

**KOGANEI**

Air Valve

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**SOLENOID VALVES 300 SERIES**

**INSTRUCTION MANUAL** Ver.1.0

## Handling Instructions and Precautions

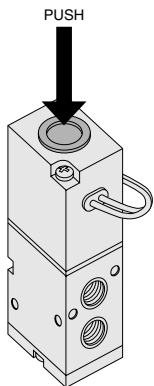


### Manual override

#### Non-locking type

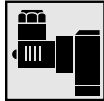
To operate the manual override, press it all the way down. For the single solenoid, the valve works the same as when in the energized state as long as the manual override is pushed down, and returns to the normal position upon release.

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



※ Illustration shows the 200 series.

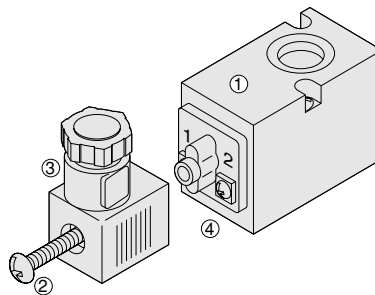
**Caution:** The 300 series valves are internal pilot type solenoid valves. As a result, the manual override cannot switch the main valve without air supplied from the 1(P) port.



### Terminal connector

#### Wiring instructions

- Remove the terminal cover mounting screw ②, pull out and lift off the terminal cover ③ from the solenoid body ①.
- Insert the cable from the wiring port on the terminal cover ③, and connect the cable to the terminal ④ of the solenoid body ①.
- While pulling the cable, position the terminal cover ③ on the solenoid body ①, and use the terminal cover mounting screw ② to secure the terminal cover on the solenoid body ① in place.



For DC 1: (+)  
2: (—)

# SOLENOID VALVES

## 300 SERIES

### Basic Models and Valve Functions

Basic model   Item	Standard type			Low current type		
	300-4E1	300-4E2	303-4E2	300-4LE1	300-4LE2	303-4LE2
	A300-4E1	A300-4E2	A303-4E2	A300-4LE1	A300-4LE2	A303-4LE2
	W300-4E1	W300-4E2	—	—	—	—
Number of positions	2		3	2		3
Number of ports	5					
Valve function	Single solenoid	Double solenoid	Double solenoid	Single solenoid	Double solenoid	Double solenoid

Remark: For optional specifications and order codes, see p.711.

### Specifications

Basic model Item	Standard type			Low current type		
	300-4E1	300-4E2	303-4E2	300-4LE1	300-4LE2	303-4LE2
	A300-4E1	A300-4E2	A303-4E2	A300-4LE1	A300-4LE2	A303-4LE2
	W300-4E1	W300-4E2	—	—	—	—
Media	Air					
Operation type	Internal pilot type					
Effective area [Cv]	mm <sup>2</sup>	25 [1.39]	20 [1.11]	25 [1.39]	20 [1.11]	
Port size <sup>Note</sup>	Rc1/4 or Rc3/8 (3 (R2) , 5 (R1) port: Rc1/4)					
Lubrication	Not required					
Operating pressure range MPa[kgf/cm <sup>2</sup> ] [psi.]	0.15~0.9 {1.5~9.2} [22~131]					
Proof pressure MPa[kgf/cm <sup>2</sup> ] [psi.]	1.35 {13.8} [196]					
Response time ms	DC24V	20/25 or below	20 or below	20 or below	20/25 or below	25 or below
ON/OFF	AC100V, AC200V	20/25 or below	20 or below	20 or below	—	—
Maximum operating frequency Hz	5					
Minimum time to energize for self holding ms	—	50	—	50	—	—
Operating temperature range (atmosphere and media) °C [°F]	5~50 [41~122]					
Shock resistance m/s <sup>2</sup> {G}	980.7 {100.0} (Axial direction 294.2 {30.0})	980.7 {100.0} (Axial direction 294.2 {30.0})	980.7 {100.0} (Axial direction 294.2 {30.0})	980.7 {100.0} (Axial direction 294.2 {30.0})	980.7 {100.0} (Axial direction 294.2 {30.0})	980.7 {100.0} (Axial direction 294.2 {30.0})
Mounting direction	Any					

Note: For details, see the port size.

### Solenoid Specifications

Rated voltage Item	Standard type			Low current type	
	DC24V	AC100V	AC200V	DC24V	
Type	—	Shading coil type			—
Operating voltage range V	21.6~26.4 (24±10%)	90~130 (100±30%)	180~260 (200±30%)	21.6~26.4 (24±10%)	
Current <sup>Note</sup> (when rated voltage is applied)	Frequency Hz	—	50 60	50 60	—
	Starting mA(r.m.s)	—	106 94	51 46	—
	Energizing mA(r.m.s)	240 (5.8W) [252 (6.0W)]	55 [57] 44 [44]	27 [26] 22 [21]	100 (2.4W)
Insulation resistance MΩ	Over 10				Over 10
Wiring type and lead wire length	Standard	Grommet type: 300mm [11.8in.]			Grommet type: 300mm [11.8in.]
	Optional	With terminal			With terminal
Color of lead wire	Red	Yellow	White	Red	
LED indicator	Red	Yellow	Green	Red	
Surge suppression	Standard	—	—	—	
	Optional	—	—	Flywheel diode	
	Made to order	—	The solenoid with LED indicator includes a surge absorber	—	

Note: Figures in brackets [ ] are for solenoids with LED indicators.

### Solenoid Valve Port Size

Basic model	Port specification	Port size
300-4E1, 300-4E2 303-4E2	Standard	Female thread Rc1/4
300-4LE1, 300-4LE2 303-4LE2	Optional	Female thread Rc3/8 (3 (R2) , 5 (R1) port : Rc1/4)

### Manifold Connection Port Size

Manifold model	Port	Location of piping connection	Port size
FM□A	1(P),3(R2),5(R1)	Manifold	Rc1/2
	4(A), 2(B)	Manifold	Rc1/4, Rc3/8
FM□F	1(P),3(R2),5(R1)	Manifold	Rc1/2
	4(A), 2(B)	Valve	Rc1/4, Rc3/8
FM□U	1(P)	Manifold	Rc1/2
FM□L	4(A),2(B),3(R2),5(R1)	Valve	Rc1/4, Rc3/8
FM□W	1(P),3(R2),5(R1)	Manifold	Rc1/2
	4(A), 2(B)	Manifold	Rc1/4, Rc3/8

## Solenoid Valve Mass (Standard type)

Basic model	Mass
300-4E1	310 [10.93]
300-4E2	460 [16.23]
303-4E2	560 [19.75]
A300-4E1	320 [11.29]
A300-4E2	470 [16.58]
A303-4E2	570 [20.11]
W300-4E1	320 [11.29]
W300-4E2	470 [16.58]

## (Low current type)

Basic model	Mass
300-4LE1	410 [14.46]
300-4LE2	640 [22.57]
303-4LE2	750 [26.46]
A300-4LE1	420 [14.81]
A300-4LE2	650 [22.93]
A303-4LE2	760 [26.81]

## Manifold Mass

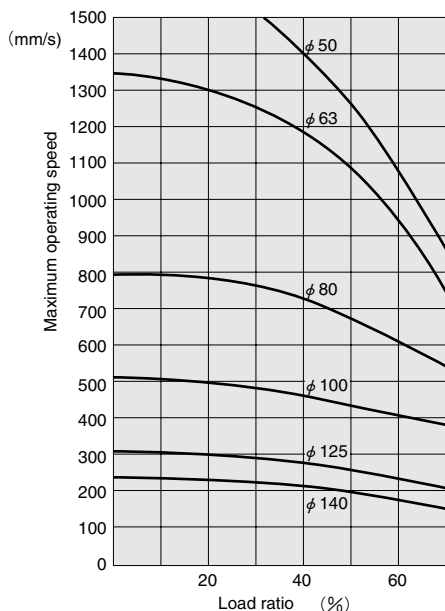
g [oz.]

Manifold model	Mass calculation of each unit (n=number of units)	Block-off plate
FM□A	$(180 \times n) + 200$ [(6.35 × n) + 7.05]	45 [1.59]
FM□F	$(190 \times n) + 200$ [(6.70 × n) + 7.05]	45 [1.59]
FM□U FM□L	$(40 \times n) + 200$ [(1.41 × n) + 7.05]	15 [0.53]
FM□W	$(210 \times n) + 250$ [(7.41 × n) + 8.82] When mounting E2 $(230 \times n) + 350$ [(8.11 × n) + 12.35]	45 [1.59]

## Cylinder Operating Speed

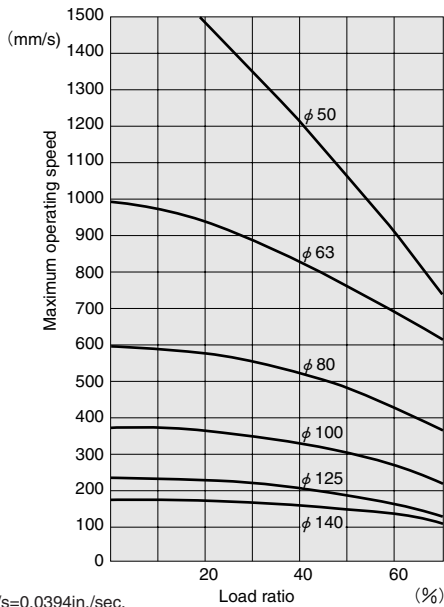
Piping length 1000mm [39in.]

### Maximum operating speed



Piping length 5000mm [197in.]

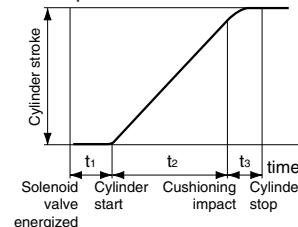
### Maximum operating speed



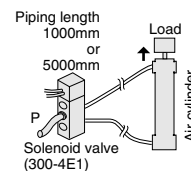
The graphs at left show the maximum operating speed for cylinders with piping lengths of 1000mm [39in.] or 5000mm [197in.].

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

### Cylinder speed curve



### Measurement conditions

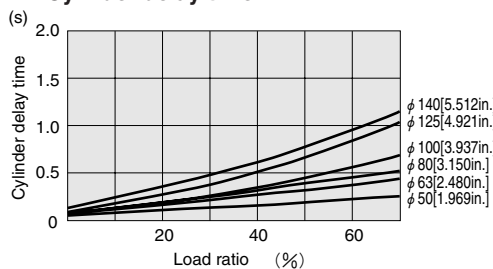


- Supply pressure: 0.5MPa [73psi.]
- Speed controller: None
- Piping and fitting inner diameter: φ8 [0.31in.]
- Cylinder stroke: 300mm [11.8in.]
- Load ratio =  $\frac{\text{Load}}{\text{Cylinder theoretical thrust}}$  (%)

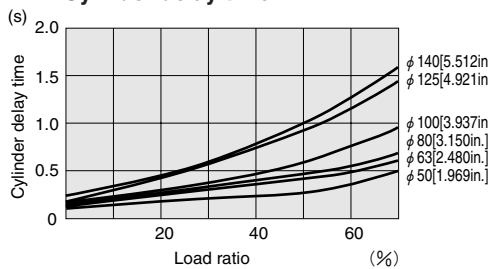
● Caution  
While the actual speed of an air cylinder in application depends on the load, cushion, and stopper configuration, in general, use a speed of 500mm/s [19.7in./sec.] or less.

● A built-in type speed controller can cause a reduction in operating speed of about 20%.

### Cylinder delay time

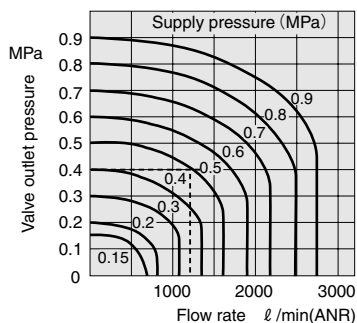


### Cylinder delay time



## Flow Rate

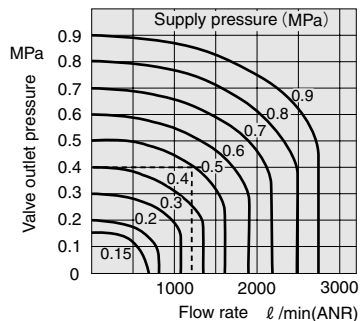
### 300-4E1 300-4E2



### How to read the graph

When the supply pressure is 0.5MPa [73psi.] and the flow rate is 1250 l/min [44.1ft<sup>3</sup>/min.] (ANR), the valve outlet pressure becomes 0.4MPa [58psi.].

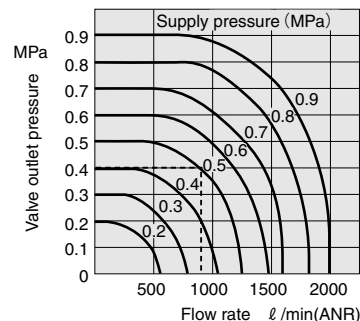
### 300-4LE1 300-4LE2



### How to read the graph

When the supply pressure is 0.5MPa [73psi.] and the flow rate is 1250 l/min [44.1ft<sup>3</sup>/min.] (ANR), the valve outlet pressure becomes 0.4MPa [58psi.].

### 303-4E2 303-4LE2

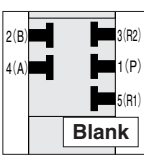
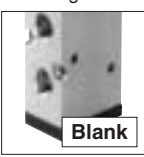

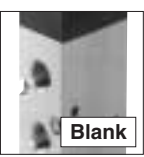
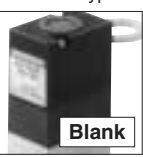
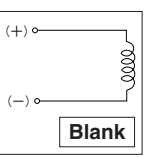
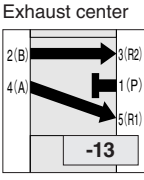

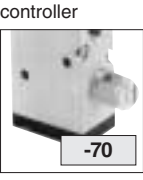
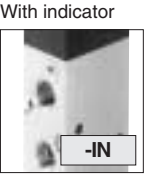

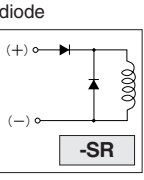


### How to read the graph

When the supply pressure is 0.5MPa [73psi.] and the flow rate is 900 l/min [31.8ft<sup>3</sup>/min.] (ANR), the valve outlet pressure becomes 0.4MPa [58psi.].

1MPa=145psi. 1 l/min.=0.0353ft<sup>3</sup>/min.

# Solenoid Valve, Air Piloted Valve Order Codes (Standard Type, Low Current Type)

		3-position valve Valve function	Port size	Mounting base	Speed controller	Indicator	Wiring type	Flywheel diode		
		Closed center  Blank	Blank: Rc1/4 -03: Rc3/8 (3 (R2), 5 (R1) ports: Rc1/4)	Without mounting base  Blank	Without speed controller  Blank	Without indicator  Blank	Grommet type  Blank	Without flywheel diode  Blank		
		Exhaust center  -13		With mounting base  -21 For single solenoid only	With speed controller  -70	With indicator  -IN	With terminal  -T	With flywheel diode  -SR		
		Basic model							Voltage	
For F, U, L type manifolds	Single solenoid	300-4E1							AC100V AC200V DC24V	
	2-position double solenoid	300-4E2		-03	-21	-70	-IN	-T		
	3-position double solenoid	303-4E2	-13							
For A type manifold	Single solenoid	A300-4E1							AC100V AC200V DC24V	
	2-position double solenoid	A300-4E2					-IN	-T		
	3-position double solenoid	A303-4E2	-13							
For W type manifold	Single solenoid	W300-4E1					-IN		AC100V AC200V DC24V	
	2-position double solenoid	W300-4E2								
For F, U, L type manifolds (low current type)	Single solenoid	300-4LE1			-21				DC24V	
	2-position double solenoid	300-4LE2		-03		-70				
	3-position double solenoid	303-4LE2	-13							
	Single solenoid	A300-4LE1					-IN	-T		
	2-position double solenoid	A300-4LE2								
	3-position double solenoid	A303-4LE2	-13					-SR		
Direct piping air piloted valve (made to order)	Single pilot	300-4A			-21	-70			-IN	
	Double pilot	300-4A2		-03						
Base piping air piloted valve (made to order)	Single pilot	A300-4A								
	Double pilot	A300-4A2								

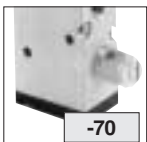
● Solenoid with flywheel diode is surge suppression type solenoid.

## Options

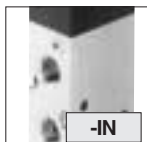
Mounting base



Speed controller



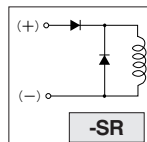
Indicator



Wiring type



Flywheel diode



● For direct piping  
● Not available for double solenoid

● For direct piping

● With terminal

Manifold Order Codes

Manifold Port size

Blank: Rc1/4  
-03: Rc3/8  
(1(P), 3(R2), 5(R1)  
ports: Rc1/2)

3-position valve Valve function

Closed center  
2(B) 3(R2)  
4(A) 1(P) 5(R1)  
Blank

Exhaust center  
2(B) 3(R2)  
4(A) 1(P) 5(R1)  
-13

Port size

Blank: Rc1/4  
-03: Rc3/8  
(1(P), 3(R2), 5(R1)  
ports: Rc1/2)

Indicator

Without indicator  
Blank

With indicator  
-IN

Wiring type

Grommet type  
Blank

With terminal  
-T

Flywheel diode

Without flywheel diode  
Blank

With flywheel diode  
-SR

Basic model

Voltage

Manifold for mounting 5-port valves (standard type)	FM	2 : 10	F	UL	stn.□ : stn.□	-300-4E1 -300-4E2 -303-4E2	-13	-03	-IN	-T	AC100V AC200V DC24V	
			A	-03	stn.□ : stn.□	-A300-4E1 -A300-4E2 -A303-4E2	-13	-IN	-T	AC100V AC200V DC24V		
			W	stn.□ : stn.□	-W300-4E1 -W300-4E2	-IN	AC100V AC200V DC24V					
			F	UL	stn.□ : stn.□	-300-4LE1 -300-4LE2 -303-4LE2	-13	-03	-IN	-T	-SR	DC24V
			A	-03	stn.□ : stn.□	-A300-4LE1 -A300-4LE2 -A303-4LE2	-13	-IN	-T	-SR	DC24V	
			F	UL	stn.□ : stn.□	-300-4A -300-4A2 -A300-4A -A300-4A2	-03	-IN				

● 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.

Made to Order

Air piloted valves 300 series

Grommet type with LED indicator

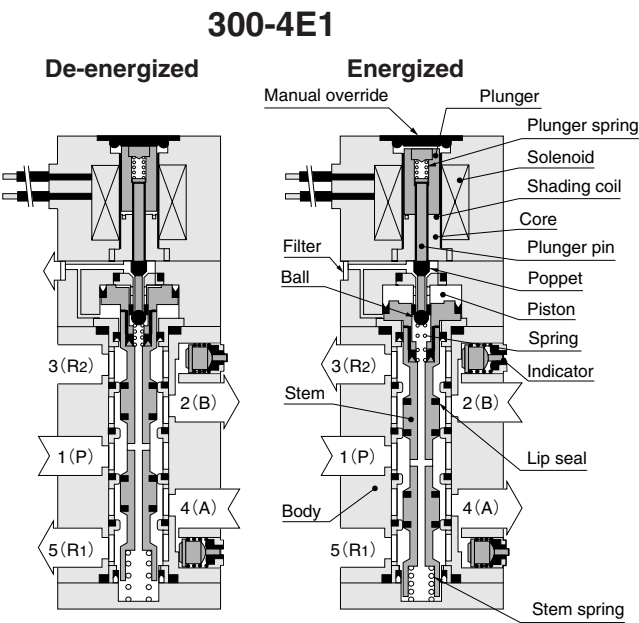
5-port, 2-position

Single pilot

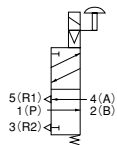
Double pilot

Operating Principles and Symbols

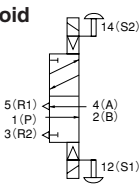
5-port, 2-position



Single solenoid

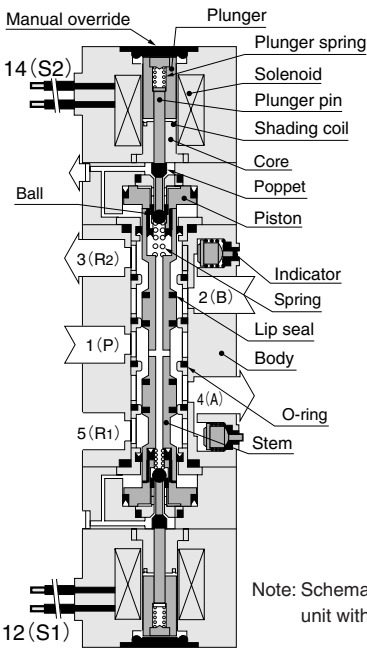


Double solenoid

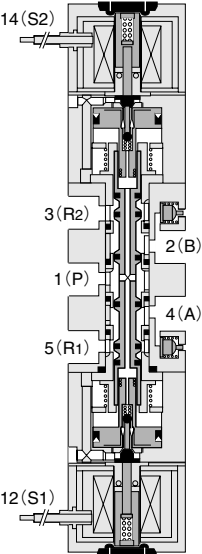
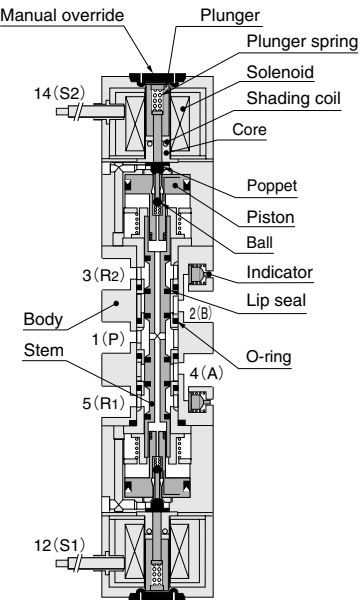
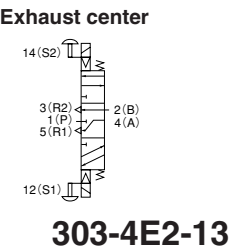
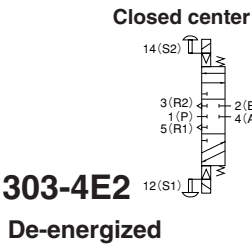


**300-4E2**

(De-energized condition after energizing solenoid 14(S2))



5-port, 3-position

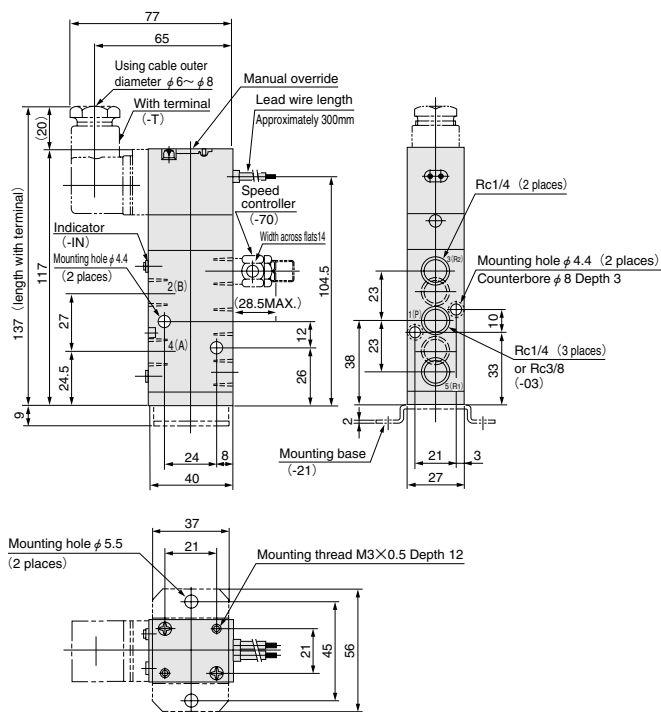


Major Parts and Materials

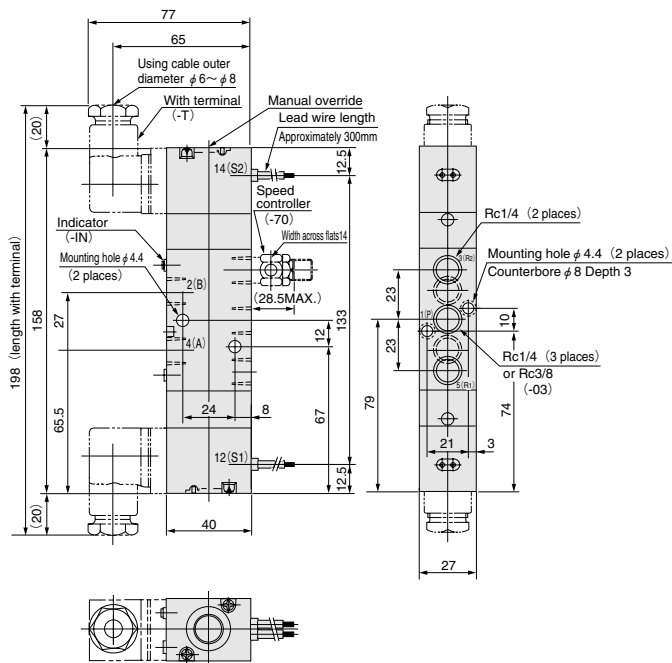
Parts		Materials
Valve	Body	Aluminum alloy
	Stem	(anodized)
	Plunger	
	Plunger pin	Stainless steel
	Stem spring	
	Lip seal	Synthetic rubber
	Seal	
	O-ring	
	Insert	Aluminum alloy (anodized)
	Base	Mild steel (zinc plated)
Manifold	Body	Aluminum alloy (anodized)
	Block-off plate	Mild steel (zinc plated)
	Bracket	

## Dimensions of Standard Type Solenoid Valve (mm)

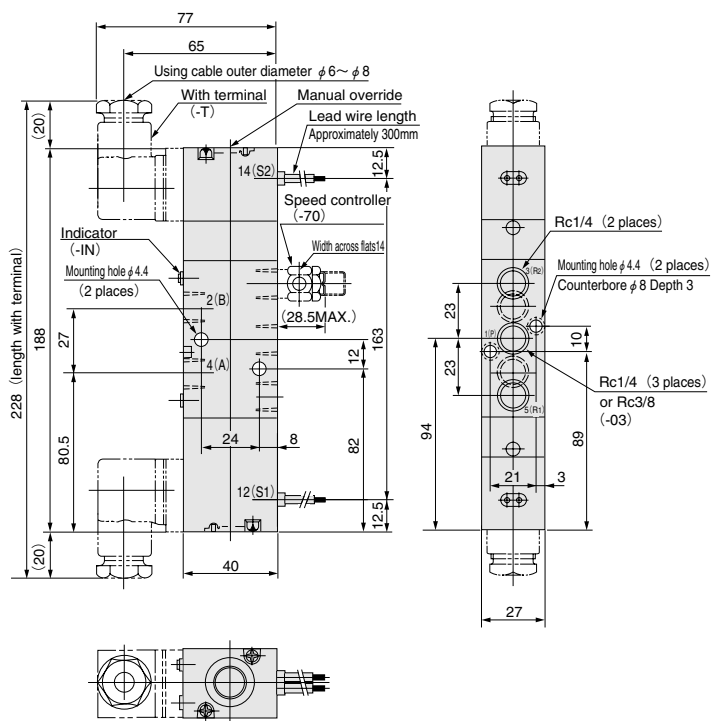
### 300-4E1



### 300-4E2



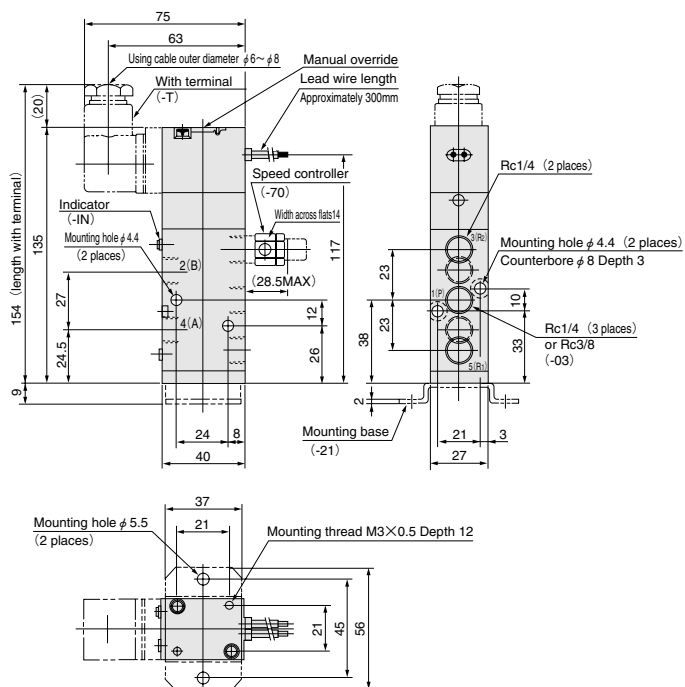
### 303-4E2



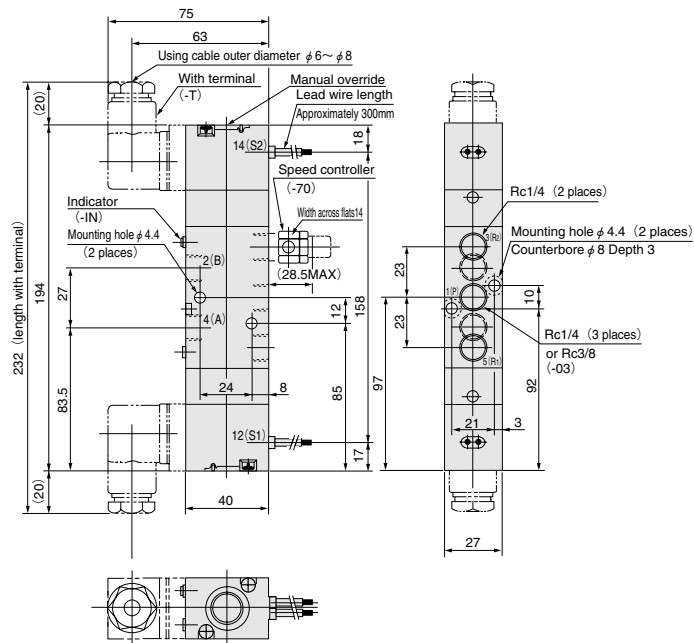


## Dimensions of Low Current Type Solenoid Valve (mm)

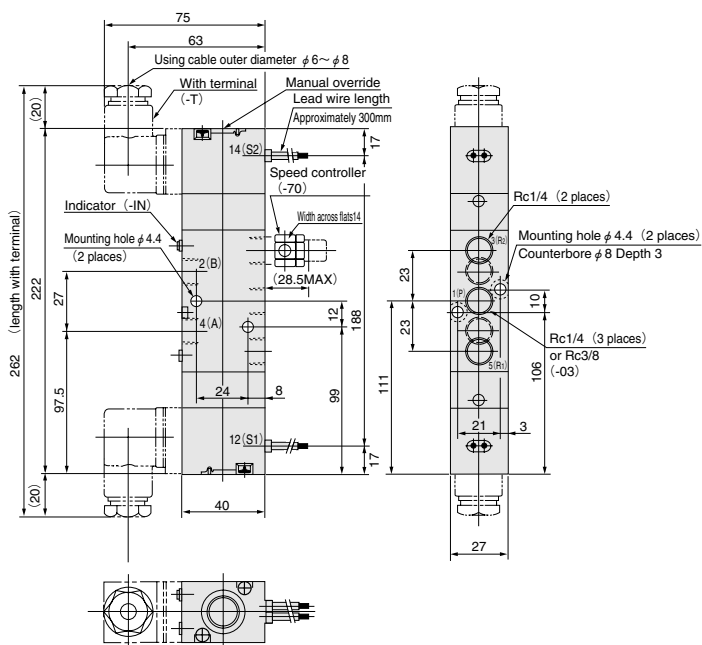
### 300-4LE1



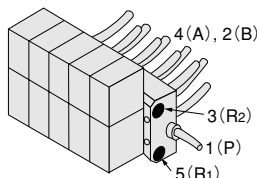
### 300-4LE2



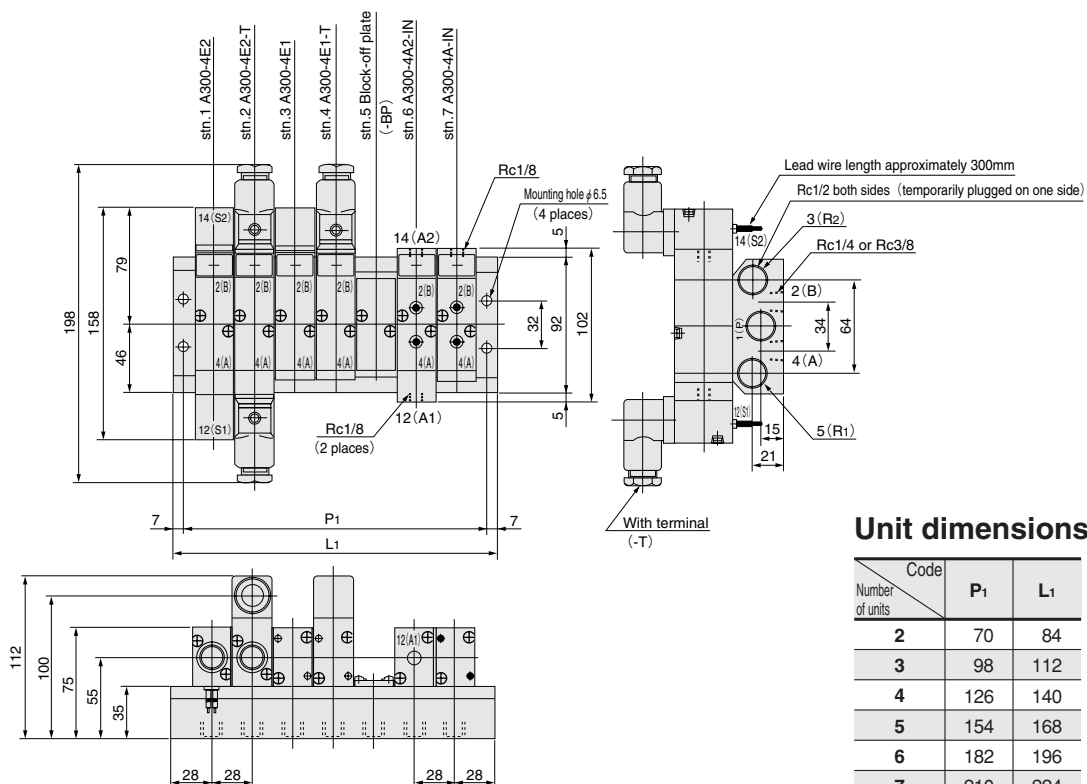
### 303-4LE2



## A type



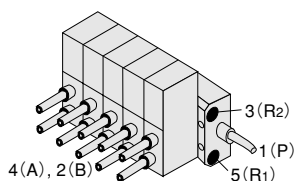
- The 4 (A) and 2 (B) ports are located on the bottom surface of the base, to allow direct piping from the inside of a control box to the outside.
- Enables collective piping of the 3 (R2) ; 5 (R1) ports.
- The valves that can be mounted are the ones for the A type manifold only.



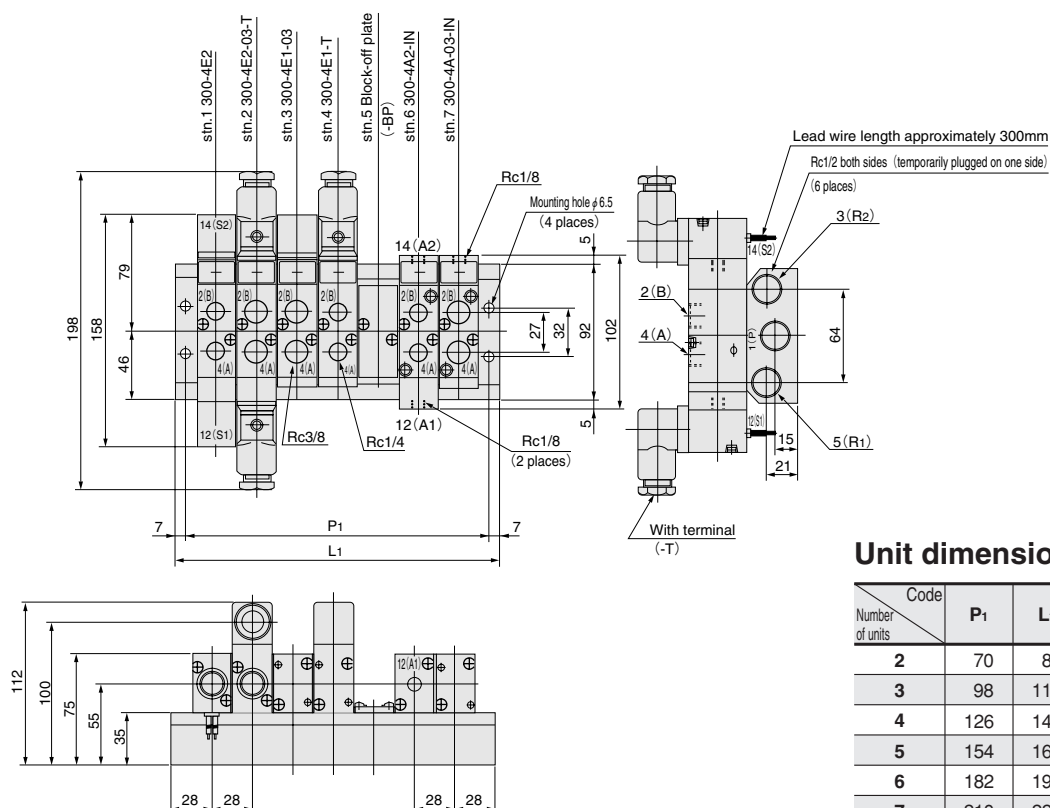
## Unit dimensions

Code Number of units	P <sub>1</sub>	L <sub>1</sub>
2	70	84
3	98	112
4	126	140
5	154	168
6	182	196
7	210	224
8	238	252
9	266	280
10	294	308

### F type



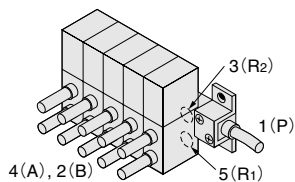
- Can be directly connected to the 4 (A) and 2 (B) ports of the valves, and the valves are the same as the single unit valves.
- Enables collective piping of the 3 (R2), 5 (R1) ports



## Unit dimensions

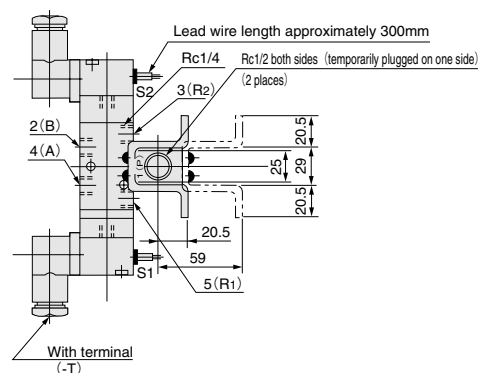
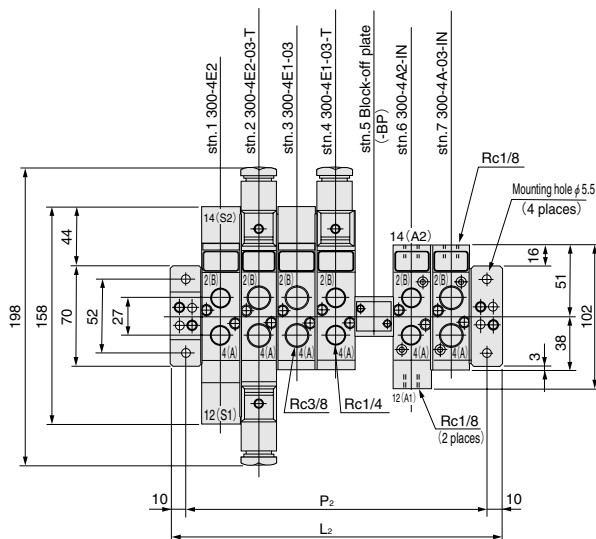
Code Number of units	P <sub>1</sub>	L <sub>1</sub>
2	70	84
3	98	112
4	126	140
5	154	168
6	182	196
7	210	224
8	238	252
9	266	280
10	294	308

## U Type



The individual port type is capable of preventing the effects of 3 (R2), 5 (R1) port back pressure.

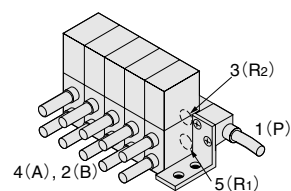
- Speed controller can be attached to the valves.
- Using valve is the same as a single-unit valve.
- Same as the L type manifold except the U type brackets are included.
- For the muffler on the 3(R2), 5(R1) ports, use the KM-22 type.



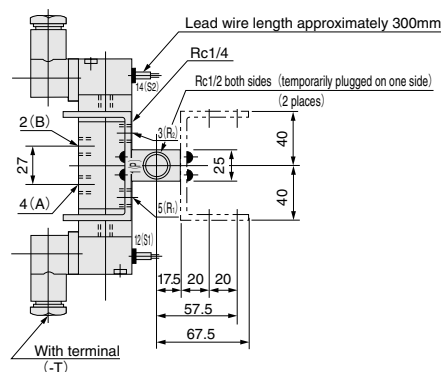
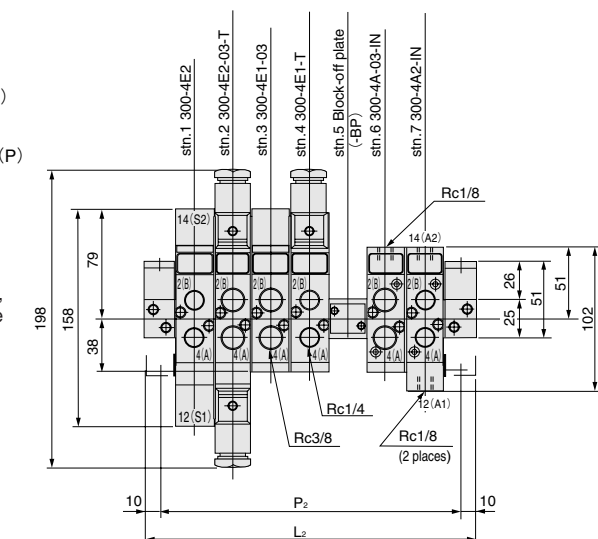
## Unit dimensions

Model Number of units	P <sub>2</sub>	L <sub>2</sub>
2	78	98
3	106	126
4	134	154
5	162	182
6	190	210
7	218	238
8	246	266
9	274	294
10	302	322

## L Type

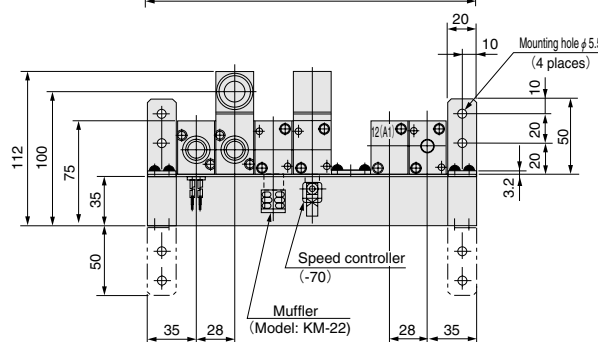


Same as the U type manifold, except the L type brackets are included.

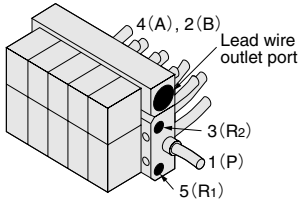


## Unit dimensions

Model Number of units	P <sub>2</sub>	L <sub>2</sub>
2	78	98
3	106	126
4	134	154
5	162	182
6	190	210
7	218	238
8	246	266
9	274	294
10	302	322

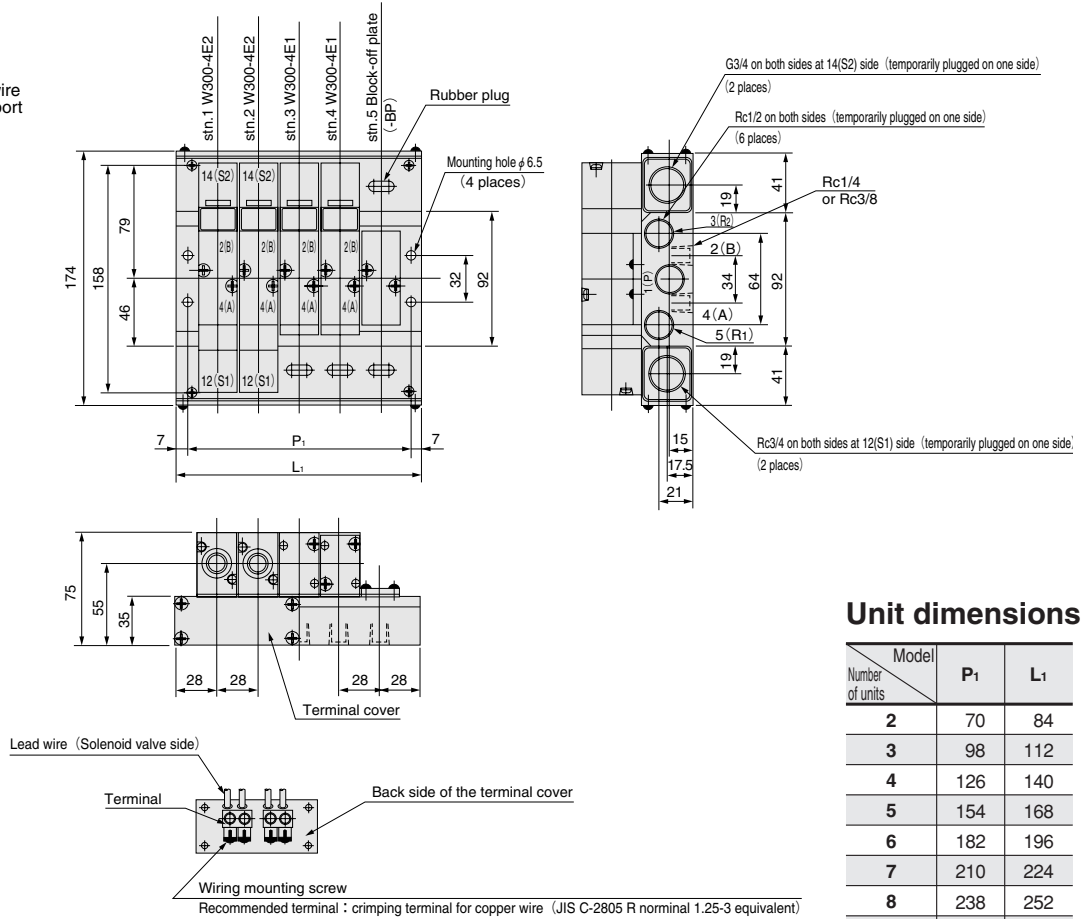


## W Type



It is a collective wiring type.  
Except that, it is the same as  
the A type manifold.

- Mountable valve types are for the W type manifold only. It is different from the A type valve for manifold use; that is, connectors are included in the lead wire, and an O-ring for the seal of the lead wire is also included.



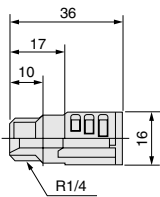
## Unit dimensions

Model \ Number of units	P <sub>1</sub>	L <sub>1</sub>
2	70	84
3	98	112
4	126	140
5	154	168
6	182	196
7	210	224
8	238	252
9	266	280
10	294	308

## Option

(For U type, L type manifolds)

## KM-22 Muffler



- Materials: Plastic
- Mass: 4.5g
- Effective area: 21mm<sup>2</sup>
- Noise suppressing effect: 18dB

## Made to Order

### Air piloted valves 300 series

- The optimum air valves for master valves or pilot valves for all-pneumatic control.



### Basic Models and Valve Functions

Basic model	300-4A	300-4A2
Item	A300-4A	A300-4A2
Number of positions	2	
Number of ports	5	
Valve function	Single pilot	Double pilot

Remark: For optional specifications and order codes, see p.711.

### Specifications

Basic model	300-4A	300-4A2
Item	A300-4A	A300-4A2
Media	Air	
Effective area [Cv] <sup>Note 1</sup> mm <sup>2</sup>	25 [1.39]	
Port size <sup>Note 2</sup>	Main	Rc1/4 or Rc3/8 (3(R2), 5(R1) ports: Rc1/4)
	Pilot	Rc1/8
Lubrication	Not required	
Operating pressure range MPa [kgf/cm <sup>2</sup> ] [psi.]	Main	0.1~0.9 {1.0~9.2} [15~131]
	Pilot	See the table "Minimum Pilot Pressure"
Proof pressure MPa [kgf/cm <sup>2</sup> ] [psi.]	1.35 [13.8] [196]	
Operating temperature range (atmosphere and media) °C[°F]	5~50 [41~122]	
Shock resistance m/s <sup>2</sup> [G]	Lateral direction	1373.0 [140.0]
	Vertical direction	—
Mounting direction	Any	

Notes: 1. For details, see the effective area.  
2. For details, see the port size.

### Effective Area [Cv]

Basic model	Standard (Single valve unit)
300-4A 300-4A2	25 [1.39]
A300-4A A300-4A2	25 [1.39]

### Air piloted Valve Connection Port

Basic model		Port size
300-4A	Main	Rc1/4, Rc3/8 (3(R2), 5(R1) ports: Rc1/4)
	Pilot	Rc1/8
300-4A2	Main	Rc1/4, Rc3/8 (3(R2), 5(R1) ports: Rc1/4)
	Pilot	Rc1/8

### Manifold Connection Port Size

Manifold model	Port	Location of piping connection	Port size
FM□A	1(P), 4(A), 2(B), 3(R2), 5(R1)	Manifold	Rc1/4, Rc3/8
FM□F	1(P), 3(R2), 5(R1)	Manifold	Rc1/4, Rc3/8
	4(A), 2(B)	Valve	Rc1/4
FM□U	1(P)	Manifold	Rc1/4, Rc3/8
FM□L	4(A), 2(B), 3(R2), 5(R1)	Valve	Rc1/4
FM□W	1(P), 4(A), 2(B), 3(R2), 5(R1)	Manifold	Rc1/4, Rc3/8

### Air piloted Valve Mass

Basic model	Mass
300-4A	200 [7.05]
300-4A2	240 [8.47]

### Manifold Mass

Manifold model	Mass calculation of each unit (n=Number of units)	Block-off plate
300FM□A	(180×n)+200 [(6.35×n)+7.05]	45 [1.59]
300FM□F	(190×n)+200 [(6.70×n)+7.05]	45 [1.59]
300FM□U 300FM□L	(40×n)+200 [(1.41×n)+7.05]	15 [0.53]

### Minimum Pilot Pressure

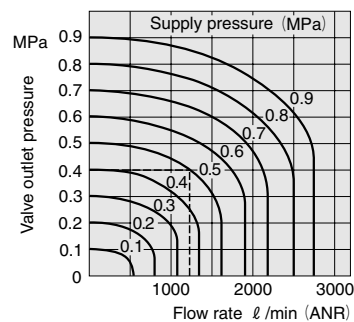
Main pressure Model	0.1 [1.0] [15]	0.3 [3.1] [44]	0.5 [5.1] [73]	0.7 [7.1] [102]	0.9 [9.2] [131]
300-4A	0.15 [1.5] [22]	0.2 [2.0] [29]	0.25 [2.5] [36]	0.33 [3.4] [48]	0.4 [4.1] [58]
300-4A2	0.1 [1.0] [15]	0.12 [1.2] [17]			0.15 [1.5] [22]

### Time Required for Switching

Valve model	Switching valve	Operation	Pilot line length ℓ m [ft.]				
			2 [6.6]	6 [19.7]	10 [32.8]	50 [164]	100 [328]
300-4A	3-port valve (125P)	ON	0.06	0.10	0.17	1.00	2.20
		OFF	0.08	0.19	0.33	2.65	6.00
300-4A2	4-port valve (125-4E1)	ON	0.06	0.12	0.20	1.20	2.80
		OFF	0.06	0.12	0.20	1.20	2.80
	3-port valves (125P)	ON	0.04	0.07	0.09	0.60	1.30
		OFF	0.04	0.07	0.09	0.60	1.30

Measurement conditions Air pressure (both main and pilot): 0.5MPa [73psi.]  
Tube inner diameter: 4mm [0.16in.]

### Flow Rate



1MPa=145psi. 1 ℓ/min.=0.0353ft<sup>3</sup>/min.

### How to read the graph

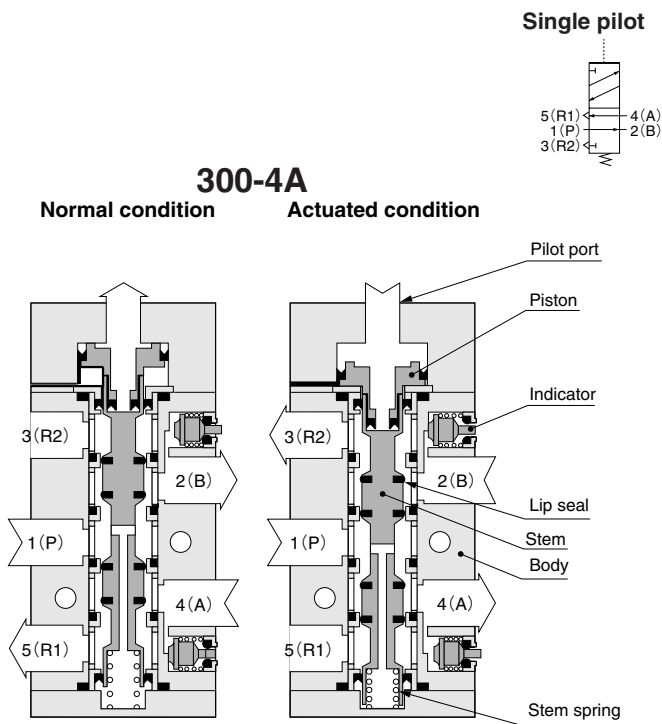
When the supply pressure is 0.5MPa [73psi.] and the flow rate is 1250 ℓ/min [44.1ft<sup>3</sup>/min.] (ANR), the valve outlet pressure becomes 0.4MPa [58psi.].

### Major Parts and Materials

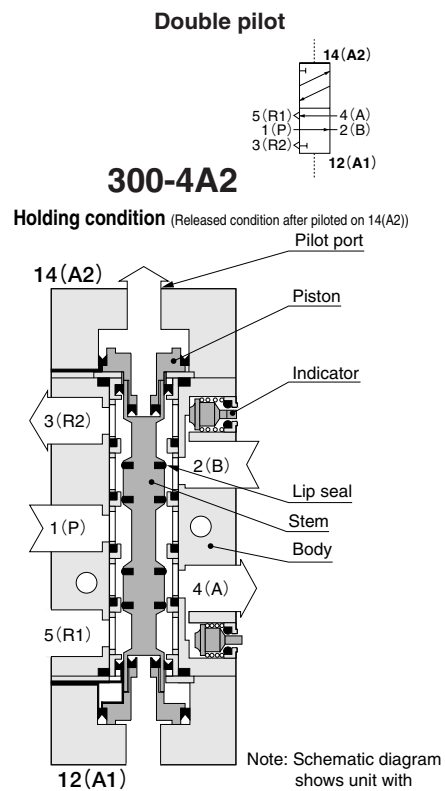
Parts	Materials
Body	Aluminum alloy (anodized)
Stem	
Stem spring	Stainless steel
Lip seal	Synthetic rubber
Seal	
O-ring	
Insert	Aluminum alloy (anodized)
Base	Mild steel (zinc plated)

# Operating Principles and Symbols

## 5-port, 2-position



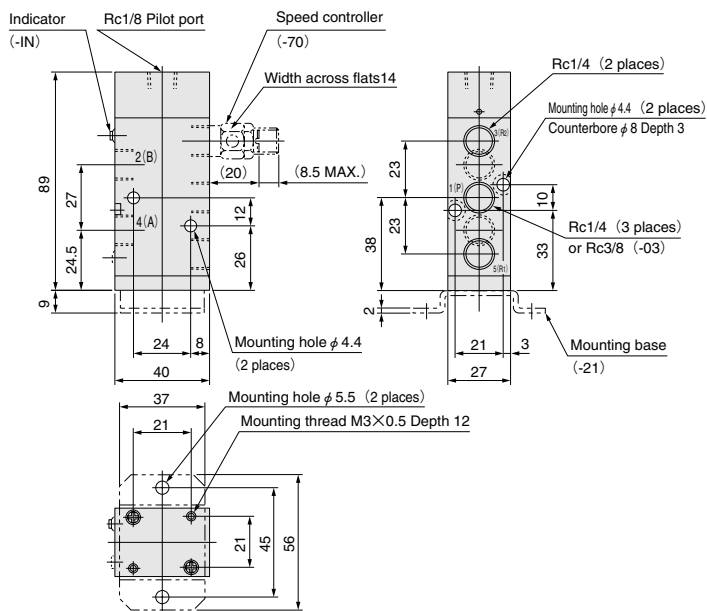
Note: Schematic diagram shows unit with indicator.



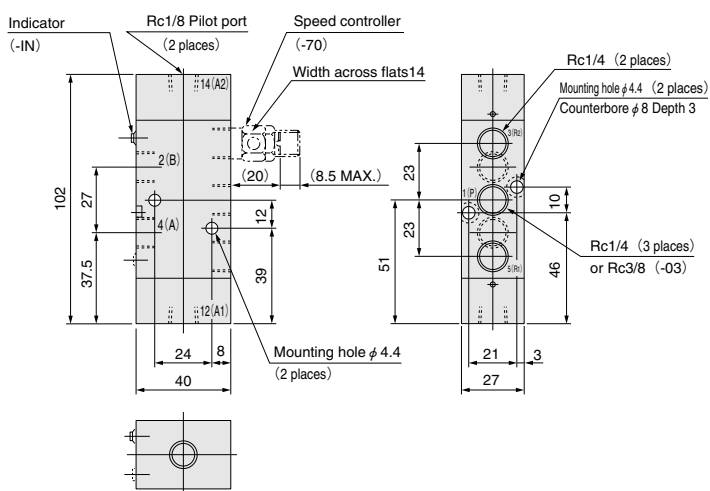
Note: Schematic diagram shows unit with indicator.

## Dimensions of Air Piloted Valve (mm)

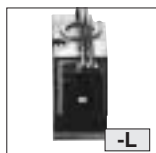
### 300-4A



### 300-4A2



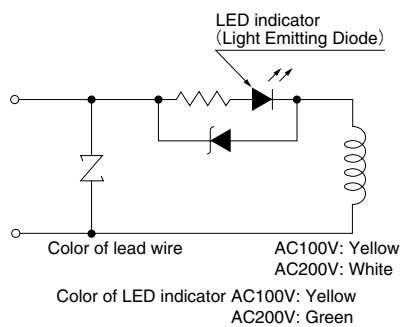
## LED indicator



Integrated LED indicator for confirmation of operation in the compact cover offers a clear monoblock look.

● When ordering, enter -L before the voltage code.

### AC100V AC200V



### DC24V

