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## Technical Specifications

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Product name : SI unit

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Model : EX250-SAS3

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EX250-SAS5

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# 1.Safety

This manual contain essential information for the protection of users and others from possible injury and damage to property and to ensure correct handling.

Please check that you fully understand 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

<b>IMPORTANT MESSAGES</b>	
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.	
<b>▲WARNING</b>	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
<b>▲CAUTION</b>	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
<b>NOTE</b>	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\*<sup>1</sup>, 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\*<sup>2</sup> including equipment that concerns itself with the safety of persons or that seriously affects the public. This usage needs special consideration\*<sup>3</sup>.
    - \*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). 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**

- ◆ 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 SI 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.  
This SI Unit is not designed to be explosion-proof.
- ◆ These instructions must be followed 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.
- ◆ These instructions must be followed while in maintenance:
  - Turn off the power supply
  - Stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance
  - Release all energy stored in equipment or devices (hydraulic pressure, mechanical springs, electric capacitors or gravity force), verify the energy is reset to zero, and then perform maintenance work.Otherwise it can cause injury.

## **⚠ CAUTION**

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

## NOTE

- ◆ Follow the instructions given below when selecting and handling your SI Unit:
- ◆ The instructions on selection (installation, wiring, environment of use, adjustment, operation and maintenance) described below must also be followed.

### \*Product specifications

- Operate SI Unit with the specified voltage.  
Operation with a voltage beyond specifications can cause malfunction or damage of the unit.
- Reserve a space for maintenance  
Remember to leave space for maintenance when designing layout of the unit.
- Do not remove labels.  
Otherwise error while in maintenance or misreading of an operation manual can cause damage or malfunction. It may also result in nonconformity to safety standards.

- ◆ Instructions on handling

### \*Installation

- Do not drop, hit or apply excessive shock to the unit.  
Otherwise it can result in damage to the unit causing failure or malfunction.
- Follow the specified tightening torque.  
Excessive tightening torque can break screws.  
Refer to “3-6 Installation and Maintenance” for installation.

### \*Wiring (including plugging in/out of connector)

- Do not bend or apply tensile force to cables, or apply force by placing heavy load on them.  
Wiring with bending stress or tensile stress can cause breakage of the cables.
- Connect wires and cables correctly.  
Miswiring can break the SI Unit depending on the miswired circuit .
- Do not connect wires while the power is on.  
Otherwise it can break the SI Unit or I/O devices causing damage or malfunction.
- Do not lay wires or cables with power cable or high-voltage cable in the same wiring route.  
Otherwise the wires to the SI Unit can be contaminated with noise or induced surge voltage from power lines or high-voltage lines causing malfunction.  
Lay the wires to the SI Unit and each I/O device to a wire duct or in a protective tube other than those for power lines or high- voltage lines.
- Verify the insulation of wiring.  
Poor insulation (interference with other circuit, poor insulation between terminals and etc.) can introduce excess voltage or current to the SI Unit or each I/O device causing damage.
- Separate power lines for solenoid valves from power line for Input and control unit.  
Otherwise wires can be contaminated with noise or induced surge voltage causing malfunction.
- Take proper measurements against noise such as noise filter when the SI Unit is incorporated in equipment or devices.  
Otherwise contamination with noise can cause malfunction.

### \*Environment

- Select the proper type of protection according to the environment of operation.  
IP67 protection is achieved when the following conditions are met.  
(1) To connect units properly with communication line connector and power cable with M12 connector at the both end, and  
(2) To install Input unit and input block, and SI Unit and manifold valves properly.  
Use cover or etc. when install in an environment where water always splashes on these units.

## NOTE

- Take sufficient shielding measures when install at a following place.  
Insufficient measures can cause malfunction or failure.  
Verify the effect of the measures after installation 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  
(5)A place where water splashes on the product.
- Do not use the product near by a place where electric surges are generated.  
Internal circuit elements of the SI Unit can deteriorate or break when equipment generating a large surge (electromagnetic lifter, high frequency induction furnace, motor, etc.) is located near the SI Unit. Provide surge preventives, and avoid interference.
- Use a SI Unit equipped with surge absorber when a surge-generating load such as a relay or 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 this product.  
Take proper measures for the remnant not to enter the SI Unit in order to prevent failure or malfunction.
- Do not expose the SI Unit to vibration and impact.  
Otherwise it can cause failure or malfunction.
- Keep the specified ambient temperature range.  
Otherwise it can cause malfunction.
- Do not use SI Unit in a place where temperature suddenly changes even if it stays within the specified range.
- Do not expose the SI Unit to heat radiation from a heat source located nearby.  
It can cause malfunction.

### **\*Adjustment and Operation**

- Use precision screwdriver with small flat blade when setting DIP and rotary switches.

### **\*Maintenance**

- Before performing maintenance, make sure to turn of the power supply, stop supplied air, release the residual air in the piping into the atmosphere, and verify that the pneumatic system is open to the air.  
Otherwise an unexpected operation of a system component can occur.
- Perform maintenance and check regularly  
Otherwise an unexpected malfunction of the system can occur due to a malfunction of the unit.  
Refer to “3-6 Installation and Maintenance” the maintenance and checking methods.
- Perform a proper functional check.  
Stop operation when an abnormality is observed such that the device does not work properly.  
Otherwise an unexpected malfunction of the system component can occur.
- Do not use solvents such as benzene, thinner or other to clean the SI Unit.  
It can 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.

## 2. Specifications

### 2-1. General Specification

Item	Specification
Operating ambient temp.	+5 to +45°C
Storage ambient humidity	35 to 85%RH (No condensation)
Storage ambient temp.	-20 to +60°C
Vibration proof	50m/s <sup>2</sup> (Complies with JIS C 0911)
Impact proof	100m/s <sup>2</sup> (Complies with JIS C 0912)
Noise immunity	±1000Vp-p. Pulse duration 1μs. On first transition 1ns
Withstand Voltage	500VAC for 1min. Between body and external terminals.
Insulation resistance	500VDC 10M ohm or more. Between body and external terminals.
Operating environment	No corrosive gas
Weight	250g or less
Enclosure	IP67

### 2-2 Communication specification

Item	Specification	
	EX250-SAS3	EX250-SAS5
Applicable system	AS-Interface (AS-i)	
AS-i Version	Version 2.11	
Address mode	Standard Address Mode	
Number of occupied slave	2	1
Max.number of connected Slaves	31	
Address Assignment range	1 to 31	
IO Code (HEX)	7, 7	7
ID Code (HEX)	F, F	F
ID Code 1(HEX)	Set within 0 to F optionally	
ID Code 2(HEX)	E, E	E
D0	IN 0,4/OUT 0,4	IN 0/OUT 0
D1	IN 1,5/OUT 1,5	IN 1/OUT 1
D2	IN 2,6/OUT 2,6	IN 2/OUT 2
D3	IN 3,7/OUT 3,7	IN 3/OUT 3

## 2-3 Electrical specification

Item		Specification	
		EX250-SAS3	EX250-SAS5
Power supply voltage	For communication	Supplied from AS-Interface communication 26.5 to 31.6VDC *1	
	For output	24VDC <sup>+10%</sup> <sub>-5%</sub> PELV *2	
Current consumption *3		100mA MAX.	65mA MAX.
Input specification	Input point	8	4
	Input style	TTL	
	Connection block	Input block : EX250-IE1 to 3 *4	
	Supply voltage for block	24VDC $\pm$ 20%	
	Current consumption *5	240mA MAX.	100mA MAX.
Output specification	Output point	8	4
	Output style	P-MOS FET open drain style	
	Connection block	Solenoid valve with lamp surge protection circuit for 24VDC and 1.5W or less surge voltage	
	Supply voltage for block	24VDC $\pm$ 10%	
	Residual voltage	0.3V or less	
	Current consumption *6	500mA MAX.	250mA MAX.

\*1 : The power supply for the communication must use the special power supply made for AS-i. Refer to each maker's manual etc. for details.

\*2 : The power supply for the output equipment must use the one which suits PELV (Protection Extra Low Voltage) demanded of IEC364-4-41.

\*3 : Current consumption inside SI unit.

\*4 : Refer to the Input Block Technical Specifications for details.

\*5 : Power for input equipment is supplied from communication power.

\*6 : Power for output equipment is supplied from output equipment power.

## 2-4 Applicable solenoid valves

Representative series	Applicable series
VQC series	VQC1000 Series, VQC2000 Series, VQC4000 Series
SV series	SV1000 Series, SV2000 Series, SV3000 Series

Refer to each solenoid valve catalogue etc. for details.



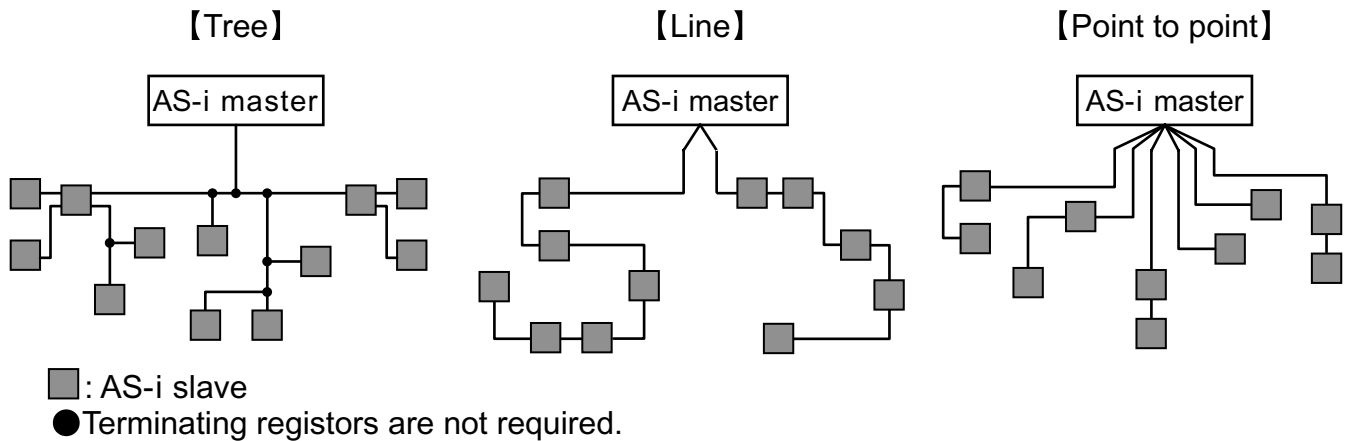
## 3. Wiring and setting

### 3-1 The topology of an AS-i network

The topology of an AS-i network can be connected a tree, a line and point-to-point.

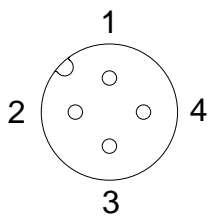
The total length of the cable is 100m.

It is possible to extend the length of a total cable up to 300m by using a repeater.



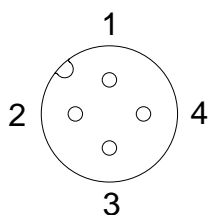
### 3-2 Wiring

Communication connector : M12 male 4pins



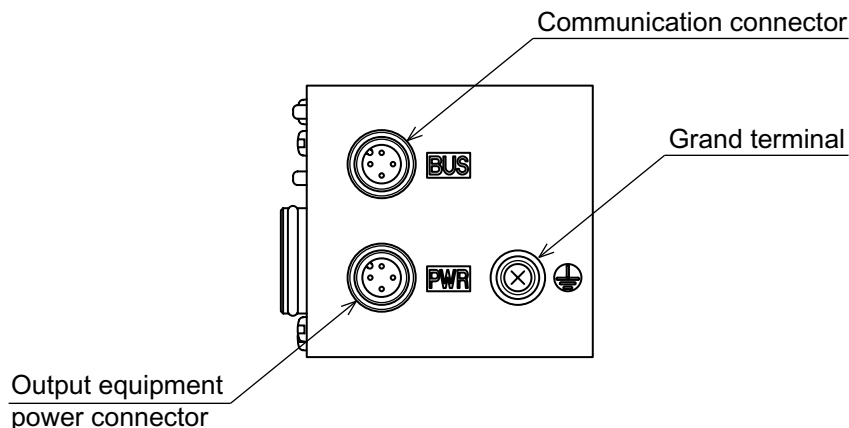
No.	Description	Function
1	AS-i +	Positive AS-Interface line
2	0V	Negative output equipment power line
3	AS-i -	Negative AS-Interface line
4	24V	Positive output equipment power line

Output equipment power connector : M12 male 4pins

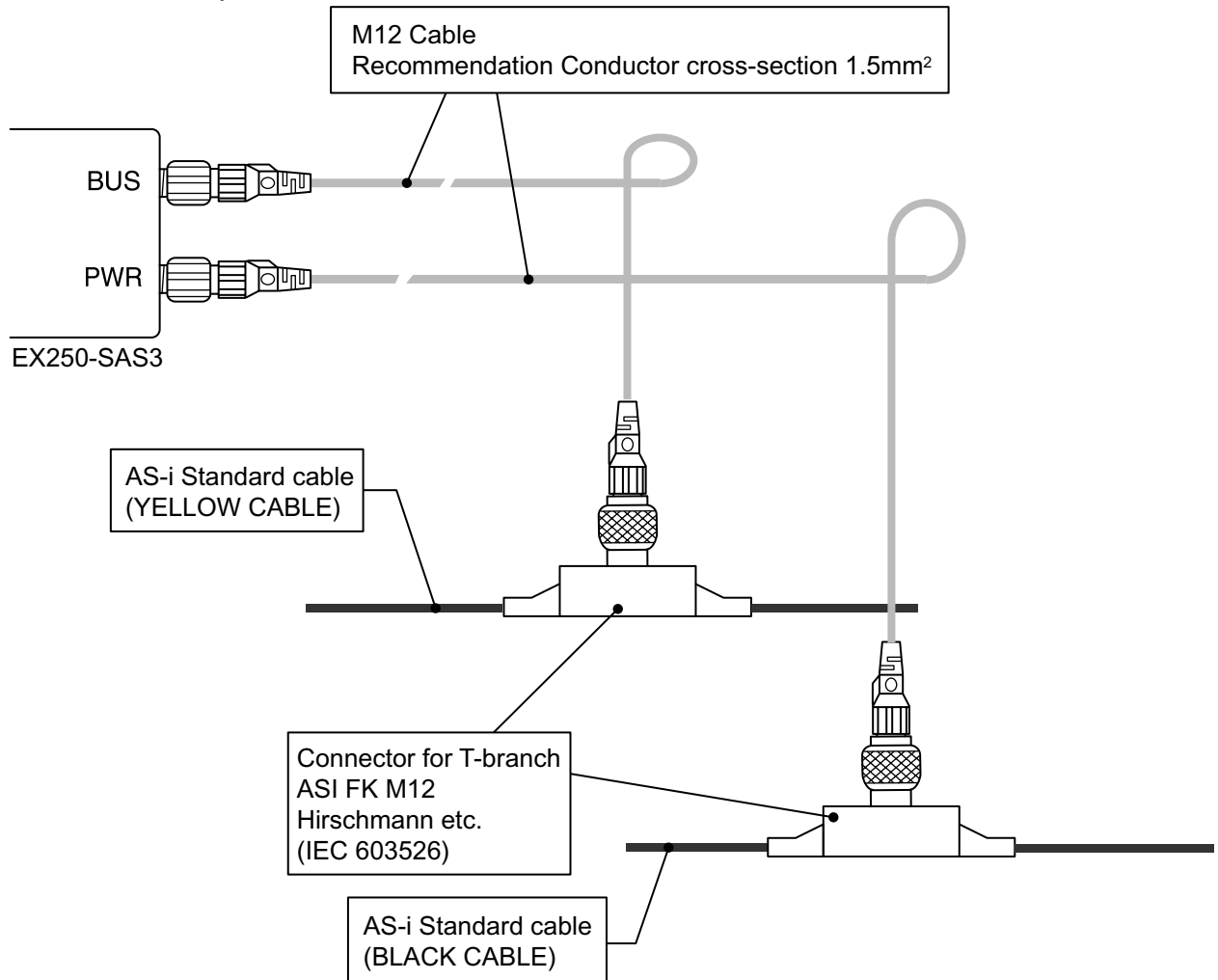


No.	Description	Function
1	24V	Positive output equipment power line
2	NC	Not connected
3	0V	Negative output equipment power line
4	NC	Not connected

\*Connected inside the SI unit.



## Connection example



Neither M12 cable, As-I standard cable, nor connector for T-branch are supplied from SMC. Contact with each maker about the detail of the catalog etc.  
Wire the cable with AS-Interface line so that a total voltage drop becomes 3V or less.

### 3-3 Address setting

AS-i cable line should be disconnected to unit while setting address. Open the cover and set address by AS-Interface address programming device and DC power jack cable etc.

(PEPPERL + FUCHS: VAZ-PK- V1-Cinch, SIEMENS: 3RK1901-3HA00 etc.)

Address assignment range is 1 to 31.

The address can be set regardless of connecting order, but it is not possible to set address overlap. The address at shipment from the factory is 0. Set different address for ADDR1 and ADDR2 as EX250-SAS3 occupy 2 slaves respectively.

\*If address is set by AS-i cable line via master unit, in EX250-SAS3, it is possible to set the slaves one by one cutting off from AS-i cable line with DC power jack for address setting inserted into the side which is not subject to address setting at the moment (ADDR1 or ADDR2). And lightening of LED during address setting is not abnormal.

#### EX250-SAS3

ADDR1: Address setting for IN0 to 3/OUT0 to 3

ADDR2: Address setting for IN4 to 7/OUT4 to 7

### 3-4 HOLD/CLEAR setting

Set whether maintaining SI unit output condition or turn off of it when communication error is generated.

This switch at shipment from the Factory is CLEAR.

### 3-5 Over Current Protection setting SW

#### 3-5-1 Over Current Protection setting SW-ON (OCP-ON)

When the over current load is connected with the input block, and the unit supply current value (specification value) is exceeded, unit LED becomes the IN-ERR lighting and COM-ERR blinking and the power supply to the input block is stopped.

#### 3-5-2 Over Current Protection setting SW-OFF (OCP-OFF)

When the over current load is connected with the input block, and the unit supply current value (specification value) is exceeded, unit LED becomes the IN-ERR lighting and COM-ERR blinking.

The power supply to the input block does not change.

\*This switch at shipment from the Factory is OCP-ON.

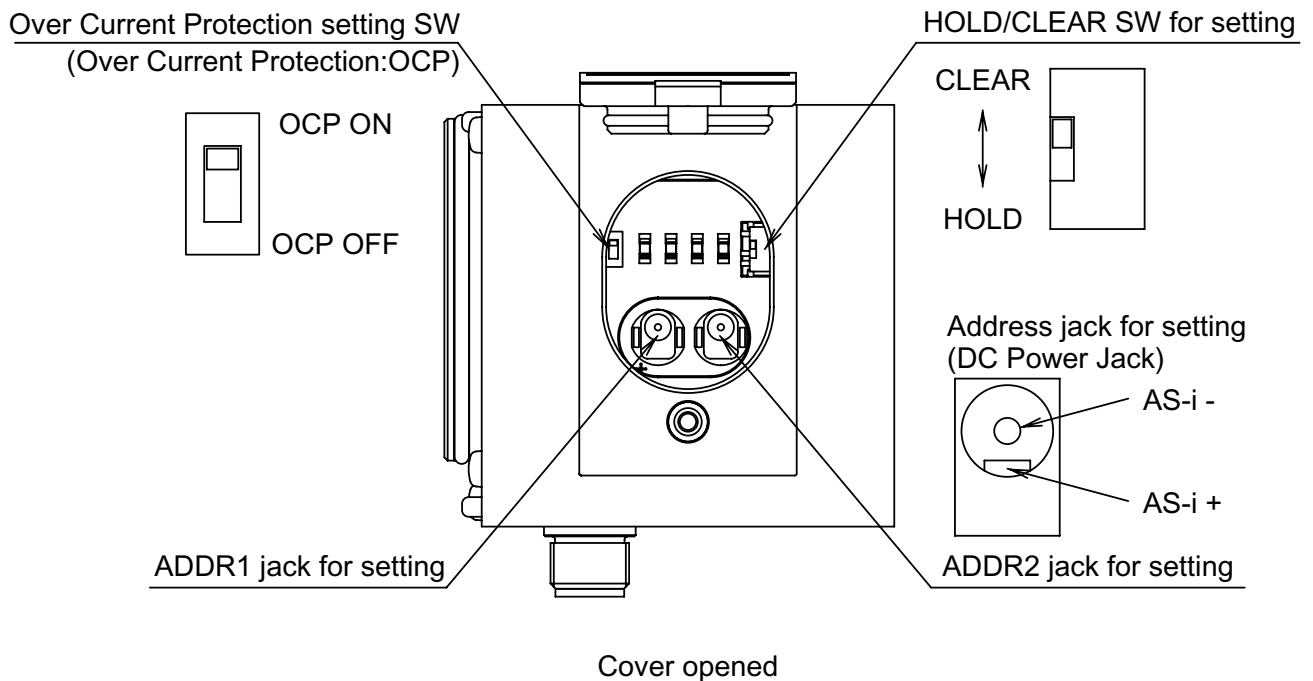
### ▲CAUTION

Use by setting OCP-OFF becomes a specification not applied to the AS-i spec.

Therefore, please use the SI unit with OCP-ON usually.

Turn off the power supply and remove the cause immediately when over current load is connected with the input block, and the peripheral fault error occurs by over current detection.

Using with the peripheral fault error occurs unit damage.

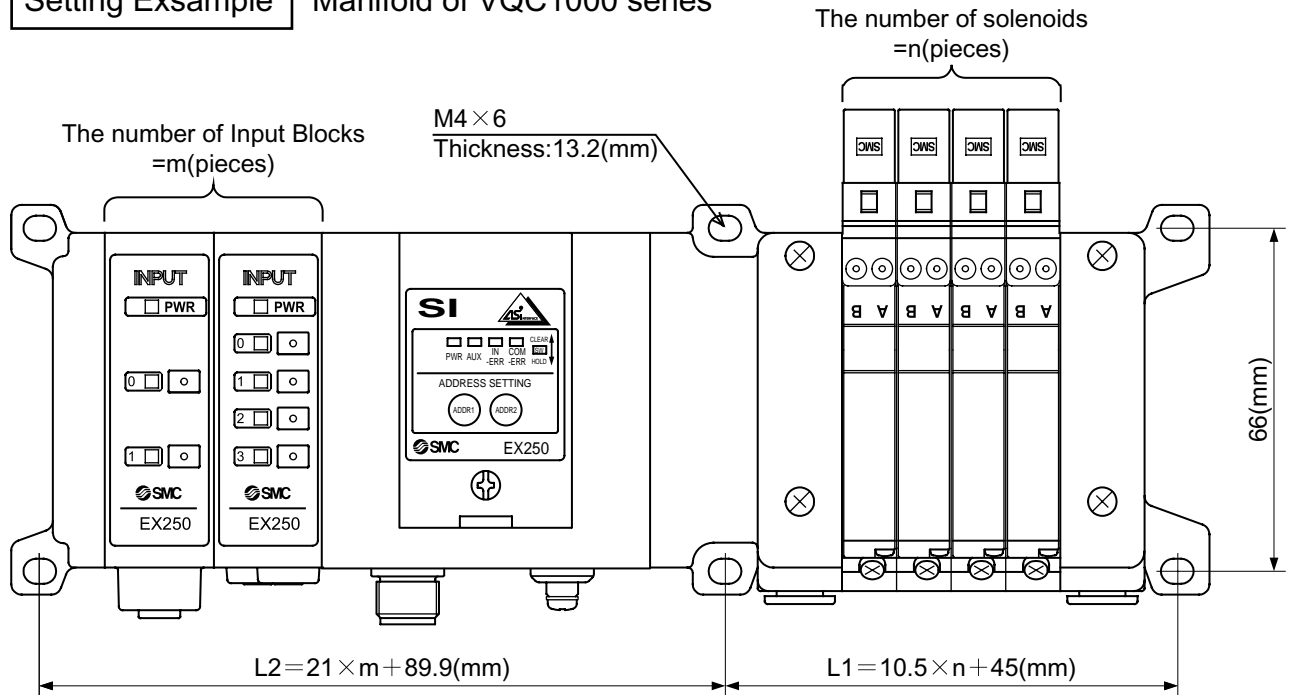


### 3-6 Installation and Maintenance

#### How to set

Not having mounting hole, it can't be set to the device independently. Use SI unit by setting manifold. And if Input Block is unnecessary, connect End Plate directly to SI unit.

#### Setting Example Manifold of VQC1000 series



For example, the table below shows the size when manifold of VQC1000 series connected. Please refer to an individual catalog for the size when other manifolds are connected.

L	n,m	0	1	2	3	4	5	6	7	8
L1		45	55.5	66	76.5	87	97.5	108	118.5	129
L2		89.8	110.8	131.8	152.8	173.8	194.8	215.8	236.8	257.8

(mm)

Wiring (for power supply, communication and input) and piping are done on only one side. On the side, make a space for wiring and piping

## Maintenance

### 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. (0.6N·m)

### 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 End Plate and tighten removed screws by specified tightening torque. (0.6N·m)

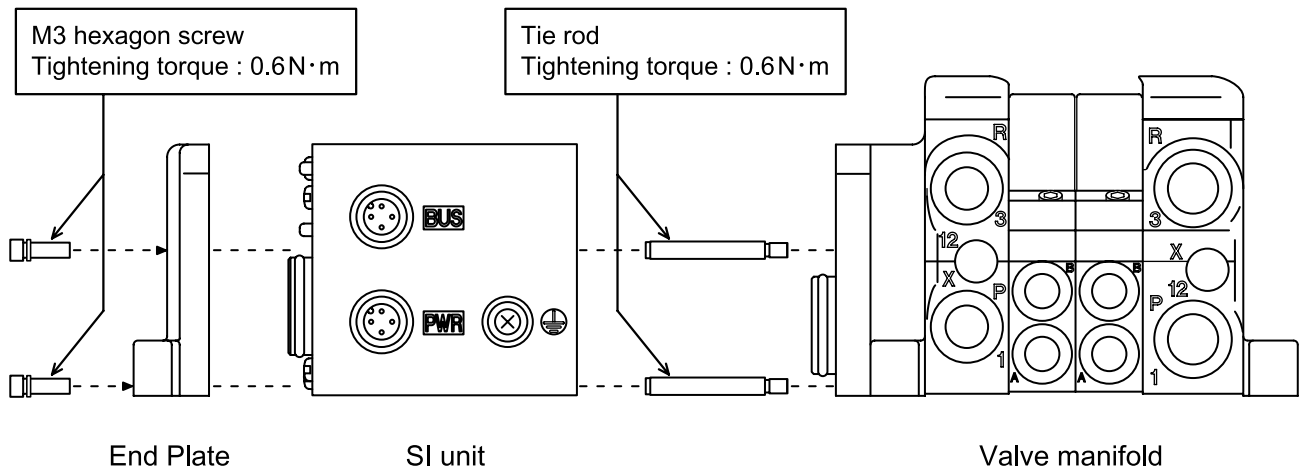
## ⚠ CAUTION

### 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.

### Assembly and disconnection of unit



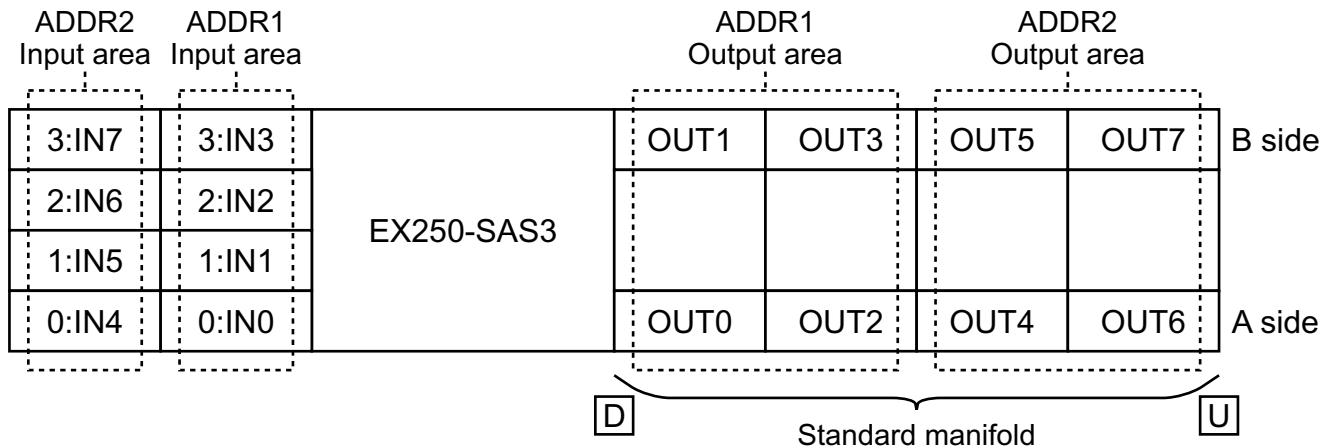
## 4.Relation between Output data and solenoid valve

### 4-1 Standard wiring

The outputs of the SI unit are assigned from the D side solenoid valve in the order 0,1,2, . . . etc. Refer to each solenoid valve's catalogue for details.

Standard Address Mode

(EX250-SAS3, EX250-IE3, Manifold standard wiring, Double solenoid wiring)



### 4-2 Semi-standard wiring (Mixed wiring)

As semi-standard wiring, mixed wiring inside manifold is available. The wiring type is specified by description of single or double solenoid valve mounted on manifold. In order to specify the mixed wiring, completion of Manifold type solenoid valve Specifications Sheet is required.

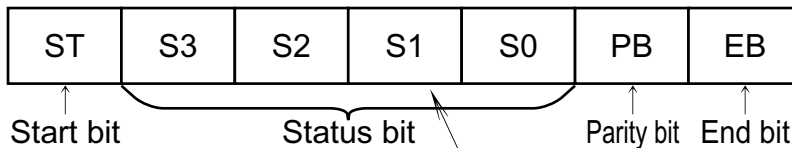
## 5.Data bit

### 5-1 SI unit I/O data bit

Address	Data bit	EX250 - SAS3	EX250 - SAS5
ADDR1	D0	IN 0 / OUT 0	IN 0 / OUT 0
	D1	IN 1 / OUT 1	IN 1 / OUT 1
	D2	IN 2 / OUT 2	IN 2 / OUT 2
	D3	IN 3 / OUT 3	IN 3 / OUT 3
ADDR2	D0	IN 4 / OUT 4	—
	D1	IN 5 / OUT 5	
	D2	IN 6 / OUT 6	
	D3	IN 7 / OUT 7	

### 5-2 Status register

It is possible to check the peripheral fault error (blowing the input block fuse or detecting over current of input power supply) by monitoring the status bit S1 which complies with the AS-i Version 2.11



0:Normal  
1:Error (Blowing the input block fuse or detecting over current of input power supply)

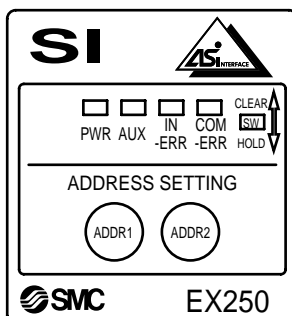
It is possible to confirm the peripheral fault error only by status register on the ADDR1 side for EX250-SAS3 which occupy 2slaves.

### ▲CAUTION

Turn off the power supply and remove the cause immediately when over current load is connected with the input block, and the peripheral fault error occurs by over current detection. Using with the peripheral fault error occurs unit damage.

## 6.LED indicator and physical dimensions

### 6-1 LED indicator



Name	LED Condition	Contents
PWR	Green Light	In time of power supply for AS-Interface line is turned on.
AUX	Green Light	In time of auxiliary power supply for output equipment is turned on.
IN-ERR	Red Light	In time of input power is detected over current. (Lights off at normal condition)
COM-ERR	Red Light	In time of communication error. (Lights off at normal condition)
	Red Blink	In time of peripheral equipment error. (Over current of input power, blowing the fuse etc.)

## 6-2 Physical dimensions

