CKD

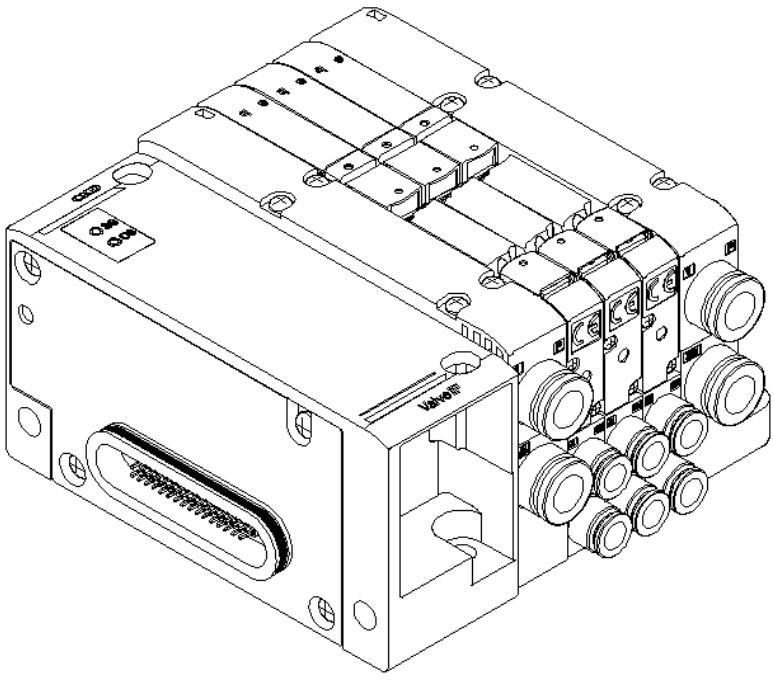
Remote I/O

RT Series

Valve I/F Unit

INSTRUCTION MANUAL

SM-A46346-A



- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's "**RT Series**". This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- This product is intended to be used by persons with sufficient knowledge and experience in the following areas.
  CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training with respect to them.
  - Electricity (qualified electrician or equivalent)
  - The industrial network communications used
  - FA systems in general
  - Each of the systems that use manifold solenoid valves, IO-Link, etc.
- 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 exercise its full performance or an accident may occur. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the pneumatic or water control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

ISO 4414, JIS B 8370, JFPS 2008 (the latest edition of each standard),
the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards relevant laws and regulations.

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 adopted in the product, 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 potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ **DANGER**	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ **WARNING**	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

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.

Precautions on Product Use

⚠ DANGER

Do not use the product for the following applications:

- Medical devices involved in sustaining or managing people's lives or physical health
- Mechanisms and mechanical devices used for the purpose of moving and transporting people
- Important safety parts for mechanical devices

⚠ 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.

This product is intended for use in general industrial machinery, equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments.

- Use for applications where safety is required
- In applications for nuclear power, railroad systems, aviation, ships, vehicles, and medical equipment
- In applications for equipment that directly touches beverages or food
- For safety measures for amusement equipment, emergency shut-off circuits, press machines, or brake circuits
- Use for applications where life or assets could be significantly affected, and applications where special safety measures are required

(An exception will be 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.)

Never modify or additionally machine this product.

These may cause failure or malfunction. In addition, they are not covered by our warranty.

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

The product may operate in an unexpected way, causing injury to people or damage to facilities.

- Inspect and service the machine and devices only after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that has pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

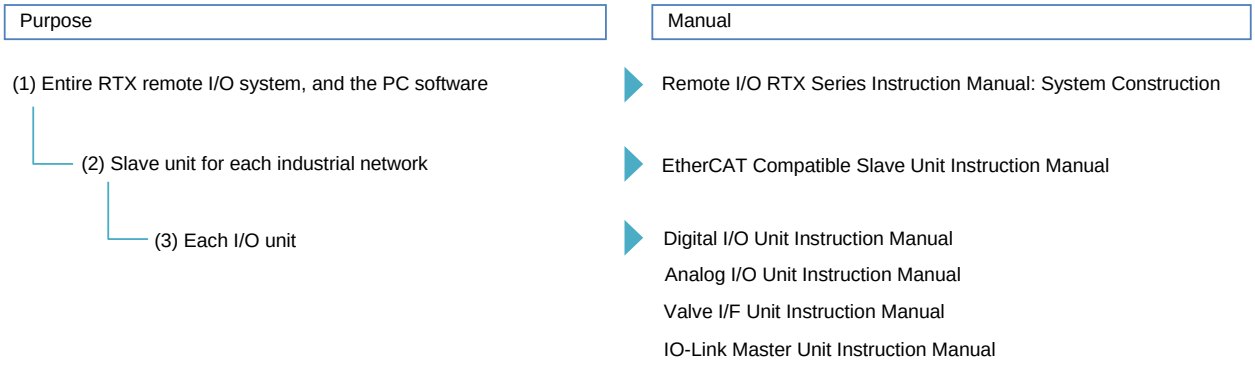
Observe the warnings and cautions on the following pages to prevent accidents.

CONTENTS

INSTRUCTION MANUAL FOR THIS PRODUCT

The manuals related to the Remote I/O RT Series are separated by purpose as follows.
(1) Entire RT remote I/O system, and the PC software
(2) Device unit for each industrial network
(3) Each I/O unit

"Remote I/O RT Series Instruction Manual: System Construction" is mandatory. Other manuals are not mandatory but must be referred to according to the units used.



List of Related Instruction Manuals

Instruction Manual No.	Instruction Manual name	Description
SM-A46342	Remote I/O RT Series Instruction Manual: System Construction	Instruction manual for the entire remote I/O RT Series system Includes explanations of the PC software RTTools, the power supply unit RT-P24A01N, and the End unit RT-EE□N00N.
SM-A46343	EtherCAT Compatible Device unit Instruction Manual	Instruction manual for the EtherCAT compatible device unit RT-TECN00N
SM-A46344	IO-Link Master Unit Instruction Manual	Instruction manual for the IO-Link master unit RT-LMSA08N
SM-A46345	Digital I/O Unit Instruction Manual	Instruction manual for the digital I/O unit RT-□DG□□□□
SM-A46346	Instruction manual for the Valve I/F unit (this manual)	Instruction manual for the Valve I/F unit RT-VV□N□□□
SM-A46347	Analog I/O Unit Instruction Manual	Instruction manual for the analog I/O unit RT-□AGA0 2N

Always read the instruction manual for each product connected to the remote I/O RT Series.
The types of products that can be connected are:
- Upper master units in each industrial network (connected to the device unit)
- IO-Link devices (connected to the IO-Link master unit)
- Manifold solenoid valves (connected to the Valve I/F unit)
- Other sensors/actuators (connected to the digital I/O unit, analog I/O unit, and IO-Link master unit)

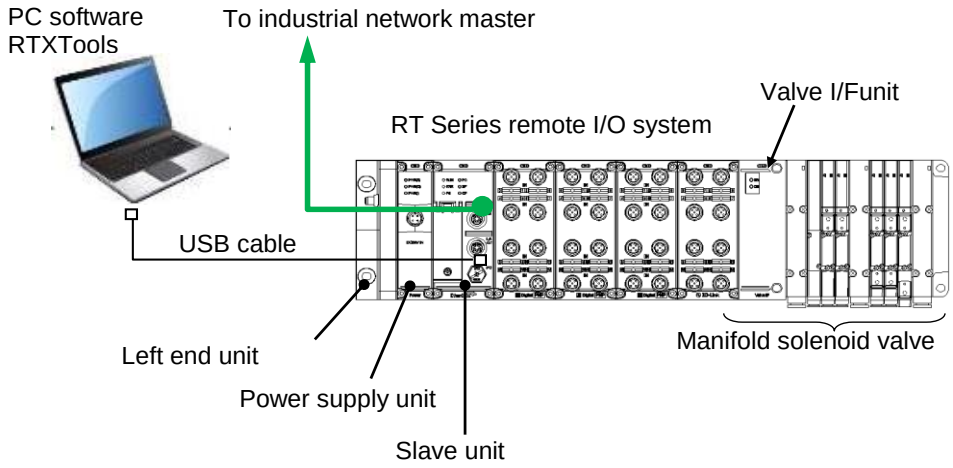
TERMS RELATED TO THE VALVE I/F UNIT

Term	Definition
Solenoid valve	Refers to a combination of an electromagnet and a valve that controls the pneumatic flow direction, for supplying compressed air to pneumatic cylinders and other actuators, or for releasing compressed air into the atmosphere.
Manifold solenoid valve	A valve that consists of two or more connected solenoid valves, where multiple tubes or passageways to pass fluid are combined.
TVG series	The TVG series in this manual refers to a manifold solenoid valve.
Wire-saving manifold solenoid valve	A type of manifold solenoid valve which is not output to each solenoid valve but rather it is wired to a unit connected to a solenoid valve (RT remote I/O device unit, etc.) to transmit a solenoid valve driving signal. This wire-saving manifold solenoid valve is connected to the Valve I/F unit.
Valve I/F unit	An output unit that interfaces between a device unit and manifold solenoid valve in the RT remote I/O.
Valve power supply	Power supply to operate a solenoid valve. If a manifold solenoid valve is connected to a Valve I/F unit, power from a Valve I/F unit to the manifold solenoid valve is supplied via the internal bus (output power supply).
Standard wiring	Wiring in which the correspondences between the solenoid output No. and valve No. are different depending on the "switching position classification" of the solenoid valve mounted. There are no spaces between the valve No. and solenoid output No. when wired.
Double wiring	Wiring that corresponds to double solenoids regardless of the "switching position classification" of the solenoid valve mounted. For a single solenoid, there is a space on the valve No. for the solenoid output No. when wired.
Single solenoid valve	A solenoid valve in which one solenoid is mounted for one valve. If the operating power is removed after operation, it will automatically return to its original position.
Double solenoid valve	A solenoid valve in which two solenoids are mounted for one valve. Even when the operation power is removed after operation, it will not return to its original position. It will return to its original position only when the opposite side is operated.
Mix manifold	A manifold solenoid valve in which both the single and double solenoid valves are mounted.
Signal line error	A failure when a short circuit, disconnection, or overheating of the signal line from the valve I/F to the connected manifold solenoid valve is detected when the "signal line error detection" setting of the Valve I/F unit is "Enable".

1. PRODUCT OVERVIEW

The RT series Valve I/F unit interfaces with a manifold solenoid valve in the remote I/O RT series system.
This Valve I/F unit can connect up to 24 manifold solenoid valves, and outputs ON/OFF for each valve (32-point output).

If connecting the PC software (free of charge) to the device unit via USB, it is possible to:
- Set the Valve I/F unit
- Set the configuration information of the manifold solenoid valve
- Check the status of the ON/OFF output

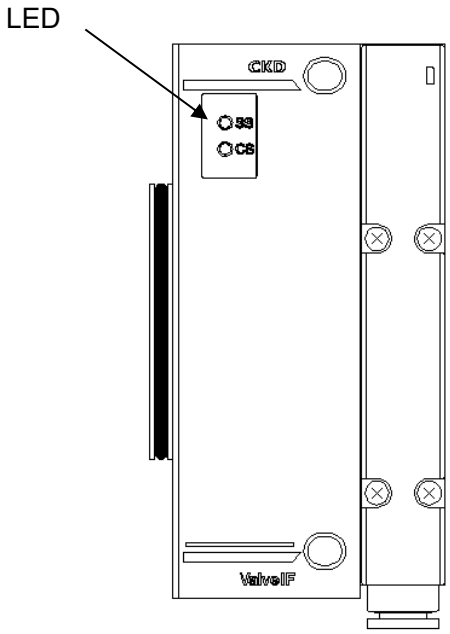


- Two or more manifold solenoid valves can be connected, up to a maximum of 24.
  A single unit cannot be connected.

1.1 Features

Features include the following:
- Supports the manifold solenoid valve TVG series .
- Achieves a remote communication system with upper master units by adding the device unit to the manifold solenoid valve. The digital I/O unit, analog I/O unit, and IO-Link master unit can be added as needed.
- Power is supplied to the connected manifold solenoid valve via the internal bus.
- The On Operating Cycle of the connected manifold solenoid valve can be counted and monitored, and an alarm notification can be received by setting the threshold over.
- It is possible to specify what output operation to perform in the event of a communication error either for the entire remote I/O or separately for each I/O unit.
- For the degree of protection, IP65/IP67 are available.
  The IP65/IP67 type can be connected to the IP65 manifold solenoid valve, and can also be installed in areas where water splashes.
  Note: The degree of protection for the entire remote I/O is in accordance with the degree for the manifold solenoid valve.

1.2 Names and Functions of Each Part



■ LEDs

Specification list

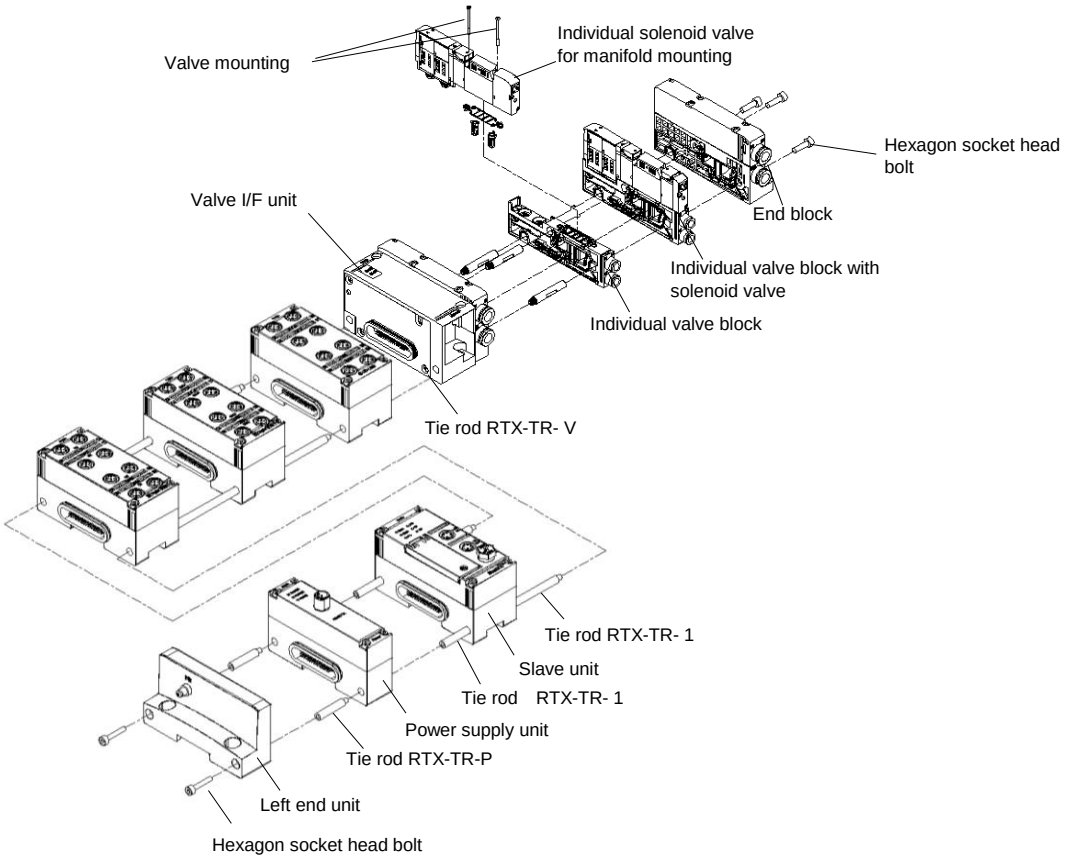
Name	Color	Description
SS	Green, yellow, red	Signal line Status: Indicates the status of the signal line, etc.
CS	Green, yellow, red	Counter Status: Indicates the Off_On cycle status.

Status list

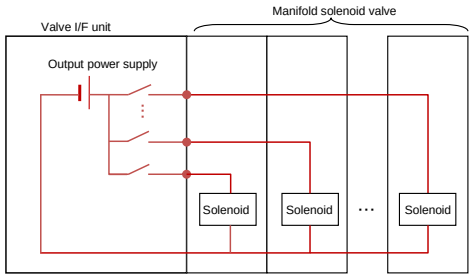
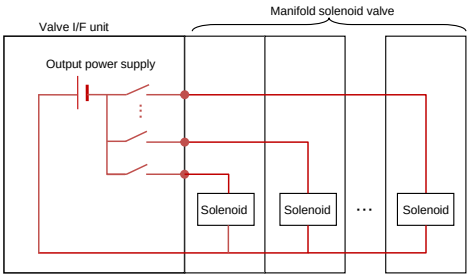
Name	Status	Meaning
SS	Red on	Internal bus communication disconnected
	Red blinking (fast)	Hardware error
	Red blinking (slow)	Signal line error detection
	Yellow on	Output power supply voltage error (detected by the device unit)
	Yellow blinking (fast)	Off_On cycle threshold over detection
	Green on	Normal
	Off	Power OFF state
CS	Red on	Internal bus communication disconnected
	Red blinking (fast)	Off_On cycle threshold over detection point: 25 to 32
	Red blinking (slow)	Off_On cycle threshold over detection point: 17 to 24
	Yellow blinking (fast)	Off_On cycle threshold over detection point: 9 to 16
	Yellow blinking (slow)	Off_On cycle threshold over detection point: 1 to 8
	Green on	Off_On cycle threshold over detection point: 0
	Off	Power OFF state

■ Connecting to the manifold solenoid valve

Refer to the figure below and connect.



Internal wiring

With power supply for output (PNP)	With power supply for output (NPN)
	

1.3 Unit Specifications

1.3.1 Valve I/F unit

<table>
<tr><th colspan="2">Item</th><th>Description</th></tr>
<tr><td colspan="2">Type</td><td>Valve I/F unit</td></tr>
<tr><td colspan="2">Model No.</td><td>Refer to "1.3.3 List of unit model No.".</td></tr>
<tr><td rowspan="7">Output specifications</td><td>Number of output points</td><td>32-point types</td></tr>
<tr><td>Output type</td><td>PNP and NPN types</td></tr>
<tr><td>The degree of protection type and connectible manifold solenoid valve</td><td>IP65/IP67</td></tr>
<tr><td>Number of connectible manifold solenoid valves</td><td>Minimum: 2; maximum: 24</td></tr>
<tr><td>Power supply to this unit (for unit/input)</td><td>24 VDC ± 10% 2 A
Note: Supplies power via the internal bus.</td></tr>
<tr><td>Power supplied to the manifold solenoid valve (valve power) (For output)</td><td>24 VDC + 10% - 5% 2 A</td></tr>
<tr><td>Protection functions</td><td>
<table>
<tr><th rowspan="2">Protection functions</th><th colspan="2">Power line</th></tr>
<tr><th>For output</th><th>Internal power supply</th></tr>
<tr><td>Short circuit protection and detection</td><td>Yes</td><td>No</td></tr>
<tr><td>Disconnection detection</td><td>Yes</td><td>No</td></tr>
<tr><td>Overcurrent protection</td><td>Yes</td><td>No</td></tr>
<tr><td>Overheating protection and detection</td><td>Yes</td><td>No</td></tr>
<tr><td>Overvoltage protection</td><td>Yes</td><td>No</td></tr>
<tr><td>Low voltage protection (reset function)</td><td>No</td><td>Yes</td></tr>
<tr><td>Counter-electromotive force protection</td><td>Yes</td><td>No</td></tr>
</table>
</td></tr>
<tr><td>Response time</td><td>ON: Delay is less than 0.5 ms; OFF: Delay is less than 1.0 ms
Note: The response time does not include the internal bus communication time.</td></tr>
<tr><td>Leakage current</td><td>0.1 mA or less</td></tr>
<tr><td colspan="2">LED</td><td>2</td></tr>
<tr><td colspan="2">Working temperature range</td><td>-10°C to +55°C</td></tr>
<tr><td colspan="2">Ambient atmosphere</td><td>No corrosive gases or heavy dust</td></tr>
<tr><td colspan="2">Degree of protection</td><td>IP65/IP67
Note: If the manifold solenoid valve is connected, the degree of protection for the entire remote I/O is in accordance with the degree of protection for the manifold solenoid valve.</td></tr>
<tr><td colspan="2">Current consumption</td><td>Unit/input power supply: 15 mA or less (24 V equivalent)
Output power supply:
32-point type: 75 mA or less (24 V equivalent) + Total current consumption of the connected manifold solenoid valve</td></tr>
<tr><td colspan="2">Mounting method</td><td>Direct screw mounting only</td></tr>
<tr><td colspan="2">Net weight</td><td>TVG1 series: Approximately 280 g
TVG2 series: Approximately 356 g</td></tr>
<tr><td colspan="2">Standard accessories</td><td>2 tie rods for the Valve I/F unit</td></tr>
</table>

1.3.2 Compatible manifold solenoid valve series

Type of Valve I/F unit	Connectible manifold solenoid valve series	Manifold solenoid valve part name	Manifold solenoid valve model No.
IP65/IP67 type	TVG series	Pilot 3/5-port plug-in block manifold solenoid valve	TVG1/TVG2

1.3.3 List of unit model No.

Connected manifold solenoid valve series	Number of output points	Output type	Valve I/F unit model No.
TVG series	32 points	PNP	TVG*P-TB-*-KA1D
		NPN	TVG*P-TB-*-KA1C

1.4 Mounting and Degree of Protection

⚠WARNING

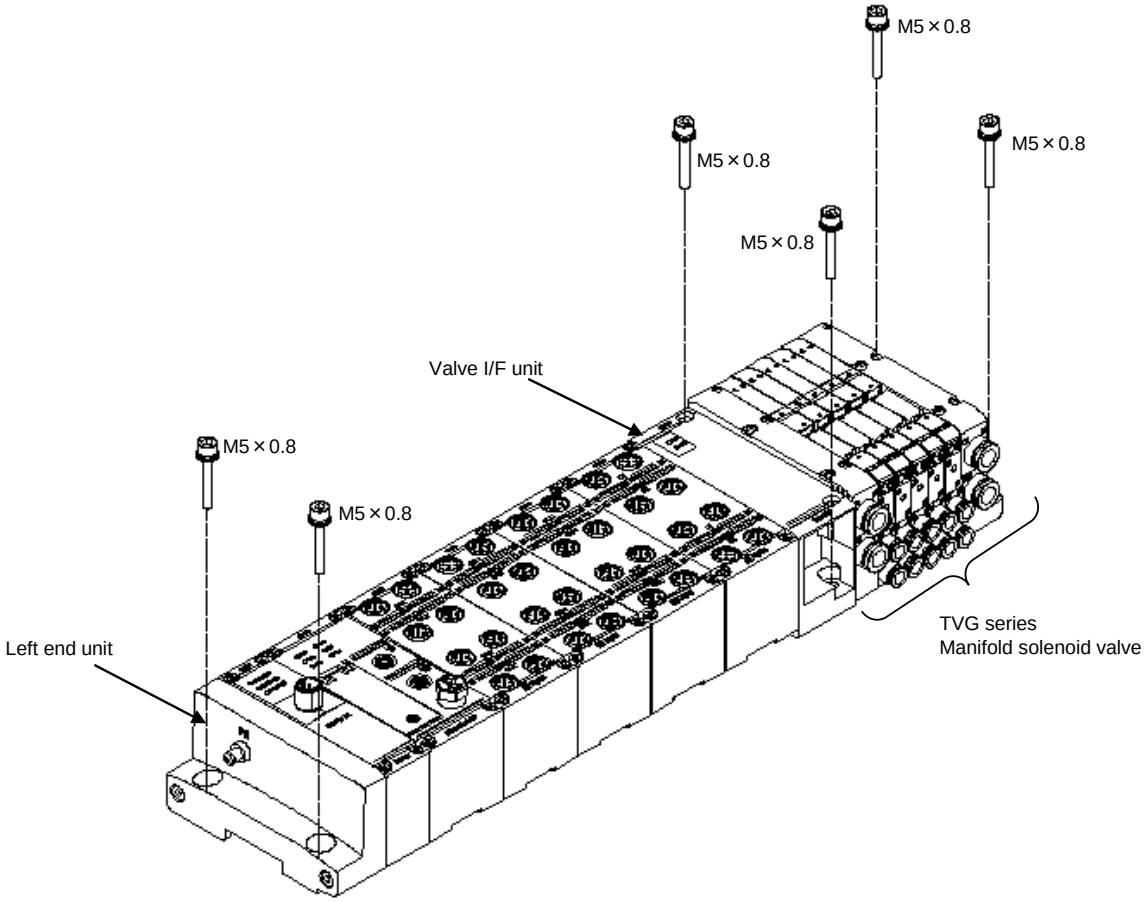
Consider the required degree of protection.

- When the TVG series is connected, the degree of protection for the entire remote I/O will be IP65/1P67.

The product must be used under the following conditions in order to achieve a degree of protection of IP65 or IP67:

- The product and external devices must be wired up correctly using cables with M12 or M8 connectors.
- Manifold solenoid valves must be fitted correctly.
- Put waterproof caps on unused connectors. If it is going to be used in an environment where it will constantly be exposed to water, take measures to protect it, such as putting covers over it.
- If the degree of protection is IP65, avoid using the product in situations where the units or manifold solenoid valves will constantly be directly exposed to water droplets or cutting oil.

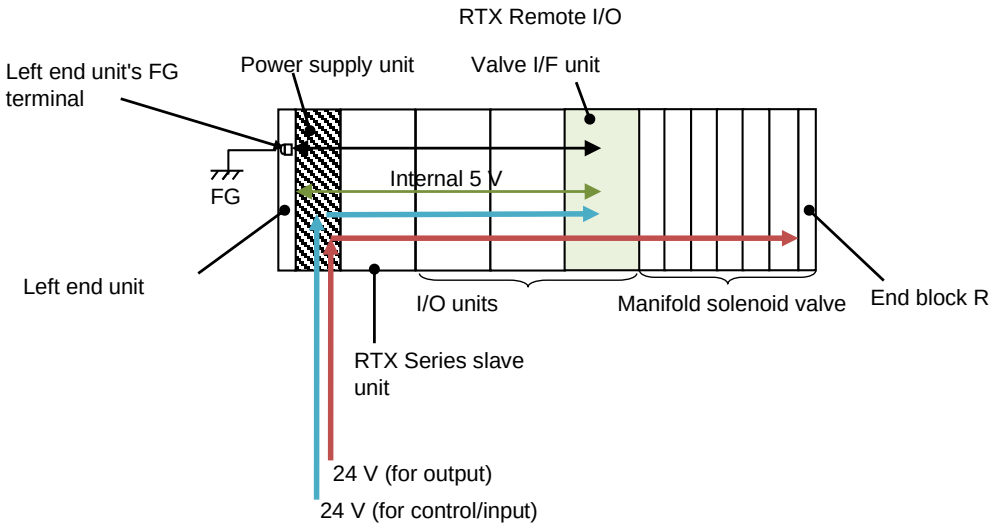
Directly mount the entire remote I/O with screws.
Tighten the mounting screws in the six places on the figure below. The size is M5 x 0.8.
(screw length 20 mm or more)



1.5 Power Supply Relationship between the Product and the Manifold Solenoid Valve

The power supply unit supplies the unit/input 24 V and output 24 V to the Valve I/F unit via the internal bus.

- The unit/input 24 V is converted to the internal 5 V in the power supply unit, and consumed as the control power supply for the Valve I/F unit itself.
- The output 24 V is supplied to the connected manifold solenoid valve as the output power (valve power) by the Valve I/F unit. If the signal line which also serves as the power supply line for this supply has an error occurring, it indicates "Signal line error".


RTX Remote I/O
Left end unit's FG terminal
Power supply unit
Valve I/F unit
FG
Internal 5 V
Left end unit
I/O units
Manifold solenoid valve
End block R
RTX Series slave unit
24 V (for output)
24 V (for control/input)

2. INSTRUCTIONS FOR USE

Instructions		Reference
Prior checking	Check the configuration of the manifold solenoid valve that is connected.	"1.3 Unit Specifications"
	Check the power supply relationship with the manifold solenoid valve.	"1.5 Power Supply Relationship between the Product and the Manifold Solenoid Valve"
	Check the mounting method of the remote I/O.	"1.4 Mounting and Degree of Protection"
	Check the degree of protection.	
	Check the manifold solenoid valve terminal and the array method of the connector pin.	"4.2 Examples of Valve No. Arrays Corresponding to Solenoid Output No."
	Check the settings regarding if it will be specified individually for each unit what output operation it will do in the event of a communication error.	"3. SETTINGS"
↓	↓	-
Hardware installation and wiring	Connect the Valve I/F unit to the remote I/O.	"Remote I/O RT Series Instruction Manual: System Construction"
	↓	-
	Connect the manifold solenoid valve.	"**エラー! 参照元が見つかりません。** Names and Function of Each Part"
	↓	-
	Install the pipe for compressed air to the manifold solenoid valve.	Instruction Manual for the manifold solenoid valve used
↓	↓	-
Valve I/F unit's setting	Supply 24 V power to the power supply unit. Note: If there is more than one power supply unit, power them all on within 3 seconds.	"Remote I/O RT Series Instruction Manual: System Construction"
	↓	-
	Connect the PC software to the device unit with a USB cable.	"3.2 List of Settings" "Remote I/O RT Series Instruction Manual: System Construction"
	↓	
	Configure the settings for each of the Valve I/F unit points via the PC software (or the industrial network's message communication).	
	↓	
	Transfer the settings to the device unit by clicking the "Set all items" button in the PC software.	
↓	↓	-
Checking the I/O assignment	Check the Valve I/F unit's I/O assignment to the upper master.	"4. I/O ASSIGNMENT"
↓	↓	-
Forced output settings	Configure the forced output settings using the PC software, and check the changes in the Valve I/F unit's LEDs and digital input values.	"Remote I/O RT Series Instruction Manual: System Construction"
↓	↓	-
Checking the output operation	Check the Valve I/F unit's LEDs.	"6.2 Troubleshooting from the LED Display"
↓	↓	-
Maintenance	- Check the LED (counter status) on the Valve I/F unit. - Check the Off_On cycle value of the manifold solenoid valve. - Check the Off_On cycle threshold over alarm of the manifold solenoid valve.	"6. TROUBLESHOOTING" For EtherCAT, refer to the object dictionary section in the "Instruction manual for the EtherCAT compatible device unit". Instruction Manual for the manifold solenoid valve used

3. SETTINGS

⚠WARNING

Check the settings of each unit before operating the system.
If the units have incorrect settings, they may malfunction. This could result in injury to people or damage to equipment.

3.1 Setting Method

There are two ways to configure the Valve I/F unit: using the PC software and using industrial network communication.

3.1.1 Using PC software

1. Select the Valve I/F unit on the "Unit configuration" main tab and click the "Settings" button.
2. Select the "Point-each sets" tab.

Valve I/F unit's "Set each point" tab

3.1.2 Using industrial network communication

Message communication commands from the upper master are used to set up the Valve I/F unit's objects.
E.g.) In the case of EtherCAT, SDO communication commands are used to set up the object dictionary for the Valve I/F unit.

3.2 List of Settings

The following can be set for each point:

Point-each setting	Description	Value	Factory setting	Setting required
Signal line error detection setting	Enable or disable signal line error detection. Error detection is set for every point.	0: Disable 1: Enable	0: Disable	-
Signal line error recovery operation setting	Set whether to maintain the same behavior as during the signal line error when it has been recovered from, or return to normal from the most recent data update after recovery.	0: Auto (Do not maintain the same behavior as during the error) 1: Manual (Maintain the same behavior as during the error)	0: Auto (Do not maintain the same behavior as during the error)	-
Output Off_On cycle threshold setting	This is a threshold for monitoring the number of times the output has changed from OFF to ON. The set value multiplied by 10 is used as the threshold.	0x000000 to 0xFFFFFF Does not count when 0	0	-
Operation setting in the event of a communication error	If the device unit's DIP switch setting SW3 is OFF (set individually for each unit), the valve output operation in the event of a communication (upper communication or internal bus communication) error is set on the Valve I/F unit side.	0: OFF 1: ON 2: HOLD (output state maintained)	2: HOLD	-

4. I/O ASSIGNMENT

This section shows the cyclic communication area of the Valve I/F unit that is assigned to the upper master.

4.1 Details of the Process Data Assignment in This Product

The I/O assignment size varies depending on the number of output points the unit has.
The valve output from the Valve I/F unit output corresponds as follows with each solenoid output of the manifold solenoid valve.

Data	Description	Size	Module name in the ESI file
Valve output	The ON/OFF output value for the valve. ON is 1 OFF is 0	Fixed at 4 bytes	Model No. of each unit

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24
Solenoid No.s32	Solenoid No.s31	Solenoid No.s30	Solenoid No.s29	Solenoid No.s28	Solenoid No.s27	Solenoid No.s26	Solenoid No.s25

Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
Solenoid No.s24	Solenoid No.s23	Solenoid No.s22	Solenoid No.s21	Solenoid No.s20	Solenoid No.s19	Solenoid No.s18	Solenoid No.s17

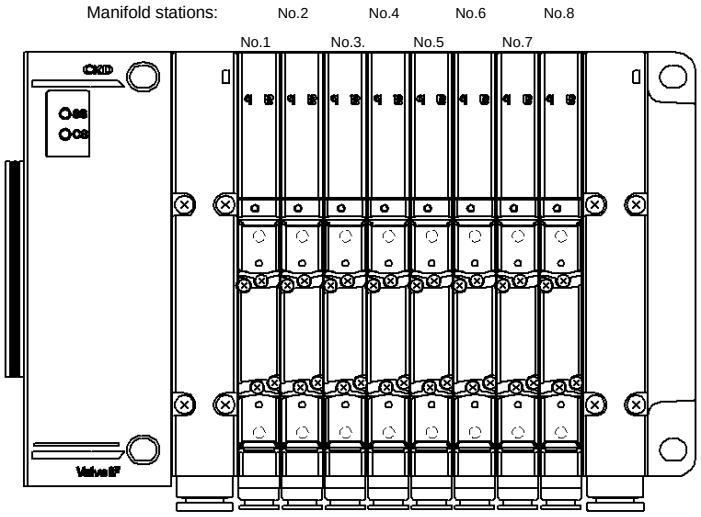
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Solenoid No.s16	Solenoid No.s15	Solenoid No.s14	Solenoid No.s13	Solenoid No.s12	Solenoid No.s11	Solenoid No.s10	Solenoid No.s9

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Solenoid No.s8	Solenoid No.s7	Solenoid No.s6	Solenoid No.s5	Solenoid No.s4	Solenoid No.s3	Solenoid No.s2	Solenoid No.s1

4.2 Examples of Valve No. Arrays Corresponding to Solenoid Output No.

The correspondence between the "solenoid output No." mounted on the Valve I/F unit and the "valve No." of the manifold solenoid valve is shown below.
Manifold stations are numbered from left to right with the piping port towards the user. As the appearance and maximum number of stations differ depending on the solenoid valve model, check the individual specifications.

■ TVG series



As an example, the diagram on the left (shows) a double solenoid type solenoid valve equipped in 8 stations.
For the single solenoid type, there is no solenoid on the b side.

The correspondence between "solenoid output No." and "valve No." of the manifold solenoid valve is as follows, depending on the "terminal/connector pin layout" of the manifold solenoid valve used:

4.2.1 Standard wiring (Double wiring)

It corresponds to the wiring of the double solenoid regardless of the "switching position classification" of the solenoid valves that are mounted (single or double solenoid).
If only double solenoids are mounted, the result is the same as standard wiring.

Note: In the table below, each valve number (Valve no.) consists of a number (1 for the first valve, 2 for the second valve, and so on) and an alphabetical character (a for the a-side solenoid, b for the b-side solenoid, and so on).

■ Single solenoid valve

Valve I/F unit point No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	(Empty)	2a	(Empty)	3a	(Empty)	4a	(Empty)	5a	(Empty)	6a	(Empty)	7a	(Empty)	8a	(Empty)

Valve I/F unit point No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid output No.	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	9a	(Empty)	10a	(Empty)	11a	(Empty)	12a	(Empty)	13a	(Empty)	14a	(Empty)	15a	(Empty)	16a	(Empty)

■ Double solenoid valve

Valve I/F unit point No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b

Valve I/F unit point No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid output No.	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	9a	9b	10a	10b	11a	11b	12a	12b	13a	13b	14a	14b	15a	15b	16a	16b

■ Mixed (both single and double solenoid valves are mounted) (Example)

Valve I/F unit point No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	(Empty)	2a	(Empty)	3a	3b	4a	4b	5a	(Empty)	6a	(Empty)	7a	7b	8a	(Empty)

Valve I/F unit point No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid output No.	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	9a	(Empty)	10a	(Empty)	11a	11b	12a	12a	13a	(Empty)	14a	(Empty)	15a	15b	16a	(Empty)

4.2.2 Single solenoid, double solenoid arrangement designation

The correspondence between "solenoid output No." and "valve No." varies depending on the "switching position classification" of the solenoid valves that are mounted (single or double solenoid).

Note: In the table below, each valve number (Valve no.) consists of a number (1 for the first valve, 2 for the second valve, and so on) and an alphabetical character (a for the a-side solenoid, b for the b-side solenoid, and so on).

■ Single solenoid valve

Valve I/F unit point No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	13a	14a	15a	16a

Valve I/F unit point No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid output No.	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	17a	18a	19a	20a	21a	22a	23a	24a	25a	26a	27a	28a	29a	30a	31a	32a

■ Double solenoid valve

Valve I/F unit point No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	8a	8b

Valve I/F unit point No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid output No.	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	9a	9b	10a	10b	11a	11b	12a	12b	13a	13b	14a	14b	15a	15b	16a	16b

■ Mixed (both single and double solenoid valves are mounted) (Example)

Valve I/F unit point No.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Solenoid output No.	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13	s14	s15	s16
Valve No.	1a	2a	3a	3b	4a	4b	5a	6a	7a	7b	8a	9a	10a	10b	11a	11b

Valve I/F unit point No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid output No.	s17	s18	s19	s20	s21	s22	s23	s24	s25	s26	s27	s28	s29	s30	s31	s32
Valve No.	12a	13a	14a	14b	15a	15b	16a	17a	18a	18b	19a	20a	21a	21b	22a	22b

4.2.3
4.3 Process Data Name

In the upper configuration tool, the following is displayed based on the ESI file:
E.g.)

Unit model No. (Module name)	Data size	Data	Data name in the ESI file for EtherCAT	Data type
RT-VVAN32A	4 bytes	Output 0	Point 0	BOOL
		…	…	…
		Output 31	Point 31	BOOL

5. FUNCTIONS

5.1 Function List

Function	Description	Related settings
Power supply to manifold solenoid valves (via the internal bus)	Supplies power to connected manifold solenoid valves from the Valve I/F unit via the internal bus.	-
Signal line error detection	Detects short circuits, disconnections, and overheating in the power supply line (signal line) from the Valve I/F unit to connected manifold solenoid valves. Whether detection is performed depends on the "Signal line error detection" setting.	Signal line error detection setting
Signal line error recovery operation setting	Specifies whether to maintain the same behavior as during the signal line error when it has been recovered from, or return to normal from the most recent data update after recovery. If it maintains the same behavior as during the error, it will wait for the user to turn the power off and on again.	
Off_On cycle counts /over alarm	Counts the number of times the Valve I/F unit's output signal has changed from OFF to ON. The counted number is stored in non-volatile memory once every 30 minutes (Note 1). It can also trigger an alarm when the set threshold is exceeded. Note 1: For EtherCAT communication, the Off_On cycle value can be found by reading the object dictionary's Off_On cycle value.	Output Off_On cycle threshold setting
Forced output setting	Forces the Valve I/F unit's output signal to be either ON or OFF (regardless of the actual control data) from the PC software.	-
Output setting in the event of a communication error	If the device unit's DIP switch setting SW3 is OFF (set individually for each unit), this function determines whether to maintain the valve output of the Valve I/F unit, or turn it ON or OFF in the event of a communication error (industrial network communication or internal bus communication).	Operation setting in the event of a communication error
Point diagnostic information for the unit	The diagnostic information for each of the valve I/F unit's points. 16 bits per point, and each bit corresponds to an error type. If an error is detected, the corresponding bit is 1 (ON). The information can be read from the PC software or upper master. The types of errors are as follows: Bit: Error description (genres of device diagnostics) 15: Signal line error (unit output) 14: Over output Off_On cycle threshold (unit output) 13: Hardware error (hardware) 12: On signal line error recovery, signal line error maintained (operation waiting)	-

6. TROUBLESHOOTING

6.1 Unit Errors (Point Diagnostic Information)

The information can be read from the PC software or upper master.

■ Error codes displayed in the PC software

The point diagnostic information can be found on the following screen of the PC software as a hexadecimal "error code" with the corresponding bit set to 1 (ON).
- "Code" in the "Error" main tab
- "Error Code" (in the error log)

■ Reading the diagnostic information area with message communication from the upper master

(For EtherCAT) The point diagnostic information is also stored in the diagnostic information area below in the object dictionary of the EtherCAT device unit. It can be read point-by-point from the upper master via SDO communication.

Index	Sub-Index	Description	Data type	Reading/writing attributes	Value	Initial value
0xAXX1	0	Number of entries	UNSIGNED8	RO	n (number of manifold solenoid valve points)	n
	1	Point diagnostic information 0	WORD	RO		0
	n	Point diagnostic information n-1	WORD	RO		0

Note: "XX" in Index above is the unit position number (0x00 to 0x11).

For the Valve I/F unit, the following errors can be found:

Bit	Error name	Description	Point-specific / unit	"Error type" in the device unit's "Remote I/O diagnostic information"
15	Signal line error detection	1 (ON) when the "Signal line error detection setting" of the Valve I/F unit is "Enable" and a power line (signal line) to the manifold solenoid valve has an error (short circuit, disconnection, or overheating).	Point-specific	Unit output error
14	Output Off_On cycle threshold over detection	1 (ON) when the count of the number of times the Valve I/F unit's output signal has changed from OFF to ON exceeds the set threshold.	Point-specific	Unit output error
13	Hardware error	1 (ON) when the Valve I/F unit has a hardware error	Unit	Hardware error
12	On signal line error recovery, same behavior maintained as during error	When the " Signal line error recovery operation setting" of the Valve I/F unit is ON (Manual), the same behavior as during the signal line error is maintained even after recovery from it. The system is waiting for the user to turn the power off and on again.	Point-specific	Operation waiting
11 to 0	Reserved	Fixed at 0.	-	-

6.2 Troubleshooting from the LED Display

■ Normal condition

Valve I/F unit		Problem
SS LED	CS LED	
Green on	Green on	Normal and no Off_On cycle threshold over.

Examples of the device unit EtherCAT response	Valve I/F unit	Problem	Cause	Action
	SS LED			
ERR: Red blinking (twice)	Green on	A communication error (application watchdog timeout) occurred in the device unit. At the moment, all valve outputs are OFF.	The device unit's DIP switch setting SW3 is OFF (set individually for each unit), and the Valve I/F unit's "Operation setting in the event of a communication error" is "0" (OFF).	If wanting the valve output to be something other than OFF, set the Valve I/F unit's "Operation setting in the event of a communication error" to "1" (ON) or "2" (HOLD).
			The DIP switch setting SW3 of the device unit is ON (apply setting to all units at once), and SW4 is OFF (CLEAR).	Review the settings of the Valve I/F unit and the device unit's DIP switches related to the functions for setting the communication error output. If wanting to maintain the valve output value and to do likewise with the other I/O units as well, set the device unit's DIP switch setting SW4 to ON (HOLD).
SF: Red blinking (fast)		An internal bus error has occurred in the device unit. At the moment, all valve outputs are OFF.	The device unit's DIP switch setting SW3 is OFF (set individually for each unit), and the Valve I/F unit's "Operation setting in the event of a communication error" is "0" (OFF).	If wanting the valve output to be something other than OFF, set the Valve I/F unit's "Operation setting in the event of a communication error" to "1" (ON) or "2" (HOLD).
CF: Yellow on		Valve outputs are not updated.	The output is being forced from the PC software.	Cancel the forced output from the PC software.

■ Error condition

Valve I/F unit	Problem	Point diagnostic information	Cause	Action
SS LED				
Red on	When the PC software is connected to the device unit, the "Unit Configuration" main tab is not displayed, and the "Error" main tab is displayed instead.	-	The Valve I/F unit is disconnected from the internal bus communication. The device unit has failed to automatically recognize the Valve I/F unit at startup. (The device unit has a "unit configuration error" (system error).)	- Check the connection between the units. - Check that the number of I/O units connected to the device unit is 17 or less.
	The RT remote I/O's unit configuration cannot be checked from the upper master's configuration tool.			
	The Valve I/F unit cannot be controlled via the upper master.		The Valve I/F unit is disconnected from the internal bus communication.	- Check whether there is a process data overflow in the device unit. - If the problem persists, contact CKD.

Valve I/F unit SS LED	Problem	Point diagnostic information	Cause	Action
Valve I/F unit SS LED	Problem	Point diagnostic information	Cause	Action
Red blinking (fast)	A hardware error has occurred. At the moment, all valve outputs are OFF. (not updated).	Hardware error (Hardware error)	A hardware error has occurred in the Valve I/F unit.	Turn the power OFF then ON again. If the problem persists, contact CKD.
Red blinking (slow)	An error has been detected in the signal line from the Valve I/F unit to the manifold solenoid valve. At the moment, valve outputs are OFF (not updated).	Signal line error detection (unit input error)	A short circuit, disconnection, or overheating has been detected in one of the Valve I/F unit's power lines when its "Signal line error detection" setting is "Enable."	- Switch OFF the power and check that the manifold solenoid valve is correctly installed. - For the TVG series, contact CKD.
-	An error in one of the signal lines from the Valve I/F unit to the manifold solenoid valve has been recovered. However, the valve output is still OFF (not updated).	On signal line error recovery, same behavior maintained as during error (Operation waiting)	When the Valve I/F unit's "Signal line error recovery operation setting" is ON (Manual), the same behavior as during the signal line error is maintained even after recovery from it.	Turn the power OFF then ON again.
Yellow on	An error in the output power supply voltage has been detected.	Output power supply voltage error Note: This is not included in the point diagnostic information for the Valve I/F unit.	This occurs if the device unit detects an "output power supply voltage error".	Check the output power supply voltage to the power supply unit closest to the device unit.
Yellow blinking (fast)	The number of times the Valve I/F unit's valve output signal has changed from OFF to ON has exceeded the set threshold.	Off_On cycle threshold over detection (unit input error)	The number of times the Valve I/F unit's valve output signal has changed from OFF to ON has exceeded the set threshold when its "Off_On cycle threshold over setting" is not "0" Note that the CS LED will blink yellow or red depending on the number of points that exceeded thresholds.	Do one of the following: - Change the threshold setting. - Clear the count value from the PC software.
Green on	Cannot output from the manifold solenoid valve.	-	There is an incorrect output specification or a problem on the manifold solenoid valve side.	Check the output specification. If the output specification is correct, and if the LED of the manifold solenoid valve for which output is specified is turned on, then the problem is related to the manifold solenoid valve itself, not the Valve I/F unit. Contact CKD.

The manifold solenoid valve's lamp may light up momentarily when its power turns ON (i.e., when the power voltage starts to rise). This will not cause the manifold solenoid valve itself to turn ON or OFF.

7. APPENDIX: LIST OF OUTPUT OPERATIONS IN THE EVENT OF AN ERROR IN THIS PRODUCT

This section lists the operations the Valve I/F unit performs when an error occurs, and when one is recovered from.

7.1 Communication Error

■ On occurrence

Upper communication error

Device unit				Operation performed by Valve I/F unit operation
DIP switch setting SW3 (output settings in the event of a communication error / priority to hardware)		DIP switch setting SW4 (HOLD/CLEAR)		
ON	Set for all units at once	ON	Hold all outputs (HOLD)	Holds the last output.
		OFF	Clear all outputs (CLEAR)	Outputs OFF.
OFF	Set individually for each unit	-		Depends on the Valve I/F unit's "Operation setting in the event of a communication error" (OFF/ON/HOLD specification).

Internal bus communication error

Device unit				Operation performed by Valve I/F unit operation
DIP switch setting SW3 (output settings in the event of a communication error / priority to hardware)		DIP switch setting SW4 (HOLD/CLEAR)		
ON	Set for all units at once	ON	Hold all outputs (HOLD)	Holds the last output.
		OFF	Clear all outputs (CLEAR)	Outputs OFF.
OFF	Set individually for each unit	-		Depends on the Valve I/F unit's "Operation setting in the event of a communication error" (OFF/ON/HOLD specification).

■ On recovery

Upper communication error

Device unit				Operation performed by Valve I/F unit operation
DIP switch setting SW3 (output settings in the event of a communication error / priority to hardware)		DIP switch setting SW4 (HOLD/CLEAR)		
ON	Set for all units at once	ON	Hold all outputs (HOLD)	Recovers automatically.
		OFF	Clear all outputs (CLEAR)	
OFF	Set individually for each unit	-		

Internal bus communication error

Device unit				Operation performed by Valve I/F unit operation
DIP switch setting SW3 (output settings in the event of a communication error / priority to hardware)		DIP switch setting SW4 (HOLD/CLEAR)		
ON	Set for all units at once	ON	Hold all outputs (HOLD)	Does not recover.
		OFF	Clear all outputs (CLEAR)	
OFF	Set individually for each unit	-		

7.2 Signal Line Error

■ On occurrence

Valve I/F unit's setting Signal line error detection setting	Operation performed by Valve I/F unit operation
Enable	Outputs OFF (depending on the protection function).
Disable	

■ On recovery

Valve I/F unit's setting Signal line error detection setting	Operation performed by Valve I/F unit operation
Enable	Depends on the " Signal line error recovery operation setting" (Auto/Manual specification).
Disable	

7.3 Memory Error

■ On occurrence

Operation performed by Valve I/F unit operation
Turns off all connector outputs.

■ On recovery

Operation performed by Valve I/F unit operation
Does not recover (remains at OFF).

8. WARRANTY PROVISIONS

8.1 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 failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that 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.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

Note 1: For details on the durability and consumable parts, contact your nearest CKD sales office.

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 have a higher priority.

8.2 Warranty Period

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