Fieldbus system

Operation Manual

EX600-SEC1 / EX600-SEC2

Thank you for purchasing an SMC EX600 Series Fieldbus system.
Please read this manual carefully before operating the product and make sure you understand its capabilities and limitations.
Please keep this manual handy for future reference.

To obtain more detailed information about operating this product, please refer to the SMC website (URL http://www.smcworld.com) or contact SMC directly.

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.

⚠ **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.

■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 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, assembling or replacing the units:**
•Avoid touching any sharp metal parts of the connectors for connecting units.
•When assembling units, take care not to get any fingers caught between units.
Injury can result.
•When disassembling units, take care to avoid excessive force.
The connection parts of the unit are firmly joined with seals and 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 safety and noise resistance of the Fieldbus system.**
Individual grounding should be provided close to the product with a short cable.

■NOTE

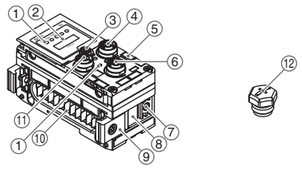
- The direct current power supply to combine should be UL1310 Class2 power supply when conformity to UL is necessary.
- The output rating is tested as a DC output for General use.

Maintenance

•Maintenance should be performed according to the Safety Instructions.
•Perform regular maintenance and inspections.
There is a risk of unexpected malfunction.
•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 fully squeezed, then wipe up the stains again with a dry cloth.

Refer to the SMC website (URL http://www.smcworld.com) for more information about maintenance.

Summary of Product parts



No.	Description	Function
1	Status display LED	Displays the status of the unit.
2	Display cover	Open to access the setting switches.
3	Display cover screw	Screw to open the display cover.
4	Connector (BUS OUT)	Connector for fieldbus outputs.
5	Marker groove	Groove for an identification marker.
6	Connector (PCI)	Connector for Handheld Terminal.
7	Valve plate mounting hole	Holes for fixing the valve plate.
8	Valve plate mounting groove	Groove for mounting the valve plate.
9	Joint bracket	Bracket for joining to adjacent units.
10	Unit connector (Plug)	Connector for signals and power supplies to adjacent units.
11	Connector (BUS IN)	Connector for fieldbus inputs.
12	Seal cap (2 pcs.)	Fitted to unused connectors. (BUS OUT and PCI)

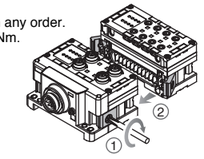
Assembly

○ **Assembling the unit as a manifold**

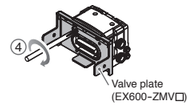
(1)Connect a unit to the end plate.
Digital and Analogue I/O units can be connected in any order.
Tighten the joint brackets to a torque of 1.5 to 1.6 Nm.

(2)Add more I/O units.
Up to 10 units (including the SI unit) can be connected to one manifold.

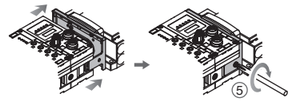
(3)Connecting the SI unit.
After connecting the required I/O units, connect the SI unit.
The method is as above in (1), (2).



(4)Mounting the valve plate.
Mount the valve plate (EX600-ZMV□) to the valve manifold using the valve set screws. (M3 x 8)
Apply 0.6 to 0.7 Nm tightening torque to the screws.



(5)Connect the SI unit to the valve manifold.
Insert the valve plate into the valve plate mounting groove on the side of the SI unit.
Fix using the valve plate screws (M4 x 6) supplied, to a torque of 0.7 to 0.8 Nm.

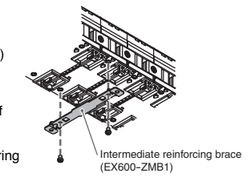


Mounting and Installation

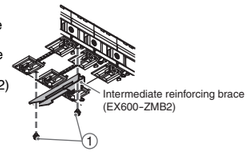
■Installation

•Direct mounting
(1)When joining six or more units, fix the middle part of the complete EX600 unit with an intermediate reinforcing brace (EX600-ZMB1) before mounting, using 2-M4 x 5 screws.
Tightening torque: 0.7 to 0.8 Nm.

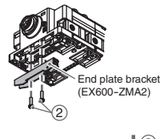
(2)Mount and tighten the end plate at one end of the unit. (M4)
Tightening torque: 0.7 to 0.8 Nm.
Fix the end plate at the valve side while referring to the operation manual of the corresponding valve manifold.



•DIN rail mounting
(Not available for SY series valves. Refer to the SY catalogue.)
(1)When joining six or more units, fix the middle part of the complete EX600 unit with an intermediate reinforcing brace (EX600-ZMB2) before mounting, using 2-M4 x 6 screws.
Tightening torque: 0.7 to 0.8 Nm.

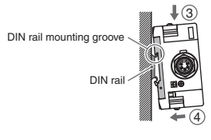


(2)Mount the end plate bracket (EX600-ZMA2) to the end plate at the opposite end to the valves, using 2-M4 x 14 screws.
Tightening torque: 0.7 to 0.8 Nm.

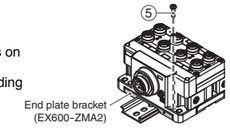


(3)Hook the DIN rail mounting groove on to the DIN rail.

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



(5)Fix the manifold by tightening the DIN rail fixing screws of the EX600-ZMA2. (M4 x 20)
Tightening torque: 0.7 to 0.8 Nm.
The tightening torque at the valve side depends on the valve type.
Refer to the operation manual of the corresponding valve manifold.

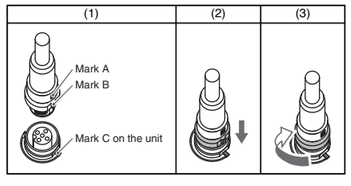


■Wiring

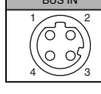
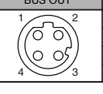
•Connect the M12 connector cable.
The M12 SPEEDCON connector connection method is explained below.
(1)Align mark B on the metal bracket of the cable connector (plug/socket) with mark A.

(2)Align with mark C on the unit and insert the connector vertically.
If they are not aligned, the connector cannot be connected correctly.

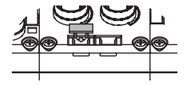
(3)When mark B has been turned 180 degrees (1/2 turn), wiring is complete. Confirm that the connection is not loose. If turned too far, it will become difficult to remove the connector.



•Connector pin assignment

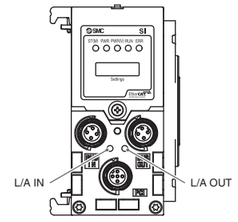
Configuration		Pin number	Signal name
BUS IN	BUS OUT		
		1	TD+
		2	RD+
		3	TD−
		4	RD−

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



LED Display

The status display LED displays the power supply and communication status.



Display	Content
ST(M)	Displays the diagnostic status of the unit.
PWR	Displays the status of the power supply voltage for control and input.
PWR(V)	Displays the status of the power supply voltage for outputs.
RUN	Displays the module status.
ERR	Displays the network status.

	Content
L/A IN	Displays the communication status of the BUS IN side physical layer.
L/A OUT	Displays the communication status of the BUS OUT side physical layer.

•SI unit common status

LED display	Content
ST(M) PWR PWR(V) ○ ○ ○ OFF.	The power supply for control and input is OFF.
ST(M) PWR PWR(V) ● ● ● Green LEDs are ON.	The unit is in normal operation.
ST(M) PWR PWR(V) ● ○ ○ Red ST(M) LED is ON.	A component failure inside the SI unit.
ST(M) PWR PWR(V) ○ ● ○ Red PWR LED is ON.	The power supply voltage for control and input is abnormal.
ST(M) PWR PWR(V) ○ ○ ● Red PWR(V) LED is ON.	The power supply voltage for outputs is abnormal.
ST(M) PWR PWR(V) ◔ ○ ○ Green ST(M) LED is flashing.	A unit other than the SI unit has been detected.
ST(M) PWR PWR(V) ◔ ○ ○ Red ST(M) LED is flashing.	Either of the following conditions: •The valve ON/OFF counter has exceeded the set value. •The valve is short circuited or disconnected.
ST(M) PWR PWR(V) ◔ ○ ○ Red/Green ST(M) LED is flashing alternately.	Either of the following conditions: •Connection error between units has occurred. •Configuration memory error has occurred.

•EtherCAT status

LED display	LED state	Content
RUN ● (Green)	OFF	Initialized status
	Flash	Pre-operational status
	Single Flash	Safe operational status
	ON	Operational status
ERR ● (Red)	OFF	No communication error
	Flash	Communication setup error
	Double Flash	Communication error (application watchdog timeout)
(L/A IN) ● (Green)	OFF	BUS IN side : No Link, No Activity
	ON	BUS IN side : Link, No Activity
	Flickering	BUS IN side : Link, Activity
(L/A OUT) ● (Green)	OFF	BUS OUT side: No Link, No Activity
	ON	BUS OUT side: Link, No Activity
	Flickering	BUS OUT side: Link, Activity

Refer to the SMC website (URL http://www.smcworld.com) for more information about LED state.

Setting and Adjustment

Settings

•V_SEL switch: Select the number of outputs (size) occupied by the SI unit.

Settings		Content	SI unit output data size
1	2		
OFF	OFF	Number of valves = 32 outputs (Default setting)	4 byte
OFF	ON	Number of valves = 24 outputs	3 byte
ON	OFF	Number of valves = 16 outputs	2 byte
ON	ON	Number of valves = 8 outputs	1 byte

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

•Diagnostics switch: Allocates the diagnostic data to the input data.

Settings		Mode	Content	Diagnostic size set for the input
3	4			
OFF	OFF	0	Input data only (Default setting)	0 byte
OFF	ON	1	Input data + System diagnosis	4 byte
ON	OFF	2	Input data + System diagnosis + Unit diagnosis (Up to 10 units)	6 byte
ON	ON			

∗: Mode 3 is a function for extension in the future. (not to be used.)

•HOLD/CLEAR switch: Sets the output status when the fieldbus has a communication error or is in idling state.

Settings	Content
5	
OFF	Output is OFF. (Default setting)
ON	Holds the output.

∗: Refer to "Parameter Setting", for the further details.

•Configuration memory switch: When the manifold configuration memory switch is set ON and the power supply is switched ON, the system will compare the stored configuration with the manifold configuration. If the configuration is different, diagnostic error will be generated.

Settings	Content
6	
OFF	Normal operation mode (Default setting)
ON	Configuration memory mode

Refer to the SMC website (URL http://www.smcworld.com) for more information about setting and adjustment.

Troubleshooting

Refer to the LED Display. Refer to the SMC website (URL http://www.smcworld.com) for more information about troubleshooting.

Specifications

Power supply	Control and input	24 VDC Class2, 2 A
	Output	24 VDC Class2, 2 A
Output rating		24 VDC, 1.5 W or less, DC General per output
Operating temperature range		−10 to 50 °C (Max. surrounding air temperature rating: 50 °C)
Storage temperature range		−20 to 60 °C
Pollution degree		For use in Pollution Degree 3 Environment (UL508)
Vibration resistance		10 to 57 Hz: constant amplitude 0.75 mm p-p 57 to 150 Hz: constant acceleration 49 m/s² for 2 hours each in direction X, Y and Z respectively (De-energized)
Impact resistance		147 m/s² 3 times each in directions of X, Y and Z respectively (De-energized)

Refer to the product catalogue or SMC website (URL http://www.smcworld.com) for more information about product specifications.

Commissioning

•Parameter Setting •Hardware Configuration •I/O Map •Diagnostic
Refer to the SMC website (URL http://www.smcworld.com) for more information about these settings.

Outline with Dimensions

Refer to the product catalogue or SMC website (URL http://www.smcworld.com) for more information about outline dimensions.

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