow rate listed in the specifications is not secured, operation will be unstable, which may lead to suction failure or cause damage to internal parts.

## Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)\*1), and other safety regulations.

-  **Caution:** **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
-  **Warning:** **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
-  **Danger :** **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

- \*1) ISO 4414: Pneumatic fluid power – General rules relating to systems.  
ISO 4413: Hydraulic fluid power – General rules relating to systems.  
IEC 60204-1: Safety of machinery – Electrical equipment of machines.  
(Part 1: General requirements)  
ISO 10218-1: Manipulating industrial robots – Safety.  
etc.

### Warning

- 1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**  
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- 2. Only personnel with appropriate training should operate machinery and equipment.**  
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
  1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
  2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
  3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
  1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
  2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
  3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
  4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

### Caution

- 1. The product is provided for use in manufacturing industries.**  
The product herein described is basically provided for peaceful use in manufacturing industries.  
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.  
If anything is unclear, contact your nearest sales branch.

## Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.  
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.  
  
\*2) **Vacuum pads are excluded from this 1 year warranty.**  
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.  
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

### Revision history

- Edition B** \* With One-touch fitting type added to connection variations.  
\* Number of pages from 8 to 12.

SR

## Safety Instructions

Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.