



Operation Manual

PRODUCT NAME

Output block / Power block

MODEL / Series / Product Number

EX9-OET1

EX9-OET2

EX9-OEP1

EX9-OEP2

EX9-PE1

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: 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.



Safety Instructions

Caution

1. 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.

■ 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 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.

• The SI unit is a UL approved product only if they have a  mark on the body.

• 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.

It may also result in non-conformity to safety standards.

●Product 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.
IP67 protection cannot be guaranteed if the screws are not tightened to the specified torque.
- 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 and/or I/O device can result, causing malfunction.
- Do not route wires and cables together with power or high voltage cables.
Otherwise the product and/or I/O device 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 and/or I/O device 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

- Select the proper type of protection according to the environment of operation.
IP67 protection is achieved when the following conditions are met.
(1) The units are connected properly with product cable with M12 connector and power cable with M12 connector.
(2) Suitable mounting of each unit and manifold valve.
If using in an environment that is exposed to water splashes, please take measures such as using a cover.
- Do not use in a place where the product could be splashed by oil or chemicals.
If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction etc.).
- Do not use the product in an environment where corrosive gases or fluids could be splashed.
Otherwise damage to the product and 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.
- When a surge-generating load such as a relay or solenoid is driven directly, use a product with a built-in surge absorbing element.
Direct drive of a load generating surge voltage can damage the product.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- 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

- 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 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.

Model Indication and How to Order

•Output block

EX9-OE □ □

• Output type

1	Source / PNP (negative common)
2	Sink / NPN (positive common)

• Power supply type

T	Internal power supply from SI unit (for low wattage load)
P	External power supply type (for high wattage load) *

*: A Power block is required.

•Power block

EX9-PE1

Product Outline

The EX9 series is connected between an applicable SI unit and the valve manifold to operate equipment such as a solenoid valve or relay. An Output block and Power block are available.

•Output block

Type	Part No.	Description	Remarks
For low wattage load	EX9-OET1 EX9-OET2	Current Output to connected load (output equipment) or manifold valves using the power supply from the SI unit.	Usable load wattage is limited to 1.5 W * because power is supplied by the SI unit. When the load is up to 12 W, use both the Power block and a high wattage load Output block.
For high wattage load	EX9-OEP1 EX9-OEP2	Current Output to connected load (output equipment) using an external power supply.	For use with the Power block (EX9-PE1) which uses an external power supply.

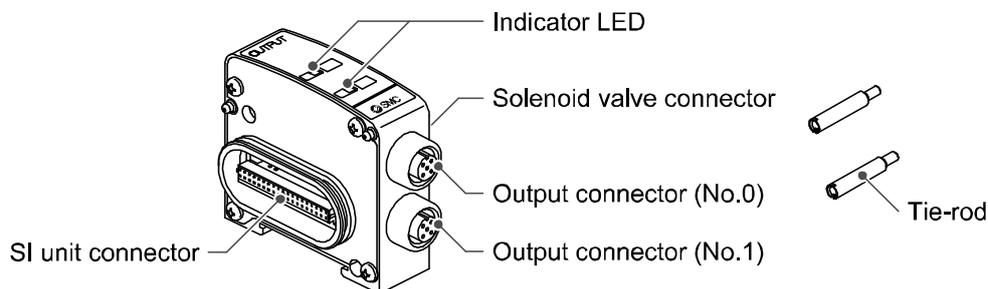
*: Limited to 1.0 W when the EX500-Q□02 SI unit (page 54) is connected.

•Power block

Type	Part No.	Description	Remarks
-	EX9-PE1	Provides an external power supply to the Output block for high wattage load.	For use with the Output block for high wattage load.

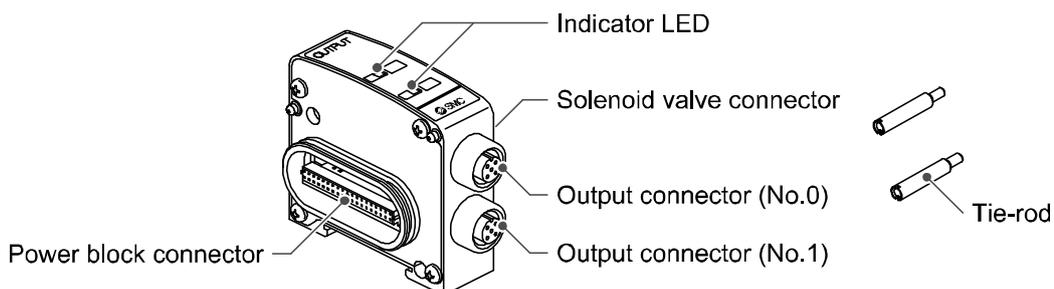
Summary of Product elements

EX9-OET1, EX9-OET2 (Output block for low wattage load)



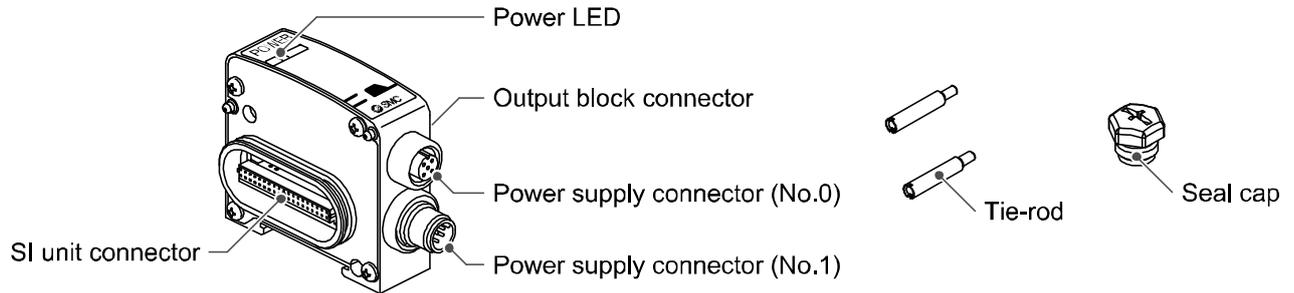
Element	Function
Indicator LED	Indicates the output status.
Solenoid valve connector	Connected to solenoid valve.
Output connector (No.0)	Connects with output device.
Output connector (No.1)	Connects with output device.
SI unit connector	Connected to SI unit.

EX9-OEP1, EX9-OEP2 (Output block for high wattage load)



Element	Function
Indicator LED	Indicates the output status.
Solenoid valve connector	Connected to solenoid valve.
Output connector (No.0)	Connects with output device.
Output connector (No.1)	Connects with output device.
Power block connector	Connected to Power block.

2. EX9-PE1 (Power block)



Element	Function
Power LED	Indicates the power supply status.
Output block connector	Connected to Output block for high wattage load.
Power supply connector (No.0)	Connector to supply power to the SI unit, only when the SI unit (EX250 or EX500 series) is on the left side of the EX9-PE1 (Power block). *
Power supply connector (No.1)	Connector to supply power to the Output block for high wattage load.
SI unit connector	Connected to SI unit.

*: Refer to page 39.

Product Selection

■ Selection for low wattage and high wattage load

The type is selected based on the SI unit type and the current consumption of the connect load.

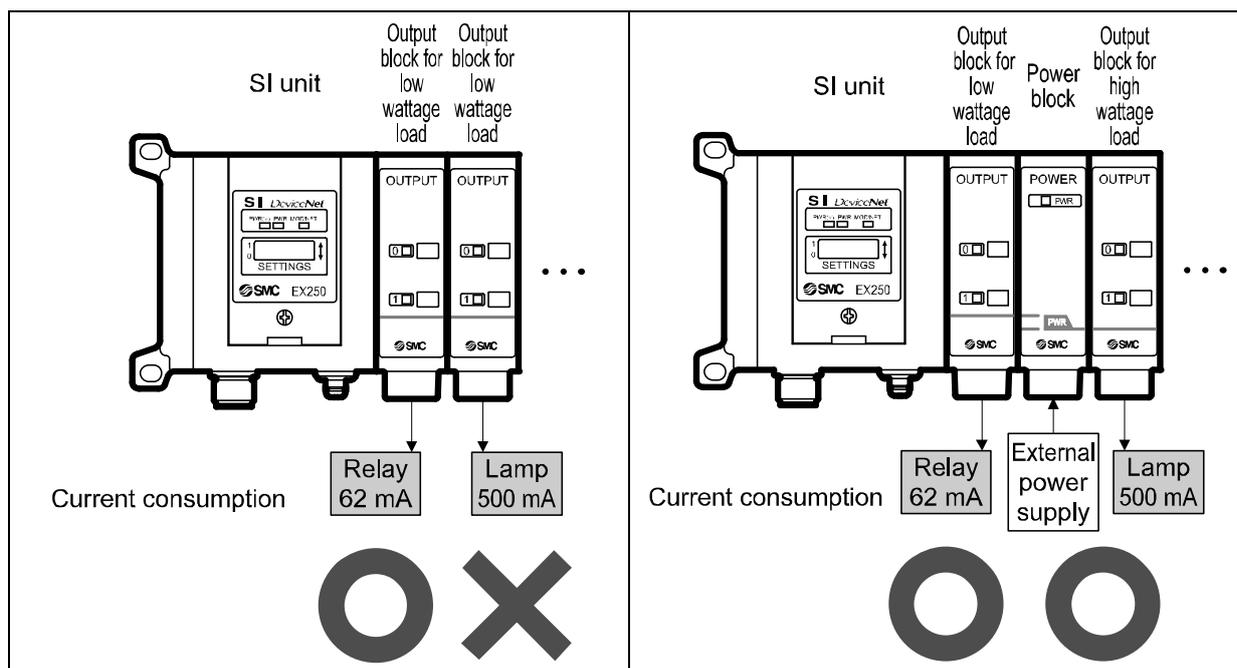
•EX126 and EX250 series (excluding the one power supply system for AS-i)

The Output block for low wattage load should not be used when the current consumption of the connected output equipment (load) is above the rated current of 62 mA (1.5 W, 24 VDC).

If used, the SI unit will malfunction.

The Output block for high wattage load and a Power block must be used when the current consumption exceeds the rated load current of 62 mA.

[Example]



○: This is possible to use it.

✕: This is not possible to use it.

Current consumption of the load (output equipment)	62 mA or less	Use Output block for low wattage load
	Above 62 mA	Use Output block for high wattage load + Power block

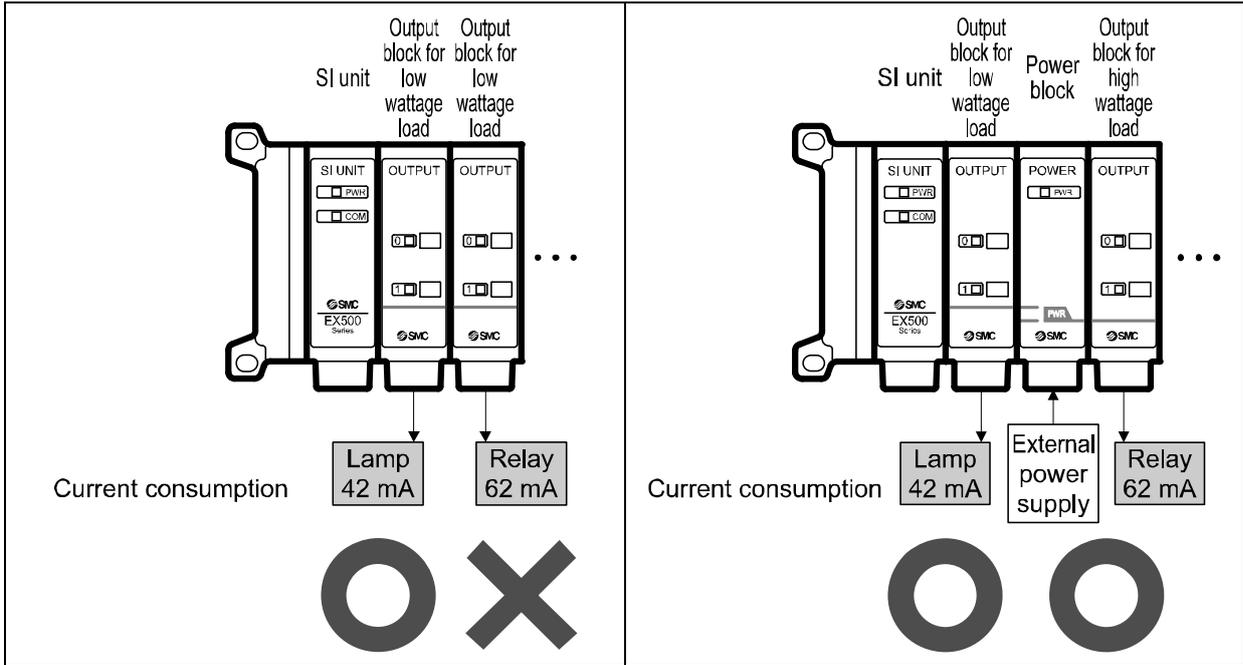
•EX500-Q □02 (page 54)

The Output block for low wattage load should not be used when the current consumption of the connected output equipment (load) is above the rated current of 42 mA (1.0 W, 24 VDC).

If used, the SI unit will malfunction.

The Output block for high wattage load and a Power block must be used when the current consumption exceeds the rated load current of 42 mA.

[Example]



○: This is possible to use it.

✕: This is not possible to use it.

Current consumption of the load (output equipment)	42 mA or less	Use Output block for low wattage load
	Over 42 mA	Use Output block for high wattage load + Power block

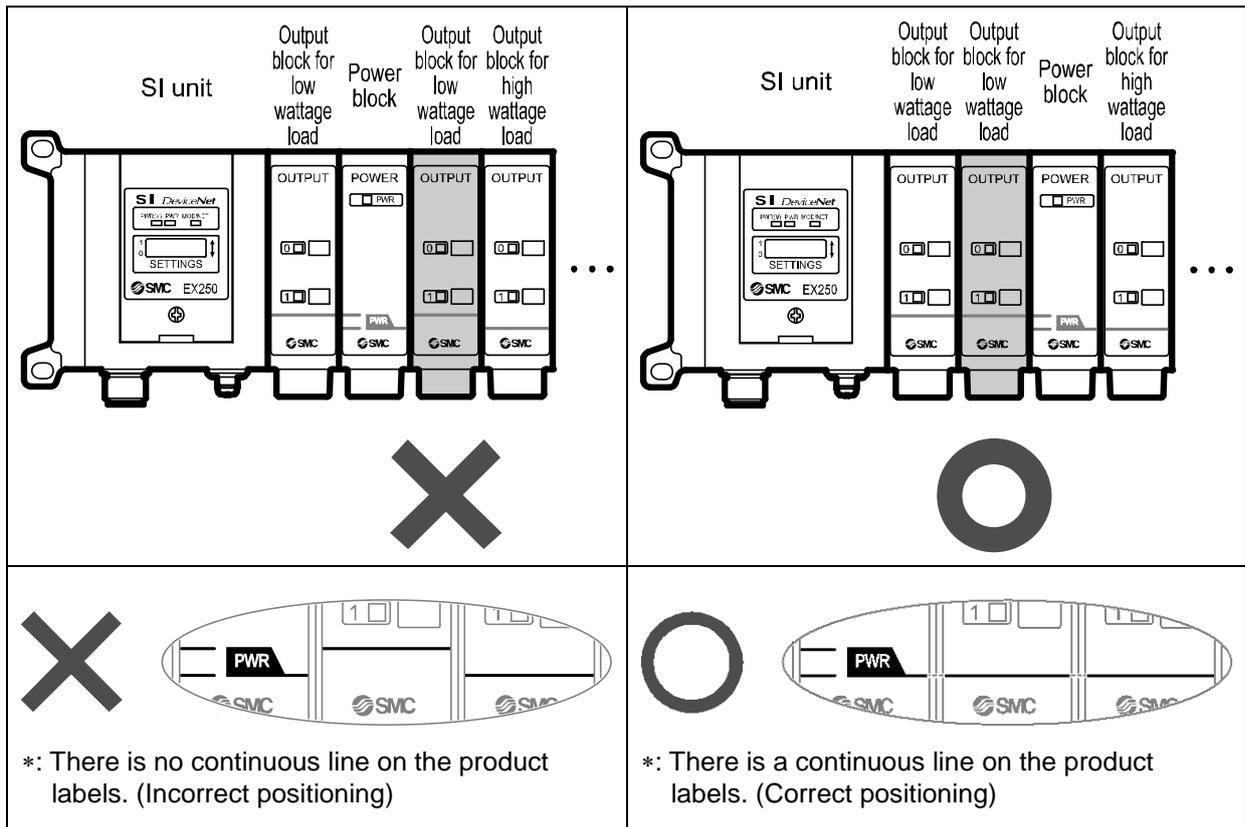
■ EX9-OET □ (Output block for low wattage load)

• Location

The Output block for low wattage load cannot be placed closer to the valve manifold than the Power block. If the Output block for low wattage load is positioned like this, it will not operate.

The correct position is with the Output block for low wattage load located between the SI unit and the Power block.

[Example]



○: This is possible to use it.

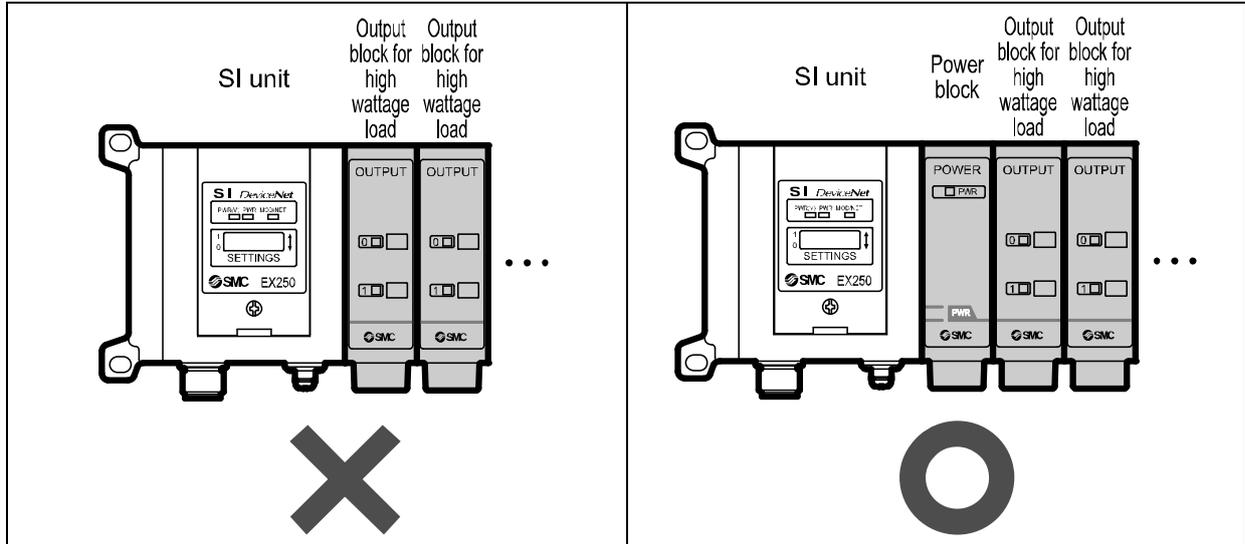
✕: This is not possible to use it.

■ EX9-OEP□ (Output block for high wattage load)

• Combination

The Output block for high wattage load (EX9-OEP□) cannot be used independently.
If the Output block for high wattage load is used independently, it will not operate.
It must be used together with a Power block (EX9-PE1).

[Example]



○: This is possible to use it.

✕: This is not possible to use it.

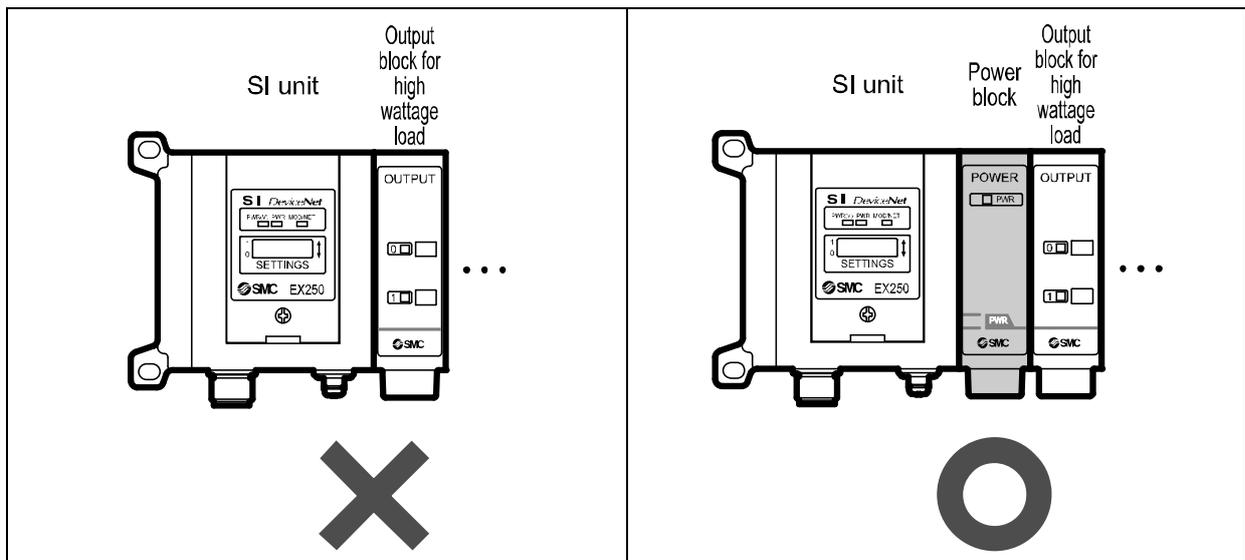
• Location

The SI unit or Output block for low wattage load cannot be positioned to the left of the Output block for high wattage load.

If the Output block for high wattage load is positioned like this, it will not operate.

Place the Power block closer to the SI unit than the Output block for high wattage load.

[Example]



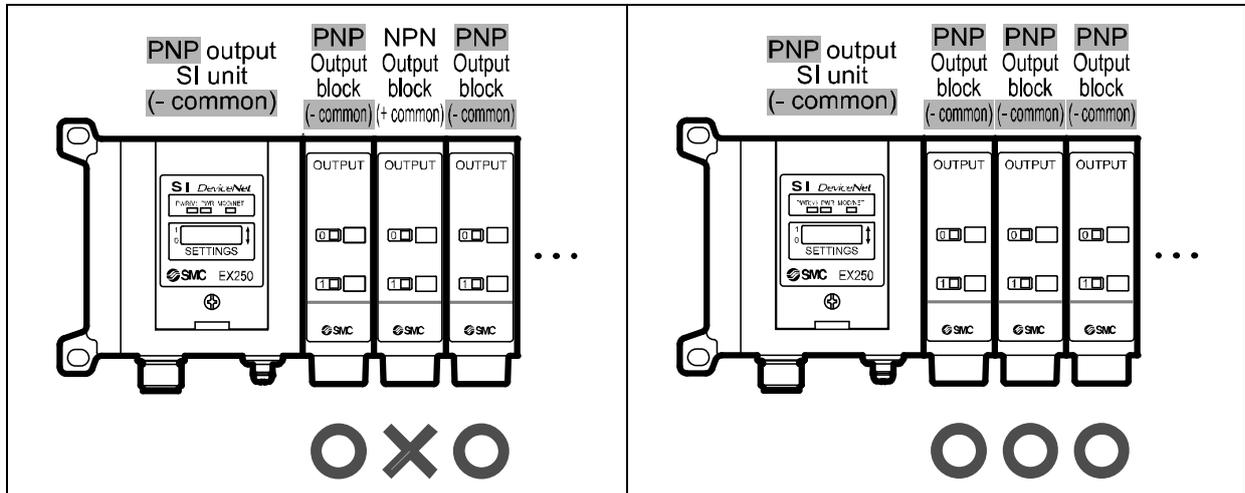
○: This is possible to use it.

✕: This is not possible to use it.

■ Polarity

Be sure to use an Output block with a polarity consistent with the polarity (output style) of the SI unit. If a product with the incorrect polarity is connected, the Output block will not operate.

[Example]



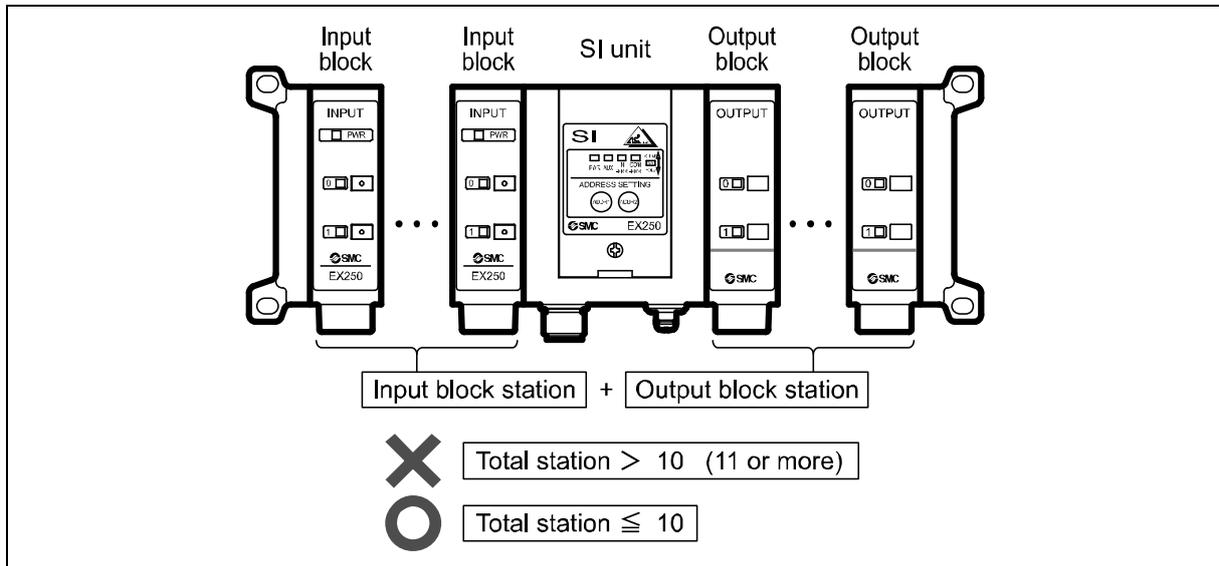
○: This is possible to use it.

×: This is not possible to use it.

■ The number of connected stations

The maximum number of connected stations in total of input / Output blocks (excluding SI unit) is 10. If more than 10 stations are connected, damage can result due to a lack of strength.

[Example]



○: This is possible to use it.

×: This is not possible to use it.

■ Limit of output points when the Output block for high wattage load and Power block are used

•EX250-SDN1, -SMJ2, -SPR1, -SCA1A, -SEN1

The maximum output points of the Output block for low wattage load is 32 (for connector pin No. 3 to 34)
 When an Output block for high wattage load and Power block are used, the number of output points of the Output block (on the right of the Power block) is limited to 24 points (connector pin No. 3 to 26). This is because 8 points (connector pin No.27 to 34) are used to output the power supply from the Power block to the Output block for high wattage load (32 points - 8 points =24 points).

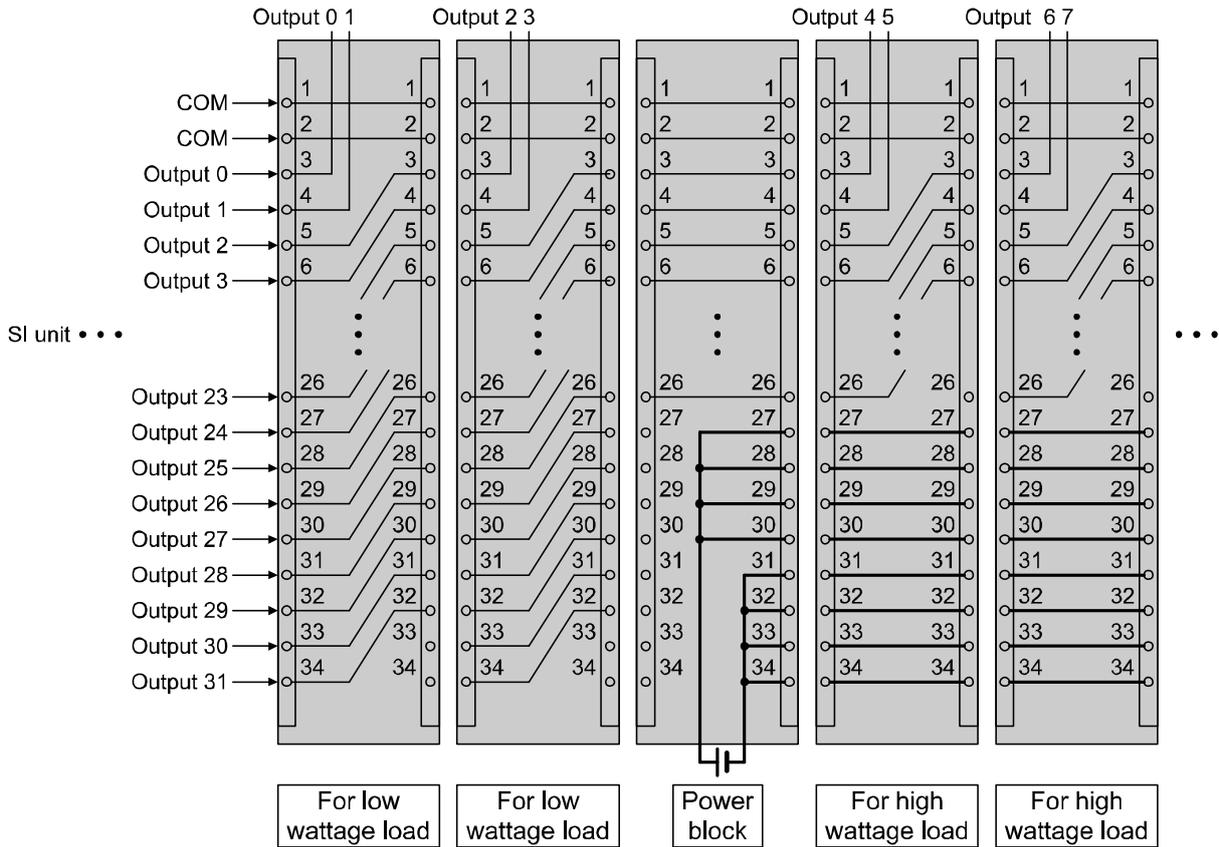


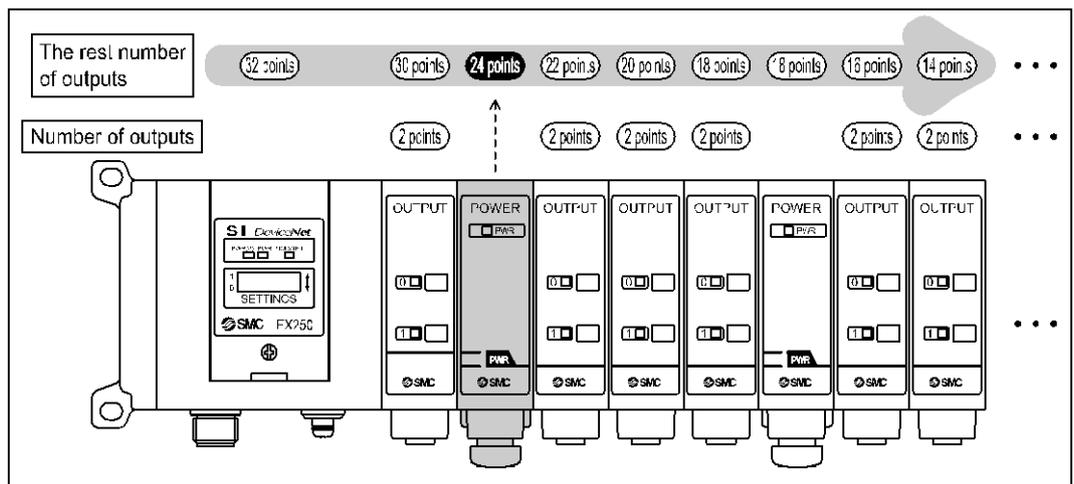
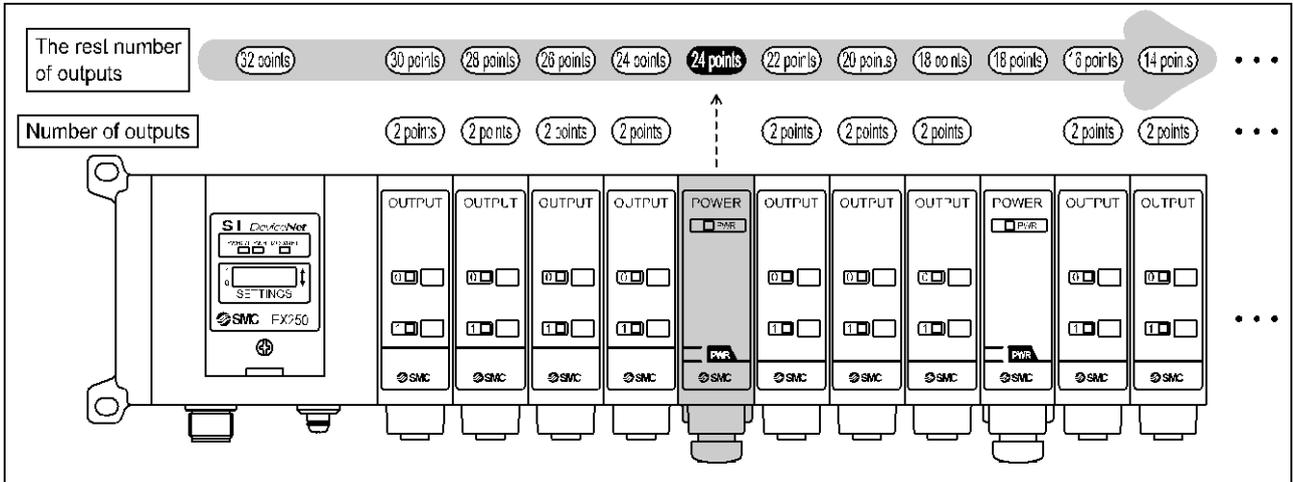
Table: Maximum number of output points when the Power block is used

SI unit model No.	SI unit specification	Max. number of output points when the Power block is used
EX250-SDN1, -SMJ2, -SPR1, -SCA1A, -SEN1 *	32 inputs / 32 outputs	24 points
EX260-SDN1, -SDN2, -SMJ1, -SMJ2, -SPR1, -SPR2 EX260-SPR5, -SPR6, -SEN1, -SEN2, -SEC1, -SEC2 EX260-SPN1, -SPN2, -SPL1	32 outputs	24 points
EX260-SDN3, -SDN4, -SMJ3, -SMJ4, -SPR3, -SPR4 EX260-SPR7, -SPR8, -SEN3, -SEN4, -SEC3, -SEC4 EX260-SPN3, -SPN4, -SPL3	16 outputs	16 points
EX126D-SMJ1 *	16 outputs	16 points
EX250-SAS5, -SAS9	4 inputs / 4 outputs	4 points
EX250-SAS3, -SAS7	8 inputs / 8 outputs	8 points
EX500-Q002, -Q102	Gateway branch system 16 outputs	16 points
EX500-S103	Gateway branch system 2 16/32 outputs (Selected using built-in setting switch)	16 outputs (with setting of 16 outputs) 24 outputs (with setting of 32 outputs)

*: If the Output block is used with the EX250 series, it can be connected to the product with manufacturing lot GV (Aug. 2002) or later. Terminal block plate (VVQC1000-74A-2) which is shipped after March 2004 can be connected to EX126 for adding the Output block. These products and assemblies have the body to enable connection with the Output block.

Example of calculating the number of outputs (For EX250-SDN1, -SMJ2, -SPR1, -SCA1A, -SEN1)

When the Power block is installed, the maximum number of outputs is 24 points.

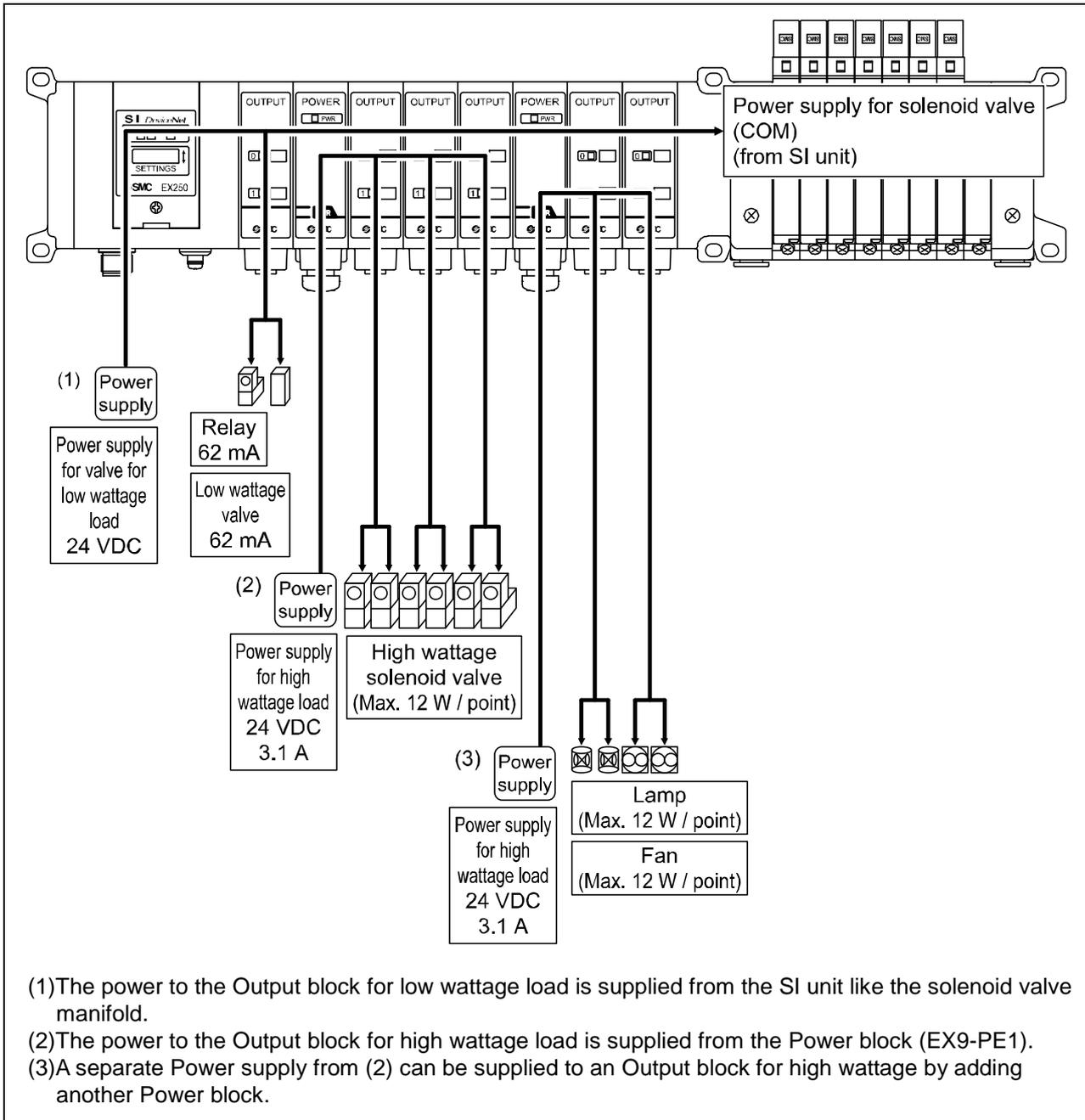


■ Supply current

There are two main power supply systems.

- The Power supply from the SI unit to the Output block for low wattage load and the manifold valve (1)
- The Power supply from the Power block to the Output block for high wattage load (2) (3)

Power supply system example



The following pages show calculation examples for the supply current for (1), (2) and (3).

Calculation example for supply current

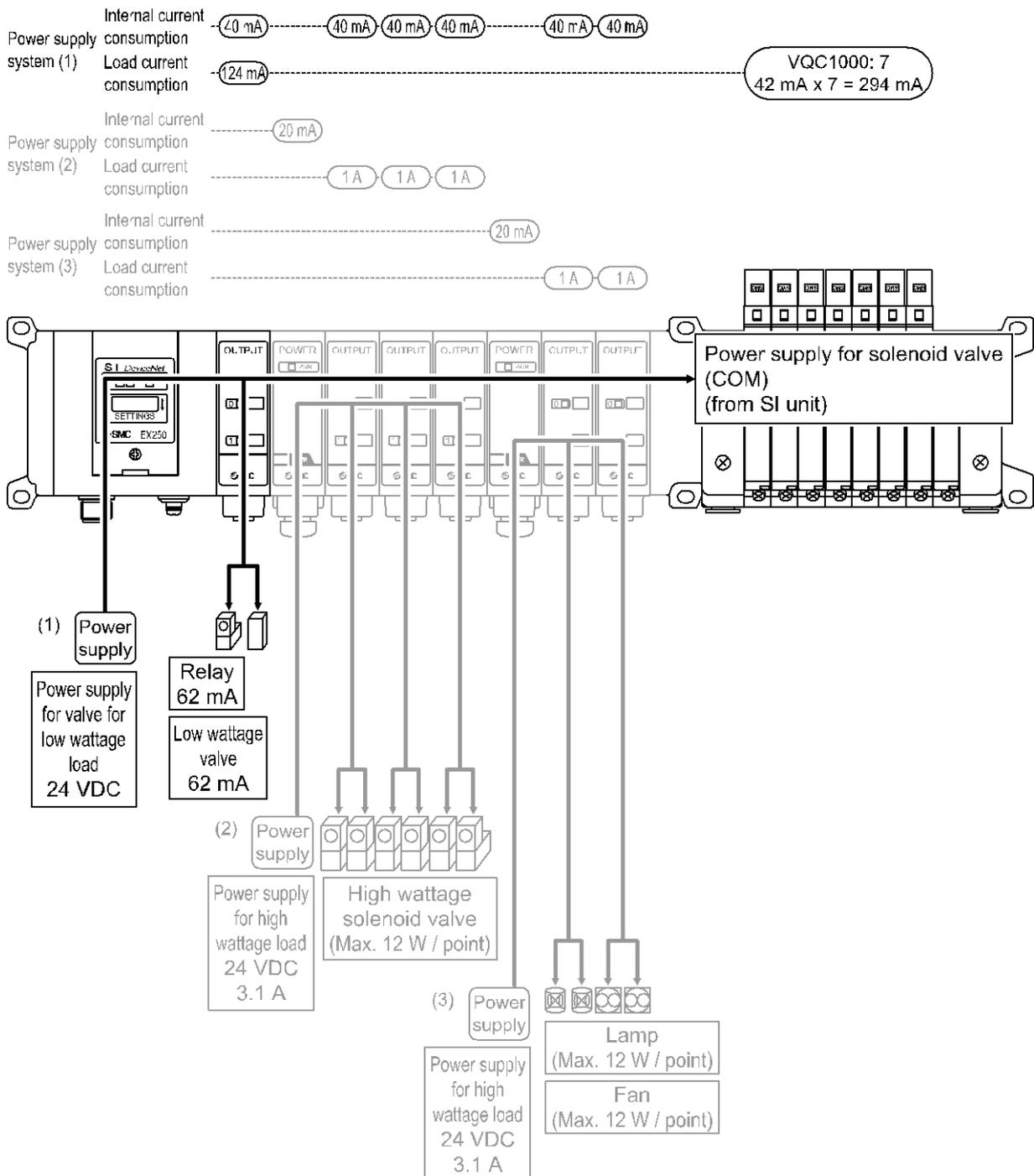
(1) SI unit → Output block for low wattage load and Manifold valves

The total current consumption of the Output block for low wattage load and the manifold valves depends on the power supply system (maximum current of each SI unit) and is limited.

Therefore, a load current above the maximum supply current for the SI unit cannot be used.

If the Output block current consumption exceeds the maximum supply current of the SI unit, use a Power block and the Output block for high wattage load.

Refer to the table on the next page and the operation manuals for the maximum supply current of each SI unit.



- Total current consumption of Output block
(Current consumption of one output x Output number) x Output block number =
(20 mA x 2 points) x 6 blocks = 240 mA
 - Current consumption of the load connected to the manifold block for low wattage load.
(Total current consumption of connected load) + (Current consumption of one valve x station number) =
(62 mA + 62 mA) + (42 mA x 7stns.) = (124 mA) + (294 mA) = 418 mA
- Total current consumption** = 240 mA + 418 mA = 658 mA $\hat{=}$ **0.7 A**

Maximum supply current for SI unit (EX250-SDN1) = 2 A

Result **0.7 A \leq 2 A** (OK)

Table: Maximum supply current from the SI unit

SI unit model No	SI unit specification	Max. Output supply current
EX126D-SMJ1	16 outputs	1.4 A
EX250-SDN1, -SMJ2, -SPR1, -SCA1A, -SEN1	32 inputs / 32 outputs	2 A
EX250-SAS3	8 inputs / 8 outputs 2 power supply systems	0.5 A
EX250-SAS5	4 inputs / 4 outputs 2 power supply systems	0.25 A
EX250-SAS7	8 inputs / 8 outputs 1 power supply system	0.24 A * (Total of inputs / outputs)
EX250-SAS9	4 inputs / 4 outputs 1 power supply system	0.12 A * (Total of inputs / outputs)
EX260-SDN1, -SDN2, -SMJ1, -SMJ2, -SPR1, -SPR2 EX260-SPR5, -SPR6, -SEN1, -SEN2, -SEC1, -SEC2 EX260-SPN1, -SPN2, -SPL1	32 outputs	2 A
EX260-SDN3, -SDN4, -SMJ3, -SMJ4, -SPR3, -SPR4 EX260-SPR7, -SPR8, -SEN3, -SEN4, -SEC3, -SEC4 EX260-SPN3, -SPN4, -SPL3	16 outputs	1 A
EX500-Q002, -Q102	Gateway branch system 16 outputs	0.75 A
EX500-S103	Gateway branch system 2 16/32 outputs (Selected using built-in setting switch)	1.5 A

*: For a single power supply system for AS-i, the maximum supply current in total of inputs / outputs is applicable.

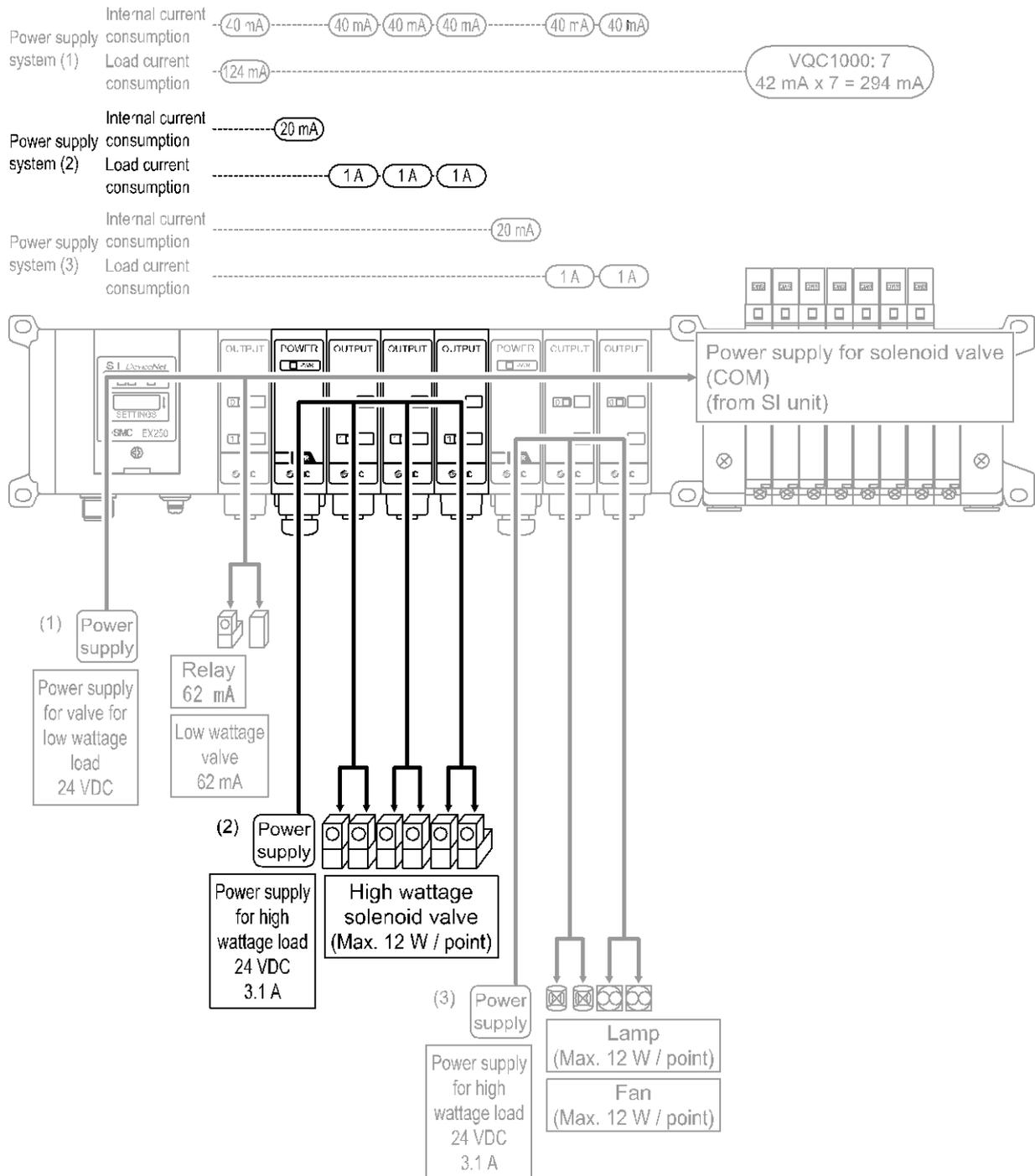
Calculation example for supply current

(2) Power block → Output block for high wattage load

The maximum supply current of the Power block (EX9-PE1) is 3.1 A *.

The maximum supply current must not be exceeded.

*: When maximum supply current is 3.0 to 3.1 A, keep the ambient temperature at 40 °C or less and do not bundle the cables.



•Current consumption in the Power block

Current consumption of the Power block = 20 mA

•Current consumption of the valve load connected to the Output block for high wattage load.

(Current consumption of one valve connected to one output x output number) x Output block number =
(0.5 A x 2 points) x 3 pcs. = (1.0 A) x 3 pcs. = 3 A

Total current consumption = 20 mA + 3 A = **3.02 A**

Maximum supply current for Power block = **3.1 A**

Result

$3.02 \text{ A} \leq 3.1 \text{ A}$

OK

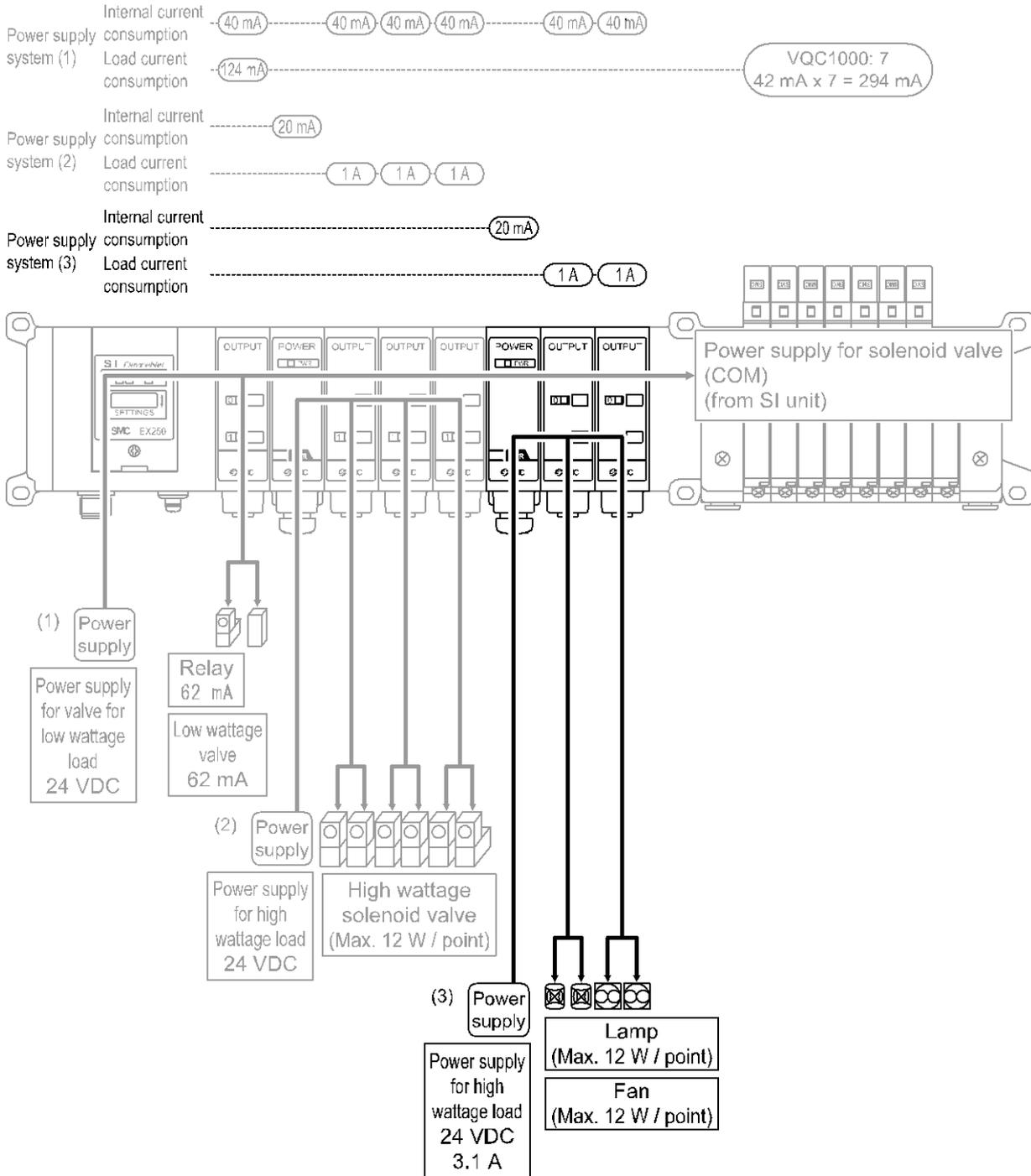
Calculation example for supply current

(3) Power block → Output block for high wattage load

The maximum supply current of the Power block (EX9-PE1) is 3.1 A *.

The maximum supply current must not be exceeded.

*: When maximum supply current is 3.0 to 3.1 A, keep the ambient temperature at 40 °C or less and do not bundle the cable.



- Current consumption in the Power block

Current consumption of the Power block = 20 mA

- Current consumption of the load connected to the Output block for high wattage load.

(Current consumption of one load connected to one output x output number) x Output block number =
(0.5 A x 2 points) x 2 pcs. = (1.0 A) x 2 pcs. = 2 A

Total current consumption = 20 mA + 2 A = **2.02 A**

Maximum supply current for Power block = 3.1 A

Result

2.02 A \leq 3.1 A

OK

•AS-i power supply system

If an AS-i power supply system is the only power supply, the supply current for the input and output equipment is limited.

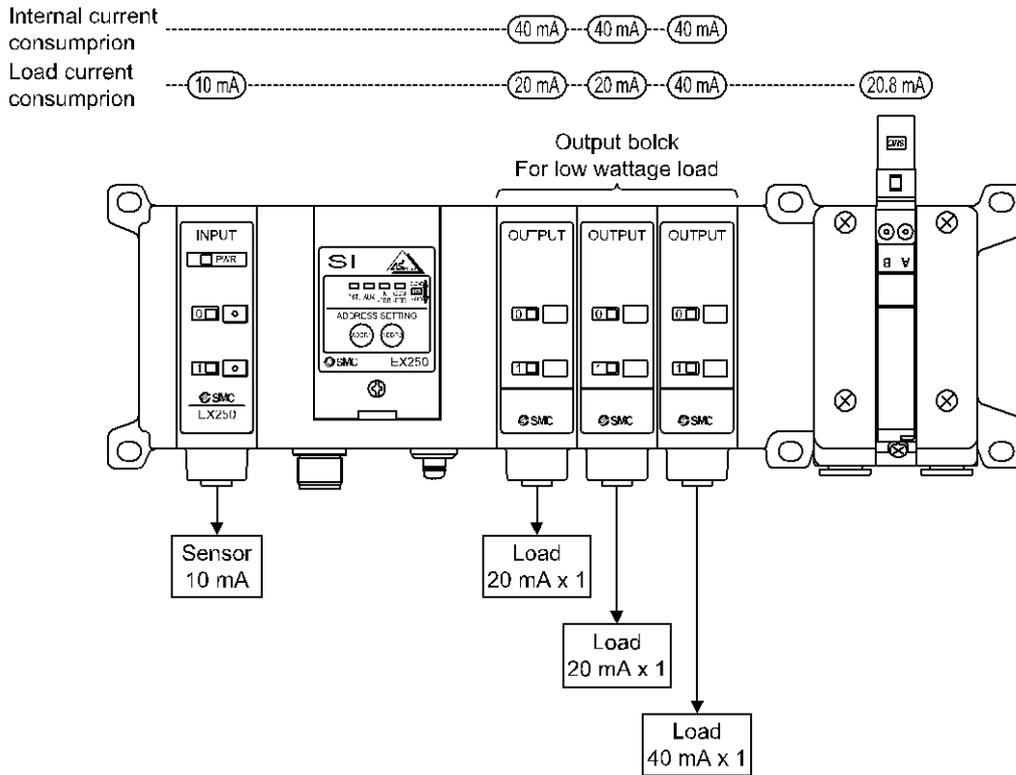
Current above the maximum supply current for the SI unit cannot be used.

Calculate the current consumption for the input and output equipment before use.

Refer to the operation manuals for the maximum supply current of each SI unit.

Calculation example for supply current

○EX250-SAS7 (AS-i, 8 inputs, 8 outputs, one power supply system)



•Current consumption in the Output block

(Current consumption of one output x Output number) x Output block number =
 (20 mA x 2 points) x 3 blocks = 120 mA

•Current consumption of the load connected to the sensor, load connected to the Output block and manifold valve.

(Total current consumption of sensors) + (Total current consumption of connected loads) + (Current consumption of one valve x station number) = (10 mA) + (20 mA + 20 mA + 40 mA) + (20.8 mA x 1 stn.) = 110.8 mA

Total current consumption = 120 mA + 110.8 mA = **230.8 mA**

Maximum supply current for SI unit (EX250-SAS7) = 240 mA

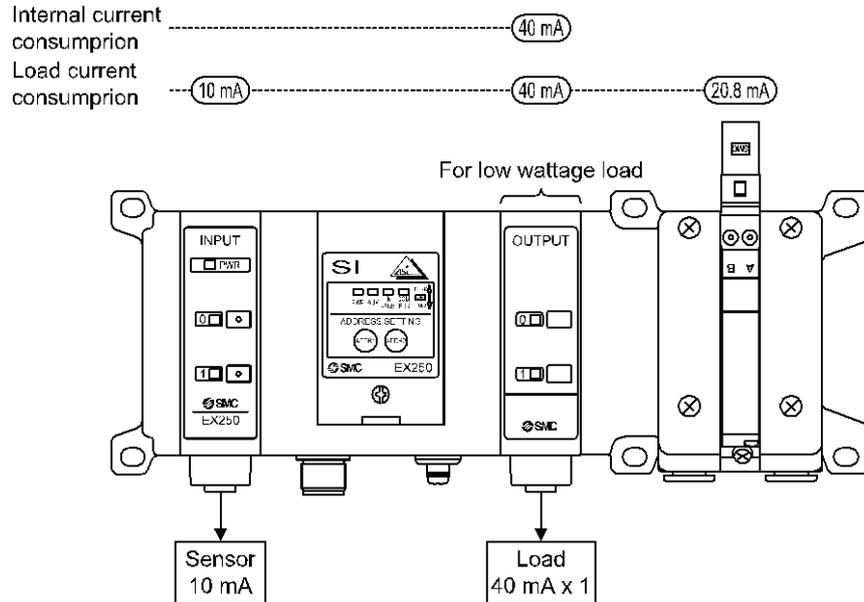
Result **230.8 mA ≤ 240 mA** (OK)

Supply current for EX250-SAS9 (AS-i, 4 inputs, 4 outputs, 1 power supply system)

Current above the maximum supply current (120 mA) cannot be used.

[Example] Refer to page 26 for details.

○EX250-SAS9



- Current consumption in the Output block

(Current consumption of one output x Output points) x Output block number =
 (20 mA x 2 points) x 1 blocks = 40 mA

- Current consumption of the load connected to the sensor, load connected to the Output block and manifold valve.

(Total current consumption of sensors) + (Total current consumption of connected loads) + (Current consumption of one valve x station number) = (10 mA) + (40 mA) + (20.8 mA x 1 stn.) = 70.8 mA

Total current consumption = 40 mA + 70.8 mA = 110.8 mA

Maximum supply current for SI unit (EX250-SAS9) = 120 mA

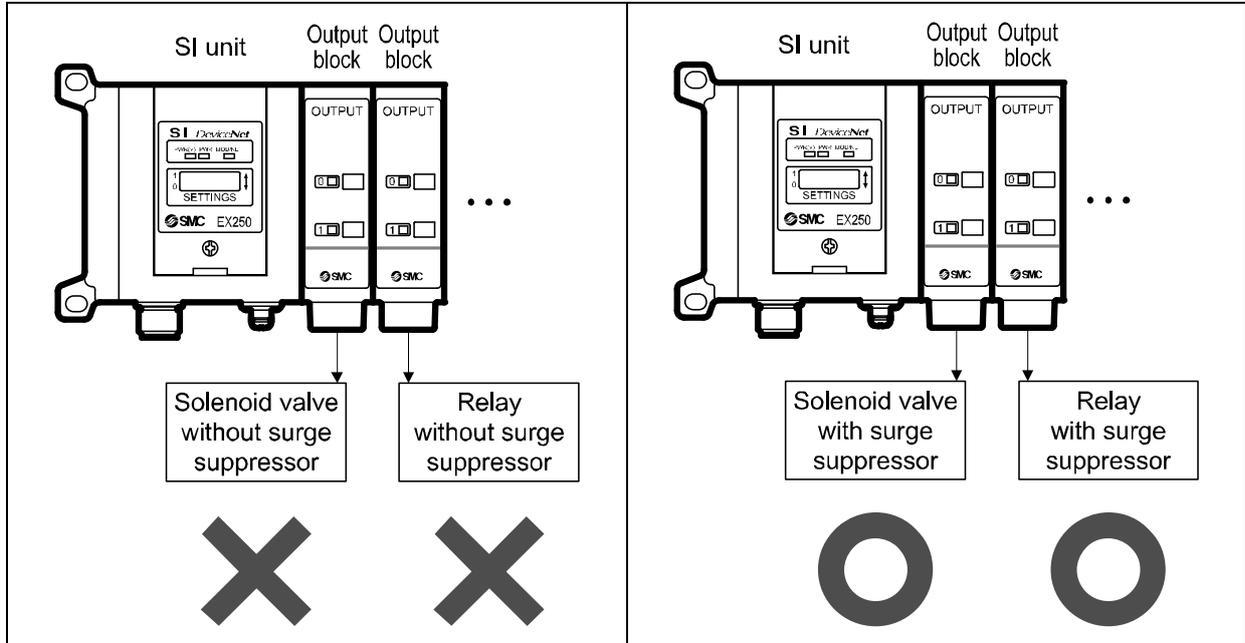
Result 110.8 mA ≤ 120 mA



■ Connection of inductive load

If the connected load is an inductive type load such as a solenoid valve or relay, be sure to select a load with built in a surge voltage protective circuit (surge suppressor) or externally connect a protective circuit. Without it, a malfunction and/or damage to the product may occur.

[Example]



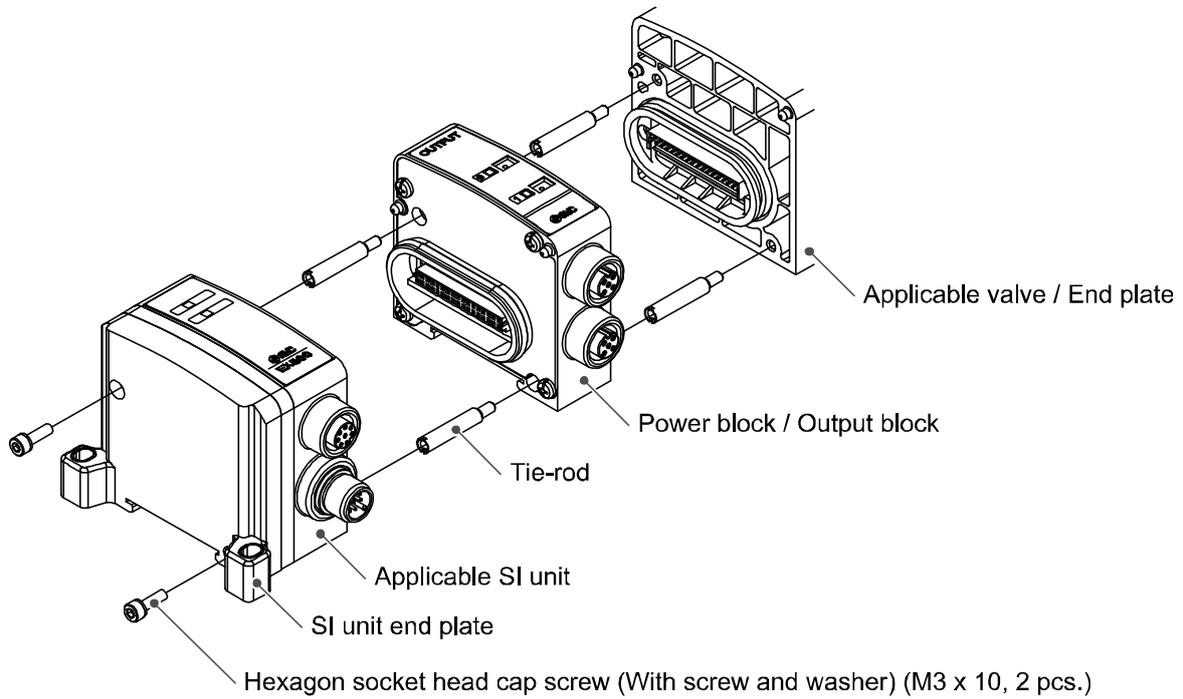
○: This is possible to use it.

✕: This is not possible to use it.

Mounting and Installation

■ Mounting

The mounting and removal methods of each product are as shown below.



Note

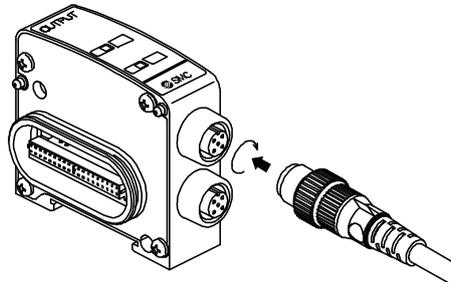
Hold together so that there is no gap between products and tighten the screws.
Be sure to tighten each screw with the required tightening torque. (Tightening torque: 0.6 Nm)

■ Installation

Follow the installation method for each SI unit and valve.

■ Wiring

- 1) Align the position of the connector groove and insert the cable connector.
- 2) Tighten the lock nut on cable side by turning it clockwise by hand.
Confirm that the connector does not move.

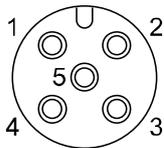


• Output block

Connect output devices to the output connectors.

EX9-OET1, EX9-OET2, EX9-OEP1, EX9-OEP2 output connector

M12 5-pin (socket)



Model	EX9-OET1/EX9-OEP1		EX9-OET2/EX9-OEP2	
No.	PNP output		NPN output	
	Output connector (No.0)	Output connector (No.1)	Output connector (No.0)	Output connector (No.1)
1	N.C.	N.C.	Power supply (24 VDC)	Power supply (24 VDC)
2	Output (OUT1) *	N.C.	Output (OUT1) *	N.C.
3	Power supply (GND)	Power supply (GND)	N.C.	N.C.
4	Output (OUT0) *	Output (OUT1)	Output (OUT0) *	Output (OUT1)
5	N.C.	N.C.	N.C.	N.C.

*: Two outputs are available with only output connector (No.0).

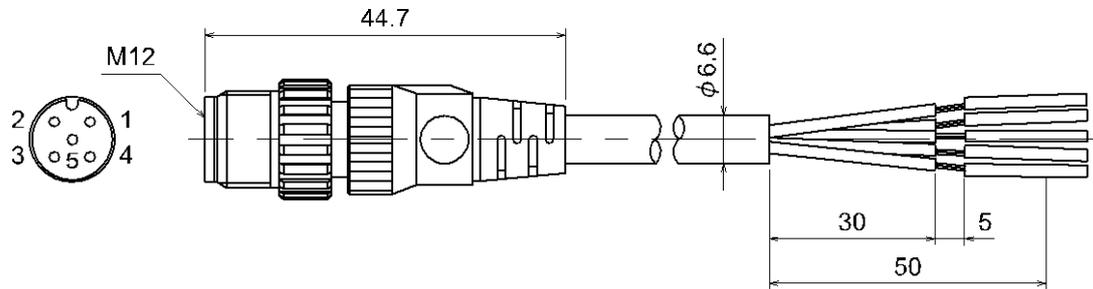
N.C.: Not connected

Note

Be sure to fit a water resistant cap on any unused connectors.
Proper use of the water resistant cap enables the enclosure to satisfy IP67 specification.
(Tightening torque for M12: 0.1 Nm)

Pin assignment of the cable to connect the Output block to the load (accessory)

- EX9-AC □-7 (Cable with M12 connector)



No.	Wire colour
1	Brown
2	White
3	Blue
4	Black
5	Grey

Item	Specifications
Cable O.D.	φ6.6 mm
Conductor nominal cross section	0.3 mm ² /AWG22
Wire D.D. (Including insulator)	1.65 mm
Min. bending radius (Fixed)	40 mm

*: Refer to Accessories (page 49) for cables.

•Power block

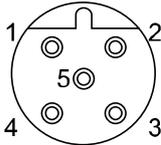
Connect the power supply to the connector.

When selecting a power supply, refer to "Safety Instructions" (page 2) in this manual.

EX9-PE1 power supply connector (No.0)

Connect the power supply from the Power block (EX9-PE1) to the SI unit.

M12 5-pin B-code (Reverse key), Socket



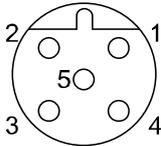
No.	Element
1	Power supply for output devices (24 VDC)
2	Power supply for output devices (0 V)
3	[Power supply for sensor (24 VDC)] *1
4	[Power supply for sensor (0 V)] *1
5	Ground (FE)

* : Each signal of connector No.0 is connected to corresponding signal of connector No.1.

*1: It is used when power is supplied to SI Unit, using an exclusive cable from the power supply connector.
When power is not supplied to the SI Unit from the Power Block, it is not required to connect the power to the pins No.3 and 4 of the power input connector.

EX9-PE1 power supply connector (No.1)

M12 5-pin B-code (Reverse key), plug



No.	Element
1	Power supply for output devices (24 VDC)
2	Power supply for output devices (0 V)
3	[Power supply for sensor (24 VDC)] *1
4	[Power supply for sensor (0 V)] *1
5	Ground (FE)

* : Each signal of connector No.0 is connected to corresponding signal of connector No.1.

*1: It is used when power is supplied to SI Unit, using an exclusive cable from the power supply connector.
When power is not supplied to the SI Unit from the Power Block, it is not required to connect the power to the pins No.3 and 4 of the power input connector.

Note

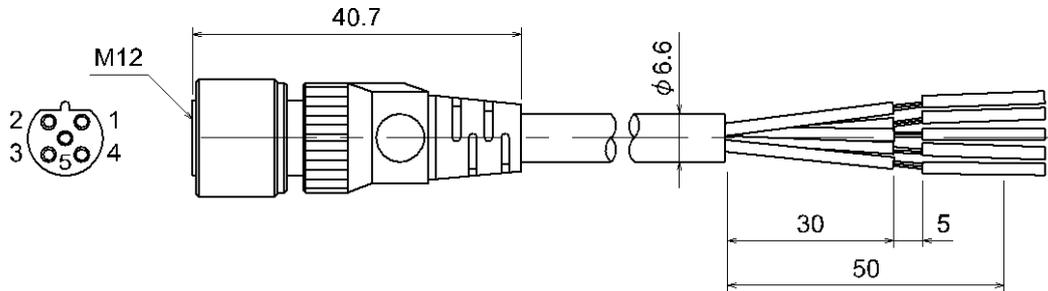
Be sure to fit a water resistant cap on any unused connectors.

Proper use of the water resistant cap enables the enclosure to satisfy IP67 specification.

(Tightening torque for M12: 0.1 Nm)

Pin assignment of the power cable for the Power block and SI unit (accessory)

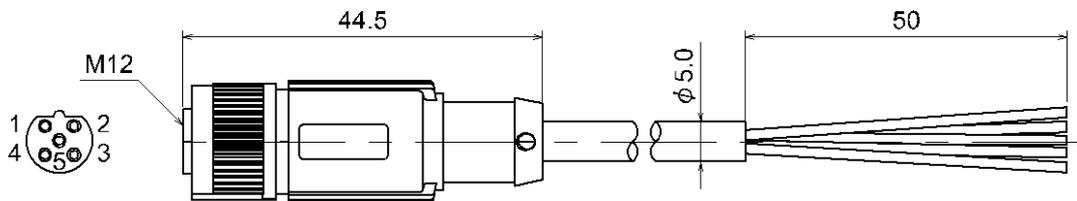
•EX9-AC □-1 (Cable with M12 connector)



No.	Wire colour: Signal name
1	Brown: Power supply for output (24 VDC)
2	White: Power supply for output (0 VDC)
3	Blue: [Power supply to sensor (24 VDC)]
4	Black: [Power supply to sensor (0 VDC)]
5	Grey: Ground (FE)

Item	Specifications
Cable O.D.	φ6.6 mm
Conductor nominal cross section	0.3 mm ² /AWG22
Wire D.D. (Including insulator)	1.65 mm
Min. bending radius (Fixed)	40 mm

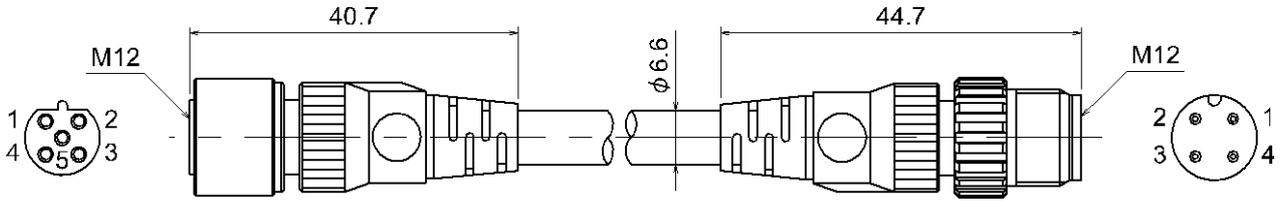
•PCA-140180 □ (Cable with M12 connector)



No.	Wire colour: Signal name
1	Brown: Power supply for output (24 VDC)
2	White: Power supply for output (0 V)
3	Blue: [Power supply to sensor (24 VDC)]
4	Black: [Power supply to sensor (0 V)]
5	Green/Yellow: Ground (FE)

Item	Specifications
Cable O.D.	φ5.0 mm
Conductor nominal cross section	0.34 mm ² /AWG22
Wire D.D. (Including insulator)	1.27 mm
Min. bending radius (Fixed)	21.7 mm

•EX9-AC010-5 (Cable with M12 connector)

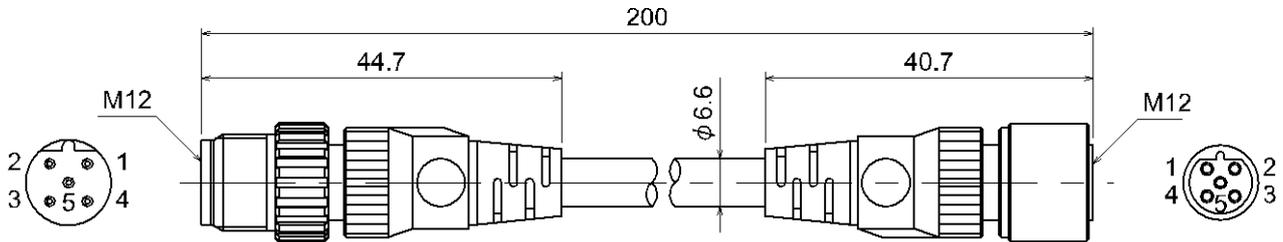


Item	Specifications
Cable O.D.	φ6.6 mm
Conductor nominal cross section	0.3 mm ² /AWG22
Wire D.D. (Including insulator)	1.65 mm
Min. bending radius (Fixed)	40 mm

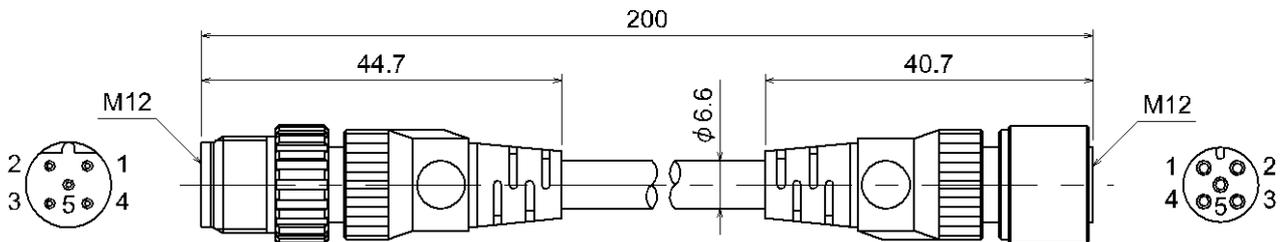
*: Refer to Accessories (page 49) for cables.

Pin assignment of the cable to connect the Power block and SI unit (accessory)

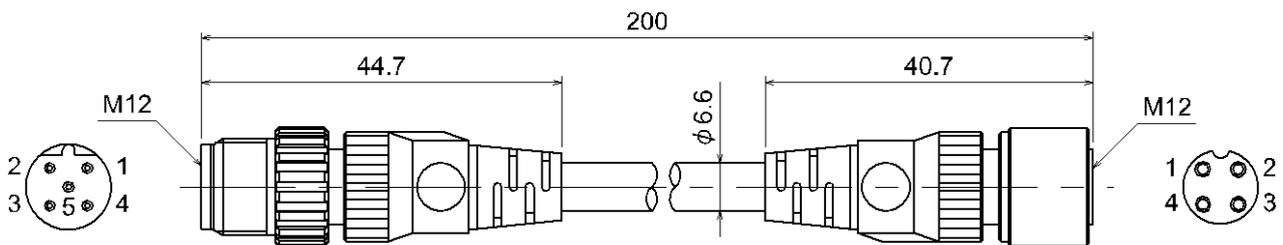
- EX9-AC002-2 (Cable with M12 connector)



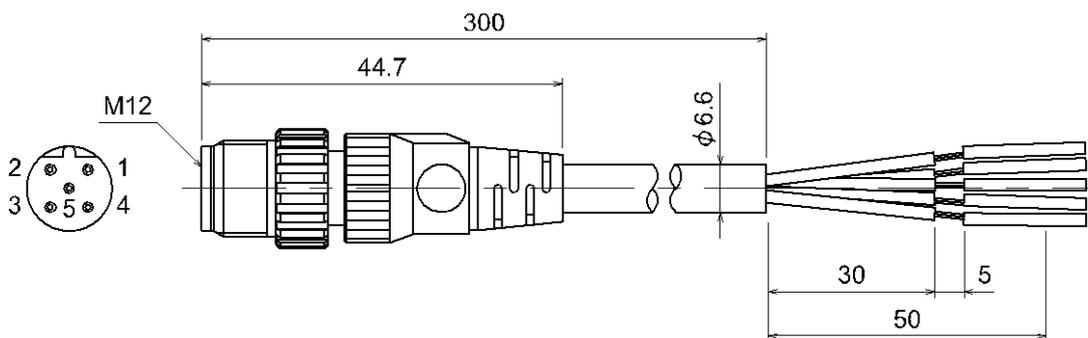
- EX9-AC002-3 (Cable with M12 connector)



- EX9-AC002-4 (Cable with M12 connector)



- EX9-AC003-6 (Cable with M12 connector)



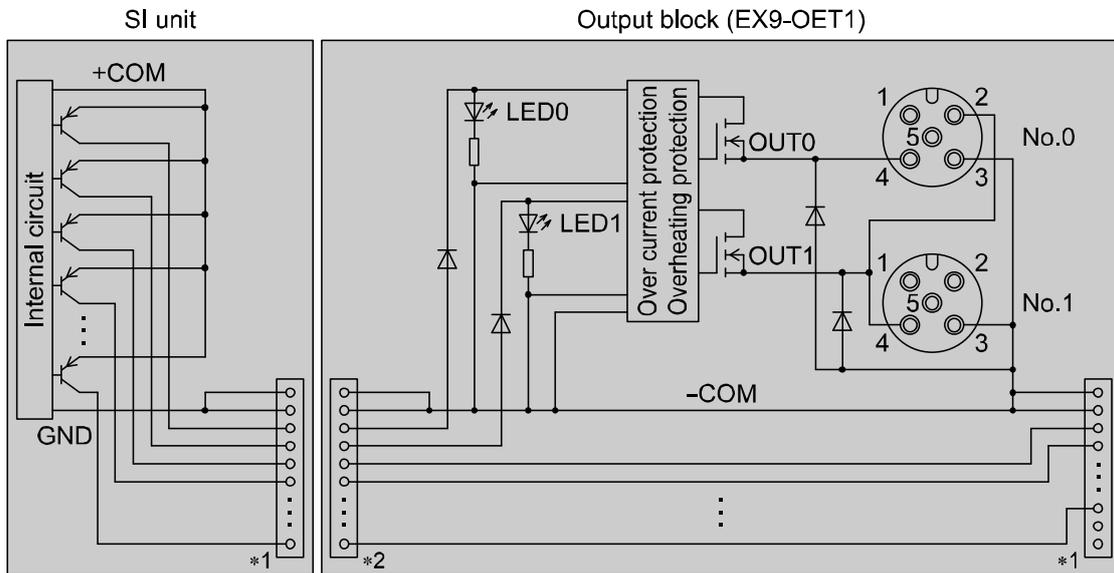
No.	Wire colour: Signal name
1	Brown: Power supply (24 VDC)
2	White: -
3	Blue: Power supply (0 VDC)
4	Black: -
5	Grey: -

Item	Specifications
Cable O.D.	$\phi 6.6$ mm
Conductor nominal cross section	0.3 mm ² /AWG22
Wire D.D. (Including insulator)	1.65 mm
Min. bending radius (Fixed)	40 mm

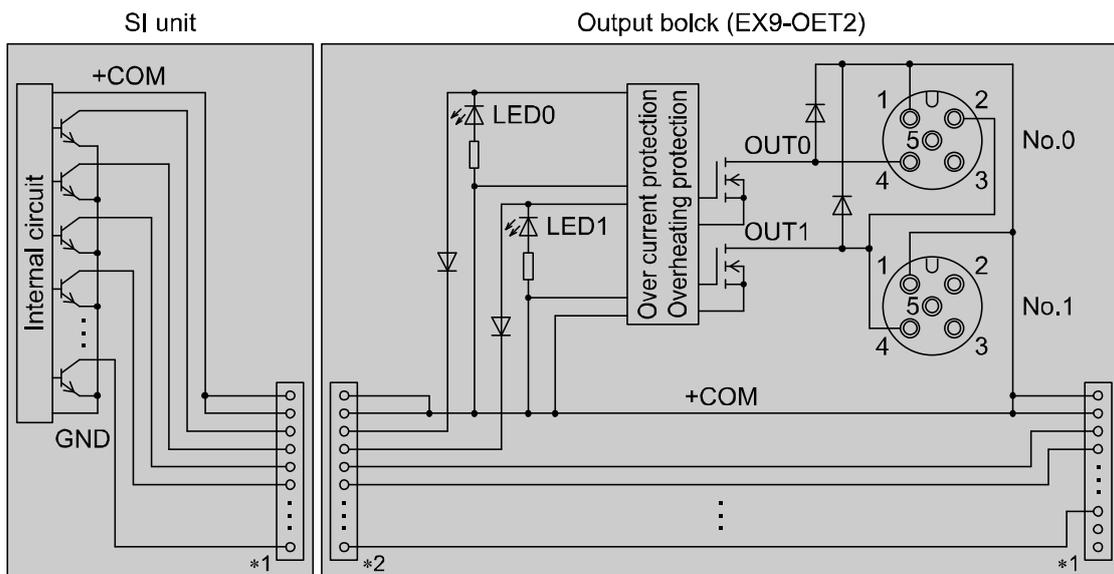
*: Refer to Accessories (page 49) for cables.

Examples of Internal Circuit and Wiring

•EX9-OET1



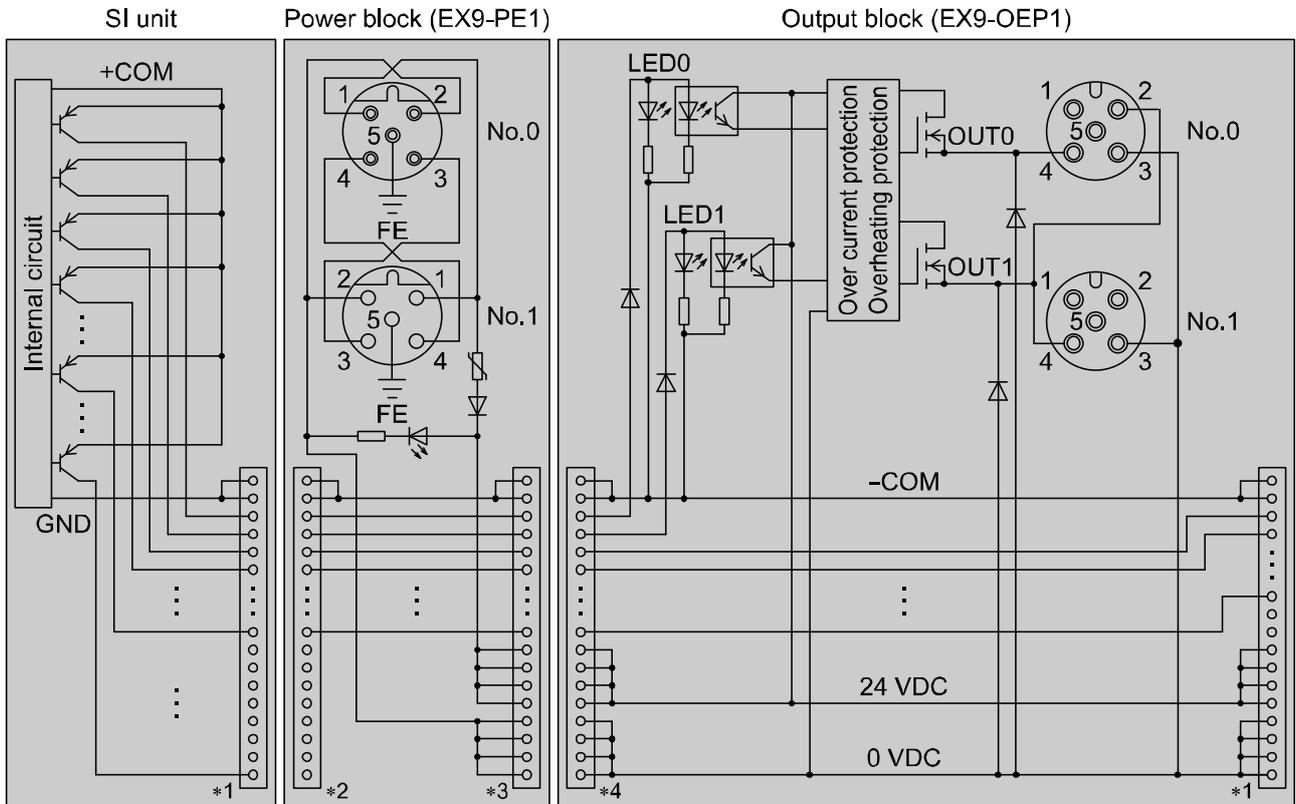
•EX9-OET2



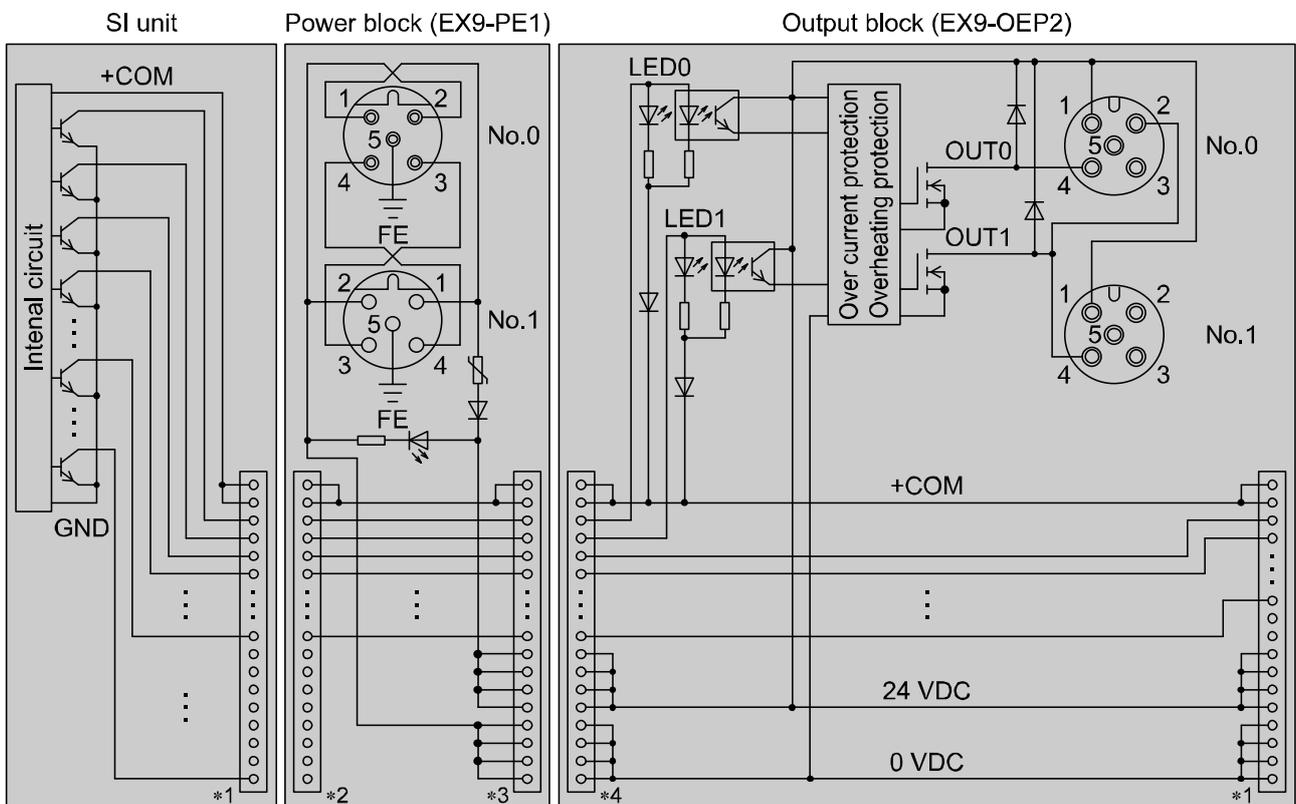
*1: Solenoid valve connector

*2: SI unit connector

•EX9-PE1 + EX9-OEP1



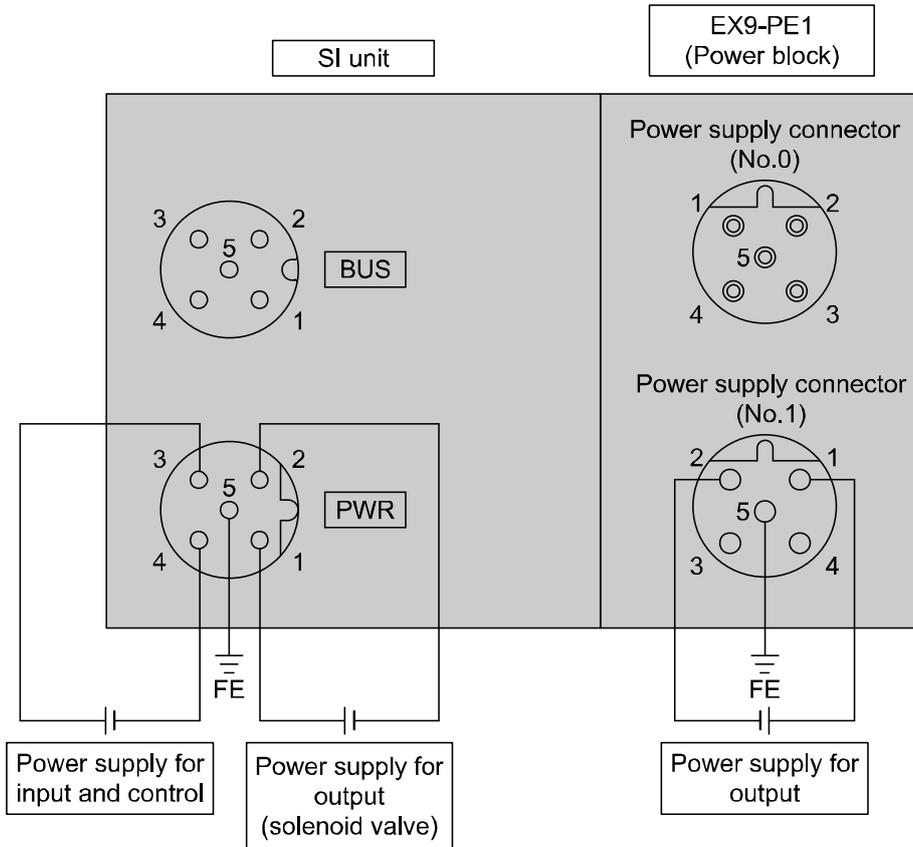
•EX9-PE1 + EX9-OEP2



*1: Solenoid valve connector
*2: SI unit connector

*3: Output block connector
*4: Power block connector

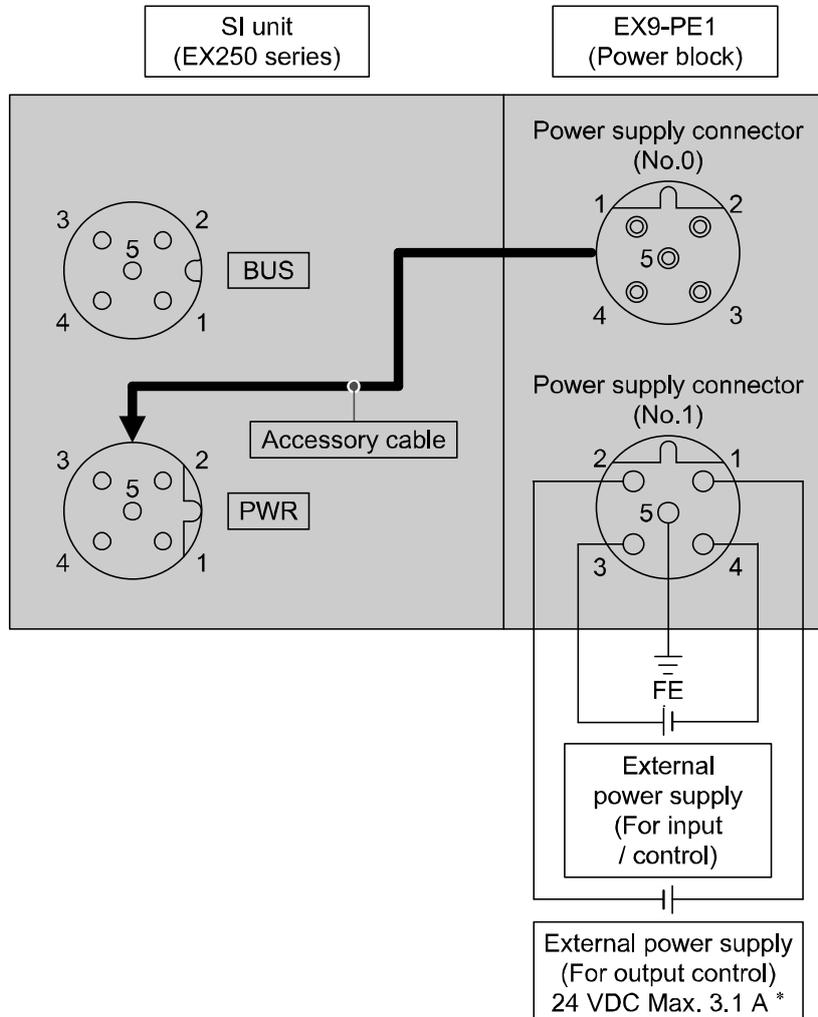
•Separate Power supply for Power block (EX9-PE1) and SI unit



•Connecting the power supply from the Power block (EX9-PE1) to the SI unit.

The Power supply can be connected only when the SI unit (EX250, EX260, EX500-Q □02 series) and Power block are side by side.

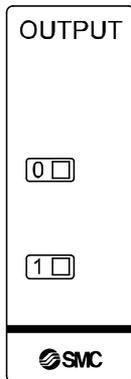
Power supply connector (No.0) and power supply connector (No.1) are connected together internally. Accessory cable (page 49) can be used to connect them.



*: When maximum supply current is 3.0 to 3.1 A, keep the ambient temperature at 40 °C or less and do not bundle the cable.

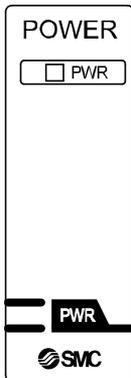
LED Indication

EX9-OET1, EX9-OET2, EX9-OEP1, EX9-OEP2 (Output block)



LED	Display	Content
0	LED is ON	Output (OUT0) is ON
	LED is OFF	Output (OUT0) is OFF
1	LED is ON	Output (OUT1) is ON
	LED is OFF	Output (OUT1) is OFF

EX9-PE1 (Power block)



LED	Display	Content
PWR	LED is ON	Power is supplied from the external power supply
	LED is OFF	Power is not supplied from the external power supply

Maintenance

Precautions for maintenance

- (1) Be sure to switch off the power.
- (2) Check there is no foreign matter inside the product.
- (3) Check there is no damage and no foreign matter stuck to the gasket.
- (4) Be sure to tighten the screws with the specified torque

If the product is not assembled properly, inside PCBs may be damaged or liquid and/or dust may enter into the unit.

Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.

Cleaning method

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.

Do not use solvents such as benzene, thinner etc. to clean each unit.

Inspection item	Content of inspection
Connector / Electric wiring	Connect properly if the connection is loose.
Water resistant cap	Tighten properly if the connection is loose.
Thread for mounting and installation	If the thread is loose, re-tighten it to the specified torque.
Connection cables	If the cable is broken or any other abnormality is confirmed by appearance, replace the cable with a new one.
Supply source voltage	Check if source voltage within the specification range (24 VDC \pm 10%) is supplied.

How to reset the product for power cut or forcible de-energizing

Supply power to the product.

The output status just before the power failure is not maintained when power supply is recovered.

Start operation after confirming safety of the entire equipment.

Troubleshooting

EX9-OET1, EX9-OET2, EX9-OEP1, EX9-OEP2 (Output block)

Error	Countermeasures
LED 0 or LED 1 does not turn ON. LED 0 or LED 1 does not turn OFF.	<ul style="list-style-type: none">•Check mounting condition of connector.•Check type of Output block (PNP/NPN).•Replace operating load and try again.•Replace Output block.•Replace SI unit.

EX9-PE1 (Power block)

Error	Countermeasures
PWR LED does not turn ON.	<ul style="list-style-type: none">•Check external power supply (24 VDC).•Check the operating load capacity.•Replace Power block.

Specification

■ Specifications

Common specifications

Item	Specifications
Ambient temperature	-10 to 50 °C *2
Ambient humidity	35 to 85%RH (No condensate)
Storage temperature	-20 to 60 °C
Withstand voltage	1500 VAC applied 1 minute (Between external terminals and the case)
Insulation resistance	500 VDC 10 MΩ or more (Between external terminals and the case)
Operating environment	No corrosive gas
Enclosure	IP67
Weight	120 g

EX9-OET1, EX9-OET2, EX9-OEP1, EX9-OEP2 (Output block)

Item	Specifications	
	EX9-OET1, EX9-OET2	EX9-OEP1, EX9-OEP2
Number of outputs	2 outputs	
Rated voltage	24 VDC	
Rated load current	Max. 62 mA (1.5 W) / point (When EX126, EX250 or EX260 is used) Max. 42 mA (1.0 W) / point (When EX500-Q□02 or EX500-S103 is used)	Max. 0.5 A (12 W) / point *2
Power supply type	Internal power source type (Supplied from SI unit)	External power source type (Supplied from Power block)
Internal current consumption	20 mA / point	
Output type	EX9-OET1, EX9-OEP1: Source / PNP (negative common) EX9-OET2, EX9-OEP2: Sink / NPN (positive common)	
Insulation type	Optocoupler insulation (SI unit)	Optocoupler insulation (this unit)

*1: Maximum supply current to the Power block is limited to 3.1 A.

EX9-PE1 (Power block)

Item	Specifications
Rated voltage	24 VDC
Supply current	Max. 3.1 A *2
Internal current consumption	20 mA / point
Applicable Output block	EX9-OEP1, EX9-OEP2

*2: When maximum supply current is 3.0 to 3.1 A, keep the ambient temperature at 40 °C or less and do not bundle the cable.

Applicable SI unit *3

Output block	Applicable SI unit
EX9-OET1, EX9-OEP1	EX250-SAS3, EX250-SAS5, EX250-SAS7 *4, EX250-SAS9 *4, EX250-SEN1, EX250-SPR1, EX250-SCA1A, EX250-SDN1 EX260-SDN1, EX260-SDN3, EX260-SMJ1, EX260-SMJ3, EX260-SPR1, EX260-SPR3, EX260-SPR5, EX260-SPR7, EX260-SEN1, EX260-SEN3, EX260-SEC1, EX260-SEC3, EX260-SPL1, EX260-SPL3, EX500-Q102, EX500-S103
EX9-OET2, EX9-OEP2	EX126D-SMJ1 EX250-SMJ2 EX260-SDN2, EX260-SDN4, EX260-SMJ2, EX260-SMJ4, EX260-SPR2, EX260-SPR4, EX260-SPR6, EX260-SPR8, EX260-SEN2, EX260-SEN4, EX260-SEC2, EX260-SEC4 EX500-Q002

*3: If the Output block is added to the EX250 series, it can be connected to the product with manufacturing lot GV (Aug. 2002) or later.

Terminal block plate (VVQC1000-74A-2) which is shipped after March 2004 can be connected to EX126 for adding the Output block. These products and assembly have the body to enable connection with the Output block.

*4: For single power supply system for AS-i, since supply current is limited, it is necessary to calculate the supply current.

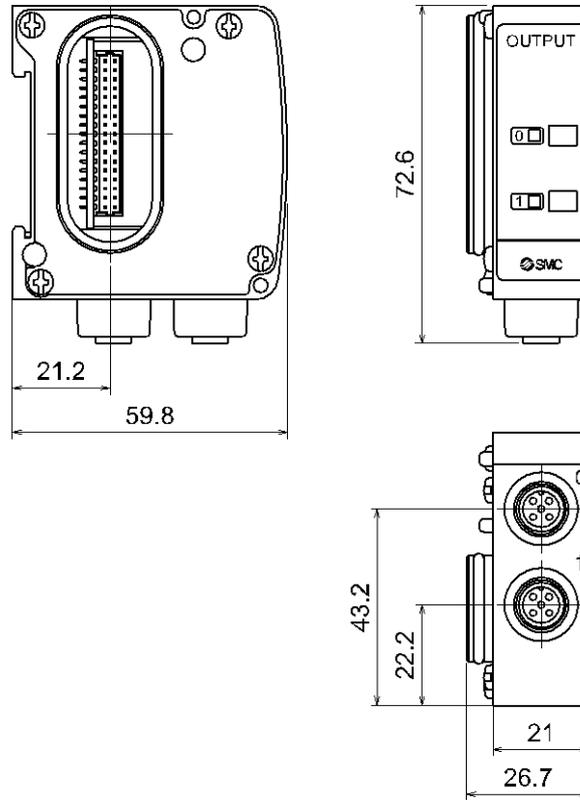
Refer to the section showing calculation of supply current for single power supply system for AS-i.

Applicable solenoid valve series

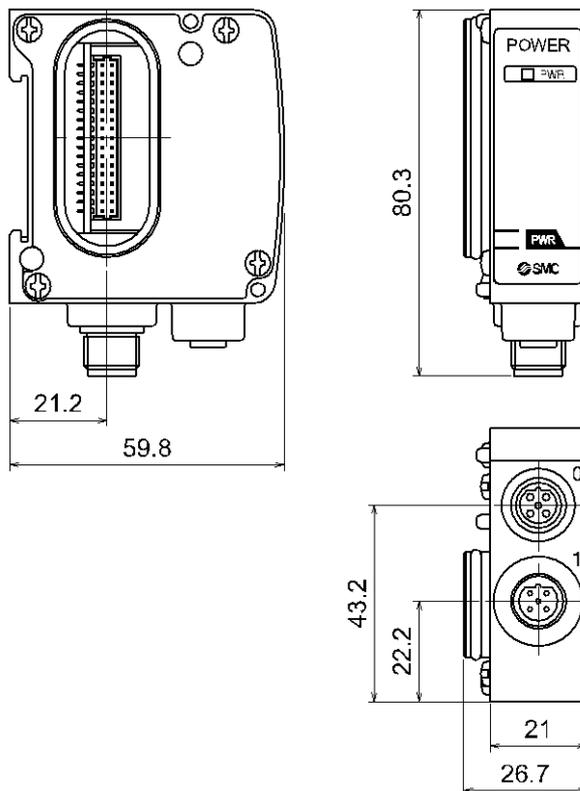
Output block	Applicable solenoid valve series
EX9-OET1, EX9-OEP1 EX9-OET2, EX9-OEP2	•SY3000, SY5000, SY7000 series •VQC1000, VQC2000, VQC4000, VQC5000 series •SV1000, SV2000, SV3000 series (EX500-Q□02 series except) •S0700 series

■ Dimensions

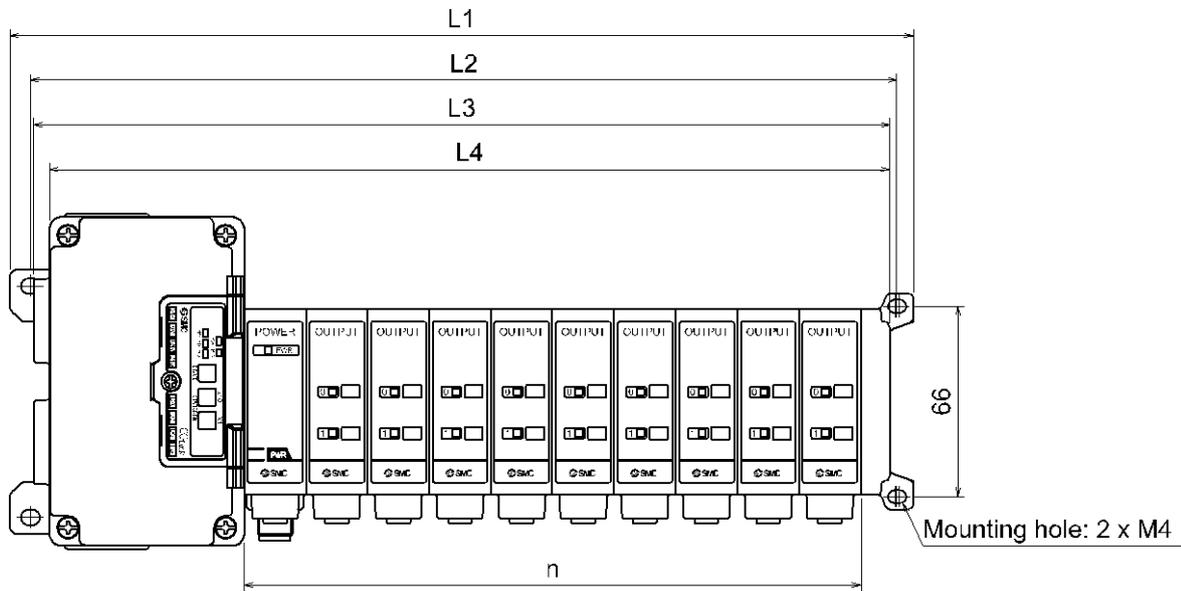
- EX9-OET1, EX9-OET2, EX9-OEP1, EX9-OEP2 (Output block)



- EX9-PE1 (Power block)



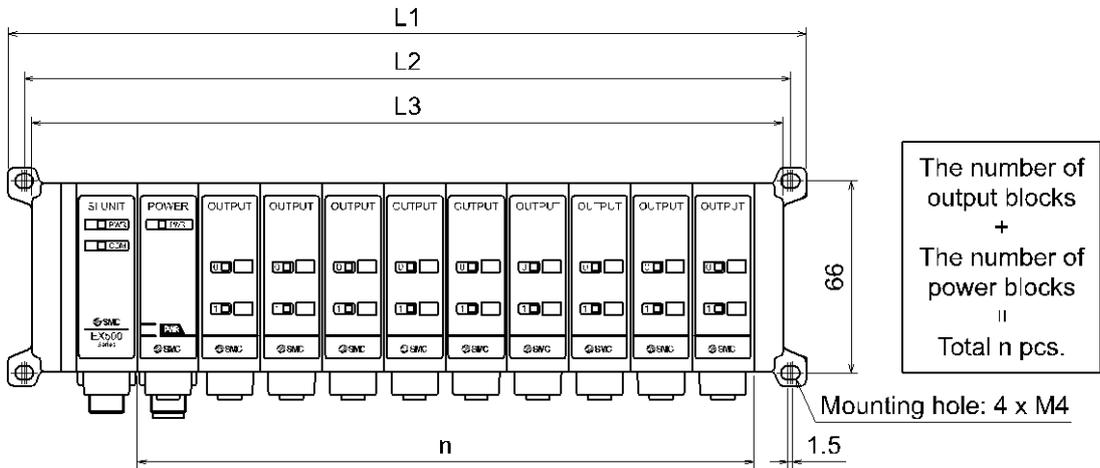
•Dimensions when EX126D-SMJ1 is used



L dimensions

n	1	2	3	4	5	6	7	8	9	10
L1 [mm]	127.8	148.8	169.8	190.8	211.8	232.8	253.8	274.8	295.8	316.8
L2 [mm]	115.2	136.2	157.2	178.2	199.2	220.2	241.2	262.2	283.2	304.2
L3 [mm]	111.7	132.7	153.7	174.7	195.7	216.7	237.7	258.7	279.7	300.7
L4 [mm]	106.8	127.8	148.8	169.8	190.8	211.8	232.8	253.8	274.8	295.8

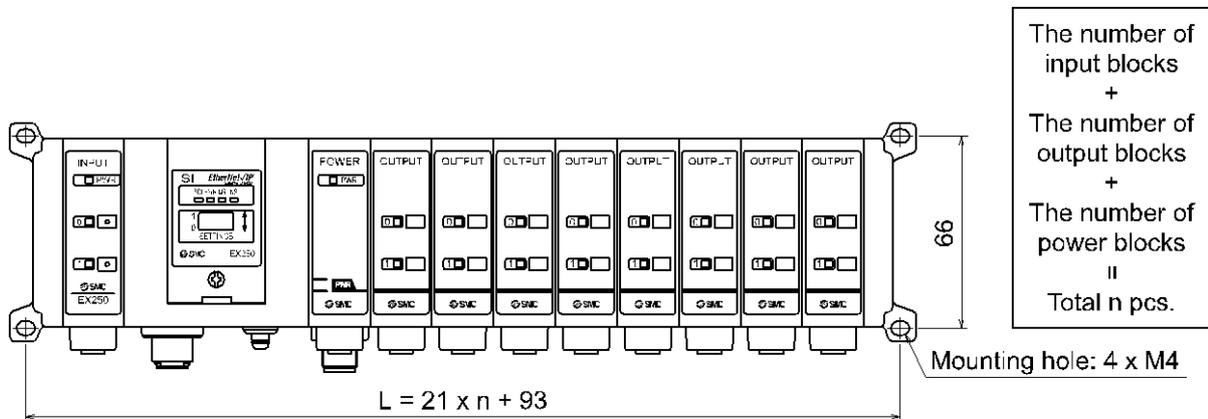
•Dimensions when EX500-Q□02 is used



L dimensions

n	1	2	3	4	5	6	7	8	9	10
L1 [mm]	83	104	125	146	167	188	209	230	251	272
L2 [mm]	72	93	114	135	156	177	198	219	240	261
L3 [mm]	67	88	109	130	151	172	193	214	235	256

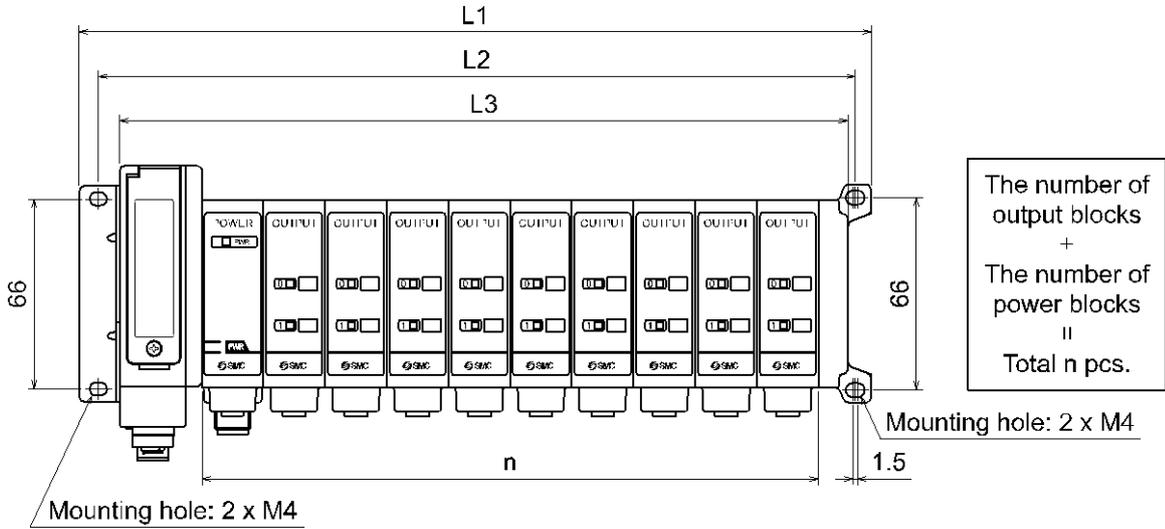
•Dimensions when EX250 is used



n	1	2	3	4	5	6	7	8	9	10
L	114	135	156	177	198	219	240	261	282	303

*: Each dimension shows the unit without solenoid valves connected and with an end plate R (on the Output block side) connected. Standard settings of L dimensions are with 10 or less n blocks. Ask SMC sales for the setting with over 10 blocks mounted. Refer to the individual specifications for the dimensions when the solenoid valves are connected.

•Dimensions when EX260 or EX500-S103 is used



L dimensions

n	1	2	3	4	5	6	7	8	9	10
L1 [mm]	81.2	102.2	123.2	144.2	165.2	186.2	207.2	228.2	249.2	270.2
L2 [mm]	69.2	90.2	111.2	132.2	153.2	174.2	195.2	216.2	237.2	258.2
L3 [mm]	59.2	80.2	101.2	122.2	143.2	164.2	185.2	206.2	227.2	248.2

Accessories

(1)Cables

How to order

EX9 - AC 010 - 1
 Cable with M12 connector

Cable type

Symbol	Cable type	Connected object		Cable part No.
		Connected from	Connected to	
1	Power supply cable for Power block and SI unit (DeviceNet™, CC-Link, CANopen)	EX9-PE1 EX250-SDN1 EX250-SMJ2 EX250-SCA1A EX260-SMJ□ EX500-S103	24 VDC power supply	EX9-AC□-1
2	To connect the Power block and SI unit (DeviceNet™, CC-Link, CANopen)	EX9-PE1	EX250-SDN1 EX250-SMJ2 EX250-SCA1A EX260-SMJ□	EX9-AC002-2
3	To connect the Power block and SI unit (PROFIBUS DP, PROFINET, EtherNet/IP™, EtherCAT, Ethernet POWERLINK)	EX9-PE1	EX250-SEN1 EX250-SPR1 EX260-SPR□ EX260-SPN□ EX260-SEC□ EX260-SPL□	EX9-AC002-3
4	To connect the Power block and SI unit (AS-i)	EX9-PE1	EX250-SAS3 EX250-SAS5	EX9-AC002-4
5	AS-i power supply	EX9-PE1	AS-i power supply cable	EX9-AC□-5
6	To connect the Power block and SI unit (CC-Link)	EX9-PE1	EX126D-SMJ1	EX9-AC003-6
7	To connect the Output block and specified load	EX9-OET□ EX9-OEP□	Output device	EX9-AC□-7

Cable length

Symbol	Length	Applicable cable part No.						
		EX9-AC□-1	EX9-AC002-2	EX9-AC002-3	EX9-AC002-4	EX9-AC□-5	EX9-AC003-6	EX9-AC□-7
002	0.2 m	-	○	○	○	-	-	-
003	0.3 m	-	-	-	-	-	○	-
010	1.0 m	○	-	-	-	○	-	○
030	3.0 m	○	-	-	-	○	-	○
050	5.0 m	○	-	-	-	○	-	-

○: Applicable
 -: Inapplicable

*1: This cable is a bypass cable used for the layout where the Power block is located to the right of the SI unit.

*2: The cable and the Power block allow the current up to 3.1 A.

When maximum supply current is 3.0 to 3.1 A, keep the ambient temperature at 40 °C or less and do not bundle the cable.

Before using the Power block power supply connector (No.0), make sure that the conditions below are satisfied.

Total Output block current consumption (20 mA / point) + Total output load current consumption + Total valve manifold current consumption = 3.1 A.

If a current of more than 3.1 A can not be avoided, supply the power to the Power block and SI unit (solenoid valve manifold) by separate cables.

*3: Cannot be used for EX260-SDN□ as the cable wiring method is different.

*4: Cannot be used for or EX260-SEN□ as the cable wiring method is different.

How to order

PCA - 140180 7

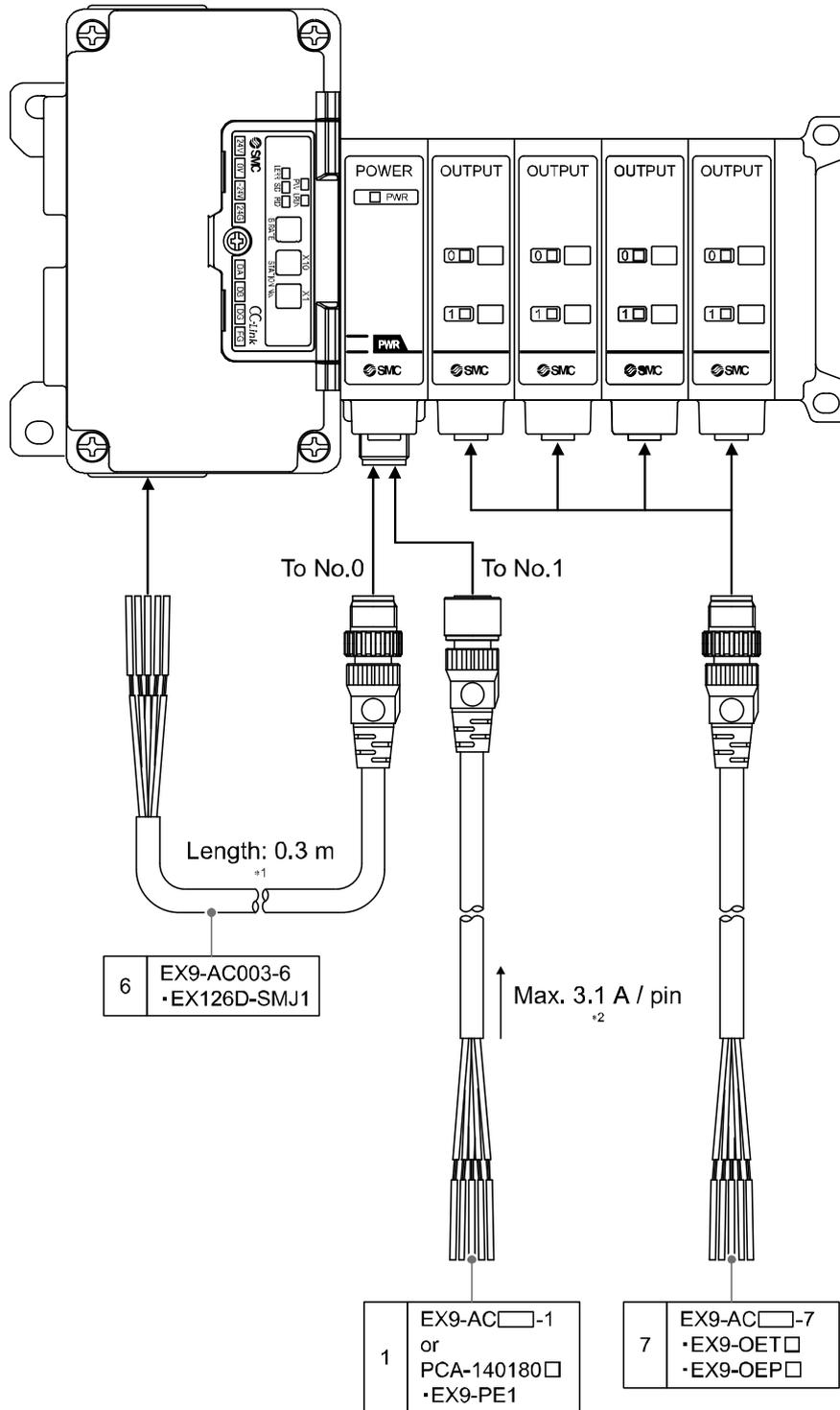
Cable length

Symbol	Length
7	1.5 m
8	3.0 m
9	5.0 m

Cable type

Symbol	Content
140180	Cable with M12 connector Power cable for Power block and SI unit

•Wiring example (EX126)



*1: This cable is a bypass cable used for the layout where the Power block is located to the right of the SI unit.

*2: The cable and the Power block allow the current up to 3.1 A.

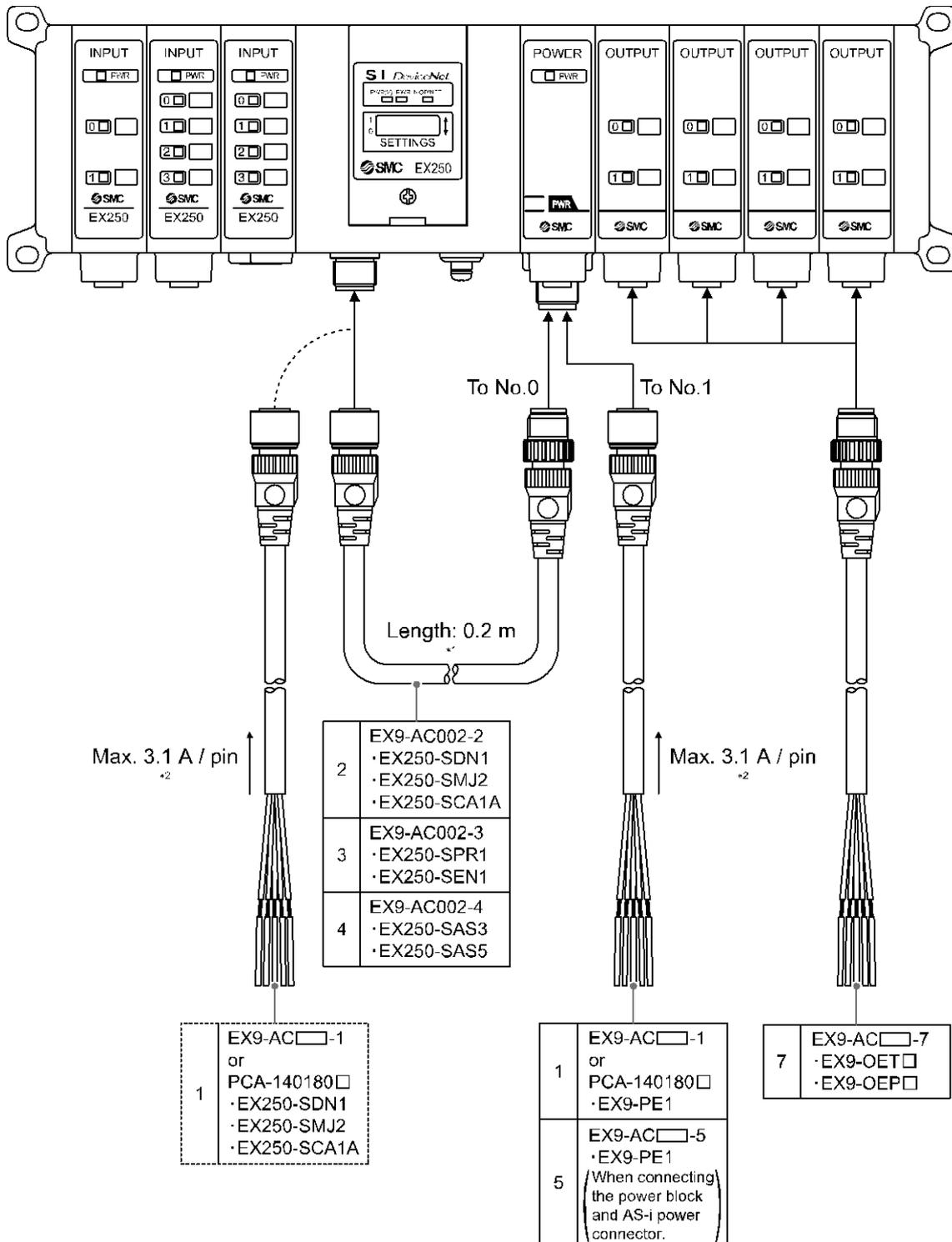
When maximum supply current is 3.0 to 3.1 A, keep the ambient temperature at 40 °C or less and do not bundle the cable.

Before using the Power block power supply connector (No.0), make sure that the inequality below is satisfied.

Total Output block current consumption (20 mA / point) + Total output load current consumption + Total valve manifold current consumption = 3.1 A.

If a current of more than 3.1 A can not be avoided, supply the power to the Power block and SI unit (solenoid valve manifold) by separate cables.

•Wiring example of EX250 and EX500-Q□02 (Drawing shows the EX250)



*1: This cable is a bypass cable used for the layout where the Power block is located to the right of the SI unit.

*2: The cable and the Power block allow the current up to 3.1 A.

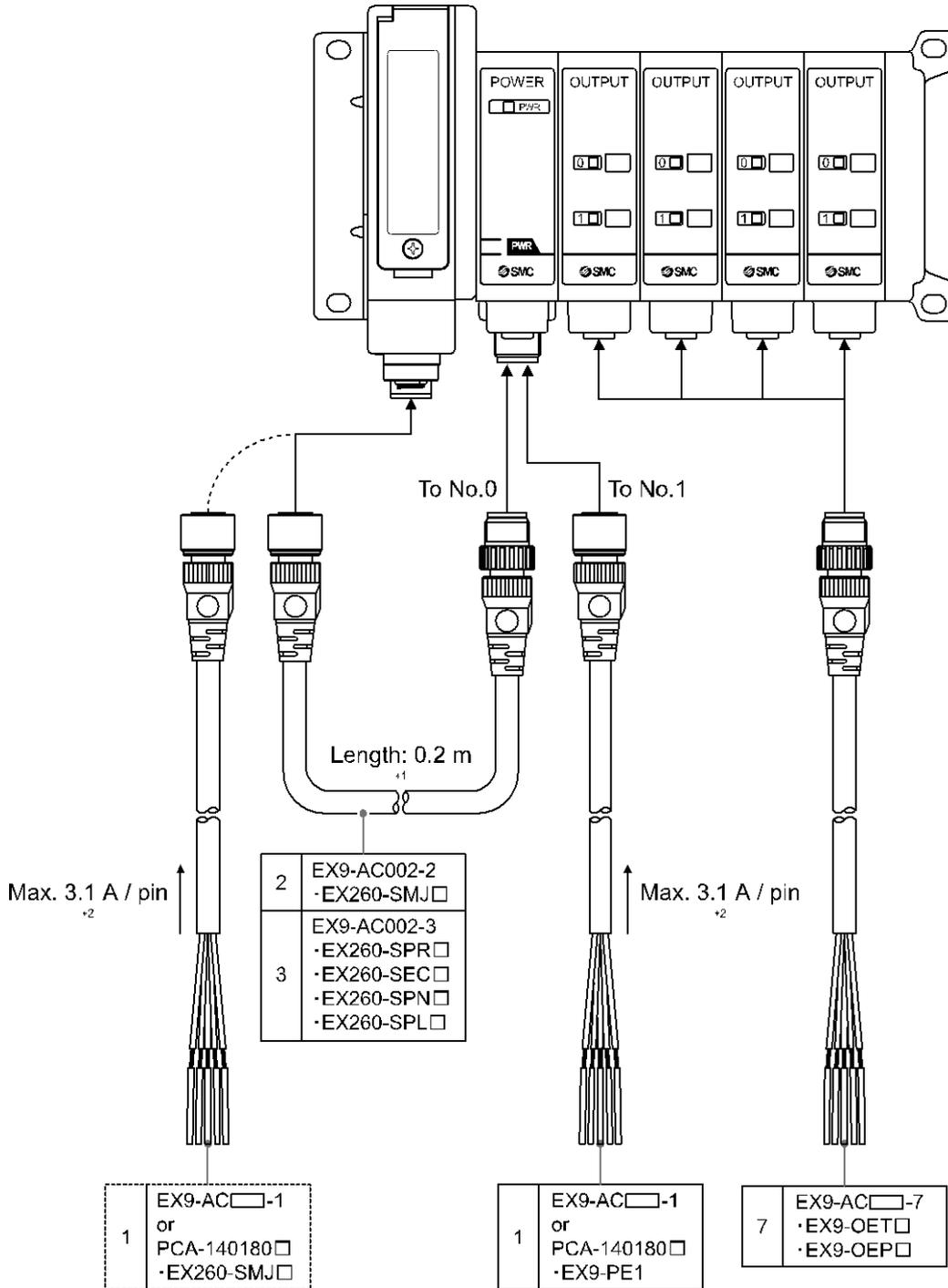
When maximum supply current is 3.0 to 3.1 A, keep the ambient temperature at 40 °C or less and do not bundle the cable.

Before using the Power block power supply connector (No.0), make sure that the inequality below is satisfied.

Total Output block current consumption (20 mA / point) + Total output load current consumption + Total valve manifold current consumption = 3.1 A.

If a current of more than 3.1 A can not be avoided, supply the power to the Power block and SI unit (solenoid valve manifold) by separate cables.

•Wiring example (EX260)



*1: This cable is a bypass cable used for the layout where the Power block is located to the right of the SI unit.

*2: The cable and the Power block allow the current up to 3.1 A.

When maximum supply current is 3.0 to 3.1 A, keep the ambient temperature at 40 °C or less and do not bundle the cable.

Before using the Power block power supply connector (No.0), make sure that the inequality below is satisfied.

Total Output block current consumption (20 mA / point) + Total output load current consumption + Total valve manifold current consumption = 3.1 A.

If a current of more than 3.1 A can not be avoided, supply the power to the Power block and SI unit (solenoid valve manifold) by separate cables.

(2) EX500 series for use with Output block

Details of EX500 series suitable for use with the Output block.

*: Only VQC series solenoid valve is applicable.

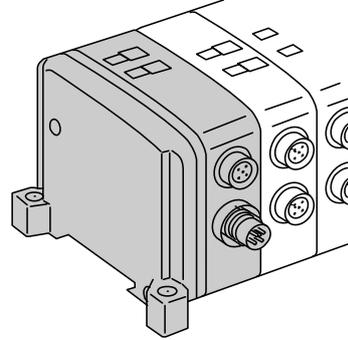
How to order

EX500 - Q 0 0 2

With end plate
SI unit output polarity

Symbol	Content
0	Sink / NPN (positive common)
1	Source / PNP (negative common)

SI unit for connection VQC



(3) End plate (Input side)

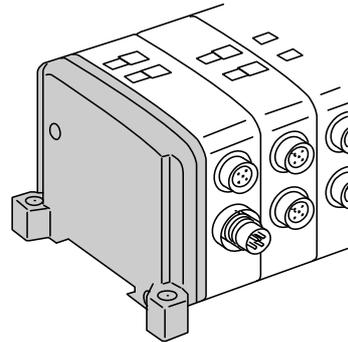
How to order

EX250 - EA 1

Type

Symbol	Content
1	Input side end plate
2	Input side end plate (with DIN rail mounting bracket)

End plate



(4) End plate R (Output side)

Details of the end plate required when used without solenoid valves.

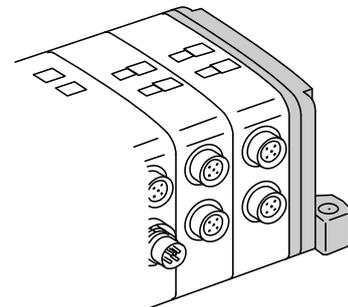
How to order

EX9 - EA 03

Type

Symbol	Content
03	Output side end plate
04	Output side end plate (with DIN rail mounting bracket)

End plate R



(5) Bracket plate for mounting EX260 series Output block and DIN rail mounting bracket
Mounting bracket to fix the Output block to the EX260 series.

How to order

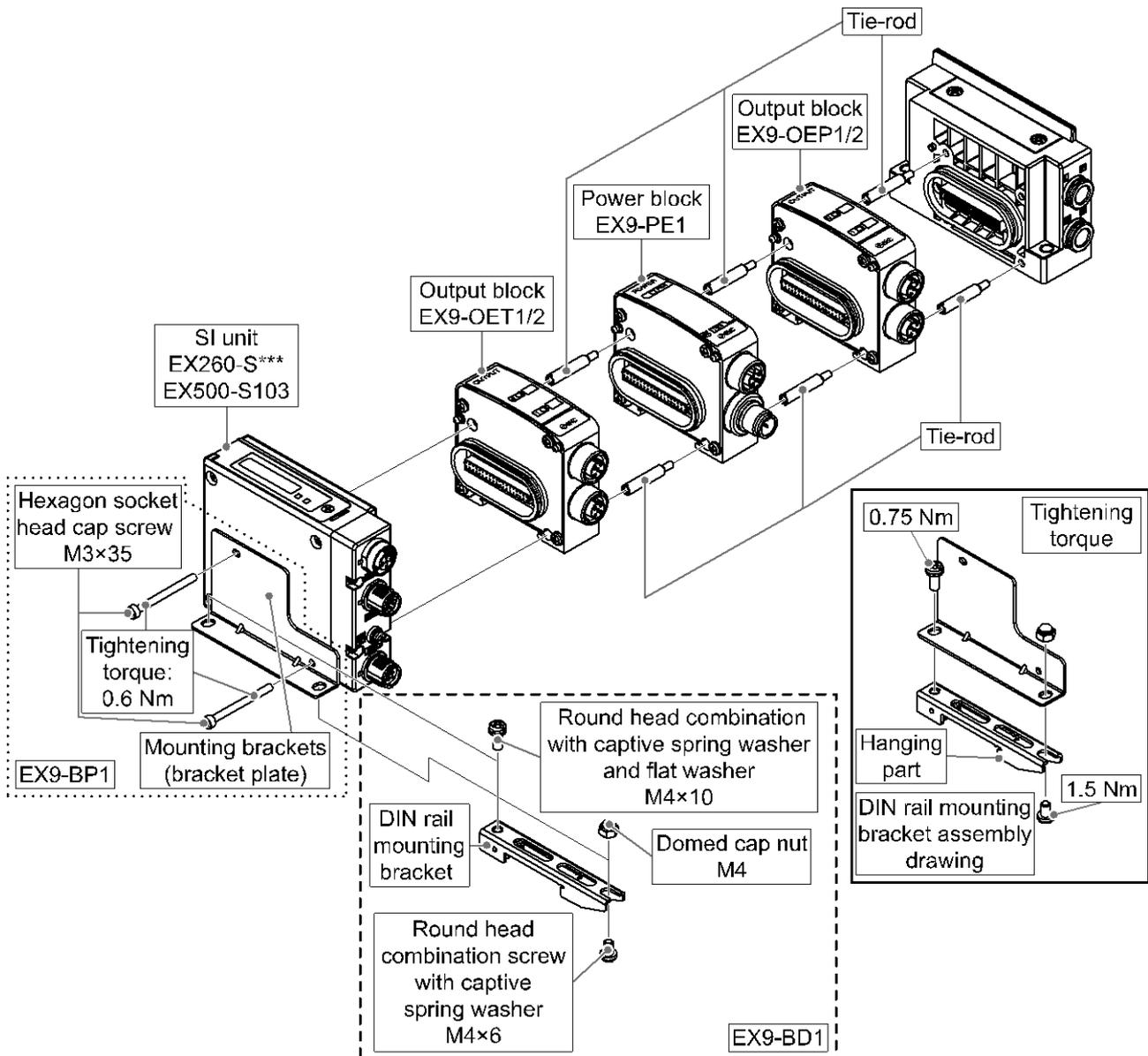
EX9 - BP1

└ Type

Symbol	Content
BP1	Bracket plate
BD1	DIN rail mounting bracket

How to increase the output block (power block)

1. Loosen the hexagon socket head cap screws (M3 x 30:2 locations) which are fixing the SI unit.
2. Separate the SI unit to valve manifold.
3. Add and increase the attached tie-rod (2 pcs. per block) to the increased block respectively and pass through a block by the tie-rod.
4. Fix the mounting brackets (bracket plate) by the attachment hexagon socket head cap screw (M3 x 35:2 locations), paying attention to avoid the gap between each block. (0.6 Nm)



Installation to the DIN rail

When mounting the SI unit and output blocks on the DIN rail, mount the DIN rail mounting bracket on the bracket plate, and mount it on the DIN rail. Refer to the assembly drawing. At this operation, align the direction of the tab with that of the mounting bracket on the valve manifold. The manifold is extended by 21 mm per one station of the output block (power block) and 42.2 mm (SI unit 28.2 mm, bracket plate 14 mm), so please prepare a DIN rail taking into account the amount extended.

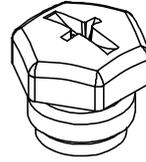
(6)Water resistant cap

Mount the water resistant cap in the unused ports of the Power block or Output block,
(water resistant cap are delivered together with each unit as accessories).

How to order

EX9 - AW ES

└─ For M12 socket / 10 pcs.
└─ Water resistant cap



Note

Be sure to fit a water resistant cap on any unused connectors.

Proper use of the water resistant cap enables the enclosure to satisfy IP67 specification.

(Tightening torque for M12: 0.1 Nm)

Revision
A: Change template.
B: Contents revised in several places. [October 2018]
C: Revision. [February 2019]

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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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