No.EX##-OMI0032

Technical Specification

Reduced wiring system
(PROFIBUS-DP compliant)

PRODUCT NAME

EX510-GPR1 *Series*

MODEL/ Series

SMC Corporation

Table of Contents

Input Unit

Safety Instructions

This manual contains essential information to prevent possible injury and damage to (users and other people, and property) and to ensure correct handling.
Please confirm understanding the meaning of the following messages (signs) before reading the remaining the text, and always follow the instructions.
Also carefully read the instruction manual for any relevant equipment or apparatus before use.

Indications

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

Operator

- This manual has been written for those who have knowledge of machinery and apparatuses that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- Please carefully read and understand this manual before assembling, operating or performing maintenance on the SI Unit.

Usage Restrictions

- This product is designed to be used in general equipment for factory automation. Never use this product with equipment or apparatus that directly concerns human lives*1, or in which a malfunction or failure can cause a great loss.
  *1:Equipment or apparatus that directly concerns human lives refers to the following:
  - Medical equipment such as life support systems or equipment used in operating rooms
  - Compulsory equipment required by law such as the Fire Prevention Law, Construction Law and etc.
  - Equipment or apparatus that conforms with those mentioned above.
- Contact our sales department when plans are made for the product to be used for the system*2 including equipment that concerns itself with the safety of persons or that seriously affects the public. Such usage requires special consideration*3.
  *2:A system or equipment that concerns itself with the safety of persons or that seriously affects the public refers to the following:
  - Nuclear reactor control systems in a nuclear power plants, safety protection systems or other systems important for safety in nuclear power facility
  - Driving control system for a mass transportation system, and flight control systems
  - Equipment or apparatuses that comes in contact with foods or beverages

  *3:Special consideration refer to discussing usage with our engineers to establish a safe system designed as fool-proof, fail-safe, redundant and etc.
- Special consideration*4 should be taken regarding safety or maintainability to prevent a failure or malfunction which can cause a hazard or less. That is likely to occur under certain environmental stress (deterioration).
  *4:Special consideration means to fully review the equipment or apparatus in design stage and to establish a back up system in advance, such as a redundant system or fail-safe system.

⚠WARNING

1.The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.
Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and / or tests to meet your specific requirements.

2.Only trained personnel should operate pneumatically operated machinery and equipment.
Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3.Do not service machinery / equipment or attempt to remove components until safety is confirmed.
- Inspection and maintenance of machinery /equipment should only be performed after confirmation of safe locked-out control positions.
- When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.
- Before machinery / equipment is re-started, take measures to prevent quick extensions of the cylinder piston rod etc. (Bleed air info the system gradually to create back-pressure.)

4.Contact SMC if the product is to be used in any of the following conditions:
- Conditions and environments beyond the given specifications, or if product is used outdoors.
Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
- An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

♦ Do not disassemble, modify (including printed circuit board changes) or repair.
An injury or failure can result.

♦ Do not operate the product outside of the specification range.
Operation in a range that exceeds the specification can cause a fire, malfunction, or damage to the unit. Verify the specifications before use.

♦ Do not use the product in an atmosphere containing combustible, explosive or corrosive gas.
It can cause a fire, explosion or corrosion.
The unit is not designed to be explosion-proof.

♦ The following instructions must be kept when using the product in an interlocking circuit:
- Provide double interlocking thorough another system such as mechanical protection
- Check the product regularly to ensure proper operation

Otherwise a malfunction can cause an accident.

♦ The following instructions must be kept while in maintenance:
- Turn off the power supply
- Stop the air supply, exhaust the residual pressure and verify that the atmosphere is released before performing maintenance work.

Otherwise the injury could be caused.

⚠CAUTION

♦ Perform proper functional checks after maintenance work.
Stop operation when an abnormality is observed such as the unit not working properly.
Safety can not be assured due to unexpected malfunctions.

♦ Provide grounding for securing safety and noise resistance of reduced-wiring system.
Individual grounding is provided to the unit closely with short distance.

NOTE

♦Follow the instructions given below when handling reduced-wiring system:
To prevent the risk of being damaged and operating failure.

♦The instructions on selection (installation, wiring, environment of use, adjustment, operation and maintenance) described below must also be followed.

∗Product specifications

•The direct-current power supply to combine should be UL authorized power supply.

(1)Limited voltage current circuit in accordance with UL508

A circuit which power is supplied by secondary coil of a transformer that meets the following conditions

· Maximum voltage (with no load) : less than 30Vrms (42.4V peak)

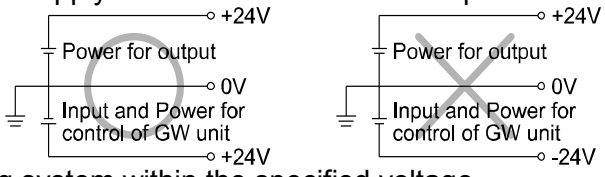
· Maximum current : (1) less than 8A(including when short circuited)

(2) limited by circuit protector (such as fuse) with the following ratings

No load voltage (V peak)	Max. current rating (A)
0 to 20 [V]	5.0
Above 20 to 30 [V]	100 / peak voltage

(2)A circuit using max. 30Vrms or less (42.4V peak), which power is supplied by Class-2 power supply unit in accordance with UL1310 or UL1585

•The reference of power supply for GW unit is 0V for both powers for output and control of GW unit.



•Operate reduced-wiring system within the specified voltage.
Operation with a voltage beyond specifications could cause malfunction or damage of the unit.

•Reserve a space for maintenance
Be sure to keep a space for maintenance when designing layout of the unit.

•Do not remove nameplate.
Otherwise maintenance error and misreading of an operation manual could cause damage or malfunction.
It may also result in nonconformity to safety standards.

♦Precautions on handling

∗Installation

•Do not drop, hit or apply excessive shock to the unit.
Otherwise the unit could be damaged so much as to result in.

•Follow the specified tightening torque.
Excessive tightening torque can break screws.
The screw should be tighten with the specified torque, otherwise IP65 protection can not be guaranteed.

∗Wiring (including plugging in/out of connector)

•Do not bend the cables or apply excessive force to them by pulling or placing heavy load.
Wiring subject to bending or tensile stress could cause the cables to break.

•Connect wires and cables correctly.
Incorrect wiring could break the reduced-wiring system to its extent.

•Do not connect wires while the power is supplied.
Otherwise it can break the reduced-wiring system or I/O devices could be damaged or malfunction.

•Do not connect power cable or high-voltage cable in the same wiring route as the unit.
Otherwise the wires to the reduced-wiring system can be interrupted with noise or induced surge voltage from power lines or high-voltage lines and malfunction could be caused.
Separate wiring of the unit and each I/O device from that of power line and high voltage line.

•Verify the insulation of wiring.
Insulation failure (interference with other circuit, poor insulation between terminals and etc.) could introduce excessive voltage or current to the reduced-wiring system or each I/O device and damage them.
•Separate power line for solenoid valves from power line for input and control unit.
Otherwise wires can be interrupted with noise or induced surge voltage causing malfunction.
•Take proper measurements such as noise filter against noise when the reduced-wiring system is incorporated in equipment or devices.
Otherwise contamination with noise can cause malfunction.

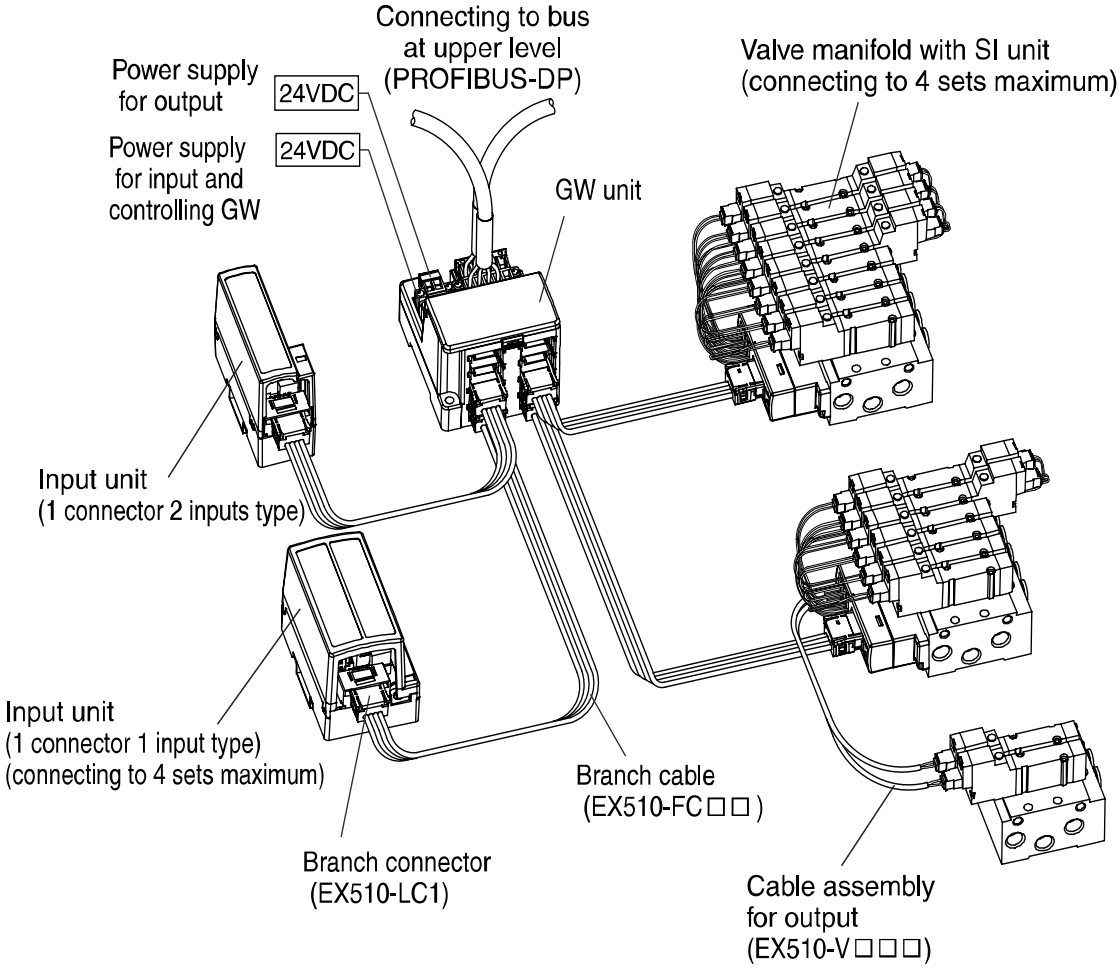
∗Environment
•Consider operating environment suitable for protection class.
•Take sufficient shielding measures when the unit is installed.
Insufficient measures could cause malfunction or failure.
Verify the effect of the measures after incorporation of the unit in equipment or devices:
(1) A place 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 unit near by a place where electric surge is generated.
Internal circuit elements of the reduced-wiring system can deteriorate or break when equipment generating a large surge (electromagnetic lifter, high frequency induction furnace, motor, etc.) is located near the reduced-wiring system. Provide surge preventives, and avoid interference with line for the equipment.
•Use the reduced-wiring system equipped with surge absorber when a surge-generating load such as solenoid valve is driven directly.
Direct drive of a load generating surge voltage can damage reduced wiring system.
•Prevent foreign matter such as remnant of wires from entering the unit.
Take proper measures for the remnant not to enter the reduced-wiring system in order to prevent failure or malfunction.
•Do not expose the reduced-wiring system to vibration and impact.
Otherwise failure or malfunction could be caused.
•Keep the specified ambient temperature range.
Otherwise malfunction could be caused.
Do not use reduced-wiring system in a place where temperature suddenly changes even within the specified range.
•Do not expose the reduced-wiring system to heat radiation from a heat source located nearby.
Malfunction could be caused.

∗Adjustment and Operation
•Use precision screwdriver with for small flat blade for setting Rotary switch.

∗Maintenance
•Perform maintenance and check regularly.
Otherwise an unexpected malfunction of components could of the unit occur due to a malfunction of the whole unit.
•Perform a proper functional check.
Stop operation when an abnormality is observed such that the device doesn't work properly.
Otherwise an unexpected malfunction of the unit component can occur.
•Do not use solvents such as benzene, thinner or other to clean the reduced-wiring system.
They could damage the surface of the body and erase the indication on the body.
Use a soft cloth to remove stains. For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

Product Summary

System structure



- Capable of decentralized control of 64 input points / 64 output points.
  Decentralized control of 4 input branches (max. points of 16×4 branches) and 4 output branches 16×4 branches) per one GW unit is possible.
- Easy setting and wiring
  Slave side does not need switch settings, but GW unit needs them such as address setting.
  It is possible to adjust length of branch cable and crimp branch cable without dedicated tool.
  Each slave does not need individual power supply because the branch cable is 4-core flat cable including a power supply line.
- Compact design
  Small and compact design is applied for all of GW unit which realizes decentralized control, Input unit which connects input equipments such as sensor, and SI unit which connects output equipment such as solenoid valve.
- Flexible setting of number of occupied station
  Utilize I/O point effectively by setting number of occupied station of GW unit.
- Applicable to each type of solenoid valves
  SMC's solenoid valves can be easily wired for serial communication.
  (See Manifold Valve for applicable valve.)
  The extra output of SI unit can be used to actuate 2-port valve etc, with a cable assembly for output.

Terminology definition

No.	Term	Definition
1	Serial transmission	A method to enable large information to be sent and received sequentially in one communication line by aligning them in line.
2	Field bus	A standard which uses digital communication to transmit a signal between an equipment running at factory and field (instrumentation and operation equipment) and controller.
3	PROFIBUS-DP	Fieldbus jointly developed by Siemens, Bosch, ABB, etc. in Germany in 1980's. PNO (PROFIBUS Nutzerorganisation e.V) starts for the PROFIBUS-DP spread.
4	PLC(Programmable Logic Controller)	An abbreviation of Programmable Logic Controller. It controls timely along with a program for logic algorithm, sequential operation and arithmetic operation.
5	Manifold	A component used to join many valves into one.
6	GW unit	A unit used to connect protocols conforming with different standards in one network. In this system, it is regarded as a unit to adjust between PROFIBUS-DP protocol and SMC dedicated protocol and connect them.
7	SI unit	An abbreviation of serial interface. It sends and receives data by bit through a couple of signal lines, convert it to parallel and correspondingly control connected load. (A serial-to-parallel converting unit)
8	Enclosure (IP)	An abbreviation of Ingress Protection. It is a standard related to protection of a product from foreign matters (hand, steel ball, steel wire, dust, water etc.).
9	Branch wiring	A method to branch and connect a communication line and signal line from GW unit to SI unit and input unit.
10	DIN rail	A metallic rail conforming with DIN (German Federation) standard.
11	Terminating resistor	A resistor mounted on both ends of wiring for connecting equipment to field bus. It prevents reflection of a signal at the end and subsequent disturbance of the signal.
12	Communication connector	A connecting part to transmit a communication signal which goes and returns between equipments in field bus.
13	Power supply connector	A connecting part to apply power to a product.
14	Input point	The number of point which can receive information from an input equipment (sensor, switch etc.).
15	Output point	The number of point which can operate an output equipment (solenoid valve, light and motor starter etc.)
16	Current sink type (NPN output)	An output configuration of an input equipment which uses NPN transistor for signal outputting part. It sinks current with input and that is the reason why it is called sink.
17	Current source type (PNP output)	An output configuration of an input equipment which uses PNP transistor for signal outputting part. It sources current with input and that is the reason why it is called source.
18	NPN output	An output configuration which operates an output equipment by using NPN transistor. Referred to as positive common type because positive potential is applied to common wire of power supply.
19	PNP output	An output configuration which operates an output equipment by using PNP transistor. Referred to as negative common type because negative potential is applied to common wire of power supply.
20	PE	An abbreviation of protective Earth. It is a ground to drop a hazardous voltage which is generated on a case (metallic conductive part) due to breakage of internal circuit (to prevent electrical shock).
21	FG	An abbreviation of frame ground meaning a body ground. Used to show a ground simply.
22	GND	An abbreviation of ground meaning reference voltage for signal. It has a same potential level as a shield wire (sheath) of signal line and connector and is referred to as a reference potential to transmit an electrical signal.
23	LED	An abbreviation of Light Emitting Diode meaning a kind of semiconductor element which emits light when current is applied.
24	BF	Abbreviation of BUS FAULT. It shows the communication of the GW unit.
25	DIA	Abbreviation of Diagnosis. It shows the GW unit status.
26	Communication port	A connection port to distribute a communication line and signal line from GW unit to SI unit and input unit.
27	Rated voltage	A optimum value of power supply voltage applied to a product. It can ensure normal operation of a product with this voltage in specified operating environment.
28	Power supply voltage range	A range of power supply voltage to operate a product normally.
29	Current consumption	A current necessary to operate a product normally. In this case, the current applied to a load is not included.

No.	Term	Definition
30	Communication speed	A speed at which data is sent and received in field bus etc. It depends on an equipment (PLC etc.) at high side and is indicated by bps (bit per second).
31	Short protection	A method to protect an internal circuit from being damaged when power supply and GND terminal are shorted.
32	Address (Station address)	A number allocated to identify the unit connected on the PROFIBUS-DP network. It is not allowed to be duplicated.
33	SYNC function	A function that the output data of the GW unit synchronizes with the SYNC command from the master.
34	FREEZE function	Function that input data of GW unit synchronizes with FREEZE command from master.
35	ID number	Number of 16bit allocated from PNO to identify product.
36	GSD file	File which describes the master data of product.
37	Class 2 master	Master for control, commissioning, and configuration functions.
38	Enhancing diagnosis information	Diagnosis information from GW unit. It is composed of standard diagnosis information provided with PROFIBUS-DP and peculiar diagnosis information to the GW unit.
39	Attenuation factor	A dissipation of signal wave form in proportion to a length of communication line. Normally, indicated by dB/ft (decibel per feet).
40	Impedance	A resistance generated when alternating current is applied to a circuit. Referred to as alternating current resistance.
41	Data rate	An amount of data which can be sent from one equipment to the other equipment. Referred to as transmission speed of data.
42	Transmission delay	A time delay from when a specified input passes a reference point until when an output reaches the reference point.
43	Conductor resistance	A electric resistance of a conductor. It is a value to show ease of current flow.
44	Opt-coupler insulation	A method for insulation by converting an electric signal to an optic signal once and using an element called opt-coupler which shows “1” and “0” when turned on and off. An opt-coupler has a part to convert an electric signal to an optic signal or opposite of it and so can be separated electrically and insulated.
45	Input delay time	Refer to “Transmission delay”.

Model no. of product and how to order

GW unit: PROFIBUS-DP compatible

EX510-G P R 1

Communication protocol

PR	PROFIBUS-DP

Input unit

EX510-DX N 1

Applicable sensor

N	NPN output
P	PNP output
B	2-wire type *

Unit type

1	1 connector 2-input type
2	1 connector 1-input type

* B (2-wire type) is available with 1 connector, 2-input type only.

SI unit

EX510-S 0 0 1 □

Output specification

0	NPN output(Common(+))
1	PNP output(Common(-))

Objective valve manifold

1	Non-plug-in manifold
2	Plug-in manifold

Mounting

No symbol	Mounted by screw
A	Mounted vertically on DIN rail
B	Mounted horizontally on DIN rail
C	Mounted horizontally on DIN rail (for SJ manifold) *

* Only EX510-S□02 is applicable.

Output unit

EX510-DY P 3

Output specification

N	NPN output(Common(+))
P	PNP output(Common(-))

Unit type

3	Terminal block type (Internal power supply)
4	Terminal block type (External power supply)

*For the detail of part no. of solenoid valve manifold and independent solenoid valve with SI unit, refer to Operation Manual or other equivalent documents of used solenoid valve.

Common Specification

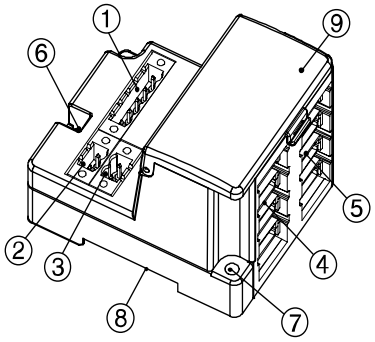
EX510 series common specification

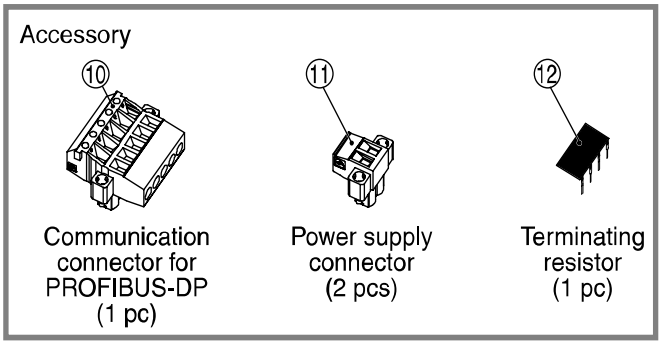
Item	Specification
Rated voltage	24VDC
Allowable instantaneous electrical stop	1msec. or less
Protection class	IP20
Applicable standard	UL / CSA, CE
Withstand voltage	500VAC 1min. (between PE and external terminal block)
Insulation resistance	10MΩ or more (500VDC is given between PE and external terminal block)
Ambient temperature	Operating: -10 to 50°C Storage: -20 to 60°C
Ambient humidity	35~85%RH (No dew condensation)
Vibration resistance	10 to 57Hz (constant amplitude) 0.35mm 57 to 150Hz (constant acceleration) 50m/s^2 2 hours for each direction, X, Y and Z (comply with JIS B 3502 and IEC61131-2)
Impact resistance	147m/s^2 is given 3 times for each direction, X, Y and Z (comply with JIS B 3502 and IEC61131-2)
Operating environment	No corrosive gas

EMC directive (89/336/EEC)

EN61000-6-2: 2001, EN55011: 1998+A1+A2

Parts and functions description



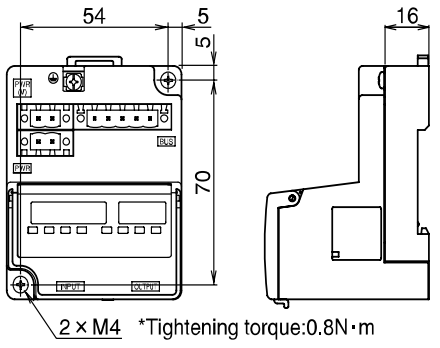


No.	Parts	Purpose
1	Communication socket (BUS)	Connect to PROFIBUS-DP line with a communication connector for PROFIBUS-DP (⑩). Connect a terminating resistor (⑫) to both end units of a transmission route.
2	Power supply socket (PWR(V))	Supplying power for output instruments such as a solenoid valve with a power supply connector (⑪).
3	Power supply socket (PWR)	Supplying power for controlling GW and for input instruments 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	PE 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.

Mounting/Installation

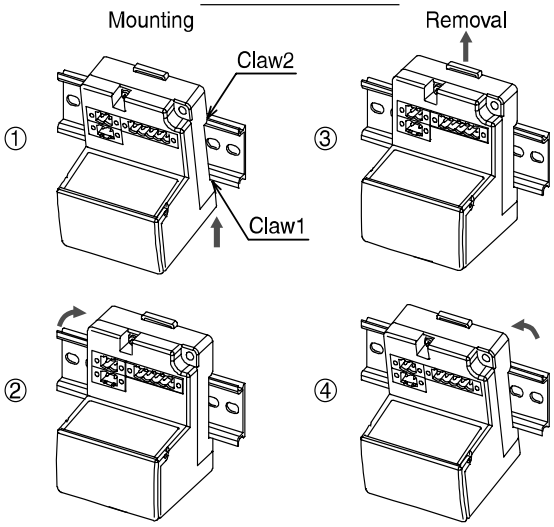
Installation

Screw installation



Perspective drawing
(tolerance±0.2)

DIN rail installation

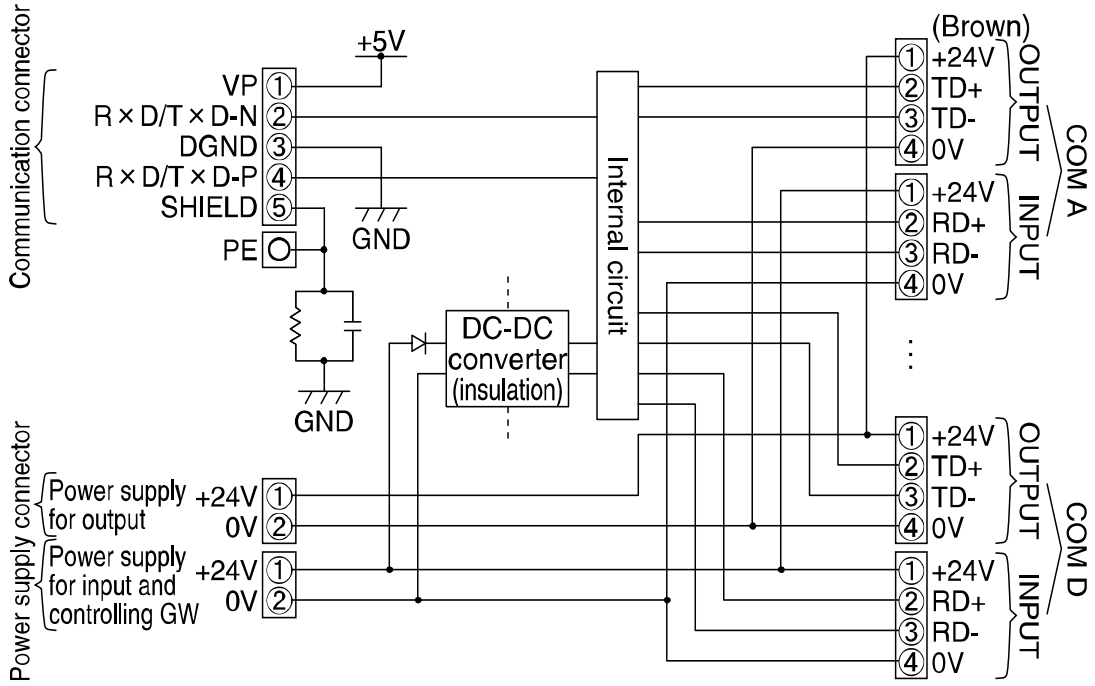


Put claw 1 of the body under DIN rail and push it upward. Push down Claw 2 to the opposite rail until the claw clicks securely on to rail.(Mounting procedure ① and ②)

For removing, lever up the DIN rail fixing plate of the body with a flat blade screwdriver, and remove it by tilting Claw 2 side forward. (Removal procedure ③ and ④)

Wiring method

Internal circuit and wiring



The wirings are described in the following order.

1.Communication wiring: Connection with PROFIBUS-DP

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2.Power supply wiring: Connections of power supplies for output and input devices and controlling GW

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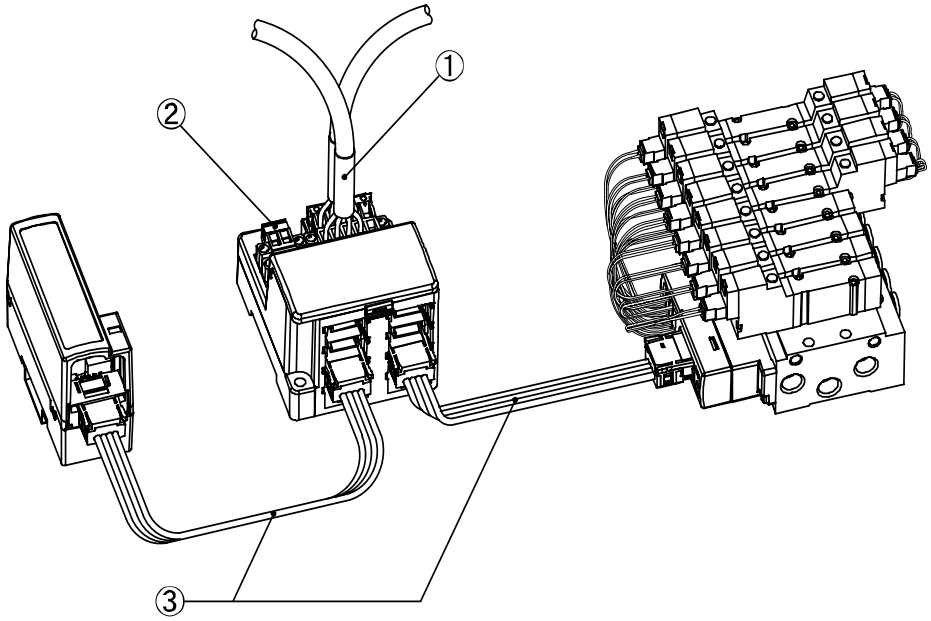
3.Branch wiring: Connection from GW unit to SI unit or Input unit



1.Communication wiring

The method to connect a PROFIBUS-DP detected cable and a GW unit PROFIBUS-DP communication connector is shown below.

Connecting cable

- Make sure to connect the signal cables to designated pins (Refer to Fig.1).
- Be sure to connect a terminating resistor to both ends of transmission line. (Refer to Fig. 2).

Tighten the connector securely to 0.5 to 0.6Nm tightening torque.

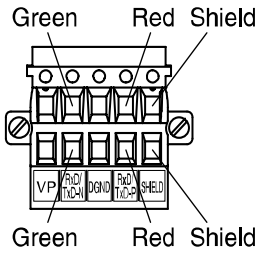


Fig.1

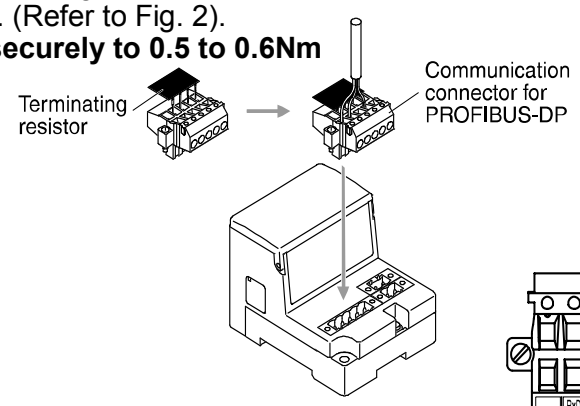
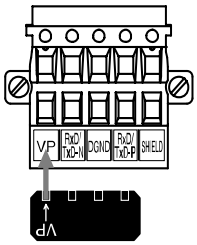


Fig.2



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

Connecting terminating resistor

- Be sure to connect a terminating resistor to both ends of transmission line (Refer to Fig. 3).

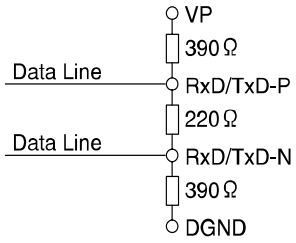
Tighten the connector securely to 0.5 to 0.6Nm tightening torque.

- The terminating resistor to be used differs depending on the specification of the cable. The following terminal resistance value is based on the specification of type A cable.

Specification of type A cable

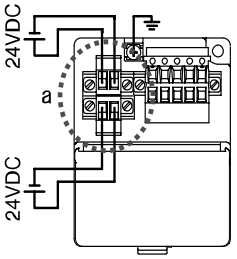
Impedance	135 to 165 Ω
Capacitance between conductors	30pF/m or less
Conductor resistance	110 Ω/km or less
Cable diameter	0.64mm or more
Conductor area	0.34mm² or more

Fig.3

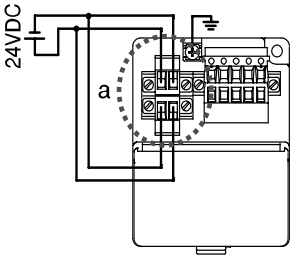


2. Power supply wiring

Connect power supply wiring to the two power supply 2-pin connectors. Power supply consists of 2 systems, but they it can be used with both of single power supply and separate power supplies. Also, other units do not need individual power supply. Make sure of connection with the designated pin. Tighten the connector securely to 0.5 to 0.6 N·m tightening torque. Refer to Fig.4 about how to connecting. When SI unit etc. (EX510-S□0□) is used besides the external power supply type output unit, it is necessary to supply power for output to the GW unit and the output unit.



A. For separate power supply use



B. For single power supply use

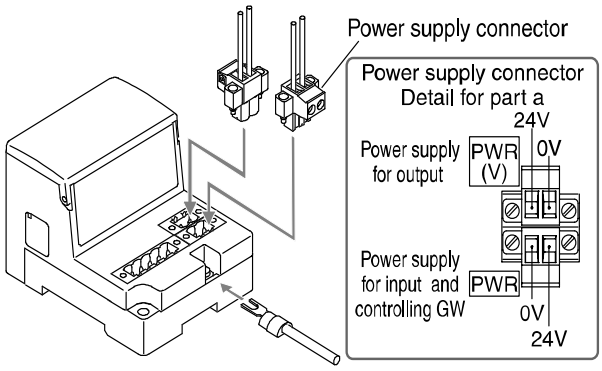


Fig.4

NOTE: Connect a ground cable of 100 ohm or less to PE terminal.

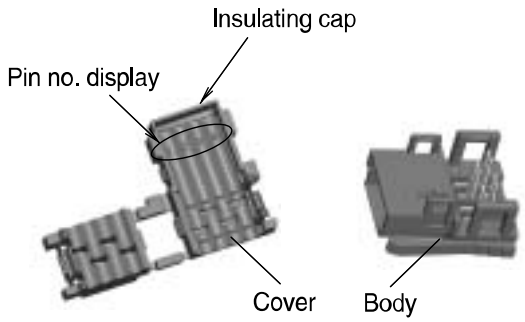
3. Branch wiring

Each unit is wired with a branch cable, and connected with a branch connector.
Two branch connectors are attached to each of SI unit and Input unit.

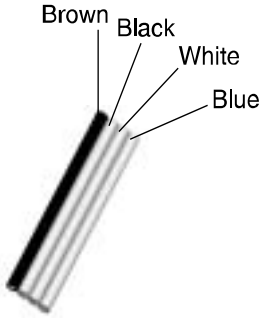
Pressure welding for branch connector

The method of pressure welding for branch connector is explained.

Components



Branch connector



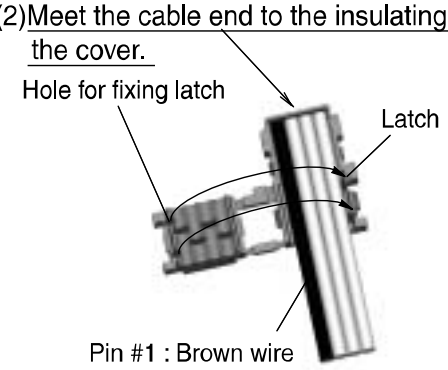
Branch cable (EX510-FC☐☐)

Working procedure

①Set 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.

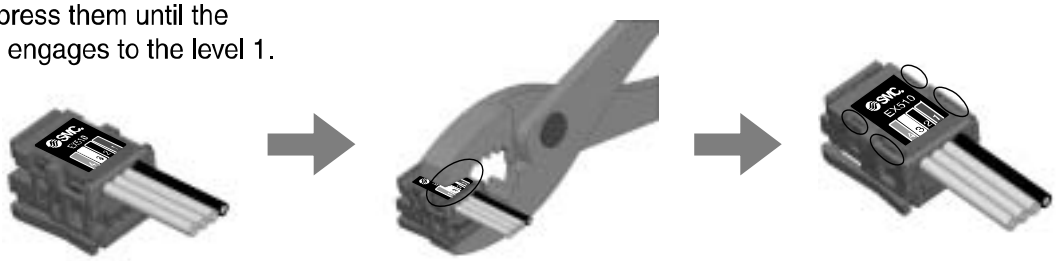
(4)Fix the latch tip by inserting to a hole for fixing latch.

Note) Check the color of wire written on a branch connector and the color of branch cable are same.

②Fix to the body tentatively
Fit 4 latches on the body to 4 ditches on the cover, and press them until the latch engages to the level 1.

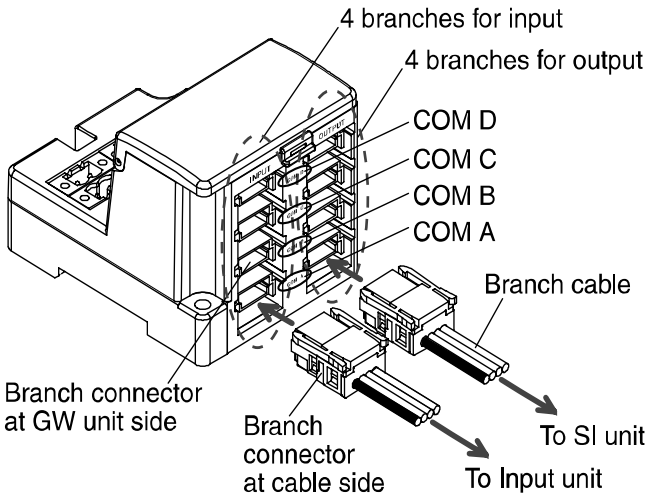
③Press fitting
Press the cover to the body with plier etc.

④Confirmation
It is completed with a check on 4 latches engaging



Wiring of branch cables

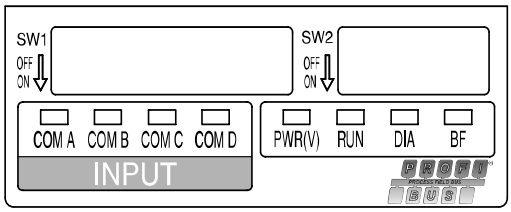
How to connect branch cable is shown below.



Connect the branch connectors for GW unit in order from the bottom one (COM A, B, C, and D).

Setting

Display for setting



Display	Contents
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 DIA LED lights up in red when the input unit connected to the input port (COM A-D) is not in a normal status (open fuse, broken wire, miswiring, loosening of joint of the branch cable) or the input unit is not connected. DIA LED does not light up in red if the input unit is connected to the unused input port.

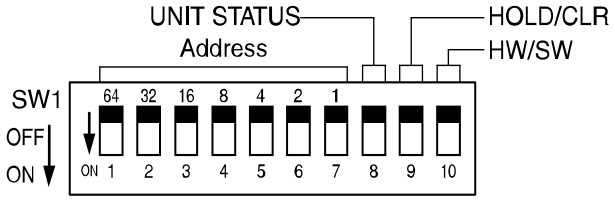
*2 Only when Input is connected and communicated normally. COM A-D LED does not light up if the port is not set to be “used” by input point setting.

Switch setting

NOTE
1. Open the cover, and set DIP switch with a flat blade driver, etc.
2. Make sure that switch setting is performed with power supply turned off.
3. Be sure to perform this setting of the switch before use.

1.Setting of Address · UNIT STATUS · HOLD/CLR · HW/SW mode (SW1)

Setting of address is performed with SW1.



•Address setting (Switch No.1 to 7)

All setting are turned OFF at shipment and the Address is set to 0.
Make sure to set the Address within 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 126 and 127 are invalid.

•UNIT STATUS setting (Switch No.8)

The setting is as follows.
Refer to P.18 for detail.
At the time of shipment from the factory, the switch is set to off and the GW unit status information is not sent to master side as an input data.

UNIT STATUS	No.8	Function
OFF	OFF	The GW unit status information is not sent to master side as an input data.
ON	**ON**	The GW unit 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.

•HOLD/CLR setting (Switch No.9)

The setting is as follows.
The setting at shipment is turned OFF, set to CLR.

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

*HOLD/CLR setting is made available per one point by parameter setting.
Refer to P.21 for detail.

•HW/SW mode setting (Switch No.10)

The setting is as follows.

Refer to P.22 “Supplementary explanation“ for detail.

The setting at shipment is turned OFF, set to HW mode.

Mode	No.10	Function
HW	OFF	Set Address with No.1 to 7 (SW1).
SW	**ON**	Addresses are set by network. Class 2 master is required for the setting via network. It is set at 126 when delivery. * No.1 to 7 (SW1) are ignored.

Supplementary explanation

•UNIT STATUS

Enhanced diagnosis information is prepared for PROFIBUS-DP to monitor the slave status between master and slave. The GW unit sends the master error condition as diagnosis information when entering states other than the normal, and the DIA display lights at the same time.

The self-diagnosis functions of this product are as follows.

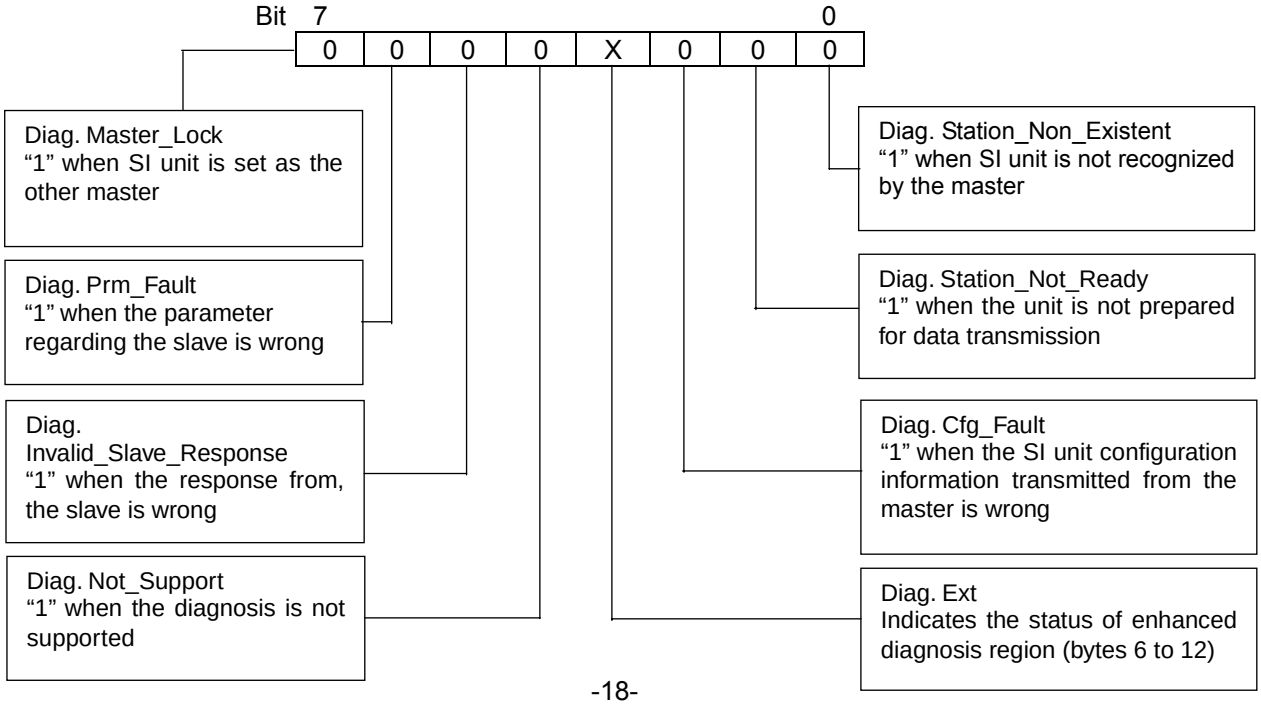
Function	Contents
Solenoid valve open fuse surveillance	It detects when the fuse for valve in the GW unit is broken.
Surveillance of solenoid valve power supply voltage	It detects when the voltage of the solenoid valve lowers to approximately 19V or less.
Input unit open fuse surveillance	It detects when the fuse of the input unit is broken and the power source to the sensor is OFF.

Diagnosis information is composed of 11 bytes. The first seven bytes are information provided by PROFIBUS, and the other four bytes are peculiar information to the unit.

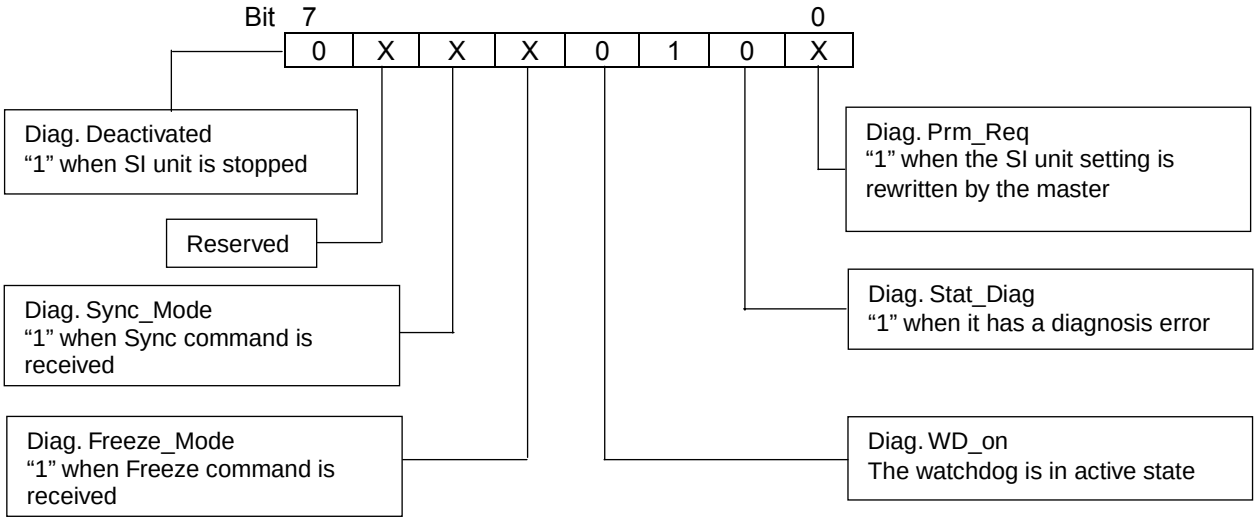
Please refer to PROFIBUS specifications and the manual of the master etc. for how to refer to diagnosis information on the master side.

The composition of diagnosis information is as follows. The value when it is normal is indicated: X is changeable.

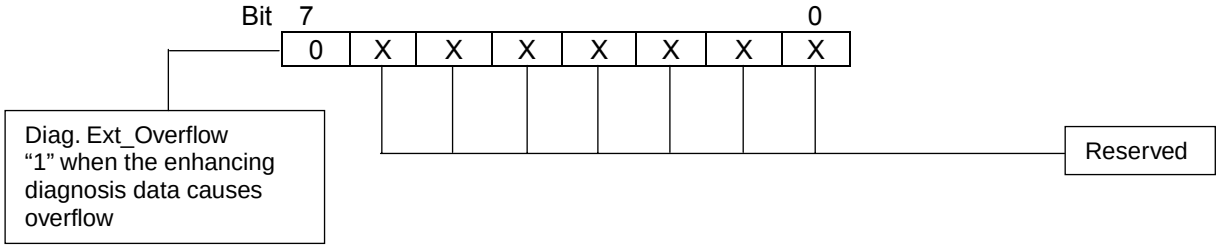
Byte0 : Station Status 1



Byte1 : Station Status 2



Byte2 : Station Status 3



Byte3：Diag.Master_Add

Indicates the master address.

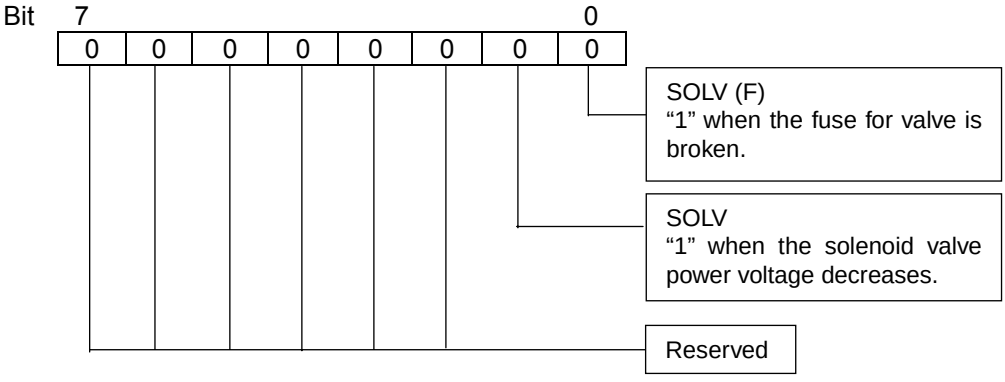
Byte4,5：Ident_Number

Indicates ID No. of SI unit.

Byte6：Diag.Header

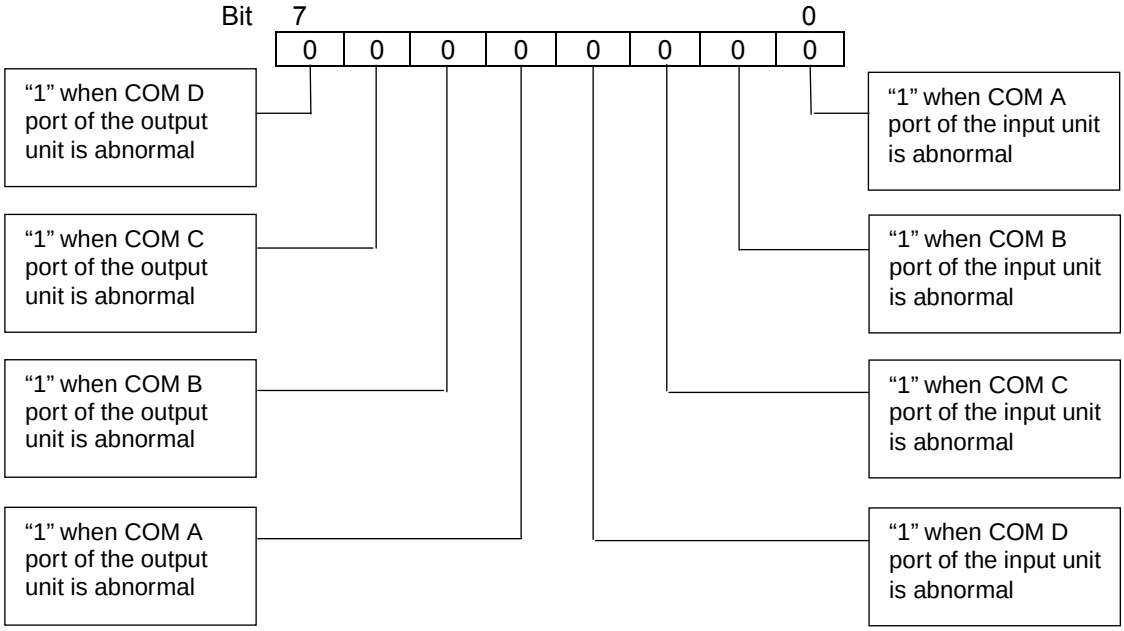
Indicates how many bits the enhancing diagnosis data has (fixed value).

Byte7：GW unit diagnosis information



Always “1” and status for output power source SOLV(F) and SOLV are invalid when equipment connected to GW are all output unit with external power source for all 4 ports (EX510-DY4) and no power for output is supplied to the GW.

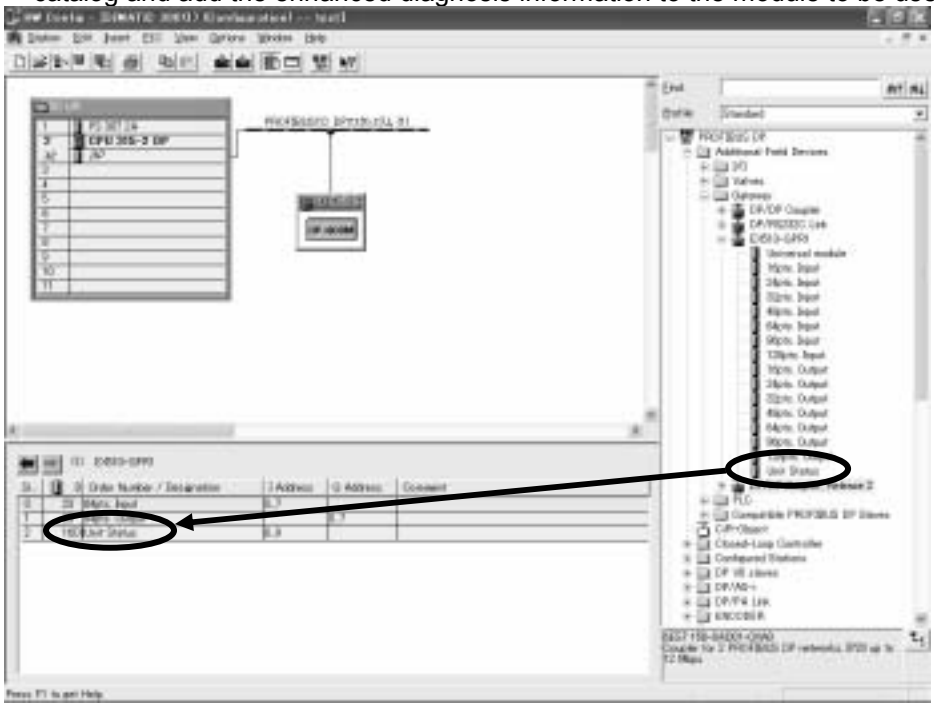
Byte8：GW unit diagnosis information



Byte9 ～ Byte10：Reserved（all 00h）

•Precautions for setting with SIMATIC STEP7

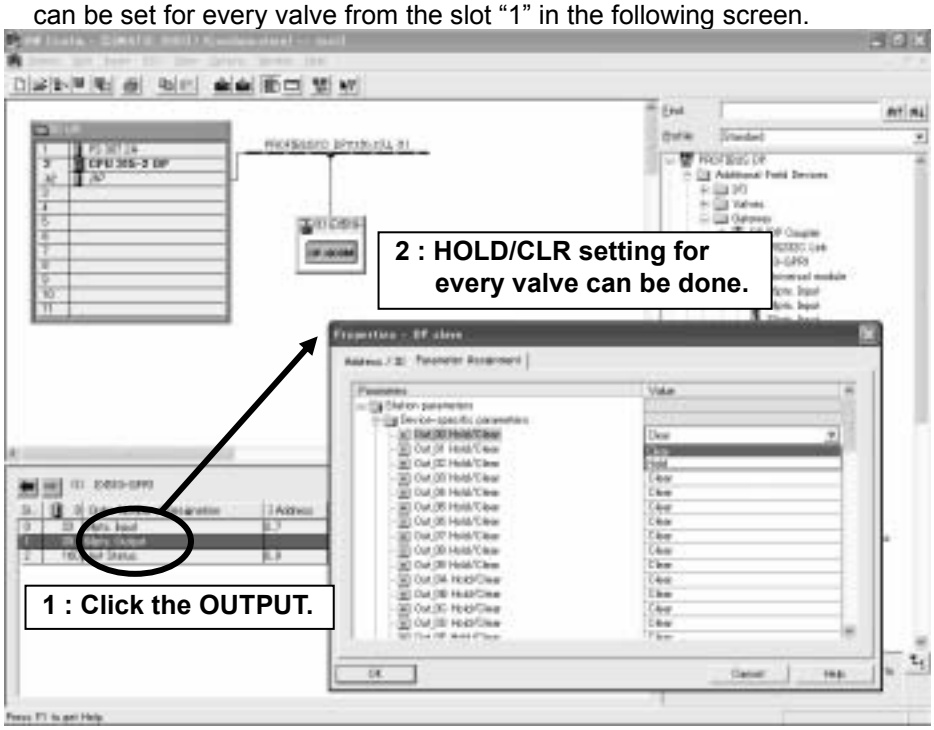
When UNIT STATUS setting for DIP_SW1 is ON, select Unit Status from the EX510-GPR1 in the hardware catalog and add the enhanced diagnosis information to the module to be used.



* PLC software STEP7 manufactured by Siemens AG is shown above. STEP7 is a registered trademark of Siemens AG.

•HOLD/CLR

When HOLD/CLR setting is to be done in every point for the parameter allocation setting of the module, it can be set for every valve from the slot “1” in the following screen.



* PLC software STEP7 manufactured by Siemens AG is shown above. STEP7 is a registered trademark of Siemens AG.

•HW/SW mode

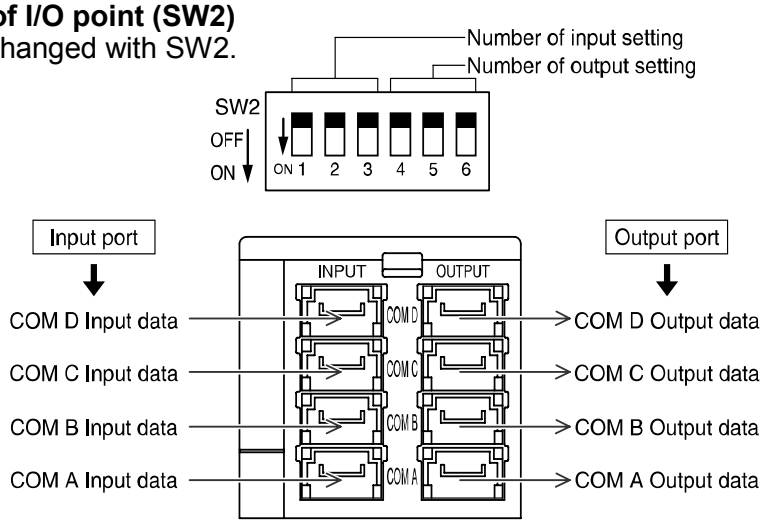
How to remove the exchange number change prohibition

When the exchange number change is set to be prohibited for the class 2 master, take the procedure below to cancel the setting.

1. Set up the address at 127 (turn the 1-7th bit of DIP_SW on) in HW mode.
2. Turn the power source (power source for communication) ON.
   (Turn the power source for micro computer ON.)
3. Set the address at 126. (Turn the 7th bit of DIP_SW1 OFF.)
   (Operation becomes invalid unless it is set within 10 seconds.)
4. Check that the RUN_LED blinks.
5. Turn the power source (power source for communication) OFF.

2.Flexible setting of I/O point (SW2)

I/O point can be changed with SW2.



Input setting (switch No.1 to 3)

The setting at shipment is turned OFF, set to 64.

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**					

It cannot be set to 0 for input and output point.

Output setting (switch No.4 to 6)

The setting at shipment is turned OFF, set to 64.

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**					

It cannot be set to 0 for input and output point.

3.Setting I/O Memory map

GW unit occupies memory area as follows according to the number of I/O point set up on the front page.

Ex.) Input point : 64, Output point : 64 (Setting at shipment)

In case of the input data, the sensor signal data of the Input unit which was connected with the COM A port, occupies "Word (a)" of the input area.

If a sensor signal is stored in the "0 bit" of the Input unit, it becomes like the figure below.

In the same way, in the case of the output data, the contents displayed in "Word (c)" of the output area.

●Memory map of input data

Input area	Branch connector (INPUT)	Data(2 byte)															
		MSB							LSB	MSB							LSB
		15							8	7							0
Word(a)	COM A			byte (b+1)								byte (b)					
Word(a+1)	COM B			byte (b+3)								byte (b+2)					
Word(a+2)	COM C			byte (b+5)								byte (b+4)					
Word(a+3)	COM D			byte (b+7)								byte (b+6)					
:	:																

(a,b=0 to)

●Memory map of output data

Input area	Branch connector (INPUT)	Data(2 byte)															
		MSB							LSB	MSB							LSB
		15							8	7							0
Word(c)	COM A			byte (d+1)								byte (d)					
Word(c+1)	COM B			byte (d+3)								byte (d+2)					
Word(c+2)	COM C			byte (d+5)								byte (d+4)					
Word(c+3)	COM D			byte (d+7)								byte (d+6)					
:	:																

(c,d=0 to)

NOTE
Read carefully the user manual of PLC which is used as a master.
The method of PLC setup, reading from or writing to memory differ from one PLC manufacturer to another.

Specification

Specification

•Basic specification

Rated voltage	24VDC
Power supply voltage	Power supply for input and controlling : 24VDC±10% Power supply for output : 24VDC+10% / -5% (Warning for voltage drop is given at approx. 20V)
Rated current	Power supply for input and controlling : Max.4.1A (Inside GW unit: 0.1A Input unit: 4A) Power supply for output : Max. 6A
Input/Output point	Input point : Max.64 / Output point : Max.64 (Changeable by switch settings)
Weight	160g (including accessories)

•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.

•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: 750kbps
Current for input branch*	Maximum 1 [A] per branch
Current for output branch	Maximum 1.5 [A] per branch
Branch cable length	Within 20m (See diagram below for details.)

*Maximum value in total of current consumption and load current of connected input equipments.

•Transmission speed

PROFIBUS-DP communication line uses a twist pair cable with a shield. The maximum cable length is determined by transmission speed. Also, the specifications of the cable length is based on type A cable.

•Network length

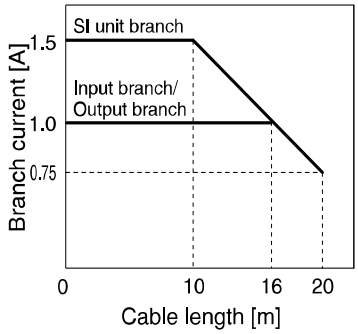
Communication speed [kbps]	9.6	19.2	45.45	93.75	187.5
Max. cable length [m]*	1200				1000
Communication speed [kbps]	500	1500	3000	6000	12000
Max. cable length [m]*	400	200	100		

*Maximum cable length differs depending on the specifications of a cable. The above cable length is based on type A cable.

•Cable specification

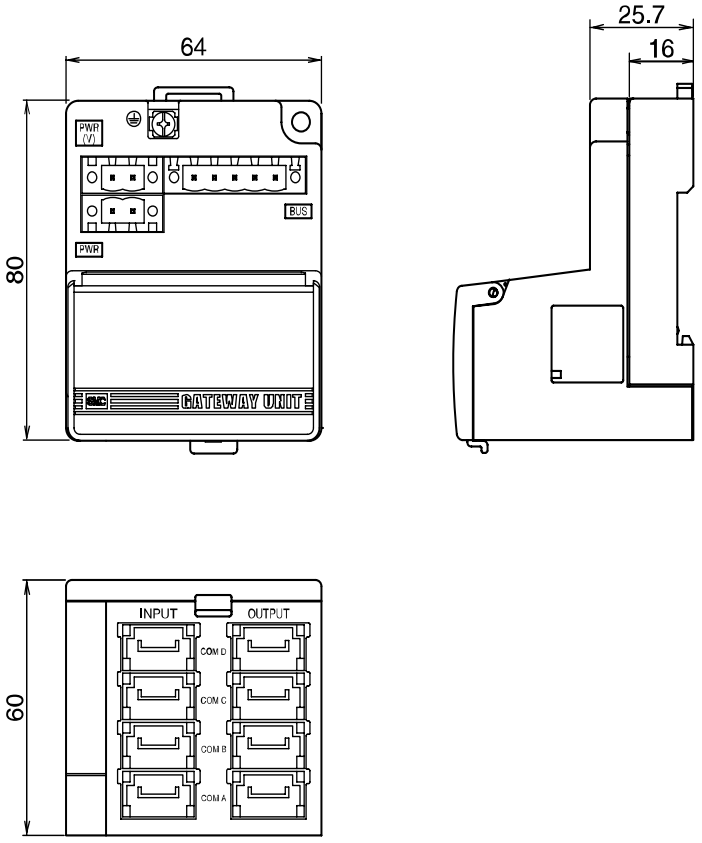
Impedance	135 to 165Ω
Capacitance between conductors	30pF/m or less
Conductor resistance	110Ω/km or less
Cable diameter	0.64mm or more
Conductor area	0.34mm^2 or more

Derating by cable length



Dimensions

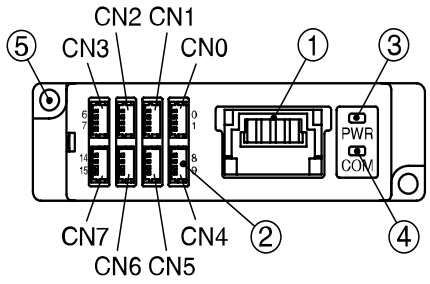
•GW unit (EX510-GPR1)



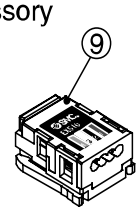
SI unit

Parts and functions description

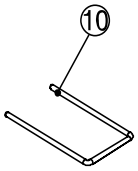
SI unit is the unit to be combined with manifold solenoid valves to communicate with GW unit. It can be used with a plug lead type and plug in type solenoid valves.
Single solenoid valve can be operated by using empty ports. (Only for EX510-S□01□)



Accessory

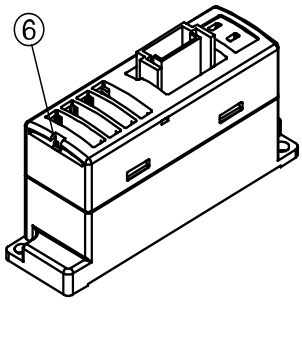


Branch connector
(2 pcs)(EX510-LC1)

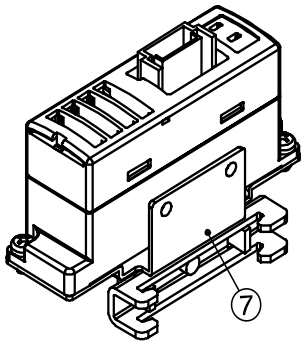


Connector lock pin
(1 pc) *

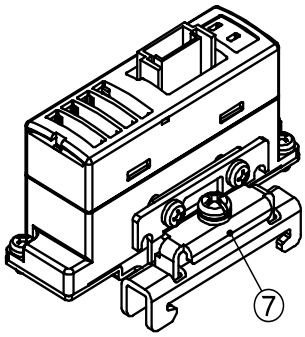
* It is integrated into the body of the unit for EX510-S□02□.



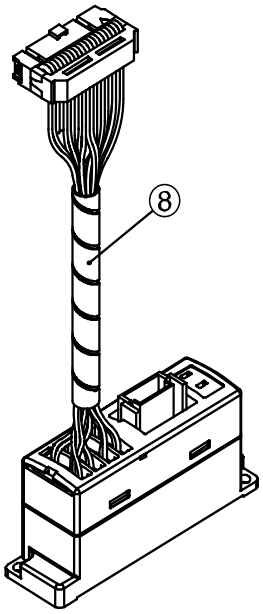
EX510-S□01



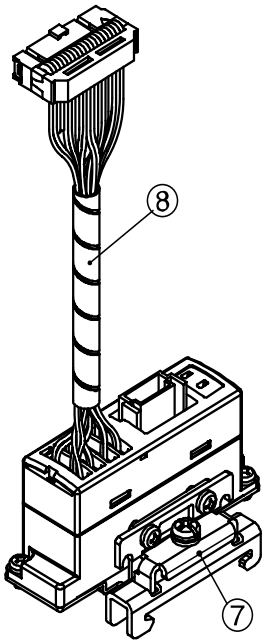
EX510-S□01B



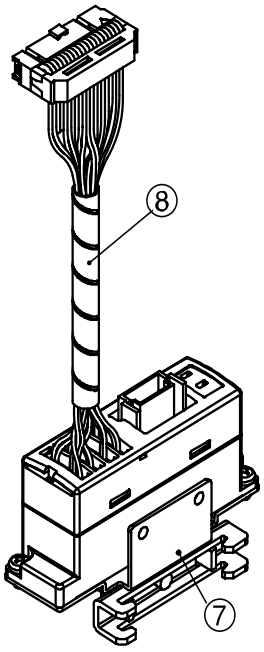
EX510-S□01A



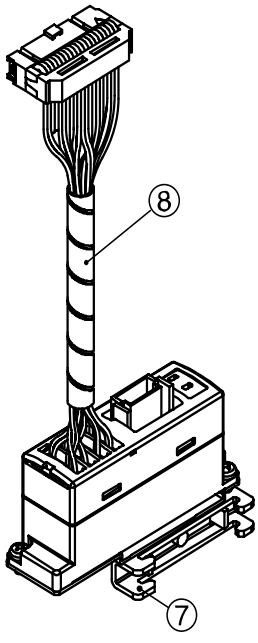
EX510-S□02



EX510-S□02A



EX510-S□02B



EX510-S□02C

No.	Parts	Purpose
1	Branch connector at Output unit	Used to crimp branch connector (⑨) into branch cable (EX510-FC□□) and connected them to GW unit.
2	Load mounting connector	Connecting output equipment such as solenoid valve.
3	Power supply LED	Lights up: Power ON (Normal) Goes off: Power OFF
4	Communication LED	Lights up: Data received Goes off: No data received
5	Mounting hole	Used to mount the unit with two M3 screws.
6	Connector locking pin inserted hole	Receiving connector locking pin (⑩).
7	Mounting bracket	Possible to mount on DIN rail. (Only for EX510-S□02□)
8	Adapter cable assembly	Connects a plug-in valve manifold.

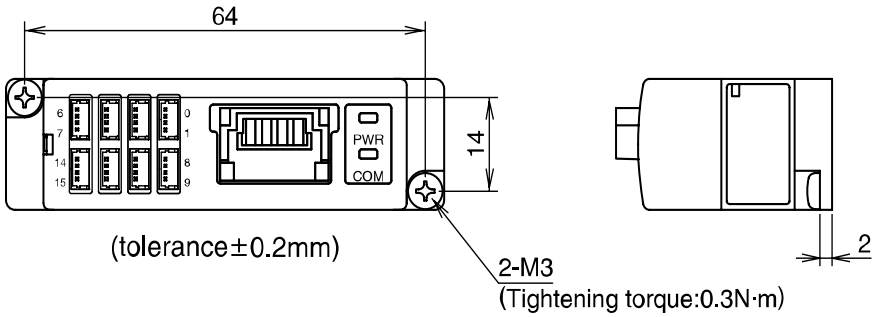
NOTE
Only mounting direction of the SI unit to the mounting bracket is different between EX510-S□□□ A and EX510-S□□□B. Mounting direction can be changed from horizontal to vertical by changing the screws which construct the mounting bracket. Mounting direction of the EX510-S□02C cannot be changed to vertical as the its mounting bracket is exclusive for horizontal mounting.

Mounting/Installation

Installation method

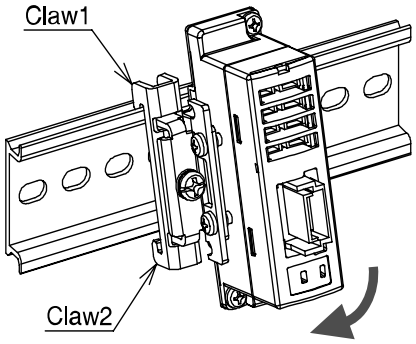
Each SI unit is mounted and removed as shown on the following figure.

Mounted by screw

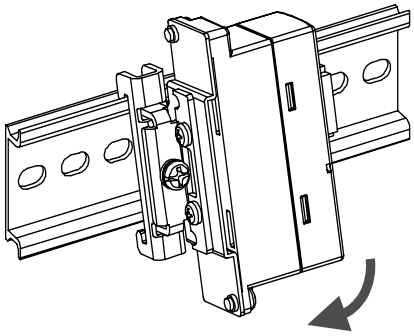


Mounted on DIN rail

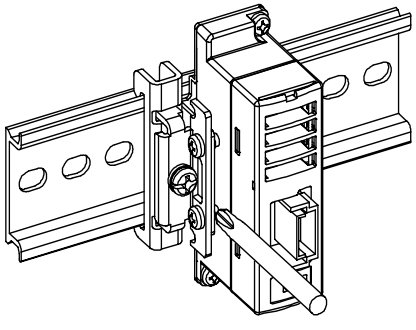
Vertical mounting EX510-S□01A
EX510-S□02A

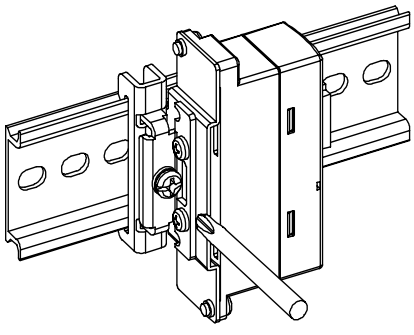


Horizontal mounting EX510-S□01B
EX510-S□02B,C



①Hook claw 1 over the upper side and claw 2 over the low side of DIN rail respectively.





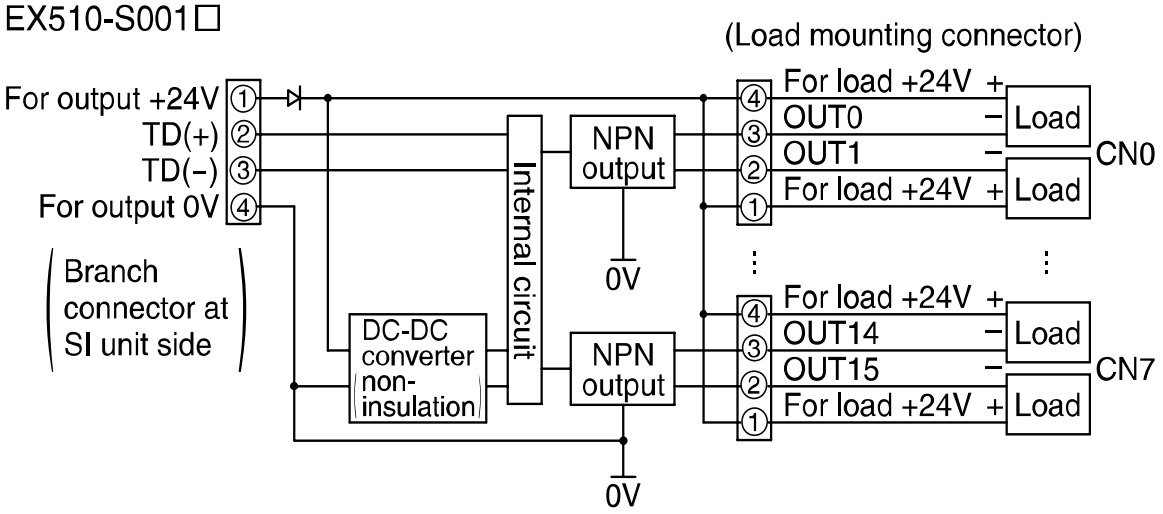
②Tighten the screw by phillips driver until DIN rail is secured. (Tightening torque0.6N·m)

③When the DIN rail is disconnected, loosen the screw and unengaged claw 2 and then claw 1 in order.

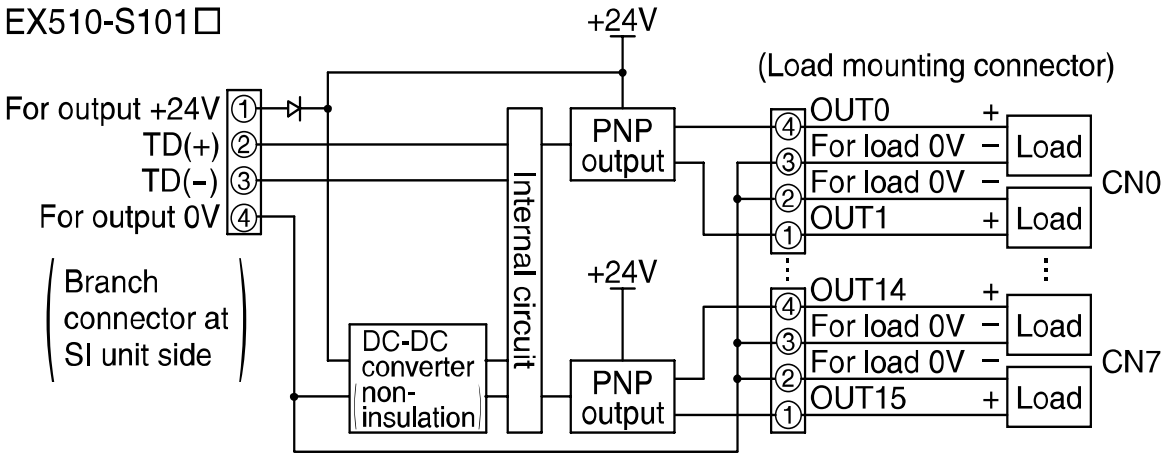
Wiring method

1.Internal circuit

EX510-S001☐

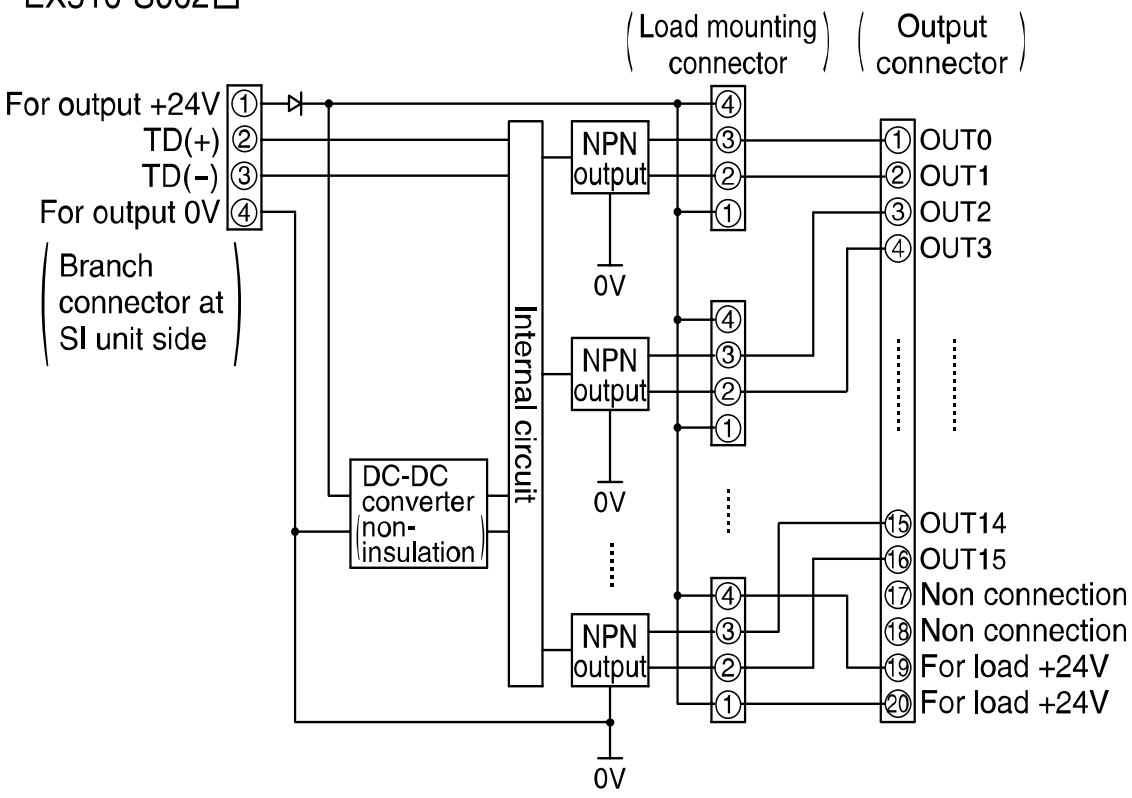


EX510-S101☐

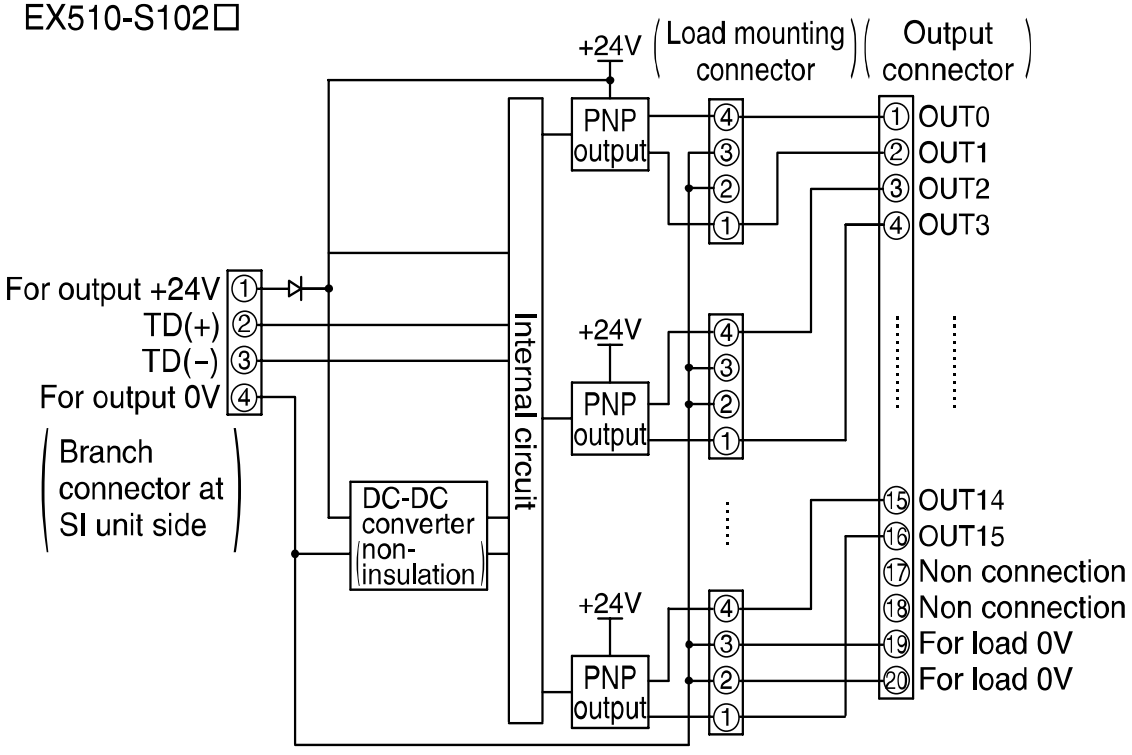


SMC

EX510-S002□



EX510-S102□

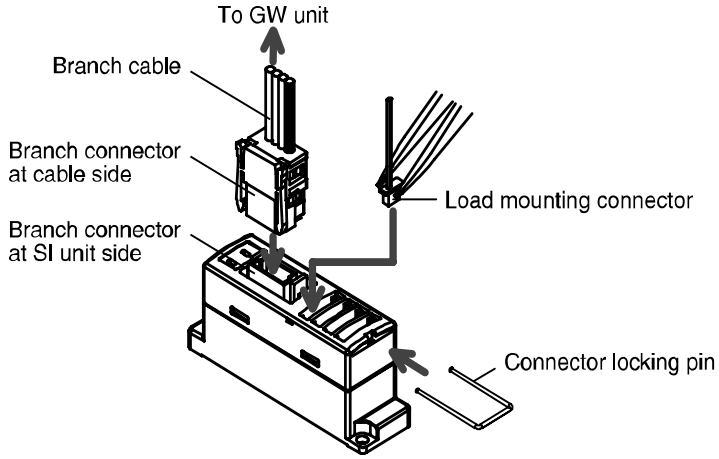


SMC

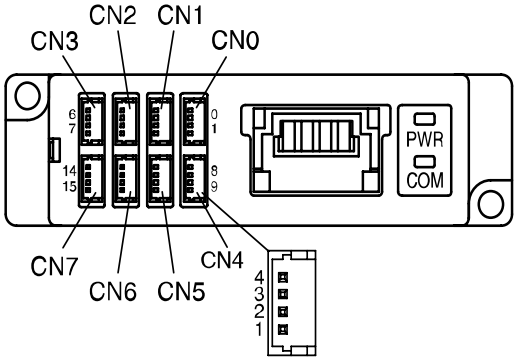
2. Wiring of the branch cable and connector for connecting load (Connector for connecting load: Applicable only to EX510-S□01□)

•Wiring of branch cables and load mounting connector are shown below.

(Insert load mounting connector with pinsette. After insertion at all load mounting connectors is completed, insert connector locking pin. The output no. of each load mounting connector can be found on the below.

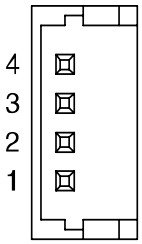


*For crimping of a branch connector, refer to page 15.



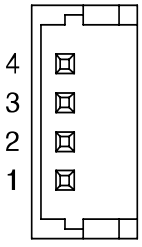
(Load connecting connector pin assignment (EX510-S□01□)

EX510-S001□



No.	Name	Function							
		CN0	CN1	CN2	CN3	CN4	CN5	CN6	CN7
4	COM	Load actuating common (+)							
3	Output (n)	OUT0	OUT2	OUT4	OUT6	OUT8	OUT10	OUT12	OUT14
2	Output (n+1)	OUT1	OUT3	OUT5	OUT7	OUT9	OUT11	OUT13	OUT15
1	COM	Load actuating common (+)							

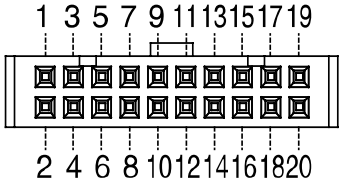
EX510-S101□



No.	Name	Function							
		CN0	CN1	CN2	CN3	CN4	CN5	CN6	CN7
4	COM	OUT0	OUT2	OUT4	OUT6	OUT8	OUT10	OUT12	OUT14
3	Output (n)	Load actuating common (–)							
2	Output (n+1)	Load actuating common (–)							
1	COM	OUT1	OUT3	OUT5	OUT7	OUT9	OUT11	OUT13	OUT15

•Output connector(MIL20pin) pin assignment(EX510-S□02□)

EX510-S002□



Terminal No.	1	3	5	7	9	11	13	15	17	19
Output No.	0	2	4	6	8	10	12	14	-	24V
Type	-	-	-	-	-	-	-	-		+COM
Terminal No.	2	4	6	8	10	12	14	16	18	20
Output No.	1	3	5	7	9	11	13	15	-	24V
Type	-	-	-	-	-	-	-	-		+COM

EX510-S102□

Terminal No.	1	3	5	7	9	11	13	15	17	19
Output No.	0	2	4	6	8	10	12	14	-	0V
Type	+	+	+	+	+	+	+	+		-COM
Terminal No.	2	4	6	8	10	12	14	16	18	20
Output No.	1	3	5	7	9	11	13	15	-	0V
Type	+	+	+	+	+	+	+	+		-COM

Note : Only a flat cable type manifold (P kit) can be connected to EX510-S□02□. It cannot be connected to PCW type (G/J kit) according to the different pin assign.

Use of remaining output (Only for EX510-S□01□)

Remaining output of SI unit can be used by using a cable assembly for output. (Refer to the figure below.)
Refer to “SI unit specification” on page 33 for the load current restriction of SI unit.
Power consumption of each valve series is shown in the table below.
Refer to the catalog of each valve series for detail.

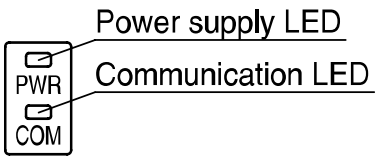
Valve series	Power consumption
SY3000 / 5000 / 7000 / 9000	Standard : 0.4W (approx. 17mA) With power saving circuit : 0.1W (approx. 4mA)
SYJ3000 / 5000 / 7000	Standard : 0.4W (approx. 17mA) With power saving circuit : 0.1W (approx. 4mA)
VQZ1000 / 2000 / 3000	Standard : 1.0W (approx. 42mA) Low wattage : 0.5W (approx. 21mA)

Refer to “Wiring of the diversion cable and connector for connecting load” on page 31 for how to wire the cable assembly for output.

NOTE
Do not pull the cable assembly for output strongly. It can cause defective connection or broken wire.

Setting

•Setting of display



Display	Contents
Power supply LED	Lights up: The power for output is supplied at specified voltage. Goes off: The power for output is not supplied at specified voltage.
Communication LED	Lights up: Data is being received from a GW unit Goes off: No data is being received.

Specification

Specification

•SI unit specification

Item	Specification	
Model No.	EX510-S001□, EX510-S002□	EX510-S101□, EX510-S102□
Output type	NPN output(Sink type)	PNP output(source type)
Number of output points	16 points	
Rated load voltage	24VDC	
Maximum load current	Meet the three following conditions ①0.25A or less/1 point ②1.4A or less/1 unit ③Total current of OUT0 to OUT7:1A or less, Total current of OUT8 to OUT15:1A or less	
Protection	Built-in protection circuit for short circuit	
Current consumption	50mA or less (inside of SI unit)	
Weight	EX510-S□01:40g EX510-S□01A,B:80g EX510-S□02:50g EX510-S□02A,B,C:90g (including accessories)	

•Applicable solenoid valve series

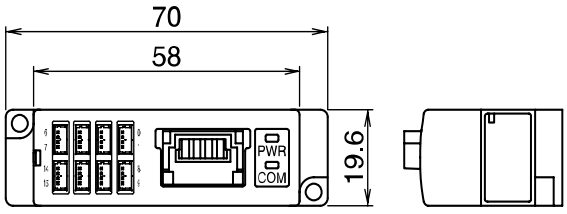
The following manifold valve can be used for EX510 series.

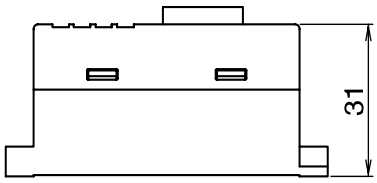
Valve series	Model No.
SY	3000, 5000, 7000, 9000
SYJ	3000, 5000, 7000
VQZ	1000, 2000, 3000

Refer to the catalogs and Technical Specification of each valve series for solenoid valve and manifold, etc.

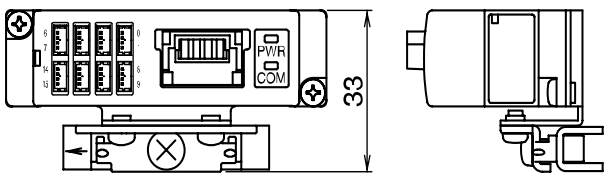
Dimensions

• EX510-S□01

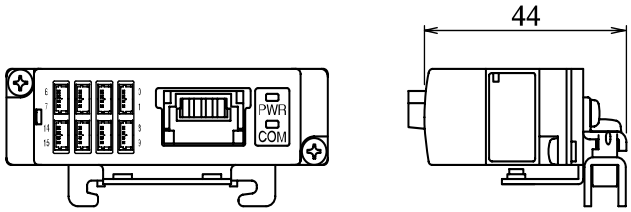




• EX510-S□01A



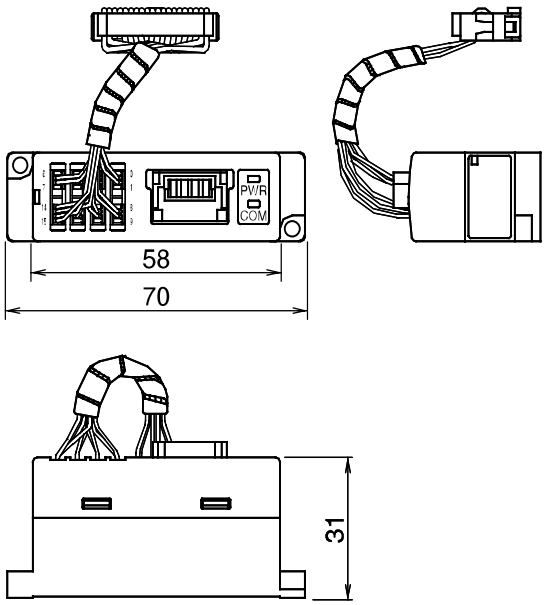
• EX510-S□02A



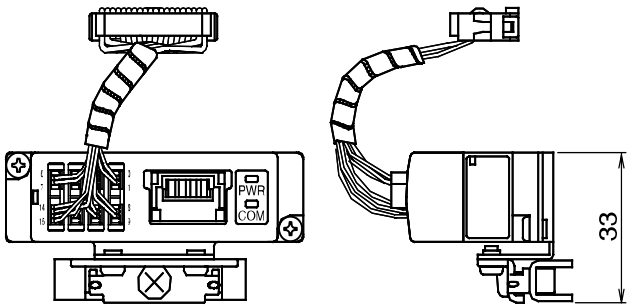
Setting

Dimensions

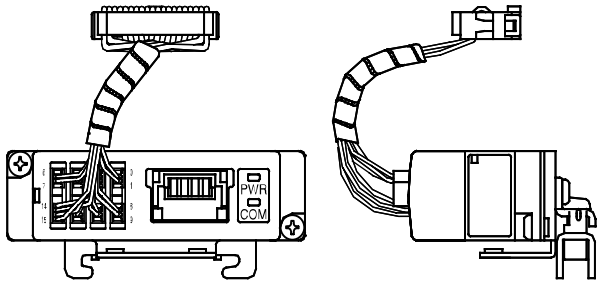
• EX510-S□02



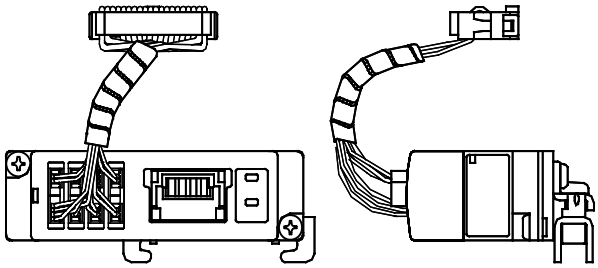
• EX510-S□02A



• EX510-S□02B



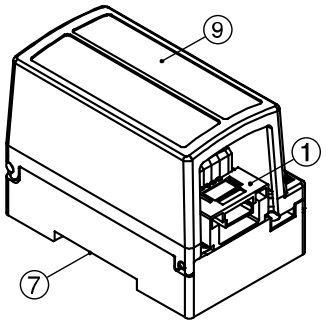
• EX510-S□02C

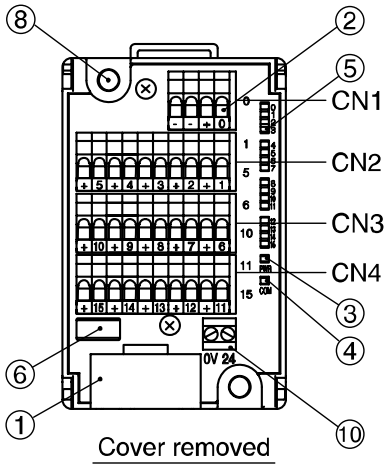


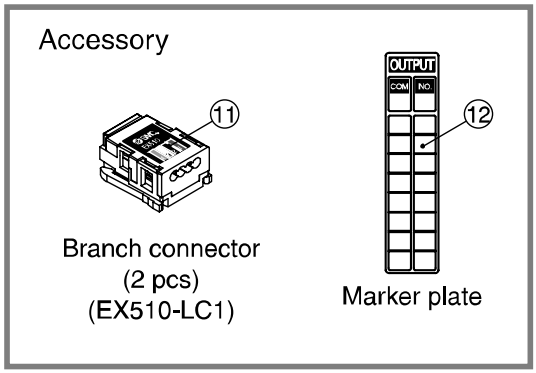
Refer to the catalogs and Technical Specification of each valve series for dimensions of the manifold valve.

Output unit

Parts and functions description





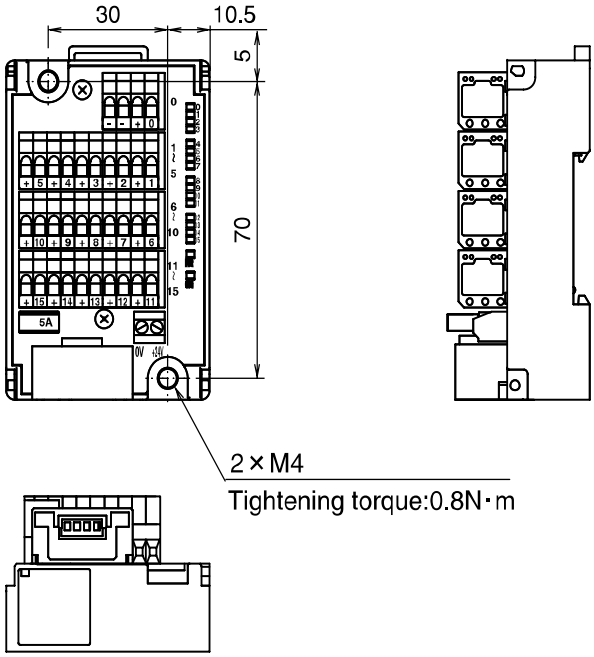


No.	Parts	Application
1	Branch connector at Output unit	Used to crimp branch connector (⑪) into branch cable (EX510-FC□□ and connected them to GW unit.
2	Output terminal block	Used to connect output load, etc.
3	Power supply LED	Lights up : Power ON (normal) Goes off : Power OFF
4	Communication LED	Lights up : Receiving data Goes off : No communication data
5	Display LED	Lights up : Output signal ON Goes off : Output signal OFF
6	Fuse	Fuse is replace cable.
7	Mounting slot	Used to mount DIN rail on the unit.
8	Mounting hole	The unit is mounted by two M4 screws.
9	Cover	Used to protect cable and provided with marker plate (⑫) on the top.
10	Terminal block for external power supply	Used to supply power. (EX510-DYN4, EX510-DYP4)

Mounting/Installation

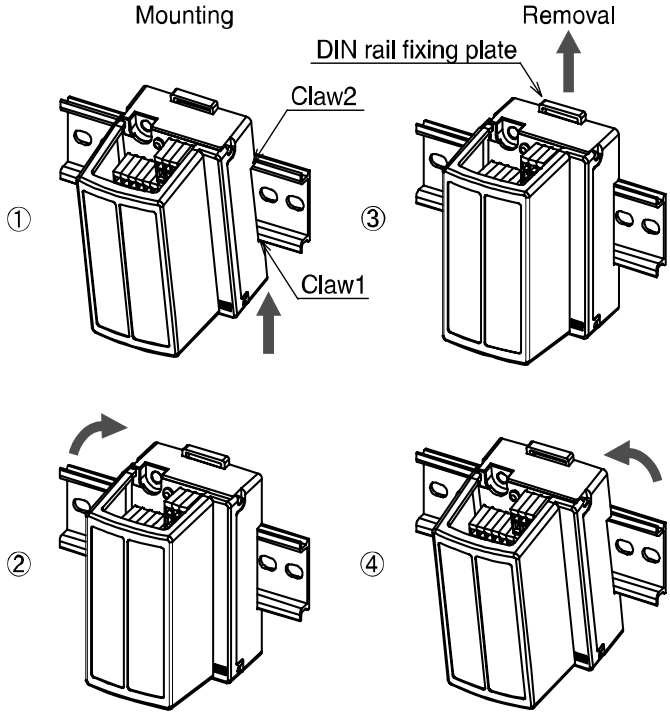
Installation method

Mounted by screw



Cover removed(Tolerance±0.2mm)

Mounted on DIN rail (Common for EX510-DX□1 and 2)



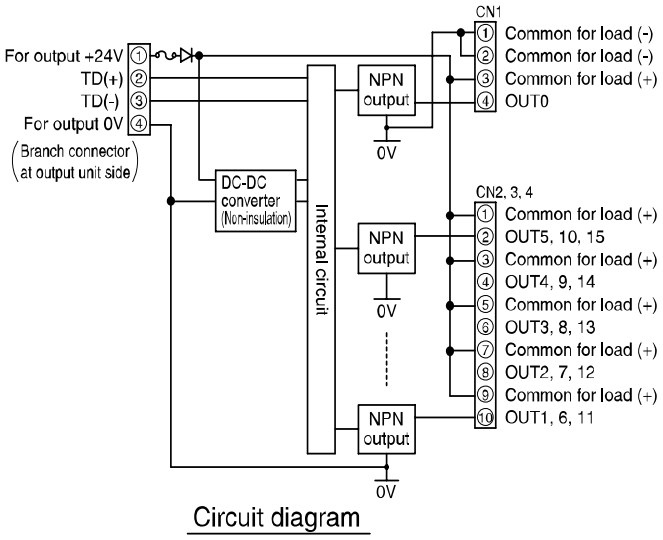
Put claw 1 at the body under DIN rail and push it upward. Push down claw 2 to the opposite rail unit the claw clicks to be set stably. (Mounting procedure ①and②)

For removing, push up DIN rail fixing plate at the body with a flat screwdriver, and remove it by tilting claw 2 side forward. (Removal procedure ③and④)

Wiring method

1. Internal circuit

EX510-DYN3 : Output unit for NPN (Internal power supply type)

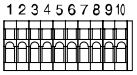


Circuit diagram

Terminal connector (CN1)

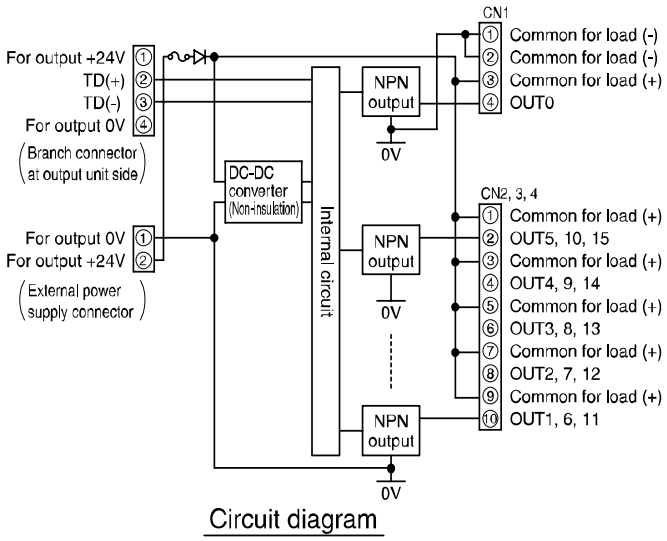
No.	Name	Function
		CN1
1	COM	Common for load (-)
2	COM	
3	COM	Common for load (+)
4	Output	OUT0

Terminal connector (CN2, CN3, CN4)



No.	Name	Function		
		CN2	CN3	CN4
1	COM	Common for load (+)		
2	Output	OUT5	OUT10	OUT15
3	COM	Common for load (+)		
4	Output	OUT4	OUT9	OUT14
5	COM	Common for load (+)		
6	Output	OUT3	OUT8	OUT13
7	COM	Common for load (+)		
8	Output	OUT2	OUT7	OUT12
9	COM	Common for load (+)		
10	Output	OUT1	OUT6	OUT11

EX510-DYN4 : Output unit for NPN (External power supply type)

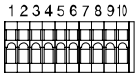


Circuit diagram

Terminal connector (CN1)

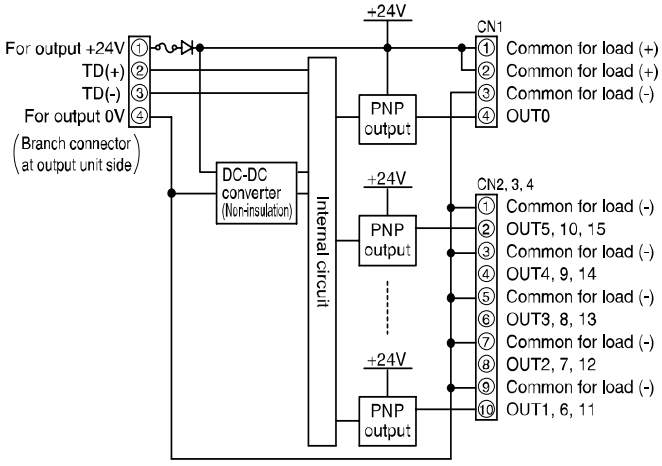
No.	Name	Function
		CN1
1	COM	Common for load (-)
2	COM	
3	COM	Common for load (+)
4	Output	OUT0

Terminal connector (CN2, CN3, CN4)



No.	Name	Function		
		CN2	CN3	CN4
1	COM	Common for load (+)		
2	Output	OUT5	OUT10	OUT15
3	COM	Common for load (+)		
4	Output	OUT4	OUT9	OUT14
5	COM	Common for load (+)		
6	Output	OUT3	OUT8	OUT13
7	COM	Common for load (+)		
8	Output	OUT2	OUT7	OUT12
9	COM	Common for load (+)		
10	Output	OUT1	OUT6	OUT11

EX510-DYP3 : Output unit for PNP (Internal power supply type)

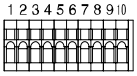


Circuit diagram

Terminal connector (CN1)

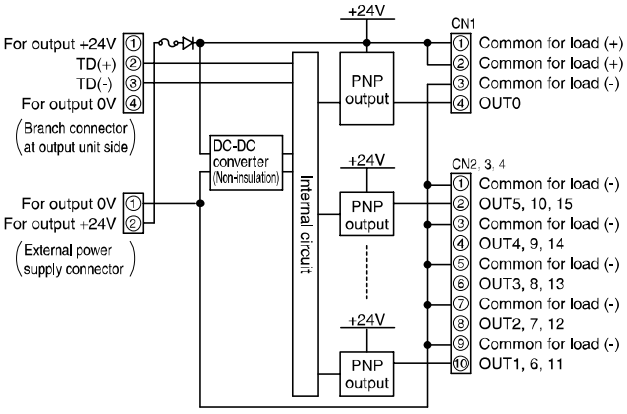
No.	Name	Function
		CN1
1	COM	Common for load (+)
2	COM	
3	COM	Common for load (-)
4	Output	OUT0

Terminal connector (CN2, CN3, CN4)



No.	Name	Function		
		CN2	CN3	CN4
1	COM	Common for load (-)		
2	Output	OUT5	OUT10	OUT15
3	COM	Common for load (-)		
4	Output	OUT4	OUT9	OUT14
5	COM	Common for load (-)		
6	Output	OUT3	OUT8	OUT13
7	COM	Common for load (-)		
8	Output	OUT2	OUT7	OUT12
9	COM	Common for load (-)		
10	Output	OUT1	OUT6	OUT11

EX510-DYP4 : Output unit for PNP (External power supply type)

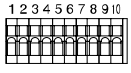


Circuit diagram

Terminal connector (CN1)

No.	Name	Function
		CN1
1	COM	Common for load (+)
2	COM	
3	COM	Common for load (-)
4	Output	OUT0

Terminal connector (CN2, CN3, CN4)



No.	Name	Function		
		CN2	CN3	CN4
1	COM	Common for load (-)		
2	Output	OUT5	OUT10	OUT15
3	COM	Common for load (-)		
4	Output	OUT4	OUT9	OUT14
5	COM	Common for load (-)		
6	Output	OUT3	OUT8	OUT13
7	COM	Common for load (-)		
8	Output	OUT2	OUT7	OUT12
9	COM	Common for load (-)		
10	Output	OUT1	OUT6	OUT11

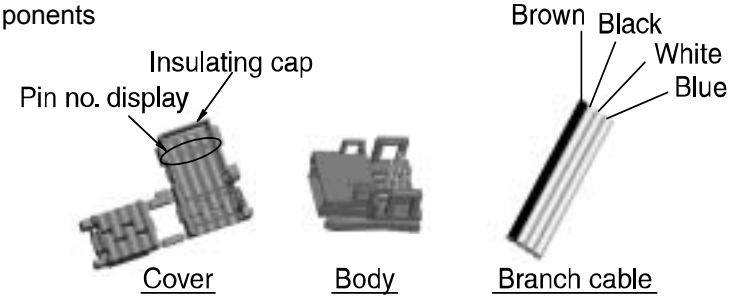
2. Branch wiring

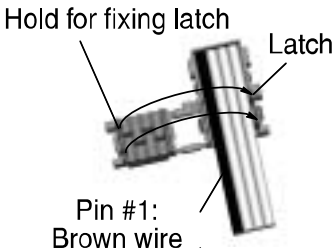
Output unit and GW unit are connected with branch cable and branch connector.
SI unit and Output unit have 2 branch connectors for each.

Pressure welding for branch connector

The method of pressure welding for branch connector is explained.

(1) Components



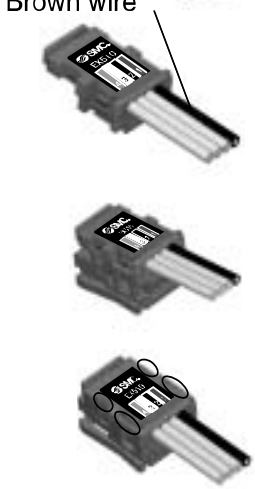


(2) Working procedure

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.

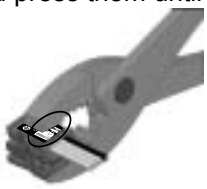


②**Fix to the body tentatively**

Fit 4 latches on the body to 4 ditches on the cover, and press them until the latch engages to the level 1.

③**Press fitting**

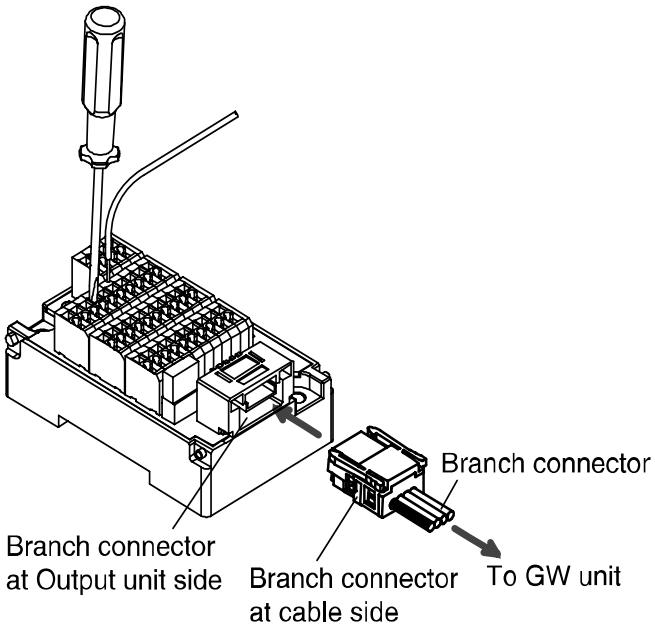
Press the cover to the body with pliers etc.



④**Confirmation**

It is completed with check on 4 latches engaging.

Wiring of load electric wire and terminal block connector



- Insert flat blade watch driver from slots on a terminal block connector to the end position.
- Hold clamping part opened with a blade of the driver.
- Insert electric wire into a clamping unit of a terminal block and pull the driver to finish wiring.
- Applicable electric wire size is 0.08 to 1.5mm^2 (AWG 16 to 28).
- Wire sheath stripped length is 5 to 6mm.
- Too long stripped length might expose conductor and cause insulation failure, and too short stropped length might get the sheath caught or make the conductor unclamped or clamped improperly resulting in contact failure or disconnection of electric wire.
- The flat blade watch driver shall have 2.5mm x 0.4mm blade end width and hold the clamp opened.

The terminal block connector can be connected with the following electric wires.

- Solid wire, fine stranded wire, stranded conductor ultrasonically bonded, stranded conductor with ferrule, stranded conductor with pin terminal.

Wiring of power supply line and terminal block for external power supply.

- Applicable electric wire size is 0.14 to 1.5mm^2 (AWG 16 to 26).
- Wire sheath stripped length is 4 to 6mm.
- Too long stripped length might expose conductor and cause insulation failure, and too short stripped length might get the sheath caught or make the conductor unclamped or clamped improperly resulting in contact failure or disconnection of electric wire.
- The flat blade watch driver shall have 2.5mm x 0.4mm blade end width and hold the clamp opened.
- Tightening torque for terminal block : 0.22Nm at minimum.

Maximum load current

Internal power supply type (EX510-DYN3, DYP3)

- The following three requirements shall be satisfied. : 1) 0.5A or less per point.
  2) 1A or less per unit.
  3) Total current from OUT0 to 7 and from OUT8 to 15 is 1A respectively.

External power supply type (EX510-DYN4, DYP4)

- The following three requirements shall be satisfied. : 1) 0.5A or less per point.
  2) 3A or less per unit.
  3) Total current from OUT0 to 7 and from OUT8 to 15 is 1.5A respectively.

For the load to the light, place an in-rush current restriction resistor to prevent potential fusing due to in-rush current.

Specification

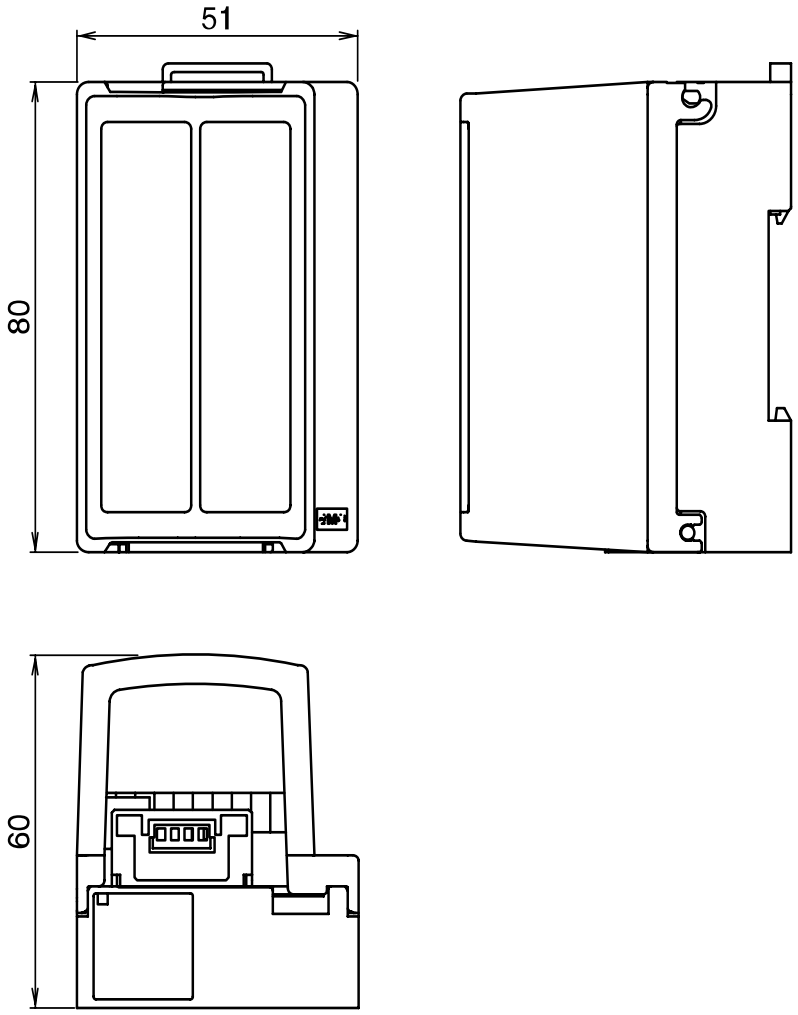
Specification

Item	Specification			
Model No.	EX510-DYN3	EX510-DYP3	EX510-DYN4	EX510-DYP4
Output type	NPN	PNP	NPN	PNP
Rated load voltage	24VDC			
Power supply type	Internal power supply (from GW unit)		External power supply (from power supply connector)	
Power supply connector acceptable electric wire	-		0.14～1.5mm^2 (AWG16～26)	
Output point	16			
Output connector type	Cage clamp type			
Acceptable electric wire	0.08 to 1.5mm^2 (AWG16 to 28)			
Maximum load current	The following three requirements shall be satisfied. 1) 0.5A or less per point. 2) 1A or less per unit. 3) Total current from OUT0 to 7 is 1A respectively.		The following three requirements shall be satisfied. 1) 0.5A or less per point. 2) 3A or less per unit. 3) Total current from OUT0 to 7 is 1.5A respectively.	
Enclosure	Short circuit installed			
Current consumption	50mA or less (Internal unit)			
Weight	130g (Include accessories)			

- Applicable manifold valve series

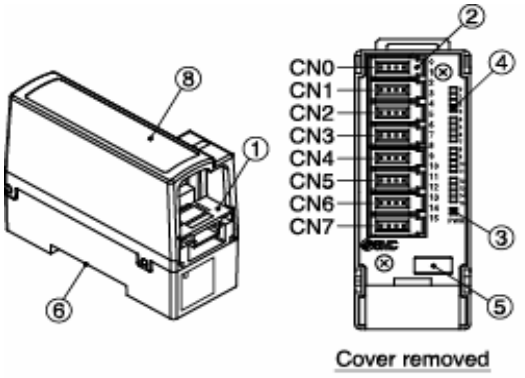
  The output unit can drive the 2-port valve of VX, VCW, VDW series, etc.
  Refer to the catalogs and Technical Specification of each valve series for detail of the solenoid valve and manifold, etc.

Dimensions

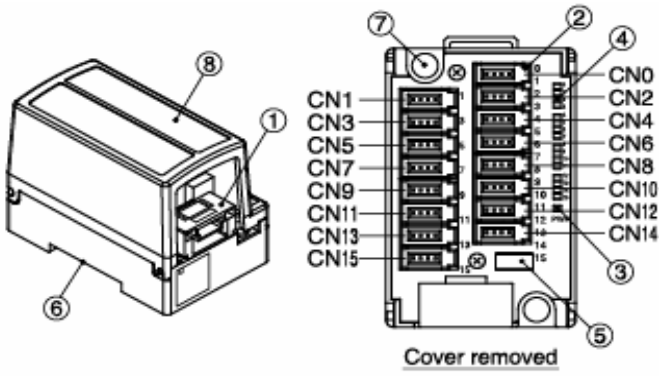


Input unit

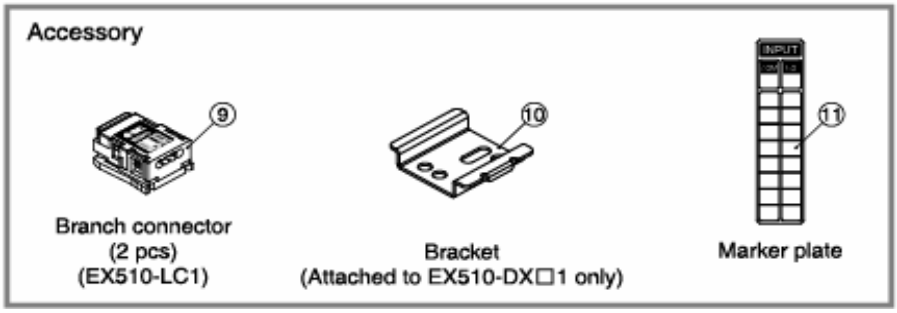
Parts and functions description



EX510-DX□1



EX510-DX□2



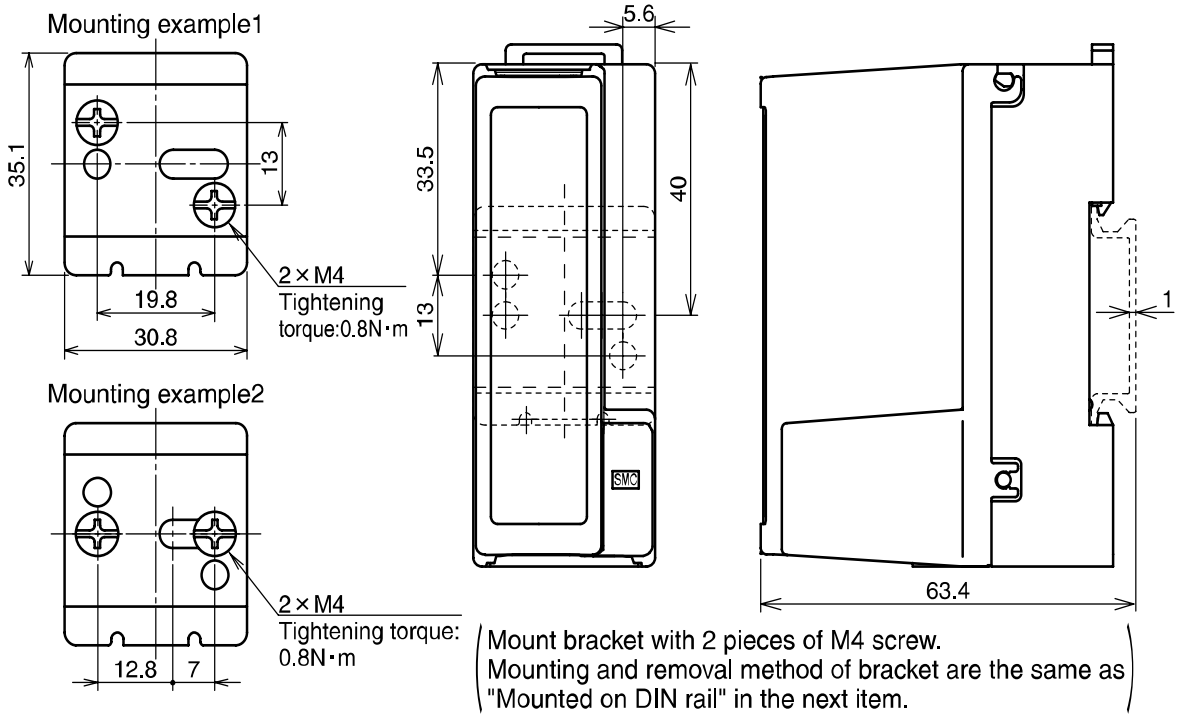
No.	Parts	Application
1	Branch connector at Input unit	Used to crimp branch connector (⑨) into branch cable (EX510-FC□□) and connected them to GW unit.
2	e-con socket	Used to connects sensor.
3	Power supply LED	Lights up : Power ON (normal) Goes off : Power OFF
4	Display LED	Lights up : Sensor signal input ON Goes off : Sensor signal input OFF
5	Fuse	Fuse is replaceable.
6	Mounting slot	Used for mounting the unit on DIN rail and with attached bracket (⑩) (thread mounting).
7	Mounting hole	Used to mount the unit with two M4 screws. (EX510-DX□ only)
8	Cover	Used to protect sensor cable and provided with marker plate (⑪) on the top.

Mounting/Installation

Installation

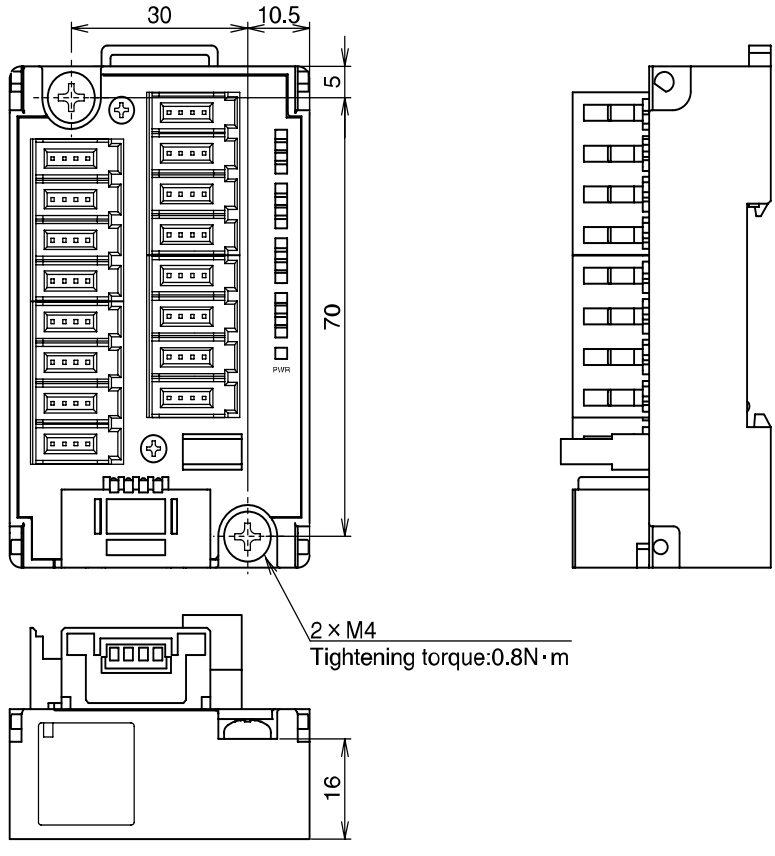
Mounted by screw

EX510-DX□1



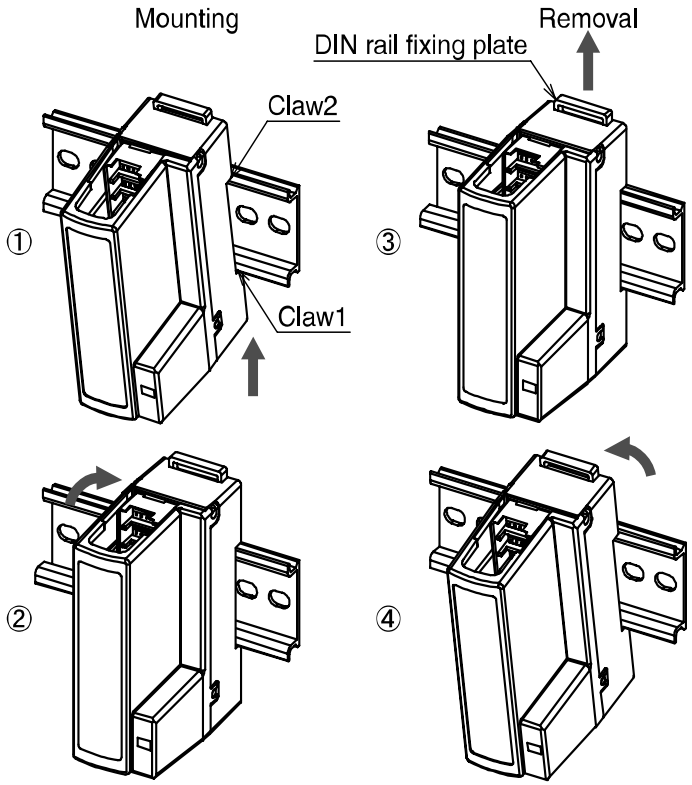
Mount bracket with 2 pieces of M4 screw.
Mounting and removal method of bracket are the same as "Mounted on DIN rail" in the next item.

EX510-DX□2



Cover removed(Tolerance±0.2mm)

Mounted on DIN rail (Common to EX510-DX□1 and 2)



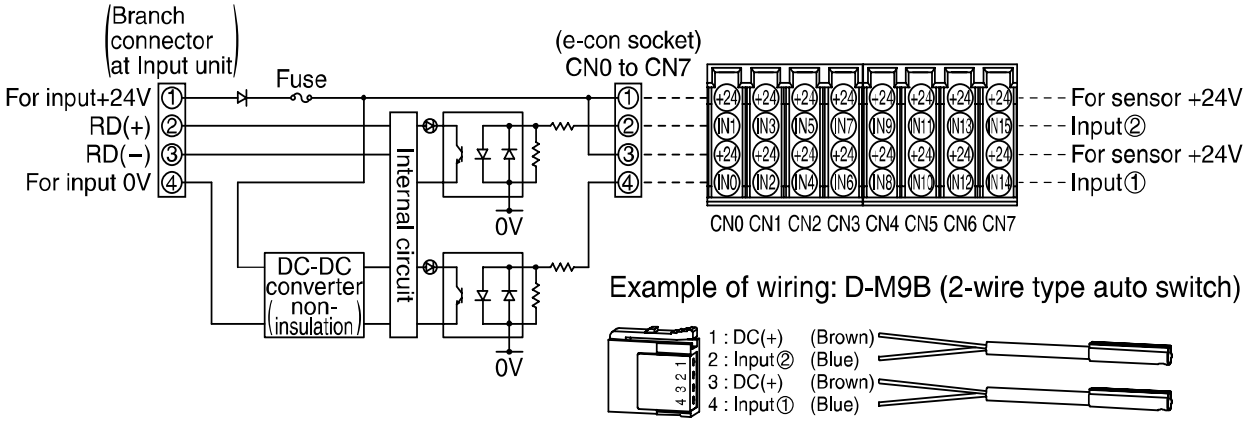
Put claw 1 at the body under DIN rail or bracket and push it upward. Push down claw 2 to the opposite rail until the claw clicks to be set stably. (Mounting procedure ① and ②)

For removing, push up DIN rail fixing plate at the body with a flat screwdriver, and remove it by tilting Claw 2 side forward. (Removal procedure ③ and ④)

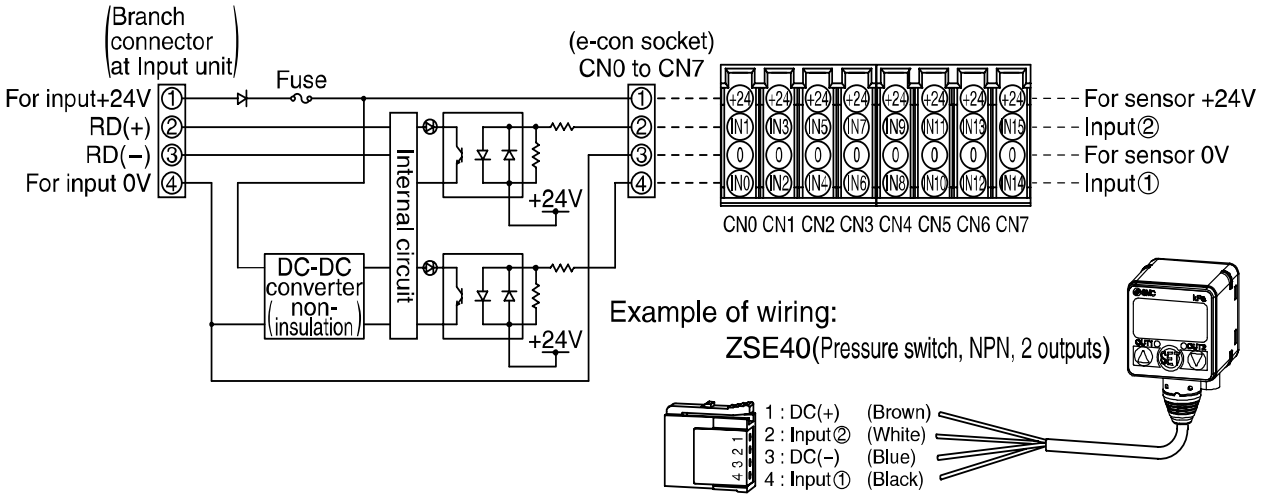
Wiring method

1. Typical internal circuit and wiring

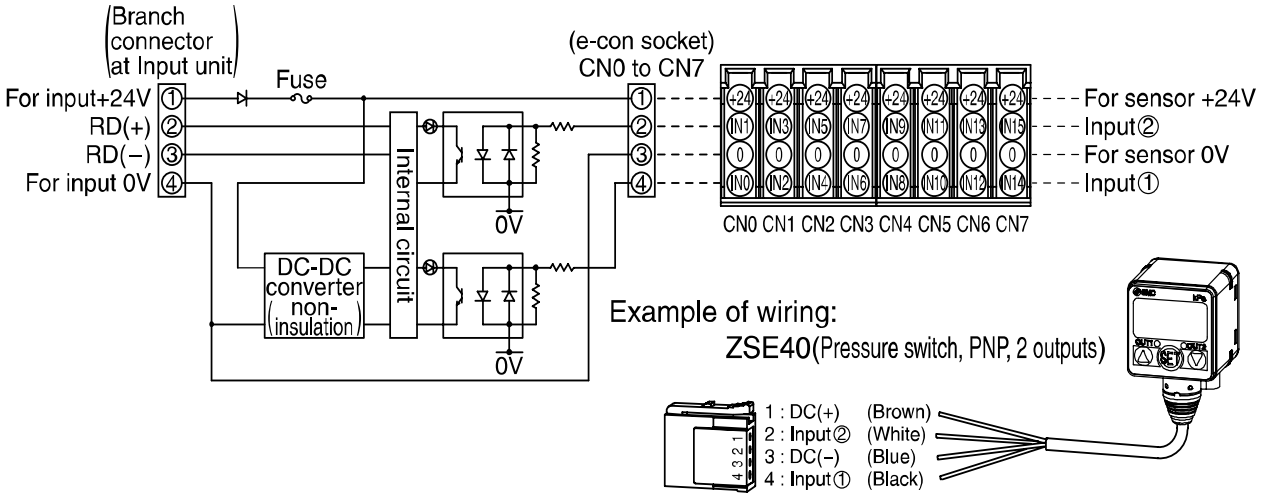
EX510-DXB1:Input unit for 2-wire type (1 connector 2-inputs type)



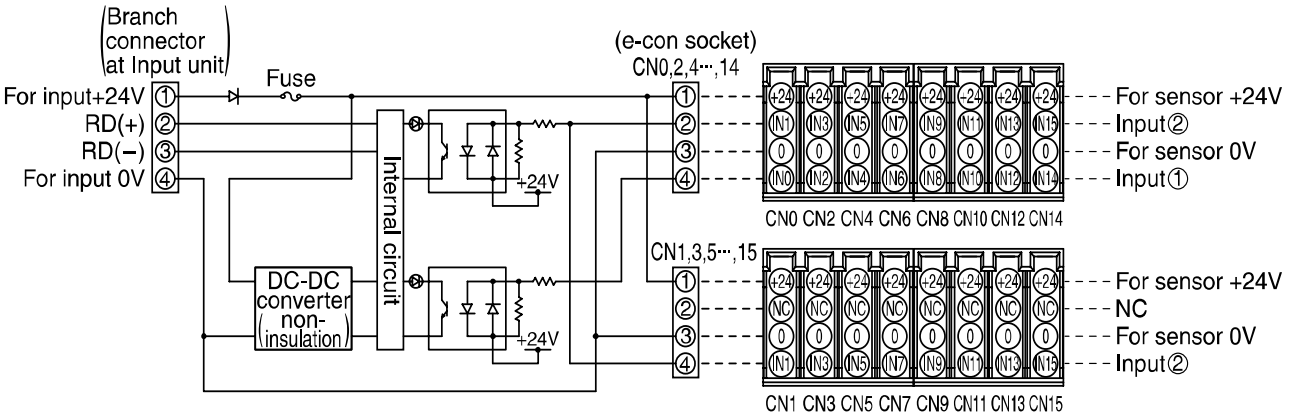
EX510-DXN1:Input unit for NPN (1 connector 2-inputs type)



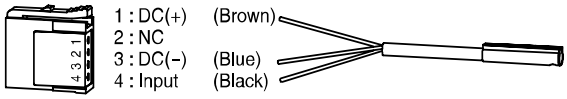
EX510-DXP1:Input unit for PNP (1 connector 2-inputs type)



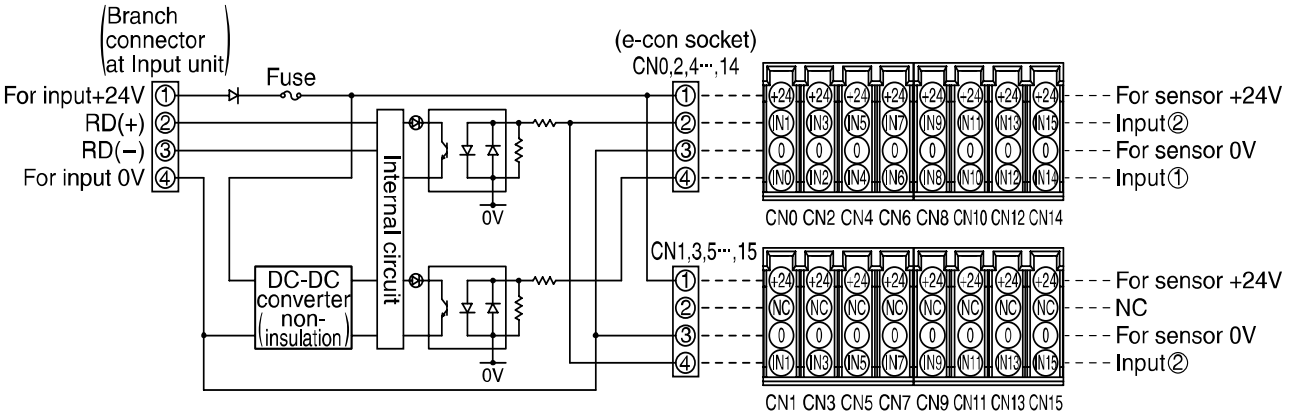
EX510-DXN2:Input unit for NPN (1 connector 1-input type)



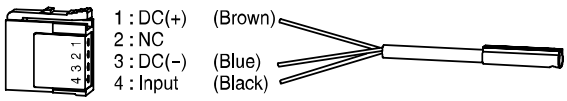
Example of wiring: D-M9N (3-wire type auto switch NPN output)



EX510-DXP2:Input unit for PNP (1 connector 1-input type)

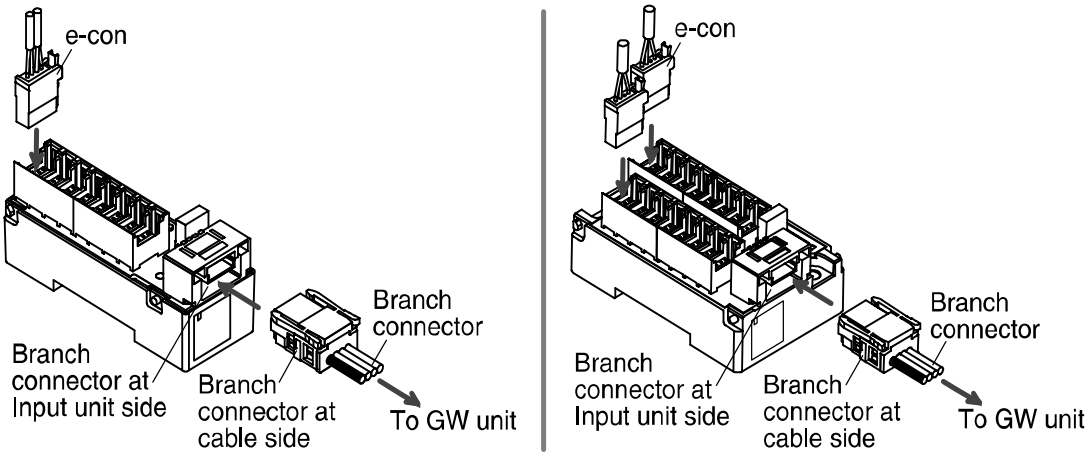


Example of wiring: D-M9P (3-wire type auto switch PNP output)



2. Wiring of branch cables and e-con

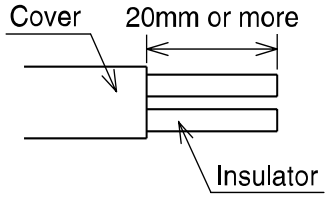
- Insert the branch connector at cable side into mating connector at Input unit side.
- Connect e-con after removal of cover.



*For crimping of a branch connector, refer to page 15.

3. Sensor connection

Utilize e-con to connect the sensor to the Input unit.



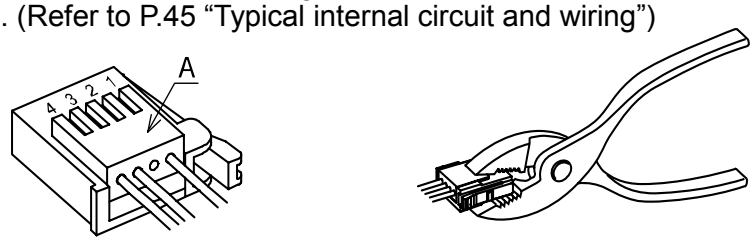
- Strip the sensor wire as shown in the right figure.
  (Refer to the table below for correspondence between connector and electrical wire gauge.)

Lead Wire Table

SMC Product No. (1 pc)	Color of cover	Applicable gauge of cable (ϕ)	Nominal sectional area (mm^2)	Product No.
ZS-28-CA-1	Orange	0.6 to 0.9	0.1 to 0.5 (AWG26 to 20)	3-1473562-4(AMP)
ZS-28-CA-2	Red	0.9 to 1.0		1-1473562-4(AMP)
ZS-28-CA-3	Yellow	1.0 to 1.15		1473562-4(AMP)
ZS-28-CA-4	Blue	1.15 to 1.35		2-1473562-4(AMP)
ZS-28-CA-5	Green	1.35 to 1.60		4-1473562-4(AMP)
ZS-28-C	Red	0.8 to 1.0	0.14 to 0.3 (AWG26 to 24)	37104-3101-000FL(Sumitomo 3M)
ZS-28-C-1	Yellow	1.0 to 1.2		37104-3122-000FL(Sumitomo 3M)
–	Transparency	to 1.5	0.08 to 0.5 (AWG28 to 20)	XN2A-1430*(OMRON)

*Note: If given tensile force more than 12N, cable may separate from connector.

- Insert the cable to the end with checking correspondence between color of cable and number stamped on e-con. (Refer to P.45 “Typical internal circuit and wiring”)

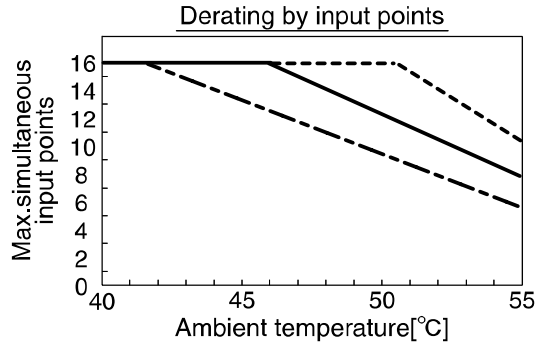


- It checks that the above-mentioned preparation work has been performed correctly, and "A" part shown in the left figure is pushed by hand and makes temporary connection.
- "A" part's center is straightly pushed in by tools, such as pliers.
- e-con is cannot be reused once crimped for connection. For the connection failure such as incorrect order of wire and incomplete insertion, please use the new e-con for sensor.

Specification

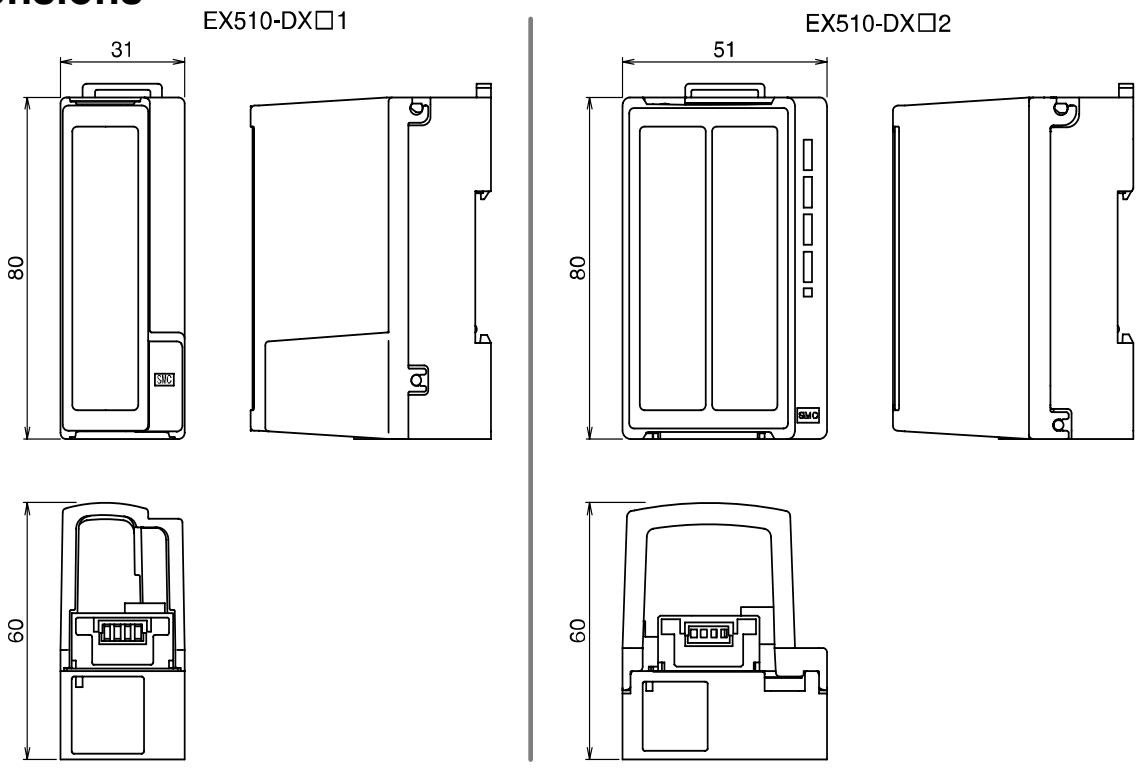
Specification

Item	Specification		
Model No.	EX510-DXN□	EX510-DXP□	EX510-DXB1
Applicable sensor	NPN output	PNP output	2 wire type
Number of input points	16 points (See diagram below for details.)		
Supply voltage for sensor	24VDC		
Max. supply current for sensor	0.2A/1 point, 0.9A/1unit		
Current consumption	100mA or less (inside of input unit)		
Input resistance	5.6kΩ		
Rated input current	Approx. 4mA		
ON voltage / ON current	17V or more / 2.5mA or more (Between input terminal and +24V for sensor)	17V or more / 2.5mA or more (Between input terminal and 0V for sensor)	
OFF voltage / OFF current	7V or less / 1mA or less (Between input terminal and +24V for sensor)	7V or less / 1mA or less (Between input terminal and 0V for sensor)	
LED display	Green LED (lights up during ON time)		
Weight	EX510-DX□1:90g, EX510-DX□2:110g(including accessories)		



	Voltage for input and controlling part [V]
----	21.6
——	24
- - -	26.4

Dimensions



Procedure

Maintenance Procedure

•Mounting and wiring conditions

Check items	Condition	Solution
Confirm the connectors of each unit (communication, power supply, input and output) is firmly connected.	No looseness	Give an additional tightening.
Confirm the terminating resister is connected to both ends of network. (If this system is located at termination of network.)	No looseness	Given an additional tightening.
Confirm there is no breakage of connecting cable.	No defect on appearance	Replace with a new one if there is a defect found on appearance.

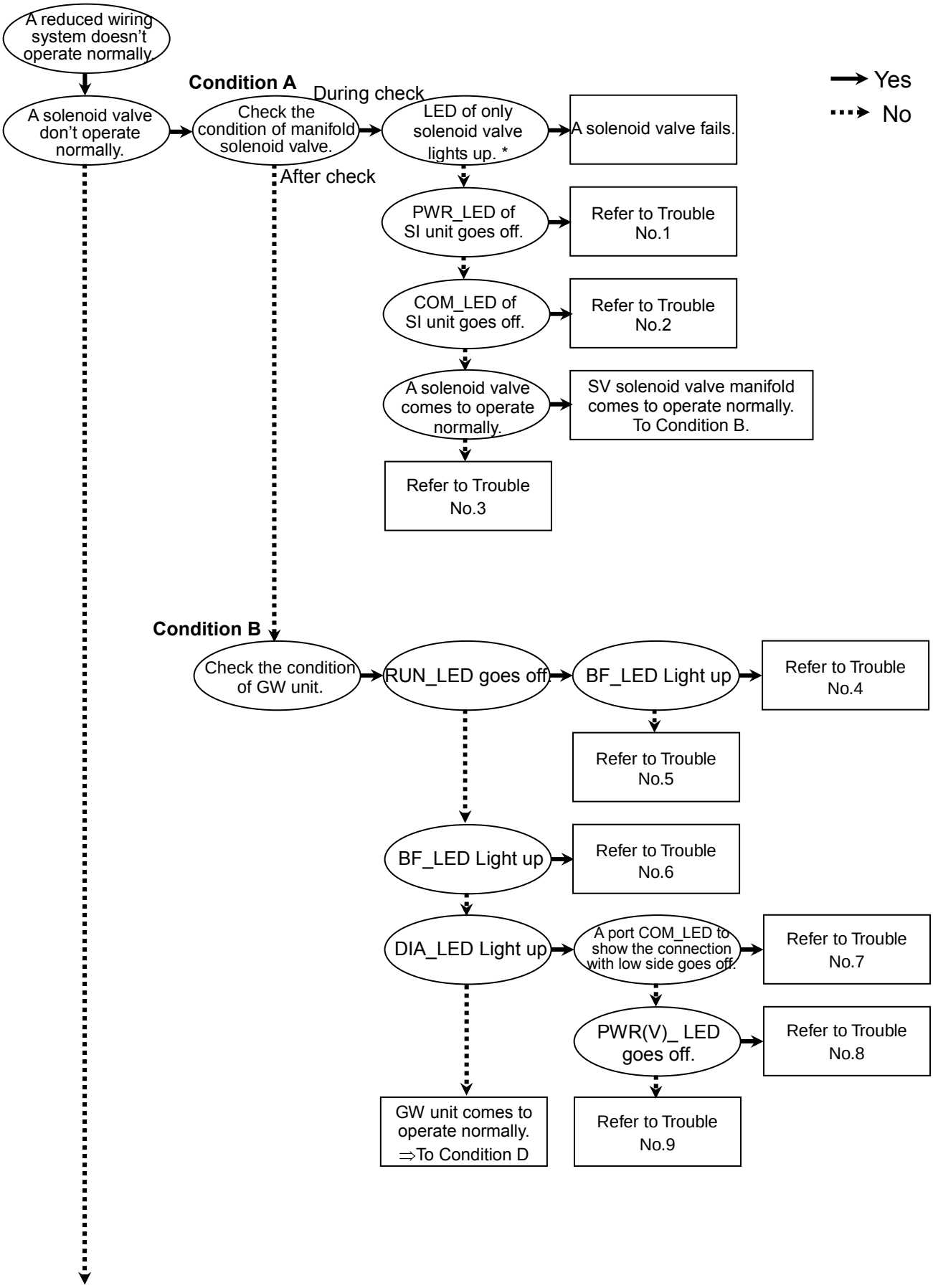
•Service parts

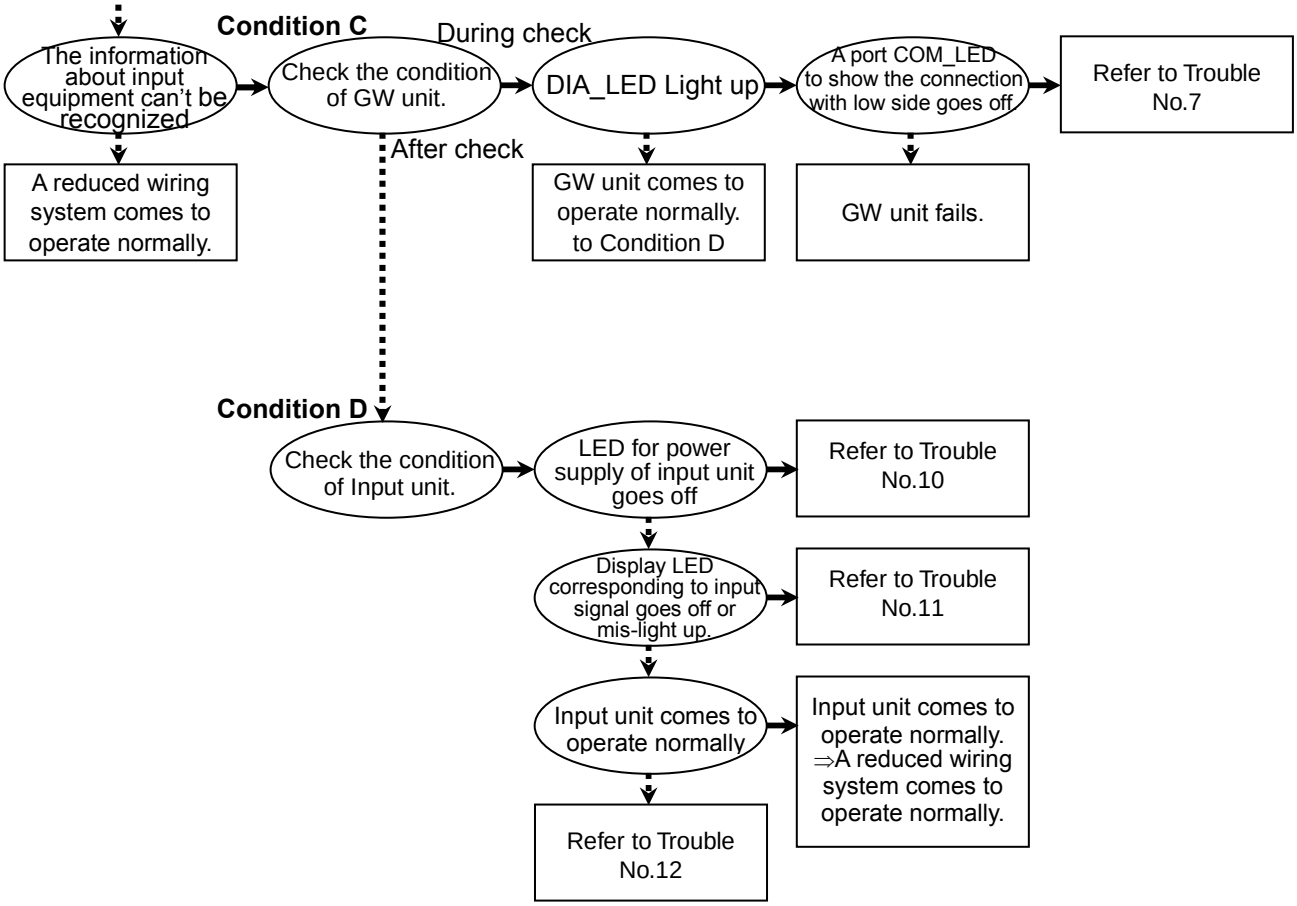
Check items	Condition	Solution
PROFIBUS-DP compatible cable for moving parts (if used)	No defect on appearance and conductor resistance	Replace with a new one if there is a defect found on appearance and conductor resistance.
Display and operation	No defect on operating conditions and display	Replace with new unit if there is unintentional operation and defect found on display.

•Power supply

Check items	Condition	Solution
Measure the voltage at both ends of input and GW/SI controlling part power supply and confirm the voltage is within specifications.	DC24V±10%	Investigate the cause of fluctuation of the voltage and take measure.
Measure the voltage at both ends of solenoid valve/output power supply and confirm the voltage is within specifications.	DC24V+10%/-5%	Investigate the cause of fluctuation of the voltage and take measure.

Troubleshoot





* Some types of output equipment do not have LED display. For such equipment, check the output unit voltage to judge if it is normal or not.

Trouble No.1

Trouble	Possible cause	Investigation method of cause	Solution
PWR_LED of unit goes off.	Incorrect branch cable connection	Confirm there is no breakage, incorrect connection and looseness at connecting part of the branch cable.	Fix the connection of the branch cable.
	Incorrect output power supply connection	There is no incorrect connection between output power supply and GW unit power supply connector.	Fix connection.
	Output power supply failure	Confirm the condition of output power supply.	Supply DC24V+10%/-5% for GW unit output power supply.

Trouble No.2

Trouble	Possible cause	Investigation method of cause	Solution
COM_LED of unit goes off.	Incorrect branch cable connection	Confirm there is no breakage, incorrect connection and looseness at connecting part of the branch cable.	Fix connection of the branch cable.
	Branch cable failure	Confirm there is no equipment and high voltage line which might generate a noise around the branch cable.	Take a proper measure such as by separating the branch cable from the noise source.
		Check the length of the branch cable and use of dedicated cable.	Fix connection.

Trouble No.3

Trouble	Possible cause	Investigation method of cause	Solution
Solenoid valve falls in failure.	Incorrect connection between unit and solenoid valve	Confirm there is no looseness of the connector between unit and solenoid valve.	Fix the connection between unit and solenoid valve.
	Incorrect wiring between unit and solenoid valve	Confirm there is no breakage and failure of wiring between unit and solenoid valve.	Fix the wiring between unit and solenoid valve
	System setting error	Confirm the GW unit is set correctly.	Fix setting
	Incorrect solenoid valve power supply voltage	Confirm the power supply voltage from the unit is within power supply voltage specified for the sensor. Also, confirm the length of a branch cable and current for the unit are within their specifications.	Operate within the specifications.
	Solenoid valve failure	Replace with new one and check the operation again.	Read the troubleshooting of solenoid valve
	Unit failure	Replace with a new one and check the operation again.	Replace unit.

Trouble No.4

Trouble	Possible cause	Investigation method of cause	Solution
RUN_LED goes off or BF_LED lights up. (DIA_LED flashes.)	Incorrect address setting	Confirm the address isn't set to 126 or 127.	Set the address between 0 and 125.

Trouble No.5

Trouble	Possible cause	Investigation method of cause	Solution
RUN_LED or BF_LED goes off. (DIA_LED goes off.)	Incorrect input and GW unit controlling part power supply connection	Confirm there is no incorrect connection between input and GW unit controlling part power supply and GW unit power supply connector.	Fix connection.
	Input and GW unit controlling part power supply failure	Confirm the condition of input and GW unit controlling part power supply.	Supply DC24V±10% for input and GW controlling part power supply of the GW unit.

Trouble No.6

Trouble	Possible cause	Investigation method of cause	Solution
BF_LED lights up.	PROFIBUS communication error.	Confirm the signal line from PLC is connected correctly.	Fix the connection.
		Address setting error: [In hardware mode]Confirm the address setting of DIP switch is performed correctly. [In software mode]Confirm the address set through network is correct.	Fix the setting of the GW unit.
		Confirm the number of I/O points are set correctly.	Fix the setting.
		Check the length of communication line in respect to the communication speed, presence of the terminating resistor at both ends of transmission line and use of PROFIBUS dedicated cable.	Fix the connection and setting.
		Confirm UNIT STATUS at GW unit side consists the one at master side.	Fix the setting.
		Confirm there is no equipment and high voltage line which might generate a noise around the communication line.	Take a proper measure such as by separating the communication line from the noise source.

Trouble No.7

Trouble	Possible cause	Investigation method of cause	Solution
A port COM_LED to show the connection with low side goes off. (COM_LED of the port set as unused remains off.	Incorrect branch cable connection	Confirm there is no breakage, incorrect connection and looseness at connecting part of the branch cable.	Fix connection of the branch cable.
	Branch cable failure	Confirm there is no equipment and high voltage line which might generate a noise around the branch cable.	Take a proper measure such as by separating the branch cable from the noise source.
		Check the length of the branch cable and use of dedicated cable.	Fix connection.
	Unconnected input unit	Confirm the input unit is connected after the input port.	It is not breakage. However, if an input unit is used, incorrect connection is also possible cause. In that case, fix the connection.
	Broken input unit fuse	Confirm the fuse is not broken.	Replace with a new one.

Trouble No.8

Trouble	Possible cause	Investigation method of cause	Solution
PWR(V)_ LED goes off.	Incorrect output power supply connection	Confirm there is no incorrect connection between output power supply and GW unit power supply connector.	Fix connection.
	Output power supply failure	Confirm the condition of output power supply.	Supply DC24V+10%/-5% for GW unit output power supply.

Trouble No.9

Trouble	Possible cause	Investigation method of cause	Solution
Others (DIA_LED lights up.)	Broken solenoid valve fuse (GW unit)	Confirm the fuse for the solenoid valve is not broken. (The information of broken fuse is sent to PLC as extensive diagnosis result and so you can check on program software. The fuse is mounted on an internal board and this check method is recommended.)	Replace with new GW unit and check the operation again.

Trouble No.10

Trouble	Possible cause	Investigation method of cause	Solution
Input unit power supply LED goes off.	Incorrect branch cable connection	Confirm there is no breakage, incorrect connection and looseness at connecting part of the branch cable.	Fix connection of the branch cable.
	Incorrect input and GW unit controlling part power supply connection	Confirm there is no incorrect connection between input and GW unit controlling part power supply and GW unit power supply connector.	Fix connection.
	Input and GW unit controlling part power supply failure	Confirm the condition of input and GW unit controlling part power supply.	Supply DC24V±10% for input and GW controlling part power supply of the GW unit.
	Broken input unit fuse	Confirm the fuse is not broken.	Replace with a new one.

Trouble No.11

Trouble	Possible cause	Investigation method of cause	Solution
Display LED correspondi ng to input signal goes off.	Incorrect sensor cable connection	Confirm e-con connector does not have looseness at its connecting part.	Connect the sensor cable correctly.
		Confirm there is no incorrect connection of the sensor cable.	Fix connection.
	Sensor failure	Replace with new one and check the operation again.	Replace sensor.

Trouble No.12

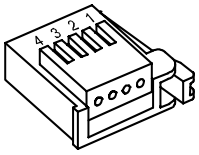
Trouble	Possible cause	Investigation method of cause	Solution
Input unit falls in an operating failure.	Inconsistence of used sensor's polarity	Confirm the specification of the sensor is compatible to the one of the input block (PNP, NPN).	Remount the input block or sensor to make them compatible.
	Improper sensor power supply voltage	Confirm the power supply voltage from the input unit is within power supply voltage specified for the sensor. Also, confirm the length of a branch cable and current for the input unit are within their specifications.	Operate within specifications.
	Incorrect system setting	Confirm a GW unit is set correctly.	Fix setting.
	Input unit failure	Replace with new one and check the operation again.	Replace input unit.

Option

•e-con

It is a connector used for connecting a sensor to the Input unit (EX510-DX□□).
Refer to "Sensor connection" on page 47 for the connector part number and the applicable electric wire size.

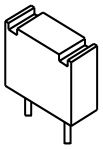
ZS-28-C□-□



•Fuse for replacement

It is a fuse for replacement used for Input unit(EX510-DX□□) and Output(EX510-DY□□) unit.

EX9-FU10



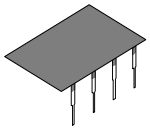
Object model No.

10	EX510-DX□□ EX510-DY□3 (Internal power supply)
50	EX510-DY□4 (External power supply)

•Terminating resistor

Used to prevent signal reflections on the end of transmission line and to connect a communication connector with a GW unit.

EX510-TR1



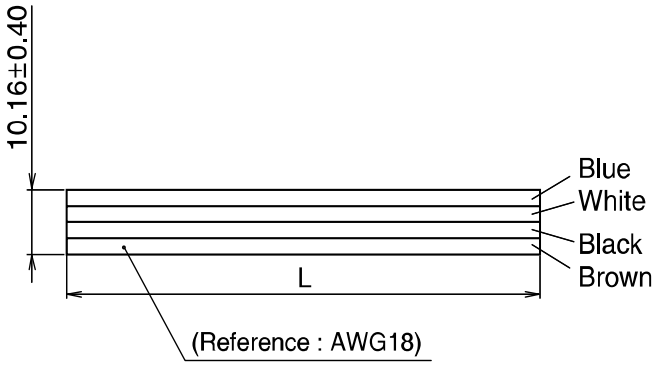
•Branch cable

It is a 4-core flat cable used for connection between each unit.

EX510-FC 1 0

Cable length [L]

01	1 [m]
02	2 [m]
05	5 [m]
10	10 [m]
20	20 [m]
60	60 [m]

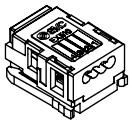


•Branch connector (Every 1 pc.)

It is a connector used to connect the branch cable to each unit.

SI unit and input unit are attached with the branch connector for 2 pcs. each.

EX510-LC1



(When pressure welding)

Electric specification	
Rated voltage	AC / DC 160V or less
Rated current	Max. 5.0A
Contact resistance	20mΩ or less
Withstand voltage	AC1000V per 1 minute (Leak current 1mA or less)

•Cable assembly for output entry

It is a cable assembly to take the remaining output of the SI unit out of it.

EX510-V S 1 0 S

Output point

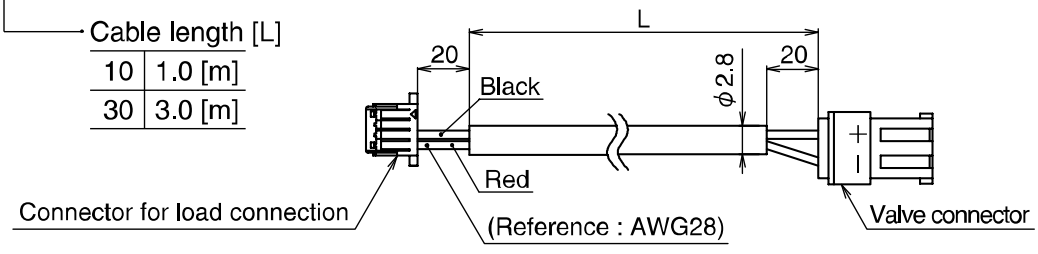
S	1 point
W	2 points

Valve connector

Nil	With out valve connector
S	For SY/SYJ
Q	For VQ/VQZ

Cable length [L]

10	1.0 [m]
30	3.0 [m]



Revision history

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No.EX##-OMI0032