



# Operation Manual

PRODUCT NAME

*Finger Valve*

MODEL / Series / Product Number

VHK-A(R)

**SMC Corporation**

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# 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.



# 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.

## Design/ Selection

### **Warning**

#### **1. Check the specifications.**

This product is not designed for the installation of equipment in conjunction with atomic energy, railways, air navigation, space appliances, shipping, vehicles, military, medical equipment, combustion devices, recreation equipment, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or any other applications unsuitable for the standard specifications described in the product catalog.

The product is designed for use only in industrial compressed air systems. Do not use fluid other than compressed air.

Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction.

#### **2. Cannot be used as an emergency shutoff valve, etc.**

The product is not designed for safety applications such as an emergency shutoff valve. If the valves are used in this type of system, other reliable safety assurance measures should also be adopted.

#### **3. This product cannot be used for an application in which the pressure must be sealed because there will be a slight leakage.**

### **Caution**

#### **1. Low temperature operation**

Protection against freezing or solidification of impurities is necessary.

#### **2. Operation**

Leaving the knob in the middle position leads to malfunction. Set the knob to OPEN or SHUT position before using the product.

#### **3. Do not supply air pressure to ports other than the 1(P) port.**

If air is supplied to 2(A) port, air leaks from 1(P) port leading to operation failure.

#### **4. Allows sufficient margin in the piping conditions of the tubing.**

#### **5. Prevent the connected tube from being rotated.**

If the fittings are used in this way, the fitting is likely to break.

## Mounting

### **Warning**

#### **1. Operation Manual**

Install and operate only after reading the operation manual carefully and understanding the contents.  
Keep the manual where it can be referred to as necessary.

#### **2. Maintenance space**

When installing the products, allow access for maintenance.

#### **3. Observe the tightening torque for screws.**

Tighten the screws to the recommended torque when mounting the product.

To prevent the tube from breaking loose, install a protective cover or fix the tube.

4. Tube can become unsecured and break loose while the product is use due to the deterioration of the tube or damage to the fitting.

#### **5. If air leakage increases or the equipment does not operate properly, stop operation.**

After installation, connect the compressed air supply to the product and perform appropriate functional and leakage inspections to check it is mounted properly.

#### **6. Do not paint the product.**

Models or specifications printed or marked on the product should not be erased, removed or covered up. Do not paint resin parts, as this may have an adverse effect due to the solvent in the paint.

#### **7. Disassembly and modification is prohibited.**

Do not disassemble the product or make any modifications, including additional machining. It may cause injury and/or an accident and will void the warranty.

### **Caution**

#### **1. Mounting L-bracket**

Tightening torque of the bolt is 0.5 to 0.6Nm.

## Piping

### **Caution**

**1. Refer to Fittings & Tubing Precautions from 1 to 5 shown in Best Pneumatics on SMC's website (URL <https://www.smcworld.com>) for the recommended piping conditions.**

#### **2. Preparation before piping.**

Before piping, blow air (flush) or clean the piping to remove any cutting chips, cutting oil, dust, etc.

#### **3. Piping to product**

Confirm the symbols before piping. The port marked  " is the air inlet. Reverse connection may cause malfunction.

#### **4. Tube piping**

1) Before mounting, confirm the model, size, etc. Also, confirm that there are no scratches, dents or cracks in the product.

2) When connecting tubing, consider factors such as changes in the tubing length due to pressure, and allow a sufficient margin.

3) Make sure that no twisting, turning, tensile force or moment load is applied to the port or tube. This may cause damage to the fitting or crushing, bursting or disconnection of tubing.

4) Make sure the tubing is not worn, tangled or damaged. This can cause crushing, bursting or disconnection of tubing, etc.

### 5. Insertion of tube

- 1) Cut the tube perpendicularly, being careful not to damage the external surface. Use SMC's tube cutter TK series. Do not cut the tube with pliers, nippers, scissors, etc. These tools result in a poor quality cut (e.g. flattening, rough edges, poor angle) and can result in a bad connection between the tube and the fitting, causing disconnection of the tube and air leakage.
- 2) The outside diameter of polyurethane tubing swells when internal pressure is applied, so it may not be possible to re-insert used tubing into One-touch fittings. Confirm the outside diameter of the tubing. If the accuracy of the outside diameter is +0.07mm or more for  $\phi 2$ , and +0.15mm or more for other sizes, insert into the one-touch fitting again without cutting it. When tubing is re-inserted into a One-touch fitting, confirm that the tubing is able to go through the release button smoothly.
- 3) After inserting the tubing, pull on it gently to confirm that it will not come out.

If it is not installed securely, problems such as leakage or disconnection of the tube can occur.

### 6. Removal of the tube

- 1) Press the release button firmly. Push the collar evenly around its circumference.
- 2) Hold down the release button while pulling out the tube. If the release button is not held down fully, it will be more difficult to pull out the tube.
- 3) If the removed tubing is to be used again, cut off the section of the tubing which has been gripped. Using previous gripped end can cause leakage or removal of the tubing.

7. If tubes of brands other than SMC are used, confirm that the materials and tolerance of the tubing outside diameter will satisfy the following specifications.

1. Nylon tube Within  $\pm 0.1\text{mm}$
2. Soft nylon tube Within  $\pm 0.1\text{mm}$
3. Soft polyurethane tube Within  $\pm 0.15\text{mm}$  or  $\pm 0.2\text{mm}$

Do not use the tubing which does not meet these outside diameter tolerances as it may not be possible to connect to the product. Confirm that no problem will occur in the operating conditions.

### 8. Connection of the product

#### 1) M5 types

First, tighten it by hand, then give it an additional approximately 1/6 to 1/4 turn with the wrench.

The reference tightening torque is 1 to 1.5 N.

#### 2) R thread

After hand tightening of the product, apply a spanner of the correct size to the spanner flats of the body, and tighten it for 2 to 3 rotations.

Use the tightening torque shown in the table below as a guide.

#### Tightening Torque for applicable piping

Thread	Number of turns after tightening by hand	Appropriate tightening torque (Nm)
R1/8	2 to 3 turns	3 to 5
R1/4		8~12
R3/8		15~20
R1/2		20~25

**3) Tighten with an appropriate wrench, using the hexagonal face of the fitting.**

Use the root nearest the thread when tightening with a wrench. Tightening with a wrench of the wrong size, or too close to the tube side, may cause damage or deformation of the fitting. After mounting, check that the fitting is not damaged or deformed.

Note) Excessive tightening may damage the thread, or deform the gasket, causing air leakage. Sealant may come out. Remove the excess sealant.

Insufficient tightening may loosen the thread or cause air leakage.

**4) Reuse**

Normally, the fittings with sealant can be reused 2 to 3 times. Remove loose sealant stuck to the fitting by blowing air over the threaded portion of the fitting before reusing. If the loose sealant enters adjacent machinery, it may cause air leakage or malfunction.

**5) When sealing effect is lost**

Apply sealant tape onto the sealant.

Only use sealant tape, do not use other types of sealant.

**6) When positioning is required, loosening the piping after it is once tightened may cause air leakage.**

## Air Supply

### **Warning**

#### **1. Use clean air.**

Do not use compressed air that contains chemicals, organic solvents based synthetic oils, salts or corrosive gases, etc., as this can cause damage or malfunction.

### **Caution**

#### **1. Install air filters.**

Install air filters close to valves on the upstream side. A filtration degree of 5 micron millimeter or less should be selected.

#### **2. Install an aftercooler, air dryer or drain catch before the filter.**

Compressed air that contains excessive drainage may cause malfunction of finger valves and other pneumatic equipment. Therefore, take appropriate measures to ensure air quality, such as by providing an after cooler, water separator.

#### **3. If excessive carbon powder is seen, install a mist separator on the upstream side of the valve.**

If excessive carbon powder is generated by the compressor, it may cause malfunction.

For detailed information regarding the quality of the compressed air described above, refer to SMC's "Cleaning Systems".

#### **4. Ensure that the fluid and ambient temperature are within the specified range.**

## Operating Environment

### **Warning**

#### **1. Do not use in an atmosphere having corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these .**

#### **2. Do not use in an atmosphere containing flammable or explosive gases. Fire or an explosion can result.**

The product is not designed to be explosion proof.

#### **3. Do not use in locations subject to vibration or impact.**

#### **4. Use a protective cover, etc. to shield the product from direct sunlight.**

#### **5. Shield the product from radiated heat generated by nearby heat sources.**

#### **6. Do not use the fitting in an environment where foreign matter may get stuck to or get inside the product.**

#### **7. Employ suitable protective measures in a location where there is contact with water, oil or welding spatter, etc.**

## Maintenance and Inspection

### **Warning**

#### **1. Maintenance should be performed according to the procedure indicated in the Operation Manual.**

Improper handling can cause an injury and damage and malfunction of equipment and machinery.

#### **2. Removal of equipment, and supply/exhaust of compressed air**

When equipment is serviced, first confirm that measures are in place to prevent dropping of driven objects and/or equipment running out of control, etc. Then cut the supply pressure and power, and

exhaust all compressed air from the system using its residual pressure release function.

When the equipment is to be started again after remounting, first confirm that measures are in place to prevent lurching of actuators, etc., and then confirm that the equipment can operate normally.

 **Caution**

**1. Discharging condensate**

Exhaust the drainage from an air filter periodically.

2. Be sure to wear safety goggles for regular maintenance.

**3. Please check the following points, and replace the parts as necessary:**

- 1) Scratches, damage, wear, or corrosion of the tubing.
- 2) Air leakage
- 3) Squeezing, kinking or twisting of the tubing
- 4) Hardening or deterioration of the tubing, softness of the tubing

## 2. Application

This product is designed to control the direction of a pneumatic circuit.

## 3. Specifications

Valve style	2 or 3 port valve
Fluid	Air
Proof pressure	1.5MPa
(Maximum operating pressure) <sup>Note 1)</sup>	1.0MPa
Operating vacuum pressure <sup>Note3)</sup>	-100KPa
Ambient and fluid temperature range	0 to 60 ° C (No freezing)
Applicable tube material <sup>Note1)</sup>	Nylon, soft nylon, polyurethane
Operation angle of the knob	90°
Valve leakage, external leakage	The leakage shall be 5 cm <sup>3</sup> /min(ANR) or less

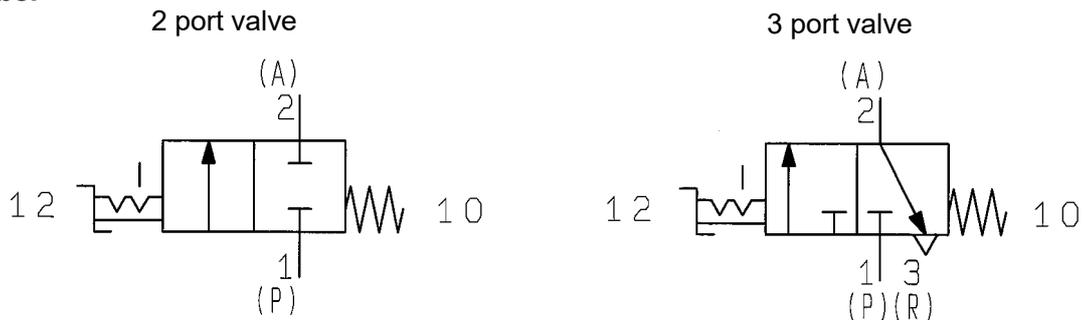
Note 1) When the product is used at 0.1MPa or less, the valve leakage will be larger than the standard value (5cm<sup>3</sup>/min(ANR)).

Note 2) Use the lesser value of the maximum operating pressure and the maximum operating temperature between the finger valve and tubing. (Maximum operating pressure of the tubing varies depending on the operating temperature.

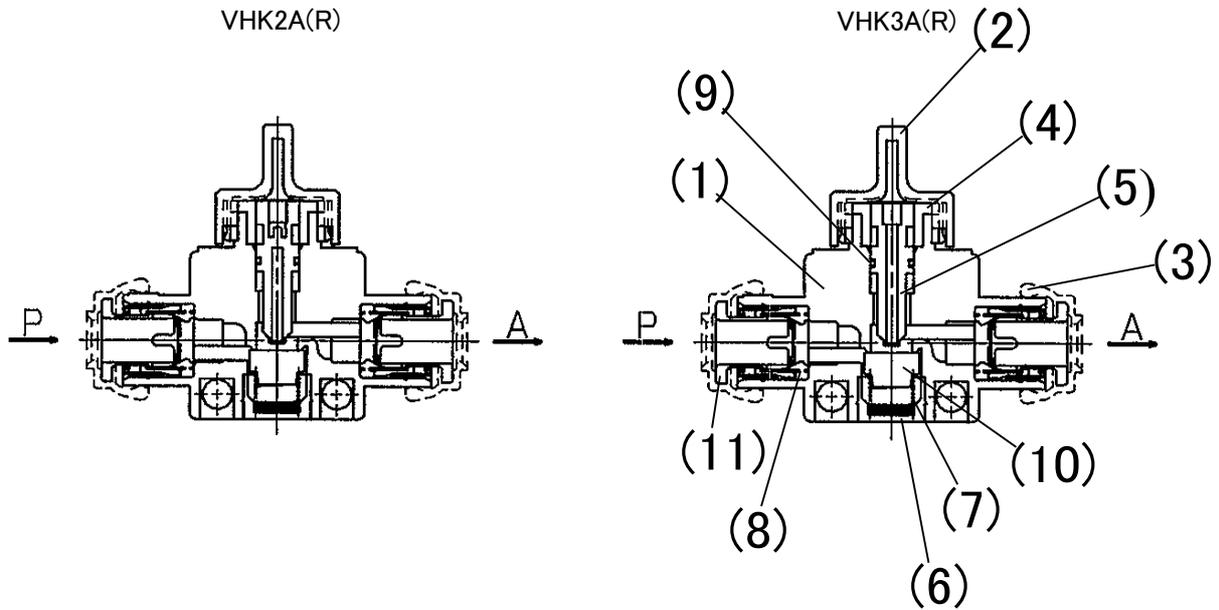
Refer to the catalog on SMC's website (URL <https://www.smcworld.com>)

Note 3) Use VHK2(2 port valve) for vacuum.

### JIS symbol



#### 4. Construction



No.	Part	Material	
		Standard type	Flame resistant type
1	Body	PBT	Flame resistant PBT (Equivalent to UL-94 standard V-0)
2	Knob	POM	Flame resistant PBT (Equivalent to UL-94 standard V-0)
3	Cover	-	Flame resistant CR (Equivalent to UL-94 standard V-0) Models with Flame resistant type cover only.
4	Cam ring	POM	
5	Stem	POM	
6	Spring guide	Brass, electroless nickel plated	
7	Spring	Stainless steel	
8	Seal	NBR	
9	O-ring	NBR	
10	Valves	NBR	
11	Cassette	POM	Flame resistant PBT (Equivalent to UL-94 standard V-0)

## 5. Replacement parts

Description	Model	
	One-touch fitting Applicable tube O.D. $\varnothing$ 8 or less	One-touch fitting Applicable tube O.D. $\varnothing$ 10 or more - 1(P)- Male thread / 2(A)- Male thread port R3/8 or larger
Component No.		
Bracket assembly <sup>Note 2)</sup>	VHK-B1A <sup>Note1)</sup>	VHK-B2A <sup>Note1)</sup>

NOTE1) Refer to the table for dimensions in catalog of VHK series on SMC's website

(URL <https://www.smcworld.com>) for selecting the bracket assembly per model.

NOTE2) Bracket assembly includes a bracket, bolts, nuts and washers.

Revision history
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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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