

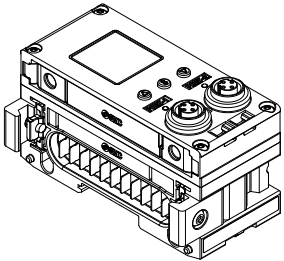


ORIGINAL INSTRUCTIONS

Instruction Manual

Fieldbus module for EtherNet/IP™

EX600-BEN1



The intended use of this product is to control pneumatic valves and I/O while connected to the EtherNet/IP™ protocol.

1 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) ^{*)}, and other safety regulations.

^{*)}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: Robotics - Safety requirements - Part 1: Industrial robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

| | | |
|--|----------------|--|
| | 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

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for further Safety Instructions.

2 Specifications

- The EX600 fieldbus system connects to an EtherNet/IP™ network and enables reduced-wiring and distributed control of standard I/O devices and safety I/O devices.
- The EX600 fieldbus system operates by combining various modules. The system can be expanded by connecting additional I/O modules to the fieldbus module.
- A safety I/O module can be connected, allowing the power supply for valves to be turned off without installing a separate safety output unit.
- Standard I/O modules can be connected, allowing up to 9 modules of input, output, and IO-Link master modules to be connected in any order.

2.1 General specifications

| Item | Specifications |
|-----------------------|--|
| Enclosure rating | IP65/IP67 (manifold assembled) |
| Operating temperature | -10 to +50 °C |
| Storage temperature | -20 to +60 °C |
| Ambient humidity | 35 to 85% RH (no condensation) |
| Withstand voltage | 500 VAC applied for 1 minute (between external terminals and FE) |
| Insulation resistance | 500 VDC, 10 MΩ min. (between external terminals and FE) |
| Vibration resistance | 10~57 Hz: constant amplitude 0.75 mm p-p 57~150 Hz: constant acceleration 49 m/s ² XYZ 2 hours in each direction (no power) |
| Standards | CE/UKCA, UL (CSA) |
| Enclosure material | PBT |
| Weight | 310 g max. |

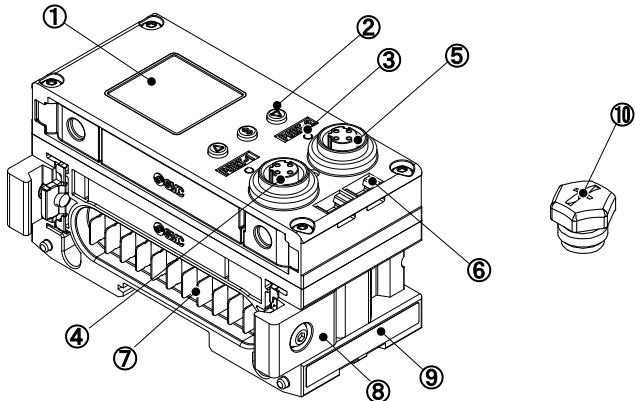
2.2 Electrical specifications

| Item | Specifications |
|--|--------------------|
| Power supply voltage for US1 (control/input) | 24 VDC +20% / -15% |
| Internal Current Consumption | 150 mA max. |
| Supply interruption for no loss of function | 1 ms max. |
| Power supply voltage for US2 (output) | 24 VDC +20% / -15% |
| Internal Current Consumption | 10 mA max. |
| Circuit protection | Reverse Protection |

2.3 Communication specifications

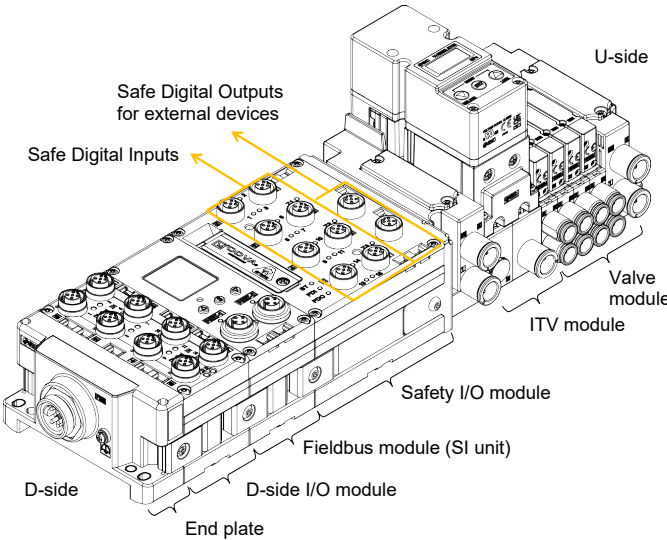
| Item | Specifications |
|-----------------------------------|---|
| Protocol | EtherNet/IP™ |
| Conformance version | Composite 21 |
| Communication speed | 10/100 Mbps |
| Communication cable | Standard ethernet cable (CAT5 or more, 100BASE-TX) |
| Cable length | 100 m max. |
| Communication type | Full duplex / Half duplex |
| Configuration (EDS) file | ex600_fvc_v**.eds (download from the SMC website) |
| Device information | Vendor ID: 7 (SMC Corporation) Device type: 12 (communication adapter) Product code: 271 |
| Data size | Standard input: 1308 bytes max. Standard output: 1308 bytes max. Safety input: 10 bytes Safety output: 6 bytes |
| Number of connectable I/O modules | 9 modules on D-side + Safety I/O module |
| Supported functions | DLR (Beacon based ring node) |

3 Name and function of parts



| No | Part | Description |
|----|---------------------------------|---|
| 1 | LCD Display | Displays the module status and display screens for pushbutton settings. |
| 2 | Pushbuttons | Buttons to operate when changing module parameters or for displaying diagnostics. |
| 3 | Link/Act LED | Displays fieldbus communication status. |
| 4 | Communication connector (PORT1) | Connection for Fieldbus cable. |
| 5 | Communication connector (PORT2) | Connection for Fieldbus cable. |
| 6 | Marker groove | For attaching identification markers. |
| 7 | Connector for module connection | Transmits control signals and power to adjacent modules. |
| 8 | Joint bracket | For connecting modules together. |
| 9 | MAC address label | Displays the 12-digit MAC address, which is unique for each module. |
| 10 | Seal cap (1 pc.) | Seal cap for all unused connectors. The default is installed in PORT2. |

4 Product Structure



| Item | Function |
|--------------------|--|
| Safety I/O module | Control safe input, safe output, valves and ITV modules (ITV module only with EX600-FVC2) |
| Fieldbus module | Communicates with upper controller (EtherNet/IP™). |
| D-side I/O modules | Digital input/output, analog input/output, IO-link module. See SMC website for further details. |
| ITV module | Electro-pneumatic regulator ITV module (can be controlled by EX600-FVC2 only). |
| Valve module | To operate pneumatic devices. |
| End plate | To supply power to the valve manifold. |

5 Assembly

5.1 Check the order of the modules

The EX600 manifold is assembled in the following order:
D-side End plate, D-side I/O modules, Fieldbus module, U-side I/O modules (Safety I/O module), and supply/exhaust block (valve manifold).
Up to 9 × I/O modules on the D-side can be connected.

The D-side I/O modules can be connected in any order; the I/O map is automatically determined by the order in which they are connected.

If a valve manifold is not to be used, connect a U-side End plate (EX600-EU1-#) instead of the supply/exhaust block.

5.2 Assembling the manifold

Warning

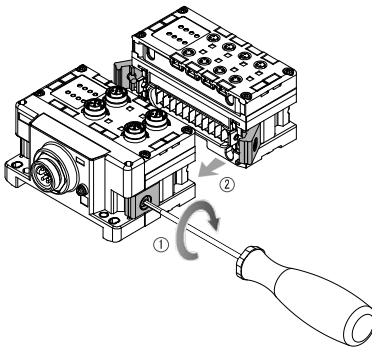
- Do not install the product unless the safety instructions have been read and understood.
- All power to the modules must be turned OFF (de-energized) before the modules are assembled or removed, to prevent damage.
- All screws must be tightened to the recommended torque. Insufficient tightening may lead to equipment malfunction, injury, or equipment damage.

(1) Connect the first I/O modules to the End plate. Align the connector positions of each module and connect them.

After connecting the module, tighten the hexagonal socket screws (width across flats 2.5 mm) supplied with the joint brackets.

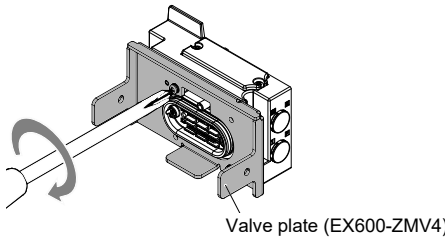
Recommended tightening torque: 1.5 to 1.6 N•m.

(2) Add additional modules. The connection method is as above.



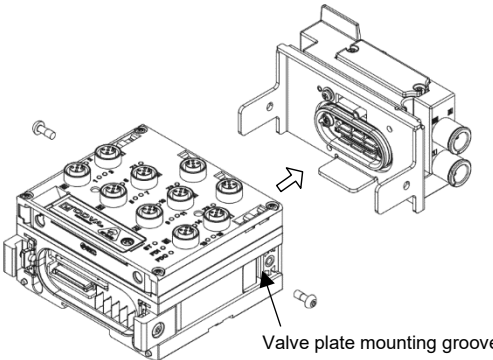
(3) Mount the valve plate (EX600-ZMV4) to the air supply/exhaust block on the valve manifold using the screws (M3 x 8 mm) supplied.

Recommended tightening torque: 0.6 to 0.7 N•m.



Note: when using the U-side End plate instead of the valve manifold, the valve plate is not required.

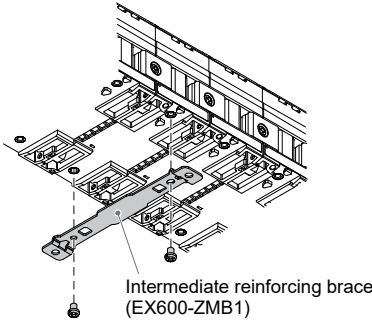
(6) Assemble the Safety I/O module to the valve plate (or U-side End plate). Insert the valve plate into the mounting grooves on the module and fasten using the screws provided.



6 Installation

6.1 Direct mounting

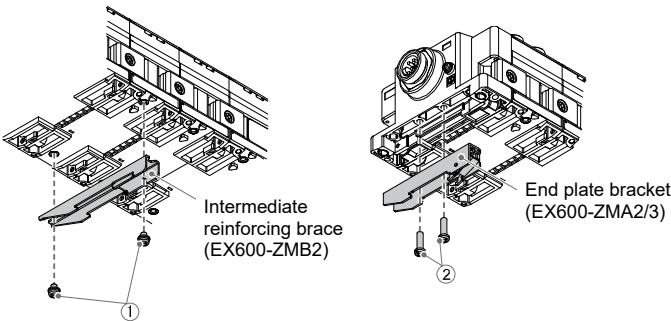
- (1) When joining five or more modules, attach an intermediate reinforcing brace (EX600-ZMB1) using 2-M4 x 5 screws supplied to the middle part of the entire manifold assembly before mounting. Also, add one intermediate reinforcing brace for every five modules to be joined, and fix in a well-balanced manner. Recommended tightening torque: 0.7 to 0.8 N•m.



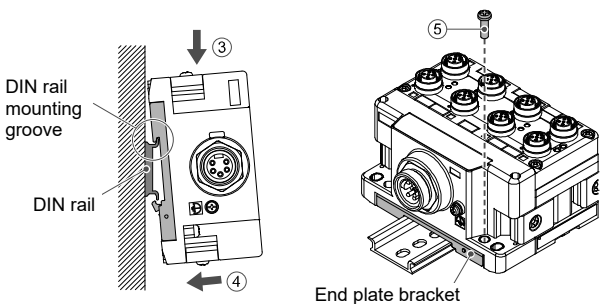
- (2) Mount and fix the End plate at the D-side of the manifold and secure the intermediate reinforcing brace if required using M4 screws. Recommended tightening torque: 0.7 to 0.8 N•m.
- (3) Mount the air supply/exhaust block on the valve side while referring to the operation manual for the applicable valve series. If using the U-side End plate tighten the mounting M4 screws with a tightening torque of 0.7 to 0.8 N•m.

6.2 DIN rail mounting

- (1) When joining five or more modules, attach an intermediate reinforcing brace (EX600-ZMB2) using 2-M4 x 5 screws supplied 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 fix in a well-balanced manner. Recommended tightening torque: 0.7 to 0.8 N•m.



- (2) Attach the End plate bracket to the End plate using the screws (2-M4 x 14 mm) supplied. Recommended tightening torque: 0.7 to 0.8 N•m. For the VQC series valves use End plate bracket (EX600-ZMA2) and for SY and JSY series valves, use End plate bracket (EX600-ZMA3).
- (3) Hook the DIN rail mounting groove on to the DIN rail.
- (4) Press the manifold using its side hooked on to the DIN rail as a fulcrum until the manifold is locked onto the DIN rail.
- (5) Fix the manifold by tightening the DIN rail fixing screws (M4 x 20 mm) on the End plate bracket (Tightening torque: 0.7 to 0.8 N•m). Refer to the Operation Manual for the applicable valve series on the SMC website (URL: <https://www.smcworld.com>) for the mounting method of the valve manifold.



5 Installation (continued)

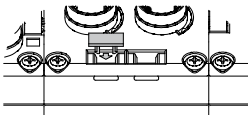
6.3 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in a place where the product could be splashed by oil or chemicals.
- Do not use in an area where electrical surges are generated. If there is equipment which generates large surges (solenoid type lifter, high frequency induction furnace, motor, etc.) near to the Fieldbus system, this may cause deterioration or internal circuit damage.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Prevent foreign matter such as remnants of wires from entering the product during assembly to avoid failure or malfunction.
- Do not mount the product in a location exposed to excessive vibration or impact.
- Do not use the product in an environment exposed to temperature cycles. Heat cycles other than ordinary changes in temperature can adversely affect the product.
- Do not expose the product to direct sunlight or UV light. Use a suitable protective cover.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product specifications.
- Keep within the specified ambient temperature range.
- Do not operate close to a heat source, or in a location exposed to radiant heat.

6.4 Identification marker

The signal name of the input or output devices can be written on the marker and can be installed on each module. Mount a marker (EX600-ZT1) into the marker groove as required.



7 Wiring

7.1 Communication Connector

Connector: M12 4-pin D-coded socket

Select appropriate cables to mate with the connectors on the fieldbus module. The EtherNet/IP™ connection port pin layout is as shown below.

| Connector PORT 1 / PORT 2 | Pin No. | Signal name |
|------------------------------|------------|-------------|
| | 1 | TX+ |
| | 2 | RX+ |
| | 3 | TX- |
| | 4 | RX- |

7.2 Power Supply Connection

The system is operated using power supplied from the End plate (EX600-ED#) module.

Refer to the End plate instruction manual and operation manual available on the SMC website (URL: <https://www.smcworld.com>) for the power supply connection details.

Warning

- Be sure to fit a waterproof seal cap (EX9-AWTS) on ALL unused M12 connectors. Proper use of the seal cap enables the enclosure to maintain IP67 specification.

8 Settings

8.1 Configuration

When configuring an EX600 system for an EtherNet/IP™ CIP safety compliant PLC, a dedicated EDS file must be used. In addition, a special icon file is used to display the EX600 icon in the configuration software. The EDS file and icon can be downloaded from the SMC website. (URL: <https://www.smcworld.com>)

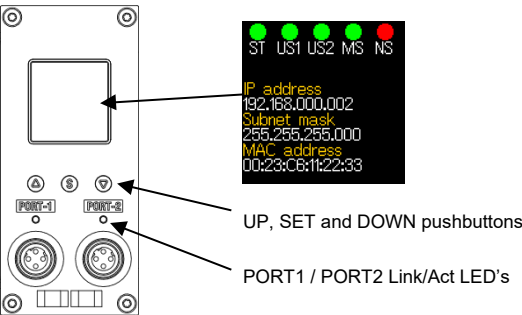
| Item | Filename |
|-----------------|-------------------|
| Safety EDS File | ex600_fvc_v11.eds |
| Icon file | ex600-fvc.ico |

Technical documentation giving detailed configuration information can be found on the SMC website (URL: <https://www.smcworld.com>).

9 LCD Display settings

9.1 Outline

The parameter settings and diagnostics for the manifold can be made using the LCD display and the pushbuttons.



| Item | Description |
|--------------------------|---|
| LCD Display | After power ON, various indicators are displayed at the top of the display. The user can change parameters and check diagnostic details at the press of a button. |
| UP button / DOWN button | Switches between items or increases / decreases the set value. Simultaneous pressing of the buttons will change the menu screen. In the menu screen, simultaneous presses are also used to cancel operations. |
| SET button | Sets the operation or value. |
| PORT1 and 2 Link/Act LED | Displays the communication status of each communication connector. |

Warning

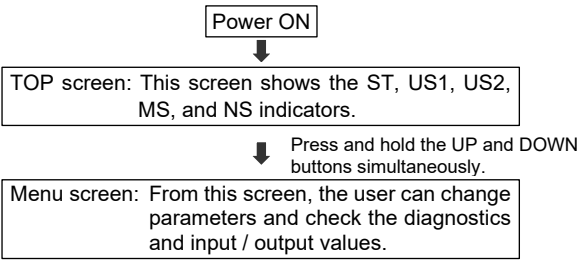
- Do not turn the power ON with the buttons pressed. The display will turn completely white.

9.2 LCD Display operation

The following operations can be performed on the LCD display by operating the pushbuttons.

- Check the status of communication with the PLC
- Confirmation of current values of input/output data
- Display diagnostic status
- Check / change parameters

The basic operation of the display and pushbuttons is as follows:



- The password for LCD display operation is required to change parameters on the LCD. The initial value is "0000". Once the display operation password is entered, subsequent password entries are skipped. Once entered, the password is valid until the TOP screen is displayed.

10 Indicators

10.1 ST Diagnostics indication

| Display | Description |
|---------|---|
| | Green ON Normal operation is in progress. |
| | Green Flashing Diagnostics is detected on any 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 be within the specifications and restart. <ul style="list-style-type: none">The I/O size exceeds the specifications.The number of connected I/O modules exceeds the specifications. |
| | Red/Green Flashing alternately An internal communication error has occurred. Check the connection between each module. |
| | Red ON The power needs to be turned off and on again. Failed to initialize the fieldbus module or failed to establish communication with the safety I/O module. |

10.2 US1 power supply indication

| Display | Description |
|---------|--|
| | OFF US1 supply voltage is less than 19 V (when US1 voltage monitoring parameter is disabled). |
| | Green ON US1 supply voltage is normal. |
| | Green Flashing US1 supply voltage is less than 19 V (when US1 voltage monitoring parameter is enabled). |

10.3 US2 power supply indication

| Display | Description |
|---------|--|
| | OFF US2 supply voltage is less than 19 V. |
| | Green ON US2 supply voltage is normal. |

10.4 MS module status indication





| 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) Either the diagnostics is detected or the IP address of the Fieldbus module does not match the TUNID setting of the Safety I/O module. |
| | Red ON The Fieldbus module has failed. |
| | Red/Green Flashing alternately The TUNID has not yet been set for the Safety I/O module. |

10.5 NS communication status indication





| 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 Proposed_TUNID request has been received, but Apply_TUNID has not been completed. |

11 LED Display

11.1 PORT1 communication status indication

| LED status | | Description |
|--|-------------------|---|
| | OFF | PORT1 side: No Link / No Activity |
|  | Green ON | PORT1 side: Link / No Activity (100 Mbps) |
|  | Green Flickering | PORT1 side: Link / Activity (100 Mbps) |
|  | Orange ON | PORT1 side: Link / No Activity (10 Mbps) |
|  | Orange Flickering | PORT1 side: Link / Activity (10 Mbps) |

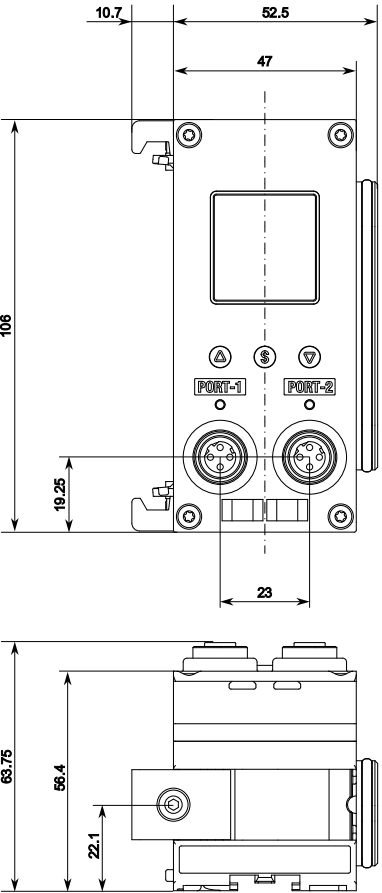
11.2 PORT2 communication status indication

| LED status | | Description |
|--|-------------------|---|
| | OFF | PORT2 side: No Link / No Activity |
|  | Green ON | PORT2 side: Link / No Activity (100 Mbps) |
|  | Green Flickering | PORT2 side: Link / Activity (100 Mbps) |
|  | Orange ON | PORT2 side: Link / No Activity (10 Mbps) |
|  | Orange Flickering | PORT2 side: Link / Activity (10 Mbps) |

12 How to Order

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for How to order information.

13 Outline Dimensions (mm)



14 Maintenance

14.1 General Maintenance

⚠ Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions
- Perform regular maintenance and inspections.
There is a risk of unexpected malfunction.
- After maintenance is complete, perform appropriate functional inspections.
Stop operation if the equipment does not function properly.
Otherwise Safety is not assured due to an unexpected malfunction or incorrect operation.
- Do not use solvents such as benzene, thinner etc. to clean the module.
They could damage the surface of the product and erase the markings on the body. Use a soft cloth to remove stains.
For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

14.2 Maintenance and Repairs

- To prevent accumulation of malfunctions, perform malfunction checks at regular intervals (otherwise known as the diagnostic test interval) based on the risk assessments of the machine or the system.

- With the exception of these periodic diagnostic tests, there is no other specific maintenance agenda for the Fieldbus module while it is in service. The module does not contain any components requiring maintenance.

⚠ Warning

- With the exception of periodic diagnostic tests, there is no other specific maintenance agenda for the Fieldbus module while it is in service. The product does not contain any components requiring maintenance. Repairs are prohibited. Do not carry out any repairs or modifications.

15 Limitations of Use

15.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

Operate the Fieldbus module exclusively for the intended activities defined in the operation manual, taking into account the prescribed values.

Safety products are designed for machine Safety functions and directly associated industrial automation tasks.

This product is intended for use in applications requiring safe disconnection of electrical power of pneumatic valves mounted to manifolds. It is the user's responsibility to determine if this product is suitable for the intended application and to specify the pneumatic valve arrangement accordingly to achieve the required safety function.

16 Product disposal

This product should not be disposed of as municipal waste. Check your local regulations and guidelines to dispose of this product correctly, in order to reduce the impact on human health and the environment.

17 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor / importer.

SMC Corporation

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
SMC Corporation, 1-5-5, Kyobashi, Chuo-ku, Tokyo 104-0031, JAPAN
Specifications are subject to change without prior notice from the manufacturer.
© SMC Corporation All Rights Reserved.
Template DKP50047-F-085O