

KOGANEI

Air Valve

SOLENOID VALVES 200 SERIES

INSTRUCTION MANUAL Ver.1.0

Handling Instructions and Precautions

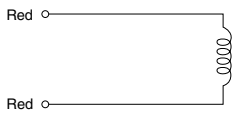


Solenoid

Internal circuit

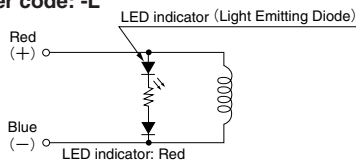
●DC24V

Standard solenoid



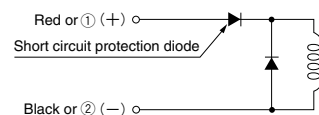
Solenoid with LED indicator

Order code: -L



Solenoid (Surge suppression)

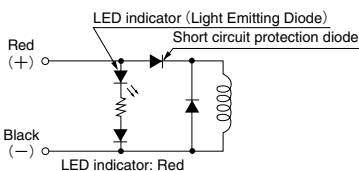
Order code: -SR



① and ② are for with DIN connector (order code: -39).

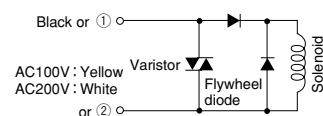
Solenoid with LED indicator (Surge suppression)

Order code: -L-SR



●AC100V, AC200V (Surge suppression)

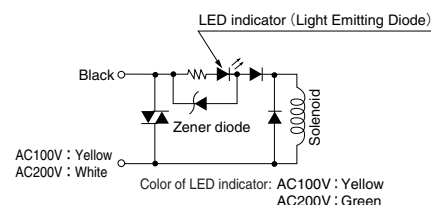
Standard solenoid



① and ② are for with DIN connector (order code: -39).

Solenoid with LED indicator

Order code: -L



- Cautions:**
1. Do not apply megger between the lead wires.
 2. The DC solenoid will not short circuit even if the wrong polarity is applied, but the valve will not operate.
 3. Leakage current inside the circuit could result in failure of the solenoid valve to return, or in other erratic operation. Always use it within the range of the allowable leakage current. If circuit conditions, etc. cause the leakage current to exceed the maximum allowable leakage current, consult us.
 4. For a double solenoid valve, avoid

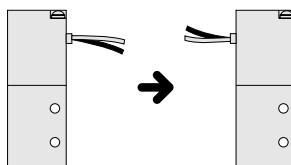
energizing both solenoids simultaneously. The valve could fall into the neutral position.

5. Since the AC solenoid uses diodes for the solenoid, always use lead wires of the same color when connecting a number of solenoid units in parallel. The DC24V standard solenoid, however, has no polarity, so either lead wire connection is acceptable.

Changing lead wire direction

The lead wire direction can be changed in the case of the add-on mounting of a sub-base regulator, etc.

Remove the two solenoid mounting screws, and rotate the solenoid 180 degrees to change the lead wire direction.

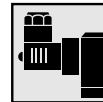
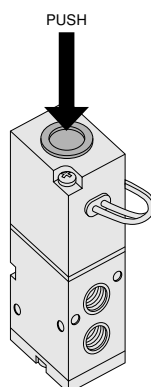


Manual override

Non-locking type

To operate the manual override, press it all the way down. The single solenoid valve works the same as when in the energized state as long as the manual override is pushed down, and returns to the rest position upon release.

For the double solenoid valve, pressing the manual override on the 12(S1) side switches the 12(S1) to the energized state, and the unit remains in that state even after the manual override is released. To return it to the rest position, operate the manual override on the 14(S2) side. This is the same for the solenoid 14(S2).

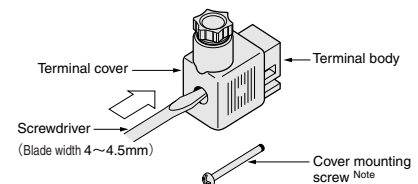


DIN connector

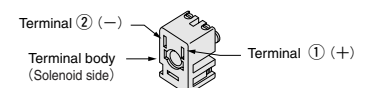
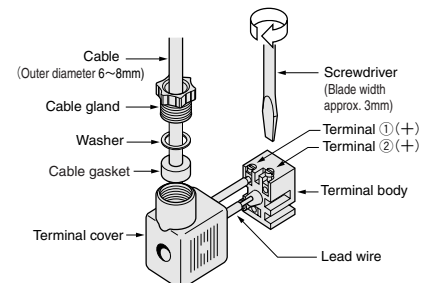
Wiring instructions

Remove the cover mounting screws, and lift the terminal cover off from the solenoid. Use a screwdriver (blade width 4~4.5mm [0.16~0.18in.]), etc. to push strongly against the terminal body through the hole of the terminal cover's mounting screw, and remove the terminal body.

Slip a cable gland, washer, and cable gasket over a cable (outer diameter 6~8mm [0.24~0.31in.]), insert the cable into the terminal cover's wiring port, and connect the lead wire to the terminal body (screwdriver blade width of about 3mm [0.12in.]).



Note: The appropriate tightening torque for the cover mounting screw is 29.4N·cm (3kgf·cm) [2.6in·lbf].



※For the DC24V solenoid with surge suppression, connect (+) to Terminal ①, and (-) to Terminal ②.



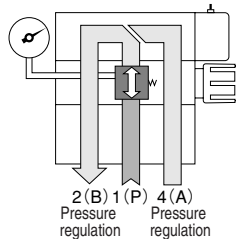
Sub-base regulator

Application example

● 1(P) port pressure regulating type

Order code: -52

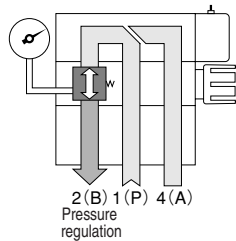
The 4(A) and 2(B) ports are regulated to the same pressure.



● 2(B) port pressure regulating type

Order code: -54

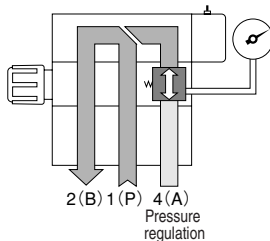
Regulates 2(B) port pressure



● 2(B) port pressure regulating type

Order code: -54

While using the 2(B) port pressure regulating type to regulate 4(A) port pressure



When the 2(B) port pressure regulating type (order code: -54) is used to regulate 4(A) port pressure, mount the sub-base regulator so that the knob is on the 3(R2) port side of the manifold.

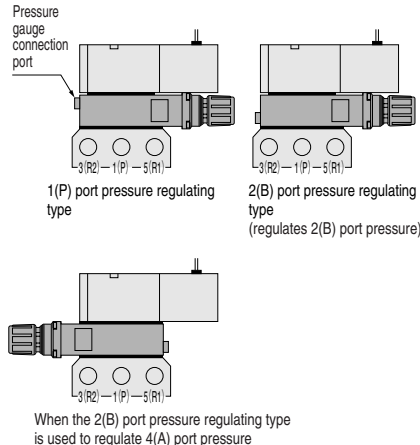
Pressure regulation

1. Connect a pressure gauge to check the pressure setting. A compact pressure gauge (Model G1-20) is recommended.
2. To regulate the pressure, pull the knob out firmly, and turn it to the right (clockwise rotation) to increase the pressure, and to the left (counterclockwise rotation) to reduce the pressure. After pressure regulation, push the knob back into the body and lock in place.

Mounting

The sub-base regulator is mounted between the manifold and the valve. While the sub-base regulator's knob is on the 5(R1) port side of the manifold for the standard type, the knob for the 2(B) port pressure regulating type is mounted so that the handle comes to the 3(R2) port side of the manifold, and can also regulate the pressure of the 4(A) port. For mounting directions and functions, see the Application example.

Cautions: 1. Pay attention to the sub-base regulator facing and the front/back sides when newly mounting a sub-base regulator, or when changing the pressure regulating port. In the 1(P) port pressure regulating type: -52, the knob is on the 5(R1) side, and the pressure gauge connection port is on the valve side. In the 2(B) port pressure regulating type: -54, the knob is on the 5(R1) side for 2(B) port pressure regulation, and on the 3(R2) side for 4(A) port pressure regulation. In both cases, the pressure gauge connection port is on the manifold side.



2. When the solenoid is a grommet type, change the solenoid orientation after confirming the "Changing lead wire direction" on the previous page, to prevent interference between the lead wires and the sub-base regulator.

SOLENOID VALVES

200 SERIES

Basic Models and Functions

Item	Basic model	200E1 (M200E1 ^{Note})	200-4E1	200-4E2	203-4E2
	Direct piping, T, C, F, U, L type manifolds				
Item	A type manifold	—	A200-4E1	A200-4E2	A203-4E2
Number of positions		2 positions			3 positions
Number of ports		2, 3 ports	5 ports		
Valve function		Normally closed (NC) or Normally open (NO)	Single solenoid	Double solenoid	Closed center (standard), exhaust center or pressure center (option)

Remark: For optional specifications and order codes, see p.163~164.

Note: M200E1 is a dedicated valve for the manifold. For details, see "About M200E1" on p.163.

Specifications

Basic model Item	Direct piping, T, C, F, U, L type manifolds	200E1 (M200E1)	200-4E1	200-4E2	203-4E2
	A type manifold	—	A200-4E1	A200-4E2	A203-4E2
Media		Air			
Operation type		Direct acting type			
Effective area [Cv]		mm ²	8.5 [0.47]	7.5 [0.42]	6.5 [0.36]
Port size		Rc1/4			
Lubrication		Not required			
Operating pressure range MPa {kgf/cm ² } [psi.]		0~0.9 {0~9.2} [0~131]		0.15~0.7 {1.5~7.1} [22~102]	0~0.7 {0~7.1} [0~102]
Proof pressure MPa {kgf/cm ² } [psi.]		1.35 {13.8} [196]		1.05 {10.7} [152]	
Response time ^{Note} ms	DC24V	20/20 or below		20 or below	20/20 or below
	ON/OFF AC100V, AC200V	20/20 or below		20 or below	20/20 or below
Maximum operating frequency Hz		5			
Minimum time to energize for self holding ms		—		50	—
Operating temperature range (atmosphere and media) °C [°F]		0~50 [32~122]			
Shock resistance m/s ² {G}	Lateral direction	980.7 {100.0}			
	Axial direction	588.4 {60.0}	392.3 {40.0}	294.2 {30.0}	588.4 {60.0}
Mounting direction		Any			

Note: Values when air pressure is 0.5MPa {5.1 kgf/cm²} [73psi.]. Values for □200-4E2 are switching time from the opposite-side position, and for □203-4E2 are switching time from the neutral valve position.

Solenoid Specifications

Rated voltage		DC24V	AC100V		AC200V		
Item							
Type		DC type	Flywheel diode type				
Operating voltage range		V	21.6~26.4 (24 ± 10%)	90~110 (100 ± 10%)	180~220 (200 ± 10%)		
Current ^{Note 1} (when rated voltage is applied)	Frequency	Hz	—	50	60	50	60
	Energizing ^{Note 2}	mA(r.m.s)	420 (10.1W) [432 (10.4W)]	160 [170]	150 [160]	70 [72]	65 [68]
Maximum allowable leakage current		mA	30	15		7	
Insulation resistance		MΩ	10				
Wiring type and lead wire length	Standard	Grommet type: 300mm [11.8in.]					
	Optional	With DIN connector					
Color of lead wire			Red {Red (+), Blue (—)} ^{Note 1} Red (+), Black (—) ^{Note 3}	Yellow, Black		White, Black	
Color of LED indicator (optional)			Red	Yellow		Green	
Surge suppression	Standard		—	Flywheel diode ^{Note 4}			
	Optional		Flywheel diode	—			

Notes: 1. Figures and descriptions in brackets [] are for solenoids with LED indicators.

2. Since the AC types have built-in flywheel diodes, the starting current value and energizing current value are virtually the same.

3. For solenoids with surge suppression, and solenoids with surge suppression and LED indicators.

4. Since the AC types have built-in flywheel diodes, they are sometimes not turned on by the solid-state relay (SSR) with zero-cross function.
For this reason, use it only after confirming the solid-state relay's ratings and precautions.

Manifold Port Size

Manifold model	Port	Location of piping port	Port size
BM□T BM□C	1 (P)	Manifold	Rc 1/4
	2 (A)	Valve	
	3 (R)	Manifold	
BM□F	1 (P)	Manifold	Rc 1/4
	4 (A), 2 (B)	Valve	
	3 (R2), 5 (R1)	Manifold	
BM□U	1 (P)	Manifold	Rc 1/4
	4 (A), 2 (B)	Valve	
	3 (R2), 5 (R1)	Valve	
BM□L	1 (P)	Manifold	Rc 1/4
	4 (A), 2 (B)	Valve	
	3 (R2), 5 (R1)	Valve	
BM□A	1 (P)	Manifold	Rc 1/4
	4 (A), 2 (B)		
	3 (R2), 5 (R1)		

Solenoid Valve Mass

g [oz.]

Basic model	Mass
200E1	300 [10.58]
M200E1	300 [10.58] ^{Note}
200-4E1	330 [11.64]
200-4E2	520 [18.34]
203-4E2	500 [17.64]
A200-4E1	330 [11.64]
A200-4E2	520 [18.34]
A203-4E2	525 [18.52]

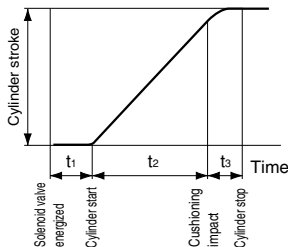
Note: Sub-plate not included. For sub-plate mass, see p.167.

Manifold Mass

g [oz.]

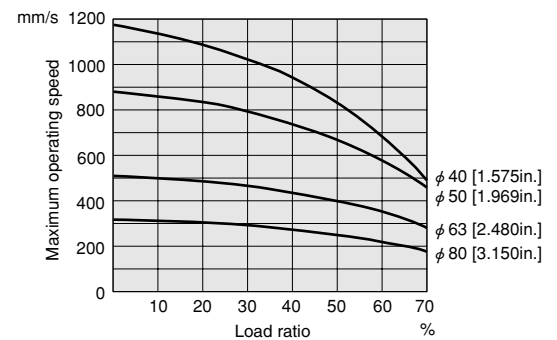
Manifold model	Mass calculation of each unit (n=number of units)	Block-off plate
BM□T	$(138 \times n) + 125$ $[(4.87 \times n) + 4.41]$	30 [1.06]
BM□C	$(138 \times n) + 125$ $[(4.87 \times n) + 4.41]$	30 [1.06]
BM□F	$(163 \times n) + 175$ $[(5.75 \times n) + 6.17]$	42 [1.48]
BM□U	$(50 \times n) + 200$ $[(1.76 \times n) + 7.05]$	15 [0.53]
BM□L	$(50 \times n) + 200$ $[(1.76 \times n) + 7.05]$	15 [0.53]
BM□A	$(145 \times n) + 150$ $[(5.11 \times n) + 5.29]$	42 [1.48]

Cylinder Operating Speed



To obtain the time required for the cylinder to complete 1 stroke, add the cylinder's delay time t_1 (time between energizing of the solenoid valve and actual starting of the cylinder), to the cylinder's max. operating speed time t_2 . When a cushion is used, add the cushioning time t_3 to the above calculations. The standard cushioning time t_3 is approximately 0.2 seconds.

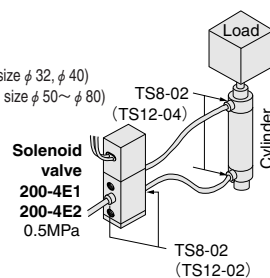
Maximum operating speed



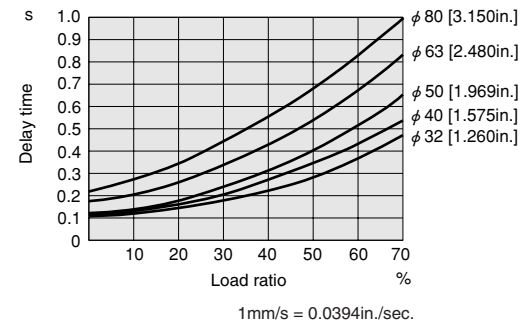
200-4E1, 200-4E2

Measurement conditions

- Air pressure: 0.5MPa {5.1kgf/cm²} [73psi.]
- Piping inner diameter and length: φ6×600mm (Bore size φ32, φ40)
φ8×1000mm (Bore size φ50~φ80)
- Fitting: Quick fitting TS8-02(TS12-02, TS12-04)
- Load ratio = $\frac{\text{Load}}{\text{Cylinder theoretical thrust}}$ (%)
- Cylinder stroke: 300mm [11.8in.]

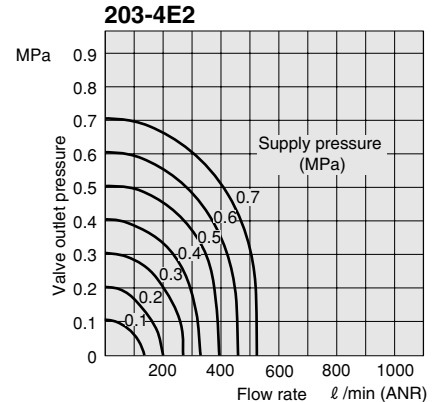
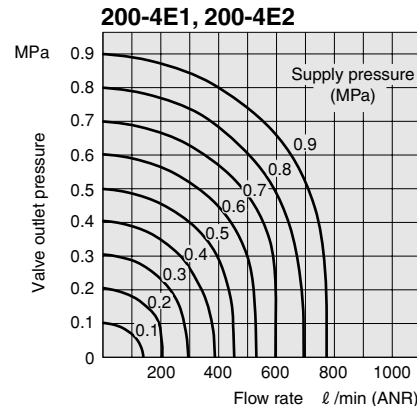
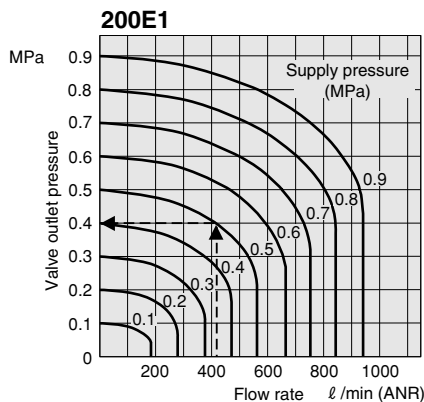


Delay time



1mm/s = 0.0394in./sec.

Flow Rate



How to read the graph

When the supply pressure is 0.5MPa [73psi.] and flow rate is 415 l/min [14.6ft³/min.] (ANR), the valve outlet pressure becomes 0.4 MPa [58psi.].

1MPa = 145psi., 1 l/min = 0.0353ft³/min.

	2-, 3-port valve Number of ports	2-, 3-port valve Valve function	3-position valve Valve function	Mounting base	Wiring type	Speed controller	LED indicator	Flywheel diode		
	3-port	 Blank	Normally closed (NC) Blank	Closed center Blank	Without mounting base Blank	Grommet type Blank	Without speed controller Blank	Without LED indicator Blank	With flywheel diode Blank	
	2-port	 -2	Normally open (NO) ^{Note} -11	Exhaust center -13	With mounting base -21	DIN connector -39	With speed controller -70	With LED indicator -L	With flywheel diode -SR	
	Note: When using as a normally open (NO) single unit, see the 2-, 3-port valves valve functions and connection port configurations on p.159.									
		Basic model							Voltage	
Direct piping	2-, 3-port single solenoid	200E1	-2 ^{Note 3}	-11 ^{Note 2}	-21	-39	-70	-L	-SR	DC24V AC100V AC200V
	5-port single solenoid	200-4E1								
	5-port double solenoid	200-4E2								
	5-port 3-position	203-4E2			-13 -14					
For manifold only ^{Note 1}	2-, 3-port single solenoid	M200E1	-2	-11		-39		-L	-SR	DC24V AC100V AC200V
	5-port single solenoid	A200-4E1								
	5-port double solenoid	A200-4E2								
	5-port 3-position	A203-4E2			-13 -14					

Notes :

1. Cannot be used as a single unit.
2. For 2-port only. Always enter **200E1-2-11**.
For the 3-port, supplying air through the 3(R) port and exhausting through the 1(P) port makes it possible to use as a normally open (NO) type valve.
3. A plug is included. Always install it in position before use.

- For DC24V only.
- For AC100V and AC200V, equipped as standard.

Manifold Models and Applicable Valves Basic Models

Valve specification Manifold model	2-, 3-port	5-port		
	Single solenoid	Single solenoid	Double solenoid	3-position
BM□T	200E1	—		
BM□C ^{Note}	M200E1-11			
BM□F	M200E1 M200E1-11	200-4E1	200-4E2	203-4E2
BM□U	200E1	200-4E1	200-4E2	203-4E2
BM□L	M200E1-11			
BM□A	—	A200-4E1	A200-4E2	A203-4E2

Note: **BM**☐ **C** is made to order.

● About M200E1

M200E1 is a dedicated valve for the manifold.
Differences with **200E1** are as shown in the table below.

Model	Point of difference	Remarks
M200E1	With sub-plate ^{Note}	For F type manifold only
M200E1-11	With sub-plate ^{Note} Port location	For T, C, F, U, L type manifolds

Note: The sub-plate is only used for mounting on F type manifolds. For details, see p.167.

● **BM** ☐ **C** is made to order.

● Valve mounting location from the left-hand side when facing the 4(A), 2(B) ports.

● Specify the valve type for each station.

● Enter **-BP** when closing a station with a block-off plate without mounting a valve.

● When ordering the non-ion specification, enter **-NCU** after the basic model code.





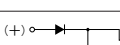


● For details, see p.171.

● For DC24V only. For AC100V and AC200V, equipped as standard.

● Not available with DIN connector

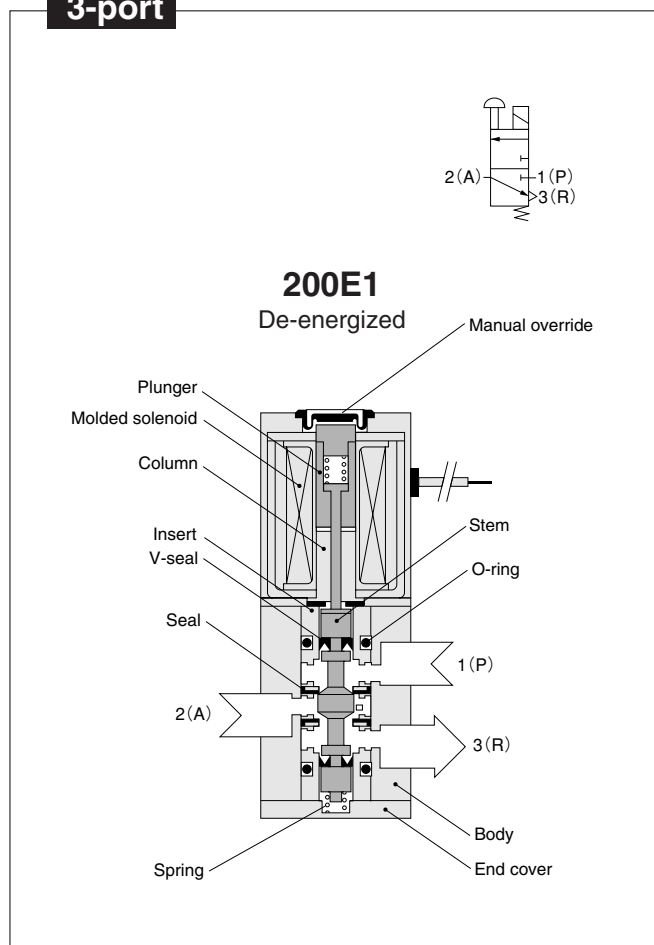
Note: **-M200E1** should be used in the normally open (optional code: **-11**) type only.

Options

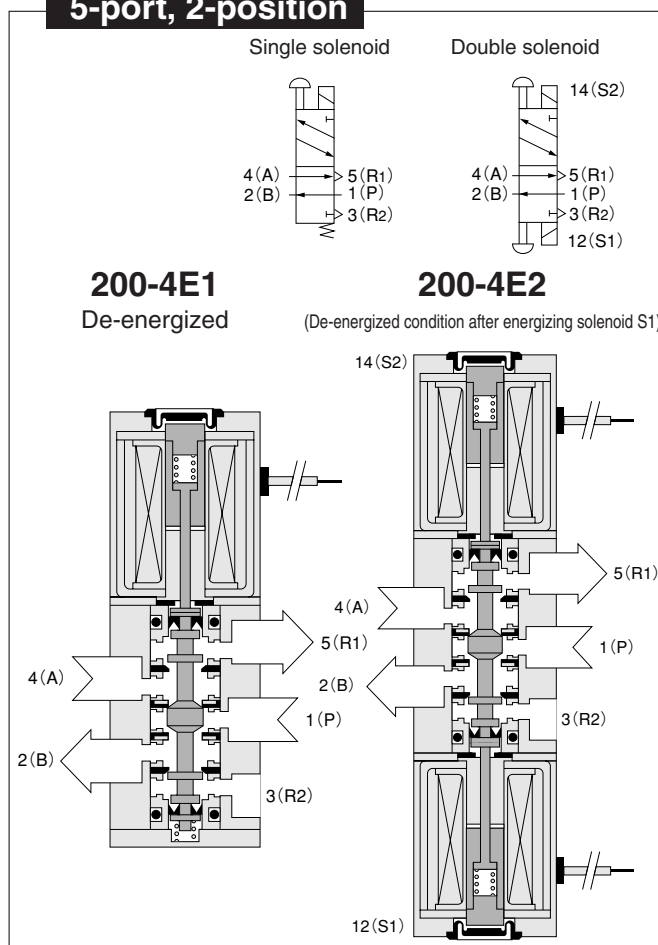
<p>Mounting base</p>  <p>-21</p> <ul style="list-style-type: none"> ● For direct piping ● Not available with double solenoid 	<p>DIN connector</p>  <p>-39</p> <ul style="list-style-type: none"> ● Cannot be used with -L 	<p>Speed controller</p>  <p>-70</p>	<p>Built-in LED indicator</p>  <p>-L</p>	<p>Built-in flywheel diode</p>  <p>-SR</p> <ul style="list-style-type: none"> ● Only for DC24V 	<p>Sub-base regulator</p>  <p>-52 -54</p> <ul style="list-style-type: none"> ● For BM□A manifold only ● -52: 1(P) port pressure regulating ● -54: 2(B) port pressure regulating 	<p>Block-off plate</p>  <p>-BP</p>
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Operating Principles and Symbols

3-port



5-port, 2-position

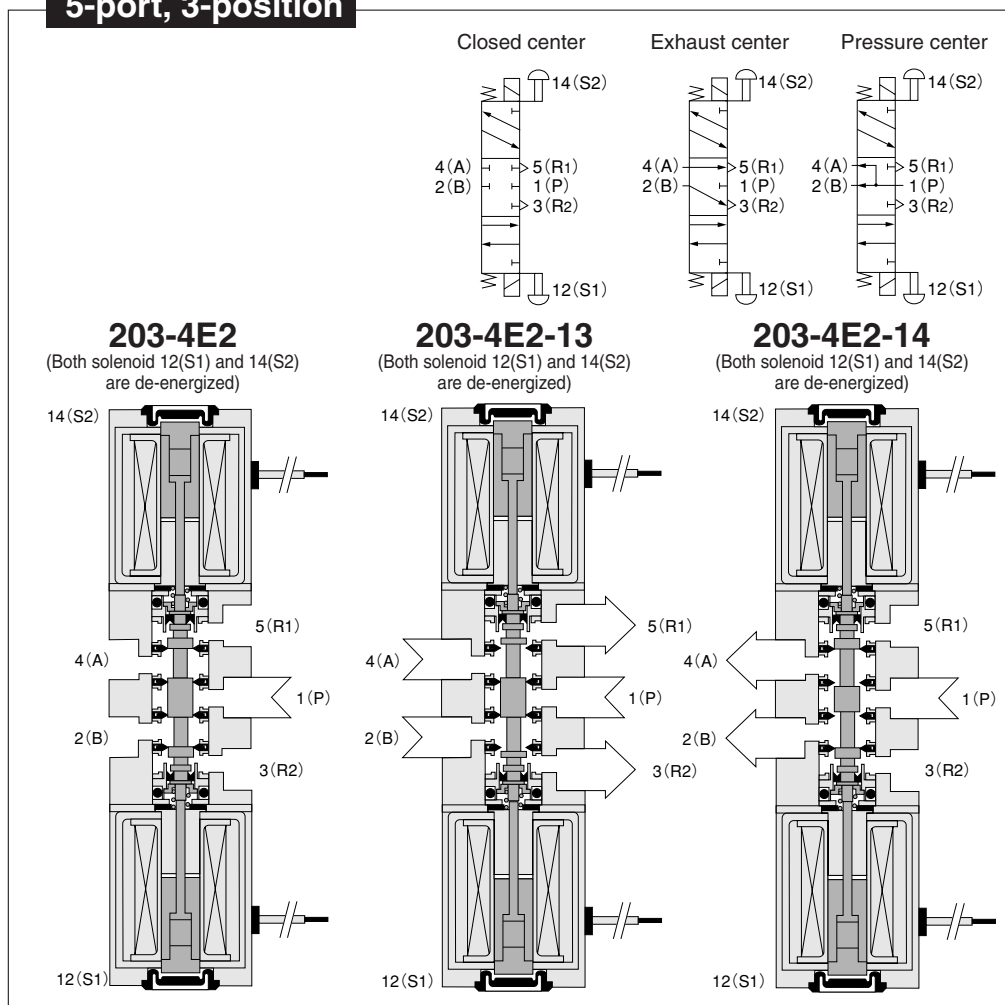


Major Parts and Materials

	Parts	Materials
Valve	Body	Aluminum alloy (anodized)
	Stem	(anodized)
	Seal	Synthetic rubber
	Insert	Aluminum alloy and brass
	Spring	Stainless steel
	Mounting base	Mild steel (zinc plated)
Manifold	Plunger	Magnetic stainless steel
	Column	Magnetic steel (zinc plated)
	Body	Aluminum alloy (anodized)
	Block-off plate	Mild steel (zinc plated)
	Seal	Synthetic rubber
	Mounting bracket	Mild steel (zinc plated)

Remark: Materials that generate copper ions are not used for the non-ion specification.

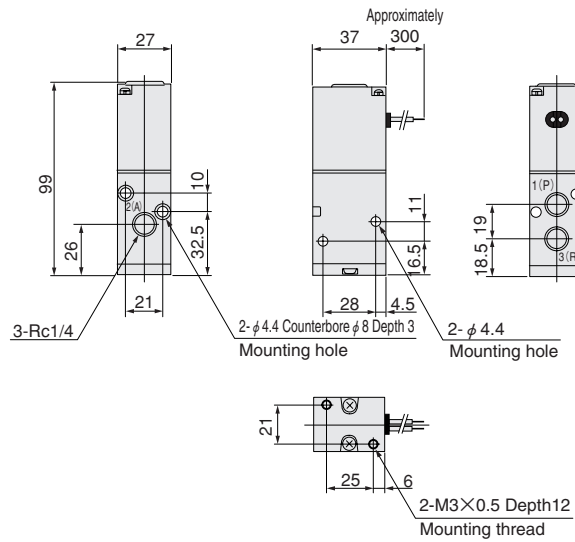
5-port, 3-position



Dimensions of Solenoid Valve (mm)

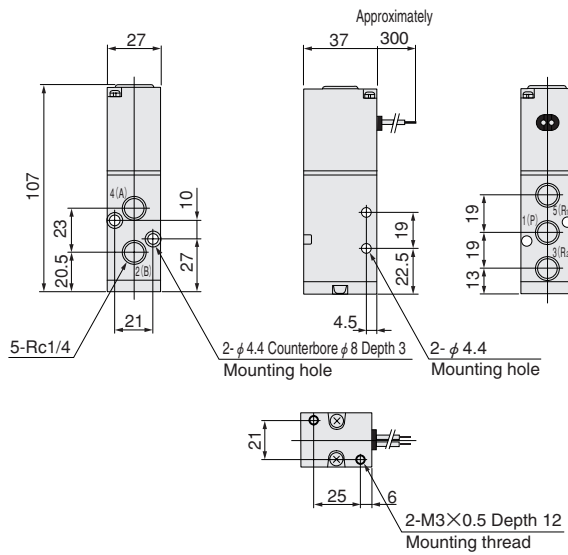
2-, 3-port

200E1

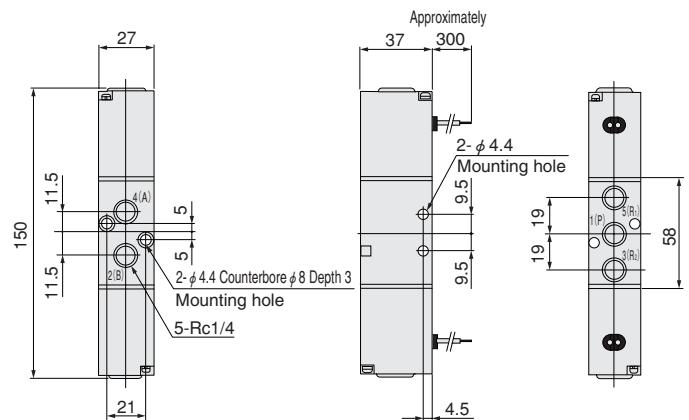


5-port, 2-position

200-4E1

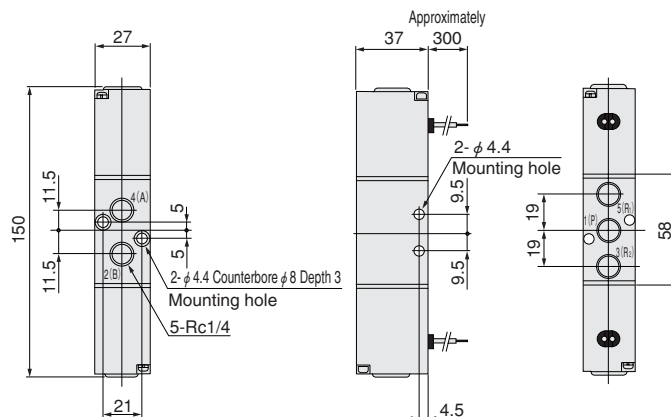


200-4E2



5-port, 3-position

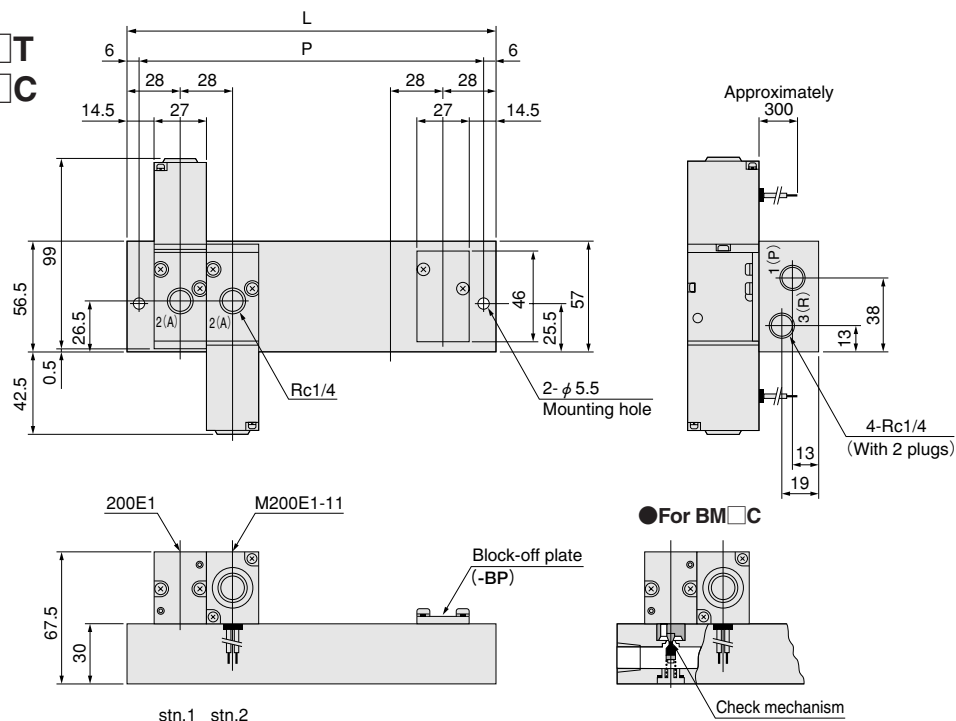
203-4E2



Dimensions of Manifold (mm)

For 2-, 3-port

BM□T
BM□C

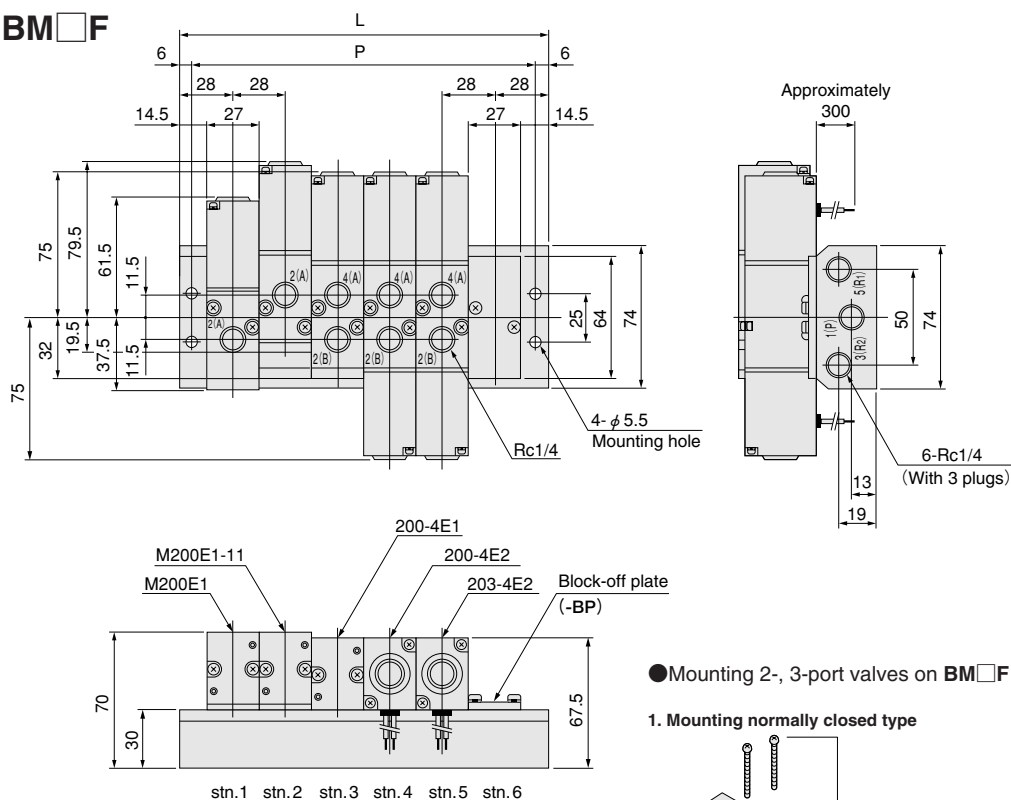


Unit dimensions

Model	L	P
BM2T	84	72
3T	112	100
4T	140	128
5T	168	156
6T	196	184
7T	224	212
8T	252	240
9T	280	268
10T	308	296

For combination mounting of 2-, 3-, 5-port

BM□F

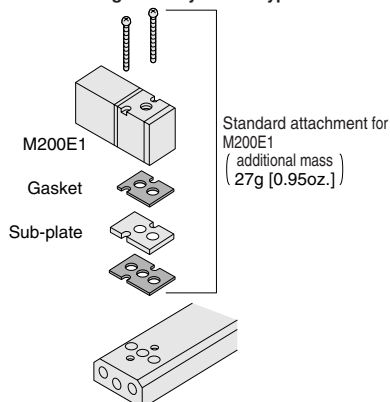


Unit dimensions

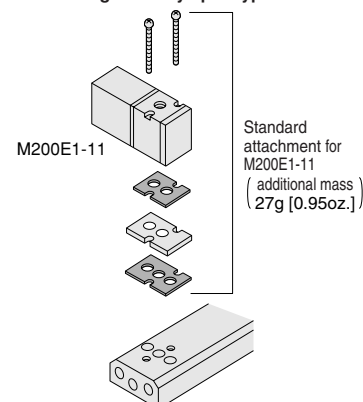
Model	L	P
BM2F	84	72
3F	112	100
4F	140	128
5F	168	156
6F	196	184
7F	224	212
8F	252	240
9F	280	268
10F	308	296

● Mounting 2-, 3-port valves on BM□F

1. Mounting normally closed type



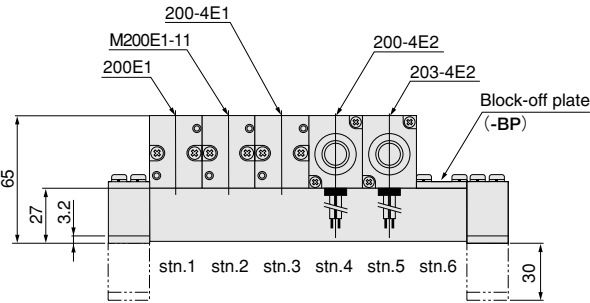
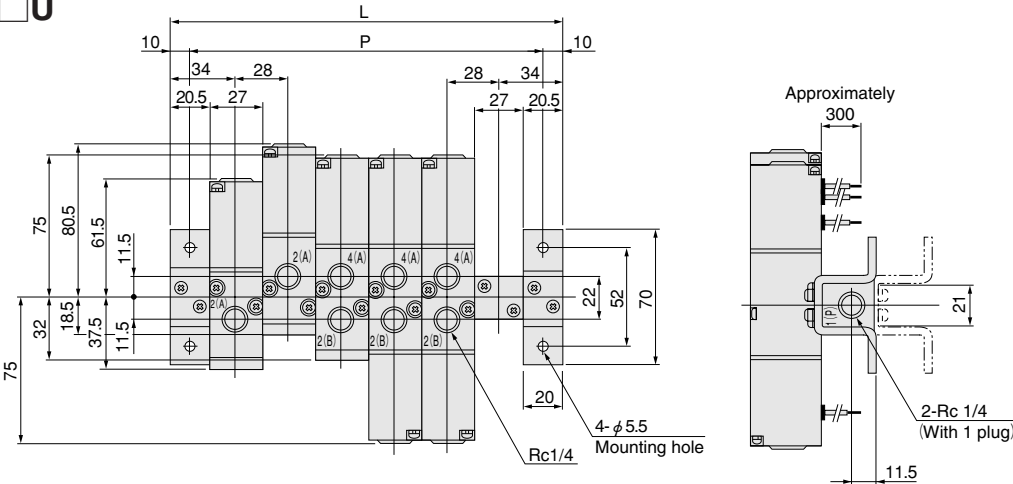
2. Mounting normally open type



Dimensions of Manifold (mm)

For combination mounting of 2-, 3-, 5-port

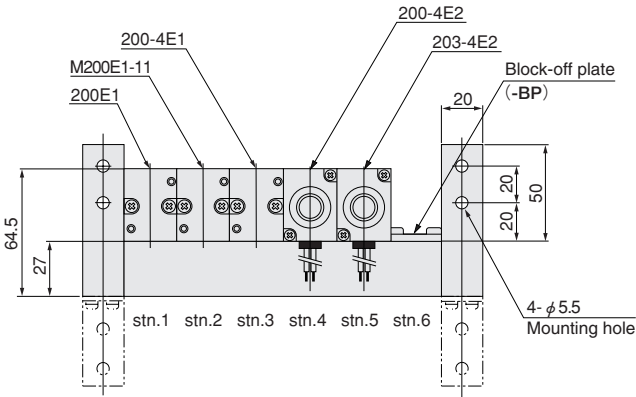
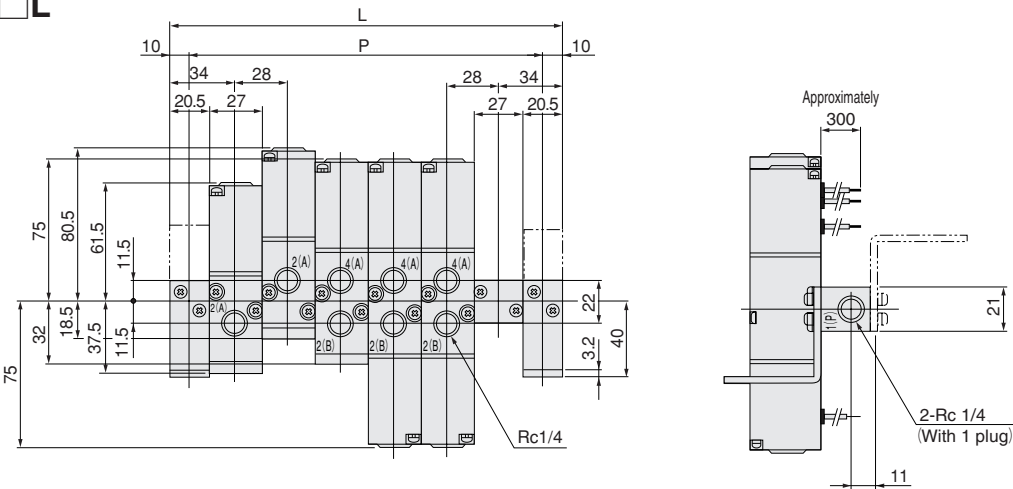
BM□U



Unit dimensions

Model	L	P
BM2U	96	76
3U	124	104
4U	152	132
5U	180	160
6U	208	188
7U	236	216
8U	264	244
9U	292	272
10U	320	300

BM□L



Unit dimensions

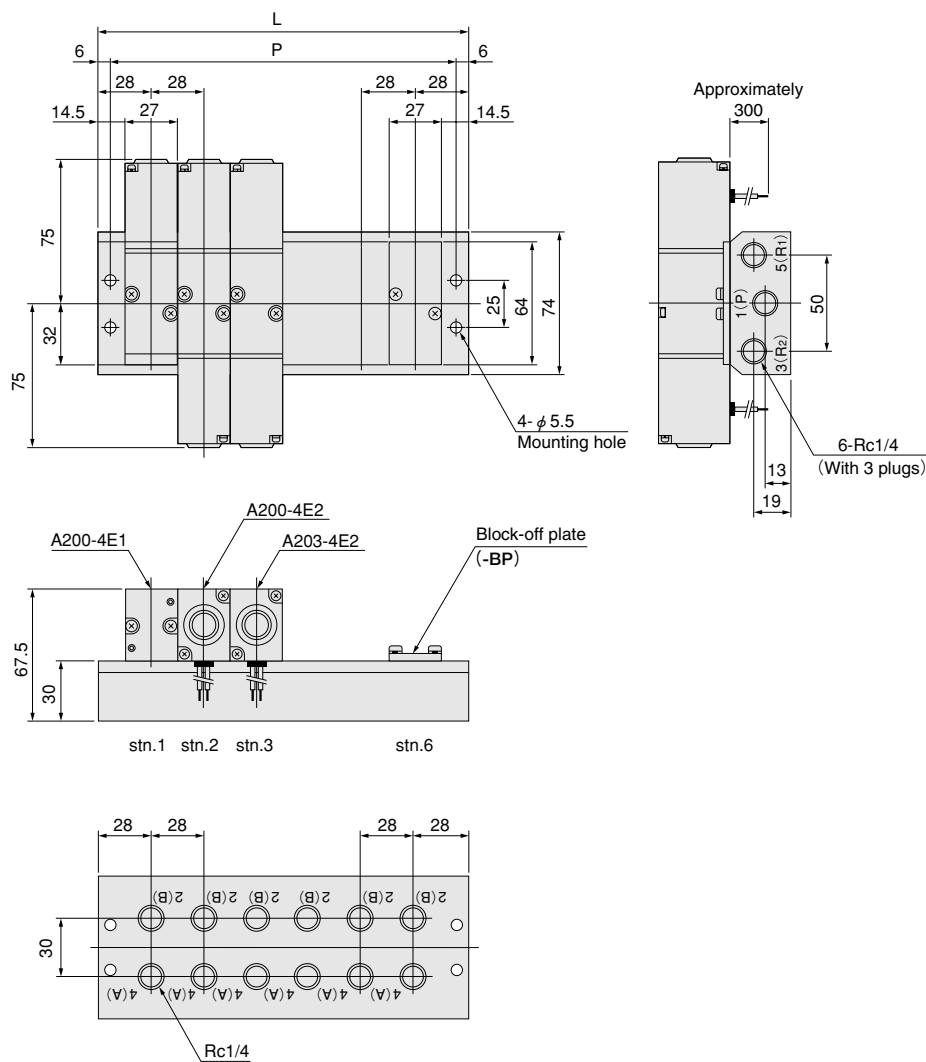
Model	L	P
BM2L	96	76
3L	124	104
4L	152	132
5L	180	160
6L	208	188
7L	236	216
8L	264	244
9L	292	272
10L	320	300

For options, see p.170.

Dimensions of Manifold (mm)

For 5-port

BM□A



Unit dimensions

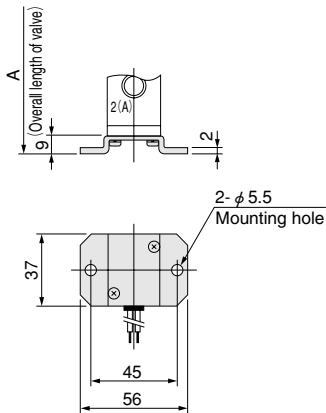
Model	L	P
BM2A	84	72
3A	112	100
4A	140	128
5A	168	156
6A	196	184
7A	224	212
8A	252	240
9A	280	268
10A	308	296

For options, see p.170.

Dimensions of Options (mm)

For single unit

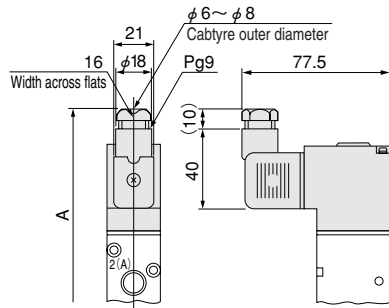
●Mounting base: -21



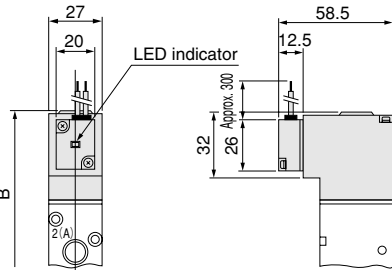
Code	A
Model	
200E1	108
200-4E1	116

For single unit and manifold

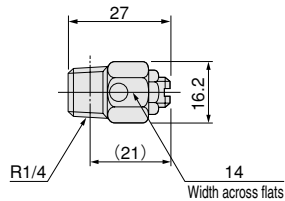
●Solenoid with DIN connector: -39



●Solenoid with LED indicator: -L



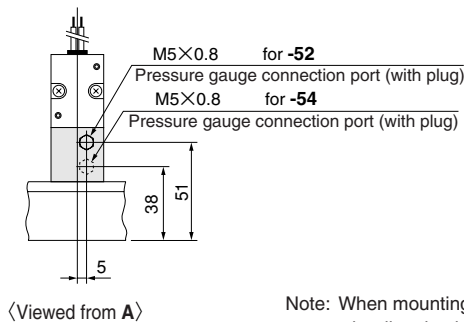
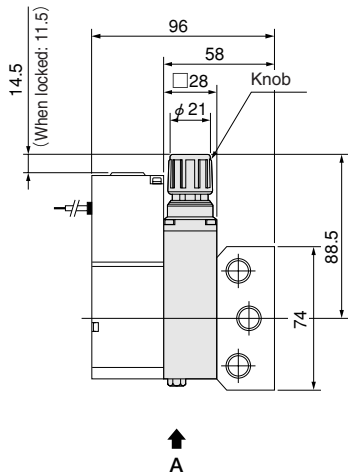
●Speed controller: -70
Note: Not available in 2-, 3-port



Code	A	B	Remark
Model			
200E1	117	99	Overall length of valve
200-4E1	125	107	
200-4E2	186	150	
203-4E2			

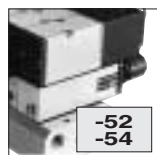
For manifold

●Sub-base regulator: -52
-54



Note: When mounting the sub-base regulator, the solenoid valve lead wire direction is reversed (solenoid rotated).
For details, see p.171.

Sub-base Regulator

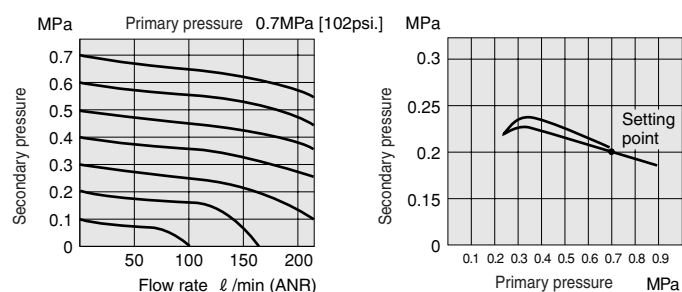


Specifications

Item	Order code	-52 (BMA-52) ^{Note}	-54 (BMA-54) ^{Note}
Functions		1(P) port pressure regulating type	2(B) port pressure regulating type
Media		Air	
Operating pressure range	MPa {kgf/cm ² } [psi.]	0.05~0.7 {0.5~7.1} [7~102]	
Maximum operating pressure	MPa {kgf/cm ² } [psi.]	0.9 {9.2} [131]	
Proof pressure	MPa {kgf/cm ² } [psi.]	1.35 {13.8} [196]	
Operating temperature range	°C [°F]	5~60 [41~140]	
Mass	g [oz.]	200 [7.05]	

Note: Order codes in parentheses () are those for the sub-base regulator which must be ordered separately.

Flow Rate Characteristics Pressure Characteristics



1MPa = 145psi., 1 l/min = 0.0353ft³/min.

Order Code

BM ☐ A stn. ☐ — ☐ — ☐

: : :

☐ ☐ ☐

| | |

Manifold model Type of mounting valve

Sub-base regulator

Blank — Station not mounting a sub-base regulator

52 — 1(P) port pressure regulating type

54 — 2(B) port pressure regulating type^{Note}

Note: 2(B) port pressure regulating type also has a 4(A) port pressure regulating type which is mounted so that the knob is on the 3(R2) port side of the manifold (Order code: -54A).

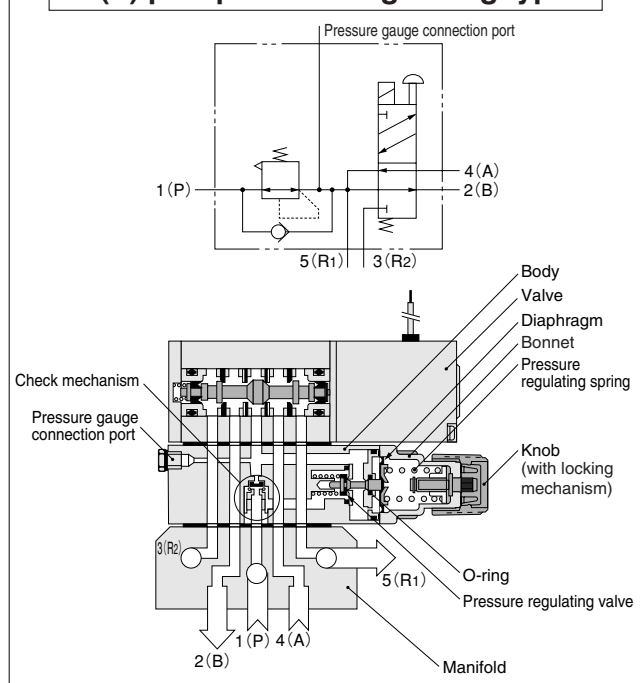
●For sub-base regulator only

BMA-52 — 1(P) port pressure regulating type

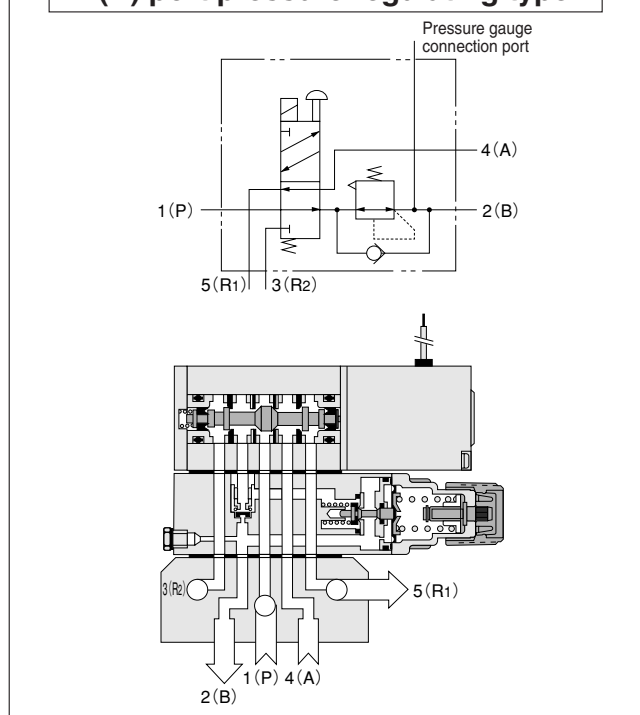
BMA-54 — 2(B) port pressure regulating type

Operating Principles and Symbols

1(P) port pressure regulating type



2(B) port pressure regulating type



Major Parts and Materials

Parts	Materials
Body	Aluminum alloy (anodized)
Knob	Plastic (POM)
Diaphragm	Synthetic rubber (NBR)
Pressure regulating spring	Piano wire (chromating)
Seal	Synthetic rubber (NBR)