

# Two Hand Control Valve

An output is available through synchronised, two-handed operation (within 0.5 s)!

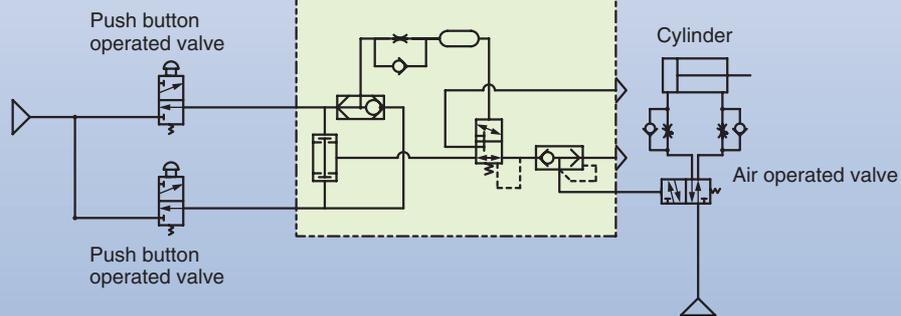


## Series VR51

Certified to type IIIA of EN574

(Interchangeable with XT92-67□)

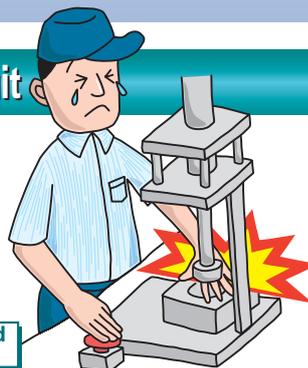
Example of a basic circuit diagram



## Equipment having a safety circuit

When starting an operation, accidents such as fingers being caught can be prevented, by requiring both hands to start these push button operated valves.

One-handed operation

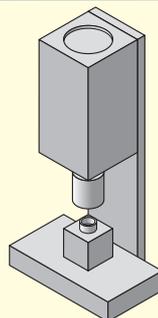


Two-handed operation

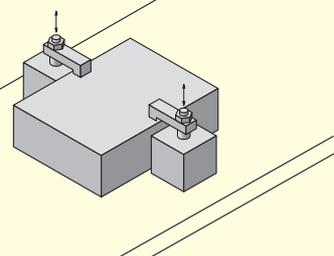


Application Examples

Press fitting with an air cylinder, Caulking

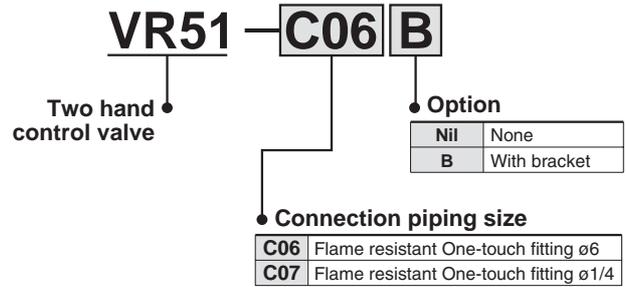
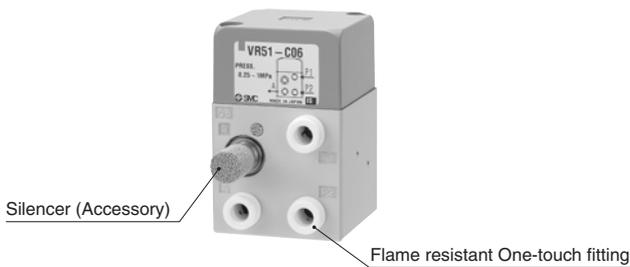


Clamping



# Two Hand Control Valve Series VR51

## How to Order



With bracket (Option)



Back side mounting



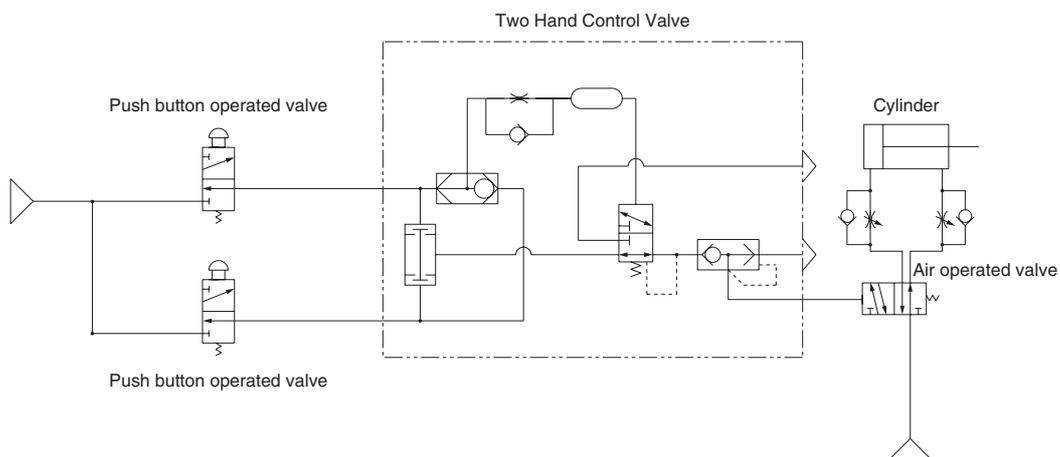
Bottom mounting

## Specifications

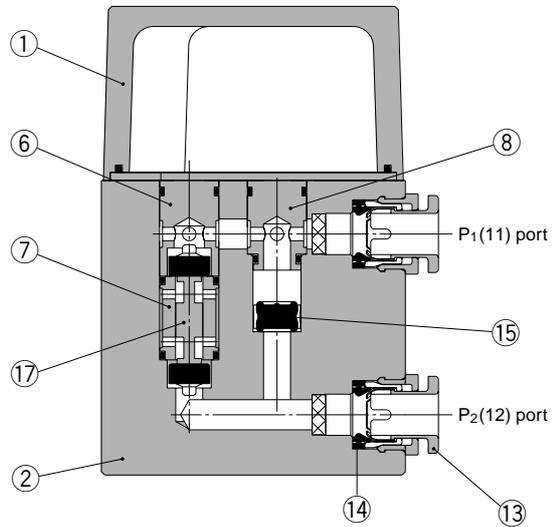
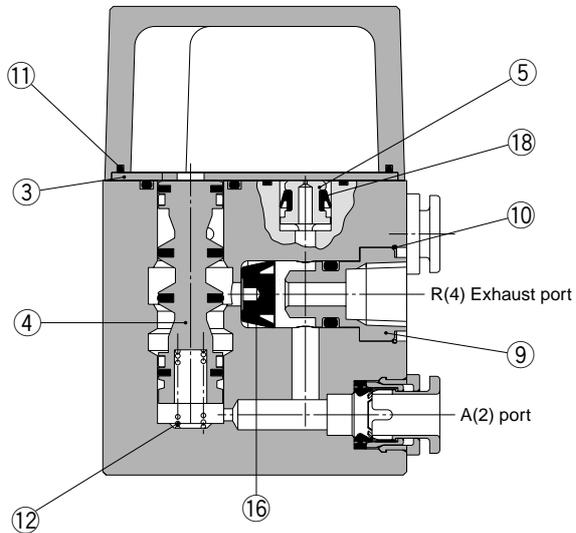
Fluid		Air		
Operating pressure		0.25 to 1 MPa		
Proof pressure		1.5 MPa		
Ambient and fluid temperature		-5 to 60°C (with no freezing)		
Flow characteristics		C[dm <sup>3</sup> /(s·bar)]	b	Cv
	P→A	0.3	—	—
	A→R	1.0	0.12	0.25
Port size	Metric size	ø6		
	Inch size	ø1/4		
Applicable tubing material (Note)		Nylon, Soft nylon, Polyurethane, Flame resistant (FR) soft nylon, FR double layer, FR double layer polyurethane		
Weight		340 g		
Accessory	Silencer	Part No.: AN101-01		
Option	Bracket	Part No.: VR51B		
EC Certifications		Type IIIA of EN574		
		Category 1 of EN954		

Note) In the case of using soft nylon or polyurethane tubing, use caution when the maximum operating pressure of the tubing is used.

## Example of a Basic Circuit Diagram



## Construction



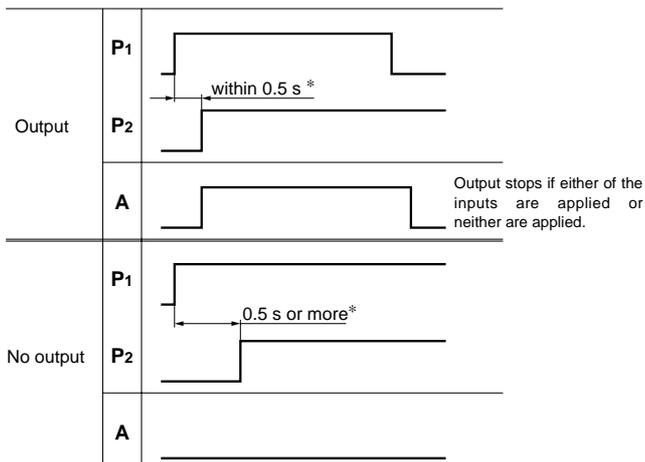
## Component Parts

No.	Description	Material	Note
1	Cover	Diecast aluminum	Urban gray
2	Body	Diecast aluminum	Urban white
3	Plate	Rolled steel	Nickel plated
4	Spool valve	Aluminum alloy	
5	Orifice	Brass	Electroless nickel plated
6	Valve seat	Aluminum alloy	
7	Valve guide B	Aluminum alloy	
8	Valve guide A	Aluminum alloy	
9	Guide	Brass	Electroless nickel plated

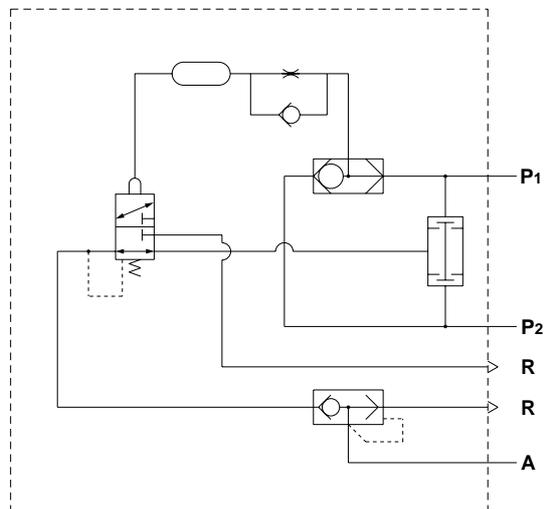
No.	Description	Material	Note
10	Clip	Stainless steel	
11	Gasket	H-NBR	
12	Spring	Stainless steel	
13	Cassette assembly		
14	Seal	NBR	
15	Valve	H-NBR	
16	Valve	NBR	
17	Valve	H-NBR	
18	U-shaped seal	H-NBR	

## Timing of Motion

\* The time lag for operation is different depending on the operating pressure. The higher the operating pressure, the shorter the time lag, and vice versa. When the operating pressure is 1 MPa, the time lag will be within approximately 0.1 seconds.

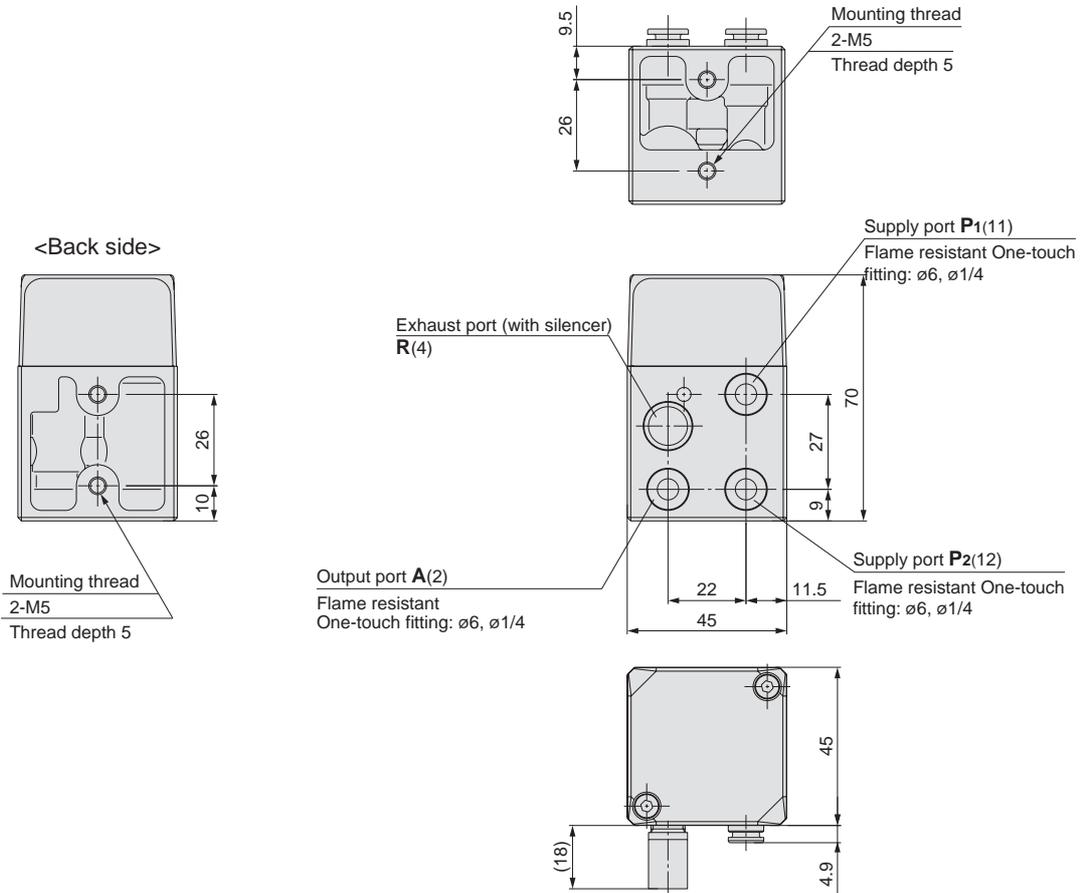


## Circuit Diagram

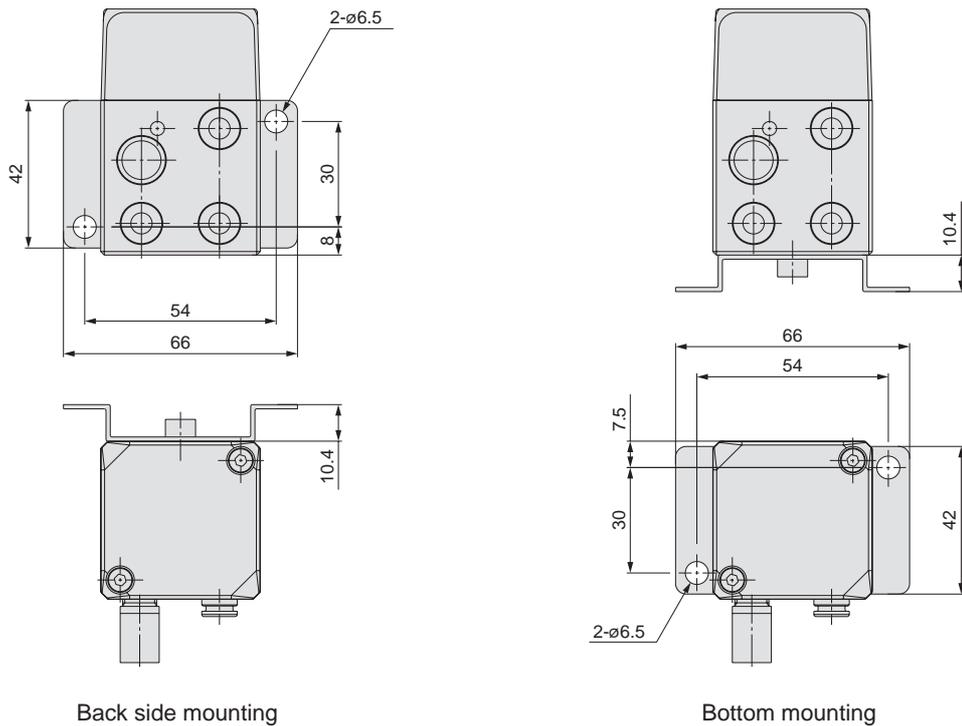


# Series VR51

## Dimensions



## Bracket mounting dimensions





Series VR51

# Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

 **Caution** : Operator error could result in injury or equipment damage.

 **Warning** : Operator error could result in serious injury or loss of life.

 **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414 : Pneumatic fluid power --General rules relating to systems

Note 2) JIS B 8370: Pneumatic system axiom

## Warning

### **1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified. Referring to the latest catalogue information with a view to giving due consideration to any possibility of equipment failure when constructing a system.

### **2. Only trained personnel should operate pneumatically operated machinery and equipment.**

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

### **3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.**

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

### **4. Contact SMC if the product is to be used in any of the following conditions:**

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.



# Two Hand Control Valve/Precautions 1

Be sure to read before handling.

## Design

### Warning

#### 1. Actuator drive

When an actuator, such as a cylinder, is to be driven using a valve, take appropriate measures to prevent potential danger caused by actuator operation.

#### 2. Maintenance space

The installation should allow sufficient space for maintenance activities (removal of valve, etc.).

#### 3. Ventilation

When a valve is used inside a sealed control panel, etc., provide ventilation to prevent a pressure increase caused by exhausted air inside the control panel or temperature rise caused by the heat generated by the valve.

## Selection

### Warning

#### 1. Confirm the specification.

The products presented in this catalogue are designed only for use in compressed air systems (including vacuum). Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to specifications.)

Contact SMC when using a fluid other than compressed air (including vacuum).

#### 2. Using in low temperature

In the case of using in low temperature, take measures not to freeze the drainage or moisture.

## Mounting

### Warning

#### 1. If air leakage increases or equipment does not operate properly, stop operation.

Check mounting conditions when air and power supplies are connected. Initial function and leakage tests should be performed after installation.

#### 2. Instruction manual

Mount and operate the product after reading the manual carefully and understanding its contents.

Also keep the manual where it can be referred to as necessary.

#### 3. Painting and coating

Warnings or specifications printed or pasted on the product should not be erased, removed or covered up.

Consult with SMC if paint is to be applied to resinous parts, as this may have an adverse effect due to the paint solvent.

### Caution

#### 1. Tubing, with the exception of coiled tubing, requires stationary installation. Do not use standard tubing (non-coiled) in applications where tubing is required to travel within a cable carrier. Tubing that travels may sustain abrasion, extension, or severance due to tensile force, or may result in removal of tubing from fitting. Use caution prior to use for proper application.

## Mounting

### Caution

#### 2. Transportation, installation, piping, operation, manipulation, maintenance, and inspection should be conducted by a knowledgeable and experienced person.

Otherwise, electric shock, injuries, fire, etc. may occur.

#### 3. Do not modify the product because this will likely cause injuries and damage.

#### 4. Do not wipe the product with a cloth containing chemicals.

## Piping

### Caution

#### 1. Preparation before piping

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 the pipe.

#### 2. When piping the product

In the case of connecting piping to the product, consult the instruction manual and use caution to avoid making a mistake with the supply port, etc.

#### 3. Connect tubing with some extra length to prevent torsion or stretching and or to prevent a moment load from being applied to the fittings and tubing. Damage to the fittings or flattening, as well as bursting and or releasing of the tubing may occur, if the above is not followed.

#### 4. The tubing connected to the product should be more than its minimum bending radius. If the minimum bending radius is tighter than that it should be, bending or flating of the tubing may occur.

The minimum bending radius is measured as following in accordance with JIS B 8381-1995.

JIS specifies the tubing deformation ratio measured at the minimum bending ratio to be 25% or less.

\* Except for the TU, TIUB, TUH, TRBU, TAU and TUS series

Tube deformation ratio at the minimum bending radius is obtained through the following formula, based on tubing diameter and mandrel diameter by wrapping the same radius mandrel tube.

$$\eta = \left(1 - \frac{L-D}{2d}\right) \times 100$$

Here,  $\eta$ : Deformation ratio (%)

d: Tube diameter (mm)

L: Measured length (mm)

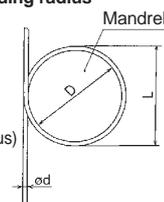
D: Mandrel diameter (mm)

(Twice against the minimum bending radius)

Test temperature: 20 ± 5°C

Relative humidity: 65 ± 5%

Tube deformation ratio at the minimum bending radius



#### 5. Do not use fluids other than specified. The only fluid that can be used is air.



# Two Hand Control Valve/Precautions 2

Be sure to read before handling.

## Handling of One-touch Fittings

### ⚠ Caution

#### 1. Tube insertion and removal from One-touch fittings

- 1) Attaching of tubing
  - a. Cut the tube perpendicularly, being careful not to damage the outside surface. Use SMC tube cutter "TK-1", "TK-2" or "TK-3". Do not cut the tube with pliers, nippers, scissors, etc., otherwise, the tube will be deformed and troubles may result.
  - b. Outside diameter of polyurethane tubing is swelled by applying internal pressure. As such, it may be that the tubing cannot be re-inserted into One-touch fittings. Make sure to confirm the tubing outside diameter, and when the accuracy of the outside diameter is more than + 0.15, insert into One-touch fitting again, not cutting the tubing to use it. When tubing is re-inserted into One-touch fitting, make sure to confirm that the tubing was able to go through the release bush smoothly.
  - c. Grasp the tube, slowly push it into the One-touch fittings until it comes to a stop.
  - d. Pull the tubing back gently to make sure it has a positive seal. Insufficient installation may cause air to leak or the tube to release.
- 2) Removal of tubing
  - a. Sufficiently depress the release bushing and tubing, making sure to apply even pressure around the release bushing.
  - b. Pull out the tubing while depressing the release bushing so that it does not pop out. If the release bushing is not depressed sufficiently, there will be an increased bite on the tubing and it will become more difficult to pull out.
  - c. When the removed tubing is reused, first cut off the section of the tubing which has been clamped. Reusing the clamped portion of the tubing can cause problems such as leakage, difficulties in removal, etc.

## Precautions on Other Tubing Brands

### ⚠ Caution

#### 1. When using tubing brands other than SMC, confirm that the tubing outside diameter tolerances satisfy the following specifications.

- |                        |                                   |
|------------------------|-----------------------------------|
| 1) Nylon tubing        | within ±0.1 mm                    |
| 2) Soft nylon tubing   | within ±0.1 mm                    |
| 3) Polyurethane tubing | within +0.15 mm<br>within -0.2 mm |

Do not use tubing if the outside diameter tolerance is not satisfied. It may not be possible to connect the tubing, or leakage or disconnection may occur after connection.

## Lubrication

### ⚠ Caution

#### 1. Lubrication

- 1) The valve has been lubricated for life at the manufacturer, and does not require any further lubrication.
- 2) If a lubrication is applied in the system, use turbine oil Class 1 (no additive), ISO VG32.  
However, once lubrication is applied it must be continued, as loss of the original lubricant may lead to malfunction.

## Lubrication

### ⚠ Caution

#### Class 1 Turbine Oil (with no additive), ISO VG32

Classification of viscosity cst (40°C)	Viscosity according to ISO Grade	32	Classification of viscosity cst (40°C)	Viscosity according to ISO Grade	32
Idemitsu Kosan Co., Ltd.	Turbine oil P-32		Kyushu Oil Co.	Stork Turbine 32	
Nippon Oil Corp.	Turbine oil 32/ Mitsubishi turbine 32		Showa Shell Sekiyu K.K.	Turbine 32	
Cosmo Oil Co., Ltd.	Cosmo turbine 32		Tonen General Sekiyu K.K.	General R turbine 32	
Japan Energy Corp.	Kyodo turbine 32		Fuji Kosan Co., Ltd.	Fucoal turbine 32	
Kygnus Oil Co.	Turbine oil 32				

Contact SMC regarding Class 2 turbine oil (with additives), ISO VG32.

## Air Supply

### ⚠ Warning

#### 1. 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.

### ⚠ Caution

#### 1. Install air filters.

Install air filters close to valves at their upstream side. A filtration degree of 5 µm or less should be selected.

#### 2. Install an air dryer, after cooler or Drain Catch, etc.

Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, after-cooler or water separator, etc.

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

If excessive carbon dust is generated by the compressor, it may adhere to the inside of valves and cause malfunction.

Refer to "SMC Best Pneumatic" catalogue for compressed air quality.

## Pneumatic Pressure

### ⚠ Warning

1. Do not use the product with a pressure of under 0.25 MPa. The time lag for operating the VR51 is different depending on the operating pressure. The higher the operating pressure, the shorter the time lag, and vice versa. If used under 0.25 MPa, an output will be available; however, safety is not likely to be maintained, even though the time lag may exceed 0.5 seconds.



# Two Hand Control Valve/Precautions 3

Be sure to read before handling.

## Operating Environment

### ⚠ Warning

1. Do not use in atmospheres where the valve is in direct contact with corrosive gases, chemicals, salt water, water or steam.
2. Do not use in locations subject to vibration or impact. Confirm the specifications in the main section of the catalogue.
3. Use a protective cover, etc., to shield valves from direct sunlight.
4. Shield valves from radiated heat generated by nearby heat sources.
5. Employ suitable protective measures in locations where there is contact with oil or welding spatter, etc.

### ⚠ Caution

1. Avoid using in a place where there is splashing oil, coolant, or water. In addition, avoid using where dust may adhere to it.

## Maintenance

### ⚠ Warning

1. Perform maintenance procedures as shown in the instruction manual.  
If handled improperly, malfunction or damage of machinery or equipment may occur.
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 work pieces and run-away of equipment, 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 or replacement, first confirm that measures are in place to prevent lurching of actuators, etc., and then confirm that the equipment is operating normally.

## Maintenance

### ⚠ Warning

3. Low frequency operation  
Valves should be switched at least once every 30 days to prevent malfunction. (Use caution regarding the air supply.)
4. Perform a periodical inspection if necessary when first starting the product to confirm that the two hand control valve is operating without fail.  
There is a probability of an unexpected malfunction and or safety may not be maintained due to misoperation.

### ⚠ Caution

1. During regular maintenance, check for the following and replace any components as necessary.
  - a) Scratches, gouges, abrasion, corrosion
  - b) Leakage
  - c) Flattening or distortion of tubing
  - d) Hardening, deterioration or softness of tubing
2. Do not repair the fittings or patch the tubing for reuse.
3. Drain flushing  
Remove drainage from air filters regularly.

## Caution on Preparing the Buttons for Manipulation

### ⚠ Caution

1. Design and prepare the buttons in accordance with instruction manuals and European directives [Safety of machinery - Two handed control equipment - Functionality aspects - Design principle] (EN574)  
If the manipulating buttons are incorrectly arranged, an unexpected motion is likely to occur and the safety cannot be maintained.

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