Compact Direct Operated 2 Port Solenoid Valve New

CE RoHS

Air | Medium vacuum | Water

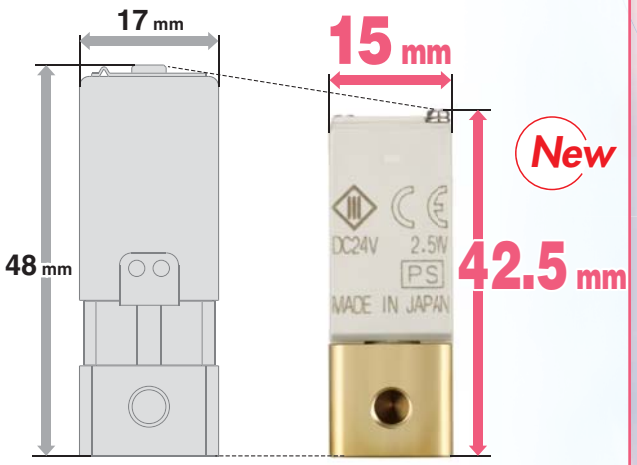
Lightweight

100g → 80g

Conventional Brass body (Size 2) — Aluminium/Resin(PPS) body (Size 2) New

Compact

Conventional model



(Compared with Size 1, Brass/Stainless steel body)

Environmental performance IP65

Power consumption 2.5W 3W

(Size 1) (Size 2)

Body material

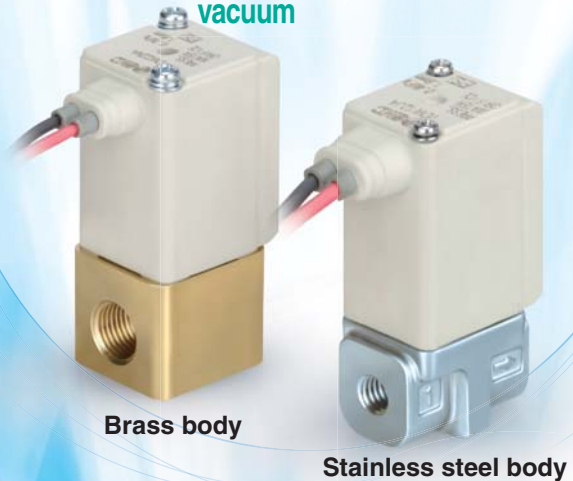
Aluminium • Resin(PPS)

Air | Water

Body material

Brass • Stainless Steel

Medium vacuum | Water



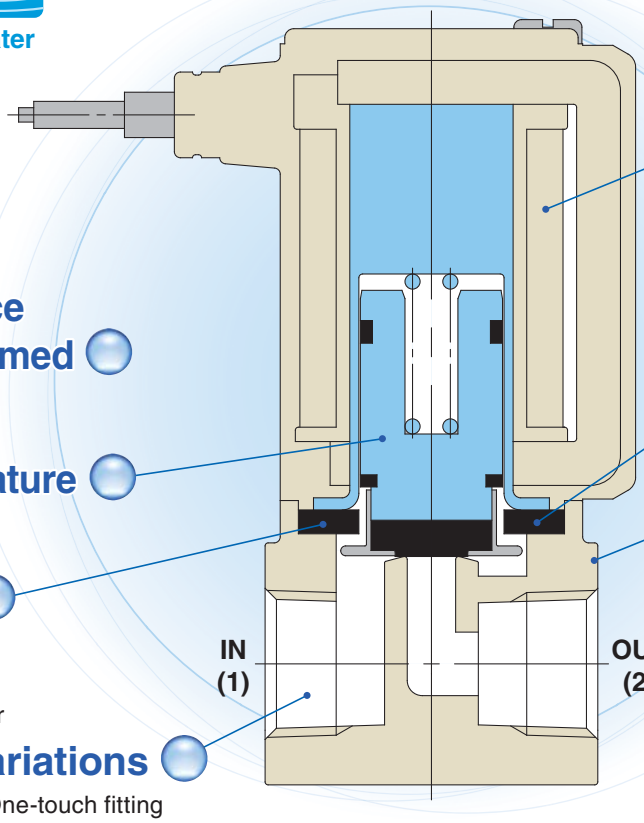
Series VDW

SMC

CAT.EUS70-49A-UK

Compact Direct Operated 2 Port Solenoid Valve *Series* VDW

Air | Medium vacuum | Water



Enclosure
IP65

Flame resistance
UL94V-0 conformed

Improved armature durability

Low-noise construction
Metal noise reduced by the rubber damper

Piping variations
Screw piping, One-touch fitting

Power consumption
2.5 W (Size 1)
3 W (Size 2)

Seal material
NBR (Air, Water)
FKM (Medium vacuum)

Body material
Air
Aluminium, Resin(PPS)
Medium vacuum
Brass, Stainless steel
Water
Resin (PPS), Brass, Stainless steel

Body material	Fluid: Air	Fluid: Medium vacuum	Fluid: Water	Size	Orifice diameter: 1	1.6	2.3	3.2	Port size: M5	1/8	ø3.2	ø4	ø6	Other special options
Aluminium	(NBR)			Size 2	—	●	●	●	●	●				· Special voltage 48 VAC 220 VAC 240 VAC 12 VDC 24 VAC · G thread, NPT thread · Oil-free Note 1) · Low concentration ozone resistant (Seal material: FKM) Note 2)
Resin(PPS)	(NBR)		(NBR)	Size 1	●	●	—	—	●		●	●		
				Size 2	—	●	●	●	●			●	●	
Brass/ Stainless steel				Size 1	●	●	—	—	●					
		(FKM)	(NBR)	Size 2	—	●	●	●	●	●				

The materials in ( ) are the seal materials.

Note 1) As standard for medium vacuum type.

Direct Operated 2 Port Solenoid Valve *Series* VX21/22/23

Air | Medium vacuum | Water | Oil

■ Applicable fluid: Air, Medium vacuum, Water, Oil
■ Body material: Aluminium, Brass, Stainless steel, Resin

CAT.EUS70-44B-UK

Valve type	Port size	Orifice diameter [mmø]
N.C./N.O.	1/8 to 1/2 One-touch fitting: ø6 to ø12	2, 3, 4, 5, 7, 8, 10

SMC

Compact Direct Operated 2 Port Solenoid Valve

Series VDW

For Air • Medium Vacuum • Water

Standard Specifications

Valve specifications	**Valve construction**		Direct operated poppet
	Withstand pressure	**MPa**	2.0 (resin body type 1.5)
	Max. system pressure	**MPa**	1.0
	Body material		Aluminium, Resin, Brass, Stainless steel
	Seal material		NBR, FKM
	Enclosure		Dusttight, Low jetproof (IP65)
	Environment		Location without corrosive or explosive gases
Coil specifications	**Rated voltage**	**AC**	100 VAC, 200 VAC, 110 VAC, 230 VAC, (220 VAC, 240 VAC, 48 VAC, 24 VAC) Note)
		DC	24 VDC, (12 VDC) Note)
	Allowable voltage fluctuation		±10% of rated voltage
	Allowable leakage voltage	**AC (With a full wave rectifier)**	10% or less of rated voltage
		DC	2% or less of rated voltage
	Coil insulation type		Class B

Note) Voltage in ( ) indicates special voltage. (Refer to page 8.)

⚠ **Be sure to read "Specific Product Precautions" before handling.**

Solenoid Coil Specifications

Normally Closed (N.C.)

DC Specification

Size	Power consumption [W] Note 1)	Temperature rise [°C] Note 2)
Size 1	2.5	60
Size 2	3	60

Note 1) Power consumption, Apparent power: The value at ambient temperature of 20°C and when the rated voltage is applied. (Variation: ±10%)
Note 2) The value at ambient temperature of 20°C and when the rated voltage is applied. The value depends on the ambient environment. This is for reference.

AC Specification (With a full wave rectifier)

Size	Apparent power [VA] Note 1) 2)	Temperature rise [°C] Note 3)
Size 1	2.5	60
Size 2	3	60

Note 1) Power consumption, Apparent power: The value at ambient temperature of 20°C and when the rated voltage is applied. (Variation: ±10%)
Note 2) There is no difference in the frequency and the inrush and energised apparent power, since a rectifying circuit is used in the AC (with a full wave rectifier).
Note 3) The value at ambient temperature of 20°C and when the rated voltage is applied. The value depends on the ambient environment. This is for reference.

Selection Steps

Step 1 **Select the fluid.**

Item	Selection item	Page	Symbol
Select the fluid.	Air	Page 2	0
	Water	Page 6	2
	Medium vacuum	Page 4	4

❶

VDW $\frac{1}{2}$ **0** A A
❶

Step 2 **Select "Body material", "Port size" and "Orifice diameter" from "Flow rate — Pressure" of each fluid.**

Item	Selection item		Symbol
Select from "Flow rate — Pressure." • Body material • Port size • Orifice diameter	Size	Size 1	1 ❷
	Body material	Resin	
	Port size	M5	A ❸
	Orifice diameter	1	

VDW **1** 0 **A** A
❷ ❸

Step 3 **Select electric specifications.**

Item	Selection item		Symbol
Select electric specifications.	Voltage	24 VDC	A ❹
	Electrical entry	Grommet	

VDW 1 0 A **A**
❹

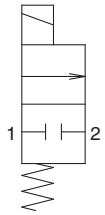
Step 4 **For other special options, refer to page 8.**

For Air Single Unit

Model/Valve Specifications

N.C.

Configuration symbol



Note) The configuration symbol shows ports 1 and 2 as blocked, but there is actually a limit to the blocking capability when the pressure of port 2 is greater than the pressure of port 1. Please contact SMC when low leakage performance is required.

Normally Closed (N.C.) Aluminium Body Type

Size	Port size	Orifice diameter [mmø]	Model	Flow-rate characteristics			Maximum operating pressure differential [MPa]	Weight [g]
				C [dm³/(s·bar)]	b	Cv	Pressurized port 1	
2	M5, 1/8	1.6	VDW20	0.30	0.45	0.07	0.7	80
		2.3		0.58	0.45	0.18	0.4	
		3.2		1.10	0.38	0.30	0.2	

Resin Body Type (Built-in One-touch Fittings)

Size	Port size	Orifice diameter [mmø]	Model	Flow-rate characteristics			Maximum operating pressure differential [MPa]	Weight [g]
				C [dm³/(s·bar)]	b	Cv	Pressurized port 1	
1	M5 ø3.2 One-touch fitting ø4 One-touch fitting	1.0	VDW10	0.14	0.40	0.04	0.9	45
		1.6		0.30	0.25	0.07	0.4	
2	M5 ø4 One-touch fitting ø6 One-touch fitting	1.6	VDW20	0.30	0.45	0.07	0.7	80
		2.3		0.58	0.45	0.18	0.4	
		3.2		1.10	0.38	0.30	0.2	

Refer to “Glossary of Terms” on page 12 for details on the maximum operating pressure differential.

Fluid and Ambient Temperature

Fluid temperature [°C]	Ambient temperature [°C]
–10 Note) to 50	–10 to 50

Note) Dew point temperature: –10°C or less

Valve Leakage

Internal Leakage

Seal material	Leakage rate (Air) Note)
NBR	1 cm³/min or less (Aluminium body type)
	15 cm³/min or less (Resin body type)

External Leakage

Seal material	Leakage rate (Air) Note)
NBR	1 cm³/min or less (Aluminium body type)
	15 cm³/min or less (Resin body type)

Note) Leakage is the value at ambient temperature 20°C.

How to Order (Single Unit)

VDW 1 0 A A

Fluid

0	For air

Common Specifications

Valve type	N.C.
Seal material	NBR
Coil insulation type	Class B
Thread type	Rc

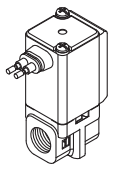
Size/Valve type

Symbol	Size	Valve type
1	Size 1	Single unit N.C.
2	Size 2	Single unit N.C.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter
A	Resin (PPS)	M5	1.0
B			1.6
C		ø3.2 One-touch fitting	1.0
D			1.6
E		ø4 One-touch fitting	1.0
F			1.6
A	Resin (PPS)	M5	1.6
B			2.3
C			3.2
D		ø4 One-touch fitting	1.6
E			2.3
F			3.2
G		ø6 One-touch fitting	1.6
H			2.3
J			3.2
K	Aluminium	M5	1.6
L			2.3
M			3.2
N		1/8	1.6
P			2.3
Q			3.2

Voltage/Electrical entry

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet 
B	100 VAC	
C	110 VAC	
D	200 VAC	
E	230 VAC	
Z	Other voltages	

Dimensions→Pages 8, 9 (Single unit)

Other Special Options

Electrical options (Special voltage)

VDW 1 0 A Z 1A

Enter standard product number.

Electrical option

Electrical option (Special voltage)

Specification	Symbol	Voltage	Electrical entry
Special voltage	1A	48 VAC	Grommet
	1B	220 VAC	
	1C	240 VAC	
	1D	12 VDC	
	1U	24 VAC	

Other options (Low concentration ozone resistant, oil-free, special thread)

VDW 1 0 A A Z

Enter standard product number.

Other option (Low concentration ozone resistant, oil-free, special thread)

Symbol	Low concentration ozone resistant (Seal material: FKM)	Oil-free	Special thread	Note
A	—	—	G	Port size 1/8
B			NPT	
C			M6	Port size M5
D	—	○	G	Port size 1/8
E			NPT	
F			M6	Port size M5
G	○	—	Standard	
H			G	Port size 1/8
J			NPT	
K			M6	Port size M5
L	○	○	Standard	
M			G	Port size 1/8
N			NPT	
P			M6	Port size M5
Z	—	○	Standard	

Bracket interchangeable with old type

The brackets are interchangeable with brackets of old VDW10/20 series. For details of exterior dimensions, please contact SMC.

* Only for aluminum and stainless steel (Select stainless steel when interchangeable product is necessary for water.)

VDW □ □ □ □ XB

Enter standard product number.

Bracket interchangeable with old type

* Enter symbols in the order to the right when ordering a combination of electrical option, other options, and bracket interchangeable with old type.

Example) **VDW 2 0 A Z 1A Z XB**

Electrical option

Other option

Bracket interchangeable with old type

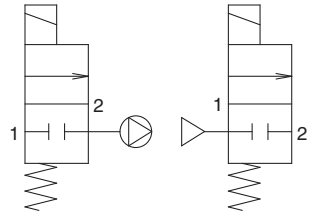
For Medium Vacuum Single Unit

Model/Valve Specifications

N.C.

Configuration symbol (Application example)

Used with vacuum **Used with pressure**



Note) The configuration symbol shows ports 1 and 2 as blocked, but there is actually a limit to the blocking capability when the pressure of port 2 is greater than the pressure of port 1. Please contact SMC when low leakage performance is required.

Normally Closed (N.C.)

Size	Port size	Orifice diameter [mmø]	Model	Flow-rate characteristics			Maximum operating pressure differential [MPa]		Weight [g]
				C [dm³/(s·bar)]	b	Cv	Used with vacuum [Pa·abs]	Pressurized port 1	
1	M5	1.0	VDW14	0.14	0.40	0.04	0.1 to atmospheric pressure	0.9	Brass: 65 Stainless steel: 60
		1.6		0.30	0.25	0.07		0.4	
2	M5, 1/8	1.6	VDW24	0.30	0.45	0.07		0.7	Brass: 115 Stainless steel: 100
		2.3		0.58	0.45	0.18		0.4	
		3.2		1.10	0.38	0.30		0.2	

Fluid and Ambient Temperature

Fluid temperature [°C]	Ambient temperature [°C]
1 to 50	–10 to 50

Note) With no freezing

Valve Leakage

Internal Leakage

Seal material	Leakage rate Note)
FKM	10^{-6}Pa·m³/sec or less

External Leakage

Seal material	Leakage rate Note)
FKM	10^{-6}Pa·m³/sec or less

Note) Leakage (10^{-6}Pa·m³/sec) is the value at differential pressure 0.1 MPa and ambient temperature 20°C.

How to Order (Single Unit)

VDW 1 4 A A

Fluid

4	For medium vacuum

Common Specifications

Valve type	N.C.
Seal material	FKM
Coil insulation type	Class B
Thread type	Rc
Oil-free	

Size/Valve type

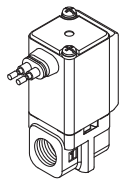
Symbol	Size	Valve type
1	Size 1	Single unit N.C.
2	Size 2	Single unit N.C.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter
G	Brass	M5	1.0
H			1.6
J	Stainless steel	M5	1.0
K			1.6
K	Brass	M5	1.6
L			2.3
M			3.2
N		1/8	1.6
P			2.3
Q			3.2
R	Stainless steel	M5	1.6
S			2.3
T			3.2
U		1/8	1.6
V			2.3
W			3.2

Voltage/Electrical entry

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet
B	100 VAC	
C	110 VAC	
D	200 VAC	
E	230 VAC	
Z	Other voltages	



Dimensions→Page 10 (Single unit)

Other Special Options

Electrical options (Special voltage)

VDW 1 0 A Z 1A

Enter standard product number.

Electrical option

Electrical option (Special voltage)

Specification	Symbol	Voltage	Electrical entry
Special voltage	1A	48 VAC	Grommet
	1B	220 VAC	
	1C	240 VAC	
	1D	12 VDC	
	1U	24 VAC	

Other options (Low concentration ozone resistant, oil-free, special thread)

VDW 1 0 A A Z

Enter standard product number.

Other option (Low concentration ozone resistant, oil-free, special thread)

Symbol	Special thread	Note
A	G	Port size 1/8
B	NPT	
C	M6	Port size M5

Bracket interchangeable with old type

The brackets are interchangeable with brackets of old VDW10/20 series.
For details of exterior dimensions, please contact SMC.

* Only for aluminum and stainless steel (Select stainless steel when interchangeable product is necessary for water.)

VDW □ □ □ □ XB

Enter standard product number.

Bracket interchangeable with old type

* Enter symbols in the order to the right when ordering a combination of electrical option, other options, and bracket interchangeable with old type.

Example) **VDW 2 0 A Z 1A Z XB**

Electrical option

Other option

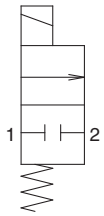
Bracket interchangeable with old type

For Water Single Unit

Model/Valve Specifications

N.C.

Configuration symbol



Note) The configuration symbol shows ports 1 and 2 as blocked, but there is actually a limit to the blocking capability when the pressure of port 2 is greater than the pressure of port 1. Please contact SMC when low leakage performance is required.

Normally Closed (N.C.)
Brass, Stainless Steel Body Type

Size	Port size	Orifice diameter [mmø]	Model	Flow-rate characteristics		Maximum operating pressure differential [MPa]	Weight [g]
				AV (x10^{-6}m^2)	Conversion Cv	Pressurized port 1	
1	M5	1.0	VDW12	0.96	0.04	0.9	Brass: 65 Stainless steel: 60
		1.6		1.70	0.07	0.4	
2	M5, 1/8	1.6	VDW22	1.70	0.07	0.7	Brass: 115 Stainless steel: 100
		2.3		4.30	0.18	0.4	
		3.2		7.20	0.30	0.2	

Resin Body Type

Size	Port size	Orifice diameter [mmø]	Model	Flow-rate characteristics		Maximum operating pressure differential [MPa]	Weight [g]
				AV	Conversion Cv	Pressurized port 1	
1	M5 ø3.2 One-touch fitting ø4 One-touch fitting	1.0	VDW12	0.96	0.04	0.9	45
		1.6		1.70	0.07	0.4	
2	M5 ø4 One-touch fitting ø6 One-touch fitting	1.6	VDW22	1.70	0.07	0.7	80
		2.3		4.30	0.18	0.4	
		3.2		7.20	0.30	0.2	

Refer to “Glossary of Terms” on page 12 for details on the maximum operating pressure differential.

Fluid and Ambient Temperature

Fluid temperature [°C]	Ambient temperature [°C]
1 to 50	−10 to 50

Note) With no freezing

Valve Leakage

Internal Leakage

Note 1) Internal leakage when pressure is supplied to Port 1 (IN).

Seal material	Leakage rate (Water) Note 2)
NBR	0.1 cm^3/min or less (Brass, Stainless steel body type)
	1 cm^3/min or less (Resin body type)

External Leakage

Seal material	Leakage rate (Water) Note 2)
NBR	0.1 cm^3/min or less (Brass, Stainless steel body type)
	1 cm^3/min or less (Resin body type)

Note 2) Leakage is the value at ambient temperature 20°C.

How to Order (Single Unit)

VDW 1 2 A A

Fluid

2	For water

Size/Valve type

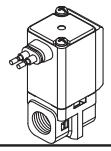
Symbol	Size	Valve type
1	Size 1	Single unit N.C.
2	Size 2	Single unit N.C.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter
A	Resin (PPS)	M5	1.0
B			1.6
C		ø3.2 One-touch fitting	1.0
D			1.6
E		ø4 One-touch fitting	1.0
F			1.6
G	Brass	M5	1.0
H			1.6
J	Stainless steel	M5	1.0
K			1.6
A	Resin (PPS)	M5	1.6
B			2.3
C			3.2
D		ø4 One-touch fitting	1.6
E			2.3
F			3.2
G		ø6 One-touch fitting	1.6
H			2.3
J			3.2
K	Brass	M5	1.6
L			2.3
M			3.2
N		1/8	1.6
P			2.3
Q			3.2
R	Stainless steel	M5	1.6
S			2.3
T			3.2
U		1/8	1.6
V			2.3
W			3.2

Voltage/Electrical entry

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet
B	100 VAC	
C	110 VAC	
D	200 VAC	
E	230 VAC	
Z	Other voltages	



Common Specifications

Valve type	N.C.
Seal material	NBR
Coil insulation type	Class B
Thread type	Rc

Dimensions → Page 9, 10 (Single unit)

Other Special Options

Electrical options (Special voltage)

VDW 1 0 A Z 1A

Enter standard product number.

Electrical option

Electrical option (Special voltage)

Specification	Symbol	Voltage	Electrical entry
Special voltage	1A	48 VAC	Grommet
	1B	220 VAC	
	1C	240 VAC	
	1D	12 VDC	
	1U	24 VAC	

* Enter symbols in the order below when ordering a combination of electrical option, other options, and bracket interchangeable with old type.

Example)

VDW 2 0 A Z 1A Z XB

Electrical option

Other option

Bracket interchangeable with old type

Other options (Low concentration ozone resistant, oil-free, special thread)

VDW 1 0 A A Z

Enter standard product number.

Other option (Low concentration ozone resistant, oil-free, special thread)

Symbol	Low concentration ozone resistant (Seal material: FKM)	Oil-free	Special thread	Note
A	—	—	G	Port size 1/8
B			NPT	
C			M6	Port size M5
D	—	○	G	Port size 1/8
E			NPT	
F			M6	Port size M5
G	○	—	Standard	
H			G	Port size 1/8
J			NPT	
K			M6	Port size M5
L	○	○	Standard	
M			G	Port size 1/8
N			NPT	
P			M6	Port size M5
Z	—	○	Standard	

Bracket interchangeable with old type

The brackets are interchangeable with brackets of old VDW10/20 series.
For details of exterior dimensions, please contact SMC.

* Only for aluminum and stainless steel (Select stainless steel when interchangeable product is necessary for water.)

VDW □□□□ XB

Enter standard product number.

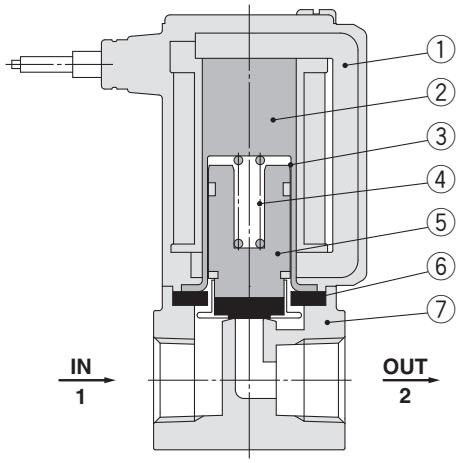
Bracket interchangeable with old type

Air, Medium Vacuum, Water

Construction

Normally closed (N.C.)

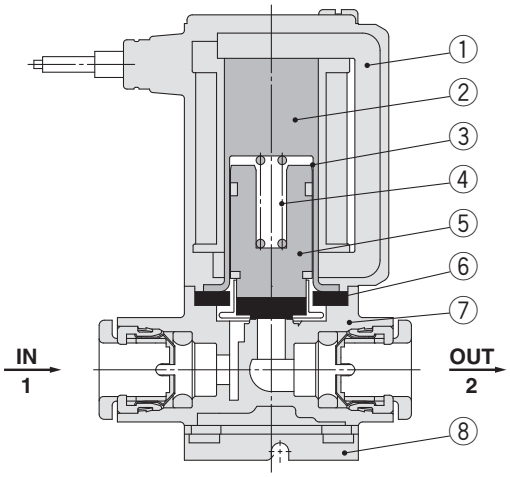
Body material: Aluminium, PPS resin, Brass, Stainless steel



Component Parts

No.	Description	Material
1	**Solenoid coil**	Cu + Fe + Resin
2	**Fixed armature**	Fe
3	**Tube**	Stainless steel
4	**Return spring**	Stainless steel
5	**Armature assembly**	NBR, FKM, Stainless steel, PPS resin
6	**Seal**	NBR, FKM
7	**Body**	Aluminium, PPS resin, Brass (C37), Stainless steel

Body material: PPS resin (One-touch fitting type)

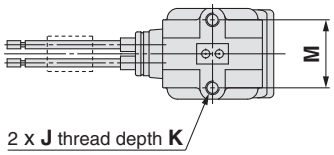


Component Parts

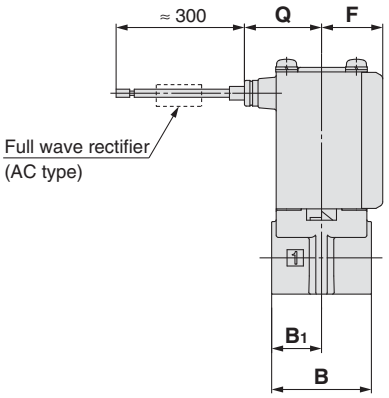
No.	Description	Material
1	**Solenoid coil**	Cu + Fe + Resin
2	**Fixed armature**	Fe
3	**Tube**	Stainless steel
4	**Return spring**	Stainless steel
5	**Armature assembly**	NBR, FKM, Stainless steel, PPS resin
6	**Seal**	NBR, FKM
7	**Body**	PPS resin
8	**Bracket**	SPCC

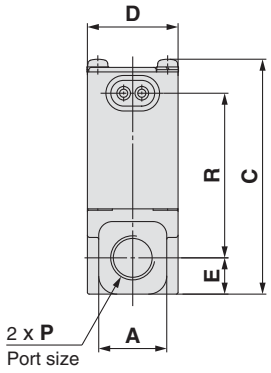
Body material Aluminium

Grommet



Note) Bracket interchangeable with old type (VDW□□□□XB) only





[mm]

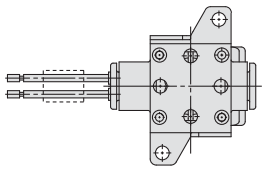
Model	Port size P	A	B	B_1	C	D	E	F	Mounting method			Electrical entry	
									J	K	M	Grommet	
												Q	R
VDW2	M5, 1/8	15	22	11	52	20	8	13.5	M3	5	15	17	36.5

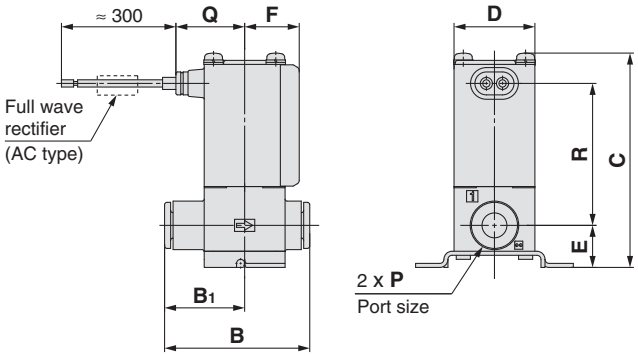
Dimensions

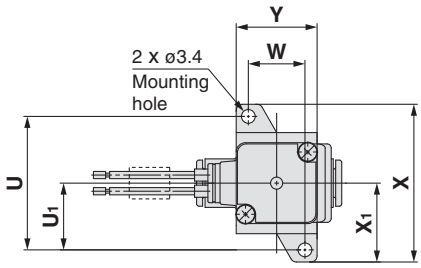
Body material Resin

With one-touch fittings

Grommet







For information on handling one-touch fittings and appropriate tubing, refer to page 15 and KJ series one-touch fittings in catalogue.
The KJ series information can be downloaded from the following SMC website, http://www.smc.eu

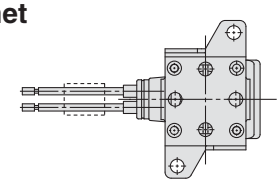
[mm]

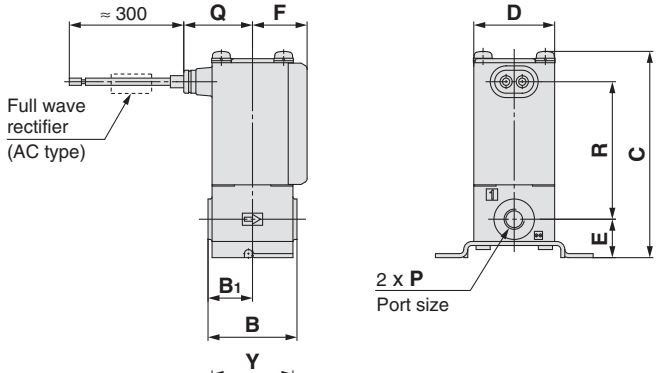
Model	One-touch fitting P	B	B_1	C	D	E	F
VDW1	ø3.2, ø4	32	17	46	15	9.5	11
VDW2	ø4, ø6	36	20	53	20	10.5	13.5

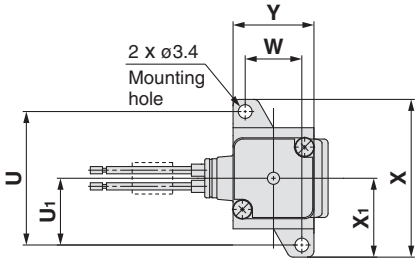
Model	One-touch fitting P	Mounting bracket dimensions						Electrical entry	
		U	U_1	W	X	X_1	Y	Grommet	
								Q	R
VDW1	ø3.2, ø4	28	14	11	34	17	17	15.5	30.5
VDW2	ø4, ø6	33	16.5	14	39	19.5	20	17	35

Port size M5/M6

Grommet







[mm]

Model	Port size P	B	B_1	C	D	E	F
VDW1	M5(M6)	20	10	46	15	9.5	11
VDW2	M5(M6)	22	11	51	20	9.5	13.5

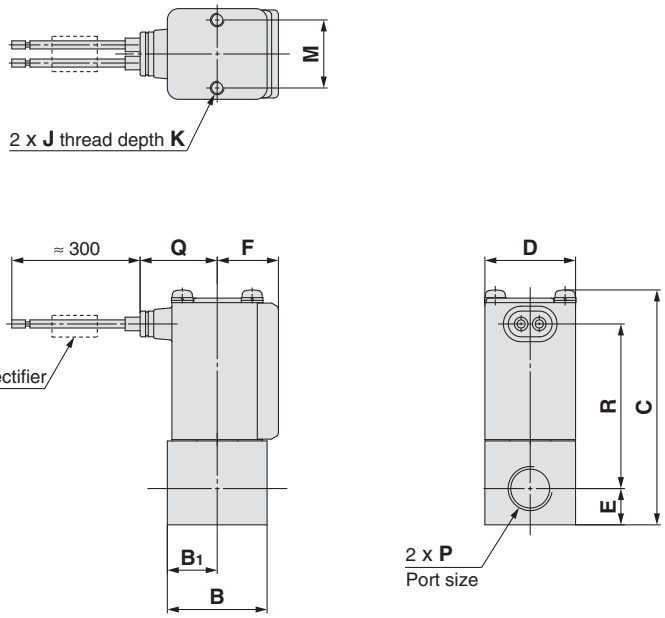
Model	Port size P	Mounting bracket dimensions						Electrical entry	
		U	U_1	W	X	X_1	Y	Grommet	
								Q	R
VDW1	M5(M6)	28	14	11	34	17	17	15.5	30.5
VDW2	M5(M6)	33	16.5	14	39	19.5	20	17	34

Air, Medium Vacuum, Water

Dimensions

Body material Brass

Grommet

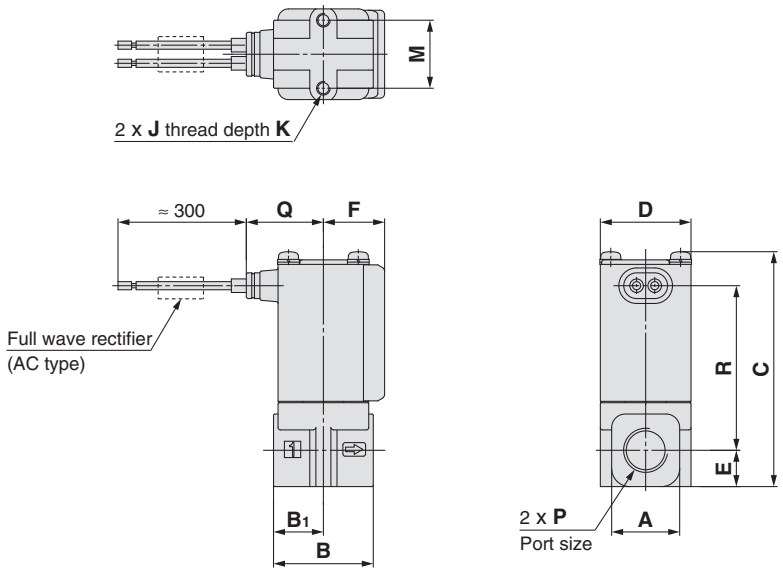


[mm]

Model	Port size P	B	B1	C	D	E	F	Mounting method			Electrical entry	
								J	K	M	Grommet	
											Q	R
VDW1	M5	20	10	42.5	15	6	11	M2.5	4	11	15.5	30
VDW2	M5, 1/8	22	11	52	20	8	13.5	M3	5	15	17	36.5

Body material Stainless Steel

Grommet



[mm]

Model	Port size P	A	B	B1	C	D	E	F	Mounting method			Electrical entry	
									J	K	M	Grommet	
												Q	R
VDW1	M5	12	20	10	42.5	15	6	11	M2.5	4	11	15.5	30
VDW2	M5, 1/8	15	22	11	52	20	8	13.5	M3	5	15	17	36.5

Series VDW
Glossary of Terms

Pressure Terminology

1. Maximum operating pressure differential

The maximum pressure differential (the difference between the inlet and outlet pressure) which is allowed for operation. When the outlet pressure is 0 MPa, this becomes the maximum operating pressure.

2. Minimum operating pressure differential

The minimum pressure differential (the difference between the inlet pressure and outlet pressure) required to keep the main valve fully opened.

3. Maximum system pressure

The maximum pressure that can be applied inside the pipelines (line pressure).

[The pressure differential in the solenoid valve portion must be less than the maximum operating pressure differential.]

4. Withstand pressure

The pressure in which the valve must be withstood without a drop in performance after holding for one minute under prescribed (static) pressure and returning to the operating pressure range. [value under the prescribed conditions]

Electrical Terminology

1. Surge voltage

A high voltage which is momentarily generated by shutting off the power in the shut-off area.

2. Enclosure

A degree of protection defined in the "JIS C 0920: Waterproof test of electric machinery/appliance and the degree of protection against the intrusion of solid foreign objects".

Verify the degree of protection for each product.

● **First Characteristics: Degrees of protection against solid foreign objects**

0	Non-protected
1	Protected against solid foreign objects of ø50 mm and greater
2	Protected against solid foreign objects of ø12 mm and greater
3	Protected against solid foreign objects of ø2.5 mm and greater
4	Protected against solid foreign objects of ø1.0 mm and greater
5	Dust-protected
6	Dusttight

● **Second Characteristics: Degrees of protection against water**

0	Non-protected	—
1	Protected against vertically falling water drops	Dripproof type 1
2	Protected against vertically falling water drops when enclosure tilted up to 15°	Dripproof type 2
3	Protected against rainfall when enclosure tilted up to 60°	Rainproof type
4	Protected against splashing water	Splashproof type
5	Protected against water jets	Low jetproof type
6	Protected against powerful water jets	Strong jetproof type
7	Protected against the effects of temporary immersion in water	Immersible type
8	Protected against the effects of continuous immersion in water	Submersible type

Example) IP65: Dusttight, Low jetproof type

"Low jetproof type" means that no water intrudes inside an equipment that could hinder from operating normally by means of applying water for 3 minutes in the prescribed manner. Take appropriate protection measures, since a device is not usable in an environment where a droplet of water is splashed constantly.

Others

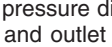
1. Material

NBR: Nitrile rubber
FKM: Fluoro rubber – Trade names: Viton®, Dai-el®, etc.

2. Oil-free treatment

The degreasing and washing of wetted parts

3. Configuration symbol

In the JIS symbol () IN and OUT are in a blocked condition ( ), but actually in the case of reverse pressure (OUT> IN), there is a limit to the blocking.

Product with flow direction 2 → 1 with pressure supplied to port 2 and universal specification product are available as specials.

Product with flow direction 2 → 1 with pressure supplied to port 2

When operating the product with pressure supplied to port 2 and pressure in the flow direction from port 2 to 1, the pressure difference between port 2 and port 1 should be according to the values shown in the table below.

Size	Orifice diameter [mm]	Max. operating pressure differential [ΔMPa]
Size 1	ø1.0	0.4
	ø1.6	0.2
Size 2	ø1.6	0.2
	ø2.3	0.1
	ø3.2	0.05

⚠Caution

When operating the product with flow direction 2 → 1 with pressure supplied to port 2, there is a risk of the valve opening momentarily and fluid leaking to the downstream side due to a rapid increase of the upstream pressure.
A special product will be available when holding pressure supplied from port 2 in the flow direction 2 → 1 with low leakage performance is required.

Universal specification

A special can be available for Universal Specification, where product operation can be both flow from port 1 to port 2 (1 → 2) and from port 2 to port 1 (2 → 1).

Series VDW
Specific Product Precautions 1

Be sure to read before handling.
Refer to back cover for Safety Instructions, "Handling Precautions for SMC Products" (M-E03-3) and the Operation Manual for 2 Port Solenoid Valves for Fluid Control Precautions. Please download it via our website, http://www.smcworld.com

Design

⚠ Warning

1. Cannot be used as an emergency shutoff valve, etc.

The valves presented in this catalogue are not designed for safety applications such as an emergency shutoff valve. If the valves are used in this type of system, other reliable safety assurance measures should also be adopted.

2. Extended periods of continuous energisation

The solenoid coil will generate heat when continuously energised. Avoid using in a tightly shut container. Install it in a well-ventilated area. Furthermore, do not touch it while it is being energised or right after it is energised.

3. Liquid rings

In cases with a flowing liquid, provide a bypass valve in the system to prevent the liquid from entering the liquid seal circuit.

4. Actuator drive

When an actuator, such as a cylinder, is to be driven using a valve, take appropriate measures to prevent potential danger caused by actuator operation.

5. Pressure (including vacuum) holding

It is not usable for an application such as holding the pressure (including vacuum) inside of a pressure vessel because air leakage is entailed in a valve.

6. When an impact, such as water hammer, etc., caused by the rapid pressure fluctuation is applied, the solenoid valve may be damaged. Give an attention to it.

Selection

⚠ Warning

1. Fluid

1) Type of fluid
Before using a fluid, check whether it is compatible with the materials of each model by referring to the fluids listed in this catalogue. Use a fluid with a kinematic viscosity of 50 mm^2/s or less. If there is something you do not know, please contact SMC.

2) Flammable oil, Gas
Confirm the specification for leakage in the interior and/or exterior area.

3) Corrosive gas
Cannot be used since it will lead to cracks by stress corrosion or result in other incidents.

4) Depending on water quality, a brass body can cause corrosion and internal leakage may occur. If such abnormalities occur, exchange the product for a stainless steel body.

5) Use an oil-free specification when any oily particle must not enter the passage.

6) Applicable fluid on the list may not be used depending on the operating condition. Give adequate confirmation, and then determine a model, just because the compatibility list shows the general case.

Selection

⚠ Warning

2. Fluid quality

The use of a fluid that contains foreign objects 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. As a general rule, use 80 to 100 mesh.
When using tap water, since substances such as calcium and magnesium which generate hard scale and sludge are included and can cause the valve to malfunction, install water softening equipment and a filter (strainer) right before the valve to remove these substances.

3. Air quality

1) Use clean air.
Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

2) Install an air filter.
Install an air filter close to the valve on the upstream side. A filtration degree of 5 μm or less should be selected.

3) Install an aftercooler or air dryer, etc.
Compressed air that contains excessive drainage may cause a malfunction of valves and other pneumatic equipment. To prevent this, install an aftercooler or air dryer, etc.

4) If excessive carbon powder is generated, eliminate it by installing a mist separator on the upstream side of valves.
If excessive carbon powder is generated by the compressor, it may adhere to the inside of the valves and cause a malfunction.

Refer to www.smcworld.com for further details on compressed air quality.

4. Ambient environment

Use within the operable ambient temperature range. Check the compatibility between the product's composition materials and the ambient atmosphere. Be certain that the fluid used does not touch the external surface of the product.

5. Countermeasures against static electricity

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

6. Low temperature operation

1) The valve can be used in an ambient temperature of between –10 to –20°C. However, take measures to prevent freezing or solidification of impurities, etc.

2) When using valves for water application in cold climates, take appropriate countermeasures to prevent the water from freezing in tubing after cutting the water supply from the pump, by draining the water, etc. When warming by a heater, etc., be careful not to expose the coil portion to a heater. Installation of a dryer, heat retaining of the body is recommended to prevent a freezing condition in which the dew point temperature is high and the ambient temperature is low, and the high flow runs.

Series VDW
Specific Product Precautions 2

Be sure to read before handling.
Refer to back cover for Safety Instructions, "Handling Precautions for SMC Products" (M-E03-3) and the Operation Manual for 2 Port Solenoid Valves for Fluid Control Precautions. Please download it via our website, http://www.smcworld.com

Selection

⚠Warning

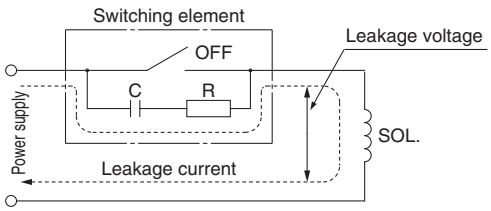
7. Fluid quality

- **Water**
  The use of a fluid that contains foreign objects 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. As a general rule, use 50 to 100 mesh.
  When using tap water, since substances such as calcium and magnesium which generate hard scale and sludge are included and can cause the valve to malfunction, install water softening equipment and a filter (strainer) right before the valve to remove these substances.
- **Air**
  Use ordinary compressed air where a filter of 5 μm or less is provided on the inlet side piping. (Except dry air)

⚠Caution

1. Leakage voltage

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.



AC/Class B built-in full wave rectifier coil: 10% or less of rated voltage
DC coil: 2% or less of rated voltage

2. Selecting model

Material depends on fluid. Select optimal models for the fluid.

Mounting

⚠Warning

1. 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.

2. Do not apply external force to the coil section.

When tightening is performed, apply a wrench or other tool to the outside of the piping connection parts.

Mounting

⚠Warning

3. Mount a valve with its coil position upwards, not downwards.

When mounting a valve with its coil positioned downwards, foreign objects in the fluid will adhere to the iron core leading to a malfunction. Especially for strict leakage control, such as with vacuum applications and non-leak specifications, the coil must be positioned upwards.

4. Do not warm the coil assembly with a heat insulator, etc.

Use tape, heaters, etc., for freeze prevention on the piping and body only. They can cause the coil to burn out.

5. Secure with brackets, except in the case of steel piping and copper fittings.

6. Avoid sources of vibration, or adjust the arm from the body to the minimum length so that resonance will not occur.

7. Painting and coating

Warnings or specifications printed or labeled on the product should not be erased, removed or covered up.

Piping

⚠Warning

1. During use, deterioration of the tube 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.

2. For piping the tube, fix the product securely using the mounting holes so that the product is not in the air.

⚠Caution

1. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.
Install piping so that it does not apply pulling, pressing, bending or other forces on the valve body.

2. Avoid connecting ground lines to piping, as this may cause electric corrosion of the system.

3. Tighten threads with the proper tightening torque.

When attaching fittings to valves, tighten with the proper tightening torque shown below.

Tightening Torque for Piping

Connection thread	Proper tightening torque (N·m)
M5	1 to 1.5
M6	1 to 1.5
Rc1/8	7 to 9

4. Connection of piping to products

When connecting piping to a product, refer to its operation manual to avoid mistakes regarding the supply port, etc.

5. In applications such as vacuum and non-leak specifications, use caution specifically against the contamination of foreign objects or airtightness of the fittings.

Series VDW
Specific Product Precautions 3

Be sure to read before handling.
Refer to back cover for Safety Instructions, "Handling Precautions for SMC Products" (M-E03-3) and the Operation Manual for 2 Port Solenoid Valves for Fluid Control Precautions. Please download it via our website, http://www.smcworld.com

Recommended Piping Conditions

1. When connecting tubes using one-touch fittings, provide some spare tube length 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.)

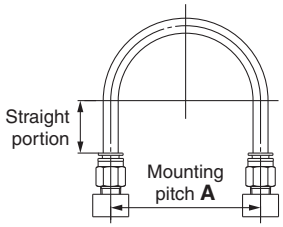


Fig. 1 Recommended piping configuration

Unit: mm

Tube size	Mounting pitch **A**			Straight portion length
	Nylon tube	Soft nylon tube	Polyurethane tube	
ø3.2	44 or more	29 or more	25 or more	16 or more
ø4	56 or more	30 or more	26 or more	20 or more
ø6	84 or more	39 or more	39 or more	30 or more

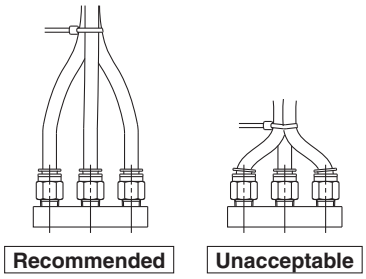


Fig. 2 Binding tubes with bands

Wiring

⚠ Caution

1. As a rule, use electric wire with a cross sectional area of 0.5 to 1.25 mm² for wiring.
Furthermore, do not allow excessive force to be applied to the lines.

2. Use electric circuits which do not generate chattering in their contacts.

3. Use voltage which is within ±10% of the rated voltage. In cases with a DC power supply where importance is placed on responsiveness, stay within ±5% of the rated value. The voltage drop is the value in the lead wire section connecting the coil.

4. When a surge from the solenoid affects the electrical circuitry, install a surge voltage suppressor, etc., in parallel with the solenoid. Or, adopt an option that comes with the surge voltage protection circuit. (However, a surge voltage occurs even if the surge voltage protection circuit is used. For details, please consult with SMC.)

Operating Environment

⚠ Warning

1. Do not use in an atmosphere having corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these.

2. Do not use in explosive atmospheres.

3. Do not use in locations subject to vibration or impact.

4. Do not use in locations where radiated heat will be received from nearby heat sources.

5. Employ suitable protective measures in locations where there is contact with water droplets, oil or welding spatter, etc.

Maintenance

⚠ Warning

1. Removing the product

The valve will reach a high temperature when used with high temperature fluids. Confirm that the valve temperature has dropped sufficiently before performing work. If touched inadvertently, there is a danger of being burned.

1) Shut off the fluid supply and release the fluid pressure in the system.
2) Shut off the power supply.
3) Remove the product.

2. 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

1. Filters and strainers

1) Be careful regarding clogging of filters and strainers.
2) Replace filter elements after one year of use, or earlier if the pressure drop reaches 0.1 MPa.
3) Clean strainers when the pressure drop reaches 0.1 MPa.

2. Lubrication

When using after lubricating, never forget to lubricate continuously.

3. Storage

In case of long term storage after use with heated water, thoroughly remove all moisture to prevent rust and deterioration of rubber materials, etc.

4. Exhaust the drainage from an air filter periodically.

Operating Precautions

⚠ Warning

1. If there is a possibility of reverse pressure being applied to the valve, take countermeasures such as mounting a check valve on the downstream side of the valve.

2. When problems are caused by a water hammer, install water hammer relief equipment (accumulator, etc.), or use an SMC water hammer relief valve (Series VXR). For details, please consult with SMC.

Series VDW
Specific Product Precautions 4

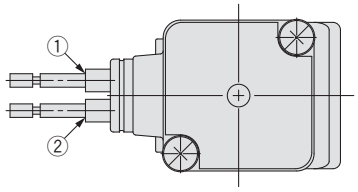
Be sure to read before handling.
Refer to back cover for Safety Instructions, "Handling Precautions for SMC Products" (M-E03-3) and the Operation Manual for 2 Port Solenoid Valves for Fluid Control Precautions. Please download it via our website, http://www.smcworld.com

Electric Connections

⚠Caution

■ **Grommet**

Class B coil: AWG20 Outside insulator diameter of 1.8 mm



Rated voltage	Lead wire color	
	①	②
DC	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Grey	Grey

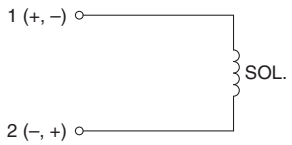
∗ There is no polarity.

Electric Circuits

⚠Caution

[DC circuit]

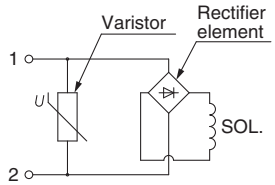
Grommet



[AC circuit]

∗ For AC (Class B), the standard product is equipped with surge voltage suppressor.

Grommet



One-touch Fitting

⚠Caution

For information on handling one-touch fittings and appropriate tubing, refer to page 15 and the KJ series one-touch fittings catalogue.
The KJ series information can be downloaded from the following SMC website, http://www.smc.eu

⚠ 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.

⚠ 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.

*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.

⚠ 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 catalogue 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 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.

⚠ 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, wichever 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 catalogue 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 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.

⚠ Safety Instructions | Be sure to read "Handling Precautions for SMC Products" (M-E03-3) before using.

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