Doc. No. DOC1121211-1

Operation Manual

PRODUCT NAME

Fieldbus System
EtherNet/IP™ compatible Fieldbus Module

MODEL / Series / Product Number

EX600-BEN1
EX600-ED#

SMC Corporation

1 Table of Contents

Safety Instructions 5
2 System Overview 12
2.1 System Configuration 12
2.2 Designation of Module Number and Channel Number 13
2.3 Glossary 14
3 Assembly 15
4 Installation 18
4.1 Direct Mounting 18
4.2 DIN Rail Mounting 21
4.3 Identification Marker 23
5 Fieldbus Module 24
5.1 Model Indication and How to Order 24
5.2 Component Names and Functions 24
5.3 Wiring 25
5.4 LCD Display 26
5.4.1 Overview 26
5.4.2 Indicators 27
5.4.3 LCD Display Operation 30
5.5 Specifications 44
5.6 Dimensions 45
6 End Plate 46
6.1 Model Indication and How to Order 46
6.1.1 End Plate (D-Side) 46
6.1.2 End Plate (U-Side) 46
6.2 Component Names and Functions 47
6.3 Wiring 48
6.4 Power Supply System(US1/US2) 49
6.5 Specifications 50
6.6 Dimensions 51
7 Troubleshooting 54
7.1 Troubleshooting Chart 54
7.2 Troubleshooting Guide 57
8 Parameter Settings 73
8.1 Fieldbus Module Parameters 73
8.2 Safety I/O Module Parameters 75
8.2.1 Safety-Related Parameters 75
8.2.2 Valve Module-Related Parameters 75
8.2.3 ITV Module-Related Parameters 76
8.3 Digital Module Parameters 77

8.3.1 Digital Input Module Parameters 77
8.3.2 Digital Output Module Parameters 78
8.4 IO-Link Master Module Parameters 79
8.4.1 Parameter List 79
8.4.2 Data Storage Function 82
9 Diagnostics 83
9.1 Overview 83
9.2 Diagnostic Data 84
9.3 Diagnostic Logs 85
9.3.1 Checking via LCD Display 85
9.3.2 Checking via EtherNet/IP Objects 86
9.4 IO-Link Master Module Diagnostics 87
10 Input/Output Process Data 88
10.1 Data Size 88
10.1.1 I/O Data Size of Each Module 88
10.1.2 Total I/O Data Size 89
10.2 IO-Link Master Module I/O Map 90
10.2.1 I/O Map Details 90
10.2.2 Port Status (PQI) Details 91
10.3 EtherNet/IP I/O Map 92
10.3.1 Example of I/O Map Configuration 93
10.3.2 Input Map Example 94
10.3.3 Output Map Example 95
11 Hardware Configuration 96
11.1 IP Address Settings 96
11.1.1 IP Address Configuration via the IP Address Setting Tool 96
11.1.2 IP Address Configuration via LCD Display 99
11.2 PLC Configuration 102
11.2.1 Configuration Using EDS Files 102
11.2.2 Configuration Using the Generic Module 112
11.3 TUNID Settings 117
11.4 Safety Parameter Settings via Safety Output Process Data 120
11.5 Module Replacement 120
12 Parameter Settings via Configuration Assemblies 121
12.1 Configuration Assembly Setting Example 121
12.2 Configuration Data Size 123
12.2.1 ID and Data Size List 123
12.2.2 Configuration Data List by Module Type 124
12.2.3 Configuration Assembly Data Creation Example 129
13 Device Level Ring (DLR) Function 131
14 QuickConnect™ Function 131

15 Explicit Message Communication 132
15.1 Explicit Message Format 132
15.2 Input and Output Assembly Objects 132
15.3 Vendor-Specific Objects 133
15.3.1 System Information and Command Objects 133
15.3.2 Module Information and Command Objects 134
15.3.3 Channel Information and Command Objects 134
15.3.4 Diagnostic Objects 135
15.3.5 Module Parameter Objects 136
15.3.6 Channel Parameter Objects 137
15.3.7 Safety Command Objects 137
15.4 IO-Link SMI Service 138
15.4.1 SMI_MasterIdentification (IO-Link Master Information) 138
15.4.2 SMI_PortConfigList (IO-Link Master Port Parameters) 139
15.4.3 SMI_PortStatusList (IO-Link Master Port Status) 141
15.4.4 SMI_DeviceRead (Receiving ISDU from IO-Link Device) 143
15.4.5 SMI_DeviceWrite (Sending ISDU to IO-Link Device) 143
16 Accessories 144

Safety Instructions

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

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
etc.

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

⚠ Warning

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

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

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

Safety Instructions

⚠ Caution
SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries. **Use in non-manufacturing industries is not allowed.** Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country. The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.
Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Operator

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

■Safety Instructions

⚠Warning

■Do not disassemble, modify (including changing the printed circuit board) or repair.
An injury or failure can result.

■Do not operate or set with wet hands.
This may lead to an electric shock.

■Do not operate the product outside of the specifications.
Do not use for flammable or harmful fluids.
Fire, malfunction, or damage to the product can result.
Verify the specifications before use.

■Do not operate in an atmosphere containing flammable or explosive gases.
Fire or an explosion can result.
This product is not designed to be explosion proof.

■If using the product in an interlocking circuit:
•Provide a double interlocking system, for example a mechanical system.
•Check the product regularly for proper operation.
Otherwise malfunction can result, causing an accident.

■The following instructions must be followed during maintenance:
•Turn off the power supply.
•Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.
Otherwise an injury can result.

⚠Caution

■When handling the unit or assembling/replacing units:
•Do not touch the sharp metal parts of the connector or plug for connecting units.
•Take care not to hit your hand when disassembling the unit.
The connecting portions of the unit are firmly joined with seals.
•When joining units, take care not to get fingers caught between units.
An injury can result.

■After maintenance is complete, perform appropriate functional inspections.
Stop operation if the equipment does not function properly.
Safety cannot be assured in the case of unexpected malfunction.

■Provide grounding to assure the 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 designing, selecting and handling the product.

●The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.
*Product specifications
- For the power supply, use SELV or PELV circuits that guarantee a reliable electric disconnection from the MAINS.
- Use the specified voltage.
  Otherwise failure or malfunction can result.
- Reserve a space for maintenance.
  Allow sufficient space for maintenance when designing the system.
- Do not remove any nameplates or labels.
  This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product.
  It may also result in non-conformity to safety standards.
- Be aware of inrush current when the power supply is turned on.
  Some connected loads can apply an initial charge current which will activate the over current protection function, causing the unit to malfunction.

●Product handling

*Installation

- Do not drop, hit or apply excessive shock to the product.
  Otherwise damage to the product can result, causing malfunction.
- Tighten to the specified tightening torque.
  If the tightening torque is exceeded the mounting screws may be broken.
  The ingress protection cannot be guaranteed if the screws are not tightened to the specified torque.
- If a large valve module is assembled, lift the manifold so that stress is not applied to the connecting part while transporting.
  The stress may cause breakage of the connecting part. The manifold may become very heavy depending on the module combination. Transportation/installation shall be performed by multiple operators.
- Never mount a product in a location that will be used as a foothold.
  The product may be damaged if excessive force is applied by stepping or climbing onto it.

*Wiring

- Avoid repeatedly bending or stretching the cables, or placing heavy load on them.
  Repetitive bending stress or tensile stress can cause breakage of the cable.
- Wire correctly.
  Incorrect wiring can break the product.
- Do not perform wiring while the power is on.
  Otherwise damage to the product and/or input or output device can result, causing malfunction.
- Do not route wires and cables together with power or high voltage cables.
  Otherwise the product can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.
  Route the wires (piping) of the product and/or input or output device separately from power or high voltage cables.
- Confirm proper insulation of wiring.
  Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
- Take appropriate measures against noise, such as using a noise filter, when the Fieldbus system is incorporated into equipment.
  Otherwise noise can cause malfunction.

*Environment

- Select the proper type of protection according to the environment of operation.
  The ingress protection is achieved when the following conditions are met.
  (1) The modules are connected properly with cable with M12/M8 connector.
  (2) Suitable mounting of each module.
  (3) Be sure to fit 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.
  Do not use in an environment where moisture or water vapor is present. Otherwise failure and malfunction can result.
- Do not use in a place where the product could be splashed by oil or chemicals.
  If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction etc.).
- Do not use the product in an environment where corrosive gases or fluids could be splashed.
  Otherwise damage to the product and malfunction can result.
- Do not use in an area where surges are generated.
  If there is equipment generating large surge near the unit (magnetic type lifter, high frequency inductive furnace, welding machine, motor, etc.), this can cause deterioration of the internal circuitry element of the module or result in damage. Take measures against the surge sources, and prevent the lines from coming into close contact.

- When a surge-generating load such as a relay, valve or lamp is driven directly, use a product with a built-in surge absorbing element.
  Direct drive of a load generating surge voltage can damage the module.
- The product is CE/UKCA marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Prevent foreign matter such as dust or wire debris from getting inside the product.
- Mount the product in a place that is not exposed to vibration or impact.
  Otherwise failure or malfunction can result.
- Do not use the product in an environment that is exposed to temperature cycling.
  Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.
  If using in a location directly exposed to sunlight, shade the product from the sunlight.
  Otherwise failure or malfunction can result.
- Keep within the specified ambient temperature range.
  Otherwise malfunction can result.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
  Otherwise malfunction can result.
- Use with caution at altitudes above 2000 m, as the reduction in atmospheric pressure reduces withstand voltage performance and noise immunity (lightning surge, electro-static discharge).

*Adjustment and Operation

- Do not press the setting buttons with a sharp pointed object.
  It may damage the setting buttons.
- Perform settings suitable for the operating conditions.
  Incorrect setting can cause operation failure.
- Refer to the PLC manufacturer's manual etc. for details of programming and addresses.
  For the PLC protocol and programming refer to the relevant manufacturer's documentation.

*Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
  There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
  There is a risk of unexpected malfunction.
- After maintenance is complete, perform appropriate functional inspections.
  Stop operation if the equipment does not function properly.
  Otherwise safety is not assured due to an unexpected malfunction or incorrect operation.
- Do not use solvents such as benzene, thinner etc. to clean each unit.
  They could damage the surface of the body and erase the markings on the body.
  Use a soft cloth to remove stains.
  For heavy stains, use a cloth soaked with diluted neutral detergent and tightly wrung, then wipe up the stains again with a dry cloth.

Fieldbus System/ Industrial IoT Cybersecurity

In recent years, factories have introduced industrial IoT, building up complex networks of production machines. These systems may be subject to a new threat, cyberattack. To protect the industrial IoT from cyberattacks, it is important to take multiple measures (multi-layer protection) for IoT devices, networks and clouds.
For this purpose, SMC recommends that the following measures are always taken into consideration. For further details of the following measures, refer to security information published by your country's security agencies.

1. Do not connect the devices via a public network.
- If you unavoidably need to access the device or cloud via a public network, ensure to use a secure, private network such as VPN.
- Do not connect an office IT network and a factory IoT network.

2. Build a firewall to prevent a threat from entering the device and system.
- Set up a router or firewall at network boundaries to allow minimum required communications.
- Disconnect from the network or turn off the device, if no continuous connection is required.

3. Physically block access to unused communication ports or disable them.
- Inspect regularly each port if any unnecessary device is connected to the network system.
- Operate necessary services (SSH, FTP, SFTP, etc.) only.
- Set a transmission range of the device using a wireless LAN or other radio system to the minimum required and use only devices approved according to the radio act in the country concerned.
- Install a device generating radio waves in locations free from indoor or outdoor interference.

4. Set up a secure communication method such as data encryption.
- Encrypt data in every environment, including IoT networks, secure gateway connections, for secure communications.

5. Grant access permissions by user accounts and limit the number of users.
- Regularly review accounts and delete all unused accounts or permissions.
- Establish an account lockout system to block an access to the account for a certain period if log-in fails more than the given threshold.

6. Protect passwords.
- Change the default password when you first use the device or system.
- Choose a long password (minimum 8 characters) using a mix of different letters and characters to make the password more secure and harder to hack.

7. Use the latest security software.
- Install antivirus software on all computers to detect and remove viruses.
- Keep the antivirus software up to date.

8. Use the latest version of the device and system software.
- Apply patches to keep the OS and applications up to date.

9. Monitor and detect abnormalities in the network.
- Keep monitoring the network for any abnormalities to take a prompt measure and issue an alert if any abnormality is detected.

Install an intrusion detection system (IDS) and intrusion prevention system (IPS).

10. Delete data from devices when disposed of.
- Before disposing of any IoT devices, delete stored data or physically destruct media to prevent any misuse of the data.

2 System Overview

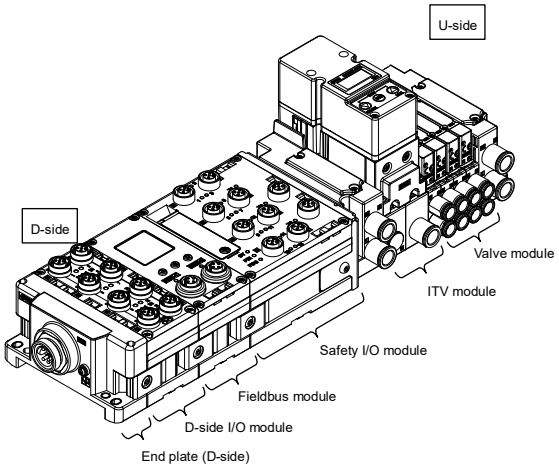
2.1 System Configuration

The EX600 fieldbus system is connected to EtherNet/IP networks and enables reduced wiring and distributed control of standard I/O devices (such as sensors, indicator lights, IO-Link devices) and safety I/O devices (such as light curtains, residual pressure relief valves).

The EX600 valve manifold system operates by combining various modules. The system can be expanded by connecting additional I/O modules to the Fieldbus module (EX600-BEN1).

Up to 9 modules, such as input, output, and IO-Link master modules, can be connected in any order to the D-side of the Fieldbus module.

The Safety I/O module can be connected to the U-side of the fieldbus module and can turn off the power supply for valves without installing another safety output device. The Safety I/O module can connect to additional devices such as safety input devices, safety output devices, and plug-in electro-pneumatic regulators.



Components	Overview
End Plate (D-Side)	Supplies power to the valve manifold system. The power cable is connected to this module.
Digital Input Module or Digital Output Module	Controls external input devices (e.g., pressure switches and auto switches) or external output devices (e.g., lamps and solenoid coils).
IO-Link Master Module	Communicates with an external IO-Link device via IO-Link communication.
Fieldbus Module	Communicates with the higher-level controller via a fieldbus.
Safety I/O Module	Controls safety inputs, safety outputs, valve modules, and ITV modules.
Valve Module	Operates pneumatic devices via the Safety I/O module.
ITV Module	Controls the output pressure based on electrical signals from the Safety I/O module.

⚠ Important:

- The Safety I/O module (EX600-FVC#) can be connected to the Fieldbus module (EX600-BEN1). Refer to the Safety Manual (Operation Manual) of the Safety I/O module for details regarding the safety functions.
- The original Safety Manual instruction (Doc. No: DOC1114013) is in English. Translated versions are for reference only.

Note:

- For detailed information on the functions of the plug-in electro-pneumatic regulator (ITV module), refer to its Operation Manual (DIY-60L00-OM002).

2.2 Designation of Module Number and Channel Number

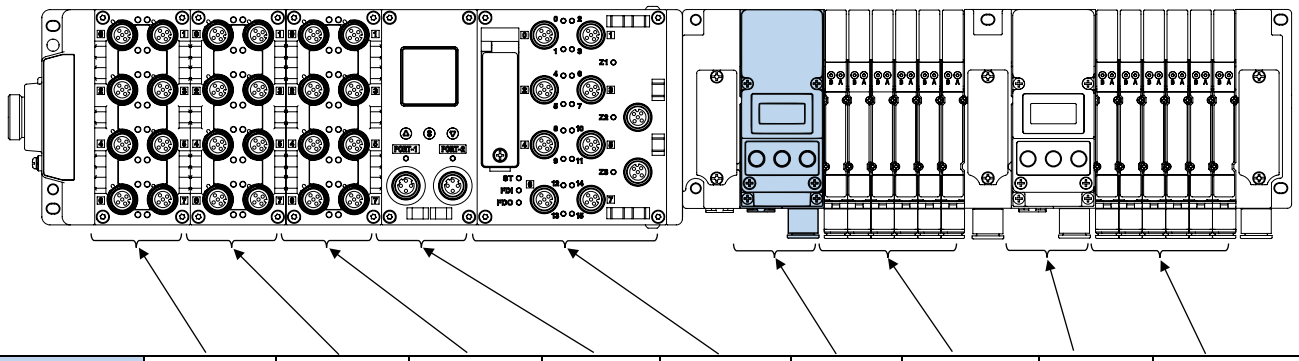
The EX600 system assigns a Module Number and a Channel Number to each module to identify the target for diagnostics and parameter settings.

The Module No. is assigned as follows according to the module connection order at startup.
- The Fieldbus module is fixed as Module No. 0.
- Each module is assigned a Module No. in ascending order, from the D-side to the U-side.

The Channel No. is assigned according to the specifications of each module.
- The Channel No. for D-side I/O modules is assigned according to connector order.
- The valve outputs of the Safety I/O module are assigned in ascending order, starting from Channel No. 0. Each Channel No. corresponds to the solenoids in order from the A-side of the valve closest to the Safety I/O module.
- The Channel No. for the ITV module, controlled by the Safety I/O module, is assigned in order from the D-side, starting at Channel No. 128.
- Safety inputs and safety outputs are not assigned a Channel No.

Assignment Example: In the configuration below, the highlighted ITV module is assigned Module No. 4 and Channel No. 128.

D-side U-side



Model Number	EX600-DXPD-A	EX600-DXPD-A	EX600-DXPD-A	EX600-BEN1	EX600-FVC2	ITV23	SY3000	ITV23	SY3000
Module No.	1	2	3	0	4	The Module No. is the same as that of EX600-FVC2			
Channel No.	0...15	0...15	0...15	-	-	128	0...7	129	8...15

2.3 Glossary

	Terminology	Description
100	100BASE-TX	A LAN transmission standard with communication speed of 100 Mbps.
D	DHCP	A protocol that automatically assigns network configuration parameters, such as IP address, required to use a TCP/IP network. This information is configured for all devices connected to the network.
	DIN rail	A metal rail conforming to the DIN (German) standard.
	DLR	Abbreviation for Device Level Ring. A protocol that provides fast switching of the communication route to maintain communication if a problem occurs in the ring network.
	D-Side	The side connected to the End plate (D-side) when the product is connected to a manifold.
E	EDS file	A file that describes product information and is used by engineering tools.
F	FE	Abbreviation for Functional Earth.
	Fieldbus	A protocol that uses digital communication to exchange signals between field equipment (instruments and actuators) running on site and a PLC.
	Full duplex	A communication system that can send and receive data at the same time bi-directionally.
H	Half duplex	A communication system that sends and receives data in one direction at a time.
I	Idle	An expression for PLC operation state. For details, refer to the manuals of each PLC manufacturer. Depending on the PLC used, the idle state might not be available.
	Internal current consumption	The current required to operate each module. Does not include inrush current and current supplied to external devices.
	IP address	A 32-bit logical address that is assigned to identify devices which are connected to the network.
	IP##	Abbreviation for International (or Ingress) Protection. A standard related to the protection from external objects (hands, steel ball, steel wire, dust, water, etc.) applied to the product. The protection rating is indicated by a two-digit code.
	ISDU	Abbreviation for Indexed Service Data Unit. A command executed when transmitting acyclic data via IO-Link communication.
M	MAC address	A unique identification number assigned to Ethernet devices.
	Manifold	An assembly consisting of multiple modules.
N	NPN input	An input type that receives the sensor output that uses an NPN transistor for the signal output line.
	NPN output	An output type that uses an NPN transistor to operate output devices. It is also known as a positive common type (sinking type) since a positive potential is applied to the power supply line.
O	On-request data	Parameter data or event data of IO-Link communication sent and received via ISDU.
	Open circuit detection	A diagnostic function to detect if the output device wiring is disconnected.
P	PLC	Abbreviation for Programmable Logic Controller. A digital computer used for automation of electromechanical processes.
	PNP input	An input type that receives the sensor output that uses a PNP transistor for the signal output line.
	PNP output	An output type that uses a PNP transistor to operate output devices. It is also known as a negative common type (sourcing type) since a negative potential is applied to the power supply line.
Q	QuickConnect™	A function that reduces the time required for the equipment to start operating and communicating after power is supplied.
S	Short circuit detection	A diagnostic function to detect an overcurrent caused by a short circuit of the output and/or power supply positive line with respect to the GND line.
U	U-Side	The side connected to the SUP/EXH Block Assembly when the product is connected to a manifold.

3 Assembly

Follow the assembly procedure below to assemble the modules into a manifold.

⚠ Important:

- To prevent damage, all power to the modules must be turned off (i.e., de-energized) before the modules are installed or removed.
- Tighten all screws to the specified torque. Insufficient tightening may cause equipment malfunction, injury, or equipment damage.

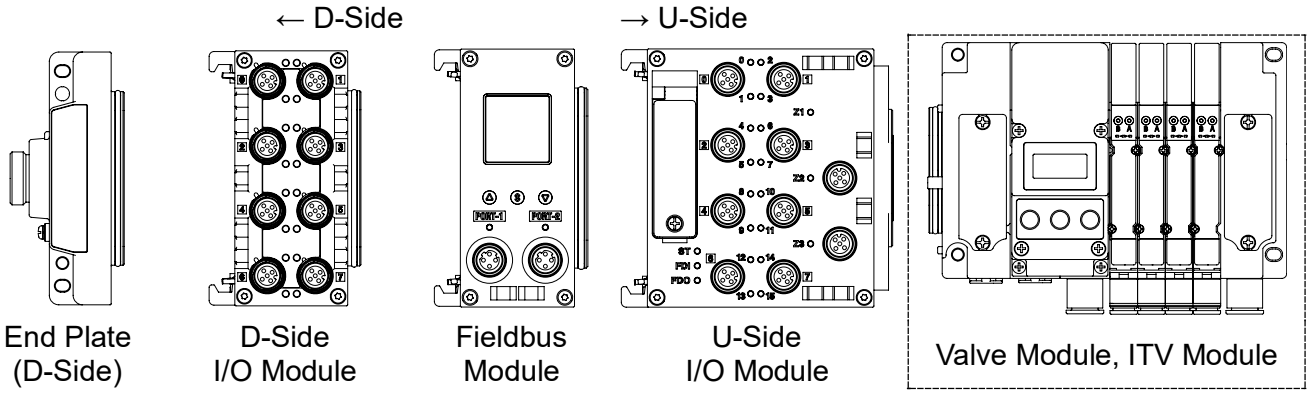
Note:

- For a list of connectable modules, refer to the catalog that lists the fieldbus module (EX600-BEN1).

(1) Module arrangement

The EX600 manifold is assembled in the following arrangement:
End plate (D-side), D-side I/O modules, Fieldbus module, U-side I/O modules (Safety I/O module), and Valve/ITV module with Supply/Exhaust block.

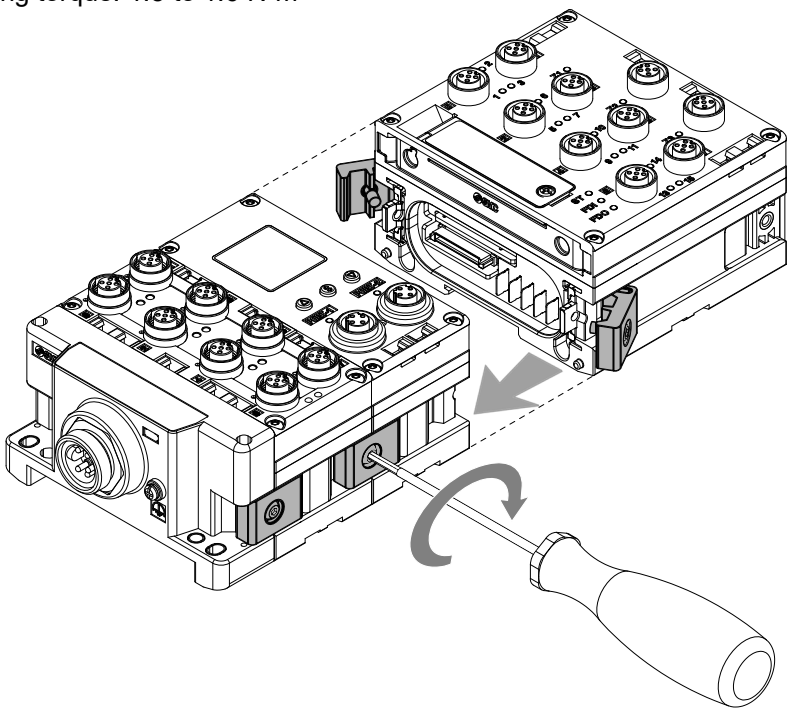
- Up to 9 modules can be connected to the D-side of the Fieldbus module.
- D-side I/O modules can be connected in any order. The I/O map is automatically determined based on the connection order.
- If a Valve module is not connected to the manifold, the End plate (U-side) (EX600-EU1-#-A) should be installed instead of the Supply/Exhaust block.



No. DOC1121211-1

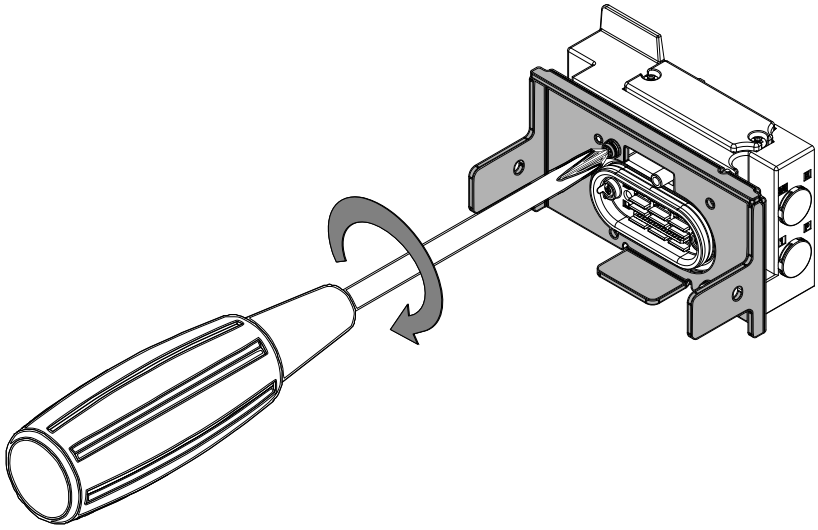
(2) Module Connection

Align the connector positions of each module and connect them. After connecting the modules, tighten the hexagonal socket screws (width across flats 2.5 mm) in the joint fittings.
Specified tightening torque: 1.5 to 1.6 N•m



(3) Valve Plate (EX600-ZMV#-A) Assembly

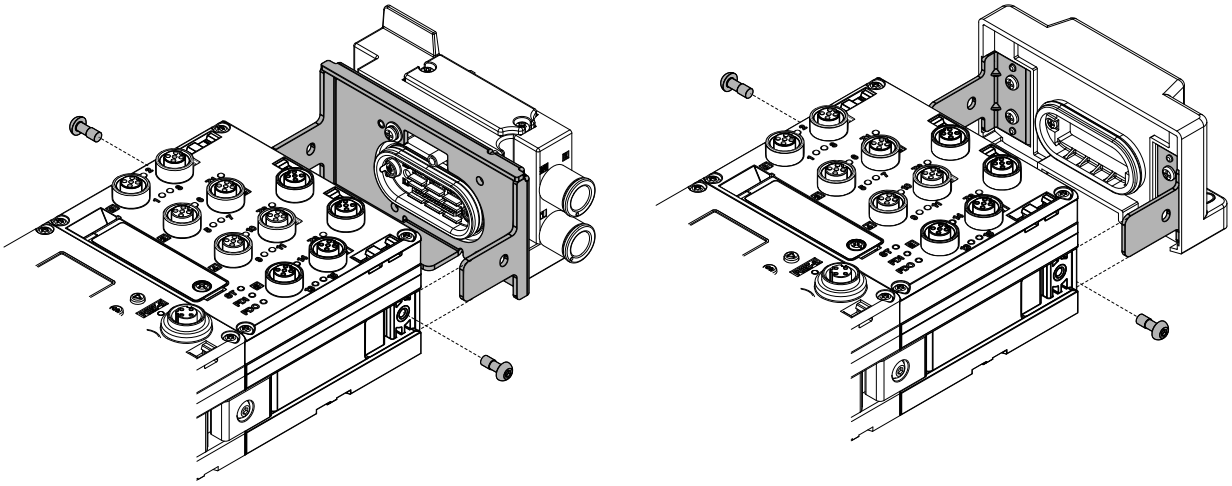
Mount the Valve plate to the Valve module using the supplied pan-head screws (M3 × 8 mm, 2 to 4 pcs).
Specified tightening torque: 0.6 to 0.7 N•m



Note:
- If a Valve module is not connected to the valve manifold, the Valve plate (EX600-ZMV#-A) is not used.
  In this case, the End plate (U-side) (EX600-EU1-#-A) should be installed to maintain ingress protection.

(4) Safety I/O Module and Valve Plate (or End Plate (U-Side)) Assembly

Insert the Valve plate (or End plate (U-side)) into the mounting grooves on the module and fasten using the two screws provided.
Specified tightening torque: 0.7 to 0.8 N•m



Hexagonal socket screws (width across flats 2.5 mm)

Important:

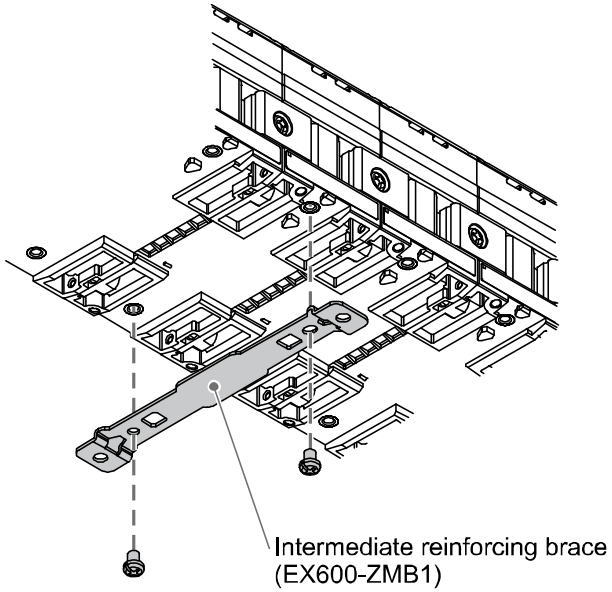
- When connecting five or more modules, the intermediate reinforcing brace (EX600-ZMB#) must be installed to prevent connection failure between modules due to deflection.
  Refer to 4. Installation (Direct Mounting: page 18, DIN Rail Mounting: page 21) for details on the Intermediate reinforcing brace.

4 Installation

4.1 Direct Mounting

(1) Intermediate Reinforcing Brace Attachment

When connecting five or more modules, secure an Intermediate reinforcing brace (EX600-ZMB1) using the supplied screws (M4 × 5 mm, 2 pcs) to the middle part of the entire manifold assembly before mounting.
Also, add one Intermediate reinforcing brace for every five modules to be joined, and install it in a well-balanced manner.
Specified tightening torque: 0.7 to 0.8 N•m

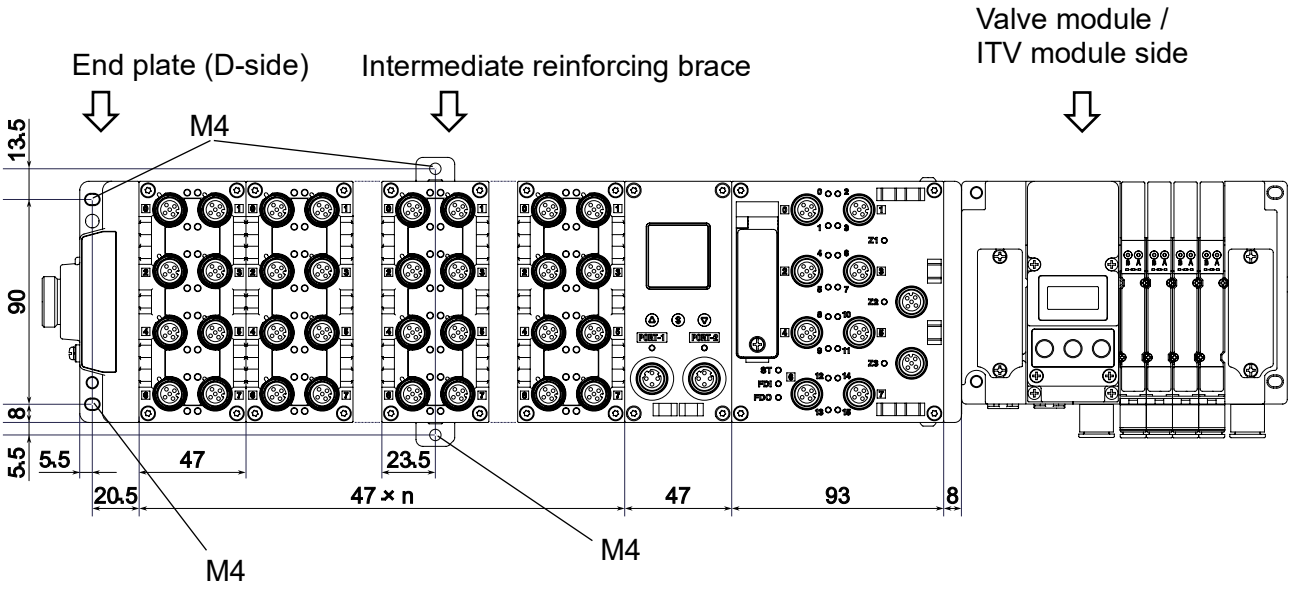


(2) Installation

Mount the valve manifold and secure the End plate (D-side) and the Valve module or ITV module. If an Intermediate reinforcing brace is used, secure it as well.
Specified tightening torque for the End plate (D-side): 0.7 to 0.8 N•m

For the Valve module or the ITV module side, refer to the operation manual for the corresponding module and secure it accordingly.
If using the End plate (U-side), secure it using M4 screws.
Specified tightening torque: 0.7 to 0.8 N•m

- **When Connecting Valve Modules and ITV Modules**

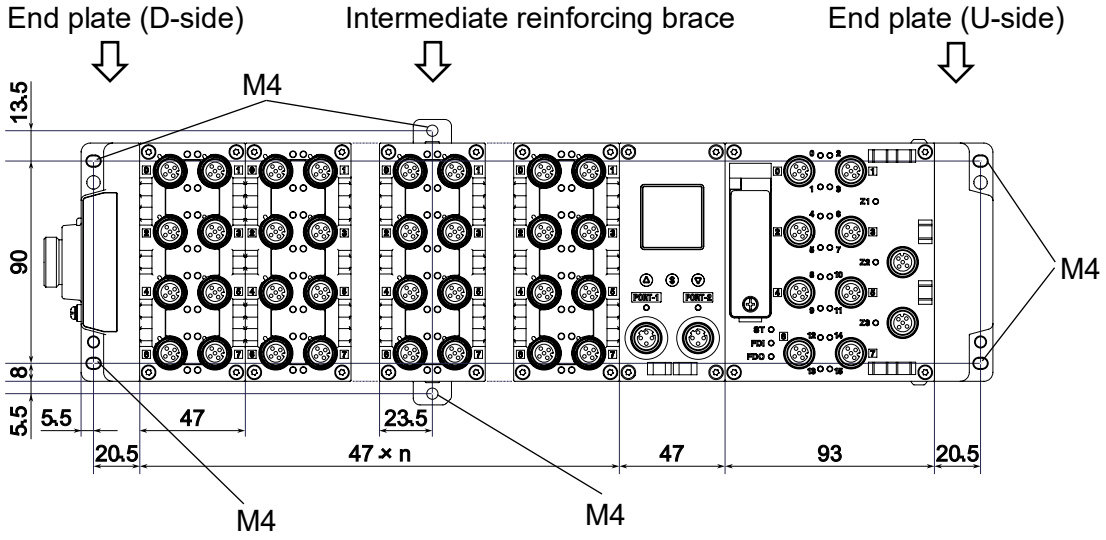


n = Number of D-side I/O modules

Important:

- When connecting five or more modules, the Intermediate reinforcing brace must be installed to prevent connection failure between modules due to deflection.

· **When Connecting End Plate (U-Side)**



n = Number of D-side I/O modules

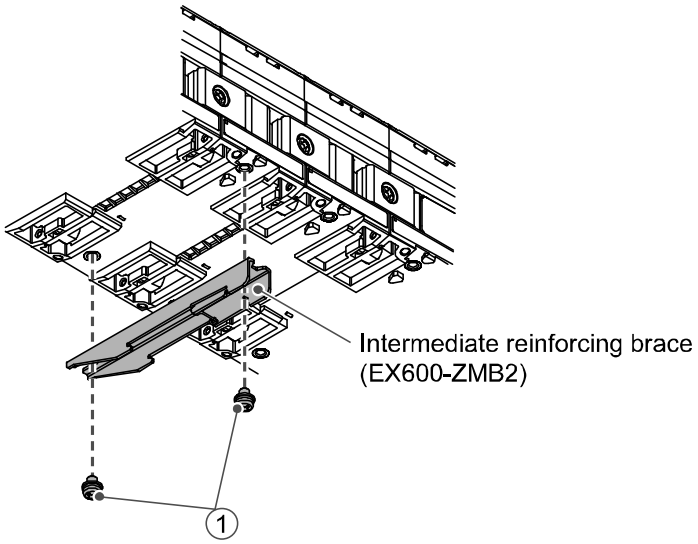
Important:

- When connecting five or more modules, the Intermediate reinforcing brace must be installed to prevent connection failure between modules due to deflection.

4.2 DIN Rail Mounting

(1) Intermediate Reinforcing Brace Attachment

When connecting five or more modules, secure an Intermediate reinforcing brace (EX600-ZMB2) using the supplied screws (M4 × 6 mm, 2 pcs) to the middle part of the entire manifold assembly before mounting.
Also, add one Intermediate reinforcing brace for every five modules to be joined, and install it in a well-balanced manner.
Specified tightening torque: 0.7 to 0.8 N•m

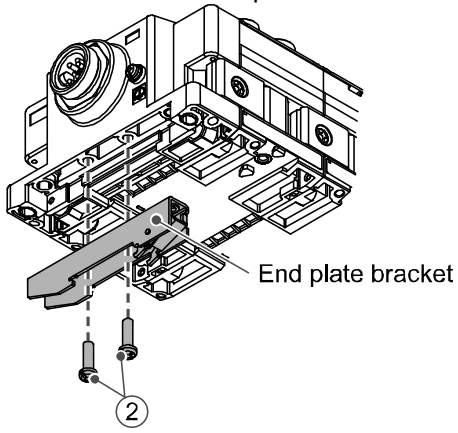


(2) End Plate Bracket Attachment

Attach the End plate bracket to the End plate using the supplied screws (M4 × 14 mm, 2 pcs).
Specified tightening torque: 0.7 to 0.8 N•m
The part number of the End plate bracket varies depending on the connected Valve module.
See the following table for details.

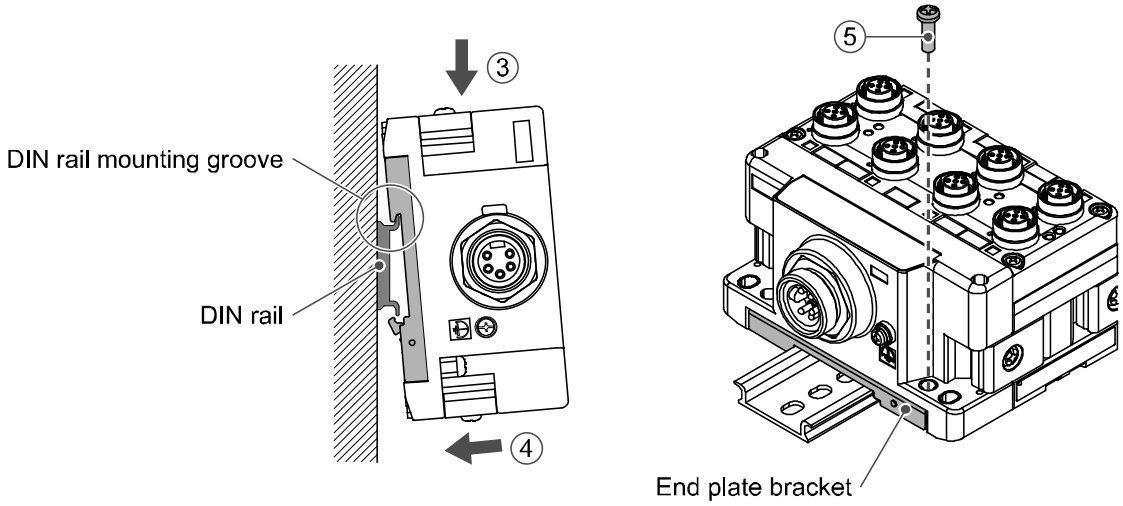
Valve Module Series	End Plate Bracket Part Number
VQC Series	EX600-ZMA2
JSY, SY Series	EX600-ZMA3

For the DIN rail clamp bracket on the Valve module or ITV module side, refer to the operation manual for the corresponding module
If using the End plate (U-side), attach the same End plate bracket.



(3) Installation to DIN Rail

Hook the DIN rail mounting groove onto the DIN rail.
Press the manifold using its side hooked onto the DIN rail as a fulcrum until the manifold is locked onto the DIN rail.
Secure the manifold by tightening the DIN rail mounting screws (M4 × 20 mm) on the End plate bracket.
Specified tightening torque: 0.7 to 0.8 N•m
Secure the Valve module or ITV module side while referring to the operation manual for the corresponding module.

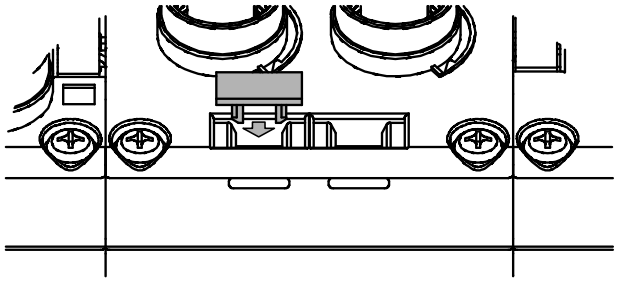


Important:

- When connecting five or more modules, the Intermediate reinforcing brace must be installed to prevent connection failure between modules due to deflection.

4.3 Identification Marker

Signal names of input or output devices can be written on a marker, and the marker can then be installed on each module. Insert a marker (EX600-ZT1) into the marker groove as needed.



5 Fieldbus Module

5.1 Model Indication and How to Order

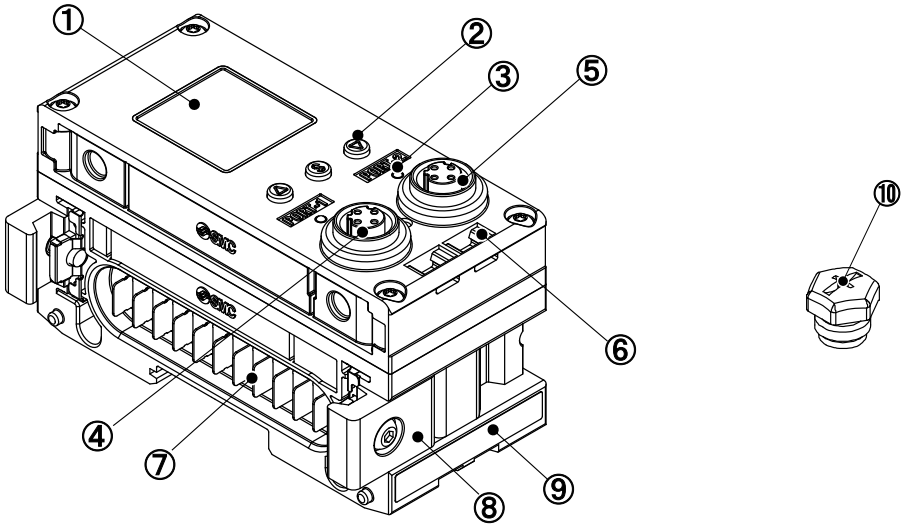
EX600- B EN 1

Fieldbus module

Protocol

Symbol	Meaning
EN	EtherNet/IP™

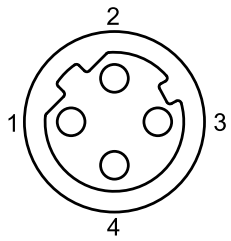
5.2 Component Names and Functions



No.	Component	Function
1	LCD display	Displays the module status and setting screens for pushbutton settings.
2	Pushbuttons	Used to change module parameters or display diagnostics.
3	Link/Act LED	Displays fieldbus communication status.
4	Communication connector (PORT1)	Connects the fieldbus cable.
5	Communication connector (PORT2)	Connects the fieldbus cable.
6	Marker groove	Holds identification markers.
7	Connector for module connection	Transmits control signals and power to adjacent modules.
8	Joint bracket	Connects modules together.
9	Product label	Displays the product-specific information (e.g., the MAC address).
10	Seal cap (1 pc.)	Seals unused connectors. Factory installed on PORT2.

5.3 Wiring

- **Communication Connector**

Connector PORT1 / PORT2	Pin No.	Signal
 M12 4-pin Socket, D-coded	1	TX+
	2	RX+
	3	TX-
	4	RX-

- **Port Type when Auto-Negotiation is Disabled**

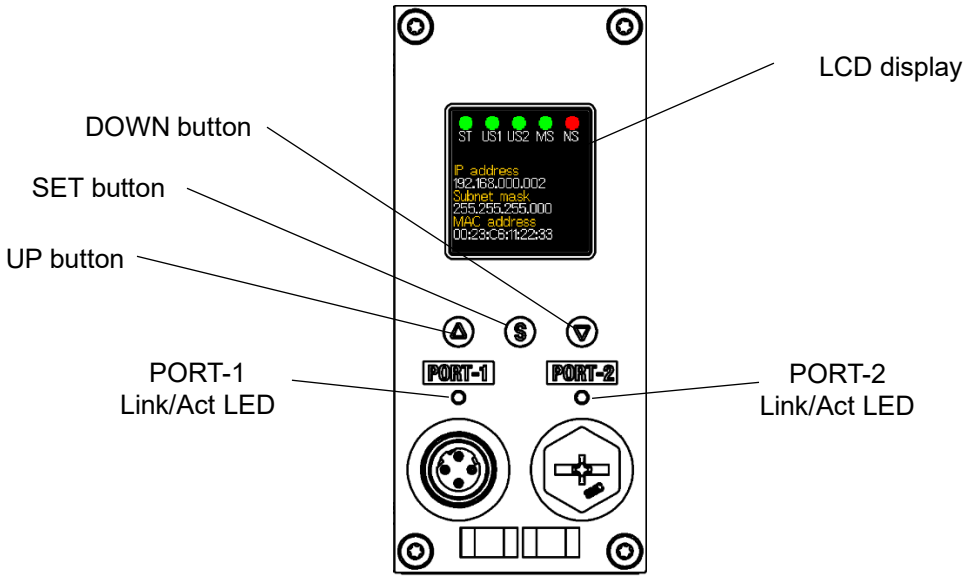
If the “Port1(Port2) Interface” parameter is set to anything other than “Autonegotiation”, the port type will be fixed as follows.

Pin No.	Signal	
	PORT1 Port Type: MDI	PORT2 Port Type: MDI-X
1	TX+	RX+
2	RX+	TX+
3	TX-	RX-
4	RX-	TX-

Important:
- Install seal caps on all unused connectors to maintain the IP rating (ingress protection).

5.4 LCD Display

5.4.1 Overview



Component	Function
LCD display	Upon power-up, various indicators are displayed at the top of the display. The user can change parameters and check diagnostic details using the buttons. Refer to 5.4.3 LCD Display Operation (page 30) for details.
UP button / DOWN button	Switches between items or increases or decreases the set value. Pressing both buttons simultaneously changes the menu screen. In the menu screen, press both buttons simultaneously to cancel operations.
SET button	Sets the operation or value.
PORT-1 Link/Act LED	Displays the communication status of each communication connector.
PORT-2 Link/Act LED	

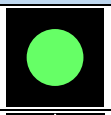
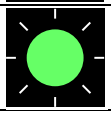
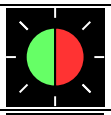
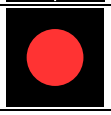
Important:

- If any button is pressed during power-up, the module will not start normally.

5.4.2 Indicators

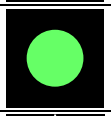
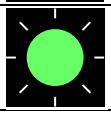
- **ST**

Displays the diagnostic status of the module.

Display		Description
	Green ON	Normal operation is in progress.
	Green flashing (2 Hz)	A diagnostic error has been detected on a module. Follow the troubleshooting steps to remove the cause of the error.
	Red flashing (2 Hz)	The following errors have been detected. Change the manifold configuration to meet specifications and restart. ・The I/O size exceeds the specifications. ・The number of connected I/O modules exceeds the specifications.
	Red/Green flashing alternately (2 Hz)	An internal communication error has occurred. Check the connections between modules.
	Red ON	Turn the power off and on again. The Fieldbus module failed to initialize or failed to establish communication with the Safety I/O module.

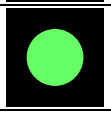
- **US1**

Displays the status of US1 (control) power supply on the module.

Display		Description
	OFF	US1 supply voltage is 19 V or less (when “US1 monitoring” parameter is set to “Disable”).
	Green ON	US1 supply voltage is within specification.
	Green flashing (2 Hz)	US1 supply voltage is 19 V or less (when “US1 monitoring” parameter is set to “Enable”).

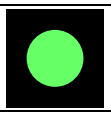
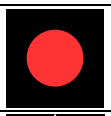
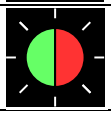
- **US2**

Displays the status of US2 (drive) power supply on the module.

Display		Description
	OFF	US2 supply voltage is 19 V or less.
	Green ON	US2 supply voltage is within specification.

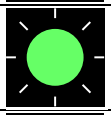
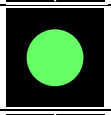
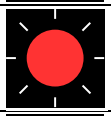
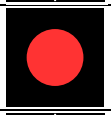
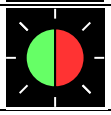
- **MS**

Displays the module status as an EtherNet/IP device.

Display		Description
	OFF	Initialization of Fieldbus module in progress.
	Green flashing (2 Hz)	Communication with the PLC has not been established or the PLC is idle.
	Green ON	Normal operation is in progress.
	Red flashing (2 Hz)	One of the following conditions exists. ・A diagnostic error has been detected. Check the status of indicators other than MS. ・The IP address of the Fieldbus module does not match the TUNID setting of the Safety I/O module. Perform a Safety reset to initialize the TUNID.
	Red ON	The Fieldbus module has detected a fault.
	Red/Green flashing alternately (2 Hz)	The TUNID has not yet been set for the Safety I/O module.

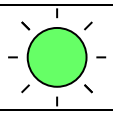
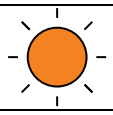
- **NS**

Displays the EtherNet/IP communication (network) status.

Display		Description
	OFF	Either the IP address is not set or the Fieldbus module is initializing.
	Green flashing (2 Hz)	EtherNet/IP communication has not been established.
	Green ON	At least one EtherNet/IP connection has been established.
	Red flashing (2 Hz)	At least one EtherNet/IP connection has timed out.
	Red ON	Duplicate IP address.
	Red/Green flashing alternately (4 Hz)	A Propose_TUNID request has been received, but an Apply_TUNID request has not been completed.

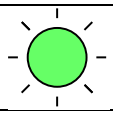
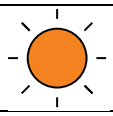
- **PORT1**

Displays the PORT1 communication status on the module.

Display		Description
	OFF	No Link / No Activity
	Green ON	Link / No Activity (100 Mbps)
	Green flickering (20 Hz)	Link / Activity (100 Mbps)
	Orange ON	Link / No Activity (10 Mbps)
	Orange flickering (20 Hz)	Link / Activity (10 Mbps)

- **PORT2**

Displays the PORT2 communication status on the module.

Display		Description
	OFF	No Link / No Activity
	Green ON	Link / No Activity (100 Mbps)
	Green flickering (20 Hz)	Link / Activity (100 Mbps)
	Orange ON	Link / No Activity (10 Mbps)
	Orange flickering (20 Hz)	Link / Activity (10 Mbps)

5.4.3 LCD Display Operation

The LCD display supports the following functions.

- Monitoring communication status with the higher-level controller.
- Monitoring current I/O data
- Displaying diagnostic status on the valve manifold.
- Monitoring and setting parameters.

Important:

- The “Display password” is required to change parameters on the LCD display. The factory default is “0000”.
  To change “Display password”, use the Option Menu (page 43) or the Explicit Message Communication (page 132).

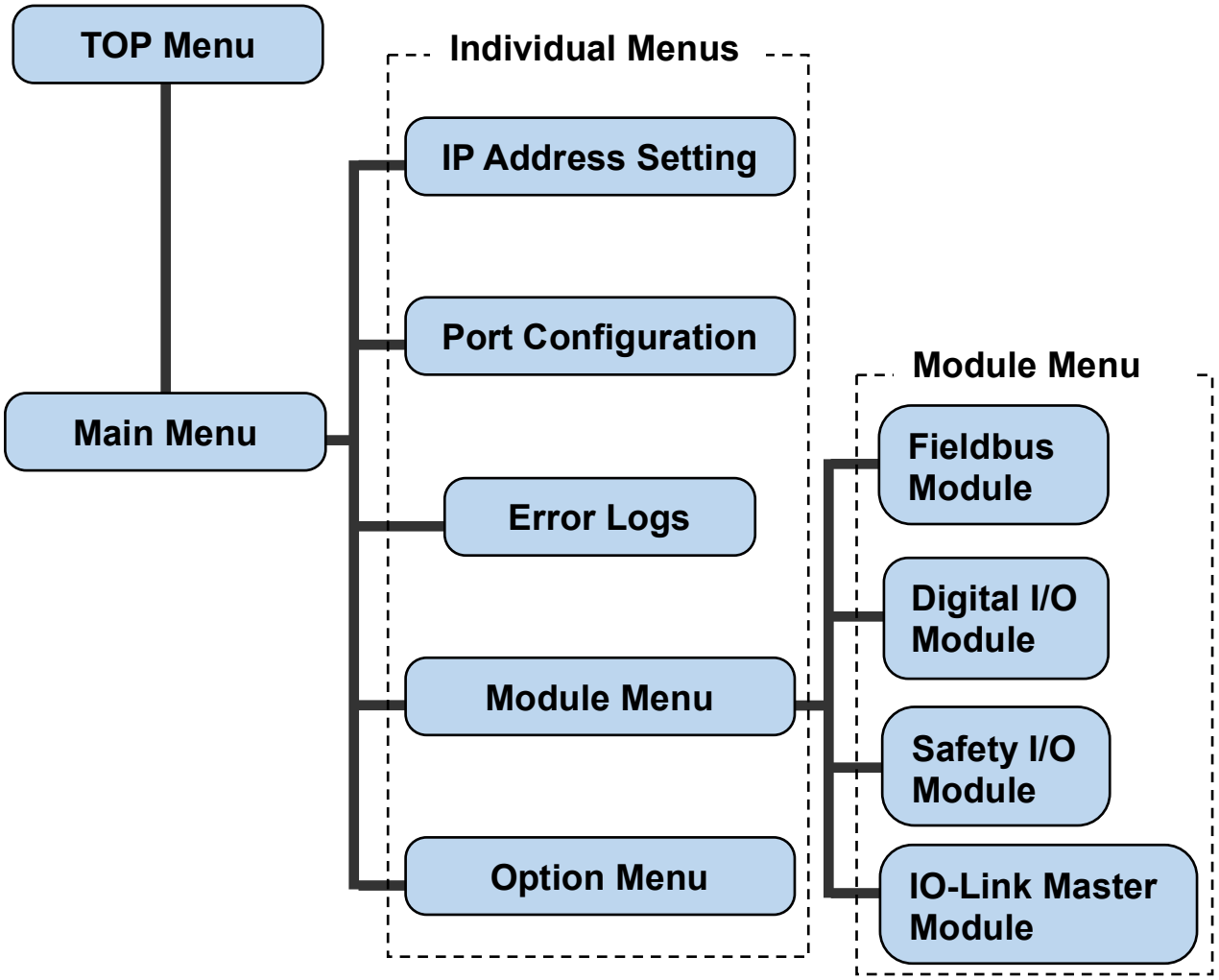
Note:

- Once “Display password” is entered, subsequent password entries will be skipped.
- Password authentication remains valid until the TOP menu is displayed again.
  For details on the screen structure, refer to the next page.
- The typefaces included herein are solely developed by DynaComware Taiwan Inc.

- Explanation of Icons

Button Operation	Meaning
△/▽	Press the UP or DOWN button. Long press is also supported.
S	Press the SET button.
△ + ▽	Press and hold the UP and DOWN buttons simultaneously.

Overall Screen Structure Map



Power ON

After the power is turned on, the MS and NS indicators will cycle through the sequence: OFF ➔ Red ➔ Green.

TOP Menu:

This screen displays information about the manifold after the power is turned on. If no buttons are pressed for 30 minutes, the screen will automatically return to this menu.

Total data size
(Input size / Output size)

IP address settings
and MAC address

Current diagnostic
status

The TOP menu may display the message as shown above.
In that case, follow the instructions on the screen.

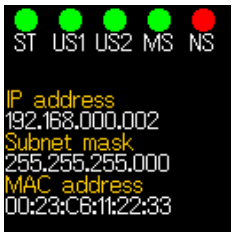
△ + ▽

Access Main Menu

S

Display the simple help menu for LCD operation.

SMC



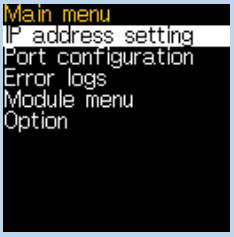
Return to the TOP Menu

△ + ▽

Main Menu

Access individual menus from this list.

- Press △ or ▽ to select a menu, then press Ⓢ to enter.
- Press △ + ▽ to return to the TOP Menu.

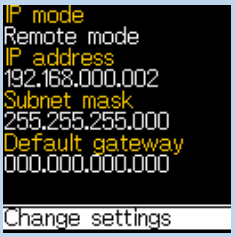


Ⓢ

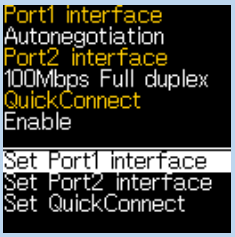
△ + ▽

Individual Menus:

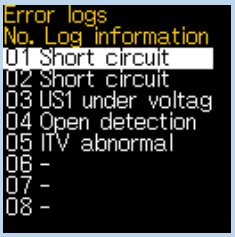
Refer to each section.



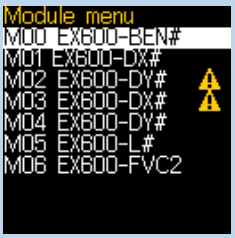
IP Address Setting:
Page 34



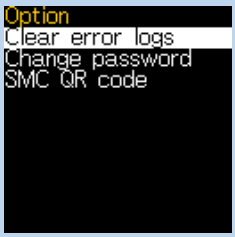
Port Configuration:
Page 36



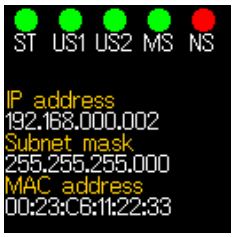
Error Logs:
Page 36



Module Menu:
Page 37



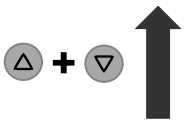
Option:
Page 43



TOP Menu

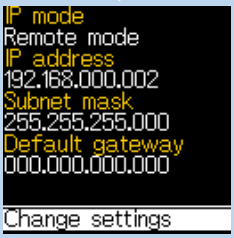
Main Menu

Return to the Main Menu from an Individual Menu



IP Address Setting Menu

Use this menu to check or change the IP address settings. Setting the “IP mode” parameter to “Hardware mode” enables on-screen configuration of the IP address.

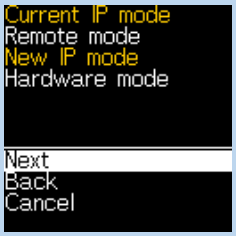


Displays the current settings

S

The “Display password” is required to change settings.
Press △/▽ to change the value and press S to move to the next digit.

S



Select IP mode:
- **Next**
  Proceeds to the next setting menu
- **Back**
  Resets the current setting
- **Cancel**
  Returns to the IP address setting menu.

Next

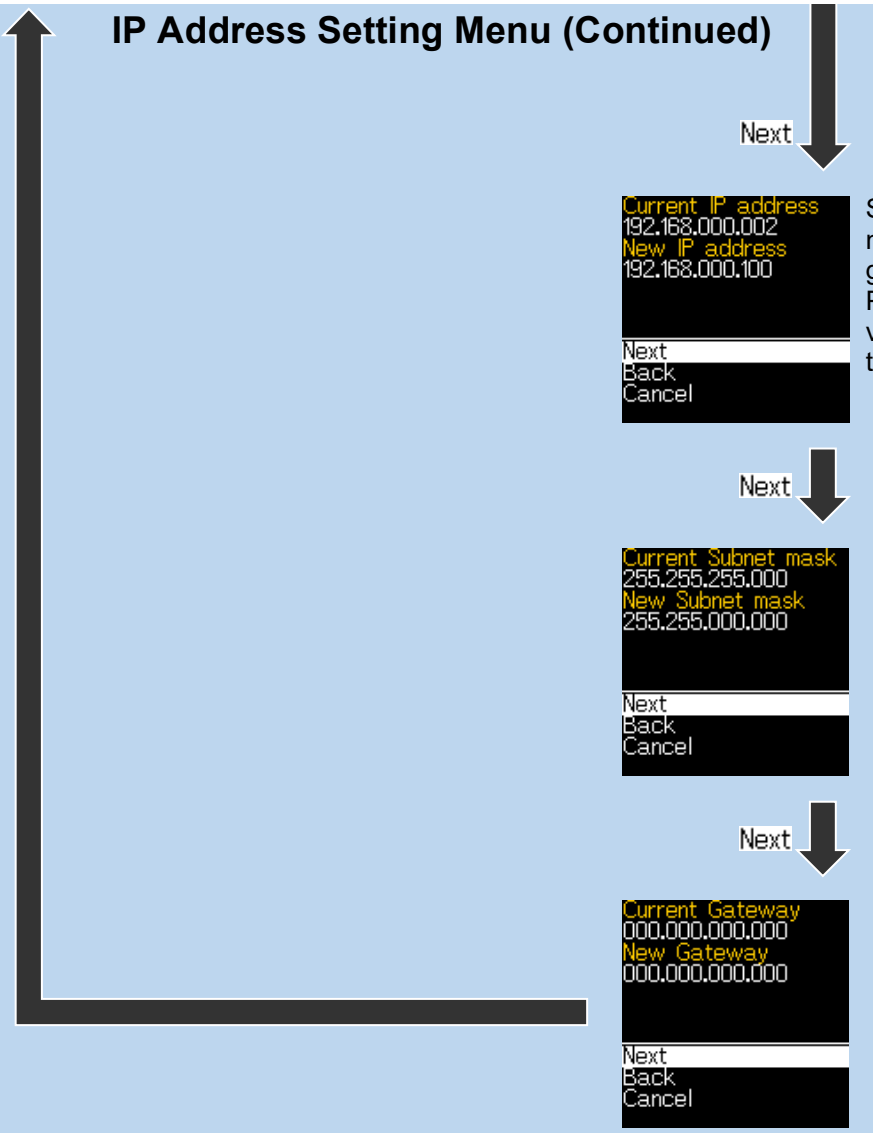
Restart later

The IP address is applied to the module after a restart.
- **Restart later**
  Allows continuation of other settings.
  The display will show the previous value until the system is restarted.
- **Restart now**
  Restarts the system immediately.

“Remote mode”:
After the settings are applied, configure the settings using the IP address settings tool. For details, see 11.1.1 IP Address Configuration via the IP Address Setting Tool (page 96).

“Hardware mode”:
Refer to the next page for details.

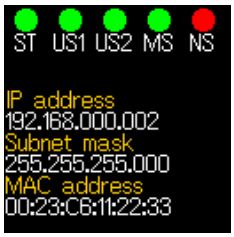
IP Address Setting Menu (Continued)



Set “IP address,” “Subnet mask,” and “Default gateway.”
Press △ /▽ to change the value and press Ⓢ to move to the next octet.

Important:

- If a Safety I/O module with TUNID settings is connected, the IP address cannot be changed. To reset the IP address of the Fieldbus module, delete the TUNID using Safety reset. For details on how to perform a Safety reset, refer to the Safety Manual of the Safety I/O module.
- The IP address cannot be changed while EtherNet/IP communication is established.

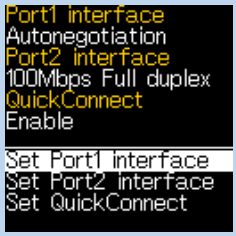


TOP Menu

Main Menu

Return to the Main Menu from an Individual Menu

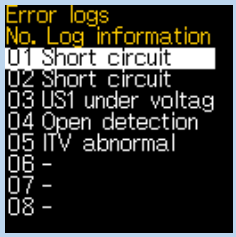
Port Configuration



△ + ▽

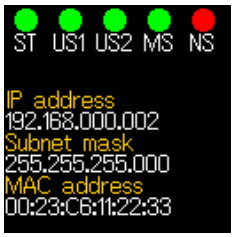
Monitors and sets parameters for the communication ports.
Press △/▽ to select the parameter and press Ⓢ to set the selected parameter.
The “Display password” is required to change settings.

Error Logs



△ + ▽

Displays up to 30 diagnostic error log entries.
Press △/▽ to select the log number to view scrolling log details.
For details, see 9.3 Diagnostic Logs (page 85).



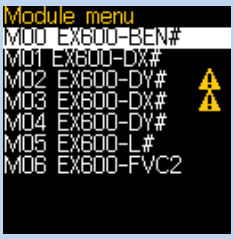
TOP Menu

Main Menu

Return to the Main Menu from an Individual Menu

△ + ▽

Module Menu



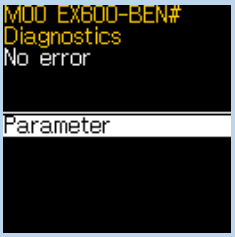
Displays the module menu in order of the module number. For the detail of the module number, see 2.2 Designation of Module Number and Channel Number (page 13).
Press △/▽ to select the module, and press S to shift to the related module setting menu.

S

Return to the Module menu

△ + ▽

Fieldbus Module

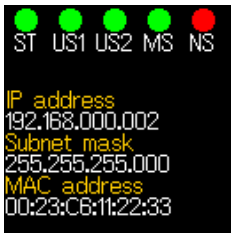


S

△ + ▽

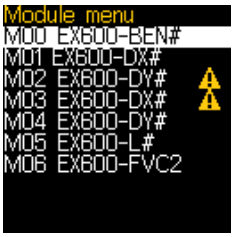
Displays the diagnostic status for the Fieldbus module.

Parameter:
Displays the configurable parameters. Selecting the parameter will display its current setting value.
The “Display password” is required to change settings.



TOP Menu

Main Menu



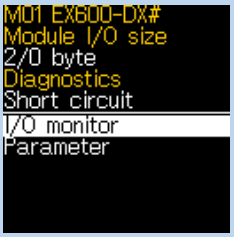
Module Menu

Return to the Module Menu

S

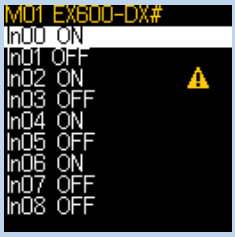
△ + ▽

Digital Input/Output Module



Displays the I/O size of the related module and diagnostic status.

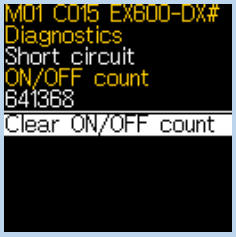
S



△ + ▽

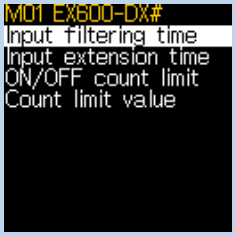
I/O monitor:
This screen displays the current input/output status.
Channels not currently displayed can be viewed by pressing △/▽ to scroll the screen.
Channels where a diagnostic error is detected are indicated by the ⚠ icon.
Pressing Ⓢ on a selected channel switches to the channel details.

S



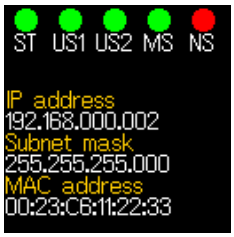
△ + ▽

Displays the channel information such as the channel diagnostics.
The “Display password” is required to clear ON/OFF count value.



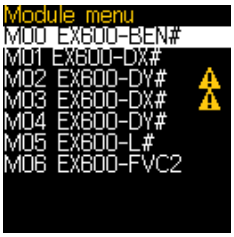
△ + ▽

Parameter:
Displays the configurable parameters.
Selecting a parameter will display its current setting value.
The “Display password” is required to change the parameter.



TOP Menu

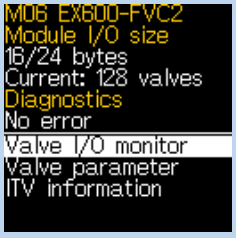
Main Menu



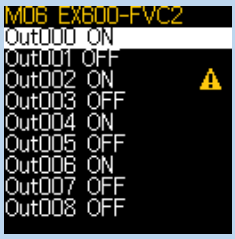
Module Menu

Return to the Module Menu

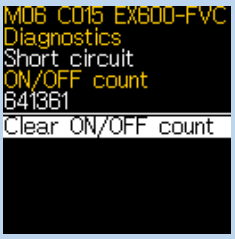
Safety I/O Module



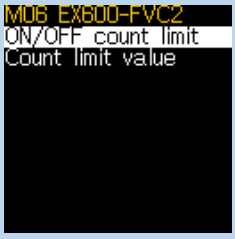
Displays the I/O size of the non-safety function and diagnostic status.



Valve I/O monitor:
This screen displays the current ON/OFF operation from the higher-level controller.
Channels not currently displayed can be viewed by pressing △/▽ to scroll the screen.
Channels where a diagnostic error is detected are indicated by the ⚠ icon. Pressing Ⓢ on a selected channel switches to the channel details.



Displays the channel information such as the channel diagnostics.
The “Display password” is required to clear ON/OFF count value.

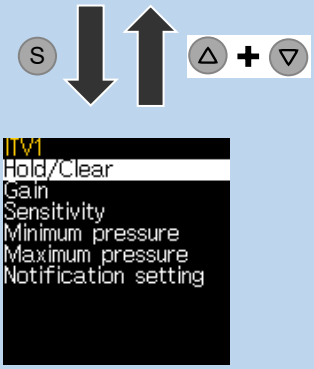


Valve parameter:
Displays the configurable parameters.
Selecting a parameter will display its current setting value.
To change the parameter, the “Display password” is required.

Safety I/O Module (Continued)

ITV information:
Displays the “ITV connection” status.
Channels where a diagnostic error is detected are indicated by the ⚠ icon.
When a channel is indicated as “connected”, selecting it and pressing Ⓢ switches to the parameter setting menu.

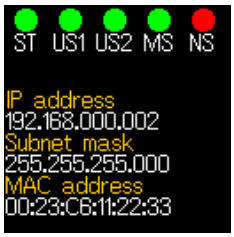
Displays the process data and diagnostic status.
Pressing Ⓢ switches to the parameter setting menu.



Parameter:
Displays the configurable parameters.
Selecting a parameter will display its current setting value.
The “Display password” is required to change the parameter.

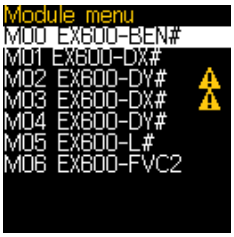
Important:

- The “Display password” is different from the product-specific password used for Safety reset to initialize the TUNID.
- The LCD display cannot display safety-related status (safety I/O status, safety-related parameters, etc.).
- When the safety output is in the safe state, the valve doesn’t operate even if the Valve I/O monitor is **ON**.



TOP Menu

Main Menu



Module Menu

Return to the Module Menu

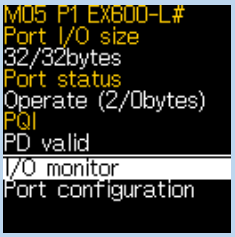
S

△ + ▽

IO-Link Master Module

Displays the assigned I/O size of the related module and diagnostic status.

S



△ + ▽

S

Port# information

・Port I/O size

Displays the allowable IO-Link process data size for this port, as set in the “Process data size” parameter.

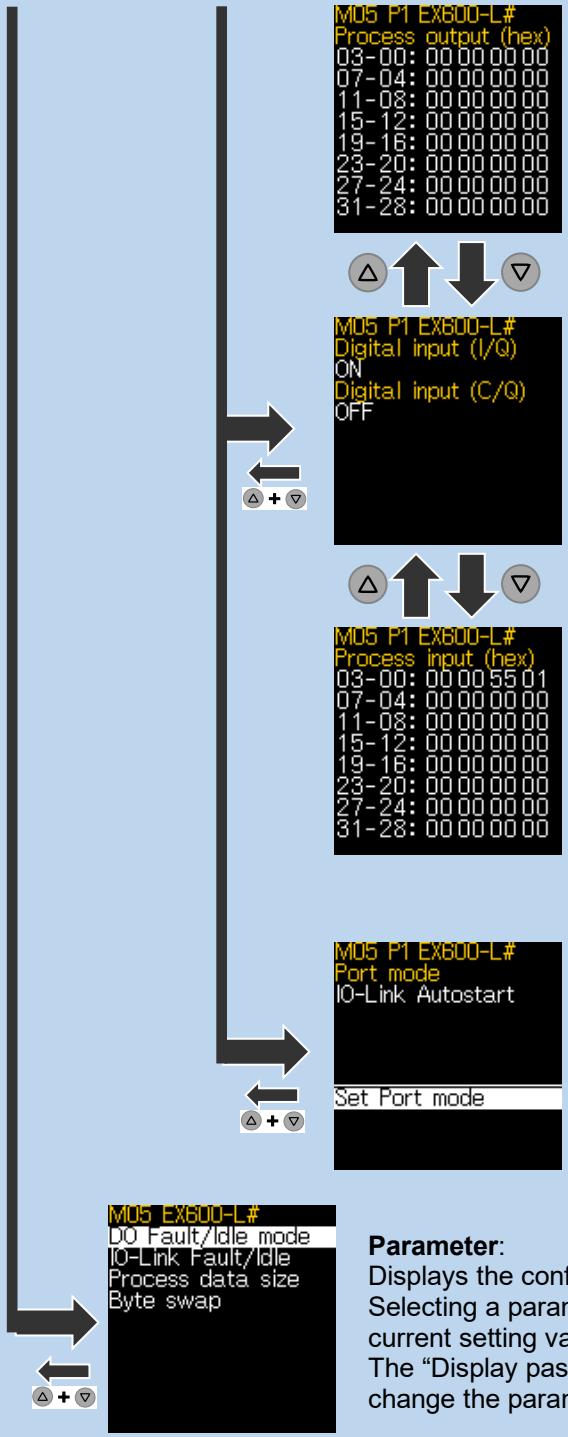
・Port status

Displays the IO-Link communication status. If an IO-Link device is connected, the data size of the connected device is also displayed.

・PQI

Displays the event status of the related port and data storage function.

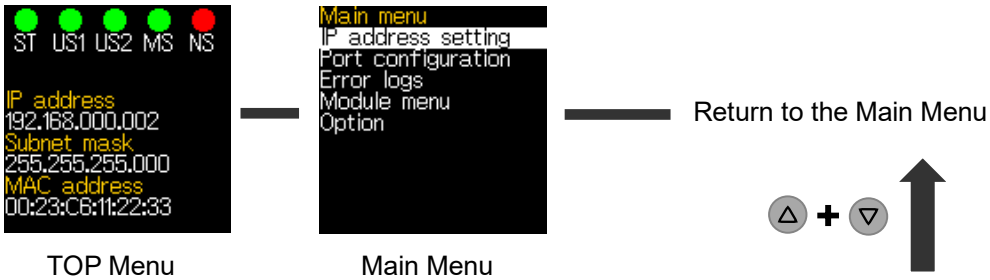
IO-Link Master Module (Continued)



I/O monitor:
Displays the current input/output data value.
There are three screens: Standard IO data, Input process data, and Output process data.
Use △/▽ to switch between the screens.

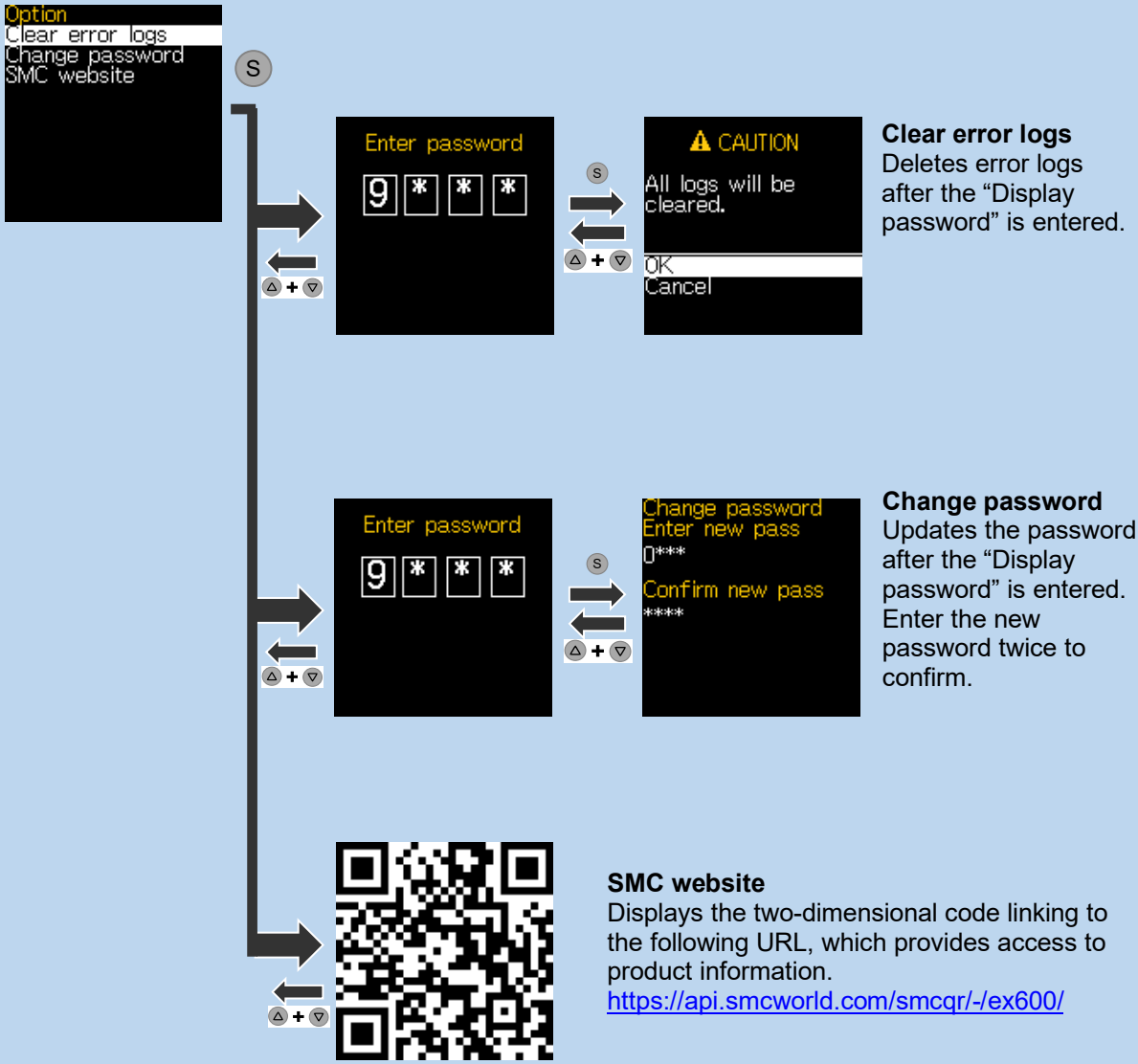
Port configuration
Displays the setting of the "Port mode" parameter, which determines the IO-Link operation mode.
The "Display password" is required to change the parameter.

Parameter:
Displays the configurable parameters.
Selecting a parameter will display its current setting value.
The "Display password" is required to change the parameter.



TOP Menu　　Main Menu

Option Menu



Clear error logs
Deletes error logs after the “Display password” is entered.

Change password
Updates the password after the “Display password” is entered. Enter the new password twice to confirm.

SMC website
Displays the two-dimensional code linking to the following URL, which provides access to product information.
https://api.smcworld.com/smcqr/-/ex600/

Note:
- Once you enter the “Display password,” it will not be required again until you return to the TOP menu. This applies even after updating the “Display password” via **Change password**.

5.5 Specifications

・Specification Table

Model		EX600-BEN1
Communication	Protocol	EtherNet/IP™
	Conformance test revision	CT21
	Communication speed	10/100 Mbps
	Communication method	Full duplex/Half duplex
	Communication cable length	Up to 100 m
	Supported functions	QuickConnect™ *1) DLR (Beacon-based ring node)
	Configuration file	EDS
	Vendor ID	7 (SMC Corporation)
	Device type	12 (Communications Adapter)
	Product code	271 *2)
	Data size	Standard input: Up to 1308 bytes Standard output: Up to 1308 bytes Safety input: 10 bytes *3) Safety output: 6 bytes *3)
Number of connectable I/O modules		D-side: Up to 9 modules U-side: Safety I/O module
Power	US1 (for logic/input)	24 VDC +20%/-15%
	Internal current consumption (US1)	150 mA or less
	US2 (for output)	24 VDC +20%/-15%
	Internal current consumption (US2)	10 mA or less
	Reverse polarity protection	Yes
Environment	Enclosure rating	IP65/IP67 (With manifold assembled) *4)
	Operating temperature range	-10°C to 50°C
	Storage temperature range	-20°C to 60°C
	Operating humidity range	35% to 85%RH (No condensation and no icing)
	Withstand voltage	500 VAC, for 1 minute (between external terminals and FE)
	Insulation resistance	10 MΩ or more (when 500 VDC is applied between terminals and FE)
	Vibration resistance	10 to 57 Hz: constant amplitude 0.75 mm p-p 57 to 150 Hz: constant acceleration 49 m/s^2 for 2 hours in each direction X, Y, and Z respectively (De-energized)
	Impact resistance	147 m/s^2 3 times in each direction X, Y, and Z respectively (De-energized)
Standard		CE/UKCA, UL(CSA)
Housing material		PBT
Weight		310 g

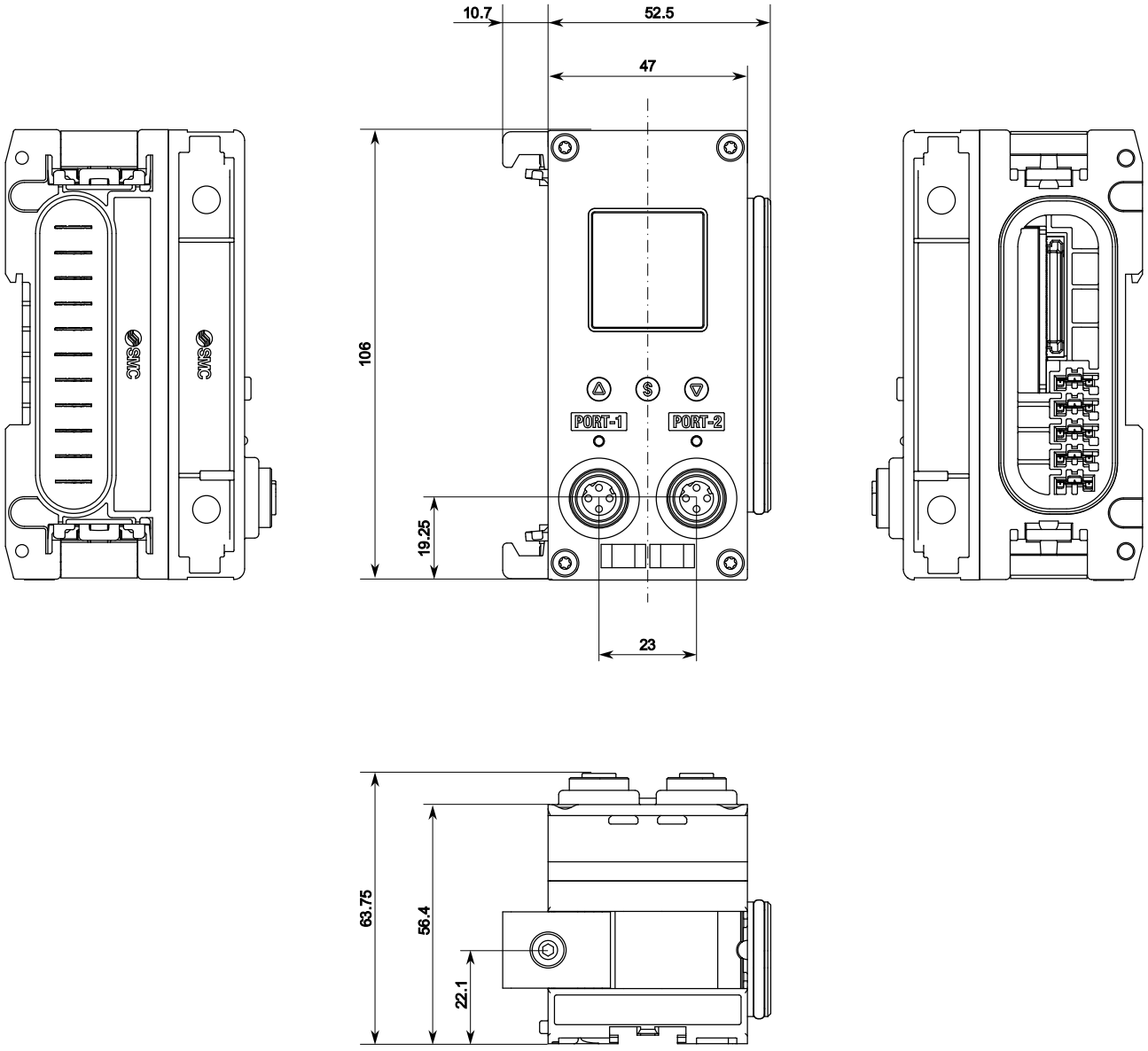
*1) QuickConnect cannot be activated when a Safety I/O module is connected to the valve manifold.

*2) The product code is 271 when the Safety I/O module is connected and 270 when the Safety I/O module is not connected.

*3) Safety input/output data is occupied only when connected to a Safety I/O module.

*4) Install seal caps on all unused connectors to maintain the IP rating (ingress protection).

5.6 Dimensions



6 End Plate

6.1 Model Indication and How to Order

6.1.1 End Plate (D-Side)

EX600- ED 3 - #

End plate (D-side)

Connector

Symbol	Connector
3	7/8 inch (5-pin)

Mounting method

Symbol	Description
Nil	No DIN rail bracket
2	With DIN rail bracket (VQC valve)
3	With DIN rail bracket (SY/JSY valve)

6.1.2 End Plate (U-Side)

EX600- EU 1 - # - A

End plate (U-side)

Mounting method

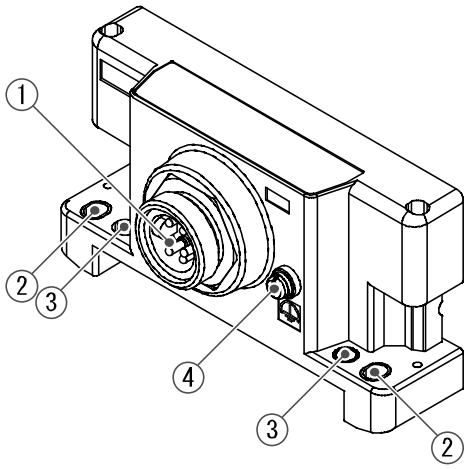
Symbol	Description
Nil	No DIN rail bracket
2	With DIN rail bracket (EX600-ED3-2)
3	With DIN rail bracket (EX600-ED3-3)

⚠ Important:

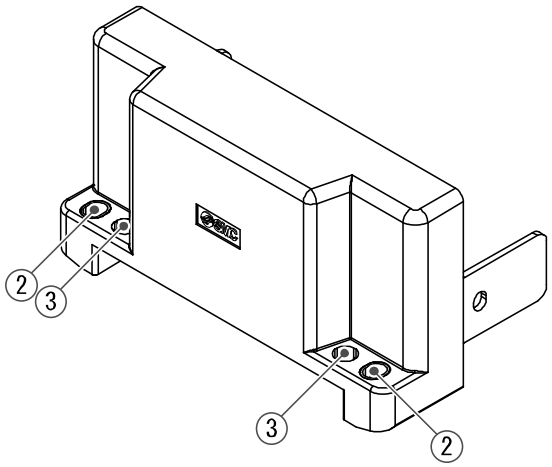
- The EX600-EU1-#-A cannot be assembled with the Safety I/O module EX600-FVC2/3/4. Select the Safety I/O module EX600-FVC1.

6.2 Component Names and Functions

- **EX600-ED3-#**



- **EX600-EU1-#-A**

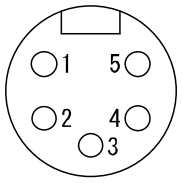


No.	Component	Function
1	Power Connector	Connector for power supply to each module
2	Fixing Hole for Direct Mounting	Holes for direct mounting
3	Fixing Hole for DIN Rail Mounting	Holes for DIN rail mounting
4	FE Terminal (M3)	Functional Earth terminal

Note:
- The FE terminal should be connected directly to system ground, and individual grounding should be provided close to the product with a short cable.

6.3 Wiring

- **Power Connector**

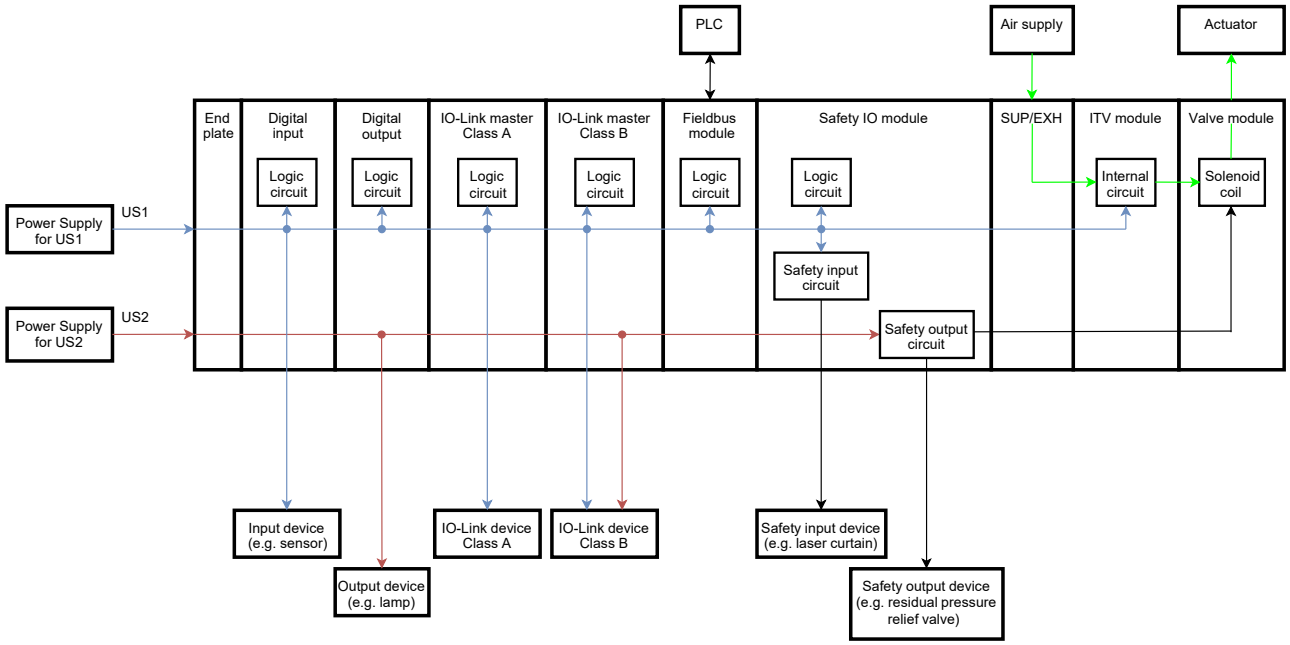
View of connector 7/8 inch (5-pin), plug	Pin No.	Allocation
	1	0V_US2 (for output)
	2	0V_US1 (for logic/input)
	3	FE
	4	24V_US1 (for logic/input)
	5	24V_US2 (for output)

6.4 Power Supply System(US1/US2)

The EX600 series has two types of power supply systems: US1 and US2. The power supply systems are galvanically isolated inside the product.

•US1 (for logic/input):
Controls each module, input devices, the power supply for IO-Link devices, and the power supply for safety inputs.

•US2 (for output):
Power supply for output devices connected to the digital output module, for P24 of IO-Link master with port class B, and power supply for safety output circuit.



Note:
- See the safety manual of the Safety I/O module for details on its block diagram.

6.5 Specifications

・Specification Table

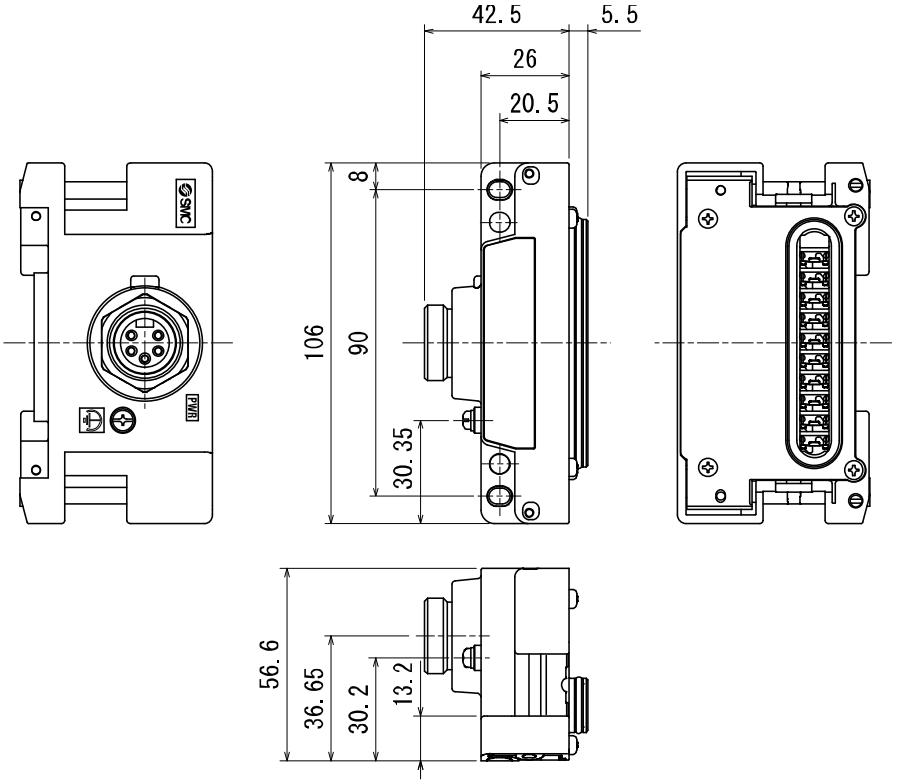
Items		EX600-ED3-#	EX600-EU1-#-A
Power	Connector	7/8 inch (5-pin), plug	-
	Power supply for US1	24 VDC +20%/-15%, 8 A	-
	Power supply for US2	24 VDC +20%/-15%, 8 A	-
Environment	Enclosure rating	IP65/IP67 (With manifold assembled) *1)	
	Operating temperature range	-10°C to 50°C	
	Storage temperature range	-20°C to 60°C	
	Operating humidity range	35% to 85%RH (No condensation and no icing)	
	Withstand voltage	500 VAC, for 1 minute (between external terminals and FE)	
	Insulation resistance	10 MΩ or more (when 500 VDC is applied between terminals and FE)	
Standards		CE/UKCA, UL(CSA)	
Housing material		PBT	
Weight *2)		175 g	240 g

*1) Install seal caps on all unused connectors to maintain the IP rating (ingress protection).

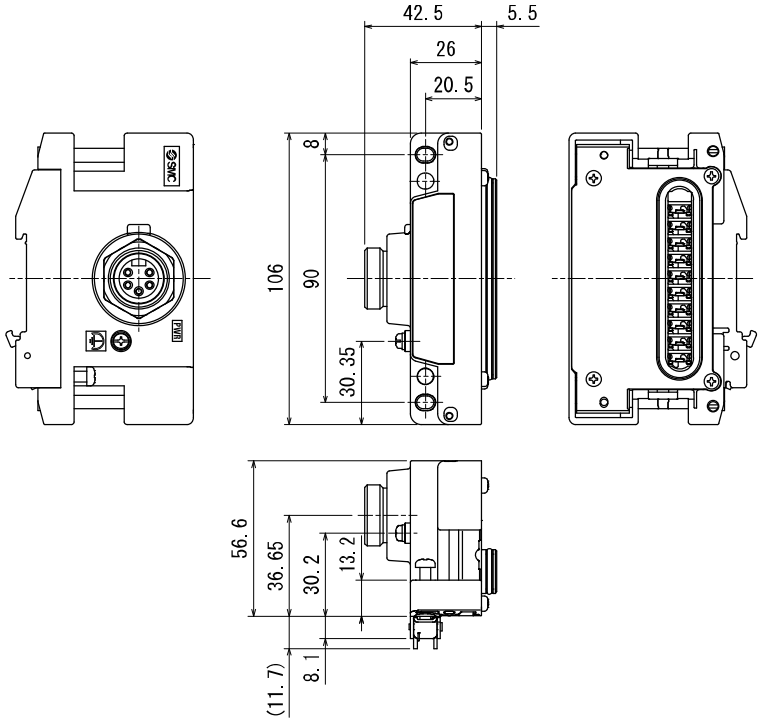
*2) The weight of End plate bracket is not included.

6.6 Dimensions

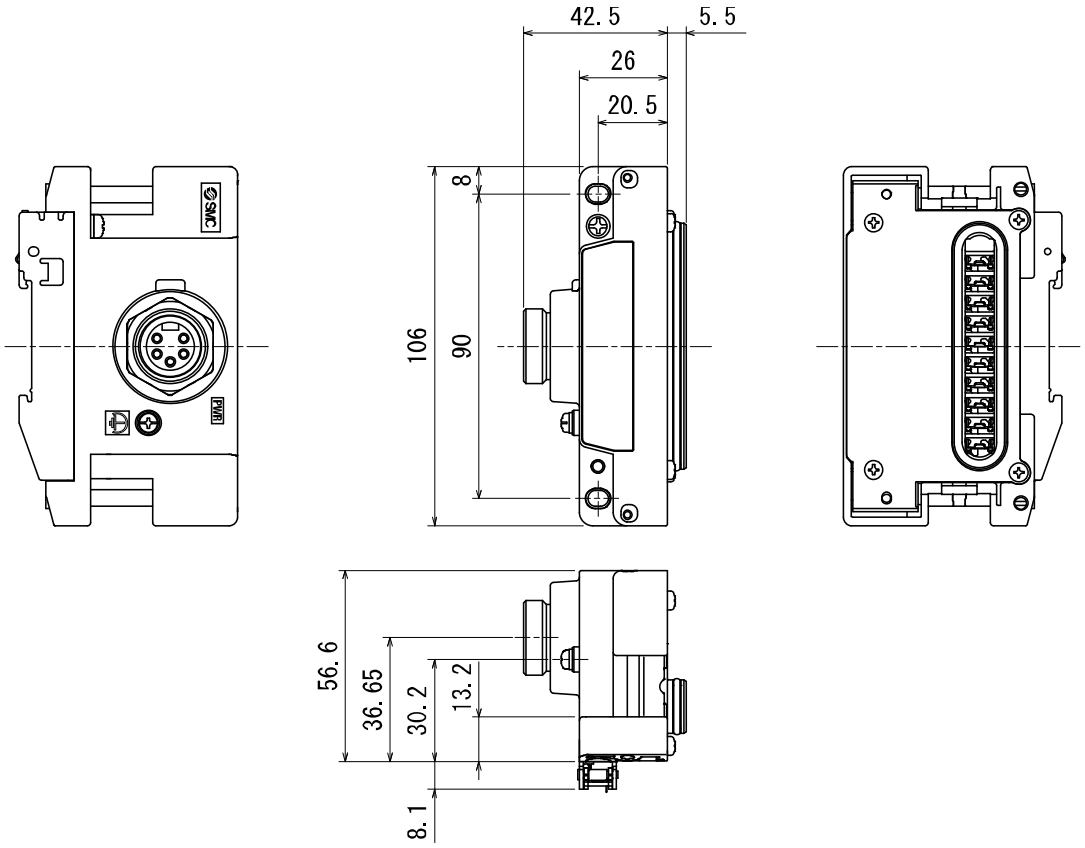
6.6.1 EX600-ED3



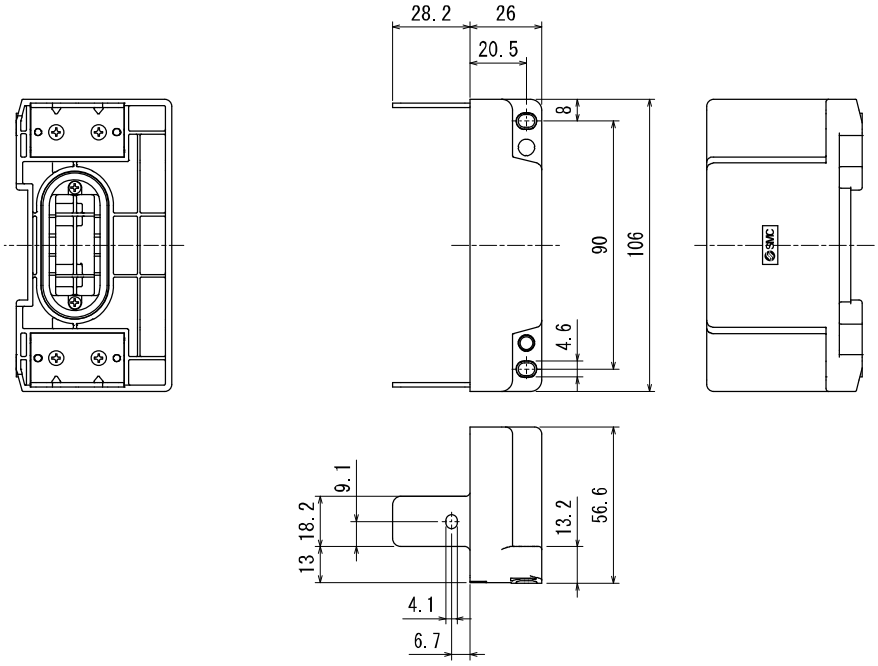
6.6.2 EX600-ED3-2



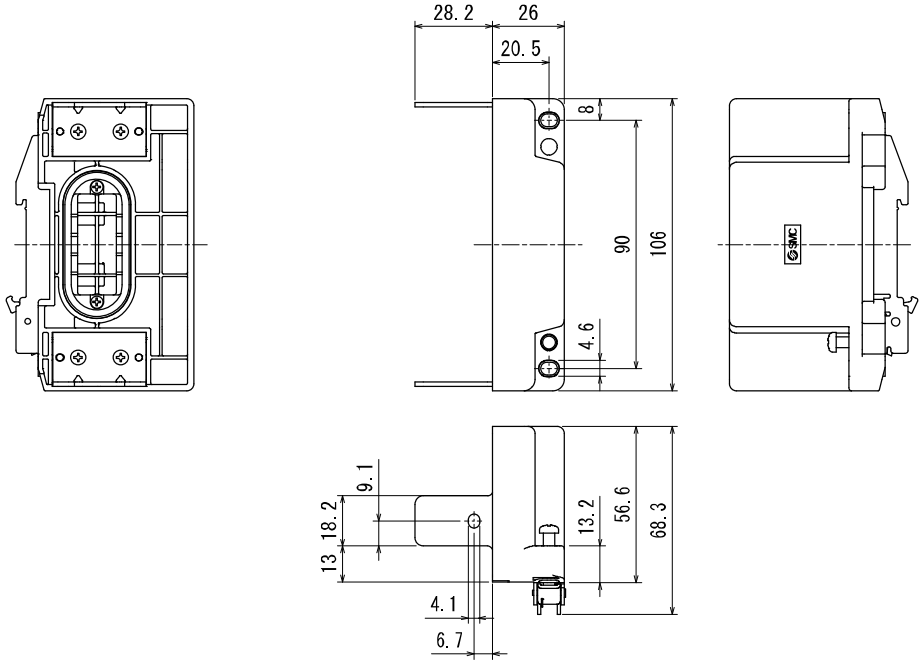
6.6.3 EX600-ED3-3



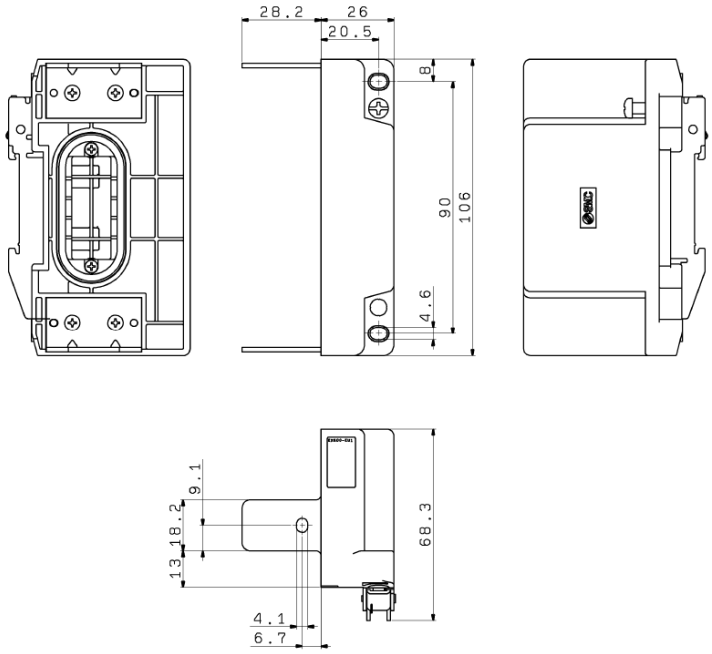
6.6.4 EX600-EU1-A



6.6.5 EX600-EU1-2-A



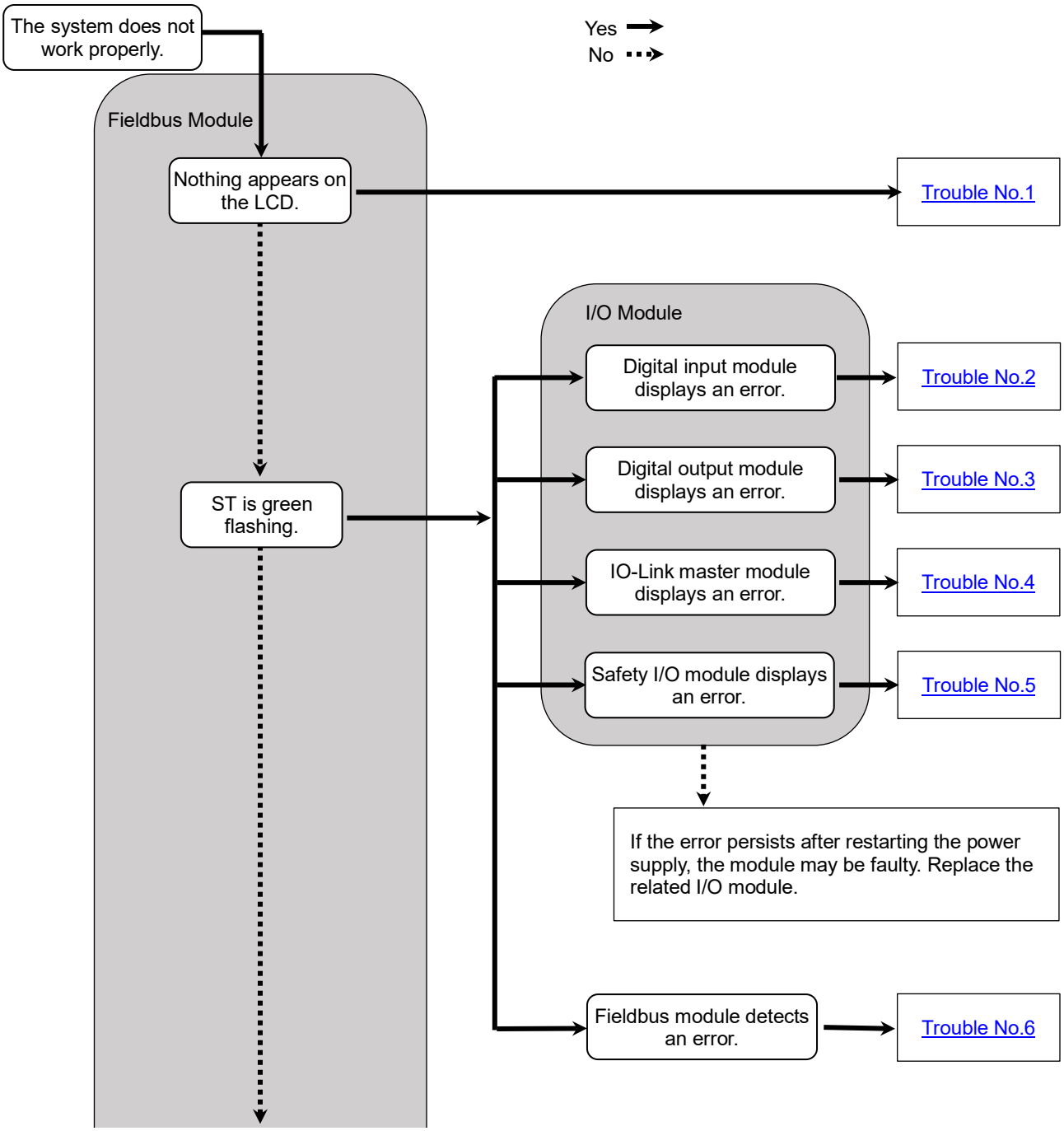
6.6.6 EX600-EU1-3-A

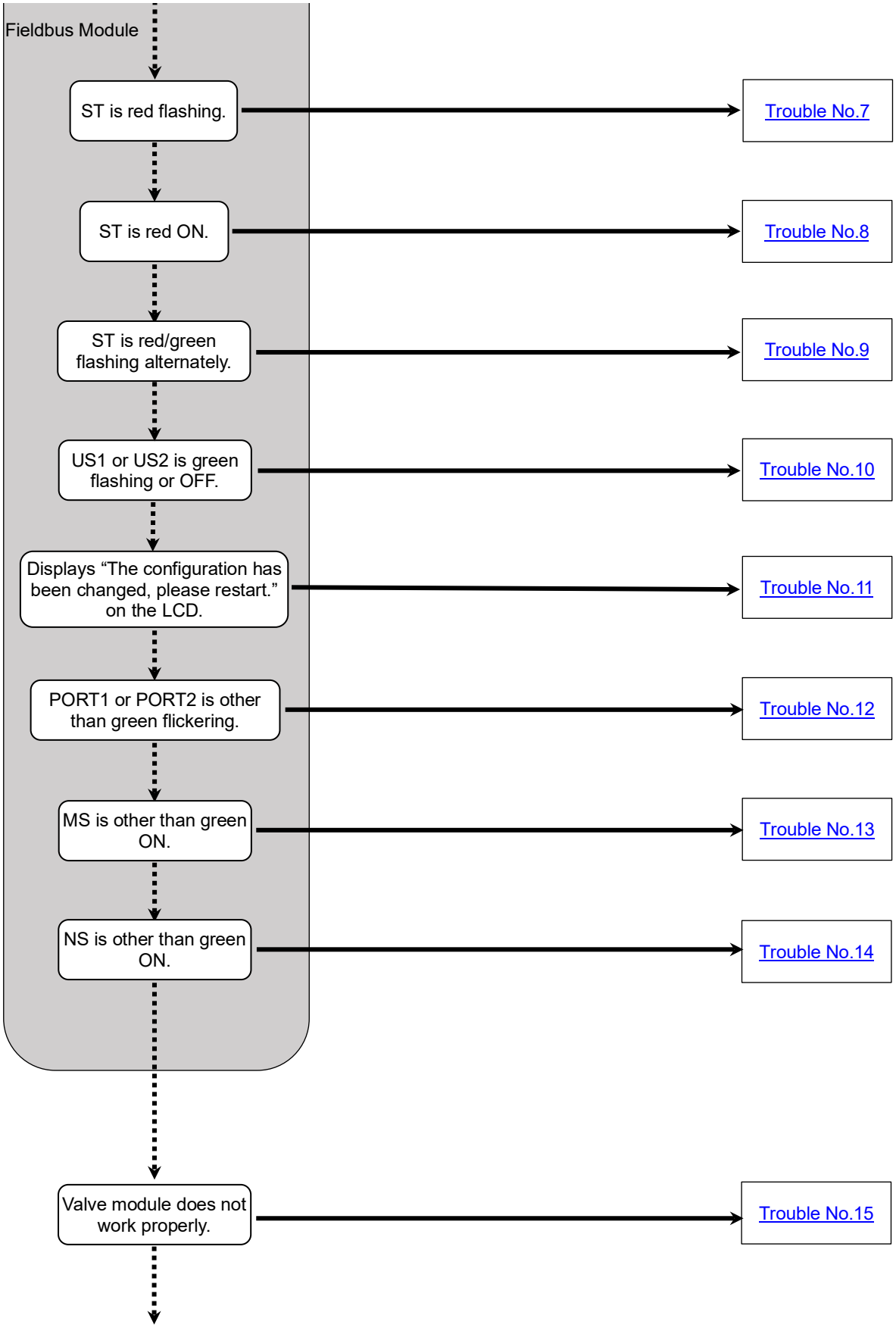


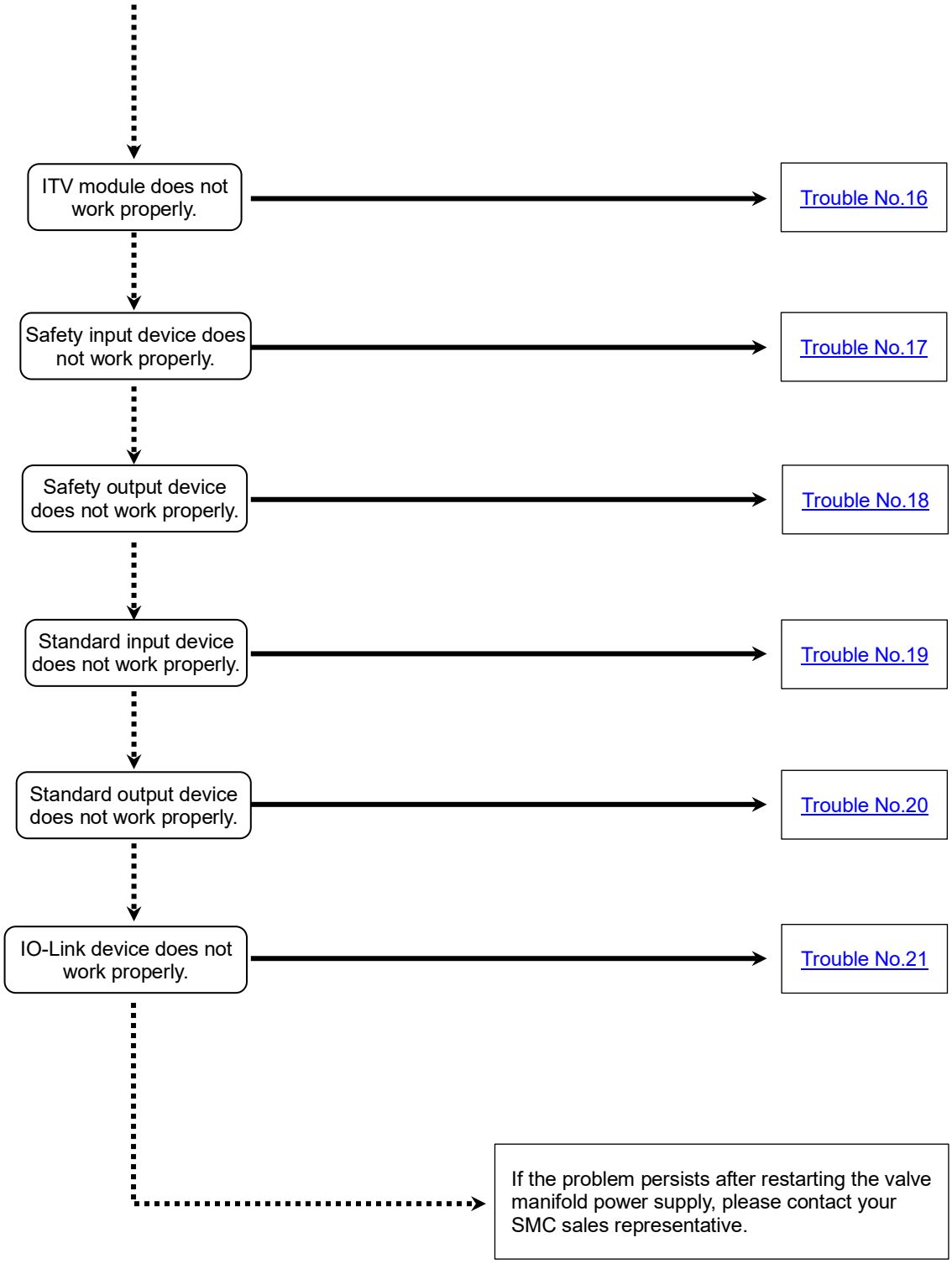
7 Troubleshooting

7.1 Troubleshooting Chart

If a problem occurs on this fieldbus system, refer to the following chart to identify and resolve the issue.
The status of the fieldbus system is indicated by the LEDs on each module, the LCD display on the Fieldbus module, and the diagnostic data.
If a cause applicable to the failure cannot be identified, this indicates that the equipment itself is faulty.
Damage to the fieldbus system can be caused by the operating environment. Please contact SMC for assistance.




Fieldbus Module
ST is red flashing.
Trouble No.7
ST is red ON.
Trouble No.8
ST is red/green flashing alternately.
Trouble No.9
US1 or US2 is green flashing or OFF.
Trouble No.10
Displays “The configuration has been changed, please restart.” on the LCD.
Trouble No.11
PORT1 or PORT2 is other than green flickering.
Trouble No.12
MS is other than green ON.
Trouble No.13
NS is other than green ON.
Trouble No.14
Valve module does not work properly.
Trouble No.15


ITV module does not work properly.
Trouble No.16
Safety input device does not work properly.
Trouble No.17
Safety output device does not work properly.
Trouble No.18
Standard input device does not work properly.
Trouble No.19
Standard output device does not work properly.
Trouble No.20
IO-Link device does not work properly.
Trouble No.21
If the problem persists after restarting the valve manifold power supply, please contact your SMC sales representative.

7.2 Troubleshooting Guide

Trouble No.1 LCD display is OFF

Part No. EX600-	Trouble	Possible cause	Action
BEN1	LCD display is OFF	US1 is OFF	Supply power within the specifications of US1.
		Incorrect wiring	Check that the power wiring to the end plate is correct and that the cable is not damaged.

Trouble No.2 Digital input module displays an error

Part No. EX600-	Trouble	Possible cause	Action
DXPC DXPD	Red ON	Power supply for input device has a short circuit.	Identify the location of the error using the LED or LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Check the following items: ・Check the wiring and cables. ・Check that the connected device is operating properly. ・Check the current consumption specification of the connected input device.
	Red flashing	ON/OFF count value exceeds the setting limit.	Identify the location of the error using the LED or LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Check the following items: ・Execute the “Clear ON/OFF count value” command. ・Change the “Count limit value” parameter to a value greater than the current value. ・Change the “ON/OFF count limit” parameter to “Disable.” ・Check the wiring for loose connectors or damaged cables that may cause input signal chattering. ・Check that the connected device settings are correct.
	All LEDs are red/green flashing alternately	Internal memory error detected in the module.	Restart the power supply. If the problem persists, turn the power OFF and replace the module that is causing the error.

Trouble No.3　Digital output module displays an error

Part No. EX600-	Trouble	Possible cause	Action
DYPB	Red ON	Output has a short circuit	Identify the location of the error using the LED or LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Check the following items: ・Check the wiring and cables. ・Check that the connected device is operating properly. ・Check the current consumption specification of the connected output device.
	Red flashing	ON/OFF count value exceeds the setting limit.	Identify the location of the error using the LED or LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Check the following items: ・Execute the “Clear ON/OFF count value” command. ・Change the “Count limit value” parameter to a value greater than the current value. ・Change the “ON/OFF count limit” parameter to “Disable.”
		Output has an open circuit.	Identify the location of the error using the LED or LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Check the following items: ・Check the wiring for loose connectors or damaged cables. ・Check that the connected device is operating properly. ・Change the “Open circuit” parameter to “Disable.”
	All LEDs are red/green flashing alternately	Internal memory error detected in the module.	Restart the power supply. If the problem persists, turn the power OFF and replace the module that is causing the error.

Trouble No.4　IO-Link master module displays an error

Part No. EX600-	Trouble	Possible cause	Action
L*B1	C/Q: Red ON	L+ has a short circuit	Identify the location of the error using the LED or LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Check the following items: ・Check the wiring and cables. ・Check that the connected device is operating properly. ・Check the current consumption specification of the connected IO-Link device.
		C/Q has a short circuit	
	P24: Red ON	P24 has a short circuit	
	All LEDs are red/green flashing alternately	Internal memory error detected in the module.	Restart the power supply. If the problem persists, turn the power OFF and replace the module that is causing the error.

Trouble No.5　Safety I/O module displays an error

Part No. EX600-	Trouble	Possible cause	Action
FVC*	Any of the following errors -ST: Red ON -FDI: Other than Green ON -FDO: Other than Green ON -INx: Red ON -Zx: Red ON	The module has a safety-related error	Safety-related errors are not displayed on the LCD or in the standard diagnostic data. See the safety manual of the Safety I/O module for details.
	ST: Red/green flashing alternately	Valve module has a short circuit	Identify the location of the error using the LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Refer to the instruction manual for the valve you are using and check/replace the valve module. The short circuit error will be cleared by one of the following methods: ・Turn OFF the valve output command for the relevant location. ・Turn OFF all safety outputs. ・Restart the module.
		ITV module has a short circuit	Identify the location of the error using the LCD display or 7-seg display on ITV module. The power supply for ITV modules is shared among all ITV modules. Refer to the instruction manual for the ITV module you are using and check/replace the module.
		ON/OFF count value exceeds the setting limit.	Identify the location of the error using the LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Check the following items: ・Execute the “Clear ON/OFF count value” command. ・Change the “Count limit value” parameter to a value greater than the current value. ・Change the “ON/OFF count limit” parameter to “Disable.”
		Communication loss between the Safety I/O module and the valve module or the number of the connected valve modules is changed after power ON.	Identify the location of the error using the LCD display or EtherNet/IP objects. When the “Changed valves” error is detected (Diagnostic data: Byte2 bit0), restart the valve manifold. If the problem persists, turn the power OFF and refer to the valve module instruction manual and reassemble the manifold correctly. Note: The number of the connected valve module can be confirmed using the following methods: ・EtherNet/IP object: See page 134 for details. ・LCD display: See page 39 for details.

Part No. EX600-	Trouble	Possible cause	Action
FVC*	ST: Red/green flashing alternately	Communication loss between the Safety I/O module and the ITV module after power ON.	Identify the location of the error using the LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. Refer to the instruction manual for the ITV module you are using and check/replace the module. If the problem persists, turn the power OFF and reassemble the manifold correctly. Note: The communication status with the ITV module can be confirmed using the following methods: ・EtherNet/IP object: See page 134 for details. ・LCD display: See page 40 for details.
		ITV module detects "*Abnormal*"	Identify the location of the error using the LCD display or 7-seg display on the ITV module. You can also investigate using diagnostic data and EtherNet/IP objects. Refer to the instruction manual for the ITV module you are using and check/replace the module.
		Internal memory error detected in the module.	Restart the power supply. If the problem persists, turn the power OFF and replace the module that is causing the error.

Trouble No.6 Fieldbus module detects an error

Part No. EX600-	Trouble	Possible cause	Action
BEN1	ST: Green flashing	Modules were added or removed while power was supplied to the valve manifold.	Identify the location of the error using the LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. If you have performed a hot swap of the Safety I/O module, turn the manifold power back on.
		Internal memory error detected in the module.	Restart the power supply. Also, perform the "Factory reset" command via EtherNet/IP object (page 134). If the problem persists, turn the power OFF and replace the module that is causing the error.

Trouble No.7 ST is red flashing

Trouble	Possible cause	Action
ST: Red flashing	The number of connected I/O modules exceeds the specifications.	The number of connected modules should be within specification. See the specification table (page 44) for details. Turn the power OFF and refer to 3 Assembly (page 15) to remove the I/O modules.
	The I/O data size exceeds the specifications.	The I/O data size should be within the specifications. See the specification table (page 44) for details. Please review the following and reduce the I/O data size: ・Change the “Process data size” parameter. ・Reduce the number of connected I/O modules.

Trouble No.8 ST is red ON

Trouble	Possible cause	Action
ST: Red ON	Communication loss between the Fieldbus module and the Safety I/O module.	Restart the power supply. Turn the manifold power back on. If the problem persists even after powering it back on, the following may be causing a failure in safety communication inside the manifold: ・The internal safety communication timed out due to a slow power-up time. ・An error has occurred that the Safety I/O module cannot recover from. ・The internal safety communication path of the Fieldbus module is damaged. Replace the Safety I/O module and check if that improves the situation. If replacing the Safety I/O module does not improve the situation, replace the Fieldbus module as well and check if that improves the situation.
	Initialization error detected in the Fieldbus module.	Restart the power supply. If the problem persists, turn the power OFF and replace the Fieldbus module that is causing the error.

Trouble No.9　ST is Red/green alternately flashing

Trouble	Possible cause	Action
ST: Red/green flashing alternately	Connection errors between modules	Turn off the power and check the installation of the manifold: ・Check that the module connection connectors are not damaged. ・Check that the joint brackets are not loose and are tightened to the correct torque. ・Check that the intermediate reinforcement brackets are used correctly. ・Check that the module connection connectors are not subjected to excessive loads on installation. If the problem persists, replace the module that is causing the error.
	I/O module failure	Identify the location of the error using the LCD display. You can also investigate using diagnostic data and EtherNet/IP objects. If the problem persists, turn the power OFF and replace the module that is causing the error.

Trouble No.10　US1/US2 is green flashing or OFF

Trouble	Possible cause	Action
US1: Green flashing	US1 detects undervoltage	・Supply voltage within the specifications. ・Disable the “US1 monitoring” parameter.
US1: OFF	US1 detects undervoltage	Supply voltage within the specifications.
US2: OFF	US2 detects undervoltage	Supply voltage within the specifications.

Trouble No.11 LCD displays “The configuration has been changed, please restart.”

Trouble	Possible cause	Action
LCD displays “The configuration has been changed, please restart.”	Change the “IO-Link master process data size” parameter.	Try one of the following: ・Restart the power supply. ・Execute the “System restart” command via EtherNet/IP object (page 133). ・Execute a reset service that supports EtherNet/IP.
	Change the “IP address setting mode” parameter.	Try one of the following: ・Restarting the power supply. ・Execute the “System restart” command via EtherNet/IP object (page 133). ・Execute a reset service that supports EtherNet/IP.

Trouble No.12 PORT1/PORT2 LED is other than green flashing

Trouble	Possible cause	Action
PORT1 or PORT2: OFF	The Ethernet link is not established.	Try one of the following: ・Check that the power supply to the higher-level EtherNet/IP device is turned on. ・Check for loose connectors or broken wires on the PORT1 and PORT2 communication cables.
PORT1 or PORT2: Green ON	The Ethernet link is established, however, it does not receive EtherNet/IP data.	Try one of the following: ・Check the status of the PLC and set the PLC to RUN mode. ・Check for loose connectors or broken wires.

Trouble No.13 MS is other than green

Trouble	Possible cause	Action
MS: Green flashing	Configuration is not complete.	Complete the settings correctly. See 11 Hardware Configuration (page 96) for details.
	PLC is in Idle mode.	Set the PLC to RUN mode.
MS: Red flashing	Diagnostic error detected on the related module.	Confirm the display for each module. Please refer to Troubleshooting No.2 to 10 in the display for countermeasures.
	Only applicable when the Safety I/O module is connected. The current IP address of the Fieldbus module and the IP address of the Safety I/O module when TUNID is set are different.	Clear the TUNID in the Safety I/O module by performing a Safety reset. See the safety manual of the Safety I/O module. After clearing the TUNID, set the TUNID again in the Safety I/O module. See 11 Hardware Configuration (page 96) for details.
MS: Red ON	Unrecoverable error detected.	Check the LCD display and refer to trouble No. 7 to 9 based on the display contents to take appropriate measures. If the problem persists, turn the power OFF and replace the module that is causing the error.
MS: Red/green flashing alternately	The TUNID is not set in the Safety I/O module.	Set the TUNID in the Safety I/O module. See 11 Hardware Configuration (page 96) for details.

Trouble No.14 NS is other than green ON

Trouble	Possible cause	Action
NS: OFF	The IP address is not set in the Fieldbus module.	Set the IP address in the Fieldbus module. See 11.1 IP Address Settings (page 96) for details.
	Communication cable disconnection	Check the communication status for EtherNet/IP: ・Check if the communication cable is broken. ・Check the power supply for the higher-level connected device.
	The IP address setting is incorrect.	If the “IP mode” parameter is set to “Hardware mode,” check that a valid value is set, and if an invalid value is set, correct it to a valid value. For examples of the invalid value, see 11.1.2 IP Address Configuration via LCD Display(page 99) for details.
NS: Green flashing	EtherNet/IP communication is not established.	Try one of the following: ・Check that the I/O data size is the same as the size set on the PLC and displayed on the LCD. ・Check that the Configuration Signature of the Safety I/O module is set in the PLC. ・Check that the TUNID is set in the Safety I/O module. ・Check the communication cable. ・Check that the “Port1 (Port2) Interface” parameter is set correctly. ・Route communication cables away from noise sources.
NS: Red/green flashing alternately	The TUNID is not set in the Safety I/O module.	Complete the TUNID setup.
NS: Red flashing	EtherNet/IP communication has timed out.	Try one of the following: ・Check the communication cable. ・Check that the ”Port1 (Port2) Interface” parameter is set correctly. ・Check that the amount of communication data on the communication line is not excessive. ・Route communication cables away from noise sources.
NS: Red ON	Duplicate the IP address.	Set an IP address that is not yet in use on the network. For setting the IP address, see 11.1 IP Address Settings (page 96) for details.

Trouble No.15 The valve module connected to the Safety I/O module is not functioning properly.

Trouble	Possible cause	Action
Valve module does not operate correctly	The PLC configuration is incorrect.	Check the PLC configuration and make sure that all connections for non-safety data, safety inputs, and safety outputs are set correctly. The Safety I/O module will not operate even if settings are configured for only some connections. Also, check that the TUNID settings for the Safety I/O module are correct. See 11 Hardware Configuration (page 96) for the details on the settings.
	The safety parameters for the Safety I/O module are not set correctly.	Check the ST, FDI, FDO LED on the Safety I/O module. If these LEDs are flashing green, it indicates that the safety parameters are not set correctly. See the safety manual of the Safety I/O module for the details for setting safety parameters.
	The Safety I/O module is in safe state.	Check the ST, FDO LED on the Safety I/O module. If these LEDs are flashing red, it indicates that a diagnostic error has occurred. See troubleshooting in the safety manual of the Safety I/O module for the details.
	US2 power supply is out of the specified range.	Ensure that the supply voltage to the US2 power supply is within the specified range. If the power supply takes a long time to start up, diagnostics may be detected before the power supply has fully started up. See troubleshooting in the safety manual of the Safety I/O module for the details.
	Safety output will not turn ON.	To turn the valve ON, not only the valve output but also the safety output should be turned ON.
	The PLC is in Idle mode, or address errors in PLC control programs, etc.	Check that the PLC status and settings are correct.
	Valve module polarity mismatch.	Check that the polarity of the valve module you are using (positive common/negative common) matches the valve output polarity of the Safety I/O module. See the safety manual of the Safety I/O module for details on the specifications.
	Wrong addresses in control programs, etc.	Monitor the PLC status and check that the valve output signal address assignments and control program, etc. are correct.
	Connection errors between modules	Turn off the power and check the installation of the manifold. ・Check that the module connection connectors are not damaged. ・Check that the module connection connectors are not subjected to excessive loads on installation.
	Number of valve modules connected exceeds specifications	Check the number of valve modules connected to the Safety I/O module. See the safety manual for the Safety I/O module for details.
	Valve module failure	Replace the valve module and check the operation. Check the troubleshooting for the valve you are using.
	Safety I/O module failure	Turn off the manifold power supply, replace the Safety I/O module, then turn the power back on and check the operation.

Trouble No.16 The ITV module connected to the Safety I/O module is not functioning properly.

Trouble	Possible cause	Action
ITV module does not operate correctly	The parameter for pressure is out of range.	Change the parameter so that the difference between “Maximum pressure” and “Minimum pressure” is greater than 410.
	US1 power supply is out of the specified range.	Supply voltage within the specified range to the US1 power supply.
	Wrong addresses in control programs, etc.	Monitor the PLC status and check that the output signal address assignment, endian, control program, etc. are correct.
	The PLC is in Idle mode, or address errors in PLC control programs, etc.	Check that the PLC status and settings are correct.
	Connection errors between modules	Check the “ITV connection” status (page 134) in the EtherNet/IP object, or check the connection status on the ITV information menu (page 40) of the LCD display. If there is an ITV module in the “disconnect” state, check the following and confirm that there are no problems with the connection between the Safety I/O module and the ITV module. ・Check that the module connection connectors are not damaged. ・Check that the module connection connectors are not subjected to excessive loads on installation.
	ITV module detects *Abnormal*	See the operation manual of the ITV module for details and replace the ITV module.
	Number of ITV modules connected exceeds specifications	Check the number of ITV modules connected to the Safety I/O module. See the safety manual for the Safety I/O module for details.
	ITV module failure	Replace the ITV module and check the operation. Check the troubleshooting for the ITV module you are using.
	Safety I/O module failure	Turn off the manifold power supply, replace the Safety I/O module, then turn the power back on and check the operation.

Trouble No.17 Safety input device connected to the Safety I/O module is not functioning properly.

Trouble	Possible cause	Action
Safety input device does not operate correctly.	The PLC configuration is incorrect.	Check the PLC configuration and make sure that all connections for non-safety data, safety inputs, and safety outputs are set correctly. The Safety I/O module will not operate even if settings are configured for only some connections. Also, check that the TUNID settings for the Safety I/O module are correct. See 11 Hardware Configuration (page 96) for details on the settings.
	The safety parameters for the Safety I/O module are not set correctly.	Check the ST, FDI, and FDO LEDs on the Safety I/O module. If these LEDs are flashing green, it indicates that the safety parameters are not set correctly. See the safety manual of the Safety I/O module for details on safety parameter settings.
	The Safety I/O module is in the safe state.	Check the FDI LED on the Safety I/O module. If this LED is flashing red, it indicates that diagnostic error has occurred. See troubleshooting in the safety manual of the Safety I/O module for details.
	US1 power supply is out of the specified range.	Supply voltage within the specified range to the US1 power supply. If the power supply takes a long time to start up, diagnostics may be detected before the power supply has fully started up. See troubleshooting in the safety manual of the Safety I/O module for details.
	The PLC is in Idle mode, or address errors in PLC control programs, etc.	Check that the PLC status and settings are correct.
	Safety input device polarity mismatch.	Check that the polarity of the safety input device you are using (PNP/NPN) matches the safety input polarity of the Safety I/O module. See the safety manual of the Safety I/O module for details on specifications.
	Wrong addresses in control programs, etc.	Monitor the PLC status and check that the safety input address assignments and control programs, etc. are correct.
	Miswiring or faulty connection	Check for loose connectors, wiring errors, and cable damage at locations where the safety input device is not working.
	Safety input device failure	Replace the connected safety input device.
	Safety I/O module failure	Turn off the manifold power supply, replace the Safety I/O module, then turn the power back on and check the operation.

Trouble No.18 Safety output device connected to the Safety I/O module is not functioning properly.

Trouble	Possible cause	Action
Safety output device does not operate correctly.	The PLC configuration is incorrect.	Check that the PLC configuration and make sure that all connections for non-safety data, safety inputs, and safety outputs are set correctly. The Safety I/O module will not operate even if settings are configured for only some connections. Also, check that the TUNID settings for the Safety I/O module are correct. See 11 Hardware Configuration (page 96) for details on the settings.
	The safety parameters for the Safety I/O module are not set correctly.	Check the ST, FDI, and FDO LEDs on the Safety I/O module. If these LEDs are flashing green, it indicates that the safety parameters are not set correctly. See the safety manual of the Safety I/O module for details on safety parameter settings.
	The Safety I/O module is in the safe state.	Check the FDO LED on the Safety I/O module. If this LED is flashing red, it indicates that a diagnostic error has occurred. See troubleshooting in the safety manual of the Safety I/O module for details.
	US2 power supply is out of the specified range.	Supply voltage within the specified range to the US2 power supply. If the power supply takes a long time to start up, diagnostics may be detected before the power supply has fully started up. See troubleshooting in the safety manual of the Safety I/O module for details.
	The PLC is in Idle mode, or address errors in PLC control programs, etc.	Check that the PLC status and settings are correct.
	Safety output device polarity mismatch	Check that the polarity of the safety output device you are using (PNP/NPN) matches the safety output polarity of the Safety I/O module. See the safety manual of the Safety I/O module for details on the specifications.
	Wrong addresses in control programs, etc.	Monitor the PLC status and check that the safety output address assignments and control programs are correct.
	Miswiring or faulty connection	Check for loose connectors, wiring errors, and cable damage at locations where the safety output device is not working.
	Safety output device failure	Replace the connected safety output device.
	Safety I/O module failure	Turn off the manifold power supply, replace the Safety I/O module, then turn the power back on and check the operation.

Trouble No.19 Digital input device connected to the digital input module is not functioning properly.

Trouble	Possible cause	Action
Digital input device does not operate correctly.	Digital input device polarity mismatch	Check that the polarity of the digital input device you are using (PNP/NPN) matches the digital input polarity of the digital input module.
	US1 power supply is out of the specified range.	Supply voltage within the specified range to the US1 power supply.
	Miswiring or faulty connection	Check for loose connectors, wiring errors, and cable damage at locations where the digital input device is not working.
	Digital input device failure	Replace the connected digital input device.
	Digital input module failure	Replace the connected digital input module.

Trouble No.20 Digital output device connected to the digital output module is not functioning properly.

Trouble	Possible cause	Action
Digital output device does not operate correctly.	Digital output device polarity mismatch	Check that the polarity of the digital output device you are using (PNP/NPN) matches the digital output polarity of the digital output module.
	US2 power supply is out of the specified range.	Supply voltage within the specified range to the US2 power supply.
	Miswiring or faulty connection	Check for loose connectors, wiring errors, and cable damage at locations where the digital output device is not working.
	The PLC is in Idle mode, or Address errors in PLC control programs, etc.	Check that the PLC status and settings are correct.
	Digital output does not turn OFF during Communication error or idle state.	Check that the “Hold all outputs” parameter of the fieldbus module is not set to “Hold all modules.” Also, check that the “DO Fault/Idle mode” parameter of each module is not set to “Hold” or “Force ON.”
	Wrong addresses in control programs, etc.	Monitor the PLC status and check that the output address assignments, control program, etc. are correct.
	Digital output device failure	Replace the connected digital output device.
	Digital output module failure	Replace the connected digital output module.

Trouble No.21 IO-Link device connected to the IO-Link master module is not functioning properly.

Trouble	Possible cause	Action
The C/Q LED on the IO-Link master module is off or orange.	The port setting is not in IO-Link communication mode.	When performing IO-Link communication, set the “Port mode” parameter to “IO-Link Manual” or “IO-Link Autostart.”
The C/Q LED on the IO-Link master module is flashing green (1 Hz).	IO-Link device is not connected.	Connect the IO-Link device.
The C/Q LED on the IO-Link master module is flashing green (2 Hz).	The data size is incorrect.	Check the “Process data size” parameter of the IO-Link master. Set the process data size for each port to be greater than the process data size of the connected IO-Link device.
	Connection IO-Link device matching error	Please check the following parameters of the IO-Link master: ・Check the “Port mode” parameter and change it to “IO-Link Autostart” if the device matching function is not required. ・Check that the vendor ID and device ID of the connected IO-Link device are set in the “Vendor ID” and “Device ID” parameters. ・Check that the IO-Link version determined by the “Validation & Backup” parameter matches the version of the connected IO-Link device.
	Data storage write error	Please write to the data storage again. See 8.4.2 Data Storage Function (page 82) for details on the data storage function.
The C/Q LED on the IO-Link master module is green ON, but the IO-Link device is not operating.	US1 power supply is out of the specified range.	Supply voltage within the specified range to the US1 power supply.
	P24 power supply is out of the specified range.	Supply voltage within the specified range of EX600-LBB1-A to the P24 power supply.
	Miswiring or faulty connection	Check for loose connectors, wiring errors, and cable damage at locations where the digital output device is not working.
	The PLC is in Idle mode, or address errors in PLC control programs, etc.	Check that the PLC status and settings are correct.
	Wrong addresses in control programs, etc.	Please check that the address allocation, data endianness, control program, etc. are correct. The data endianness can be swapped using the “Byte swap” parameter of the IO-Link master module.
	IO-Link device failure	Replace the connected IO-Link device. Or check the troubleshooting for the IO-Link device you are using.
	IO-Link master module failure	Replace the connected IO-Link master module.

8 Parameter Settings

Each module and channel has configurable parameters.
These parameters can be changed via the LCD display (page 30), explicit messages (page 132), or configuration assembly (page 121). The following table describes the parameters that can be set for each module.

Important:
- When reusing modules with modified parameters, please reset them to their factory default settings before use.
- Safety parameters for the Safety I/O module are configured via process data. For details on how to set the safety parameters, refer to the Safety manual.

8.1 Fieldbus Module Parameters

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
1	IP mode	Determines whether to assign the IP address via software or via pushbuttons on the fieldbus module.	Remote mode	Set the IP address via the IP address setting software.	Remote mode	Module
			Hardware mode	Set the IP address via pushbuttons.		
			DHCP mode	Always obtains an IP address from the DHCP server. Cannot be selected while the Safety I/O module is connected.		
2	IP address	These are settings used to connect to the EtherNet/IP network.	0.0.0.0 to 255.255.255.255	Set according to the PLC configuration. For details on how to configure the settings, refer to page 96. When setting in “Hardware mode,” any configuration that does not meet the IP address requirements will be invalidated, and the device will operate with the factory default values.	0.0.0.0	Module
3	Subnet mask		0.0.0.0 to 255.255.255.255		0.0.0.0	
4	Default gateway		0.0.0.0 to 255.255.255.255		0.0.0.0	
5	Port1 Interface	Set the communication speed and communication method for PORT1.	Autonegotiation	Select the communication speed and communication method appropriate for the link destination.	Autonegotiation	Module
			10 Mbps Half duplex			
			10 Mbps Full duplex			
			100 Mbps Half duplex			
			100 Mbps Full duplex			
6	Port2 Interface	Set the communication speed and communication method for PORT2.	Autonegotiation	Select the communication speed and communication method appropriate for the link destination.	Autonegotiation	Module
			10 Mbps Half duplex			
			10 Mbps Full duplex			
			100 Mbps Half duplex			
			100 Mbps Full duplex			

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
7	QuickConnect	Configures the QuickConnect function (EtherNet/IP object Class:0xF5, Instance: 0x01, Attribute: 0x0C). This parameter cannot be enabled if a Safety I/O module is connected.	Disable	Set when the QuickConnect feature is not used.	Disable	Module
			Enable	Set when the QuickConnect feature is used. Cannot be selected if the Safety I/O module is connected.		
8	US1 monitoring	Determines whether to generate a diagnostic error when the US1 power supply voltage falls below approximately 19 VDC.	Disable	Does not generate diagnostic errors.	Enable	Module
			Enable	Generates diagnostic error.		
9	Hold all outputs	In the event of EtherNet/IP communication error or idle state, all output data of the entire system can be held collectively without configuring each module individually. This setting does not apply to the ITV module. To hold its output pressure, configure the parameters of the ITV module individually.	Depends on modules	Each module operates according to the settings of its “DO Fault/Idle mode” and “IO-Link Fault/Idle” parameters.	Depends on modules	Module
			Hold all modules	Holds the output data of all modules except the ITV module.		

8.2 Safety I/O Module Parameters

8.2.1 Safety-Related Parameters

Safety parameters are set using safety output data. For details, refer to the Safety manual for the Safety I/O module.

8.2.2 Valve Module-Related Parameters

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
1	ON/OFF count limit	Generates a diagnostic error when the ON/OFF count exceeds the set limit value.	Disable	Does not generate a diagnostic error.	Disable	Module
			Enable	Generates a diagnostic error.		
2	Count limit value	Determines the upper limit for the number of valve operations. If the “ON/OFF count limit” parameter is set to “Enable,” the diagnostic error will occur.	1 to 65535	The upper limit is determined by multiplying the set value by 1000. A diagnostic error occurs when the number of ON/OFF operations exceeds this setting.	65535	Channel

⚠ Important:

- When the Safety I/O module detects short circuits in valves, it will turn off the valve output at the short-circuited location and will not automatically recover. To turn it back on, turn off the corresponding valve output once or turn off all safety outputs.
- Regardless of the “Hold all outputs” parameter setting of the fieldbus module, the valve output will turn OFF during EtherNet/IP communication error or when idle.

Note:

- The ON/OFF count immediately after power-on is the value stored in the internal memory of each I/O module.
  Counting is resumed from the read-out value, and the count value is saved to the internal memory every hour.

8.2.3 ITV Module-Related Parameters

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
1	Hold/Clear	Sets pressure control behavior in the event of an EtherNet/IP communication error or idle state.	Pressure Clear	Exhaust completely.	Pressure Clear	Channel
			Pressure Hold	Output pressure is maintained.		
2	Gain	Changes the response time.	0 to 15	Gain can be adjusted in the range from 0 to 15.	9	Channel
3	Sensitivity	Changes the pressure correction operation near the set pressure.	0 to 7	Sensitivity can be adjusted in the range from 0 to 7.	2	Channel
4	Minimum pressure	Sets the minimum pressure (F_1).	0 to 3686	The following settings are available. ・Minimum pressure: 0% to 90% ・Maximum pressure: 10% to 120% Combinations of values that satisfy the following formula cannot be set. Max. – Min. < 410	0	Channel
5	Maximum pressure	Sets the maximum pressure (F_2).	410 to 4914		4095	Channel
6	Notification setting	When the accumulated energizing time reaches the set value, a notification is sent via the input data of the ITV module.	0 to 4294967295	0: Notification disabled, no notifications will be sent. 1 to 4294967295: Set in units of 1 hour.	0	Channel

Note:
- The “Hold all outputs” parameter setting of the fieldbus module does not take effect on the ITV module. To hold the pressure, use the “Hold/Clear” parameter.
- For details on parameters related to the ITV module, refer to the ITV module operation manual.

8.3 Digital Module Parameters

8.3.1 Digital Input Module Parameters

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
1	Input filtering time	Sets the time to ignore changes in the input signal.	0.1 ms 1.0 ms 10 ms 20 ms	Select the filtering time.	1.0 ms	Module
2	Input extension time	Sets the time to hold the input signal.	1.0 ms 15 ms 100 ms 200 ms	Select the time to hold the input signal.	15 ms	Module
3	ON/OFF count limit	Generates a diagnostic error when the ON/OFF count exceeds the set limit value.	Disable Enable	Does not generate a diagnostic error. Generates a diagnostic error.	Disable	Module
4	Count limit value	Determines the upper limit for the number of input signal ON/OFF operations. If the “ON/OFF count limit” parameter is set to “Enable,” the diagnostic error will occur.	1 to 65000	The upper limit is determined by multiplying the set value by 1000. A diagnostic error occurs when the number of ON/OFF operations exceeds this setting.	65000	Channel

Note:

- The ON/OFF count immediately after power-on is the value stored in the internal memory of each I/O module.
  Counting is resumed from the read-out value, and the count value is saved to the internal memory every hour.

8.3.2 Digital Output Module Parameters

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
1	Open circuit	Generates error when the disconnection of the output device is detected.	Disable	Generates an error.	Disable	channel
			Enable	Does not generate an error.		
2	DO Fault/Idle mode	Sets the output behavior in the event of an EtherNet/IP communication error or idle state.	Clear	Turns the output OFF.	Clear	module
			Hold	The last output command is retained.		
			Force ON	Forces the output to ON.		
3	ON/OFF count limit	Generates a diagnostic error when the ON/OFF count exceeds the set limit value.	Disable	Does not generate a diagnostic error.	Disable	module
			Enable	Generates a diagnostic error.		
4	Count limit value	Determines the upper limit for the number of valve operations. If the “ON/OFF count limit” parameter is set to “Enable,” the diagnostic error will occur.	1 to 65000	The upper limit is determined by multiplying the set value by 1000. A diagnostic error occurs when the number of ON/OFF operations exceeds this setting.	65000	channel

Note:

- When the “Hold all outputs” parameter of the fieldbus module is set to “Hold all modules,” the “DO Fault/Idle mode” parameter settings of each module are disabled and always hold. Depending on the PLC model, the above settings may not be reflected during communication idle.
- The ON/OFF count immediately after power-on is the value stored in the internal memory of each I/O module.
  Counting is resumed from the read-out value, and the count value is saved to the internal memory every hour.

8.4 IO-Link Master Module Parameters

8.4.1 Parameter List

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
1	Port mode	Set the operating mode of the IO-Link port.	Deactivated	Set as an unused port.	Deactivated	Port (Channel)
			IO-Link Manual	Set as an IO-Link communication port. Configuring parameters enables verification and data storage functions.		
			IO-Link Autostart	Set as an IO-Link communication port. Communication is automatically established by ignoring the “Validation & Backup” parameter.		
			Digital input C/Q	Set as a digital input port.		
			Digital output C/Q	Set as a digital output port.		
2	Process data size	Determine the process data size for each port of the IO-Link master.	2/2/2/2 byte : 32/32/32/32 byte	Determine the input/output process data size for each port 1, 2, 3, and 4. Set it to a value equal to or larger than the process data of the connected IO-Link device. Available sizes: ・0 byte ・2 byte ・4 byte ・8 byte ・16 byte ・32 byte	2/2/2/2 byte	Module
3	Byte swap	Reorder the byte order of process data sent and received between EtherNet/IP communication and IO-Link communication.	No Swap	Data sequence remains unchanged. Example: IO-Link device size: 10 bytes IO-Link master port size: 16 bytes 0xJIHG FEDC BA98 7654 3210 ↓ 0x0000 0000 0000 JIHG FEDC BA98 7654 3210	No Swap	Port (Channel)
			Swap 16 bit	Data is swapped in word (2-byte) units. Example: IO-Link device size: 10 bytes IO-Link master port size: 16 bytes 0xJIHG FEDC BA98 7654 3210 ↓ 0x0000 0000 0000 HGJI DCFE 98BA 5476 1032		
			Swap 32 bit	Data is swapped in double word (4-byte) units. Example: IO-Link device size: 10 bytes IO-Link master port size: 16 bytes 0xJIHG FEDC BA98 7654 3210 ↓ 0x0000 0000 HGJI 0000 98BA DCFE 1032 5476		
			Swap All	All bytes are rearranged in reverse order. Example: IO-Link device size: 10 bytes IO-Link master port size: 16 bytes 0xJIHG FEDC BA98 7654 3210 ↓ 0x1032 5476 98BA DCFE HGJI 0000 0000 0000		

Note:
- If the "Process data size" of a port is set to 2 bytes, swapping will not occur even if "Byte swap" is set to "Swap 32."

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
4	IO-Link Fault/Idle	Determines how to handle IO-Link communication output process data in the event of an EtherNet/IP communication error or idle state.	Clear/ PD Out valid	Clears the output of IO-Link devices. ・Output process data: All outputs are turned off. ・IO-Link communication: Remains valid.	Clear/ PD Out invalid	Module
			Hold	Continues the last output command to the IO-Link device. ・Output process data: Retained. ・IO-Link communication: Remains valid.		
			Clear/ PD Out invalid	Operates according to the output settings of the IO-Link device when communication is invalid. ・Output process data: All outputs are turned off. ・IO-Link communication: Set to invalid.		
5	DO Fault/Idle mode	To ports where the “Port mode” parameter is set to “Digital output C/Q,” sets the digital output signal behavior in the event of an EtherNet/IP communication error or idle state.	Clear	Turns the output OFF.	Clear	Module
			Hold	The last output command is retained.		
			Force ON	Forces the output to ON.		
6	Cycle time	Sets the communication interval with IO-Link devices. This affects the process data update rate. The minimum value varies depending on the following factors: ・Minimum cycle time of IO-Link devices ・IO-Link communication speed (COM2/3) ・Process data size	As fast as possible (AFAP)	Communicates at the fastest interval among the configurable communication intervals.	As fast as possible (AFAP)	Port (Channel)
			0.4 ms to 132.8 ms	Communicates at the set interval. If the parameter is set below the minimum value, the actual communication interval will be extended to the fastest value that can be set.		
7	Vendor ID	Sets the Vendor ID used when the IO-Link Device Verification function is enabled.	0x0000 to 0xFFFF	Set the vendor ID of the connected device.	0x0001	Port (Channel)
8	Device ID	Sets the Device ID used when the IO-Link Device Verification function is enabled.	0x000000 to 0xFFFFFF	Set the device ID of the connected device.	0x000001	Port (Channel)

Note:

- When the “Hold all outputs” parameter of the fieldbus module is set to “Hold all modules,” the “IO-Link Fault/Idle” and “DO Fault/Idle mode” parameter settings of each module are disabled and always hold.
  Depending on the PLC model, the above settings may not be reflected during communication idle.

No.	Name	Parameter Description	Setting Items	Setting Details	Factory Default	Effective Scope
9	L+ control	The L+ power supply can be turned OFF when only the P24 power supply is used.	L+ ON	Uses the L+ power supply.	L+ ON	Port (Channel)
			L+ OFF	Does not use the L+ power supply.		
10	Validation & Backup	Configures the settings for verification of the connected IO-Link device (verification of Vendor ID and Device ID) and the Data Storage (DS) function. The verification function enables the detection of incorrect IO-Link device connections. The Data Storage function allows the parameters of the connected IO-Link device to be saved to the internal memory of the IO-Link master. Refer to page 82 for details.	No Device Check	Verification function: Disabled DS function: Disabled	No Device Check	Port (Channel)
			Type compatible Device V1.0	Connected device: V1.0 Verification function: Enabled DS function: Disabled		
			Type compatible Device V1.1	Connected devices: V1.1 Verification function: Enabled DS function: Disabled		
			Type compatible Device V1.1, Backup + Restore	Connected devices: V1.1 Verification function: Enabled DS function: Enabled (Backup & Restore)		
			Type compatible Device V1.1, Restore	Connected devices: V1.1 Verification function: Enabled DS function: Enabled (Restore only)		

Important:

- To use the verification function, set the following parameters in advance:
  Set “Port mode” to “IO-Link Manual.”
  Set “Vendor ID” to the vendor ID value of the connected IO-Link device specification.
  Set “Device ID” to the device ID value of the connected IO-Link device specification.
- If “Port mode” is changed to a setting other than “IO-Link Manual,” the parameter automatically switches to “No Device Check.”

8.4.2 Data Storage Function

IO-Link communication features the Data Storage function, which saves the parameters of an IO-Link device to the memory of the IO-Link master. This function reduces the time required to reconfigure parameters when replacing an IO-Link device.
To use the Data Storage function, configure the following settings:
- Set the “Port mode” parameter to “IO-Link Manual.”
- Set the “Validation & Backup” parameter to “Type compatible Device V1.1, Backup + Restore” or “Type compatible Device V1.1, Restore.”

- **Overview of Backup and Restore**

  Parameter settings within each IO-Link device can be saved to the IO-Link master (referred to as “backup”).
  In addition, when an IO-Link device is replaced with the same model, the parameter settings backed up in the IO-Link master can be transferred to the IO-Link device (referred to as “restore”).

- **Conditions for backup/restore operation when starting IO-Link communication**

  The Data Storage operation is performed as follows, based on the Data Storage status of the IO-Link master and the parameter change status of the IO-Link device.

Validation & Backup	Conditions			Data Storage Operation
	Data Storage Status	Backup Requirement from the Device	Checksum Comparison (Data Storage vs. Device Parameters)	
No Device Check	–	–	–	Cleared
Type compatible Device V1.0	–	–	–	Cleared
Type compatible Device V1.1	–	–	–	Cleared
Type compatible Device V1.1, Backup + Restore	Data exists	Required	–	Backup
	Data exists	No requirement	Not identical	Restore
	Data exists	No requirement	Identical	Nothing occurs
	No data	–	–	Backup
Type compatible Device V1.1, Restore	Data exists	Required	–	Nothing occurs
	Data exists	No requirement	Not identical	Restore
	Data exists	No requirement	Identical	Nothing occurs
	No data	–	–	Nothing occurs

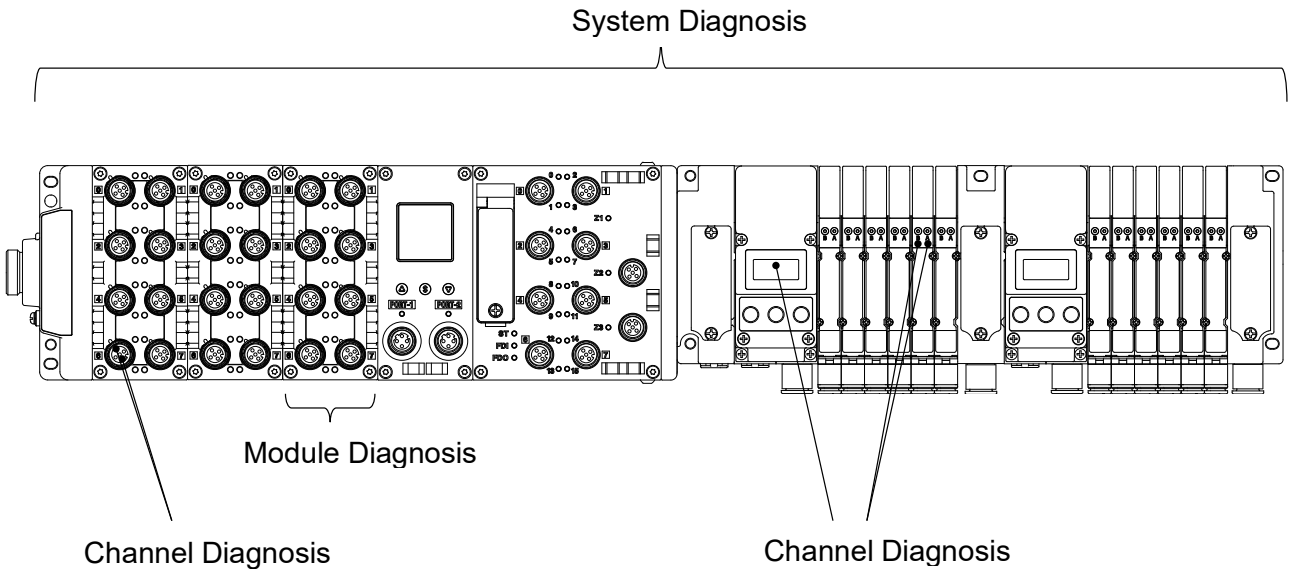
Important:
- If the “Vendor ID” or “Device ID” parameter is changed, the Data Storage is cleared.
- If the “Port mode” parameter is changed to a setting other than “IO-Link Manual,” the “Validation & Backup” parameter automatically switches to “No Device Check.” As a result, the Data Storage is cleared.

9 Diagnostics

9.1 Overview

The fieldbus module maps the following diagnostic data to the beginning of the input process data.
The diagnostic input data is 0 during normal operation. When a diagnostic error occurs, the corresponding diagnostic data is set to 1.

Input Data Byte	Diagnostic Data	Description
0...1	System Diagnosis	Errors affecting the entire EX600 manifold (e.g., power supply voltage drop).
2	Module Diagnosis	Errors occurring in each module (e.g., module failure).
3	Channel Diagnosis	Errors occurring in each channel (e.g., output short circuit).
4...5	Diagnosis Location	Indicates which module has generated the Module Diagnosis or Channel Diagnosis.



9.2 Diagnostic Data

Byte	Bit	Description	Scope
0	0	1: US1 power supply voltage dropped to 19 V or less.	System
	1	Reserved	
	2	1: Connection to the D-side I/O module failed at startup.	
	3	1: Internal communication with the D-side I/O module failed at startup.	
	4	1: Connection to the U-side I/O module failed at startup.	
	5	1: Internal communication with the U-side I/O module failed at startup.	
	6	1: The total I/O size of the entire manifold exceeds the specifications.	
	7	1: The number of connected I/O modules exceeds the specifications.	
1	0	1: An I/O module was added or removed while the power supply was ON.	
	1	1: The safety communication with the Safety I/O module was lost.	
	2...7	Reserved	
2	0	1: The number of valve modules has changed.	Module
	1	1: Some internal functions of the module are not operating.	
	2	1: Internal communication with the corresponding I/O module has failed.	
	3	1: The module initialization failed.	
	4...7	Reserved	
3	0	1: Digital signal ON/OFF operation count exceeds the upper limit setting value.	Channel
	1	1: Short circuit detected.	
	2	1: *Abnormal* diagnosis detected in the ITV module.	
	3	1: Open circuit detected.	
	4...7	Reserved	
4	0	1: Error occurring in Module 0 (Fieldbus module).	Location
	1	1: Error occurring in Module 1.	
	2	1: Error occurring in Module 2.	
	3	1: Error occurring in Module 3.	
	4	1: Error occurring in Module 4.	
	5	1: Error occurring in Module 5.	
	6	1: Error occurring in Module 6.	
	7	1: Error occurring in Module 7.	
5	0	1: Error occurring in Module 8.	
	1	1: Error occurring in Module 9.	
	2	1: Error occurring in Module 10.	
	3...7	Reserved	

Note:

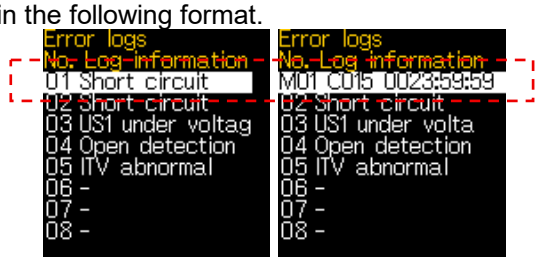
- When each bit of the diagnostic data is *0*, it indicates that no diagnosis has occurred. When it is *1*, it indicates that a diagnosis has occurred.
- The bits for the diagnostic content and the occurrence location are set to *1* simultaneously. In addition, if multiple diagnostic errors occur, all corresponding diagnostic bits are set to *1*.
  Example:
  If a short circuit is detected in Module 2 and Module 3, the following bits are set to *1*:
  Byte 3 – bit 1
  Byte 4 – bit 2 and bit 3

9.3 Diagnostic Logs

The fieldbus module stores up to 30 diagnostic logs in its internal non-volatile memory each time a diagnosis occurs in the EX600 system. When the maximum limit is exceeded, the oldest log data is overwritten.
The diagnostic logs can be checked using the following two methods. Refer to the respective operation description pages for detailed procedures.

9.3.1 Checking via LCD Display

Diagnostic logs can be checked by navigating to the Error Logs screen on the LCD display.
The logs are displayed in the following format.



- **Screen display contents**

Display Item	Description
No.	The order in which diagnostic errors were recorded. No. 01 is the latest. The No. is incremented each time an error occurs. If a new error occurs when 30 errors are already recorded, No. 30 is deleted.
Error Content	Text corresponding to the diagnostic error content in the table below is displayed.
M**	If the diagnostic error is a Module Diagnosis or Channel Diagnosis, the module number where the error occurred is recorded.
C***	If the diagnostic error is a Channel Diagnosis, the channel number where the error occurred is recorded.
****:**:**	The time when the diagnostic error was recorded. Counting starts from system startup. When the power is turned off, the count is reset, and measurement restarts from 0000:00:00.

- **Log content**

Contents	Text
US1 power supply voltage dropped to 19 V or less.	US1 under voltage
Connection to the D-side I/O module failed at startup.	D Connection fault
Internal communication with the D-side I/O module failed at startup.	D COM fault
Connection to the U-side I/O module failed at startup.	U Connection fault
Internal communication with the U-side I/O module failed at startup.	U COM fault
The total I/O size of the entire manifold exceeds the specifications.	Too large I/O map
The number of connected I/O modules exceeds the specifications.	Too many modules
An I/O module was added or removed while the power supply was ON.	Hot swapping
The safety communication with the Safety I/O module was lost.	Black channel fault
The number of valve modules has changed.	Changed valves
Some internal functions of the module are not operating.	Hardware failure
Internal communication with the corresponding I/O module has failed.	Communication fault
The module initialization failed.	Initialization failure
Digital signal ON/OFF operation count exceeds the upper limit setting value.	Over counter limit
Short circuit detected.	Short circuit
Abnormal diagnosis detected in the ITV module.	ITV abnormal
Open circuit detected.	Open detection

9.3.2 Checking via EtherNet/IP Objects

By executing “Get error logs” (15.3.1 System Information and Command Objects, page 133) using a vendor-specific EtherNet/IP object that can be read via Explicit Message communication, the content of the selected log No. can be checked in the following format.

- **“Get error logs” format**

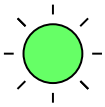
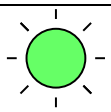
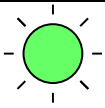
Byte	data	Contents
0...3	Error occurrence time [sec]	Corresponds to the time when the diagnostic error was recorded. Counting starts from system startup. When the power is turned off, the count is reset, and counting restarts from 0 seconds.
4	Module number	If the diagnostic error is a Module Diagnosis or Channel Diagnosis, the module number where the error occurred is recorded. For System Diagnosis, 0x00 is read out.
5	Channel number	If the diagnostic error is a Channel Diagnosis, the channel number where the error occurred is recorded. For System Diagnosis or Module Diagnosis, 0x00 is read out.
6	Error code	The error code corresponding to the diagnostic error is read out. Refer to the table below for the correspondence.

- **Error Code Table**

Error code	Contents
0x00	No diagnostic error recorded.
0x01	US1 power supply voltage dropped to 19 V or less.
0x03	Connection to the D-side I/O module failed at startup.
0x04	Internal communication with the D-side I/O module failed at startup.
0x05	Connection to the U-side I/O module failed at startup.
0x06	Internal communication with the U-side I/O module failed at startup.
0x07	The total I/O size of the entire manifold exceeds the specifications.
0x08	The number of connected I/O modules exceeds the specifications.
0x09	An I/O module was added or removed while the power supply was ON.
0x0A	The safety communication with the Safety I/O module was lost.
0x11	The number of valve modules has changed.
0x12	Some internal functions of the module are not operating.
0x13	Internal communication with the corresponding I/O module has failed.
0x14	The module initialization failed.
0x19	Digital signal ON/OFF operation count exceeds upper limit setting value.
0x1A	Short circuit detected.
0x1B	*Abnormal* diagnosis detected in the ITV module.
0x1C	Open circuit detected.

9.4 IO-Link Master Module Diagnostics

The EX600 IO-Link Master Module has diagnostic functions for each port. Diagnostic information is indicated by the LEDs, the PQI mapped to the input process data, and event codes.
The LED indication, PQI, and event codes for each diagnosis are as follows.

Diagnostic Error	Description	Port LED Status	PQI bit No. (Name)	Event Code
L+ short circuit	Short circuit detected between pins 1 and 3.	 Red ON	2 (PwrShort)	0x1806
P24 short circuit	Short circuit detected between pins 2 and 5.	 Red ON	2 (PwrShort)	0x180F
C/Q short circuit	Short circuit detected between pins 1 and 4 or pins 3 and 4.	 Red ON	3 (CQShort)	0x1804 0x1813
Device Verification Error	The “Vendor ID” and “Device ID” parameters of the IO-Link master differ from those of the connected IO-Link device while the “Validation & Backup” parameter is set to “Type compatible.”	 Green flashing 2 Hz	0 (ID Mismatch)	0x1803
Process Data Mapping Error	An IO-Link device with process data larger than the size set by the “Process data size” parameter is connected.	 Green flashing 2 Hz	1 (PDmapping-Mismatch)	0x1F01
Device Disconnected	No IO-Link device is detected when the “Port mode” parameter is set to “IO-Link Manual” or “IO-Link Autostart.”	 Green flashing 1 Hz	5 (DevCom)	0x1800
P24 Voltage Drop	Power supply voltage (US2 power supply voltage) drop detected between pins 2 and 5 in the EX600-LBB1-A (Class B type).	OFF (P24 LED)	—	0x180E

Note:
- Diagnoses other than short circuit detection (L+, P24, C/Q) are not reflected in the diagnostic data of the fieldbus module. Check the LED status or PQI of the IO-Link master module for diagnoses other than short circuit detection.
- When a Process Data Mapping Error occurs, all input and output process data values are set to zero.
- When no IO-Link device is connected, all input process data values are set to zero.

10 Input/Output Process Data

10.1 Data Size

The input and output process data used when the EX600 system is configured for the higher-level network varies depending on the connected modules and parameter settings. Calculate the total input and output data sizes of each module to perform the configuration.

10.1.1 I/O Data Size of Each Module

Module Name	Module Part Number	Occupied Byte Size [byte]			
		Standard Input	Standard Output	Safety Input	Safety Output
Fieldbus module	EX600-BEN1	6	0	0	0
Safety I/O module	EX600-FVC1	0	4	10	6
	EX600-FVC2	16	8 bytes + Number of valve modules × 1 byte	10	6
	EX600-FVC3	0	Number of valve modules × 1 byte	10	6
	EX600-FVC4	16	8 bytes + Number of valve modules × 1 byte	10	6
Digital input module	EX600-DXPC-A	1	0	0	0
	EX600-DXPD-A	2	0	0	0
Digital output module	EX600-DYPB-A	0	1	0	0
IO-Link master module	EX600-LAB1-A	IO-Link process data + 6 bytes of fixed data	IO-Link process data	0	0
	EX600-LBB1-A	IO-Link process data + 6 bytes of fixed data	IO-Link process data	0	0

Important:

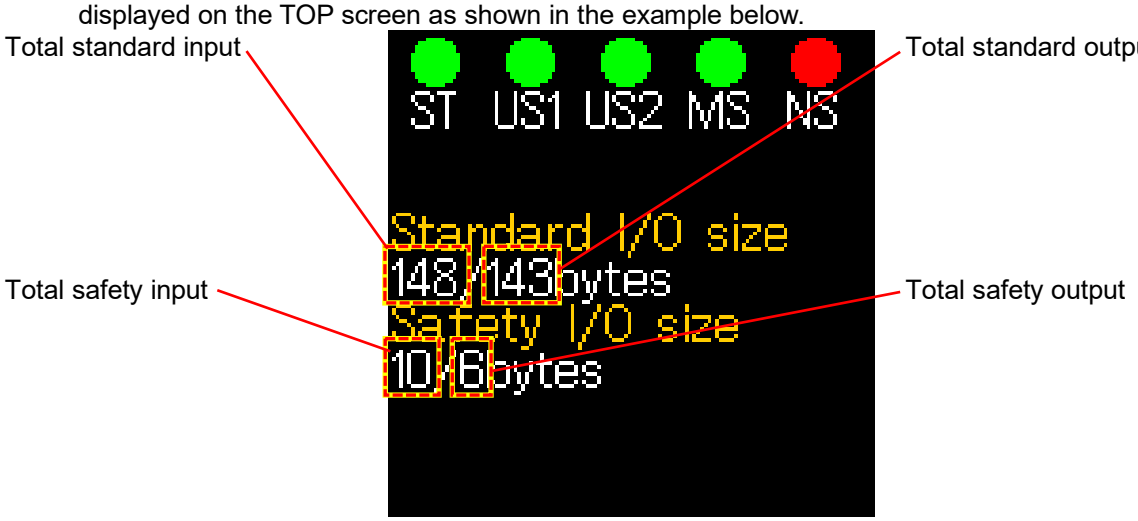
- If the input or output data size exceeds 505 bytes, the PLC must support Large Forward Open. Check the data size supported by the PLC to be used.

Note:

- The Fieldbus module occupies 6 bytes of standard input data for diagnostic data.
- Refer to the operation manual of the ITV module for details on the I/O data of each ITV module.
- For details on the I/O map of the IO-Link master module, refer to 10.2 IO-Link Master Module I/O Map (page 90).
- To set configuration assembly data, a configuration assembly data list must be created according to the parameters to be set. Refer to 12 Parameter Settings via Configuration Assemblies (page 121) for details.
  Set the data size to *0* if the configuration assembly is not used.

10.1.2 Total I/O Data Size

The I/O process data size calculated by the Fieldbus module can be checked on the LCD display. It is displayed on the TOP screen as shown in the example below.



10.2 IO-Link Master Module I/O Map

The I/O map for the IO-Link master module (EX600-LAB1-A, EX600-LBB1-A) is shown below.
The I/O map consists of fixed data (StandardIO + PQI) and variable IO-Link process data.

Component	Description
StandardIO	Digital signal data when the “Port mode” parameter is set to “Digital input C/Q” or “Digital output C/Q,” or digital input signal data assigned to pin 2 of the EX600-LAB1-A.
PQI	Diagnostic data for each port. Occupies 1 byte × number of ports. For details on this data, see 10.2.2 Port Status (PQI) Details (page 91).
IO-Link process data	Data size for each port determined by the “Process data size” parameter.

10.2.1 I/O Map Details

Example: When the “Process data size” parameter of the IO-Link master is set to *2/4/8/32 byte*

<table>
<tr><th rowspan="2">Byte</th><th colspan="8">Input map</th><th colspan="8">Output map</th></tr>
<tr><th colspan="8">Bit 7 … Bit 0</th><th colspan="8">Bit 7 … Bit 0</th></tr>
<tr><td rowspan="3">0
(StandardIO)</td><td>X2</td><td>X4</td><td>X2</td><td>X4</td><td>X2</td><td>X4</td><td>X2</td><td>X4</td><td></td><td>Y4</td><td></td><td>Y4</td><td></td><td>Y4</td><td></td><td>Y4</td></tr>
<tr><td colspan="2">Port 4</td><td colspan="2">Port 3</td><td colspan="2">Port 2</td><td colspan="2">Port 1</td><td colspan="2">Port 4</td><td colspan="2">Port 3</td><td colspan="2">Port 2</td><td colspan="2">Port 1</td></tr>
<tr><td colspan="8">Digital Input</td><td colspan="8">Digital Output</td></tr>
<tr><td>1
(StandardIO)</td><td colspan="8">Reserved (fixed value: 0)</td><td colspan="8">Reserved (fixed value: 0)</td></tr>
<tr><td>2...3</td><td colspan="8">Port 1 input process data (2 bytes)</td><td colspan="8">Port 1 output process data (2 bytes)</td></tr>
<tr><td>4...7</td><td colspan="8">Port 2 input process data (4 bytes)</td><td colspan="8">Port 2 output process data (4 bytes)</td></tr>
<tr><td>8...15</td><td colspan="8">Port 3 input process data (8 bytes)</td><td colspan="8">Port 3 output process data (8 bytes)</td></tr>
<tr><td>16...47</td><td colspan="8">Port 4 input process data (32 bytes)</td><td colspan="8">Port 4 output process data (32 bytes)</td></tr>
<tr><td>48</td><td colspan="8">Port 1 Status (PQI)</td><td colspan="8" rowspan="4"></td></tr>
<tr><td>49</td><td colspan="8">Port 2 Status (PQI)</td></tr>
<tr><td>50</td><td colspan="8">Port 3 Status (PQI)</td></tr>
<tr><td>51</td><td colspan="8">Port 4 Status (PQI)</td></tr>
</table>

X2: Pin 2 input signal (EX600-LAB1 only)
X4: Pin 4 input signal when the “Port mode” parameter of the IO-Link master is set to “Digital input C/Q”
Y4: Pin 4 output signal when the “Port mode” parameter of the IO-Link master is set to “Digital output C/Q”

Note:
- When no IO-Link device is connected, all input process data for the corresponding port is set to 0.
- When the received input process data becomes invalid (i.e., Process Data Invalid status), the previous input process data value is retained.

10.2.2 Port Status (PQI) Details

Input byte n	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	PQ	DevErr	DevCom	DSStatus	CQShort	PwrShort	PDmapping-Mismatch	ID-Mismatch

Bit	Name	Contents	Value
0	ID-Mismatch	Connected device verification error	0: Match 1: Mismatch
1	PDmapping-Mismatch	Connected device process data size exceeded	0: IO-Link master setting size or less 1: Exceeds IO-Link master setting size
2	PwrShort	L+ short circuit or P24 short circuit	0: No short circuit 1: Short circuit detected
3	CQShort	C/Q short circuit	0: No short circuit 1: Short circuit detected
4	DSStatus	Data Storage (DS) save status	0: No DS data / DS saved data error 1: DS saved data valid
5	DevCom	Port communication status	0: Device disconnected 1: Operate or Preoperate state
6	DevErr	Event status of the IO-Link device or the IO-Link master	0: No event or notification 1: Warning or Error
7	PQ	Validity of received input process data	0: Invalid (Abnormal) 1: Valid (Normal)

10.3 EtherNet/IP I/O Map

I/O data assigned to the EX600 system via EtherNet/IP communication is mapped sequentially starting from Module No. 0. For the definition of Module No., refer to 2.2 Designation of Module Number and Channel Number (page 13).

The mapping specifications are as follows:

- The Fieldbus module occupies 6 bytes of diagnostic data.
- If the total standard output data is 0 bytes, 2 bytes of padding data is added to the end of the map.
- If the total byte count of standard input or standard output data is odd, 1 byte of padding data is added to the end of the map.

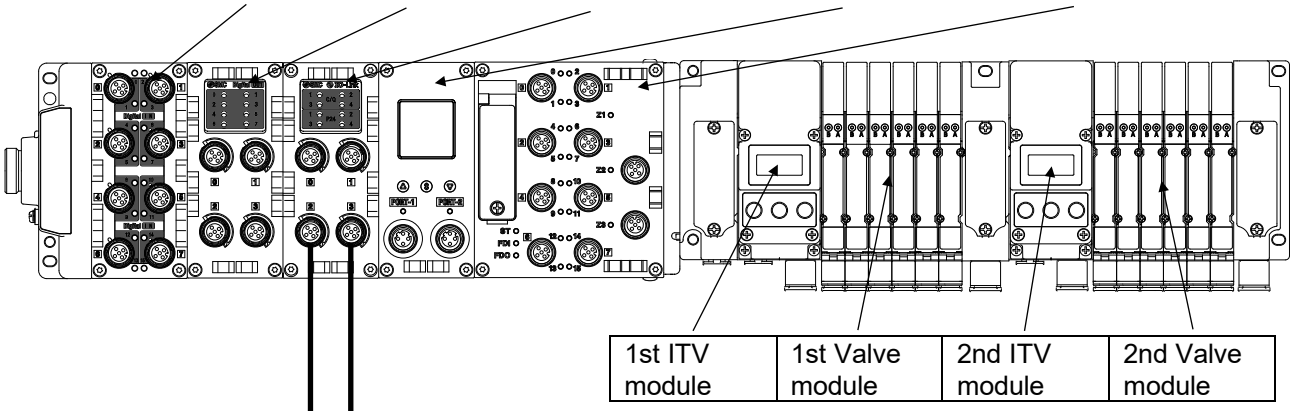
Important:

- The I/O map of the EX600 system is determined at system startup.
  When using the IO-Link master module, the occupied byte size can be changed using the “Process data size” parameter, but the I/O map will not change until the system is restarted.
  In addition, connecting or disconnecting a U-side module while the power is ON does not change the I/O map.
- The “Process data size” parameter of the IO-Link Master Module cannot be changed while EtherNet/IP communication is established.

10.3.1 Example of I/O Map Configuration

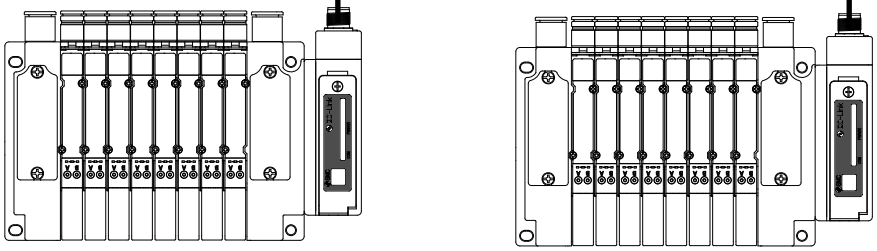
The I/O map for EtherNet/IP communication is explained using the following configuration as an example. The safety I/O map of the Safety I/O module EX600-FVC2 is omitted. Refer to the Safety manual of the Safety I/O module for details on the safety I/O map.

No.	Module 1	Module 2	Module 3	Module 0	Module 4
Product number	EX600-DXPD-A	EX600-DYPB-A	EX600-LBB1-A	EX600-BEN1	EX600-FVC2
Input size	2 bytes	0 bytes	20 bytes	6 bytes	16 bytes
Output size	0 bytes	1 byte	16 bytes	0 bytes	10 bytes
Parameter setting	-	-	“Process data size”: Set to 2/0/4/8 byte	-	Number of connected valve modules: 2 modules (16 valves)



1st ITV module	1st Valve module	2nd ITV module	2nd Valve module

3rd ITV module: Not connected
4th ITV module: Not connected



Port 1	Not connected Process data unused

Port 2	Not connected Process data unused

Port 3	EX260-SIL1 Process data Input: 2 bytes Output: 4 bytes

Port 4	EX260-SIL1 Process data Input: 2 bytes Output: 4 bytes

10.3.2 Input Map Example

EtherNet/IP mapping	EX600 system map							
Byte 0	Module 0 BEN1	Byte 0	Diagnosis	Byte 0				
Byte 1		Byte 1		Byte 1				
Byte 2		Byte 2		Byte 2				
Byte 3		Byte 3		Byte 3				
Byte 4		Byte 4		Byte 4				
Byte 5		Byte 5		Byte 5				
Byte 6	Module 1 DXPD	Byte 0	Input	Bit 0 to 7				
Byte 7		Byte 1		Bit 8 to 15				
Byte 8	Module 3 LBB1	Byte 0	StandardIO		IO-Link communication	Connected IO-Link devices map		
Byte 9		Byte 1						
Byte 10		Byte 2	Port 1 process data		Byte 0	Not connected (fixed value: 0)		
Byte 11		Byte 3			Byte 1			
Byte 12		Byte 4	Port 3 process data		Byte 0	EX260-SIL1 input process data	Byte0	
Byte 13		Byte 5			Byte 1		Byte1	
Byte 14		Byte 6			Byte 2	Unused (fixed value: 0)		
Byte 15		Byte 7			Byte 3			
Byte 16		Byte 8	Port 4 process data		Byte 0	EX260-SIL1 input process data	Byte0	
Byte 17		Byte 9			Byte 1		Byte1	
Byte 18		Byte 10			Byte 2	Unused (fixed value: 0)		
Byte 19		Byte 11			Byte 3			
Byte 20		Byte 12			Byte 4			
Byte 21		Byte 13			Byte 5			
Byte 22		Byte 14			Byte 6			
Byte 23		Byte 15			Byte 7			
Byte 24		Byte 16	Port 1 PQI					
Byte 25		Byte 17	Port 2 PQI					
Byte 26		Byte 18	Port 3 PQI					
Byte 27		Byte 19	Port 4 PQI					
Byte 28	Module 4 FVC2	Byte 0	1st ITV module	Bitoffset 0 to 7				
Byte 29		Byte 1		Bitoffset 8 to 15				
Byte 30		Byte 2		Bitoffset 16 to 23				
Byte 31		Byte 3		Bitoffset 24 to 31				
Byte 32		Byte 4	2nd ITV module	Bitoffset 0 to 7				
Byte 33		Byte 5		Bitoffset 8 to 15				
Byte 34		Byte 6		Bitoffset 16 to 23				
Byte 35		Byte 7		Bitoffset 24 to 31				
Byte 36		Byte 8	3rd ITV module	Not connected (fixed value: 0)				
Byte 37		Byte 9						
Byte 38		Byte 10						
Byte 39		Byte 11						
Byte 40		Byte 12	4th ITV module	Not connected (fixed value: 0)				
Byte 41		Byte 13						
Byte 42		Byte 14						
Byte 43		Byte 15						

10.3.3 Output Map Example

EtherNet/IP mapping	EX600 system map				IO-Link communication	Connected IO-Link devices map	
Byte 0	Module 2	Byte 0	Output	Bit 0 to 7			
Byte 1	Module 3	Byte 0	StandardIO				
Byte 2		Byte 1					
Byte 3		Byte 2	Port 1 process data		Byte 0	Not connected (fixed value: 0)	
Byte 4		Byte 3			Byte 1		
Byte 5		Byte 4	Port 3 process data		Byte 0	EX260-SIL1 output process data	Byte 0
Byte 6		Byte 5			Byte 1		Byte 1
Byte 7		Byte 6			Byte 2		Byte 2
Byte 8		Byte 7			Byte 3		Byte 3
Byte 9		Byte 8	Port 4 process data		Byte 0	EX260-SIL1 output process data	Byte 0
Byte 10		Byte 9			Byte 1		Byte 1
Byte 11		Byte 10			Byte 2		Byte 2
Byte 12		Byte 11			Byte 3		Byte 3
Byte 13		Byte 12			Byte 4	Unused (fixed value: 0)	
Byte 14		Byte 13			Byte 5		
Byte 15		Byte 14			Byte 6		
Byte 16		Byte 15			Byte 7		
Byte 17	Module 4	Byte 0	1st valve modules				
Byte 18		Byte 1	2nd valve module				
Byte 19		Byte 2	1st ITV module	Bitoffset 0 to 7			
Byte 20		Byte 3		Bitoffset 8 to 15			
Byte 21		Byte 4	2nd ITV module	Bitoffset 0 to 7			
Byte 22		Byte 5		Bitoffset 8 to 15			
Byte 23		Byte 6	3rd ITV module	Not connected (fixed value: 0)			
Byte 24		Byte 7					
Byte 25		Byte 8	4th ITV module	Not connected (fixed value: 0)			
Byte 26		Byte 9					
Byte 27	Padding	Byte 0	Unused (fixed value: 0)				

Note:
- For details on the I/O data of the ITV module, refer to the operation manual of the ITV module.

11 Hardware Configuration

11.1 IP Address Settings

An IP address must be configured to connect to the EtherNet/IP network.
There are two methods for configuring the IP address of the EX600-BEN1 fieldbus module: using the IP address configuration software or using the LCD display.
The following describes each configuration method.

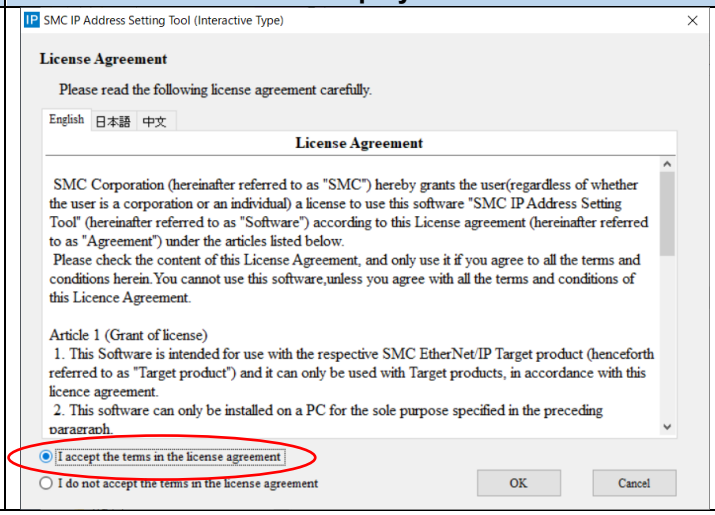
11.1.1 IP Address Configuration via the IP Address Setting Tool

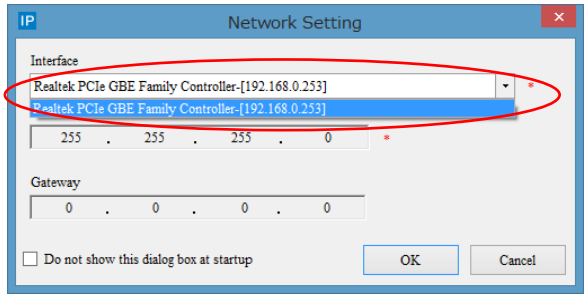
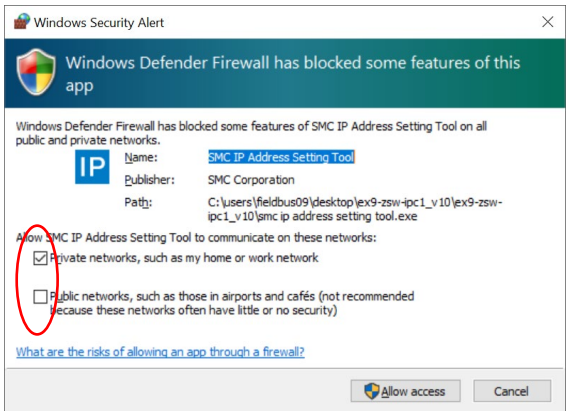
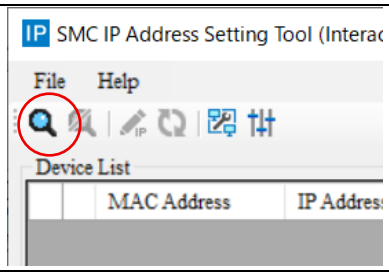
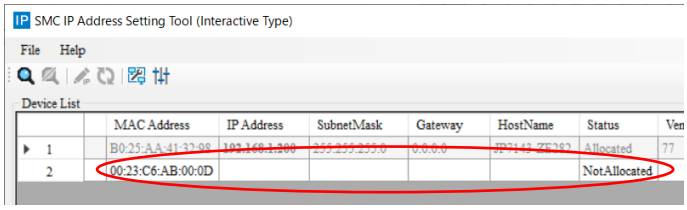
When “IP mode” is set to the default “Remote mode,” the IP address can be set using the setting software on a PC.
This section describes the procedure for setting the IP address using the IP address setting software (EX9-ZSW-IPC1), which is available for download from the SMC website (Tool Download Page).

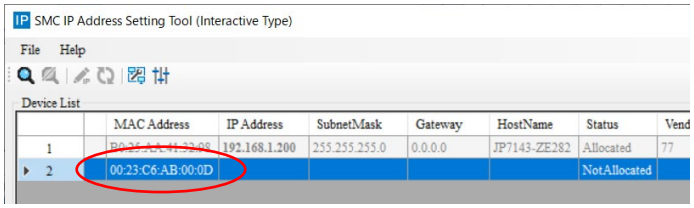
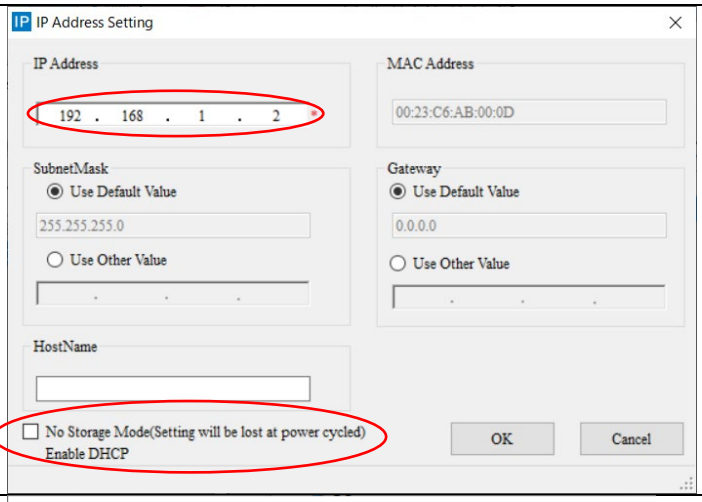
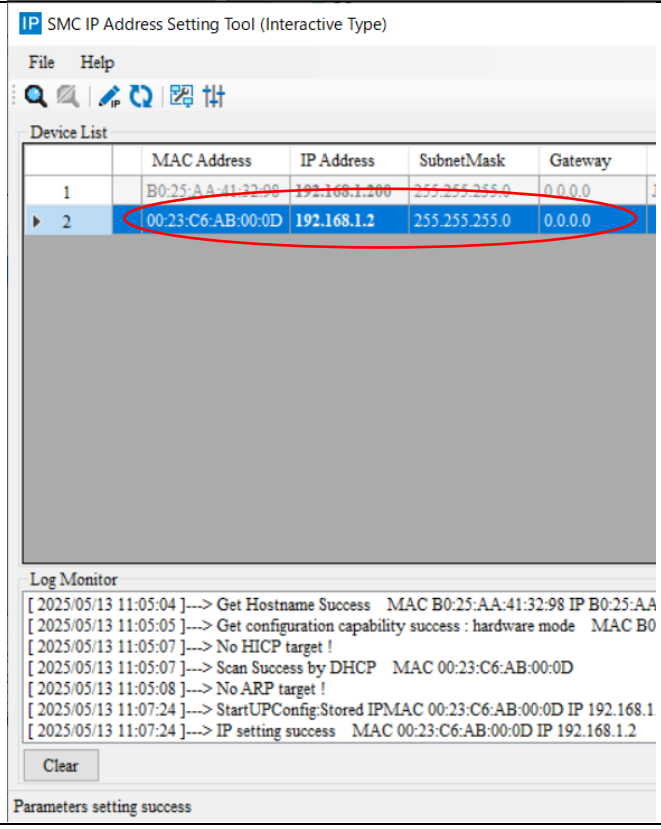
Follow steps (1) to (8) below to configure the IP address settings.

⚠ Important:

- If a Safety I/O module with a TUNID configured is connected, the IP address cannot be changed. To reconfigure the IP address of the fieldbus module, delete the TUNID by performing a Safety reset. Refer to the Safety manual of the Safety I/O module for the “Safety reset” method.
- The IP address cannot be changed while EtherNet/IP communication is established.

No.	Display	Procedure
1		Start the EX9-ZSW-IPC1. The License Agreement screen will appear. If you agree to the terms, select **I accept the terms in the license agreement** and click **OK**.

No.	Display	Procedure
2		The **Network Setting** dialog box appears. Select the network interface to which the communication cable is connected. After selecting the interface, click **OK**.
3		When starting the application for the first time, a **Windows Security Alert** related to the firewall may appear. In this case, select **Private networks** or **Public networks,** and click **Allow access**.
4		The main screen is displayed. Click to check for Ethernet devices connected to the network.
5		The scanned Ethernet devices are displayed. If the IP address has not been set, only the MAC address is displayed. The following products are grayed out if detected: - Fieldbus modules with the “IP mode” parameter set to “Hardware mode” - Products with an IP address set via switches - Products not supported by the tool

No.	Display	Procedure
6		Double-click the row displaying the MAC address found on the product label of the device to be configured (page 24).
7		The **IP address setting** dialog box appears. To retain the IP address, clear **No Storage Mode**. Enter the IP address settings, and click **OK**.
8		When configuration is complete, the IP address is displayed on the main screen. In addition, “Parameters setting success” is displayed in the lower left. If the Safety I/O module with a configured TUNID is connected, “Some parameters setting failed” may be displayed. In this case, although the IP address is configured, it cannot be retained when power is turned OFF.

11.1.2 IP Address Configuration via LCD Display

The IP address can be configured on the LCD display without using the tool. Follow steps (1) to (8) below to perform the screen operations.

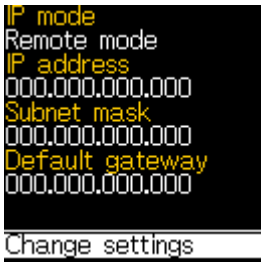
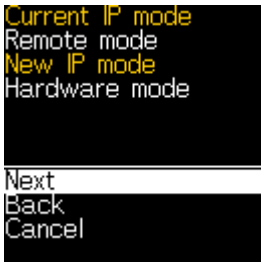
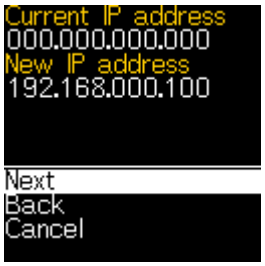
Important:

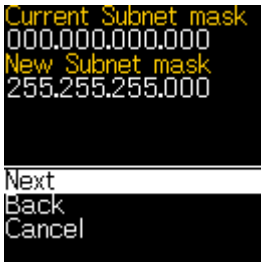
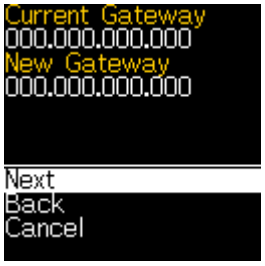
- If a Safety I/O module with a TUNID configured is connected, the IP address cannot be changed. To reconfigure the IP address of the fieldbus module, perform a Safety reset to clear the TUNID. Refer to the Safety manual of the Safety I/O module for details on performing a Safety reset.
- The IP address cannot be changed while EtherNet/IP communication is established.

Note:

- Changes to the IP address made via the LCD display are applied after a system restart.
- Do not configure invalid IP addresses, subnets, or gateways such as the following.
  If the settings are invalid, the system will operate with the factory default IP address.
  - The host part of the IP address is all 0s (network address) or all 1s (broadcast address).
  - The first octet of the IP address is 0, 127, or 224 or greater.
  - The subnet mask is a non-contiguous value (e.g., *254*.255.255.0).
  - A broadcast address or network address is specified as the gateway address.

No.	Screen Display	Procedure
1		On the TOP screen, press and hold △ + ▽ to switch screens.
2		Select **IP address setting**, and press Ⓢ.

No.	Screen Display	Procedure
3		The current values are displayed. By default, “IP mode” is set to “Remote mode,” and the “IP address,” “Subnet mask,” and “Default gateway” are set to 0.0.0.0. Press Ⓢ to begin configuration.
4		A screen operation password is required to change the IP address. Select a number using ▲/▽, and then press Ⓢ to enter the number. Default password: 0000
5		The “IP mode” parameter selection screen is displayed. Switch to “Hardware mode” using ▽ and press Ⓢ to confirm. After confirmation, select **Next** and press Ⓢ to proceed to the next parameter.
6		The “IP Address” settings screen is displayed. Set the IP address starting from the first octet. Select a value using ▲/▽, and then press Ⓢ to move to the next octet. After setting all octets, select **Next** and press Ⓢ to proceed to the next parameter.

No.	Screen Display	Procedure
7		The “Subnet mask” parameter settings screen is displayed. Set the value in the same way as for the “IP address.”
8		The “Default gateway” parameter settings screen is displayed. Set the value in the same way as for the “IP address.” Setting the “Default gateway” parameter completes and saves the entire IP address configuration.
9		Once the IP address configuration is complete, restart the system to apply the settings. Selecting **Restart now** restarts the system and applies the settings. If **Reset later** is selected, manually cycle the power to apply the settings.

11.2 PLC Configuration

To configure the EX600 system for a PLC, use the configuration software provided by the PLC manufacturer (e.g., Studio 5000 Logix Designer® from Rockwell Automation).
For detailed operating procedures, refer to the manual for the respective configuration software.
The following explanation uses screens from Studio 5000 Logix Designer® Version 37 as an example.

11.2.1 Configuration Using EDS Files

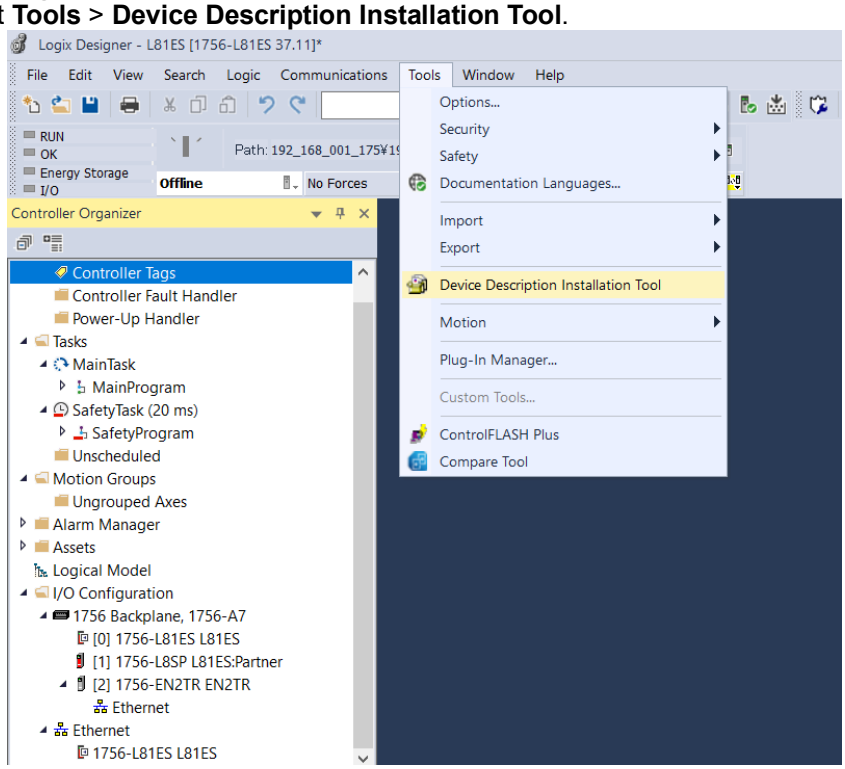
- **Obtaining the configuration file (EDS file)**

A dedicated EDS file can be used when configuring the EX600 system for a PLC.
In addition, a dedicated icon file is required to display the EX600 icon in the configuration software.
The EDS file and icon file can be downloaded from the URL below.
URL: https://www.smcworld.com/manuals/en-jp/

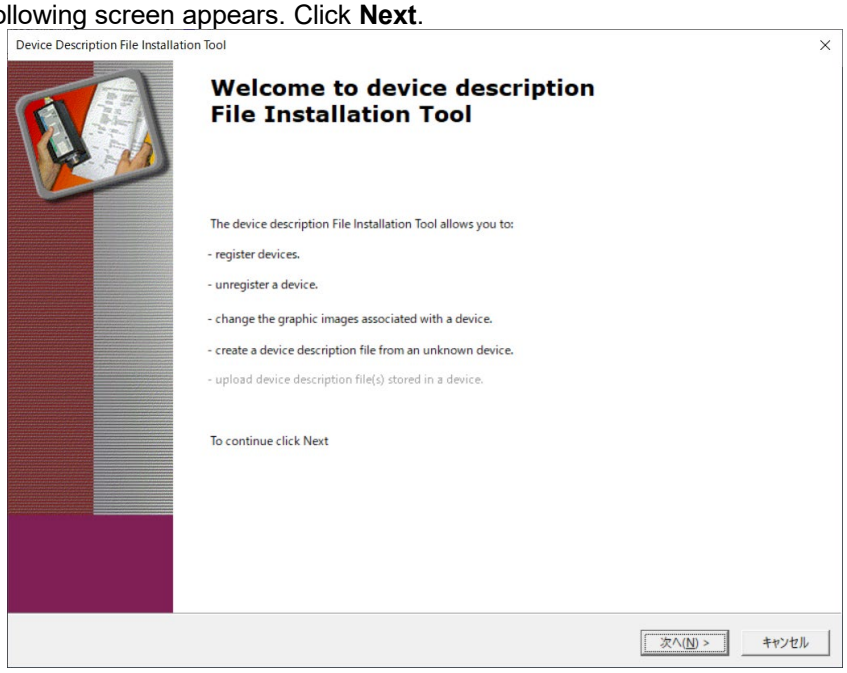
Item	File name
EDS file with safety connection	ex600_fvc_v11.eds
icon file	ex600-fvc.ico

- **Installing the EDS file**

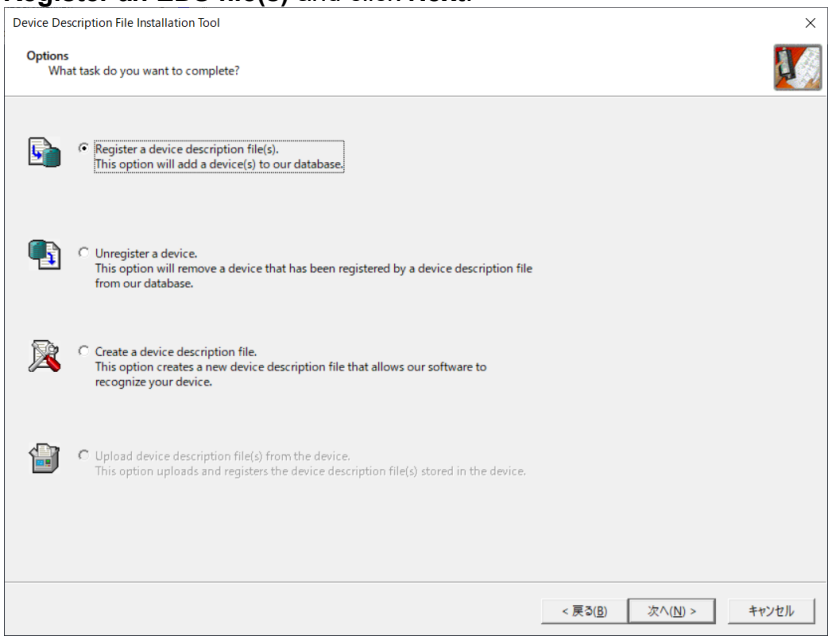
1) Select **Tools** > **Device Description Installation Tool**.



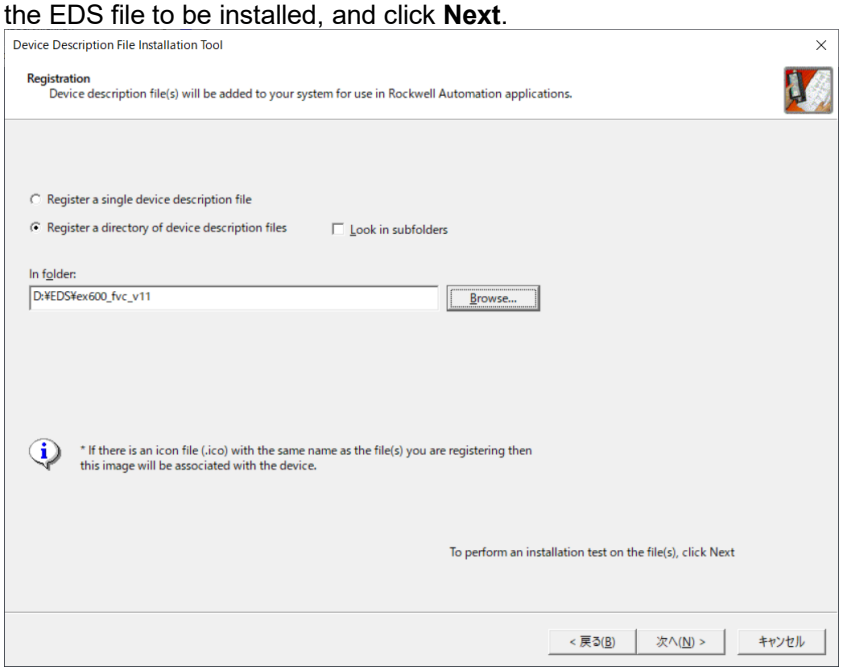
2) The following screen appears. Click **Next**.



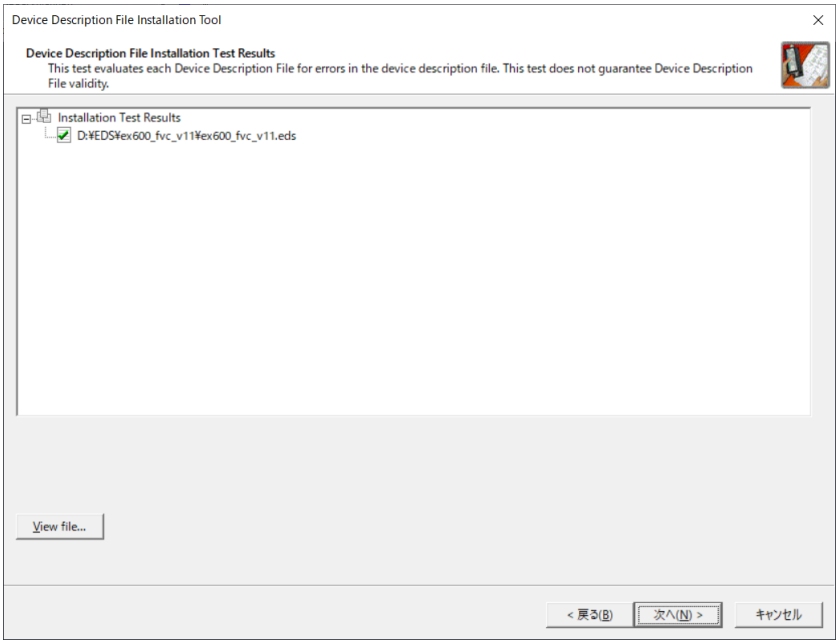
3) Select **Register an EDS file(s)** and click **Next**.



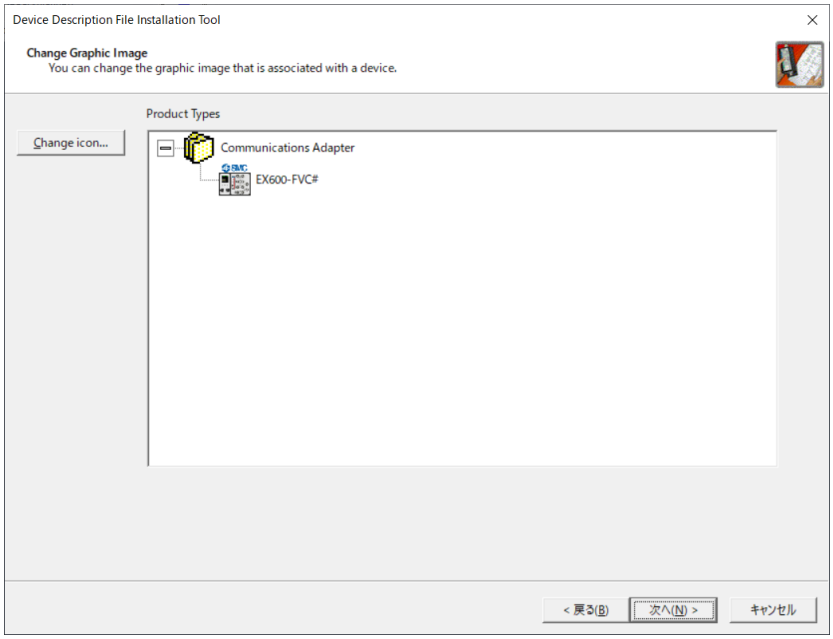
4) Select the EDS file to be installed, and click **Next**.



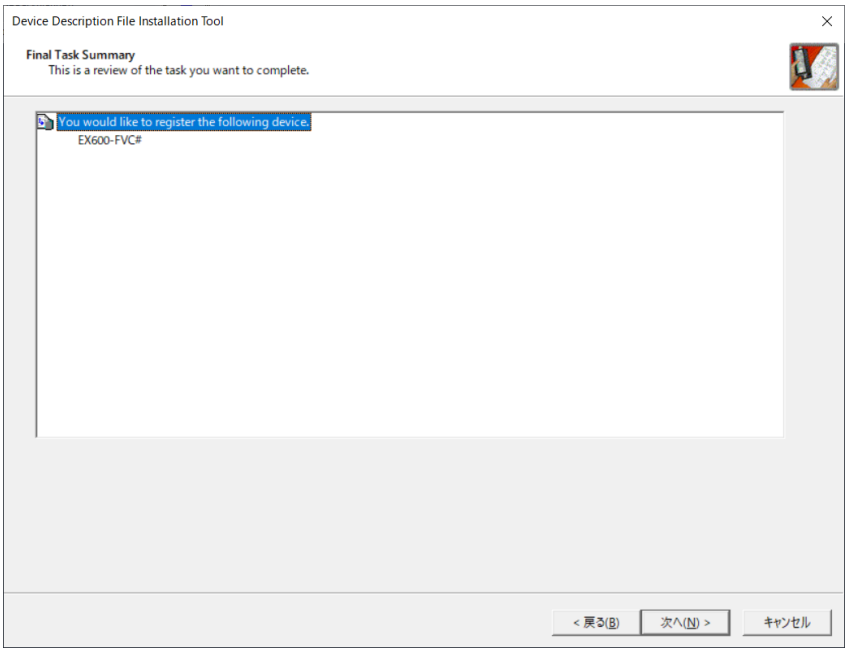
5) The installation test results are displayed. Click **Next**.



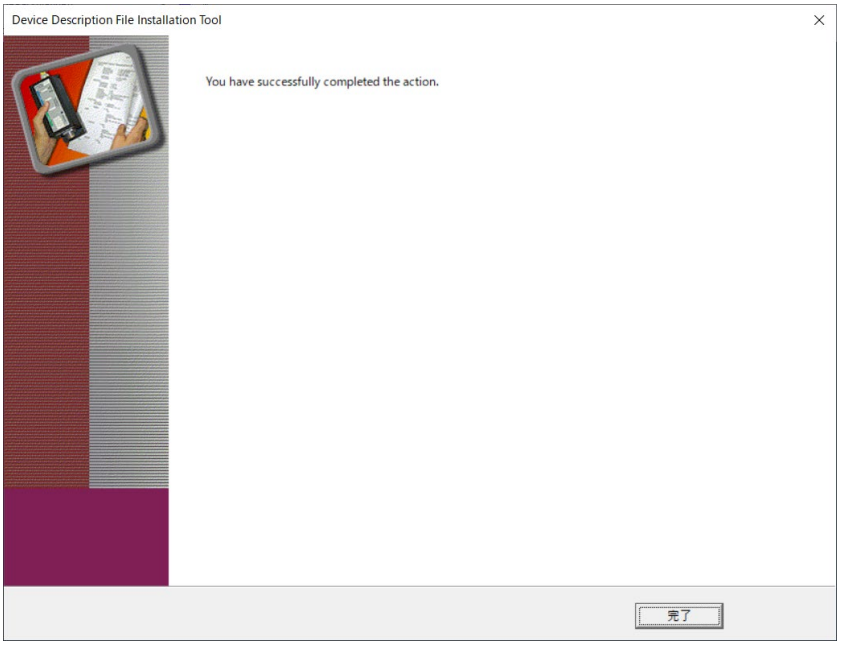
6) Confirm the icon to be used, and click Next.



7) The Final Task Summary is displayed. Click **Next**.

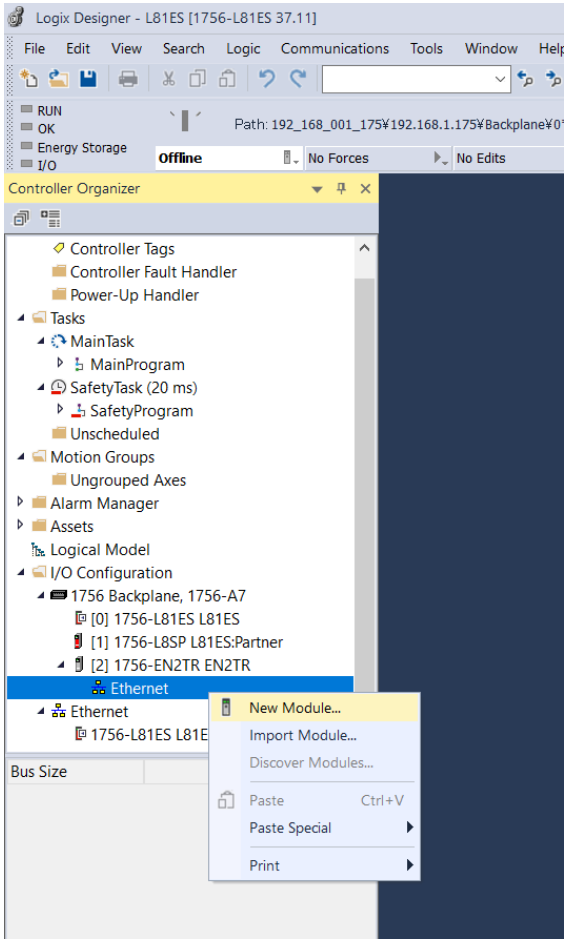


8) When the following screen appears, the EDS installation is complete. Click **Finish**.

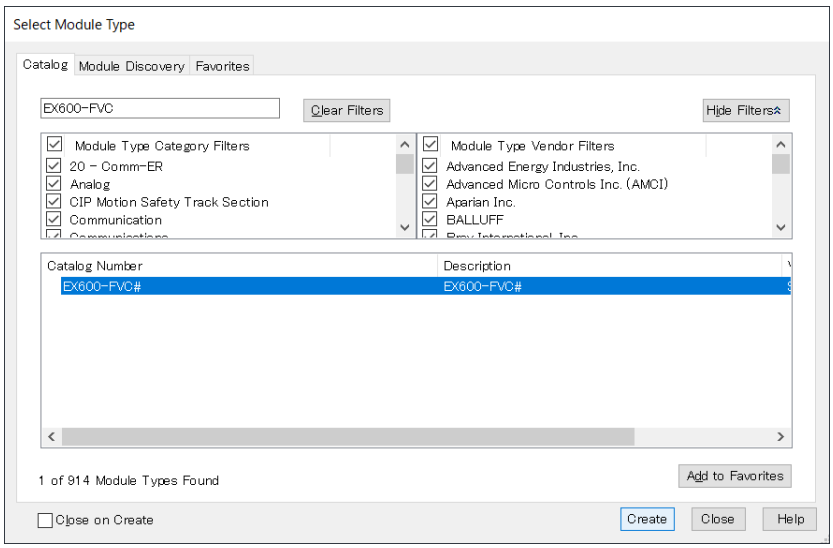


- **Module configuration**

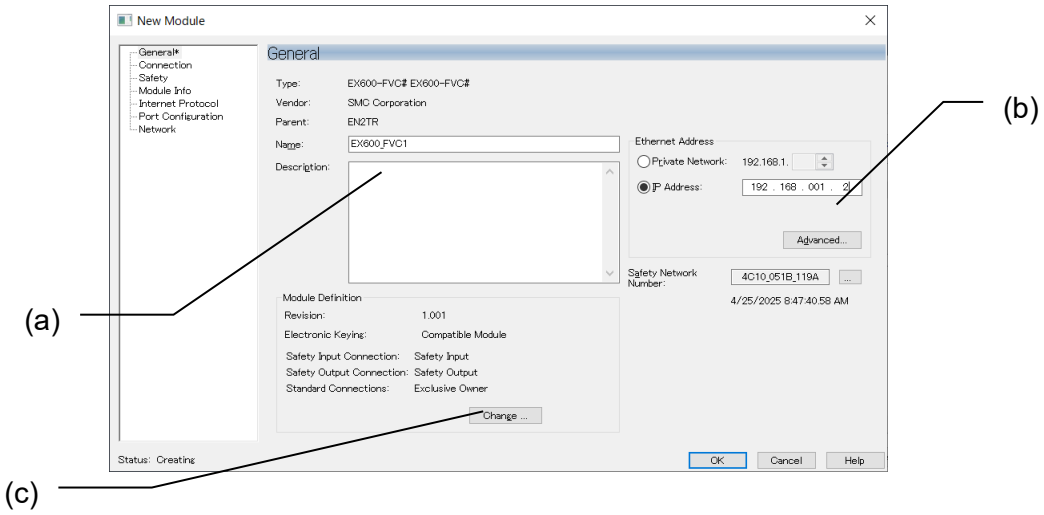
1) After registering the EDS file, right-click **Ethernet** under **I/O Configuration**, and select **New Module**.



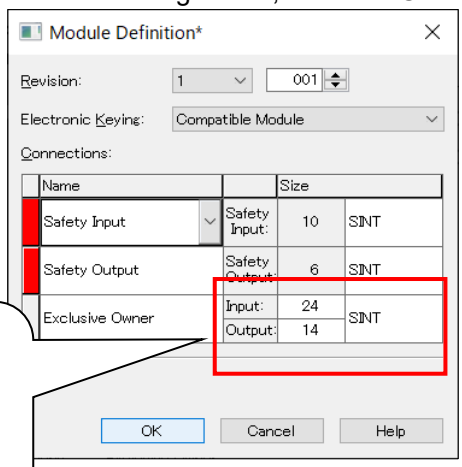
2) In the **Select Module Type** dialog box, search for **EX600-FVC#**. Select it and click **Create**.



3) The **New Module** dialog box appears. Configure the settings as follows:
(a) **Name** : Any manifold name (e.g., *EX600_FVC1*)
(b) **IP Address** : The IP address set for the Fieldbus module (e.g., *192.168.1.2*)
(c) **Module Definition** : Click **Change**.

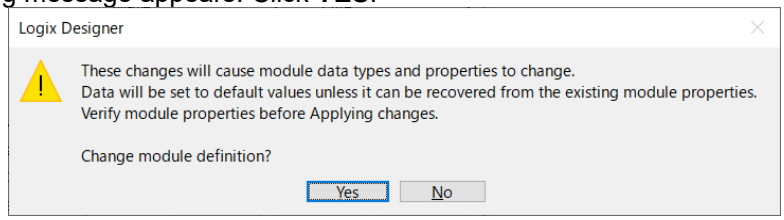


(d) In the Module Definition dialog box, set the standard input and output data sizes for **Input** and **Output** according to the manifold configuration, and click **OK**.

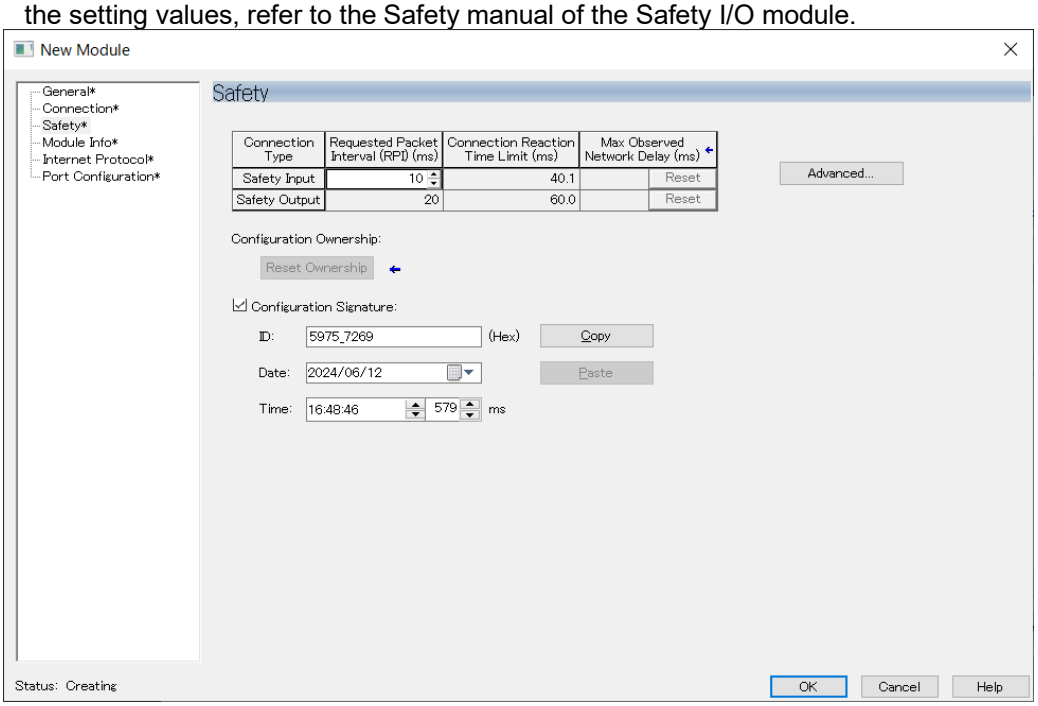


For the calculation method of standard input and output data sizes, refer to 10.1.1 I/O Data Size of Each Module (page 88).
For how to check the sizes on the actual manifold, refer to 10.1.2 Total I/O Data Size (page 89).

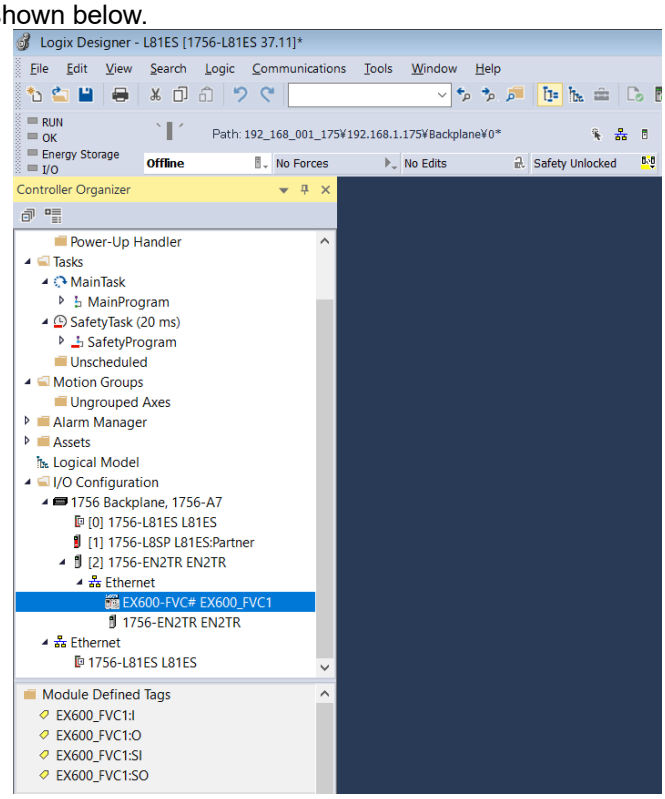
4) A warning message appears. Click **YES**.



5) After completing the Module Definition settings, go to the **Safety** menu on the **New Module** dialog box and enter the **Configuration Signature** of the Safety I/O module.
For details on the **Configuration Signature**, **ID** (SCCRC), **Date** and **Time** (SCTS) as well as the setting values, refer to the Safety manual of the Safety I/O module.

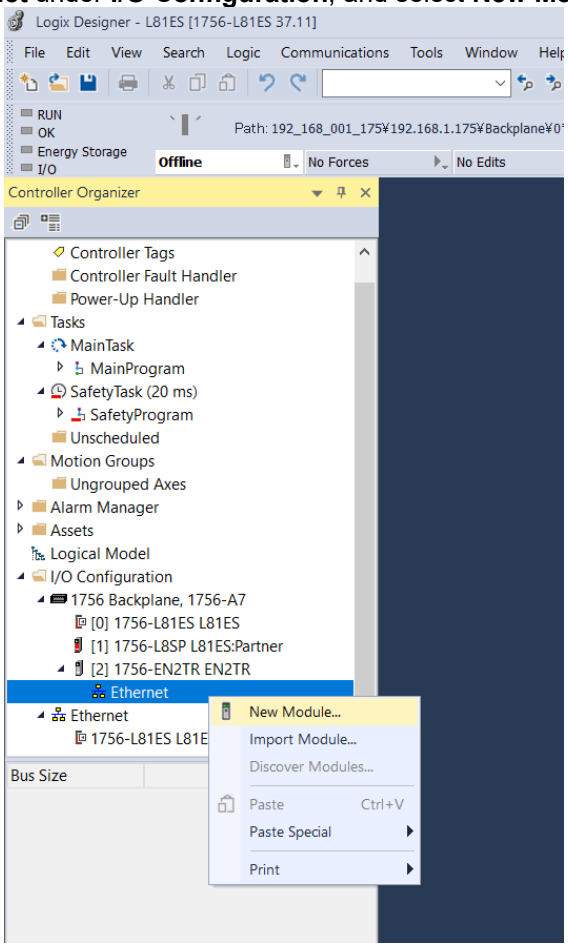


6) After completing all settings, click **OK** to close the dialog box. The device settings will be reflected as shown below.

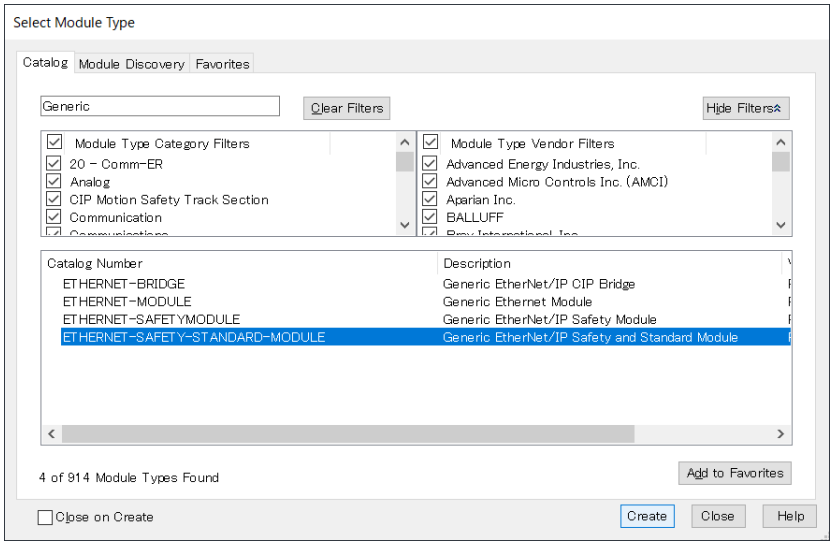


11.2.2 Configuration Using the Generic Module

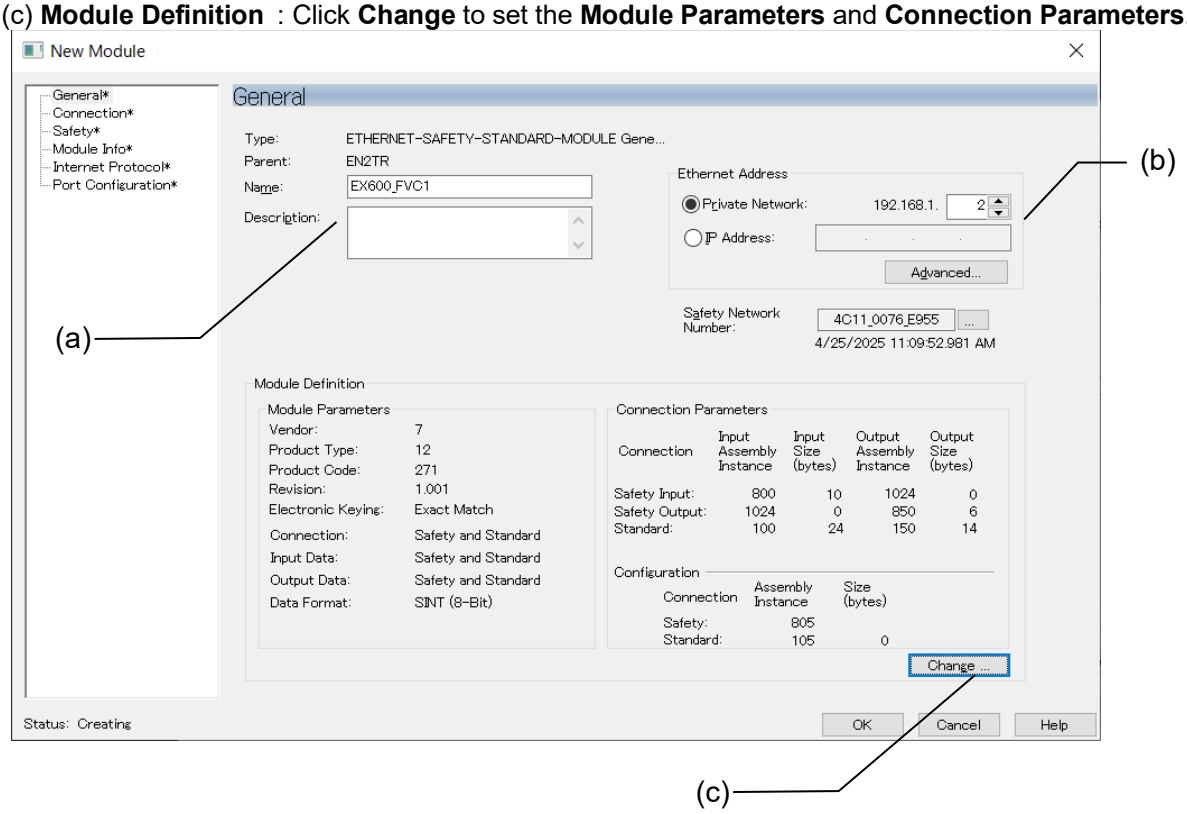
1) Right-click **Ethernet** under **I/O Configuration**, and select **New Module**.



2) In the **Select Module Type** dialog box, search for **Generic EtherNet/IP Safety and Standard Module**. Select it and click **Create**.

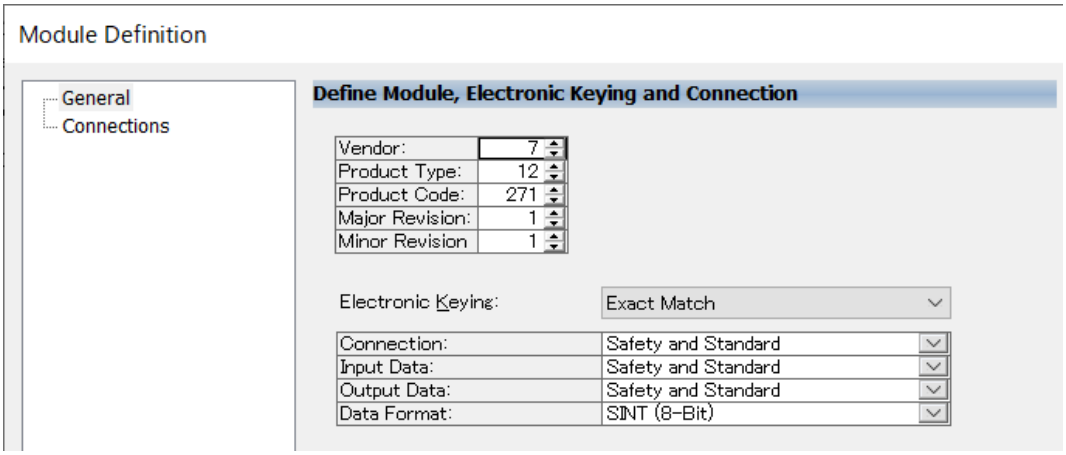


3) The **New Module** dialog box appears. Configure the settings on the **General** menu as follows:
(a) **Name** : Any manifold name (e.g., *EX600_FVC1*)
(b) **IP Address** : The IP address set for the Fieldbus module (e.g., *192.168.1.2*)
(c) **Module Definition** : Click **Change** to set the **Module Parameters** and **Connection Parameters**.



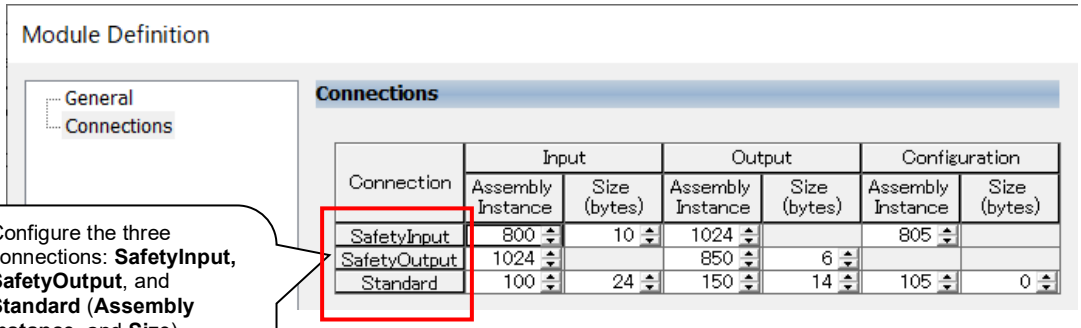
4) Configure the information in the **Module Definition** dialog box. Use the **General** menu to define the communication parameters, and the **Connections** menu to configure the CIP connection.

- **General menu**



Communication parameter name	Set value	Remarks
Vendor	7	The communication parameter values to be set for each item are specified in the Safety manual of the Safety I/O module. Refer to the Safety manual for details.
Product Type	12	
Product Code	271	
Major Revision	1	
Minor Revision	1	
Connection	Safety and Standard	The EX600 system requires both a standard connection and a safety connection. It is also possible to use separate PLCs for the standard connection and the safety connection.
Input Data	Safety and Standard	
Output Data	Safety and Standard	
Data Format	SINT(8-Bit)	-

- **Connections menu**



Configure the three connections: **SafetyInput, SafetyOutput**, and **Standard** (**Assembly Instance,** and **Size**). Refer to the table below for the **Assembly Instance** values.

The **Size** for **SafetyInput** or **SafetyOutput** is a fixed value determined by the corresponding safety input or safety output data size of the Safety I/O module.

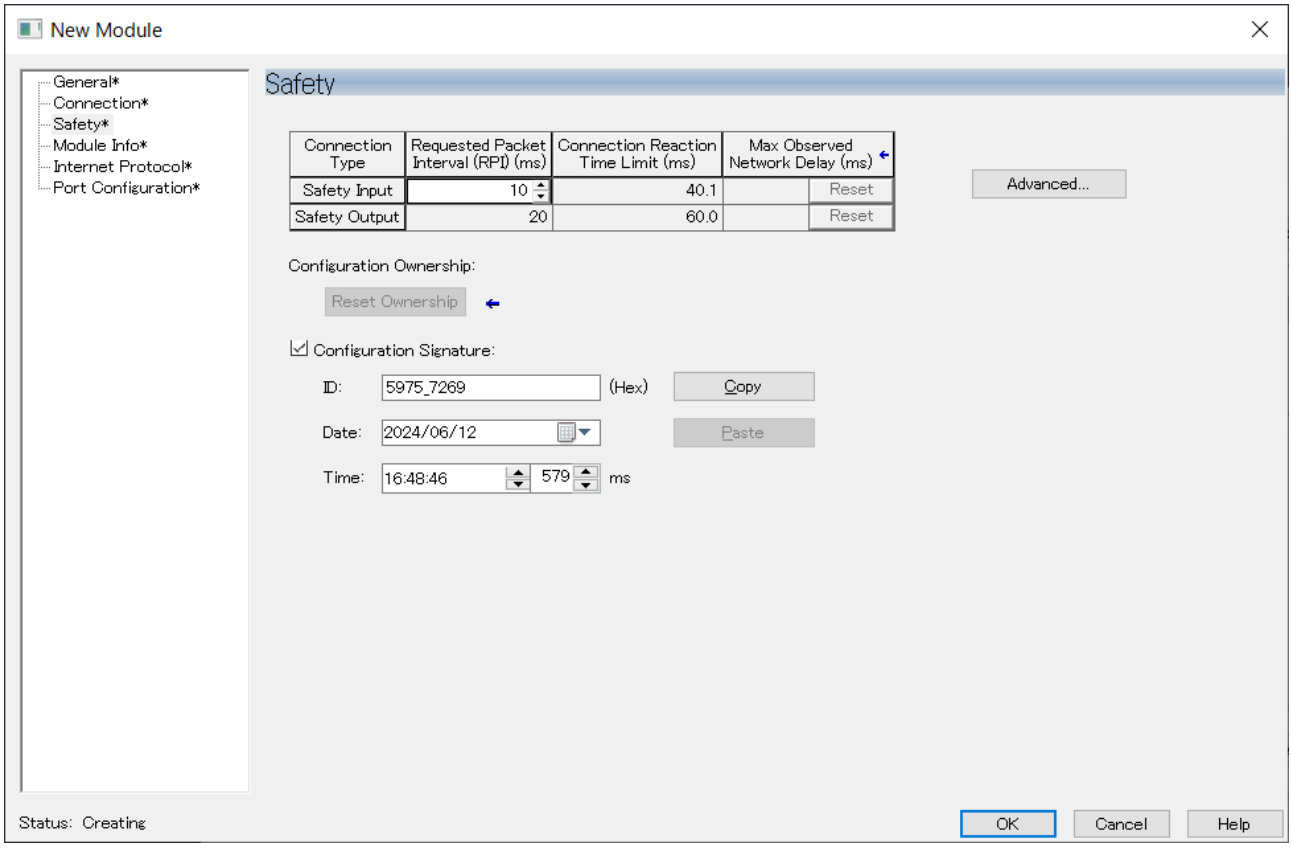
Connection	Input		Output		Configuration	
	Assembly Instance	Size (bytes)	Assembly Instance	Size (bytes)	Assembly Instance	Size (bytes)
SafetyInput	800	10	1024	-	805	-
SafetyOutput	1024	-	850	6	-	-
Standard	100	*	150	*	105	*

For the **Size** of **Standard**, enter the standard input or standard output data size determined by the manifold configuration.
For calculation method, refer to 10.1.1 I/O Data Size of Each Module (page 88).
For how to check the sizes on the actual manifold, refer to 10.1.2 Total I/O Data Size (page 89).

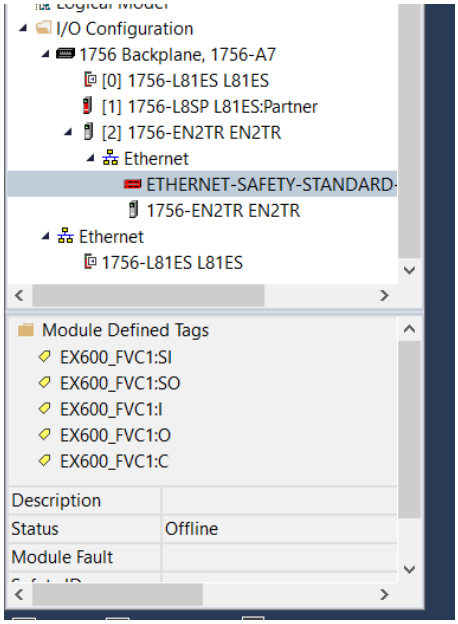
Set the size to *0* if the configuration assembly is not used.
If there are modules or IO-Link devices for which parameters need to be changed, set an appropriate size based on the module part number and the number of parameters.
For details on the configuration assembly, refer to 12 Parameter Settings via Configuration Assemblies (page 121).

Note:
- Depending on the PLC, the maximum configurable sizes for Input, Output, and Configuration may be smaller than the specifications of the Fieldbus module. Check the specifications of the PLC you are using.

5) After completing the Module Definition settings, go to the **New Module** dialog box and enter the **Configuration Signature** of the Safety I/O module.
For details on the **Configuration Signature**, **ID** (SCCRC), **Date** and **Time** (SCTS) as well as their setting values, refer to the Safety manual of the Safety I/O module.



6) After completing all settings, click **OK** to close the dialog box. The device settings will be reflected as shown below.



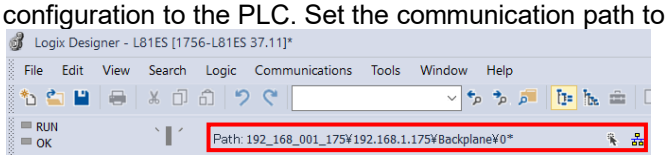
11.3 TUNID Settings

After completing the PLC configuration, the TUNID must be set in the internal memory of the Safety I/O module to establish communication. The TUNID is generated by combining the Safety Network Number and the IP address, and it is set using the configuration tool.
For details on the TUNID, Safety Network Number, and how to read and initialize the values set in the Safety I/O module, refer to the Safety manual of the Safety I/O module.

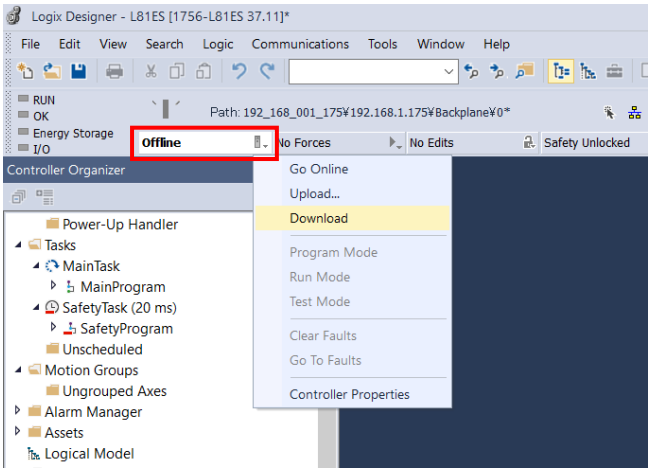
The following describes the procedure for configuring the TUNID using Studio 5000 Logix Designer® Version 37 from Rockwell Automation as an example.

1) Connect the EX600 manifold (with the IP address configured) and the PLC using a communication cable, and then turn on the power in advance.

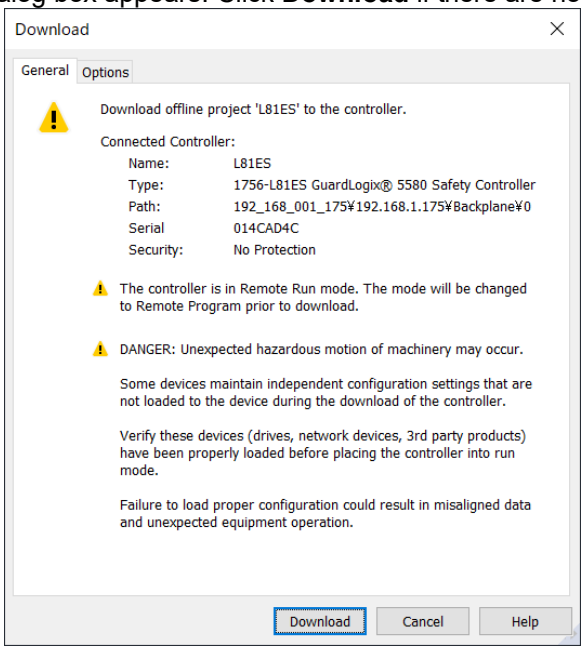
2) Download the configuration to the PLC. Set the communication path to the PLC in **Path**.



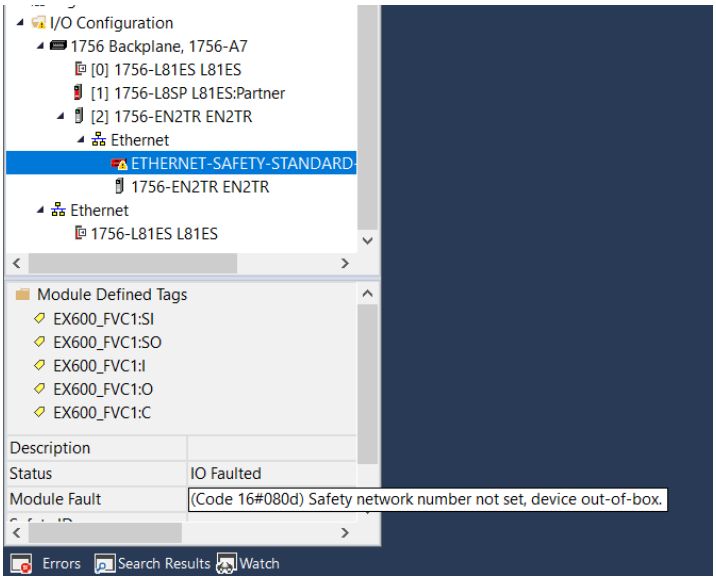
3) Select **Download** from the Controller Status Menu.



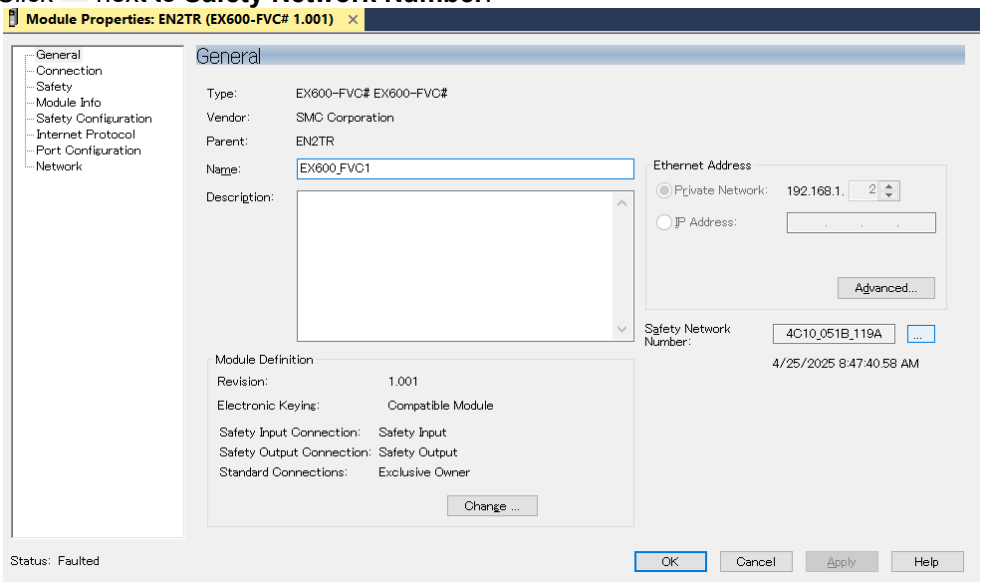
4) The Download dialog box appears. Click **Download** if there are no issues.



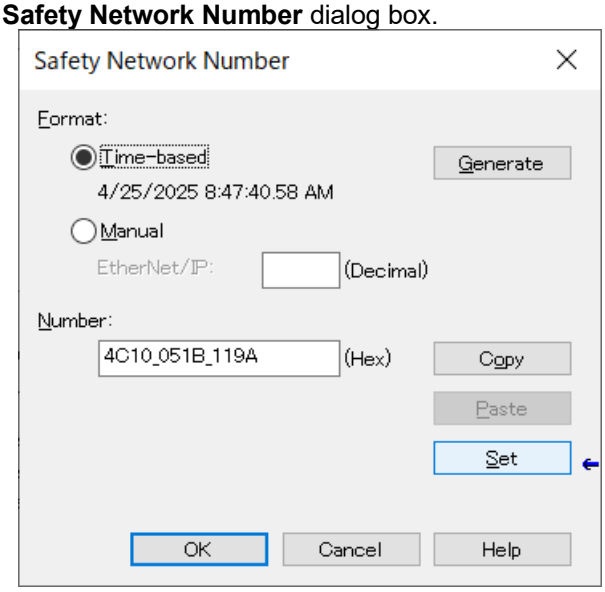
5) After the download is complete, change the controller status to Online. To check the status of the EX600 manifold, select the EX600 manifold and confirm that “(Code 16#080d) Safety network number not set, device out-of-box.” is displayed. Then, double-click the EX600 manifold to display the properties.



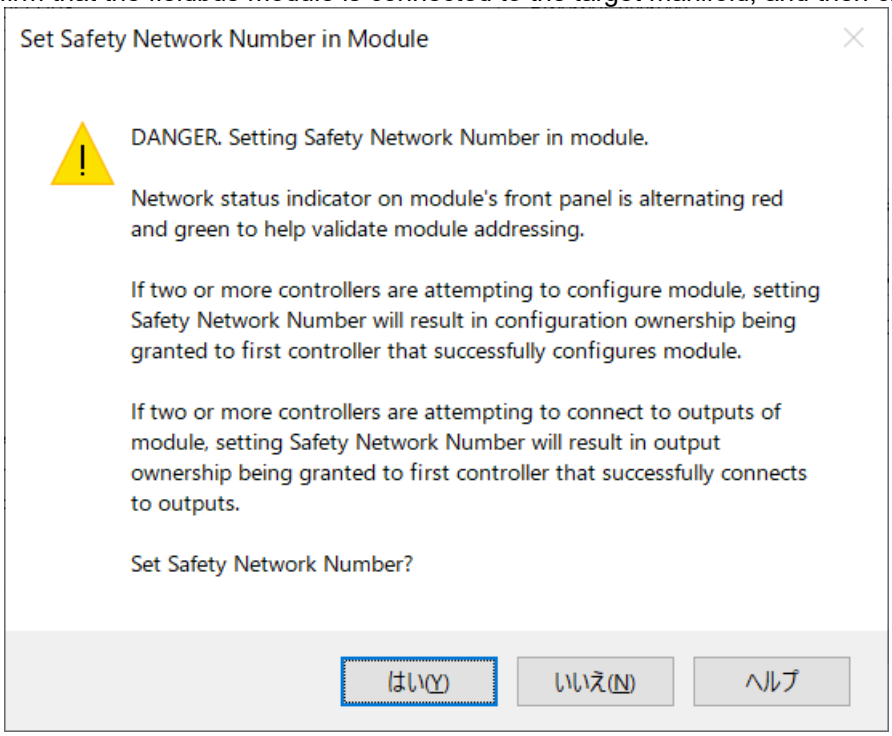
6) Click … next to **Safety Network Number**.



7) Click **Set** in the **Safety Network Number** dialog box.



8) A confirmation dialog box appears, and the NS indicator on the fieldbus module (EX600-BEN1) displays Red/Green flashing alternately (4 Hz).
Confirm that the fieldbus module is connected to the target manifold, and then click **Yes**.



9) The TUNID is set in the Safety I/O module, and the NS indicator on the Fieldbus module (EX600-BEN1) stops Red/Green flashing alternately.

11.4 Safety Parameter Settings via Safety Output Process Data

Setting the TUNID starts the transmission and reception of safety input and safety output process data, but the Safety I/O module remains in the safe state and does not start operating. To activate the Safety I/O module, the safety parameters must be set via the safety output process data. Refer to the Safety manual of the Safety I/O module to configure the safety parameters.
Even if the Safety I/O module is in the safe state, it is possible to control D-side modules and ITV modules.

11.5 Module Replacement

The following describes precautions when replacing a single module, such as when a module fails or when swapping a module from unstable equipment with one from stable equipment to check operation.
Be sure to turn OFF the power supply before replacing the module. Also, refer to page 15 for assembly methods and page 18 for installation methods. For replacement methods of the ITV and valve modules, refer to the specific operation manuals.

- **D-side Module**

If there is a possibility that the configured parameters have been changed, record the parameters before replacement. After replacing the module, reconfigure the recorded parameters.

- **Fieldbus Module**

Record the parameters such as the configured IP address and communication port settings. After replacing the module, reconfigure the recorded parameters.
If a Safety I/O module with a configured TUNID is connected, some parameter changes are restricted. Therefore, the Safety I/O module must be initialized by performing a *Safety reset*.
For the Safety reset method, refer to the Safety manual of the Safety I/O module.

- **Safety I/O Module**

The TUNID must be reconfigured after replacement. If replacing with a module that already has a TUNID configured, the Safety I/O module must be initialized by performing a *Safety reset*.
For the Safety reset method, refer to the Safety manual of the Safety I/O module.
For the TUNID configuration method, refer to 11.3 TUNID Settings (page 117) in Hardware Configuration.

12 Parameter Settings via Configuration Assemblies

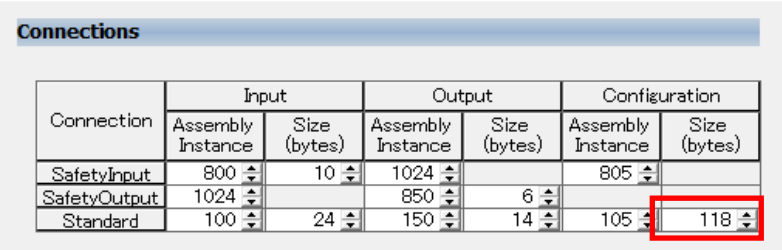
By configuring the Configuration connection in addition to the Input and Output connections during hardware configuration and entering parameter values on the PLC, parameters can be sent from the PLC to the EtherNet/IP device upon establishing EtherNet/IP communication.

Note:
- Some types of PLCs may not support this function.
- The maximum data size that the Fieldbus module (EX600-BEN1) can receive via the configuration assembly is 456 bytes. Depending on the PLC, the maximum configurable size may be smaller than 456 bytes. Check the specifications of the PLC you are using.
- Some parameters cannot be set via the configuration assembly. Set such parameters using Explicit Messages (page 132) or LCD operation (page 30).
- Safety parameters of the Safety I/O module are set using safety output data. They are not configured via the configuration assembly.

12.1 Configuration Assembly Setting Example

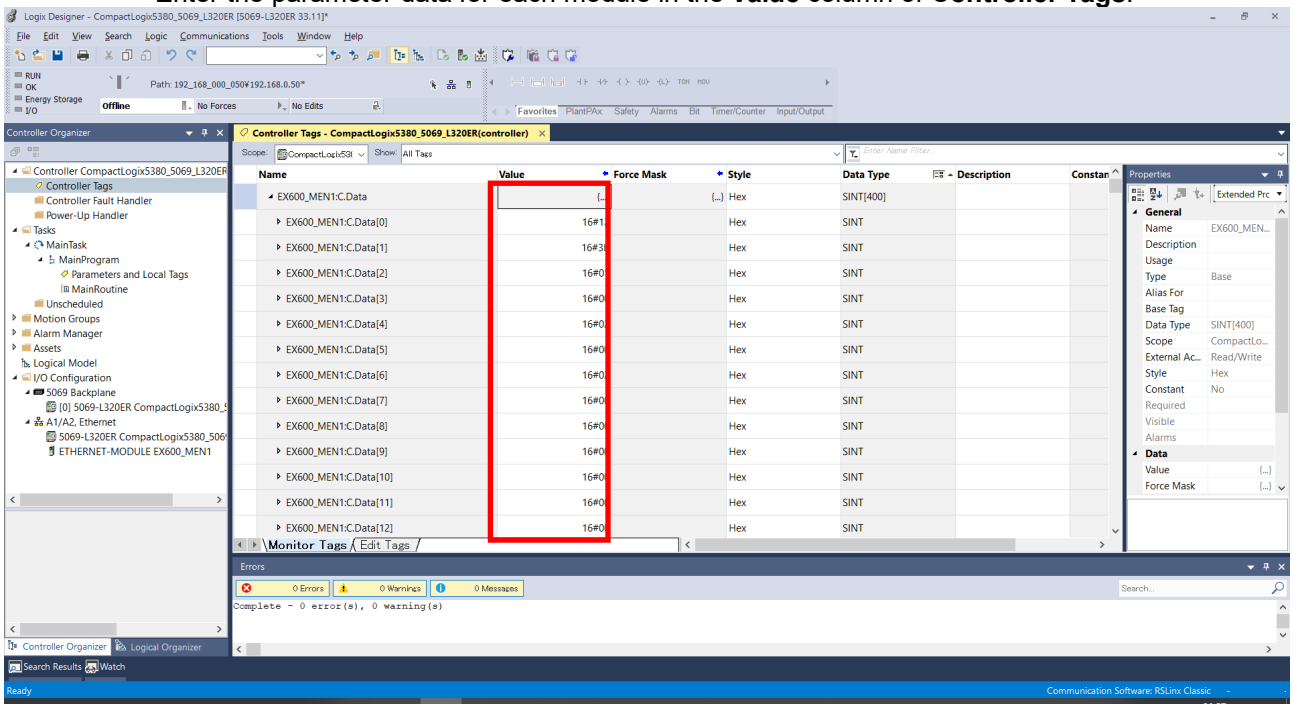
The following describes the procedure for configuring the configuration assembly, using screens from Studio 5000 Logix Designer® Version 37 from Rockwell Automation as an example.

1) Change the **Size** of **Configuration** set in 11 Hardware Configuration (page 96). The **Size** represents the size of the parameters to be set in the PLC. For the parameter size calculation method, refer to 12.2 Configuration Data Size (page 123).
After setting the **Size**, download the configuration to the PLC.



2) Create the parameter data to be set in the PLC. For details on parameter data for each module, refer to 12.2.2 Configuration Data List by Module Type (page 124).

3) Set the created parameter data in the PLC.
Enter the parameter data for each module in the **Value** column of **Controller Tags**.



4) If all data is entered correctly, the set parameters will be reflected in the EX600 system upon establishing EtherNet/IP communication.

12.2 Configuration Data Size

Each module has configuration assembly data in the data format shown in the table below. The configuration assembly data consists of a fixed 4 bytes and the parameter bytes of the module, and the size is determined for each module. Calculate the total data size of the modules for which parameters are to be set, and set the total value in the PLC.

For the list of sizes for each module, refer to 12.2.1 ID and Data Size List (page 123).
For details on the data content, refer to 12.2.2 Configuration Data List by Module Type (page 124).

Byte	Name	Contents
0	Module No.	Specifies the Module No. of the target module. Perform the following calculation before entering the value. 0x80 + Module No. For details on the Module No., refer to 2.2 Designation of Module Number and Channel Number (page 13).
1	Parameter type designation	Enter the following value to specify the target for parameter setting. 0x01: EX600 module parameters 0x02: ITV module parameters 0x03: IO-Link device parameters
2...3	ID	Enter the ID value corresponding to the part number of the target module.
4 and later	Parameter setting value	Specifies all parameter setting values of the module.

12.2.1 ID and Data Size List

Module Type	Module part number	Parameter type	ID	Data size [byte]
Fieldbus module	EX600-BEN1	0x01	0x00E0	5
Digital input	EX600-DXPC-A	0x01	0x0003	5
	EX600-DXPD-A	0x01	0x0005	5
Digital output	EX600-DYPB-A	0x01	0x0008	7
IO-Link master module	EX600-LAB1-A	0x01	0x003B	59
		0x03 (IO-Link device)	0x003B	Fixed value 6 bytes + IO-Link device parameters
	EX600-LBB1-A	0x01	0x003C	59
		0x03 (IO-Link device)	0x003C	Fixed value 6 bytes + IO-Link device parameters
Safety I/O module	EX600-FVC2/4	0x02 (ITV)	0x6700	16

Note:
- There are no parameters configurable via the configuration assembly for the Safety I/O module EX600-FVC1/3.

12.2.2 Configuration Data List by Module Type

- **Configuration data for EX600-BEN1**

Byte	Bit	Parameter	Setting Value
0	-	Module No.	0x80 (Fixed to Module No. 0)
1	-	Parameter type	0x01
2	-	ID (LSB)	0xE0
3	-	ID (MSB)	0x00
Module parameter			
4	0...4	Reserved	-
	5	Hold all outputs	0: Depends on modules 1: Hold all modules
	6	Reserved	-
	7	US1 monitoring	0: Disable 1: Enable

- **Configuration data for EX600-DXPC-A and EX600-DXPD-A**

Byte	Bit	Parameter	Setting Value
0	-	Module No.	0x80 + 0x01...0x09
1	-	Parameter type	0x01
2	-	ID (LSB)	EX600-DXPC-A: 0x03 EX600-DXPD-A: 0x05
3	-	ID (MSB)	0x00
Module parameter			
4	0...3	Reserved	-
	4	Input filtering time	0: 0.1 ms 1: 1 ms 2: 10 ms 3: 20 ms
	5		
	6	Input extension time	0: 1 ms 1: 15 ms 2: 100 ms 3: 200 ms
	7		

- **Configuration data for EX600-DYPB-A**

Byte	Bit	Parameter	Setting Value
0	-	Module No.	0x80 + 0x01...0x09
1	-	Parameter type	0x01
2	-	ID (LSB)	0x08
3	-	ID (MSB)	0x00
Module parameter			
4	-	Reserved	-
5	1...0	DO Fault/Idle mode	0: Clear 1: Hold 2: Force ON
	2...7	Reserved	-
Channel parameter			
6	0	(Out 0) Open circuit	0: Disable 1: Enable
	:	:	:
	7	(Out 7) Open circuit	0: Disable 1: Enable

- **Configuration data for EX600-LAB1 / EX600-LBB1**

Byte	Bit	Parameter	Setting Value
0	-	Module No.	0x80 + 0x01...0x09
1	-	Parameter type	0x01
2		ID (LSB)	EX600-LAB1-A: 0x3B EX600-LBB1-A: 0x3C
3	-	ID (MSB)	0x00
Module parameter			
4	-	Reserved	-
5	0...1	DO Fault/Idle mode	0: Clear 1: Hold 2: Force ON
	2...3	Reserved	-
	4...5	IO-Link Fault/Idle	0: Clear/PD Out valid 1: Hold 2: Clear/PD Out invalid
	6...7	Reserved	-

Port (Channel) parameter			
Port 1			
6	0...1	Byte swap	0: No Swap 1: Swap 16 bit 2: Swap 32 bit 3: Swap All
	2...6	Reserved	-
	7	L+ control	0: L+ ON 1: L+ OFF
7	-	Port mode	0: Deactivated 1: IO-Link Manual 2: IO-Link Autostart 3: Digital input C/Q 4: Digital output C/Q
8	-	Validation & Backup	0: No Device Check 1: Type compatible Device V1.0 2: Type compatible Device V1.1 3: Type compatible Device V1.1, Backup + Restore 4: Type compatible Device V1.1, Restore
9	-	Reserved	-
10	-	Cycle time	0 : As fast as possible 1...3: 0.4 ms 4...63: 0.4 to 6.3 ms in 0.1 ms increments 64...127: 6.4 to 31.6 ms in 0.4 ms increments 128...191: 32 to 132.8 ms in 1.6 ms increments 192...255: 132.8 ms
11	-	VendorID [0] (MSB)	0x0000 ... 0xFFFF
12	-	VendorID [1] (LSB)	
13	-	Reserved	0x000000 ... 0xFFFFFF
14	-	DeviceID [0] (MSB)	
15	-	DeviceID [1]	
16	-	DeviceID [2] (LSB)	
Port 2			
17...27	-	See Port 1.	
Port 3			
28...38	-	See Port 1.	
Port 4			
39...49	-	See Port 1.	-

- **IO-Link device configuration data**

Byte	Bit	Parameter	Setting Value
0	-	Module No.	0x80 + 0x01...0x09
1	-	Parameter type	0x03
2	-	ID (LSB)	EX600-LAB1-A: 0x3B EX600-LBB1-A: 0x3C
3	-	ID (MSB)	0x00
4	-	Target IO-Link port	1...4
5	-	The total number of parameters to be sent	N
IO-Link device parameters			
Parameter 1			
6	-	Data size n*)	up to 232
7	-	Index [0] (MSB)	Set the Index, Subindex, and data for the parameters to be changed, referring to the operation manual of the IO-Link device.
8	-	Index [1] (LSB)	
9	-	Subindex	
9 + 1	-	Data byte 1 (MSB)	
9 + 2	-	Data byte 2	
:	:	:	
9 + n	-	Data byte n*) (LSB)	
Add the subsequent data according to the setting value N of “The total number of parameters to be sent.”			
Parameter 2			
9 + n + 1	-	Data size m*)	up to 232
9 + n + 2	-	Index [0] (MSB)	Set the Index, Subindex, and data for the parameters to be changed, referring to the operation manual of the IO-Link device.
9 + n + 3	-	Index [1] (LSB)	
9 + n + 4	-	Subindex	
9 + n + 4 + 1	-	Data byte 1 (MSB)	
9 + n + 4 + 2	-	Data byte 2	
:	:	:	
9 + n + 4 + m	-	Data byte m*) (LSB)	
Parameter 3			
:	:	:	:
Parameter N			
:	:	:	:

*) *n* and *m* are the data lengths of the parameters. The data length is determined by the parameter specifications of the IO-Link device.

- **ITV module configuration data**

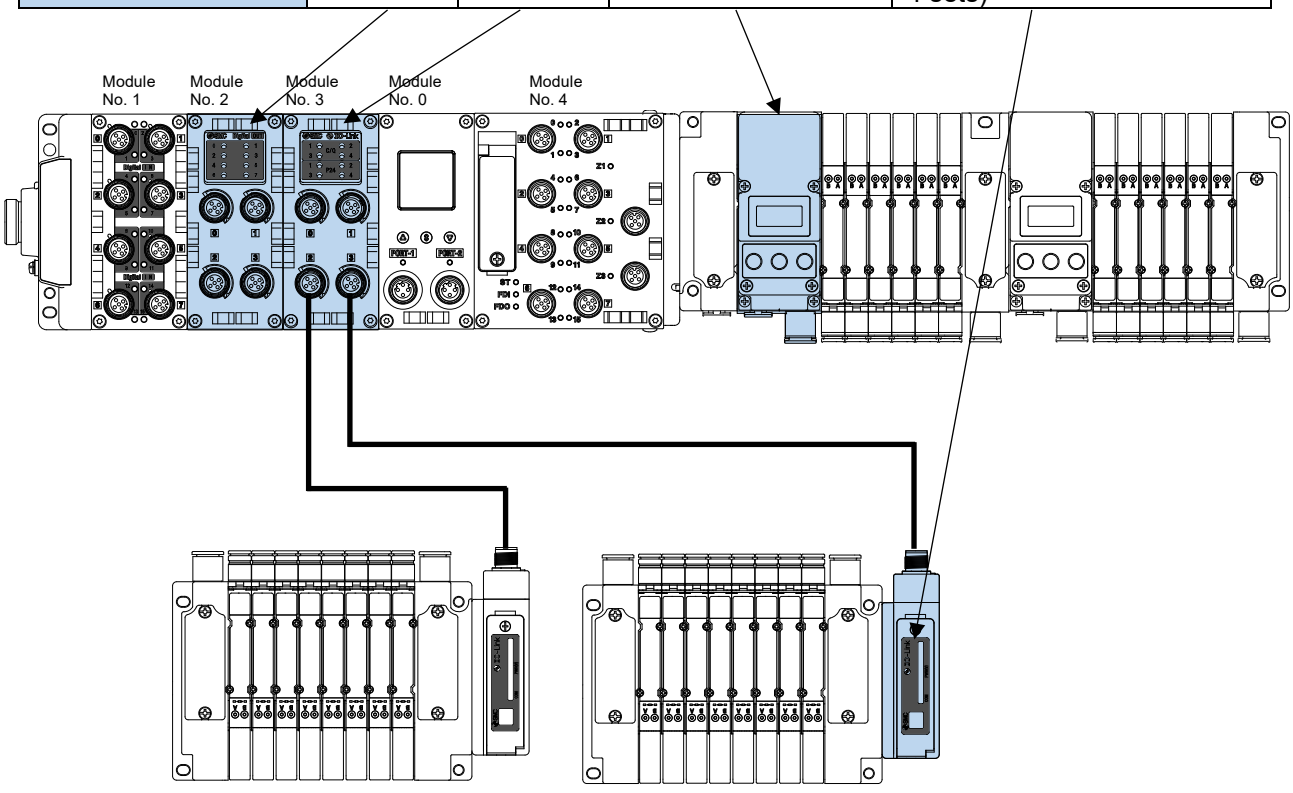
Byte	Bit	Parameter	Setting Value
0	-	Module No.	0x80 + 0x01...0x10
1	-	Parameter type	0x02
2		ID (LSB)	0x00
3	-	ID (MSB)	0x67
4	-	Target ITV module position	0: 1st station (ch.128) : 3: 4th station (ch.131)
Parameter for ITV module			
5	-	Hold/Clear	0: Pressure Clear 1: Pressure Hold
6	-	Gain	0...15
7	-	Sensitivity	0...7
8	-	Minimum pressure [0] (MSB)	0x0000...0x0E66: 0 to 3686
9	-	Minimum pressure [1] (LSB)	
10	-	Maximum pressure [0] (MSB)	0x019A...0x1332: 410 to 4914
11	-	Maximum pressure [1] (LSB)	
12	-	Notification setting [0] (MSB)	0x00000000: Notification disabled 0x00000001: 1 hour : 0xFFFFFFFF: 4,294,967,295 hours
13	-	Notification setting [1]	
14	-	Notification setting [2]	
15	-	Notification setting [3] (LSB)	

12.2.3 Configuration Assembly Data Creation Example

The following shows an example of data creation when setting parameters for equipment with the configuration below.

- **Parameter Setting Target**

Module No.	Module 2	Module 3	Module 4 Position: 1st station	Module 3 Connection port: Port 4
Module part number	EX600-DYPB-A	EX600-LBB1-A	EX600-FVC2	EX600-LBB1-A
Parameter type	1	1	2	3
ID	0x0008	0x003C	0x6700	0x003C
Configuration data size	7 bytes	50 bytes	16 bytes	26 bytes (Fixed value 6 bytes + IO-Link device parameters 5 bytes × 4 sets)



IO-Link device part number: EX260-SIL1
Parameter name: “Output Fault Action”
Index: 0x0054
Subindex: 1, 2, 3, 4
Data length: 1 byte

- **Creating parameter data**

Create the configuration data shown in the table below by referring to 12.2.2 Configuration Data List by Module Type (page 124).
As shown in the table below, the configuration data size is 99 bytes.

Parameter Setting target	Byte	Parameter	Setting Value	Remarks
EX600-DYPB-A Module No. 2 7 bytes	0	Module No.	0x82	Case where “DO Fault/Idle mode” is set to “Hold” and “Open circuit” for all channels is set to “Enable.” For details on each parameter, refer to page 125.
	1	Parameter type	0x01	
	2...3	ID	0x0008	
	4	Module parameter (Reserved)	0x00	
	5	Module parameter (DO Fault/Idle mode)	0x01	
	6	Channel parameter (Open circuit)	0xFF	
EX600-LBB1-A Module No. 3 50 bytes	7	Module No.	0x83	For details on the Module parameter and Port# parameters, refer to page 125.
	8	Parameter type	0x01	
	9...10	ID	0x003C	
	11...12	Module parameter	:	
	13...23	Port1 parameter	:	
	24...34	Port2 parameter	:	
	35...45	Port3 parameter	:	
	46...56	Port4 parameter	:	
ITV module 16 bytes	57	Module No.	0x84	For details on the parameters for the ITV module, refer to page 128.
	58	Parameter type	0x02	
	59...60	ID	0x6700	
	61	Target ITV module position (1st station)	0x00	
	62...72	Parameters for the ITV module	:	
IO-Link devices 26 bytes	73	Module No.	0x83	- Since one *IO-Link Device Parameter* specifies the ISDU for only one combination of Index and Subindex, four *IO-Link Device Parameter* settings are required to switch the Subindex between 1, 2, 3, and 4. - Byte 78 is set to 0x04 to execute the parameter setting 4 times. - *Data* is the parameter setting value for the ISDU “Output Fault Action” specified here (Data length: 1 byte).
	74	Parameter type	0x03	
	75...76	ID	0x003C	
	77	Target IO-Link port	0x04	
	78	The total number of parameters to be sent	0x04	
	IO-Link Device Parameter 1			
	79	Data size of Parameter 1	0x01	
	80	Index (MSB)	0x00	
	81	Index (LSB)	0x54	
	82	Subindex	0x01	
	83	Data	0xFF	
	IO-Link Device Parameter 2			
	84	Data size of Parameter 2	0x01	
	85	Index (MSB)	0x00	
	86	Index (LSB)	0x54	
	87	Subindex	0x02	
	88	Data	0xFF	
	IO-Link Device Parameter 3			
	89...93	Parameter 3	:	
	IO-Link Device Parameter 4			
	94...98	Parameter 4	:	

13 Device Level Ring (DLR) Function

Enabling the DLR function allows communication to continue even if a cable break occurs at one point in an EtherNet/IP network configured in a ring topology. It also enables the identification of the disconnection location on the PLC.
The Fieldbus module (EX600-BEN1) can be used as a Ring Node supporting the DLR function.

Note:
- To enable the DLR function for the entire EtherNet/IP network, all Ring Nodes must support the DLR function.
- Since all DLR function settings are performed by the Ring Supervisor, no settings are required on the Fieldbus module. For detailed setting methods, refer to the manual of the Ring Supervisor you are using.

14 QuickConnect™ Function

Enabling the QuickConnect function reduces the time required from power-on to the establishment of EtherNet/IP communication.
However, according to CIP Safety™ specifications, the QuickConnect function cannot be enabled for CIP Safety devices.
Although the EX600 Fieldbus module supports the QuickConnect function, if a Safety I/O module is connected, the EX600 system operates as a CIP Safety device, and the QuickConnect function is automatically disabled.

15 Explicit Message Communication

Using EtherNet/IP Explicit message communication (Acyclic communication) allows reading and writing of data in EtherNet/IP devices (EtherNet/IP objects) as needed.
Explicit message communication enables access to device data by specifying the IP address, even if an EtherNet/IP communication connection is not established.

15.1 Explicit Message Format

To issue an Explicit Message, the following items must be specified:

- Target IP address
- Service code (Get, Set, Reset, Vendor-specific services, etc.)
- Data ID (Class, Instance, Attribute)
- Data content

Since the method for setting each item varies depending on the tool or program used, refer to the manual of the respective manufacturer.

The service codes used in the following sections are shown below.

Service Code	Name	Description
0x0E	Get Attribute Single	Read EtherNet/IP object
0x10	Set Attribute Single	Write EtherNet/IP object
0x32	IO-Link SMI Read Service	Read data related to the IO-Link
0x33	IO-Link SMI Write Service	Write data related to the IO-Link

15.2 Input and Output Assembly Objects

Explicit message communication allows access to the contents of 10 Input/Output Process Data (page 88), enabling the checking of current input and output values. Furthermore, standard output values can be changed when the device is not under PLC control, such as in the following states:

- The EtherNet/IP communication connection with the PLC has never been established since the power was turned ON.
- All EtherNet/IP communication connections with the PLC have been terminated normally.

Even after standard output values are changed via Explicit message communication, control immediately switches to the PLC once an EtherNet/IP communication connection with the PLC is established.

- **Input/Output Object List**

Class	Instance	Attribute	Access*)	Name	Description
0x04	0x64	0x03	Get	Standard Input value	-
	0x96		Get/Set	Standard Output value	To control the valve output of the Safety I/O module, EtherNet/IP communication must be established and the safety output must be turned ON.
	0x320		Get	Safety Input value	The Safety Input and Safety Output values obtained via Explicit message communication are for reference only. Do not use them for control purposes.
	0x352		Get	Safety Output value	

*) Get: Service code 0x0E Get Attribute Single
Set: Service code 0x10 Set Attribute Single

15.3 Vendor-Specific Objects

The EX600 system has the following vendor-specific objects, enabling the verification of diagnostic data and the reading and changing of various parameters via Explicit Message communication.

Regarding Table Terms:
- "Mod." in Instance indicates the Module No., and "Ch." in Attribute indicates the Channel No. For the definitions of Module No. and Channel No., refer to 2.2 Designation of Module Number and Channel Number (page 13).
- "Get" in Access represents Service Code 0x0E Get Attribute Single, and "Set" represents Service Code 0x10 Set Attribute Single.
- "Type" represents the data size and display format. For details, refer to page 137.
- For the Log No. to be specified in "Get error logs," refer to 9.3 Diagnostic Logs (page 85).

15.3.1 System Information and Command Objects

Class	Instance	Attribute	Access	Name	Type	Description
0x64	0x01	0x64	Get	Standard input size	UINT	Standard input data byte size of the entire EX600 system
	0x02	0x64	Get	Standard output size	UINT	Standard output data byte size of the entire EX600 system
	0x03	0x64	Get	Safety input size	UINT	Safety input data byte size of the entire EX600 system
	0x04	0x64	Get	Safety output size	UINT	Safety output data byte size of the entire EX600 system
	0x05	0x64	Get	Number of connected modules	USINT	Number of connected modules
	0x06	0x64	Get	System ver.	STRUCT 3 bytes	Reads the version value of the EX600 system. Byte 0: Major Byte 1: Minor Byte 2: Build
	0x07	0x64 + Log No.	Get	Get error logs	STRUCT 7 bytes	Error log data consists of: Byte 0...3: Error occurrence time [sec] Byte 4: Module number Byte 5: Channel number Byte 6: Error code Log No. 1 is the latest, and up to 30 logs are stored. For details on the log, refer to 9.3.2 Checking via EtherNet/IP Objects (page 86).
0x65	0x01	0x64	Set	Clear error logs	BOOL	1: Execute Clears all error logs.
0x66	0x01	0x64	Set	System restart	BOOL	1: Execute Restarts the fieldbus module.

15.3.2 Module Information and Command Objects

Class	Instance	Attribute	Access	Name	Module	Type	Description
0x6A	Mod. + 0x64	0x64	Get	Current number of valves	• FVC#	USINT	0...128 (Number of valve modules × 8)
		0x65	Get	Lot No.	• BEN1 • FVC#	STRING 2 bytes	Reads the Lot No. printed on the product label.
		0x66	Get	Product Ver.	• BEN1 • FVC#	STRUCT 2 bytes	Reads the FW/HW version printed on the product. Byte 0: Firmware Ver. Byte 1: Hardware Ver.
		0x67	Get	Software information	• BEN1 • FVC#	STRUCT 4 bytes	Reads the software information of the product. Byte 0...1: Software number Byte 2...3: Software version
		0x68	Get	Serial No.	• BEN1 • FVC#	STRING 16 bytes	Reads the serial number of the product.
0x6E	Mod. + 0x64	0x64	Set	Factory reset	• BEN1 • FVC#	BOOL	1: Execute Resets the parameters of the target module to the factory default settings. The IP address, safety-related data, and ITV module parameters are not initialized.

15.3.3 Channel Information and Command Objects

Class	Instance	Attribute	Access	Name	Module	Type	Description
0x72	Mod. + 0x64	Ch. + 0x64	Get	ON/OFF count value	• DXP# • DYPB • FVC#	UDINT	0: 0 times 1: 1 time : 4294967295: 4,294,967,295 times Reads the ON/OFF operation count of the target channel.
0x73	Mod. + 0x64	Ch. + 0x64	Get	ITV connection	• FVC2/4	BOOL	0: No ITV connection 1: ITV connected
0x74	Mod. + 0x64	Ch. + 0x64	Get	Accumulated energization time	• FVC2/4	UDINT	0: 0 hours 1: 1 hour : 4294967295: 4,294,967,295 hours Reads the energization time stored in the ITV module.
0x78	Mod. + 0x64	Ch. + 0x64	Set	Clear ON/OFF count value	• DXP# • DYPB • FVC#	BOOL	1: Execute Resets the ON/OFF operation count of the target channel to 0.

15.3.4 Diagnostic Objects

Class	Instance	Attribute	Access	Name	Type	Description
0x82	0x01	0x64	Get	System diagnostic information	WORD	Gets system diagnosis. The data structure is the same as Bytes 0...1 System diagnosis in 9.2 Diagnostic Data (page 84). 0: Normal 1: Diagnosis occurred
		0x65	Get	Module diagnosis location in the system	STRUCT 2 bytes	Checks the Module No. where module diagnosis or channel diagnosis has occurred. The data structure is the same as Bytes 4...5 in 9.2 Diagnostic Data (page 84). 0: Normal 1: Module with diagnosis
0x86	Mod. + 0x64	0x64	Get	Module diagnostic information	BYTE	Gets the module diagnosis of the module specified by the Instance. The data structure is the same as Byte 2 in 9.2 Diagnostic Data (page 84). 0: Normal 1: Diagnosis occurred
		0x65	Get	Channel diagnosis location in the module	STRUCT 17 bytes	Checks the Channel No. where channel diagnosis has occurred in the module specified by the Instance. Byte 0 – bit 0: Channel No. 0 Byte 0 – bit 1: Channel No. 1 : Byte 16 – bit 3: Channel No. 131 0: Normal 1: Channel with diagnosis
0x8A	Mod. + 0x64	Ch. + 0x64	Get	Channel diagnostic information	BYTE	Gets the channel diagnosis of the channel indicated by the Attribute within the module specified by the Instance. The data structure is the same as Byte 3 in 9.2 Diagnostic Data (page 84). 0: Normal 1: Diagnosis occurred

15.3.5 Module Parameter Objects

Class	Instance	Attribute	Access	Name	Module	Type	Description
0x8E	Mod. + 0x64	0x64	Get/Set	US1 voltage monitoring	• BEN1	BOOL	0: Invalid 1: Valid
0x90				Display password	• BEN1	UINT	0000 (0x0000) to 9999 (0x270F)
0x91				Hold all outputs setting	• BEN1	BOOL	0: Depends on each module 1: Hold all modules
0x93				Input filtering time	• DXP#	USINT	0: 0.1 ms 1: 1 ms 2: 10 ms 3: 20 ms
0x94				Input extension time	• DXP#	USINT	0: 1 ms 1: 15 ms 2: 100 ms 3: 200 ms
0x95				ON/OFF count monitoring	• DXP# • DYPB • FVC#	BOOL	0: Invalid 1: Valid
0x96				Fault/Idle mode	• DYPB • L#B1	USINT	0: Clear 1: Hold 2: Force ON
0x97				Fault/Idle mode (IO-Link)	• L#B1	USINT	0: Clear/PD Out valid 1: Hold 2: Clear/PD Out invalid
0x98				IO-Link master process data size	• L#B1	STRUCT 4 bytes	0: 0 byte 1: 2 byte 2: 4 byte 3: 8 byte 4: 16 byte 5: 32 byte The above size settings are applied to each port. The correspondence between bytes and ports is as follows: Byte 0: Port 1 Byte 1: Port 2 Byte 2: Port 3 Byte 3: Port 4 This parameter can be set only when no EtherNet/IP communication connection is established. Perform a system restart (Class: 0x66) after setting to apply the parameters.

15.3.6 Channel Parameter Objects

Class	Instance	Attribute	Access	Name	Module	Type	Description
0xA0	Mod. + 0x64	Ch. + 0x64	Get/Set	ON/OFF count limit value (×1000)	• DXP# • DYPB • FVC#	UINT	1: 1000 times 2: 2000 times : 65535: 65,535,000 times The setting range varies depending on the module part number.
0xA1				Open circuit detection	• DYPB	BOOL	0: Disable 1: Enable
0xA2				Port mode	• L#B1	USINT	0: Deactivated 1: IOL_Manual 2: IOL_Autostart 3: DI_C/Q 4: DO_C/Q
0xA3				Byte swap	• L#B1	USINT	0: No Swap 1: Swap 16 bit 2: Swap 32 bit 3: Swap All
0xA4				Hold/Clear	• FVC2/4	BOOL	0: Pressure Clear 1: Pressure Hold
0xA5				Gain	• FVC2/4	USINT	0: Gain 0 : 15: Gain F
0xA6				Sensitivity	• FVC2/4	USINT	0: Sensibility - : 7: Sensibility 5
0xA7				Minimum pressure	• FVC2/4	UINT	0...3686 Values that do not satisfy the setting conditions are invalid.
0xA8				Maximum pressure	• FVC2/4	UINT	410...4914 Values that do not satisfy the setting conditions are invalid.
0xA9				Notification setting of the accumulated energization time	• FVC2/4	UDINT	0: Notification disabled 1: 1 hour : 4294967295: 4,294,967,295 hours

The data size for each type is shown below.

Type	Data length	Description
BOOL	1 byte	1-bit data
BYTE	1 byte	8-bit data
WORD	2 bytes	16-bit data
USINT	1 byte	Unsigned integer data
UINT	2 bytes	
UDINT	4 bytes	
STRUCT n bytes	n bytes	n-byte data
STRING n bytes	n bytes	n-character ASCII code data

15.3.7 Safety Command Objects

Safety commands are assigned to Class 0xC7. Class 0xC7 is used when changing the safety password of the Safety I/O module. Refer to the Safety manual for details.

15.4 IO-Link SMI Service

SMI services are executed on the IO-Link master using Explicit message communication.
SMI services allow reading and writing data of the IO-Link master and IO-Link devices.
The following 5 types of SMI services can be executed via Explicit message communication.

No.	Name	Data type	Access
1	SMI_MasterIdentification	IO-Link master information	Read only
2	SMI_PortConfiguration	IO-Link master port parameters	Read/Write
3	SMI_PortStatus	IO-Link master port status	Read only
4	SMI_DeviceRead	Receive ISDU from IO-Link devices	Read only
5	SMI_DeviceWrite	Send ISDU to IO-Link devices	Write only

“Mod.” in the Instance within the Explicit Message indicates the Module No.
For the definition of Module No., refer to 2.2 Designation of Module Number and Channel Number (page 13).

15.4.1 SMI_MasterIdentification (IO-Link Master Information)

- **Read service for IO-Link master information**

[Request]

Data	Value	Remarks
Service code	0x32	IO-Link SMI Read Service
Class	0x7E	
Instance	Mod. + 0x64	Specifies the Module No.
Attribute	0x64	
Data[0]	0x00	Fixed value
Data[1]	0x01	Fixed value

[Response]

Data	Value	Remarks
Ack[0]...[3]	0xB2000000	Successful Read: 0xB2000000
Data[0]...[1]	VendorID	Vendor ID of the IO-Link master SMC: 0x0083
Data[2]...[5]	MasterID	IO-Link master ID EX600-LAB1-A: 0x0000003B EX600-LBB1-A: 0x0000003C
Data[6]	Master type	IO-Link master type (0x02)
Data[7]...[8]	Feature	Functions supported by the IO-Link master (0x0400)
Data[9]	Max. number of ports	Maximum number of IO-Link ports supported by the IO-Link master (0x04)
Data[10]	Port 1 type	Port type 0: Class A (EX600-LAB1-A) 2: Class B (EX600-LBB1-A)
Data[11]	Port 2 type	
Data[12]	Port 3 type	
Data[13]	Port 4 type	

15.4.2 SMI_PortConfigList (IO-Link Master Port Parameters)

- **Read service for IO-Link master port parameters**

[Request]

Data	Value	Remarks
Service code	0x32	IO-Link SMI Read Service
Class	0x7E	
Instance	Mod. + 0x64	Specifies the Module No.
Attribute	0x65...0x68	Specifies Port 1, 2, 3, or 4
Data[0]	0x80	Fixed value
Data[1]	0x00	Fixed value

[Response]

Data	Value	Remarks
Ack[0]...[3]	0xB2000000	Successful Read: 0xB2000000
Data[0]	Port mode	0: Deactivated 1: IO-Link Manual 2: IO-Link Autostart 3: Digital input C/Q 4: Digital output C/Q
Data[1]	Validation & Backup	0: No Device Check 1: Type compatible Device V1.0 2: Type compatible Device V1.1 3: Type compatible Device V1.1, Backup + Restore 4: Type compatible Device V1.1, Restore
Data[2]	I/Q behavior	Function of Pin 2 1: Digital input (for EX600-LAB1-A) 5: Power 2 (for EX600-LBB1-A)
Data[3]	Port cycle time	0 : As fast as possible 1 to 3 : 0.4 ms 4 to 63 : 0.4 to 6.3 ms (in 0.1 ms increments) 64 to 127 : 6.4 to 31.6 ms (in 0.4 ms increments) 128 to 191 : 32.0 to 132.8 ms (in 1.6 ms increments) 192 to 255 : 132.8 ms
Data[4]	VendorID[0] (MSB)	Vendor ID for the device verification function
Data[5]	VendorID[1] (LSB)	
Data[6]	0x00	Reserved
Data[7]	DeviceID[0] (MSB)	Device ID for the device verification function
Data[8]	DeviceID[1]	
Data[9]	DeviceID[2] (LSB)	

- **Write service for IO-Link master port parameters**

[Request]

Data	Value	Remarks
Service code	0x33	IO-Link SMI Write Service
Class	0x7E	
Instance	Mod. + 0x64	Specifies the Module No.
Attribute	0x65...0x68	Specifies Port 1, 2, 3, or 4
Data[0]	0x80	Fixed value
Data[1]	0x00	Fixed value
Data[2]	Port mode	0: Deactivated 1: IOL_Manual 2: IOL_Autostart 3: DI_C/Q 4: DO_C/Q
Data[3]	Validation & Backup	0: No Device Check 1: Type compatible Device V1.0 2: Type compatible Device V1.1 3: Type compatible Device V1.1, Backup + Restore 4: Type compatible Device V1.1, Restore
Data[4]	0x00	Fixed value
Data[5]	Port cycle time	0 : As fast as possible 1 to 3 : 0.4 ms 4 to 63 : 0.4 to 6.3 ms (in 0.1 ms increments) 64 to 127 : 6.4 to 31.6 ms (in 0.4 ms increments) 128 to 191 : 32.0 to 132.8 ms (in 1.6 ms increments) 192 to 255 : 132.8 ms
Data[6]	Vendor ID[0] (MSB)	Set the Vendor ID for the device verification function.
Data[7]	Vendor ID[1] (LSB)	
Data[8]	0x00	Fixed value
Data[9]	Device ID[0] (MSB)	Set the Device ID for the device verification function.
Data[10]	Device ID[1]	
Data[11]	Device ID[2] (LSB)	

[Response]

Data	Value	Remarks
Ack[0]...[3]	0xB3000000	Successful Write: 0xB3000000

15.4.3 SMI_PortStatusList (IO-Link Master Port Status)

- **Read service for IO-Link master port status**

[Request]

Data	Value	Remarks
Service code	0x32	IO-Link SMI Read Service
Class	0x7E	
Instance	Mod. + 0x64	Specifies the Module No.
Attribute	0x65...0x68	Specifies Port 1, 2, 3, or 4
Data[0]	0x90	Fixed value
Data[1]	0x00	Fixed value

[Response]

Data	Value	Remarks
Ack[0]...[3]	0xB2000000	Successful Read: 0xB2000000
Data[0]	PortStatusInfo	Status of IO-Link communication 0: NO_DEVICE 1: DEACTIVATED 2: PORT_DIAG 3: PREOPERATE 4: OPERATE 5: DI_C/Q 6: DO_C/Q
Data[1]	PortQualityInfo	Status of process data 0: Input valid, Output valid 1: Input invalid, Output valid 2: Input valid, Output invalid 3: Input invalid, Output invalid
Data[2]	RevisionID	IO-Link version of the IO-Link device 0x10: V1.0 0x11: V1.1
Data[3]	TransmissionRate	Communication speed 0: NOT_DETECTED 1: COM1 2: COM2 3: COM3
Data[4]	MasterCycleTime	Actual cycle time value 4 to 63 : 0.4 to 6.3 ms (in 0.1 ms increments) 64 to 127 : 6.4 to 31.6 ms (in 0.4 ms increments) 128 to 191 : 32.0 to 132.8 ms (in 1.6 ms increments)
Data[5]	InputDataLength	Input process data length
Data[6]	OutputDataLength	Output process data length
Data[7]	VendorID[0] (MSB)	Vendor ID of the connected IO-Link device
Data[8]	VendorID[0] (LSB)	
Data[9]	0x00	Reserved

Data	Value	Remarks
Data[10]	DeviceID[0] (MSB)	Device ID of the connected IO-Link device
Data[11]	DeviceID[1]	
Data[12]	DeviceID[2] (LSB)	
Data[13]	NumberOfDiags	Number of events occurred
Data[14]	EventQualifier1	Indicates the type of event. Refer to the table below.
Data[15]	EventCode1[0] (MSB)	Event code of the IO-Link master or device
Data[16]	EventCode1[1] (LSB)	
Data[17]	EventQualifier2	See EventQualifier1 and EventCode1
Data[18]	EventCode2[0] (MSB)	
Data[19]	EventCode2[1] (LSB)	
:	:	:

[EventQualifier Specifications]

Bit							
7	6	5	4	3	2	1	0
Mode		Type		Source	Instance		
0: Reserved 1: Event single shot 2: Event disappears 3: Event appears		0: Reserved 1: Notification 2: Warning 3: Error		0: Device 1: Master	0: Unknown 1-3: Reserved 4: Application 5-7: Reserved		

Note:

- When NumberOfDiags is *0*, data after Data[14] is not appended.
  Data is added in 3-byte increments according to the value of NumberOfDiags.
- For details on the event codes of the IO-Link master, refer to 9.4 IO-Link Master Module Diagnostics (page 87).
- For details on the event codes of the IO-Link device, refer to the operation manual of the IO-Link device.

15.4.4 SMI_DeviceRead (Receiving ISDU from IO-Link Device)

- **Read service for receiving ISDU from an IO-Link device**

[Request]

Data	Value	Remarks
Service code	0x32	IO-Link SMI Read Service
Class	0x7E	
Instance	Mod. + 0x64	Specifies the Module No.
Attribute	0x65...0x68	Specifies Port 1, 2, 3, or 4
Data[0]	0x30	Fixed value
Data[1]	0x00	Fixed value
Data[2]	Index[0] (MSB)	Refer to the operation manual of the IO-Link device
Data[3]	Index[1] (LSB)	
Data[4]	Subindex	Refer to the operation manual of the IO-Link device

[Response]

Data	Value	Remarks
Ack[0]...[3]	0xB2000000	Successful Read: 0xB2000000
Data[0]	On request data[0] (MSB)	Refer to the operation manual of the IO-Link device
Data[1]	On request data[1]	
:	:	

15.4.5 SMI_DeviceWrite (Sending ISDU to IO-Link Device)

- **Write service for sending ISDU to an IO-Link device**

[Request]

Data	Value	Remarks
Service code	0x33	IO-Link SMI Write Service
Class	0x7E	
Instance	Mod. + 0x64	Specifies the Module No.
Attribute	0x65...0x68	Specifies Port 1, 2, 3, or 4
Data[0]	0x30	Fixed value
Data[1]	0x00	Fixed value
Data[2]	Index[0] (MSB)	Refer to the operation manual of the IO-Link device
Data[3]	Index[1] (LSB)	
Data[4]	Subindex	Refer to the operation manual of the IO-Link device
Data[5]	On request data[0] (MSB)	Refer to the operation manual of the IO-Link device
Data[6]	On request data[1]	
:	:	

[Response]

Data	Value	Remarks
Ack[0]...[3]	0xB3000000	Successful Write: 0xB3000000

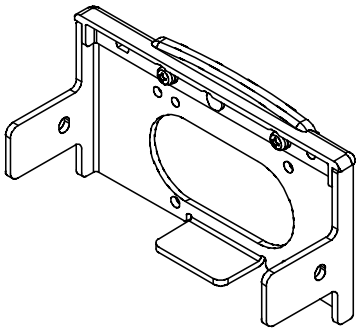
16 Accessories

For the selection of accessories, refer to the catalog.

(1) Valve plate

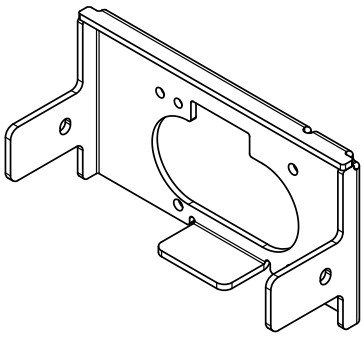
EX600-ZMV1-A: For VQC series

Enclosed parts: Hexagon socket screws (M4 × 6), 2 pcs.
Round head screw (M3 × 8), 4 pcs.



EX600-ZMV3-A: For SY, JSY series

Enclosed parts: Hexagon socket screws (M4 × 6), 2 pcs.
Round head screw (M3 × 8), 2 pcs.



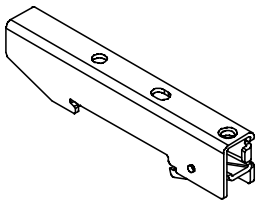
(2) End plate bracket

EX600-ZMA2

Enclosed parts: Round head screw (M4 × 20), 1 pc.
P tight screw (4 × 14), 2 pcs.

EX600-ZMA3

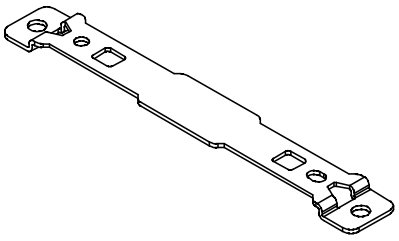
Enclosed parts: Round head screw (M4 × 20) with washer, 1 pc.
P tight screw (4 × 14), 2 pcs.



(3) Intermediate reinforcing brace

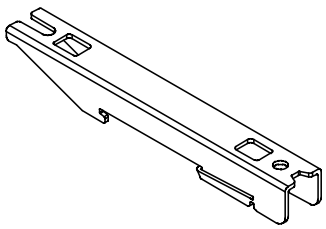
EX600-ZMB1: For direct mounting

Enclosed parts: Round head screw (M4 × 5), 2 pcs.

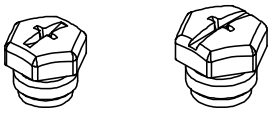


EX600-ZMB2: For DIN rail mounting

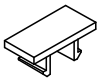
Enclosed parts: Round head screw (M4 × 6), 2 pcs.



(4) Seal cap (10 pcs.)
EX9-AWES: For M8 connector
EX9-AWTS: For M12 connector



(5) Marker (1 sheet, 88 pcs.)
EX600-ZT1



(6) Field-wireable connector
PCA-1446553 For EtherNet/IP communication, M12 (4-pin) Plug, D-coded
PCA-1578081 For power supply, 7/8 inch, Socket, Cable O.D.: 12 to 14 mm

(7) Power supply cable
PCA-1558810 Cable with 7/8 inch connector, Socket, Straight, 2 m
PCA-1558823 Cable with 7/8 inch connector, Socket, Straight, 6 m
PCA-1558836 Cable with 7/8 inch connector, Socket, Right angle, 2 m
PCA-1558849 Cable with 7/8 inch connector, Socket, Right angle, 6 m

(8) EtherNet/IP communication cable

PCA-1446566: Cable with M12 connector, D-coded, Plug, Straight, 5 m, SPEEDCON compatible
EX9-AC010EN-PSRJ: Cable with M12 (D-coded) to RJ45 connector, Plug, Straight, 1 m
EX9-AC020EN-PSRJ: Cable with M12 (D-coded) to RJ45 connector, Plug, Straight, 2 m
EX9-AC030EN-PSRJ: Cable with M12 (D-coded) to RJ45 connector, Plug, Straight, 3 m
EX9-AC050EN-PSRJ: Cable with M12 (D-coded) to RJ45 connector, Plug, Straight, 5 m
EX9-AC100EN-PSRJ: Cable with M12 (D-coded) to RJ45 connector, Plug, Straight, 10 m
EX9-AC005EN-PSPS: Cable with M12 connector, dual-side D-coded, Plug, Straight, 0.5 m
EX9-AC010EN-PSPS: Cable with M12 connector, dual-side D-coded, Plug, Straight, 1 m
EX9-AC020EN-PSPS: Cable with M12 connector, dual-side D-coded, Plug, Straight, 2 m
EX9-AC030EN-PSPS: Cable with M12 connector, dual-side D-coded, Plug, Straight, 3 m
EX9-AC050EN-PSPS: Cable with M12 connector, dual-side D-coded, Plug, Straight, 5 m
EX9-AC100EN-PSPS: Cable with M12 connector, dual-side D-coded, Plug, Straight, 10 m
EX9-AC005EN-PAPA: Cable with M12 connector, dual-side D-coded, Plug, Right angle, 0.5 m
EX9-AC010EN-PAPA: Cable with M12 connector, dual-side D-coded, Plug, Right angle, 1 m
EX9-AC020EN-PAPA: Cable with M12 connector, dual-side D-coded, Plug, Right angle, 2 m
EX9-AC030EN-PAPA: Cable with M12 connector, dual-side D-coded, Plug, Right angle, 3 m
EX9-AC050EN-PAPA: Cable with M12 connector, dual-side D-coded, Plug, Right angle, 5 m
EX9-AC100EN-PAPA: Cable with M12 connector, dual-side D-coded, Plug, Right angle, 10 m

(9) IO-Link communication cable

EX9-AC005-SSPS: Cable with M12 connector, Socket, Plug, Straight, 0.5 m
EX9-AC010-SSPS: Cable with M12 connector, Socket, Plug, Straight, 1 m
EX9-AC020-SSPS: Cable with M12 connector, Socket, Plug, Straight, 2 m
EX9-AC030-SSPS: Cable with M12 connector, Socket, Plug, Straight, 3 m
EX9-AC050-SSPS: Cable with M12 connector, Socket, Plug, Straight, 5 m
EX9-AC100-SSPS: Cable with M12 connector, Socket, Plug, Straight, 10 m

Revision history
1: Description revised (June, 2026)

SMC Corporation

URL https://www.smcworld.com

No. DOC1121211-1