



Operation Manual

PRODUCT NAME

SI unit for EtherNet/IP™

MODEL / Series / Product Number

EX250-SEN1

SMC Corporation

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Refer to the operation manual EX250-IE1 / -IE2 / -IE3 for the input block specifications, and EX9-OET1 / -OET2 / -OEP1 / -OEP2 / PE1 for the output block and power block specifications.

Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or "Danger". They are all important notes for safety and must be followed in addition to International standards (ISO/IEC) *1) and other safety regulations.

- *1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.
- ISO 4413: Hydraulic fluid power -- General rules relating to systems.
- IEC 60204-1: Safety of machinery -- Electrical equipment of machines. (Part 1: General requirements)
- ISO 10218-1992: Manipulating industrial robots -Safety.
- etc.

-  **Caution** : CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
-  **Warning** : WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
-  **Danger** : DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

- 1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- 2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.
- 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
 1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
 2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
 3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
 1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
 2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
 3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
 4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Caution

The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first. *2)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Operator

- ◆ This operation manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment. Only those persons are allowed to perform assembly, operation and maintenance.
- ◆ Read and understand this operation manual carefully before assembling, operating or providing maintenance to the product.

Warning

- Do not disassemble, modify (including changing the printed circuit board) or repair.
An injury or failure can result.
- Do not operate the product outside of the specifications.
Do not use for flammable or harmful fluids.
Fire, malfunction, or damage to the product can result.
Verify the specifications before use.
- Do not operate in an atmosphere containing flammable or explosive gases.
Fire or an explosion can result.
This product is not designed to be explosion proof.
- If using the product in an interlocking circuit:
 - Provide a double interlocking system, for example a mechanical system.
 - Check the product regularly for proper operation.Otherwise malfunction can result, causing an accident.
- The following instructions must be followed during maintenance:
 - Turn off the power supply.
 - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.Otherwise an injury can result.

Caution

- After maintenance is complete, perform appropriate functional inspections.
Stop operation if the equipment does not function properly.
Safety cannot be assured in the case of unexpected malfunction.
- Provide grounding to assure the safety and noise resistance of the SI unit.
Individual grounding should be provided close to the product with a short cable.

■NOTE

- Follow the instructions given below when designing, selecting and handling the product.
- The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.
 - *Product specifications
 - When conformity to UL is required, the SI unit should be used with a UL1310 Class 2 power supply.
 - The SI unit is a UL approved product only if they have a  mark on the body.
 - Use the specified voltage.
 - Otherwise failure or malfunction can result.
 - Reserve a space for maintenance.
 - Allow sufficient space for maintenance when designing the system.
 - Do not remove any nameplates or labels.
 - This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product.
 - It may also result in non-conformity to safety standards.
 - Product handling
 - *Installation
 - Do not drop, hit or apply excessive shock to the SI unit.
 - Otherwise damage to the product can result, causing malfunction.
 - Tighten to the specified tightening torque.
 - If the tightening torque is exceeded the mounting screws may be broken.
 - IP67 protection cannot be guaranteed if the screws are not tightened to the specified torque.
 - Never mount a product in a location that will be used as a foothold.
 - The product may be damaged if excessive force is applied by stepping or climbing onto it.
 - *Wiring
 - Avoid repeatedly bending or stretching the cables, or placing heavy load on them.
 - Repetitive bending stress or tensile stress can cause breakage of the cable.
 - Wire correctly.
 - Incorrect wiring can break the product.
 - Do not perform wiring while the power is on.
 - Otherwise damage to the SI unit and/or I/O device can result, causing malfunction.
 - Do not route wires and cables together with power or high voltage cables.
 - Otherwise the SI unit and/or I/O device can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.
 - Route the wires (piping) of the SI unit and/or I/O device separately from power or high voltage cables.
 - Confirm proper insulation of wiring.
 - Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
 - Take appropriate measures against noise, such as using a noise filter, when the SI unit is incorporated into equipment.
 - Otherwise noise can cause malfunction.
 - *Environment
 - Select the proper type of protection according to the environment of operation.
 - IP65/67 protection is achieved when the following conditions are met.
 - (1) The units are connected properly with fieldbus cable with M12/M8 connector and power cable with M12/M8 connector.
 - (2) Suitable mounting of each unit and manifold valve.
 - If using in an environment that is exposed to water splashes, please take measures such as using a cover.
 - Do not use in a place where the product could be splashed by oil or chemicals.
 - If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction etc.).

- Do not use the product in an environment where corrosive gases or fluids could be splashed.
Otherwise damage to the product and malfunction can result.
- Do not use in an area where surges are generated.
If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the SI unit, this may cause deterioration or breakage of the internal circuit of the SI unit. Avoid sources of surge generation and crossed lines.
- When a surge-generating load such as a relay or solenoid is driven directly, use an SI unit with a built-in surge absorbing element.
Direct drive of a load generating surge voltage can damage the SI unit.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Prevent foreign matter such as remnant of wires from entering the SI unit to avoid failure and malfunction.
Otherwise failure or malfunction can result.
- Mount the product in a place that is not exposed to vibration or impact.
Otherwise failure or malfunction can result.
- Do not use the product in an environment that is exposed to temperature cycle.
Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.
If using in a location directly exposed to sunlight, shade the product from the sunlight.
Otherwise failure or malfunction can result.
- Keep within the specified ambient temperature range.
Otherwise malfunction can result.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
Otherwise malfunction can result.

*Adjustment and Operation

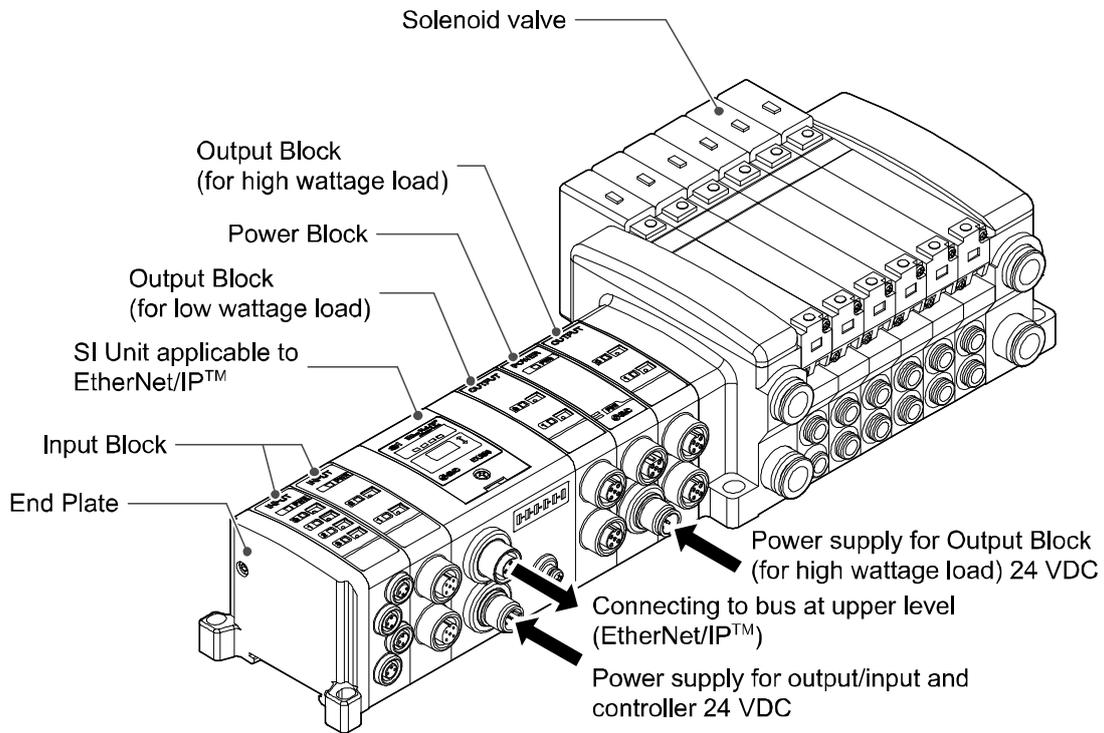
- Set the switches by using a sharp-pointed screwdriver etc.
It may damage set switches.
- Perform settings suitable for the operating conditions.
Incorrect setting can cause operation failure.
For details of each setting, refer to page 17 to 18 of this manual.
- Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.
For the PLC protocol and programming refer to the relevant manufacturer's documentation.

*Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
There is a risk of unexpected malfunction.
- After maintenance is complete, perform appropriate functional inspections.
Stop operation if the equipment does not function properly.
Otherwise safety is not assured due to an unexpected malfunction or incorrect operation.
- Do not use solvents such as benzene, thinner etc. to clean the SI unit.
They could damage the surface of the body and erase the markings 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 configuration



This system realizes the reduce wiring between the input and output equipment by connecting to EtherNet/IP™.

EtherNet/IP™ and the input and output equipment communicate through the SI unit.

Up to 32 inputs can be connected to the SI unit using Input blocks.

Up to 32 outputs* from combined EX9 Output blocks and valve manifolds can be connected to the SI unit.

*: The maximum output point is 24 when the Power block is connected.

■ Definition and terminology

	Terms	Definition
1	100BASE-TX	Standard of LAN transmission route with a transmission speed of 100 Mbps.
D	DHCP	A protocol to automatically set the information to be registered in individual equipment connected with a TCP/IP network in order to use the network. This includes the IP address.
E	EtherNet/IP™	Open fieldbus for factory automation. This is a protocol that integrates the DeviceNet communication protocol (CIP: Common Industrial Protocol) into Ethernet or TCP/IP. Currently, it is popular in the US and is spreading to Europe.
F	Full duplex	Communication method by sending and receiving simultaneously for bilateral communication.
H	Half duplex	Communication method by sending and receiving alternately for bilateral communication.
I	IP address	A 32 bit sequence of numbers assigned to identify individual equipment connected to a network. All connected to the network are given individual IP addresses.
M	MAC address	A number unique to equipment, connected to Ethernet.
	MS	Abbreviation of "module status". It shows whether the power supply of SI unit is turned on and the normal operation is available.
N	NS	Abbreviation of "network status". It shows the status of EtherNet/IP™ communication.
S	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.)

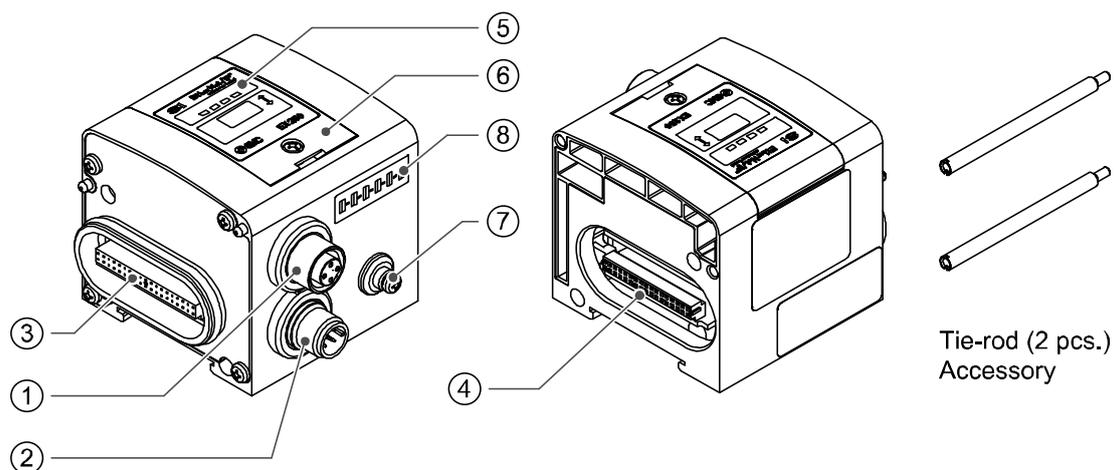
Model Indication and How to Order

EX250 - SEN1

• Communication protocol

EN1	EtherNet/IP™
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Summary of Product Parts



No.	Part names	Application
1	Communication connector	Connect the EtherNet/IP™ line. *1
2	Power supply connector	Supplies power to the solenoid valve, Output block, SI unit and Input block. *1
3	Input block connector	Connects the Input block.
4	Output block connector	Connects the solenoid valve, Output block, etc.
5	Display	LED display showing the SI unit status. *2
6	Switch protective cover	Incorporates the internal switch setting IP address and communication method. *2
7	Ground terminal	Used for grounding.
8	MAC address	A unique MAC address of 12 hexadecimal number digits to each SI unit.

*1: For wiring method, refer to subsection "Wiring" (page 12) in this manual.

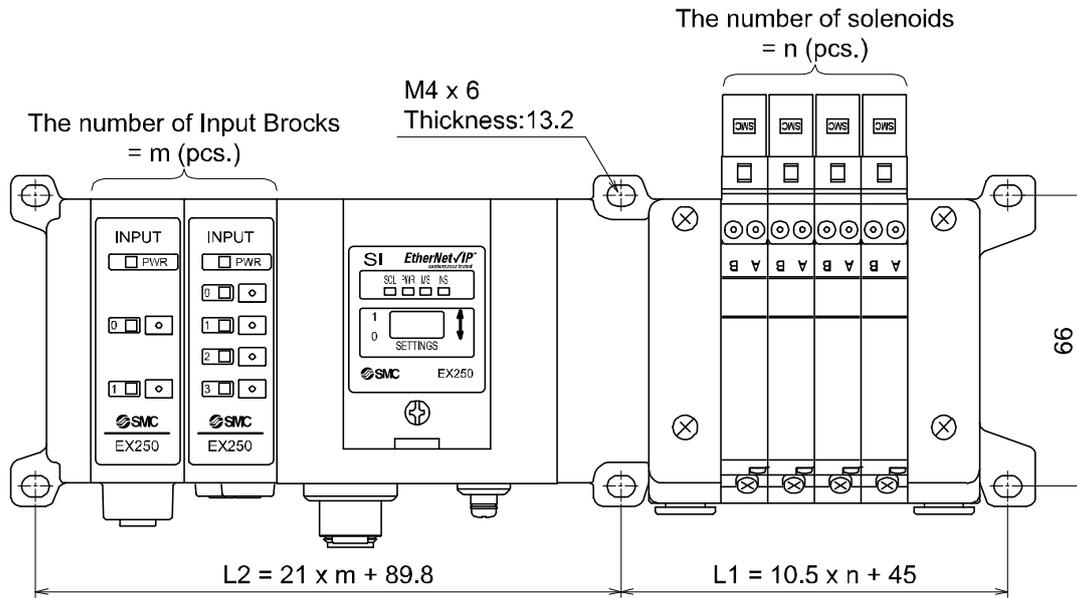
*2: For display and setting method, refer to subsection "LED Indication and Settings" (page 16) in this manual.

Mounting and Installation

■ Installation

The SI unit does not have mounting holes, so it cannot be installed alone. Make sure to connect the solenoid valve. When an input block is not required, connect the end plate directly to the SI unit.

○ Installation example



L \ n,m	0	1	2	3	4	5	6	7	8	9	10
L1	45	55.5	66	76.5	87	97.5	108	118.5	129	139.5	150
L2	89.8	110.8	131.8	152.8	173.8	194.8	215.8	236.8	257.8	278.8	299.8

L \ n,m	11	12	13	14	15	16
L1	160.5	171	181.5	192	202.5	213
L2						

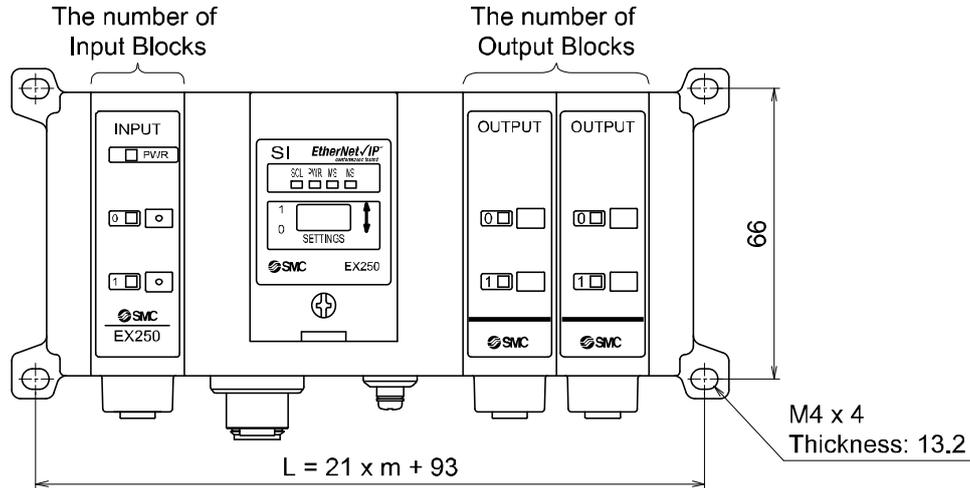
[mm]

*: L1 shows the dimensions of the VQC1000 series solenoid valve. Refer to the individual specifications for other solenoid valve series.

■ Position of end plate

- Be sure to connect the end plate (on the Input block side) at the left end of the manifold.
- When the valve is not connected, be sure to connect the end plate R (on the Output block side) at the right end of the manifold.

○ Installation example: Dimensions with solenoid valves unconnected [Unit: mm]



*: The number of Input Blocks + The number of Output Blocks + The number of Power Blocks: m

L \ m	1	2	3	4	5	6	7	8	9	10
L	114	135	156	177	198	219	240	261	282	303

[mm]

*: Each dimension shows the SI unit without solenoid valves connected and with the end plate R (on the Output block side) connected. Standard settings of L dimensions are with 10 or less m blocks. Contact SMC sales for the setting with over 10 blocks mounted. Refer to the specification for each dimension when the solenoid valves are connected.

Wiring (for power supply, communication, input and output) and piping are done on only one side. On the side, make a space for wiring and piping.

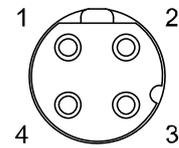
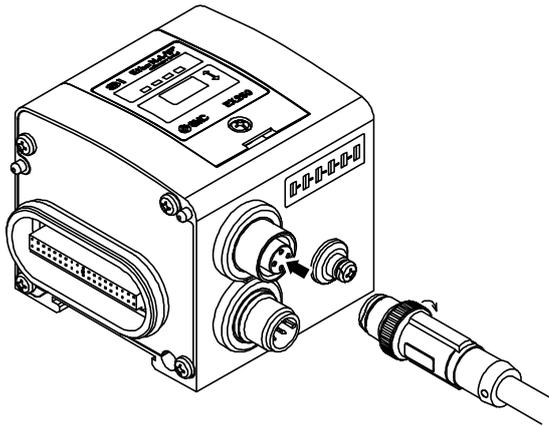
■Wiring

1. Communication wiring

Connect the Ethernet communication cable to the communication connector of SI unit.

Cable connection

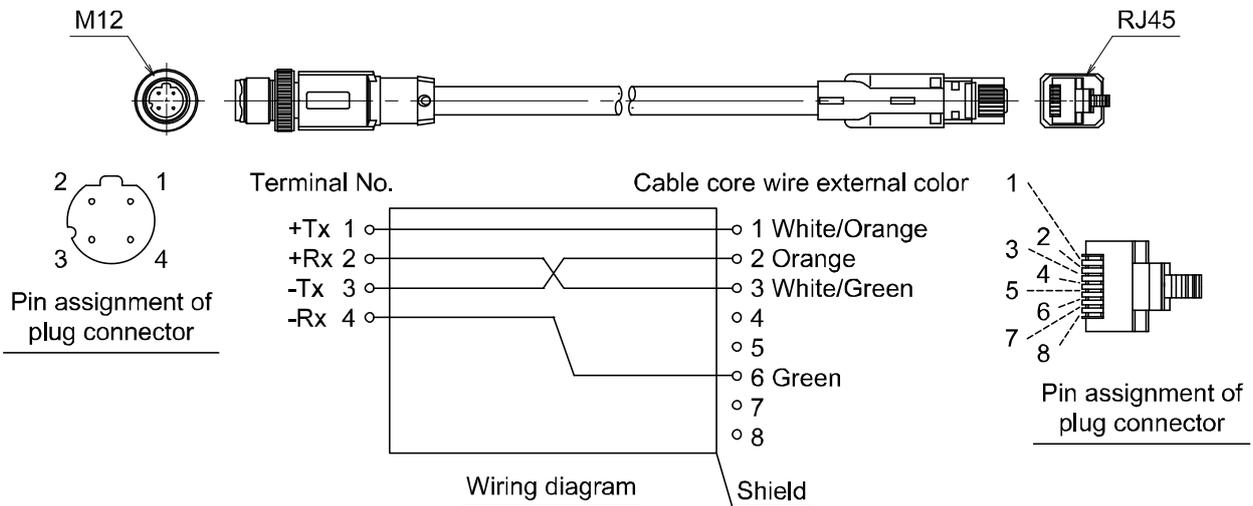
- 1) Aligning the key groove with the communication connector (4-pin, socket) of SI unit, plug the Ethernet communication cable (plug).
- 2) Tighten the lock nut on the cable side by turning it clockwise by hand.
- 3) Confirm that the connector does not move.



SI unit communication connector pin layout

Pin layout and connection diagram of Ethernet communication cable

Model No.: EX9-AC□EN-PSRJ (Refer to page 31.)



Cable specifications	
Core wire	AWG 26
Sheath color	Blue green

Refer to "Media Planning and Installation Manual" of ODVA for detail of Wiring.

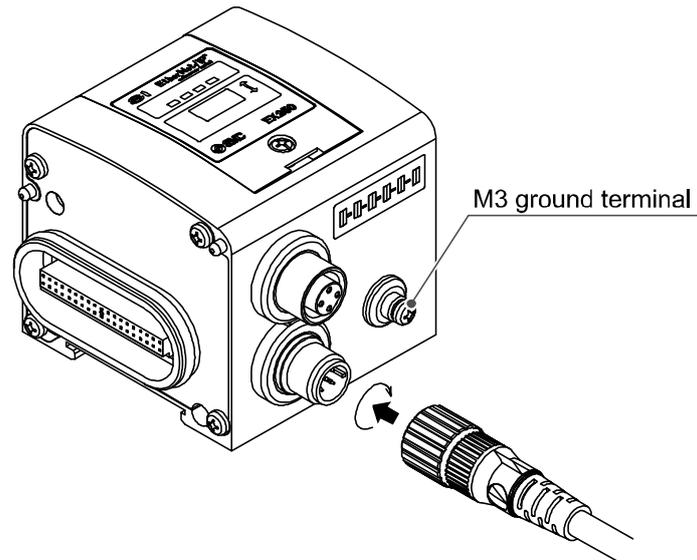
2. Power supply wiring

Connect the power supply cable to the power supply connector of SI unit.

When selecting the power supply, refer to "Safety Instructions" (page 5) in this manual.

Cable connection

- 1) Aligning the key groove with the power supply connector (plug) of SI unit, plug the power supply cable (socket).
- 2) Tighten the lock nut on the cable side by turning it clockwise by hand.
- 3) Confirm that the connector does not move.

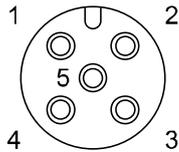
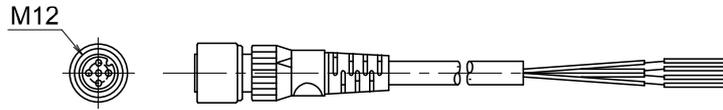


NOTE

D class grounding (with the ground resistance of 100 ohm or less) should be performed for ground terminal, and ground at one point.

Pin layout and connection diagram of power supply connector cable (unit: mm)

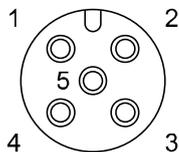
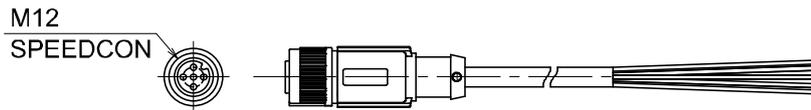
Model No.: EX500-AP□-S (Refer to page 31.)



Socket connector pin layout

Pin No.	Cable color: Signal name
1	Brown: 24 VDC +10%/-5% (for solenoid valves/output)
2	White: 0 V (for solenoid valves/output)
3	Blue: 24 VDC ±10% (for input and control)
4	Black: 0 V (for input and control)
5	Gray: Not connected

Model No.: PCA-140180□ (Refer to page 31.)



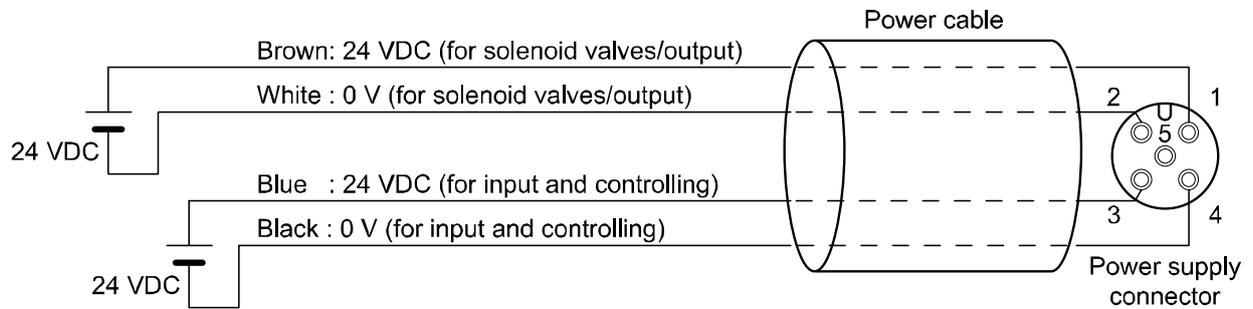
Socket connector pin layout

Pin No.	Cable color: Signal name
1	Brown: 24 VDC +10%/-5% (Solenoid valve power supply)
2	White: 0 V (Solenoid valve power supply)
3	Blue: 24 VDC ±10% (Control power supply)
4	Black: 0 V (Control power supply)
5	Green / Yellow: Not connected

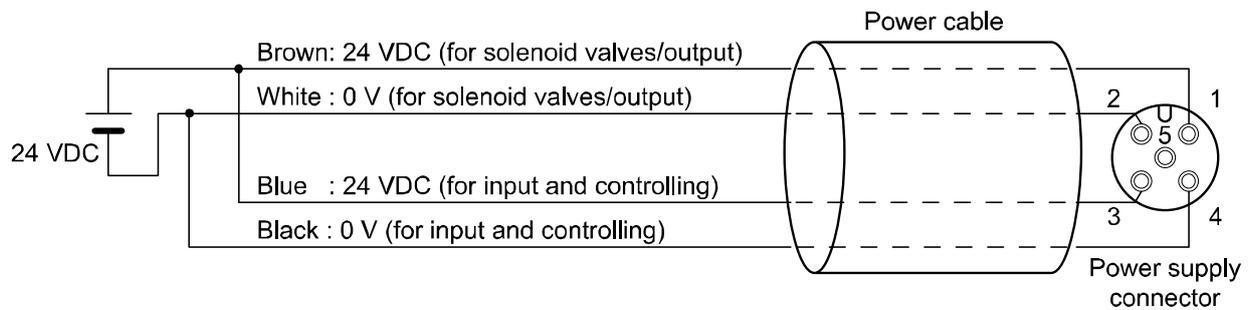
Connecting one or two power supplies to SI Unit

Both of single power supply and two power supply systems can be adopted, however, the wiring should be made separately (for solenoid valves/output and for input and control) for both systems.

A. Two power supplies



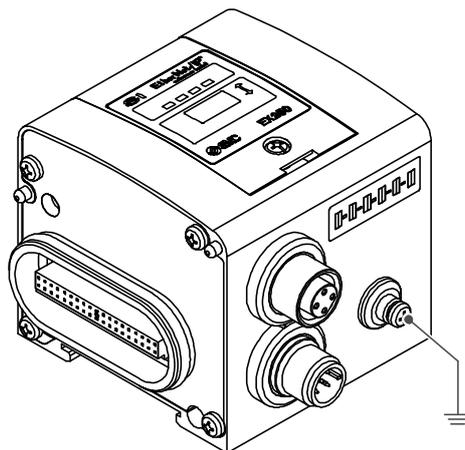
B. Single power supply



3. Ground terminal

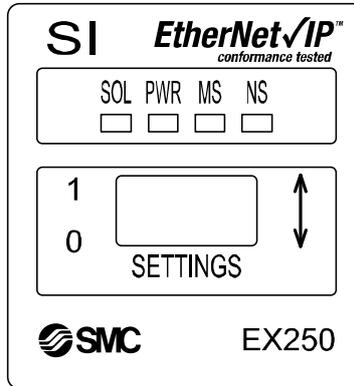
Connect the ground terminal to ground.

Resistance to ground should be 100 ohms or less.



LED Indication and Settings

oLED indication



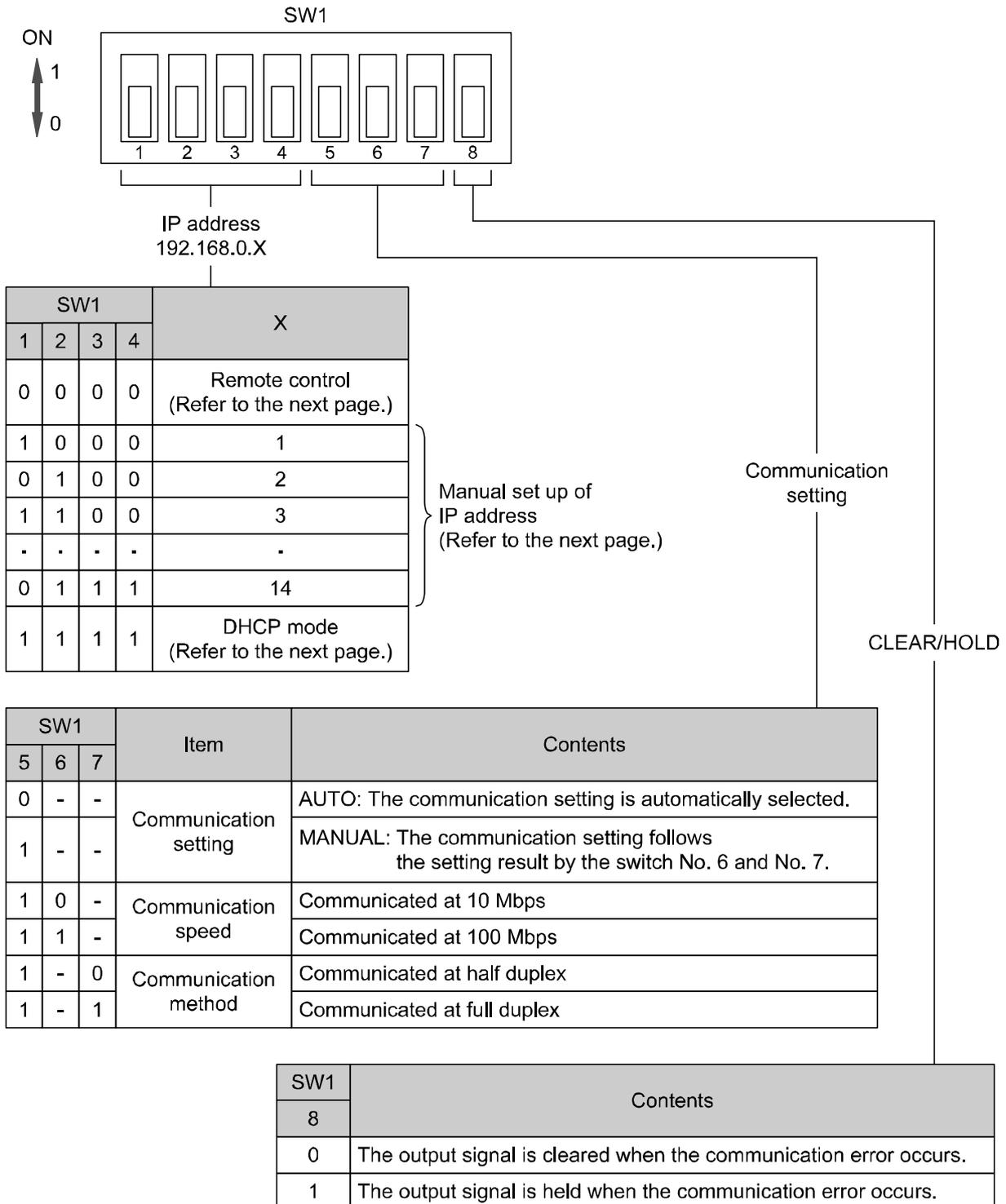
Display	Contents	
SOL	OFF	Insufficient power supply for solenoids
	Green light ON	Normal power supply for solenoids
PWR	OFF	Insufficient power supply for input and control
	Green light ON	Normal power supply for input and control
MS	OFF	The power supply for control is OFF
	Green light ON	Operating normally
	Green flashes	Setting error (Device has not been configured)
	Red flashes	Recoverable internal error
	Red light ON	Unrecoverable internal error
NS	OFF	The power supply for control is OFF or IP address not set
	Green flashes	EtherNet/IP™-level communication not established
	Green light ON	Multiple EtherNet/IP™-level communications established
	Red flashes	Multiple EtherNet/IP™-level communications time out
	Red light ON	IP address duplicated

○Switch settings

Open the switch protective cover and set the switches with a sharp-pointed watchmakers screwdriver etc.

NOTE

1. Be sure to turn off the power supply before setting the switches.
2. Be sure to set these switches before use.
3. After setting the switch, close the switch protective cover and tighten the screws with proper tightening torque. (Tightening torque: 0.6 Nm)



•Remote control (SW1 Dip switches 1-4 OFF)

SMC's EX250 SI Unit will respond to the following Rockwell Automation BOOTP/DHCP Server commands.

Enable DHCP

Selecting this function will enable the EX250 SI Unit to retrieve its IP address * from the BOOTP/DHCP Server. If DHCP is enabled the EX250 SI Unit will retrieve its IP address * during the next power up.

If the IP address * is not acquired after approximately 30 seconds from when the power is supplied, the previous IP address * from immediately before will be set.

Disable BOOTP/DHCP

Selecting this function will disable the EX250 from retrieving its IP address * from the BOOTP/DHCP Server, and will cause the EX250 to retain its current configuration during the next power up.

•DHCP mode (SW1 Dip switches 1-4 ON)

The IP address * is acquired from the DHCP Server. If the IP address * is not acquired after approximately 30 seconds from when the power is supplied, the previous IP address * from immediately before will be set. The IP address * will be lost if the power supply is disconnected.

•Manual set up of IP address *

The IP address* range is 192.168.0.1 to 192.168.0.14.

*: Information such as the subnet masks is included.

Default settings

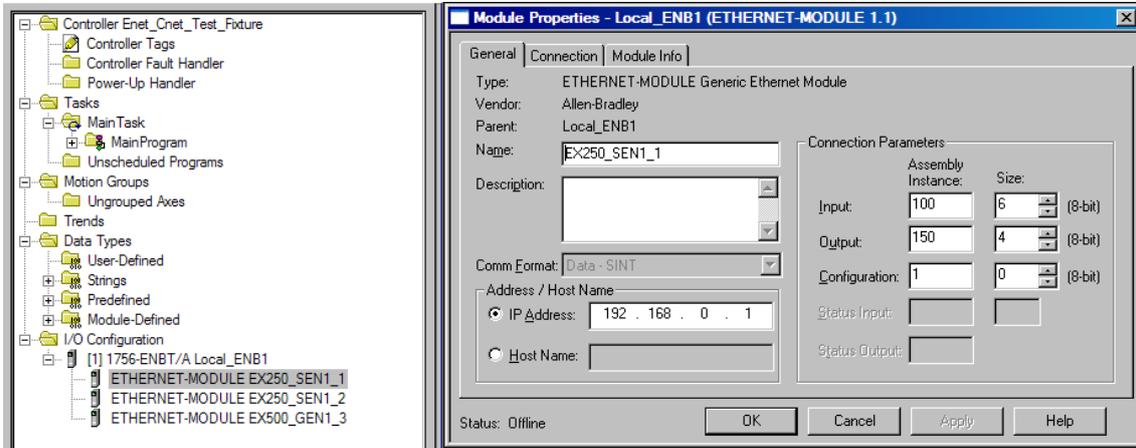
At the time of factory shipment, the product is in "Remote Control Mode" and set to "Enable DHCP".

NOTE

If the stored address of an EX250 is not known, please go to the "DHCP Mode" section.

EtherNet/IP™ CONFIGURATION WITH RSLogix5000™

When setting up the node with RSLogix5000™, specific values must be entered for the assembly instance with regards to Input, Output and Configuration. Please see the diagram below for a Rockwell Automation's RSLogix5000™ programming software example.



*: PLC software RSLogix5000™ manufactured by Rockwell Automation is shown above. RSLogix5000™ is a registered trademark of Rockwell Automation.

Connection Parameter

Assembly Instance values:

Description	Decimal	
	"Data-INT"	"Data-SINT"
Comm Format		
Input	100	100
Output	150	150
Configuration	1	1

Size:

Description	Size	
	"Data-INT"	"Data-SINT"
Comm Format		
Input	3 words	6 bytes
Output	2 words	4 bytes
Configuration	0 word	0 byte

Maintenance

How to replace SI unit

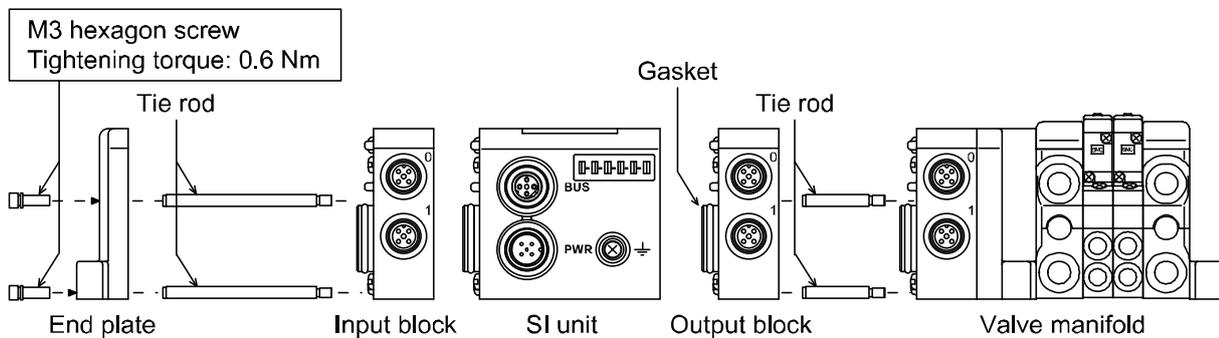
- Remove screws mounted on the end plate, and separate it from the valve unit.
 - Replace the SI unit (Tie-rods should not be removed).
- Mount the removed end plate, and tighten it with the same screws with specified tightening torque. (0.6 Nm)

⚠ Precautions on maintenance

- (1) Be sure to check that all the power supply is turned off.
- (2) Foreign matters must not be intruded in the unit.
- (3) Foreign matters or scratches must not be present on the gasket.
- (4) Tighten the screws with the specified tightening torque.

If they are not set properly, the failure of board, or liquid and or dust intrusion the unit can result.

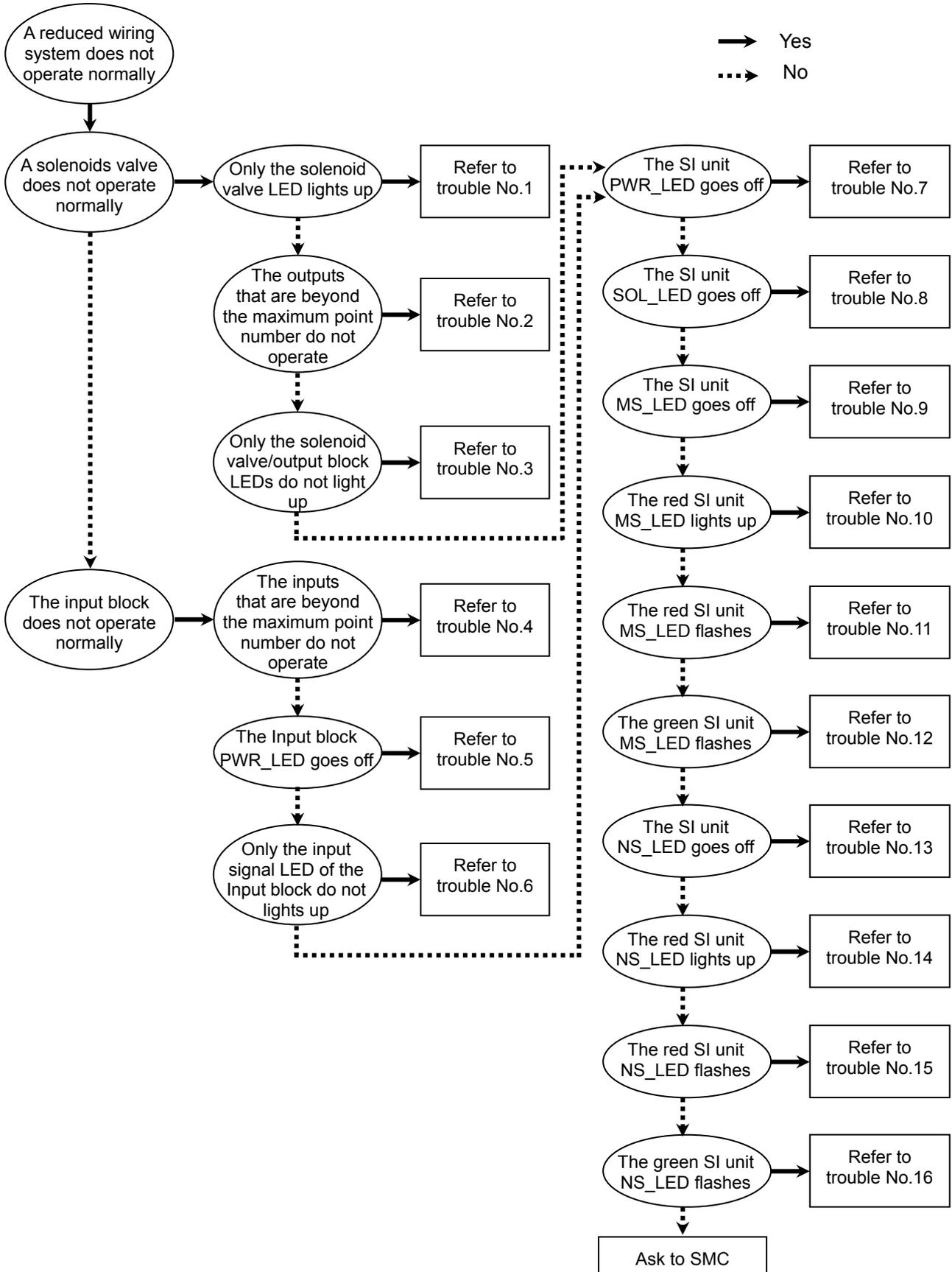
How to assemble and disassemble SI unit



Troubleshooting

Troubleshooting flow chart

If the SI unit malfunctions, select the specific trouble with the flow chart stated below.



Trouble

Trouble No.1

Trouble	Possible cause	Investigation method of cause	Remedy
Only the solenoid valve LED lights up	Solenoid valve failure	Check the troubleshooting for the solenoid valve.	Correct the trouble of the solenoid valve.

Trouble No.2

Trouble	Possible cause	Investigation method of cause	Remedy
The outputs that are beyond the maximum point number do not operate.	Inadequate total number of outputs from the solenoid valves and Output block connected with the SI unit	Check if the total number of outputs is 32 or less (24 for the solenoid valve VQC series).	Eliminate extra unused outputs from the manifold to ensure the number of outputs is 32 or less.

Trouble No.3

Trouble	Possible cause	Investigation method of cause	Remedy
Only the solenoid valve/Output block LEDs do not light up	Incorrect wiring for the power supply for solenoid valve and the power supply for output	Check that the power supply cable for the solenoid valve and output is not broken, and that the connection between the power supply cable and connector has not loosened.	Review the connection condition of the power supply cable. (If the cable is broken, replace it with a new one.)
		Check that there is no incorrect wiring of the power supply cable.	Review the wiring condition of the power supply cable.
	Failure of the power supply for the solenoid valve and output	Check the supply voltage to the power supply for the solenoid valve and output.	Supply 24 VDC +10%/-5% to the power supply for the solenoid valve and output.
	Incorrect connection between the SI unit and the solenoid valve and/or output block	Check that the bolt joining the SI unit with the solenoid valve and Output block has not loosened.	Tighten the bolts by hand so that there is no gap between the SI unit and the solenoid valve and/or Output block. Tighten at the specified torque. (Tightening torque: 0.6 Nm)
		Check if the Output block (for high wattage and load and low wattage and load) and power block are mounted in the right position.	Review the position of the Output block and Power block.
Intrusion of liquids such as water	Check that unused connectors of the Output block and Power block are plugged with waterproof caps.	If liquid such as water has got into the Output block and/or Power block, replace the Output block and Power block with new ones.	

Trouble No.3

Trouble	Possible cause	Investigation method of cause	Remedy
Only the solenoid valve/Output block LEDs do not light up	Incorrect connection of the load with the Output block	Check that the output load cable is not broken, and that the connection between the output load and connector has not loosened.	Review the connecting condition of the output load. (If the cable is broken, replace it with a new one.)
		Check if the specifications of the SI unit match those of the output load (+ common, - common).	Use - common with the output load for the PNP output.
	Inconsistent polarity between the solenoid valve (VQC1000/2000) and output block	Check if the specifications of the SI unit match those of the solenoid valve and output block (+ common, - common).	Use - common with the solenoid valve and Output block suitable for the PNP output of the SI unit.
	Failure of the solenoid valve and/or Output block	Check the troubleshooting for the solenoid valve.	Correct the trouble of the solenoid valve.
Replace the SI unit with new one and operate to check the normal operation recovers.		Replace the SI unit with new one.	

Trouble No.4

Trouble	Possible cause	Investigation method of cause	Remedy
The inputs that are beyond the maximum point number do not operate.	Inadequate total number of inputs from the Input block connected with the SI unit	Check if the total number of inputs is 32 or less.	Eliminate extra unused inputs from the manifold to ensure the number of inputs is 32 or less.

Trouble No.5

Trouble	Possible cause	Investigation method of cause	Remedy
The Input block PWR_LED goes off.	Failure of the power supply for the input and control of the SI unit.	Check the supply voltage to the power supply for the input and control of the SI unit.	Supply 24 VDC \pm 10% to the power supply for the input and control.
	Incorrect connection between the SI unit and input block	Check that the bolt joining the SI unit and Input block has not loosened.	Tighten the bolts by hand so that there is no gap between the SI unit and Input block. Tighten at the specified torque. (Tightening torque: 0.6 Nm)
	The Input block fuse has melted	Check if the fuse of the input block has melted.	Remove the cause of the short-circuit and replace the fuse with new one.
	Intrusion of liquids such as water	Check that unused connectors of the Input block are plugged with waterproof caps.	If liquid such as water has got into the input, replace the Input block with new one.
	Input block failure	Replace the Input block with new one and operate to check the normal operation recovers.	Replace the Input block with new one.

Trouble No.6

Trouble	Possible cause	Investigation method of cause	Remedy
Only the input signal LED of the Input block do not lights up	Inconsistent polarity in sensors	Check the specifications of the Input block (NPN, PNP) match those of the sensor.	Make a suitable combination of Input block and sensor.
	Incorrect connection of the sensor	Check that the sensor cable is not broken and that the connection between the sensor cable and connector has not loosened.	Review the connection condition of the sensor cable. (If the cable is broken, replace it with new one.)
	Sensor failure	Check the troubleshooting of the sensor.	Correct the trouble of the sensor.

Trouble No.7

Trouble	Possible cause	Investigation method of cause	Remedy
The SI unit PWR_LED goes off.	Incorrect wiring of the power supply for the input and control	Check that the power supply cable for the input and control is not broken, and that the connection between the power supply cable and connector has not loosened.	Review the connection condition of the power supply cable. (If the cable is broken, replace it with new one.)
		Check that there is no incorrect wiring of the power supply cable.	Review the wiring condition of the power supply cable.
	Failure of the power supply for the input and control	Check the supply voltage to the power supply for the input and control.	Supply 24 VDC \pm 10% to the power supply for the input and control.

Trouble No.8

Trouble	Possible cause	Investigation method of cause	Remedy
The SI unit SOL_LED goes off.	Incorrect wiring for the power supply for solenoid valve and the power supply for output	Check that the power supply cable for the solenoid valve and output is not broken, and that the connection between the power supply cable and connector has not loosened.	Review the connection condition of the power supply cable. (If the cable is broken, replace it with new one.)
		Check that there is no incorrect wiring of the power supply cable.	Review the wiring condition of the power supply cable.
	Failure of the power supply for the solenoid valve and output	Check the supply voltage to the power supply for the solenoid valve and output.	Supply 24 VDC +10%/-5% to the power supply for the solenoid valve and output.

Trouble No.9

Trouble	Possible cause	Investigation method of cause	Remedy
The SI unit MS_LED goes off.	Abnormal status of the SI unit.	Check if the Earth terminal is grounded.	Provide grounding to improve the noise resistance of the reduced wiring system.
		Check if the power supply line is in the same route as the power line and/or high voltage line	Separate the power supply cable from the power line and/or high voltage line and restart the power supply of the SI unit.

Trouble No.10

Trouble	Possible cause	Investigation method of cause	Remedy
The red SI unit MS_LED lights up.	Abnormal status of the SI unit.	Check if the Earth terminal is grounded.	Provide grounding to improve the noise resistance of the reduced wiring system.
		Check if the power supply line is in the same route as the power line and/or high voltage line.	Separate the power supply cable from the power line and/or high voltage line.
	SI unit failure.	Replace the SI unit with a new one and operate to check the normal operation recovers.	Replace the SI unit with a new one.

Trouble No.11

Trouble	Possible cause	Investigation method of cause	Remedy
The red SI unit MS_LED flashes.	Abnormal status of the SI unit.	Check if the Earth terminal is grounded.	Provide grounding to improve the noise resistance of the reduced wiring system.
		Check if the power supply line is in the same route as the power line and/or high voltage line.	Separate the power supply cable from the power line and/or high voltage line.

Trouble No.12

Trouble	Possible cause	Investigation method of cause	Remedy
The green SI unit MS_LED flashes.	Setting error.	Check the setting of the SI unit.	Review the setting of the SI unit.

Trouble No.13

Trouble	Possible cause	Investigation method of cause	Remedy
The SI unit NS_LED goes off.	IP address not set.	Check the setting of IP addresses.	Review the setting of IP addresses.

Trouble No.14

Trouble	Possible cause	Investigation method of cause	Remedy
The red SI unit NS_LED lights up.	Duplicated IP address.	Check that there is no duplicated IP address.	Review the setting of IP addresses.

Trouble No.15

Trouble	Possible cause	Investigation method of cause	Remedy
The red SI unit NS_LED flashes.	Broken communication line.	Check that there is no broken communication line or loosened connector.	Review the connection condition of the communication line. (If the cable is broken, replace it with a new one.)
		Check if the PLC is operating normally.	Review the setting of PLC.

Trouble No.16

Trouble	Possible cause	Investigation method of cause	Remedy
The green SI unit NS_LED flashes.	Waiting for connection to be established.	Check the address and communication setting.	Review the setting of the switch and address.
		Check that there is no broken communication line or loosened connector.	Review the connection condition of the communication line. (If the cable is broken, replace it with a new one.)
		Check if the PLC is operating normally.	Review the setting of PLC.

Specifications

■ Specifications

General specification

Item	Specification
Operating ambient temp.	5 to 45 °C
Operating ambient humidity	35 to 85%RH (No dew condensation)
Storage ambient temp.	-20 to +60 °C
Withstand voltage	500 VAC for 1 min.
Insulation resistance	500 VDC 10 MΩ or more
Operating environment	No corrosive gas
Pollution degree	Pollution degree 3
Enclosure	IP67
Weight	Approx. 250 g
Applicable standard	UL/CSA, CE

Electrical specifications

Item	Specification		
Rated voltage	24 VDC		
Range of power supply voltage	Power supply for input and control: 24 VDC±10% Power supply for output: 24 VDC+10%/-5%		
Rated current	Power supply for input and control: Max. 1.1 A <table border="1" style="margin-left: 20px;"> <tr> <td style="padding: 2px;">Inside SI Unit: 0.1 A</td> </tr> <tr> <td style="padding: 2px;">Input device: 1 A</td> </tr> </table> Power supply for output: Max. 2 A	Inside SI Unit: 0.1 A	Input device: 1 A
Inside SI Unit: 0.1 A			
Input device: 1 A			
Number of input/output points	Input point: Max. 32 / Output point: Max. 32 *		
Output type	PNP (negative common) / source		

*: The maximum output point is 24 when the Power block is connected.

Communication specification

Item	Specification
Protocol	Ethernet (IEEE802.3)
Media	100BASE-TX
Communication speed	10 M/100 Mbps (Automatic selection or manual setting)
Max. segment length	100 m (328 ft)
Max. transceiver number	2 (per segment)
Communication method	Full duplex/Half duplex (Automatic selection or manual setting)
Fieldbus protocol	EtherNet/IP™
I/O message	Input : Data length 6 byte, Instance 100. Output : Data length 4 byte, Instance 150.
IP address setting range	192.168.0.1 to 192.168.0.14 (Setting by an internal switch) Or optional setting by the DHCP server
Device information	Vendor ID : 7 (SMC Corp.) Product type : 12 (communication adapter) Product code : 107

I/O mapping

Input area mapping

Offset (word)	Input data																
	MSB								LSB								
	15								0								
0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Sensor input area
1	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	
2	L	L	L	L	SP	DI	L	L	L	L	L	L	L	L	L	L	

L: Fixed to Low

Status input area

Diagnostic (Status input area)

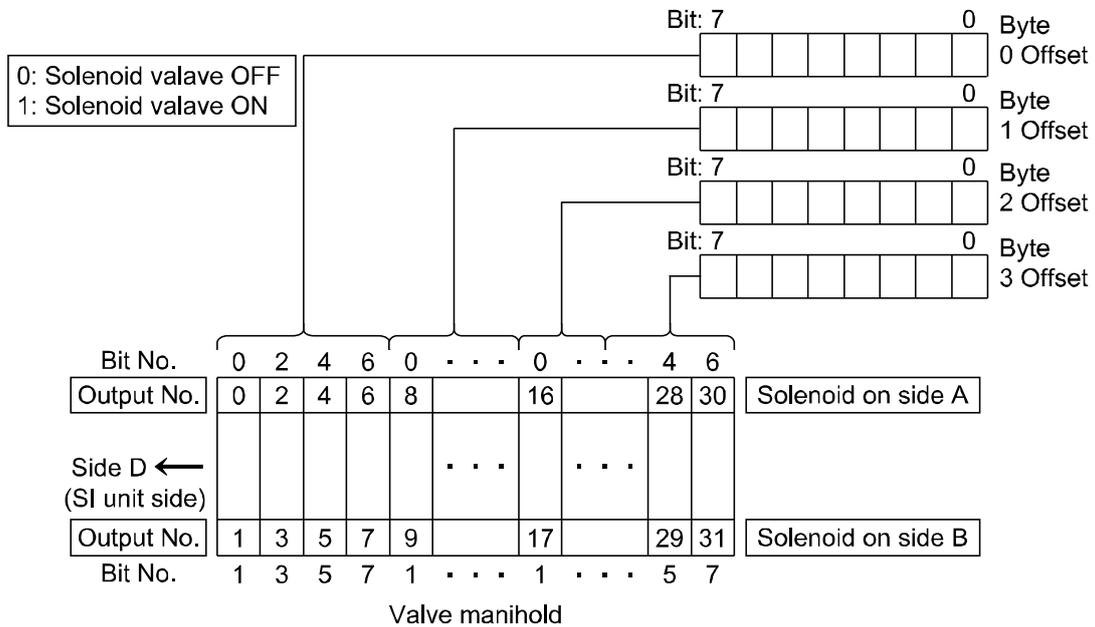
Item	Status	Condition	
SP	Status of solenoid power supply	0	No supply voltage
		1	Supply voltage OK
DI	Status of sensor power supply	0	Short circuit
		1	Normal

Output area mapping

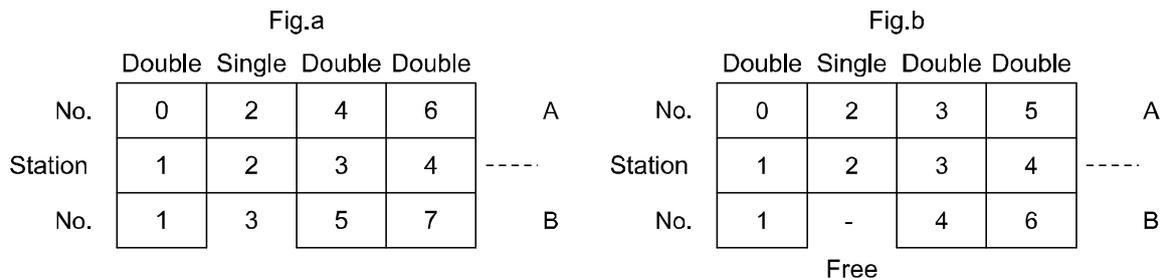
Offset (word)	Output data															
	MSB								LSB							
	15								0							
0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

○Output No. assignment

Combinations of output data and valve manifold

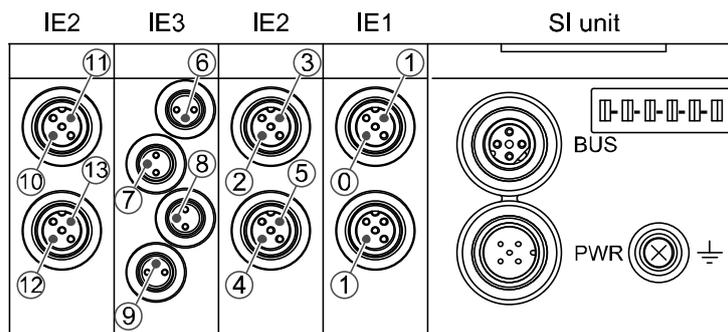


- *: Output No. starts from 0, and will be assigned to the valves in order from the SI unit mounted side.
- *: Manifold wiring is double wired as standard ("double wiring specification"), and the output numbers are assigned in order from A side to B side. If the mounted valves are single solenoid valves, the output on B side will be empty. (See Fig. a)
- *: Special wiring specification with a mixed wiring of single solenoid and double solenoid can be specified with a wiring specification sheet. This makes it possible to specify the output numbers without empty outputs. (See Fig. b)
- *: Each bit status, 0 or 1, of the data shows the ON or OFF solenoid valve status (0: OFF, 1: ON), and the output number starting from 0 will be assigned to from the lowest bit of the memory data.

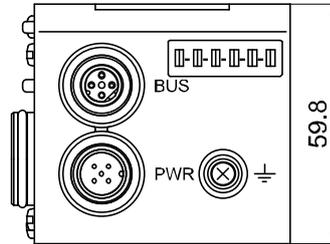
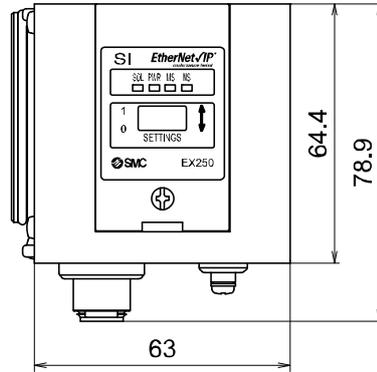
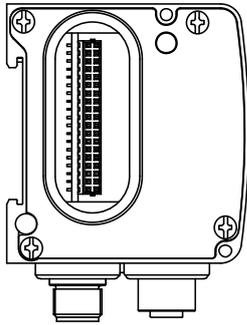


○Input No. assignment

Input numbers start from 0, and will be assigned to the input blocks in order from the SI unit mounted side.



■Dimensions



Option

1. Ethernet communication cable

For details, refer to subsection "Wiring" (page 12) in this manual.

How to order

EX9-AC 020 EN-PSRJ

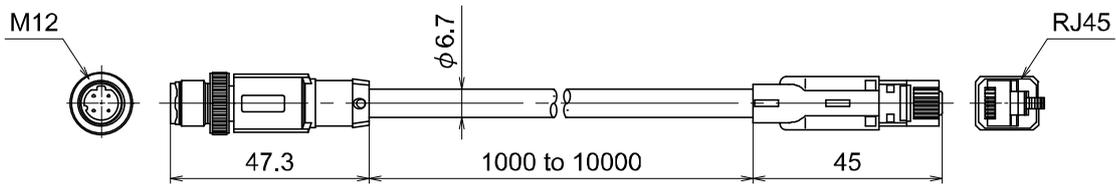
• Connector specification

PSRJ	M12 plug (straight) ↔ RJ45 connector
------	--------------------------------------

• Cable length

010	1 [m]
020	2 [m]
030	3 [m]
050	5 [m]
100	10 [m]

Cable outer diameter	Approx. 6.7 mm
Minimum bending radius	33.5 mm (Fixed)



2. Power supply cable

For details, refer to subsection "Wiring" (page 13) in this manual.

How to order

EX500-AP 010 - S

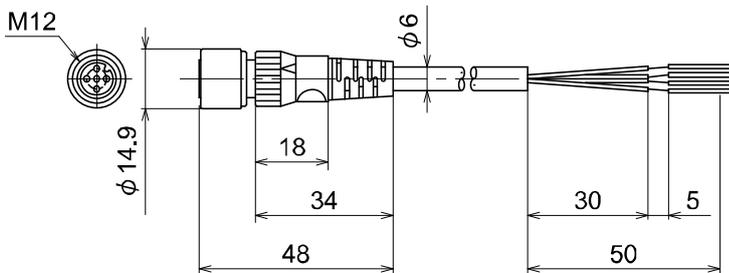
• Connector specification

S	Straight
---	----------

• Cable length

010	1 [m]
050	5 [m]

Cable outer diameter	Approx. 6 mm
Wire gauge (stranded wire cross section)	0.3 mm ² /AWG22
Wire outer diameter (including insulating material)	Approx. 1.6 mm
Minimum bending radius	40 mm (Fixed)

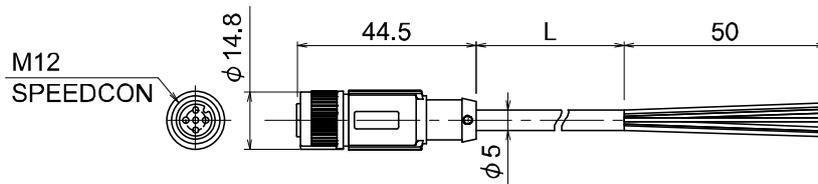


PCA-140180⁴

• Cable length

4	1.5 [m]
5	3 [m]
6	5 [m]

Cable outer diameter	Approx. 5 mm
Wire gauge (stranded wire cross section)	0.34 mm ² /AWG22
Wire outer diameter (including insulating material)	Approx. 1.27 mm
Minimum bending radius	21.7 mm (Fixed)



3. Spare fuse (for Input block)

How to order

EX9-FU⁰⁵

• Rating

05	0.5 [A]
----	---------

4. Output cable

How to order

EX9-AC⁰¹⁰-7

• Cable length

010	1 [m]
030	3 [m]

5. Power supply cable (for power input connector of Power block)

How to order

EX9-AC 010 -1

• Cable length

010	1 [m]
030	3 [m]
050	5 [m]

6. Power supply cable (for power supply connector of Power block)

How to order

EX9-AC 002 -3

• Cable length

002	0.2 [m]
-----	---------

7. Input block relay connector cable

How to order

PCA- 1557769

• Cable specification

1557769	M12, 4-pin connector: 3 m
1557772	M8, 3-pin connector: 3 m

8. Input block assembly type connector

How to order

PCA- 1557730

• Cable specification

1557730	M8, 3-pin Plug connector (AWG26 to 22)
1557743	M12, 4-pin Plug connector (AWG26 to 22)
1557756	M12, 4-pin Plug connector (AWG22 to 18)

9. End plate (Input block side)

How to order

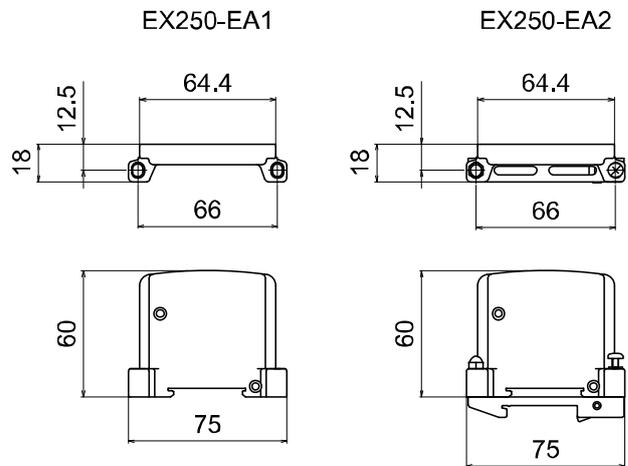
EX250-EA **1**

• Mounting method

1	Standard product
2	For DIN rail mounting

Accessory

Hexagon thin socket head bolt (2 pcs.)



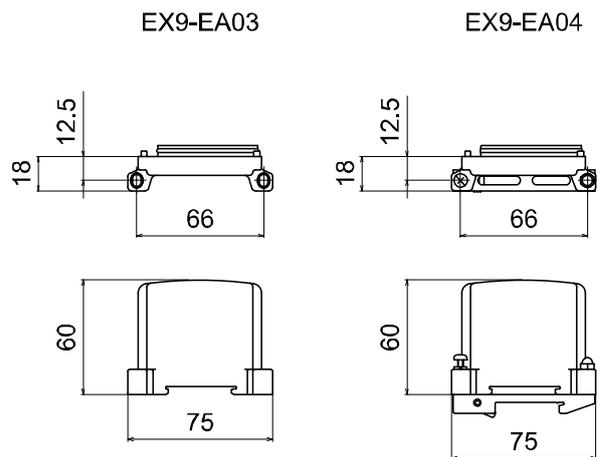
10. End plate R (Output block side)

How to order

EX9-EA **03**

• Mounting method

03	Standard product
04	For DIN rail mounting



11. Waterproof cap

Mounted on the unused ports of the Input block, Output block and Power block.

Proper use of this waterproof cap can achieve IP67 enclosure. (The waterproof caps are delivered together with the Power block as accessories.)

How to order

EX9-AW **ES**

• Connector specification

ES	M8 connector (for socket) / 10 pcs.
TS	M12 connector (for socket) / 10 pcs.



NOTE

Tighten the waterproof cap with the specified tightening torque. (0.05 Nm for M8, 0.1 Nm for M12)

Revision history
A: Add some contents.
B: Add some contents.

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

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