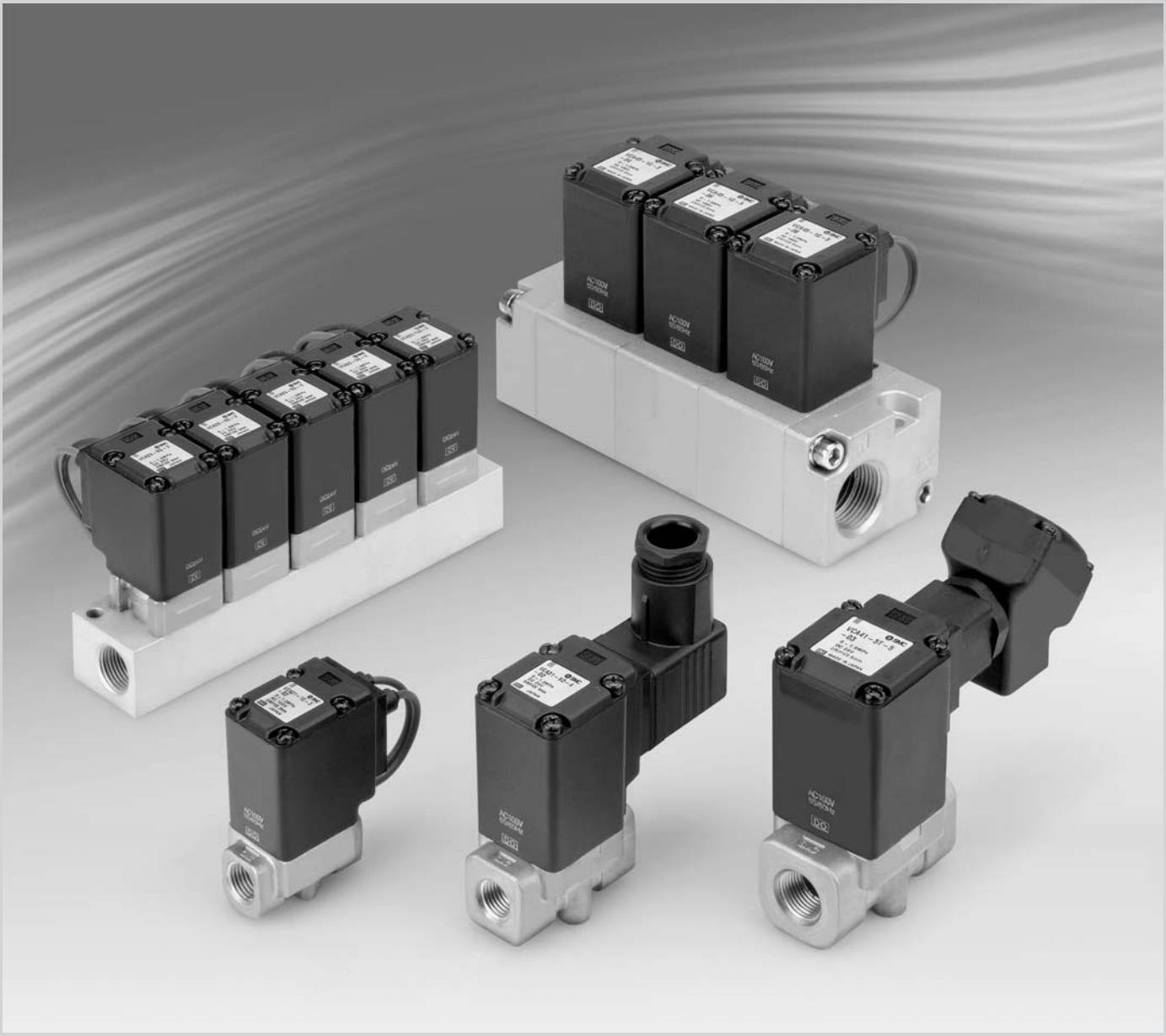
Series VC
Direct Operated 2 Port Solenoid Valve for Air
Series VCA



Multipurpose Valve for Air
Direct Operated 2 Port Solenoid Valve for Air

Series VCA

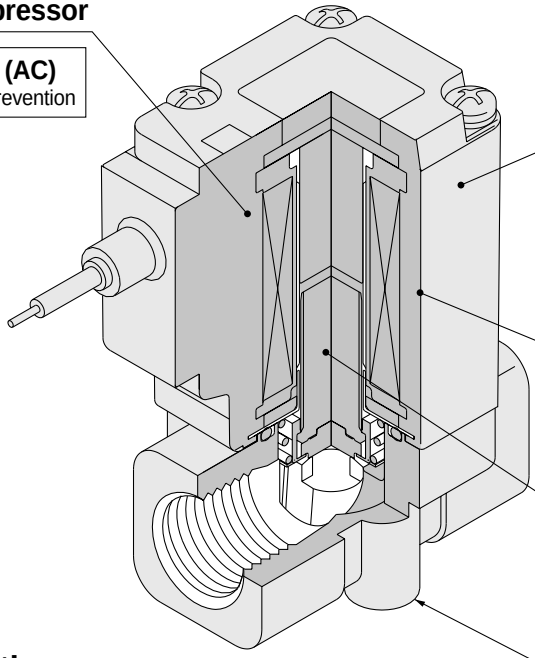
Improved durability (Nearly twice the life of the previous series)
Operating resistance of moving parts reduced for improved longevity and wear resistance.

High flow rate: 324 to 2071 Nℓ/min

Compact: Single valve volume reduced 13% (Class 2)
Weight reduced 25% (Class 2)
Manifold length reduced 22% (Class 1: 5 stations)
(Compared to previous series)

Built-in surge voltage suppressor

Built-in rectifying circuit (AC)
• Noise prevention • Burn-out prevention



Miniaturized coil
Size and weight reduced
New compact coil reduces the size and weight of the valve
Volume : –13%
Weight : –25%
} Compared to previous series (Class 2)

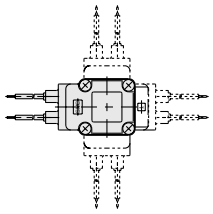
Flame resistance
UL94 V-0 standard

Special construction reduces operating resistance

Bottom mounting threads
Mounting bracket also available

Electrical entry directions

Electrical entry is possible from four directions

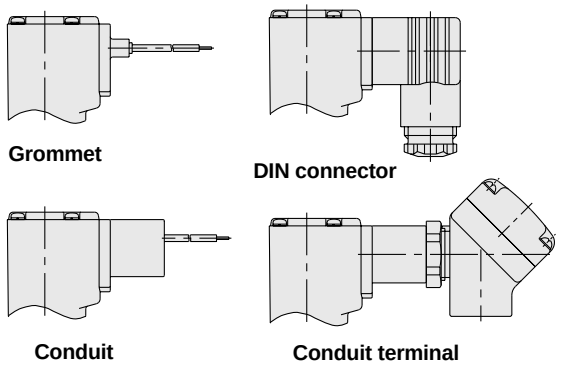


∗ When shipped from the factory, the electrical entry is on the IN port side.

A variety of wiring variations
Grommet, DIN connector,
Conduit, Conduit terminal

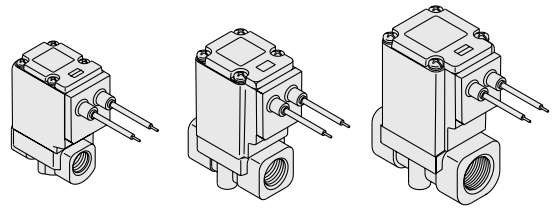
Wiring specifications (Class B coil)

Wiring variations



Enclosure: Dust-proof & splash-proof (IP65 equivalent)

Three compact sizes available

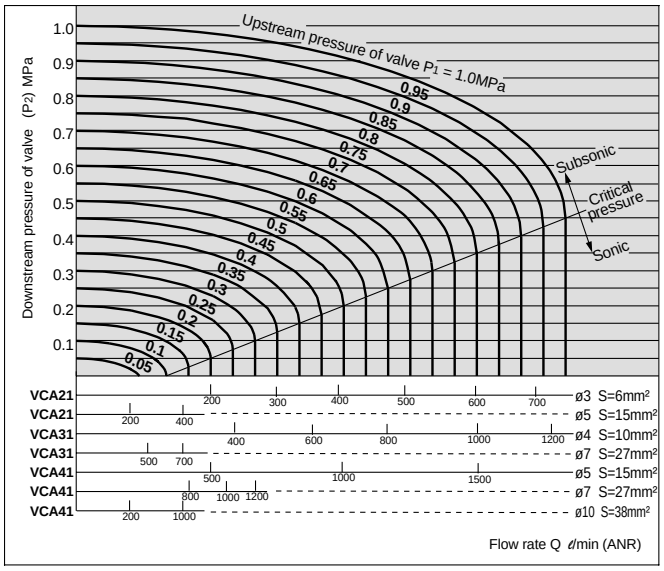


Series VCA
Model Selection

Orifice size/Port size combinations

Model	Class	Port size	Orifice size (mm ø)				
			3	4	5	7	10
VCA (for air) 2 port solenoid valve	2	1/4 (8A)	●	–	●	–	–
	3	1/4 (8A)	–	●	–	●	–
		3/8 (10A)	–	●	–	●	–
	4	3/8 (10A)	–	–	●	●	●
		1/2 (15A)	–	–	●	●	●
		3/4 (20A)	–	–	–	–	●

Flow characteristics



Viewing the graph

The sonic range pressure to generate a flow rate of 500ℓ/min (ANR) is
P = 0.64MPa for ø3 orifice, and
P = 0.35MPa for ø4 orifice, and

How to find the flow rate for air/ Flow rate formulas based on the air temperature of 20°C

For subsonic range where $P_1 + 0.1013 < 1.89 (P_2 + 0.1013)$

$$Q = 226S\sqrt{\Delta P (P_2 + 0.1013)}$$

For sonic range where $P_1 = 0.1013 \geq 1.89 (P_2 + 0.1013)$

$$Q = 113S (P_1 + 0.1013)$$

Q: Flow rate ℓ/min (ANR)
S: Effective area (mm²)
ΔP: Pressure dropl P_1 — P_2 (MPa)
P_1: Upstream pressure (MPa)
P_2: Downstream pressure (MPa)

* **How to make correctio when the air temperature is different**

Multiply the flow rate obtained from the formulas above by the factor in the table below.

Air temperature (°C)	-20	-10	0	10	30	40	50	60
Correction factor	1.08	1.06	1.04	1.02	0.98	0.97	0.95	0.94

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.

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

HNBR: Nitrile hydride rubber

Direct Operated 2 Port Solenoid Valve for Air

Series VCA

How to Order Valves (Single Type)

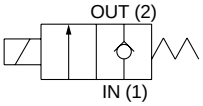
VC A 2 1 □ – 5 G □ – 3 02 □ □ – Q

For air

Series

2	Class 2
3	Class 3
4	Class 4

Valve type

1	N.C. OUT (2)  IN (1)

Fluid

Nil	General air
A	Dry air

Voltage

AC*

1	100VAC
2	200VAC
3	110VAC
4	220VAC
9	(Other, less than 250VAC)

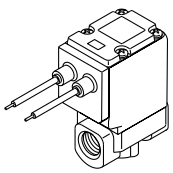
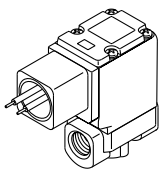
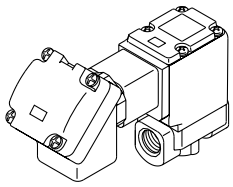
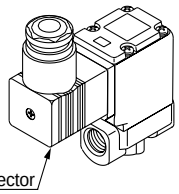
DC*

5	24VDC
6	12VDC
9	(Other, less than 50VDC)

* AC specifications are only for DIN terminal and conduit terminal type.

Order Made * Consult SMC regarding other voltages (9).

Electrical entry

G – Grommet	C – Conduit
	
T – With conduit terminal **TL – With conduit terminal and light**	**D – DIN** **DL – DIN with light** **DO – DIN (without connector)**
	 Connector

* All types equipped with surge voltage suppressor.

Option

Nil	None
F	Foot type bracket

* When only brackets are required, refer to Table 2 below.

Thread type (single type)

Nil	Rc
F	G
N	NPT
T	NPTF

Port size

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

Orifice size

Symbol	Orifice size (mmø)	Class 2	Class 3	Class 4
3	3	○	—	—
4	4	—	○	—
5	5	○	—	○
7	7	—	○	○
10	10	—	—	○

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

Manual Override

Nil	None
B	Slotted locking type

Table 1. Orifice and port size combinations

Class	Port size	Orifice size (mmø)				
		3	4	5	7	10
2	1/4 (8A)	●	—	●	—	—
3	1/4 (8A)	—	●	—	●	—
	3/8 (10A)	—	●	—	●	—
4	3/8 (10A)	—	—	●	●	●
	1/2 (15A)	—	—	●	●	●
	3/4 (20A)	—	—	—	—	●

Table 2. Bracket assembly part nos.

Valve model	Bracket assembly part no.
VCA21	VCA20-12-1A
VCA31	VCA30-12-1A
VCA41	VCA40-12-1A

Standard Specifications

Valve specifications	**Valve construction**			Direct operated poppet
	Fluid			Air/Inert gas
	Withstand pressure MPa			2.0
	Body material			Al
	Seal material			HNBR
	Ambient temperature °C			–20 to 60
	Fluid temperature °C			–10 to 60 (with no freezing)
	Enclosure			Dust proof, Splash proof (equivalent to IP65)
	Environment			Location without corrosive or explosive gases
	Valve leakage cm³/ min (ANR)			0.2 or less
	Mounting orientation			Unrestricted
	Vibration/Impact resistance m/s² Note 2)			30/150 or less
Coil specifications	**Rated voltage**			24VDC, 12VDC, 100VAC, 110VAC, 200VAC, 220VAC (50/60Hz)
	Allowable voltage fluctuation			±10% of rated voltage
	Coil insulation type			Class B
	Power consumption	**DC**		VCA2: 6.5W, VCA3: 8W, VCA4: 11.5W
	Apparent power	**AC** Note 1)	**50Hz**	VCA2: 7.5VA, VCA3: 10VA, VCA4: 13VA
			60Hz	

Note 1) Since AC coil specifications include a rectifying device, there is no difference in apparent power for starting and holding.

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

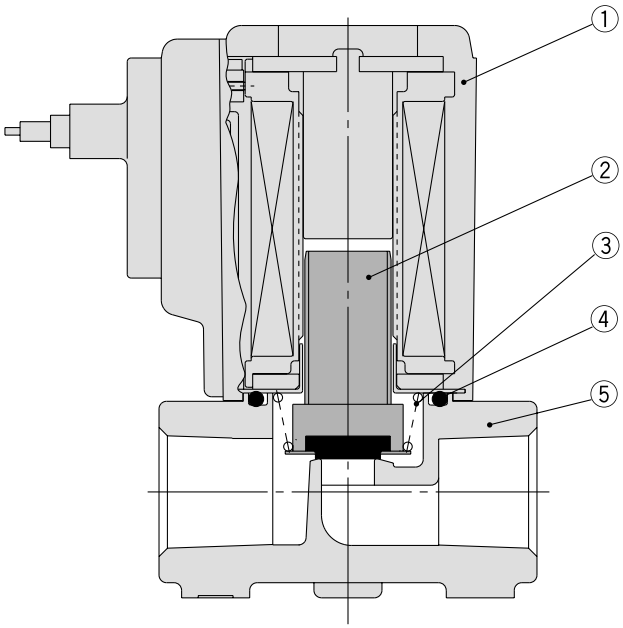
Impact resistance …… Conditions when tested with a drop tester in the axial direction and at a right angle to the armature, one time each in energized and deenergized states

Characteristic Specifications

Model	Class	Port size	Orifice size mmØ	Maximum operating pressure differential MPa	Effective area mm² (Nℓ/min)	Max. operating pressure MPa	Note 1) Weight kg
VCA (for air) 2 port solenoid valve	2	1/4 (8A)	3	1.0	6 (324)	1.0	0.21
			5	0.15	15 (815)		
	3	1/4 (8A) 3/8 (10A)	4	1.0	10 (540)	1.0	0.30
			7	0.15	27 (1472)		
	4	3/8 (10A) 1/2 (15A) 3/4 (20A)	5	1.0	15 (815)	1.0	0.50
			7	0.3	27 (1472)		
			10	0.15	38 (2071)		

Note 1) Weight values are for the grommet type.

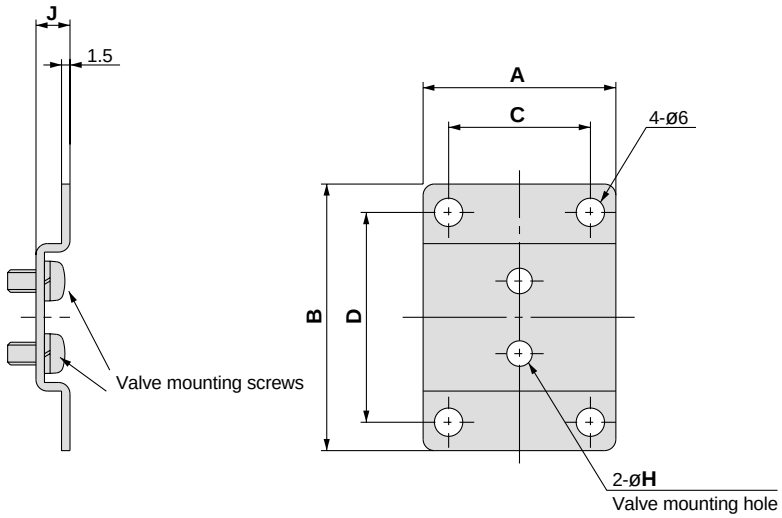
Construction



Parts list

No.	Description	Material
1	**Solenoid coil**	—
2	**Armature assembly**	Stainless steel, HNBR, PPS
3	**Return spring**	Stainless steel
4	**O-ring**	HNBR
5	**Body**	Al

Bracket Assembly Dimensions

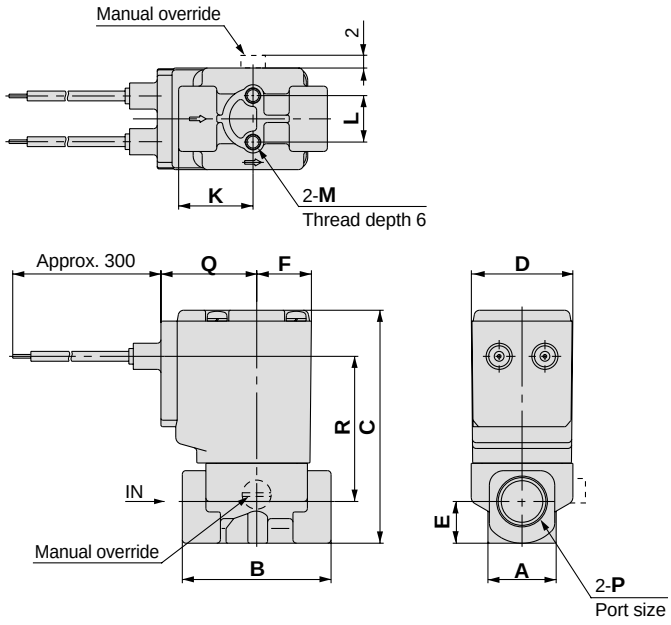


Bracket mounting dimensions/Bracket material: Stainless steel

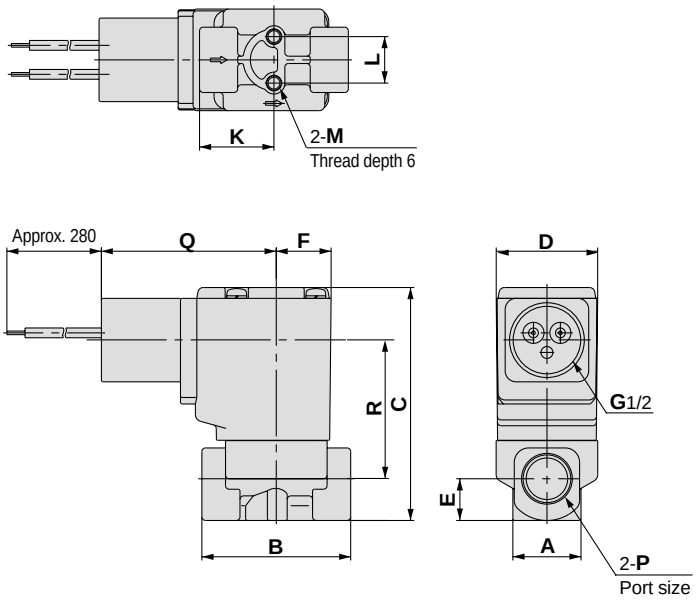
Assembly part no.	A	B	C	D	H	J
VCA20-12-1A	41	52	30	40	4.5	6
VCA30-12-1A	48	56	36	44	5.5	7
VCA40-12-1A	50	62	38	50	5.5	7

Dimensions

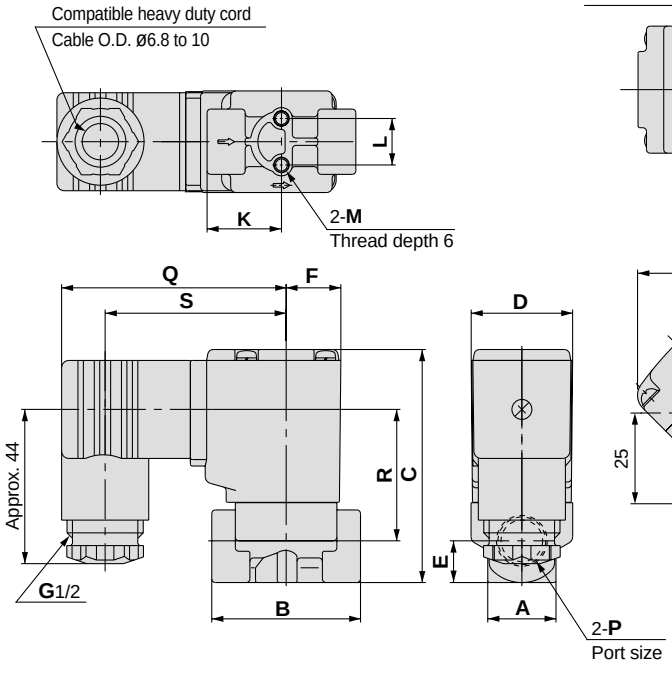
Grommet: G



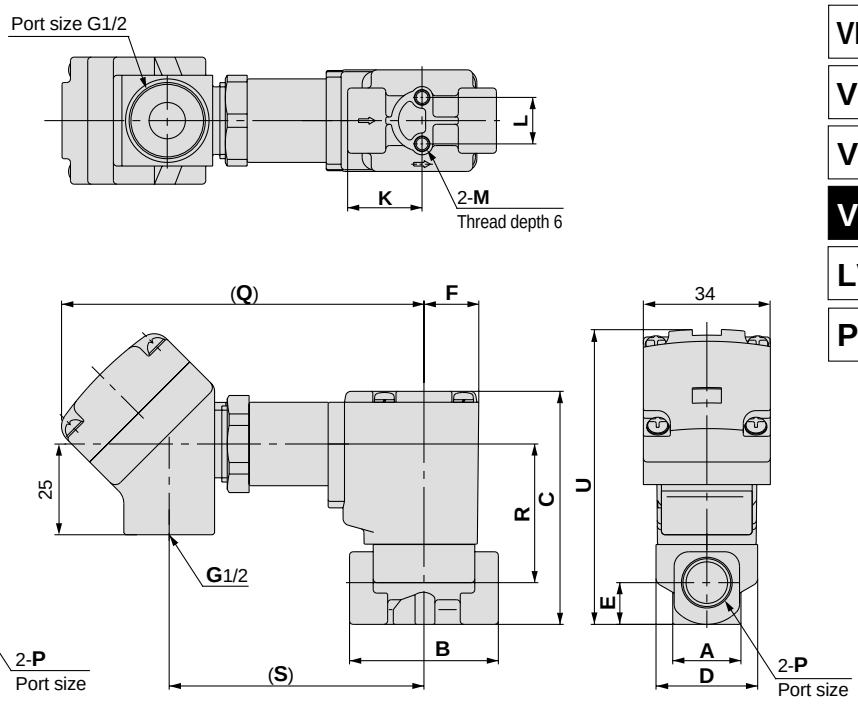
Conduit: C



DIN connector: D



Conduit terminal: T



(mm)

Model	P Port size	A	B	C	D	E	F	K	L	M	Electrical entry										
											Grommet: G		Conduit: C		DIN connector: D			Conduit terminal: T			
											Q	R	Q	R	Q	R	S	Q	R	S	U
VCA21	1/4	18	41	64	28	11.5	15	20.5	12.8	M4	27	40	46	36	63	35	51	98	36	68	81
VCA31	1/4, 3/8	24	50	76	34	14	17	25	19	M5	30	48	50	44	66	42	54	101	44	71	91.5
VCA41	3/8, 1/2	30	60	86	40	15	20	30	23	M5	32	56	52	53	69	51	57	104	53	74	101
	3/4	35	68	91	40	17.5	20	34	23	M5	32	58.5	52	55.5	69	53.5	57	104	55.5	74	103.5

How to Order Manifolds (VCA20)

VV2C A 2 — 02 02 —]

For air

Series

2	Class 2

Stations

02	2 stations
:	:
10	10 stations

OUT port size

02	1/4 (8A)

Thread type

Nil	Rc
F	G
N	NPT
T	NPTF

IN port direction

Nil	Side
A	Front

How to Order Manifold Assemblies (Example)

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

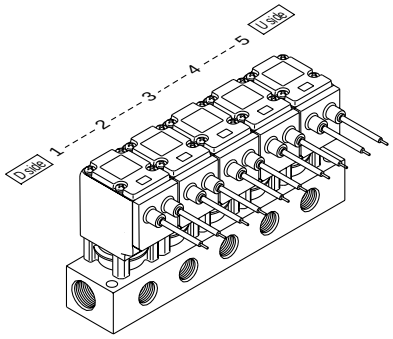
<Example>

VV2CA2-0502 ..... 1 set — Manifold part no.

∗ VCA23-5G-3-Q ..... 5 sets — Valve part no. (Stations 1 to 5)

"∗" is the symbol for mounting. Add a "∗" 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 (VCA20)

VC A 2 3 — 5 G — 3 — Q

For air

Series

2	Class 2

Valve type

3	N.C. for manifold

Fluid

Nil	General air
A	Dry air

Voltage

AC∗

1	100VAC
2	200VAC
3	110VAC
4	220VAC
9	(Other, less than 250VAC)

DC∗

5	24VDC
6	12VDC
9	(Other, less than 50VDC)

∗ AC specifications are only for DIN terminal and conduit terminal type.

Order Made ∗ Consult SMC regarding other voltages (9).

Electrical entry

G	Grommet
C	Conduit
T	Conduit terminal
TL	Conduit terminal with light
D	DIN
DL	DIN with light
DO	DIN (without connector)

∗ All types equipped with surge voltage suppressor.

Manual override

Nil	None
B	Slotted locking type (tool required)

Orifice size

Symbol	Orifice size (mmø)
3	3
5	5

How to Order Manifolds (VCA30/40)

VV2C A 3 02 ☐ ☐

For air

Series

3	Class 3
4	Class 4

Stations

02	2 stations
:	:
10	10 stations

Thread type

Nil	Rc
F	G
N	NPT
T	NPTF

IN port direction

Nil	Side
A	Front

How to Order Manifold Assemblies (Example)

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

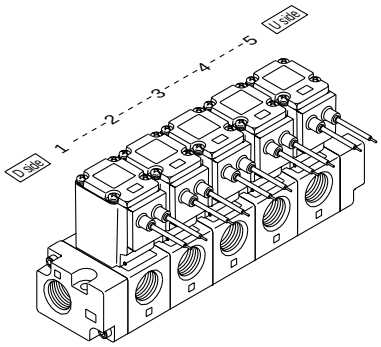
<Example>

VV2CA3-05 ..... 1 set — Manifold part no.

∗ VCA35-5G-4-03-Q ..... 5 sets — Valve part no. (Stations 1 to 5)

"∗" is the symbol for mounting. Add a "∗" 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 (VCA30/40)

VC A 3 5 ☐ – 5 G ☐ – 4 – 03 ☐ – Q

For air

Series

3	Class 3
4	Class 4

Valve type

5	N.C. for manifold

Fluid

Nil	General air
A	Dry air

Voltage

AC∗

1	100VAC
2	200VAC
3	110VAC
4	220VAC
9	(Other, less than 250VAC)

DC∗

5	24VDC
6	12VDC
9	(Other, less than 50VDC)

∗ AC specifications are only for DIN terminal and conduit terminal type.

Order Made ∗ Consult SMC regarding other voltages (9).

Electrical entry

G	Grommet
C	Conduit
T	Conduit terminal
TL	Conduit terminal with light
D	DIN
DL	DIN with light
DO	DIN (without connector)

∗ All types equipped with surge voltage suppressor.

Manual override

Nil	None
B	Slotted locking type (tool required)

Orifice size

Symbol	Orifice size (mmø)	Class 3	Class 4
4	4	○	—
5	5	—	○
7	7	○	○
10	10	—	○

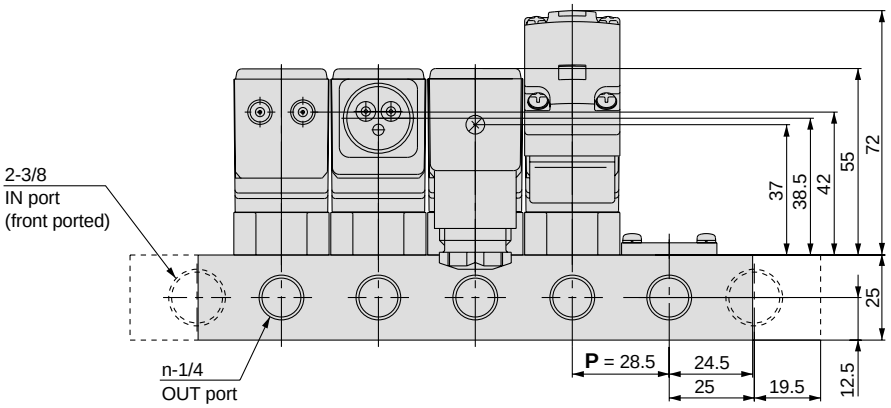
Thread type

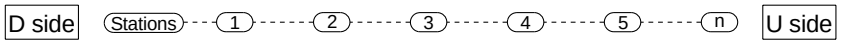
Nil	Rc
F	G
N	NPT
T	NPTF

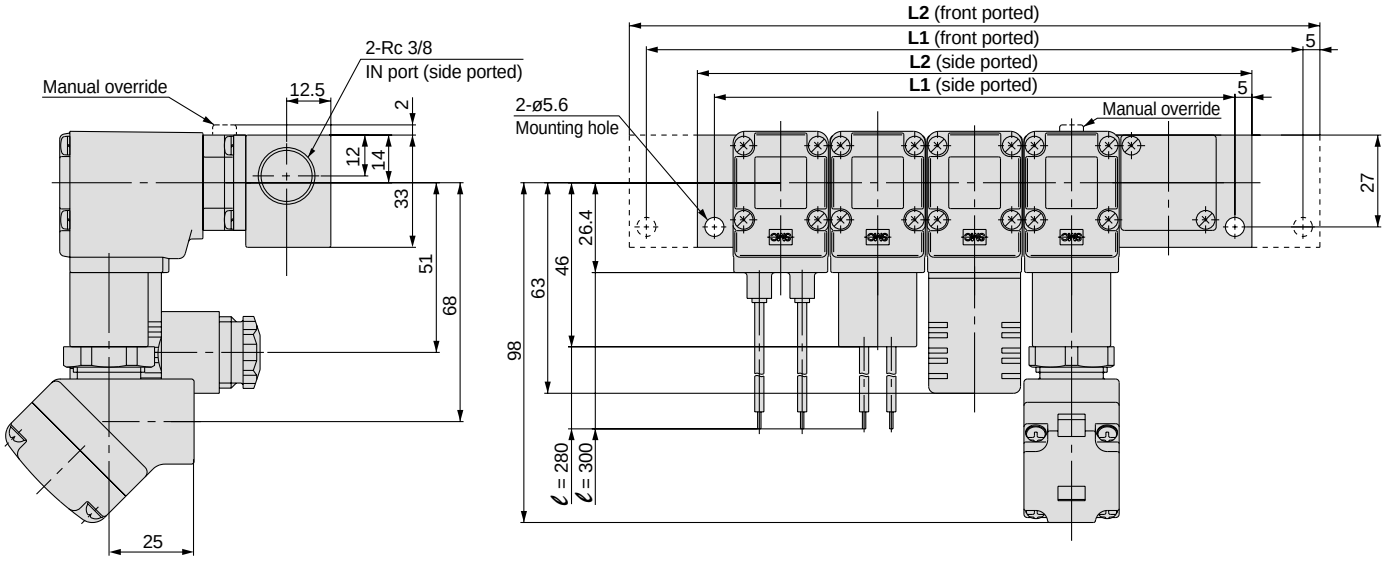
Port size (OUT)

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

Dimensions/VCA20 Manifold





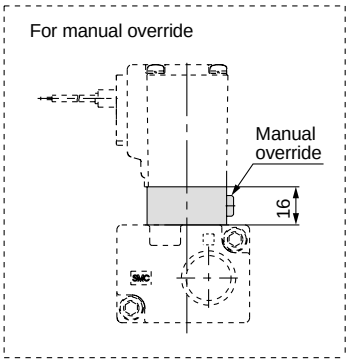


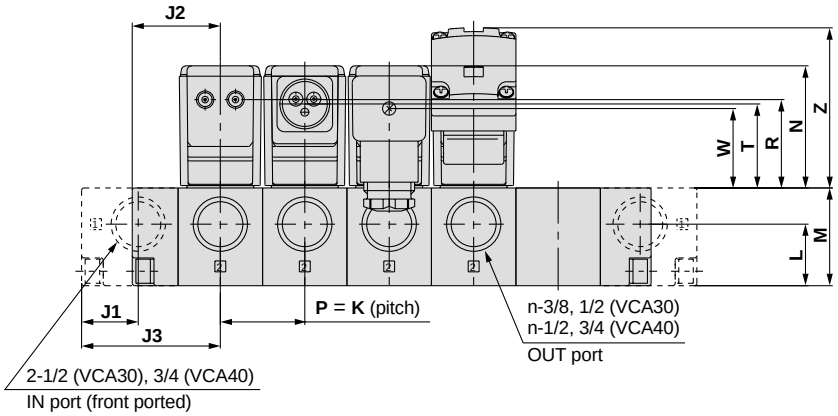
L dimensions Side ported: L1 = n x 28.5 + 10.5 L2 = n x 28.5 + 20.5
Front ported: L1 = n x 28.5 + 50.5 L2 = n x 28.5 + 60.5

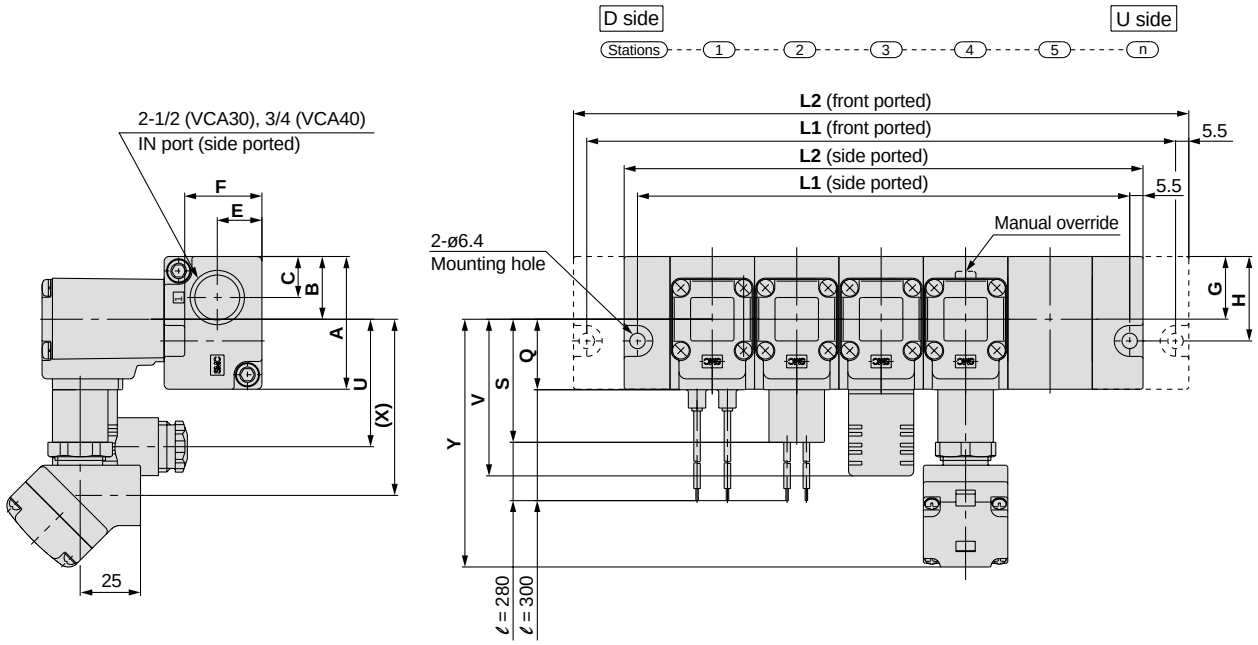
(mm)

Model	IN port direction	Dimension	n (stations)								
			2	3	4	5	6	7	8	9	10
VV2CA2	Side ported	**L1**	67.5	96	124.5	153	181.5	210	238.5	267	295.5
		L2	77.5	106	134.5	163	191.5	220	248.5	277	305.5
	Front ported	**L1**	107.5	136	164.5	193	221.5	250	278.5	307	335.5
		L2	117.5	146	174.5	203	231.5	260	288.5	317	345.5

Dimensions/VCA30/40 Manifold







VX
VN□
VQ
VDW
VC
LV
PA

L dimensions

(mm)

Model	IN port direction	Dimension	n (stations)								
			2	3	4	5	6	7	8	9	10
VV2CA3	Side ported	**L1**	103	138	173	208	243	278	313	348	383
		L2	114	149	184	219	254	289	324	359	394
	Front ported	**L1**	139	174	209	244	279	314	349	384	419
		L2	150	185	220	255	290	325	360	395	430
VV2CA4	Side ported	**L1**	117	158	199	240	281	322	363	404	445
		L2	128	169	210	251	292	333	374	415	456
	Front ported	**L1**	161	202	243	284	325	366	407	448	489
		L2	172	213	254	295	336	377	418	459	500

Formulas
VV2CA3
Side ported: L1 = n x 35 + 33, L2 = n x 35 + 44
Front ported: L1 = n x 35 + 69, L2 = n x 35 + 80
VV2CA4
Side ported: L1 = n x 41 + 35, L2 = n x 41 + 46
Front ported: L1 = n x 41 + 79, L2 = n x 41 + 90

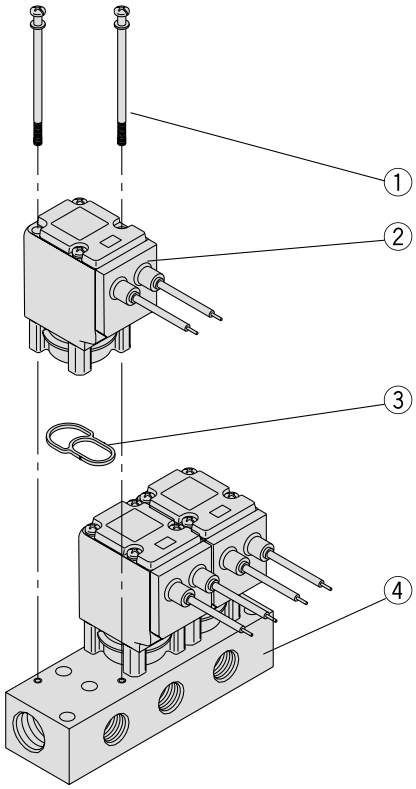
Dimensions

(mm)

Model	A	B	C	E	F	G	H	J1	J2	J3	K	L	M	N	Electrical entry									
															Grommet: **G**		Conduit: **C**		DIN connector: **D**			Conduit terminal: **T**		
															Q	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**
VV2CA3	55	26	17	19.5	33	26	35	23.5	39.5	57.5	35	26.5	41.5	50	30	36	50	32	54	66	30	71	101	65.5
VV2CA4	62	31	19	21	39.5	31	43	27	43.5	65.5	41	29	48	55	32	41	52	38	57	69	36	74	104	71

Manifold Exploded View

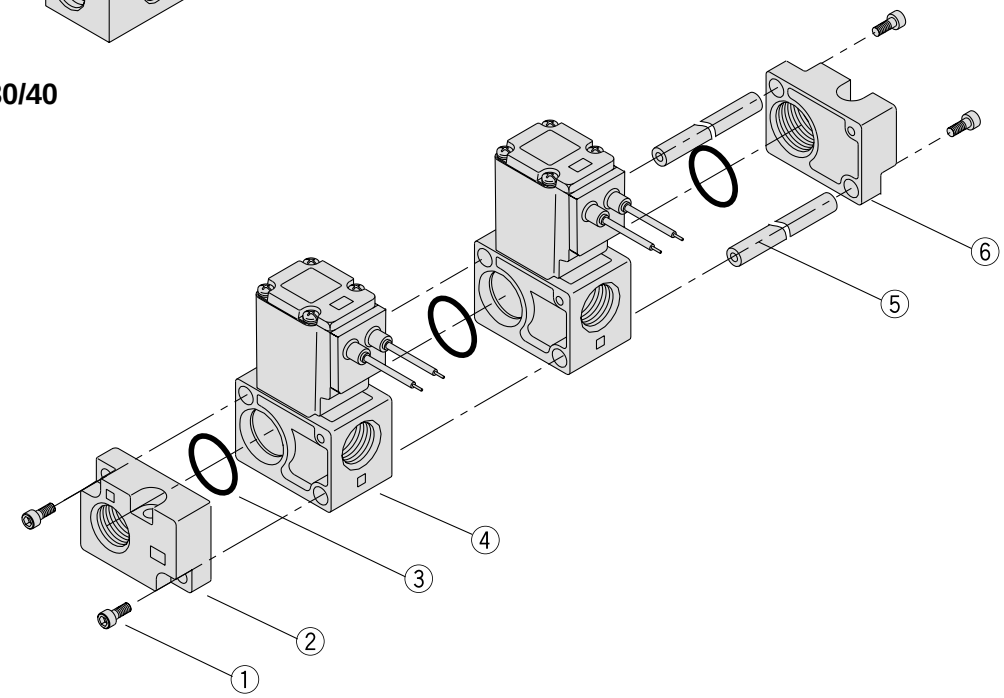
Series VCA20



No.	Part no.	Description	Material
1	**AXT632-68-2**	Mounting screw	Steel
2	**VCA23□-□□□-□-Q**	Manifold valve Note 1)	
3	**VVCA20-3-1**	Gasket	HNBR
4	**VV2CA2-□□**	Manifold base	Al

Note 1) Gasket ③ is included with manifold valve ②.

Series VCA30/40



Series VCA30

No.	Part no.	Description	Material
1	**AXT632-69-1**	Mounting screw (side ported)	Steel
	AXT632-69-2	Mounting screw (front ported)	
2	**VVCA30-3A-04-2**	End plate assembly (D side, side ported)	Al
	VVCA30-3A-04-1	End plate assembly (D side, front ported)	
3	**OR-2200-200-H**	O-ring (for VCA30)	HNBR
4	**VCA35□-□□-□-□□-Q**	Manifold valve Note 2)	
5	**VVCA30-6-n**	Tie-rod	Steel
6	**VVCA30-4A-04-2**	End plate assembly (U side, side ported)	Al
	VVCA30-4A-04-1	End plate assembly (U side, front ported)	

Note 2) O-ring ③ is included with manifold valve ④.

Series VCA40

No.	Part no.	Description	Material
1	**AXT632-69-1**	Mounting screw (side ported)	Steel
	AXT632-69-2	Mounting screw (front ported)	
2	**VVCA40-3A-06-2**	End plate assembly (D side, side ported)	Al
	VVCA40-3A-06-1	End plate assembly (D side, front ported)	
3	**OR-3200-200-H**	O-ring (for VCA40)	HNBR
4	**VCA45□-□□-□-□□-Q**	Manifold valve Note 2)	
5	**VVCA40-6-n**	Tie-rod	Steel
6	**VVCA40-4A-06-2**	End plate assembly (U side, side ported)	Al
	VVCA40-4A-06-1	End plate assembly (U side, front ported)	

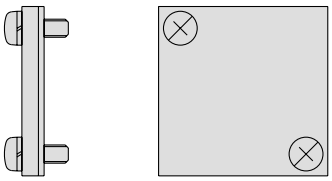
Note 2) O-ring ③ is included with manifold valve ④.

Manifold Options

Blanking plate assembly (VCA20)

VVCA20 - 4A

This is used when a blanking plate is mounted on a manifold as preparation for a planned valve installation.

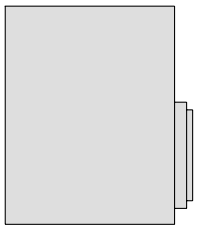


Blanking block assembly (VCA30, 40)

VVCA 3 0 - 2A - 00

3	Series VCA30
4	Series VCA40

This is used when a blanking block is mounted on a manifold as preparation for a planned valve installation.

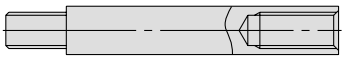


Tie-rod for additional stations (1 station, set of 2) (VCA30, 40)

VVCA 3 0 - 6 - 1A

3	Series VCA30
4	Series VCA40

Mounted on the tie-rod when adding one station.



Series VCA
2 Port Solenoid Valve for Fluid Control Precautions
Be sure to read before handling.

Wiring

⚠Caution

1. Use electrical wire with a conductor cross sectional area of 0.5 to 1.25mm² for wiring. Furthermore, do not allow excessive force to be applied to the lines.

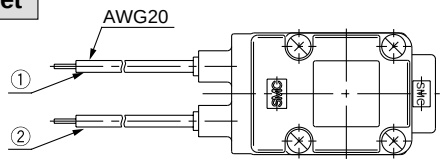
2. Use electrical circuits which do not generate chattering in their contacts.

3. Use voltage which is within ±10% of the rated voltage. In cases 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

Grommet

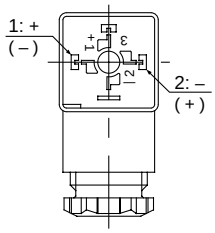


Rated voltage	Lead wire color	
	①	②
DC	Black	Red

∗ There is no polarity for DC.

DIN connector

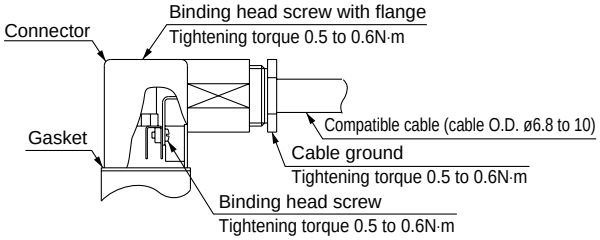
Since internal connections are as shown below for the DIN connector, make connections to the power supply accordingly.



Terminal no.	1	2
DIN terminal	+ (–)	– (+)

∗ There is no polarity.

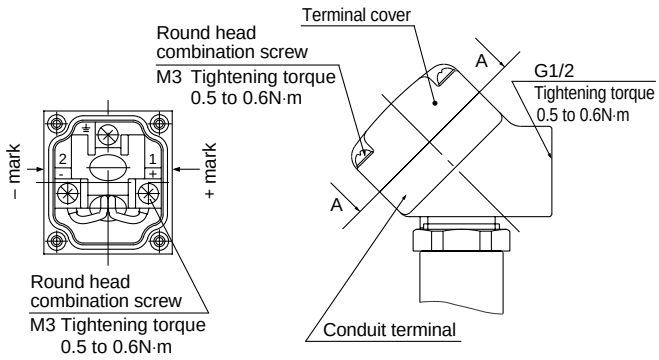
- Use compatible heavy duty cords with cable O.D. of ø6.8 to 10.
- Use the tightening torques below for each section.



Conduit terminal

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

- Use the tightening torques below for each section.
- Properly seal the terminal connection (G1/2) with the special wiring conduit, etc.

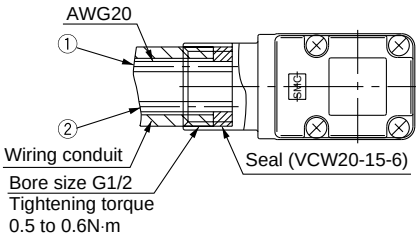


View A-A
(Internal connection diagram)

∗ There is polarity only when equipped with light.

Conduit

When used as an IP65 equivalent, use seal (part no. VCW20-15-6) to install the wiring conduit. Also, use the tightening torque below for the conduit.



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

Series VCA
2 Port Solenoid Valve for Fluid Control Precautions

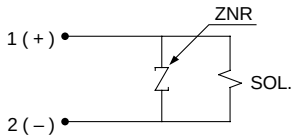
Be sure to read before handling.

Electrical Circuits

⚠Caution

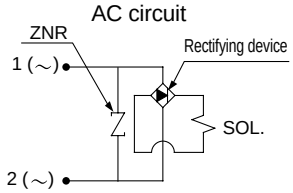
Grommet, Conduit, Conduit terminal, DIN connector

DC circuit



Without light

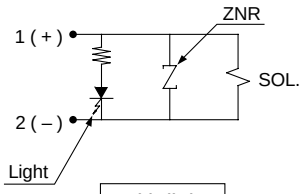
AC circuit



Without light

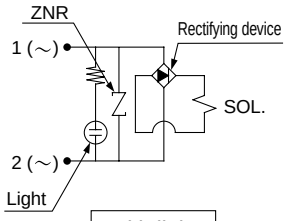
Conduit terminal

DC circuit



With light

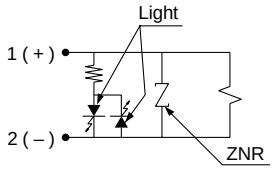
AC circuit



With light

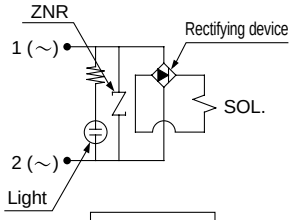
DIN connector

DC circuit



With light

AC circuit



With light

Operating Environment

⚠Warning

1. **Do not use valves in atmospheres of 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. Removing the product

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

2. Low frequency operation

Switch valves at least once every 30 days to prevent malfunction.

⚠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 air filters periodically.

2. Manual override operation

When the manual override is operated, connected equipment will be actuated. Confirm safety before operating.

Lubrication

⚠Caution

1. This solenoid valve can be operated without lubrication.

In the event that it is lubricated, use Class 1 turbine oil (without additives), ISO VG32.

Specific Product Precautions

Be sure to read before handling.

Manual Override Operation

⚠Warning

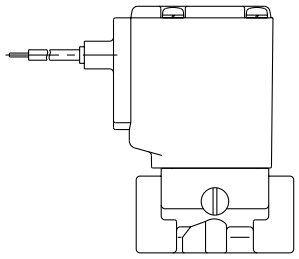
Manual operation

Slotted locking type (tool required)

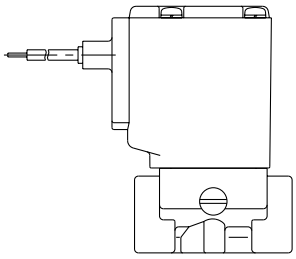
Opening the valve: With a flat head screw driver, turn 90° to the right to open the valve. The valve remains in the open condition even when the screw driver is removed.

Closing the valve: Turn 90° to the left from the open condition to close the valve.

Perform electrical operation with the valve closed.



Closed condition (vertical slot)



Open condition (horizontal slot)

Assembly and Disassembly

⚠Caution

- Before disassembling, shut down the power supply and air pressure supply, and release the residual pressure.

- Disassembly procedure

1. Remove the mounting screws on the top.
2. Remove the solenoid coil, spring, and armature assembly.
3. If foreign matter is adhering to the parts, perform an appropriate procedure, such as blowing with air or cleaning with a neutral detergent.

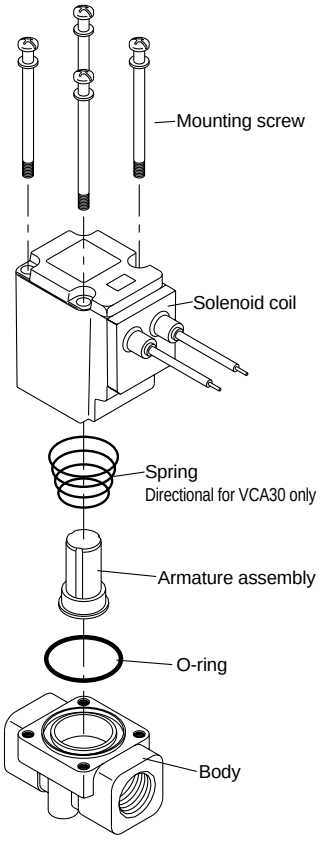
- Assembly procedure

Re-assemble by following the disassembly procedure in the reverse order.

When changing the electrical entry direction, mount it in the direction that solenoid coils will be mounted.

Note 1) For series VCA30, the end of the spring with the smaller O.D. is fitted over the armature assembly. Be sure to make this distinction when assembling.

Note 2) Tighten the four mounting screws in the diagonally crossing order, and use the proper tightening torque below.



Proper tightening torque N·m

VCA20	0.4 to 0.5
VCA30	0.6 to 0.8
VCA40	0.6 to 0.8