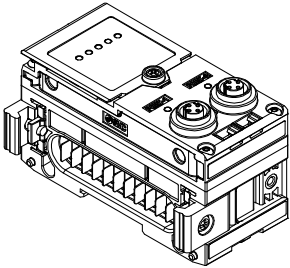




ORIGINAL INSTRUCTIONS

Instruction Manual
Fieldbus device - SI unit for EtherCAT
Series EX600-SEC3 / -SEC4



The intended use of this SI unit is for the control of pneumatic valves and I/O while connected to IO-Link and EtherCAT communication 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 relating to systems.
ISO 4413: Hydraulic fluid power - General rules relating to systems.
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety. etc.

- 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.

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



Warning

- 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 32 outputs, and to input, output, I/O and IO-Link units to a maximum of 9 units.

2.1 General specifications

Item	Specifications
Operating temperature	-10 to +50 °C
Ambient humidity	35 to 85% RH (no condensate)
Ambient storage temperature	-20 to +60 °C
Withstand voltage	500 VAC applied for 1 minute
Insulation resistance	500 VDC, 10 MΩ or more
Impact resistance	147 m/s ² 3 times in each direction of X, Y and Z respectively
Enclosure	IP67
Weight	300 g

2 Specifications (continued)

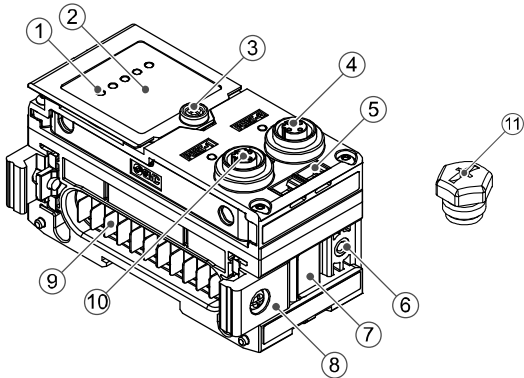
2.2 Electrical specifications

Item		Specifications
Power supply voltage / current	Controller power supply	21.6 to 26.4 VDC 0.1 A max.
	Solenoid valve and output power supply	22.8 to 26.4 VDC 2.0 A or less, according to the solenoid valve specification
Internal current consumption		120 mA max.
Solenoid valve	Output type	EX600-SEC3 PNP (negative common) / source EX600-SEC4 NPN (positive common) / sink
	Number of outputs	32 outputs (8/16/24/32 selectable)
	Output condition Fail safe	HOLD / CLEAR / Force ON
	Connected load	24 VDC and 1.0 W solenoid valve with surge voltage suppressor (manufactured by SMC).
	Protection	Short circuit protection

2.3 Communication specifications

Item	Specifications
Number of ports	2 ports
Fieldbus protocol	EtherCAT (conformance test record V2.3.0)
Communication speed	100 Mbps
Occupied area (No. of I/O)	1212 inputs / 1210 outputs max.
Vendor ID	0x00000114 hex (276 dec)
Product code	0x0100004B hex (16777291 dec)
Applicable function	Web server
Configuration file	ESI file: SMC_EX600-SEC3_4_V1.2.xml

3 Name and function of Individual parts



No	Part	Description
1	Status LED display	Displays the SI unit status.
2	Display cover	Open the cover for switch settings.
3	Display cover screw	Screw to open the display cover.
4	Connector (BUS OUT)	Connector (PORT 2) for fieldbus outputs.
5	Marker groove	Groove for identification marker.
6	Valve plate hole	Hole for valve plate mounting.
7	Valve plate groove	Groove for valve plate mounting.
8	Joint bracket	Bracket for joining to adjacent units.
9	Unit connector (plug)	Connector for signal/power to next unit.
10	Connector (BUS IN)	Connector (PORT 1) for fieldbus Inputs.
11	Seal cap (1 pc.)	Fitted to unused connectors.

4 Assembly

4.1 Assembling the unit



Warning

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

- (1) Connect an I/O unit to the end plate. Digital and analogue units can be connected in any order. Joint bracket screw tightening torque: 1.5 to 1.6 N•m.

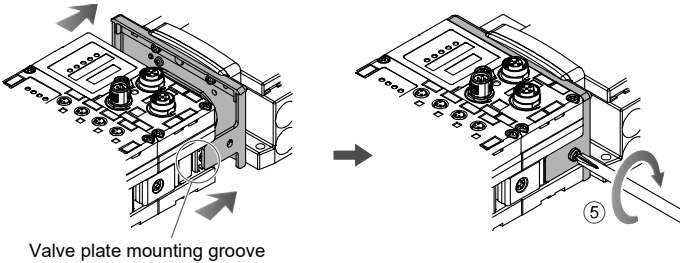
- (2) Add more I/O units. Up to 9 I/O units can be connected to one manifold.

- (3) Connect the SI unit. After connecting the required I/O units, connect the SI unit. The connection method is as above.

- (4) Mount the valve plate (EX600-ZMV#) to the valve manifold using the valve screws (M3 x 8) supplied. (Tightening torque: 0.6 to 0.7 N•m).

- (5) Connect the SI unit assembly to the valve manifold. Insert the valve plate into the valve plate mounting groove.

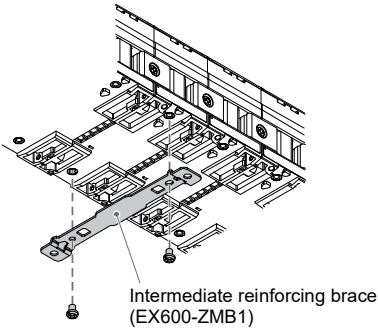
Then fix using the valve plate mounting screws (M4 x 6) supplied (Tightening torque: 0.7 to 0.8 N•m).



5 Installation

• Direct mounting

- (1) 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).



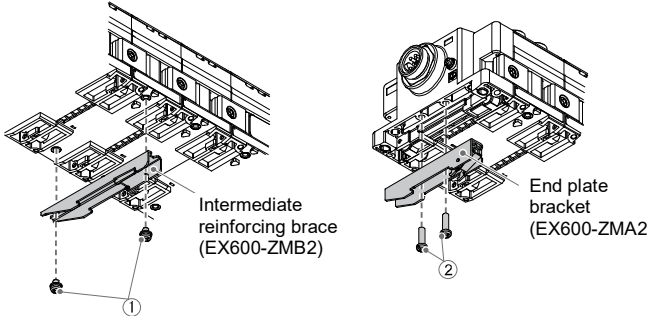
- (2) Mount and tighten the end plate at one end of the unit and mount the intermediate reinforcing brace if required using M4 screws (Tightening torque: 0.7 to 0.8 N•m). Fix the end plate at the valve side while referring to the operation manual for the applicable valve series.

• DIN rail mounting

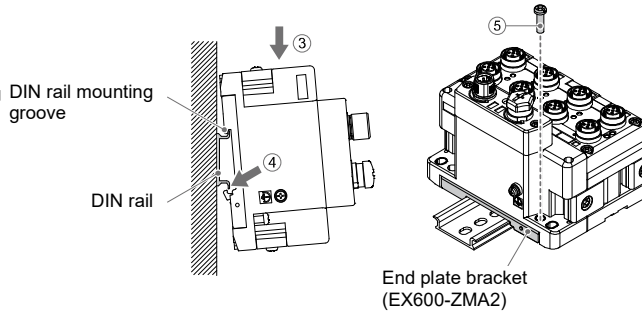
- (1) When assembling six or more units, the middle part of the complete assembly must be fitted with an intermediate reinforcing brace for DIN rail mounting (EX600-ZMB2), using 2-M4 x 6 screws. (Tightening torque: 0.7 to 0.8 N•m).

5 Installation (continued)

- (2) Mount the end plate bracket (EX600-ZMA2) to the end plate using 2-M4 x 14 screws (Tightening torque: 0.7 to 0.8 N•m). For the SY series, 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 to the DIN rail as a fulcrum until the manifold is locked onto the DIL rail.
(5) Fix the manifold by tightening the DIN rail fixing screws (M4 x 20) 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.



5.1 Wiring connections

• Communication Connector

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
BUS IN (PORT 1)	BUS OUT (PORT 2)		
		1	TX+
		2	RX+
		3	TX-
		4	RX-

• Power Supply Connector

The system is operated using power supplied from the EX600-ED# end plate. Refer to the end plate instruction manual and operation manual for the power supply connection details.

The M12 connector cable for fieldbus and power supply connections has two types, Standard M12 and SPEEDCON compatible. If both plug and socket have SPEEDCON connectors, the cable can be inserted and connected by turning it a 1/2 rotation. A standard connector can be connected to a SPEEDCON connector.



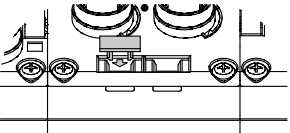
Warning

- 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.

5 Installation (continued)

5.2 Identification marker

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



5.3 Environment

Warning

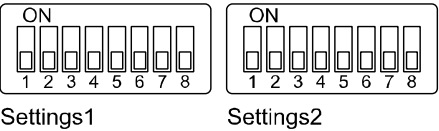
- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.

6 Setting

6.1 Switch Setting

All default switch settings are OFF. Perform settings before using the product.

- Open the display cover.
- Turn OFF the power before setting the switches.
- Set the switches using a small flat blade screwdriver, referring to the information below.
- After setting the switches close the cover and tighten the screw (Tightening torque: 0.3 to 0.4 N•m).



Settings 1		Settings 2	
1	V_SEL	1	IO-Link master size setting
2		2	
3	Diagnostics setting	3	EX600-SEC1/2 Compatibility mode*1
4		4	
5	Hold/Clear setting	5	Fixed to OFF
6	Fixed to OFF	6	
7		7	
8		8	

*1: When switch 3 of Settings2 is turned ON, the memory map and the functions change to EX600-SEC1/2 Compatibility mode. Use the ESI file for EX600-SEC1/2 in this mode.

- Switch 6 to 8 of the Settings1 and switch 4 to 8 of the Settings2 are not used and should never be turned ON.

6.1.1 V_SEL switch setting

Select the number of outputs (size) occupied by the SI unit.

Settings 1		Number of occupied valves	SI unit Output data size
1	2		
OFF	OFF	32 outputs	4 bytes (default)
OFF	ON	24 outputs	3 bytes
ON	OFF	16 outputs	2 bytes
ON	ON	8 outputs	1 byte

* Set the number of occupied valve outputs to at least the number of valves used.

6 Setting (continued)

6.1.2 Diagnostics switch setting

Allocate the diagnostic data to the input data.

Settings 1		Mode	Content	Diagnostic size set for the input
3	4			
OFF	OFF	0	Input data only (Default setting)	0 bytes
OFF	ON	1	Input data + System diagnostics	4 bytes
ON	OFF	2	Input data + System diagnostics + Unit diagnostics	6 bytes
ON	ON			

6.1.3 HOLD / CLEAR switch setting

Set the output status for when the fieldbus has a communication error or is in the idle state.

Settings 1	Content
5	
OFF	
ON	Holds the output.

6.1.4 IO-Link Master size switch setting

Set the byte size which every IO-Link master in the manifold occupies (only for use in Normal mode).

Settings2		Content	IO-Link master size setting (Process data size at each communication port)
1	2		
OFF	OFF	Port 1 / 2 / 3 / 4 (Input and Output)	22 bytes (default setting) (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)

6.1.5 EX600-SEC1/2 Compatibility mode switch setting

Settings2	Content
3	
OFF	Run in Normal mode (default setting)
ON	Run in EX600-SEC1/2 compatibility mode.

6.2 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.

6.2.1 ESI file

The ESI file is required to configure the EX600.
The ESI file can be downloaded from the SMC website (URL: <https://www.smcworld.com>).
Product Document → Instruction Manual

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

7 How to Order

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

8 Outline Dimensions (mm)

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

9 LED Display

ST(M) PWR PWR(V) RUN ERR



9.1.1 ST(M) LED

LED display	Content
OFF	Power supply voltage for control and input is not connected.
Green ON	Normal operation.
Green flashing	Diagnostic error of I/O unit is detected.
Red flashing	Either of the following diagnostic errors is detected (with diagnostic parameter enabled). <ul style="list-style-type: none">Valve ON/OFF counter has exceeded the set value.Valve is short circuited or disconnected.
Red/Green flashing alternately	Communication error between SI unit and I/O unit detected.
Red ON	SI unit has failed.

9.1.2 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 (with diagnostic parameter enabled).

9.1.3 PWR(V) LED

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

9.1.4 RUN LED

LED display	Content
OFF	INIT state
Green flashing	PRE-OPERATIONAL state
Green single flashing	SAFE-OPERATIONAL state
Green flickering	BOOTSTRAP state
Green ON	OPERATIONAL state

9.1.5 ERR LED

LED display	Content
OFF	Normal communication (no errors)
Red flashing	Invalid configuration
Red single flashing	Synchronization error, communication data error.
Red double flashing	Communication error (application watchdog timeout).

9.1.6 L/A PORT1 LED

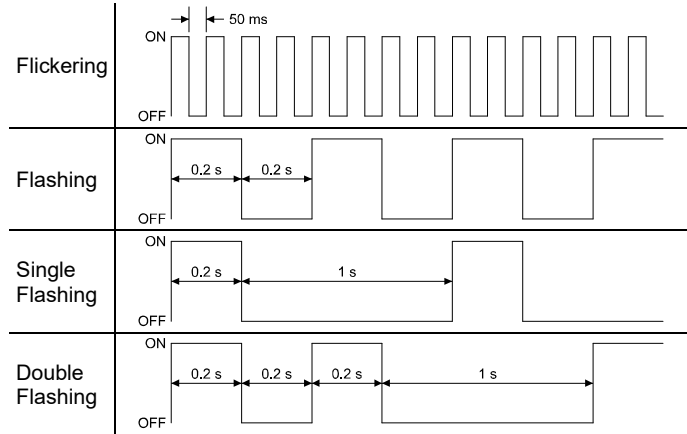
LED display	Content
OFF	No Link, No Activity (BUS IN side)
Green ON	100 Mbps Link, No Activity (BUS IN side)
Green flickering	100 Mbps Link, Activity (BUS IN side)

9.1.7 L/A PORT2 LED

LED display	Content
OFF	No Link, No Activity (BUS OUT side)
Green ON	100 Mbps Link, No Activity (BUS OUT side)
Green flickering	100 Mbps Link, Activity (BUS OUT side)

9 LED Display (continued)

9.2 LED flashing pattern



10 Maintenance

10.1 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 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.

How to reset the product for power cut or forcible de-energizing

Supply power to the product.
The output status just before the power failure is not maintained when the power supply is recovered. Start the operation after confirming safety of the entire equipment.

11 Limitations of Use

11.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

12 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.

13 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, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
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