N Series for Ethernet Isolated Analog Output Unit
(±10V Voltage Output)
AO-1604VIN-ETH
N Series for Ethernet Isolated Analog Output Unit
(0-20mA Current Output)
AO-1604AIN-ETH

The product is an Ethernet-compatible unit with analog output function.

Compact design, (188.0(W)×78.0(D)×30.5(H)mm), features flexibility in installation. The product can be set on the floor, wall, and inside the console or equipment with the DIN rail.

Windows/Linux device driver is supported with the product.

For AO-1604VIN-ETH, 4 channels of 16-bit analog output, and digital input and output (4 channels respectively) are equipped, and these circuits are isolated from the computer.

The output range supports ±10V voltage output

As for AO-1604AIN-ETH, 4 channels of 16-bit analog output, and digital input and output (4 channels respectively) are equipped, and these circuits are isolated from the computer.

The output range supports 0-20mA current output.

* The contents in this document are subject to change without notice.
* Visit the CONTEC website to check the latest details in the document.
* The information in the data sheets is as of February, 2024.

* The photograph is an AO-1604VIN-ETH.
* Specifications, color and design of the products are subject to change without notice.

Features

4 channels of analog output (voltage output) with high accuracy, and 4 channels of digital input and output respectively are contained (AO-1604VIN-ETH only)
Analog output (10μsec, 16bit, 4ch), digital input and output (Input: TTL level 4 channels, Output: Open-collector 4 channels)) are equipped. The analog output supports the ±10V voltage output bipolar.

4 channels of analog output (current output) with high accuracy, and 4 channels of digital input and output respectively are contained (AO-1604AIN-ETH only)
Analog output (20μsec, 16bit, 8ch), digital input and output (Input: TTL level 4 channels, Output: Open-collector 4 channels)) are equipped. The analog output supports the 0-20mA current output.

Generating can be driven by a clock or by various triggers
Generating can be started and stopped by software and external (timing of control signals input from external) triggers.
The generating period can be controlled by the internal clock (high-precision timer included in the product).

Isolated from the bus by a digital isolator
The product isolates the PC from analog output as well as digital I/O by a digital isolator, which improves the noise performance.

Open collector output for digital output
The use of open collector output ensures digital outputting with TTL or 12-24 V power by the power of the external device.

Operable in a wide range of 12 - 24VDC power
The product can be operated in the various environments with a wide range power supply of 12 - 24VDC. In addition, the FG terminal is equipped in the power supply connector.

Compact design not restricting installation location (188.0(W) x 78.0(D) x 30.5(H))
Compact design of 188.0(W) × 78.0(D) × 30.5(H) does not require special installation location.

Usable as an Ethernet-based analog output
Analog output is controlled via Ethernet, making remote monitoring easy.

Diverse installations such as screw fastening, magnet (optional purchase), DIN rail are possible
Installation on the floor / wall /ceiling is possible by screw fastening, with magnets (optional purchase), rubber feet, etc.
In addition, DIN rail mounting mechanism is equipped as standard with the product, making it easy to install the product within the panel or the device.

Easy-to-wire terminal connector adopted
Adoption of terminal connector (with screws) enables to achieve easy wiring.

Windows/Linux support device driver
Using the device driver API-TOOL makes it possible to create applications of Windows/Linux. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

Software-based calibration function
Calibration of analog output can be all performed by software. Apart from the adjustment information prepared before shipment, additional adjustment information can be stored according to the use environment.

Included Items

Product ...1
Interface connector...2
Power supply connector...1

Rubber feet...4
Please read the following...1

Support Software

Name	Contents	How to get
Windows Version Analog I/O Driver software API-AIO(WDM)	The Windows device driver is provided as a form of Windows API functions. Various sample programs such as C# and Visual Basic .NET , Visual C++, Python etc. and diagnostic program useful for checking operation is provided.	Download from the CONTEC website *1
Linux Version Analog I/O Driver software API-AIO(LNX)	The Linux device driver is provided as a shared library. The software includes various sample programs such as gcc (C, C++) and Python programs, as well as a configuration tool to configure the device settings.	Download from the CONTEC website *1
Software Development Tool Kits (SDK) and Support Software	In addition to the device drivers, we offer many software programs for using CONTEC devices in an easier way.	Download from the CONTEC website *2

*1 Download the files from the following URL.
　　https://www.contec.com/download/

*2 For supported software, search the CONTEC website for this product and view the product page.
　　https://www.contec.com/

Specifications

Function specification

Item		AO-1604VIN-ETH	AO-1604AIN-ETH
Analog output			
	Isolated specification	Bus-Isolated	
	Number of output channels	4ch	
	Output range	Voltage: Bipolar ±10V	Current: 0 - 20mA
	Maximum output current	±5mA	-
	Output impedance	1Ω or less	-
	Resolution	16bit	
	Non-linear error *1	±15LSB	±15LSB
	Settling time	10μsec(Max.)	20μsec(Max.)
	Buffer memory	8K data	
	Conversion start trigger	Software / external trigger	
	Conversion stop trigger	Number of generating times / external trigger / software	
	External start signal	TTL level (Rising or falling edge can be selected to the DI00-pin by software)	
	External stop signal	TTL level (Rising or falling edge can be selected to the DI01-pin by software)	
	External clock signal	TTL level (Rising or falling edge can be selected to the DI02-pin by software)	
Digital input			
	Number of input channels	4ch	
	Input type	Bus-isolated TTL level input (Negative logic) *2*3	
Digital output			
	Number of output channels	4ch	
	Output format	Bus-isolated open collector output (Negative logic) *2	
	Output rating	Output voltage	30VDC (Max.)	
		Output current	40mA (par channel) (Max.)	
LAN section *4			
	Transmission standard	10BASE-T/100BASE-TX	
	Connector	RJ-45 connector	
	LED	Speed(Orange), Link / Act(Green)	
Power supply			
	Input voltage range	12 - 24VDC±10%	
	Current consumption	12VDC 450mA(Max.), 24VDC 250mA(Max.)	12VDC 400mA(Max.), 24VDC 200mA(Max.)
	Power supply connector	European type terminal 3.5mm pitch 3-pin jack connector	
Common section			
	Interface connector	European type terminal 3.5mm pitch 10-pin jack connector	
	Dielectric strength	500VAC	
	Physical dimensions (mm)	188.0(W)×78.0(D)×30.5(H) (No projection included)	
	Weight	250g	

*1 The non-linearity error means an error of approximately ±0.1% occurs over the maximum range at -20℃ and 60℃ ambient temperature.

*2 Data "0" and "1" correspond to the High and Low levels, respectively.

*3 The DI00 / DI01 / DI02-pin of digital input cannot be used simultaneously with External start signal/ External stop signal/ External clock signal.

*4 Use an STP cable.

Installation Environment Requirements

Item		AO-1604VIN-ETH	AO-1604AIN-ETH
Operating ambient temperature *1		-20 - +60℃ *2	
Operating ambient humidity		10 - 90%RH (No condensation)	
Floating dust particles		Not to be excessive	
Corrosive gases		None	
Line-noise resistance *3	Line noise	AC Line/±2kV, Signal Line/±1kV (IEC61000-4-4 Level 3, EN61000-4-4 Level 3)	
	Static electricity resistance	Contact discharge /±4kV (IEC61000-4-2 Level 2, EN61000-4-2 Level 2) Air discharge /±8kV (IEC61000-4-2 Level 3, EN61000-4-2 Level 3)	
Vibration resistance	Sweep resistance	10 - 57Hz /semi-amplitude vibration 0.15mm, 57 - 150Hz/2G 40minutes each in X, Y, and Z directions (JIS C60068-2-6-compliant, IEC60068-2-6-compliant)	
Shock resistance		147m/s^2(15G)/11ms/half-sine shock (JIS C 60068-2-27-compliant, IEC 60068-2-27-compliant)	

Item	AO-1604VIN-ETH	AO-1604AIN-ETH
Standard	VCCI Class A, FCC Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA	

*1 Secure a distance of at least 50mm between the top of the product (single use) and any surrounding objects.

*2 When using the supplied AC adaptor POA 201-10-2, it is 0 - 40℃.

*3 When using the supplied AC adaptor POA 201-10-2.

Physical Dimensions

[mm]
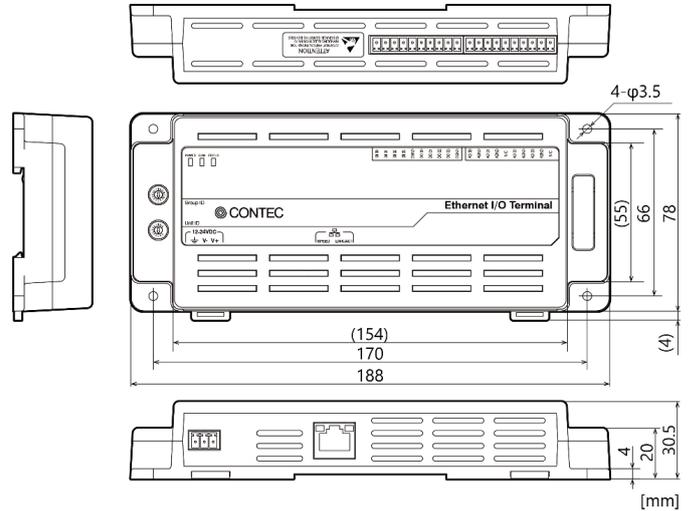
Optional Products

| Product Name	Model type	Note
AC-DC Power Adaptor (12VDC, 1A)	POA201-10-2	*1
CONPROSYS Series Magnet (Four Piece Set)	CPS-MAG01-4	
CONPROSYS Series 12VDC AC-DC Converter	CPS-PWD-15AW12-01	*2
CONPROSYS Series 12VDC AC-DC Converter	CPS-PWD-30AW24-01	*2
CONPROSYS Series 12VDC AC-DC Converter	CPS-PWD-90AW24-01	*2

*1 The operating ambient temperature is 0 to 40 ℃. It is the same adapter included in this package.

*2 The operating ambient temperature is -20 to 70 ℃.

Component Name
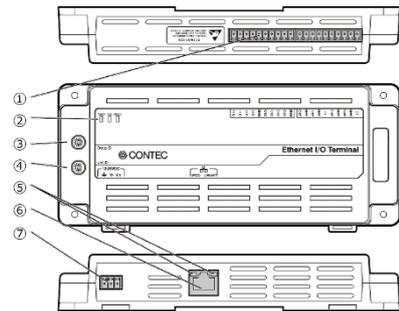
No.	Name	No.	Name
1	Interface Connector	5	LAN LED
2	LED Indicator	6	Ethernet Connector
3	Setting Switch: Group ID	7	Power Supply Connector (Attached connector)
4	Setting Switch: Unit ID		

Signal Layout on the Interface Connector
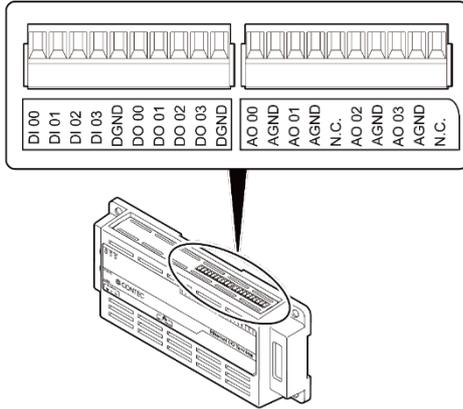
| DI 00 -- DI 03	Digital input pins. The numbers correspond to input bits.
DO 00 -- DO 03	Digital output pins. The numbers correspond to output bits.
DGND	This is a digital ground and shares channels of I/O signals.
AO 00 -- AO 03	Analog output pins. The numbers correspond to channel numbers.
AGND	This is an analog ground and shares channels of analog output signals.
N.C.	This pin is left unconnected.

Connecting Analog Output Signal (AO-1604VIN-ETH)

The AO-1604VIN-ETH has 4 channels of AO that supports voltage output.

Connection Example of Voltage Output
- Example of flat cable connection
Connect the voltage output pins of each channel of the interface connector to the analog ground. Use a flat cable to connect to the input of the external device and the ground.
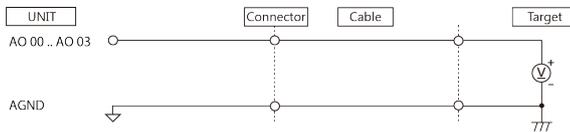
- Example of coaxial cable connection
A coaxial cable can be used in situations where the product is at a relatively large distance from the external device or when the noise immunity of the product must be improved.

In this case, the voltage output and the analog ground for each channel are connected to the input of the external device and the ground by using the core wire and the shield braid of the coaxial cable.
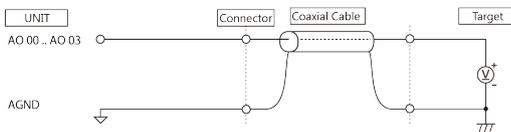
⚠ CAUTION

- To avoid any malfunction, the voltage output signal should not be connected to the analog ground.
- To avoid any malfunction, the voltage output signal should not be connected to another analog output signal or the output signal of an external device.
- To avoid any malfunction, the internet connector plug should not be attached or detached when the power for the product or the external device is on. This may result in the product damages.
- In situations where the connecting cable is subject to the effects of noise, the accurate voltage output can fail. The connecting cable should be installed away from any source of noise.
- The maximum current capacity for a voltage output signal is ±5mA. To avoid any malfunction, do not connect an external device that generates a load exceeding this range.
- In situations where the connecting cable is excessively long, the accurate voltage output can fail. The connection cable should therefore be within 1.5 meters.
- An undefined value might be output momentarily when the power is turned on.

Connecting Analog Output Signal (AO-1604AIN-ETH)

The AO-1604AIN-ETH has 4 channels of AO that supports current output.

Connection Example of Current Output
- Floating Load and Fixed Load
Two types of connection methods can be employed: fixed load and floating load. "Floating load" is employed when the analog ground is connected to the negative side of an external power supply. "Fixed load" is employed when the analog ground is connected to the load.

If the product is used as a load resistance, multiple current loops can be implemented by using the same power supply.

The use of current output requires an external power supply (12 - 24V). In such a case, a power supply with a small ripple should be used in order to avoid an adverse impact on the conversion accuracy due to a large power supply ripple.

The load resistance R_L that is connected to the current output of each channel should be between 100 and 500Ω, including the output impedance of the connected device and wire resistance.

The Power Composition of Connecting to Multiple Load Resistors

|	Single Power Supply	Multiple Power Supplies
Floating Load	○	○
Fixed Load	X	○

- Example of flat cable connection
Use a flat cable to connect the current output and the analog ground of each channel to the load resistance R_L.

Connecting to a Floating Load
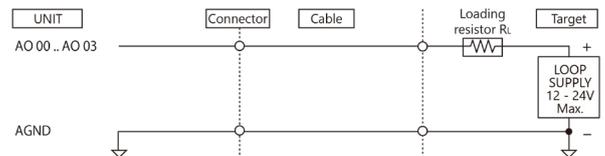
Connecting to a Floating Load
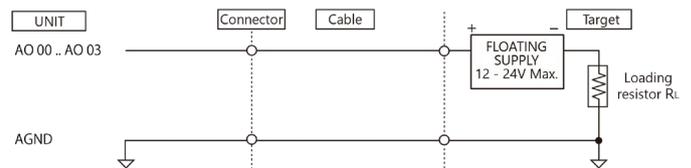
**- Example of coaxial cable connection**
A coaxial cable can be used in situations where the product is at a relatively large distance from the external device or when the noise immunity of the product must be improved.

In this case, the current output and the analog ground for each channel are connected to the load resistance R_L of the external device by using the core wire and the shield braid of the coaxial cable

Connecting to a Floating Load
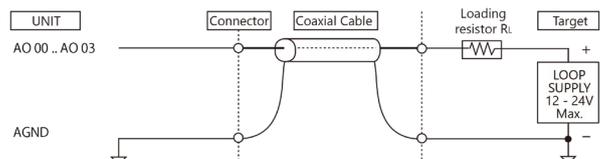
Connecting to a Fixed Load
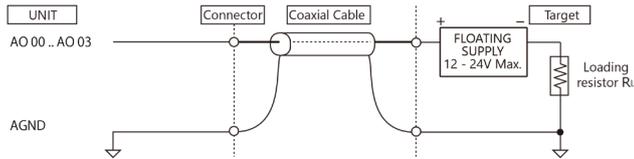
### - Example of connecting to multiple floating load resistors

As shown below, connect the current output and the analog ground of each channel to the load resistance R_L.

Multiple current loops can be implemented by using the same power supply.

Connecting to a Single Power Supply
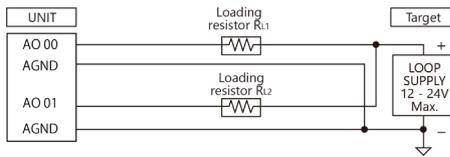
Connecting to Multiple Power Supplies
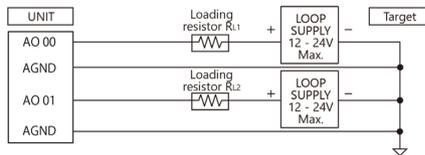
- Example of connecting to multiple fixed load resistors

As shown below, connect the current output and the analog ground of each channel to the load resistance R_L. Multiple current loops can be implemented by using the same power supply.
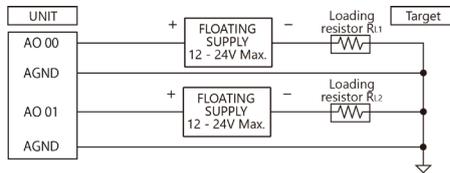

⚠ **CAUTION**

- To avoid any malfunction, the current output signal should not be connected to the analog ground or the external device.
- In situations where the connecting cable is subject to the effects of noise, the accurate current output can fail. The connecting cable should be installed away from any source of noise.
- To avoid any malfunction, the interface connector plug should not be attached or detached when the power for the product or the external device is on. This may result in the product damages.

Connecting Digital I/O Signals

Digital I/O signals can be used as control I/O signals (external trigger input signals, generating clock input signals, etc.). The following section shows examples of how to connect signals.

Input Circuit

The following is a digital I/O circuit of the interface (connector) part.

External digital signals given to signal input section are TTL level, and each signal is taken to a PC using negative logic. Each signal input section is pulled-up in the product, therefore, outputs of relay contacts or semiconductor switch can be connected directly between this signal input and signal common.
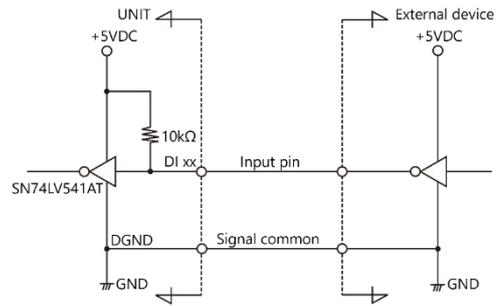
*Input pins are indicated as DI xx.　xx corresponds to input bits.

DI 00 - DI02 can be used as control signals listed below.　However, when using them as control signals, they cannot be used as general-purpose digital inputs.

DI 00: External Start Signal Input (External Start Trigger Input)

DI 01: External Stop Signal Input (External Stop Trigger Input)

DI 02: External Clock Signal Input (External Clock Input)

Example Connection with switch
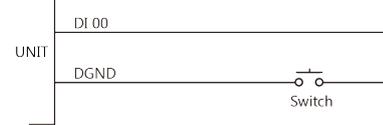
When switch is "ON", the corresponding bit is "1".

When switch is "OFF" in contrast, the corresponding bit is "0".

Output Circuit

The following is an output circuit of the interface (connector) part.

Signal output section is an open-collector, and each signal is sent to external devices using negative logic.

Outputting by open-collector makes outputting in accordance with the power of the external devices. Note that each signal output section is not pulled-up in the product, therefore, pull up at the external device side.

⚠ **CAUTION**

- Do not short the output signals to analog ground, and/or digital ground. Doing so may damage the product.
- When supplying power of 12-24VDC power (such as the AC adapter), all output will be OFF.
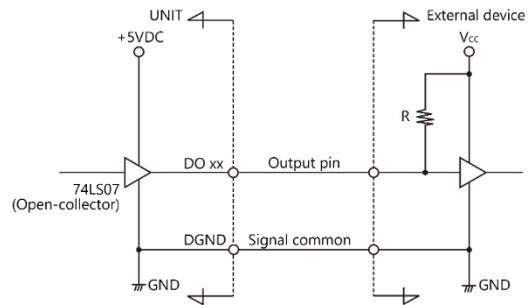
*Output pins are indicated as DO xx.　xx corresponds to output bits.

Example Connection with LED
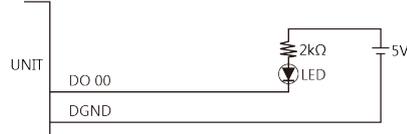
When "1" is output to a relevant bit, the corresponding LED comes on.

When "0" is output to the bit, in contrast, the LED goes out.

Power Supply Connector

Connect this product to the external power supply with the supplied power input connector.

When using a commercially available DC output power supply, follow the same procedure described here.
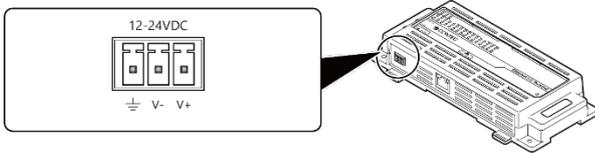
Mark	Signal Name
⏚	Frame ground (FG)
V-	Power supply (GND)
V+	Power supply (12 − 24VDC)

Connecting to an External Power Supply for Driving the Product
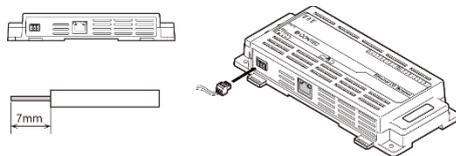
When supplying power using the supplied power supply connector or the compatible connector, strip off approximately 7mm (±0.5mm) of the covered part of the cable and insert it into the connector and securely screw it in place.

When connecting the FG pin of the product to ground (earth), follow the same procedure.

Use the power cable described below.

Cable	Twisted pair cable (when using a single wire, twist V+ wire and V- wire)
Cable Diameter	AWG24 - 16(0.2mm^2 - 1.25mm^2)
Cable Length	Within 3 meters

Use the FG cable described below.

Cable Diameter	AWG18 - 16(0.75mm^2 - 1.25mm^2)

About a power rise

When using a commercially available DC output power supply, use a power supply with an input voltage that rises to above 11.4VDC and below 12 to 24VDC (+10%) within 20ms. A power supply that does not rise to this level may not operate the product properly or may cause a product failure or accident.
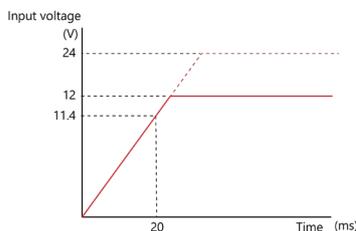

### Connecting an external power supply

Use an external power supply as necessary for the environment and application.

When using the separately sold AC adapter POA201-10-2 or DIN rail fitting power supply, connect the connector included with that product to the power supply connector, and do not use the supplied power supply connector. Use an external power supply as necessary for the environment and application.

Connecting the AC Adapter POA201-10-2 (Option)
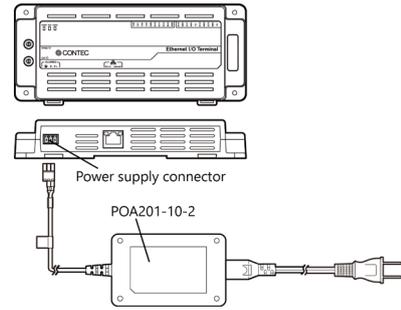
Connecting DIN rail fitting power supply (Option)
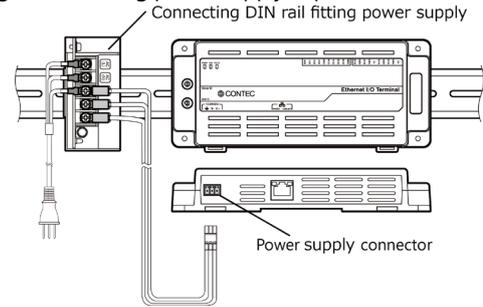
⚠ CAUTION

- Refer to the specifications in "Function Specifications" for the required input power specifications per unit of the product.
- The tightening torque for the supplied power supply connector is 0.19N·m.
- If the maximum output current of the external power supply does not include a sufficient margin compared with the maximum current consumption of the product, abnormal operation may occur due to the inrush current at startup or load fluctuations, or a start failure may occur due to degradation of the power supply over time.
- When the product is not used, leave the 12 - 24VDC power supply (such as the separately sold AC adapter) unplugged.
- Connect the 12-24VDC power supply (such as the separately sold AC adapter) to the power supply connector of the product first. When unplugging, unplug it from the power outlet side of the AC adapter first.
- Grasping the cable to remove the power supply connector of the 12-24VDC can break the wire. Always grasp the connector to remove it.
- When the 12-24VDC power supply in supplied, do not disconnect the 12-24VDC power supply from the power supply connector.
- If you use the product in a noisy environment, connect the FG pin of the product to the ground (earth) to stabilize the operation.
- Using the separately sold AC adapter in a heated state continuously affects its life.
- Use the separately sold AC adapter not in a closed place but in a well-ventilated place to prevent the product from being overheated.
- Do not remove the power supply connector [MC1,5/3-ST-3,5] that is attached to the separately sold AC adapter.

Circuit Block Diagram