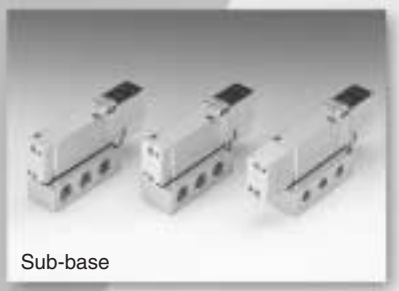
We have achieved the "High Flow Rate" and space Operation" and "Environmental Resistance" needed in

Solenoid Valves PA Series

This highly reliable 5-port, 2- or 3-position valve can serve as a key valve for mid-sized actuators.


Single unit


Sub-base

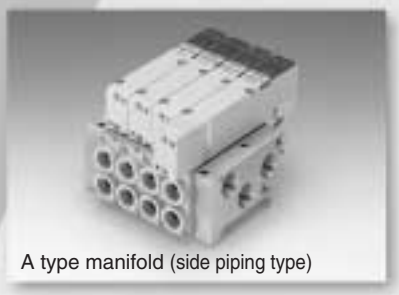
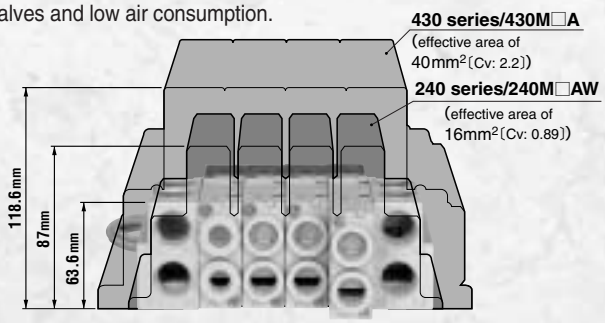

A type manifold (side piping type)


Photo shows F type manifold.

Space Saving with Large Flow Rate

- While attaining large flow rates by an effective area of 36mm² (Cv: 2.0), the valve achieves excellent space saving with a compact width of just 23.8mm [0.937in.].
- Valve selection from either a **25**mm² (Cv: 1.4) or a **36**mm² (Cv: 2.0) effective area with the same outer dimensions offers a choice of valves and low air consumption.



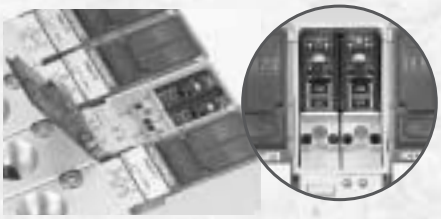
PB series/PBM□P (effective area of 25/36mm² (Cv: 1.4/2.0))

Low Power Consumption

- Achieves power consumption of just **1W** (DC24V) while maintaining a large flow rate.
- DC 24V coil specification uses bridge diodes for the internal circuit, enabling wiring connections without observing polarity like AC coils.

High Performance and Flexible Adaptability

- 2-position double solenoid valves can be switched to single solenoid valves.※1
- External pilot type can be changed to internal pilot type※2 (PB series only).
- A compact and highly reliable solenoid valve is used as a pilot valve. Easy replacement is possible by opening the valve body cover.



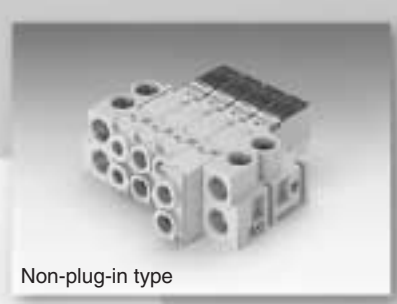
※1: Single solenoid valves cannot be switched to double solenoid valves.
※2: Internal pilot type cannot be switched to external pilot type.

saving "Compact Body" size, as well as the "Ease of mid sized valves.

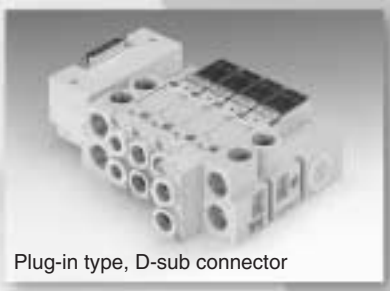
Solenoid Valves PB Series

Achieves new generation "easy operation" and "high performance" in an integrated valve with a manifold.

Photo shows plug-in with cable type manifold.



Non-plug-in type



Plug-in type, D-sub connector

Serial transmission type

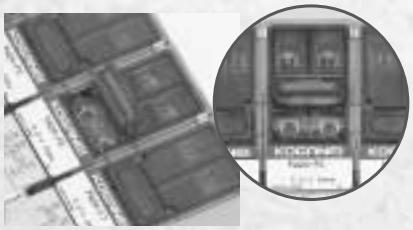
Compatible with a Wide Range of Application Environments

- Environmental protection rating **IP65** equivalent (dust ingress and water jet resistant) is available as an option.
- Maximum **1MPa** {10.2kgf/cm^2} [145psi.] pressure air.
- Stainless steel screws are used for high resistance to corrosion.[Note] Standard screws are compatible with NCU (non-ion) specification.

Note: Nickel plated screws are used in a few sections, such as on the terminal block.

Improved Safety and Reliability

- Non-neutral construction eliminates unstable operation upon valve position switching.
- Manual override is located under a protective cover, preventing the possibility of erroneous operation.

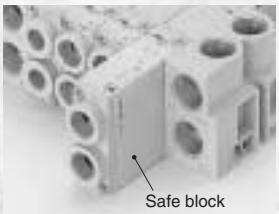


Wide Range of Wiring Types and Options

- The PB series plug-in type offers a wide choice of wiring selections as an option, e.g., D-sub connector, terminal box and serial transmission types, which are compatible with the serial transmission systems of various companies, to suit the customer's applications.

- Safe Block

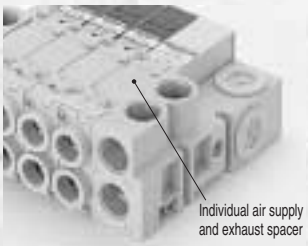
  When used in combination with a 3-position exhaust center valve on the same manifold, the safe block can ensure cylinder intermediate stop and hold its position for long periods without being affected by air leaks between the spool and valve body.



Safe block

- Individual air supply and exhaust spacer

  Completely blocks 1 valve on the manifold from the other valves, and then performs air supply and exhaust separately for each valve.



Individual air supply and exhaust spacer

Solenoid Valves PA, PB Series Product Range

PA Series

Instructions, Precautions p.665
Specifications p.671

Single Valve Unit

Direct piping

Base piping

Wiring specifications

DIN connector

Grommet type straight connector

Grommet type L connector

Cabtyre cable

Can be used with either direct piping or sub-base piping.
For wiring specifications, choose from among 4 types.

Order Code p.676
Dimensions p.678

A type Manifold (side piping type)

The side piping type manifold offers superior cost performance and easy maintenance.
For the manifold outlet type, select from either the ported manifold type or piping block type.

Order Code p.675
Dimensions p.682

Wiring specification
As with the single valve units, select from among 4 types.

Ported manifold type

Piping block type

B type Manifold (bottom piping type)

The bottom piping type manifold offers superior cost performance and easy maintenance.
For the manifold outlet type, select from either the ported manifold type or piping block type.

Order Code p.675
Dimensions p.682

Wiring specification
As with the single valve units, select from among 4 types.

Ported manifold type

Piping block type

F type Manifold (direct piping type)

The direct piping type manifold offers superior cost performance.
Achieves completely compact size and greatly reduced weight.

Order Code p.675
Dimensions p.681

Wiring specification
As with the single valve units, select from among 4 types.

Supply and exhaust port (Rc3/8)

Supply and exhaust block (Rc1/2)

PB Series

(Dedicated valves for manifolds)

The PB series piping blocks allow selection or switching from either the front surface or top surface piping for all models.

Instructions, Precautions p.665 | Specifications p.685 | Serial Transmission Specifications p.695

Non-Plug-In Type

The individual wiring type manifold achieves a perfectly thin and compact unit. Choose from among 4 types of wiring specifications.

Order Code p.689 | Dimensions p.698

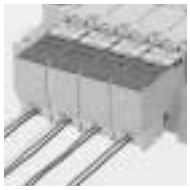
Front surface piping

Top surface piping

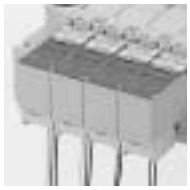
Wiring specifications

DIN connector

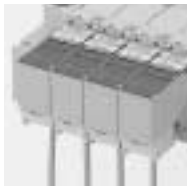
Grommet type straight connector



Grommet type L connector



Cabtyre cable



Plug-In Type

The labor saving wiring type manifold achieves a perfectly thin and compact unit. Choose from among 5 types of wiring specifications. In addition, the D-sub connector orientation can be changed to either the top surface or side surface.

Order Code p.689 | Dimensions p.699

Front surface piping

Top surface piping

Wiring Specifications

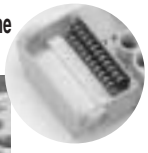
Top surface cable outlet at the left (right)

Side surface cable outlet at the left (right)

D-sub connector on top surface at the left (right) mounting

D-sub connector on side surface at the left (right) mounting

Terminal block box at the left (right) mounting



Choose either left or right for the plug-in type wiring specifications. Specify the selection when placing an order.

Serial Transmission Type

Compatible with the serial transmission systems of many different companies.
Select either left or right side mounting positions of the serial transmission block. Moreover, either the front or top surface can be selected for piping.

Order Code p.689 | Dimensions p.701

- **For Mitsubishi Electric MELSECNET/MINI-S3**
- **For Mitsubishi Electric MELSEC I/O LINK**
- **For Mitsubishi Electric CC-Link**
- **For OMRON SYSBUS Wire System**
- **For OMRON B7A Link Terminal**
- **For OMRON CompoBus/S**
- **For UNI-WIRE® System**
- **For KOYO ELECTRONICS INDUSTRIES SA Bus**
- **For SUNX S-LINK**
- **For Fuji Electric FA Components & Systems T Link Mini**
- **For KEYENCE KZ-R**
- **For OPCN-1 (former JPCN-1)**
- **For DeviceNet (CompoBus/D)**

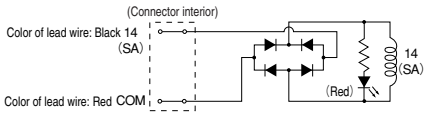
For details, see p.695～697.

Solenoid

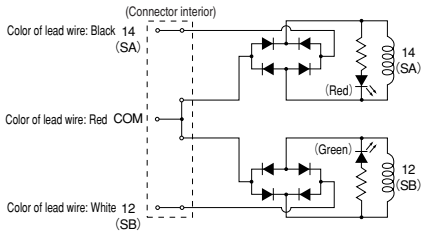
Internal circuit

●DC24V

●Single solenoid



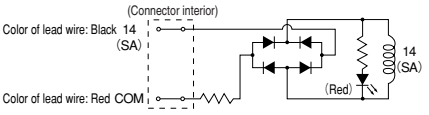
●Double solenoid



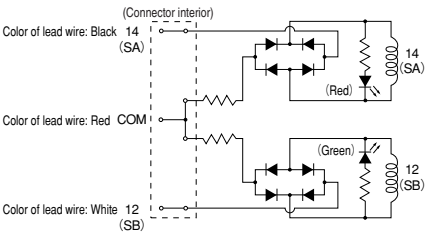
Note:Since there is no polarity, the valve can be used for either +COM or −COM.

●AC100V, 200V

●Single solenoid



●Double solenoid



Cautions: 1. Do not apply megger between the pins.
2. 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 in electrical specifications listed on p.671, 685. If circuit conditions, etc. cause the current leakage to exceed the allowable leakage current, consult us.
3. For double solenoid valves, avoid energizing both solenoids simultaneously.

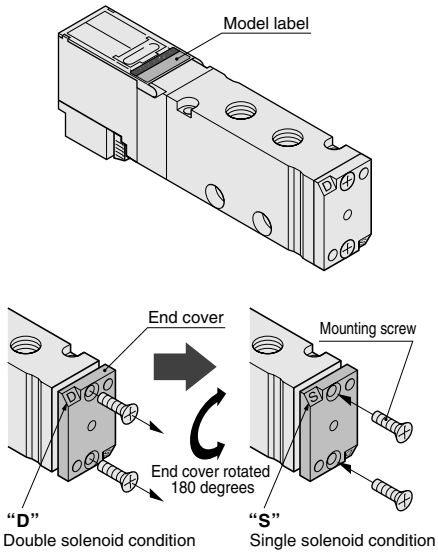
Method for Switching from Double to Single

●For the PA series

Rotate the end covers on the PA□F6 and PA□A6 models (2-position double solenoid valves) 180 degrees to use them as single solenoid valves (this change is not possible on 3-position valves). Note that the PA□F5 and PA□A5 models (2-position single solenoid valves) are designed specifically for use as single solenoid valves, and cannot be used as double solenoid valves.

Switching from double solenoid valves (at shipping) to single solenoid valves

As shown in the illustration below, a **"D"** marked on the end cover on the model label surface side means that the unit is set for a double solenoid function. To convert to the single solenoid valve function, use a Phillips screwdriver to remove the end cover, rotate it 180 degrees, and set the mark to **"S."** The recommended tightening torque for the end cover mounting screw is as shown below.



Recommended tightening torque for mounting screws: 88.3N·cm {9.0kgf·cm} [7.8in·lbf]

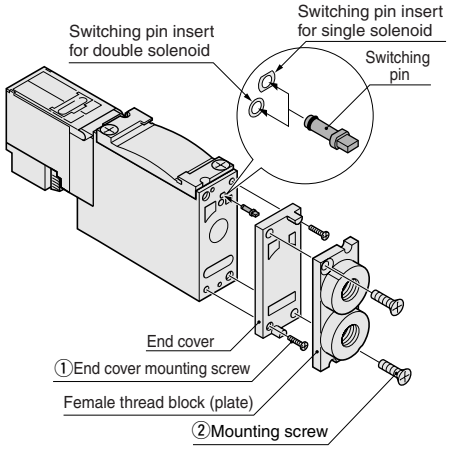
Cautions: 1. Do not remove the end cover except when switching between single and double solenoids.
2. When mounting the end cover, confirm that the gasket is attached before proceeding with the mounting.

●For the PB series

Change the switching pin on the PB□C6 model (2-position double solenoid valve) to use as a single solenoid valve (this change is not possible on the 3-position valve).
Note that the PB□C5 model (2-position single solenoid valve) is designed specifically for use as a single solenoid valve, and cannot be used as a double solenoid valve.

Switching from double solenoid valves (at shipping) to single solenoid valves

As shown in the illustration below, use a Phillips screwdriver to remove the female thread block or plate of the unit's front surface output port 4(A) and 2(B), then remove the end cover, remove the switching pin from the lower level hole and insert it in the upper level hole, to convert to the single solenoid function. The recommended mounting screw tightening torque for the end cover and the female thread block or plate are as shown below.



Recommended tightening torques for mounting screws
① End cover mounting screw : 39.2N·cm {4.0kgf·cm} [3.5in·lbf]
② Mounting screw : 137.3N·cm {14.0kgf·cm} [12.2in·lbf]

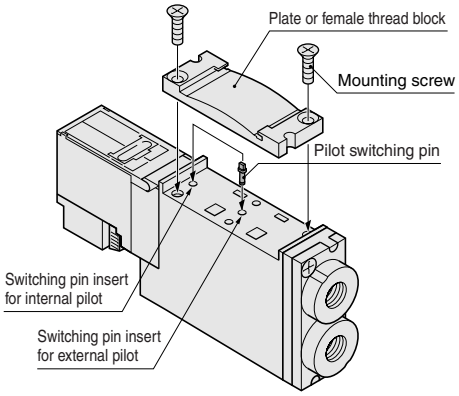
Cautions: 1. Do not remove the end cover except when switching between the single and double solenoids.
2. When mounting the end cover and the female thread block or plate, confirm that the gasket is attached before proceeding with the mounting.

Pilot air switching method (PB series only)

Change the switching pins on the PB□G and PB□V models (external pilot positive pressure valves and vacuum valves) to use as an internal pilot positive pressure valve. Note that the PB□ model (internal pilot valve) is for internal pilot use only, and cannot be used as an external pilot positive pressure or vacuum valve.

Switching from double solenoid valves (at shipping) to single solenoid valves

As shown in the illustration below, use a Phillips screwdriver to remove the female thread block or plate of the unit's top surface side outlet port 4(A) and 2(B), and then remove the switching pin from its position (lower level) for the external pilot specification and insert it in the position (upper level) for the internal pilot specification, to convert to the internal pilot specification. The recommended mounting screw tightening torque for the female thread block or plate is as shown below.



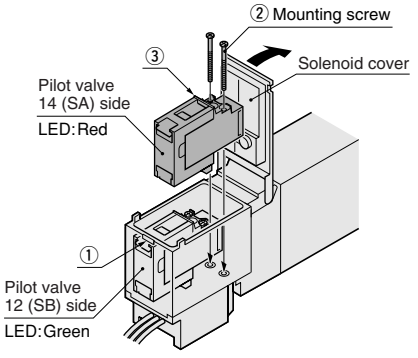
Recommended tightening torque for mounting screws: 137.3N·cm {14.0kgf·cm} [12.2in·lbf]

Caution: When mounting the female thread block or plate, confirm that the gasket is attached before proceeding with the mounting.

Pilot valve replacement

●Removal

Hand-open the solenoid cover at ① and use a small screwdriver to remove the mounting screws ② mounting the pilot valve in place. Use pliers to hold and pull out the pilot valve's flange ③, and then remove the pilot valve.



Caution: The maximum height of the cover when open is 48mm [1.89in.] from the top surface. Ensure enough space for maintenance, etc.

●Installation

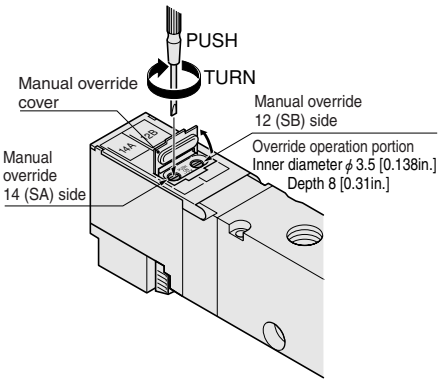
Confirm the installation of the pilot valve gasket, and then firmly tighten the mounting screws to the recommended torque below. Lastly, firmly close the solenoid cover.

Recommended tightening torque for mounting screws: 14.7N·cm {1.5kgf·cm} [1.3in·lbf]

Manual override

●Manual override (for both locking and non-locking types)

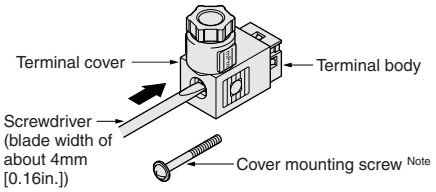
To lock the manual override, use a small screwdriver to open the manual override cover. In that position, press it all the way down and turn it 90 degrees in the clockwise direction to lock. When in the lock position, turning the manual override 90 degrees in the counterclockwise direction releases a spring on the manual override, returns it to the normal position, and releases the lock. When the manual override is not turned, this type acts just like the non-locking type.



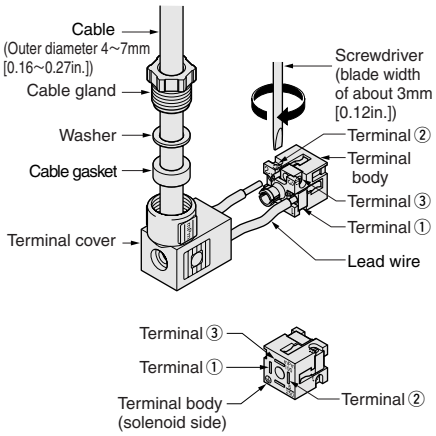
Cautions:
1. The PA/PB series valves are pilot type solenoid valves. As a result, the manual override cannot switch the main valve without air supplied from the 1(P) or X(P2) port.
2. Always release the lock of the manual overrides before commencing normal operation.
3. Do not attempt to operate the manual override with a pin or other object having an extremely fine tip. It could damage the manual override button.
4. Caution should be exercised to avoid rotating the manual override too far. It could damage the button.
5. If operating the solenoid valve's manual override for maintenance, etc., check before restarting operations that the solenoid valve's manual override has returned to the normal position, and that the main valve is in the required position for switching.
6. The maximum height of the cover when open is 8.4mm [0.331in.] from the top surface of the cover.

Wiring instructions

Remove the cover mounting screw and lift the terminal cover off from the solenoid valve.
Use a screwdriver, etc. to press hard against the head of the terminal body from the mounting hole of the terminal cover, and remove the terminal body.
Pass a cable gland, washer, and cable gasket over the cable, insert it via the wiring outlet of the terminal cover, and connect lead wires 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].



〈Terminal internal wiring connections〉

Terminal No.	Internal wiring connections
①	SOL.14 (SA) side
②	SOL.12 (SB) side
③	COM.
⏚	Ground

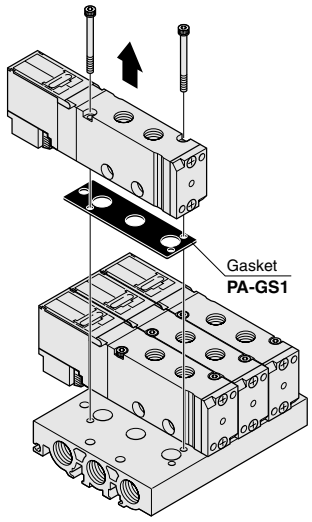
Caution: Because the cable has no polarity, it can be used for either +COM or −COM.

Manifold

Valve mounting and removal

●For PA series

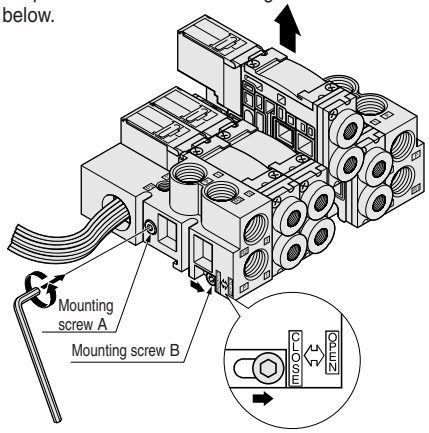
When removing the valve body from a sub-base or manifold, loosen the valve mounting screws (2 places), and lift in the direction of the arrow (see illustration below). To mount, follow the above procedure in reverse. The recommended tightening torque for the valve mounting screws is as shown below.



Recommended tightening torque for mounting screws:
176.5N・cm {18.0kgf・cm} [15.6in・lbf]

●For PB series

When removing the valve, use a hexagonal bar wrench to loosen the valve mounting screws A and B by 2～4 rotations. Move the mounting screw B (which includes screws on both sides, and a tie rod) in the direction of the arrow, move the valve until a gap of about 1mm opens up on each side of the valve, and then lift the valve in the direction of the large arrow. Be careful when loosening the mounting screws A and B, since the valve could fall at that time, for example, in an upside down manifold mounting. To assemble, follow the above procedure in reverse. The recommended tightening torque for the valve mounting screws is shown below.



Recommended tightening torque for mounting screws:
411.9N・cm {42.0kgf・cm} [36.5in・lbf]

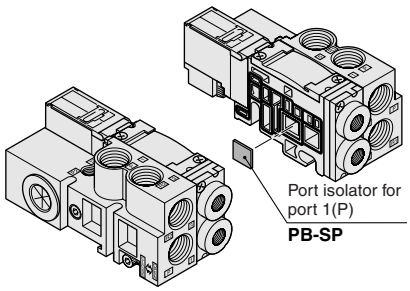
Caution: Although the flow path for the PA and PB double solenoid specifications (F6, A6, C6) is set to the 1(P)→ 2(B) at shipping from the factory, conditions during shipping could cause the stem to move and the position to shift. When applying air to the system for the first time, confirm that it is safely set by running a preliminary check on switching, using electricity or manually. Beware that air could suddenly blow out from the OUT port.

Port isolator (**PB** series settings only)

Installation of a port isolator at port 1(P) between the stations of a split-type manifold isolates the air path between the station where the port isolator is installed and a station with a smaller stn. No.

●Port isolator for port 1(P) (Type: PB-SP)

Can supply 2 different types of pressure.

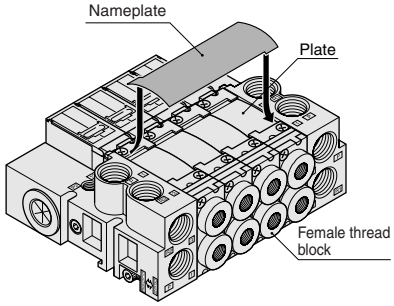


Caution: For later installing of other port isolators, the manifold must be disassembled and then reassembled. See the disassembly diagram on p.669.

Nameplate

The nameplate is attached to the other side from that of the female thread block. For attaching or removing, flex it so that it fits the grooves on the upper and lower side of the plate, as shown in the illustration.

Since the nameplate can be attached to either the top surface or front surface, make a careful selection to conform with the valve piping specifications that require combinations on the front and top surface piping.

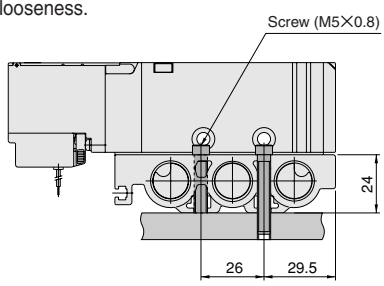


Manifold installation methods

●Installing the PA series F type manifold (PAM□F)

1. Installation using a top-surface bolt

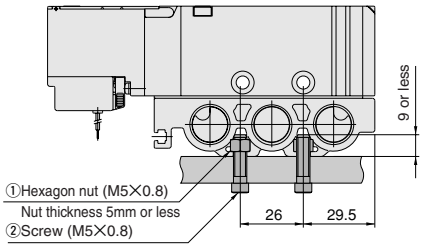
Use a bolt to tighten from the top of the manifold. Care must be exercised when mounting to use a sufficiently long screw, and mount it with particular attention for the tightening torque. In addition, use a washer if necessary to prevent looseness.



2. Installation using a bottom-surface nut

①Insert a hexagon nut into the manifold's T groove.

②Use a screw to tighten from the bottom of the mounting plate. Ensure that a suitable length screw is used, and mount it with particular attention for the tightening torque. In addition, use a washer if necessary to prevent looseness.



3. Installation using a DIN rail

Insert into the grooves in the sequence of ① and ② below.

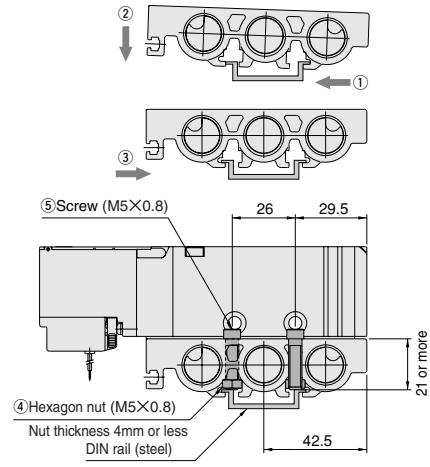
Push in the direction of ③, and align with the center of the DIN rail.

④Insert a hexagon nut into the manifold's T groove.

⑤Use a screw to tighten from the top of the manifold.

Always use a steel DIN rail. Do not use an aluminum rail, as it would not be sufficiently strong, causing deflection to loose products or dents in the rail that could lead to defects.

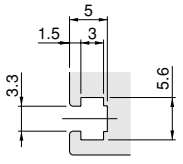
Ensure that a suitable length screw is used, and mount it with particular attention for the tightening torque. In addition, use a double nut, etc., on the top surface of the manifold if necessary for the prevention of looseness.



Recommended tightening torque for mounting screws:
284.4N・cm {29.0kgf・cm} [25.2in・lbf]

●Precaution for installation of PA series manifolds (PAM□F, PAM□A, PAM□B)

While the manifold has an M3 groove, be aware that this groove is not for use in manifold installation. Use this groove when binding lead wires, as a space for securing bands of binding wires.



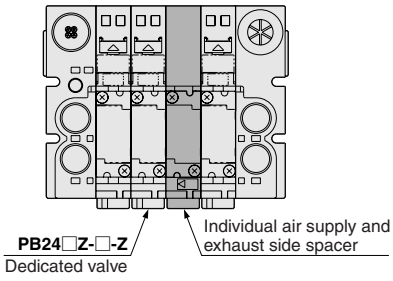
Dimensions of M3 nut groove
(cannot be used for securing the manifold in place)

Piping

Individual air supply and exhaust spacer

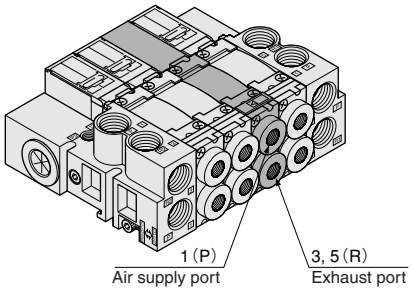
(Available in **PB** series only)

Use an individual air supply and exhaust spacer when individually supplying and exhausting air for a certain 1 station on the same manifold. Installation of the individual air supply and exhaust spacer allows control from the spacer installation position of the air supply and exhaust to the next smaller stn. number valve. Note that a dedicated valve (**PB24□Z-□-Z**) is required when using this spacer, and take particular caution on product selection.

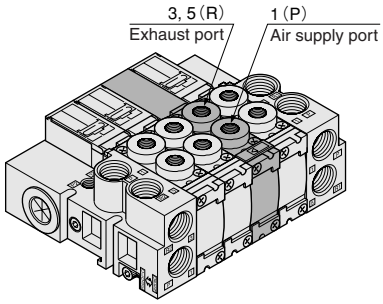


●Port position for air supply and exhaust (individual air supply and exhaust spacer)

1. For front surface piping



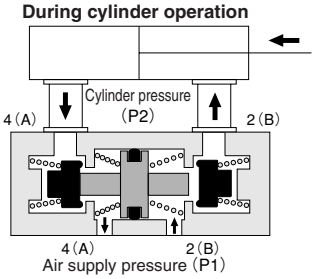
2. For top surface piping



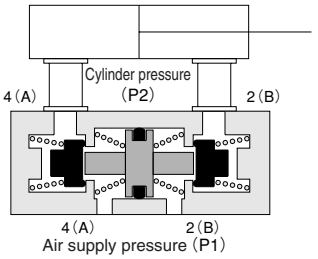
Safe block

When used in combination with a 3-position exhaust center valve on the same manifold, the safe block can ensure cylinder intermediate stop and hold its position for long periods without being affected by air leaks between the spool and valve body. In addition, when used in combination with a 2-position valve, the safe block can be used to prevent falls at the end of cylinder stroke when residual pressure on the supply side is exhausted.

During cylinder operation



During check valve operation

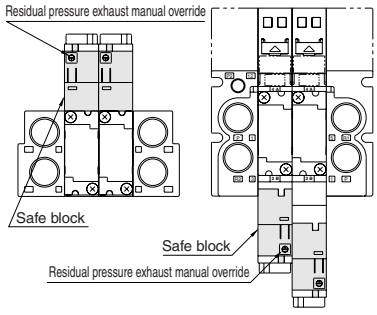


Cautions: 1. Set the cylinder load so that the pressure on the cylinder side 2(B) and 4(A) ports is less than double the supply side pressure and also does not exceed the allowable pressure range.

2. When exhausting residual pressure on the cylinder side, use a small screwdriver, etc., to push the residual pressure exhaust manual override, as shown in the diagram below. Caution should be exercised to guard against the possibility of workpieces falling or moving when the residual pressure is exhausted.

3. When a safe block is used in combination with a 3-position closed center valve or pressure center valve, it does not ensure a cylinder's intermediate stop and position holding, but prevents workpieces from falling.

For top surface piping **For front surface piping**



4. To lock the residual pressure exhaust manual override, push the manual override all the way down and rotate it 90 degrees in the clockwise direction. When in the locked state, rotate the manual override 90 degrees in the counter-clockwise direction; a spring returns the manual override to its normal position, and the lock is released. When the manual override is not turned, this type acts just like the non-locking type.

5. Always release the lock of the manual override before commencing normal operation.

6. Do not attempt to operate the manual override with a pin or other object having an extremely fine tip. It could damage the manual override button.

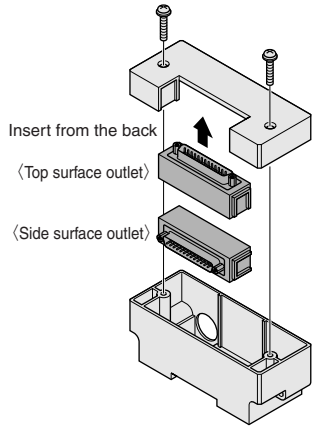
7. Caution should be exercised to avoid rotating the manual override too far. It could damage the button.

8. When the residual pressure exhaust manual override is operated for maintenance, etc., ensure that the manual override has returned to its normal position before restarting operations.

Wiring

D-sub connector

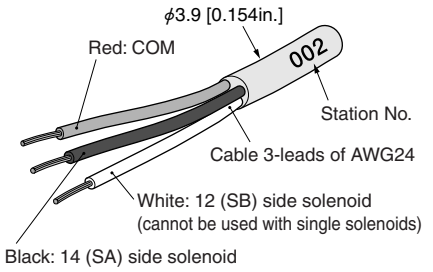
The D-sub connector can change the wiring outlet orientation between the top surface and side surface.



Recommended tightening torque for mounting screws: 58.8N·cm {6.0kgf·cm} [5.2in·lbf]

Cable specification

In the case of cable specification, the shape of the cable ends is shown in the diagram below.



Because the cable has no polarity, it can be used for either +COM or −COM.

1. Single solenoid (C5 type)

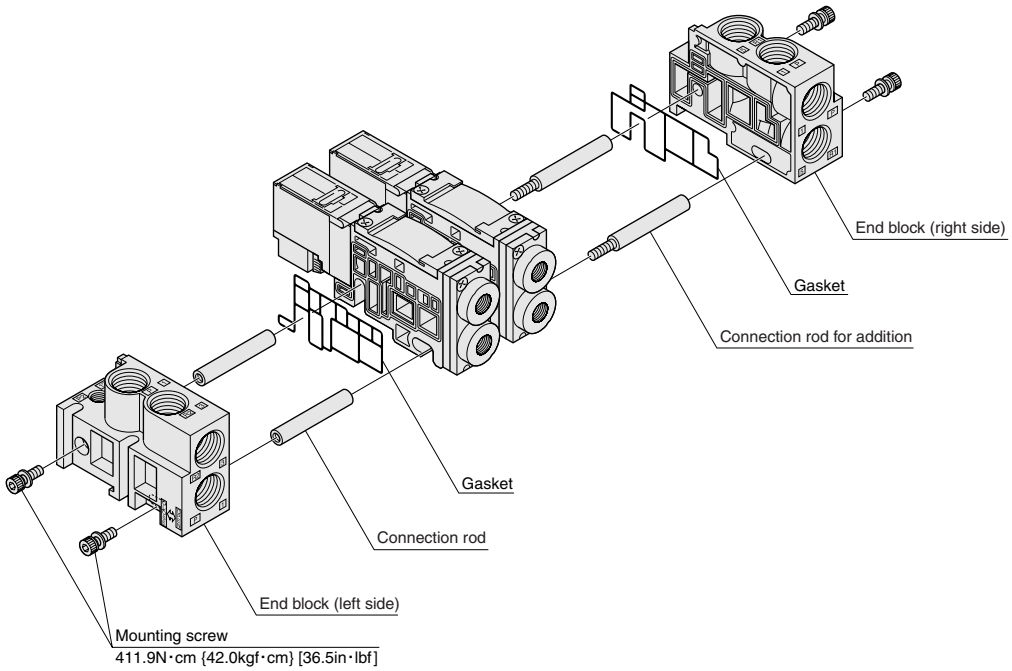
Connection polarity		Color of lead wire	Circuit diagram
Positive common	Negative common		
−	+	Black	SA
+	−	Red	COM

2. Double solenoid (C6,C7,C8,C9 type)

Connection polarity		Color of lead wire	Circuit diagram
Positive common	Negative common		
−	+	Black	SA
+	−	Red	COM
−	+	White	SB

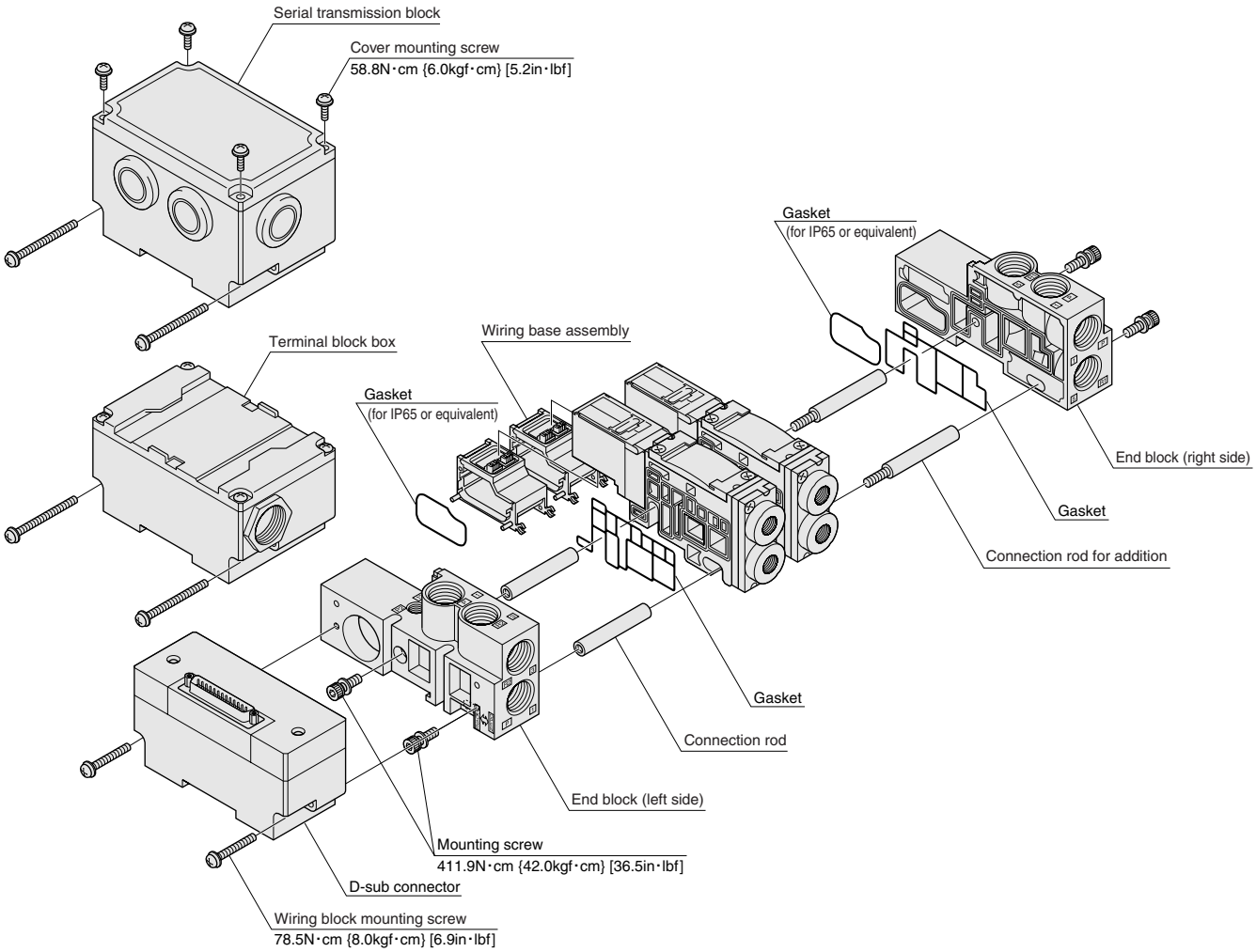
Solenoid Valves PB Series Disassembly Diagram

●Non-plug-in type



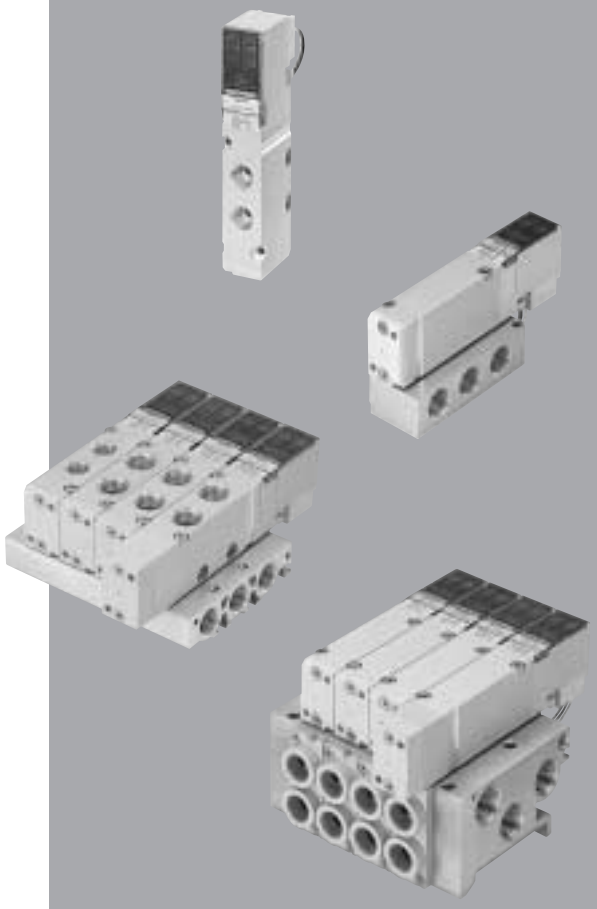
※Wiring-related parts are omitted.

●Plug-in type



※Wiring-related parts are omitted.

Solenoid Valves
PA Series



Specifications

Basic Models and Valve Functions

Item \ Basic model				
	For direct piping, F type Manifold	**PA24□F5**	**PA24□F6**	**PA24□F7, PA24□F8, PA24□F9**
	For sub-base piping For A type and B type Manifolds	**PA24□A5**	**PA24□A6**	**PA24□A7, PA24□A8, PA24□A9**
Number of positions		2 positions		3 positions
Number of ports		5		
Valve function		Single solenoid	Double solenoid Note	Closed center, Exhaust center, Pressure center

Remark: For the specifications and order codes, see p.675～677.
Note: 2-position double solenoid valve can be switched to a single solenoid valve. For details, see p.665.

Specifications

Item \ Basic model										
	For direct piping For F type Manifold	**PA24□F5**	**PA24□F6**	**PA24□F7 PA24□F8 PA24□F9**	**PA24□F5G**	**PA24□F6G**	**PA24□F7G PA24□F8G PA24□F9G**	**PA24□F5V**	**PA24□F6V**	**PA24□F7V**
	For sub-base piping For A type and B type Manifolds	**PA24□A5**	**PA24□A6**	**PA24□A7 PA24□A8 PA24□A9**	**PA24□A5G**	**PA24□A6G**	**PA24□A7G PA24□A8G PA24□A9G**	**PA24□A5V**	**PA24□A6V**	**PA24□A7V**
Media		Air								
Operation type		Internal pilot type			External pilot type (for positive pressure)			External pilot type (for vacuum)		
Effective area〔Cv〕Note1	mm²	25〔1.4〕, 36〔2.0〕								
Port size Note2		Rc1/4, 3/8								
Lubrication		Not required								
Operating pressure range	Main valve	0.2～1.0MPa {2～10.2kgf/cm²} [29～145psi.]			0～1.0MPa {0～10.2kgf/cm²} [0～145psi.]			0.2MPa～−100kPa {2kgf/cm²～−750.1mmHg} [29psi.～−29.53in.Hg]		
	External pilot	——			0.2～1.0MPa {2～10.2kgf/cm²}Note3 [29～145psi.]			0.2～0.5MPa {2～5.1kgf/cm²}Note7 [29～73psi.]		
Proof pressure Note4	MPa {kgf/cm²} [psi.]	1.5 {15.3} [218]								
Response time Note5 ON/OFF	ms	45/25	25/30	25/35	45/25	25/30	25/35	45/25	25/30	25/35
Maximum operating frequency	Hz	5								
Minimum time to energize for self holding Note6	ms	——	50	——	——	50	——	——	50	——
Operating temperature range (Atmosphere or media)	℃ [°F]	5～50 [41～122]								
Shock resistance	m/s² {G}	1373 {140.0} (Pilot valve axial direction 294.2 {30.0})		294.2 {30.0}	1373 {140.0} (Pilot valve axial direction 294.2 {30.0})		294.2 {30.0}	1373 {140.0} (Pilot valve axial direction 294.2 {30.0})		294.2 {30.0}
Mounting direction		Any								
Environmental protection		IP65 or equivalent (optional)								

Notes: 1. For details, see the effective area on p.672.
2. For details, see the port size on p.672.
3. When the main valve is 0.2～1.0MPa [29～145psi.], set the external pilot pressure to the same pressure as the main valve or larger, and at 1.0MPa [145psi.] or smaller.
4. The proof pressure is the pressure at which no damage, rupture, or external leaking can occur when maintained for 1 minute; it is not supposed to be used continuously.
5. The value when air pressure is at 0.5MPa [73psi.]. The 3-position shows the value when the valve is switched from the neutral position.
A maximum of 5ms should be added to the response time for AC specifications, depending on the timing of the switching phase.
6. For a double solenoid
7. The recommended value. Can be used up to a maximum of 1.0MPa [145psi.].

Solenoid Specifications

Item \ Rated voltage		DC24V Note	AC100V Note		AC200V Note	
Operating voltage range	V	21.6～26.4 (24±10%)	90～110 (100±10%)		180～220 (200±10%)	
Rated frequency	Hz	——	50	60	50	60
Current (when rated voltage is applied)	mA (r.m.s)	42	11		6.5	
Power consumption		1.0W	1.1VA		1.3VA	
Allowable leakage current	mA	2.0	1.0		1.0	
Insulation resistance	MΩ	Over 100 (value at DC500V megger)				
Wiring type and lead wire length	mm [in.]	Grommet type, cabtyre cable (300 [11.8], 1000 [39], 3000 [118]), and DIN connectors				
Color of lead wire		Red (COM), Black (14SA side), White (12SB side)				
Color of LED indicator		Red (14SA side), Green (12SB side)				
Surge suppression (Standard equipment)		Bridge diode				

Notes: 1. Since AC-coils already have built-in bridge diodes, the starting current value is virtually identical to the energizing current value.
2. For long continuous energizing in AC-coils, consult us.
3. For both AC- and DC-coils, provide heat radiation measures to ensure that the ambient temperature (when used in a control box, the temperature inside the box) always remains within the specified temperature range.

Effective Area〔Cv〕

mm²

Basic model	Valve port size	
	-02(Rc1/4)	-03(Rc3/8)
PA24HF5, PA24HF6 PA24HA5, PA24HA6	28〔1.6〕	36〔2.0〕
PA24HF7 PA24HA7	28〔1.6〕	32〔1.8〕
PA24HF8 PA24HA8	28〔1.6〕	1(P)→4(A),2(B) 32〔1.8〕 4(A),2(B)→5(R1),3(R2) 36〔2.0〕
PA24HF9 PA24HA9	28〔1.6〕	1(P)→4(A),2(B) 36〔2.0〕 4(A),2(B)→5(R1),3(R2) 32〔1.8〕
PA24F5, PA24F6, PA24F7 PA24F8, PA24F9 PA24A5, PA24A6, PA24A7 PA24A8, PA24A9	22〔1.2〕	25〔1.4〕

Safe Block Specifications

Basic model	Effective area〔Cv〕 mm²	Response time (ON/OFF) ms
PA24□-H	22〔1.2〕	40/40

Port Size

●Solenoid valves

Basic model	1(P)	4(A), 2(B)	3(R2), 5(R1)	PR
PA24□F□-02	Rc1/4	Rc1/4	Rc1/4	M5×0.8
PA24□F□-03	Rc3/8	Rc3/8	Rc1/4	M5×0.8

Remark: Set the tightening torque for the screws of the solenoid valve PR portion at 29.4N·cm {3kgf·cm} [2.6in·lbf] or less (only when -N is selected).

●Sub-base piping specifications

Basic model	1(P)	4(A), 2(B)	3(R2), 5(R1)	PR	X(P2)
PA24□A□-02-25	Rc1/4	Rc1/4	Rc1/4	M5×0.8	M5×0.8
PA24□A□-03-25	Rc3/8	Rc3/8	Rc3/8	M5×0.8	M5×0.8
PA24□A□-04-25	Rc1/2	Rc1/2	Rc1/2	M5×0.8	M5×0.8

Remark: The PR and X(P2) ports are available for the external pilot specifications (for positive pressure and vacuum) only.
The pilot exhaust of internal pilot type is collected to 5(R1).

●Manifold

Manifold model	1(P)	4(A), 2(B)		3(R2), 5(R1)	PR	X(P2)
		-02	-03			
PAM□F	Rc3/8	(Rc1/4)	(Rc3/8)	Rc3/8	——	——
PAM□F-04	Rc1/2	(Rc1/4)	(Rc3/8)	Rc1/2	——	——
PAM□A	Rc1/2	Rc1/4	Rc3/8	Rc1/2	Rc1/8	——
PAM□B	Rc1/2	Rc1/4	Rc3/8	Rc1/2	Rc1/8	——
PAM□FG	Rc3/8	(Rc1/4)	(Rc3/8)	Rc3/8	Rc1/8	Rc1/8
PAM□FG-04	Rc1/2	(Rc1/4)	(Rc3/8)	Rc1/2	Rc1/8	Rc1/8
PAM□AG	Rc1/2	Rc1/4	Rc3/8	Rc1/2	Rc1/8	Rc1/8
PAM□BG	Rc1/2	Rc1/4	Rc3/8	Rc1/2	Rc1/8	Rc1/8

Remark: The positions of the 4(A) and 2(B) piping ports ( ) are on the solenoid valve side.
The pilot exhaust of PAM□F and PAM□F-04 is collected to 5(R1).

Mass

●Direct piping specification, F type manifold specifications

g [oz.]

Basic model	Mass calculation of each unit (n=number of units)	Solenoid valve single unit (Port size)Note 1						Block-off plate PA-BP
		-02(Rc1/4)			-03(Rc3/8)			
		PA24□F5	**PA24□F6**	**PA24□F7 PA24□F8 PA24□F9**	**PA24□F5**	**PA24□F6**	**PA24□F7 PA24□F8 PA24□F9**	
PAM□F	(80×n)+90 [(2.82×n)+3.17]	203 [7.16]	215 [7.58]	241 [8.50]	197 [6.95]	209 [7.37]	235 [8.29]	54 [1.90]
PAM□F-04	(80×n)+270 [(2.82×n)+9.52]							

Calculation example: **PBM4F**
stn.1～3 PA24F5-03-G1 D4
stn.4 PA-BP
(80×4)+90+(197×3)+54=1055g [37.21oz.]

Notes: 1. For the wiring specification of DIN connector (-39), add 12g [0.42oz.] to the above, and for the cabtyre cable (-G3), add 3g [0.11oz.].
2. The wiring specifications assume a lead wire length of 300mm [11.8in.].
3. Plug R3/8: 14g [0.49in.], R1/2: 21g [0.74oz.]

●Sub-base piping specification, A type and B type manifold specifications

g [oz.]

Basic model	Mass calculation of each unit (n=number of units)	Solenoid valve single unitNote1			Additional mass (n=number of units)						
					Port size specification					Safe block -H	Block-off plate PA-BP
					Ported manifold			Piping block			
		PA24□A5	**PA24□A6**	**PA24□A7 PA24□A8 PA24□A9**	-02 (Rc1/4)	-03 (Rc3/8)	-04 (Rc1/2)	-B2 (Rc1/4)	-B3 (Rc3/8)		
PA24□A□	——	212 [7.48]	224 [7.90]	250 [8.82]	200 [7.05]	190 [6.70]	260 [9.17]	——	——	——	——
PAM□A	(200×n)+380 [(7.05×n)+13.40]				20×n [0.71×n]	10×n [0.35×n]	——	55×n [1.94×n]	46×n [1.62×n]	82 [2.89]	54 [1.90]
PAM□B	(200×n)+390 [(7.05×n)+13.76]				20×n [0.71×n]	10×n [0.35×n]	——	55×n [1.94×n]	46×n [1.62×n]		

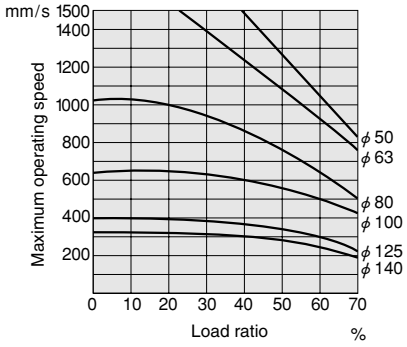
Calculation example: **PAM4A-B3**
stn.1～3 PA24A5-G1 D4
stn.4 PA-BP
(200×4)+380+(212×3)+(46×3)+54=2008g [70.83oz.]

Notes: 1. For the wiring specification of DIN connector (-39), add 12g [0.42oz.] to the above, and for the cabtyre cable (-G3), add 3g [0.11oz.].
2. The wiring specifications assume a lead wire length of 300mm [11.8in.].
3. Plug R1/2: 21g [0.74oz.]

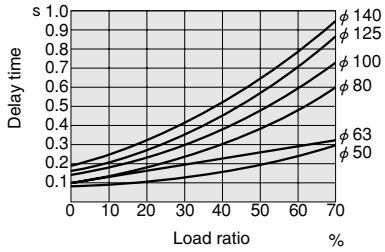
Cylinder Operating Speed

PA24HF5-03
PA24HA5-03-25

Maximum operating speed

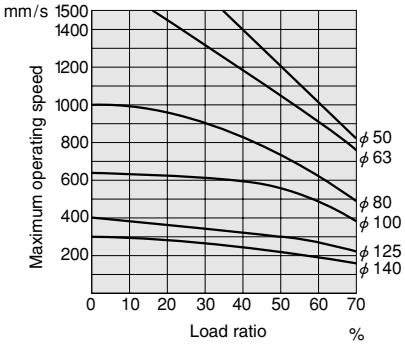


Delay time

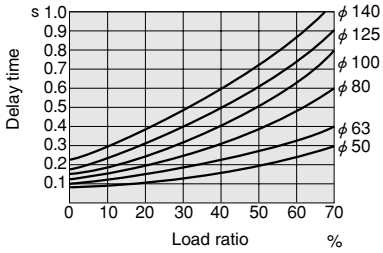


PA24F5-03
PA24A5-03-25

Maximum operating speed

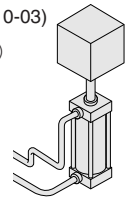


Delay time



Measurement conditions

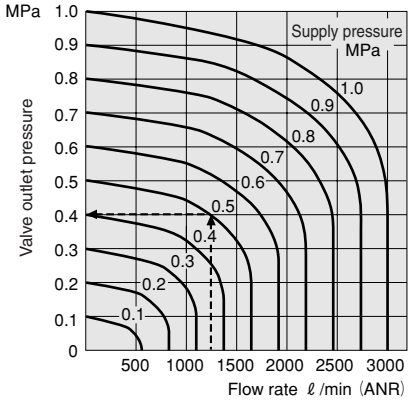
- Air pressure: 0.5MPa {5.1kgf/cm²} [73psi.]
- Piping inner diameter and length: φ7.5×1000mm [39in.]
- Fitting: Quick fitting (Model: NTS10-03)
- Load ratio = $\frac{\text{Load}}{\text{Cylinder theoretical thrust}}$ (%)
- Cylinder stroke: 300mm [11.8in.]



1mm/s = 0.0394in./sec.

Flow Rate

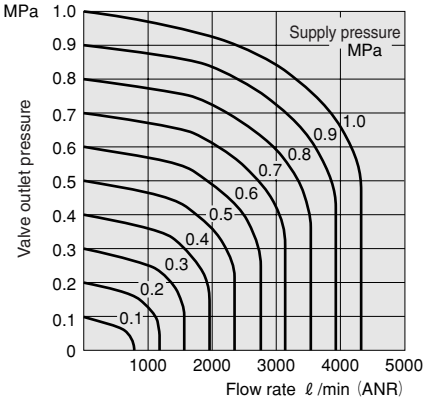
PA24□



How to read the graph

When the supply pressure is 0.5MPa [73psi.] and the flow rate is 1220 ℓ/min [43.1ft³/min.] (ANR), the valve outlet pressure becomes 0.4MPa [58psi.]

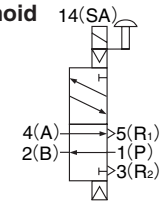
PA24H□



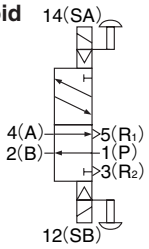
1MPa = 145psi.
1 ℓ/min = 0.0353ft³/min.

5-port, 2-position

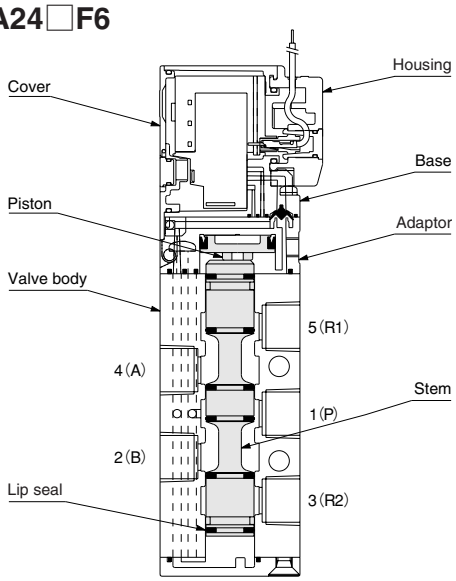
Single solenoid



Double solenoid



PA24□F5
PA24□F6



※Schematic diagram shows double solenoid (de-energizing condition after energizing solenoid 12(SB)).

Major parts and materials

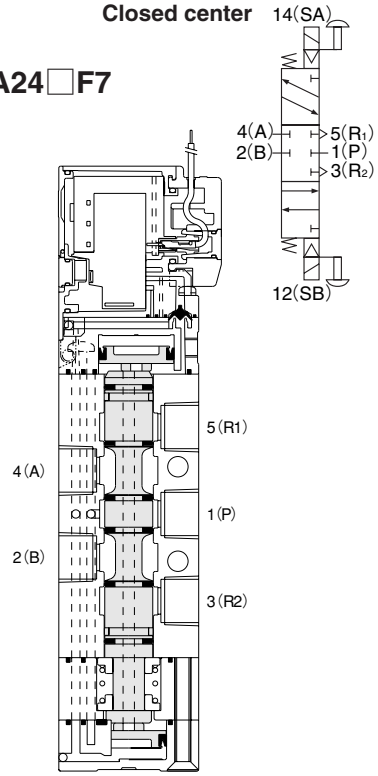
Parts		Materials
Valve	Body	Aluminum alloy (Anodized)
	Stem	Aluminum alloy
	Cover	Plastic
	Base	
	Housing	
	Adaptor	
	Lip seal	Synthetic rubber
	Piston	Plastic
Manifold	Body	Aluminum alloy (Anodized)
	Block-off plate	Mild steel (Nickel-plated)
	Seal	Synthetic rubber

5-port, 3-position

〔Both solenoid 14(SA) and 12(SB) are de-energized.〕

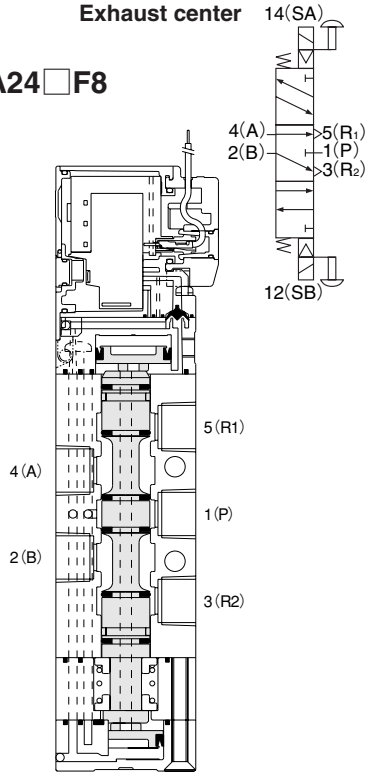
Closed center

PA24□F7



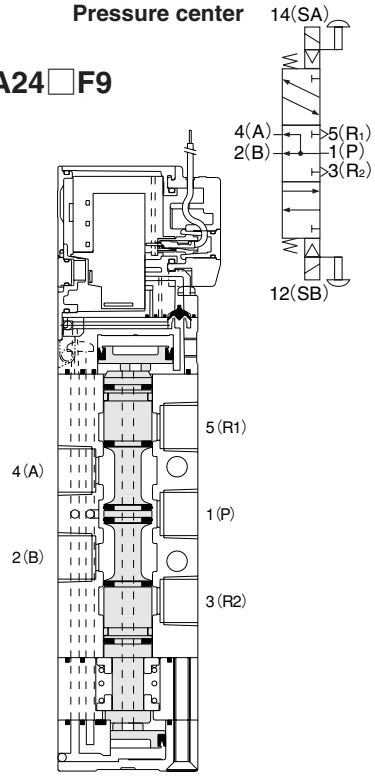
Exhaust center

PA24□F8



Pressure center

PA24□F9



PA Series Manifold Order Codes

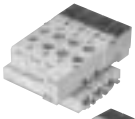
	Model	❶ Number of units	❷ Manifold type	❸ Pilot specification	❹ Air supply and exhaust block	❺ Manifold outlet specification	❻ Mounted valve
	Manifold model						Mounted valve
F type manifold (Direct piping type)	**PAM**	**2** ⋮ **16**	**F**	**Blank** **G**	**Blank** **-04**		**stn.1** ⋮ **stn.□**
A type manifold (Side piping type)			**A**	**Blank** **G**		**-02** **-03** **-B2** **-B3**	
B type manifold (Bottom piping type)			**B**	**Blank** **G**		**-02** **-03** **-B2** **-B3**	

❶ Number of units

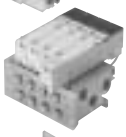
- **2** 2 units
- **3** 3 units
- ⋮
- **16** 16 units

❷ Manifold type

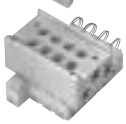
- **F** F type manifold (Direct piping type)



- **A** A type manifold (Side piping type)



- **B** B type manifold (Bottom piping type)



❸ Pilot specification

- **Blank** Internal pilot manifold
- **G** External pilot manifold

❹ Air supply and exhaust block size ※F type manifold only

- **Blank** Rc3/8

- **-04** Rc1/2

❺ Manifold outlet specifications

- **-02** Manifold thread port Rc1/4
- **-03** Manifold thread port Rc3/8

- **-B2** Piping block Rc1/4
- **-B3** Piping block Rc3/8

※For A type and B type manifolds only

❻ Mounted valve

※See next page.

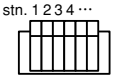
stn.1 PA24□□-□-□-□-□……

stn.2 PA24□□-□-□-□-□……

⋮

Note: For the stn. No., enter the valve specifications in the order of the required stations, or 1, 2, ..., from the left when the valve is viewed from the top.

stn. 1 2 3 4 ···

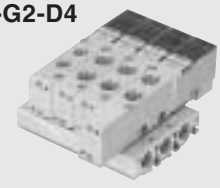


※When using a block-off plate to block, enter **PA-BP**.

Manifold Order Code Examples

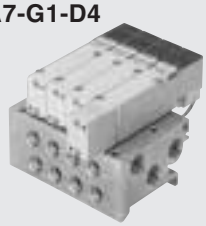
●F type manifold (Direct piping type)
4 units DC24V

PAM4F
stn.1 PA24F5-02-G2-D4
stn.2 PA24F5-03-G2-D4
stn.3 PA24F6-03-G2-D4
stn.4 PA24F7-03-G2-D4



●A type manifold (Side piping type)
4 units DC24V

PAM4A-03
stn.1～2 PA24A5-G1-D4
stn.3 PA24A6-G1-D4
stn.4 PA24A7-G1-D4



PA Series Valve Order Codes (for valve single unit/manifold mounting)

	❶ Model	❷ Valve specification	❸ Operation type	❹ Number of ports	❺ Piping size	❻ PR port	❼ Sub-base	❽ Wiring specification	❾ Lead wire length	❿ Safe block	⓫ Environmental protection	⓬ Voltage
●Valve single unit ●For F type manifold	PA24 PA24H	F5 F8 F6 F9 F7	Blank G V	Blank -32 -33 -34	-02 -03	Blank -N		-39 -G1 -G2 -G3	Blank -1L -3L		Blank -P	-D4 -A1 -A2
●For Sub-base piping		A5 A6 A7 A8 A9			Blank -02 -03 -04		Blank -25					
●For A type manifold ●For B type manifold										Blank -H		

❶ Model

PA24 Standard type (Effective area 25mm² 〔Cv: 1.4〕)

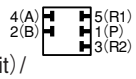
PA24H Large flow rate type (Effective area 36mm² 〔Cv: 2.0〕)

❷ Valve specification

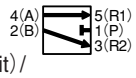
F5 5-port single solenoid direct piping (single unit) / for F type manifold

F6 5-port double solenoid direct piping (single unit) / for F type manifold

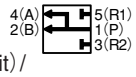
F7 5-port 3-position closed center direct piping (single unit) / for F type manifold



F8 5-port 3-position exhaust center Note direct piping (single unit) / for F type manifold



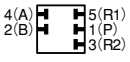
F9 5-port 3-position pressure center Note direct piping (single unit) / for F type manifold



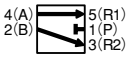
A5 5-port single solenoid sub-base piping/ for A and B type manifolds

A6 5-port double solenoid sub-base piping/ for A and B type manifolds

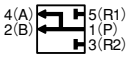
A7 5-port 3-position closed center sub-base piping/ for A and B type manifolds



A8 5-port 3-position exhaust center Note sub-base piping/ for A and B type manifolds



A9 5-port 3-position pressure center Note sub-base piping/ for A and B type manifolds



Note: Not available for vacuum (V)

❸ Operation type

Blank Internal pilot type

G External pilot type (for positive pressure) Note

V External pilot type (for vacuum) Note

Note: The single unit valve is not compatible with the external pilot type (for positive pressure, and for vacuum). For use as a single unit, select the sub-base piping specification.

❹ Number of ports

Blank Standard (5-port valve)

-32 3-port valve (Rc1/4) Note

-33 3-port valve (Rc3/8) Note

-34 3-port valve (Rc1/2) Note
(Available for sub-base piping only)

Note: When the 5-port valve used as a 3-port valve, plugs are supplied.

❺ Piping size ※Direct piping and sub-base piping only

Blank Without sub-base

-02 Rc1/4

-03 Rc3/8

Note: For the direct piping type, the 3(R2) and 5(R1) ports become Rc1/4.

-04 Rc1/2
(Available for sub-base piping only)

❻ PR port ※Direct piping (single unit) only

Blank No threads

-N With female threads (M5×0.8)

❼ Sub-base ※Sub-base piping only

Blank Without sub-base (With 1 gasket, 2 mounting screws)

-25 With sub-base

❽ Wiring specification

-39 DIN connector

-G1 Grommet type straight connector

-G2 Grommet type L connector

-G3 Cabtyre Cable

❾ Lead wire length ※Except DIN connector

Blank Lead wire 300mm [11.8in.]

-1L Lead wire 1000mm [39in.]

-3L Lead wire 3000mm [118in.]

Note: Available for wiring specifications -G1, -G2, and -G3 only.

❿ Safe block ※A type and B type manifolds only

Blank Without safe block

-H With safe block Note

Note: When ordering a manifold, the safe block is available provided the manifold outlet specifications are **-B2** and **-B3** (with piping block). The safe block cannot be used with external pilot types (for positive pressure and for vacuum).

⓫ Environmental protection

Blank Standard

-P IP65 or equivalent

Note: DIN connector (-39) is compatible with IP65 as the standard.

⓬ Voltage

-D4 DC24V

-A1 AC100V

-A2 AC200V

Additional Parts Order Codes for PA Series Manifold

Block-off plate

(With 1 gasket, 2 mounting screws)

PA-BP **-F** For F type manifold
-A For A type manifold
-B For B type manifold

Replacement of pilot valve

Pilot valves are available as replacements. The valves for 14 (SA) and 12 (SB) are distinguished from the LED color. The 14 (SA) LED is red, and the 12 (SB) LED is green. Select the required type (a gasket and 2 mounting screws are supplied).

PA **-D4** 14 (SA) pilot valve, DC24V
-A1 14 (SA) pilot valve, AC100V
-A2 14 (SA) pilot valve, AC200V
-D4B 12 (SB) pilot valve, DC24V
-A1B 12 (SB) pilot valve, AC100V
-A2B 12 (SB) pilot valve, AC200V

Safe block

Can be mounted at the same station where the valve is installed (with 2 mounting screws).

PA **-H** Safe block

Notes: 1. Safe blocks can be mounted only on A type or B type manifolds, and the manifold outlet specifications are **-B2** or **-B3**.
2. The piping block is not included.

Piping block

PA **-B2** Piping block Rc1/4
-B3 Piping block Rc3/8
(with 1 gasket)

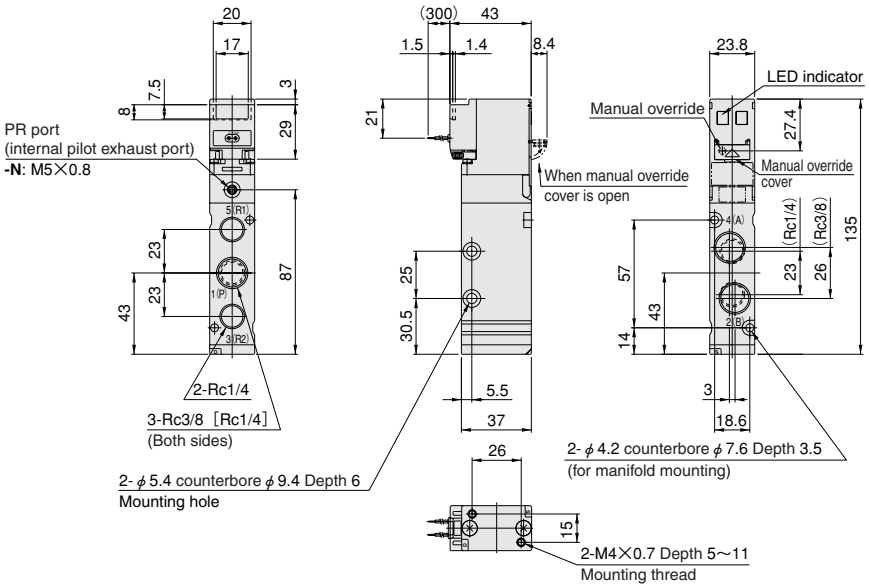
Gasket (for valve mounting)

(With 2 mounting screws)

PA **-GS1** Gasket for F type manifold
-GS2 Gasket for A type and B type manifolds and sub-base piping

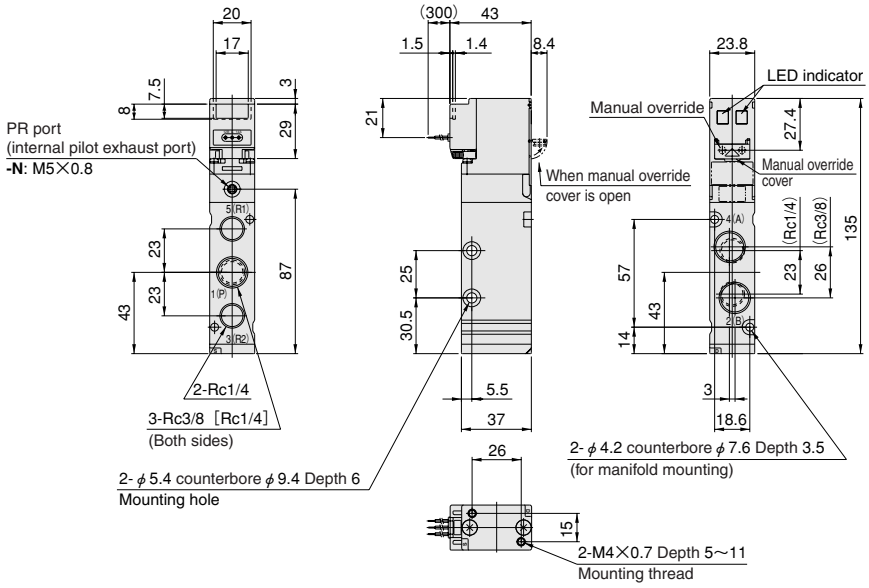
PA24□F5-G2

Grommet type L connector



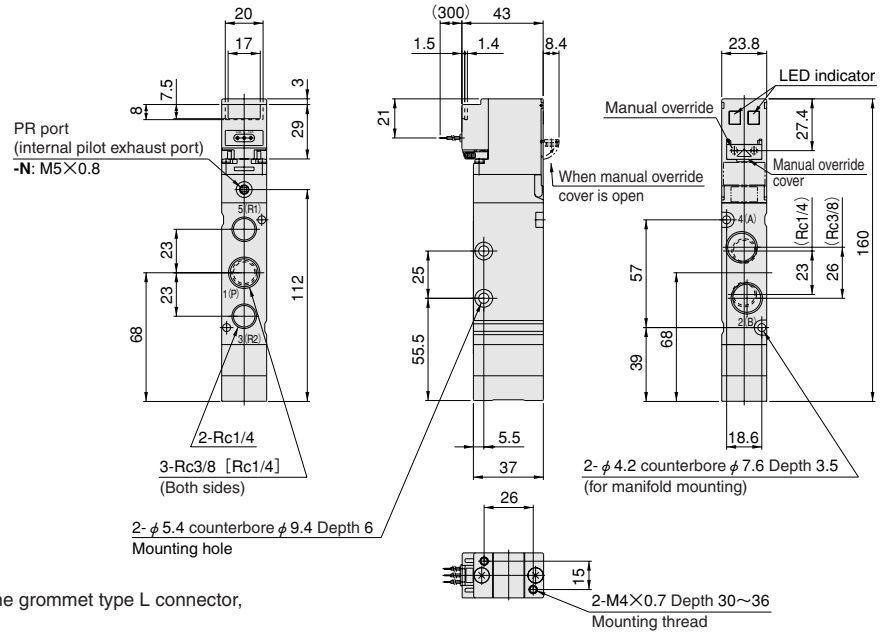
PA24□F6-G2

Grommet type L connector



PA24□F7-G2
PA24□F8-G2
PA24□F9-G2

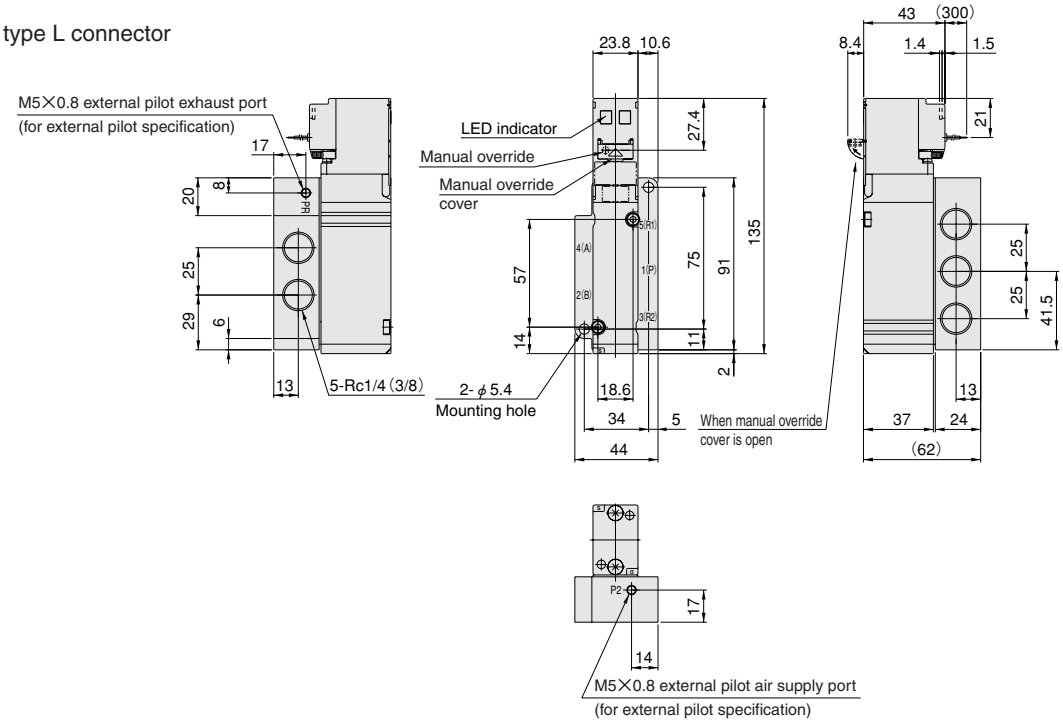
Grommet type L connector



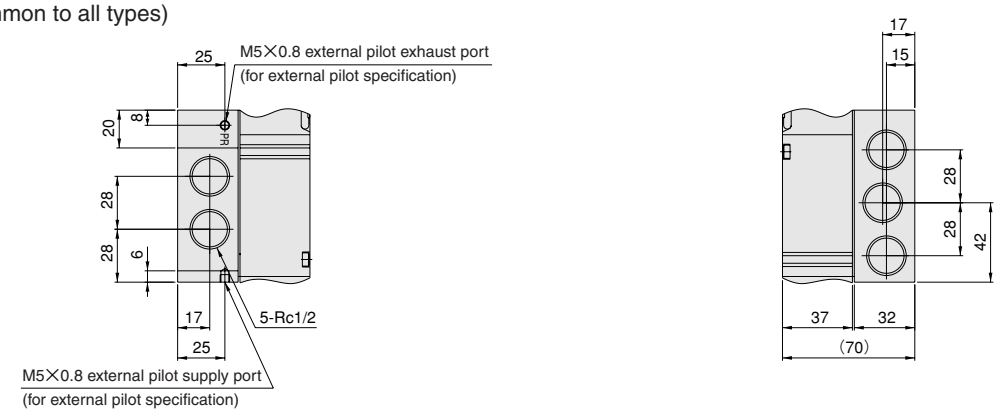
For wiring specifications other than the grommet type L connector, see p.679.

PA24□A5-□-25

Grommet type L connector

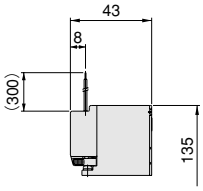


●For Rc1/2 (common to all types)

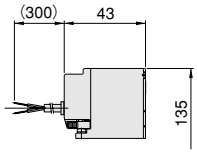


Wiring Specifications

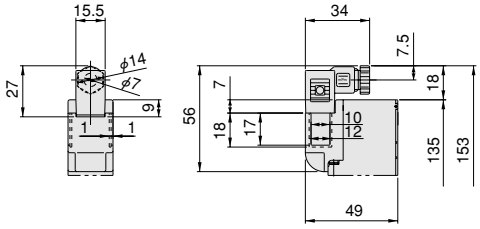
●Grommet type straight connector: **-G1**



●Cabtyre cable: **-G3**

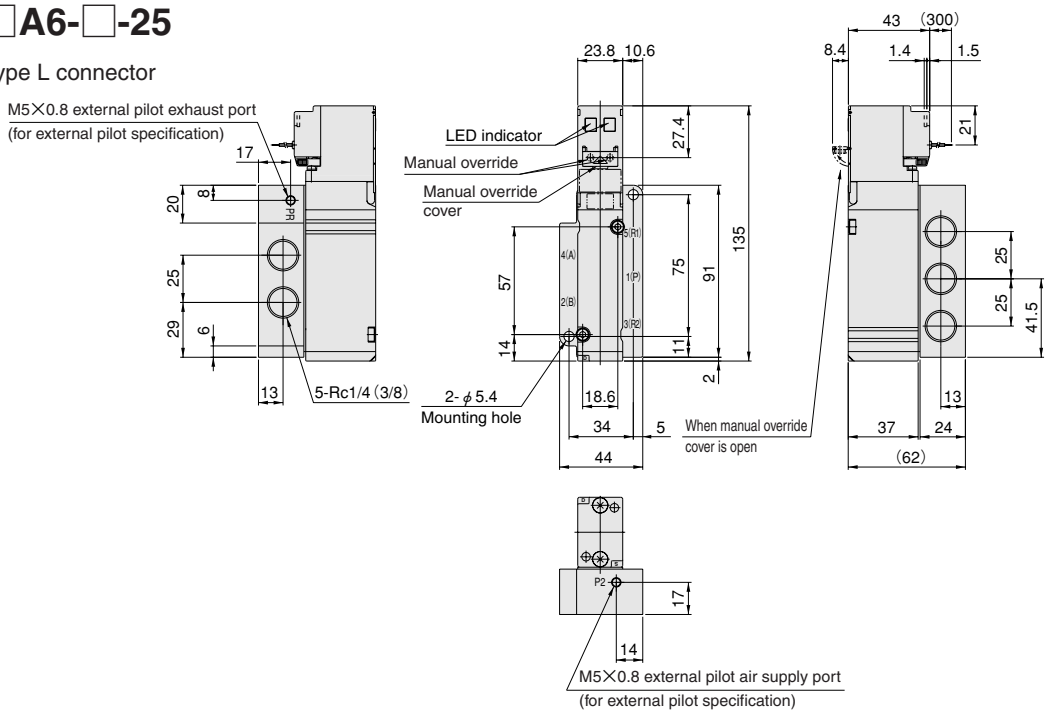


●DIN connector: **-39**



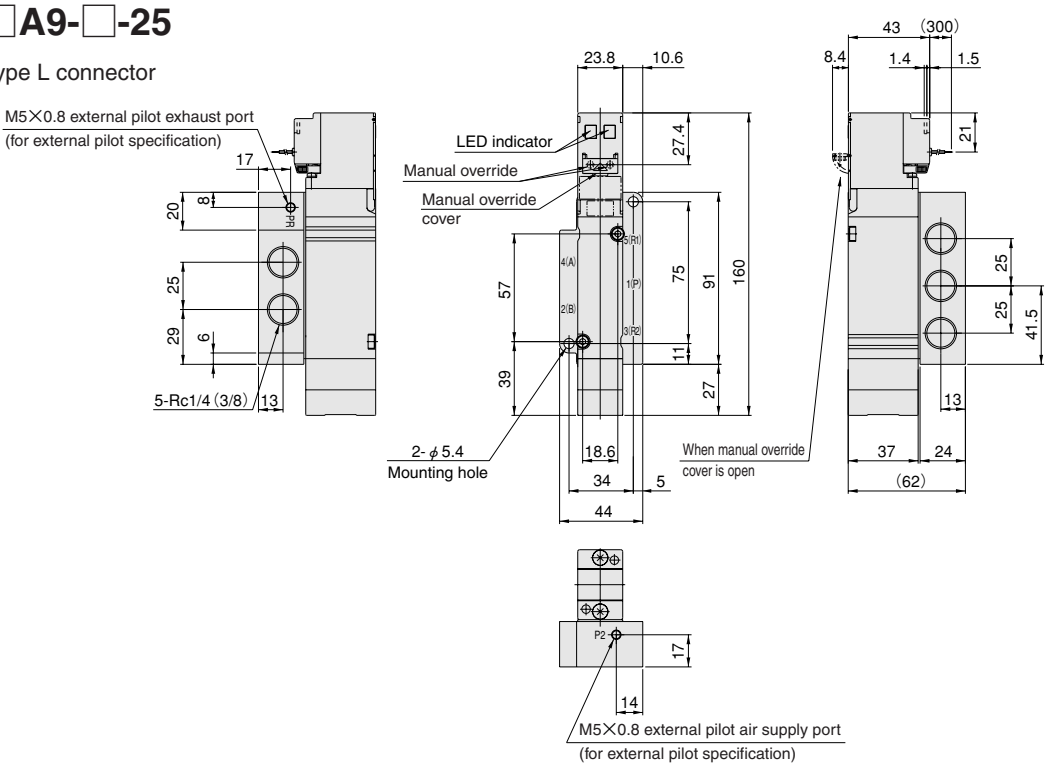
PA24□A6-□-25

Grommet type L connector



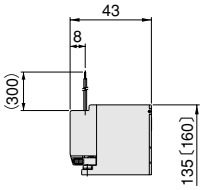
PA24□A7-□-25
PA24□A8-□-25
PA24□A9-□-25

Grommet type L connector

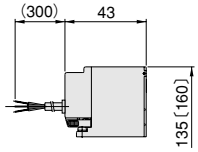


Wiring Specifications

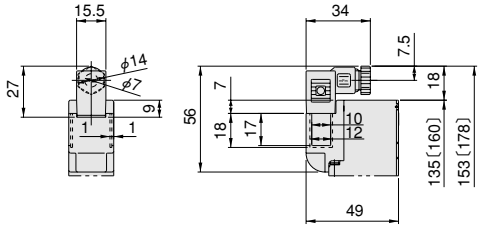
●Grommet type straight connector: **-G1**



●Cabtyre cable: **-G3**



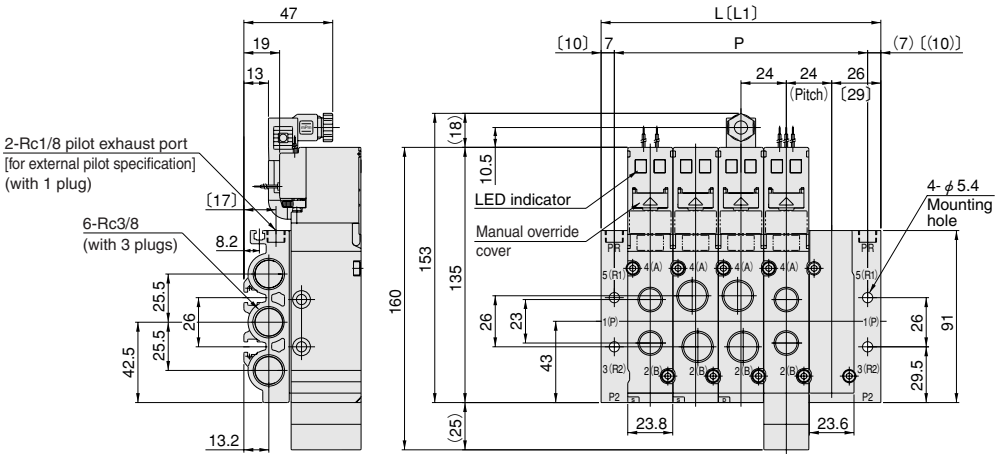
●DIN connector: **-39**



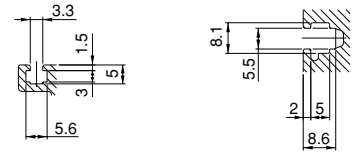
The figures in parentheses〔 〕are for the 3-position case.

PAM□F

Direct piping type

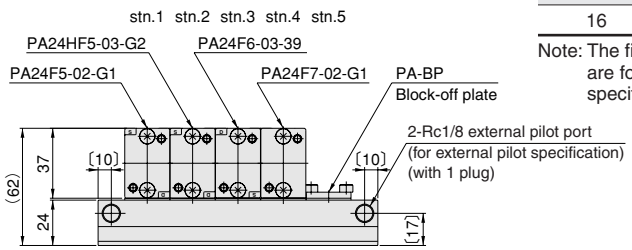


●Groove details



Groove for M3 nut
(cannot be used to mount
the manifold in place)

Groove for M5 nut
(for manifold mounting)



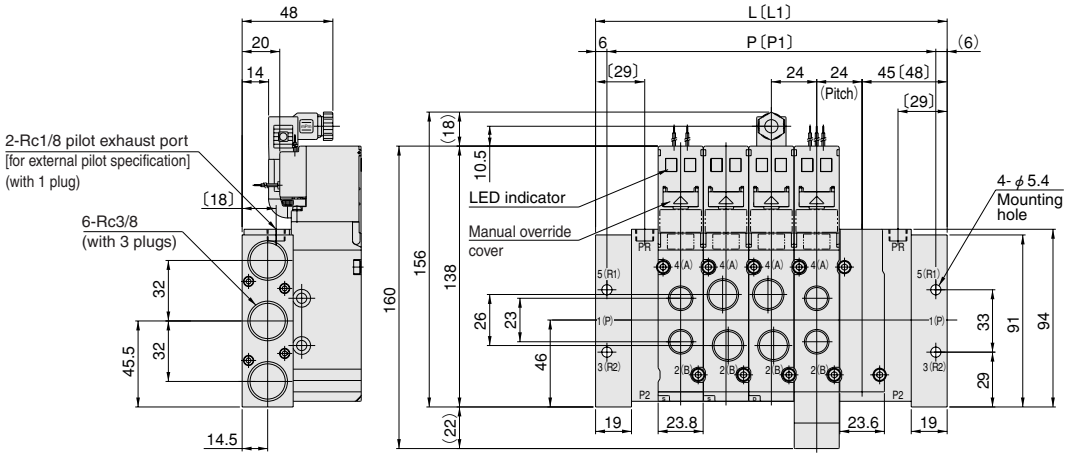
Unit Dimensions

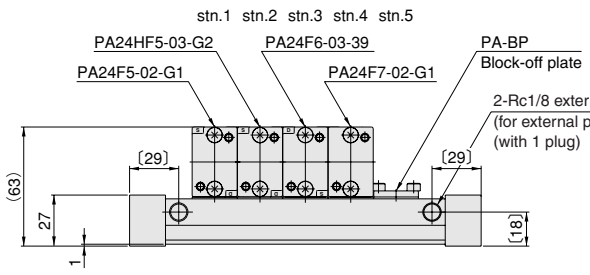
Number of units	L	P	〔L1〕
2	76	62	82
3	100	86	106
4	124	110	130
5	148	134	154
6	172	158	178
7	196	182	202
8	220	206	226
9	244	230	250
10	268	254	274
11	292	278	298
12	316	302	322
13	340	326	346
14	364	350	370
15	388	374	394
16	412	398	418

Note: The figures in parentheses〔 〕
are for the external pilot
specification.

PAM□F-04

Direct piping type





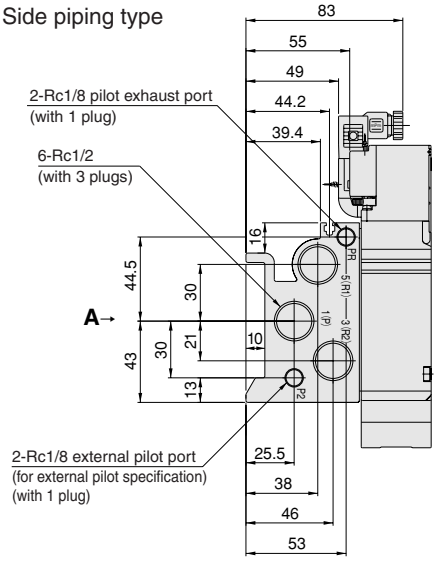
Unit Dimensions

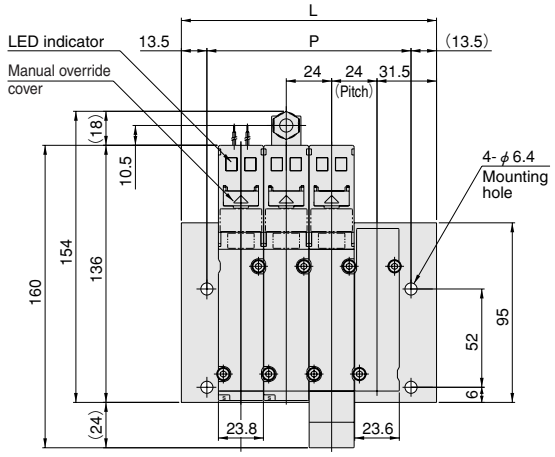
Number of units	L	P	〔L1〕	〔P1〕
2	114	102	120	108
3	138	126	144	132
4	162	150	168	156
5	186	174	192	180
6	210	198	216	204
7	234	222	240	228
8	258	246	264	252
9	282	270	288	276
10	306	294	312	300
11	330	318	336	324
12	354	342	360	348
13	378	366	384	372
14	402	390	408	396
15	426	414	432	420
16	450	438	456	444

Note: The figures in parentheses〔 〕are for the
external pilot specification.

PAM□A-0□

Side piping type

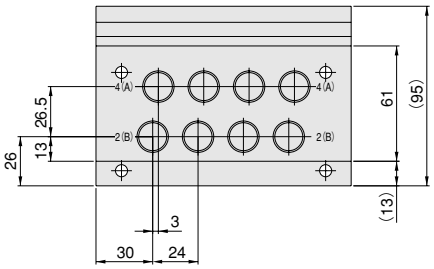


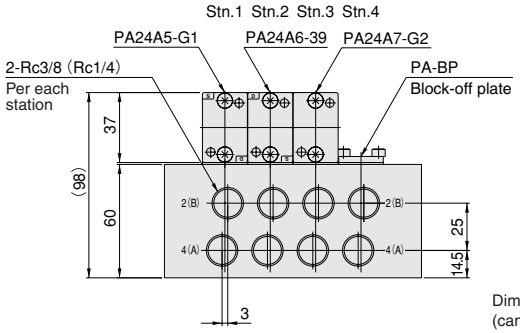


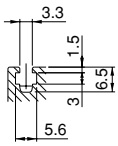
Unit Dimensions

Number of units	L	P
2	87	60
3	111	84
4	135	108
5	159	132
6	183	156
7	207	180
8	231	204
9	255	228
10	279	252
11	303	276
12	327	300
13	351	324
14	375	348
15	399	372
16	423	396

●Viewed from **A**
PAM□B-0□ (for bottom piping type)





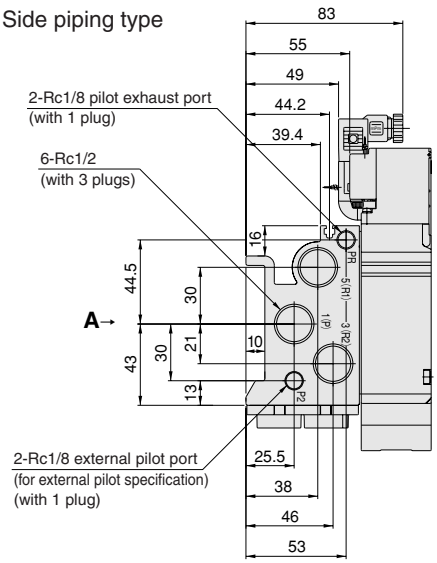


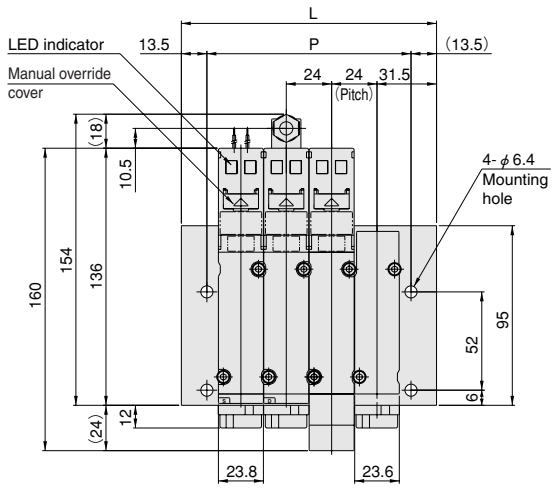
Dimensions of groove for M3 nut (2:1)
(cannot be used to mount the manifold)

Note: The side piping type and bottom piping type cannot be selected on the same manifold. Select either piping type for the manifold.

PAM□A-B□

Side piping type

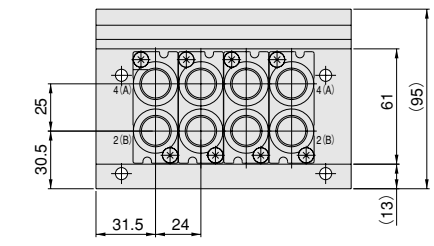


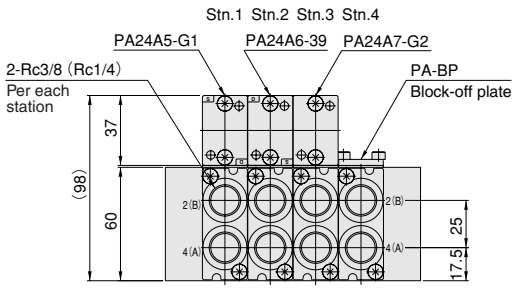


Unit Dimensions

Number of units	L	P
2	87	60
3	111	84
4	135	108
5	159	132
6	183	156
7	207	180
8	231	204
9	255	228
10	279	252
11	303	276
12	327	300
13	351	324
14	375	348
15	399	372
16	423	396

●Viewed from **A**
PAM□B-B□ (for bottom piping type)

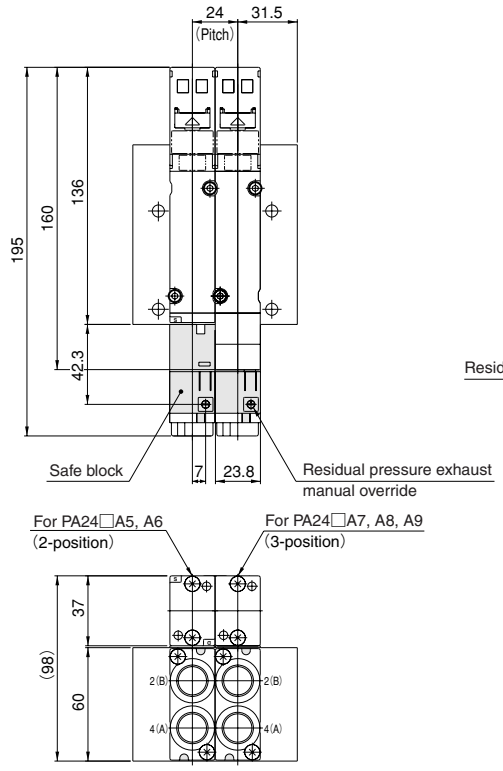




Note: The side piping type and bottom piping type cannot be selected on the same manifold. Select either piping type for the manifold.

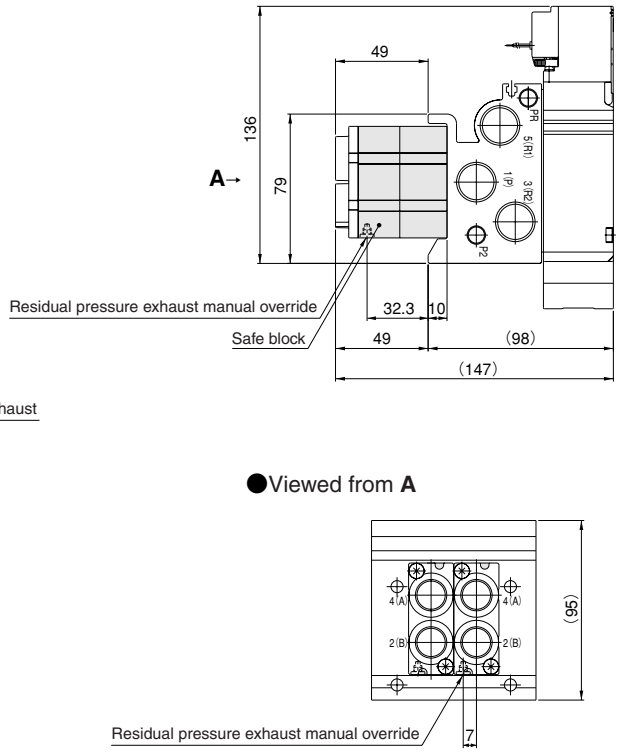
PAM□A

Side piping type



PAM□B

Bottom piping type



●Viewed from **A**