No.EX##-OML0005

Operation Manual

Fieldbus system
PROFIBUS DP compatible

PRODUCT NAME

*EX600-SPR**
*EX600-DX**
*EX600-DY**
*EX600-AX**
*EX600-ED**

MODEL/ Series

SMC Corporation

Table of Contents

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), Japan Industrial Standards (JIS)[*1)] and other safety regulations[*2)].

*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.
JIS B 8370: General rules for pneumatic equipment.
JIS B 8361: General rules for hydraulic equipment.
JIS B 9960-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
JIS B 8433-1993: Manipulating industrial robots - Safety.
etc.

*2) Labor Safety and Sanitation Law, etc.

⚠ **Caution** : Operator error could result in injury or equipment damage.

⚠ **Warning** : Operator error could result in serious injury or loss of life.

⚠ **Danger** : In extreme conditions, there is a possibility of serious injury or loss of life.

⚠ 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

1. 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.*3)
   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.

*3) 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

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

Operator

- ♦This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- ♦Please read this operation manual carefully and understand it before assembling, operating or providing maintenance.

⚠Warning

♦Do not disassemble, modify (including change of printed circuit board) or repair this product.
Injury or failure can result.

♦Do not perform operation or setting with wet hands.
There is a risk of electric shock.

♦Do not operate the product beyond the specification range.
Do not apply the product to flammable gas or liquid or the gas or liquid harmful to human body.
Otherwise it causes fire, malfunction, or damage to the system.
Please confirm the specifications before use.

♦Do not operate the product in an environment where flammable or explosive gas may be present.
Fire, explosion or corrosion can result.
The product is not designed to be explosion proof.

♦The following instructions must be followed when using the product in an interlocking circuit:
• Provide multiple interlocking using another system such as mechanical protection
• Check the product regularly to ensure proper operation
Otherwise malfunction can cause an accident.

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

Otherwise it can cause injury.

⚠ Caution

♦When handling, assembling and replacing the unit:
- When handling the unit, do not touch any sharp metal parts of the connector and plug.
- When disassembling the unit, do not strike the product forcefully.
  The connection parts are firmly joined with seals.
- When joining units, take care not to get your fingers trapped between units.

♦Perform a proper functional check after completing maintenance work.
Stop operation if any abnormality is observed or if the product is not working properly.
Safety cannot be assured due to unexpected malfunction.

♦Provide grounding to assure the safety and noise resistance of the fieldbus system.
Individual grounding should be provided close to the product with a short cable.

NOTE

♦ Follow the instructions given below when handling the fieldbus system.
Otherwise, the system may be damaged and may fail.

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

Product specifications

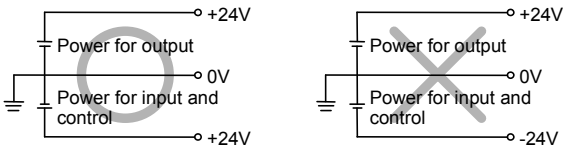
- Use the following UL recognized direct-current (DC) power supply.

(1) Limited voltage current circuit in accordance with UL508
A circuit whose power is supplied by secondary coil of an isolating transformer that meets the following conditions
- Maximum voltage (with no load) : less than 30 Vrms (42.4 Vpeak)
- Maximum current : (1) less than 8A (including when short circuited)
(2) limited by circuit protector (such as a fuse) with the following ratings

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

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

- Operate the fieldbus system within the specified voltage.
Operation with a voltage outside of the specifications could cause malfunction or damage to the system.
- The reference for the power supply of the SI unit is 0 V for both the output and control power supplies of the SI unit.



- Do not mount in a location where the product will be used as a foothold.
The unit may be damaged if excessive force is applied by stepping or climbing onto it.

- Reserve sufficient space for maintenance around the product
  Be sure to reserve sufficient space for maintenance when designing the layout of 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 unit.
  It may also result in non-conformity to safety standards.
- Be careful regarding the inrush current generated when the power is supplied.
  Depending on the connected load, an initial charging current may cause an over current protective function resulting in malfunction of the system.

♦ Precautions for handling

Installation

- Do not drop, hit or apply excessive shock to the unit.
  Otherwise the unit could be damaged, resulting in failure.
- Tighten screws to the specified tightening torque.
  Excessive tightening torque can break the screws.
  IP67 protection cannot be guaranteed if the screws are not tightened to the specified torque.
- When lifting a large size solenoid valve manifold unit, take care to avoid causing stress to the valve connection joint
  The connection parts of the unit may be damaged.
  Because the unit may be heavy, carrying and installation should be performed by more than one operator to avoid strain or injury.

Wiring (including plugging in/out of connector)

- Do not bend the cables or apply excessive force by pulling or placing heavy loads on them.
  Bending or tensile stress could cause the cables to break.
- Connect wires and cables correctly.
  Incorrect wiring could break the fieldbus system.
- Do not connect wires while the power is supplied.
  This can damage components and also cause undisirable behaviour
- Do not lay wires and cables together with power or high-voltage cables in the same wiring route.
  Otherwise the wires to the fieldbus system could be affected by noise or induced surge voltage from power lines or high-voltage cables, causing malfunction. Route the wires to the SI Unit and each I/O device to a wire duct or in a protective tube other than those for power lines or high-voltage cables
- Verify the insulation of wiring.
  Poor insulation (interference with other circuits, poor insulation between terminals, etc.) can introduce excessive voltage or current to the SI Unit or each I/O device causing damage.
- Separate the power line for solenoid valves from the power line for input and control unit.
  Otherwise wires can be affected by noise or induced surge voltage, causing malfunction.
- Take appropriate measures against noise, such as using a noise filter, when the fieldbus system is incorporated into equipment. Otherwise noise can cause malfunction.

Operating 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 communication line connector and power cable M12 connector at both ends,
  (2) Suitable mounting of each unit and manifold valve.
  (3) Be sure to mount a seal cap on any unused connectors.
  If using in an environment that is exposed to water splashes, please take measures such as using a cover.

- Take sufficient shielding measures if the unit is installed in any of the locations described below.
  Insufficient measures could cause malfunction or failure.
  Verify the effectiveness of the measures after incorporation of the unit into the equipment.
  (1) A place where noise is generated due to static electricity
  (2) A place where electric field strength is high
  (3) A place where there is radioactive irradiation
  (4) A place near a power line
- Do not use in an environment exposed to oil or chemicals.
  Using the product in an environment exposed to any type of oil or chemicals, such as coolants and cleaning fluids, may adversely affect the unit, causing failure or malfunction reducing the life of the product.
- Do not use in an environment exposed to corrosive gases or liquids.
  The unit may be damaged, leading to malfunction.
- Do not use the unit near to a place where electrical surges are generated.
  Internal circuit elements of the fieldbus system can deteriorate or break if equipment generating a large surge (electromagnetic lifter, high frequency induction furnace, motor, etc.) is located near the fieldbus system. Provide surge prevention measures, and avoid interference.
- Use the fieldbus system equipped with a surge absorber if a surge-generating load such as a solenoid valve is driven directly.
  Direct drive of a load generating surge voltage can damage the fieldbus system.
- The product does not have resistance against lightning surges required for CE marking, so please take measures against lightning surge on the equipment side.
- Make sure foreign matter such as dust and piping waste does not get inside the product.
  This may cause failure or malfunction.
- Do not expose the fieldbus system to vibration or impact.
  Otherwise failure or malfunction could be caused.
- Do not use in an environment that is subject to a temperature cycle.
  If it is subjected to a temperature cycle outside of normal temperature changes, this may adversely affect the internal parts of the unit.
- Do not use in a location directly exposed to sunlight.
  If the product is located in such a position, arrange a suitable cover to protect the unit.
  Direct exposure to sunlight may cause failure or malfunction.
- Keep within the specified ambient temperature range.
  Otherwise malfunction could be caused.
  Do not use the fieldbus system in a place where temperature changes suddenly, even within the specified range.
- Do not expose the fieldbus system to heat radiation from a heat source located nearby.
  Malfunction could be caused.

Adjustment and Operation

- Set the switches using a small screwdriver, etc..
  When operating the switches, do not touch parts other than the related parts.
  This may lead to failure due to component damage or short-circuit.
- Perform setting appropriate to the operating conditions.
  Inappropriate settings can cause defective operation.
- Please refer to page20-23 of this document for the settings of each switch.
- Please refer to the PLC manufacturer's manual for details of programming and addresses.
  For the PLC protocol and programming refer to the relevant manufacturer's documentation.

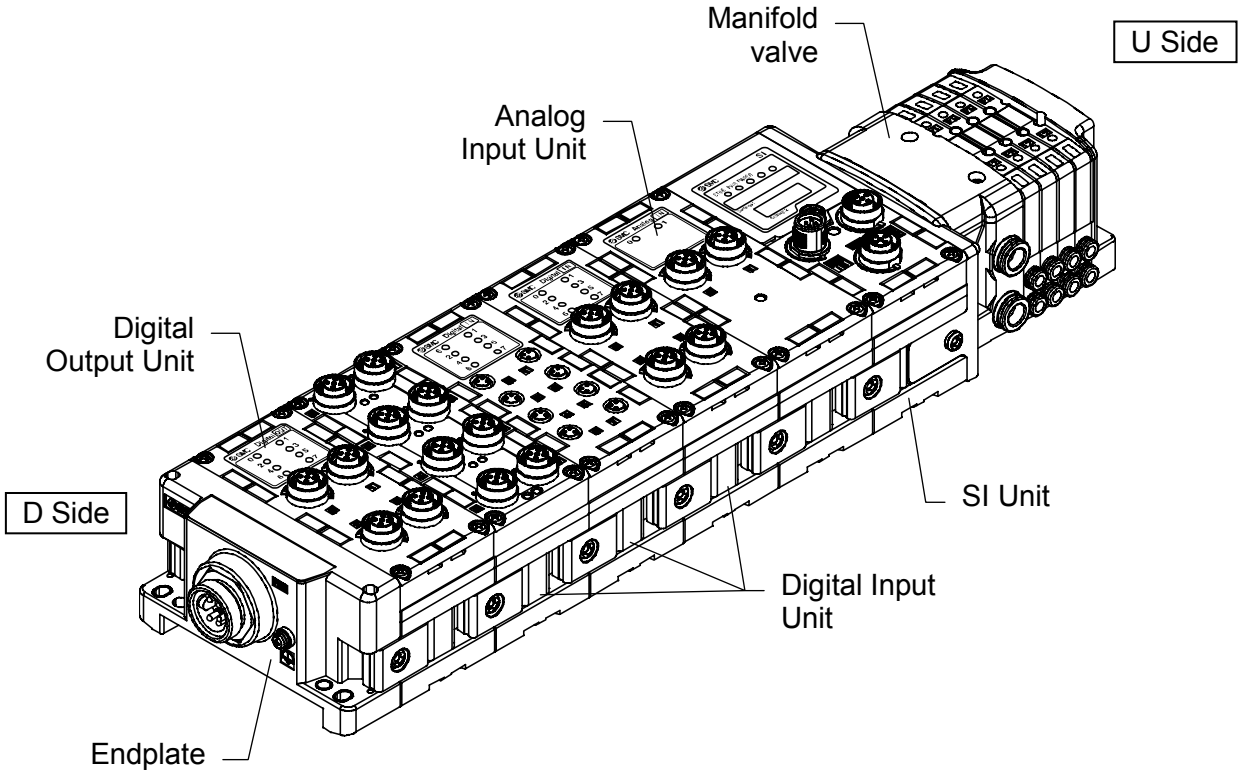
Maintenance and Checks

- Before performing maintenance work, turn off the power supply, stop the supply of air, exhaust the compressed air from inside the piping, and verify that the air is released to atmosphere.
  Otherwise, there is a risk of unexpected malfunction of the system components.
- Perform maintenance and checks regularly.
  Otherwise unexpected malfunction of components could occur due to a malfunction of the whole unit.
- Perform appropriate functional checks.
  Stop operation if any abnormality is observed or if the device does not work properly.
  Otherwise an unexpected malfunction of the unit or components could occur.
- Do not use solvents such as benzene, thinner, etc. to clean the fieldbus system.
  They could damage the surface of the body and erase the indication markings on the body.
  Use a soft cloth to remove stains. For heavy stains, use a cloth soaked in diluted neutral detergent and fully squeezed, then wipe again with a dry cloth.

Product Outline

System configuration

The EX600 range of units can be connected to various types of Fieldbus to realize the reduction of I/O device wiring and the distributed control system. The unit communicates with the Fieldbus through the SI unit. One SI unit can be connected with manifold valves with up to 32 points and I/O units with maximum 10 points.
All wiring between devices use cables with connectors at both ends and the system is compliant to IP67 protection.



- SI unit: Performs fieldbus communication and solenoid valve manifold ON/OFF output.
- Digital Input unit: For connecting sensors with switch output capability. PNP and NPN types are available.
- Digital Output unit: For connecting output equipment such as solenoid valves, lamps, buzzers, etc. PNP and NPN types are available.
- Analog Input unit: For connecting sensors with analog output capability.
- Endplate: Connected at EX600 Manifold's D side, incorporating the power supply connection.
- Solenoid valve manifold: An assembly of solenoid valves. One connector is used as the electric connection to all connected valves.

Glossary

No.	Term	Definition
A	Address (Station Address)	Number allocated to identify each unit connected on PROFIBUS DP network. Address number is not permitted to be duplicated.
C	Communication speed	Data receive and transmit speed used by the fieldbus. This depends on master equipment (PLC etc.), the unit used is bps (bit per second).
C	Current consumption	The amount of current required by each unit in order to operate.
D	Diagnosis Information	Diagnosis information that composed of standard diagnosis information of PROFIBUS DP and EX600 diagnosis information.
D	DIN rail	Metal rail in accordance with DIN standard.
D	D Side	T The DOWN side of the manifold, where EX600 Endplate is connected
F	FAIL SAFE Function	When PLC (DP master) is at clear mode, it sends data packet of output data with data length =“0”. As a result the slave will be set to a defined state (Hold/Clear/Force ON).
F	FE	Functional Earth.
F	Fieldbus	Type of communication system between a PLC and factory equipment (such as measuring instruments or machines), in which data is exchanged by digital communication.
F	FREEZE Function	Function which synchronizes input data of SI unit with FREEZE Command from PLC (DP master).
G	GSD file	General Station Description file. This is a file which describes the product characteristics for configuration with PROFIBUS DP system.
H	Handheld Terminal (H.T.)	A unit to connect with the SI unit PCI connection, for parameter adjustment, to monitor all input and output signal status, and for Forced input/output selection.
I	ID No.	16 bit number which is assigned by PNO to identify the product
I	Idle	Condition when SI unit (PROFIBUS DP) receives FAIL SAFE command. Using parameter setting, output can be set to CLEAR/HOLD/Force ON.
I	Input points	Number of points that which can receive information from input equipment. (Sensor and switch, etc.)
M	Manifold	An assembly with many openings for receiving and distributing fluid or gas.
N	NPN output	Output that switches a load through an NPN transistor. The +ve side of the load is connected to a common +ve. For this reason, NPN output is often referred to as “common positive”.
N	NPN input	Input that receives data from sensor with an NPN output signal.
O	Open circuit detection	Diagnosis function which detects open circuit, caused by broken or disconnected wiring to the input/output equipment.
O	Output Points	Number of points of output equipment (Solenoid Valve, lamp, motor starter, etc.) which can be operated.

No.	Term	Definition
P	PLC	Programmable Logic Controller. A Controller which performs sequential control using programs of logical, order and arithmetic operation, etc.
P	PNP output	Output that switches a load through a PNP transistor. The –ve side of the load is connected to the 0V common return. For this reason, PNP output is often referred to as “common negative”.
P	PNP input	Input that receives data from sensor with PNP output signal.
P	PROFIBUS DP	Fieldbus that Siemens, Bosch, and ABB, etc. jointly developed in Germany in 1980's. PNO (PROFIBUS Nutzerorganisation e.V) is started in order to spreads the PROFIBUS.
P	Protection Class (IP□□)	International Protection Rating. A Standard related to protection against foreign objects into electrical enclosures. (Hand,wire, dust, and water, etc.)
S	Short circuit detection	Function that detect if output or power supply positive line is short circuited with GND, thus over current state has occurred.
S	Short circuit protection	Internal circuit protection to prevent damage by over current caused by power supply positive line being short circuit with GND
S	SI unit	Serial Interface Unit. A unit for connection with a PLC, to and perform input/output data communication.
S	SYNC Function	Function that synchronizes output data of SI unit with SYNC command from a PLC (DP master).
T	Terminating resistance	When connecting device to the fieldbus, resistance must be installed on both ends of wiring system. This prevents signal reflection, and maintains data integrity.
U	U Side	The UP side of the manifold, where solenoid valve manifold is connected.

Assembly

Composing the unit as a manifold.

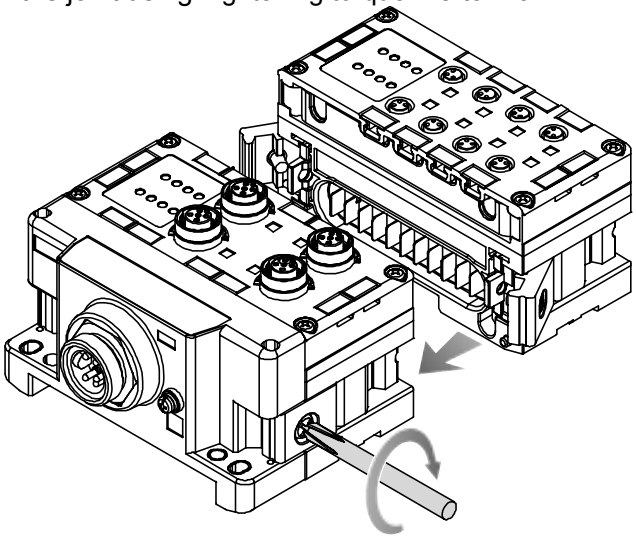
*: If the unit was purchased as a manifold, the work described in this section is not necessary.

> **Note**
>
> Be sure to turn off the power when carrying out the work to compose the unit as a manifold.

(1) Connect the unit to the end plate

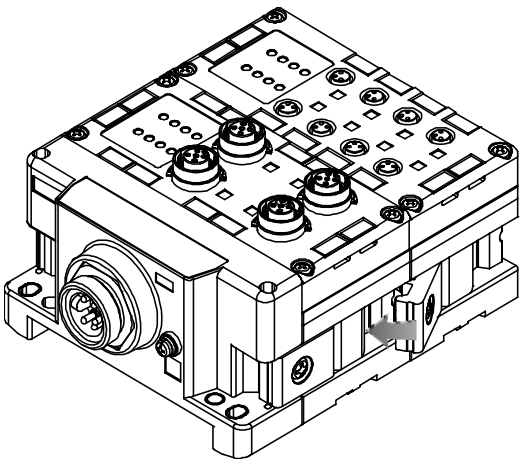
Digital input unit/digital output unit/Analog unit can be connected in any order.

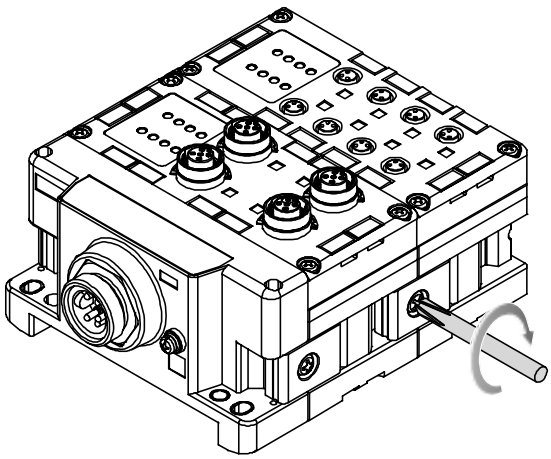
Tighten the bracket of the joint using Tightening torque 1.5 to 1.6 N•m.



(2) Add more units

Up to 10 units (including the SI unit) can be connected to one manifold.





(3)Connecting SI unit

After connecting the necessary units, connect the SI unit.

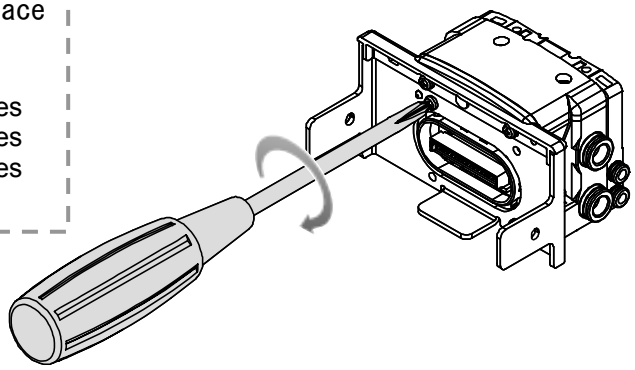
Connecting method is the same as above.

(4) Mounting the valve plate

Mount the valve plate to the manifold solenoid valve using the valve set screws.

Apply 0.6 to 0.7N•m tightening torque to the screws.

Screw mounting place
SV : 2 places
S070 : 2 places
VQC1000 : 2 places
VQC2000 : 3 places
VQC4000 : 4 places

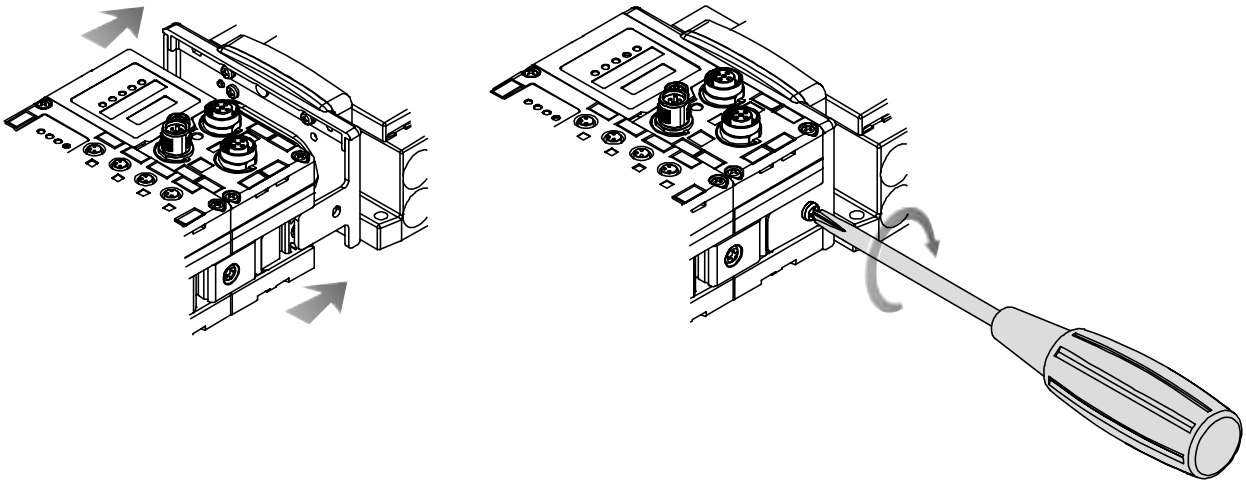


(5) Connect the SI unit and the manifold solenoid valve.

Insert the valve plate to the valve plate set groove on the side of SI unit.

Then, tighten it with the valve plate set screws to fix the plate.

Tightening torque for set screws 0.7 to 0.8N•m.



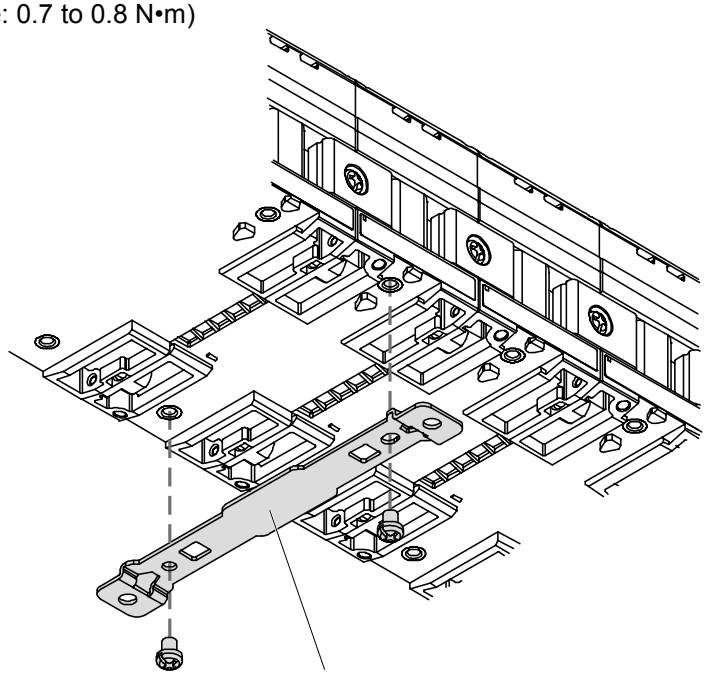
Note:
Please do not connect the unit while the power supply is active.
It will cause equipment damage.

Mounting and Installation

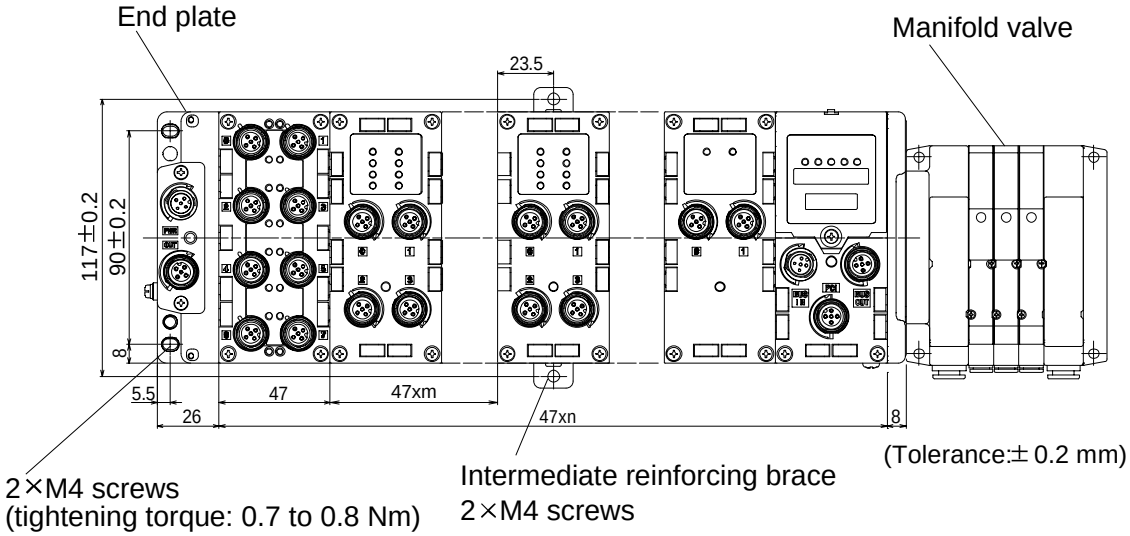
• Installation method

(1) Direct mounting

When joining six or more units, fix the middle part of the complete EX600 unit with an intermediate reinforcing brace (EX600-ZMB1) before mounting (Refer to the figure below.) using 2xM4 screws (Tightening torque: 0.7 to 0.8 N•m)



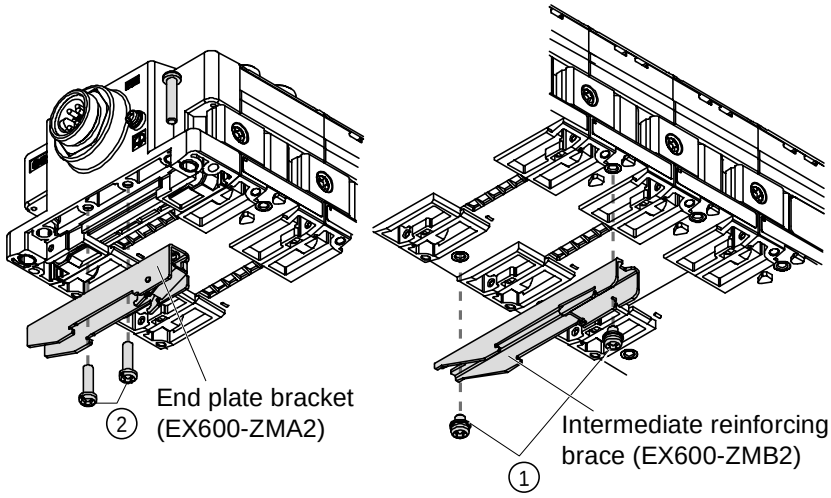
Fix and tighten the end plates at one end of the unit as shown in the figure below.
(Tightening torque: 0.7 to 0.8 N•m)
Fix the end plate at the valve side while referring to the operation manual of the corresponding manifold valve.



(2) DIN rail mounting

(i) When joining six or more units, fix the middle part of the complete EX600 unit with an intermediate reinforcing brace (EX600-ZMB2) before mounting, using 2xM4 screws (Tightening torque: 0.7 to 0.8 N•m)

(ii) Mount the end plate bracket (EX600-ZMA2) to the end plate at the opposite end to the valves, using 2xM4 screws (Tightening torque: 0.7 to 0.8 N•m)



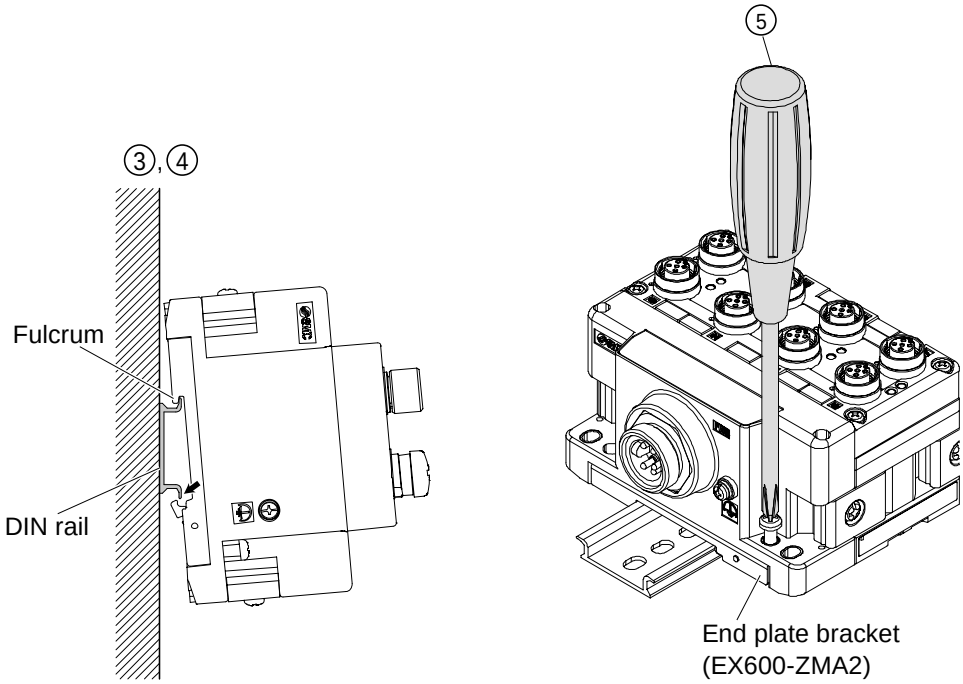
(iii) Hook the DIN rail mounting groove to the DIN rail. (See the figure below.)

(iv) Press the manifold using its side hooked to the DIN rail as a fulcrum until the manifold is locked.

(v) Fix the manifold by tightening the DIN rail fixing screws of the EX600-ZMA2.

(Tightening torque: 0.7 to 0.8 Nm)

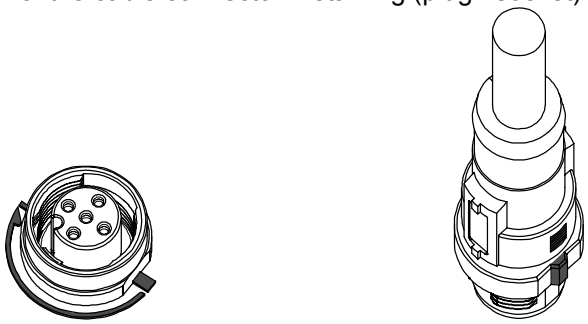
The tightening torque at the valve side depends on the valve type.



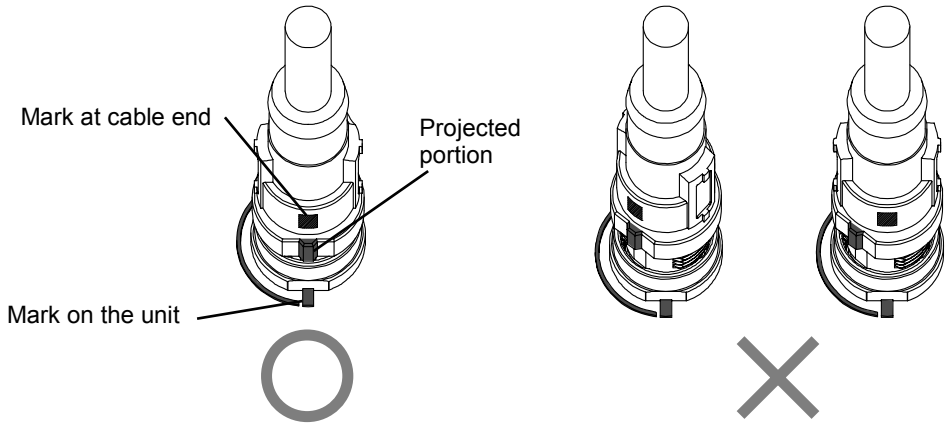
• Wiring

The M12 connector can be mated with a SPEEDCON connector or standard M12 connector.

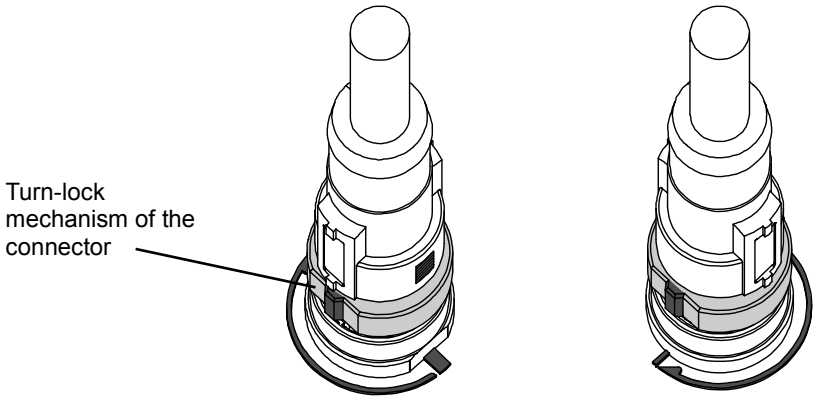
(1) Set the projected portion of the cable connector metal ring (plug / socket) to the mark.



(2) Push the connector straight to insert it into the receptacle of the unit. If inserted without aligning the mark, the connector will not mate with the receptacle.



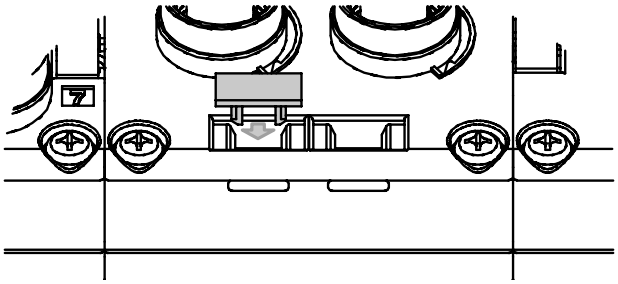
(3) Turn the connector clockwise. It stops when turned 1/4 turn.Turn it further. When the connector is turned 1/2 turn from the original position, the projected portion is set at the diagonal position to the mark and the turn is completed.
Check that the connector is securely locked.



If the connector is turned excessively, it will become difficult to remove.

• Mounting the marker

Mount the marker (EX600-ZT1) into the marker groove as required.



How to order

EX600 – S □□

SI Unit

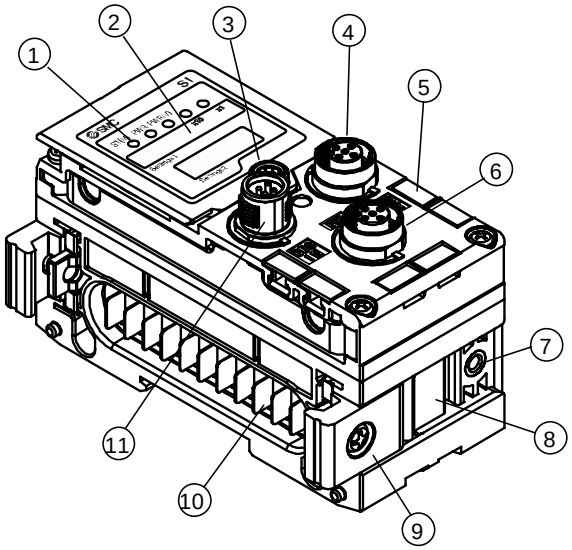
Protocol

Symbol	Description
PR	PROFIBUS DP

Output polarity

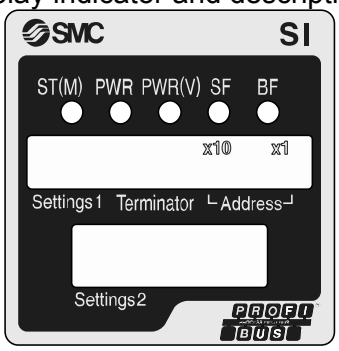
Symbol	Description
1	PNP (-COM.)
2	NPN (+COM.)

Name and Function of the Parts



No.	Name	Description
1	Status indication LED	Indicates the unit status
2	Indication cover	Open to gain access to the Setting switches
3	Indication cover set screw	Loosen to open the cover
4	Connector(BUS OUT)	Connector for FieldBus output
5	Marker groove	Groove to mount an indication marker
6	Connector (H.T.)	Connector to connect handheld terminal
7	Valve plate mounting hole	Holes for fixing the valve plate
8	Valve plate mounting groove	Groove for mounting the valve plate
9	Joint bracket	Bracket used to secure the adjacent unit
10	Connector for unit (Plug)	Conveys the signals and power supply to the adjacent unit
11	Connector (BUS IN)	Connector for FieldBus input

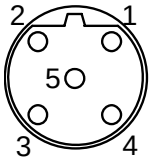
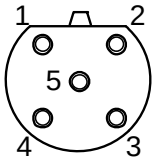
• Display indicator and description



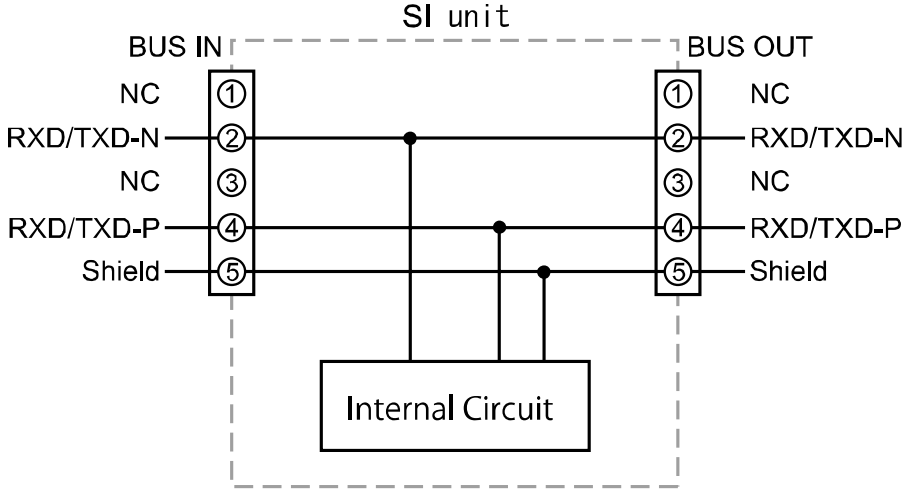
Indicator	Description
ST(M)	Unit diagnostics status
PWR	Displays the power supply voltage status of the power supply for control and input
PWR(V)	Displays the power supply voltage status of the power supply for output
SF	System fault
BF	Bus fault

Mounting and Installation

• Connector Pin Assignment

Pin No.	Signal name	Configuration	
		BUS IN	BUS OUT
1	NC		
2	RXD/TXD-N		
3	NC		
4	RXD/TXD-P		
5	Shield		

The branch connection is arranged in the EX600-SPR1/2 as illustrated on the circuit below.
When connecting other PROFIBUS DP products, connect using the BUS OUT connector, to increase the number of PROFIBUS DP Slave stations.



Note
Be sure to place a seal cap on any unused connectors.
Placing the seal cap appropriately enables the unit to achieve IP67 protection.

Transmission distance

For communication wiring, PROFIBUS DP compatible shielded twisted pair cable must be used. The longest permissible cable length depends on transmission speed and type of cable used.

The table below gives data for when type A cable is used.

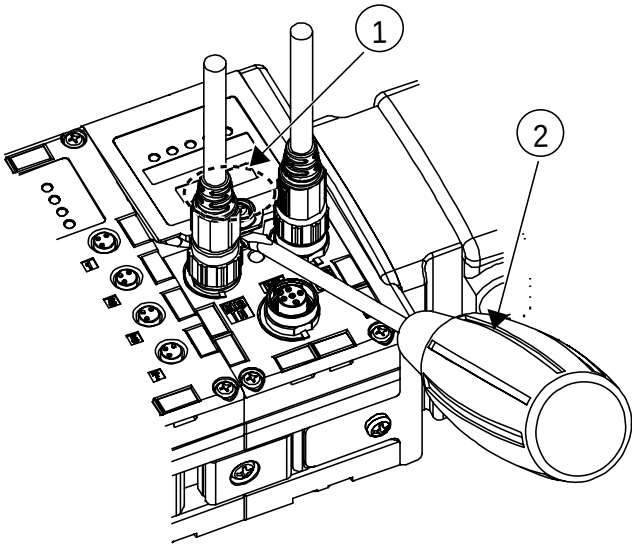
Communication speed [kbps]	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Cable length [m]	1200		1000		400		200		100	

Setting and Adjustment

• Setting procedure

(1) Loosen the screw of the switch protection cover (indicated with an arrow).

(2) Open the cover with a flat blade screwdriver.



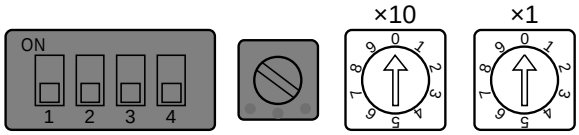
(3) Perform the switch settings referring to the following pages.
Set the switches with a small point precision screwdriver.

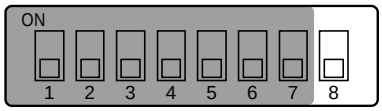
(4) After setting the switches close the switch protection cover and tighten the screw in the reverse order to the above. (Tightening torque: 0.3 to 0.4 Nm)

Note

- When adjusting the switch, make sure not to touch other parts other than the setting switch. Failure can be caused by damaged parts or short circuit.
- Be sure to perform the switch settings with the power turned OFF.
- All switches are set to OFF or 0 when delivered (Factory setting). Perform the switch settings before use.
- When any foreign matter or water droplets are observed near the switch protection cover, wipe them off before opening the cover.

○Address setting switch





Setting2

Address Setting switch (x10): To set PROFIBUS DP Node Address Tens digit.

Address Setting switch (x1): To set PROFIBUS DP Node Address Units digit.

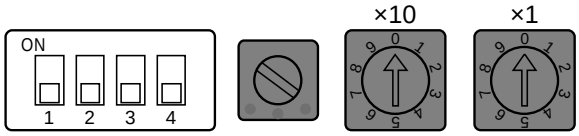
Setting2 (No.8) switch: To set PROFIBUS DP Node Address Hundreds digit.

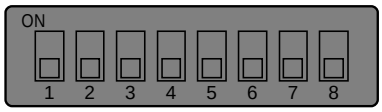
Address Setting

Setting2	Address SW		Node Address
No.8	×10	×1	
OFF	0	0	0(Factory default)
	0	1	1
	0 ~ 9	2 ~ 8	2 ~ 98
	9	9	99
ON	0	0	100
	0 ~ 2	1 ~ 6	101 ~ 126

Note) If the address is set to 0 or number greater than 126, an error will result and “SF” and “BF” LED’s will flash.

○ Setting1 switch





Setting2

V_SEL switch: A function to select the number of points occupied by valve outputs.
Select the output points (size) occupied by the SI unit.

Setting1		Description	SI unit Output data size
No.1	No.2		
OFF	OFF	Occupied bit for valve output is 32	4byte(Factory default)
OFF	ON	Occupied bit for valve output is 24	3byte
ON	OFF	Occupied bit for valve output is 26	2byte
ON	ON	Occupied bit for valve output is 8	1byte

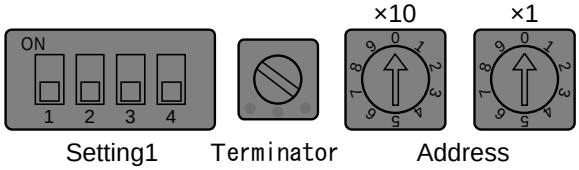
Note) Please set the number of occupied valve points to more than the connected number of valves.

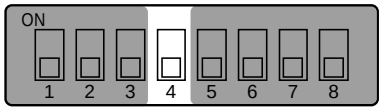
Baud Rate switch: Switches to set the baud rate of internal communication.

Setting1		Description
No3.	No.4	
OFF	OFF	1Mbps(factory setting)
OFF	ON	500kbps
ON	OFF	250kbps
ON	ON	125kbps

Note) 500, 250 & 125kbps settings are for future extension. Please use 1 Mbps (factory default setting).

○ Setting2 switch





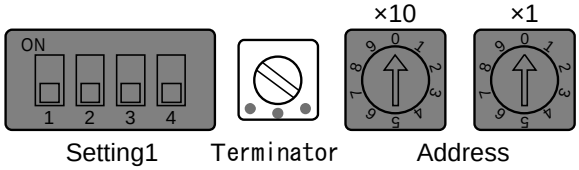
Setting2

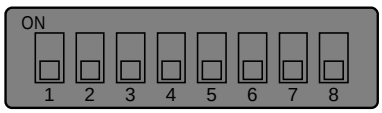
HOLD/CLR Switch : When a fieldbus communication error occurs or the communication idle state, all output can be set to Hold or Clear.

Active/inactive of this switch can be set with Parameter. (Refer to page 60)

Setting2 No.4	Description
OFF	All outputs are cleared “0” when a communication error occurs. (Factory setting)
ON	All outputs are held when a communication error occurs

○ Terminator switch





Setting2

Terminator switch: Set the Terminator resistance of the PROFIBUS communication line

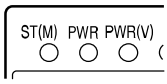
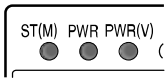
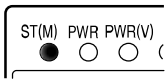
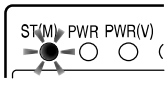
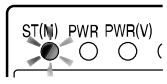
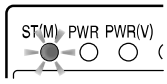
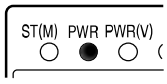
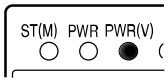
Terminator setting		
		
Terminator resistance fitted	No terminator resistance (Factory default)	No terminator resistance

Note

- When this unit is connected at the end of the PROFIBUS DP line, make sure to set to [Terminator Resistance fitted]
- The size of terminator resistance depends on the specification of the cable used. This terminator resistance value is fitted to suit type A cable.

Error display

SI unit common status

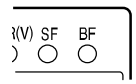
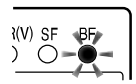
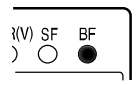
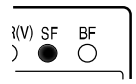
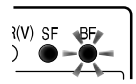
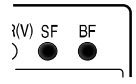
LED status	Descriptions
	Power supply for control and input is OFF.
	Unit is operating normally.
	Component failure inside the SI unit. When ST (M) indicator is red, stop using the product and contact SMC.
	Valve is in short-circuit or open-circuit status. Replace the valve. Valve ON/OFF counter exceeds setting value. (When Open/Short-circuit detection mode is ON)
	Communication error between units. Check the connection between units.
	Error diagnostic detected the error of a unit other than the SI unit.
	Abnormal power voltage for control/input devices. Check the power supply and adjust or replace it.
	Abnormal power voltage for valve/output devices. Check the power supply and adjust or replace it.

OFF　Red Light ON　Green Light ON

Flashing Red　Flashing Red and Green alternately (1 second frequency)

Flashing Green

PROFIBUS DP

LED status	Descriptions
	Normal status with established communication with DP master, or unit power is in OFF status.
	SI unit recognized the communication speed but DP master address setting is wrong. Check the address and correct it.
	Any one of the following: ♦ No connection between DP master and SI unit. ♦ SI unit cannot recognize the communication speed. ♦ DP master failure or SI unit failure.
	Communication established between DP master and SI unit, but with diagnostic error.
	Discrepancy between DP master setting and device configuration data. Check the setting and correct it.
	SI unit address set to “0” or above “126”. Check the address and correct it.

○ OFF ● Red Light ON  Flashing Red

Specifications

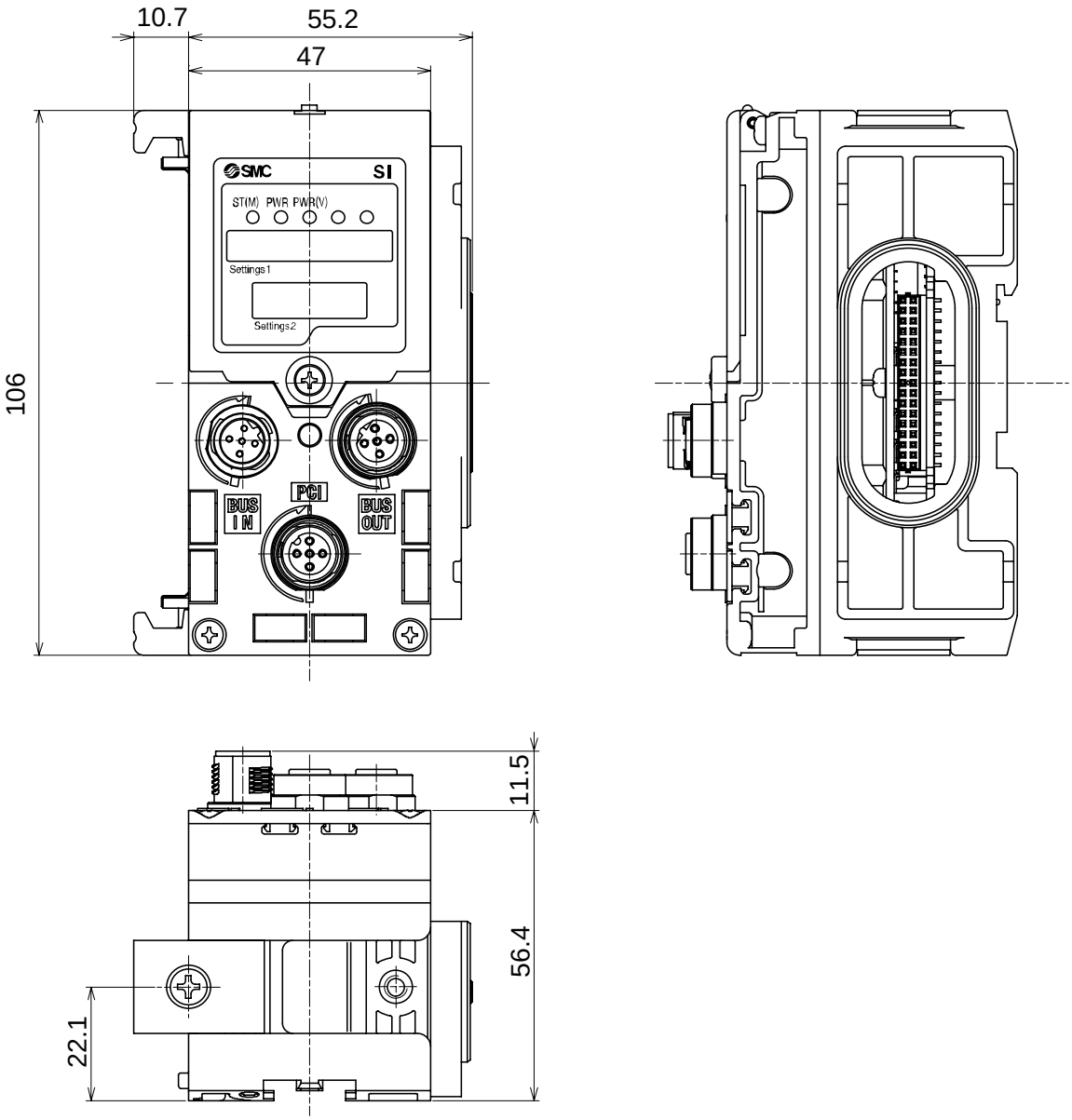
• Specifications

Model		EX600-SPR1	EX600-SPR2
Communication	Fieldbus	PROFIBUS DP (DP-V0)	
	Device type	DP slave	
	Communication speed	9.6/19.2/45.45/93.75/ 187.5/500kbps 1.5/3/6/12Mbps	
	Configuration file	GSD (SMCA1411.gsd)	
	I/O occupation area (Inputs/Outputs)	(512 points/512 points) max	
Terminal Resistance		Internally implemented(For type A cable)	
Internal Current Consumption (Power supply for Control and Input)		Less than 80mA	
Valve output	Output method	PNP (-COM.)	NPN (+COM.)
	Output channel	32 channels (8/16/24/32 channels selectable)	
	Connected load	Solenoid valve with lamp and circuit of protection of surge voltage of DC24V 1.5W (SMC)	
	Supply voltage	DC24V +10/-5%	
	Output for com. error	HOLD/CLEAR/ Force ON	
	Protective function	Short-circuit protective	
Environmental resistance	Enclosure	IP67(manifold assembly)	
	Operating temp. range	-10~50°C	
	Operating humidity range	35~85%RH (no dew condensation)	
	Withstand voltage	AC500V for 1 min. between external terminals and FE	
	Insulation resistance	DC500V, 10MΩ or more between external terminals and FE	
	Vibration resistance	10~57Hz with constant amplitude of 0.75mm p-p 57-150Hz with constant acceleration of 49m/s^2 for 2 hours in each direction of X, Y and Z direction (during de-energizing)	
	Impact resistance	147m/s^2 3 times in each direction of X, Y and Z (during de-energizing)	
Standard		CE marking, UL recognition (CSA)	
Weight		300 g	

PROFIBUS DP function.

Model number	EX600-SPR1	EX600-SPR2
Address setting range	1~125	
FREEZE Function	Supported	
SYNC Function	Supported	
FAIL SAFE Function	Supported	
ID Number	1411(Hex)	

- Outline Dimensions



How to order

EX600 – DX □ □

Digital input

Input polarity

Symbol	Description
P	PNP
N	NPN

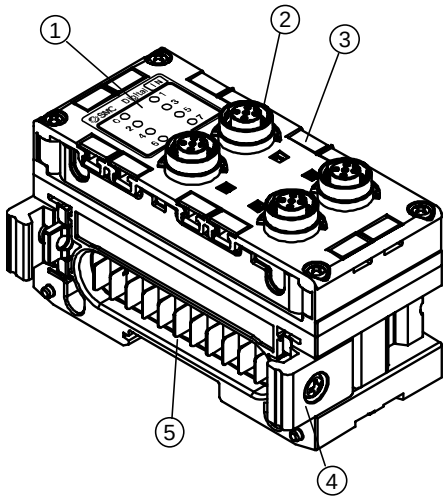
Connector and input points and open circuit detection

Symbol	Connector	Input points	Open circuit detection
B	4 x M12(5Pin)	8 points	No
C	8 x M8(3Pin)	8 points	No
C1	8 x M8(3Pin)	8 points	Yes
D	8 x M12(5Pin)	16 points	No

Note: Input equipment with 4 pin M12 connector can also be connected to M12 (5pin) connector.

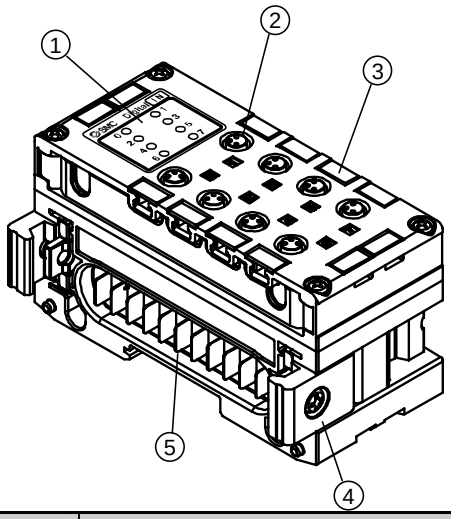
Name and Function of the Parts

EX600-DX*B



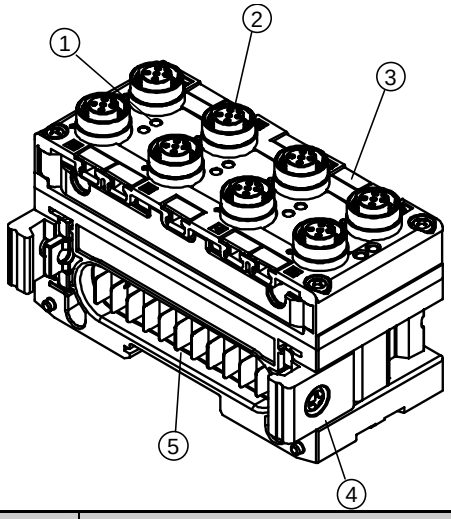
No.	Name	Description
1	Status indication LED	Indicates the unit status. (Refer to the chapter “Troubleshooting” for the detailed display contents.)
2	Connector(Input)	Connector for digital inputs. (M12, 5pin, socket : SPEEDCON)
3	Marker groove	Groove to mount an indication marker.
4	Joint bracket	Joint bracket to join the adjacent unit, fixed with attached screws.
5	Connector for unit (plug)	Conveys the signals and power supplies to the adjacent unit.

EX600-DX*C*



No.	Name	Description
1	Status indication LED	Indicates the unit status. (Refer to the chapter “Troubleshooting” for the detailed display contents.)
2	Connector(Input)	Connector for digital inputs. (M8, 3pin, socket)
3	Marker groove	Groove to mount an indication marker.
4	Joint bracket	Joint bracket to join the adjacent unit, fixed with attached screws.
5	Connector for unit (plug)	Conveys the signals and power supplies to the adjacent unit.

EX600-DX*D

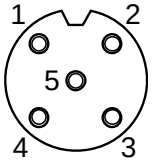


No.	Name	Description
1	Status indication LED	Indicates the unit status. (Refer to the chapter “Troubleshooting” for the detailed display contents.)
2	Connector(Input)	Connector for digital inputs. (M12, 5pin, socket : SPEEDCON)
3	Marker groove	Groove to mount an indication marker.
4	Joint bracket	Joint bracket to join the adjacent unit, fixed with attached screws.
5	Connector for unit (plug)	Conveys the signals and power supplies to the adjacent unit.

Pin assignment and wiring diagram

(1) EX600-DX*B/EX600-DX*D

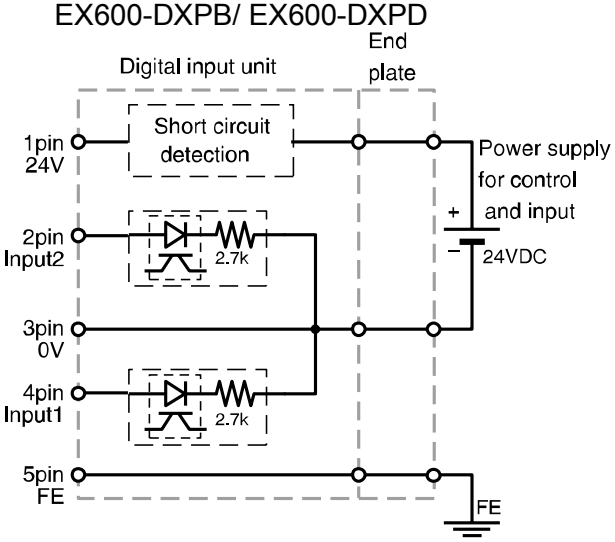
○Connector's Pin assignment

Pin No.	Signal name	Configuration
1	24V(for control / input)	
2	Input2	
3	0V(for control / input)	
4	Input1	
5	FE	

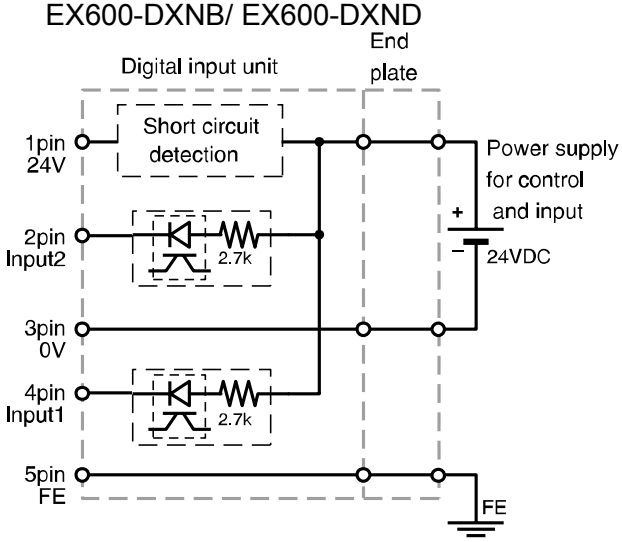
Note: Input equipment with M12 (4 pin)connector can also be connected to M12 (5pin) connector.

○ Wiring diagram

EX600-DXPB/ EX600-DXPD



EX600-DXNB/ EX600-DXND

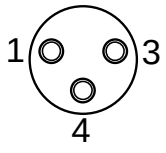


Note

Be sure to place a seal cap on any unused connectors. Using the appropriate seal cap enables the unit to achieve IP67 protection.

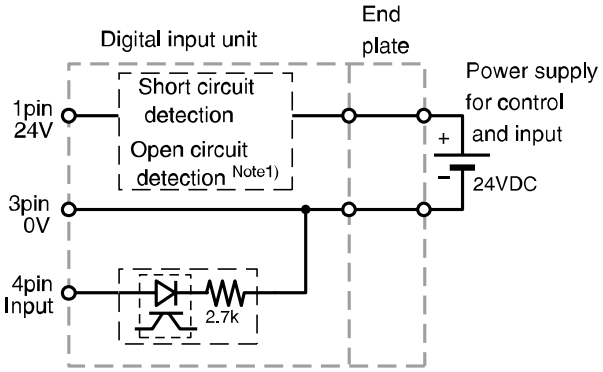
(2) EX600-DX*C*

○ Connector's pin assignment

Pin No.	Signal name	Configuration
1	24V(for control / input)	
3	0V(for control / input)	
4	Input1	

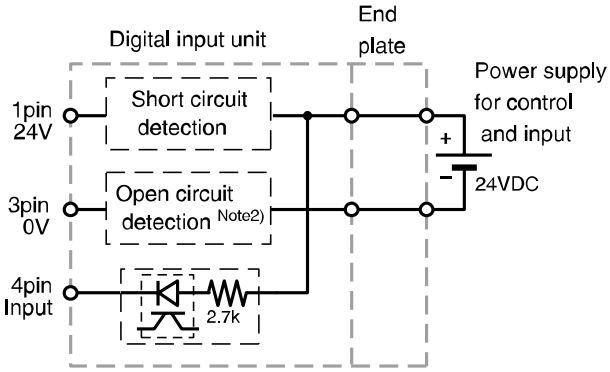
○ Wiring diagram

EX600-DXPC*



Note1)Applicable only for EX600-DXPC1.

EX600-DXNC*



Note2): Applicable only for EX600-DXNC1.

Note

Be sure to place a seal cap on any unused connectors. Using the appropriate seal cap enables the unit to achieve IP67 protection.

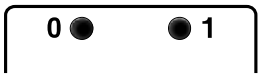
■Handling care.

Please note the following points when using Open Circuit Detection function.

- Open Circuit Detection setting can only be carried out using a Handheld Terminal. Setting can not be carried out using a PLC.
- When 2-wire sensor is used, sensor which has current leakage during OFF status is less than 0.5mA (contact sensor, etc.) will not be detected. Please use sensor which has current leakage of 0.5mA or more during OFF status.
- When 3-wire sensor is used, sensor that has current consumption of less than 0.5mA will not be detected, and also open circuit (wire breakage) at input signal line will not be detected

Error display

Status indication LED displays power supply status and communication status. These can be checked according to the following:-

LED status	Descriptions
○ OFF	Power supply for control and input is OFF, or input device is OFF.
● Green Light ON	Input device is ON.
 Flashing Red	Either of the following: (1) Input device ON/OFF count has exceeded the set value. (2) Input device not connected (for open circuit detection type only).
 All LED Flashing Red and Green alternately	Component failure inside the digital input unit. Stop using the product and contact SMC.
 Red Light ON (Both adjacent LED's are ON)	**<without Open Circuit Detection>** Short circuit in power line of either input device “0” or “1”. Check which input device has caused the short circuit.
 Red Light ON (Either one of adjacent LED's is ON)	**<with Open Circuit Detection>** Short circuit in power line of input device indicated.

Specifications

• Specifications

Model			EX600-DXPB	EX600-DXNB	EX600-DXPC□	EX600-DXNC□	EX600-DXPD	EX600-DXND
Input Specifications	Input type		PNP	NPN	PNP	NPN	PNP	NPN
	Input connector		M12(5Pin)socket Note1		M8(3Pin)socket		M12(5Pin)socket Note1	
	Input channels		8channels (2channels/Connector)		8channels (1 channels/Connector)		16channels (2channels/Connector)	
	Sensor supplied voltage		24VDC(Supplied from the power supply for control and inputs)					
	Maximum sensor supplied voltage		0.5A/Connector 2A/unit		0.25A/Connector 2A/unit		0.5A/Connector 2A/unit	
	Protection		Short circuit protection					
	Input resistance		2.7 kΩ					
	Rated input current		9 mA or less					
	ON voltage /ON current		17 V or more/ 5 mA or more (At NPN input, between the pin for input terminal and for sensor supplied voltage of +24 V) (At PNP input, between the pin for input terminal and for sensor supplied voltage of 0 V)					
	OFF voltage/OFF current		5 V or less/ 1 mA or less (At NPN input, between the pin for input terminal and for sensor supplied voltage of +24 V) (At PNP input, between the pin for input terminal and for sensor supplied voltage of 0 V)					
	Open circuit detection current Note2	2 wires	—		0.5mA/Point Note2		—	
		3 wires	—		0.5mA/Connector Note2		—	
Current consumption			50mA or less		55mA or less		70mA or less	
Indicator			Green LED on (Input is ON) Red LED on (when short circuit detected at sensor's power supply) Red LED flashing (ON/OFF counter exceeded/ open circuit detected Note2)					
Environmental resistance	Enclosure		IP67(manifold assembly)					
	Operating temp. range		-10~50°C					
	Operating humidity range		35~85%RH (no dew condensation)					
	Withstand voltage		AC500V for 1 min. between external terminals and FE					
	Insulation resistance		DC500V, 10MΩ or more between external terminals and FE					
	Vibration resistance		10~57Hz with constant amplitude of 0.75mm p-p 57-150Hz with constant acceleration of 49m/s^2 for 2 hours in each direction of X, Y and Z direction (during de-energizing)					
	Impact resistance		147m/s^2 3 times in each direction of X, Y and Z (during de-energizing)					
Standard			CE marking, UL recognition (CSA)					
Weight			300g		275g		340g	

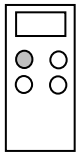
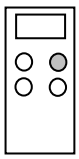
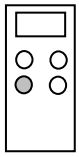
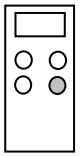
Note 1：M12(4 pin)connector can be connected.

Note 2：Applicable only for unit with Open circuit detection function.

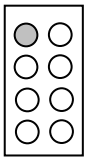
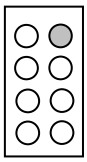
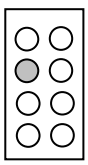
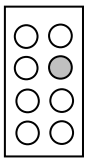
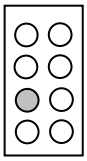
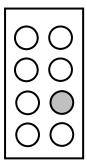
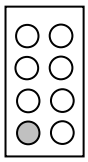
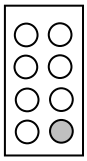
Digital Input data

The table shows the relation between the connector position and the input data allocation.

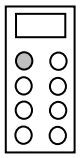
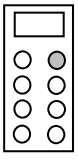
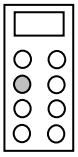
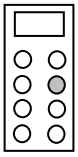
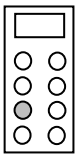
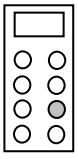
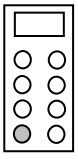
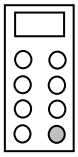
○Table for input signal (EX600-DX*B)

connector position					
connector №		0	1	2	3
input signal	Pin 2	Bit 1	Bit 3	Bit 5	Bit 7
	Pin 4	Bit 0	Bit 2	Bit 4	Bit 6

○Table for input signal (EX600-DX*D)

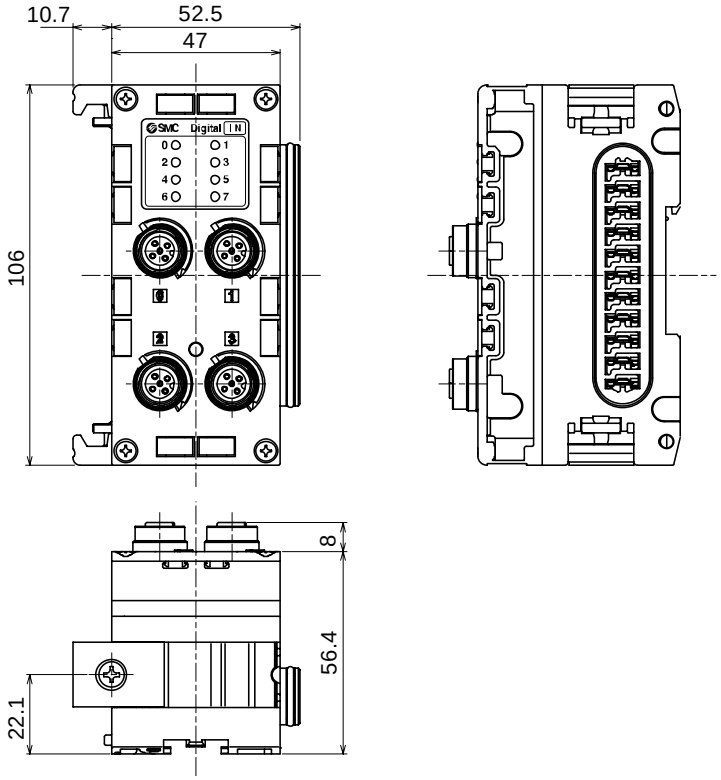
connector position									
connector №		0	1	2	3	4	5	6	7
input signal	Pin 2	Bit 1	Bit 3	Bit 5	Bit 7	Bit 9	Bit 11	Bit 13	Bit 15
	Pin 4	Bit 0	Bit 2	Bit 4	Bit 6	Bit 8	Bit 10	Bit 12	Bit 14

○Table for input signal (EX600-DX*C*)

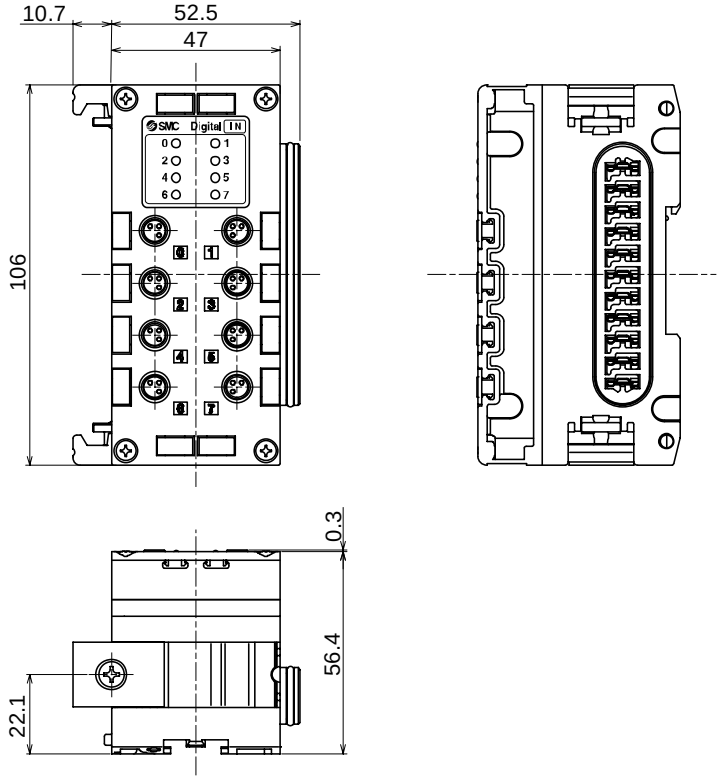
connector position									
connector №		0	1	2	3	4	5	6	7
input signal	Pin 4	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7

• Outline Dimensions

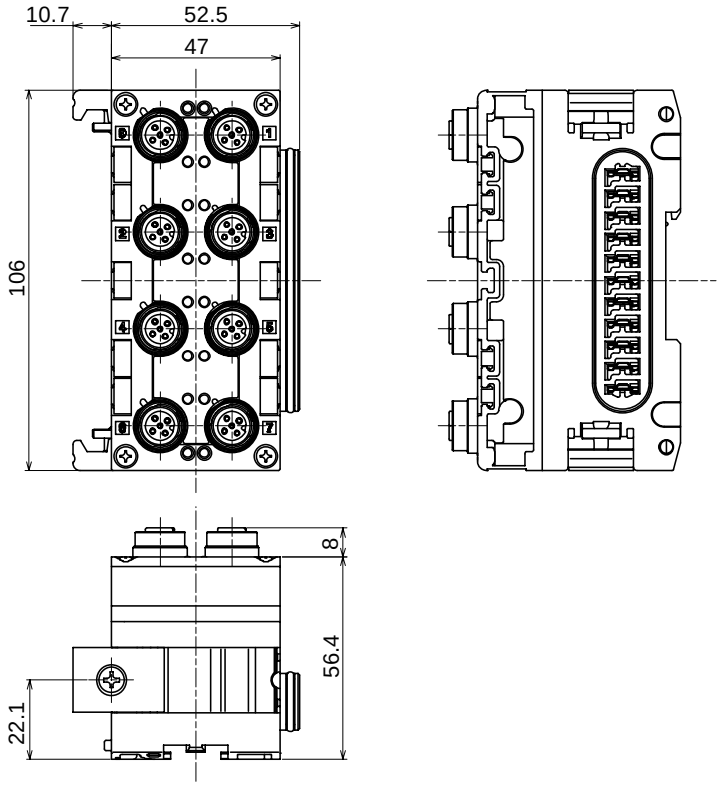
EX600-DX*B



EX600-DX*C*



EX600-DX*D



Digital Output unit

How to order

EX600 – DY □ □

Digital Output

Output specification

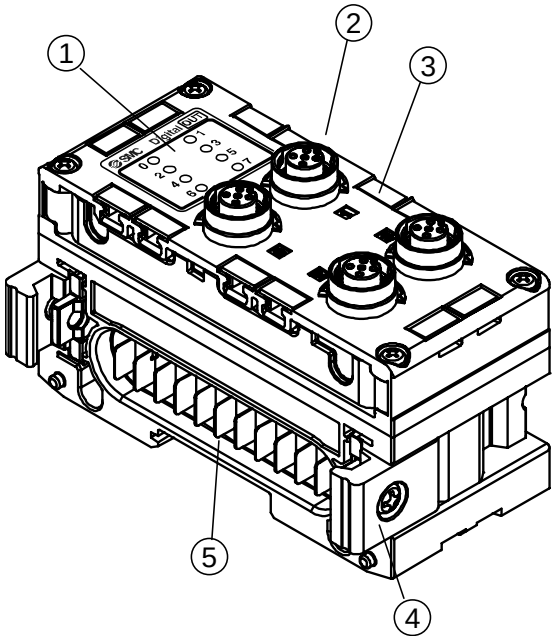
Symbol	Description
P	PNP
N	NPN

Connector and number of channel

Symbol	Connector	Output channels
B	4 x M12(5Pin)	8 channels

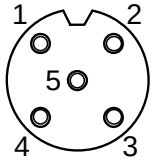
Note：output equipment with 4 pin M12 connector can also be connected to M12 (5pin) connector。

Name and Function of the Parts



No.	Name	Description
1	Status indication LED	Indicates the unit status. (Refer to the chapter “Troubleshooting” for the detailed display contents.)
2	Connector(Input)	Connector for digital outputs. (M12, 5pin, socket : SPEEDCON)
3	Marker groove	Groove to mount an indication marker.
4	Joint bracket	Joint bracket to join the adjacent unit, fixed with attached screws.
5	Connector for unit (plug)	Conveys the signals and power supplies to the adjacent unit.

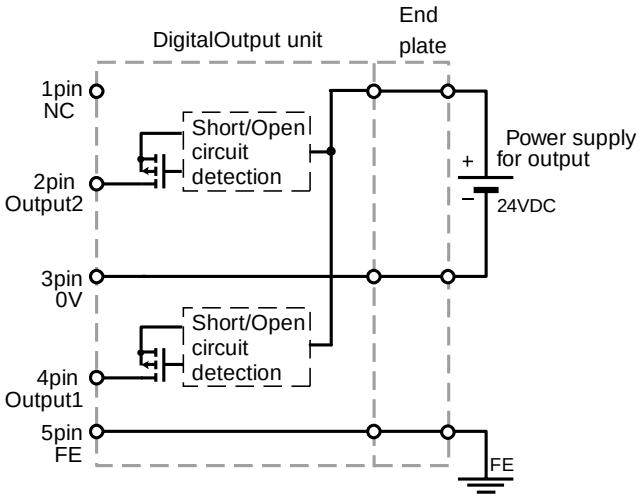
- Connector's pin assignment and wiring diagram
  - ○ Connector's pin assignment

Pin No.	Signal name		Configuration
	EX600-DYPB	EX600-DYNB	
1	NC	24V(For Output)	
2	Output2	Output2	
3	0V(for Output)	NC	
4	Output1	Output1	
5	FE	FE	

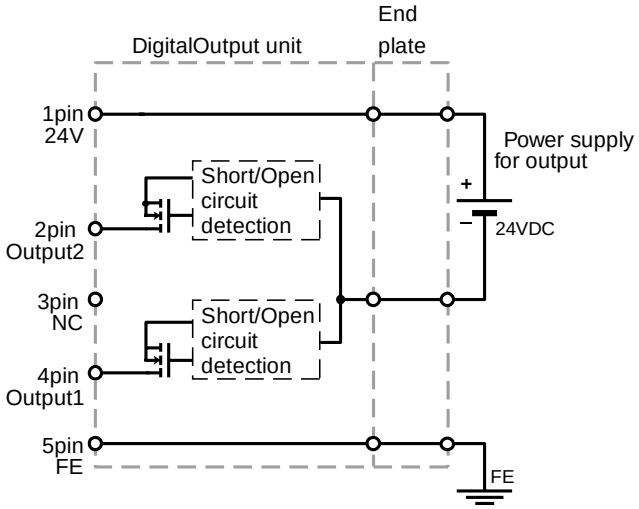
Note : output equipment with 4 pin M12 connector can also be connected to M12 (5pin) connector

○ Wiring Diagram

EX600-DYPB



EX600-DYNB



Note
Be sure to place a seal cap on any unused connectors. Using the appropriate seal cap enables the unit to achieve IP67 protection.

Handling care.

Please note the following points when using Open Circuit Detection function.

- Open Circuit Detection setting can only be carried out using a Handheld Terminal. Setting can not be carried out at the PLC.
- This function detects open circuit only when the output is OFF. Therefore if output is turned ON, open circuit can not be detected

Error display

Status indication LED (see figure to the right) displays power supply status and communication status. These can be checked according to the following:-

LED status	Descriptions
○ OFF	Power supply for control and input is OFF, or output device is OFF.
● Green Light ON	Output device is ON.
● Red Light ON	Output is short circuited.
 Flashing Red	Either of the following: Output device contact operations count has exceeded the set value. Output device is not connected.
 All LED Flashing Red and Green alternately	Component failure inside the digital output unit. Stop using the product and contact SMC.

Specifications

• Specifications

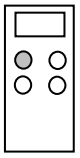
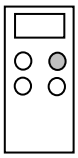
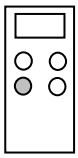
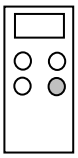
Model		EX600-DYPB	EX600-DYNB
Output Specification	Output style	PNP	NPN
	Output connector	M12(5Pin),Socket Note1	
	Output channel	8 channels (2 channels/connector)	
	Rated load voltage	24VDC(Supplied from Power supply for output)	
	Max. load current	0.5A/1 channel 2A/unit	
	Protection	Short circuit protection	
Current consumption		50mA or less	
Display		Green LED on (during output is ON) Red LED on (short circuit at load) Red LED flashing (ON/OFF counter is exceeded, or open circuit detected)	
Environmental resistance	Enclosure	IP67(manifold assembly)	
	Operating temp. range	-10~50°C	
	Operating humidity range	35~85%RH (no dew condensation)	
	Withstand voltage	AC500V for 1 min. between external terminals and FE	
	Insulation resistance	DC500V, 10MΩ or more between external terminals and FE	
	Vibration resistance	10~57Hz with constant amplitude of 0.75mm p-p 57-150Hz with constant acceleration of 49m/s^2 for 2 hours in each direction of X, Y and Z direction (during de-energizing)	
	Impact resistance	147m/s^2 3 times in each direction of X, Y and Z (during de-energizing)	
Standard		CE marking, UL recognition (CSA)	
Weight		300g	

Note1 : M12 (4 pin) connector can also be connected.

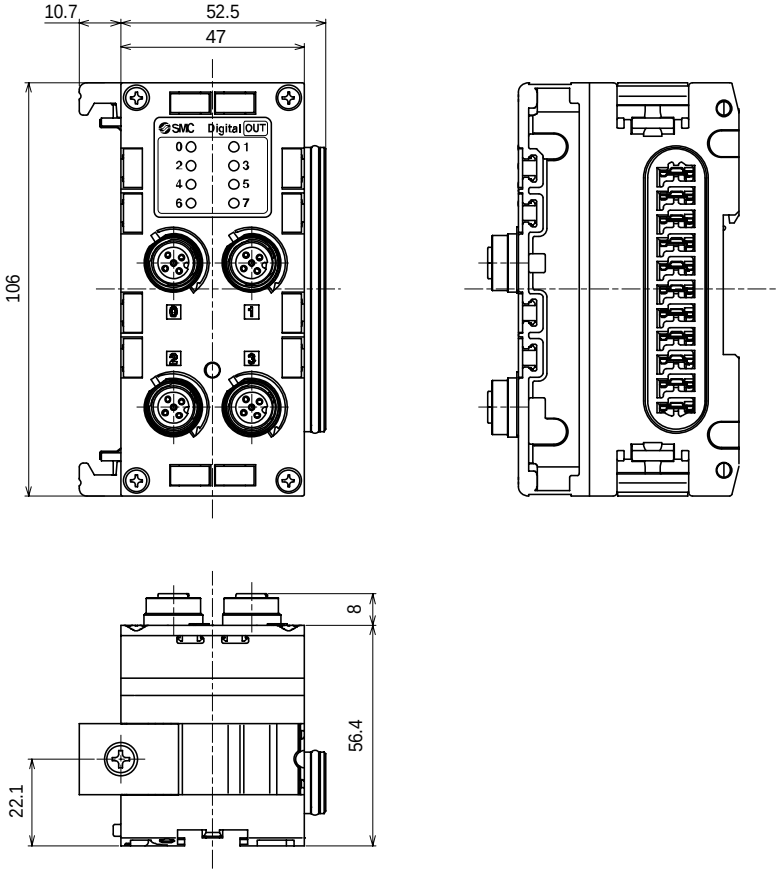
•Digital Output data

The table shows the relation between the connector position and the output data allocation.

○Table for output signal (EX600-DY*B)

connector position					
connector №		0	1	2	3
output signal	Pin 2	Bit 1	Bit 3	Bit 5	Bit 7
	Pin 4	Bit 0	Bit 2	Bit 4	Bit 6

• Outline Dimensions



Analog Input Unit

How to order

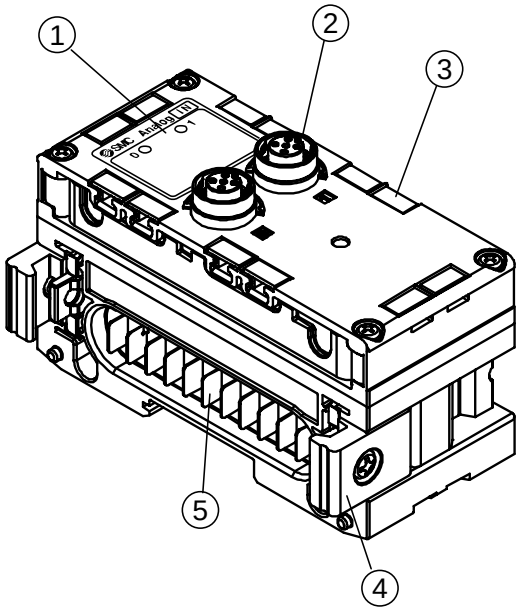
EX600 – AX □

Analog input

Connector and Input channel

Symbol	Connector	Input channels
A	2 x M12(5Pin)	2 channel

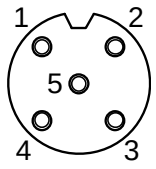
Name and Function of the Parts



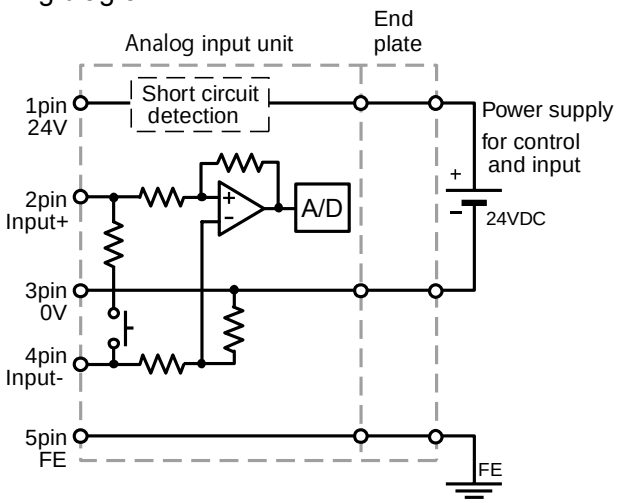
No.	Name	Description
1	Status indication LED	Indicates the unit status. (Refer to the chapter “Troubleshooting” for the detailed display contents.)
2	Connector(Input)	Connector for digital inputs. (M12, 5pin, socket : SPEEDCON)
3	Marker groove	Groove to mount an indication marker.
4	Joint bracket	Joint bracket to join the adjacent unit, fixed with attached screws.
5	Connector for unit (plug)	Conveys the signals and power supplies to the adjacent unit.

•Pin Assignment and wiring diagram

○ Pin assignment

Pin No	Signal name	Configuration
1	24V(For Control/Input)	
2	Input+	
3	0V(For Control/input)	
4	Input-	
5	FE	

○ Wiring diagram



Input impedance

Voltage input type: 100kΩ

Current input type: 50Ω

Note

Be sure to place a seal cap on any unused connectors. Using the appropriate seal cap enables the unit to achieve IP67 protection.

■Handling care

Please note the following points when wiring the Analogue input unit and sensor.

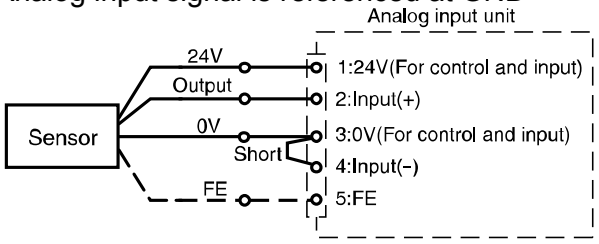
The EX600 Analogue Input operates using a differential input specification, therefore pin No.4 (input -) becomes the reference and pin No.2 (input +) carries the signal data.

This means that, if pin No.4 is not connected, the signal input cannot be correctly input.

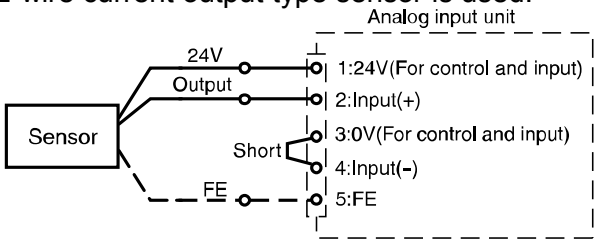
Therefore externally connect pin No.3 and pin No.4 together when a differential output sensor is not used.

•Sensor and wiring example is shown below

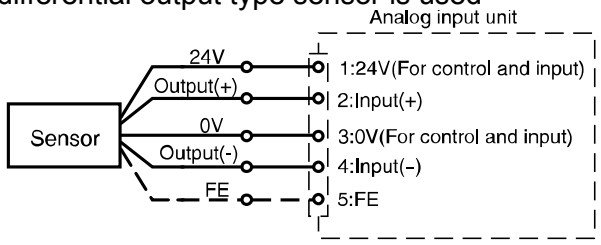
○When Analog input signal is referenced at GND



○When 2-wire current output type sensor is used.



○When differential output type sensor is used



Error display

Status indication LED displays power supply status and communication status. These can be checked according to the following:-

LED status	Descriptions
○ OFF	Power supply for control and input is OFF.
● Green Light ON	Operating normally.
● Red Light ON	Power supply for input devices is short circuited.
Flashing Red	Upper or lower limit is detected for the following items: (1) Range (2)Measurement value(User setting)
All LED Flashing Red and Green alternately	Component failure inside the analog input unit. Stop using the product and contact SMC.

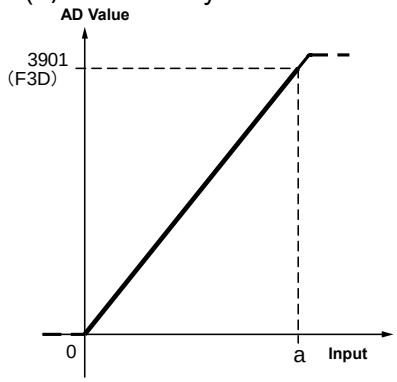
Specifications

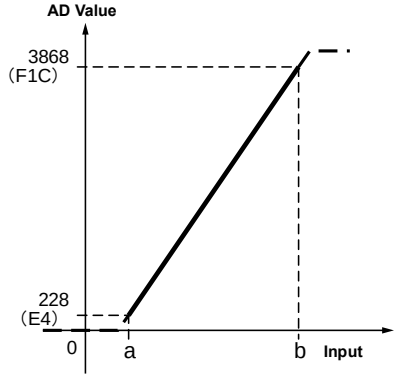
• Specifications

Model			EX600-AXA	
Input Specifications	Input type		Voltage input	Current input
	Input connector		M12(5Pin), Socket	
	Input channels		2channel(1channel/Connector)	
	Sensor supplied voltage		DC24V (Supplied from power supply for control and input)	
	Maximum sensor supplied voltage		0.5A/channel	
	Protection		Short circuit protection	
	Input signal range	12bit Resolution	0 ~ 10V 1 ~ 5V 0 ~ 5V	0 ~ 20mA 4 ~ 20mA
		16bit Resolution	-10V ~ 10V (factory default setting) -5V~5V	-20mA ~ 20mA
	Max. input signal		±15V	±40mA
	Input impedance		100kΩ	50Ω
	Linearity		±0.05%F.S or less	
	Repeatability		±0.15%F.S. or less	
	Absolute accuracy		±0.5%F.S. or less	±0.6%F.S. or less
Current consumption			70mA or less	
Display			Green LED on (when input is ON) Red LED on (Short circuit at sensor power supply) Red LED flashing (analog input exceeds measurement range or user setting range)	
Environmental resistance	Enclosure		IP67(manifold assembly)	
	Operating temp. range		-10~50°C	
	Operating humidity range		35~85%RH (no dew condensation)	
	Withstand voltage		AC500V for 1 min. between external terminals and FE	
	Insulation resistance		DC500V, 10MΩ or more between external terminals and FE	
	Vibration resistance		10~57Hz with constant amplitude of 0.75mm p-p 57-150Hz with constant acceleration of 49m/s^2 for 2 hours in each direction of X, Y and Z direction (during de-energizing)	
	Impact resistance		147m/s^2 3 times in each direction of X, Y and Z (during de-energizing)	
Standard			CE marking, UL recognition (CSA)	
Weight			290g	

•Analog characteristics

(1)Offset binary data format





Input signal range	a
0 ~ 10V	10V
0 ~ 5V	5V
0 ~ 20mA	20mA

Input signal range	a	b
1 ~ 5V	1V	5V
4 ~ 20mA	4mA	20mA

Regarding AD value

In the above graph, 2 AD values are explained as below.

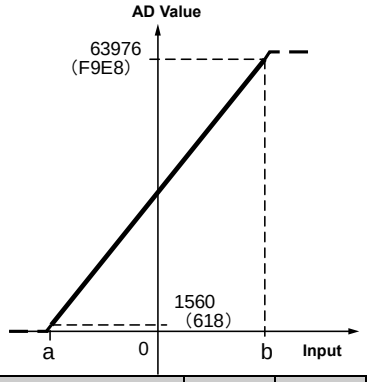
3901: AD value [decimal value]

(F3D): Offset Binary type ［hexadecimal value］

Data Format

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	MSB	AD value										LSB

AD value		0 ~ 10V	1 ~ 5V	0 ~ 5V	0 ~ 20mA	4 ~ 20mA
Hexadecimal	Decimal	Voltage [V]			Current[mA]	
0FFF	4095	10.5	5.25	5.25	21	21
0F3D	3901	10	-	5	20	-
0F1C	3868	-	5	-	-	20
0800	2048	5.25	3	2.625	10.5	12
00E4	228	-	1	-	-	4
0000	0	0	0.75	0	0	3



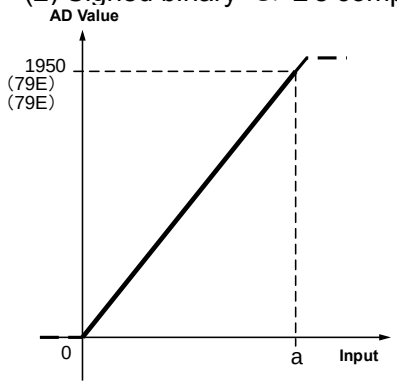
Input signal range	a	b
-10 ~ 10V	-10V	10V
-5 ~ 5V	-5V	5V
-20 ~ 20mA	-20mA	20mA

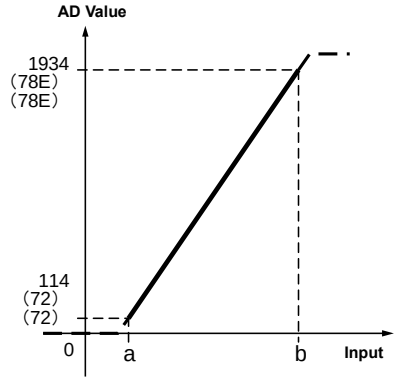
Data format

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB							AD value								LSB

AD value		-10V ~ 10V	-5 ~ 5V	-20mA ~ 20mA
Hexadecimal	Decimal	Voltage [V]		Current [mA]
FFFF	65535	10.5	5.25	21
F9E8	63976	10	5	20
BCF4	48372	5	2.5	10
8000	32768	0	0	0
430C	17164	-5	-2.5	-10
0618	1560	-10	-5	-20
0000	0	-10.5	-5.25	-21

(2) Signed binary & 2's complements data format





Input signal range	a
0 ~ 10V	10V
0 ~ 5V	5V
0 ~ 20mA	20mA

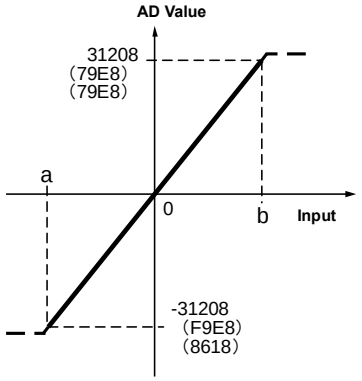
Input signal range	a	b
1 ~ 5V	1V	5V
4 ~ 20mA	4mA	20mA

Regarding AD value
In the above graph, 2 AD values are explained as below.
-31208: AD value［decimal value］
(F9E8): Sign & Magnitude［Hexadecimal value］
(8618): 2's complements［Hexadecimal value］

Data format

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	MSB	AD value									LSB

AD value		0 ~ 10V	1V ~ 5V	0 ~ 5V	0 ~ 20mA	4 ~ 20mA
Hexadecimal	Decimal	Voltage [V]			Current [mA]	
07FF	2047	10.5	5.25	5.25	21	21
079E	1950	10	-	5	20	-
078E	1934	-	5	-	-	20
0400	1024	5.25	3	2.625	10.5	12
0072	114	-	1	-	-	4
0000	0	0	0.75	0	0	3



Input signal range	a	b
-10 ~ 10V	-10V	10V
-5 ~ 5V	-5V	5V
-20 ~ 20mA	-20mA	20mA

Data format

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Sign	MSB							AD value							LSB

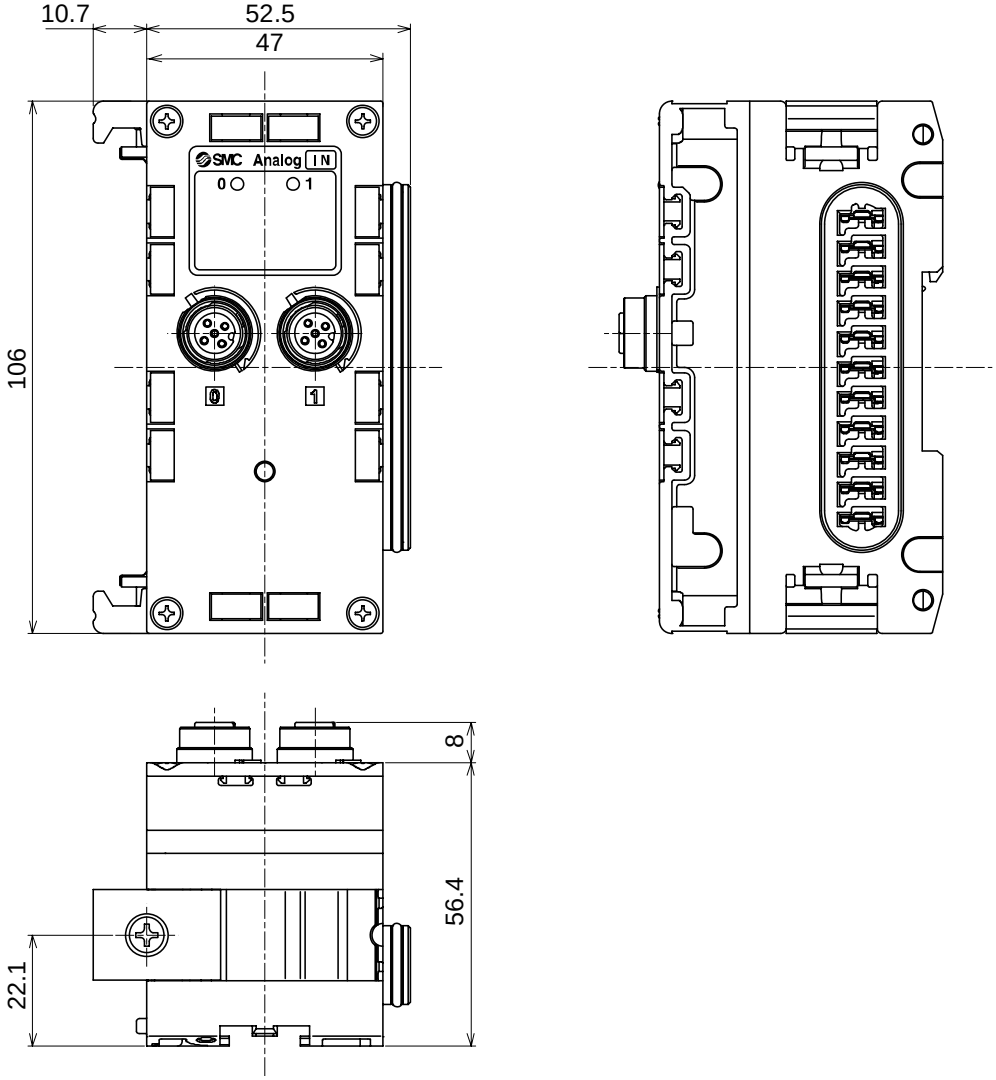
Signed Binary

AD value		-10V ~ 10V	-5V ~ 5V	-20mA ~ 20mA
Hexadecimal	Decimal	Voltage [V]		Current [mA]
7FFF	32767	10.5*	5.25	21
79E8	31208	10	5	20
3CF4	15604	5	2.5	10
0000	0	0	0	0
BCF4	-15604	-5	-2.5	-10
F9E8	-31208	-10	-5	-20
FFFF	-32767	-10.5	-5.25	-21

2's complements

AD value		-10V ~ 10V	-5V ~ 5V	-20mA ~ 20mA
Hexadecimal	Decimal	Voltage [V]		Current [mA]
7FFF	32767	10.5	5.25	21
79E8	31208	10	5	20
3CF4	15604	5	2.5	10
0000	0	0	0	0
C30C	-15604	-5	-2.5	-10
8618	-31208	-10	-5	-20
8000	-32767	-10.5	-5.25	-21

• Outline Dimensions



End plate

How to order

EX600 – ED □ – □

End plate at D side

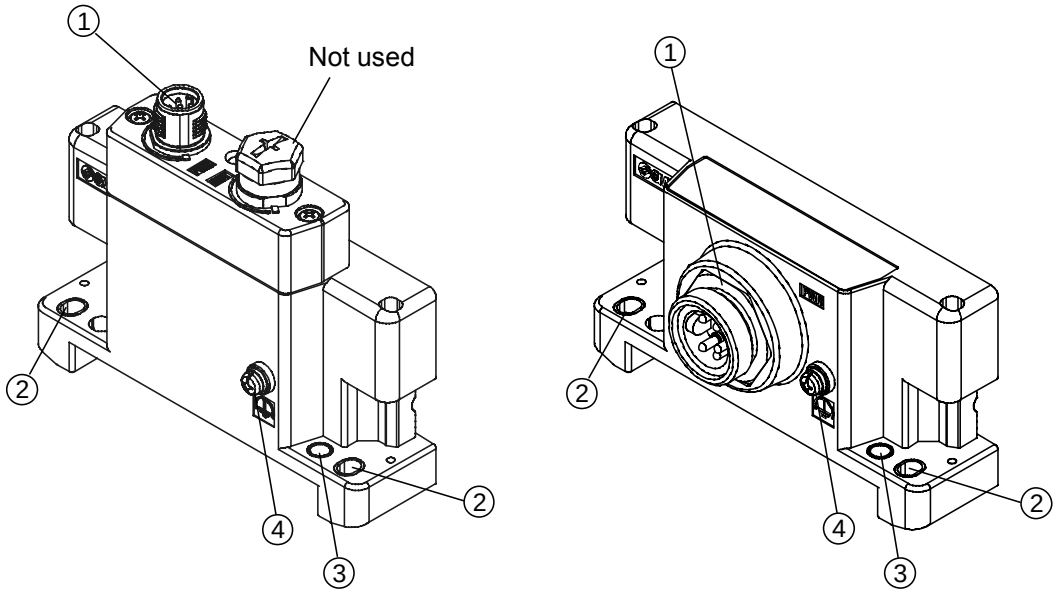
Connector

Symbol	Connector
2	M12(5Pin)
3	7/8inch Connector

Mounting method

Symbol	Mounting method
None	No DIN rail mounting plate
2	With DIN rail mounting plate

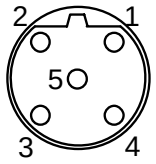
Name and Function of the Parts



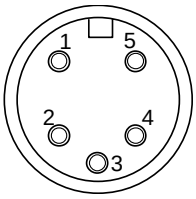
No.	Name	Description
1	Power connector	Connector for power input
2	Fixing hole for direct mounting	Holes used for direct mounting
3	DIN rail fixing hole	Holes used to fix DIN rail
4	FE terminal	FE terminal to earth.

•Connector's pin assignment

(1) EX600-ED2

Pin No.	Signal name	Configuration
1	24V(for Output)	
2	0V(for Output)	
3	24V(for control / input)	
4	0V(for control / input)	
5	FE	

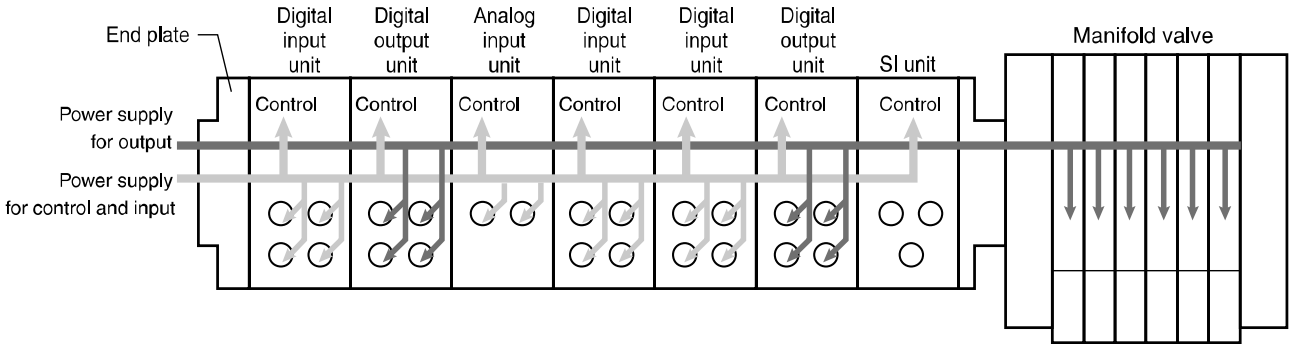
(2) EX600-ED3

Pin No.	Signal name	Configuration
1	0V(for Output)	
2	0V(for control / input)	
3	FE	
4	24V(for control / input)	
5	24V(for Output)	

Regarding the 2 types of power supply

This product has 2 power supplies, and it is divided as follows.

- Power supply for control and input: supplying power for control of each unit's power supply for control and also for equipment connected to Digital input unit and Analog input unit.
- Power supply for output: supplying power for equipment connected to digital output unit, and also power supply for solenoid valve manifold.



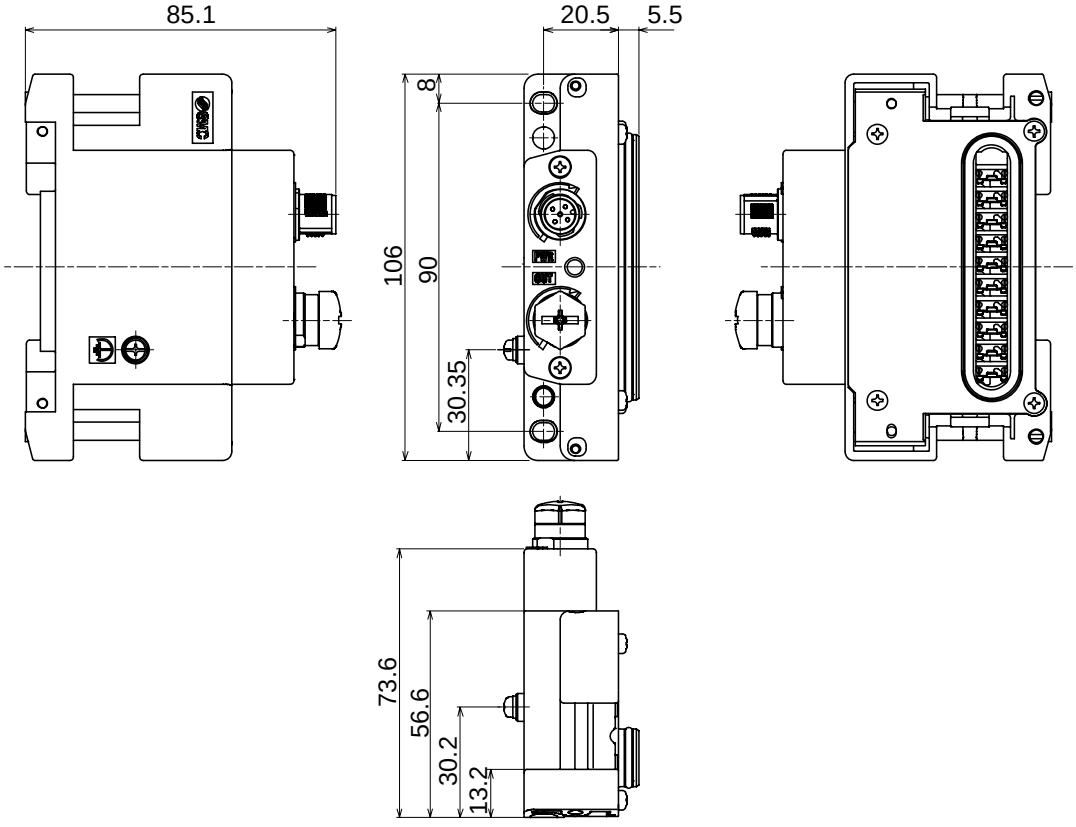
Specifications

• Specifications

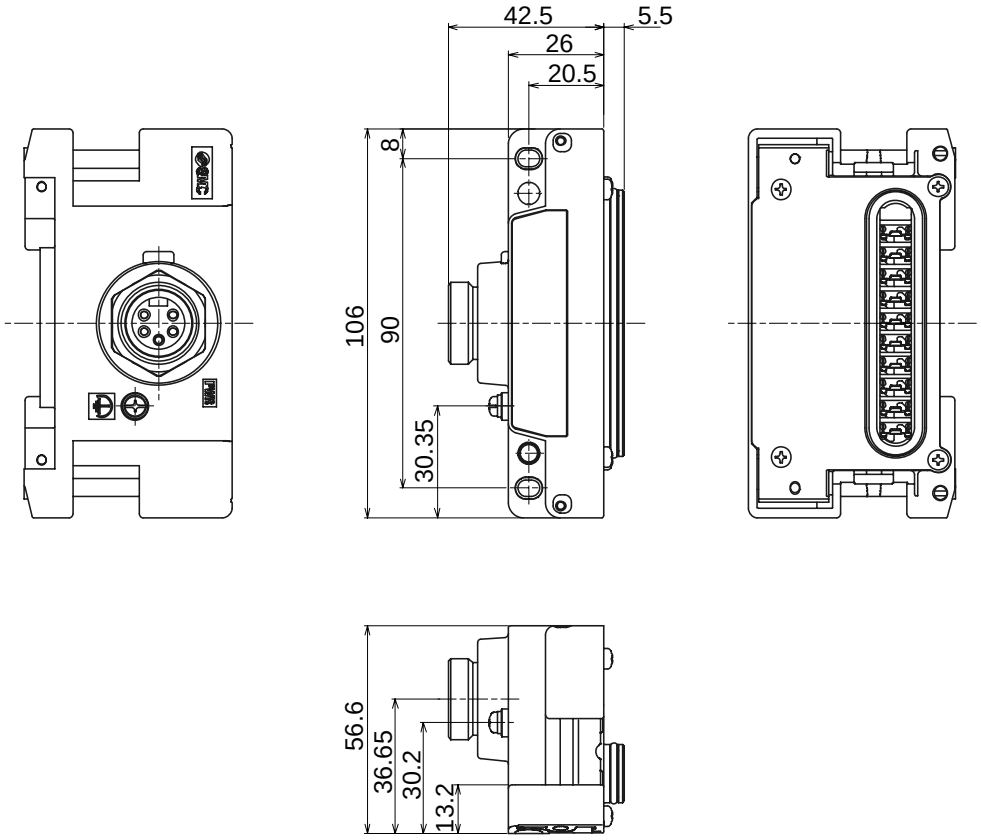
Model		EX600-ED2	EX600-ED3
Input	Power connector	M12(5Pin) Plug	7/8inch(5Pin) Plug
	Control, input power supply	24VDC±10% Maximum 2 A	24VDC±10% Maximum 8 A
	Output power supply	24VDC +10%/-5% Maximum 2 A	24VDC +10%/-5% Maximum 8 A
Environmental	Enclosure	IP67(manifold assembly)	
	Operating temp. range	-10~50°C	
	Operating humidity range	35~85%RH (no dew condensation)	
	Withstand voltage	AC500V for 1 min. between external terminals and FE	
	Insulation resistance	DC500V, 10MΩ or more between external terminals and FE	
	Vibration resistance	10~57Hz with constant amplitude of 0.75mm p-p 57-150Hz with constant acceleration of 49m/s^2 for 2 hours in each direction of X, Y and Z direction (during de-energizing)	
	Impact resistance	147m/s^2 3 times in each direction of X, Y and Z (during de-energizing)	
Standard		CE marking, UL recognition (CSA)	
Weight		170g	175g

• Outline Dimensions

(1) EX600-ED2

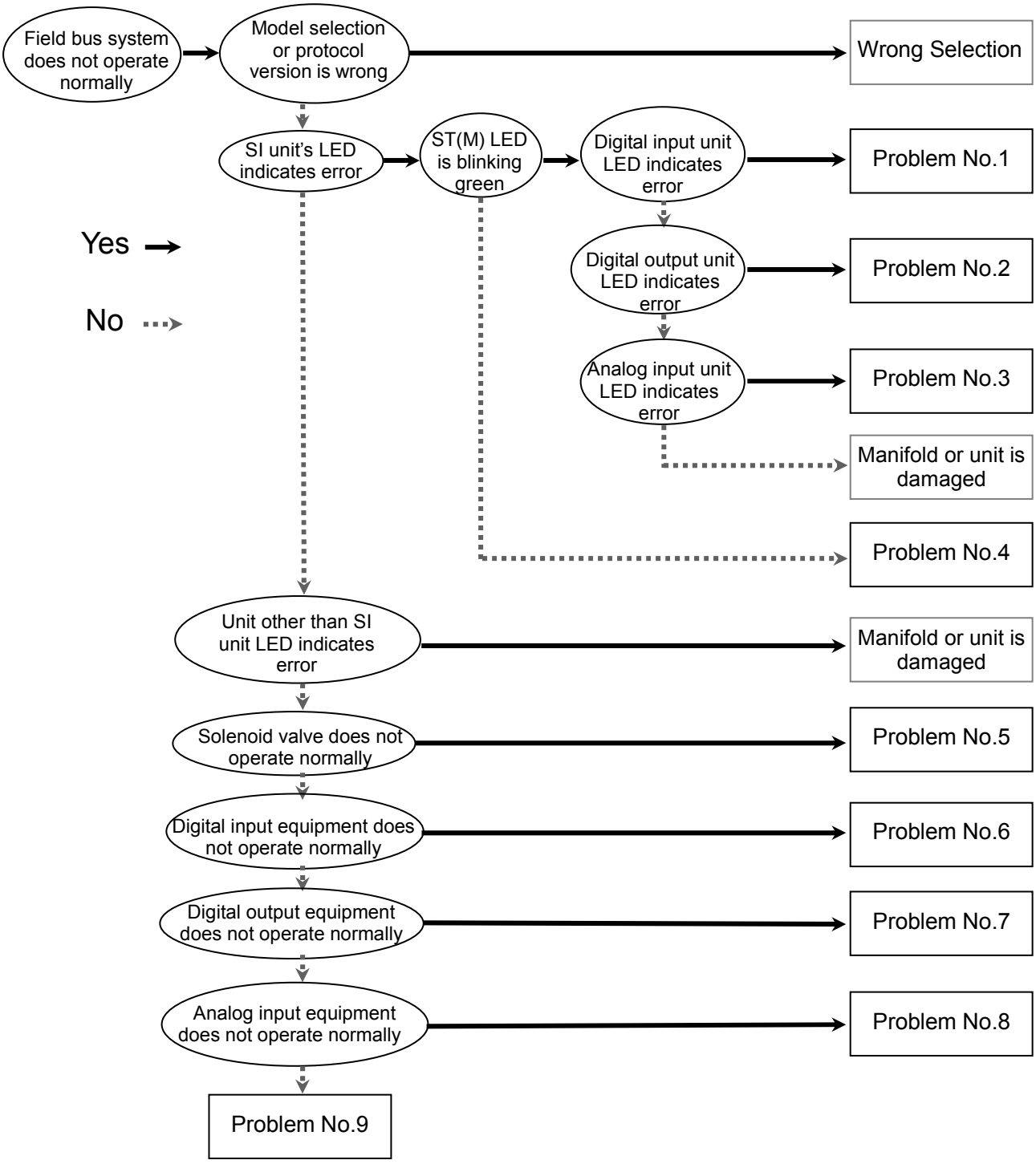


(2) EX600-ED3



Troubleshooting

Please refer to the following troubleshooting flowchart if errors occur on the fieldbus system.
Error status is also reflected by the parameter settings of fieldbus system.
When trouble occurs, please give appropriate counter measure after referring to the troubleshooting and the parameter setting.
If cause of the problem cannot be confirmed, it is possible that the equipment may have failed. When failure of fieldbus system equipment occurs, it is also possible that the error caused by the system requirements. If that is the case, please consider the counter-measures accordingly



Trouble counter measure method

Problem No.	LED indication	Problem	Investigation Method	Counter-measure
1	Flashing Red (Diagnostic is active)	Cause can be either: 1) Sensor's ON/OFF counter exceeds setting value 2) Open circuit is detected on input sensor or cable. (for Open Circuit Detection type only)	Confirm cause 1) or 2) by PLC or H.T. Refer to details of system diagnosis data.	1) Reset the counter, change the setting or disable the diagnostic through parameter setting. 2) Confirm if there are loose connector and wire breakage. Moreover, please confirm if applicable sensor is used.
	Red (Diagnostic is active)	Diagnosis error (Sensor power supply is short circuited)	[No open circuit detection] Either of two adjacent sensor connections is short circuited (2x LED's will be ON). [With open circuit detection] The sensor connection is short circuited (LED is ON).	Check the wiring of the sensor connection which has the short circuit, or confirm whether the cable and the sensor are operating correctly.
	All LED flashing Green and Red	Unit has failed	-	Stop operation and contact SMC sales office
2	Flashing Red (Diagnostic is active)	Cause can be either: 1) Output device ON/OFF counter exceeds setting value 2) Open circuit is detected on output device or cable.	Confirm cause 1) or 2) by PLC or H.T. Refer to details of system diagnosis data.	1) Reset the counter, change the setting or disable the diagnostics through parameter setting. 2) Confirm if there are loose connections or broken wires.
	Red (Diagnostic is active)	Diagnosis error (output equipment is short circuited)	The output connection is short circuited (LED is ON).	Check the wiring, or confirm whether the output equipment is operating correctly
	All LED flashing Green and Red	Unit has failed	-	Stop operation and contact SMC sales office
3	Flashing Red (Diagnosis is active)	Diagnosis error (Upper/lower range limit exceeded)	1) Confirm if the sensor output exceeds the upper/lower measurement limits. 2) Confirm whether sensor output exceeds user setting upper/lower range.	1) Please adjust sensor output so that it is inside the measurement range, or adjust setting range or turn off over/under range detection. 2) Please adjust sensor output so that it is Inside the user setting value, or adjust user setting value or turn off user set value upper/lower limit detection.
	Red (Diagnostic is active)	Diagnosis error (Short circuit is detected on the sensor power supply).	Confirm if short circuit occurs at the sensor or cable	Confirm if sensor and cable are operating correctly.
	All LED Flashing green and red	Unit has failed	-	Please stop operation and please contact our sales office

Problem No.	LED indication	Problem	Investigation Method	Counter-measure
4	ST(M): Off	Power supply for control/input is OFF	Confirm if power supply for control/input is connected.	Re-connect power supply for control/input
	ST(M): Red	SI unit has failed	-	Stop operation and contact SMC sales office.
	ST(M): Flashing red (Diagnosis is active)	Diagnosis error (SI unit) 1) Valve short circuited 2) Broken wire at valve 3) Valve ON/OFF counter exceeds setting value.	Confirm through PLC or handheld terminal. For details, please refer to the System Diagnosis information.	For 1) and 2): valve is broken. Please replace valve and confirm operation. 3) Reset counter value, change setting value or disable the diagnostic through parameter setting.
	ST(M): Flashing green and red	Communication error between SI unit and I/O unit	Confirm if the connection between units is not loose.	f the error does not recover, stop operation and contact SMC sales office
	PWR: Red (Diagnostic is active)	The power supply voltage level for control and input is not normal	Confirm the power supply voltage level.	Supply DC24V±10% to the power supply for control and input.
	PWR(V): Red (Diagnostic is active)	The power supply voltage level for output is not normal	Confirm the used power supply voltage level.	Supply DC24V+10/-5% to the power supply for output.
	SF: Off BF: Flashing Red	Address Setting fault	Confirm if SI Unit address is consistent with address at DP master.	Set the correct address.
	SF: Off BF: Red	PROFIBUS DP communication fault	1) Confirm if communication speed and wiring length are compatible. 2) Confirm if terminating resistance is connected appropriately at both ends of network. 3) Confirm if communication wiring is close to any noise source.	Wire based on the PROFIBUS specification. Moreover, separate wire for the communication line and the noise source.
	SF: Red BF: Off (Diagnosis is active)	Diagnosis Error (Between PLC and Unit)	Confirm each unit's LED display.	Perform counter measure according to each unit LED display.
	SF: Red BF: Flashing Red	Configuration is inconsistent	Confirm PLC Configuration setting.	Match the PLC configuration setting with the actual unit configuration.
	SF: Red BF: Red	Address setting fault	Confirm if SI Unit address is "0" or above "126".	Set SI Unit address to be between 1 and 125.

Problem No.	LED indication	Problem	Investigation Method	Counter-measure
5	Solenoid valve does not operate normally	Valve output setting for occupied points is less than the number of connected valves	Confirm the V_SEL switch setting in the SI unit is set to more than the actual connected valves.	Set the SI unit switch settings to an occupation points count greater than the number of valves used.
		Program does not operate normally.	Confirm if ladder program at PLC Is correct	Same as left
		Power supply for output is defective	Check the status of the power supply for output	Supply DC24V +10/-5% to the power supply for output from the end plate unit
		Connection between SI Unit and solenoid valve manifold is defective	Confirm the connection between the SI Unit and solenoid valve manifold (Connector pin not bent, etc.)	Connect the SI Unit to the solenoid valve Manifold correctly
		SI Unit output type is not compatible with the solenoid valves	Confirm that the SI Unit and solenoid valves are compatible: EX600-SPR1 (PNP Output) - Negative common type valve EX600-SPR2 (NPN Output) - Positive common type valve	Replace the SI Unit or the solenoid valve so that the correct combination is used
		Defective SI Unit	Replace the SI Unit and confirm the operation	Replace the SI Unit.
		Defective solenoid valve	Replace the solenoid valve and confirm the operation	If the problem continues, refer to the solenoid valve operation manual.
6	Digital input equipment does not operate normally	Input type is not compatible	Confirm if input unit specification (PNP or NPN) and connected input equipment specification are compatible	Replace input unit or input equipment so that it become the correct combination
		Power supply for control and input is defective	Check the status of power supply for control and input	Supply DC24V ±10% to the power supply for control and input from the end plate
		Wiring or connection is defective	Confirm connection and wiring between input equipment and digital input unit.	Make corrections to the wiring between input equipment and digital input unit and continue operation
		Digital input unit is defective	Confirm the digital input unit	Replace the digital input unit
		Defective input equipment	Replace the input equipment and confirm the operation.	If the problem continues, refer to the input equipment operation manual.

Problem No.	LED indication	Problem	Investigation Method	Counter-measure
7	Digital output equipment does not operate normally	Output type is not compatible	Confirm if output unit specification (PNP or NPN) and connected load specification are compatible.	Replace the output unit or load to give the correct combination
		Program does not operate normally	Confirm if the ladder program at the PLC Is correct	Correct the ladder program at the PLC
		Power supply for output is defective	Check the status of the power supply for output	Supply DC24V +10/-5% to the power supply for output from the end plate
		Wiring and connection is defective	Confirm connection between the output equipment and digital output unit.	Make corrections to the wiring between the output equipment and digital output unit and continue operation
		Digital output unit is defective	Confirm the digital output unit.	Replace the digital output unit.
		Output equipment is defective	Replace the output equipment and confirm the operation.	If the problem continues, refer to the output equipment operation manual.
8	Analog input sensor does not operate normally	Power supply for control and input is defective	Check the status of the power supply for control and input	Supply DC24V±10% to the power supply for control and input from the end plate
		Input signal range setting is not compatible	Confirm the connected sensor specification	Set the input signal range to suit the sensor specification.
		Analog data format is not compatible	Confirm the data format setting of the Analog input unit.	Set the data format of the Analog input unit to suit the application/program.
		Wiring and connection is defective	Confirm the connection between the input sensor and Analog input unit	Correct the wiring between the input sensor and Analog input unit
		Analog Input Unit is defective	Check the Analog input unit and confirm the operation	Replace the Analog input unit and confirm the operation
		Defective sensor	Replace the sensor and confirm the operation.	If the problem continues, refer to the sensor operation manual.
9	Other peripheral units do not operate normally	Defective peripheral units	Confirm that the program at PLC is correct.	For further details, refer to the relevant manuals of each peripheral unit.

Parameter Setting

The EX600 has parameters settings for the system, unit and also each unit's channel, which can be set through PLC or Handheld Terminal.
There are no priorities in setting the parameter. The most recent setting will be reflected on the unit.

Caution
The following notes apply to Parameter setting, which can be changed from both PLC and Handheld Terminal (H.T.)
If a parameter is changed using the H.T., the parameter setting content in the PLC will not be changed. This means that, if the parameter is changed by the H.T., when the PROFIBUS communication is disconnected and then reconnected again, the parameter settings will revert to the settings saved in the PLC.
When setting parameters which can be set from both the PLC or H.T., it is recommended that the setting is made from the PLC.

Parameter Definition

System parameter

No	Parameter Name	Contents
1	Diagnosis Mode	Change memory mapping of extended diagnostic data. There are 4 types of diagnostic: [No Diagnostic], [System Diagnostic], [Unit Diagnostic], [Channel Diagnostic]. Please refer to (Page 76) for the memory map information.
2	Hold/Clear Setting Method	Select setting method of output state during communication fault or communication idle state, either with the unit's setting switches or using a HHT. When using an HHT, each channel's output state can be set to Hold/Clear/Force ON. However, when using setting switches, the entire system's output state can be set.

SI Unit Parameter

No	Parameter Name	Contents
1	Power Supply Voltage Monitor (Control/Input)	When power supply voltage for control/input goes above 26V or falls below 21V, a diagnostic error will be generated.
2	Power Supply Voltage Monitor (Output)	When power supply voltage for output goes above 26V or falls below 20V, a diagnostic error will be generated.
3	Short Circuit Detection	If short circuit or over current occurs when the valve output is ON, diagnostic error will be generated.
4	Restart after short circuit	When a short circuit at the valve has been removed, the short circuit detection error diagnostic can be set to automatically reset (error will automatically be cleared) or manual reset (error will not be cleared until power supply is reset)
5	Open Circuit Detection	If an open circuit is detected during Valve Output OFF, a diagnostic error will be generated. This setting can be made for each channel.
6	Output setting during communication fault	At the time of communication fault, each channel's Valve Output can be set to Hold, Clear or Force ON setting. This function will only be activated when the Hold/Clear setting method at the system configuration is set to Handheld.
7	Output setting during communication idle	At the time when the communication is idle, each channel's Valve Output can be set to Hold, Clear or Force ON setting. This function will only be activated when Hold/Clear setting method at the system configuration is set to Handheld.
8	Channel ON/OFF Counter	The number of times the valve is ON/OFF is recorded for each channel. There is a set value for each channel, and it is possible to generate a diagnostic error when the set value is reached. However, recording the number of ON/OFF is done in 30 second intervals (30 seconds per channel) from CH0 to the channels which have valve outputs. If the power supply for control and input is turned OFF, the last recorded value for each channel will become valid.

Digital Input Unit Parameter

No.	Parameter Name	Contents
1	Short circuit detection	If a short circuit or over current occurs at the sensor power supply, a diagnostic error will be generated.
2	Open Circuit Detection (Only available for Open Circuit Detection Unit)	If an open circuit is detected at the input sensor, a diagnostic error will be generated. There is a setting available for each channel. Please note the following: 1) When a 2-wire type sensor is used, during OFF state, a leak current of less than 0.5mA will not be detected. A sensor with a leak current of 0.5mA or more (in the OFF state) must be used. 2) When a 3-wire type sensor is used, if the sensor has a current consumption of less than 0.5mA, an open circuit may not be detected.
3	Inrush current filter	When an input equipment with high capacitance is connected, at the time power is supplied, over current will be detected. If the inrush current filter is active, during the first 100msec after power is supplied, over current will not be detected.
4	Input filtering time	A change of signal faster than the input filtering time will be disregarded.
5	Input extension time	An Input signal will be extended to the time set by this parameter. If the signal is longer than the setting, then this parameter's setting will be disregarded.
6	Channel On/Off Counter	The number of times the input is ON/OFF is recorded for each channel. There is a set value for each channel, and it is possible to generate a diagnostic error when the set value is reached. However, the counter value is recorded every one hour. If the power supply for control and input is turned OFF, data that has not been recorded will be cleared.

Digital Output Unit Parameter

No	Parameter Name	Contents
1	Short Circuit Detection	If a short circuit or over-current occurs at the output's load, a diagnostic error will be generated.
2	Restart after Short Circuit	When a short circuit at the output has been removed, the short circuit detection error diagnostic can be set to automatically reset (error will automatically be cleared) or manual reset (error will not be cleared until power supply is reset)
3	Open Circuit Detection	If an open circuit is detected when the output is in the OFF state, a diagnostic error will be generated. This setting can be made for each channel.
4	Output Setting during communication fault	At the time of communication fault, each channel's output can be set to Hold, Clear or Force ON setting. This function will only be activated when the Hold/Clear setting method at the system configuration is set to Handheld.
5	Output Setting during communication idle	At the time when the communication is idle, each channel's output can be set to Hold, Clear or Force ON setting. This function will only be activated when the Hold/Clear Setting method at the system configuration is set to Handheld.
6	Channel On/Off Counter	The number of times the output is ON/OFF is recorded for each channel. There is a set value for each channel, and it is possible to generate a diagnostic error when the set value is reached. However, the counter value is recorded every one hour. If the power supply for control and input is turned OFF, data that has not been recorded will be cleared.

Analog Input Unit Parameter

No	Parameter Name	Contents
1	Short Circuit Detection	If a short circuit or over-current occurs at the sensor power supply, a diagnostic error will be generated.
2	Analog input measurement range	Selection of Analog Input Range. The settable measurement ranges are: 0...10V, 1...5V, 0...5V, -10V...+10V, -5V...+5V, 0...20mA, 4...20mA, -20mA...+20mA.
3	Analog data format	Select data format, which is output to the PLC from the Analog Input unit. Available selections are: Offset Binary, Signed Binary, 2's Complements.
4	Analog averaging filter	Selection of analog averaging filter. The sampling cycle is about 2 seconds. Selectable values are: No filter, 2 Average (average between the last 2 input values), 4 Average, and 8 Average.
5	Range Upper Limit Error	If the input signal exceeds the upper limit value of the input range (0.5%), a diagnostic error will be generated.
6	Range Lower Limit Error	If the input signal exceeds the lower limit value of the input range (0.5%), a diagnostic error will be generated.
7	User settable value upper limit	If the input signal exceeds the upper limit value of the user settable range, a diagnostic error will be generated. This setting can be made for each channel.
8	User settable value lower limit	If the input signal exceeds the lower limit value of the user settable range, a diagnostic error will be generated. This setting can be made for each channel.

Parameter's Factory Default Setting

System Parameter

No	Parameter Name (GSD Parameter)	Setting Value	Contents	Setting Level	Default setting	Setting Method	
						By PLC	By H.T.
1	Diagnostic mode (Diag. mode)	No diag.	No Diagnostic data	System		O	O
		Device diag.	System diagnostic data only				
		Device +Module Diag.	System and unit diagnostic data				
		Device[+Module +Channel diag.	System, unit and channel diagnostic data		O		
2	Hold/Clear Setting Method (Hold/Clear)	Switch	Hold/Clear Setting is made at SI Unit setting switch.	System	O	O	O
		Handheld	Hold/Clear Setting is made at Handheld Terminal				

SI Unit Parameter

No	Parameter Name (GSD Parameter)	Setting Value	Contents	Setting Level	Default setting	Setting Method	
						By PLC	By H.T.
1	Power supply voltage for control and input monitor (Pwr control monitor)	Enable	Enable monitoring of power supply voltage for control and input.	Unit	O	O	O
		Disable	Disable monitoring of power supply voltage for control and input.				
2	Power supply voltage for output monitor (Pwr output monitor)	Enable	Enable monitoring of power supply voltage for output	Unit	O	O	O
		Disable	Disable monitoring of power supply voltage for output				
3	Short Circuit Detection (Monitor short circuit)	Enable	Enable valve short circuit detection	Unit	O	O	O
		Disable	Disable valve short circuit detection				
4	Restart after short circuit (Restart after short circuit)	Auto	After short circuit has been removed, the error will be cleared automatically.	Unit	O	O	O
		Manual	After short circuit has been removed, the error will not be cleared until the power supply is reset.				
5	Open Circuit Detection (OC_Mon)	Enable	Enable valve open circuit detection	Channel		X	O
		Disable	Disable valve open circuit detection		O		
6	Output setting during communication fault. (Fault_MD)	Clear	During communication fault, clear valve output.	Channel	O	X	O
		Hold	During communication fault, hold valve output.				
		ForceOn	During communication fault, turn ON valve output.				
7	Output setting during communication idle (Idle_MD)	Clear	During communication idle, clear valve output.	Channel	O	X	O
		Hold	During communication idle, hold valve output.				
		ForceOn	During communication idle, turn ON valve output.				
8	Valve ON/OFF counter (Counter)	Enable	If valve's ON/OFF counter exceeds the setting value, a diagnostic error will be generated.	Channel		X	O
		Disable	Diagnostic error will not be generated		O		
		Val	Set maximum counter value. Settable values are (1~65000) x 1000 times		65000		

Digital Input Unit Parameter

No	Name (GSD Parameter)	Setting Value	Contents	Setting Level	Default setting	Setting Method	
						By PLC	By H.T.
1	Short circuit detection (Monitor short circuit)	Enable	Enable sensor's power supply short circuit detection	Unit	O	O	O
		Disable	Disable sensor's power supply short circuit detection				
2	Open circuit detection (Monitor open circuit) Note 1)	Enable	Enable input sensor open circuit detection	Channel		X	O
		Disable	Disable input sensor open circuit detection		O		
3	Inrush current Filter (Inrush current filter)	Enable	Enable inrush current filter	Unit	O	O	O
		Disable	Disable inrush current filter				
4	Input Filtering time (Input filtering time)	0.1/1/10/20 msec	Set input signal filtering time.	Unit	1msec	O	O
5	Input extension time (Input extension time)	1/15/100/200 msec	Set input signal's extension time	Unit	15 msec	O	O
6	Input Sensor's ON/OFF (Counter)	Enable	If input sensor's ON/OFF counter exceeds setting value, diagnostic error will be generated.	Channel		X	O
		Disable	Diagnostic error will not be generated		O		
		Val	Set maximum counter value. Settable setting value are (1~65000) x 1000 times		65000		

Note 1) Open Circuit Detection parameter is only available on Digital input unit with open circuit detection (P/N EX600-DXPC1, EX600-DXNC1).

Digital Output Unit Parameter

No	Name (GSD Parameter)	Setting Value	Contents	Setting Level	Default setting	Setting Method	
						By PLC	By H.T.
1	Short Circuit Detection (Monitor short circuit)	Enable	Enable output short circuit detection	Unit	O	O	O
		Disable	Disable output short circuit detection				
2	Restart after Short Circuit (Restart after short circuit)	Auto	After short circuit has been removed, the error will be cleared automatically	Unit	O	O	O
		Manual	After short circuit has been removed, the error will not be cleared until the power supply is reset				
3	Open Circuit Detection (Monitor pen circuit)	Enable	Enable output open circuit detection	Channel		X	O
		Disable	Disable output open circuit detection		O		
4	Output setting during communication fault (Fault action)	Clear	During communication fault, clear output	Channel	O	X	O
		Hold	During communication fault hold output				
		Force On	During communication fault, turn ON output				
5	Output setting during communication idle (Idle mode)	Clear	During communication idle, clear output	Channel	O	X	O
		Hold	During communication idle, hold output				
		Force On	During communication idle, turn ON output				
6	Output ON/OFF counter (Switching counter)	Enable	If output ON/OFF counter exceeds the setting value, a diagnostic error will be generated.	Channel		X	O
		Disable	Diagnostic error will not be generated		O		
		Val	Set the maximum counter value. Settable value are (1~65000) x 1000 times		65000		

Analog Input Unit Parameter(1)

No	Name (GSD Parameter)	Setting Value	Contents	Setting Level	Default setting	Setting Method	
						By PLC	By H.T.
1	Short Circuit Detection (Monitor short circuit)	Enable	Enable sensor power supply short circuit detection	Unit	O	O	O
		Disable	Disable sensor power supply short circuit detection				
2	Analog Input Range (Ch # Range)	0...10V, 1...5V、0...5V, -10V...+10V, -5V...+5V, 0...20mA, 4...20mA, -20mA...+20mA	Select analog input range	Channel	-10V ~ 10V	O	O
3	Analog Data Format (Data format)	Offset Binary, Sign & Magnitude, 2s Complement	Select analog data format	Unit	Offset Binary	O	O
4	Analog Filter (Ch # Filter)	None, 2 value average, 4 value average, 8 value average	Select analog data filter	Unit	2 value average	O	O
5	Over Range detection (Monitor over range)	Enable	If the analog input exceeds the maximum allowable input range (0.5%), a diagnostic error will be generated	Unit	Enable	O	O
		Disable	Above diagnostic error will not be generated.				
6	Under Range detection (Monitor under range)	Enable	If the analog input exceeds the minimum allowable input range (0.5%), a diagnostic error will be generated	Unit	Enable	O	O
		Disable	Above diagnostic error will not be generated.				

Analog Input Unit Parameter (2)

No	Name (GSD Parameter)	Setting Value	Contents	Setting Level	Default setting	Setting Method	
						By PLC	By H.T.
7	User Setting Value Upper Limit Error (Analog upper limit)	Enable	If the analog input exceeds the upper user setting lower limit, diagnostic error will be generated	Channel	Disable	X	O
		Disable	Above diagnostic error will not be generated.				
		Val	Refer to Note1) for possible set value		10V[Note2)]		
8	User Setting Value lower Limit Error (Analog under limit)	Enable	If the analog input falls below the lower user setting lower limit, diagnostic error will be generated	Channel	Disable	X	O
		Disable	Above diagnostic error will not be generated.				
		Val	Refer to Note1) for possible set value		10V		

Note1) User setting value is settable according to the table below.

Analog input measurement range	User setting value set range	
	Upr_Lmt	Lwr_Lmt
-10 ... +10V	-10.5 ~ +10.45V	-10.45 ~ +10.5V
-5V ... +5V	-5.25 ~ +5.22V	-5.22 ~ +5.25V
-20 ... +20mA	-21 ~ +20.9mA	-20.9 ~ +21mA
0 ... +10V	0 ~ +10.45V	0.05 ~ +10.5V
0 ... +5V	0 ~ +5.22V	0.02 ~ +5.25V
+1 ... +5V	+0.75 ~ +5.22V	+0.77 ~ +5.25V
0 ... +20mA	0 ~ +20.9mA	0.1 ~ +21mA
+4 ... +20mA	+3 ~ +20.9mA	+3.1 ~ +21mA

Note 2) Factory default setting for Analog input range is -10...+10V
When changing the analog input measurement range, please make sure to confirm the set value and set the correct value accordingly.

Hardware Configuration

This section will explain hardware configuration and implementation and parameter allocation methods for the EX600 Series.

GSD File and Symbol File

GSD file is required to configure the EX600 with a DP Master. The GSD File contains ID number, version, and unit information. Furthermore, a symbol file is necessary for the display microcontroller of the EX600 on the DP Master Software. The GSD File and Symbol File can be downloaded from the URL given below.

- URL : http://www.smcworld.com
- GSD File : SMCA1411.gsd
- Symbol File : EX600_1N.bmp(standard type)
  : EX600_1D.bmp(diagnostic type)
  : EX600_1S.bmp(special operating mode)

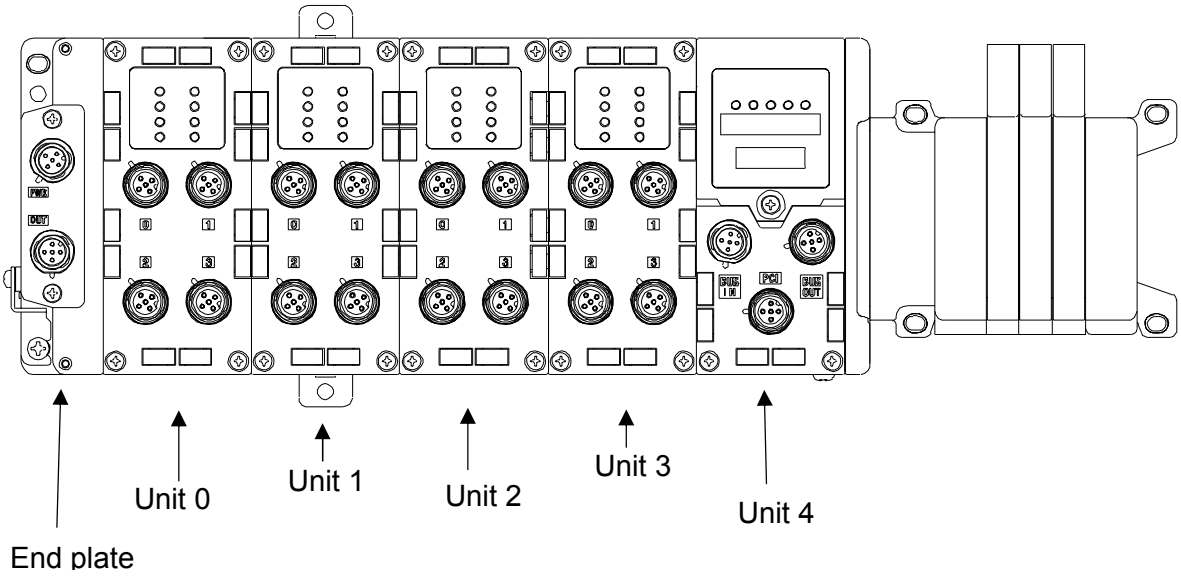
Unit Identification

Each Unit of EX600 Series has a unique identification number.

Unit Part Number	Unit Name	Occupied Byte		DP ID number	
		Input	Output	Siemens	IEC61158
EX600-SPR# (32 Ch) (#:1/2)	SI Unit (32 Ch)	0	4	32DO	23h
EX600-SPR# (24 Ch) (#:1/2)	SI Unit (24 Ch)	0	3	24DO	22h
EX600-SPR# (16 Ch) (#:1/2)	SI Unit (16 Ch)	0	2	16DO	21h
EX600-SPR# (8 Ch) (#:1/2)	SI Unit (8 Ch)	0	1	8DO	20h
EX600-DX#B (#:P/N)	Digital Input Unit	1	0	8DI	10h
EX600-DX#C (#:P/N)	Digital Input Unit	1	0	8DI	10h
EX600-DX#C1 (#:P/N)	Digital Input Unit (With Open Circuit Detection)	1	0	8DI	10h
EX600-DX#D (#:P/N)	Digital Input Unit	2	0	16DI	11h
EX600-DY#B (#:P/N)	Digital Output Unit	0	0	8DO	20h
EX600-AXA (2channel)	Analog Input Unit (2 Channel)	4 (1 Channel is 2 bytes)	0	2AI	51h

Configuration Layout

The Unit number is sequentially allotted from the End Plate end of the EX600 assembly. The communication with the DP Master will not be established if the layout of the hardware configuration does not match the actual system configuration.



SIEMENS PLC S7 Connection Method

Below is an explanation of the EX600 Series connection method with a SIEMENS' PLC STEP7™.

GSD File Installation

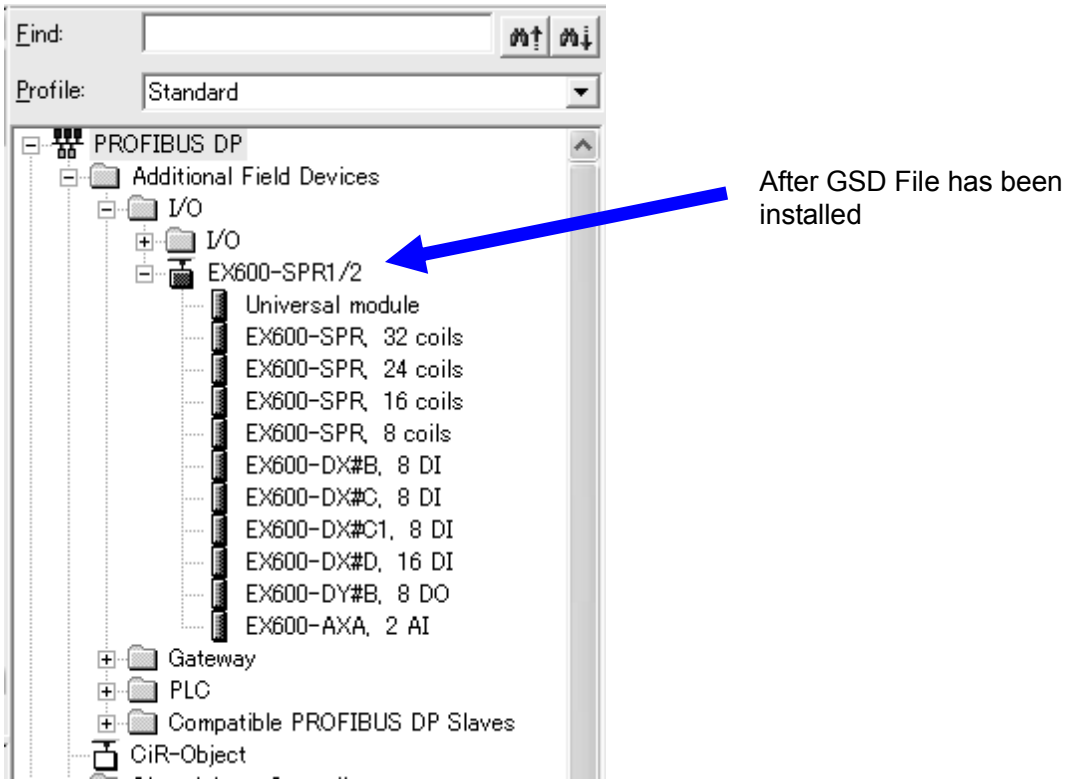
There are 2 methods for installing the EX600-SPR# GSD file:

Method1: Before starting-up STEP7™.

- Copy GSD file to […/ Siemens / Step7:/ S7data / gsd] folder.
- Copy Symbol file to […/Siemens / Step7 / S7data / nsbmp] folder.
- After completing the above steps, the EX600-SPR1/2 will automatically be added to the Hardware Catalogue under the STEP7™ [Hardware Catalogue] [Additional Field Devices / I/O /] Folder.

Method 2: After STEP7™ has been started.

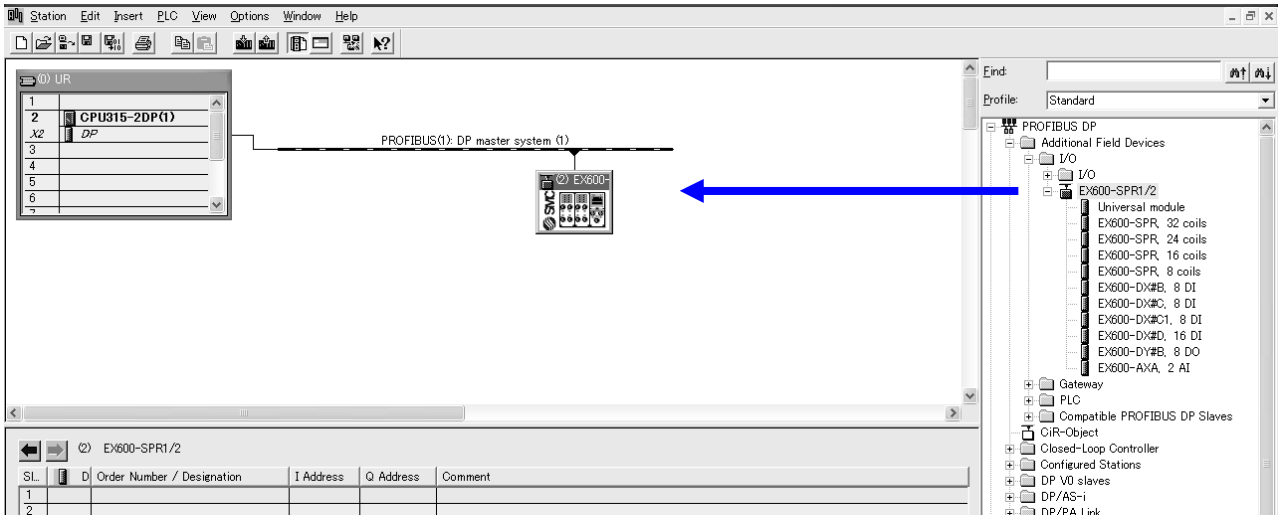
- Open [Hardware Configuration] screen.
- Select "Option→Install New GSD… " From the menu bar.
- Select GSD File (SMCA1411.gsd), and click the Open button.
- Copy symbol file to [… / Siemens / STEP7 / S7data / nsbmp] folder.
- After completing the above steps, the EX600-SPR1/2 will automatically be added to the Hardware Catalogue under the STEP7™ [Hardware Catalogue] [Additional Field Devices / I/O /] Folder..



Screen data used on this document is taken from STEP7™ software by Siemens AG.

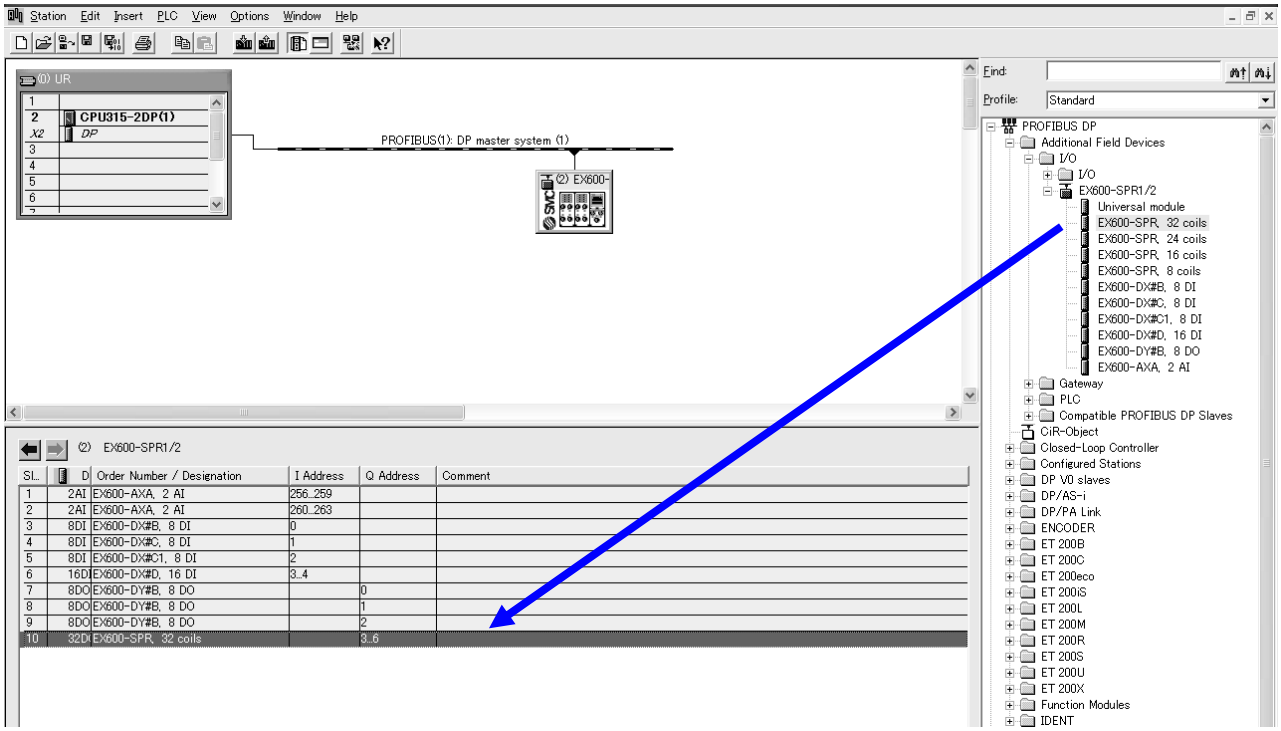
Adding Stations

- Drag and drop EX600-SPR1/2 from the Hardware Catalogue to the station window. “Property-PROFIBUS Interface EX600-SPR1/2” Dialogue Box will be displayed.
- Enter the unit address on the dialogue box. Please make sure that the address entered is the same as the address set, using the SI unit switches.
- Press the OK button to confirm the address setting. EX600-SPR1/2 will be shown on the station window.



Adding Units

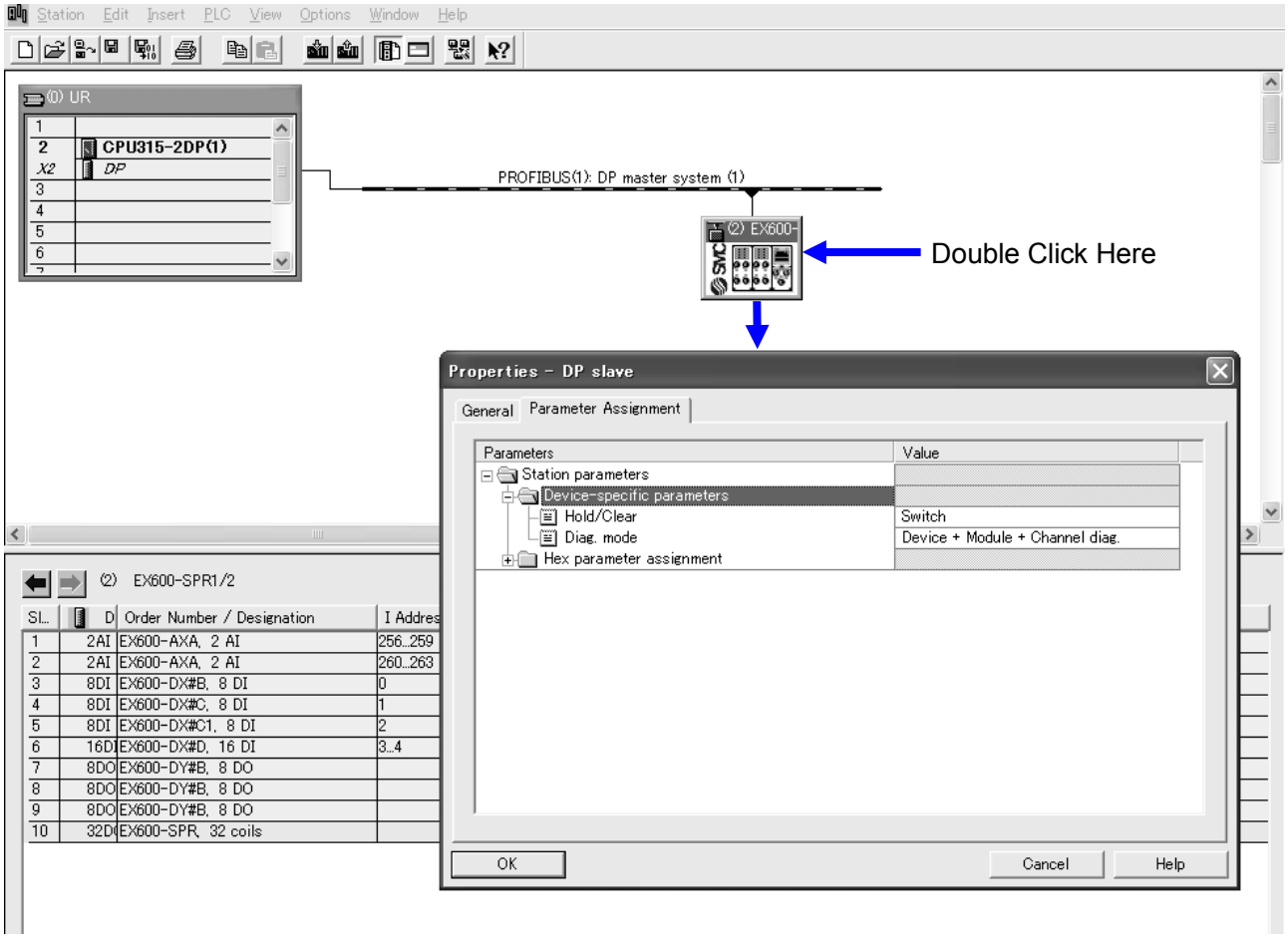
- Select “EX600-SPR1/2” from the station window.
- An empty slot for EX600-SPR1/2 will be displayed on the configuration table, below the station window.
- Drag and drop the connected unit from [Hardware Catalogue] Window to slot 1. Please make sure to add the unit as the real system’s order of connecting (i.e Unit 0 at Slot 1).
- Add the other units, according to the connected order, to the configuration table, ending with the SI unit.
- The SI Unit for 32, 24, 16, 8 coils can be selected, please make sure to match the setting with the V_SEL switch setting in the SI unit.



Parameter Setting at PLC

System Parameter Setting

- Double click the “EX600-SPR1/2” symbol on the PROFIBUS: DP master system line. The system properties window will be displayed.
- Select the [Parameter Assignment] tab; the available Parameter setting list will be displayed under [Device-Specific parameters] folder.
- Change the parameter value by clicking on the Value column of the selected parameter.
- Press the OK Button, after the configuration data is downloaded to the PLC, the setting will be completed.

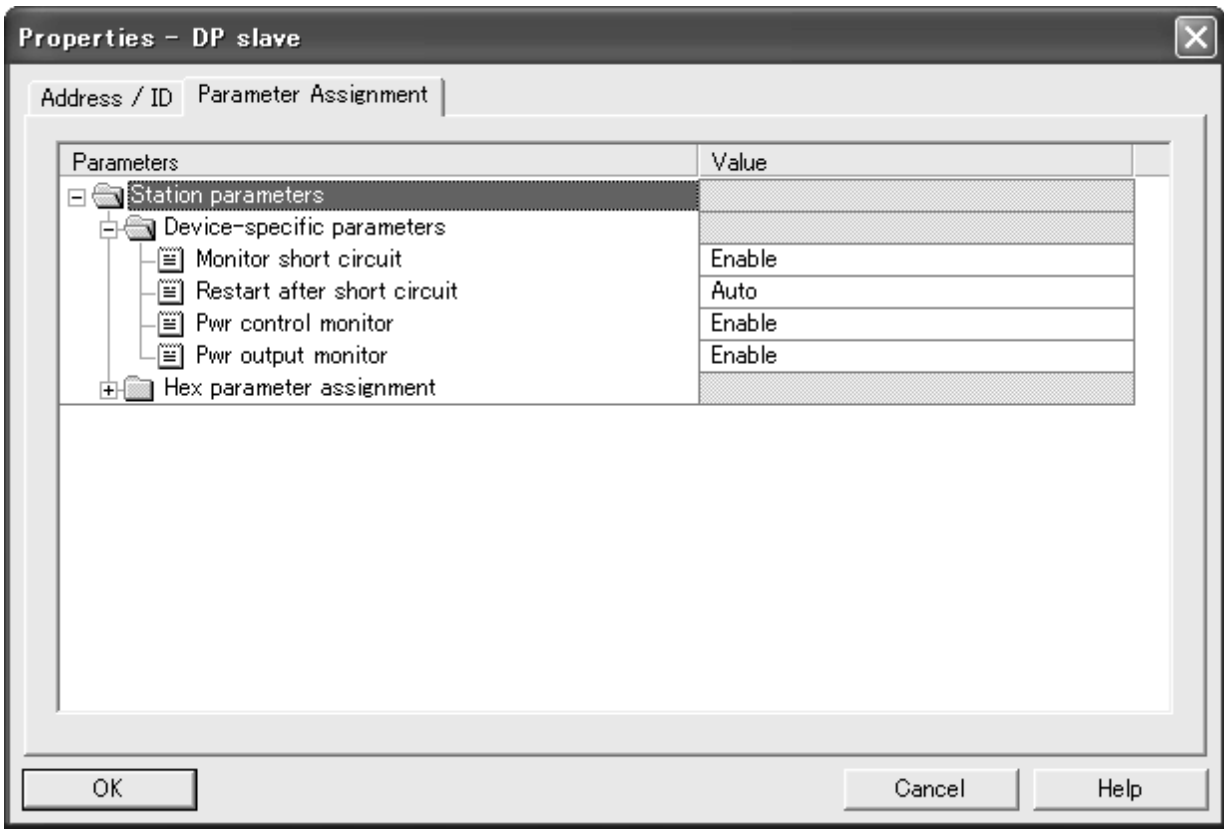


The system parameters given below can be set at the STEP7™.

System Parameter	Setting Value
Hold/Clear	Switch
	Parameter
Diag.mode	No diag.
	Device diag
	Device + Module diag.
	Device + Module + Channel Diag

Unit Parameter Setting

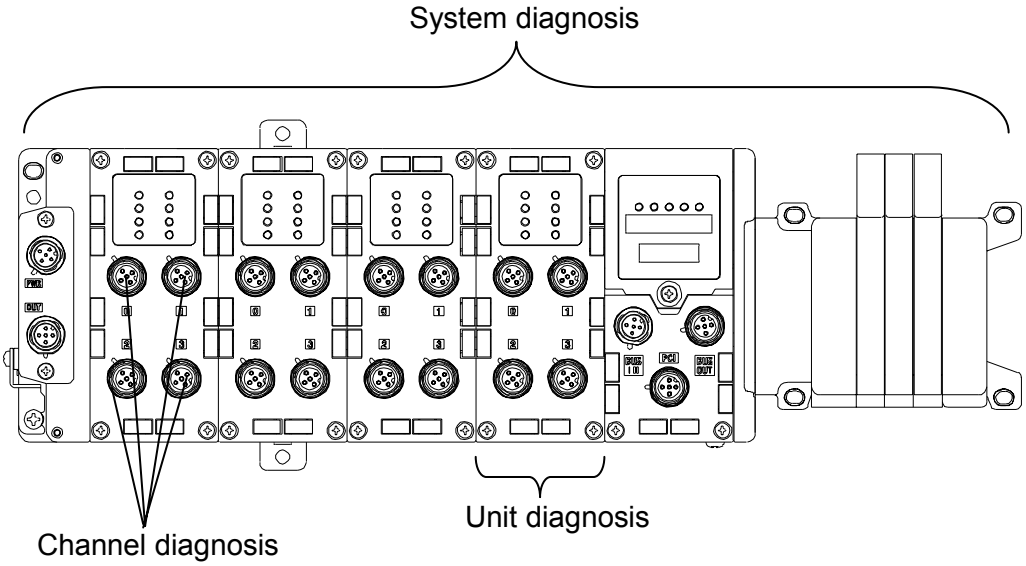
- Double click a unit that you want to set on the configuration table, select [Parameter Assignment] tab. The setting method is the same as described above for system parameter setting.



Diagnostic Mode

The diagnostic Mode can be set at Diag. Mode in the system parameter setting.

No.	Diagnostic Mode	Contents
1	No diag.	Provides standard diagnostic data
2	Device diag	Provides standard diagnostic + system diagnostic data
3	Device + Module diag.	Provides standard diagnostic + system diagnostic + unit diagnostic data
4	Device + Module + Channel Diag	Provides standard diagnostic + system diagnostic + unit diagnostic + channel diagnostic data



Diagnostic Map

Diagnostic Map is shown below

Byte No.	Contents	Diagnostic type
Byte 0	Station Status 1	Standard Diagnostic data
Byte 1	Station Status 2	
Byte 2	Station Status 3	
Byte 3	Master PROFIBUS Address	
Byte 4	Manufacturer ID(MSB : 14h)	
Byte 5	Manufacturer ID(LSB : 11h)	
Byte 6	Header	System Diagnostic data
Byte 7	System diag.1	
Byte 8	System diag.2	
Byte 9	System diag.3	
Byte 10	System diag.4	
Byte 11	Reserved	
...	...	
Byte 18	Reserved	
Byte 19	Header	Unit Diagnostic data
Byte 20	Unit 0~7	
Byte 21	Unit 8~9	
Byte 22	Reserved	
…	…	
Byte 27	Reserved	
Byte 28	Unit A	Channel Diagnostic data
Byte 29	Channel A	
Byte 30	Diagnostic contents A	
Byte 31	Unit B	
Byte 32	Channel B	
Byte 33	Diagnostic contents B	
...	...	
Byte 61	Unit L	
Byte 62	Channel L	
Byte 63	Diagnostic contents L	

Standard Diagnostic data

Station Status 1

	7	6	5	4	3	2	1	0
Byte 0								

Bit No.	Meaning
0	DP Slave can not be accessed by DP Master
1	DP Slave is not ready to exchange data
2	Configuration data transmitted to DP Slave by DP Master does not match with setting of DP Slave.
3	External diagnostic function can be used
4	DP Slave does not support the required function
5	DP Master can not interpret the response of DP Slave
6	DP Slave type does not correspond to software configuration
7	Parameter is allocated to DP Slave by different DP Master

Station Status 2

	7	6	5	4	3	2	1	0
Byte 1		0				1		

Bit No.	Meaning
0	New Parameter needs to be allocated to the DP slave
1	A new message was generated
2	(At DP Slave, this bit is always 1)
3	The response monitor is effective to DP Slave.
4	DP Slave received FREEZE control command.
5	DP Slave received the SYNC control command.
6	(Bit is always 0)
7	DP Slave is inactive

Station Status 3

	7	6	5	4	3	2	1	0
Byte 2		0	0	0	0	0	0	0

Bit No.	Meaning
0~6	(Bit is always 0)
7	There are more diagnostic message than DP Slave can store.

Master PROFIBUS Address

Byte 3 shows the PROFIBUS Address of the DP Master.
When the address is FFh, the parameter of the DP Slave cannot be changed. For all other address settings, the parameters of the DP Slave can be changed.

Manufacturer ID

The DP Slave manufacturer ID is shown. The EX600-SPR1/2 manufacturer ID is 1411h.

System Diagnostic data

Header

	7	6	5	4	3	2	1	0
Byte 6	0	0	0	0	1	1	0	1

Bit No.	Meaning
0~5	Number of Byte of devices Diagnostic data
6, 7	(Bits are always 0)

System diag.1

	7	6	5	4	3	2	1	0
Byte 7								

Bit No.	Meaning
0	Analog input falls below user's setting lower limit value
1	Analog input exceeds user's setting upper limit value
2	Analog input falls below lower measurement range
3	Analog input exceeds upper measurement range
4	Channel ON/OFF counter exceeds setting value
5	Open circuit error detected
6	Short circuit detected on valve output or digital output.
7	Short circuit detected on input sensor's power supply

System diag.2

	7	6	5	4	3	2	1	0
Byte 8			-			-		

Bit No.	Meaning
0	Power supply voltage for output is outside operating range
1	Power supply voltage for control and sensor is outside operating range
2	Reserved
3	Connection error on I/O Unit (during operation)
4	Connection error on I/O Unit(at system start up)
5	Reserved
6	System error
7	Hardware error

System diag.3

	7	6	5	4	3	2	1	0
Byte 9	-	-	-	-	-	-	-	-

Bit no.	Meaning
0~7	Reserved

System diag.4

	7	6	5	4	3	2	1	0
Byte 10	-	-	-		-			

Bit No.	Meaning
0	Error detected on Digital Input unit.
1	Error detected on Digital Output unit.
2	Error detected on Analog Input unit.
3	Reserved
4	Error detected on SI unit.
5	Reserved
6	Reserved
7	Reserved

Unit Standard Diagnostic data

Header

	7	6	5	4	3	2	1	0
Byte 19	0	1	0	0	1	0	0	1

Bit No.	Meaning
0~5	Number of byte of unit diagnostic data
6	(Bit is always 1)
7	(Bit is always 0)

Unit 0~7

	7	6	5	4	3	2	1	0
Byte 20								

Bit No.	Meaning
0	Error detected on Unit 0
1	Error detected on Unit 1
2	Error detected on Unit 2
3	Error detected on Unit 3
4	Error detected on Unit 4
5	Error detected on Unit 5
6	Error detected on Unit 6
7	Error detected on Unit 7

Unit 8~9

	7	6	5	4	3	2	1	0
Byte 21	-	-	-	-	-	-		

Bit No.	Meaning
0	Error detected on Unit 8
1	Error detected on Unit 9
2~7	Reserved

Channel Diagnostic data

Each channel diagnostic data is composed of 3 bytes, with a maximum of 12 errors which can be detected. However, because only one error may output per one unit, when two or more errors are generated by the same unit, the error on the channel with the lowest number will be output.

	7	6	5	4	3	2	1	0	
Byte 28	1	0	-						Unit number A
Byte 29									Channel number A
Byte 30									Diagnosis type A

•••••

	7	6	5	4	3	2	1	0	
Byte 61	1	0	-						Unit number L
Byte 62									Channel number L
Byte 63									Diagnosis type L

Unit Number

Bit No.	Meaning
0~4	Displays Unit number 0~9
5	Reserved
6	(Bit is always 0)
7	(Bit is always 1)

Channel Number

Bit no.	Meaning
0~5	Displays Channel number 0~63
6, 7	Input / Output Type： 00= Reserved、01= Input 、10= Output、11= Input / output

Diagnostic Type

Bit No.	Meaning
0~4	Error Code
5~7	Channel Type： 001= Bit (Unit other than Analog Input) 101＝Word(Analog Input Unit)

Error Code

Error Code (Decimal)	Meaning	Level
0	Reserved	
1	Short Circuit Detection	3
2~5	Reserved	
6	Open circuit Detection	3
7	Analog input exceeds upper measurement range	3
8	Analog input falls below lower measurement range	3
9~15	Reserved	
16	Analog input exceeds user’s setting upper limit value	3
17	Analog input falls below user’s setting lower limit value	3
18	Channel ON/OFF counter exceeds setting value	3
19~29	Reserved	
30	Connection error on I/O Unit	1
31 (Note2)	Hardware error	2

Note1) It becomes the order of the priority level (1→2→3) when an error is detected on the same unit same channel.
Note2) The Channel number when an Error is generated is assumed to be 0.

Accessories

Please refer to the catalogue for selecting the accessories.

(1)Valve Plate

Used for mounting solenoid valve manifold and SI unit.

EX600-ZMV1

(2)Metal fittings for Endplate

Metal fittings used with endplate when installed on DIN rail.

EX600-ZMA2

(3)Metal fittings for the intermediate reinforcement

Metal fittings used at the intermediate position when more than 6 units are assembled.

EX600-ZMB1	For direct mounting
EX600-ZMB2	For DIN rail mounting

(4)Seal cap (10 pcs included)

Please install a seal cap in all unused input/output connectors, to maintain the protective construction of IP67.

EX9-AWES	For M8
EX9-AWTS	For M12

(5)Marker (1 sheet, 88pcs included)

A marker to show input/output equipment signal names and unit addresses, etc. can be inserted for each unit.

EX600-ZT1

(6)Y Junction connector

Connector used to branch off between sensor and input unit.

PCA-1557785	2×M12(3 pin)-M12(5 pin)

(7)Assembled type connector

PCA-1558797	Power supply cable 7/8”,Plug
PCA-1558807	Power supply cable 7/8”,Socket
PCA-1557701	PROFIBUS DP communication cable, Plug
PCA-1557714	PROFIBUS DP communication cable, Socket
PCA-1557730	M8(3 pin),Plug
PCA-1557743	M12(4 pin),Plug ,AWG26~AWG22,SPEEDCON compatible
PCA-1557756	M12(4 pin),Plug ,AWG22~AWG18,SPEEDCON compatible

(8)Power supply cable

PCA-1558810	Cable with 7/8” connector, Socket, Straight 2m
PCA-1558823	Cable with 7/8” connector, Socket, Straight 6m
PCA-1558836	Cable with 7/8” connector, Socket, Right angle 2m
PCA-1558849	Cable with 7/8” connector, Socket, Right angle 6m
PCA-1564927	Cable with M12 connector, B Code, Socket, Straight 2m, SPEEDCON compatible
PCA-1564930	Cable with M12 connector, B Code ,Socket ,Straight 6m, SPEEDCON compatible
PCA-1564943	Cable with M12 connector, B Code, Socket, Right angle 2m, SPEEDCON compatible
PCA-1564969	Cable with M12 connector, B Code, Socket, Right angle 6m, SPEEDCON compatible

(9)PROFIBUS DP communication cable

PCA-1557688	Cable with M12 connector cable, B Code, Socket, Straight 5m, SPEEDCON compatible
PCA-1557691	Cable with M12 connector, B Code, Plug, Straight 5m, SPEEDCON compatible

(10)Connector extension cable

PCA-1557769	M12(4pin),Straight 3m
PCA-1557772	M8(3pin),Straight 3m

Revision history

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