

Measurement Environment

Testing environment (CPU,Memory)	Core i7-2600K 3.4GHz, MEM: 12GByte	Driver version	API-AIO (WDM) Ver. 6.00, API-DIO (WDM) Ver.6.90
OS	Windows10 1903		

Example Configuration 1 Controls 1 I/O module with 1 coupler unit.

I/O Module	Model	No. of I/O Module	Measurement Result (msec)
Analog input 8ch	CPSN-AI-1208LI	1	4.21
Digital input 8ch	CPSN-DI-08L	1	3.65
Digital output 8ch	CPSN-DO-08L	1	3.96

Example Configuration 2 Controls 4 same type of I/O modules with 1 coupler unit.

I/O Module	Model	No. of I/O Module	Measurement Result (msec)
Analog input 8ch	CPSN-AI-1208LI	4	16.89
Digital input 8ch	CPSN-DI-08L	4	14.9
Digital output 8ch	CPSN-DO-08L	4	16.29

Example Configuration 3 Controls 12 same type of I/O modules with 3 coupler units. (4 modules per coupler unit)

I/O Module	Model	No. of I/O Module (sum)	Measurement Result (msec)
Analog input 8ch	CPSN-AI-1208LI	12	50.5
Digital input 8ch	CPSN-DI-08L	12	44.01
Digital output 8ch	CPSN-DO-08L	12	47.82

The measurement results are measured values in the environment prepared by us. That are not the guaranteed specification data.

Embedded Switching HUB

Product Name	Model	Specification	Dimensions (mm/inch)
Embedded switching HUB (8 ports)	SH-8008F	<ul style="list-style-type: none"> Supports 100BASE-TX Operating temperature from -20 to 60°C (-4 to 140°F) Power supply redundant, power supply reverse wiring countermeasure circuit built-in 	40/1.57(W) x 60/2.36(D) x 90/3.54(H)
Embedded switching HUB (5 ports)	CPS-HBL-8005F	<ul style="list-style-type: none"> Mountable on the 35mm DIN rail 	25.2/0.99(W) x 94.7/3.73(D) x 124.8/4.91(H)

An external power supply is required. Contec offers an AC adapter product (model: POA201-10-2) (sold separately). Please check Contec website for details.



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Ethernet Based Remote I/O System for IoT

CONPROSYS™
nano
Series



Remote I/O System for IoT

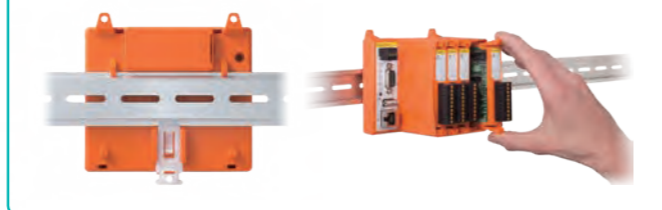
CONPROSYS™ nano Series

Remote I/O devices for digitizing interspersed local devices.
CONPROSYS nano is easy to use and excellent cost performance, which accelerates digital transformation for industrial systems.



 **GOOD DESIGN AWARD 2018**

35mm DIN rail mountable.
Tool-free to insert / remove an I/O modules



Abundant I/O modules

Various signals supported

Abundant I/O modules for computerizing various signals

Keep adding new modules



- Voltage input and output
- Current input and output
- Temperature input
- Accumulating counter
- Digital input and output
- Relay output
- RS-485 communication

Excellent cost performance

Helps reducing equipment costs

Low-cost Ethernet-based remote I/O focused on required functions with the ease of use



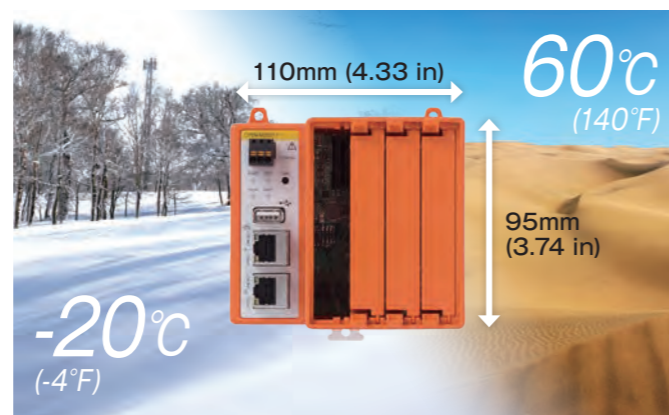
Couple Unit

I/O Module

-20 to 60 °C (-4 to 140°F) Wide temperature range and compact design

Suitable for various fields

Environment resistant design that can be installed anywhere
Space-saving design allows installation in narrow spaces



Flexible modular method

Unit configuration without waste

Modular method can configure the unit with only the required functions and I/O points
App development becomes easier

Conventional

- Serial communication
- Analog input
- Analog output
- Serial communication

- Many units are needed to support various I/O
- More nodes, higher costs, more complex programs

With CONPROSYS nano

Simple without waste

- Enables a node configuration with the required number of I/O points without waste
- Reduce costs by consolidating nodes, simplify communication programs

Two types of coupler units available for different usages and system configurations

For PC-based (Windows / Linux) / PLC-based centralized control

Remote I/O coupler units

P4- ➔

Slave type CPSN-MCB271



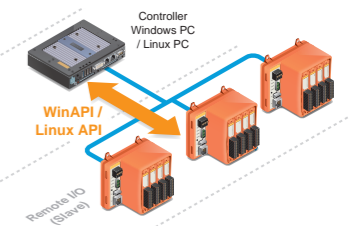
2 LAN ports (with built-in switch function) model

Win32 API functions

Library software that provides commands to our measurement control devices using OS standard APIs. Download free of charge from Contec website.

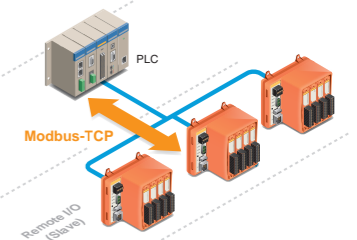
Control from host PC with Windows / Linux API

Windows / Linux driver available. You can build a remote I/O system with an industrial computer as the master.



Control from host PLC with Modbus-TCP/RTU

Supports Modbus communication. You can build a remote I/O system using a Modbus-compatible PLC as a master.



For distributed control

Programmable remote I/O coupler unit

P5- ➔

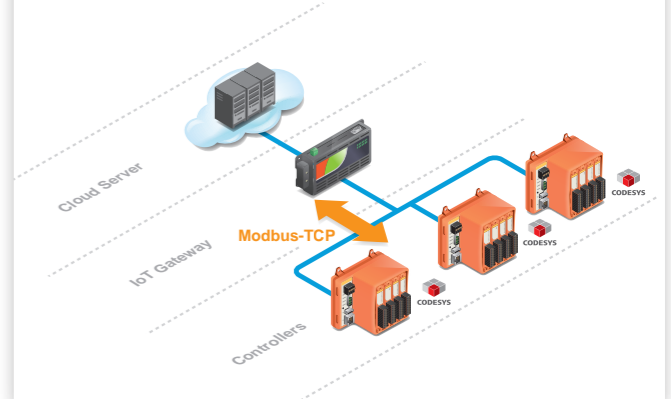
Software PLC type CPSN-PCB271



Equipped with CODESYS runtime system. Executable of IEC 61131-3 compliant PLC program developed in CODESYS integrated development environment.



Distributed autonomous control using PLC language. Cooperated with host computer through Modbus.

PLC program can be written into a software PLC type coupler unit. It responds to the host system as a Modbus slave device while functioning as an autonomous controller.



Remote I/O

Coupler Units As a remote I/O of a communication device that supports Modbus master function, various I/O modules can be used.

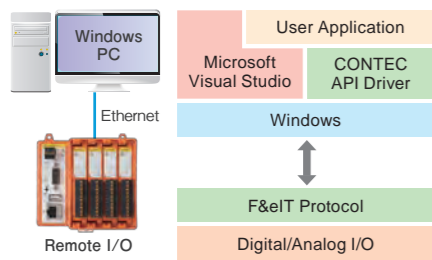
Type of remote I/O coupler units						
Type	Model	Function	Power Supply	Dimensions (mm/inch)	Installation Method	Operating Temperature
 RS-232C Model	CPSN-MCB271-S1-041	Windows / Linux dedicated driver 1 x LAN 1 x RS-232C 4 x I/O module slots	12 to 24VDC	110/4.33(W) x 74.8/2.95(D) x 95/3.74(H) (Excluding protrusions)	35mm DIN Rail Screw	-20 to 60°C /-4 to 140°F *1
 2 LAN-equipped model	CPSN-MCB271-1-041	Windows / Linux dedicated driver 2 x LAN (switch built-in) 4 x I/O module slots				

*1 The operating temperature is from -20°C to 55°C (-4°F to 131°F) when the unit is wall mounted by rolling left/right 90° or when the unit put on placed flat on the table.

Model	No. of I/O Module Slots	Power Consumption		Windows Driver		Communication Protocols		
		Coupler Itself	Includes the I/O modules & USB connected device	API functions (DLL)	Virtual COM	Modbus TCP Slave	Modbus RTU Slave	F&EIT Protocol
CPSN-MCB271-S1-041	4 Slot	24VDC 2.4W (Max.) 12VDC 2.4W (Max.)	24VDC 36W (Max.) 12VDC 24W (Max.)	○	○ Standard RS-232C Extended serial module	○	○	○
CPSN-MCB271-1-041		○	○ Only extended serial module	○ When added a CPSN-COM-1PD	○			

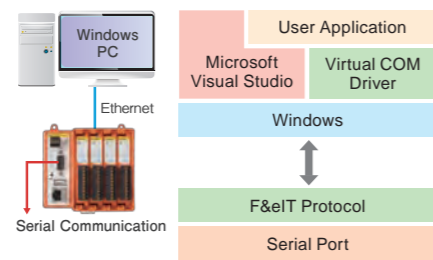
* To use Modbus RTU (RS-422A / 485 (multi-drop possible)), additional CPSN-COM-1PD module is required.

Windows Driver Windows API



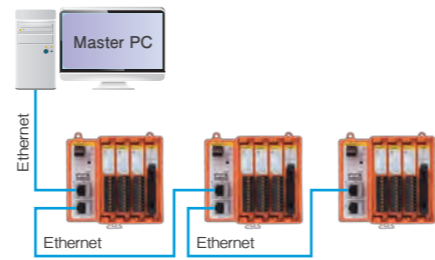
By using a driver library that can be downloaded free of charge from Contec website, it is possible to create control programs to input / output digital and analog signals. Windows API is same as for Contec's expansion cards.

Virtual COM Function



By using the virtual COM driver that can be downloaded free of charge from Contec website, the serial port of the remote I/O can be accessed as a Windows COM port.

Daisy Chain Connection



When configuring multiple remote I/O couples on a network, remote I/O couples can be connected in a daisy chain, eliminating the need for a HUB for branching the network.

* Only two LAN-equipped model is supported.

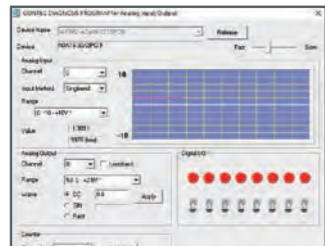
Method of creating a program using Windows driver

- Downloads and installs driver software
- Install the driver manually with Device Manager
- Confirm the device name with Contec Device Utility
- Start the diagnostic program and check the operation of each device
- Create a program using API functions from Visual Studio

Digital input and output	API-DIO (WDM)
Analog input and output	API-AIO (WDM)



A sample screen of checking digital input/output

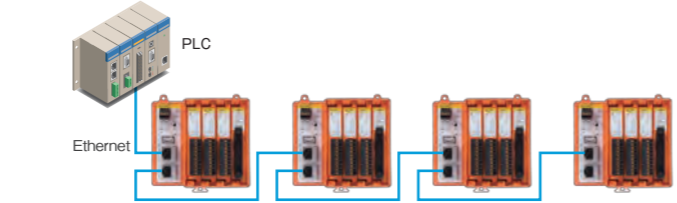


A sample screen of checking analog input/output

Remote I/O using Modbus

Equipped with the industry standard Modbus protocol, I/O modules can be used as remote I/O from devices that support the Modbus master function.

System configuration



Communication function

● Modbus TCP

Item	Content
Sessions	5
Port number	502

● Modbus RTU


Item	Content
Baudrate	300 ~ 921600
Data length	8bit
Parity	None, Odd, Even
Stop bit	1bit, 2bit

● Supported function codes

Code	Function
0x01	Read coil and DO
0x02	Read input status and DI
0x03	Read holding register
0x04	Read input register
0x05	Write one bit to coil and DO
0x06	Write to holding register
0x0F	Batch writing to multiple coils and DO
0x10	Batch write to multiple holding registers

Programmable Remote I/O

Coupler Units Equipped with a CODESYS runtime system conforming to IEC61131-3, enabling use of various I/O modules be used.

Type of remote I/O coupler unit						
Type	Model	Function	Power Supply	Dimensions (mm/inch)	Installation Method	Operating Temperature
 CODESYS-equipped model	CPSN-PCB271-S1-041	IEC 61131-3 compliant programming 1 x LAN 1 x RS-232C 4 x I/O module slots	12 to 24VDC	110/4.33(W) x 74.8/2.95(D) x 95/3.74(H) (Excluding protrusions)	35mm DIN Rail Screw	-20 to 60°C /-4 to 140°F *2

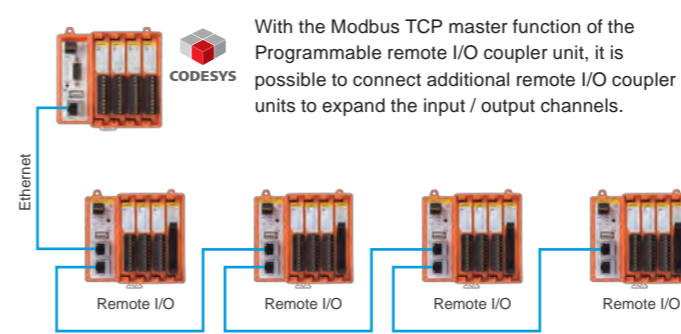
*2 The operating temperature is from -20°C to 55°C (-4°F to 131°F) when the unit is wall mounted by rolling left/right 90° or when the unit put on placed flat on the table.

No. of I/O Module Slots	Power Consumption		Supported Modbus protocols				IEC61131-3 supported languages				
	Coupler Itself	Includes the I/O modules & USB connected device	Modbus TCP Master	Modbus TCP Slave	Modbus RTU Master	Modbus RTU Slave	LD	FBD	ST	IL	SFC
4 Slot	24VDC 2.4W (Max.) 12VDC 2.4W (Max.)	24VDC 36W (Max.) 12VDC 24W (Max.)	○	○	○	○	○	○	○	○	○

Supported Codesys version	Program size (stored in ROM area)	Maximum steps	Basic instruction processing speed (LD)	Application instruction execution speed (ST)	Scan time (in 20000 steps)
V3.5 SP12 Patch 2 or later	1MB	250K steps	98.4ns	105.6ns	2757.3µs

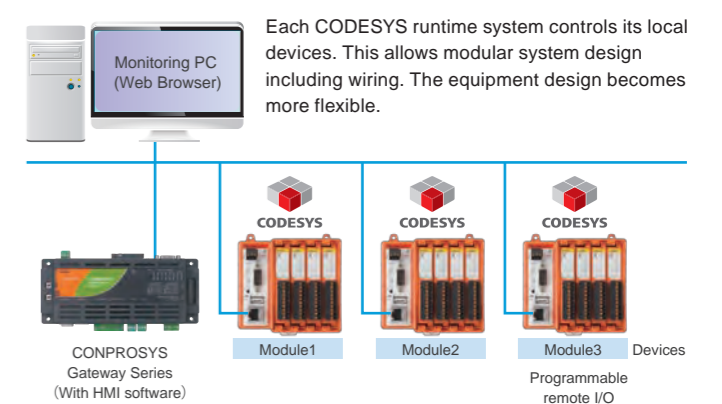
* To use Modbus RTU (RS-422A / 485 (multi-drop possible)), additional CPSN-COM-1PD module is required.

Expands input and output channels



With the Modbus TCP master function of the Programmable remote I/O coupler unit, it is possible to connect additional remote I/O coupler units to expand the input / output channels.

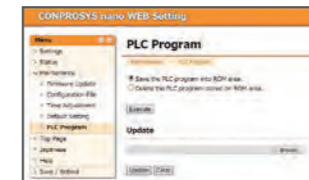
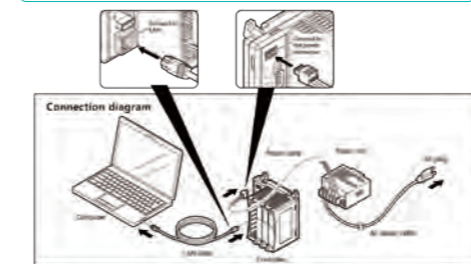
Modularization of equipment by distributed control



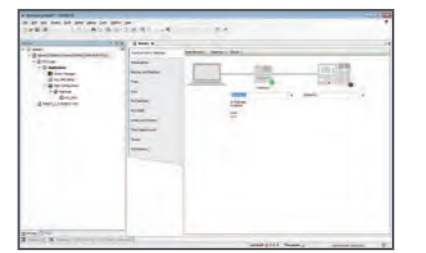
Each CODESYS runtime system controls its local devices. This allows modular system design including wiring. The equipment design becomes more flexible.

Method of creating a program under the CODESYS development environment

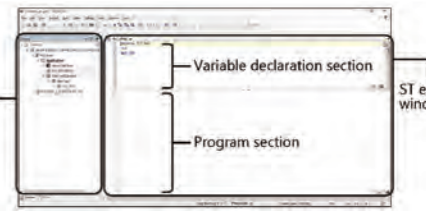
- Downloads and install the CODESYS development environment from "CODESYS Store" (free of charge)
- Downloads the CODESYS package of the nano series from Contec website (free of charge)
- Specifies the CODESYS package of the nano series with the package manager of the CODESYS development environment
- Connects the PC of the CODESYS development environment and CONPROSYS nano coupler unit with an Ethernet cable
- Checks each IP address in network settings. (For example, the IP of Coupler unit is "10.1.1.101" or not, the IP of PC is "10.1.1.200" or not.)
- Writes programs under CODESYS development environment
 - A) Creates a new project
 - B) Adds I/O module configuration
 - C) Defines input and output variables of the I/O modules
 - D) Creates PLC program using IEC-61131-3 compliant language
 - E) Executes "Build" action from the menu of the development environment
 - F) Downloads target program
 - G) Checks program operations by debugging
 - H) Saves the finished PLC program into ROM of the coupler unit



ROM save screen (Web setting screen)



Device window



ST editor window

I/O Modules

Digital Input and Output Modules				
Model	Input	Output	Power Consumption	Connector
CPSN-DI-08L	8ch Opto-coupler isolated input Supports current sink (negative logic) or source (positive logic) output	—	0.3W	Screw terminal block (3.81mm/0.15" pitch 10 pins)
CPSN-DI-08BL (Built-in 12V DC power supply)	8ch Opto-coupler isolated input Supports current sink (negative logic) output	—	0.9W	
CPSN-DO-08L	—	8ch Opto-coupler isolated open collector output Current sink type (negative logic)	0.4W	
CPSN-DO-08BL (Built-in 12V DC power supply)	—	8ch Opto-coupler isolated open collector output Current sink type (negative logic)	1.2W	
CPSN-DO-08RL	—	8ch Opto-coupler isolated output Current source type (positive logic)	0.3W	
CPSN-DO-08BRL (Built-in 12V DC power supply)	—	8ch Opto-coupler isolated output Current source type (positive logic)	1.2W	
CPSN-DI-16BCL (External 12 to 24 VDC power supply / Built-in 12V DC power supply)	16ch Opto-coupler isolated input Supports current sink (negative logic) or source (positive logic) output With simple counter function	—	1.3W	MILconnector (20pin)
CPSN-DIO-08SL	Bidirectional: 8ch (Each channel can be used as input channel or output channel) For input: Opto-coupler isolated input. Supports current sink (negative logic) output. For output: Opto-coupler isolated open collector output. Current sink type (negative logic)		0.3W	Screw terminal block (3.81mm/0.15" pitch 10 pins)

Relay Module				
Model	Input	Output	Power Consumption	Connector
CPSN-RRY-4PCA	—	4ch relay contact (form a contact) output	1.2W	Screw terminal block (3.81mm/0.15" pitch 10 pins)

Analog Input Modules							
Model	Input Format *1	No. of Input Channels	Resolution	Input Voltage Range*2	Input Current Range*1,2	Power Consumption	Connector
CPSN-AI-1208LI	Single-end input or differential input	8ch (single-end input) / bus isolation, 4ch (differential input) / bus isolation	12bit	±10V, ±5V, ±2.5V, 0 to 10V	±20mA	1.4W	Screw terminal block (3.81mm/0.15" pitch 10 pins)
CPSN-AI-2408LI		24bit	±10V, ±5V, ±2.5V, 0 to 10V, 0 to 5V	±20mA, 0~20mA	1W		

*1 All input channels are assigned for the same input format and input range. *2 Current input is only for differential input.

Analog Output Module							
Model	Output Format	No. of Output Channels / Isolation	Resolution	Output Range	Output Current Range	Power Consumption	Connector
CPSN-AO-1602LC	Voltage / current output	2ch / Channel isolated	16bit	±10V, ±5V, 0 to 10V, 0 to 5V	0~20mA	2.1W	Screw terminal block (3.81mm/0.15" pitch 10 pins)

* Each channel can be set for different output format and output range independently.

Counter Module				
Model	Input	Output	Power Consumption	Connector
CPSN-CNT-3201I	Phase-A/UP 1-ch Phase-B/DOWN 1-ch Phase-Z/CLR 1-ch General input 1-ch Opto-coupler isolated inputs	Match signal output 1-ch Opto-coupler isolated open collector output	0.4W	Screw terminal block (3.81mm/0.15" pitch 10 pins)

Serial Communication Module				
Model	Transmission Scheme	No. of Channel / Isolation	Power Consumption	Connector
CPSN-COM-1PD	RS-422A/485 Asynchronous serial transmission (Full duplex / Half duplex)	1ch / Bus isolated	1.7W	Screw terminal block (3.81mm/0.15" pitch 10 pins)

Sensor Module					
Model	Input Format	No. of CH / Isolation	Supported Sensors	Power Consumption	Connector
CPSN-SSI-4C	Thermocouple input (differential input)	4ch / Bus isolated	Thermocouple types (J, K, E, N, R, S, T)	1.1W	Screw terminal block (3.81mm/0.15" pitch 10 pins)

Options

Embedded power supply units that can be mounted on a DIN rail				
Model	Rated Voltage Input Range	Rated Output Voltage	Rated Output Current	Rated Power
CPS-PWD-30AW24-01	100 to 240V (50~60Hz)	24VDC	1.3A (Max)	30W
CPS-PWD-90AW24-01	100 to 240V (50~60Hz)	24VDC	3.8A (Max)	90W

* A DC cable and a 3-pin I/O connector are included. * AC power cable is not included. An optional AC power is available from Contec (IPC-ACC0DE3).

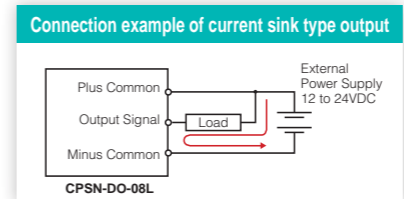
AC Power Cable			
Model	Rated Voltage and Current	Cable	Terminals
IPC-ACC0DE3	125VAC 7A	2m	3-pole round terminal

Suitable Power Supply Unit is available at Contec

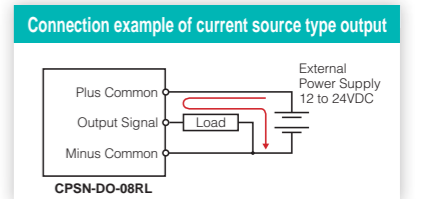
The power consumption is the sum of the power consumption of the coupler unit and the I/O modules. Please prepare a Contec power supply unit or a commercially available product that can supply the required power. * If the power supply unit also supplies power to other devices, select a power supply that matches the total power consumption amount.

Digital Output

Opto-coupler isolated open collector output (current sink type)
Generally, this is an output type called NPN transistor output or minus common type. Connect the load between the positive terminal of the external power supply and the output terminal. It is widely used in Japan. The built-in power supply module has a built-in 12VDC power supply that can drive the opto-coupler of the output circuit. This is useful when an external power supply is not available.

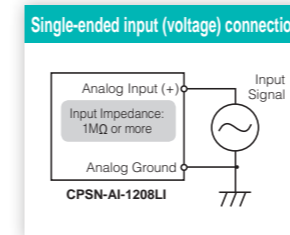


Opto-coupler isolated output (current source type)
Generally, it is an output type called PNP transistor output, plus common type. Connect the load between the negative terminal of the external power supply and the output terminal. Since the load does not operate even if it is short-circuited to 0V, it is widely used in Europe for safety reasons. The built-in power supply module has a built-in 12VDC power supply that can drive the opto-coupler of the output circuit. This is useful when an external power supply is not available.

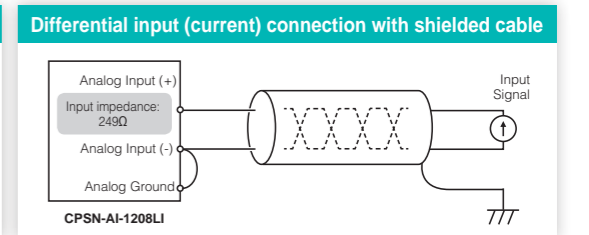
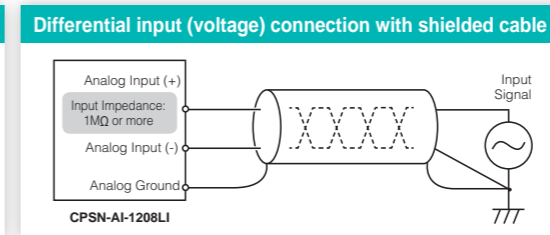


Analog Input

Single-end Input
This method uses two wires, a signal wire and a ground wire, and measures the voltage of the signal source based on the potential difference from the ground. The advantage is that only two wires are required for each signal source. The disadvantage is that it is more susceptible to noise than differential inputs.



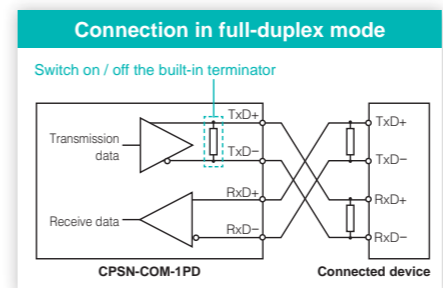
Differential Input
This method measures the voltage of the signal source using a total of three wires, two signal wires and a ground wire. Measure by taking the potential difference between the ground and the analog signal (+) and between the ground and the analog signal (-). Therefore, noise on the ground is canceled. However, since three wires are required for each signal source, the number of usable channels is halved.



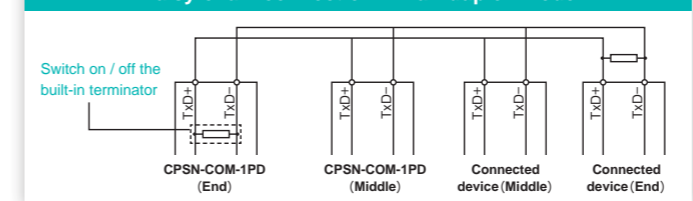
Serial Communication

RS-422A / 485 communication (full duplex / half duplex)

Supports RS-422A and RS-485 communications that are well used for sensor connection. It is possible to connect a full-duplex communication with a 4-wire cable, or daisy-chain (multidrop) connection in half-duplex mode with 2-wire cables.



Daisy-chain connection in half-duplex mode



Thermocouple Sensor Input

A cold junction sensor is built into the module and performs cold junction compensation (reference junction compensation), so the plus terminal and the minus terminal of the thermocouple or the compensating lead wire (used to extend the thermocouple) can be connected as they are. When connecting a shielded thermocouple, connect the shield to the analog ground terminal.

Supported Thermocouple Type	Measurement Temperature Range
K	-100°C to +1372°C
J	-100°C to +1200°C
E	-100°C to +1000°C
N	-100°C to +1300°C
T	-100°C to +400°C
R,S	0°C to +1768°C

Connection of thermocouple sensor input

The plus terminal and the minus terminal of the thermocouple can be directly connected. If there is a shielded wire, connect it to analog ground terminal and makes grounded.

