No.EX##-OMO0019

Operation Manual

PRODUCT NAME

PROFIBUS DP Compatible Fieldbus System

MODEL / Series / Product Number

EX500-GPR1A etc.

SMC Corporation

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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

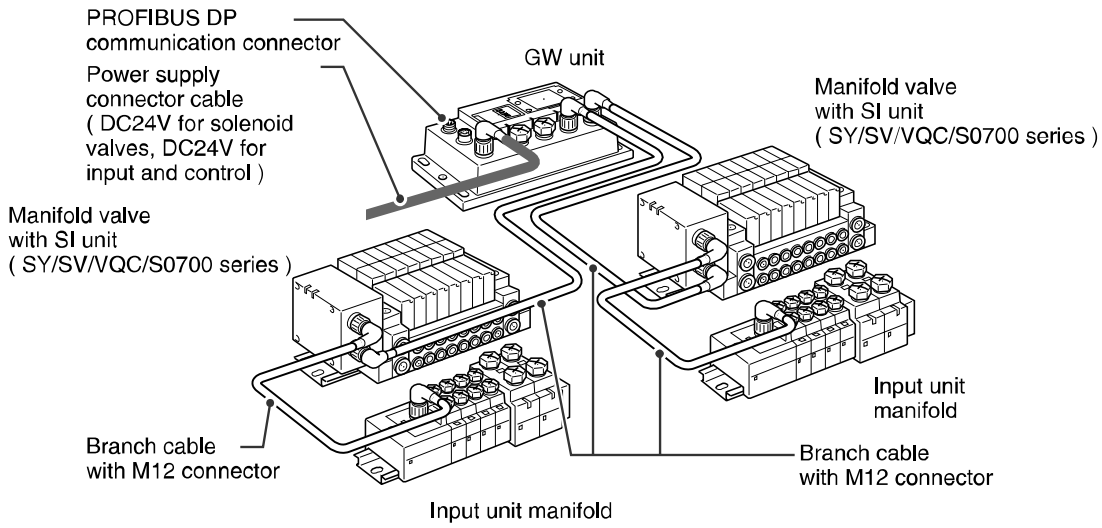
- Perform settings suitable for the operating conditions.
  Incorrect setting can cause operation failure.
- Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.
  For the PLC protocol and programming refer to the relevant manufacturer's documentation.

∗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 (PROFIBUS DP) 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 connectors are used for all wirings among devices, the system complies with the IP65 environment.

Model indication and How to order

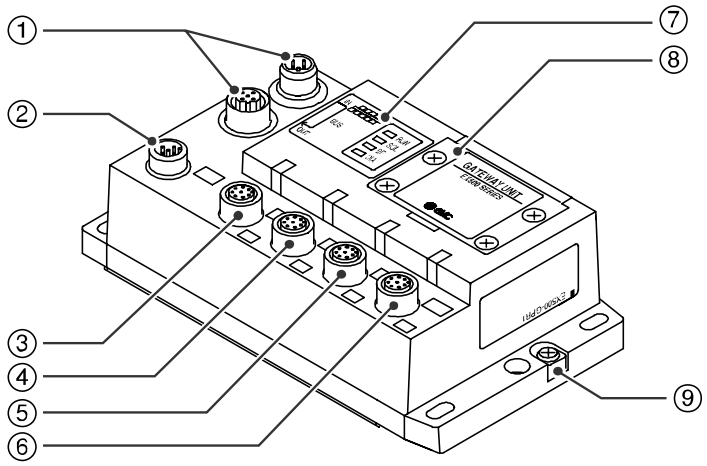
- GW unit

EX500-GPR1A

Fieldbus

PR1A	PROFIBUS DP

Summary of Product parts



No.	Description	Function
1	Communication connector	Connect with PROFIBUS DP line. *1
2	Power supply connector	Supply power for output devices such as solenoid valve, for input devices such as sensor, and for control 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	Indicator	Indicate the power supply status and communication status with PLC. *2
8	Station number switch protective cover	Set address and bus terminator by using the switches under this cover. *2
9	Ground terminal (FE)	Used for grounding.

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

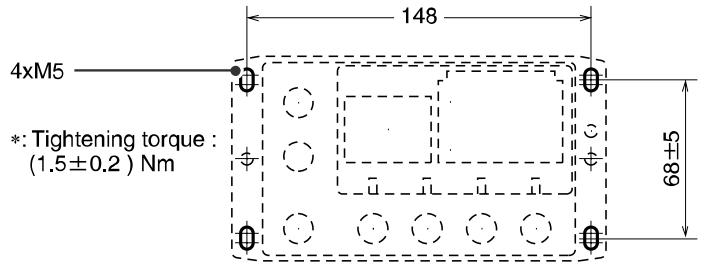
∗2: For display and setting method, refer to subsection "Setting" (page 18) of section "GW unit" in this manual.

Mounting and Installation

■Installation

•Thread mounting

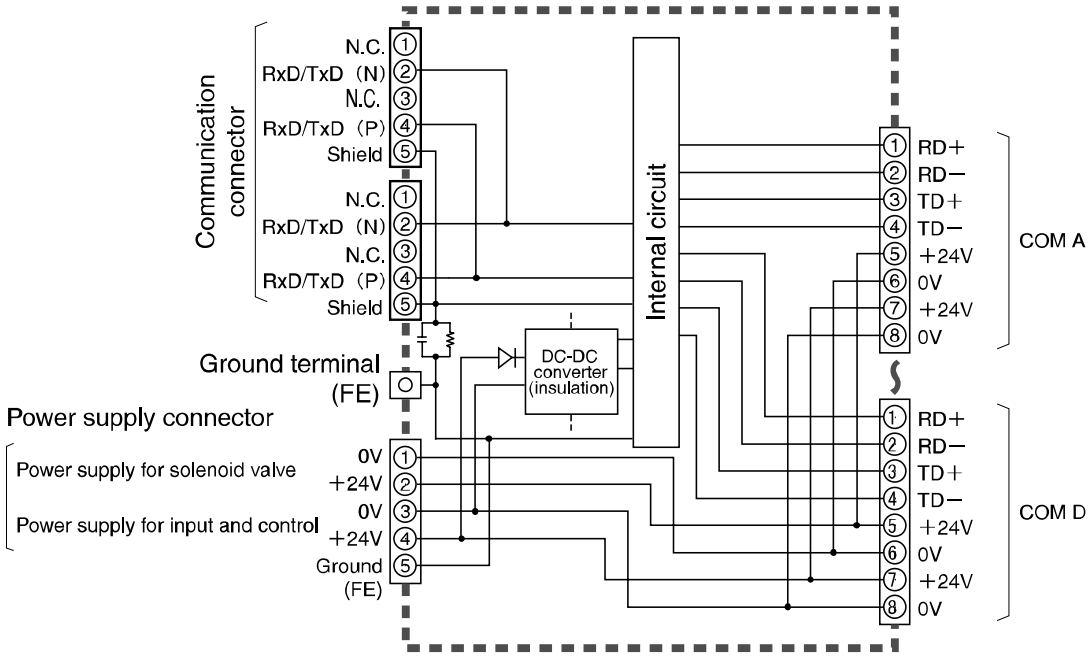
Secure at four positions with screws with head diameter of 5.2 or more and thread length of 15 mm or more.

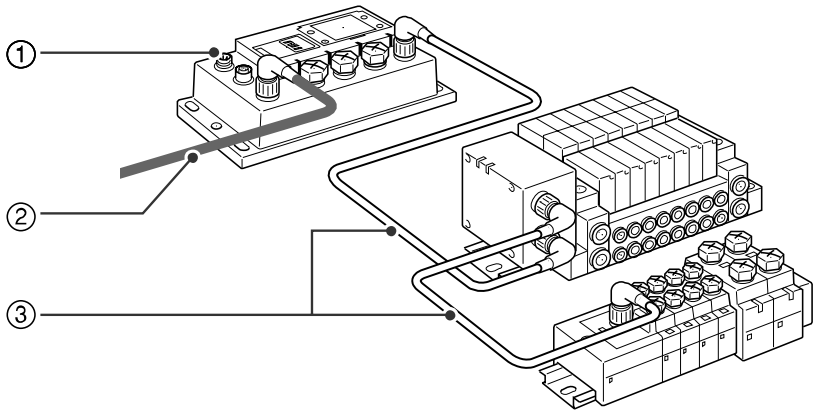


Cutout Dimensions for Mounting

■Wiring

•Internal circuit





The wirings are described in the following order.

1. Communication wiring: Connection with PROFIBUS DP

↓

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

↓

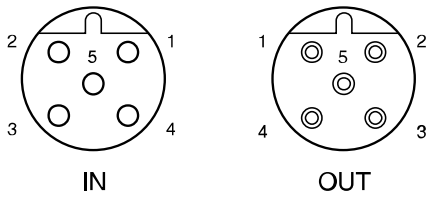
3. Branch wiring: Connection from GW unit to SI unit or Input unit

1. Communication wiring

Connect the cable with PROFIBUS DP communication connector to the communication connector of GW unit.

Cable connection

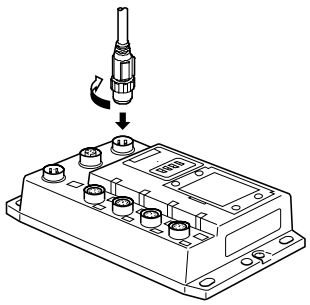
(1)Aligning the key groove with the IN-side communication connector (5-pin, plug, B-code) of GW unit, plug the PROFIBUS DP communication cable (socket).



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

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

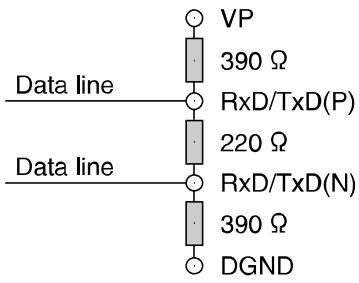
(4)Similar to the above, connect the other communication cable (plug) to the OUT-side communication connector (5-pin, socket, B-code) of GW unit.
Mount a waterproof caps which are supplied on unused OUT-side communication connector.



Connection of bus terminator

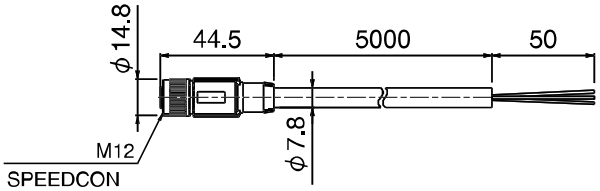
(1)To the units at both ends of PROFIBUS DP system, be sure to connect bus terminators(PCA-1557727 etc).

(2)If this EX500 is such end unit, set the bus terminator. (For how to set, refer to subsection "Display/Switch Setting" (page 18) of section "EX500 GW unit" in this manual.)



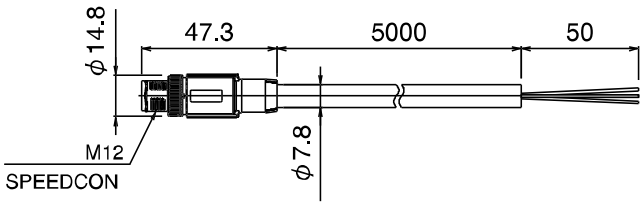
Pin layout and connection diagram of cable with PROFIBUS DP communication connector

Connect the communication cable with M12 connector to the communication connector.



M12 socket connector

PCA-1557688



M12 plug connector

PCA-1557691

Common to IN side and OUT side

Pin No.	Cable color: Signal name
1	N.C. :N.C.
2	Green :RxD/TxD (N) (A Line)
3	N.C. :N.C.
4	Red :RxD/TxD (P) (B Line)
5	N.C. :N.C.

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 supply for solenoid valve 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.

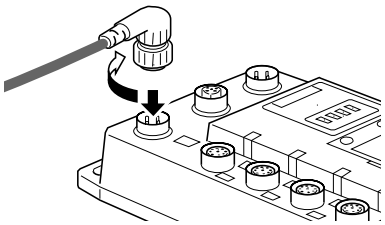
When selecting the power supply, refer to "Safety Instructions" (page 3) in this manual.

Cable connection

(1)Aligning the key groove with the power supply connector (5 pin, plug, A-code) of GW unit, plug the power supply cable (socket).

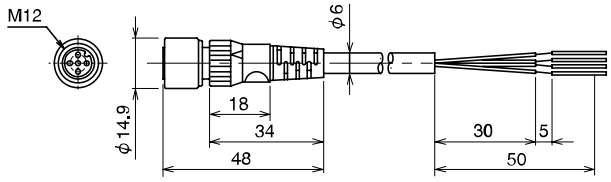
(2)Tighten the lock nut on cable side by turning it clockwise by hand.

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



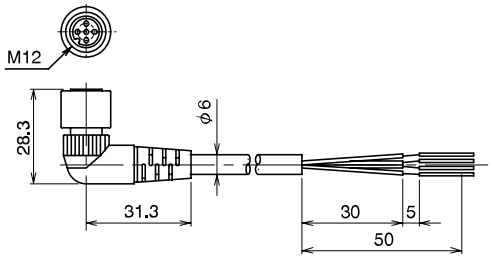
Pin layout and connection diagram of power supply connector cable for (unit: mm)

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



Straight connector Type

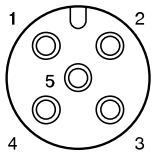
EX500-AP□-S



Angle connector Type

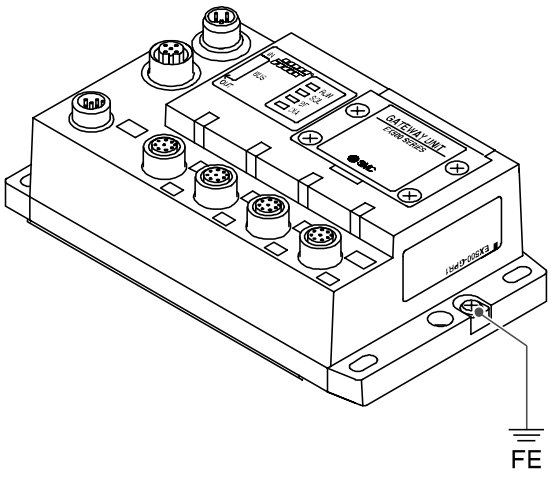
EX500-AP□-A

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



Socket Connector Pin Layout

○FE connection



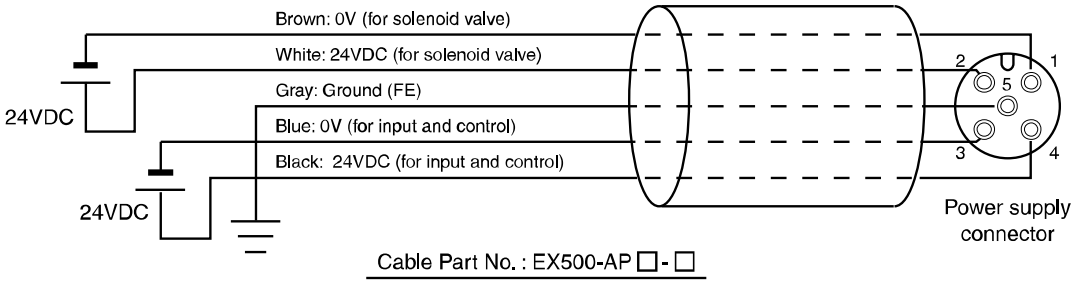
NOTE

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

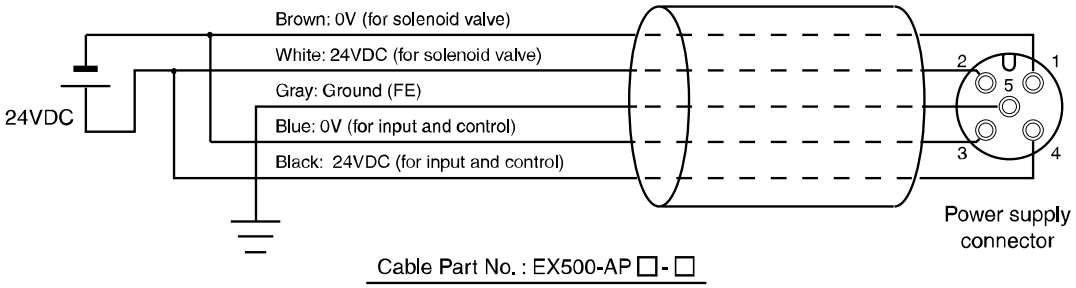
Both single power supply and two power supply systems can be adopted, however, the wiring shall be made separately (for solenoid valve and for input and control) for either system.

A. Dual power supply system



Cable Part No. : EX500-AP☐-☐

B. Single power supply system



Cable Part No. : EX500-AP☐-☐

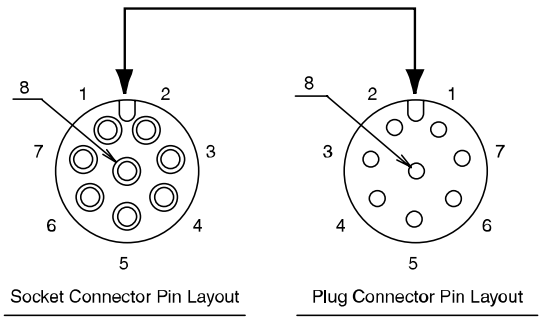
3. Branch wiring (wiring to communication ports)

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.

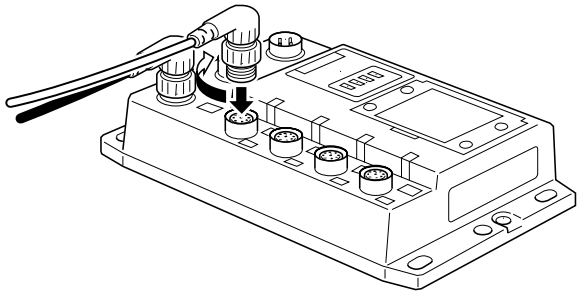
Cable connection

(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.

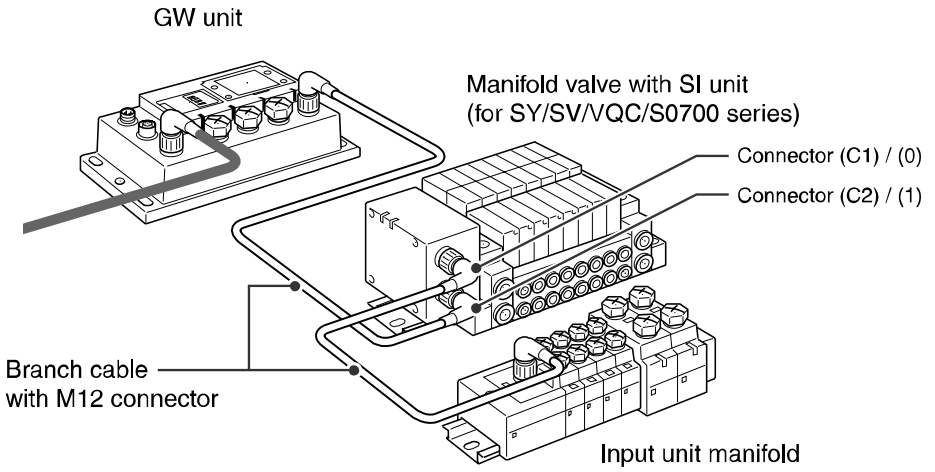


NOTE

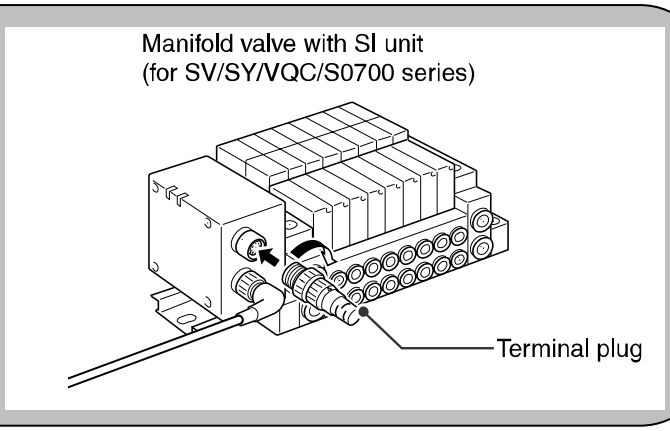
Mount a waterproof cap on each unused connector of GW unit. The proper use of waterproof cap can achieve IP65 Enclosure. (Tightening torque: 0.1Nm for M12)

For GW unit – Manifold valve with SI unit - 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.

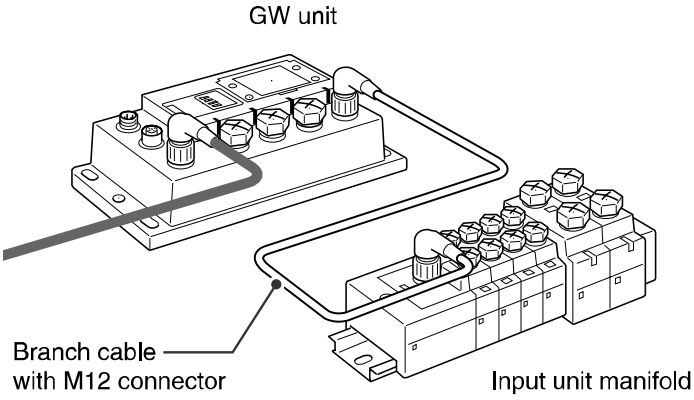


NOTE
When no Input unit is connected to the connector (C1) or (0) of SI unit, mount a terminal plug on the connector.

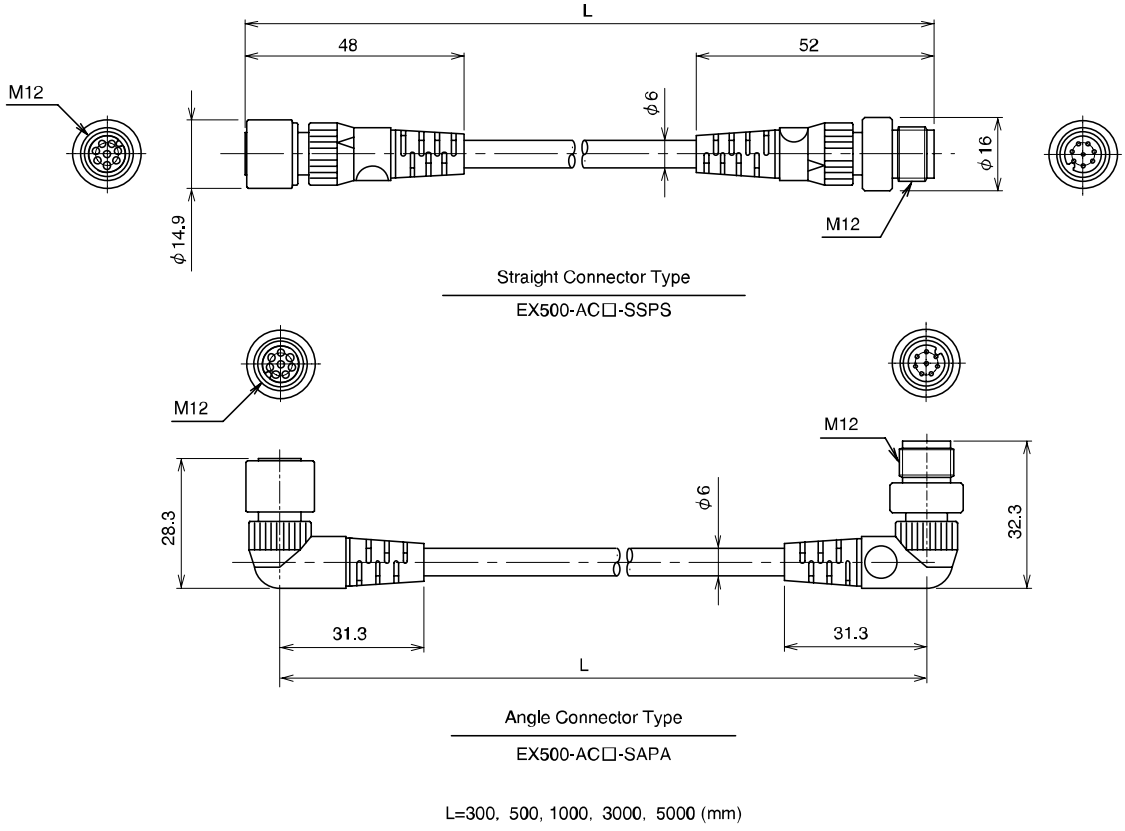


For GW unit – Input unit manifold configuration

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

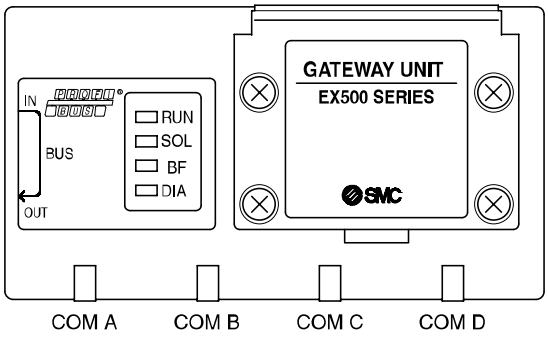


Branch cable with M12 connector (EX500-AC□-S□P□)



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

Setting



Display	Content	
RUN	Green OFF	Power for Input and control is not supplied.
	Green ON	Power for Input and control is supplied.
SOL	Green OFF	Power is not supplied to solenoid valves at specified voltage.(Voltage dropped to lower than 20 V)
	Green ON	Power is supplied to solenoid valves at specified voltage.
BF	Red OFF	PROFIBUS DP communication is normal.
	Red ON	PROFIBUS DP communication is abnormal.
DIA	Red OFF	DIA is normal.
	Red ON	DIA is abnormal.
COM A	Green OFF	COM A has no received data.
	Green ON	COM A is receiving data.
COM B	Green OFF	COM B has no received data.
	Green ON	COM B is receiving data.
COM C	Green OFF	COM C has no received data.
	Green ON	COM C is receiving data.
COM D	Green OFF	COM D has no received data.
	Green ON	COM D is receiving data.

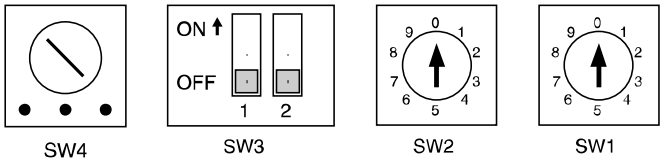
NOTE
When connecting manifold valve only without connecting Input unit manifold, LEDs of COM A - D do not light. To make them light, connect a terminal plug (EX500-AC000-S) to the unused connector of SI unit ("C1" or "0").

•Switch setting

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

NOTE

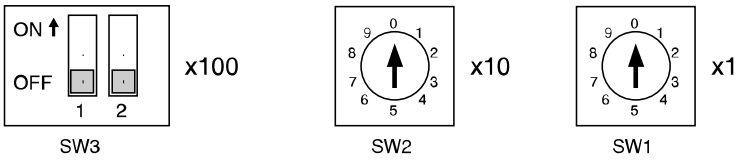
1. Be sure to turn off the power before setting the switches.
2. Be sure to set these switches before use. The factory default settings are all "OFF" or "0".
3. After opening and closing the station number switch protective cover, tighten the screws by proper tightening torque. (Tightening torque: 0.6Nm)



Address setting switches 1, 2 and 3 (SW1, SW2 and SW3)

The node address can be set 0-125 range.

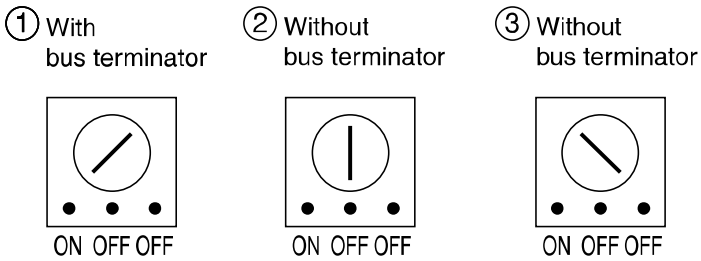
The number of available node is up to 32 stations per segment (without repeater) or 126 stations (with repeater).



SW3		SW2	SW1	Address
1	2			
N.C.	0	0	0	0
		0	1	1
		0	2	2
		…		…
		9	9	99
	1	0	0	100
		0	1	101
		…		…
		2	5	125

Bus terminator switch (SW4)

This switch can set the bus terminator.



○Configuration

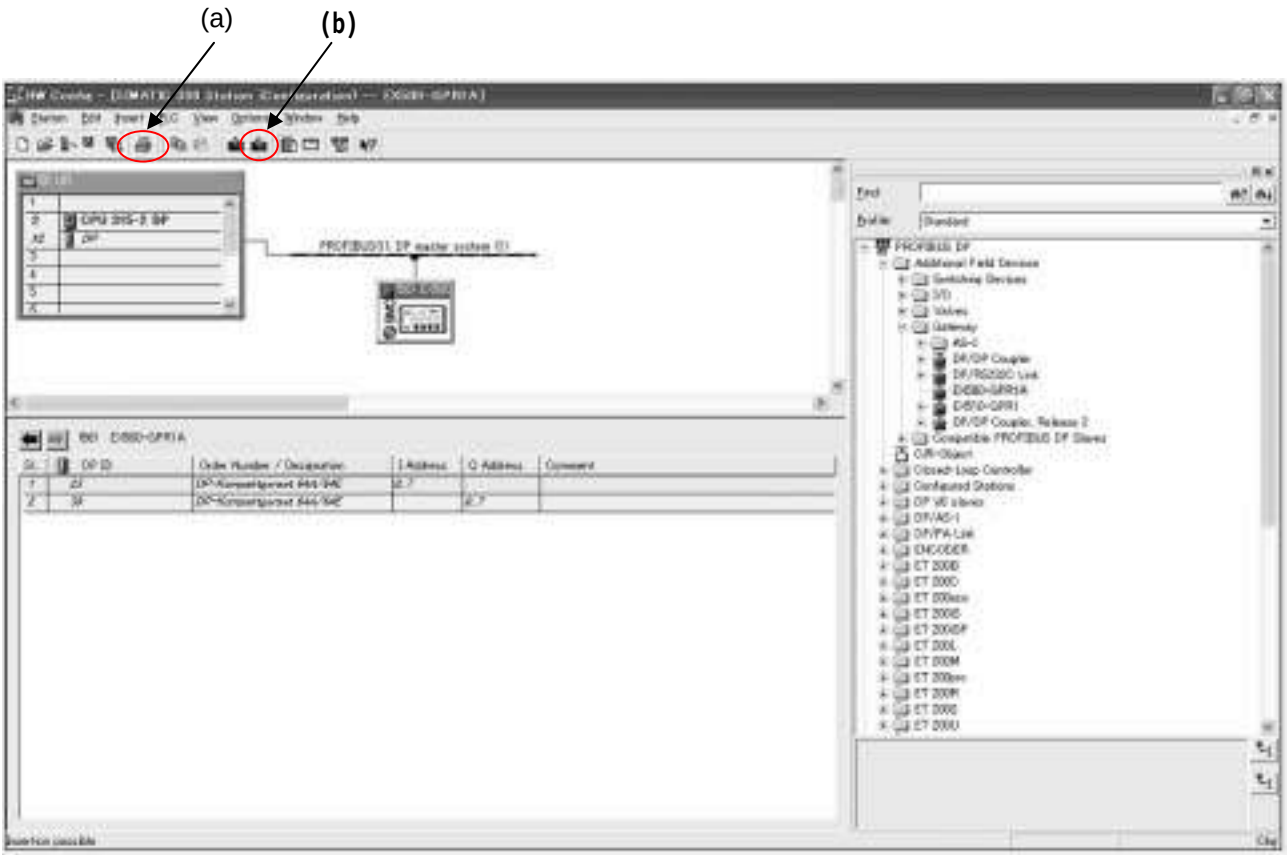
In order to configure the GW unit in the PROFIBUS DP network, the appropriate device master file (GSD file) for the GW unit will be required.
The current GSD file can be found on the SMC website (URL http://www.smcworld.com).

GSD file

	Part number	GSD file
1	EX500-GPR1A	Smc_1405.gsd

The following sections describe as an example the main configuration steps with the STEP7 software.
(1) Copy the GSD file for the GW unit (Smc_1405.gsd) into the directory on your PC.
(2) Start up STEP7, and execute “Options” – “Install GSD Files” from the HW Config tools.
(3) Open “View” and “Catalog”, then an icon “Gateway” is added underneath PROFIBUS DP – Additional Field Devices. Drag and drop “EX500-GPR1A” on the PROFIBUS DP line, then the icon will be added into the PROFIBUS DP line.
(4) Download the setting into the PLC.
Click the icon (a) “Save and Compile” and compile.
After compiling is completed, click the icon (b) “Download to Module” and download.

Now the configuration is complete.



●I/O memory map

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)	offset (Byte)	Input data						
		MSB 7						LSB 0
IWn+0	IBn+0	IN7			COM A			IN0
	IBn+1	IN15						IN8
IWn+1	IBn+2	IN7			COM B			IN0
	IBn+3	IN15						IN8
IWn+2	IBn+4	IN7			COM C			IN0
	IBn+5	IN15						IN8
IWn+3	IBn+6	IN7			COM D			IN0
	IBn+7	IN15						IN8

Output area mapping

offset (Word)	offset (Byte)	Output data						
		MSB 7						LSB 0
QWn+0	QBn+0	OUT7			COM A			OUT0
	QBn+1	OUT15						OUT8
QWn+1	QBn+2	OUT7			COM B			OUT0
	QBn+3	OUT15						OUT8
QWn+2	QBn+4	OUT7			COM C			OUT0
	QBn+5	OUT15						OUT8
QWn+3	QBn+6	OUT7			COM D			OUT0
	QBn+7	OUT15						OUT8

∗: Please refer to the PLC manufacturer's manual etc. for details of the setting memory, reading and writing.

Specification

■Specifications

Basic specifications

Item	Specification
Rated voltage	24 VDC
Power supply voltage range	Power supply for input and control: 24 VDC±10% Power supply for solenoid valve: 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	PROFIBUS DP (EN50170)
BUS .interface	EIA RS-485
Transmission speed	9.6/19.2/45.45/93.75/187.5/500 kbps、1.5/3/6/12 Mbps
Transmission distance	Refer to the next page.
FREEZE mode/SYNC mode	Supported
ID number	1405h (Hexadecimal number)

Transmission distance

For the communication wiring, use a PROFIBUS DP compatible twisted pair cable with shield.
The maximum cable length depends on the transmission rate and the cable type to use. The following table shows the values cable Type A (see ∗) is used.

Transmission speed [kbps]	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Cable length [m]	1200				1000	400	200	100		

∗: Cable Type A specification

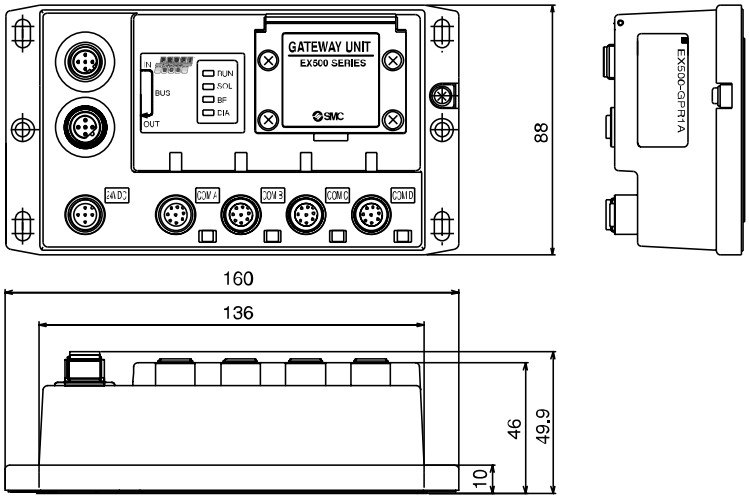
Item	Specification
Impedance	135 to 165 Ω
Capacity	30 pF/m or less
Loop resistance	110 Ω/km
Wire diameter	0.64 mm or more
Core cross-section	0.34 mm^2 or more

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: 750 kbps
Branch current for input	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 $\frac{1}{2}$ is connected)
Branch cable length	5 m or less per branch (total extended length: 10 m 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)

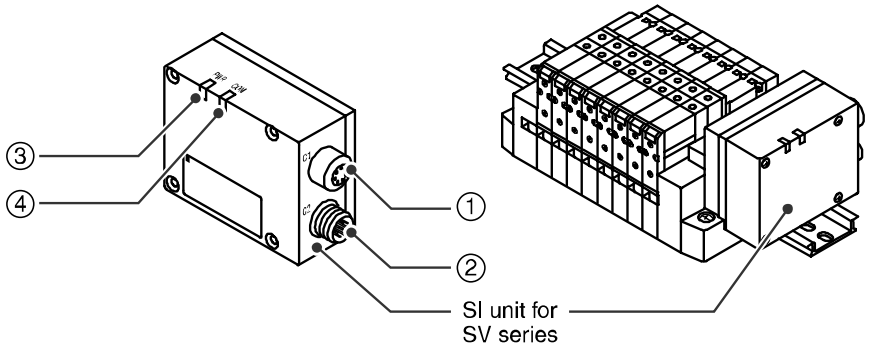
Applicable value manifold

Q	SY, VQC, S0700 series

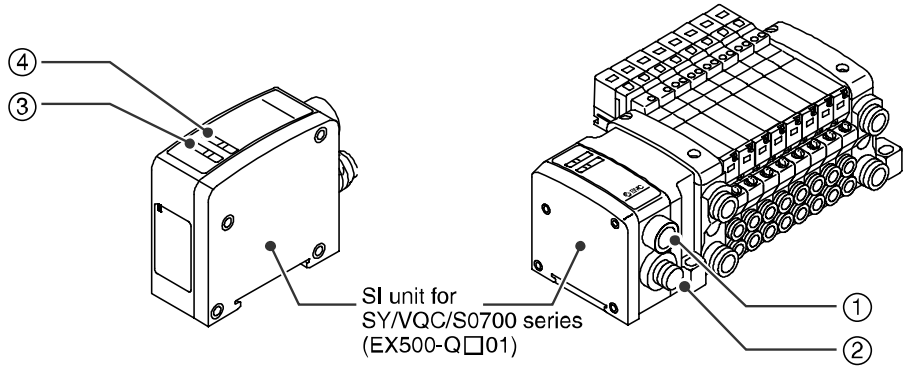
Summary of Product parts

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 43) 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

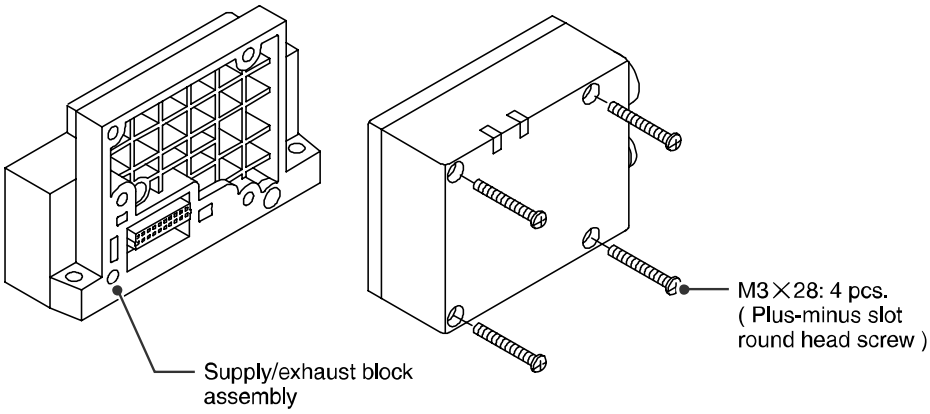
∗1: For wiring method, refer to subsection "Wiring" (page 10) of section "EX500 GW unit" in this manual.

∗2: For display, refer to "Setting" (page 29) in section "SI Unit" in this manual.

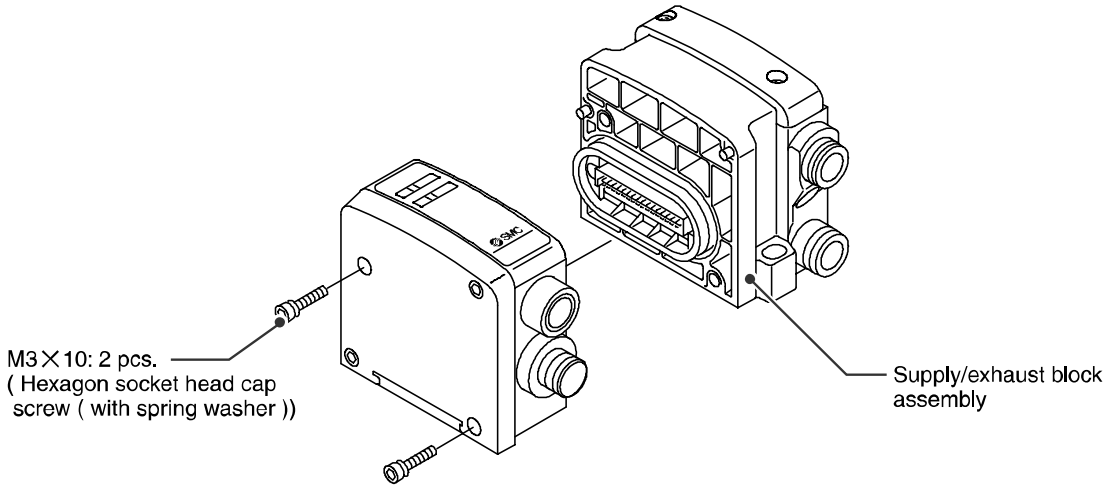
Mounting and Installation

■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 43) 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

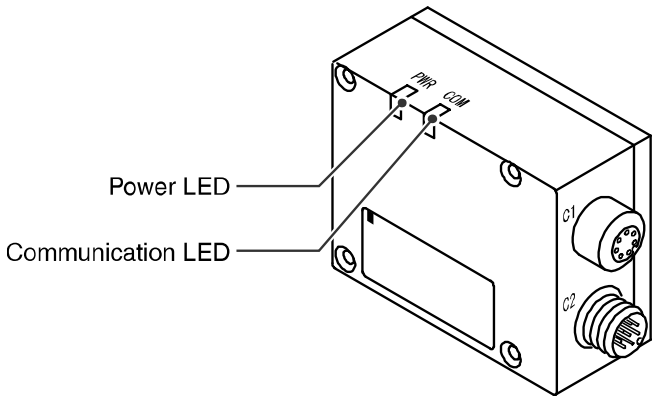
fig.b

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

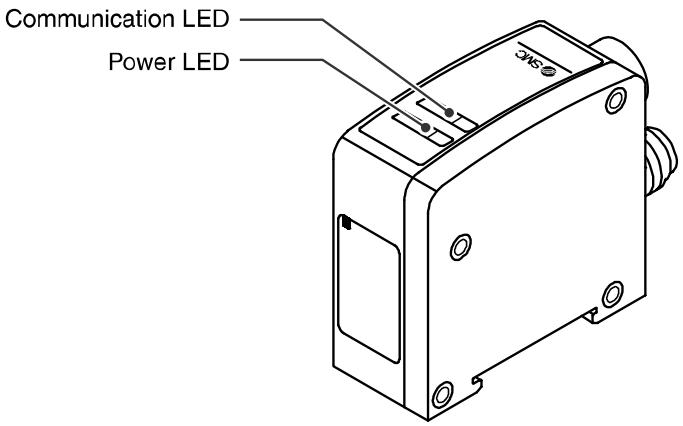
Open

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.)	

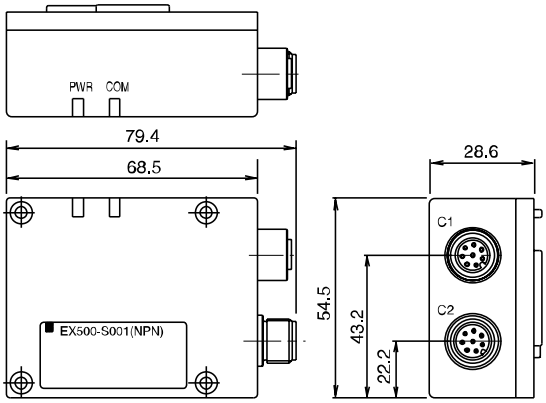
3. Applicable valve series

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

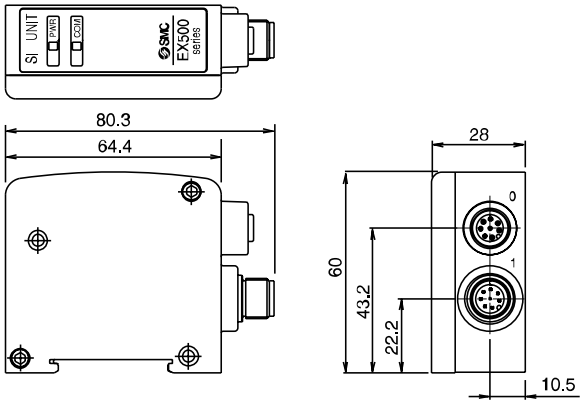
SV1000/2000/3000/4000
SY3000/5000
VQC1000/2000/4000
S0700

■Dimensions

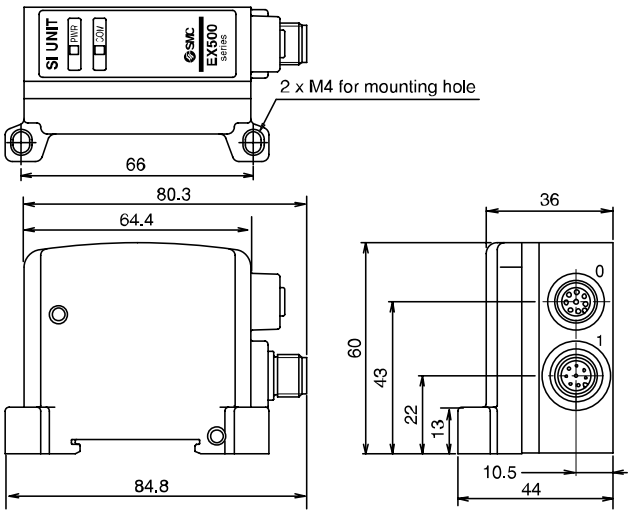
1. SI unit for SV series valves (EX500-S001)



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.

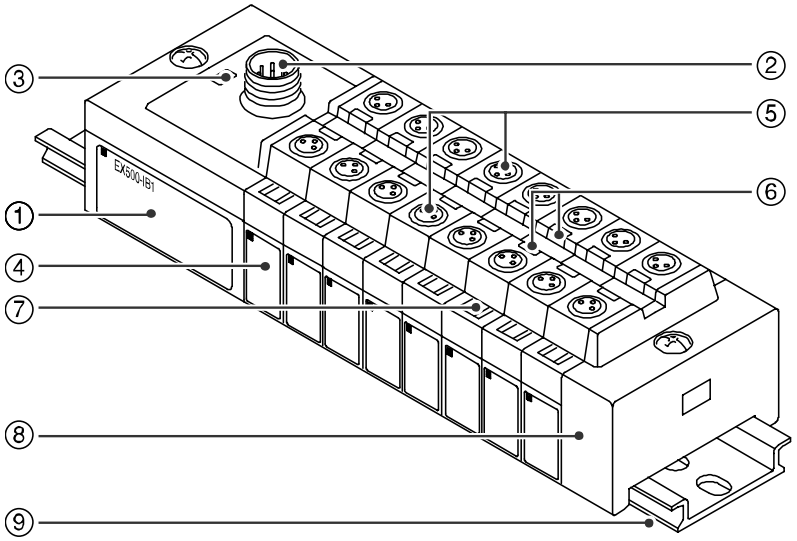


Figure shows the configuration when only input blocks for M8 connector are connected.

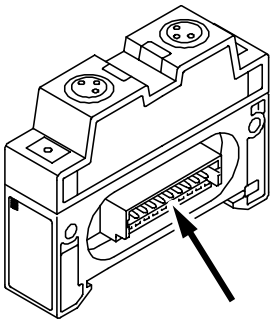
No.	Description	Function
1	Input unit	Unit to communicate with GW unit.
2	Communication connector	To be connected with branch cables from GW unit or SI unit (branch cable with M12 connector) *1
3	Power LED	Indicates the power supply status. *2
4	Input block	Unit for sensor signal input.
5	Sensor connector	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 39) 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)



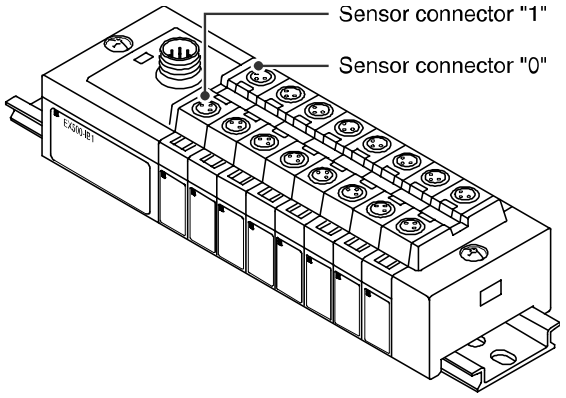
■Wiring

•Branch wiring

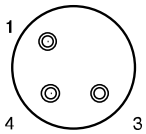
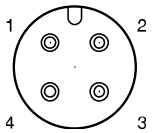
For wiring method, refer to subsection "Wiring" (page 10) of section "EX500 GW unit" in this manual. To input devices such as sensor, the power is supplied through the branch wiring (branch cable with M12 connector). Therefore, there is no need to supply the power to them individually.

•Sensor wiring

Connect sensors to the sensor connectors of input block.

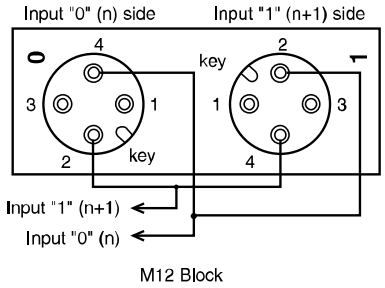


Pin layout of sensor connector

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.

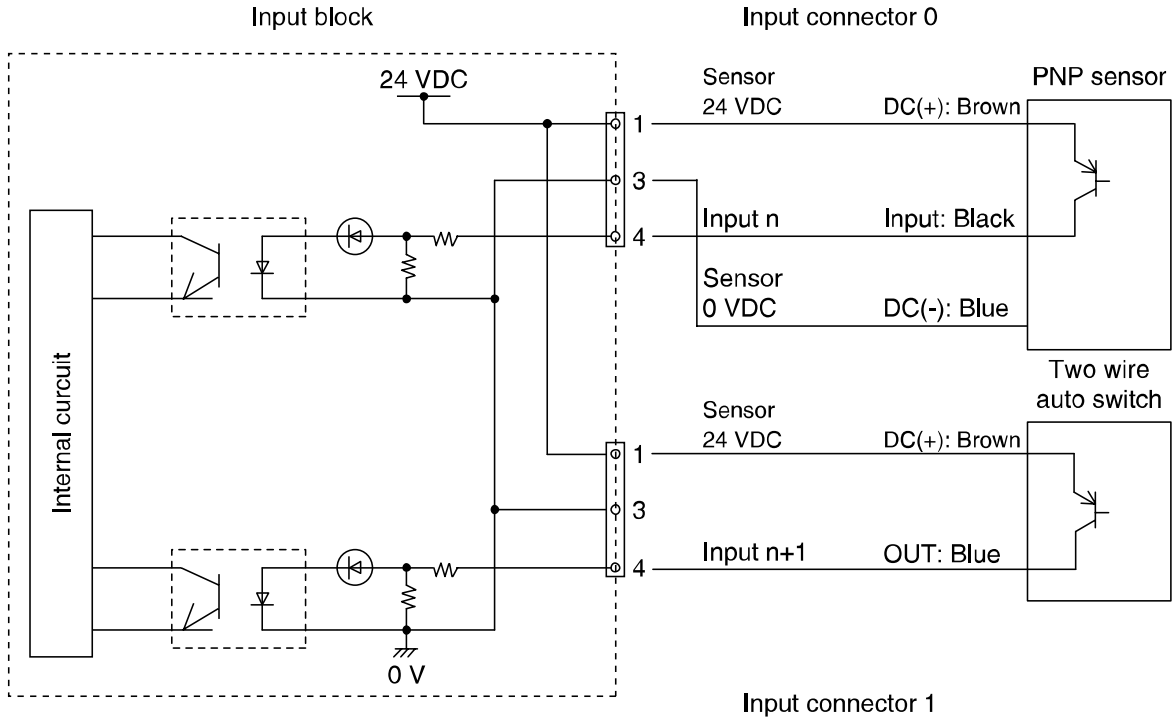


M12 Block

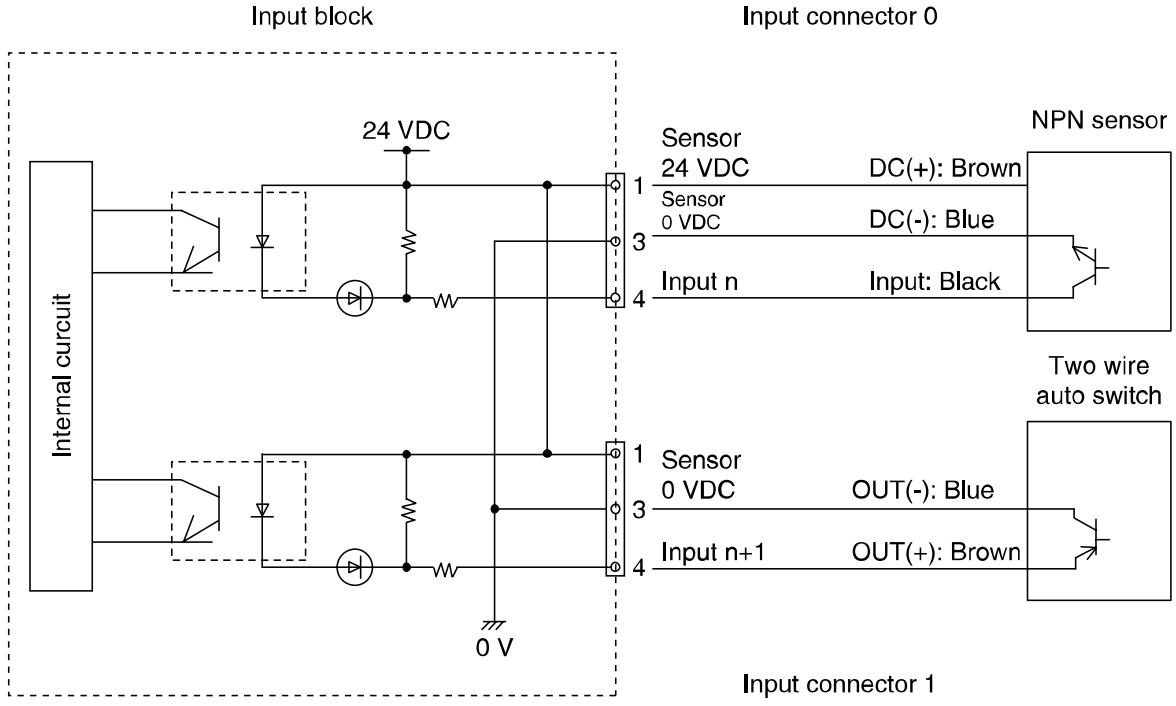
NOTE
Mount a waterproof cap on each unused connector of Input unit. The proper use of waterproof cap can achieve IP65 Enclosure. (Tightening torque: 0.05 Nm for M8 and 0.1 Nm for M12)

●Sensor wiring example

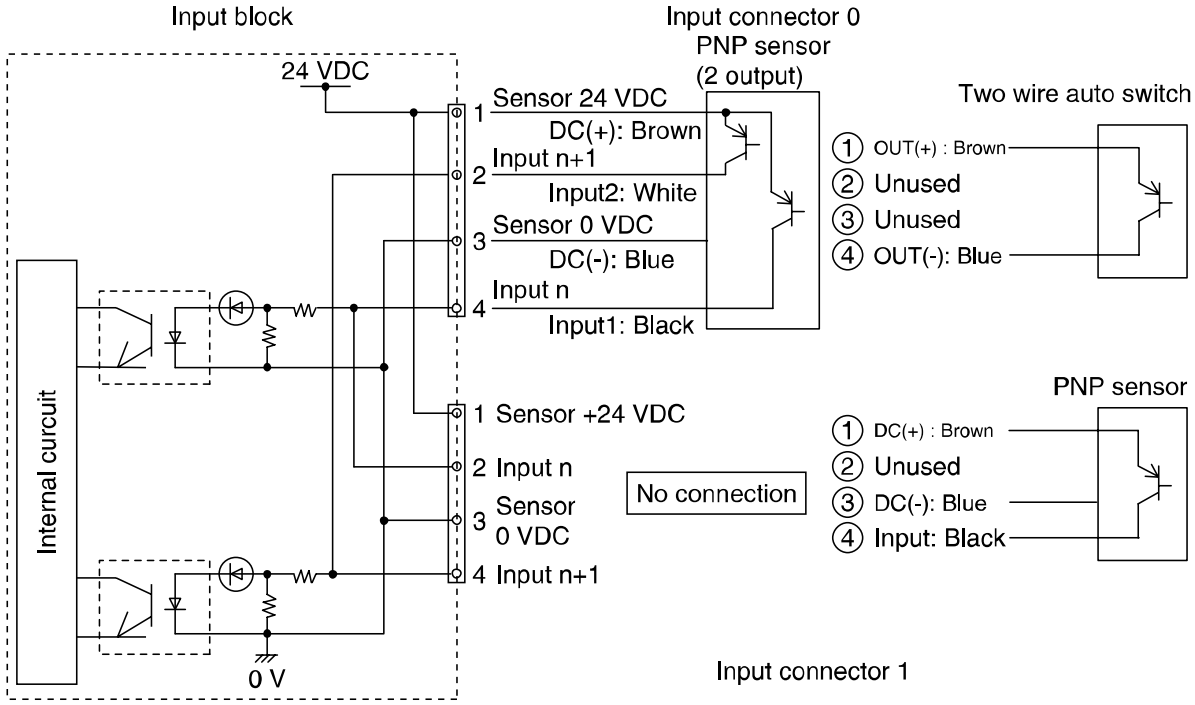
○EX500-IE1/-IE5: M8, 3 pin PNP input block



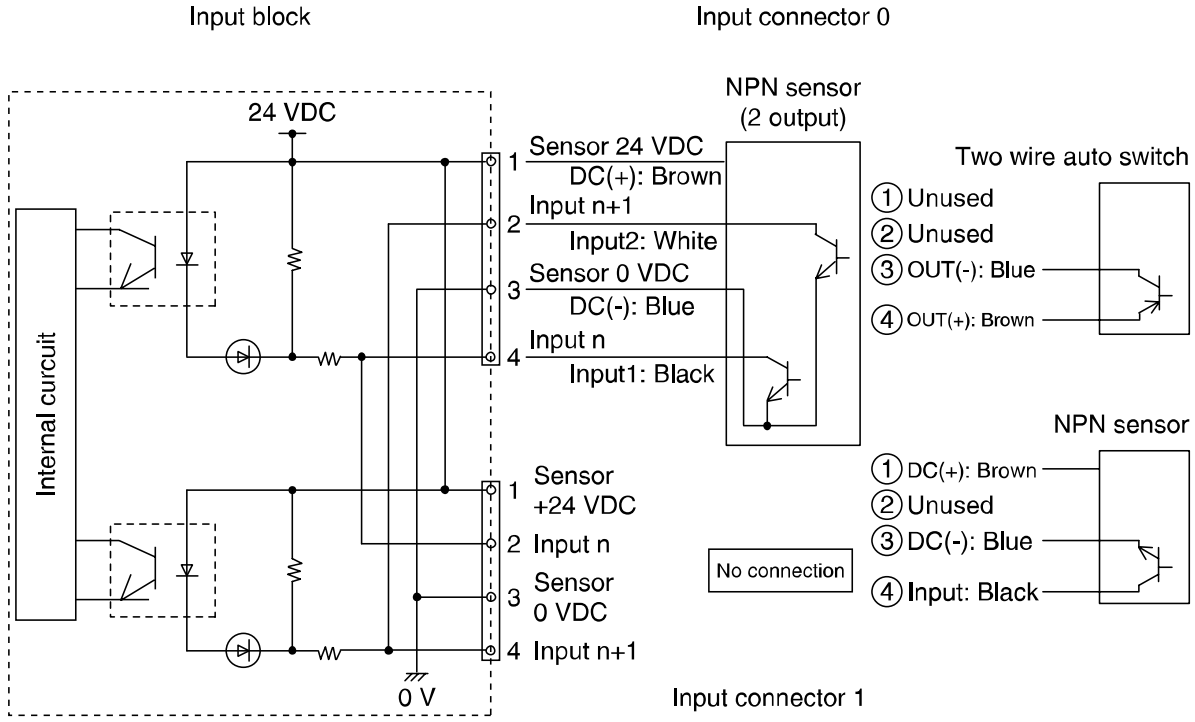
○EX500-IE2/-IE6: M8, 3 pin NPN input block



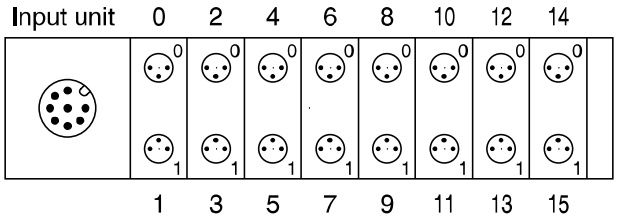
○EX500-IE3: M12, 4 pin PNP input block



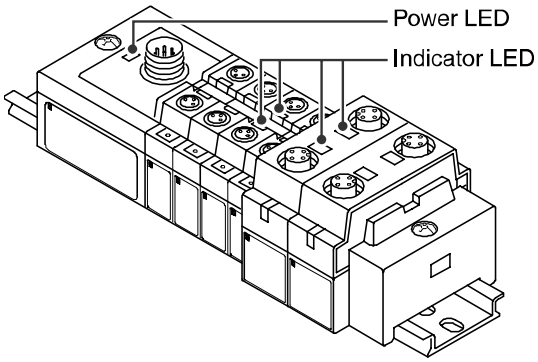
○EX500-IE4: M12, 4 pin NPN input block



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

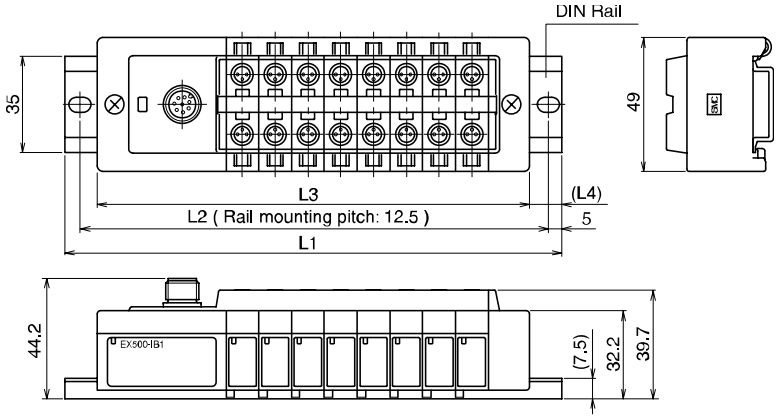
Item	Specification
Connected block	Current source type input block (PNP input block) or Current sink type input block (NPN input block)
Connected block station	Max. 8 blocks
Supply voltage for block	24 VDC
Supply current for block	0.5 A Max.
Current consumption	100 mA or less (at rated voltage)
Short 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

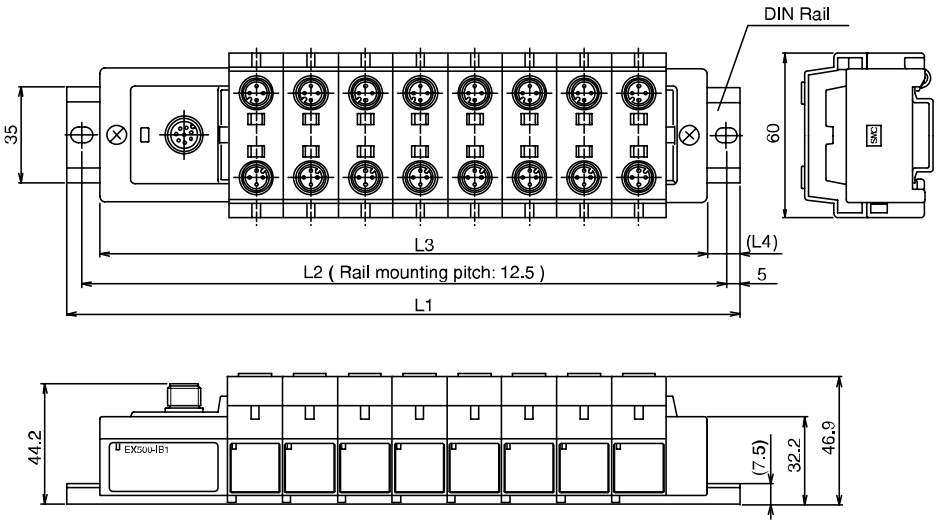


Stations	1	2	3	4	5	6	7	8
L1 [mm]: Rail length	98	110.5	123	135.5	148	160.5	173	185.5
L2 [mm]: Mounting pitch	87.5	100	112.5	125	137.5	150	162.5	175
L3 [mm]: Manifold length	74	86	98	110	122	134	146	158
L4 [mm]	12	12	12.5	12.5	13	13	13.5	13.5

•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

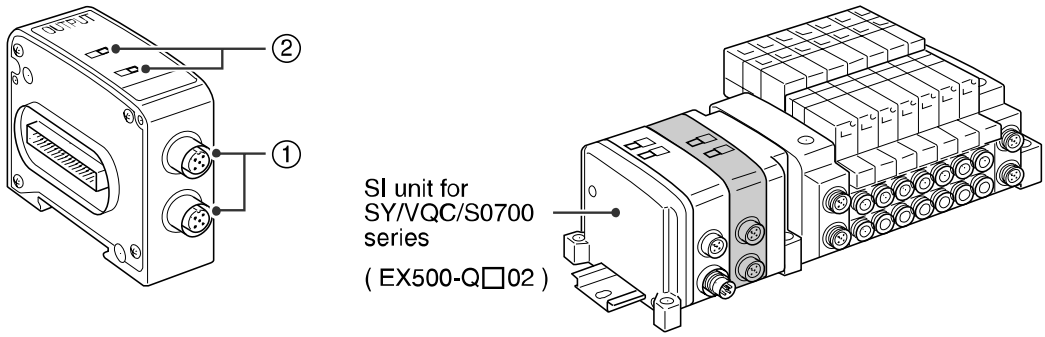
EX9-PE1

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

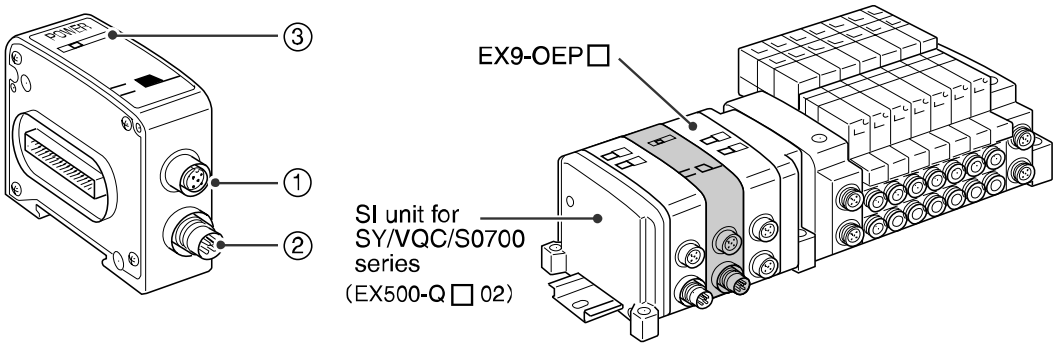
∗: When connecting it with the EX500 series



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 46) of section "EX9 Series General Purpose Output Block" in this manual.
∗2: For display, refer to subsection "Setting" (page 48) of section "EX9 Series General Purpose Output Block" in this manual.

2. EX9-PE1



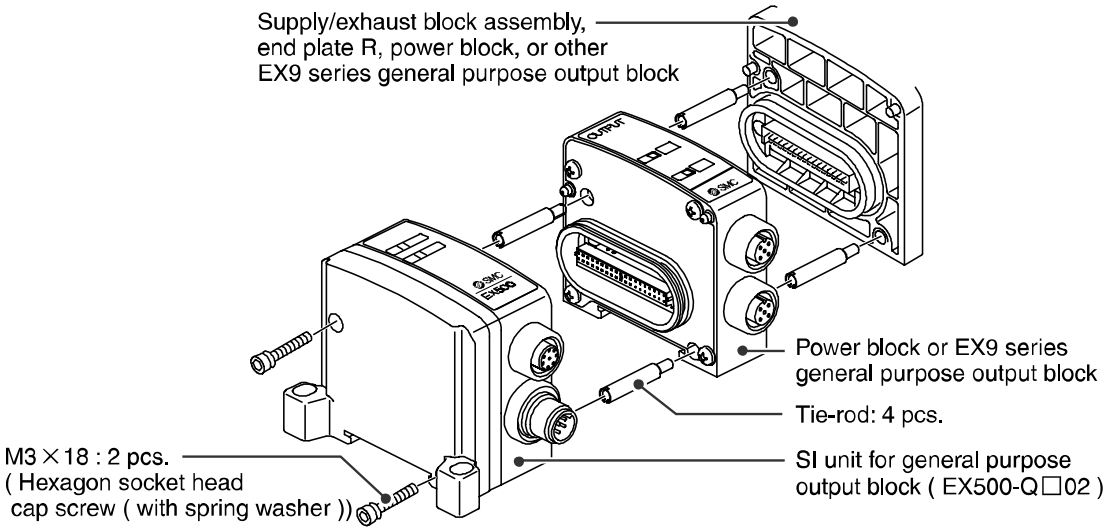
No.	Description	Function
1	Power supply connector	Unused
2	Power input connector	Supplies power for output devices. *1
3	Power LED	Indicates the power supply status. *2

∗1: For wiring method, refer to subsection "Wiring" (page 46) of section "EX9 Series General Purpose Output Block" in this manual.
∗2: For display, refer to subsection "Setting" (page 48) in section "EX9 Series General Purpose Output Block" in this manual.

Mounting and Installation

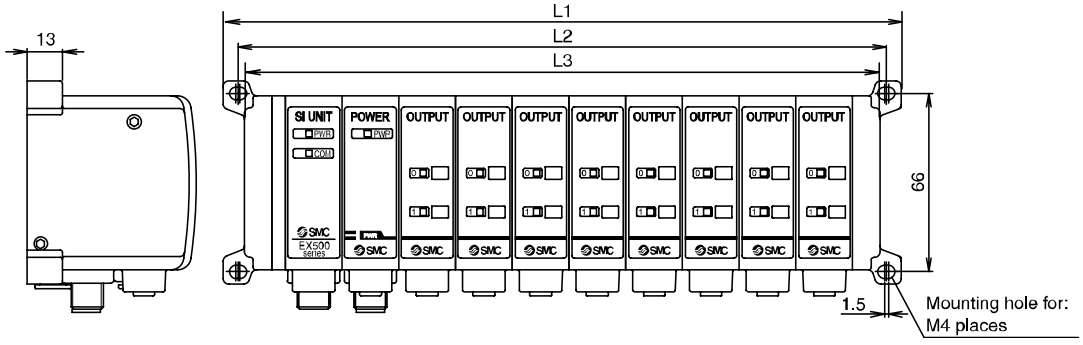
■Installation

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.

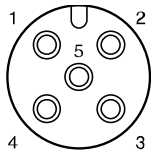
■Wiring

•Output wiring

Connect output devices to the output connectors.

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

M12, 5-pin, socket

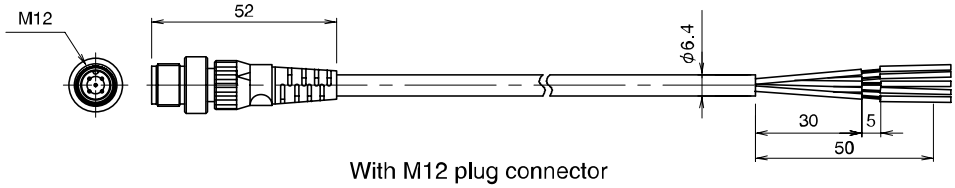


Model	EX9-OET2/EX9-OEP2		EX9-OET1/EX9-OEP1	
No.	NPN output		PNP output	
	Output connector No.0	Output connector No.1	Output connector No.0	Output connector No.1
1	Power supply (24 VDC)	Power supply (24 VDC)	N.C.	N.C.
2	Output (OUT1) *	N.C.	Output (OUT1) *	N.C.
3	N.C.	N.C.	Power supply (GND)	Power supply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

N.C.: Not connected

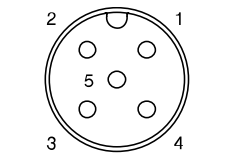
Two outputs are available with only output connector No. 0.

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

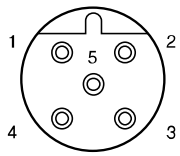
When combining EX9-OEP1 (or EX9-OEP2) and EX9-PE1 and using external power supply, connect the power supply to the power input connector of EX9-PE1.

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)

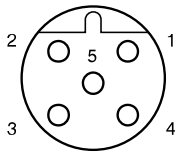


∗: Keep the waterproof cap mounted on power supply connector No.0 while using EX9-PE1. This connector is prepared supplementary and not used normally.

EX9-PE1 power input connector No.1

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

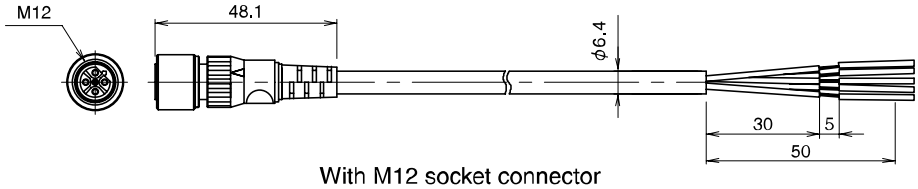
No.	Description
1	Power supply for output devices (24 VDC)
2	Power supply for output devices (0 V)
3	[Power supply for sensor (24 VDC)]
4	[Power supply for sensor (0 V)]
5	Ground (FE)



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

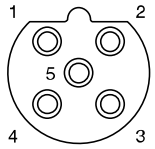
The pins whose applications are shown in brackets [ ], are prepared supplementary and not used normally.

Pin alignment and connection drawing of the Power Supply Cable



With M12 socket connector

EX9-AC□-1

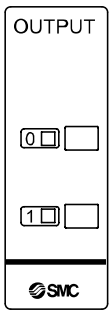


Socket connector pin layout B-code (Reverse key)

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)

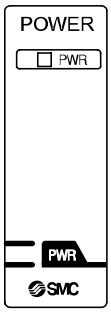
Setting

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)	

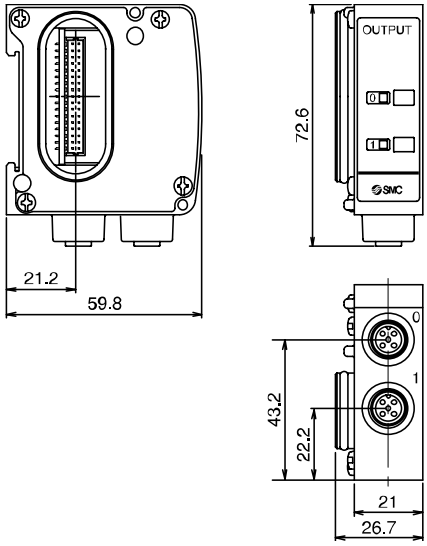
∗: To be used in combination with EX9-PE1.

2. EX9-PE1

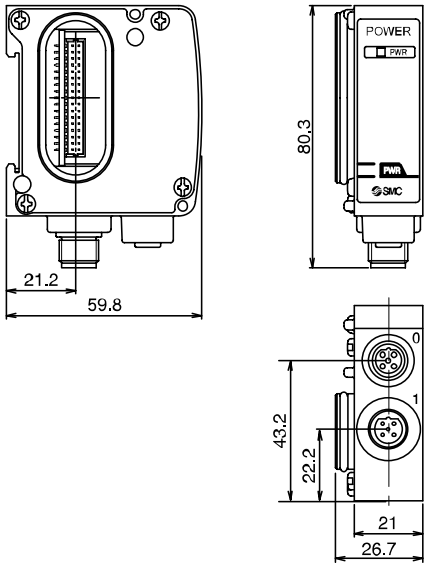
Item	Specification
Rated voltage	24 VDC+10%/-5%
Supply current	3 A Max.

■Dimensions

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



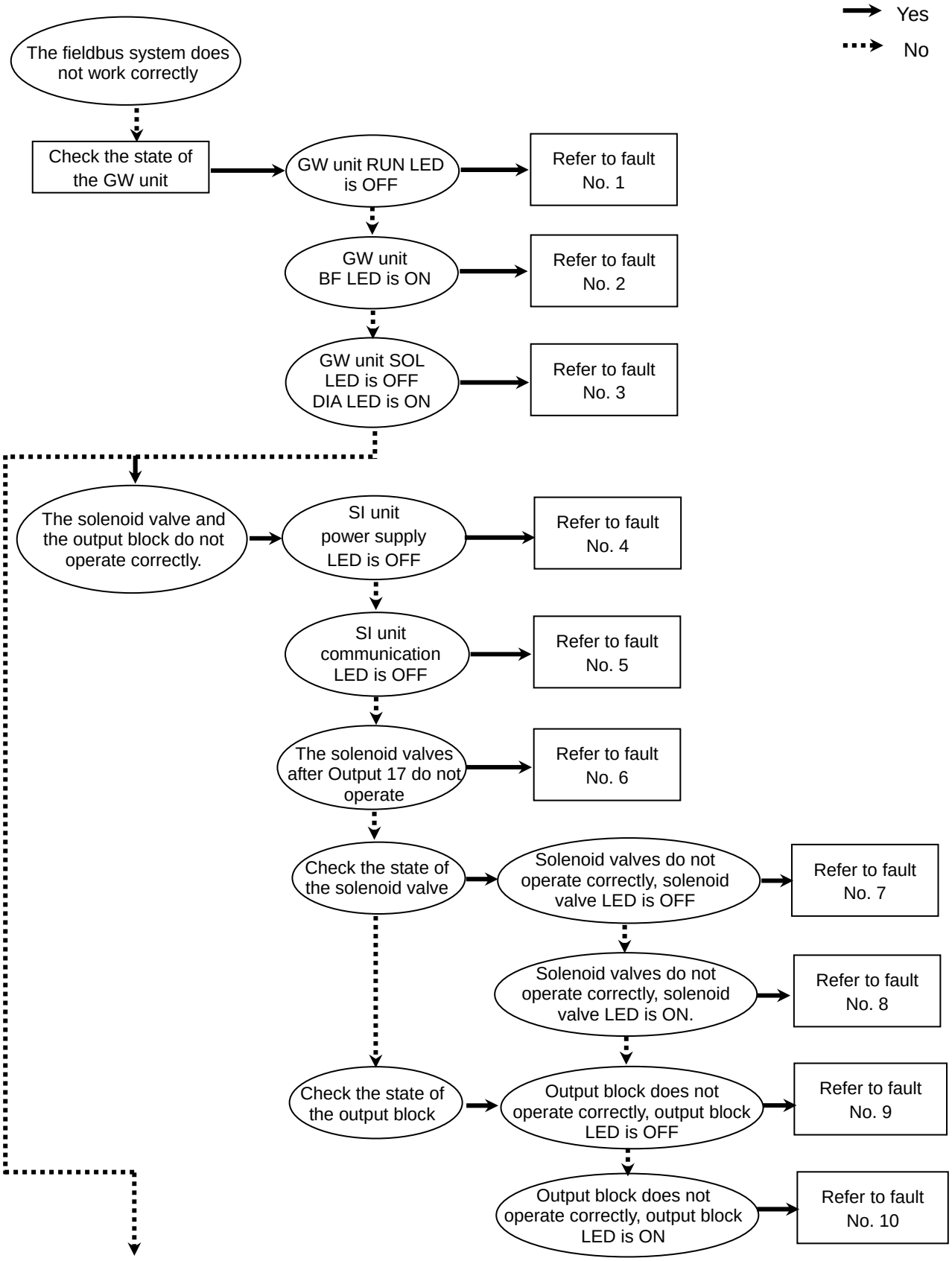
2. EX9-PE1

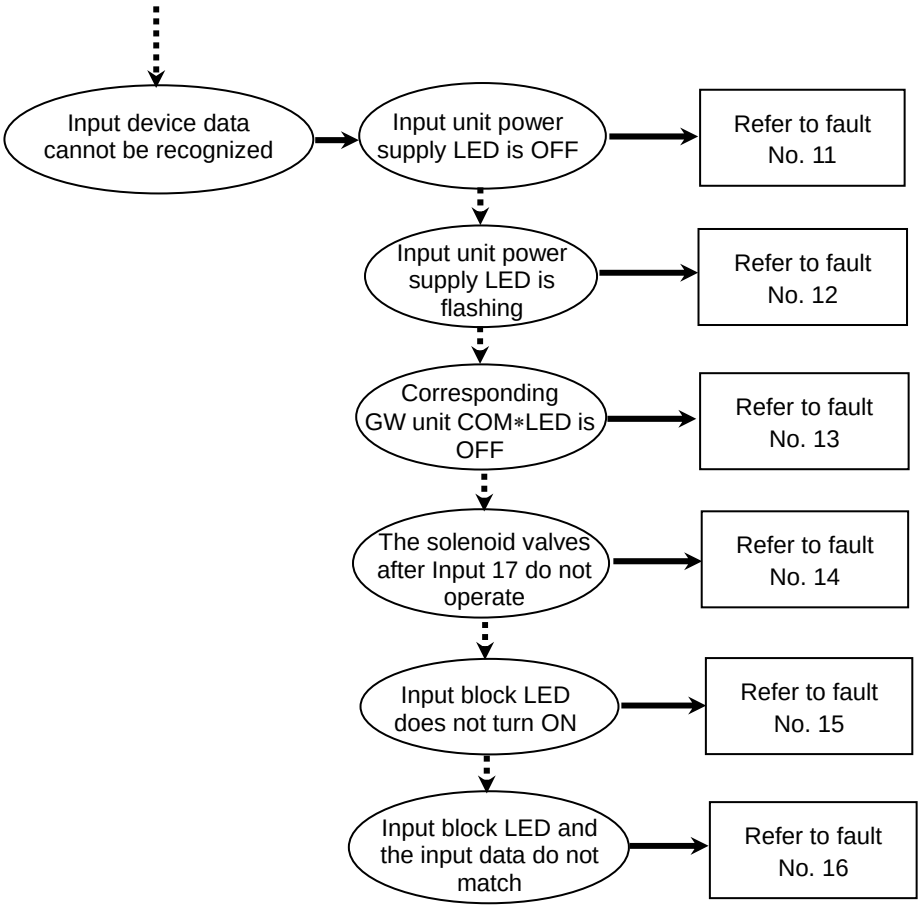


Troubleshooting

Troubleshooting flow chart

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




Input device data cannot be recognized
Input unit power supply LED is OFF
Refer to fault No. 11
Input unit power supply LED is flashing
Refer to fault No. 12
Corresponding GW unit COM∗LED is OFF
Refer to fault No. 13
The solenoid valves after Input 17 do not operate
Refer to fault No. 14
Input block LED does not turn ON
Refer to fault No. 15
Input block LED and the input data do not match
Refer to fault No. 16

○Cross-reference for troubleshooting

Fault No. 1

Problem	Possible cause	Investigation method	Countermeasures
GW unit RUN 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 BF LED is ON	PROFIBUS communication is abnormal	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 wiring length is within the specified operating range. Check that the terminating resistors are mounted correctly at both ends of the trunk line. Check that the cable used is the recommended cable for PROFIBUS. Check the communication cable wiring and the pin numbers.	Wire the communication cable according to the PROFIBUS wiring specifications.
		Check the address setting. Check the settings of the PLC.	Set within the range 0 to 125. Check the operation manual for the PLC.
		Check that there is no high voltage cable or equipment that generates noise around the communication cable.	Separate the communication cable away from noise sources.

Fault No. 3

Problem	Possible cause	Investigation method	Countermeasures
GW unit SOL LED is OFF, DIA LED is ON	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. 4

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. 5

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. 6

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. 7

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. 8

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. 9

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. 10

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. 11

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. 12

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. 13

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. 14

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. 15

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. 16

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 PROFIBUS DP For details, refer to subsection "Wiring" (page 10) in section "EX500 GW unit" in this manual.

How to order: PCA-1557688

Cable specification

1557688	M12 Socket connector: 5 [m]
1557691	M12 Plug connector: 5 [m]

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

How to order: PCA-1557714

Connector specification

1557714	M12 Socket connector
1557701	M12 Plug connector

3. Terminal plug for PROFIBUS DP For details, refer to subsection "Wiring" (page 10) in section "EX500 GW unit" in this manual.

How to order: PCA-1557727

Terminator specification

1557727	M12 Plug connector type

4. 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-AC[030]-[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

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

How to order: EX500-AP[050]-[S]

Cable length (L)

010	1 [m]
050	5 [m]

Connector specification

S	Straight
A	Angle

6. Output cable For details, refer to subsection "Wiring" (page 46) of section "EX9 series General Purpose Output Black " in this manual.

How to order: EX9-AP[010]-7

Cable length(L)

010	1[m]
030	3[m]

7. Power supply connector cable For details, refer to subsection "Wiring" (page 46) of section "EX9 series General Purpose Output Black " in this manual.

How to order: EX9-AC010- 1

Cable length (L)

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

8. Input block connector junction cable For details, refer to subsection "Wiring" (page 35) 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]

9. Fieldwireable connector for input block For details, refer to subsection "Wiring" (page 35) in section "Input Unit Manifold" in this manual.

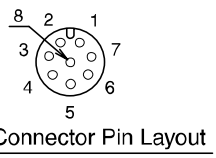
How to order: PCA-1557730

Connector specification

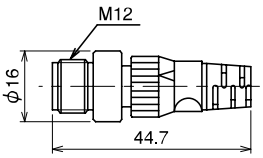
1557730	M8, 3 pin Plug connector (AGW26 to 22)
1557743	M12, 4 pin Plug connector (AGW26 to 22)
1557756	M12, 4 pin Plug connector (AGW22 to 18)

10. 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

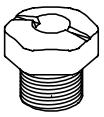


11. Waterproof cap
Mounted on unused ports of GW unit, input block, power block and output block.
The proper use of this waterproof cap can achieve IP65/67 Enclosure. (The waterproof caps are delivered together with each as accessories.)

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

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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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