No.EX##-OMN0003-A

Operation Manual

PRODUCT NAME

EtherNet/IP™ Compatible Fieldbus System

MODEL / Series / Product Number

EX500-GEN1 etc.

SMC Corporation

Contents

Safety Instructions	3
Product Summary	8
System configuration	8
EX500 GW unit	
Model indication and How to order	9
Summary of Product parts	9
Mounting and Installation	10
Installation	10
Wiring	10
Setting	18
EtherNet/IP™ CONFIGURATION WITH RSLogix5000™	21
Specification	23
Specifications	23
Dimensions	25
SI unit	
Model indication and How to order	26
Summary of Product parts	27
Mounting and Installation	28
Installation	28
Setting	30
Specification	31
Specifications	31
Dimensions	33
Input Unit Manifold	
Model indication and How to order	34
Summary of Product parts	35
Mounting and Installation	36
Installation	36
Wiring	36
Setting	40
Specification	41
Specifications	41
Dimensions	42
EX9 series General Purpose Output Block	
Model indication and How to order	44
Summary of Product parts	45

Mounting and Installation 46
Installation 46
Wiring 47
Setting 49
Specification 50
Specifications 50
Dimensions 51
Troubleshooting 52
Option 62

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. ***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.

■Safety Instructions

⚠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 Serial System.
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

•The direct current power supply to combine should be UL1310 Class 2 power supply when conformity to UL is necessary.

•The product is a c UL us approved product only if they have a c UL us 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 fieldbus system.

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.

IP65/67 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 fieldbus system and/or I/O device can result, causing malfunction.

•Do not route wires and cables together with power or high voltage cables.

Otherwise the fieldbus system 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 fieldbus system 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 fieldbus system is incorporated into equipment.

Otherwise noise can cause malfunction.

•Separate the power line for output devices from the power line for control.

Otherwise noise or induced surge voltage 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 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.
  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 fieldbus system, this may cause deterioration or breakage of the internal circuit of the fieldbus system. Avoid sources of surge generation and crossed lines.
- When a surge-generating load such as a relay or solenoid is driven directly, use an fieldbus system with a built-in surge absorbing element.
  Direct drive of a load generating surge voltage can damage the fieldbus system.
- 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 fieldbus system to avoid failure and malfunction.
- 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

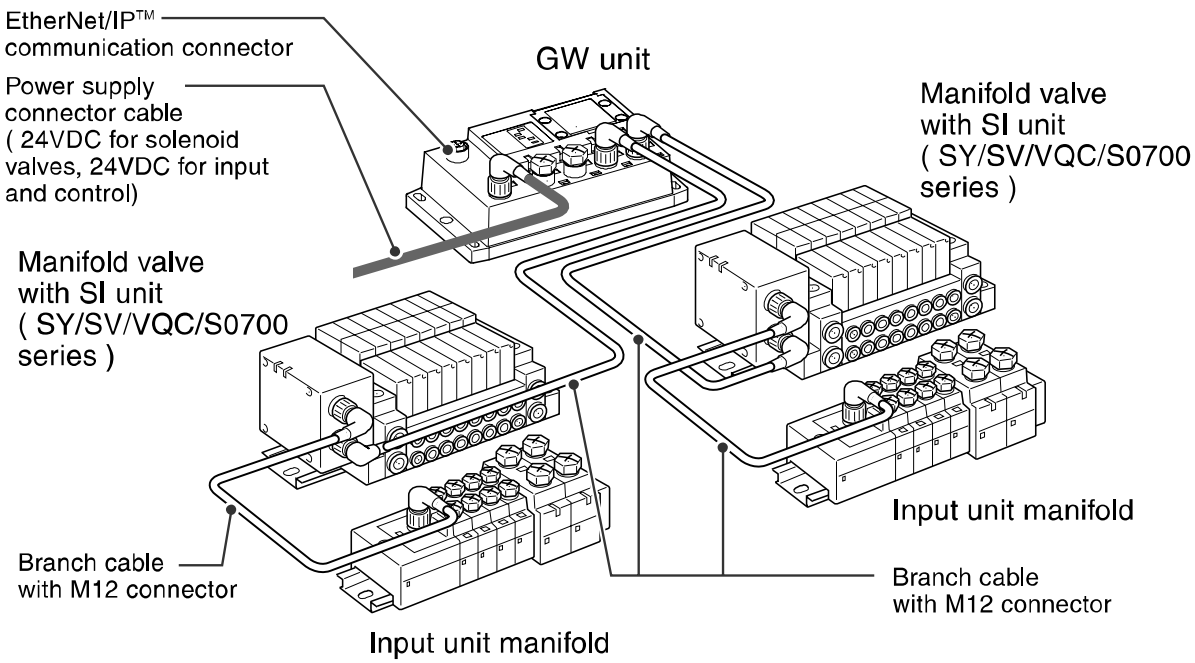
- Perform settings suitable for the operating conditions.
  Incorrect setting can cause operation failure.
- Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.
  For the PLC protocol and programming refer to the relevant manufacturer's documentation.

∗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 each 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



The Fieldbus system is connected to open fieldbus (EtherNet/IP™) realizes the reduced wiring and decentralized installation of I/O devices. The signals to/from fieldbus are exchanged by GW unit, and the signals to/from decentralized I/O devices are collected and delivered by GW unit.
The maximum number of connections of manifold valve/Input unit manifold is 16/branch x 4 branches = 64 points each for output and input.

As the cables with M12 connectors are used for all wirings among devices, the system complies with the IP65 environment.

Model indication and How to order

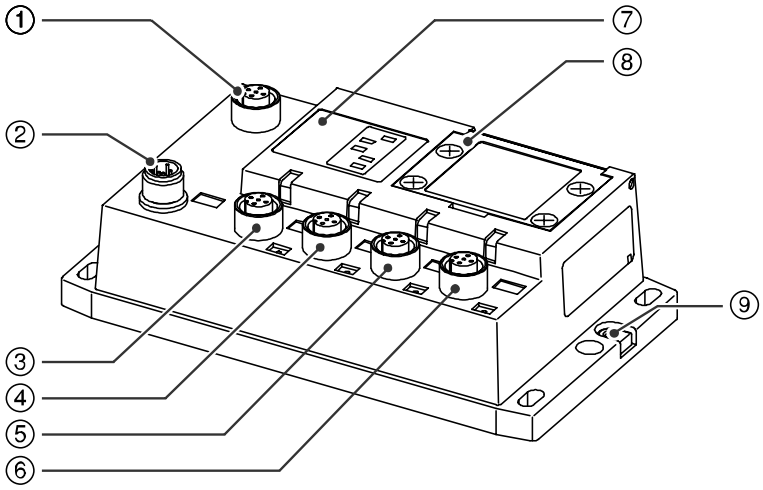
- GW unit

EX500-GEN1

Fieldbus

EN1	EtherNet/IP™

Summary of Product parts



No.	Description	Function
1	Communication connector	Connect with EtherNet/IP™ line. *1
2	Power supply connector	Supply power for output devices such as solenoid valve, for input devices such as sensor, and for controlling GW/SI by using power supply connector cable. *1
3	Communication port A (COM A)	Connect SI unit (manifold valve) or Input unit by using branch cable with M12 connectors. *1
4	Communication port B (COM B)	
5	Communication port C (COM C)	
6	Communication port D (COM D)	
7	Display	Display the power supply status and communication status with PLC. *2
8	Station number switch protective cover	Set IP address and communication method by using the switches under this cover. *2
9	Ground terminal	Functional earth (FE).

∗1: For wiring method, refer to subsection "Wiring" (page 10) of section "EX500 GW unit" in this manual.

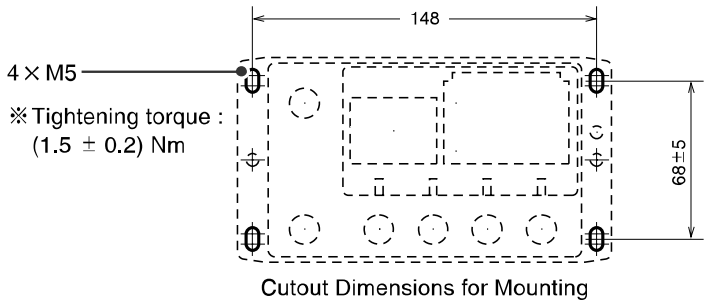
∗2: For display and setting method, refer to subsection "Setting" (page 18) of section "GW unit" in this manual.

Mounting and Installation

■Installation

•Thread mounting

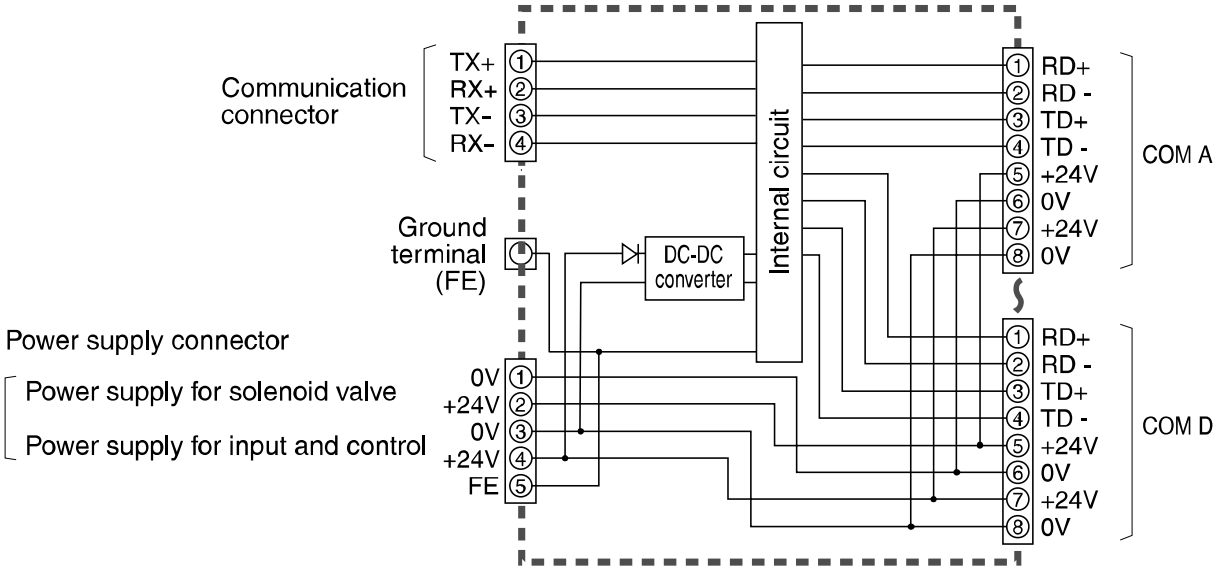
Secure at four positions with screws with head diameter of 5.2 or more and thread length of 15 mm or more.

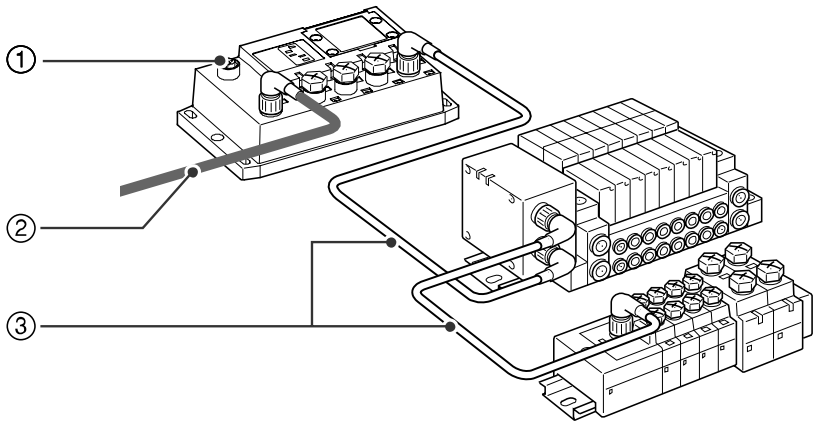


Cutout Dimensions for Mounting

■Wiring

•Internal circuit





The wirings are described in the following order.

1. Communication wiring: Connection with EtherNet/IP™

↓

2. Power supply wiring: Connections of power supplies for solenoid valves and for input devices and control

↓

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

1. Communication wiring

Connect the cable with Ethernet communication connector to the communication connector of GW unit.

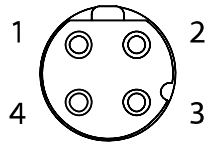
Cable connection

(1) Aligning the key groove with the communication connector (4-pin, socket, D-code) of GW unit, plug the Ethernet communication cable (plug).

Pin layout with communication connector

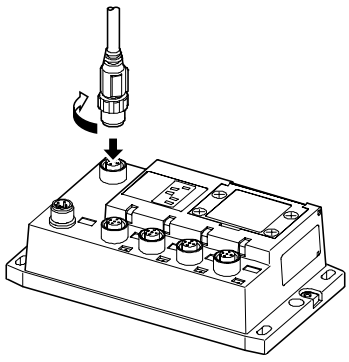
M12, 4-pin, socket, D-code

No	Description
1	TX+
2	RX+
3	TX-
4	RX-



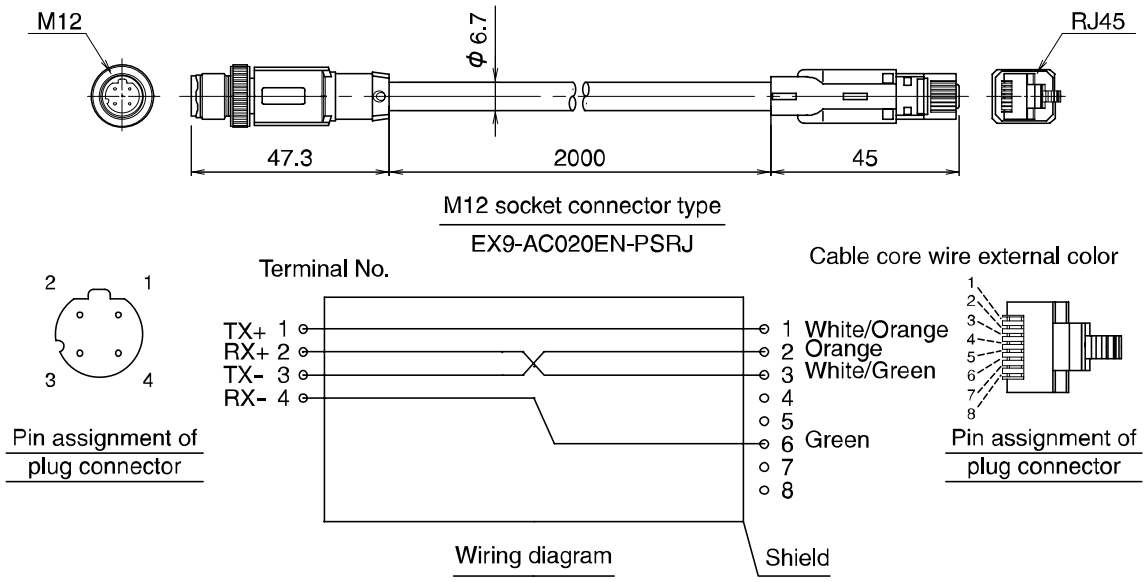
(2)Tighten the lock nut on cable side by turning it clockwise by hand.

(3)Confirm that the connector portion does not move.

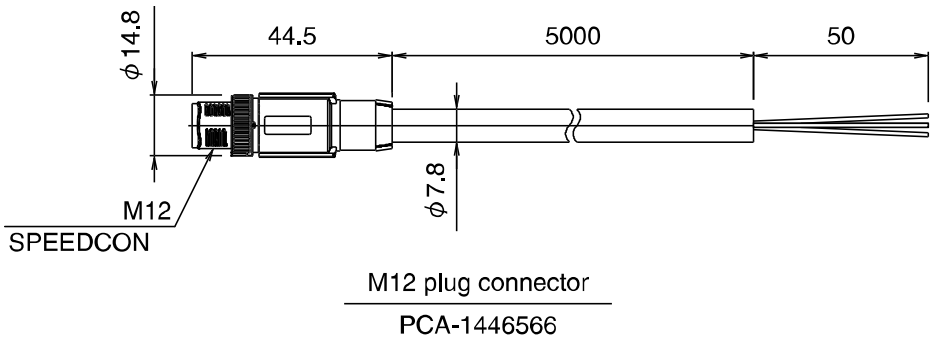


Pin layout and connection diagram of cable with Ethernet communication connectors

Connect the communication cable with plug-type M12 connector to the communication connector of GW unit.



Cable specifications	
Core wire colour	AWG 26
Sheath color	Blue green



Pin No.	Cable color : Signal name
1	Yellow or White/Orange: TX+
2	White or White/Green : RX+
3	Orange : TX-
4	Blue or Green : RX-

2. Power supply wiring

Connect the power supply connector cable which connector type have straight and angle to the power supply connector of GW unit.

With this cable, the power is supplied to the output devices such as solenoid valve, and the input devices such as sensor, and for control. Therefore, there is no need to supply the power to other units individually.

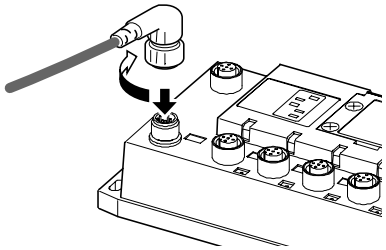
When selecting the power supply, refer to "Safety Instructions" (page 3) in this manual.

Cable connection

(1) Aligning the key groove with the power supply connector (plug) of GW unit, plug the power supply cable (socket)

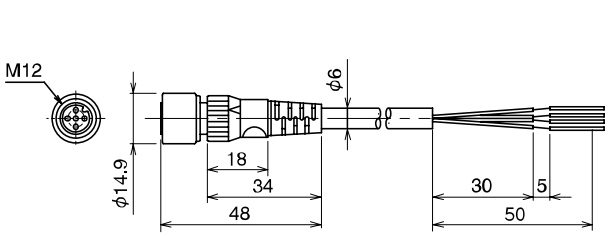
(2)Tighten the lock nut on cable side by turning it clockwise by hand.

(3)Confirm that the connector portion does not move.



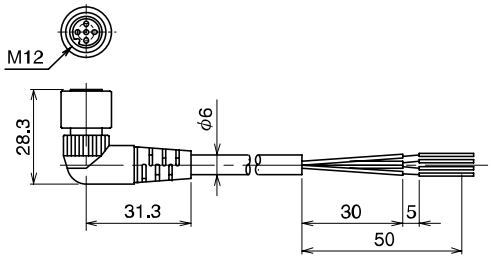
Pin layout and connection diagram of power supply connector cable for (unit: mm)

(Pin layout and connection diagram are common to all cables.)



Straight connector Type

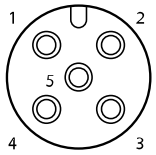
EX500-AP□-S



Angle connector Type

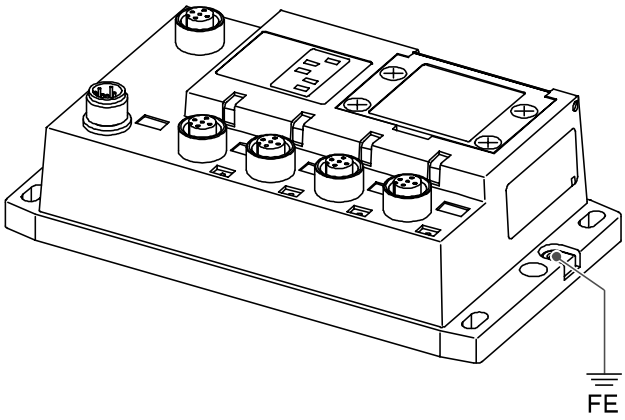
EX500-AP□-A

Pin No.	Cable color: Signal name
1	Brown: 0 V (for solenoid valves)
2	White: 24 VDC+10%/-5% (for solenoid valves)
3	Blue: 0 V (for input and control)
4	Black: 24 VDC ±10% (for input and control)
5	Gray: Ground (FE)



Socket Connector Pin Layout

○FE connection

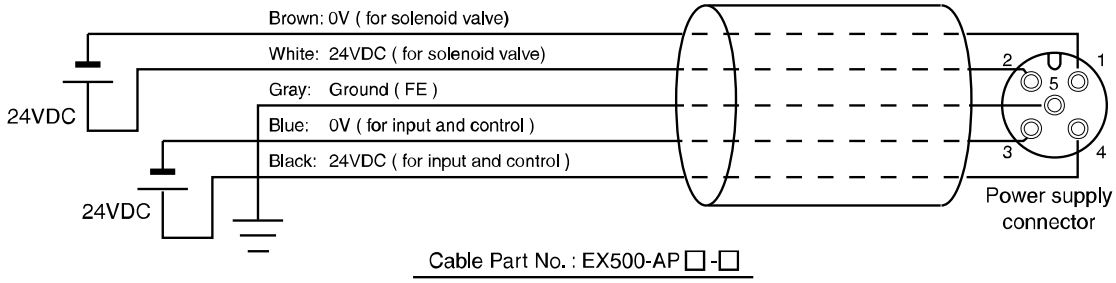


NOTE
Connect the ground terminal to the ground. Resistance to the ground should be 100 ohms or less.

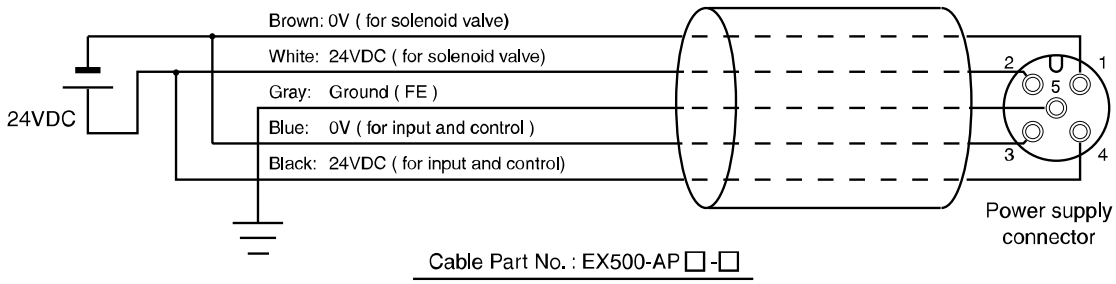
Separate wiring for power supply for solenoid valves/output and for input and control of GW/SI

Both single power supply and two power supply systems can be adopted, however, the wiring shall be made separately (for solenoid valves and for input and control) for either system.

A. Dual power supply system



B. Single power supply system



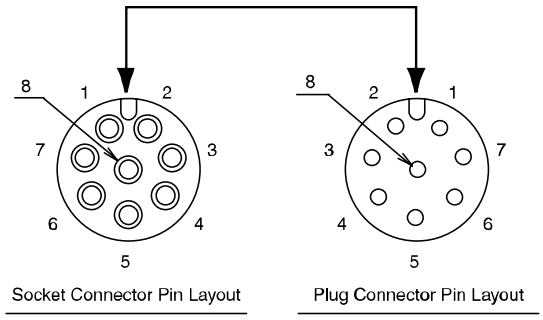
3. Branch wiring (wiring to communication ports)

The wiring of the solenoid valve and the input equipment is connected to communication port A-D with M12 connector cable which have straight and angle connector type.

As each cable contains power supply wire, there is no need to supply the power to solenoid valves or input devices individually.

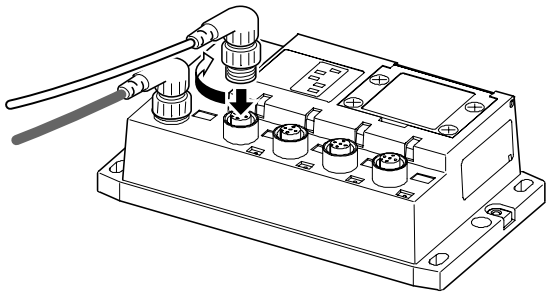
Cable connection

(1)Aligning the key groove with the connector (socket) of GW unit, plug in the cable (plug).



(2)Tighten the lock nut on cable side by turning it clockwise by hand.

(3)Confirm that the connector portion does not move.

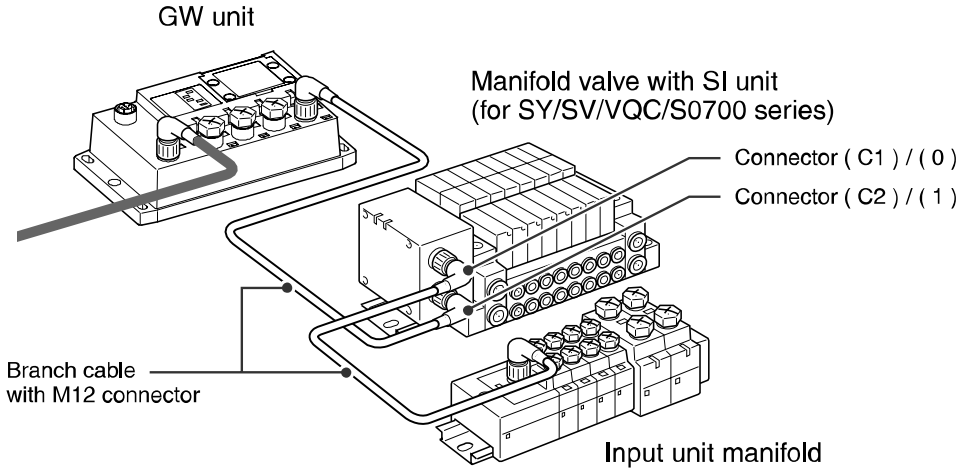


NOTE

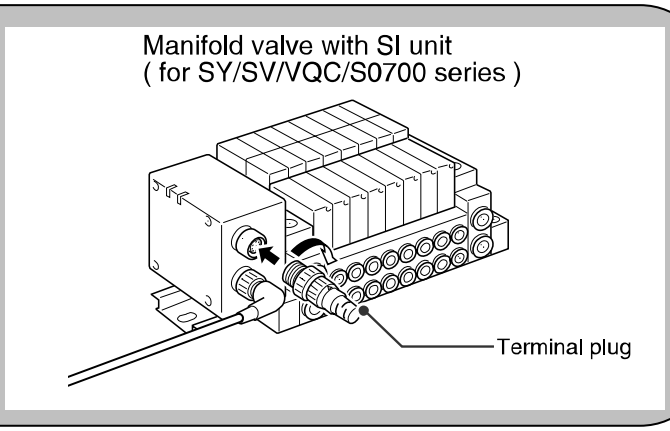
Mount a waterproof cap on each unused connector of GW unit. The proper use of waterproof cap can achieve IP65 Enclosure. (Tightening torque: 0.1 Nm for M12)

For GW unit – Manifold valve – Input unit manifold configuration

Two communication connectors in SI unit and one communication connector in Input unit are installed respectively.
To the communication connector (C2) or (1) of SI unit, connect the branch cable with M12 connector from GW.
To the communication connector (C1) or (0), connect the branch cable with M12 connector from Input unit.
To the communication connector of Input unit, connect the branch cable with M12 connector from SI unit.

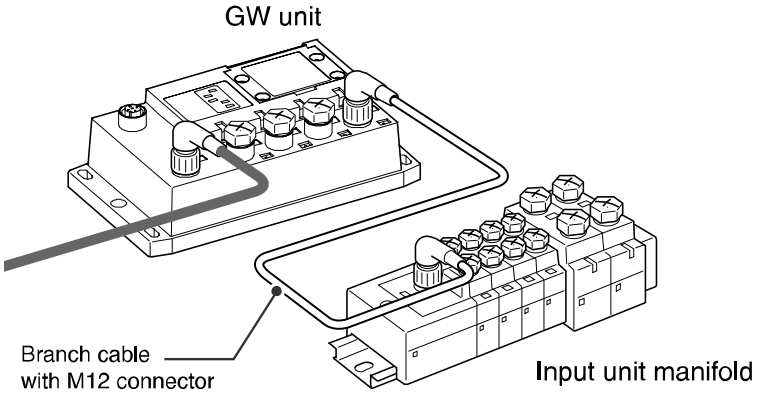


NOTE
When no Input unit is connected to the connector (C1) or (0) of SI unit, mount a terminal plug on the connector.

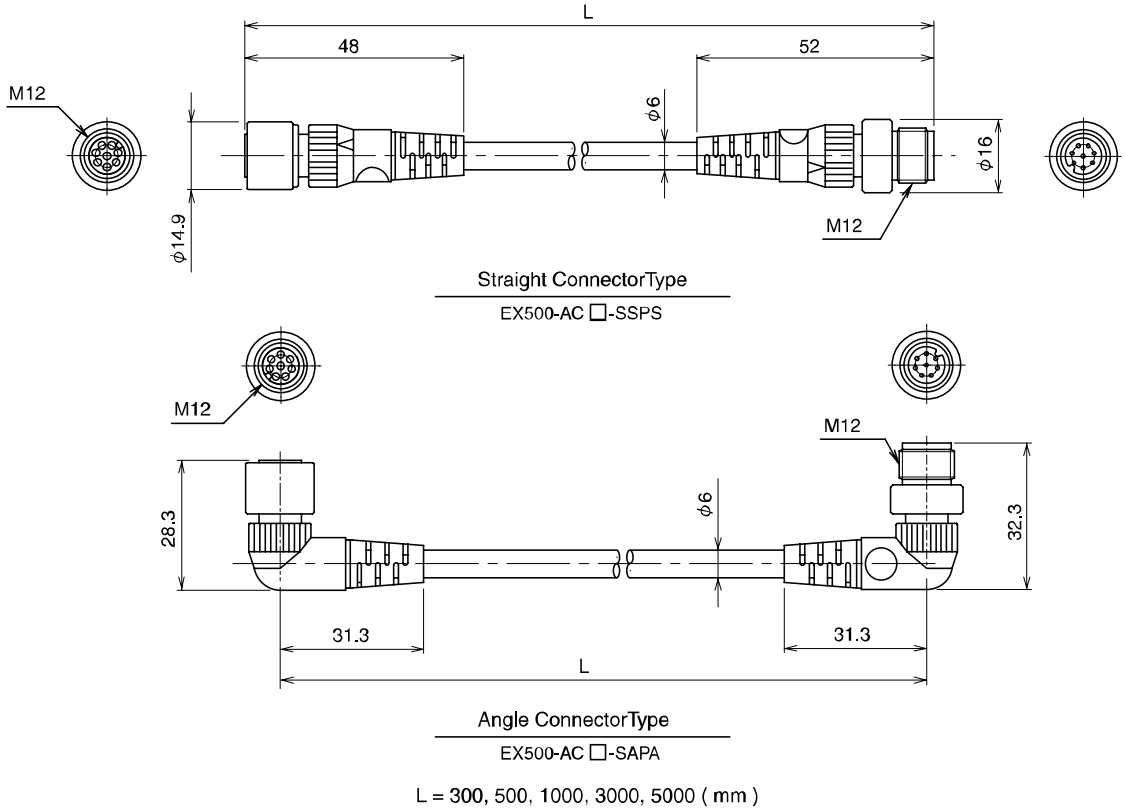


For GW unit – Input unit manifold configuration

To the communication connector of Input unit, connect the branch cable with M12 connector from GW unit.

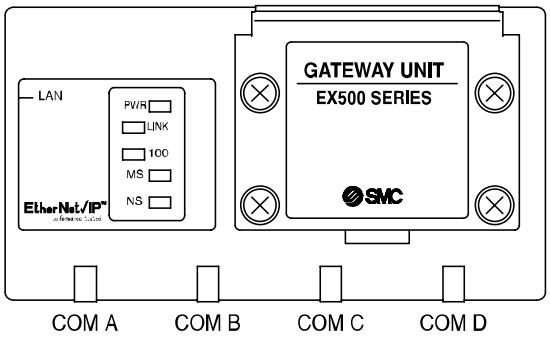


Branch cable with M12 connector (EX500-AC□-S□P□)



L = 300, 500, 1000, 3000, 5000 (mm)

Setting



Display	Content	
PWR	OFF	The power supply for solenoid valves lowering
	Green ON	The power supply for solenoid valves normal
LINK	OFF	The power supply off/initialized
	Green ON	Ethernet communication established
	Green flashes	Data sent/received
100	OFF	Communication at 10 Mbps
	Green ON	Communication at 100 Mbps
MS	OFF	The power supply off
	Green ON	Operating normally
	Green flashes	Setting error
	Red flashes	Recoverable internal error
	Red ON	Unrecoverable internal error
NS	OFF	The power supply off/IP address not set
	Green flashes	EtherNet/IP™-level communication not established
	Green ON	Multiple EtherNet/IP™-level communications established
	Red flashes	Multiple EtherNet/IP™-level communications time out
	Red ON	IP address duplicated
COM A	OFF	No input data
	Green ON	Input data received
COM B	OFF	No input data
	Green ON	Input data received
COM C	OFF	No input data
	Green ON	Input data received
COM D	OFF	No input data
	Green ON	Input data received

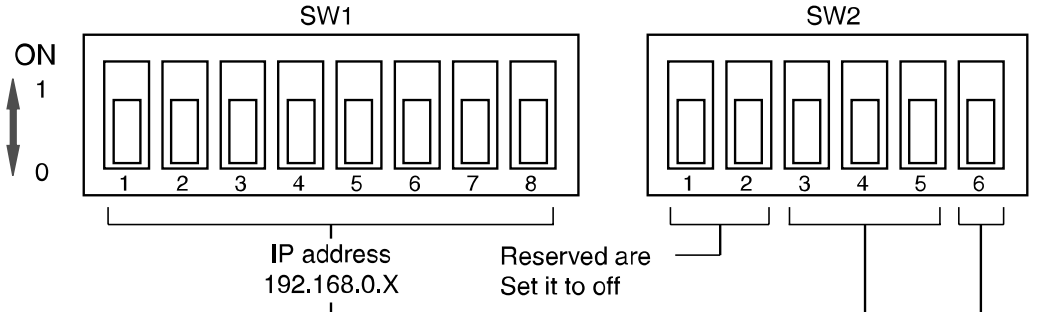
NOTE
When connecting manifold valve only without connecting Input unit manifold, LEDs of COM A - D do not light. To make them light, connect a terminal plug (EX500-AC000-S) to the unused connector of SI unit ("C1" or "0").

•Switch setting

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

NOTE

1. Be sure to turn off the power before setting the switches.
2. Be sure to set these switches before use. The factory default settings are all "OFF" or "0".
3. After opening and closing the station number switch protective cover, tighten the screws by proper tightening torque. (Tightening torque: 0.6 Nm)



SW1								X
1	2	3	4	5	6	7	8	
0	0	0	0	0	0	0	0	Remote control *1
1	0	0	0	0	0	0	0	1
0	1	0	0	0	0	0	0	2
1	1	0	0	0	0	0	0	3
·	·	·	·	·	·	·	·	·
0	1	1	1	1	1	1	1	254
1	1	1	1	1	1	1	1	DHCP mode *2

Manual set up of IP address *3

Communication setting

CLR/HOLD

SW2			Item	Content
3	4	5		
0	-	-	Communication setting	AUTO: The communication setting is automatically selected.
1	-	-		MANUAL: The communication setting follows the setting result by the switch No.4 and 5.
1	0	-	Communication speed	Communicated at 10Mbps
1	1	-		Communicated at 100Mbps
1	-	0	Communication method	Communicated at half duplex
1	-	1		Communicated at full duplex

SW2	Content
6	
0	The output signal is cleared when the communication error occurs.
1	The output signal is held when the communication error occurs.

∗1: Remote control (SW1 all dip-switches off)

SMC's EX500 GW Unit will respond to the following Rockwell Automation BOOTP/DHCP Server commands.

Enable DHCP

Selecting this function will enable the EX500 GW Unit to retrieve its boot information from the BOOTP/DHCP Server. If DHCP is enabled the EX500 GW Unit will retrieve its boot information during the next power up.

Disable BOOTP/DHCP

Selecting this function will disable the EX500 to retrieve its boot information from the BOOTP/DHCP Server, and causes the EX500 to retain its current configuration during the next power up.

∗2: DHCP Mode (SW1 all dip-switches on)

The IP address is acquired via DHCP Server. The IP address is not saved and lost if the power to the EX500 unit is cycled.

∗3: Hardware Addressing

The IP address range is 192.168.0.1 to 192.168.0.254.

Default settings

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

NOTE

Remote Control mode

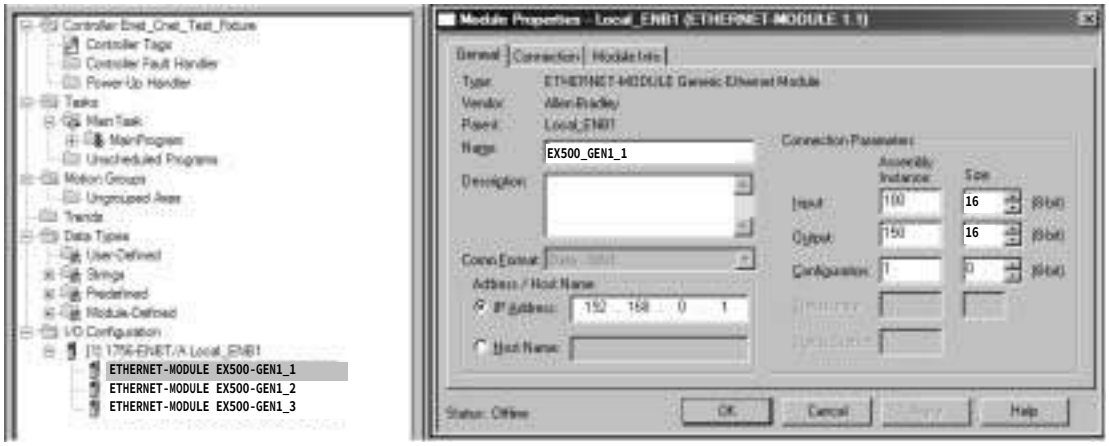
If the EX500 IP address is unknown, change to DHCP mode and re-assign the correct IP address. When the DHCP server has assigned the correct address, turn off the power supply and return the unit to Remote control mode. Upon power-up, the EX500 will now be available using the address that was set whilst in DHCP mode.

<Caution>

If an IP address is set manually using the DIP-switches the EX500 will disable BOOTP/DHCP mode. If the unit is changed from a manual IP address setting to Remote control mode, the manually set IP address will be stored.

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

Size:

Description	Size	
Comm Format	"Data-INT"	"Data-SINT"
Input	8words	16bytes
Output	8words	16bytes
Configuration	0word	0byte

•I/O mapping

The GW unit can control 128 input/output points in total.
Regardless of I/O points of the equipment, it always occupies each data memory area for 64 inputs and 64 outputs.

Input area mapping

Offset (word)	Input data															
	MSB							LSB	MSB							LSB
	15							8	7							0
0	IN15	~						COM-A						~	IN0	Sensor input area
1	IN15	~						COM-B						~	IN0	
2	IN15	~						COM-C						~	IN0	
3	IN15	~						COM-D						~	IN0	
4	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
5	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
6	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
7	L	L	L	L	L	L	L	L	L	L	L	SOLV	IN-A	IN-B	IN-C	IN-D	Status input area

L: Fixed to Low (reserved area)

Status input area specifications

Item	Status	Condition	
IN-*	The connection of branched bus	0	1) The input unit detected
			2) The SI unit with terminal plug detected
		1	Wire open detected
SOLV	The power supply for solenoid valves	0	Supply voltage OK
		1	Supply voltage below lower limit

Output area mapping

Offset (word)	Output data															
	MSB							LSB	MSB							LSB
	15							8	7							0
0	OUT15	~						COM-A						~	OUT0	Output area
1	OUT15	~						COM-B						~	OUT0	
2	OUT15	~						COM-C						~	OUT0	
3	OUT15	~						COM-D						~	OUT0	
4	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
5	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
6	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
7	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	

L: Fixed to Low (reserved area)

Specification

■Specifications

Basic specifications

Item	Specification
Rated voltage	24 VDC
Power supply voltage range	Power supply for input and controlling: 24 VDC±10% Power supply for solenoid valves: 24 VDC+10%/-5% (Voltage drop warning at around 20 V)
Rated current	Power supply for input and control : 3 A (Inside GW unit : 0.2 A Input device and SI control section : 2.8 A) Power supply for solenoid valve : 3 A
Number of input/output points	Input point: Max. 64/Output point: Max. 64
Standards	CE marking. UL (CSA)
Weight	470 g
Accessory: waterproof cap (for M12 connector socket)	EX9-AWTS (5 pcs.)

Environment specifications

Item	Specification
Enclosure	IP65
Operating temperature range	Operating: 5 to 45 °C Stored: –25 to 70 °C (with no freezing and condensation)
Operating humidity range	Operating, Stored: 35 to 85%RH (with no condensation)
Withstand voltage	1000 VAC applied 1 minute
Insulation resistance	2 MΩ or more (500 VDC Mega) between whole charging part and case
Operating atmosphere	No corrosive gas
Pollution degree	For use in Pollution degree 3 Environment

Higher-level bus

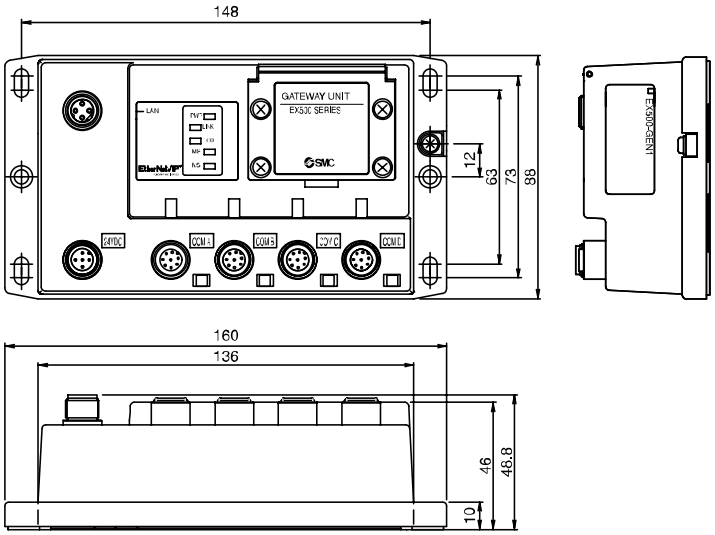
Item		Specification
Protocol		Ethernet (IEEE802.3)
	Media	100BASE-TX
	Communication speed	10M/100Mbps (Automatic selection or manual setting)
	Max. segment length	100m (328ft)
	Max. transceiver number	2 (per segment)
	Communication method	Full duplex/Half duplex (automatic selection or manual setting)
Fieldbus protocol		EtherNet/IP™ Release1.0
	I/O message	Input : 16 byte (assembly instance: 100) Output : 16 byte (assembly instance: 150)
	Port No.	44818 (0xAF12)
IP address setting range		192.168.0.1 to 192.168.0.254 (Setting by an internal switch) Or optional setting by the DHCP server
Subnet mask		255. 255. 255. 0 fixed
Device information		Vendor ID : 7 (SMC Corp.) Product type : 12 (communication adapter) Product code : 104

Lower-level bus

Item	Specification
Number of branches for input/output	4 branches (16 points/branch) for input 4 branches (16 points/branch) for output
Communication method	Protocol : Dedicated for SMC Speed : 750kbps
Branch current for input (Note)	Max. 0.7 [A] per branch
Branch current for output	Max. 0.65 [A] per branch (when SI unit EX500-S001 is connected) Max. 0.75 [A] per branch (when SI unit EX500-Q□0^{1}_{2} is connected)
Branch cable length	5m or less between devices (total extended length: 10m or less)

■Dimensions

•EX500 body



Model indication and How to order

· SI unit (SV series)

EX500-S001

- Output method

0	NPN (Positive common)

- Applicable value manifold

S	SV series

· SI unit (SY, VQC, S0700 series)

EX500-Q 0 01

- SI unit type

1	For without EX9 output block
2	For EX9 output block mounting

- Output method

0	NPN (Positive common)
1	PNP (Negative common)

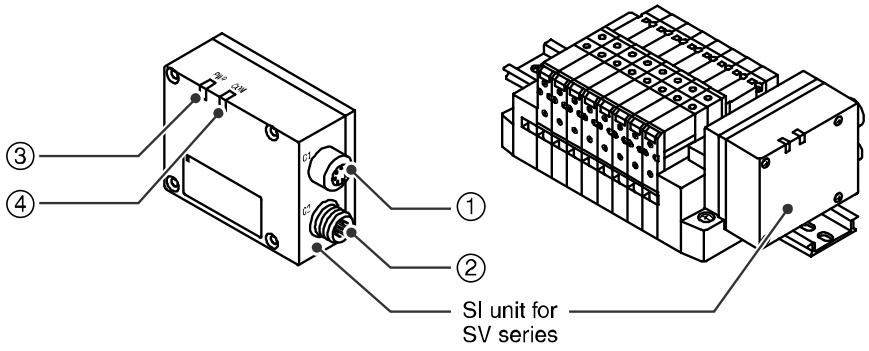
- Applicable value manifold

Q	SY, VQC, S0700 series

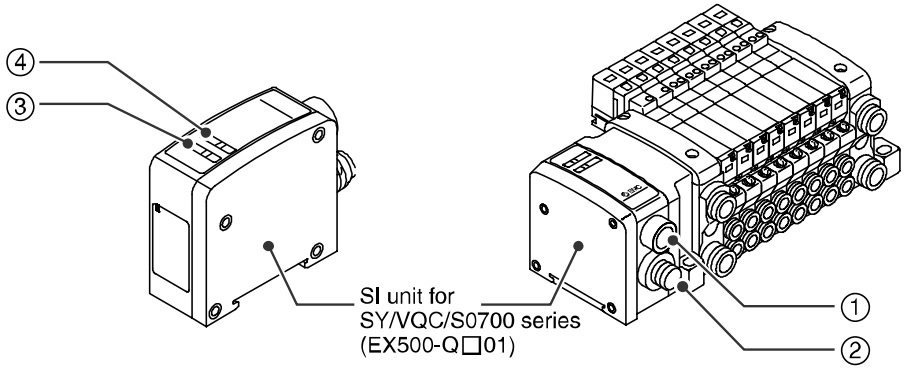
Summary of Product parts

The SI unit is the unit to communicate with GW unit in combination with manifold valve.
It can be used with SV series valves, SY series valves, VQC series valves and S0700 series valves.
In addition, this unit is able to operate solenoid valves, relays. etc. in combination with EX9 series general purpose output block. For how to use it, refer to section "EX9 Series General Purpose Output Block" (page 44) in this manual.

1. SI unit for SV series valves (EX500-S001)



2. SI unit for SY/VQC/S0700 series valves (EX500-Q□0 $^{1}_{2}$)



Common to EX500-S001/EX500-Q□0 $^{1}_{2}$

No.	Description	Function
1	Communication connector "C1" or "0"	Connects the branch cable to Input unit (branch cable with M12 connector) *1
2	Communication connector "C2" or "1"	Connects the branch cable from GW unit (branch cable with M12 connector) *2
3	Power LED	Indicates the power supply status. *2
4	Communication LED	Indicates the communication status with GW unit. *2

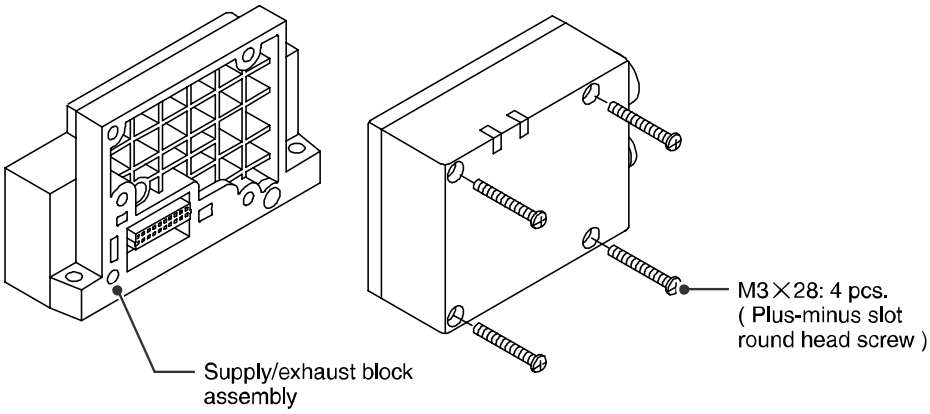
∗1: For wiring method, refer to subsection "Wiring" (page 10) of section "EX500 GW unit" in this manual.

∗2: For display, refer to "Setting" (page 30) in section "SI Unit" in this manual.

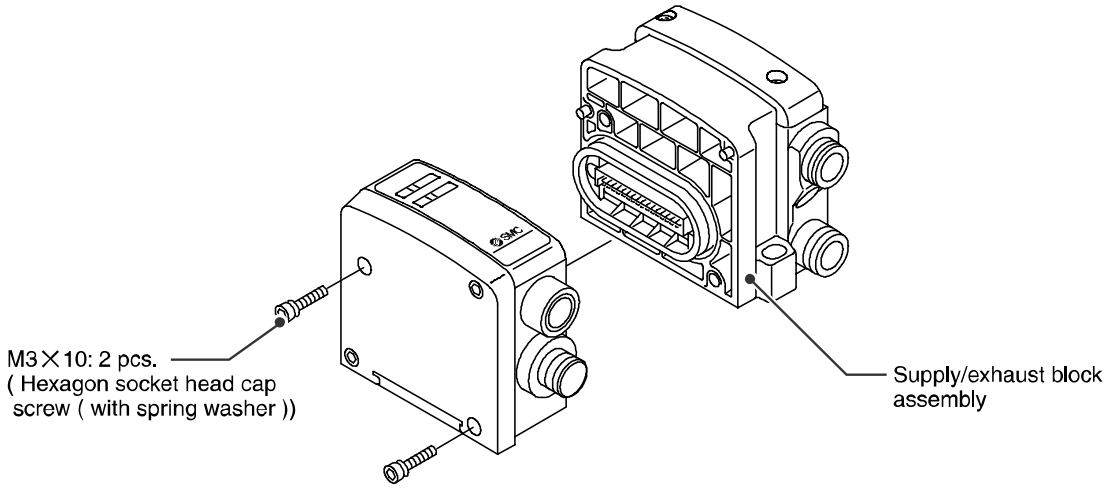
Mounting and Installation

■Installation

The mounting and removing methods of SI unit are as shown below.



SI Unit for SV Series Valves (EX500-S001)



SI Unit for SY/VQC/VS0700 Series Valves (EX500-Q □ 01)

NOTE

Holding with hand so that there will be no gap between SI unit and Air supply/exhaust block assembly, tighten the bolts. Be sure to tighten each bolt by specified tightening torque.
(Tightening torque: 0.6 Nm)

∗1: For branch wiring method, refer to subsection "Wiring" (page 10) of section "EX500 GW unit" in this manual. As the power to output devices such as solenoid valve is supplied by branch wiring (branch cable with M12 connector), there is no need to supply power individually.

∗2: For mounting/installation methods of solenoid valve, manifold, etc., refer to the catalogs, instruction manuals, technical data, etc. of each valve series. When connecting general purpose output block only, refer to subsection "Mounting and installation" (page 46) of section "EX9 Series General Purpose Output Block" in this manual.

○Output number assignment

Output No.	0	2	4	6	8	10	12	14	Solenoid on side A
Side D ⟵ (SI unit side)									⟶ Side U
Output No.	1	3	5	7	9	11	13	15	Solenoid on side B

Valve maifold

∗: The output number refers to the D side solenoid position on the manifold and starts at zero.

∗: Standard wiring on the manifold is for double-solenoid valves and output number starts A side and B side in that order as shown in the figure a.

If you mount a single-solenoid valve on the standard wiring manifold, output number for B side valve is skipped.

∗: Custom wiring for mixed mounting single-solenoid valves and double-solenoid-valves can be specified with a Wiring Specification Sheet. Example wiring is shown in the figure b.

fig.a

	Double	Single	Double	Double	
No.	0	2	4	6	Side A
Station	1	2	3	4	-----
No.	1	3	5	7	Side B

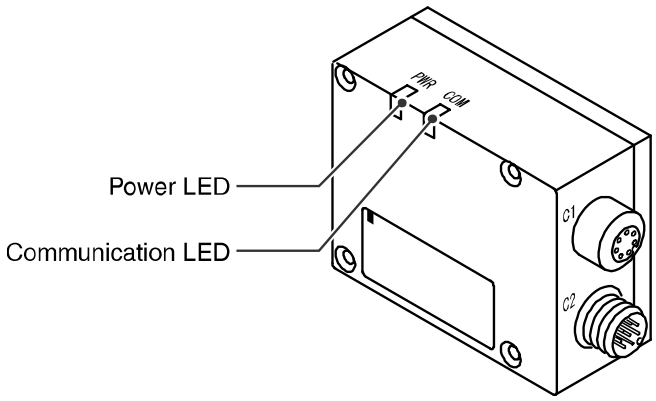
fig.b

	Double	Single	Double	Double	
No.	0	2	3	5	Side A
Station	1	2	3	4	-----
No.	1	-	4	6	Side B

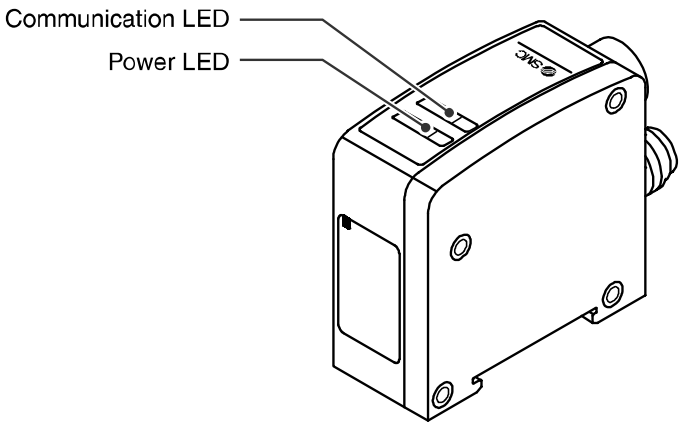
Open

Setting

1. SI unit for SV series valves (EX500-S001)



2. SI unit for SY/VQC/S0700 series valves (EX500-Q□0 $^{1}_{2}$)



Common to EX500-S001/EX500-Q□0 $^{1}_{2}$

Display	Content
Power LED	Turns on: Power for Input and control is supplied. Turns off: Power for Input and control is not supplied.
Communication LED	Turns on: Receiving data from GW Turns off: No received data

Specification

■Specifications

1. SI unit for SV series valve (EX500-S001)

Item	Specification	
Connected block	Solenoid valve (single, double) Relay output module (1-point output, 2- point output)	
Connected block station	Double solenoid valve Relay output module (2-point output)	Max. 8 stations
	Single solenoid valve Relay output module (1-point output)	Max. 16 stations
Output type	NPN (Positive common)	
Supply voltage for block	24 VDC	
Supply current for block	0.65 A Max.	
Current consumption	100 mA or less (at rated voltage)	
Enclosure	IP65	
Operating temperature range	Operating: 5 to 45 ^{o}C Stored: –25 to 70 ^{o}C (with no freezing and condensation)	
Operating humidity range	Operating, Stored: 35 to 85%RH (with no condensation)	
Withstand voltage	1000 VAC applied 1 minute	
Insulation resistance	2 MΩ or more (500 VDC Mega) between whole charging part and case	
Operating atmosphere	No corrosive gas	
Pollution degree	For use in Pollution Degree 3 Environment	
Standards	CE marking. UL (CSA)	
Weight	115 g	
Accessory: waterproof cap (for M8 connector socket)	EX9-AWTS (1 pc.)	

2. SI unit for VQC/S0700 series valve (EX500-Q□0 $\frac{1}{2}$)

Item		Specification	
Connected block		Solenoid valve (single, double) General purpose output block (EX500-Q□02 only)	
Connected block station		Double solenoid valve	Max. 8 stations
		Single solenoid valve	Max. 16 stations
		General purpose output block (EX500-Q□02 only)	Max. 8 stations
Output type	Q00□	NPN (Positive common)	
	Q10□	PNP (Negative common)	
Supply voltage for block		24 VDC	
Supply current for block		0.75 A max.	
Current consumption		100 mA or less (at rated voltage)	
Enclosure		IP65	
Operating temperature range		Operating: 5 to 45 °C Stored: –25 to 70 °C (with no freezing and condensation)	
Operating humidity range		Operating, Stored: 35 to 85%RH (with no condensation)	
Withstand voltage		1000 VAC applied 1 minute	
Insulation resistance		2 MΩ or more (500 VDC Mega) between whole charging part and case	
Operating atmosphere		No corrosive gas	
Pollution degree		For use in Pollution Degree 3 Environment	
Standards		CE marking. UL (CSA)	
Weight		105 g	
Accessory: waterproof cap (for M8 connector socket)		EX9-AWTS (1 pc.)	

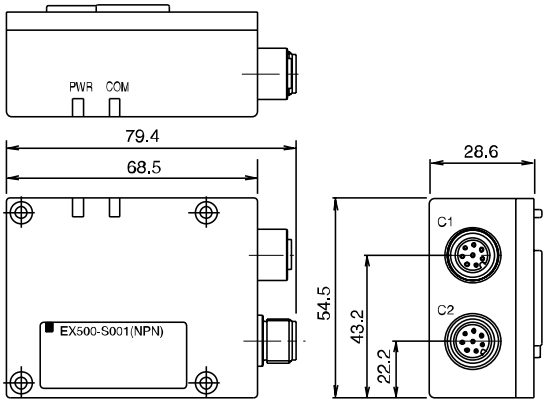
3. Applicable valve series

For detailed specifications of solenoid valve and manifold, refer to the catalogs, operation manuals, technical data, etc. of each valve series.

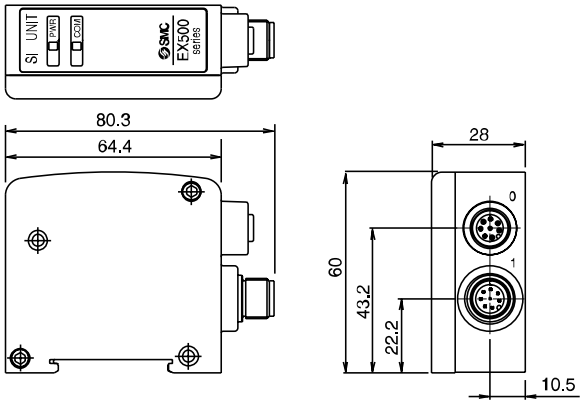
SV1000/2000/3000/4000
SY3000/5000
VQC1000/2000/4000
S0700

■Dimensions

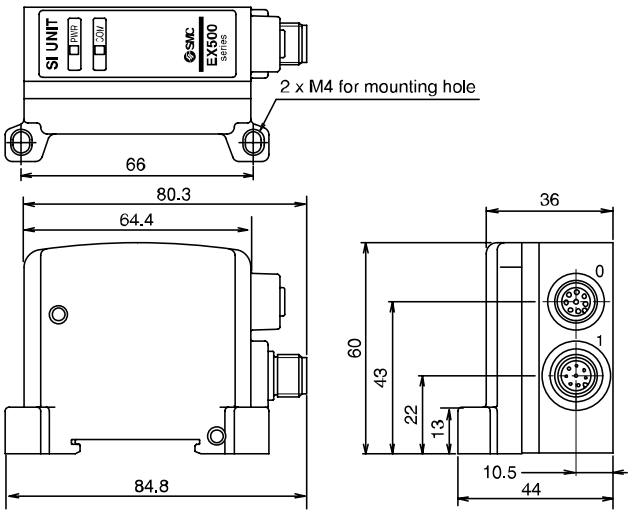
1. SI unit for SV series valves (EX500-S001)



2. SI unit for SY/VQC/S0700 series valves (EX500-Q□01)



(EX500-Q□02)



Input Unit Manifold

Model indication and How to order

· Input unit manifold (Input unit+End block+DIN rail)

EX500-IB1-E 8

Number of stations

1	1 station
⋮	⋮
8	8 stations

Connector type

E	M8 connector
T	M12 connector
M	M8, M12 mixed

· Input unit

EX500-IB1

· Input block

EX500-IE1

Block type

1	M8 connector, 2 inputs, PNP
2	M8 connector, 2 inputs, NPN
3	M12 connector, 2 inputs, PNP
4	M12 connector, 2 inputs, NPN
5	M8 connector, 8 inputs integrated, PNP
6	M8 connector, 8 inputs integrated, NPN

· End block

EX500-IB1

*: To order the input unit manifold, refer to the product catalogue.

Summary of Product parts

The Input unit manifold consists of Input unit, input block (s), end block and DIN rail.
The input block up to 8 can be connected (16 points).
Any combination of input blocks (for M8 connector, M12 connector and 8-point integrated type, NPN and PNP) is acceptable.

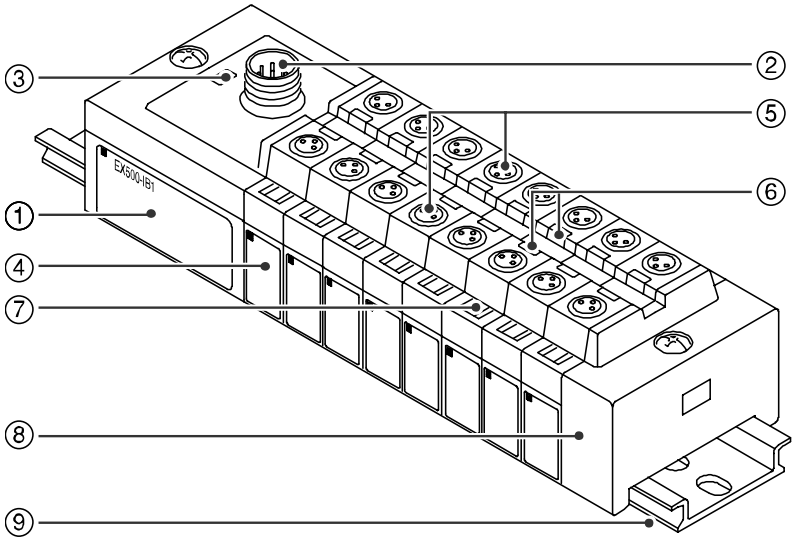


Figure shows the configuration when only input blocks for M8 connector are connected.

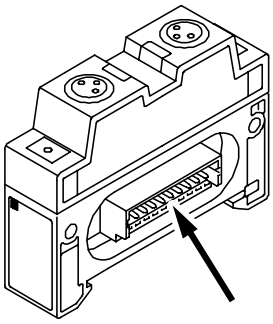
No.	Description	Function
1	Input unit	Unit to communicate with GW unit.
2	Communication connector	To be connected with branch cables from GW unit or SI unit (branch cable with M12 connector) *1
3	Power LED	Indicates the power supply status. *2
4	Input block	Unit for sensor signal input.
5	Sensor connector	Connects with sensor. *1
6	Indicator LED	Indicates sensor signal status. *2
7	Marker (attached)	To be used for writing input No. etc.
8	End block	Composes the end of Input unit manifold.
9	DIN rail	To be mounted with Input unit manifold.

∗1: For wiring method, refer to subsection "Wiring" (page 10) of section "EX500 GW unit" in this manual.
∗2: For display, refer to "Setting" (page 40) in section "Input Unit Manifold" in this manual.

Mounting and Installation

■Installation

1. Connect each connector of Input unit, input blocks, and end block (portion indicated by arrow in the figure to the bellow).
2. Holding with hands so that there will be no gap between blocks, place the jointed unit and blocks on DIN rail.
3. Tighten the bolts of Input unit and end block to secure the jointed unit and blocks to DIN rail.
   Be sure to tighten the bolts by proper tightening torque. (Tightening torque: 0.6 Nm)



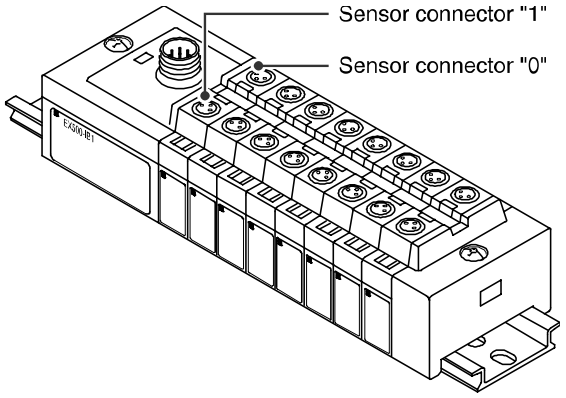
■Wiring

•Branch wiring

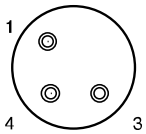
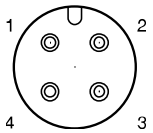
For wiring method, refer to subsection "Wiring" (page 10) of section "EX500 GW unit" in this manual. To input devices such as sensor, the power is supplied through the branch wiring (branch cable with M12 connector). Therefore, there is no need to supply the power to them individually.

•Sensor wiring

Connect sensors to the sensor connectors of input block.

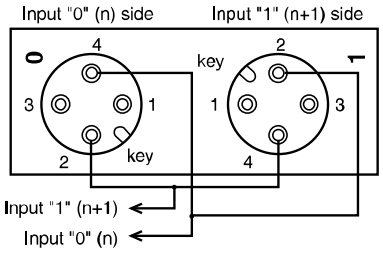


Pin layout of sensor connector

M8 connector (3-pin socket)			M12 connector (4-pin socket)		
No.	Description		No.	Description	
1	Power supply (24 VDC)		1	Power supply (24 VDC)	
3	Power supply (0 V)		2	(Input) *	
4	Input		3	Power supply (0 V)	
			4	Input	

∗: Internal wiring of M12 input block and key position for mounting sensor connector

- No. 2 pins of M12 input block connectors are wired to each other's sensor signal input pins (No. 4 pins) internally.
- This wiring enables direct input of signals from two points combined into one cable through concentric connector etc.
- When connecting sensors, confirm the specification of output signal carefully.
  Otherwise malfunction can result.
- The key position for mounting sensor connector is as shown to the right. Consider this key position when selecting sensor.

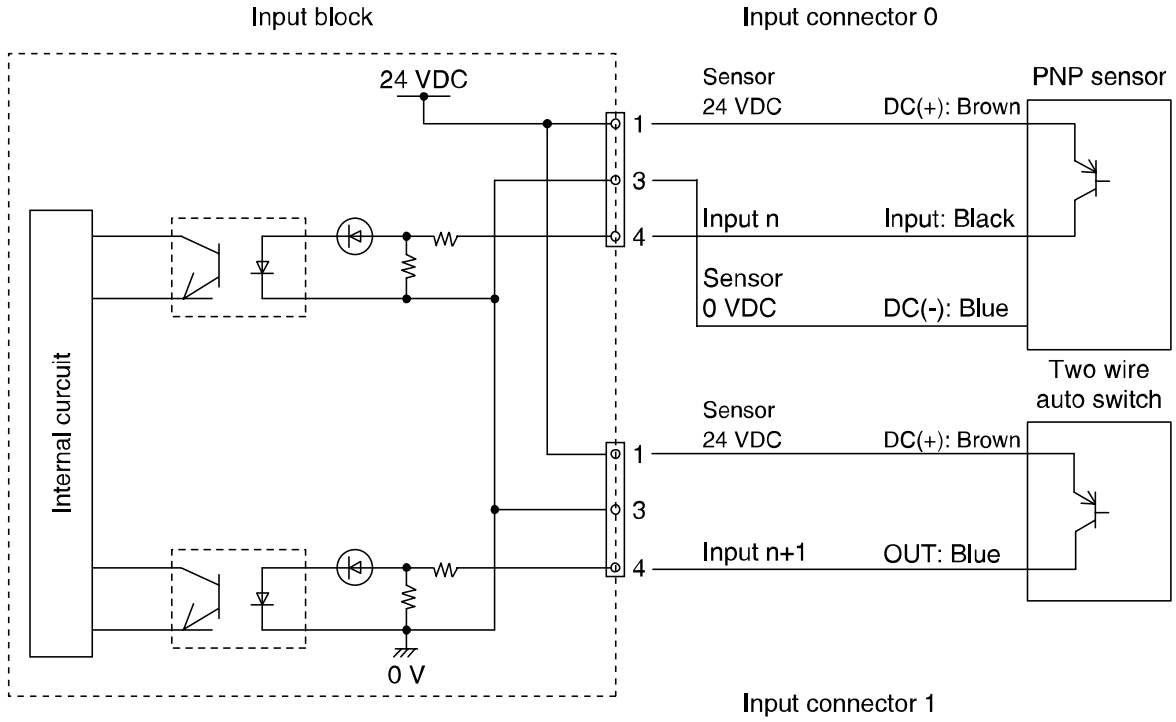


M12 Block

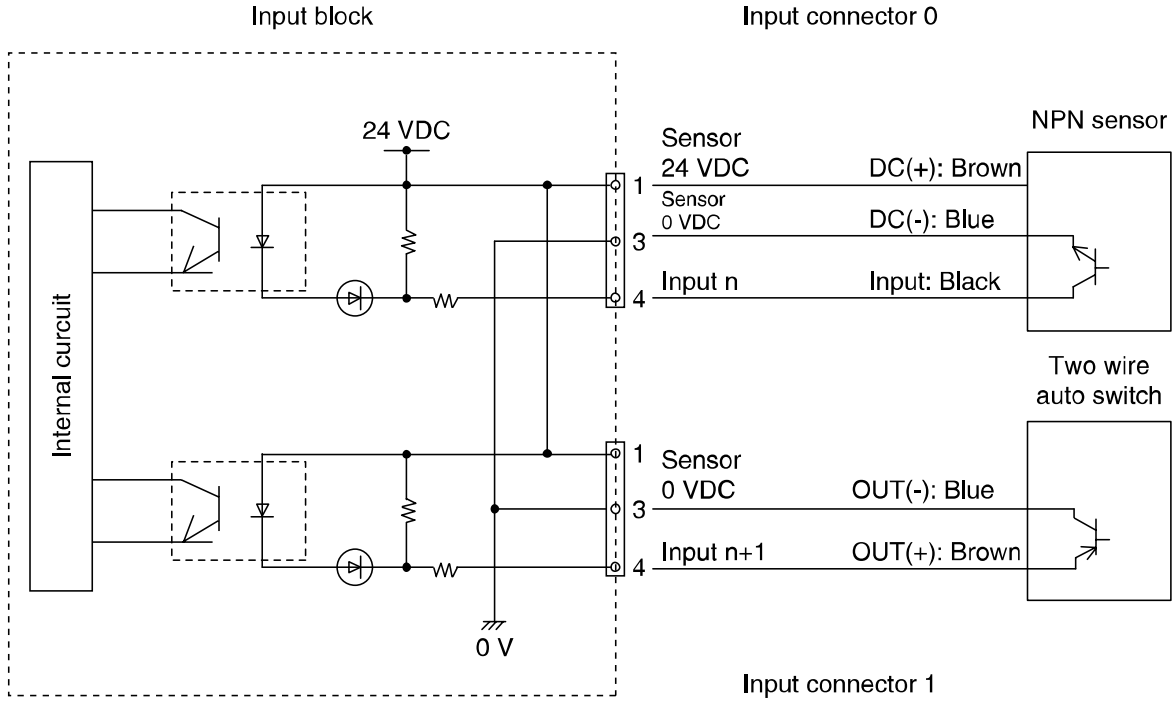
NOTE
Mount a waterproof cap on each unused connector of Input unit. The proper use of waterproof cap can achieve IP65 Enclosure. (Tightening torque: 0.05 Nm for M8 and 0.1 Nm for M12)

●Sensor wiring example

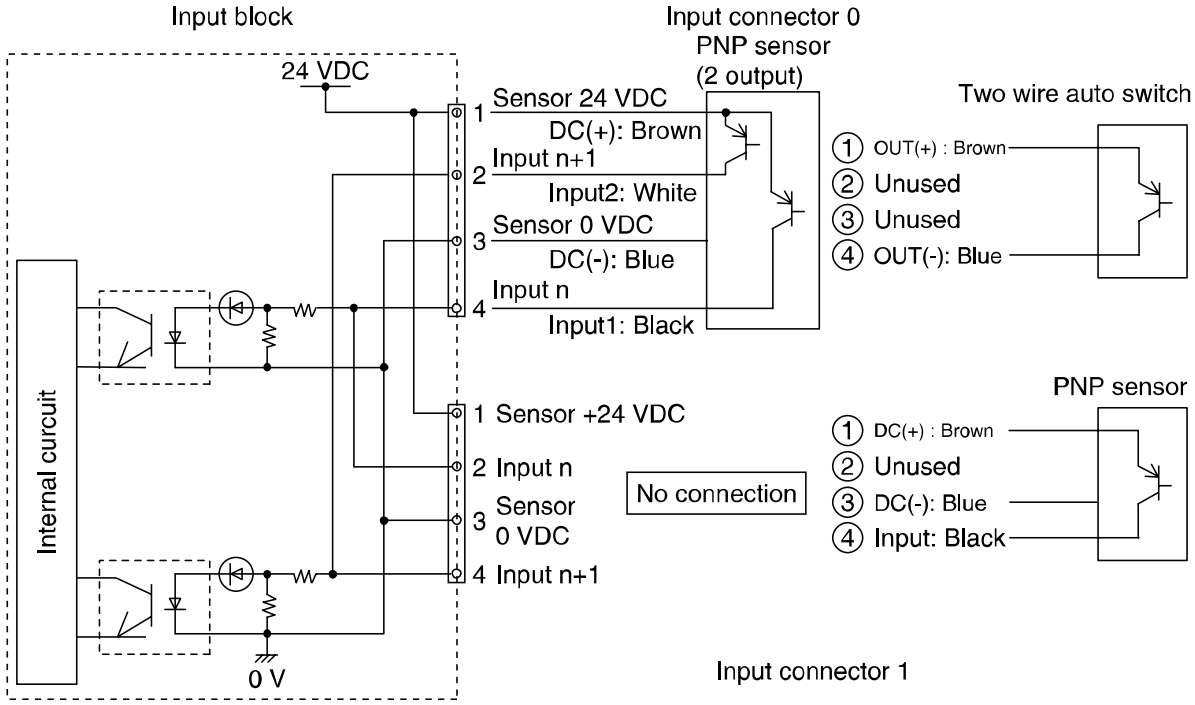
○EX500-IE1/-IE5: M8, 3 pin PNP input block



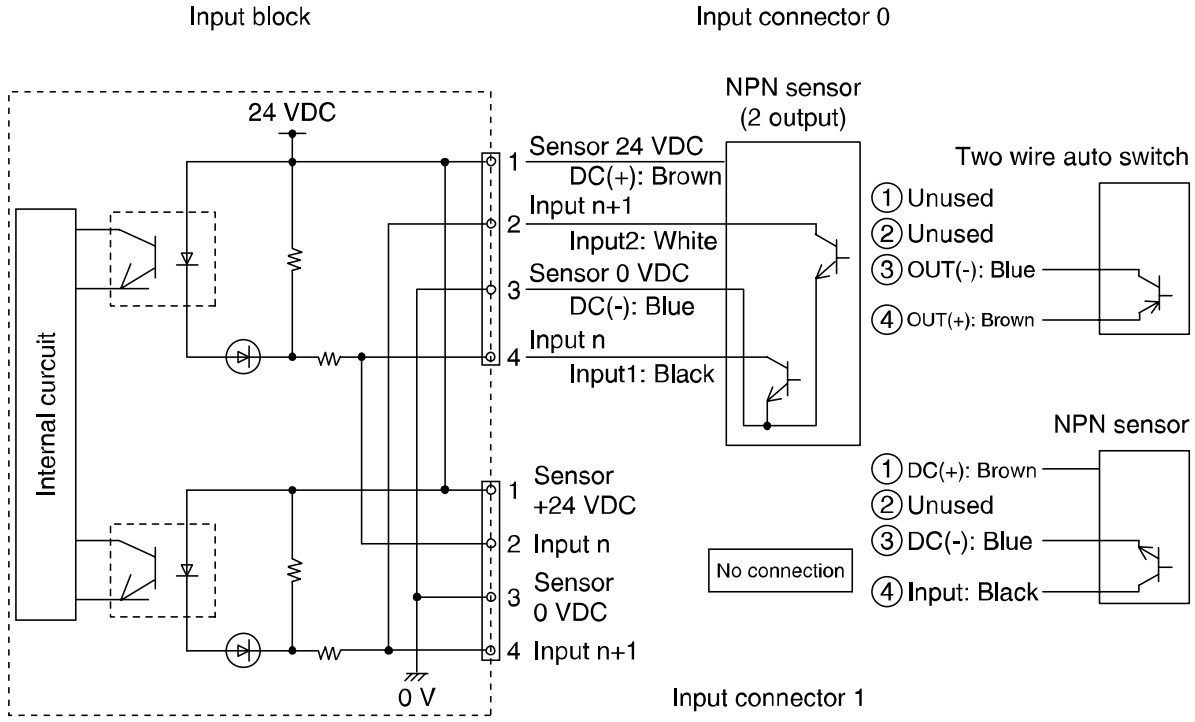
○EX500-IE2/-IE6: M8, 3 pin NPN input block



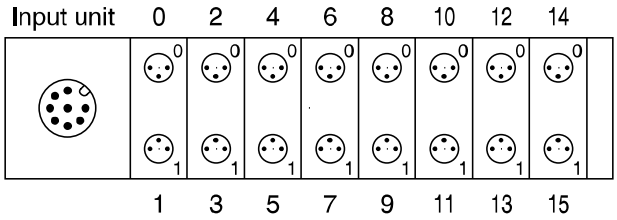
○EX500-IE3: M12, 4 pin PNP input block



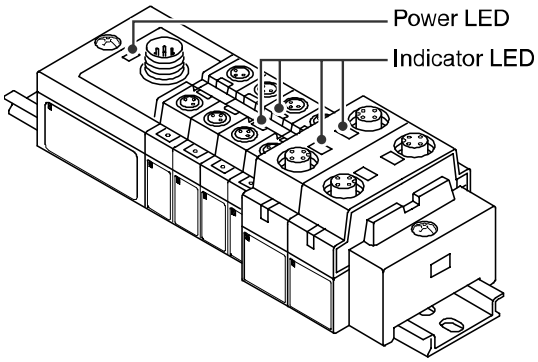
○EX500-IE4: M12, 4 pin NPN input block



Correspondence between input number and input block
Input block up to 8 can be connected (16 points).
Input numbers are 0 to 15 from Input unit side.



Setting



Display	Content
Power LED	Turns on: Power for input and control is supplied. Blinks: Under short circuit protection (abnormal status). As the short circuit protective function is operating, the power is not supplied. To cancel blinking, turn off and return the power to GW unit. Turns off: Power for input and control is not supplied.
Indicator LED	Turns on: Sensor signal input ON (logical "1") Turns off: Sensor signal input OFF (logical "0")

Specification

■Specifications

Specifications for Input unit

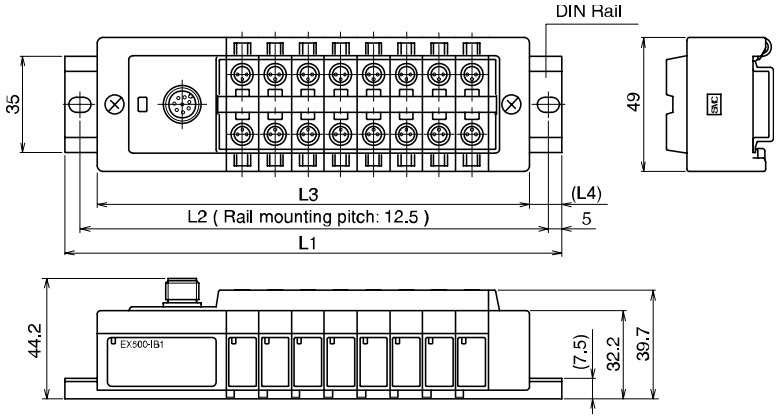
Item	Specification
Connected block	Current source type input block (PNP input block) or Current sink type input block (NPN input block)
Connected block station	Max. 8 blocks
Supply voltage for block	24 VDC
Supply current for block	0.5 A Max.
Current consumption	100 mA or less (at rated voltage)
Short circuit protection	Operates at 1A Typ. (Cuts power supply) Can be reset by returning the power after cutting the power supply to input and control section of GW unit.
Enclosure	IP65
Operating temperature range	Operating: 5 to 45 °C Stored: –25 to 70 °C (with no freezing and condensation)
Operating humidity range	Operating, Stored: 35 to 85%RH (with no condensation)
Withstand voltage	1000 VAC applied 1 minute
Insulation resistance	2 MΩ or more (500 VDC Mega) between whole charging part and case
Operating atmosphere	No corrosive gas
Pollution degree	For use in Pollution Degree 3 Environment
Standards	CE marking. UL (CSA)
Weight	100 g (Input block + End block)

Specifications for input block

Model		EX500-IE1	EX500-IE2	EX500-IE3	EX500-IE4	EX500-IE5	EX500-IE6
Input type		PNP sensor input	NPN sensor input	PNP sensor input	NPN sensor input	PNP sensor input	NPN sensor input
Input points		2 points				8 points	
Input device supply voltage		24 VDC					
Input device supply current		Max. 480 mA/Input unit manifold					
Rated input current		Approx. 5 mA					
Display		Green LED (Lights when power is turned ON.)					
Connector on the input device side		M8 connector (3 pins, plug)		M12 connector (4 pins, plug)		M8 connector (3 pins, plug)	
Enclosure		IP65					
Operating temperature range		Operating: 5 to 45 °C Stored: –25 to 70 °C (with no freezing and condensation)					
Operating humidity range		Operating, Stored: 35 to 85%RH (with no condensation)					
Withstand voltage		1000 VAC applied 1 minute					
Insulation resistance		2 MΩ or more (500 VDC Mega) between whole charging part and case					
Operating atmosphere		No corrosive gas					
Pollution degree		For use in Pollution Degree 3 Environment					
Standards		CE marking. UL (CSA)					
Weight		20 g		40 g		55 g	
Accessory: waterproof cap	(for M8 connector socket)	EX9-AWES (2 pcs.)		-		EX9-AWES (8 pcs.)	
	(for M12 connector socket)	-		EX9-AWTS (2 pcs.)		-	

■Dimensions

•When only input blocks for M8 connector are connected

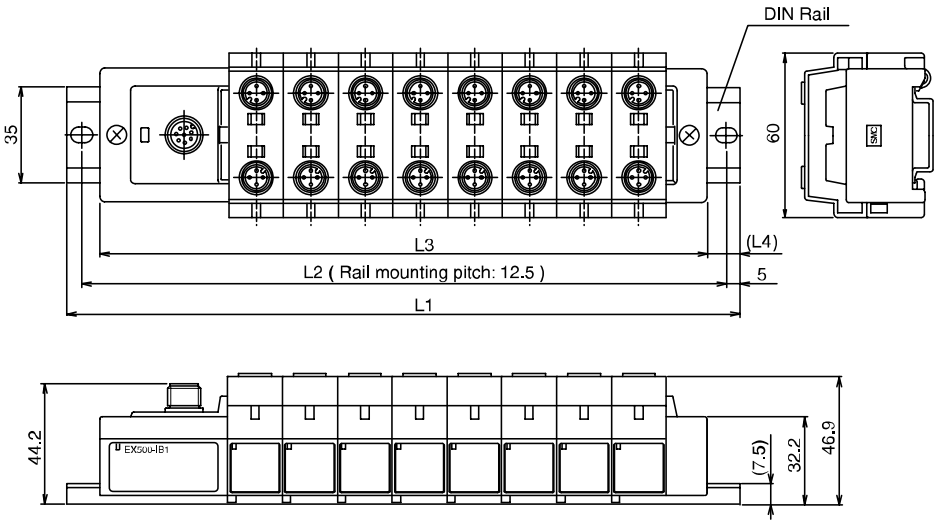


Stations	1	2	3	4	5	6	7	8
L1 [mm]: Rail length	98	110.5	123	135.5	148	160.5	173	185.5
L2 [mm]: Mounting pitch	87.5	100	112.5	125	137.5	150	162.5	175
L3 [mm]: Manifold length	74	86	98	110	122	134	146	158
L4 [mm]	12	12	12.5	12.5	13	13	13.5	13.5

•When only input blocks of 8-point-integrated type are connected

Stations	1	2
L1 [mm]: Rail length	135.5	185.5
L2 [mm]: Mounting pitch	125	175
L3 [mm]: Manifold length	110	158
L4 [mm]	12.5	13.5

•When only input blocks for M12 connector are connected



Stations	1	2	3	4	5	6	7	8
L1 [mm]: Rail length	110.5	123	148	173	185.5	210.5	223	248
L2 [mm]: Mounting pitch	100	112.5	137.5	162.5	175	200	212.5	237.5
L3 [mm]: Manifold length	82	102	122	142	162	182	202	222
L4 [mm]	12	12	12.5	12.5	13	13	13.5	13.5

EX9 Series General Purpose Output Block

Model indication and How to order

· Output block

EX9-O E T 1

Output method

1	PNP (Negative common)
2	NPN (Positive common)

Power supply type

T	Internal power supply type (for low-watlage load)
P	Integrated power supply type (for high-watlage load)

· Power block

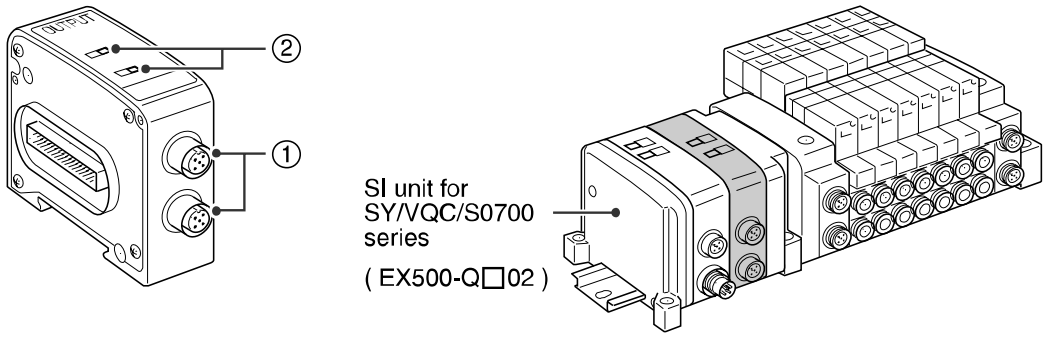
EX9-PE1

Summary of Product parts

The EX9 series general purpose output block is the unit to operate solenoid valve, relay, etc. in combination with SY/SV/VQC/S0700 series valve and applicable SI unit.
There are two types ---- one type is for low wattage load (EX9-OET1 or EX9-OET2) that outputs signals by receiving power supply from SI unit, and the other type is for high wattage load (EX9-OEP1 or EX9-OEP2) that outputs signals by receiving power supply from outside. The type for high wattage load is used in combination with the power block (EX9-PE1) connected with external power supply. As the low-wattage-load type is powered from SI unit, the wattage of load is limited to 1.0 W*1. For a load up to 12 W, use the power block and the high-wattage-load type.
For output block and power block specifications, refer to the manual. (EX##-OMH0005)

1. EX9-OET1/EX9-OET2/EX9-OEP1/EX9-OEP2

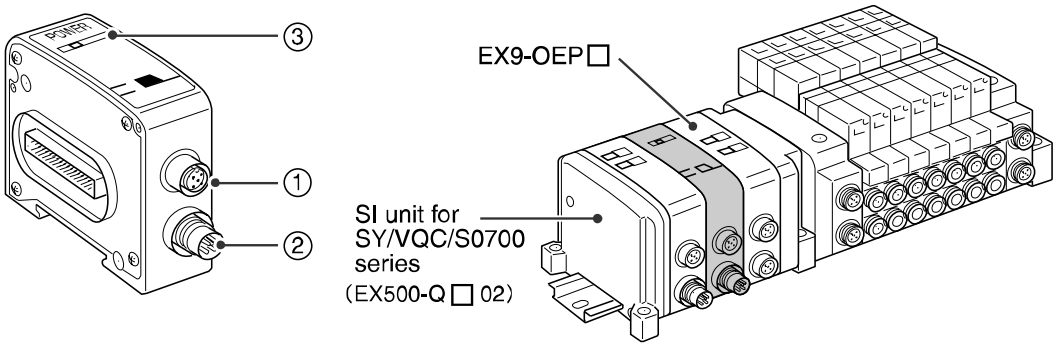
∗: When connecting it with the EX500 series



No.	Description	Function
1	Output connector	Connects with output device. *1
2	Indicator LED	Indicates the output status. *2

∗1: For wiring method, refer to subsection "Wiring" (page 47) of section "EX9 Series General Purpose Output Block" in this manual.
∗2: For display, refer to subsection "Setting" (page 49) of section "EX9 Series General Purpose Output Block" in this manual.

2. EX9-PE1



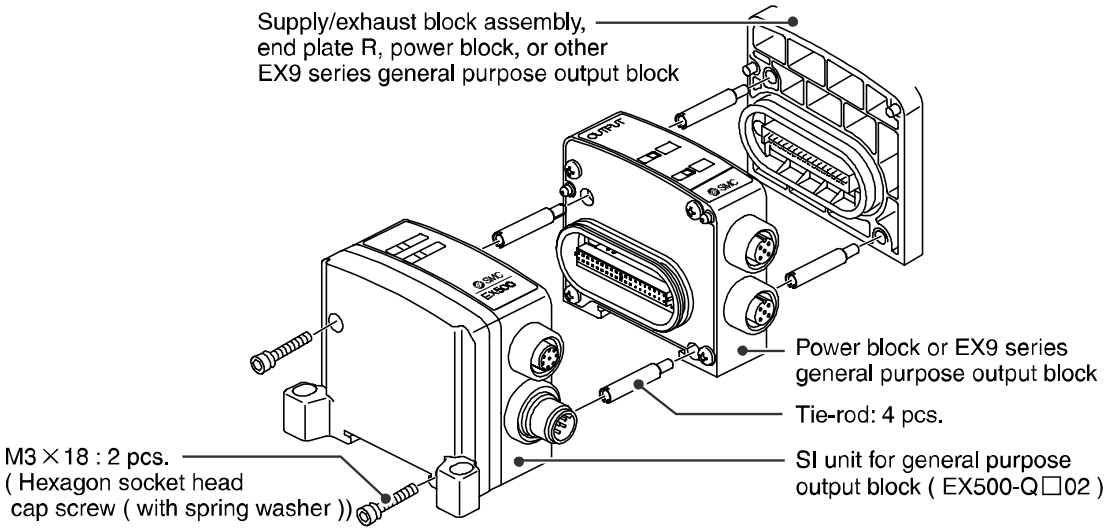
No.	Description	Function
1	Power supply connector	Unused
2	Power input connector	Supplies power for output devices. *1
3	Power LED	Indicates the power supply status. *2

∗1: For wiring method, refer to subsection "Wiring" (page 47) of section "EX9 Series General Purpose Output Block" in this manual.
∗2: For display, refer to subsection "Setting" (page 49) in section "EX9 Series General Purpose Output Block" in this manual.

Mounting and Installation

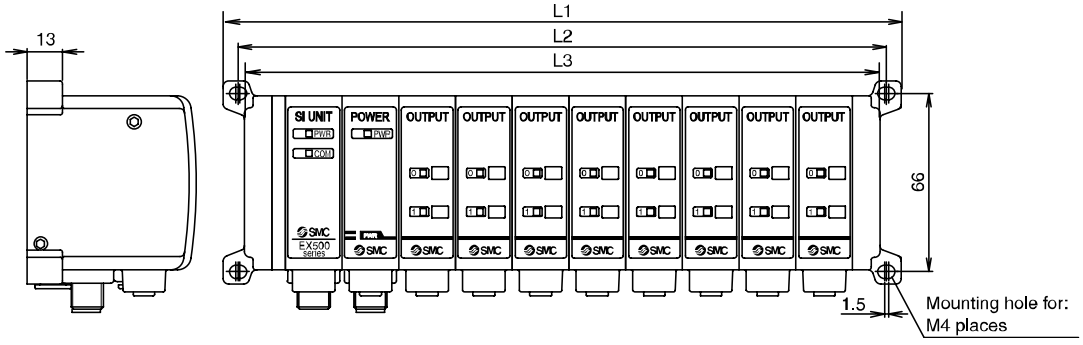
■Installation

The mounting and removing methods of each SI unit are as shown below.



NOTE
Holding with hand so that there will be no gap between units and tighten the bolts.
Be sure to tighten each bolt by specified tightening torque. (Tightening torque: 0.6 Nm)

•Dimensions when general purpose output block is connected



L dimensions

No. of output blocks / power blocks stations	1	2	3	4	5	6	7	8
L1 [mm]	83	104	125	146	167	188	209	230
L2 [mm]	72	93	114	135	156	177	198	219
L3 [mm]	67	88	109	130	151	172	193	214

∗: The above dimensions show an example when one unit of power block (width: 21 mm) is combined.

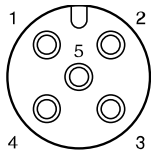
■Wiring

•Output wiring

Connect output devices to the output connectors.

EX9-OET1/EX9-OET2/EX9-OEP1/EX9-OEP2 output connectors

M12, 5-pin, socket

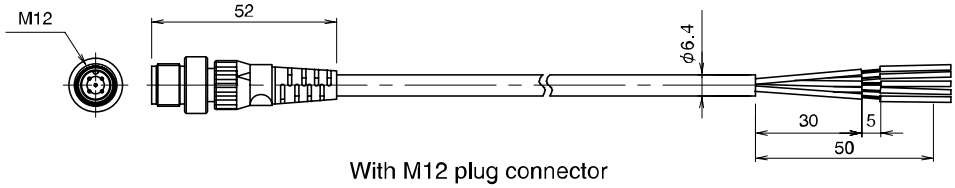


Model	EX9-OET2/EX9-OEP2		EX9-OET1/EX9-OEP1	
No.	NPN output		PNP output	
	Output connector No.0	Output connector No.1	Output connector No.0	Output connector No.1
1	Power supply (24 VDC)	Power supply (24 VDC)	N.C.	N.C.
2	Output (OUT1) *	N.C.	Output (OUT1) *	N.C.
3	N.C.	N.C.	Power supply (GND)	Power supply (GND)
4	Output (OUT0)	Output (OUT1)	Output (OUT0)	Output (OUT1)
5	N.C.	N.C.	N.C.	N.C.

N.C.: Not connected

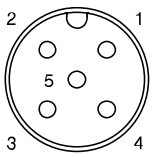
Two outputs are available with only output connector No. 0.

Pin alignment and connection drawing of the Output Cable



With M12 plug connector

EX9-AC□-7



Plug connector pin layout

Pin No.	Cable color
1	Brown
2	White
3	Blue
4	Black
5	Grey

NOTE

Mount a waterproof cap to each unused connector. The proper use of waterproof cap can achieve IP65/67 Enclosure. (Tightening torque for M12: 0.1 Nm)

•Power supply wiring

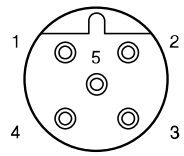
When combining EX9-OEP1 (or EX9-OEP2) and EX9-PE1 and using external power supply, connect the power supply to the power input connector of EX9-PE1.

When selecting power supply, refer to "Safety Instructions" (page 3) in this manual.

EX9-PE1 power supply connector No.0

M12, 5-pin, B-code (Reverse key), Socket

No.	Description
1	Power supply for output devices (24 VDC)
2	Power supply for output devices (0 V)
3	[Power supply for sensor (24 VDC)]
4	[Power supply for sensor (0 V)]
5	Ground (FE)

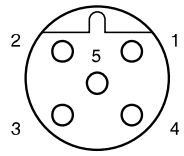


∗: Keep the waterproof cap mounted on power supply connector No.0 while using EX9-PE1. This connector is prepared supplementary and not used normally.

EX9-PE1 power input connector No.1

M12, 5-pin, B-code (Reverse key), plug

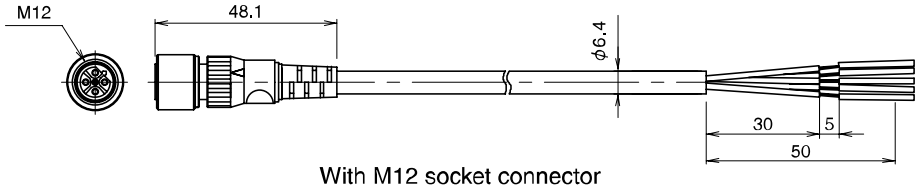
No.	Description
1	Power supply for output devices (24 VDC)
2	Power supply for output devices (0 V)
3	[Power supply for sensor (24 VDC)]
4	[Power supply for sensor (0 V)]
5	Ground (FE)



∗: Each signal of connector No.0 is connected to corresponding signal of connector No.1.

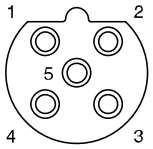
The pins whose applications are shown in brackets [ ], are prepared supplementary and not used normally.

Pin alignment and connection drawing of the Power Supply Cable



With M12 socket connector

EX9-AC□-1

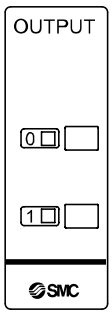


Socket connector pin layout B-code (Reverse key)

Pin No.	Cable color: Signal name
1	Brown: Power supply for output (24 VDC)
2	White: Power supply for output (0 V)
3	Blue: [Power supply to sensor (24 VDC)]
4	Black: [Power supply to sensor (0 V)]
5	Grey: Ground (FE)

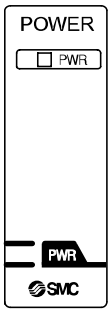
Setting

1. EX9-OET1/EX9-OET2/EX9-OEP1/EX9-OEP2



Display	Content
0	Turns on: Output (OUT 0) is ON. Turns off: Output (OUT 0) is OFF.
1	Turns on: Output (OUT 1) is ON. Turns off: Output (OUT 1) is OFF.

2. EX9-PE1



Display	Content
PWR	Turns on: Power is supplied from external power supply. Turns off: Power is not supplied from external power supply.

Specification

■Specifications

1. EX9-OET1/EX9-OET2/EX9-OEP1/EX9-OEP2

Item	Specification			
Model No.	EX9-OET1	EX9-OET2	EX9-OEP1	EX9-OEP2
No. of output points	2 points/unit			
Output type	PNP (Negative common)	NPN (Positive common)	PNP (Negative common)	NPN (Positive common)
Insulation method	Optical isolation (with SI unit)		Optical isolation (with this unit) (Note)	

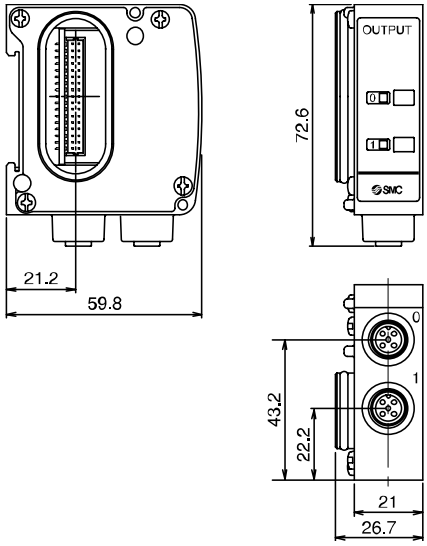
∗: To be used in combination with EX9-PE1.

2. EX9-PE1

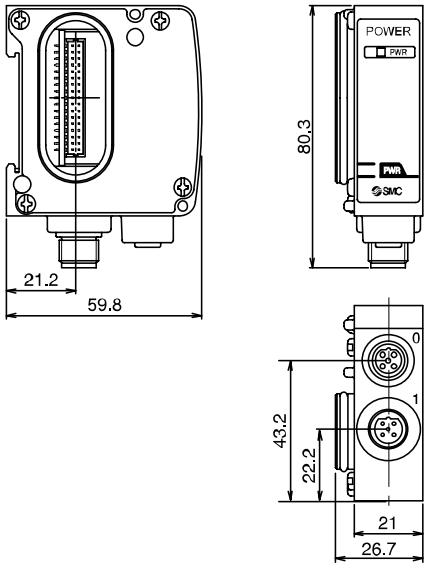
Item	Specification
Rated voltage	24 VDC+10%/-5%
Supply current	3 A Max.

■Dimensions

1. EX9-OET1/EX9-OET2/EX9-OEP1/EX9-OEP2



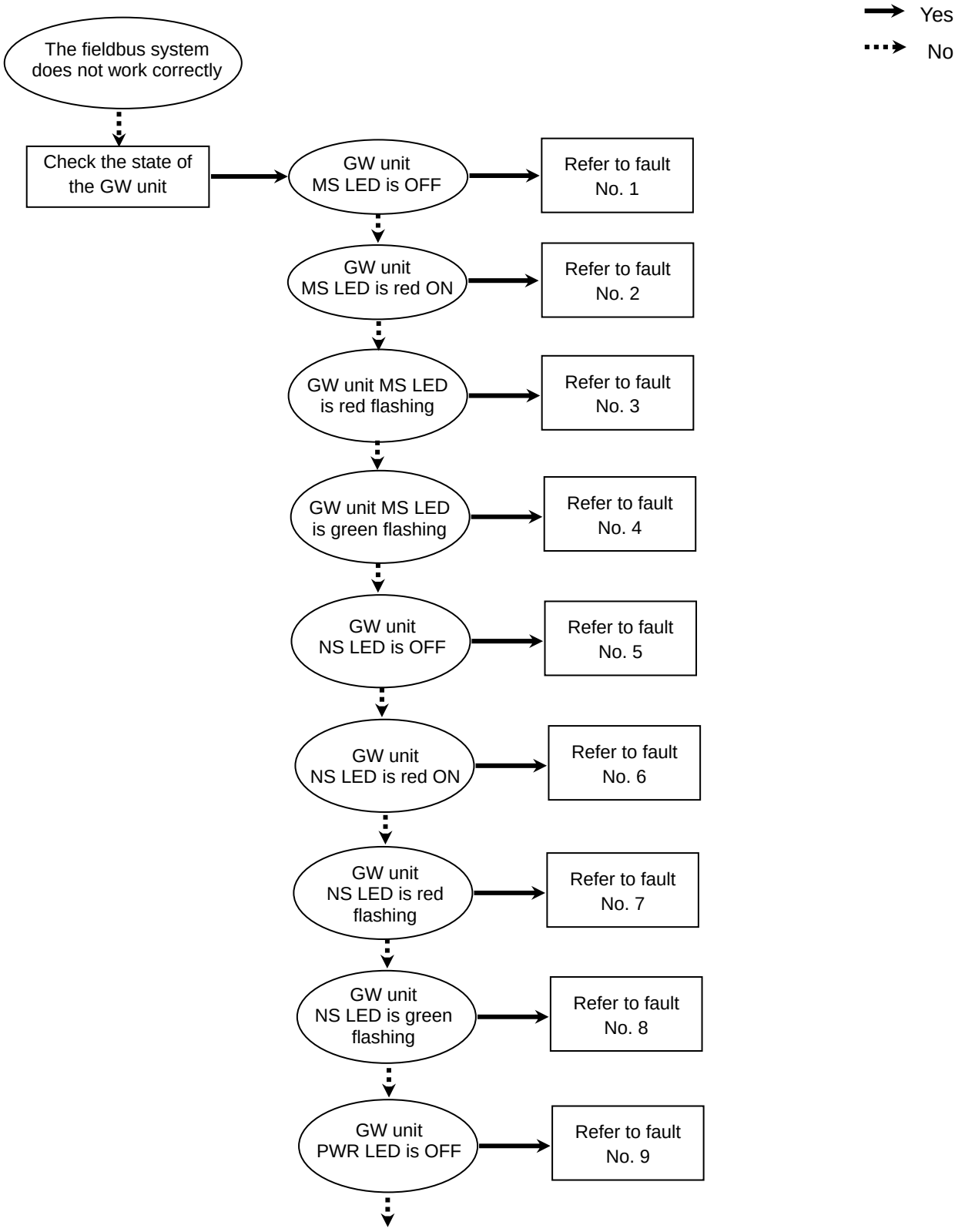
2. EX9-PE1

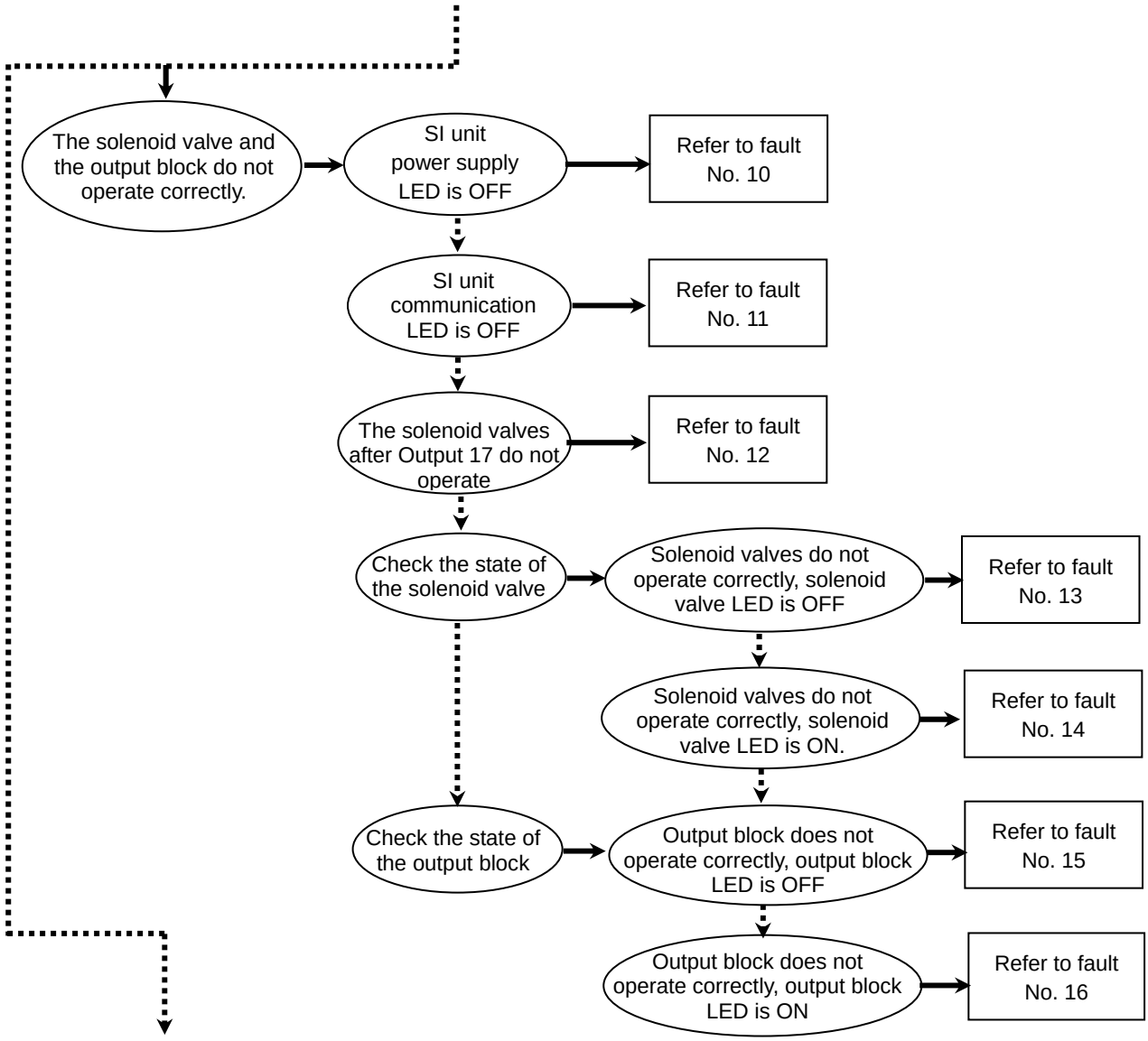


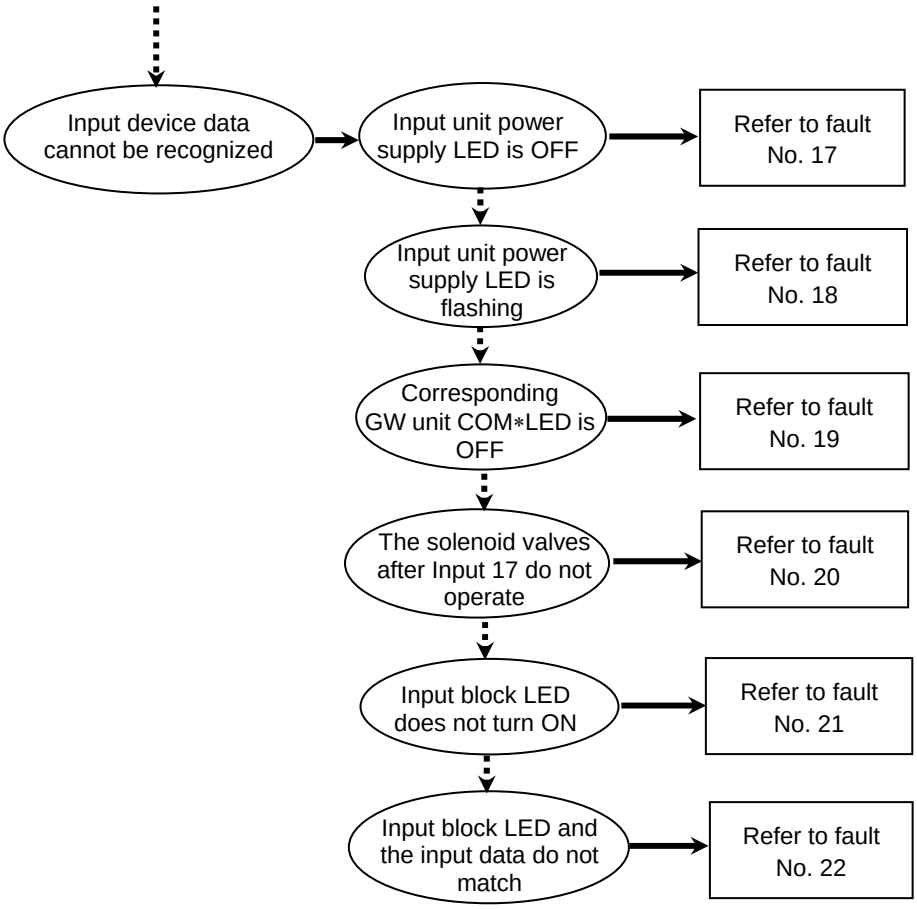
Troubleshooting

Troubleshooting flow chart

When any fieldbus system failure occurs, perform the following troubleshooting procedure:-




The solenoid valve and the output block do not operate correctly.
SI unit power supply LED is OFF
Refer to fault No. 10
SI unit communication LED is OFF
Refer to fault No. 11
The solenoid valves after Output 17 do not operate
Refer to fault No. 12
Check the state of the solenoid valve
Solenoid valves do not operate correctly, solenoid valve LED is OFF
Refer to fault No. 13
Solenoid valves do not operate correctly, solenoid valve LED is ON.
Refer to fault No. 14
Check the state of the output block
Output block does not operate correctly, output block LED is OFF
Refer to fault No. 15
Output block does not operate correctly, output block LED is ON
Refer to fault No. 16


Input device data cannot be recognized
Input unit power supply LED is OFF
Refer to fault No. 17
Input unit power supply LED is flashing
Refer to fault No. 18
Corresponding GW unit COM∗LED is OFF
Refer to fault No. 19
The solenoid valves after Input 17 do not operate
Refer to fault No. 20
Input block LED does not turn ON
Refer to fault No. 21
Input block LED and the input data do not match
Refer to fault No. 22

○Cross-reference for troubleshooting

Fault No. 1

Problem	Possible cause	Investigation method	Countermeasures
GW unit MS LED is OFF	Defective wiring of the power supply for input and control	Check the power supply cable connections and check for broken wires.	Tighten the power supply cable connection. (If the cable has a broken wire, replace the cable).
			Rectify the wiring of the power supply cable.
	Incorrect power supply for input and control	Check the supply voltage for input and control.	Supply 24 VDC ±10% to the power supply for the GW unit control.

Fault No. 2

Problem	Possible cause	Investigation method	Countermeasures
GW unit MS LED is red ON	Malfunction of the GW unit	Change the GW unit and then check whether it is improved or not.	Same as left.

Fault No. 3

Problem	Possible cause	Investigation method	Countermeasures
GW unit MS LED is red flashing	Incomplete network configuration	Check the settings of the EtherNet/IP™ master.	Complete the configuration of the master.

Fault No. 4

Problem	Possible cause	Investigation method	Countermeasures
GW unit MS LED is green flashing	Incomplete network configuration	Check the settings of the EtherNet/IP™ master.	Complete the configuration of the master.

Fault No. 5

Problem	Possible cause	Investigation method	Countermeasures
GW unit NS LED is OFF	Incorrect wiring of the power supply for input and control	Check the power supply cable connections and check for broken wires.	Re-tighten the power cable. (Replace the cable if it is broken).
			Correct the power cable wiring layout
	Incorrect power supply for input and control	Check the supply voltage to the power supply for the input and control.	Supply 24 VDC ±10% to the power supply for the input and control.
	No IP address	Wait for the IP address to be set by the DHCP server	Set the IP address using the DHCP server.

Fault No. 6

Problem	Possible cause	Investigation method	Countermeasures
GW unit NS LED is red ON	IP address has been duplicated	Check that the IP address has not been duplicated on another slave unit.	Set the IP address so that it is not duplicated.

Fault No.7

Problem	Possible cause	Investigation method	Countermeasures
GW unit NS LED is red flashing	EtherNet/IP™ connection time out	Check the communication cable connections and check for broken wires.	Tighten the communication cable connection. (If the cable has a broken wire, replace the cable).
		Check that the communication cable length is within the maximum specified length. Check that the recommended cable for Ethernet has been used. Check that the communication cable wiring is correct.	Wire the communication cable according to the Ethernet wiring specifications.
		Check that there is no noise source or high voltage line around the Ethernet cables and power cables.	Keep noise sources away from Ethernet cables and power cables.

Fault No. 8

Problem	Possible cause	Investigation method	Countermeasures
GW unit NS LED is green flashing	Waiting for connection to be established.	Check the address and communication setting.	Review the setting of the switch and address.
		Check the communication cable connections and check for broken wires.	Tighten the communication cable connection. (If the cable has a broken wire, replace the cable).
		Check if the PLC is operating normally.	Review the setting of PLC.
	Time out to the DHCP server	Check the communication cable connections. Check that the MAC ID and IP address have been registered on the DHCP server.	Register the MAC ID and IP address on the DHCP server. Then supply power to the GW unit again.

Fault No. 9

Problem	Possible cause	Investigation method	Countermeasures
GW unit PWR LED is OFF	Defective wiring of the power supply for solenoid valves	Check the power supply cable connections and check for broken wires.	Tighten the power supply cable connection. (If the cable has a broken wire, replace the cable).
			Rectify the wiring of the power supply cable.
	Incorrect power supply for solenoid valves	Check the supply voltage for solenoid valves.	Supply 24 VDC +10%/-5% to the power supply for solenoid valves.

Fault No. 10

Problem	Possible cause	Investigation method	Countermeasures
SI unit power supply LED is OFF	Defective wiring of the power supply for input and control	Check the branch cable connections and check for broken wires.	Tighten the branch cable connection. (If the cable has a broken wire, replace the cable).

Fault No. 11

Problem	Possible cause	Investigation method	Countermeasures
SI unit communication LED is OFF	Communication failure of the EX500 local bus	Check the branch cable connections and check for broken wires.	Tighten the branch cable connection. (If the cable has a broken wire, replace the cable).
		Check the wiring length of the local bus cable and check that the recommended cable is used.	Review the wiring to make the wire length between the GW unit and SI unit 5 m maximum. Make the wire length between the SI unit and input unit 5 m maximum. Recommended SMC cable: EX500-AC∗∗∗-S∗P∗
		Check that there is no high voltage cable or equipment that generates noise around the local bus cable.	Separate the local bus cable away from noise sources.

Fault No.12

Problem	Possible cause	Investigation method	Countermeasures
The solenoid valves after Output 17 do not operate	The total number of output devices (solenoid valves and output blocks) for one port of the GW unit should be 16 maximum	Check the total number of output devices.	Remove the excessive output devices.

Fault No. 13

Problem	Possible cause	Investigation method	Countermeasures
Solenoid valves do not operate correctly, solenoid valve LED is OFF	Defective connection between the SI unit and solenoid valve manifold	Check that the screws which connect the SI unit and the solenoid valve are not loose.	Tighten the screws while holding the SI unit and the solenoid valve manifold so that there is no gap between them. Tighten the screws to the specified torque.
	Polarity of the solenoid valve and the SI unit output are not compatible	Check that the solenoid valve polarity specification and output polarity of the SI unit are compatible.	Use a solenoid valve polarity compatible with the output polarity of the SI unit.
	Solenoid valve failure	Check that the solenoid valve operates correctly.	Check the solenoid valve operation manual troubleshooting section.

Fault No. 14

Problem	Possible cause	Investigation method	Countermeasures
Solenoid valves do not operate correctly, solenoid valve LED is ON	Solenoid valve failure	Check that the solenoid valve operates correctly.	Check the solenoid valve operation manual troubleshooting section.

Fault No. 15

Problem	Possible cause	Investigation method	Countermeasures
Output block does not operate correctly, output block LED is OFF	Defective connection between the SI unit and output block	Check that the screws which connect the SI unit and output block are not loose.	Tighten the screws while holding the SI unit and the output block so that there is no gap between them. Tighten the screws to the specified torque.
	Polarity of the output block and SI unit output are not compatible	Check that the output block polarity specification and output polarity of the SI unit are compatible. •EX500-Q002 (NPN output) ⇔EX9-OET2/-OEP2 •EX500-Q102 (PNP output) ⇔EX9-OET1/-OEP1	Use an output block polarity compatible with the output polarity of the SI unit.
	Defective connection of the power block (when using EX9-OEP1/-OEP2)	Check if a power block is used, and check that the position of the power block is correct.	Install the power block on the SI unit side of the output block (EX9-OEP1/-OEP2). Refer to the operation manual of EX9 series general purpose output block).
	Failure of power block or output block	Check that the power block and output block are operating correctly.	Replace the power block or output block and check the operation.

Fault No. 16

Problem	Possible cause	Investigation method	Countermeasures
Output block does not operate correctly, output block LED is ON	Defective connection between the output block and load device	Check the connection and wiring (pin layout) between the load device and the output block. Check for broken wires.	Tighten the cable connection. (If the cable has a broken wire, replace the cable).
			Rectify the wiring of the load device cable.
	Output block failure	Check that the output block is operating correctly.	Replace the output block and check the operation.

Fault No. 17

Problem	Possible cause	Investigation method	Countermeasures
Input unit power supply LED is OFF	Defective wiring of the power supply for input and control	Check the branch cable connections and check for broken wires.	Tighten the branch cable connection. (If the cable has a broken wire, replace the cable).

Fault No. 18

Problem	Possible cause	Investigation method	Countermeasures
Input unit power supply LED is flashing	Over current power supply for input and control	Check the total current consumption of the input devices used.	Ensure that the total current consumption is within the specified range of the input unit.
			Resolve the short-circuit or over current.
		Check the input devices used, and check the wiring to the input devices.	Refer to the input device operation manual troubleshooting section, or contact the input device manufacturer.
	Power supply short-circuit of the input devices used	Check that the input device is operating correctly.	

Fault No. 19

Problem	Possible cause	Investigation method	Countermeasures
Corresponding GW unit COM∗LED is OFF	Communication failure of the EX500 local bus	Check the branch cable connections and check for broken wires.	Tighten the branch cable connection. (If the cable has a broken wire, replace the cable).
		Check the wiring length of the local bus cable and that the recommended cable is used.	Review the wiring to make the wire length between the GW unit and SI unit 5 m maximum. Make the wire length between the SI unit and input unit 5 m maximum. Recommended SMC cable: EX500-AC∗∗∗-S∗P∗
		Check that the input unit used is correct.	Use the correct type of input unit.
		Check that there is no high voltage cable or equipment that generates noise around the local bus cable.	Separate the local bus cable away from noise sources.

Fault No. 20

Problem	Possible cause	Investigation method	Countermeasures
The solenoid valves after Input 17 do not operate	The total number of inputs for one port of the GW unit should be 16 maximum.	Check the total number of input blocks.	Remove the excessive input blocks.

Fault No.21

Problem	Possible cause	Investigation method	Countermeasures
Input block LED does not turn ON	Defective connection between the input unit and input block.	Check that the screws which connect the input unit and input block are not loose.	Tighten the screws while holding the input unit and the input block so that there is no gap between them. Tighten the screws to the specified tightening torque.
	Polarity of the input block and input device are not compatible.	Check that the polarity of the input block and the input device are compatible.	Use an input device polarity compatible with the polarity of the input block.
	Defective connection between the input block and input device.	Check the input device connection and wiring (pin layout) and check for broken wires.	Tighten the cable connection. (If the cable has a broken wire, replace the cable).
			Rectify the wiring of the input device cable.
	Input block failure	Check that the input block is operating correctly.	Replace the input block and check the operation.

Fault No. 22

Problem	Possible cause	Investigation method	Countermeasures
Input block LED and the input data do not match	Defective connection between the input unit and input block.	Check that the screws which connect the input unit and input block are not loose.	Tighten the screws while holding the input unit and the input block so that there is no gap between them. Tighten the screws to the specified tightening torque.
	Communication failure of the EX500 local bus	Check the wiring length of the local bus cable and that the recommended cable is used.	Review the wiring to make the wire length between the GW unit and SI unit 5 m maximum. Make the wire length between the SI unit and input unit 5 m maximum. Recommended SMC cable: EX500-AC∗∗∗-S∗P∗
		Check that there is no high voltage cable or equipment that generates noise around the local bus cable.	Separate the local bus cable away from noise sources.
	Failure of the input unit or input block	Check that the input unit and input block are operating correctly.	Replace the input unit or input block and check the operation.

Option

1. Communication cable for Ethernet For details, refer to subsection "Wiring" (page 10) in section "EX500 GW unit" in this manual.

How to order: EX9-AC020EN-PSRJ

Cable specification

M12 plug-RJ45 connector: 2 [m]

How to order: PCA-1446566

Cable specification

M12 plug connector (Single side: loose wire): 5 m

2. Fieldwireable connector for Ethernet For details, refer to subsection "Wiring" (page 10) in section "EX500 GW unit" in this manual.

How to order: PCA-1446533

Connector specification

M12 Plug connector

3 Branch cable with M12 connector For details, refer to subsection "Wiring" (page 10) in section "EX500 GW unit" in this manual.

How to order: EX500-AC030-SSPS

Cable length (L)

003	0.3 [m]
005	0.5 [m]
010	1 [m]
030	3 [m]
050	5 [m]

Connector specification

SSPS	Socket side: Straight, Plug side: Straight
SAPA	Socket side: Angle, Plug side: Angle

4 Power supply connector cable For details, refer to subsection "Wiring" (page 10) of section "EX500 GW unit" in this manual.

How to order: EX500-AP050-S

Cable length (L)

010	1 [m]
050	5 [m]

Connector specification

S	Straight
A	Angle

5 Output cable For details, refer to subsection "Wiring" (page 47) of section "EX9 series General Purpose Output Block " in this manual.

How to order: EX9-AP010-7

Cable length(L)

010	1[m]
030	3[m]

6 Power supply connector cable For details, refer to subsection "Wiring" (page 47) of section "EX9 series General Purpose Output Block " in this manual.

How to order: EX9-AC010- 1

Cable length (L)

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

7 Input block connector junction cable For details, refer to subsection "Wiring" (page 36) of section "Input Unit Manifold" in this manual.

How to order: PCA-1557769

Cable specification

1557769	M12 4 pin connector, 3 [m]
1557772	M8 3 pin connector, 3 [m]

8 Fieldwireable connector for input block For details, refer to subsection "Wiring" (page 36) in section "Input Unit Manifold" in this manual.

How to order: PCA-1557730

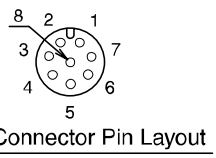
Connector specification

1557730	M8, 3 pin Plug connector (AGW26 to 22)
1557743	M12, 4 pin Plug connector (AGW26 to 22)
1557756	M12, 4 pin Plug connector (AGW22 to 18)

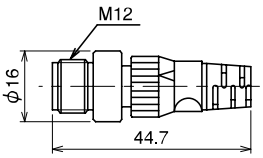
9 Terminal Plug

Connected to C1 (or 0) of SI unit when Input unit manifold is unused. (If this terminal plug is not used, COM LED of GW unit does not light on.)

How to order: EX500-AC000-S



Plug Connector Pin Layout



10 Waterproof cap

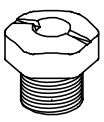
Mounted on unused ports of GW unit, input block, power block and output block.

The proper use of this waterproof cap can achieve IP65/67 Enclosure. (The waterproof caps are delivered together with each as accessories.)

How to order: EX9-AW□

Connector specification

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



NOTE

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

Revision history
A: Contents revised in several places.

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No.EX##-OMN0003-A