3 Port Solenoid Valve
Series VQ100

Outstandingly high speed, stable response, and long service life.

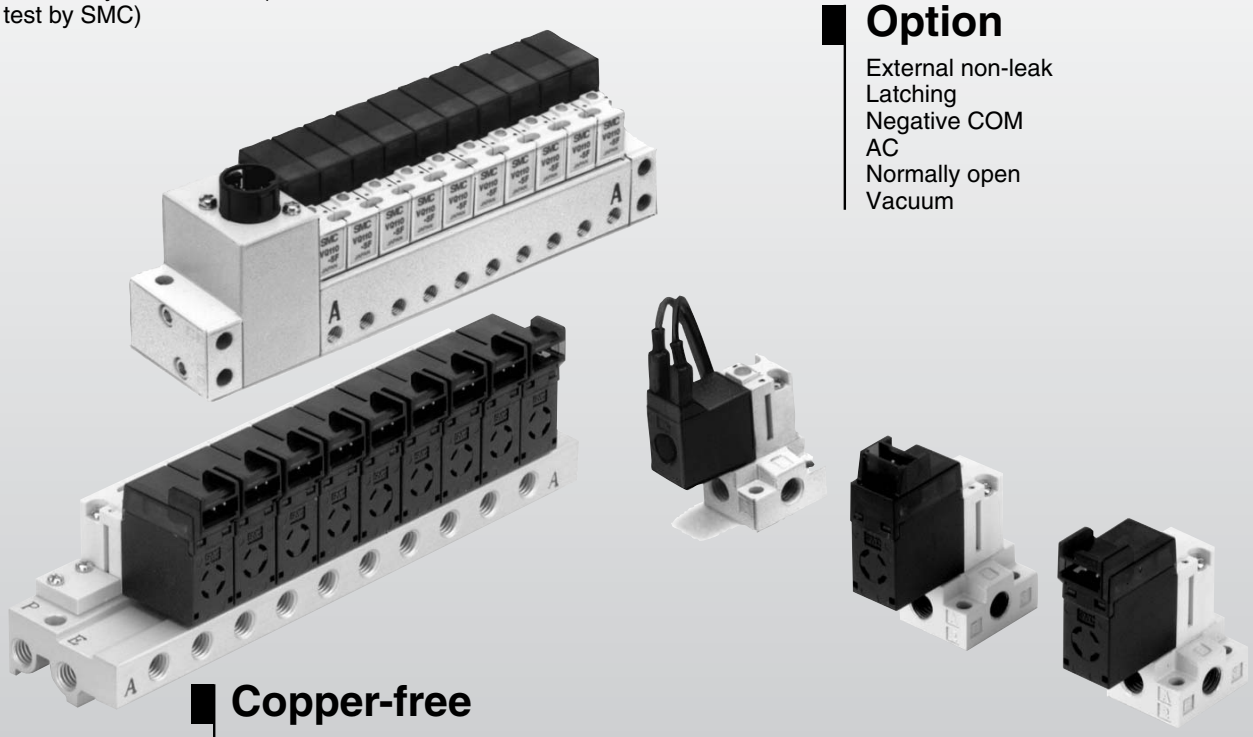
ON: 3.5 ms, OFF: 2 ms, Dispension accuracy ±1 ms (With light/surge voltage suppressor; supply pressure 0.5 MPa)
200 million cycles or more (Factors determined in a life test by SMC)

Compact yet provides a large flow capacity

Body width: 9.8 mm
C: 0.055 dm³/(s·bar)(Standard, high pressure type)
C: 0.14 dm³/(s·bar) (Large flow type)
: Option

Option

External non-leak
Latching
Negative COM
AC
Normally open
Vacuum

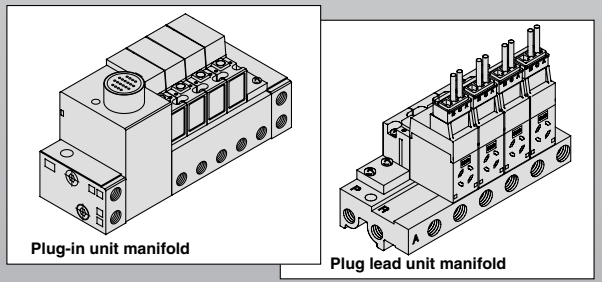


Copper-free

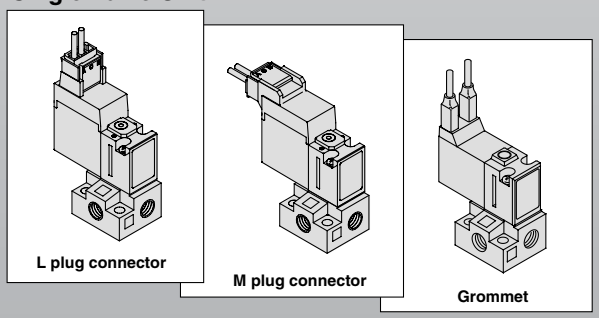
The fluid contacting section is copper-free and the standard style can be used as it is.

Wide variations of wiring

Manifold



Single Valve Unit



⚠Precautions

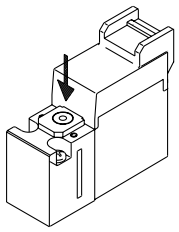
Be sure to read before handling. For Safety Instructions and Solenoid Valve Precautions, refer to page 4-18-2.

Manual Override Operation

⚠Warning

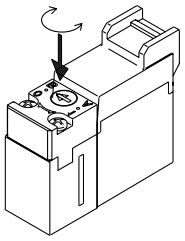
If the manual override is manipulated, since any connected equipment will be activated, make sure to be done only after no danger is confirmed.

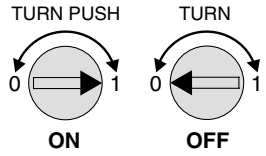
■ Non-locking push type (Tool required)



• It is turned ON by pushing the button in the direction indicated by the arrow until it hits the end and is turned OFF by releasing the button.

■ Locking type (Tool required) <Option>

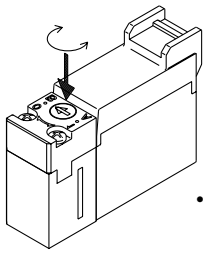


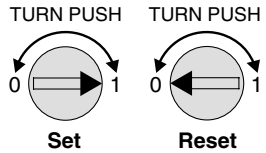


• If the manual override is turned clockwise and the ► mark is adjusted to 1, it will be locked in the ON state.
• If the manual override is turned, counterclockwise and ◄ mark is adjusted to 0, locking will be released and the manual override will return.

Note) Ensure the locking type manual override is unlocked before using.

■ Push-locking type (Tool required) <Latching type>





• If the manual override is turned clockwise and the ► mark is adjusted to 1, it will be backed to the reset condition. (Passage P → A)
• If the manual override is turned counterclockwise and the ► mark is adjusted to 0, it will be back to the reset condition. (Passage A → R) (Reset state at the time of shipment.)

⚠Caution When operating the lock with the driver, use a watchmakers' screwdriver and turn lightly.
[Torque 0.1 N·m or less]

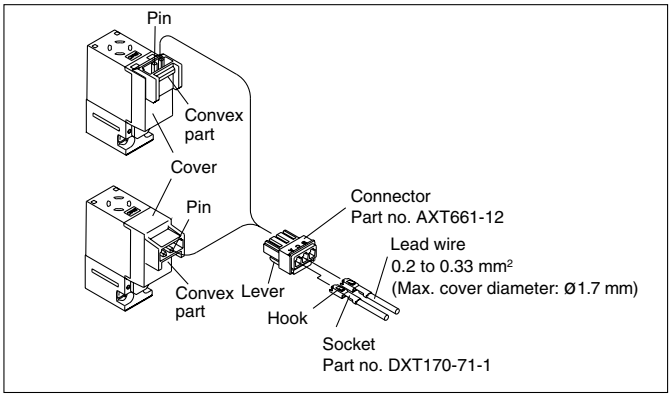
How to Use Plug Connector

⚠Caution

Attaching and detaching connectors

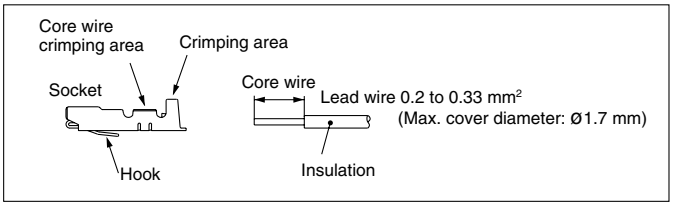
● To attach a connector, hold the lever and connector unit between your fingers and insert straight onto the pins of the solenoid valve so that the lever's pawl is pushed into the groove and locks.
● To detach a connector, remove the pawl from the groove by pushing the lever downward with your thumb, and pull the connector straight out.

Note) GENTLY pull the lead wire, otherwise it may cause contact failure or disconnection.



Crimping of lead wires and sockets

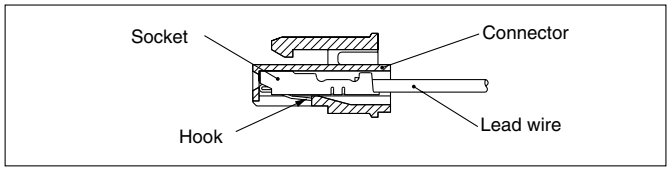
Peel 3.2 to 3.7 mm of the tip of lead wire, enter the core wires neatly into a socket and crimp it with a special crimp tool. Be careful so that the cover of lead wire does not enter into the crimping part. (Crimping tool part no.: DXT170-75-1)



Attaching and detaching lead wires with sockets

● Attaching
Insert the sockets into the square holes of the connector (with A, C, and B indication) and continue to push the sockets all the way in until the lock by hooking into the seats in the connector. (When they are pushed in, their hooks open and they are locked automatically.) Then confirm that they are locked by pulling lightly on the lead wires.

● Detaching
Pull and detach the lead wire, pressing in on the end of the hook of the socket through the side hole using a stick with thin end (about 1 mm). To reuse the socket, extend the hook outward.



⚠ Precautions

Be sure to read before handling. For Safety Instructions and Solenoid Valve Precautions, refer to page 4-18-2.

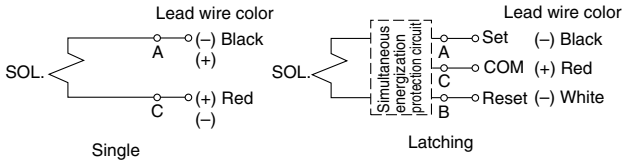
How to Use Plug Connector

⚠ Caution

Wiring specifications

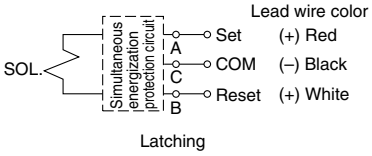
● Lead wires are connected as follows. Connect them to the power supply side.

DC positive common

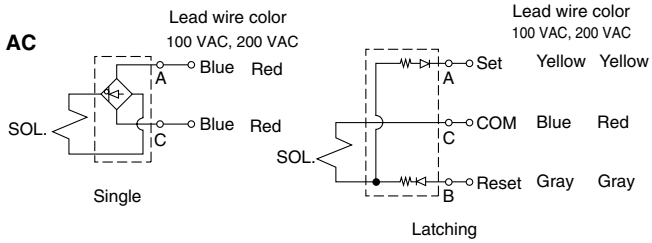


DC negative common

Note) Single type: No polarity



AC



● **How to order connector assembly**

DC positive common

• Single

AXT661-14A- □

• Latching

AXT661-13A- □

DC negative common

• Latching

AXT661-13AN- □

100 VAC

• Single

AXT661-31A- □

• Latching

AXT661-32A- □

200 VAC

• Single

AXT661-34A- □

• Latching

AXT661-35A- □

Only connector and sockets (3 pcs.) AXT661-12A

Lead wire length

Nil	300 mm
6	600 mm
10	1000 mm
20	2000 mm
30	3000 mm

● **Plug connector lead wire length**

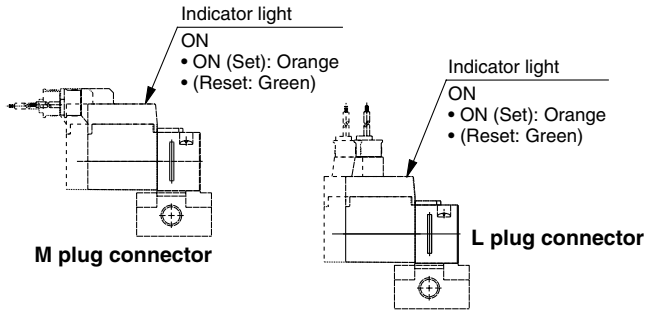
The lead wire length of the valve with lead wire is 300 mm. When ordering a valve with a lead wire of 600 mm or longer, be sure to indicate the model number of the valve without connector and connector assembly.

Light/Surge Voltage Suppressor

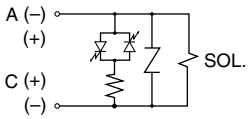
⚠ Caution

For latching type, set energizing side and reset the energizing side are indicated with orange and green respectively.

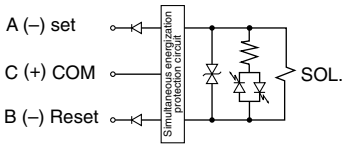
∗ ( ) and the broken line: Large flow type



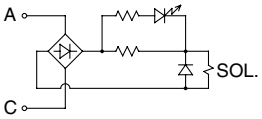
Single solenoid (DC)



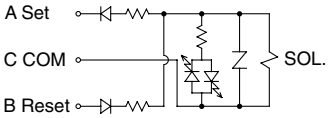
Latching solenoid (DC)



Single solenoid (AC)



Latching solenoid (AC)



Note 1) Single: No polarity
ON: Orange light lights.

Note 2) Setting side energizing: Orange light lights.
Resetting side energizing: Green light lights.
With wrong wiring preventing ability (stop diode)
With surge voltage suppresser (ZNR/Surge absorbing diode)

Note 3) A (set) side energizing: P → A
B (set) side energizing: A → R

Note 4) Negative common specifications is applicable.

Latching Type

⚠ Caution

The latching solenoid is equipped with a self-holding mechanism, which permits a movable iron core in the solenoid to hold the "set" position. Therefore there is no need to energize continuously.

<Special Cautions for Latching Solenoid>

1. Make sure ON and OFF signals are not energized simultaneously.

2. 10 ms energizing time is necessary for self-holding.

3. Please consult with SMC if using in a place with high vibrations (10 G or more) or high magnetic fields.

4. Even though this valve is held on to reset position (passage: A → R), it may switch to the set position during transportation or due to impact when mounting valves, etc. Therefore, check the initial position by means of power supply or manual override prior to use.

Latching type	Passage	Indicator light
A-C ON (Set)	P → A	Orange
B-C ON (Reset)	A → R	Green

Single	Passage	Indicator light
A-C ON	P → A	Orange
OFF	A → R	———

⚠ Precautions

Be sure to read before handling. For Safety Instructions and Solenoid Valve Precautions, refer to page 4-18-2.

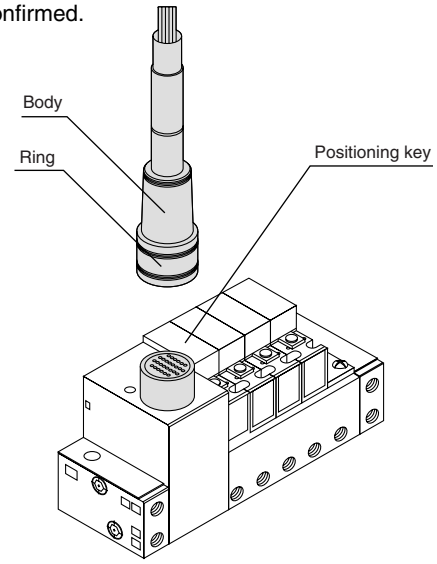
How to Use Circular Connector

(For plug-in manifold: For VV3Q11)

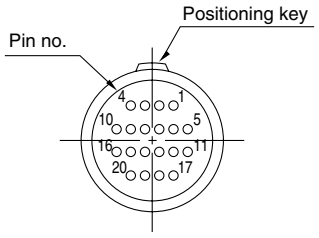
⚠ Caution

1. Attaching and detaching connectors

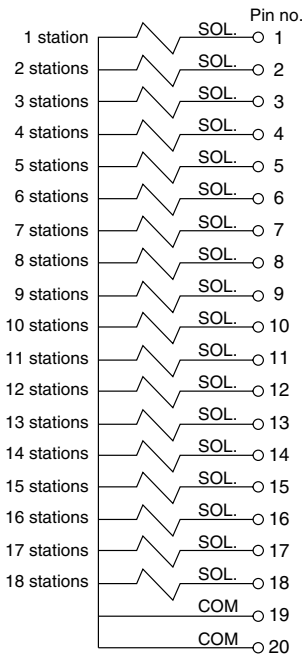
If the manual override is manipulated, since any connected equipment will be activated, make sure to be done only after no danger is confirmed.



2. Wiring specifications



Multi-connector pin arrangement



Electrical wiring specifications

Terminal No./Lead Wire Color

Terminal no.	Lead wire color	
	Lead wire color	Dot marking
1	Black	—
2	Brown	—
3	Red	—
4	Orange	—
5	Yellow	—
6	Pink	—
7	Blue	—
8	Purple	White
9	Gray	Black
10	White	Black
11	White	Red
12	Yellow	Red
13	Orange	Red
14	Yellow	Black
15	Pink	Black
16	Blue	White
17	Purple	—
18	Gray	—
19	Orange	Black
20	Red	White

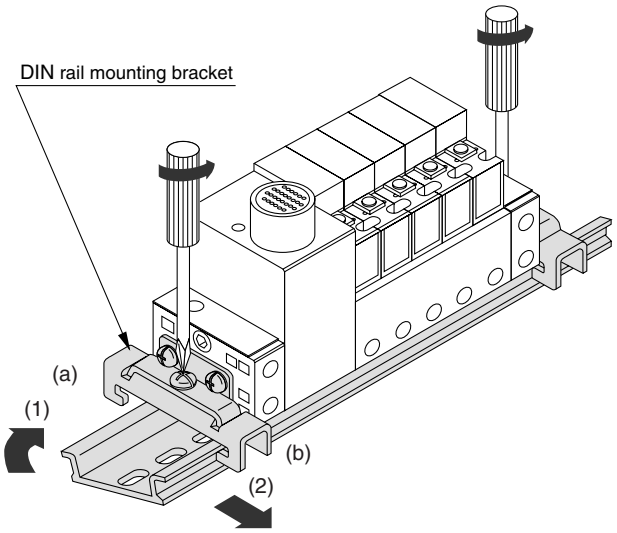
How to Connect/Disconnect DIN Rail

⚠ Caution

Removal

1. Loosen the clamp screw of the end plate on both sides.

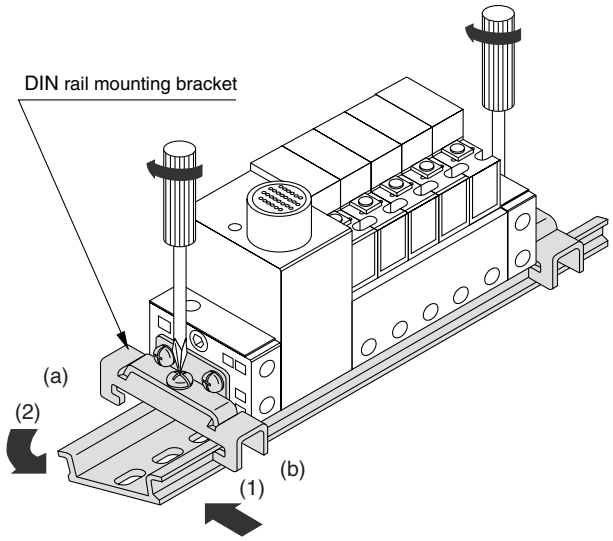
2. Lift the (a) side of the manifold off the DIN rail and slide it in the direction of the (2) side.



Mounting

1. Hook side (b) of the manifold base on the DIN rail.

2. Press down side (a) and mount the end plate on the DIN rail. Tighten the clamp screw on the side.
Proper tightening torque of thread: 0.8 to 1.2 N·m



How to Calculate the Flow Rate

For obtaining the flow rate, refer to page 4-1-6.

NRTL /C

For details about the applicable products conforming to international standards, visit us at www.smcworld.com.

3 Port Solenoid Valve
Series VQ100

How to Order Valves

VQ1 1 0 □ — 5 F □ — □

Series VQ
Compact 3 port valve

Type of actuation

1	N.C. (Normally closed)
2 Note)	N.O. (Normally open)

Note) Normally open type is available only with standard type. (1 W)

Port size

Nil	Without sub-plate
M3	With sub-plate
M5	With sub-plate

Function

Nil	Standard type (1 W)
H	High pressure type (1.5W)
Y Note)	Low wattage type (0.5 W)
L*	Latching type, Positive COM
N*	Latching type, Negative COM
U*	Large flow type

∗ Option
Note) Except latching and large flow type.

Manual override

Nil	Non-locking push type (Tool required)
	Latching type: Push-locking type (Tool required)
B*	Locking type (Tool required)

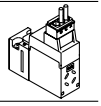
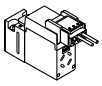
∗ Option
Note) Latching manual override: Push-locking type only.

Coil rated voltage

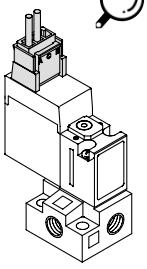
1	100 VAC (50/60 Hz)
2	200 VAC (50/60 Hz)
3	110 VAC (50/60 Hz)
4	220 VAC (50/60 Hz)
5	24 VDC
6	12 VDC
9	Other

For the special voltages, please consult with SMC.

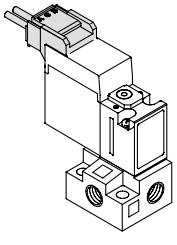
Electrical entry

F	Plug-in, With light/surge voltage suppressor (Only for plug-in manifold)	
L	L plug connector, With lead wire With light/surge voltage suppressor	
LO	L plug connector, Without connector With light/surge voltage suppressor	
M	M plug connector, With lead wire With light/surge voltage suppressor	
MO	M plug connector, Without connector With light/surge voltage suppressor	
G	Grommet	

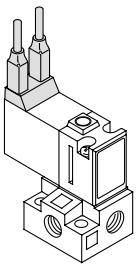
Note) Grommet: No latching type, AC and large flow



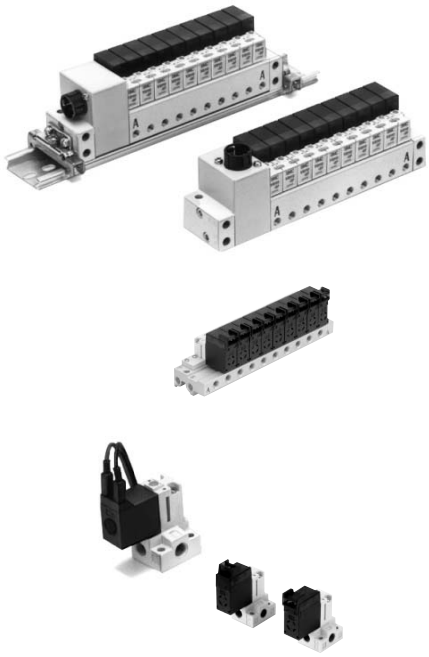
L plug connector



M plug connector



Grommet



Standard Specifications

Item				Type	Standard type (1 W)	High pressure type (1.5W)	Low wattage type (0.5 W)
Valve specifications	Valve construction				3 port direct operated poppet (NC)		
	Fluid				Air/Inert gas		
	Maximum operating pressure				0.7 MPa	0.8 MPa	0.7 MPa
	Minimum operating pressure				0 MPa (–0.1 MPa[5])		
	Flow characteristics	1 → 2		C[dm³/(s·bar)]	0.055		0.042
				b	0.22		0.27
				Cv	0.014		0.011
		2 → 3		C[dm3/(s·bar)]	0.083		0.045
				b	0.28		0.28
				Cv	0.021		0.012
	Response time [1]				ON: 3.5 ms, OFF: 2 ms		ON: 3.5 ms, OFF: 2.5 ms
	Ambient and fluid temperature				–10 to 50°C [2]		
	Lubrication				Not required		
	Manual override				Non-locking push type/Locking type (Tool required)[3]		
	Mounting orientation				Unrestricted		
	Shock/Vibration resistance [4]				150/30 m/s²		
	Enclosure				Dustproof		
	Weight				12.6 g (L/M plug connector, Without sub-plate)		
Electricity specifications	Coil rated voltage			DC	24 V, 12 V		
	Allowable voltage fluctuation				±10% of rated voltage		
	Coil insulation type				Class B or equivalent		
	Power consumption (Current)			DC	1 W (42 mA)	1.5 W (63 mA)	0.5 W (21 mA)
	Electrical entry				Grommet Plug-in, L plug connector, M plug connector (With light/surge voltage suppressor)		

Note 1) Based on JIS B 8374-1993. With light/surge voltage suppressor (Use clean air), Dispersion accuracy ±1 ms

Note 2) Use dry air to prevent condensation when operating at low temperatures.

Note 3) Locking style: Option

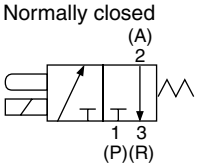
Note 4) Impact resistance: No malfunction occurred when it is tested with a drop tester in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states every once for each condition. (Values at the initial period)

Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Test was performed at both energized and de-energized states in the axial direction and at the right angles to the main valve and armature. (Values at the initial period)

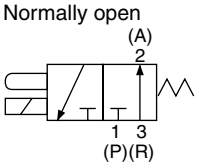
Note 5) In vaccum applications, use 10- Clean Series which can use with 3 (R) port vacuum and 1 (P) port vaccum release pressure. (Differential pressure between 3 (P) and 1 (P) is up to the maximum operating pressure for each type.)

JIS Symbol

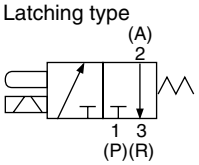
Normally closed



Normally open



Latching type



Clean Series

Clean series is available for both standard and option specifications.

How to order manifold

10-VQ110□-□

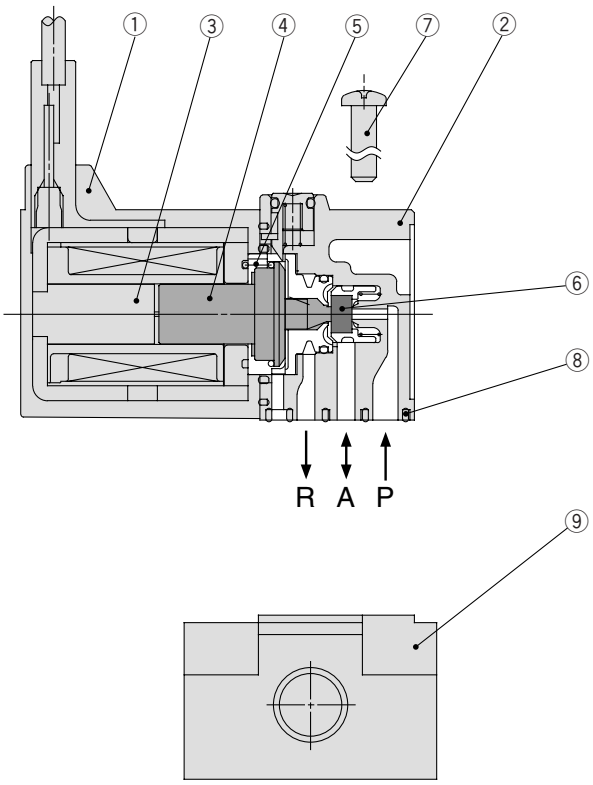
Clean Series

Option

Item			Type	Latching type	AC type	Large flow type	Normally open type
Valve specifications	Model			**VQ110L-□**	**VQ110-$\frac{1}{2}$□**	**VQ110U-□**	**VQ120-□**
	Maximum operating pressure			0.7 MPa		0.6 MPa	0.5 MPa
	Ambient and fluid temperature			0 MPa(—100 MPa[4][5])			
	Flow characteristics	$1 \rightarrow 2$ $(3 \rightarrow 2)$ [6]	C[$dm^3/(s \cdot bar)$]	0.042		0.14	0.04
			b	0.27		0.26	0.11
			Cv	0.011		0.036	0.009
		$2 \rightarrow 3$ $(2 \rightarrow 1)$ [6]	C[dm3/(s·bar)]	0.045		0.14	0.044
			b	0.28		0.25	0.3
			Cv	0.012		0.036	0.011
	Response time [2]			5 ms or less	15 ms or less	5 ms or less	5 ms or less
Electricity specifications	Power consumption (Current)		24 VDC	1 W (42 mA)	—	0.7 W (29 mA) [3]	1 W (42 mA)
			12 VDC	1 W (83 mA)	—	0.7 W (58 mA) [3]	1 W (83 mA)
			100 VAC	0.6 VA (6 mA)	0.5 VA (5 mA)	—	
			110 VAC	0.65 VA (5.9 mA)	0.55 VA (5 mA)	—	
			200 VAC	1.2 VA (6 mA)	1.0 VA (5 mA)	—	
			220 VAC	1.3 VA (5.9 mA)	1.1 VA (5 mA)	—	
	Electrical entry [1]			Plug-in, L plug connector, M plug connector (With light/surge voltage suppressor)			

Note 1) Grommet is available only for normally open type (without light/surge voltage suppressor). Normally open type is available only with 1 W DC specifications.
Note 2) With light/surge voltage suppressor based on JIS B 8374-1993 (clean air).
Note 3) Inrush: 3.1 W (10 ms after energized.), Holding: 0.7 W
Note 4) In vacuum applications, use 10- Clean Series which can use with 3 (R) port vacuum and 1 (P) port vacuum release pressure. (Differential pressure between 3 (P) and 1 (P) is up to the maximum operating pressure for each type.)
Note 5) In the case of 1 (P) port vacuum, and 3 (R) port vacuum release, use VQ120 (Normally open type). In this case, 10- is not required.
Note 6) ( ) values insides denote the air passage for normally open type.

Construction



(For N.C. valve)

Component Parts

No.	Description	Material
①	Solenoid coil	—
②	Body	Resin
③	Fixed iron core	Stainless steel
④	Movable iron core assembly	Stainless steel, Resin
⑤	Return spring	Stainless steel
⑥	Poppet	NBR
⑦	Round head combination screw	Carbon steel
⑧	Interface gasket	NBR

Replacement Parts

No.	Description	Material	Part no.
⑨	Sub-plate	ZDC	AXT662-1-$\frac{1}{2}$ (1: M5, 2: M3)

Optional parts

• Gasket, screw: VQ100-GS-5

Note) 1 set includes: 1 gasket and 2 screws.
Purchasing order is available in units of 10 pieces.

How to Order Valves

VQ1 1 0 □ — 5 L □ — M5

Series VQ
Compact 3 port valve

Type of actuation

1	N.C. (Normally closed)
2 Note)	N.O. (Normally open)

Note) Normally open type is available only with standard type. (1 W)

Function

Nil	Standard type (1 W)
H	High pressure type (1.5W)
Y Note)	Low wattage type (0.5 W)
L *	Latching type, Positive COM
N *	Latching type, Negative COM
U *	Large flow type

* Option
Note) Except latching and large flow type.

Coil rated voltage

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

For the special voltages, please consult with SMC.

Electrical entry

L	L plug connector, With lead wire With light/surge voltage suppressor
LO	L plug connector, Without connector With light/surge voltage suppressor
M	M plug connector, With lead wire With light/surge voltage suppressor
MO	M plug connector, Without connector, With light/surge voltage suppressor
G	Grommet

Note) Grommet: No latching type, AC and large flow

Manual override

Nil	Non-locking push type (Tool required)
	Latching type: Push-locking type (Tool required)
B*	Locking type (Tool required)

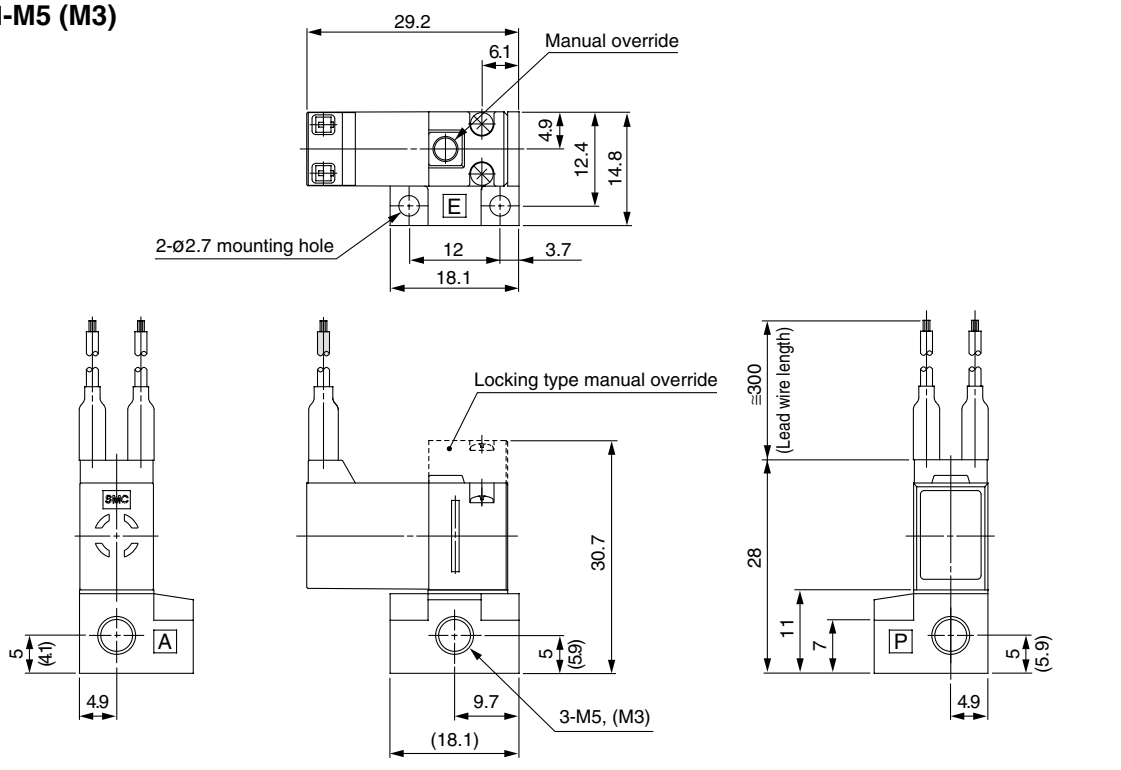
* Option
Note) Latching manual override: Push-locking type only.

Port size

Nil	Without sub-plate
M3	With sub-plate
M5	With sub-plate

Dimensions

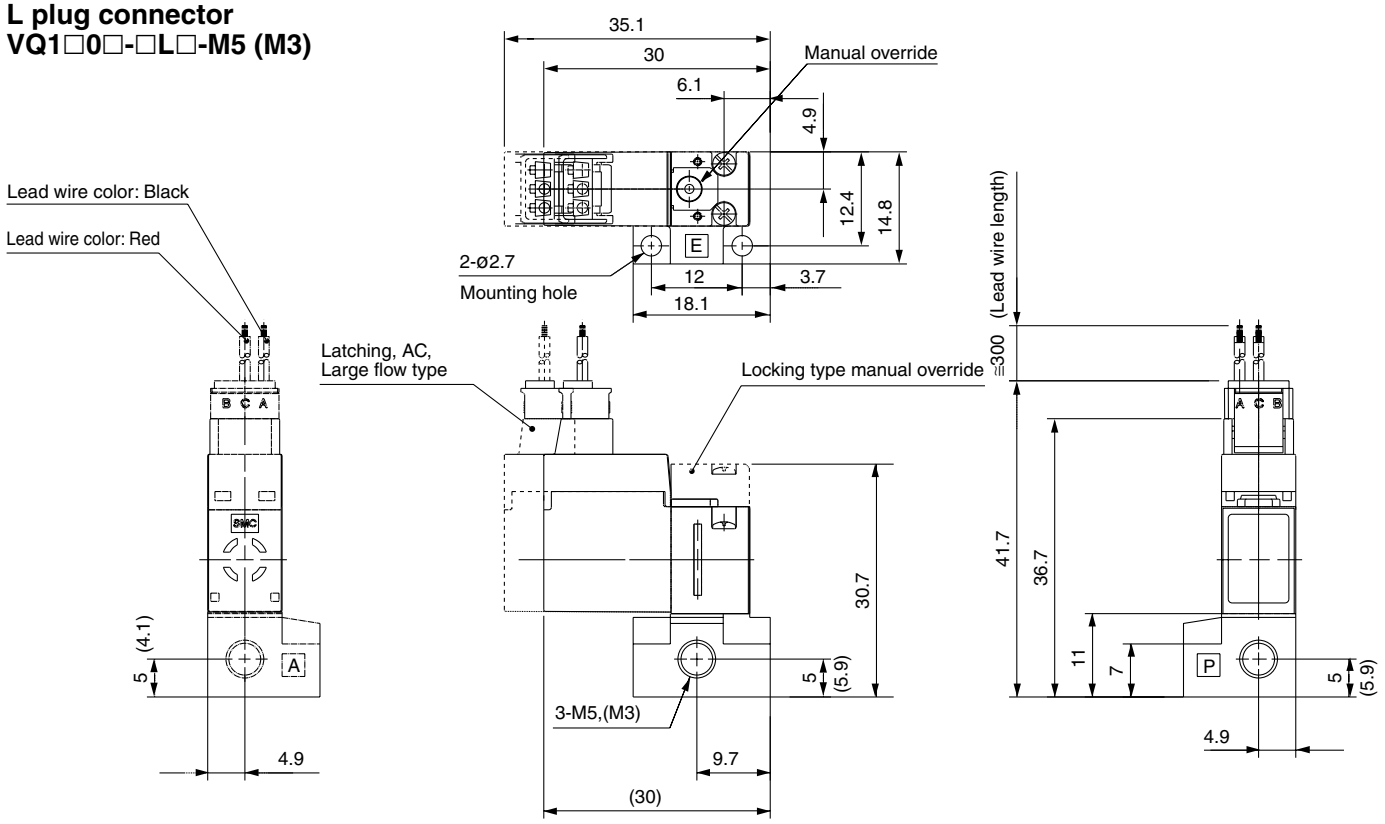
Grommet
VQ1□0□-□G□-M5 (M3)



• ( ): M3
• Broken line: Locking type manual override

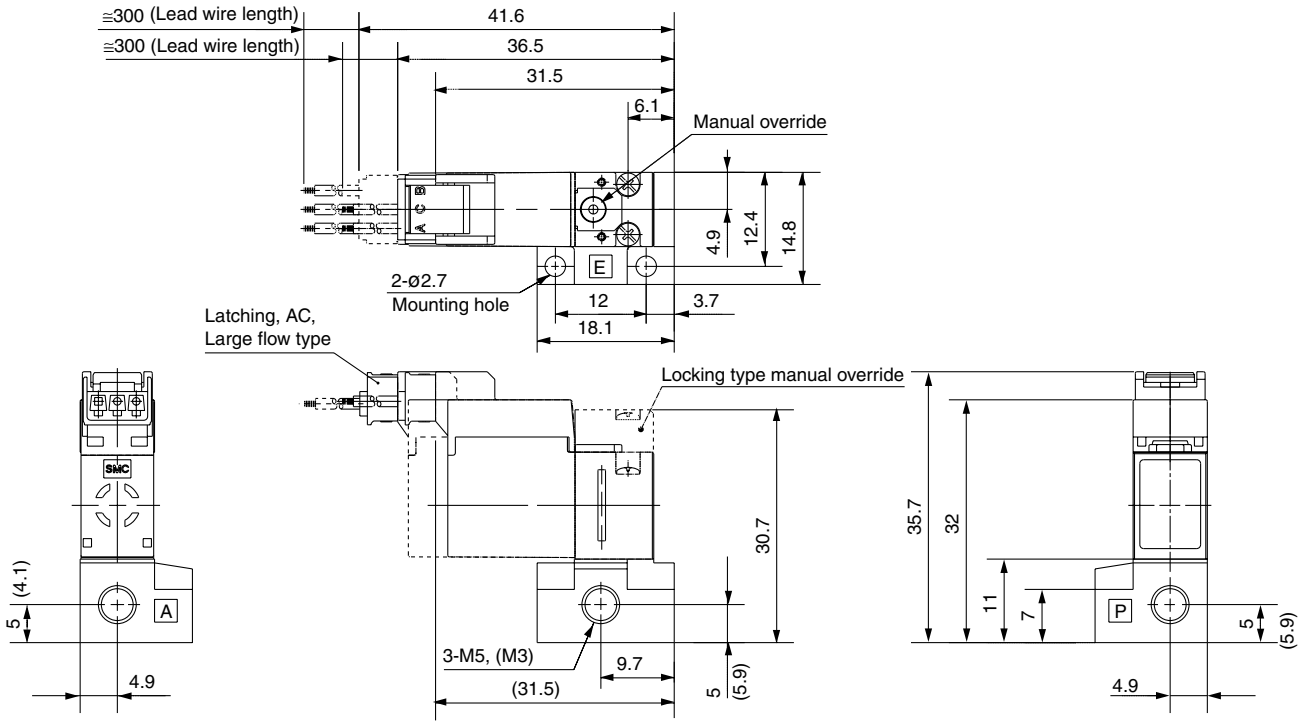
Dimensions

L plug connector
VQ1□0□-□L□-M5 (M3)



• ( ): M3
• Broken line: Latching, AC and large flow capacity
• One dot chain line: Locking type manual override and push-locking type manual override (latching)

M plug connector
VQ1□0□-□M□-M5 (M3)



• ( ): M3
• Broken line: Latching, AC and large flow capacity
• One dot chain line: Locking type manual override and push-locking type manual override (latching)

How to Order Manifold

Plug-in unit manifold

VV3Q 1 1 — 08 C U 1 — D

Applicable solenoid valve (Plug-in type)
VQ1□0□-□F

- For mounting latching type, please consult with SMC.
- Possible to mount Type U (Large flow type).

Series

1	VQ100

Manifold base model no.

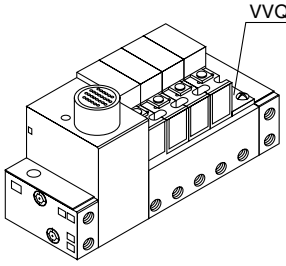
1	Plug-in unit

Note) Normally closed and normally open style cannot be mounted on the same manifold.

Stations

02	2 stations
⋮	⋮
18	18 stations

VVQ100-10A-1



Electrical entry

C	Multi-connector

Lead wire entry direction

U	Top entry
S	Side entry

Cable length

0	Without cable
1	With cable (1.5 m)
2	With cable (3 m)
3	With cable (5 m)

Option

Nil	None
D	DIN rail mounted (With standard length of DIN rail)
DO Note)	DIN rail mounting style (Without DIN rail)

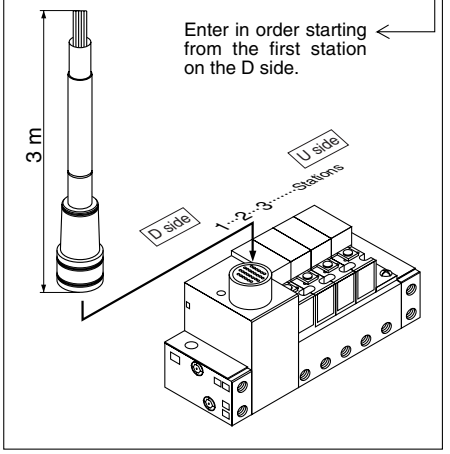
Note) Order DIN rail separately.
For DIN rail model number, refer to page 4-12-12.

How to Order Manifold Assembly

Specify the part numbers for valves and options together beneath the manifold base part number.

<Example>
Plug-in unit manifold with cable (3 m)
VV3Q11-05CU2···1 set — Manifold base part no.
∗VQ110-5F·····4 set — Valve part no. (1st to 4th stations)
∗VVQ100-10A-1···1 set — Blanking plate part no. (5th stations)
∗ Prefix the asterisk to the part nos. of the solenoid valve, etc.

Enter in order starting from the first station on the D side.



How to Order Valves

VQ1 1 0 □ — 5 F □

Series VQ
Compact 3 port valve

Type of actuation

1	Normally closed
2 Note)	Normally open

Note) Normally open type is available only with standard type. (1 W)

Function

Nil	Standard type (1 W)
H	High pressure type (1.5W)
Y Note)	Low wattage type (0.5 W)
U ∗	Large flow type

∗ Option
Note) Except large flow type.

Coil rated voltage

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

For the special voltages, please consult with SMC.

Electrical entry

F	Plug-in With light/surge voltage suppressor (Only for plug-in manifold)

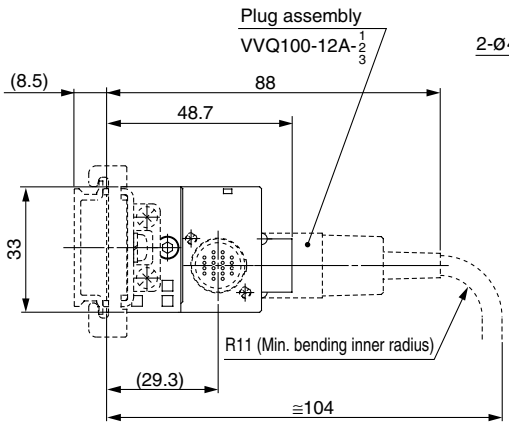
Manual override

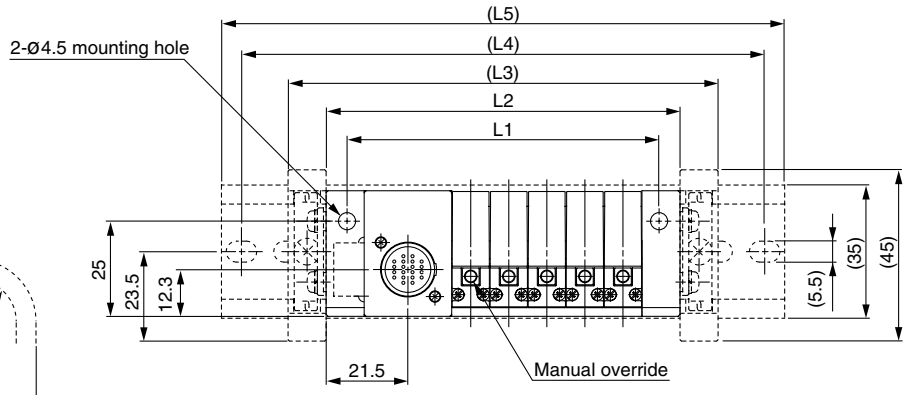
Nil	Non-locking push type (Tool required)
B∗	Locking type (Tool required)

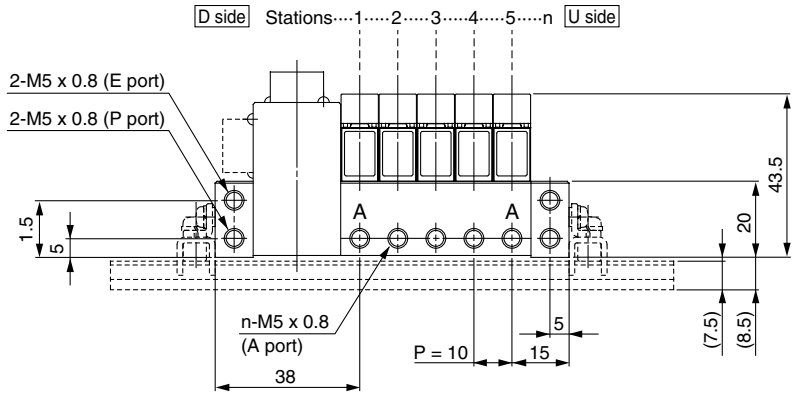
∗ Option

Plug-in Unit (VV3Q11) Manifold with Multi-connector

The broken line indicates DIN rail mounting style (-D) and side entry connection (S).







Dimensions

Formula: L1 = 10n + 32 L2 = 10n + 43 n: Stations (Maximum 18 stations)

L \ n	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
L1	52	62	72	82	92	102	112	122	132	142	152	162	172	182	192	202	212
L2	63	73	83	93	103	113	123	133	143	153	163	173	183	193	203	213	223
(L3)	83	93	103	113	123	133	143	153	163	173	183	193	203	213	223	233	243
(L4)	112.5	112.5	125	137.5	150	162.5	162.5	175	187.5	200	212.5	212.5	225	237.5	250	262.5	262.5
(L5)	123	123	135.5	148	160.5	173	173	185.5	198	210.5	223	223	235.5	248	260.5	273	273

How to Order Manifold

Plug lead unit manifold

VV3Q1 2 — 08 01N

Applicable solenoid valve (Plug lead type)
VQ1□0□-□L
VQ1□0□-□M
VQ1□0□-□G

Series

1	VQ100

Manifold base model no.

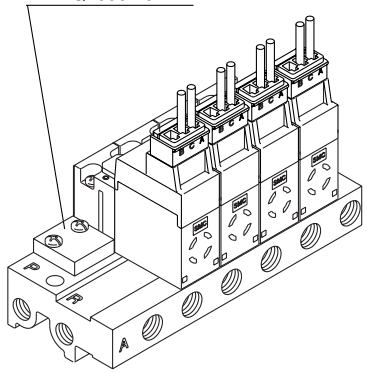
2	Plug lead unit
2U	Plug lead unit Type U (large flow type) mounting base

Note) Normally closed and normally open type cannot be mounted on the same manifold.

Stations

02	2 stations
⋮	⋮
20	20 stations

VVQ1000-10A-2



Port size* and thread

Nil	M5, Rc 1/8
01N	NPT 1/8
01T	NPTF 1/8
01F	PF 1/8

* Only thread port size 1/8 type, (Type 2U, P/E port) has choice of thread.

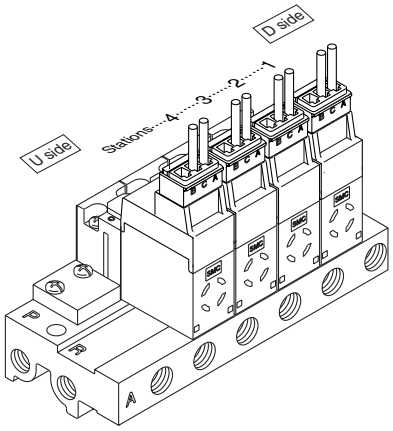
How to Order Manifold Assembly

Specify the part numbers for valves and options together beneath the manifold base part number.

<Example>
Plug-in unit manifold
VV3Q12-05·····1 set — Manifold base part no.
*VQ110-5L····· 4 set — Valve part no. (1st to 4th stations)
*VVQ100-10A-2····· 1 set — Blanking plate part no. (5th stations)

→ * Prefix the asterisk to the part nos. of the solenoid valve, etc.

Enter in order starting from the first station on the D side.



How to Order Valves

VQ1 1 0 — 5 L

Series VQ
Compact 3 port valve

Type of actuation

1	N.C. (Normally closed)
2 Note)	N.O. (Normally open)

Note) Normally open type is available only with standard type. (1 W)

Function

Nil	Standard type (1 W)
H	High pressure type (1.5W)
Y Note)	Low wattage type (0.5 W)
L*	Latching type, Positive COM
N*	Latching type, Negative COM
U*	Large flow type

* Option
Note) Except latching and large flow type.

Coil rated voltage

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

For the special voltages, please consult with SMC.

Electrical entry

L	L plug connector, With lead wire With light/surge voltage suppressor
LO	L plug connector, Without connector With light/surge voltage suppressor
M	M plug connector, With lead wire With light/surge voltage suppressor
MO	M plug connector, Without connector, With light/surge voltage suppressor
G	Grommet

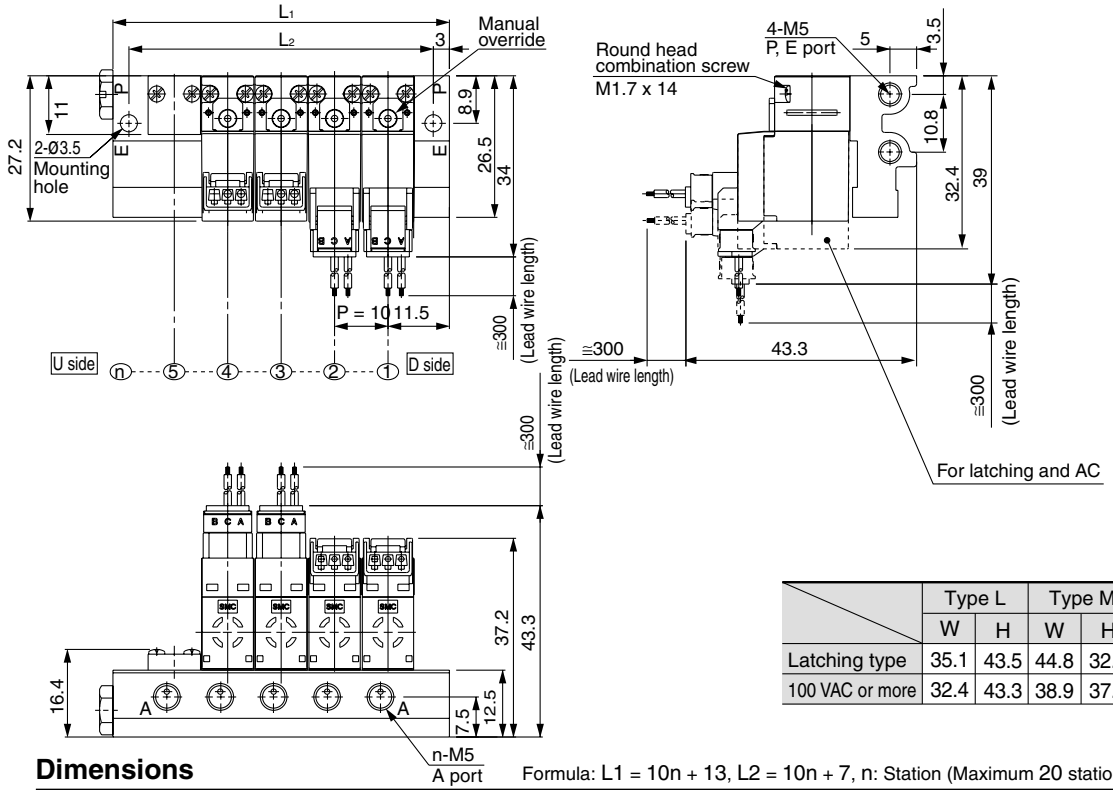
Note) Grommet: No latching type, AC and large flow

Manual override

Nil	Non-locking push type (Tool required)
B*	Latching type: Push-locking type (Tool required)
	Locking type (Tool required)

* Option
Note) Latching manual override: push-locking type only.

Plug Lead Unit Manifold (VV3Q12)



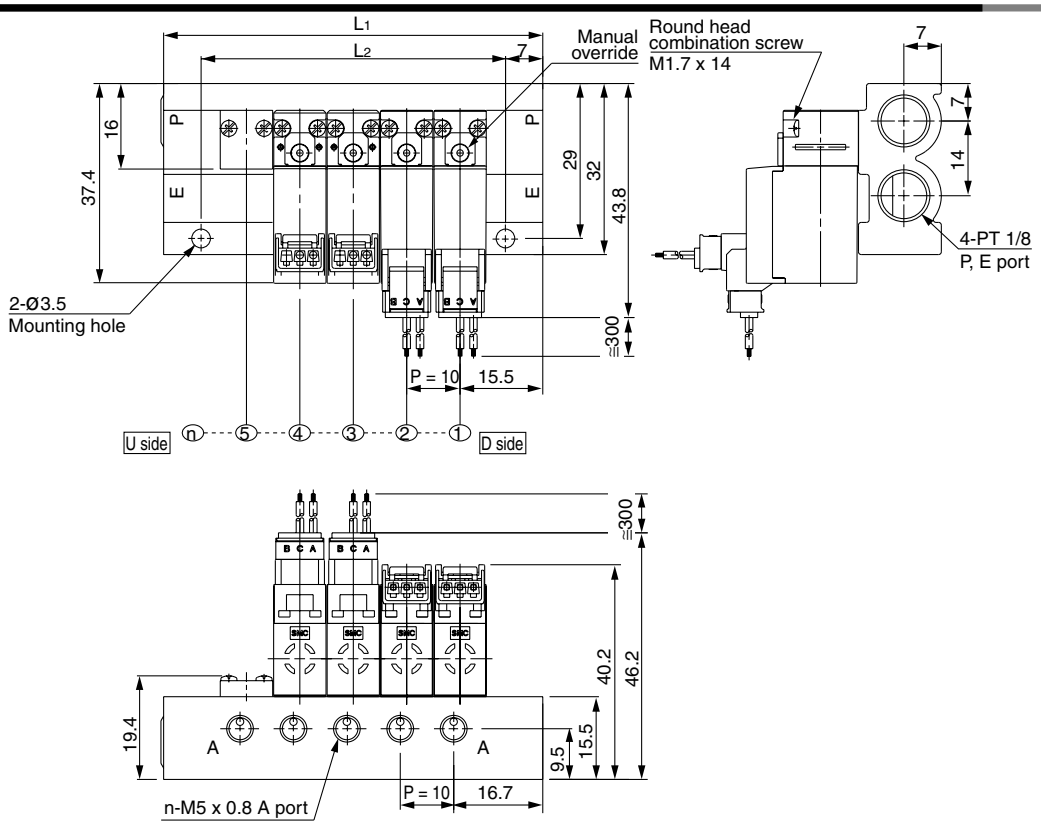
	Type L		Type M	
	W	H	W	H
Latching type	35.1	43.5	44.8	32.2
100 VAC or more	32.4	43.3	38.9	37.2

Dimensions

Formula: L1 = 10n + 13, L2 = 10n + 7, n: Station (Maximum 20 stations)

L \ n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L1	23	33	43	53	63	73	83	93	103	113	123	133	143	153	163	173	183	193	203	213
L2	17	27	37	47	57	67	77	87	97	107	117	127	137	147	157	167	177	187	197	207

Plug Lead Unit, Type U (Large Flow Type) Mounted Manifold (VV3Q12U)



Dimensions

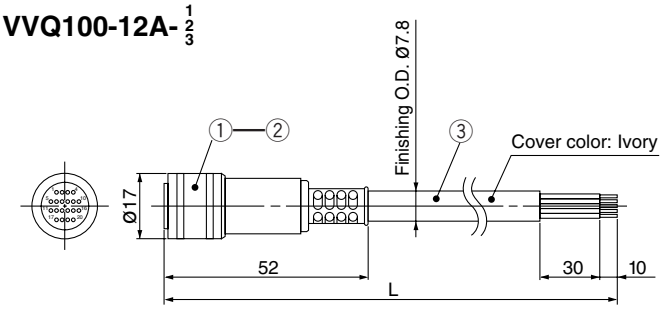
Formula: L1 = 10n + 21, L2 = 10n + 7, n: Station (Max. 20 stations)

L \ n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L1	31	41	51	61	71	81	91	101	111	121	131	141	151	161	171	181	191	201	211	221
L2	17	27	37	47	57	67	77	87	97	107	117	127	137	147	157	167	177	187	197	207

Manifold Option

Plug Assembly

VVQ100-12A- 1 2 3



①	Plug	RP13A-12PS-20SC <Made by Hirose Electric Co., Ltd.>
②	Female contact	RP19-SC-222 <Made by Hirose Electric Co., Ltd.>
③	Vinyl multi-core Cable	VVRF 0.2 mm² 20 core

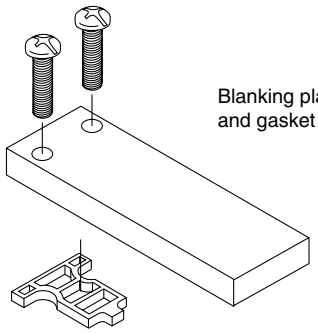
Cable Length

Part no.	L dimension
VVQ100-12A-1	1.5 m
VVQ100-12A-2	3 m
VVQ100-12A-3	5 m

Blanking Plate Assembly

VVQ100-10A-1

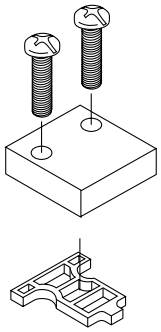
Plug-in unit (**VV3Q11**) for manifold with multiple connectors



Blanking plate with 2 screws and gasket

VVQ100-10A-2

Plug lead unit (**VV3Q12**) for manifold



Blanking plate with 2 screws and gasket

VV3Q11 for Manifold with Multi-connector

<D side end plate assembly>

D side end plate assembly part no.

VVQ100-3A-□

Option

1	Standard type
2	DIN rail mounting

<U side end plate assembly>

U side end plate assembly part no.

VVQ100-2A-□

Option

1	Standard type
2	DIN rail mounting

<DIN rail mounting bracket assembly>

DIN rail mounting bracket assembly part no.

AXT802-1A-□

Mounting direction

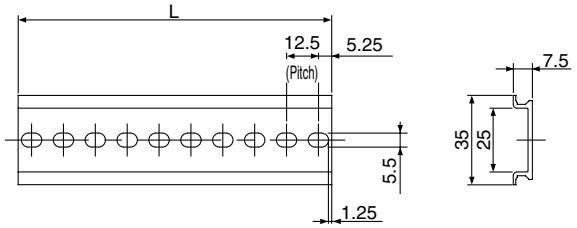
D	D side mounting
U	U side mounting

Note) The number of manifold stations cannot be changed.

How to Order Only DIN Rail

DIN rail part no.: AXT100-DR-□

∗ Refer to DIN rail dimension table below and put number into □ to order DIN rail.
Refer to the manifold dimensions on page 4-12-13 to determine L dimension.



L Dimension

L = 12.5n + 10.5

No.	1	2	3	4	5	6	7	8	9	10
L dimension	23	35.5	48	60.5	73	85.5	98	110.5	123	135.5
No.	11	12	13	14	15	16	17	18	19	20
L dimension	148	160.5	173	185.5	198	210.5	223	235.5	248	260.5
No.	21	22	23	24	25	26	27	28	29	30
L dimension	273	285.5	298	310.5	323	335.5	348	360.5	373	385.5
No.	31	32	33	34	35	36	37	38	39	40
L dimension	398	410.5	423	435.5	448	460.5	473	485.5	498	510.5