Panasonic

Motion Controller

Reference Manual

Hardware

WUME-GM1H-10

2024.12

(MEMO)

Introduction

Thank you for purchasing a Panasonic product. Before you use the product, please carefully read through the installation instructions and the manuals, and understand them in detail to use the product properly.

Types of Manuals

- There are different types of manuals for the GM1 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.

  These manuals can be downloaded from our website: https://industry.panasonic.com/global/en/products/fasys/plc/mc/gm1

Manuals for GM1 series

Manual name	Manual code	Manual description
GM1 Series Reference Manual (Hardware Edition)	WUME-GM1H	Explains the functions and performance of each GM1 unit.
GM1 Series Reference Manual (Instructions Edition)	WUME-GM1PGR	Explains the specifications of each instruction that can be used with the GM1 Series.
GM1 Series Reference Manual (Analog I/O Unit Edition)	WUME-GM1AIO	Explains the functions and performance of the GM1 Analog Expansion Unit.
GM1 Series Reference Manual (Pulse Output Unit Edition)	WUME-GM1PG	Explains the functions and performance of the GM1 Pulse Output Unit.
GM1 Series Reference Manual (Serial Communication Unit Edition)	WUME-GM1SC	Explains the functions and performance of the GM1 Serial Communication Unit.
GM1 Series User's Manual (Operation Edition)	WUME-GM1OP	Explains how to use GM Programmer and PANATERM Lite for GM, set up each function, create projects, and perform other operations.

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Table of Contents

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1 Before Using This Product

1.1 Safety Precautions

This section explains important rules that must be observed to prevent personal injury and property damage.

- Injuries and damages that may occur as a result of incorrect use are classified into the following levels and safety precautions are explained according to the level.

⚠ **WARNING**	Indicates that there is a risk of death or serious injury
⚠ **CAUTION**	Indicates that there is a risk of minor injury or property damage

⃠	Indicates an action that is prohibited
❗	Indicates an action that must be taken

⚠ **WARNING**	
❗	• Take safety measures outside this product to ensure the safety of the entire system even if this product fails or an error occurs due to external factors.
⃠	• Do not use this product in atmospheres that contain flammable gases. Doing so may result in explosion.
⃠	• Do not throw this product into the fire. Doing so may cause the batteries or other electronic parts to explode.

⚠ **CAUTION**	
❗	• To prevent abnormal heat generation or smoke generation, use this product with some leeway from the guaranteed characteristics and performance values of the product.
⃠	• Do not disassemble or modify this product. Doing so may result in abnormal heat generation or smoke generation.
⃠	• Do not touch any terminals while the power is on. Doing so may result in electrical shock.
❗	• Configure emergency stop and interlock circuits outside this product.
❗	• Connect wires and connectors properly. Failure to do so may result in abnormal heat generation or smoke generation.
⃠	• Do not perform work (such as connection or removal) with the power turned on. Doing so may result in electrical shock.
❗	• If this product is used in any way that is not specified by Panasonic, its protection function may be impaired.
❗	• This product has been developed and manufactured for industrial use only.

1.2 Handling Precautions

■ **In this manual, the following symbols are used to indicate safety information that must be observed.**

Stop	Indicates an action that is prohibited or a matter that requires caution.
!	Indicates an action that must be taken.
Info.	Indicates supplemental information.
Note	Indicates details about the subject in question or information useful to remember.
1 2 Procedure	Indicates operation procedures.

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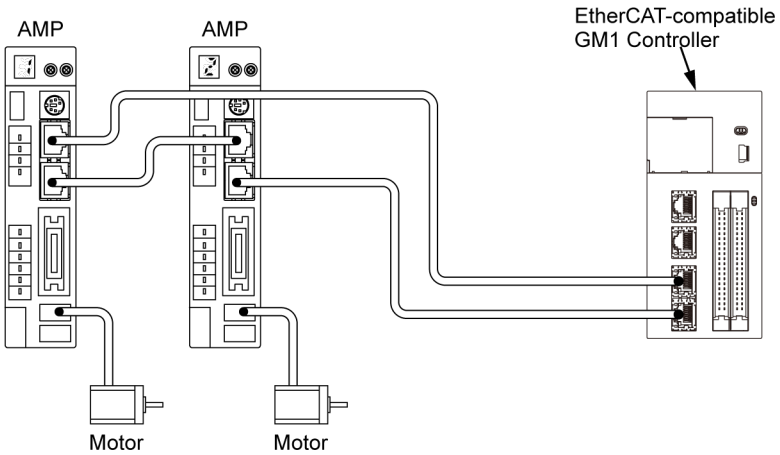
2 System Configuration

2.1 Outline of the GM1 System

■ Network control

With the RTEX-compatible GM1 Controller, a MINAS series A6N/A5N servomotor network system can be easily configured using the RTEX network dedicated to motion control.

The EtherCAT-compatible GM1 Controller is a MINAS series servomotor network system can be easily configured by adopting EtherCAT communication.



■ Two LAN ports

There are two Ethernet connection ports.

Each port can have a unique IP address. They can be used for different purposes, such as for an in-device network or for a host system network.

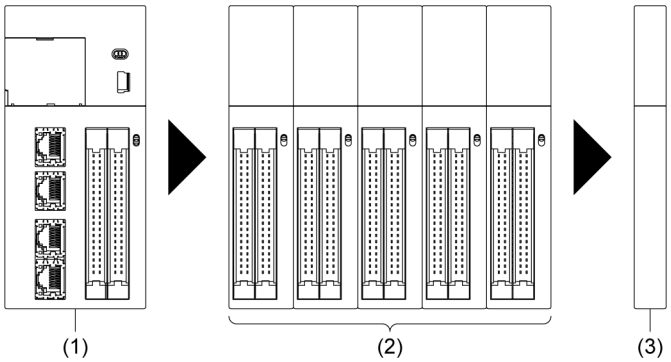
■ Equipped with the high-speed counter input and PWM output

The RTEX-compatible GM1 Controller / EtherCAT-compatible GM1 Controller is equipped with a 2-ch high-speed counter input for 16 MHz (multiplied by 4) and a 4-ch PWM output that can output a maximum of 100 kHz. These functions can be used without adding expansion units.

2.2 Restrictions on the Number of Expansion Units

Up to 15 expansion units can be mounted on the right side of the GM1 Controller (RTEX-compatible / EtherCAT-compatible).

Example: For RTEX-compatible GM1 Controller



(1)	RTEX-compatible GM1 Controller	(2)	Expansion units	(3)	End unit(Note 1)

(Note 1) Make sure to connect an end unit to the end of the system.

2.3 Programming Tools

Programming software

Product name	Applicable version	Product No.
GM Programmer	Japanese / English / Chinese	AGMSMP

(Note 1) When the GM Programmer is installed, MINAS setup support software "PANATERM Lite for GM" is installed at the same time.

Software operating environment

Item	Description
OS	Microsoft(R) Windows(R) 10：32bit/64bit Microsoft(R) Windows(R) 11：64bit

Info.

For the tool operation, refer to the *GM1 Controller User's Manual (Operation)*.

3 Product Lineup

3.1 GM1 controller

Name	Specifications						Product No.
	Communication	High-speed counter	PWM output	Input	Output	Number of axes controlled	
GM1controller	Ethernet : 2 ports RS-232C : 1 port	2 ch	4 ch	16 points	16 points Transistor output Sink Type (NPN)	RTEX Max. 32 axis	AGM1CSRX16T
					Transistor output Sink Type(NPN)	EtherCAT Max. 32 axis	AGM1CSEC16T
					Transistor output Source Type(PNP)		AGM1CSEC16P

3.2 Expansion Unit

3.2.1 Digital I/O Unit

Name	Specifications		Product No.
	Input	Outpt	
GM1 Digital Input Unit	64 points	—	AGM1X64D2
GM1 Digital Output Unit	—	64 points Transistor output Sink Type (NPN)	AGM1Y64T
		64 points Transistor output Source Type (PNP)	AGM1Y64P
GM1 Digital I/O Unit	32 points	32 points Transistor output Sink Type(NPN)	AGM1XY64D2T
		32 points Transistor output Source Type (PNP)	AGM1XY64D2P

3.2.2 Analog I/O Unit

Name	Specifications	Product No.
GM1 Analog Input Unit	8 ch voltage input / current input	AGM1AD8
GM1 Analog Output Unit	4 ch voltage output / current output	AGM1DA4

3.2.3 Pulse Output Unit

Name	Specifications	Product No.
GM1 Pulse Output Unit	4 axis Transistor output	AGM1PG04T
	4 axis Line driver output	AGM1PG04L

3.2.4 Serial Communication Unit

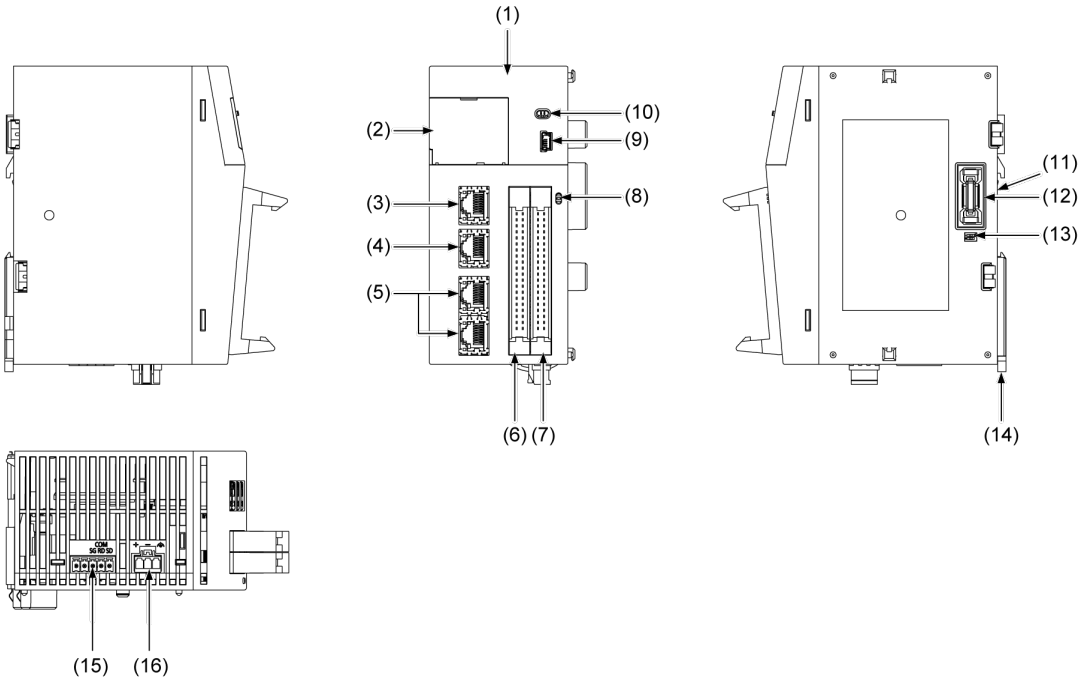
Name	Specifications	Product No.
GM1 Serial Communication Unit	RS-232C × 2ch	AGM1NSCS2
	RS-422A/485 × 2ch	AGM1NSCM2
	RS-232C × 1ch RS-422A/485 × 1ch	AGM1NSCS1M1

4 Names and Functions of Components

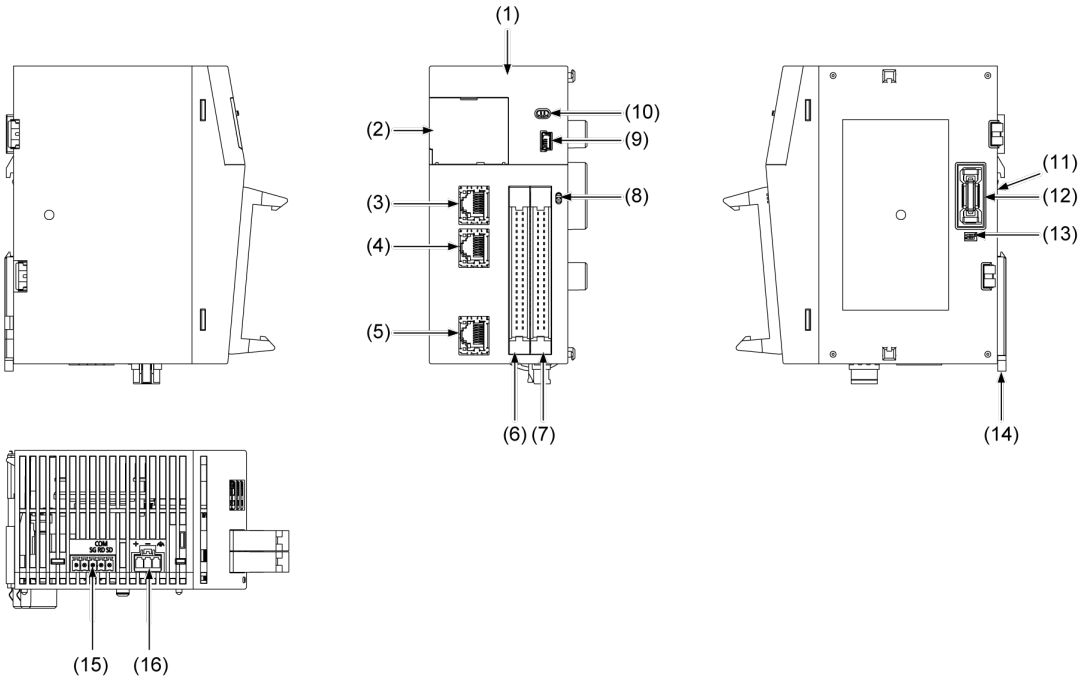
4.1 GM1 controller

■ Names and Functions of Components

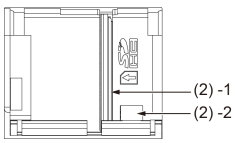
GM1 controller RTEX Type



GM1 controller EtherCAT Type



■ Function

No.	Name	Function
(1)	Operation monitor LEDs	LEDs indicate the RTEX-compatible GM1 Controller state.
(2)	Card cover(Note 1) Inside the card cover 	Stores the SD memory card. The following are contained inside the cover. (2) -1 SD memory card slot (2) -2 Cover switch
(3)	LAN port 1	Ethernet connector
(4)	LAN port 2	Ethernet connector
(5)-1	RTEX port	Motion network connector dedicated for connecting the MINAS A6N or A5N series ● "RX" reception side ● "TX" transmission side
(5)-2	EtherCAT port	Motion network connector dedicated for connecting the MINAS A6B or A5B series
(6)	High-speed counter input connector	High-speed counter input connect parts
(7)	General-purpose I/O connector	General-purpose I/O connector parts
(8)	Display selector switch	Used to select either the input state (X) or the output state (Y) of operation monitor LEDs

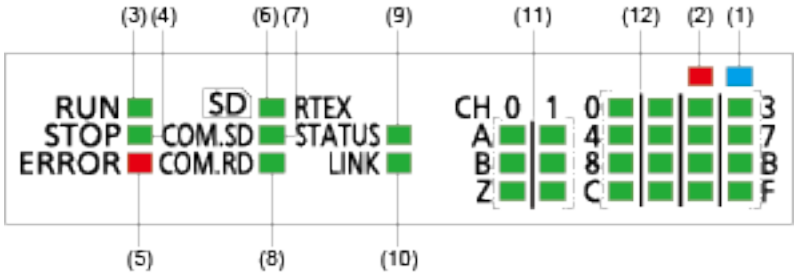
No.	Name	Function
(9)	USB port	Used to connect to a personal computer that uses a tool software. (miniB type)
(10)	Mode selector switch	Used to change the mode to RUN or STOP. Regardless of whether the switch is set to RUN or STOP, the mode can be switched through remote operation from the GM Programmer. When power is turned ON, it operates in the mode set on the switch.
(11)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(12)	Unit connector	This is a connector to which each expansion unit is connected. An end unit is fitted when the unit is shipped.
(13)	Dip switches 	SW1 : Do not change the setting. It is set to ON as the factory default. SW2 : Reset bit This is the switch used to reset the devices. If the power supply is turned ON with the mode selector switch set to STOP and the reset bit set to ON, the “Device reset (GM1 initialization)” function is implemented
(14)	DIN hook	Used to fix the Controller to a DIN rail
(15)	COM port terminal	Serial (RS-232C) connector
(16)	Power supply connector	24 V DC power supply connector

(Note 1) Do not apply an excessive force to the card cover when opening or closing it or when the cover is left open.

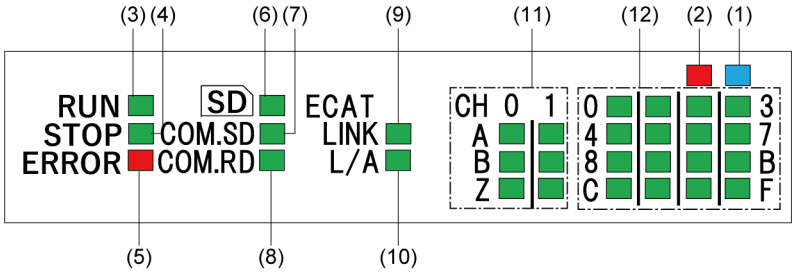
Otherwise, the cover attachment part will be deformed to cause malfunction in the cover switch mounted inside the product.

■ Names and functions of operation monitor LEDs

GM1 controller RTEX Type



GM1 controller EtherCAT Type



■ Functions of operation monitor LEDs

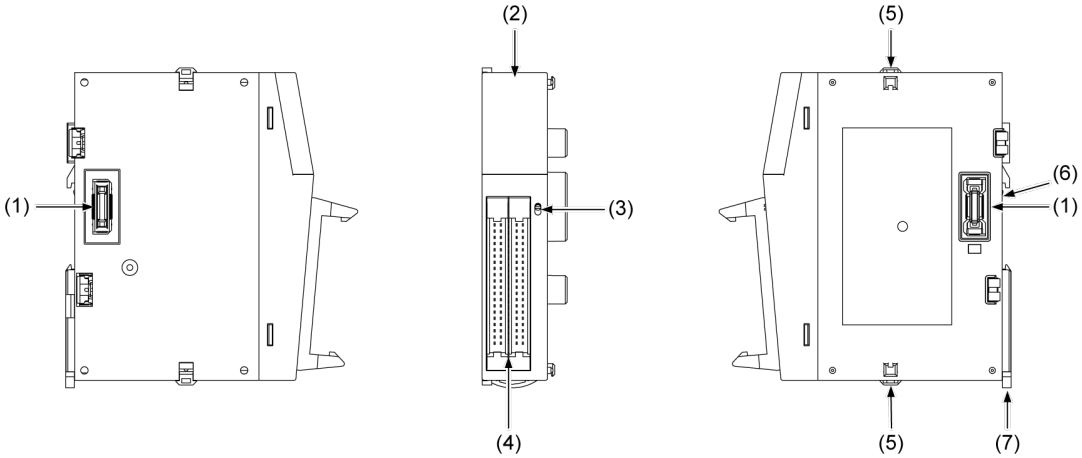
No.	Name	LED color	Function
(1)	Power	Blue	Indicates the power state of the unit. Lit: Power supply of the unit is started normally. Unlit: Power is not supplied. Or, there is an error in the power supply to the system.
(2)	Alarm	Red	Indicates that an alarm has occurred in the system. Lit: System error Unlit: Normal
(3)	RUN	Green	Indicates the operating state of the application. RUN (Lit) and STOP (Unlit): The application is in the operating state. RUN (Unlit) and STOP (Lit): The application is in the stopped state. RUN (Unlit) and STOP (Unlit): No application exists.
(4)	STOP	Green	
(5)	ERROR	Red	Indicates that an error has occurred in the system. Flashing: An error occurred. (Flashing cycle: ON for 0.5 sec and OFF for 0.5 sec) Unlit: Normal
(6)	SD	Green	Indicates an access state to the SD memory card. Lit: Currently accessing to the SD memory card Unlit: No access to the SD memory card
(7)	COM.SD	Green	Flashes while data is transmitted from the COM port.
(8)	COM.RD	Green	Flashes while data is received by the COM port.
(9)-1	RTEX STATUS	Green	Indicates the packet transmission / reception state through motion communication. Lit: Communication is established with normal communication. Flashing: Starting up Unlit: Communication is not established.
(9)-2	ECAT LINK	Green	Indicates the LINK state of EtherCAT communication. Lit: EtherCAT communication LINK is established. (= Operational mode) (All slave devices connected to the master device are in the Active state.) Flashing: EtherCAT is starting up. (When the Active state turns OFF due to wire disconnection or other reasons while the master device is in the Active state) Unlit: EtherCAT communication is not established. (When the master device is invalid or does not exist)
(10)-1	RTEX LINK	Green	Indicates the LINK state of motion communication. Lit: Normal connection (The TX of the sending node and the RX of the local node are electrically connected normally.) Unlit: Not connected
(10)-2	ECAT L/A	Green	ndicates the state of the physical port of EtherCAT communication. Lit: PHY LINK is established and data are transmitted / received. Flashing: PHY LINK is established and data are not transmitted / received. Unlit: PHY LINK is not established.
(11)	CH0 A、B、Z	Green	Indicates the status of the high-speed counter input signal

No.	Name	LED color	Function
	CH1 A、B、Z		(Note 1)
(12)	0-F	Green	Indicates the ON/OFF state of the Controller I/O depending on the state of the display selector switch. Display selector switch X Lit: Each terminal of the input contacts X0-XF is ON. Unlit: Each terminal of the input contacts X0-XF is OFF. Display selector switch Y Lit: Each terminal of the output contacts Y0-YF is ON. Unlit: Each terminal of the output contacts Y0-YF is OFF.

(Note 1) The LEDs for the high-speed counter input signal flash according to the input statuses. Thus look as if they are continuously lit if the input frequencies are high.

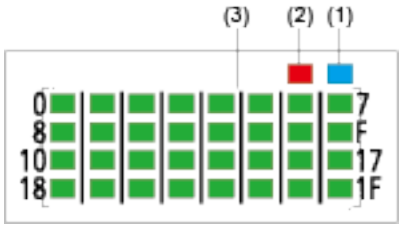
4.2 Digital I/O Unit

■ Names and Functions of Components



No.	Name	Function
(1)	Unit connector	This is a connector to which each expansion unit is connected.
(2)	Operation monitor LEDs	These LEDs indicate the status of expansion units.
(3)	Display selector switch	This is a switch used to select I/O information to be displayed on LEDs.
(4)	I/O connector	Used to connect input devices to output devices.
(5)	Expansion hook	This is a hook used to fix each expansion unit to another
(6)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(7)	DIN hook	Used to fix the Controller to a DIN rail

■ Names and functions of each operation monitor LED

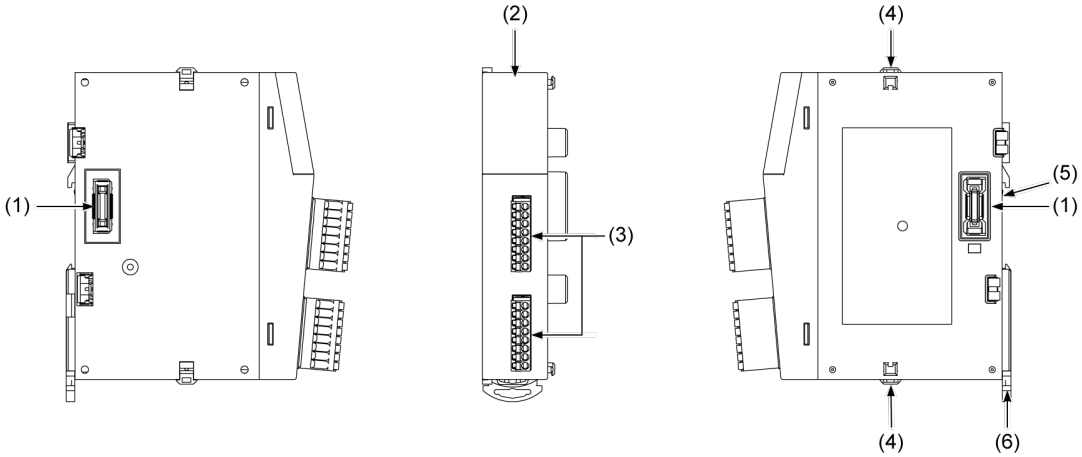


No.	Name	LED color	Function
(1)	Power	Blue	Indicates the power state of the unit. Lit: Power supply of the unit is started normally Unlit: Power is not supplied. Or, there is an error in the power supply to the system.
(2)	Alarm	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error Unlit: Normal

No.	Name	LED color	Function
(3)	0-1F	Green	Indicates the ON / OFF state of the expansion unit depending on the state of the display selector switch. ● 64-point digital input unit • Display selector switch CN1 Lit: Each terminal of the X0-1F is ON. Unlit: Each terminal of the X0-1F is OFF. • Display selector switch CN2 Lit: Each terminal of the X20-3F is ON. Unlit: Each terminal of the X20-3F is OFF. ● 64-point digital output unit • Display selector switch CN1 Lit: Each terminal of the Y0-1F is ON. Unlit: Each terminal of the Y0-1F is OFF. • Display selector switch CN2 Lit: Each terminal of the Y20-3F is ON. Unlit: Each terminal of the Y20-3F is OFF. ● 64-point digital I/O unit • Display selector switch CN1 Lit: Each terminal of the X0-1F is ON. Unlit: Each terminal of the X0-1F is OFF. • Display selector switch CN2 Lit: Each terminal of the Y0-1F is ON. Unlit: Each terminal of the Y0-1F is OFF.

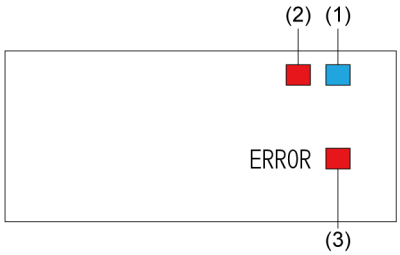
4.3 Analog I/O Unit

■ Names and Functions of Components



No.	Name	Function
(1)	Unit connector	This is a connector to which each expansion unit is connected.
(2)	Operation monitor LEDs	These LEDs indicate the status of expansion units.
(3)	I/O connector	Used to connect input devices or output devices.
(4)	Expansion hook	This is a hook used to fix each expansion unit to another.
(5)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(6)	DIN hook	Used to fix the Controller to a DIN rail

■ Names and functions of each operation monitor LED

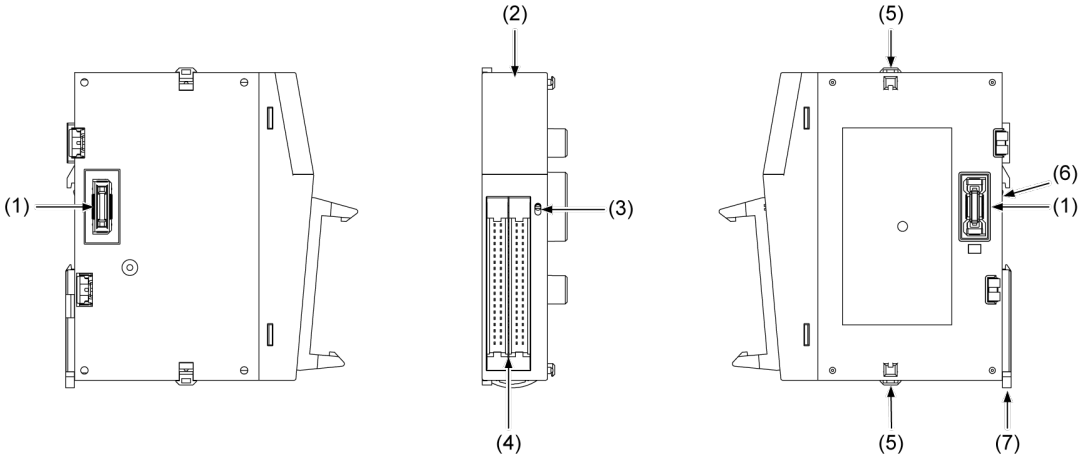


No.	Name	LED color	Function
(1)	Power	Blue	Indicates the completion of power processing of the unit. Lit: Power supply of the unit is started normally. Unlit: Power is not supplied. Or, there is an error in the power supply to the system.
(2)	Alarm	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error Unlit: Normal
(3)	ERROR	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error

No.	Name	LED color	Function
			Unlit: Normal

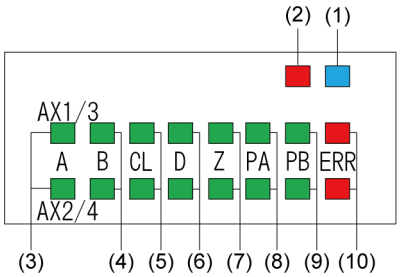
4.4 Pulse Output Unit

■ Names and Functions of Components



No.	Name	Function
(1)	Unit connector	This is a connector to which each expansion unit is connected.
(2)	Operation monitor LEDs	These LEDs indicate the status of expansion units.
(3)	Operation monitor selection switch	This switches operation display between the display for axes 1 and 2, and that for axes 3 and 4.
(4)	Output connector	This is used to connect an output device.
(5)	Expansion hook	This is a hook used to fix each expansion unit to another.
(6)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(7)	DIN hook	Used to fix the Controller to a DIN rail

■ Names and functions of each operation monitor LED



No.	Name	LED color	Function
(1)	Power	Blue	Indicates the completion of power processing of the unit. Lit: Power supply of the unit is started normally. Unlit: Power is not supplied. Or, there is an error in the power supply to the system.
(2)	Alarm	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error

No.	Name	LED color	Function
			Unlit: Normal
(3)	A	Green	Indicates the pulse output A signal.(Note 1) ● When set to pulse / sign output method Flashing: During pulse output Unlit: During stop ● When set to CW / CCW output method Flashing: During pulse output (Forward) Unlit: During stop (Forward)
(4)	B	Green	Indicates the pulse output B signal.(Note 1) ● When set to pulse / sign output method Lit: Reverse direction command Unlit: Forward direction command ● When set to CW / CCW output method Flashing: During pulse output (Reverse) Unlit: During stop (Reverse)
(5)	CL	Green	Indicates the counter clear signal output. Lit: Output ON Unlit: Output OFF
(6)	D	Green	Indicates the near home status.(Note 2) Lit: ON Unlit: OFF
(7)	Z	Green	Indicates the home input state.(Note 2) Lit: ON Unlit: OFF
(8)	PA	Green	Indicates the pulse input A signal.(Note 3)
(9)	PB	Green	Indicates the pulse input B signal.(Note 3)
(10)	ERR	Red	Indicates that an error has occurred in the unit. Lit: Error occurred. Unlit: Normal

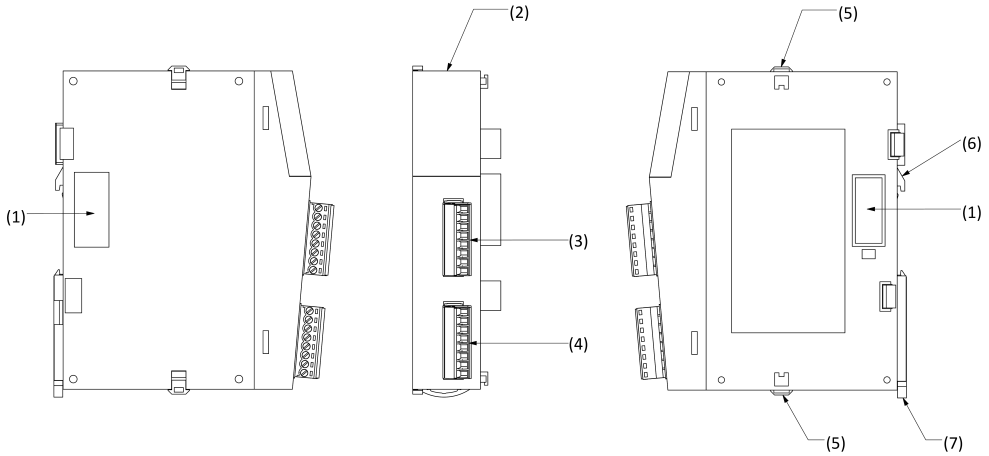
(Note 1) The pulse output signal display LEDs (A and B) blink at the output frequency (speed). For this reason they may appear to light steadily at high-speed output.

(Note 2) The near home (D) and home input (Z) LEDs light when the respective input becomes valid.

(Note 3) Pulse input signal (PA) and (PB) display the pulse signal input status.

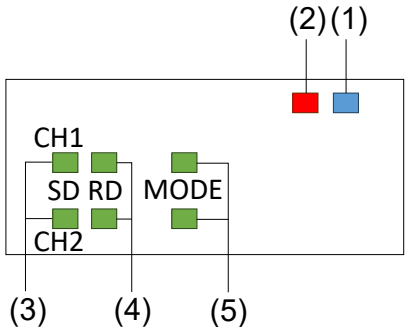
4.5 Serial Communication Unit

■ Names and Functions of Components



No.	Name	Function
(1)	Unit connector	This is a connector to which each expansion unit is connected.
(2)	Operation monitor LEDs	These LEDs indicate the status of expansion units.
(3)	Telecommunications connector 1	This is used to connect a serial communication device.
(4)	Telecommunications connector 2	This is used to connect a serial communication device.
(5)	Expansion hook	This is a hook used to fix each expansion unit to another.
(6)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(7)	DIN hook	Used to fix the Controller to a DIN rail

■ Names and functions of operation monitor LEDs



No.	Name	LED color	Function
(1)	Power	Blue	Indicates the completion of power processing of the unit. Lit: Power supply of the unit is started normally. Unlit: Power is not supplied. Or, there is an error in the power supply to the system.

No.	Name	LED color	Function
(2)	Alarm	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error Unlit: Normal
(3)	SD	Green	Flashes while data is being sent.
(4)	RD	Green	Flashes while data is being received.
(5)	MODE	Green	● RS-232C: Indicates the flow control (RS/CS) setting. Lit: Flow control Unlit: No flow control ● RS-422A/485: Indicates the communication method of the interface. Lit: RS-422A Unlit: RS-485

5 Specifications and Dimensions

5.1 Specifications of the GM1 Series

<table>
<tr><th>Item</th><th colspan="3">Specifications</th></tr>
<tr><td>Rated voltage</td><td colspan="3">24 V DC</td></tr>
<tr><td>Operating voltage range</td><td colspan="3">20.4 to 28.8 V DC</td></tr>
<tr><td>Allowable momentary power failure time</td><td colspan="3">24 V DC 10 ms or less (at Product shipment)</td></tr>
<tr><td rowspan="6">Dielectric strength</td><td>GM1 Controller</td><td>● Between all LAN ports and Power supply terminals ,all Function earths
● Between all High-speed counter input terminals, Input terminals and Output terminals
and Power supply terminal,all Function earths
● Between Input terminals ,Output terminals
and all High-speed counter input terminals
● Between all Input terminals and all Output terminal</td><td rowspan="6">500 V AC for one minute
(Leakage current: 5 mA)</td></tr>
<tr><td>Digital I/O Unit</td><td>● Between Input terminal,all Output terminals
and Controller supply terminal , all Function earths
● Between all Input terminals
and all Input terminals (different common terminals)
● Between all Output terminals
and all Output terminals⇔ (different common terminals)
● Between all Input terminals and all Output terminals</td></tr>
<tr><td>Analog I/O Unit</td><td>● Between Input terminals
and Controller supply , all Function earths
● Between Output terminals
and Controller supply , all Function earths</td></tr>
<tr><td>Pulse Output Unit</td><td>● Between Input terminals
and Controller supply , all Function earths
● Between Output terminals
and Controller supply , all Function earths</td></tr>
<tr><td>Serial Communication Unit</td><td>● Between all Communication connector 1 terminal
and Controller supply , all Function earths
● Between all Communication connector 2 terminal
and Controller supply , all Function earths
● Between all Communication connector 1 terminal
and all Communication connector 2 terminal</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="3">Specifications</th></tr>
<tr><td rowspan="6">Insulation resistance</td><td>GM1 Controller</td><td>● Between all LAN ports and Power supply terminals ,all Function earths
● and all High-speed counter input terminals, Input terminals,Output terminals
and Power supply terminal,All Function earth
● Between Input terminals ,all Output terminals
and all High-speed counter input terminals
● Between all Input terminals and all Output terminals</td><td rowspan="6">100 MΩ or more
(Test voltage 500 V DC)</td></tr>
<tr><td>Digital I/O Unit</td><td>● Between Input terminals ,all Output terminals
and Controller supply , all Function earths
● Between all Input terminals
and all Input terminals (different common terminals)
● Between all Output terminals
and all Output terminals⇔ (different common terminals)
● Between all Input terminals and all Output terminals</td></tr>
<tr><td>Analog I/O Unit</td><td>● Between Input terminals
and Controller supply , all Function earths
● Between Output terminals
and Controller supply , all Function earths</td></tr>
<tr><td>Pulse Output Unit</td><td>● Between all External connector terminal
and Controller supply terminal , all Function earths</td></tr>
<tr><td>Serial Communication Unit</td><td>● Between all Communication connector 1 terminal
and Controller supply , all Function earths
● Between all Communication connector 2 terminal
and Controller supply , all Function earths
● Between all Communication connector 1 terminal
and all Communication connector 2 terminal</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Vibration resistance</td><td colspan="3">5 to 8.4 Hz, half amplitude 3.5 mm,
8.4 to 150 Hz acceleration 9.8 m/s^2
10 sweeps each in X, Y and Z directions (1 octave/min)</td></tr>
<tr><td>Shock resistance</td><td colspan="3">147 m/s^2, 3 times each in the X, Y, Z directions</td></tr>
<tr><td>Noise resistance</td><td colspan="3">1000 V [p-p] with pulse widths of 1 μs and 50 ns (using a noise simulator) (Power supply terminal)</td></tr>
<tr><td>Operating ambient temperature</td><td colspan="3">0 to +55℃</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="3">-40 to +70℃</td></tr>
</table>

Item	Specifications		
Operating ambient humidity	10 to 95% RH (at +25℃, no condensation or icing)		
Storage ambient humidity	10 to 95% RH (at +25℃, no condensation or icing)		
Pollution degree	Pollution degree 2 or less		
Atmosphere	Free of corrosive gases No excessive dust		
Altitude	2,000 m above sea level or lower		
Overvoltage category	Category II		
Installation place	Inside a control panel that provides a protection rating of IP54 or higher.(metal panel with sufficient strength)		
weights	GM1 Controller	AGM1CSRX16T	Approx. 370 g (including the terminal block and end cover)
		AGM1CSEC16T	
		AGM1CSEC16P	
	Digital I/O Unit	AGM1X64D2	Approx. 160 g (including the terminal block)
		AGM1Y64T	
		AGM1Y64P	
		AGM1XY64D2T	
		AGM1XY64D2P	
	Analog I/O Unit	AGM1AD8	Approx. 150 g (including the terminal block)
		AGM1DA4	
	Pulse Output Unit	AGM1PG04T	Approx. 160 g (including the terminal block)
		AGM1PG04L	
	Serial Communication Unit	AGM1NSCS2	Approx. 150 g (including the terminal block)
		AGM1NSCM2	
		AGM1NSCS1M1	
consumption current	GM1 Controller	AGM1CSRX16T	400 mA or less
		AGM1CSEC16T	
		AGM1CSEC16P	
	Digital I/O Unit	AGM1X64D2	90 mA or less (Note 1)
		AGM1Y64T	160 mA or less (Note 1)
		AGM1Y64P	
		AGM1XY64D2T	120 mA or less (Note 1)
		AGM1XY64D2P	
	Analog I/O Unit	AGM1AD8	160 mA or less (Note 1)
		AGM1DA4	320 mA or less (Note 1)

Item	Specifications		
	Pulse Output Unit	AGM1PG04T	120 mA or less (Note 1)
		AGM1PG04L	
	Serial Communication Unit	AGM1NSCS2	120 mA or less (Note 1)
		AGM1NSCM2	140 mA or less (Note 1)
		AGM1NSCS1M1	130 mA or less (Note 1)

(Note 1) This value is the increase in the GM1 controller current consumption.(Operating voltage range：20.4 to 28.8 V DC)

5.2 GM1 Controller

5.2.1 Communication Specifications

Specifications of the RTEX Port

Item	Specifications
Baud rate	100 Mbps
Physical layer	100BASE-TX full duplex (IEEE 802.3u)
Insulation method	Pulse transformer
Communication cycle	500 µs to 2 ms
Command update period	500 µs to 4 ms
Number of connectable axes	32 real axes , 20 virtual axes (Total 52 axes)

Specifications of the EtherCAT Port

Item	Specifications
Baud rate	100 Mbps
Physical layer	100BASE-TX full duplex (IEEE 802.3u)
Insulation method	Pulse transformer
Communication cycle	500 us or more
Number of connectable axes	32 real axes , 20 virtual axes (Total 52 axes)

Specifications of the LAN Port

Item		Specifications
Number of ports		2
Communication interface		Ethernet 100BASE-TX / 10BASE-T
Baud rate		100 Mbps / 10 Mbps, automatic negotiation
Communication protocol		TCP/IP UDP
No. of simultaneous connections	LAN1	Max. 16 units (System connection: 1 unit, user connection: 15 units)
	LAN2	Max. 32 units, general-purpose: 16 units A cycle restriction is applied depending on the total number of connections.
Communication method		Full-duplex / half-duplex communication
TCP/IP protocol		TCP/IP compliant (IPV4)

Item		Specifications
LED display	LINK	Lit when connection is established with the device on the Ethernet network.
	ACT	Flashes when some communication is performed such as transmitting commands and responses with the devices with established connections.

Specifications of the COM Port (RS-232C)

Item		Specifications
No. of channels		1
Physical layer		RS-232C, three-wire system (non-isolated)
Communication mode		1:1 communication
Communication method		Half-duplex transmission
Baud rate		9600/19200/38400/57600/115200 bps
Communication format	Data length	7 bit/8 bit
	Parity	None, odd, even
	Stop bit	1 bit/2 bit
	Start code	None
	End code	None

Specifications of the USB Port

Item	Specifications
Standard	USB2.0 Fullspeed
Connector shape	USB MiniB type

5.2.2 Performance Specifications

Item		Specifications
SD (SDHC) memory card	Support media	SD memory card, SDHC memory card Max.32 GB
	Supported format standard	Conforms to SD standard.
	Operating mode indicator	LED display (Flashes when accessed.)
	Detection when the cover is open	Available
Memory capacity	Program	16 MB
	Variable (non-hold)	16 MB
	Variable (hold)	192 kB
Clock / calender	Clock accuracy	95 seconds max. per month (at 0℃) 15 seconds max. per month (at +25℃)

Item		Specifications
		130 seconds max. per month (at +55℃
	Holding time maintained by the internal capacitor when a power failure occurs	14 days or more (at +25°C) (Note 1)

(Note 1) The power-ON time of five minutes or longer is required.

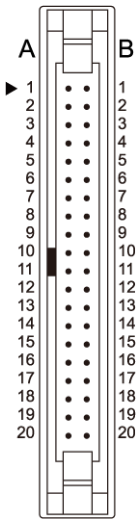
5.2.3 I/O specifications

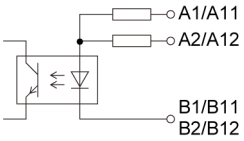
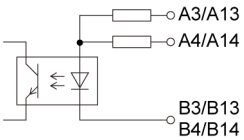
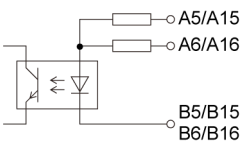
High-speed counter input part

■ Input specifications

Item	Specifications		
	Input A, B, Z signals		
	24 V DC	5 V DC	
		Open collector connection	Line driver connection
Insulation method	Optical coupler		
Rated input voltage	12 V DC to 24 V DC	5 V DC	Equivalent to AM26LS31
Operating voltage range	10.8 V DC to 26.4 V DC	3.5 V DC to 5.5 V DC	
Input points per common	Independent common for each point		
Min. ON voltage / Min. ON current	10 V DC/4 mA	3 V DC/4 mA	
Max. OFF voltage / Max. OFF current	2 V DC/2 mA	1 V DC/0.5 mA	
Input impedance	Approx. 3.9 kΩ	Approx. 560 Ω	
Operating mode indicator	6-point LED display		

■ Internal circuit diagram / Terminal layout diagram



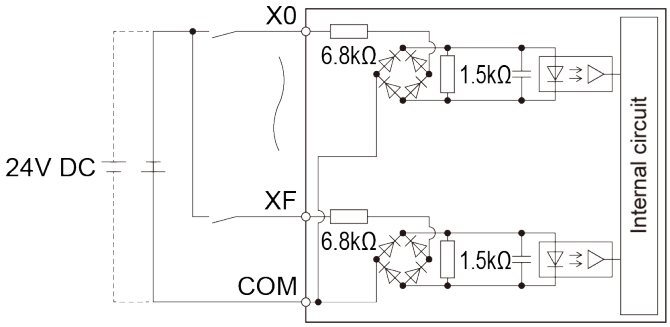
Pin No.		Circuit	Signal name
Ch0	Ch1		
A1	A11		Input A：24 V DC (12 V DC to 24 V DC)
A2	A12		Input A：5 V DC (3.5 V DC to 5 V DC)
B1	B11		Input A：COM
B2	B12		Input A：COM
A3	A13		Input B：24 V DC (12 V DC to 24 V DC)
A4	A14		Input B：5 V DC (3.5 V DC to 5 V DC)
B3	B13		Input B：COM
B4	B14		Input B：COM
A5	A15		Input Z：24 V DC (12 V DC to 24 V DC)
A6	A16		Input Z：5 V DC (3.5 V DC to 5 V DC)
B5	B15		Input Z：COM
B6	B16		Input Z：COM
A7 to A10	B7 to B10	—	—
A17 to A20	B17 to B20	—	—

General-purpose I/O part

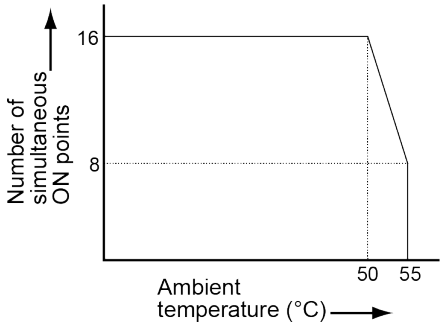
■ Input specifications

Item		Specifications
Insulation method		Optical coupler
Rated input voltage		24 V DC
Rated input current		Approx. 3 mA (at 24 V DC)
Input impedance		Approx. 6.8 kΩ
Operating voltage range		21.6 V DC to 26.4 V DC
Min. ON voltage / Min. ON current		19.2 V DC/6 mA
Max. OFF voltage / Max. OFF current		2.4 V DC/1 mA
Response time	OFF→ON	135 μs or less (Possible to change by using the input time constant selection function)
	ON→OFF	135 μs or less (Possible to change by using the input time constant selection function)
Input points per common		16 points/common
Operating mode indicator		16-point LED display (Lit when ON, SW selection)
External connection method		Connector connection (Compliant with the MIL standard, 40P)

■ Internal circuit diagram



■ Limitations on the number of simultaneous input ON points

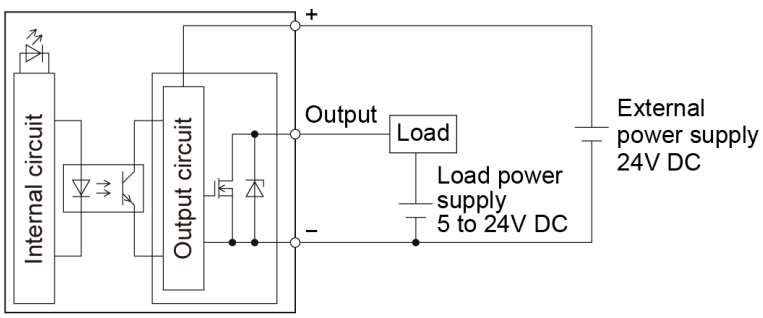


■ Output specifications (Sink type)

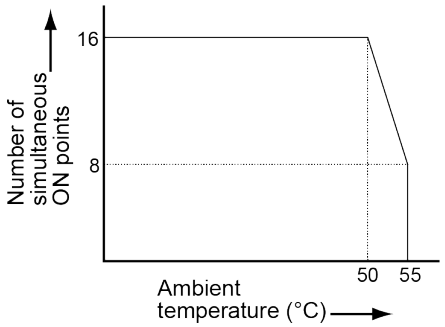
Item		Specifications
Insulation method		Optical coupler
Output type		NPN open collector
Rated load voltage		5 V DC to 24 V DC
Allowable load voltage range		4.75 V DC to 26.4 V DC
Max. load current		0.1 A
Common restrictions		1.6 A/Common
Max. inrush current		1.0 A
OFF state leakage current		1 μA or less
ON state max. voltage drop		0.7 V or less
Response time	OFF→ON	6 μs or less (at +25 ℃)
	ON→OFF	15 μs or less (at +25 ℃)
External power supply	Voltage	4.75 V DC to 26.4 V DC
	Current	15 mA or Less (at 24 V DC)
Surge absorber		Zener diode
Short-circuit protection		Provided (to automatically protect every eight points) (Note 1)
Input points per common		16 points/common
Operating mode indicator		16-point LED display (Lit when ON, SW selection)
External connection method		Connector connection (Compliant with the MIL standard, 40P)

(Note 1) When the maximum inrush current is exceeded, eight output points in the same protection block are turned OFF simultaneously.

■ Internal circuit diagram



■ **Limitations on the number of simultaneous output ON points**

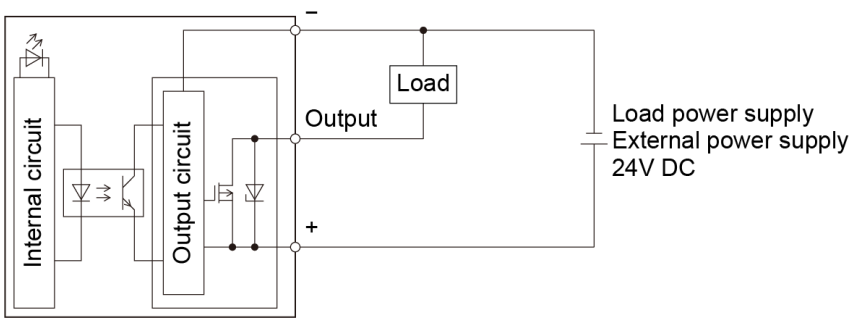


■ Output pecifications (Source Type) (EtherCAT compatible GM1 Controller only)

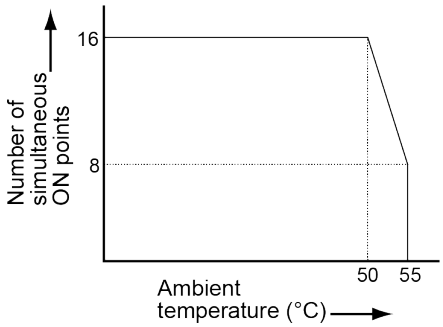
Item		Specifications
Insulation method		Optical coupler
Output type		PNP open collector
Rated load voltage		24 V DC
Allowable load voltage range		21.6 V DC to 26.4 V DC
Max. load current		0.1 A
Common restrictions		1.6 A/Common
Max. inrush current		1.0 A
OFF state leakage current		2 μA or less
ON state max. voltage drop		0.7 V or less
Response time	OFF→ON	6 μs or less (at +25 ℃)
	ON→OFF	15 μs or less (at +25 ℃)
External power supply	Voltage	21.6 V DC to 26.4 V DC
	Current	200 mA or Less (at 24 V DC)
Surge absorber		Zener diode
Short-circuit protection		Provided (to automatically protect every eight points)(Note 1)
Input points per common		16 points/common
Operating mode indicator		16-point LED display (Lit when ON, SW selection)
External connection method		Connector connection (Compliant with the MIL standard, 40P)

(Note 1) When the maximum inrush current is exceeded, eight output points in the same protection block are turned OFF simultaneously.

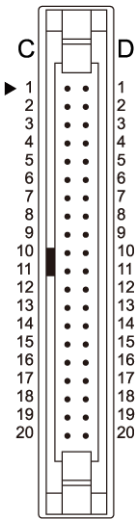
■ Internal circuit diagram



■ Limitations on the number of simultaneous output ON points



■ Terminal layout diagram



Pin No.	General purpose I/O	Signal name
C1	X0	High-speed Counter ch0 Control 0 signal
C2	X1	High-speed Counter ch0 Control 1 signal
C3	X2	High-speed Counter ch1 Control 0 signal
C4	X3	High-speed Counter ch1 Control 1 signal
C5	X4	—
C6	X5	—
C7	X6	—
C8	X7	—
C9	COM(Note 1)	COM
C10	COM(Note 1)	COM
C11	Y0	High-speed Counter ch0 External output 0 signal
C12	Y1	High-speed Counter ch0 External output 1 signal

Pin No.	General purpose I/O	Signal name
C13	Y2	High-speed Counter ch1 External output 0 signal
C14	Y3	High-speed Counter ch1 External output 1 signal
C15	Y4	PWM output 0
C16	Y5	PWM output 1
C17	Y6	PWM output 2
C18	Y7	PWM output 3
C19	+(Note 2)	+V
C20	-(Note 3)	-V
D1	X8	—
D2	X9	—
D3	X10	—
D4	X11	—
D5	X12	—
D6	X13	—
D7	X14	—
D8	X15	—
D9	COM (Note 1)	COM
D10	COM (Note 1)	COM
D11	Y8	—
D12	Y9	—
D13	Y10	—
D14	Y11	—
D15	Y12	—
D16	Y13	—
D17	Y14	—
D18	Y15	—
D19	+(Note 2)	+V
D20	-(Note 3)	-V

(Note 1) The COM terminals (4 places) of the general-purpose input are connected within the unit.

(Note 2) The positive terminals (2 places) of the general-purpose output are connected within the unit.

(Note 3) The negative terminals (2 places) of the general-purpose output are connected within the unit.

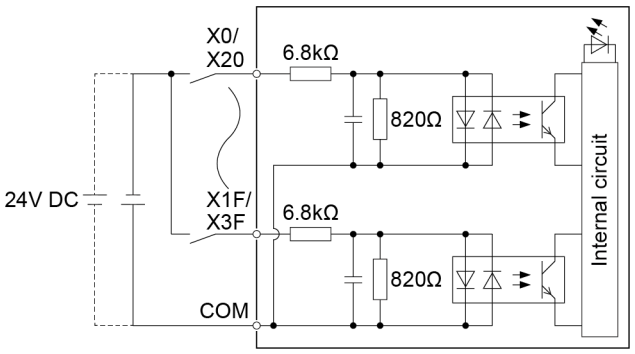
5.3 Digital I/O Unit

5.3.1 64-point Digital Input Unit

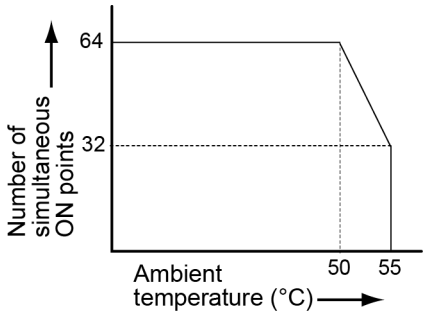
■ Input specifications

Item		Specifications
Insulation method		Optical coupler
Rated input voltage		24 V DC
Rated input current		Approx. 3.4 mA (at 24 V DC)
Input impedance		Approx. 6.8 kΩ
Operating voltage range		20.4 V DC to 26.4 V DC
Min. ON voltage / Min. ON current		19.2 V DC/2.5 mA
Max. OFF voltage / Max. OFF current		5.0 V DC/1.5 mA
Response time	OFF→ON	0.2 ms max. (Possible to change by using the input time constant selection function)
	ON→OFF	0.2 ms max. (Possible to change by using the input time constant selection function)
Input points per common		32 points/common
Operating mode indicator		32-point LED display (Lit when ON, selection using the display selector switch)
External connection method		Connector connection (Compliant with the MIL standard, 40P, two pieces used)

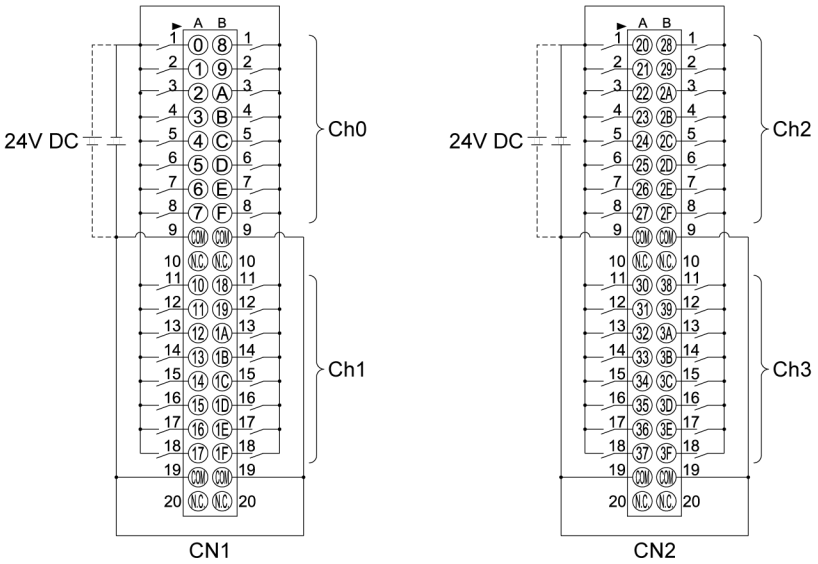
■ Internal circuit diagram



■ Limitations on the number of simultaneous input ON points



■ Terminal layout diagram



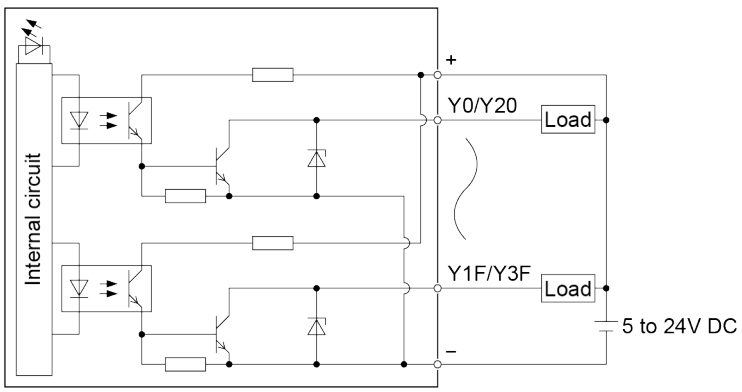
(Note 1) The COM terminals in the same connector are connected internally.

5.3.2 64-point Digital Output Unit (Sink Type)

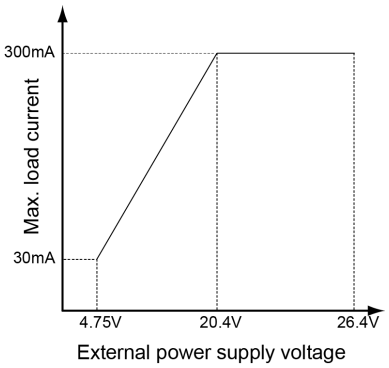
■ Output specifications

Item		Specifications
Insulation method		Optical coupler
Output type		Open collector
Rated load voltage		5 V DC to 24 V DC
Allowable load voltage range		4.75 V DC to 26.4 V DC
Max. load current		0.3 A (20.4 V DC to 26.4 V DC) 30 mA (4.75 V DC)
Common restrictions		3.2 A/common
Max. inrush current		0.6 A
OFF state leakage current		1 μA or less
ON state max. voltage drop		0.5 V or less
Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)
	ON→OFF	0.3 ms or less (Load current: 2 mA or more)
External power supply	Voltage	4.75 V DC to 26.4 V DC
	Current	120 mA or Less (at 24 V DC)
Surge absorber		Zener diode
Short-circuit protection		None
Input points per common		32 points/common
Operating mode indicator		32-point LED display (Lit when ON, selection using the display selector switch)
External connection method		Connector connection (Compliant with the MIL standard, 40P, two pieces used)

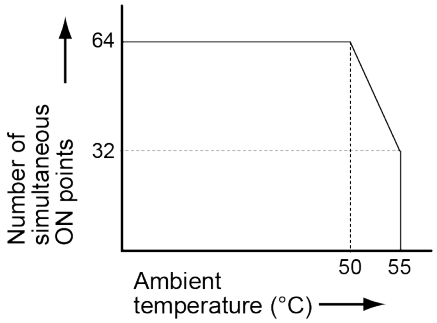
■ Internal circuit diagram



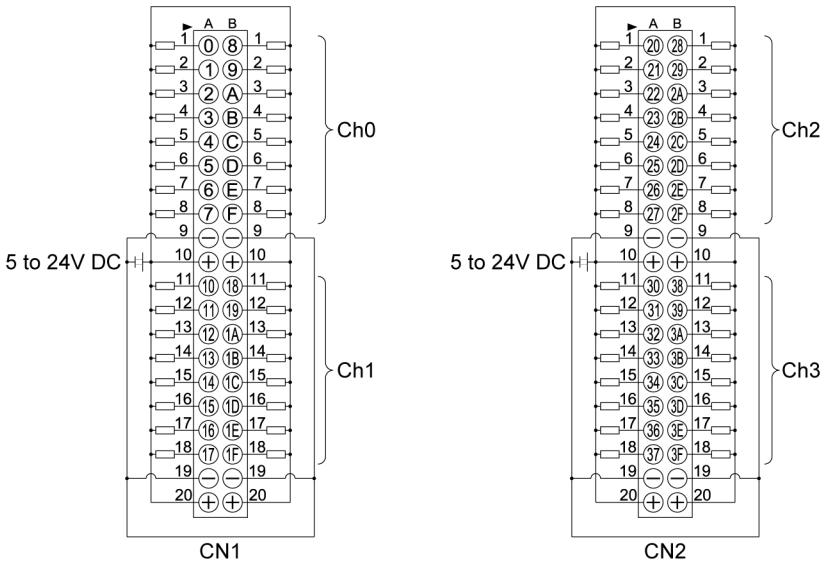
■ Limitations on the load current



■ Limitations on the number of simultaneous output ON points



■ Terminal layout diagram



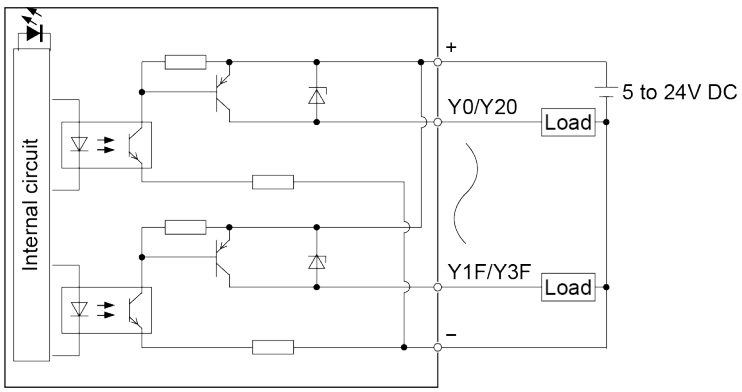
(Note 1) Although the positive and negative terminals are connected internally, connect these terminals externally as well.

5.3.3 64-point Digital Output Unit (Source Type)

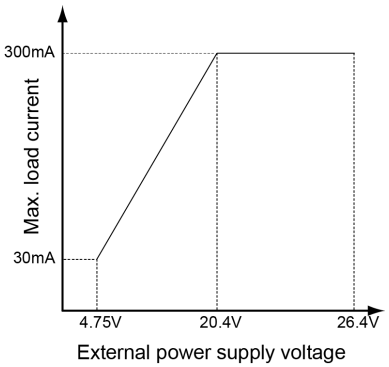
■ Output specifications

Item		Specifications
Insulation method		Optical coupler
Output type		Open collector
Rated load voltage		5 V DC to 24V DC
Allowable load voltage range		4.75 V DC to 26.4V DC
Max. load current		0.3A (20.4 V DC to 26.4V DC) 30mA (4.75V DC)
Common restrictions		3.2 A/common
Max. inrush current		0.6 A
OFF state leakage current		1 μA or less
ON state max. voltage drop		0.5 V or less
Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)
	ON→OFF	0.5 ms or less (Load current: 2 mA or more)
External power supply	Voltage	4.75 V DC to 26.4V DC
	Current	140 mA or Less (at 24 V DC)
Surge absorber		Zener diode
Short-circuit protection		None
Input points per common		32 points / common
Operating mode indicator		32-point LED display (Lit when ON, selection using the display selector switch)
External connection method		Connector connection (Compliant with the MIL standard, 40P, two pieces used)

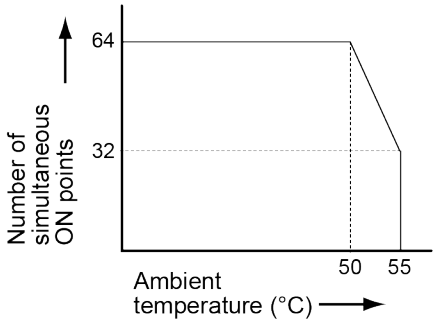
■ Internal circuit diagram



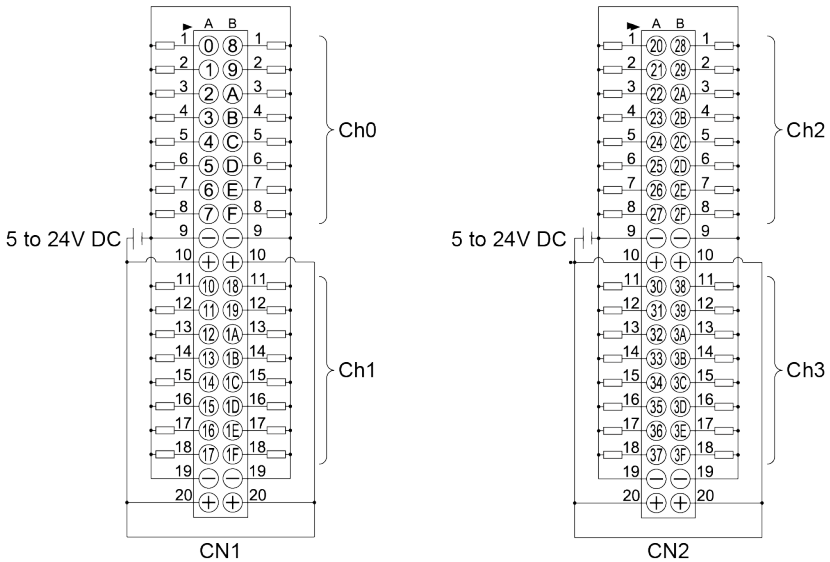
■ Limitations on the load current



■ Limitations on the number of simultaneous output ON points



■ Terminal layout diagram



(Note 1) Although the positive and negative terminals are connected internally, connect these terminals externally as well.

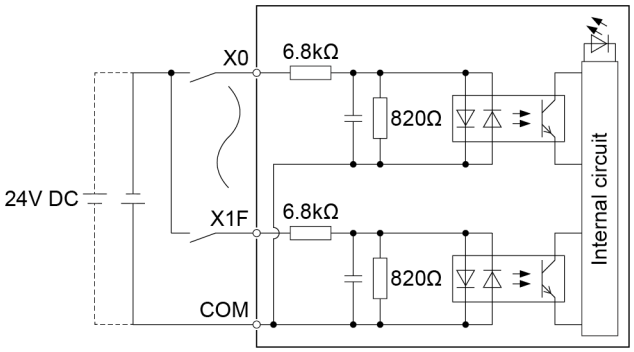
5.3.4 64-point Digital I/O Unit (Sink Type)

■ I/O specifications

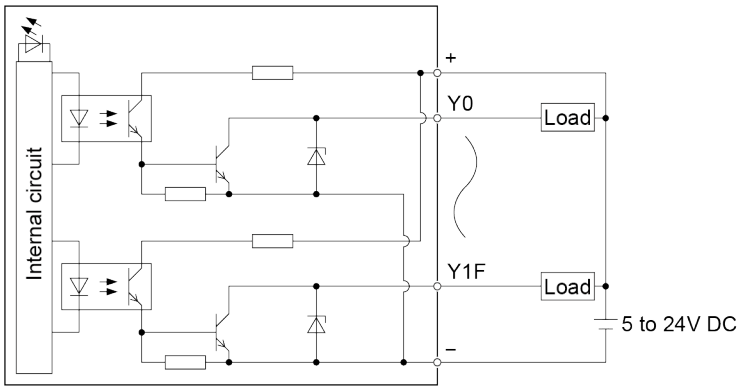
Item			Specifications
Input specifications	Insulation method		Optical coupler
	Rated input voltage		24 V DC
	Rated input current		Approx. 3.4 mA (at 24 V DC)
	Input impedance		Approx. 6.8 kΩ
	Operating voltage range		20.4 V DC to 26.4 V DC
	Min. ON voltage / Min. ON current		19.2 V DC/2.5 mA
	Max. OFF voltage / Max. OFF current		5 V DC/1.5 mA
	Response time	OFF→ON	0.2 ms max. (Possible to change by using the input time constant selection function)
		ON→OFF	0.2 ms max. (Possible to change by using the input time constant selection function)
	Input points per common		32 points/common
Output specifications	Insulation method		Optical coupler
	Output type		Open collector
	Rated load voltage		5 V DC to 24 V DC
	Allowable load voltage range		4.75 V DC to 26.4 V DC
	Max. load current		0.3 A (20.4 V DC to 6.4 V DC) 30 mA (4.75 V DC)
	Common restrictions		3.2 A/common
	Max. inrush current		0.6 A
	OFF state leakage current		1 μA or less
	ON state max. voltage drop		0.5 V or less
	Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)
		ON→OFF	0.3 msor less (Load current: 2 mA or more)
	External power supply	Voltage	4.75 V DC to 26.4 V DC
		Current	120 mA or Less (at 24 V DC)
	Surge absorber		Zener diode
	Short-circuit protection		None
	Input points per common		32 points/ common
Operating mode indicator			32-point LED display (Lit when ON, selection using the display selector switch)
External connection method			Connector connection (Compliant with the MIL standard, 40P, two pieces used)

■ Internal circuit diagram

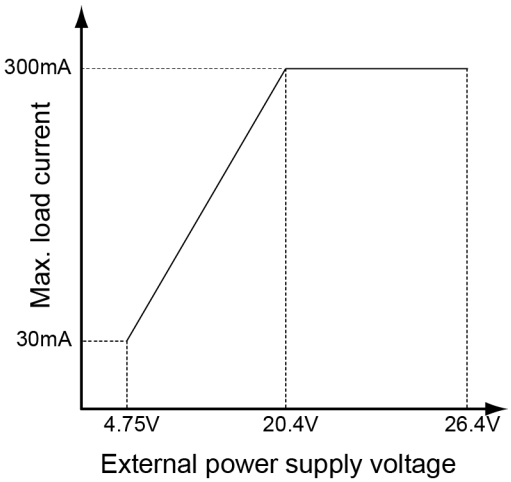
Input section (32 points)



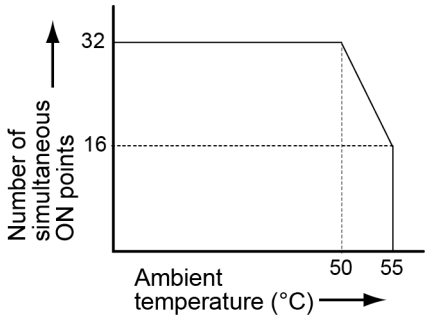
Output section (32 points)



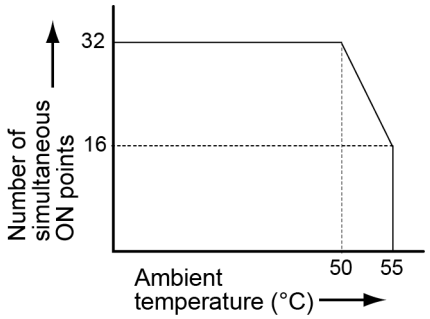
■ Limitations on the load current



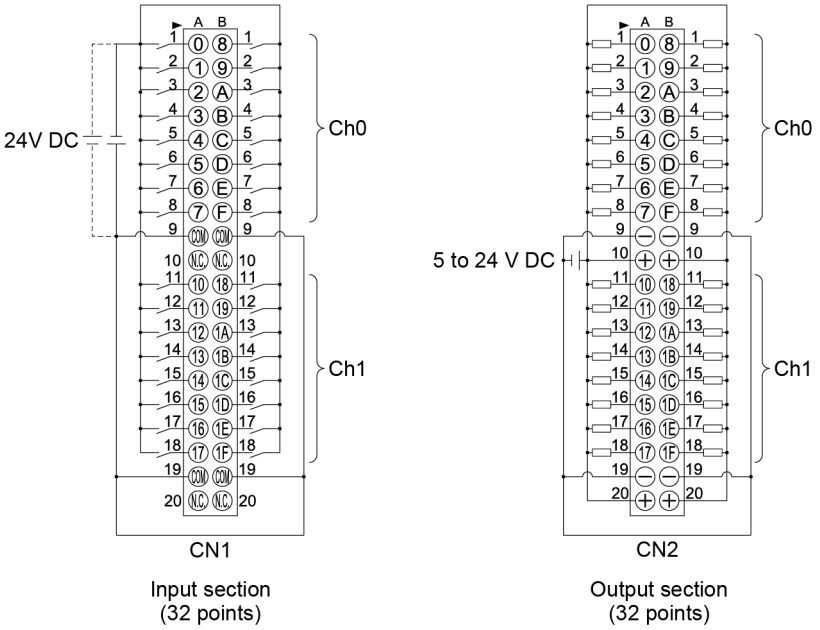
■ **Limitations on the number of simultaneous input ON points**



■ **Limitations on the number of simultaneous output ON points**



■ **Terminal layout diagram**



(Note 1) The COM terminals in the same connector are connected internally.

(Note 2) Although the positive and negative terminals are connected internally, connect these terminals externally as well.

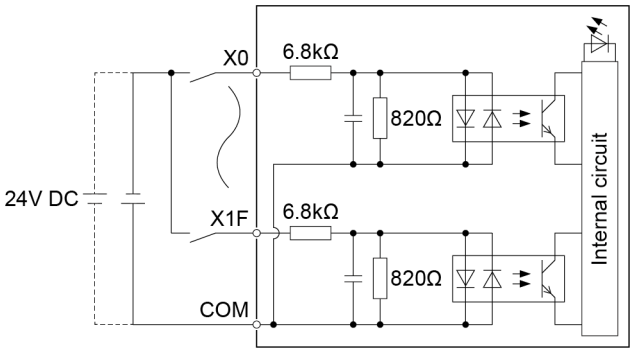
5.3.5 64-point Digital I/O Unit (Source Type)

■ I/O specifications

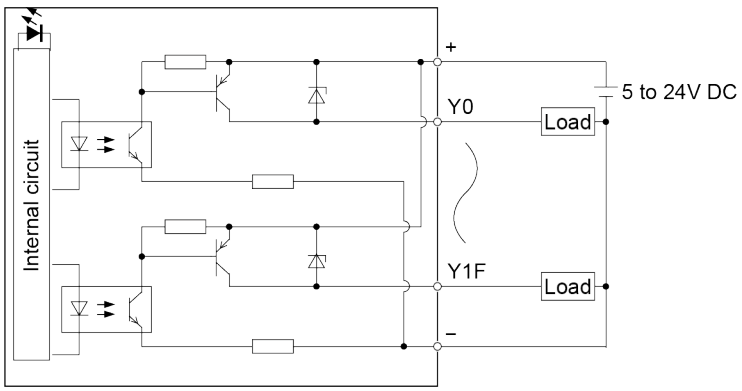
Item			Specifications
Input specifications	Insulation method		Optical coupler
	Rated input voltage		24 V DC
	Rated input current		Approx. 3.4 mA (at 24 V DC)
	Input impedance		Approx. 6.8 kΩ
	Operating voltage range		20.4 V DC to 26.4 V DC
	Min. ON voltage / Min. ON current		19.2 V DC/2.5 mA
	Max. OFF voltage / Max. OFF current		5 V DC/1.5 mA
	Response time	OFF→ON	0.2 ms max. (Possible to change by using the input time constant selection function)
		ON→OFF	0.2 ms max. (Possible to change by using the input time constant selection function)
	Input points per common		32 points/common
Output specifications	Insulation method		Optical coupler
	Output type		Open collector
	Rated load voltage		5 V DC to 24 V DC
	Allowable load voltage range		4.75 V DC to 26.4 V DC
	Max. load current		0.3 A (20.4 V DC to 26.4 V DC) 30 mA (4.75 V DC)
	Common restrictions		3.2 A/common
	Max. inrush current		0.6 A
	OFF state leakage current		1 μA or less
	ON state max. voltage drop		0.5 V or less
	Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)
		ON→OFF	0.5 ms or less (Load current: 2 mA or more)
	External power supply	Voltage	4.75 V DC to 26.4 V DC
		Current	140 mA or Less (at 24 V DC)
	Surge absorber		Zener diode
	Short-circuit protection		None
	Input points per common		32 points/ common
Operating mode indicator			32-point LED display (Lit when ON, selection using the display selector switch)
External connection method			Connector connection (Compliant with the MIL standard, 40P, two pieces used)

■ Internal circuit diagram

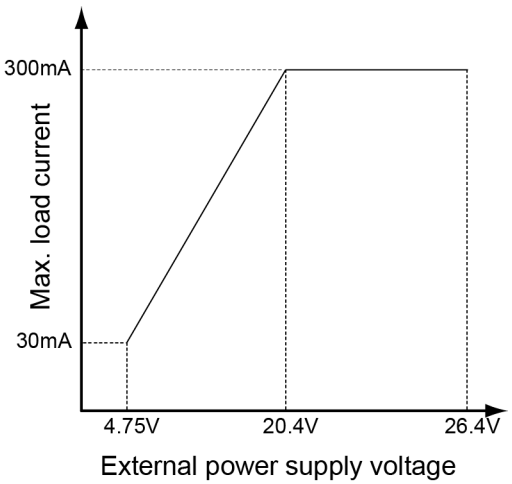
Input section (32 points)



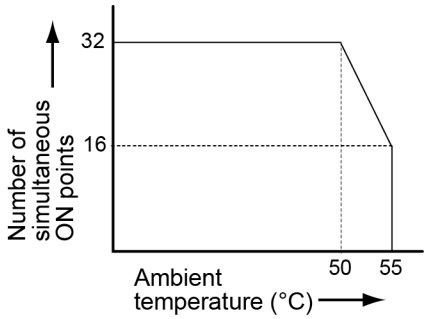
Output section (32 points)



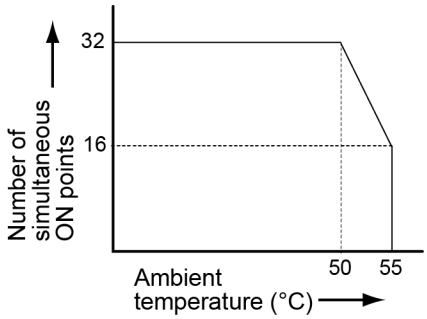
■ Limitations on the load current



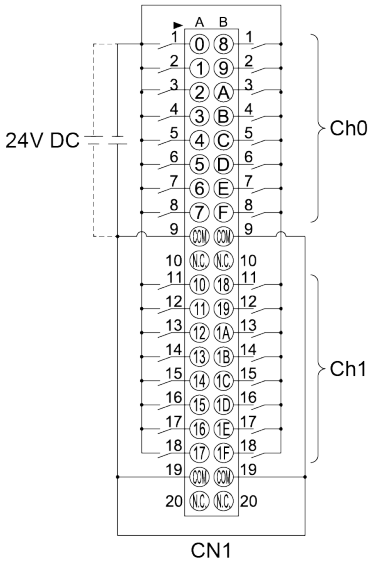
■ **Limitations on the number of simultaneous input ON points**



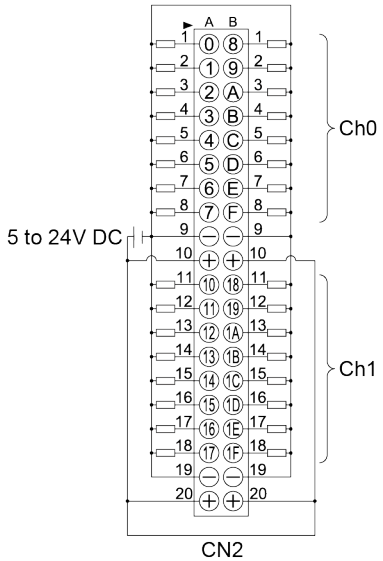
■ **Limitations on the number of simultaneous output ON points**



■ **Terminal layout diagram**



Input section (32 points)



Output section (32 points)

(Note 1) The COM terminals in the same connector are connected internally.

(Note 2) Although the positive and negative terminals are connected internally, connect these terminals externally as well.

5.4 Analog I/O Unit

5.4.1 Analog Input Unit

■ Input specifications

Item		Specifications
No. of input points		8 ch
Input range (resolution)	Voltage	-10 to +10 V DC (Resolution: 1/64,000) 0 to +10 V DC (Resolution：1/32,000) -5 to +5 V DC (Resolution：1/64,000) 0 to +5 V DC (Resolution：1/32,000) +1 to +5 V DC (Resolution：1/25,600)(Note 1)
	Current	0 to +20 mA (Resolution：1/32,000) +4 to +20 mA (Resolution：1/25,600)(Note 1)
Conversion speed		50 μs/ch
Exceeding the rated range		Input is possible up to ± 2% of the input range (Note 2)
Total accuracy		±0.2 % F.S.or less (at +25 °C) ±0.4 % F.S. or less (at 0 to +55 °C)
Input impedance		Voltage input: Approximately 1 MΩ; current input: Approximately 250 Ω
Absolute max. input		Voltage input: -15 V to +15 V; current input: -30 mA to +30 mA
Insulation method		Between input terminals and internal circuit: Photocoupler and isolated DC/DC converter Between channels: Non-insulated
Execution / Non-execution channel settings		Possible to make non-converted channel settings.
Input range selection		Possible to make settings on a channel-by-channel basis
Average processing	Number of averaging times	Setting range of 2 to 60,000 times
	Time average	Time setting range of 1 to 1,500 ms
	Moving average	Setting range of 2 to 2,000 times
Offset / Gain settings		A desired value within the digital output range can be set for the offset value. Setting range: -3000 to +3000 A desired value within the digital output range can be set for the gain value. Setting range：+9000 to +11000 (90 % to 110 %)
Scale conversion settings		A desired value within the digital output range can be set for the scale conversion setting value. Setting range：-32768 to +32767
Upper limit / lower limit comparison		Output if the value is outside the preset upper limit or lower limit. Setting range：-32768 to +32767

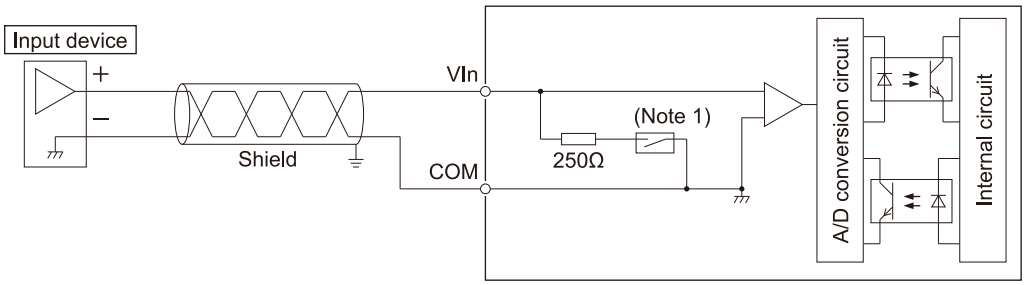
Item	Specifications
Max. / Min. hold	Holding max. / min. values sampled
Disconnection detection	Disconnection detection is possible for the following ranges. Possible to select auto or manual resetting ● 1 to 5 V range (Detection level: 0.7 V or less) ● 4 to 20 mA range (Detection level: 2.8 mA or less.)

(Note 1) The full scale (F.S.) on the accuracy of an analog voltage input range from +1 to +5 V and that of an analog current input range from +4 to +20 mA are 0 to +5 V and 0 to +20 mA, respectively.

(Note 2) If a value that exceeds the input range ± 2% is entered, it will be rounded to the input range ± 2%. However, 0 to 20.4 mA is possible in the 0 to 20 mA range.

■ Internal circuit diagram

- Analog voltage input(-10 to +10 V、0 to +10 V、-5 to +5 V、0 to +5 V、+1 to +5 V)
- Analog current input(0 to +20 mA、+4 to +20 mA)

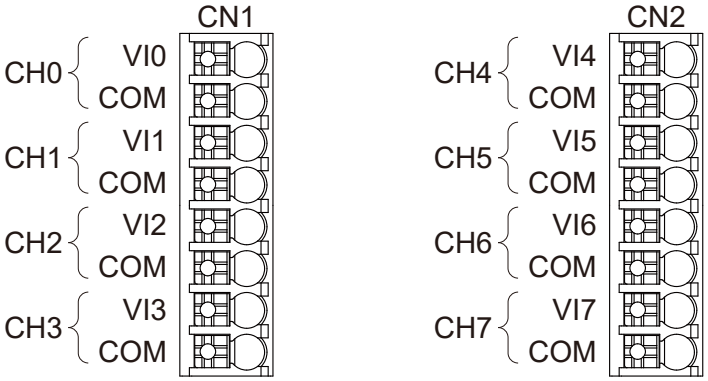


(Note 1) The circuit connection varies depending on parameter settings.

(Note 2) "n" indicates the channel number.

■ Terminal layout diagram

The terminal used by the analog voltage input is common to that used by the analog current input.



- Terminal layout diagram to CN1

Pin No.	Signal name	Specifications
1	VI0	Analog input CH0 voltage / current signal

Pin No.	Signal name	Specifications
2	COM(Note 1)	COM
3	VI1	Analog Input CH1 voltage / current signal
4	COM(Note 1)	COM
5	VI2	Analog Input CH2 voltage / current signal
6	COM(Note 1)	COM
7	VI3	Analog Input CH3 voltage / current signal
8	COM(Note 1)	COM

- Terminal layout diagram to CN2

Pin No.	Signal name	Specifications
1	VI4	Analog Input CH4 voltage / current signal
2	COM(Note 1)	COM
3	VI5	Analog Input CH5 voltage / current signal
4	COM(Note 1)	COM
5	VI6	Analog Input CH6 voltage / current signal
6	COM(Note 1)	COM
7	VI7	Analog Input CH7 voltage / current signal
8	COM(Note 1)	COM

(Note 1) All COM terminals are connected within the unit.

5.4.2 Analog Output Unit

■ Output specifications

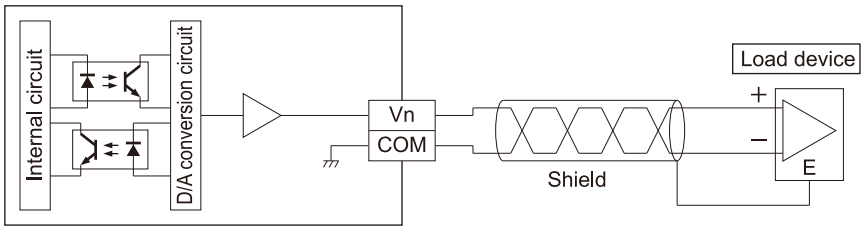
Item		Specifications
No. of output points		4 ch
Output range (Resolution) (Note 1)	Voltage	-10 to +10 V DC (Resolution：1/64,000) 0 to +10 V DC (Resolution：1/32,000) -5 to +5 V DC (Resolution：1/64,000) 0 to +5 V DC (Resolution：1/32,000) +1 to +5 V DC (Resolution：1/25,600) (Note 1)
	Current	0 to +20 mA (Resolution：1/32,000) +4 to +20 mA (Resolution：1/25,600) (Note 1)
Conversion speed		50 μs/ch
Exceeding the rated range		Output is possible up to ± 2% of the output range(Note 2)
Total accuracy		±0.2 % F.S.or less (at +25 ℃) ±0.4 % F.S or less (at 0 to +55 ℃)
Output impedance (voltage output)		0.5 Ω or less
Maximum output current (voltage output)		10 mA
Output allowable load resistance (current output)		500 Ω or less
Insulation method		Between output terminals and internal circuit: Photocoupler and isolated DC/DC converter Between channels: Non-nsulated
Execution / Non-execution channel settings		Possible to make non-converted channel settings.
Clipping function		Upper and lower output limits can be set for digital input values. Setting range：-32,640 to +32,640
Offset / Gain settings		A desired value within the digital output range can be set for the offset value. Setting range：-3,000 to +3,000 A desired value within the digital output range can be set for the gain value. Setting range：+9000 to +11000 (90 % to 110 %)
Scale conversion settings		A desired value within the digital output range can be set for the scale conversion setting value. Setting range：-32768 to +32767
Analog output hold (in STOP mode)		A desired output value while in STOP mode can be set as a digital value. Setting range：-32640 to +32640

(Note 1) The full scale (F.S.) on the accuracy of an analog voltage input range from +1 to +5 V and that of an analog current input range from +4 to +20 mA are 0 to +5 V and 0 to +20 mA, respectively.

(Note 2) If a value that exceeds the input range ± 2% is entered, it will be rounded to the input range ± 2%.
However, 0 to 20.4 mA is possible in the 0 to 20 mA range.

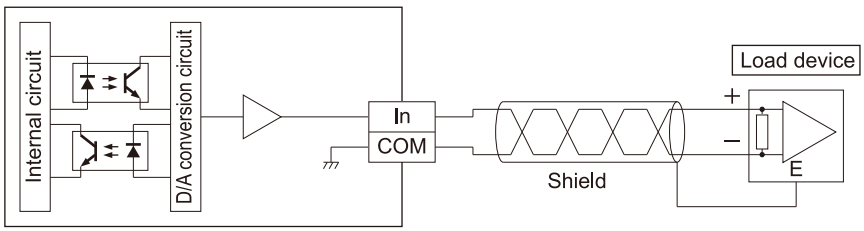
■ Internal circuit diagram

● Analog voltage input (-10 to +10 V、0 to +10 V、-5 to +5 V、0 to +5 V、+1 to +5 V)



(Note 1) "n" indicates the channel number.

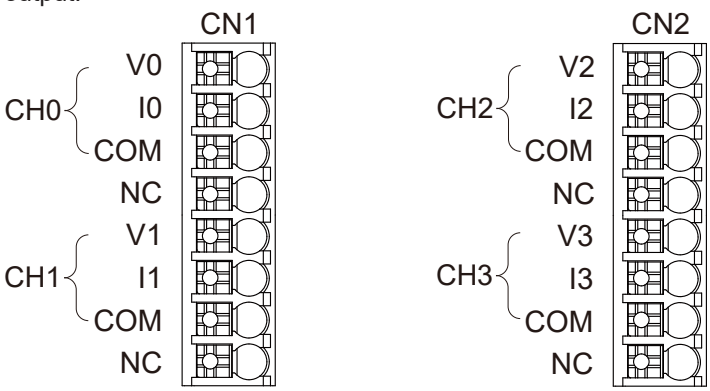
● Analog current input (0 to +20 mA、+4 to +20 mA)



(Note 1) "n" indicates the channel number.

■ Terminal layout diagram

The terminal used by the analog voltage output is different from that used by the analog current output.



● Terminal layout diagram to CN1

Pin No.	Signal name	Specifications
1	V0	Analog output CH0 voltage signal
2	I0	Analog output CH0 current signal
3	COM(Note 1)	COM
4	N.C.	—

Pin No.	Signal name	Specifications
5	V1	Analog output CH1 voltage signal
6	I1	Analog output CH1 current signal
7	COM(Note 1)	COM
8	N.C.	-

- Terminal layout diagram to CN2

Pin No.	Signal name	Specifications
1	V2	Analog output CH2 voltage signal
2	I2	Analog output CH2 current signal
3	COM(Note 1)	COM
4	N.C.	-
5	V3	Analog output CH3 voltage signal
6	I3	Analog output CH3 current signal
7	COM(Note 1)	COM
8	N.C.	-

(Note 1) All COM terminals are connected within the unit.

5.5 Pulse Output Unit

5.5.1 Pulse Output Unit

■ Performance specifications

Item		Specifications	
Product No.		**AGM1PG04T**	**AGM1PG04L**
Output type		Transistor	Line driver
Number of axes controlled		4 axis, independent	
Position command	Command unit	Pulse unit (for increment or absolute)	
	Max. pulse count	Signed 32 bits (-2,147,483,648 to +2,147,483,647 pulses)	
Speed command	Command range	1 pps to 500 kpps (can be set in 1 pps.)	1 pps to 4 Mpps (can be set in 1 pps.)
Acceleration / deceleration command	Acceleration / deceleration method	Linear acceleration / deceleration, S-shaped acceleration / deceleration control	
	S-shape pattern	Sine curve, Cubic curve (can be select)	
Home return	Home return speed	Speed setting possible (changes return speed and search speed)	
	Input signal	Home input, near home input, over limit input (+), over limit input (-)	
	Output signal	Deviation counter clear signal	
Operation mode		● E-point control (Linear and S-shaped acceleration / deceleration) ● P-point control (Linear and S-shaped acceleration / deceleration) ● Home return (Home search) ● JOG operation(Note 1) ● JOG positioning ● Pulser input operation(Note 2) Transfer multiplication ratio (x1, x2, x5, x10, x50, x100, x500, x1000) ● Real-time frequency change function	
Startup time		0.001 ms / 0.005 ms / 0.02 ms	
Output interface	Output mode	Pulse/Sign,CW/CCW	
Feedback counter function(Note 2)	Counting range	Signed 32 bits (-2,147,483,648 to +2,147,483,647 pulses)	
	Input mode	2-phase input, direction identification input, individual input (transfer multiple available for each mode)	
	Max. counting speed	4 MHz (2-phase input) 1 MHz (Direction distinction input and individual input)	
Other functions		● Built-in over limit input (+) and over limit input (-) ● Servo ON output incorporated	

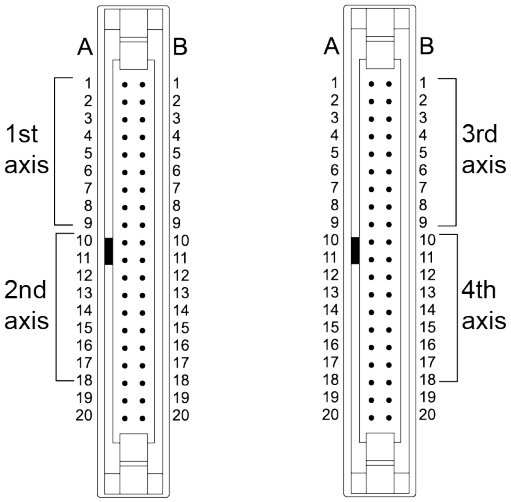
(Note 1) When Linear acceleration/deceleration operation is selected, the target speed can be changed during an operation.

(Note 2) "Pulser input operation" and "Feedback counter" use the same pulse input terminal. Either function of the two can only be used.

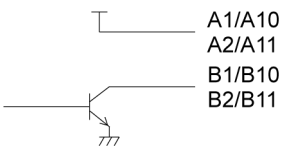
■ I/O specifications

- The Pulse Output Unit uses two connectors. The signal pins for two axes are assigned to one connector.
- AX1 and 2, and AX3 and 4 connectors have the completely same pin assignments. Therefore, the same pin number functions the same.
- Between the Transistor type and the Line driver type, the output terminal performance is different. However, the specifications of the input terminal and the power supply terminal are the same for both types.

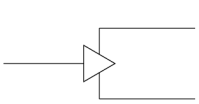
■ Terminal Layout Diagram



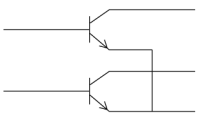
■ output terminals (Transistor output type)

Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
A1	A10	Pulse output A : 5V DC output		Output Specifications	Output type	Open collector
B1	B10	Pulse output A : Open collector			Operating voltage range	4.75 to 26.4 V DC
A2	A11	Pulse output B : 5V DC output			Max. load current	15 mA
B2	B11	Pulse output B : Open collector			ON state max. voltage drop	0.6 V

■ output terminals (Line driver output type)

Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
A1	A10	Pulse output A : Line driver (+)		Output Specifications	Output type	● Line driver output Equivalent to AM26C31
B1	B10	Pulse output A : Line driver (-)				
A2	A11	Pulse output B : Line driver (+)				
B2	B11	Pulse output B : Line driver (-)				

■ output terminals (Common)

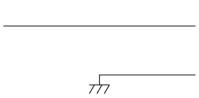
Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
B5	B14	Servo ON output(+)		Output Specifications	Output type	Open collector
A7	A16	Deviation counter clear (+) (Note 1)			Operating voltage range:	4.75 to 26.4 V DC
B7	B16	COM			Max. load current	10 mA
					ON state max. voltage drop	1.0 V

(Note 1) The deviation counter clear signal is output when the power supply is turned ON for about 1 ms. When the home return is complete,

the signal is output for about 1 ms or 10 ms.

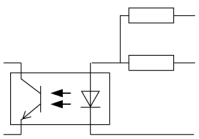
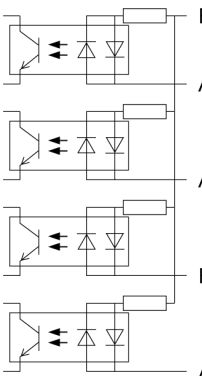
The time can be specified using the" "Parameter"

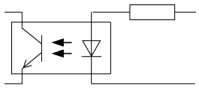
■ Power supply terminal (Common)

Pin No.	Signal name	Circuit		Item	Specifications
A20	External power supply input: 24 V DC, SELV and LIM (+)(Note 1)		Power supply Specifications	Supplied power range	21.4 to 26.4 V DC
B20	External power supply input: 24 V DC, SELV and LIM (-)(Note 1)			Consumption current	90 mA or less

(Note 1) The external power supply input terminals between two connectors are connected internally.

■ Input Specifications (Common)

Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
A3	A12	Home input: 24 VDC, SELV and LIM (+)		Input Specifications (24 V DC)	Operating voltage range	21.6 to 26.4 V DC
					Min. ON voltage / current	19.2 V DC/5.5 mA
					Max. OFF voltage / current	2.0 V DC/2.0 mA
					Input impedance	Approx. 3.9 kΩ
					Pulse width	100 µs or more
A4	A13	Home input: 5 VDC, SELV and LIM (+)		Input Specifications (5 V DC)	Operating voltage range	3.5 to 5.25 V DC (5 V DC, Line driver specifications)
					Min. ON voltage / current	3.0 V DC/4 mA
B3	B12	Home input (-)			Max. OFF voltage / current	1.0 V DC/0.5 mA
					Input impedance	Approx. 560 Ω
					Pulse width	100 µs or more
B4	B13	COM [24V DC SELV and LIM (+)]		Input Specifications	Operating voltage range	21.6 to 26.4 V DC
A5	A14	Near home input (DOG)			Min. ON voltage / current	Near home input (DOG) 19.2 V DC/5.0 mA Limit input (+) Limit input (-) Positioning control start input 19.2V DC/2.6 mA
A6	A15	Limit input (+)			Max. OFF voltage / current	2.0V DC/1.5 mA
B6	B15	Limit input (-)			Input impedance	Near home input (DOG) Approx. 3.6 kΩ Limit input (+) Limit input (-) Positioning control start input Approx. 6.8 kΩ
A19	B19	Timing input			Pulse width	500 µs or more

Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
A8	A17	Pulse input A (+)	 A8/A17 A9/A18 B8/B17 B9/B18	Input Specifications	Operating voltage range	3.5 to 5.25 V DC (5 V DC,Line driver specifications)
B8	B17	Pulse input A (-)			Min. ON voltage / current	3.0 V DC/3.2 mA
A9	A18	Pulse input B (+)			Max. OFF voltage / current	1.0 V DC/0.5 mA
B9	B18	Pulse input B (-)			Input impedance	Approx. 560 Ω
					Pulse width	0.5 µs or more (Each phase Max. 1 MHz)

5.6 Serial Communication Unit

5.6.1 Serial Communication Unit

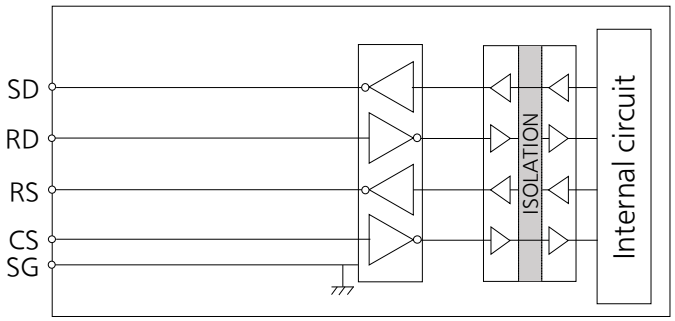
■ Communication Specifications

Item		Specifications		
Product No.		**AGM1NSCS2**	**AGM1NSCM2**	**AGM1NSCS1M1**
Interface	Connector 1	RS-232C	RS-422A/485	RS-232C
	Connector 2	RS-232C	RS-422A/485	RS-422A/485
Communication method	RS-232C	Full-duplex / half-duplex	-	Full-duplex / half-duplex
	RS-422A	-	Full-duplex / half-duplex	Full-duplex / half-duplex
	RS-485	-	Half-duplex	Half-duplex
Transmission distance(Note 1)	RS-232C	Max. 15 m	-	Max. 15 m
	RS-422A RS-485	-	Max. 1,200 m(Note 1) (total extension distance)	Max. 1,200 m(Note 1) (total extension distance)
Transmission mode Number of destination units	RS-232C	1:1	-	1:1
	RS-422A	-	1:1	1:1
	RS-485	-	1:N (N = 32 max.)	1:N (N = 32 max.)
Protocol		General-purpose communication / Modbus-RTU (master / slave)		
Baud rate	General-purpose communication	1,200 / 2,400 / 4,800 / 9,600 / 19,200 / 38,400 / 57,600 / 115,200 / 230,400 bps		
	Modbus-RTU	1,200 / 2,400 / 4,800 / 9,600 / 19,200 / 38,400 / 57,600 / 115,200 bps		
Maximum data length	General-purpose communication	1,024 Byte		
	Modbus-RTU	252 Byte		
Communication format	Data length	7bit / 8bit		
	Parity	None, odd, even		
	Stop code	1bit / 2bit		
	Start code	None		
	End code	None		

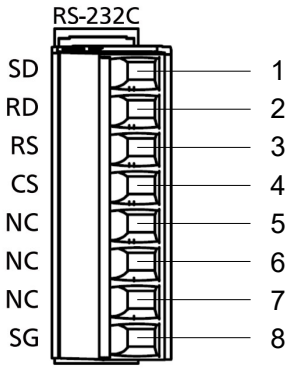
(Note 1) Check the transmission distance using the actual unit as it may depend on the destination device. The recommended transmission distance is 100 m or less.

■ RS-232C port

● Circuit diagram



● Terminal layout diagram

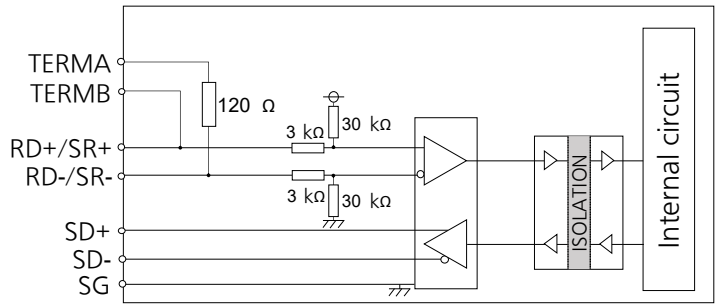


Pin No.	Signal name	Specifications
1	SD	Send data
2	RD	Receive data
3	RS	Request to send
4	CS	Clear to send
5	N.C.	-
6	N.C.	-
7	N.C.	-
8	SG	Signal ground

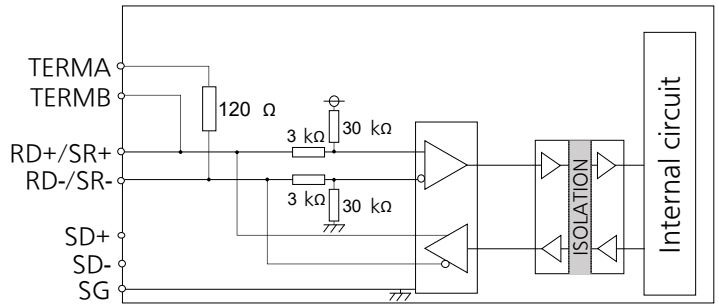
■ RS-422A/485 port

● Circuit diagram

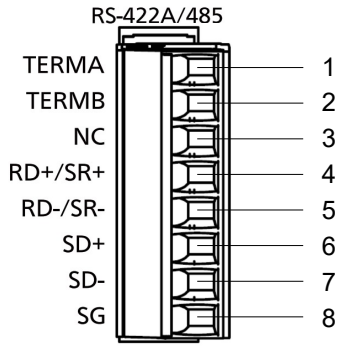
[RS-422A]



[RS-485]



- Terminal layout diagram



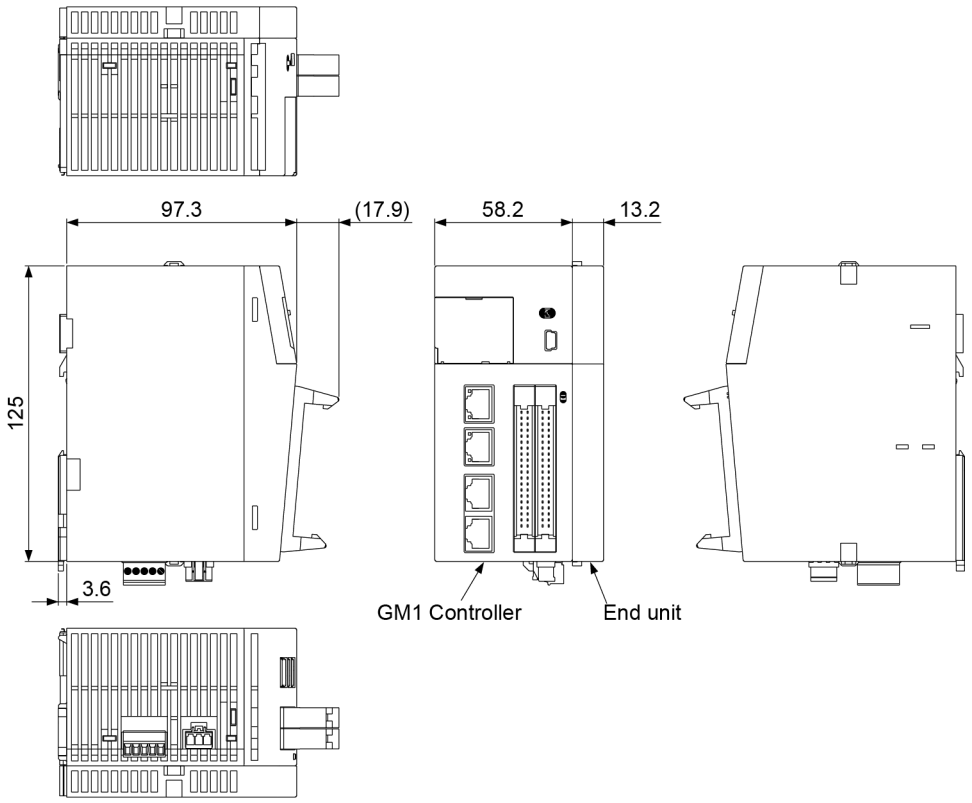
Pin No.	Signal name	Specifications	
		RS-422A	RS-485
1	TERMA	Termination resistor connection terminal(Note 1)	Termination resistor connection terminal(Note 1)
2	TERMB	Termination resistor connection terminal(Note 1)	Termination resistor connection terminal(Note 1)
3	N.C.	-	-
4	RD+/SR+	Receive data (+)	Send and receive data (+)
5	RD-/SR-	Receive data (-)	Send and receive data (-)
6	SD+	Send data (+)	-
7	SD-	Send data (-)	-
8	SG	Signal ground	Signal ground

(Note 1) When the TERMA and TERMB terminals are short-circuited, the termination resistor (120 Ω) is connected in the internal circuit.

5.7 Dimensions

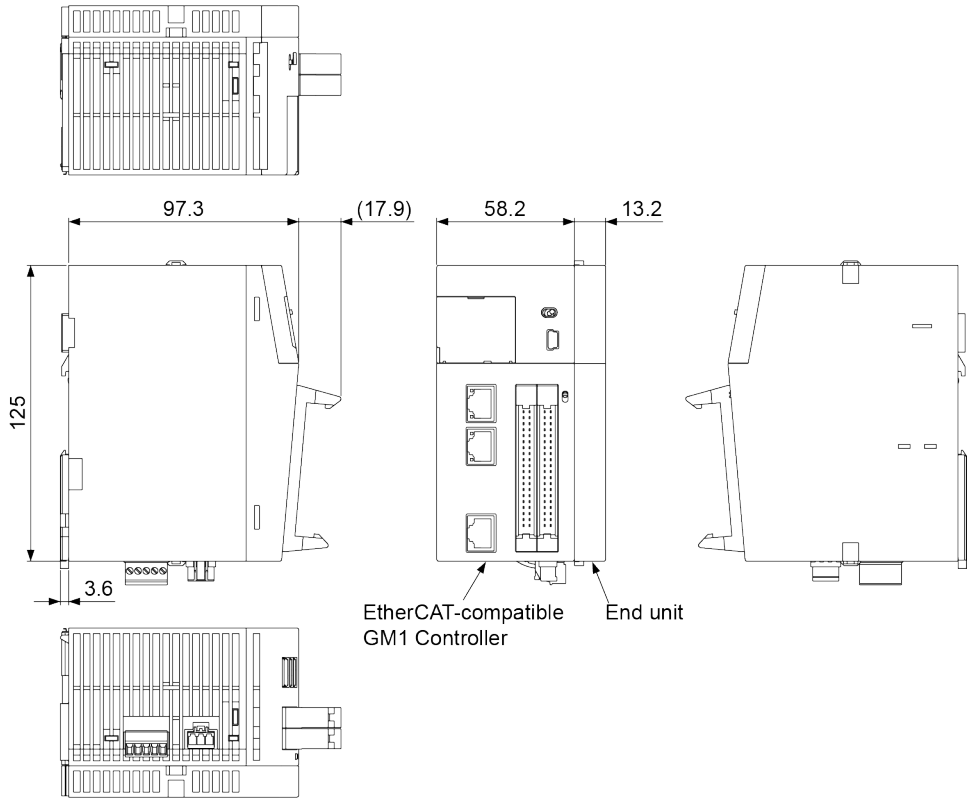
5.7.1 GM1 controller

■ **GM1 controller RTEX type**



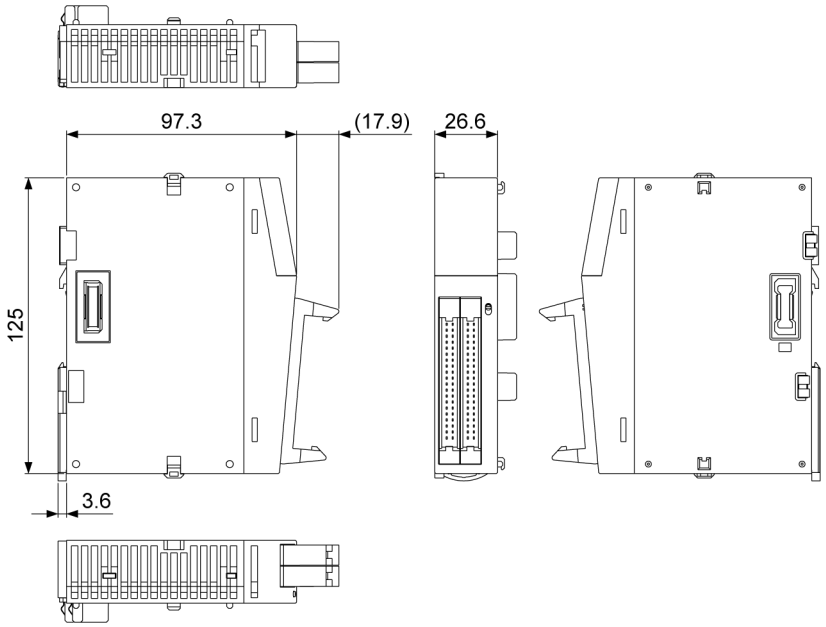
Unit : mm

■ **GM1 controller EtherCAT type**



Unit : mm

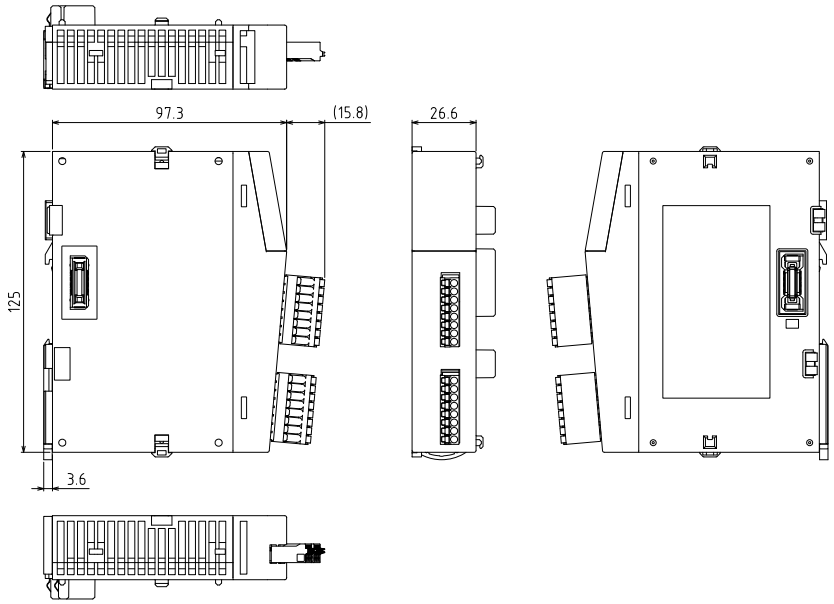
5.7.2 Digital I/O Unit



Unit : mm

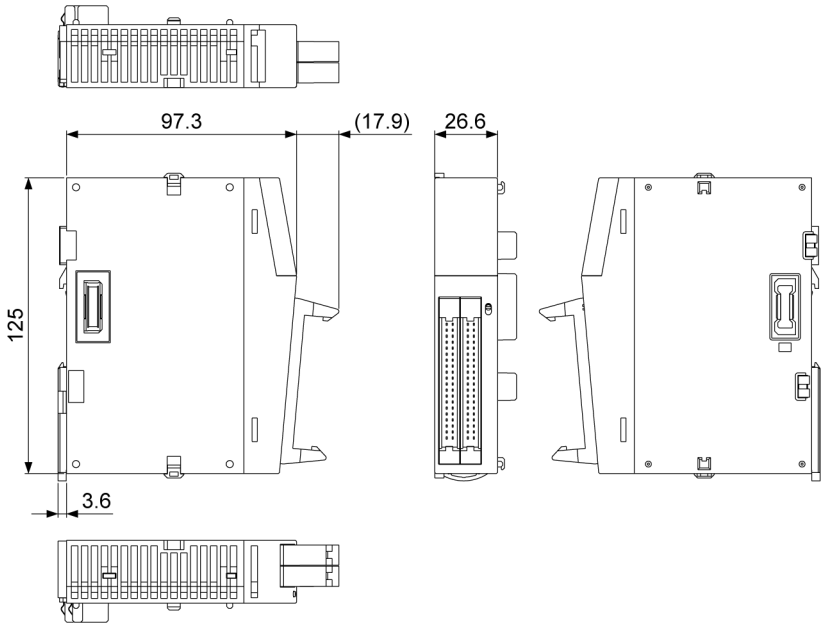
5.7.3 Analog I/O Unit

Applicable model: AGM1AD8、AGM1DA4



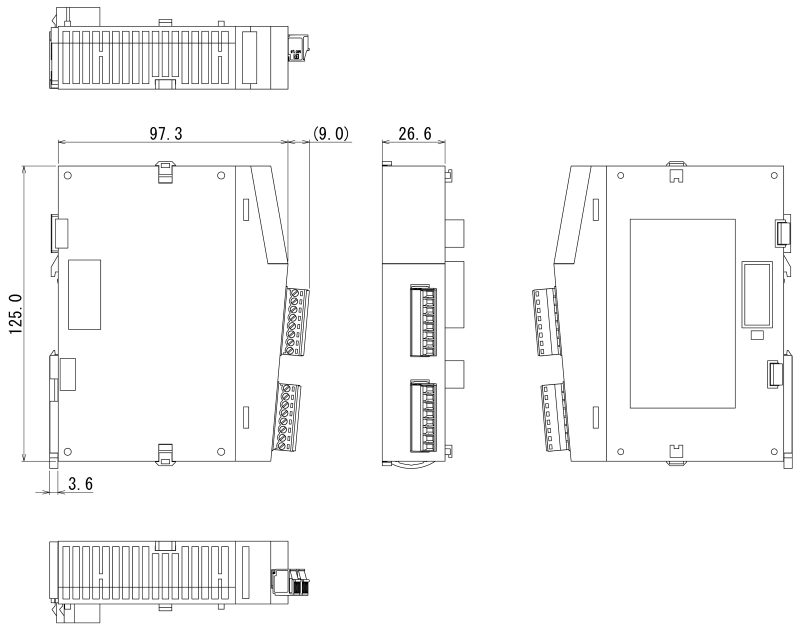
Unit ： mm

5.7.4 Pulse Output Unit



Unit : mm

5.7.5 Serial Communication Unit



Unit : mm

5.8 Conformance to international standards

5.8.1 List of conformed standards for motion controllers

conformed standards		Standard number
EU/UK Standards	EMC	EN 61131-2
	RoHS	EN IEC 63000
UL Standards		UL61010-1, UL61010-2-201
CSA Standards		C22.2 No.61010-1-12, C22.2 No.61010-2-201
Radio Waves Act (KC)		KN 61131-2

EMC : Electromagnetic Compatibility
RoHS : Restriction of Hazardous Substances
IEC : International Electrotechnical Commission
EN : Europaischen Norman
UL : Underwriters Laboratories
CSA : Canadian Standards Association
KC : Radio Waves Act (South Korea)

5.8.2 About Radio Waves Act(South Korea)

The motion controller is a Class A device (commercial broadcasting communication device) under Radio Waves Act(South Korea).

Please use this product after recognizing the following precautions.

A 급 기기 (업무용 방송통신기자재)

이 기기는 업무용(A 급) 전자파적합기기로서 판매자

또는 사용자는 이 점을 주의하시기 바라며, 가정외의

지역에서 사용하는 것을 목적으로 합니다.

(대상기종 Motion controller)

[Reference English translation]

Class A equipment (commercial broadcasting communication equipment)

This device is a commercial electromagnetic wave generator (ClassA) and is intended for use outside the home.

Sellers and users should be aware of this.

（Applicable model Motion Controller)

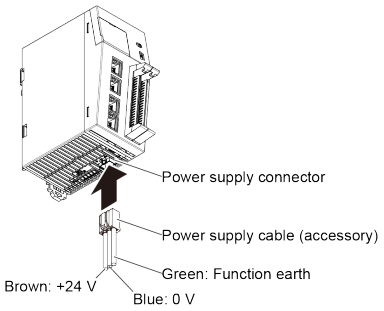
6 Wiring

6.1 GM1 Controller

6.1.1 Wiring the Power Supply

Wiring

■ Wiring the Power Supply

Units	Wiring diagram
GM1Controller (RTEX,EtherCAT)	

■ Selection of a power supply

- To protect the system against erroneous voltage from the power supply line, use an insulated power supply with an internal protective circuit (power supply with reinforced insulation or double insulation).
- The regulator on the unit is a non-insulated type.
- Select a power supply larger than the capacity of the units to be connected. In the minimum configuration, select a power supply of 24 W or larger.

■ Power supply voltage

- Confirm that the voltage of the power supply to be connected is within the allowable range.

Rated input voltage	Allowable voltage range	Rated output capacity
24 V DC	20.4 to 28.8 V DC	24 W or more

■ Power supply cable

- Use the power supply cable (Part No.:AFPG805) that comes with the unit to connect the power supply.

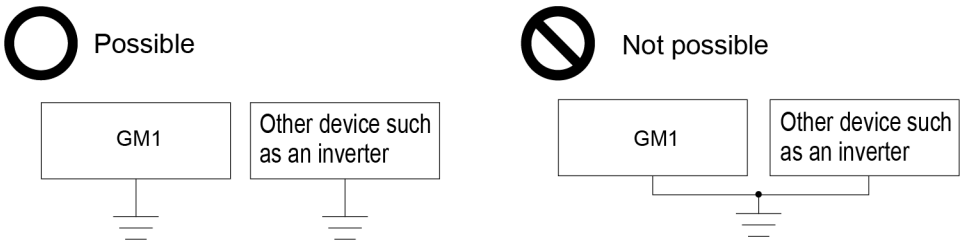
length	Size	Specifications	Product No.
1m	AWG#24	Brown：24 V DC,Blue：0 V,Green：Function earth	AFPG805

- Also, twist the power supply cables to minimize adverse effects from noise.

Grounding

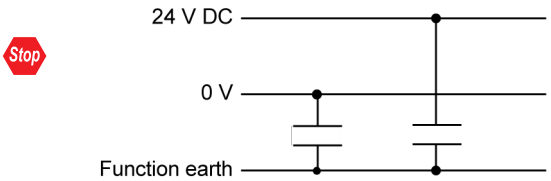
■ Use dedicated grounding

- The grounding connection should have a resistance of 100 Ω or less.
- The point of grounding should be as close to the GM1 as possible. The ground wire should be as short as possible.
- Sharing the ground with another device may have an adverse effect. Therefore, be sure that grounding is dedicated.



- **Conversely, depending on your environment, grounding may cause a problem.**

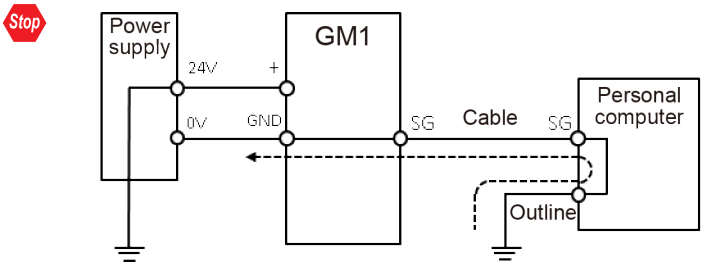
  As for the GM1 Controller (RTEX-compatible / EtherCAT-compatible), since its power supply line is connected to the function earth through a high-voltage capacitor, it is no problem.



Power supply line to the GM1 expansion unit

- **Do not ground the function earth when grounding a plus (+) terminal of the power.**

  When grounding a plus terminal of the power supply, prepare a power supply dedicated to the GM1 and do not ground the plus terminal of the GM1 power supply. In some personal computers, the SG terminal of the internal circuit and shielding are connected. Furthermore, since the power supply circuit for the GM1 is not isolated, if the plus terminal of the power supply is grounded, the power supply will be short circuited to cause a breakdown.



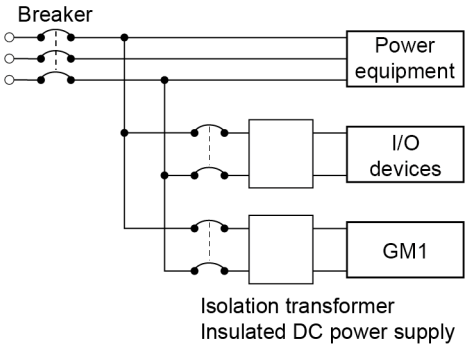
Precautions

■ Selection of a power supply

- Use a low noise power supply.
- The inherent noise resistance is sufficient for the noise superimposed on the power wires, however, the noise can be attenuated further by using the isolation transformer / insulated power supply.

■ Isolation of power supply systems

Wiring to the units, I/O devices, and other power devices should have separate wiring systems.



■ Power supply sequence

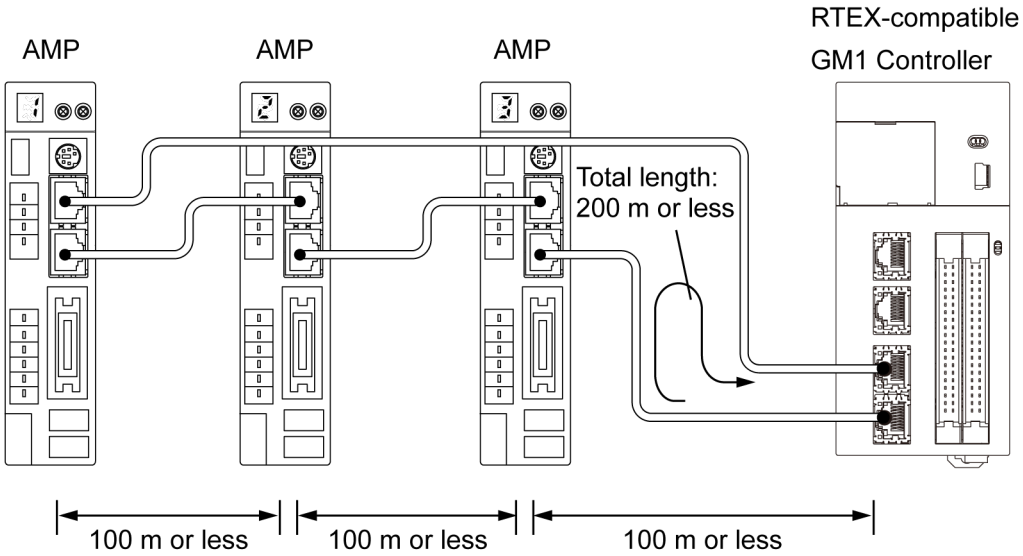
- Have the power supply sequence such that the power supply of the GM1 Controller (RTEX-compatible / EtherCAT-compatible) turns OFF before the power supply for input and output.
- If the I/O power supplies are turned OFF before the power to the GM1 Controller (RTEX-compatible / EtherCAT-compatible), the GM1 Controller (RTEX-compatible / EtherCAT-compatible) will detect the input fluctuations and may begin an unscheduled operation.

6.1.2 Wiring of Network

Wiring to RTEX・EtherCAT ports

RTEX

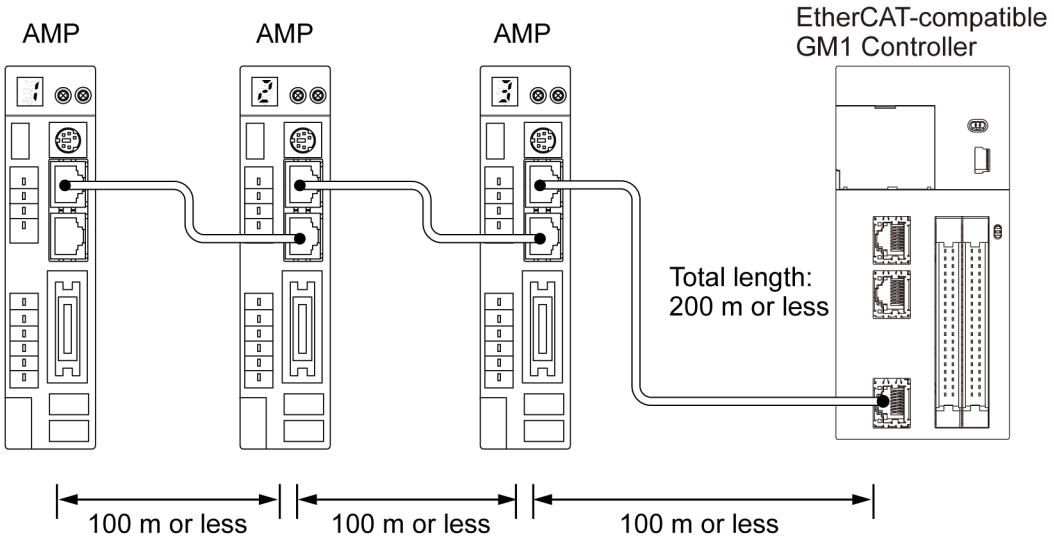
Item	Specifications
Cable	Shielded twisted pair (TIA/EIA-568B CAT5e or higher)
Topology	Ring
Connector	8-pin RJ45
Maximum cable length	Between nodes: 100 m, total length: 200 m



- Connect the cable that is connected to the "TX" of the GM1 Controller (RTEX) to the "X2A Connector (RX) "of the servo amplifier. In the same way,connect between amplifiers from X2B (TX) to X2A (RX).Connect them in a loop in such a way that X2B (TX) of the end amplifier is connected to the "RX" of the GM1 Controller (RTEX)

EtherCAT

Item	Specifications
Cable	Shielded twisted pair (TIA/EIA-568B CAT5e or higher)
Topology	Daisy chain (No branching)
Connector	8-pin RJ45
Maximum cable length	Between nodes: 100 m, total length: 200 m



- Connect the cable that is connected to the "EtherCAT port" of the GM1 Controller (EtherCAT) to the "X2A Connector (RX) "of the servo amplifier. In the same way,connect between amplifiers from X2B (TX) to X2A (RX).

- Always use shielded twisted pair (STP) cables that are compatible with category 5e or higher.
- Turn OFF the power to the system before wiring cables.
- To prevent the cable from coming off, securely connect the connector of the cable to the network connector (RJ45 connector) of the unit.
- The Ethernet hub cannot be used.
- For detailed information of cable specifications and precautions, refer to the data "RTEX Cable" listed on the web page.
  https://industrial.panasonic.com/ac/j/dl_center/manual/

Wiring to LAN port

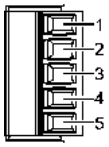
Item	Specifications
Max. segment length	100 m(Note 1)
Max. distance between nodes	100BASE-TX 2 segments
	10BASE-T 5 segments
Communication cable	Shielded twisted pair (TIA/EIA-568B CAT5e or higher)

(Note 1) The standards cite 100m as the maximum, but noise resistance measures such as attaching a ferrite core may be necessary in some cases, depending on the usage environment. Also, it is recommended to position a hub near the control board, and limit the length within 10m.

Wiring to COM port

Item	Specifications
Transmission distance	MAX. 15 m
Transmission line	Multicore shielded wire
Connector shape	Removable terminal block (5-pin)

■ Terminal layout

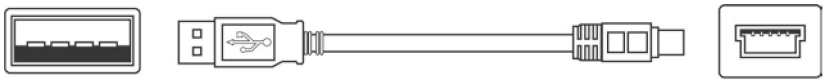


Terminal no.	Signal name	Function
1	SD	Send data
2	RD	Receive data
3	SG	Signal ground
4	N.C.	—
5	N.C.	—

Wiring to USB port

Cable type	Length
USB 2.0 cable (A: miniB)(Note 1)	Max. 5 m

(Note 1) Match the connection terminal shape of the USB2.0 cable on the PC side with the specifications of the PC side.



USB A type (male) - USB miniB type (5-pin, male)

(PC side) (GM1 side)

6.1.3 Mounting SD/SDHC Memory card

Preparation of the SD Memory Card and SDHC Memory Card

■ Usable SD memory card and SDHC memory cards

We recommend SLC SD Memory Cards and SLC SDHC Memory Cards.

Logo printed on the GM1 Controller (RTEX-compatible / EtherCAT-compatible)	Usable SD (SDHC) memory cards	
	Card type	Capacity
	SD memory card	2 GB
	SDHC memory card	4 GB to 32 GB

■ Precautions on handling the SD memory card and SDHC memory card

The data saved in the SD memory card or in the SDHC memory card may be lost in the following cases. We assume no responsibility whatsoever for the loss of saved data.

- When the user or a third party has misused the SD memory card or SDHC memory card
- When the SD memory card or SDHC memory card was affected by any static electricity or electrical noise
- When the SD memory card or SDHC memory card was taken out, or the power supply to the GM1 Controller (RTEX-compatible / EtherCAT-compatible) was turned OFF, while the card was being accessed to save or delete data

- It is recommended to save important data in another media for backup.
- Never remove the card or turn OFF the power supply to the GM1 Controller (RTEX-compatible / EtherCAT-compatible) while the "SD" LED on the GM1 Controller (RTEX-compatible / EtherCAT-compatible) is lit (data is being read from or written into the card). Data may be damaged.
- Do not use an SD memory card or SDHC memory card that has a memory capacity larger than the usable capacity. Data in the card may be damaged.
- Implements SD memory card or SDHC memory card management to prevent data in the card from being leaked to third parties.

■ Formatting the SD memory card and SDHC memory card

In principle, the SD memory card and SDHC memory card have been formatted by the time of purchase, and no formatting by the user is required. If formatting becomes necessary, download the SD formatter software from the SD association site and format the memory card.

Info.

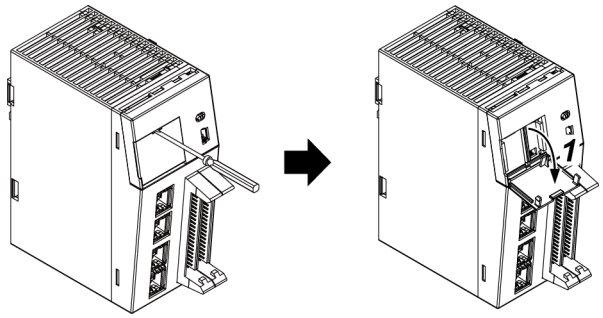
- The SD memory card or SDHC memory card file system formatted by PC's standard formatting software does not satisfy the SD memory card or SDHC memory card specifications. Please use the dedicated formatting software.

Inserting the SD Memory Card and SDHC Memory Card

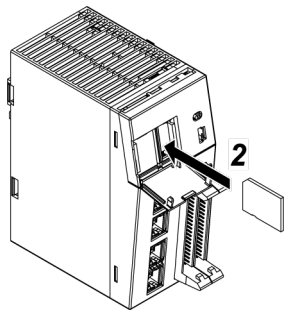
- Do not apply an excessive force to the card cover when opening or closing it or when the cover is left open. Otherwise, the cover attachment part will be deformed to cause malfunction in the cover switch mounted inside the product.

Procedure

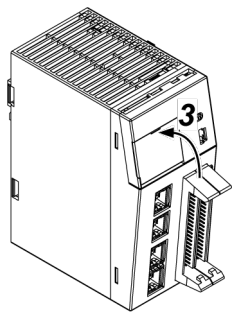
1. Insert the tip of a flat blade screw driver into the cavity on the card cover to open the cover.



2. Insert the SD memory card or SDHC memory card into the SD memory card slot until it is locked in place.



3. Close the SD memory card cover.



Info.

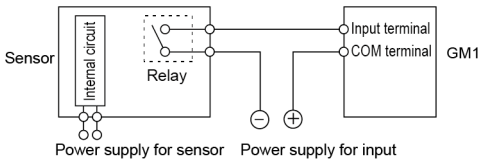
- When removing the SD memory card or SDHC memory card, make sure that the "SD" LED on the GM1 Controller (RTEX-compatible / EtherCAT-compatible) is not lit.

6.1.4 Wiring to General purpose I/O or High-speed Counter input

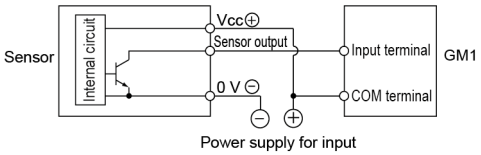
Input Wiring

■ Connection of photoelectric sensor and proximity sensor

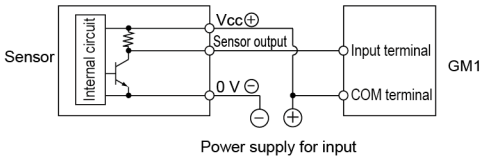
Relay output type



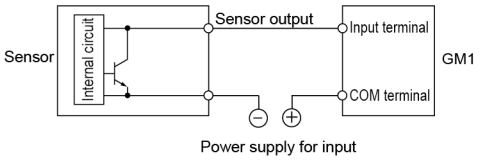
NPN open collector output type



Voltage output type

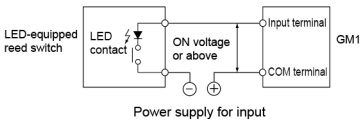


Two-wire output type



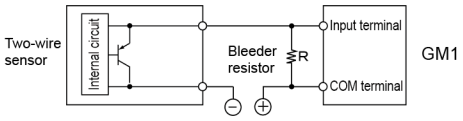
■ Precaution when using LED-equipped reed switch

When a LED is connected in series to an input contact such as LED-equipped reed switch, make sure that the voltage applied to the GM1 input terminal is greater than the ON voltage. In particular, take care when connecting a number of switches in series.



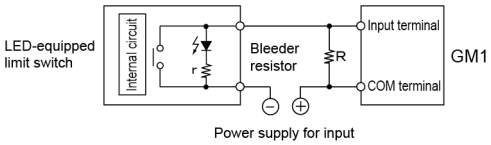
■ Precaution when using two-wire type sensor

If the input to the GM1 does not turn OFF because of leakage current from the two-wire type photoelectric sensor or proximity sensor, connect a bleeder resistor as shown below.



■ Precaution when using LED-equipped limit switch

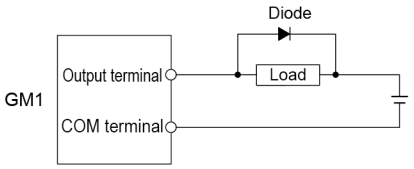
If the input to the GM1 does not turn OFF because of leakage current from the LED-equipped limit switch, connect a bleeder resistor as shown on below.



Output Wiring

■ Protective circuit for inductive loads

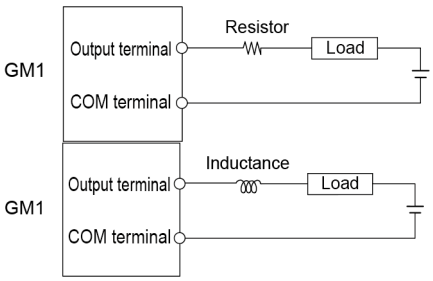
With an inductive load, a protective circuit should be installed in parallel with the load.



Diode	Reverse breakdown voltage	Three times higher than load voltage or more
	Average rectified current	Higher than load current

■ Precautions when using capacitive loads

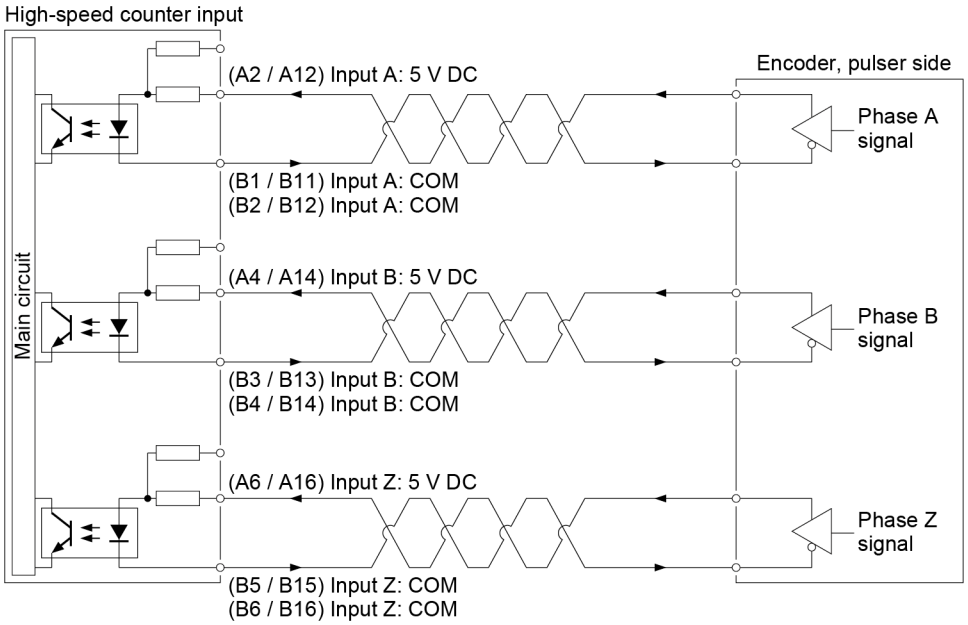
When connecting loads with large in-rush currents, to minimize their effect, connect a protection circuit as shown below.



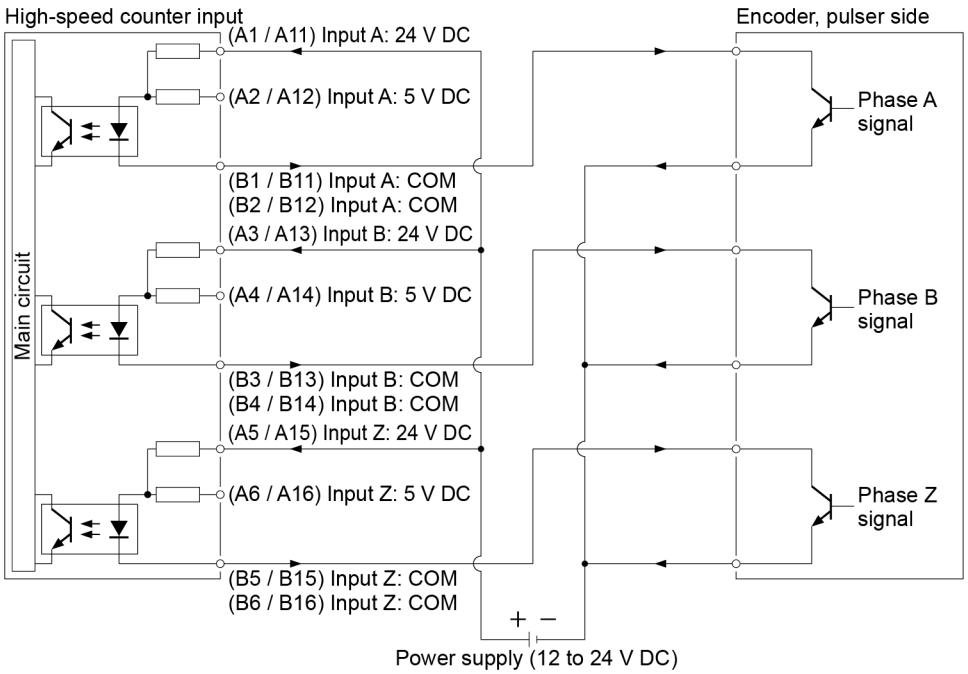
High-speed Counter Input Wiring

- For the connection between the count input (phases A, B, Z) and encoder, etc., use shielded twisted-pair cables.
- The length of connected wires should be 10 m or below.

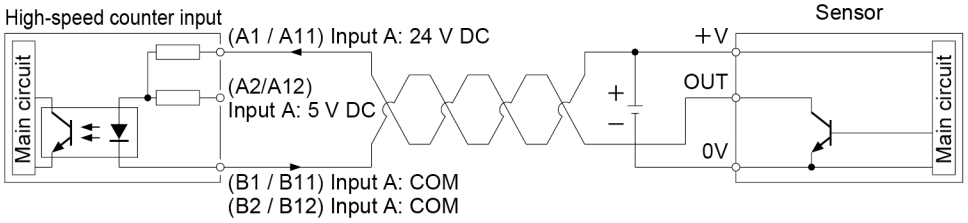
■ For line driver of encoder input



■ For transistor open collector type of encoder input



■ For sensor input



Precautions

■ Wiring arrangement

- Arrange the wiring so that the input and output wiring are separated, and these wirings are separated from the power wiring, as much as possible.
- Do not route them through the same duct or tie them in a bundle.
- Separate the I/O wires from the power and high voltage wires by at least 100 mm.

■ Selection of wires

- Be sure to select the thickness (dia.) of the input and output wires while taking into consideration the required current capacity.

■ The NC terminals

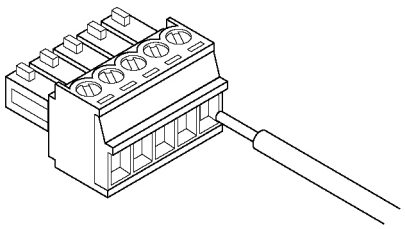
- The NC terminals on the terminal block are unused. Do not use these terminals to relay wires because the terminals include those connected internally.

■ Power supply

- Wiring should be carried out after the power supply to the GM1 was turned OFF. Also turn OFF the power supply when connecting the GM1 Controller (RTEX-compatible / EtherCAT-compatible) to expansion units. If they are connected during the power supply is on, it may cause the fault or malfunction.

6.1.5 Wiring to the Screw-tightening Type Connector

The communication port has a screw-tightening type terminal block. Use the following items for wiring.



■ Compatible wires (stranded wire)

Size	Nominal cross-sectional area
AWG#26 to 16	0.14 mm^2 to 1.5 mm^2

■ Compatible wires (stranded wire) for rod terminal connection

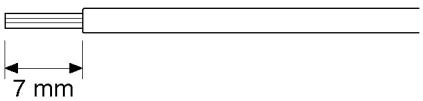
Connection	Size	Cross-sectional area
Rod terminal (without insulation sleeve)	AWG#24 to 16	0.25 mm^2 to 1.5 mm^2
Ferrule (with insulation sleeve)	AWG#24 to 20	0.25 mm^2 to 0.5 mm^2

■ Special tool to tighten the terminal block of communication block

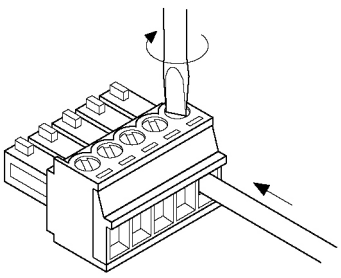
To tighten terminals, use a screwdriver from Phoenix Contact (model No. SZS 0,4 x 2,5, product No. 1205037, blade size 0.4 x 2.5). The tightening torque should be 0.22 to 0.25 N·m.

■ Wiring method

1. Strip the sheath from the wire.



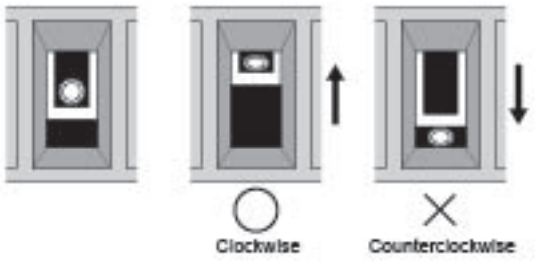
2. Insert wire into terminal hole until it stops. Tighten the screw clockwise to fix it in place. (The tightening torque should be 0.22 to 0.25 N·m.)



■ Precautions on wiring

The following precautions should be observed to avoid broken or disconnected wires.

- When removing the wire's sheath, be careful not to scratch the core wire.
- Connect the core wire without twisting.
- Connect the core wire without soldering. Otherwise, the core wire may break due to vibration.
- After wiring, make sure stress is not applied to the wire.
- Due to the terminal construction, if the wire is fastened in a counterclockwise direction, the connection is faulty. Disconnect the wire, check the terminal hole, and then re-connect the wire.

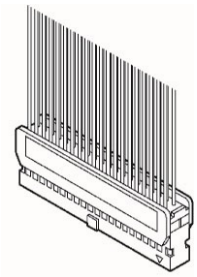


6.1.6 Connection of MIL connector

Discrete-wire Connector

This is a connector that allows loose wires to be connected without removing the wire's insulation. Use a special tool for wire connection.

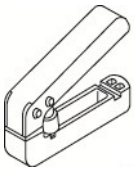
■ **Discrete-wire connector (40P)**



■ **AFP2801 Discrete-wire Connector (Purchase separately)**

Composition of parts	Quantity (2 sets)
Housing (40P)	1 pc.
Semi-cover (40P)	2 pc.
Contact (For AWG22 and AWG24 5 pins	8 pc.

■ **AXY52000FP Dedicated crimping tool (Purchase separately)**

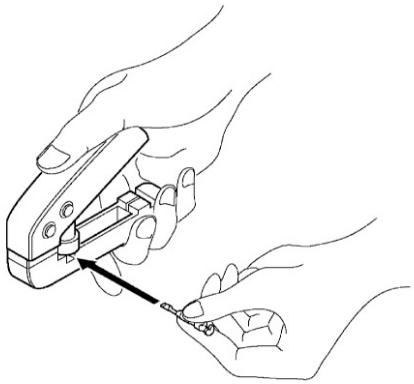


Wiring the Discrete-wire Connector

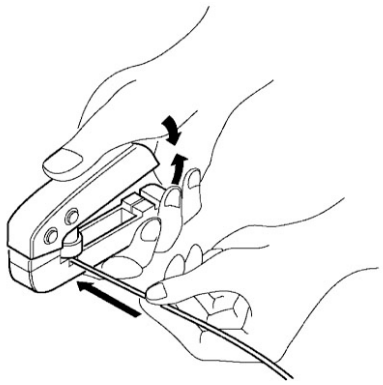
- When performing wiring work, refer to the instruction manual of the crimping tool in order to prevent faulty wiring.

Procedure

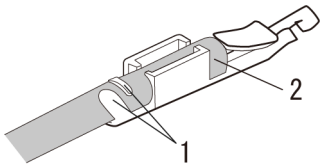
1. Bend and break the contact, and set it in the crimping tool.



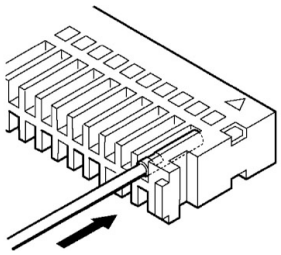
2. Insert the wire without removing its insulation until it stops, and lightly grip the crimping tool.



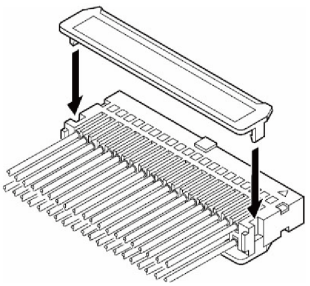
3. The contact appears as shown below after it is crimped. Confirm the following two points.
   1. The wire must be embraced inside the clamped part.
   2. The wire must be inserted to the end.

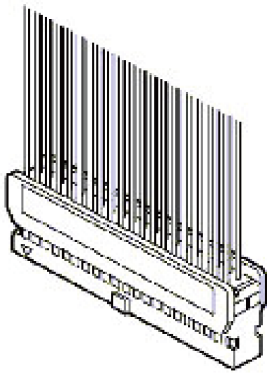


4. Insert the wire with the contact into the housing.



5. When all the wires have been inserted, fit the semi-cover into place.

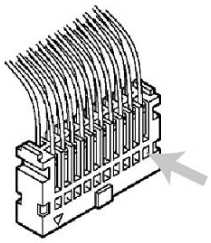




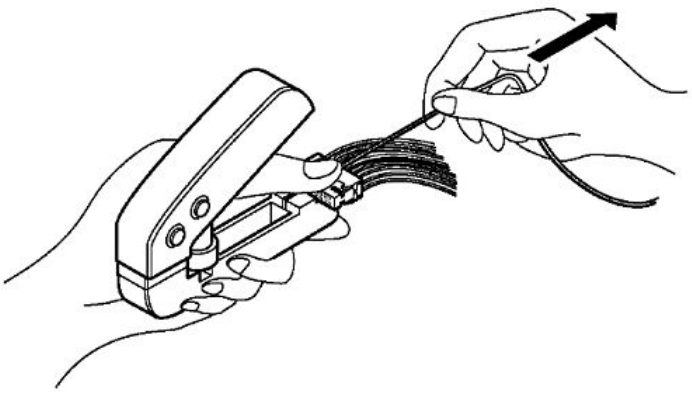
Info.

- If there is a wiring mistake or the wire is incorrectly press-fit, use the crimping tool to remove the contact.

  1. Set the pin of the crimping tool at the position indicated by an arrow.



  2. Hold the housing with fingers and pull the wire.



Push in connector

This is a 40 pin push-in connector made by DEGSON.

■ Push in connector

Product name	Model number	Note
Push in connector set (40 P)	AFP2808	2 pieces

■ Rod terminals with compatible insulation sleeve

Use the following rod terminals.

Manufacturer	Model number	Size	Cross-sectional area
Phoenix Contact Co. Ltd	AI0,34−8TQ	AWG#22	0.34 mm^2

■ Crimping tool dedicated to rod terminals

Manufacturer	Model number
Phoenix Contact Co. Ltd	CRIMPFOX 10S

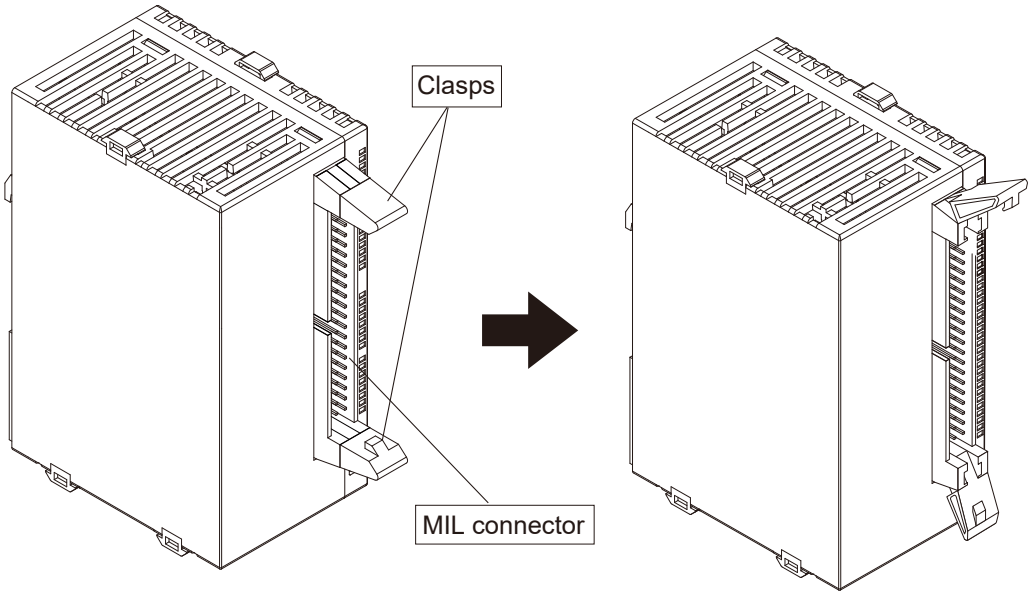
Mounting to the Unit

■ Mounting to the unit

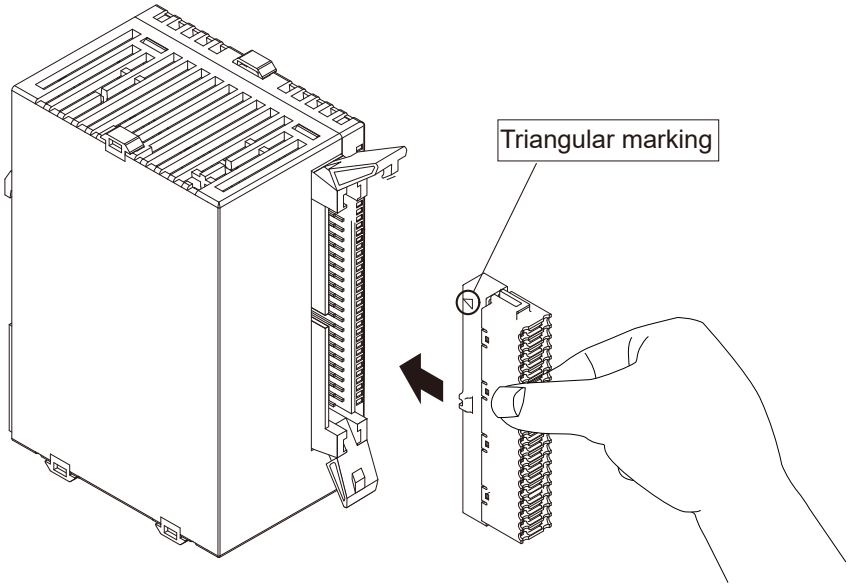
Follow the procedure below to mount the push-in connector to the unit.

1 2 Procedure

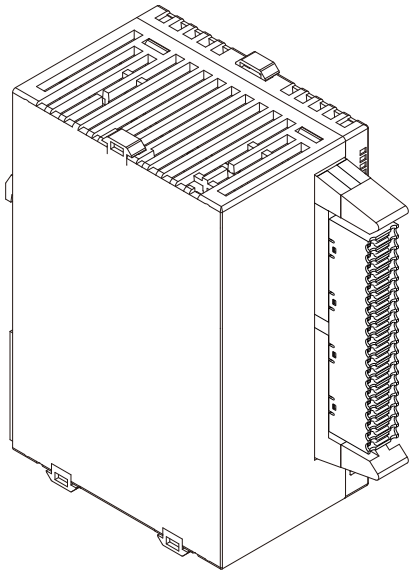
1. Open the clasps of the MIL connector.



2. Insert the push-in connector into the MIL connector. When inserting the push-in connector, make sure that the triangular marking is at the top.



3. Insert the push-in connector into the MIL connector until its clasps are closed.



Wiring to the Push-in Connector

The wiring procedure is as follows.

Note

Precautions on wiring

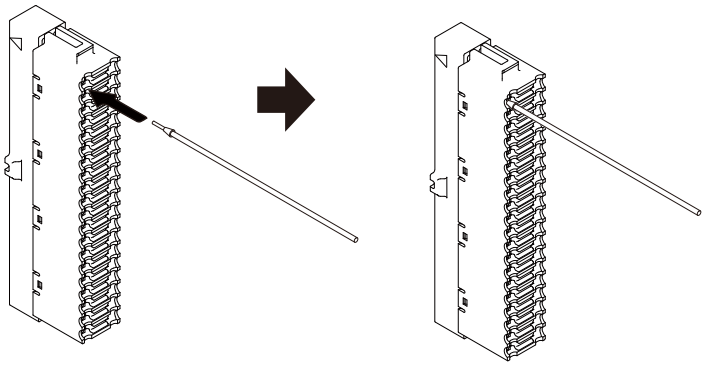
- When removing the wire's sheath, be careful not to scratch the core wire.
- After wiring, make sure stress is not applied to the wire.
- Do not solder the core wire. Soldering the core wire may cause wire breakage due to vibration.

Procedure

1. Strip the sheath from the wire.

2. Attach the rod terminal to the core wire part. When attaching it, do not twist the core wire.

3. After attaching the rod terminal, use the dedicated rod terminal crimping tool to crimp it.
4. After crimping the rod terminal, insert the wire into the push-in connector.



Info.

After inserting the wire, ensure that it does not come out.

Wire Replacement

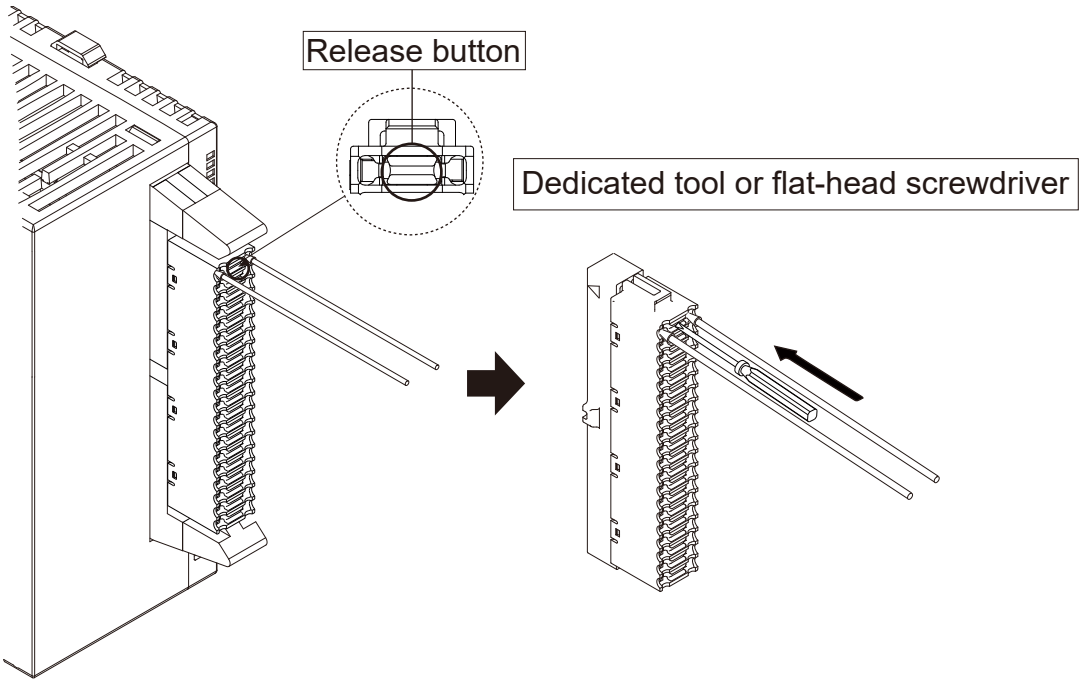
The wire replacement procedure is as follows.
To remove the wire, use the following dedicated tool or equivalent flat-blade screwdriver.

■ Dedicated tool

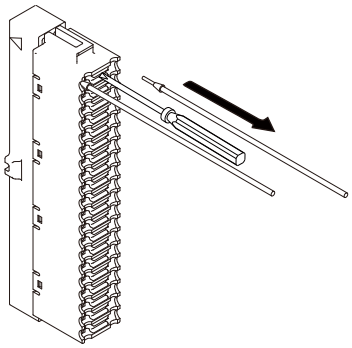
Manufacturer	Model number	Remarks
Phoenix Contact Co. Ltd	SZS 0, 4x2, 5	Blade width 0.4 × Blade thickness 2.5

1 2 Procedure

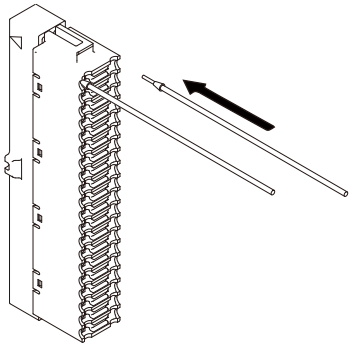
1. Use the dedicated tool or a flat-blade screwdriver to push the release button on the push-in connector.



2. While pushing the button, remove the wire.



3. Insert a new wire. For details on how to insert a wire, refer to "Wiring to the Push-in Connector".



Info.

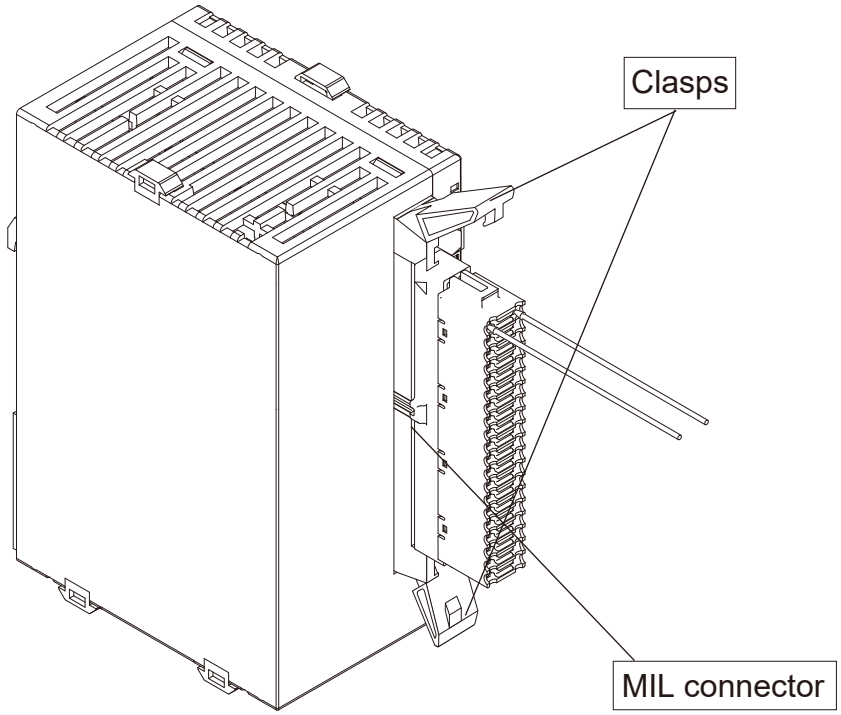
- Pushing the release button releases the wire locks on both sides of the button. After wire replacement, ensure that the wire does not come out.

Removing from the Unit

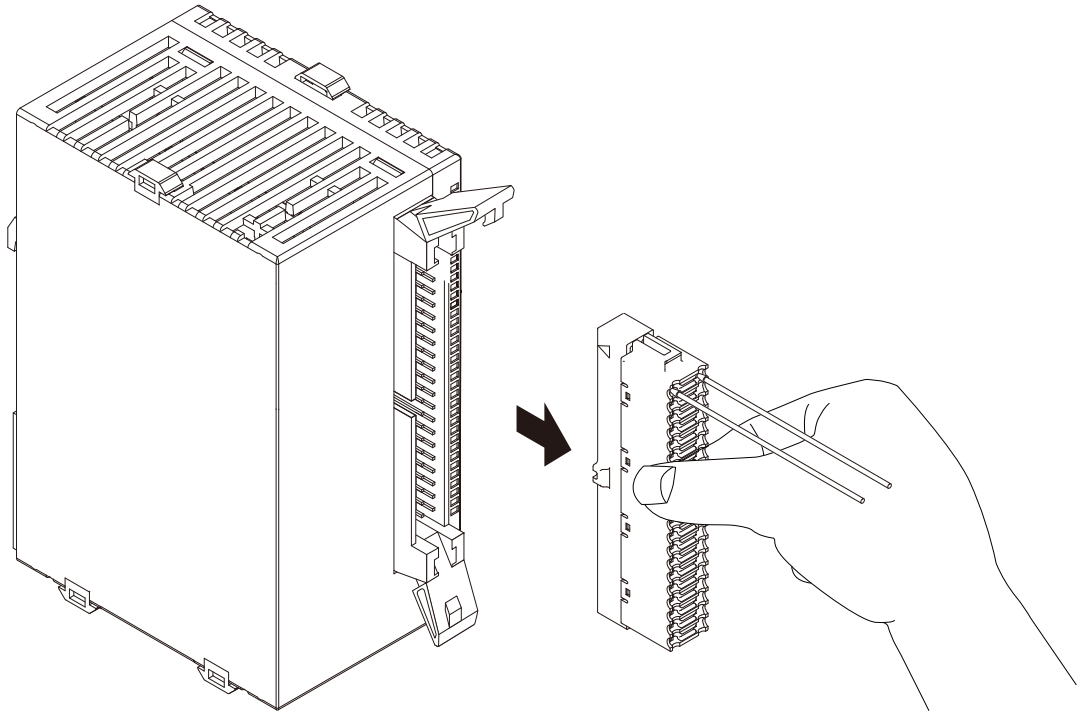
Follow the procedure below to remove the push-in connector from the unit.

Procedure

1. Open the clasps of the MIL connector.



2. Remove the push-in connector from the unit.



6.2 Digital I/O Unit

6.2.1 Wiring to Digital I/O Unit

For Digital I/O Unit wiring, please refer to "Input Wiring" or "Output Wiring".

6.2.2 Connection of MIL connector

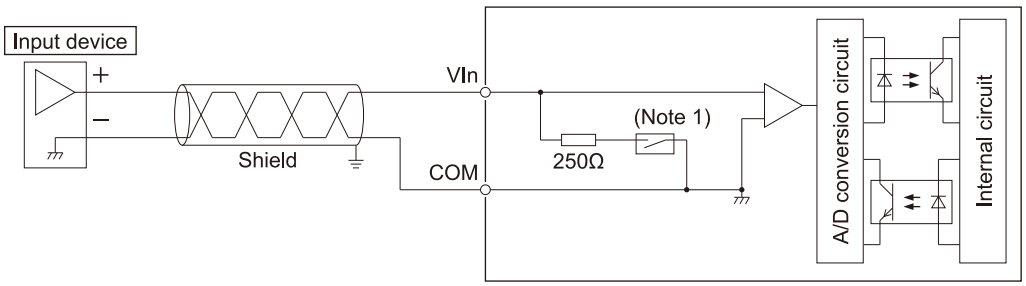
For connection to MIL connector, please refer to "6.1.6 Connection of MIL connector".

6.3 Analog I/O Unit

6.3.1 Wiring to Analog I/O Unit

Analog input wiring

This section describes the input circuit and wiring of the analog input unit. The circuit for the voltage input is the same as that for the current input.

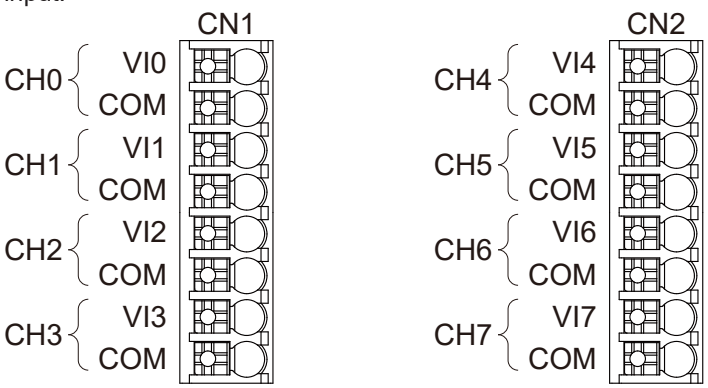


(Note 1) The circuit connection varies depending on parameter settings.

(Note 2) "n" indicates the channel number.

Terminal layout diagram

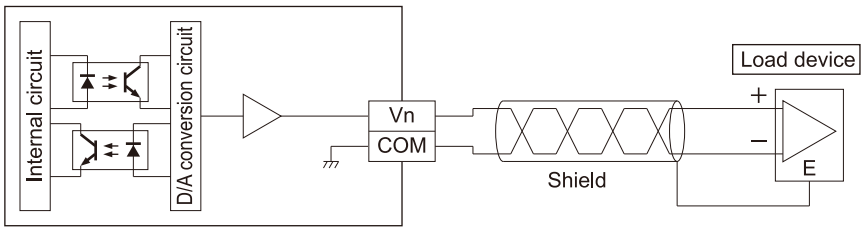
The terminal used by the analog voltage input is common to that used by the analog current input.



Analog output wiring

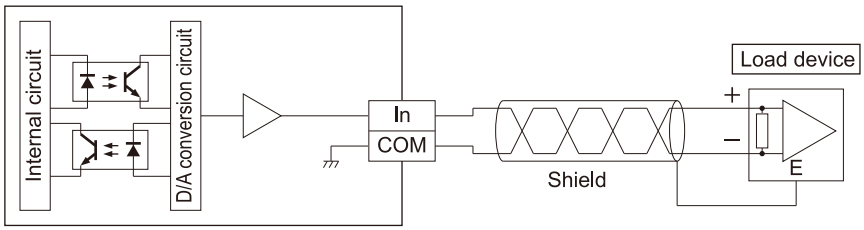
This section describes the output circuit and wiring of the analog output unit when the output range is set to the voltage output (-10 to +10 V, 0 to +10 V, -5 to +5 V, 0 to + 5 V, +1 to +5 V).

Case:Analog voltage input



(Note 1) "n" indicates the channel number.（0 to 3）

Case:Analog current input

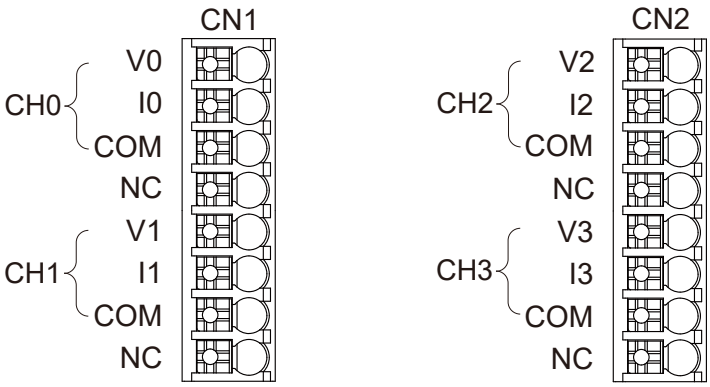


Terminal layout diagram

The terminal used by the analog voltage output is different from that used by the analog current output.

- Case:Analog voltage input：Vn
- Case:Analog current input：In

"n" indicates the channel number（0 to 3）



Precautions

- Use double-core twisted-pair shielded wires for connecting analog signals.
- Connect the shield of the shielded cable to the ground on the load device side.
  However, depending on the conditions of the external noise, it may be better to ground externally or not to ground the shield.
- Do not have the analog input wiring close to AC wires, power wires, or load line from a device other than the Motion Controller. Also, do not bundle it with them.
- The NC terminals on the terminal block are unused. Do not use these terminals to relay wires because the terminals include those connected internally.

6.3.2 Connectioning to Push in connector

Push-in Connector

A spring connection type is used for the terminal block of the analog I/O section. Perform wire connection properly by referring to the compatible products listed in the following tables.

■ **Compatible wires (stranded wire)**

Size	Nominal cross-sectional area
AWG#24 to 16	0.2 mm^2 to 1.5 mm^2

■ **Compatible wires (stranded wire) for rod terminal connection**

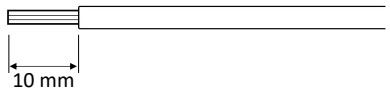
Connection	Size	Cross-sectional area
Rod terminal (without insulation sleeve) Ferrule (without insulation sleeve)	AWG#24 - 16	0.25 mm^2 to 1.5 mm^2
Ferrule (with insulation sleeve)	AWG#26 - 18	0.14 mm^2 to 0.75 mm^2

wire conenection method to Push in connector

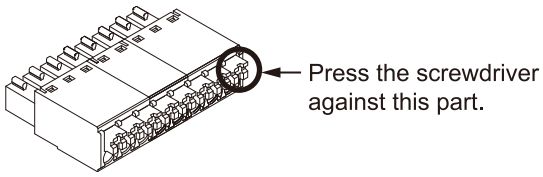
Perform wire connection of the terminal block according to the following procedure.

Procedure

1. Strip the sheath from the electric wire.



2. While pressing the tab on the terminal block using a flat-blade screwdriver, insert the wire all the way until it stops. Confirm that the electric wire is fixed in place when the screwdriver is released.



(Note 1) The above illustration shows an eight-pin type when it is removed from the unit.

(Note 2) Use a screwdriver listed in the following table as a dedicated tool or equivalent (blade width: 0.4 x 2.5）.

Manufacturer	Model number	Production number
Phoenix Contact Co., Ltd	SZS 0, 4x2, 5	1205037

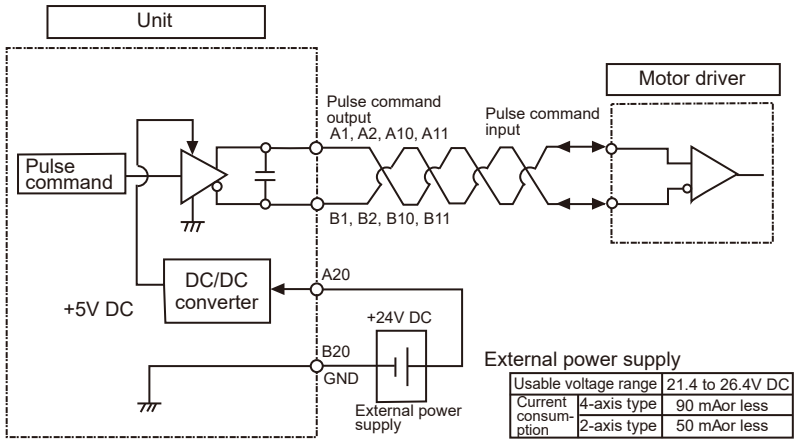
- The following precautions should be observed to avoid broken or disconnected wires.
  - When removing the wire's sheath, be careful not to scratch the core wire.
  - Do not twist the wires to connect them.
  - Do not solder the wires to connect them. The solder may break due to vibration.
  - After wiring, make sure stress is not applied to the wire.

6.4 Pulse Output Unit

6.4.1 Pulse output Wiring

Supplying Power for Internal Circuit Drive

■ **Case:Line Driver Output Type**



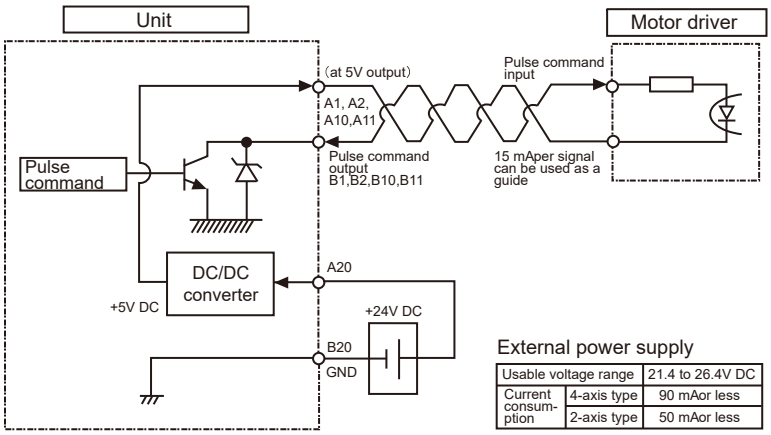
External power supply

Usable voltage range		21.4 to 26.4V DC
Current consum-ption	4-axis type	90 mAor less
	2-axis type	50 mAor less

The illustration shows one signal component extracted from the overall configuration.

■ **Case:Transistor Output Type**

The power supply for the pulser command output circuit can be taken from the 5 V DC output pins.



External power supply

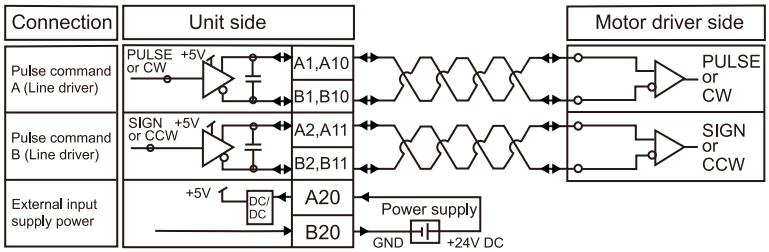
Usable voltage range		21.4 to 26.4V DC
Current consum-ption	4-axis type	90 mAor less
	2-axis type	50 mAor less

- When transistor output (open collector output) is used, a value of 15 mA per signal should be used as a guide. If 15 mA is exceeded, an appropriate resistance should be added.

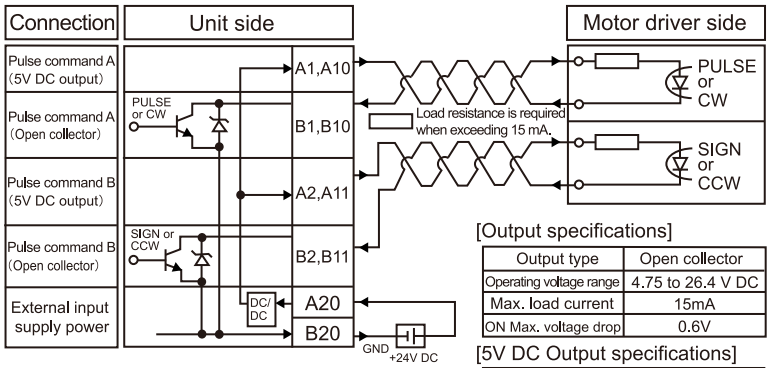
Connection of Pulse Command Output Signal

The pulse output unit is equipped with two output types to match two types of motor driver interfaces. Connect to either one of them depending on the interface of the motor driver to be used.

■ Case:Line Driver Output Type



■ Case:Transistor Output Type



[Output specifications]

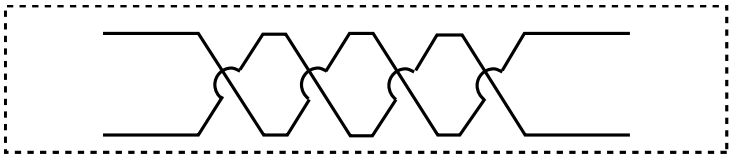
Output type	Open collector
Operating voltage range	4.75 to 26.4 V DC
Max. load current	15mA
ON Max. voltage drop	0.6V

[5V DC Output specifications]

Output power supply range	4.75 to 5.25 V DC
Current consumption	5V DC 15mA/1signal

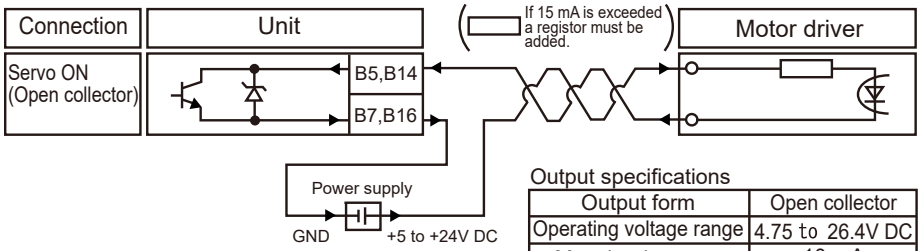
Info.

- A value of 15 mA per signal should be used as a guide. If this is exceeded, resistance should be added.
- The symbol below indicates a twisted-pair wiring. We recommend using twisted-pair cables as the wiring between the output of the pulse output unit and the motor driver.



Connection of Servo ON Output

- This is an example showing the connection of the servo ON to the servo amplifier.
- An external power supply (+5 V DC to +24 V DC) must be provided for the connection.

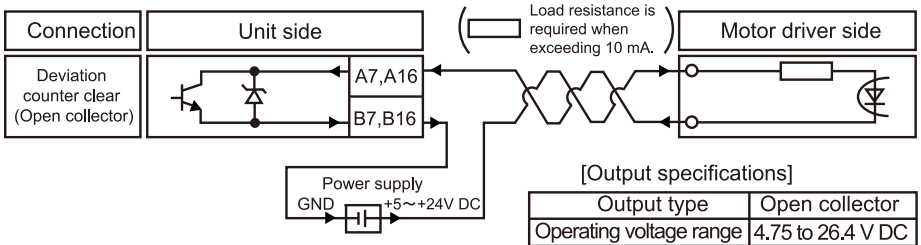


Output specifications

Output form	Open collector
Operating voltage range	4.75 to 26.4V DC
Max. load current	10 mA
ON Max. voltage drop	1V

Connection of Deviation Counter Clear Output Signal

- This is an example showing the connection of the counter clear input to the servo amplifier.
- An external power supply (+5 V DC to +24 V DC) must be provided for the connection.



[Output specifications]

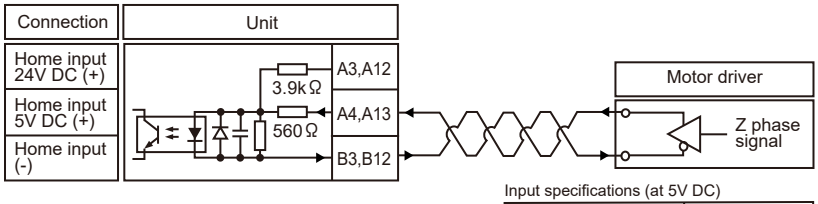
Output type	Open collector
Operating voltage range	4.75 to 26.4 V DC
Max. load current	10mA
ON Max. voltage drop	1V

Note

- Always use twisted-pair cables for wiring.
- The current which can be conducted as the deviation counter clear output signal is 10 mA max. If this is exceeded, a resistance should be added.

Connection precautions

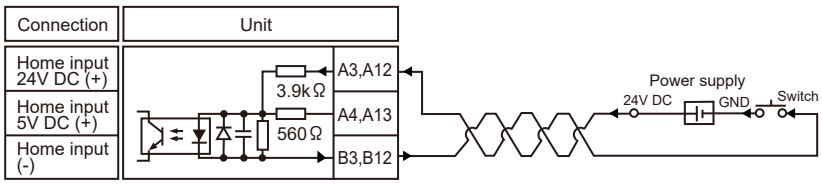
■ Connection of Home Input (When connecting to motor driver Z phase output)



Input specifications (at 5V DC)

Input voltage range	3.5 to 5.25V DC
Min. ON voltage/current	3V DC/4mA
Max. OFF voltage/current	1V DC/0.5mA
Input impedance	560Ω
Min. input pulse width	100μs

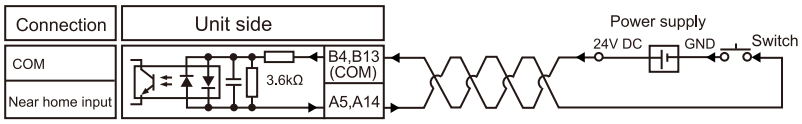
■ Connection of Home Input (When connecting to an external switch/sensor)



Input specifications (at 24V DC)

Input voltage range	21.6 to 26.4V DC
Min. ON voltage/current	19.2V DC/5.5mA
Max. OFF voltage/current	2V DC/2mA
Input impedance	3.9kΩ
Min. input pulse width	100μs

■ Connection of Near Home Input Signal

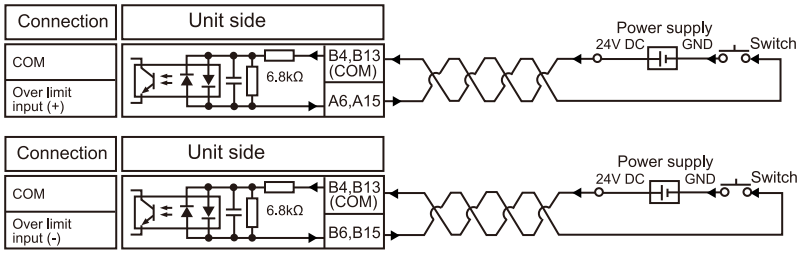


[Input specifications]

Input voltage range	21.6 to 26.4 V DC
Min. ON voltage/current	19.2V DC/5.0mA
Max. OFF voltage/current	2V DC/1.5mA
Input impedance	Approx. 3.6kΩ
Min. input pulse width	500μs

(Note 1) Terminal numbers B4 and B13 are common for the Near home input, Over limit input (+), Over limit input (-) and Positioning control start input.

■ Connection of Over Limit Input Signal

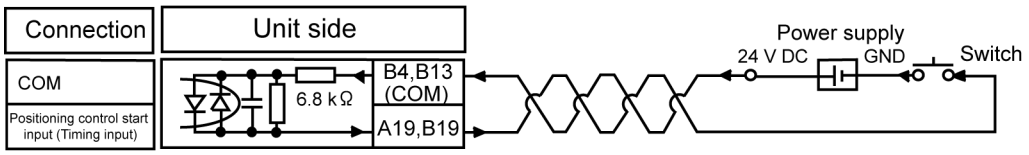


[Input specifications]

Input voltage range	21.6 to 26.4 V DC
Min. ON voltage/current	19.2V DC/2.6mA
Max. OFF voltage/current	2V DC/1.5mA
Input impedance	Approx. 6.8kΩ
Min. input pulse width	500μs

(Note 1) Terminal numbers B4 and B13 are common for the Near home input, Over limit input (+), Over limit input (-) and Positioning control start input.

■ **Connection of Positioning Control Start Input (Timing Input)**



[Input specifications]

Input voltage range	21.6～26.4 V DC
Min. ON voltage/current	19.2 V DC/2.6 mA
Max. OFF voltage/current	2 V DC/1.5 mA
Input impedance	Approx. 6.8 kΩ
Min. input pulse width	500 μs

(Note 1) Terminal numbers B4 and B13 are common for the Near home input, Over limit input (+), Over limit input (-) and Positioning control start input.

6.4.2 Connection of MIL connector

For connection to MIL connector, please refer to "6.1.6 Connection of MIL connector".

6.5 Serial Communication Unit

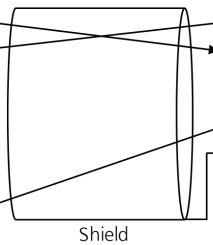
6.5.1 Connection of RS-232C

Example of RS-232C Wiring

- When Setting No Flow Control

AGM1NSC*		
Pin No.	Symbol	Function
1	SD	Send data
2	RD	Receive data
3	RS	-
4	CS	-
5	NC	-
6	NC	-
7	NC	-
8	SG	Signal ground

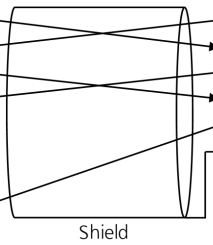
Connect to	
Symbol	Function
SD	Send data
RD	Receive data
RS	-
CS	-
SG	Signal ground
FG	Case ground



- When Setting Flow Control

AGM1NSC*		
Pin No.	Symbol	Function
1	SD	Send data
2	RD	Receive data
3	RS	Request to send
4	CS	Clear to send
5	NC	-
6	NC	-
7	NC	-
8	SG	Signal ground

Connect to	
Symbol	Function
SD	Send data
RD	Receive data
RS	Request to send
CS	Clear to send
SG	Signal ground
FG	Case ground



Precautions

- Use shielded wires for RS-232C communication.
- Connect the shield of the shielded cable to the ground on the load device side.
  However, depending on the conditions of the external noise, it may be better to ground externally or not to ground the shield.
- Do not have the RS-232C communication wiring close to AC wires, power wires, or load line from a device other than the Motion Controller. Also, do not bundle it with them.
- The NC terminals on the terminal block are unused. Do not use these terminals to relay wires because the terminals include those connected internally.

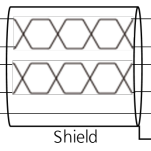
6.5.2 Connection of RS-422A/485

Example of RS-422A/485 Wiring

- Example of RS-422A Wiring

AGM1NSC*

Pin No.	Symbol	Function
1	TERMA	-
2	TERMB	-
3	NC	-
4	RD+/SR+	Receive data (+)
5	RD-/SR-	Receive data (-)
6	SD+	Send data (+)
7	SD-	Send data (-)
8	SG	Signal ground



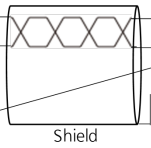
Connect to

Symbol	Function
SD+	Send data (+)
SD-	Send data (-)
RD+	Receive data (+)
RD-	Receive data (-)
SG	Signal ground
FG	Case ground

- Example of RS-485 Wiring (1-to-1 Connection)

AGM1NSC*

Pin No.	Symbol	Function
1	TERMA	Termination resistor
2	TERMB	Termination resistor
3	NC	-
4	RD+/SR+	Send and receive data (+)
5	RD-/SR-	Send and receive data (-)
6	SD+	-
7	SD-	-
8	SG	Signal ground



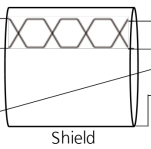
Connect to

Symbol	Function
SR-	Send and receive data (-)
SR+	Send and receive data (+)
SG	Signal ground
FG	Case ground

- Example of RS-485 Wiring (1-to-N Connection)

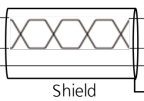
AGM1NSC*

Pin No.	Symbol	Function
1	TERMA	Termination resistor
2	TERMB	Termination resistor
3	NC	-
4	RD+/SR+	Send and receive data (+)
5	RD-/SR-	Send and receive data (-)
6	SD+	-
7	SD-	-
8	SG	Signal ground



Connect to

Symbol	Function
SR-	Send and receive data (-)
SR+	Send and receive data (+)
SG	Signal ground
FG	Case ground



Connect to

Symbol	Function
SR+	Send and receive data (+)
SR-	Send and receive data (-)
SG	Signal ground
FG	Case ground

Precautions

- When the unit is set up for RS-422A, connect a termination resistor. When the unit is set up for RS-485, connect a termination resistor only when it is a terminal unit.

  To connect the GM1's termination resistor, short-circuit the TERMA and TERMB terminals.
- Use twisted-pair shielded wires for connection for RS-422A/485 communication wiring.
- Although the unit communicates even when the SG terminal is not connected, connecting it to the SG terminal on the load device side may improve noise immunity.
- Connect the shield of the shielded cable to the ground on the load device side.

  However, depending on the conditions of the external noise, it may be better to ground externally or not to ground the shield.
- Do not have the RS-422A/485 communication wiring close to AC wires, power wires, or load line from a device other than the Motion Controller. Also, do not bundle it with them.
- The NC terminals on the terminal block are unused. Do not use these terminals to relay wires because the terminals include those connected internally.

6.5.3 Wiring to the Screw-tightening Type Connector

The communication port has a screw-tightening type terminal block. Use the following items for wiring.

■ Compatible wires (stranded wire)

Connection	Size	Cross-sectional area
1-wire connection	AWG#26 to 16	0.14 mm^2 to 1.5 mm^2
2-wire connection(Note 1)	AWG#28 to 18	0.18 mm^2 to 0.75 mm^2

■ Compatible wires (stranded wire) for rod terminal connection

Connection	Size	Cross-sectional area
1-wire connection, rod terminal (without insulation sleeve)	AWG#24 to 16	0.25 mm^2 to 1.5 mm^2
1-wire connection, ferrule (with insulation sleeve)	AWG#24 to 20	0.25 mm^2 to 0.50 mm^2
2-wire connection, ferrule (without insulation sleeve)(Note 1)	AWG#24 to 22	0.25 mm^2 to 0.34 mm^2
2-wire connection, TWIN ferrule (with insulation sleeve) (Note 1)	AWG#20	0.5 mm^2

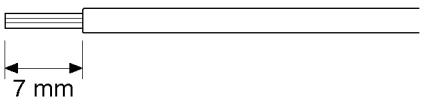
(Note 1) For conformance to UL/cUL standards, use an appropriate UL/cUL listed TWIN ferrule (CCN: ZMLF/7) to connect the machine, equipment, etc.

■ Special tool to tighten the terminal block of communication block

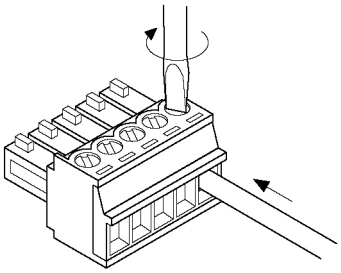
To tighten terminals, use a screwdriver from Phoenix Contact (model No. SZS 0,4 x 2,5, product No. 1205037, blade size 0.4 x 2.5). The tightening torque should be 0.22 to 0.25 N·m.

■ Wiring method

1. Strip the sheath from the wire.



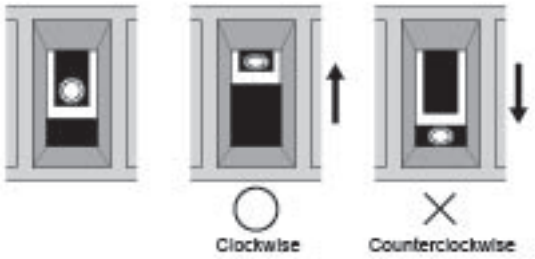
2. Insert wire into terminal hole until it stops. Tighten the screw clockwise to fix it in place. (The tightening torque should be 0.22 to 0.25 N·m.)



■ Precautions on wiring

The following precautions should be observed to avoid broken or disconnected wires.

- When removing the wire's sheath, be careful not to scratch the core wire.
- Connect the core wire without twisting.
- Connect the core wire without soldering. Otherwise, the core wire may break due to vibration.
- After wiring, make sure stress is not applied to the wire.
- Due to the terminal construction, if the wire is fastened in a counterclockwise direction, the connection is faulty. Disconnect the wire, check the terminal hole, and then re-connect the wire.
- If two wires are connected to the RS-485 terminal, use the same wire material of the same cross-sectional area.



6.6 Safety Measures

6.6.1 General Safety Measures

■ Precautions regarding system design

- In the system where the GM1 is used, malfunction may occur for the following reasons:
  - Power on timing differences between the GM1 system and I/O devices or power devices.
  - Response time lag when a momentary power failure occurs.
  - Abnormality in the GM1 Controller, external power supply, or other devices.

  In order to prevent a malfunction resulting in an error or accident of the overall system, take adequate safety measures.

■ Installation of an interlock circuit

- When controlling conflicting operations such as the motor rotation in clockwise or counter-clockwise direction, provide an interlock circuit external to the GM1.

■ Installation of an emergency stop circuit

- Provide an emergency stop circuit external to the GM1 to turn OFF the power supply of the output device.

■ Power supply sequence

- Start the GM1 only after I/O devices and power devices are energized.
- In case of stopping the operation of the GM1, have the I/O devices or power devices turned OFF after the GM1 has stopped operating.

■ Grounding

- When installing the GM1 next to devices that generate high voltages from switching, such as inverters, do not ground them together. Connect an exclusive ground with a resistance of 100 Ω or less.

6.6.2 Momentary Power Failure

■ Operations when a momentary power failure occurs

- If the duration of the momentary power failure is less than 10 ms, the GM1 continues to operate. If the power is off for 10 ms or longer, operation changes depending on the combination of units, the power supply voltage, and other factors. (In some cases, operation may be the same as that for a power supply reset.)

6.6.3 Watchdog Timer

- The watchdog timer is a program error and hardware error detection timer.

- When the watchdog timer is activated, the "Alarm" LED on the front of the Controller is lit. When this occurs, all outputs to the output units are turned OFF and the unit is put in halted state.

7 Installation

7.1 Installation Environment

■ Installation environment

Use the unit within the range of the general specifications when installing.

- Ambient temperature: 0 to +55°C
- Ambient humidity: 10 to 95% RH (at 25°C, non-condensing)
- Pollution degree: 2
- Altitude: 2,000 m above sea level or lower
- Overvoltage category: II or less
- Installation place: It is assumed to be used in an environment inside a control panel (metal panel with sufficient strength) that provides a protection rating of IP54 or higher.

Do not use it in the following environments.

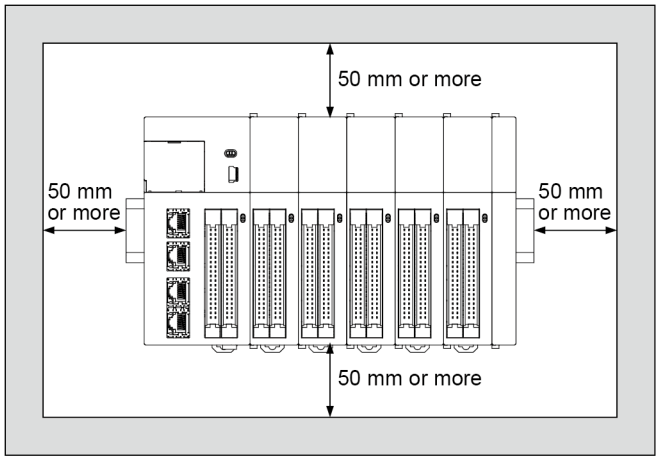
- Direct sunlight
- Sudden temperature changes causing condensation.
- Inflammable or corrosive gas.
- Excessive airborne dust, metal particles or saline matter.
- Benzine, paint thinner, alcohol or other organic solvents or strong alkaline solutions such as ammonia or caustic soda.
- Direct vibration, shock or direct drop of water.
- Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges. (100 mm or more)

■ Handling instructions

- Do not directly touch connector pins directly to prevent electrostatic discharge failure.
- Always rid yourself of any static electricity before handling this product.
- Do not connect a unit other than our GM1 series to the side connector on the unit.
- Use copper wires with a temperature rating of 90°C.

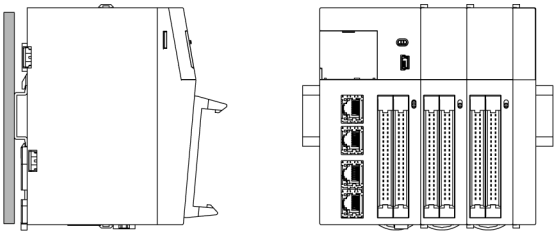
7.2 Attaching to Control panel

- Install the unit at least 50 mm away from other devices or wiring duct on the left and right sides and top and bottom sides of the unit to provide a ventilation space.

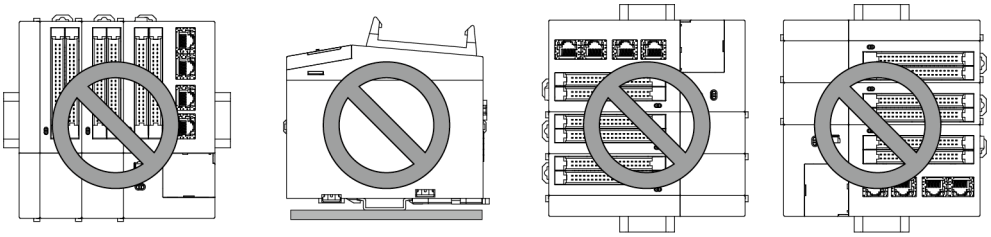


■ Measures regarding heat radiation

- As countermeasures against heat radiation, install the unit in the direction shown below.



- Do not install the unit stacked up, horizontally or upside down. Doing so will prevent proper cooling of the unit and cause overheating inside.



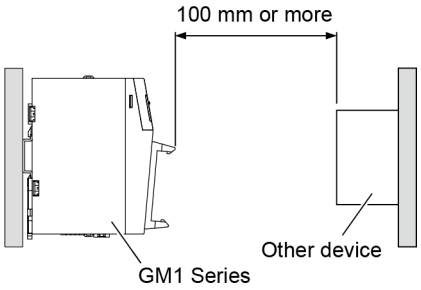
Installing the unit upside down

Installing the unit so that it stays in a horizontal position

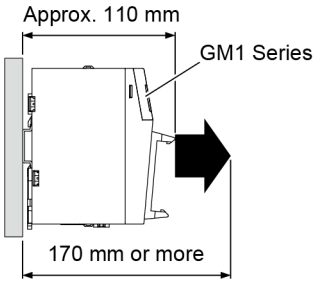
Installing the unit so that the DIN rail is mounted vertically

- Do not install the unit above devices which generate heat such as heaters, transformers or large scale resistors.

- In order to eliminate any effects from noise emission, power wires and electromagnetic devices should be kept at least 100 mm away from the surfaces of the unit. When installing the unit behind the doors of the control board, be especially careful to secure clearances as above.



- Secure a clearance of at least 170 mm from the mounting surface of the GM1Series for connecting tool software cables.



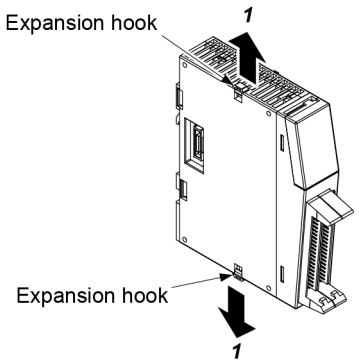
7.3 Attaching or Removing the Unit

- Install the expansion unit between the GM1 Controller (RTEX-compatible / EtherCAT-compatible) and the end unit.
- Make sure to connect an end unit.
- Make sure to turn OFF the power supply before installing the unit.
- Do not directly touch the connector part of the unit.
- Make sure that the connector parts are not stressed when and after installing the unit.

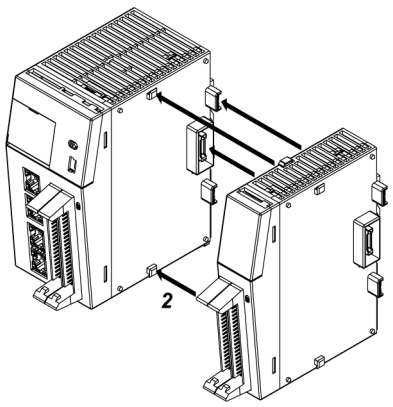
7.3.1 Attaching the Unit

Procedure

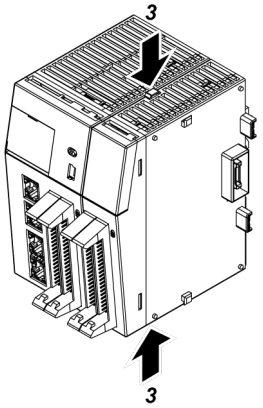
1. Raise the expansion hooks on the sides of the unit with a screwdriver to release them.



2. Attach the unit connectors on the side of the unit to those on the the other unit.



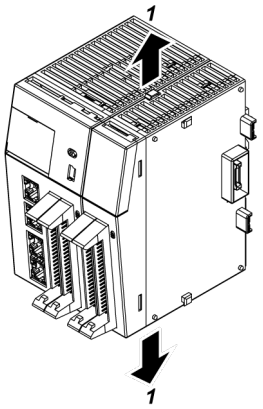
3. Lower the expansion hooks to lock the units in place.



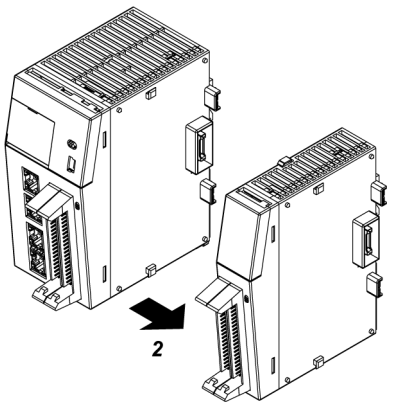
7.3.2 Removing the Unit

1 2 Procedure

1. Raise expansion hooks on the sides of the unit with a screwdriver to release them.



2. Slide the unit sideways to remove it.

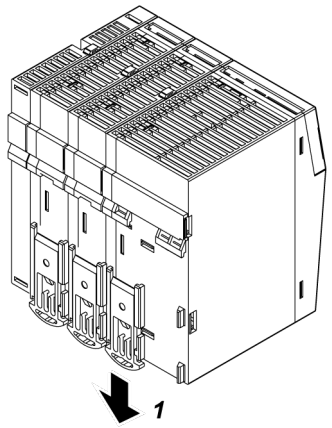


7.4 Attaching or Removing the DIN Rail

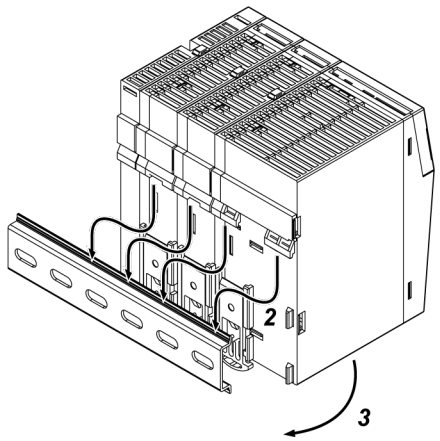
7.4.1 Attaching to DIN Rail

1 2 Procedure

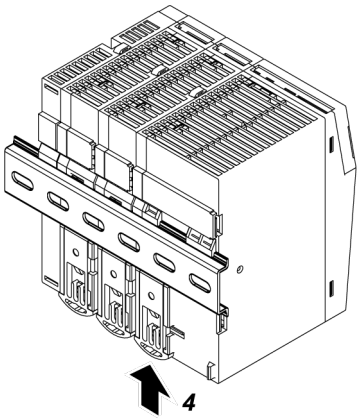
1. Using a screwdriver, push down the DIN rail attachment lever on the back of each unit.



2. Fit the top of the unit attachment part into the DIN rail.
3. While pressing down the unit attachment part onto the DIN rail, fit the bottom of the unit attachment part into the DIN rail.



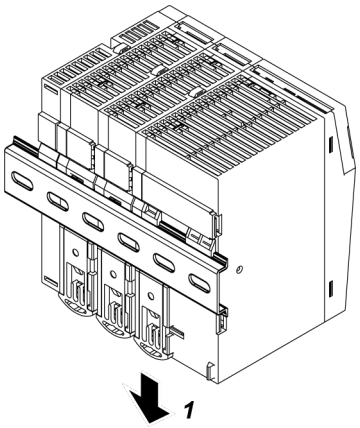
4. Push up the DIN rail attachment lever on the back of the unit until it "clicks" to lock.



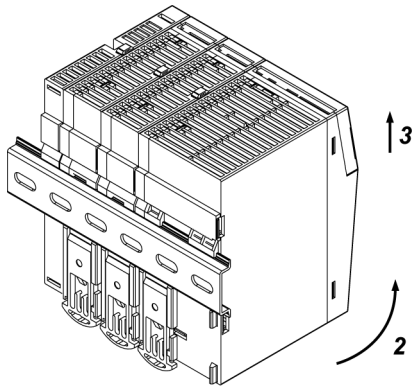
7.4.2 Removing from DIN Rail

Procedure

1. Using a screwdriver, push down the DIN rail attachment lever on the back of each unit.



2. Pull the bottom of the unit toward you.
3. While holding up the unit, remove it from the DIN rail.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8 Troubleshooting

8.1 Self-diagnostic Function

The GM1 Controller (RTEX-compatible / EtherCAT-compatible) has a self-diagnostic function which identifies errors and stops operation if necessary.

Indications concerning self-diagnosis are as follows.

■ LEDs related to self-diagnostic errors

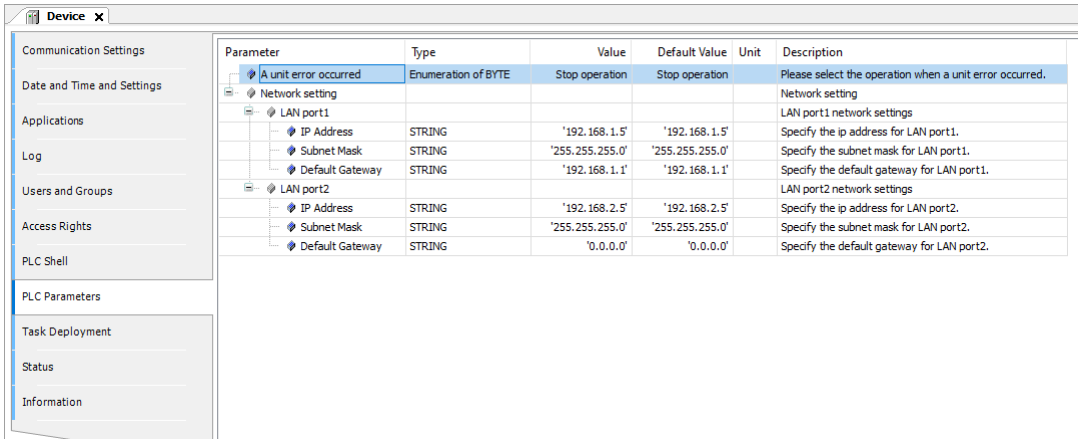
●: Lit, ▲: Flashing, ○: Unlit, －: Indefinite (Lit or unlit)

	LED display				Description	Operation status
	RUN	STOP	ERROR	ALARM		
Normal	●	○	○	○	Normal operation	Operating
	○	●	○	○	STOP mode	Stopped
Error	●	○	▲	○	When a self-diagnostic error occurs (Operation continues.)	Operating
	○	●	▲	○	When a self-diagnostic error occurs (Operation stops.)	Stopped
	○	●	－	●	System error	Stopped

8.2 Operation Status at the Time of Error

■ PLC parameter setting

Operation mode at the time of error can be set to continue operation or stop operation in the PLC parameter setting.



8.3 What to Do If an Error Occurs

8.3.1 ERROR LED Flashes on the Control Unit

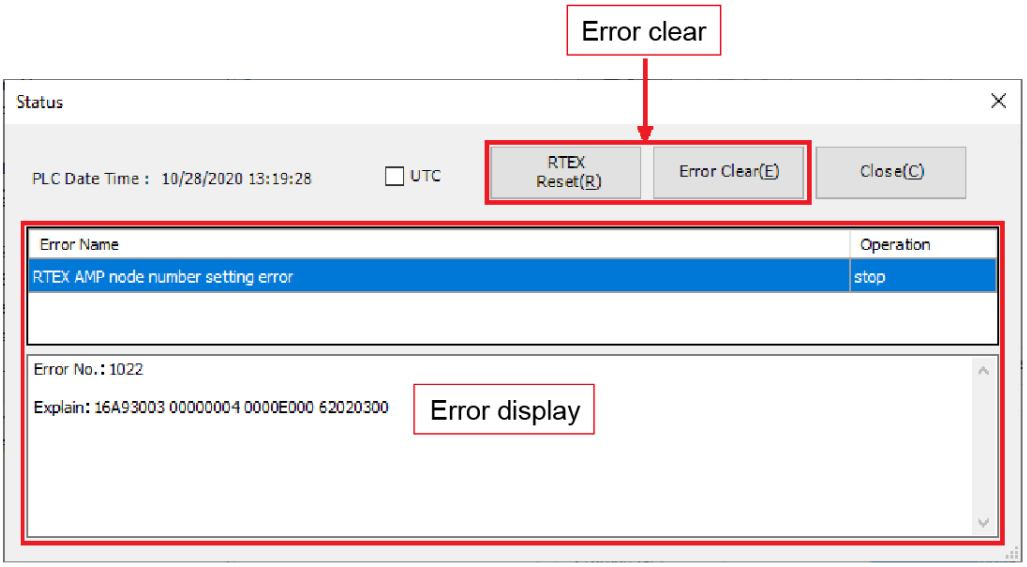
■ **Condition**

A self-diagnostic error has occurred.

■ **Solution**

Check the condition according to the following procedure.

1. On the GM Programmer, select **Online**>**Status** and check the error content (error code).
2. Switch to the STOP mode.
3. On the Status screen of the GM Programmer, check the error information.
   In case of an operation continue error, the error can be resolved by RTEX Reset / Error Clear.



4. Cancel the situation in accordance with the error code.

Info.

- For the error codes, refer to the , *GM1 Controller RTEX User's Manual (Operation)* or *GM1 Controller EtherCAT User's Manual (Operation)*.

8.3.2 POWER LED Does not Light on the Control Unit

■ Condition

It is possible that sufficient power is not supplied.

■ Solution

1. Power off the unit and double-check the wiring status. (e.g. Is there any loose terminal?)
2. Check if the output of the power supply to the control unit does not exceed the rating.
   If the 24-V power supply is not sufficient, review the power supply configuration.
   Disconnect the power supply wiring to the other devices if the power supplied to the control unit is shared with them.

8.3.3 Desired Output Is Not Obtained: Checking when the Output Does Not Turn ON / OFF

■ Condition

Both software factors such as program or I/O allocation and hardware factors such as wiring or power supply can be assumed.

■ Solution

1. Check if the output display LED of the unit is lit.
   If it is lit, proceed to the following step. If it is not lit, proceed to step 4.
2. Recheck the wiring of the loads for loose terminals, etc.
3. Check if proper voltage is applied to the loads.
   If the voltage is properly applied to the load, there is probably an abnormality in the load.
   If the voltage is not applied to the load, there is probably an abnormality in the output section of the unit.
4. Using the GM Programmer, check the monitor function by forcibly setting or resetting the output.
   If the output LED of the unit changes, it is possible that the output has been overwritten in the program.
   If the LED does not change, there is probably an abnormality in the output section of the unit.

8.3.4 If the ALARM LED Is Lit on the Expansion Unit

■ Condition

If the ALARM LED is lit on the expansion unit, there may be a system failure.

■ Solution

1. Turn the system OFF and then ON.
2. If the system is not reset, there may be a hardware failure. Please consult your Panasonic representative.

8.3.5 If the ALARM LED Is Unlit on the Expansion Unit

■ Condition

It can be assumed that a system error has occurred in the expansion unit connected to the control unit or in the control unit.

■ Solution

Clarify the situation in the following procedure.

1. Check if an end unit is connected to the last expansion unit.
2. Check the wiring of the cables connected to the expansion units and wiring of the power supply.
3. Clear the self-diagnosis error of the control unit.
4. Restart the power supply of the control unit.

9 Maintenance and Inspection

9.1 Inspection

To always use the unit in optimal conditions, carry out routine or periodic inspections.

Inspection items

Inspection item	Inspection details	Criterion	Related page
Installation status	Mounting on DIN rail, looseness, and unit looseness and backlash	The unit must have been installed properly.	"P.7-7"
Connection status	Connector looseness	Each connector must not be loose.	"6 Wiring"
Usage conditions	Ambient temperature (in-panel temperature) Ambient humidity (in-panel humidity) Atmosphere	0 to +55℃ 10 to 95%RH Free of dust and corrosive gases	"P.5-2"

Appendix Warranty / Cautions for Proper Use

Warranty

Warranty Period

The warranty period of the Product shall be 12 months from the ex-factory date or 18 months from the date of manufacturing unless otherwise specified between both parties.

Warranty Scope

Panasonic warrants the replacement of the defected parts of the Product or repair of them when the defects of the Product occur during the Warranty Period, and when the defects are under Panasonic responsibility. This Warranty only covers the Product itself and does not cover any damage to your company and the third party incurred by the Product, such as damage that is induced by an object machined or produced using the Product or by the defects of the Product. This Warranty shall be exempted in the following cases,

1. Defects resulting from misuse and/or repair or modification by the customer.
2. Defects resulting from drop of the Product or damage during transportation.
3. Defects resulting from improper usage of the Product beyond the Specifications.
4. Defects resulting from fire, earthquake, lightening, flood, damage from salt, abnormal voltage or other Act of God, or other disaster.
5. Defects resulting from the intrusion of foreign material to the Product, such as water, oil or metallic particles.
6. Parts exceeding their standard lifetime specified in this document.
7. The machines are not assembled in accordance with the instructions or precautions noted in this specification.
8. When the machine does not match the Product assembled in the machine.
9. When the machine condition is not caused by Panasonic reasons.
10. Defects that Panasonic could not foresee at the time of delivery of the Prodcuct.

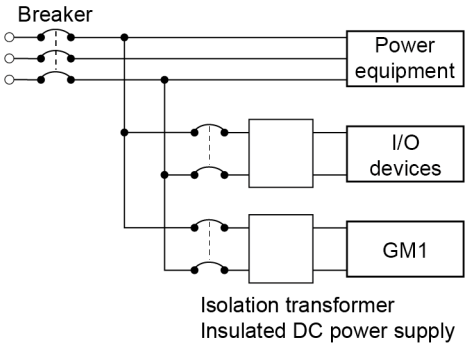
Cautions for Proper Use

■ Selection of a power supply

- Use a low noise power supply.
- The inherent noise resistance is sufficient for the noise superimposed on the power wires, however, the noise can be attenuated further by using the isolation transformer / insulated power supply.

■ Isolation of power supply systems

- Wiring to the units, I/O devices, and other power devices should have separate wiring systems.

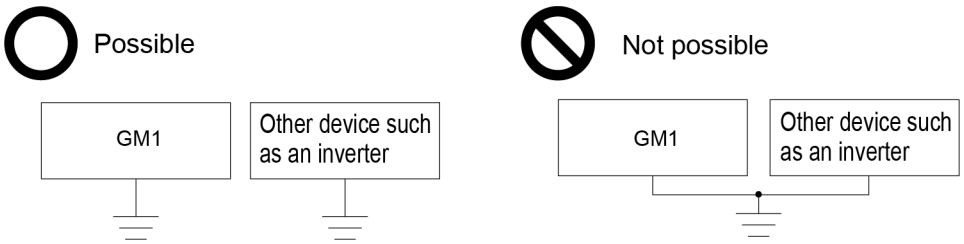


■ Power supply sequence

- Start the GM1 controller only after I/O devices and power devices are energized.
  In case of stopping the operation of the GM1 controller, have the I/O devices or power devices turned OFF after the GM1 controller has stopped operating.

■ Grounding

- The grounding connection should have a resistance of 100 Ω or less.
- The point of grounding should be as close to the GM1 controller as possible. The ground wire should be as short as possible.
- Sharing the ground with another device may have an adverse effect. Therefore, be sure that grounding is dedicated.



Conversely, depending on your environment, grounding may cause a problem. Do not ground the function earth when grounding a plus (+) terminal of the power.

■ Wiring

- Turn OFF the power supply when carry out wiring or connecting the GM1 controller to expansion units.
- Noise resistance measures such as attaching a noise filter, a surge absorber or a ferrite core may be necessary in some cases, depending on the usage environment.

■ Installation of an interlock circuit

- When controlling conflicting operations such as the motor rotation in clockwise or counter-clockwise direction, provide an interlock circuit external to the GM1 controller.

■ Installation of an emergency stop circuit

- Provide an emergency stop circuit external to the GM1 controller to turn OFF the power supply of the output device.

■ Installation environment

Do not use it in the following environments.

- Direct sunlight
- Sudden temperature changes causing condensation.
- Inflammable or corrosive gas.
- Excessive airborne dust, metal particles or saline matter.
- Benzine, paint thinner, alcohol or other organic solvents or strong alkaline solutions such as ammonia or caustic soda.
- Direct vibration, shock or direct drop of water.
- Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges. (100 mm or more)

■ Handling instructions

- Before touching the unit, always touch a grounded piece of metal in order to discharge static electricity.
- Always rid yourself of any static electricity before handling this product.
- Do not connect a unit other than our GM1 series to the side connector on the unit.
- Use copper wires with a temperature rating of 90°C or higher.

Revision History

The manual code is shown at the bottom of the cover page.

Date of issue	Manual code	Revision details
February 2021	WUME-GM1H-01	First edition
August 2021	WUME-GM1H-02	2nd edition ● Added the following models. • EtherCAT-compatible GM1Controller • Digital I/O unit (Source type) • Analog I/O Unit • Pulse Output Unit
March 2022	WUME-GM1H-03	3rd edition ● Clerical corrections
April 2022	WUME-GM1H-04	4th edition ● Changed the Company name
June 2022	WUME-GM1H-05	5th edition ● Clerical corrections ● Added conformance to international standards
August 2023	WUME-GM1H-06	6th edition ● Chapter structure corrections ● Clerical corrections ● Added conformance to international standards
November 2023	WUME-GM1H-07	7th edition ● Made changes associated with RTEX maximum 32 axes ● Clerical corrections ● Windows(R) 11：64bit support
May 2024	WUME-GM1H-08	8th edition ● Notes for AGM1CSEC16P, AGM1XY64D2P, and AGM1Y64P were deleted in order to obtain KC standards.
August 2024	WUME-GM1H-09	9th edition ● Configuration change ● Consolidated wiring information from various manuals ● Added description of serial communication units ● Clerical corrections
December 2024	WUME-GM1H-10	10th edition ● Specifications changed • Output specifications (sink), Output specifications (source) External power supply: Current

Date of issue	Manual code	Revision details
		• Digital input/output specifications External power supply: Current • Digital input/output specifications Rated input current ● Driver (AFP0806) Removed due to end of order

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