CKD

SM-P00022-A／5

INSTRUCTION MANUAL

(ISO Standard Solenoid Valve)

PV5G·PV5 SERIES

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

Ver.5

CKD Corporation

For Safety Use

To use this product safety, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (ISO 4414 *1, JIS B 8370 *2).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, **read this operation manual carefully for proper operation.**

Observe the cautions on handling described in this manual, as well as the following instructions:

⚠ **DANGER** : Failure to pay attention to DANGER notices may cause a situation that results in a fatality or serious injury and that requires urgent addressing

⚠ **WARNING** : Failure to pay attention to WARNING notices may result in a fatality or serious injury.

⚠ **CAUTION** : Failure to pay attention to CAUTION notices may result in injury or damage to equipment or facilities.

*1) ISO 4414 : Pneumatic fluid power ··· Recommendations for the application of equipment to transmission and control systems.

*2) JIS B 8370 : General rule for pneumatic systems

UNPACKING (Section 3)

⚠ CAUTION : Bags containing solenoid valves should be opened only when you are ready to connect the valves to the pipes immediately afterward.

- If bags are opened before the valves are ready to be connected to the pipes, the entry of foreign matter from the piping ports could cause the solenoid valves to fail or malfunction.

INSTALLATION (Section 4)

⚠ CAUTION : If you have to use the product under conditions that are different from the specified conditions or if you intend to use the product for a special application, be sure to consult us about the product specifications before using the product.

ENVIRONMENT (Section 4.1)

⚠ CAUTION :

a) In a dusty environment, foreign matter may enter even through the exhaust port.

- The movement of the exhaust valve causes a respiratory action at the exhaust valve, which may cause inhalation of foreign matter near the exhaust port. This potential situation would be worse if the exhaust port is facing upward. Attach a silencer to the exhaust port or have the exhaust port face downward.

b) Do not keep water or coolant dripping to the solenoid valve system constantly.

- In case that the solenoid valve system is used under the conditions with constant water splash, protect it by a cover or install it inside a enclosure.
- If the cylinder rod is splashed with cutting oil, the oil may penetrate through the cylinder into the secondary side piping of the solenoid valve. This must be prevented to avoid malfunctions. Consult with CKD us for preventive measures.

c) The coils will produce heat.

- Particularly if the solenoid valve system is installed in a control board or if the solenoid coils need to be energized for a long time, consider providing sufficient ventilation to release the heat. The coils can get very hot.

d) Do not use the solenoid valve system in an atmosphere that includes a corrosive gas or solvent vapors.

- Do not use the solenoid valve system in an atmosphere that includes a corrosive gas such as the sulfur dioxide gas or in an atmosphere that includes solvent vapors.

e) Vibrations and shocks

- Do not subject the solenoid valve system to vibrations 50m/s^2 or stronger or shocks 300m/s^2 or stronger.

f) Avoid using the solenoid valve system in a humid environment because the humidity is likely to cause condensation with a change in the temperature.

g) Do not use the normal type solenoid valves for an application that requires conformity with explosion-proof specifications. Choose explosion-proof solenoid valves instead.

INSTALLATION (Section 4.2)

⚠ WARNING :

When installing a solenoid valve unit, never attempt to hold it in position by means of the pipes connected to it.
Mount the solenoid valve by applying the mounting screws and/or mounting plate to the solenoid valve.

PIPING (Section 4.3)

⚠ CAUTION :

a) Observe the recommended tightening torque when connecting pipes.
- Observing the recommended tightening torque prevents air leakage and damage to the screw threads. To prevent damage to the screw threads, first use your hand to lightly tighten the screw and then use a tool to tighten the screw to the recommended torque.

b) Make sure that the pipes will not be disconnected at the joints by mechanical movements, vibrations or tension.
- If the exhaust piping of the pneumatic circuit is disconnected, the actuator speed control is disabled.
- If the above happens to a chuck holding mechanism, the chuck will open. The inadvertent opening of the chuck may cause a serious accident.

c) When supplying the compressed air for the first time after completing the piping, be sure to check every joint in the piping for air leakage.

d) When supplying the compressed air for the first time after completing the piping, increase the air pressure gradually but never introduce a highly-pressurized air suddenly.
- A sudden introduction of a highly-pressurized air may disconnect pipes at joints and/or cause the tubes to jump around, any of which may cause an injury.

e) Do not decrease the inside diameter of the piping from any of the solenoid valve exhaust ports to a diameter less than the exhaust pipe connecting port size.
- Normal operation of the actuator depends on the smoothness of the exhaust flow. With a manifold system, a restriction to the exhaust flow may prevent normal operation of other solenoid valves.

f) Removal of foreign matter
- Rust and other foreign matter in the pneumatic circuit may cause a malfunction or leakage from the valve seat. Insert a filter (maximum allowable particle size 5μm or less) immediately upstream of the solenoid valve.

g) Air supply

Do not restrict the flow of air through the air supply piping. With a manifold system with multiple stations, a drop in the air supply pressure may cause trouble through a delay in the operation timing.

WIRING (Section 4.4)

⚠ CAUTION : Before supplying the power, check the power supply voltage and the current type (AC or DC).

Protection class :class Ⅰ ()･･･AC100,110V,200V,220V

Protection class :classⅢ ()･･･DC12,24V

⚠ WARNING : When carrying out electrical connections, please perform disassembling and assembling work after reading the Instruction Manual carefully and with full understanding of its contents.

- Your understanding of the structure of solenoid valve and its operation principle is required in order to secure the safety.

MANUAL OVERRIDE (Section 5.2)

⚠ WARNING : Before using the manual override, make sure that nobody is present near the cylinder to be activated.

AIR QUALITY (Section 5.3)

⚠ WARNING :

a) Do not supply anything other than compressed air.
b) Supply clean compressed air without any mixture of corrosive gas.

⚠ CAUTION :

a) Compressed air usually contains a large amount of drain, oxidized oil, tar, foreign matter, and rust from the piping. Filter out those elements in the supplied air because they may cause a malfunction and decrease service life. In addition, clean the exhaust before it is released to the air to minimize pollution.
b) Once you have lubricated a pre-lubricated valve, the valve is no longer capable of running without being lubricated from the outside. Do not leave the valve without lubrication but keep it lubricated.
c) Do not use spindle oil or machine oil. They may induce expansion of the rubber parts, which may cause a malfunction.

ELECTRIC CIRCUITS (Section 5.4)

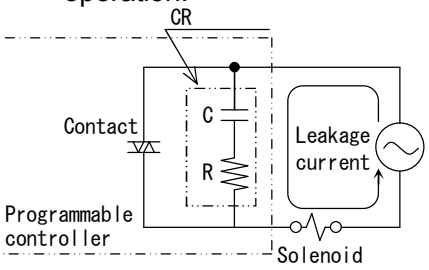
⚠ CAUTION :

a) Check for the presence of any current leak from the external control device because it may cause an erroneous valve operation.

- When a programmable controller or a similar control device is used, a current leak may prevent the normal returning of the valve when the solenoid is de-energized.

b) Restriction on current leak

- When controlling solenoid valves using a programmable controller or a similar control device, make sure that the current leak in the programmable controller output is equal to or less than the level shown in the table below. A current leak larger than the allowable level may cause an erroneous valve operation.



AC100V	3.0 mA or less
AC200V	1.5 mA or less
DC12V	1.5 mA or less
DC24V	1.8 mA or less

PERIODIC INSPECTION (Section 6.1)

⚠ WARNING :

Before providing a maintenance service, cut the power and the supply of compressed air and confirm the absence of residual pressure.
The above is required to ensure safety.

⚠ CAUTION :

Regularly perform the daily and periodic inspections to correctly maintain product performance.
If the product is not correctly maintained, product performance may deteriorate dramatically, resulting in a shorter service life, fractures of components, and malfunctions.

DISASSEMBLING AND ASSEMBLING (Section 6.2)

⚠ WARNING :

Please avoid disassembling and reassembling the solenoid valve, otherwise the sealing and drip proof performance may deform. Disassembled and Reassembled product by the customer will not be guaranteed.

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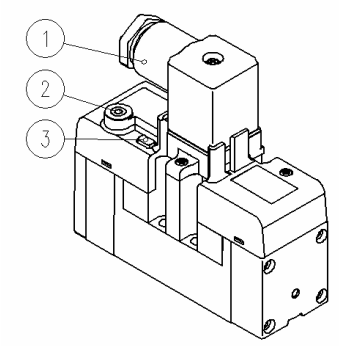
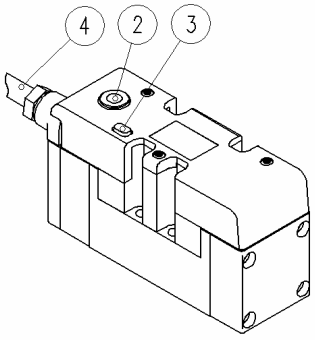
PV5G･PV5
Manual No. SM-P00022-A／5

1. PRODUCT



PV5G(DIN terminal box type)



PV5(I/O connector type)

No.	Name	Description
①	DIN terminal box	Connection to coil.
②	Manual override	Push to turn ON, release to turn OFF.
③	Indication lamp	When coil is energized, a display lamp indicating energized status turns ON. (a: Red when ON b: Green when ON)
④	I/O connector cable	Connection to coil.

2. INTERNATIONAL SYSTEM OF UNITS (SI) AND PORT INDICATION

2.1 Port Indication

Each piping port is marked with JIS conformable piping port indication codes.

Application	JIS	ISO
Supply port	P	1
Output port	A	4
Output port	B	2
Exhaust port	R1	5
Exhaust port	R2	3

●Installing position of the solenoid valve is free.

2.2 Conversion between International System of Units (SI) and Conventional Units

In this manual, values are expressed using the International System of Units (SI).
Use the table below to convert them into values expressed in conventional units.

Table of conversion between SI units and conventional units
(The values printed in Bolds fonts are values given in the International System of Units (SI)):

Example (converting a pressure value):
1kgf/cm² → **0.980665MPa** **1MPa** → 1.01972×10kgf/cm²

- Force

N	dyn	kgf
1	1×10^{5}	1.01972×10^{-1}
1×10^{-5}	1	1.01972×10^{-6}
9.80665	9.80665×10^{5}	1

- Stress

Pa or N/m²	MPa or N/mm²	kgf/mm²	kgf/cm²
1	1×10^{-6}	1.01972×10^{-7}	1.01972×10^{-5}
1×10^{6}	1	1.01972×10^{-1}	1.01972×10
9.80665×10^{6}	9.80665	1	1×10^{2}
9.80665×10^{4}	9.80665×10^{-2}	1×10^{-2}	1

※:1Pa=1N/m², 1MPa=1N/mm²

- Pressure

Pa	kPa	MPa	bar	kgf/cm²	atm	mmH_2O	MmHg or Torr
1	1×10^{-3}	1×10^{-6}	1×10^{-5}	1.01972×10^{-5}	9.86923×10^{-6}	1.01972×10^{-1}	7.50062×10^{-3}
1×10^{3}	1	1×10^{-3}	1×10^{-2}	1.01972×10^{-2}	9.86923×10^{-3}	1.01972×10^{2}	7.50062
1×10^{6}	1×10^{3}	1	1×10	1.01972×10	9.86923	1.01972×10^{5}	7.50062×10^{3}
1×10^{5}	1×10^{2}	1×10^{-1}	1	1.01972	9.86923×10^{-1}	1.01972×10^{4}	7.50062×10^{2}
9.80665×10^{4}	9.80665×10	9.80665×10^{-2}	9.80665×10^{-1}	1	9.67841×10^{-1}	1×10^{4}	7.35559×10^{2}
1.01325×10^{5}	1.01325×10^{2}	1.01325×10^{-1}	1.01325	1.01323	1	1.03323×10^{4}	7.60000×10^{2}
9.80665	9.80665×10^{-3}	9.80665×10^{-6}	9.80665×10^{-5}	1×10^{-4}	9.67841×10^{-5}	1	7.35559×10^{-2}
1.33322×10^{2}	1.33322×10^{-1}	1.33322×10^{-4}	1.33322×10^{-3}	1.35951×10^{-3}	1.31579×10^{-3}	1.35951×10	1

※:1Pa=1N/m²

3. UNPACKING

⚠ CAUTION : Bags containing solenoid valves should be opened only when you are ready to connect the valves to the pipes immediately afterward.

- If bags are opened before the valves are ready to be connected to the pipes, the entry of foreign matter from the piping ports could cause the solenoid valves to fail or malfunction.

a) Check the model number imprinted on the product to make sure that the product you received is exactly the product you ordered.
b) Check the exterior of the product for any damage.
c) Before using the product, read the supplied documentation.

4. INSTALLATION

⚠ CAUTION : If you have to use the product under conditions that are different from the specified conditions or if you intend to use the product for a special application, be sure to consult us about the product specifications before using the product.

4.1 Environment

⚠ CAUTION :

a) In a dusty environment, foreign matter may enter even through the exhaust port.
- The movement of the exhaust valve causes a respiratory action at the exhaust valve, which may cause inhalation of foreign matter near the exhaust port. This potential situation would be worse if the exhaust port is facing upward. Attach a silencer to the exhaust port or have the exhaust port face downward.

b) Do not keep water or coolant dripping to the solenoid valve system constantly.
- In case that the solenoid valve system is used under the conditions with constant water splash, protect it by a cover or install it inside a enclosure.
- If the cylinder rod is splashed with cutting oil, the oil may penetrate through the cylinder into the secondary side piping of the solenoid valve. This must be prevented to avoid malfunctions. Consult us for preventive measures.

c) The coils will produce heat.
- Particularly if the solenoid valve system is installed in a control board or if the solenoid coils need to be energized for a long time, consider providing sufficient ventilation to release the heat. The coils can get very hot.

d) Do not use the solenoid valve system in an atmosphere that includes a corrosive gas or solvent vapors.
- Do not use the solenoid valve system in an atmosphere that includes a corrosive gas such as the sulfur dioxide gas or in an atmosphere that includes solvent vapors.

e) Vibrations and shocks
- Do not subject the solenoid valve system to vibrations 50m/s^2 or stronger or shocks 300m/s^2 or stronger.

f) Avoid using the solenoid valve system in a humid environment because the humidity is likely to cause condensation with a change in the temperature.

g) Do not use the normal type solenoid valves for an application that requires conformity with explosion-proof specifications. Choose explosion-proof solenoid valves instead.

4.2 Installation

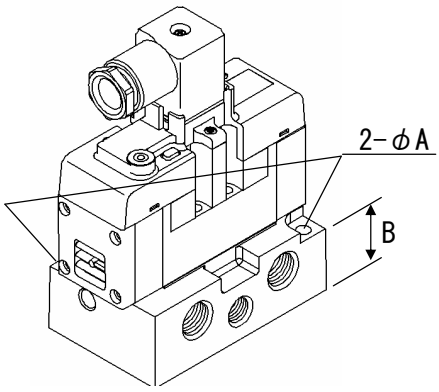
> **⚠ WARNING :** When installing a solenoid valve unit, never attempt to hold it in position by means of the pipes connected to it.
> - Mount the solenoid valve by applying the mounting screws and/or mounting plate to the solenoid valve.

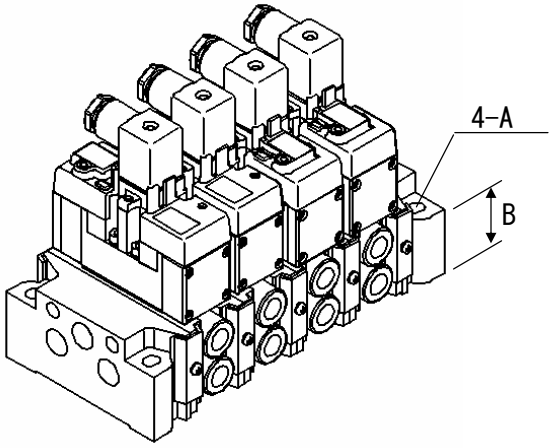
4.2.1 Please secure an enough space around the solenoid valve for mounting, dismounting and piping work.

4.2.2 In case of installing directly

1) Individual sub base type
Use the two (2) drilled holes.

2) Manifold type
Use the four (4) holes for mounting.





	Size	Dimension A	Dimension B
Individual sub base type	ISO size 1 ; A02,A03	6.5	31
	ISO size 2 ; A03,A04	6.5	42
	ISO size 2 ; A06	7.5	55
Manifold type	CMF1	9×11	45
	CMF2	11×13	45

About detail of manifold type, please refer to CMF manual instructions(SM-1998-A).

4.3 Piping

⚠ CAUTION :

a) Observe the recommended tightening torque when connecting pipes.
- Observing the recommended tightening torque prevents air leakage and damage to the screw threads. To prevent damage to the screw threads, first use your hand to lightly tighten the screw and then use a tool to tighten the screw to the recommended torque.

b) Make sure that the pipes will not be disconnected at the joints by mechanical movements, vibrations or tension.
- If the exhaust piping of the pneumatic circuit is disconnected, the actuator speed control is disabled.
- If the above happens to a chuck holding mechanism, the chuck will open. The inadvertent opening of the chuck may cause a serious accident.

c) When supplying the compressed air for the first time after completing the piping, be sure to check every joint in the piping for air leakage.

d) When supplying the compressed air for the first time after completing the piping, increase the air pressure gradually but never introduce a highly-pressurized air suddenly.
- A sudden introduction of a highly-pressurized air may disconnect pipes at joints and/or cause the tubes to jump around, any of which may cause an injury.

e) Do not decrease the inside diameter of the piping from any of the solenoid valve exhaust ports to a diameter less than the exhaust pipe connecting port size.
- Normal operation of the actuator depends on the smoothness of the exhaust flow. With a manifold system, a restriction to the exhaust flow may prevent normal operation of other solenoid valves.

f) Removal of foreign matter
- Rust and other foreign matter in the pneumatic circuit may cause a malfunction or leakage from the valve seat. Insert a filter (maximum allowable particle size 5μm or less) immediately upstream of the solenoid valve.

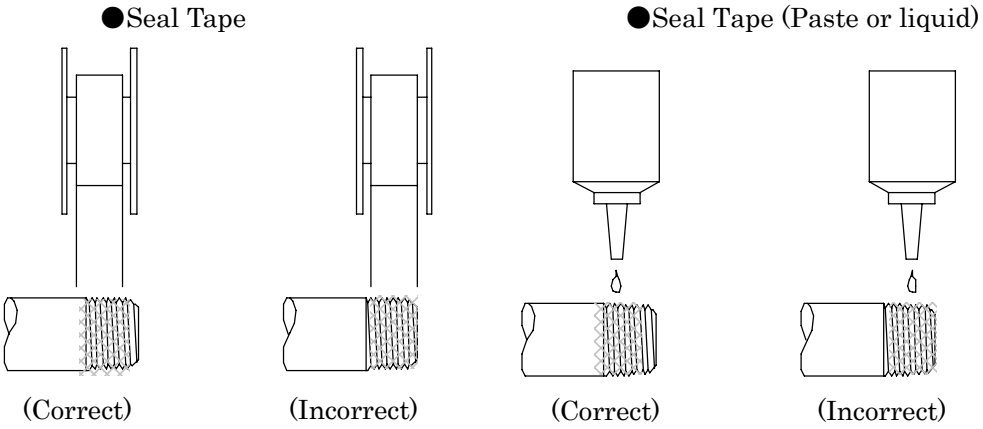
g) Air supply
- Do not restrict the flow of air through the air supply piping. With a manifold system with multiple stations, a drop in the air supply pressure may cause trouble through a delay in the operation timing.

Tightening torque

Joint screw	Tightening torque N·m
Rc1/8	3 to 5
Rc1/4	6 to 8
Rc3/8	13 to 15
Rc1/2	16 to 18
Rc3/4	19 to 40

4.3.1 Seal material

When using seal material, take care to avoid getting it in the pipes or overflowing on the exterior surface of the pipes.



When applying fluororesin sealing tape to the screw threads, wind the tape two or three times around the threads but leave the one or two threads at the pipe end uncovered. Firmly press the tape against the threads using the tip of your fingernail. When applying liquid type seal material, apply the material to all the threads except one or two threads at the pipe end and take care not to apply too much of it.

Never apply the seal material to the female threads in the device side piping port.

4.3.2 Flushing

Before connecting pipes, flush the interiors of the tubes, solenoid valves, and connected devices to remove foreign matter.

4.3.3 Blow circuit

Do not open the cylinder port circuit to the air because a drop in the air supply pressure may cause a malfunction. Select the external pilot type design instead of the internal pilot type design. The lowest allowable pressure with the internal pilot type design is 2-position:0.15 MPa,3-position:0.2MPa.

4.3.4 Exhaust port

Minimize the restriction to the flow of the exhaust air because such restriction may cause a delay in the cylinder response. If such a delay happens, the speed needs to be adjusted between the cylinder and solenoid valve.

4.3.5 Pipe connections

(1) Tubes to be used

For use with solenoid valves with push-in joints, select tubes of the type specified by us:

Soft nylon tubes (F-1500 Series)
Urethane tubes (U-9500 Series)

(2) For installation at a site that has spatters in the air, select incombustible tubes or metal pipes.

(3) For a piping used for both hydraulic and pneumatic controls, select a hydraulic hose.
When combining a spiral tube with a standard push-in joint, fix the tube origin using a hose band. Otherwise the rotation of the tube will decrease the efficiency of the clamping.
For use in a high-temperature atmosphere, select fastener joints instead of push-in joints.

(4) When selecting from tubes commercially available, carefully study the accuracy of the outside diameter as well as the wall thickness and the hardness. The hardness of a urethane tube should be 93° or more (as measured by a rubber hardness meter).
With a tube that does not have a sufficient accuracy of the outside diameter or the specified hardness, a decrease in the chucking force may cause disconnection or difficulty in inserting.

Tube dimensions

Outside diameter mm	Inside diameter mm	
	Nylon	Urethane
φ4	φ2.5	φ2
φ6	φ4	φ4
φ8	φ5.7	φ5
φ10	φ7.2	φ6.5

Outside diameter allowance

Soft or hard nylon	±0.1mm
Urethane φ4, φ6	+0.1mm -0.15mm
Urethane φ8, φ10	+0.1mm -0.2mm

(5) Bending radius of tubes

Observe the minimum bending radius of tubes. Neglecting the minimum bending radius may cause disconnection or leaks.

Tube bore	Minimum bending radius mm	
	Nylon	Urethane
φ4	10	10
φ6	20	20
φ8	30	30
φ10	40	40

(6) Cutting a tube

To cut a tube, use a tube cutter to cut the tube perpendicularly to the length of the tube. Inserting an obliquely cut end of a tube may cause air leakage.

(7) Tube connections

Do not bend a tube immediately at where it is connected to the joint but lead it out straight from the end of the joint for a length equal to or greater than the outside diameter or the tube. The tension applied sideways through the tube should not exceed 40N.

4.4 Wiring

> **⚠ CAUTION:** Before energizing, check the voltage of power source and whether AC or DC.
>
> Protection class :class Ⅰ (⏚)・・・AC100,110V,200V,220V
>
> Protection class :class Ⅲ (Ⅲ)・・・DC12,24V

> **⚠ WARNING:** When carrying out electric wiring, please perform disassembling and assembling work after reading the Instruction Manual carefully and with full understanding of its contents.
>
> ・Your understanding of the structure of solenoid valve and its operation principle is required in order to secure the safety.

4.4.1 DIN terminal box type

1) About DIN terminal box

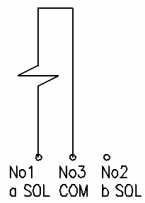
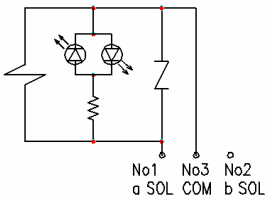
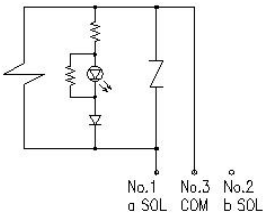
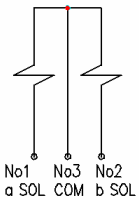
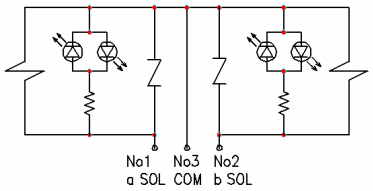
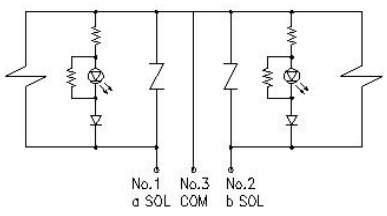
(1) Please use the cable conformable with JIS C3312 (600V vinyl insulation vinyl cable), conductor cross-section areas 0.75mm^2 or 1.25mm^2, and 2/3/4 conductor (O.D. :8.5 to 11.5mm)

(2) On the end of cable, use crimp terminal to prevent contact defective and coming off. (E.g. :1.25Y-3U/1.25-3.5S/1.25-4M/I.D.M3.5/O.D. should be within 7mm)

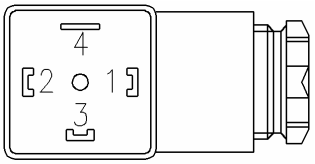
(3) Tighten set screws with 0.5 to 0.6 N・m tightening torque.

2) Wiring

(1) Internal circuit diagram

	Without lamp	With lamp and surge absorber
Single	DC AC 	DC  AC 
Double	DC AC 	DC  AC 

(2)How to wire



DC12,24V

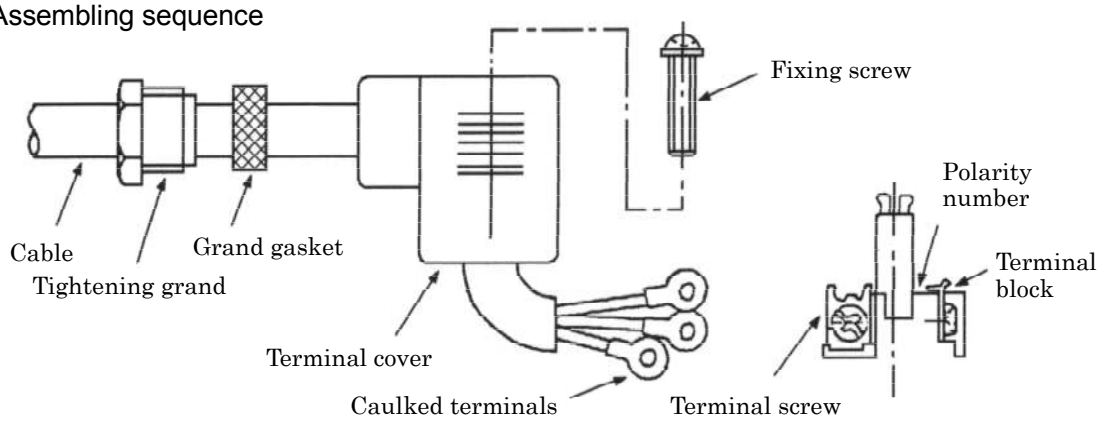
Terminal	Wiring position
1	Solenoid a
2	Solenoid b
3	Common terminal

AC100,110V,200V,220V

Terminal	Wiring position
1	Solenoid a
2	Solenoid b
3	Common terminal
4	Earth (ground)

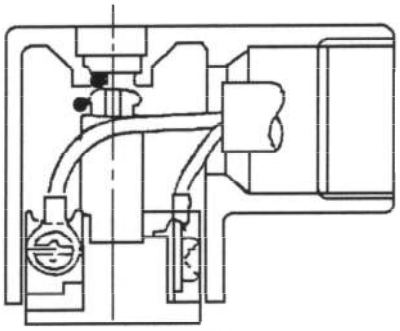
Note: No polarity in DC voltage.

(3)Assembling sequence



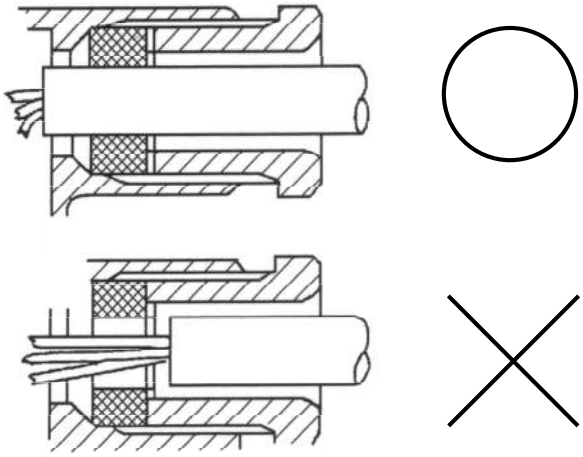
Strip the cable to predetermined length and interest it through tightening grand, grand gasket, terminal cover and caulk terminal metal piece. Connect terminals onto terminal blocks refering to casted polarity number on the blocks. Insert blocks into terminal cover. Tighten grand after applying grand gasket seal.

(4)Cautions while inserting blocks into terminal cover



Insert each single wire as illustrated to left. Carefully avoid to have cable wire hooked at ● marked corner as it may cause damage of wire or terminal blocks.

(5)Cautions while serring grand gasket



Before tightening grand seal, ensure the cable comes out through grand as illustrated to the left so as to provide appropriate sealing effect and to stand against pulling strain.
It is questionable electrically against pulling stress as well as the effect of water proof if mutual correlation of grand and cable is as per illustrated below.

(6) Cautions while disassembling and assembling

In case of taking terminal blocks out of terminal cover, make sure to do it after removing mounting screw. In case of inserting terminal blocks into terminal cover, tighten mounting screw only after inserting terminal blocks into terminal cover correctly. Negligence of above may cause damage of the tip of block making blocks unable being fixed by terminal cover.

(7) Appropriate tightening torque to respective mounting screws

Terminal screw (M3.5)	0.9 to 1.4 N·m
Tightening grand (PE1 / 2)	1.0 to 1.5 N·m
Mounting screw (M3)	0.5 to 0.6 N·m

2) About I/O connector type

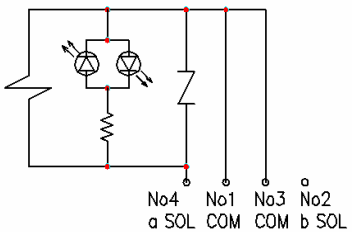
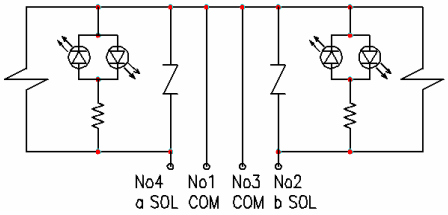
(1) The internal wiring has already been made at the factory.

(2) Please connect a connection cable suitable to I/O connector. In such a case, pay your careful attention to the tightening torque. (Proper tightening torque 0.39 to 0.49 N･m)

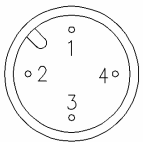
Example of connection cable of I/O connector type

Manufacturer's name	Model number
Omron Co., Ltd.	XS2W-D421-B81-T

(3) Internal circuit diagram

	With lamp and surge absorber
Single	DC 
Double	DC 

(4) How to wire



(Connector terminal)

Terminal	Wiring position
1	Common terminal
2	Solenoid b
3	Common terminal
4	Solenoid a

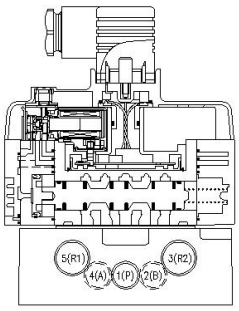
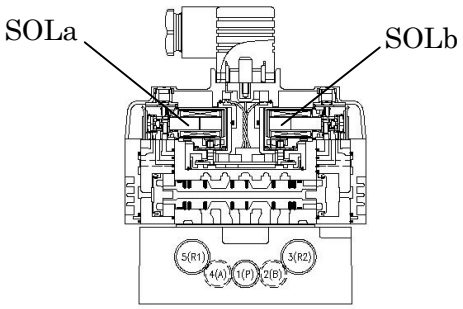
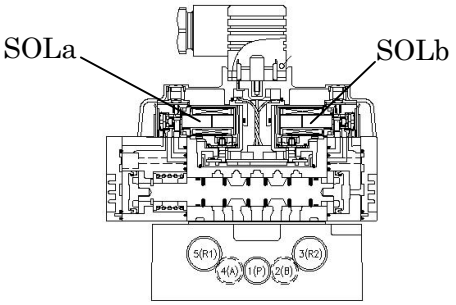
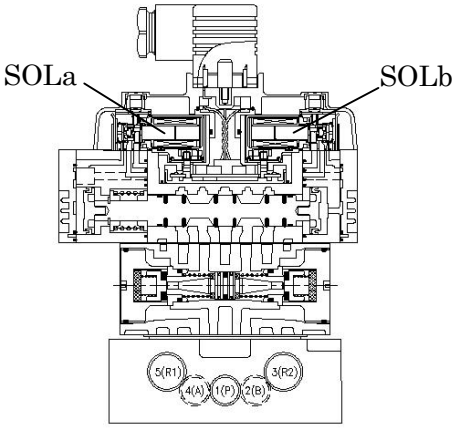
Note: Terminal 2 is not used for Single.

5. OPERATING RECOMMENDATION

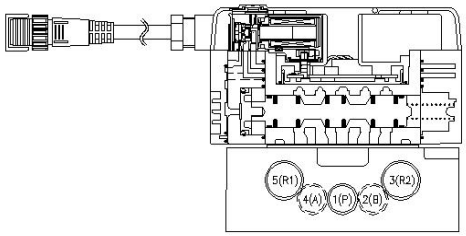
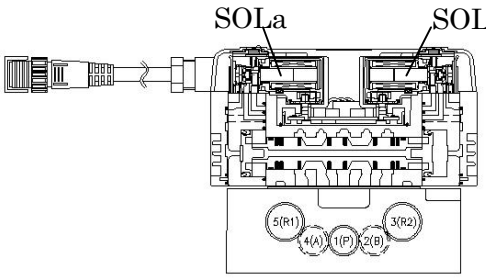
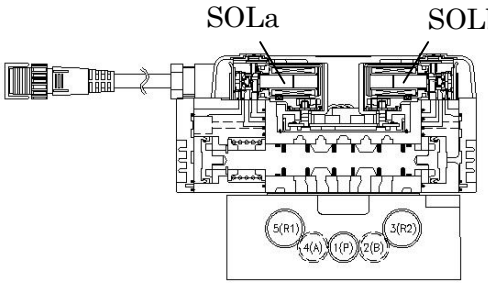
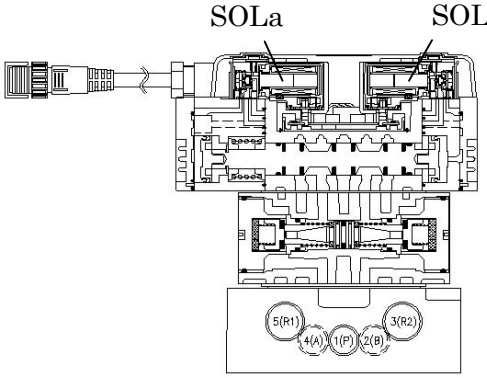
5.1 Operation

1) Valve operation

DIN terminal box type

	Illustration of operation	Explanation of operation
PV5G-6-※-S PV5G-8-※-S Single		FG-S(Supply pressure type) When de-energized (shown on the illustration) 1(P) → 2(B) 4(A) → 5(R1) When energized 1(P) → 4(A) 2(B) → 3(R2)
		YZ-S(Exhaust pressure type) When de-energized (shown on the illustration) 5(R1) → 4(A) 2(B) → 1(P) When energized 3(R2) → 2(B) 4(A) → 1(P)
PV5G-6-※-D PV5G-8-※-D Double		FG-D(Supply pressure type) SOLb When energized(Shown on the illustration) 1(P) → 2(B) 4(A) → 5(R1) SOLa When energized 1(P) → 4(A) 2(B) → 3(R2) The valve, once energized, retains by itself its position even if the power supply is switched off.
		YZ-D(Exhaust pressure type) SOLb When energized(Shown on the illustration) 5(R1) → 4(A) 2(B) → 1(P) SOLa When energized 3(R2) → 2(B) 4(A) → 1(P) The valve, once energized, retains by itself its position even if the power supply is switched off.
PV5G-6-※-D PV5G-8-※-D 3-position		FHG-D When de-energized 1(P), 4(A), 2(B), 5(R1), 3(R2) close
		FJG-D When de-energized 1(P) close 4(A), 2(B) → 5(R1), 3(R2)
		FIG-D When de-energized 1(P) → 4(A), 2(B) 5(R1), 3(R2) close
PV5G-6-FPG-D PV5G-8-FPG-D 3-position All port block Non leak		When de-energized (shown on the illustration) 1(P),4(A),2(B) close 5(R1),3(R2) open

I/O connector type

	Illustration of operation	Explanation of operation
PV5-※R-FG-S Single		When de-energized (shown on the illustration) 1(P) → 2(B)　4(A) → 5(R1) When energized 1(P) → 4(A)　2(B) → 3(R2)
PV5-※R-FG-D Double		SOLb When energized(Shown on the illustration) 1(P) → 2(B)　4(A) → 5(R1) SOLa When energized 1(P) → 4(A)　2(B) → 3(R2) The valve, once energized, retains by itself its position even if the power supply is switched off.
PV5-※R-※-D 3-position		FHG-D When de-energized 1(P), 4(A), 2(B), 5(R1), 3(R2) close FJG-D When de-energized 1(P) close 4(A), 2(B) → 5(R1), 3(R2) FIG-D When de-energized 1(P) → 4(A), 2(B) 5(R1), 3(R2) close
PV5-※R-FPG-D 3-position All port block Non leak		When de-energized (shown on the illustration) 1(P),4(A),2(B) close 5(R1),3(R2) open

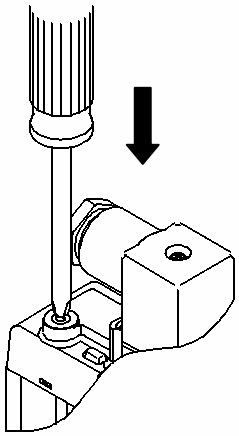
5.2 Manual override

Non-lock type (Standard)

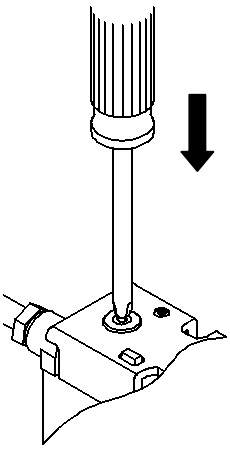
ON･･･Push button in the arrow direction below

OFF･･･Release it

DIN terminal box type



I/O connecter type



⚠ CAUTION: Do not press the manual override with a tool with a sharp end, or the rubber cover could be broken.
(Use a Phillips screwdriver not less than tip size #2.)

5.3 Air Quality

⚠ WARNING :

a) Do not supply anything other than compressed air.
b) Supply clean compressed air without any mixture of corrosive gas.

⚠ CAUTION :

a) Compressed air usually contains a large amount of drain, oxidized oil, tar, foreign matter, and rust from the piping. Filter out those elements in the supplied air because they may cause a malfunction and decrease service life. In addition, clean the exhaust before it is released to the air to minimize pollution.
b) Once you have lubricated a pre-lubricated valve, the valve is no longer capable of running without being lubricated from the outside. Do not leave the valve without lubrication but keep it lubricated.
c) Do not use spindle oil or machine oil. They may induce expansion of the rubber parts, which may cause a malfunction.

5.3.1 Lubrication

The PV5G･PV5 Series solenoid valve systems use pre-lubricated valves that usually do not require lubrication from the outside. If you have to lubricate a valve, use Type 1 turbine oil (ISO-VG32) without additives.

Excessive lubrication and extremely low pressure may cause a longer response time. The response time in the catalogue assumes no lubrication from the outside and the air supply pressure of 0.5 MPa.

5.3.2 Ultra-dry compressed air

The use of ultra-dry compressed air will cause splashing of the lubrication oil and result in a shorter service life.

5.3.3 Drain

(1) The drain is produced by a drop of temperature in pneumatic piping and devices.
(2) The drain may enter and instantaneously block a passage inside a pneumatic device and cause a malfunction.
(3) The drain accelerates the production of rust, which may cause the failure of pneumatic devices.
(4) The drain may wash away the lubrication oil, causing a malfunction from the lack of lubrication.

5.3.4 Foreign matter in the compressed air

1) Supply clean compressed air that does not include oxidized oil, tar, carbon, or other foreign matter from the air compressor.
(1) If oxidized oil, tar, carbon, or the like enters a pneumatic device and sticks to its components, an increase in the resistance at sliding portions may cause a malfunction.
(2) If oxidized oil, tar, carbon, or the like is mixed with the supplied lubrication oil, wear of the sliding components of the pneumatic device may be accelerated.
2) Supply clean compressed air that does not include solid foreign matter.
(1) Solid foreign matter in the compressed air may cause wear of the sliding components of the pneumatic device or stick to such components and cause hydraulic lock.

5.3.5 Cleaning the supplied air

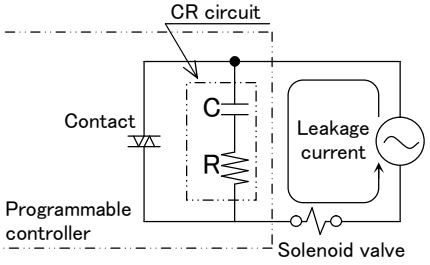
Compressed air usually contains a large amount of drain (water, oxidized oil, tar, and foreign matter). Remove these elements and clean the supplied air because they may cause a failure of the air compressor. For example, remove the humidity using an after-cooler dryer and remove the tar using a tar filter.

5.4 Electric circuits

⚠ CAUTION :

a) Check for the presence of any current leak from the external control device because it may cause an erroneous valve operation.
- When a programmable controller or a similar control device is used, a current leak may prevent the normal returning of the valve when the solenoid is de-energized.

b) Restriction on current leak
- When controlling solenoid valves using a programmable controller or a similar control device, make sure that the current leak in the programmable controller output is equal to or less than the level shown in the table below. A current leak larger than the allowable level may cause an erroneous valve operation.



AC100V	3.0 mA or less
AC200V	1.5 mA or less
DC12V	1.5 mA or less
DC24V	1.8 mA or less

(1) With a double solenoid type valve system, energize the solenoid for at least 0.1 second even for an instantaneous valve operation. If the target valve can be affected by a back pressure induced by another solenoid valve, it is recommendable to energize the solenoid as long as the cylinder is making an action.

(2) If solenoids are energized for a prolonged period of time, the surface temperature of the manifold will rise. Through this increase in the temperature should not be regarded as abnormal, provide a suitable means of ventilation or heat release.

6. MAINTENANCE

6.1 Periodic Inspection

⚠ WARNING :	Before providing a maintenance service, cut the power and the supply of compressed air and confirm the absence of residual pressure. ● The above is required to ensure safety.

⚠ CAUTION :	Regularly perform the daily and periodic inspections to correctly maintain product performance. ● If the product is not correctly maintained, product performance may deteriorate dramatically, resulting in a shorter service life, fractures of components, and malfunctions.

1) To use the solenoid valve system under optimum conditions, perform a periodic inspection once or twice a year.

2) Check the screws for loosening and the joints in the piping for integrity of the sealing. Regularly remove the drain from the air filters.

(1) Checking the compressed air supply pressure:
Is the supply pressure at the specified level?
The pressure gauge indicates the specified pressure when the system is operating?
(2) Checking the air filters:
Is the drain normally discharged?
Is the amount of dirt attached to the bowl and element at a normal level?
(3) Checking joints in the piping for the leakage of compressed air:
Are the pipes normally connected at joints, especially at the movable parts?
(4) Checking the operation of solenoid valves:
Is not there any delay in the operation? Is the exhaust flow normal?
(5) Checking the operation of pneumatic actuators:
Is the operation smooth?
Does the actuator stop normally at the end of the stroke?
Is the coupling with the load normal?
(6) Checking the lubricator:
Is the amount of oil adjusted properly?
(7) Checking the lubrication oil:
Is the supplied lubrication oil of the type specified by the manufacturer？

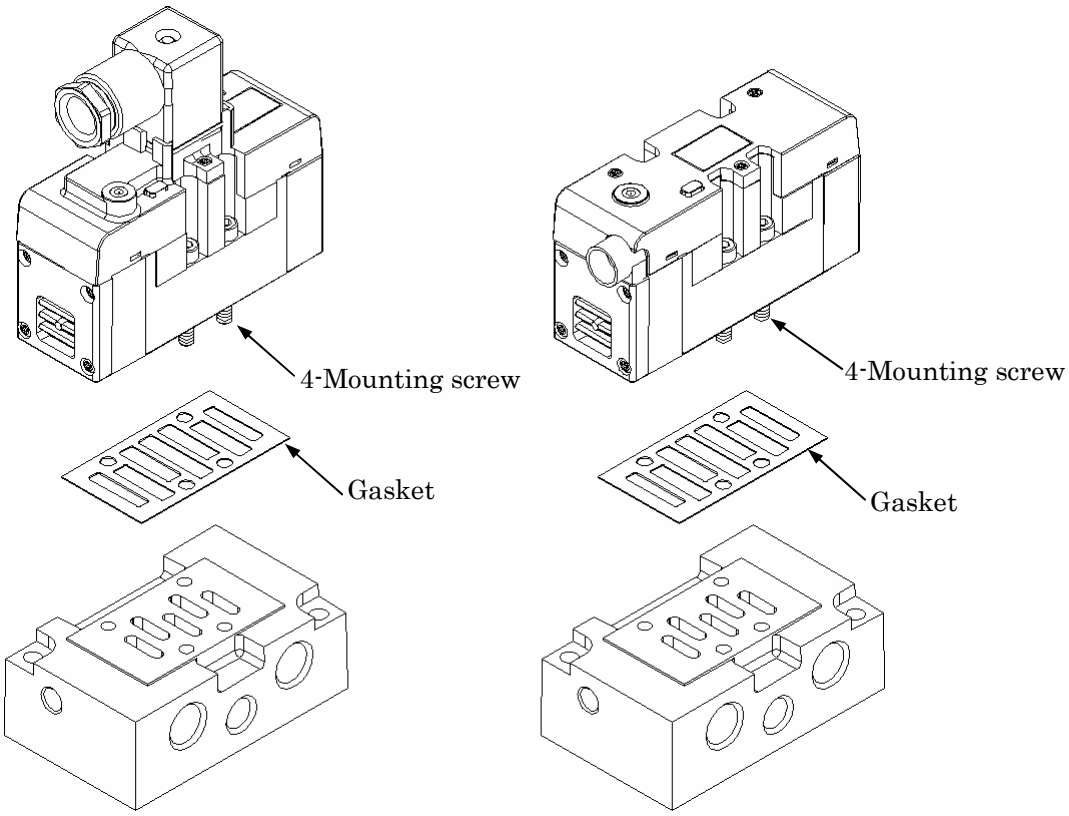
6.2 Disassembling and Reassembling

⚠ WARNING:	Please avoid disassembling and reassembling the solenoid valve, otherwise the sealing and drip proof performance may deform. Disassembled and Reassembled product by the customer will not be guaranteed.

6.2.1 When replacing the solenoid valve:

When replacing the solenoid valve, please pay your careful attention so that no gasket may fall apart.

Model	Tightening torque N･m
PV5G-6, PV5-6R	4.0 to 5.0
PV5G-8, PV5-8R	7.0 to 8.0



7. TROUBLE SHOOTING

TROUBLE SHOOTING

Motion troubles	Suspected cause	Remedies
Does not actuate	No electric signals	Turn on the power
	Damage to signal wiring system	Repair the control circuit
	Excessive fluctuating range of current or voltage	Reaffirm the power capacity. (within ±10% of voltage fluctuation)
Malfunctions	Excessive leaking current	Correct control circuit and / or set a bleed circuit
	Chattering	Inspect switching system and / or tighten each loosen terminal screw
	Voltage deviates than specified on the name plate	Rectify the voltage to meet the specification
	Erroneous shut off pressure source	Turn on the power source
	Insufficient pressure	Reset the pressure reducer valve or install a pressure raising valve
	Insufficient flow of fluid	Rectify the size of pipe or install a surge tank
	Pressure supplied through exhaust port	Change the piping to an external pilot system
	Erroneous piping, erroneous omitting some piping	Rectify the piping system
	Speed control valve completely closed by error	Reset the needle valve
	Output port is directly released to an open air	Install pipe joints to output ports with diameter equal to or smaller than that of to supply port joint
	Valve is frozen	Add remedies of avoiding freezing (Heating system or dehumidifying system etc.)
	Delayed return of a plunger (Excessive oil, existence of far)	Check the quality of the lubricant (Turbine oil type1, ISO VG 32 or equivalent) Rectify the quantity of lubricant drip Install a tar removing filter
	Clogged-up exhausting port with dust	Install a cover or silencer and clean it regularly
High actuating pressure is required	Bulged or decomposed packing	Check the quality of the lubricant (Turbine oil type1, ISO VG 32 or equivalent) Relocate the valves away from splashing area of cutting coolant Keep organic chemicals away from valves.
	Release of A and / or B port to an open air directly	Check the piping.

8. PRODUCT SPECIFICATIONS AND HOW TO ORDER

8.1 Product specifications

1) Common specifications

Model number / Item		PV5G-6/PV5G-8,PV5-6R/PV5-8R
Working fluid		Compressed air
Actuation		Pilot operated type
Valve structure		Soft spool valve
Min. working pressure MPa	2-position	0.15 Note 3
	3-position	0.2
Max. working pressure MPa		1.0
Proof pressure MPa		1.50
Ambient temperature °C		-5 to 60(No freezing)
Fluid temperature °C		5 to 60
Manual override		Non-locked type
Lubrication Note 1		Not required
Degree of protection Note 2		Dust-proof/Jet-proof (Equivalent to IP65 enclosure)
Vibration resistance m/s^2		50 or less
Shock resistance m/s^2		300 or less
Atmosphere		Must not used in any corrosive gas environment

Note 1 : In case of lubrication, please use turbine oil 1st grade ISO VG32.
Excess lubrication or intermittent lubrication may cause unsteady operation.
Note 2 : This is based on the standard test method of IP65 (IEC60529 [IEC529: 1989-11])
Please check the sealing tightness in advance.
Note 3 : Use working pressure of R1 > R2 ≧ 0.15 MPa for exhaust port pressure (YZ-S type only)
Ref. : The pressure unit is indicated in MPa. Conversion rate: 1MPa = 10.1972kgf/cm^2

2) Electric specifications

Item				内容	
				PV5G-6、PV5G-8	PV5-6R、PV5-8R
Rated voltage V		AC		100（50/60Hz）	
				110（50/60Hz）	
				200（50/60Hz）	
				220（50/60Hz）	
		DC		12、24	24
Voltage fluctuation range				±10%	±10%
Starting current A		AC	100V(50/60Hz)	0.056/0.044	
			110V(50/60Hz)	0.051/0.040	
			200V(50/60Hz)	0.034/0.026	
			220V(50/60Hz)	0.031/0.024	
Holding current (With indicator) A		AC	100V(50/60Hz)	0.028/0.022(0.030/0.024)	
			110V(50/60Hz)	0.025/0.020(0.027/0.022)	
			200V(50/60Hz)	0.017/0.013(0.019/0.015)	
			220V(50/60Hz)	0.015/0.012(0.017/0.014)	
		DC	12V	0.083(0.100)	
			24V	0.042(0.050)	(0.050)
Power consumption (With indicator) W		AC	100V(50/60Hz)	1.8/1.4 (1.8/1.5)	
			110V(50/60Hz)		
			200V(50/60Hz)	2.1/1.6 (2.2/1.7)	
			220V(50/60Hz)		
		DC	12V	1.0(1.2)	
			24V	1.0(1.2)	(1.2)
Wiring type				Electrical plug connector	I/O connector
Heat-resistance class				B（mold coil）	

3) Specifications for each model

Item			PV5G-6	PV5G-6、PV5-6R
Port size			Rc1/4 、Rc3/8	Rc1/4 、Rc3/8
Rated voltage			AC	DC
Response time ms Note 1	2-position	Single	30（OFF → ON） 48（ON → OFF）	30（OFF → ON） 40（ON → OFF）
		Double	38	30
	3-position		30（OFF → ON） 58（ON → OFF）	30（OFF → ON） 50（ON → OFF）

Note1:The response time is the value under working pressure 0.5MPa without lubrication. This varies depending on the pressure and type of oil.

Item			PV5G-8	PV5G-8、PV5-8R
Port size			Rc3/8、 Rc1/2 、Rc3/4	Rc3/8、 Rc1/2 、Rc3/4
Rated voltage			AC	DC
Response time ms Note 1	2-position	Single	40FF → ON） 68N → OFF）	40（OFF → ON） 60（ON → OFF）
		Double	48	40
	3-position		40（OFF → ON） 68（ON → OFF）	40（OFF → ON） 60（ON → OFF）

Note1:The response time is the value under working pressure 0.5MPa without lubrication. This varies depending on the pressure and type of oil.

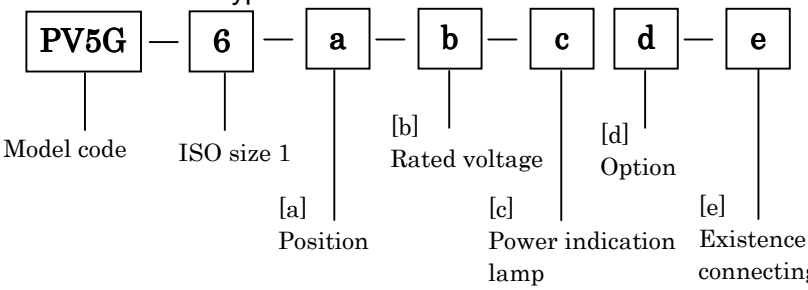
4） Flow specifications

Model	Connecting port diameter	Position	P→A/B		A/B→R1/R2	
			C[dm^3/(s·bar)]	b	C[dm^3/(s·bar)]	b
PV5G-6 PV5-6R	Rc1/4	2-pos. Single	6.1	0.28	6.7	0.20
		2-pos. Double	6.1	0.28	6.7	0.20
		3-pos. All port block	5.2	0.32	5.6	0.30
		3-pos. A·B·R connection	5.1	0.32	6.9	0.16
		3-pos. P·A·B connection	6.3	0.28	5.9	0.28
		3-pos. All port block Non leak	3.4	—	3.0	—
PV5G-8 PV5-8R	Rc3/8	2-pos. Single	10.7	0.17	13.0	0.19
		2-pos. Double	10.7	0.17	13.0	0.19
		3-pos. All port block	10.0	0.16	11.0	0.25
		3-pos. A·B·R connection	9.9	0.14	13.0	0.16
		3-pos. P·A·B connection	11.0	0.12	12.0	0.21
		3-pos. All port block Non leak	6.6	—	6.2	—

Reference: S (Effective sectional area) ≒ 5.0 X C (Sonic conductance)

8.2 How to order

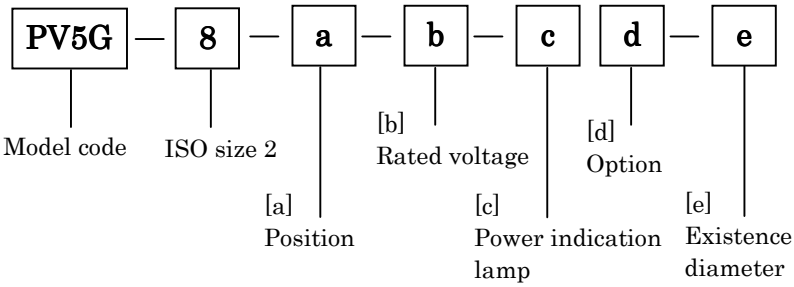
8.2.1 DIN terminal box type



[a]Position			[b]Rated voltage		[c]Power indication lamp	
FG-S	2-pos. Single	Supply pressure type	1	AC100V	No mark	Without lamp
FG-D	2-pos. Double		2	AC200V	N	With lamp and surge absober
FHG-D	3-pos. All port block		3	DC24V		
FJG-D	3-pos. A･B･R connection		4	DC12V		
FIG-D	3-pos. P･A･B connection		5	AC110V		
FPG-D	3-pos. All port block Non leak		6	AC220V		
YZ-S	2-pos. Single	Exhaust pressure type				
YZ-D	2-pos. Double					

[d]Option		[e]Existence of sub base and connecting port	
No mark	Without option	No mark	Without sub base
A	Coolant proof	A02	Side piping Rc1/4 (R port only Rc3/8)
		A03	Side piping Rc3/8

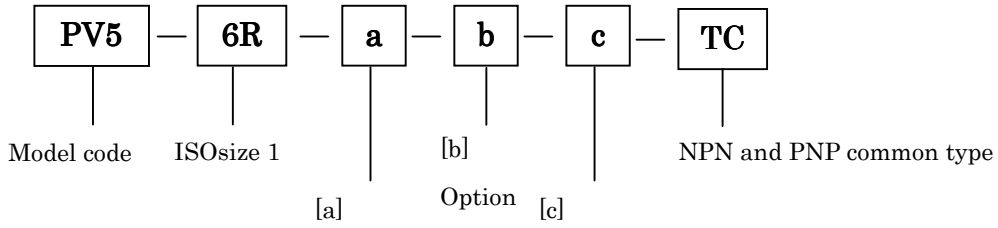
8 HOW TO ORDER



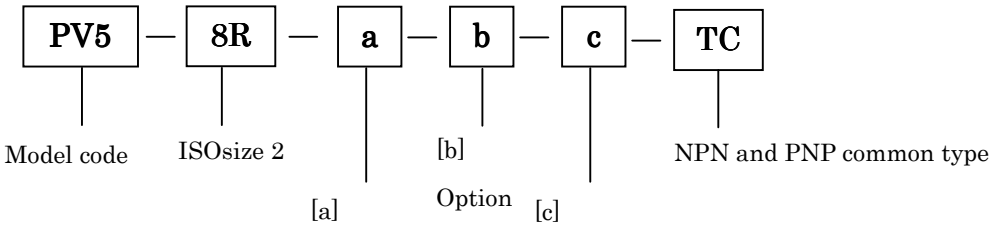
[a]Position			[b]Rated voltage		[c]Power indication lamp	
FG-S	2-pos. Single	Supply pressure type	1	AC100V	No mark	Without lamp
FG-D	2-pos. Double		2	AC200V	N	With lamp and surge absober
FHG-D	3-pos. All port block		3	DC24V		
FJG-D	3-pos. A･B･R connection		4	DC12V		
FIG-D	3-pos. P･A･B connection		5	AC110V		
FPG-D	3-pos. All port block Non leak		6	AC220V		
YZ-S	2-pos. Single	Exhaust pressure type				
YZ-D	2-pos. Double					

[d]Option		[e]Existence of sub base and connecting port	
No mark	Without option	No mark	Without sub base
A	Coolant proof	A03	Side piping Rc3/8 (R port only Rc1/2)
		A04	Side piping Rc1/2
		A06	Side piping Rc3/4

8.2.2 I/O connecter type



[a]Position			[b]Option		[c]Existence of sub base and connecting port diameter	
FG-S	2-pos. Single	Supply pressure type	No mark	Without option	No mark	Without sub base
FG-D	2-pos. Double		A	Coolant proof	A02	Side piping Rc1/4 (R port only Rc3/8)
FHG-D	3-pos. All port block				A03	Side piping Rc3/8
FJG-D	3-pos. A･B･R connection					
FIG-D	3-pos. P･A･B connection					
FPG-D	3-pos. All port block Non leak					



[a]Position			[b]Option		[c]Existence of sub base and connecting port diameter	
FGS	2-pos. Single	Supply pressure type	No mark	Without option	No mark	Without sub base
FGD	2-pos. Double		A	Coolant proof	A03	Side piping port Rc3/8(R port only Rc1/2)
FHGD	3-pos. All port block				A04	Side piping port Rc1/2
FJGD	3-pos. A･B･R connection				A06	Side piping Rc3/4
FIGD	3-pos. P･A･B connection					
FPGD	3-pos. All port block Non leak					