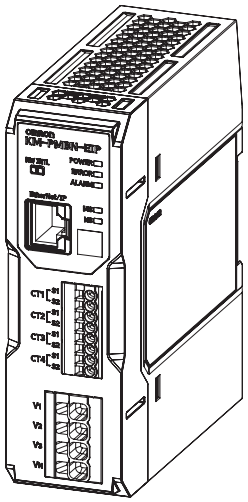
OMRON

Power Monitor

KM-PMBN-EIP

Users Manual



Thank you for purchasing this power monitor, model KM-PMBN-EIP (referred to as model KM-PM in this manual).
This Users Manual describes the functions, performance, and application methods needed for optimum use of the unit.

Please observe the following when using this unit.

- This product is designed for use by qualified personnel with a knowledge of electrical systems.
- Before using the product, thoroughly read and understand this Users Manual to ensure correct use.
- Keep this Users Manual in a safe location so that it is available for reference whenever required.
- PDF version of this manual can be downloaded from the OMRON website. (https://www.omron.com)

Catalog no. N241-E1-01

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Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

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PRECAUTIONS ON SAFETY

Key to Warning Symbols

⚠ CAUTION	**Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or there may be property damage.**

Meanings of the symbols

Symbol		Meaning
Caution		• General Caution Indicates non-specific general cautions, warnings, and dangers.
		• Electrical shock caution Indicates possibility of electric shock under special conditions.
		• Explosion caution Indicates possibility of explosion under special conditions.
Prohibition		• General prohibitions Indicates a general prohibition without particular categorization.
		• Disassembly prohibition This indicates that there is the danger of electric shock or other injury if the unit is disassembled.
Mandatory Caution		• Mandatory actions Indicates a general action that must be performed by the user.

PRECAUTIONS ON SAFETY (continued)

Warning Indications

⚠ CAUTION	
Breakdown or explosion may occasionally occur. Use the power voltage and load within the specified and rate ranges.	
Minor or moderate injury or property damage may occur due to explosion. Do not use in locations exposed to flammable or explosive gases.	
Electric shock may occasionally occur. Do not touch any of the terminals while the power is being supplied.	
Minor electric shock, fire, or malfunction may occasionally occur. Never disassemble, modify, or repair the product.	
Electric shock may occasionally occur. Always make sure that the power to the circuit the CT is being attached to is turned OFF before connecting the CT *.	
Property damage may occur due to fire. Always make sure that the wires are connected properly before turning ON the power supply.	
Minor injury due to electric shock may occasionally occur. Do not touch the product except for any buttons (keys) while power is being supplied.	
Property damage may occasionally occur due to ignition. When wiring, make sure that the wiring material is properly inserted all the way into each terminal hole of the product.	
Minor electric shock, fire, or malfunction may occasionally occur. Do not allow metal objects, conductors, or cuttings from installation work to enter the product.	

* CT: Current Transformer

⚠ CAUTION

Take adequate security measures against DDoS attacks (Distributed Denial of Service attacks), computer viruses and other technologically harmful programs, unauthorized access and other possible attacks before using this product.

Security Measures

Anti-virus protection Install the latest commercial-quality antivirus software on the computer connected to the control/ monitor system and maintain to keep the software up-to-date.	
Security measures to prevent unauthorized access Take the following measures to prevent unauthorized access to our products. • Install physical controls so that only authorized personnel can access control/monitor systems and equipment. • Reduce connections to control/monitor systems and equipment via networks to prevent access from untrusted devices. • Install firewalls to shut down unused communications ports and limit communications hosts and isolate control/monitor systems and equipment from the IT network. • Use a virtual private network (VPN) for remote access to control/monitor systems and equipment. • Scan virus to ensure safety of SD cards or other external storages before connecting them to control/monitor systems and equipment.	
Data input and output protection Validate backups and ranges to cope with unintentional modification of input/output data to control/ monitor systems and equipment. • Checking the scope of data • Checking validity of backups and preparing data for restore in case of falsification and abnormalities • Safety design, such as emergency shutdown, in case of data tampering and abnormalities	
Data recovery Backup data and keep the data up-to-date periodically to prepare for data loss.	
When using an intranet environment through a global address, connecting to a SCADA or an unauthorized terminal such as an HMI or to an unauthorized server may result in network security issues such as spoofing and tampering. You must take sufficient measures such as restricting access to the terminal, using a terminal equipped with a secure function, and locking the installation area by yourself.	
When constructing an intranet, communication failure may occur due to cable disconnection or the influence of unauthorized network equipment. Take adequate measures, such as restricting physical access to network devices, by means such as locking the installation area.	
When using a device equipped with the SD Memory Card function, there is a security risk that a third party may acquire, alter, or replace the files and data in the removable media by removing the removable media or unmounting the removable media. Please take sufficient measures, such as restricting physical access to the Controller or taking appropriate management measures for removable media, by means of locking the installation area, entrance management, etc., by yourself.	

Security Measures of Software Tool (Condition Monitoring Configuration Tool)

To prevent computer viruses, install antivirus software on a computer where you use this software. Make sure to keep the antivirus software updated.	
Keep your computer's OS updated to avoid security risks caused by a vulnerability in the OS. Manage usernames and passwords in the OS or this software carefully to protect them from unauthorized uses.	
Always use the highest version of this software to add new features, increase operability, and enhance security.	
Set up a firewall (E.g., disabling unused communications ports, limiting communications hosts, etc.) on a network for a control/monitor system and devices to separate them from other IT networks. Make sure to connect to the control/monitor system inside the firewall.	
Use a virtual private network (VPN) for remote access to a control/monitor system and devices from this software.	

PRECAUTIONS FOR SAFE USE

Observe the following to ensure safe use of model KM-PMBN-EIP.

- If the product is used in a manner not specified by the INSTRUCTION MANUAL, the protection provided by the product may be impaired.
- Do not use or store the product in any of the following locations.
  - Locations subject to shock or vibration
  - Unstable locations
  - Locations subject to temperatures or humidity outside rated ranges
  - Locations subject to condensation as the result of severe changes in temperature
  - Outside or otherwise exposed to direct sunlight and weather
  - Locations subject to static electricity or other forms of noise
  - Locations exposed to electromagnetic fields
  - Locations subject to exposure to water or oil
  - Locations exposed to water
  - Locations subject to exposure to salt water spray
  - Locations subject to corrosive gases (in particular, sulfide gas and ammonia gas)
  - Locations subject to dust (including iron dust)
  - Locations subject to exposure to solvents
  - Locations subject to bugs and small animals
  - Locations subject to a load
- Ensure the screws fixing the DIN rails are tight. Also ensure that the DIN rails and the body are attached properly. Looseness may cause the DIN rails, body, and wires to separate if vibrations or impacts occur.
- Use 35mm width DIN rails (OMRON, model PFP-50N/-100N).
- Use AWG24 to 12 to wire the input voltage terminals. The heat resistant temperature of the wire is 70 degrees or more.
- Be sure to check that the wiring is correct before turning on the power.
- Before using or maintaining the product, thoroughly read and understand this manual.
- Understand the user manual before setting the device.
- Do not pull cables.
- For compliance with standards and safety, in order to protect against overcurrent, install a branch circuit protector with a rated current of 1A conforming to the voltage at which the device is used and the appropriate standards of the country where the device is used (US: UL Listed, Canada: cUL Listed,and other countries: for example, IEC60947-1 and IEC60947-2). Failure to do so may lead to an electric shock or fire. Check the wiring diagram in this manual to connect the voltage input terminal of this product to the branch circuit protector. If multi-electrode breakers are being used to prevent fire, the neutral conductor and the contactless ground of the main power supply must all be shut down simultaneously. (For example, a 4-pole circuit breaker that can simultaneously disconnect 4 poles.) If other branch circuit protector (for example, fuse) is to be used as an overcurrent protector, select ones with the same characteristics for all poles.
- Before using the device, be sure to check the wiring before turning on the power. Electric shock, injury, accident, or malfunction may occasionally occur because defective wiring.
- This is a“class A”product. In residential areas it may cause radio interference. The user may be required to take adequate measures to reduce interference if this occurs.
- Separate the product wiring from high-voltage or high-current power lines to prevent inductive noise. Do not place the product wiring parallel to or in the same ducts or conduits as power lines.
- Do not install the product close to heat-producing devices (those using coil elements, for instance).
- When mounting the product on the DIN rail, slide the DIN hook unit until a clicking sound is heard.
- Be sure to wire properly with the correct terminal name. Do not wire unused terminals.
- If EtherNet/IP tag data links (cyclic communications) are used with a repeating hub, the communications load on the network will increase.
  This will increase collisions and may prevent stable communications.
- Follow the directions indicated in the manual for connecting EtherNet/IP or the cable. It may result in communication failure.

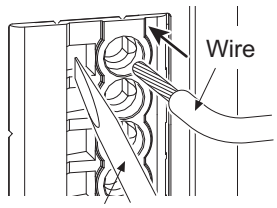
PRECAUTIONS FOR SAFE USE (continued)

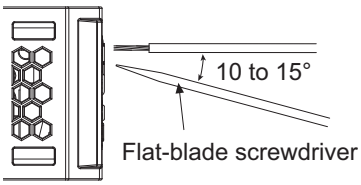
- If you accidentally drop the product, the inside of the product may be damaged, so do not use it.
- Periodically check that the LED indicators operate correctly.
  Depending on the operating environment, the display or indicators may fail due to deterioration.
- Use and store the product in a location where the ambient temperature and humidity are within the specified ranges. If applicable, provide forced cooling.
- Do not continue to use the product if the front surface peels.
- Mount the product in the correct direction for installation.
- When wiring, use a wire of sufficient length.
- Make sure that the Voltage input and the CT input are within the specifications of the product.
- Make sure the crimp terminals for wiring are of the specified size.
- The product may be subject to radio disturbances. Do not install the product near equipment that generates high frequencies or surges.
- Do not exceed the communications distance that is given in the specifications and use the specified communications cable. As for the requirements on the communication distance and the cable, refer to KM-PMBN-EIP User' s Manual (Man. No: N241-E1).
- Dispose of this product appropriately as industrial refuse in accordance with local and national regulations.
- Clamp the wire of the CT correctly. After clamping, make sure until it clicks into place.
- Use this product inside the control panel to prevent external noise.
- The terminal block may be damaged if you insert a flat-blade screwdriver in the release hole with excessive force. When inserting a flat-blade screwdriver into the release holes, operate with a force of 15 N or less.
- The voltage input and connect the CT input correctly to the same application.
- Do not bend a wire more than its natural bending radius or pull on it with excessive force. Doing so may cause wire disconnection or damage to the terminal block.
- Do not wire anything to the release holes.

PRECAUTIONS FOR CORRECT USE

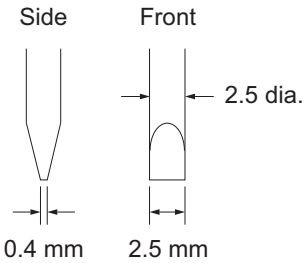
Observe the following operating methods to prevent failure and malfunction.

- When cleaning the unit, make sure the power is off and wipe the surface of the unit with a soft dry cloth. Do not use chemicals including solvents such as thinners, benzine, or alcohol.
- This product is not categorized as "a specified measuring instrument" officially approved by an organization specified in relevant measurement acts. It cannot be used to certify power usage.
- Mount this product on DIN rails for use.
- This product cannot be used to measure the inverter's secondary side.
- Ensure that the rated voltage is reached within 2 seconds of turning the power on.
- Set the parameters of the product so that they are suitable for the system being measured.
- Refer to the status information of the product on the tag data link communications and refer to the received data only in case of no errors occurring with the product.
- Confirm that the wire does not stick up after wiring of the stranded cable.
- The factory default IP address is '192.168.250.50'. Please ensure that it does not conflict with any other devices when setting it up on your PC.
  Pressing and holding the NW INTL switch on the front of the product will reset it to the factory default IP address.)
- When wiring a ferrule terminal or single wire, push it directly into the terminal hole.
  When wiring a stranded wire, insert the wire into the terminal hole while pushing straight along the taper of the release hole with the recommended flat-blade screwdriver.





- The terminal block may be damaged if a specialized tool is not used. Use a recommended flat-blade screwdriver to insert into a release hole on the terminal block.



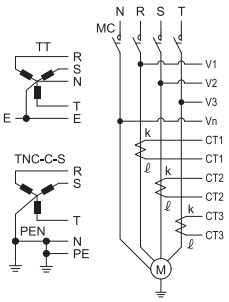
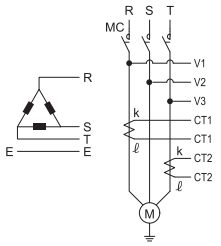
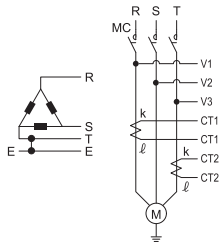
- Use the power supply and transformers with suitable capacities and rated outputs.
- Do not install the product in close contact with the heating element.
- Do not install the product near equipment that generates high frequencies or surges.
- Make sure that the setting values in the product match the specifications of the load and CT that are actually used.
- Do not ground the terminal on the output side of the CT. Failure to do so may result in unstable measurements.
- Do not directly clamp the CT to the lines exceeding 600 VAC.
- Mount the product in the correct direction for installation.
- For the wire to be measured passing through the primary side of the special CT, use an insulated wire with basic insulation or a higher degree of insulation.

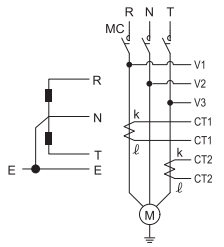
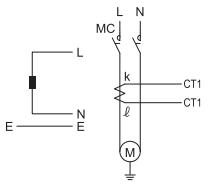
Regulations and Standards

● Conformance to Safety Standards

- The protection provided by the device may be impaired if the device is used in a manner that is not specified by the manufacturer.
- To use the product, install it as an embedded device within a control panel.
- To use the CT, install it in the same control panel as the product with a sufficient clearance from other devices.
- Use the CT listed as "●Special CT (CT to connect to this product)".
- Use the voltage and CT inputs under conditions specified for the measurement category.
- The maximum temperature of the terminal block is 70°C. Therefore, use wires with a rated temperature of 70°C or higher.
- Select such a wire as the case temperature of the special CT will be 65°C or less.
- For the wire passing through the primary side of the special CT, use an insulated wire with basic insulation or higher degree of insulation that conforms to the rated voltage and size of the AWM (Appliance Wiring Material) wire in Table 1. Additionally, there are conditions regarding the allowable wire sizes based on the primary side current values of the CT and the ambient temperature. For more details, please refer to the dedicated CT's instruction manual.
- Table 1 below summarizes the nominal voltage and measurement circuit connections available for each overvoltage category (OVC II, OVC III) and each measurement category (CAT II, CAT III) in the Main Power Supply System Configurations. Do not use the device under conditions that exceed this category and conditions.

Table 1

	3-phase 4-wire (earthed neutral)		3-phase 3-wire type (contactless ground)		3-phase 3-wire type (1-phase ground)	
						
	Nominal Voltage	Rated voltage and size of AWM wires	Nominal Voltage	Rated voltage and size of AWM wires	Nominal Voltage	Rated voltage and size of AWM wires
OVC III CAT III	100 V ≤ phase voltage ≤ 150 V	150 V min. No size limit	---	---	100 V ≤ line voltage ≤ 150 V	150 V min. No size limit
	150 V < phase voltage ≤ 277 V	600 V min. 1 AWG min.	173 V ≤ line voltage ≤ 300 V	600 V min. 1 AWG min.	150 V < line voltage ≤ 300 V	600 V min. 1 AWG min.
OVC II CAT II	---	---	---	---	100 V ≤ line voltage ≤ 150 V	150 V min. No size limit
	---	---	173 V ≤ line voltage ≤ 300 V	300 V min. No size limit	150 V < line voltage ≤ 300 V	300 V min. No size limit
	---	---	300 V < line voltage ≤ 480 V	600 V min. 1 AWG min.	300 V < line voltage ≤ 480 V	600 V min. 1 AWG min.

	1-phase 3-wire		1-phase 2-wire	
				
	Nominal Voltage	Rated voltage and size of AWM wires	Nominal Voltage	Rated voltage and size of AWM wires
OVC III CAT III	100 V ≤ phase voltage ≤ 150 V	150 V min. No size limit	100 V ≤ line voltage ≤ 150 V	150 V min. No size limit
	150 V < phase voltage ≤ 240 V	600 V min. 1 AWG min.	150 V < line voltage ≤ 277 V	600 V min. 1 AWG min.
OVC II CAT II	---	---	---	---
	---	---	---	---
	---	---	---	---

Regulations and Standards (continued)

- For the wire passing through the primary side of the special CT, select an AWM (Appliance Wiring Material) wire that meets the following conditions:
  * Insulated wire that meets the rated voltage and size requirements, provides at least basic insulation, and ensures that the case temperature of the dedicated CT remains below 65°C.

Table 2

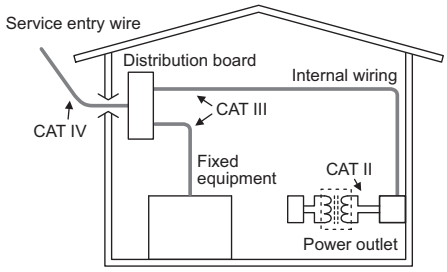
Model	Wire size	Operating Ambient Temperature for This CT and the Equipment Used in Combination with It
KM-PCBE005	24 AWG min. (0.25 mm^2 min.)	55°C max.
KM-PCBE050	6 AWG min. (16 mm^2 min.)	55°C max.
KM-PCBE100	4 AWG min. (22 mm^2 min.)	45°C max.
	2 AWG min. (35 mm^2 min.)	50°C max.
	1 AWG min. (50 mm^2 min.)	55°C max. (up to primary current of 90 A)
KM-PCBE200	2/0 AWG min. (70 mm^2 min.)	45°C max.
	3/0 AWG min. (95 mm^2 min.)	50°C max.
	4/0 AWG min. (120 mm^2 min.)	55°C max. (up to primary current of 160 A)
KM-PCBE400	450 kcmil min. (250 mm^2 min.)	40°C max.
		50°C max. (up to primary current of 300 A)
		55°C max. (up to primary current of 240 A)

Regulations and Standards (continued)

■ Measurement category

The measurement category classifies the places and equipment which you can connect to the measurement terminals, as prescribed in EN/IEC 61010-2-030.
Each category is as follows.

CAT II: Energy-consuming equipment with an energy supply from fixed wiring equipment (such as a power outlet)
CAT III: Equipment in fixed wiring equipment that particularly demands equipment reliability and effectiveness
CAT IV: Equipment to use at the electrical service entry



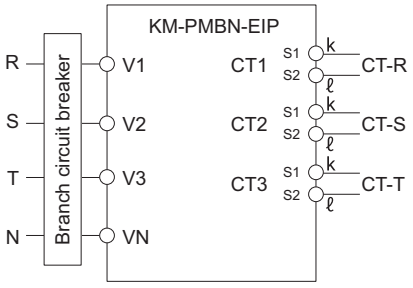
■ Special CT (CT to connect to this product)

Primary-side rated current	Model	Supplied cable
5A	KM-PCBE005	Included
50A	KM-PCBE050	
100A	KM-PCBE100	
200A	KM-PCBE200	
400A	KM-PCBE400	
600A *	KM-PCBE600	

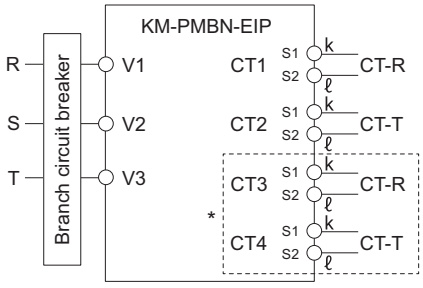
* 600 A-rated current transformers (model KM-PCBE600) do not comply with safety standard certifications, including UL/CSA certification.

■ Connection diagrams

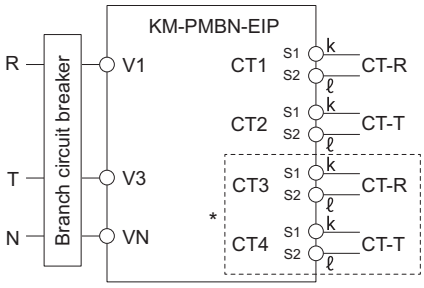
If 3-phase 4-wire type



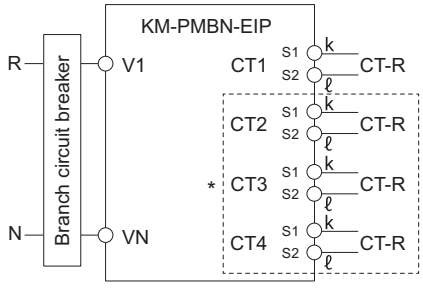
If 3-phase 3-wire type



If 1-phase 3-wire type



If 1-phase 2-wire type



* Wire only during multiple circuit measurements.

● Conformance to EN/IEC Standards

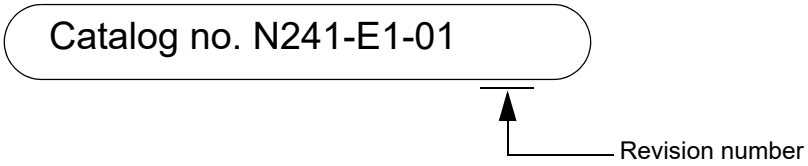
This is a “class A” product. In residential areas it may cause radio interference. The user may be required to take adequate measures to reduce interference if this occurs. The product must be installed within a control panel.

● Conformity with Korea KC Mark

The conformity to the Korean KC Mark can be checked at the following URL.
http://www.rra.go.kr/selform/OMR-KM-PM01

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



Revision number	Date of revision	Reason for revision, pages revised
01	October 2025	First edition

● Abbreviated Indicators

The “Configuration Tool” that appears in the diagrams and descriptions refers to the “Condition Monitoring Configuration Tool.”

1.1 Main features

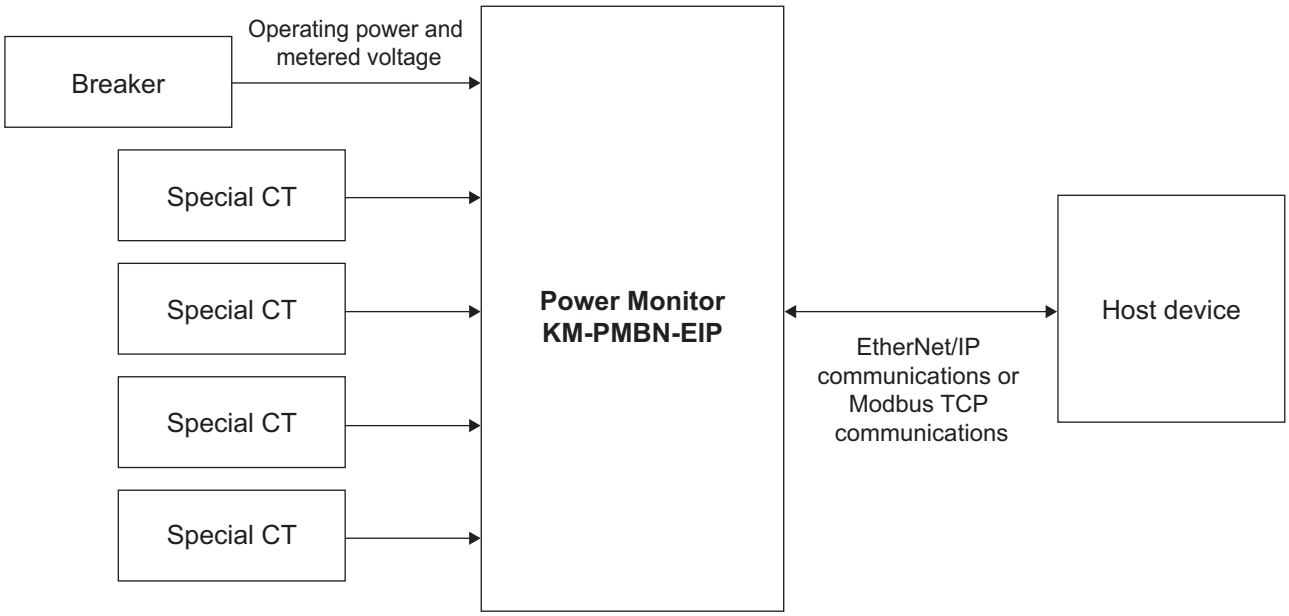
- Supports international standards
  It complies with the international IEC accuracy standards.

- Multi-circuit metering
  Multi-circuit metering is possible with one unit, with up to 4 circuits metered by 1-phase 2-wire, and up to 2 circuits metered by 1-phase 3-wire and 3-phase 3-wire. It is also possible to measure multiple 1-phase 2-wire with different phases branching off a 1-phase 3-wire, and to simultaneously measure both 1-phase 3-wire and 1-phase 2-wire. Use special CTs for measurement.

- Configuration Tool
  The KM-PM allows configuration and logging[*1] with Condition Monitoring Configuration Tool, which is the same configuration tool as that of Omron's condition monitoring device series.

  *1.The logging function is designed to provide support for configuration, and is not intended for long-term operation. For long-term data collection, build and use a system appropriate for the purpose of use.

1.2 Device configuration

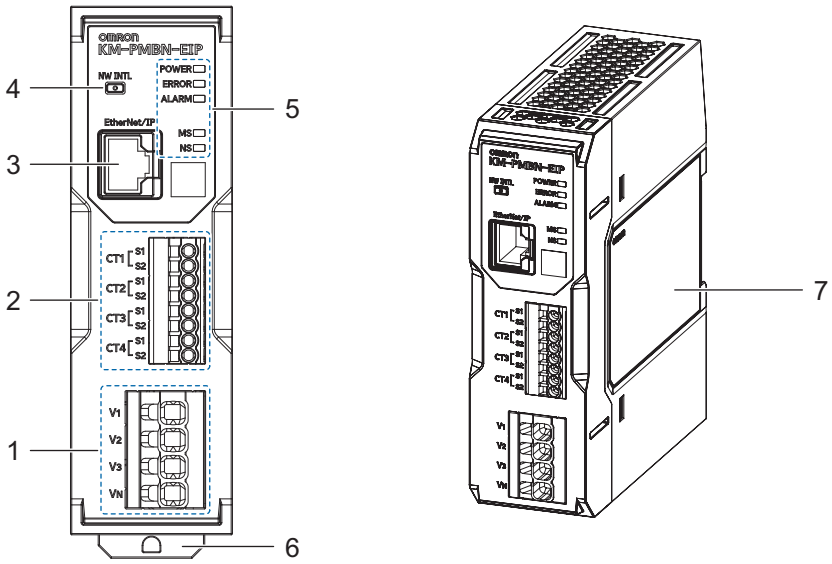


- Special CTs are available for use with this product. Generic CTs cannot be used. By using a CT listed in the table below in combination with a KM-PMBN-EIP, the safety standards are supported, including the use of a CT and power monitors.
  Note that the CT with a 600 A rating (KM-PCBE600) does not support safety standard certification, including UL/CSA certification.

Name	Model	Description
Current Transformer (CT)	KM-PCBE005	Rated 5 A
	KM-PCBE050	Rated 50 A
	KM-PCBE100	Rated 100 A
	KM-PCBE200	Rated 200 A
	KM-PCBE400	Rated 400 A
	KM-PCBE600	Rated 600 A

1.3 Names of the parts and their functions

[Main unit]
Front



No.	Name	Description
1	Voltage input terminals	Terminals for inputting the power and voltage (combined with the input for measured voltage)
2	CT input terminals	Terminal for connecting the CT cables for CT1 to CT4
3	Communication connector	Terminals for connecting an EtherNet/IP network communications cable.
4	Network setting initialization button	Button to return the IP address, password, and other settings to the factory default state. Press and hold this button for three seconds. For the settings initialized, refer to “8.2Security Functions (⇨ 126)”.
5	Status display LED	[POWER]: Lights in green when power is supplied. [ERROR]: Flashes in red when there is an error such as a malfunction. [ALARM]: Flashes in orange when there is a warning. "MS": Module Status. Displays the status of the Main Unit. It is green when it is normal. "NS": Network Status. Displays the state of the communications. It lights or flashes green when it is normal.* * For details, refer to “■MS/NS Indicators (⇨ 22)”.
6	DIN Hook	Hook for attaching to the DIN rail
7	Product labels	Label with information such as the model, power voltage, connector layout, and serial number

1.3 Names of the parts and their functions (continued)

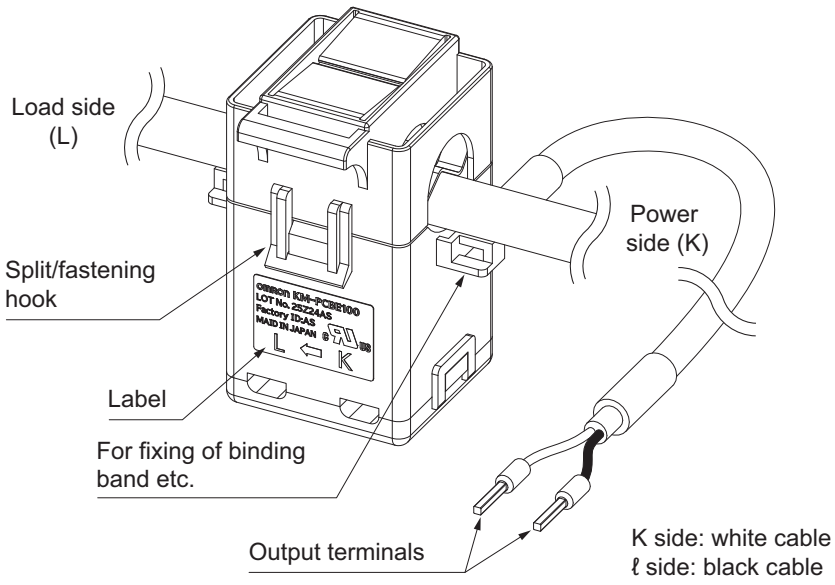
■ MS/NS Indicators

Symbol	Name	Color	Status	Operating condition
MS	Product status indication (Module Status)	Green	Lit.	Normal status
			Flashes at 1-s intervals.	Obtaining the IP address from the BOOTP/DHCP server
		Red	Lit.	Critical product failure (communication is not possible)
			Flashes at 1-s intervals.	One of the following conditions • IP address is duplicated (communication is not possible) • Product internal communication error (communication is possible) The product has failed if it does not return to normal as a result of cycling the power supply or performing a software reset.
		---	Not lit.	No power supply
NS	Network status indication (Network Status)	Green	Lit.	Tag data link or message connection established
			Flashes at 1-s intervals.	No tag data link or message connection established
		Red	Lit.	IP address duplication status
			Flashes at 1-s intervals.	The connection has timed out
		---	Not lit.	No power is being supplied, offline, obtaining the IP address from the BOOTP/DHCP server, or critical failure

1.3 Names of the parts and their functions (continued)

[Special CT]

The appearance of the special CT and the names of parts and their functions are as follows.

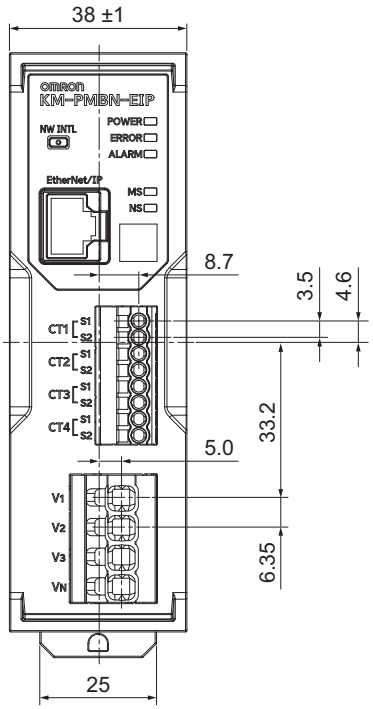


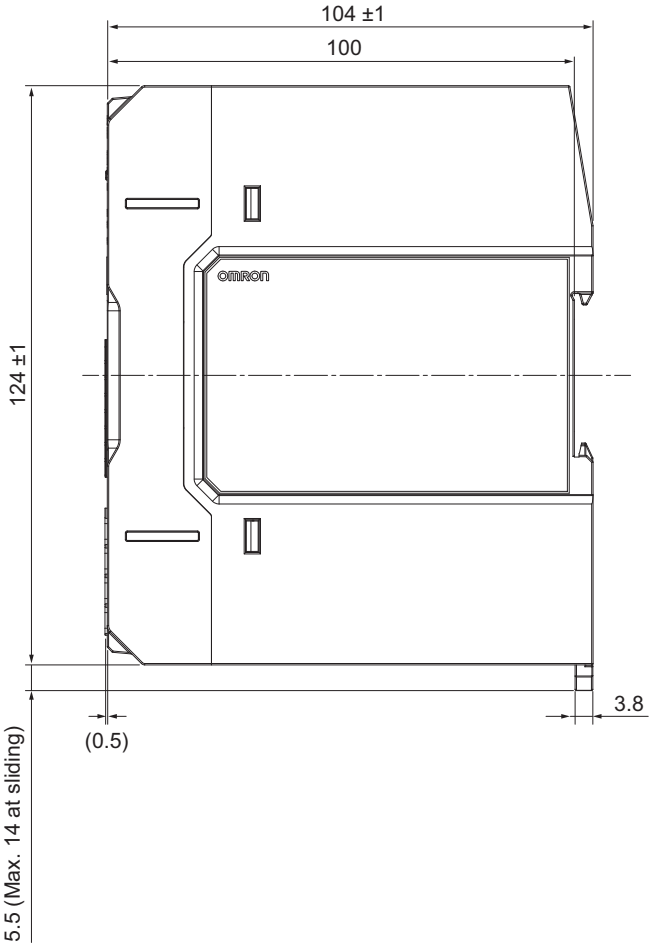
A special CT has a mounting direction.
Mount a special CT to any one phase according to the mounting direction stated on the CT label when you mount it.

1.4 Dimensions

[Main unit]

Units (mm)



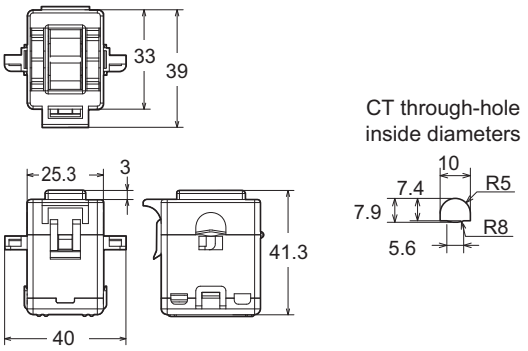


1.4 Dimensions (continued)

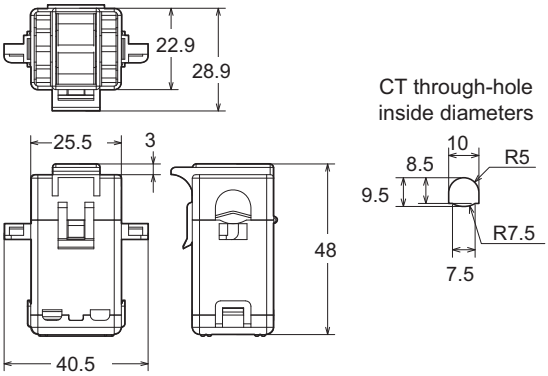
[Dedicated CT]

Units (mm)

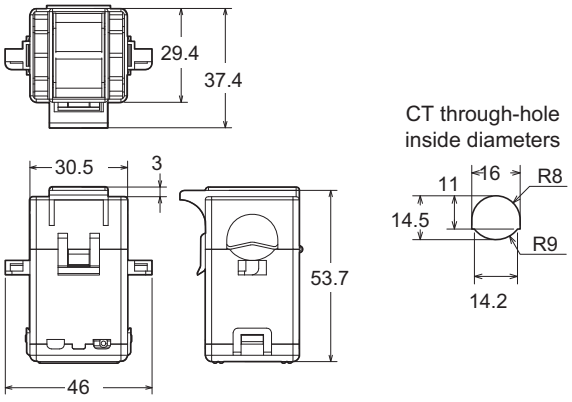
KM-PCBE005



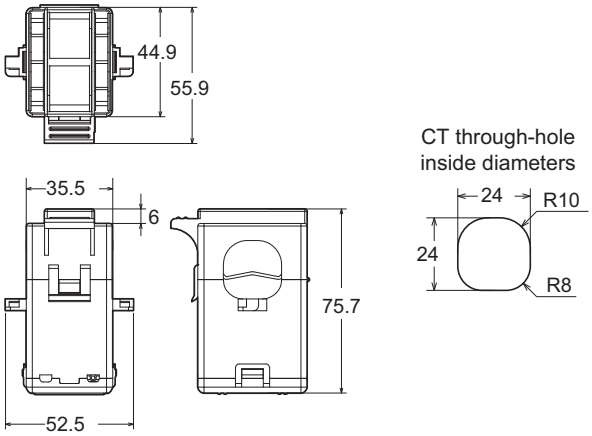
KM-PCBE050



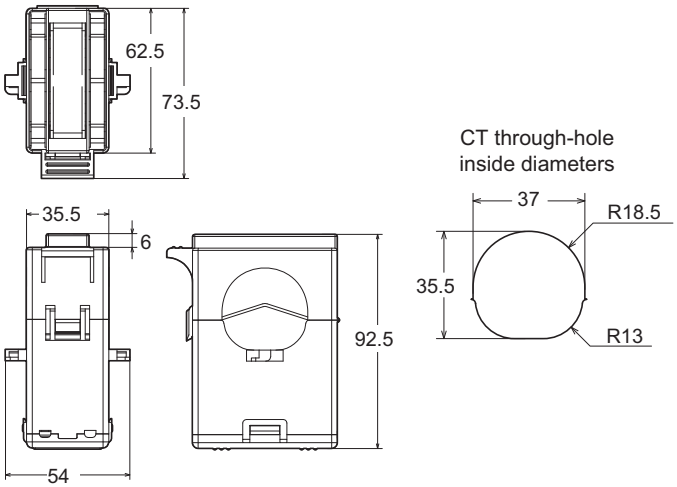
KM-PCBE100



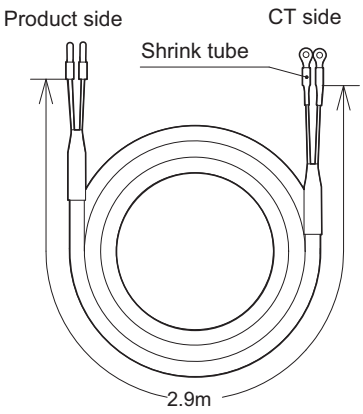
KM-PCBE200



KM-PCBE400
KM-PCBE600



[CT-supplied cable]



Note: The CT-supplied cable is attached to the CT.

1.5 Multi-circuit metering

Multi-circuit metering is possible with this product. Measuring circuit refers to the measurement point where electricity measuring is conducted. Furthermore, this product measures voltage commonly across all circuits and measures current with each separate circuit by using generic CTs.

● Maximum number of measuring circuits for each phase and wire type

You can connect up to 4 generic CTs to this unit. The phase and wire types and the usable number of measuring circuits are shown in the following table.
Refer to “2.5Wiring Diagram of Each Measuring Circuit (Power Supply Voltage and CT) (⇨ 39)” for more on wiring each of the phase and wire types.

Phase and wire type	Abbreviations for phase and wire types	Maximum number of measuring circuits	Circuits used
3-phase 4-wire	3P4W	1 circuit	Circuit A
1-phase 2-wire	1P2W	4 circuit	Circuit A, Circuit B, Circuit C, Circuit D
1-phase 3-wire	1P3W	2 circuit	Circuit A, Circuit C
3-phase 3-wire	3P3W	2 circuit	Circuit A, Circuit C
1-phase 2-wire voltage selected	1P2W2	4 circuit	Circuit A, Circuit B, Circuit C, Circuit D
1-phase 3-wire composite	1P3W2	1-phase 3-wire: 1 circuit	Circuit A
		1-phase 2-wire: 2 circuit	Circuit C, Circuit D

- Set 1-phase 2-wire voltage selected when measuring multiple 1-phase 2-wire with different phases branching off a 1-phase 3-wire switchboard. You can measure 1-phase 2-wire by selecting the corresponding voltage.
- Set 1-phase 3-wire composite to measure both the main 1-phase 3-wire switchboard and a 1-phase 2-wire branching off. You can measure 1-phase 2-wire by selecting the corresponding voltage.
- Refer to “4.5Voltage Selected Setting (Only with 1P2W2 or 1P3W2) (⇨ 58)” for more on 1-phase 2-wire voltage selected and 1-phase 3-wire composite.

1.5 Multi-circuit metering (continued)

● Allocating the circuits used and the CTs for each phase and wire type

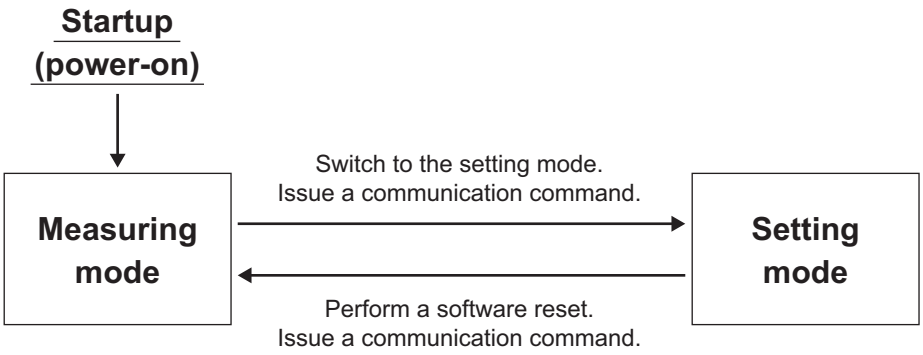
The following table shows the phase and wire types and the CT allocations for each measuring circuits.
By enabling circuits B to D to increase the number of measurement points, you can meter electricity using the required number of circuits.
This are disabled by default.

Phase and wire type	Abbreviations for phase and wire types	Measuring circuits			
		Circuit A	Circuit B	Circuit C	Circuit D
3-phase 4-wire	3P4W	CT1, CT2, CT3			
1-phase 2-wire	1P2W	CT1	CT2	CT3	CT4
1-phase 3-wire	1P3W	CT1, CT2		CT3, CT4	
3-phase 3-wire	3P3W	CT1, CT2		CT3, CT4	
1-phase 2-wire voltage selected	1P2W2	CT1	CT2	CT3	CT4
1-phase 3-wire composite	1P3W2	CT1, CT2		CT3	CT4

1.6 Mode Configuration

This product has the following two operating modes. It can be configured only by communication.

- Measuring mode: Executes measurement of each circuit.
  The setting values cannot be changed by writing.
- Setting mode: This mode is for configuring the various settings of each circuit, and the common settings.



The product's operating status and operating mode status can be determined from the status information.

bit	Status name	ON	OFF
:	:	:	:
9	Operating mode status	Setting mode	Measuring mode
:	:	:	:

For details, refer to “●Main Unit Monitor Object (Class ID: 37F hex) (⇨ 75) “.

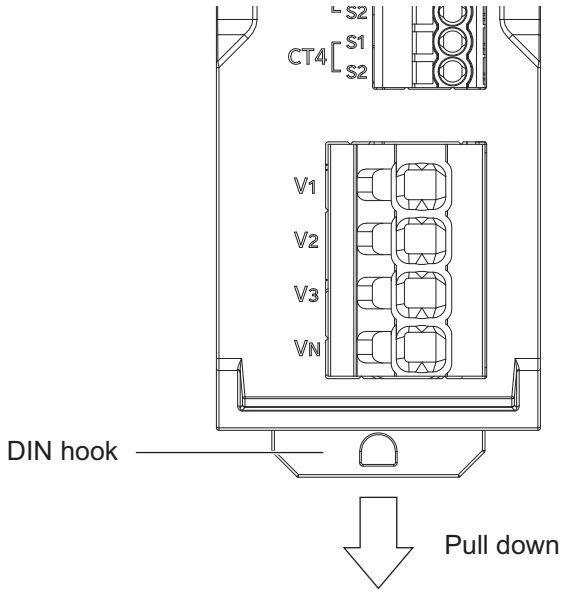
2.1 Installation

For safety purposes, install the unit in a location where you won't touch the terminals when operating the main unit. For example, install so that the terminals are hidden within the control board so that a person working on the unit will not be able to touch live wires.

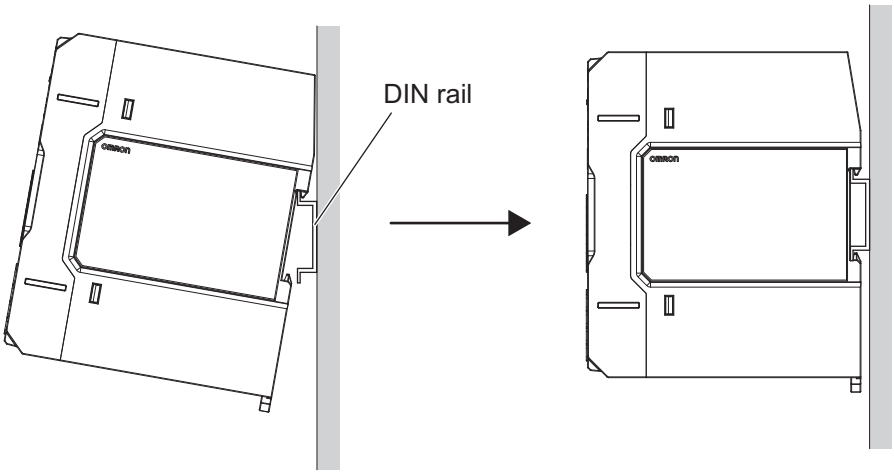
1 Fix the DIN rail to the installation location

– DIN rail (recommended product): Model PFP-50N/-100N (from Omron)

2 Pull down the DIN hook on the bottom of the body of the unit

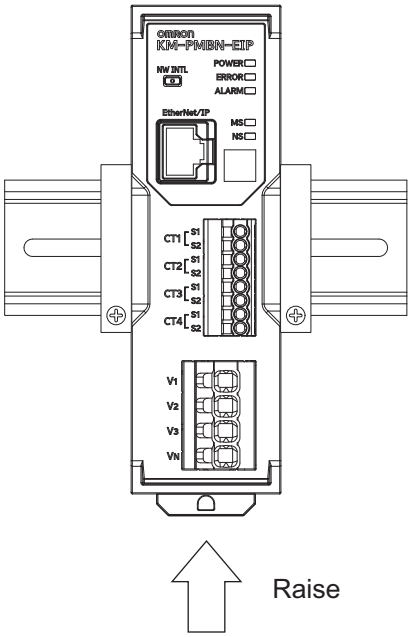


3 Fit the flanges of the body onto the DIN rail as shown in the below diagram, and click into place



2.1 Installation (continued)

4 Raise the DIN hook and fix the body to the DIN rail



Detaching the body of the unit

When removing the body from the DIN rail, use a flathead screwdriver to flick open the DIN hook and open downwards.

Important

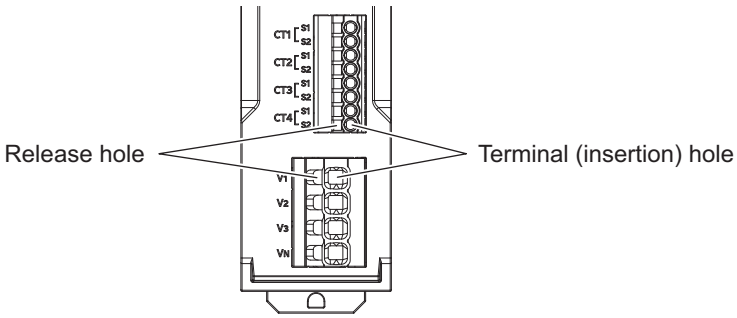
- **Ensure that the DIN rails and the body are attached properly. Looseness may cause the DIN rails, body, and wires to separate if vibrations or impacts occur.**
- **Fix end plates to the body units at each end of the DIN rail.**
  These stop the units from jumping off the DIN rail due to vibration or impacts.
  – End plate (recommended part): model PFP-M (from Omron)
- **Make sure you install so there is space for wiring above and below the body of the unit.**
  (about 50 mm above the unit and 30 mm below the unit)

Information

- You can attach multiple model KM-PM to the DIN rail and fit the bodies next to each other.

2.2 How to Connect to the Push-In Terminal Blocks

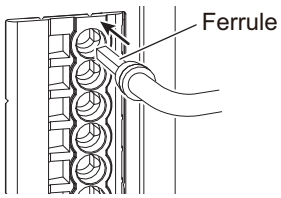
Part Names



Name	Function
Terminal (insertion) hole	Used to insert wires with ferrules, solid wires, and stranded wires.
Release hole	Releases the wire when the specified flat-blade screwdriver is inserted. Also used when you insert stranded wires.

Connecting Wires with Ferrules and Solid Wires

Insert the ferrule or solid wire straight into the terminal block until the end touches the terminal block.



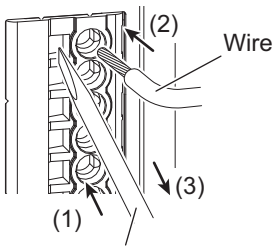
If you use a ferrule with a conductor length of 12 mm, part of the conductor may be visible after the ferrule is inserted into the terminal block, but the product insulation distance will still be satisfied.

If it is difficult to insert fine solid wires, insert the wire with a screwdriver inserted into the release hole, and then remove the screwdriver while ensuring that the fine solid wire is still held.

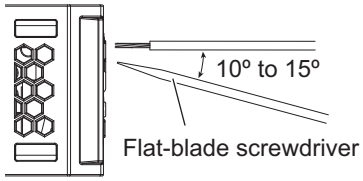
Connecting Stranded Wires

- Hold a flat-blade screwdriver at an angle and insert it into the release hole. The angle should be between 10º and 15º.

  If the flat-blade screwdriver is inserted correctly, you will feel the spring in the release hole.



Flat-blade screwdriver



Caution

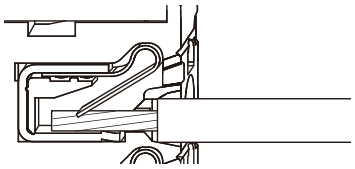
- Do not apply more than 50 N force to the terminal block when you insert wiring or insert a flat-blade screwdriver into the release hole.
- Do not wire anything to the release holes.
- Do not tilt or twist a flat-blade screwdriver while it is inserted into a release hole on the terminal block. The terminal block may be damaged.
- Insert a flat-blade screwdriver into the release holes at an angle. The terminal block may be damaged if you insert the screwdriver straight in.
- Do not allow the flat-blade screwdriver to fall out while it is inserted into a release hole.
- Insert the wire straight into the terminal block until the end touches the terminal block.
- Remove the flat-blade screwdriver from the release hole.

2.2 How to Connect to the Push-In Terminal Blocks (continued)

Checking Connections

After the insertion, pull gently on the wire to make sure that it will not come off and the wire is securely fastened to the terminal block.

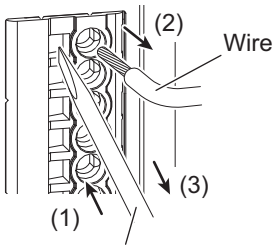
When you use a stranded wire, make sure that the stranded wire does not bend or touch the adjacent terminal.



Removing Wires from the Push-In Terminal Blocks

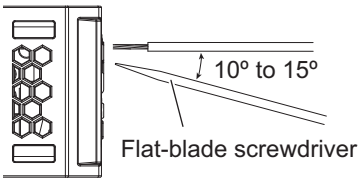
Use the following procedure to remove wires from the terminal block.
The same method is used to remove stranded wires, solid wires, and ferrules.

- Hold a flat-blade screwdriver at an angle and insert it into the release hole. The angle should be between 10º and 15º.
  If the flat-blade screwdriver is inserted correctly, you will feel the spring in the release hole.



Flat-blade screwdriver

- Remove the wire.
- Remove the flat-blade screwdriver from the release hole.



Push-In Terminal Blocks Specifications

■ Specifications

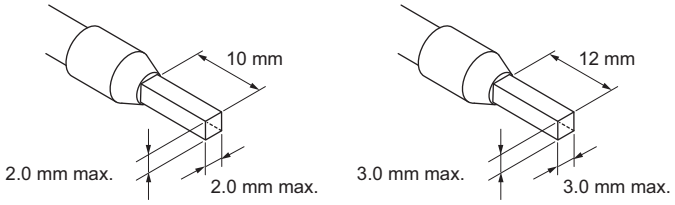
Item	Specifications	
	Voltage input terminal block	Current input terminal block
Construction	Push-In Terminal Blocks	
Applicable wires	Stranded wires, solid wires, and ferrules	
Applicable wire size	0.2 mm^2 to 4 mm^2 (AWG 24 to AWG 12)	0.2 mm^2 to 1.5 mm^2 (AWG 24 to AWG 16)
Screwdriver insertion force	Approximately 50 N	
Wire stripping length	12 to 13 mm	9 to 10 mm
Ferrule length	12 mm	10 mm
Current capacity	32 A (per pole)	17.5 A (per pole)

2.2 How to Connect to the Push-In Terminal Blocks (continued)

■ Recommended Ferrules

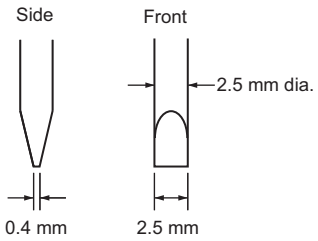
Applicable wire		Ferrule, Conductor length (mm)	Stripping length (mm) (ferrules used)	Recommended Ferrules		
(mm^2)	AWG			Manufactured by Phoenix Contact	Manufactured by Weidmuller	Manufactured by Wago
0.2/0.25	24	10	12	AI 0,25-10	-	-
		12	14	AI 0,25-12	-	-
0.34	22	10	12	AI 0,34-10	-	-
		12	14	AI 0,34-12	-	-
0.5	20	10	12	AI 0,5-10	H0,5/16	FE-0.5-10N-WH
		12	14	AI 0,5-12	H0,5/18	FE-0.5-12N-WH
0.75	18	10	12	AI 0,75-10	H0,75/16	FE-0.75-10N-GY
		12	14	AI 0,75-12	H0,75/18	FE-0.75-12N-GY
1/1.25	18/17	10	12	AI 1-10	H1,0/16	FE-1.0-10N-RD
		12	14	AI 1-12	H1,0/18	FE-1.0-12N-RD
1.25/1.5	17/16	10	12	AI 1,5-10	H1,5/16	FE-1.5-10N-BK
		12	14	AI 1,5-12	H1,5/18D	FE-1.5-12N-BK
2.5	14	12	14	AI 2,5-12	H2,5/19D	FE-2.5-12N-BU
4	12	12	14	AI 4-12	H4,0/20D	FE-4.0-12N-GY
Recommended crimp tool				CRIMPFOX6 CRIMPFOX6T-F CRIMPFOX10S	PZ6 roto	Variocrimp4

Note 1. Make sure that the outer diameter of the wire coating is smaller than the inner diameter of the insulation sleeve of the recommended ferrule.
2. Make sure that the ferrule processing dimensions conform to the figure on the right.



■ Recommended Flat-blade Screwdrivers

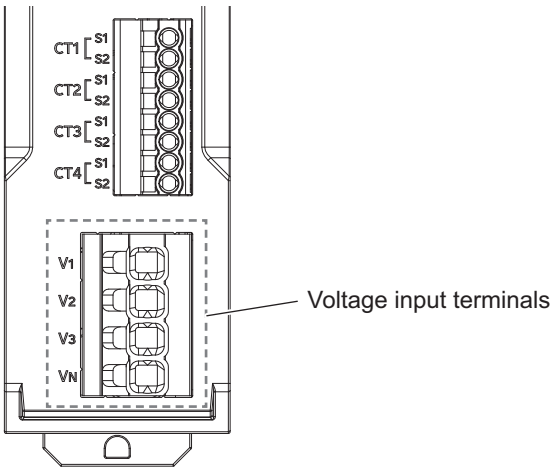
Model	Manufacturer
ESD 0,40×2,5	Wera
SZS 0,4×2,5 SZF 0-0,4×2,5*	Phoenix Contact
0.4×2.5×75 302	Wiha
AEF.2,5×75	Facom
210-719	Wago
SDI 0.4×2.5×75	Weidmuller



* You can purchase the SZF 0-0,4×2,5 flat-blade screwdriver made by PHOENIX CONTACT with OMRON model XW4Z-00B.

2.3 Wiring for power and monitored voltage input

Voltage input terminals V1/V2/V3/VN on this product act as both operating power terminals and as voltage measuring terminals.
The layout of voltage input terminals is as follows.



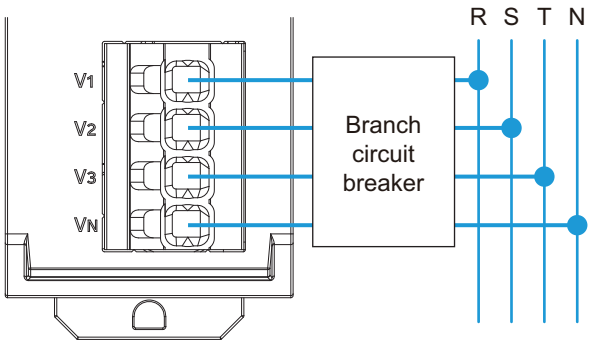
Phase and wire type	Voltage input terminals			
	V1	V2	V3	VN
3-phase 4-wire	R	S	T	N
1-phase 2-wire	L	-	-	N
1-phase 3-wire	R	-	T	N
3-phase 3-wire	R	S	T	-

Information
- R/S/T/N may be labeled U/V/W/O or L1/L2/L3/N in some cases.
- R/N/T may be labeled U/O/W or L1/N/L2 in some cases.

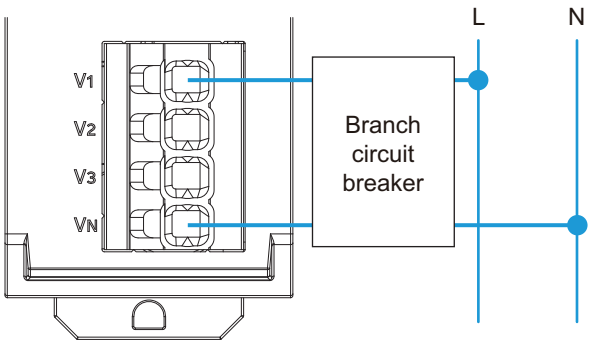
2.3 Wiring for Power and Monitored Voltage Input (Continued)

Wire the device according to the phase and wire type as shown in the following diagram.
Install a branch circuit breaker between the wiring for each of R/S/T/N, L/N and R/N/T so that the power can be turned off immediately.

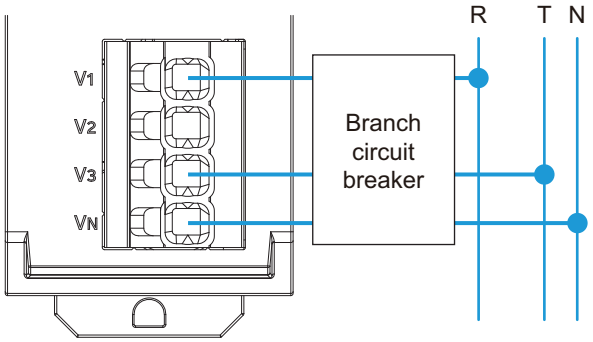
3-phase 4-wire



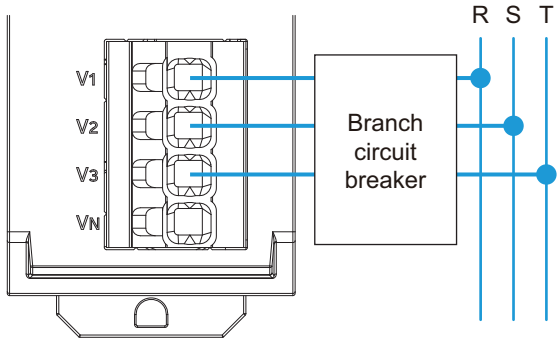
1-phase 2-wire



1-phase 3-wire
(1-phase 2-wire voltage selected,
1-phase 3-wire composite)



3-phase 3-wire



Important

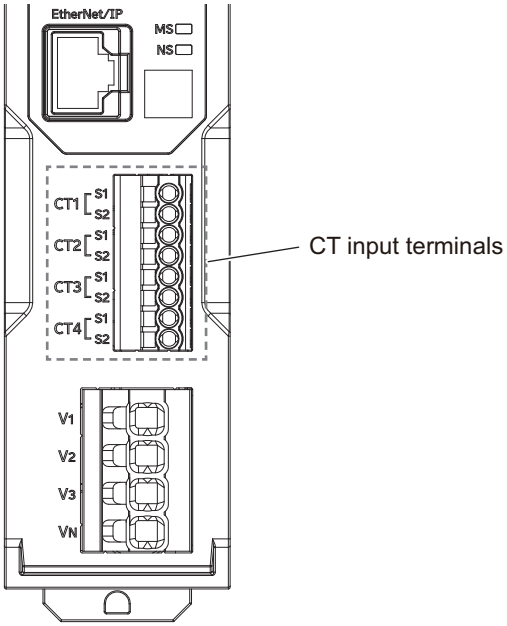
- **When using a multi-pole circuit breaker as overcurrent protection, you need to interrupt all of the mains power neutral wire and ungrounded wires simultaneously. (Example: 4-pole circuit breaker that can interrupt 4 poles simultaneously)**
- **When using another branch circuit protection device (such as a fuse) as overcurrent protection, select a device with the same characteristics for all poles.**
- **For safety purposes, turn off the mains power to ensure there is no power supply while you are working.**
- **Wire correctly so the phase sequence is correct. You will be unable to measure the power and energy correctly if you fail to do so.**

2.4 Wiring the CTs

● Wiring the CTs

You can connect up to a maximum of 4 generic CTs to this unit (⇨ 26). The number of CTs used depends on the phase and wire type of the power source being monitored. The following table shows the phase and wire types and the CTs to use for each. For example, use CT1 when measuring only one 1-phase 2-wire circuit. Further, when measuring two 1-phase 3-wire circuits, use CT1 and CT2 for circuit A and use CT3 and CT4 for circuit C.

The layout of CT input terminals is as follows.



The following table shows the phase and wire types and the CT allocations for each measuring circuits.

Phase and wire type	Abbreviations for phase and wire types	Measuring circuits			
		Circuit A	Circuit B	Circuit C	Circuit D
3-phase 4-wire	3P4W	CT1, CT2, CT3	—	—	—
1-phase 2-wire	1P2W	CT1	CT2	CT3	CT4
1-phase 3-wire	1P3W	CT1, CT2	—	CT3, CT4	—
3-phase 3-wire	3P3W	CT1, CT2	—	CT3, CT4	—
1-phase 2-wire voltage selected	1P2W2	CT1	CT2	CT3	CT4
1-phase 3-wire composite	1P3W2	CT1, CT2	—	CT3	CT4

- Connect the CT cables for CT1/CT2/CT3/CT4 to the terminals on the main unit that are labeled CT1/CT2/CT3/CT4.
- Connect the power supply (K) side (white cable) of the CT cable to the S1 terminal, and the load (L) side (black cable) of the CT cable to the S2 terminal. For details on distinguishing between the power supply side (K) and load side (L) of a CT, check the instruction manual of the CT you are using.

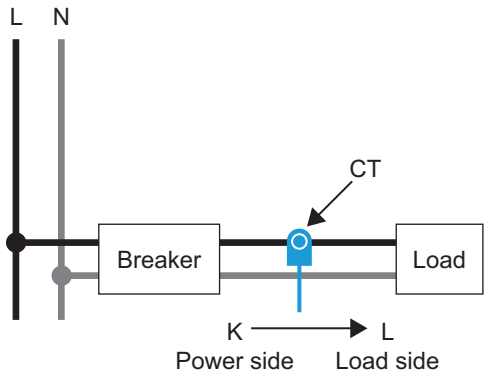
2.4 Wiring the CTs (Continued)

Important

- **Do not try to connect or disconnect CTs or CT cables during measurement or while the power of this product is on. There is a danger of electric shock. Furthermore, this may cause this unit and the CT to malfunction.**
- **After fixing the wiring in place, pull gently to confirm that the wiring is fixed firmly.**

● Fitting the CTs to the measuring wires

When monitoring one circuit with 1-phase 2-wire, you need one CT. When monitoring one circuit with 1-phase 3-wire, you need 2 CTs. When monitoring one circuit with 3-phase 4-wire, you need 3 CTs. The following diagram is an example of fitting CTs when monitoring one circuit with 1-phase 2-wire.



- For details about how to connect the CTs to the measuring wires, refer to the manual of the CTs you are using.
- Fit the CTs to the measuring wires after connecting the CT cables to the unit.
- Attach to the L-phase if measuring 1-phase 2-wire.
  Attach to the R-phase and T-phase if measuring 1-phase 3-wire or 3-phase 3-wire.
  Attach to the R-phase, S-phase, and T-phase if measuring 3-phase 4-wire.
- Refer to “2.5Wiring Diagram of Each Measuring Circuit (Power Supply Voltage and CT) (⇨ 39)” for more on attaching CTs according to the phase and wire types.
- CTs have polarity. Check the directionality of the power side (K) and the load side (L) before connecting. You will be unable to measure correctly if you make a mistake with the directions.

Important

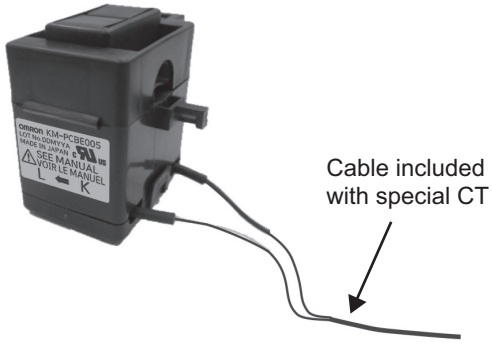
- **Electric shock may occasionally occur.**
  Always make sure that the power is turned OFF before connecting the CT.
- **Make sure that the primary electrical wire clamped at the CT is insulated coated wire.**
- **Do not expose the CTs to excessive vibrations or impacts.**

2.4 Wiring the CTs (Continued)

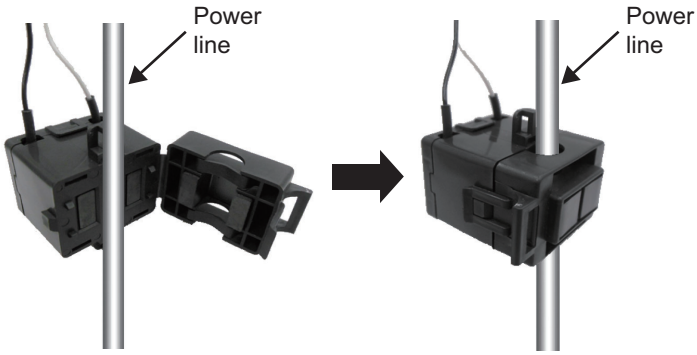
Caution

- Do not extend the cable included with the special CT.
  If it is extended, the safety standards will no longer be met.

Special CT



- Mount the special CT to any one phase.



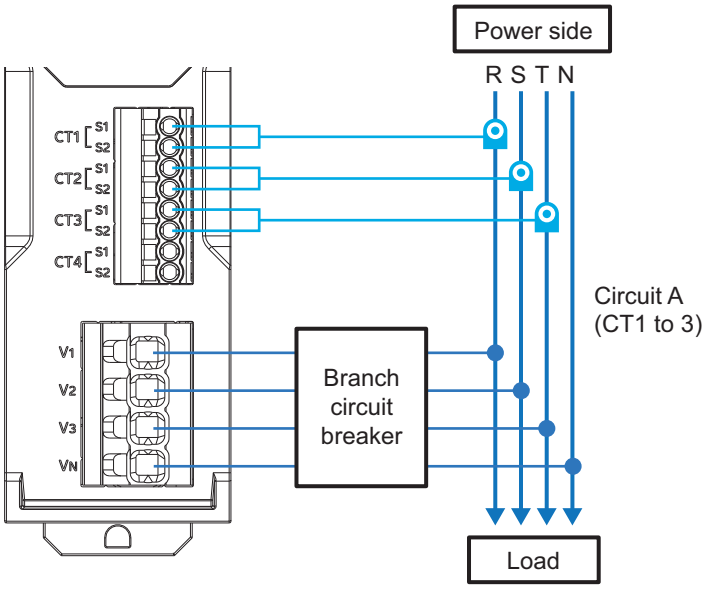
The KM-PM end of the cable included with the special CT has a ferrule terminal.
K side: white cable, ℓ side: black cable

2.5 Wiring Diagram of Each Measuring Circuit (Power Supply Voltage and CT)

The below table shows the wiring for voltage, current, and CT by each phase and wire type.

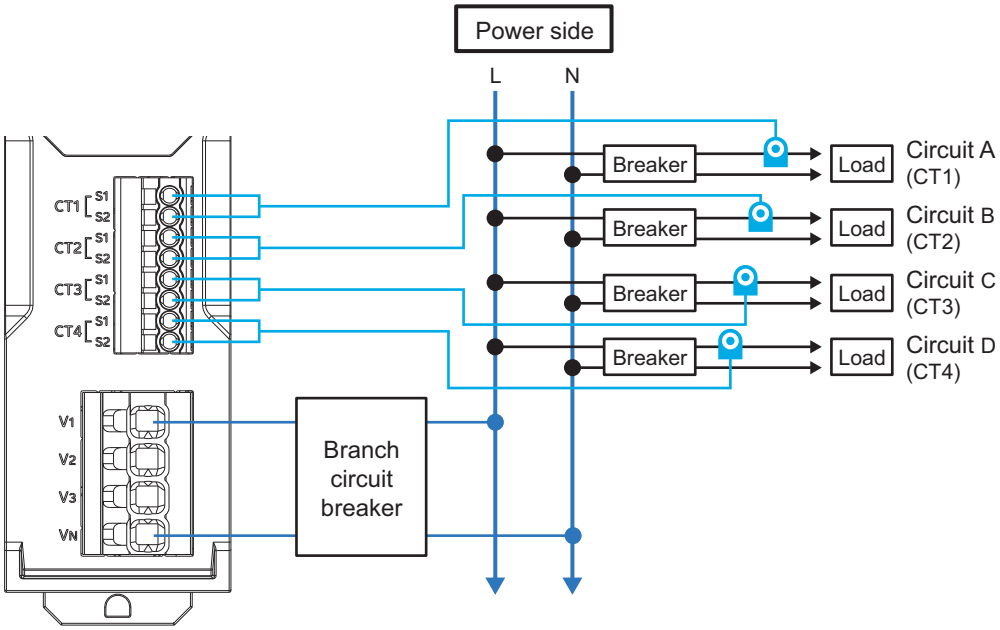
■ For 3-phase 4-wire (3P4W)

3-phase 4-wire measures one circuit, as shown in the following diagram.



■ For 1-phase 2-wire (1P2W)

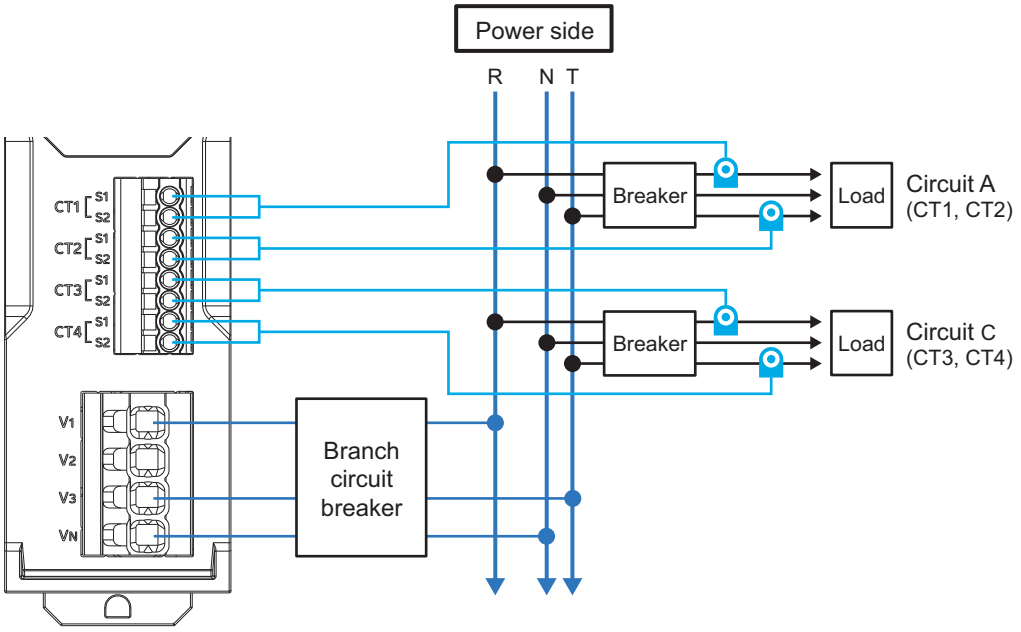
As shown below, 1-phase 2-wire can measure a maximum of 4 circuits. The CT must be attached to the L-phase.



2.5 Wiring Diagram of Each Measuring Circuit (Power Supply Voltage and CT) (continued)

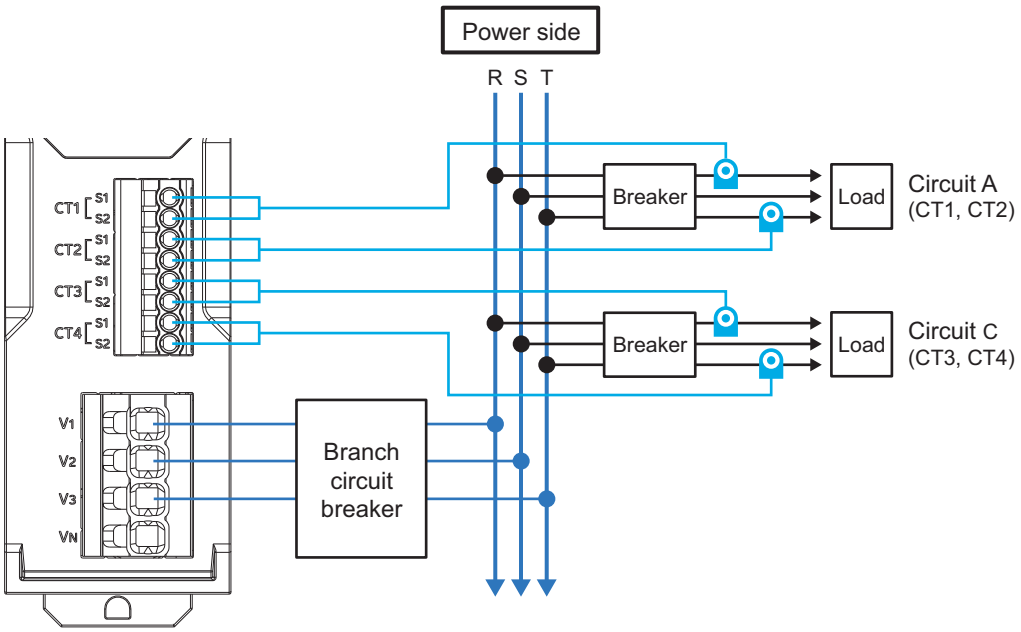
■ For 1-phase 3-wire (1P3W)

As shown below, 1-phase 3-wire can measure a maximum of 2 circuits. Use CT1,CT2 when measuring only 1 circuit. The CT must be attached to the R-phase and the T-phase.



■ For 3-phase 3-wire (3P3W)

As shown below, 3-phase 3-wire can measure a maximum of 2 circuits. Use CT1,CT2 when measuring only 1 circuit. The CT must be attached to the R-phase and the T-phase.

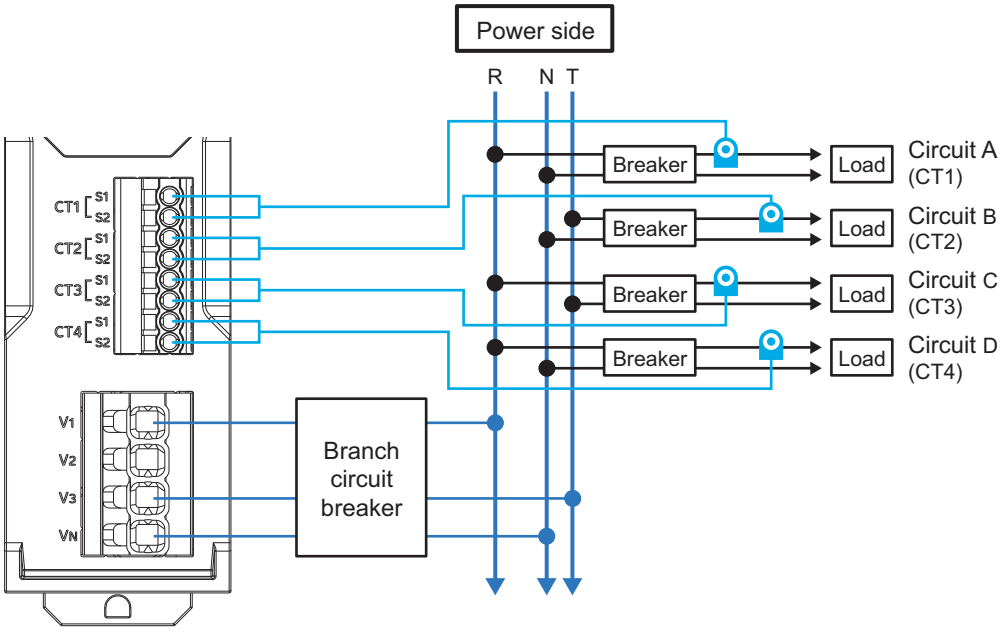


2.5 Wiring Diagram of Each Measuring Circuit (Power Supply Voltage and CT) (continued)

The following wiring is also possible as a further method of measuring.

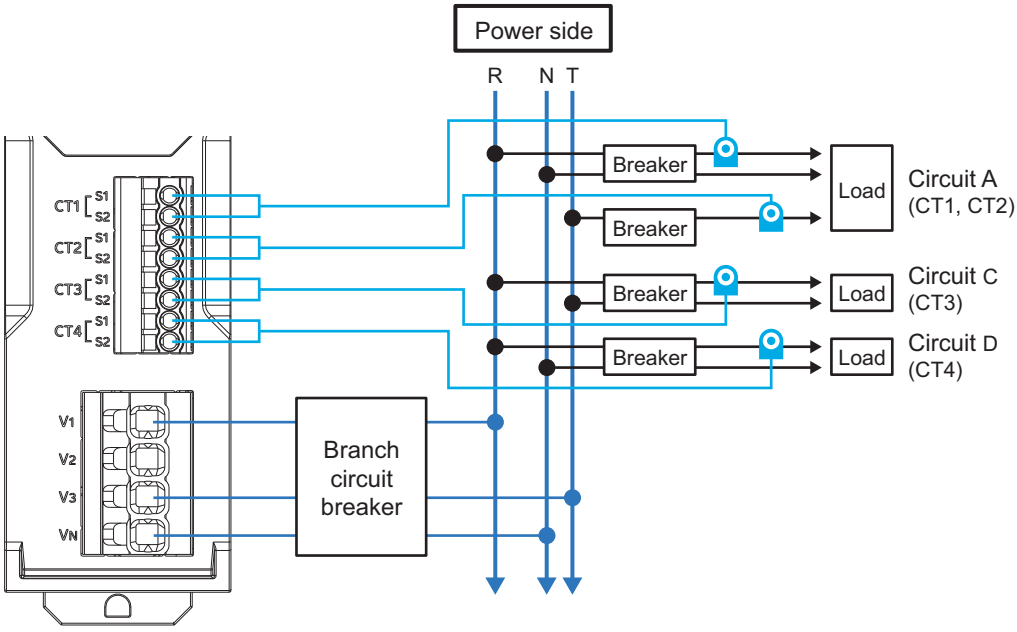
■ For 1-phase 2-wire voltage selected (1P2W2)

The 1-phase 2-wire branching off from the 1-phase 3-wire is measured. With this connection, a setting is required according to which of R-N phase, T-N phase, or R-T phase is connected to the 1-phase 2-wire circuit. (⇨ 58) The CT must be attached to the R-phase or the T-phase.



■ For 1-phase 3-wire composite (1P3W2)

The 1-phase 3-wire circuit and the 1-phase 2-wire branching off from it are measured at the same time. With this connection, a setting is required according to which of R-N phase, T-N phase, or R-T phase is connected to the 1-phase 2-wire circuit. (⇨ 58) The 1-phase 2-wire circuit CT must be attached to the R-phase or the T-phase.



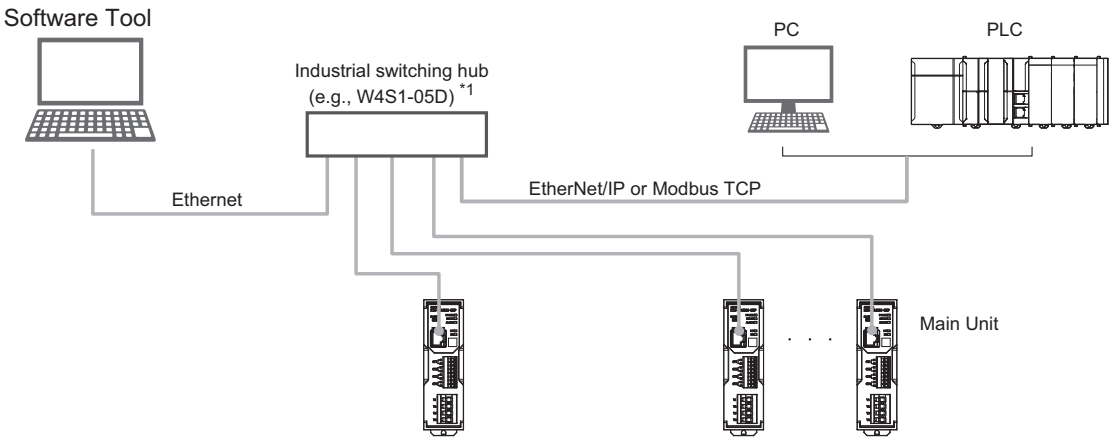
2.6 Ethernet Wiring

Connect the Main Units with the Condition Monitoring Configuration Tool, PLC, or PC via the industrial switching hub with the Ethernet cables.
Use an STP (shielded twisted-pair) cable of Ethernet category 5 or higher. You can use either a straight or cross cable.

■ Recommended Ethernet Cables/connectors

Part name	Manufacturer	Model
Ethernet cable	KURAMO ELECTRIC CO., LTD.	KETH-SB *1
	JMACS Japan Co., Ltd.	IETP-SB *1
	Proterial, Ltd.	NETSTAR-C5E SAB 0.5×4P
RJ45 connector	Panduit Corp.	MPS588-C *1

*1. We recommend use of these cables and connectors in the above combinations.



*1. In the default setting state, the Main Units are connected one-to-one by Ethernet cable without using a switching hub.

2.6 Ethernet Wiring (continued)

■ Recommended Ethernet Switches

Ethernet switches are recommended for use in environments that can be used in FA environments and devices that can use QoS (Packet Priority Control) dedicated to EtherNet/IP.
The following are recommended items.

Manufacturer	Model	Description
OMRON	W4S1-05D	Packet priority control (QoS): EtherNet/IP control data priority Failure detection: Broadcast storm, LSI failure detection 100Base-TX/10Base-T, Auto negotiation Number of ports: 5
Cisco Systems, Inc	Consult the manufacturer. http://www.cisco.com/web/JP/index.html	
Contec USA, Inc.	Consult the manufacturer. https://www.contec.com/jp/	
Phoenix Contact USA Consult	Consult the manufacturer. https://www.phoenixcontact.com/online/portal/jp	

Caution

- If EtherNet/IP tag data links (cyclic communications) are used with a repeating hub, the communications load on the network will increase. This will increase collisions and may prevent stable communications.
- Do not bend the communications cables past its natural bending radius or pull on it with excessive force.
- Do not place heavy objects on top of the communications cables or other wiring lines. Doing so may cause the wire disconnection.
- Do not exceed the communications distance that is given in the specifications and use the specified communications cable.
- Make the following settings for the switching hub used to connect the Main Unit. Set the switching hub connected to the Main Units as follows.

Switching hub \ KM-PM		AUTO-Nego
AUTO-Nego		Recommended
100 Mbps fixed	FULL	Not allowed
	HALF	Allowed

- In tag data links, when a network system is constructed together with a node for which multicast communications settings have been made, a tag data link timeout may occur. Block the multicast by using a switching hub having a multicast block function so that multicast packets do not reach the main unit. (The OMRON W4S1 series does not have the multicast block function.)

3.1 Startup Procedure Workflow

The explanation of the workflow to use Configuration Tool also contains references in the Condition Monitoring Configuration Tool Usage Guide (N240). Check those references as well.

Turn the power ON

Check that there is no mistake with the wiring before turning the power ON.
"2.Installation and Wiring (⇨ 29)"

↓

Configure the IP address settings

"3.2Installing Condition Monitoring Configuration Tool (⇨ 45)" and
"3.3IP Address Setting (⇨ 46)"

↓

Set the Main Unit

“3.4Main Unit Settings (⇨ 49)”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↓

Start normal operation

“●Logging (⇨ 50)”


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3.2 Installing Condition Monitoring Configuration Tool

Condition Monitoring Configuration Tool is a tool to configure the following condition monitoring devices by communications. The unified configuration and verification environment of the tool makes it easy to verify the deployment of condition monitoring devices.
This product (KM-PM) also allows you to perform the initial setup and logging with this tool.
Condition Monitoring Configuration Tool is referred to as “Configuration Tool” in this manual.

Name	Model	Outline
Motor Condition Monitoring Device	K6CM	Quantify the status of three-phase induction motors.
Thermal Condition Monitoring Device	K6PM-TH	Constantly and remotely monitor and diagnose the temperature status of panel devices to achieve both labor-saving and risk mitigation of abnormal stops.
Insulation Resistance Monitoring Device	K7GE-MG	Understand degradation trends through automatic measurement of insulation resistance. Prevent unexpected equipment stoppages.
Heater Condition Monitoring Device	K7TM	Transform reactive maintenance and scheduled maintenance of heater equipment into predictive maintenance through heater condition monitoring.
Advanced Motor Condition Monitoring Device	K7DD	Implement predictive maintenance with real-time condition monitoring of variable speed motors.
Power Monitor	KM-PMBN-EIP	Ethernet-compatible power monitor that can be added to already installed global production equipment to promote energy saving Use Condition Monitoring Configuration Tool Ver.1.3.0 or later.

■ Operating Environment

Supported OS	Windows 10 (Version1607 or later) and 11 (Japanese or English) 64 bit
PC specifications	CPU: 1 GHz or higher, 64 bit processor Memory: 2 GB or higher Disk reserved area capacity: 20 GB or more Monitor resolution: 1920 × 1080 Others: LAN port (for network connection)

■ How to obtain the Condition Monitoring Configuration Tool

The Tool is provided by download only.
https://www.ia.omron.com/cmc_tool

3.3 IP Address Setting

This section describes the setting of the IP address of your PC and each IP address of the Main Units.

● IP Address Setting of Your PC

Before starting this tool and monitoring and logging the Main Unit, it is necessary to set the IP address of the computer to the IP address of the same segment as the Main Unit. This section describes the procedure.

■ Windows 10 or 11

1 **Click Start and select Windows System Tools | Control Panel.**

2 **Select Network and Internet | Network and Sharing Center | Change Adapter Settings.**

3 **Right-click Ethernet and click Properties.**

4 **Select Internet Protocol Version 4 (TCP / IPv4) and click Properties.**

Check “Use next IP address” and manually set the IP address of the computer.

3.3 IP Address Setting (continued)

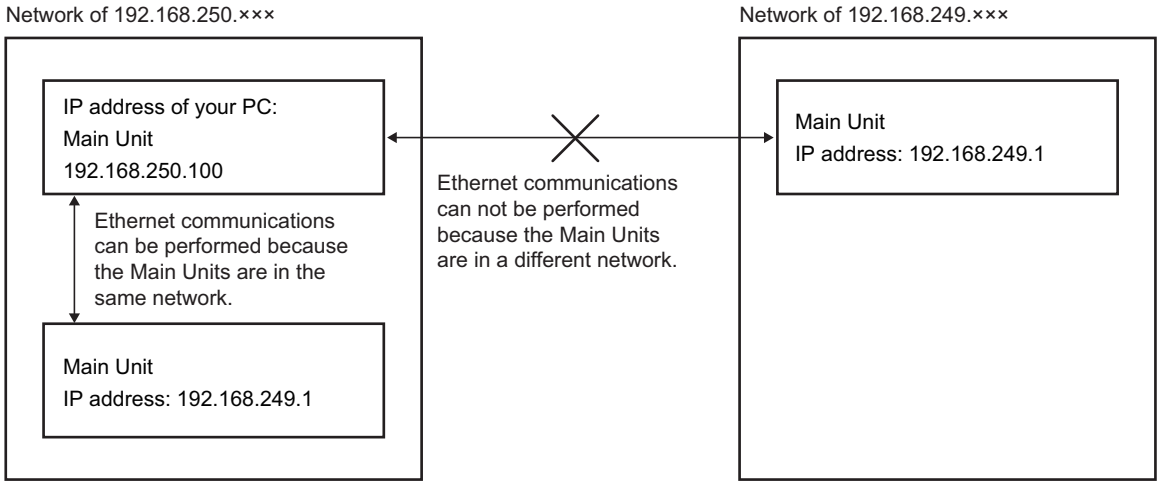
IP Address Settings Example

When using Ethernet for the first time, if you set the IP address and subnet mask of the computer and Main Unit as below, it is possible to connect the Software Tool to the Main Unit.

Device name	IP address	Sub-net mask	Default gateway
Computer	192.168.250.100	255.255.255.0	Blank
Main Unit 1st Unit	192.168.250.51	255.255.255.0	No change required (0.0.0.0)
Main Unit 2nd Unit	192.168.250.52	255.255.255.0	No change required (0.0.0.0)
Main Unit 3rd Unit	192.168.250.53	255.255.255.0	No change required (0.0.0.0)
:	:	:	:
Main Unit 30th Unit	192.168.250.80	255.255.255.0	No change required (0.0.0.0)

When the subnet mask is "255.255.255.0", the range of IP addresses that can be set for the devices 192.168.250.1 to 192.168.250.254. Assign IP address in this range to each Main Unit.
The same IP address can not be assigned to more than one device.
The default value of the IP address of type Main Unit is “192.168.250.50” common to all models.

When subnet mask set for the all devices is "255.255.255.0",
each of devices having an IP address within the range of 192.168.250.1 to 192.168.250.254 can communicate via Ethernet as the devices are to exist on the same network (segment).

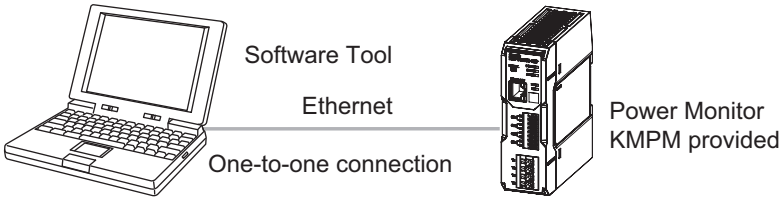


3.3 IP Address Setting (continued)

● Setting the IP Address of the Main Units with the Software Tool

Establish a One-to-one Connection between the PC and the Main Units

Connect a PC on which the Configuration Tool has been installed one to one with each Main Unit, either directly or via a hub.



After completing the above preparations, you need to perform operations using the Configuration Tool.
Refer to the Condition Monitoring Configuration Tool Usage Guide (N240) for more information.

3.4 Main Unit Settings

Use the Configuration Tool (Condition Monitoring Configuration Tool).

● Adding equipment and monitoring device

Refer to the following sections in the Condition Monitoring Configuration Tool Usage Guide (N240).
- 1-1 Startup Screen/ Creating a Project1-2 Add Monitoring Device (Home Screen (1))
- 1-2 Add Monitoring Device (Home Screen (1))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● Basic settings

The basic settings are made up of three setting types: [Communication Settings], [Initial Settings], and [Option Settings].
Refer to the following sections in the Condition Monitoring Configuration Tool Usage Guide (N240).


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[Communication Settings]
- 1-3 Communication Settings (Home Screen (2))

[Initial Settings] and [Option Settings]
- 2-6 KM-PM Basic Settings

The setting items in the initial settings and option settings are listed below.

■ Initial setting item list

Setting item	Target	Setting range	Initial value	Remarks
Phase and wire type	Common	3P4W / 1P2W / 1P3W / 3P3W / 1P2W2 / 1P3W2	3P4W	3P4W: 3-phase 4-wire, 1P2W: 1-phase 2-wire 1P3W: 1-phase 3-wire, 3P3W: 3-phase 3-wire 1P2W2: 1-phase 2-wire voltage selected 1P3W2: 1-phase 3-wire composite
Circuit ON/ OFF	Circuit B	ON / OFF	OFF	Enable or disable the measurement of circuits B to D.
	Circuit C			
	Circuit D			
CT type	Circuit A	5A / 50A / 100A / 200A / 400A / 600A	5A	Set the rated values for the primary side of the special CT.
	Circuit B			
	Circuit C			
	Circuit D			
Voltage selected	Circuit A	V_R / V_T / V_R-T	V_R	Set the voltage phase of the 1-phase 2-wire circuit when 1P2W2 is selected.
	Circuit B			
	Circuit C			Set the voltage phase of the 1-phase 2-wire circuit when 1P2W2 or 1P3W2 is selected.
	Circuit D			
VT Ratio	Common	1.00 to 999.99	1.00	Set the ratio between the primary side voltage and secondary side voltage when voltage input using VT.

3.4 Main Unit Settings (continued)

■ Option setting item list

Setting item	Category	Setting range	Initial value	Remarks
Tariff ON/OFF	Common	ON / OFF	ON	Enable or disable the tariff function.
Current Tariff	Common	T1 / T2 / T3 / T4	T1	Specify T1 to T4 for the location to save cumulative active energy data.
Conversion Factor	Common	0.000 to 99.999	10.000	Set the conversion factor by which Active energy (import) (resettable) (Wh) is multiplied for each circuit. You can convert the cumulative active energy to a monetary figure or volume of CO2. “Conversion value” in the measurement items is the measurement result.

● Logging


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Check the operation while the equipment is actually operated in logging.
Refer to the following sections in the Condition Monitoring Configuration Tool Usage Guide (N240).
•5. Logging
•5-6 KM-PM Logging

The measurement values to be monitored during initial setup and logging are listed below.

Measurement item	Description	Units	Phase and wire types and target circuits that can be monitored					
			3P4W	1P2W	1P3W	3P3W	1P2W2	1P3W2
Voltage 1 *1	Voltage effective value: Between V1 and VN 0.1 V	0.1 V	A	A,B,C,D	A,C	---	According to voltage selected	A, according to voltage selected (C or D)
Voltage 2 *1	Voltage effective value: Between V2 and VN	0.1 V	A	---	---	---	---	---
Voltage 3 *1	Voltage effective value: Between V3 and VN	0.1 V	A	---	A,C	---	---	A
Voltage V1-V2 *1	Voltage effective value: Between V1 and V2	0.1 V	A	---	---	A,C	---	---
Voltage V1-V3 *1	Voltage effective value: Between V1 and V3	0.1 V	A	---	A,C	A,C	---	A
Voltage V2-V3 *1	Voltage effective value: Between V2 and V3	0.1 V	A	---	---	A,C	---	---
Current 1 *1	Current effective value	0.001 A	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Current 2 *1	Current effective value	0.001 A	A	---	A,C	A,C	---	A
Current 3 *1	Current effective value	0.001 A	A	---	A,C	A,C	---	A
Power factor *1	Frequency obtained from voltage V1	0.1 Hz	Supported	Supported	Supported	Supported	Supported	Supported
Power factor *1	Power factor per circuit	0.01	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D

3.4 Main Unit Settings (continued)

Measurement item	Description	Units	Phase and wire types and target circuits that can be monitored					
			3P4W	1P2W	1P3W	3P3W	1P2W2	1P3W2
Active power *1	Active power value per circuit ¦ Power consumption ¦ - ¦ Regenerative energy ¦	0.1 W	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive power *1	Reactive power value per circuit	0.1 Var	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Active energy (import) (not resettable) (Wh)	Cumulative value when active power was positive number	Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Active energy (export) (not resettable) (Wh)	Cumulative absolute value when active power was negative number	Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive energy (import) (not resettable) (Varh)	Cumulative value when reactive power was leading	Varh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive energy (export) (not resettable) (Varh)	Cumulative value when reactive power was lagging	Varh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Cumulative total reactive power (not resettable) (Varh)	Absolute cumulative total value for leading and lagging of reactive power	Varh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T1 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T1	Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T2 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T2	Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T3 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T3	Wh	A	A,B,C,D	A,C	✓	A,B,C,D	A,C,D
T4 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T4	Wh	A	A,B,C,D	A,C	✓	A,B,C,D	A,C,D
Active energy (import) (not resettable) (kWh)	Cumulative value when active power was positive number (unit: kWh)	kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Active energy (export) (not resettable) (kWh)	Cumulative absolute value when active power was negative number (unit: kWh)	kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive energy (import) (not resettable) (kVarh)	Cumulative value when reactive power was leading (unit: kVar)	kVarh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive energy (export) (not resettable) (kVarh)	Cumulative value when reactive power was lagging (unit: kVar)	kVarh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Cumulative total reactive power (not resettable) (kVarh)	Absolute cumulative total value for leading and lagging of reactive power (unit: kVar)	kVarh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T1 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T1 (unit: kWh)	kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D

3.4 Main Unit Settings (continued)

Measurement item	Description	Units	Phase and wire types and target circuits that can be monitored					
			3P4W	1P2W	1P3W	3P3W	1P2W2	1P3W2
T2 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T2 (unit: kWh)	kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T3 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T3 (unit: kWh)	kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T4 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T4 (unit: kWh)	kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Active energy (import) (resettable) (Wh) *1	Cumulative value when active power was positive number	0.001 Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Active energy (export) (resettable) (Wh) *1	Cumulative absolute value when active power was negative number	0.001 Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive energy (import) (resettable) (Varh)	Cumulative value when reactive power was leading	0.001 var	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive energy (export) (resettable) (Varh)	Cumulative value when reactive power was lagging	0.001 var	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Cumulative total reactive power (resettable) (Varh)	Absolute cumulative total value for leading and lagging of reactive power	0.001 var	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T1 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T1	0.001 Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T2 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T2	0.001 Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T3 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T3	0.001 Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T4 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T4	0.001 Wh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Active energy (import) (resettable) (kWh) *1	Cumulative value when active power was positive number (unit: kWh)	0.001 kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Active energy (export) (resettable) (kWh) *1	Cumulative absolute value when active power was negative number (unit: kWh)	0.001 kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive energy (import) (resettable) (kVarh)	Cumulative value when reactive power was leading (unit: kVar)	0.001 kvar	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Reactive energy (export) (resettable) (kVarh)	Cumulative value when reactive power was lagging (unit: kVar)	0.001 kvar	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Cumulative total reactive power (resettable) (kVarh)	Absolute cumulative total value for leading and lagging of reactive power (unit: kVar)	0.001 kvar	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D

3.4 Main Unit Settings (continued)

Measurement item	Description	Units	Phase and wire types and target circuits that can be monitored					
			3P4W	1P2W	1P3W	3P3W	1P2W2	1P3W2
T1 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T1 (unit: kWh)	0.001 kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T2 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T2 (unit: kWh)	0.001 kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T3 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T3 (unit: kWh)	0.001 kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
T4 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T4 (unit: kWh	0.001 kWh	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Conversion value (1000 times) *1	Active energy (import) x value of conversion factor	10 characters max., arbitrary *2	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D
Conversion value (0.001 times) *1	Active energy (import) x value of conversion factor	10 characters max., arbitrary *2	A	A,B,C,D	A,C	A,C	A,B,C,D	A,C,D

*1. This measurement item is set as a logging target in the initial settings.
*2. Only the Configuration Tool allows arbitrary unit configuration.

4.1 Setting Items for Measuring Electricity

The setting items for measuring electricity are as follows.
These are initial setting items of the Configuration Tool.

Setting item	Description	Attribute
Phase and wire type	Select from six phase and wire types.	Common
Circuit ON/OFF	Enable or disable the measurement of circuits B to D.	Individual circuits
CT type	Set the rated values for the primary side of the special CT.	Individual circuits
Voltage selected	If the phase and wire type has been set to 1-phase 2-wire voltage selected (1P2W2) or 1-phase 3-wire composite (1P3W2), select the voltage for the 1-phase 2-wire circuit for measurement.	Individual circuits
High voltage measurement (VT Ratio)	Setting the VT ratio enables high voltage measurement. The VT ratio has the following relationship. Primary side voltage value / secondary side voltage value = VT ratio	Common

4.2 Phase and Wire Type Settings

You can select from six phase and wire types.
The setting of the phase and wire type is an overall common setting, but it is a setting item of circuit A.
The KM-PM operates with circuit A as an ON circuit that is always used regardless of the phase and wire type.
For details on the wiring of each phase and wire type, refer to "2.5Wiring Diagram of Each Measuring Circuit (Power Supply Voltage and CT) (⇨ 39)".

Phase and wire type	Abbreviations for phase and wire types	Maximum number of measuring circuits	Circuits used
3-phase 4-wire	3P4W	1 circuit	Circuit A
1-phase 2-wire	1P2W	4 circuit	Circuit A, Circuit B, Circuit C, Circuit D
1-phase 3-wire	1P3W	2 circuit	Circuit A, Circuit C
3-phase 3-wire	3P3W	2 circuit	Circuit A, Circuit C
1-phase 2-wire voltage selected	1P2W2	4 circuit	Circuit A, Circuit B, Circuit C, Circuit D
1-phase 3-wire composite	1P3W2	1-phase 3-wire: 1 circuit	Circuit A
		1-phase 2-wire: 2 circuit	Circuit C, Circuit D

- Set 1-phase 2-wire voltage selected when measuring multiple 1-phase 2-wire with different phases branching off a 1-phase 3-wire switchboard. You can measure 1-phase 2-wire by selecting the corresponding voltage.
- Set 1-phase 3-wire composite to measure both the main 1-phase 3-wire switchboard and a 1-phase 2-wire branching off. You can measure 1-phase 2-wire by selecting the corresponding voltage.
- Refer to "4.5Voltage Selected Setting (Only with 1P2W2 or 1P3W2) (⇨ 58)" for more on 1-phase 2-wire voltage selected and 1-phase 3-wire composite.

4.3 Allocating the Circuits and CTs Used for Each Phase and Wire Type

The following table shows the phase and wire types and the CT allocations for each measuring circuit.
By enabling circuits B to D (turning the circuits ON/OFF) to increase the number of measurement points, you can meter electricity using the required number of circuits. They are disabled by default.

Phase and wire type	Abbreviations for phase and wire types	Measuring circuits			
		Circuit A	Circuit B	Circuit C	Circuit D
3-phase 4-wire	3P4W	CT1, CT2, CT3			
1-phase 2-wire	1P2W	CT1	CT2	CT3	CT4
1-phase 3-wire	1P3W	CT1, CT2		CT3, CT4	
3-phase 3-wire	3P3W	CT1, CT2		CT3, CT4	
1-phase 2-wire voltage selected	1P2W2	CT1	CT2	CT3	CT4
1-phase 3-wire composite	1P3W2	CT1, CT2		CT3	CT4
		Circuit A Always ON	Circuit B ON/OFF	Circuit C ON/OFF	Circuit D ON/OFF

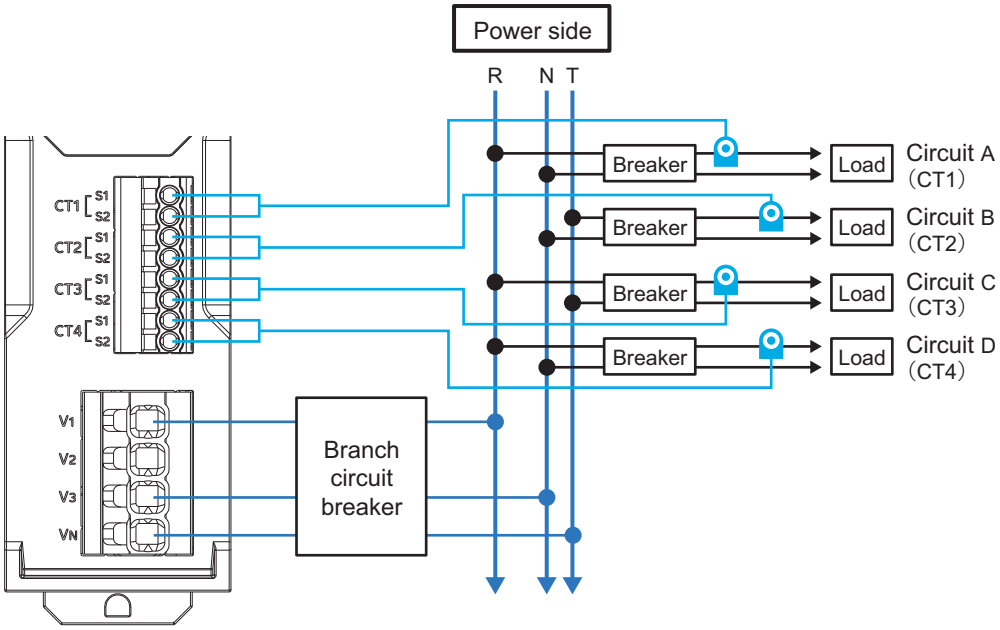
4.4 Setting the Special CTs Used

Set the rated current of the special CTs to be used for the KM-PM.

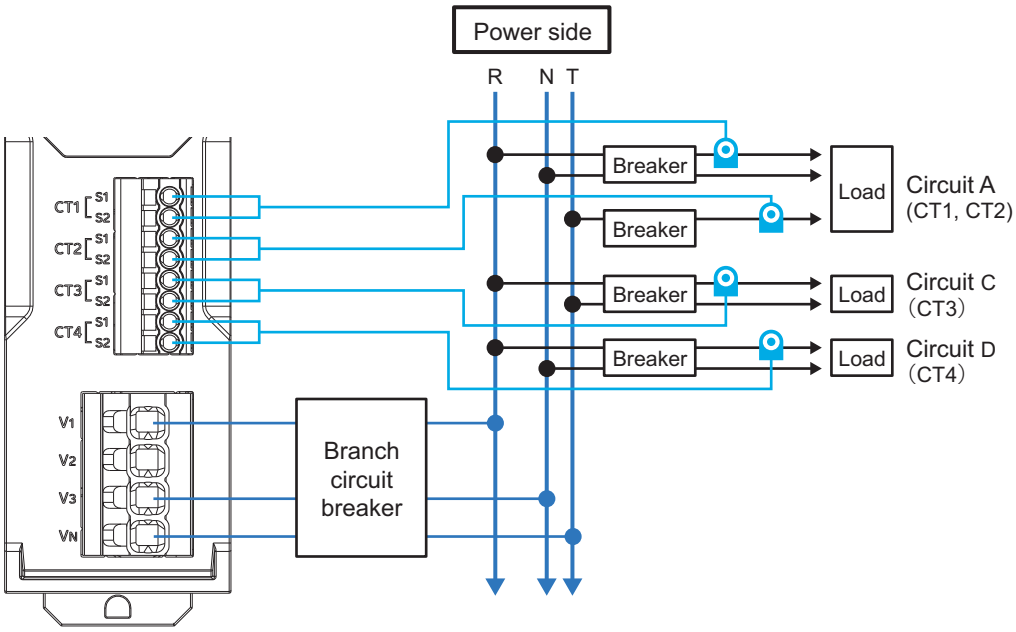
Item \ Model	KM-PCBE005	KM-PCBE050	KM-PCBE100	KM-PCBE200	KM-PCBE400	KM-PCBE600
CT type	5 A	50 A	100 A	200 A	400 A	600 A

4.5 Voltage Selected Setting (Only with 1P2W2 or 1P3W2)

If the phase and wire type has been set to 1-phase 2-wire voltage selected (1P2W2) or 1-phase 3-wire composite (1P3W2), then you need to set the voltage for the 1-phase 2-wire circuit doing the measuring. Set R-N phase, T-N phase, or R-T phase to match the voltage wire to be connected to the KM-PM.
As the following diagram shows, the 1-phase 2-wire circuit for which the voltage allocation is set is circuit A, circuit B, circuit C, and circuit D for 1P2W2 wiring and circuit C and circuit D in the 1P3W2 wiring diagram.
You need to allocate voltage for each circuit.



Wiring diagram for 1-phase 2-wire voltage selected

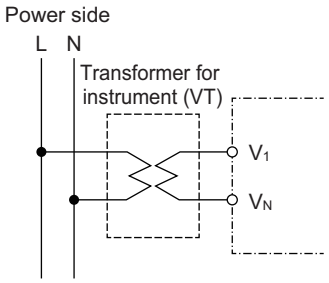


Wiring diagram for 1-phase 3-wire composite

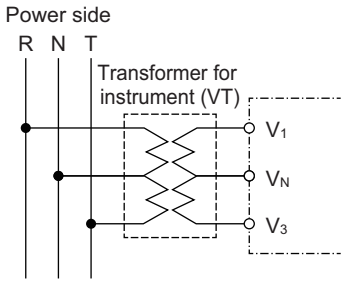
4.6 Setting VT Ratio to Use with High Voltage Measurement

When measuring 6600 V within a cubicle, for example, and the measured voltage exceeds 480 V, you need to use a transformer to convert the voltage to fit within the input voltage range of this unit. Set the multiplication factor from the primary voltage value and the secondary voltage value. For example, if the primary voltage is 880 V and the secondary voltage is 110 V, this becomes 880/110=8.00.

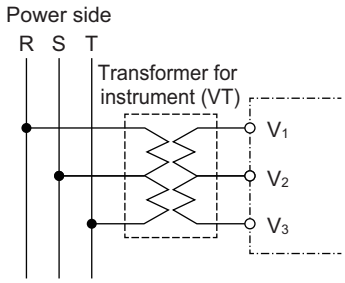
1-phase 2-wire



1-phase 3-wire



3-phase 3-wire



Caution

- When measuring voltage under 480 V, accuracy can be improved by directly entering the voltage rather than by using a transformer.

5.1 List of Other Functions

The table below lists advanced functions of the power monitor.

Function	Description	Attribute
Tariff function (energy classification)	This function allows you to classify energy. The storage locations of T1 to T4 can be selected. This is an option setting item of the Configuration Tool.	Common
Conversion	Set the conversion factor by which active energy is multiplied for each circuit. You can convert the active energy to a monetary figure or volume of CO_2. Set the conversion factor. This is an option setting item of the Configuration Tool.	Common
Initialization	Resettable active energy is initialized. Non-resettable active energy is not initialized. The set values can also be initialized.	Individual circuits
Warning for voltage miss-wiring	This function reflects an alarm in the status information when the voltage phase for the phase and wire type is open, when the wrong phase sequence (for 1-phase 3-wire, 3-phase 3-wire, and 3-phase 4-wire) is detected, when the active power is a negative value, or when the frequency goes out of the rated range. This does not need to be set by the user.	Common

5.2 Tariff Function (Energy Classification)

This feature allows you to select a location to save cumulative active energy data from T1 to T4.
Using the tariff feature allows you to, for example, change the location to save active energy so that you can later on check the sum of active energy during a particular time period (for example, night and day when the electricity charges are different).

- The current tariff default value is T1.
- The initial value of “Tariff ON/OFF” is ON. When not using the tariff function, set it to OFF.

5.3 Energy Conversion Function

This function allows you to multiply the Active energy (import) (resettable) (Wh) of each circuit by a specified conversion factor to convert the active energy to a monetary figure or volume of CO_2.
In the logging function of the Configuration Tool, the unit for displaying converted values can be arbitrarily set using up to 10 alphanumeric characters.

5.4 Initialize

There are two different types of initialization.
(1) Resetting the active energy for each circuit
(2) Resetting the active energy for all circuits

- Setting values remain unchanged if you do (1).
- The settings for each of the circuits are also initialized if you do (2). This is reflected in operation after a restart.
- Active energy includes resettable measurement values and non-resettable measurement values.
  Resettable active energy is initialized.
  Non-resettable active energy is not initialized.

5.5 Warning for Voltage Miss-wiring (Setting Not Required)

This feature outputs alarms when voltage phase for the phase and wire type is open, when the wrong phase sequence (for 1-phase 3-wire, 3-phase 3-wire, and 3-phase 4-wire) is detected, when the active power is a negative value, or when the frequency goes out of the rated range.

- If the V_1 voltage phase is under 85 V, this is “VR open phase warning”.
- If the V_2 voltage phase is under 85 V, this is “VS phase warning”.
- If the V_3 voltage phase is under 85 V, this is “VT phase warning”.
- A phase sequence error occurs when the phase sequence for 3-phase 4-wire, 1-phase 3-wire, and 3-phase 3-wire is incorrect.
- If the active power is a negative value, the error is “Active power is a negative value”.
- If the frequency goes out of the range between 45 and 65 Hz, the error is “Input frequency error warning”.

An alarm is reflected by an LED of the Main Unit or in the status information. (⇨ 137)

Information

- If the alarm LED flashes, it cancels after you make corrections to the wiring and input and then restart the Unit.

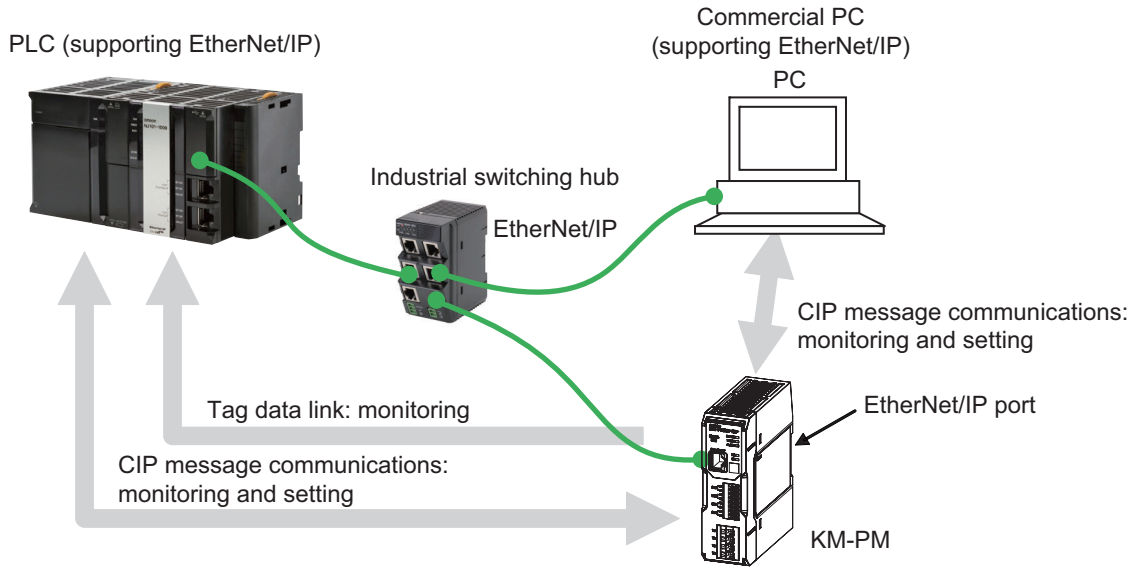
6.1 Overview

This section describes how to monitor the Main Units using the EtherNet/IP.

● What is Monitoring Using EtherNet/IP?

The Main Units can be monitored from a PLC or PC via EtherNet/IP.
The following two communications methods can be used.

Communications method	Outline	For the Main Units	
		Monitor	Settings
Tag data link	Multiple data such as measured values can be monitored without using a communications program. For data that can be monitored, refer to “6.2 Monitoring Using the Tag Data Link (⇨ 69)”.	Supported	Not supported
CIP message communications	Individual data such as measured values can be read and written by using communications program. It can also be used during tag data link.	Supported	Supported



6.1 Outline (continued)

Tag Data Link

Multiple data such as measured values of the Main Units are periodically sent to the specified area of the PLC.
The KM-PM can perform tag data link communications over four connections.

- PLC-side input tag set
  The I/O memory address or variables are assigned. The data size is 136 bytes per set, with 4 tag sets totaling 544 bytes.
- Main Unit-side output tag set
  The Main Unit assigns the instance ID of the internal data to be tagged data link. The data size is 136 bytes per set, with 4 tag sets totaling 544 bytes.

• Configuration Tool

When configuring with OMRON controllers, the following setting tools for the tag data link should be used.

Configurations	Tag data link setting tool (configuration tool) to be used
CS/CJ-series	Network Configurator (Support version is ver.3.77 or later)
NJ/NX-series	Network Configurator (Support version is ver.3.77 or later) or Sysmac Studio

CIP Message Communications

A CIP client such as the NJ/NX-series issues any CIP command in the Explicit message to the Main Units. This allows you to read and write all the data of the Main Unit.

• Communications Instructions

When sending a CIP command with Explicit messages from OMRON PLCs or Controllers, use the following communications Instruction.

Configurations	Communications Instruction
CS/CJ-series	• Explicit message send commands for CIP routing are issued by CMND instructions
NJ/NX-series	• CIPSend (Send Explicit Message Class 3) instruction or • CIPUCMMSend (Send Explicit Message UCMM) instruction

● EtherNet/IP Communications Specifications

Item		Specifications
Tag data link	Class1	Connection resource: 4
	Packet interval (RPI)	250 to 10,000 ms
	Timeout value	Multiples of RPI (4 times, 8 times, 16 times, …, and 512 times)
	Connection type	Point To Point Connection (fixed)
Explicit message	Class3	Number of clients that can communicate at one time: 2
	UCMM	Number of clients that can communicate at one time: 4
Conformance	EtherNet/IP conformance test	Conforms to CT21

6.2 Monitoring Using the Tag Data Link

This section describes the contents of monitoring with the tag data link.

● Connection Setting

Setting items		Description
Originator device (PLC)	Input tag set	Specify 136 bytes as the tag set on the PLC side.
	Connection type	Specify "Point to Point connection".
Target device (KM-PM)	Assembly instance (output)	You can specify any of the following. • Instance ID: 100, Size: 136 bytes • Instance ID: 101, Size: 136 bytes • Instance ID: 102, Size: 136 bytes • Instance ID: 103, Size: 136 bytes
Packet interval (RPI)		250 ms to 10,000 ms (default: 250 ms)
Timeout value		Multiples of RPI (4 times, 8 times, 16 times, …, and 512 times)

Match the size of the PLC-side tag set with the instance ID (identification number of the internal data of the Main Unit) to be selected. Only a single connection can be established with each instance ID. If you try to establish multiple connections, an error will occur.

Caution

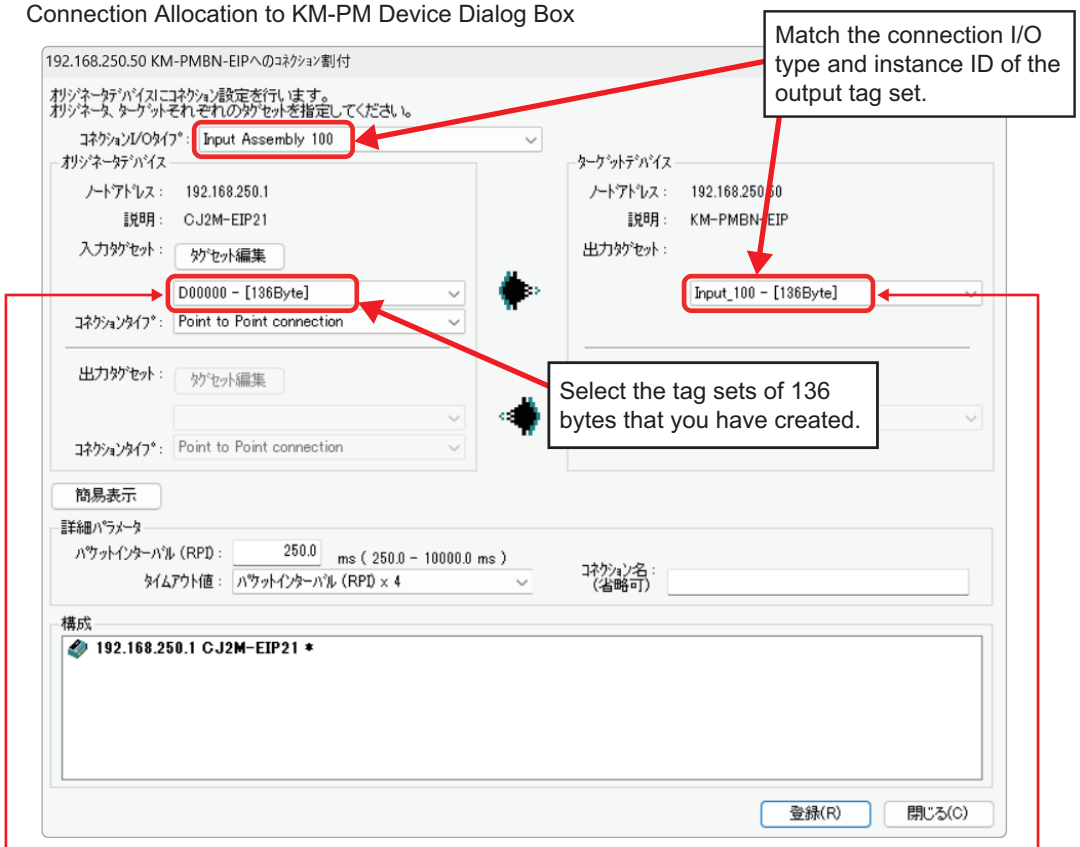
- If I/O memory addresses are specified for the communications areas, the information in the communications areas will be cleared when the operating mode of the PLC changes unless addresses in the Area, which are maintained, are specified.

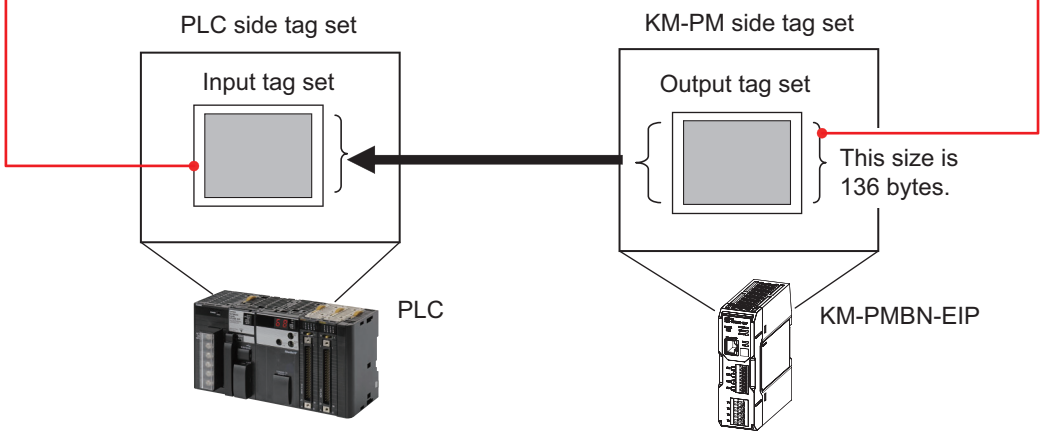
6.2 Monitoring Using the Tag Data Link (continued)

Connection to be Created

The method of setting the connection "Using the CS/CJ-series" and "Using the NJ/NX-series" is described below.
The following shows an image of the settings for the connection with the CS/CJ-series.
For details on the setting procedure, refer to “A.2 Tag Data Link Connection Setting Procedures (⇨ 146)”.
For details on the setting procedure for connecting with the NJ/NX-series, refer to “● Using the NJ/NX-series (⇨ 160)”.

Connection Allocation to KM-PM Device Dialog Box





Create a tag that matches the sizes of 136 bytes of the internal data of the KM-PM device selected on the right, and set it as the input tag set as it is.

Select the output tag set name to be displayed from below.
- Input_100-[136Bytes]
- Input_101-[136Bytes]
- Input_102-[136Bytes]
- Input_103-[136Bytes]

6.2 Monitoring Using the Tag Data Link (continued)

● Setting the Assembly Object

Parameter name	Setting value	Remarks	Description
Instance ID	64 hex (Input_100)	Output connection (Size: 136 bytes)	• Status information • Voltages 1 to 3, currents 1 to 3 : Measured values such as converted values (e.g. K_JPY)
	65 hex (Input_101)	Output connection (Size: 136 bytes)	• Status information • Voltages 1 to 3, currents 1 to 3 : Measured values such as converted values (e.g. K_JPY)
	66 hex (Input_102)	Output connection (Size: 136 bytes)	• Status information • Voltages 1 to 3, currents 1 to 3 : Measured values such as converted values (e.g. K_JPY)
	67 hex (Input_103)	Output connection (Size: 136 bytes)	• Status information • Voltages 1 to 3, currents 1 to 3 : Measured values such as converted values (e.g. K_JPY)

The correspondence between the circuit of phase and wire type and the instance ID are given in the following table.

Phase and wire type	Circuit A	Circuit B	Circuit C	Circuit D
3-phase 4-wire	100	---	---	---
1-phase 2-wire	100	101	102	103
1-phase 3-wire	100	---	101	---
3-phase 3-wire	100	---	101	---
1-phase 2-wire voltage selected	100	101	102	103
1-phase 3-wire composite	100	---	101	102

6.2 Monitoring Using the Tag Data Link (Continued)

● Assigning the Assembly Instance

For details on the data, refer to “6.3 Monitoring and Setting Using CIP Message Communications (⇨ 73)”.

Instance ID: 64 hex, 65 hex, 66 hex, 66 hex

The assignments of the 100, 101, 102, and 103 instance IDs are the same. Refer to the following table.
For details on the data, refer to “6.3 Monitoring and Setting Using CIP Message Communications (⇨ 73)”.

Address map (bytes)																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
+0	Status information				Voltage 1 (V)				Voltage 2 (V)				Voltage 3 (V)			
+16	Current 1 (A)				Current 2 (A)				Current 3 (A)				Power factor			
+32	Frequency (Hz)				Active power (W)				Reactive power (Var)				Voltage V1-V2 (V)			
+48	Voltage V1-V3 (V)				Voltage V2-V3 (V)				Active energy (import) (resettable) (Wh)				Active energy (export) (resettable) (Wh)			
+64	Reactive energy (import) (resettable) (Varh)				Reactive energy (export) (resettable) (Varh)				Cumulative total reactive power (resettable) (Varh)				T1 Active energy (import) (resettable) (Wh)			
+80	T2 Active energy (import) (resettable) (Wh)				T3 Active energy (import) (resettable) (Wh)				T4 Active energy (import) (resettable) (Wh)				Active energy (import) (resettable) (kWh)			
+96	Active energy (export) (resettable) (kWh)				Reactive energy (import) (resettable) (kVarh)				Reactive energy (export) (resettable) (kVarh)				Cumulative total reactive power (resettable) (kVarh)			
+112	T1 Active energy (import) (resettable) (kWh)				T2 Active energy (import) (resettable) (kWh)				T3 Active energy (import) (resettable) (kWh)				T4 Active energy (import) (resettable) (kWh)			
+128	Conversion value (1000 times) (e.g. JPY)				Conversion value (0.001 times) (e.g. K.JPY)											

- If the assembly instance corresponds to a disabled circuit due to the phase and wire type and the circuit enable/disable setting values, the data becomes 0. However, the following data is not applicable.
  - Status information
  - Cumulative **** related data
  - Conversion value

6.3 Monitoring and Setting Using CIP Message Communications

This section describes details of monitoring and setting using CIP message communications, and examples of communications instructions.

● Services Supported by Objects in the KM-PM Main Unit

The services supported by the objects in the KM-PM Main Unit are as follows.

Object name	Class ID	Description
Operation command object	37E hex	This is an object that can execute operation command services.
Main Unit monitor object	37F hex	This is an object that can read KM-PM status information.
Circuit-specific monitor object	380 hex	This is an object that can read the monitor parameters of each circuit.
Main Unit setting object	381 hex	This is an object that can read and write the common setting parameters of the KM-PM Main Unit.
Circuit-specific setting object	382 hex	This is an object that can read and write the settings of each circuit.
Security object	383 hex	This an object that can read and write parameters and execute operation commands related to security.
Identity object	01 hex	This object performs software reset of the Main Unit, reads the identification information of the KM-PM Main Unit, and reads the status of the built-in EtherNet/IP port.
Assembly object	04 hex	This object provides access to a device that sends and receives via a tag data link. It can be used to send data to a device that does not support tag data link communications.
TCP/IP Interface object	F5 hex	This object writes and reads the IP address, subnet mask, default gateway, and other settings.
Ethernet Link object	F6 hex	This object manages the settings of the Ethernet link (physical layer).
LLDP Management object	109 hex	This object stores the LLDP protocol management information.

● Correspondence Between the Circuit of Phase and Wire Type and the Instance ID

Depending on the object, the circuit may need to be specified.
The phase and wire types and the instance ID of each circuit are shown below.

Phase and wire type	Circuit A	Circuit B	Circuit C	Circuit D
3-phase 4-wire	0x01	---	---	---
1-phase 2-wire	0x01	0x02	0x03	0x04
1-phase 3-wire	0x01	---	0x02	---
3-phase 3-wire	0x01	---	0x02	---
1-phase 2-wire voltage selected	0x01	0x02	0x03	0x04
1-phase 3-wire composite	0x01	---	0x02	0x03

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

● Operation Command Object (Class ID: 37E hex)

This is an object that can execute operation command services on the KM-PM.

Service codes

Service code	Service name	Description	Supported service range		Remarks
			Class	Instance	
4B hex	Application_Parameter_ Initialization	Executes initialization (active energy + setting value).	Not supported	Supported	Request data... 0x0900: Execute
4C hex	Network_Parameter_ Initialization	Executes setting value initialization (network data initialization).	Not supported	Supported	Request data... 0x0001: Execute
4D hex	Setting_Mode_ Transition	Executes switching to setting mode.	Not supported	Supported	Request data... 0x0700: Execute
59 hex	Active_Energy_Reset	Executes active energy reset.	Not supported	Supported	Request data... 0x0300: Execute

Class ID

Specify 37E hex.

Instance ID

The instance ID to specify differs depending on the service code.

- If the service code is 4B hex, 4C hex, or 4D hex, specify 01 hex for the instance ID.
- If the service code is 59 hex, specify from 01 to 04 hex to match the circuit to be reset.
  Refer to "● Correspondence Between the Circuit of Phase and Wire Type and the Instance ID (⇨ 73)".

Attribute ID

■ Class attribute ID

None.

■ Instance attribute ID

None.

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

● Main Unit Monitor Object (Class ID: 37F hex)

This is an object that can read KM-PM status information.

Service code

Service code	Service name	Description	Supported service range	
			Class	Instance
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Not supported	Supported

Class ID

Specify 37F hex.

Instance ID

Specify 01 hex.

Attribute ID

■ Class attribute ID

None.

■ Instance attribute ID

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
64 to 67 hex	Reserved data	Access prohibited*1	Reading	DWORD	---
68 HEX	Status information	Refer to Status information(⇨ 76).	Reading	DWORD	Current value
69 to C7 hex	Reserved data	Access prohibited*1	Reading	DWORD	---

Caution

- Do not access reserved data. If a user program that has accessed reserved data is used, unintended data may be accessed in a future KM-PM update and result in erroneous operation.

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Status information

Bit position	Status	Bit contents	
		1	0
0	Memory Error	Occurred	Not occurred
1	VR Open phase Warning	Occurred	Not occurred
2	VS Open phase Warning	Occurred	Not occurred
3	VT Open phase Warning	Occurred	Not occurred
4	Input Frequency Warning	Occurred	Not occurred
5	Phase Sequence Warning	Occurred	Not occurred
6	Negative Active Power Warning	Occurred	Not occurred
7	Open	---	---
8	Operation status	Error	Measuring
9	Operating mode status	Setting mode	Measuring mode
10	Open	---	---
11	Open	---	---
12	Internal Communication Error	Occurred	Not occurred
13	Settings locked	Enabled	Disabled
14 to 31	Open	---	---

● Circuit-specific Monitor Object (Class ID: 380 hex)

This is an object that can read the monitor parameters of each circuit.

Service code

Service code	Service name	Description	Supported service range	
			Class	Instance
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Not supported	Supported

Class ID

Specify 380 hex.

Instance ID

Specify from 01 to 04 hex.
Refer to "● Correspondence Between the Circuit of Phase and Wire Type and the Instance ID (⇨ 73)".

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID

■ Class attribute ID

None.

■ Instance attribute ID

Attribute ID	Parameter name	Description	Monitor value	Attribute	Data	
					Data type	Value
64 hex	Voltage 1 (V)*1	Voltage effective value: Between V1 and VN	H'00000000 to H'0098967F (0.0 to 999999.9)	Reading	UDINT	Current value
65 hex	Voltage 2 (V)*1	Voltage effective value: Between V2 and VN		Reading	UDINT	Current value
66 hex	Voltage 3 (V)*1	Voltage effective value: Between V3 and VN		Reading	UDINT	Current value
67 hex	Current 1 (A)*1	Current effective value	H'00000000 to H'05F5E0FF (0.000 to 99999.999)	Reading	UDINT	Current value
68 hex	Current 2 (A)*1	Current effective value		Reading	UDINT	Current value
69 hex	Current 3 (A)*1	Current effective value		Reading	UDINT	Current value
6A hex	Power factor	Power factor per circuit	H'FFFFFF9C to H'00000064 (-1.00 to 1.00)	Reading	DINT	Current value
6B hex	Frequency (Hz)	Frequency obtained from voltage V1	H'000001C2 to H'0000028A (45.0 to 65.0)	Reading	UDINT	Current value
6C hex	Active power (W)	Active power value per circuit | Power consumption | - | Regenerative energy |	H'80000000 to H'7FFFFFFF (-21474836.8 to 214748364.7)	Reading	DINT	Current value
6D hex	Reactive power (Var)	Reactive power value per circuit		Reading	DINT	Current value
6E hex	Voltage V1-V2 (V)*1	Voltage effective value: Between V1 and V2	H'00000000 to H'0098967F (0.0 to 999999.9)	Reading	UDINT	Current value
6F hex	Voltage V1-V3 (V)*1	Voltage effective value: Between V1 and V3		Reading	UDINT	Current value
70 hex	Voltage V2-V3 (V)*1	Voltage effective value: Between V2 and V3		Reading	UDINT	Current value
71 to C7 hex	Reserved data	Access prohibited		Reading	UDINT	---

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Monitor value	Attribute	Data	
					Data type	Value
300 hex	Active energy (import) (not resettable) (Wh)	Cumulative value when active power was positive number	H'00000000 to H'3B9AC9FF (0 to 999999999)	Reading	UDINT	Current value
301 hex	Active energy (export) (not resettable) (Wh)	Cumulative absolute value when active power was negative number		Reading	UDINT	Current value
302 hex	Reactive energy (import) (not resettable) (Varh)	Cumulative value when reactive power was leading		Reading	UDINT	Current value
303 hex	Reactive energy (export) (not resettable) (Varh)	Cumulative value when reactive power was lagging		Reading	UDINT	Current value
304 hex	Cumulative total reactive power (not resettable) (Varh)	Absolute cumulative total value for leading and lagging of reactive power		Reading	UDINT	Current value
305 hex	T1 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T1		Reading	UDINT	Current value
306 hex	T2 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T2		Reading	UDINT	Current value
307 hex	T3 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T3		Reading	UDINT	Current value
308 hex	T4 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T4		Reading	UDINT	Current value
309 to 30F hex	Reserved data	Access prohibited		Reading	UDINT	---

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Monitor value	Attribute	Data	
					Data type	Value
310 hex	Active energy (import) (not resettable) (kWh)	Cumulative value when active power was positive number (unit: kWh)	H'00000000 to H'3B9AC9FF (0 to 999999999)	Reading	UDINT	Current value
311 hex	Active energy (export) (not resettable) (kWh)	Cumulative absolute value when active power was negative number (unit: kWh)		Reading	UDINT	Current value
312 hex	Reactive energy (import) (not resettable) (kVarh)	Cumulative value when reactive power was leading (unit: kVar)		Reading	UDINT	Current value
313 hex	Reactive energy (export) (not resettable) (kVarh)	Cumulative value when reactive power was lagging (unit: kVar)		Reading	UDINT	Current value
314 hex	Cumulative total reactive power (not resettable) (kVarh)	Absolute cumulative total value for leading and lagging of reactive power (unit: kVar)		Reading	UDINT	Current value
315 hex	T1 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T1 (unit: kWh)		Reading	UDINT	Current value
316 hex	T2 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T2 (unit: kWh)		Reading	UDINT	Current value
317 hex	T3 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T3 (unit: kWh)		Reading	UDINT	Current value
318 hex	T4 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T4 (unit: kWh)		Reading	UDINT	Current value
319 to 31F hex	Reserved data	Access prohibited		Reading	UDINT	---
320 hex	Active energy (import) (resettable) (Wh)	Cumulative value when active power was positive number	H'00000000 to H'3B9AC9FF (0 to 999999999)	Reading	UDINT	Current value
321 hex	Active energy (export) (resettable) (Wh)	Cumulative absolute value when active power was negative number		Reading	UDINT	Current value

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Monitor value	Attribute	Data	
					Data type	Value
322 hex	Reactive energy (import) (resettable) (Varh)	Cumulative value when reactive power was leading	H'00000000 to H'3B9AC9FF (0 to 999999999)	Reading	UDINT	Current value
323 hex	Reactive energy (export) (resettable) (Varh)	Cumulative value when reactive power was lagging		Reading	UDINT	Current value
324 hex	Cumulative total reactive power (resettable) (Varh)	Absolute cumulative total value for leading and lagging of reactive power		Reading	UDINT	Current value
325 hex	T1 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T1		Reading	UDINT	Current value
326 hex	T2 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T2		Reading	UDINT	Current value
327 hex	T3 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T3		Reading	UDINT	Current value
328 hex	T4 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T4		Reading	UDINT	Current value
329 to 32F hex	Reserved data	Access prohibited		Reading	UDINT	---

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Monitor value	Attribute	Data	
					Data type	Value
330 HEX	Active energy (import) (resettable) (kWh)	Cumulative value when active power was positive number (unit: kWh)	H'00000000 to H'3B9AC9FF (0 to 999999999)	Reading	UDINT	Current value
331 HEX	Active energy (export) (resettable) (kWh)	Cumulative absolute value when active power was negative number (unit: kWh)		Reading	UDINT	Current value
332 HEX	Reactive energy (import) (resettable) (kVarh)	Cumulative value when reactive power was leading (unit: kVar)		Reading	UDINT	Current value
333 HEX	Reactive energy (export) (resettable) (kVarh)	Cumulative value when reactive power was lagging (unit: kVar)		Reading	UDINT	Current value
334 HEX	Cumulative total reactive power (resettable) (kVarh)	Absolute cumulative total value for leading and lagging of reactive power (unit: kVar)		Reading	UDINT	Current value
335 HEX	T1 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T1 (unit: kWh)		Reading	UDINT	Current value
336 HEX	T2 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T2 (unit: kWh)		Reading	UDINT	Current value
337 HEX	T3 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T3 (unit: kWh)		Reading	UDINT	Current value
338 HEX	T4 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T4 (unit: kWh)		Reading	UDINT	Current value
339 to 33F HEX	Reserved data	Access prohibited		Reading	UDINT	---
380 HEX	Conversion value (1000 times)	Active energy (import) (resettable) (Wh) x value of conversion factor	H'00000000 to H'3B9AC9FF (0 to 999999999)	Reading	UDINT	Current value
381 HEX	Conversion value (0.001 times)	Active energy (import) (resettable) (Wh) x value of conversion factor		Reading	UDINT	Current value
382 to 3FF HEX	Reserved data	Access prohibited		Reading	UDINT	---

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

*1. The correspondence between the phase and wire type and the data are given in the following table.

Parameter name	1P2W	1P3W	3P3W	3P4W
Voltage 1 (V)	Vrn	Vrn	---	Vrn
Voltage 2 (V)	---	---	---	Vsn
Voltage 3 (V)	---	Vtn	---	Vtn
Current 1 (A)	IR	IR	IR	IR
Current 2 (A)	---	IN *	IS *	IS
Current 3 (A)	---	IT	IT	IT
Voltage V1-V2 (V)	---	---	Vrs	Vrs
Voltage V1-V3 (V)	---	Vrt	Vrt	Vrt
Voltage V2-V3 (V)	---	---	Vst	Vst

* Value calculated from current 1 and current 3.

● Main Unit Setting Object (Class ID: 381 hex)

This is an object that can read and write the common setting parameters of the KM-PM Main Unit.

Service codes

Service Code	Service name	Description	Supported service range	
			Class	Instance
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Not supported	Supported
10 hex	Set_Attribute_Single	Writes the value of the specified attribute.	Not supported	Supported

Class ID

Specify 381 hex.

Instance ID

Specify 01 hex.

Attribute ID

■ Class attribute ID

None.

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

■ Instance attribute ID

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Default value
64 to 6A hex	Reserved data	Access prohibited	Writing	UDINT	---
6B hex	VT Ratio	Set the ratio between the primary side voltage and secondary side voltage when voltage input using VT. 00000064 hex to 0001869F hex This is reflected after a restart.	Writing	UDINT	00000064 hex (1.00)
6C hex	Conversion Factor	Set the conversion factor by which active energy is multiplied for each circuit. 00000000 hex to 0001869F hex This is reflected after a restart.	Writing	UDINT	00002710 hex (10.000)
6D to 70 hex	Reserved data	Access prohibited	Writing	UDINT	---
71 hex	Tariff ON/ OFF	0: Disabled 1: Enabled This is reflected after a restart.	Writing	UDINT	00000001 hex (Enabled)
72 hex	Current Tariff	Storage location T1: 00000000 hex T2: 00000001 hex T3: 00000002 hex T4: 00000003 hex This is reflected after a restart.	Writing	UDINT	T1:00000000 hex
73 to 7C hex	Reserved data	Access prohibited	Writing	UDINT	---
7D hex	Circuit B ON/ OFF	0: Disabled 1: Enabled This is reflected after a restart.	Writing	UDINT	00000000 hex (Disabled)
7E hex	Circuit C ON/ OFF	0: Disabled 1: Enabled This is reflected after a restart.	Writing	UDINT	00000000 hex (Disabled)
7F hex	Circuit D ON/ OFF	0: Disabled 1: Enabled This is reflected after a restart.	Writing	UDINT	00000000 hex (Disabled)
80 to C7 hex	Reserved data	Access prohibited	Writing	UDINT	---

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

● Circuit-specific Setting Object (Class ID: 382 hex)

This is an object that can read and write the settings of each circuit.

Service codes

Service Code	Service name	Description	Supported service range	
			Class	Instance
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Not supported	Supported
10 hex	Set_Attribute_Single	Writes the value of the specified attribute.	Not supported	Supported

Class ID

Specify 382 hex.

Instance ID

Specify from 01 to 04 hex.
Refer to "● Correspondence Between the Circuit of Phase and Wire Type and the Instance ID (⇨ 73)".

Attribute ID

■ Class attribute ID

None.

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

■ Instance attribute ID

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Default value
64 hex	Phase and wire type	1P2W: 00000000 hex 1P3W: 00000001 hex 3P3W: 00000002 hex 1P2W2: 00000003 hex 1P3W2: 00000004 hex 3P4W: 00000005 hex This is reflected after a restart.	Writing	UDINT	3P4W: 00000005 hex
65 to 6C hex	Reserved data	Access prohibited	Writing	UDINT	---
6D hex	Voltage selected	V_R: 00000000 hex V_T: 00000001 hex V_R-T: 00000002 hex This is reflected after a restart.	Writing	UDINT	V_R: 00000000 hex
6E hex	Reserved data	Access prohibited	Writing	UDINT	---
6F hex	Reserved data	Access prohibited	Writing	UDINT	---
70 hex	CT type	5 A: 00000000 hex 50 A: 00000001 hex 100 A: 00000002 hex 200 A: 00000003 hex 400 A: 00000004 hex 600 A: 00000005 hex This is reflected after a restart.	Writing	UDINT	5A: 00000000 hex
71 to C7 hex	Reserved	Access prohibited	Writing	UDINT	---

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

● Security Object (Class ID: 383 hex)

This an object that can read and write parameters and execute operation commands related to security.

Service codes

Service Code	Service name	Description	Supported service range		Remarks
			Class	Instance	
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Not supported	Supported	
10 hex	Set_Attribute_Single	Writes the value of the specified attribute.	Not supported	Supported	
4B hex	Change_ Password	Executes a password change. This is reflected immediately.	Not supported	Supported	• Request data 32-byte password (Data type: ARRAY OF 32 USINT) • Initial value of password Following value obtained by hashing Omron123 with SHA256 0x4fd4bfdf7b9933fca0912607d826c4a833c169f946a5c7d5572fd63dcb873ef9
4C hex	Transfer_ Setting_ Unlock	Executes switching to settings unlocked.	Not supported	Supported	• Request data 32-byte hash value Value obtained by hashing a password and random number with SHA256 (Data type: ARRAY OF 32 USINT)
4D hex	Transfer_ Setting_Lock	Switches to settings locked.	Not supported	Supported	• Request data 0x0001: Execute (Data type: UINT)

Class ID

Specify 383 hex.

Instance ID

Specify 01 hex.

Attribute ID

■ Class attribute ID

None.

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

■ Instance attribute ID

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
64 hex	Security function Enabled / Disabled	Enables or disables the security functions. 0: Disabled 1: Enabled This is reflected after a restart.	Writing	UINT	0: Disabled
65 hex	Communications protocols Enabled / Disabled	Enables or disables communications protocols. 0: All enabled 1: Modbus/TCP enabled (EtherNet/IP is disabled) 2: EtherNet/IP enabled (Modbus/TCP is disabled) This is reflected after a restart.	Writing	UINT	0: All enabled
300 hex	Random number (nonce)	A random value for digest authentication can be read. Example: When the random number is “01234567” in ASCII, the random number is stored in the following arrangement. Array [0]: 30 Array [1]: 31 : Array [6]: 36 Array [7]: 37	Reading	ARRAY OF 8 USINT	Current value
301 hex	Power-ON duration	Power-ON duration of the Main Unit	Reading	UDINT	Current value

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
302 hex	1st security log (oldest)	The access log for when a write command is received can be read.	Reading	STRUCT of	---
	Power-ON time	Time accessed [seconds]		UDINT	Value logged
	IP address of sender	IP address of access origin		UDINT	Initial value is 0.
	Communications protocols	Communications protocol <B12> Modbus/TCP: 0x01 EtherNet/IP: 0x02		USINT	
	Write result	Written result 00 when normal Protocol error code when abnormal		USINT	
	Write information ID	Write information ID ■EtherNet/IP Class ID (2 bytes) + Instance ID (2 bytes) + Attribute ID (2 bytes) (operation command is service code) + Data to write (first 2 bytes only) ■Modbus/TCP 0x00000000 + Variable address (2 bytes) + Data to write (2 bytes)		ARRAY OF 8 BYTE	
: : :	Nth security log	Same as above	Same as above	Same as above	Same as above
31F hex	30th security log (most recent)	Same as above	Same as above	Same as above	Same as above

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

● Identity Object (Class ID: 01 hex)

This object reads the Main Unit software reset and the Main Unit identification information, and also reads the state of the built-in EtherNet/IP port.

Service codes

Service Code	Service name	Description	Supported service range	
			Class	Instance
01 hex	Get_Attributes_All	Reads the values of all attributes.	Supported	Supported
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Supported	Supported
05 hex	Reset	Performs software reset of the Main Unit. Execute this service code to perform software reset of the Main Unit when you change the parameter settings and want to apply the changed parameters.	Not supported	Supported

Class ID

Specify 01 hex.

Instance ID

Specify the following depending on the target.

- For class: 00 hex
- For instance: 01 hex

Attribute ID

The attribute ID specifies the information to read.

■ Class attribute ID

The class attribute ID specifies the attribute of the object class.

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
01 hex	Revision	Revision of the object	Read	UINT	0001 hex

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

■ Instance attribute ID

The instance attribute ID specifies the per-instance attribute.

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
01 hex	Vendor ID	Vendor ID	Read	UINT	002F hex
02 hex	Device Type	Device type	Read	UINT	0307 hex
03 hex	Product Code	Product code	Read	UINT	*1
04 hex	Revision	Device revision	Read	Struct of	---
	Major Revision	Major revision	Read	USINT	Product specific
	Minor Revision	Minor revision	Read	USINT	Product specific
05 hex	Status	Status of the EtherNet/IP Port	Read	WORD	*2
06 hex	Serial Number	Serial number	Read	UDINT	Product specific
07 hex	Product Name	Product name	Read	SHORT_STRING	Product specific

*1. Product code

Model	Product code	Product name (number of characters (1 byte) + character string)) hex
KM-PMBN-EIP	202 hex (514)	0B 4B 4D 2D 50 4D 42 4E 2D 45 49 50

*2. Status of the built-in Ether- Net/IP port

Bit	Name	Description
0	Owned	Indicates when the built-in EtherNet/IP port has an open connection as the target of a tag data link.
1	Reserved	Always FALSE.
2	Configured	Tag data link settings exist.
3	Reserved	Always FALSE.
4 to 7	Extended Device Status Indicates the status of the built-in EtherNet/IP port.	Indicates the status of the built-in EtherNet/IP port. 0: Not used 1: Not used 2: One or more I/O connection failures 3: I/O connection is not established 4: Not used 5: Serious defect occurred (MS Criticality) 6: One or more I/O connections are established and one or more are in the RUN state 7: One or more I/O connections are established and all are idle 8 to 15: Not used
8	Minor Recoverable Fault Indicates the status of the built-in EtherNet/IP port.	Always FALSE.
9	Minor Unrecoverable Fault Indicates the status of the built-in EtherNet/IP port.	Always FALSE.

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Bit	Name	Description
10	Major Recoverable Fault Indicates the status of the built-in EtherNet/IP port.	When the MS indicator matches conditions of the lighting red: TRUE
11	Major Unrecoverable Fault Indicates the status of the built-in EtherNet/IP port.	When the MS indicator matches conditions of the lighting red: TRUE
12 to 15	Reserved	Always FALSE.

● Assembly Object (Class ID: 04 hex)

This object enables access to data that is sent and received via a tag data link. It can be used to read data of a tag data link using a CIP message even for a device that does not support tag data link communications.

Service codes

Service Code	Service name	Description	Supported service range	
			Class	Instance
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Not supported	Supported

Class ID

Specify 04 hex.

Instance ID

Specify the following depending on the target.

- For class: 00 hex
- For instance: 01 to 04 hex

Attribute ID

The attribute ID specifies the information to read.

■ Class attribute ID

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
01 hex	Revision	Revision of the object	Read	UINT	3

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

■ Instance attribute ID

Specify the attributes for each instance.

Input (produced) instance ID: 64 hex (100), 65 hex (101), 66 hex (102), 67 hex (104)

ID	Name	Data type	Description	Attribute	Value
03 hex	Data	ARRAY OF BYTE	Data in Assigning the “Assigning the Assembly Instance(⇨ 72)”	Reading	---
04 hex	Size	UINT	Number of bytes	Reading	136

Output (consumed) instance ID: 6E hex (110), 6F hex (111), 70 hex (112), 71 hex (113)

ID	Name	Data type	Description	Attribute	Value
3	Data	ARRAY OF BYTE	Data in Assigning the “Assigning the Assembly Instance(⇨ 72)”	Reflected immediately upon writing	---
4	Size	UINT	Number of bytes	Reading	136

● TCP/IP Interface Object (Class ID: F5 hex)

This object is used to read and write settings such as the IP address, subnet mask, and default gateway.

Service codes

Service Code	Service name	Description	Supported service range	
			Class	Instance
01 hex	Get_Attributes_All	Reads the values of all attributes.	Not supported	Supported
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Supported	Supported
10 hex	Set_Attribute_Single	Writes the value to the specified attribute.	Not supported	Supported

Class ID

Specify F5 hex.

Instance ID

Specify 01 hex.

Attribute ID

The attribute ID specifies the information to read.

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

■ Class attribute ID

The class attribute ID specifies the attribute of the object class.

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
01 hex	Revision	Revision of the object	Read	UINT	0004 hex

■ Instance attribute ID

Specify the attributes for each instance.

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
01 hex	Status	Indicates the IP address setting status of the interface. For details, refer to “Details of attribute ID: 01 hex (status)(⇨ 95)”	Read	DWORD	1
02 hex	Configuration Capability	Indicates the controller configuration and settings that can be configured for the interface. Bit 0: BOOTP Client: TRUE (fixed) Bit 1: DNS Client: FALSE (fixed) Bit 2: DHCP Client: TRUE (fixed) Bit 3: DHCP-DNS Update: FALSE (fixed) Bit 4: Configuration Settable: TRUE (fixed) (Can the Interface Configuration attribute be set?) Bit 5: Hardware Configurable: FALSE (fixed) (Can the IP address be set by the hardware?) Bit 6: Interface Configuration Change Requires Reset: TRUE (fixed) (Is it necessary to restart the device after changing the Interface Configuration attribute?) Bit 7: ACD Capable: TRUE (fixed) (Is an ACD function incorporated?) Bits 8 to 31: Reserved area FALSE	Read	DWORD	000000D5 hex
03 hex	Configuration Capability	Sets the method used to set the IP address when the interface starts up. 0: Set static IP address. 1: Set by BOOTP. 2: Set by DHCP.	Writing	DWORD	00000000 hex
04 hex	Physical Link Object	Path to the link object in the physical layer	Read	Struct of	---
	Path size	Path size (WORD size)		UINT	0002 hex
	Path	Path to the link object in the physical layer (Path to the Ethernet Link object (Class ID: F6 hex))		Padded EPATH	20F6 2401 hex

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
05 hex	Interface Cofiguration	Interface settings	Writing	Struct of	---
	IP Address	IP address		UDINT	Set value (Factory default: 192.168.250.50)
	Network Mask	Subnet mask		UDINT	255.255. 255.0
	Gateway Address	Default gateway		UDINT	0.0.0.0
	Nama Server	Primary name server		UDINT	0.0.0.0
	Nama Server2	Secondary name server		UDINT	0.0.0.0
	Domain Name	Domain name		STRING	0000 hex
06 hex	Host Name	Host Name	Reflected immediately upon writing	STRING	0000 hex
0D hex	Encapsulation Inactivity Timeout	Encapsulation session timeout time (Timeout time of TCP connection or DLTS connection)	Writing	UINT	0078 hex (120 seconds) Setting range: 1 to 3,600 seconds (0: Prohibited)
10 hex	SelectAcd	Indicates whether the ACD function is enabled or disabled. 0: ACD function is disabled. 1: ACD function is enabled.	Writing	BOOL	1
11 hex	LastConflict Detected	Stores the IP address duplication detection information (ACD diagnosis information). The information can be cleared by setting this attribute to all 0.	Reflected immediately upon writing	STRUCT of	---
	Acd Activity	Indicates the status of ACD Activity when duplication is detected. 0: NoConflictDetected 1: ProbeIpv4Address 2: OngoingDetection 3: SemiActiveProbe		USINT	Current value
	Remote MAC	MAC address of remote node when duplication is detected. This stores the source MAC address of Ethernet packets.		ARRAY of 6 USINT	Current value
	Arp Pdu	ARP PDU data when duplication is detected (28 bytes). This stores the data of the received ARP frame starting from Hardware Address Type.		ARRAY of 28 USINT	Current value

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
13 hex	Encapsulation Inactivity Timeout	Encapsulation session timeout time (Timeout time of TCP connection or DLTS connection) 1 to 3,600 seconds (0: Prohibited)	Reflected immediately upon writing	UINT	120
100 hex	Expansion Configuration Control	Sets the method used to set the IP address when the interface starts up. 0x00: Use a set static IP address. 0x01: Obtain the IP address using BOOTP. 0x02: Obtain the IP address using DHCP. 0x81: Obtain the IP address using BOOTP (1 shot), and change the setting to static IP address (= 0x00) once obtaining the IP address. 0x82: Obtain the IP address using DHCP (1 shot), and change the setting to static IP address (= 0x00) once obtaining the IP address.	Writing	DWORD	00000000 hex

Details of attribute ID: 01 hex (status)

Bit position	Status	Bit status
0 to 3	Interface Configuration Status	Indicates the IP address setting status of the interface. 0 = IP address is unset (including during BOOTP startup). 1 = IP address is set.
4	Mcast Pending	This is always 0 with KM-PM.
5	Interface Configuration Pending	This is the state where a setting has been change in one of the parameters of attributes 03 hex/05 hex/100 hex and waiting to be reset. 0: No change 1: There is a setting change to attributes 03/05/100 (enabled after reset).
6	AcdStatus	Indicates whether or not an IP address duplication has been detected by the ACD function since startup. 0: No change 1: IP address duplication was detected with the ACD function.
7	AcdFault	Indicates the IP address duplication detection status when the ACD function is supported. 0: No change 1: Detecting IP address duplication with the ACD function.
8	IANA Port Admin Change Pending	This is always 0 with KM-PM.
9	IANA Protocol Admin Change Pending	This is always 0 with KM-PM.
10 to 31	Reserved	Always 0 (reserved area)

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

● Ethernet Link Object (Class ID: F6 hex)

This object manages the settings of the Ethernet link (physical layer).

Service codes

Service Code	Service name	Description	Supported service range	
			Class	Instance
01 hex	Get_Attributes_All	Reads the values of all attributes.	Not supported	Supported*1
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Supported	Supported
4C hex	Get_and_Clear	This service performs the operation of Get_Attribute_Single and clearing of data after reading. It is applicable to the following attributes. • Attribute4 (Interface Counters) • Attribute5 (Media Counters) • Attribute15 (Link Down Counter)	Not supported	Supported

*1. The following data is obtained by Get_Attributes_All.

Attribute ID	Parameter name	Data	
		Data type	Value
01 hex	Interface Speed	UDINT	Current value
02 hex	Interface Flags	DWORD	Current value
03 hex	Physical Address	ARRAY of 6 USINTs	Current value
04 hex	Interface Counters	STRUCT of 11 UDINTS	Current value
05 hex	Media Counters	STRUCT of 12 UDINTS	Current value
06 hex	Interface Control	STRUCT of	---
	Control Bits	WORD	0
	Forced Interface Speed	UINT	0
07 hex	Interface Type	USINT	0
08 hex	Interface State	USINT	0
09 hex	Admin State	USINT	0
0A hex	Interface Lavel	USINT	0
0B hex	Interface Capability	STRUCT of	---
	Capabilty Bits	DWORD	Current value
	Speed/Duplex Options	STRUCT of	Current value
	Speed/Duplex Array Count	USINT	Current value
0C hex	HC Interface Counters	STRUCT of 8 ULINTS	0
0D hex	HC Media Counters	STRUCT of 6 ULINTS	0
0E hex	Ethernet Errors	UDINT	Current value
0F hex	Link Down Counter	UDINT	Current value

Class ID

Specify F6 hex.

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Instance ID

Specify the following depending on the target.

- For class: 00 hex
- For instance: 01 hex

Attribute ID

■ Class attribute ID

The class attribute ID specifies the attribute of the object class.

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
01 hex	Revision	Revision of the object	Reading	UINT	4

■ Instance attribute ID

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
01 hex	Interface Speed	Indicates the communications speed of the interface. 0x0000000A: 10 Mbps 0x00000064: 100 Mbps	Reading	UDINT	Current value
02 hex	Interface Flags	Indicates the status of the interface.	Reading	DWORD	*1
03 hex	Physical Address	Indicates the MAC address of the interface.	Reading	ARRAY of 6 USINT	Product-specific
04 hex	Interface Counters	Number of packets sent and received on the interface	Reading	STRUCT of	Current value
	In Octets	Number of octets received by the interface		UDINT	*1
	In Ucast Packets	Number of unicast packets received by the interface		UDINT	Product-specific
	In NUcast Packets	Number of non-unicast packets received by the interface		UDINT	Current value
	In Discards	Number of packets discarded after they were received by the interface		UDINT	Current value
	In Errors	Number of packets including errors received by the interface (excluding those of In Discards)		UDINT	Current value
	In Unknown Protos	Number of packets of an unknown protocol received by the interface		UDINT	Current value
	Out Octets	Number of octets sent by the interface		UDINT	Current value
	Out Ucast Packets	Number of unicast packets sent by the interface		UDINT	Current value
	Out NUcast Packets	Number of non-unicast packets sent by the interface		UDINT	Current value
	Out Discards	Number of packets discarded when sent by the interface		UDINT	Current value
	Out Errors	Number of packets including errors sent by the interface		UDINT	Current value

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
05 hex	Media Counters	Media counter of communications port	Reading	STRUCT of	---
	Alignment Errors	Number of received frames whose length is not an integral multiple of the number of octets		UDINT	Current value
	FCS Errors	Number of received frames whose length is not an integral multiple of the number of octets		UDINT	Current value
	Single Collisions	Number of times successfully sent a frame with only one collision detected		UDINT	Current value
	Multiple Collisions	Number of times successfully sent a frame with two or more collisions detected		UDINT	Current value
	SQE Test Errors	Number of times an SQE test error message was generated		UDINT	Current value
	Deferred Transmissions	Number of frames whose first transmission was deferred because media was busy		UDINT	Current value
	Late Collisions	Number of time a collision was detected later than 512-bit time during packet transmission		UDINT	Current value
	Excessive Collisions	Number of frames whose transmission failed due to excessive collisions		UDINT	Current value
	MAC Transmit Errors	Number of frames whose transmission failed due to internal MAC sublayer transmission error		UDINT	Current value
	Carrier Sense Errors	Number of times the carrier sense condition was lost or not asserted when transmitting frames		UDINT	Current value
	Frame Too Long	Number of received frames that exceeded the maximum allowable frame size		UDINT	Current value
	MAC Receive Errors	Number of frames whose receiving failed due to internal MAC sublayer receiving error		UDINT	Current value
0B hex	Interface Capability	Interface function	Reading	STRUCT of	---
	Capability Bits	Interface function other than speed/duplex Bit 0: Manual setting requires reset 0 because unsupported Bit 1: Auto-negotiate 1 because supported Bit 2: Auto-MDIX 1 because supported Bit 3: Manual speed/duplex 0 because unsupported Bits 4 to 31: Reserved		DWORD	0x0006
	Speed/Duplex Options	Indicates the pair of speed/duplex supported by the interface control attributes.		STRUCT of	---
	Speed/Duplex Array Count	Number of elements of interface information		USINT	0

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
0E hex	Ethernet Errors	Indicates the total value for members of the following attributes. • "In Discards", "In Errors", "Out Discards", "Out Errors" of Interface Counters (Attr.4) (4 members) • All members of Media Counters (Attr.5) (12 members)	Reading	UDINT	Current value
0F hex	Link Down Counter	Number of times link was down. Increments upon occurrence of event where the link state of the corresponding port changed from LinkUp to LinkDown.	Reading	UDINT	Current value

*1. The details of the statuses of the interface are as follows.

Interface Flags

Bit	Name	Description
0	LinskStatus	0: Link is down. 1: Link is up.
1	Half/FullDuplex	0: Half duplex 1: Full duplex
2 to 4	Negotiation Status	Indicates the auto-negotiation status. 0: Auto-negotiation operation is in progress. 1: Auto-negotiation failed. Operating with default values (10 Mbps, half duplex). 2: Auto-negotiation failed, but only baud rate is determined. For duplex mode, operating with the default value (half duplex). 3: Auto-negotiation was successful. 4: Operating not with auto-negotiation but using the specified baud rate/ duplex mode.
5	Manual Setting Requires Speed	Fixed to False. Bit to indicate whether it is possible to operate with the transmission speed and other settings fixed.
6	Local Hardware Fault	Fixed to False. Bit to notify when a local hardware failure is detected.
7 to 31	Reserved	

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

● LLDP Management Object (Class ID: 109 hex)

This object stores the LLDP protocol management information.

Service codes

Service Code	Service name	Description	Supported service range	
			Class	Instance
01 hex	Get_Attributes_All	Reads the values of all attributes.	Supported*1	Supported
0E hex	Get_Attribute_Single	Reads the value of the specified attribute.	Not supported	Supported
10 hex	Set_Attribute_Single	Writes the value of the specified attribute.	Not supported	Supported

*1. The following data is obtained by Get_Attributes_All.

Attribute ID	Parameter name	Data	
		Data type	Value
01 hex	Revision	UINT	1
02 hex	Max Instance	UINT	1
03 hex	Number of Instances	UINT	1
04 hex	Optional Attribute List	STRUCT of:	---
	number of attributes	UINT	0(default)
	optional attributes	Array of UINT	(null)
05 hex	Optional Service List	STRUCT of:	---
	number of services	UINT	0
	optional services	Array of UINT	(null)
06 hex	Max ID Number Class Attributes	UINT	7
07 hex	Max ID Number Instance Attributes	UINT	3

Class ID

Specify 109 hex.

Instance ID

Specify the following depending on the target.

- For class: None
- For instance: 01 hex

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Attribute ID

■ Class attribute ID

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
01 hex	Revision	Revision of the object	Reading	UINT	1
02 hex	Max Instance	Maximum instance number currently generated	Reading	UINT	1
03 hex	Number of Instances	Number of instances currently generated	Reading	UINT	1
06 hex	Max ID Number Class Attributes	Maximum class attribute number	Reading	UINT	7
07 hex	Max ID Number Instance Attributes	Maximum instance attribute number	Reading	UINT	3

■ Instance attribute ID

Attribute ID	Parameter name	Description	Attribute	Data	
				Data type	Value
1	LLDP Enable	Indicates whether the LLDP function is enabled or disabled.	Reflected immediately upon writing	STRUCT of	---
	LLDP Enable Array Length	Number of bits defined in the LLDP Enable Array member. This will be the Max Instance number of Ethernet Link Object plus 1. With this Unit, it will be 2 because the number of ports (LAN connectors) is 1.		UINT	2 (Initial value)
	LLDP Enable Array	Bit 0: Global Enable (Setting to enable/disable globally) 0: LLDP Tx & Rx Disabled 1: LLDP Tx & Rx Enabled (Default) Bit 1: Port Tx Enable (Setting to enable/disable for each port) 0: LLDP Tx Disabled 1: LLDP Tx Enabled (Default) Bits 2 to 7: Reserved		ARRAY of BYTE	0x03 (Initial value)
2	msgTxInterval	Interval to send LLDP frames. Setting range: 1 to 3,600 (unit: seconds) (0 and range of 3,601 to 65,535 are reserved)	Reflected immediately upon writing	UINT	30 (Initial value)
3	msgTxHold	Multiplier of msgTxInterval for determining the value of TTL TLV sent to adjacent device Setting range: 1 to 100 (multiplier of LLDP frame sending) (0 and range of 101 to 255 are reserved)	Reflected immediately upon writing	USINT	4 (Initial value)

6.3 Monitoring and Setting Using CIP Message Communications (Continued)

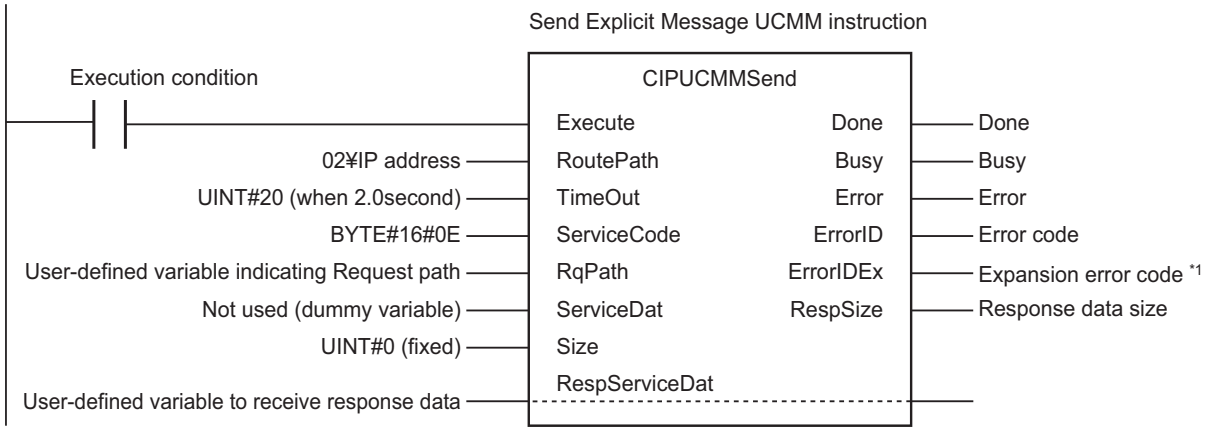
● Examples of CIP Message Communications Instruction

An example of reading data in the Main Unit using the CIP message communications is shown below.

Example: The following is an example of reading the status information of the KM-PM using the CIP message communications instruction of the NJ/NX-series Controller.
The CIPUCMMSend (Send Explicit Message UCMM) instruction is used a CIP message communications instruction.

Send the following CIP message.
- Service code: 16#0E (Get_Attribute_Single: read the value of the specified attribute)
- Class ID: 37F hex
- Instance ID: 01 hex
- Attribute ID: 68 hex (status information)

The CIPUCMMSend instruction sends the command data "ServiceDat" as a UCMM message corresponding to the service specified by the "ServiceCode".
The destination is specified by the route path "RoutePath". The request path is specified by "RqPath".



6.3 Monitoring and Setting Using CIP Message Communications (Continued)

Set the following value to the input variable of the above communications instruction.

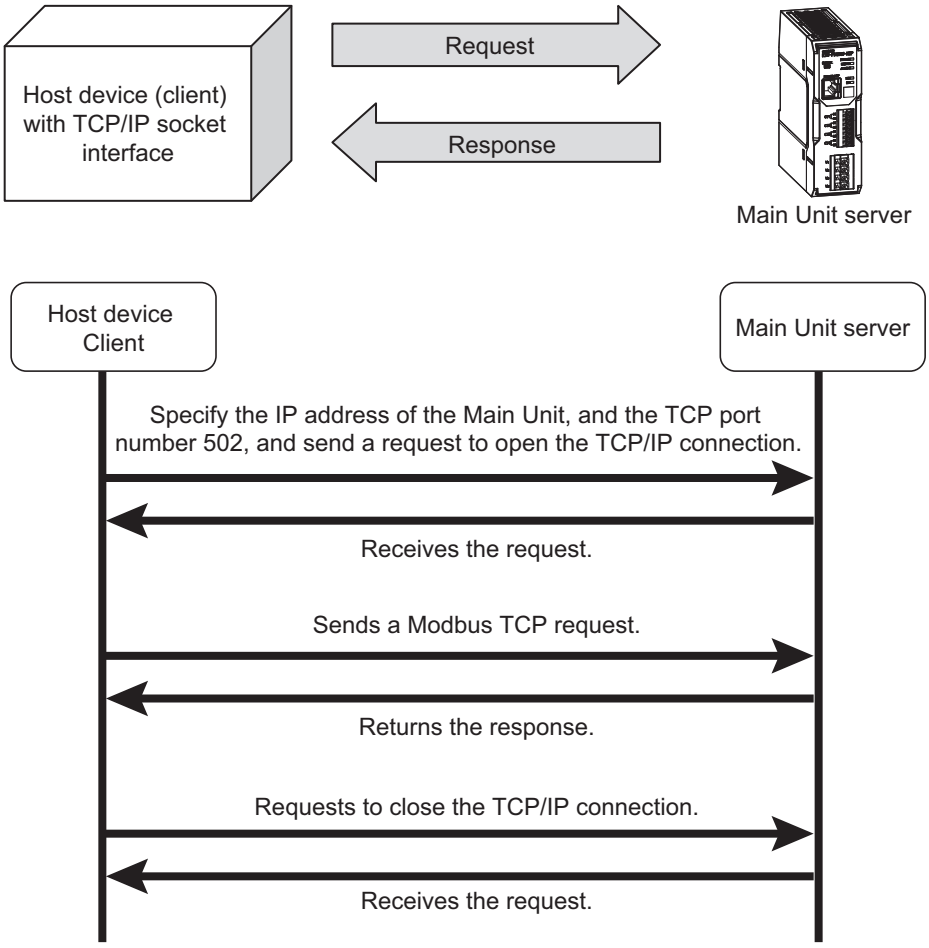
Input variable of the communications instruction	Specification	Value to pass to input variable	Meaning
RoutePath	Route path specification	02¥IP address	"02" specifies the output from the NJ-series built-in EtherNet/IP port or the NX-series built-in EtherNet/IP port 1. The IP address specifies the IP address of the Main Unit.
TimeOut	Timeout time specification	UINT#20	Timeout time is specified. The integer "20" specifies 2.0 s as the timeout time. It is 0.1 s unit.
ServiceCode	Service code	BYTE#16#0E	0E hex specifies "Get_Attribute_Single” as a service code which reads the value of the specified attribute.
RqPath	Request path specification	Specified by user variable indicating the Request path	Specify a user-defined variable. Use the data type "_sREQUEST_PATH" corresponding to the input variable "RqPath". You can use any variable name. Specify the following. Class ID, Instance ID, Attribute ID Example: Reading of the status information: Specify the following. ClassID: = 37F hex (meaning of “Main Unit monitor object”) InstanceID: = 01 hex isAttributeID: = TRUE (meaning of using an attribute ID) AttributeID: = 68 hex (meaning of status information)
ServiceDat	Data to send	Not used (dummy variable)	Since the service code is "read", specify a dummy variable.
Size	Number of elements to send	UINT#0	Since the service code is "read", specify integer 0 (fixed).
RespServiceDat	Response data specification	Specified by user variable r variable to receive response data	Specify a user-defined variable. Use the data type "ARRAY [0..10] OF BYTE" corresponding to the input/output variable "RespServiceDat". You can use any variable name.

- If the value of "ErrorID" is WORD#16#1C00 (Explicit error), the CIP message error code is stored in "ErrorIDEx". For details on "ErrorIDEx", refer to “A.3 Expansion Error Code of the CIP Message Communications (⇨ 170)”.

7.1 Outline

This section provides an overview of how to monitor the KM-PM using the Modbus TCP.

Modbus TCP is a communications protocol that uses TCP/IP to communicate with host devices such as PLCs. This communications protocol allows host devices with a TCP/IP socket interface to read and write the internal data of the KM-PM.



Note The socket is an interface for using TCP directly from the user program.
The host device specifies the IP address of KM-PM and TCP port number of 502 (01F6 hex) and opens the socket in Active. After that, it sends Modbus TCP request and reads and writes the internal data of the KM-PM.
In addition, Modbus TCP can be connected to up to two clients simultaneously.

7.2 Function Codes

This section describes function codes that can be used with Modbus TCP.

● Function Code List

The function codes that can be used are as follows.

Function Codes	Name	Usages
03 hex	Reading of multiple registers	Used to read measured values such as status information, voltages, currents.
06 hex	Operation command	Used to instruct software reset, switch to setting mode, active energy reset, etc.
10 hex	Writing of multiple registers	Used to set the IP address, Main Unit initial setting, etc.

The following table shows the correspondence between the circuit of phase and wire type and the unit ID

Phase and wire type	Circuit A	Circuit B	Circuit C	Circuit D
3-phase 4-wire	0x01	-	-	-
1-phase 2-wire	0x01	0x02	0x03	0x04
1-phase 3-wire	0x01	-	0x02	-
3-phase 3-wire	0x01	-	0x02	-
1-phase 2-wire voltage selected	0x01	0x02	0x03	0x04
1-phase 3-wire composite	0x01	-	0x02	0x03

7.2 Function Codes (continued)

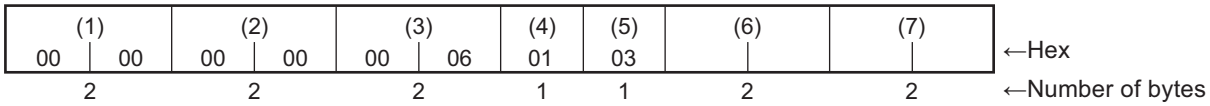
● 03 hex: Reading of Multiple Registers

This function can read the contents of multiple registers starting from the specified address.

Frame Configurations

The frame configurations of Modbus TCP are as follows.

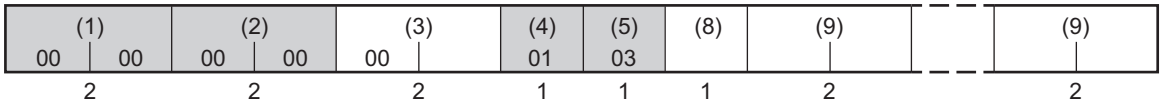
■ Request



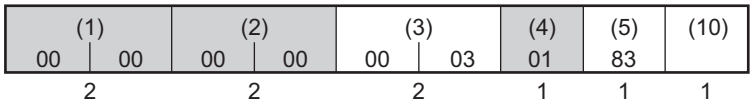
(1): Transaction ID : Specify any value. For example, 0000 hex is used in this explanation.
(2): Protocol ID : Specify 0000 hex.
(3): Number of bytes transferred : Specify the total number of bytes of (4) and the successor. In the above case, it is from (4) to (7), so it is 0006 hex.
(4): Unit ID : Specify 01 to 04 hex. In this manual, 01 hex is used.
(5): Function Codes : Specify 03 hex (Reading of multiple registers).
(6): Start address : Specify the address to start reading.
Refer to “7.3 Register Address Lists (⇨ 111)”.
(7): Number of words to read : Specify the number of words of the register to be read. The maximum value is 125 (007D hex).

Pass the following values for the input variables of the above communications instruction.

■ Normal Response



■ Error Response



(3): Number of bytes transferred : The total number of bytes of (4) and the successor is set.
(8): Byte count : The total number of bytes of (9) is set.
(9): Register contents : Register contents from the start address to the number of read words are set.
(10): Exception code : Error information is set. Refer to “Exception Code List(⇨ 110)”.

Note 1. For the other elements (the elements shaded in the above figure), the value specified in the request is set.
2. The function code of (5) at error response is 83 hex.

7.2 Function Codes (continued)

Example: Read the status information

■ Request

(1)		(2)		(3)		(4)	(5)	(6)		(7)	
00	00	00	00	00	06	01	03	24	08	00	02

(6): Start address : Specify the address of the status information.
(7): Number of words to read : The entire measurement information is 2 word (4 bytes), so specify 0002 hex.

■ Normal Response

(1)		(2)		(3)		(4)	(5)	(8)	Status information			
00	00	00	00	00	07	01	03	04				

(3): Number of bytes transferred : The total number of bytes of (4) and the successor are 7, so 0007 hex is set.
(8): Byte count : The status information is 4 bytes, so 4 hex is set.

Note For the other elements (the elements shaded in the above figure), the value specified in the request is set.

● 06 hex: Operation Command

Executes a software reset, active energy reset, switch to setting mode, or initialization.

Frame Configurations

The frame configurations of Modbus TCP are as follows.

■ Request

(1)		(2)		(3)		(4)	(5)	(6)		(7)		
00	00	00	00	00	06	01	06	FF	FF	99	00	←Hex
2		2		2		1	1	2		2		←Number of bytes

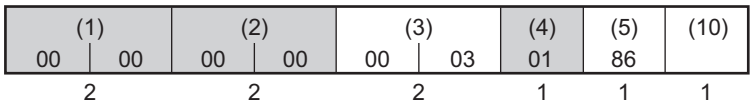
(1): Transaction ID : Specify any value. For example, 0000 hex is used in this explanation.
(2): Protocol ID : Specify 0000 hex.
(3): Number of bytes transferred : Specify the total number of bytes of (4) and the successor. In the above case, it is from (4) to (7), so it is 0006 hex.
(4): Unit ID : Specify 01 to 04 hex. In this manual, 01 hex is used.
(5): Function Codes : Specify 06 hex (Operation command).
(6): Start address : Specify FFFF hex (Operation command).
(7): Number of words to read : Specify 9900 hex (Software reset).

■ Normal Response

It is the same as the request.

7.2 Function Codes (continued)

■ Error Response



(3): Number of bytes transferred : The total number of bytes of (4) and the successor is set.
(5): Function Codes : 86 hex is set.
(10): Exception code : Error information is set. Refer to “Exception Code List(⇨ 110)”.

Note For the other elements (the elements shaded in the above figure), the value specified in the request is set.

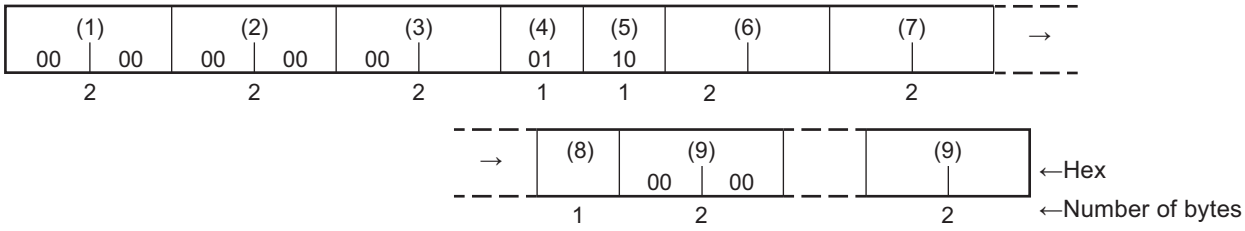
● 10 hex: Writing of Multiple Registers

This function can write data to multiple registers with the specified address as the start address.

Frame Configurations

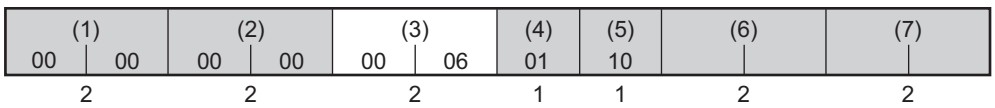
The frame configurations of Modbus TCP are as follows.

■ Request



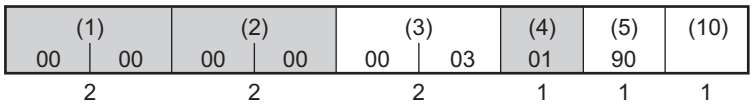
(1): Transaction ID : Specify any value. For example, 0000 hex is used in this explanation.
(2): Protocol ID : Specify 0000 hex.
(3): Number of bytes transferred : Specify the total number of bytes of (4) and the successor.
(4): Unit ID : Specify 01 to 04 hex. In this manual, 01 hex is used.
(5): Function Codes : 10 hex (Writing of multiple registers) is specified.
(6): Start address : Specify the address to start writing. Refer to “Register Address Lists(⇨ 111)”.
(7): Number of words to read : Specify the number of words of the register to be write. The maximum value is 123 (007B hex).
(8): Byte count : Specify the total number of bytes of (9).
(9): Data : Register contents from the start address to the number of write words are set.

■ Normal Response



7.2 Function Codes (continued)

■ Error Response



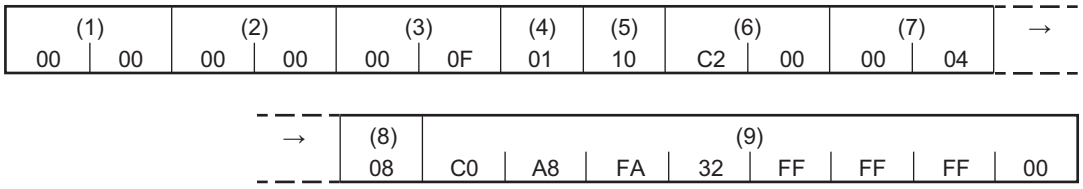
(3): Number of bytes transferred : The total number of bytes of (4) and the successor is set.

(10): Exception code : Error information is set. Refer to “Exception Code List(⇨ 110)”.

Note 1. The elements shaded in the above figures are set to the value specified in the request.
2. The function code of (5) at error response is 90 hex.

Example: Change IP Address/Subnet mask

■ Request



(1): Transaction ID : Specify any value. For example, 0000 hex is used in this explanation.

(2): Protocol ID : Specify 0000 hex.

(3): Number of bytes transferred : The total number of bytes of (4) and the successor are 11, so specify 000B hex.

(4): Unit ID : Specify 01 to 04 hex. In this manual, 01 hex is used.

(5): Function Codes : 10 hex (Writing of multiple registers) is specified.

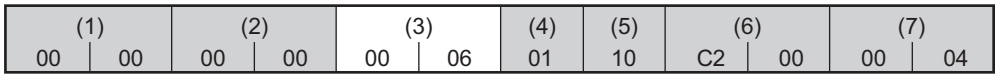
(6): Start address : Specify the register address of the IP address.

(7): Number of words to read : The IP address is 2 words (4 bytes) and subnet mask is 2 words (4 bytes), so specify a total of 0004 hex.

(8): Byte count : The total number of bytes of (9) is 8 bytes, so specify 08 hex.

(9): Data : Specify 192.168.250.50 (C0 A8 FA 32 hex) as the IP address and 255.255.255.0 (FF FF FF 00 hex) as the subnet mask.

■ Normal Response



(3): Number of bytes transferred : The total number of bytes of (4) and the successor are 6, so 0006 hex is set.

Note For the other elements (the elements shaded in the above figure), the value specified in the request is set.

7.2 Function Codes (continued)

● Exception Code List

The following is the exception codes when an error response occurs. Confirm this content and review the request.

Exception code	Types of error	Function
01 hex	Illegal function codes	In the case of an unsupported function code.
02 hex	Illegal data address	When an address that cannot be read or written is included.
03 hex	Illegal data value	When data that cannot be written, such as data that is outside the setting range, is included.
04 hex	Failure in associated device	This is the state in which normal execution cannot be performed. • When an operation command and writing of multiple registers cannot be performed. Refer to “Register Address Lists(⇨ 111)”.
05 hex	Status error	When a failure occurs and continuing use is not possible.

7.3 Register Address Lists

Registers that can be read and written using Modbus TCP are as follows.

Offset address (hexadecimal)	Contents (communications area)	R/W
0000 hex to 0018 hex	Measurement value (instantaneous)	R
0200 hex to 0210 hex	Measurement value (cumulative), not resettable	R
0220 hex to 0230 hex	Measurement value (cumulative k unit), not resettable	R
0240 hex to 0250 hex	Measurement value (cumulative), resettable	R
0260 hex to 0270 hex	Measurement value (cumulative k unit), resettable	R
0300 hex to 0302 hex	Conversion value	R
2000 hex to 2018 hex	Circuit-specific setting	R/W
220E hex to 2304 hex	Common setting	R/W
2408 hex	Status information	R
C000 hex to C01D hex	Product information	R
C200 hex to C207 hex	IP address	R/W
C220 hex	EIP timeout setting	R/W
C230 hex	ACD setting	R/W
C270 hex to C273 hex	LLDP	R/W
C300 hex to CA20 hex	Security	R/W
D009 hex FFFF hex	Operation command	W
F300 hex	Modbus TCP setting	R/W

7.3 Register Address Lists (Continued)

● Measurement Values (Instantaneous)

Address	Parameter name	Description	Monitor value	Number of bytes	R/W *1
0000 hex	Voltage 1 (V) *2	Voltage effective value: Between V1 and VN	H'00000000 to H'0098967F (0.0 to 999999.9)	4	R
0002 hex	Voltage 2 (V) *2	Voltage effective value: Between V2 and VN		4	R
0004 hex	Voltage 3 (V) *2	Voltage effective value: Between V3 and VN		4	R
0006 hex	Current 1 (A) *2	Current effective value	H'00000000 to H'05F5E0FF (0.000 to 99999.999)	4	R
0008 hex	Current 2 (A) *2	Current effective value		4	R
000A hex	Current 3 (A) *2	Current effective value		4	R
000C hex	Power factor	Power factor per circuit	H'FFFFFF9C to H'00000064 (-1.00 to 1.00)	4	R
000E hex	Frequency (Hz)	Frequency obtained from voltage V1	H'000001C2 to H'0000028A (45.0 to 65.0)	4	R
0010 hex	Active power (W)	Active power value per circuit |Power consumption| - |Regenerative energy|	H'80000000 to H'7FFFFFFF (-21474836.8 to 214748364.7)	4	R
0012 hex	Reactive power (Var)	Reactive power value per circuit		4	R
0014 hex	Voltage V1-V2 (V) *2	Voltage effective value: Between V1 and V2	H'00000000 to H'0098967F (0.0 to 999999.9)	4	R
0016 hex	Voltage V1-V3 (V) *2	Voltage effective value: Between V1 and V3		4	R
0018 hex	Voltage V2-V3 (V) *2	Voltage effective value: Between V2 and V3		4	R

*1. R: Read using reading of multiple registers (03 hex).
*2. The correspondence between the phase and wire type and the data are given in the following table.

Parameter name	1P2W	1P3W	3P3W	3P4W
Voltage 1 (V)	Vrn	Vrn	---	Vrn
Voltage 2 (V)	---	---	---	Vsn
Voltage 3 (V)	---	Vtn	---	Vtn
Current 1 (A)	IR	IR	IR	IR
Current 2 (A)	---	IN *	IS *	IS
Current 3 (A)	---	IT	IT	IT
Voltage V1-V2 (V)	---	---	Vrs	Vrs
Voltage V1-V3 (V)	---	Vrt	Vrt	Vrt
Voltage V2-V3 (V)	---	---	Vst	Vst

* Value calculated from current 1 and current 3.

7.3 Register Address Lists (Continued)

● Measurement Values (Cumulative), Not Resettable

Address	Parameter name	Description	Monitor value	Number of bytes	R/W *1
0200 hex	Active energy (import) (not resettable) (Wh)	Cumulative value when active power was positive number	H'00000000 to H'3B9AC9FF (0 to 999999999)	4	R
0202 hex	Active energy (export) (not resettable) (Wh)	Cumulative absolute value when active power was negative number		4	R
0204 hex	Reactive energy (import) (not resettable) (Varh)	Cumulative value when reactive power was leading		4	R
0206 hex	Reactive energy (export) (not resettable) (Varh)	Cumulative value when reactive power was lagging		4	R
0208 hex	Cumulative total reactive power (not resettable) (Varh)	Absolute cumulative total value for leading and lagging of reactive power		4	R
020A hex	T1 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T1		4	R
020C hex	T2 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T2		4	R
020E hex	T3 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T3		4	R
0210 hex	T4 Active energy (import) (not resettable) (Wh)	Cumulative value when the current tariff was T4		4	R

*1. R: Read using reading of multiple registers (03 hex).

7.3 Register Address Lists (Continued)

● Measurement Values (Cumulative k Unit), Not Resettable

Address	Parameter name	Description	Monitor value	Number of bytes	R/W *1
0220 hex	Active energy (import) (not resettable) (kWh)	Cumulative value when active power was positive number (unit: kWh)	H'00000000 to H'3B9AC9FF (0 to 999999999)	4	R
0222 hex	Active energy (export) (not resettable) (kWh)	Cumulative absolute value when active power was negative number (unit: kWh)		4	R
0224 hex	Reactive energy (import) (not resettable) (kVarh)	Cumulative value when reactive power was leading (unit: kVarh)		4	R
0226 hex	Reactive energy (export) (not resettable) (kVarh)	Cumulative value when reactive power was lagging (unit: kVarh)		4	R
0228 hex	Cumulative total reactive power (not resettable) (kVarh)	Absolute cumulative total value for leading and lagging of reactive power (unit: kVarh)		4	R
022A hex	T1 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T1 (unit: kWh)		4	R
022C hex	T2 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T2 (unit: kWh)		4	R
022E hex	T3 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T3 (unit: kWh)		4	R
0230 hex	T4 Active energy (import) (not resettable) (kWh)	Cumulative value when the current tariff was T4 (unit: kWh)		4	R

*1. R: Read using reading of multiple registers (03 hex).

7.3 Register Address Lists (Continued)

● Register Address Lists (Continued)

Address	Parameter name	Description	Monitor value	Number of bytes	R/W *1
0240 hex	Active energy (import) (resettable) (Wh)	Cumulative value when active power was positive number	H'00000000 to H'3B9AC9FF (0 to 999999999)	4	R
0242 hex	Active energy (export) (resettable) (Wh)	Cumulative absolute value when active power was negative number		4	R
0244 hex	Reactive energy (import) (resettable) (Varh)	Cumulative value when reactive power was leading		4	R
0246 hex	Reactive energy (export) (resettable) (Varh)	Cumulative value when reactive power was lagging		4	R
0248 hex	Cumulative total reactive power (resettable) (Varh)	Absolute cumulative total value for leading and lagging of reactive power		4	R
024A hex	T1 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T1		4	R
024C hex	T2 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T2		4	R
024E hex	T3 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T3		4	R
0250 hex	T4 Active energy (import) (resettable) (Wh)	Cumulative value when the current tariff was T4		4	R

*1. R: Read using reading of multiple registers (03 hex).

7.3 Register Address Lists (Continued)

● Measurement Values (Cumulative k Unit), Resettable

Address	Parameter name	Description	Monitor value	Number of bytes	R/W *1
0260 hex	Active energy (import) (resettable) (kWh)	Cumulative value when active power was positive number (unit: kWh)	H'00000000 to H'3B9AC9FF (0 to 999999999)	4	R
0262 hex	Active energy (export) (resettable) (kWh)	Cumulative absolute value when active power was negative number (unit: kWh)		4	R
0264 hex	Reactive energy (import) (resettable) (kVarh)	Cumulative value when reactive power was leading (unit: kVarh)		4	R
0266 hex	Reactive energy (export) (resettable) (kVarh)	Cumulative value when reactive power was lagging (unit: kVarh)		4	R
0268 hex	Cumulative total reactive power (resettable) (kVarh)	Absolute cumulative total value for leading and lagging of reactive power (unit: kVarh)		4	R
026A hex	T1 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T1 (unit: kWh)		4	R
026C hex	T2 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T2 (unit: kWh)		4	R
026E hex	T3 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T3 (unit: kWh)		4	R
0270 hex	T4 Active energy (import) (resettable) (kWh)	Cumulative value when the current tariff was T4 (unit: kWh)		4	R

*1. R: Read using reading of multiple registers (03 hex).

● Conversion Values

Address	Parameter name	Description	Monitor value	Number of bytes	R/W *1
0300 hex	Conversion value (1000 times)	Active energy (import) (resettable) (Wh) x value of conversion factor	H'00000000 to H'3B9AC9FF (0 to 999999999)	4	R
0302 hex	Conversion value (0.001 times)	Active energy (import) (resettable) (Wh) x value of conversion factor		4	R

*1. R: Read using reading of multiple registers (03 hex).
W: Write using writing of multiple registers (10 hex).

7.3 Register Address Lists (Continued)

● Circuit-specific Settings

Address	Parameter name	Description	Initial value	Number of bytes	R/W *1
2000 hex	Phase and wire type	1P2W: 00000000 hex 1P3W: 00000001 hex 3P3W: 00000002 hex 1P2W2: 00000003 hex 1P3W2: 00000004 hex 3P4W: 00000005 hex This is reflected after a restart.	3P4W: 00000005 hex	4	R/W
2002 hex to 2011 hex	Reserved data	Access prohibited	---	---	---
2012 hex	Voltage selected	V_R: 00000000 hex V_T: 00000001 hex V_R-T: 00000002 hex This is reflected after a restart.	V_R: 00000000 hex	4	R/W
2018 hex	CT type	5 A: 00000000 hex 50 A: 00000001 hex 100 A: 00000002 hex 200 A: 00000003 hex 400 A: 00000004 hex 600 A: 00000005 hex This is reflected after a restart.	5A: 00000000 hex	4	R/W

*1. R: Read using reading of multiple registers (03 hex).
W: Write using writing of multiple registers (10 hex).

7.3 Register Address Lists (Continued)

● Common setting

Address	Parameter name	Description	Initial value	Number of bytes	R/W *1
220E hex	VT Ratio	Set the ratio between the primary side voltage and secondary side voltage when voltage input using VT. This is reflected after a restart.	00000064 hex	4	R/W
2210 hex	Conversion Factor	Set the conversion factor by which Active energy (import) (resettable) (Wh) is multiplied for each circuit. This is reflected after a restart.	00002710 hex	4	R/W
2212 hex to 2218 hex	Reserved data	Access prohibited	---	---	---
221A hex	Tariff ON/OFF	0: Disabled 1: Enabled This is reflected after a restart.	00000001 hex	4	R/W
221C hex	Current Tariff	Storage location T1: 00000000 hex T2: 00000001 hex T3: 00000002 hex T4: 00000003 hex This is reflected after a restart.	T1: 00000000 hex	4	R/W
221E hex to 22FF hex	Reserved data	Access prohibited	---	---	---
2300 hex	Circuit B ON/OFF	0: Disabled 1: Enabled This is reflected after a restart.	00000000 hex (Disabled)	4	R/W
2302 hex	Circuit C ON/OF	0: Disabled 1: Enabled This is reflected after a restart.	00000000 hex (Disabled)	4	R/W
2304 hex	Circuit D ON/OFF	0: Disabled 1: Enabled This is reflected after a restart.	00000000 hex (Disabled)	4	R/W

*1. R: Read using reading of multiple registers (03 hex).
W: Write using writing of multiple registers (10 hex).

7.3 Register Address Lists (Continued)

● Status information

Address	Parameter name	Description	Number of bytes	R/W *1
2408 hex	Status Information	This is the status of the KM-PMBN-EIP Main Unit. Refer to "● Status information" in "Main Unit Monitor Object (Class ID: 37F hex)(⇨ 75)".	4	R

*1. R: Read using reading of multiple registers (03 hex).

● Product Information

Address	Data name	Data range	Number of bytes	R/W *1
C000 hex	Vendor ID	002F hex	2	R
C001 hex	Device type	0307 hex	2	R
C002 hex	Product code	*2	2	R
C003 hex	Product revision (major)	*3	2	R
C004 hex	Product revision (minor)	*3	2	R
C005 hex	Serial number	Product-specific	4	R
C007 hex	MAC address	00 00 0A ** ** ** hex	6	R
C00A hex	Product name	*4	32	R
C01A hex	Product code (JAN/EAN code)	4550431072931 When the product code is read, it becomes 0XXXXXXXXXXXX00 hex, with 0 hex appended to the most-significant digit and 00 hex appended to the least-significant digit. Variable address C01A hex is the most-significant digit and C01D hex is the least-significant digit.	8	R

*1. R: Read using reading of multiple registers (03 hex).
*2. Product code

Product code	Model
514 (202 hex)	KM-PMBN-EIP

*3. The product revision is as follows.
Example: In the case of version 1.23
Major: 0001 hex
Minor: 0023 hex
*4. Product name is in ASCII notation.
Example: 4B 4D 2D 50 4D...hex (KM-PM...)
If the name is less than 32 characters, all the succeeding areas become 20 hex.

7.3 Register Address Lists (Continued)

● IP address

Address	Data name	Data range	Number of bytes	R/W *1
C200 hex	IIP address *2	Initial value: C0 A8 FA 32 hex (192.168.250.50) This is reflected after a restart.	4	R/W
C202 hex	Subnet mask *2	Initial value: FF FF FF 00 hex (255.255.255.0) This is reflected after a restart.	4	R/W
C204 hex	Default gatewa	Initial value: 00 00 00 00 hex (0.0.0.0) This is reflected after a restart.	4	R/W
C206 hex	IP address setting method	00000000 hex: Set static IP address (initial value) 00000001 hex: Set by BOOTP 00000002 hex: Set by DHCP 00000081 hex: Set by BOOTP (1 shot) 00000082 hex: Set by DHCP (1 shot) This is reflected after a restart.	4	R/W

*1. R: Read using reading of multiple registers (03 hex).
W: Write using writing of multiple registers (10 hex).
*2. Write all of the 8-byte portion combining the IP address and subnet mask in a single operation. If less than 8 bytes are written, an error occurs.

● EIP Timeout Setting

Address	Data name	Data range	Initial value	Number of bytes	R/W
C220 hex	Encapsulation session timeout time	1 to 3,600 seconds (0000 to 0E10 hex) This is reflected after a restart.	120 seconds (0078 hex)	2	R/W

● ACD Setting

Address	Data name	Data range	Initial value	Number of bytes	R/W
C230 hex	ACD function enable/disable (SelectAcd)	0: Disabled 1: Enabled This is reflected after a restart.	1: Enabled (0001 hex)	2	R/W

7.3 Register Address Lists (Continued)

● LLDP

Address	Data name	Data range	Initial value	Number of bytes	R/W
C270 hex	LLDP Enable Array Length	2 (0002 hex) This is reflected after a restart.	2 (0002 hex	2	R/W
C271 hex	LLDP Enable Array	Bit 0: Enable/disable LLDP (1: Enabled, 0: Disabled) Bit 1: Enable/disable LLDP for 1st port (1: Enabled, 0: Disabled) This is reflected after a restart.	3 (0003 hex)	2	R/W
C272 hex	msgTxInterval	1 to 3,600 seconds (0001 to 0E10 hex) This is reflected after a restart.	30 seconds (0078 hex)	2	R/W
C273 hex	msgTxHold	1 to 100 (0001 to 0064 hex) This is reflected after a restart.	4 (0004 hex)	2	R/W

● Security

Address	Data name	Data range	Initial value	Number of bytes	R/W
C300 hex	Security function Enabled / Disabled	Enables or disables the security functions. 0: Disabled 1: Enabled This is reflected after a restart.	0: Disabled (0000 hex)	2	R/W
C301 hex	Communications protocols Enabled / Disabled	Enables or disables communications protocols. 0: All enabled 1: Modbus/TCP enabled (EtherNet/IP is disabled) 2: EtherNet/IP enabled (Modbus/TCP is disabled) This is reflected after a restart.	0: All enabled (0000 hex)	2	R/W
C400 hex C401 hex C402 hex C403 hex	Random number (nonce) HH digit HL digit LH digit LL digit	A random value for digest authentication can be read. Example: When the random number is “01234567” in ASCII, the random number is stored in the following arrangement. Array [0]: 30 hex Array [1]: 31 hex : Array [6]: 36 hex Array [7]: 37 hex	Current value	8	R
C404 hex C405 hex	Power-ON duration High-order digit Low-order digit	Power-ON duration of the Main Unit	Current value	4	R

7.3 Register Address Lists (Continued)

Address	Data name	Data range	Initial value	Number of bytes	R/W *1
C406 hex to C40E hex	1st security log information (oldest)	The contents of the log are as follows. Power-ON time: Time accessed [seconds] IP address of sender: IP address of access origin Communications protocol: 01 hex: Modbus/TCP 02 hex: EtherNet/IP Write result 00 hex: Normal Other than 00 hex: Error. Refer to the error code.*1 Write information ID 0x00000000 + Variable address (2 bytes) + Data to write (2 bytes) When reading the security log, specify the number of elements so that they will be in record units (multiples of 9).	0	18	R
:	:	:	:	:	:
C50B hex to C513 hex	30th security log information (most recent)	Same as above	Same as above	18	R
CA00 hex to CA0F hex	Password change *2	32-byte password	Initial value of password Following value obtained by hashing Omron123 with SHA256 0x4fd4bfdf7b9933fca0912607d826c4a833c169f946a5c7d5572fd63dcb873ef9	32	W
CA10 hex to CA1F hex	Switch to settings unlocked *2	32-byte hash value (Value obtained by hashing the password and random number with SHA256)	---	32	W
CA20 hex	Switch to settings locked *2	0001 hex: Execute	---	2	W

*1. For details on error codes, refer to “Exception Code List(⇨ 110)”.
*2. W: Write using writing of multiple registers (10 hex).

7.3 Register Address Lists (Continued)

● Operation command

Address	Data name	Data range	Number of bytes	R/W *1
FFFF hex	Active energy reset (Specify the reset target circuit for the Unit ID.)	Execute: 0300 hex	2	W
FFFF hex	Switch to Setting Mode	Execute: 0700 hex	2	W
FFFF hex	Initialization (active energy + setting value)	Execute: 0900 hex	2	W
FFFF hex	Software Reset	Execute: 9900 hex	2	W
D009 hex	Initialize Setting Values (network data initialization)	Execute: 0001 hex	2	W

*1. W: Write using operation command (06 hex).

● Modbus TCP Setting

Address	Data name	Data range	Initial value	Number of bytes	R/W
F300	Modbus connection timeout time	0 to 3,600 (unit: seconds) This is reflected after a restart.	10	2	R/W

8.1 Security Guide

A lack of security has become a major concern for society and IoT devices. As the importance of the data held by factory automation (hereinafter “FA”) equipment and the safety and quality of products increases, there are an increasing number of attacks targeting FA systems themselves and attacks exploiting organizations or FA systems with insufficient security within the supply chain so as to get a foothold.
Accordingly, various countries are working to establish cybersecurity-related laws and regulations targeting FA system manufacturers and operators, FA systems, and equipment that make up FA systems, as well as standardize security requirements in various industries, such as the control system, semiconductor, and automotive industries. Therefore, societal demands for cybersecurity are increasing more than ever.

● Necessity of Security Measures

To ensure the safety and security of FA systems, not only are countermeasures in our FA products necessary, but our customers also need to implement security measures according to their respective roles.
For this purpose, it is important for you to properly understand and evaluate security risks related to the operations, services, and systems you provide, and to implement appropriate security measures throughout the life cycle of the FA system.

● Clarifying the Purposes of Security Measures

It is important to demonstrate the purposes of security measures, goals to be achieved, and business necessity for security measures with clear rationale to obtain the agreement of all stakeholders including management before proceeding with implementation. If you proceed without obtaining the agreement of the stakeholders, other business requirements may take priority, making it difficult to achieve cooperation and collaboration among departments. The following can be considered as purposes for implementing security measures.
(1) For business continuity and maintaining production
(2) For ensuring factory safety and product quality
(3) For ensuring normal operation of FA systems
(4) For protecting information, know-how, and data related to products and production
(5) For ensuring product security quality and fulfilling manufacturing responsibilities
(6) For meeting social requirements from standards and external demands
(7) For maintaining brand image and preventing loss of customer trust

Based on these security purposes, threats with particularly high impact on business should be clarified, and their impacts should be quantified and clarified in combination with the costs of countermeasures so as to obtain agreement on goals.

8.2 Security Guide (Continued)

Elements to protect

In respect to the purposes of the security measures, clarifying what elements to protect – which elements have the greatest impact on business – makes it easier to set goals. As elements that make up security, you can consider securing the three elements of “availability”, “integrity”, and “confidentiality” of operations, services, and products provided by your company.

	Securing availability	Securing integrity	Securing confidentiality
Purpose	Prevent production equipment operation from stopping.	Prevent malfunctions of production equipment due to unauthorized modification of settings or data.	Prevent leakage of important information such as production know-how and control programs.
Impact if compromised	• Business interruption • Delivery delays • Increased costs	• Decreased quality • Reduced safety • Adverse health effects • Environmental harm	• Reduced social trust • Loss of business advantage • Legal violations

Among “availability”, “integrity”, and “confidentiality”, the severity of impact differs depending on your industry, services provided, products, and assets to be protected. Even within the same industry, this will differ depending on the work content and target processes.
It is important to thoroughly consider which elements should be prioritized for equipment used by your company before promoting security measures.

For Omron’s product security initiatives and the risk assessment procedures that should be implemented by customers, refer to the Security Guideline for Factory Automation System TECHNICAL GUIDE (P162-E1).

8.2 Security Functions

This section describes the security functions to use with the KM-PMBN-EIP.
By using the security functions, you can protect against setting data tampering and also prevent erroneous operations.
Additionally, you can refer to the history as a way of preventing repudiation in the event of a problem occurring.

The KM-PMBN-EIP has the following security functions.

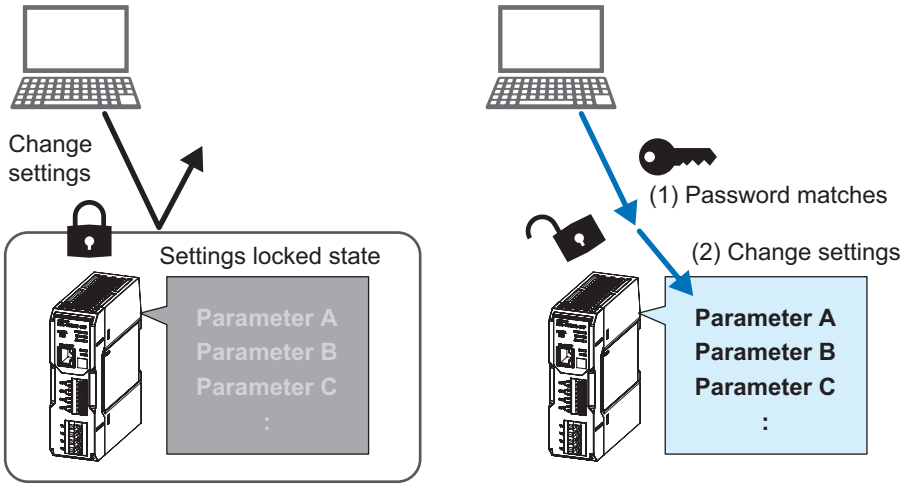
Security function	Purpose	Function overview	Reference
Password authentication	Function tampering prevention Erroneous operation prevention	This function protects against setting changes and operation instructions via communications messages over EtherNet/IP or Modbus/TCP.	● Password Authentication Function
Security history function	Repudiation prevention	When setting change or operation instruction commands are received by communications, the following information is recorded in the Main Unit. • Execution time information • IP address of sender • Written information This information allows you to check when and what operations were performed, and can be used as a way of preventing repudiation in the event of a problem occurring.	● Security History Function

8.2 Security Functions (Continued)

● Password Authentication Function

Overview

This function protects against setting changes and operation instructions via communications messages over EtherNet/IP or Modbus/TCP.
When the security functions are enabled, the product enters the settings locked state and the settings cannot be changed.
To change the settings, you need to use the password to switch to the settings unlocked state and then perform writing.
After writing, reflect the settings by performing a software reset or cycling the power supply. The Unit starts up in the settings locked state after the restart.



Password specifications

- When the security functions are enabled, the settings cannot be changed while the password remains set to the initial value. Be sure to change the password.
- To avoid dictionary attacks and similar threats, avoid using a simple password.
- The possible setting range for the password is shown below.

Item	Description
Number of valid characters	8 or more characters and 32 or fewer characters*1
Usable characters	Single-byte alphanumeric characters and symbols (case-sensitive)*2

*1. Can be arbitrarily set using between 8 and 32 characters.
2. The characters that can be used are ASCII characters from 0x21 to 0x7E (0-9 A-Z a-z, '-!"#$%&(),./:;?@[]^_`{|}~+<=>\).

- The password saved to this product is a value hashed with the SHA-256 hash function.
  Use any hash calculation tool for hashing.

8.2 Security Functions (Continued)

How to enable the password authentication function

The password authentication function is enabled by enabling the security functions.
When using the password authentication function, you need to change the password from the initial value.
Use the following procedure to configure the setting.

■ When using EtherNet/IP

Step 1. Enable the security functions

Command item	Description
Service code:	10 hex (Writing) (Set_Attribute_Single)
Class ID:	383 hex (Security object)
Instance ID:	01 hex (Fixed)
Attribute ID:	64 hex (Security function Enabled / Disabled)
Request data:	1: Enabled

Caution

- After sending the command to enable the security functions in step 1, do not perform a reset or turn off the power.
  Performing a reset or turning off the power will enable the security functions. To change the password, enter the hash value for the password initial value “Omron123” to disable the password and then write a new password.

Step 2. Write a new password

Command item	Description
Service code:	4B hex (Change_Password)
Class ID:	383 hex (Security object)
Instance ID:	01 hex (Fixed)
Request data:	32-byte password

Step 3. Reset

Command item	Description
Service code:	05 hex (Reset)
Class ID:	01 hex (Identity object)
Instance ID:	01 hex (Fixed)
Request data:	00 hex

8.2 Security Functions (Continued)

■ When using Modbus/TCP

Step 1. Enable the security functions

Command item	Description
Write multiple registers:	10 hex
Address:	C300 hex (Security function Enabled / Disabled)
Write data:	1: Enabled

Command: 0000,0000,0009,01,10,C300,0001,02,0001

Caution
- After sending the command to enable the security functions in step 1, do not perform a reset or turn off the power.
  Performing a reset or turning off the power will enable the security functions. To change the password, enter the hash value for the password initial value “Omron123” to disable the password and then write a new password.

Step 2. Write a new password

Command item	Description
Write multiple registers:	10 hex
Address:	CA00 hex to CA0F hexhex (change password)
Write data:	Example: AaBbCc@123 Hash value: E7C5F4315C87A2B4A49631600DA092DB60D952 CCEF5F90D15217116DAD9CA402

Command example:
0000,0000,0027,01,10,CA00,0010,20,E7C5F4315C87A2B4A49631600DA092DB60D952CCEF5F90D15217116DAD9CA402

Step 3. Reset

Command item	Description
Operation command:	06 hex
Address:	FFFF hex (Software Reset)
Write data:	Execute: 9900 hex

Command: 0000,0000,0006,01,06,FFFF,9900

■ When using Configuration Tool

Refer to “1-3 Communication Settings (Home Screen (2))” in the Condition Monitoring Configuration Tool Usage Guide (N240).

8.2 Security Functions (Continued)

How to disable the password

When the security functions are enabled, this product enters the settings locked state when you turn on its power. To change the settings, use the following procedure to switch to the settings unlocked state then change the settings.

■ When using EtherNet/IP

Step 1. Read the random number (nonce) (will be read in ASCII code)

Command item	Description
Service code:	0E hex (Reading) (Get_Attribute_Single)
Class ID:	383 hex (Security object)
Instance ID:	01 hex (Fixed)
Attribute ID:	300 hex (random number (nonce))

Step 2. Hash the password and random number (nonce) with SHA-256 (digest authentication)

Generate value A obtained by further hashing the “hashed password” + “random number (nonce)”.

Example: When setting the password as “**Omron123**” and the random number (nonce) as “**9ae7f135**”

Password = Omron123

SHA256 hash function Input = Omron123

SHA256 hash function Output =
0x4FD4BFDF7B9933FCA0912607D826C4A833C169F946A5C7D5572FD63DCB873EF9

(Random number (nonce) = 9ae7f135 (0x3961653766313335) (ASCII code is indicated in parentheses)

SHA256 hash function Input =
0x4FD4BFDF7B9933FCA0912607D826C4A833C169F946A5C7D5572FD63DCB873EF93961653766313335

SHA256 hash function Output =
0xD02FFD6F5F6F494556C201A452F4240148325B1F29AA868A383F1D0E81448E90

Value **A** obtained by further hashing the “hashed password” + “random number (nonce)”.

Use any hash calculation tool for hashing.

Step 3. Switch to the settings unlocked state (write hashed value A (32 bytes))

Command item	Description
Service code:	4C hex (Transfer_Setting_Unlock)
Class ID:	383 hex (Security object)
Instance ID:	01 hex (Fixed)
Request data:	32-byte password (hashed value A)

8.2 Security Functions (Continued)

■ When using Modbus/TCP

Step 1. Read the random number (nonce) (will be read in ASCII code)

Command item	Description
Read multiple registers:	03 hex
Address: Random number (nonce)	C400 hex to C403 hex (random number (nonce))

Command: 0000,0000,0006,01,03,C400,0004

Step 2. Hash the password and random number (nonce) with SHA-256

Generate value A obtained by further hashing the “hashed password” + “random number (nonce)”.

Example: When setting the password as “Omron123” and the random number (nonce) as “9ae7f135”

Password = Omron123

SHA256 hash function Input = Omron123

SHA256 hash function Output =
0x4FD4BFDF7B9933FCA0912607D826C4A833C169F946A5C7D5572FD63DCB873EF9

(Random number (nonce) = 9ae7f135 (0x3961653766313335) (ASCII code is indicated in parentheses)

SHA256 hash function Input =
0x4FD4BFDF7B9933FCA0912607D826C4A833C169F946A5C7D5572FD63DCB873EF93961653766313335

SHA256 hash function Output =
0xD02FFD6F5F6F494556C201A452F4240148325B1F29AA868A383F1D0E81448E90

Value **A** obtained by further hashing the “hashed password” + “random number (nonce)”.

Use any hash calculation tool for hashing.

Step 3. Switch to the settings unlocked state (write hashed value A (32 bytes))

Command item	Description
Write multiple registers:	10 hex
Address:	CA10 hex to CA1F hex (switch to settings unlocked state)
Write data:	32-byte password (hashed value A)

Command example:
0000,0000,0027,01,10,CA10,0010,20,D02FFD6F5F6F494556C201A452F4240148325B1F29AA868A383F1D0E81448E90

■ When using Configuration Tool

Refer to “1-3 Communication Settings (Home Screen (2))” in the Condition Monitoring Configuration Tool Usage Guide (N240).

8.2 Security Functions (Continued)

How to change the password

To change the password, use the following procedure.

Caution

- We recommend changing the password in an offline environment. This helps minimize the risk of information leakage via the network. An offline environment refers to the following.
  Connect to each KM-PM on a one-to-one basis with an Ethernet cable not via a switching hub.

■ When using EtherNet/IP

Step 1. Write the current password (disable the password)

Command item	Description
Service code:	4C hex (Transfer_Setting_Unlock)
Class ID:	383 hex (Security object)
Instance ID:	01 hex (Fixed)
Request data:	32-byte password (hashed value A)

Step 2. Write a new password (change the password)

Command item	Description
Service code:	4B hex (Change_Password)
Class ID:	383 hex (Security object)
Instance ID:	01 hex (Fixed)
Request data:	32-byte password (any hashed value)

Step 3. Lock the settings

Command item	Description
Service code:	4D hex (Transfer_Setting_Lock)
Class ID:	383 hex (Security object)
Instance ID:	01 hex (Fixed)
Request data:	Execute settings lock: 1

8.2 Security Functions (Continued)

■ When using Modbus/TCP

Step 1. Write the current password (disable the password)

Command item	Description
Write multiple registers:	10 hex
Address:	CA10 hex to CA1F hex (switch to settings unlocked state)
Write data:	32-byte password (hashed value A)

Command:
0000,0000,0027,01,10,CA10,0010,20,D02FFD6F5F6F494556C201A452F4240148325B1F29AA868A383F1D0E81448E90

Step 2. Write a new password (change the password)

Command item	Description
Write multiple registers:	10 hex
Address:	CA00 hex to CA0F hex (change password)
Write data:	Example: AaBbCc@123 Hash value: E7C5F4315C87A2B4A49631600DA092DB60D952 CCEF5F90D15217116DAD9CA402

Command example:
0000,0000,0027,01,10,CA00,0010,20,E7C5F4315C87A2B4A49631600DA092DB60D952CCEF5F90D15217116DAD9CA402

Step 3. Lock the settings

Command item	Description
Write multiple registers:	10 hex
Address:	CA20 hex (switch to settings locked state)
Write data:	Execute: 1

Command: 0000,0000,0009,01,10,CA20,0001,02,0001

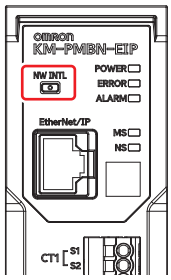
■ When using Configuration Tool

Refer to “1-3 Communication Settings (Home Screen (2))” in the Condition Monitoring Configuration Tool Usage Guide (N240).

8.2 Security Functions (Continued)

Measure if forget password

The following describes what to do if you forget the password.
Press and hold [NW INTL] (network setting initialization button) on the Main Unit for three seconds.



Caution
All network-related settings will be initialized.
The target parameters are the parameters in the following sections.

[When using EtherNet/IP]
Following items in “6.3 Monitoring and Setting Using CIP Message Communications”
●Security Object (Class ID: 383 hex) (⇨ 86)
●TCP/IP Interface Object (Class ID: F5 hex) (⇨ 92)
●LLDP Management Object (Class ID: 109 hex) (⇨ 100)

[When using Modbus/TCP]
●IP address (⇨ 120)
●Encapsulation session timeout time (⇨ 120)
●ACD Setting (⇨ 120)
●LLDP (⇨ 121)
●Security (⇨ 121)
●Modbus connection timeout time (⇨ 123)

8.2 Security Functions (Continued)

● Security History Function

Overview

When setting change or operation instruction commands are received by communications, the following information is recorded in the Main Unit.

- Execution time information
- IP address of sender
- Written information

This information allows you to check when and what operations were performed, and can be used as a way of preventing repudiation in the event of a problem occurring.

Security history information

The following information is saved in the Main Unit.

Item	Description
Power-ON duration (seconds)	The power-ON duration (seconds) when a command is received is saved in the Main Unit. The power-ON duration (seconds) is saved in the Main Unit in 1-hour cycles or when the security history information is updated. This may be shorter than the actual product operating time depending on the timing of power interruptions. Therefore, errors are accumulated according to the save interval of the power-ON duration. The data is 4 bytes. Example: 36234 seconds (0x00008D8A)
IP address of sender	The IP address of the sender is saved when a command is received. The data is 4 bytes. Example: 192.168.250.100 (0xC0A8FA64)
Communications protocols	The communications protocol is saved when a command is received. • When using EtherNet/IP: 0x02 • When using Modbus/TCP: 0x01 The data is 1 byte.
Write result	The write result (error code) is saved when a command is received. The data is 1 byte. Example for Modbus/TCP: Normal response: 0x00 Variable data error: 0x03
Write information ID	The “write information ID” is saved when a command is received. The data contains the following depending on the communications protocol. The data is 8 bytes. • When using EtherNet/IP [Write information ID*] + [Data to write (first 2 bytes)] *Write information ID: Class ID (2 bytes) + Instance ID (2 bytes) + Attribute ID (operation command is the service code) (2 bytes) Example: 0x0382000100640000 (writing of “phase and wire type”) • When using Modbus/TCP [Reserved (4 bytes)] + [Variable address (2 bytes)] + [Data to write (first 2 bytes)] Example: 0x0000000020000000 (writing of “phase and wire type”) In the case of EtherNet/IP, there are parameters for which the attribute ID or data to write is saved as fixed to 0x0000.

8.2 Security Functions (Continued)

Reading security history

The security history is read by using the following command.

■ When using EtherNet/IP

Command item	Description
Service code:	0E hex (Reading) (Get_Attribute_Single)
Class ID:	383 hex (Security object)
Instance ID:	01 hex (Fixed)
Attribute ID:	302 hex to 31F hex (1st security history (oldest) to 30th security history (most recent))

■ When using Modbus/TCP

Command item	Description
Read multiple registers:	03 hex
Address:	C406 hex to C40 hex (1st security history (oldest)) : C50B hex to C513 hex (30th security history (most recent))
Number of elements:	The record unit is 9. When reading multiple records, set a multiple of 9.

Command example: 0000,0000,0006,01,03,C50B,0009
(This is a command example for when reading only the most recent one security history.)

Security history suppression

When setting change or operation instruction commands are accepted five times while in the settings locked state, security history will not be saved. However, saving will resume under the following conditions:

- 60 seconds have elapsed.
- Power of the Unit is turned OFF or a software reset is performed.

9.1 KM-PM-EIP Main Unit

● Warnings

Warnings come as errors and alarms. The types of errors and alarms are described below.

Warning type		Description	LED display	Status information	Action to take
Error	Memory error	Internal memory corrupted	Error LED flashing	Bit 0 is ON	Repair is necessary. Contact the place of purchase or the manufacturer.
Alarm	V_R open phase warning	The voltage has not reached the rated value.	Alarm LED flashing	Bit 1 is ON	There may be an issue such as the wiring to the voltage input terminal being loose, so that voltage does not reach the rated value for each phase due to miss-wiring. Redo the wiring correctly to match the phase and wire type you are using.
	V_S open phase warning			Bit 2 is ON	
	V_T open phase warning			Bit 3 is ON	
	Input frequency warning	Measured frequency is outside rated ranges		Bit 4 is ON	Input the power and voltage with the frequency within the rated ranges.
	Phase sequence error	The phase sequence is wrong for 3-phase 4-wire, 1-phase 3-wire, or 3-phase 3-wire connection.		Bit 5 is ON	The wiring to the voltage input terminal does not match the phase and wire type you are using. Redo the wiring correctly to match the phase and wire type you are using.
	Active power is a negative value	Active power is a negative value. (The voltage and current phase may not match due to incorrect wiring.)		Bit 6 is ON	Redo the wiring correctly according to the situation.*1

*1 If you intend to meter negative values (exported energy), then no correction is necessary. Metering continues normally even when a warning is displayed.

* To cancel the alarm, take the actions described to remove the cause, then switch the power on again.

9.1 KM-PM-EIP Main Unit (Continued)

Check if an issue is covered by the following items if the product doesn't seem to be working correctly.

Phenomena	Description	Action to take	Page
The main unit doesn't start	Is the power LED off?	The unit isn't being supplied with power. Check that the voltage terminals have been wired and that voltage within the rated range is being supplied.	⇨ 34
Cannot measure voltage	Are the voltage connections and phase correct?	Check that the voltage connection matches the phase and wire type you have selected.	⇨ 39
	Have you selected 1P2W2 (1-phase 2-wire voltage selected) or 1P3W2 (1-phase 3-wire composite) as the phase and wire type?	If 1P2W2 or 1P3W2 is selected as the phase and wire type, set “Voltage selected” to match the connected voltage line.	⇨ 58
Cannot measure current	Is the CT connected?	Connect the CT to the main unit. Also check if the CT has become separated from the electric wire.	⇨ 36
	Is the connection positioning of the measuring circuits and the CT terminals correct?	Check that the connected CT matches the selected phase and wire type.	⇨ 36
Voltage and current can be measured, but power cannot be measured	Are the CT fitted back to front?	If negative electricity is being measured, there is a chance that all of the fitted CTs have been fitted back to front. Alternatively, if electricity is being measured is a value near 0, there is a chance that one of the fitted CTs has been fitted back to front.	⇨ 37
	Is the voltage phase correct?	If the phase sequence of the voltage is wrong, power cannot be measured correctly. The occurrence of a phase sequence warning can be checked from the status information. Perform the wiring correctly.	⇨ 39, 58
	Have you selected 1P2W2 (1-phase 2-wire voltage selected) or 1P3W2 (1-phase 3-wire composite) as the phase and wire type?	If 1P2W2 or 1P3W2 is selected as the phase and wire type, set “Voltage selected” to match the connected voltage line.	⇨ 58

9.1 KM-PM-EIP Main Unit (Continued)

Phenomena	Description	Action to take	Page
There is a large discrepancy in measured values	Does the selected phase and wire type match the wiring?	Wire correctly.	⇨ 39
	Do the CT used and CT type set match?	Check the CT type of the CT used, and configure the setting correctly.	⇨ 20
		When performing multi-circuit metering, you need to set the CT type for all circuits.	⇨ 56
	Has the input exceeded the input range of the CT?	Check the primary side current of the CT used, then use a CT appropriate for the rated current value of the circuit for measurement.	⇨ 20
	Is the phase and wire type setting correct?	Check the phase and wire type for the measuring circuits and make the correct settings.	⇨ 26
An abnormal measurement value (instantaneous) is recorded	Did a momentary stop or similar problem occur with the power system that is being measured?	If a momentary stop or similar problem occurs, an abnormal value may be recorded. Check the error history of the power system that is being measured.	---
	If a momentary stop or similar problem occurs, an abnormal value may be recorded.	If the power of the measurement target is turned OFF during communication, the measurement value (instantaneous) at the moment the power turned OFF may be recorded. Stop reading from the host device and then turn off the power of the measurement target.	---
Unable to change the settings by communications messages because forgotten the password	---	Press and hold [NW INTL] (network setting initialization button) on the Main Unit for three seconds to initialize the network-related setting values.	---

9.2 Using the Tools

This section describes the troubleshooting for using the Software Tool.

Using the Software Tool

Phenomena	Cause	Possible correction	Reference
Communication with the KM-PMBN Main Unit from the Software Tool is not possible	The IP address of the computer is automatically acquired or fixedly set to a segment different from the IP address of the Main Unit.	Set the IP address of the computer to IP address of same segment as the Main Unit.	---
	The IP address setting of the Main Unit on the project is different from the actual IP address.	Reset the IP address of the target Main Unit on the Setting KM-PMBN Screen.	---

9.3 Using EtherNet Communications

This section shows troubleshooting when using the EtherNet/IP or Modbus TCP.

EtherNet/IP

Phenomena		Cause	Possible correction	Reference
EtherNet/IP communications can not be executed when using BOOTP mode or DHCP mode	NS LED is not lit	IP address has not been acquired from the BOOTP/DHCP server	Check the connection between BOOTP/DHCP server and the Main Units. If you do not have a BOOTP/DHCP server, press and hold [NW INTL] (network setting initialization button) for 3 seconds to initialize the network-related setting values.	---
EtherNet/IP communications are not possible.	NS LED lighting red	The IP address of the built-in EtherNet/IP port is also used as the IP address of another node.	Change the IP address setting to avoid duplication Then, perform a restart.	
	NS LED is not lit	An Ethernet link OFF was detected	Check the connection between the switching hub and the Main Units to see if the following items are normal. • Whether the Ethernet cable is broken, loose, or disconnected • Power state of the switching hub • Communications settings of the switching hub	
A timeout occurred in a tag data link.	NS LED blinking red	Communications with the originator device timed out.	Make sure the following items are normal on the communications route. • Whether the Ethernet cable is broken, loose, or disconnected • Power supply state and operation state of the originator • Power state of the switching hub • State of noise	

Modbus TCP

Phenomena		Cause	Possible correction	Reference
Modbus TCP communication is not possible when using BOOTP mode or DHCP mode	NS LED is not lit	An IP address has not been obtained from the BOOTP/DHCP server.	Check the connection between the BOOTP/DHCP server and the Main Units. If you do not have a BOOTP/DHCP server, press and hold [NW INTL] (network setting initialization button) for three seconds to initialize the network-related setting values.	---

A.1 Specifications

■ Main unit specifications

Item	Description
Rated input voltage (common with power supply voltage)	3-phase 4-wire: 100 to 277 VAC (L-N), 173 to 480 VAC (L-L) 1-phase 2-wire: 100 to 277 VAC 1-phase 3-wire: 100 to 240 VAC (L-N), 200 to 480 VAC (L-L) 3-phase 3-wire 1-phase ground: 100 to 480 VAC (L-L) 3-phase 3-wire contactless ground: 173 to 480 VAC (L-L)
Rated frequency	50/60Hz
Allowable power supply voltage range	85% to 115% of the rated input voltage
Power consumption	15 VA or less
Ambient operating temperature	-25 to 55°C (with no icing or condensation)
Ambient operating humidity	25% to 85%RH
Storage temperature	-25 to 85°C (with no icing or condensation)
Storage humidity	25% to 85%RH
Dielectric strength voltage	1) Between the set of voltage input terminals + set of current input terminals and the LAN port: 2,000 VAC for 1 minute 2) Between all terminals and the case: 2,000 VAC for 1 minute
Insulation resistance	1) Between the set of voltage input terminals + set of current input terminals and the LAN port: 20 MΩ min. (at 500 VDC mega) 2) Between all terminals and the case: 20 MΩ min. (at 500 VDC mega)
Vibration resistance	Single amplitude: 0.35 mm, Acceleration: 50 m/s^2, Frequency: 10 to 55 Hz 10 sweeps for 5 minutes along the 3 axes
Shock resistance	150 m/s^2, 3 times each in the up, down, left, right, forward, and back directions
Electromagnetic environment	Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)
Weight	250 g
Degree of protection	IP20 (excluding LAN port section)
Mounting	Attaching the DIN rail
Altitude	Under 2,000 m
Applicable standards	CE, UKCA Installation environment: EN61010-2-030, Pollution degree 2, Overvoltage/measurement category II (L-N: 480 V) and III (L-N: 300 V) EMC: EN61326-1, Class A (EMI), Industrial environment (EMS) UL • UL61010-1 Pollution degree 2, Overvoltage category II (L-N: 480 V) and III (L-N: 300 V) • UL61010-2-030 Measurement category II (L-N: 480 V) and III (L-N: 300 V) CSA • CAN/CSA C22.2 No.61010-1 Pollution degree 2, Overvoltage category II (L-N: 480 V) and III (L-N: 300 V) • CAN/CSA C22.2 No.61010-2-030 Measurement category II (L-N: 480 V) and III (L-N: 300 V) Korean Radio Waves Act KSC9610-6-2, KSC9811 RCM EN61326-1

A.1 Specifications (Continued)

■ Input specifications

Item	Description
Applicable circuit type	3-phase 4-wire, 1-phase 2-wire, 1-phase 3-wire, 3-phase 3-wire
Number of measuring circuits	3-phase 4-wire : Maximum of 1 circuit 1-phase 2-wire : Maximum of 4 circuits 1-phase 3-wire, 3-phase 3-wire : Maximum of 2 circuits
Connectable CTs	Special CT
CT secondary side rated current	According to the rating of Special CT
Maximum current for CT secondary side	According to the rating of Special CT

■ Communications specifications

Item		Specifications
Communications protocols		TCP/IP, UDP/IP
Supported services		Modbus/TCP (server) EtherNet/IP (tag data link (Class 1)), CIP message communications (Class 3/UCMM) BOOTP (client), DHCP (client) ACD LLDP (agent: transmission function only)
Number of ports		1
Physical layer		100BASE-TX
Ethernet interface		AutoNegotiation, AutoMDI/MDI-X
Transmission specifications		
	Media access method	CSMA/CD
	Modulation	Baseband
	Topology	Star
	Baud rate	100 Mbps (100BASE-TX)
	Transmission media	Twisted pair cable (shielded: STP): Category 5/5e or higher
	Transmission distance	100 m max. (distance between hub and node)
	Number of cascade connections	No restrictions with respect to use of a switching hub

A.1 Specifications (Continued)

■ Measurement specifications (50A CT, 100A CT, 200A CT, 400A CT, 600A CT)

Item	Description
Measurement item	Active energy (Active / Regenerative / Reactive), Power (Active / Reactive), Current, Voltage, Power factor, Frequency
Active power	0.5%* (IEC62053-22 class 0.5S)**
Reactive power	2%* (IEC62053-23 class 2)**
Measurement frequency	80 ms (at 50 Hz), 66.7 ms (at 60 Hz)
Functions	Conversion

* This does not include the error margin of the special CT.
** IEC62053 is an international standard dealing with electricity metering.

■ Measurement specifications (5A CT)

Item		Description
Measurement item		Active energy (Active / Regenerative / Reactive), Power (Active / Reactive), Current, Voltage, Power factor, Frequency
Accuracy*1*2*3	Voltage*4	±0.5% of F.S. ±1 digit
	Current*5	±0.5% of F.S. ±1 digit
	Power	±1.0% of F.S. ±1 digit (power factor = 1)
	Frequency	±0.2 Hz ±1 digit
Influence of temperature*6		±1.0% of F.S.
Influence of frequency*7		±1.0% of F.S.
Influence of harmonics*8		±0.5% of F.S.
Measurement frequency		80 ms (at 50 Hz), 66.7 ms (at 60 Hz)
Functions		Conversion

*1. This does not include the measuring error margin of the special CT.
*2. Value when ambient temperature of 23°C, rated input, and rated frequency.
*3. 10% or more of the rated input current
*4. For the voltage between R and T phases, the accuracy is ±1.0% of F.S ±1 digit under the same conditions.
*5. For the S phase current of 3-phase 3-wire and N phase current of 1-wire 3-phase, the accuracy is ±1.0% of F.S ±1 digit under the same conditions.
*6. Percentage with respect to measurement value when within operating temperature range, ambient temperature of 23°C, rated input, rated frequency, and power factor of 1.
*7. Percentage with respect to measurement value when within range of rated frequency ±5 Hz, ambient temperature of 23°C, rated input, rated frequency, and power factor of 1.
*8. Error margin when ambient temperature of 23°C and superimposed the 2nd, 3rd, 5th, 7th, 9th, 11th, and 13th harmonics with content percentages of 30% current and 5% voltage relative to the fundamental wave.

A.1 Specifications (Continued)

■ Special CT specifications

Item \ Model	KMPCBE005	KMPCBE050	KMPCBE100	KMPCBE200	KMPCBE400	KMPCBE600*
Primary side rated current	5 A	50 A	100 A	200 A	400 A	600 A
Rated voltage	480 VAC					
Secondary winding	3,000 turns				6,000 turns	9,000 turns
Insulation resistance	Between output terminals and case: 50 mΩ min.					
Dielectric strength voltage	Between output terminals and case: 2,000 VAC for 1 minute					
Protective element	7.5 V clamp element					
Allowable number of attachments and detachments	100 times					
Diameter of wire attachable	7.9 mm dia. max.	9.5 mm dia. max.	14.5 mm dia. max.	24.0 mm dia. max.	35.5 mm dia. max.	
Operating temperature and humidity ranges	-25 to 55°C, 25% to 85%RH (with no icing or condensation)					
Storage temperature and humidity ranges	-30 to 65°C, 25% to 85%RH (with no icing or condensation)					
Supplied cable length	2.9 m					
Supplied cable terminals – Output side	Ferrule terminal					
Supplied cable terminals – CT side	Round terminal					

When using the CT as a set with the KM-PMBN-EIP Power Monitor, also consider the operating environment conditions of the power monitor.
Consider the operating environment conditions of the device that is used as a set with this CT.

* The CT with a 600 A rating (KM-PCBE600) does not support safety standard certification, including UL/CSA certification.

A.2 Tag Data Link Connection Setting Procedures

● Preface

The internal data (parameters) of the tag data link supported by the Main Unit is assigned to any one of the four tag sets. Therefore, it is necessary to select the tag set to use according to the purpose of the customer, and then set it. See below for the size and contents of the four tag sets.

Size and Contents of Tag Sets

Identification number (Instance ID of Assembly object)	Remarks	Function
64 hex (Input_100)	Output connection (Size: 136 bytes)	• Status information • Voltages 1 to 3, currents 1 to 3 : Measured values such as converted values (e.g. K_JPY)
65 hex (Input_101)	Output connection (Size: 136 bytes)	• Status information • Voltages 1 to 3, currents 1 to 3 : Measured values such as converted values (e.g. K_JPY)
66 hex (Input_102)	Output connection (Size: 136 bytes)	• Status information • Voltages 1 to 3, currents 1 to 3 : Measured values such as converted values (e.g. K_JPY)
67 hex (Input_103)	Output connection (Size: 136 bytes)	• Status information • Voltages 1 to 3, currents 1 to 3 : Measured values such as converted values (e.g. K_JPY)

● Using the CS/CJ-series

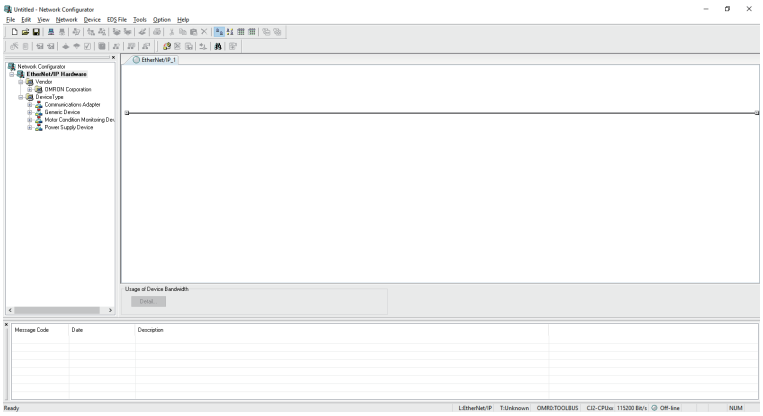
You can set tag data link settings using the Network Configurator for EtherNet/IP.
When using the CS/CJ-series PLC as an originator, use the Network Configurator for EtherNet/IP supporting the model and version of the CPU Unit. (Refer to the CS/CJ Series EtherNet/IP Units Operation Manual (Cat. No. W465) for the setting status of the setting tool.)

The setting method when the CS/CJ-series PLC is an originator is as follows.

A.2 Tag Data Link Connection Setting Procedures (continued)

1 Starting the Network Configurator for EtherNet/IP

To start the Network Configurator, select All Programs | OMRON | CX-One | Network Configurator for EtherNetIP | Network Configurator from the Windows Start Menu.
The Main Window consists of a Hardware List and a Network Configuration Pane, as shown in the following diagram.

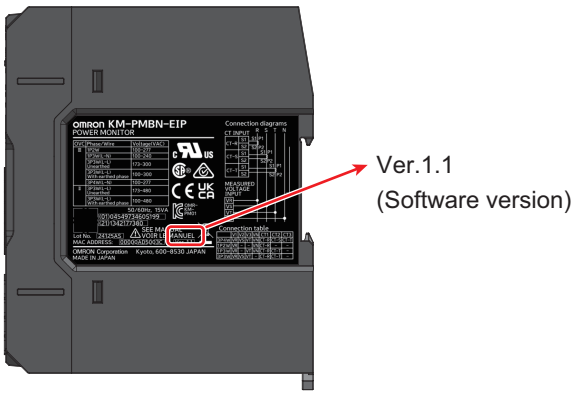


2 Installing EDS Files

To configure KM-PMBN-EIP as an EtherNet/IP tag data link communications target, install the EDS file containing the configuration information of the KM-PMBN-EIP in the Network Configurator. Once this installation is done, this operation is unnecessary from the next setting.

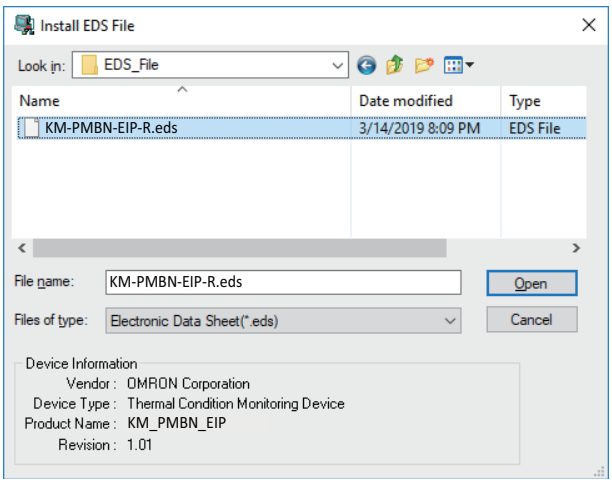
EDS files can also be downloaded from our website.
Register the CIP revision corresponding to the EIP CPU version on the side label of the Main Unit.

Software version	CIP revision	
	Major revision	Revision on the Hardware list
Ver.1.1	1	Rev1



A.2 Tag Data Link Connection Setting Procedures (continued)

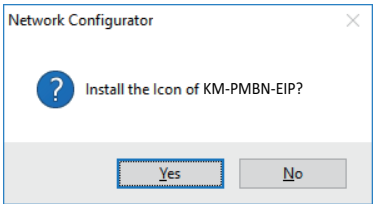
Select EDS File (S) | Install (I) ... on the menu bar.



After selecting the following EDS file, click Open and install it.

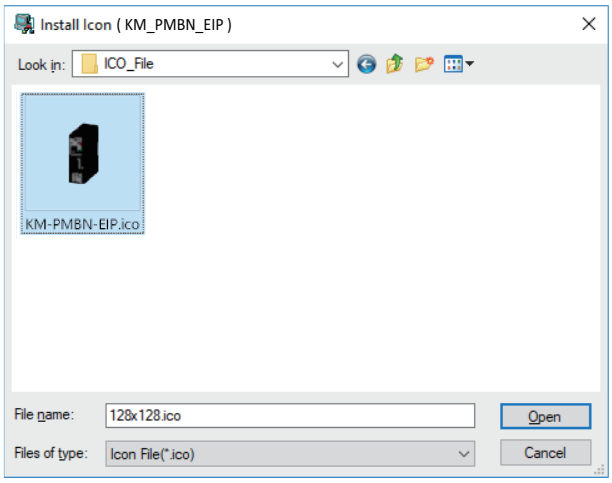
Model name of the KM-PM	EDS file name
KM-PMBN-EIP	KM-PMBN-EIP-R1.eds

At this time, an icon confirmation message will be displayed. Click Yes (Y).



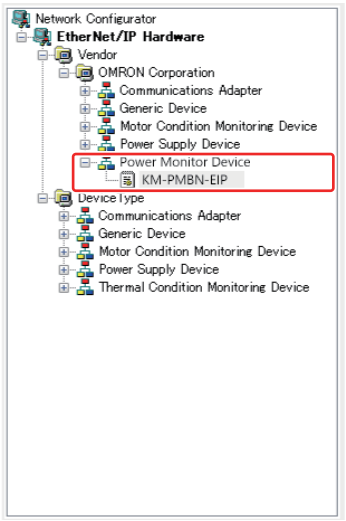
After selecting the following ICON file, click Open and install it.

Model name of the KM-PM	ICON file name
KM-PMBN-EIP	KM-PMBN-EIP.ico



A.2 Tag Data Link Connection Setting Procedures (continued)

When the installation is completed, the device is added to the hardware list.

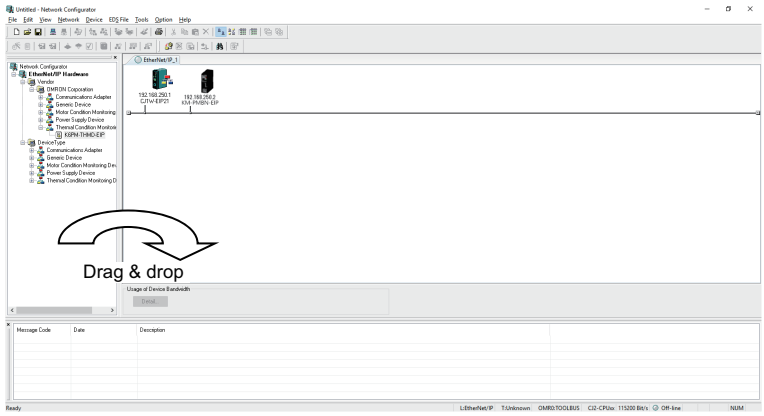


3 Registering devices

(1) Device registration to the network configuration

Register the EtherNet/IP devices which participate in the tag data links in the Network Configuration Window.

From the hardware list, you can register a PLC as an originator device and Main Units, by dragging and dropping each device at a time, or by selecting and double-clicking it.
As an example, register a CJ1W-EIP21 (Rev 3) in the "Communications Adapter" categories an originator device and register a KM-PMBN-EIP as a target device.



Note Select the same model as the device you use and register it.

A.2 Tag Data Link Connection Setting Procedures (continued)

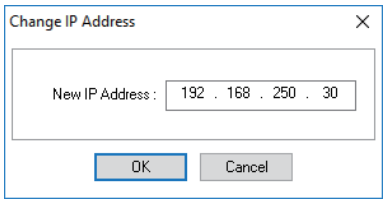
The device names and major CIP revisions (Rev □) are displayed in the hardware list.
The device name and the major CIP revision of the CS/CJ-series CPU Unit are as follows.

Device name in hardware list	Unit version	CIP revision	
		Major revision	Revision name in hardware list
CJ2B-EIP21	Unit version.2.0 and 2.1	2	Rev2
	Unit version.3.0	3	Rev3
CJ2M-EIP21	Unit version.2.0 and 2.1	2	Not available.
CJ1W-EIP21	Unit version.1.0	1	Rev1
	Unit version.2.0 and 2.1	2	Rev2
	Unit version.3.0	3	Rev3
CS1W-EIP21	Unit version.1.0	1	Rev1
	Unit version.2.0 and 2.1	2	Rev2
	Unit version.3.0	3	Rev3
CJ1W-EIP21(CJ2)*1	Unit version.2.0 and 2.1	2	Rev2
	Unit version.3.0	3	Rev3

*1. This shows the case where the CJ1W-EIP21 Unit is mounted on the CJ2 CPU Unit.

(2) Device Node Address (IP Address) Setting

Set the node address (IP address) of the device to be used.
In the Network Configuration Window, click the device you want to change the node address IP address), right click and select Change Node Address (A)....
Enter the node address (IP address) of the device to be used actually, and click OK.



A.2 Tag Data Link Connection Setting Procedures (continued)

4 EtherNet/IP Connection Settings

The procedure of creating the tag sets and setting the connections is described below. The internal data (parameters) of the tag data link supported by the Main Unit is assigned to any one of the four tag sets. Therefore, it is necessary to select the tag set to use according to the purpose of the customer, and then set it.

(1) Create Tag sets and Tags

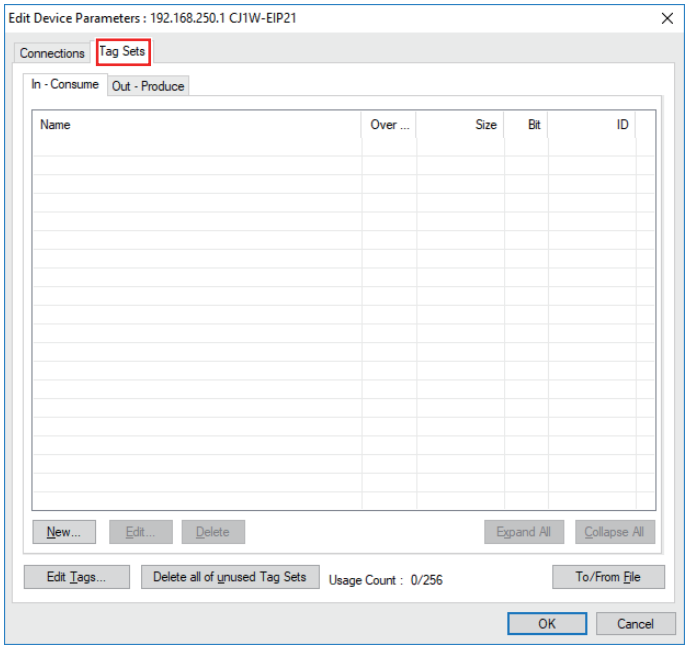
Create tag sets and those members tags necessary for connection for the registered EtherNet/IP Unit. For tags, you can set the I/O memory address or network symbols used by the control program (CJ2H-CPU6□-EIP/CJ2M-CPU3□, CJ2H-CPU6□ Ver.1.6 or higher, or CJ2M-CPU1□ Ver.2.2 or higher).

Information
The setting contents depend on the originator device connecting the KM-PM series.
For detailed settings, refer to the manual of the originator device.
• "SYSMAC CS/CJ Series EtherNet/IP Units Operation Manual (Cat. No. W465)"

Information
Tag set names and tag names can also be created in advance using the CX-Programmer. When creating in advance, make them the same names as the tags to be created with the Network Configurator. You can also use them as symbol variables of PLC by sharing them with CX-Programmer by importing from or exporting to a file the tag set names and tag names of PLC edited with Network Configurator.
For detailed settings, refer to the manual of the originator.
• "SYSMAC CS/CJ Series EtherNet/IP Units Operation Manual (Cat. No. W465)"

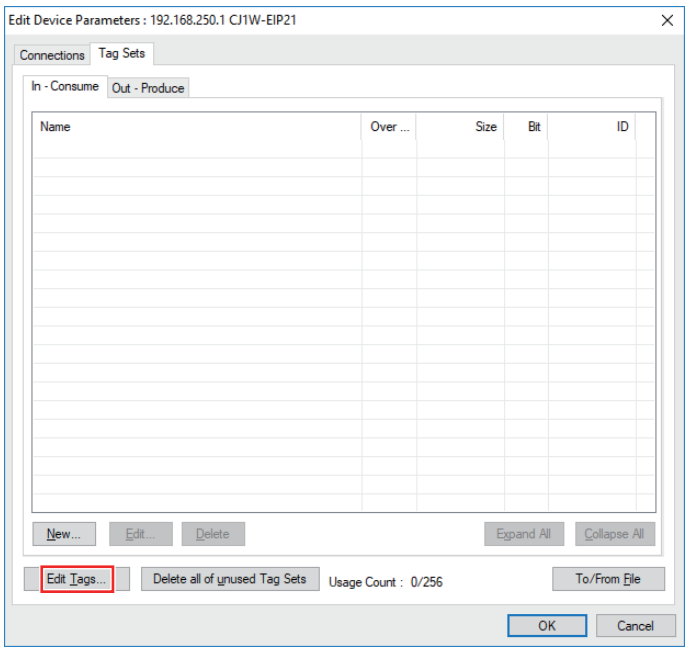
(1)-1 Tag Editing

Select the device (e.g., CJ1W-EIP21) for editing the tag set and the tag.
Then right-click it and select Parameter (P) | Edit (E) ... or double-click it.



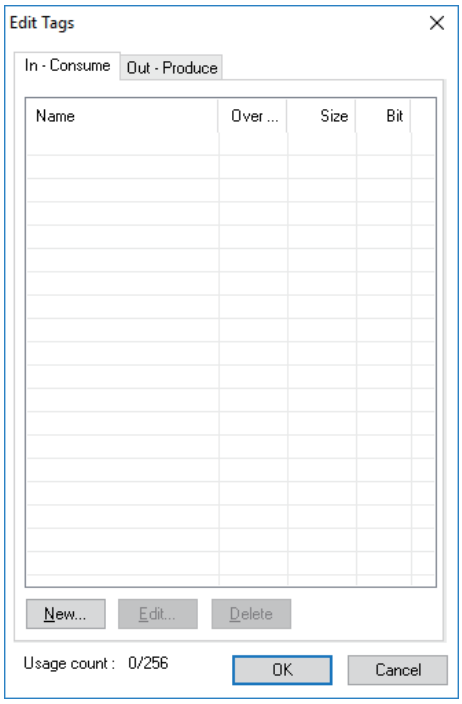
A.2 Tag Data Link Connection Setting Procedures (continued)

Click the Tag Sets Tab at in the Edit Device Parameters Dialog Box.



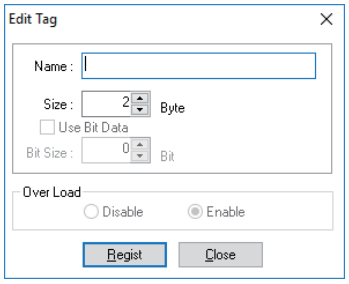
Information
If you have created network symbols, tag set names and tag names in advance with the CX-Programmer and have the exported file (.CSV), click To/From File at the lower right, select Import from File.... By doing so, you can omit the following "(1) -1 Tag editing" and "(1) -2 Editing tag set" below.

Click Edit Tag (T) ... in the Edit Device Parameters Dialog Box to edit tag sets.



A.2 Tag Data Link Connection Setting Procedures (continued)

To enter tags, there are tabs for Input (Consume) and Output (Produce), but set only the Input (Consume) tab when connecting the KM-PM series. Select the In - Consume Tab and click New (N) ..., the Edit Tags Dialog Box will be displayed.



Enter the tag name and its size (136 bytes), and click Register (R).

As a "tag name", enter the character string for the CPU Unit's I/O memory address or a network symbol (e.g., 100, W100, D0, Input_Signal).
Addresses in the following I/O memory areas can be set.

CPU Unit's data area		Address Range
CIO Area		0000 to 6143
Holding Area		H000 to H511
Work Area		W000 to W511
DM Area		D00000 to D32767
EM Area	Bank 0 hex	E0_00000 to E0_32767
	:	:
	Bank 0 hex	E18_00000 to E18_32767

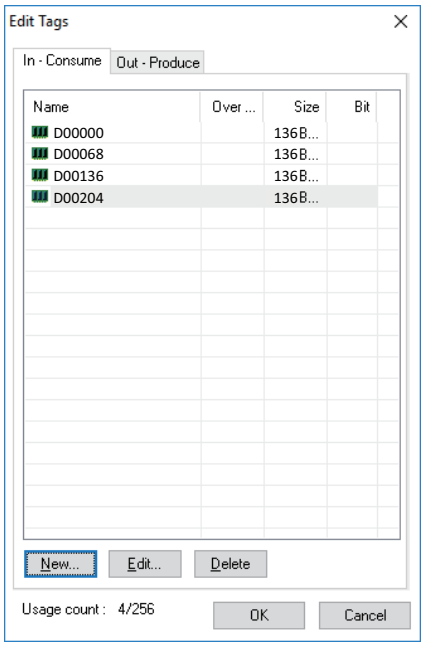
Information
Here, create a symbol that matches the name of the I/O memory address used in the PLC or the name of the network symbol (input).

Continue to edit tags. Click Close (C) to end tag editing.

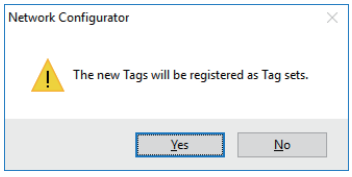
A.2 Tag Data Link Connection Setting Procedures (continued)

As an example, register a tag with the following information:
Tag name: "D00000"
Size: 136 bytes
Register the tag according to the required number of connections.

The tags registered are displayed in the Edit Tag Dialog Box.



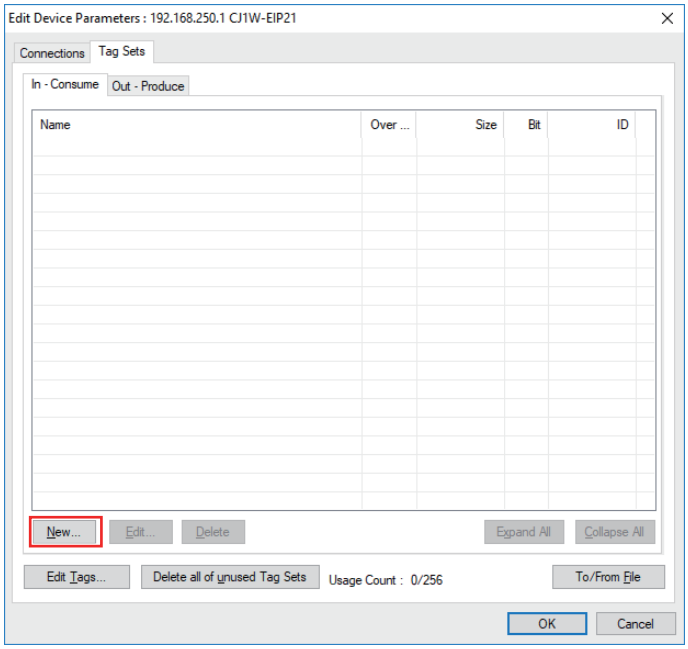
Click OK in the Edit Tag Dialog to register tags and complete tag editing.
At that time, if you have created a new tag, the following confirmation message will be displayed. To register the tag name as it is as the tag set name, click Yes (Y). If you register the tag name as it is as the tag set name, one tag is registered as one tag set. Here, when selecting Yes (Y), you can omit "(1) -2. Editing tag set" for the newly created tag.



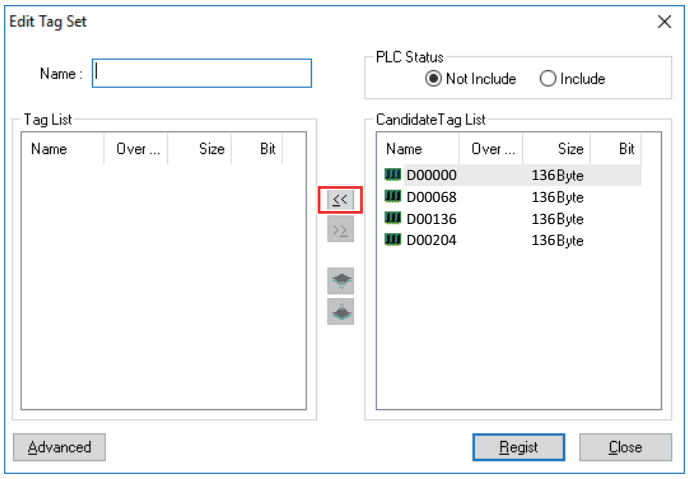
A.2 Tag Data Link Connection Setting Procedures (continued)

(1)-2 Editing tag set

To enter tags, there are tabs for Input (Consume) and Output (Produce), but set only the Input (Consume) tab when connecting the KM-PM series.
For editing tag set, click New (N) ... in the following Edit Tag Set Dialog Box.



The Edit Tag Set Dialog Box is displayed.



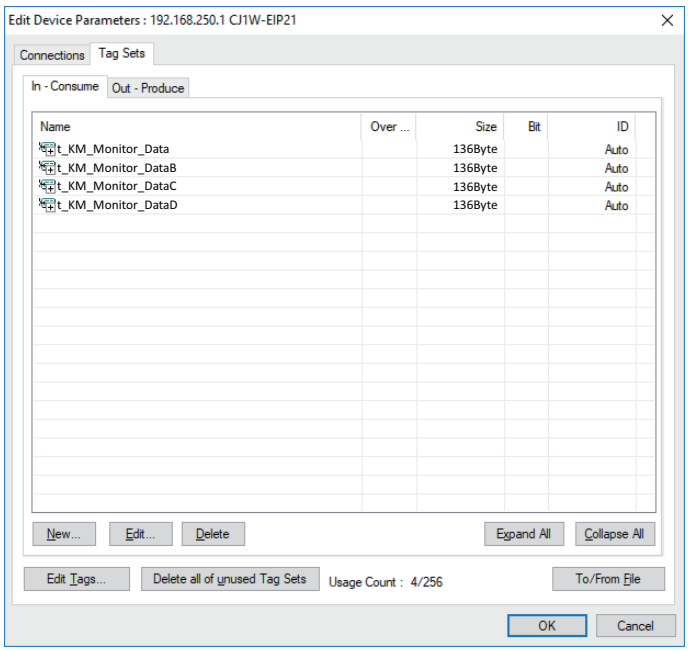
Enter the tag set name, select from the candidate tag list the tag to be a member, and add it by clicking the << (add tag) Button at the center or by double-clicking it.
After adding a member, you can register tag set by clicking Register (R).
In this example, we set “t_KM_Monitor_Data”, “t_KM_Monitor_DataB”, “t_KM_Monitor_DataC”, and “t_KM_Monitor_DataD” as the tag set names.

Information
If you add a tag without specifying a tag set name and click Register (R), the tag name at the top of the tag list is automatically entered as the tag set name.

Continue to edit tag sets. Click Close (C) to end tag set editing.and return to the Edit Tag Set Dialog Box.

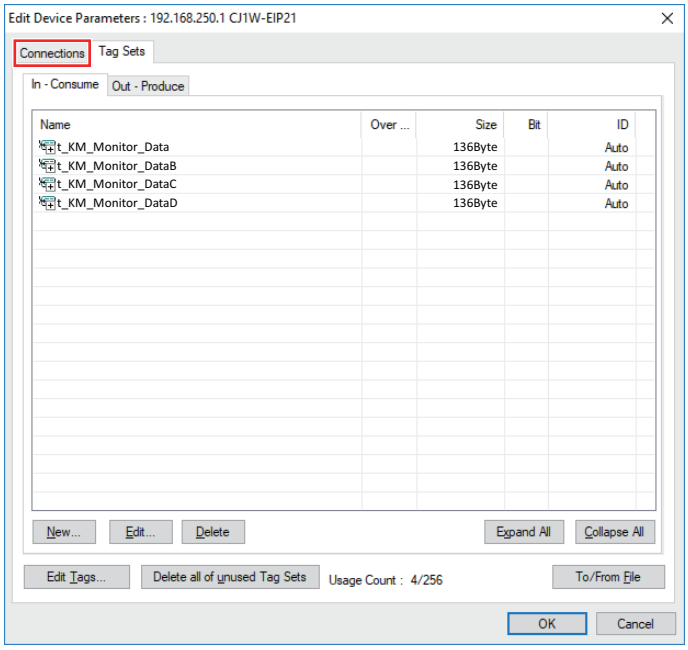
A.2 Tag Data Link Connection Setting Procedures (continued)

The registered tag set is displayed.



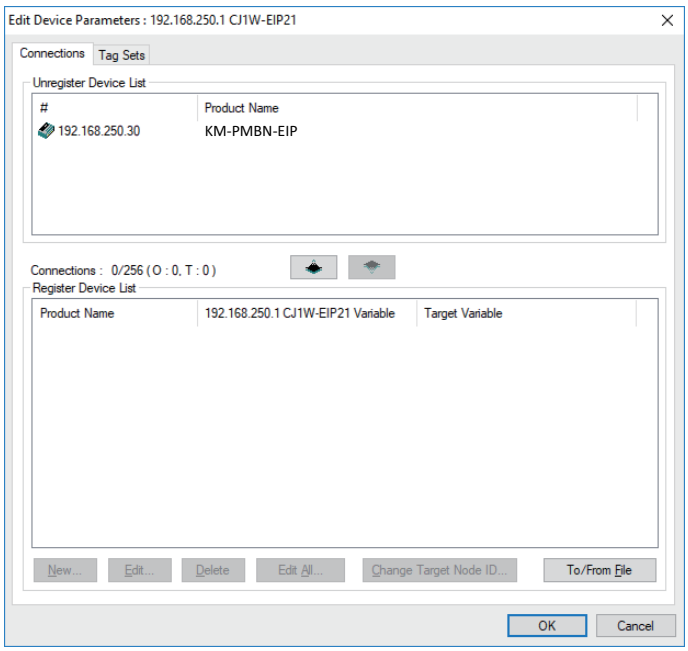
(1) EtherNet/IP Connection Settings

Set communications parameters for tag data link communications.
Select the Connections Tab in the Edit Device Parameters Dialog Box,

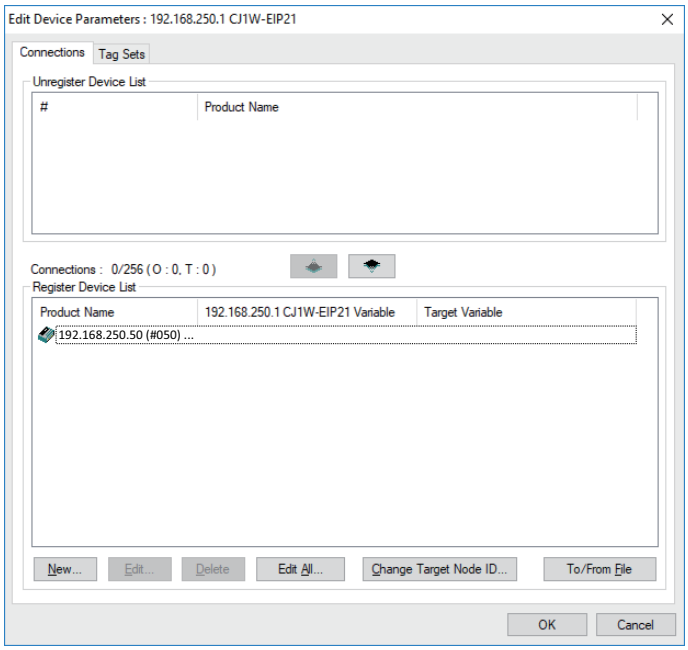


A.2 Tag Data Link Connection Setting Procedures (continued)

The Connection Edit is displayed in the Edit Device Parameters Dialog Box.

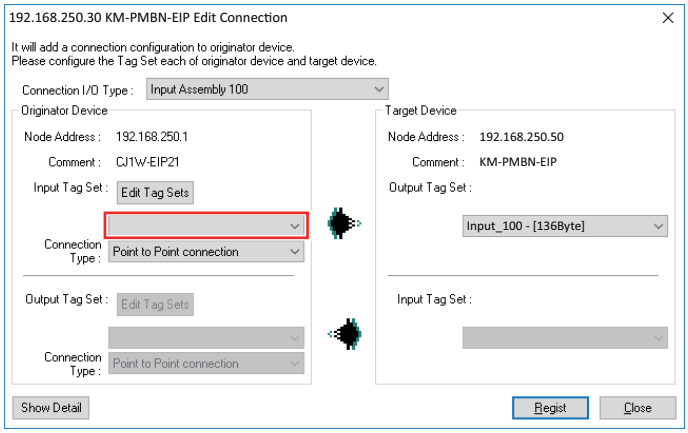


Select the KM-PM series, and then click the middle  (Add device) Button to register the connection in the tag data link.



A.2 Tag Data Link Connection Setting Procedures (continued)

Select the KM-PM series displayed in the registered device list, click New (N) ... or double-click the device, the Connection Allocation Dialog Box will be displayed.



The default values of each parameter are displayed, and then set the following items.

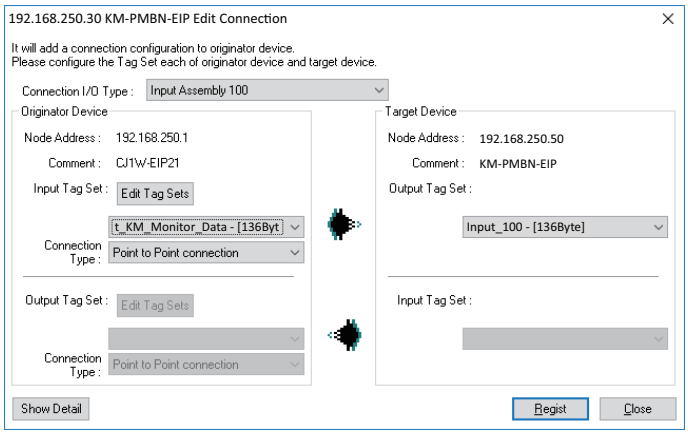
- Connection I/O Type
  Set the connection to register from the drop-down list. The output tag set is automatically selected according to the setting.

Connection I/O Type	Output tag set
Input Assembly 100	Input_100 - [136Byte]
Input Assembly 101	Input_101 - [136Byte]
Input Assembly 102	Input_102 - [136Byte]
Input Assembly 103	Input_103 - [136Byte]

- Input tag set
  Select the tag set name edited in "(1) -2. Editing tag set" from the drop down list and set it.
- Packet interval (RPI)
  From the setting range of KM-PMBN-EIP (250 ms to 10,000 ms), set the data send interval from KM-PMBN-EIP according to the system.
- Timeout value
  Select the timeout value at the occurrence of a communications error from the pull down list and set it. The value can be set by multiple of packet interval (RPI). (4 times, 8 times, 16 times, ..., 512 times)

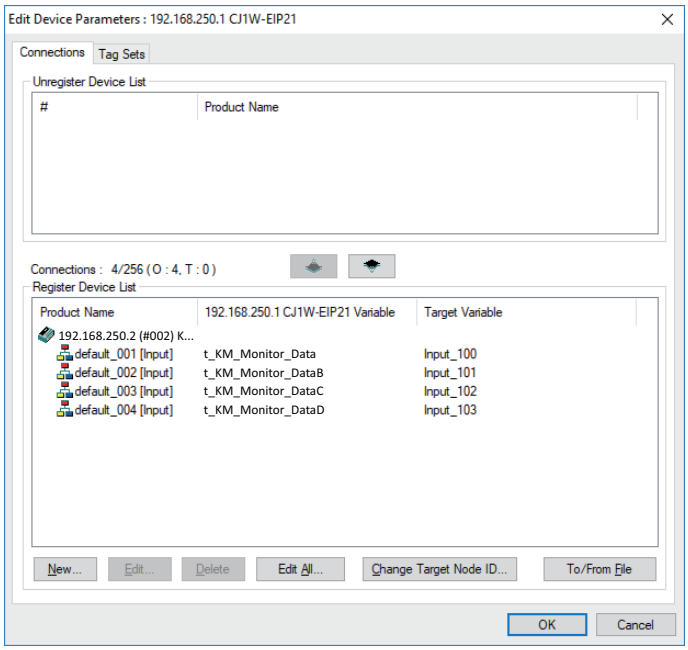
Information
If detailed parameters (i.e., packet interval (RPI), timeout value) are not displayed, it can be displayed by clicking Show Detail.

A.2 Tag Data Link Connection Setting Procedures (continued)



Click Register after connection allocations, then connection allocations are completed. Register the connections one by one. Click Close and return from the Connection Allocation Dialog Box.

When the setting is completed, it is displayed as follows.



Setting is completed by clicking OK at the lower right.

A.2 Tag Data Link Connection Setting Procedures (continued)

5 Downloading settings

Connect online to the originator device and download the configuration settings.

(1) Online

Select the communications interface to use from Option (O) | Select Interface (I) on the menu bar. (This operation is unnecessary if interface is not changed after interface setting.)

Then, select Network (N) | Connection (C) ... on the menu bar or click  (Online button) to go online to the EtherNet/IP network.
After online, select the originator device (PLC) to download, right click it and select Parameter (P) | Download (D) and download it.

Information
For details on online and download operations, refer to the manual of the originator device.
For detailed settings, refer to the manual of the originator device.
• "SYSMAC CS/CJ Series EtherNet/IP Units Operation Manual (Cat. No. W465)"

● Using the NJ/NX-series

With the Sysmac Studio Ver.1.10 or higher, tag data link (EtherNet/IP connection) setting is possible when using NJ/NX-series PLC as a tag data link originator.

Creating Network Variables (Input)

Create Input area in the PLC to receive Input data from KM-PMBN-EIP devices.
The setting method for the NJ/NX-series PLC is shown below.

1 Starting the SysmacStudio

Start the SysmacStudio in one of the following ways.
– Double-click the shortcut icon of Sysmac Studio on the desktop.

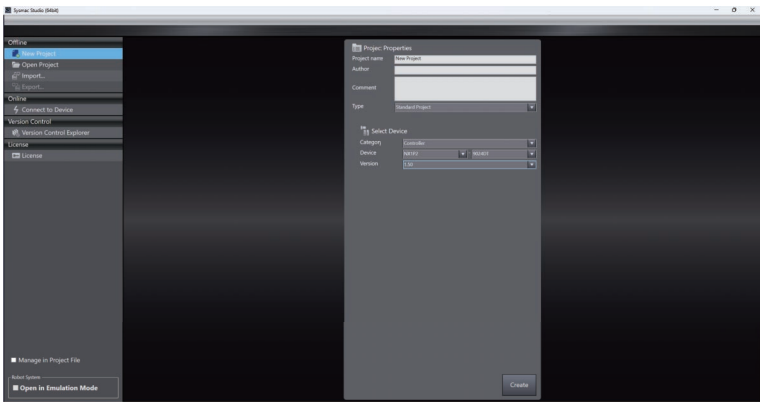
– To start the Sysmac Studio, select All Programs | OMRON | Sysmac Studio | Sysmac Studio from the Windows Start Menu.

A.2 Tag Data Link Connection Setting Procedures (continued)

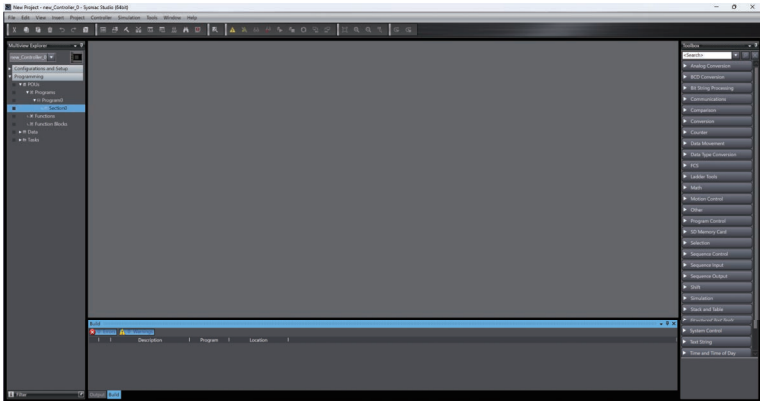
2 Creating Project File

Click New Project in the upper left in the start page.
To edit an existing project file, click Open Project and select the saved project.

Enter the Project name, author, and comment in the Project Properties Dialog Box, select the device category, the device (PLC model) to use and its version, and then click the Create Button. (Only the project name is required.)



When you finish setting Project Properties, the following screen will be displayed.



A.2 Tag Data Link Connection Setting Procedures (continued)

3 Creating Network Variables (Input)

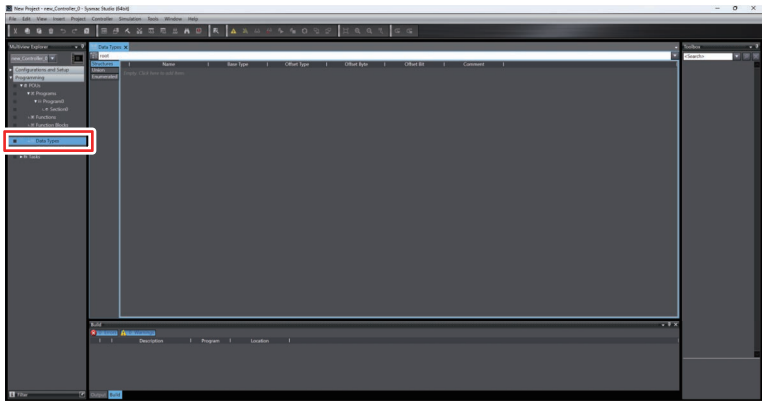
Create network variables to be the input area in the PLC.
The KM-PMBN-EIP sends four tag sets (136 bytes each) as the input data, so create the network variable as a structure variable or array variable.
This section shows how to create structure variables. (For array variables, the following "(1) data type registration" are unnecessary.)

(1) Registering Data Type

Create a structure type as the basis with the following procedure to create a structure type network variable (136 bytes each) for receiving the input data of the KM-PMBN-EIP.

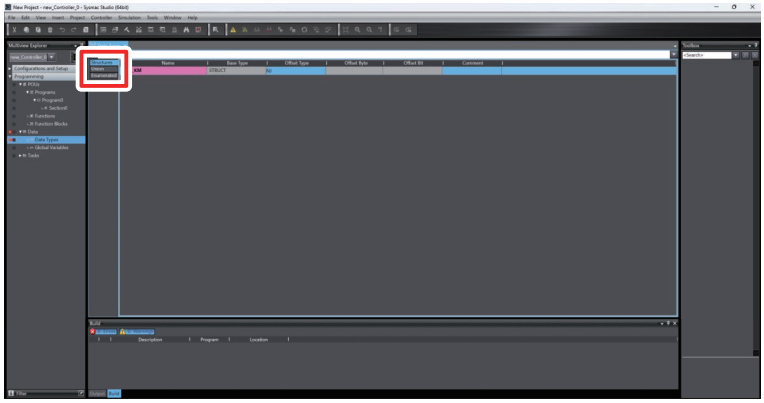
(1)-1 Opening the Data Types Tab Page

Double-click Data Type under Programming | Data in the Multiview Explorer, or right-click Data Type and select Edit from the menu.



(1)-2 Registering structure Type

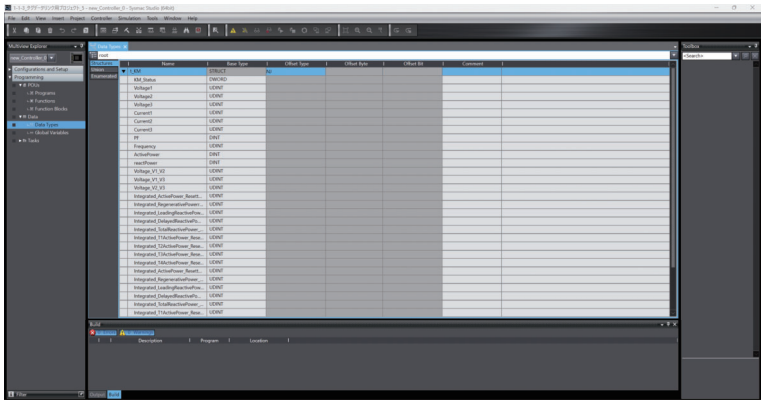
Click the Structures Side Tab in the Data Type Editor, and then the Structure Data Type Editor is displayed.
In the Data Type Editor, press the Insert Key or right-click and select Create New Data Type (N), and enter a structure name. As an example, we set "t_KM" here. An error is displayed because there is no structure member registration at this time.



A.2 Tag Data Link Connection Setting Procedures (continued)

(1)-3 Adding structure Members

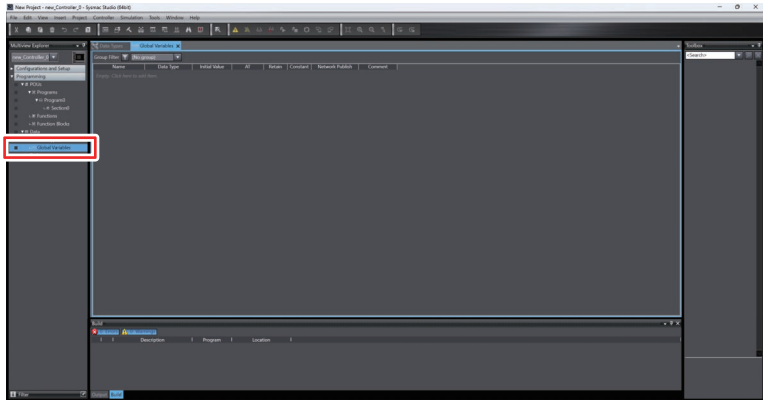
Right-click the structure data type you just created and select Create New Member (M) from the menu.
Register members and data types to match data received from the Main Unit.
The registered Pane will be as follows. The member name can be changed as appropriate.



(2) Network Variables (Input) Definition

(2)-1 Opening the Global Variable Tab Page

Double-click Global Variables under Programming | Data in the Multiview Explorer, or right-click Global Variables and select Edit from the menu.

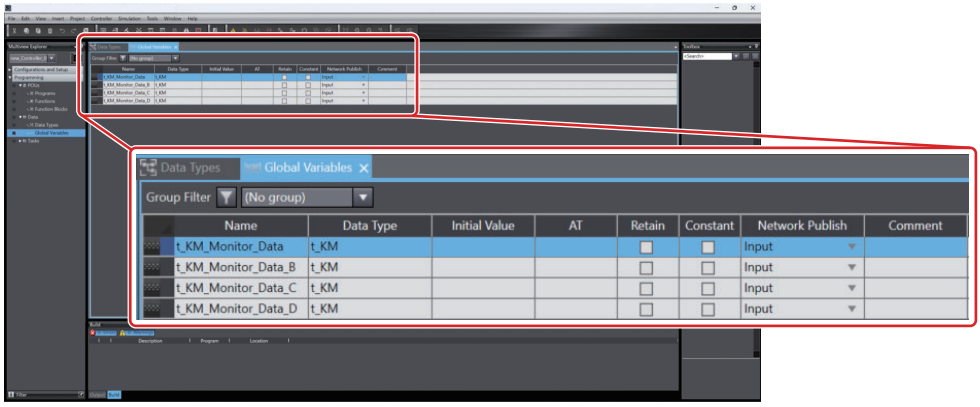


A.2 Tag Data Link Connection Setting Procedures (continued)

(2)-2 Registering Network Variables (Input)

In the global variable table, press the Insert Key or right-click and select Create New (N), and enter a variable name. Next, change Data Type to the structure type name created in "(1) Registering Data Type", and change the Network Publish Attribute to Input from the pull down list. In this example, the names of the network variables (inputs) are set as follows.
t_KM_Monitor_Data
t_KM_Monitor_Data_B
t_KM_Monitor_Data_C
t_KM_Monitor_Data_D

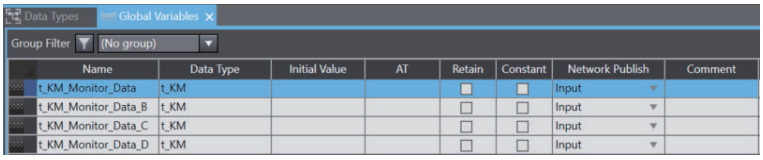
Also, “t_KM” created in “(1) Registering Data Type” is used as the data type.



Associate the network variables created here with the tags used in the EtherNet/IP connection settings described below.

Information

To process the input data as an array variable instead of a structure variable, create a network variable having the required tag set 136 bytes with an array of UINT as Data Type in the following example.



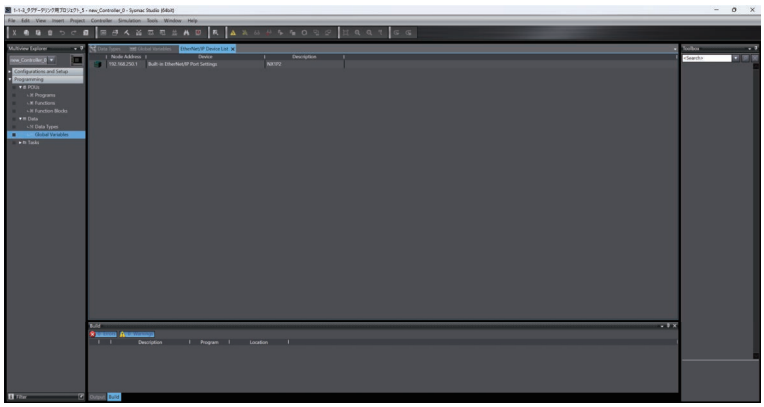
A.2 Tag Data Link Connection Setting Procedures (continued)

4 EtherNet/IP Connection Settings

After creating the network variables (input), perform setting the EtherNet/IP connection for EtherNet/IP tag data link communications.

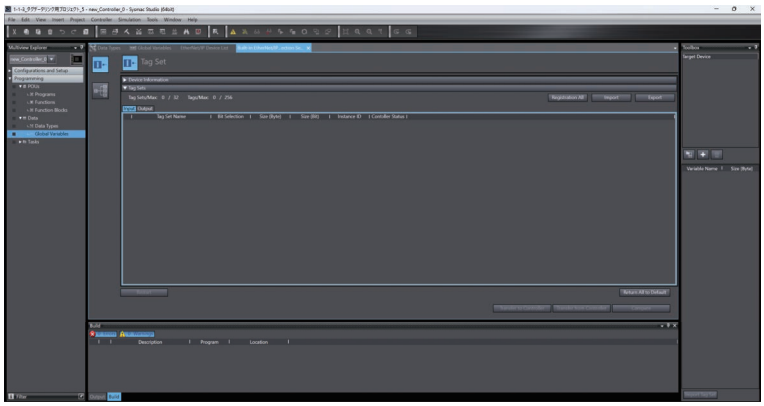
(1) Opening the EtherNet/IP Device List Tab Page

Select Tool (T) | EtherNet/IP Connection Settings (N) on the menu bar.



(2) Opening the EtherNet/IP Connection Settings (Tag Set Display)

Select the EtherNet/IP originator device and double-click it, or right-click the originator device and select Edit (E). (If you use the built-in EtherNet/IP port, only the built-in EtherNet/IP port is displayed as an originator device. In that case select it, highlight it and then operate it.)



(2) Registering the KM-PMBN-EIP Devices to the Network

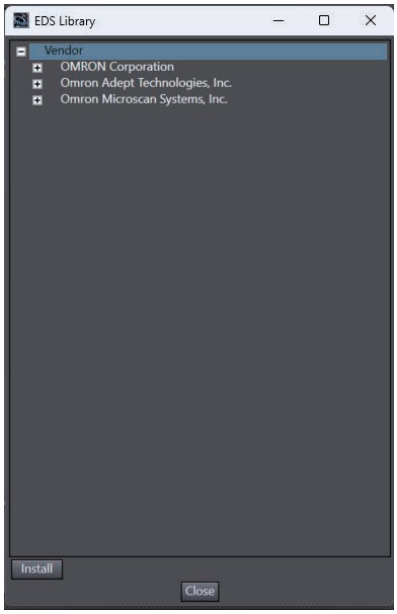
Make the following settings so that the KM-PMBN-EIP device operates as a target.

(3)-1 Installing EDS Files

To configure KM-PMBN-EIP as an EtherNet/IP tag data link communications target, install the EDS file containing the configuration information of the KM-PMBN-EIP in the SysmacStudio. Once this installation is done, this operation is unnecessary from the next setting.
EDS files can also be downloaded from our website.
Register the CIP revision that corresponds to the EIP CPU version indicated on the side label of the Main Unit.
Refer to the label on the side of KM-PMBN-EIP on page 147 of “A.2 Tag Data Link Connection Setting Procedures (⇨ 146)” to check the CIP revision.

A.2 Tag Data Link Connection Setting Procedures (continued)

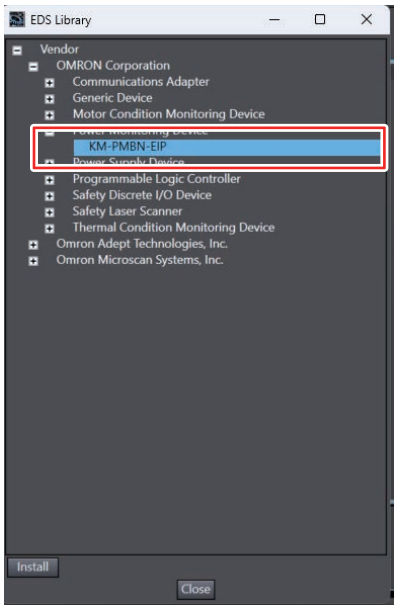
Right-click anywhere in the Target Device List in the Toolbox on the right of the EtherNet/IP Connection Setting Tab Page and select Display EDS Library from the menu.



Click the Install Button at the bottom left, select the following EDS file, click Open and install it.

Model name of the KM-PM	EDS file name
KM-PMBN-EIP	KM-PMBN-EIP.eds

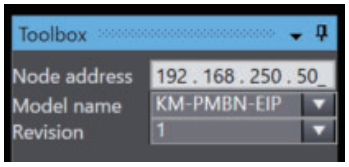
When installation is completed, the category “Motor Condition Monitoring Device” and the registered KM-PM devices are displayed under the tree of the OMRON Corporation in the EDS Library Dialog Box.



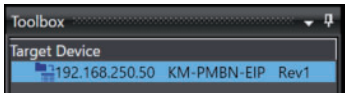
A.2 Tag Data Link Connection Setting Procedures (continued)

(3)-2 Tag Data Link Connection Setting Procedures (continued)

Click the (Add Target Device) Button in the Toolbox on the right of the EtherNet/IP Connection Setting Tab Page.
As shown in the following example, enter the node address (IP address), and from the pull-down list, select the model and revision.



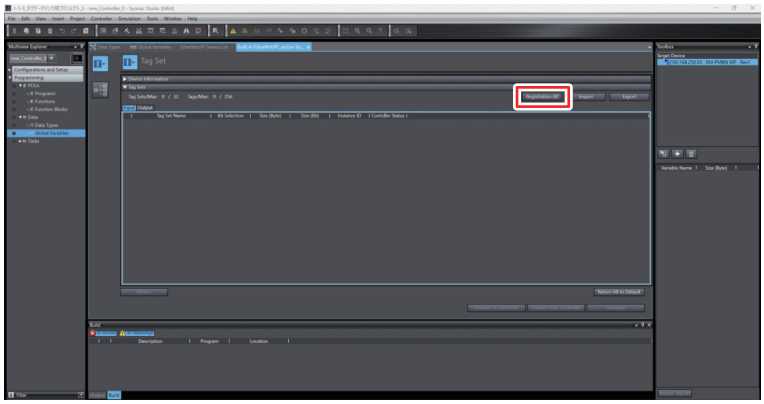
Click the Add Button at the bottom of the toolbox. The KM-PMBN-EIP device will be added as a target device.



(4) Editing tag set

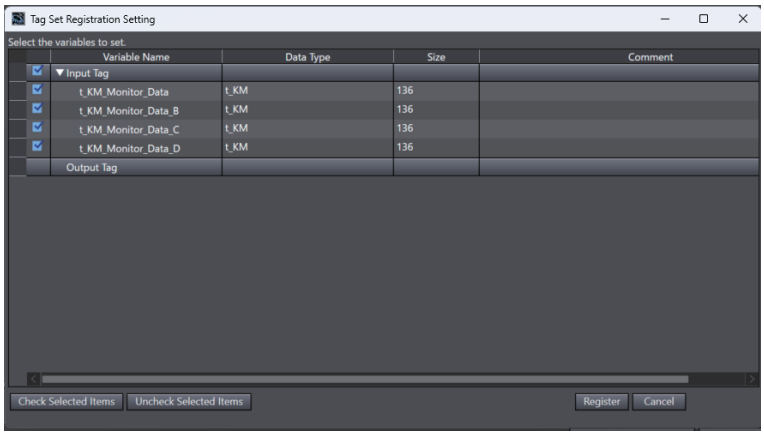
Map the KM-PMBN-EIP Input data to the memory area of the PLC using the EtherNet/IP tag data link by associating the network variable (input) of the PLC with the tag used in the network. As a method of editing the tag set, there is a method of registering all tag sets, and a method of individual registering by right-clicking and selecting Create New Tag Set. Here, the method of registering is described.

(4)-1 Open Tag Set Registration Setting Dialog Box



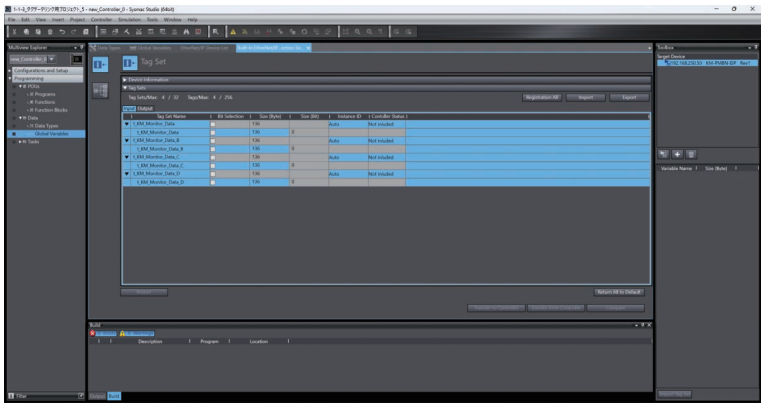
A.2 Tag Data Link Connection Setting Procedures (continued)

Click the Registration All Button in the Tag Set Pane, a list of network-published global variables will be displayed. In this example, only the following registered network variables (inputs) are displayed.
t_KM_Monitor_Data
t_KM_Monitor_Data_B
t_KM_Monitor_Data_C
t_KM_Monitor_Data_D



(4)-2 Registering All Tag Sets

Check the check box of the network variable to be used as the input tag among the network-published variables and click the Register Button, and then the specified tag is displayed in the tag set Pane.



If you perform the registering all tag set, the tag set and the tag are displayed as the same name.
The tag set names displayed can be used as connection settings. (Use these tag set names, when configuring EtherNet/IP connections using the Network Configurator.)
You can change the tag set names as required.
Also, the tag name displayed under the tag set name must match the variable name registered as a network variable (input).

Information
If you create connection settings using the Network Configurator, you can share the tag set names and tag names of the PLC you edit here with the Network Configurator.

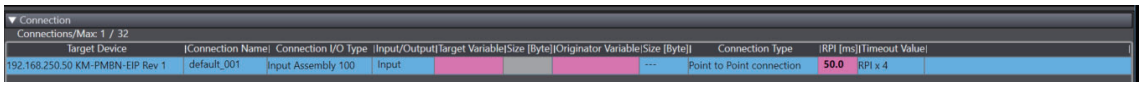
A.2 Tag Data Link Connection Setting Procedures (continued)

(5) Opening the EtherNet/IP Connection Settings (Connection Display)

Click the Connection Button  at the upper left of the EtherNet/IP Connection Settings (Tag Set Display) to display the Connection.

(6) Target Devices Registration to the Connection Settings of the Originator

Register the KM-PM devices to the connection settings of the originator device (PLC).
Right click and select Create New (A) or click the  (New) Button in the EtherNet/IP Connection Setting Tab Page, then select the KM-PMBN-EIP from the pull-down list as the target device. (This operation can also be performed by double clicking the KM-PMBN-EIP in the Target Device Pane of the Toolbox.)

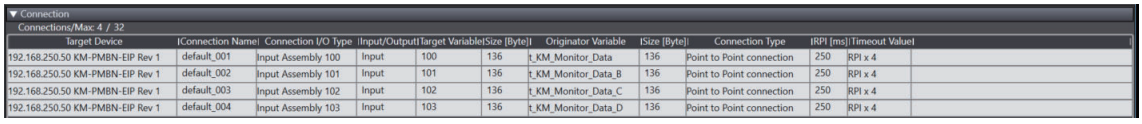


The Connection I/O Type is set individually for each connection.

Connection I/O Type	Target Variable
Input Assembly 100	100
Input Assembly 101	101
Input Assembly 102	102
Input Assembly 103	103

Next, when setting a target variable, if you press Ctrl + space Key at the same time, the selectable ID number is displayed, so select the ID number to use.

For originator variables, select the tag set created in "(4) Editing tag set" from the pull down list and set it.
In RPI (ms), from the setting range of the KM-PMBN-EIP device (250 ms to 10,000 ms), set the data send interval from the KM-PMBN-EIP device according to the system. Select the Timeout value from the pull-down list and set it.
The timeout time when a communications error occurs can be calculated as follows.
Timeout time = RPI (ms) × multiple of RPI set by timeout value (4 times, 8 times, 16 times, ..., 512 times)



This completes the tag data link setting. Go online to the originator device (PLC) and download the EtherNet/IP tag data link settings to the PLC by clicking Transfer to Controller Button.

A.3 Expansion Error Code of the CIP Message Communications

● General Status

General Status (hex)	Status Name	Description of Status
00	Success	Service was successfully performed by the object specified.
01	Connection failure	A connection related service failed along the connection path.
02	Resource unavailable	Resources needed for the object to perform the requested service were unavailable.
03	Invalid parameter value	See Status Code 20 hex, which is the preferred value to use for this condition.
04	Path segment error	The path segment identifier or the segment syntax was not understood by the processing node. Path processing shall stop when a path segment error is encountered.
05	Path destination unknown	The path is referencing an object class, instance or structure element that is not known or is not contained in the processing node. Path processing shall stop when a path destination unknown error is encountered.
06	Partial transfer	Only part of the expected data was transferred.
07	Connection lost	The messaging connection was lost.
08	Service not supported	The requested service was not supported or was not defined for this object class/instance. The requested service was not supported or was not defined for this object class/instance.
09	Invalid attribute value	Invalid attribute data detected.
0A	Attribute list error	An attribute in the Get_Attribute_List or Set_Attribute_List response has a non-zero status.
0B	Already in requested mode/ state	The object is already in the mode/state being requested by the service.
0C	Object state conflict	The object cannot perform the requested service in its current mode/state.
0D	Object already exists	The requested instance of object to be created already exists.
0E	Attribute not settable	A request to modify a non-modifiable attribute was received.
0F	Privilege violation	A permission/privilege check failed.
10	Device state conflict	The device's current mode/state prohibits the execution of the requested service.
11	Reply data too large	The data to be transmitted in the response buffer is larger than the allocated response buffer.
12	Fragmentation of a primitive value	The service specified an operation that is going to fragment a primitive data value, i.e. half a REAL data type.
13	Not enough data	The service did not supply enough data to perform the specified operation.
14	Attribute not supported	The attribute specified in the request is not supported.
15	Too much data	The service supplied more data than was expected.
16	Object does not exist	The object specified does not exist in the device.

A.3 Expansion Error Code of the CIP Message Communications (continued)

General Status (hex)	Status Name	Description of Status
17	Service fragmentation sequence not in progress	The fragmentation sequence for this service is not currently active for this data.
18	No stored attribute data	The attribute data of this object was not saved prior to the requested service.
19	Store operation failure	The attribute data of this object was not saved due to a failure during the attempt.
1A	Routing failure (request packet too large)	The service request packet was too large for transmission on a network in the path to the destination. The routing device was forced to abort the service.
1B	Routing failure (response packet too large)	The service response packet was too large for transmission on a network in the path from the destination. The routing device was forced to abort the service.
1C	Missing attribute list entry data	The service did not supply an attribute in a list of attributes that was needed by the service to perform the requested behavior.
1D	Invalid attribute value list	The service is returning the list of attributes supplied with status information for those attributes that were invalid.
1E	Embedded service error	An embedded service resulted in an error.
20	Invalid parameter	A parameter associated with the request was invalid. This code is used when a parameter does not meet the requirements of this specification and/or the requirements defined in an Application Object Specification.
21	Write-once value or medium already written	An attempt was made to write to a write-once medium (e.g. WORM drive, PROM) that has already been written, or to modify a value that cannot be changed once established.
22	Invalid Reply Received	An invalid reply is received (For example, the reply service code does not match the request service code, or the reply message is shorter than the minimum expected reply size.) This status code can serve for other causes of invalid replies.
23-24		Reserved by CIP for future extensions.
25	Key Failure in path	The Key Segment that was included as the first segment in the path does not match the destination module. The object specific status shall indicate which part of the key check failed.
26	Path Size Invalid	The size of the path which was sent with the Service Request is either not large enough to allow the Request to be routed to an object or too much routing data was included.
27	Unexpected attribute in list	An attempt was made to set an attribute that is not able to be set at this time.
28	Invalid Member ID	The Member ID specified in the request does not exist in the specified Class/Instance/Attribute.
29	Member not settable	A request to modify a non-modifiable member was received.
2B-CF		Reserved by CIP for future extensions.
D0-FF	Reserved for Object Class and service errors	This range of error codes is to be used to indicate Object Class specific errors. Use of this range should only be performed when none of the Error Codes presented in this table accurately reflect the error that was encountered. The additional code field is used to describe the general error code in more detail.

A.3 Expansion Error Code of the CIP Message Communications (continued)

● Additional Status When General Status Is 01 hex

General Status (hex)	Additional Status (hex)	Explanation
01	0100	Connection in Use or Duplicate Forward Open.
01	0103	Transport Class and Trigger combination not supported.
01	0106	Ownership Conflict.
01	0107	Connection not found at target application.
01	0108	Invalid Connection Type. Indicates a problem with either the Connection Type or Priority of the Connection.
01	0109	Invalid Connection Size.
01	0110	Device not configured.
01	0111	RPI not supported. May also indicate problem with connection time-out multiplier, or production inhibit time.
01	0113	Connection Manager cannot support any more connections.
01	0114	Either the Vendor Id or the Product Code in the key segment did not match thedevice.
01	0115	Product Type in the key segment did not match the device.
01	0116	Major or Minor Revision information in the key segment did not match the device.
01	0117	Invalid Connection Point.
01	0118	Invalid Configuration Format.
01	0119	Connection request fails since there is no controlling connection currently open.
01	011A	Target Application cannot support any more connections.
01	011B	RPI is smaller than the Production Inhibit Time.
01	0203	Connection cannot be closed since the connection has timed out.
01	0204	Unconnected_Send timed out waiting for a response.
01	0205	Parameter Error in Unconnected_Send Service.
01	0206	Message too large for Unconnected message service.
01	0207	Unconnected acknowledge without reply.
01	0301	No buffer memory available.
01	0302	Network Bandwidth not available for data.
01	0303	No Tag filters available.
01	0304	Not Configured to send real-time data.
01	0311	Port specified in Port Segment Not Available.
01	0312	Link Address specified in Port Segment Not Available.

A.3 Expansion Error Code of the CIP Message Communications (continued)

General Status (hex)	Additional Status (hex)	Explanation
01	0315	Invalid Segment Type or Segment Value in Path.
01	0316	Path and Connection not equal in close.
01	0317	Either the segment is not present or the encoded value in the network segment is invalid.
01	0318	Link Address to Self Invalid.
01	0319	Resources on Secondary Unavailable.
01	031A	Connection already established.
01	031B	Direct connection already established.
01	031C	Miscellaneous.
01	031D	Redundant connection mismatch.
01	031E	There are no more available reception resources in the sending module.
01	031F	No connection resources exist for target path.
01	0320- 07FF	Unused.

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