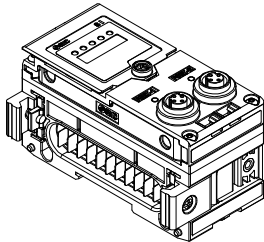




Instruction Manual
Fieldbus device - SI unit for EtherCAT
EX600-MEC1



The intended use of this product is to control pneumatic valves and I/O while connected to the EtherCAT (and IO-Link) 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: Robots and robotic devices - Safety requirements for industrial robots - Part 1: 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.

2 Specifications

The EX600 range of units can be connected to a fieldbus to realize the reduction of input / output device wiring and a distributed control system. The system communicates with the fieldbus through the SI unit. One SI unit can be connected to manifold valves with up to 64 stations (128 outputs) and up to 4 ITV modules in random order. In addition, up to 9 sets of input, output, input/output units, and IO-Link master units, including SI units, can be connected in random order.

2.1 General specifications

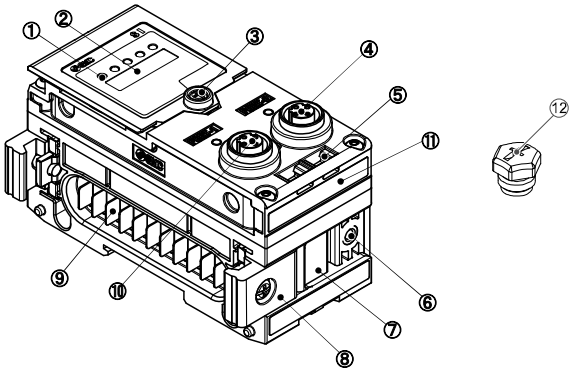
Item	Specifications
Enclosure rating	IP67 (with manifold assembled)
Operating temperature	-10 to +50 °C
Ambient humidity	35 to 85% RH (no condensate)
Storage temperature	-20 to +60 °C
Withstand voltage	500 VAC for 1 minute between terminals and F.E.
Insulation resistance	500 VDC, 10 MΩ or more between terminals and F.E.
Weight	310 g

2 Specifications (continued)

2.2 Specifications

	Model	EX600-MEC1
Communication	Protocol	EtherCAT
	Conformance version	Test Record V.2.4.0
	Communication speed	100 Mbps
	Configuration file	ESI file
	Applicable function	Web server
Electrical	Power supply for control / input	24 VDC, Class 2, 1 A (US1)
	Internal current consumption (power supply for control / input)	170 mA or less
	Power supply for output	24 VDC, Class2, 2 A (US2)
Valve control	Applicable manifold series	Plug-in Connector Connecting Base (64-station Compatible Manifold)
	Number of outputs	128 outputs max.
	Output operation at network fault	HOLD / CLEAR / Force ON
	Protection	Short circuit protection (on the valve manifold)
ITV control	Applicable ITV series	Plug-in type electro-pneumatic regulator for manifold
	Number of modules	4 modules max.
	Protection	Short circuit protection

3 Name and function of parts



No	Part	Description
1	Status display LED	Displays the status of the unit.
2	Display cover	Display cover for switch setting.
3	Display cover screw	To open the display cover.
4	BUS OUT connector (PORT 2)	Connector for Fieldbus communication.
5	Marker groove	Groove for an identification marker.
6	Valve plate mounting screw hole	Holes for mounting the valve plate.
7	Valve plate mounting groove	Groove for mounting valve plate.
8	Joint bracket	Bracket for joining to adjacent units.
9	Unit connector (plug)	Connector for transmitting signals and power to adjacent units.
10	BUS IN connector (PORT 1)	Connector for Fieldbus communication.
11	MAC address label	12-digit MAC address unique for SI unit.
12	Seal cap	Seal cap for unused connectors (factory installed in PORT2).

4 Assembly

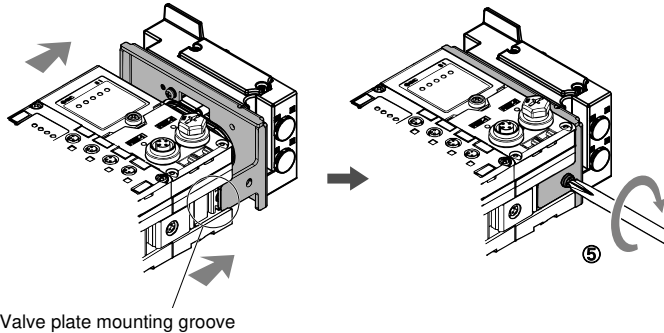
4.1 Assembling the unit

Warning

Do not install the product unless the safety instructions have been read and understood.

- Connect a unit to the end plate. Digital, analogue or IO-Link master units can be connected in any order. Joint bracket screw tightening torque: 1.5 to 1.6 N•m.
- Add more units. Up to 9 units (including SI unit) can be connected to one manifold.
- Connect the SI unit. After connecting the required I/O units, connect the SI unit. The connection method is as above.
- Mount the valve plate (EX600-ZMV3) to the valve manifold using the set screws (M3 x 8) supplied. Tightening torque: 0.6 to 0.7 N•m.
- Connect the SI unit assembly to the valve manifold SUP/EXH block. Insert the valve plate into the valve plate mounting groove.

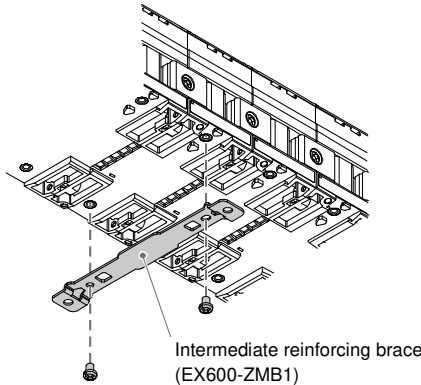
Then fix using the valve plate mounting screws (M4 x 6 mm) supplied (Tightening torque: 0.7 to 0.8 N•m).



5 Installation

• **Direct mounting**

- When assembling six or more units, the middle part of the assembly must be fitted with an intermediate reinforcing brace (EX600-ZMB1) before mounting using 2-M4x5 screws (Tightening torque: 0.7 to 0.8 N•m).

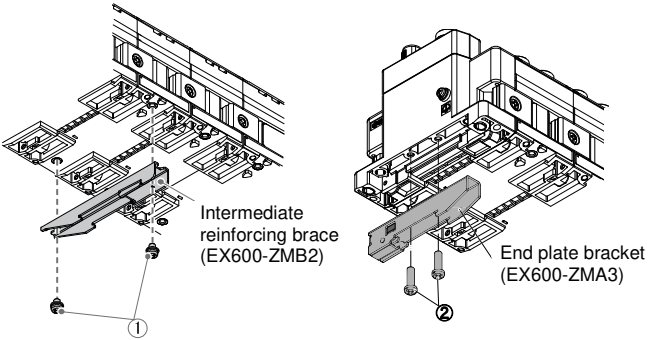


- Mount and tighten the end plate at one end of the unit and mount the intermediate reinforcing brace if required using M4 screws (Tightening torque: 0.7 to 0.8 N•m). Fix the SUP/EXH block assembly side while referring to the operation manual of the corresponding valve manifold or ITV module.

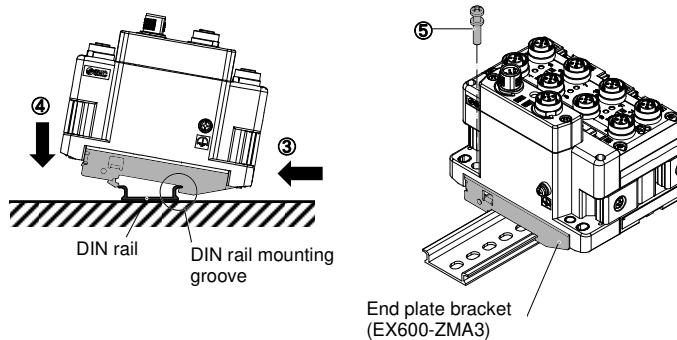
5 Installation (continued)

• **DIN rail mounting**

- When assembling six or more units, the middle part of the complete assembly must be fitted with an intermediate reinforcing brace for DIN rail mounting (EX600-ZMB2), using 2-M4 x 6 screws. Tightening torque: 0.7 to 0.8 N•m.
- Mount the end plate bracket (EX600-ZMA3) to the end plate using 2-M4 x 14 screws (Tightening torque: 0.7 to 0.8 N•m).

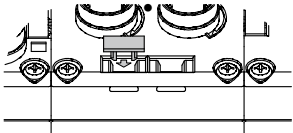


- Hook the DIN rail mounting groove on to the DIN rail.
- Press the manifold using its side hooked to the DIN rail as a fulcrum until the manifold is locked onto the DIN rail.
- Fix the manifold by tightening the DIN rail fixing screws supplied of the EX600-ZMA3 (M4 x 20 mm). Tightening torque: 0.7 to 0.8 N•m. Fix the SUP/EXH block assembly while referring to the operation manual of the corresponding valve manifold or ITV module.



5.1 Identification marker

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



5.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product specifications.
- Select the appropriate type of protection according to the environment of operation. IP67 protection is achieved when the following conditions are met.
 - The units are connected properly with fieldbus cable with M12 connector and power cable with M12 connector.
 - Suitable mounting of each unit and manifold valve.
 - Be sure to fit a waterproof cap on any unused connectors.
- 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.

6 Wiring

6.1 Wiring connections

- Select the appropriate cables to mate with the connectors on the SI unit. The EtherCAT connection port pin layout is as shown below.

Connector	Pin No.	Signal name
PORT1 / PORT2		
	1	TX+
	2	RX+
	3	TX-
	4	RX-

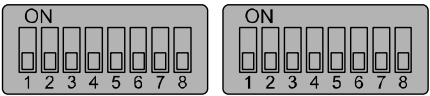
Warning

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

7 Settings

7.1 Switch settings

- (1) Open the display cover.
- (2) Turn OFF the power before setting the switches.
- (3) Set the switches using a small flat blade screwdriver, referring to the information below.
- (4) After setting the switches close the cover and tighten the screw (Tightening torque: 0.3 to 0.4 N•m).
- (5) When the power supply is turned ON the switch setting will become effective.



Settings1

Settings2

- Note! Switch 6 to 8 of the Settings1 and switch 6 to 8 of the Settings2 switches are not used and should be OFF (Never turn them ON).

IO-Link master size setting

Sets byte size that every IO-Link master unit in the manifold occupies.

Settings1		IO-Link master I/O data size	Process data size Port 1/2/3/4 (Input and Output)
1	2		
OFF	OFF	22 bytes (default)	4/4/4/4 bytes
OFF	ON	38 bytes	8/8/8/8 bytes
ON	OFF	70 bytes	16/16/16/16 bytes
ON	ON	134 bytes	32/32/32/32 bytes

Diagnostics mode setting

Allocates the diagnostic data to the input data.

Settings1		Content	Diagnostic size set for input
3	4		
OFF	OFF	Input data only (default)	0 bytes
OFF	ON	Input data + system diagnostics	4 bytes
ON	ON/OFF	Input data + system diagnostics + unit diagnostics	6 bytes

Hold / Clear setting

Sets the output operation when the fieldbus has a communication error or is in idling state.

Settings 1	Content
5	
OFF	
ON	Output is OFF (default).
ON	Hold the output.

Note1: This setting can be enabled and disabled using system parameters.

Note2: The above switch setting does not affect the pressure hold / clear setting of ITV modules and Fault / Idle output setting of the IO-Link master unit (EX600-L#B1). To configure these hold / clear settings, change the parameters using the CoE object dictionary, or the Web server.

7 Settings (continued)

SI unit data size setting (Valve output)

Set the data size for the valve output on the EtherCAT communication. Set the switch to at least the number of connected valves.

Settings2			Content	Valve output data size
1	2	3		
OFF	OFF	OFF	128 valve outputs max. (default)	16 bytes
OFF	OFF	ON	96 valve outputs max.	12 bytes
OFF	ON	OFF	64 valve outputs max.	8 bytes
OFF	ON	ON	32 valve outputs max.	4 bytes
ON	ON/OFF	ON/OFF	No valve outputs	0 bytes

SI unit data size setting (ITV module)

Set the data size for the ITV module on the EtherCAT communication. Set this switch to at least the number of connected ITV modules.

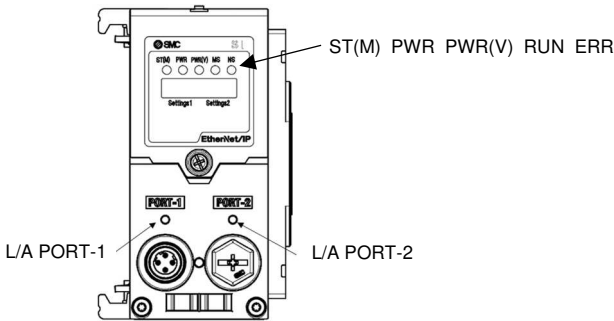
Settings2		Content	ITV module data size
4	5		
OFF	OFF	4 x ITV modules max. (default)	Input: 16 bytes Output: 8 bytes
OFF	ON	2 x ITV modules max.	Input: 8 bytes Output: 4 bytes
ON	ON/OFF	No ITV modules	Input: 0 bytes Output: 0 bytes

7.2 Configuration

- The address is automatically recognized and allocated to the EtherCAT product during configuration. There is no need for the user to set an address. To configure the EX600 SI unit with the EtherCAT master, an ESI file is required. The ESI file can be downloaded from the SMC website (URL: <https://www.smcworld.com>).

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

8 LED Display



8.1 ST(M) LED

LED display	Content
Green ON	Normal operation.
Green flashing	Diagnostic error in I/O unit is detected.
Red flashing (1 Hz)	Any of the following diagnostic errors detected. <ul style="list-style-type: none">• Valve ON/OFF counter has exceeded the set value (with diagnostic parameter enabled).• Valve is short-circuited.• The connected valve stations have increased or decreased.• IO-Link master process data mapping fault diagnostics is detected.
Red flashing (Double flash)	Any of the following diagnostic errors detected. <ul style="list-style-type: none">• The power supply for ITV module is short-circuited.• ITV module has failed.• Internal communication error between SI unit and ITV module is detected.
Red/green flashing alternately	Internal communication error between SI unit and I/O unit is detected.
Red ON	SI unit has failed.

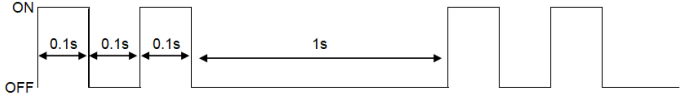
8 LED Display (continued)

ST(M) LED Flashing pattern

Red flashing (1 Hz)



Red flashing (Double flash)



8.2 PWR LED

LED display	Content
Green ON	Power supply voltage for control and input is correct.
Red ON	Power supply voltage for control and input is below 19 VDC (diagnostic parameter enabled).

8.3 PWR(V) LED

LED display	Content
OFF	Power supply voltage for output is below 19 VDC (diagnostic parameter disabled).
Green ON	Power supply for output is correct.
Red ON	Power supply voltage for output is below 19 VDC (diagnostic parameter enabled).

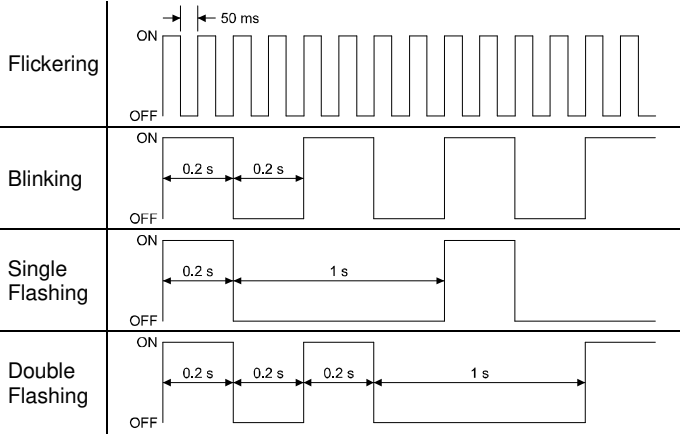
8.4 RUN LED

LED display	Content
OFF	INIT state
Green blinking	PRE-OPERATIONAL state
Green single flashing	SAFE-OPERATIONAL state
Green flickering	BOOTSTRAP state
Green ON	OPERATIONAL state
Red ON	SI unit has failed.

8.5 ERR LED

LED display	Content
OFF	No communication errors.
Red blinking	Invalid configuration.
Red single flashing	Synchronization error, communication data error.
Red double flashing	Communication error (Application watchdog timeout).
Red ON	SI unit has failed.

8.6 RUN LED and ERR LED flashing pattern



8 LED Display (continued)

8.7 L/A PORT1 LED

LED display	Content
OFF	PORT-1 (BUS IN): No Link, No Activity
Green ON	PORT-1 (BUS IN): Link, No Activity (100 Mbps)
Green flickering	PORT-1 (BUS IN): Link, Activity (100 Mbps)

8.8 L/A PORT2 LED

LED display	Content
OFF	PORT-2 (BUS OUT): No Link, No Activity
Green ON	PORT-2 (BUS OUT): Link, No Activity (100 Mbps)
Green flickering	PORT-2 (BUS OUT): Link, Activity (100 Mbps)

9 How to Order

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

10 Outline Dimensions (mm)

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

11 Maintenance

11.1 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
- Stop operation if the product does not function correctly.

12 Limitations of Use

12.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

13 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.

14 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)
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