

# Compact Direct Operated 2/3 Port Solenoid Valve for Water and Air

## Series VDW

VDW10/20/30: 2 Port, VDW200/300: 3 Port



**Molded coil specifications have been added!**

**IP65**



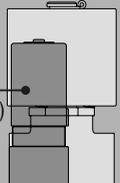
Grommet/Molded



Faston™ terminal (Note)/Molded

**Compact / Lightweight**  
(as compared to the VX series)

Single valve volume: Reduced by -75% (VDW20)  
100 g: Reduced approx. by -50%  
(for orifice diameter equivalent to ø2)

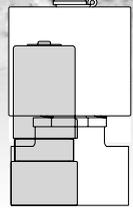


Note) Faston™ is a trademark of Tyco Electronics Corp.

**For Water and Air Compact Direct Operated 2/3 Port Solenoid Valve**

# Series VDW

- **Compact (as compared to the VX series)**  
Single valve volume: **Reduced by -75%** (VDW20)  
Manifold length: **Reduced by -18%** (VDW30, 7 stations)
- **Lightweight (as compared to the VX series)**  
**100 g: Reduced approx. by -50%**  
(for orifice diameter equivalent to  $\varnothing 2$ )



## Improved durability (Nearly twice the life of the previous series)

The use of a unique magnetic material reduces the operating resistance of moving parts, while improving service life, wear and corrosion resistance.

**Improved corrosion resistance**  
Special material introduced

**Clip type**

**Ease of maintenance has been improved.**

Changing of the coil is made easy by means of clip design. (2 port)

**Threaded assembly**  
Simplifies maintenance.

**High flow rate: Cv factor**  
**0.04 to 0.46 (2 port)**

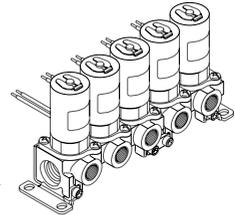
**Universal porting**  
**VDW200/300 (3 port)**

**Brass (C37)/Stainless steel manifolds added to series (2 port)**

## Improved environment resistance

Environment resistance is improved by using a molded coil. (Enclosure IP65 or equivalent, grommet mold)

**Threaded for bottom mounting**  
Special bracket can be mounted.



Grommet/Molded

## Lineup by Compact Design

2 Port P.243			3 Port P.254	
$\varnothing 17$	$\varnothing 20.5$	$\varnothing 28$	$\varnothing 20.5$	$\varnothing 28$
VDW10	VDW20	VDW30	VDW200	VDW300

# Compact Direct Operated 2 Port Solenoid Valve for Water and Air Series **VDW10/20/30**



## How to Order Valves (Single Unit)

**VDW 2 1 - 1 G - 2 - 01** - - - - -

For Water, Air, Vacuum •

**Series**

1	10
2	20
3	30

**Valve type**

**CE compliant**

Nil	—
Q	CE compliant

**Made to Order**  
(Refer to page 244.)

**Option**

Nil	None
F	Foot bracket

Note) The foot bracket is packed with a valve.

**Material and insulation type**

Symbol	Body material	Seal material	Coil insulation
Nil	—	NBR	Class B
A	Brass (C37)	FKM	
B	—	EPDM	
G	—	NBR	
H	Stainless steel	FKM	
J	—	EPDM	
L (Note)	—	FKM	

Note) The armature assembly is a corrosion resistant construction.

**Material and insulation type**

Symbol	Body material	Seal material	Coil insulation
Nil	—	NBR	Class B
A	Brass (C37)	FKM	
B	—	EPDM	
G	—	NBR	
H	Stainless steel	FKM	
J	—	EPDM	
L (Note)	—	FKM	

**Coil type**

G – Grommet / Tape winding	W – Grommet / Molded
Magnet wire protection: Tape winding	Magnet wire protection: Resin Molded

**F – Faston terminal / Molded**

Magnet wire protection: Resin Molded

**Thread type**

Nil	Rc
F	G
N	NPT

**Port size**

Symbol	Port size	Series		
		10	20	30
M5	M5	○	○	—
01	1/8 (6A)	—	○	○
02	1/4 (8A)	—	—	○

**Orifice diameter**

Symbol	Orifice diameter (mm ø)	Series
1	1	10
2	1.6	
1	1.6	20
2	2.3	
3	3.2	30
2	2	
3	3	
4	4	

**Series and Coil Type Combinations**

Series	Grommet / Tape winding	Faston terminal / Molded	Grommet / Molded
10	●	—	●
20	●	●	●
30	●	●	●

**Voltage**

Symbol	Voltage	Grommet / Tape winding (G)	Faston terminal, Molded (F)	Grommet / Molded (W)
1	100 VAC (50/60 Hz)	●	—	●
2	200 VAC (50/60 Hz)	●	—	●
3	110 VAC (50/60 Hz)	●	—	●
4	220 VAC (50/60 Hz)	●	—	●
5	24 VDC	●	●	●
6	12 VDC	●	●	●
V	6 VDC	●	●	●
S	5 VDC	●	●	●
R	3 VDC	●	●	●

\* Please consult with SMC regarding other voltages.

- VX2
- VXD
- VXZ
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA
- VCH
- VDW
- VQ
- LVM
- VCA
- VCB
- VCL
- VCS
- VCW



## Standard Specifications

Valve specifications	<b>Valve construction</b>	Direct operated poppet	
	<b>Fluid</b> <small>Note 2</small>	Water (except waste water or agricultural water), Air, Low vacuum	
	<b>Withstand pressure (MPa)</b>	2.0	
	<b>Ambient temperature (°C)</b>	-10 to 50	
	<b>Fluid temperature (°C)</b>	1 to 50 (No freezing)	
	<b>Environment</b>	Location without corrosive or explosive gases	
	<b>Valve leakage (cm<sup>3</sup>/min)</b>	0 (with water pressure) 1 or less (Air)	
Coil specifications	<b>Mounting orientation</b>	Unrestricted	
	<b>Vibration/Impact (m/s<sup>2</sup>)</b> <small>Note 4</small>	30/150	
	<b>Rated voltage</b>	24 VDC, 12 VDC, 6 VDC, 5 VDC, 3 VDC, 100 VAC, 110 VAC, 200 VAC, 220 VAC (50/60 Hz)	
	<b>Allowable voltage fluctuation (%)</b>	±10% of rated voltage	
	<b>Coil insulation type</b>	Class B	
	<b>Enclosure</b>	<b>Grommet / Tape winding</b>	Dust-proof (equivalent to IP40)
		<b>Faston terminal / Molded</b>	Dust-tight (equivalent to IP60) <small>Note 5</small>
<b>Grommet / Molded</b>		Dust-tight / Low jetproof (equivalent to IP65)	
<b>Power consumption (W)</b> <small>Note 3</small>	2.5 (VDW10), 3 (VDW20/30)		

**Note 1** When used under conditions which may cause condensation on the exterior of the product, select Grommet / Molded.

**Note 2** When used with deionized water, select "L" (Stainless steel, FKM) for the material type.

**Note 3** Since the AC coil specification includes a rectifier element, there is no difference in power consumption between inrush and holding.

**In the case of 110/220 VAC, the VDW10 is 3 W and the VDW20/30 is 3.5 W.**

**Note 4** Vibration resistance ..... No malfunction when tested with one sweep of 5 to 200 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 armature, one time each in energized and deenergized states.

**Note 5** Since electrical connections are exposed, there is no water resistance.



**Made to Order**

(For details, refer to page 259.)

Symbol	Specifications
<b>X22</b>	Non-leak (10 <sup>-6</sup> Pa·m <sup>3</sup> /sec) / Vacuum (0.1Pa-abs) specification
<b>X23</b>	Oil-free specification
<b>X60</b>	Lead wire length: 600 mm specification
<b>X133</b>	Seal material: Kalrez <sup>®</sup> specification <small>Note</small>

Note) Kalrez<sup>®</sup> is a registered trademark of DuPont Dow Elastomers.

## Characteristic Specifications

Model	Port size	Orifice dia. (mm ø)	Max. operating pressure differential (MPa) <small>Note 1</small>		Operating Pressure range (MPa) <small>Note 2</small>	Mass (kg)
			Pressure port 1	Pressure port 2		
VDW10	M5	1	0.9	0.4	0 to 1.0	0.08
		1.6	0.4	0.2		
VDW20	M5 1/8 (6A)	1.6	0.7	0.2		
		2.3	0.4	0.1		
		3.2	0.2	0.05		
		2	0.8	0.2		
VDW30	1/8 (6A) 1/4 (8A)	3	0.4	0.1	1/8: 0.23 1/4: 0.26	
		4	0.2	0.05		

**Note 1** The maximum operating pressure differential changes depending on the flow direction of the fluid. Refer to page 264 for details.

**Note 2** For low vacuum specifications, the operating pressure range is 1 Torr (1.33 x 10<sup>2</sup> Pa) to 1.0 MPa.

Please consult with SMC if using below 1 Torr (1.33 x 10<sup>2</sup> Pa).

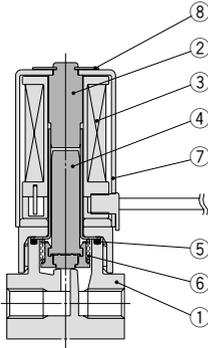
## Flow Characteristics

Model	Port size	Orifice dia. (mm ø)	Water			Air		
			1→2 (IN→N.C.)			1→2 (IN→N.C.)		
			N.C.	Av x 10 <sup>-6</sup> m <sup>2</sup>	Cv converted	C [dm <sup>3</sup> /(s·bar)]	b	Cv
VDW10	M5	1	0.96	0.04	0.14	0.40	0.04	
		1.6	1.7	0.07	0.30	0.25	0.07	
VDW20	M5 1/8 (6A)	1.6	1.9	0.08	0.31	0.45	0.09	
		2.3	4.3	0.18	0.58	0.45	0.18	
		3.2	7.2	0.30	1.2	0.38	0.33	
VDW30	1/8 (6A) 1/4 (8A)	2	3.8	0.16	0.52	0.52	0.16	
		3	6.7	0.28	1.0	0.52	0.30	
		4	11	0.44	1.5	0.49	0.46	

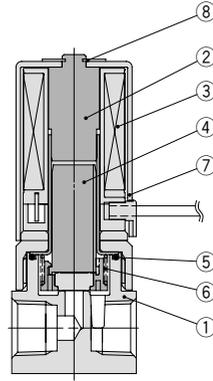
**Compact Direct Operated  
2 Port Solenoid Valve for Water and Air *Series VDW10/20/30***

**Construction**

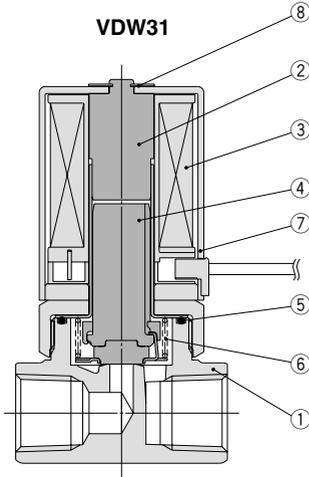
**VDW11**



**VDW21**



**VDW31**



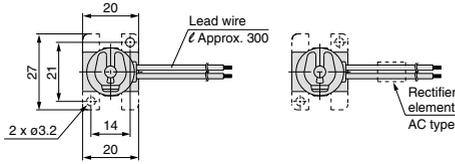
**Component Parts**

No.	Description	Material	
		Standard	Option
1	<b>Body</b>	Brass (C37)	Stainless steel
2	<b>Tube assembly</b>	Stainless steel	—
3	<b>Coil assembly</b>	—	—
4	<b>Armature assembly</b>	Stainless steel, PPS, NBR	FKM, EPDM
5	<b>O-ring (Body)</b>	NBR	FKM, EPDM
6	<b>Return spring</b>	Stainless steel	—
7	<b>Cover</b>	SPCE	—
8	<b>Clip</b>	Stainless steel	—

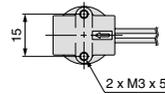
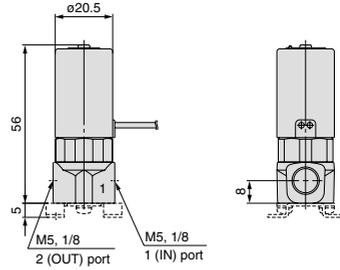
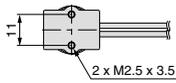
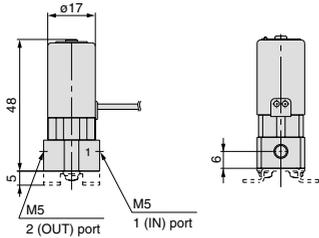
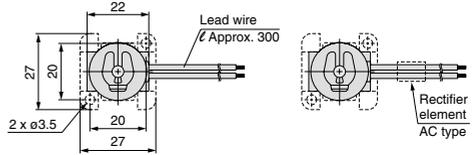
# Series VDW10/20/30

## Dimensions

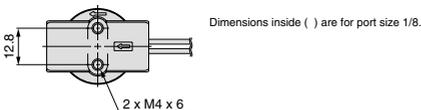
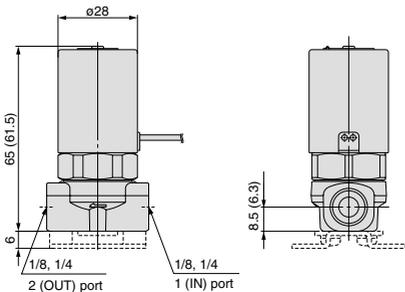
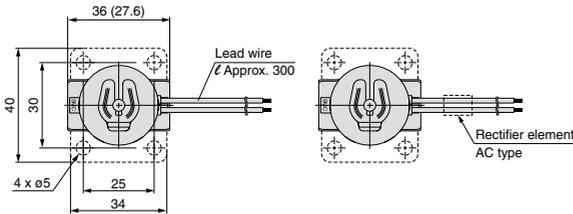
### VDW11-□<sup>G</sup><sub>W</sub>



### VDW21-□<sup>G</sup><sub>W</sub>



### VDW31-□<sup>G</sup><sub>W</sub>



Dimensions inside ( ) are for port size 1/8.

### Bracket assembly part no.

- Series 10, 20

**VDW 2 0-15A-1**

- Series

1	10
2	20

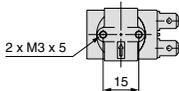
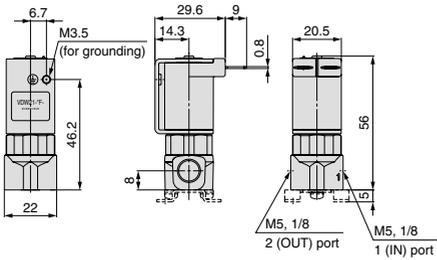
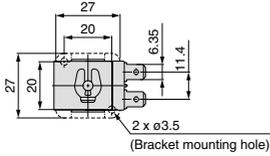
- Series 30

**VCW20-12-01A**

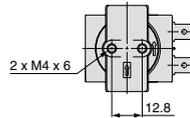
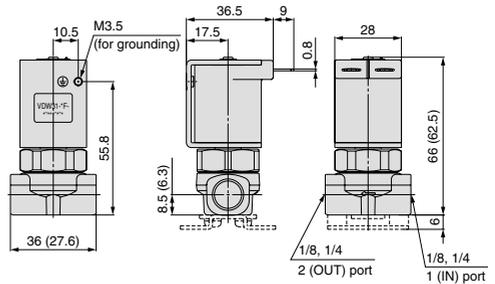
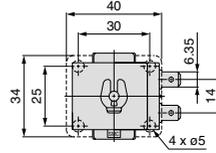
**Compact Direct Operated**  
**2 Port Solenoid Valve for Water and Air** *Series VDW10/20/30*

**Dimensions**

**VDW21-□F**



**VDW31-□F**



**Bracket assembly part no.**

- Series 20

**VDW20 – 15A – 1**

- Series 30

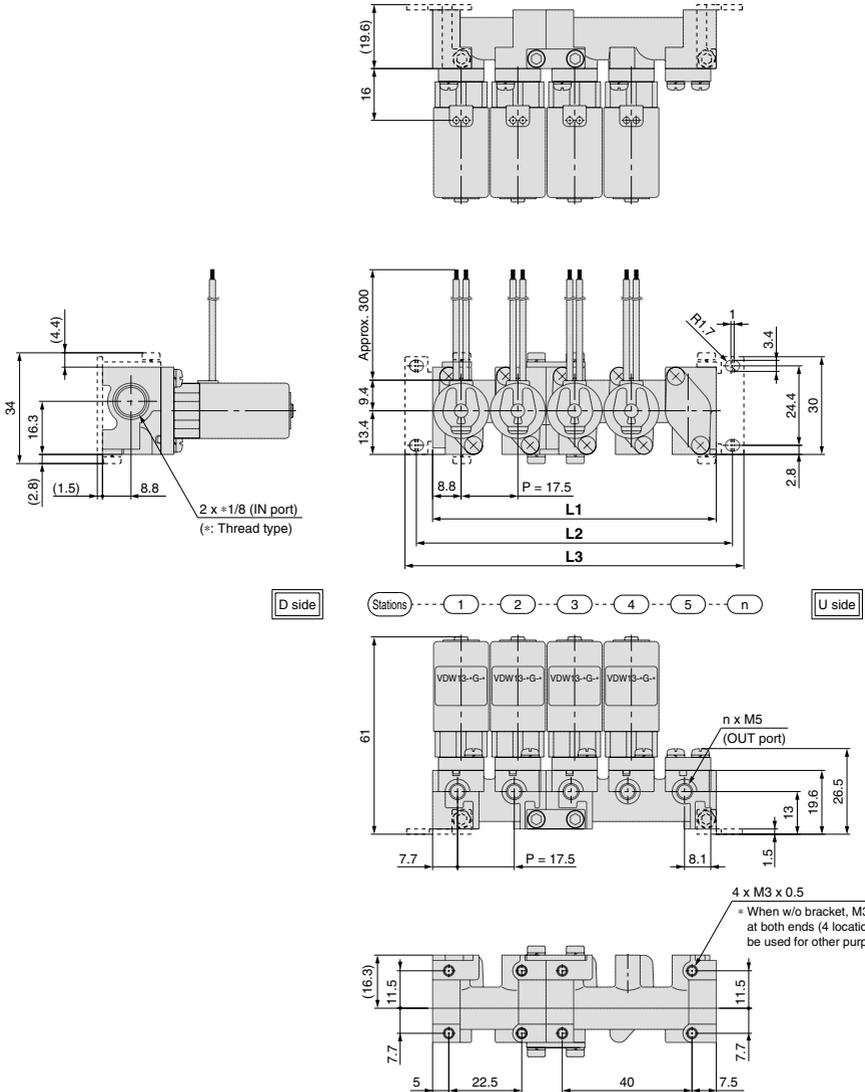
**VCW20 – 12 – 01A**



# Compact Direct Operated 2 Port Solenoid Valve for Water and Air *Series VDW10/20/30*

## Dimensions

### VV2DW1



### L Dimension

Dimension	n (stations)									
	2	3	4	5	6	7	8	9	10	
<b>L1</b>	35	52.5	70	87.5	105	122.5	140	157.5	175	
<b>L2</b>	45	62.5	80	97.5	115	132.5	150	167.5	185	
<b>L3</b>	52	69.5	87	104.5	122	139.5	157	174.5	192	
<b>Manifold composition</b>	2 stns. x 1	3 stns. x 1	2 stns. x 2	2 stns. + 3 stns.	3 stns. x 2	2 stns. x 2 + 3 stns.	2 stns. + 3 stns. x 2	3 stns. x 3	2 stns. x 2 + 3 stns. x 2	

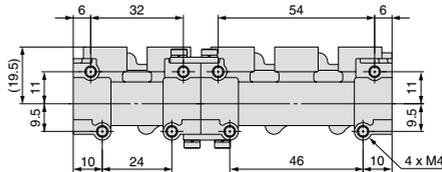
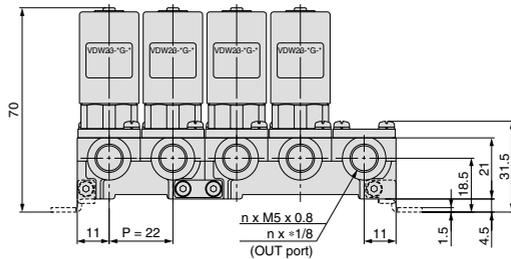
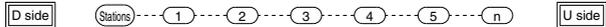
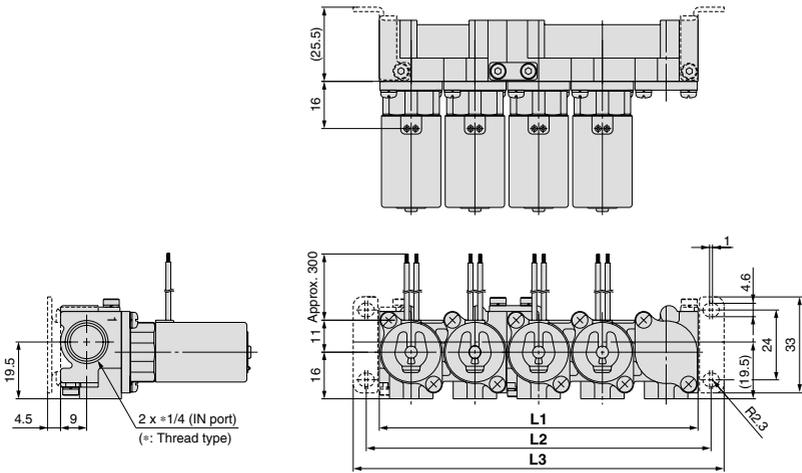
Note) Manifold base is consisted of the junction of 2 and 3 station bases.

Refer to page 252 and 253 regarding manifold additions.

# Series VDW10/20/30

## Dimensions

### VV2DW2



\* When w/o bracket, M4 threads at both ends (4 locations) can be used for other purposes.

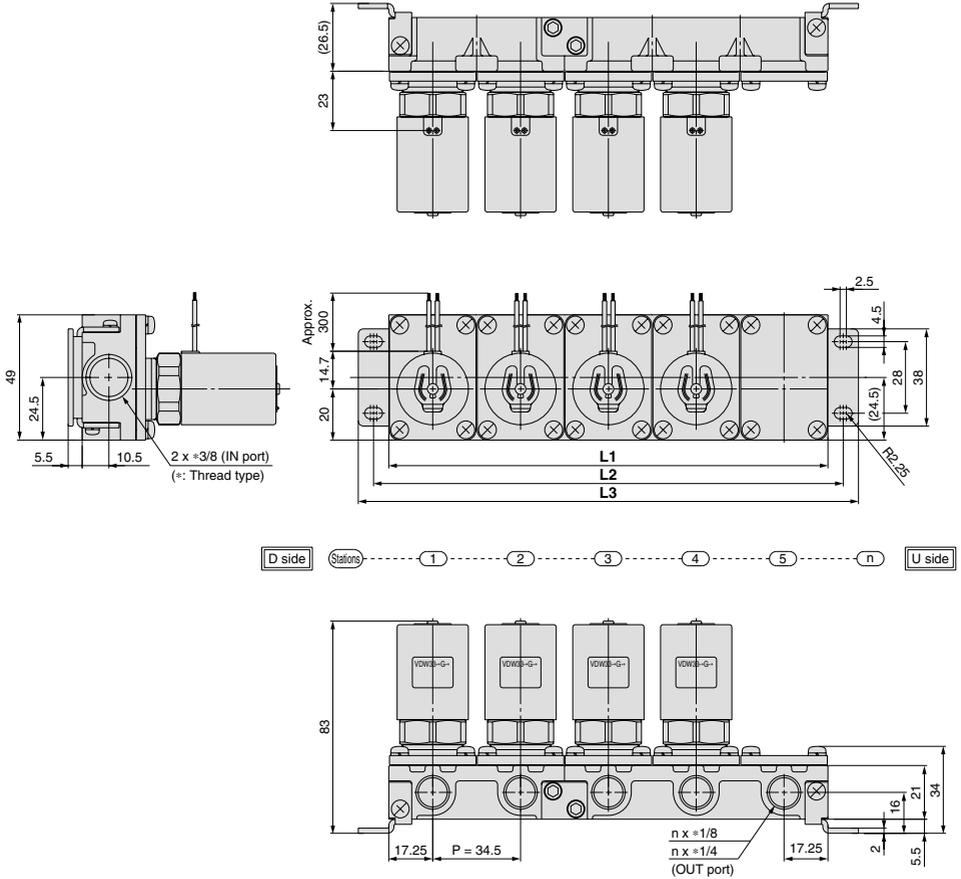
### L Dimension

Dimension	n (stations)									
	2	3	4	5	6	7	8	9	10	
L1	44	66	88	110	132	154	176	198	220	
L2	53	75	97	119	141	163	185	207	229	
L3	62	84	106	128	150	172	194	216	238	
Manifold composition	2 stns. x 1	3 stns. x 1	2 stns. x 2	2 stns. + 3 stns.	3 stns. x 2	2 stns. x 2 + 3 stns.	2 stns. + 3 stns. x 2	3 stns. x 3	2 stns. x 2 + 3 stns. x 2	

Note) Manifold base is consisted of the junction of 2 and 3 station bases.  
Refer to page 252 and 253 regarding manifold additions.

# Compact Direct Operated 2 Port Solenoid Valve for Water and Air *Series VDW10/20/30*

**VV2DW3**



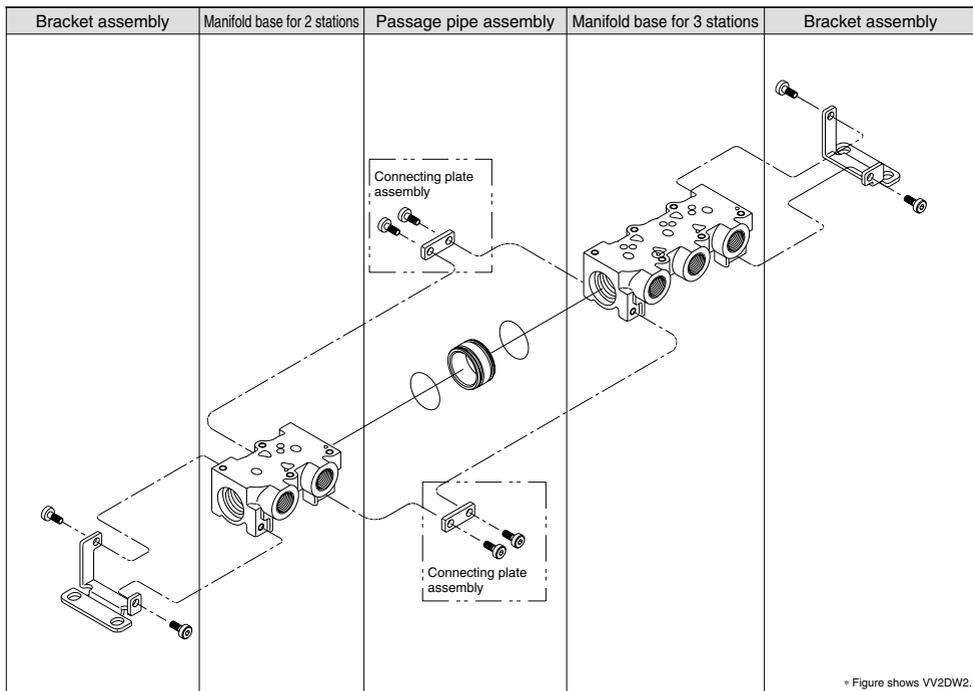
**L Dimension**

Dimension	n (stations)									
	2	3	4	5	6	7	8	9	10	
<b>L1</b>	70	105	140	175	210	245	280	315	350	
<b>L2</b>	82	117	152	187	222	257	292	327	362	
<b>L3</b>	94	129	164	199	234	269	304	339	374	
<b>Manifold composition</b>	2 stns. x 1	3 stns. x 1	2 stns. x 2	2 stns. + 3 stns.	3 stns. x 2	2 stns. x 2 + 3 stns.	2 stns. + 3 stns. x 2	3 stns. x 3	2 stns. x 2 + 3 stns. x 2	

Note) Manifold base is consisted of the junction of 2 and 3 station bases.  
Refer to page 252 and 253 regarding manifold additions.

# Series VDW10/20/30

## Manifold Exploded View



### Manifold additions

- 1 Install a passage pipe assembly in between the manifold bases to be added.
- 2 Connect the respective manifold bases with a connecting plate assembly. (Tightening torque:  $0.9 \pm 0.1$  N·m)
- 3 Attach brackets to the manifold bases. (when equipped with brackets) (Tightening torque:  $0.9 \pm 0.1$  N·m)

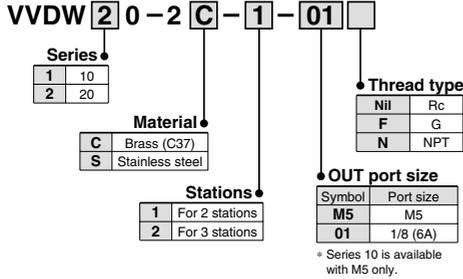
Note) Manifold can be increased by every 2 or 3-station unit.

Order one set each of manifold base, connection plate assembly and passage pipe assembly.

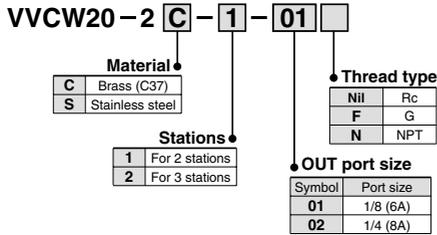
# Compact Direct Operated 2 Port Solenoid Valve for Water and Air *Series VDW10/20/30*

### <Manifold base>

- Series 10, 20



- Series 30



### <Connecting plate assembly>

- Series 10, 20

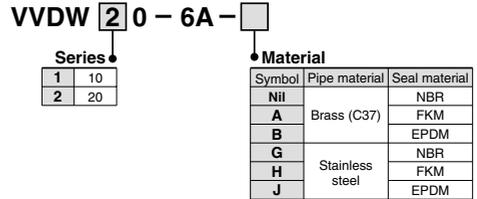


- Series 30

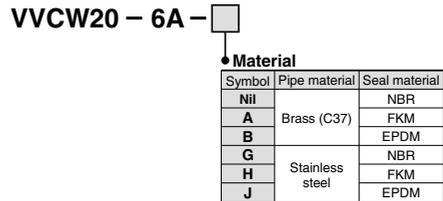
VVCW20-4A

### <Passage pipe assembly>

- Series 10, 20



- Series 30



### <Bracket assembly>

- Series 10, 20



- Series 30

VVCW20-5A

# Compact Direct Operated 3 Port Solenoid Valve for Water and Air Series **VDW200/300**



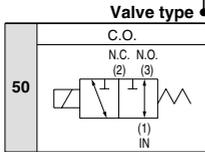
## How to Order Valves (Single Unit)

VDW **2**50-**1**G-**2**-**01** - - - - -

For Water, Air, Vacuum

Series

2	200
3	300



CE compliant

Nil	—
Q	CE compliant

Made to Order  
(Refer to page 255.)

Option

Nil	None
F	Foot bracket

Note) The foot bracket is packed with a valve.

Voltage

Symbol	Voltage	Grommet / Tape winding (G)	Faston terminal / Molded (F)	Grommet / Molded (W)
1	100 VAC (50/60 Hz)	●	—	●
2	200 VAC (50/60 Hz)	●	—	●
3	110 VAC (50/60 Hz)	●	—	●
4	220 VAC (50/60 Hz)	●	—	●
5	24 VDC	●	●	●
6	12 VDC	●	●	●
V	6 VDC	●	●	●
S	5 VDC	●	●	●
R	3 VDC	●	●	●

\* Please consult with SMC regarding other voltages.

### Material and insulation type

Symbol	Body material	Seal material	Coil insulation
Nil	Brass (C37)	NBR	Class B
A		FKM	
B		EPDM	
G	NBR		
H	FKM		
J	EPDM		
L (Note)	Stainless steel	FKM	
		EPDM	

Note) The armature assembly is a corrosion resistant construction.

### Thread type

Nil	Rc
F	G
N	NPT

### Port size

Symbol	Port size	Series	
		200	300
M5	M5	○	—
01	1/8 (6A)	○	○
02	1/4 (8A)	—	○

### Orifice diameter

Symbol	N.C. Orifice diameter (mm ø)	N.O. Orifice diameter (mm ø)	Series
1	1	1	200
2	1.6		
2	2	1.8	300
3	3		
4	4		

### Coil type

G – Grommet / Tape winding	W – Grommet / Molded
<p>Magnet wire protection: Tape winding</p>	<p>Magnet wire protection: Resin Molded</p>
<p>F – Faston terminal / Molded</p> <p>Magnet wire protection: Resin Molded</p>	

# Compact Direct Operated 3 Port Solenoid Valve for Water and Air *Series VDW200/300*

## Standard Specifications



Valve specifications	Valve construction	Direct operated poppet
	Fluid <sup>Note 2)</sup>	Water (except waste water or agricultural water), Air, Low vacuum
	Withstand pressure (MPa)	2.0
	Ambient temperature (°C)	-10 to 50
	Fluid temperature (°C)	1 to 50 (No freezing)
	Environment	Location without corrosive or explosive gases
	Valve leakage (cm <sup>3</sup> /min)	0 (with water pressure) 1 (Air)
	Mounting orientation	Unrestricted
Coil specifications	Vibration/Impact (m/s <sup>2</sup> ) <sup>Note 4)</sup>	30/150
	Rated voltage	24 VDC, 12 VDC, 100 VAC, 110 VAC, 200 VAC, 220 VAC (50/60 Hz)
	Allowable voltage fluctuation (%)	±10% of rated voltage
	Coil insulation type	Class B
	Enclosure	Grommet / Tape winding
Faston terminal / Molded		Dust-tight (equivalent to IP60) <sup>Note 5)</sup>
Grommet / Molded		Dust-tight / Low jetproof (equivalent to IP65)
Power consumption (W) <sup>Note 3)</sup>	3	



Note 1) Please consult with SMC when used under conditions which may cause condensation on the exterior of the product.

Note 2) When used with deionized water, select "L" (Stainless steel, FKM) for the material type.

Note 3) Since the AC coil specification includes a rectifier element, there is no difference in power consumption between inrush and holding.  
**3.5 W in the case of 110/220 VAC**

Note 4) Vibration resistance ..... No malfunction when tested with one sweep of 5 to 200 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 armature, one time each in energized and deenergized states.

Note 5) Since electrical connections are exposed, there is no water resistance.



**Made to Order**  
(For details, refer to page 259.)

Symbol	Specifications
<b>X22</b>	Non-leak (10 <sup>-6</sup> Pa·m <sup>3</sup> /sec) / Vacuum (0.1 Pa-abs) specification
<b>X23</b>	Oil-free specification
<b>X60</b>	Lead wire length: 600 mm specification
<b>X133</b>	Seal material: Kalrez <sup>®</sup> specification <sup>Note)</sup>

Note) Kalrez<sup>®</sup> is a registered trademark of DuPont Dow Elastomers.

## Characteristic Specifications

Model	Port size	Orifice dia. (mm ø)	Max. operating pressure differential (MPa) <sup>Note 2)</sup>		Operating pressure range (MPa) <sup>Note 3)</sup>	Mass (kg)
			Pressure port 1	Pressure port 2, 3 <sup>Note 1)</sup>		
VDW200	M5 1/8 (6A)	1	0.9	0.3	0 to 1.0	0.12
		1.6	0.7	0.1		
VDW300	1/8 (6A) 1/4 (8A)	2	0.8	0.2		
		3	0.4	0.1		
		4	0.2	0.05		



Note 1) Indicates the maximum operating pressure differential of pressure ports 2 and 3.

Note 2) The maximum operating pressure differential changes depending on the flow direction of the fluid. Refer to page 264 for details.

Note 3) For low vacuum specifications, the operating pressure range is 1 Torr (1.33 x 10<sup>2</sup> Pa) to 1.0 MPa.

Please consult with SMC if using below 1 Torr (1.33 x 10<sup>2</sup> Pa).

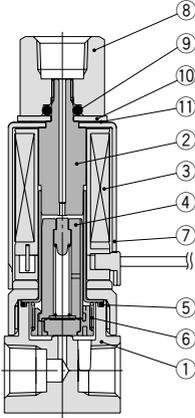
## Flow Characteristics

Model	Port size	Orifice dia. (mm ø)		Water				Air					
		N.C.	N.O.	1→2 (IN→N.C.)		1→3 (IN→N.O.)		1→2 (IN→N.C.)			1→3 (IN→N.O.)		
				Av x 10 <sup>-6</sup> m <sup>2</sup>	Cv converted	Av x 10 <sup>-6</sup> m <sup>2</sup>	Cv converted	C [dm <sup>3</sup> /(s·bar)]	b	Cv	C [dm <sup>3</sup> /(s·bar)]	b	Cv
VDW200	M5 1/8 (6A)	1	1	0.72	0.03	0.96	0.04	0.12	0.35	0.03	0.13	0.52	0.04
		1.6		1.9	0.08			0.31	0.45	0.09			
VDW300	1/8 (6A) 1/4 (8A)	2	1.8	3.8	0.16	3.1	0.13	0.52	0.52	0.16	0.38	0.50	0.12
		3		6.7	0.28			1.0	0.52	0.30			
		4		11	0.44			1.5	0.49	0.46			

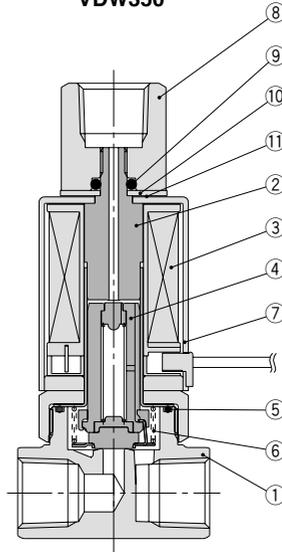
# Series VDW200/300

## Construction

VDW250



VDW350



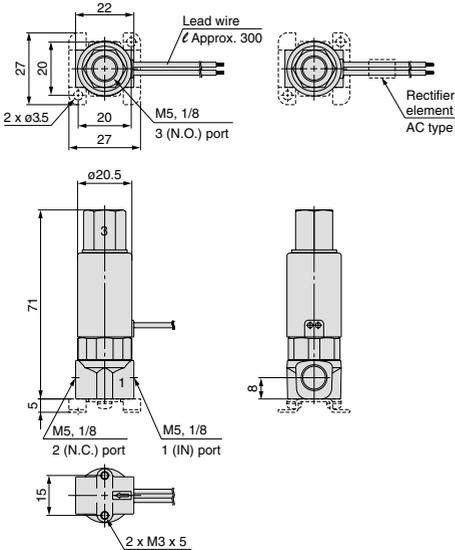
### Component Parts

No.	Description	Material	
		Standard	Option
1	<b>Body</b>	Brass (C37)	Stainless steel
2	<b>Tube assembly</b>	Stainless steel	—
3	<b>Coil assembly</b>	—	—
4	<b>Armature assembly</b>	Stainless steel, PPS, NBR	Stainless steel, PPS, FKM, EPDM
5	<b>O-ring (Body)</b>	NBR	FKM, EPDM
6	<b>Return spring</b>	Stainless steel	—
7	<b>Cover</b>	SPCE	—
8	<b>Socket</b>	C36	Stainless steel
9	<b>O-ring</b>	NBR	FKM, EPDM
10	<b>Plate</b>	SPCC	—
11	<b>Wave washer</b>	Stainless steel	—

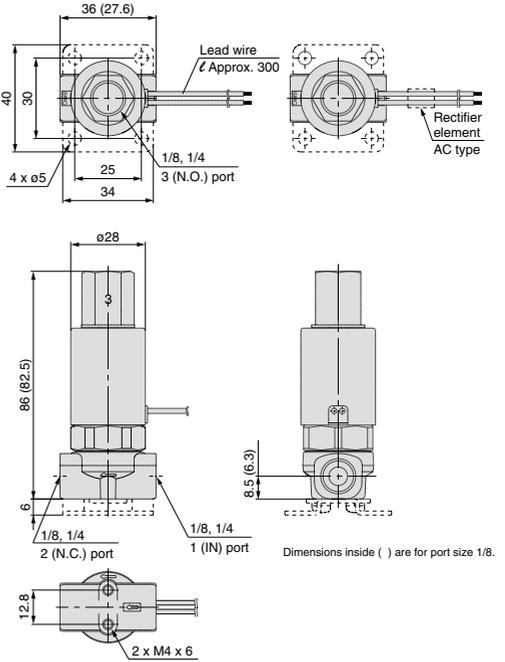
Compact Direct Operated  
3 Port Solenoid Valve for Water and Air **Series VDW200/300**

**Dimensions**

**VDW250-□<sup>G</sup><sub>W</sub>**



**VDW350-□<sup>G</sup><sub>W</sub>**



**Bracket assembly part no.**

- Series 200

**VDW20-15A-1**

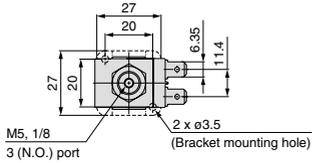
- Series 300

**VCW20-12-01A**

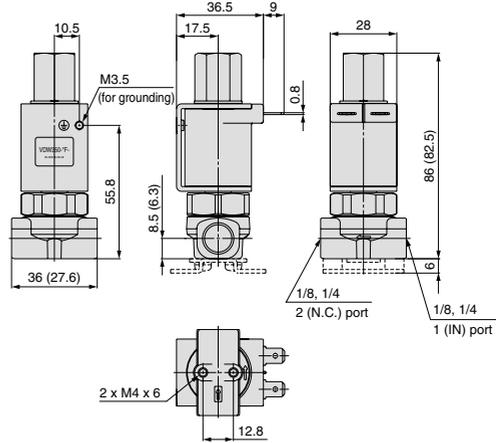
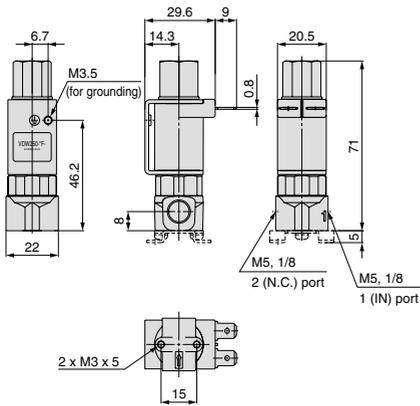
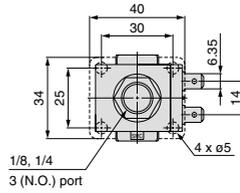
# Series VDW200/300

## Dimensions

### VDW250-□F



### VDW350-□F



### Bracket assembly part no.

- Series 200

**VDW20-15A-1**

- Series 300

**VCW20-12-01A**

# Series VDW

## Made to Order Specifications:

Please consult with SMC for detailed size, specifications and delivery.



**1** Non-leak ( $10^{-6}$  Pa·m<sup>3</sup>/sec) / Vacuum (0.1 Pa-abs) Specification **X22**

VDW  – X22(-Q)

**2** Oil-free Specification **X23**

VDW  – X23(-Q)

**3** Lead Wire Length: 600 mm Specification **X60**

VDW  – X60(-Q)

**4** Seal Material: Kalrez® Specification **X133**

VDW  – X133(-Q)

VX2

VXD

VXZ

VXE

VXP

VXR

VXH

VXF

VX3

VXA

VCH□

**VDW**

VQ

LVM

VCA

VCB

VCL

VCS

VCW



## Series VDW

# Specific Product Precautions 1

Be sure to read this before handling.

Refer to front matters 42 and 43 for Safety Instructions, and pages 17 to 19 for 2 Port Solenoid Valves for Fluid Control Precautions.

### Design

#### Warning

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

The valves presented in this catalog 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 energization

Please consult with SMC when using with energization for long periods of time.

##### 3. Liquid rings

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

##### 4. This solenoid valve cannot be used for explosion proof applications.

##### 5. Maintenance space

The installation should allow sufficient space for maintenance activities (removal of valve, etc.).

### Selection

#### Warning

##### 1. Confirm the specifications.

Give careful consideration to the operating conditions such as the application, fluid and environment, and use within the operating ranges specified in this catalog.

##### 2. Fluid temperature

Please use within the operating fluid temperature range.

##### 3. 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 80 to 100 is a guideline for the filter.

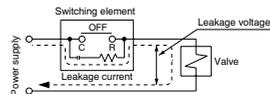
###### In the case of air

Please use ordinary compressed air where a filter of 40  $\mu\text{m}$  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 coil

10% or less of rated voltage

##### DC coil

2% or less of rated voltage

##### 2. Low temperature operation

- 1) The valves can be used up to an ambient temperature of  $-10^{\circ}\text{C}$ , 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.



# Series VDW

## Specific Product Precautions 2

Be sure to read this before handling.

Refer to front matters 42 and 43 for Safety Instructions, and pages 17 to 19 for 2 Port Solenoid Valves for Fluid Control Precautions.

### 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.

**3. 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.

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

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

**6. Instruction manual**

The product should be mounted and operated after the instruction manual is thoroughly read and its contents are understood. Keep the instruction manual where it can be referred to as needed.

**7. Painting and coating**

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

### Piping

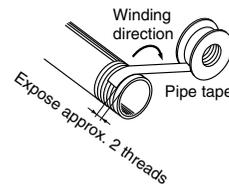
#### Caution

**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.

**2. Wrapping of pipe tape**

When connecting pipes, fittings, etc., be sure that chips from the pipe threads and sealing material do not enter the valve. Furthermore, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



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

**4. Connection of piping and fittings**

When screwing piping or fittings into the valve, tighten them as follows.

○ **When using SMC's fittings, follow the procedures below to tighten them.**

• **Connection thread: M5**

First, tighten by hand, then use a suitable wrench to tighten the hexagonal portion of the body an additional 1/6 to 1/4 turn.

The reference value for the tightening torque is 1 to 1.5 N·m.

• **Fittings with sealant: R, NPT**

First, tighten the fitting by hand, then use a suitable wrench to tighten the hexagonal portion of the body a further two or three turns.

For the tightening torque, refer to the table below.

Connection thread size (R, NPT)	Proper tightening torque (N·m)
1/8	3 to 5
1/4	8 to 12
3/8	15 to 20

○ **When using a fitting other than an SMC fitting, follow the instructions given by the fitting manufacturer.**

**5. Connection of piping to products**

• When connecting piping to a product, refer to its instruction 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.

VX2

VXD

VXZ

VXE

VXP

VXR

VXH

VXF

VX3

VXA

VCH

VDW

VQ

LVM

VCA

VCB

VCL

VCS

VCW



# Series VDW

## Specific Product Precautions 3

Be sure to read this before handling.

Refer to front matters 42 and 43 for Safety Instructions, and pages 17 to 19 for 2 Port Solenoid Valves for Fluid Control Precautions.

### Wiring

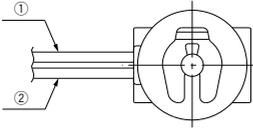
#### ⚠ Caution

1. As a rule, use electrical wire with a cross sectional area of 0.5 to 1.25 mm<sup>2</sup> for wiring.  
Furthermore, do not allow excessive force to be applied to the lines.
2. Use electrical 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.

### Electrical Connections

#### ⚠ Caution



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

\* There is no polarity for DC.

\* Lead wire: AWG20, outside diameter of insulator 1.79

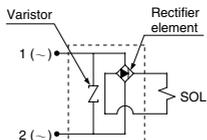
### Electrical Circuit

#### ⚠ Caution

DC circuit



AC circuit



### Operating Environment

#### ⚠ Warning

1. Do not use the valves in an atmosphere having corrosive gases, chemicals, salt 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. Perform maintenance according to the procedure in the instruction manual.  
Incorrect handling will cause damage or malfunction to devices or equipment.
2. Removing the product
  - 1) Shut off the fluid supply and release the fluid pressure in the system.
  - 2) Shut off the power supply.
  - 3) Dismount the product.
3. 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.
  - 4) Exhaust the drain from an air filter periodically.
2. Storage

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



# Series VDW Specific Product Precautions 4

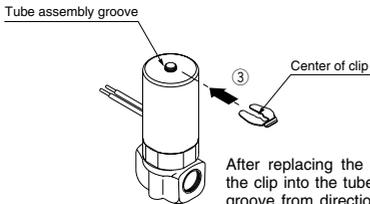
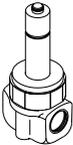
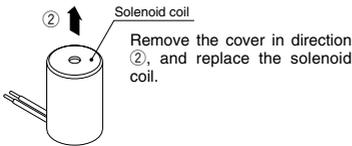
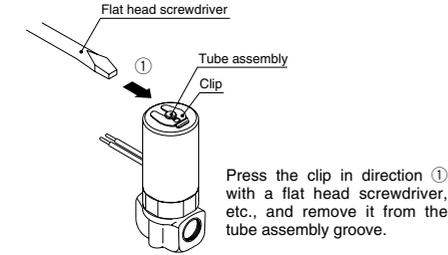
Be sure to read this before handling.

Refer to front matters 42 and 43 for Safety Instructions, and pages 17 to 19 for 2 Port Solenoid Valves for Fluid Control Precautions.

## Replacing the Solenoid Coils

### ⚠ Caution

2 port valve

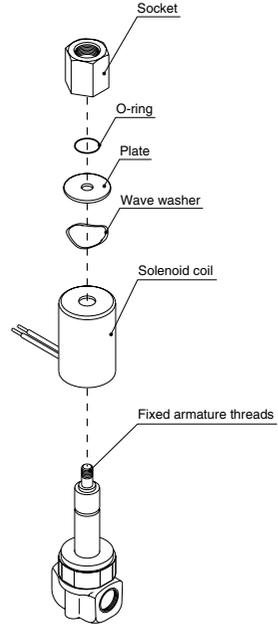


Inserted position



Inserted condition

3 port valve



After removing the socket with a wrench, etc., lift off the plate, wave washer and cover, and replace the coil assembly. After replacing the coil, first tighten the socket by hand while holding down the plate and wave washer, and then tighten it further with a torque of 0.8 to 1 N·m.

- Precautions when attaching and removing the socket
- Be careful that the O-ring installed on the bottom (plate side) of the socket does not fall out or become chewed up, etc.
- Be sure to secure the body by wrench, etc., and tighten the socket within the tightening torque range given above. If the torque is applied excessively, there is a danger of damaging the threads.



# Series VDW Specific Product Precautions 5

Be sure to read this before handling.

Refer to front matters 42 and 43 for Safety Instructions, and pages 17 to 19 for 2 Port Solenoid Valves for Fluid Control Precautions.

## Replacement Parts

- Solenoid coil part no.

VDW **2** 0-1 **C** 1-1-□

Series	
1	10
2	20, 200
3	30, 300

### Coil type

<b>C</b>	Grommet / Tape winding
<b>F</b>	Faston terminal / Molded
<b>W</b>	Grommet / Molded

### Type

1	10, 20, 30
2	200, 300

- Lead wire length

<b>Nii</b>	300 mm
<b>L1</b> <small>(Note)</small>	600 mm

Note) Type L1 is optional.

### Voltage

<b>1</b>	100 VAC
<b>2</b>	200 VAC
<b>3</b>	110 VAC
<b>4</b>	220 VAC
<b>5</b>	24 VDC
<b>6</b>	12 VDC
<b>V</b>	6 VDC
<b>S</b>	5 VDC
<b>R</b>	3 VDC

## Coil Type and Voltage Combinations

Voltage	Grommet / Tape winding	Faston terminal / Molded	Grommet / Molded
100 VAC	●	—	●
200 VAC	●	—	●
110 VAC	●	—	●
220 VAC	●	—	●
24 VDC	●	●	●
12 VDC	●	●	●
6 VDC	●	●	●
5 VDC	●	●	●
3 VDC	●	●	●

Note) To have a label on the cover, enter the part number below together with the coil part number.

**AZ-T-VDW** Valve model no. on page 243, 248, 254

- Clip part no. (2 port)

VDW **2** 0-10

### Series

2	10, 20
3	30

- Socket assembly part no. (3 port)

VDW **2** 0-12A-**01** □-□

### Series

2	200
3	300

### Port size

Symbol	Port size	Series	
		200	300
<b>M5</b>	M5	○	—
<b>01</b>	1/8 (6A)	○	○
<b>02</b>	1/4 (8A)	—	○

### Material

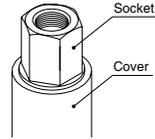
Symbol	Socket material	Seal material
<b>Nii</b>	Brass (C37)	NBR
<b>A</b>		FKM
<b>B</b>		EPDM
<b>G</b>		NBR
<b>H</b>	Stainless steel	FKM
<b>J</b>		EPDM
<b>L</b>		FKM

### Thread type

<b>Nii</b>	Rc
<b>F</b>	G
<b>N</b>	NPT

## Piping to 3 Port Valve N.O. Port

### Caution

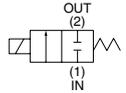


When piping to an N.O. port, be sure to perform piping work while securing the socket by using wrench or other tool. Refer to back page 261 for other precautions related to piping.

## Fluid Flow Direction

### Caution

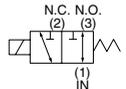
The maximum operating pressure differential differs depending on the flow direction of the fluid. If the pressure differential at each port exceeds the values in the table below, valve leakage may occur.



## 2 Port Valve

Model	Orifice diameter (mm ø)	Max. operating pressure differential (MPa)	
		Pressure port 1	Pressure port 2 <small>(Note)</small>
<b>VDW10</b>	1	0.9	0.4
	1.6	0.4	0.2
<b>VDW20</b>	1.6	0.7	0.2
	2.3	0.4	0.1
	3.2	0.2	0.05
<b>VDW30</b>	2	0.8	0.2
	3	0.4	0.1
	4	0.2	0.05

Note) When applying pressure from port 2, be careful to avoid vibration and impacts, etc.



## 3 Port Valve

Model	Orifice diameter (mm ø)	Max. operating pressure differential (MPa)	
		Pressure port 1	Pressure port 2, 3 <small>(Note 1)</small>
<b>VDW200</b>	1	0.9	0.3
	1.6	0.7	0.1
<b>VDW300</b>	2	0.8	0.2
	3	0.4	0.1
	4	0.2	0.05

Note 1) Indicates the maximum operating pressure differential of pressure ports 2 and 3.

Note 2) When the port 2 pressure is in the higher pressure side, be careful to avoid vibration and impacts, etc.



# Series VDW Specific Product Precautions 6

Be sure to read this before handling.

Refer to front matters 42 and 43 for Safety Instructions, and pages 17 to 19 for 2 Port Solenoid Valves for Fluid Control Precautions.

## Glossary

### Pressure Terminology

#### 1. Maximum operating pressure differential

This indicates the maximum pressure differential (inlet and outlet pressure differential) which can be allowed for operation with the valve closed or open. When the outlet pressure is 0 MPa, this becomes the maximum operating pressure.

#### 2. Maximum operating pressure

This indicates the limit of pressure that can be applied inside the pipelines. (Line pressure)  
(The pressure differential of the solenoid valve unit must be no more than the maximum operating pressure differential.)

#### 3. Withstand pressure

The pressure which must be withstood without a drop in performance after returning to the operating pressure range (The value under the prescribed conditions).

### Electrical Terminology

#### 1. Surge voltage

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

#### 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 50 mm $\phi$ and greater
2	Protected against solid foreign objects of 12 mm $\phi$ and greater
3	Protected against solid foreign objects of 2.5 mm $\phi$ and greater
4	Protected against solid foreign objects of 1.0 mm $\phi$ 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.

### Other

#### 1. Material

NBR: Nitrile rubber  
FKM: Fluoro rubber = FPM — Trade name: Viton<sup>®</sup>, DAI-EL<sup>™</sup>, etc.  
EPDM: Ethylene propylene rubber = EPR  
C37: Brass  
SUS: Stainless steel

### Faston Terminal

#### 1. Faston<sup>™</sup> is a trademark of Tyco Electronics Corp.

#### 2. For electrical connection of the Faston terminal and molded coil, please use Tyco's "Amp/Faston connector/250 Series" or the equivalent.

#### 3. When providing a body ground, please use the frame ground (M3.5).

(Recommended fastening bolt: M3.5, length 5 mm)