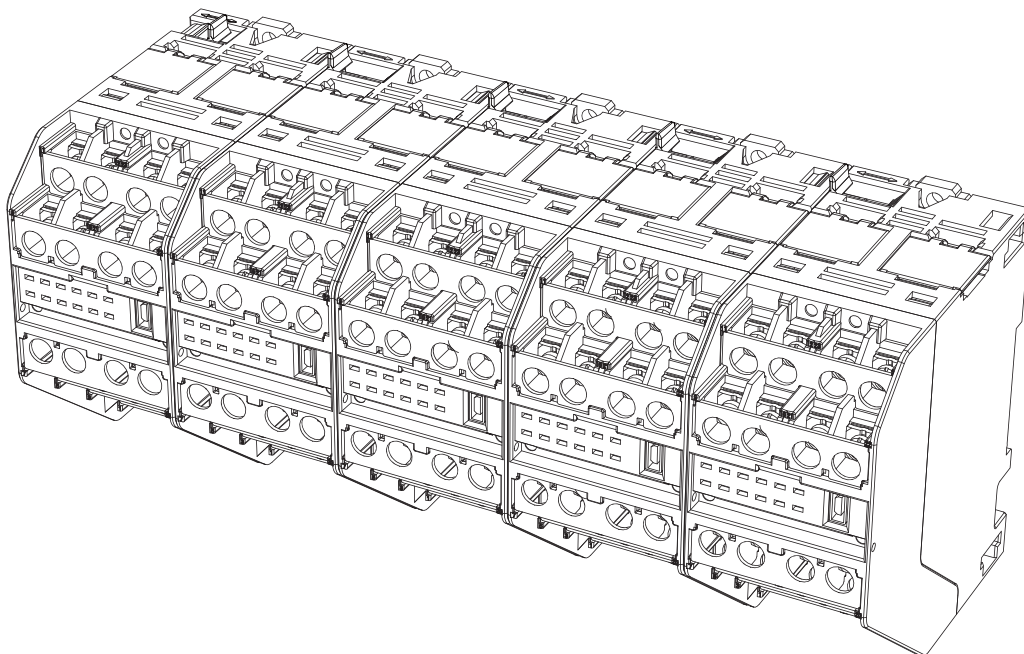


Model KM1 Smart Power Monitor

User's Manual



INTRODUCTION

Thank you for purchasing the Model KM1.

The Model KM1 is a board built-in type Smart Power Monitor. The Model KM1 is divided into the following units. The operation is performed by using the master unit independently or connecting slave units. The system can be expanded according to the number of power measurement points. A combination with the Model KE1-CTD8E can make measurements at 36 points maximum.

>> Master unit

- Model KM1-PMU1A-FLK : Can make power measurements.
- Model KM1-PMU2A-FLK : Can make power measurements of two systems.

>> Slave unit

- Model KM1-EMU8A-FLK : Can enter pulse/temperature and classify energies.

These units providing various functions can be operated independently or combined to use as many functions as required.

Model KE1 is divided into the following units.

>> Master unit

- Model KE1-PGR1C-FLK : Can perform power measurements and earth leakage detection.
- Model KE1-PVS1C-FLK : Can perform power measurements and instantaneous voltage drop detection.

>> Slave unit

- Model KE1-VSU1B-FLK : Can perform instantaneous voltage drop detection.
- Model KE1-VAU1B-FLK : Can monitor voltage and current.
- Model KE1-CTD8E : Can expand CT (current transformer) and perform multi-circuit measurements.
- Model KE1-ZCT8E : Can expand ZCT (zero-phase-sequence current transformer) to monitor multi-circuit earth leakage.
- Model KE1-DRT-FLK : Can carry out DeviceNet communication.

For Model KE1, refer to "User's Manual for Model KE1" (SGTE-717).

For Model KE1-DRT-FLK, refer to "User's Manual for Model KE1 DeviceNet Communication" (SGTE-718).

This User's Manual describes information on the functions, performances, and usage necessary for using this product.

When using this product, be sure to observe the following points.

- Only the experts having practical knowledge of electricity shall be allowed to handle this product.
- Go through and fully understand this User's Manual, and use the product correctly.
- Keep this User's Manual at hand for quick reference.

In addition to this manual, refer to the "Model KM1/KE1 Communication Manual" (SGTE-719) on the web site for the explanation of communication functions.

Items on which you Agree by Using this Product

1. Warranty details

[1] Warranty period

The warranty period for this product is one year from purchase or delivery to a specified site.

[2] Warranty scope

If faults attributable to Omron arise with this product within the above warranty period, a replacement product will be provided or repair services will be provided for free at the site where the user purchased the product.

However, if any of the following are the cause of the fault, the product will be out-of-scope for the warranty.

- a) If the product is used in a condition, environment, or handling other than that stated in the catalog or Instruction Manual.
- b) If the fault was due to other products
- c) If the fault was due to modifications or repairs other than those by Omron
- d) If the product was used in different ways from those for which the product was originally intended
- e) If the fault could not be expected based on the level of science and technology as of the time delivery from Omron.
- f) If the fault is due to reasons not attributable to Omron, such as natural disasters

Also, the warranty stated in this manual refers to the warranty for a single unit of this product, and damage caused by faults with this product is out-of-scope for the warranty.

2. Liability limitation

[1] Omron shall not bear any responsibility for special damage, indirect damage, or consequential damage arising due to this product.

[2] Omron shall not bear any responsibility for results arising from programs run by parties other than Omron for this product, which can be programmed.

3. Conditions for compatibility purposes

[1] If this product is used with other products, you need to check standards and regulations or restrictions that need to be complied with. Also, you need to check the compatibility of systems, machines and devices to be used with this product. If you do not perform the above, Omron shall not bear any responsibility for the compatibility of this product.

[2] If this product is used for the following use applications, you shall use the specifications, etc., for the confirmation after consultation with an Omron sales representative. In addition, you shall use this product within the rated values and performance and take safety measures, e.g., use of a safety circuit, to minimize risks even if a failure occurs.

- a) Outdoor use and use which may have a potential chemical contamination or electric impedance, or use in conditions or environments other than those stated in the catalog or User's Manual
- b) Use for equipment such as nuclear control, incineration facilities, train/ aviation system, vehicle facilities, medical machines, entertainment machines, safety devices, or for facilities covered by regulations of administrative bodies or individual industries.
- c) Systems, machines, and devices which may cause harm to human lives and assets
- d) Facilities which require a high reliability such as gas, water, and electricity supply systems, and 24-hour continuous operation system.

e) Other purposes requiring a high level of safety as per the above a) – d)

[3] If the product is used for purposes which may cause harm to human lives or assets, you must notify concerned parties of such risks related to overall systems, and you must check beforehand that a redundant design is created to ensure required safety, and that wiring and installation have been appropriately completed for the overall intended purposes for this product.

[4] Application examples stated in catalogues are for reference purposes. When you use product, you must check the performance and safety of related machines and devices.

[5] You must fully understand prohibited items and precautions for use, so that there will be no unexpected damage to you or to third parties due to incorrect use of this product.

4. Specification Change

The specifications of this product and accessories may be changed if necessary for reasons such as improvements. Please contact an Omron sales representative to check the current specifications of this product.

5. Applicable scope

The details given above are based on the assumption that the product will be traded and used within Japan

If trading and using disparate outside Japan, please contact an Omron sales representative.

About this manual

- (1) No part of this publication may be copied or reproduced in any form without the prior written permission of OMRON.
- (2) The contents of this manual, e.g., specifications, may be revised for improvement without prior notice.
- (3) OMRON takes all possible measures to ensure the contents of this manual. However, if you find any part unclear or incorrect, contact our branch office or sales office listed at the end of this manual. In doing so, please also state the catalog number given at the end of the manual.

Safety Precautions

● Symbols for Safe Use and Their Meanings

This manual employs the following indications or symbols for points to note for the user to use Model KM1 safely.





The points to note shown here indicate important details related to safety. You must adhere to them.

The following indications and symbols can be shown.






Meaning of Warning

 Caution	Handling this product incorrectly is dangerous. This may lead to mild to moderate severity ended injuries, or this may lead to damage to objects
--	---

● Explanation of Symbols

Symbol	Meaning
	<ul style="list-style-type: none">● Prohibition of assembly Notice of prohibition indicated when disassembly of equipment may cause an electric shock or injuries.
	<ul style="list-style-type: none">● General mandatory notice Indication for instructing behaviors of unspecified general users not specified.
	<ul style="list-style-type: none">● Caution, electricity Notice for giving attention about the possibility of electric shock under a specific condition.
	<ul style="list-style-type: none">● Caution, explosion risk Wrong use may cause an explosion.

● Display of warning

 Caution	
<p>Ignition may occur and this may cause damage to objects. Make sure you tighten terminal screws with standard tightening torque. Recommended tightening torque of terminal screw: 0.69 to 0.88 N·m After the screw is tightened, ensure that it is not tilted.</p>	
<p>Explosion may cause a medium or minor degree of injuries or physical loss or damage. Do not use the product at a place where it is exposed to flammable or explosive gas.</p>	
<p>Breakage or explosion may occur. When using the product, put the supply voltage and load in the specified or rated range.</p>	
<p>Breakage or explosion may occur. The portion between the voltage input circuit and the CT secondary side circuit is not insulated. If the dedicated CT is grounded, the portion between the voltage input circuit and the CT secondary circuit is short-circuited due to wrong wiring. Do not ground the dedicated CT to prevent failures. This product, which uses a dedicated CT, can make normal measurements with the CT not grounded.</p>	
<p>Electric shocks may occur. When the CT is connected, disconnect voltage inputs connected to the power supply and system of the main body.</p>	
<p>Electric shocks may occur. When power is distributed, do not touch the terminals.</p>	
<p>Electric shocks may occur. For the primary side electric wire where the CT is clamped, be sure to use a covered electric wire, which has been at least basically insulated. When clamping is done for a conductive object, such as bus bar, ensure the basic insulation, at least, by covering it with insulating material, etc.</p>	
<p>Electric shocks, minor degree of injuries, ignition, or equipment failures may occur. Do not perform assembling, repairing, or remodeling.</p>	

Safety Points

To prevent operation failure or malfunction of the product, and prevent affecting performances and function, observe the following.

- 1) Prevent the operation and storage (including transportation) of the product under the following environment.
 - In a place with large vibrations or which is greatly influenced by shocks
 - In an unstable place
 - In a place at a temperature or humidity outside the specification range
 - Places with large changes in temperature and humidity, or where there is a possibility of condensation or freezing
 - Place where the product is exposed to direct sunlight.
 - Outdoors or in a place directly exposed to wind and rain
 - In a place affected by static electricity or noise
 - In a place where the product is exposed to oil or salt water.
 - In a place where corrosive gas (sulfurizing gas, ammonia gas, etc.) exists
 - In a place with a lot of dust or iron powder
 - In a place that is affected by electrical fields or magnetic fields
- 2) When installing the DIN rail with screws, prevent looseness. Securely install the DIN rail on the main body. Looseness, if any, causes the DIN rail, the main unit of the product or wiring to come off due to vibration, impact, etc.
- 3) Use the DIN rail of 35 mm in width (Model PFP-50N/-100N manufactured by OMRON).
- 4) When wiring on the main body of the product, use a crimp-style terminal suitable for M3.5 screw.
- 5) Before distributing energy, confirm that the specification and wiring are correct.
- 6) Before performing operation and maintenance, fully understand the instruction manual. Not doing so may result in electric shock, faults, accidents, injury, or incorrect operation.
- 7) For the worker to turn OFF the power supply, install a switch or a circuit breaker matching the requirements of IEC60947-1 and IEC60947-3, and display it appropriately.
- 8) When setting the equipment, fully understand the manual.
- 9) When installing this product, keep it away as far as possible from the equipment generating strong high-frequency noise or surge.
- 10) Touch this product after taking measures against static electricity, such as touching metal that has been earthed.
- 11) To prevent inductive noise, isolate the wiring on the main body from the power line of high voltage or large current. In addition, avoid wiring in parallel to or shared with power lines. Use of a different conduit, a duct, or a shield line is an effective method of wiring.
- 12) Do not install this product close to heating equipment (equipment having a coil, winding wire, etc.).
- 13) Take measures to prevent metal, conductive wire, or chip generated during processing from entering this product.
- 14) Do not use thinner-type products when cleaning. Use a commercially-available alcohol.
- 15) Use an appropriate electrical power source and wiring to supply a power voltage and in/output to this product. Otherwise, failures, burnout, or electric shocks may be caused.
- 16) When installing the product on a wall, use screws to prevent looseness. Looseness, if any, causes the main unit of the product or wiring to come off due to vibration, impact, etc.
- 17) When multiple units are used, slide a horizontal connection hook until it is clicked.
- 18) When installing the product in a DIN rail, slide the DIN hook until it is clicked.

19) Use the dedicated CT and dedicated CT cable specified by OMRON.

Split type	Model KM20-CTF-5A	Model KM20-CTF-50A	Model KM20-CTF-100A
	Model KM20-CTF-200A	Model KM20-CTF-400A	Model KM20-CTF-600A
Through type	Model KM20-CTB-5A/50A		

Dedicated CT cable: Model KM20-CTF-CB3 (3 m)

- 20) It is not available for measuring inverter secondary side measurements.
- 21) Do not block the air ventilation holes of this product and the area surrounding them, in order to allow heat to be emitted.
- 22) Check the terminal number and carry out wiring correctly. Connect nothing to the terminals not used.
- 23) This product is a "Class A" (industrial environment product). Using this product in a residential setting environment may cause electronic jamming. In that case, appropriate measures for electronic jamming must be taken.
- 24) Use the dedicated CT in a low voltage circuit of 600 V or less.

Requests for Installation

● To use this product for a long time

Use this product within the following temperature and humidity ranges.

Temperature: -10 to +55°C (without freezing and condensation)

Humidity: 25 to 85%RH

Not the temperature around the board but the temperature around this product must be within 55°C.

This product has a product service life that is determined by the service life of electronic parts used inside. The service life of parts depends on the ambient temperature. As the ambient temperature is higher, the service life is shorter, and as the temperature is lower, the life is longer. Therefore, lowering the internal temperature of the product can lengthen its life.

Installing more than one Model KM1 close to each other or by arranging them in the up-down direction requires the consideration of forced cooling by, e.g., sending air to the products through a fan.

● To achieve resistance against peripheral noise

To prevent inductive noise, isolate the wiring in the terminal block of the main body from the power line of high voltage or large current. In addition, avoid wiring in parallel to or shared with power lines. Use of a different conduit, a duct, or a shield line is an effective method of wiring.

Attach a surge absorber or a noise filter to the equipment (equipment having inductance components in particular, e.g., motor transformer, solenoid, and magnet coil) generating noise around the product.

When installing this product, keep it away as far as possible from the equipment (high frequency welder, high frequency machine, etc.) generating strong high-frequency noise or surge.

Precautions for Use

- 1) Make correct settings according to the targets to be monitored.
- 2) Do not hold and pull a cable.
- 3) This product is not a specific measuring instrument that has passed an examination performed pursuant to the Measurement Act.
This product is not available to issue a certificate for electric energy.
- 4) When discarding this product, appropriately treat it as an industrial waste.
- 5) If this product is used in the environment of overvoltage category III, install a varistor between lines on the power supply of this product/outside voltage measurement input.

Before Using this Product

Referring to the instruction manual that came with this product, confirm the relevant items below.

When	Confirmation item	Confirmation contents
When the product is purchased	Appearance of the product	After purchasing the product, check the packing box for dents. If the inside has been damaged, measurements cannot be made properly depending on the point of damage.
	Product format and specification	Confirm that the specification of the purchased product matches that desired.
At the time of installation	Installation place of the product	When installing the product, allow the heat to radiate by preventing covering the area around the product. Do not cover the vent holes of the main body. When installing the products close to each other, consider forced cooling, such as by sending air to the products through a fan.
At the time of wiring	Wiring of terminals	When tightening a screw, be careful to prevent giving excessive stress. In addition, tighten the screw to the specified torque (0.69 to 0.88 N · m) and confirm that it does not loosen. Confirming the polarity of each terminal, perform wiring correctly.
	Power supply/voltage input	Perform correct wiring of power supply/voltage input. Incorrect wiring may cause the destruction of the internal circuit.
Working environment	Ambient temperature	The working ambient environment of this product ranges from -10 to +55°C (without condensation or freezing). To make the service life longer, install the product in such a way that the ambient temperature becomes as low as possible. If the temperature is high, consider forced cooling by a fan.
	Vibration/impact	Confirm that the vibration/impact of the installation environment satisfies the specified standard. (If the product is installed near a conductor, keep it away as far as possible from the conductor, because vibration/impact is applied to it.)
	Entry of foreign matter	Do not install the product in a place where liquid or foreign matter may enter it. If corrosive gas, such as sulfur or chlorine, is generated, the environment should be improved by removing the generation source or by installing a fan.

Relevant Manuals

Man. No.	Model	Manual Name	Details
SGTE-717	Model KE1-□□□□□-FLK Model KE1-□□□□□	Model KE1 User' s Manual for Smart Measurement and Monitoring Instrument	Describes the overview, characteristics, functions and settings of Model KE1
SGTE-718	Model KE1-DRT-FLK	Model KE1 User' s Manual for Device Net Communication Unit	Describes the functions and settings of DeviceNet Communication Unit
SGTE-719	Model KM1/KE1	Model KM1/KE1 Smart Power Monitor Communication Manual for Smart Measurement and Monitoring Instrument	Describes the details of communication for the Model KM1/KE1 series
GAMS-010	Model KM1/KE1	KM1/KE1-Setting User' s Manual	Describes how to use setting tools for the Model KM1/KE1 series and the setting procedure.

Abbreviation

Abbreviation	Format	Name	Unit type
PMU1A (Electric power)	Model KM1-PMU1A-FLK	Power Measuring Unit	Measurement master (*1) (*3)
PMU2A (Power Two-System)	Model KM1-PMU2A-FLK	Power Two-System Measurement Unit	
EMU8A (Pulse/temperature)	Model KM1-EMU8A-FLK	Pulse/Temperature Input Unit	Functional slave (*2)/(*3)
PGR1C (Power/Earth leakage)	Model KE1-PGR1C-FLK	Power/Earth Leakage Monitor Unit	Measurement master (*1) (*2) (*3)
PVS1C (Power instantaneous voltage drop)	Model KE1-PVS1C-FLK	Power/Instantaneous Voltage Drop Monitoring Unit	
VSU1B (Instantaneous voltage drop)	Model E1-VSU1B-FLK	Instantaneous Voltage Drop Monitoring Unit	
VAU1B (voltage/current)	Model KE1-VAU1B-FLK	Voltage/Current Monitoring Unit	Functional slave (*2) (*3) (*4)
CTD8E (CT expansion)	Model KE1-CTD8E	CT Expansion Unit	CT expansion slave (*2) (*4)
ZCT8E (ZCT expansion)	Model KE1-ZCT8E	ZCT Expansion Unit	
DRT (DeviceNet)	Model KE1-DRT-FLK	DeviceNet Communication Unit	Communication slave (*2) (*4)

*1 Slaves can be connected.

*2 Can be connected to the measurement master.

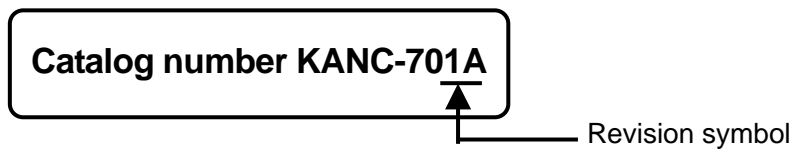
*3 Can be operated independently.

*4 Product of KE1.

For the connection, refer to pages 1 to 9.
In addition, for the combinations, refer to Page A-19.

Manual Revision History

The manual revision symbol is given at the end of the catalog number on the front cover and the bottom left of the back cover of the manual.



Revision symbol	Date of revision	Reason for revision/ pages revised
A	May 2012	Initial version
B	June 2012	Correction of error in writing

Table of Contents

INTRODUCTION	I
Items on which you Agree by Using this Product.....	II
Safety Precautions.....	IV
Safety Points	VI
Requests for Installation	VII
Precautions for Use	VIII
Before Using this Product.....	VIII
Relevant Manuals	IX
Abbreviation	IX
Manual Revision History.....	X
Table of Contents	XI
Chapter 1 Overview	1-1
1.1 Main features and functions	1-2
■ Main features	1-2
■ Main functions.....	1-3
1.2 Name and function of each part.....	1-6
■ Name of each part	1-6
■ Explanation of the display unit.....	1-7
■ Setting switch.....	1-8
1.3 System configuration	1-9
■ Model kind.....	1-9
■ Configuration.....	1-10
1.4 Format standard	1-13
■ Format standard	1-13
Chapter 2 Preparation	2-1
2.1 Flow before use	2-2
■ Setting example.....	2-3
2.2 Installation	2-6
■ External Dimensions (unit: mm).....	2-6
■ Connection method	2-7
■ Installation procedure	2-9
2.3 Installation of dedicated CT	2-12
■ Wire connection and installation of dedicated CT	2-13
2.4 Input/output configuration and example of wiring diagram.....	2-14
■ Model KM1-PMU1A-FLK	2-14
■ Model KM1-PMU2A-FLK	2-16
■ Model KM1-EMU8A-FLK	2-19
■ Model KE1-CTD8E.....	2-20

2.5	Wiring.....	2-25
	■ Requests for wiring	2-25
	■ Wiring	2-25
Chapter 3 Functions		3-1
3.1	List of functions.....	3-2
3.2	Basic functions.....	3-3
	■ Applicable phase wire	3-3
	■ Synchronization selection for measuring block	3-3
	■ Dedicated CT type	3-3
	■ VT ratio.....	3-4
	■ CT ratio	3-4
	■ Low-cut function.....	3-4
	■ Average count	3-5
	■ Logging function.....	3-5
	■ Signal detection	3-5
	■ Measurement function	3-6
3.3	Output function.....	3-9
	■ Output terminal 1/output terminal 2/output terminal 3 function setting	3-9
	■ Integrated power amount pulse output	3-10
	■ Phase-sequence	3-11
	■ Alarm output	3-12
3.4	Event input function.....	3-16
	■ Event input NPN/PNP input mode setting	3-16
	■ Event input N-O/N-C input mode setting	3-16
	■ Pulse entering count	3-17
	■ ON time of pulse enter	3-17
	■ Function using event input.....	3-17
3.5	3-STATE function	3-18
	■ 3-STATE target	3-18
	■ 3-STATE HIGH threshold/3-STATE LOW threshold	3-20
	■ 3-STATE hysteresis.....	3-20
3.6	Other functions	3-21
	■ Time	3-21
	■ Initialization	3-21
Chapter 4 Troubleshooting		4-1
4.1	Flow of troubleshooting.....	4-2
4.2	Assume based on operation indicator LED	4-3
4.3	Assume based on the status.....	4-4
4.4	Assume based on phenomena	4-5

Appendix.....	A-1
Product specifications	A-2
■ Rating of main unit	A-2
■ Main part specifications	A-3
■ Protection functions	A-5
■ Accessories.....	A-6
Dedicated CT	A-7
■ Specification.....	A-7
■ External dimensions (unit: mm)	A-7
List of parameters	A-9
List of data logging items	A-15
Model KM1/KE1 combination list	A-19

Chapter 1. Overview

Chapter 1.	Overview	1-1
1.1	Main features and functions	1-2
	■ Main features	1-2
	■ Main functions	1-3
	● Function by unit	1-3
	● Output function	1-3
	● Input function	1-5
	● Communication function	1-5
	● Logging function of measurement data	1-5
1.2	Name and function of each part	1-6
	■ Name of each part	1-6
	■ Explanation of the display unit	1-7
	■ Setting switch	1-8
	● How to use setting switches	1-8
1.3	System configuration	1-9
	■ Model kind	1-9
	■ Configuration	1-10
	● Multiple-unit connection	1-10
	● Minimum configuration	1-11
	● Maximum configuration	1-11
	● Multiple-system configuration	1-12
1.4	Format standard	1-13
	■ Format standard	1-13

1.1 Main features and functions

■ Main features

This section describes the main features fro Model KM1.

- Models providing the following functions are lined up and are selectable according to intended end-usage.
 - Power measurement
 - Detection of over or under current
 - Temperature measurement
 - Pulse input count
 - ON time of pulse input
 - CO₂ emissions/conversion to electric power charge
 - 3-STATE function (power, current, and voltage)
 - Reverse phase detection
 - Power Two-System Measurement
 - Detection of over/under voltage
 - Event input
 - Pulse output
 - Simple measurement
- Power measurements of two different systems insulated each other can be made using a unit.
- The installed logging function allows the user to select eight cycles (5 min, 10 min, 30 min, 1 hour, 2 hours, 6 hours, 12 hours, 24 hours) available for saving data.
- Two types of communication protocol, CompoWay/F (*1) and Modbus (RTU) (*2), can be supported by one unit.
- Conforms to the safety standard (EN/IEC).

[Connection of multiple units (PMU1A (electric power)/PMU2A (power two-system) + EMU8A (pulse/temperature))]

- According to the event input of EMU8A (pulse/temperature), the total power consumption measured with PMU1A (electric power) and PMU2A (power two-system) can be classified to the three states: HIGH state, MIDDLE state, and LOW state. (3-STATE function)

[Connection with Model KE1]

Connection with Model KE1-CTD8E can expand current CT, allowing the user to make measurements at 36 points maximum.

After this, this manual also describes the expansion function of current CT when this product is connected to KE1-CTD8E (CT expansion unit).

For Model KE1-CTD8E, refer to "Model KE1 User's Manual" (SGTE-717).

- *1 CompoWay/F is a unified communication procedure within Omron's generic serial communication. It has commands conforming to the time-proven FINS in the unified frame format and Omron's programmable controller, making easy the communication between the personal computer and the components.
- *2 Communication control system conforming to RTU Mode of Modbus Protocol. Modbus is a registered trademark of Schneider Electric.

■ Main functions

This section describes main functions of Model KM1.

● Function by unit

- PMU1A (Electric power) : Provides the power measurement function and 3-STATE function.
- PMU2A (Power two-system) : Provides the power measurement function and 3-STATE function. Two-system measurements can be done.
- EMU8A (Pulse/temperature) : Has an event input and temperature input. It provides temperature measurement function.
- CTD8E (CT expansion) : CT can be expanded to perform power and current multi-circuit measurements.

● Output function

The following function is provided as an output function.

1) Total power consumption pulse output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	×	×

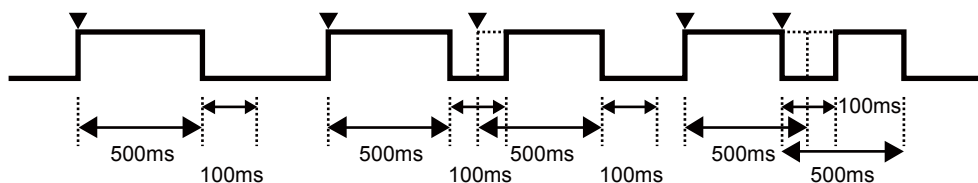
○: With function ×: Without function

When the total power consumption reaches the pulse output unit set by the user, pulses are output from output terminal 1, output terminal 2, and output terminal 3 (terminal set by the output terminal function setting).

The pulse ON time is normally fixed to 500 ms. The time for turning OFF the pulse is 100 ms minimum. However, if it reaches the pulse output unit again within 600 ms after having reached the pulse output unit, the pulse ON time becomes shorter, because higher priority is given to the next output. After that, pulse of 100 ms is turned OFF, and then the next pulse is turned ON. (The minimum pulse ON time is 100 ms.)

Pulse output is judged at sampling intervals.

Pulse output timing



* ▼ indicates that the pulse output unit is reached.

2)3-STATE output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	×	×

○: With function ×: Without function

This function sets HIGH threshold and LOW threshold to assign total power consumption and total time to HIGH, MIDDLE, and LOW states.

When one of the electric power, current, voltage, and event input is selected as a target for judgment based on the setting, it can be classified to the three conditions (HIGH, MIDDLE, and LOW) by setting HIGH threshold and LOW threshold. If a value is more than the HIGH threshold, the condition is assigned to HIGH. If less than the LOW threshold, the condition is assigned to LOW. In other cases, the condition is assigned to MIDDLE. The total power consumption and total time in each condition can be read.

For details, refer to Page 3-18.

- * The 3-STATE output using event input is applied only when EMU8A (pulse/temperature) is connected.

3)Alarm output

	PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
Active power alarm	○	○	×	○
Over current alarm	○	○	×	○
Under current alarm	○	○	×	○
Over voltage alarm	○	○	×	×
Under voltage alarm	○	○	×	×
Power factor alarm	○	○	×	○
Reactive power alarm	○	○	×	○
Temperature alarm	×	×	○	×
Reverse phase alarm	○	○	×	×

○: With alarm output
X: Without alarm output

● Input function

The input functions include the following functions.

- Event input 7 points

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
×	×	○	×

○: With function X: Without function

A pulse output from external equipment is counted as an input pulse.

Using the event input can achieve the 3-STATE function, whose target for judgment includes the following: a power original unit calculated by dividing the total power consumption, which is measured with PMU1A (electric power) and PMU2A (power two-system), by the total value of two input count numbers (event inputs 1 and 2, event inputs 3 and 4, and event inputs 5 and 6), a pulse input ON time measured by using OR judgment, and an event input.

The power original unit and the pulse input ON time are used for measurement of tact power in a production line and for calculation of operating time of equipment, respectively.

- * The 3-STATE function using power original unit and event input are available only when the product is connected to PMU1A (electric power), PMU2A (power two-system).

● Communication function

The communication function using CompoWay/F and Modbus (RTU) is available.

● Logging function of measurement data

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	○	△

○: With function
△: Backup at intervals of 5 min and alarm history only.

Model KM1 has a data logging function. Log data is divided into the three types: data that is backed up every 5 min, data that is backed up at arbitrary timing (5 min, 10 min, 30 min, 1 hour, 2 hours, 6 hours, 12 hours, or 24 hours), and alarm history that is backed up when an alarm is generated.

- 1) Data that is backed up every 5 min

This data includes the following items.

- Total active power consumption, total regenerated energy, and total reactive power
- 3-STATE HIGH total power consumption, 3-STATE MIDDLE total power consumption, 3-STATE LOW total power consumption
- 3-STATE HIGH total time, 3-STATE MIDDLE total time, 3-STATE LOW total time
- Pulse input ON time, pulse input count

- 2) Data that can be saved as log data at arbitrary timings

Log data is saved in conjunction with the time of the main body.

For the items, refer to "List of log data to be saved" on Page A-15.

- 3) Alarm history

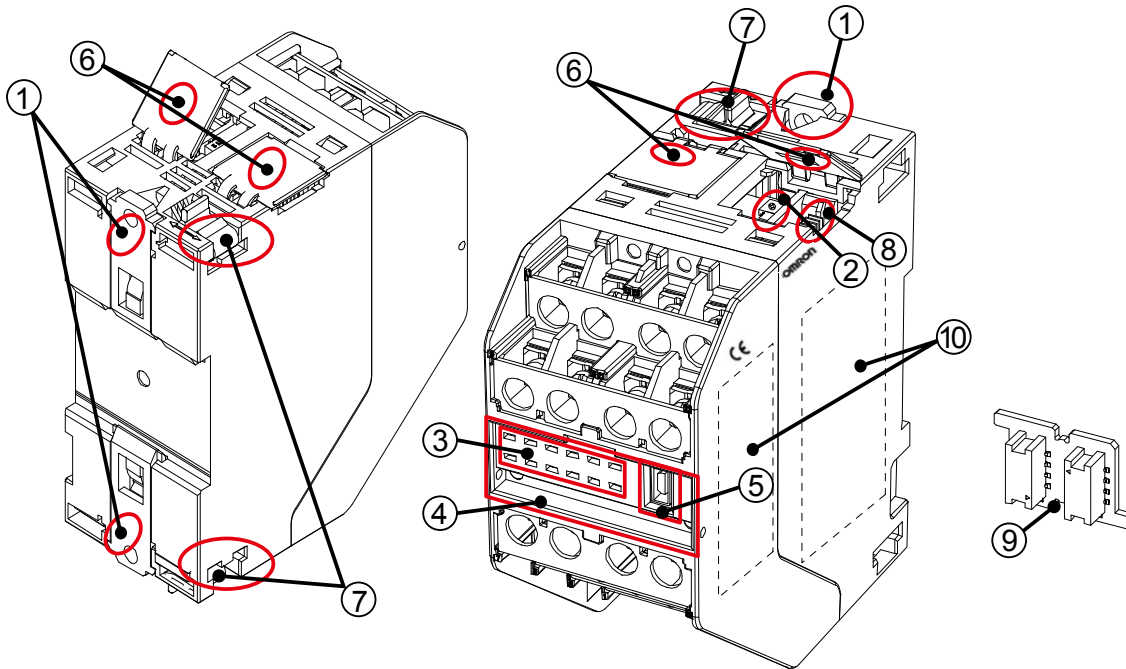
Histories of alarms generated in the past can be confirmed via communication.

Data is saved every 5 min.

For details, refer to Page 3-12.

1.2 Name and function of each part

■ Name of each part



[1] DIN hook

A hook, which is mounted in each of the upper and lower parts of the main body, is used to install the product in the DIN rail or on a wall. For the installation procedure, refer to Page 2-9 to 2-11.

[2] Setting switch

DIP switch and rotary switch are used. For the functions and setting procedure, refer to Page 1-8.

[3] Display unit

Displays the operating status of the main body by lighting or blinking LED. For details on the function of each LED, refer to Pages 1-7 to 4-3.

[4] Display cover

This cover protects the display unit and USB port.

[5] USB port

Insert a USB cable to carry out USB communication with the main body.

[6] Connection connector cover

This cover protects the connection connector (on the main body side).

[7] Horizontally connecting hook

A hook is installed in each of the upper and lower positions. These hooks are used to connect units to each other.

For the connection procedures ([7] to [9]), refer to Pages 2-7 to 2-8.

[8] Connector (on the main body side)

When connecting units to each other, insert the connector (accessory).

[9] Connector (accessory)

















































Inserted into the connector to connect connectors to each other (main body side).

* It does not come with the measurement master.

[10] Rating name plate

Displays the model name, ratings, terminal assignments, etc.

■ Explanation of the display unit

PMU1A (Electric power)	 PWR	 ALM	 CT1	 CT2	 CT3	
	 CONN	 COMM	 OUT1	 OUT2	 OUT3	
PMU2A (Power two-system)	 PWR	 ALM	 CT1	 CT2	 CT3	 CT4
	 CONN	 COMM	 OUT1	 OUT2	 OUT3	
EMU8A (Pulse/temperature)	 PWR	 ALM	 EV1	 EV2	 EV3	 EV4
	 CONN	 COMM	 EV5	 EV6	 EV7	 TH
CTD8E (CT expansion)	 PWR	 ALM	 CT1	 CT2	 CT3	 CT4
	 CONN	 COMM	 CT5	 CT6	 CT7	 CT8

* Explanation of abbreviations

PWR (Green) : Lights when the power supply is turned ON. Blinks when an EEPROM, RAM, or RTC error occurs.

CONN (Yellow) : Lights when multiple units are connected.

ALM (Red) : Lights when an alarm is output.

COMM (Yellow): Lights when RS-485 or USB communication is carried out.

CT (Yellow) : Corresponding LED lights at the time of CT input.

EV (Yellow) : Corresponding LED lights at the time of event input.

OUT (Yellow) : Corresponding LED lights at the time of output.

TH (Yellow) : Lights at the time of thermistor input.

* Normal and abnormal states are displayed by combining above LEDs that lights up or blink. For details, refer to Page 4-3.

■ Setting switch

DIP switches and a rotary switch are used for setting switches. DIP switches select communication protocols, while a rotary switch sets a slave ID. When multiple units are connected, slave IDs are used to identify the units. (A rotary switch is used only for functional slaves and CT extension slaves. The slave for measurement master will have a fixed ID of 0.)

- DIP switch

No.1 ⇒ Idle

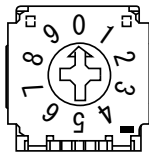
No.2 ⇒ Selection of communication protocol: OFF CompoWay/F
 ON Modbus



- Rotary switch

Set a slave ID.

: Do not use the IDs of 0 and 6-9.)



- * For slave units, set slave ID of 1-4. For EMU8A (pulse/temperature) to be used for the 3-STATE function or power original unit, however, set slave ID to 5.
- * If multiple units are connected, set slave IDs in a way to avoid duplicates.

● How to use setting switches

- Be sure to use the switch when the power supply is turned OFF. The settings will be read only when connected to a power supply and any change made during power distribution will not be reflected. To make change, switch off the power first and change the settings. And switch on the power again.
- When selecting a switch, set it to the specified position securely by using a small flat-head screwdriver.

1.3 System configuration

■ Model type

In this manual, an object that has been set in a state where various measurements and monitor can be performed is defined as "System."

This product allows an independent unit (single-unit configuration) or multiple units connected (multiple-unit connection configuration) to perform data measurements and status monitor. From here, the description of this manual therefore employs as "a system" an object that has been set in a state where various measurements and monitor can be done, regardless of whether one-unit configuration or multiple-unit connection configuration is used.

		Measurement master		Functional slave	CT extension slave
		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (pulse/temperature)	CTD8E (CT expansion)
Master behavior		○	○	×	×
Independent behavior		○	○	△	×
CT expansion		○	○	×	×
Measurement (Monitoring) function	Electric power	○	○	×	○
	Electric currents	○	○	×	○
	Voltage	○	○	×	×
	Temperature	×	×	○	×
	Pulse	×	×	○	×
	Reverse phase	○	○	×	×
Power voltage		AC100~240V 50/60Hz			None (supplied from measurement master)

○: Enabled (with)
 ×: Disabled (without)
 △: Limited in part

- * Master behavior is an operation for setting connections with slaves or sending or receiving measurement data on slaves.
- * Independent behavior is an operation that is performed for measurements or status monitor with a single unit configuration adopted.
- * CT expansion is a function by which CT extension slaves can be connected.
- * EMU8A, which adopts one-unit configuration, cannot perform 3-STATE classification function or calculation of power original unit.
 (The 3-STATE classification function and calculation of power origin unit are available only when the configuration of connection with the measurement master is adopted.)

■ Configuration

This product is used in the unit independent or multiple-unit connection configuration (connection of the measurement master with functional slave and CT extension slave).

* Available combinations of connections have been prepared for models. For details, refer to "List of Combinations in Model KM1/KE1 Series" on Page A-19.

● Multiple-unit connection

Connecting the measurement master to a functional slave or a CT extension slave can expand functions.

(Functional slaves cannot be connected to each other.)

In addition, a CT extension slave must be connected to the measurement master.

* A CT extension slave behaves when power voltage is applied from the measurement master.

Connection of units uses a horizontally connecting hook and a connector. Appropriately insert the connector to send and receive data between the units and to apply power voltage.

Inappropriate insertion may cause problems, such as data communication error and power failure in the unit. (Figure 2)

* For the connection procedures, refer to Page 2-7.

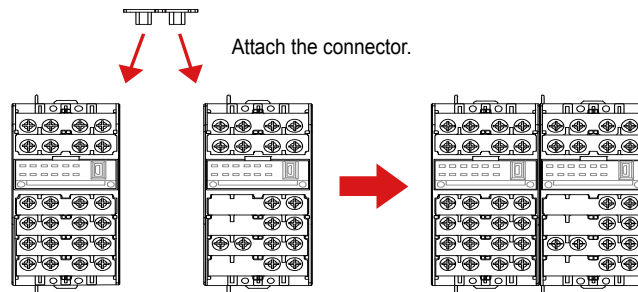


Figure 1

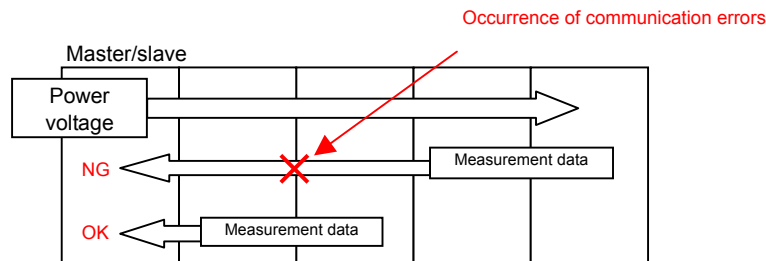


Figure 2

Note: Power voltage is applied to the CT extension slave only.

If settings of a functional slave or a CT extension slave are changed directly not via the master when multiple units are connected, supply the power to the system all over again.

* As shown in Figure 3, prevent multiple wiring for RS-485 connection within a system.

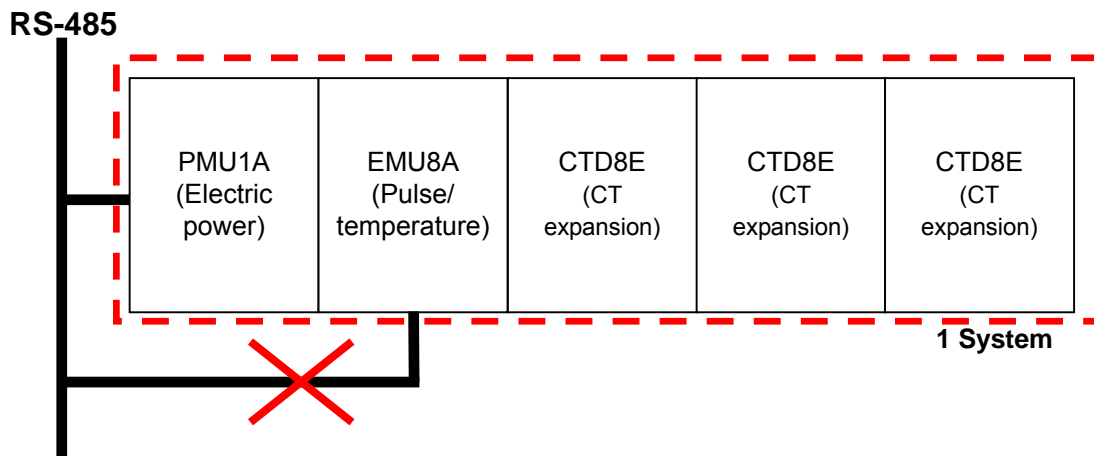
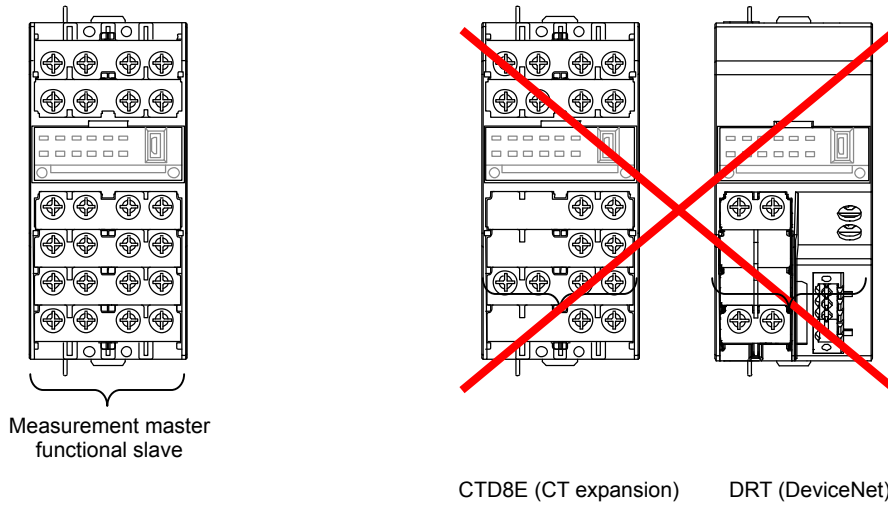


Figure 3

● Minimum configuration

- A measurement master or functional slave can be used independently.
- * A single unit of CT expansion slave is not available.



● Maximum configuration

- One measurement master can connect to a maximum of four units, including functional slave and CT extension slave units. A communication slave can connect to only one unit.



* For the communication slave (DRT (DeviceNet)), refer to "Model KE1 User's Manual" (SGTE-717) and "Model KE1 User's Manual for DeviceNet Communication Unit" (SGTE-718).

● Multiple-system configuration

Model KM1 is a system containing a maximum of six units. Multiple-system configuration can be made via RS-485 communication.

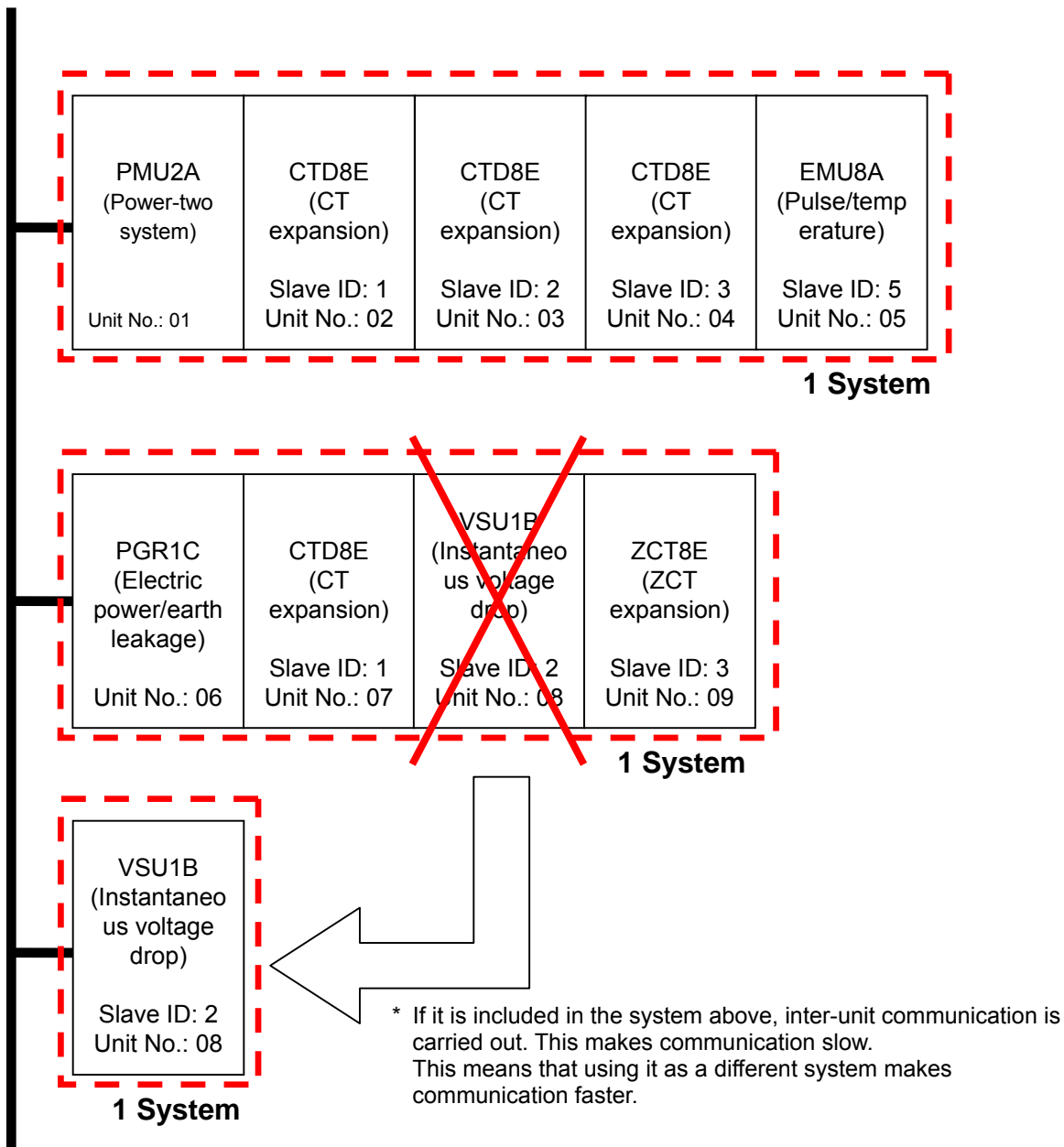
Connecting masters to each other via RS-485 wiring can achieve various functions.
Connecting to Model KE1 can detect earth leakage or instantaneous voltage drop.

*1. For Model KE1, refer to "Model KE1 User's Manual" (SGTE-717).

◆ Example of multiple-system configuration

Purpose of use : Classification of energy by equipment of single-phase 3-wire system line.
Power measurements by single phase 3-wire system, 3-phase 3-wire system, and 3-phase 4-wire system
3-phase 3-wire system earth leakage and instantaneous voltage drop monitoring.

RS-485



- *2. Set slave IDs in a way to avoid duplicates within the same system.
- *3. Make sure the communication protocol matches across the entire systems.
- *4. Set unit numbers in a way to avoid duplicates across the entire systems.
- *5. Within a system where multiple units are connected, do not use RS-485 wiring for multiple connections.

1.4 Format standard

■ Format standard

K **□** **1** - **□** **□** **□** **□** **□** - **FLK**

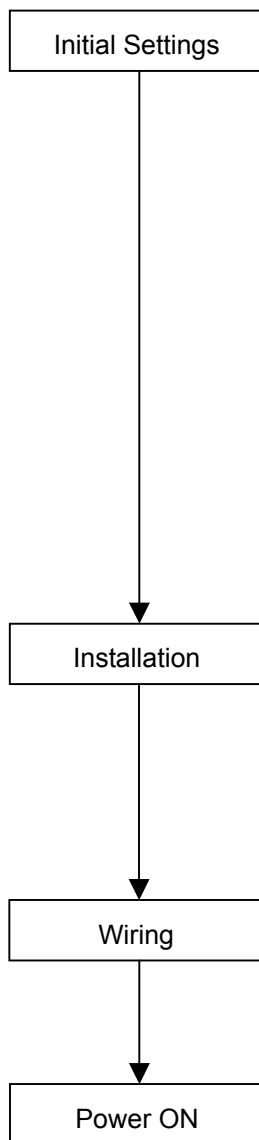
[1] [2] [3] [4] [5] [6] [7]

[1] K	:	Product of measurement monitor
[2] M	:	Smart Power Monitor
E	:	Smart Measurement and Monitoring Instrument
[3] 1	:	Series No.
[4] □□□	:	Unit type
		PMU Power measurement unit
		EMU Pulse/temperature input unit
		CTD CT Expansion Unit
[5] □	:	Number of input circuits
[6] □	:	A NPN transistor X 3 outputs
		E 1a relay X 1 output
[7] FLK	:	With communication function

Chapter 2. Preparation

2.1	Flow before use	2-2
	■ Setting example	2-3
	● Setting list of units	2-4
2.2	Installation	2-6
	■ External dimensions (unit: mm)	2-6
	■ Connection method	2-7
	● Horizontally connecting hook	2-7
	● Connector	2-8
	■ Installation procedure	2-9
	● Installation of DIN rail	2-9
	● Installation on a wall	2-11
2.3	Installation of dedicated CT	2-12
	■ Wire connection and installation of dedicated CT	2-13
2.4	Input/output configuration and example of wiring diagram	2-14
	■ Model KM1-PMU1A-FLK	2-14
	● Terminal arrangements and input/output configuration	2-14
	● Function of terminal	2-14
	● Example of wiring diagram	2-15
	■ Model KM1-PMU2A-FLK	2-16
	● Terminal arrangements and input/output configuration	2-16
	● Function of terminal	2-16
	● Example of wiring diagram	2-17
	■ Model KM1-EMU8A-FLK	2-19
	● Terminal arrangements and input/output configuration	2-19
	● Function of terminal	2-19
	■ Model KE1-CTD8E	2-20
	● Terminal arrangements and input/output configuration	2-20
	● Function of terminal	2-20
	● Example of wiring diagram	2-21
2.5	Wiring	2-25
	■ Requests for wiring	2-25
	■ Wiring	2-25
	● Power voltage	2-25
	● USB port	2-26
	● Input voltage	2-26
	● CT input	2-27
	● RS-485 communication	2-28
	● Output	2-29
	● Event input	2-29

2.1 Flow before use



Make settings of communication protocol and slave ID with setting switches.

(Refer to Page 1-8.)

- * For the units to be used, use the same communication protocol.
- * Confirm that slave IDs are not duplicated between units.

Initialize setting values via USB communication. (Unit no. XX)

Initialize the units via USB communication or RS-485 communication.

Setting item

- Setup of unit no.
- Setup of connection configuration
- Arbitrary setting (alarm output setting, setting of log data to be saved, etc.)
- * Since CT expansion slave has a terminal for RS-485 communication, make the settings via RS-485 communication that is carried out via USB communication or the measurement master.
- * When performing RS-485 communication, apply power voltage.
- * Set unit numbers in a way to avoid duplicates across the entire systems.
- * For examples of initial setting, refer to Page 2-3.

Perform installation

- * If power voltage has been applied, turn OFF the power supply.

Installation procedure

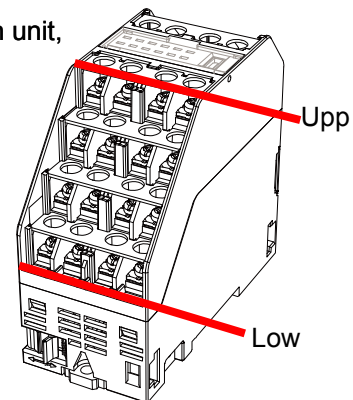
- Installation of DIN rail (refer to Page 2-9)
- Installation on a wall (refer to Page 2-11)
- * When using multiple units, connect them and then install them in the DIN rail.
- * Installation on a wall is not allowed when multiple units are used.

Perform wiring.

- * Perform wiring from the lower stage.
 - * When performing wiring, use input/output configuration and examples of wiring diagram for the reference.
- (Refer to Page 2-14.)

Turn ON the power supply.

- * Between terminals [1] and [2] in each unit, apply the power voltage.



- * For the setting, use KM1/KE1-Setting.

For how to use KM1/KE1-Setting, refer to "KM1/KM1 User's Manual for Setting Tool" (GAMS-010).

Download KM1/KE1-Setting and the manual at i-Web (<http://www.fa.omron.co.jp/>).

■ Setting example

- System Configuration : Master --- PMU2A (power two-system)
Slave --- EMU8A (pulse/temperature)
CTD8E (CT expansion)
- Purpose : Classification of operating signals (condition) for the facilities of 3-phase 3-wire line.
Extraction of waste in the electric power of single-phase 2-wire
Measurement of electric power in facilities of each line.
- Setting switch : Set the Pin no. 2 of DIP switch to OFF (CompoWay/F) across the entire system.
Using the rotary switch, set the slave ID.
EMU8A (pulse/temperature) --- 5 (to use event input for 3-STATE)
CTD8E (CT expansion) --- 1 (Because the setting range of slave ID is from 1 to 4)
- Unit no. : PMU2A --- 01 (Because the setting range of unit no. is from 00 to 99.)
EMU8A --- 02 (Because the setting range of unit no. is from 00 to 99)
CTD8E --- 03 (Because the setting range of unit no. is from 00 to 99.)

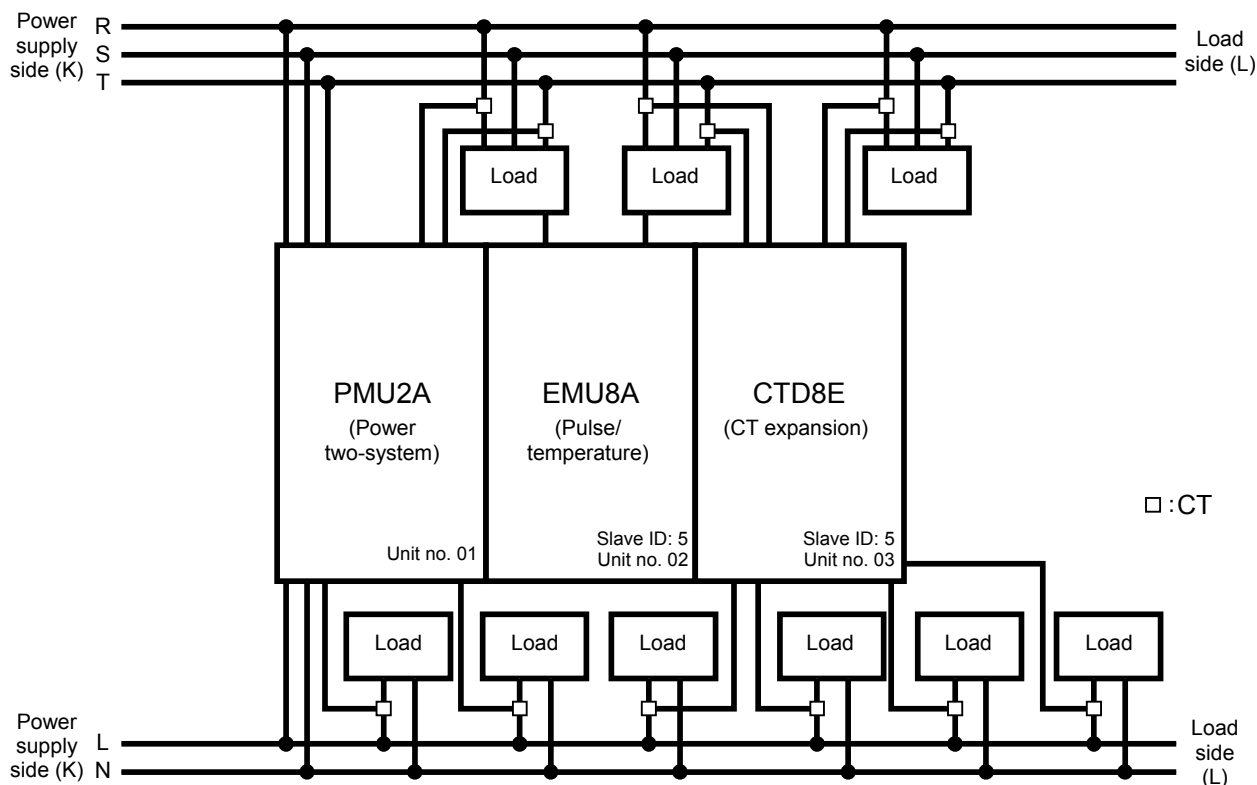
* A unit no. is assigned by higher equipment (example: PC) to identify units from each other.

Connection configuration : H'11

0	0	0	1	0	0	0	1
-	-	With/without slave ID 6	With/without slave ID 5	With/without slave ID 4	With/without slave ID 3	With/without slave ID 2	With/without slave ID 1

1

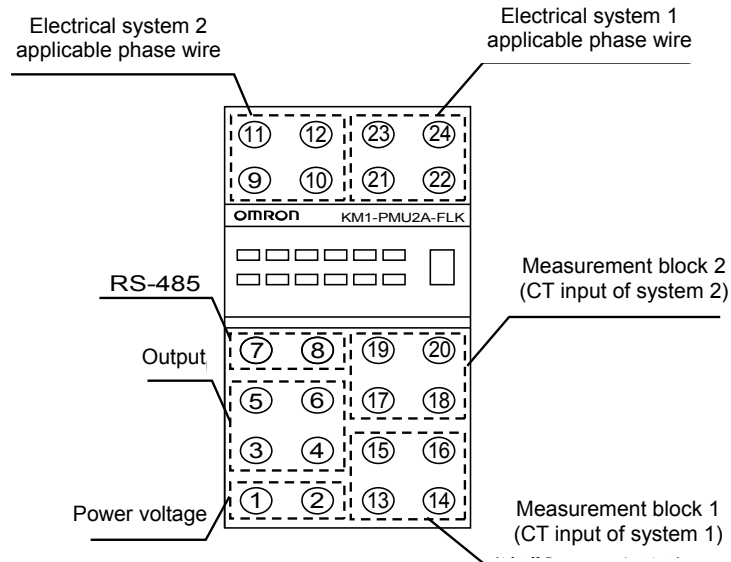
1



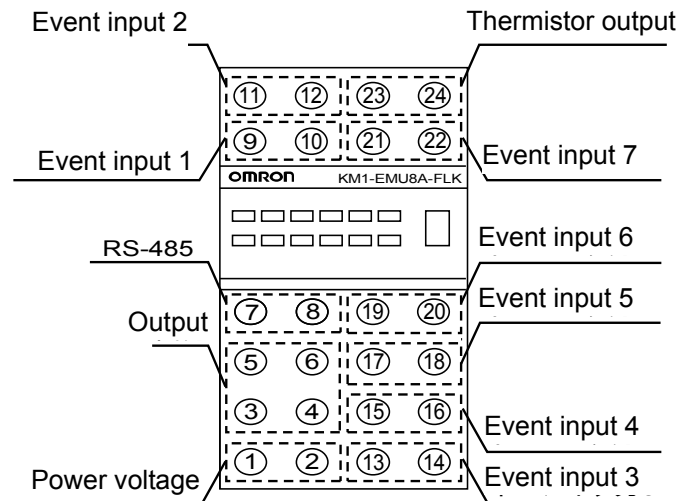
● Setting list of units

PMU2A (power two-system)

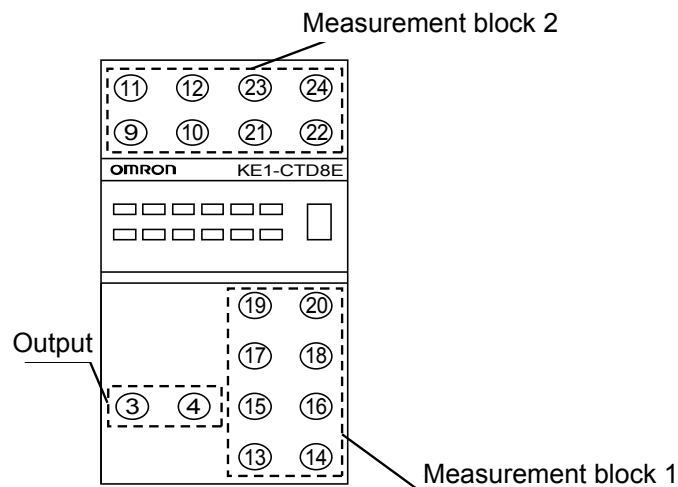
Electrical system 1 applicable phase wire	: 3-phase 3-wire	
Electrical system 2 applicable phase wire	: Single phase 2-wire	
Dedicated CT type for measuring block 1	: 50 A	
Dedicated CT type for measuring block 2	: 5 A	
Measurement start time	: 08:30	
Measurement end time	: 17:15	
Measuring block 1 3-STATE judgment target	: Event input	
Measuring block 2 3-STATE judgment target	: Electric power	
Measuring block 1 3-STATE/p3-STATE/original unit event input		: 1 and 2
Measuring block 2 3-STATE HIGH threshold	: 100.0	
Measuring block 2 3-STATE LOW threshold	: 80.0	
Measuring block 2 3-STATE hysteresis	: 5.0	
Connection configuration	: H'11	
Unit no.	: 01	
Communication speed	: 9.6 kbps	
Data bit length	: 7 bits	
Stop bit length	: 2 bits	
Vertical parity	: Even	
Transmission wait time	: 20 ms	



EMU8A (pulse/temperature)	
Event input setting 1	: 3-ST (3-STATE classification)
Event input setting 2	: 3-ST (3-STATE classification)
Event input 1 NPN/PNP input mode setting	: PNP (With voltage)
Event input 2 NPN/PNP input mode setting	: PNP (With voltage)
Event input 1 input mode setting	: N-O (Normally open)
Event input 2 input mode setting	: N-O (Normally open)
Unit no.	: 02
Communication speed	: 9.6 kbps
Data bit length	: 7 bits
Stop bit length	: 2 bits
Vertical parity	: Even
Transmission wait time	: 20 ms



CTD8E (CT expansion)	
Electrical system 1 applicable phase wire measurement master setting)	: 3 phase 3-wire (to conform to the measurement master setting)
Electrical system 2 applicable phase wire measurement master setting)	: Single phase 2-wire (to conform to the measurement master setting)
Measuring block 1 sync select	: Electrical system 1
Measuring block 2 sync select	: Electrical system 2
Dedicated CT type for measuring block 1	: 50 A
Dedicated CT type for measuring block 2	: 5 A
Unit no.	: 03



* For the setting range for each item, refer to "List of parameters" on Page A-9.

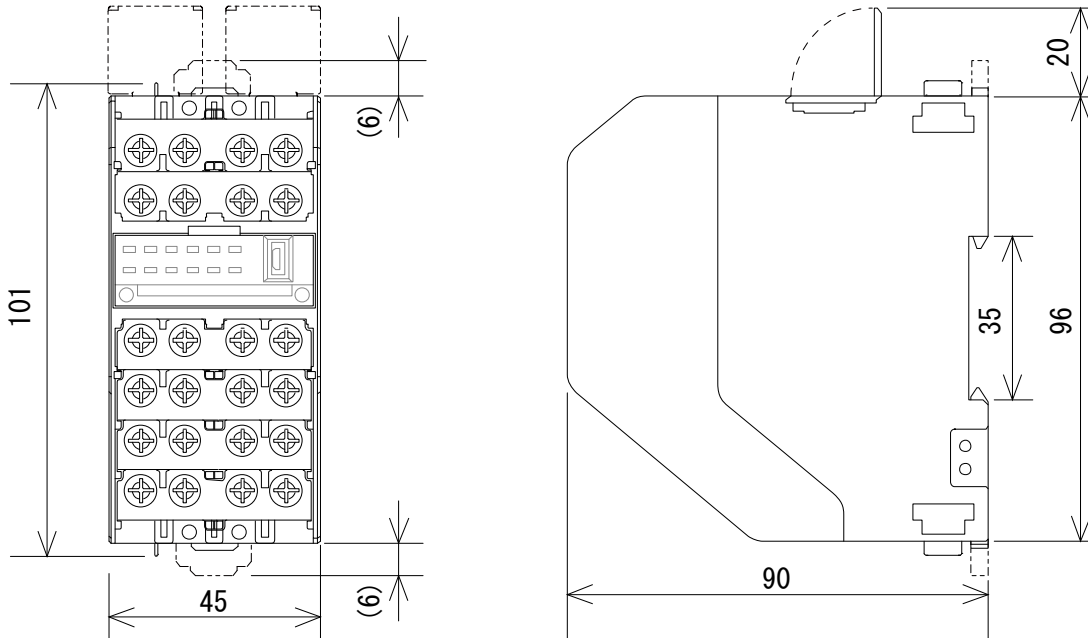
2.2 Installation

■ External dimensions (unit: mm)

45 in width X 96 in height X 90 in depth

(Protruding portion is not included)

Preparation



* Dimensions put in parentheses are applicable when DIN hook is pulled out.

■ Connection method

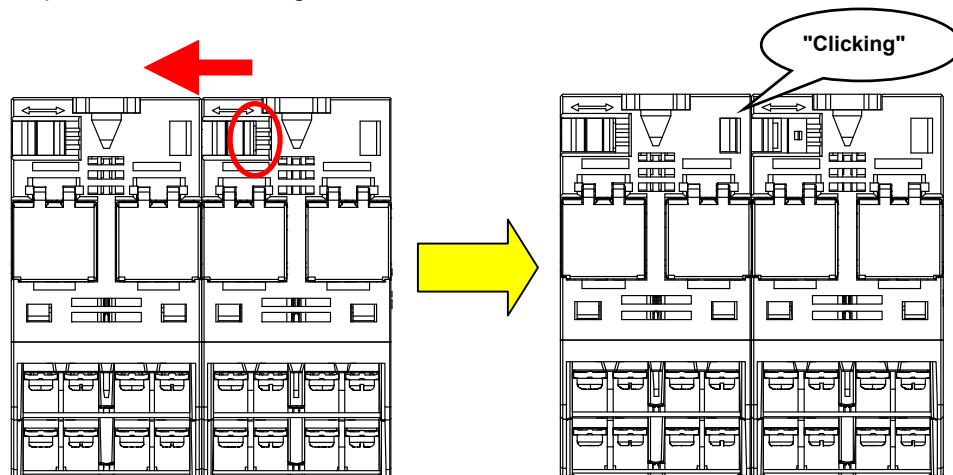
Using horizontally connecting hooks and connection connectors, connect adjacent units to each other.

● Horizontally connecting hook

This hook is used to securely fix units to each other on the DIN rail.

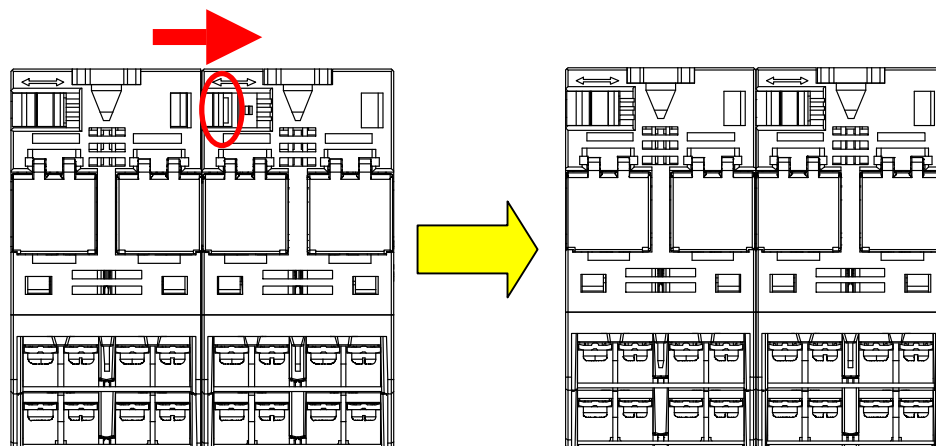
- Installation procedure

Slide the white, horizontally connecting hooks on top and at the bottom of the product until a clicking sound is heard and lock.



- Removal procedure

Pushing the protruding portion encircled, slide it in the direction opposite to that in which locking is done for installation.



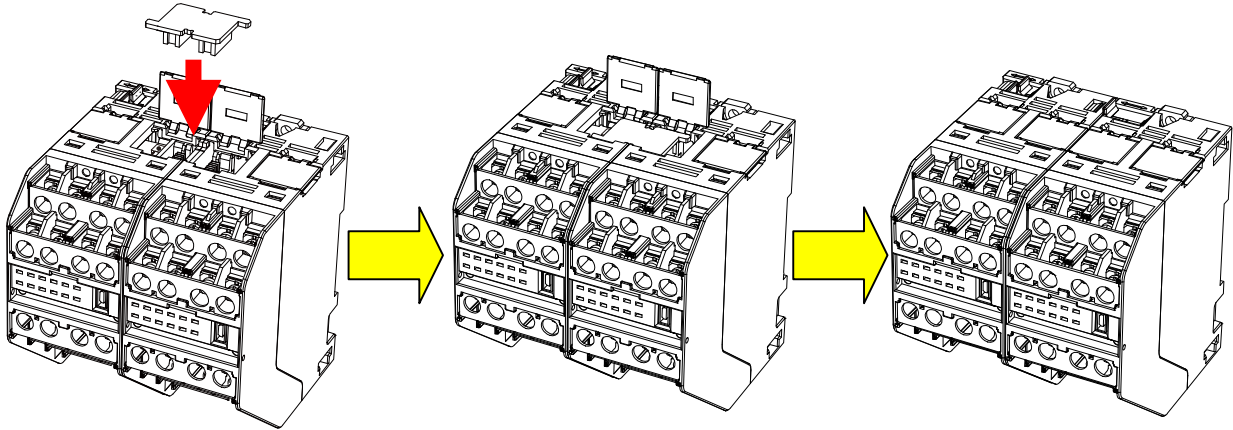
- Connector

This connector is used to connect units to each other.

Inter-unit communication can be carried out to expand functions.

- Installation procedure

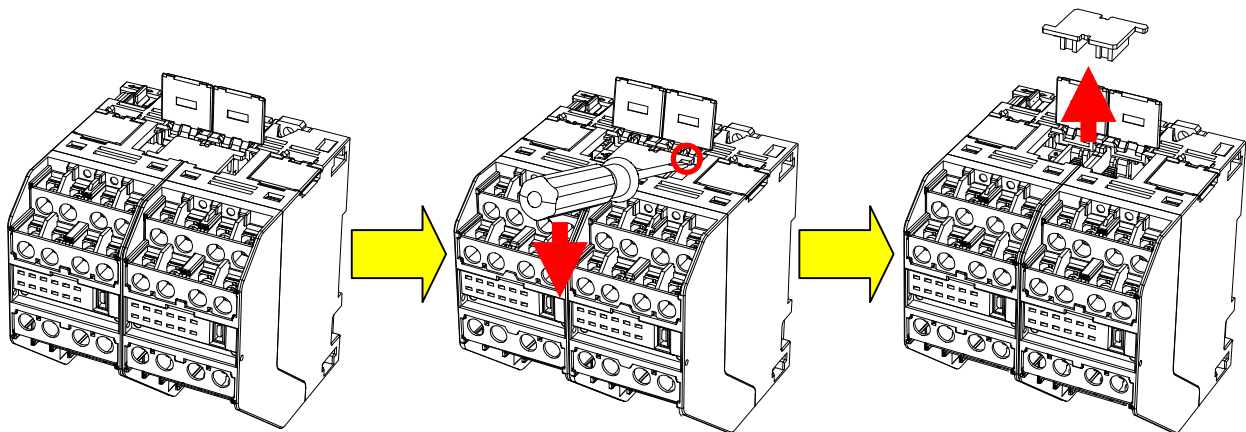
Lift the cover on top of the product and set the connection connector. Close the cover before use.



- Removal procedure

Open the lid at the top of the product, and remove the connection connector by hooking a flat head screwdriver on the red circle portion shown in the figure.

* Be careful not to make the flat head screwdriver contact the internal board.



* 1 When multiple units are used within the system, be sure to install the connector by locking it with the horizontal connecting hook.

■ Installation procedure

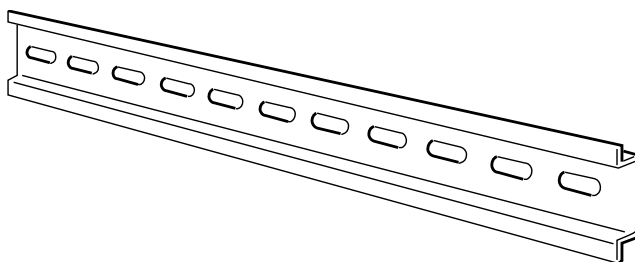
● Installation of DIN rail

When installing Model KM1, use the DIN rail or screws.

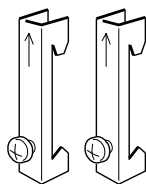
When using the DIN rail, fix it with three or more screws within the control panel.

● Recommended DIN rail

Model	Dimensions	Manufacturer
Model PFP-100N	1,000 mm	OMRON
Model PFP-50N	500 mm	

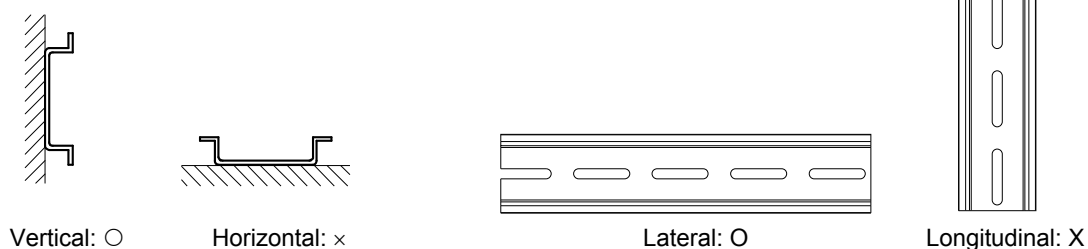


● End plate Model PFP-M (2 pieces)



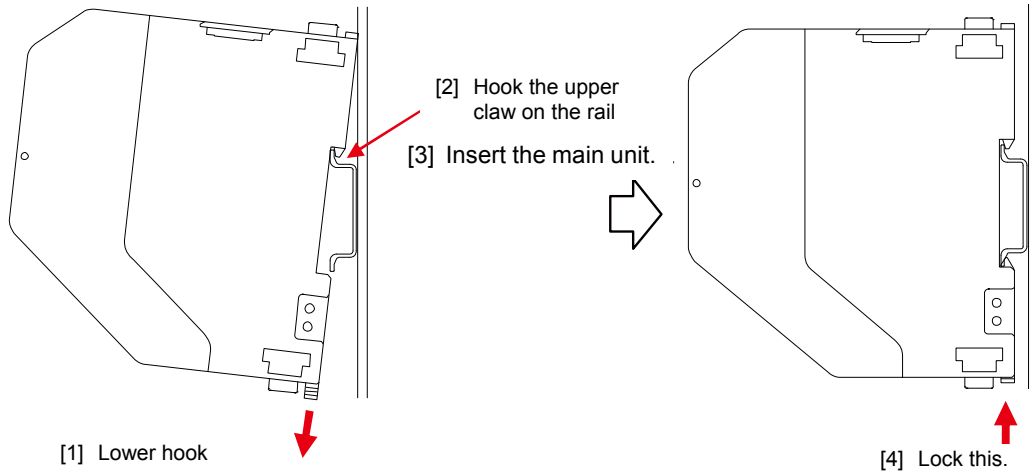
● Installation direction

The installation direction of Model KM1 has been determined. As shown below, place the DIN rail vertical to the ground and install it in the horizontal direction.



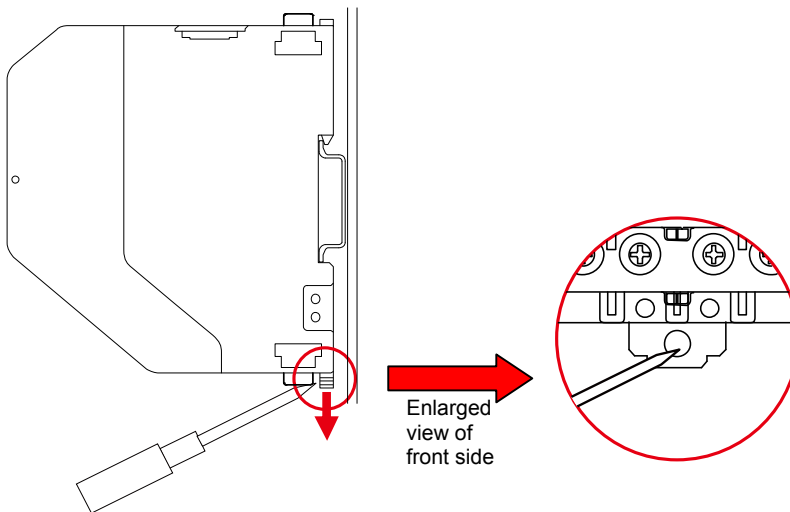
- **Installation procedure**

Lower the DIN hook, hook the upper claw on the DIN rail, and push it until the DIN hook can be locked. Then lock it by raising the hook.



- **Removal procedure**

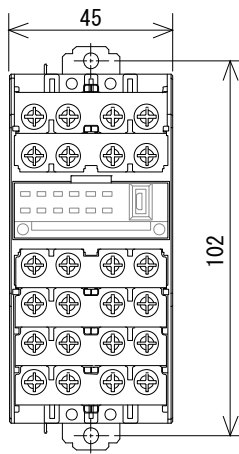
Pull the DIN hook out with a flat head screwdriver, etc., and then raise it from the lower side.



- Installation on a wall

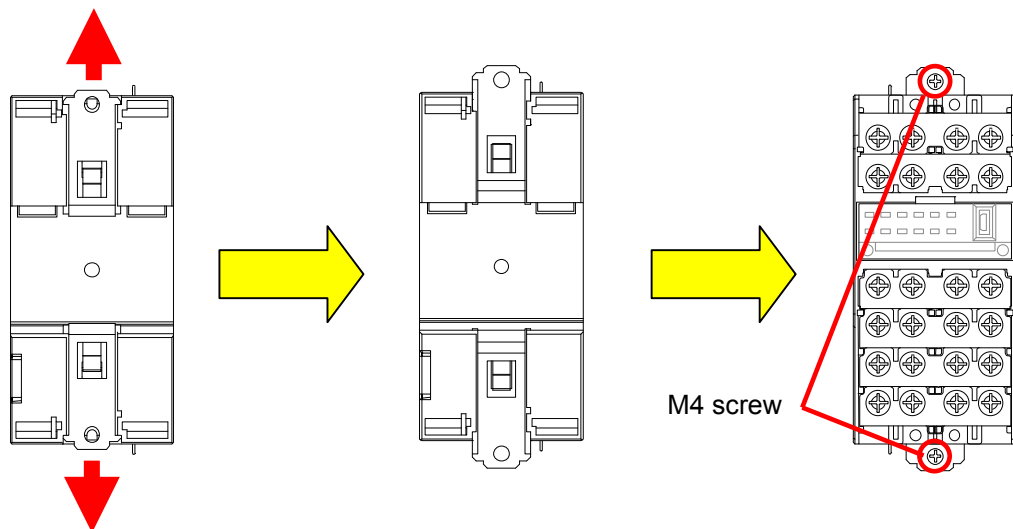
If the product is used as a single unit, it can be installed on a wall. When using multiple units, be sure to install them in the DIN rail.

- Installation procedure



- Installation procedure

Pull two DIN hooks on the back of the product to the outside until a clicking sound is heard. Put them in the DIN hook holes and install them with M4 screws.



2.3 Installation of dedicated CT

The dedicated CT is divided into the two types: split type and panel fixed (through) type.

[Common]

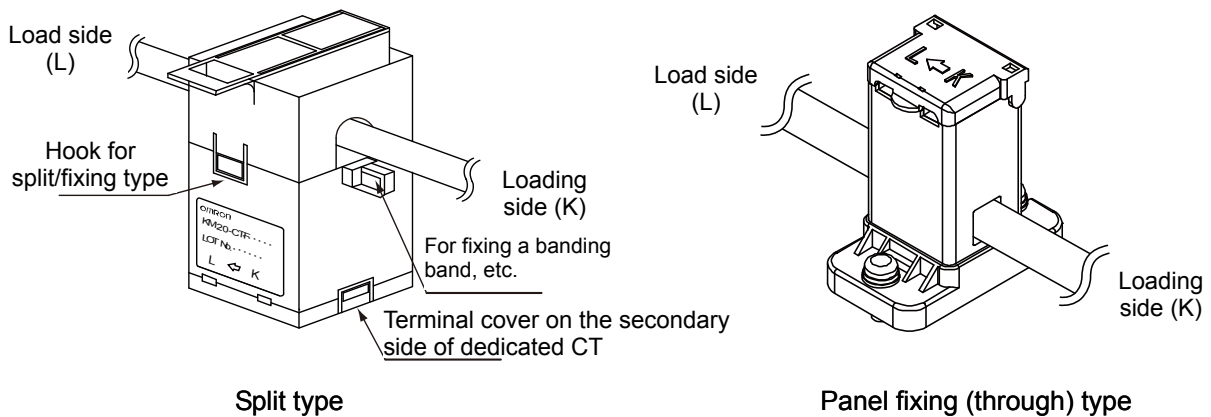
- Measurement with single-phase 2-wire requires one dedicated CT, measurement with single-phase 3-wire or 3-phase 3-wire requires two dedicated CTs, and measurement with 3-phase 4-wire requires three dedicated CTs.
- Use of dedicated CTs in a circuit requires all the CTs to have the same standard.
- The standard of the dedicated CTs to be used should match the settings of the dedicated CT of Model KM1.
- A dedicated CT has its polarity. Carry out wiring correctly between (K) and (L).
For terminal positions, refer to Page 2-14 and later.
- Before making connections, confirm the directions of power supply side (K) and load side (L). Wrong direction prevents correct measurements.
- Securely close the terminal cover on the secondary side of dedicated CT.
- Do not ground the dedicated CT. Doing so causes a failure.
- Electric shocks may occur.
For the primary side wire to be clamped in CT, be sure to use a covered electric wire of 600 V or more in basic insulation.
When using a conductive object, such as bus bar, for clamping, ensure the basic insulation at least by, e.g., covering with an insulator.
- Avoid direct clamping in a line of 600 VAC or more.

[Split type]

- Open the hook for the split/fixed type and clamp each phase. After clamping, securely perform fitting until a clicking sound is heard.

[Panel fixing (through) type]

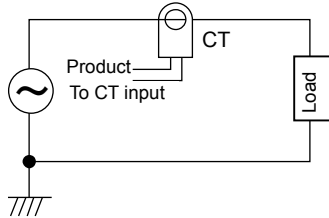
- Securely fix the dedicated CT to the panel, etc.



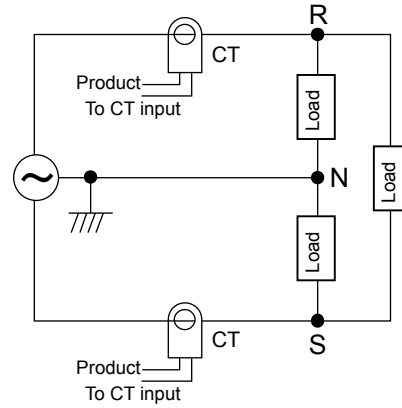
■ Wire connection and installation of dedicated CT

This section describes the wire connection for each phase wire and the installation of dedicated CT.

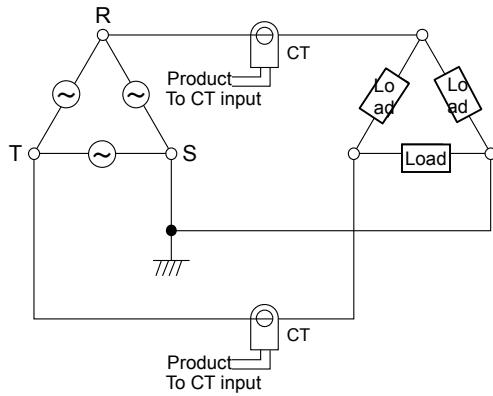
Single-phase 2-wire



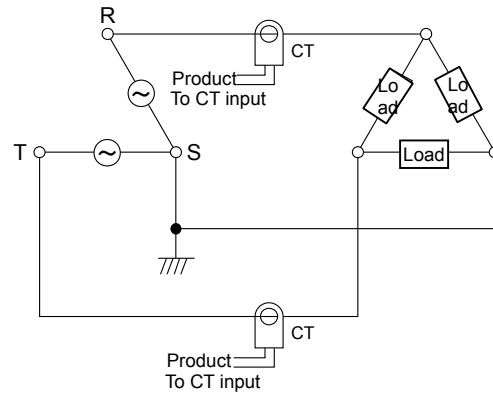
Single-phase 3-wire



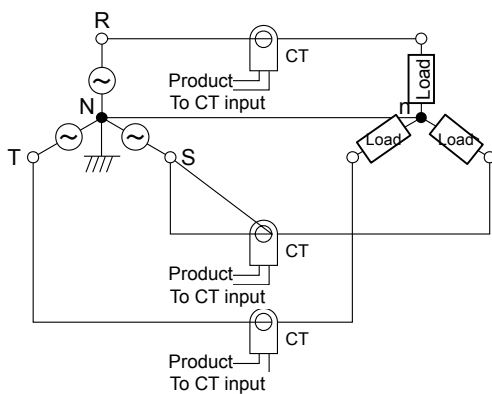
3-phase 3-wire (Δ (delta) wire connection)



3-phase 3-wire (V wire connection)



3-phase 4 wire (Y (star) wire connection)



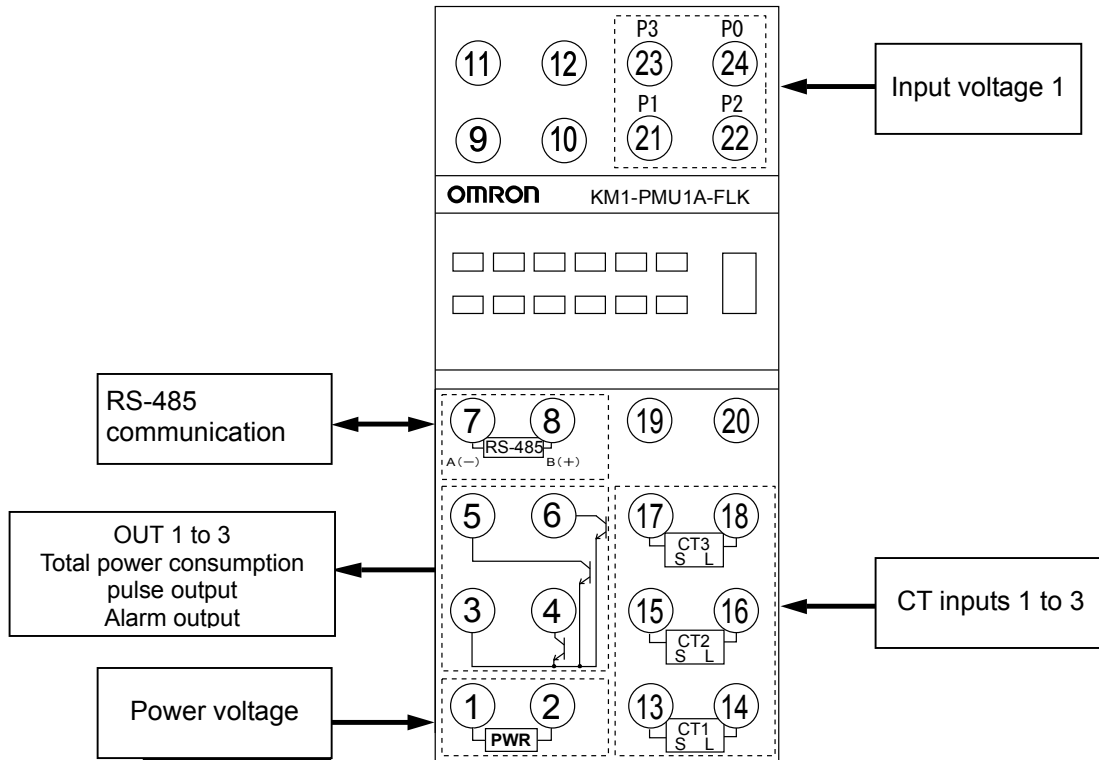
* When installing the dedicated CT, set K and L at the power supply side and load side, respectively.

2.4 Input/output configuration and example of wiring diagram

Terminal arrangements should be confirmed according to the numbers printed on the side face of the product and on the terminal block.

■ Model KM1-PMU1A-FLK

- Terminal arrangements and input/output configuration

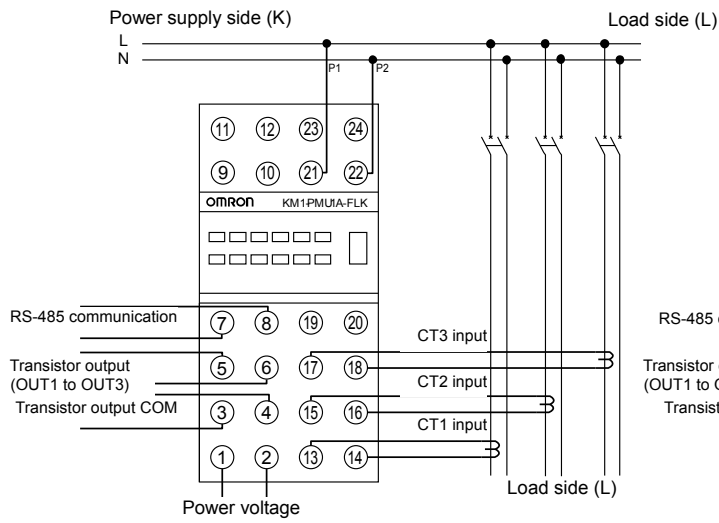


- Function of terminal

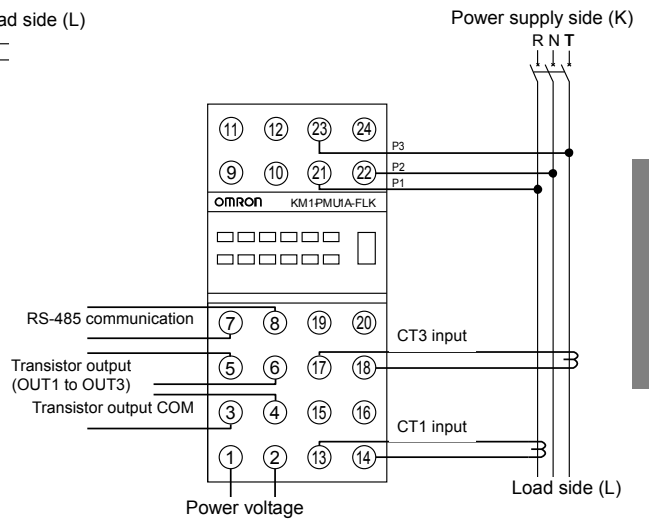
①	Power voltage (AC100 ~ 240V)	⑨	NC	⑰	CT - 3S
②		⑩	NC	⑱	CT - 3L
③	Transistor output COM	⑪	NC	⑲	NC
④	Transistor output 1	⑫	NC	⑳	NC
⑤	Transistor output 2	⑬	CT - 1S	㉑	Measurement voltage input P1
⑥	Transistor output 3	⑭	CT - 1L	㉒	Measurement voltage input P2
⑦	RS - 485 A(-)	⑮	CT - 2S	㉓	Measurement voltage input 3
⑧	RS - 485 B(+)	⑯	CT - 2L	㉔	Measurement voltage input 0

● Example of wiring diagram

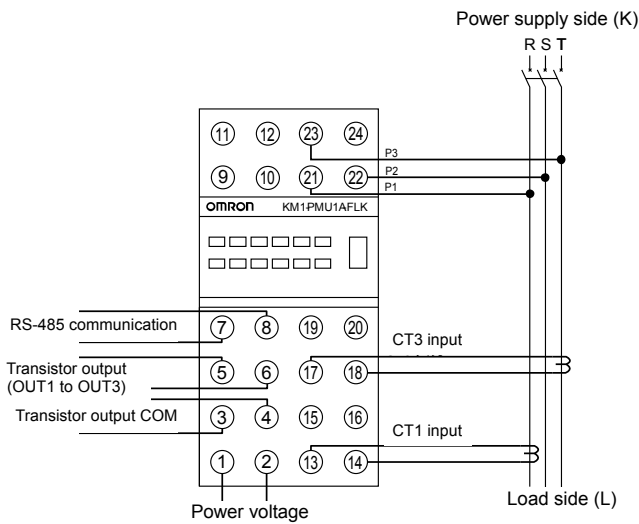
▪ Single-2 wire



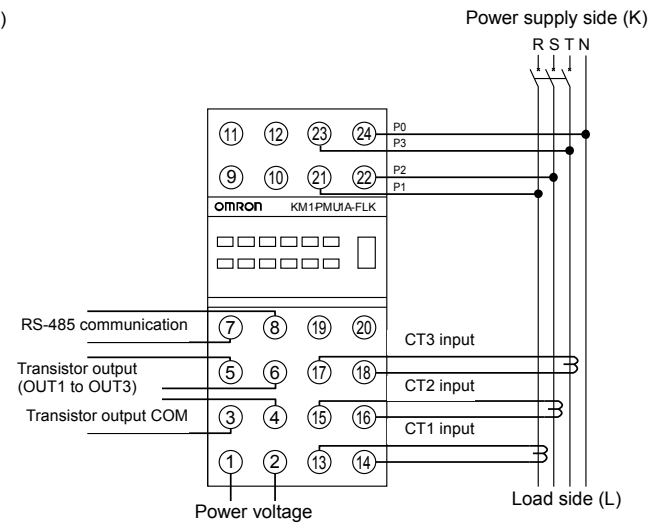
▪ Single-3 wire



▪ 3-phase 3-wire

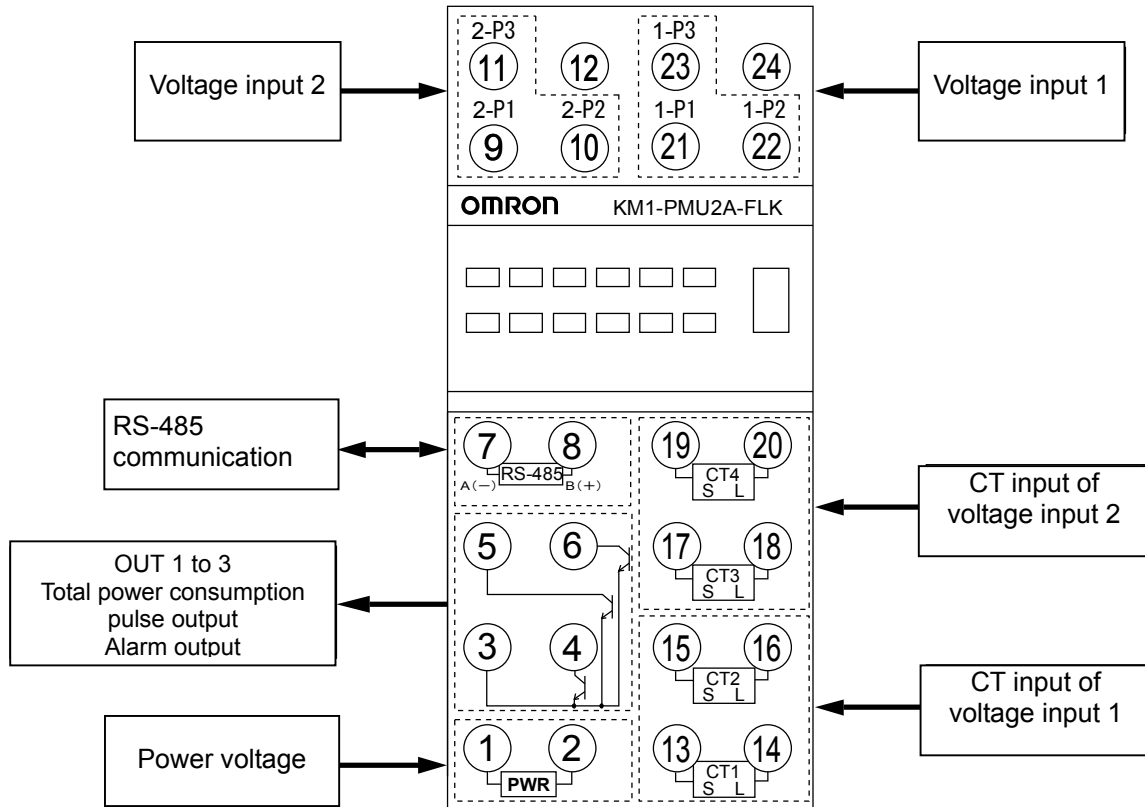


▪ 3-phase 4-wire



■ Model KM1-PMU2A-FLK

- Terminal arrangements and input/output configuration

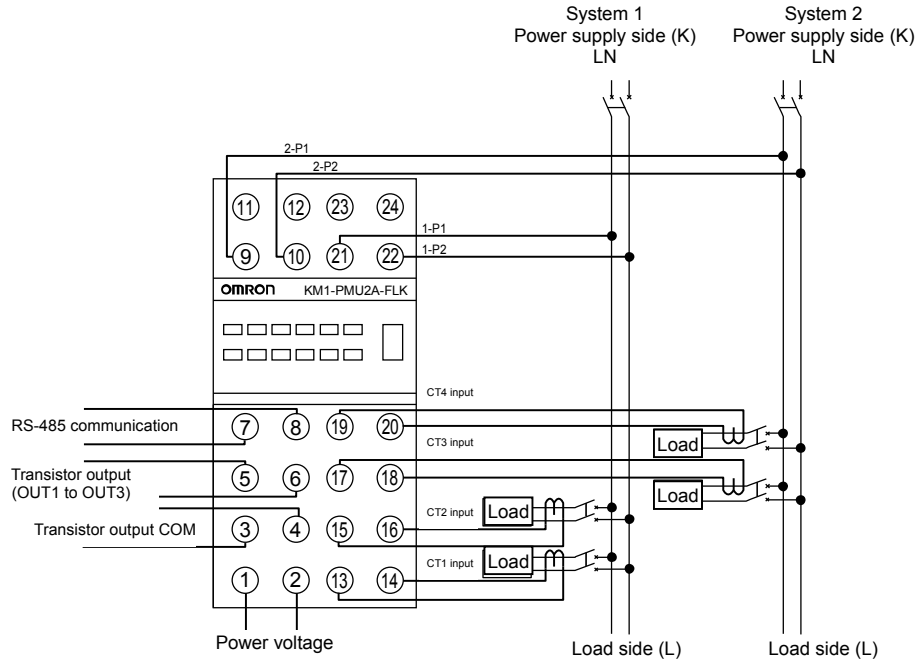


- Function of terminal

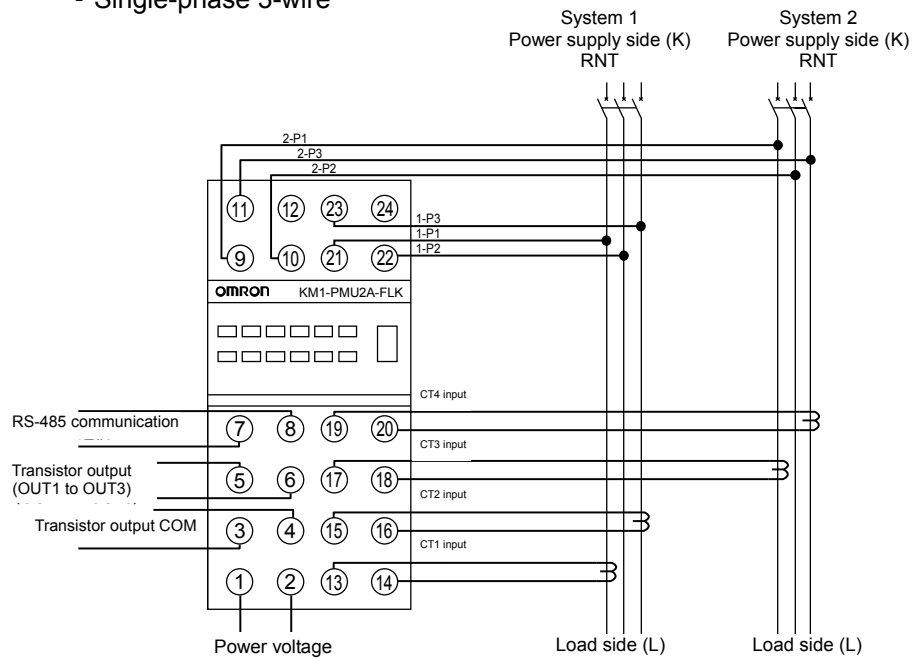
①	Power voltage (AC100 ~ 240V)	⑨	Measurement voltage input 2-P1	⑰	CT - 3S
②		⑩	Measurement voltage input 2-P2	⑱	CT - 3L
③	Transistor output COM	⑪	Measurement voltage input 2-P3	⑲	CT - 4S
④		⑫	DO NOT USE	⑳	CT - 4L
⑤	Transistor output 2	⑬	CT - 1S	㉑	Measurement voltage input P1
⑥	Transistor output 3	⑭	CT - 1L	㉒	Measurement voltage input P2
⑦	RS - 485 A (-)	⑮	CT - 2S	㉓	Measurement voltage input P3
⑧	RS - 485 B (+)	⑯	CT - 2L	㉔	DO NOT USE

- Example of wiring diagram

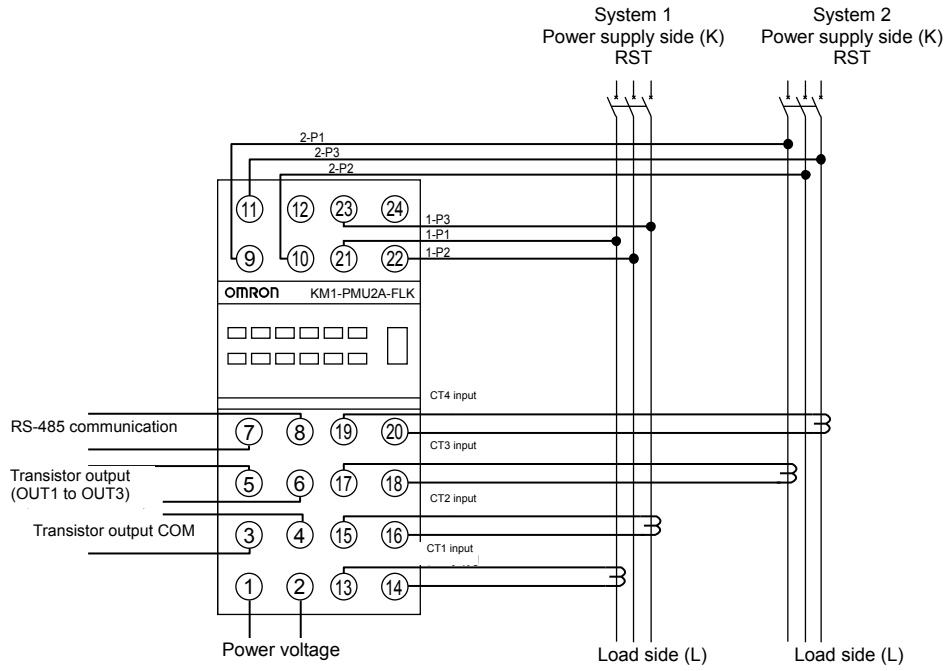
- Single-phase 2-wire



- Single-phase 3-wire

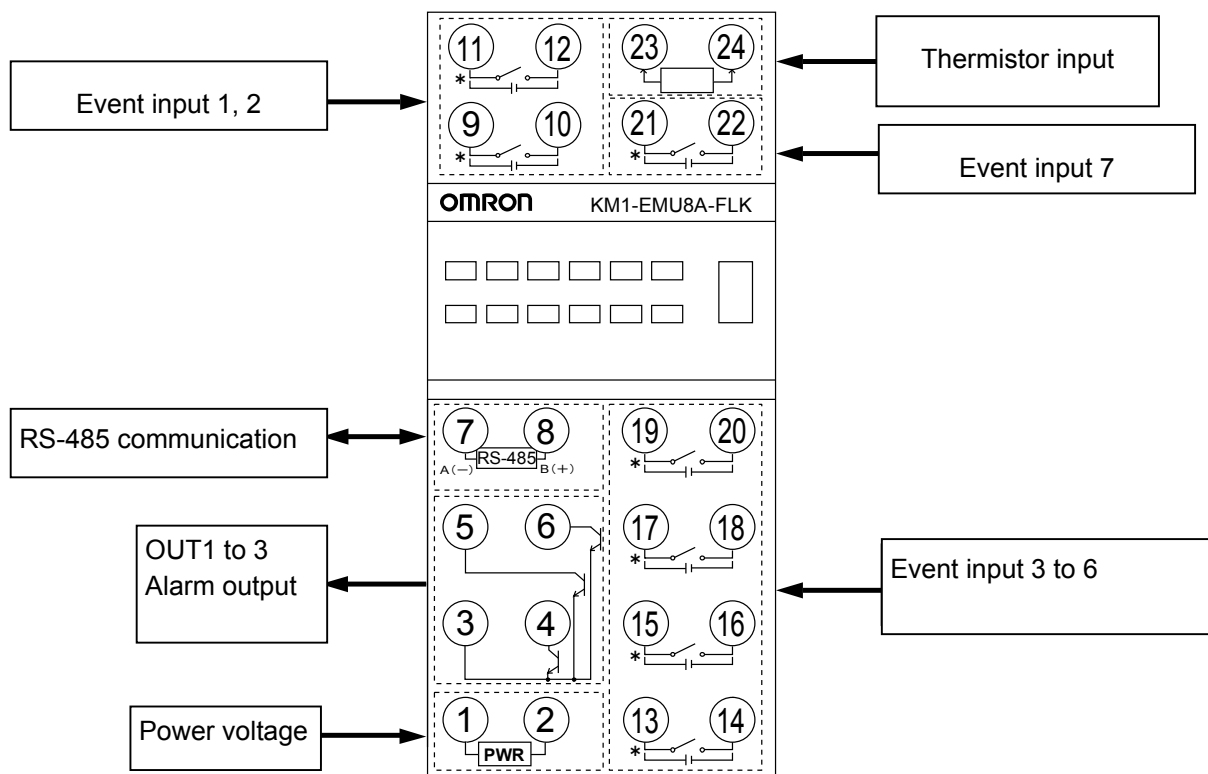


■ 3-phase 3-wire



■ Model KM1-EMU8A-FLK

- Terminal arrangements and input/output configuration



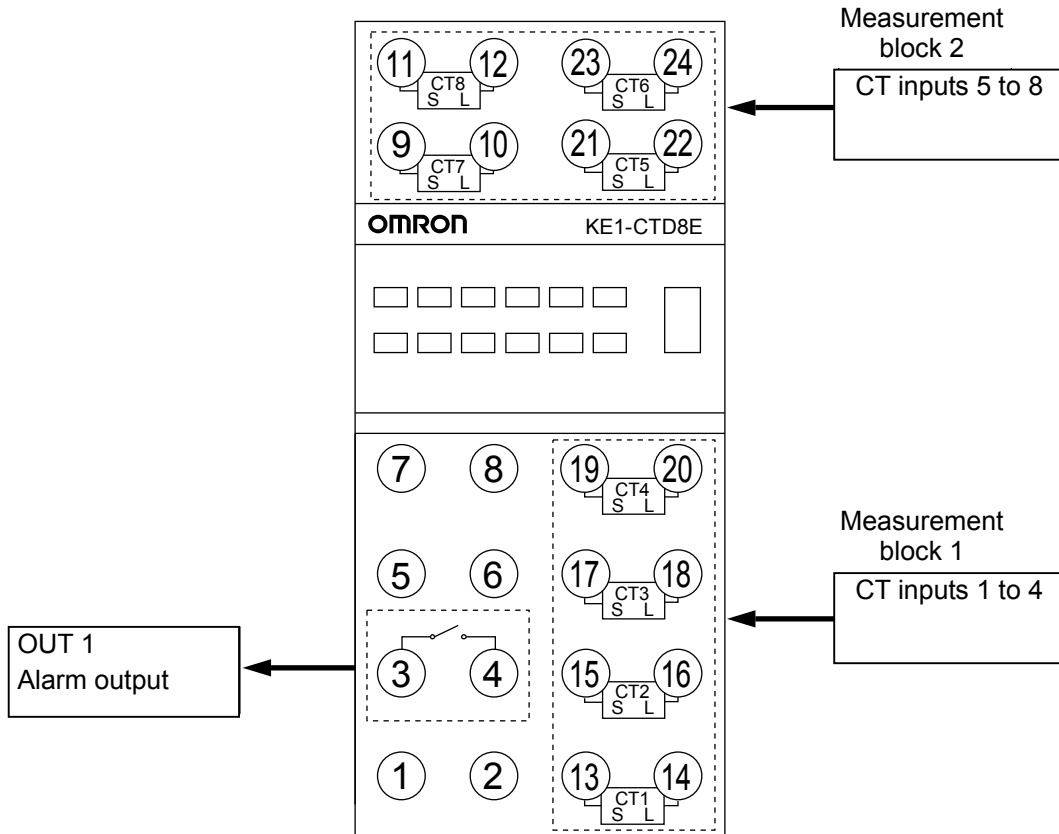
* With Voltage/Without Voltage can be set.

- Function of terminal

①	Power voltage (AC100 ~ 240V)	⑨	Event input 1 (+)	⑰	Event input 5 (+)
②		⑩	Event input 1 (-)	⑱	Event input 5 (-)
③	Transistor output COM	⑪	Event input 2 (+)	⑲	Event input 6 (+)
④		⑫	Event input 2 (-)	⑳	Event input 6 (-)
⑤		⑬	Event input 3 (+)	㉑	Event input 7 (+)
⑥	Transistor output 3	⑭	Event input 3 (-)	㉒	Event input 7 (-)
⑦		⑮	Event input 4 (+)	㉓	Thermistor input
⑧	RS - 485 B (+)	⑯	Event input 4 (-)	㉔	Thermistor input

■ Model KE1-CTD8E

- Terminal arrangements and input/output configuration



* Use of the setting tool can assign Measuring block 1 and measuring block 2 to electrical system 1 and electrical system 2 of the master arbitrarily.

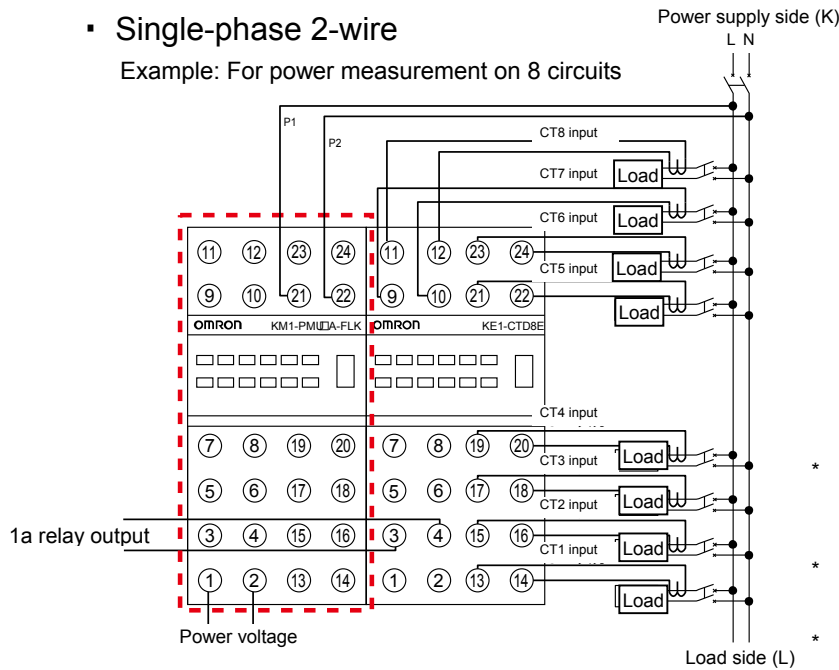
- Function of terminal

①	NC	⑨	CT - 7S	⑰	CT - 3S
②	NC	⑩	CT - 7L	⑱	CT - 3L
③	1a relay output	⑪	CT - 8S	⑲	CT - 4S
④		⑫	CT - 8L	⑳	CT - 4L
⑤	NC	⑬	CT - 1S	㉑	CT - 5S
⑥	NC	⑭	CT - 1L	㉒	CT - 5L
⑦	NC	⑮	CT - 2S	㉓	CT - 6S
⑧	NC	⑯	CT - 2L	㉔	CT - 6L

● Example of wiring diagram

▪ Single-phase 2-wire

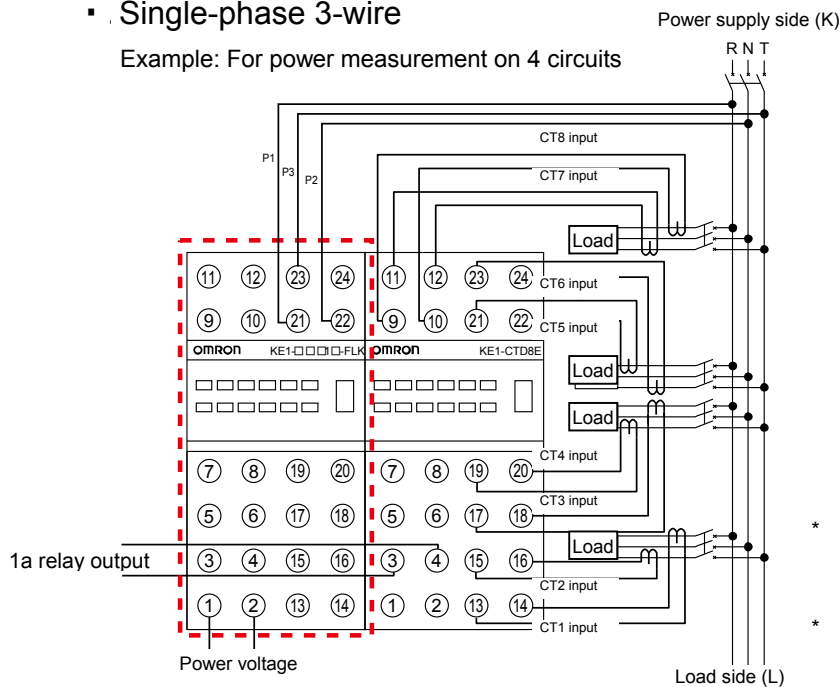
Example: For power measurement on 8 circuits



- * Model KE1-CTD8E does not operate as a single unit. For the operation, be sure to connect it to the measurement master.
- * The number CT inputs required differ depending on the line type.
Single-phase 2-wire: CT1 input
- * The number of circuits that can be measured in one Model KE1-CTD8E unit is as follows:
Single-phase 2-wire: Up to 8 circuits

▪ Single-phase 3-wire

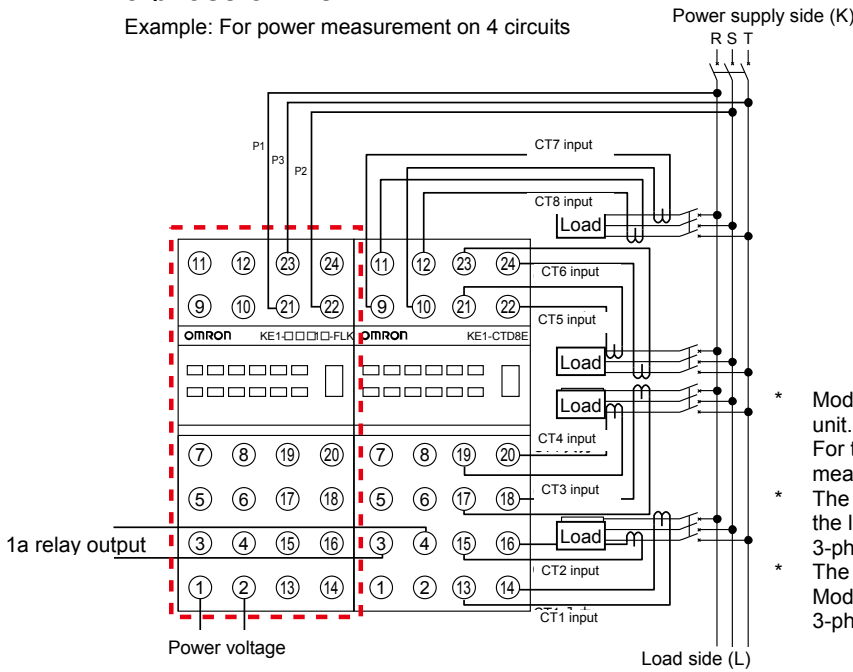
Example: For power measurement on 4 circuits



- * Model KE1-CTD8E does not operate as a single unit. For the operation, be sure to connect it to the measurement master.
- * The number CT inputs required differ depending on the line type.
Single-phase 3-wire: CT2 input
- * The number of circuits that can be measured in one Model KE1-CTD8E unit is as follows:
Single-phase 3-wire: Up to 4 circuits

3-phase 3-wire

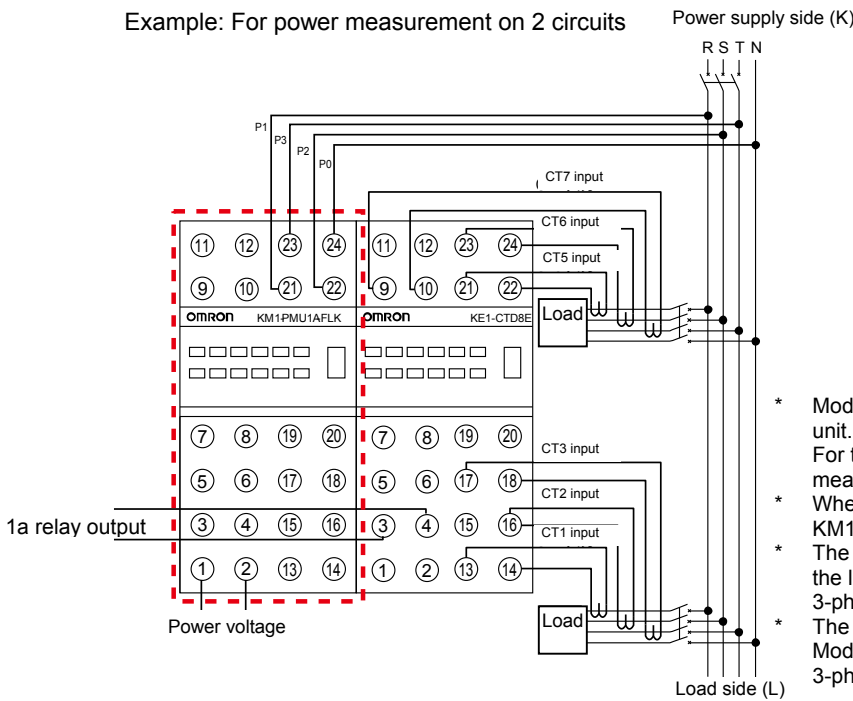
Example: For power measurement on 4 circuits



- * Model KE1-CTD8E does not operate as a single unit. For the operation, be sure to connect it to the measurement master.
- * The number CT inputs required differ depending on the line type.
3-phase 3-wire: CT2 input
- * The number of circuits that can be measured in one Model KE1-CTD8E unit is as follows:
3-phase 3-wire: Up to 4 circuits

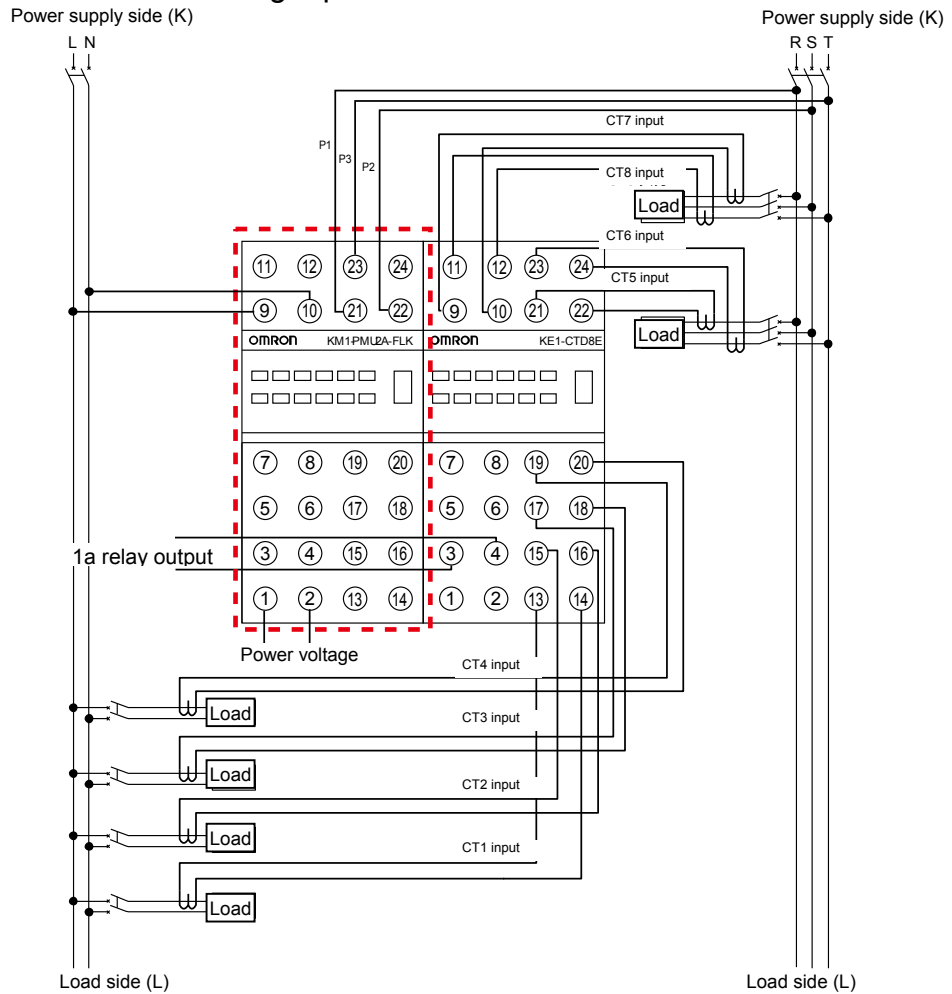
3-phase 4-wire

Example: For power measurement on 2 circuits



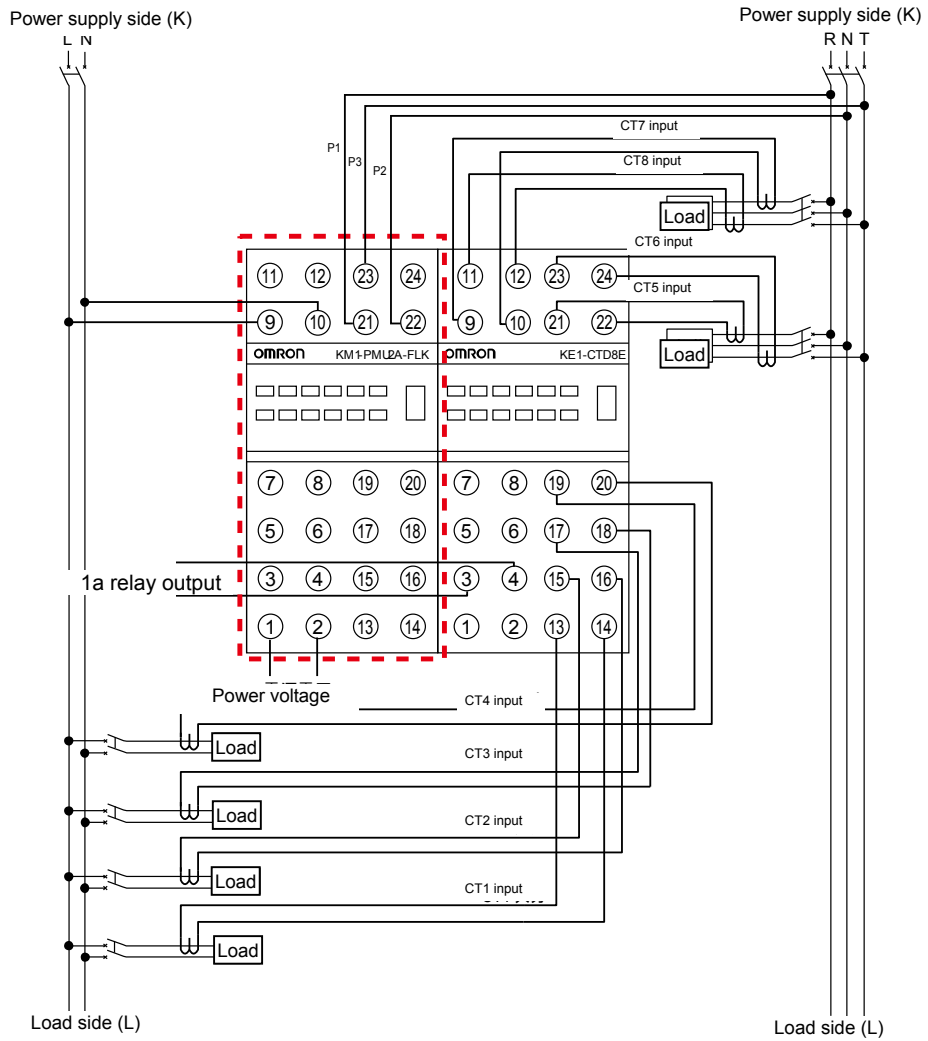
- * Model KE1-CTD8E does not operate as a single unit. For the operation, be sure to connect it to the measurement master.
- * When measuring 3-phase 4-wire, connect to Model KM1-PMU1A-FLK.
- * The number CT inputs required differ depending on the line type.
3-phase 4-wire: CT3 input
- * The number of circuits that can be measured in one Model KE1-CTD8E unit is as follows:
3-phase 4-wire: Up to 2 circuits

▪ 3-phase 3-wire 2-circuit/single-phase 2-wire 4-circuit



* Model KE1-CTD8E does not operate as a single unit.
To measure two systems, connect it to Model KM1-PMU2A-FLK.

- Single-phase 2-wire 4-circuit/single-phase 3-wire 2-circuit



* Model KE1-CTD8E does not operate as a single unit.
To measure two systems, connect it to Model KM1-PMU2A-FLK.

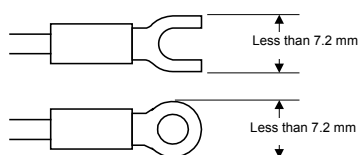
2.5 Wiring

■ Requests for wiring

- Do not change the terminal screws, but use existing screws.
- To prevent being affected by noise, wiring of signal line should be different from that of power line.
- Cable to be used for wiring terminals excepting CT should be twist pair AWG25 (whose cross-sectional area is 0.205 mm²) to AWG12 (whose cross-sectional area is 3.309 mm²).
- For circuits in use, select appropriate cables.
- When connecting dedicated CT, use the cable for dedicated CT (Model KM20-CTF-CB3: 3 m).

When doing so, connect the shrinkable tube side to the dedicated CT.

- For RS-485 connection, the total cable length is up to 500 m.
- Do not ground the dedicated CT or RS-485 signal line. Doing so causes a failure.
- For the terminal section, carry out wiring by using a solderless terminal.
- Use wiring materials and crimp tools that are suitable for the solderless terminal.
- Tighten a terminal screw to the torque of 0.69 to 0.88 N·m.
- For a solderless terminal, use the M3.5 terminal whose shape is as follows.



■ Wiring

● Power voltage

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	○	×

○: With input X: Without input

Connect between terminals [1] and [2].

The specifications are as follows.

Power voltage	Consumed power
AC100 ~ 240 V (50/60 Hz)	Measurement master : 10 VA or less for independent behavior. 14 VA or less at the time of maximum expansion Functional slave : 10 VA or lower

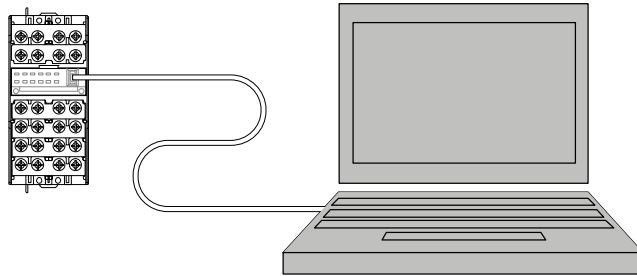
● USB port

Connecting Model KM1 and a PC via a USB cable can make settings and read measurement values. In addition, supplying power from a PC via USB (driving USB bus power) can make settings only. For the functions available via a USB port, refer to the table below.

- *1. For the USB cable, use mini-USB type B.
- *2. If settings have been made via USB, remove the USB cable from the product, and then supply the power to it. When reading measurement values via USB communication, remove the USB cable once after the setting change, and then connect the product again.

	When one product is used	When multiple units are connected
Without power voltage	For all models, only settings can be made.	Only the measurement master can be set.
With power voltage	For all models, settings and reading of measurement values can be performed.	Connecting the measurement master can perform settings and reading of measurement values. Settings of the slave connected to the measurement master and reading of the measurement values can be performed.

- *3. Connect the USB cable only when USB communication is required. If the USB cable is always connected, and the power supply to the product is turned ON/OFF due to instantaneous voltage drop, etc., the product cannot be started up normally to make measurements.
- *4. Do not carry out RS-485 communication during USB communication. (Doing so may return a response.)



● Input voltage

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	x	x

⊙: With input in 2 systems ○: With input X: Without input

Connect between terminals (21), (22), (23), and (24) in the measurement master. When using PMU2A (power two-system) to make measurements of two systems, perform wiring between terminals [9], [10], and [11]. However, PMU2A (power two-system) does not support 3-phase 4-wire.

* When wiring, avoid error in the order of phases. An error will cause incorrect measurement.

[PMU1A (electric power)]

	Single phase 2-wire	Single phase 3-wire	3-phase 3-wire	3-phase 4-wire
P1 ⑳	L	R	R	R
P2 ㉑	N	N	S	S
P3 ㉒	—	T	T	T
P0 ㉓	—	—	—	N

PMU2A (power two-system)]

	Single phase 2-wire	Single phase 3-wire	3-phase 3-wire
1-P1 ㉑	2-P1 ㉑	L	R
1-P2 ㉒	2-P2 ㉒	N	S
1-P3 ㉓	2-P3 ㉓	—	T

* Indication of voltage: $V_{[A][B]}$: Indicates a voltage between [A] and [B].
Example: V_{RS} indicates a voltage between R and S.

- CT input

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	×	○

O: With input X: Without input

[PMU1A (electric power)]

When connecting dedicated CT, perform wiring as follows: between terminals [13] and [14], [15] and [16], and [17] and [18] in single-phase 2-wire; phase R between terminals [13] and [14] and phase T between terminals [17] and [18] in single-phase 3-wire or 3-phase 3-wire; phase R between terminals [13] and [14], phase S between terminals [15] and [16], and phase T between terminals [17] and [18] in 3-phase 4-wire.

In this case, terminals [13], [15], and [17] are specified as S, and terminals [14], [16], and [18], as L.

	Single phase 2-wire	Single phase 3-wire	3-phase 3-wire	3-phase 4-wire
CT1([13]-[14])	L	R	R	R
CT2([15]-[16])	L	-	-	S
CT3([17]-[18])	L	T	T	T
Number of measurement circuits	3 circuits	1 circuit	1 circuit	1 circuit

[PMU2A (power two-system)]

When connecting dedicated CT to system 1, perform wiring as follows: between terminals [13] and [14] and [15] and [16] in single-phase 2-wire; R phase between terminals [13] and [14] and phase T between terminals [15] and [16] in single phase 3-wire or 3-phase 3-wire.

When connecting dedicated CT to system 2, perform the wiring as follows: between terminals [17] and [18] in single-phase 2-wire; phase R between terminals [17] and [18] and phase T between terminals [19] and [20] in single-phase 3-wire or 3-phase 3-wire.

In this case, terminals [13], [15], [17], and [19] are specified as S, and terminals [14], [16], [18], and [20], as L.

	Single phase 2-wire	Single phase 3-wire	3-phase 3-wire
CT1([13]-[14])	L	R	R
CT2([15]-[16])	L	T	T
CT3([17]-[18])	L	R	R
CT4([19]-[20])	L	T	T
Number of measurement circuits	4 circuits	2 circuits	2 circuits

- * In PMU2A, CT1 and CT2 are assigned for measurements in system 1, and CT3 and CT4 are assigned for measurements in system 2. If, for example, 4 circuits are measured in single-phase 2-wire, CT1 to CT4 are used. Cross-wiring is therefore required between systems 1 and 2.

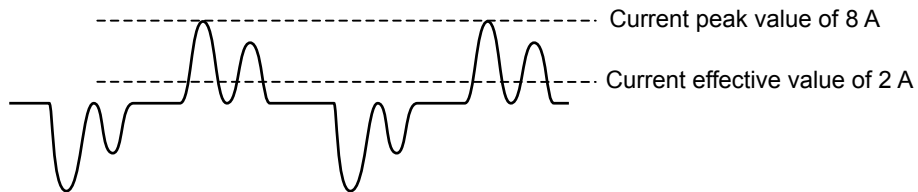
[CTD8E (CT expansion)]

When connecting dedicated CT, perform wiring as follows: between terminals [9] and [10], [11] and [12], [13] and [14], [15] and [16], [17] and [18], [19] and [20], [21] and [22], and [23] and [24] in single-phase 2-wire; phase R between terminals [9] and [10], [13] and [14], [17] and [18], and [21] and [22], and phase T between terminals [11] and [12], [15] and [16], [19] and [20], and [23] and [24] in single-phase 3-wire or 3-phase 3-wire; phase R between terminals [13] and [14] and [21] and [22], phase S between terminals [15] and [16] and [23] and [24], and phase T between terminals [17] and [18] and [9] and [10] in 3-phase 4-wire.

In this case, terminals [9], [10], [13], [15], [17], [19], [21], and [23] are specified as S, and terminals [10], [12], [14], [16], [18], [20], [22] and [24] as L.

	Single phase 2-wire	Single phase 3-wire	3-phase 3-wire	3-phase 4-wire
CT1([13]-[14])	L	R	R	R
CT2([15]-[16])	L	T	T	S
CT3([17]-[18])	L	R	R	T
CT4([19]-[20])	L	T	T	-
CT5([21]-[22])	L	R	R	R
CT6([23]-[24])	L	T	T	S
CT7([9]-[10])	L	R	R	T
CT8([11]-[12])	L	T	T	-
Number of measurement circuits	8 circuits	4 circuits	4 circuits	2 circuits

- *1 Do not touch charging metal part of the dedicated CT terminal. Electric shocks may occur.
- *2 Do not ground the dedicated CT. Doing so causes a failure.
- *3 When measuring electric power containing higher harmonics, such as inverter primary current, select a dedicated CT having allowance to standard load. For the current waveform (effective value of 2 A, and peak value of 8 A) as shown below, a dedicated CT of 50 A must be used. If 5ACT is used, saturation occurs, preventing obtaining correct measurement values. In general, entering a filter, AC reactor, etc., between the power supply and an inverter greatly changes the ratio of current and effective value of the inverter primary current. The ratio also changes depending on the capacitor, diode, etc.



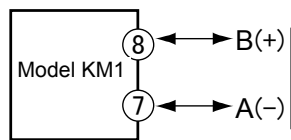
Example of inverter primary current waveform

● RS-485 communication

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	○	×

○: With terminal ×: Without terminal

When using RS-485 communication functions, connect a communication cable between terminals [8] and [7].



A termination resistor must be connected to each end of the transmission path. Each termination resistor should be 120 Ω (1/2 W).

Communication connection diagram

- For the connection configuration, 1 : 1 or 1 : N is applicable. The number of connected units is as follows: when the protocol is CompoWay/F, 31 units, and when Modbus, up to 99 units. The total cable length is up to a maximum of 500 m. For the cable, use a twisted pair cable with shield (AWG24 (cross-sectional area of 0.205 mm²) to AWG14 (cross-sectional area of 2.081 mm²).
- * Do not ground the RS-485 signal line. Doing so causes a failure.
- * Do not carry out RS-485 communication during USB communication. (Doing so may return a response.)

● Output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	○	○

O: With output

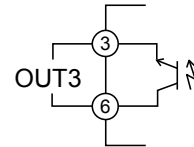
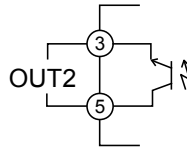
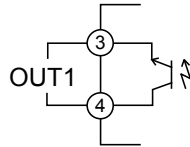
Setting output terminals can perform alarm output, total power consumption pulse output, and 3-STATE output.

The output terminals are as follows.

[PMU1A (electric power), PMU2A (power-2 system), EMU8A (pulse/temperature)]

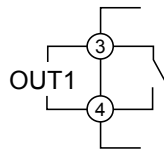
Three transistor output points exist.

[3] Terminal numbers (COM) are common.



[CTD8E (CT expansion)]

One relay output point exists.



* For the output terminal functions, refer to Page 3-9.

● Event input

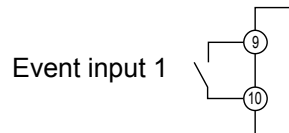
PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
x	x	○	x

O: With input, X: Without input

Using event input requires a combination of PMU1A (electric power), PMU2A (power-2 system), and EMU8A (pulse/temperature).

To use event inputs, make connections between terminal [9] and [10], [11] and [12], [13] and [14], [15] and [16], [17] and [18], [19] and [20], and [21] and [22] in EMU8A (pulse/temperature).

For the event input, either Without voltage or With voltage is settable.



Input without voltage (NPN)



Input with voltage (PNP)

* For the event input, refer to Page 3-16.

Chapter 3 Functions

3.1	List of functions	2
3.2	Basic functions	3
	■ Applicable phase wire	3
	■ Synchronization selection for measuring block	3
	■ Dedicated CT type	3
	■ VT ratio	4
	■ CT ratio	4
	■ Low-cut function	4
	● Low-cut current value	4
	■ Average count	4
	■ Average count	5
	■ Logging function	5
	■ CT signal detection	5
	■ Measurement function	6
	● Active power	6
	● Integrated power amount	6
	● Voltage	7
	● Power factor	7
	● Reactive power	7
	● Frequency	7
	● Temperature measurement	7
	● Simple measurement	8
	● Total power conversion coefficient	8
	● Pulse conversion coefficient	8
3.3	Output function	9
	■ Output terminal 1/output terminal 2/output terminal 3 function setting	9
	■ Integrated power amount pulse output	10
	● Pulse output unit	10
	■ Reverse phase	11
	■ Alarm output	12
	● Alarm history	12
	● Time chart of alarm output function	12
	● Active input setting	12
	● Active power alarm output	13
	● Over current alarm output	13
	● Under current alarm output	13
	● Over voltage alarm output	14
	● Under voltage alarm output	14
	● Power factor alarm output	14
	● Reactive power alarm output	15
	● Temperature alarm output	15
	● Reverse phase alarm output	15
3.4	Event input function	16
	■ Event input NPN/PNP input mode setting	16
	■ Event input N-O/N-C input mode setting	16
	■ Pulse input count	17
	■ ON time of pulse input	17
	■ Function using event input	17
	● Measurement start time/measurement end time	17
	● Power original unit	17
	● 3-STATE function	17
3.5	3-STATE function	18
	■ 3-STATE target	18
	■ 3-STATE HIGH threshold/3-STATE LOW threshold	20
	■ 3-STATE hysteresis	20
3.6	Other functions	21
	■ Time	21
	■ Initialization	21

3.1 List of functions

		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
Applicable circuit	Single-phase 2-wire	○	⊙	×	⊙
	Single-phase 3-wire	○	⊙	×	⊙
	3-phase 3-wire	○	⊙	×	⊙
	3-phase 4-wire	○	×	×	○
Measurement function	Active power	○	⊙	×	⊙
	Integrated active power amount	○	⊙	×	⊙
	Current	○	⊙	×	⊙
	Voltage	○	⊙	×	×
	Power factor	○	⊙	×	⊙
	Reactive power	○	⊙	×	⊙
	Frequency	○	⊙	×	×
	Pulse input count	×	×	○	×
	ON time of pulse input	×	×	○	×
	Integrated regeneration power amount	○	⊙	×	⊙
	Integrated reactive power amount	○	⊙	×	⊙
	Temperature measurement	×	×	○	×
	Error detection function	Active power	○	⊙	×
Over/under current		○	⊙	×	⊙
Over/under voltage		○	⊙	×	×
Power factor		○	⊙	×	⊙
Reactive power		○	⊙	×	⊙
Temperature		×	×	○	×
Reverse phase		○	⊙	×	×
Additional function	3-STATE function *1	○	⊙	×	×
	Power original unit measurement *2	○	⊙	×	×
	Conversion value	○	⊙	×	⊙
	Pulse conversion value	×	×	○	×
	CT signal detection	○	⊙	×	⊙
	Simple measurement	○	⊙	×	⊙
Target for log		Refer to Page A-15.			×

○: With function

⊙: Support of two systems (for CTD8E (CT expansion), two systems are supported when connected to PMU2A (power two-system) is connected.)

×: Without function

*1. When using an event input, connect EMU8A (pulse/temperature).

*2. Only when EMU8A (pulse/temperature) is connected

3.2 Basic functions

■ Applicable phase wire

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: With settings of two-system ○: With setting X: Without setting

- Set the phase wire to be measured.
- Setting range: Single-phase 2-wire, single-phase 3-wire, 3-phase 3-wire, and 3-phase 4-wire (initial value: 3-phase 3-wire)
- *1. For PMU2A (power two-system), 3-phase 4-wire cannot be set.
- *2. CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

■ Synchronization selection for measuring block

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
×	×	×	○

○: With setting X: Without setting

- Set the voltage system synchronized with a measuring block.
- Setting range: System 1, system 2 (initial value: system 1)

The measuring blocks are divided into measuring block 1 and measuring block 2, which are assigned to system 1 and system 2, respectively, to perform power measurements. For PMU1A and PMU2A, since their measuring blocks and voltage systems are fixed, the setting of synchronization selection for measuring block is not required.

■ Dedicated CT type

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: With settings of two-system ○: With setting X: Without setting

- Set the dedicated CTs to be used.
- The dedicated CTs are as follows.

Split type

CT Model	Standard
Model KM20-CTF-5A	5A
Model KM20-CTF-50A	50A
Model KM20-CTF-100A	100A
Model KM20-CTF-200A	200A
Model KM20-CTF-400A	400A
Model KM20-CTF-600A	600A

Panel fixed (through) type

CT Model	Standard
Model KM20-CTB-5A/50A	5A/50A

- Setting range: 5 A, 50 A, 100 A, 200 A, 400 A, 600 A (initial value: 100 A)
- * CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).
- * PMU2A (power two-system) can set dedicated a CT type for each system. CTD8E (CT expansion) can set a type for each measuring block.

■ VT ratio

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	x	⊙

⊙: With settings of two-system ○: With setting X: Without setting

- Setting a VT ratio can measure a voltage higher than the standard by using general VT.
- Accuracy assurance is not applicable to general VT.
- Setting range: 001 to 99.99 (initial value: 1.00)
- * The settings of CTD8E (CT expansion) should conform to those of the measurement master. In addition, CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

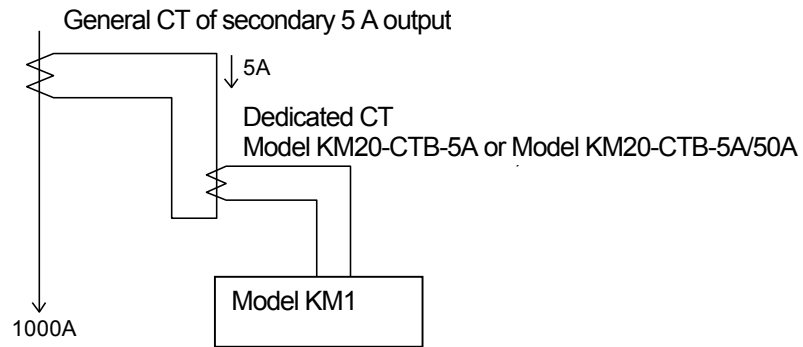
■ CT ratio

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	x	⊙

⊙: With settings of two-system ○: With setting X: Without setting

- Setting the CT ratio by using general CT can measure currents higher than the standard of dedicated CT.
- The CT ratio of general CT is set to make measurements by combining existing general CT.
- Accuracy assurance is not applicable to general CT.
- Setting range: 1 to 1000 (Initial value: 1)
- * Set it to 1 when it is not used.
- * CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

<When 5ACT is connected>



■ Low-cut function

- This function forcibly sets the current measurement value to 0 when the current value becomes less than (standard current of CT) X (setting ratio).
- The ratio of an unmeasured load current to the standard current is set.
- As a result, setting the current value to 0 can set the electric power to 0. Setting this function can cut current and power that are measured due to inductive noise in no-load condition. Set an optimum value.
- *1. The low-cut function works only when all currents of a phase connected to dedicated CT becomes lower than or equal to the set current low-cut value.
- *2. Effective values are used to judge low-cut. This means that, if the peak value is higher than the low-cut value, and the effective value is lower than the low-cut value, the low-cut function works.

● Low-cut current value

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	x	⊙

⊙: With settings of two-system ○: With setting x: Without setting

When the low-cut function works, the current and (active/reactive) power are fixed to 0, and the power factor is fixed to 1.

Setting range: 0.1 to 19.9% (Initial value: 0.6%)

- * CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

Average count

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	×	○

O: With setting X: Without setting

- Average count is set to reduce dispersion in measurement values.
- When the average count is set to OFF, the instantaneous value updated every 100 ms is the latest value.
- The following measurement values are averaged: active power, current, voltage, power factor, and reactive power.
- Average value is calculated by the following formula.

Value determined previously X $\frac{(\text{Average count} - 1) + \text{Value measured this time X}}{\text{Average count}} = \text{Value determined this time}$

- Setting range: OFF, 2, 4, 8, 16, 32, 64, 128, 256, 512, and 1024 (Initial value: OFF)
- * Over/under voltage, over/under current, and reverse phase alarm function are not affected.

Logging function

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	○	×

O: With function

X: Without function

- Six data logging areas have been prepared. Each area can save 588 pieces of data (up to 6 items can be set.)
- Data logging cycle can be selected from among 5 minutes, 10 minutes, 30 minutes, 1 hour, 2 hours, 6 hours, 12 hours, and 24 hours, and is controlled by specifying 0:00 of the internal clock in the main unit as the starting point.

Example : When the logging function is set to 18:12, April 1, 2012 based on the time of the internal clock in the main unit.

Every 5 min : Saved at 18:15, April 1, 2012. Every 5 min after that
 Every 10 min : Saved at 18:20, April 1, 2012. Every 10 min after that
 Every 30 min : Saved at 18:30, April 1, 2012. Every 30 min after that
 Every hour : Saved at 19:00, April 1, 2012. Every hour after that
 Every 2 hours : Saved at 20:00, April 1, 2012. Every 2 hours after that
 Every 6 hours : Saved at 0:00, April 2, 2012. Every 6 hours after that
 Every 12 hours : Saved at 0:00, April 2, 2012. Every 12 hours after that
 Every 24 hours : Saved at 0:00, April 2, 2012. Every 24 hours after that

- For logging, after measurement data within a logging cycle is saved, data is reset to start the measurement at the next cycle. For example, setting logging cycle of 5 min and voltage MAX accumulates voltage MAX values every 5 min.
- The number of days for which log data can be saved differs depending on logging cycles.

Every 5 min : 2 days + 1 hour
 Every 10 min : 4 days + 2 hours
 Every 30 min : 12 days + 6 hours
 Every hour : 24 days + 12 hours
 Every 2 hours : 49 days
 Every 6 hours : 147 days
 Every 12 hours : 294 days
 Every 24 hours : 588 days

- For logging items that can be set, refer to Page A-15.

CT signal detection

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	×	○

O: With function

X: Without function

- When the CT is connected, and the current whose measurement value is 2% of the standard current is supplied continuously for 10 or more seconds, the targeted LED lights.
- * Even when the low-cut function forcibly sets the current measurement value to 0, CT signal detection turns LED ON, if the actually flowing current is more than 2% of the standard current.

Measurement function

Active power

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: two-system having measurement function ○: With measurement function X: Without measurement function

Measurement range: -99999999.9 to 99999999.9 W (minimum unit: 0.1 W)

The following active powers are measured: instantaneous value, maximum value, and minimum value.

The active power means a consumed power. Power that is generating electricity is referred to as regenerated power.

If the input current is less than low-cut setting value, the active power value is forced to be 0 W.

Measurement values to be logged include PMU1A (electric power) and PMU2A (power two-system) only.

The measurement value of CTD8E (CT expansion) is excluded. (CTD8E (CT expansion) does not have logging function.)

* CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

Integrated power amount

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: Two-system having measurement function ○: With measurement function X: Without measurement function

Measurement range: Excess of the measurement range of 0 to 999999999 Wh returns to 0 Wh, continuing the integration.

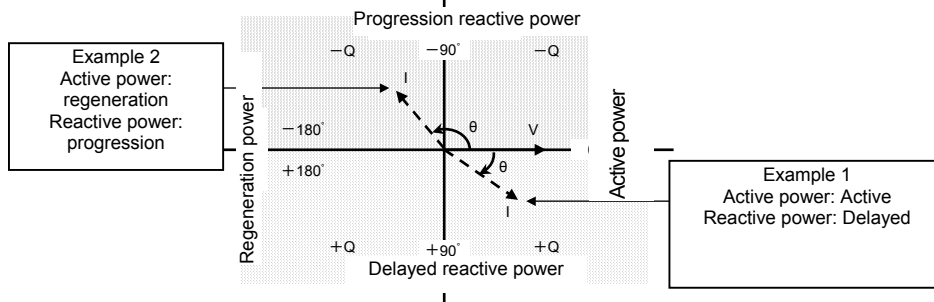
Power consumption (active power) and reverse power (regenerated power) are integrated separated from each other. After the conversion of VT and CT ratios, power is also integrated. Reactive power is also integrated. Via communication, integrated progression reactive power amount, integrated delayed reactive power amount and integrated total reactive power amount can be confirmed in units of varh. Each measurable amount is up to 999999999 varh. When each amount measured reaches 999999999 varh, it is reset to 0 varh. The reactive power amount to be integrated is divided into the three types: phase progression reactive power, phase delayed reactive power, and total reactive power of phase progression and phase delayed absolute values.

When the 3-STATE function is used for integration, the power measured during operation of the facilities is specified as HIGH integrated power amount, the power measured while the facilities are waiting is specified as MIDDLE integrated power amount, and the power measured during stop of facilities is specified as LOW integrated power amount.

* CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

* Measurement values to be logged include PMU1A (electric power) and PMU2A (power two-system) only. CTD8E (CT expansion) does not have logging function.

◆ Definitions of phase progression and phase delayed of integrated reactive power amount
Whether the active power is active or regenerated, the integration progression reactive power amount is integrated in the case of phase progression, and integrated delayed reactive power amount is integrated in the case of phase delayed. In addition, for the integrated total reactive power amount, the absolute value of progression reactive power amount and the absolute value of delayed reactive power amount are integrated. The progression and delayed reactive power amounts are calculated according to the phase of the voltage based current.



The following power amounts are integrated whether point power is active or regenerated.

- Integrated progression reactive power amount: Integration of -Q
- Integrated delayed reactive power amount: Integration of +Q
- Integrated total reactive power amount: Integration of both absolute values of +Q and -Q

● Current

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	×	⊙

⊙: Two-system having measurement function ○: With measurement function
X: Without measurement function

Measurement range: 0.000 to 9999.999 A (minimum unit: 0.001 A)

The following currents are measured: instantaneous value, maximum value, and minimum value.

Measurement values to be logged include PMU1A (electric power) and PMU2A (power two-system) only. The measurement value of CTD8E (CT expansion) is excluded. (CTD8E (CT expansion) does not have logging function.)

S-phase current of 3-phase 3-wire is calculated based on R-phase and T-phase currents. N-phase current of single-phase 3-wire is calculated based on R-phase and T-phase currents.

* CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

● Voltage

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	×	×

⊙: two-system having measurement function ○: With measurement function
X: Without measurement function

Measurement range: 0.0 to 99999.9 V (minimum unit: 0.1 V)

The following voltages are measured: instantaneous value, maximum value, and minimum value.

● Power factor

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	×	⊙

⊙: Two-system having measurement function ○: With measurement function
X: Without measurement function

Measurement range: -1.00 to 0.00 to 1.00 (units of 0.01 (3 digits))

The following power factors are measured: instantaneous value, maximum value, and minimum value.

When the low-cut function works, the power factor measurement value is fixed to 1.

Measurement values to be logged include PMU1A (electric power) and PMU2A (power two-system) only. The measurement value of CTD8E (CT expansion) is excluded. (CTD8E (CT expansion) does not have logging function.)

* CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

● Reactive power

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	×	⊙

⊙: Two-system having measurement function ○: With measurement function
X: Without measurement function

Measurement range: -99999999.9 to 99999999.9 var (minimum unit: 0.1 var)

The following reactive power amounts are measured: instantaneous value, maximum value, and minimum value.

If the input current is less than the low-cut setting value, the reactive power value is forced to be 0 var.

Measurement values to be logged include PMU1A (electric power) and PMU2A (power two-system) only. The measurement value of CTD8E (CT expansion) is excluded. (CTD8E (CT expansion) does not have logging function.)

* CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

● Frequency

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	×	×

⊙: Two-system having measurement function ○: With measurement function
X: Without measurement function

Measurement range: 45.0 to 65.0 Hz (minimum unit: 0.1 Hz)

● Temperature measurement

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
×	×	○	×

○: With measurement function X: Without measurement function

- Measurement range: -50.0 to 100.0°C -58.0 to 212.0°F
- Ambient temperature is measurable.
- Celsius or Fahrenheit is selectable. (Initial value: Celsius)
- Setting an arbitrary value can compensate the temperature.
- The measurement value is obtained by adding set temperature compensation.
- Setting range of temperature compensation: -50.0 to 50.0 (Initial value: 0.0)

● Simple measurement

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	×	⊙

⊙: Two-system having measurement function ○: With measurement function
 X: Without measurement function

- The simple measurement function roughly grasps the power of installed circuits without making voltage measurements (wiring).
- This function is set when voltage cannot be entered to the Model KM1 due to conditions of the field, limitations of wiring, etc.
- Simple measurement calculates the power amount by considering a fixed value of power factor for the fixed value of voltage and actually calculated current value.
- In the simple measurement, the frequency is fixed to 50 Hz. (No change allowed)
- Accuracy assurance is not applicable because the voltage, power factor, and frequency are fixed.
- Setting range: OFF/ON (Initial value: OFF)
- During the simple measurement, pay attention to the following points.
 - *1. An overvoltage error or frequency error has not been detected.
 - *2. The setting of VT is disabled with the simple measurement set to ON.
 - *3 Since the phase with current has not been measured actually, it is unavailable for measurement of regenerated power.
 - *4. CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).
 - *5. The setting is required in each unit.
- ◆ Voltage on simple measurement
 - Set the voltage value to be used in simple measurement.
 - Setting range: 0.1 to 9999.9 V (Initial value: 110.0 V)
- ◆ Power factor on simple measurement
 - Set the power factor to be used in simple measurement.
 - Setting range: 0.01 to 1.00 (Initial value: 1.00)

● Total power conversion coefficient

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	×	⊙

⊙: With settings of two-system ○: With setting X: Without setting

Set a coefficient to be used to convert integrated power.
 It can be converted into CO₂emissions or currencies according to the value to be set.
 Conversion values can be obtained by the following calculation formula.

$$\text{Conversion value} = \frac{\text{Total integrated power amount} \times \text{Total power conversion coefficient}}{\text{Total power conversion coefficient}}$$

Setting range: 0.000 to 9999.999 (Initial value: 1.000)

- * CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).
- * CO₂emissions differ depending on power business establishments and fiscal years. When calculating the emissions, refer to the web sites of power companies, etc., and set the conversion coefficient of integrated power amount.
 When calculating the currencies, refer to the web sites of power companies, etc., about power charge per kWh and set the conversion coefficient of integrated power amount. When converting into currencies other than Japanese Yen, set values considering their exchange rates.

● Pulse conversion coefficient

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
×	×	○	×

○: With setting X: Without setting

Targets for numerical conversion or conversion coefficients can arbitrarily be set to measure discharge amounts, such as flow rate of exhaust gas, as conversion values.

- » Pulse conversion value
 - Pulse conversion values can be obtained by the following calculation formula.

$$\text{Pulse conversion value} = \text{Pulse input count} \times \text{Pulse conversion coefficient}$$
 - Setting range: 0.01 to 9999.99 (Initial value: 1.00)

3.3 Output function

■ Output terminal 1/output terminal 2/output terminal 3 function setting

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	○	○

○: With setting

- An arbitrary output can be set at each of output terminal 1, output terminal 2, and output terminal 3. This setting can perform alarm outputs, pulse outputs, 3-STATE outputs, etc.

<When setting an alarm output>

When an alarm output is set, the alarm output can be performed only by setting the alarm for the output terminal setting with alarm parameter setting/alarm output setting made.

» Alarm parameter setting

This setting is made to judge alarms. Alarms that have been set can be confirmed using the alarm history, status, and alarm LED.

» Alarm output setting

This setting is made to output alarms. Selecting multiple alarms outputs them when one of them enters an alarm condition.

For the setting range of alarm parameter setting, alarm output setting, and output terminal setting, refer to "List of parameters" on Page A-9.

A reverse phase alarm not included in the alarm parameter settings is judged as an alarm by setting the reverse phase detection to ON.

Alarm parameter setting includes the following items, from which an alarm to be judged can be selected.

[PMU1A (Electric power), PMU2A (Power two-system)]

- Active power alarm
- Over voltage alarm
- Reactive power alarm
- Over current alarm
- Under voltage alarm
- Under current alarm
- Power factor alarm

[EMU8A (Pulse/temperature)]

- Temperature alarm

[CTD8E (CT expansion)]

- Active power alarm
- Power factor alarm
- Over current alarm
- Under current alarm
- Reactive power alarm

This function turns the output ON by judging the following cases as alarm detection (hereinafter referred to as detection): a measurement value is more than the upper threshold of alarm output or less than the lower limit threshold. When the measured value becomes more than or less than the range of hysteresis set in the alarm detection condition, it is judged to be alarm return (hereinafter referred to as return), and the output is turned OFF.

At the time of detection, on-delay, which retains the output OFF for the specified hours and minutes can be set.

During the output of an alarm, the operation indicator LED of the specified output terminal lights.

- * For the reverse phase, refer to Page 3-11.
- * Alarm detection/return is judged by a threshold and hysteresis, and an alarm is then output by considering on-delay for alarm judgment. For details, please refer to Page 3-13.
- * If an active input setting is set to OFF, and the input, which is set to OFF, is targeted for an alarm, it is not judged as an alarm.

<When the pulse output has been set>

Only PMU1A (electric power) and PMU2A (power two-system) can set the integrated power amount pulse output.

When the integrated power amount reaches a pulse output unit set by the user, the pulse output is carried out.

For details, refer to Page 3-10.

<When 3-STATE output has been set>

Only PMU1A (electric power) and PMU2A (power two-system) can set 3-STATE output. Terminals can be set to HIGH, MIDDLE, and LOW.

Setting HIGH threshold and LOW threshold can classify integrated power amounts into three types: HIGH, MIDDLE, and LOW.

This function helps to grasp power consumption condition and to extract loss power.

For details, please refer to Page 3-18.

Integrated power amount pulse output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	×	×

O: With function

X: Without function

Each time the integrated power amount reaches a set pulse output unit, pulse is output from the terminal set by the output pulse setting.

As the power amount increases, the integrated power amount increases, and pulse output cycles (intervals) become shorter. As the power amount decreases, the integrated power amount decreases, and pulse output cycles become longer.

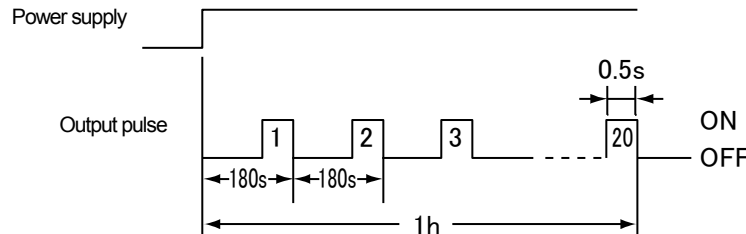
Output pulse cycles can be obtained by the following calculation formula.

$$\text{Pulse output cycle [s]} = 3600 \text{ [s]} / (\text{Power [W]} / \text{Pulse output unit [Wh]})$$

The calculation method of pulse output cycles is described taking an example.

Example:

When input power is 200 k[W] and pulse output unit is 10 k[Wh] in 3-phase 3-wire, output pulse cycle = $3600 \text{ [s]} / (200 \text{ k [W]} / 10 \text{ k[Wh]}) = 180 \text{ [s]}$ is obtained. If the status with input voltage of 10 k[W] is continued for an hour, passage of an hour (3600 s) gives 10 k[Wh]. If an input of 200 k[W] sets the pulse output unit to 10 k[Wh], $200 \text{ k[W]} / 10 \text{ k[Wh]} = 20$ pulses are output for an hour, and the cycle is as follows: $3600 \text{ [s]} / 20 \text{ pulses} = 180 \text{ [s]}$. For the output pulse, one pulse is output (ON) every 180 [s].



When the cycle is shorter than the pulse width, or when the next output is turned ON immediately after the output is turned OFF, OFF time of 100 ms is given.

If OFF time is short, count error may occur due to scan time such as PLC. Set an appropriate pulse output unit.

Pulse output unit

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	×	×

O: With setting X: Without setting

Available when a pulse output is assigned to the output setting.

Any pulse output unit can be set.

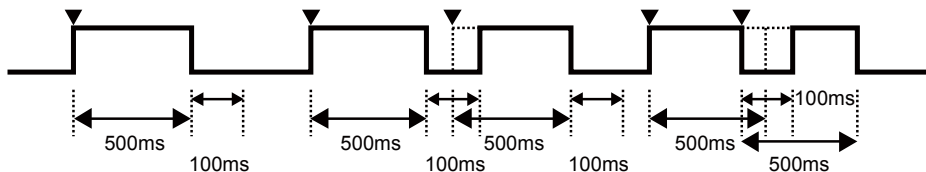
Setting range: 1 Wh, 10 Wh, 100 Wh, 1 kWh, 2 kWh, 5 kWh, 10 kWh, 20 kWh, 50 kWh, 100 kWh (Initial value: 100 Wh)

When the integrated power amount reaches the pulse output, power of the output unit is subtracted from the integrated power amount to perform pulse output.

The pulse output width is fixed to 500 ms. For 100 ms after the pulse output, next pulse output is forcibly turned OFF.

Overlap of pulses forcibly turns OFF the output for 100 ms to inhibit turning ON continuously.

Pulse output timing



- *1. ▼ indicates that the pulse output unit is reached.
- *2. The target circuit is selected by setting a pulse output circuit.

Setting range : Circuit 1, Circuit 2, Circuit 3, Circuit 4 (Initial value: Circuit 1)

	PMU1A (Electric power)			PMU2A (Power two-system)			
	Circuit 1	Circuit 2	Circuit 3	Circuit 1	Circuit 2	Circuit 3	Circuit 4
Single-phase 2-wire	CT input 1	CT input 2	CT input 3	CT input 1	CT input 2	CT input 3	CT input 4
Single-phase 3-wire	CT input 1, 3			CT input 1, 2		CT input 3, 4	
3-phase 3-wire	CT input 1, 3			CT input 1, 2		CT input 3, 4	
3-phase 4-wire	CT input 1, 2, 3						

Reverse phase

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	×	×

⊙: With two-system
Without function

○: With function

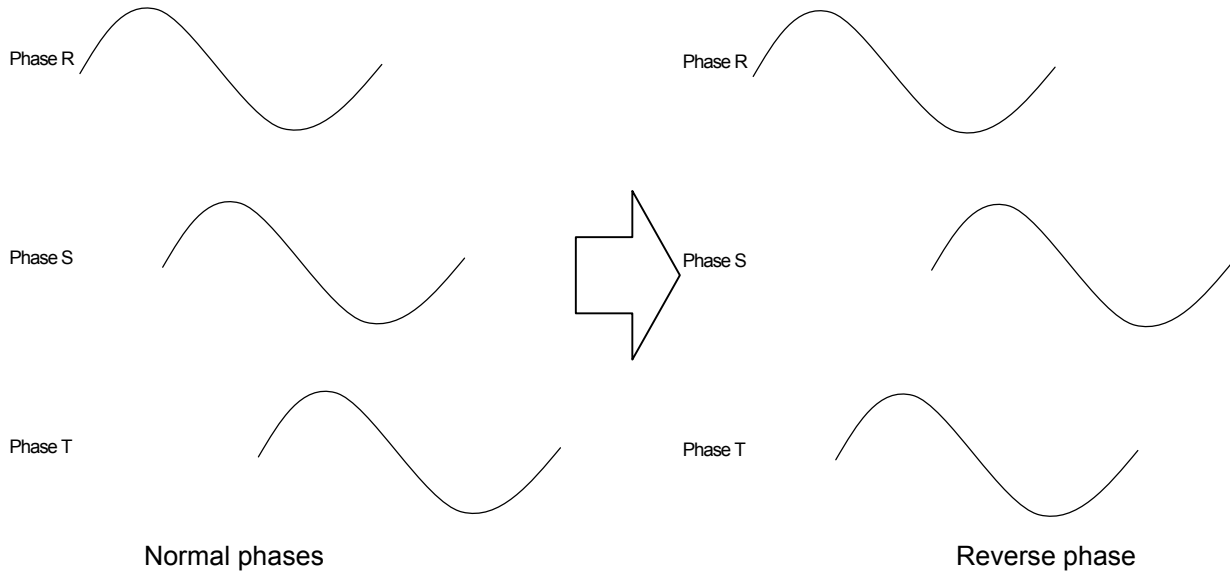
×

Reverse phase means that the phase order of voltages is not normal.

When the phase order is normal, phases R, S, and T are 0° , 120° , and 240° , respectively, with reference to phase R. If a measurement of the relationships between differences in phase indicates that the condition is broken and then the broken condition continues for 0.1s or more, it is judged as reverse phase.

Reverse phase can be used to confirm problems in facilities or wrong wiring.

* Since the condition where phases are not normal is judged as reverse phase, phase-loss may be judged as reverse phase.



■ Alarm output

- Alarm output upper/lower limit threshold, alarm output hysteresis, alarm output on-delay can be set.
- Setting hysteresis can prevent frequently turning ON/OFF an alarm even when a measurement value varies near the alarm output judgment value.
- On-delay is a function that keeps the output OFF for the specified hours and minutes. Set an optimum value.
- Setting the upper limit threshold of each alarm to the maximum value turns the upper limit alarm function OFF, while setting the lower limit threshold to the minimum value turns the lower alarm function OFF. The setting should be made to use only either upper limit alarm or lower limit alarm.
- * Do not use the alarm output function in cases related to safety, e.g., machine control, etc., because the function is assumed to detect errors and call attention by sounding a buzzer or lighting a lamp.

● Alarm history

Histories of alarms generated in the past can be confirmed via communication.

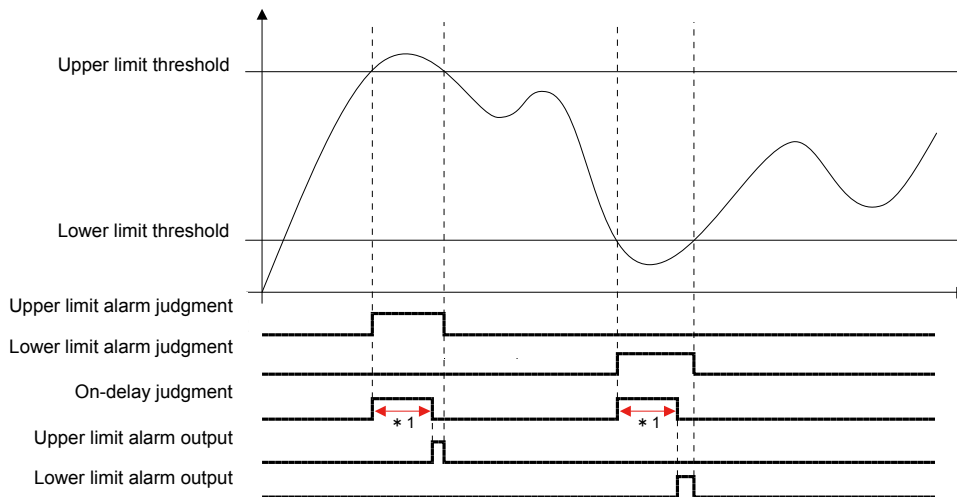
Histories of only 20 alarms generated in the past can be read. If the number of alarms generated exceeds 20, histories are deleted from the oldest one.

Alarm type, and time of alarm generation: The circuit in which an alarm was generated, and the time of generation are saved at first.

Alarm release time: Saved when all circuits to be judged have been alarm-released.

● Time chart of alarm output function

With on-delay setting, without hysteresis setting



*1. Turn the alarm output OFF if the state remains OFF continuously in on-delay hour/minute and alarm judgment.

● Active input setting

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	○	○

○: With setting

- Sets input that performs alarm judgment.
- Since 1 bit corresponds to 1 input, bits 0 to 7 correspond to inputs 1 to 8.
- Even if input whose bit is set to 0 (OFF) is a target for alarm, it is not judged as an alarm.
- The number of CT inputs per circuit differs depending on phase wire. In that case, if one of the CT inputs within the circuit is set to 1 (ON), it is judged as a target for alarm. For the inputs to be used, refer to the table below and Section 2.4 "Input/output configuration and example of wiring diagram."
- Setting range H'00000000 to H'000000FF (Initial value: H'000000FF)

	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input 8
PMU1A (Electric power)	CT input 1	CT input 2	CT input 3	/	/	/	/	/
PMU2A (Power two-system)	CT input 1	CT input 2	CT input 3	CT input 4	/	/	/	/
EMU8A (Pulse/temperature)	/	/	/	/	/	/	/	Thermistor input
CTD8E (CT expansion)	CT input 1	CT input 2	CT input 3	CT input 4	CT input 5	CT input 6	CT input 7	CT input 8

● Active power alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: With two-system alarm ○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as an alarm after the setting of alarm parameter setting and alarm output setting.
 - Active power upper limit alarm threshold : -120000000 to 120000000 W (Initial value: 1000 W)
 - Active power upper limit alarm hysteresis : 0 to 24000000 W (Initial value: 100 W)
 - Active power upper limit alarm on-delay : 0.5 to 10.0 s (Initial value: 0.5 s)
 - Active power lower limit alarm threshold : -120000000 to 120000000 W (Initial value: 300 W)
 - Active power lower limit alarm hysteresis : 0 to 24000000 W (Initial value: 100 W)
 - Active power lower limit alarm on-delay : 0.5 to 10.0 s (Initial value: 0.5 s)
- *1. Setting a negative value can output an alarm against regenerated power.
*2. CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

● Over current alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: With two-system alarm ○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as an alarm after the setting of alarm parameter setting and alarm output setting.
 - Alarm judgment implements the OR operation in phases (when the value of a phase exceeds the over current alarm threshold). In addition, release of an alarm implements the AND operation (when the values of all phases are lower than over current alarm threshold and current alarm hysteresis).
 - Over current alarm threshold : 0.0 to 6000.0 A (Initial value: 100.0 A)
 - Over current alarm hysteresis : 0.0 to 1000.0 A (Initial value: 5.0 A)
 - Over current alarm on-delay : 0.1 to 10.0 s (Initial value: 0.1 s)
- * CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

● Under current alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: With two-system alarm ○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as an alarm after the setting of alarm parameter setting and alarm output setting.
 - Alarm judgment implements the OR operation in phases (when the value of a phase is lower than the under current alarm threshold). In addition, release of an alarm implements the AND operation (when the values of all phases exceed under current alarm threshold and current alarm hysteresis).
 - Under current alarm threshold : 0.0 to 6000.0 A (Initial value: 10.0 A)
 - Under current alarm hysteresis : 0.0 to 1000.0 A (Initial value: 5.0 A)
 - Under current alarm on-delay : 0.1 to 10.0 s (Initial value: 0.1 s)
- * CTD8E (CT expansion) can perform the two-system measurement only when it is connected to PMU2A (power two-system).

● Over voltage alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	×

⊖: With two-system alarm ○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as an alarm after the setting of alarm parameter setting and alarm output setting.
- Alarm judgment implements the OR operation in phases (when the value of a phase exceeds the over voltage alarm threshold). In addition, release of an alarm implements the AND operation (when the values of all phases are lower than over voltage alarm threshold and voltage alarm hysteresis).
- Over voltage alarm threshold : 0.0 to 12100.0 V (Initial value: 528.0 V)
- Over voltage alarm hysteresis : 0.0 to 2200.0 V (Initial value: 24.0 V)
- Over voltage alarm on-delay : 0.1 to 10.0 s (Initial value: 0.1 s)

● Under voltage alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	×

⊖: With two-system alarm ○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as an alarm after the setting of alarm parameter setting and alarm output setting.
- Alarm judgment implements the OR operation in phases (when the value of a phase is lower than the under voltage alarm threshold). In addition, release of an alarm implements the AND operation (when the values of all phases exceed under voltage alarm threshold and voltage alarm hysteresis).
- Under voltage alarm threshold : 0.0 to 12100.0 V (Initial value: 85.0 V)
- Under voltage alarm hysteresis : 0.0 to 2200.0 V (Initial value: 24.0 V)
- Under voltage alarm on-delay : 0.1 to 10.0 s (Initial value: 0.1 s)

● Power factor alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: With two-system alarm ○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as an alarm after the setting of alarm parameter setting and alarm output setting.
- Power factor alarm threshold : -1.00 to 1.00 (Initial value: 0.00)
- Power factor alarm hysteresis : 0.00 to 1.00 (Initial value: 0.05)
- Power factor alarm on-delay : 0.5 to 10.0 s (Initial value: 0.5 s)
- *1. CTD8E (CT expansion) can perform the two-system setting only when it is connected to PMU2A (power two-system).

● Reactive power alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	⊖

⊖: With two-system alarm ○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as an alarm after the setting of alarm parameter setting and alarm output setting.
 - Reactive power upper limit alarm threshold : -120000000 to 120000000 var (Initial value: 1000 var)
 - Reactive power upper limit alarm hysteresis : 0 to 24000000 var (Initial value: 100 var)
 - Reactive power upper limit alarm on-delay : 0.5 to 10.0 s (Initial value: 0.5 s)
 - Reactive power lower limit alarm threshold : -120000000 to 120000000 var (Initial value: 300 var)
 - Reactive power lower limit alarm hysteresis : 0 to 24000000 var (Initial value: 100 var)
 - Reactive power lower limit alarm on-delay : 0.5 to 10.0 s (Initial value: 0.5 s)
- *1. CTD8E (CT expansion) can perform the two-system setting only when it is connected to PMU2A (power two-system).

● Temperature alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
×	×	○	×

○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as an alarm after the setting of alarm parameter setting and alarm output setting.
- Upper-limit temperature alarm threshold : -58.0 to 212.0 (Initial value: 80.0)
- Upper-limit temperature alarm hysteresis : 0.0 to 10.0 (Initial value: 5.0)
- Upper-limit temperature alarm on-delay : 0.5 to 10.0 s (Initial value: 0.5 s)
- Lower-limit temperature alarm threshold : -58.0 to 212.0 (Initial value: 0.0)
- Lower-limit temperature alarm hysteresis : 0.0 to 10.0 (Initial value: 5.0)
- Lower-limit temperature alarm on-delay : 0.5 to 10.0 s (Initial value: 0.5 s)

● Reverse phase alarm output

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊖	×	×

⊖: With two-system alarm ○: With alarm X: Without alarm

- This function is available when output terminal function setting is selected as a reverse phase.
 - If the condition in which voltage phase order has changed continues for 0.1 s or more, the alarm output is turned ON.
 - Setting range: OFF, ON (Initial value: OFF)
- * Since the state where phases are not normal is judged as reverse phase, phase-loss may be judged as reverse phase.

3.4 Event input function

- Number of input points: 7
- Counts pulses by judging a pulse output from external equipment as an input.
- Calculates power original unit by dividing integrated power amount by pulse input count.
- Measures pulse input ON time.
- Classifies energies according to event input conditions. (3-STATE function)
- * Power original unit is used for measuring tact power of product lines. Pulse input ON time is used for calculating operation time of equipment.

■ Event input NPN/PNP input mode setting

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
x	x	○	x

O: With setting X: Without setting

- Performs switching between input without voltage and with voltage in event inputs 1 to 7.
- When using this function for relays, etc., take into account chattering, etc. that will occur.
On resistance: 1 kΩ or less, Off resistance: 100 kΩ or more
- With Voltage (PNP) means an input for switching ON/OFF by applying voltage to the event input terminal.
H level: 4.75 to 30 VDC, L level: 0 to 2 VDC
- Setting range: PNP, NPN (Initial value: PNP)

■ Event input N-O/N-C input mode setting

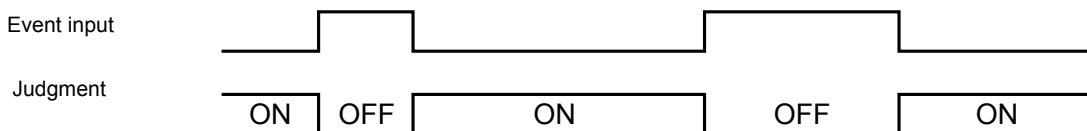
PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
x	x	○	x

O: With setting X: Without setting

- Performs switching between Normally open and Normally closed in the event input.
- Normally open (N-O) judges an open (release) state as event OFF, and a closed (continuity) state as event ON.
On the other hand, Normally closed (N-C) judges a closed (continuity) state as event ON, and an open (release) state as event OFF.
- Setting range : N-O, N-C (Initial value: N-O)
The time chart of Normally open is as follows.



The time chart of Normally closed is as follows.

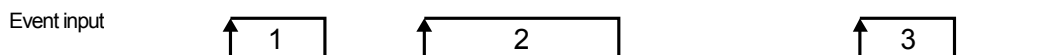


■ Pulse input count

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
x	x	○	x

○: With setting x: Without setting

- Pulse input counts 1 to 7 are used to count pulse inputs for event inputs 1 to 7.
- Pulse input count is reset when the pulse count is more than or equal to the upper limit value (999999999).
- The time chart for pulse count (Normally open) is as follows.



In the example above, the pulse count is 3. For Normally open, the timing to count up is the time of rising (for Normal close, time of falling).

■ ON time of pulse input

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
x	x	○	x

○: With setting x: Without setting

Performs the calculation by integrating ON time of event input as the time. (Unit: s)

As a use application, operating time of equipment can be monitored.

* Resetting is not done even by changing the time setting on the same day.

■ Function using event input

If EMU8A (pulse/temperature) is connected to the measurement master PMU1A (electric power) or PMU2A (power two-system), the 3-STATE function using measurement start time/measurement end time, power original unit, and event input can be used.

To use these functions, set the slave ID of EMU8A (pulse/temperature) to 5.

● Measurement start time/measurement end time

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	○	x	x

○: With setting x: Without setting

- Sets the times to start and end the calculation of power original unit, 3-STATE integrated power amount, and 3-STATE integrated time.
- For the setting time, the measurement start time can be set only when it is before the measurement end time.
- Measurement start time : 00:00 to 23:59 (Initial value: 00:00)
- Measurement end time : 00:01 to 24:00 (Initial value: 24:00)

● Power original unit

- The power original unit can be calculated by dividing the power amount integrated within a specified time by a pulse input count.
- When the power original unit reaches its upper limit, it is fixed to the upper limit value.
- For the pulse input count to be used for calculation, an input is specified to be the total number of ON times at two points of event input. Two points of event input can be selected from among the three: event inputs 1 and 2, event inputs 3 and 4, and event inputs 5 and 6.

● 3-STATE function

- Like the 3-STATE function described later, the 3-STATE function by event input can measure HIGH, MIDDLE, and LOW integrated power amounts and integrated times. For details on 3-STATE function, refer to Page 3-18.

3.5 3-STATE function

PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
○	⊙	△	×

⊙: With settings of two-system connected to PMU□A ○: With setting △: When
 ×: Without setting

- Classifies integrated power amount and integrated time into the three types.
- One of the present measurement values (power, voltage, current, and event input) outputs its condition signal according to the specified threshold.
 - * Output requires the output terminal to be set to HIGH, MIDDLE, or LOW.
- When measurement and saving operations are done, a value more than or equal to HIGH threshold is specified to be "HIGH integrated power amount," less than LOW threshold, "LOW integrated power amount," and others, "MIDDLE condition integrated power amount."
- When using the 3-STATE function, set the measurement start time/measurement end time. (Refer to Page 3-17.)

3-STATE target

- Targets for judgment of 3-STATE output function can be selected from one of the following.
- Judgment method for each target

1) Electric power (active) (unit of 1 W)

Using active power as a target for judgment, integrate power amount according to the HIGH/LOW threshold.

2) Current, voltage (unit of 0.1 A, 0.1 V)

Using the directly measured current/voltage line (*1) as a target for judgment, integrate power amount according to the HIGH/LOW threshold.

*1. The targets for judgment are shown below.

Phase wire	Target for current judgment	Target for voltage judgment
Single-phase 2-wire	VIn	I
Single-phase 3-wire	Vrn, Vtn	Ir, It
3-phase 3-wire	Vrs, Vst	Ir, It
3-phase 4-wire	Vrn, Vsn, Vtn	Ir, Is, It

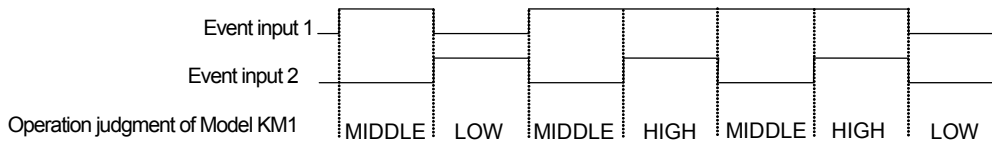
The HIGH condition judgment implements the OR operation (either value exceeds the threshold), while the LOW condition judgment implements the AND operation (both values are lower than the threshold).

3) Event input

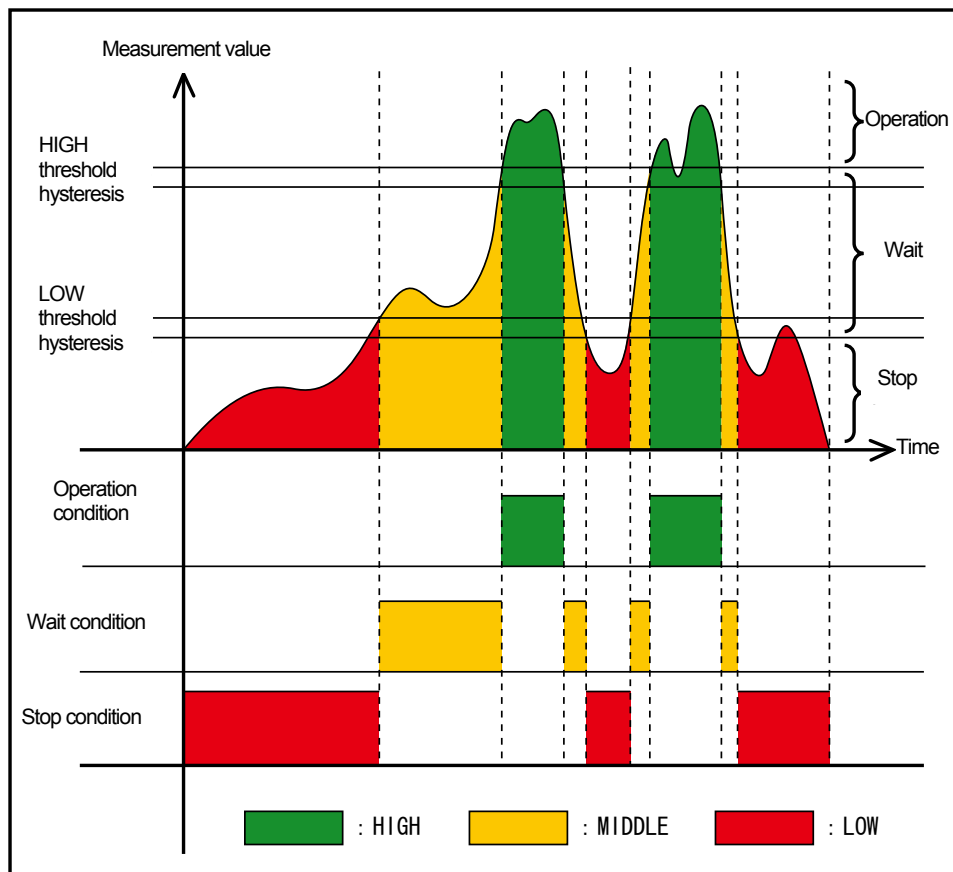
If event inputs are used as the discrimination of 3-STATE, one of the following combinations is used: event input 1 and event input 2, event input 3 and event input 4, and event input 5 and event input 6. For the judgment criteria, refer to the table below.

Event input 1	Event input 2	Judgment
0	0	LOW
0	1	LOW
1	0	MIDDLE
1	1	HIGH

0: Without input, 1: With input



- * If event inputs are used as the discrimination of 3-STATE, EMU8A (pulse/temperature) must be connected to PMU1A (electric power) or PMU2A (power two-system). In this case, set the slave ID of EMU8A (pulse/temperature) to 5. If electric power, current, and voltage are used for judgment, only PMU1A (electric power) and PMU2A (power two-system) are available.
- * Hysteresis can be set for HIGH threshold and LOW threshold. Set within the range of 0 to 24000000.
- * When defining HIGH = equipment operation condition, MIDDLE = equipment wait condition, and LOW equipment stop condition, 3-STATE has operation examples as shown below.
- * For single-phase 2 wire, PMU1A (electric power) and PMU2A (power two-system) can output only the CT1 condition, and the CT1 and CT3 conditions, respectively.



■ 3-STATE HIGH threshold/3-STATE LOW threshold

- Sets the threshold of the measurement condition output of an item set in a target for judgment.
- The condition is judged to be HIGH when the measurement value is more than the set value of HIGH threshold, judged to be LOW when lower than the set value of LOW threshold, and MIDDLE when other than the above.
- HIGH threshold that is smaller than LOW threshold cannot be set. LOW threshold that is larger than HIGH threshold cannot be set. (Doing so eliminates the MIDDLE condition, preventing 3-STATE operation.)

■ 3-STATE hysteresis

- Setting hysteresis can prevent frequent changes in output condition even if the measured value varies near the set threshold.
- If hysteresis is set, judgment values including the hysteresis setting are used for all of integrated power amount assignment, output, and operation indicator LED.
- Hysteresis can be set regardless of the setting values of HIGH threshold and LOW threshold.

3.6 Other functions

■ Time

The product is connected to a PC to make settings by using higher-level software.

For details on the setting, refer to the manual for higher-level software.

The time can be set between 2012 and 2099.

Leap years in this period are also supported.

The accuracy is ± 1.5 min/month.

When a power failure (23°C) occurs, a backup is performed with an electric double layer capacitor for about 7 days.

■ Initialization

Initialization includes the following.

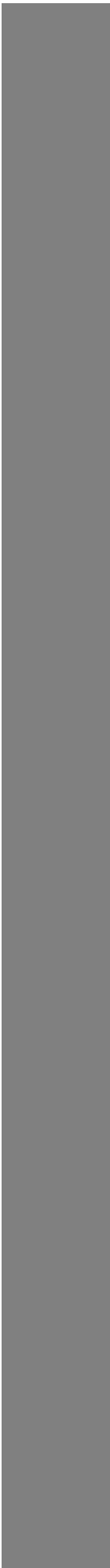
- Setting value initialization : Initializes setting values excepting time setting.
- MAX/MIN initialization : Initializes maximum and minimum values.
- Measurement history initialization : Initializes items to be logged.
- Alarm history initialization : Initializes alarm histories.
- Integrated power amount initialization : Initializes items to be backed up every 5 minutes.
- All initialization : Initializes all items excepting time setting.

	Setting value	MAX/MIN	Measurement history	Alarm history	Integrated power amount	All initialization
Measurement item	-	Initialization	-	-	-	Initialization
Integrated active power amount	-	-	-	-	Initialization	Initialization
Integrated regeneration power amount	-	-	-	-	Initialization	Initialization
Integration progression reactive power amount	-	-	-	-	Initialization	Initialization
Integrated delayed reactive power amount	-	-	-	-	Initialization	Initialization
Integrated total reactive power amount	-	-	-	-	Initialization	Initialization
Conversion value	-	-	-	-	Initialization	Initialization
Pulse conversion value	-	-	-	-	Initialization	Initialization
Pulse input count	-	-	-	-	Initialization	Initialization
ON time of pulse input	-	-	-	-	Initialization	Initialization
Power original unit	-	-	-	-	Initialization	Initialization
3-STATE integrated power amount	-	-	-	-	Initialization	Initialization
3-STATE integrated time	-	-	-	-	Initialization	Initialization
Target for log	-	-	Initialization	-	-	Initialization
Alarm history	-	-	-	Initialization	-	Initialization
Setting contents	Initialization	-	-	-	-	Initialization
Time setting	-	-	-	-	-	-



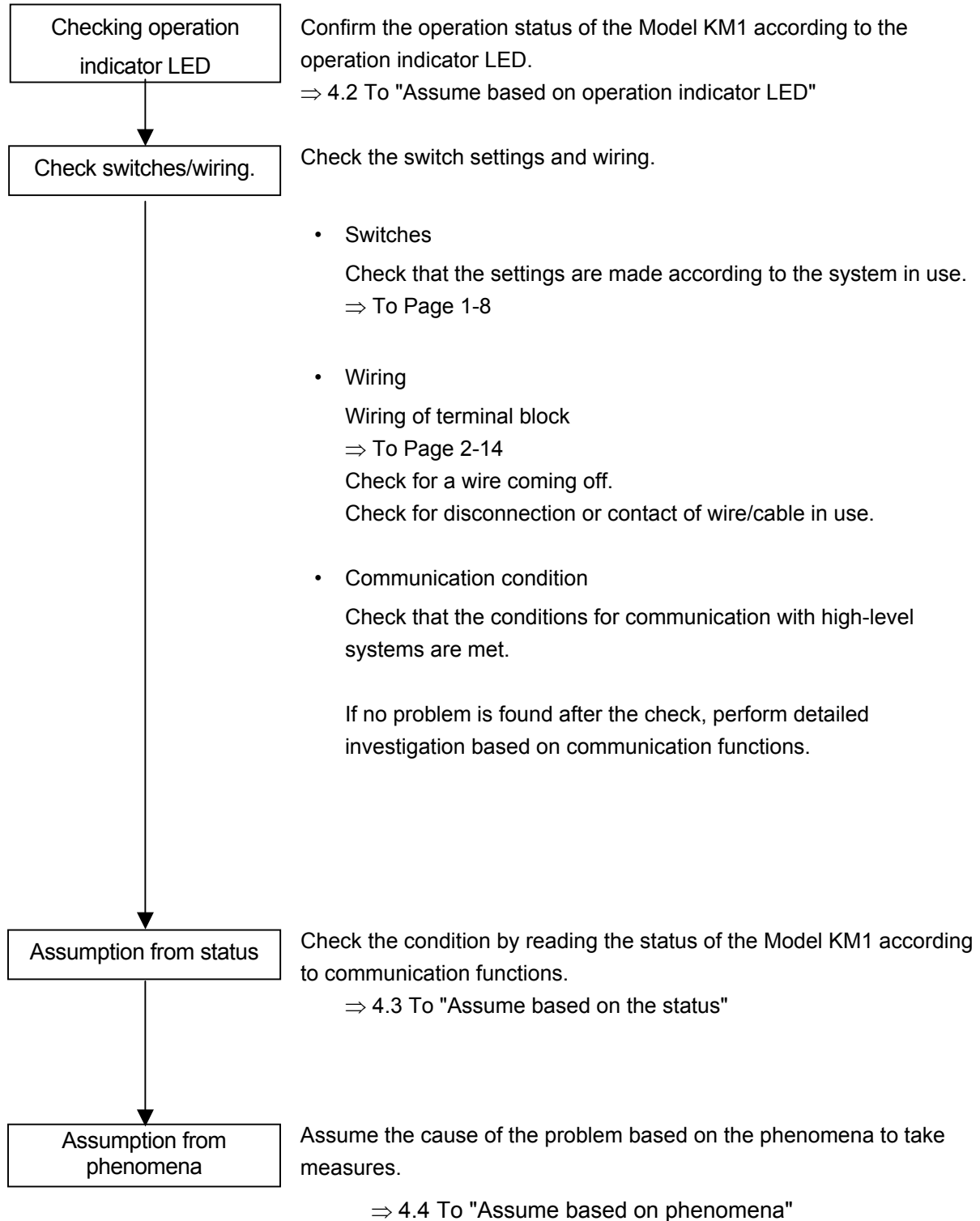
Chapter 4 Troubleshooting

4.1	Flow of troubleshooting	2
4.2	Assume based on operation indicator LED	3
4.3	Assume based on the status	4
4.4	Assume based on phenomena	5

































4.1 Flow of troubleshooting

If some problem occurs, check the sections according to the following items.



4.2 Assume based on operation indicator LED

If the power (PWR) lamp of the measurement master, CT expansion slave, or function slave is flashing, it indicates that an error has occurred.

Operation indicator LED				Assumable cause	Measures
PWR	CONN	ALM	COMM		
Lit 	Lit 	Lit 	Lit 	Immediately after power ON (All LEDs lit)	-
Lit 	Flashing 	Off 	Off 	Destruction of EEPROM data (All LEDs lit)	Repair is required. Contact the supplier you purchased the product from or our sales representative.
				Duplicates of slave ID, or out of range	Review the ID setting.
				Duplicates of unit no.	Review the unit no.
				Duplicates of the master	Review the master/slave.
				Over the allowable number of units connected	Check the number of units connected.
				Incompatibility in protocol of DIP switches	Check the settings of CompWay/F and Modbus and make the settings to match the protocol.
				Mismatch between the connection configuration and the ID of the connected slave	Make the ID of the connected slave match the connection configuration.
Lit 	Off 	Off 	Off 	Internal bus communication not allowed	Recheck the connection.
				Error in the unit connected	Check the error of the unit.
Lit 	Off 	Off 	Off 	Normal start-up (independent)	-
				During measurement (independent)	-
Lit 	Lit 	Off 	Off 	Normal start-up (multiple units)	-
				During measurement (multiple units)	-
Flashing 	Off 	Off 	Off 	EEPROM error	If the condition is not changed even by turning the power OFF, repair is required. Contact the supplier you purchased the product from or our sales representative.
				RAM error	
				RTC error	
Lit 	Lit/Off 	Off 	Lit 	Communication error	If the condition is not changed even by rechecking communication settings and wiring, repair is required. Contact the supplier you purchased the product from or our sales representative.
				RS-485/USB communication in progress	-
Lit 	Lit/Off 	Lit 	Off/Flashing 	Alarm output in progress	Since this is caused by functions of units, check the settings and then refer to Page 3-9.
				Lit 	Lit/Off 
Excess of over voltage					
				Frequency input error	

4.3 Assume based on the status

By reading the status through communication, you can confirm the condition of Model KM1.

The status is made up of 32 bits: bit 1 indicating the occurrence and bit 0 indicating non-occurrence (mode of operation 1: stop; 0: operation). (For the status of each model, refer to "Model KM1/KE1 Communication Manual" (SGTE-719).)

Status name	Meaning	Measures
RAM error	Indicates a RAM error.	If the condition is not changed even by turning the power OFF, repair is required. Contact the supplier you purchased the product from or our sales representative.
EEPROM error	Indicates an EEPROM error.	
RTC error	Indicates an RTC error.	
Communication error	Indicates a communication error.	If the condition is not changed even by rechecking communication settings and wiring, repair is required. Contact the supplier you purchased the product from or our sales representative.
Operation Modes	Indicates the operation condition.	-
Voltage input over	Indicates that the measurement voltage is larger than the standard.	Return it to within the range of standard.
Current input over	Indicates that the measurement current is larger than the standard.	
Insufficient input voltage	Indicates that the measurement voltage is smaller than the standard.	
Frequency input error	Indicates that the measurement frequency is out of the range of standard.	
CT input <input type="checkbox"/>	Indicates that CT <input type="checkbox"/> has an input.	-
Event input <input type="checkbox"/>	Indicates that event input <input type="checkbox"/> has an input.	-
Thermistor input	Indicates that thermistor input exists.	-
OUT <input type="checkbox"/>	Indicates that there is an output from OUT <input type="checkbox"/> .	-
LOW condition	Indicates that the condition is LOW.	-
MIDDLE condition	Indicates that the condition is MIDDLE.	-
HIGH condition	Indicates that the condition is HIGH.	-
Alarm 1	Indicates that one of the items set in the measuring block 1 item setting reaches the condition of alarm output.	-
Alarm 2	Indicates that one of the items set in the measuring block 2 item setting reaches the condition of alarm output.	-

4.4 Assume based on phenomena

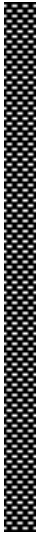
Before you think the product is malfunctioning

If Model KM1 does not operate normally, check applicable items listed below before making a request for repair.

If the product does not operate normally despite your check, we would like you to return the product to us via our sales division.

When	Phenomenon	Items to be checked	Action to be taken	Reference page
At time of initial connection to power	Operation indicator LEDs, OUT1, OUT2, and OUT3, light up.	Check that the lamp is flashing in conjunction with pulse output for measurement or alarm output.	If lamps, OUT1, OUT2, and OUT3, light up in conjunction with pulse output for measurement or alarm output, the product is normal.	-
	Voltage and current can be measured, but power cannot be measured correctly.	Check that the dedicated CT is not installed in the reverse direction.	If negative power is measured, all dedicated CTs may have been installed in the reverse direction. If the power close to 0 is measured, one of the two dedicated CTs may have been installed in the reverse direction.	2-14
	Large measurement error	Check that the wiring is correct.	Perform wiring correctly.	2-14
		Check that the type of the dedicated CT is correct.	Checking the type of your dedicated CT, set the dedicated CT of a correct type.	3-3
		Check that inputs are within the input range of the dedicated CT.	Checking the standard of the dedicated CT, supply current so that the dedicated CT can be within the range of the standard.	A-7
	Current becomes 0	Check that the current input value is higher than the current low-cut value.	Make settings so that the current low-cut value is lower than the current input value.	3-4
	Communication not allowed	Check that only the recommended communication converter (K3SC-10) is used.	Check that no error has occurred in the equipment connected.	-
		Check that the higher level systems (communication equipment) are normal.		-
		Check that settings for communication are correct.	Check that the communication setting is the same between the KM1 main unit and the communication converter.	-
		Check that the wiring is correct.	Perform wiring correctly.	2-14
		Check that the termination resistor has been installed.	Install termination resistors of 120 Ω (1/2 W) at the end of Model KM1 and in the communication converter.	2-28
		Check that the transmission distance is within the allowable maximum range.	Make connections in such a way that the maximum transmission distance for communication is 500 m or less.	-
		Check that the number of pieces of equipment connected to the same communication line is within the maximum number of connected units.	When CompoWay/F is selected for protocol, the maximum number of pieces of equipment connected must be 31 units in the KE/KM series. When Modbus, it must be 99 units or less in the KE/KM series (in either case, no base unit is included).	2-28
		Operation indicator LED PWR lights up, and CONN is flashing.	Check for duplicates of slave ID. Or, check that the setting is within the range.	Recheck the setting of slave ID.
	Check that the number of master units is one.		Check that the number of master units is one per system.	1-11
	Check that the number units connected is within the limit.		Check the maximum number of units connected.	1-11
Check that the communication protocol is matched.	Recheck the setting of communication protocol.		2-2	

When	Phenomenon	Items to be checked	Action to be taken	Reference page
When used	The primary current of the inverter cannot be measured correctly.	Check that the selected dedicated CT has some margin in the standard.	When the primary current of inverter is measured, the crest value is several times larger than the effective value. Therefore, use a dedicated CT having some margin in the standard.	A-7
	The date and time of the clock are initialized to April 1, 2012 at 0:0:0.	Check whether the RTC backup period has passed.	Set the clock all over again.	-
	Communication with the unit connected cannot be carried out.	Check that the specified connector has been used.	Use the specified connector.	2-7
		Check that the settings of the connection configuration are correct.	Match the setting of the slave ID of the connected unit with that of the connection configuration of the measurement master.	2-3
		Check that the power voltage has been applied to the functional slave.	Power voltage can be applied from the measurement master to CT expansion slaves only. Apply power voltage to the functional slave.	-
	Data backed up every 5 minutes or alarm histories for CTD8E (CT expansion) are not saved.	Check for errors in connections.	Connecting units to each other via the connector, match the setting of the slave ID with that of the connection configuration of the measurement master.	-
	Although communication with the unit connected can be carried out, CONN remains OFF.	-	Reset the entire system.	-



Appendix

Product specifications	A-2
■ Rating of main unit.....	A-2
■ Main part specifications	A-3
■ Protection functions	A-5
■ Accessories	A-6
● Connection connector (excepting measurement master)	A-6
● Instruction Manual (Japanese, English, Korean)	A-6
Dedicated CT.....	A-7
■ Specification	A-7
■ External dimensions (unit: mm)	A-7
● Split type	A-7
● Panel fixed (through) type.....	A-8
● Dedicated CT cable	A-8
List of parameters.....	A-9
List of data logging items.....	A-15
Model KM1/KE1 combination list.....	A-19

Product specifications

Rating of main unit

Model		KM4		KE4	
		PMU1A (Electric power)	PMU2A (Pulse/temperature two-system)	CTD8E (CT expansion)	
Applicable circuit		Single-phase 2-wire, single-phase 3-wire, 3-phase 3-wire, 3-phase 4-wire	Single-phase 2-wire, single-phase 3-wire, 3-phase 3-wire	Single-phase 2-wire, single-phase 3-wire, 3-phase 3-wire, 3-phase 4-wire	
Power source	Standard power voltage	100~240 VAC 50/60 Hz			
	Permissible power voltage range	85 to 110% of the standard power voltage			
	Supply frequency fluctuation range	45~65Hz			
	Consumed power	10 VA or less for independent use, 14 VA for expansion		10 VA or less	
Input	Standard input voltage	100 to 480 VAC Single-phase 2-wire: line-to-line voltage 100/200 VAC single-phase 3-wire: phase voltage/line-to-line voltage 100 to 480 VAC 3-phase 3-wire: line-to-line voltage 58 to 277 VAC 3-phase 4-wire: Phase voltage	100 to 480 VAC Single-phase 2-wire: line-to-line voltage 100/200 VAC single-phase 3-wire: phase voltage/line-to-line voltage 100 to 480 VAC 3-phase 3-wire: line-to-line voltage		
	Standard input current	5 A, 50 A, 100 A, 200 A, 400 A, 600 A		5 A, 50 A, 100 A, 200 A, 400 A, 600 A	
	Standard input power	When 5ACT is used : 4 kW When 50ACT is used : 40 kW When 100ACT is used : 80 kW When 200ACT is used : 160 kW When 400ACT is used : 320 kW When 600ACT is used : 480 kW			
	Standard input frequency	50/60 Hz			
	Input frequency fluctuation range	45~65 Hz			
	Permissible input voltage	110% of standard input voltage (continuous)			
	Permissible input current	120% of standard input current (continuous)		120% of standard input current (continuous)	
	Standard input load	Voltage input of 0.5 VA or less (excepting power supply section) Current input of 0.5 VA or less (each input)		Current input of 0.5 VA or less (each input)	
	Clock	Setting the time	2012 to 2099 (also supported in leap years during this period)		
		Clock accuracy	±1.5 min/month (at 23°C)		
Clock backup retaining period		Backed up by the electric double layer capacitor for approximately 7 days (At 23°C with power not supplied after power is distributed for approximately 24 hours or more)			
Usage ambient temperature		-10 to +55°C (however there is to be no condensation or freezing) °			
Storage temperature		-25 to 65°C (however there is to be no condensation or freezing)			
Storage ambient humidity		Relative humidity of 25 - 85%			
Storage humidity		Relative humidity of 25 - 85%			
Altitude		2000 m or less			
Installation environment		Over voltage category II, pollution level 2, measurement category II			
Applicable standards		IEC61010-2-030, EN61326-1			

■ Main part specifications

Item	Model	KM1			KE1
		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
Accuracy (*1)	Voltage	±1.0% FS ±1 digit * However, intra Vtr voltage shall be ±2.0% FS ±1digit under the same conditions.			
	Current	±1.0% FS ±1 digit * However, S-phase current of 3-phase 3-wire and N-phase current shall be ±2.0% FS ±1 digit under the same conditions.			±1.0% FS ±1 digit * However, S-phase current of 3-phase 3-wire and N-phase current shall be ±2.0% FS ±1 digit under the same conditions.
	Electric power (Active power, reactive power)	Active power, reactive power ±2.0% FS ±1 digit (power factor)			Active power, reactive power ±2.0% FS ±1 digit (power factor)
	Frequency	±0.3 Hz ±1 digit			
	Power factor (*2)	±5.0% FS (Ambient temperature of 23°C, standard input, standard frequency, power factor = range of 0.5 to 1 to 0.5)			±5.0% FS (Ambient temperature of 23°C, standard input, standard frequency, power factor = range of 0.5 to 1 to 0.5)
Temperature				After passage of 2 hours after power distribution, ±5°C (However, after compensation based on the environment of the ambient temperature)	
Influence by temperature	±1.0% FS (Ratio to measurement value at ambient temperature of 23°C, with standard input, standard frequency, and power factor of 1, within the working temperature range)			±1.0%FS (Ratio to measurement value at ambient temperature of 23°C within the working temperature range)	
Influence by frequency	±1.0% FS (Ratio to measurement value at ambient temperature of 23°C, with standard input, standard frequency, and power factor of 1, within the standard frequency range of ±5 Hz)			±1.0%FS (Ratio to measurement value at ambient temperature of 23°C, with standard input, standard frequency, and power factor of 1, within the standard frequency range of ±5 Hz)	
Influence by higher harmonic wave	±0.5% FS (Error generated when the 2nd-, 3rd-, 5th-, 7th-, 9th-, 11th-, or 13th-order higher harmonic wave is superimposed over the basic wave at ambient temperature of 23°C with the content rates of 30% in current and 5% in voltage)			±0.5% FS (Error generated when the 2nd-, 3rd-, 5th-, 7th-, 9th-, 11th-, or 13th-order higher harmonic wave is superimposed over the basic wave at ambient temperature of 23°C with the content rates of 30% in current and 5% in voltage)	
Low-cut current setting value	Variable in units of 0.1% between 0.1-19.9% of the standard input			Variable in units of 0.1% between 0.1-19.9% of the standard input	
Sampling frequency	100 ms (with measurement voltage at 50 Hz), 83.3 ms (with measurement voltage at 60 Hz)			100 ms 100 ms (with measurement voltage at 50 Hz), 83.3 ms(with measurement voltage at 60 Hz)	
Insulation resistance	Insulation resistance value of 20 MΩ (500 VDC)				
Voltage withstood	Common: 2000 V for 1 minute, place to which the voltage is applied: Between all terminals as a whole and the case PMU1A : Between power supplies as a whole and outputs of RS-485/USB/transistor as a whole : Between all power supplies as a whole and current/voltage inputs as a whole : Between current/voltage inputs as a whole and outputs of RS-485/USB/transistor as a whole PMU2A : Between power supplies as a whole and outputs of RS-485/USB/transistor as a whole : Between all power supplies as a whole and current/voltage inputs as a whole : Between current/voltage inputs as a whole and outputs of RS-485/USB/transistor as a whole EMU8A : Between current/voltage input 1 and voltage input 2 as a whole : Between power supplies as a whole and outputs of temperature input/RS-485/USB/transistor as a whole CTD8E : Between current inputs as a whole and USB/relay outputs as a whole				
Vibration tolerance	Half amplitude of 0.35 mm, acceleration of 50 m/s ² Frequency of 10 to 55 Hz, sweeping along three axes, 5 min x 10 times each				
Shocks withstood	150 m/s ² up/down, left/right, front/back in 6 directions, 3 times each				
Mass	Approximately 230 g				
Memory protection	EEPROM (non-volatile memory) Number of write times: :1 million times				
Event input	Number of input points				7 points
	Input without voltage				ON time current: 15 mA or less ON time residual voltage: 8 V or less OFF time leakage current of 1.5 mA or less
	Input with voltage				H level: 4.75 to 30 VDC L level: 0 to 2 VDC Input impedance: Approximately 2 kΩ
Temperature input	Number of input points				1 point
	Applicable thermistor				Model E52-THE5A Color code (blue): -50 to 50°C Color code (black): 0 to 100°C
Combination	Connection to KM1-EMU8A-FLK can support 7 event input points and 1 temperature input point.				
Transistor output	Number of other points	Common to 3 open collector points (OUT1, OUT2, OUT3)			
	Output capacity	30 VDC ,30 mA			
	ON residual voltage	1.2 V or less			
	OFF time leakage current	100 μA or less			
	Integrated power amount pulse output	1 pulse output when the power amount in the set pulse output voltage is reached 1, 10, 100, 1 k, 2 k, 5 k, 10 k, 20 k, 50 k, 100 k (W·h)			
	Alarm output	Outputs an alarm based on the set alarm output threshold			
Return method	Automatic return only				

Model		KM1			KE1
		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
Relay output	Number of other points				1 a-contact point (OUT1)
	Standard load				Resistance load 125 VAC 3 A 30 VDC 3 A
	Mechanical life				5 million times or more
	Electrical life				200,000 times or more (standard load, 1800 times/h in open-close frequency)
	Failure rate P level				5 VDC 10 mA (in open-close frequency of 120 times/min)
	Alarm output				Turning output ON/OFF according to the setting value of alarm
	Return method				Automatic return only
RS-485	Protocol	Communication protocol switching, OFF: CompoWay/F ON: Modbus			
	Synchronous system	Start stop synchronization			
	Setup of unit no.	CompoWay/F:0-99, Modbus:1-99 * If switching operation switches the protocol to Modbus when the unit No. setting is set to 0, the unit no. setting value is automatically changed to 1.			
	Communication speed	9600 bps, 19200 bps, 38400 bps			
	Transmission code	CompoWay/F:ASCII		Modbus :Binary	
	Data bit (*3)	CompoWay/F: 7 bit, 8 bit		Modbus: 8 bit	
	Stop bit (*3)	CompoWay/F: 1 bit, 2 bit		Modbus: 1 bit with parity, 2 bits without parity	
	Parity	No, Even, Odd			
	Maximum transmission distance	500 m			
	Maximum number of connected units	CompoWay/F: 31 units		Modbus: 99 units	
Communication item	Refer to Model KM1/KE1 Communication Manual (SGTE-719).				
USB	Conforms to USB Standard V1.1				
Retained during power failure	Setting data, integrated power amount (saved in internal memory every 5 minutes)				
Number of connector insertion/removal times	25 times				

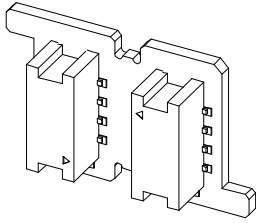
- *1 Conforms to JISC1111. Error in dedicated CT is not included. For ambient temperature of 23°C, standard input, standard frequency, and higher harmonic wave, the 2nd-, 3rd, 5th-, 7th-, 9th-, 11-th, and 13-th orders are supported.
- *2. Calculation formula: Power factor = Active power/Apparent power
Apparent power = $\sqrt{(\text{Active power})^2 + (\text{Reactive power})^2}$
- *3 If the protocol is switched to Modbus, the setting value may be changed. When switching DIP switches, check the setting contents.

Protection functions

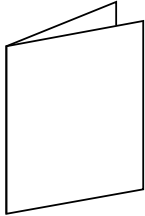
Item	Model	KM1			KE1
		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
Active power monitor	Operation setting range	Upper limit alarm : -120000000 to 120000000 W Lower limit alarm : -120000000 to 120000000 W			Upper limit alarm -120000000 to 120000000W Lower limit alarm -120000000 to 120000000W
	Operation characteristics	±2.0%FS±1 digit			±2.0%FS±1 digit
	Operation time	0.5~10 s			0.5~10 s
	Operation time characteristics	±0.2 s			±0.2 s
	Return power	Upper limit alarm : Upper limit monitor operation value 0 to 24000000 W Lower limit alarm : Lower limit alarm operation value 0 to 24000000 W			Upper limit alarm Upper limit monitor operation value 0 to 24000000 W Lower limit alarm Lower limit alarm operation value 0 to 24000000 W
Current monitor	Operation setting range	Upper limit alarm : 0.0 to 6000.0 A Lower limit alarm : 0.0 to 6000.0 A			Upper limit alarm : 0.0 to 6000.0 A Lower limit alarm : 0.0 to 6000.0 A
	Operation characteristics	±1.0%FS±1 digit			±1.0%FS±1 digit
	Operation time	0.1~10 s			0.1~10 s
	Operation time characteristics	±0.2 s			±0.2 s
	Return current	Upper limit alarm : Upper limit alarm operation value 0.0 to 1000.0 A Lower limit alarm : Lower limit alarm operation value 0.0 to 1000.0 A			Upper limit alarm Upper limit alarm operation value 0.0 to 1000.0 A Lower limit alarm Lower limit alarm operation value 0.0 to 1000.0 A
Voltage monitor	Operation setting range	Upper limit alarm : 0.0 to 12100.0 V Lower limit alarm : 0.0 to 12100.0 V			
	Operation characteristics	±1.0% FS ±1 digit However, intra Vtr voltage shall be ±2.0% FS ±1 digit under the same conditions.			
	Operation time	0.1~10 s			
	Operation time characteristics	±0.2 s			
	Return voltage	Upper limit alarm : Upper limit alarm operation value 0.0 to 2200.0 V Lower limit alarm : Lower limit alarm operation value 0.0 to 2200.0 V			
Power factor monitor	Operation setting range	-1.00~1.00			-1.00~1.00
	Operation characteristics	±5.0% FS (power factor = range of 0.5 to 1 to 0.5)			±5.0% FS (power factor = range of 0.5 to 1 to 0.5)
	Operation time	0.5~10 s			0.5~10 s
	Operation time characteristics	±0.2 s			±0.2 s
	Return value	0.00~1.00			0.00~1.00
Reactive power monitor	Operation setting range	Upper limit alarm : -120000000 to 120000000 var Lower limit alarm : -120000000 to 120000000 var			Upper limit alarm -120000000 to 120000000 var Lower limit alarm -120000000 to 120000000 var
	Operation characteristics	±2.0%FS±1 digit			±2.0%FS±1 digit
	Operation time	0.5~10 s			0.5~10 s
	Operation time characteristics	±0.2 s			±0.2 s
	Return power	Upper limit alarm : Upper limit monitor operation value 0 to 24000000 var Lower limit alarm : Lower limit alarm operation value 0 to 24000000 var			Upper limit alarm : Upper limit monitor operation value 0 to 24000000 var Lower limit alarm : Lower limit alarm operation value 0 to 24000000 var
Temperature monitor	Operation setting range	Upper limit alarm : -50.0 to 100.0 Lower limit alarm : -50.0 to 100.0			
	Operation time	0.5 to 10 s			
	Operation time characteristics	±0.2 s			
	Return temperature	Upper limit alarm : .0 to 10.0 Lower limit alarm : 0.0 to 10.0			
Reverse phase monitor	Operation time	0.1 s			
	Operation time characteristics	±0.2 s			

■ Accessories

- Connection connector (excepting measurement master)



- Instruction Manual (Japanese, English, Korean)



Dedicated CT

■ Specification

Item	Model	Split type				
	Model KM20-CTF-5A	Model KM20-CTF-50A	Model KM20-CTF-100A	Model KM20-CTF-200A	Model KM20-CTF-400A	Model KM20-CTF-600A
Primary standard current	5 A	50 A	100 A	200 A	400 A	600 A
Secondary standard current	1.67 mA	16.7 mA	33.3 mA	66.7 mA	66.7 mA	66.7 mA
Secondary coil	3,000 turns			6,000 turns		9,000 turns
Applicable frequency	10 Hz~5 kHz					
Insulation resistance	Between output terminal and case : 50 MΩ or higher (500 VDC mega)					
Voltage withstood	Between output terminal and case : 2000 VAC 1 min					
Protection element	7.5 V clamp element					
Permissible number of insertion/removal times	100 times					
Inner diameter	Φ10		Φ16	Φ24	Φ37	
Working temperature/humidity range	-20 to + 60°C with 85% or less (without condensation)					
Storage temperature/humidity range	-30 to + 65°C with 85% or less (without condensation)					

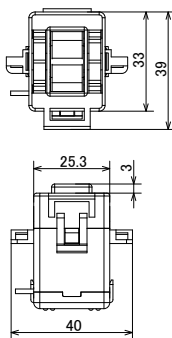
Item	Model	Panel fixed (through) type
	Model KM20-CTB-5A/50A	
Primary standard current	5 A/50 A	
Secondary standard current	1.67 mA/16.7 mA	
Secondary coil	3,000 turns	
Applicable frequency	10 Hz to 5 kHz	
Insulation resistance	Between output terminal and case : 50 MΩ or higher (500 VDC mega)	
Voltage withstood	Between output terminal and case : 2000 VAC 1 min	
Protection element	7.5 V clamp element	
Inner diameter	Φ10	
Working temperature/humidity range	-20 to + 60°C with 85% or less (without condensation)	
Storage temperature/humidity range	-30 to + 65°C with 85% or less (without condensation)	

- *1. Use the dedicated CT at a low voltage of 600 V or less.
- *2. When clamping at a conductive object, such as bus bar, ensure the basic insulation at least by covering it with an insulator, etc.

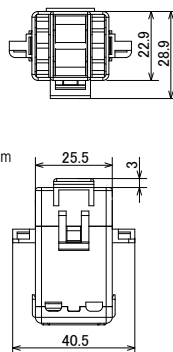
■ External dimensions (unit: mm)

● Split type

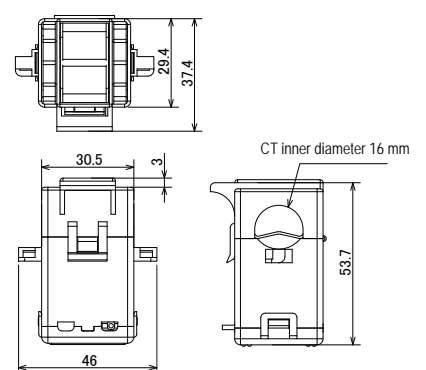
Model KM20-CTF-5A



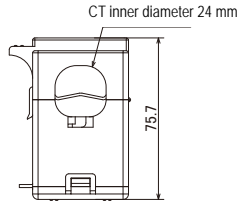
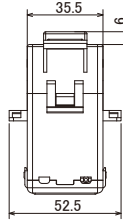
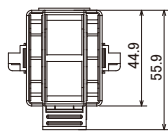
Model KM20-CTF-50A



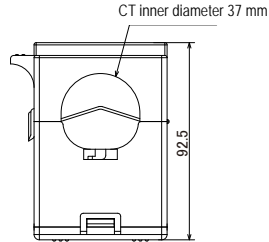
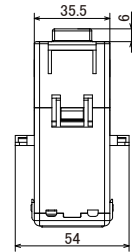
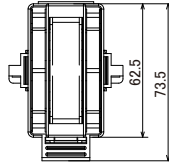
Model KM20-CTF-100A



Model KM20-CTF-200A

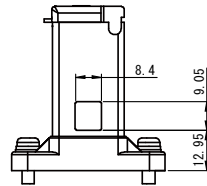
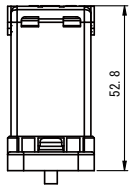
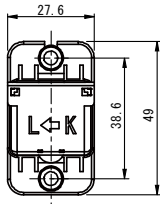


Model KM20-CTF-400A/Model KM20-CTF-600A



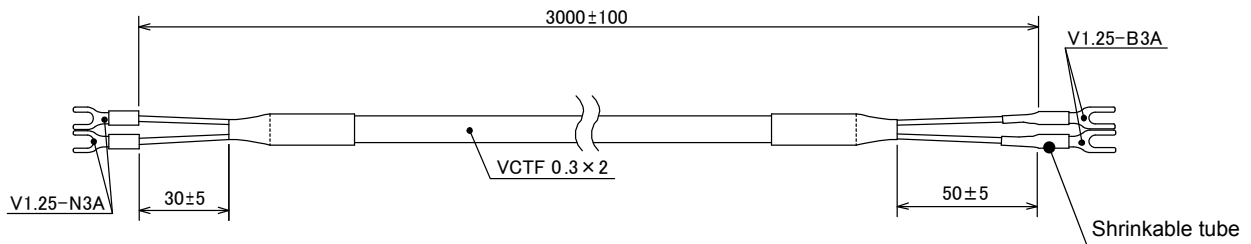
● Panel fixed (through) type

Model KM20-CTB-5A/50A



● Dedicated CT cable

Model KM20-CTF-CB3 (Cable for dedicated CT)



* When installing the cable in dedicated CT, install the shrinkable tube side to the dedicated CT.

List of parameters

Setting item	Initial value	Setting range	PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
Electrical system 1 applicable phase wire	2: 3-phase 3-wire	0: Single-phase 2-wire 1: Single-phase 3-wire 2: 3-phase 3-wire 3: 3-phase 4-wire	○	○	×	○
Electrical system 2 applicable phase wire	2: 3-phase 3-wire	0: Single-phase 2-wire 1: Single-phase 3-wire 2: 3-phase 3-wire	×	○	×	○
Synchronization selection for measuring block 1	0: Electrical system 1	0: Electrical system 1 1: Electrical system 2	×	×	×	○
Synchronization selection for measuring block 2			×	×	×	○
Dedicated CT type for measuring block 1	2: 100 A	0: 5 A 1: 50 A 2: 100 A 3: 200 A 4: 400 A 5: 600 A	○	○	×	○
Dedicated CT type for measuring block 2			×	○	×	○
Electrical system 1 VT ratio	1.00	0.01~99.99	○	○	×	○
Electrical system 2 VT ratio			×	○	×	○
Measuring block 1 CT ratio	1	1~1000	○	○	×	○
Measuring block 2 CT ratio			×	○	×	○
Low-cut current for measuring block 1	0.6%	0.1~19.9%	○	○	×	○
Low-cut current for measuring block 2			×	○	×	○
Simple measurement	0:OFF	0: OFF (Regular measurement) 1: ON (Simple measurement)	○	○	×	○
Voltage on simple measurement for system 1	110.0 V	0.1~9999.9 V	○	○	×	○
Voltage on simple measurement for system 2			×	○	×	○
Power factor on simple measurement for measuring block 1	1.00	0.01~1.00	○	○	×	○
Power factor on simple measurement for measuring block 2			×	○	×	○
Average count	0:OFF	0: OFF 1: 2 times 2: 4 times 3: 8 times 4: 16 times 5: 32 times 6: 64 times 7: 128 times 8: 256 times 9: 512 times A: 1024 times	○	○	×	○

Setting item	Initial value	Setting range	PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
Event input setting 1	0:P.CSP	0: P.CSP (Pulse input count) 1: H-ON (ON time of pulse input) 2: 3-ST (3-STATE classification)	x	x	○	x
Event input setting 2			x	x	○	x
Event input setting 3			x	x	○	x
Event input setting 4			x	x	○	x
Event input setting 5			x	x	○	x
Event input setting 6			x	x	○	x
Event input setting 7			x	x	○	x
NPN/PNP input mode setting for event input 1	0:PNP	0:PNP 1:NPN	x	x	○	x
NPN/PNP input mode setting for event input 2			x	x	○	x
NPN/PNP input mode setting for event input 3			x	x	○	x
NPN/PNP input mode setting for event input 4			x	x	○	x
NPN/PNP input mode setting for event input 5			x	x	○	x
NPN/PNP input mode setting for event input 6			x	x	○	x
NPN/PNP input mode setting for event input 7			x	x	○	x
Input mode setting for event input 1	0:N-O	0: N-O (Normally open) 1:N-C (Normally closed)	x	x	○	x
Input mode setting for event input 2			x	x	○	x
Input mode setting for event input 3			x	x	○	x
Input mode setting for event input 4			x	x	○	x
Input mode setting for event input 5			x	x	○	x
Input mode setting for event input 6			x	x	○	x
Input mode setting for event input 7			x	x	○	x
Measurement start time	00:00	00:00~23:59	○	○	x	x
Measurement end time	24:00	00:01~24:00	○	○	x	x
3-STATE target for measuring block 1	4: No	0: Electric power 1: Current 2: Voltage 3: Event input 4: No	○	○	x	x
3-STATE target for measuring block 2			x	○	x	x
Measuring block 1 3-STATE/original unit event input	0: 1 and 2	(Terminal for event input) 0: 1 and 2 1: 3 and 4 2: 5 and 6	○	○	x	x
Measuring block 2 3-STATE/original unit event input			x	○	x	x

Setting item	Initial value	Setting range	PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
3-STATE HIGH threshold for measuring block 1	1000	-120000000~120000000	○	○	×	×
3-STATE HIGH threshold for measuring block 2			×	○	×	×
3-STATE LOW threshold for measuring block 1	800	-120000000~120000000	○	○	×	×
3-STATE LOW threshold for measuring block 2			×	○	×	×
3-STATE hysteresis for measuring block 1	50	0~24000000	○	○	×	×
3-STATE hysteresis for measuring block 2			×	○	×	×
Temperature unit	0: Celsius	0: Celsius (C) 1: Fahrenheit (F)	×	×	○	×
Temperature compensation 1	0 (C or F)	-50.0~50.0	×	×	○	×
Pulse conversion coefficient setting 1	1.00	0.01~9999.99	×	×	○	×
Pulse conversion coefficient setting 2			×	×	○	×
Pulse conversion coefficient setting 3			×	×	○	×
Pulse conversion coefficient setting 4			×	×	○	×
Pulse conversion coefficient setting 5			×	×	○	×
Pulse conversion coefficient setting 6			×	×	○	×
Pulse conversion coefficient setting 7			×	×	○	×
Pulse output unit	2: 100 Wh	0: 1 Wh 1: 10 Wh 2: 100 Wh 3: 1 kWh 4: 2 kWh 5: 5 kWh 6: 10 kWh 7: 20 kWh 8: 50 kWh 9: 100 kWh	○	○	×	×
Pulse output circuit	0: Circuit 1	0: Circuit 1 1: Circuit 2 2: Circuit 3 3: Circuit 4	○	○	×	×
Total power coefficient 1	1.000	0.000~9999.999	○	○	×	○
Total power coefficient 2			×	○	×	○
Reverse phase detection	0:OFF	0:OFF 1:ON	○	○	×	×
Output terminal 1 function setting	0:OFF	0: OFF 1: Measuring block 1 alarm 2: Measuring block 2 alarm 3: Earth leakage 4: Temperature 5: Phase-loss 6: Reverse phase 7: Pulse output	○	○	○	○
Output terminal 2 function setting	0:OFF	8: Measuring block 1 3-STATE HIGH 9: Measuring block 1 3-STATE MIDDLE A: Measuring block 1 3-STATE LOW	○	○	○	×
Output terminal 3 function setting	0:OFF	B: Measuring block 2 3-STATE HIGH C: Measuring block 2 3-STATE MIDDLE D: Measuring block 2 3-STATE LOW	○	○	○	×
Output terminal 1 condition	0:N-O	0: N-O (Normally open) 1:N-C (Normally closed)	○	○	○	○
Output terminal 2 condition			○	○	○	×
Output terminal 3 condition			○	○	○	×

Setting item	Initial value	Setting range	PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/ temperature)	CTD8E (CT expansion)
Alarm parameter setting for measuring block 1	H'00000000	0bit: Over voltage alarm 1bit: Under voltage alarm 2bit: Over current alarm 3bit: Under current alarm 4bit: Active power upper limit alarm 5bit: Active power lower limit alarm 6bit: Reactive power upper limit alarm 7bit: Reactive power lower limit alarm 8bit: Power factor alarm 9bit to 31bit: Idle	○	○	×	○
Alarm parameter setting for measuring block 2		0bit: Over voltage alarm 1bit: Under voltage alarm 2bit: Over current alarm 3bit: Under current alarm 4bit: Active power upper limit alarm 5bit: Active power lower limit alarm 6bit: Reactive power upper limit alarm 7bit: Reactive power lower limit alarm 8bit: Power factor alarm 9bit to 31bit: Idle	×	○	×	○
Alarm output setting for measuring block 1	H'00000000	0bit: Over voltage alarm 1bit: Under voltage alarm 2bit: Over current alarm 3bit: Under current alarm 4bit: Active power upper limit alarm 5bit: Active power lower limit alarm 6bit: Reactive power upper limit alarm 7bit: Reactive power lower limit alarm 8bit: Power factor alarm 9bit to 31bit: Idle	○	○	×	○
Alarm output setting for measuring block 2		0bit: Over voltage alarm 1bit: Under voltage alarm 2bit: Over current alarm 3bit: Under current alarm 4bit: Active power upper limit alarm 5bit: Active power lower limit alarm 6bit: Reactive power upper limit alarm 7bit: Reactive power lower limit alarm 8bit: Power factor alarm 9bit to 31bit: Idle	×	○	×	○
Active power upper limit alarm threshold for measuring block 1	1000 W	-120000000~120000000 W	○	○	×	○
Active power upper limit alarm hysteresis for measuring block 1	100 W	0~24000000 W	○	○	×	○
Active power upper limit alarm on-delay for measuring block 1	0.5 s	0.5~10.0 s	○	○	×	○
Active power lower limit alarm threshold for measuring block 1	300 W	-120000000~120000000 W	○	○	×	○
Active power lower limit alarm hysteresis for measuring block 1	100 W	0~24000000 W	○	○	×	○
Active power lower limit alarm on-delay for measuring block 1	0.5 s	0.5~10.0 s	○	○	×	○
Active power upper limit alarm threshold for measuring block 2	1000 W	-120000000~120000000 W	×	○	×	○
Active power upper limit alarm hysteresis for measuring block 2	100 W	0~24000000 W	×	○	×	○
Active power upper limit alarm on-delay for measuring block 2	0.5 s	0.5~10.0 s	×	○	×	○
Active power lower limit alarm threshold for measuring block 2	300 W	-120000000~120000000 W	×	○	×	○
Active power lower limit alarm hysteresis for measuring block 2	100 W	0~24000000 W	×	○	×	○
Active power lower limit alarm on-delay for measuring block 2	0.5 s	0.5~10.0 s	×	○	×	○
Over current alarm threshold for measuring block 1	100.0 A	0.0~6000.0 A	○	○	×	○
Over current alarm hysteresis for measuring block 1	5.0 A	0.0~1000.0 A	○	○	×	○
Over current alarm on-delay for measuring block 1	0.1 s	0.1~10.0 s	○	○	×	○
Under current alarm threshold for measuring block 1	10.0 A	0.0~6000.0 A	○	○	×	○
Under current alarm hysteresis for measuring block 1	5.0 A	0.0~1000.0 A	○	○	×	○
Under current alarm on-delay for measuring block 1	0.1 s	0.1~10.0 s	○	○	×	○
Over current alarm threshold for measuring block 2	100.0	0.0~6000.0 A	×	○	×	○
Over current alarm hysteresis for measuring block 2	5.0 A	0.0~1000.0 A	×	○	×	○
Over current alarm on-delay for measuring block 2	0.1 s	0.1~10.0 s	×	○	×	○
Under current alarm threshold for measuring block 2	10.0 A	0.0~6000.0 A	×	○	×	○
Under current alarm hysteresis for measuring block 2	5.0 A	0.0~1000.0 A	×	○	×	○
Under current alarm on-delay for measuring block 2	0.1 s	0.1~10.0 s	×	○	×	○
Over voltage alarm threshold for measuring block 1	528.0 V	0.0~12100.0 V	○	○	×	×
Over voltage alarm hysteresis for measuring block 1	24.0 V	0~2200.0 V	○	○	×	×
Over voltage alarm on-delay for measuring block 1	0.1 s	0.1~10.0 s	○	○	×	×
Under voltage alarm threshold for measuring block 1	85.0 V	0.0~12100.0 V	○	○	×	×
Under voltage alarm hysteresis for measuring block 1	24.0 V	0.0~2200.0 V	○	○	×	×
Under voltage alarm on-delay for measuring block 1	0.1 s	0.1~10.0 s	○	○	×	×

Setting item	Initial value	Setting range	PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/ temperature)	CTD8E (CT expansion)
Over voltage alarm threshold for measuring block 2	528.0 V	0.0~12100.0 V	x	○	x	x
Over voltage alarm hysteresis for measuring block 2	24.0 V	0.0~2200.0 V	x	○	x	x
Over voltage alarm on-delay for measuring block 2	0.1 s	0.1~10.0 s	x	○	x	x
Under voltage alarm threshold for measuring block 2	85.0 V	0.0~12100.0 V	x	○	x	x
Under voltage alarm hysteresis for measuring block 2	24.0 V	0.0~2200.0 V	x	○	x	x
Under voltage alarm on-delay for measuring block 2	0.1 s	0.1~10.0 s	x	○	x	x
Power factor alarm threshold for measuring block 1	0.00	-1.00~1.00	○	○	x	○
Power factor alarm hysteresis for measuring block 1	0.05	0.00~1.00	○	○	x	○
Power factor alarm on-delay for measuring block 1	0.5 s	0.5~10.0 s	○	○	x	○
Power factor alarm threshold for measuring block 2	0.00	-1.00~1.00	x	○	x	○
Power factor alarm hysteresis for measuring block 2	0.05	0.00~1.00	x	○	x	○
Power factor alarm on-delay for measuring block 2	0.5 s	0.5~10.0 s	x	○	x	○
Reactive power upper limit alarm threshold for measuring block 1	1000 var	-120000000~120000000 var	○	○	x	○
Reactive power upper limit alarm hysteresis for measuring block 1	100 var	0.0~24000000 var	○	○	x	○
Reactive power upper limit alarm on-delay for measuring block 1	0.5 s	0.5~10.0 s	○	○	x	○
Reactive power lower limit alarm threshold for measuring block 1	300 var	-120000000~200000000 var	○	○	x	○
Reactive power lower limit alarm hysteresis for measuring block 1	100 var	0.0~24000000 var	○	○	x	○
Reactive power lower limit alarm on-delay for measuring block 1	0.5 s	0.5~10.0 s	○	○	x	○
Reactive power upper limit alarm threshold for measuring block 2	1000 var	-120000000~120000000 var	x	○	x	○
Reactive power upper limit alarm hysteresis for measuring block 2	100 var	0~24000000 var	x	○	x	○
Reactive power upper limit alarm on-delay for measuring block 2	0.5 s	0.5~10.0 s	x	○	x	○
Reactive power lower limit alarm threshold for measuring block 2	300 var	-120000000~120000000 var	x	○	x	○
Reactive power lower limit alarm hysteresis for measuring block 2	100 var	0~24000000 var	x	○	x	○
Reactive power lower limit alarm on-delay for measuring block 2	0.5 s	0.5~10.0 s	x	○	x	○
Upper-limit temperature alarm threshold	80.0	-50.0~100.0	x	x	○	x
Upper-limit temperature alarm hysteresis	5.0	0.0~10.0	x	x	○	x
Upper-limit temperature alarm on-delay	0.5 s	0.5~10.0 s	x	x	○	x
Lower-limit temperature alarm threshold	0.0	-50.0~100.0	x	x	○	x
Lower-limit temperature alarm hysteresis	5.0	0.0~10.0	x	x	○	x
Lower-limit temperature alarm on-delay	0.5 s	0.5~10.0 s	x	x	○	x
Active input setting	H'000000FF	0bit: Input 1 1bit: Input 2 2bit: Input 3 3bit: Input 4 4bit: Input 5 5bit: Input 6 6bit: Input 7 7bit: Input 8	○	○	○	○
Unit no.	01	0~99	○	○	○	○
Communication speed	0: 9.6 kbps	0: 9.6 kbps 1: 19.2 kbps 2: 38.4 kbps	○	○	○	x
Data bit length	0: 7 bits	0: 7 bits 1: 8 bits	○	○	○	x
Stop bit length	1: 2 bits	0: 1 bit 1: 2 bits	○	○	○	x
Vertical parity	1: Even	0: No 1: Even 2: Odd	○	○	○	x
Transmission wait time	20 ms	0 to 99 ms	○	○	○	x
Connection configuration	H'00000000 (Not connected)	0 bit: Slave ID 1 connected/not connected 1 bit: Slave ID 2 connected/not connected 2 bit: Slave ID 3 connected/not connected 3 bit: Slave ID 4 connected/not connected 4 bit: Slave ID 5 connected/not connected 5 bit: Slave ID 6 connected/not connected	○	○	x	x

Setting item	Initial value	Setting range	PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/temperature)	CTD8E (CT expansion)
Data logging 1 item	Voltage MAX 1 (EMU8A: Temperature MAX1)	Refer to Page A-15	○	○	○	×
Data logging 2 item	Voltage MAX 2 (EMU8A: Temperature MIN1)		○	○	○	×
Data logging 3 item	Voltage MAX 3 (EMU8A: ON time 1 of pulse input)		○	○	○	×
Data logging 4 item	Voltage MIN1 (EMU8A: ON time 2 of pulse input)		○	○	○	×
Data logging 5 item	Voltage MIN 2 (EMU8A: Pulse input count 1)		○	○	○	×
Data logging 6 item	Voltage MIN 3 (EMU8A: Pulse input count 2)		○	○	○	×
Data logging 1 cycle	0: 5min	0: 5 min	○	○	○	×
Data logging 2 cycle	0: 5min	1: 10 min	○	○	○	×
Data logging 3 cycle	0: 5min	2: 30 min	○	○	○	×
Data logging 4 cycle	0: 5min	3: 1 h	○	○	○	×
Data logging 5 cycle	0: 5min	4: 2 h	○	○	○	×
Data logging 6 cycle	0: 5min	5: 6 h	○	○	○	×
Data logging 7 cycle	0: 5min	6: 12 h	○	○	○	×
Data logging 8 cycle	0: 5min	7: 24 h	○	○	○	×
Main unit attribute reading 1	Differs depending on the model.	Refer to Model KM1/KE1 Communication Manual (SGTE-719).	○	○	○	○
Main unit attribute reading 2			○	○	○	○
Main unit attribute reading 3			○	○	○	○
Main unit attribute reading 4			○	○	○	○
Time information (month/day)	-	H'00YYMMDD YY: 2-digit year H'00 to H'63 (00 to 99) MM: 2-digit month H'00 to H'0C (01 to 12) YY: Date H'00 to H'1F (01 to 31)	○	○	○	×
Time information (hour/minute/second)	-	H'0000HHMMSS HH: Hour H'00 to H'17 (00 to 23) MM: Minute H'00 to H'3B (00 to 59) SS: Second H'00 to H'3B (00 to 59)	○	○	○	×

List of data logging items

Setting value	Data logging item	Targeted unit		
		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/ temperature)
0	Integrated active power amount 1	○	○	×
1	Integrated active power amount 2	○	○	×
2	Integrated active power amount 3	○	×	×
4	Integrated active power amount 5	×	○	×
5	Integrated active power amount 6	×	○	×
8	Total regenerated power amount 1	○	○	×
9	Total regenerated power amount 2	○	○	×
A	Total regenerated power amount 3	○	×	×
C	Total regenerated power amount 5	×	○	×
D	Total regenerated power amount 6	×	○	×
10	Integration progression reactive power amount 1	○	○	×
11	Integration progression reactive power amount 2	○	○	×
12	Integration progression reactive power amount 3	○	×	×
14	Integration progression reactive power amount 5	×	○	×
15	Integration progression reactive power amount 6	×	○	×
18	Integrated delayed reactive power amount 1	○	○	×
19	Integrated delayed reactive power amount 2	○	○	×
1A	Integrated delayed reactive power amount 3	○	×	×
1C	Integrated delayed reactive power amount 5	×	○	×
1D	Integrated delayed reactive power amount 6	×	○	×
20	Integrated total reactive power amount 1	○	○	×
21	Integrated total reactive power amount 2	○	○	×
22	Integrated total reactive power amount 3	○	×	×
24	Integrated total reactive power amount 5	×	○	×
25	Integrated total reactive power amount 6	×	○	×
26	Integrated total reactive power amount 7	×	×	×
27	Integrated total reactive power amount 8	×	×	×
28	Voltage MAX 1	○	○	×
29	Voltage MAX 2	○	○	×
2A	Voltage MAX 3	○	○	×
2B	Voltage MAX 4	×	○	×
2C	Voltage MAX 5	×	○	×
2D	Voltage MAX 6	×	○	×

Setting value	Data logging item	Targeted unit		
		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/ temperature)
2E	Voltage MIN 1	○	○	×
2F	Voltage MIN 2	○	○	×
30	Voltage MIN 3	○	○	×
31	Voltage MIN 4	×	○	×
32	Voltage MIN 5	×	○	×
33	Voltage MIN 6	×	○	×
34	Current MAX 1	○	○	×
35	Current MAX 2	○	○	×
36	Current MAX 3	○	○	×
3A	Current MAX 7	×	○	×
3B	Current MAX 8	×	○	×
3C	Current MAX 9	×	○	×
40	Current MIN 1	○	○	×
41	Current MIN 2	○	○	×
42	Current MIN 3	○	○	×
46	Current MIN 7	×	○	×
47	Current MIN 8	×	○	×
48	Current MIN 9	×	○	×
4C	Active power MAX 1	○	○	×
4D	Active power MAX 2	○	○	×
4E	Active power MAX 3	○	×	×
50	Active power MAX 5	×	○	×
51	Active power MAX 6	×	○	×
54	Active power MIN 1	○	○	×
55	Active power MIN 2	○	○	×
56	Active power MIN 3	○	×	×
58	Active power MIN 5	×	○	×
59	Active power MIN 6	×	○	×
5C	Reactive power MAX 1	○	○	×
5D	Reactive power MAX 2	○	○	×
5E	Reactive power MAX 3	○	×	×
60	Reactive power MAX 5	×	○	×
61	Reactive power MAX 6	×	○	×

Setting value	Data logging item	Targeted unit		
		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/ temperature)
64	Reactive power NIN1	○	○	×
65	Reactive power NIN2	○	○	×
66	Reactive power NIN3	○	×	×
68	Reactive power NIN5	×	○	×
69	Reactive power NIN6	×	○	×
6C	Power factor MAX 1	○	○	×
6D	Power factor MAX 2	○	○	×
6E	Power factor MAX 3	○	×	×
70	Power factor MAX 5	×	○	×
71	Power factor MAX 6	×	○	×
74	Power factor MIN 1	○	○	×
75	Power factor MIN 2	○	○	×
76	Power factor MIN 3	○	×	×
78	Power factor MIN 5	×	○	×
79	Power factor MIN 6	×	○	×
7C	Power original unit 1	○	○	×
7D	Power original unit 2	○	○	×
7E	Power original unit 3	○	○	×
7F	Power original unit 4	×	○	×
80	3-STATE High integrated power amount 1	○	○	×
81	3-STATE High integrated power amount 2	○	○	×
82	3-STATE High integrated power amount 3	○	○	×
83	3-STATE High integrated power amount 4	×	○	×
84	3-STATE Middle integrated power amount 1	○	○	×
85	3-STATE Middle integrated power amount 2	○	○	×
86	3-STATE Middle integrated power amount 3	○	○	×
87	3-STATE Middle integrated power amount 4	×	○	×
88	3-STATE Low integrated power amount 1	○	○	×
89	3-STATE Low integrated power amount 2	○	○	×
8A	3-STATE Low integrated power amount 3	○	○	×
8B	3-STATE Low integrated power amount 4	×	○	×
8C	3-STATE High integrated time 1	○	○	×
8D	3-STATE High integrated time 2	○	○	×
8E	3-STATE High integrated time 3	○	○	×
8F	3-STATE High integrated time 4	×	○	×

Setting value	Data logging item	Targeted unit		
		PMU1A (Electric power)	PMU2A (Power two-system)	EMU8A (Pulse/ temperature)
90	3-STATE Middle integrated time 1	○	○	×
91	3-STATE Middle integrated time 2	○	○	×
92	3-STATE Middle integrated time 3	○	○	×
93	3-STATE Middle integrated time 4	×	○	×
94	3-STATE Low integrated time 1	○	○	×
95	3-STATE Low integrated time 2	○	○	×
96	3-STATE Low integrated time 3	○	○	×
97	3-STATE Low integrated time 4	×	○	×
98	Temperature MAX 1	×	×	○
A0	Temperature MIN 1	×	×	○
B8	ON time 1 of pulse input	×	×	○
B9	ON time 2 of pulse input	×	×	○
BA	ON time 3 of pulse input	×	×	○
BB	ON time 4 of pulse input	×	×	○
BC	ON time 5 of pulse input	×	×	○
BD	ON time 6 of pulse input	×	×	○
BE	ON time 7 of pulse input	×	×	○
BF	Pulse input count 1	×	×	○
C0	Pulse input count 2	×	×	○
C1	Pulse input count 3	×	×	○
C2	Pulse input count 4	×	×	○
C3	Pulse input count 5	×	×	○
C4	Pulse input count 6	×	×	○
C5	Pulse input count 7	×	×	○

Model KM1/KE1 combination list

		Master			
		Model KM1-PMU1A-FLK (Electric power)	Model KM1-PMU2A-FLK (Power two-system)	Model KE1-PGR1C-FLK (Electric power/earth leakage)	Model KE1-PVS1C-FLK (Electric power/instantaneous voltage drop)
Slave	Model KM1-EMU8A-FLK (Pulse/ temperature)	○	○	○	○
	Model KE1-VSU1B-FLK (Instantaneous voltage drop)	×	×	○	○
	Model KE1-VAU1B-FLK (Voltage/current)	×	×	○	○
	Model KE1-CTD8E (CT expansion)	○	○	○	○
	Model KE1-ZCT8E (ZCT expansion)	×	×	○	×
	Model KE1-DRT-FLK (DeviceNet communication)	○	○	○	○

O: Connection allowed
X: Connection not allowed

Index

Numbers/symbols

- 3-phase 3-wire.....2-13, 2-26, 2-27, 2-28
- 3-phase 4-wire.....2-13, 2-26, 2-27, 2-28
- 3-STATE HIGH threshold/3-STATE LOW threshold
..... 3-20
- 3-STATE function 3-17, 3-18
- 3-STATE target..... 3-18
- 3-STATE hysteresis 3-20

A

- Abbreviation IX
- PMU1A IX
- PMU2A IX
- EMU8A IX
- PGR1C IX
- PVS1C IX
- VSU1B IX
- VAU1B IX
- CTD8E IX
- ZCT8E IX
- DRT IX
- About dedicated CT.....A-7
- Specifications.....A-7
- External Dimensions (unit: mm).....A-7
- Split type A-7
- Panel fixed (through) type A-8
- Dedicated CT cable.....A-8
- Active input setting 3-12
- Active power 3-6
- Active power alarm output..... 3-13
- Alarm history 3-12
- Alarm output..... 3-12
- Alarm output setting 3-9
- Alarm parameter setting 3-9
- Applicable phase wire 3-3
- Assume based on operation indicator LED 4-3
- Assume based on phenomena..... 4-5
- Assume based on the status 4-4
- RAM error 4-4
- EEPROM error..... 4-4
- RTC error..... 4-4
- Communication error 4-4
- Operation mode 4-4
- Voltage input over 4-4
- Current input over 4-4
- Insufficient input voltage 4-4
- Frequency input error 4-4
- CT input 4-4
- Event input 4-4
- Thermistor input..... 4-4
- OUT 4-4
- LOW condition 4-4
- MIDDLE condition..... 4-4
- HIGH condition 4-4
- Alarm 4-4
- Average count 3-5

C

- Communication function..... 1-5
- CompoWay/F 1-2,2-28
- Connection configuration..... 2-3
- Connection connector 2-8
- Consumed power 2-25
- CT input..... 2-27
- CT ratio..... 3-4
- CT signal detection..... 3-5
- Current 3-7

D

- Dedicated CT VII, 2-12, A-7
- Dedicated CT cable..... VII, A-8
- Dedicated CT type 3-3
- Model KM20-CTF-5A..... 3-3
- Model KM20-CTF-50A..... 3-3
- Model KM20-CTF-100A..... 3-3
- Model KM20-CTF-200A..... 3-3
- Model KM20-CTF-400A..... 3-3
- Model KM20-CTF-600A..... 3-3
- Model KM20-CTB-5A/50A 3-3
- Driving USB bus power 2-26

E

- Event input 2-29
- Event input function..... 3-16
- Event NPN/PNP input mode setting 3-16
- Event N-O/N-C input mode setting 3-16
- Pulse input count 3-17
- ON time of pulse enter..... 3-17
- Function using event input..... 3-17
- Measurement start time/measurement end time
..... 3-17
- Power original unit 3-17
- 3-STATE function 3-17
- Explanation of the display unit..... 1-7
- PWR 1-7
- CONN 1-7
- ALM 1-7
- COMM 1-7
- CT..... 1-7
- EV..... 1-7
- OUT 1-7
- TH..... 1-7

F

- Flow before use..... 2-2
- Setting example..... 2-3
- Flow of troubleshooting 4-2
- Format..... IX
- Model KM1-PMU1A-FLK IX
- Model KM1-PMU2A-FLK IX
- Model KM1-EMU8A-FLK IX
- Model KE1-PGR1C-FLK..... IX
- Model KE1-PVS1C-FLK IX
- Model KE1-VSU1B-FLK IX
- Model KE1-VAU1B-FLK..... IX
- Model KE1-CTD8E IX
- Model KE1-ZCT8E IX
- Model KE1-DRT-FLK IX
- Format standard..... 1-13
- Frequency 3-7
- Function by unit..... 1-3

H

- HIGH, MIDDLE, or LOW state integrated time "Ratio"
..... 3-21
- HIGH, MIDDLE, or LOW state integrated power
amount "Ratio" 3-21
- Horizontally connecting hook 2-7

I

- Inactive power 3-7
- Inactive power alarm output 3-15
- Indication of voltage 2-26
- Initialization 3-21
- Setting value initialization 3-21
- MAX/MIN initialization..... 3-21
- Measurement history initialization..... 3-21
- Alarm history initialization 3-21

Integrated power amount initialization	3-21
All initialization	3-21
Input function	1-5
Event input	1-5
Input/output configuration and example of wiring diagram	2-14
Model KM1-PMU1A-FLK	2-14
Model KM1-PMU2A-FLK	2-16
Model KM1-EMU8A-FLK	2-19
Model KE1-CTD8E	2-20
Installation	2-6
External Dimensions (unit: mm)	2-6
Connection method	2-7
Horizontally connecting hook	2-7
Connection connector	2-8
Installation procedure	2-9
Installation of DIN rail	2-9
Installation on a wall	2-11
Installation of DIN rail	2-9
Installation on a wall	2-11
Integrated power amount	3-6
Integrated power amount pulse output	3-10
Inverter primary current	2-28
K	
KM1/KE1-Setting	2-2
L	
List of combinations in Model KM1/KE1 Series A	1-9
List of functions	3-2
List of parameters	A-9
Log data to be saved	A-15
Logging function	3-5
Logging function of measurement data	1-5
Low-cut function	3-4
Low-cut current value	3-4
M	
Main features	1-2
Main functions	1-3
Main unit standard	A-2
Master unit	I
Measurement function	3-6
Active voltage	3-6
Integrated power amount	3-6
Current	3-7
Voltage	3-7
Power factor	3-7
Inactive power	3-7
Frequency	3-7
Temperature measurement	3-7
Simple measurement	3-8
Conversion coefficient of integrated power amount	3-8
Pulse conversion coefficient	3-8
Modbus	1-2, 2-28
Model KE1-CTD8E	2-20
Model KM1-EMU8A-FLK	2-19
Model KM1-PMU1A-FLK	2-14
Model KM1-PMU2A-FLK	2-16
N	
Name	IX
Power measurement unit	IX
Power Two-System Measurement Unit	IX
Temperature/Pulse Input Unit	IX
Power/Earth Leakage Monitor Unit	IX
Power/Instantaneous Voltage Drop Monitoring Unit	IX
Instantaneous Voltage Drop Monitoring Unit	IX
Voltage/Current Monitoring Unit	IX
CT Expansion Unit	IX
ZCT Expansion Unit	IX
DeviceNet Communication Unit	IX
Name of each part	1-6

O	
Output	2-29
Transistor output	2-29
Relay output	2-29
Output function	1-3, 3-9
Integrated power amount pulse output	1-3
3-STATE output	1-3
Alarm output	1-3
Output terminal 1/output terminal 2/output terminal 3 function setting	3-9
Over current alarm output	3-13
Over voltage alarm output	3-14
P	
Panel fixed (through) type	A-8
Performances of the main unit	A-3
Phase-sequence	3-11
Phase-sequence alarm output	3-15
Power factor	3-7
Power factor alarm output	3-14
Power original unit	3-17
Power voltage	2-25
Product specification	A-2
Main unit standard	A-2
Performances of the main unit	A-3
Protection function	A-5
Accessories	A-6
Connection connector	A-6
Instruction Manual (Japanese, English, Korean)	A-6
Protection function	A-5
Pulse conversion coefficient	3-8
Pulse output unit	3-10
R	
RS-485 communication	2-28
S	
Setting switch	1-8
DIP switch	1-8
Rotary switch	1-8
Simple measurement	3-8
Single-phase 2 wire	2-13, 2-26, 2-27, 2-28
Single-phase 3 wire	2-13, 2-26, 2-27, 2-28
Slave ID	1-8
Slave unit	I
Solderless terminal	2-15
Specifications	A-7
Split type	VII, A-7
Synchronization selection for measuring block	3-3
System configuration	1-9
Model kind	1-9
Configuration	1-10
Multiple-unit connection	1-10
Minimum configuration	1-11
Maximum configuration	1-11
Multiple-system configuration	1-12
T	
Temperature alarm output	3-15
Temperature measurement	3-7
Through type	VII
Time	3-21
Time chart of alarm output function	3-12
U	
Under current alarm output	3-13
Under voltage alarm output	3-14
Unit No.	2-3
Unit type	IX
Measurement master	IX
Function slave	IX
CT expansion slave	IX
Communication slave	IX
USB cable	2-26

USB port..... 2-26

V

Voltage 3-7

Voltage input..... 2-26

VT ratio..... 3-4

W

Wire connection and installation of dedicated CT....
..... 2-13

Single-phase 2 wire 2-13

Single-phase 3 wire 2-13

3-phase 3-wire (Δ (delta) wire connection) ... 2-13

3-phase 3-wire (V wire connection) 2-13

3-phase 4-wire (Y (star) wire connection) 2-13

Wiring 2-25

OMRON Corporation Industrial Automation Company
Tokyo, JAPAN

Contact: www.ia.omron.com

Regional Headquarters

OMRON EUROPE B.V.

Wegalaan 67-69-2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC

One Commerce Drive Schaumburg,
IL 60173-5302 U.S.A.
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.

No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

Authorized Distributor:

© OMRON Corporation 2012 All Rights Reserved.
In the interest of product improvement,
specifications are subject to change without notice.

Cat. No. N171-E1-01

Printed in Japan