CKD

PNEUMATIC 3, 5-PORT SOLENOID VALVES

TVG SERIES

· Reduced Wiring Manifold

INSTRUCTION MANUAL

SM-A79480-A/3

- Be sure to read this Instruction Manual before using the product.
- In particular, read safety instructions carefully.
- Keep this Instruction Manual safe, so that you can readily consult it whenever necessary.

CKD Corporation

PREFACE

Thank you very much for purchasing CKD's **pneumatic 3, 5-port solenoid valve**. This Instruction Manual describes basic matters such as installation and usage in order to fully demonstrate the performance of this product. Read this manual carefully to use this product correctly.
Keep this Instruction Manual safe, so that it will not be lost.

Specifications and appearance described in this Instruction Manual are subject to change without notice.

- This product is intended for people who have a basic knowledge of materials, fluids, piping and electricity when using control valves (solenoid valves, motor-operated valves, air-operated valves, etc.). CKD shall not be liable for any accident caused by the selection or use of a control valve by a person without knowledge of the control valve or insufficient training.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to work at its full performance or an accident may occur due to fluid, pipework, or other conditions. It is the customer's responsibility to check the product specifications and determine the method of use depending on the application and usage.

SAFETY INFORMATION

When you design or manufacture equipment using this product, you are obligated to manufacture safe equipment. To do this, make sure that the mechanical mechanism of the equipment and the pneumatic or water control circuits, as well as the systems that electrically control them, are safe.

In regard to the safety related to the design and management of the equipment, please be sure to observe all industrial standards and regulations.

ISO 4414, JIS B 8370, JFPS 2008 (latest edition of each standard)
High Pressure Gas Safety Act, Occupational Safety and Health Act, other safety regulations, industrial standards, regulations, etc.

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been implemented in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER," "WARNING," and "CAUTION."

⚠ DANGER	Indicates a potentially hazardous situation which, if handled improperly, could result in imminent danger of death or serious injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if handled improperly, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if handled improperly, could result in personal injury or property damage.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Instructions on Product Use

⚠WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

Since this product is intended for use in devices or parts for general industrial machinery, it is not intended for use outdoors or in the conditions or environment listed below.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where significant effects on people and property are expected, especially in applications where safety is required.

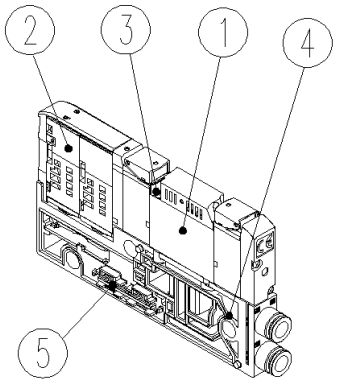
Do not handle the product or remove pipes and devices until confirming safety.

- Confirm the safety of all systems involved in the product before inspecting or maintaining the machine and devices. Also, shut off the supplied air and water, which are energy sources, as well as the power of the equipment, vent the compressed air in the system, and watch out for water leaks and electric leakage.
- Even when the operation is stopped, there still may be a hot section or an electrified section, so be careful when handling the product and removing pipes and devices.
- Before starting or restarting a machine or device that uses pneumatic equipment, check whether the safety of the system is ensured by measures such as a pop-out prevention mechanism.

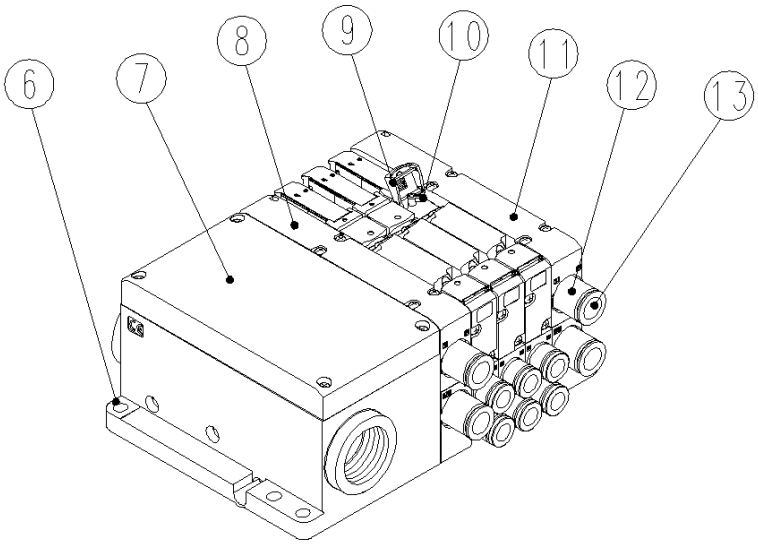
CONTENTS

1. PRODUCT OVERVIEW

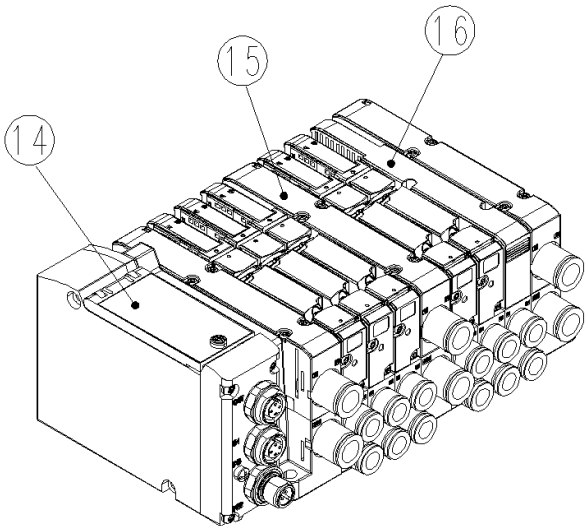
1.1 Part Name



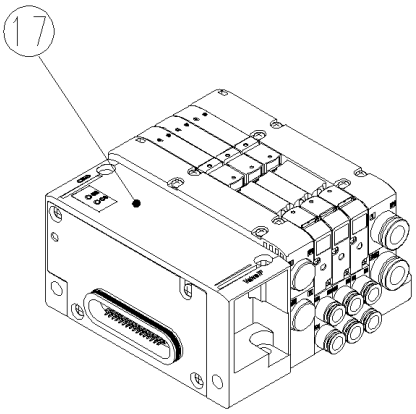
Valve block with solenoid valve



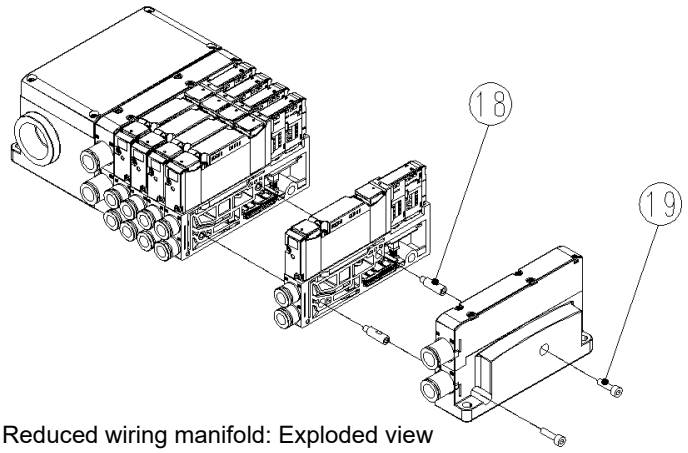
Manifold with centralized terminal block type solenoid valve



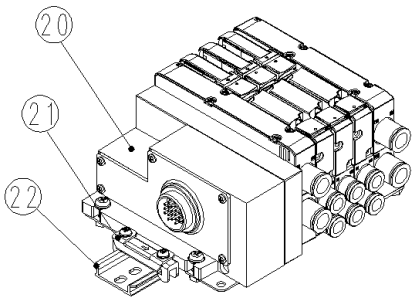
Manifold with serial transmission slave station type solenoid valve



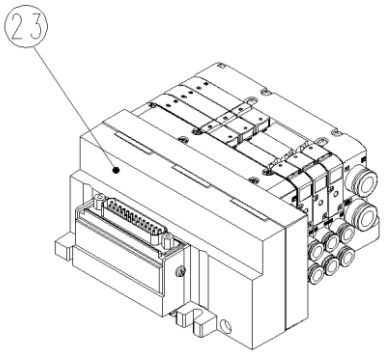
Manifold with remote IO connection block type solenoid valve



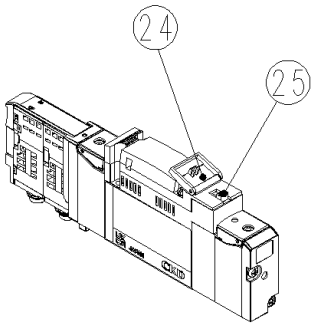
Reduced wiring manifold: Exploded view



Multi connector type manifold with solenoid valve



D-sub connector type manifold with solenoid valve

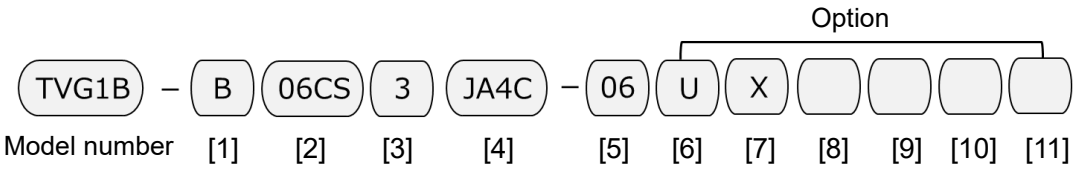


Residual pressure exhaust valve option

No.	Name	Description
1	Discrete valve	It has a mechanism to open and close the air passage.
2	Coil assembly	It switches the valves when it is energized. The protection structure is IP65 or IP67 rated.
3	Discrete valve mounting screw	Each discrete valve has two of them, fixing a discrete valve to each base.
4	Valve block	It has an output port that supplies compressed air to the secondary equipment.
5	Board connector	It is installed in the valve block and energizes the coil assembly in response to signals from the centralized terminal block or serial transmission slave station.
6	Mounting hole	It is used for direct mounting.
7	Centralized terminal block	It connects the output wires of the primary control equipment to the terminal block and transmits signals to the discrete valve.
8	Wiring block	It transmits signals from the centralized terminal block and serial transmission slave station to the valve. It has a supply port and an exhaust port.
9	Manual protection cover	It is a cover to prevent erroneous operation of manual override. Open it for manual override.
10	Manual override	There are different types of manual override: Locking/non-locking type; non-locking type; and tool-operated type.
11	End block	It has a supply port and an exhaust port and is installed on the side of the manifold.
12	Fitting	It is a replaceable cartridge-type push-in fitting.
13	Piping port	1 (P) for air supply, 3 /5(R) for exhaust, and 2 (B)/4 (A) for output port.
14	Serial transmission slave station	It receives signals from the master side via serial communication and switches valves.
15	Intermediate supply and exhaust block	It is a block with a supply port and an exhaust port. It can be installed between valve blocks.
16	Blanking plate	It is used to replace a discrete valve when adding a valve.
17	Remote IO connection block	It can connect the remote IO RT series.
18	Tie rod	It is used to fasten valve blocks.
19	Mounting screw	It secures manifold block parts.
20	Multi-connector	It is a multi-connector for waterproofing. It has 20 pins.
21	DIN rail mounting bracket	It installs the manifold with a solenoid valve on the DIN rail.
22	DIN rail	It is a rail for mounting solenoid valves in accordance with the DIN (German industrial standards).
23	D-sub connector	It is a 25-pin D-sub connector. The protection structure is IP40.
24	Residual pressure exhaust valve cover	It is a protective cover to prevent erroneous operation of the residual pressure exhaust valve operating axis. Open it during residual pressure exhaust operation.
25	Residual pressure exhaust valve operating axis	It can exhaust the pressure on the secondary side. Locking and non-locking types are available.

1.2 Model Number Indication

1.2.1 Manifold base



Model number

Symbol	Description
TVG1B	TVG1 series
TVG2B	TVG2 series

[1] Pipe direction

Symbol	Description
B	Pipe connection on side

[2] Connection bore

Type	Fitting (millimeter)		Type	Fitting (inch)	
	Port A	Port B		Port A	Port B
0ACS	φ1.8 push-in fitting		03LS	φ1/8 push-in fitting	
04CS	φ4 push-in fitting		04LS	φ5/32 push-in fitting	
06CS	φ6 push-in fitting		06LS	φ1/4 push-in fitting	
08CS	φ8 push-in fitting		08LS	φ5/16 push-in fitting	
10CS	Φ10 push-in fitting		03LU	φ1/8 push-in fitting, L shape, upward	
0ACU	φ1.8 push-in fitting, L shape, upward		04LU	φ5/32 push-in fitting, L shape, upward	
04CU	φ4 push-in fitting, L shape, upward		06LU	φ1/4 push-in fitting, L shape, upward	
06CU	φ6 push-in fitting, L shape, upward		08LU	φ5/16 push-in fitting, L shape, upward	
08CU	φ8 push-in fitting, L shape, upward				
0ACD	φ1.8 push-in fitting, L shape, downward				
04CD	φ4 push-in fitting, L shape, downward				
06CD	φ6 push-in fitting, L shape, downward				
08CD	φ8 push-in fitting, L shape, downward				

[3] Voltage

Symbol	Description
3	24 VDC

[4] Wire connection

Reduced wiring connection		
EA1A	Centralized terminal block (M3 screw)	NPN valve output
EA1B	Centralized terminal block (M3 screw)	PNP valve output
FA1A	Multi-connector	NPN valve output
FA1B		PNP valve output
GA1A	D-sub connector	NPN valve output
GA1B		PNP valve output
Serial transmission		
JA1C	DeviceNet	32-point output (NPN valve output)
JA1D		32-point output (PNP valve output)
JA2C	CC-Link	32-point output (NPN valve output)
JA2D		32-point output (PNP valve output)
JA3C	EtherCAT	32-point output (NPN valve output)
JA3D		32-point output (PNP valve output)
JA4C	EtherNet/IP	32-point output (NPN valve output)
JA4D		32-point output (PNP valve output)
JA5C	CC-Link IEF Basic	32-point output (NPN valve output)
JA5D		32-point output (PNP valve output)
JA6C	PROFINET	32-point output (NPN valve output)
JA6D		32-point output (PNP valve output)
JA7C	CC-Link IE Field	32-point output (NPN valve output)
JA7D		32-point output (PNP valve output)
JA8C	CC-Link IE TSN	32-point output (NPN valve output)
JA8D		32-point output (PNP valve output)
JA9C	IO-Link Class A	32-point output (NPN valve output)
JA9D		32-point output (PNP valve output)
JA9G	IO-Link Class B	32-point output (NPN valve output)
JA9H		32-point output (PNP valve output)
JB1C	IO-Link Wireless	32-point output (NPN valve output)
JB1D		32-point output (PNP valve output)

Interface for RT series		
KA1C	**Interface for RT series**	32-point output (NPN valve output)
KA1D		32-point output (PNP valve output)

[5] Number of Stations

Symbol	Description
02 to 16	2 to 16 stations EA1*;Up to10 stations FA1*; Up to 8 stations GA1*; Up to 12 stations

[6] Port P/R location

Symbol	Description
U	U side
D	D side
B	Both U and D sides

[7] Exhaust system

Symbol	Description
No symbol	Centralized exhaust
X	Built-in silencer

[8] Pilot operation method

Symbol	Description
No symbol	Internal pilot
K	External pilot

[9] Electrical circuit specifications

Symbol	Description
No symbol	With surge killer lamp
E1	Low heat generating/energy saving circuit
E2	Surgeless circuit

[10] Port A/B filter

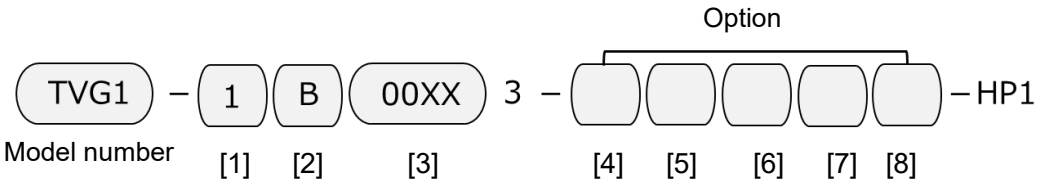
Symbol	Description
No symbol	None
F	Built-in Port A/B filter

[11] Mounting type

Symbol	Description
No symbol	Direct mounting type
R	DIN rail mounting type

Please refer to the catalog for notes on selecting a model number.

1.2.2 Discrete solenoid valve



Model number

Symbol	Description
TVG1	TVG1 series
TVG2	TVG2 series

[1] Switching position category

Symbol	Switching position category	
1	2-position single	
2	2-position double	
3	3-position closed center	
4	3-position exhaust center	
5	3-position pressure center	
A	Two built-in 3-port valves	Valve A side: Normally closed, Valve B side: Normally closed
B		Valve A side: Normally open, Valve B side: Normally open
C		Valve A side: Normally closed, Valve B side: Normally open

[2] Pipe direction

Symbol	Description
B	Pipe connection on side

[3] Connection bore

Symbol	Description
00XX	Discrete solenoid valve for base mounting

[4] Pilot operation method

Symbol	Description
No symbol	Internal pilot
K	External pilot

[5] Manual override

Symbol	Description
No symbol	Locking/non-locking type, with cover to prevent erroneous operation
M1	Non-locking type, with cover to prevent erroneous operation
M2	Locking/non-locking type, tool-operated, without cover
M3	Non-locking type, tool-operated type, without cover

[6] Works with ozone and cutting oil

Symbol	Description
No symbol	Standard specifications
A	Works with ozone and cutting oil (main valve specification: fluorine)

[7] Residual pressure exhaust valve

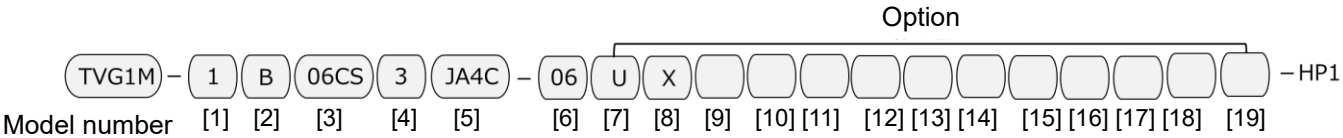
Symbol	Description
No symbol	No residual pressure exhaust valve
Y1	With non-locking type residual pressure exhaust valve
Y2	With locking type residual pressure exhaust valve

[8] Types of valve mounting screws

Symbol	Description
No symbol	Round head screw (Phillips/slotted)
J	Hexagon socket bolt

Please refer to the catalog for notes on selecting a model number.

1.2.3 Manifold with solenoid valve



Model number

Symbol	Description
TVG1M	TVG1 series
TVG2M	TVG2 series

[1] Switching position category

Symbol	Switching position category	
1	2-position single	
2	2-position double	
3	3-position closed center	
4	3-position exhaust center	
5	3-position pressure center	
A	Two built-in 3-port valves	Valve A side: Normally closed, Valve B side: Normally closed
B		Valve A side: Normally open, Valve B side: Normally open
C		Valve A side: Normally closed, Valve B side: Normally open
X	Mix	

[2] Pipe direction

Symbol	Description
B	Pipe connection on side

[3] Connection bore

Type	Fitting (millimeter)		Type	Fitting (inch)	
	Port A	Port B		Port A	Port B
0ACS	φ1.8 push-in fitting		03LS	φ1/8 push-in fitting	
04CS	φ4 push-in fitting		04LS	φ5/32 push-in fitting	
06CS	φ6 push-in fitting		06LS	φ1/4 push-in fitting	
08CS	φ8 push-in fitting		08LS	φ5/16 push-in fitting	
10CS	Φ10 push-in fitting		03LU	φ1/8 push-in fitting, L shape, upward	
0ACU	φ1.8 push-in fitting, L shape, upward		04LU	φ5/32 push-in fitting, L shape, upward	
04CU	φ4 push-in fitting, L shape, upward		06LU	φ1/4 push-in fitting, L shape, upward	
06CU	φ6 push-in fitting, L shape, upward		08LU	φ5/16 push-in fitting, L shape, upward	
08CU	φ8 push-in fitting, L shape, upward		99LX	Push-in fitting mix (no CX for Port A/B)	
0ACD	φ1.8 push-in fitting, L shape, downward		03LA	φ1/8 push-in fitting	Plug
04CD	φ4 push-in fitting, L shape, downward		04LA	φ5/32 push-in fitting	
06CD	φ6 push-in fitting, L shape, downward		06LA	φ1/4 push-in fitting	
08CD	φ8 push-in fitting, L shape, downward		08LA	φ5/16 push-in fitting	

99CX	Push-in fitting mix (no CX for Port A/B)	
0ACA	φ1.8 push-in fitting	Plug
04CA	φ4 push-in fitting	
06CA	φ6 push-in fitting	
08CA	φ8 push-in fitting	
10CA	φ10 push-in fitting	
0ACF	Plug	φ1.8 push-in fitting
04CF		φ4 push-in fitting
06CF		φ6 push-in fitting
08CF		φ8 push-in fitting
10CF		φ10 push-in fitting
0ACB	φ1.8 push-in fitting, L shape, upward	Plug
04CB	φ4 push-in fitting, L shape, upward	
06CB	φ6 push-in fitting, L shape, upward	
08CB	φ8 push-in fitting, L shape, upward	
0ACG	Plug	φ1.8 push-in fitting, L shape, upward
04CG		φ4 push-in fitting, L shape, upward
06CG		φ6 push-in fitting, L shape, upward
08CG		φ8 push-in fitting, L shape, upward
0ACC	φ1.8 push-in fitting, L shape, downward	Plug
04CC	φ4 push-in fitting, L shape, downward	
06CC	φ6 push-in fitting, L shape, downward	
08CC	φ8 push-in fitting, L shape, downward	
0ACH	Plug	φ1.8 push-in fitting, L shape, downward
04CH		φ4 push-in fitting, L shape, downward
06CH		φ6 push-in fitting, L shape, downward
08Ch		Φ8 push-in fitting, L shape, downward

03LF	Plug	φ1/8 push-in fitting
04LF		φ5/32 push-in fitting
06LF		φ1/4 push-in fitting
08LF		φ5/16 push-in fitting
03LB	φ1/8 push-in fitting, L shape, upward	Plug
04LB	φ5/32 push-in fitting, L shape, upward	
06LB	φ1/4 push-in fitting, L shape, upward	
08LB	φ5/16 push-in fitting, L shape, upward	
03LG	Plug	φ1/8 push-in fitting, L shape, upward
04LG		φ5/32 push-in fitting, L shape, upward
06LG		φ1/4 push-in fitting, L shape, upward
08LG		φ5/16 push-in fitting, L shape, upward

[4] Voltage

Symbol	Description
3	24 VDC

[5] Wire connection

Reduced wiring connection		
EA1A	Centralized terminal block (M3 screw)	NPN valve output
EA1B	Centralized terminal block (M3 screw)	PNP valve output
FA1A	Multi-connector	NPN valve output
FA1B		PNP valve output
GA1A	D-sub connector	NPN valve output
GA1B		PNP valve output
Serial transmission		
JA1C	DeviceNet	32-point output (NPN valve output)
JA1D		32-point output (PNP valve output)
JA2C	CC-Link	32-point output (NPN valve output)
JA2D		32-point output (PNP valve output)
JA3C	EtherCAT	32-point output (NPN valve output)
JA3D		32-point output (PNP valve output)
JA4C	EtherNet/IP	32-point output (NPN valve output)
JA4D		32-point output (PNP valve output)
JA5C	CC-Link IEF Basic	32-point output (NPN valve output)
JA5D		32-point output (PNP valve output)
JA6C	PROFINET	32-point output (NPN valve output)
JA6D		32-point output (PNP valve output)
JA7C	CC-Link IE Field	32-point output (NPN valve output)
JA7D		32-point output (PNP valve output)
JA8C	CC-Link IE TSN	32-point output (NPN valve output)
JA8D		32-point output (PNP valve output)
JA9C	IO-Link Class A	32-point output (NPN valve output)
JA9D		32-point output (PNP valve output)
JA9G	IO-Link Class B	32-point output (NPN valve output)
JA9H		32-point output (PNP valve output)
JB1C	IO-Link Wireless	32-point output (NPN valve output)
JB1D		32-point output (PNP valve output)
Interface for RT series		
KA1C	Interface for RT series	32-point output (NPN valve output)
KA1D	Interface for RT series	32-point output (PNP valve output)

[6] Number of Stations

Symbol	Description
02 to 24	2 to 24 stations EA1*;Up to 20 stations EA1*; Up to 20 stations FA1*; Up to 16 stations

[7] Port P/R location

Symbol	Description
U	U side
D	D side
B	Both U and D sides
T	Both U and D sides, Intermediate supply and exhaust block

[8] Exhaust system

Symbol	Description
No symbol	Centralized exhaust
X	Built-in silencer

[9] Wiring method inside the base

Symbol	Description
No symbol	Double wiring
S	Single solenoid, double solenoid arrangement designation

[10] Pilot operation method

Symbol	Description
No symbol	Internal pilot
K	External pilot
KZ	External pilot (PA/PR Separated)

[11] Electrical circuit specifications

Symbol	Description
No symbol	With surge killer lamp
E1	Low heat generating/energy saving circuit
E2	Surgeless circuit

[12] Manual override

Symbol	Description
No symbol	Locking/non-locking type, with cover to prevent erroneous operation
M1	Non-locking type, with cover to prevent erroneous operation
M2	Locking/non-locking type, tool-operated, without cover
M3	Non-locking type, tool-operated type, without cover

[13] Works with ozone and cutting oil

Symbol	Description
No symbol	Standard specifications
A	Works with ozone and cutting oil (main valve specification: fluorine)

[14] Residual pressure exhaust valve

Symbol	Description
No symbol	No residual pressure exhaust valve
Y1	With non-locking type residual pressure exhaust valve
Y2	With locking type residual pressure exhaust valve

[15] Types of valve mounting screws

Symbol	Description
No symbol	Round head screw (Phillips/slotted)
J	Hexagon socket bolt

[16] With/without spacer

Symbol	Description
No symbol	Without spacer
Z	With spacer (type and location specified in MF specifications)

[17] Exhaust malfunction prevention valve

Symbol	Description
No symbol	None
H	With exhaust malfunction prevention valve

[18] Port A/B filter

Symbol	Description
No symbol	None
F	Built-in Port A/B filter

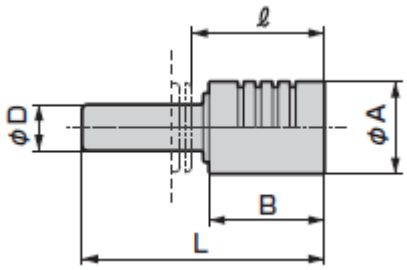
[19] Mounting type

Symbol	Description
No symbol	Direct mounting type
R	DIN rail mounting type

Please refer to the catalog for notes on selecting a model number.

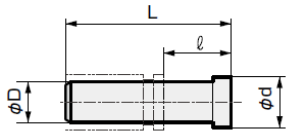
1.2.4 Related equipment

■ Silencer



Model number	A	B	D	L	l
SLW-H6	16	20	Φ6	41	23.5
SLW-H8	16	20	φ8	42	23
SLW-H10	20	27	φ10	53	31.5

■ Blank plug



Model number	D	L	ℓ	d
PG-P2-B	φ1.8	20	13	5
GWP4-B	φ4	27	16	6
GWP6-B	φ6	29	11.5	8
GWP8-B	φ8	33	14	10
GWP10-B	φ10	40	18.5	12

Please refer to the catalog for notes on selecting a model number.

1.2.5 Kit Parts

■ Cartridge-type fitting

Model	Part name		Model number
TVG1	φ1.8 straight		4G1R-JOINT-C18
	φ4 straight		4G1R-JOINT-C4
	φ6 straight		4G1R-JOINT-C6
	φ1.8 elbow		4G1R-JOINT-CL18, CLL18
	φ4 elbow		4G1R-JOINT-CL4, CLL4
	φ6 elbow		4G1 R-JOINT-CL6, CLL6
	φ1/8 straight		4G1R-JOINT-C3N
	φ5/32 straight		4G1R-JOINT-C4N
	φ1/8 elbow	Note 1	4G1R-JOINT-CL3N, CLL3N
	φ5/32 elbow	Note 1	4G1R-JOINT-CL4N, CLL4N
	Plug cartridge		4G1R-JOINT-CPG
TVG2	φ4 straight		4G2R-JOINT-C4
	φ6 straight		4G2R-JOINT-C6
	φ8 straight		4G2R-JOINT-C8
	φ10 straight		TVG2P-JOINT-C10
	φ6 elbow		4G2R-JOINT-CL6, CLL6
	φ8 elbow		4G2R-JOINT-CL8, CLL8
	φ1/4 straight		4G2R-JOINT-C6N
	φ5/16 straight		4G2R-JOINT-C8N
	φ1/4 elbow	Note 1	4G2R-JOINT-CL6N, CLL6N
	φ5/16 elbow	Note 1	4G2R-JOINT-CL8N, CLL8N
	Plug cartridge		4G2R-JOINT-CPG

Note 1: It is made-to-order.

■ Tie rod

For valve blocks

TVG1P – TR – 02

Model number [1]

[1] Number of Stations

Symbol	Description
01 to 24	1 to 24 stations

About additional stations
・TVG□P-TR-01 is a tie rod for adding one station.
・3 stations can be added to manifolds with 2 to 17 stations.
・For 18 stations or more, use tie rods that match the number of stations after the station increase.
・Attach tie rods for additional stations to the wiring block.
If it is installed on the end block side, it may not be assembled correctly.

For supply and exhaust blocks

Model	Model number
TVG1	TVG1P-TR-Q
TVG2	TVG2P-TR-Q

Please refer to the catalog for notes on selecting a model number.

■ Blanking plate kit

Model	Model number	Parts included
TVG1	TVG1P-BP	Blanking plate, 2 mounting screws
TVG2	TVG2P-BP	Blanking plate, 2 mounting screws
TVG2	TVG2P-BP-J	Blanking plate, 2 mounting screws Hexagon socket bolt

■ Gasket

Model	Model number
TVG1	TVG1-GASKET
TVG2	TVG2-GASKET

■ Exhaust malfunction prevention valve (a set of 2 pieces)

Model	Model number
TVG1	TVG1-CHECK-VALVE
TVG2	TVG2-CHECK-VALVE

■ Mounting screws (a set of 10 screws)

Model	Model number
TVG1	TVG1-SET-SCREW
TVG2	TVG2-SET-SCREW
TVG2	TVG2P-SET-SCREW-J

■ Manual cover (1 pc)

Model	Model number
TVG1	TVG1P-MANUAL-COVER
TVG2	TVG2P- MANUAL-COVER

Please refer to the catalog for notes on selecting a model number.

1.3 Specifications, performance, characteristics

1.3.1 Common specifications

Model number		TVG1, TVG2
Valve type and operation method		Pilot type soft spool valve
Fluid used		Compressed air
Maximum working pressure MPa		0.7
Minimum working pressure of internal pilot (MPa)	**2-position double Note 1**	0.1
	2-position single 3-position Two built-in 3-port valves	0.2
Minimum working pressure of external pilot kPa		-100 (pilot pressure: 0.2 MPa or higher)
Withstanding pressure MPa		1.05
Ambient temperature ºC		-5 to 55 (no freezing)
Fluid temperature ºC		5 to 55
Manual override		Locking/non-locking type (standard)
Pilot exhaust method	**Internal pilot**	Centralized exhaust for main valve and pilot valve
	External pilot (PA/PR separated)	Individual exhaust for main valve and pilot valve
Lubrication Note 2		Not required
Protective structure Note 3		IP65, IP67
Vibration resistance Note 4 m/s^2		50 or less
Impact resistance m/s^2		300 or less
Atmosphere		This product cannot be used in corrosive gas atmosphere.

Note 1: The low heat generating/energy saving type has a minimum working pressure of 0.2 MPa.

Note 2: When lubricating, use turbine oil Class 1 ISO VG 32. Excessive or intermittent lubrication makes operation unstable.

Note 3: Note that this product cannot be used underwater although it is IP65/67 rated and is protected against dust and water. Also, when using the product in an environment where it is constantly exposed to dust or water, take measures such as protective covers.
In addition, the D-sub connector, spacer regulator, perfect spacer (with a manual device), residual pressure exhaust valve option, and the protective structure of the vent to open air specifications are dustproof (equivalent to IP40). The protective structure of the multi-connector is equivalent to IP65.

Note 4: The vibration resistance of the DIN rail mount is 20 m/s^2 or less for 2 to 12 stations and 10 m/s^2 or less for 13 to 16 stations.

1.3.2 Electrical specifications

Model number		TVG1, TVG2
Rated voltage		24 VDC
Voltage fluctuation range		±10%
Holding current A	**Standard, surgeless type**	0.017
	Low heat generating/energy saving circuit	0.005
Power consumption W	**Standard, surgeless type**	0.4
	Low heat generating/energy saving circuit	0.1
Heat-resistant class		B
Surge killer		Zener diode
Indicator		LED

1.3.3 Response time

(Units: ms)

Switching position category		TVG1		TVG2	
		ON	OFF	ON	OFF
Two built-in 3-port valves		15	25	20	37
2-position	Single	15	20	22	24
	Double	15	-	26	-
3-position	Exhaust center	20	30	25	35

* The response time is measured at a supply pressure of 0.5 MPa and 20°C without lubrication. It changes depending on the pressure and oil quality.

1.3.4 Flow rate characteristics

■ Manifold

Model number	Switching position category		1(P) → 4(A)/2(B)			4(A)/2(B) → 5(R1)/3(R2)		
			C [dm^3/(s·bar)]	b	Q [L/min(ANR)]	C [dm^3/(s·bar)]	b	Q [L/min(ANR)]
TVG1	Two built-in 3-port valves		0.77	0.37	205	1.1 (0.56)	0.34 (0.37)	287(149)
	2-position		1.0	0.29	253	1.2 (0.59)	0.36 (0.41)	317(162)
	3-position	Closed center	0.96	0.33	249	1.0	0.35	263
		Exhaust center	0.96	0.32	247	1.3 (0.60)	0.38 (0.40)	349(163)
		Pressure center	1.1	0.35	289	1.0	0.36	265
TVG2	Two built-in 3-port valves		1.7	0.44	476	2.2 (1.8)	0.43 (0.20)	612(431)
	2-position		2.4	0.32	618	2.8 (2.0)	0.34 (0.19)	731(476)
	3-position	Closed center	2.2	0.35	578	2.5	0.38	670
		Exhaust center	2.2	0.32	567	2.9(2.1)	0.40 (0.21)	789(506)
		Pressure center	2.6	0.34	678	2.5	0.37	666

* C: Sonic conductance, b: Critical pressure ratio, Q: Mass flow rate.
* The conversion between the effective cross section S and the sonic conductance C is S ≈ 5.0 × C.
* Values inside parentheses are those with exhaust malfunction prevention valves.

1.3.5 Mass

■ Discrete solenoid valve and blanking plate

(Unit: g)

Switching position category/wire connection		TVG1	TVG2
2-position	Single	55	95
	Double	63	101
3-position	Closed center	66	110
Blanking plate		40	69

* The type with two built-in 3-port valves has the same mass as that of the 2-position double type.

■ Discrete valve block with solenoid valve and valve block with blanking plate

(Unit: g)

Switching position category/wire connection		TVG1	TVG2
2-position	Single	86	161
	Double	94	167
3-position	Closed center	97	176
Blanking plate		71	135

* The type with two built-in 3-port valves has the same mass as that of the 2-position double type.
* The mass includes the cartridge fitting (straight) with a connection whose diameter is φ4 for TVG1 or φ6 for TVG2.

■ End supply and exhaust block, wiring supply and exhaust block, intermediate supply and exhaust block, tie rod

● End supply and exhaust block, wiring supply and exhaust block, intermediate supply and exhaust block

(Unit: g)

Item	Option	TVG1	TVG2
End supply and exhaust block	Standard	159	224
	External pilot	167	239
	Vent to open air	158	222
Wiring block EA1*	Standard	518	580
	External pilot	526	595
	Vent to open air	517	578
Wiring block FA1*	Standard	850	912
	External pilot	858	927
	Vent to open air	849	910
Wiring block GA1*	Standard	706	768
	External pilot	714	783
	Vent to open air	705	766
Wiring block JA*/JB*	Standard	456	529
	External pilot	464	544
	Vent to open air	455	527

Remote IO connection block KA*	Standard	280	356
	External pilot	288	371
	Vent to open air	279	354
Intermediate supply and exhaust block	Standard	116	171
	External pilot	124	186
	Vent to open air	115	169

* The mass includes the cartridge fitting (straight) with a connection whose diameter is φ8 for TVG1 or φ10 for TVG2.

● Tie rod

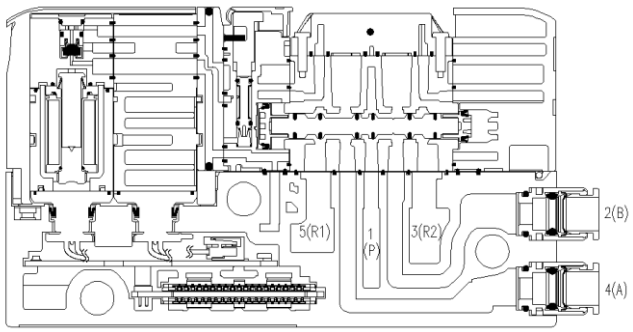
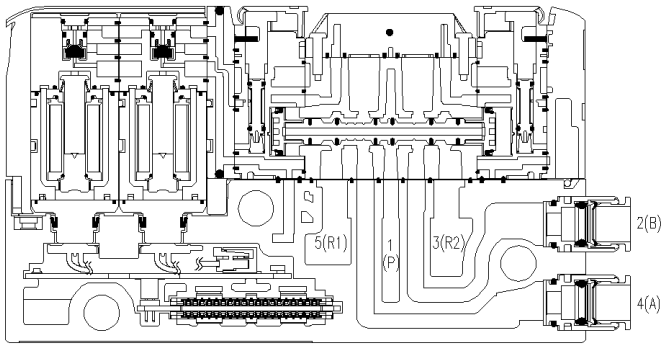
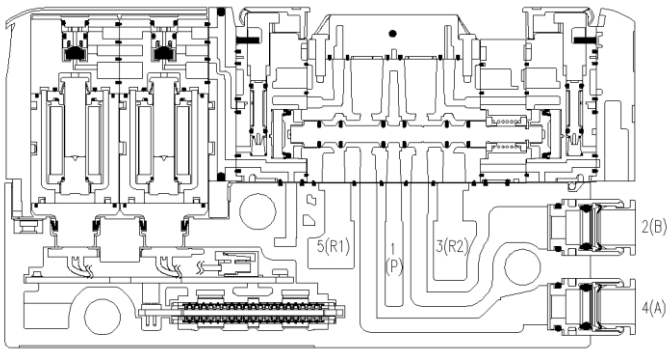
(Unit: g)

Stations	TVG1(3 pcs)	TVG2（2 pcs）
1（for additional stations）	6	6
2	8	11
3	14	18
4	22	25
5	29	32
6	36	40
7	43	48
8	52	55
9	59	62
10	67	70
11	74	77
12	81	84
13	89	92
14	96	99
15	103	106
16	110	113
17	117	120
18	124	128
19	131	135
20	138	142
21	145	149
22	152	157
23	160	164
24	167	171
For intermediate supply and exhaust block	10	7

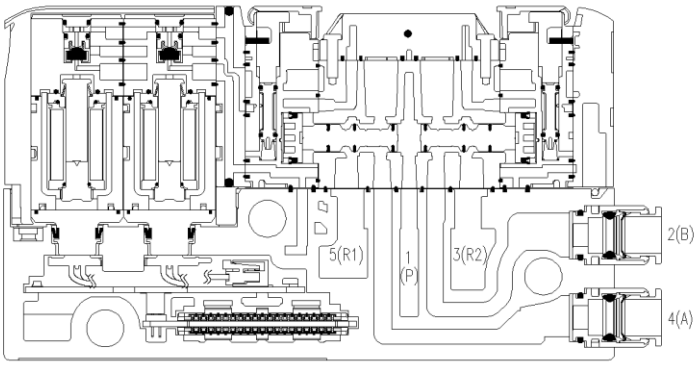
1.4 Internal Structure

1.4.1 Description of operation

■ Valve operation

	Operation diagram (shown by TVG1 series as an example)	Description of operation
TVG□ 2-position single		When not energized (shown) 1(P) → 2(B) 4(A) → 5(R1) When energized 1(P) → 4(A) 2(B) → 3(R2)
TVG□ 2-position double		When SOL a is energized 1(P) → 4(A) 2(B) → 3(R2) When SOL b is energized (shown) 1(P) → 2(B) 4(A) → 5(R1) After being energized, the switch maintains its position even when it gets de-energized.
TVG□ 3-position		When TVG□-3B00XX is not energized 1(P), 4(A), 2(B), 5(R1) and 3(R2) are closed When TVG□-4B00XX is not energized 1(P) is closed 4(A), 2(B) → 5(R1), 3(R2) When TVG□-5B00XX is not energized 1(P) → 4(A), 2(B) 5(R1) and 3(R2) are closed

* SOL refers to solenoid.

	Operation diagram (shown by TVG1 series as an example)	Description of operation
TVG□-AB00XX TVG□-BB00XX TVG□-CB00XX Two Built-in 3-port valves		TVG□-AB00XX When not energized 4(A) → 5(R1) 2(B) → 3(R2) When SOL a is energized 1(P) → 4(A) When SOL b is energized 1(P) → 2(B) TVG□-BB00XX When not energized 1(P) → 4(A) 1(P) → 2(B) When SOL a is energized 4(A) → 5(R1) When SOL b is energized 2(B) → 3(R2) TVG□-CB00XX When not energized 4(A) → 5(R1) 1(P) → 2(B) When SOL a is energized 1(P) → 4(A) When SOL b is energized 2(B) → 3(R2)

* SOL refers to solenoid.

■ Manifold operation

The main exhaust and pilot exhaust meet in the manifold base and air is exhausted from the exhaust port.

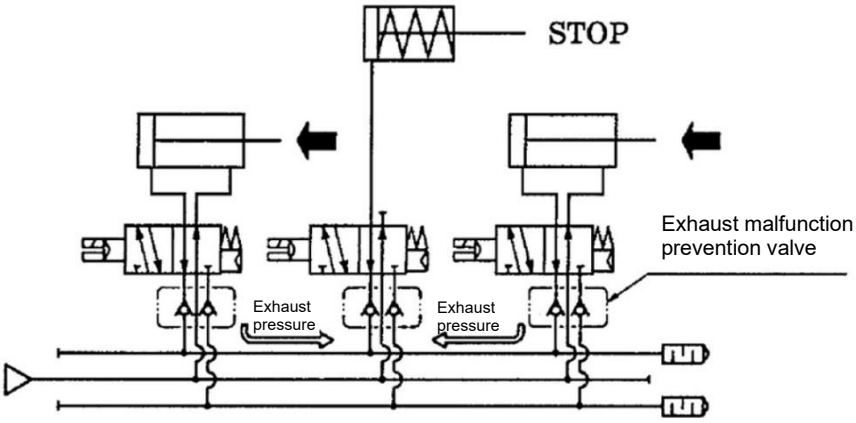
■ Malfunction prevention

You can chose a gasket with “exhaust malfunction prevention valve” as an option.
This optional gasket prevents malfunctions in a single-acting cylinder or a double-acting cylinder connected to exhaust center valve due to the flow of back pressure caused by actuation of other cylinders.
Note that this option cannot be selected for valves with closed center and pressure center valves since there is no back pressure flowing.

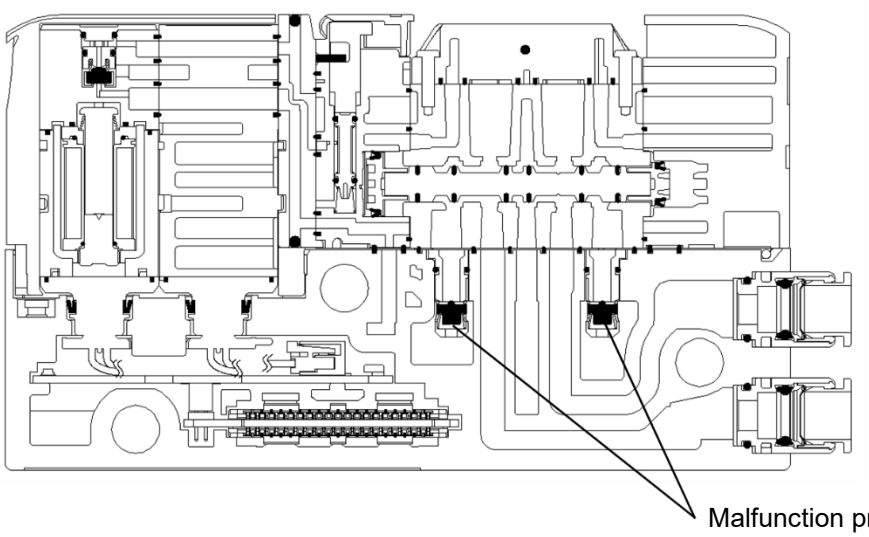
Exhaust malfunction prevention valves are check valves. Do not directly operate the cylinder rod under no pressure, as it causes the check valve to open and prevent the cylinder rod from moving.

< TVG Series pneumatic pressure system >

- Malfunction prevention for a single-acting cylinder



- Exhaust malfunction prevention valve (internal structure diagram)



2. INSTALLATION

2.1 Installation Environment

⚠WARNING

Observe the following instructions since coils produce heat.

- Appropriate ventilation or heat dissipation measures must be considered if the product is installed in a control panel or if the coil needs to be energized for a long period.
- Be careful when touching the valve since the coil temperature may rise depending on the surrounding temperature and energization time.

Do not use the product in the presence of corrosive gas or solvents.

Do not use the product in an environment where corrosive gases such as sulfur dioxide gas or solvents are present.

Do not use the product in a humid environment.

Condensation may occur due to a change in the temperature.

Do not use the product in an explosive gas environment.

- For use in an explosive gas environment, select an explosion-proof solenoid valve.
- When using the product with the internal pressure explosion-proof, follow explosion-proof standards such as JNIOSH-TR-46-3 and JIS C-60079-2. CKD's solenoid valves are not certified as an explosion-proof type. Customers are required to apply for and obtain the explosion-proof type certification.

Do not use the product in water or in environments subject to constant dust or water exposure.

This product cannot be used in water although it is IP65-/67-rated. Also, take measures such as protective covers in environments where the product is constantly exposed to dust or water.

⚠CAUTION

Take measures to prevent foreign matters from entering the exhaust port in a dusty environment.

Foreign matters may enter the exhaust port of a solenoid valve when the valve is operated to supply or exhaust air or if the exhaust port is installed facing up. Install a silencer to prevent foreign matters from entering the exhaust port or install the exhaust port facing down.

Do not use the product where it is subject to vibrations or shocks.

Do not use the product in areas where vibration is greater than 50 m/s^2 and impact is greater than 300 m/s^2.

Use extreme care to avoid deterioration of packing and gaskets when using the product in a place with high ozone concentration, for example, near a beach or in an area with frequent lightning.

Packing and gaskets may deteriorate faster than usual.

Take measures against lightning surges on the device side.

The product is not resistant to lightning surges.

2.2 Unpacking

⚠CAUTION

Do not remove the solenoid valves from their packaging bag until just before connecting pipes to them.
If packaging bags are opened before conducting the piping work, foreign matters may enter the solenoid valves from the piping ports and may cause a failure or malfunction.

- Check that the model number you have ordered and the model number indicated on the product are the same.
- Check that there is no damage on the exterior of the product.
- No instruction manual accompanies the product. You can check and download the instruction manual from CKD's website by clicking the QR code on the attached Q code sticker. When installing the valve, place the sticker where the QR reader can read it, so that you can readily consult the instruction manual.
- Secure sufficient space around the solenoid valve for installation, removal, wiring, and piping.

2.3 Mounting Method

⚠CAUTION

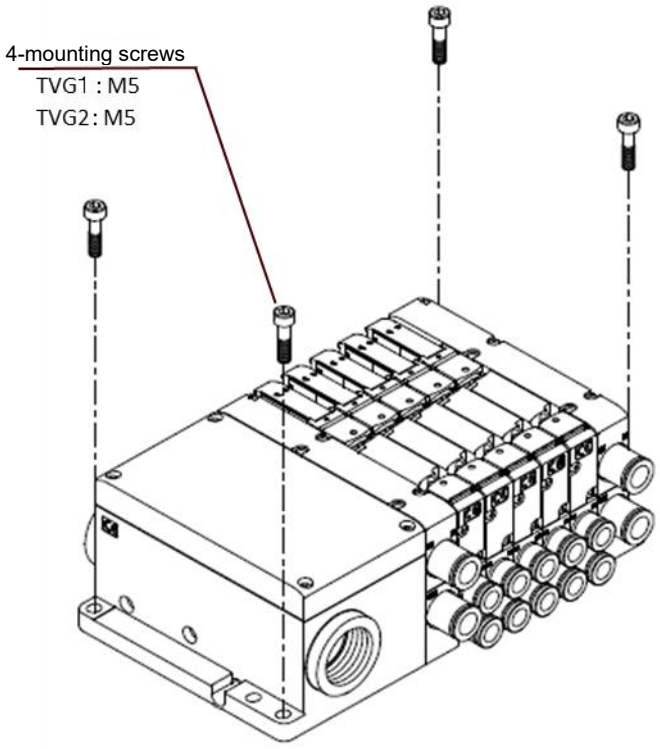
Do not install solenoid valves in a manner they are supported by pipes.
Mount and secure the solenoid valve body.

Tighten the screws with the appropriate tightening torque.
If assembly or tightening is not appropriately done, it may result in air leakage, product falling off, or damage to the screw threads. Also, when mounting the products with 10 stations or more, use flat washers.

2.3.1 Direct mount type mounting method

■ When mounting the product

The product can be mounted by tightening bolts to through holes.
When using screw holes, select bolts that can be screwed in by at least 10 threads and tighten them with proper tightening torque.
The recommended tightening torque is 1.4 to 1.6 N·m. If not mounted correctly, the threads may become damaged.

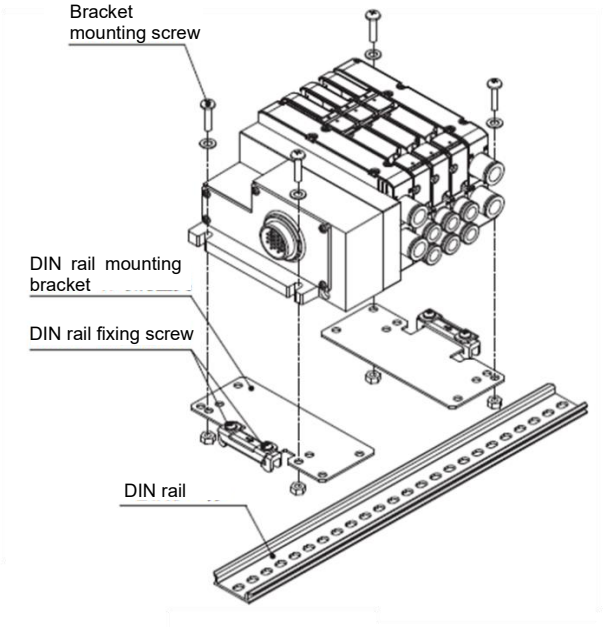


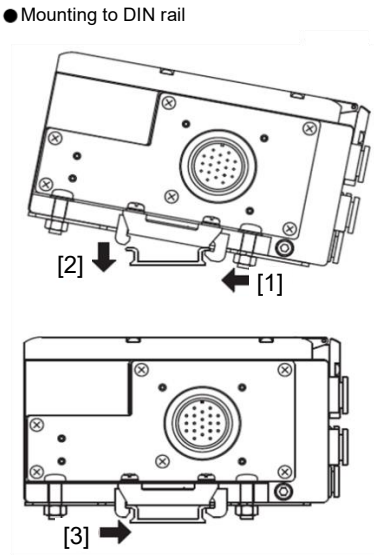
2.3.2 DIN rail mount type mounting method

・In the case of the TVG series, the direct mounting type manifold can be replaced with the DIN rail mounting type. Note that incorrect installation may cause drop and/or damage of the manifold.
・When the total mass of the manifold exceeds 1 kg or in an environment subject to vibration and/or shock, fix the DIN rail to the mounting surface at intervals of 50 to 100 mm and thoroughly check that there are no abnormalities in the installation conditions before use. Although there are no restrictions on the mounting direction or posture, resonance caused by vibration can loosen the mounting screws and cause the manifold to drop. Be sure to check it during operation.
・The vibration applied to the manifold must be equal to or less than the values specified in the table below.

Vibration resistance [m/s^2]

Number of stations	TVG1	TVG2
2 to 12 stations	20	20
13 to 16 stations	10	10





1. Install the DIN rail mounting brackets. (Tightening torque: 1.8 to 2.3 N·m)
2. Hook the claws on the DIN rail in the order of [1] and [2].
3. Push it in the direction of [3].
4. Tighten the DIN rail fixing screws. (Tightening torque: 1.2 to 1.6 N·m)

•

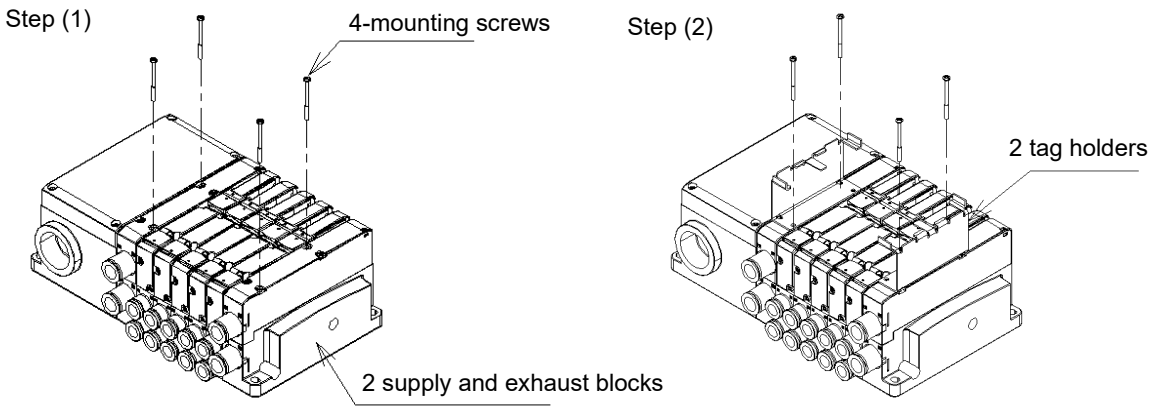
2.3.3 Tag holder and tag rating plate mounting method

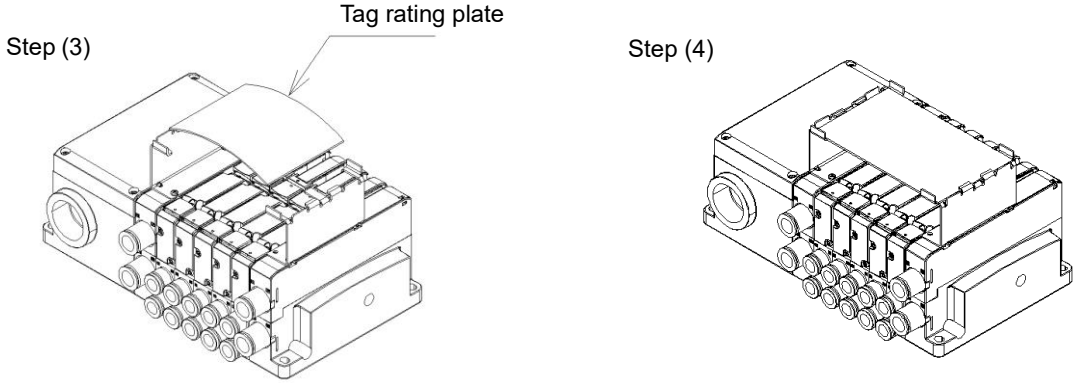
[1] Remove the mounting screws of the supply and exhaust block.

[2] Install the tag holder on the top surface of the supply and exhaust block and fasten the mounting screws (tightening torque 0.4 N·m).

[3] Attach the tag holder to the holder by curving the tag holder.

[4] After installation is complete, you can affix the rating plate sticker on the tag holder and make identification notations.





2.4 Piping Method

⚠CAUTION

Connect pipes so that the pipes/tubes will not come off the joints through mechanical movements, vibrations or tension.

- If the exhaust side piping of the pneumatic circuit comes off, the speed control of the actuator becomes impossible.
- For the chuck holding mechanism, the chuck holding force will be lost when the piping comes off.

When the pipe connection is complete and compressed air is supplied, make sure there is no air leak in all parts of the pipe connection.

Ensure that high pressure is not applied suddenly when supplying compressed air for the first time after connecting the pipes/tubes.

Sudden application of highly-pressurized air may cause the pipes/tubes to come off and jump around, resulting in accidents.

Do not decrease the inside diameter of the piping from any of the solenoid valve exhaust ports to a diameter less than the piping port size.

If the exhaust does not perform smoothly, the actuator will not work properly. In the case of manifolds, the exhaust can prevent other solenoid valves from operating properly.

Remove foreign matters.

Rust and other foreign matters in the piping may cause a malfunction or valve seat leakage. Install a filter (which removes particles exceeding 5 μm) immediately upstream of the solenoid valve.

Do not restrict the flow of air through the supply piping.

- A delay in operation may occur due to a drop in the pressure when multiple valves are operated.
- If the amount of air supply is insufficient, install additional intermediate supply and exhaust blocks to ensure an appropriate flow rate.
- Exhaust center provides a bleed structure where the supply port and the exhaust port are temporarily connected during valve switching. If the amount of air supply is insufficient, the valve may malfunction, so ensure sufficient air supply.

2.4.1 Flushing

Before starting to install pipework, flush the pipes/tubes, solenoid valves, and related equipment to remove foreign matters.

2.4.2 Blow circuit

Do not open the supply port to the atmosphere. Use an external pilot type since a drop in supply air pressure may cause malfunction. The lower limit pressure for the internal pilot type is 0.1 MPa for the 2-position double type and 0.2 MPa for the other switching categories.

2.4.3 Exhaust port

Blocking the flow of exhaust air may cause a delay in the cylinder response. Adjust the speed between the cylinder and the solenoid valve.

2.4.4 Piping connection

■ Appropriate tube

For solenoid valves with push-in fittings, use CKD's designated tubes.
- Soft Nylon (F-1500 Series)
- Urethane (U-9500 Series)

* Use UP-9402 (urethane) for φ1.8 push-in fittings (C18).

■ Spatter

In an environment where the products can be exposed to spatter, use flame-retardant tubes or steel pipes.

■ Hydraulic hose

When piping is for use in both hydraulic and pneumatic systems, use a hydraulic hose.
When the standard push-in fitting is used with a spiral tube, secure the root of the tube with a hose band. If not fixed, the tube will rotate and lose its clamping ability.
Use fastening fittings in high-temperature atmosphere. Do not use push-in fittings.

■ Commercially available tubes

When using commercially available tubes, check the outside diameter accuracy, wall thickness, and hardness of such tubes. When using urethane tubes, the hardness must be 93° or more (as measured by a rubber hardness meter).
Using a tube with insufficient diameter accuracy and hardness will cause the chucking force to drop, which makes the tube come off easily or difficult to insert.

Tube dimensions

Outside diameter (mm)	Inside diameter (mm)	
	Nylon	Urethane
φ1.8	-	φ1.2
φ4	φ2.5	φ2
φ6	φ4	φ4
φ8	φ5.7	φ5
φ10	φ7.2	φ6.5

Outside diameter tolerance	
Soft or hard nylon	±0.1 mm
Urethane (φ1.8)	±0.1 mm
Urethane (φ4, φ6)	+0.1 mm -0.15 mm
Urethane (φ8, φ10)	+0.1 mm -0.2 mm

■ Bending radius of tube

The bending radius of a tube shall be greater than the minimum bending radius. Failure to do so can cause coming off or leakage.

Outside diameter (mm)	Minimum bending radius (mm)	
	Nylon	Urethane
φ1.8	-	4
φ4	10	10
φ6	20	20
φ8	30	30
φ10	40	40

■ Tube cutting

Use a tube cutter to cut the tube perpendicular to the axial direction. Inserting an obliquely cut end of a tube may cause air leakage.

■ Tube connection status

From the end of the fitting, secure a straight section as long as the outside diameter of the tube. Do not bend the tube abruptly at the fitting insertion point. Make sure that the tension applied sideways through the tube does not exceed 40 N (approx. 5 N for C 18, CL18 and CLL18).

■ Applicable blanking plug

For solenoid valves with push-in fitting, use blanking plugs specified by CKD.
- Blanking plug (PG-P2-B): φ1.8 push-in fitting
- Blanking plug (GWP□-B Series): φ4 to 10 push-in fitting

2.4.5 Piping ports for external pilot (option symbol: K)

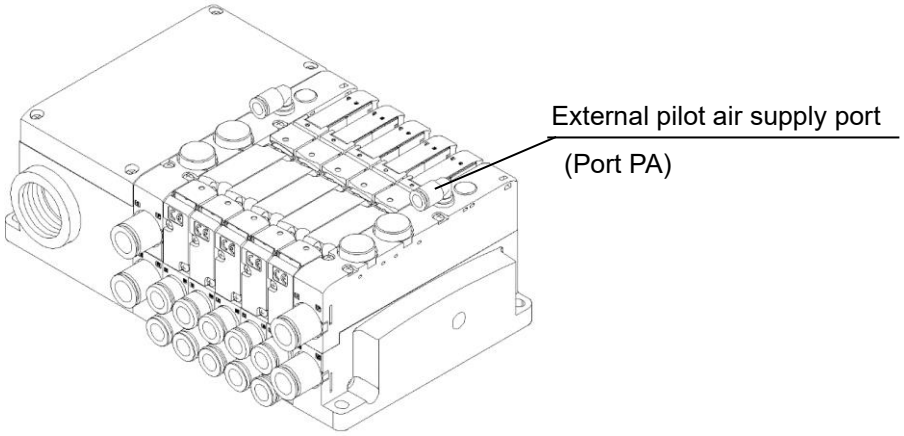
From among the external pilot (option symbol: K) types, you can chose either the centralized exhaust (option symbol K) or individual exhaust with separated Port PA/PR (option symbol KZ) for the pilot air. Check the pilot air supply and exhaust ports, especially for Port PA/PR separation type, and make sure that there are no mistakes in pipe connections. Failure to connect pipes properly may cause malfunction.

Port identification

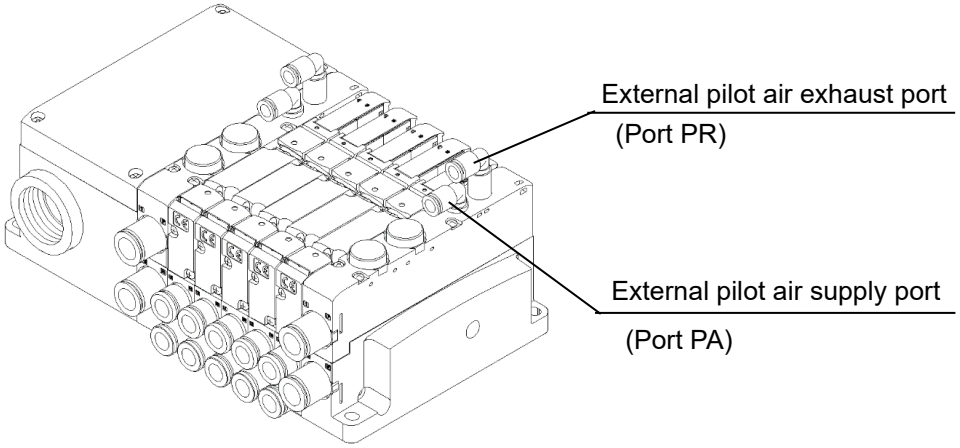
Application	Port	Identification (ISO standard)
Pilot air	Supply port (Port PA)	12/14
	Exhaust port (Port PR)	82/84

< Manifold >
- TVG

For the option symbol K



For the option symbol KZ



2.5 Wiring Method

⚠WARNING

Turn off the power before wiring.
Failure to do so may cause electric shock.

Do not touch the live part with your bare hands.
Doing so may cause electric shock.

Thoroughly read and understand this Instruction Manual before working on electrical wiring.
The product must be handled by a person who understands the structure and operation principle of solenoid valves and has knowledge of how to ensure the safety.

⚠CAUTION

Check the power supply voltage and AC/DC before supplying power.

Make sure that the voltage drop on the solenoid does not exceed 10% of the rated voltage.
Voltage drop occurs when more than one solenoid is energized at the same time or depending on the cable length.

Watch for surge voltage.
The low heat generating/energy saving circuit option has a built-in circuit to control current and voltage and is not surge resistant to the standard type. Use a non-contact relay for the input contact and take measures against surges.

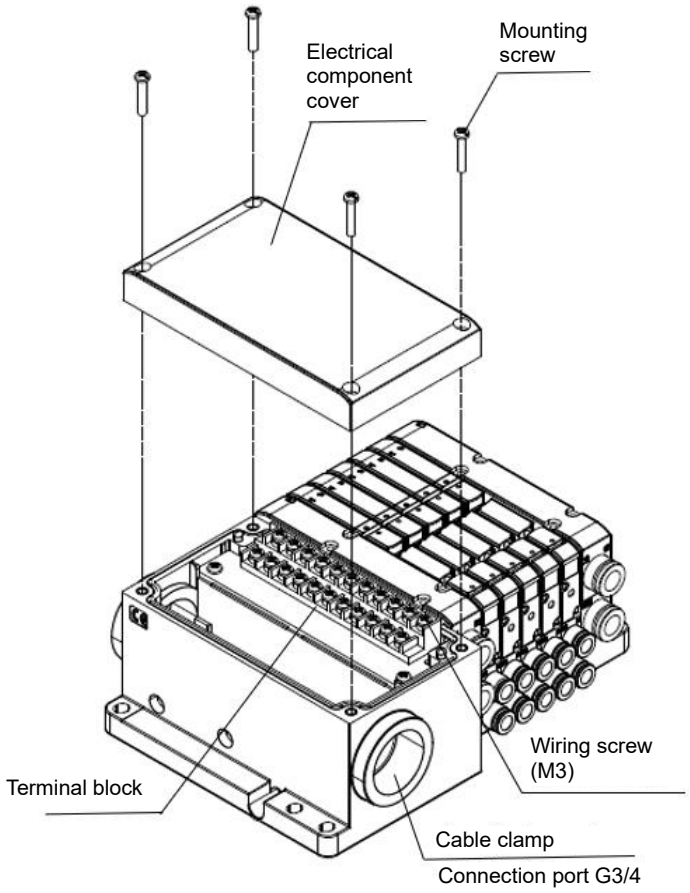
Connect this product to the output unit.
Connecting the product to the input unit may damage not only the product but also peripheral devices. Do not connect the product to the input unit.

Pay attention to the polarity.
The control board built into the valve block has polarity. Pay attention to the wiring.
Miswiring can lead to faulty indicator (LED) lighting and damage to the internal board.

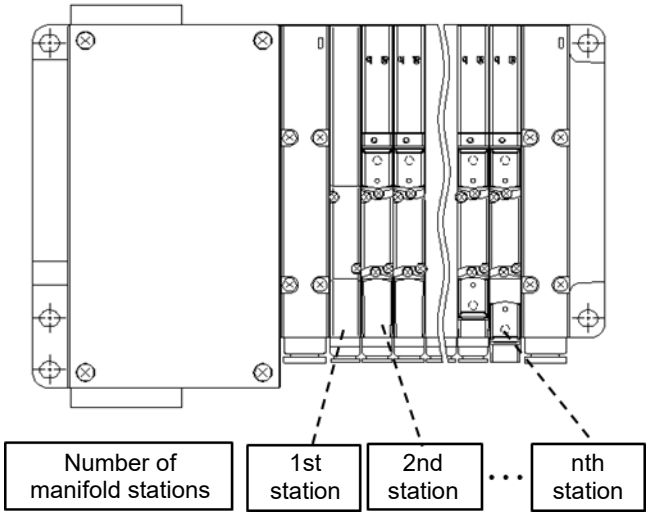
2.5.1 Centralized terminal block (EA1*)

■ Instructions on centralized terminal block (EA1*)

(1) Remove the electrical component cover when wiring. (Appropriate tightening torque of electrical component cover mounting screws: 0.6 N·m)
(2) Route the wires through the cable clamp connection port.
(If IP65/67 performance is required, connect a cable clamp to protect it. In doing so, pay attention to the tightening torque.)
(3) Since the common wiring has already been connected on the manifold side in the case of the centralized terminal block type, use the same manifold power supply.
For the independent contact PLC output unit, connect the common wiring of the contact.
(4) Check that the station number matches the solenoid positions to avoid incorrect wiring. It depends on the 3) Wiring method.
(5) Note that the maximum number of solenoids is 20, so wiring exceeding the maximum number is unavailable.
(6) Manifold stations are numbered in order from left to right with the piping port facing the user. (Refer the figure below)
(7) Voltage drop occurs when more than one solenoid is energized at the same time or depending on the cable length. Make sure that the voltage drop on the solenoid does not exceed 10% of the rated voltage.
(8) Use the Y terminal or round terminal for wire connection. Use crimping terminals with a width of 6.2 or less for M3. Connecting the lead wire directly may cause the solenoid valve to malfunction due to disconnection, poor contact, etc.
(9) Appropriate tightening torque for connection screws: 0.6 N·m



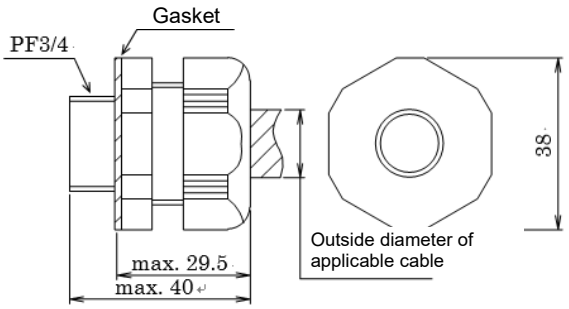
● In-line station arrangement on manifold



Wiring supply and exhaust block (EA1*) parts kit

● Cable clamp

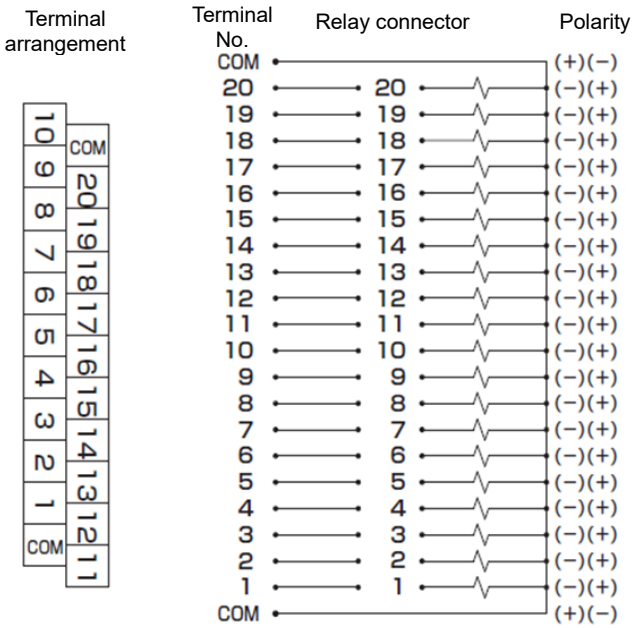
Model number	Outside diameter of applicable cable	Description
TVGP-SCL-18A	φ14.5 to 16.5	Used for drip-proof protection of cables.
TVGP-SCL-18B	φ16.5 to 18.5	



(Reference)
Body tightening torque 4～4.5N·m
Cable clamp tightening torque 3～3.5N·m

■ Internal connection

Internal connection of EA1* (maximum number of solenoids is 20)



■ Terminal layout of centralized terminal blocks (example)

The manifold's maximum number of stations varies depending on the model. Check the specifications for each model.
The numeral of each valve number (No. 1a, 2a, 2b, ...) indicate a station number (1st, 2nd, ...), and alphabet a indicates the side a and b indicates the side b.
When using a single solenoid with standard wiring.
When the blank part in the table below is energized, the operation lamp lights up, but It's not abnormal.

Terminal No.

	COM	20	19	18	17	16	15	14	13	12	11
10	9	8	7	6	5	4	3	2	1	COM	

< Standard wiring (double wiring)>

Single solenoid valves

(Maximum number of 10 MF stations)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(Not used)	10a	(Not used)	9a	(Not used)	8a	(Not used)	7a	(Not used)	6a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	(Not used)	5a	(Not used)	4a	(Not used)	3a	(Not used)	2a	(Not used)	1a

Double solenoid valves

(Maximum number of 10 MF stations)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	10b	10a	9b	9a	8b	8b	7b	7a	6b	6a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	5b	5a	4b	4a	3b	3a	2b	2a	1b	1a

Single solenoid and double solenoid valves

(Maximum number of solenoids: 20)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(Not used)	10a	9b	9a	8b	8a	7b	7a	(Not used)	6a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	5b	5a	4b	4a	(Not used)	3a	(Not used)	2a	(Not used)	1a

< Single solenoid, double solenoid wiring designation >

Single solenoid valves

(Maximum number of MF stations: 20)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	20a	19a	18a	17a	16a	15a	14a	13a	12a	11a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	10a	9a	8a	7a	6a	5a	4a	3a	2a	1a

Double solenoid valves

(Maximum number of 10 MF stations)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	10b	10a	9b	9a	8b	8b	7b	7a	6b	6a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	5b	5a	4b	4a	3b	3a	2b	2a	1b	1a

Single solenoid and double solenoid valves
(Maximum number of solenoids: 20)

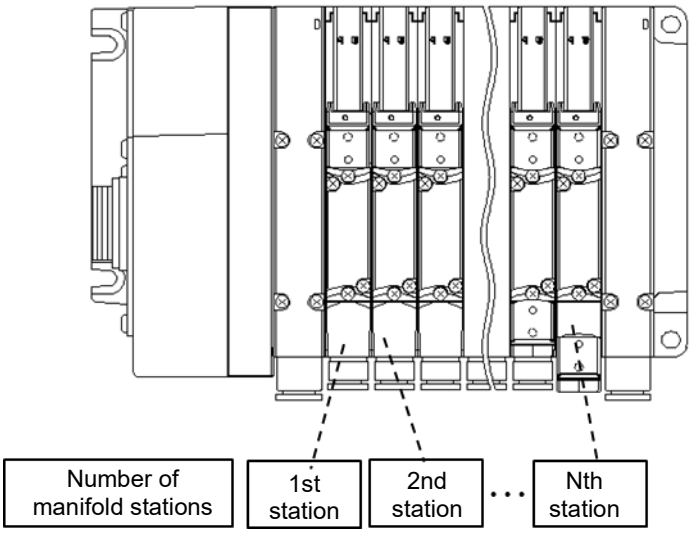
Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	10a	9b	9a	8b	8a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	7b	7a	6a	5b	5a	4b	4a	3a	2a	1a

2.5.2 Multi-connector type (FA1*)

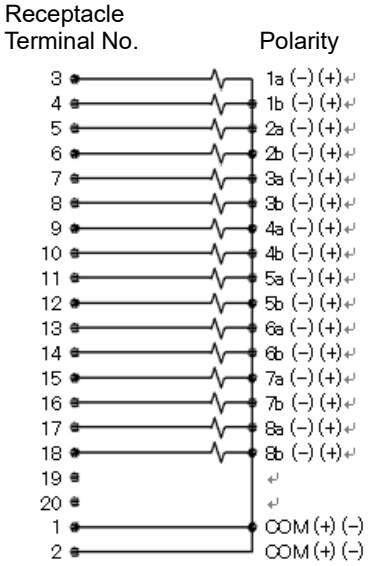
(1) Since the common wiring has already been connected on the manifold side in the case of the multi-connector type, use the same manifold power supply.
For the independent contact PC output unit, connect the common wiring of the contact.
(2) Check that the station number matches the solenoid position to avoid incorrect wiring. It depends on the 3) Wiring method.
(3) Note that the maximum number of solenoids is 16, so wiring exceeding the maximum number is unavailable.
(4) Manifold stations are numbered in order from left to right with the piping port facing the user.
(5) Voltage drop occurs when more than one solenoid is energized at the same time or depending on the cable length. Make sure that the voltage drop on the solenoid does not exceed 10% of the rated voltage.
(6) Connect an applicable connector cable to the receptacle. Upon connection, pay attention to the tightening torque.

Example of connector

Manufacturer name	Model number
Hirose Electric Co., Ltd.	RM21WTP-20S



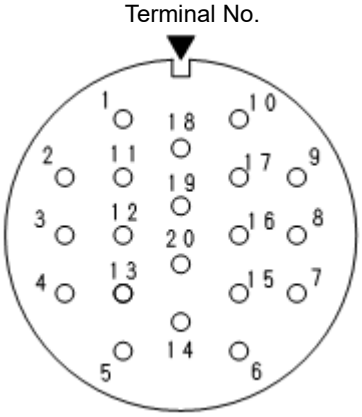
■ Internal connection



■ Wiring method

The maximum number of manifold stations varies depending on the model. Check the specifications for each model.

Note) The numeral of each valve number (No. 1a, 2a, 2b, ...) indicates a station number (1st, 2nd, ...), and alphabet a indicates the side a and b indicates the side b.



<Standard wiring (double wiring)>

Single solenoid valves

(Maximum number of MF stations: 8)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(None)	(None)	(Not used)	8a	(Not used)	7a	(Not used)	6a	(Not used)	5a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	(Not used)	4a	(Not used)	3a	(Not used)	2a	(Not used)	1a	COM	COM

Double solenoid valves

(Maximum number of MF stations: 8)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(None)	(None)	8b	8a	7b	7a	6b	6a	5b	5a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	4b	4a	3b	3a	2b	2a	1b	1a	COM	COM

Single solenoid and double solenoid valves
(Maximum number of solenoids: 16)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(None)	(None)	8b	8a	(Not used)	7a	6b	6a	5b	5a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	4b	4a	(Not used)	3a	2b	2a	(Not used)	1a	COM	COM

<Single solenoid, double solenoid wiring designation>

Single solenoid valves
(Maximum number of MF stations: 16)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(None)	(None)	16a	15a	14a	13a	12a	11a	10a	9a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	8a	7a	6a	5a	4a	3a	2a	1a	COM	COM

Double solenoid valves
(Maximum number of MF stations: 8)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(None)	(None)	8b	8a	7b	7a	6b	6a	5b	5a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	4b	4a	3b	3a	2b	2a	1b	1a	COM	COM

Single solenoid and double solenoid valves
(Maximum number of solenoids: 16)

Terminal block No.	20	19	18	17	16	15	14	13	12	11
Valve No.	(None)	(None)	10b	10a	9a	8b	8a	7a	6b	6a
Terminal block No.	10	9	8	7	6	5	4	3	2	1
Valve No.	5b	5a	4b	4a	3a	2b	2a	1a	COM	COM

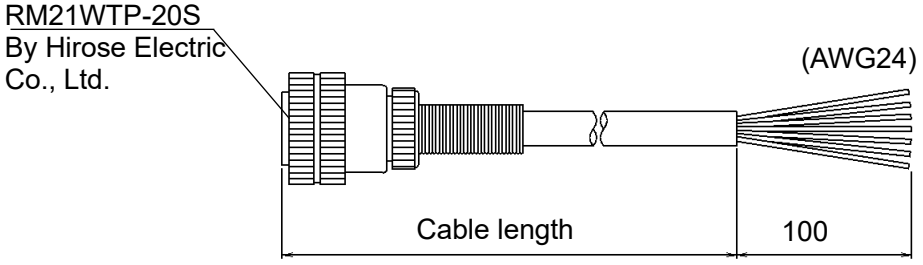
■ CKD cable and connector specifications
Our cables can also be used with the following model numbers.

TVGP – RMC – 1

Model number [1]

[1] Cable length

Symbol	Description
1	1 m
2	3 m
3	5 m



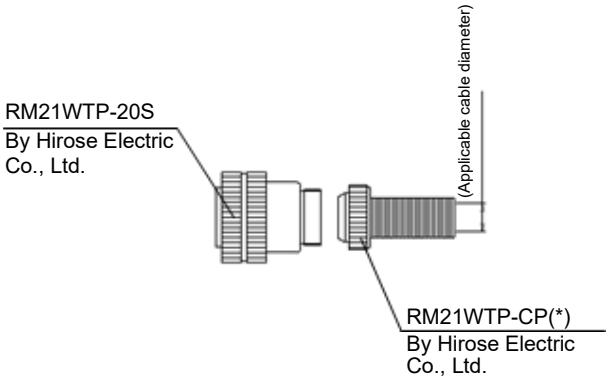
Correspondence between terminal No. and wire core

Terminal No.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Wire core Identification	Wire color	White	Brown	Green	Yellow	Gray	Pink	Blue	Red	Black	Purple
	Mark tube No.	1	2	3	4	5	6	7	8	9	10
Terminal No.		**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Wire core Identification	Wire color	Gray/ Pink	Red/ Blue	White/ Green	Brown/ Green	White/ Yellow	Yellow/ Brown	White/ Gray	Gray/ Brown	(None)	(None)
	Mark tube No.	11	12	13	14	15	16	17	18	(None)	(None)

Our connectors can also be used with the following model numbers.

TVGP – RM21WTP – 10

Model number [1]



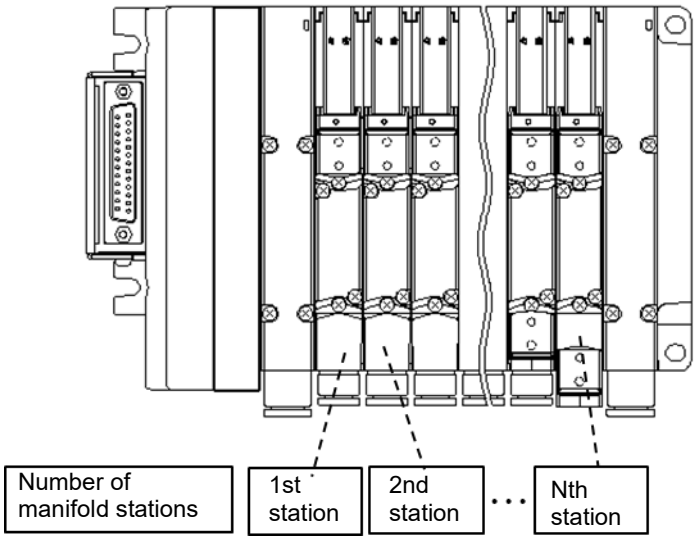
[1] Applicable cable diameter

Symbol	Description
8	φ8
10	φ10
12	φ12

*Since the clamping force and waterproof property vary according to the cable type, make sure to use the applicable cable diameter.

2.5.3 D-sub connector type (GA1*)

The connectors used for the wiring method GA1* are generally called D-sub connectors and are widely used in FA and OA devices. In particular, the 25P type is also the connector designated by the RS232C standard, which is adopted as a PC communication function. Manifold stations are numbered in order from left to right with the piping port facing the user.

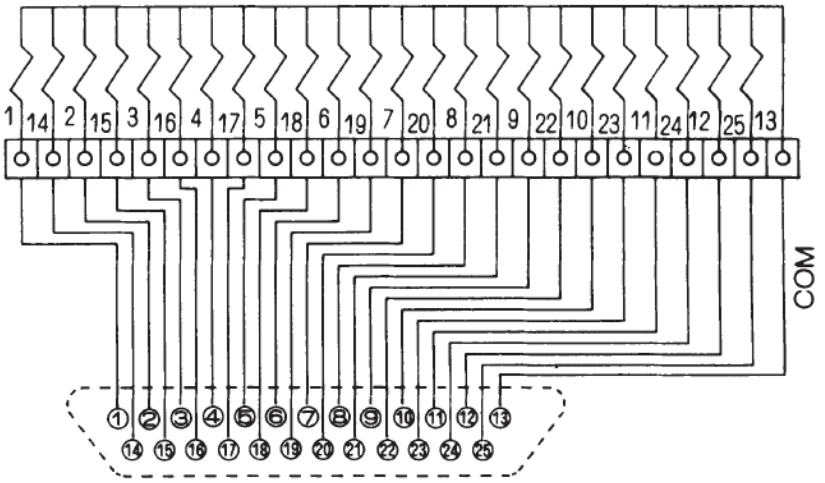


[1] The signal arrangement of the PLC output unit must match the signal arrangement on the valve side.

[2] The power supply is used only for DC24V.

[3] Voltage drop occurs when more than one solenoid is energized at the same time or depending on the cable length. Make sure that the voltage drop on the solenoid does not exceed 10% of the rated voltage.

Internal connection

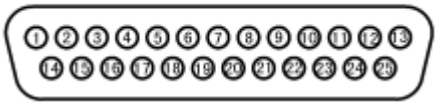


Wiring method

The maximum number of manifold stations varies depending on the model. Check the specifications for each model.

Note) The numeral of each valve number (No. 1a, 2a, 2b, ...) indicates a station number (1st, 2nd, ...), and alphabet a indicates the side a and b indicates the side b.

Connector pin No.



<Standard wiring (double wiring)>

Single solenoid valves

(Maximum number of MF stations: 12)

Terminal block No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	COM
Terminal block No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	

Double solenoid valves

(Maximum number of MF stations: 12)

Terminal block No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	COM
Terminal block No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	1b	2b	3b	4b	5b	6b	7b	8b	9b	10b	11b	12b	

Single solenoid and double solenoid valves

(Maximum number of solenoids: 24)

Terminal block No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	COM
Terminal block No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	(Not used)	(Not used)	3b	4b	(Not used)	(Not used)	7b	(Not used)	(Not used)	(Not used)	11b	12b	

<Single solenoid/double solenoid wiring designation>

Single solenoid valves

(Maximum number of MF stations: 24)

Terminal block No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	3a	5a	7a	9a	11a	13a	15a	17a	19a	21a	23a	COM
Terminal block No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	2a	4a	6a	8a	10a	12a	14a	16a	18a	20a	22a	24a	

Double solenoid valves

(Maximum number of MF stations: 12)

Terminal block No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	COM
Terminal block No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	1b	2b	3b	4b	5b	6b	7b	8b	9b	10b	11b	12b	

Single solenoid and double solenoid valves

(Maximum number of solenoids: 24)

Terminal block No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Valve No.	1a	3a	4a	5a	7a	8a	10a	11b	12b	14a	15b	17a	COM
Terminal block No.	14	15	16	17	18	19	20	21	22	23	24	25	
Valve No.	2a	3b	4b	6a	7b	9a	11a	12a	13a	15a	16a	18b	

■ CKD cable specifications

(Our cables can also be used with the following model numbers.)

TVGP – CABLE – D0 [1] – [2]

Model number [1] [2]

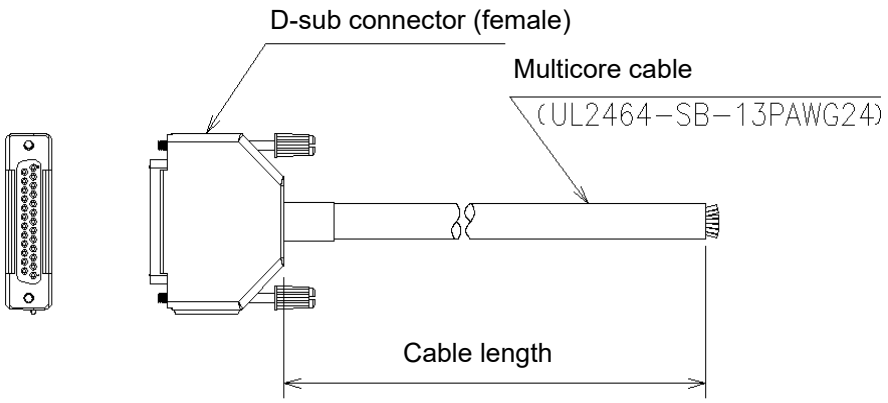
[1] User side connection method

Symbol	Description
0	Cutting only
1	With round terminal for M3.5 screw

[2] Cable length

Symbol	Description
1	1 m
3	3 m
5	5 m

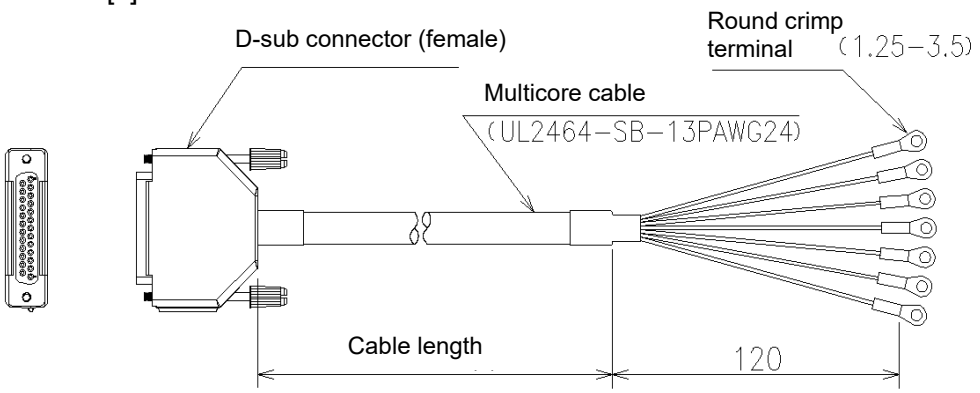
●TVGP-CABLE-D00-(2)



Correspondence between D-sub connector terminal No. and wire core

D-sub connector terminal No.		1	2	3	4	5	6	7	8	9	10	11	12	13
Wire core identification	Color of insulator	Black	Yellow/ Green	Brown	Brown/ Black	Red	Red/ Black	Orange	Orange/ Black	Yellow	Yellow/ Black	Green	Green/ Black	Blue
D-sub connector terminal No.		**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	
Wire core identification	Color of insulator	Blue/ Black	Purple	Purple/ Black	Gray	Gray/ Black	White	White/ Black	Pink	Pink/ Black	Yellow green	Yellow green/ Black	Light blue	Light blue/ Black

●TVG-CABLE-D01-[2]



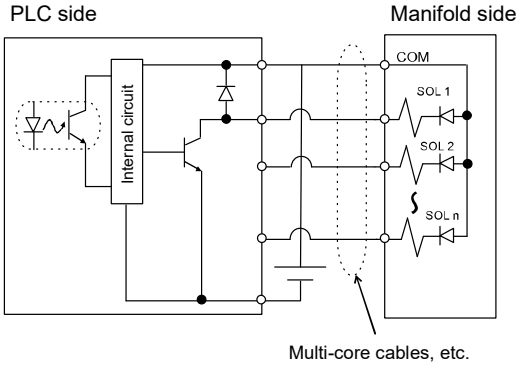
Correspondence between D-sub connector terminal No. and wire core

D-sub connector terminal No.		1	2	3	4	5	6	7	8	9	10	11	12	13
Wire core identification	Color of insulator	Black	Yellow/ Green	Brown	Brown/ Black	Red	Red/ Black	Orange	Orange/ Black	Yellow	Yellow/ Black	Green	Green/ Black	Blue
Mark tube No.		1	2	3	4	5	6	7	8	9	10	11	12	13
D-sub connector terminal No.		**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	
Wire core identification	Color of insulator	Blue/ Black	Purple	Purple/ Black	Gray	Gray/ Black	White	White/ Black	Pink	Pink/ Black	Yellow green	Yellow green /Black	Light blue	Light blue/ Black
Mark tube No.		14	15	16	17	18	19	20	21	22	23	24	25	

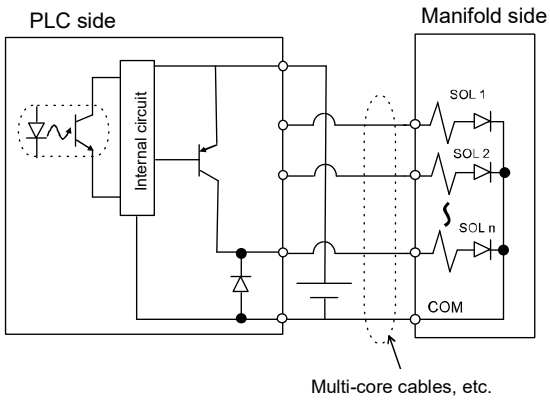
How to connect to PLC

The common wiring has already been connected on the manifold side, but the solenoid valve has polarity. Select the solenoid valve according to the DC output unit NPN output and PNP output of the PLC.
Wire according to the following diagrams.

DC output unit (NPN output type)



DC output unit (PNP output type)



* SOL refers to solenoid.

3. USAGE

⚠WARNING

Consult CKD about the specifications before using the product outside the designated specifications or for special applications.

3.1 Instructions on Use

3.1.1 Air quality

⚠WARNING

Do not supply anything other than compressed air.

Use clean compressed air that does not contain corrosive gases.

Do not use the exhaust malfunction prevention valves for purposes other than to block the back pressure from adjacent air devices.
It is not structured to retain pressure continuously.

⚠CAUTION

Improve the quality of air.
Compressed air usually contains a large amount of condensate, oxidized oil, tar, foreign matters, and rust from piping, which may cause malfunction such as an operation fault and short service life. In addition, the exhaust causes pollution.

Use Class 1 ISO VG 32 turbine oil for lubrication.
Although the product is structured for lubrication-free operations, once it is lubricated, it will require periodic lubrication from then on. Make sure to keep it lubricated.

Do not use spindle oil or machine oil.
They induce expansion of the rubber parts, which will cause operation faults.

■ Super-dry air

Super-dry air with a JIS B 8392-1 humidity rating of 0 to 3 may cause the lubricant to scatter, resulting in short service life.

■ Lubrication

Generally, the TVG Series does not require any lubrication. If lubrication is required, use Class 1 ISO VG 32 turbine oil.
The response time may be delayed if there is too much lubrication or if the pressure is extremely low. The response time indicated in the catalog shows the time obtained when the product is not lubricated and the pressure is 0.5 MPa.

■ Condensate

- Condensate is formed if the temperature inside the pneumatic piping or pneumatic equipment drops.
- If condensate enters and momentarily blocks the air passage inside the pneumatic components, it may cause an operation fault.
- If condensate causes rust, it may cause a failure in the pneumatic equipment.
- If condensate flushes the lubricant, it may cause a lubrication failure.

■ Contamination by foreign matters

- Use compressed air that does not contain oxidized oil, tar, carbon or other components coming from the air compressor.
  If oxidized oil, tar, carbon or other component enters and adheres to the inside of the pneumatic equipment, the resistance of the sliding section may increase and result in operation faults.
  In addition, if the supplied lubricant mixes in with oxidized oil, tar, carbon or other component, the sliding section of the pneumatic components will wear out.
- Use compressed air that does not contain solid foreign matters.
  If solid foreign matters from compressed air enters the pneumatic equipment, the sliding section will wear out and contaminants will adhere to the inside.

■ Improvement of air quality

Improve the air quality by dehumidifying with an aftercooler and a dryer, removing foreign matters with a filter, or removing tar with a tar removing filter.

3.1.2 Use of vacuum

⚠CAUTION

Select an external pilot type.
If it is an internal pilot type, it will cause malfunction.

Supply compressed air of 0.2 to 0.7 MPa to the external pilot port (Port PA) and connect a negative pressure line to the supply port (Port P).
Simply connecting a negative pressure line to the supply port (Port P) will not activate the valve. Be sure to supply pilot pressure to Port PA to activate the valve.

Use in low vacuum conditions (up to -100 kPa).
It cannot be used in medium to very high vacuum.

When connecting a vacuum generator to the exhaust port, select option KZ (Port PA, Port PR Separation Type) for the end supply and exhaust block, wiring supply and exhaust block and intermediate supply and exhaust block.
The negative pressure in the exhaust port causes the internal check valve to malfunction, resulting in operation failure.

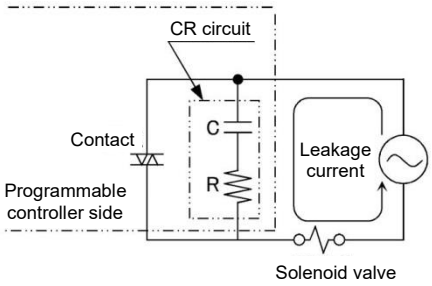
Install a filter in the piping on the secondary side.
Install a filter such as a Port A/B filter to prevent malfunctioning of the valve due to suction of foreign matters from the secondary side.

3.1.3 Electric circuit

⚠CAUTION

To avoid malfunction due to leakage current from other control devices, make sure that the leakage current is 1.2 mA or less.

When a programmable controller or contactless relay is used, leakage current may affect the solenoid valve in a way that the valve does not switch even when it gets de-energized.
When operating a solenoid valve using a programmable controller or a contactless relay, make sure that the leakage current at the output contacts of the programmable controller is 1.2 mA or less.



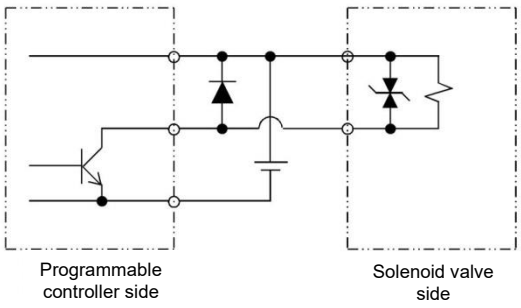
Pay attention to the surge voltage generated from the coil of the solenoid valve.

Surge killers work to limit solenoid valve surge voltages, which can reach hundreds of volts, to low voltage levels that output contacts can withstand. However, this may not be sufficient for some output circuits, and the product may break or malfunction. Consider the surge voltage limit level of the solenoid valve to be used, the withstanding voltage of the output device, the circuit configuration, and the degree of the return delay time before deciding whether to use it.

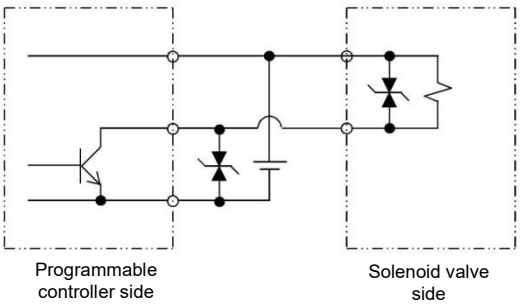
Take additional surge protection measures as needed. The TVG Series solenoid valves can suppress the terminal-to-terminal reverse voltage surge generated upon shut-off, to the level of approx. 47 V. It can also be reduced to approx. 1 V with the surge-less type and low heat generating/energy saving circuit type.

For an NPN type output unit, install an additional contact protection circuit since the output transistor may be susceptible to the surge voltage of the sum of the voltage specified in the table above and the source voltage.

・Example 1 of additional output transistor protection circuit



・Example 2 of additional output transistor protection circuit



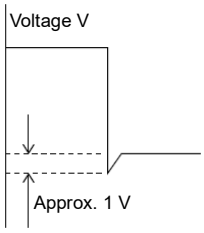
Take measures against surge reaching the solenoid valve.

Opening and closing surges that occur when switches, relays, and other devices are turned on and off can cause malfunction of electronic circuits and damage to electronic components. Transient voltage surges induced at the contact points are very high, especially due to the sudden current change at off and the inductance of the circuit, wiring, and motor, etc. The surge-less option and the low heat generation and power saving circuit option lead to damage of electronic components on the control board. For the surge-less option and the low heat generation and power saving circuit option, take measures such as installing a non-contact relay or surge absorber before use.

- When energizing a double-solenoid type instantaneously, the energizing time must be 0.1 second or longer. If back pressure of another solenoid valves is possible, it is recommended to energize while the cylinder is operating.
- When energizing continuously, the surface temperature of the manifold increases.
  This is not abnormal, but appropriate ventilation or heat dissipation measures must be considered.

3.1.4 Surgeless (option symbol: E2)

Diodes incorporated in the solenoid valves of surgeless models reduce the surge voltage of solenoid valves to approximately 1 V.



3.1.5 Low heat generating/energy saving circuit (optional symbol: E1)

⚠CAUTION

Do not use this type in any environment where vibrations and impacts exceeding the specified range are applied.
Doing so will cause malfunction of the valve.

On occurrence of disturbance that causes a momentary power failure for 30 ms or less to the power supply unit of the solenoid valve being continuously energized, turn off the power for 50 ms or more in order to turn the solenoid valve on again.
When a momentary power failure for 30 ms or less occurs to a power supply unit of the solenoid valve, the valve cannot remain energized.

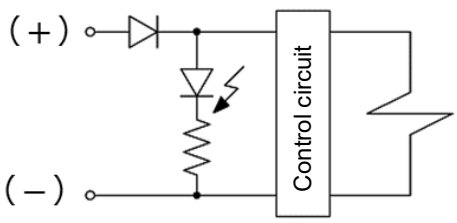
Do not increase the voltage gradually when using this type.
The valve cannot be operated.

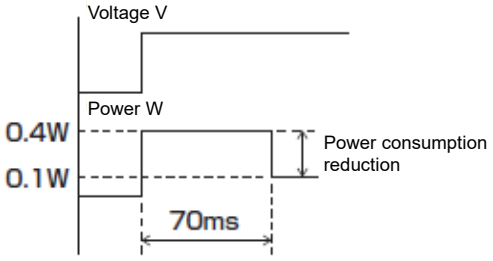
The minimum working pressure shall be at least 0.2 MPa.
When the low heat generating/energy saving circuit type is selected, use a maximum working pressure of 0.2 MPa or more.

Solenoid valves of low heat generating/energy saving circuit type have built-in PWM circuit and are structured to lower the electric power required for the coil to attract and hold. Power consumption will be reduced to 1/4 compared to the standard products.

< Low heat generating/energy saving circuit type >

	Voltage	Current (A)	Power consumption W
At start-up	24 VDC	0.017	0.4
When holding	24 VDC	0.005	0.1





3.2 Manual Override

⚠WARNING

After operating with a manual override, return the cylinder to the original position (initial position) before re-starting operation.

Make sure that nobody is near the cylinder to be activated before performing manual override.

In the case of locking/non-locking type, unlock the manual override before performing normal operation.

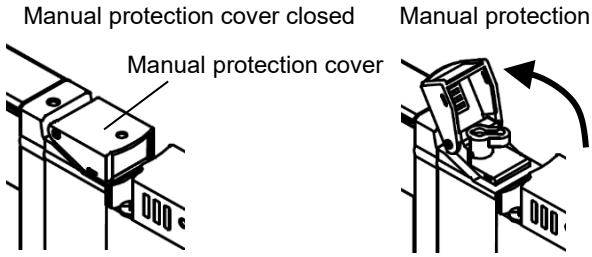
- Performing normal operation while the manual override is locked causes malfunction.

- The TVG series is a pilot operated solenoid valve. If air is not supplied to Port P (Port PA for external pilots), the main valve does not switch even if the manual override is operated.
- Since the manual protection cover is closed when the manual override with manual protection cover is shipped out of the factory, open the cover to operate the manual override. Note that the manual protection cover will not close unless the locking type manual override is unlocked.
- The locking/non-locking type comes standard as the manual override. It is locked by pressing down and turning the lever. When locking, make sure to turn the lever while pressing it down. Turning the lever without pressing it down could damage the manual override and cause air leakage.

3.2.1 Manual override with manual protection cover

■ How to open and close the manual protection cover

Do not apply excessive force to the manual protection cover when opening and closing the cover. Excessive external force may cause failure. (Below 5 N)

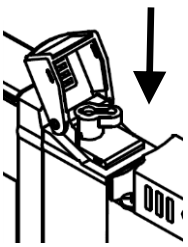


■ How to operate locking/non-locking type of manual override

< Non-locking operation >

1 Press the lever down in the direction of the arrow until it stops.
Manual override can be performed while the lever is pressed down.

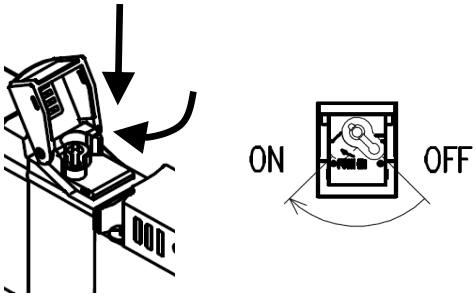
2 Release the lever to finish manual override.
The lever returns to its original position.



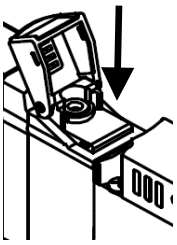
< Locking operation >

1 Press the lever down and turn it in the direction of the arrow until it stops.
The lever is locked in place, maintaining the manual override activated.

2 When the manual override is complete, return the lever to the original position.



■ How to operate non-locking manual override

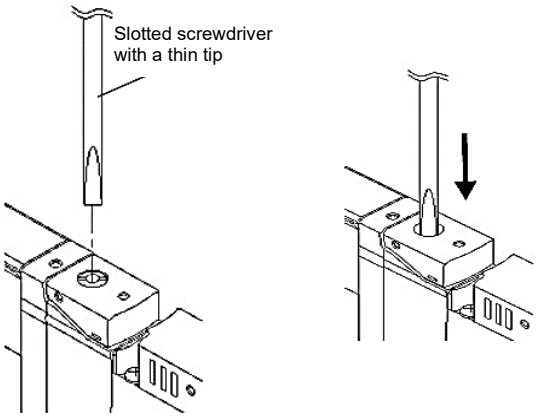


1 Press the lever down in the direction of the arrow until it stops.
Manual override can be performed while the lever is pressed down.

2 Release the lever to finish manual override.
The lever returns to its original position.

3.2.2 Tool-operated type manual override

■ How to operate the locking/non-locking type of manual override

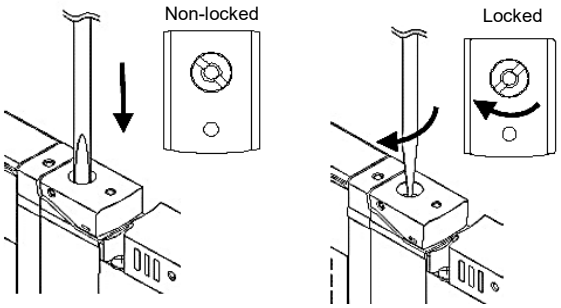


< Non-locking operation >

1 Press the manual override button with the tool in the direction of the arrow until it cannot go further.
Manual override can be performed while the lever is pressed down.

2 When the manual override is complete, release the tool from the manual override button. The manual override button returns to its original position.

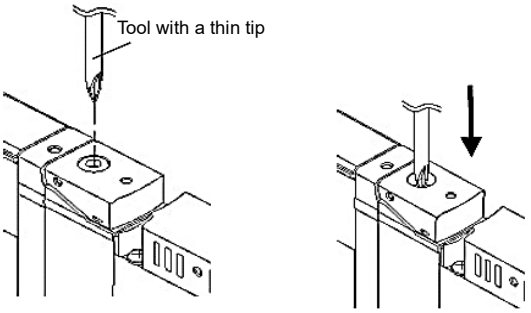
< Locking operation >



1 Press and turn the manual override button in the direction of the arrow until it cannot go further.
The manual override button is locked in place to maintain the manual override activated.

2 When the manual operation is complete, release the tool from the manual override button and return it to its original position.

■ How to operate the non-locking type of manual override



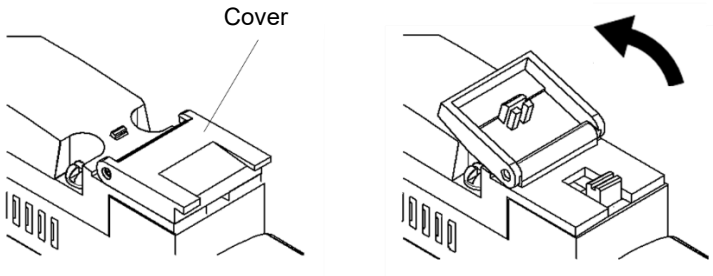
1 Press the manual override button with the tool in the direction of the arrow until it cannot go further.
Manual override can be performed while the lever is pressed down.

2 When the manual override is complete, release the tool from the manual override button. The manual override button returns to its original position.

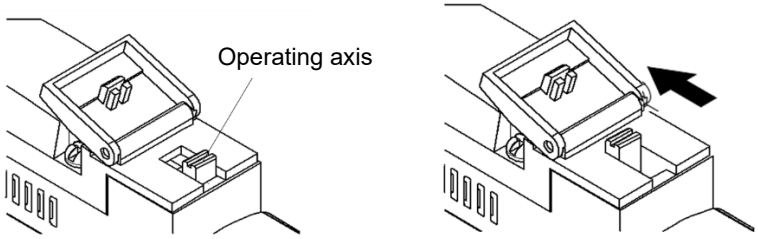
3.2.3 Manual device with residual pressure exhaust valve

<Opening and closing cover>

1 Do not apply unnecessary force when opening and closing the cover.
Excessive external force may cause breakage (less than 5N).



2 When discharging residual pressure, push the operating axis in the arrow direction.
In the case of the non-locking type (option Y1), the operating axis is unlocked when it is released.
In the case of the locking type (option Y2), the operating axis is not unlocked even when it is released.
(Be careful not to forget to put it back.)



4. MAINTENANCE AND INSPECTION

4.1 Periodic Inspection

⚠WARNING

Before performing maintenance, turn off the power, stop the supply of compressed air and make sure that there is no residual pressure.
It is a necessary condition to ensure safety.

⚠CAUTION

Conduct daily and periodic inspections in a planned manner to ensure proper maintenance management.
If maintenance is not properly managed, the product's functions may deteriorate significantly, leading to faults such as short service life, damage, and malfunction, or accidents.

In order to use the product under optimum conditions, perform a periodic inspection once or twice a year.

■ Pressure management of supplied compressed air

- Is the compressed air supplied at the set pressure?
- Does the pressure gauge indicate the set pressure during operation of the device?

■ Management of pneumatic filters

- Is condensate properly discharged?
- Aren't the bowl and element abnormally dirty?

■ Management of compressed air leakage at pipe connections

- Are all connections, especially at movable sections, correctly connected?

■ Solenoid valve operating condition management

- Is there any delay in operation?
- Do the valves exhaust air properly?

■ Pneumatic actuator operating condition management

- Does it operate smoothly?
- Does it reach the end stop properly?
- Are load connection points normal?

■ Management of lubricators

- Is the oil amount adjusted correctly?

■ Management of lubricants

- Is the specified lubricant supplied?

■ Management of screws

- Are there any loose screws?

4.2 How to Disassemble and Assemble

⚠WARNING

Thoroughly read and understand this Instruction Manual before working on disassembly or assembly of the manifold.

- The product must be handled by a person who understands the structure and operation principle of solenoid valves and has knowledge of how to ensure the safety.
- A level of 2nd grade (or higher) Certified Skilled Professional of Pneumatic Apparatus Assembling is required.

When increasing or decreasing the number of manifolds, turn off the power and release the pressure.

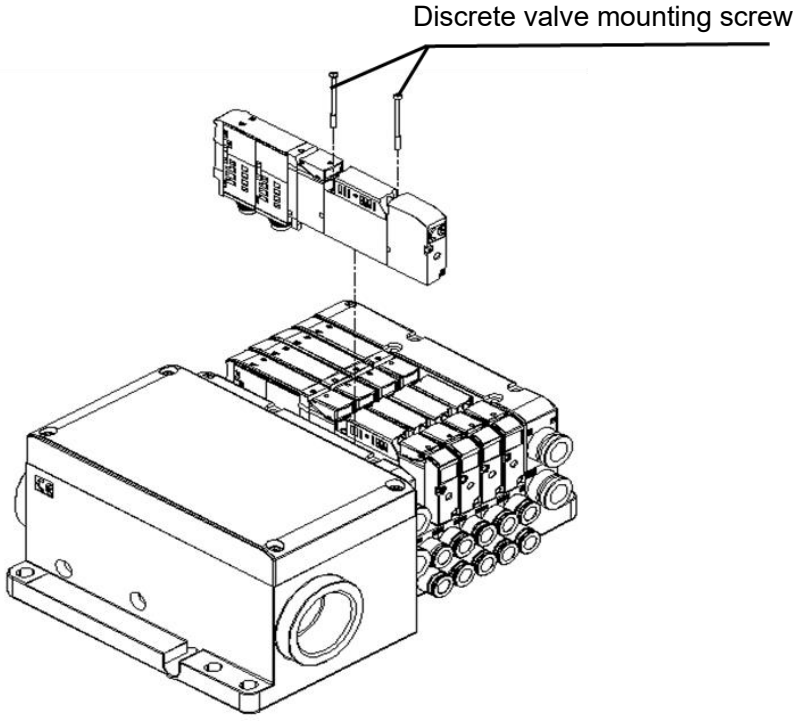
Do not disassemble or reassemble the solenoid valves.

- Disassembling or reassembling the inside of the solenoid valve will impair the sealing performance.
- Disassembled and reassembled solenoid valves are not covered by the warranty.

4.2.1 Replacement of solenoid valves

When replacing the solenoid valves, make sure that the gasket is in place and tighten with the appropriate torque.

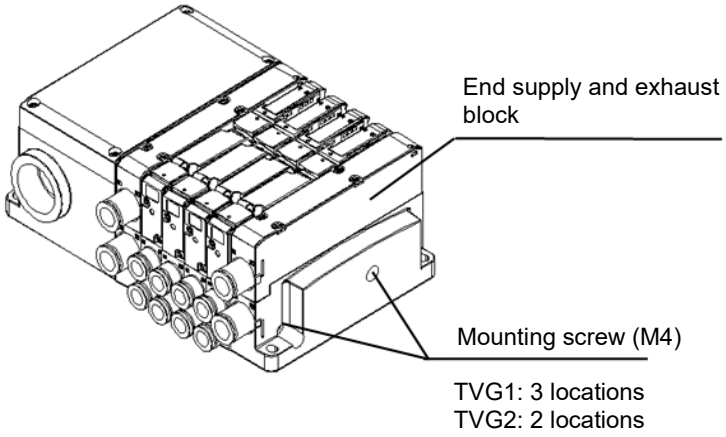
Model	Screw size	Appropriate tightening torque (N·m)
TVG1	M1.7	0.19 to 0.21
TVG2	M2.5	0.35 to 0.40



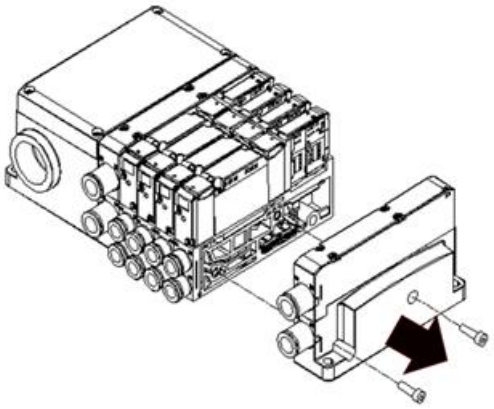
4.2.2 Addition of valve blocks

・TVG□P-TR-01 is a tie rod for adding one station.
・3 stations can be added to manifolds with 2 to 17 stations.
・For 18 stations or more, use tie rods that match the number of stations after the station increase.
・Attach tie rods for additional stations to the wiring block.
If it is installed on the end block side, it may not be assembled correctly.

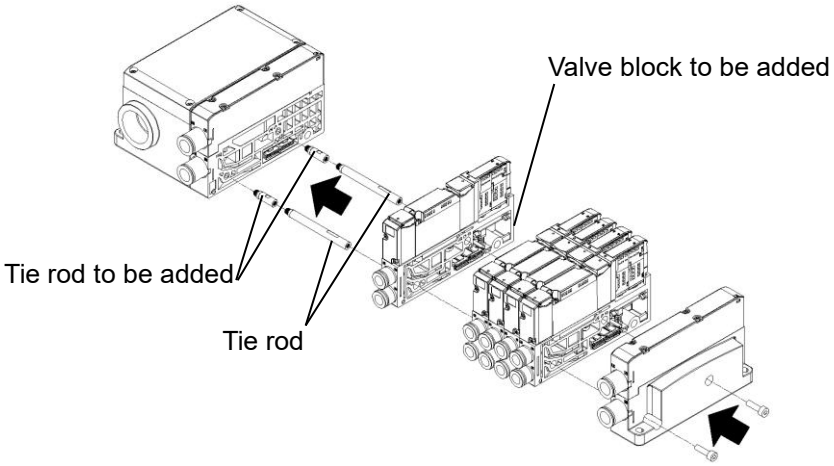
1. Loosen the end supply and exhaust block mounting screws.



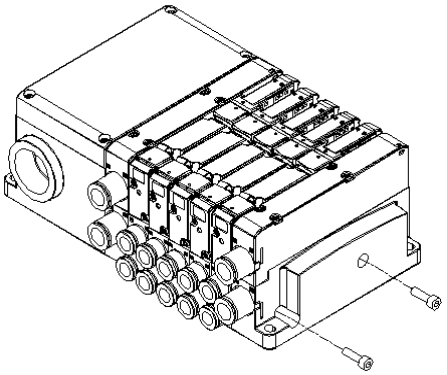
2. Remove the end supply and exhaust block.



3. Add an additional valve block and tie rods.
At this time, assemble them so that the gasket of the valve block does not fall off or get compressed.



4. Tighten the mounting screws.



Model	Screw size	Appropriate tightening torque (N·m)
TVG1	M4	1.2
TVG2	M4	1.2

◆ Wiring between the supply and exhaust block and the valve block when adding valve blocks

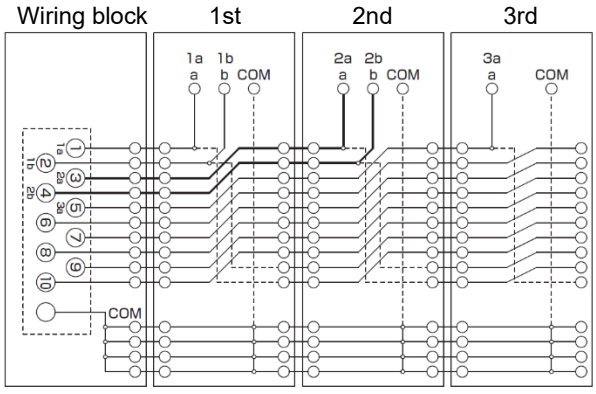
Valve blocks, intermediate supply and exhaust blocks, and other blocks are structured to have built-in parts called dedicated wiring connectors to allow wiring work simultaneously with disassembly and assembly of block manifolds. No special wiring work is required during disassembly and assembly. Since there is a regularity between the connector pin number of the centralized terminal block and the wired valve, make a connection between the valve and the control device after checking “2.5 Wiring Method.” Pay special attention when increasing or decreasing the number of valve blocks. The figure below shows an example of the wiring circuit when the number of valve blocks is increased.

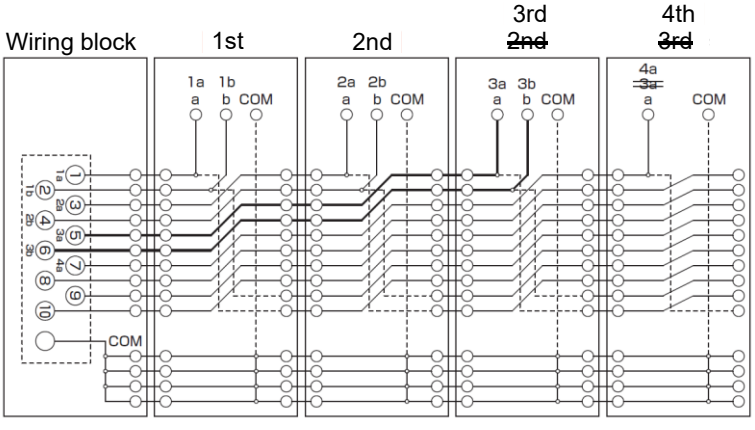
Example of wiring circuit

The figure below is a schematic diagram of the wiring circuit of the TVG series, which is different from the actual specifications.

- Standard wiring

  When a valve block is added between the second and third stations, the outputs assigned to terminal blocks No. 5 and No. 6 of the electrical component block are automatically shifted by two solenoids and assigned to terminal blocks No. 7 and No. 8.

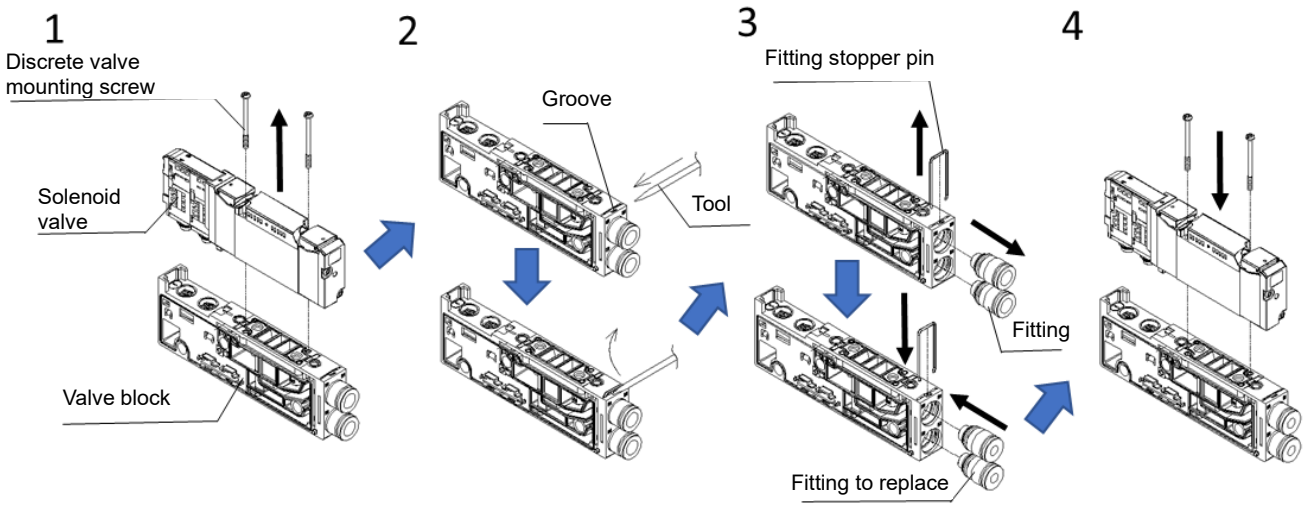




- Single solenoid, double solenoid placement specification wiring (wiring method: S)
  As in the case of standard wiring, the terminal block number is shifted and assigned. However, how it is shifted depends on the solenoid valve type. In the case of a single solenoid (2-position single), terminal block numbers are shifted by 1 solenoid, and in the case of 2 solenoids (2-position double/3-position), they are shifted by 2 solenoids.

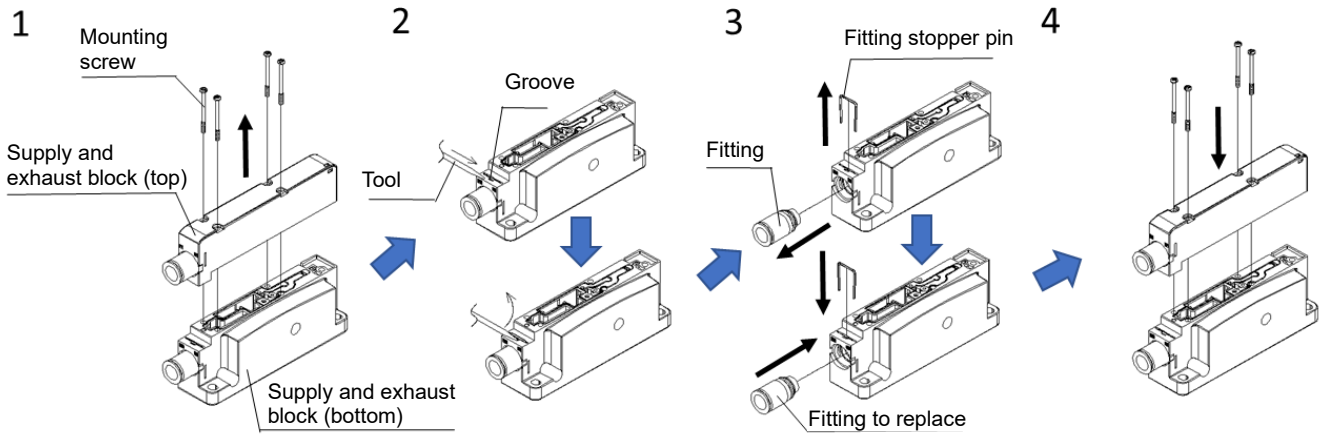
■ Valve block cartridge type fitting replacement method

1. Loosen the discrete valve mounting screw and remove the solenoid valve from the valve block.
2. Insert a fine-tipped tool into the groove of the valve block and remove the fitting stopper pin.
3. Replace the fitting and insert the fitting stopper pin.
4. Assemble the solenoid valve to the valve block and fasten the discrete valve mounting screw with an appropriate torque.



■ How to replace cartridge fittings of end supply and exhaust block, wiring supply and exhaust block and intermediate supply and exhaust block

1. Loosen the supply and exhaust block mounting screws to separate the upper and lower supply and exhaust blocks from each other.
2. Insert a fine-tipped tool into the groove of the supply and exhaust block and remove the fitting stopper pin.
3. Replace the fitting and insert the fitting stopper pin again.
4. Assemble the upper and lower supply and exhaust block and fasten the mounting screws with an appropriate torque. (Tightening torque: N·m)



5. TROUBLESHOOTING

5.1 Causes and Troubleshooting

If the product does not operate as intended, inspect the product according to the table below.

Problem	Cause	Solution
The product does not work.	No electrical signal.	Turn the power on.
	Electric signals are faulty.	Repair the control circuit.
	Voltage or current fluctuation is excessive.	Check the power capacity (voltage fluctuation range +/- 10%)
	Wiring is not correct.	Correct the wiring.
	All pilot exhaust ports are blocked	Check and correct the piping.
The product does not operate correctly.	Leakage current is excessive.	Correct the control circuit and/or add a bleed circuit.
	Chattering occurs.	Check the switching system and check for loose wiring.
	Voltage is not the same as specified on the nameplate.	Correct the voltage to meet the specification.
	Coil is broken or short-circuited.	Replace the coil.
	The pressure source is disconnected.	Turn on the pressure source.
	Pressure is insufficient.	Readjust the pressure reducing valve or install a valve for increasing pressure.
	Flow rate is insufficient.	Check and correct the piping or install a surge tank.
	Pressure is supplied through exhaust port.	Check and correct the piping.
	Piping is incorrect or omitted.	Check and correct the piping.
	Speed controller throttle valve is fully closed.	Readjust the needle.
	Port A or B is opened to atmosphere.	Use a fitting pipe with diameter equal to or smaller than the diameter of Port P fitting.
	Valve is frozen.	Take measures against freezing (add thermal insulation, remove moisture, etc.)
	Plunger return is delayed (too much oil, tar).	Check the quality of the lubricant (Class 1 ISO VG 32 turbine oil), readjust lubricator drip rate, and/or install tar removal filters.
	Exhaust ports are clogged with dust.	Install a cover or silencer and/or clean the exhaust periodically.
Operating pressure is high.	Packing is swollen.	Check the lubrication (Class 1 ISO VG 32 turbine oil), keep solenoid valves away from areas where cutting oil is used, and/or keep organic solvents away.
	Port A or B is opened to atmosphere.	Check and correct the piping.
	Foreign matters are stuck in packing.	Remove foreign matters from the packing

If you have any other questions, contact your nearest CKD sales office or distributor.

6. REFERENCE INFORMATION

6.1 Port Identification

Piping ports are labeled, such as 1P and 4A, in accordance with ISO and JIS standards.

Port	ISO Standard	JIS Standard
Supply port	1	P
Output port	4	A
Output port	2	B
Exhaust port	5/3	R
Pilot supply port	12/14	PA
Pilot exhaust port	82/84	PR

There is no restriction on the mounting orientation of the solenoid valves.

7. WARRANTY PROVISIONS

7.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following cases are excluded from this warranty:

- When the product is handled or used under conditions or in environments other than those described in the catalog, specifications, or this Instruction Manual
- When the failure is caused by misuse due to carelessness or mismanagement
- When the failure is caused by reasons other than the product
- When the product is used in a manner other than its intended use
- When the failure is caused by modifications/alterations or repairs not carried out by CKD
- When the failure could have been avoided if the customer's machinery or device into which the product is incorporated had functions and structures generally provided in the industry
- When the failure is caused by reasons unforeseen at the level of technology available at the time of delivery
- When the failure is caused by something CKD is not responsible for, such as acts of nature and disasters

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall take precedence.

7.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.