No.EX※※-OMB0004-A

Operation Manual

PRODUCT NAME

SI unit

MODEL / Series / Product Number

EX12#-SSL#

SMC Corporation

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• 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) *1) and other safety regulations.

*1) 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 10218-1992: Manipulating industrial robots -Safety.
etc.

⚠ 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

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.
1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.
1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

⚠ Caution

The product is provided for use in manufacturing industries.
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".
Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first. ***2)**
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

∗2) Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

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.

■Precautions

⚠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 product.
Individual grounding should be provided close to the product with a short cable.

■NOTE

○Follow the instructions given below when designing, selecting and handling the product.

•The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.

∗Product specifications

•When conformity to UL is required, the SI unit should be used with a UL1310 Class 2 power supply.

•Use the specified voltage.

Otherwise failure or malfunction can result.

•Reserve a space for maintenance.

Allow sufficient space for maintenance when designing the system.

•Do not remove any nameplates or labels.

This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product.

•Precautions on handling

∗Installation

•Do not drop, hit or apply excessive shock to the product.

Otherwise damage to the product can result, causing malfunction.

•Tighten to the specified tightening torque.

If the tightening torque is exceeded the mounting screws may be broken.

•Never mount a product in a location that will be used as a foothold.

The product may be damaged if excessive force is applied by stepping or climbing onto it.

∗Wiring

•Avoid repeatedly bending or stretching the cables, or placing heavy load on them.

Repetitive bending stress or tensile stress can cause breakage of the cable.

•Wire correctly.

Incorrect wiring can break the product.

•Do not perform wiring while the power is on.

Otherwise damage to the product can result, causing malfunction.

•Do not route wires and cables together with power or high voltage cables.

Otherwise the product can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.

Route the wires (piping) of the product separately from power or high voltage cables.

•Confirm proper insulation of wiring.

Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.

•Take appropriate measures against noise, such as using a noise filter, when the product is incorporated into equipment.

Otherwise noise can cause malfunction.

∗Environment

- Do not use the product in area that is exposed to corrosive gases, chemicals, sea water, water or steam.
  Otherwise failure or malfunction can result.
- Do not use in an area where surges are generated.
  If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the product, this may cause deterioration or breakage of the internal circuit of the product. Avoid sources of surge generation and crossed lines.
- Prevent foreign matter such as remnant of wires from entering the product to avoid failure and malfunction.
- Mount the product in a place that is not exposed to vibration or impact.
  Otherwise failure or malfunction can result.
- Do not use the product in an environment that is exposed to temperature cycle.
  Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.
  If using in a location directly exposed to sunlight, shade the product from the sunlight.
  Otherwise failure or malfunction can result.
- Keep within the specified ambient temperature range.
  Otherwise malfunction can result.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
  Otherwise malfunction can result.

∗Adjustment and Operation

- Set the switches by using a sharp-pointed screwdriver etc.
  It may damage set switches.
- Perform settings suitable for the operating conditions.
  Incorrect setting can cause operation failure.
- Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.
  For the PLC protocol and programming refer to the relevant manufacturer's documentation.

∗Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
  There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
  There is a risk of unexpected malfunction.
- After maintenance is complete, perform appropriate functional inspections.
  Stop operation if the equipment does not function properly.
  Otherwise safety is not assured due to an unexpected malfunction or incorrect operation.
- Do not use solvents such as benzene, thinner etc. to clean the product.
  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.

1. Outline

1-1. S-LINK System

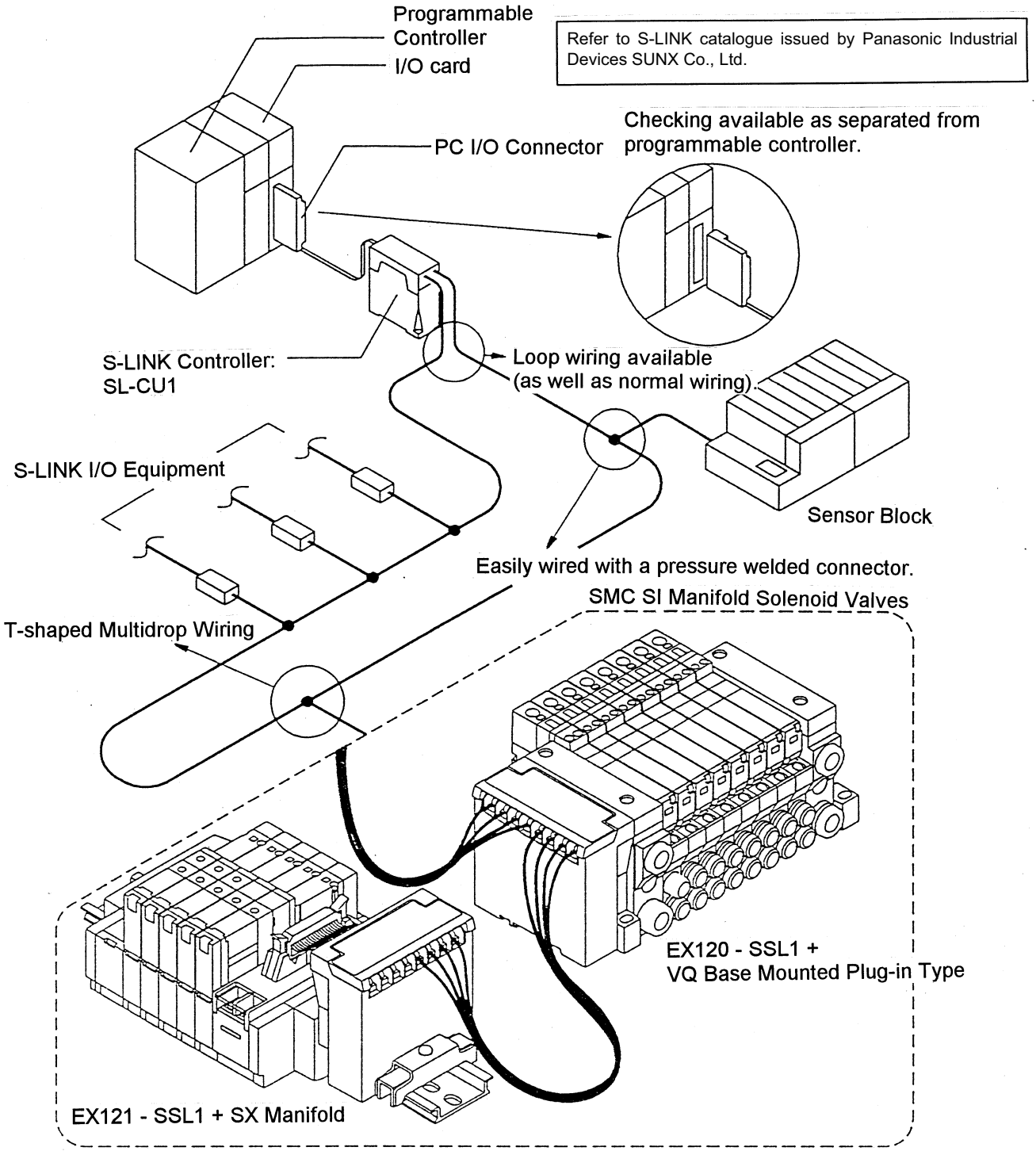
(1) S-LINK system is a wire-saving system developed by Panasonic Industrial Devices SUNX Co., Ltd.
(2) 128 points of I/O can be transmitted up to 200 m using two signal wires.
(3) T-shaped multi-drop wiring is available.
(4) Programmable controller of any manufacturer can be used by connecting S-LINK PC I/O connector to I/O card of programmable controller.
(5) Signal transmission is highly reliable due to loop wiring, address displaying function of disconnected unit, and double signal checking.
(6) Delay of transmission is 3.9 ms when 32 points are in use and 10.7 ms when 128 points are in use.

1-2. SI Unit Manifold Solenoid Valve for S-LINK

(1) It is a manifold solenoid valve equipped Serial Transmission Unit (SI unit) connectable to S-LINK system.
(2) SI unit functions as output unit of S-LINK system.
(3) Functions of S-LINK system such as error address detection are available.

2. System Structure & Features

2 - 1. System Structure & Features



SMC does not deal with equipment related to S-LINK except SI manifold solenoid valves.
Contact any sales office or distributor of Panasonic Industrial Devices SUNX Co., Ltd. for orders and inquiries.

3. Specifications

3-1 General Specifications

Ambient Temperature	0 to +55°C (when a maximum of 8 points is ON) 0 to +50°C (when all the points are ON)
Ambient Humidity	10 to 90% RH (without dew condensation)
Withstand Voltage	Between external terminal package and ground, AC1500V for 1 min.
Insulation Resistance	Between external terminal package and ground, DC500V, 2MΩ or more on insulation resistance tester
Environment	No corrosive gas, No dust

3-2 Communication Specifications

Applicable System	S-LINK system (Superior interchangeability for sensor link system)
Transmission	Two-way time –division multiplex transmission
Synchronization	Bit synchronization, Frame synchronization
Transmission Procedure	S-LINK protocol
Transmission Lag	Max. 10.7 ms (Transmission speed 28.5kbps)
Wiring	T-shape multidrop wiring/Crossover wiring
Transmission Distance	Max. 200 m

3-3 SI Unit Specifications

Unit	EX12∗-SSL1	EX12∗-SSL2
No. of Output Points	16 points	8 points
Output	Transistor (Open collector type)	
Connected Load	DC24V, Solenoid valve with 2.1 W or less of surge voltage suppressor	
Residual Voltage	1 V or less	
Power Supply Voltage	DC24V +10%/-5%	
Power consumption	0.1 A (Inside the unit)	
Enclosure	EX120/121/122: IP20 EX123U/D: IP65	
Weight	EX120: 110g or less EX121: 140g or less EX122: 130g or less EX123U/D: 240g or less	

4. Applicable Solenoid Valves

4-1 Applicable Solenoid Valves

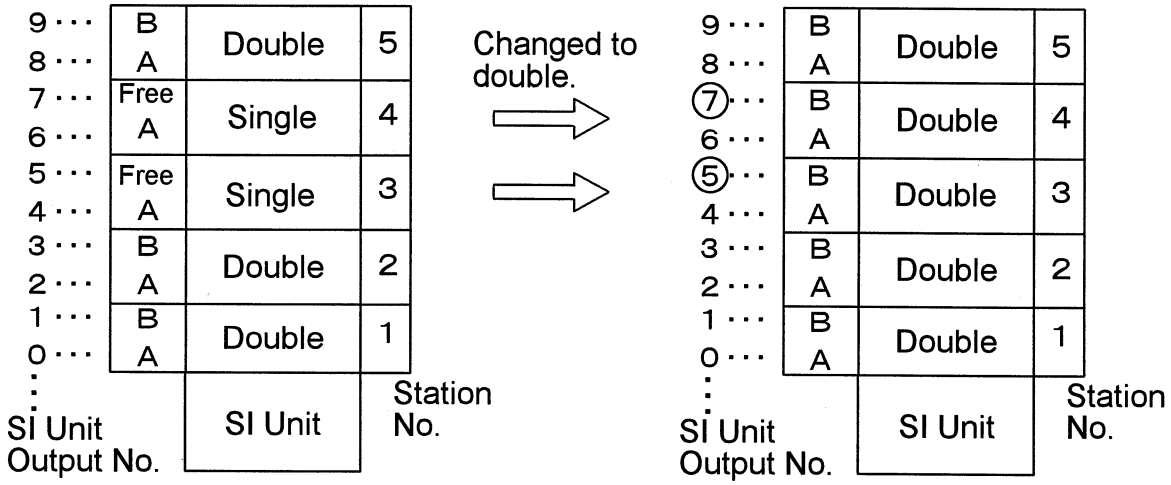
SI Unit	Applicable Solenoid Valves
EX120-SSL1 EX120-SSL2	SY3000, SY5000, SY7000 series VQ1000, VQ2000 series SV1000, SV2000, SV3000, SV4000 series
EX121-SSL1 EX121-SSL2	SY3000, SY5000 series
EX122-SSL1 EX122-SSL2	SY3000, SY5000 series
EX123U/D-SSL1 EX123U/D-SSL1	VQ2000, VQ4000, VQ5000 series

4 - 2. Solenoid Valve Wiring Specifications

- Standard Wiring (Double Wiring)

When there are 8 stations or less of solenoid valves, double wiring is standardized for manifold internal wiring. If any single solenoid valve is used, there will be a free SI unit output. For example, in the following wiring, output no. 5 and 7 are free.

〈Example〉 VQ Manifold Solenoid Valve

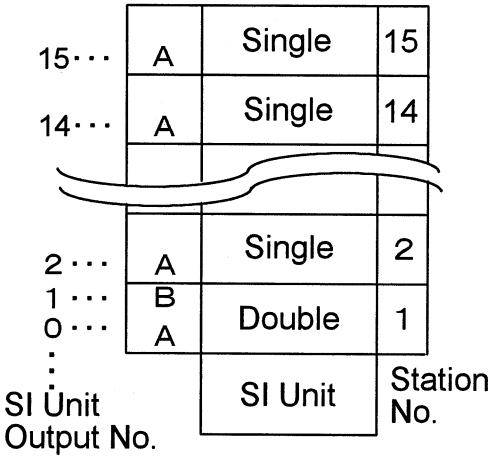


For double wiring, it is possible to change a single solenoid valve to double one. In the wiring above, No.3 and 4 solenoid valves can be changed to double solenoid valves. If do so, B of 3rd station will have no. 5 output and B of 4th station no.7.

- Semi-standard Wiring (Multiple wiring)

Wiring should be specified in manifold specifications when there are 9 to 16 stations of solenoid valves or continuous addresses are desired for 8 stations or less of manifold which includes single solenoid valves.

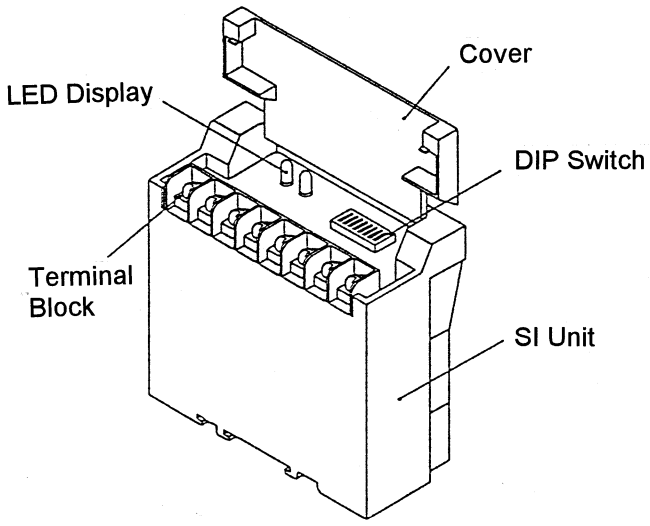
〈Example〉 VQ Manifold Solenoid Valve



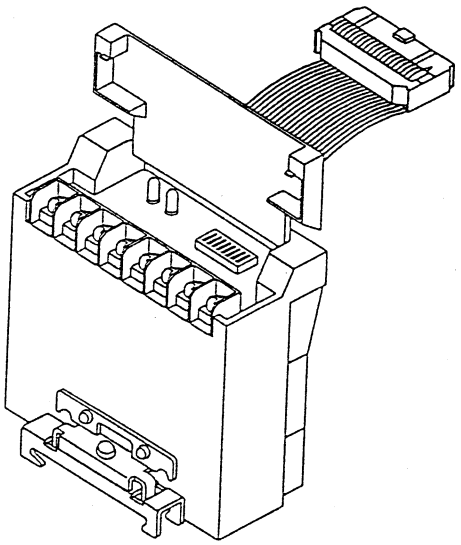
Internal wiring of manifold should be fixed depending on the type of solenoid valves to be mounted: single or double.
n this case, SI unit cannot output due to lack of internal wiring to solenoid B even if single solenoid valves are changed to double ones.
16 stations can be added to a manifold at the maximum if all the solenoid valves are single.

5.Components

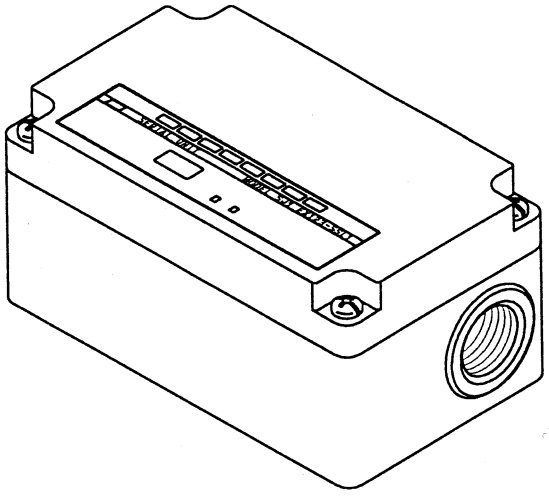
5 - 1. Descriptions & Functions



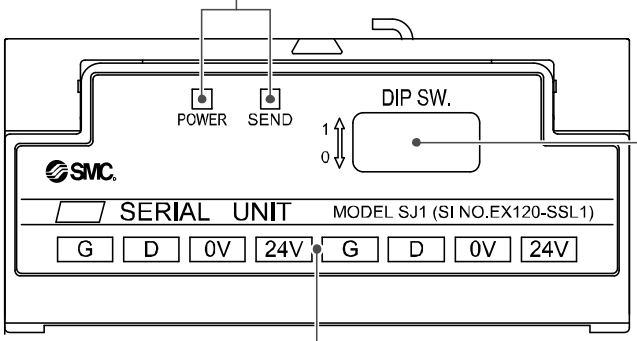
EX120-SSL※



EX121-SSL※



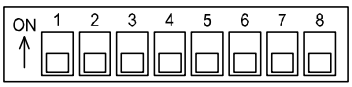
EX123-SSL※



• LED Display

LED	Function
POWER	Lights up while power is supplied.
SEND	Blinks for proper transmission. Blinks slowly for transmission failure.

• DIP Switch



No.	Function
1 to 7	Address Setting
8	Output Hold Setting

• Terminal Block

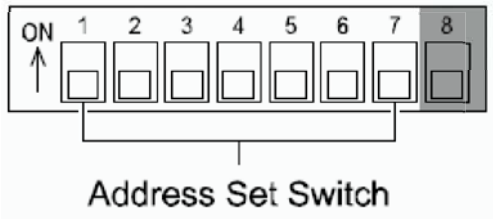
Terminal	Function
24V	DC24V Power Supply Line
0V	
D	Transmission Line D
G	Transmission Line G

6.Switch Setting

6 - 1. Address Setting

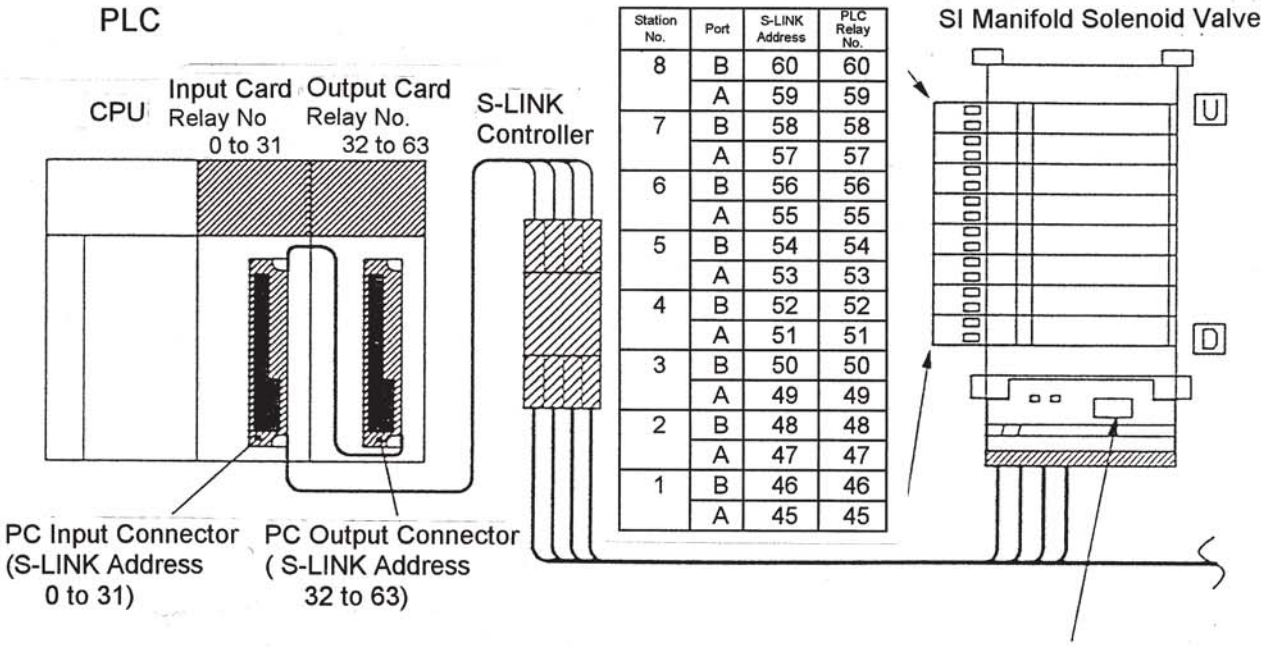
S-LINK I/O equipment sets addresses to correspond with PLC I/O card.
For SI unit, address assignment is done using DIP switches. 0 to 127 of addresses can be set with binary codes.
For manifold, an address is assigned to each solenoid valve. First of all, SI unit address is directed to a solenoid valve with output no. 0 and the rest follows it.

■ Relationship Between Address & Set Switch



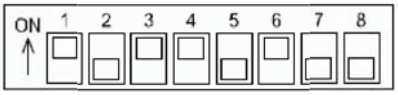
Switch No.		1	2	3	4	5	6	7
Weight of Bits		1	2	4	8	16	32	64
Address Set Value	0	0	0	0	0	0	0	0
	1	1	0	0	0	0	0	0
	2	0	1	0	0	0	0	0
	⋮							
	127	1	1	1	1	1	1	1

■ Example



Station No.	Port	S-LINK Address	PLC Relay No.
8	B	60	60
	A	59	59
7	B	58	58
	A	57	57
6	B	56	56
	A	55	55
5	B	54	54
	A	53	53
4	B	52	52
	A	51	51
3	B	50	50
	A	49	49
2	B	48	48
	A	47	47
1	B	46	46
	A	45	45

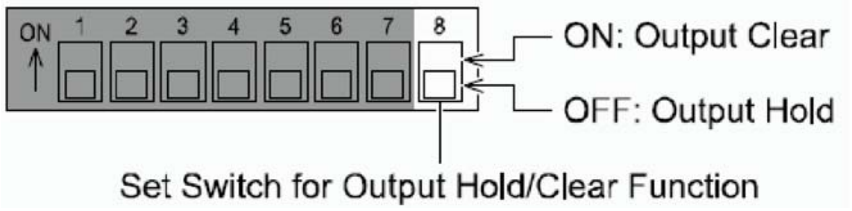
When SI unit address is set to 45, a solenoid valve whose output no. is 0 will have address 45 and the one with output no. 1 address 46. (Refer to Chapter 4 for output number assignment to solenoid valves.)
With the formation above, PLC relay numbers corresponding to SI manifold solenoid valve (Double, 8 stations, 16 points) will be 45 to 60.

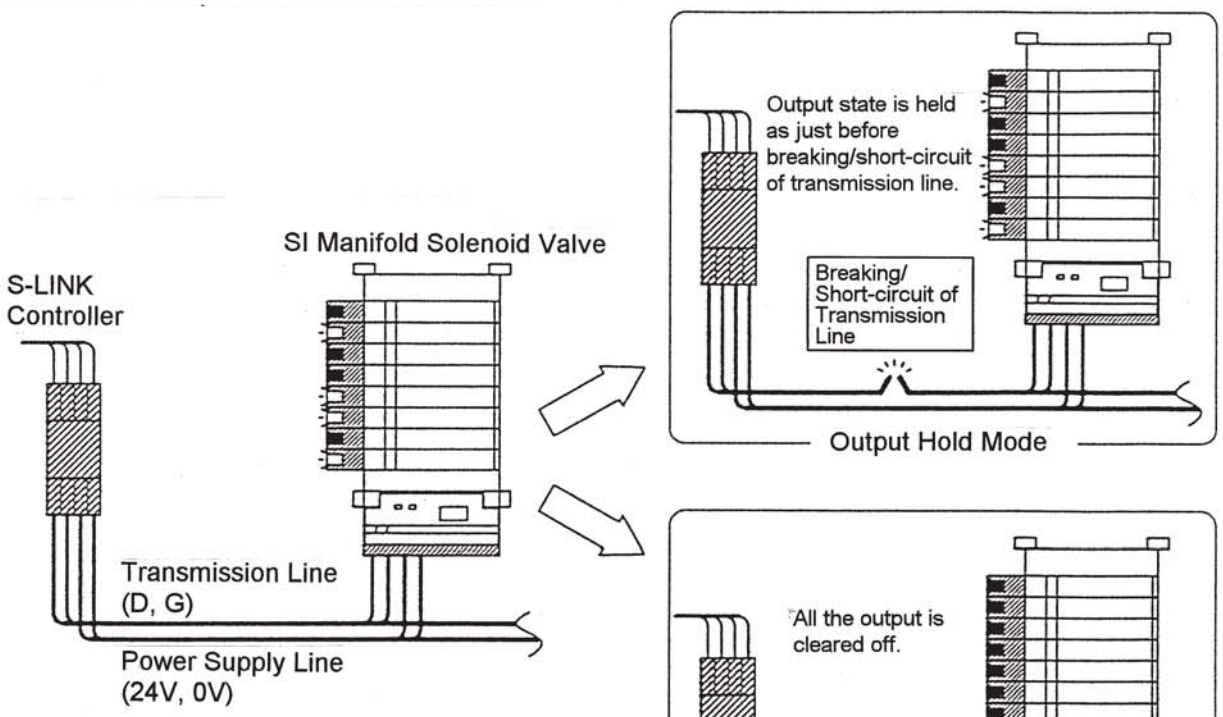


SI Unit Address
1+4+8+32 = 45

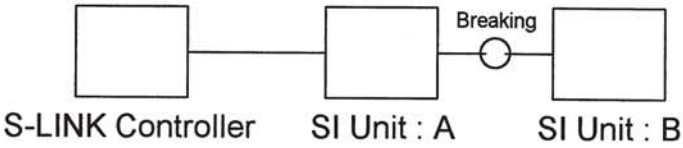
6 - 2. Output Hold Setting

Output of SI unit can be hold as it was before transmission line failure (output hold) or cleared off completely (output clear) when transmission lines (D, G) are disconnected/ shorted. Chose either of them and set with No. 8 DIP switch.





Output hold / clear function activates at transmissionline failure only for a unit in which signals from S-LINK controller cannot be sent. When breaking of transmission line takes place as shown below, output hold/ clear function will activate in SI unit: B but SI unit: A.



Caution !

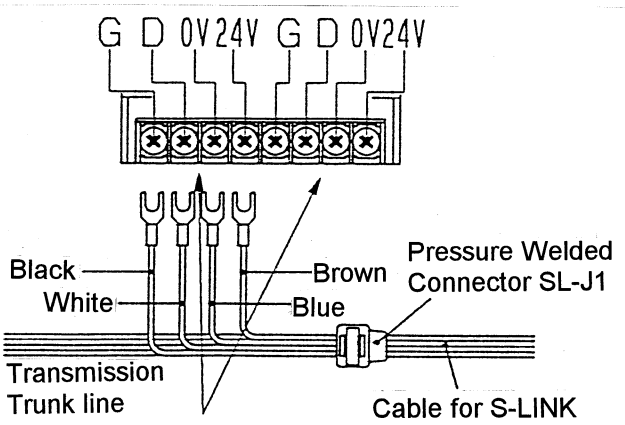
SI controller may output incorrectly if transmission line is returned without turning off the power once output hold / clear function activates. Make sure to turn the power off before reset.

7. Wiring

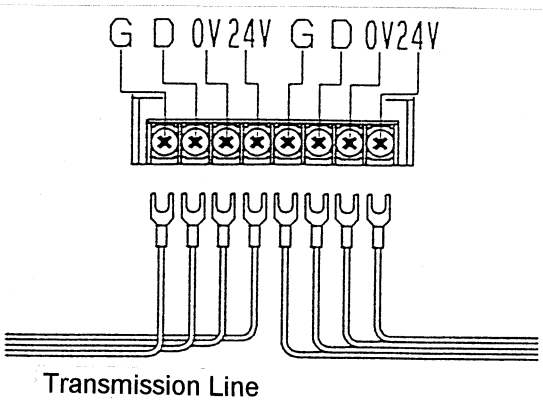
7 - 1. Wiring Method

For wiring, transmission lines (D, G) and power supply lines (24 V, 0 V) should be connected severally to the corresponding terminals. There are two ways of connecting SI unit to S-LINK transmission lines; T-shaped multidrop wiring and crossover wiring. Each wiring method is shown below.

a) T-shaped Multidrop Wiring



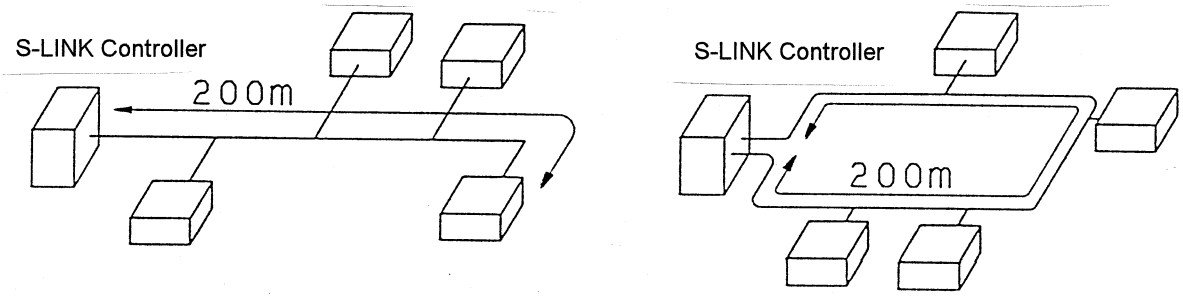
b) Crossover Wiring



Connectable to either side, since both right and left terminals are connected internally.
In the examples above, special flat cables for S-LINK: SL-RCM*00 are used.

- For connection of S-LINK system equipment and sensor link system, crossover wiring is recommended. If T-shaped multidrop wiring is done in sensor link system, disconnection of branch lines cannot be detected. Keep branch lines as short as possible.

- Transmission Distance
  1) 200 m or less of cables from S-LINK controller to the farthest unit.
  2) 200 m or less of cables in case of loop wiring.
  3) 400 m or less of total length of trunk and branch lines.

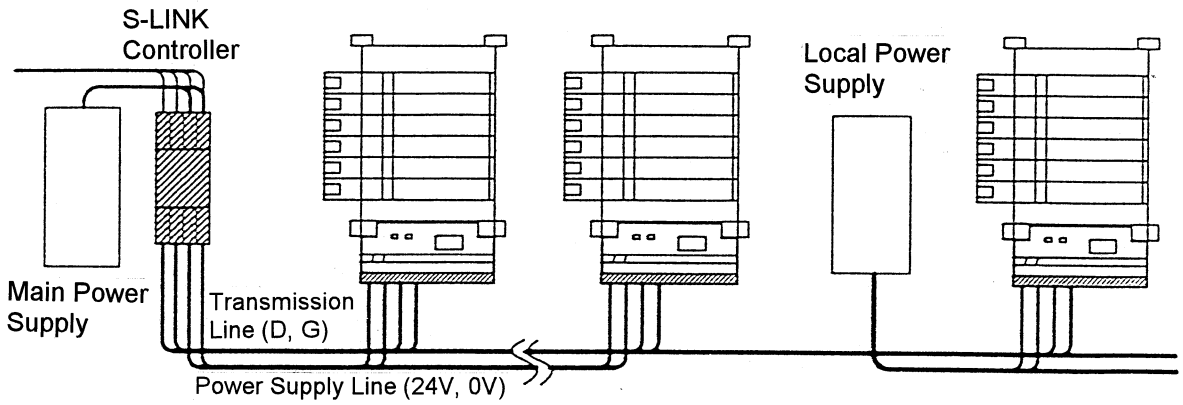


- Transmission distance is also constrained by the number of units connected and voltage drop in power supply lines. Refer to the S-LINK Instruction Manual prepared by Panasonic Industrial Devices SUNX Co., Ltd. for details.

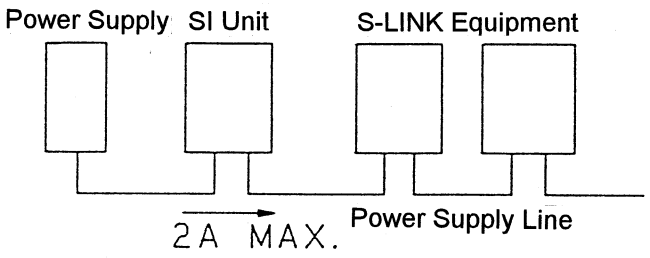
Connectable Number of Units
Connectable number of units is defined according to decrease of output capacity due to FAN-IN, FAN-OUT and cable length of S-LINK components. Refer to the S-LINK Instruction Manual prepared by Panasonic Industrial Devices SUNX Co., Ltd. for its calculation.

7 - 2. Power Supply

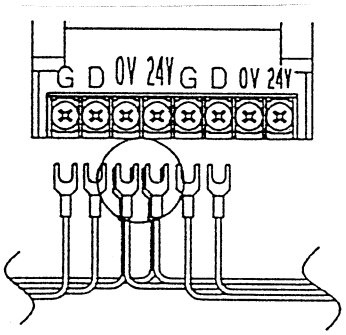
Supply DC24V $^{+10\%}_{-5\%}$ as a power source. S-LINK system has two ways of supplying power: centralized power supply and local power supply. With centralized power supply, electric power is delivered to all the S-LINK I/O equipment from a power source connected to S-LINK controller. In this case, load is constrained according to voltage drop in power lines (relating to cross section and length of cables), allowable current for cable and capacity of the main power supply.
If load capacity is large, provide local power supply as well as the main power supply to avoid concentration of power source.



For crossover wiring, power supply current delivered to other equipment through a SI unit should be 2A or less. If more than 2A of current is required, connect cables in T-shaped multidrop wiring or wire all the power supply terminals in one.



- When more than 2A of power supply current is applied via crossover wiring.



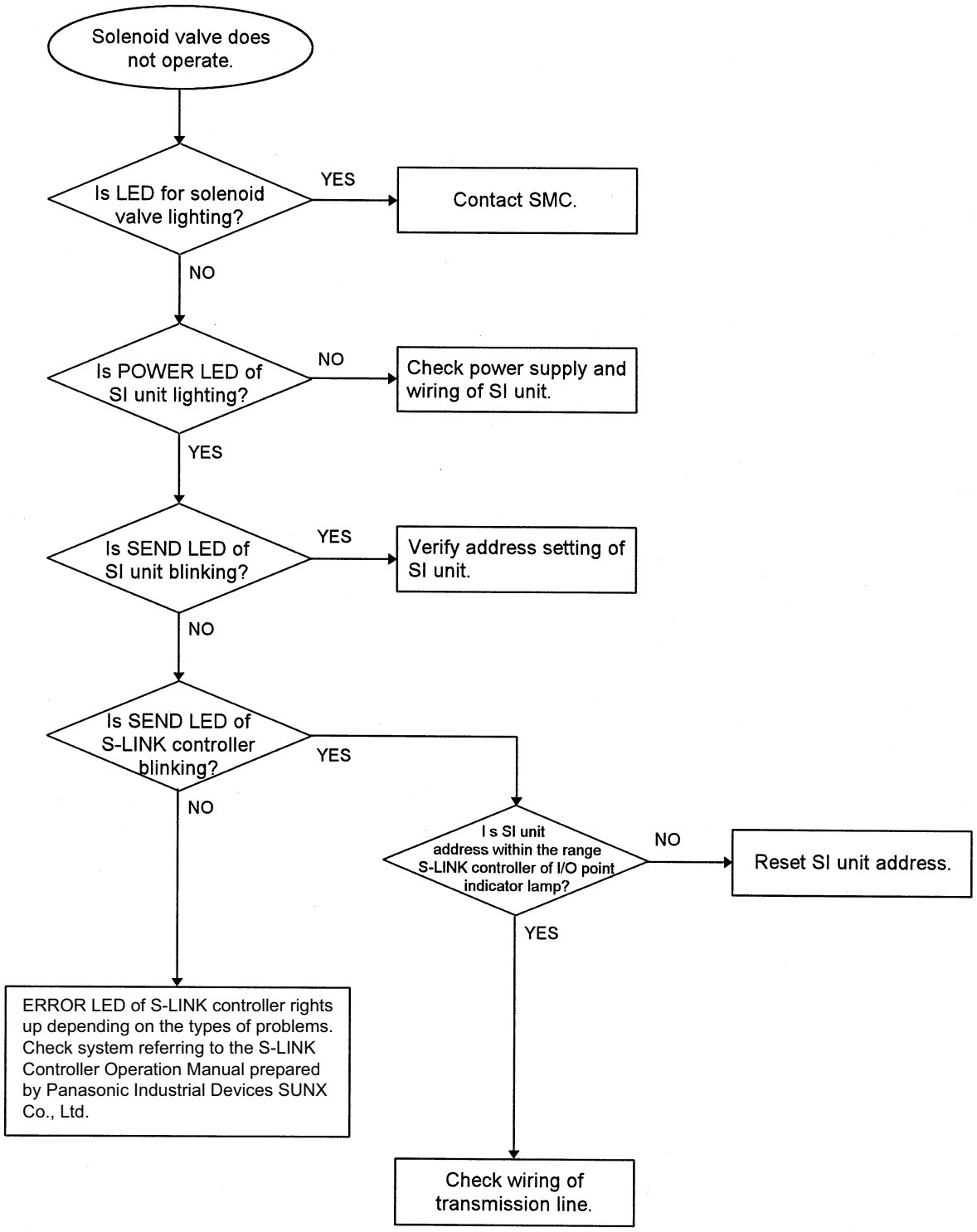
Caution !

Keep the voltage among power supply terminals of SI unit at 22.8 V (- 5% of supply voltage) or higher even when the maximum load is applied.
Never fail to ground FG of power supply (switching power supply). Also, keep cables for power supply, an inverter motor for instance, and S-LINK apart.

8. Maintenance

8 - 1. Troubleshooting

The following flow shows how to cope with improper operation of SI unit.
Refer to the Instruction Manual prepared by Panasonic Industrial Devices SUNX Co., Ltd. when the whole system needs troubleshooting.



Revision history
A: Contents revised in several places.

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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