


EX モジュール
ハードウェアマニュアル

EX Modules
Hardware Manual



Thank you for purchasing the EX Module (hereafter referred to as the “this unit”) for the Pro-face’s LT3000 Series. This unit is intended for use with expansion I/O module designed for the LT3000 Series Graphical Logic Controller unit (hereby referred to as “LT”) or with Remote I/O unit (GP3000 Series CANopen board type).
Before actually beginning to use this product, please be sure to read through this manual and other related manuals to fully understand all the settings and functions.

NOTICE

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1. Essential Safety Precautions

DANGER

- An emergency stop circuit and an interlock circuit should be constructed outside of this unit. Constructing these circuits inside this unit may cause a runaway situation, system failure, or an accident due to unit failure.
- Systems using this unit should be designed so that output signals which could cause a serious accident are monitored from outside the unit.
- This unit is designed to be a general-purpose device for general industries, and is neither designed nor produced to be used with equipment or systems in potentially life-threatening conditions. If you are considering using this unit for special uses, including nuclear power control devices, electric power devices, aerospace equipment, medical life support equipment, or transportation vehicles, please contact your local distributor.

WARNING

- Whenever installing, dismantling, wiring, and conducting maintenance or inspections, be sure to disconnect power to this unit to prevent the possibility of electric shock or fire.
- Do not disassemble or remodel this unit, since it may lead to an electric shock or fire.
- Do not use this unit in an environment that contains flammable gases since an explosion may occur.
- Do not use this unit in an environment that is not specified in the manuals. Otherwise, an electric shock, fire, malfunction or other failure may occur.
- Because of the possibility of an electric shock or malfunction, do not touch any power terminals while the unit is operating.

CAUTION

- Communication cables or I/O signal lines must be wired separately from the main circuit (high-voltage, large-current) line, high-frequency lines such as inverter lines, and the power line. Otherwise, a malfunction may occur due to noise.
- This unit must be properly installed according to directions in the manuals. Improper installation may cause the unit to malfunction, or fail.
- This unit must be properly wired according to directions in the manuals. Improper wiring may cause a malfunction, failure or electric shock.
- Do not allow foreign substances, including chips, wire pieces, water, or liquids to enter inside this unit's case. Otherwise, a malfunction, failure, electric shock, or fire may occur.
- When the product is disposed of, it should be disposed of in a manner appropriate to, and in accordance with, the user country's industrial machinery disposal/recycling standards.

■ To Avoid Damage

- Avoid storing or operating this unit in either direct sunlight or excessively dusty or dirty environments.
- Because this unit is a precision instrument, do not store or use it in locations where excessive shocks or vibration may occur.
- Avoid covering this unit's ventilation holes, or operating it in an environment that may cause it to overheat.
- Avoid operating this unit in locations where sudden temperature changes can cause condensation to form inside the unit.
- Do not use paint thinner or organic solvents to clean this unit.

■ About the Relay Output Inductive Load

◆ Protecting Outputs from Inductive Load Damage

Depending on the load, a protection circuit may be needed for the outputs on the controllers and certain modules. Inductive loads using DC voltages may create voltage reflections resulting in overshoot that will damage or shorten the life of output devices.

CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

- Use an appropriate external protective circuit or device to reduce the risk of inductive direct current load damage.

Failure to follow these instructions can result in injury or equipment damage.

Relay outputs can support up to 240 Vac. Inductive damage to these types of outputs can result in welded contacts and loss of control. Each inductive load must be equipped with a protection device such as a peak limiter, RC circuit or flyback diode. Capacitive loads are not supported by these relays.

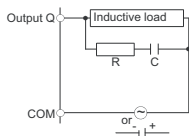
WARNING

RELAY OUTPUTS WELDED CLOSED

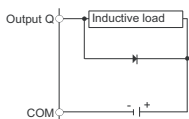
- Always protect relay outputs from inductive alternating current load damage using an appropriate external protective circuit or device.
- Do not connect relay outputs to capacitive loads.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Protective circuit A: this protection circuit can be used for both AC and DC load power circuits.



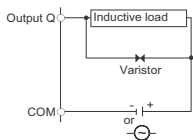
Protective circuit B: this protection circuit can be used for DC load power circuits.



Use a diode with the following ratings:

- Reverse withstand voltage: power voltage of the load circuit x 10.
- Forward current: more than the load current.

Protective circuit C: this protection circuit can be used for both AC and DC load power circuits.



NOTE

- The above schematics show sinking DC outputs, but would apply equally to source outputs.

2. Package Contents

- (1) Inquiry/UL/c-UL Approval (1)
- (2) EX Module Unit (1)
- (3) Terminal Connector

A connector for EX modules except EXM-DDO16UK/EXM-DDO16TK/EXM-DMM24DRF.

For the details about number of pieces and pins, please see I/O Specifications of each module. (Chapter 15)



- (4) Terminal Block (nonremoval) (2)
(EXM-DMM24DRF)
- (5) Power Supply Screw Terminal Block (1)
(EXM-ARI8LT)

*MIL Connector is not packed with EX Module Unit.
(EXM-DDO16UK/EXM-DDO16TK)

This unit has been carefully packed, with special attention to quality. However, should you find anything damaged or missing, please contact your Pro-face local distributor immediately.

3. Supported Models and Software

■ Supported models

- LT3000 Series
- Hybrid Terminal Block (HTB)*1

*1 Hybrid Terminal Block (HTB)-compatible and CANopen-compatible connectors and cables are necessary for the connection to the GP3000 Series CANopen board type. For details, refer to the GP3000 Series Hardware Manual and the Hybrid Terminal Block Hardware Manual.

■ Supported Software Version, GP-Pro EX

An LT/GP with a project file, see table for lowest version, should be used. (Version of transfer tool should be identical.)

| | LT3000 Series | | GP3000 Series CANopen board type connecting HTB |
|-----------------------------------------------------------|----------------|----------------|-------------------------------------------------------|
| | LT-3200 Series | LT-3300 Series | |
| EXM-DMM24DRF | Ver.2.6 | Ver.2.6 | Ver.2.61 |
| EXM-AMI4LT | | | |
| EXM-ARI8LT | | | |
| EXM-AVO2HT | | | |
| EXM-AMM6HT | | | |
| EX Module (Except for the five models listed above) | Ver.2.0 | Ver.2.1 | Ver.2.1 |

4. EX Modules Model Names

■ Standard Input Module

| Product Name | Model No. | Description |
|--------------------------------------|-------------|-------------------------------------------------------------------------------|
| EX Module (8-point input module) | EXM-DDI8DT | 8-point sink/source shared I/O Unit. 24VDC input signal can be connected. |
| EX Module (16-point input module) | EXM-DDI16DT | 16-point sink/source shared I/O Unit. 24VDC input signal can be connected. |

■ Standard Output Module

| Product Name | Model No. | Description |
|----------------------------------------------|-------------|-----------------------------------------------|
| EX Module (8-point relay-output module) | EXM-DRA8RT | 8-point relay output/2 common type I/O Unit. |
| EX Module (16-point relay-output module) | EXM-DRA16RT | 16-point relay output/2 common type I/O Unit. |
| EX Module (8-point sink-output module) | EXM-DDO8UT | 8-point transistor output sink I/O Unit. |
| EX Module (8-point source-output module) | EXM-DDO8TT | 8-point transistor output source I/O Unit. |
| EX Module (16-point sink-output module) | EXM-DDO16UK | 16-point transistor output sink I/O Unit. |
| EX Module (16-point source-output module) | EXM-DDO16TK | 16-point transistor output source I/O Unit. |

■ Standard I/O Module

| Product Name | Model No. | Description |
|---------------------------------------------------------|--------------|-------------------------------------------------------------------------|
| EX Module (4-point inputs/4-point relay-output module) | EXM-DMM8DRT | 4-point input sink-source/4-point relay-output/1 common type I/O Unit. |
| EX module (16-point inputs/8-point relay-output module) | EXM-DMM24DRF | 16-point input sink-source/8-point relay-output/1 common type I/O Unit. |

■ Analog Input Module

| Product Name | Model No. | Description |
|----------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------|
| EX Module (2-ch analog-input module) | EXM-AMI2HT | 2-ch analog Input Unit. (Voltage DC0 to 10V / Current DC4 to 20mA) |
| EX module (4-ch Analog input / Temperature input module) | EXM-AMI4LT | 4-ch temperature Input Unit. (Voltage DC0 to 10V / Current DC0 to 20mA) Pt100/Pt1000/Ni100/Ni1000 |
| EX module (8-ch Pt100/Pt1000 input module) | EXM-ARI8LT | 8-ch temperature Input Unit. Pt100/Pt1000 |

■ Analog Output Module

| Product Name | Model No. | Description |
|------------------------------------------|------------|------------------------------------------------------------------------|
| EX Module (1-ch analog-output module) | EXM-AMO1HT | 1-ch analog Output Unit. (Voltage DC0 to 10V / Current DC4 to 20mA) |
| EX module (2-ch analog-output module) | EXM-AVO2HT | 2-ch analog Output Unit. (Voltage DC-10 to +10V) |

■ Analog I/O Module

| Product Name | Model No. | Description |
|----------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------|
| EX Module (Thermocouple Pt100 input/1-ch analog-output module) | EXM-ALM3LT | 2-ch temperature Input/1-ch analog Output Unit. Pt100 Input (Voltage Output DC0 to 10V / Current Output DC4 to 20mA) |
| EX Module (2-ch analog-input/1-ch analog-output module) | EXM-AMM3HT | 2-ch analog Input/1-ch analog Output Unit. (Voltage I/O DC0 to 10V / Current I/O DC4 to 20mA) |
| EX module (4-ch analog-input/2-ch analog-output module) | EXM-AMM6HT | 4-ch analog Input/2-ch analog Output Unit. (Voltage I/O DC0 to 10V / Current I/O DC4 to 20mA) |

5. About the Manual

For detailed information on this unit for the LT3000 and other series, refer to Pro-face's PDF manuals such as follows:

- LT3000 Series Hardware Manual
- GP3000 Series Hardware Manual
- GP-Pro EX Reference Manual
"Controlling External I/O"
- Maintenance/Troubleshooting

The manuals can be selected from the help menu of GP-Pro EX or downloaded from Pro-face website.

URL

<http://www.pro-face.com/otasuke/>

6. Inquiry

Do you have any questions about difficulties with this product?

Please access Pro-face website anytime that you need help with a solution.

<http://www.pro-face.com/otasuke/>

7. Installation prerequisites for standards

The following unit is UL/c-UL listed product: (UL File No. E210412)

| | |
|-------------|--------------|
| EXM-DDI8DT | EXM-DDO16TK |
| EXM-DDI16DT | EXM-DMM8DRT |
| EXM-DRA8RT | EXM-DMM24DRF |
| EXM-DRA16RT | EXM-AMI2HT |
| EXM-DDO8UT | EXM-AMO1HT |
| EXM-DDO8TT | EXM-ALM3LT |
| EXM-DDO16UK | EXM-AMM3HT |

The following unit is UL/CSA listed product: (UL File No. E210412, CSA File No.258181)

| | |
|------------|------------|
| EXM-AMI4LT | EXM-ARI8LT |
| EXM-AVO2HT | |

The following unit is UL/c-UL/CSA listed product: (UL File No. E210412, CSA File No.258181)

| |
|------------|
| EXM-AMM6HT |
|------------|

This product conforms to the following standards:

- UL508

Industrial Control Equipment

- ANSI/ISA 12.12.01

Nonincendive Electrical Equipment for Use in Class I, Division 2 Hazardous (Classified) Locations

- CSA-C22.2 No.142-M1987 (c-UL or CSA Approval)

Standard for Process Control Equipment

- CSA-C22.2 No.213-M1987 (c-UL or CSA Approval)

Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations

Hazardous Locations - Compliance and Handling Cautions

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.

Warning - Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.

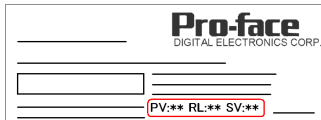
Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

8. CE Marking

This unit is CE marked product that conforms to EMC directives, EN55011 Class A and EN61131-2.

9. Revision

The revision is printed on the attached nameplate.

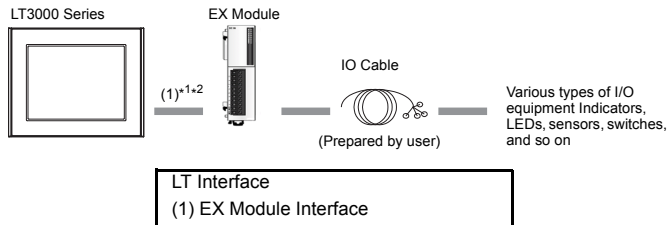


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11. System Design

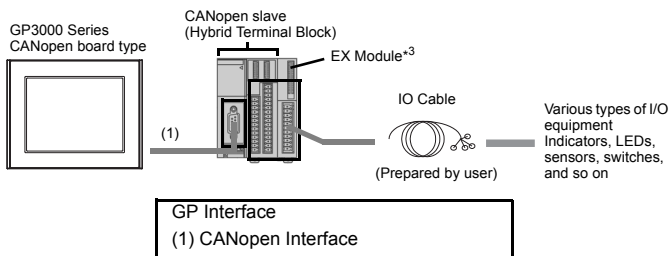
■ When using the LT3000 Series



*1 Up to two EX modules can be connected to the rear side of the LT-3200 series.
Up to three EX modules can be connected to the rear side of the LT-3300 series.

*2 As for EXM-DMM24DRF and EXM-ARI8LT, only one EX module can be connected to an LT.

■ When using the GP3000 Series CANopen board type



*3 Up to seven EX modules can be connected next to the Hybrid Terminal Block (HTB).

12. Accessories

12.1 Option Items

| | Product Name | Model No. | Description |
|-------------------|-------------------------------------------|-------------------|-------------------------------------------------------------------|
| Option Items | MIL Connector (20 pin) for EX Module | CA6-EXMCNHE20P-01 | 20 pin connector (MIL connector) only for EX module (a set of 5) |
| Maintenance Items | Terminal Connector (10 pin) for EX Module | CA6-EXMCNRS10P-01 | 10 pin connector (terminal block) only for EX module (a set of 5) |
| | Terminal Connector (11 pin) for EX Module | CA6-EXMCNRS11P-01 | 11 pin connector (terminal block) only for EX module (a set of 5) |
| | EX Module Securing Hook | CA7-FIXEXM-01 | Hook for securing three EX modules to the LT-3300 series. |

13. Part Names and Functions

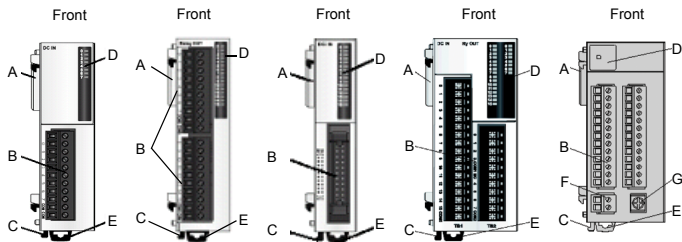
EXM-DDI8DT
EXM-DDO8UT
EXM-DDO8TT
EXM-DRA8RT
EXM-DMM8DRT
EXM-AMI2HT
EXM-ALM3LT
EXM-AMM3HT
EXM-AMO1HT
EXM-AMI4LT
EXM-AVO2HT

EXM-DDI16DT
EXM-DRA16RT
EXM-AMM6HT

EXM-DDO16UK
EXM-DDO16TK

EXM-DMM24DRF

EXM-ARI8LT



| | Name | | Description | |
|---|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| A | Extension Connector | | Connect the extension connector to the EX module interface at the rear side of the LT or connect the extension connector as the second connector for the LT to the EX module (the first unit). The extension plug-type connector is on the left side and the extension socket-type connector is mounted on the right side. | |
| B | Terminal Block (Terminal Connector/ Removable) | EXM-DDI8DT EXM-DDO8UT EXM-DDO8TT EXM-DRA8RT EXM-DMM8DRT EXM-AMI2HT EXM-ALM3LT EXM-AMM3HT EXM-AMO1HT EXM-DDI16DT EXM-DRA16RT EXM-AMI4LT EXM-ARI8LT EXM-AVO2HT EXM-AMM6HT | Terminals for external I/O interfaces | |
| | | Terminal Block (Nonremovable) | | EXM-DMM24DRF |
| | | MIL Connector | | EXM-DDO16UK EXM-DDO16TK |
| | | | | |
| C | Latch Button | | Bracket that secures the EX module to the LT or secures two EX modules. | |
| D | Status LED | | Indicator that switches on and off as the input and the output signals turn on and off. (I/O module only) | |
| | Power Indicator LED (PWR) | | (Analog type only) | |
| E | Clamp | | For the extension (DIN rail mounting) | |
| F | Power supply screw terminal block | | DC24 V | |
| G | Screw for functional ground | | - | |

14. General Specifications

14.1 Electrical Specifications

| | | | |
|--------------|-------------------|---------------------------------|-------------|
| Power Supply | Rated Voltage | 5 VDC (Supplied from LT or HTB) | |
| | Power Consumption | EXM-DDI8DT | 0.17 W max. |
| | | EXM-DDI16DT | 0.27 W max. |
| | | EXM-DRA8RT | 1.16 W max. |
| | | EXM-DRA16RT | 2.10 W max. |
| | | EXM-DDO8UT | 0.55 W max. |
| | | EXM-DDO8TT | 0.55 W max. |
| | | EXM-DDO16UK | 1.03 W max. |
| | | EXM-DDO16TK | 1.03 W max. |
| | | EXM-DMM8DRT | 0.65 W max. |
| | | EXM-DMM24DRF | 1.52 W max. |
| | | EXM-AMI2HT | 0.34 W max. |
| | | EXM-AMI4LT | 0.34 W max. |
| | | EXM-ARI8LT | 0.60 W max. |
| | | EXM-AMO1HT | 0.34 W max. |
| | | EXM-AVO2HT | 0.40 W max. |
| | | EXM-ALM3LT | 0.34 W max. |
| EXM-AMM3HT | 0.34 W max. | | |
| EXM-AMM6HT | 0.40 W max. | | |

14.2 Environmental Specifications

| | | |
|----------|-----------------------------------|---------------------------------------------------------------------|
| Physical | Surrounding Operating Temperature | 0 to 55°C |
| | Storage Temperature | -25 to +70°C |
| | Ambient Humidity | 30 to 95%RH (Wet bulb temperature: 39°C max. - no condensation.) |
| | Storage Humidity | 30 to 95%RH (Wet bulb temperature: 39°C max. - no condensation.) |
| | Pollution Degree | For use in Pollution Degree 2 environment |

14.3 Structural Specifications

| | | |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Installation Configuration | Connect the EX module directly to the rear side of the LT or to the right side of the EX module attached to the rear side of the LT. | |
| Cooling Method | Natural air circulation | |
| Weight Approx. | EXM-DDI8DT: 85 g EXM-DDI16DT: 100 g EXM-DDO8UT: 85 g EXM-DDO8TT: 85 g EXM-DDO16UK: 70 g EXM-DDO16TK: 70 g EXM-DRA8RT: 110 g EXM-DRA16RT: 145 g EXM-DMM8DRT: 95 g EXM-DMM24DRF: 140g | EXM-AMI2HT: 85 g ^{*1} , 100 g ^{*2} EXM-AMI4LT: 85g EXM-ALM3LT: 85 g ^{*1} , 100 g ^{*2} EXM-AMM3HT: 85 g ^{*1} , 100 g ^{*2} EXM-AMM6HT: 85g EXM-AMO1HT: 85 g ^{*1} , 100 g ^{*2} EXM-AVO2HT: 85g EXM-ARI8LT: 85g |
| Protective Structure | IP20 | |

*1 Compatible with models that have revision "PV: 03 RL: 07 SV: 1.2". Please refer to "Revision" on page 5.

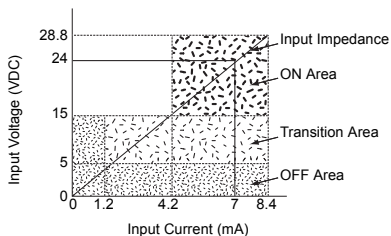
*2 Compatible with models that have revision "PV: 04 RL: 08 SV: 2.0". Please refer to "Revision" on page 5.

15. I/O Specifications

15.1 8-point/16-point input module

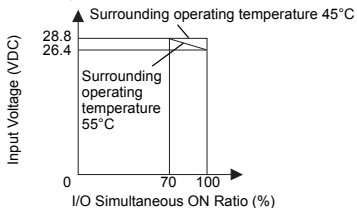
| | EXM-DDI8DT | EXM-DDI16DT |
|---------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Rated Input Voltage | 24 VDC | |
| Rated Input Voltage Range | DC20.4 to 28.8 V | |
| Rated Input Current | 7.3 mA/input (when 24 VDC is applied) | |
| No. of Input Points | 8 points (sink/source type - dual use) | 16 points (sink/source type - dual use) |
| No. of Common | 1 | |
| Input ON Voltage | 15 VDC or higher ^{*1} | |
| Input OFF Voltage | 5 VDC or less ^{*1} | |
| Input Impedance | 3.3 kΩ | |
| Isolation Method | Between input terminals and internal circuit: photocoupler isolated Between input terminals: not isolated | |
| Input Delay | OFF-ON | 4 ms |
| | ON-OFF | 4 ms |
| Usage Limits | No limits | Limits ^{*2} |
| External Connection | 10-pin terminal connector | |

*1 Operating Range



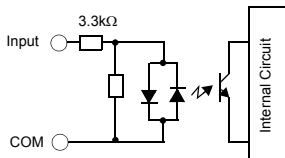
Input voltage / current characteristics 24 VDC (Input sink/source type)

*2 Usage Limits (for EXM-DDI16DT)

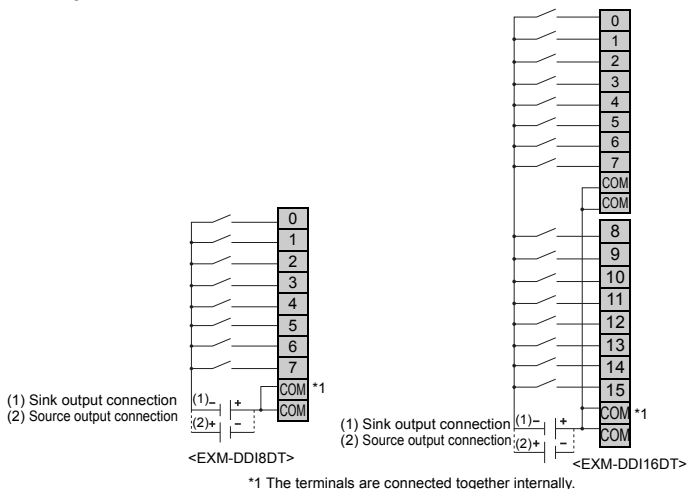


■ Input Circuit Drawings

◆ Internal Circuit



◆ Wiring



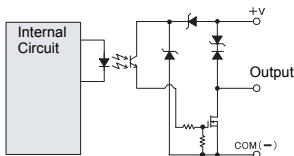
15.2 8-point/16-point sink-output module

| | | EXM-DDO8UT | EXM-DDO16UK |
|----------------------------|-------------|----------------------------------------------------------------------------|--------------------|
| Rated Output Voltage | | 24 VDC | |
| Rated Output Voltage Range | | DC20.4 to 28.8 V | |
| Output Method | | Transistor sink output | |
| No. of Output Points | | 8 points | 16 points |
| No. of Common | | 1 | |
| Common Design | | 8 points/1 common | 16 points/1 common |
| Maximum Load Voltage | Per Channel | 0.3 A | 0.1 A |
| | Per Common | 3 A | 1 A |
| Output Protection Type | | Output is unprotected | |
| Output Voltage Drop | | 1 VDC or less (voltage between COM and output terminals when output is on) | |
| Clamp Voltage | | 39 VDC \pm 1 V | |
| Voltage Leakage (When OFF) | | 0.1 mA or less | |
| Output Delay Time | OFF-ON | 300 μ s or less | |
| | ON-OFF | 300 μ s or less | |

| | EXM-DDO8UT | EXM-DDO16UK |
|---------------------|----------------------------------------------------------------------------------------------------------------|---------------|
| Isolation Method | Between output terminals and internal circuit: photocoupler isolated Between output terminals: not isolated | |
| External Connection | 10-pin terminal connector | MIL connector |

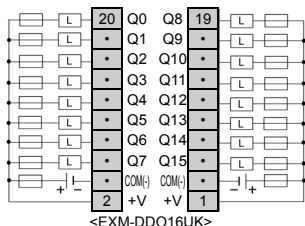
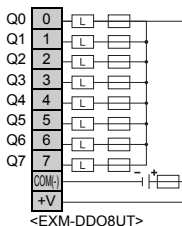
■ Input Circuit Drawings

◆ Internal Circuit



◆ Wiring

□ indicates a fuse. L indicates load.



NOTE

- Since the output terminals are not electrically protected, an output line might be shortcircuited or a connection fault might damage this product. Please install an applicable fuse to prevent an overload in the circuit, if necessary.

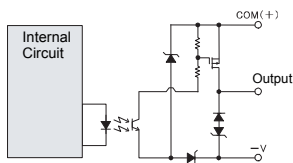
15.3 8-point/16-point source-output module

| | EXM-DDO8TT | EXM-DDO16TK |
|----------------------------|--------------------------|--------------------|
| Rated Output Voltage | 24 VDC | |
| Rated Output Voltage Range | DC20.4 to 28.8 V | |
| Output Method | Transistor source output | |
| No. of Output Points | 8 points | 16 points |
| No. of Common | 1 | |
| Common Design | 8 points/1 common | 16 points/1 common |

| | | EXM-DDO8TT | EXM-DDO16TK |
|----------------------------|-------------|----------------------------------------------------------------------------------------------------------------|---------------|
| Maximum Load Voltage | Per Channel | 0.3 A | 0.1 A |
| | Per Common | 3 A | 1 A |
| Output Protection Type | | Output is unprotected | |
| Output Voltage Drop | | 1 VDC or less (voltage between COM and output terminals when output is on) | |
| Clamp Voltage | | 39 VDC \pm 1 V | |
| Voltage Leakage (when OFF) | | 0.1 mA or less | |
| Output Delay Time | OFF-ON | 300 μ s or less | |
| | ON-OFF | 300 μ s or less | |
| Isolation Method | | Between output terminals and internal circuit: photocoupler isolated Between output terminals: not isolated | |
| External Connection | | 10-pin terminal connector | MIL connector |

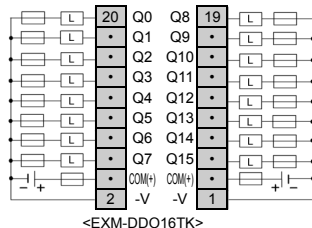
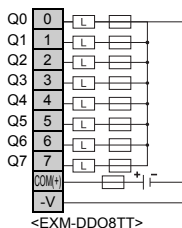
■ Input Circuit Drawings

◆ Internal Circuit



◆ Wiring

□ indicates a fuse. L indicates load.



NOTE

- Since the output terminals are not electrically protected, an output line might be shortcircuited or a connection fault might damage this product. Please install an applicable fuse to prevent an overload in the circuit, if necessary.

**WARNING****RELAY OUTPUTS WELDED CLOSED**

- Always protect relay outputs from inductive alternating current load damage using an appropriate external protective circuit or device.
- Do not connect relay outputs to capacitive loads.

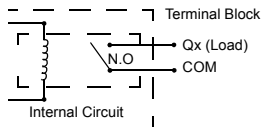
Failure to follow these instructions can result in death, serious injury, or equipment damage.

| | | EXM-DRA8RT | EXM-DRA16RT |
|-----------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| No. of Output Points | | 8 points (4 points/1 common) | 16 points (8 points/1 common)*1 |
| No. of Common | | 2 | |
| Output Method | | 1a-contact | |
| Maximum Load Voltage | Per Channel | 2 A or less | |
| | Per Common | 7 A or less | 8 A or less |
| Maximum Load Voltage | | 0.1 mA/0.1 VDC (reference value) | |
| Contact Rating | | 240 VAC, 2 A (resistance load, $\cos \theta=0.4$ induced load) 30 VDC, 2 A (resistance load, L/R-7 ms induced load) | |
| Initial Shorting Resistance | | 30 m Ω max. | |
| Electrical Life | | 100,000 operations or more (rated resistive load 1,800 operations/h) | |
| Mechanical Life | | 20 million operations or more (no load 18,000 operations/h) | |
| Voltage Endurance | | Between output to terminals: 1500 VAC, 1 minute Between output terminal and internal circuit: 1500 VAC, 1 minute Between output groups: 1500 VAC, 1 minute | |
| Output Delay Time | | <p>Command ON/OFF</p> <p>Output Relay Status ON/OFF</p> <p>ON delay: 6 ms max.</p> <p>OFF delay: 10 ms max.</p> <p>Contact bounce: 6 ms max.</p> | |
| External Connection | | 11-pin terminal connector | 10-pin terminal connector |

*1 When connecting to Hybrid Terminal Block (HTB), up to 6 EXM-DRA16RT (up to 96 points of the total output points of EXM-DRA16RT) can be connected. When connecting EXM-DRA16RT up to 6, the following output modules cannot be connected to as the 7th module; EXM-DRA8RT, EXM-DRA16RT, EXM-DDO8UT, EXM-DDO8TT, EXM-DDO16UK, EXM-DDO16TK, EXM-DMM8DRT.

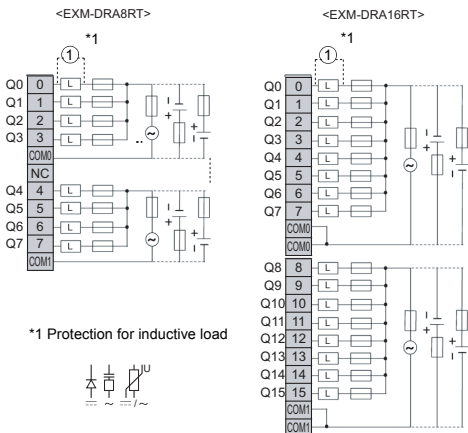
■ Input Circuit Drawings

◆ Internal Circuit



◆ Wiring

□ indicates a fuse. L indicates load.



NOTE

- The relay specifications can change the COM power supply.
- Since the output terminals are not electrically protected, an output line might be shortcircuited or a connection fault might damage this product. Please install an applicable fuse to prevent an overload in the circuit, if necessary.
- The COM0 and COM1 terminals are not connected together internally.
- Please be sure to refer 1.Essential Safety Precautions“About the Relay Output Inductive Load”, page 3

15.5 4-point inputs/4-point relay-output module, 16-point inputs/8-point relay-output module



WARNING

RELAY OUTPUTS WELDED CLOSED

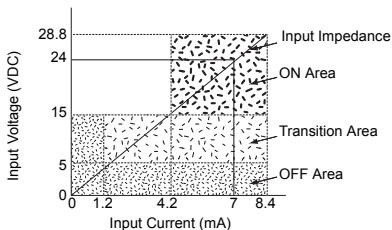
- Always protect relay outputs from inductive alternating current load damage using an appropriate external protective circuit or device.
- Do not connect relay outputs to capacitive loads.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

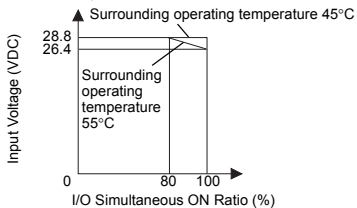
| | | EXM-DMM8DRT | EXM-DMM24DRF |
|---------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Rated Input Voltage | | 24 VDC | |
| Rated Input Voltage Range | | DC20.4 to 28.8 V | |
| Rated Input Current | | 7.3 mA/input (when 24 VDC is applied) | 7 mA/input (when 24 VDC is applied) |
| No. of Input Points | | 4 points (sink/source type - dual use) | 16 points (sink/source type - dual use) |
| No. of Input Common | | 1 | |
| Input ON Voltage | | 15 VDC or higher ^{*1} | |
| Input OFF Voltage | | 5 VDC or less ^{*1} | |
| Input Impedance | | 3.3 kΩ | 3.4 kΩ |
| Isolation Method | | Between input terminals and internal circuit: photocoupler isolated Between input terminals: not isolated | |
| Input Delay | OFF-ON | 4 ms | |
| | ON-OFF | 4 ms | |
| Usage Limits | | No limits | Limits ^{*2} |
| External Load for I/O Interconnection | | Not needed | |
| Signal Determination Method | | LED lights when each point turns ON (logical side) | |
| No. of Output Points | | 4 points (4 points/1 common) | 8 points |
| No. of Output Common | | 1 NO | 2 NO |
| Output Method | | 1a-contact | |
| Maximum Load Current ^{*3} | Per Channel | 2 A or less | |
| | Per Common | 7 A or less | |
| Min. Open/Close Load | | 0.1 mA/0.1 VDC (reference value) | |

| | EXM-DMM8DRT | EXM-DMM24DRF |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Contact Rating | 240 VAC, 2 A (resistance load, $\cos \phi=0.4$ induced load) 30 VDC, 2 A (resistance load, L/R-7 ms induced load) | |
| Output Delay Time | | |
| Initial Shorting Resistance | 30 m Ω max. | 45 m Ω max. |
| Electrical Life | 100,000 operations or more (rated resistive load 1,800 operations/h) | |
| Mechanical Life | 20 million operations or more (no load 18,000 operations/h) | |
| Voltage Endurance | Between output to terminals: 1500 VAC, 1 minute Between output terminal and internal circuit: 1500 VAC, 1 minute Between output groups: 1500 VAC, 1 minute | |
| External Connection | 11-pin terminal connector | Terminal Block (nonremoval) |

*1 Operating Range



*2 Usage Limits (for EXM-DMM24DRF)



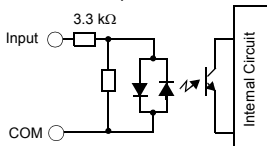
*3 Value when the resistance load or induction load is applied.

■ Input/Output Circuit Drawings

◆ Internal Circuit

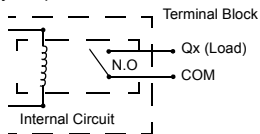
<Input>

- Sink/Source Input



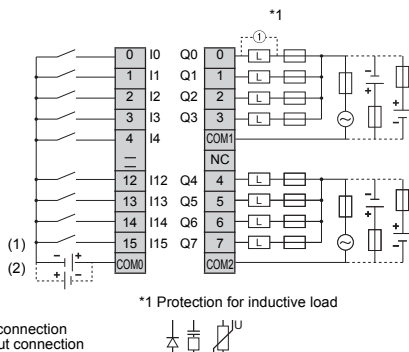
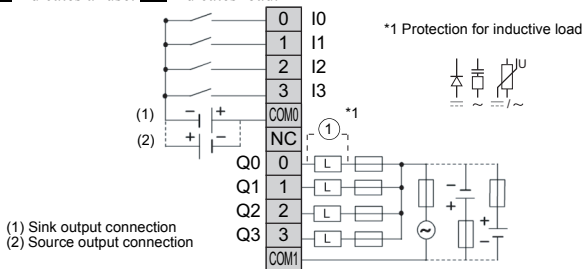
<Output>

- Relay Output Contact



◆ Wiring

□ indicates a fuse. L indicates load.



NOTE

- The COM0, COM1 and COM2 terminals are not connected together internally.
- Since the output terminals are not electrically protected, an output line might be short-circuited or a connection fault might damage this product. Please install an applicable fuse to prevent an overload in the circuit, if necessary.
- Please be sure to refer 1.Essential Safety Precautions“About the Relay Output Inductive Load” on page 3

15.6 2-ch analog-input module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from DC20.4 to 28.8 V The consumption current is 35 mA*1 or 40 mA*2 (24VDC) when the input is not-open, output 100%. You can select either voltage or current for each input channel.

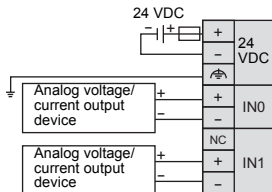
| | | EXM-AMI2HT | |
|------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Characteristics of Analog Voltage Inputs | | Voltage Input | Current Input |
| Input Range | | From DC0 to 10 V | From DC4 to 20 mA |
| Input Impedance | | 1 M Ω min. | 10 Ω |
| Input Points | | 2 points | |
| A-D Conversion | Sample Repetition Time | 20 ms max. | |
| | Total Input System Transfer Time*3 | 105 ms + 1 scan time*1 60 ms + 1 scan time*2 | |
| | Input Type | Single-ended input | Differential input |
| | Operating Mode | Self-scan | |
| | Conversion Mode | $\Sigma\Delta$ type ADC | |
| Input Error | Maximum Error at 25°C (77°F) | $\pm 0.2\%$ of full scale | |
| | Temperature Coefficient | $\pm 0.006\%$ of full scale/°C | |
| | Repeatable after Stabilization Time | $\pm 0.5\%$ of full scale | |
| | Nonlinear | $\pm 0.2\%$ of full scale | |
| | Maximum error | $\pm 1\%$ of full scale | |
| Data | Digital Resolution | 4096 increments (12 bits) | |
| | Input Value of LSB | 2.5 mV | 4 μ A |
| | Data Type in Application Program | 0 to 4095 (12 bit data) -32768 to 32767 (optional range designation)*4 | |
| | Monotonicity | Yes | |
| | Input Data Out of Range | Detectable*5*6 | |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | $\pm 3\%$ maximum*1 or $\pm 1\%$ maximum*2 when a 1 kV clamp voltage is applied to the I/O wiring and 1 kV is applied to the power directly. | |
| | Common Mode Characteristics | Common mode reject ratio (CMRR): -50 dB | |
| | Common Mode Voltage | 16 VDC | |
| | Input Filter | No | |
| | Cable | Twisted-pair shielded cable is recommended for improved noise immunity | |
| | Crosstalk | 2 LSB max. | |
| Voltage Endurance | | 500 V between input and power circuit | |
| Isolation Method | | Photocoupler Isolation between input and internal circuit | |

| EXM-AMI2HT | | |
|--------------------------------------------------------|----------------------------|---------------|
| Characteristics of Analog Voltage Inputs | Voltage Input | Current Input |
| Maximum Permanent Allowed Overload (No Damage) | 13 VDC | 40 mA DC |
| Selection of Analog Input Signal Type | Using software programming | |
| Calibration or Verification to Maintain Rated Accuracy | Approximately 10 years | |
| Disconnection detection | No | |
| External Connection | 11-pin terminal connector | |

- *1 Compatible with models that have revision "PV: 03 RL: 07 SV: 1.2". Please refer to "Revision" on page 5.
- *2 Compatible with models that have revision "PV: 04 RL: 08 SV: 2.0". Please refer to "Revision" on page 5.
- *3 Total input system transfer time = sample repetition \times 2 + internal operation time + 1 scan time.
As for revision "PV: 03 RL: 07 SV: 1.2", the value is maximum time. Typ. 33ms + 1 scan time.
As for revision "PV: 04 RL: 08 SV: 2.0", the value is maximum time. Typ. 26.5ms + 1 scan time.
- *4 The 12-bit data (0 to 4095) and 10-bit data (0 to 1023) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767.
The Optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.
- *5 As for voltage input data out of range (less than DC 0V, more than DC 10V), or current input data out of range (less than DC 4mA, more than DC 20mA), the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the "Maintenance/Troubleshooting Guide".
- *6 The input value may be regarded as "Input Data Out of Range" due to the maximum error even when it is in the specified input range. Before inputting the value, therefore, consider the maximum error.

◆ Wiring

□ indicates a fuse.



<EXM-AMI2HT>

- Be sure the analog OUT lines are placed in a separate duct from high-frequency, live lines such as high-voltage, high-power lines, inverters, etc.

IMPORTANT

- The power for the analog module should be supplied separately from the LT.
Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.

NOTE

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- When the voltage input is open, the input into the unused channels is approx. 2.5 VDC for revision “PV: 03 RL: 07 SV: 1.2” and 0 VDC for revision “PV: 04 RL: 08 SV: 2.0”. When the voltage input is short circuited, 0 VDC is input to them. Please shortcircuit to prevent from the invalid values input. When the current input is open, error code (RGEF130 input data error) occurs to the unused channels, then the invalid values are input. The voltage input settings is recommended to the unused channels.
- The (-) poles of inputs IN0 and IN1 are connected internally.

15.7 4-ch Analog input / Temperature input module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from DC19.2 to 30 V including ripple. The consumption current is 60 mA (24 VDC) when the input is not-open, output 100%. You can input voltage, current, or temperature probes on up to 4 channels. You cannot use different types of input at the same time.

| | | EXM-AMI4LT | | |
|------------------------------------------|------------------------------------|------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Characteristics of Analog Voltage Inputs | | Voltage Input | Current Input | Temperature Probes |
| Input Range | | DC0 to 10 V | DC0 to 20 mA | (RTD) Pt100/Pt1000/ Ni100/Ni1000, 3-wire type Pt sensor: -200 to +600°C (-328 to +1112°F) Ni sensor: -50 to +150°C (-58 to +302°F) |
| Input Impedance | | 10 k Ω min. | 250 Ω max. | 10 k Ω min. |
| Input Points | | 4 points | | |
| A-D Conversion | Sample Repetition Time | 160 ms | | |
| | Total Input System Transfer Time*1 | 4x160 ms + 1 scan time | | 8x160 ms + 1 scan time |
| | Input Type | Non differential input | | |
| | Operating Mode | Self-scan | | |
| Conversion Mode | | $\Sigma\Delta$ type ADC | | |
| Input Error | Maximum Error at 25°C (77°F) | $\pm 0.2\%$ of full scale $\pm 0.4\%$ temperature probe input | | |
| | Temperature Coefficient | $\pm 0.005\%$ of full scale/°C | | |

| | | EXM-AMI4LT | | |
|-----------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------|
| Characteristics of Analog Voltage Inputs | | Voltage Input | Current Input | Temperature Probes |
| Characteristics of Voltage, Current & Temperature Inputs | Repeatable after Stabilization Time | ±0.1% of full scale | | |
| | Nonlinear | ±0.02% of full scale | | |
| | Maximum Error | ±0.5% of full scale | | |
| Data | Digital Resolution | 4096 increments (12 bits) | | |
| | Input Value of LSB | 2.5 mV | 4.8 µA | Pt: 0.20 °C (32.36 °F) Ni: 0.05 °C (32.09 °F) |
| | Data Type in Application Program | 0 to 4095 (12 bit) Custom range up to -32768 to +32767*2 | | Celsius / Fahrenheit |
| | Input Data Out of Range | Detectable*3*4 | | |
| Noise Resistance | Cable | Twisted-pair shielded cable is recommended for improved noise immunity | | |
| | Crosstalk | 1 LSB max. | | |
| Voltage Endurance | | 2500 VAC between inputs, external power supply and internal logic circuits | | |
| Isolation Method | | Photocoupler Isolation between input and internal circuit (1500 VDC isolation) | | |
| Maximum Permanent Allowed Overload (No Damage) | | 13 VDC | 40 mA | - |
| Selection of Analog Input Signal Type | | Using software programming NOTE All inputs have the same voltage/current configuration or temperature. For temperature, it is possible to configure each channel independently of the type of probe. | | |
| Calibration or Verification to Maintain Rated Accuracy | | Approximately 10 years | | |
| Default input value in case of temperature sensor disconnection | | Upper limit*5 | | |
| External Connection | | 11-pin terminal connector | | |

*1 Total input system transfer time = sample repetition × 2 + 1 scan time.

*2 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

*3 If the input data is not in the range, the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the "Maintenance/Troubleshooting Guide".

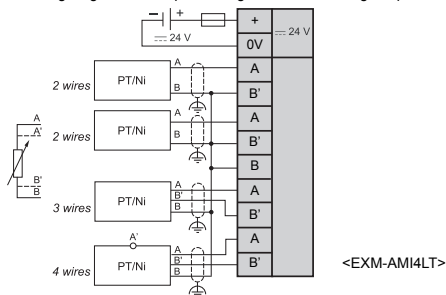
*4 The input value may be regarded as "Input Data Out of Range" due to the maximum error even when it is in the specified input range. Before inputting the value, therefore, consider the maximum error.

*5 Only when connected to Hybrid Terminal Block (HTB)

◆ Wiring

□ indicates a fuse.

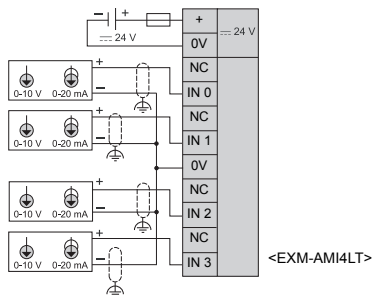
This wiring diagram is for inputs configured for measuring temperature.



NOTE

- For 4-wire cabling, “output A’ ” is not connected.

This wiring diagram is for inputs configured for measuring voltage/current.



IMPORTANT

- The power for the analog module should be supplied separately from the LT. Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.

NOTE

- Connect an appropriate fuse for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

15.8 8-ch Pt100/Pt1000 input module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from DC20.4 to 28.8 V. The consumption current is 140 mA (24 VDC) when the input is not-open, output 100%.

| | | EXM-ARI8LT |
|----------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sensor type | | Temperature Probes |
| Input Range | | Pt1000: -50 to +200°C (-58 to +392°F) Pt100: -200 to +600°C (-328 to +1112°F) |
| Input Impedance | | 10 kΩ min. |
| Input Points | | 8 points |
| A-D Conversion | Sample Repetition Time | 320 ms per channel |
| | Total Input System Transfer Time* ¹ | 4x320 ms + 1 scan time |
| | Input Type | Differential input |
| | Operating Mode | Self-scan |
| | Conversion Mode | ΣΔ type ADC |
| Input Error | Maximum Error at 25°C (77°F) | Pt1000: ±0.5°C (0.9°F) Pt100: ±1.5°C (2.7°F) Range -50°C (-58°F) to +200°C (+392°F): ±1°C(±33.8°F) Range -200°C (392°F) to 600°C (1112°F): +0.1% / -0.5% full scale |
| | Temperature Coefficient | ±0.5°C (0.9°F) |
| Characteristics of Voltage, Current & Temperature Inputs | Repeatable after Stabilization Time | ±0.1°C (±32.18°F) |
| | Total maximum deviation | Pt1000: ±1°C (±33.8°F) Pt100: +1°C (33.8°F)/-4°C (24.8°F) |
| Data | Digital Resolution | 4096 increments (12 bits) |
| | Input Value of LSB | Pt1000: 0.06°C (0.108°F) Pt100: 0.2°C (0.36°F) |
| | Data Type in Application Program | 0 to 4095 (12 bit) Custom range up to -32768 to +32767* ² |
| | Input Data Out of Range | Detectable* ^{3*4} |
| | Broken wire detection | Detectable* ³ |
| Noise Resistance | Cable | Twisted-pair shielded cable is recommended for improved noise immunity |
| | Crosstalk | 1 LSB max. |
| Voltage Endurance | | -2500 VAC between inputs, external power supply and internal logic circuits - 1500 Vrms between inputs and internal bus - 500 Vrms between inputs and ground -1500 Vrms between internal bus and ground |
| Isolation Method | | Photocoupler Isolation between input and internal circuit (1500 VDC isolation) |

| | EXM-ARI8LT |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Selection of Analog Input Signal Type | Using software programming NOTE It is possible to use Pt100 and Pt 1000's probe. |
| Calibration or Verification to Maintain Rated Accuracy | Approximately 10 years |
| Default input value in case of temperature sensor disconnection | Upper limit |
| External Connection | 2 x 13-pin terminal connector 1 x 2-pin power supply screw terminal block |

*1 Total input system transfer time = sample repetition × 2 + 1 scan time.

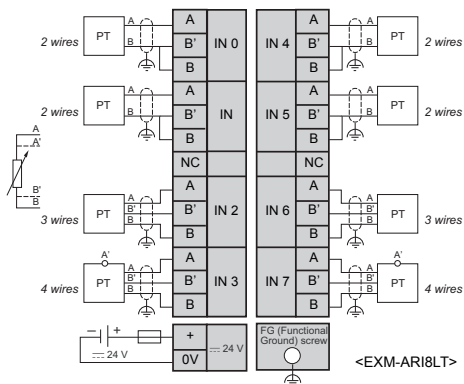
*2 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

*3 If the input data is not in the range, the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the "Maintenance/Troubleshooting Guide".

*4 The input value may be regarded as "Input Data Out of Range" due to the total maximum deviation even when it is in the specified input range. Before inputting the value, therefore, consider the total maximum deviation.

◆ Wiring

□ indicates a fuse.



IMPORTANT

- The power for the analog module should be supplied separately from the LT. Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.

NOTE

- Connect an appropriate fuse for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

15.9 1-ch analog-output module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from DC20.4 to 28.8 V. The consumption current is 40 mA (24 VDC) when the input is not-open, output 100%.

| | | EXM-AMO1HT | |
|------------------------------|-----------------------------------|------------------------------------------------|-------------------|
| Analog Output Specifications | | Voltage Output | Current Output |
| Rated Output Voltage Range | | From DC0 to 10 V | From DC4 to 20 mA |
| Load | Load Impedance | 2 k Ω min.*1, 1 k Ω min.*2 | 300 Ω max. |
| | Application Load Type | Resistive load | |
| D-A Conversion | Conversion Time | 50 ms*1 10 ms*2 | |
| | Total Output System Transfer Time | 50 ms + 1 scan time*1 10 ms + 1 scan time*2 | |

| | | EXM-AMO1HT | |
|--------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------|
| Analog Output Specifications | | Voltage Output | Current Output |
| Output Error | Maximum Error at 25°C (77°F) | ±0.2% of full scale | |
| | Temperature Coefficient | ±0.015% of full scale/°C | |
| | Repeatable after Stabilization Time | ±0.5% of full scale | |
| | Output Voltage Drop | ±1% of full scale | - |
| | Nonlinear | ±0.2% of full scale | |
| | Output Ripple | 1 LSB max. | |
| | Overshoot | 0% | |
| | Total Error | ±1% of full scale | |
| Data | Digital Resolution | 4,096 increments (12 bits) | |
| | Output Value of LSB | 2.5 mV | 4 µA |
| | Data Type in Application Program | 0 to 4095 (12 bit data) -32768 to 32767 (optional range designation)*3 | |
| | Monotonicity | Yes | |
| | Current Loop Open | - | Not detectable |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | ±3% maximum*1 or ±1% maximum*2 when a 1 kV clamp voltage is applied to the I/O wiring and 1 kV is applied to the power directly. | |
| | Cable | Twisted-pair shielded cable is recommended for improved noise immunity | |
| | Crosstalk | No crosstalk because of 1 channel output | |
| Voltage Endurance | | 500V between output and power circuit | |
| Isolation Method | | Photocoupler Isolation between output and internal circuit | |
| Selection of Analog Output Signal Type | | Using software programming | |
| Calibration or Verification to Maintain Rated Accuracy | | Approximately 10 years | |
| External Connection | | 11-pin terminal connector | |

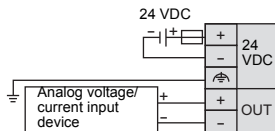
*1 Compatible with models that have revision "PV: 03 RL: 07 SV: 1.2". Please refer to "Revision" on page 5.

*2 Compatible with models that have revision "PV: 04 RL: 08 SV: 2.0". Please refer to "Revision" on page 5.

*3 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

◆ Wiring

□ indicates a fuse.



<EXM-AMO1HT>

IMPORTANT

- The power for the analog module should be supplied separately from the LT. Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.
- Be sure the analog OUT lines are placed in a separate duct from high-frequency, live lines such as high-voltage, high-power lines, inverters, etc.

NOTE

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

15.10 2-ch analog-output module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from DC19.2 to 30 V including ripple. The consumption current is 60 mA (24 VDC) when the input is not-open, output 100%.

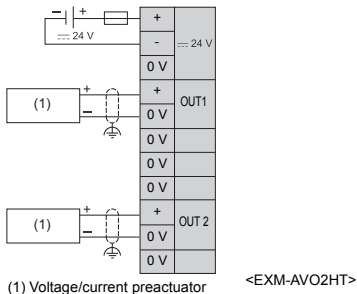
| | | EXM-AVO2HT |
|------------------------------|-------------------------------------------------|----------------------|
| Analog Output Specifications | | Voltage Output |
| Rated Output Voltage Range | | From DC -10 to +10 V |
| Load | Load Impedance | 3 k Ω min. |
| | Application Load Type | Resistive load |
| D-A Conversion | Conversion Time | 2 ms |
| | Total Output System Transfer Time* ¹ | 2 ms + 1 scan time |

| | | EXM-AVO2HT |
|--------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Analog Output Specifications | | Voltage Output |
| Output Error | Maximum Error at 25°C (77°F) | ±0.5% of full scale |
| | Temperature Coefficient | ±0.01% of full scale/°C |
| | Repeatable after Stabilization Time | ±0.1% of full scale |
| | Output voltage drop | ±0.5% of full scale |
| | Nonlinear | ±0.2% of full scale |
| | Output Ripple | 1 LSB max. |
| | Overshoot | 0% |
| | Total Error | ±1% of full scale |
| Data | Digital Resolution | 11 bits + sign |
| | Output Value of LSB | ±9.8 mV |
| | Data Type in Application Program | -2,048 to +2,047*1 Custom range up to -32768 to +32767 |
| | Current Loop Open | Not Detectable |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | ±1% of full scale |
| | Cable | Twisted-pair shielded cable is recommended for improved noise immunity |
| | Crosstalk | No crosstalk because of 1channel output |
| Voltage Endurance | | 2500 VAC by photocoupler between outputs, external power supply and internal logic circuits |
| Selection of Analog Output Signal Type | | Using software programming |
| Calibration or Verification to Maintain Rated Accuracy | | Approximately 10 years |
| External Connection | | 11-pin terminal connector |

*1 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

◆ Wiring

□ indicates a fuse.



IMPORTANT

- The power for the analog module should be supplied separately from the LT. Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.

NOTE

- Use the braid supplied with the module to connect the functional ground.
- Connect an appropriate fuse for the applied voltage and current draw, at the position shown in the diagram.
- To avoid disturbances on the analog outputs, the power supply of the EXM-AVO2HT module must be turned on or off at the same time than the base controller power supply.

15.11 2-ch analog-input/1-ch analog-output module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from DC20.4 to 28.8 V The consumption current is 45 mA*1 or 50 mA*2 (24VDC) when the input is not-open, output 100%. You can select either voltage or current for each input or output channel.

| | | EXM-AMM3HT | |
|------------------------------------------|------------------------------------|-------------------------------------------------|--------------------|
| Characteristics of Analog Voltage Inputs | | Voltage Input | Current Input |
| Input Range | | From DC0 to 10V | From DC4 to 20 mA |
| Input Impedance | | 1 M Ω min. | 10 Ω |
| Input Points | | 2 points | |
| A-D Conversion | Sample Repetition Time | 20 ms max. | |
| | Total Input System Transfer Time*3 | 105 ms + 1 scan time*1 60 ms + 1 scan time*2 | |
| | Input Type | Single-ended input | Differential input |
| | Operating Mode | Self-scan | |
| | Conversion Mode | $\Sigma\Delta$ type ADC | |

| | | EXM-AMM3HT | |
|--------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------|
| Characteristics of Analog Voltage Inputs | | Voltage Input | Current Input |
| Input Error | Maximum Error at 25°C (77°F) | ±0.2% of full scale | |
| | Temperature Coefficient | ±0.006% of full scale/°C | |
| | Repeatable After Stabilization Time | ±0.5% of full scale | |
| | Nonlinear | ±0.2% of full scale | |
| | Maximum Error | ±1% of full scale | |
| Data | Digital Resolution | 4096 increments (12 bits) | |
| | Input Value of LSB | 2.5 mV | 4 µA |
| | Data Type in Application Program | 0 to 4095 (12 bit data) -32768 to 32767 (optional range designation)*4 | |
| | Monotonicity | Yes | |
| | Input Data Out of Range | Detectable*5*6 | |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | ±3% maximum when a 1 kV clamp voltage is applied to the I/O wiring and 1 kV is applied to the power directly. | |
| | Common Mode Characteristics | Common mode reject ratio (CMRR): -50 dB | |
| | Common Mode Voltage | 16 VDC | |
| | Input Filter | No | |
| | Cable | Twisted-pair shielded cable is recommended for improved noise immunity | |
| | Crosstalk | 2 LSB max. | |
| Voltage Endurance | 500 V between input and power circuit | | |
| Isolation Method | Photocoupler between input and internal circuit | | |
| Maximum Permanent Allowed Overload (No Damage) | 13 VDC | 40 mA DC | |
| Selection of Analog Input Signal Type | Using software programming | | |
| Calibration or Verification to Maintain Rated Accuracy | Approximately 10 years | | |
| Disconnection detection | No | | |
| External Connection | 11-pin terminal connector | | |

*1 Compatible with models that have revision "PV: 03 RL: 07 SV: 1.2". Please refer to "Revision" on page 5.

*2 Compatible with models that have revision "PV: 04 RL: 08 SV: 2.0". Please refer to "Revision" on page 5.

*3 Total input system transfer time = sample repetition × 2 + internal operation time + 1 scan time.
As for revision "PV: 03 RL: 07 SV: 1.2", the value is maximum time. Typ. 33ms + 1 scan time.

As for revision "PV: 04 RL: 08 SV: 2.0", the value is maximum time. Typ. 26.5ms + 1 scan time.

*4 The 12-bit data (0 to 4095) and 10-bit data (0 to 1023) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767.

The Optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

*5 As for voltage input data out of range (less than DC 0V, more than DC 10V), or current input data out of range (less than DC 4mA, more than DC 20mA), the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the "Maintenance/Troubleshooting Guide".

*6 The input value may be regarded as "Input Data Out of Range" due to the maximum error even when it

is in the specified input range. Before inputting the value, therefore, consider the maximum error.

| | | EXM-AMM3HT | |
|--------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Analog Output Specifications | | Voltage Output | Current Output |
| Rated Output Voltage Range | | From DC0 to 10 V | From DC4 to 20 mA |
| Load | Load Impedance | 2 k Ω min.*1, 1 k Ω min.*2 | 300 Ω max. |
| | Application Load Type | Resistive load | |
| D-A Conversion | Conversion Time | 50 ms*1 10 ms*2 | |
| | Total Output System Transfer Time | 50 ms + 1 scan time*1 10 ms + 1 scan time*2 | |
| Output Error | Maximum Error at 25°C (77°F) | $\pm 0.2\%$ of full scale | |
| | Temperature Coefficient | $\pm 0.015\%$ of full scale/°C | |
| | Repeatable after Stabilization Time | $\pm 0.5\%$ of full scale | |
| | Output Voltage Drop | $\pm 1\%$ of full scale | - |
| | Nonlinear | $\pm 0.2\%$ of full scale | |
| | Output Ripple | 1 LSB max. | |
| | Overshoot | 0% | |
| | Total Error | $\pm 1\%$ of full scale | |
| Data | Digital Resolution | 4,096 increments (12 bits) | |
| | Output Value of LSB | 2.5 mV | 4 μ A |
| | Data Type in Application Program | 0 to 4095 (12 bit data) -32768 to 32767 (optional range designation)*3 | |
| | Monotonicity | Yes | |
| | Current Loop Open | - | Not detectable |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | $\pm 3\%$ maximum*1 or $\pm 1\%$ maximum*2 when a 1 kV clamp voltage is applied to the I/O wiring and 1 kV is applied to the power directly. | |
| | Cable | Twisted-pair shielded cable is recommended for improved noise immunity | |
| | Crosstalk | No crosstalk because of 1 channel output | |
| Voltage Endurance | | 500 V between output and power circuit | |
| Isolation Method | | Photocoupler Isolation between output and internal circuit | |
| Selection of Analog Output Signal Type | | Using software programming | |
| Calibration or Verification to Maintain Rated Accuracy | | Approximately 10 years | |
| Disconnection detection | | No | |
| External Connection | | 11-pin terminal Connector | |

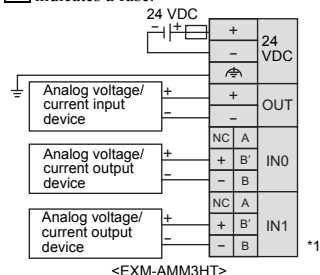
*1 Compatible with models that have revision "PV: 03 RL: 07 SV: 1.2". Please refer to "Revision" on page 5.

*2 Compatible with models that have revision "PV: 04 RL: 08 SV: 2.0". Please refer to "Revision" on page 5.

*3 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

◆ Wiring

□ indicates a fuse.



*1 The (-) poles of inputs IN0 and IN1 are connected internally

NOTE

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- When the voltage input is open, the input into the unused channels is approx. 2.5 VDC for revision “PV: 03 RL: 07 SV: 1.2” and 0 VDC for revision “PV: 04 RL: 08 SV: 2.0”. When the voltage input is short circuited, 0 VDC is input to them. Please shortcircuit to prevent from the invalid values input. When the current input is open, error code (RGEF130 input data error) occurs to the unused channels, then the invalid values are input. The voltage input settings is recommended to the unused channels.

IMPORTANT

- The power for the analog module should be supplied separately from the LT. Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.
- Be sure the analog IN/OUT lines are placed in a separate duct from high-frequency, live lines such as high-voltage, high-power lines, inverters, etc.

15.124-ch analog-input/2-ch analog-output module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from DC20.4 to 28.8 V. The consumption current is 80 mA (24 VDC) when the input is not-open, output 100%. You can select voltage or current for each input or output channel.

| | | EXM-AMM6HT | |
|--------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------|-------------------|
| Characteristics of Analog Voltage Inputs | | Voltage Input | Current Input |
| Input Range | | DC0 to 10 V | DC4 to 20 mA |
| Input Impedance | | 1 M Ω | 250 Ω max. |
| Input Points | | 4 points | |
| A-D Conversion | Sample Repetition Time | 64 ms | |
| | Total Input System Transfer Time* ¹ | 4x64 ms + 1 scan time | |
| | Input Type | Non differential input | |
| | Operating Mode | Self-scan | |
| | Conversion Mode | $\Sigma\Delta$ type ADC | |
| Input Error | Maximum Error at 25°C (77°F) | $\pm 0.5\%$ of full scale | |
| | Temperature Coefficient | $\pm 0.015\%$ of full scale/°C | |
| Characteristics of Voltage & Current Inputs | Repeatable after Stabilization Time | $\pm 0.5\%$ of full scale | |
| | Nonlinear | $\pm 0.4\%$ of full scale | |
| | Maximum Error | $\pm 1\%$ of full scale | |
| Data | Digital Resolution | 4096 increments (12 bits) | |
| | Input Value of LSB | 2.5 mV | 4.8 μ A |
| | Data Type in Application Program | 0 to 4095 (12 bit) Custom range up to -32768 to +32767* ² | |
| | Input Data Out of Range | Detectable* ^{3*4} | |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | $\pm 2\%$ of full scale | |
| | Cable | Twisted-pair shielded cable is recommended for improved noise immunity | |
| | Crosstalk | 1 LSB max. | |
| Voltage Endurance | | 800 VAC | |
| Isolation Method | | Photocoupler Isolation between inputs, and internal circuits | |
| Maximum Permanent Allowed Overload (No Damage) | | 30 VDC | 40 mA |
| Selection of Analog Input Signal Type | | Using software programming | |
| Calibration or Verification to Maintain Rated Accuracy | | Approximately 10 years | |
| External Connection | | 10-pin terminal connector | |

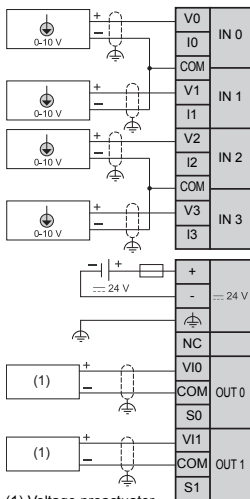
- *1 Total input system transfer time = sample repetition × active channel number + 1 scan time.
- *2 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.
- *3 If the input data is not in the range, the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the "Maintenance/Troubleshooting Guide".
- *4 The input value may be regarded as "Input Data Out of Range" due to the maximum error even when it is in the specified input range. Before inputting the value, therefore, consider the maximum error.

| | | EXM-AMM6HT | |
|--------------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------|-------------------|
| Analog Output Specifications | | Voltage Output | Current Output |
| Rated Output Voltage Range | | DC0 to 10 V | From DC4 to 20 mA |
| Load | Load Impedance | 2 kΩ min. | 300 Ω max. |
| | Application Load Type | Resistive load | |
| D-A Conversion | Conversion Time | 20 ms | |
| | Total Output System Transfer Time* ¹ | 20 ms + 1 scan time | |
| Output Error | Maximum Error at 25°C (77°F) | ±0.9% of full scale | |
| | Temperature Coefficient | ±0.015% of full scale/°C | |
| | Repeatable after Stabilization Time | ±1% of full scale | |
| | Output voltage drop | ±1% of full scale | |
| | Nonlinear | ±0.5% of full scale | |
| | Output Ripple | ±0.5% of full scale | |
| | Overshoot | ±0.5% of full scale | |
| | Total Error | ±1.5% of full scale | |
| Data | Digital Resolution | 4096 increments (12 bits) | |
| | Output Value of LSB | 2.5 mV | 4.8 μA |
| | Data Type in Application Program | 0 to 4095 (12 bit data) Custom range up to -32768 to +32767* ¹ | |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | ±1% of full scale | |
| | Cable | Twisted-pair shielded cable is recommended for improved noise immunity | |
| | Crosstalk | ±0.1% of full scale max. | |
| Voltage Endurance | | 800 VAC | |
| Isolation Method | | Photocoupler Isolation between outputs and internal circuit | |
| Selection of Analog Input Signal Type | | Using software programming | |
| Calibration or Verification to Maintain Rated Accuracy | | Approximately 10 years | |
| External Connection | | 10-pin terminal connector | |

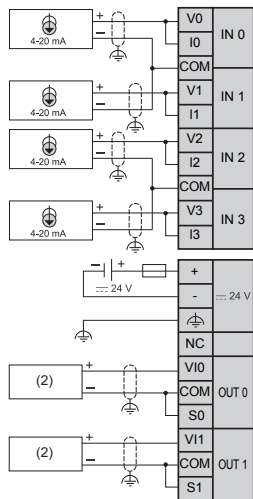
*1 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

◆ Wiring

□ indicates a fuse.



(1) Voltage preactuator
(2) Current preactuator



<EXM-AMM6HT>

IMPORTANT

- The power for the analog module should be supplied separately from the LT. Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.

NOTE

- Use the braid supplied with the module to connect the functional ground.
- Connect an appropriate fuse for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.
- To avoid unintended operation of analog I/Os, the EXM-AMM6HT power supply must be switched off when the PLC module is switched off.

15.13 Thermocouple Pt100 input/1-ch analog-output module

The detail of the external power supply is: the rated supply voltage is 24 VDC, the rated input voltage ranges from DC20.4 to 28.8 V. The consumption current is 40 mA*1 or 50 mA*2 (24 VDC) when the input is not-open, output 100%.

| EXM-ALM3LT | | | |
|------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Characteristics of Thermocouple & Temperature Inputs | | Thermocouple | Temperature Probes |
| Input Range | | Type K: 0 to 1300°C/32 to 2372°F Type J: 0 to 1200°C/32 to 2192°F Type T: 0 to 400°C/32 to 742°F | (RTD) Pt 100, 3-wire type (-100 to 500°C) (-148 to 932°F) |
| Input Impedance | | 1 MΩ min. | |
| A-D Conversion | Sample Repetition Time | 20 ms max. | 20 ms max.*1 40 ms max.*2 |
| | Total Input System Transfer Time*3 | 200 ms + 1 scan time*1 60 ms + 1 scan time*2 | 200 ms + 1 scan time*1 80 ms + 1 scan time*2 |
| | Input Type | Differential input | |
| | Operating Mode | Self-scan | |
| | Conversion Mode | ΣΔ type ADC | |
| Input Error | Maximum Error at 25°C (77°F) | ±0.2% of full scale plus reference Junction compensation accuracy ±4°C max | ±0.2% of full scale |
| | Temperature Coefficient | ±0.006% of full scale/°C | |
| | Repeatable after Stabilization Time | ±0.5% of full scale | |
| | Nonlinear | ±0.2% of full scale | |
| | Maximum Error | ±1% of full scale | |
| Data | Digital Resolution | All types: 4,096 increments (12 bits)*1 Type K: 13,000 increments (14 bits)*2 Type J: 12,000 increments (14 bits)*2 Type T: 4,000 increments (12 bits)*2 | 4,096 increments (12 bits)*1 6,000 increments (13 bits)*2 |
| | Input Value of LSB*4 | Type K: 0.325°C/0.585°F*1 Type J: 0.300°C/0.540°F*1 Type T: 0.100°C/0.180°F*1 All types: 0.100°C*2/0.180°F*2 | 0.15°C/0.27°F*1 0.100°C/0.180°F*2 |

| | | EXM-ALM3LT | | |
|--------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--|
| Characteristics of Thermocouple & Temperature Inputs | | Thermocouple | Temperature Probes | |
| Data | Data Type in Application Program | Per 0.1 degrees°C (Type K: 0.0 to 1300.0 degrees°C) Per 0.1 degree°F (Type K: 32.0 to 2372.0 degrees°F) | | |
| | Monotonicity | Yes | | |
| | Input Data Out of Range | Detectable *5*6 | | |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | ±3% maximum*1 or ±1% maximum*2 when a 1 kV clamp voltage is applied to the I/O wiring and 1 kV is applied to the power directly. | Accuracy is not assured when noise is applied. | |
| | Common Mode Characteristics | Common mode reject ratio (CMRR): -50 dB | | |
| | Common Mode Voltage | 16 VDC | | |
| | Input Filter | No | | |
| | Crosstalk | 2 LSB max. | | |
| Voltage Endurance | | 500 V between input and power circuit | | |
| Isolation Method | | Photocoupler Isolation between input and internal circuit | | |
| Selection of Analog Input Signal Type | | Using software programming | | |
| Calibration or Verification to Maintain Rated Accuracy | | Approximately 10 years | | |
| Disconnection detection | | No | | |
| External Connection | | 11-pin terminal connector | | |

*1 Compatible with models that have revision "PV: 03 RL: 07 SV: 1.2". Please refer to "Revision" on page 5.

*2 Compatible with models that have revision "PV: 04 RL: 08 SV: 2.0". Please refer to "Revision" on page 5.

*3 Total input system transfer time = sample repetition × 2 + internal operation time + 1 scan time.
The value is the maximum time.

For Thermocouple,

as for revision "PV: 03 RL: 07 SV: 1.2", Typ 33ms + 1 scan time

as for revision "PV: 04 RL: 08 SV: 2.0", Typ 36.5ms + 1 scan time

For Temperature Probes,

as for revision "PV: 03 RL: 07 SV: 1.2", Typ 43ms + 1 scan time

as for revision "PV: 04 RL: 08 SV: 2.0", Typ 26.5ms + 1 scan time

*4 The input value per 1 bit is as shown in the table. LT truncates a number to the 2nd decimal places.

EX.) LT shows 100.1°C for the value, 100.15°C.

*5 If the input data is not in the range, the error code RGEF130 (Input data error) is output for the analog module. Once the error occurs, input data from the point of the error is no longer updated. For more information about error codes, read the "Maintenance/Troubleshooting Guide".

*6 The input value may be regarded as "Input Data Out of Range" due to the maximum error even when it is in the specified input range. Before inputting the value, therefore, consider the maximum error.

| Model No. | EXM-ALM3LT | |
|------------------------------|------------------|-------------------|
| Analog Output Specifications | Voltage Output | Current Output |
| Rated Output Voltage Range | From DC0 to 10 V | From DC4 to 20 mA |

| Model No. | | EXM-ALM3LT | |
|--------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------|
| Analog Output Specifications | | Voltage Output | Current Output |
| Load | Load Impedance | 2 k Ω min.*1, 1 k Ω min.*2 | 300 Ω max. |
| | Application Load Type | Resistive load | |
| D-A Conversion | Conversion Time | 130 ms | |
| | Total Output System Transfer Time | 130 ms + 1 scan time*1 10 ms + 1 scan time*2 | |
| Output Error | Maximum Error at 25°C (77°F) | $\pm 0.2\%$ of full scale | |
| | Temperature Coefficient | $\pm 0.015\%$ of full scale/°C | |
| | Repeatable after Stabilization Time | $\pm 0.5\%$ of full scale | |
| | Output Voltage Drop | $\pm 1\%$ of full scale | - |
| | Nonlinear | $\pm 0.2\%$ of full scale | |
| | Output Ripple | 1 LSB max. | |
| | Overshoot | 0% | |
| | Total Error | $\pm 1\%$ of full scale | |
| Data | Digital Resolution | 4,096 increments (12 bits) | |
| | Output Value of LSB | 2.5 mV | 4 μ A |
| | Data Type in Application Program | 0 to 4095 (12 bit data) -32768 to 32767 (optional range designation)*3 | |
| | Monotonicity | Yes | |
| | Current Loop Open | - | Not detectable |
| Noise Resistance | Maximum Temporary Deviation during Electrical Noise Tests | $\pm 3\%$ maximum when a 1 kV clamp voltage is applied to the I/O wiring and 1 kV is applied to the power directly. | |
| | Cable | Twisted-pair shielded cable is recommended for improved noise immunity | |
| | Crosstalk | No crosstalk because of 1 channel output | |
| Voltage Endurance | | 500 V between output and power circuit | |
| Isolation Method | | Photocoupler Isolation between output and internal circuit | |
| Selection of Analog Output Signal Type | | Using software programming | |
| Calibration or Verification to Maintain Rated Accuracy | | Approximately 10 years | |
| Disconnection detection | | No | |
| External Connection | | 11-pin terminal connector | |

*1 Compatible with models that have revision "PV: 03 RL: 07 SV: 1.2". Please refer to "Revision" on page 5.

*2 Compatible with models that have revision "PV: 04 RL: 08 SV: 2.0". Please refer to "Revision" on page 5.

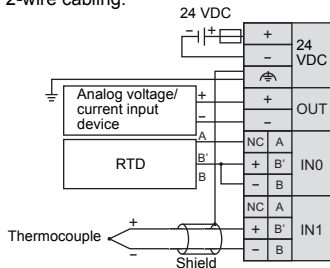
*3 The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

◆ Wiring

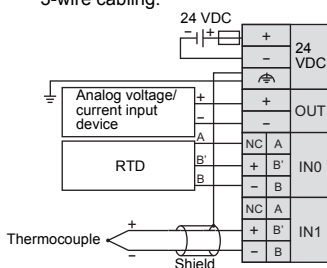
□ indicates a fuse.

<EXM-ALM3LT>

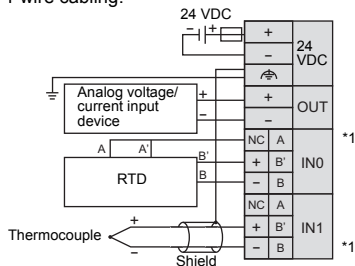
2-wire cabling:



3-wire cabling:



4-wire cabling:



*1

*1 For 4-wire cabling, output A' is not connected.

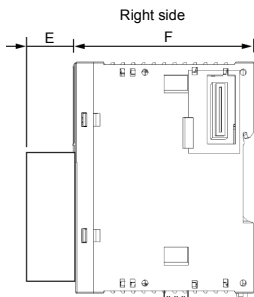
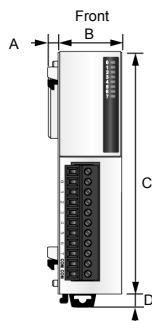
IMPORTANT

- The power for the analog module should be supplied separately from the LT.
Turn the analog module on before turning the LT on. Wait at least 30 seconds after power-off to restart the external power-supply or it may not operate properly.
- Be sure the analog IN/OUT lines (especially, Temperature Probes) are placed in a separate duct from high-frequency, live lines such as high-voltage, high-power lines, inverters, etc.

NOTE

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect cables to a channel that is not used. When the input is open, an error code (RGEF130 input data error) occurs to the unused channels, then the invalid values are input. Do not map the parameters on the unused channels.
- When connecting an RTD, connect the three wires to terminals A, B', and B of input channel 0 or 1.
- When connecting a thermocouple, connect the two wires to terminals B' and B of input channel 0 or 1.

16. Dimensions



Unit: mm [in.]

| Model No. | A | B | C | D | E | F |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|--------------|-----------------------------|----------------|--------------|
| EXM-DMM24DRF | 3.8 [0.15] | 39.1 [1.54] | 90 [3.54] | 4.5 ^{*1} [0.18] | 1.0 [0.04] | 70 [2.76] |
| EXM-ARI8LT | 3.8 [0.15] | 39.1 [1.54] | 90 [3.54] | 4.5 ^{*1} [0.18] | 14.6 [0.57] | 70 [2.76] |
| EXM-DDI16DT EXM-DDI8DT EXM-DRA8RT EXM-DRA16RT EXM-DDO8UT EXM-DDO8TT EXM-DMM8DRT EXM-AMI2HT EXM-ALM3LT EXM-AMM3HT EXM-AMO1HT EXM-AVO2HT EXM-AMI4LT EXM-AMM6HT | 3.8 [0.15] | 23.5 [0.93] | 90 [3.54] | 4.5 ^{*1} [0.18] | 14.6 [0.57] | 70 [2.76] |
| EXM-DDO16UK EXM-DDO16TK | 3.8 [0.15] | 17.6 [0.69] | 90 [3.54] | 4.5 ^{*1} [0.18] | 11.3 [0.44] | 70 [2.76] |

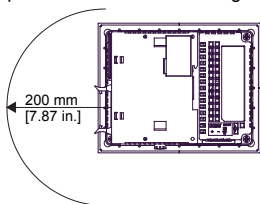
*1 The length of the pulled out hook is 8.5 mm [0.33 in.].

17. Installation

17.1 Installation requirements

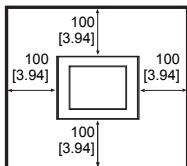
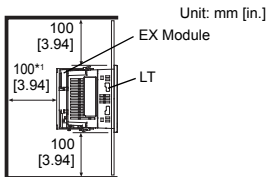
IMPORTANT

- Be sure to clamp the I/O cables wired for EX module within 200 mm [7.87 in.] position from the connector to prevent EX module's damage.



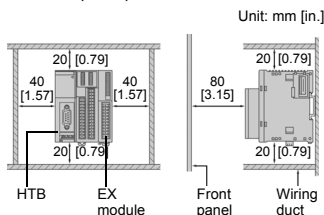
- In order to improve maintenance performance, operability and aeration performance, provide the following amount of space between the LT that mounts the EX module, or the Hybrid Terminal Block (HTB) and other parts or structural objects.

Attachment at the rear side of the LT



- *1 As with the LT, provide space (100 mm [3.94 in.]) between the EX module on the rear side of the LT and other structural objects (the EX module as a unit requires 80 mm [3.15 in.] space).

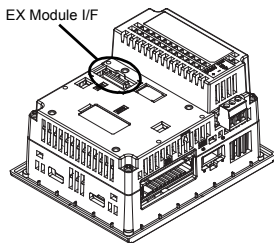
Connection to a Hybrid Terminal Block (HTB)



17.2 Attachment/Removal

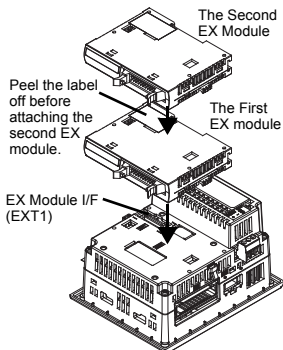
Attachment / Removal

- Peel off the label from the EX module interface on the rear side of the LT.

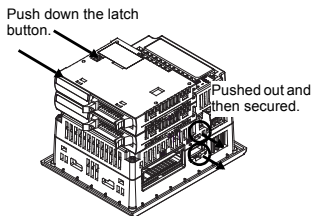


(LT-3200 Series)

- (2) Attach the first EX module to the rear side of the LT.
Insert the extension connector at the left side of the first EX module to the EX module interface (EXT1) of the LT. Attach the second and third EX modules in a similar manner.



- (3) Push down the latch buttons on the top to secure the EX module to the LT.

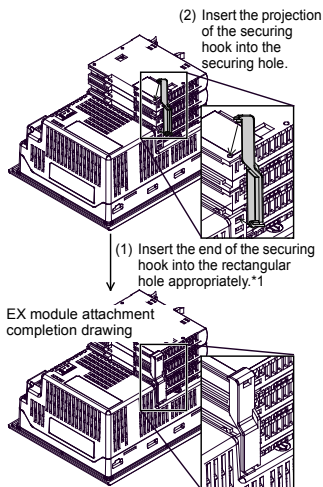


IMPORTANT

- Make sure to fix the EX modules to the LT securely using the latch buttons.
- Up to two EX modules can be connected to the rear side of the LT-3200 Series.
- Up to three EX modules can be connected to the rear side of the LT-3300 Series. Only the third EX module

must be fixed with the securing hook attached to the LT

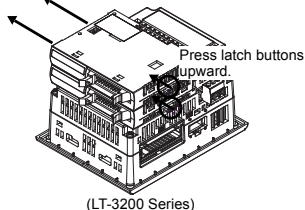
- As for EXM-DMM24DRF and EXM-ARI8LT, only one EX module can be connected to an LT.



*1 Before the insertion step, determine the position of the rectangular hole. The appropriate position varies depending on the combination of the EX modules that you use.

■ Removal

- (1) To remove the EX module, push up the latch buttons to unlock it.
Latch buttons released when pushed out



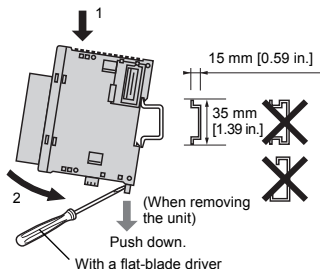
17.3 Mounting to / Removal from a DIN rail

NOTE

- Use a DIN rail when connecting the EX module to a HTB.

■ Attachment

Put the upper groove of the unit on the upper edge of the DIN rail. Push the lower side of the unit to the lower edge of the DIN rail unit it clicks.



■ Removal

While pushing down the hook in the direction of the arrow with a flat-blade driver, pull the lower side of the unit and remove the unit from the DIN rail.

IMPORTANT

- Check the vertical direction of the unit. Attach the unit on to the vertical plane properly. Improper mounting of the unit may prevent heat release and proper operation of the unit.
- The unit release hooks are kept open when not used. Make sure that the unit release hooks close properly and the unit is firmly fixed on the DIN rail.

18. Wiring

⚠ WARNING

- To avoid an electric shock, prior to connecting this unit's power cord terminals to the power supply screw terminal block, confirm that this unit's power supply is completely turned OFF, via a breaker, or similar unit.
- Any other power level can damage both this unit and the power supply.
- When the FG terminal is connected, be sure the wire is grounded.

IMPORTANT

- Make sure to remove the connectors from this unit first, then connect cables to the terminal. Failure to do so may cause an electric shock.

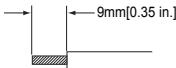
18.1 Power Supply and FG Terminal

NOTE

- This power supply and FG terminal are mounted to the EXM-ARI8LT.

■ Power Cord Cable Specification

Use copper conductors only.

| | |
|---------------------|---------------------------------------------------------------------------------------------------|
| Power Cord Diameter | 0.75 to 1.3 mm ² (18 - 16 AWG) |
| Conductor type | Stranded Wire *1 |
| Conductor Length |  9mm[0.35 in.] |

*1 If the conductor's end (individual) wires are not twisted correctly, the end wires may either short against each other, or against an electrode.

Use the following items when performing wiring. Items are made by Phoenix Contact.

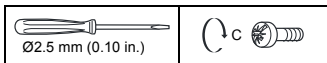
| | |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recommended Driver | SZS 0,4X2,5 (1205037) |
| Recommended Pin Terminals | AI 1,5-8 BK (3200043) (For FG only) AI 1-8 RD(3200030) AI-TWIN2X0,75-8 GY (3200807) AI 0,5-8 WH(3200014) AI-TWIN2X0,5-8 WH (3200933) |
| Recommended Pin Terminal Crimp Tool | CRIMPFOX ZA 3 (1201882) |

■ Power Cord Cable Connection

- (1) Confirm that the power cord of the unit, connected the EX module, is unplugged from the power supply.
- (2) Loosen the screw of the terminal connector to which the power cord cable is connected.



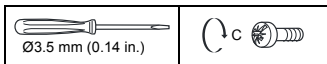
- (3) Strip the power cord cable and twist the core of the power cord cable. Insert it into the pin terminal and crimp the terminal. Attach the terminal to the terminal connector.
- (4) Fasten the screw of the terminal connector to secure the power cord cable.



IMPORTANT

- The torque required to tighten these screws is 0.22 to 0.25N•m.
 - Do not solder the cable connection.
- (5) Insert the connector, which the power cord cable is connected to, into the terminal block.

■ Connection of the Functional Ground Screw



IMPORTANT

- The torque required to tighten the screw is 0.5N•m.

18.2 Terminal Connector

NOTE

- Models that have interfaces to the terminal connector are as follows:

10 pin connector compatible models:

| | |
|-------------|-------------|
| EXM-DDI8DT | EXM-DDO8TT |
| EXM-DDI16DT | EXM-DRA16RT |
| EXM-DDO8UT | EXM-AMM6HT |

11 pin connector compatible models:

| | |
|-------------|------------|
| EXM-DRA8RT | EXM-AMO1HT |
| EXM-DMM8DRT | EXM-AMM3HT |
| EXM-AMI2HT | EXM-ALM3LT |
| EXM-AVO2HT | EXM-AMI4LT |

13 pin connector compatible model:

EXM-ARI8LT

I/O Cable Specification

| | |
|----------------------------------------------------------|-----------------------------------------------|
| I/O Cable Diameter | 0.20 to 1.31 mm ² (24 - 16 AWG) |
| Cable length in compliance with electromagnetic immunity | 3 m (max.) |
| Conductor Type | Simple or Twisted Wire*1 |

*1 If the conductor's end (individual) wires are not twisted correctly, the end wires may either short against each other, or against an electrode.

NOTE

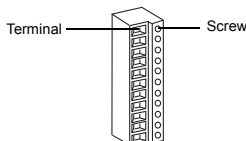
- Terminal connector is CA6-EXMCNRS10P-01(10 pins)/CA6-EXMCNRS11P-01(11 pins) from Pro-face, or MC1,5/10-ST-3,5(10 pins)/MC1,5/11-ST-3,5(11 pins) from PHOENIX CONTACT.

Use the following items when performing wiring. Items are made by Phoenix Contact.

| | |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recommended Driver | SZS 0,4X2,5 (1205037) |
| Recommended Pin Terminals | AI 1,5-8 BK (3200043) (For FG only) AI 1-8 RD(3200030) AI-TWIN2X0,75-8 GY (3200807) AI 0,5-8 WH(3200014) AI-TWIN2X0,5-8 WH (3200933) |
| Recommended Pin Terminal Crimp Tool | CRIMPFOX ZA 3 (1201882) |

I/O Cable Connection

- Confirm that the power cord of the unit, connected the EX module, is unplugged from the power supply.
- Loosen the screw of the terminal connector to which the I/O cable is connected.



- Strip the I/O cable and twist the core of the I/O cable. Insert it into the pin terminal and crimp the terminal. Attach the terminal to the terminal connector.
- Fasten the screw of the terminal connector to secure the I/O cable.

IMPORTANT

- Use a flat-blade screwdriver (Size 0.4 × 2.5) to tighten the terminal screws. The torque required to tighten these screws is 0.22 to 0.25N•m.
- Do not solder the cable connection.

- (5) Insert the terminal connector, which the I/O cable is connected to, into the terminal block.

NOTE

- The terminal connector withstands insertion and removal more than 100 times.

18.3 MIL Connector

NOTE

- Models that have MIL connector interfaces are as follows:

EXM-DDO16UK

EXM-DDO16TK

■ I/O Cable Specifications

| | |
|----------------------------------------------------------|-------------------------------|
| I/O Cable Diameter | 0.08 mm ² (28 AWG) |
| Cable length in compliance with electromagnetic immunity | 3 m (max.) |

NOTE

- MIL connector from Oki Electric Cable Co., Ltd. FL20A2F0 is recommended.

18.4 Terminal Block (nonremoval)

NOTE

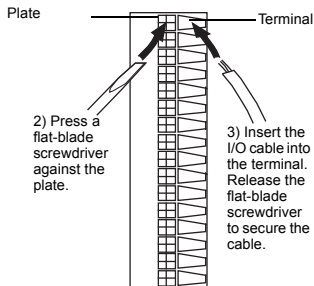
- This terminal block is mounted to the EXM-DMM24DRF and cannot be removed.

■ I/O Cable Specifications

| | |
|----------------------------------------------------------|---------------------------------------------|
| I/O Cable Diameter | 0.5 to 1.0 mm ² (20 - 18 AWG) |
| Cable length in compliance with electromagnetic immunity | 3 m (max.) |

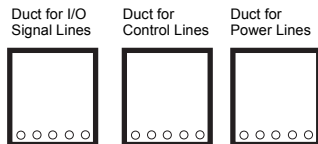
■ I/O Cable Connection

- Confirm that the power cord of the unit, connected the EX module, is unplugged from the power supply.
- Push in the plate next to the terminal with a flat-blade screwdriver (size: 2.5 x 0.4 mm).
- The terminal opens. Insert the stripped I/O cable. Release the flat-blade screwdriver to allow the terminal to clamp the I/O cable.

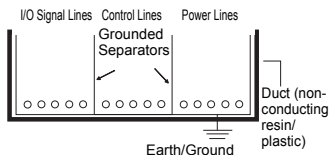


18.5 Wiring Precaution

- To help prevent noise and interference problems, separate all control, communication and power lines by placing them in a separate ducts.



If different wires must be placed in the same duct, separate them with an earthed/grounded divider.



NOTE

- If the lines cannot be separated, use shielded lines and create a ground from the shield line.

IMPORTANT

- Use noise-reducing external wiring methods to increase overall system reliability.
- To prevent power surges or noise interference, use ducts to separate all DC I/O or current circuit wires from communication cables.
- To prevent malfunctions due to noise, communication cables must be wired separately from high-frequency lines and power lines such as high-voltage lines, high-current lines, and inverters.

After-sales service

For details on after-sales service, refer to Pro-face website at <http://www.pro-face.com/trans/en/manual/1001.html>



California Proposition 65 Warning—Lead and Lead Compounds

Advertencia de la Proposición 65 de California—Plomo y compuestos de plomo

Avertissement concernant la Proposition 65 de Californie—Plomb et composés de plomb

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