



Operation Manual

PRODUCT NAME

Compact Direct Operated 2 Port Solenoid Valve

MODEL / Series / Product Number

VDW30/40-XF Series

SMC Corporation

Contents

1. Contents	P1
2. How to Order	P2
3. Specifications	P3
4. Construction / Dimensions	P4,5
5. Precautions	P6,7
6. Safety Instructions	P8,9
7. Troubleshooting	P10

Compact / Lightweight 2 Port Solenoid Valve

For Air/Water

VDW30/40-XF Series



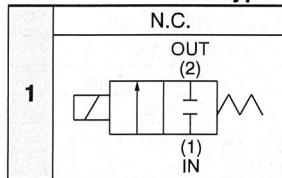
How to Order Valves (Single Unit)

VDW **3** **1** - **5** **G** **1** - **P7** - **1** - **1** - **XF**

Series

3	30
4	40

Valve type



Voltage

5	24 VDC
6	12 VDC

Coil type

G	Grommet
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Power-saving circuit

Nil	None
E	With power-saving circuit

Electrical entry direction

Nil	Piping direction IN OUT	L1	45° left direction IN OUT
R2	90° right direction IN OUT	L2	90° left direction IN OUT

Note) Cannot be reassembled in different combinations.

Option

Nil	None
N	Bottom mounting insert type
K	With 2 quick fastener clips ^{Note)}

Note) Port connection type: Supports P7 and P10 quick fasteners only.

Body material and coil insulation type

Symbol	Body material	Seal material	Coil insulation
Nil	PPS	NBR	Class B
A		FKM	
B		EPDM	

Port connection type

Symbol	Size	Series
P7	P7 quick fastener	30
P10	P10 quick fastener	40
C4	One-touch fitting for ø4	30
C6	One-touch fitting for ø6	
C8	One-touch fitting for ø8	
C10	One-touch fitting for ø10	40

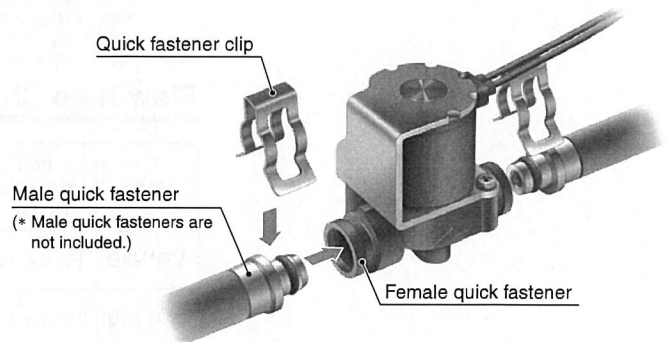
Orifice diameter

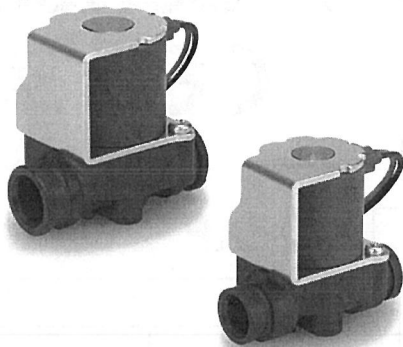
Symbol	Orifice diameter (mm ø)	Series
1	1.0	30
3	3.0	
4	4.5	40
6	6.0	

Quick Fastener Clip Part No.

Series	Size	Quick fastener clip part no. (2 pcs.)	Material
30	P7 quick fastener	VDW30-CP7	Stainless steel
40	P10 quick fastener	VDW40-CP10	

* Ten pieces come in each set.





Standard Specifications

Valve specifications	Valve construction	Direct operated poppet
	Valve type	Normally closed (N.C.)
	Fluid	Quick fastener type
		Water (1 to 50°C), Air, Heated water (80°C) ^{Note 3)} , Low vacuum (133 Pa-abs)
	One-touch fitting type ^{Note 4)}	Air, Water (1 to 40°C) ^{Note 5)} , Low vacuum (133 Pa-abs)
	Withstand pressure	1.0 MPa
	Ambient temperature	-10 to 50°C
	Fluid temperature	1 to 50°C (No freezing)
	Ambient humidity	RH85%
	Environment	Location without corrosive or explosive gases
	Valve leakage ^{Note 1)}	0.1 cm ³ /min or less (With water pressure), 1 cm ³ /min or less (Air)
	Exterior leakage	0.1 cm ³ /min or less (With water pressure), 1 cm ³ /min or less (Air)
	Mounting orientation	Upward coil
Coil specifications	Vibration/Impact ^{Note 2)}	30 m/s ² / 90 m/s ²
	Port size	P7, P10 (Quick fastener) C4, C6, C8, C10 (One-touch fitting)
	Orifice diameter	ø1, ø3, ø4.5, ø6
	Rated voltage	24 VDC, 12 VDC
	Allowable voltage fluctuation	±10% of rated voltage
	Coil insulation type	Class B
	Insulation resistance	500 VDC, 10 MΩ or more
	Voltage limit	1800 VAC, 1 sec., 3 mA or less
	Noise tolerance ^{Note 3)}	Simulation noise: 500 Vp-p (Based on 1 μ sec. pulse width, 50 ±10 Hz frequency noise simulation) Fast transient noise: IEC61000-4-4: 1 kV
	Power consumption	VDW30: 3 W (With 0.5 W power-saving circuit) VDW40: 6.5 W (With 1 W power-saving circuit)
	Enclosure	IP65 ^{Note 6)}

Note 1) The amount of leakage from the OUT port when the set pressure is applied to the IN port.

Note 2) Vibration resistance No malfunction when tested with one sweep of 10 to 150 Hz in the axial direction and at a right angle to the armature, in both energized and deenergized states.

Impact resistance No malfunction when tested with a drop tester in the axial direction and at a right angle to the main armature, one time each in energized and deenergized states.

Note 3) Products with power-saving circuit only.

Note 4) When using One-touch fittings, make sure to employ tubing that is compatible with SMC fittings (KQ2 series).

Note 5) When using One-touch fittings with water, care must be taken when handling tubing and piping conditions to prevent water from leaking when the tubes are inserted. Soft nylon tubing cannot be used with water.

Note 6) When using the product in a place which requires water resistance, please contact SMC.

Characteristic Specifications

Model	Port connection type	Orifice dia. (mm ø)	Max. operating pressure differential (MPa) ^{Note 1)}	Operating Pressure range (MPa) ^{Note 2) Note 3)}	Weight (kg)
			Pressure port 1		
VDW30	P7 C4, C6	1.0	0.6	-0.1 to 0.6	0.1
		3.0	0.1		
VDW40	P10 C8, C10	4.5	0.1 (With power-saving circuit)		0.23
			0.05 (Without power-saving circuit)		
		6.0	0.05 (With power-saving circuit)		
			0.02 (Without power-saving circuit)		

Note 1) The maximum operating pressure differential changes depending on the flow direction of the fluid. Refer to page 503 for details.

Note 2) For low vacuum specifications, the operating pressure range is 1 Torr (1.33 x 10² Pa) to 0.6 MPa.

Please consult with SMC if using below 1 Torr (1.33 x 10² Pa).
Some leakage is permitted, so avoid use in situations where a vacuum must be maintained, such as in leak testing.

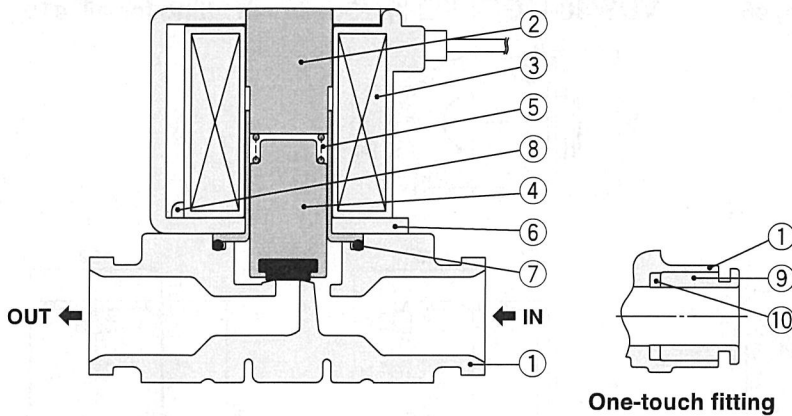
Note 3) The surge pressure must be under the maximum operating pressure.

Flow Rate Characteristics

Model	Port connection type	Orifice dia. (mm ø)	Water		Air		
			1→2 (IN→N.C.)		1→2 (IN→N.C.)		
		N.C.	Kv	Cv converted	C [dm³/(s·bar)]	b	Cv
VDW30	P7, C4, C6	1.0	0.03	0.04	0.14	0.4	0.09
		3.0	0.24	0.28	1.0	0.52	0.3
VDW40	P10, C8, C10	4.5	0.54	0.61	2.3	0.46	0.61
		6.0	0.86	1.0	4.0	0.4	1.1

VDW30/40-XF Series

Construction



Component Parts Materials

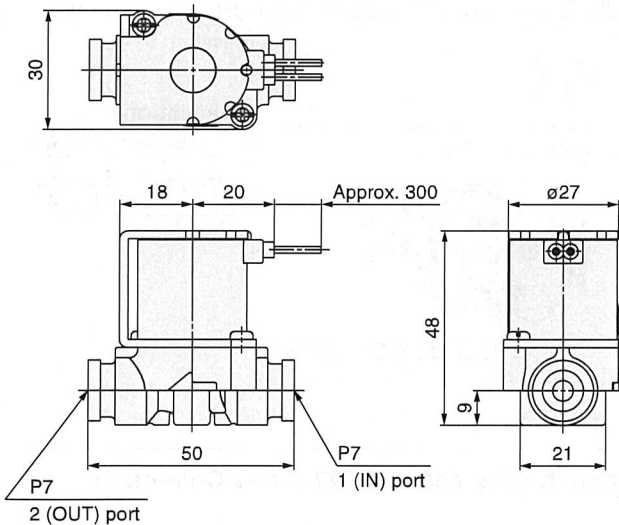
No.	Description	Material
1	Body	PPS
2	Tube assembly	Stainless steel
3	Coil assembly	—
4	Armature assembly	Stainless steel, NBR, FKM, EPDM
5	Return spring	Stainless steel
6	Flame	Iron
7	O-ring	NBR, FKM, EPDM
8	Round head combination screw	Iron
9	Cassette	POM, Stainless steel
10	Seal	NBR, FKM, EPDM

Caution

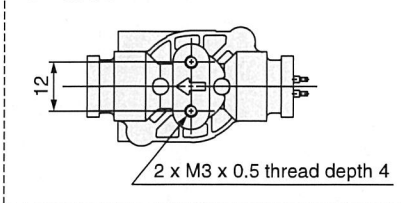
Do not disassemble.

Dimensions

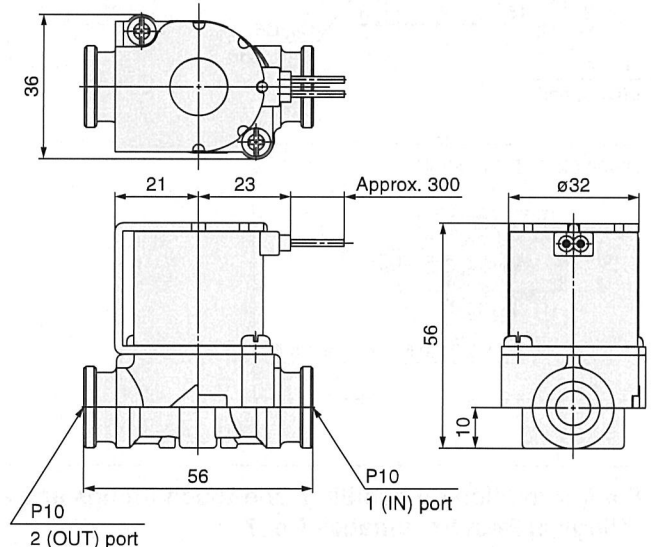
VDW30-□G□□-□-P7 / P7 Quick Fastener



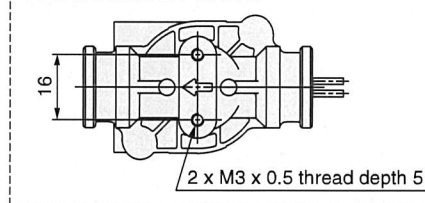
VDW30-5G□□-□-P7-□-N



VDW40-□G□□-□-P10 / P10 Quick Fastener

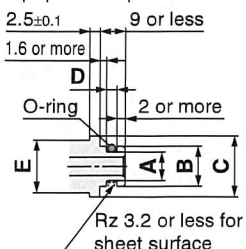


VDW40-5G□□-□-P10-□-N



Male Quick Fastener Dimensions

* Male quick fasteners are not included.
Since they are not available as commercial products, please contact SMC when you cannot prepare male quick fasteners.

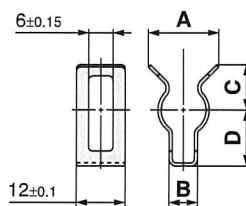


Male Quick Fastener Dimensions Table

Port size (Quick fastener)	P7	P10
A	$\phi 7.0_{-0.05}^{+0.05}$	$\phi 10.0_{-0.05}^{+0.05}$
B	$\phi 9.9_{\pm 0.05}$	$\phi 12.85_{\pm 0.05}$
C	$\phi 15$	$\phi 20$
D	$2.5_{-0}^{+0.25}$	$2.5_{-0}^{+0.25}$
E	$\phi 13$	$\phi 17$
O-ring dimensions* (Nominal no.)	P7	P10
Applicable clip	Clip for P7	Clip for P10

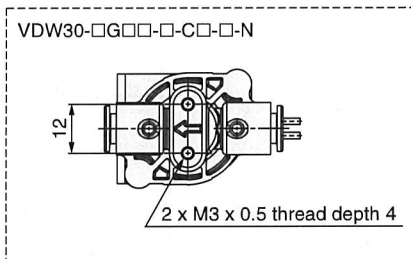
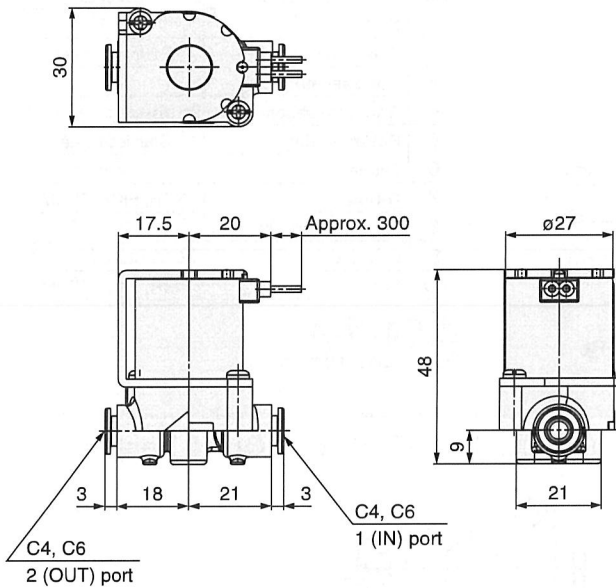
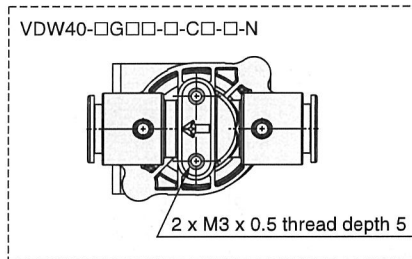
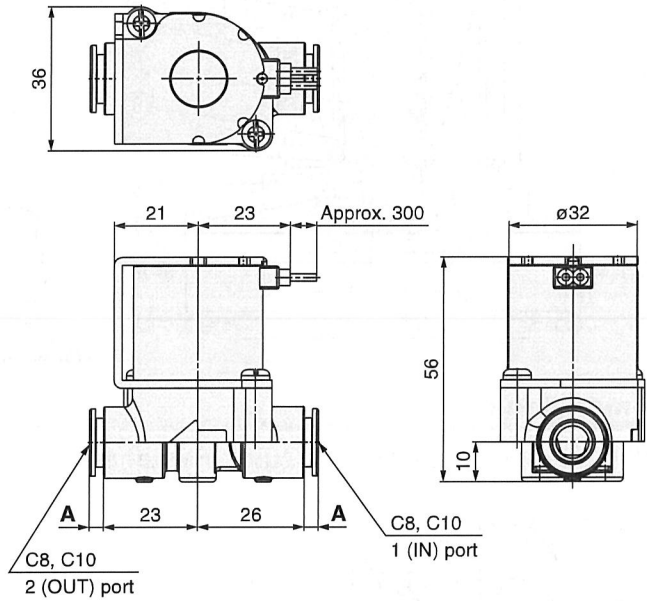
* Conforms to JIS B 2401 dimensional standard for O-rings for industrial applications.

Quick Fastener Clip Dimensions



Applicable Clip Part No./Dimensions

Port size (Quick fastener)	P7	P10
Clip part no.	VDW30-CP7	VDW40-CP10
A	26	28
B	7	10
C	9	10
D	14	15

Dimensions**VDW30-□G□□-□- $\frac{C4}{C6}$ /One-touch fitting for $\phi 4$, $\phi 6$** **VDW40-□G□□-□- $\frac{C8}{C10}$ /One-touch fitting for $\phi 8$, $\phi 10$** **Dimensions**

Series	A
VDW40 C8	3
VDW40 C10	4

For information on handling One-touch fittings and appropriate tubing, see the KQ2 series One-touch fittings in Best Pneumatics No. 7.



VDW30/40 Series Specific Product Precautions 1

Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions, pages 17 to 19 for Fluids Control 2 Port Valves Precautions, and pages 467 to 470 for VDW Series/Specific Product Precautions.

Selection

Warning

1. Fluid quality

In the case of water

The use of a fluid which contains foreign matter can cause problems such as malfunction and seal failure by promoting wear of the valve seat and armature, and by sticking to the sliding parts of the armature, etc. Install a suitable filter (strainer) immediately upstream from the valve. In general, a mesh of about 50 to 100 is a guideline for the filter.

When using ordinary tap water, scaling and sludge from substances in hard water such as calcium and magnesium can cause solenoid valves to malfunction. It is therefore necessary to install a water softener to remove such substances and a filter (strainer) immediately before the solenoid valve.

In the case of air

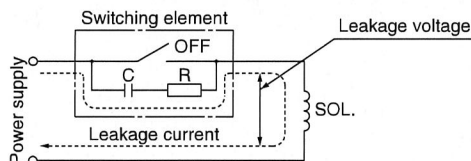
Please use ordinary compressed air where a filter of 40 μm or less is provided on the inlet side piping. (Except dry air)

Caution

1. Leakage voltage

When the solenoid valve is operated using the controller, etc., the leakage voltage should be the product allowable leakage voltage or less.

Particularly when using a resistor in parallel with a switching element and 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., creating a possible danger that the valve may not turn off.



- 1) Take steps to ensure that there are no problems such as abnormal voltage drops or insufficient capacity associated with the signal power supply used to drive the solenoid valve.
- 2) Make sure the leakage current flowing through the solenoid valve when power is not being supplied is 0.1 mA or less. If there the leakage current is larger than this, take appropriate measures such as connecting a bleeder resistor (models with power-saving circuit).
- 3) An attenuation function is provided to reduce voltage surges produced by the solenoid valve. However, the controller should be equipped with protection against voltage surges as some residual surge voltage may still reach external components.

DC coil

2% or less of rated voltage

2. Low temperature operation

- 1) The valves can be used up to an ambient temperature of -10°C , however take measures to prevent solidification of impurities or freezing, etc.
- 2) When using valves for water application in cold climates, first stop the water supply/discharge of the pump, etc., and then take measures to prevent freezing such as draining water in pipe. When heating by steam, be careful not to expose the coil portion to steam. Also, please take measures to prevent freezing such as heating the body.

Mounting

Warning

1. When the valve is secured using an insert nut (part number suffix "-N"), handle with care during installation because the application of excessive stress to the body could damage it (appropriate tightening torque: 0.8 to 1.0 N·m).

Piping

Warning

1. During use, deterioration of the tubing or damage to the fittings could cause tubes to come loose from their fittings and thrash about.

To prevent uncontrolled tube movement, install protective covers or fasten tubes securely in place.

Caution

1. Connection of piping to products

- When connecting piping to a product, refer to its operation manual to avoid mistakes regarding the supply port, etc.
- Do not apply external force to the coil when holding it to connect piping, as the tube may deform.
- When attaching fittings to a solenoid valve, do not use fittings that do not conform to the quick fastener standard.
- Handle with care when attaching fittings because the application of excessive stress to the quick fastener portion could damage the body.

Recommended Piping Conditions

1. When connecting tubes using One-touch fittings, provide some spare tube length as shown in Fig. 1, recommended piping configuration.

Also, do not apply external force to the fittings when binding tubes with bands, etc. (see Fig. 2.)

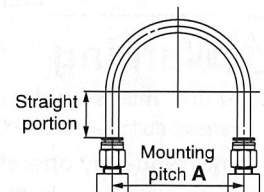


Fig. 1 Recommended piping configuration

Unit: mm

Tube size	Mounting pitch A			Straight portion length
	Nylon tube	Soft nylon tube	Polyurethane tube	
$\phi 4$	56 or more	30 or more	26 or more	20 or more
$\phi 6$	84 or more	39 or more	39 or more	30 or more
$\phi 8$	112 or more	58 or more	52 or more	40 or more
$\phi 10$	140 or more	70 or more	69 or more	50 or more

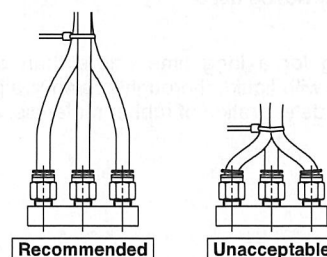


Fig. 2 Binding tubes with bands



VDW30/40 Series

Specific Product Precautions 2

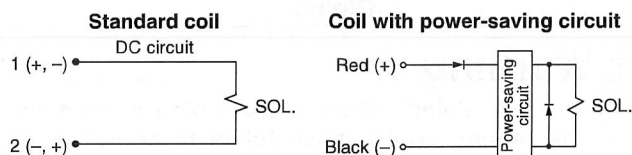
Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions, pages 17 to 19 for Fluids Control 2 Port Valves Precautions, and pages 467 to 470 for VDW Series/Specific Product Precautions.

Electrical Connections

⚠ Caution

- Solenoid valves with power-saving circuits (coil part number “-5GE”) have polarity, so follow the wiring diagram below when making connections. Standard coils have no polarity.**

The solenoid valve will not switch properly if the polarity is reversed.



- Apply the correct voltage.**

Incorrect voltage could cause shorting of the power-saving circuit, coil burnout, or valve malfunction.

- Do not apply a tension load of 30 N or more to the solenoid valve lead wires.**

- Apply voltage which is within $\pm 10\%$ of the rated voltage.**

Also, do not use excessive power supply voltage or superimpose electrical noise such as ripple voltage on the power supply voltage as these could harm the valve.

- When connecting an induction load such as a circuit protector to the solenoid valve connection, take measures to ensure that the current to the solenoid valve is not reduced too much.**

Maintenance

⚠ Warning

- Do not disassemble solenoid valves.**

Disassembling a solenoid valve will void its warranty.

- Low frequency operation**

Switch valves at least once every 30 days to prevent malfunction. Also, in order to use it under the optimum state, conduct a regular inspection once a half year.

⚠ Caution

- Store indoors in a location away from direct sunlight and where the following conditions are maintained.**

- Temperature: -10 to 50°C
- Relative humidity: 20% to 85%RH (No condensation)
- Liquid rings may not be used.

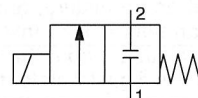
- Storage**

When not using for a long time (more than approx. one month) after use with liquid, thoroughly remove all moisture to prevent rust and deterioration of rubber materials, etc.

Fluid Flow Direction

⚠ Caution

The maximum operating pressure differential differs depending on the flow direction of the fluid. If the pressure differential at each port exceeds the values in the table below, valve leakage may occur.



2 Port Valve

Model	Orifice diameter (mm ϕ)	Max. operating pressure differential (MPa)
		Pressure port 1
VDW30	1.0	0.6
	3.0	0.1
VDW40	4.5	0.1 (With power-saving circuit)
		0.05 (Without power-saving circuit)
	6.0	0.05 (With power-saving circuit)
		0.02 (Without power-saving circuit)

One-touch Fittings

⚠ Caution

For information on handling One-touch fittings and appropriate tubing, see the KQ2 series One-touch fittings in Best Pneumatics No. 7.



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 10218-1992: Manipulating industrial robots -Safety.

etc.



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

1. 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 catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. 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.

3. 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.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. 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, combustion 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 specifications described in the product catalog.

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.



Safety Instructions

Caution

1. 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.

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.*2)

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 catalog for the particular products.

***2) 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 regulation 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.

2 Port Solenoid Valve - Troubleshooting

Phenomenon		Possible causes	Investigation method and location of possible causes	Countermeasures
The valve will not turn ON.	Flow does not start.	Voltage lower than the rated voltage had been applied to the valve.	Check the power supply voltage	Adjust the power supply voltage to the specified value (Allowable voltage fluctuation: +/-5% of the rated voltage)
		Large operating pressure differential	Check the upstream pressure and downstream pressure	Optimize the pressure
		Fluid temperature and ambient temperature are too high.	Check ambient/fluid temperature	Optimize the ambient/fluid temperature
		Incorrect wiring or problem with control equipment.	Check the wiring or control equipment.	Correct the wiring or replace or repair the control equipment.
		Foreign matter entering the product.	Check foreign matter in the valve.	- Install an air blow filter in the piping. - Replace the valve
		High viscosity of the fluid	Check the viscosity	Viscosity 50 (mm/s) or less
		Connected in the opposite direction.	Check for the piping port	Assign the IN for high pressure.
		Damage, wearing, deformation or deterioration of parts	Check the damage, wearing, deformation or deterioration of parts	Replace the valve
		Broken wire	Check the input power supply.	- Setting the voltage to within the allowable voltage range. (Allowable voltage fluctuation: +/-5% of the rated voltage) - Replace the valve
		Coil has burned out.	Check if the valve is exposed to water Check foreign matter in the valve. Check the input power supply.	- Protect the valve to prevent it from being exposed to water - Install an air filter upstream in the piping. - Set voltage to specified value when the applied voltage is large. (Allowable voltage fluctuation: +/-5% of the rated voltage) - Replace the valve
		Electrical connection direction is reversed (with power-saving circuit only)	Check the polarity direction	- Connect positive side (+) to the red lead wire, and connect negative side (-) to the black lead wire.
	Fluid does not stop.	High leakage voltage	Measure leakage voltage Not less than 2% of the rated voltage	- Select a control circuit or element - Install a bleeder resistor
		Foreign matter entering the product.	Check foreign matter in the piping	• Flush the piping with air - Install a filter - Replace the valve
		High viscosity of the fluid	Check the viscosity	Viscosity 50 (mm/s) or less
		Damage, wearing, deformation or deterioration of parts	Check the damage, wearing, deformation or deterioration of parts	Replace the valve
Fluid leakage occurs.	Internal leakage	Foreign matter entering the product.	Check foreign matter in the piping	• Flush the piping with air - Install a filter - Replace the valve
		Damage, wearing, deformation or deterioration of parts	Check the damage, wearing, deformation or deterioration of parts	Replace the valve
		Too much vibration or impact	Check the vibration and impact of the system	- Condition of the vibration IEC C 60068—2—6 Annex C - Impact 150m/s ² or less - Keep the product away from the vibration source
		Swelling and deterioration due to fluid	Check the fluid property	Replace the valve
		Freezing of fluid	- Check fluid and ambient temperature - Check for freezing in the valve	- Discharge fluid from the piping (when stopping the supply or discharge of water for the pump) - Keep the fluid temperature above freezing.
		Connected in the opposite direction.	Check for the piping port	Connect high pressure side to IN Port
	External leakage	Leakage from the fitting (quick fastener)	- Check the scratches of the quick fastener of male side and O ring - Check the scratches of the sealing surface of the quick fastener (valve body) of female side.	- Replace the quick fastener of of male side (O ring) - Replace the valve
		Leakage of fitting (one-touch cassette)	- Check tubing size and scratches on the surface. - Check the damage of the cassette and O-ring.	- Change/ replace the tubing. - Replace the valve
		Damage, wearing, deformation or deterioration of parts	Check the damage, wearing, deformation or deterioration of parts	Replace the valve
		Swelling and deterioration due to fluid	Check the damage, wearing, deformation or deterioration of	Replace the valve
		Freezing of fluid	- Check ambient/fluid temperature - Check for freezing in the valve	- Discharge fluid from the piping (when stopping the supply or discharge of water for the pump) - Keep the fluid temperature above freezing.

Revision history

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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