

Fieldbus system  
PROFIBUS DP Compatible GW unit



# Operation Manual

EX510-GPR1



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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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EX※※-OMH0024-C

# Table of Contents

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Thank you for purchasing an SMC fieldbus system EX510 series.  
Please read this manual carefully before operating the product and make sure you understand its capabilities and limitations.  
Please keep this manual handy for future reference.

## OPERATOR

- This operation manual has been written for those who have knowledge of machinery and apparatuses that use fieldbus system and have full knowledge of assembly, operation and maintenance of such equipment.
- Please read this operation manual carefully and understand it before assembling, operating or providing maintenance service to the actuator.

Safety Instructions .....	2
Product Summary .....	6
Name of Parts/ Accessories .....	7
Dimensions .....	8
Settings .....	8
Specifications .....	10
Wiring .....	11
Display/ Switch Setting .....	17
Troubleshooting .....	21

## Safety Instructions

The product and this manual contain essential information to protect users and others from possible injury and property damage and to ensure correct handling.

Please check that you fully understand the definition of the following messages (signs) before going on to read the text, and always follow the instructions.

Please read the operation manual of related apparatus and understand it before operating the actuator.

IMPORTANT MESSAGES	
Read this manual and follow its instructions. Signal words such as WARNING, CAUTION and NOTE, will be followed by important safety information that must be carefully reviewed.	
<b>⚠WARNING</b>	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
<b>⚠CAUTION</b>	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
<b>NOTE</b>	Gives you helpful information.

### ⚠WARNING

**Do not disassemble, modify (including change of printed circuit board) or repair.**

An injury or failure can result.

**Do not operate the product outside of the specifications.**

Fire, malfunction, or damage to the product can result.

Verify the specifications before use.

**Do not operate in an atmosphere containing flammable or explosive gases.**

Fire or an explosion can result.

This product is not designed to be explosion proof.

**If using the product in an interlocking circuit:**

•**Provide a double interlocking system, for example a mechanical system.**

•**Check the product regularly for proper operation.**

Otherwise malfunction can result, causing an accident.

**The following instructions must be followed during maintenance:**

•**Turn off the power supply.**

•**Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.**

Otherwise an injury can result.

### ⚠CAUTION

**After maintenance is complete, perform appropriate functional inspections.**

Stop operation if the equipment does not function properly.

Safety cannot be assured in the case of unexpected malfunction.

**Provide grounding to assure the noise resistance of the product.**

Individual grounding should be provided close to the product with a short cable.

## Safety Instructions (continued)

### Note

- When conformity to UL is required, the SI unit should be used with a UL1310 Class 2 power supply.

Follow the instructions given below when handling your product.

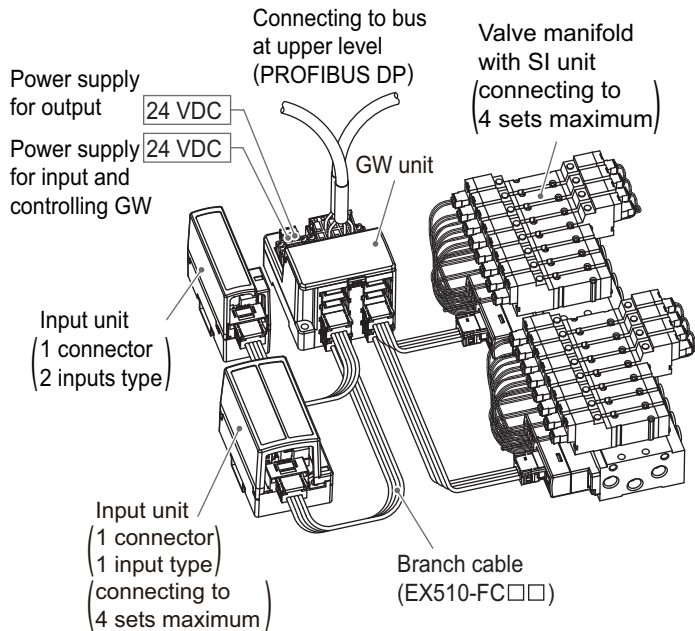
Or, it will have a risk of being damaged and operating failure.

- Operate product with the specified voltage.
- Reserve a space for maintenance.
- Do not remove labels.
- Do not drop, hit or apply excessive shock to the product.
- Follow the specified tightening torque.
- Never mount a product in a location that will be used as a foothold.
- Do not bend or apply tensile force to cables, or apply force by placing heavy load on them.
- Connect wires and cables correctly.
- Do not connect wires while the power is on.
- Do not lay wires or cables with power line or high-voltage line in the same wiring route.
- Verify the insulation of wiring.
- Separate power line for solenoid valves from power line for Input and control unit.
- Take appropriate measures against noise, such as using a noise filter, when the product is incorporated into equipment.
- Select the proper type of protection according to the environment of operation.

- Take sufficient shielding measures when installing at the following place.
  - (1) A place where noise due to static electricity is generated
  - (2) A place where electric field strength is high
  - (3) A place where there is radioactive irradiation
  - (4) A place near power line
- Do not use the product near by a place where electric surges are generated.
- When a surge-generating load such as a relay or solenoid is driven directly, use an product with a built-in surge absorbing element.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Prevent foreign matter such as remnant of wires from entering the product to avoid failure and malfunction.
- Mount the product in a place that is not exposed to vibration or impact.
- Do not use the product in an environment that is exposed to temperature cycle.
- Do not expose the product to direct sunlight.
- Keep the specified ambient temperature range.
- Do not expose the product to heat radiation from a heat source located nearby.
- Set the switches by using a sharp-pointed screwdriver etc.
- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
- Perform maintenance and check regularly.
- Perform a proper functional check.
- Do not use solvents such as benzene, thinner etc. to clean the product.

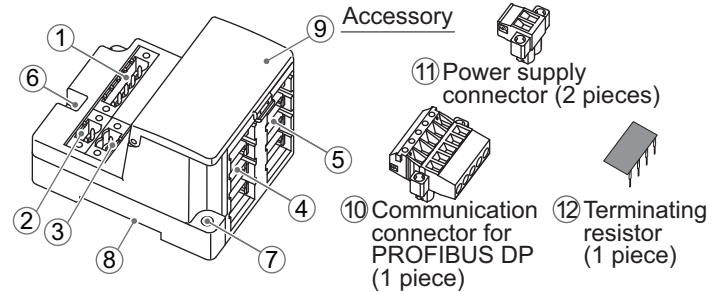
# Product Summary

## System structure



The system which realizes wiring saving and distributed installation by connecting to PROFIBUS DP. The signal to PROFIBUS DP is transmitted by GW unit, and the signal to input/output device which is installed discretely is collected by GW unit.

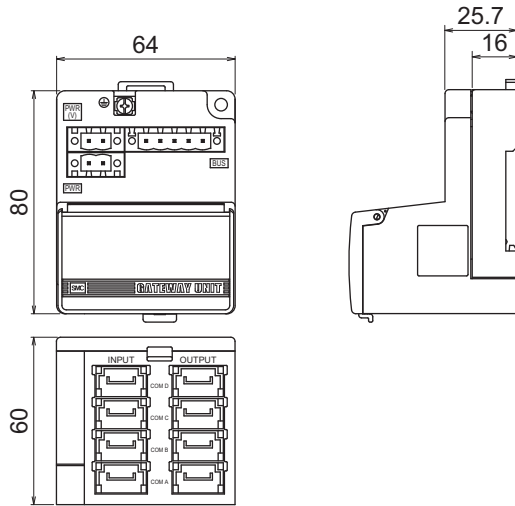
## Name of Parts/ Accessories



No.	Parts	Purpose
1	Communication socket (BUS)	Connect to PROFIBUS DP line with an accessory connector for PROFIBUS DP (⑩). Connect a terminating resistor (⑫) to both end units of a transmission route. *
2	Power supply socket (PWR(V))	Supplying power for output instruments such as a solenoid valve with an accessory connector (⑪). *
3	Power supply socket (PWR)	Supplying power for controlling GW and for input devices such as a sensor with a power supply connector (⑪). *
4	GW unit side branch connector (for input)	Connecting an input unit etc. by using branch cables (EX510-FC□□).
5	GW unit side branch connector (for output)	Connecting SI unit (manifold valve) etc. by using branch cables (EX510-FC□□).
6	FG terminal	Used for grounding.
7	Mounting hole	Used when an unit is mounted with two M4 screws.
8	DIN rail mounting slot	Used when an unit is mounted to DIN rail.
9	Display/ switch setting part	Sets up the switch on such as LED display and address, I/O points.

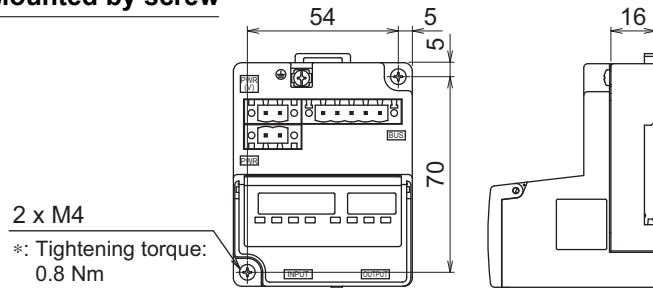
\*: For wiring method, refer to "Wring" in the "Operation Manual".

## Dimensions (in mm)



## Settings

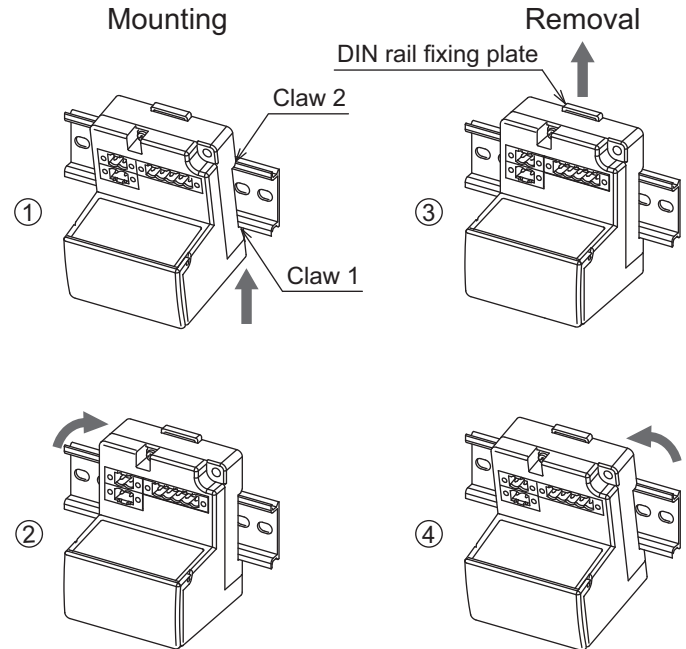
### Mounted by screw



Perspective drawing (tolerance  $\pm 0.2$ )

## Settings (continued)

### Mounted on DIN rail



Put Claw 1 of the body under DIN rail and push it upward. Push down Claw 2 to the opposite rail until the claw clicks securely on to rail.

(Mounting procedure ① and ②)

For removing, lever up the DIN rail fixing plate at the body with a flat blade screwdriver, and remove it by tilting Claw 2 side forward.

(Removal procedure ③ and ④)

# Specifications

## Basic specifications

Rated voltage	24 VDC
Power supply voltage	Power supply for input and controlling GW: 24 VDC $\pm$ 10% Power supply for output: 24 VDC+10%/-5% (Warning for voltage drop is given at approx. 20 V)
Rated current	Power supply for input and controlling GW: Max. 4.1 A (Inside GW unit: 0.1 A, Input unit: 4 A) Power supply for output: Max. 6 A
Input/ output point	Input point: Max. 64/ Output point: Max. 64 (Changeable by switch settings)
Operation temp. range	-10 to 50 °C

## Higher-level bus

Protocol	PROFIBUS DP V0
Bus Interface	EIA RS-485
Freeze function	Available
Synchronous function	Available
Address setting range	0 to 125
ID No.	140d HEX
Device data file	GSD file *

\*: This file is necessary for automatic device setting.

Communication speed	9.6 kbps	19.2 kbps	45.45 kbps	93.75 kbps	187.5 kbps
Max. wiring length *	1200 m				1000 m
Communication speed	500 kbps	1500 kbps	3000 kbps	6000 kbps	12000 kbps
Max. wiring length *	400 m	200 m	100 m		

\*: Max. wiring length differs depending on the specification of a cable.

The specification of wiring length is based on type A cable.

## Lower level bus

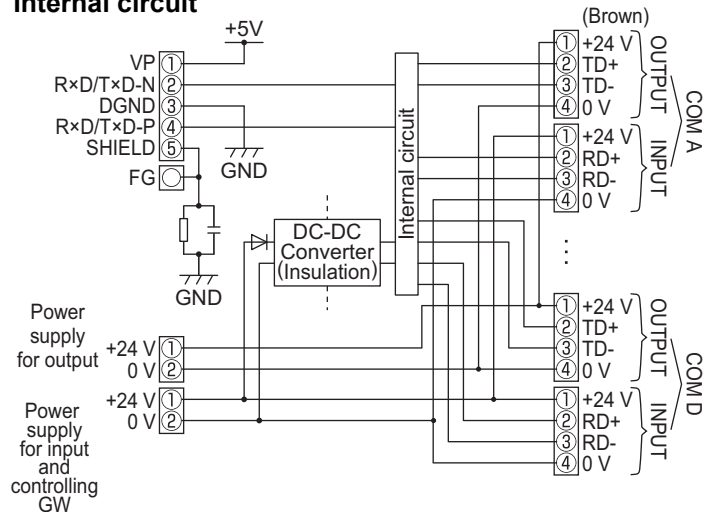
Number of branches for input/ output	4 branches for input 4 branches for output
Communication type	Communication protocol: Dedicated for SMC Communication speed : 750 kbps
Current for input branch	Max. 1 A per branch
Current for output branch	Max. 1.5 A per branch
Branch cable length	At 0.75 A per branch: 20 m or less At 1.0 A per branch : 16 m or less At 1.5 A per branch : 10 m or less

\*1: Input terminals are not isolated from Power source.

\*2: Do not connect outside Power source to Input and Output terminals.

## Wiring

### Internal circuit



## Wiring (continued)

### Branch wiring

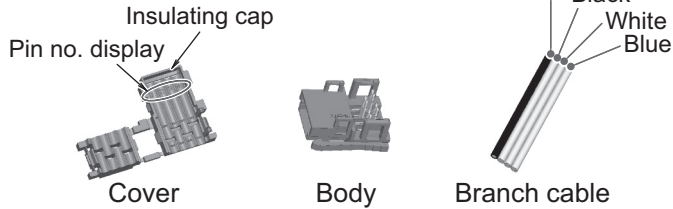
The wiring between each unit should use branch cables, and be connected with branch connectors.

SI unit and Input unit have 2 branch connectors for each.

### Pressure welding for branch connector

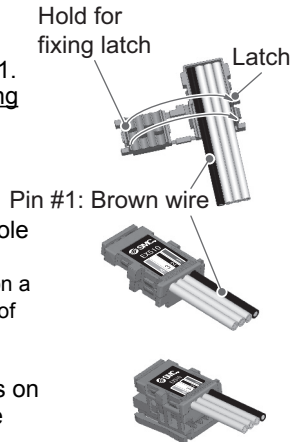
The method of pressure welding for branch connector is explained.

#### (1) Components

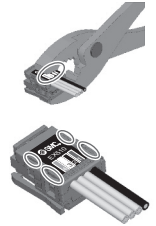


#### (2) Working procedure

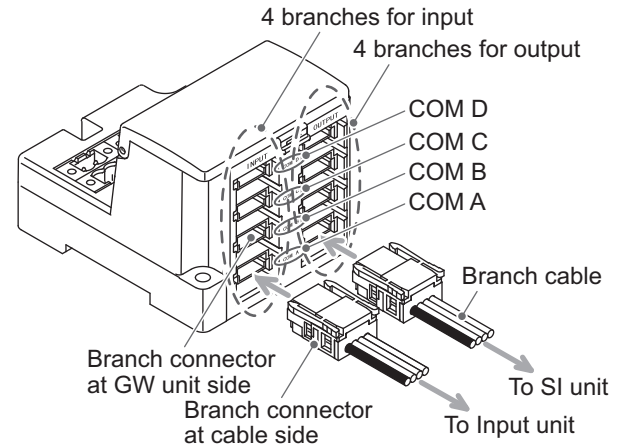
- ① Set a branch cable to the cover.
  - 1) Set the brown wire of the branch cable so that it comes to the pin #1.
  - 2) Meet the cable end to the insulating cap at the cover.
  - 3) Fold the cover so that the branch cable can be put between the cover.
  - 4) Fix the latch tip by inserting to a hole for fixing latch.  
Note) Check the color of wire written on a branch connector and the color of branch cable are same.
- ② Fix to a body tentatively.  
Fit 4 latches on a body to 4 ditches on the cover, and press them until the latch engages to the level 1.



- ③ Press fitting  
Press the cover to the body with plier etc.
- ④ Confirmation  
It is completed with a check on 4 latches engaging.



### Wiring of branch cables



Insert branch connector on the table side from the bottom (COM A, B, C, D of branch connector of GW unit side).



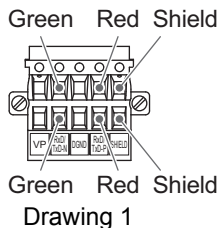
### NOTE

1. Select a branch cable length suitable to avoid stress being applied to the branch connector and cable, and provide sufficient cable length for maintenance.
2. Do not pull the branch connector and branch cable after wiring. There is a risk of damage.
3. Do not open and close the branch connector hook repeatedly. There is a risk of damage.
4. Cut the branch cable and replace the branch connector when the branch connector hook is broken or no longer functions.
5. Use SMC branch connector (product No.: EX510-LC1) and branch cable (product No.: EX510-FC□□). Usage of other branch connector or cable is out of the applicable range of product guarantee.

### Communication wiring

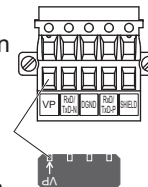
Connect PROFIBUS DP dedicated cables to the communication connector for PROFIBUS DP.

- (1) Make sure to connect the signal cables to designated pins (Refer to Drawing 1).  
And tighten the connector surely to 0.5 to 0.6 Nm tightening torque.



- (2) Make sure to connect a "terminating resistor" to the units at the both ends of the system. (Refer to Drawing 2) For firmly tightening, give a torque of 0.5 to 0.6 Nm.  
\*: The terminating resistor attached to this unit as an accessory is recommended.

Connect the pin with VP mark on terminal resistance to VP of the communication connector.

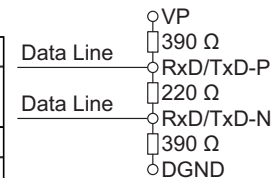


Drawing 2

The value of terminating resistor changes with cable specification. This value of terminating resistor is based on type A cable. (Refer to Drawing 3)

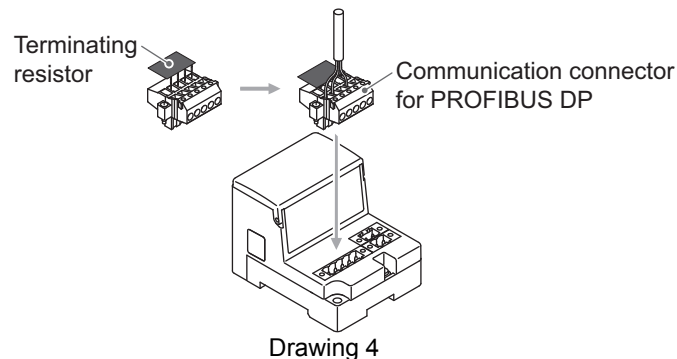
#### Specification of type A cable

Impedance	135 to 165 $\Omega$
Capacitance between conductors	30 pF/m or less
Conductor resistance	110 $\Omega$ /km or less
Cable diameter	0.64 mm or more
Conductor area	0.34 mm <sup>2</sup> or more



Drawing 3

- (3) Refer to Drawing 4 about how to connect to the unit.



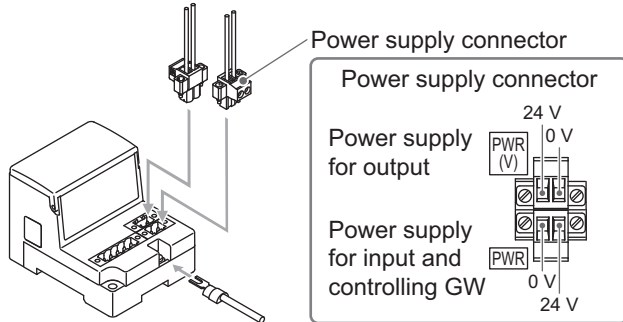
## Wiring (continued)

### Power supply wiring

Connect power supply wiring to the two power supply 2-pin connectors. Power supply structure consists of 2 systems, but it can be used with both single power supply and separate power supply.

Individual power supply for other units is not necessary.

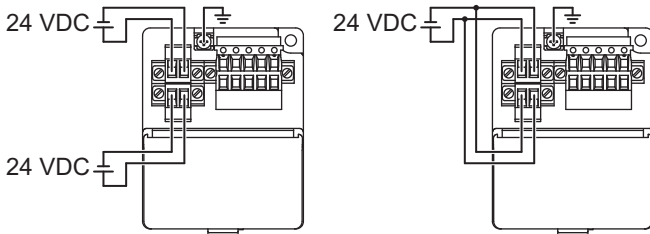
Make sure of connection with the designated pin. Tighten the connector securely to 0.5 to 0.6 Nm tightening torque.



**Note:** A secure earth connection (Protection class 3) should be performed for FG terminal.

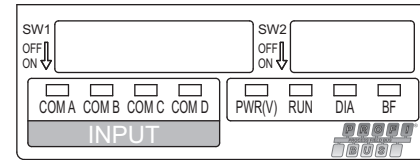
A. For separate power supply use

B. For single power supply use



## Display/ Switch Setting

### Setting for Display



Display	Meaning
PWR (V)	The power for output is supplied at specified voltage: Lights up The power for output is not supplied at specified voltage: Goes off
RUN	The power for input and GW unit controlling part is supplied: Lights up The power for input and GW unit controlling part is not supplied: Goes off
DIA *1	DIA error: Lights up Normal DIA: Goes off
BF	PROFIBUS DP communication error: Lights up Normal PROFIBUS DP communication: Goes off
COM A	COM A is receiving data: Lights up *2 COM A is having no data to receive: Goes off
COM B	COM B is receiving data: Lights up *2 COM B is having no data to receive: Goes off
COM C	COM C is receiving data: Lights up *2 COM C is having no data to receive: Goes off
COM D	COM D is receiving data: Lights up *2 COM D is having no data to receive: Goes off

\*1: Refer to "Operation Manual" for the extension diagnosis information.

\*2: It is lit when input unit is connected and communicating normally.

LED of COM A-D does not light up if the port is not set to be "used" by input point setting.

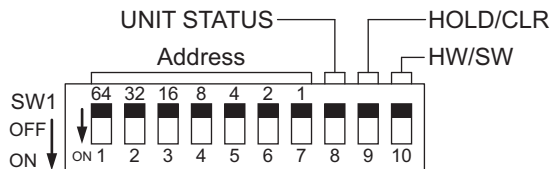
## Display/ Switch Setting (continued)

### Switch setting

Make sure that switch setting is performed with power supply turned off. Open the cover, and set DIP switch with a small flat blade screwdriver, etc.

### Setting of Address, UNIT STATUS, HOLD/CLR and HW/SW mode (SW1)

Setting of Address, UNIT STATUS, HOLD/CLR and HW/SW mode are done with SW1.



### Address setting (switch No.1 to 7)

All of the settings when shipped from plant are turned OFF and the address is set 0. Make sure to set the station number in the range of 0 to 125.

Address	64 (No.1)	32 (No.2)	16 (No.3)	8 (No.4)	4 (No.5)	2 (No.6)	1 (No.7)
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	OFF	ON	OFF	OFF
:	:	:	:	:	:	:	:
24	OFF	OFF	ON	ON	OFF	OFF	OFF
25	OFF	OFF	ON	ON	OFF	OFF	ON
:	:	:	:	:	:	:	:
125	ON	ON	ON	ON	ON	OFF	ON
126	ON	ON	ON	ON	ON	ON	OFF
127	ON	ON	ON	ON	ON	ON	ON

\*: Setting of the address 126 and 127 are invalid.

### UNIT STATUS setting (switch No.8)

The setting is as follows.

The settings when shipped from plant is turned OFF, GW status information is not sent to master side as an input data.

UNIT STATUS	No.8	Function
OFF	OFF	GW status information isn't sent to master side as an input data.
ON	ON	GW status information is sent to master side as an input data.

\*: If the address setting is turned on, an input setting for PLC is required. Refer to "Operation Manual" for detail.

### HOLD/CLR setting (switch No.9)

The setting is as follows.

The setting when shipped from plant is turned OFF, set to CLR.

HOLD/CLR	No.9	Function
CLR	OFF	Output is cleared when a communication error occurs.
HOLD	ON	Output is held when a communication error occurs.

\*: HOLD/CLR setting is made available per one point by parameter setting. Refer to "Operation Manual" for detail.

### HW/SW mode setting (switch No.10)

The setting is as follows.

The setting when shipped from plant is turned OFF, set to HW mode.

Mode	No.10	Function
HW	OFF	Set Address with SW1 to 7.
SW	ON	Address are set by network. The setting when shipped from plant is 126. *: SW1 to 7 are ignored.

## Display/ Switch Setting (continued)

### Input/Output setting (SW2)

Input/output setting is performed with SW2.

Number of input setting Number of output setting



### Input setting (switch No.1 to 3), Output setting (switch No.4 to 6)

The setting is as follows. All of the settings when shipped from plant are turned OFF, 64 I/O points.

No.1	No.2	No.3	Input point	COM A	COM B	COM C	COM D	
OFF	OFF	OFF	64	16	16	16	16	
OFF	OFF	ON	0	–	–	–	–	
OFF	ON	OFF	16	8	8	–	–	
OFF	ON	ON	24	8	8	8	–	
ON	OFF	OFF	32	8	8	8	8	
ON	OFF	ON	48	16	16	16	–	
ON	ON	OFF	Reserve					
ON	ON	ON						

No.4	No.5	No.6	Output point	COM A	COM B	COM C	COM D	
OFF	OFF	OFF	64	16	16	16	16	
OFF	OFF	ON	0	–	–	–	–	
OFF	ON	OFF	16	8	8	–	–	
OFF	ON	ON	24	8	8	8	–	
ON	OFF	OFF	32	8	8	8	8	
ON	OFF	ON	48	16	16	16	–	
ON	ON	OFF	Reserve					
ON	ON	ON						

\*: Input/Output points set at PLC must be consistent with the Input/Output points set at the GW unit.

## Troubleshooting

### Overall system

No.	Item	Remedy/ Disposal
1	Solenoid valve is not working	<ul style="list-style-type: none"> <li>•Check the power for output (24 VDC) is supplied.</li> <li>•Check the branch cable is connected to SI unit.</li> <li>•Check the LED for power supply (PWR) and the LED for communication (COM) at SI unit are ON.</li> <li>•Ensure output branch current does not exceed the specification range.</li> </ul>
2	Valve is not working as program directs	<ul style="list-style-type: none"> <li>•Program it after checking the wiring specification of manifold block assembly.</li> </ul>
3	Signals cannot be received even with a sensor	<ul style="list-style-type: none"> <li>•Check the power for input and controlling GW (24 VDC) is supplied.</li> <li>•Check the input unit indication LED is ON.</li> <li>•Ensure input branch current does not exceed the specification range.</li> </ul>
4	COM A-D is not LIT	<ul style="list-style-type: none"> <li>•Check the connection of UNLIT COM port branch to input unit.</li> <li>•LED of unused COM port does not light up when an input unit is connected. Check the port is set to be "unused" by input point setting.</li> </ul>
5	RUN LED goes off	<ul style="list-style-type: none"> <li>•Check the power for input and controlling GW is supplied.</li> </ul>
6	PWR(V) LED goes off	<ul style="list-style-type: none"> <li>•Check the power for output (24 VDC) is supplied.</li> <li>•Check the power supply voltage for output is above 20 V.</li> <li>•Check the power for input and controlling GW (24 VDC) is supplied.</li> </ul>

## Troubleshooting (continued)

### PROFIBUS DP compatible communication

No.	Item	Remedy/ Disposal
1	BF LED is lights up	<ul style="list-style-type: none"><li>•Check the signal line from PLC is correctly connected.</li><li>•Check the wiring and pin numbers.</li><li>•Check the address setting is correct.</li><li>•Check the connecting condition of the terminating resistor.</li><li>•Check the number of input/output is set correctly.</li></ul>
2	DIA LED is lights up	<ul style="list-style-type: none"><li>•Check the power for output (24 VDC) is powered at a specified voltage.</li><li>•Check the power supply voltage for output is above 20 V.</li><li>•Check the input unit is connected after the input port.</li></ul>

\*: Refer to "Operation Manual" for detail of troubleshooting.