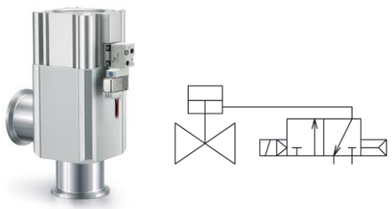
ORIGINAL INSTRUCTIONS

Instruction Manual

High Vacuum Angle Valve

Series XLAV-2

Refer to Declaration of Conformity for relevant Directives



The intended use of this product is isolation between vacuum pump and chamber.

Refer to product catalogues for additional information.

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) *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 10218-1: 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.

⚠ **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

- **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.**
  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.**
  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.

1 Safety Instructions - continued

3) 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.**
  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, 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.
  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.
- **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 General Specifications

Valve type		Normally closed
Fluid		Inert gas
Operating temperature range		5 to 50 °C
Operating pressure range		Atmospheric pressure to 1 x 10^{-6} Pa
Min. operating pressure		1 x 10^{-6} Pa
Pilot pressure range		0.4 to 0.7 MPa
Leakage Note 1)	Internal	1.3 x 10^{-10} Pa·m^3/s
	External	1.3 x 10^{-11} Pa·m^3/s
Body material		Aluminum alloy
Seal material		FKM
Other material in contact with gas		Stainless steel

Note 1) Leakage when the ambient temperature is at 20°C. Gas permeation is not included.

2.2 Pilot Valve Coil Specifications

Electrical entry	Grommet, L plug connector, M plug connector, M8 connector
Rated voltage	24 VDC, 12VDC
Allowable voltage fluctuation	±10% of rated voltage
Allowable leakage voltage	3% or less of rated voltage
Power consumption W	0.35 (with light: 0.4)
Surge voltage suppressor	Diode (Non-polar type: Varistor)
Indicator light	LED

2.3 Connection / Flow specifications

Model	Flange Type	Flange Size	Conductance L/s Note 1)	Weight kg
XLAV-16-2	KF	16	5	0.33
XLAV-25-2	KF	25	14	0.52
XLAV-40-2	KF	40	45	1.2
XLAV-50-2	KF	50	80	1.8
XLAV-63-2	KF/K	63	180	3.2
XLAV-80-2	KF/K	80	200	5.2

Note 1) Conductance is the value for the elbow with the same dimensions.

2.4 Auto Switch specifications (Option)

2.4.1 Solid state switch

Model	D-M9N	D-M9P	D-M9B
Wiring	3 wire		2 wire
Output	NPN	PNP	-

2 Specifications - continued

Application	IC circuit / Relay / PLC		24 VDC Relay / PLC
Power voltage	5 / 12/ 24 VDC (4.5 to 28 VDC)		-
Current consumption	10 mA or less		-
Load voltage	28 VDC or less	-	24 VDC (10 to 28 VDC))
Load current	40 mA or less		2.5 to 40 mA
Internal voltage drop	0.8 V or less at 10 mA load current (2 V or less at 40 mA)		4 V or less
Current leakage	100 mA or less at 24 VDC		0.8 mA or less
Operating time	1 ms or less		
Indicator light	Operating position : Red LED lights up		
Insulation resistance	50 MΩ or more at 500 VDC mega		
Withstand voltage	1000 VAC for 1 minute (between terminals and housing)		
Enclosure	IEC60529 standard IP67, JISC0920		

2.4.2 Reed switch

Model	D-A93	D-A90	
Wiring	2 wire		
Application	Relay / PLC	Relay / PLC / IC circuit	
Load voltage	24 VDC	24 V_{DC}^{AC} or less	48 V_{DC}^{AC} or less
Load current	5 to 40 mA	50 mA	40 mA
Internal voltage drop	2.4 V or less (up to 20 mA) 3 V or less (up to 50 mA)	-	
Internal resistance	-	1 Ω or less (including 3m lead wire)	
Contact protection circuit	None		
Operating time	1.2 ms		
Indicator light	Operating position : Red LED lights up		
Insulation resistance	50 MΩ or more at 500 VDC mega		
Withstand voltage	1500 VAC for 1 minute (between terminals and housing)		
Enclosure	IEC60529 standard IP67, JISC0920		

3 Installation

⚠ Warning

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

3.1 Selection

3.1.1 Type of fluid

Before using actual fluid, check whether it is compatible with the materials of component parts.

3.1.2 Fluid quality

- Air

Use clean air.
Do not use compressed air that contains chemicals, synthetic oils that include organic solvents, salt, corrosive gases, etc., as it can cause damage or malfunction.
Install an air filter, if necessary.
Install an air filter close to the valve on the upstream side.

- Vacuum

Avoid the entry of foreign matter.

3.1.3 Ambient environment

Use within the operable ambient temperature range. Check the compatibility between the product’s materials and any fluid contained in the ambient atmosphere. Ensure that any harmful fluid used does not touch the external surface of the product.

3.1.4 Countermeasures against static electricity

Take measures to prevent static electricity since some fluids can cause it.

3 Installation - continued

⚠ Caution

3.1.1 Leakage voltage

Particularly when using a resistor in parallel with a switching element and when using a C-R element (surge voltage suppressor) to protect the switching element, take note that leakage current will flow through the resistor, C-R element, etc., which may prevent the valve from turning off.

Ensure that any leakage current, when the switching element is OFF, meets the following limits:

DC coil: 3% or less of the rated voltage

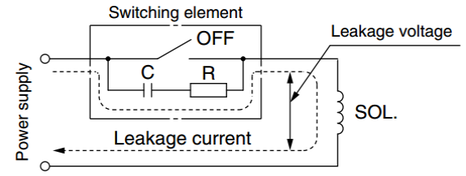


Figure 1

3.2 Valve Mounting

⚠ Warning

- **If air leakage increases or equipment does not operate properly, stop operation.**
  After mounting is completed, confirm that it has been done correctly by performing a suitable function test.
- **Do not warm the coil assembly with a heat insulator, etc.**
  Use tape, heaters, etc., for freeze prevention on the piping and body only. Warming the coil can cause it to burn out.
- **Avoid sources of vibration, or adjust the arm from the body to the minimum length so that resonance will not occur.**
- **Painting and coating**
  Warnings or specifications printed or labelled on the product should not be erased, removed, or covered up.

3.3 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 from nearby sources.
- Employ suitable protective measures in locations where there is contact with water droplets, oil or welding splatter, etc.
- In high humidity environments, keep valves packed until the time of installation.

3.4 Piping

⚠ Caution

- Before piping make sure to clean out chips, cutting oil, dust etc.
- Prepare piping by cleaning the sealing surface with ethanol etc.
- Perform piping so that excessive force is not applied to the flange sections. In case there is vibration of heavy objects or attachments, secure them so that torque is not applied directly to the flanges.
- When mounting the fitting to the pilot port, mount it so that the solenoid valve and plate are secured at the same time.

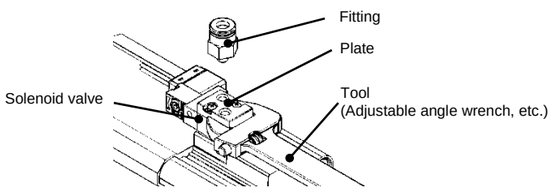


Figure 2

3 Installation - continued

3.5 Precautions on Design

Caution

- **Not suitable for use as an emergency shut-off valve, etc.**
  These valves are not designed for safety applications such as an emergency shutoff valve.
  If the valves are used for the mentioned applications, additional safety measures should be adopted.

- **Extended periods of continuous energization.**

Caution hot surface

∗ Be aware that the valve surface may get hot.
The solenoid coil will generate heat when continuously energized, so avoid installing in an enclosed space. Install in a well-ventilated area.
Do not touch the coil while it is being energized or immediately after energization.

3.6 Wiring (Solenoid valve)

3.6.1 How to use plug connector

Caution

Attaching and detaching connectors

- To attach a connector, hold the lever and connector unit between your fingers and insert straight onto the pins of the solenoid valve so that the lever's pawl is pushed into the groove and locks.

- To detach a connector, remove the pawl from the groove by pushing the lever downward with your thumb, and pull the connector straight out.

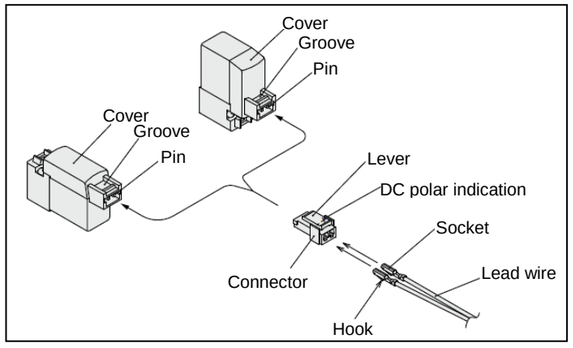


Figure 3

Crimping connection of lead wire and socket
Strip 3.2 to 3.7 mm at the end of lead wires, insert the end of the core wires evenly into the sockets, and then crimp it by a crimping tool. When this is done, take care that the coverings of the lead wires do not enter the core wire crimping area.
(Please contact SMC for the dedicated crimping tools.)

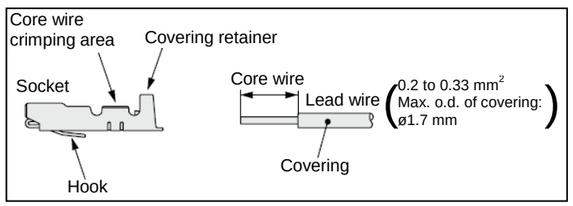


Figure 4

3 Installation - continued

Attaching and detaching lead wires with sockets

- **Attaching**

Insert the sockets into the square holes of the connection (+,- indication), and continue to push the sockets all the way in until the lock by hooking into the seats in the connector.
(When they are pushed in, their hooks open and they are locked automatically.) Then confirm that they are locked by pulling lightly on the lead wires.

- **Detaching**

To detach a socket from a connector, pull out the lead wire while pressing the socket's hook with a stick having a thin tip (approx. 1 mm).

If the socket will be used again, first spread the hook outward.

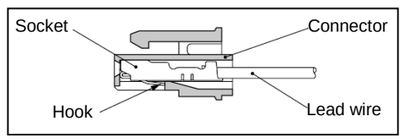


Figure 5

3.6.2 Surge voltage suppressor

- **Grommet, L/M Plug Connector**

▪ **Standard type (With polarity)**

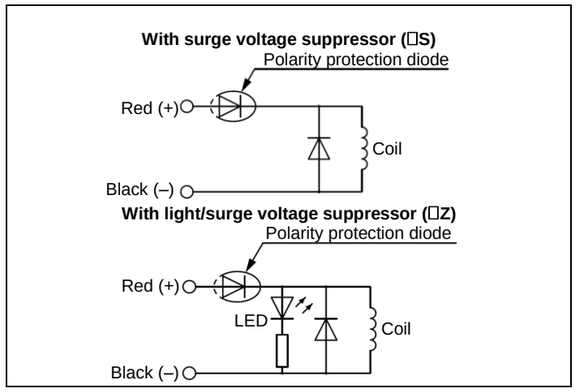


Figure 6

▪ **Non-polar type**

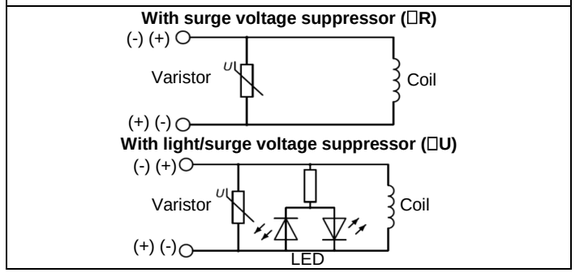


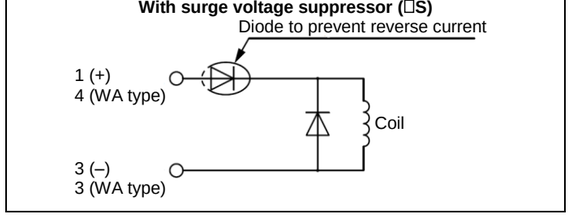
Figure 7

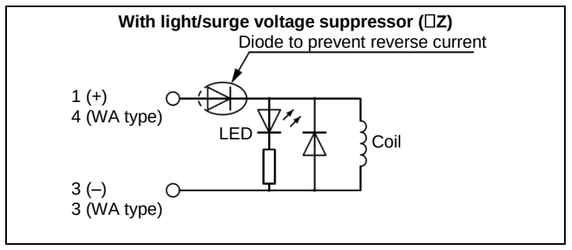
3 Installation - continued

- Connect the standard type in accordance with the +, - polarity indication (the non-polar type can be used with the connections made either way)
- When wiring is done at the factory, positive (+) is red and negative (-) is black.

- **M8 Connector**

▪ **Standard type (With polarity)**





▪ **Non-polar type**

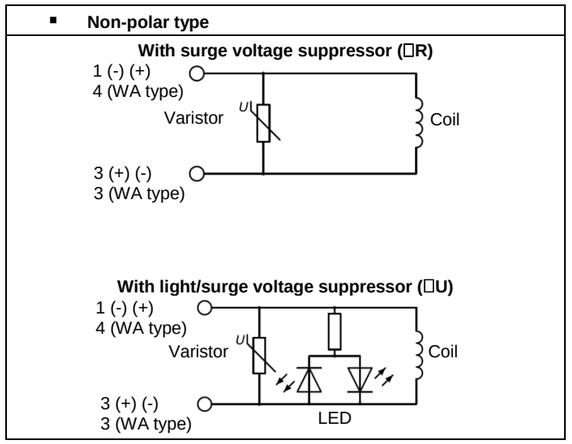


Figure 8

Solenoid valve side pin wiring diagram

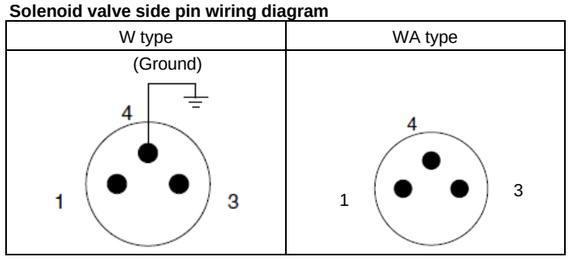


Figure 9

3 Installation - continued

- For the standard type, connect + to 1 and – to 3 for Type W according to polarity, while + to 4 and – to 3 for Type WA.
- For DC voltages other than 12 V and 24 V, incorrect wiring will cause damage to the surge suppressor circuit.
- The WA-type valve cannot be grounded.

3.7 Wiring (Auto switch) - option

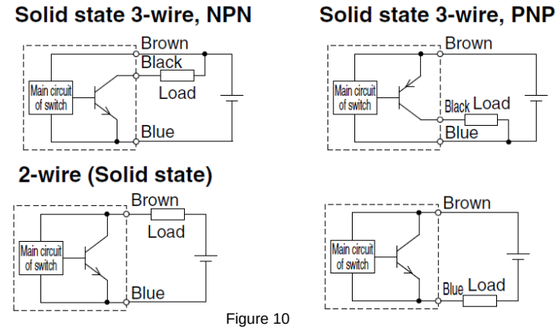


Figure 10

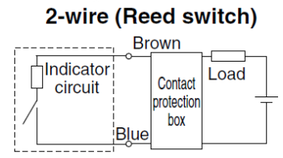


Figure 11

- Avoid repeatedly bending or stretching lead wires.
  Broken lead wires can result from wiring layouts which repeatedly applying bending stress or tensile force to the lead wires.
- Be sure to connect the load before power is applied.
  If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged due to excess current.
- Confirm proper insulation of wiring.
  Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.) Damage may occur due to excess current flowing into the switch.
- Do not route the wires with power lines or high voltage lines.
  Route wires separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit.
  Control circuits containing auto switches may malfunction due to noise from these other lines.
- Do not allow short circuit of loads.
  If the power is turned ON with a load in a short circuit condition, the switch will be instantly damaged because of excess current flow into the switch.
- Avoid incorrect wiring.
  A 24 VDC switch with indicator light has polarity. The No.1 pin is (+), and the No.4 pin is (-)
  *If connections are reversed, a switch will operate, however, the light emitting diode will not light up.
  Note that exceeding the specified current greater will damage the light emitting diode. It will no longer operate.

3.8 Manual override (Solenoid valve)

Warning

Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Connected actuator is started by manual operation. Use the manual override after confirming that there is no danger.

■Non-locking push type (Standard)
Press in the direction of the arrow.

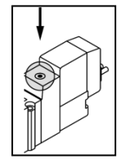


Figure 12

4 How to Order

XLAV – 16 ☐ G – 2 M9N A – 5 G ☐ – Q

Flange size

16	16
25	25
40	40
50	50
63	63
80	80

Flange type

		Applicable flange size
Nil	KF	16,25,40,50,63,80
D	K	63,80

Indicator/solenoid valve direction

		Solenoid valve direction
F	With indicator	Left flange surface
G		Rear flange surface
J		Right flange surface
K	Without indicator	Left flange surface
L		Rear flange surface
M		Right flange surface

Auto switch option

Nil	Without switch	Without magnet
M9N(M)(L)(Z)	D-M9N(M)(L)(Z)	Solid state switch
M9P(M)(L)(Z)	D-M9P(M)(L)(Z)	
M9B(M)(L)(Z)	D-M9B(M)(L)(Z)	
A90(L)	D-A90(M)(L)(Z)	Reed switch (Not applicable to size 16)
A93(M)(L)(Z)	D-A93(M)(L)(Z)	
M9//	Without switch	With magnet

Rated Voltage

5	24 VDC
6	12 VDC

Number of auto switch/position

Nil	Without switch	-
A	2pcs.	Open & Closed
B	1pc.	Open
C	1pc.	Closed

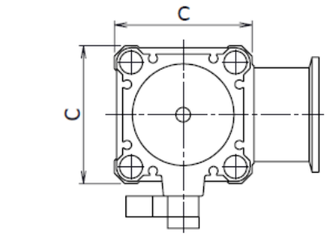
Light/surge voltage suppressor

Nil	None
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
R	With surge voltage suppressor (Non-polar type)
U	With light/surge voltage suppressor (Non-polar type)

Electrical entry

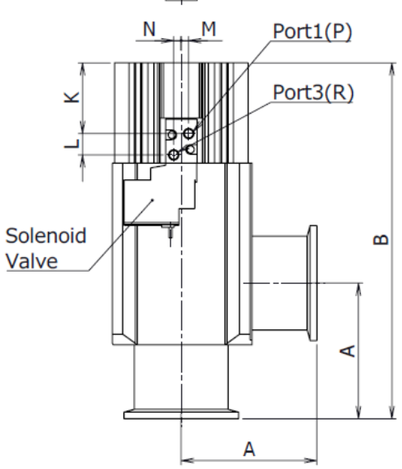
G	Grommet (Lead wire 300mm)
H	Grommet (Lead wire 600mm)
L	L plug connector
LN	L plug connector (without lead wire)
LO	L plug connector (without connector)
M	M plug connector
MN	M plug connector (without lead wire)
MO	M plug connector (without connector)
WO	M8 connector (without connector)
WAO	M8 connector (without connector)

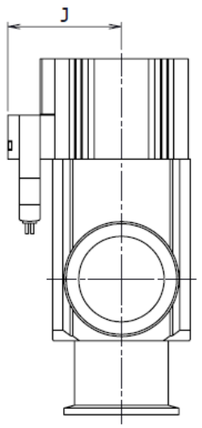
5 Outline Dimensions (mm)



Dimensions [mm]

Model	A	B	C	J	K	L	M	N	Port1 Size	Port3 Size
XLAV-16-2	40	108	38	41	17.2	10.2	3.6	3.6	M5	M5
XLAV-25-2	50	121	48	46	21.4	10.2	3.6	3.6	M5	M5
XLAV-40-2	65	171	66	54.5	33.9	10.2	3.6	3.6	M5	M5
XLAV-50-2	70	185	79	61	38.2	10.2	3.6	3.6	M5	M5
XLAV-63-2	88	212	100	80.5	43.8	12	4	2	Rc1/8	M5
XLAV-80-2	90	257	117	90.5	59.8	12	4	2	Rc1/8	M5





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.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modifications to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

7 Limitations of Use

7.1 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[(1)]. 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.

  [(1)] 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

Do not exceed any of the specifications laid out in section 2 of this document or the specific product catalogue.

7 Limitations of use - continued

⚠ Warning

If a safe output from a safety relay or PLC is used to operate this valve, ensure that any output test pulse duration is shorter than 1 ms to avoid the valve solenoid responding.

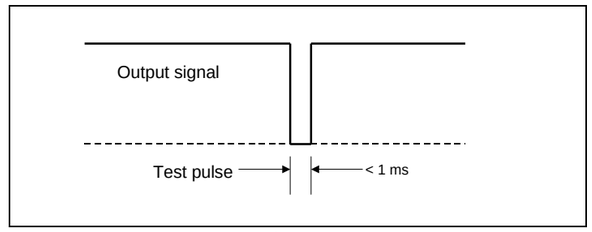


Figure 13

8 Contacts

AUSTRIA	SMC Pneumatik GmbH,Girakstrasse 8, AT-2100 Korneuburg
BELGIUM	SMC Pneumatics N.V./S.A. Nijverheidsstraat 20, B-2160 Wommelgem
BULGARIA	SMC Industrial Automation Bulgaria EOOD, Business Park Sofia, Building 8-6th floor, BG-1715 Sofia
CROATIA	SMC IndustrijskaAutomatikad.o.o. ZagrebačkaAvenija 104,10 000 Zagreb
CZECH REP.	SMC Industrial Automation CZ s.r.o. Hudcova 78a, CZ-61200 Brno
DENMARK	SMC Pneumatik A/S,Egeskovvej 1, DK-8700 Horsens
ESTONIA	SMC Pneumatics Estonia Oü,Laki 12, EE-10621 Tallinn
FINLAND	SMC Automation Oy, PL72, Tiistinniityntie 4, SF-02031 Espoo
FRANCE	SMC France, 1, Boulevard de Strasbourg, Parc Gustave Eiffel, Bussy Saint Georges, F-77607 Marne La ValleeCedex 3
GERMANY	SMC Deutschland GmbH, Boschring 13-15, 63329 Egelsbach
GREECE	SMC Italia Hellas Branch, Anagenniseos 7-9-P.C. 14342 N.Philadelphia, Athens
HUNGARY	SMC Hungary IpariAutomatizálásiKft.Torbágy u. 19, HU-2045 Törökbálint
IRELAND	SMC Pneumatics (Ireland) Ltd.2002 Citywest Business Campus, Naas Road, Saggart, Co. Dublin
ITALY	SMC Italia S.p.A.Via Garibaldi 62, I-20061Carugate, (Milano)
LATVIA	SMC Pneumatics Latvia SIA, Dzelzavas str. 120g, Riga, LV-1021,
LITHUANIA	UAB “SMC Pneumatics”, Oslo g. 1, LT-04123 Vilnius
NETHERLANDS	SMC Pneumatics B.V.De Ruyterkade 120, NL-1011 AB Amsterdam
NORWAY	SMC Pneumatics Norway AS, Vollsveien 13 C, GranfosNæringspark, N-1366 Lysaker
POLAND	SMC Industrial Automation, Polska Sp z o.o. 02-826 Warszawa, ul. Poloneza 89
PORTUGAL	SMC Sucursal Portugal, S.A.Rua De Eng Ferrerira Dias 452 4100-246, Porto
ROMANIA	SMC Romania S.r.l. StrFrunzei 29, Sector 2, Bucharest
RUSSIA	SMC Pneumatik LLC. Business centre, building 3, 15 Kondratjevskij prospect, St.Petersburg, 195197
SLOVAKIA	SMC PriemyselnáAutomatizáciaSpols.r.o. Fantranská 1223, Teplickanadvahom, 01301
SLOVENIA	SMC IndustrijskaAvtomatikad.o.o. Mirnskacesta 7, SLO-8210 Trebnje
SPAIN	SMC España S.A. Zuazobidea 14, 01015 Vitoria
SWEDEN	SMC Pneumatics Sweden AB,Ekhagsvägen 29-31, SE-141 71 Segeltorp
SWITZERLAND	SMC Schweiz AG,Dorfstrasse 7, Postfach, 8484 Weisslingen,
TURKEY	SMC PnömatikSanayiTicaretveServis A.Ş. GülbaharCaddesi, Aydın Plaza, No: 9/4 Güneşli – 34212 , Istanbul
UK	SMC Pneumatics (U.K.) Ltd. Vincent Avenue, Crownhill, Milton Keynes, Buckinghamshire MK8 0AN

SMC Corporation

URL : http// www.smcworld.com (Global) http// www.smceu.com (Europe)
'SMC Corporation, Akihabara UDX15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101 0021
Specifications are subject to change without prior notice from the manufacturer.

Template DKP50047-F-085G