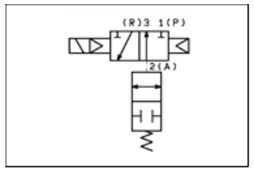
ORIGINAL INSTRUCTIONS

Instruction Manual
High Vacuum Angle Valve
XLAV/XMAV/XYAV-Q Series



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

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: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

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

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

2 Specifications

2.1 General specifications

Model		XLAV XMAV XYAV-16/25/40/50	XLAV XMAV XYAV-63/80/100/160
Valve type		Normally closed	
Fluid		Inert gas under vacuum	
Fluid and ambient temperature range [°C]		5 to 50	
Operating pressure [Pa]		Atmospheric to 1 x 10^{-6}	
Leakage [Pa m^3/s]	Internal	1.3 x 10^{-10} at ordinary temperatures – excluding gas permeation	
	External	1.3 x 10^{-11} at ordinary temperatures – excluding gas permeation	
Pilot pressure range [MPa]		0.4 to 0.7	

Conductance [L/s] Note 1)	5	14	45	80	160	200	300	800
Pilot port size	M5				P: Rc1/8 R: M5			
Flange Type Note 2)	KF				KF / K			

Table 1.

Note 1) Conductance is the value for the elbow with the same dimensions.
Note 2) CF type flange available for XMA(V) sizes 16, 40 and 63. See catalogue for dimensions.

2 Specifications - continued

2.2 Material specifications

Model	XLAV	XMAV	XYAV
Body material	Aluminium alloy	Stainless steel 304	
Seal material	FKM		
Other materials in contact with fluid	Stainless steel		

Table 2.

2.3 Weight specifications

Model		XLAV	XMAV	XYAV
Weight [kg] Note 1)	X*AV-16	0.29	0.37 (0.41)	-
	X*AV-25	0.49	0.65	0.7
	X*AV-40	1.14	1.44 (1.8)	1.46
	X*AV-50	1.64	2.04	2.44
	X*AV-63	2.96	3.66 (5.02)	4.36
	X*AV-80	5.06	6.26	7.76
	XLAV-100	10.7	-	-
	XLAV-160	18.6	-	-

Table 3.

Note 1) Figures in ( ) indicates the weight with CF (conflate) fittings.

2.4 Pilot valve coil specifications

Electrical entry	Grommet, L plug connector, M plug connector, M8 connector
Rated voltage	24 VDC, 12 VDC
Allowable voltage fluctuation [%]	±10 of rated voltage
Allowable voltage leakage [%]	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

2.5 Auto switch specifications (option)

2.5.1 Solid state switch

Model	D-M9N	D-M9P	D-M9B
Wiring	3 wire		2 wire
Output	NPN	PNP	-
Application	IC circuit / Relay / PLC		24 VDC Relay / PLC
Power voltage [V]	5 / 12 / 24 (4.5 to 28) DC		-
Current [mA]	10 or less		-
Load voltage [V]	28 DC or less	-	24 DC (10 to 28 DC)
Load current [mA]	40 or less		2.5 to 40
Voltage drop [V]	0.8 or less (at 10 mA load) 2 or less (at 40 mA load)		4 or less
Current leakage [mA]	0.001 or less (at 24 VDC)		0.8 or less
Operating time [ms]	1 or less		
Indicator light	Red LED ON (operating position)		
Insulation resistance [MΩ]	50 more (at 500 VDC)		
Withstand voltage [V]	1000 for 1 minute (AC) (between lead wire and case)		
Enclosure	IEC60529 standard IP67, JISC0920		

Table 4.

2.5.2 Reed switch specifications

Model	D-A93	D-A90	
Wiring	2 wire		
Application	Relay / PLC	IC circuit / Relay / PLC	
Load voltage [V]	28 or less	24 or less	48 or less
Load current [mA]	5 to 40	50	40
Voltage drop [V]	2.4 or less (up to 20 mA load) 3 or less (up to 40 mA load)	-	
Internal resistance [Ω]	-	1 or less (including 3m wire)	
Contact protection	None		

Operating time [ms]	1.2
Indicator light	Red LED ON (operating position)
Insulation resistance [MΩ]	50 more (at 500 VDC)
Withstand voltage [V]	1500 for 1 minute (AC) (between lead wire and case)
Enclosure	IEC60529 standard IP67, JISC0920

Table 5.

Warning

Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

3 Installation

3.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.
- Use clean air. Do not use 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 close to the valve on the upstream side.
- Use within stated ambient temperature range. Check the compatibility of product's materials with any fluid contained in the ambient atmosphere. Ensure that any harmful fluid used does come into contact with the external surface of the product.
- Take measures to prevent static electricity since some fluids can cause static electricity.
- Not suitable for use as an emergency shutoff valve. 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 measured should be adopted.
- Be aware that the valve surface may get hot if operated continuously. The solenoid coil will generate heat when continuously energized, so avoid installing it in an enclosed space.
- Do not touch the coil while it is being energized or immediately after energization.

3.2 Vacuum piping

Warning

- Before piping make sure to clean up chips, cutting oil, dust etc. Clean the surface of the flange seal and the O-ring with ethanol, etc.
- Be sure that the flange O-ring is compressed by 15% or more.
- In high humidity environments, keep in packaged condition until just before piping.
- Seal part on flange is protected, but for safety reasons, do not handle.
- 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.

3.3 Leakage voltage

Caution

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. Suppressor residual voltage leakage should be as follows:

DC coil: 3% or less of the rated voltage

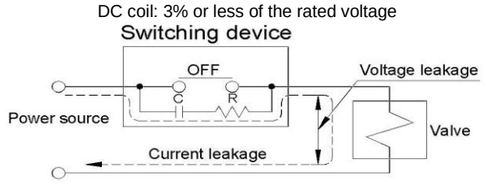


Figure 1.

3 Installation - continued

3.4 Valve mounting

Warning

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If leakage increases or equipment does not operate properly, stop operation.
- After mounting is complete, confirm that it was 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 the body only. 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.
- Warnings or specifications printed or labelled on the product should not be erased, removed, or covered up.

3.5 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 in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Employ suitable protective measures in locations where there is contact with water droplets, oil or welding splatter, etc.

3.6 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, refer to catalogue for details.

3.7 Piping (fitting)

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque. A reference value for the tightening torque is below.

Port Size	Tightening torque
M5	1 to 1.5 N.m
Rc1/8	3 to 5 N.m

Table 6.

- When mounting the fitting to the pilot port, mount it so that the solenoid valve and plate are secured at the same time.

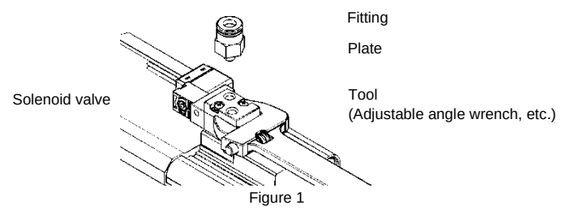


Figure 1

3.8 Wiring (solenoid valve)

3.8.1 How to use plug connection

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

3 Installation - continued

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

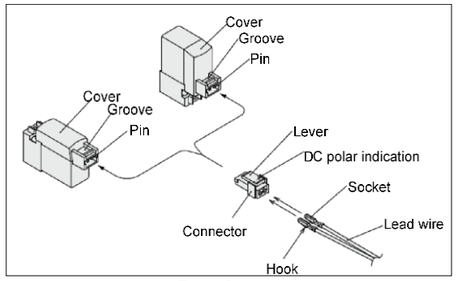


Figure 3.

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 (contact SMC for the dedicated crimping tools).

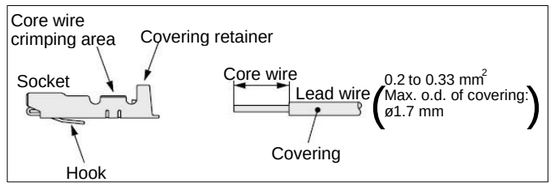


Figure 4.

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.

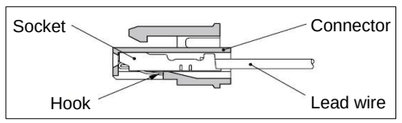


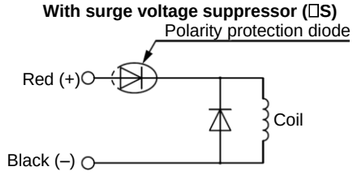
Figure 5.

3.8.2 Connectors

Grommet, L/M plug connector

▪ **Standard type (With polarity)**

With surge voltage suppressor (□S)



With light/surge voltage suppressor (□Z)

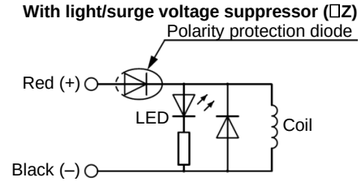
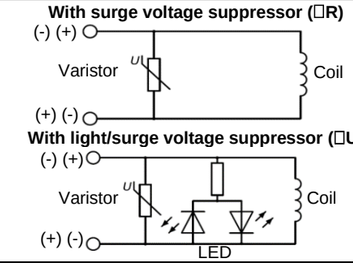


Figure 6

3 Installation - continued

▪ **Non-polar type**

With surge voltage suppressor (□R)



With light/surge voltage suppressor (□U)

Figure 7.

- 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)**

With surge voltage suppressor (□S)

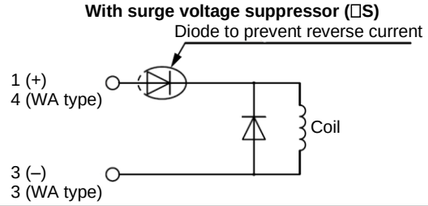


Figure 8.

With light/surge voltage suppressor (□Z)

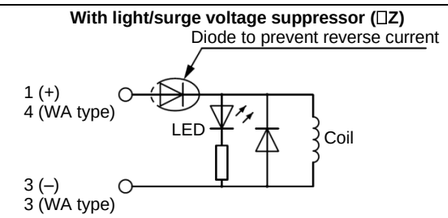
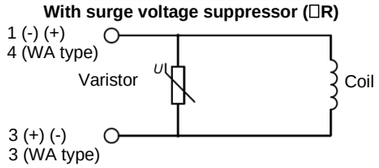


Figure 2.

▪ **Non-polar type**

With surge voltage suppressor (□R)



With light/surge voltage suppressor (□U)

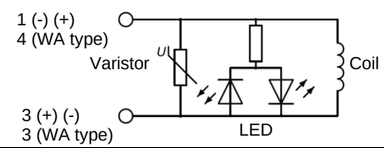


Figure 10.

3 Installation - continued

Solenoid valve side pin wiring diagram

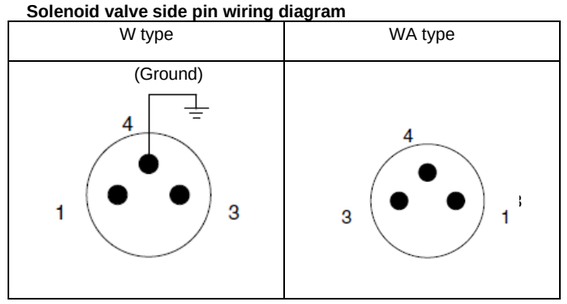
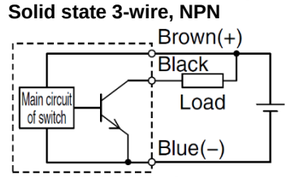


Figure 11.

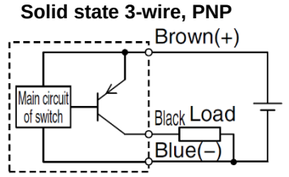
- For the standard type, connect + to 1 and – to 3 for Type W according to polarity, while + to 4 and – to 3 for Type WA.
- For DC voltages other than 12 V and 24 V, incorrect wiring will cause damage to the surge suppressor circuit.
- The WA-type valve cannot be grounded.

3.9 Wiring (Auto switch) – option

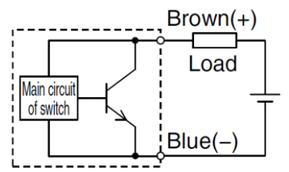
Solid state 3-wire, NPN



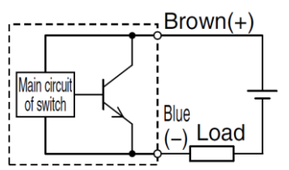
Solid state 3-wire, PNP



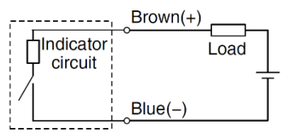
2-wire (Solid state)



Read Switch 2-wire Without indicator



Read Switch 2-wire With indicator



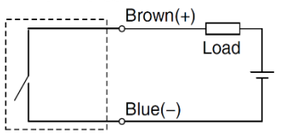


Figure 12

- 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.

3 Installation - continued

- 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 will damage the light emitting diode. It will no longer operate.

3.10 Manual override

⚠ Warning

Regardless of an electrical signal to the valve, the manual override is used for switching the main valve. Connected actuator is started by this 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.

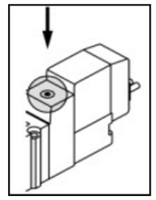


Figure 13.

4 How to Order

Refer to drawings or catalogue for 'How to Order'.

5 Outline Dimensions

Refer to drawings or catalogue for outline dimensions.

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 modification 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

Refer to Handling Precautions for SMC Products.

⚠ Warning

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

⚠ 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.

8 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

9 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : https:// www.smcworld.com (Global) https:// www.smc.eu (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan

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