

# Series VC

## Direct Operated 2 Port Solenoid Valve for Steam

# Series VCS



VX
VN□
VQ
VDW
<b>VC</b>
LV
PA

# Multipurpose Valve for Steam Direct Operated 2 Port Solenoid Valve for Steam

## Series VCS

### Improved durability

(nearly twice the life of the previous series)

The internal resistance of moving parts has been reduced through the use of a unique magnetic material.

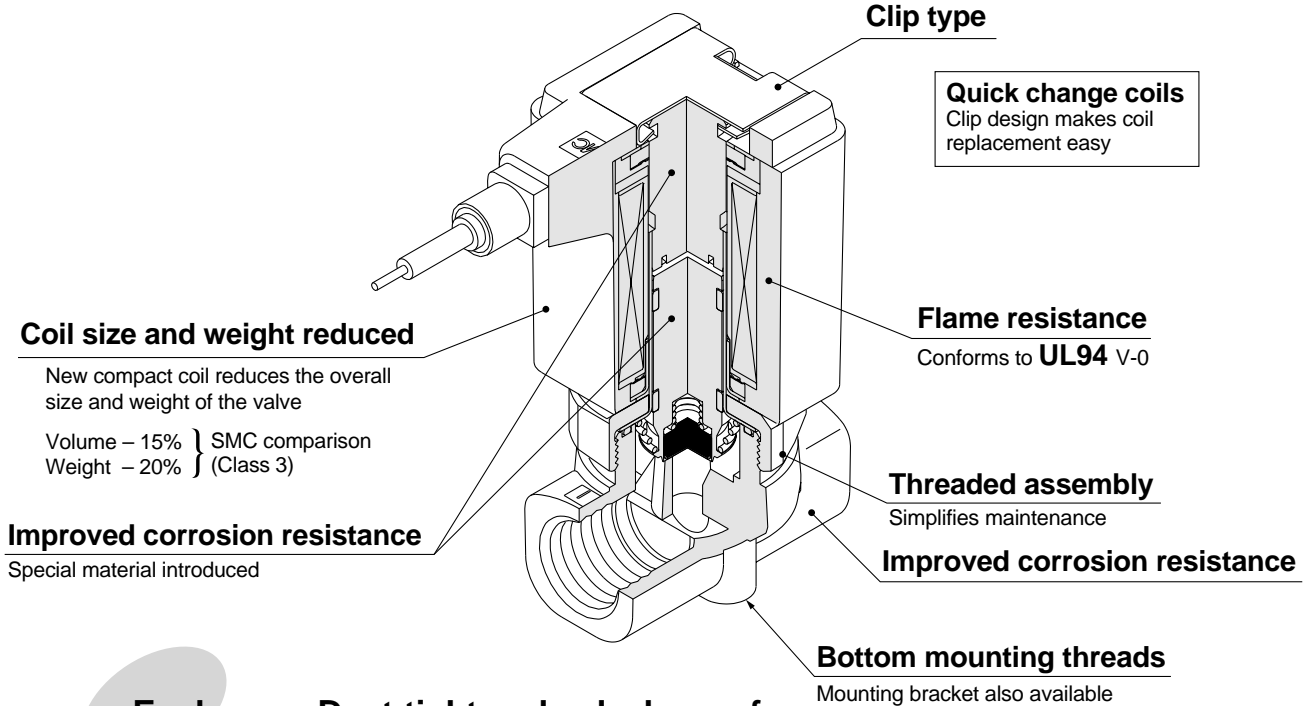
Service life, durability and corrosion resistance have been increased.

**High flow rate:**  
N/min 157 to 2061

### Smaller size:

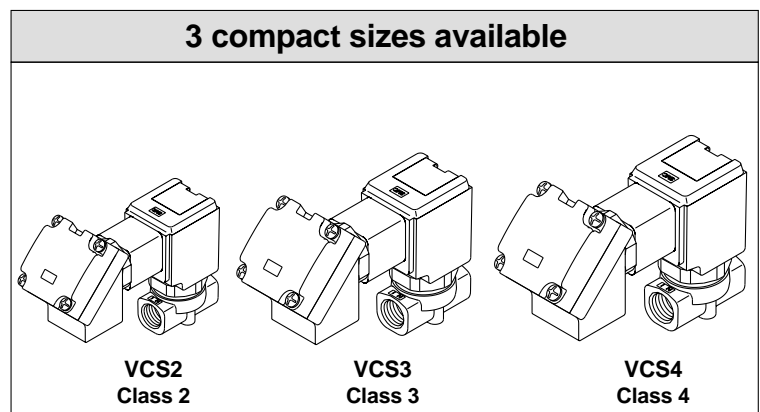
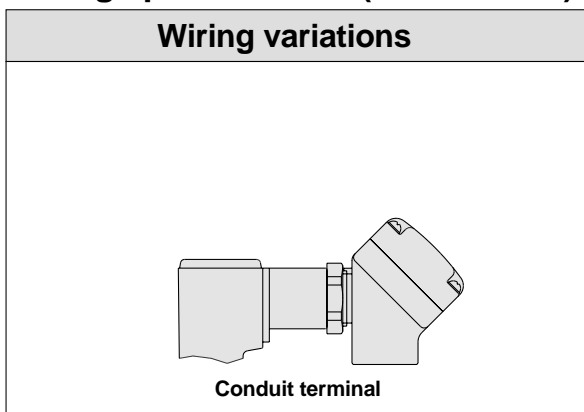
Single valve volume reduced by 15% (Class 3)

Manifold length reduced by 18% (Class 3: 5 stations) (SMC comparison)



**Enclosure: Dust-tight and splash proof  
(equivalent to IP65)**

### Wiring specifications (Class H coil)



# Direct Operated 2 Port Solenoid Valve for Steam Series VCS

## How to Order Valves (Single Type)

VC S 2 1 1 G 2 02 [ ] [ ] [ ] Q

**For steam**

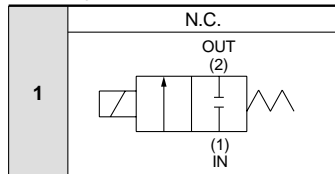
When no symbol is shown for "Material and insulation type"

- Body material: Brass
- Seal material: PTFE
- Coil insulation: Class H

**Series**

2	Class 2
3	Class 3
4	Class 4

**Valve type**



**Voltage**

1	100VAC
2	200VAC
3	110VAC
4	220VAC
36	230VAC
9	less than 250VAC

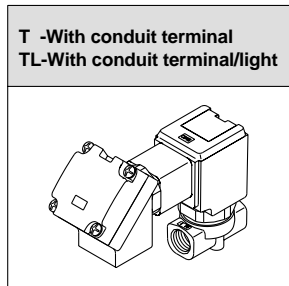


Contact SMC for other voltages (9)



Protective class class III (Mark: ⚡)..... Grommet, L and M plug connector

**Electrical entry**



**Option**

Nil	None
F	Foot type bracket

**Material and insulation type**

Symbol	Body material	Seal material	Coil insulation
Nil	Brass	PTFE	Class H
D		FKM	
R	Stainless steel	PTFE	
N		FKM	

**Thread type**

Nil	Rc
N	NPT
F	G

**Port size**

Symbol	Port size	Class 2	Class 3	Class 4
01	1/8 (6A)	○	—	—
02	1/4 (8A)	○	○	○
03	3/8 (10A)	—	○	○
04	1/2 (15A)	—	○	○
06	3/4 (20A)	—	—	○

**Orifice size**

Symbol	Orifice diameter	Class 2	Class 3	Class 4
2	ø2mm	○	—	—
3	ø3mm	○	○	○
4	ø4mm	○	○	○
5	ø5mm	○	○	○
7	ø7mm	—	○	○
10	ø10mm	—	○	○

\* Refer to the table below for orifice and port size combinations.

**Orifice and port size combinations**

Class	Port size	Orifice size					
		ø2	ø3	ø4	ø5	ø7	ø10
2	1/8 ( 6A)	●	●	●	●	—	—
	1/4 ( 8A)	●	●	●	●	—	—
3	1/4 ( 8A)	—	●	●	●	●	—
	3/8 (10A)	—	●	●	●	●	●
	1/2 (15A)	—	—	—	—	—	●
4	1/4 ( 8A)	—	●	●	●	●	—
	3/8 (10A)	—	●	●	●	●	●
	1/2 (15A)	—	—	—	—	—	●
	3/4 (20A)	—	—	—	—	—	●

Note 1) ø10 is available with seal material FKM only.

VX

VN□

VQ

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PA



## Standard Specifications

Valve specifications	Valve construction		Direct operated poppet
	Fluid		Steam (184°C or less)
	Withstand pressure MPa		5.0
	Body material		Brass, Stainless steel
	Seal material		PTFE (FKM)
	Ambient temperature °C		-20 to 100
	Fluid temperature °C		184 or less (PTFE), 120 or less (FKM) <sup>Note 1)</sup>
	Enclosure		Dust proof, Splash proof (equivalent to IP65)
	Environment		Location without corrosive or explosive gases
	Valve leakage cm <sup>3</sup> /min		300 (PTFE), 0.1 (FKM) with air
	Mounting orientation		Unrestricted
Vibration/Impact resistance m/s <sup>2</sup> <sup>Note 2)</sup>		30/150 or less	
Coil Specifications	Rated voltage		100VAC, 110VAC, 200VAC, 220VAC, 230VAC (50/60Hz)
	Allowable voltage fluctuation		±10% of rated voltage
	Coil insulation type		Class H
	Power consumption W 50/60Hz		VCS2: 4.9/4.1, VCS3: 7.7/6.6, VCS4: 10.5/9.3
	Apparent power VA 50/60Hz	Inrush	VCS2: 22/19, VCS3: 36/30, VCS4: 45/37
Holding		VCS2: 10/8, VCS3: 15/13, VCS4: 19/16	

Note 1) In case of low pressure steam at a temperature of 120°C or less, use FKM for the seal material.

Note 2) Vibration resistance ... Conditions when tested with one sweep of 10 to 300Hz in the axial direction and at a right angle to the armature, in both energized and deenergized states

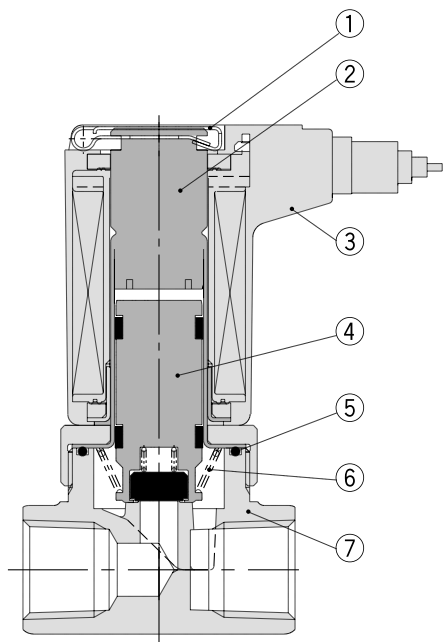
Impact resistance ..... Conditions when tested with a drop tester in the axial direction and at a right angle to the armature, one time each in energized and deenergized states

## Characteristic Specifications

Model	Class	<sup>Note 1)</sup> Port size	<sup>Note 1)</sup> Orifice size mm	Maximum operating pressure differential MPa	Effective area mm <sup>2</sup> (Nl/min)	Max. operating pressure MPa	Weight kg
VCS2	2	1/8 (6A) 1/4 (8A)	ø2	1.0	2.8 (157)	1.0 (10)	1/8: 0.21 1/4: 0.24
			ø3	0.8	5.9 (324)		
			ø4	0.5	9.2 (500)		
			ø5	0.3	11.7 (638)		
VCS3	3	1/4 (8A) 3/8 (10A) 1/2 (15A)	ø3	1.0	6.3 (344)	1.0 (10)	1/4: 0.42 3/8: 0.40 1/2: 0.49
			ø4	0.8	9.7 (530)		
			ø5	0.5	14.4 (785)		
			ø7	0.2	24.8 (1354)		
VCS4	4	1/4 (8A) 3/8 (10A) 1/2 (15A) 3/4 (20A)	ø3	1.0	6.3 (843)	1.0 (10)	1/4: 0.58 3/8: 0.55 1/2: 0.62 3/4: 0.78
			ø4	1.0	10.8 (589)		
			ø5	0.7	15.3 (834)		
			ø7	0.3	24.8 (1354)		
			ø10	0.12	37.8 (2061)		

Note 1) Refer to model selection on page 4.5-59 regarding port size and orifice size combinations.

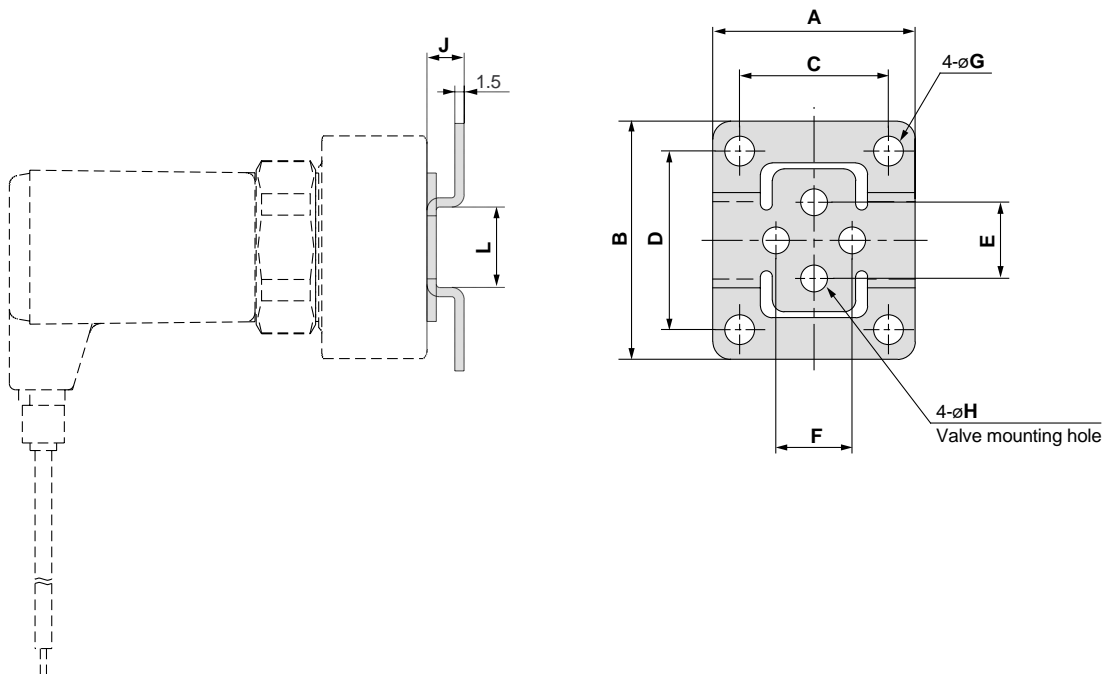
## Construction



### Parts list

No.	Description	Material
		Standard
1	Clip	Stainless steel
2	Tube assembly	Stainless steel, Cu
3	Coil assembly	Class H
4	Armature assembly	Stainless steel, PTFE (FKM)
5	Seal	PTFE (FKM)
6	Return spring	Stainless steel
7	Body	Brass

## Dimensions/Bracket



### Bracket mounting dimensions

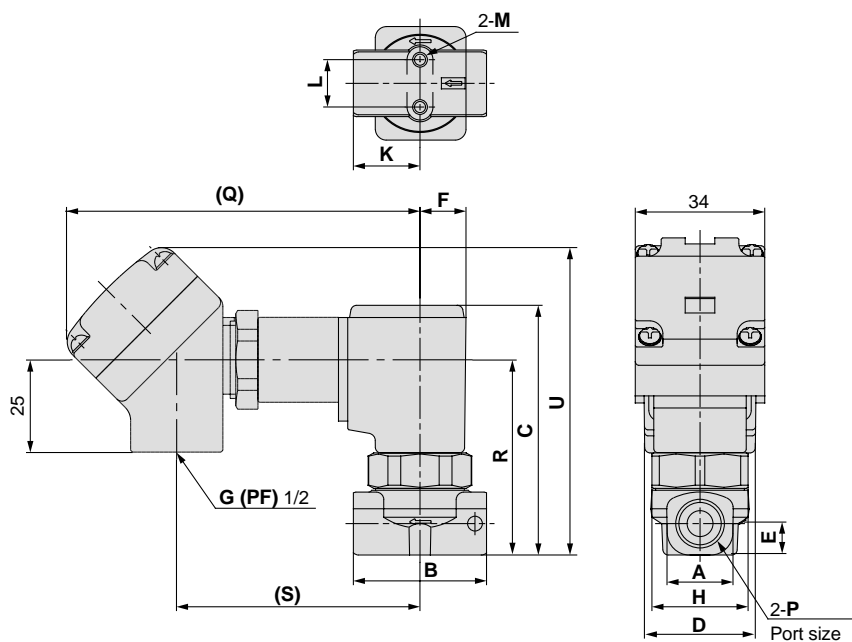
Valve model	Port size	Bracket part no.	A	B	C	D	E	F	G	H	J	L
VCS21	1/8, 1/4	VCS20-12-01A	34	40	25	30	12.8	12.8	5	4.5	6	13
VCS31	1/4, 3/8	VCS30-12-02A	42	52	30	40	19	19	6	5.5	7	19
	1/2	VCS30-12-04A	48	56	36	44	23	23	6	5.5	7	23
VCS41	1/4, 3/8	VCS40-12-02A	42	52	30	40	23	23	6	5.5	7	19
	1/2	VCS30-12-04A	48	56	36	44	23	23	6	5.5	7	23
	3/4	VCS40-12-06A	56	65	44	53	28.2	28.2	6	5.5	7	26

\* Bracket material: Stainless steel

# Series VCS

## Dimensions

### Conduit terminal: T



### N.C.

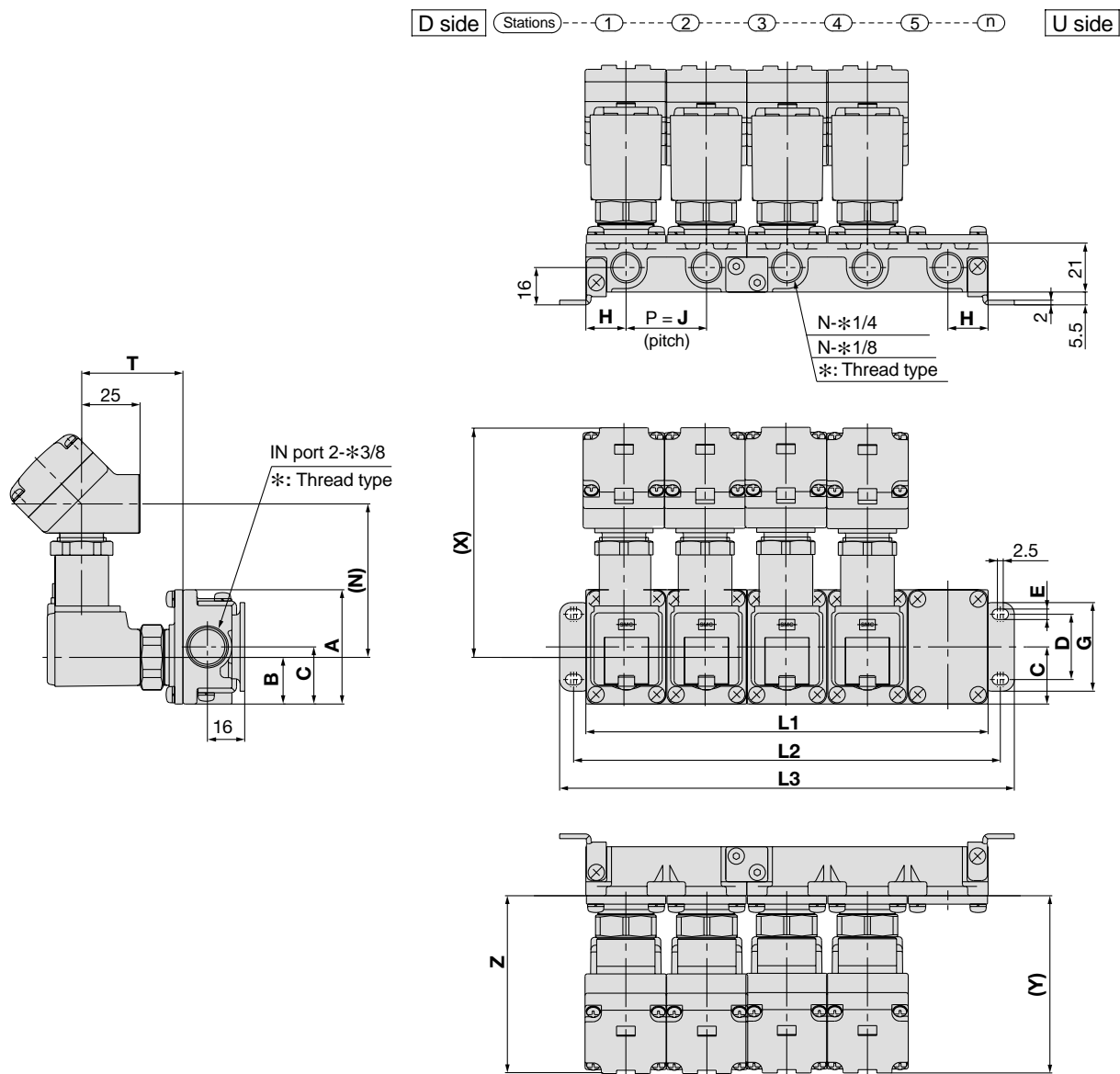
(mm)

Model	P Port size	A	B	C	D	E	F	H	K	L	M	Electrical entry			
												Conduit terminal: T			
												Q	R	S	U
VCS21	1/8	13.5	28	64	31	6.5	12.5	28	14	12.8	M4	99	50	66	83
	1/4	18	36	67.5	31	8.5	12.5	28	18	12.8	M4	99	53	66	86
VCS31	1/4, 3/8	22	40	81.5	36.5	11	15	32	20	19	M5	101	66.5	68	99
	1/2	30	50	86	36.5	13.5	15	32	25	23	M5	101	71	68	104
VCS41	1/4, 3/8	22	45	90	41	11	17	36	22.5	23	M5	103	74.5	70	107
	1/2	30	50	94	41	13.5	17	36	25	23	M5	103	78.5	70	111.5
	3/4	35	60	102	41	17.5	17	36	30	28.2	M5	103	86.5	70	119



# Series VCS

## Dimensions



### L dimensions

Model	Dimensions	n (stations)								
		2	3	4	5	6	7	8	9	10
VV2CS2	L1	69	103.5	138	172.5	207	241.5	276	310.5	345
	L2	81	115.5	150	184.5	219	253.5	288	322.5	357
	L3	93	127.5	162	196.5	231	265.5	300	334.5	369
VV2CS3	L1	77	115.5	154	192.5	231	269.5	308	346.5	385
	L2	89	127.5	166	204.5	243	281.5	320	358.5	397
	L3	101	139.5	178	216.5	255	293.5	332	370.5	409
VV2CS4	L1	83	124.5	166	207.5	249	290.5	332	373.5	415
	L2	95	136.5	178	219.5	261	302.5	344	385.5	427
	L3	107	148.5	190	231.5	273	314.5	356	397.5	439
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.

### Dimensions

Model	A	B	C	D	E	G	H	J	Z	Electrical entry						
										Grommet: G			Conduit: C		Conduit terminal: T	
										Q	R	S	T	N	X	Y
VV2CS2	49	20	24.5	28	4.5	38	17.3	34.5	56	22	50.5	44	41.5	66	99	77
VV2CS3	57	25.5	28.5	30	5.5	42	19.3	38.5	66	24	60	45.5	51	68	101	86.5
VV2CS4	57	25.5	28.5	30	5.5	42	20.8	41.5	74	26	68	47.5	58.5	70	103	94

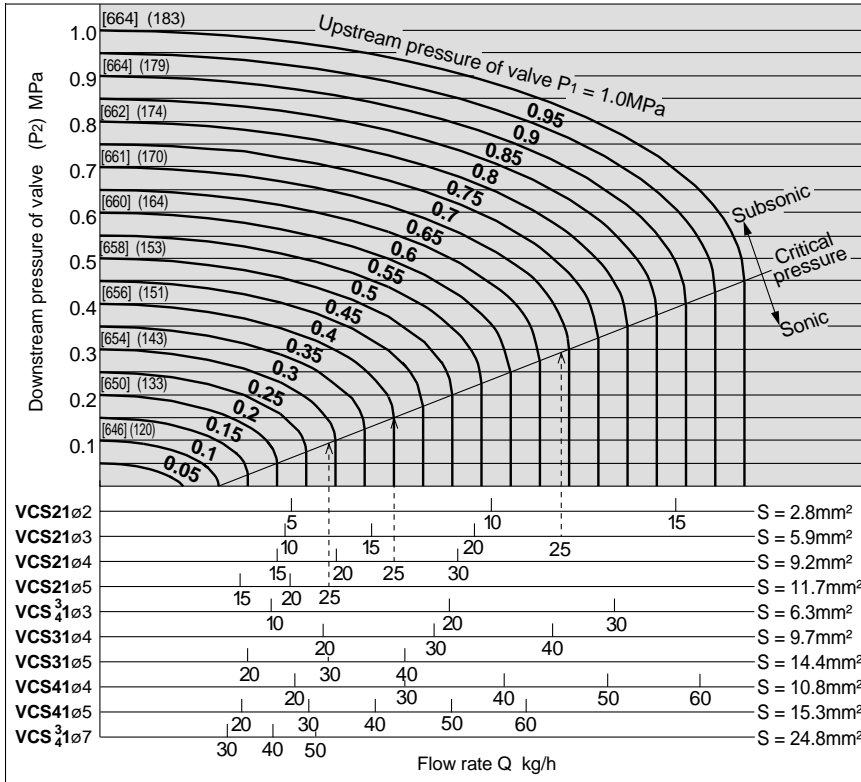
# Series VCS Model Selection

## VCS (for steam) 2 port solenoid valve

Model	Material		Class	Port size	Orifice size					
	Body	Seal			ø2	ø3	ø4	ø5	ø7	ø10 <sup>Note 1)</sup>
VCS (for steam) 2 port solenoid valve	Brass (stainless steel)	PTFE (FKM)	2	1/8 ( 6A)	●	●	●	●	-	-
				1/4 ( 8A)	●	●	●	●	-	-
			3	1/4 ( 8A)	-	●	●	●	●	-
				3/8 (10A)	-	●	●	●	●	●
				1/2 (15A)	-	-	-	-	-	●
			4	1/4 ( 8A)	-	●	●	●	●	-
				3/8 (10A)	-	●	●	●	●	●
				1/2 (15A)	-	-	-	-	-	●
				3/4 (20A)	-	-	-	-	-	●

Note 1) ø10 is available with seal material FKM only.

## For saturated steam



Figures inside [ ] indicate the saturated steam holding heat (kcal/kg).  
Figures inside ( ) indicate the saturation temperature (°C).

## Viewing the graph

The sonic range pressure to generate a flow rate of 25kg/h  
for orifice ø3 (VCS21) is P1 approx. 0.68MPa  
for orifice ø4 (VCS21) is P1 approx. 0.40MPa  
for orifice ø5 (VCS21) is P1 approx. 0.29MPa  
The holding heat differs somewhat depending on the pressure P1, but at 25kg/h it is approximately 16000kcal/h.

## How to find the flow rate for saturated steam

- For subsonic range  
Where  $P_1 + 0.1013 = (1 \text{ to } 2) (P_2 + 0.1013)$   
  - Formula based on Cv factor  
 $Q = 197.8 \cdot C_v \cdot \sqrt{\Delta P (P_2 + 0.1013)} \dots \text{kg/h}$
  - Formula based on effective area  
 $Q = 11.0 \cdot S \cdot \sqrt{\Delta P (P_2 + 0.1013)} \dots \text{kg/h}$
- For sonic range  
Where  $P_1 = 0.1013 \geq 2 (P_2 + 0.1013)$   
  - Formula based on Cv factor  
 $Q = 98.9 \cdot C_v \cdot (P_1 + 0.1013) \dots \text{kg/h}$
  - Formula based on effective area  
 $Q = 5.5 \cdot S \cdot (P_1 + 0.1013) \dots \text{kg/h}$

VX

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## 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

PTFE: Tetrafluoroethylene resin – Trade names: Teflon®, Polyflon®, etc.

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



# Series VCS

## 2 Port Solenoid Valve for Fluid Control

Be sure to read before handling.

### Wiring

#### ⚠ Caution

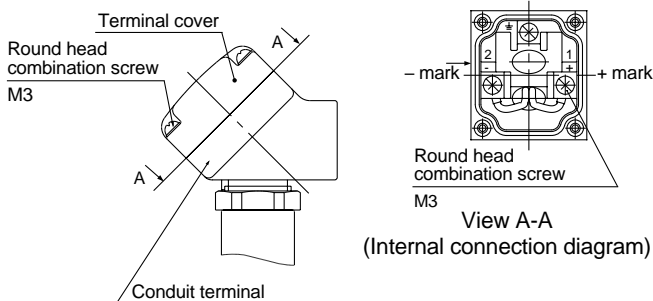
1. As a rule, use electrical wire of 0.5 to 1.25mm<sup>2</sup> for wiring. Furthermore, do not allow excessive force to be applied to the lines.
2. Use electrical circuits which do not generate chattering in their contacts.
3. Use voltage which is within  $\pm 10\%$  of the rated voltage. In cases with a DC power supply where importance 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.
4. When surge from the solenoid affects the electrical circuitry, install a surge absorber, etc., in parallel with the solenoid.

### Electrical Connections

#### ⚠ Caution

##### Conduit terminal

In the case of the conduit terminal, make connections according to the marks shown below.

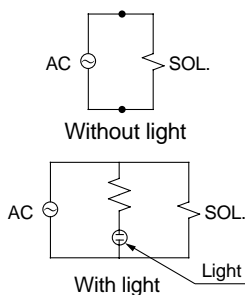


\* There is polarity only when equipped with light.

### Electrical Circuits

#### ⚠ Caution

##### Conduit terminal



### Operating Environment

#### ⚠ Warning

1. Do not use valves in atmospheres of corrosive gases, chemicals, salt water, water, 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 machinery and equipment, etc.

In addition, perform maintenance inspections once every six months to ensure optimum performance.

2. Removing the product

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

##### Removal

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.

#### ⚠ 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 0.1MPa.
3. Clean strainers when the pressure drop reaches 0.1MPa.

2. Storage

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

### Operating Precautions

#### ⚠ Warning

1. Valves will reach high temperatures from high temperature fluids such as steam. Use caution, as there is a danger of being burned if a valve is touched directly.
2. Valves may reach high temperatures when continuously energized. Use caution, as there is a danger of being burned if a valve is touched directly.

VX

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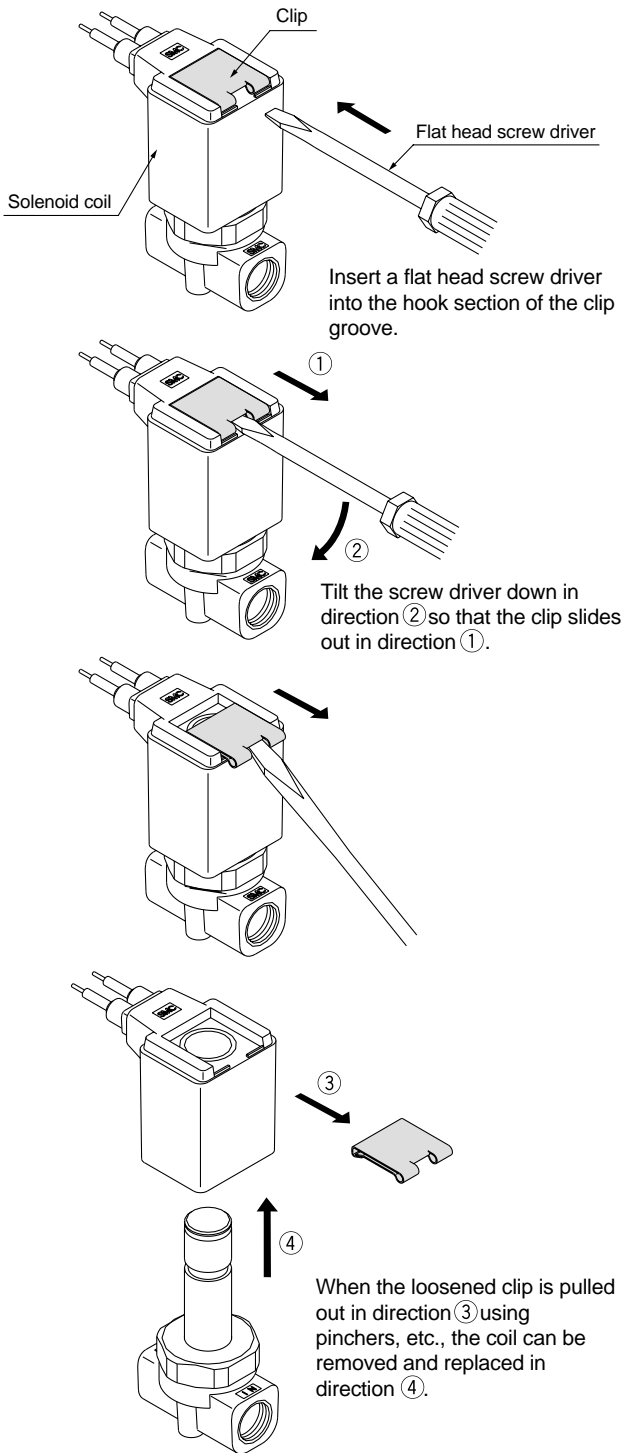
# Series VCS Specific Product Precautions

Be sure to read before handling.

## Replacing the Solenoid Coil

### Caution

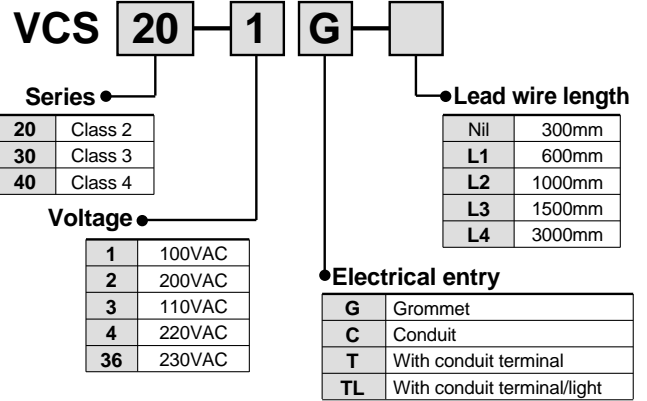
The valve will reach high temperatures from high temperature fluids such as steam. Confirm that the valve has cooled sufficiently before performing work. If touched inadvertently, there is a danger of being burned.



After replacing the coil, the clip is reinstalled by pushing it back in the direction opposite to its removal.

## Replacement Parts

### Solenoid coil part numbers



### Clip part numbers

**AZ-T-VCS** How to Order Valves → Page 4.5-53 Valve model  
Page 4.5-57 Valve model

Note) Indicate the valve model, as a label will be attached to the clip.

### Seal part numbers

Valve

For VCS20

**OR-1860-120-P**  
P: PTFE  
F: FKM

For VCS30

**OR-2380-130-P**  
P: PTFE  
F: FKM

For VCS40

**OR-2600-180-P**  
P: PTFE  
F: FKM

Manifold

For VCS20

**OR-1400-178-P**  
P: PTFE  
F: FKM

**OR-2670-178-P**  
P: PTFE  
F: FKM

For VCS30, 40

**OR-1717-178-P**  
P: PTFE  
F: FKM

**OR-3305-178-P**  
P: PTFE  
F: FKM

When external leakage occurs after disassembling a valve, replace the above seals.