

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

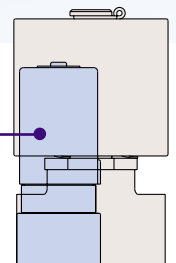
# Series *VDW*

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



**Compact/Light weight (compared to series VX)**

Single valve volume: Reduced 75% (VDW20)  
100g: Reduced approx. 50% (for orifice size equivalent to  $\phi 2$ )



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

## Series VDW

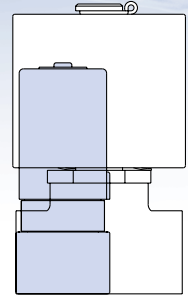
- **Compact (compared to series VX)**

Single valve volume: Reduced 75% (VDW20)

Manifold length: Reduced 18% (VDW30, 7 stations)

- **Light weight (compared series VX)**

100g: Reduced approx. 50% (for orifice size 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**

**Quick change coils**

Clip design makes coil replacement easy (2 port)

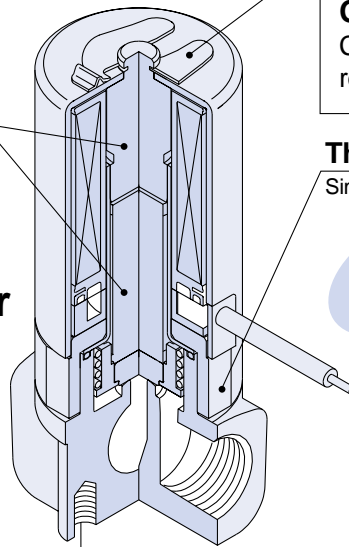
**Threaded assembly**

Simplifies maintenance

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

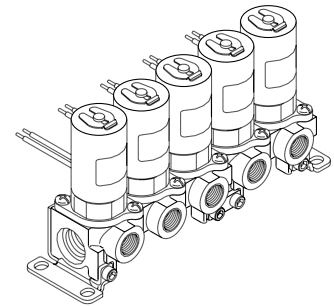
**High flow rate: Cv factor 0.03 to 0.44 (2 port)**

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



**Bottom mounting threads**

Mounting bracket also available



Series of compact designs					
<b>2 port</b>			<b>3 port</b>		
$\varnothing 17$	$\varnothing 20.5$	$\varnothing 28$	$\varnothing 20.5$	$\varnothing 28$	
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 Type)

**VDW 2 1 - 1 G - 2 - 01** □ □ □

For water, air and vacuum ●

**Series** ●

1	10
2	20
3	30

**Valve type** ●

**Voltage** ●

1	100VAC (50/60Hz)
2	200VAC (50/60Hz)
3	110VAC (50/60Hz)
4	210VAC (50/60Hz)
5	24VDC
6	12VDC

\* Contact SMC regarding other voltages.

**Electrical entry** ●

**G - Grommet**

**Option** ●

Nil	None
F	Foot type bracket

Note) Foot brackets are packed with valves.

**Materials and insulation type** ●

Symbol	Body material	Seal material	Coil insulation
Nil	Brass	NBR	Class B
A		FKM	
G	Stainless steel	NBR	
H		FKM	
L <sup>Note)</sup>		FKM	

Note) For pure water: Armature assembly is a corrosion resistant construction.

**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 size** ●

Symbol	Orifice size mm	Series
1	ø1	10
2	ø1.6	
1	ø1.6	20
2	ø2.3	
3	ø3.2	
2	ø2	30
3	ø3	
4	ø4	

# Series VDW10/20/30



## 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 (with no freezing)
	Environment	Location without corrosive or explosive gases
	Valve leakage cm <sup>3</sup> /min	0 (with water pressure)
	Mounting orientation	Unrestricted
	Vibration/Impact m/s <sup>2</sup> <sup>Note 4)</sup>	30/150
Coil specifications	Rated voltage	24VDC, 12VDC, 100VAC, 110VAC, 200VAC, 220VAC (50/60Hz)
	Allowable voltage fluctuation %	±10% of rated voltage
	Coil insulation type	Class B
	Enclosure <sup>Note 5)</sup>	Dust proof (equivalent to IP40)
	Power consumption W <sup>Note 3)</sup>	2.5 (VDW10), 3 (VDW20/30)

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

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

Note 3) Since AC coil specifications include a rectifying device, there is no difference in power consumption for starting and holding.

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

Note 4) Vibration resistance ... No malfunction when tested with one sweep of 5 to 200Hz 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) Consult SMC regarding drip-proof specifications (equivalent to IP54).

## Characteristic Specifications

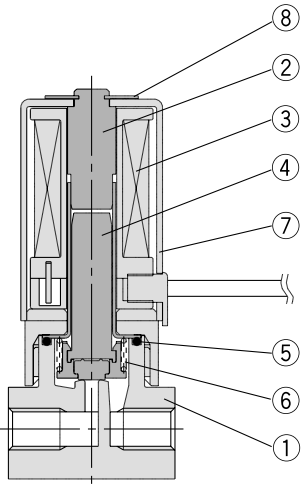
Model	Port size	Orifice size mm	Maximum operating pressure differential MPa <sup>Note 1)</sup>		Operating pressure range MPa <sup>Note 2)</sup>	Effective area mm <sup>2</sup> (Cv factor)	Weight kg
			Pressure port 1	Pressure port 2			
VDW10	M5	ø1	0.9	0.4	0 to 1.0	0.54 (0.03)	0.08
		ø1.6	0.4	0.2		1.2 (0.07)	
VDW20	M5 1/8 (6A)	ø1.6	0.7	0.2		1.2 (0.07)	0.1
		ø2.3	0.4	0.1		3.2 (0.18)	
		ø3.2	0.2	0.05		5.8 (0.3)	
VDW30	1/8 (6A) 1/4 (8A)	ø2	0.8	0.2		2.8 (0.16)	1/8: 0.23 1/4: 0.26
		ø3	0.4	0.1	5.0 (0.28)		
		ø4	0.2	0.05	8.0 (0.44)		

Note 1) The maximum operating pressure differential changes depending on the flow direction of the fluid. Refer to page 21 for details.

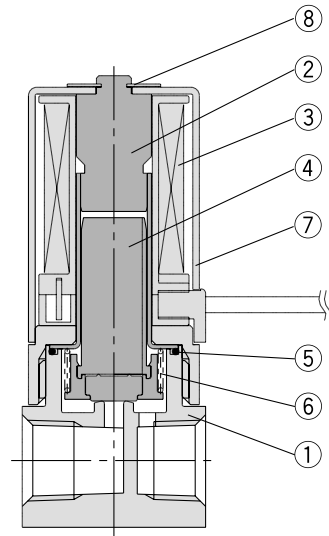
Note 2) For low vacuum specifications, the operating pressure range is 1Torr (1.33 x 10<sup>2</sup> Pa) to 1.0MPa. Consult SMC if used below 1Torr (1.33 x 10<sup>2</sup> Pa).

**Construction**

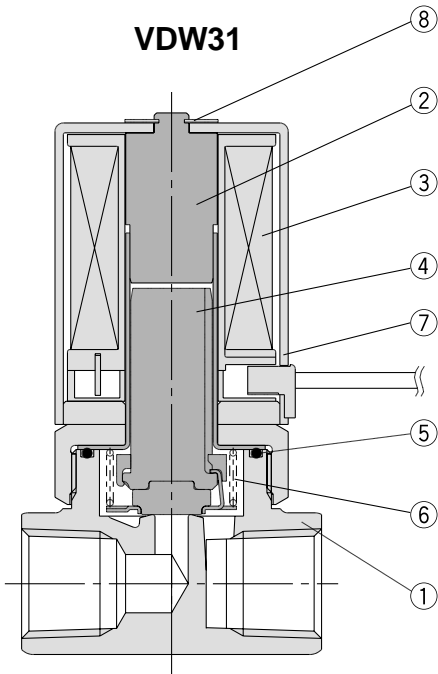
**VDW11**



**VDW21**



**VDW31**



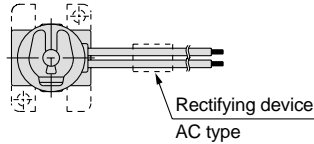
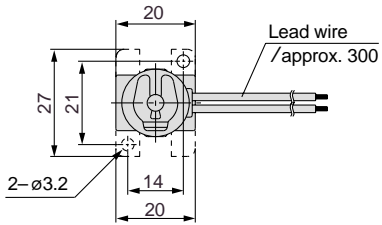
**Parts list**

No.	Description	Material	
		Standard	Optional
1	Body	Brass	Stainless steel
2	Tube assembly	Stainless steel	—
3	Coil assembly	—	—
4	Amature assembly	VDW11/21: Stainless steel, PPS, NBR	VDW11/21: Stainless steel, PPS, FKM
		VDW31: Stainless steel, NBR	VDW31: Stainless steel, FKM
5	O-ring (body)	NBR	FKM
6	Return spring	Stainless steel	—
7	Cover	SPCE	—
8	Clip	Stainless steel	—

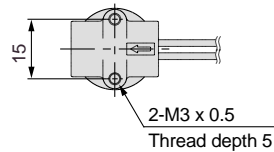
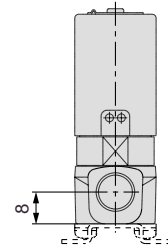
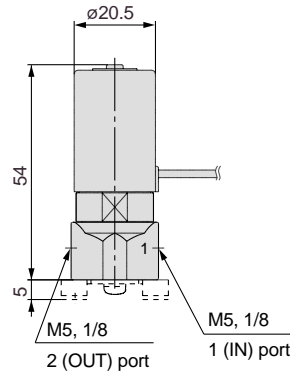
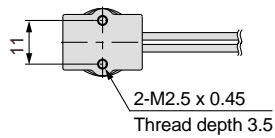
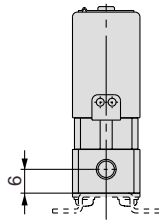
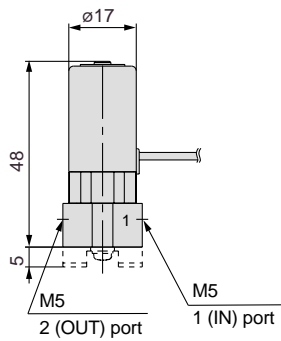
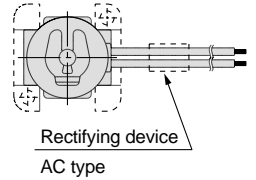
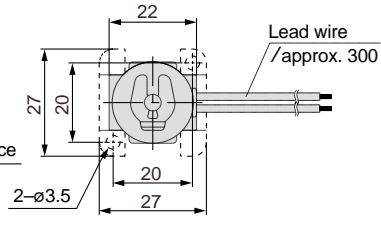
# Series VDW10/20/30

## Dimensions

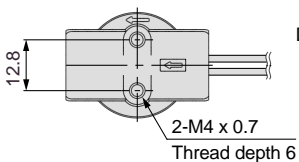
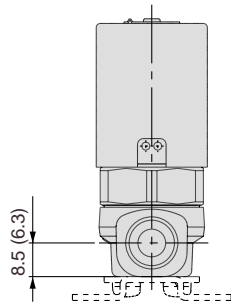
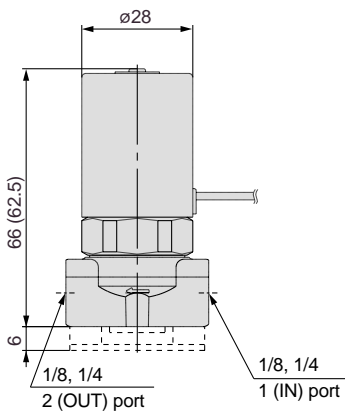
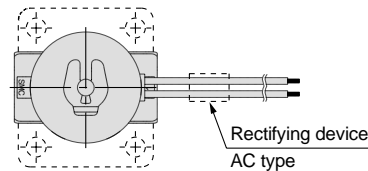
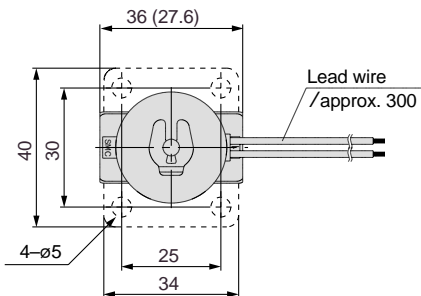
### VDW11



### VDW21



### VDW31



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

### Bracket assembly part no.

- Types 10, 20

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

- Series

1	10
2	20

- Type 30

**VCW20 - 12 - 01A**

## How to Order Manifolds

**VV2DW 2 05 01**

**Series**

1	10
2	20
3	30

**Materials**

Symbol	Manifold material	Seal material
Nil	Brass	NBR
A		FKM
G	Stainless steel	NBR
H		FKM

**Option**

Nil	None
F	With bracket

Note) Type 30 is available only with bracket.

**Thread type**

Nil	Rc
F	G
N	NPT


**OUT port size**

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

Note) IN port sizes are as follows.  
10: 1/8 (6A)  
20: 1/4 (8A)  
30: 3/8 (10A)

**Stations**

02	2 stations
:	:
10	10 stations



## How to Order Manifold Assemblies (Example)

Enter the valve and option models to be mounted under the manifold base part number.

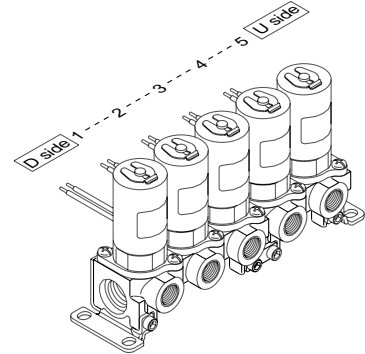
**<Example>**

VV2DW2-0501 ..... 1 set Manifold part no.

\*VDW23-5G-2 ..... 5 sets Valve part no.  
(Stations 1 to 5)

"\*" is the symbol for mounting. Add "\*" in front of the part numbers for solenoid valves, etc., to be mounted.

Enter together in order, counting from station 1 on the D side.



## How to Order Valves (for Manifold)

**VDW 2 3 5 G 2**

**Series**

1	10
2	20
3	30

**Valve type**

3	N.C. for Manifold
---	-------------------

**Voltage**

1	100VAC (50/60Hz)
2	200VAC (50/60Hz)
3	110VAC (50/60Hz)
4	220VAC (50/60Hz)
5	24VDC
6	12VDC
9	Other

**Materials and insulation type**

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

Note) For pure water: The armature is a corrosion resistant construction.

**Orifice size**

Symbol	Orifice size mm	Series
1	ø1	10
2	ø1.6	
1	ø1.6	20
2	ø2.3	
3	ø3.2	
2	ø2	30
3	ø3	
4	ø4	

**Electrical entry**

G	Grommet
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## Manifold Options

### Blanking plate assembly

• Types 10, 20

**VVDW 2 0 - 3A**

**Series**

1	10
2	20

**Materials**

Symbol	Plate material	Seal material
G	Stainless steel	NBR
H		FKM

\* Plate material is stainless steel only.

• Type 30

**VVCW20 - 3A**

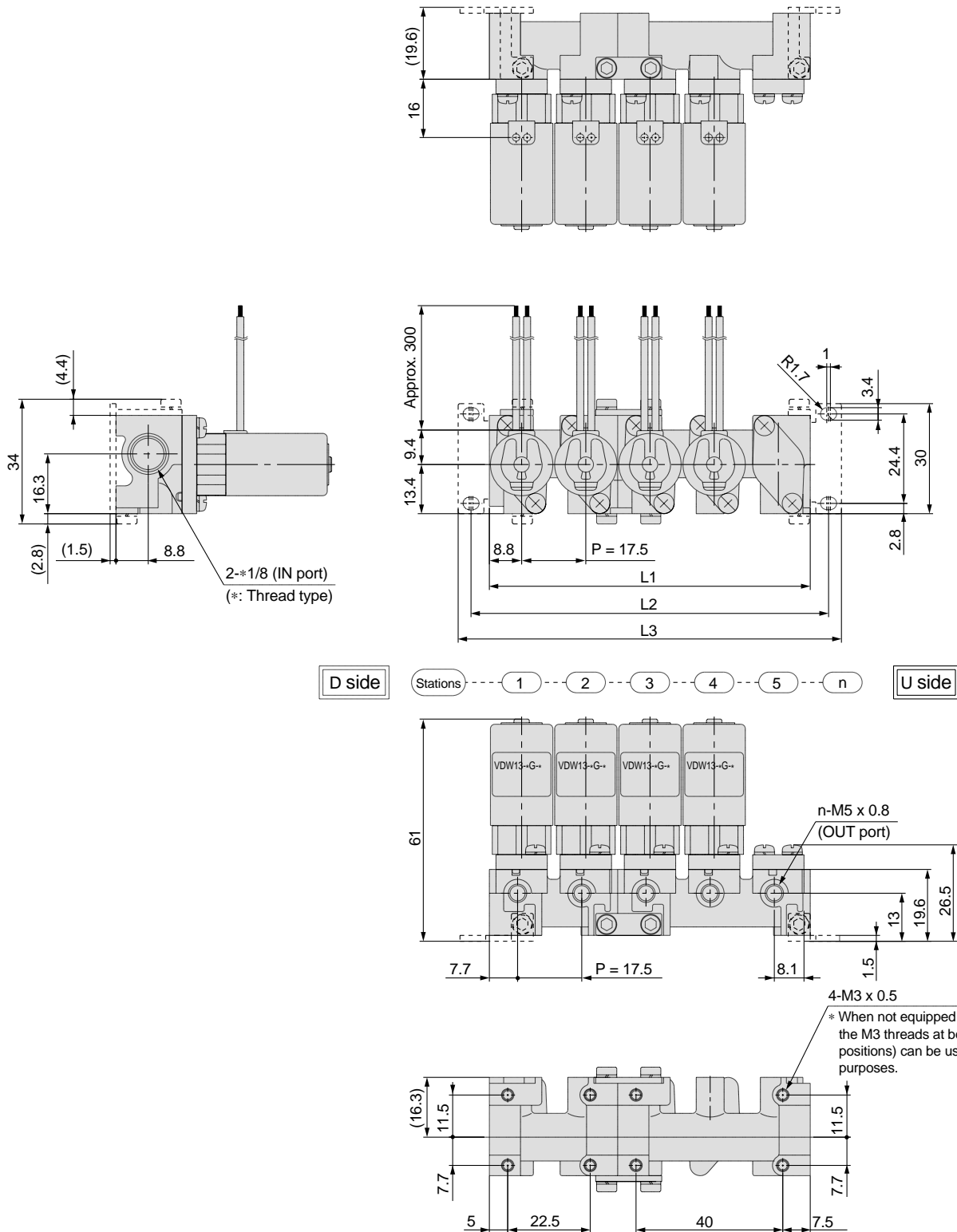
**Materials**

Symbol	Plate material	Seal material
Nil	Brass	NBR
A		FKM
G	Stainless steel	NBR
H		FKM

# Series VDW10/20/30

## Dimensions

### VV2DW1



### L dimensions

Dimensions	n (stations)									
	2	3	4	5	6	7	8	9	10	
L1	35	52.5	70	87.5	105	122.5	140	157.5	175	
L2	45	62.5	80	97.5	115	132.5	150	167.5	185	
L3	52	69.5	87	104.5	122	139.5	157	174.5	192	
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	

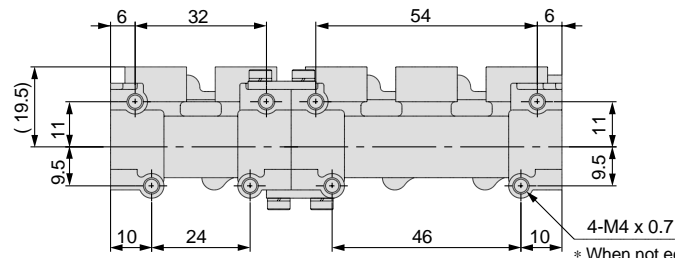
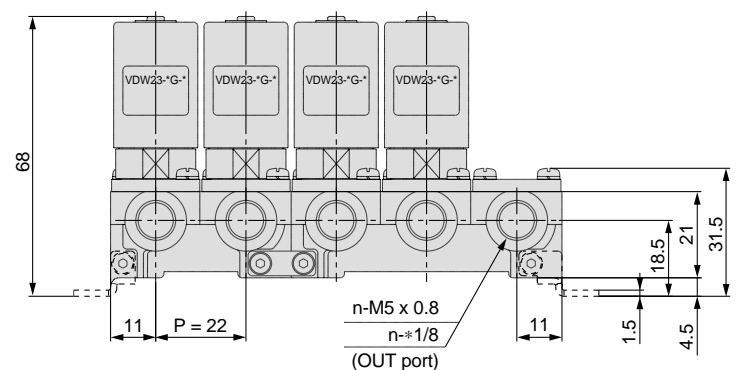
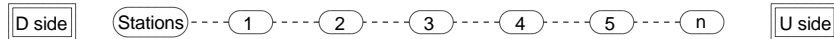
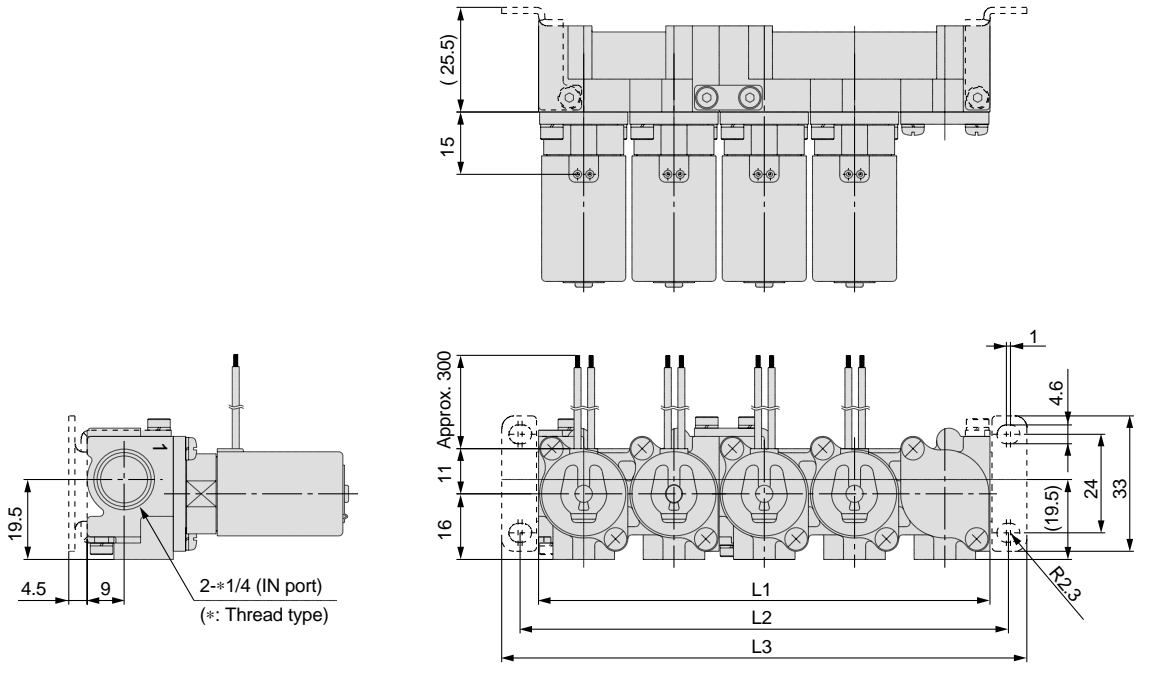
Note) Manifold bases are composed by connecting 2 station and 3 station bases.  
Refer to pages 9 and 10 regarding manifold additions.



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

**Dimensions**

**VV2DW2**



\* When not equipped with bracket, the M3 threads at both ends (4 positions) can be used for other purposes.

**L dimensions**

Dimensions	n (stations)									
	2	3	4	5	6	7	8	9	10	
<b>L1</b>	44	66	88	110	132	154	176	198	220	
<b>L2</b>	53	75	97	119	141	163	185	207	229	
<b>L3</b>	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	

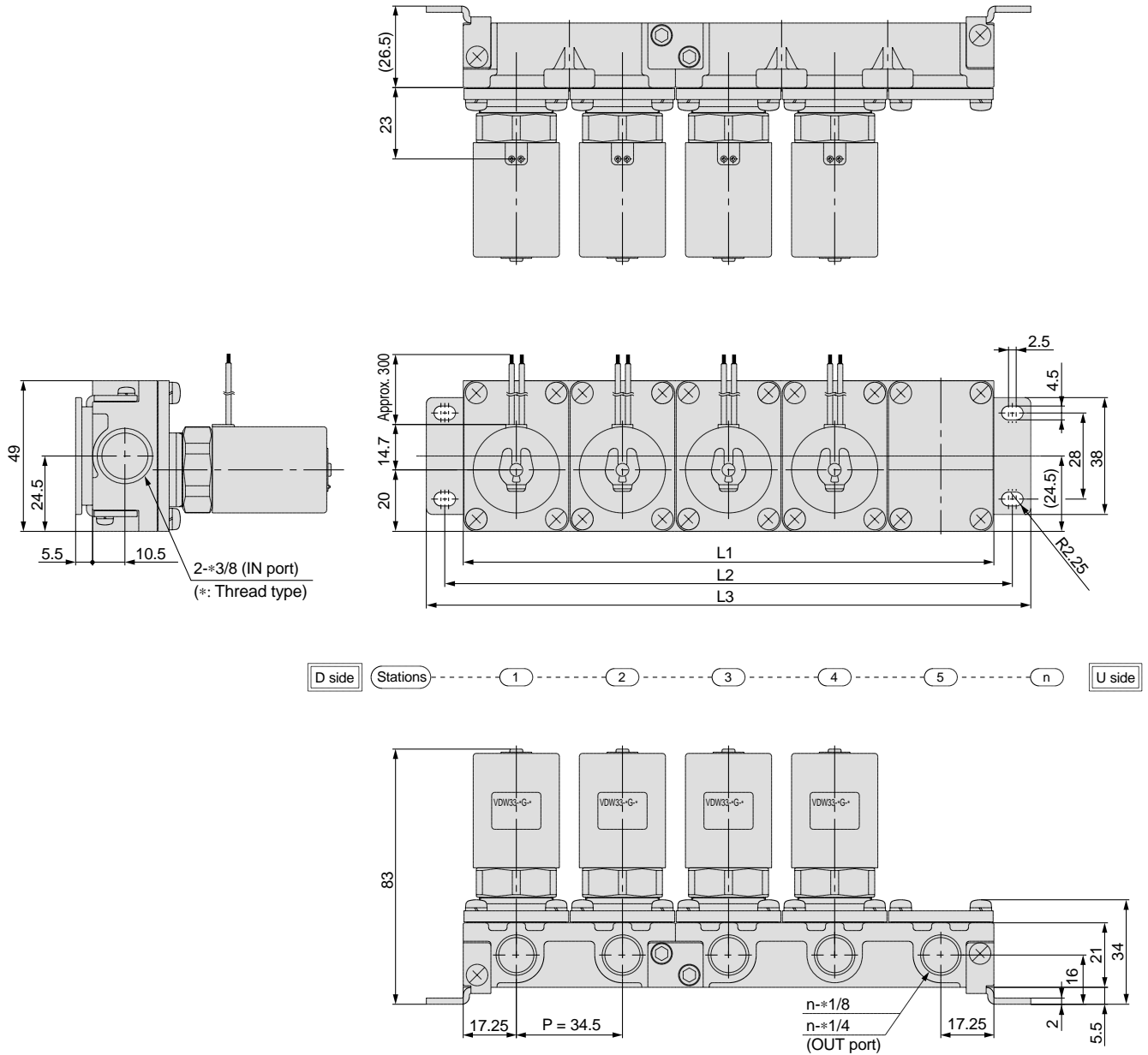
Note) Manifold bases are composed by connecting 2 station and 3 station bases.  
Refer to pages 9 and 10 regarding manifold additions.



# Series VDW10/20/30

## Dimensions

### VV2DW3

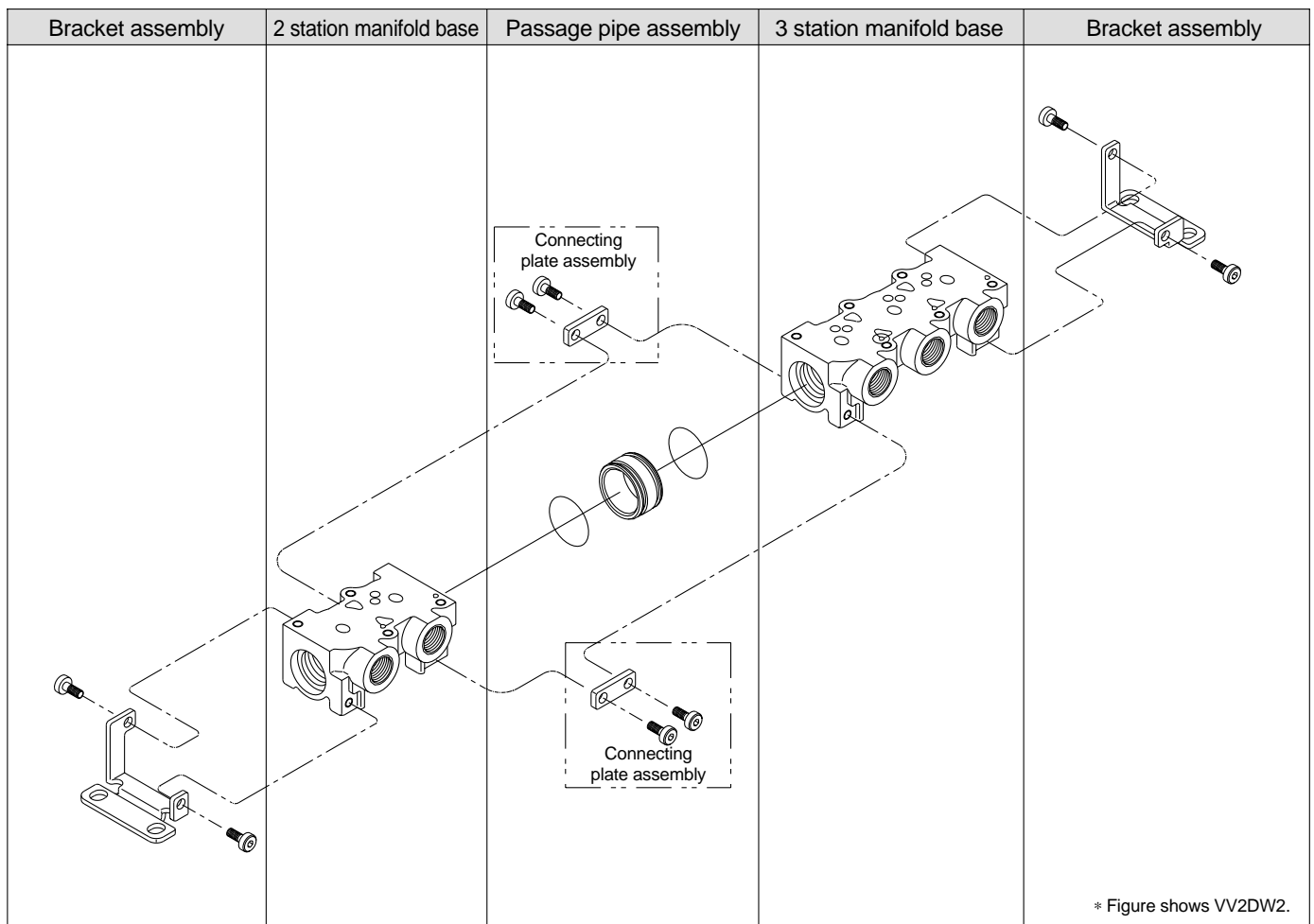


### L dimensions

Dimensions	n (stations)									
	2	3	4	5	6	7	8	9	10	
<b>L1</b>	69	103.5	138	172.5	207	241.5	276	310.5	345	
<b>L2</b>	81	115.5	150	184.5	219	253.5	288	322.5	357	
<b>L3</b>	93	127.5	162	196.5	231	265.5	300	334.5	369	
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 bases are composed by connecting 2 station and 3 station bases.  
Refer to pages 9 and 10 regarding manifold additions.

## Manifold Exploded View



### Manifold additions

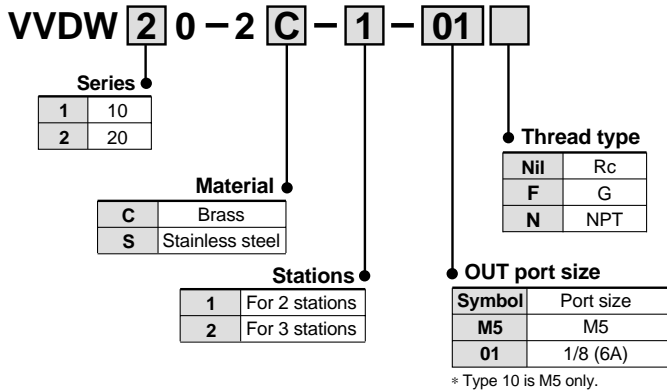
- 1 Install a passage pipe assembly in between the manifold bases to be added.
- ↓
- 2 Connect the respective manifold bases with a connecting plate assembly. (Tightening torque:  $0.9 \pm 0.1 \text{ N} \cdot \text{m}$ )
- ↓
- 3 Attach brackets to the manifold bases. {when equipped with brackets} (Tightening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

Note) Manifold station additions can be made in units of 2 or 3 stations.  
Order one set each of manifold base, connection plate assembly and passage pipe assembly.

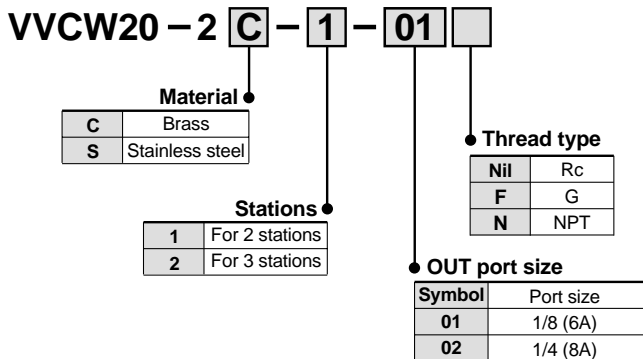
# Series VDW10/20/30

## <Manifold bases>

- Types 10, 20



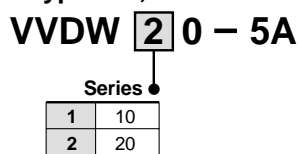
- Type 30



## <Bracket assembly>

Note) Consists of a set for the D and U sides.

- Types 10, 20



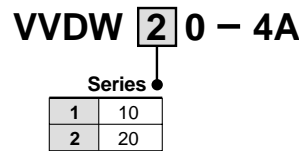
- Type 30

VVCW20-5A

## <Connecting plate assembly>

Note) Two sets of connecting plate and mounting screws.

- Types 10, 20

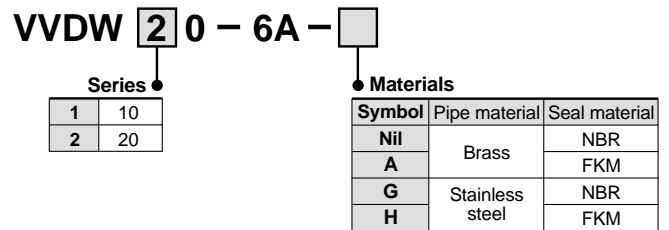


- Type 30

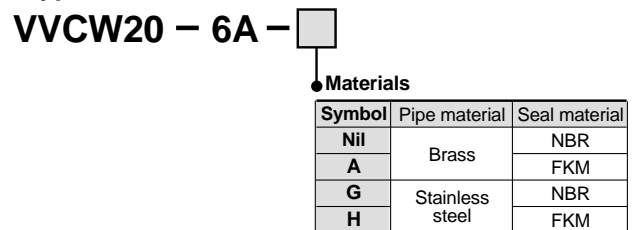
VVCW20-4A

## <Passage pipe assembly>

- Types 10, 20



- Type 30



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

## Series *VDW200/300*

### How to Order Valves (Single Type)

**VDW 2 50-1 G-2-01** □ □ □

For water, air and vacuum

**Series**

2	200
3	300

**Valve type**

50

**Voltage**

1	100VAC (50/60Hz)
2	200VAC (50/60Hz)
3	110VAC (50/60Hz)
4	210VAC (50/60Hz)
5	24VDC
6	12VDC

\* Consult SMC regarding other voltages.

**Electrical entry**

G – Grommet

**Option**

Nil	None
F	Foot type bracket

Note) Foot brackets are packed with valves.

**Materials and insulation type**

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

Note) For pure water: 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 size**

Symbol	N.C. Orifice size mm	N.O. Orifice size mm	Series
1	ø1	ø1	200
2	ø1.6		
2	ø2	ø1.8	300
3	ø3		
4	ø4		

# 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 (with no freezing)
	Environment	Location without corrosive or explosive gases
	Valve leakage cm <sup>3</sup> /min	0 (with water pressure)
	Mounting orientation	Unrestricted
	Vibration/Impact m/s <sup>2</sup> <sup>Note 4)</sup>	30/150
Coil specifications	Rated voltage	24VDC, 12VDC, 100VAC, 110VAC, 200VAC, 220VAC (50/60Hz)
	Allowable voltage fluctuation %	±10% of rated voltage
	Coil insulation type	Class B
	Enclosure <sup>Note 5)</sup>	Dust proof (equivalent to IP40)
	Power consumption W <sup>Note 3)</sup>	3

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

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

Note 3) Since AC coil specifications include a rectifying device, there is no difference in power consumption for starting and holding.

**3.5W in case of 110/220VAC.**

Note 4) Vibration resistance ... No malfunction when tested with one sweep of 5 to 200Hz 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) Consult SMC regarding drip-proof specifications (equivalent to IP54) .

## Characteristic Specifications

Model	Port size	Orifice size mm	Maximum operating pressure differential MPa <sup>Note 3)</sup>		Operating pressure range MPa <sup>Note 4)</sup>	Effective area mm <sup>2</sup> (Cv factor) <sup>Note 1)</sup>	Weight kg
			Pressure port 1	Pressure ports 2, 3 <sup>Note 2)</sup>			
VDW200	M5 1/8 (6A)	ø1	0.9	0.3	0 to 1.0	0.54 (0.03)	0.12
		ø1.6	0.7	0.1		1.2 (0.07)	
VDW300	1/8 (6A) 1/4 (8A)	ø2	0.8	0.2		2.8 (0.16)	1/8: 0.27 1/4: 0.30
		ø3	0.4	0.1		5.0 (0.28)	
		ø4	0.2	0.05	8.0 (0.44)		

Note 1) Effective area is for the case when IN is normally closed (N.C.).

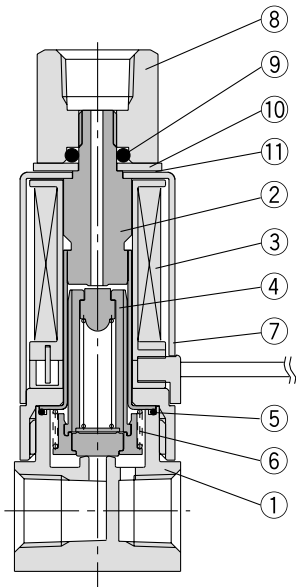
Note 2) Indicates the maximum operating pressure differential of pressure ports 2 and 3.

Note 3) The maximum operating pressure differential changes depending on the flow direction of the fluid. Refer to page 21 for details.

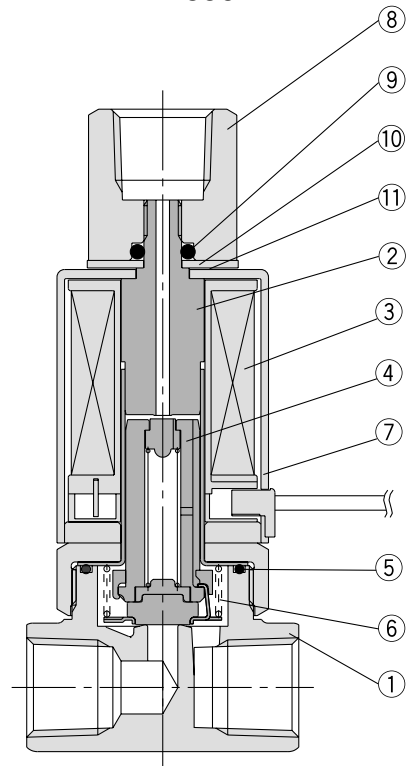
Note 4) For low vacuum specifications, the operating pressure range is 1Torr (1.33 x 10<sup>2</sup>Pa) to 1.0MPa. Consult SMC if used below 1Torr (1.33 x 10<sup>2</sup>Pa).

**Construction**

**VDW250**



**VDW350**



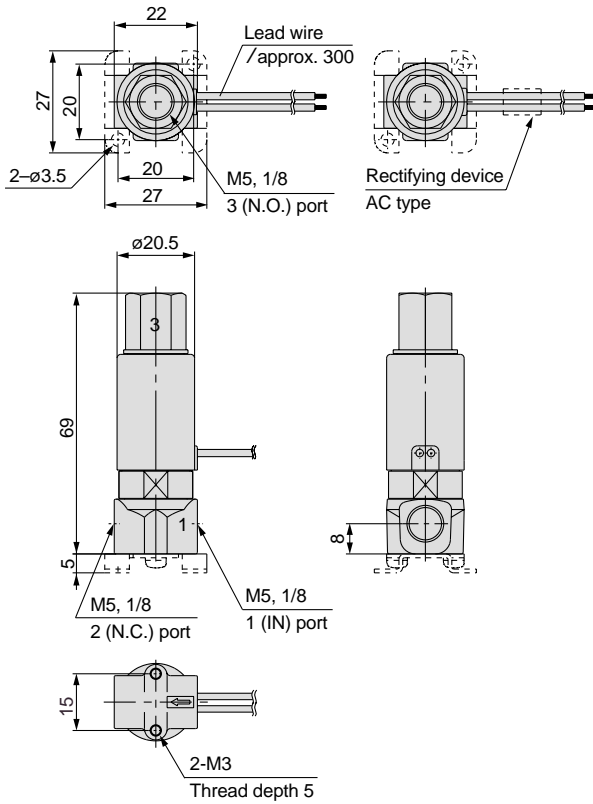
**Parts list**

No.	Description	Material	
		Standard	Optional
1	Body	Brass	Stainless steel
2	Tube assembly	Stainless steel	—
3	Coil assembly	—	—
4	Armature assembly	VDW250: Stainless steel, PPS, NBR	VDW250: Stainless steel, PPS, FKM
		VDW350: Stainless steel, NBR	VDW350: Stainless steel, FKM
5	O-ring (body)	NBR	FKM
6	Return spring	Stainless steel	—
7	Cover	SPCE	—
8	Socket	Brass	Stainless steel
9	O-ring	NBR	FKM
10	Plate	SPCC	—
11	Wave washer	Stainless steel	—

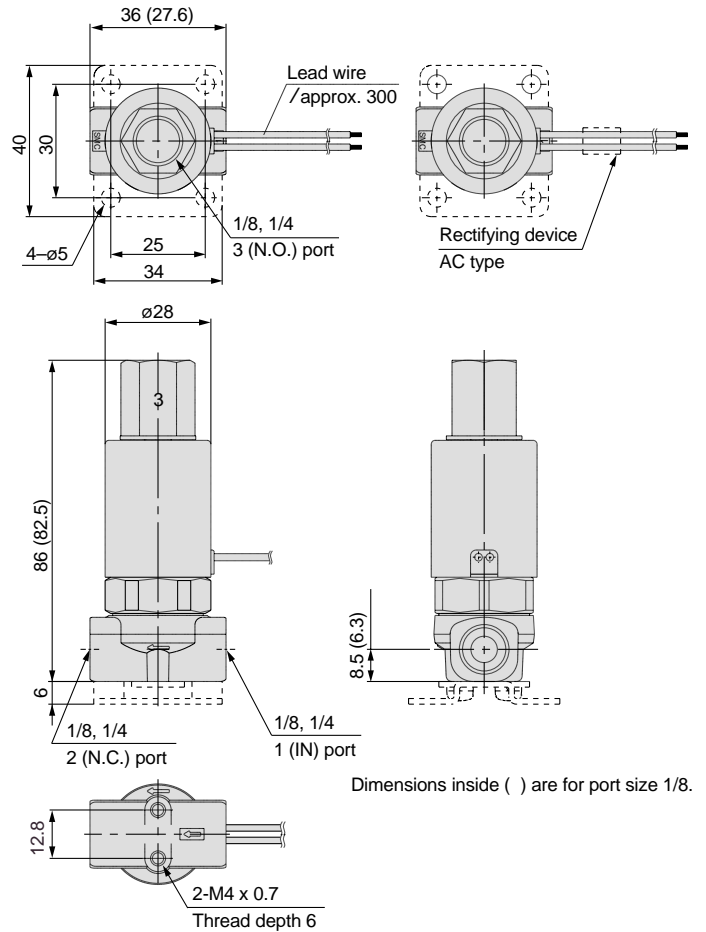
# Series VDW200/300

## Dimensions

### VDW250



### VDW350



### Bracket part no.

- Type 200

**VDW20 – 15A – 1**

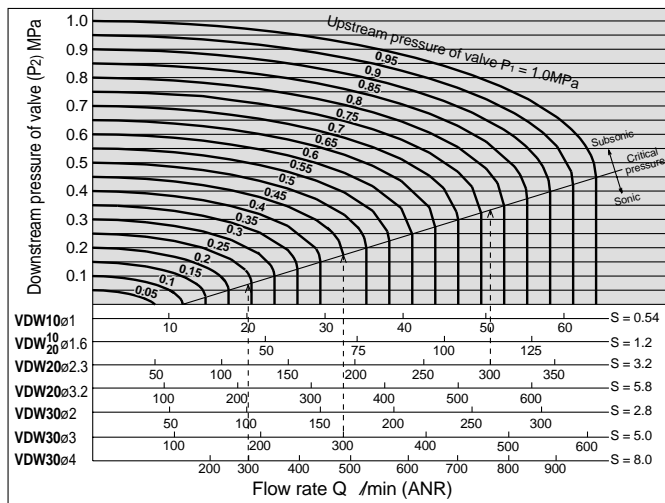
- Type 300

**VCW20 – 12 – 01A**



# Series VDW Model Selection

For air

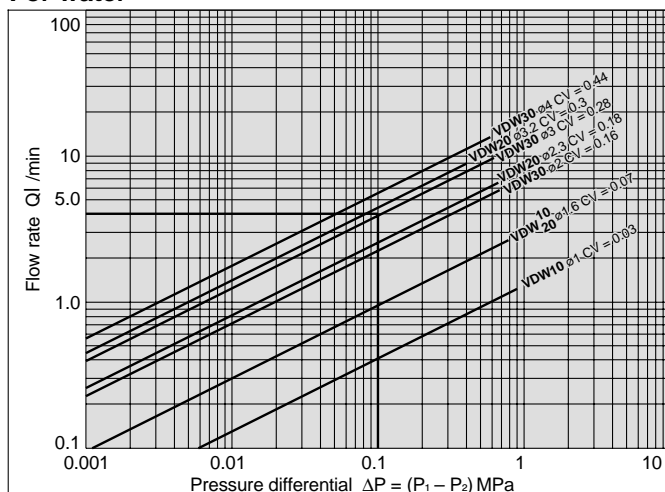


**Viewing the graph** The sonic range pressure to generate a flow rate of 300 l/min (ANR) for orifice ø2.3 (VDW20) is P<sub>1</sub> approx. 0.77MPa, for orifice ø3 (VDW30) is P<sub>1</sub> approx. 0.45MPa, for orifice ø4 (VDW30) is P<sub>1</sub> approx. 0.24MPa.

**How to find the flow rate for air**

- For subsonic range  
Where  $P_1 + 0.1013 = (1 + 1.8941) (P_2 + 0.1013)$ 
  - Formula based on Cv factor  
 $Q = 4073.4 \cdot C_v \cdot \sqrt{\Delta P (P_2 + 0.1013)} \dots \text{ l/min (ANR)}$
  - Formula based on effective area  
 $Q = 226.3 \cdot S \cdot \sqrt{\Delta P (P_2 + 0.1013)} \dots \text{ l/min (ANR)}$
- For sonic range  
Where  $P_1 + 0.1013 \geq 1.8941 (P_2 + 0.1013)$ 
  - Formula based on Cv factor  
 $Q = 1972.8 \cdot C_v \cdot (P_1 + 0.1013) \dots \text{ l/min (ANR)}$
  - Formula based on effective area  
 $Q = 109.6 \cdot S \cdot (P_1 + 0.1013) \dots \text{ l/min (ANR)}$

For water



**Viewing the graph** To generate a water flow of 4 l/min at a differential pressure of 0.1MPa, an effective area with Cv factor 0.28 (VDW30ø3) or more is required.

**How to find the flow rate for water**

- Formula based on Cv factor  
 $Q = 14.2 \cdot C_v \cdot \sqrt{10.2 \cdot \Delta P} \dots \text{ l/min}$
- Formula based on effective area (Smm<sup>2</sup>)  
 $Q = 0.8 \cdot S \cdot \sqrt{10.2 \cdot \Delta P} \dots \text{ l/min}$

Q: Flow rate (l/min), ΔP: Pressure differential (P<sub>1</sub>-P<sub>2</sub>), P<sub>1</sub>: Upstream pressure (MPa)  
P<sub>2</sub>: Downstream pressure (MPa), S: Effective area (mm<sup>2</sup>), Cv: Cv factor

## Explanation of Terminology

### Pressure Terminology

#### 1. Maximum operating pressure differential

This indicates the maximum pressure differential (upstream and downstream pressure differential) which can be allowed for operation with the valve closed or open. When the downstream pressure is 0MPa, 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.

### Other

#### 1. Materials

NBR: Nitrile rubber


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





**Series VDW**

# Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 Note 1) and other safety practices.

 **Caution** : Operator error could result in injury or equipment damage.

 **Warning** : Operator error could result in serious injury or loss of life.

 **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414 : Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems

## **Warning**

### **1. The compatibility of equipment is the responsibility of the person who designs the system or decides its specifications.**

Since the products specified here are used in various operating conditions, their compatibility for the specific system must be based on specifications or after analysis and/or tests to meet your specific requirements. Be particularly careful in determining the compatibility of the fluid to be used.

### **2. Only trained personnel should operate machinery and equipment.**

The fluid can be dangerous if handled incorrectly. Assembly, handling or repair of systems should be performed by trained and experienced operators.

### **3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.**

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions and measures to prevent danger from the fluid.
2. When equipment is to be removed, confirm the safety process as mentioned above and be certain there is no danger from fluid leakage or fluid remaining in the system.
3. Restart machinery carefully, confirming that safety measures are being implemented.

### **4. Contact SMC if the product is to be used in any of the following conditions:**

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. With fluids whose application causes concern due to the type of fluid or additives, etc.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.



## Series VDW

# 2/3 Port Solenoid Valve for Fluid Control/Precautions 1

Be sure to read before handling.

### Precautions on 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

Consult SMC if valves will be continuously energized for extended periods of time.

##### 3. Liquid seals

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 protection.

##### 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 operating conditions such as the application, fluid and environment, and use within the operating ranges specified in this catalog.

##### 2. Fluid temperature

Operate within the prescribed fluid temperature range.

##### 3. Fluid quality

###### For water

The use of fluid which contains foreign matter can cause problems such as malfunction and seal failure by promoting wear of the valve seat and core, 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.

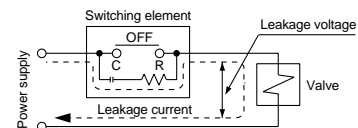
###### For air

Use general purpose compressed air (except dry air) and provide a filter of 40 $\mu$ m or less in the upstream piping.

#### ⚠ 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 and C-R element, etc., creating a danger that the valve may not shut OFF.



AC coil

10% or less of rated voltage

DC coil

2% or less of rated voltage

##### 2. Low temperature operation

1. The valve can be used at ambient temperatures as low as  $-10^{\circ}\text{C}$ , but take measures to prevent freezing or solidification of impurities, etc.
2. When used in cold areas with water, etc., adopt freeze prevention measures such as draining the water from pipelines after pump operation has been stopped. If warmed with a heater, etc., avoid the coil unit. Also, implement warming or other freeze prevention measures for the body.



# Series VDW

## 2/3 Port Solenoid Valve for Fluid Control/Precautions 2

Be sure to read before handling.

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

##### 4. Secure the product except in the case of steel piping and copper fittings.

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

##### 6. Instruction manual

Mount the product after reading the manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

##### 7. Painting and coating

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

### Piping

#### ⚠ Caution

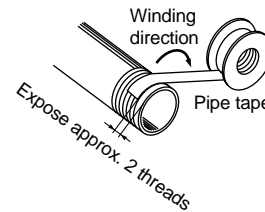
##### 1. Preparation before piping

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 and fittings, etc., be sure that chips from the pipe threads and sealing material do not get inside the valve.

Furthermore, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



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

##### 4. Always tighten threads with the proper tightening torque.

When screwing fittings into valves, tighten with the proper tightening torque as shown below.

#### Tightening torque for piping

Connection threads	Proper tightening torque N·m
M5	1.5 to 2
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24

\* Reference

Tightening of M5 fitting threads

After tightening by hand, tighten approximately 1/6 turn further with a tightening tool. However, when using miniature fittings, tighten an additional 1/4 turn after tightening by hand. (In cases where there is a gasket in two places such as a universal elbow or universal tee, double the additional tightening to 1/2 turn.)

##### 5. Connection of piping to the product

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



# Series VDW

## 2/3 Port Solenoid Valve for Fluid Control/Precautions 3

Be sure to read before handling.

### Wiring

#### ⚠ Caution

1. As a rule, use electrical wire of 0.5 to 1.25mm<sup>2</sup> or more.

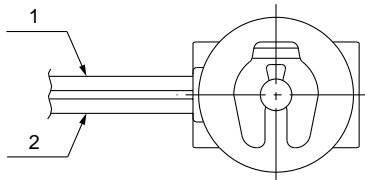
Furthermore, do not allow excessive force to be applied to the lines.

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

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

### Electrical Connections

#### ⚠ Caution



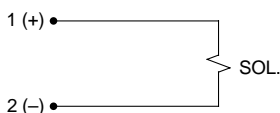
Rated voltage	Lead wire color	
	①	②
DC	Black	Red
100VAC	Blue	Blue
200VAC	Red	Red
Other AC	Gray	Gray

\* DC does not have polarity.

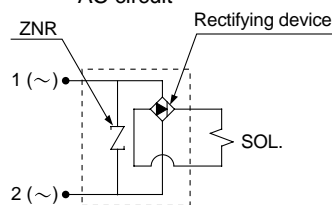
### Electrical Circuits

#### ⚠ Caution

DC circuit



AC circuit



### Operating Environment

#### ⚠ Warning

1. Do not use valves in atmospheres of corrosive gases, chemicals, salt water, water or steam, or where there is direct contact with same.

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 in accordance with the procedures in the instruction manual.

Improper handling can cause damage or malfunction of equipment and devices, etc.

2. Demounting of the product

1. Shut off the fluid supply and release the fluid pressure in the system.

2. Shut off the power supply.

3. Demount the product.

3. Low frequency operation

Switch valves at least once every 30 days to prevent malfunction. In addition, perform maintenance inspections once every six months to ensure optimum performance.

#### ⚠ 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 amount of pressure drop reaches 0.1MPa.

3. Clean strainers when the amount of pressure drop reaches 0.1MPa.

4. Flush drainage from filters periodically.

2. Storage

In case of long term (approx. one month or more) storage after use with water, first thoroughly remove all moisture to prevent rust and deterioration of rubber materials, etc.



# Series VDW/Specific Product Precautions 1

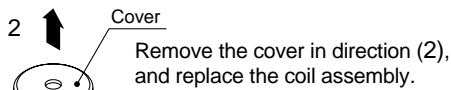
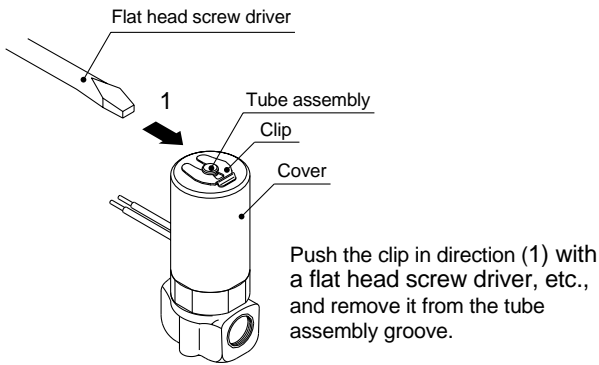
Be sure to read before handling.

Refer to pages 16 through 19 for safety instructions and precautions for 2/3 port solenoid valve for fluid control.

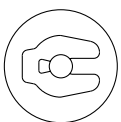
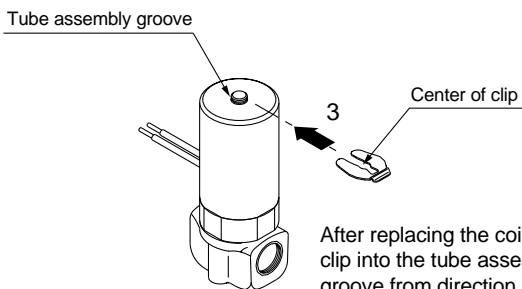
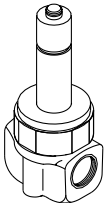
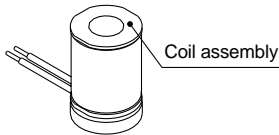
## Replacement of the Solenoid Coil

### Caution

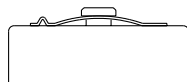
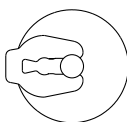
#### 2 port valve



Note  
In case of types 10 and 30, the cover alone cannot be removed because it is integrated with the coil assembly.

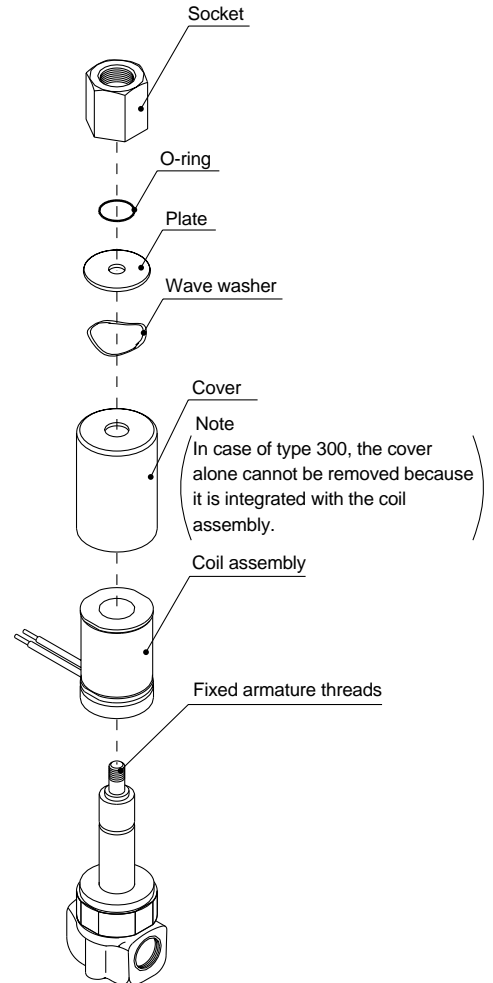


Inserted position



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 1N·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 hold the body with a wrench, etc., and tighten the socket within the tightening torque range given above. If excessive torque is applied, there is a danger of damaging the threads.



# Series VDW/Specific Product Precautions 2

Be sure to read before handling.

Refer to pages 16 through 19 for safety instructions and precautions for 2/3 port solenoid valve for fluid control.

## Replacement Parts

### Solenoid coil part numbers

VDW **2** 0 — 1 **B** — 1 —   

#### Series

1	10
2	20, 200
3	30, 300

#### Lead wire length

Nil	300mm
L1 (Note)	600mm

Note) Type L1 is optional.

#### Type (Note 1)

B	20, 200
C1	10, 30
C2	300

#### Voltage

1	100VAC
2	200VAC
3	110VAC
4	220VAC
5	24VDC
6	12VDC

Note 1) In case of a type C coil (for 10, 30, 300), the cover will be an integrated type.  
To have a label on the cover, enter the part number below together with the coil part number.

## AZ-T-VDW

**How to Order Valves**  
(Refer to pages 1, 5 and 11.)

### Clip part numbers (2 port)

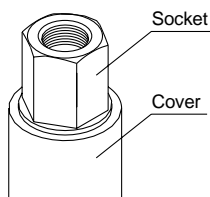
VDW **2** 0 — 10

#### Series

2	10, 20
3	30

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

### Caution

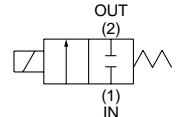


When piping to an N.O. port, be sure to perform piping work while holding the socket with a wrench or other tool. Refer to page 18 for other precautions related to piping.

## Fluid Flow Direction

### Caution

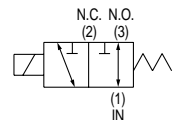
The maximum operating pressure differential differs depending on the flow direction of the fluid. If the pressure differential at each port exceeds the values in the table below, valve leakage may occur.



### 2 port valve

Model	Orifice size mm	Maximum operating pressure differential MPa	
		Pressure port 1	Pressure port 2 (Note 1)
VDW10	ø1	0.9	0.4
	ø1.6	0.4	0.2
VDW20	ø1.6	0.7	0.2
	ø2.3	0.4	0.1
	ø3.2	0.2	0.05
VDW30	ø2	0.8	0.2
	ø3	0.4	0.1
	ø4	0.2	0.05

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



### 3 port valve

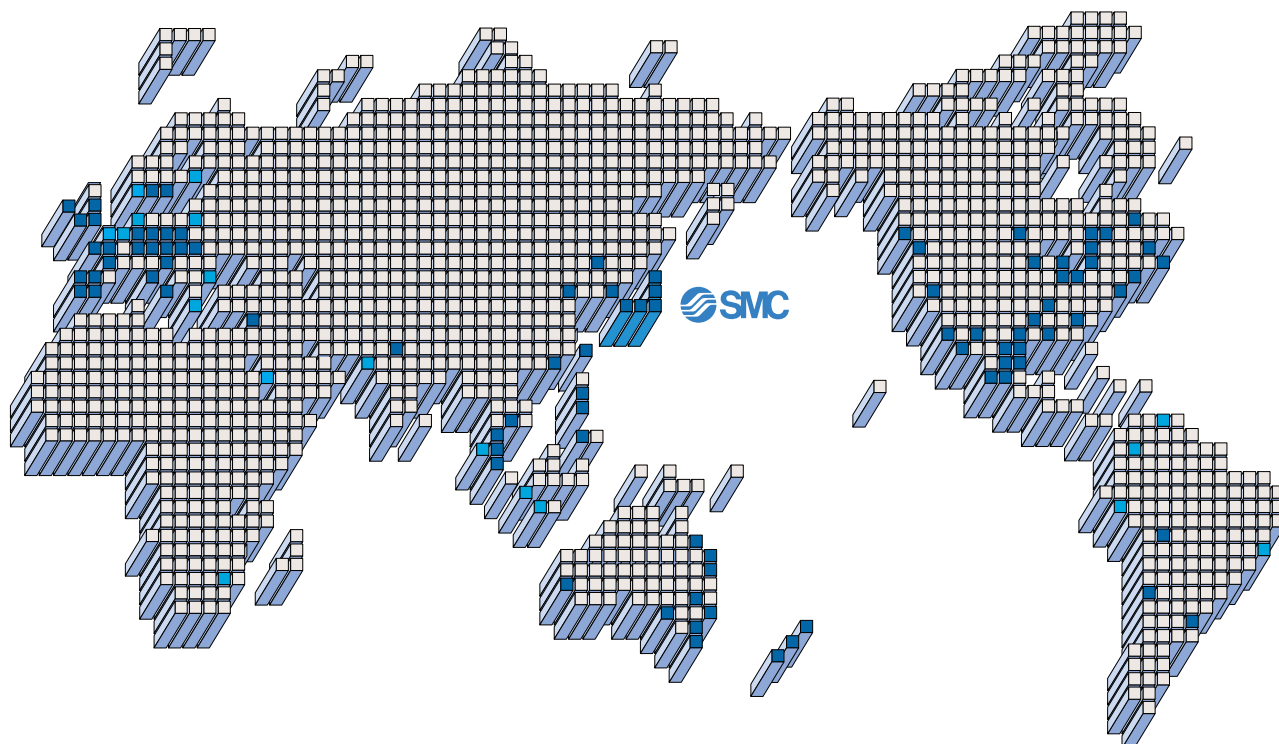
Model	Orifice size mm	Maximum operating pressure differential MPa	
		Pressure port 1	Pressure ports 2, 3 (Note 1 & 2)
VDW200	ø1	0.9	0.3
	ø1.6	0.7	0.1
VDW300	ø2	0.8	0.2
	ø3	0.4	0.1
	ø4	0.2	0.05

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

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



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