



# Operation Manual

## PRODUCT NAME

*Pressure Relief 3 Port Valve with Locking Holes*

## MODEL / Series / Product Number

**VHS20-(F,N)01~(F,N)02(-B,S)(-K,M,R,Z)-D**

**VHS30-(F,N)02~(F,N)03(-B,S)(-K,M,R,Z)-D**

**VHS40-(F,N)02~(F,N)04(-B,S)(-K,M,R,Z)-D**

**VHS40-(F,N)06(-B,S)(-K,M,R,Z)-D**

**VHS50-(F,N)06~(F,N)10(-B,S)(-K,M,R,Z)-D**

**VHS20W-(F,N)01~(F,N)02(-B,S)(-K,M,R,Z)-D**

**VHS30W-(F,N)02~(F,N)03(-B,S)(-K,M,R,Z)-D**

**VHS40W-(F,N)02~(F,N)04(-B,S)(-K,M,R,Z)-D**

**VHS40W-(F,N)06(-B,S)(-K,M,R,Z)-D**

**VHS50W-(F,N)06~(F,N)10(-B,S)(-K,M,R,Z)-D**

**SMC Corporation**

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# Pressure Relief 3 Port Valve with Locking Holes 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.

\*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: Manipulating industrial robots -Safety.

etc.



## 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.

## 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.



# Pressure Relief 3 Port Valve with Locking Holes Safety Instructions

## Caution

**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 regulation 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.

## ⚠ Caution

**SMC products are not intended for use as instruments for legal metrology.**

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

## Precautions for Design

### Warning

1. Please consult with SMC if the intended application calls for absolutely zero leakage due to special atmospheric requirement, or if the use of a fluid other than air is required.
2. Do not apply negative pressure, as may cause malfunction.
3. Do not supply air pressure from ports other than the 1(P) port, as may cause malfunction.
4. When lockout is to be used, recommend using a lock with a shackle diameter of  $\phi 5$  or more. Less than  $\phi 5$  is to be used, please test it on the actual machine.

## Selection

### Warning

1. Grease used on internal parts and seals may flow to downstream side. Please consult with SMC if this causes any inconvenience in use.

## Mounting / Adjustment

### Warning

1. Do not drop or apply impact during transportation or installation, as may cause breakage or malfunction.
2. Do not install in locations of high humidity or high temperature. Operation outside of the product specification range may cause breakage, malfunction, or shorten life performance.
3. Connect the product ensuring the direction of "1"(IN) and "2"(OUT) for air direction and indicated arrow. Reverse connection may cause malfunction.

### Caution

4. The valve must be switched to each position instantly and securely. Stopping the handle between the extreme positions may cause malfunction.
5. Double action type requires two actions (push the handle + turn). Confirm that the handle is pushed properly before turning it. If the handle is not pushed properly to the end, the internal parts will be broken by turning the handle.

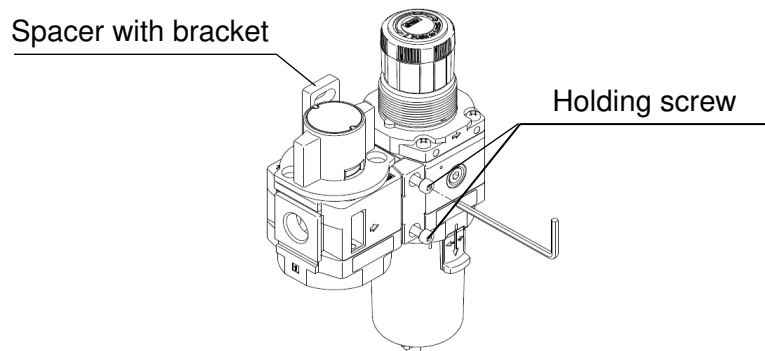
**⚠ Caution**

6. Tighten the two set screws on the spacer with bracket and spacer evenly. Tighten them to the recommended tightening torque. Insufficient tightening torque may cause loosening or sealing failure, and excessive tightening torque may cause breakage of screws

Recommended tightening torque

Unit: N m

Applicable models	VHS20-D	VHS30-D	VHS40-D	VHS40-06-D	VHS50-D
Spacer with bracket P/N	Y200T-D	Y300T-D	Y400T-D	Y500T-D	Y600T-D
Spacer P/N	Y200-D	Y300-D	Y400-D	Y500-D	Y600-D
Torque	0.36 +/-0.036	1.2 +/-0.05	1.2 +/-0.05	1.2 +/-0.05	2 +/-0.1



**Piping**

**⚠ Warning**

1. Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside. Should they remain, they could cause malfunction.
2. When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not enter the piping. Also, if sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of threads.
3. When screwing piping into a component, hold female threaded side and apply the recommended tightening torque. Insufficient tightening torque may cause loosening or sealing failure and excess tightening torque may cause damage to threads. Tightening without holding female threaded side, excess force is applied to the bracket directly, and may cause breakage.

Recommended tightening torque

Unit: N m

Thread size	1/8	1/4	3/8	1/2	3/4	1
Torque	7 to 9	12 to 14	22 to 24	28 to 30	28 to 30	36 to 38

4. When using SMC fitting or S coupler, please refer to "Tightening torque" of operation manual.

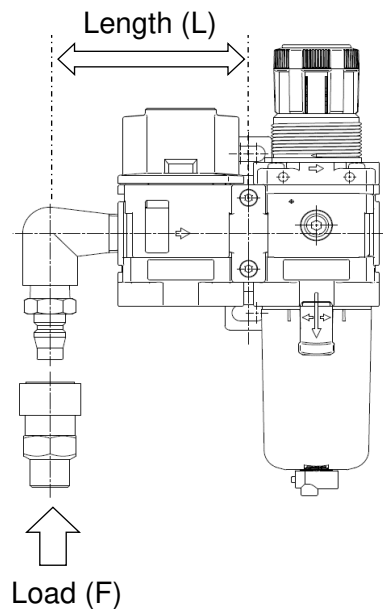
**⚠ Warning**

- Do not apply torsion or bending moment other than the product's own weight. Support external piping separately as it may cause breakage. If moment applied to the equipment is unavoidable during operation, the moment should be lower than the maximum moment shown below. Non-flexible piping, such as steel tube piping, are prone to be affected by excess moment load or vibration. Use flexible piping in between to avoid such affects.

Unit: N m

Applicable models	VHS20-D	VHS30-D	VHS40-D	VHS40-06-D	VHS50-D
Max. moment (M)	14.5	16	19.5	35	45

$$\text{Max. moment (M)} = \text{Length (L)} \times \text{Load (F)}$$



- For piping into the exhaust port, recommended installing a silencer. When installing resin built-in silencers (VHS series / Optional Parts), after tightening by hand, use a suitable wrench on octagonal flats to tighten until it contacts to the end surface. When installing resin silencers (AN series), after tightening by hand, use a suitable wrench on the hexagonal flats to tighten an additional 1/4 turn. When installing one-touch fittings (KQ2 series) or the piping, add 1/2 turn after tightening by hand. Excess tightening torque may cause damage to threads.

## Air Supply

### **Warning**

1. Use clean air. Do not use compressed air which contains chemicals, organic solvent, synthetic oil or corrosive gas, etc., as it may cause breakage or malfunction.
2. Install an air dryer or after cooler on upstream side. Air containing excess drainage may cause malfunction.

### **Caution**

3. Install an air filter of 5  $\mu\text{m}$  filtration on upstream side.
4. Install a mist separator on upstream side to remove carbon powder from the compressor or other equipment. Excess carbon dust may cause malfunction.

Refer to SMC's "Air Cleaning Equipment" catalog for further details on compressed air quality.

## Operating Environment

### **Warning**

1. Do not use in atmospheres contacting corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these.
2. Do not use in explosive atmosphere.
3. Do not use in locations subject to vibration or impact.
4. Do not expose to direct sunlight for an extended period of time. Protective cover should be used to shield.
5. Do not mound in locations where is nearby heat source. Radiated heat should be also prevented.
6. Implement suitable protective measures in locations where there is contact with water droplets, oil, or welding spatter.
7. Install a silencer into exhaust port to prevent the dust ingress if there is a lot of dust in atmosphere, as dust may cause air leakage.

If above conditions (1 to 7) are applicable, use metal handle type for your safety.

## Maintenance

### **Warning**

1. When equipment is to be removed, first confirm that measures are in place to prevent workpieces from dropping, run-away of equipment, etc.. Then cut off the supply air pressure and electric power, and exhaust all compressed air from the system using its residual pressure release function.  
When the equipment is to be restarted after remounting or replacement, first confirm that measures are in place to prevent lurching of actuators and then confirm that equipment operates normally.
2. Do not disassemble. Improper handling may cause malfunction or breakage of the machinery or equipment.



## 2. Applications

This product is a residual pressure release valve which is switched by hand.

## 3. Specifications

(1) Standard specifications

Model		VHS20-D	VHS30-D	VHS40-D	VHS40-06-D	VHS50-D
Fluid		Air				
Ambient and fluid temperature		-5 to 60°C (No freezing)				
Proof pressure		1.5MPa				
Maximum operating pressure		1.0MPa				
Handle operation	Switching angle	90°				
	Rotating torque <small>Note1)</small>	0.8N m or less	1.0N m or less	3.0N m or less	3.0N m or less	3.5N m or less
Weight		95g	181g	400g	431g	818g

Note 1) Supply pressure: 1.0 MPa

(2) Flow characteristics

Model	Port size		Supply (IN→OUT)			Exhaust (OUT→EXH)		
	IN, OUT	EXH	C(dm <sup>3</sup> /s·bar)	b	Cv	C(dm <sup>3</sup> /s·bar)	b	Cv
VHS20-D	1/8	1/8	4.0	0.41	1.1	3.7	0.42	1.1
	1/4		5.8	0.31	1.4	3.8	0.42	1.1
VHS30-D	1/4	1/4	8.8	0.44	2.4	8.0	0.46	2.3
	3/8		14.1	0.28	3.5	7.8	0.46	2.2
VHS40-D	1/4	3/8	9.5	0.49	2.8	13.3	0.47	3.6
	3/8		17.2	0.47	4.8	13.6	0.47	3.7
	1/2		26.7	0.29	6.3	13.4	0.43	3.7
VHS40-06-D	3/4	1/2	34.0	0.22	7.6	16.1	0.41	4.4
VHS50-D	3/4	1/2	45.0	0.26	10.6	23.0	0.49	6.4
	1		53.3	0.36	13.5	22.8	0.49	6.3

## 4. How to Order

VHS 30   -   03 -   -   - D

1
2
3
4
5
6

		Symbol	Description	<b>1</b>						
				Body size						
				20	30	40	50			
+										
<b>2</b>	Handle operation	Nil	Single action	●	●	●	●			
		W	Double action	●	●	●	●			
+										
<b>3</b>	Thread type	Nil	Rc <sup>*2)</sup>	●	●	●	●			
		N	NPT	●	●	●	●			
		F	G	●	●	●	●			
+										
<b>4</b>	Port size	01	1/8	●	—	—	—			
		02	1/4	●	●	●	—			
		03	3/8	—	●	●	—			
		04	1/2	—	—	●	—			
		06	3/4	—	—	●	●			
		10	1	—	—	—	●			
+										
<b>5</b> <sup>*1)</sup>	Option	a	Mounting	Nil	Without mounting option		●	●	●	●
			B	With bracket		●	●	●	●	
	+									
	b	Silencer	Nil	Without silencer		●	●	●	●	
S			With built-in silencer (for EXH port)		●	●	●	●		
+										
<b>6</b> <sup>*1)</sup>	Semi-standard	c	Handle color	Nil	Red		●	●	●	●
			K	Black		●	●	●	●	
		+								
		d	Handle material	Nil	Plastic		●	●	●	●
	M			Metal		●	●	●	●	
	+									
	e	Flow direction	Nil	Flow direction: Left to Right		●	●	●	●	
			R	Flow direction: Right to Left		●	●	●	●	
+										
f	Pressure unit Temp. unit	Nil	Unit of product label: MPa		●	●	●	●		
		Z	Unit of product label: psi		○ <sup>*3)</sup>	○ <sup>*3)</sup>	○ <sup>*3)</sup>	○ <sup>*3)</sup>		

\*1) **5** Option and **6** Semi-standard: Select one each for **a** to **f**.

\*2) EXH port thread type: G

\*3) ○: For NPT thread type only

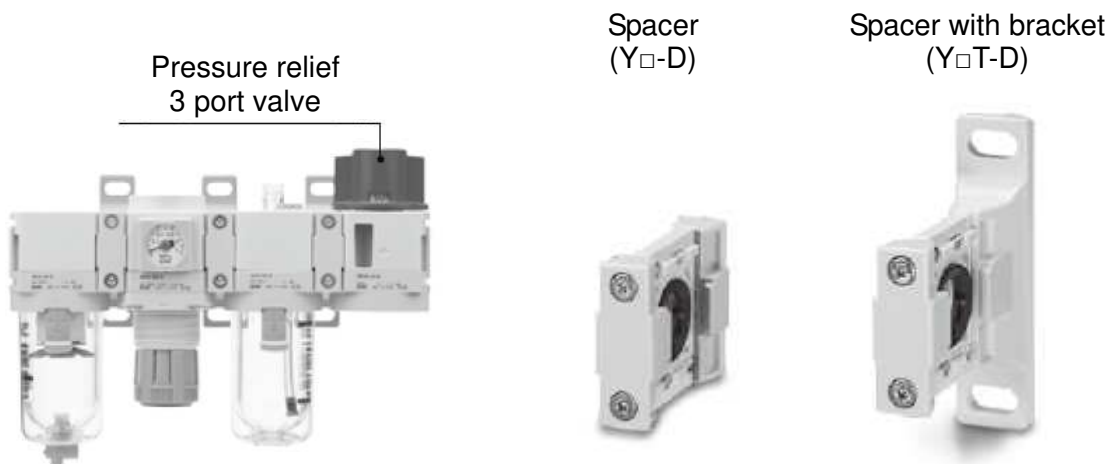
# A spacer or spacer with bracket is required if the valve is combined with modular F.R.L.  
Please order it separately.

VHS type can be ordered from How to Order of modular F.R.L. combination.

Pressure relief 3 port valve	Spacer P/N	Spacer with bracket P/N	Applicable F.R.L. combination
VHS20-D	Y200-D	Y200T-D	AC20-D
VHS30-D	Y300-D	Y300T-D	AC30-D
VHS40-D	Y400-D	Y400T-D	AC40-D
VHS40-06-D	Y500-D	Y500T-D	AC40-06-D
VHS50-D	Y600-D	Y600T-D	AC50-D AC60-D <sup>Note)</sup>

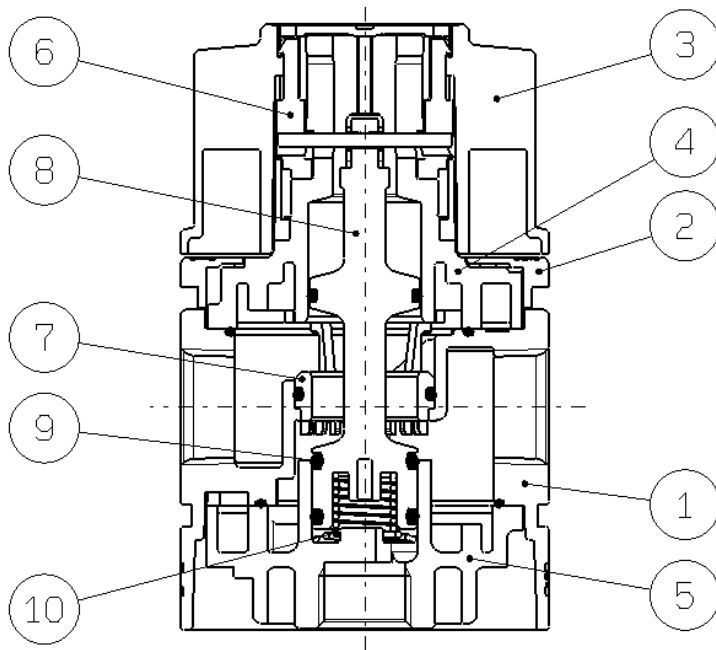
Note) VHS50 can be connected to AC60.

\* New VHS series is compatible with previous model spacer Y200(T)-A to Y600(T)-A.



## 5. Construction / Parts list

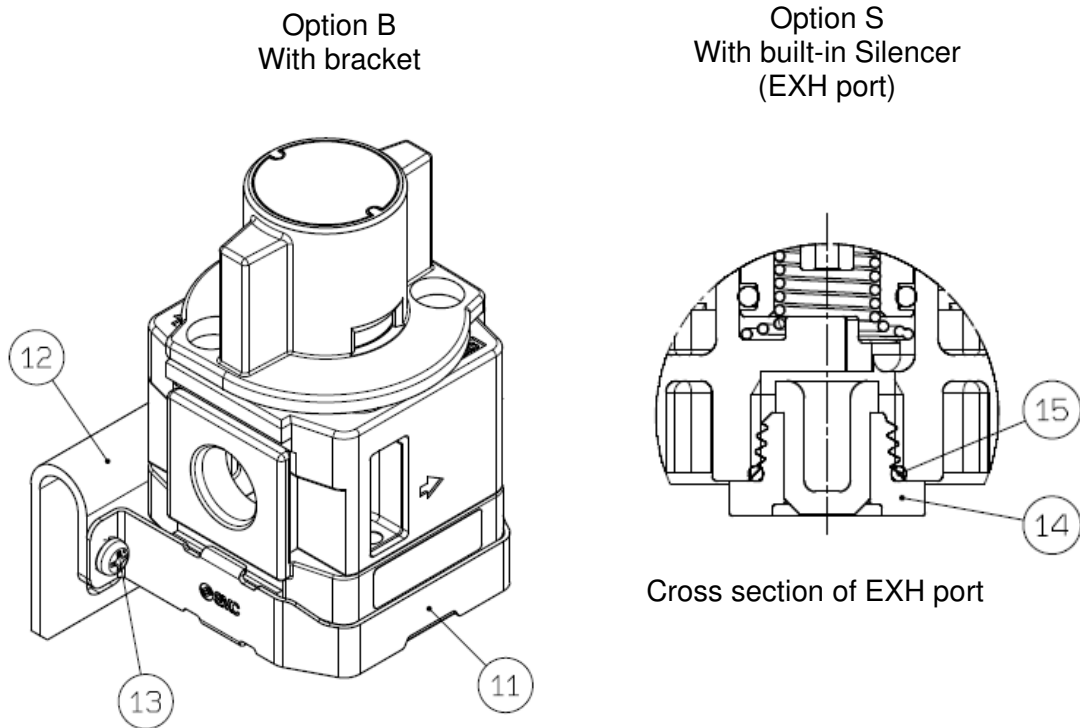
(1) Standard



No.	Description	Standard specifications	
		Material	Note
1	Body	ADC12	White
2	Body cover	POM	White
3	Handle	POM	Red
4	Bonnet	PBT	-
5	Valve guide	Flame resistant PBT (UL94 standard V-0 equivalent)	White
6	Cam ring	POM	-
7	Sleeve	POM	-
8	Spool	PBT	-
9	O-ring	HNBR	-
10	Spring	Stainless steel	-

# The VHS series cannot be disassembled. Parts cannot be shipped separately.

(2) Options specifications



Optional Parts

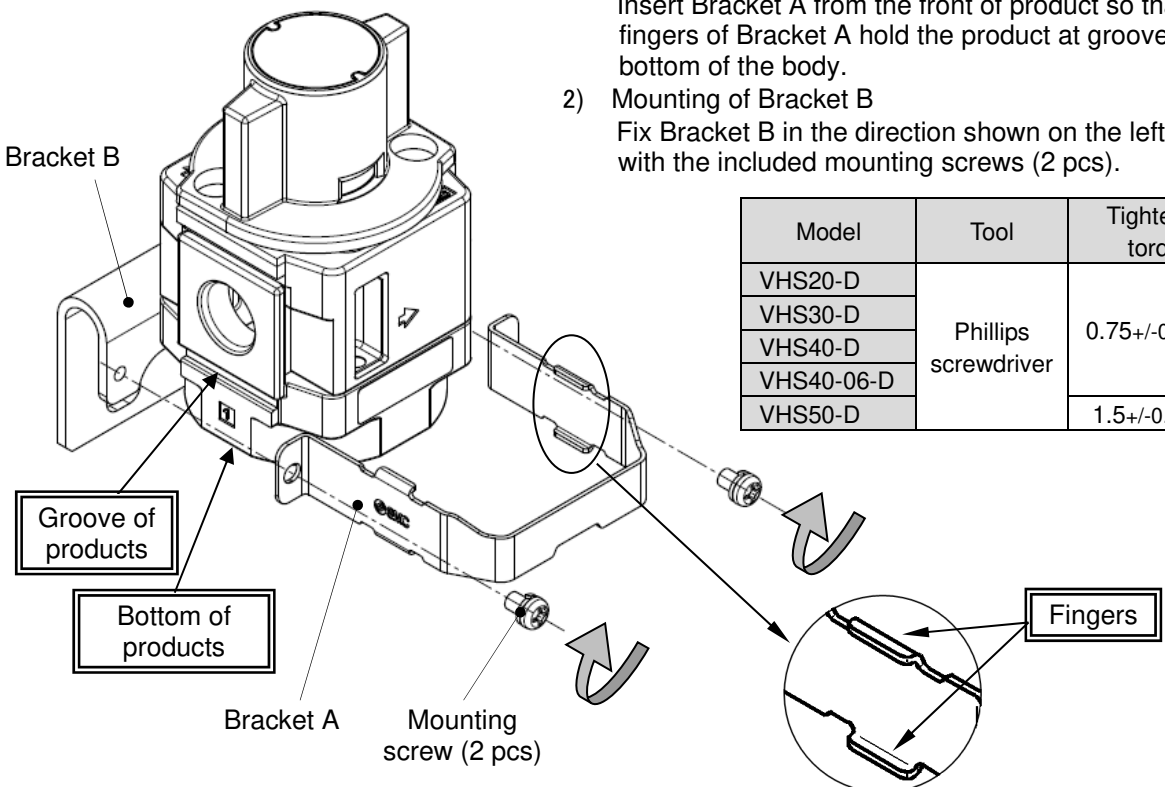
Model	Bracket assembly P/N	Silencer assembly P/N
VHS20-D	VHS24P-180AS	VHS24P-190AS
VHS30-D	VHS34P-180AS	VHS34P-190AS
VHS40-D	VHS44P-180AS	VHS44P-190AS
VHS40-06-D	VHS44P-180AS	VHS54P-190AS
VHS50-D	VHS54P-180AS	VHS54P-190AS

Construction of Optional Parts

No.	Description	Material	Bracket assembly	Silencer assembly	Note
11	Bracket A	Stainless steel	1 pc		—
12	Bracket B	Steel strip	1 pc		Zinc chromate
13	Mounting screw	Steel wire	2 pcs		Zinc chromate
14	Element assembly	PP		1 pc	—
15	O-ring	NBR		1 pc	—

## 6. Assembly of Optional Parts

### (1) Bracket

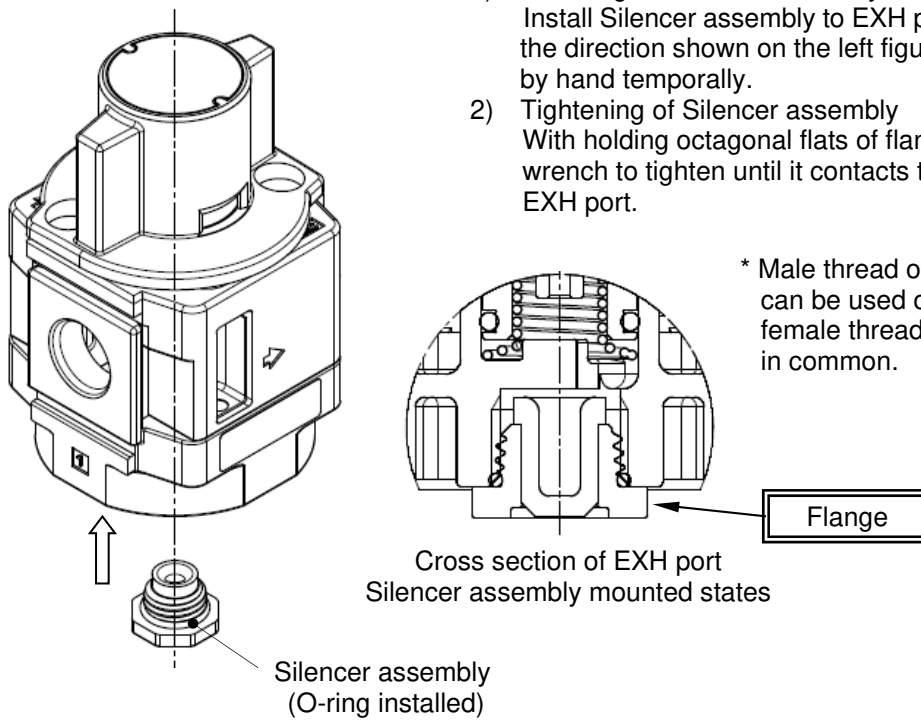


1) Mounting of Bracket A  
Insert Bracket A from the front of product so that the fingers of Bracket A hold the product at groove and bottom of the body.

2) Mounting of Bracket B  
Fix Bracket B in the direction shown on the left figure with the included mounting screws (2 pcs).

Model	Tool	Tightening torque
VHS20-D	Phillips screwdriver	0.75+/-0.2 N m
VHS30-D		
VHS40-D		
VHS40-06-D		
VHS50-D		1.5+/-0.2 N m

### (2) Built-in silencer



1) Mounting of Silencer assembly  
Install Silencer assembly to EXH port (Female port) in the direction shown on the left figure, and then tighten by hand temporarily.

2) Tightening of Silencer assembly  
With holding octagonal flats of flange by using a suitable wrench to tighten until it contacts to the end surface of EXH port.

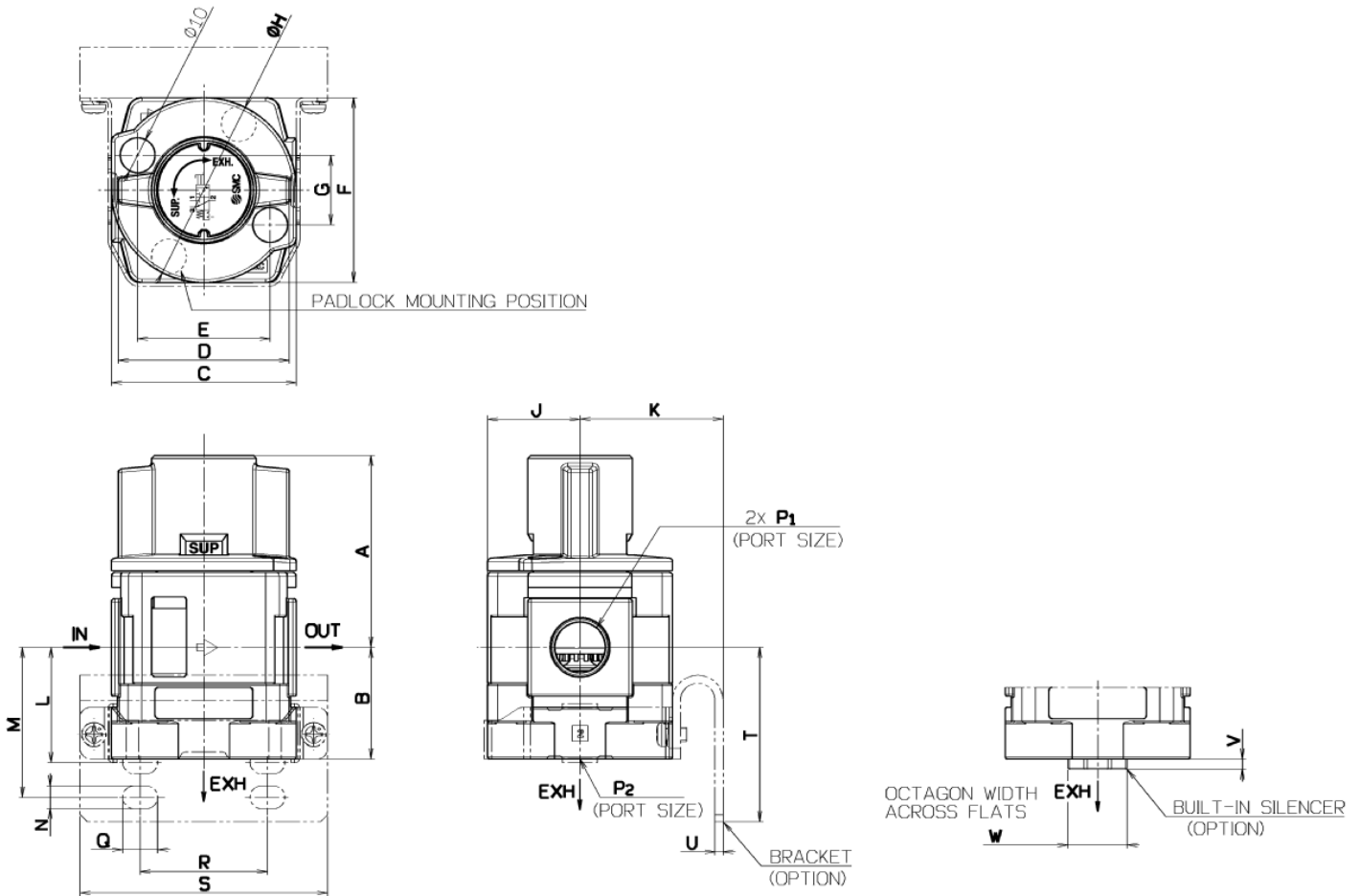
\* Male thread of Silencer assembly can be used on both of EXH port female thread types G and NPT in common.

Cross section of EXH port  
Silencer assembly mounted states

Silencer assembly (O-ring installed)

Flange

## 7. Dimensions



Model	Standard specifications											
	P1	P2	A		B	C	D	E	F	G	H	J
			Single	Double								
VHS20-D	1/8, 1/4	1/8	48.5	51.7	23	40	37	28	42	17.5	40	21
VHS30-D	1/4, 3/8	1/4	55	58.2	32	53	49	38	53	20	53	26.5
VHS40-D	1/4, 3/8, 1/2	3/8	69.7	73.9	41.3	70	63	52	71	29	70	35.5
VHS40-06-D	3/4	1/2	71.7	75.9	43.3	75	63	52	71	29	70	35.5
VHS50-D	3/4, 1	1/2	86.5	90.7	44.5	90	80	72	90	33	90	45

Model	Options specifications										
	With bracket									With built-in silencer	
	K	L	M	N	Q	R	S	T	U	V	W
VHS20-D	30	25.3	34	5.4	8.4	27	60	40	2.3	3	13
VHS30-D	41	33	43	6.5	10	36.5	71	50	2.3	3	17
VHS40-D	50	44	57	8.5	19	43.5	88	66	2.3	3	21
VHS40-06-D	50	46	59	8.5	19	43.5	88	68	2.3	4	27
VHS50-D	70	60	-	11	27.5	49.5	113	71	3.2	4	27

#### Revision history

Rev. A - Safety Instructions (Piping) corrected.  
- How to Order added \*2 and \*3.

Rev. B - Overall revision

Rev. C - Safety Instructions (Mounting/Adjustment)  
(Piping) corrected.  
- Dimensions corrected.  
- Model name corrected.

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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