

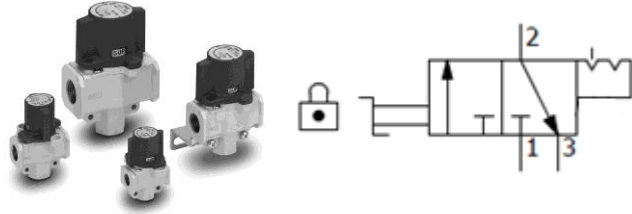


ORIGINAL INSTRUCTIONS

Instruction Manual

Pressure Relief 3 Port Valve with Locking Holes (Single Action)

Series VHS#0-A and VHS#0-B



The intended use of this valve is to release residual pressure by switching the valve by hand.

Validated according to ISO 13849, see section 2 and section 5.

1 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)<sup>1)</sup>, and other safety regulations.

- <sup>1)</sup>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.

This manual contains essential information for the protection of users and

others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- To ensure safety of personnel and equipment the safety instructions in this manual must be observed, along with other relevant safety practices.

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

**Warning**

- 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 catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- Only personnel with appropriate training should operate machinery and equipment.**

1 Safety Instructions - continued

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.

- Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

- 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.
- 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.
- Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

- Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

- Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
- Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustions 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 specification described in the product catalogue.
- An application which could have negative effects on people, property, or animals requiring special safety analysis outside the scope of ISO 13849 described in this document.
- 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.

- Always ensure compliance with relevant safety laws and standards.**
- All electrical work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

**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.

2 Specifications

2.1 Specifications

Model	VHS20	VHS30	VHS40	VHS40-06	VHS50
Fluid	Air				
Min. air quality	5 µm filtration				
Ambient and fluid temperature	-5 to +60 °C (No freezing)				
Proof pressure	1.5 MPa				
Min. operating pressure	0.1 MPa				
Max. operating pressure	1.0 MPa				
Handle switching angle	90°				
Paint colour (Standard)	Handle: Red Body: White				
Weight for -A series	76 g	127 g	247 g	293 g	532 g
Weight for -B series	92 g	156 g	301 g	349 g	630 g
Flow	See Table 2				
Lubrication	Not required (Refer to 3.4)				
Standards	Complies with the basic and well-tried safety principles of EN ISO 13849-2:2012				
B <sub>10</sub>	7,400 cycles <sup>Note 1)</sup>				
B <sub>10d</sub>	14,800 cycles <sup>Note 1)</sup>				

Table 1

2 Specifications – continued

Notes:

Note 1) Under SMC test conditions. The B<sub>10</sub> figure is estimated from SMC life tests. The B<sub>10d</sub> figure is derived from B<sub>10</sub> using the assumption in EN ISO 13849-1:2015 Annex C. Contact SMC for details.

2.2 Flow characteristics

Model	Port size			IN → OUT			OUT → EXH		
	IN, OUT	EXH		C [dm <sup>3</sup> /(s·bar)]	b	Cv	C [dm <sup>3</sup> /(s·bar)]	b	Cv
VHS20	1/8	1/8		2.4	0.43	0.65	2.5	0.39	0.69
	1/4			3.3	0.40	0.88	3.1	0.51	0.84
VHS30	1/4	1/4		6.4	0.45	1.7	6.2	0.38	1.7
	3/8			8.3	0.41	2.3	7.0	0.41	1.9
VHS40	1/4	3/8		7.3	0.49	2.0	8.5	0.35	2.3
	3/8			10.9	0.45	3.0	11.6	0.40	3.1
	1/2			14.2	0.39	3.8	13.3	0.43	3.6
VHS40-06	3/4	1/2		18.3	0.31	5.0	17.7	0.37	4.8
VHS50	3/4	1/2		23.8	0.41	6.4	21.8	0.41	5.9
	1			31.9	0.33	8.6	23.5	0.44	6.4

Table 2

2.3 Indicator window

The supply/exhaust status of the air flow can be verified at a glance in the indicator window.



**Caution**

Special products might have specifications different from those shown in this section. Contact SMC for specific drawings. These drawings will give the appropriate specification details and compliance with the safety principles of ISO 13849, if applicable.

3 Installation

3.1 Installation

**Warning**

- Do not install the product unless the safety instructions have been read and understood.
- Confirm the symbols "1" and "2" before the valve is connected. The port marked "1" is the air inlet and the port marked "2" is the outlet. Pressurization is only possible via the inlet port "1". Reverse connection may cause malfunction. The port symbols and corresponding piping types are shown in the table below.

Port symbol	Piping type
1	Inlet
2	Outlet
3	Exhaust

Table 3

**Caution**

- The valve must be switched to each position instantly and securely. Stopping the knob between the extreme positions may cause malfunction.
- Do not remove the mounting screws from the bonnet. This may cause malfunction.

3.2 Environment

**Warning**

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.

3 Installation – continued

- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact. Check the product specifications.
- Do not mount in a location exposed to radiant heat.
- Consult SMC if the ambient environment does not permit leakage.
- Employ suitable protective measures in locations where there is contact with water droplets, oil, or welding spatter.
- Install a silencer into port (3) to prevent the ingress of dust if there is a lot of dust in the atmosphere. If dust enters the valve via port (3), it may cause air leakage.

3.3 Piping

**Warning**

- Before piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

Thread	1/8	1/4	3/8	1/2	3/4	1
Tightening Torque [N·m]	7 to 9	12 to 14	22 to 24	28 to 30	28 to 30	36 to 38

Table 4

3.4 Lubrication

**Caution**

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.

3.5 Air Supply

**Warning**

- Use clean air. Do not use compressed air which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as this can cause damage or malfunction.
- Install an air dryer or after cooler on the upstream side of the pressure release 3 port valve because air containing excessive drainage may cause malfunction.
- Do not apply negative pressure. It may result in malfunction.

**Caution**

- Install a mist separator on the inlet side to remove carbon powder from the compressor or other equipment. An excessive amount of carbon dust ingress via the inlet may cause the valve to malfunction.

### 3 Installation – continued

#### 3.6 Assembly of optional parts

##### 3.6.1 Bracket assembly

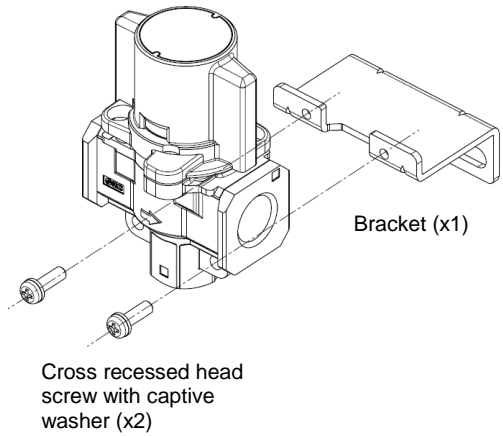


Figure 1

- 1) Installation of bracket  
Align two holes of the bracket with the holes at the bottom of the product. (See Figure 1)
- 2) Tightening of screw  
Insert the mounting screws (cross recessed head screw with captive washer) to the holes of the product at the opposite side of the bracket, and tighten the screws to hold the bracket.

##### 3.6.2 Silencer assembly

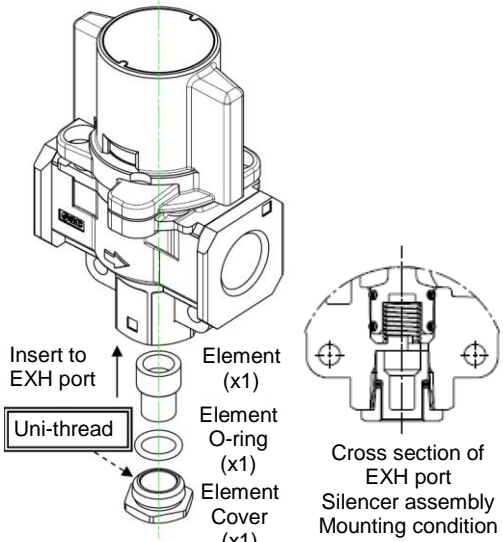


Figure 2

- 1) Mounting of the element  
After inserting the element O-ring to the element, insert the element to EXH port.
- 2) Tightening of the screw of the element cover  
Mount the element cover to the female thread of EXH port.  
\* The male thread of the element cover is Uni-thread. It is applicable to all thread types of Rc/G/NPT.

### 4 Settings

#### 4.1 Double action

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. Two step action prevents malfunction.

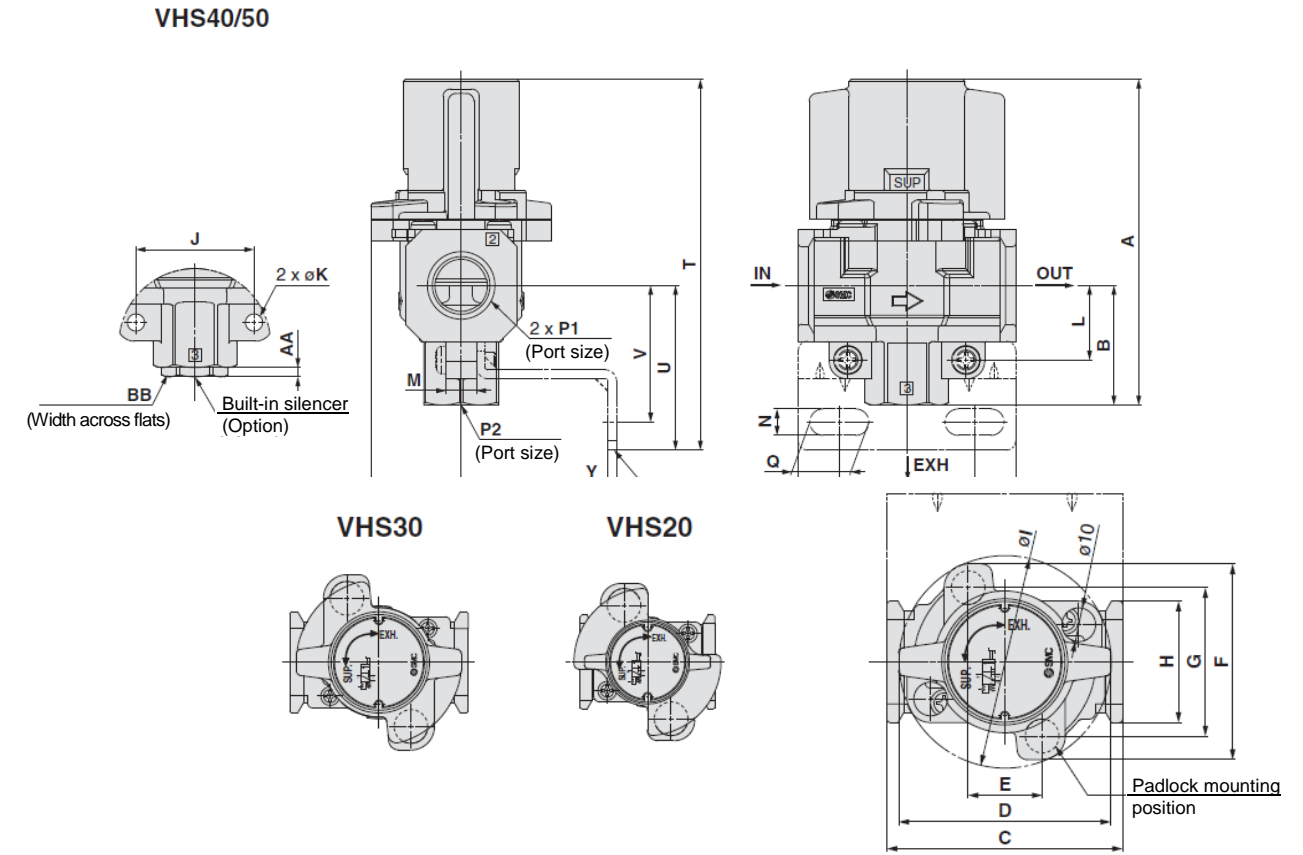


#### 4.2 Built-in Silencer (Option) [Bronze Sintered Metal Element]

##### Caution

- Products made of bronze may contain uneven colour due to the oxidization process of the atmosphere. However, this oxidization process occurs in the limited range of less than 1 μm of thickness and is so thin as to not affect the product characteristics. The uneven colour occurs depending on the storage duration before utilization (stock as a product, stock in customers).  
\* If this is a problem, please contact SMC, so that SMC can pre-treat them with nickel plating.

### 6 Outline Dimensions (mm)



### 5 How to Order

VHS 40 - 04 - BS -

Body size	Validated <sup>◇</sup>	Thread type	
20	-	Nil	Rc
30	-	F	G
40	●	N	NPT
50	●		

Port size Symbol	Port size	Body size			
		20	30	40	50
01	1/8	●	-	-	-
02	1/4	●	●	●	-
03	3/8	-	●	●	-
04	1/2	-	-	●	●
06	3/4	-	-	●	●
10	1	-	-	-	●

Validated <sup>◇</sup>	
	●

Handle / Bonnet material	
A	Flame resistant PBT
B	Aluminum

Option	
Symbol	Description
Nil	-
K	Handle color: Black
R	Flow direction: Right→Left
Z <sup>Note 1)</sup>	psi as unit displayed on label

Note 1) Only for NPT thread.  
Under the New Measurement Law, products for overseas use only (SI unit type for use in Japan).

Options	
Nil	-
B	With bracket
S	Built-in Silencer (EXH port)

B: Packed together  
S: Assembled for shipping

Made to Order  
X1 Body: Red

◇: Validated according to ISO 13849.

## 6 Outline Dimensions (mm) - continued

### 6.1 Standard specifications

Model	P1	P2	A	B	C	D	E	F	G	H	I	J	K	L	M
VHS20	1/8, 1/4	1/8	66.4	22.3	40	37.5	14	46.6	33.6	28	43	24	4.5	14.8	9
VHS30	1/4, 3/8	1/4	80.3	29.4	53	49	19	52	38	30	49	30	4.5	19	9
VHS40	1/4, 3/8, 1/2	3/8	104.9	38.5	70	63	22	58	44	36	63	38	5.5	24	10
VHS40-06	3/4	1/2	110.4	42	75	63	22	58	44	44	63	43	5.5	26	10
VHS50	3/4, 1	1/2	134.3	53	90	76	26	76	61	53	81	50	6.5	31	12

Table 5

### 6.2 Options specifications

Model	With bracket											Built-in silencer	
	N	Q	R	S	T	U	V	W	X	Y	AA	BB	
VHS20	5.4	8.4	27	40	75.4	31.3	25.3	53.3	30	2.3	3	12	
VHS30	6.5	10	36.5	53	90.9	40	33	67	41	2.3	3	14	
VHS40	8.5	19	43.5	70	119.4	53	44	79	50	2.8	3	19	
VHS40-06	8.5	19	43.5	70	123.4	55	46	79	50	2.8	4	22	
VHS50	11	27.5	49.5	90	152.3	71	60	108	70	3.2	4	22	

Table 6

## 8 Limitations of Use

### 8.1 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<sup>(1)</sup>. 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 catalogue for the particular products.

<sup>(1)</sup> 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.

### 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.

### Warning

Any use in an ISO 13849 system must be within the specified limits and application conditions. The user is responsible for the specification, design, implementation, validation and maintenance of the safety system (SRP/CS).

## 9 Contacts

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