VR51-TFO26-A

Installation and Maintenance Manual
Original Instructions
VR51, Two Hand Control Valve

1 Safety Instructions

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.
- These instructions indicate the level of potential hazard by label of “Caution”, “Warning” or “Danger”, followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.

⚠ **Caution**	Indicates a hazard with a low level of risk, which if not avoided, could result in minor or moderate injury.
⚠ **Warning**	Indicates a hazard with a medium level of risk, which if not avoided, could result in death or serious injury.
⚠ **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 pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

  Since the products specified here can be used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet specific requirements.
- **Only trained personnel should operate pneumatically operated machinery and equipment.**

  Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced personnel.
- **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. Switch off air and electrical supplies and exhaust all residual compressed air in the system.

  3) Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Supply air into the system gradually to create back pressure, i.e. incorporate a soft-start valve).
- **Do not use this product outside of the specifications. Contact SMC if it is to be used in any of the following conditions:**

  1) Conditions and environments beyond the given specifications, or if the product is to be used outdoors.

  2) Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, 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.

⚠ Caution

- Ensure that the air supply system is filtered to 5 µm.

2 Specifications

2.1 Specifications

Fluid		Air		
Operating pressure		0.25 to 1.0 MPa		
Proof pressure		1.5 MPa		
Ambient and fluid temperature		-5 to 60°C (with no freezing)		
Flow characteristics		C[dm3/(s·bar)]	b	Cv
Operating frequency Max		10cpm		
Operating frequency Min		Once every 30 days		
Vibration & shock resistance		Do not use in a vibration environment		
Environment		Indoor use only		
P to A		0.3	-	-
A to R		1.0	0.12	0.25
Port size	Metric	Ø6		
	Inch	Ø1/4		
Applicable tube material Note)		Nylon, Soft nylon, Polyurethane, Flame resistant (FR) soft nylon, FR double layer, FR double layer polyurethane		
Weight		340g		
Accessory option	Silencer	Part No.: AN101-01		
	Bracket	Part No.: VR51B		

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

2.2 Features

- When there is a time delay of less than 0.5 seconds between the two air signal inputs, the VR51 provides an output signal.
- VR51 output stops when one of the two air signal inputs stops.
- Two simultaneous air signals resets the output.

2.3 Declaration of Conformity

A sample Declaration of conformity (DoC) for this product is shown below. An actual DoC is supplied with each product.

SMC CE

Doc. No. **K32-TFQ0003**

EC DECLARATION OF CONFORMITY

SMC Corporation
4-14-1 Soto-Kanda, Chiyoda-ku, Tokyo 101-0021 Japan
declares under sole responsibility that the following equipment:

Two Hand Control Valve
VR51
Batch No: Qo,QP,QQ,QR,QS,QT,QU,QV,QW,QX,Qy,QZ
conforms with the following directive(s) and harmonized standards:

Directive		Harmonized standards
Machinery Directive	2006/42/EC	EN 574: 1996 + A1: 2008

Name and address of the person authorised to compile the technical file:
Mr. G. Berakoetxea, Director & General Manager, SMC European Zone, SMC España, S.A.,Zuazobidea 14, 01015 Vitoria, Spain

Classification: Type IIIA

Importer/Distributor in EU and EFTA:

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Czech Republic	SMC Industrial Automation CZ s.r.o.	(420) 541-426-611	Hudcova 78a CZ-61200 Brno
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Lithuania	SMC Pneumatics Lietuva,UAB	(370)5-264-81-26	Oslo g.1, LT-04123 Vilnius
Netherlands	SMC Pneumatics B.V.	(31) 20-531-8888	De Ruyterkade 120, NL-1011 AB Amsterdam
Norway	SMC Pneumatics Norway AS	(47) 67-12-90-20	Vollsveien 13c, Granfoss Næringspark, N-1366 Lysaker
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Romania	SMC Romania S.r.l.	(40)21-3205111	Str. Frunzei, Nr.29, Sector 2 Bucharest, Romania
Slovakia	SMC Priemyselna Automatizacia, s.r.o.	(421) 2-444 56 725	Námestie Matina Benku, 10, 81107 Bratislava
Slovenia	SMC Industrijska Avtomatika d.o.o.	(386) 7388 5412	Mirnska cesta 7, SLO-8210 Trebnje
Spain	SMC España, S.A.	(34) 945-184-100	Zuazobidea 14, 01015 Vitoria
Sweden	SMC Pneumatics Sweden AB	(46) 8-603-12-00	Ekhagsvägen 29-31, SE-14171 Segeltorp
Switzerland	SMC Pneumatik AG	(41) 52-396-3131	Dorfstrasse 7, Postfach 117 CH-8484, Weisslingen
United Kingdom	SMC Pneumatics (U.K.) Ltd.	(44) 1908-563888	Vincent Avenue, Crownhill, Milton Keynes, Bucks MK8 0AN

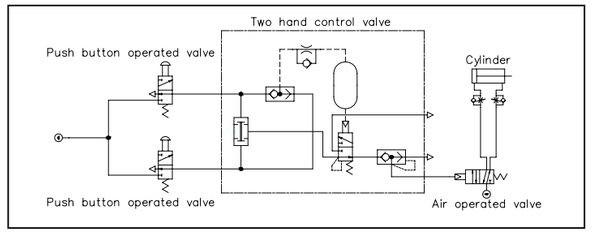
Tokyo, <Date: 11, July,2012>

M. Takeuchi

Mr. Masatoshi Takeuchi
General Manager
Product Development Division - 3

2 Specifications (Continued)

2.4 Typical Circuit



2.5 Production batch code

The production batch code printed on the label indicates the month and year of production as shown in the following table:

Production batch codes									
Year / Month		2010	2011	2012	…	2021	2022	2023	…
		H	I	J	…	Z	A	B	…
Jan	O	oo	Po	Qo	…	Zo	Ao	Bo	…
Feb	P	oP	PP	QP	…	ZP	AP	BP	…
Mar	Q	oQ	PQ	QQ	…	ZQ	AQ	BQ	…
Apr	R	oR	PR	QR	…	ZR	AR	BR	…
May	S	oS	PS	QS	…	ZS	AS	BS	…
Jun	T	oT	PT	QT	…	ZT	AT	BT	…
Jul	U	oU	PU	QU	…	ZU	AU	BU	…
Aug	V	oV	PV	QV	…	ZV	AV	BV	…
Sep	W	oW	PW	QW	…	ZW	AW	BW	…
Oct	X	oX	PX	QX	…	ZX	AX	BX	…
Nov	Y	oy	Py	Qy	…	Zy	Ay	By	…
Dec	Z	oZ	PZ	JZ	…	ZZ	AZ	BZ	…

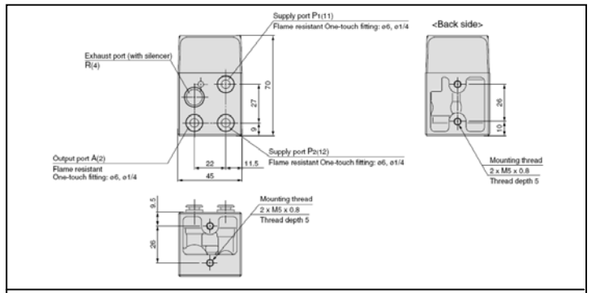
Note that lowercase letters are used in some instances.

3 Installation

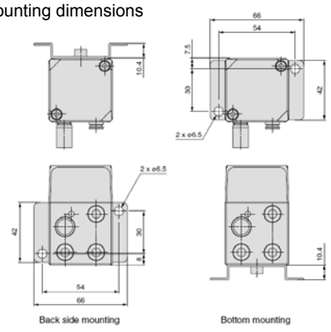
3.1 Installation

⚠ Warning

- Do not install the product unless the safety instructions have been read and understood.



Bracket mounting dimensions



Note) Order the silencer separately, see section 2.

3 Installation (Continued)

3.1 Environment

⚠ Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- 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.
- Employ suitable protective measures in locations where there is contact with oil or welding spatter etc.

⚠ Caution

- Avoid using in places where there is splashing oil, coolant or water. In addition, avoid using where dust may adhere.

3.2 Piping

⚠ Warning

- Before piping make sure to clean up chips, cutting oil, dust etc.
- When connecting piping, consult the instruction manual and use caution to avoid incorrect piping.
- Connect tubing with a longer length than required to prevent torsion, stretching or moment loads. Damage of the fittings or flattening, as well as bursting or releasing of the tubing may occur if the instructions are not followed.
- Tubing connected to the VR51 should be used at more than its minimum bend radius. If used under the minimum bend radius, bending or flattening of the tubing may occur.

  The minimum bend radius is measured in accordance with JIS B 8381-1995.

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

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

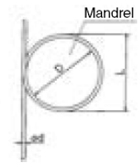
Tube deformation ratio at the minimum bend radius is obtained by the following formula, based on tube and mandrel diameter

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

Here, η: Deformation ratio (%)
d: Tube diameter (mm)
L: Measured length (mm)
D: Mandrel diameter (mm)
(Twice against the minimum bending radius)

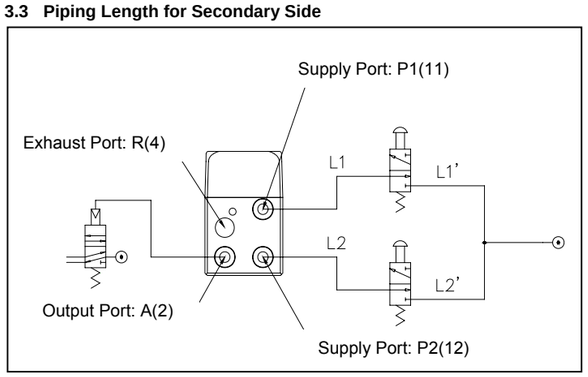
Test temperature: 20 ± 5°C
Relative humidity: 65 ± 5%

Tube deformation ratio at the minimum bending radius



- Use the same control valves for each input port.
- Use tubing of the same length and diameter between the VR51 and each control actuating device: L2=L1, L2’=L1’.
- Operate the control valves from the same pressure source.

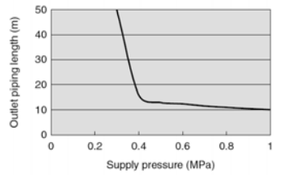
3.3 Piping Length for Secondary Side



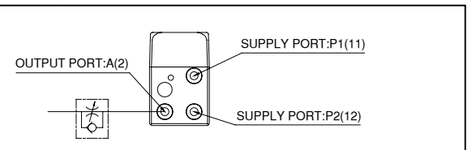
3 Installation (Continued)

When the outlet side piping length is long or the piping capacity is large due to a branch, output from the A port may not occur when the operation buttons are pressed simultaneously because the outlet pressure will rise slowly.
The applicable piping capacity for the outlet side is calculated by the tubing length of T0604 (I.D. ø4 mm). The outlet side piping length should be less than the values shown in the graph below.

Supply pressure and piping length at the outlet side



When the piping length is long or the capacity is large due to a branch, install a speed controller (AS2051F-06, AS3001F-06, etc.) close to the A port as shown in the figure below.



3.1 Lubrication

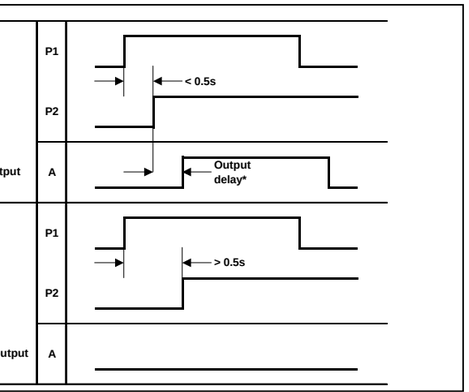
Caution

- 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.

4 Operation Timing and Output

4.1 Control timing

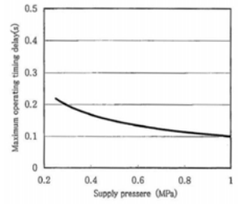
VR51 provides an output signal when there is less than 0.5 seconds difference between the two input air signals, see timing diagram below. The output delay* depends on the piping arrangement and the operating pressure. The relationship between output timing delay and pressure is given in the chart. This is for typical piping, the exact delay will depend on the application.



4 Operation Timing and Output (continued)

Output timing delay

Conditions
1, Piping: Tube: T0604 with I.D. Ø4mm
2, Piping length: Primary side 1m
Secondary side 3m
3, Connected equipment: 1 Air operated valve



5 Operating Button Setup

5.1 Preparing the buttons for use

Caution

Design and prepare the buttons in accordance with instruction manuals and European Directives. Install the button according to EN 574 Safety of machinery. Two-hand control devices. Functional aspects. Principles for design
If the operating buttons are incorrectly arranged, an unexpected motion is likely to occur and safety cannot be maintained.
Principle precautions:

- Configure the buttons so only 2 hand operation is possible, ensure it is not possible to operate by 1 hand only.
- Configure the buttons so only 2 hand operation is possible, as to ensure it is not possible to operate by forearm(s) or elbow(s).
- Configure the buttons so only 2 hand operation is possible, as to ensure it is not possible to operate by 1 hand and any other part of the body (knee or hip for example).

Example of button setup:

Ensure a safe spacing of the buttons so they cannot be operated by 1 hand



Install an isolating object between the buttons so they cannot be operated by 1 hand



Place a cover over both buttons so they cannot be operated by 1 hand



6 Maintenance

6.1 General Maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous. Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- Low frequency operation: Valves should be switched at least once every 30 days to prevent malfunction. (Use caution regarding air supply.)
- Perform a periodical inspection if necessary when first starting the product to confirm that the two hand control valve is operating without fail.

7 Air Supply

7.1 Air quality

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.

Caution

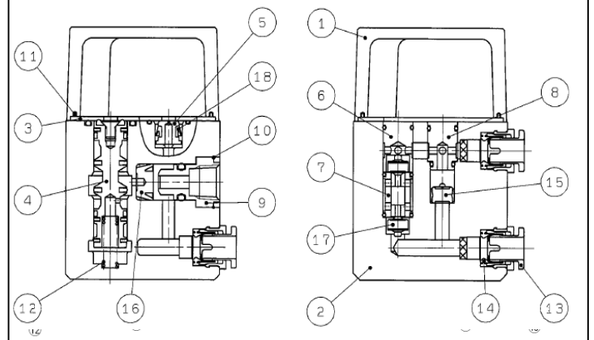
- Install air filters.
  Install air filters close to valves on the upstream side. A filtration degree of 5 µm or less should be selected.
- Install an air dryer, after cooler or water separator, etc.
  Air that includes excessive moisture may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, after-cooler or water separator, etc.
- If excessive carbon dust is present, 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's "Air Cleaning Equipment" catalogue for compressed air quality.

7.2 Pneumatic pressure

Warning

- Do not use fluids other than those specified. The only fluid that can be used is air.
- Do not use the product with a pressure 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 produced; however, safety is not likely to be maintained, even though the time lag may exceed 0.5 seconds.

8 Construction



Component Parts

No.	Description	Material	Note
1	Cover	Aluminum die-cast	Urban gray
2	Body	Aluminum die-cast	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	

9 Contacts

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