4 Port Solenoid Valve

Series VQD1000

Rubber Seal **Direct Operated Poppet Type**

Unprecedented high speed, with stable response times

ON: 4 ms, OFF: 2 ms, Dispersion accuracy
±1 ms (With light/surge voltage suppressor
at a supply pressure of 0.5 MPa)
(Use clean and dry air.)

Compact and lightweight (34 g) with large flow capacity

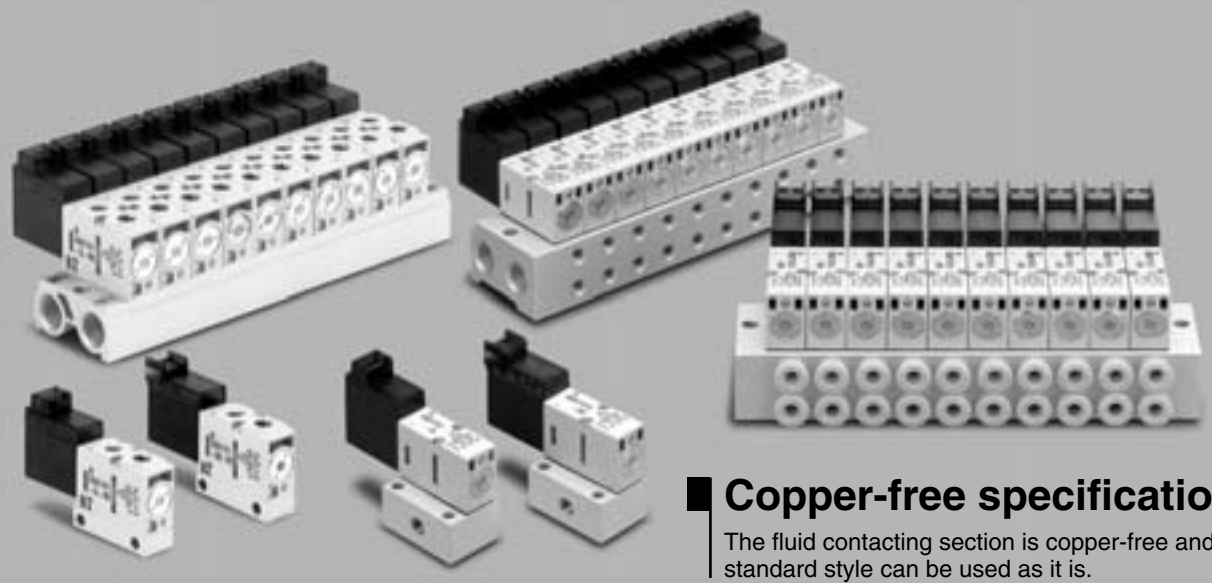
Body width of 10 mm, C: 0.22 dm³/(s·bar) 2 W
C: 0.27 dm³/(s·bar)
3.2 W (U type: Large flow)

Available in vacuum applications (Up to –101.2 kPa)

(Valve leakage: 0.03 cm³/s He or less)
Can be used in vacuum/release circuits
When used as a 3 port valve, conversion from N.O. to N.C. and vice versa is possible by plugging either port 4(A) or 2(B).

Clean room specifications available as special.

Since the main valve has no sliding seals, non-oil treatment specification at the fluid contacting section is available (Made-to-Order part no. X16). The external non-leak specification is also available (Series 10-).



Body ported Base mounted

Copper-free specifications

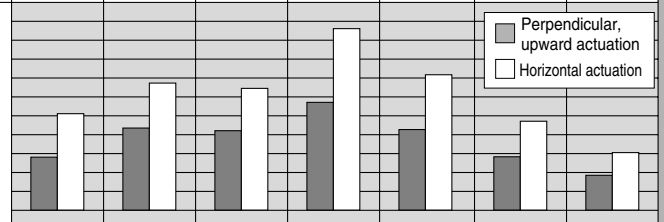
The fluid contacting section is copper-free and the standard style can be used as it is.

Cylinder Speed Chart

Base Mounted

Use as a guide for selection.
Please confirm the actual conditions with SMC Sizing Program.

Series	Average speed (mm/s)	Bore size						
		Series CJ2 Pressure 0.5 MPa Load factor 50% Stroke 60 mm			Series CM2 Pressure: 0.5 MPa Load ratio: 50% Stroke: 300 mm			
		ø6	ø10	ø16	ø20	ø25	ø32	ø40
VQD1151U	500							
	450							
	400							
	350							
	300							
	250							
	200							
	150							
	100							
	50							
	0							



Conditions

Base mounted		Series CJ2	Series CM2
VQD1151U	Tube bore x Length	TU0425 x 1m	
	Speed controller	AS1201F-M5-04	AS2201F-02-04
	Silencer	AN120-M5	

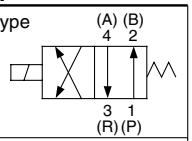
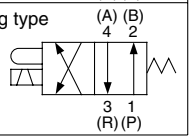
* It is when the cylinder is extending that is meter-out controlled by speed controller which is directly connected with cylinder, and its needle valve with being fully open.
* The average velocity of the cylinder is what the stroke is divided by the total stroke time.
* Load factor: ((Load weight x 9.8)/Theoretical force) x 100%

4 Port Solenoid Valve
Direct Operated Poppet Type
Series VQD1000

How to Order Valves

VQD1 [1] [5] 1 [ ] – [5] [L] – [ ] – [ ]

Type of actuation

1	Single type	
2	Latching type	

Body type

2	Body ported (Single unit)
3	Body ported (Manifold)
5	Base mounted

Note) Latching type: Base mounted type only.

Valve option

Nil	Standard
V	Vacuum
U	For large flow(1)
W	For large flow, vacuum(1)

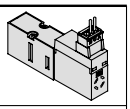
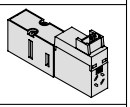
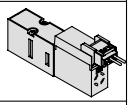
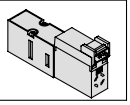
Note 1) Latching type: U and W only
Note 2) Latching type (-COM): NU and NW

Rated voltage

5	24 VDC
6	12 VDC

Note) Latching type: 24 VDC only

Electrical entry

L: Plug lead type L plug connector, With lead wire With light/surge voltage suppressor	
LO: Plug lead type L plug connector, Without connector With light/surge voltage suppressor	
M: Plug lead type M plug connector, With lead wire With light/ surge voltage suppressor	
MO: Plug lead type M plug connector, Without connector With light/surge voltage suppressor	

Note) When you expect to energize the unit for extended periods of time, refer to page 3 for details.

Port size

Body ported	M5	M5 thread
Base mounted	Nil	Without sub-plate (Manifold)
	M5	M5 thread

Made to Order

X16	Fluid-contact part: Oil-free


L plug connector
Base mounted


L plug connector
Body ported


M plug connector
Base mounted


M plug connector
Body ported

Standard Specifications

Item			Standard single type (2W)	Large-flow single type (3.2W·Energy saving type)	Large-flow latching type (2W)
Valve specifications	Valve construction		4 port direct operated poppet valve		
	Fluid		Air/Inert gas		
	Maximum operating pressure		0.7 MPa		
	Minimum operating pressure/Vacuum		0 MPa / –101.2 kPa		
	Response time(1)		ON: 4ms, OFF: 2ms		10ms or less
	Ambient and fluid temperature		–10 to 50°C (2)		
	Lubrication		Not required		
	Manual override		Non-locking push type		Locking type
	Shock/Vibration resistance(3)		150/30 m/s²		
	Mounting position		Unrestricted		
	Enclosure		Dust tight		
	Mass		34 g		37 g
Electricity specifications	Coil rated voltage	DC	24 V, 12 V		24 DC
	Allowable voltage fluctuation		±10% of rated voltage		
	Coil insulation type		Class B or equivalent		
	Power consumption	DC	2 W	3.2 W (Energy saving type) (Inrush: 3.2 W, Holding: 2.4 W)	2 W
	Electrical entry		L plug connector, M plug connector (With indicator light and surge voltage suppressor)		

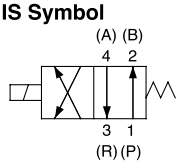
Note 1) Based on JIS B 8375-1981. Factor: With light/surge voltage suppressor (Use clean air). Dispersion accuracy: ±1 ms
Note 2) Operating the valve at low temperatures may cause condensate to form, therefore dry air must be used.
Note 3) Impact resistance: No malfunction occurred when it is tested 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)

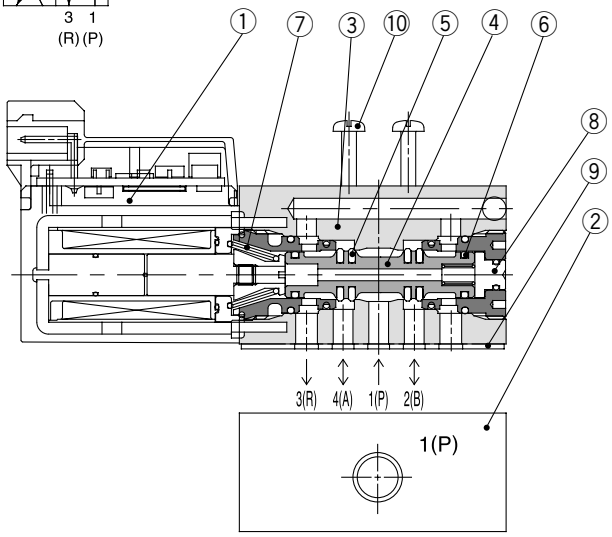
Flow Characteristics

Valve model		Port size	Flow characteristics					
			1 → 4/2 (P → A/B)			4/2 → 5/3 (A/B → EA/EB)		
			C [dm³/(s·bar)]	b	Cv	C [dm³/(s·bar)]	b	Cv
Body ported	VQD1121-□$^{L}_{M}$-M5	M5 x 0.8	0.22	0.16	0.05	0.19	0.31	0.05
	VQD1121$^{U}_{W}$-□$^{L}_{M}$-M5		0.27	0.24	0.07	0.28	0.28	0.07
Base mounted (With sub-plate)	VQD1151-□$^{L}_{M}$-M5		0.22	0.10	0.05	0.22	0.31	0.06
	VQD1$^{1}_{2}$51$^{U}_{W}$-□$^{L}_{M}$-M5		0.27	0.25	0.07	0.27	0.28	0.07

Construction

JIS Symbol





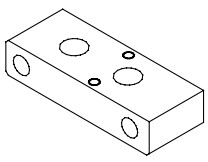
Component Parts (Single Type)

No	Description	Material	Note
1	**Solenoid coil assembly**	—	
2	**Sub-plate**	Aluminum	VQD1000-S-M5 (Base mounted only)
3	**Body**	ZDC	
4	**Spool valve**	Aluminum	
5	**Poppet**	HNBR	
6	**Guide ring**	Resin	
7	**Return spring**	Stainless steel	
8	**Manual override**	Aluminum	
9	**Gasket**	HNBR	VQD1000-9-1H
10	**Round head combination screw**	Steel	AXT632-7-13 (M1.7 x 18)

Note) Body cannot be disassembled.

Valve Single Unit Option

Piping plate assembly
VQD1000-20A

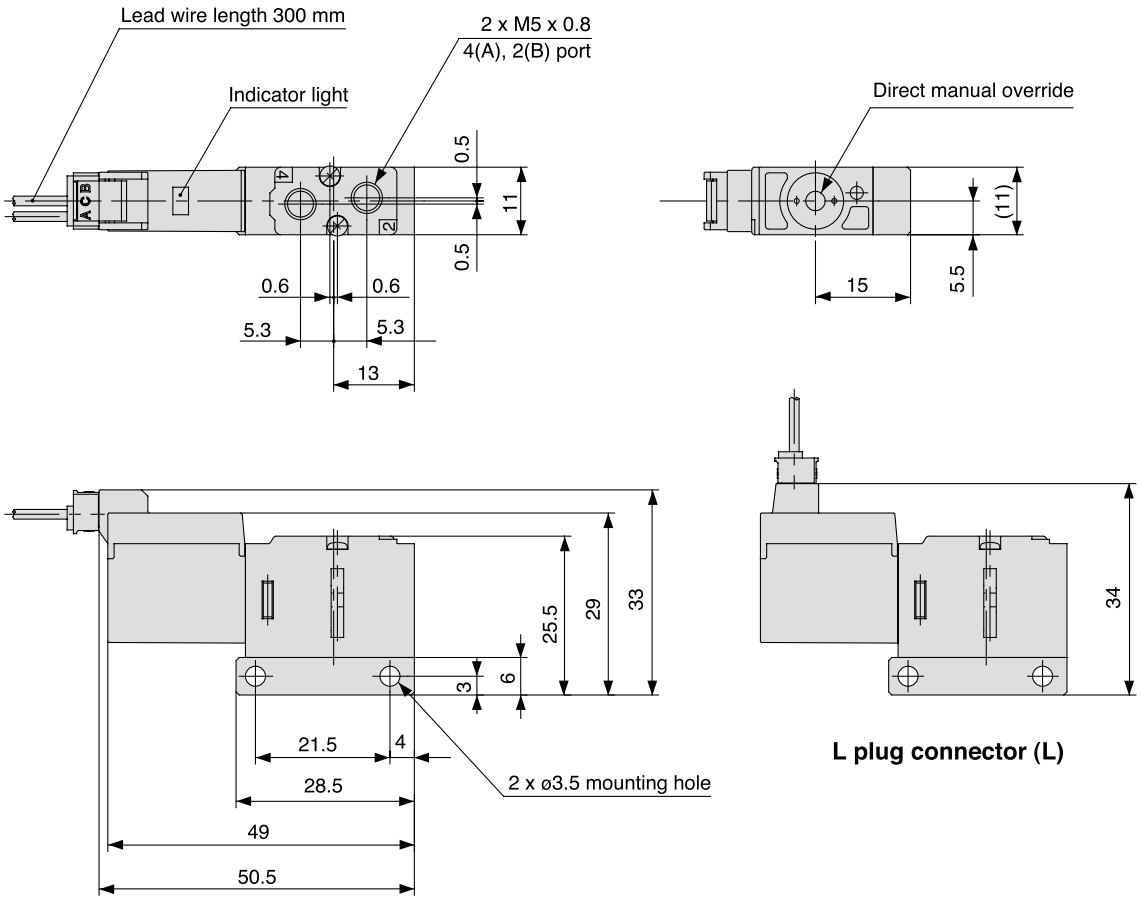


Manifold type (VQD1131) can be changed to single unit type (VQD1121) by mounting plate assembly.

Note) Plate should be mounted with manifold mounting screws (M1.7 x 20).
Proper tightening torque of thread: 0.18 to 0.25 N·m

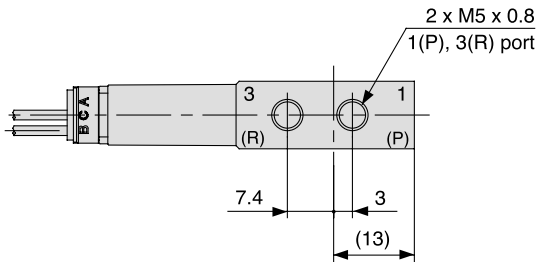
Dimensions/Body Ported

L plug connector: VQD1121□-□L-M5
M plug connector: VQD1121□-□M-M5



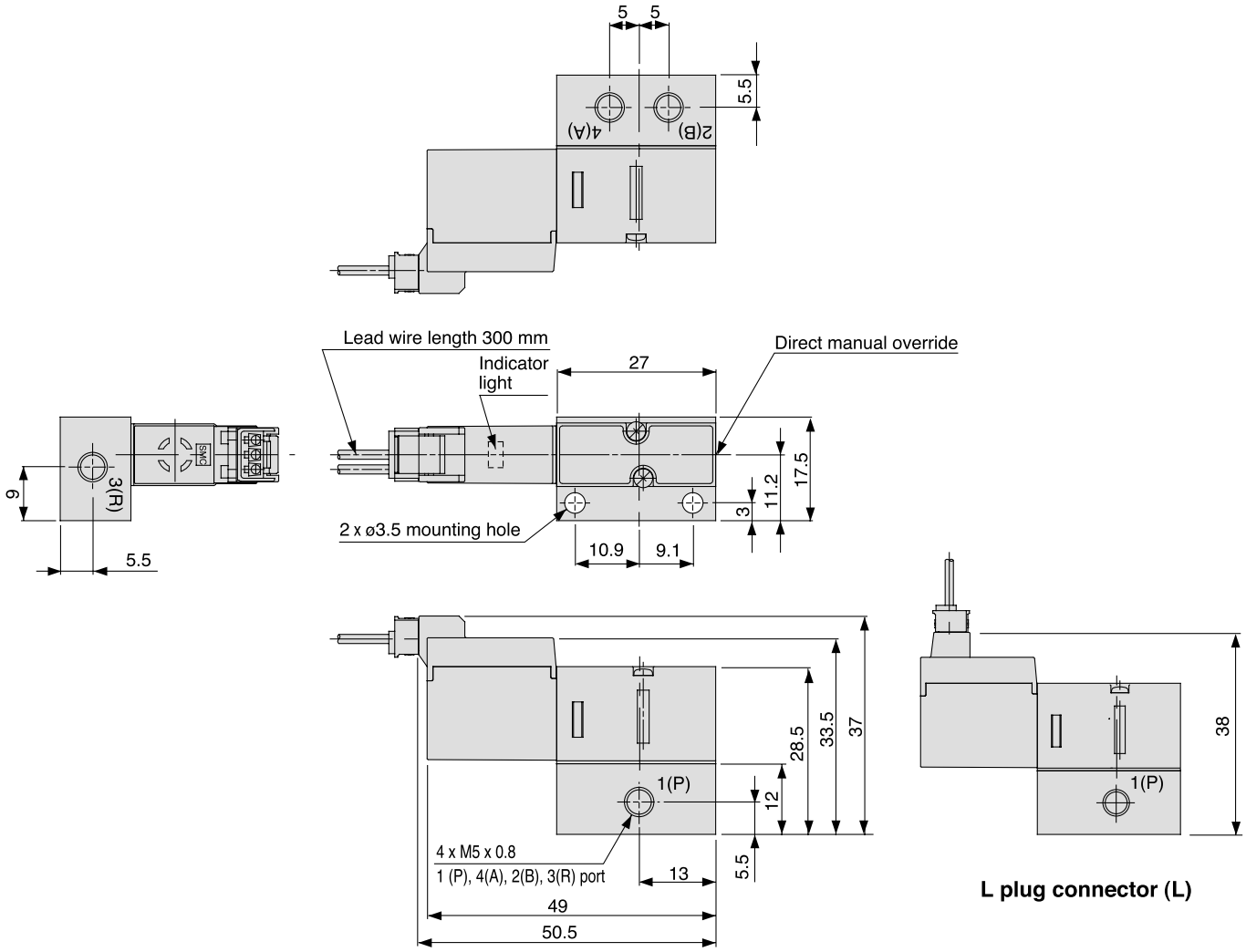
L plug connector (L)

M plug connector (M)



Dimensions/Base Mounted

L plug connector: VQD1151□-□L-M5
M plug connector: VQD1151□-□M-M5



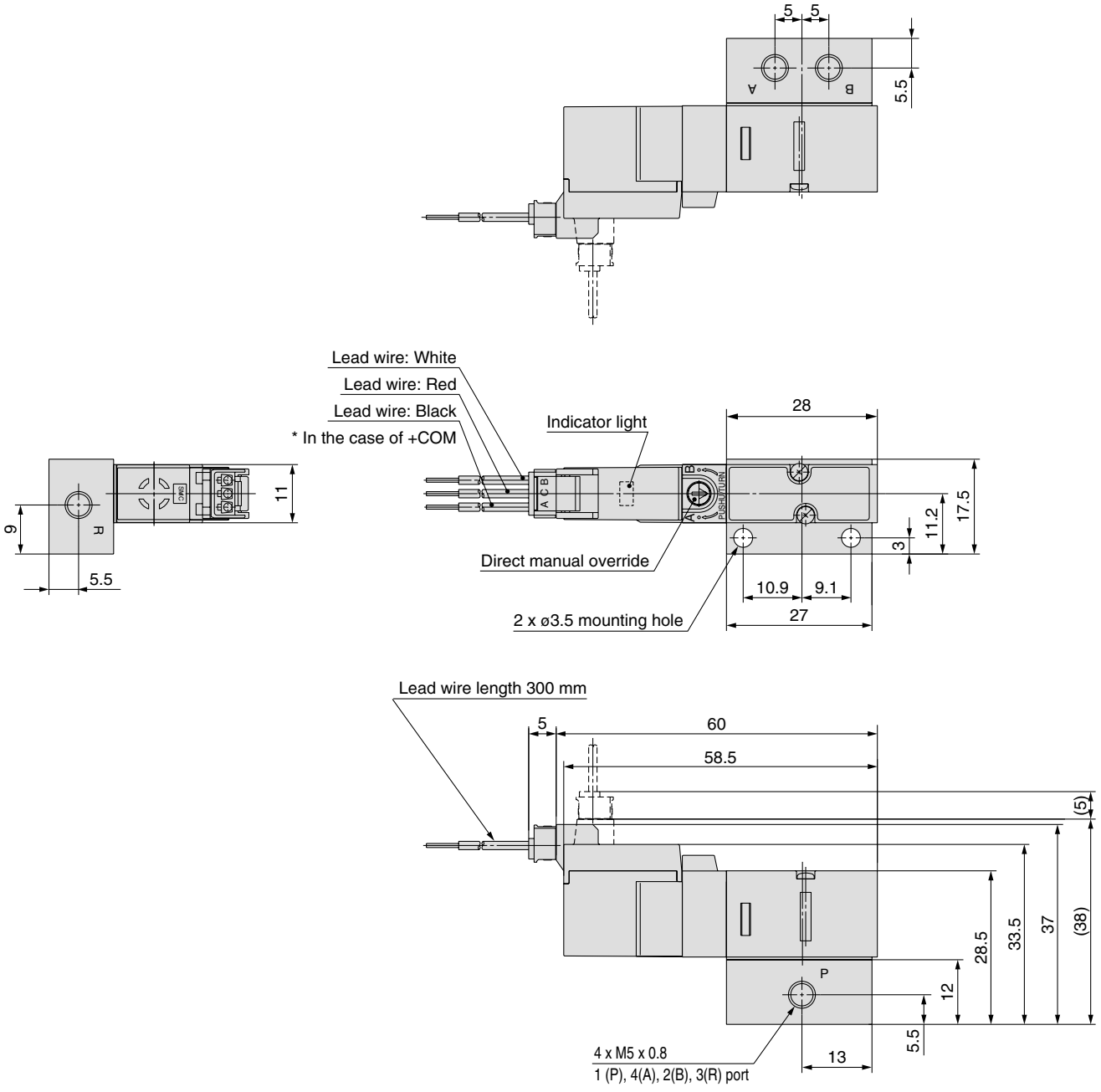
M plug connector (M)

L plug connector (L)

Dimensions/Base Mounted

L plug connector: VQD1251□-□L-M5

M plug connector: VQD1251□-□M-M5



• The dashed line indicates L plug connector.

How to Order Manifold

Plug lead unit manifold

VV4QD1 5 – □ □

Manifold

2	Body ported
5	Base mounted

Valve station

02	2 stations
⋮	⋮
20	20 stations (Max.)

Cylinder port (Base mounted only)

M5	M5 thread
C4	One-touch fitting for ø4

1(P), 3(R) port: Rc 1/8

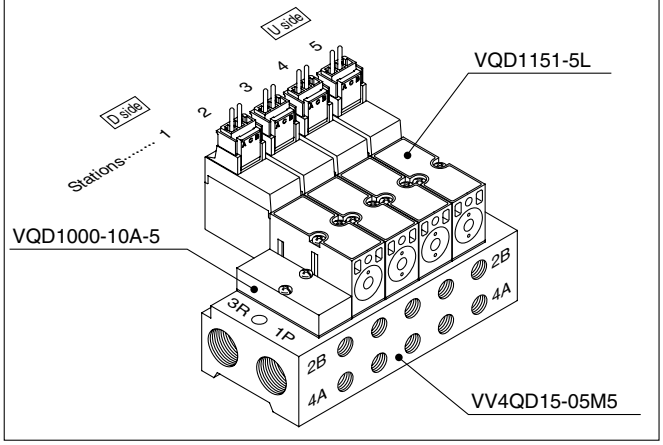
How to Order Manifold Assembly

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

<Example>
Plug lead unit manifold
VV4QD15-05M5····· 1 set —— Manifold base part no.
∗VVQD1000-10A-5····1 set —— Blanking plate part no. (1st station)
∗VQD1151-5L·····4 sets — Valve part no. (2 to 5th station)

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

VQD1 1 5 1 □ – 5 L – M5

Type of actuation

1	Single type
2	Latching type

Body type

3	Body ported
5	Base mounted

Note) Latching type: Base-mounted type only.

Valve option

Nil	Standard (2W)
V	Vacuum (2 W)
U Note)	For large flow (3.2 W)
W Note)	For large flow, vacuum (3.2 W)

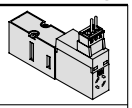
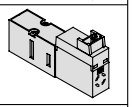
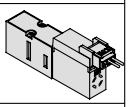
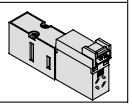
Note 1) Latching type: U and W only
Note 2) Latching type (-COM): NU and NW

Rated voltage

5	24 VDC
6	12 VDC

Note) Latching type: 24 VDC only

Electrical entry

L: Plug lead type L plug connector, With lead wire With light/surge voltage suppressor	
LO: Plug lead type L plug connector, Without connector With light/surge voltage suppressor	
M: Plug lead type M plug connector, With lead wire With light/surge voltage suppressor	
MO: Plug lead type M plug connector, Without connector With light/surge voltage suppressor	

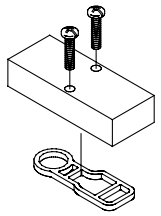
Port size (Body ported only)

M5	M5 thread

Manifold Option

Blanking plate assembly/Body ported

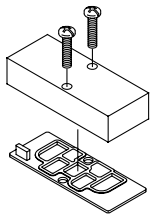
VVQD1000-10A-2



Blanking plate assembly includes 2 screws
and gasket

Blanking plate assembly/Base mounted

VVQD1000-10A-5

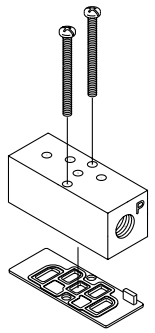


Blanking plate assembly includes 2 screws
and gasket

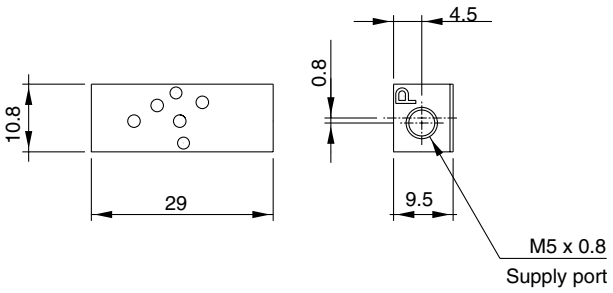
Individual SUP spacer/Base mounted

VVQD1000-P-M5-5

Mount the individual SUP spacer on the manifold base, and thus making it possible to have supply port individually for each valve.



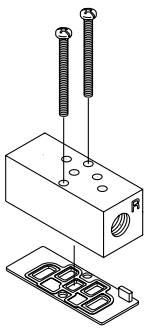
Individual SUP spacer with screw (2 pcs.)
and gasket



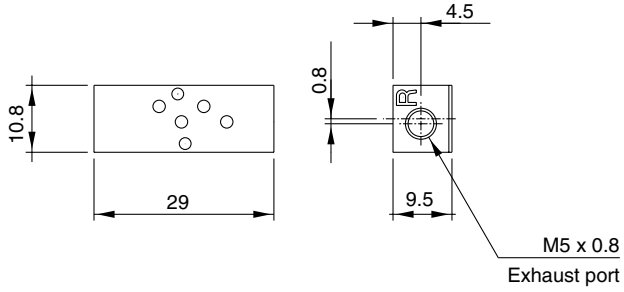
Individual EXH spacer/Base mounted

VVQD1000-R-M5-5

Mount the individual EXH spacer on the manifold base, and thus making it possible to have exhaust port individually for each valve. (Common EXH type)

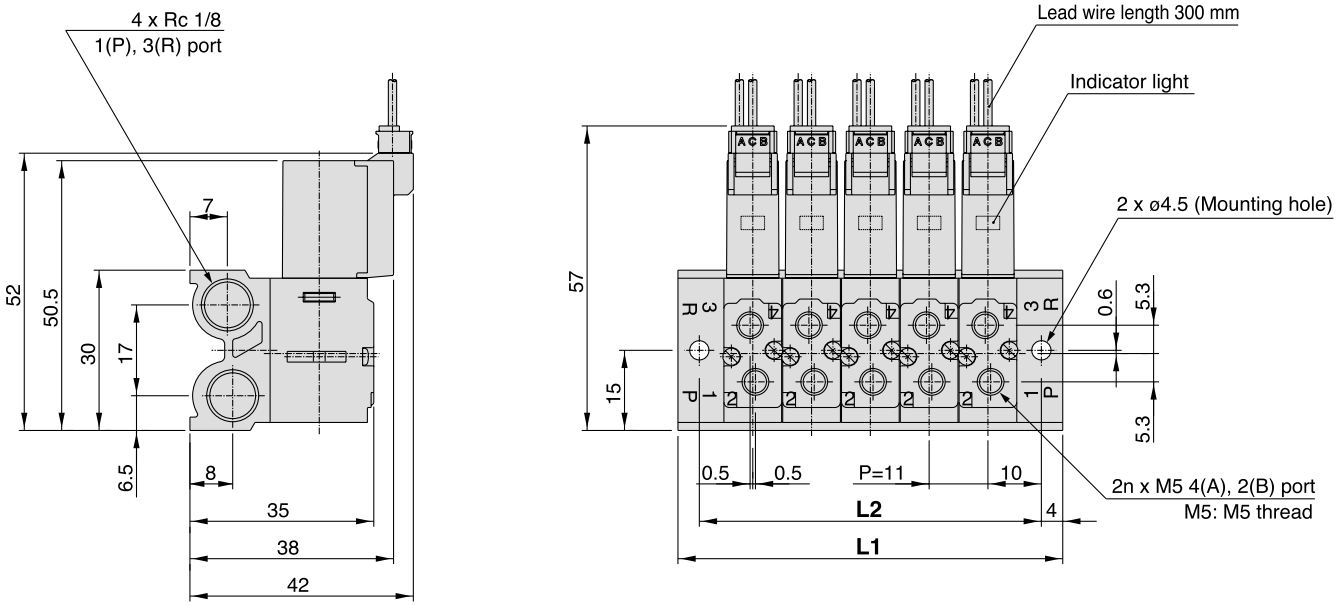


Individual EXH spacer with screw (2 pcs.)
and gasket

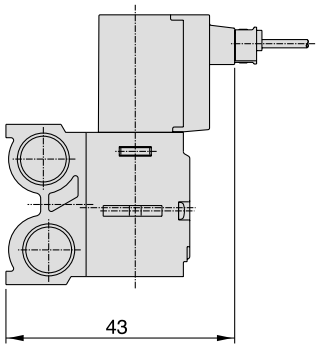


Dimensions/Body Ported

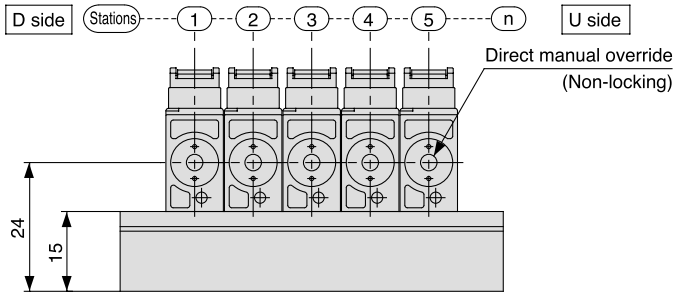
Plug lead unit manifold(VV4QD12-□)



M plug connector (M)



L plug connector (L)



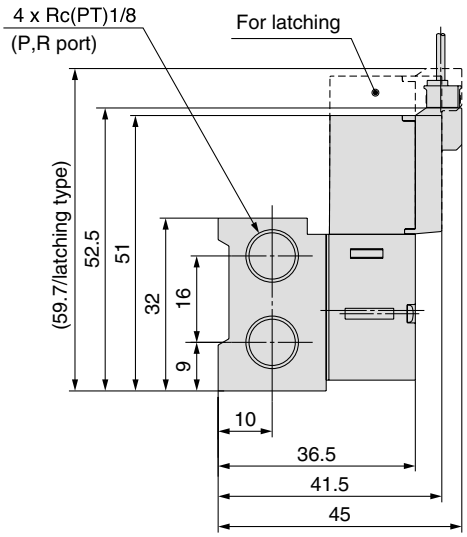
Dimensions

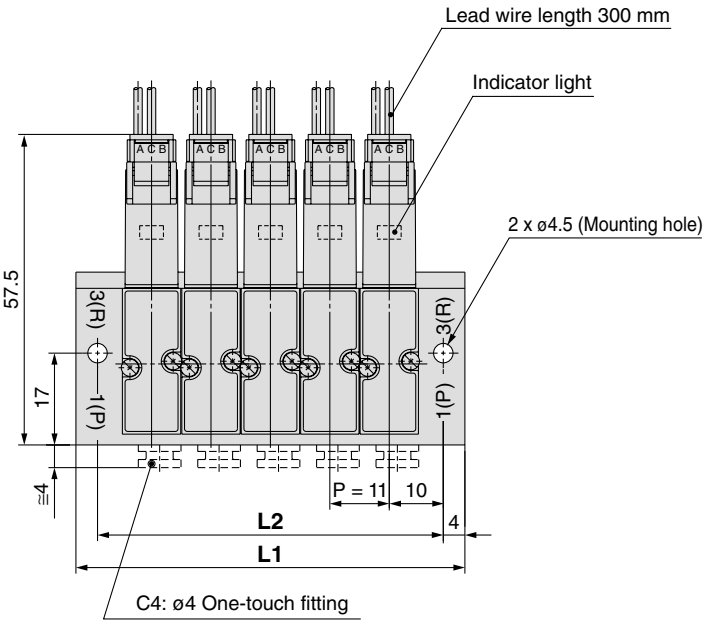
n: Stations

L \ n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L1	28	39	50	61	72	83	94	105	116	127	138	149	160	171	182	193	204	215	226	237
L2	20	31	42	53	64	75	86	97	108	119	130	141	152	163	174	185	196	207	218	229

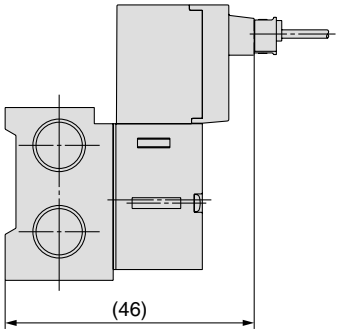
Dimensions/Base Mounted

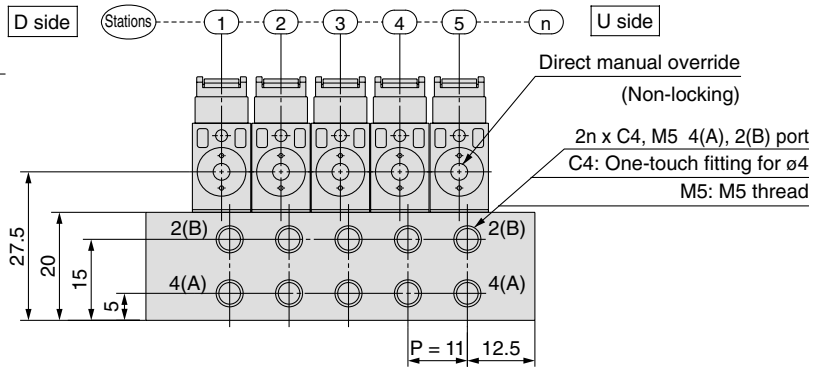
Plug lead manifold unit (VV4QD15-□)





M plug connector (M)





L plug connector (L)

Dimensions

n: Stations

L \ n	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L1	39	50	61	72	83	94	105	116	127	138	149	160	171	182	193	204	215	226	237
L2	31	42	53	64	75	86	97	108	119	130	141	152	163	174	185	196	207	218	229

Series VQD1000
Specific Product Precautions 1

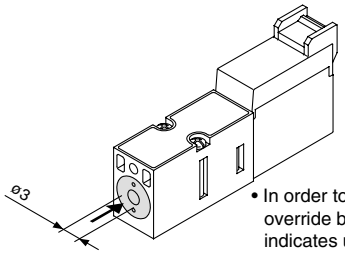
Be sure to read before handling. Refer to front matters 58 and 59 for Safety Instructions and pages 3 to 7 for 3/4/5 Port Solenoid Valve Precautions.

Manual Override Operation

⚠ Warning

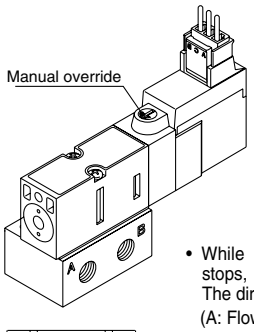
Connected actuator is started by manual operation. Use the manual override after confirming that there is no danger.

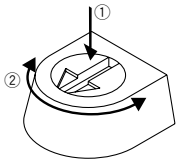
■Single type: Non-locking push type (Tool required)



- In order to turn it ON, push down the manual override button in the direction the arrow (→) indicates until it stops (approx. 0.5 mm), and release it to turn it OFF.

■Latching type: Locking type (Tool required)





- While pushing down the manual override until it stops, turn it by 90° and stop the arrow at A or B. The direction can be changed as desired.
  (A: Flow path: P → A, B: Flow path: P → B)
- The manual override is in the locked state when it is released.
- The locking will be released and the manual override will return, when it is returned to the free position.

Note) Be sure to release the locking before starting the normal operation.

Manual override-free position

Continuous Energization

⚠ Warning

- **Coil temperature may get high due to ambient temperature or energizing duration. Do not touch the valve by hand directly. When there is such a dangerous case to be touched by hands directly, install a protective cover.**
- **When you expect to energize the single type for extended periods of time, refer to page 3 for details.**
- **The latching type should not be energized over 30 seconds. Be sure to wait more than you energize the unit (both A and B should be turned off.) before you move on to the next operation.**
- **When it is the manifold and the adjacent valve is continuously energized, align them so that they would be energized or de-energized alternately.**

Mounting of Valves

⚠ Caution

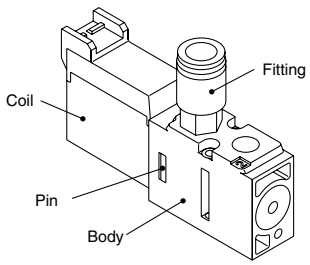
- **After confirming the gasket is correctly placed under the valve, securely tighten the bolts with the proper torque shown in the table below.**

Proper tightening torque (N·m)
0.18 to 0.25

Mounting of Valves

⚠ Caution

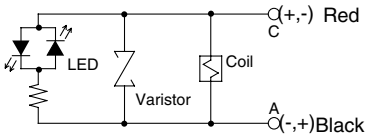
- **When tighten the piping, clamp the body part in order not to apply force to coil. (Latching: 50 N or more) If you apply force over 120 N to coil, connection pins deform, which may cause malfunction.**



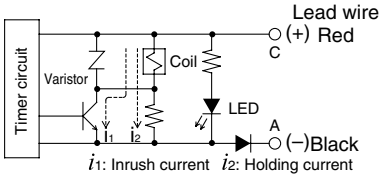
Wiring Specifications

⚠ Caution

- **Single type (Standard: 2 W)**



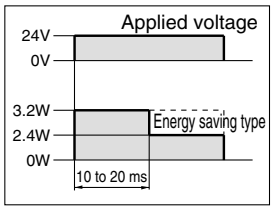
- **Single type (Large flow: 3.2 W)**



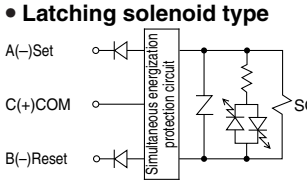
Note) Coil surge voltage generated when OFF is about 60 V. Please consult with SMC when you need to reduce the surge voltage.

3.2 W type (Energy saving type) reduces current consumption at holding which reduces the overall power consumption using the circuit shown in the left figure. Refer to the energy saving type's electrical power waveform below.

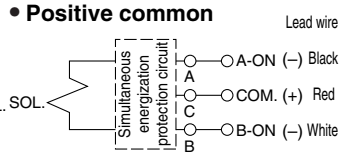
<Energy saving type's electrical power waveform>
(Rated voltage: 24 VDC)



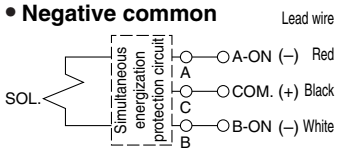
- **Latching solenoid type**



- **Positive common**



- **Negative common**



- **How to order connector assembly**

DC positive common
- Single **AXT661-14A-**
- Latching **AXT661-13A-**

DC negative common
- Latching **AXT661-13AN-**

Connector and socket (3 pcs.) only **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**

Lead wire length of plug connector 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.

Series VQD1000
Specific Product Precautions 2

Be sure to read before handling. Refer to front matters 58 and 59 for Safety Instructions and pages 3 to 7 for 3/4/5 Port Solenoid Valve Precautions.

Latching

⚠Caution

Latching Type

The latching is equipped with a self-holding mechanism, which permits a movable iron core in the solenoid to hold the set (A-ON) and reset (B-ON) positions during momentary energization (50 ms or longer). Therefore, there is no need to energize continuously.

< Special Cautions for Latching>

1. Use in a circuit that does not have simultaneous energization of A-ON and B-ON signals.
2. The minimum energization time required for self-holding is 50 ms.
3. Although there is no problem for normal operations and environments, please consult SMC when operating in an environment with vibration (10G or more) or strong magnetic fields.
4. When there is the magnetic body at the valve side, it may cause malfunction.
   Allow a space over 10 mm between the valve and magnetic body.
5. Even though this valve is held on to B-ON position (passage: P → B), 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.

Energization			Passage	Light color
A-ON (Set)	A (–) Black	B (+) Red	P → A (B → R)	Orange
B-ON (Reset)	B (–) White	C (+) Red	P → B (A → R)	Green

Note) For positive common

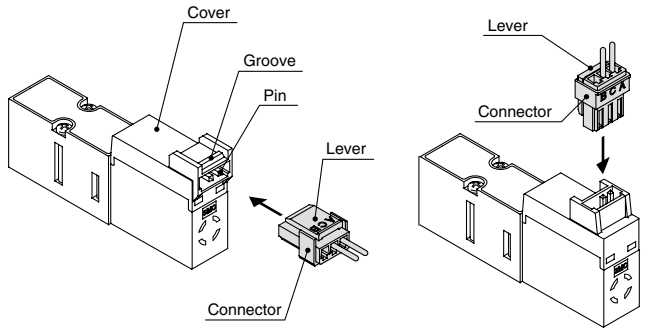
How to Use Plug Connector

⚠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.

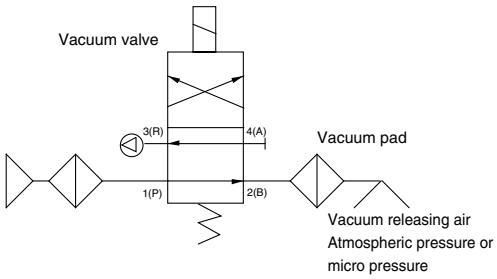
Note) GENTLY pull the lead wire, otherwise it may cause contact failure or disconnection.



How to Use the Valve for Vacuum Applications (When used as a 3 port valve)

⚠Caution

Application example of "**VQD1$_{2}^{1}{}_{5}^{3}$2$_{W}^{V}$**"
(Symbols used are typical examples.)



- Use a **VQD1$_{2}^{1}{}_{5}^{3}$2$_{W}^{V}$** valve for vacuum applications.
  Connect the vacuum source to the 3(R) port.
  ∗ Air pressure cannot be applied to the 3(R) port.
- When used as a 3 port valve, conversion from N.O. to N.C. and vice versa is possible by plugging either port 4(A) or 2(B).
  ∗ Cannot be used as 2 port valve.

How to Calculate the Flow Rate

For obtaining the flow rate, refer to front matters 44 to 47.