Fieldbus device
Operation Manual

EX250 Series for CANopen

Thank you for purchasing an SMC EX250 Series Fieldbus device (Hereinafter referred to as "SI unit").
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.

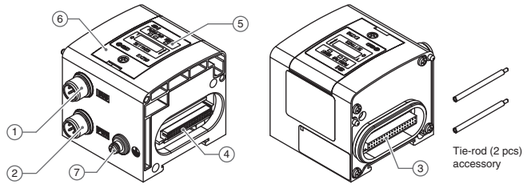
⚠ Warning: WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

⚠ 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 maintenace 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.

Summary of Product elements



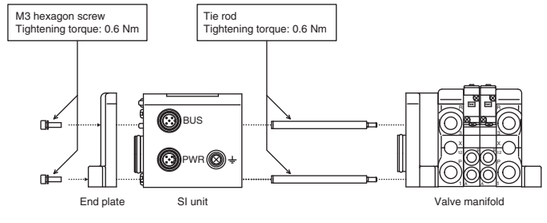
No.	Description	Function
1	Communication connector	Connect with CANopen communication line.
2	Power supply connector	Supplies power to the solenoid valve, the Output block, SI unit and the Input block.
3	Input block connector	Connects the Input block.
4	Output block connector	Connects the solenoid valve, Output block and etc.
5	Display	LED display shows the SI unit status.
6	Switch protective cover	Set node ID and Baud rate by using the switches under the cover.
7	FE	Used for grounding.

Mounting and Installation

■Installation

The SI unit does not have mounting holes, so it cannot be installed alone. Make sure to connect the solenoid valve. When an input block is not required, connect the end plate directly to the SI unit.

○Assembly and disassembly of the SI unit



Exchange of SI unit
- Remove screws from End Plate and release connection of each unit.
- Replace old SI unit with new one. (Tie rod does not need to be removed.)
- Connect Input Block and End Plate and tighten removed screws by specified tightening torque. (0.6 Nm)

Assembly and disconnection of unit
Addition of Input Block
- Remove screws from End Plate.
- Mount attached tie rod.
- Connect additional Input Block.
- Connect End Plate and tighten removed screws by specified tightening torque. (0.6 Nm)

Caution for maintenance
(1) Be sure to turn-off all power supplies.
(2) Be sure that there is no foreign object in any of units.
(3) Be sure that gasket is lined properly.
(4) Be sure that tightening torque is according to specification.

If these items are not kept, it may lead to the breakage of substrate or intrusion of liquid or dust into the units.

■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

■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.

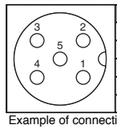
■NOTE

- When conformity to UL is necessary the SI unit must be used with a UL1310 Class2 power supply.

■Wiring

○Communication wiring

- Communication connector M12 5 pins plug A-coded



No.	Description	Function
1	CAN_SHLD	Shield
2	CAN_V+	Power supply + for CANopen
3	CAN_GND	Power supply – for CANopen
4	CAN_H	CAN_H bus line (dominant high)
5	CAN_L	CAN_L bus line (dominant low)

Example of connection cable: M12 socket 5 pins cable with shield (according to ISO11898)

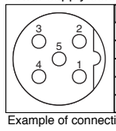
○Communication wiring

Relation Baud rate and Bus length are as follows.

Baud rate (Communication speed) (bit/s)	1 M	800 k	500 k	250 k	125 k	50 k	20 k	10 k
Max. bus cable length (m)	25	50	100	250	500	1000	2000	5000

○Power supply wiring

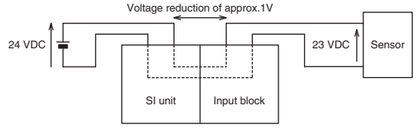
- Power supply connector M12 5pins plug B-coded (reverse key type)



No.	Description	Function
1	SV24 V	+24 V for solenoid valve.
2	SV0 V	0 V for solenoid valve
3	SW24 V	+24 V for input block
4	SW0 V	0 V for input block
5	FE	Function ground

Example of connection cable: EX9-AC050-1 etc.

SW power is supplied to the sensor connected to the input block. There is a voltage drop up to maximum 1 V inside the SI unit when SW power is supplied. Select a sensor taking this voltage drop into consideration. If 24 V must be supplied to the sensor, it is necessary to increase the SW power supply voltage so that the input voltage of the sensor will be 24 V with the actual load. (Allowable SW power supply range: 19.2 V to 28.8 V)



○Bus cable and termination resistors

The cables, connectors, and termination resistors used in CANopen networks shall meet the requirements defined in ISO 11898. In addition, here are given some guidelines for selecting cables and connectors.

The table below shows some standard values for DC parameters for CANopen networks with less than 64 nodes.

Bus length [m]	Bus cable specification		Termination resistance [Ω]
	Length-related resistance [mΩ/m]	Cross-section [mm²]	
0···40	<70	0.25···0.34	124
40···300	<60	0.34···0.6	150···300
300···600	<40	0.5···0.6	150···300
600···1000	<26	0.75···0.8	150···300

For drop cables a wire cross-section of 0.25 to 0.34 mm² would be an appropriate choice in many cases.
Besides the cable resistance, there should also be considered the real resistance of the connectors, if calculating the voltage drop. The read resistance of one connector should be in the range of 2.5 to 10 mΩ.

○FE connection

Connect the ground terminal to the ground. Resistance to the ground should be 100 Ω or less.

Setting

○Switch setting

Before setting of Node-ID by DIP switch, turn “OFF” power supply to the SI unit.

Setting of Node-ID

Node-ID	SW1	SW2	SW3	SW4	SW5	SW6
0	0	0	0	0	0	0
1	1	0	0	0	0	0
2	0	1	0	0	0	0
⋮						
62	0	1	1	1	1	1
63	1	1	1	1	1	1

Set SW7 to 0. (SW7 is not used.)

Set SW8 to 1. (fixed)

Setting of output when stopped state

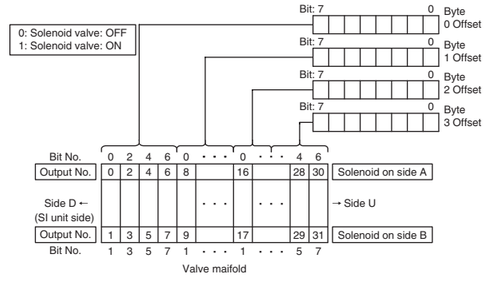
SW9	Output condition of solenoid valve when stopped state by an error occurs (Error Control ,Emergency Object) or “Stop Remote Node” command is received.
0	Output Value shall take the pre-defined condition specified in Error Value Output Object (6207h,6307h,6327h) Default: all outputs are cleared.
1	Output Value shall be kept.

Setting of mode

SW10	Mode
0	HW mode. Setting of Node-ID is achieved by DIP switches SW1-6.
1	SW mode. Setting of Node-ID is achived via network. SW1-8 become unavailable. Node-ID can be set up to 127. Default is 127 (7Fh).

○Output No. assignment

Combinations of output data and valve manifold



∗: Output numbers are assigned to stations from side D to U of manifold in order. (See manual of each valve manifold for the directions of side D and U).
∗: Standard manifold is wired in double. Output numbers are assigned to side A and B alternatively. In case of single solenoid valve, output on side B is free. (Refer to fig.a)
∗: Mixed (single and double) wiring is available as long as wiring specifications designate it. This allows output numbers to be specified without having free output. (Refer to fig.b)
∗: Each bit of data sent from master (4 bytes) shows ON/OFF (0: OFF, 1: ON) of solenoid valve. Starting from LSB of the first byte (Offset0), output numbers are assigned to all the bits in numeric order.

fig.a

	Double	Single	Double	Double	
No.	0	2	4	6	Side A
Station	1	2	3	4	- - -
No.	1	3	5	7	Side B

fig.b

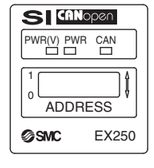
	Double	Single	Double	Double	
No.	0	2	3	5	Side A
Station	1	2	3	4	- - -
No.	1	-	4	6	Side B

Open

○Input No. assignment

The inputs of the Input block are assigned from the SI unit side Input block in the order 0,1,2…maximum of 31.

LED indication



LED	Description	
PWR(V)	Green Light	Illuminates when power for solenoid valves is supplied.
PWR	Green Light	Illuminates when power for CANopen line is supplied.
CAN	Green Light	Illuminates when SI unit is in the Operational state.
	Green Light (blinking)	SI unit is in the Pre-Operational state.
	Green Light (single flash)	Single flash when SI unit is in Stopped state.
	Red Light (single flash)	Single flash when CAN controller error occurs.
	Red Light (double flash)	Double flash when Error Control Event occurs.
	Green / Red Light (flickering)	Flickering when SI unit is in Configuration mode. (LSS services)
	Red Light	SI unit is in “Bus OFF” state.

Troubleshooting

Technical documentation giving detailed troubleshooting information can be found on the SMC website (URL http://www.smcworld.com).

Specifications

Power for CANopen communication: 18 to 30 VDC, 0.1 A or less
Power for input block: 24 VDC ±20%, 1 A or less (Depending on number of connecting sensors and specifications)
Power for solenoid valve: 24 VDC +10%/-5%, 2 A or less (Depending on number of solenoid valve station and specifications)
Connection load: Solenoid valve with protection circuit for 24 VDC and 1.5 W or less surge voltage. (made by SMC)
Operating ambient temp: -10 to 50 ◦C Storage ambient temp: -20 to 60 ◦C
Pollution degree: Pollution degree 3 (UL508)

Technical documentation giving detailed specification information can be found on the SMC website (URL http://www.smcworld.com).

Outline Dimensions

Technical documentation giving detailed outline dimensions information can be found on the SMC website (URL http://www.smcworld.com).

Accessories

Technical documentation giving detailed accessories information can be found on the SMC website (URL http://www.smcworld.com).

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