Network Instrumentation Modules NX Supervisor modules NX-S11/12/21

Overview

Network Instrumentation Modules make optimal distributed configuration a reality. Distributed modules execute cooperative control using Ethernet connectivity. This instrumentation offers an excellent solution for productivity and energy conservation needs.

Supervisor modules, in combination with controller modules, realize the following three multi-loop cooperative control functions.

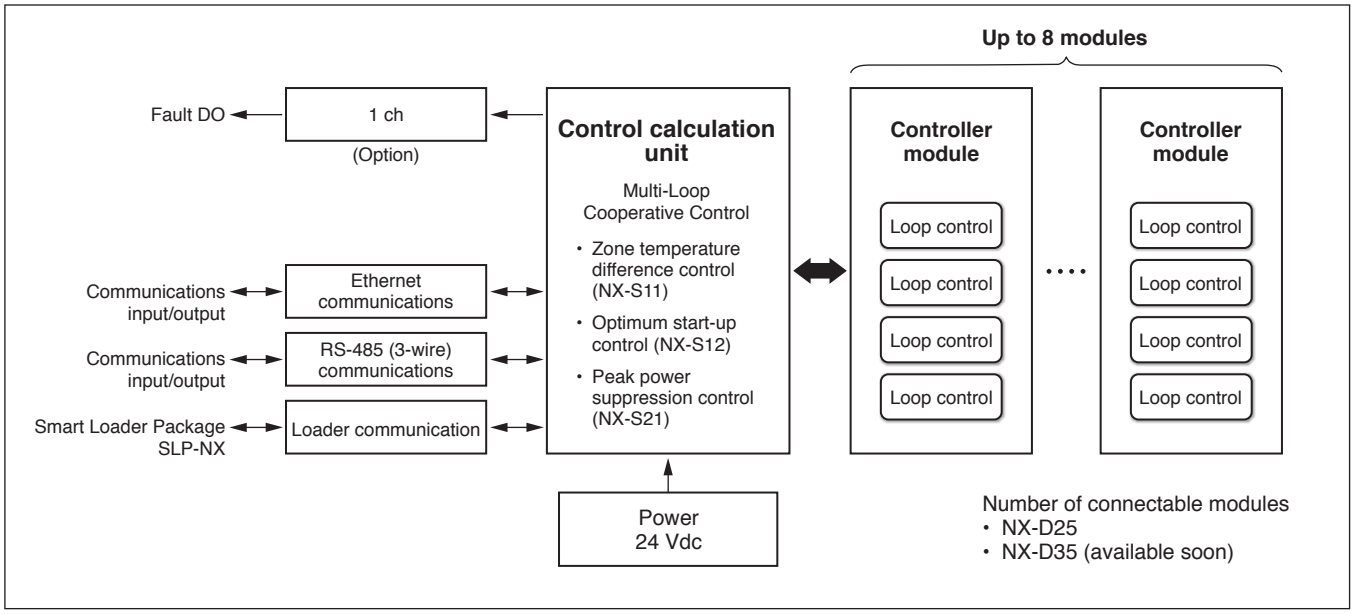
- Zone temperature difference control
- Optimal start-up control
- Peak power suppression control

In addition, advanced control algorithms can be applied by merely setting parameters.

Features

- Three types of multi-loop cooperative control (depending on the model)
- Up to 8 controller modules can be combined for 32 cooperative control loops.
- The 32 loops can be controlled in up to 8 groups.
- Ethernet and RS-485 as standard features
- Side connectors for reduced wiring
- 3-part structure for easy maintenance

NX-S11/12/21 Basic Functional Blocks



Specifications

Model No.		NX-S11	NX-S12	NX-S21
Wiring method		Screw terminals on base (power supply, RS-485 communication)		
Multi-loop cooperative control	Control type	Zone temperature difference control	Optimum start-up control	Peak power suppression control
	Target control output type	–––	–––	Time proportional output
	Time proportional cycle	–––	–––	2 s min.
	Time proportional minimum ON/OFF time	–––	–––	10 ms min.
	Connectable modules	NX-D25 and NX-D35 controller modules		
	Number of connectable modules	Up to 8		
	Number of control groups	Selection of 1 to 8 groups		
	Number of target loops	Up to 32 loops (can be divided into 8 groups)		
	Control cycle	200 ms		
	Cooperative operation modes	Selectable from among: stop, independent operation (auto), cooperative operation, and independent operation (manual)		
	Pair switching	–––	–––	Coupling function (After coupling, the MV becomes 0 % for approximately 1.5 s.)
	Reference loop selection	Selection between PV average, reference loop assignment, or maximum deviation PV	Selection between automatic or reference loop specification Selection between automatic or reference loop specification	–––
	Error mode setting	Selection between all-loop stop or all-loop independent operation.		Fixed at all-loop stop
	Operation after error mode restoration	Selection between auto and manual		
	Control start time after power-on	–––	–––	60 es max. (Indicates the time required for readiness for the start of multi-loop cooperative control after power-on.)
Data retention/ protection	Battery backup	Lithium battery is used to retain the data in SRAM.		
	Parameter backup	Backs up the parameters in SRAM to nonvolatile memory (flash ROM).		
	Parameter restoration	Restores the parameters in nonvolatile memory (flash ROM) to SRAM. Parameters can be restored only when the module is in IDLE mode.		
	Parameter backup timing	When initiated from the SLP-NX loader		
	Parameter restoration timing	When initiated from the SLP-NX loader or when an error occurs in SRAM data during power-on		
Loader communication	Dedicated loader	SLP-NX-J70 or SLP-NX-J71		
RS-485 communication	Signal level	Conforms to RS-485		
	Network	Multidrop type (up to 31 units as slave stations to one host)		
	Communications/ synchronization method	Half-duplex, start/stop synchronization		
	Max. line length	500 m		
	No. of wires	3-wire system		
	Transmission speed	Selection of 4800, 9600, 19200, 38400, 57600, or 115200 bps		
	Terminating resistor	External (150 Ω 0.5 W min.)		
	Data Length	7 or 8 bits		
	Stop bit length	1 or 2 bits		
	Parity bit	Even, odd, or none		
	Protocol	Selectable from CPL, MODBUS/ASCII, and MODBUS/RTU		
Ethernet communication (when using a communications adapter)	Transmission path type	IEEE 802.3u 100BASE-TX (with full duplex and auto MDI/MDI-X functions. The auto negotiation function must be activated on connected modules.)		
	Connector	RJ-45		
	Cable	UTP cable (4P) Cat 5e or later (straight) (ANSI/TIA/EIA-568-B, both ends)		
	Protocol	MODBUS/TCP		
	Host Ethernet connection	When there is an interface to a host system over Ethernet, be sure to connect the host system using a communication box. Note: NX-CB1RR cannot be used.		
Host communication	RS-485 communication	Up to 2 host communication devices can be connected (with one connection each).		
	Ethernet			

Model No.		NX-S11	NX-S12	NX-S21
General specifications	Fault digital output contact (optional function: NX-S_ _ _ _ _ _ 1 _)	Outputs	1	
		Contact rated voltage	24 Vdc	
		Allowable voltage	20.4 to 27.6 Vdc	
		Allowable output current	100 mAdc max.	
		Output type	PhotoMOS relay output (no voltage from A contact)	
		Polarity	None	
		OFF-state leakage current	100 μA max.	
		Maximum ON-state voltage drop	2 V max. (at 24 Vdc, 0.1 A)	
	Standard conditions	Ambient temperature	23 ±2 °C	
		Ambient humidity	60 ±5 % RH (without condensation)	
		Rated voltage	24 Vdc	
		Vibration	0 m/s^2	
		Shock	0 m/s^2	
		Mounting angle	Reference plane ±3 °	
	Operating conditions	Ambient temperature	0 to 50 °C (under installed unit)	
		Ambient humidity	10 to 90 % RH (without condensation)	
		Allowable operating voltage	21.6 to 26.4 Vdc	
		Vibration	0 to 3.2 m/s^2 (10 to 150 Hz for 2 h each in x, y, and z directions)	
		Shock	0 to 9.8 m/s^2	
		Mounting angle	Reference plane ±3 °	
		Dust	0.3 mg/m^3 max.	
		Corrosive gas	None	
		Altitude	2000 m max.	
		Pollution degree	2 (equal to a normal office environment)	
	Transport and storage conditions	Ambient temperature	–20 to +70 °C	
		Ambient humidity	5 to 95 % RH (without condensation)	
		Vibration	0 to 9.8 m/s^2 (10 to 150 Hz for 2 h each in x, y, and z directions)	
		Shock	0 to 300 m/s^2 (three times vertically when mounted on DIN rail)	
		Package drop test	60 cm drop height (free drop on 1 corner, 3 edges, and 6 planes)	
	Memory backup	SRAM is backed up using nonvolatile memory (flash ROM) and a battery.		
	EEPROM erase/ write cycles	Up to 100,000		
	Battery life	3 years (without power-on, under standard conditions)		
	Timekeeper IC	Built-in RTC, ±2.2 s/day, with calendar		
	Power consumption	4 W max. (under operating conditions)		
	Inrush current	Max. 12 A (under operating conditions)		
	Operation after power-on	Warmup time is approx. 10 s (time until normal operation, under standard conditions).		
	Insulation resistance	500 Vdc, 20 MΩ or more (between power terminals 1 and 2, and between power terminals and isolated I/O terminals)		
	Dielectric strength	500 Vac for 1 min (between power terminals 1 and 2, and between power terminals and isolated I/O terminals)		
	External dimensions	30 × 100 × 85 mm (for details, see the external dimensions drawing)		
	Case material, color	Modified PPO resin, black		
	Mounting method	DIN rail		
	Terminal screw tightening torque	0.6 ±0.1 N·m		
	Mass	200 g max.		
	Included accessories	Manual No. CP-UM-5557JE		
	Replacement parts	Battery, model No. 83170639-001 (optional, sold separately)		

Model Number

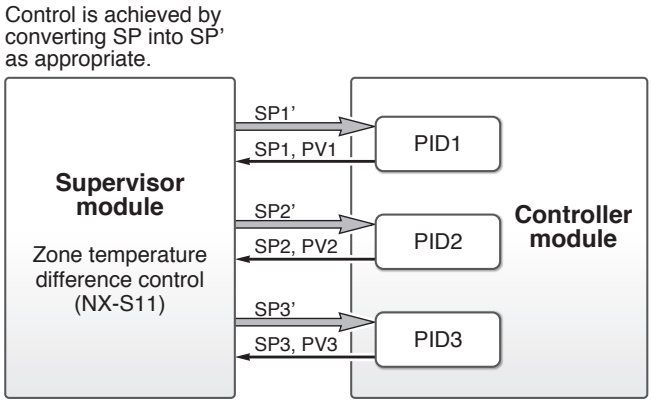
Basic model No.	Type	Ring connection	Option 1	Option 2	Option 3	Addition	Description
NX-							Network Instrumentation Module
	S11						Zone temperature difference control model
	S12						Optimum start-up control model
	S21						Peak power suppression control model
		N					Non-ring connection
		R					Ring connection
			0				None
				00			None
					0		None
					1		With fault DO
						0	None
						D	Inspection certificate
						T	Tropicalization treatment
						K	Anti-sulfide treatment
						B	Tropicalization treatment + inspection certificate
						L	Anti-sulfide treatment + inspection certificate

Control Type

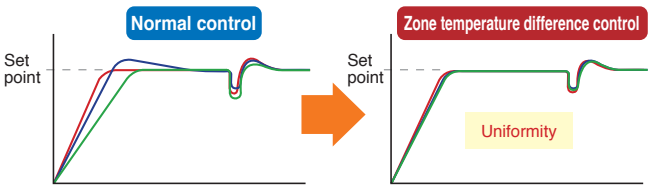
■ Zone temperature difference control (NX-S11)

Controls temperature differences between control loops. Control loops with the same setting are controlled so that they always have the same temperature in all circumstances, including disturbances.

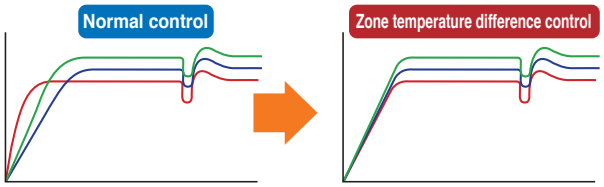
Control loops with different control settings can be controlled so that they always maintain a constant temperature difference.



- Uniform heat during a temperature rise or after a disturbance

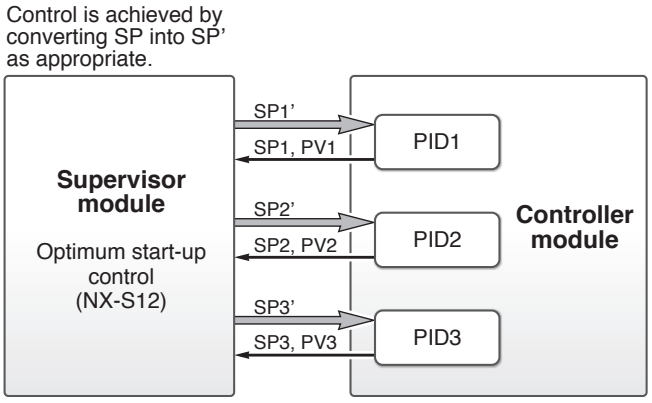


- Maintenance of constant temperature

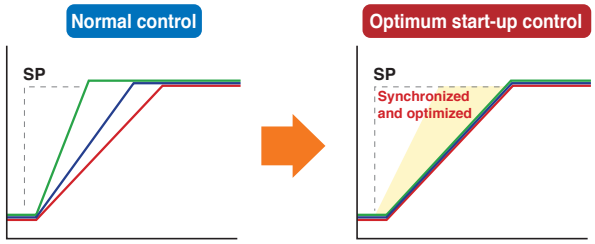


■ Optimal startup control (NX-S12)

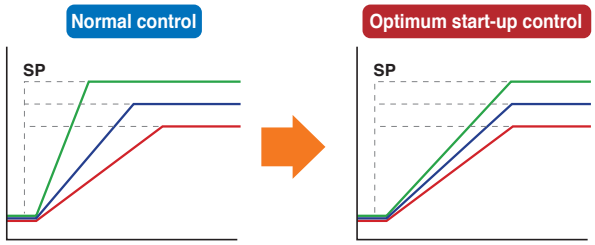
Reduces energy loss in the system by synchronizing and optimizing the system startup. In a system with both fast rising and slow rising loops, this function helps to conserve energy by holding back the control output of those loops that are fast rising.



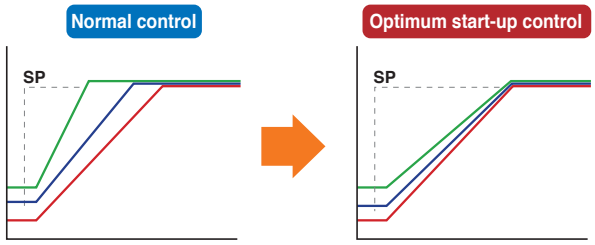
- Temperature rise to the same temperature



- Temperature rise to different temperatures



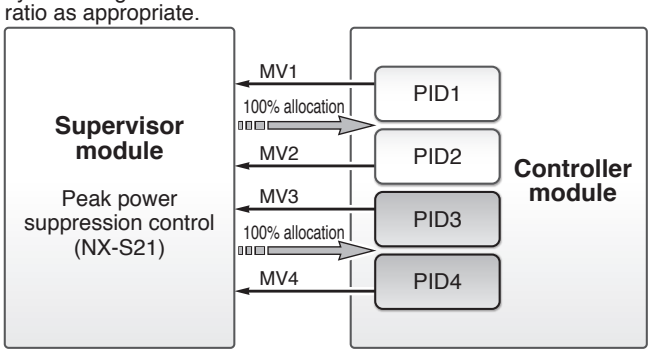
- Temperature rise from different temperatures

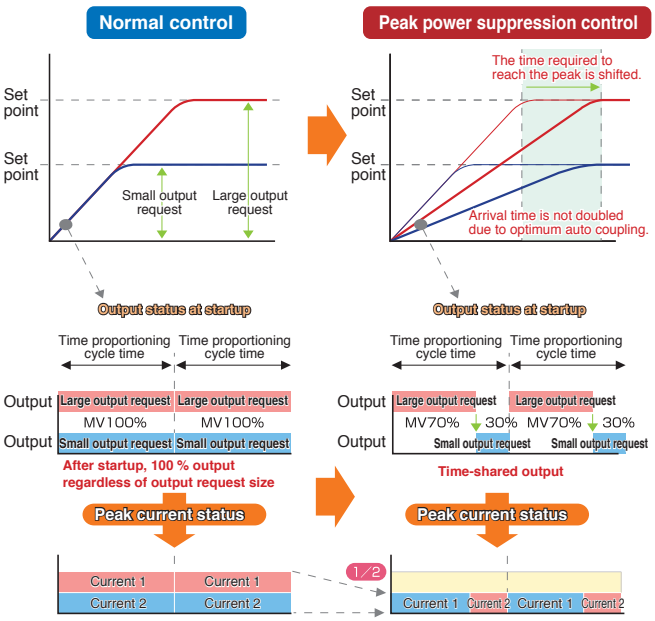


■ Peak power suppression control (NX-S21)

This function controls peak power by means of the time-sharing of outputs from 2 control loops within the time proportional output cycle time.
Time-shared loops are automatically coupled by supervisor modules in an optimal way. This works effectively to suppress peak power in the case of temperature rises due to system startup.

This control is achieved by allocating the MV ratio as appropriate.





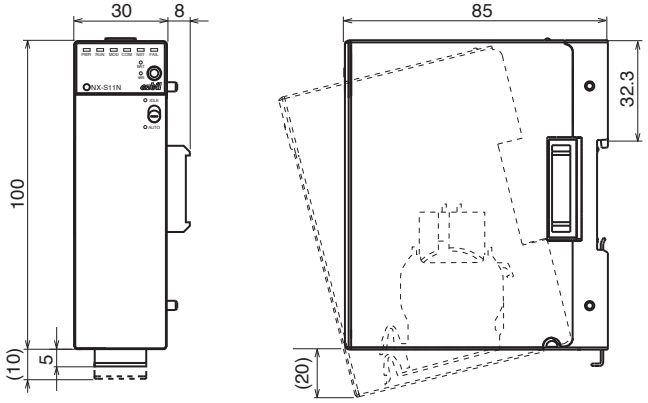
External Dimensions

■ External dimensions

The NX-S11 is shown in the following diagrams, but the dimensions for the NX-S12 and NX-S21 are the same.

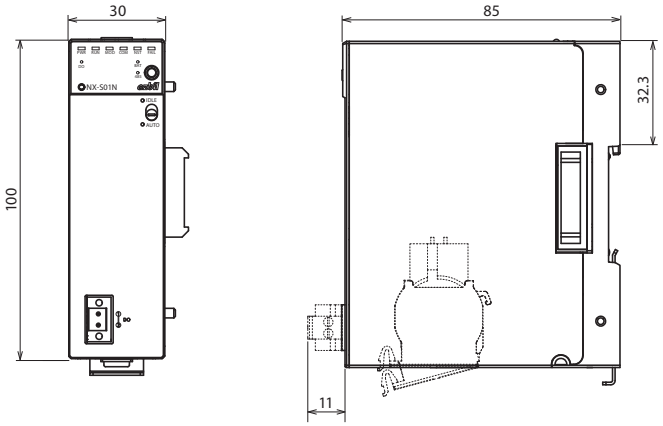
- Model without options

Unit: mm



- Model with fault DO

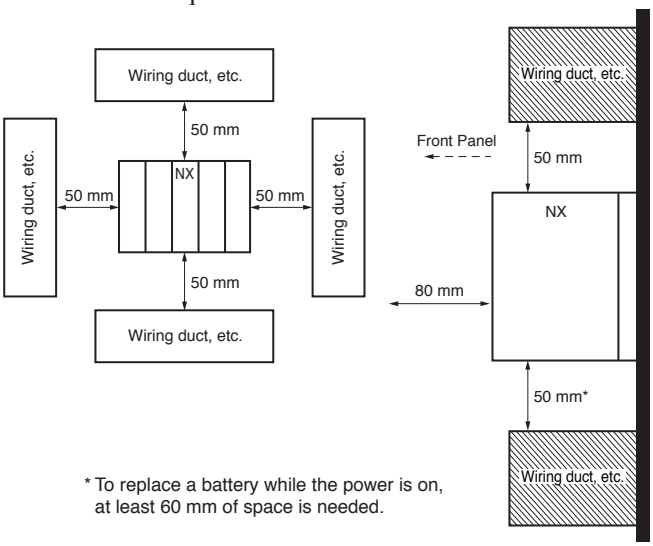
Unit: mm



Mounting

■ Location

The minimum required clearances are shown below.



* To replace a battery while the power is on, at least 60 mm of space is needed.

Do not install in a location having any of the following characteristics:

- High or low temperatures or high or low humidity outside of the specification range
- Sulfide gas or other corrosive gases
- Dust or oily smoke
- Direct sunlight, wind or rain
- Mechanical vibration or shock outside of the specification range
- Nearby high-voltage lines, welding machines or other sources of electrical noise
- Within 15 meters of a device with high-voltage ignition, such as a boiler
- Strong magnetic fields
- Flammable liquid or gas

■ Module connection

Connect this module to other modules using the connectors on the left and right sides of the base.
Connect modules together before installing them on the DIN rail. Connecting the modules connects the power and communication of each module, reducing the amount of wiring that is required. With RS-485 communication, the module on the right side can be disconnected using the RS-485 cut-off switch on the base.

■ Mounting procedure

Use this unit after securing it to a DIN rail.
After mounting the DIN rail, pull open the locking tab an adequate amount and then attach the base to the rail. Next, push in the DIN rail locking tab upwards until it clicks into place.

! Handling Precautions

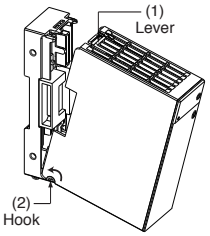
- Mount the unit so that it is vertical with the DIN rail locking tab at the bottom.
- Link this unit before installing it on the DIN rail.

■ Attaching the main unit to the base

! Handling Precautions

- Use the base and main unit from the same package together as a pair.
- First attach the hook at the bottom of the main unit to the base. Not doing so might cause damage.

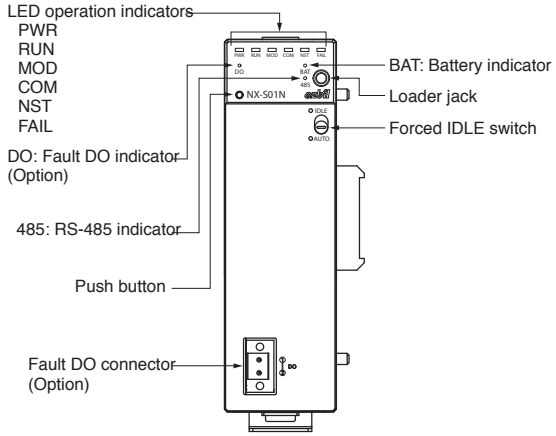
(1) Attach the hook at the bottom of the main unit to the base.
(2) Insert the upper part of the main unit until the lever clicks into place.



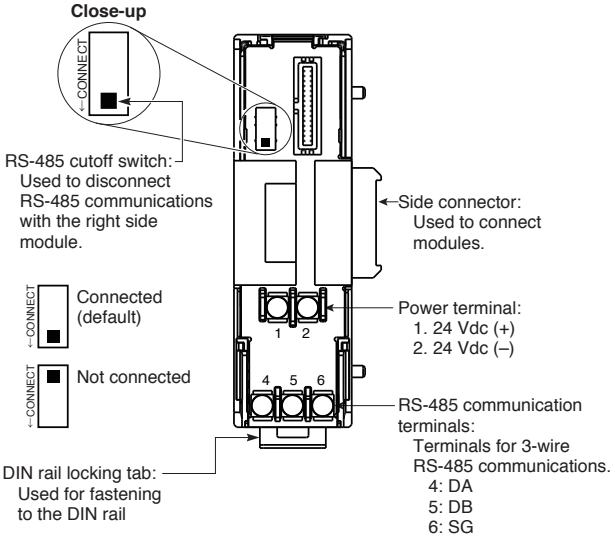
To remove, press the lever on the top and pull the unit towards you.

Names and Functions of Parts

■ Main unit



■ Base



Changing Batteries

■ Changing batteries

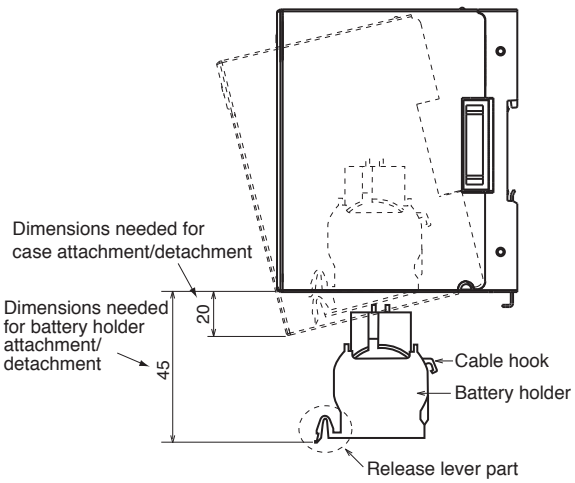
The backup battery can be replaced while in an energized state or when the power is OFF.

! Handling Precautions

- To replace the battery while the power is OFF, make sure the device was energized for at least 60 minutes before power is turned OFF, and perform the replacement within 10 minutes. Otherwise, backup data may be lost on occasion.
- If replacing the battery while in an energized state, it will take up to 3 minutes for the low battery indicator to turn off.
- When returning the battery folder to the device, firmly press down the removal lever until it clicks into place.

- How to replace when turning the power OFF
  (1) Use the SLP-NX to backup device data on a computer.
  (2) Make sure the device was energized for at least 60 minutes, then turn the power OFF.
  (3) Remove the device from the base, remove the battery cover from the bottom of the device, and take out the battery.
  (4) Fit the replacement battery inside of the battery holder, attach it to the connecter, and hang it on the cable hanger.
  (5) Return each battery folder to the device, and reconnect the device to the base.
  (6) Use the SLP-NX to make sure the date and time data are correct. If not correct, fix the date and time data, then access the backup data which you created on a computer in step 1 and write it to the device.

Unit: mm



- How to replace while in an energized state
  (1) Remove the battery holder from the bottom of the device, and remove it from the connecter.
  (2) Take the battery out of the battery holder.
  (3) Fit the replacement battery inside of the battery holder, attach it to the connecter, and hang it on the cable hanger.
  (4) Return each battery folder to the device.

■ Battery disposal

When disposing of this battery, do it appropriately in accordance with local laws and regulations.

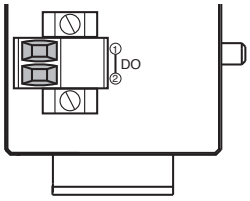
Terminal Wiring Diagram

■ Wiring precautions

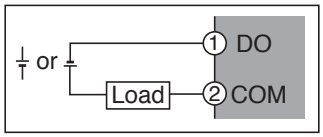
- Make sure that the wiring follows regulations for indoor wiring and technical standards for electrical equipment.
- Do not mount wiring outdoors. Doing so might cause electric shock.
- When connecting wires to the power terminals, use crimp terminals with insulating sleeves.
- Before wiring the unit, verify the device's model No. and terminal Nos. written on the wiring diagram on the side of the main body.
- Use M3 crimp-type terminal lugs for wiring to a screw-type terminal block.
- Pay special attention so that no crimp type terminal lugs make contact with adjacent terminals.
- Leave a distance of at least 60 cm between I/O lead wires and communications lead wires or power lead wires. Also, do not pass these lead wires through the same conduit or wiring duct.
- When connecting in parallel to another device, check the requirements of the other device carefully before performing instrumentation.
- To ensure stability, the unit is designed so that after the power is turned ON, there is no output for about 10 seconds.
- When the wiring is completed, check that there are no wiring mistakes before turning the power ON.

■ Wiring diagrams (model with fault DO)

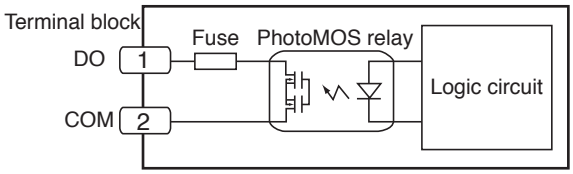
Connect fault outputs according to the specifications for the 2-piece terminal block.



- Connection diagram

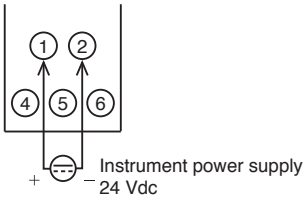


- Fault DO circuit



■ Power connections

Connect the power terminals as shown below.

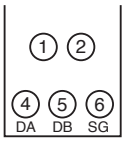


! Handling Precautions

- Electrical power is transferred between connected modules.
- Supply power to any one of the connected modules.
- Use a power source that has ample capacity for the total power consumption of the connected modules.

■ RS-485 Communication Connections

Connect CPL and MODBUS (RS-485 communication) as shown below.



! Handling Precautions

- Attach a 0.5 W or greater terminating resistor of 150 Ω ± 5 % at each end of the communications lines. If a device does not allow terminating resistor to be placed in the same line, follow the instructions for that device.
- Be sure to connect the SG terminals together. Failure to do so might cause unstable communications.
- Use twisted pair cable for communication wiring.

■ I/O isolation

The solid lines in the diagram below indicate isolation from the rest of the circuit.

Power (including side connectors)*1	
Logic circuits Loader jack RS-485 communications, side connector Ethernet communications*1 Displays (LED, push button, etc.)	Fault DO
Side connector ring communication*1	

*1. The power, ring communication, and RS-485 and Ethernet communications are isolated from each other and connected by means of the side connector.

Please, read 'Terms and Conditions' from following URL before the order and use.

http://www.azbil.com/products/bi/order.html

R.O.C. Invention Patent No. 1402752.

Specifications are subject to change without notice.

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