



Technical Specification

SI Unit (IP-Link)

PRODUCT NAME

EX250-SBI1-X41

MODE/ Series

SMC Corporation

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SAFETY

This manual contains essential information to prevent possible injury and damage to (users and other people, and property) and to ensure correct handling.

Please confirm understanding the definition of the following messages (signs) before going on to read the text, and always follow the instructions.

Also read carefully the instruction manual of relevant equipment or apparatus before use.

◆ Indications

IMPORTANT MESSAGES	
Read this manual and follow its instructions. Signal words such as WARNING, CAUTION and NOTE, will be followed by important safety information that must be carefully reviewed.	
▲WARNING	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
▲CAUTION	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
NOTE	Gives you helpful information.

◆ Operator

- ◆ This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- ◆ Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the SI Unit.

◆ Usage Restrictions

- ◆ This product is designed for use in general equipment for factory automation. Never use this product with equipment or apparatus that directly concerns human lives*¹, or which malfunction or failure can cause a huge loss.
 - *1: Equipment or apparatus that directly matters human lives means the following:
 - Medical equipment such as life support systems or equipment used in operating rooms
 - Compulsory equipment required by law such as the Fire Prevention Law, Construction Law and etc.
 - Equipment or apparatus that conforms with those mentioned above.
- ◆ Contact our sales department when plans are made for the product to be used for the system*² including equipment that concerns itself with the safety of persons or that seriously affects the public. This usage needs special consideration*³.
 - *2: The system including equipment that concerns itself with the safety of persons or that seriously affects the public means the following:
 - Nuclear reactor control systems in nuclear power plants, safety protection systems or other systems important for safety in nuclear power facilities
 - Driving control systems of mass transportation systems, and flight control systems
 - Equipment or apparatus that comes into contact with foods or beverages
 - *3: Special consideration means discussing usage with our engineers to establish a safe system designed as fool-proof, fail-safe, redundant and etc.
- ◆ Special consideration of safety or maintainability should be taken to prevent hazard or loss caused by a failure or malfunction that is likely to occur in certain probability due to environmental stress (deterioration).
 - *4: The special consideration means to fully review the equipment or apparatus in design stage and to establish a backup system in advance such as a redundant system or fail-safe system.

WARNING

- ◆ The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.
Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and / or tests to meet your specific requirements.
- ◆ Only trained personnel should operate pneumatically operated machinery and equipment.
Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
- ◆ Do not service machinery / equipment or attempt to remove components until safety is confirmed.
 1. Inspection and maintenance of machinery /equipment should only be performed after confirmation of safe locked-out control positions.
 2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.
 3. Before machinery / equipment is re-started, take measures to prevent quick extensions of the cylinder piston rod etc. (Bleed air into the system gradually to create back-pressure.)
- ◆ Contact SMC if the product is to be used in any of the following conditions:
 1. Conditions and environments beyond the given specifications, or if product is used outdoors.
 2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
 3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

⚠ WARNING

- ◆ Do not disassemble, modify (including change of printed circuit board) or repair.
An injury or failure can result.
- ◆ Do not operate the product beyond specification range.
Operation at a range that exceeds the specifications can cause a fire, malfunction, or damage to the unit.
Verify the specifications before use.
- ◆ Do not use the product in an atmosphere containing combustible, explosive or corrosive gas.
It can cause a fire, explosion or corrosion.
The unit is not designed to be explosion-proof.
- ◆ Do not apply voltage over 250 between the lead wire and metal fitting.
If voltage over 250 is applied, the lead wire insulation is damaged and this lead to cause failure, head and smoke.
Attention should be taken during insulation test.
- ◆ The following instructions must be kept when using the product in an interlocking circuit:
 - Provide double interlocking by another system such as mechanical protection
 - Check the product regularly to ensure proper operationOtherwise malfunction can cause an accident.
- ◆ The following instructions must be kept while in maintenance:
 - Turn off the power supply
 - Stop the supplied air, exhaust the residual pressure and verify the release to atmosphere before performing maintenanceOtherwise the injury could be caused.

⚠ CAUTION

- ◆ Perform proper functional checks after maintenance.
Stop operation when an abnormality is observed such that the unit does not work properly.
Safety is not be assured due to unexpected malfunction.

NOTE

- ◆ Follow the instructions given below when handling SI unit :
Or it will have a risk of being damaged and operating failure.
- ◆ The instructions on selection (installation, wiring, environment of use, adjustment, operation and maintenance) described below must also be followed.

*Product specifications

- Use the following UL recognized direct-current power supply to combine.

(1) Limited voltage current circuit in accordance with UL508

A circuit whose power is supplied by secondary coil of a insulating transformer that meets the following conditions

- Maximum voltage (with no load) : less than 30Vrms (42.4V peak)
- Maximum current : (1) less than 8A(including when short circuited)

(2) limited by circuit protector (such as fuse) with the following ratings

No load voltage (V peak)	Max. current rating (A)
0 ~ 20 [V]	5.0
Above 20 to 30 [V]	100 / peak voltage

(2) A circuit using max. 30V rms or less (Class-2 circuit), whose power is supplied by Class-2 power supply unit in accordance with UL1310 or Class-2 power supply unit in accordance with UL1585

- Operate SI unit with the specified voltage.
Operation with a voltage beyond specifications could cause malfunction or damage of the unit.
- Reserve a space for maintenance
Be sure to keep a space for maintenance when designing layout of the unit.
- Do not remove nameplate.
Otherwise maintenance error and misreading of an operation manual could cause damage or malfunction.
It may also result in nonconformity to safety standards.

◆Precautions on handling

*Installation

- Do not drop, hit or apply excessive shock to the unit.
Otherwise the unit could be damaged so much as to result in.
- Follow the specified tightening torque.
Excessive tightening torque can break screws.
The screw should be tighten with the specified torque, otherwise IP67 protection can not be guaranteed.

*Wiring (including plugging in/out of connector)

- Do not bend the cables or apply excessive force to them by pulling or placing heavy load.
Wiring subject to bending or tensile stress could cause the cables to break.
- Connect wires and cables correctly.
Incorrect could wiring break SI unit to its extent.
- Do not connect wires while the power is supplied.
SI unit and component could be damaged or malfunction.
- Do not connect power cable or high-voltage cable in the same wiring route as the unit.
Otherwise the wires to SI unit can be interrupted with noise or induced surge voltage from power lines or high-voltage lines and malfunction could be caused.
Separate wiring of SI unit and component from that of power line and high voltage line.
- Verify the insulation of wiring.
Insulation failure (interference with other circuit, poor insulation between terminals and etc.) could introduce excessive voltage or current to SI unit or component and damage them.

- Wire power line in two systems. One for solenoid valve, and the other is for SI unit control.
Otherwise wires can be interrupted with noise or induced surge voltage causing malfunction.
- Take proper measurements such as noise filter against noise when SI unit is incorporated in equipment or devices.
Otherwise contamination with noise can cause malfunction.

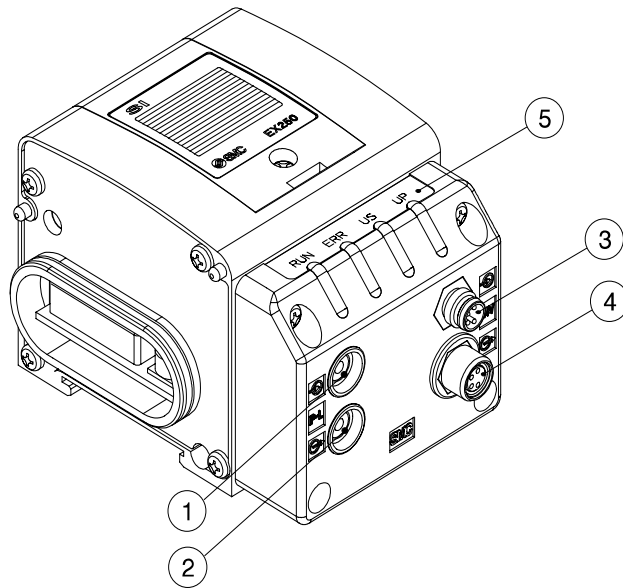
***Environment**

- Consider operating environment suitable for protection class.
Protection class IP67 is achieved by performing followings
 - (1) Wire each unit properly with M8 power cable with connector and power cable for communication.
 - (2) Mount SI unit and the manifold valve properly.
 Protected the products with cover where exposed to splashing water.
- Take sufficient shielding measures when the unit is installed.
Insufficient measures could cause malfunction or failure.
Verify the effect of the measures after incorporation of the unit in equipment or devices:
 - (1) A place where noise due to static electricity is generated
 - (2) A place where electric field strength is high
 - (3) A place where there is radioactive irradiation
 - (4) A place near power line
- Do not use the unit near by a place where electric surge is generated.
Internal circuit elements of SI unit can deteriorate or break when equipment generating a large surge (electromagnetic lifter, high frequency induction furnace, motor, etc.) is located near SI unit. Provide surge preventives, and avoid interference with line for the equipment.
- Use SI unit equipped with surge absorber when a surge-generating load such as solenoid valve is driven directly.
Direct drive of a load generating surge voltage can damage SI unit.
- Prevent foreign matter such as remnant of wires from entering the unit.
Take proper measures for the remnant not to enter SI unit in order to prevent failure or malfunction.
- Do not expose SI unit to vibration and impact.
Otherwise failure or malfunction could be caused.
- Keep the specified ambient temperature range.
Otherwise malfunction could be caused.
Do not use SI unit in a place where temperature suddenly changes even within the specified range.
- Do not expose SI unit to heat radiation from a heat source located nearby.
Malfunction could be caused.

***Maintenance**

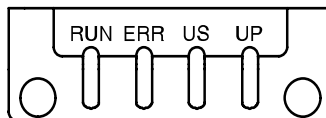
- Perform maintenance and check regularly.
Otherwise an unexpected malfunction of components could of the unit occur due to a malfunction of the whole unit.
- Perform a proper functional check.
Stop operation when an abnormality is observed such that the device doesn't work properly.
Otherwise an unexpected malfunction of the unit component can occur.
- Do not use solvents such as benzene, thinner or other to clean SI unit.
They could damage the surface of the body and erase the indication 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.

Component – Description and function



No.	Description	Application
1	IP-Link connector (IN)	Connect to IP-Link line using IP-Link connector.
2	IP-Link connector (OUT)	
3	Power connector (IN)	Supply SI unit control power and solenoid valve power by using M8 4pin connector.
4	Power connector (OUT)	
5	Display	Unit status is displayed by LED

LED display



Description	Function	Color
US	SI unit control power is supplied	Green lights
	SI unit control power is not supplied	Light off
UP	Solenoid valve power is supplied	Green lights
	Solenoid valve power is not supplied	Light off
RUN	Communication is normal	Green lights
	Optical data receiving start, or damped optical data is received	Green flickers
	Communication disconnected	Light off
ERR	Optical data is not received	Red lights
	Damped optical data is received	Red flickers
	Optical data is received	Light off

Mounting / installation

Installation

• Manifold type

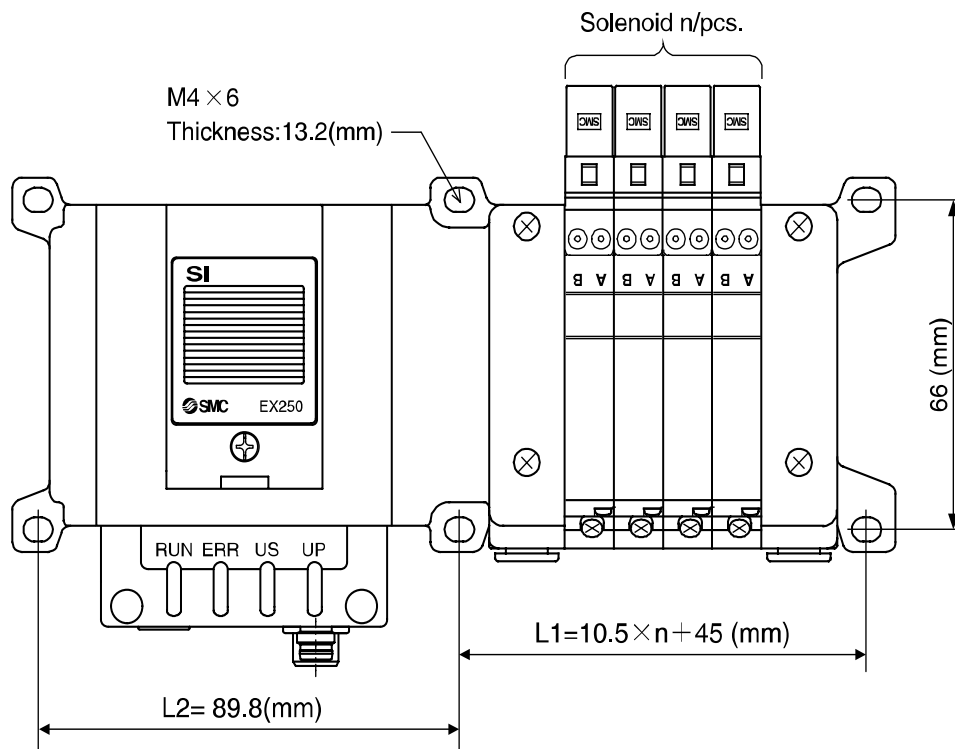
Representative series	Applicable type
VQC series	VQC1000、VQC2000、VQC4000
SV series	SV1000、SV2000、SV3000 (10 type tie rod base)

* For details of the solenoid valve and manifold, see the catalogue and the operation manual of each valve series.

• Mounting manifold

Because there is no mounting hole on SI unit, it can not be used alone.
Be sure to connect manifold to SI unit for setting.

Installation example



See the table below for dimensions when VQC1000 series solenoid valve manifold is connected.

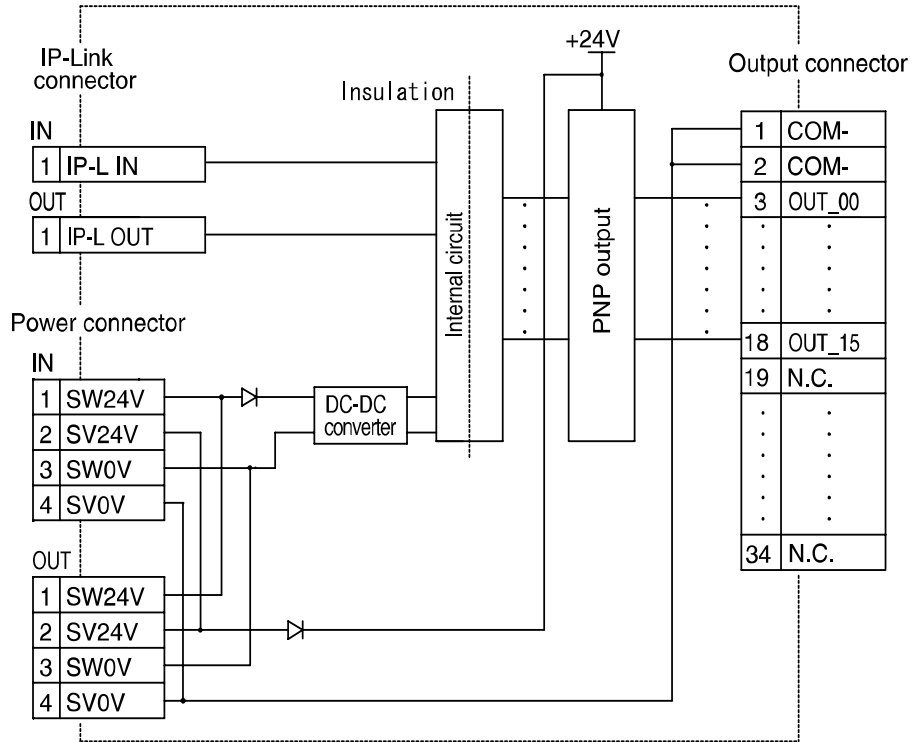
For other solenoid valve dimensions, see the catalogue.

n	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L1	45	55.5	66	76.5	87	97.5	108	118.5	129	139.5	150	160.5	171	181.5	192	202.5	213

Wiring(for power and communication) and piping can be done only one side. Space for piping/wiring is necessary in that direction.

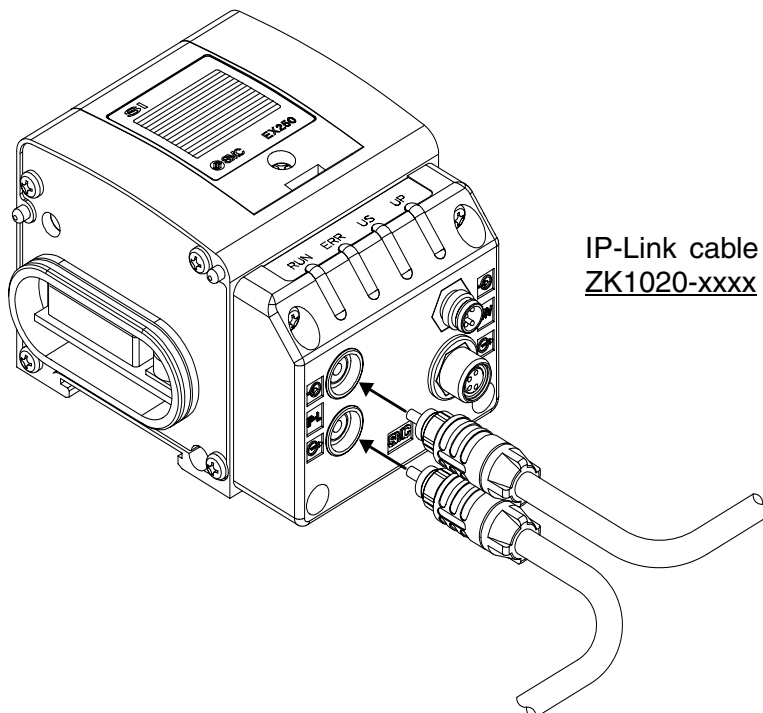
Wiring

• Internal circuit



• Communication wiring

Connection of IP-Link cable and SI unit IP-Link connector.

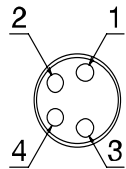


IP-Link cable from BECKHOFF
ZK1020-xxxx

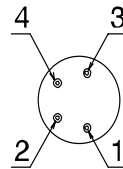
• **Power supply wiring**

In the unit, Solenoid valve power supply(SV) and SI unit control power supply(SW) are independent. Supply DC24V for each of them. Either single or dual power supply is available.

OUT(M8 4 pin female)



IN(M8 4 pin male)



Pin No.	Description	Function
1	SW24V	SI unit control power supply + 24V
2	SV24V	Solenoid valve power supply + 24V
3	SW0V	SI unit control power supply 0V
4	SV0V	Solenoid valve power supply 0V

Maintenance

• Maintenance

Replacement of SI unit

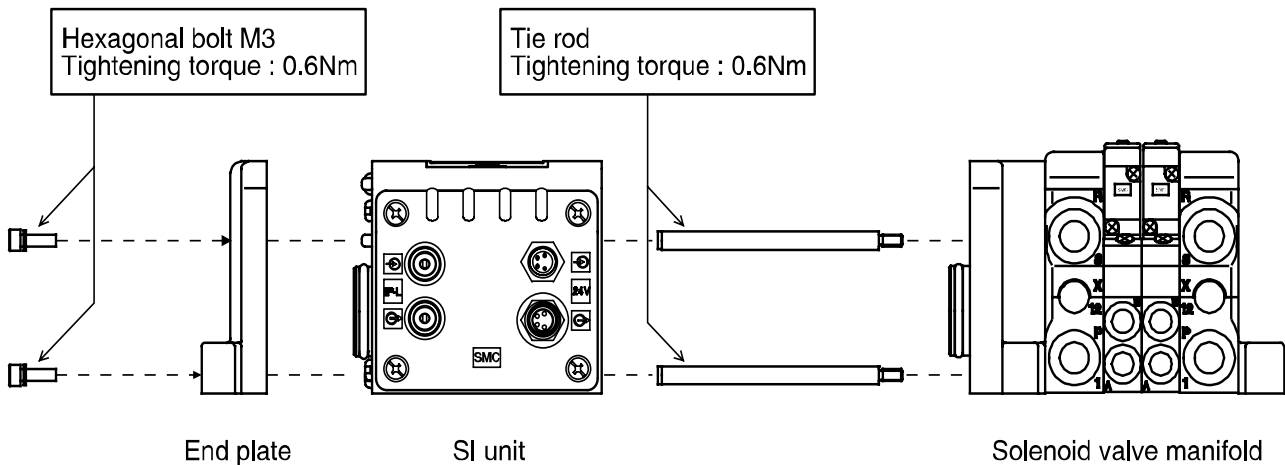
- Remove the end plate bolt to separate from the solenoid valve manifold.
- Replace SI unit. (No need to remove the tie rod)
- Mount removed end plate and tighten the bolt with specified tightening torque(0.6Nm).

Precautions on maintenance

- (1) Ensure all power supply is turned off.
- (2) Ensure no foreign material in the unit.
- (3) Ensure not foreign material adhered to the gasket or no gouge on the gasket.
- (4) Ensure the torque is specified tightening torque.

If component are not properly set, it lead to cause printed circuit board failure or fluid or particles may enter into the unit.

• Assembly and disassembly of SI unit



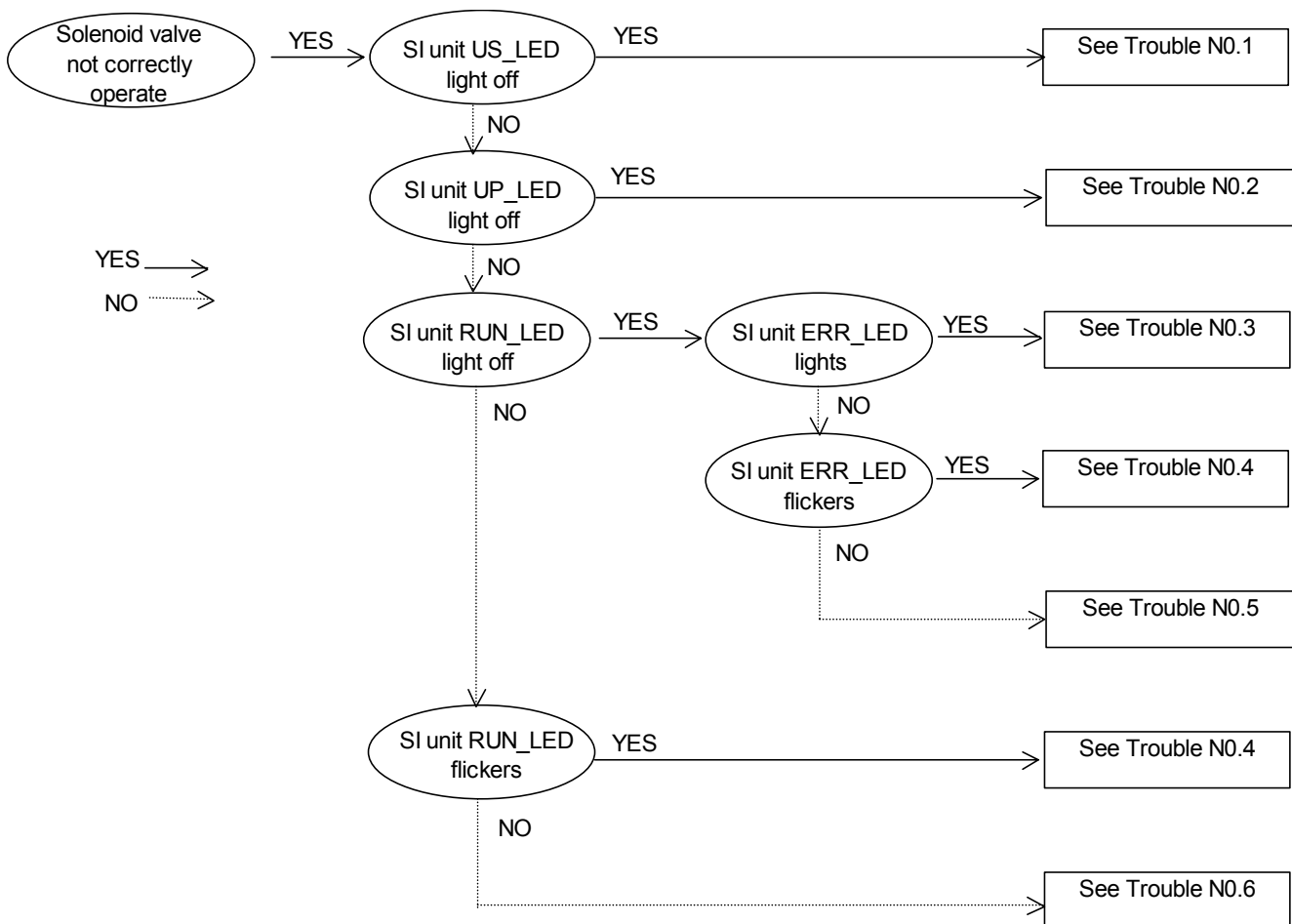
Trouble shooting

Trouble shoot

Applicable SI unit : Refer the flow chart below for solving troubles when operation failure occur to SI unit.

When no cause corresponding trouble phenomenon is found, and proper operation is available after replacing SI unit, SI unit failure is possible. Operating environment(network configuration) may become the cause of SI unit failure. In this case, please consult SMC.

When no cause corresponding trouble phenomenon is found, and SI unit has no failure, problem is considered to exist in the inconsistency between the setting of master station and the network configuration.



List of Troubles and Countermeasures

No . 1

Trouble phenomenon	Trouble / Possible cause	Investigation method	Countermeasure
SI unit US_LED light off	SI unit control power supply wiring failure	Ensure no disconnection, wrong connection, and loose connection of SI unit control power supply cable. Ensure no repeated bending stress and tensile force, which lead to cause disconnection, exist.	Connect power supply cable correctly. If disconnection is confirmed, replace the power supply cable.
		Ensure no incorrect wiring of SI unit control power supply.	Correct the wiring. (See P.10)
	SI unit control power supply failure	Confirm SI unit control power supply voltage condition.	Supply DC24+20%/-15% to SI unit control power supply.

No . 2

Trouble phenomenon	Trouble / Possible cause	Investigation method	Countermeasure
SI unit UP_LED light off	Solenoid valve power supply wiring failure	Ensure no disconnection, wrong connection, and loose connection of solenoid valve power supply cable. Ensure no repeated bending stress and tensile force, which lead to cause disconnection, exist.	Connect power supply cable correctly. If disconnection is confirmed, replace the power supply cable.
		Ensure no incorrect wiring of solenoid valve power supply.	Correct the wiring. (See P.10)
	Solenoid valve power supply failure	Confirm solenoid valve power supply voltage condition.	Supply DC24+20%/-15% to solenoid valve power supply.

No . 3

Trouble phenomenon	Trouble / Possible cause	Investigation method	Countermeasure
SI unit RUN_LED light off ERR_LED lights	Communication line wiring failure	Check if (IN) and (OUT) of IP-Link connector are connected reversely.	Connect the communication cable to (IN) and (OUT) of IP-Link connector correctly.
		Ensure IP-Link connector(IN) is connected.	Wire the communication cable to IP-Link connector (IN) correctly.
		Check if the communication cable which is connected to IP-Link(IN) is disconnected.	Replace the communication cable.
	Communication failure	Ensure there is no component nor high voltage line which generates noise around the communication and power supply line.	Keep the communication, power supply cable away from the noise source.

No . 4

Trouble phenomenon	Trouble / Possible cause	Investigation method	Countermeasure
SI unit RUN_LED light off or flickers ERR_LED flickers	Communication line connect failure	Ensure the joint of the communication cable and the connector is not loose.	Connect the communication cable correctly.
	Communication failure	Ensure there is no component nor high voltage line which generates noise around the communication and power source line.	Keep the communication, power supply cable away from the noise source.

No . 5

Trouble phenomenon	Trouble / Possible cause	Investigation method	Countermeasure
SI unit RUN_LED light off ERR_LED light off	Communication line wiring failure	Ensure IP-Link connector(OUT) is connected.	Wire the communication cable to IP-Link connector(OUT) correctly.
		Check if the communication cable which is connected to IP-Link connector(OUT) is disconnected.	Replace the communication cable.
	Master station communication abnormality	Ensure the master unit operates normally.	Operates the master unit normally. See the operation manual of the master unit.
	Communication failure	Ensure there is no component nor high voltage line which generates noise around the communication and power supply line.	Keep the communication, power supply cable away from the noise source.

No . 6

Trouble phenomenon	Trouble / Possible cause	Investigation method	Countermeasure
Solenoid valve operation failure	Solenoid valve failure	Replace the solenoid valve and confirm the operation.	Confirm the troubleshooting of the solenoid valve.
	Solenoid valve power supply voltage abnormality	Confirm supplied power supply voltage from SI unit stay within solenoid valve power supply voltage range.	Operates at DC24V±10%.
	SI unit failure	Replace SI unit and check the operation.	Replace SI unit. Keep away fluid or particles from inner part during replacement.
	Solenoid valve after 16th output do not operate	Confirm that the total solenoid valve outputs which were connected to the manifold is 16 or less.	Max. output of EX250-SB11-X41 is 16. Keep output point 16 or less.

Specification

Specification table

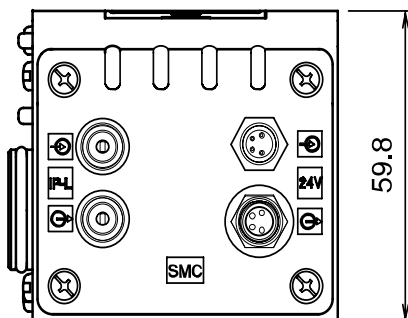
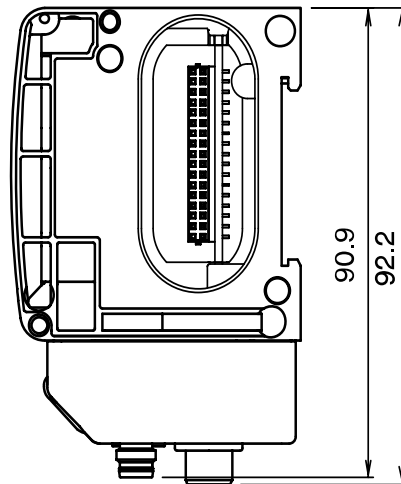
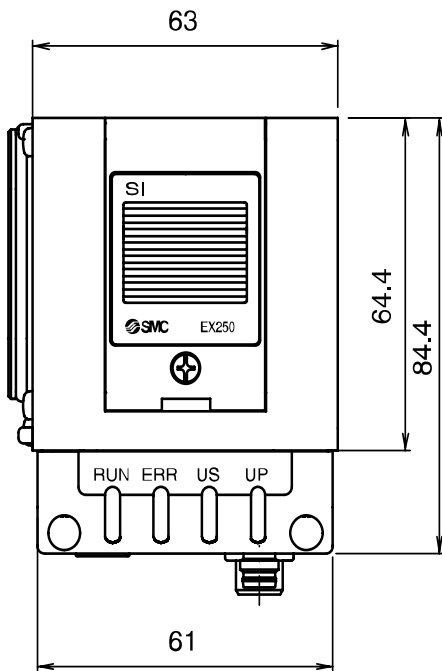
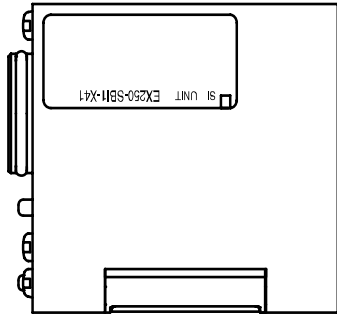
Item	Specification	
Communication spec.	BECKHOFF IP-Link system	
Rated voltage	DC24V	
Power supply voltage range	SI unit control power supply : DC24V+20%/-15% Solenoid valve power supply : DC24V+10%/-5%	
Output point	16 points	
Short-circuit protection	Applied	
Current consumption	100mA or less	
Allowable instantaneous power failure	1ms or less	
Environmental specification	Protection	IP67
	Withstand voltage	AC500V, 1min
	Insulation resistance	10MΩ or more, DC500V
	Ambient temp.	Operating temp. : 5°C to 45°C Storage : -20°C to 60°C
	Ambient humidity	35% to 85%(No freezing)
	Vibration resistance	5Hz to 9Hz(Constant amplitude)1.75mm 9Hz ~ 150Hz(Constant acceleration)4.9m/s ² 3 times in each X, Y, Z direction(Accordance with JIS B 3502、IEC61131-2)
	Impact resistance	147m/s ² 3 times in each X, Y, Z direction(Accordance with JIS B 3502, IEC61131-2)
	Operating atmosphere	No corrosive gas
Corresponding standard	UL/CSA(E209424), CE marking(Note 1)	
Weight	250g	

Note 1 : EMC directive(89/336/EEC)

EN61000-6-2 : 2001

EN55011 : 1998+A1 : 1999+A2 : 2002

Dimension (Unit : mm)



Revision history	
A : Ambient temp. change in specification table.	JZ

SMC Corporation

URL <http://www.smcworld.com>

Note: Please acknowledge that this content might change without a previous notice beforehand.

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