



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[dm ³ /(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-TF0003**

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:

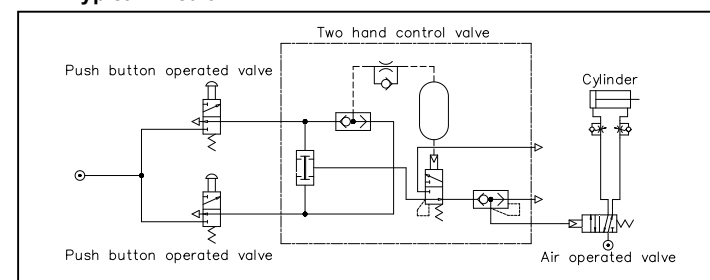
Country	Company	Telephone	Address
Austria	SMC Pneumatics GmbH (Austria)	(43) 2242-2290	Grünbühlstr. 6, AT-2103 Leopoldsdorf
Belgium	SMC Pneumatics N.V./S.A.	(32) 3-205-1664	Nieuwlandseweg 20, B-1160 Wommelgem
Bulgaria	SMC Industrial Automation Bulgaria EOOD	(359) 2-974492	Business Park Sofia, Building 8-6th Floor, BG-1715 Sofia
Czech Republic	SMC Industrial Automation C.S. s.r.o.	(420) 24-454-811	Hudcova 71a, CZ-21020 Brno
Denmark	SMC Pneumatics A/S	(45) 70 25 20 00	Engelstovvej 1, DK-4700 Hornaa
Estonia	SMC Pneumatics Estonia OÜ	(372) 661-0100	Lõuna 12, EE-10611 Tallinn
Finland	SMC Pneumatikka Finland Oy	(358) 30 7513 513	Rt 12, Tuusula, FI-02031 Espoo
France	SMC Pneumatique S.A.	(33) 1-4476-1000	1 Boulevard de Strasbourg, Parc Guillaume Estie, Bussy Saint Georges, F-71000
Germany	SMC Pneumatik GmbH	(49) 6103-262-2	Böschung 13-19, D-63303 Eschbach
Greece	SMC Hellas S.P.A.	(30) 210-217295	Araconakio 22, P.O. 14262, Nea Philadelphia, Athens
Hungary	SMC Hungary Ipari Automatizálás Kft.	(36) 23-511-300	Törökváry u. 19, HU-2045 Törökváralja
Italy	SMC Pneumatici (International) S.p.A.	(39) 043-400-9000	2003 Chiavari Business Campus, Viale Rinaldo Ossola, 20030 Chiavari, Genova, Italy
Italy	SMC Italia S.p.A.	(39) 02-9771-1	Via Ruffinetti 49, I-20081 Cinisello Balsamo, Milano
Latvia	SMC Pneumatici Latvija SIA	(371) 793-77-00	Smeļņu ielā, LV-1006, Riga
Lithuania	SMC Pneumatici Lietuva UAB	(370) 864-21-28	Osio g. 1, LT-04123 Vilnius
Netherlands	SMC Pneumatics B.V.	(31) 20-531-8888	De Ruyterkade 128, NL-1011 AB Amsterdam
Norway	SMC Pneumatics Norway AS	(47) 67-12-90-20	Vollstretet 15c, Garntorp, Næringspark, N-1360 Lysekker
Poland	SMC Industrial Automation Polska Sp. z o.o.	(48) 22-211-98-00	ul. Polkowa 89, PL-42-420 Warszawa
Portugal	SMC Societate Portugal, S.A.	(351) 21-818-9030	Rua De King Helena Dias 402, 4100-246 Porto
Romania	SMC Romania S.r.l.	(40) 21-3205111	Str. Furuzon, Nr.26, Sector 2 Bucharest, Romania
Slovakia	SMC Pneumatica Automatikas, s.r.o.	(421) 2-444-98-20	Národná Miestna Aréna, SK-11102 Bratislava
Slovenia	SMC Industrijska Avtomatika d.o.o.	(386) 7-888-5412	Mimika cesta 7, SI-0-4110 Trebnje
Spain	SMC España, S.A.	(34) 94-188-100	Zeluzeta 14, 01015 Vitoria
Sweden	SMC Pneumatics Sweden AB	(46) 8-403-12-00	Björkstamsvägen 20-23, SE-14171 Segelstorp
Switzerland	SMC Pneumatik AG	(41) 52-396-5131	Dorfstrasse 7, Postfach 117 CH-8464, Weinfelden
United Kingdom	SMC Pneumatics Ltd K-1 Ltd.	(44) 1908-503688	Venart Avenue, Coventry, CV3 9EF, UK

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

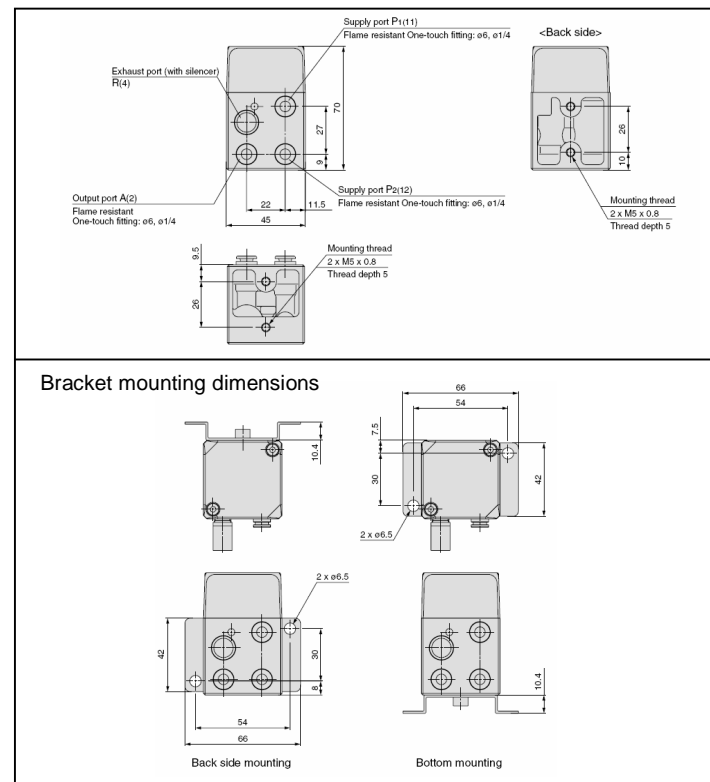
Note that lowercase letters are used in some instances.

3 Installation

3.1 Installation

Warning

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



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

Tube deformation ratio at the minimum bending radius

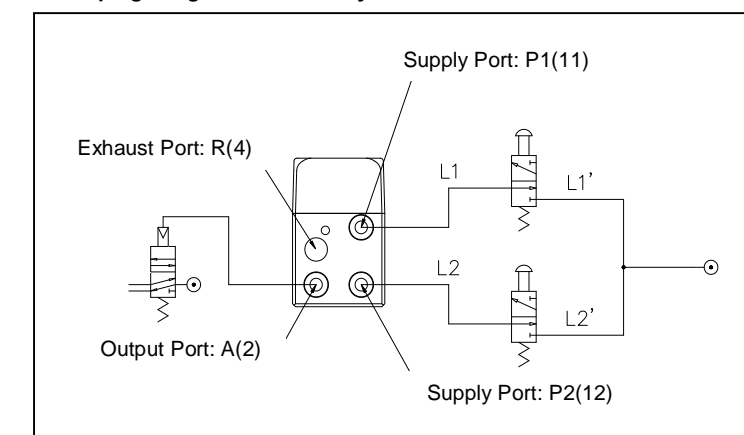
$$\eta = \left(1 - \frac{L-D}{2d}\right) \times 100$$

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%

- 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, L2φ=L1φ
- Operate the control valves from the same pressure source.

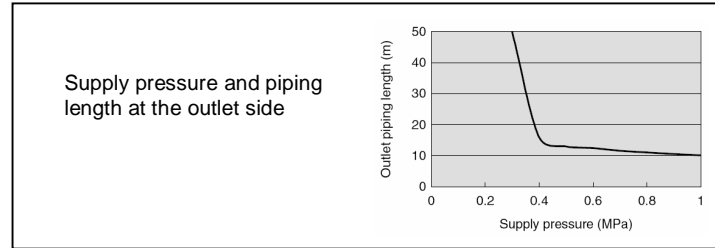
3.3 Piping Length for Secondary Side



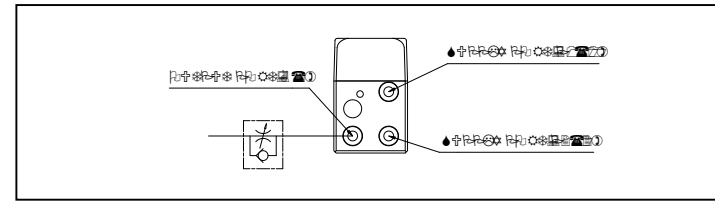
3 Installation (Continued)

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. \varnothing 4 mm). The outlet side piping length should be less than the values shown in the graph below.



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

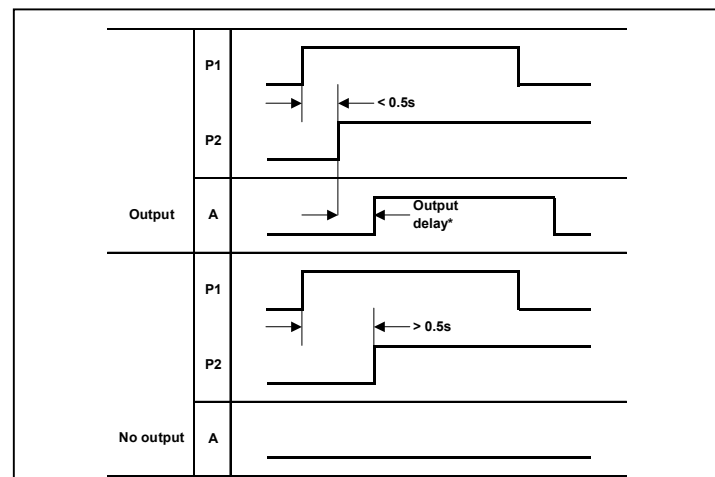
Caution

- 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.

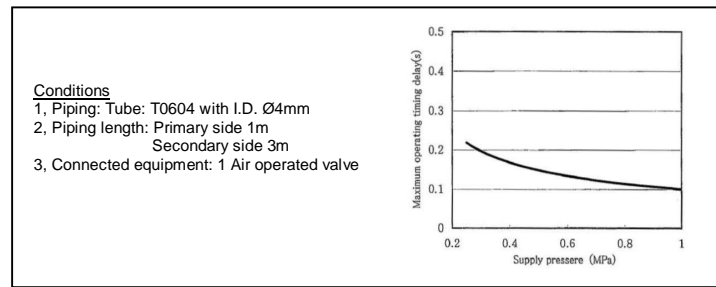
4 Operation Timing and Output

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.



Output timing delay



5 Operating Button Setup

5.1 Preparing the buttons for use

Caution

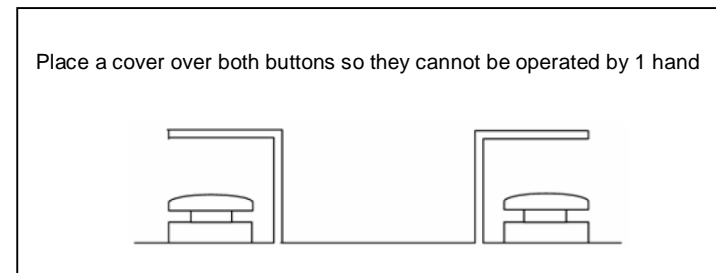
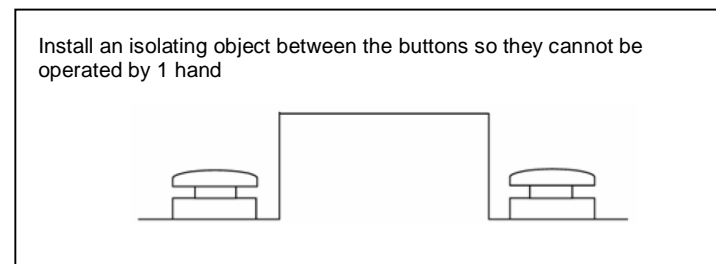
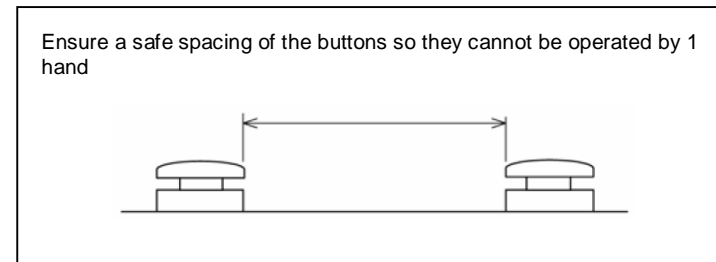
Design and prepare the buttons in accordance with instruction manuals and European Directives. Install the button according to EN 574 Safety of machinery. Two-hand control devices. Functional aspects. Principles for design

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:



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

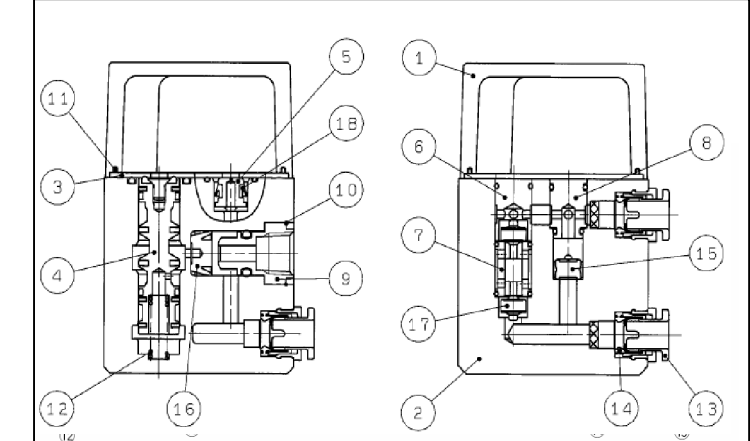
- Install air filters.
Install air filters close to valves on the upstream side. A filtration degree of 5 μ m or less should be selected.
- Install an air dryer, after cooler or water separator, etc.
Air that includes excessive moisture may cause malfunction of valves and other pneumatic equipment. To 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



No.	Description	Material	Note	No.	Description	Material	Note
1	Cover	Aluminum die-cast	Urban gray	10	Clip	Stainless steel	
2	Body	Aluminum die-cast	Urban white	11	Gasket	H-NBR	
3	Plate	Fluted steel	Nickel plated	12	Spring	Stainless steel	
4	Spool valve	Aluminum alloy		13	Cassette assembly		
5	Orifice	Brass	Electroless nickel plated	14	Seal	NBR	
6	Valve seat	Aluminum alloy		15	Valve	H-NBR	
7	Valve guide B	Aluminum alloy		16	Valve	NBR	
8	Valve guide A	Aluminum alloy		17	Valve	H-NBR	
9	Guide	Brass	Electroless nickel plated	18	U-shaped seal	H-NBR	

9 Contacts

Europe:

AUSTRIA	(43) 2262-62280-0	LATVIA	(371) 781 77 00
BELGIUM	(32) 3-355-1464	LITHUANIA	(370) 5 264 8126
BULGARIA	(359) 2 9744492	NETHERLANDS	(31) 20 531 8888
CZECH REP.	(420) 541-424-611	NORWAY	(47) 67 12 90 20
DENMARK	(45) 7025 2900	POLAND	(48) 22 211 9600
ESTONIA	(372) 651 0370	PORTUGAL	(351) 21 471 1880
FINLAND	(358) 207 513513	ROMANIA	(40) 21 320 5111
FRANCE	(33) 1-6476-1199	SLOVAKIA	(421) 2 444 56725
GERMANY	(49) 6103-402-0	SLOVENIA	(386) 73 885 412
GREECE	(30) 210-2717265	SPAIN	(34) 945 184 100
HUNGARY	(36) 23-511-390	SWEDEN	(46) 8 603 1200
IRELAND	(353) 1-403-9000	SWITZERLAND	(41) 52 396 3131
ITALY	(39) 02 92711	UNITED KINGDOM	(44) 1908 563888

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SMC Corporation

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