KOGANEI

VALVES GENERAL CATALOG

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SOLENOID VALVES
100 SERIES
INDEX

SOLENOID VALVES 100 SERIES

⚠ **Caution** | Before use, be sure to read the "Safety Precautions" on p. 31.

The standard for square and direct acting types
Solenoid Valves 100 Series

Offers reliable control of φ20 [0.787in.]～ φ50 [1.969in.] bore size air cylinders. Standard direct acting solenoid valve offers a refined inner construction and versatility with excellent reliability and durability, responding with ease of use and flexibility to its "reliable operation" feature.

● The sealing method uses a pressure-balanced poppet for balancing supply pressure at the valve seat portion. Low power consumption translates to optimum performance for high cycle applications, and the valve is compact but large flow.
● An overspring mechanism prevents excessive force from being applied on the seal. It demonstrates excellent durability.
● The single solenoid 2-, 3-, 5-port valves offer assured operations even under low pressure. They demonstrate multiple performance capabilities as a low pressure specification actuator operation, selector valve, or divider valve.
● A flywheel diode is standard equipment for the AC solenoid (optional for the DC24V). Eliminates solenoid burning and humming.
● Responds to diversified needs. Wide selection of options. Units with LED indicators are now simpler than ever.
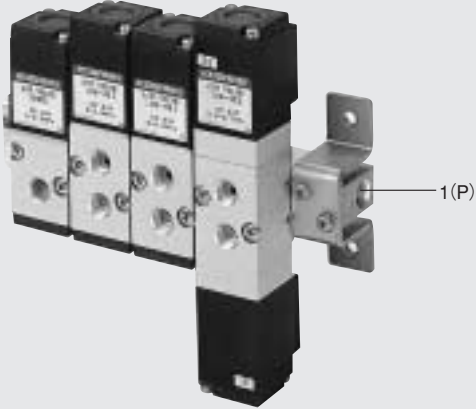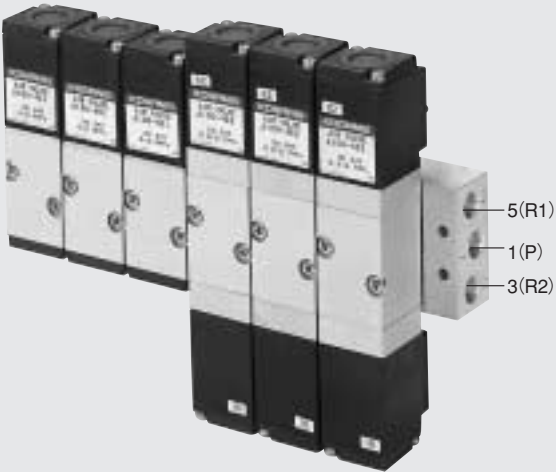
2-, 3-port Valves Valve Functions and Connection Port Configurations

		De-energized	Energized
2-port	Normally closed (NC)	2(A) ← 1(P) 3(R) (Plug)	2(A) ← 1(P) 3(R) (Plug)
2-port	Normally open (NO)	(Plug) 1(P) 2(A) ← 3(R)	(Plug) 1(P) 2(A) ← 3(R)
3-port	Normally closed (NC)	2(A) 1(P) 3(R)	2(A) ← 1(P) 3(R)
3-port	Normally open (NO)	2(A) 1(P) 3(R)	2(A) 1(P) 3(R)
	Selector valve	2(A) ← 1(P) 3(R)	2(A) ← 1(P) 3(R)
	Divider valve	2(A) 1(P) 3(R)	2(A) 1(P) 3(R)

100 Series Single Unit Basic Models and Configuration

2-, 3-port	5-port
	2-position
	Single solenoid / Double solenoid

2-, 3-port	5-port	
100E1	**100-4E1**	**100-4E2**

100 Series Manifold Basic Models and Configuration

Manifold for 2-, 3-port valves	Manifold for combination mounting of 2-, 3-, 5-port valves
HM☐T—T type (1(P), 3(R) port) manifold	**HM☐F**—F type (1(P), 3(R2), 5(R1) port) manifold

1(P)
3(R)

5(R1)
1(P)
3(R2)

Manifold for combination mounting of 2-, 3-, 5-port valves	
HM☐U—U type (1(P) port) manifold	**HM☐L**—L type (1(P) port) manifold

1(P)

1(P)

Manifold for 5-port valves only

HM☐A—A type (all port) manifold

5(R1)
1(P)
3(R2)

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SOLENOID VALVES
100 SERIES

Basic Models and Functions

Item / Basic model	Direct piping, T, F, U, L type manifolds	100E1 (M100E1[Note])	100-4E1	100-4E2
	A type manifold	——	A100-4E1	A100-4E2
Number of positions		2 positions		
Number of ports		2, 3 ports	5 ports	
Valve function		Normally closed (NC) or Normally open (NO)	Single solenoid	Double solenoid

Remark: For optional specifications and order codes, see p.149～150.
Note: M100E1 is a dedicated valve for the manifold. For details, see "About M100E1" on p.149.

Specifications

Item / Basic model	Direct piping, T, F, U, L type manifolds	100E1 (M100E1)	100-4E1	100-4E2
	A type manifold	——	A100-4E1	A100-4E2
Media		Air		
Operation type		Direct acting type		
Effective area 〔Cv〕 mm^2		5.0〔0.28〕	3.4〔0.19〕	3.0〔0.17〕
Port size		Rc1/8		
Lubrication		Not required		
Operating pressure range MPa{kgf/cm^2} [psi.]		0～0.9 {0～9.2} [0～131]		0.2～0.7 {2～7.1} [29～102]
Proof pressure MPa{kgf/cm^2} [psi.]		1.35 {13.8} [196]		1.05 {10.7} [152]
Response time [Note] ms ON/OFF	DC24V	20/20 or below		20 or below
	AC100V, AC200V	20/20 or below		20 or below
Maximum operating frequency Hz		5		
Minimum time to energize for self holding ms		—		50
Operating temperature range (atmosphere and media) ℃ [℉]		0～50 [32～122]		5～50 [41～122]
Shock resistance m/s^2{G}	Lateral direction	1373.0 {140.0}		
	Axial direction	392.3 {40.0}		147.1 {15.0}
Mounting direction		Any		

Note: Values when air pressure is 0.5MPa {5.1 kgf/cm^2} [73psi.]. Values of double solenoid valves are switching time from the opposite position.

Solenoid Specifications

Item / Rated voltage		DC24V	AC100V		AC200V	
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)	270 (6.5W) 〔282 (6.8W)〕	100 〔107〕	95 〔101〕	48 〔50〕	46 〔48〕
Maximum allowable leakage current mA		20	10		5	
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 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 model has a built-in flywheel diode, 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
HM□T	1(P)	Manifold	Rc 1/8
	2(A)	Valve	
	3(R)	Manifold	
HM□F	1(P)	Manifold	Rc 1/8
	4(A), 2(B)	Valve	
	3(R2), 5(R1)	Manifold	
HM□U	1(P)	Manifold	Rc 1/8
	4(A), 2(B)	Valve	
	3(R2), 5(R1)	Valve	
HM□L	1(P)	Manifold	Rc 1/8
	4(A), 2(B)	Valve	
	3(R2), 5(R1)	Valve	
HM□A	1(P)		Rc 1/8
	4(A), 2(B)	Manifold	
	3(R2), 5(R1)		

Solenoid Valve Mass

g [oz.]

| Basic model	Mass
100E1	190 [6.70]
M100E1	190 [6.70]Note
100-4E1	220 [7.76]
100-4E2	400 [14.11]
A100-4E1	230 [8.11]
A100-4E2	410 [14.46]

Note: Sub-plate not included. For sub-plate mass, see p.153.

Manifold Mass

g [oz.]

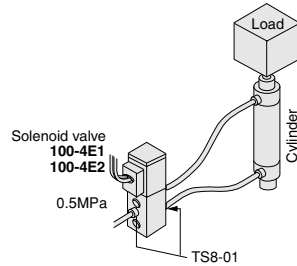| Manifold model	Mass calculation of each unit (n＝number of units)		Block-off plate
HM□T	(73×n)＋73	[(2.57×n)＋2.57]	21 [0.74]
HM□F	(64×n)＋64	[(2.26×n)＋2.26]	26 [0.92]
HM□U	(26×n)＋130	[(0.92×n)＋4.59]	11 [0.39]
HM□L	(26×n)＋130	[(0.92×n)＋4.59]	11 [0.39]
HM□A	(64×n)＋64	[(2.26×n)＋2.26]	26 [0.92]

Cylinder Operating Speed
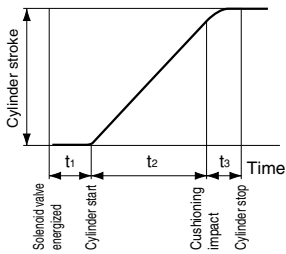
To obtain the time required for the cylinder to complete 1 stroke, add the cylinder's delay time t_1 (time between energizing of the solenoid valve and actual starting of the cylinder), to the cylinder's max. operating speed time t_2. When a cushion is used, add the cushioning time t_3, to the above calculations. The standard cushioning time t_3 is approximately 0.2 seconds.
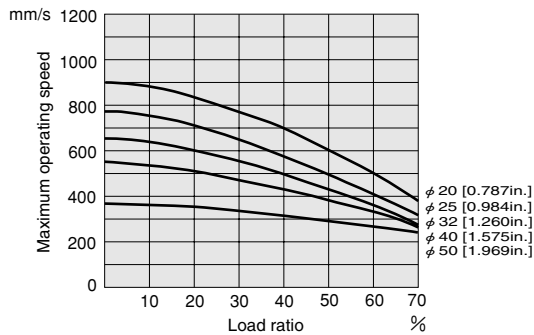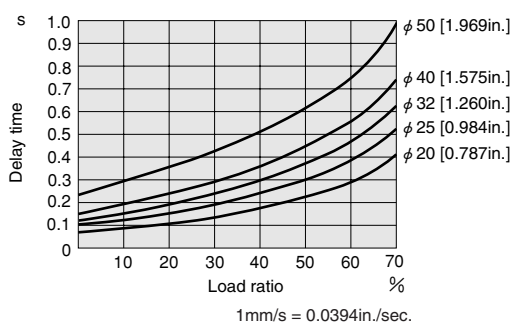
100-4E1, 100-4E2

Measurement conditions

● Air pressure: 0.5MPa {5.1kgf/cm²} [73psi.]
● Piping inner diameter and length: φ 6×600mm
● Fitting: Quick fitting TS8-01
● Load ratio＝$\dfrac{\text{Load}}{\text{Cylinder theoretical thrust}}$ (%)
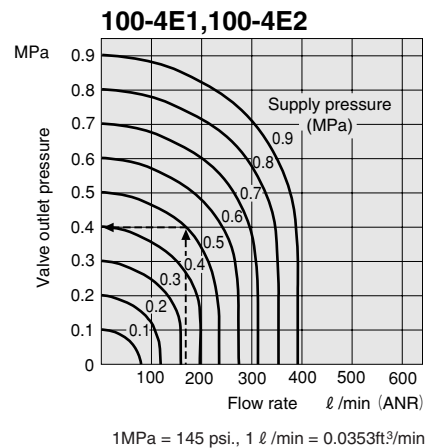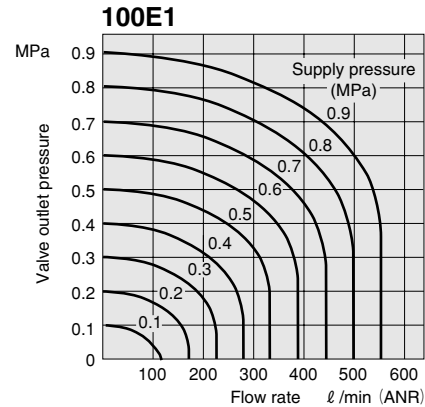● Cylinder stroke: 150mm [5.91in.]

Maximum operating speed

Delay time

1mm/s = 0.0394in./sec.

Flow Rate

100E1

100-4E1, 100-4E2

1MPa = 145 psi., 1 ℓ /min = 0.0353ft.³/min.

How to read the graph

When the supply pressure is 0.5MPa [73psi.] and flow rate is 175 ℓ /min [6.18ft.³/min.] (ANR), the valve outlet pressure becomes 0.4 MPa [58psi.].

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100 Series Solenoid Valve Order Codes

■2-, 3-port valve Number of ports	■2-, 3-port valve Valve function	■Mounting base	■Wiring type	■Speed controller	■Muffler	■LED indicator	■Flywheel diode
			●Lead wire length: 300mm [11.8in.] is standard.				
3-port	Normally closed (NC)	Without mounting base	Grommet type	Without speed controller	Without muffler	Without LED indicator	Without flywheel diode
Blank	**Blank**	**Blank**	**Blank**	**Blank**	**Blank**	**Blank**	**Blank**
2-port	Normally open (NO)Note	With mounting base	DIN connector	With speed controller	With muffler	With LED indicator	With flywheel diode
-2	**-11**	**-21**	**-39**	**-70**	**-75**	**-LF**	**-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.145.

		Basic model									Voltage
Direct piping	2-, 3-port single solenoid	**100E1**	-2Note4	-11Note2	-21	-39	-70	-75	-LF	-SR	DC24V AC100V AC200V
	5-port single solenoid	**100-4E1**									
	5-port double solenoid	**100-4E2**									
For manifold onlyNote1	2-, 3-port single solenoid	**M100E1**	-2	-11		-39		-75Note3	-LF	-SR	DC24V AC100V AC200V
	5-port single solenoid	**A100-4E1**									
	5-port double solenoid	**A100-4E2**									

Notes : 1. Cannot be used as a single unit.
2. For 2-port only. Always enter **100E1-2-11**. 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. For U, L type manifolds only.
4. A plug is included. Always install it in position before use.

● **M100E1** includes sub-plates for mounting on the F type manifold, gaskets, and mounting screws.
● When ordering the non-ion specification, enter **-NCU** after the basic model code.

● Not available with DIN connector.

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

Manifold Models and the Applicable Valves Basic Models

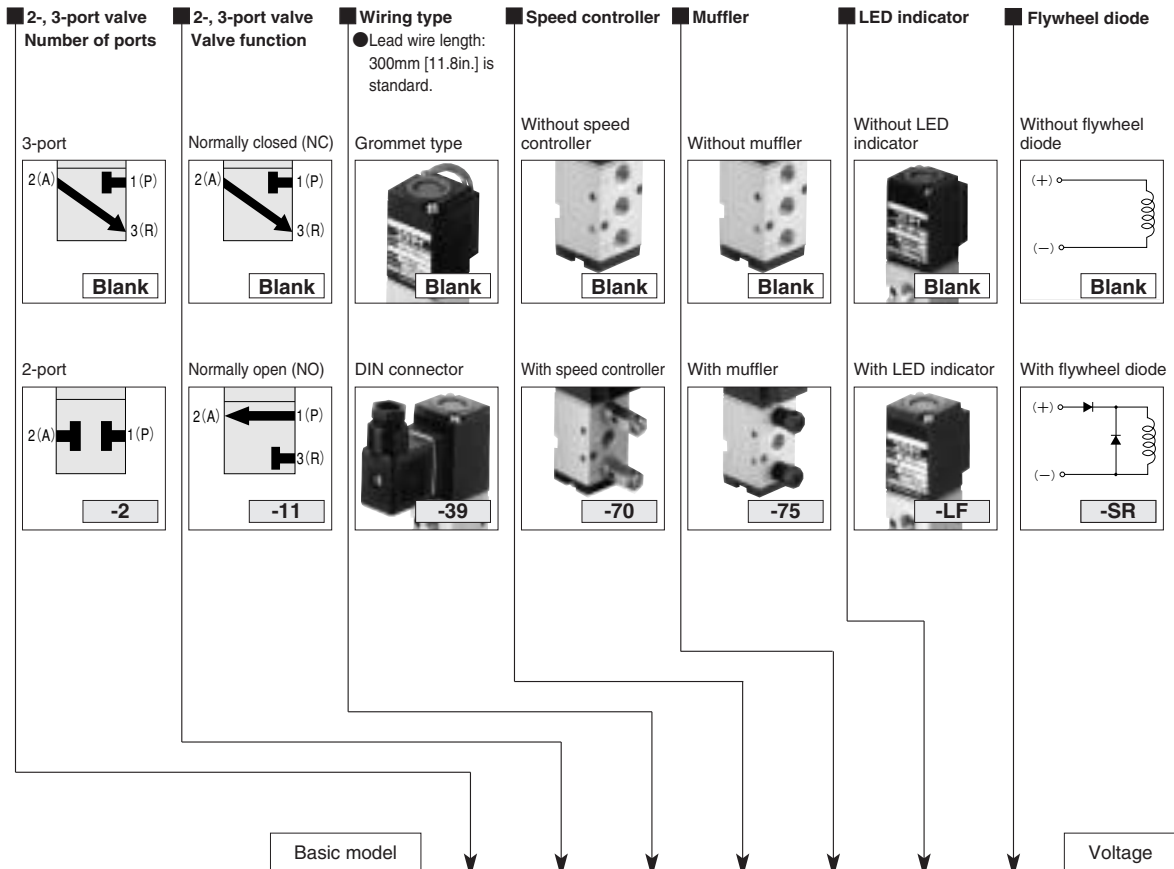| Valve specification / Manifold model	2-, 3-port Single solenoid	5-port Single solenoid	5-port Double solenoid
HM☐T	100E1 M100E1-11	——	
HM☐F	M100E1 M100E1-11	100-4E1	100-4E2
HM☐U	100E1 M100E1-11	100-4E1	100-4E2
HM☐L	100E1 M100E1-11		
HM☐A	——	A100-4E1	A100-4E2

● About M100E1

M100E1 is a dedicated valve for the manifold.
Differences with **100E1** are as shown in the table below:

Model	Point of difference	Remarks
M100E1	With sub-plateNote	For F type manifold only
M100E1-11	With sub-plateNote Port location	For T, F, U, L type manifolds

Note: The sub-plate is only used for mounting on F type manifolds. For details, see p.153.

100 Series Manifold Order Codes

2-, 3-port valve Number of ports	**2-, 3-port valve Valve function**	**Wiring type** ●Lead wire length: 300mm [11.8in.] is standard.	**Speed controller**	**Muffler**	**LED indicator**	**Flywheel diode**
3-port	Normally closed (NC)	Grommet type	Without speed controller	Without muffler	Without LED indicator	Without flywheel diode
Blank	**Blank**	**Blank**	**Blank**	**Blank**	**Blank**	**Blank**
2-port	Normally open (NO)	DIN connector	With speed controller	With muffler	With LED indicator	With flywheel diode
-2	**-11**	**-39**	**-70**	**-75**	**-LF**	**-SR**

2(A) — 1(P), 3(R) diagrams shown for each valve configuration.

Flywheel diode diagram: (+) / (−) with coil.

Order code table

			Basic model									Voltage
HM	2 ... 10	T	stn.□ ... stn.□	-100E1 / -M100E1 Note	-2	-11	-39			-LF	-SR	DC24V AC100V AC200V
		F	stn.□ ... stn.□	-M100E1 Note / -100-4E1 / -100-4E2	-2	-11	-39			-LF	-SR	DC24V AC100V AC200V
		U L	stn.□ ... stn.□	-100E1 / -M100E1 Note / -100-4E1 / -100-4E2	-2	-11	-39	-70	-75	-LF	-SR	DC24V AC100V AC200V
		A	stn.□ ... stn.□	-A100-4E1 / -A100-4E2			-39			-LF	-SR	DC24V AC100V AC200V

Note: **-M100E1** should be used in the normally open type (optional code: **-11**) only.

●Specify the valve model 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.

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

●For DC24V only. For AC100V and AC200V, equipped as standard.
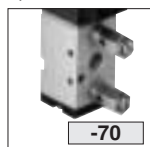
●Not available with DIN connector.
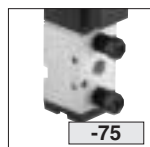
Options

Mounting base	Speed controller	Muffler	DIN connector	Built-in LED indicator	Built-in flywheel diode	Block-off plate
-21	**-70**	**-75**	**-39**	**-LF**	**-SR**	**-BP**

- Mounting base **-21**: ●For direct piping ●Not available with double solenoid
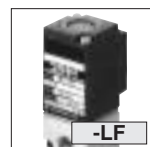- Speed controller **-70**: ●For direct piping ●Not available with 2-, 3-port
- DIN connector **-39**: ●Cannot be used with **-LF**
- Built-in flywheel diode **-SR**: ●Only for DC24V
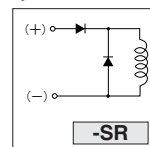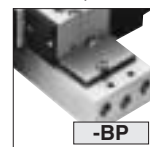
Operating Principles and Symbols

3-port
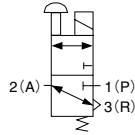
100E1

De-energized
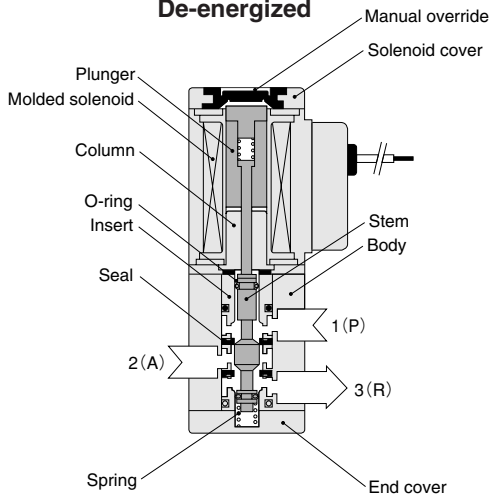
Major Parts and Materials

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

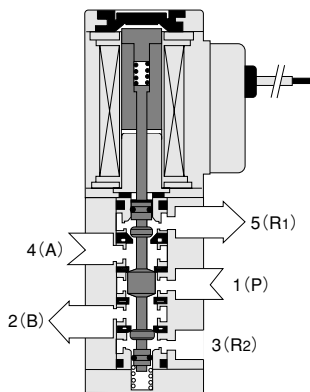Remark: Materials that generate copper ions are not used for the non-ion specification.

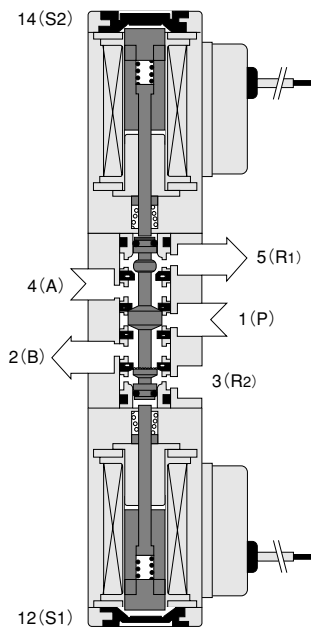### 5-port

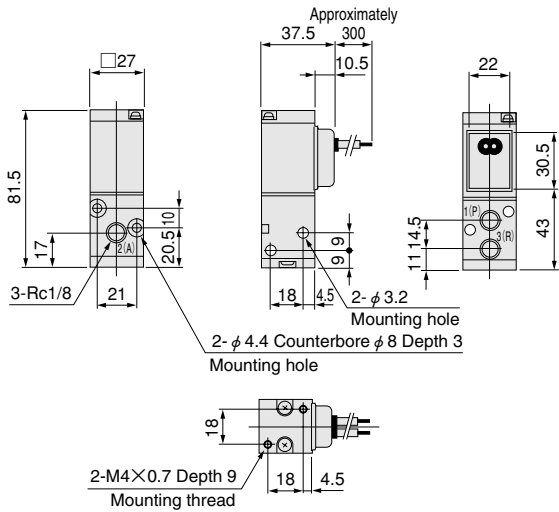**Single solenoid**   **Double solenoid**
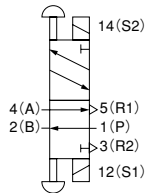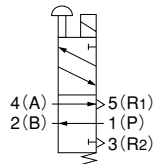
100-4E1

De-energized

100-4E2

(De-energized condition after energizing solenoid 12(S1))
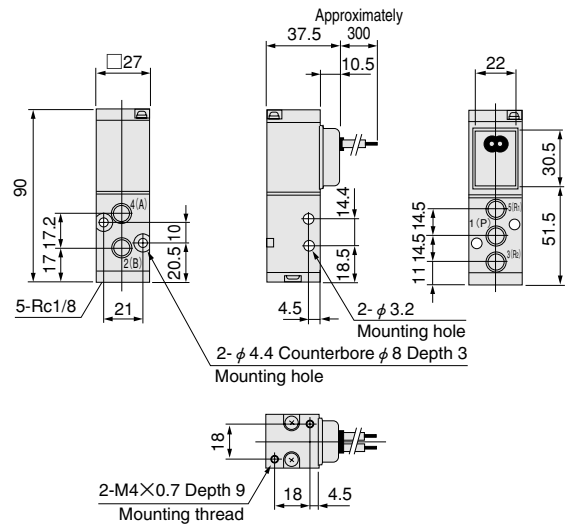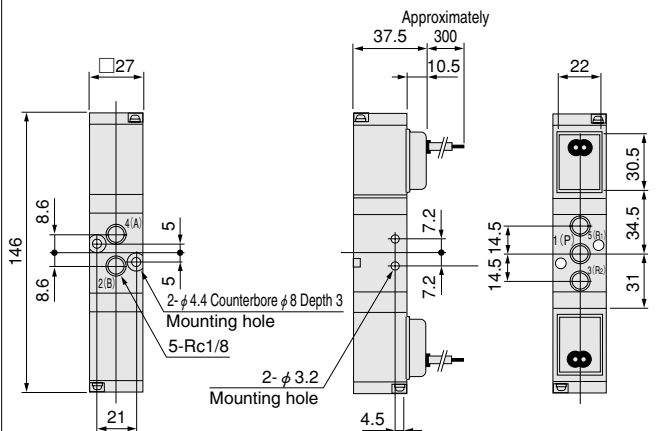
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Dimensions of Solenoid Valve (mm)

2-, 3-port

100E1

□27
Approximately 37.5 / 300
10.5
22
81.5
17
20.5 10
30.5
43
3-Rc1/8
21
2(A)
18 4.5
9 9
11 14.5
1(P)
3(R)
2-φ3.2
Mounting hole
2-φ4.4 Counterbore φ8 Depth 3
Mounting hole

18
2-M4×0.7 Depth 9
Mounting thread
18 4.5

5-port

100-4E1

□27
Approximately 37.5 / 300
10.5
22
90
17 17.2
20.5 10
14.4
30.5
51.5
5-Rc1/8
21
4(A)
2(B)
18.5
4.5
11 14.5 14.5
1(P)
5(R)
3(R)
2-φ3.2
Mounting hole
2-φ4.4 Counterbore φ8 Depth 3
Mounting hole

18
2-M4×0.7 Depth 9
Mounting thread
18 4.5

100-4E2

□27
Approximately 37.5 / 300
10.5
22
146
8.6
8.6
5
5
4(A)
2(B)
7.2
7.2
7.2
30.5
34.5
31
14.5 14.5
1(P)
2-φ4.4 Counterbore φ8 Depth 3
Mounting hole
5-Rc1/8
21
2-φ3.2
Mounting hole
4.5

Options (mm)

● Mounting base: **-21**

A
6
2
4(A)
2(B)
Mounting hole
(2 places)
26
4.5
38
40
48
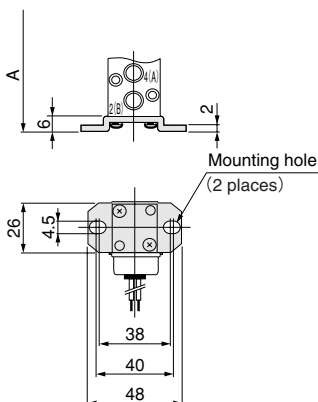
● Solenoid with DIN connector: **-39**

φ6～φ8
Cabtyre outer diameter
21
φ18
Pg9
16
Width across flats
69.5
(10)
40
B
4(A)

● Solenoid with LED indicator: **-LF**

LED indicator
4(A)
2(B)

● Speed controller: **-70**

25
11.4
R1/8
(21)
10
Width across flats

● Muffler: **-75**

16
10
10
Width across flats
φ9.8
(11.5)
R1/8
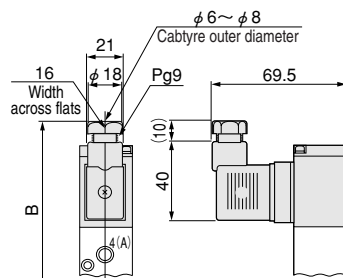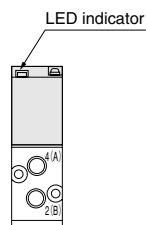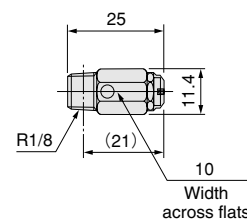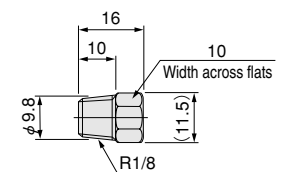
| Model	Code	A	B	Remarks
100E1		87.5	94	A: Overall length to the top surface of the valve
100-4E1		96	103	B: Overall length to the bottom of the valve
100-4E2		—	172	Overall length to the end of the opposite side solenoid

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Dimensions of Manifold (mm)

For 2-, 3-port

HM☐T
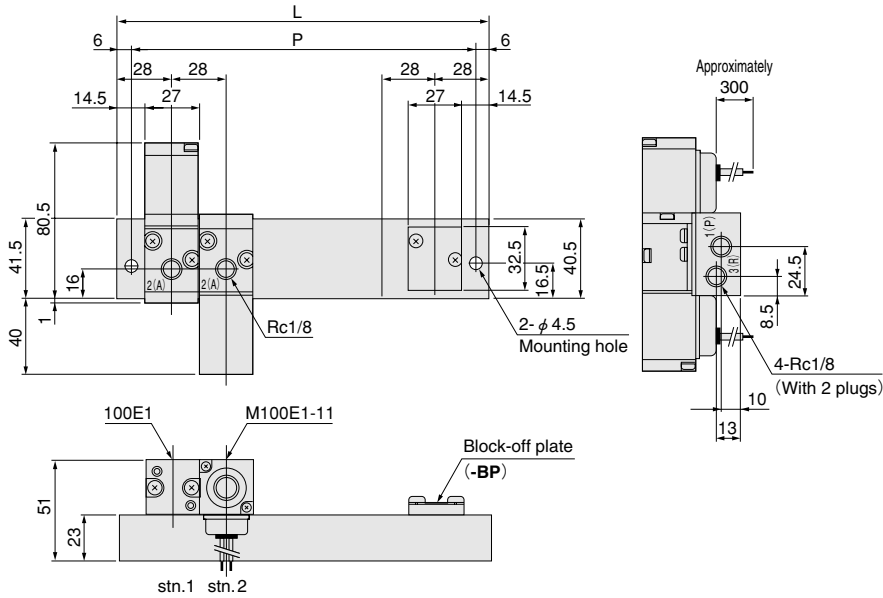
Unit dimensions

Model	L	P
HM2T	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

HM☐F
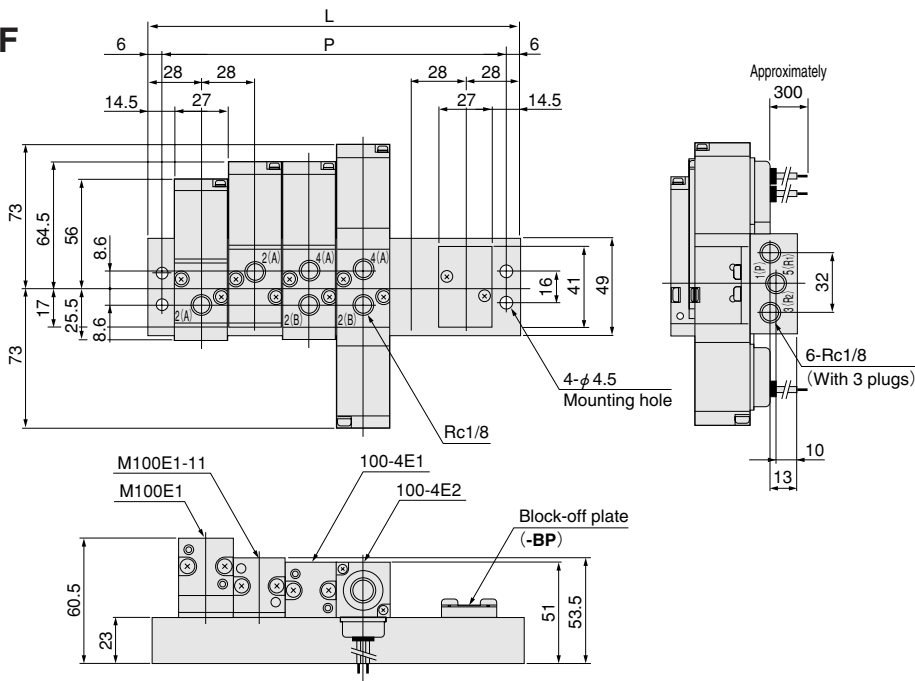
Unit dimensions

Model	L	P
HM2F	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 HM☐F**

1. Mounting normally closed type

M100E1
Gasket
Sub-plate
Sub-plate

Standard attachment for M100E1 (additional mass 42g [1.48oz.])
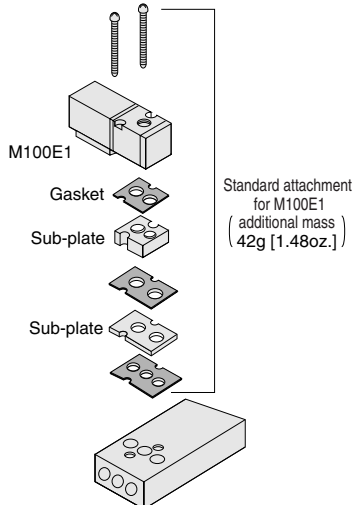
2. Mounting normally open type

M100E1-11

Standard attachment for M100E1-11 (additional mass 20g [0.71oz.])
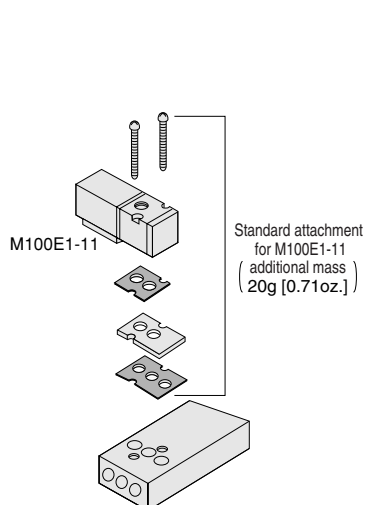
3. Mounting normally closed or normally open with DIN connector

M100E1-39, M100E1-11-39

Standard attachment for M100E1-39, M100E1-11-39 (additional mass 20g [0.71oz.])

153
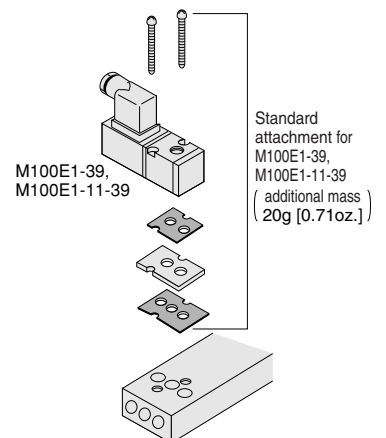
Dimensions of Manifold (mm)

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

HM□U

M100E1-11
100E1
100-4E1
100-4E2
Block-off plate (-**BP**)

stn.1 stn.2 stn.3 stn.4
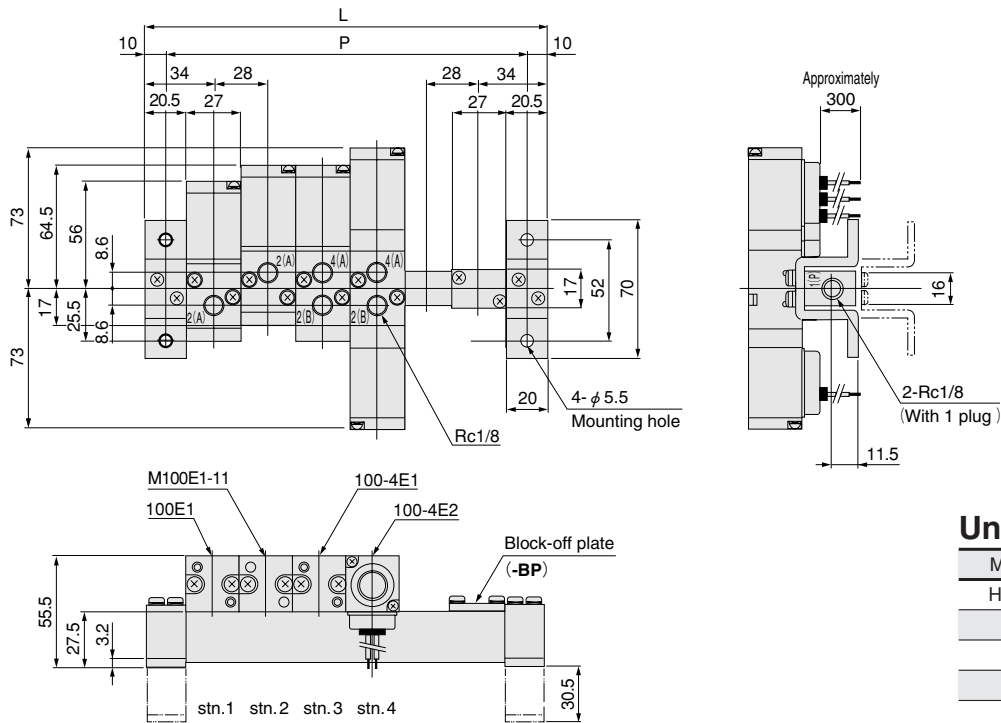
Unit dimensions

Model	L	P
HM2U	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

HM□L

M100E1-11
100E1
100-4E1
100-4E2
Block-off plate (-**BP**)

stn.1 stn.2 stn.3 stn.4
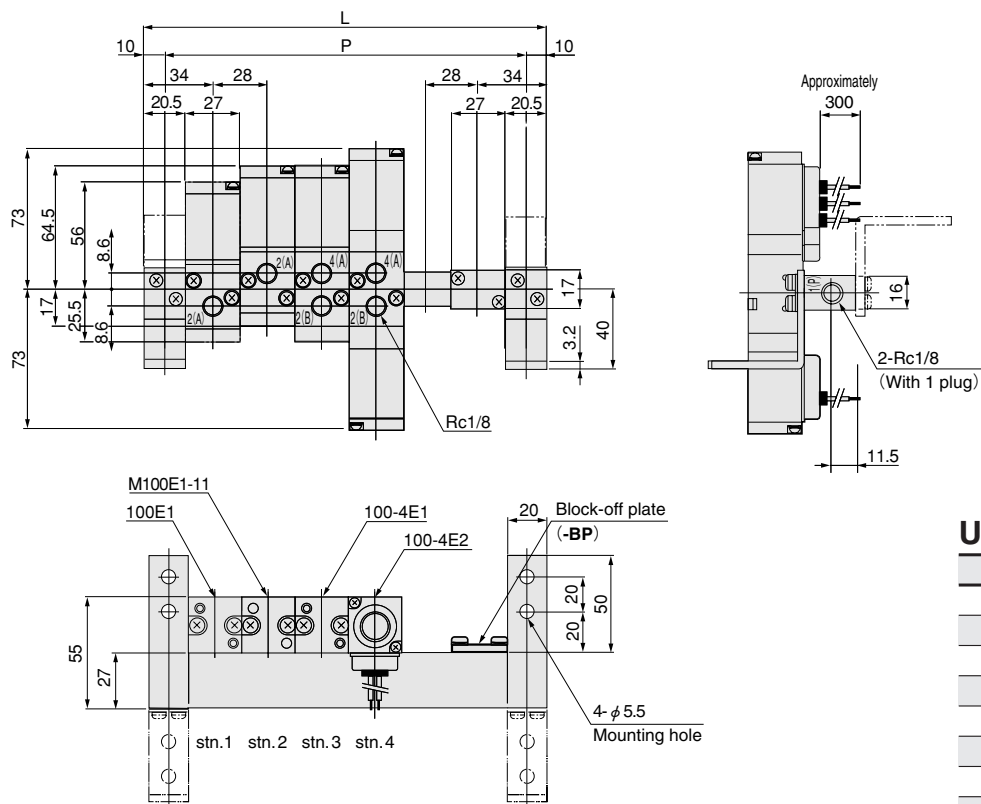
Unit dimensions

Model	L	P
HM2L	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

SOLENOID VALVES 100 SERIES

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For 5-port

HM☐A

A100-4E1   A100-4E2

Block-off plate
(-BP)

stn. 1   stn.2

6-Rc1/8
(With 3 plugs)

4-φ4.5
Mounting hole

Rc1/8
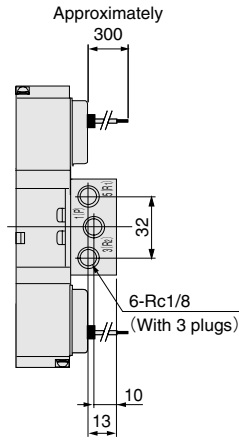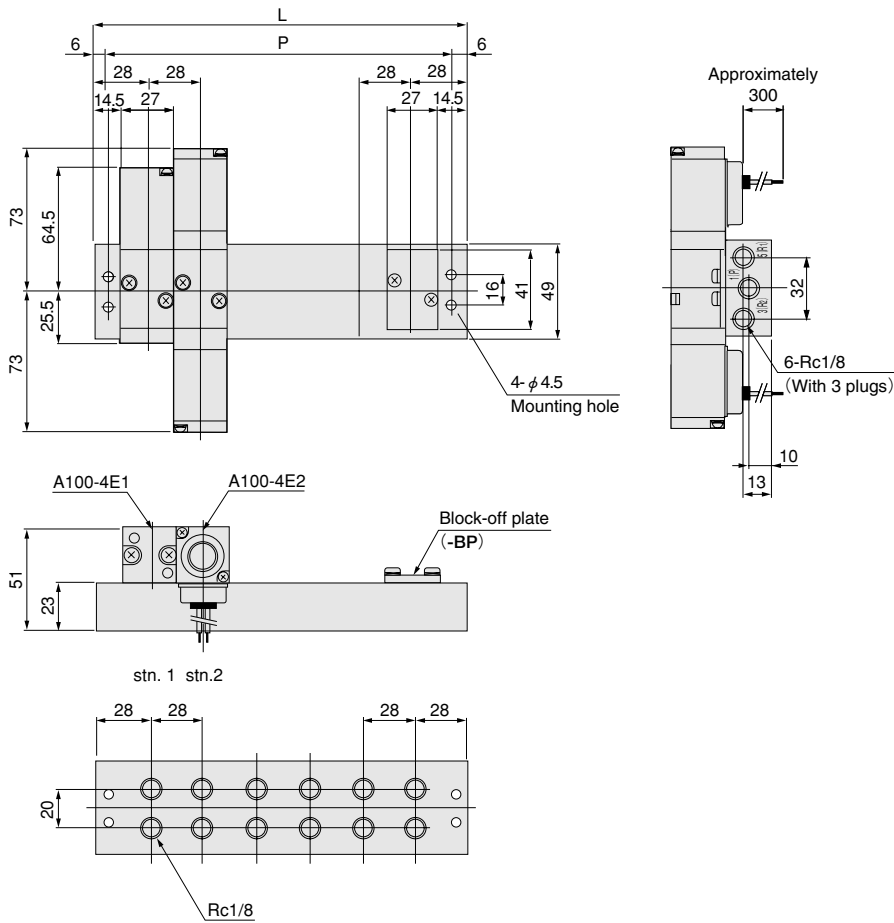
Unit dimensions

Model	L	P
HM2A	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.152.

Handling Instructions and Precautions

⚡ Solenoid

Internal circuit

● **DC24V**
Standard solenoid

Red ○
Red ○

Solenoid with LED indicator
Order code: -LF

LED indicator
（Light Emitting Diode）
Red（＋）
Blue（−）
LED indicator: Red
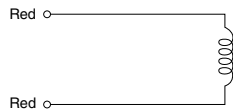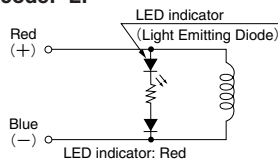
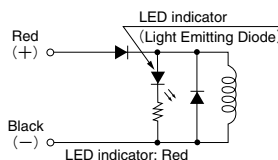**Solenoid (Surge suppression)**
Order code: -SR

Red or ①（＋）○
Black or ②（−）○
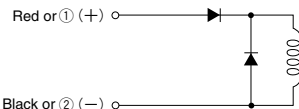
① and ② are for with DIN connector (order code: -39).

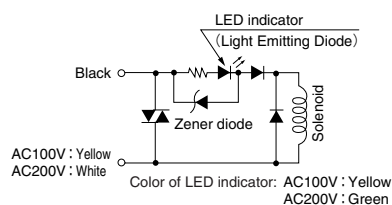**Solenoid with LED indicator (Surge suppression)**
Order code: -LF-SR

LED indicator
（Light Emitting Diode）
Red（＋）
Black（−）
LED indicator: Red

● **AC100V, AC200V (Surge suppression)**
Standard solenoid
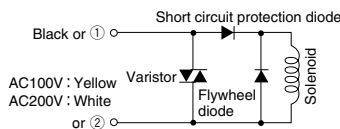
Short circuit protection diode
Black or ①
AC100V : Yellow
AC200V : White
or ②
Varistor
Flywheel diode
Solenoid

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

Solenoid with LED indicator
Order code: -LF

LED indicator
（Light Emitting Diode）
Black
AC100V : Yellow
AC200V : White
Zener diode
Solenoid
Color of LED indicator: AC100V : Yellow
AC200V : Green

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.

👆 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).
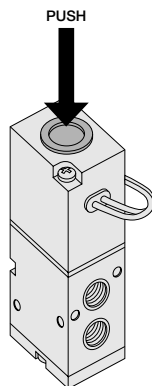
PUSH

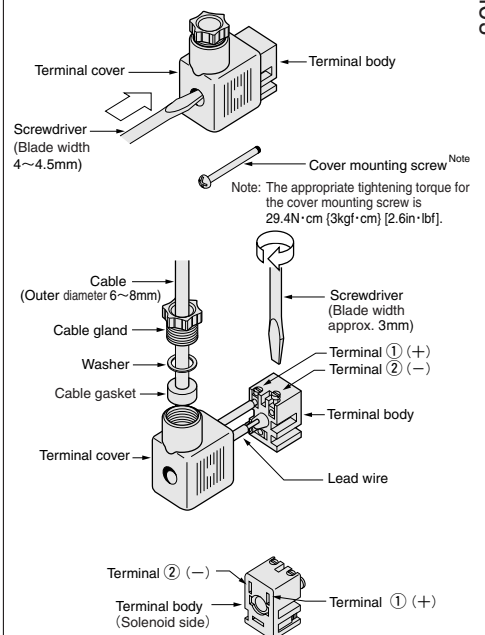※Illustration shows the 200 series.
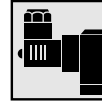
DIN connector

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.]).

Terminal cover
Terminal body
Screwdriver
(Blade width 4～4.5mm)
Cover mounting screw[Note]
Note: The appropriate tightening torque for the cover mounting screw is 29.4N·cm {3kgf·cm} [2.6in·lbf].

Cable
(Outer diameter 6～8mm)
Cable gland
Washer
Cable gasket
Terminal cover
Screwdriver
(Blade width approx. 3mm)
Terminal ①（＋）
Terminal ②（−）
Terminal body
Lead wire

Terminal ②（−）
Terminal body
(Solenoid side)
Terminal ①（＋）

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