New Value For Control Panels

Power Monitors

KM-N2 / KM-N3

- Power Monitors applicable around the globe
- Solve design, installation, and operation topics with one model for each installation type

New Value For Control Panels

Control Panels: The Heart of Manufacturing Sites.
Evolution in control panels results in large evolution in production facilities.
And if control panel design, control panel manufacturing processes, and human interaction with them are innovated, control panel manufacturing becomes simpler and takes a leap forward.
OMRON will continue to achieve a control panel evolution and process innovation through many undertakings starting with the shared Value Design for Panel *1 concept for the specifications of products used in control panels.

Value Design for Panel

*1 Value Design for Panel

Our shared Value Design for Panel (herein after referred to as "Value Design") concept for the specifications of products used in control panels will create new value to our customer's control panels.
Combining multiple products that share the Value Design concept will further increase the value provided to control panels.

Innovation for panel building **Process**

Further Evolution for **Panels**

New Value For Control Panels

Simple & Easy for panel business **People**

Process

Conceptual design → Detailed design → Assembly/ Wiring → Shipment

Conceptual design → Detailed design → Assembly/ Wiring → Shipment

Panels

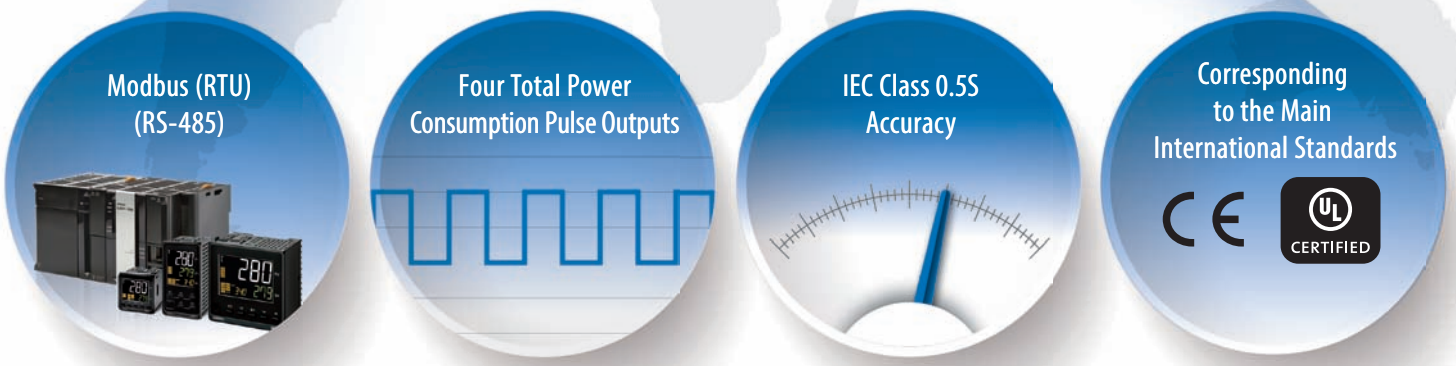
People

Multi-circuit Power Monitors for Energy Management Easily Implement All Types of Power Monitoring with On-panel and In-panel Installation

The New KM-N2 and KM-N3 Power Monitors

Energy management starts by continuously monitoring power.
The KN-N2 and KN-N3 enable all types of power measurement with easy installation and easy system construction.
You can mount them on or in control panels and distribution boards and
take advantage of their compatibility with power supplies around the world.

Packed Full of Functions!



Features Common to Both the KM-N2 and KM-N3

Power Monitors for Energy Management That

Easier Application and Greater Work Efficiency for Everyone

System Design Manager

Handle All EMS* Specifications

Energy Manager

No Numeric Value

*EMS: Energy Management System

General-purpose CTs

Corresponding to the Main International Standards

CE UL CERTIFIED

Many Host Communications Methods

PLC | Proprietary systems | Central monitoring system

RS-485 communications
Modbus(RTU)
CompoWay/F

Total power consumption
pulse outputs

Multi-address System

Large Easy-to-read Displays

Actual Size

DIN Rail Installation Type KM-N2

Solve Design,Installation, and Operation Issues

Overlooked

Installation Manager

Efficient Wiring

Actual Size

On-panel Installation Type KM-N3

Push-In Plus Terminal Block

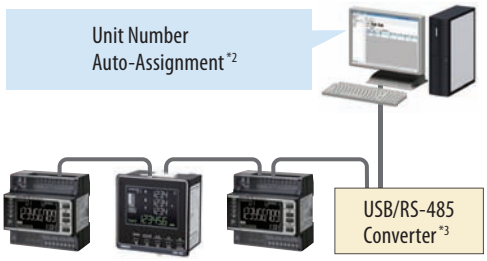
The structure of Push-In Plus terminal blocks helps reduce wiring mistakes with easy-to-insert terminals that hold wires firmly (RS-485 communications and pulse output terminals).

KM-N2

KM-N3

Efficient Initial Setting Tool *1

- Easy-to-use setting functions of the communications and measurement conditions
- Save/Load setting by CSV file



*1. Supported Version of main unit: V2.0.0 or higher for all models.
*2. Except for KM-N2-FLK.
*3. For this software, compatibility of the USB/RS-485 converter has been verified for SI-35USB (LINEEYE Co.,Ltd.). K3SC-10 is not compatible.

Wiring Error Detection

ALARM lamp blinks

KM-N2

(!) lamp lights up

KM-N3

Power Monitor

KM-N2-FLK

Global Power Monitor for Mounting Inside Control Panels

- Solve design, installation, and operation topics.
- You can measure up to four circuits with one Power Monitor.
- Use general-purpose CTs and handle a variety of worksites.
- Large, easy-to-read white LCD for improved visibility.
- IEC Class 0.5S high-precision measurements (Power Monitor only).

⚠ **Refer to Safety Precautions on page 19.**

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Ordering Information

Power Monitor

Model	Rated input voltage (Common terminals of a power supply and a measurement voltage input.)	Dimensions	Communications
KM-N2-FLK	1-phase 2-wire: 100 to 277 VAC 1-phase 3-wire: 100 to 220 VAC (L-N), 200 to 440 VAC (L-L) 3-phase 3-wire: 173 to 277 VAC (L-L) 3-phase 4-wire (earthed neutral): 100 to 254 VAC (L-N), 173 to 440 VAC (L-L) 3-phase 4-wire (unearthed neutral): 100 to 120 VAC (L-N), 173 to 208 VAC (L-L)	90 × 90 × 65 mm (H×W×D)	RS-485 communications, pulse output

To use a commercially available current transformer, use a CT with a secondary current rating of 1 A or 5 A, and a rated load of at least 1.0 VA.

Split Type Current Transformer (CT) (CE marking compliant KM-N2/N3 dedicated products ✻)

Model	Rated primary current	Rated secondary current
KM-NCT-E100A	100 A	1 A
KM-NCT-E250A	250 A	
KM-NCT-E500A	500 A	

✻ The KM-NCT-E conforms to the standards shown above ONLY when it is used with a power monitor KM-N2-FLK or KM-N3-FLK to which it is attached. Use of the KM-NCT-E without a power monitor does not conform to these standards.

Note: Select a CT cable that does not exceed the rated load of 1 VA.

Specifications

Ratings (Power Monitor)

Item	Model	KM-N2-FLK
Applicable phase wiring methods		Single-phase two-wire, single-phase three-wire, three-phase three-wire, and three-phase four-wire
Number of measured circuits		Single-phase two-wire: 4 circuits max., Single-phase three-wire or three-phase three-wire: 2 circuits max., Three-phase four-wire: 1 circuit
Power consumption		7 VA max.
Input	**Rated input voltage (Common terminals of a power supply and a measurement voltage input.)**	1-phase 2-wire: 100 to 277 VAC 1-phase 3-wire: 100 to 220 VAC (L-N), 200 to 440 VAC (L-L) 3-phase 3-wire: 173 to 277 VAC (L-L) 3-phase 4-wire (earthed neutral): 100 to 254 VAC (L-N), 173 to 440 VAC (L-L) 3-phase 4-wire (unearthed neutral): 100 to 120 VAC (L-N), 173 to 208 VAC (L-L)
	Allowable supply voltage range	85% to 115% of rated power supply voltage
	Connectable CTs	General-purpose CT with a rated secondary current of 1 A or 5 A ✻
	Maximum CT secondary current	6 A
	Rated input frequency	50/60 Hz
Ambient operating temperature		−25 to 55°C (with no condensation or icing)
Ambient operating humidity		25% to 85%
Storage temperature		−25 to 85°C (with no condensation or icing)
Storage humidity		25% to 85%
Operating altitude		2,000 m max.
Installation environment		Overvoltage category II, measurement category II, pollution degree 2
Electromagnetic environment		Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)
Compliant standards		EN 61010-2-030, EN 61326-1, and UL 61010-1

✻ The KM-series CTs (the KM20-CTF or KM-NCT Series) cannot be used. Use general-purpose CTs with a secondary-side output of 1 A or 5 A.

Split Type Current Transformer (CT) (CE marking compliant KM-N2/N3 dedicated products ✻)

Item	KM-NCT-E100A	KM-NCT-E250A	KM-NCT-E500A
Rated primary current: In	100 A	250 A	500 A
Rated secondary current: Is	1 A		
Rated frequency	50/60 Hz		
Cable Length	Please refer to *Writing to KM-NCT-E□□□A*		
Rated load	1 VA		
Insulation resistance	100 MΩ min. (at 500 VDC mega) between core and all output terminals		
Dielectric strength voltage	2300 VAC, 1 minute between core and all output terminals.		
Weight	Approx. 170 g	Approx. 175 g	Approx. 290 g
Maximum wire diameter	24 dia.	24 dia.	36 dia.
Operating temperature and humidity range	–20 to 55 °C, relative humidity: 85% max. with no condensation		
Storage temperature and humidity range	–30 to 90 °C, relative humidity: 85% max. with no condensation		
Applicable standards ✻	EN61010-1, EN61010-2-030, EN61326-1		
Installation environment	Overvoltage category and measurement category: II, Pollution level: 2		

✻ The KM-NCT-E conforms to the standards shown above ONLY when it is used with a power monitor KM-N2-FLK or KM-N3-FLK to which it is attached. Use of the KM-NCT-E without a power monitor does not conform to these standards.

Wiring to KM-NCT-E□□□A

- For wiring of the output terminal of CT, use AWG18-14 electric wire (with a cross-section of 0.75-2.0 mm^2) and Y-shape terminal compatible with the M3 screw.
- The recommended torque for screwing the M3 screws onto the output terminal is 0.3 N·m. Make sure the Y terminal is pushed all the way in and tightened firmly. After fixing the wiring, confirm that the wire is fixed securely.
- The guideline of the maximum wiring length between KM-N2-FLK or KM-N3-FLK and KM-NCT-E is as follows.
  The longer the wire length, the larger the measurement error using the KM-NCT-E becomes.
- The limit of the wiring length can also be calculated by the following formula. Calculate the wiring length limit according to the conductor resistivity of the wiring and keep the wiring length below the limit.
- The limits of the wiring length shown below are for reference only. They do not guarantee proper use.

Wiring diameter	Guideline for wiring length limit
0.75 mm^2 (AWG18 equivalent)	15 m
2.0 mm^2 (AWG14 equivalent)	43 m

Wiring extension limit value (one-way) (m)=
0.475/conductor resistivity (Ω/m)

Note: Select a CT cable that does not exceed the rated load of 1 VA.

Performance (Power Monitor)

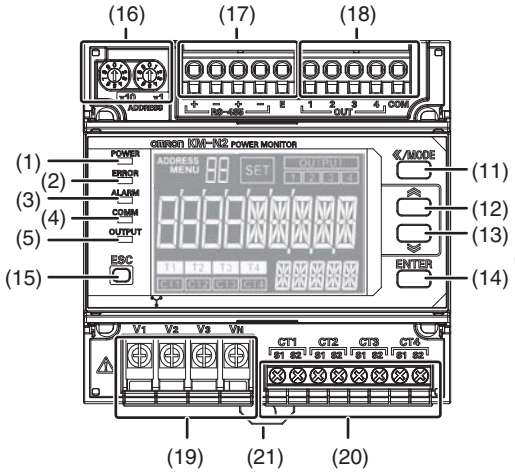
Item	Model	KM-N2-FLK
Measured items		Total power consumption (active, regenerative, and reactive), power (active and reactive), current, voltage, power factor, and frequency
Measurement specifications	Active power	0.5% (IEC 62053-22 class 0.5S) ✻
	Reactive power	2% (IEC 62053-23 class 2) ✻
	Sampling cycle	80 ms for 50 Hz and 66.7 ms for 60 Hz
Insulation resistance		(1) Between all electrical circuits and the case: 20 MΩ min. (at 500 VDC) (2) Between all power supply and voltage inputs and all communications and pulse output terminals: 20 MΩ max. (at 500 VDC)
Dielectric strength		(1) Between all electrical circuits and the case: 2,200 VAC for 1 min (2) Between all voltage and current inputs and all communications and pulse output terminals: 2,200 VAC for 1 min
Vibration resistance		Single amplitude: 0.1 mm, Acceleration: 15 m/s^2, Frequency: 10 to 150 Hz, 10 sweeps for 8 min each along three axes
Shock resistance		150 m/s^2, 3 times each in 6 directions (up/down, left/right, forward/backward)
Indications and operation method		LED/LCD indications and operation buttons
Weight		Approx. 350 g (Power Monitor only)
Degree of protection		IP20
Pulse output	Number of outputs	Number of outputs: 4 (photoMOS relay outputs) Used for the total power consumption pulse output.
	Output capacity	50 mA at 40 VDC ON residual voltage: 1.5 V max. (for output current of 50 mA) OFF leakage current: 0.1 mA max.
	Output unit	Output unit: 1, 10, 100, 1k, 5k, 10k, 50k, or 100k (wh) Pulse ON time: 500 ms (Cannot be changed.)
Communications interface	Communications method	RS-485 (2-wire half-duplex with start-stop synchronization)
	Communications protocol	Modbus (RTU): Binary. CompoWay/F: ASCII
	Baud rate	1.2, 2.4, 4.8, 9.6, 19.2, or 38.4 kbps
	Data length	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Vertical parity: Even, odd, or none
	Maximum transmission distance	1,200 m
	Maximum number of connected Power Monitors	Modbus: 99, CompoWay/F: 31 If you measure more than one circuit with one Power Monitor, the number of circuits is treated as the number of connected Power Monitors.
Dimensions (H×W×D)		90 × 90 × 65 mm (excluding protrusions)
Installation method		DIN Rail mounting
Accessories		Instruction Manual and Compliance Sheet

✻ The error of the CT or VT is not included. IEC 62053 is an international standard for power metering.

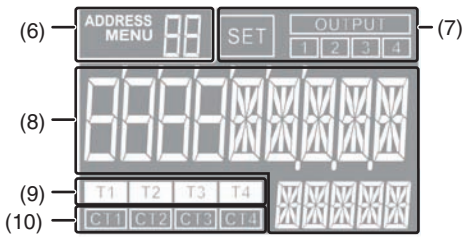
Part Names and Functions

Power Monitor

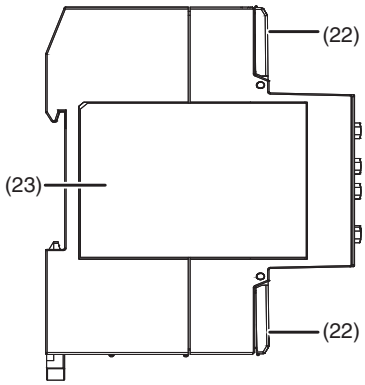
Front Panel with Terminal Block Covers Removed



Detailed View of LCD



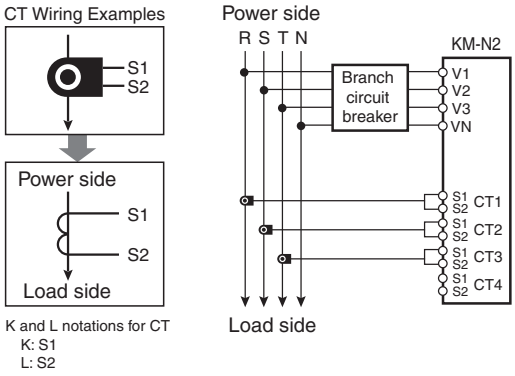
Side View



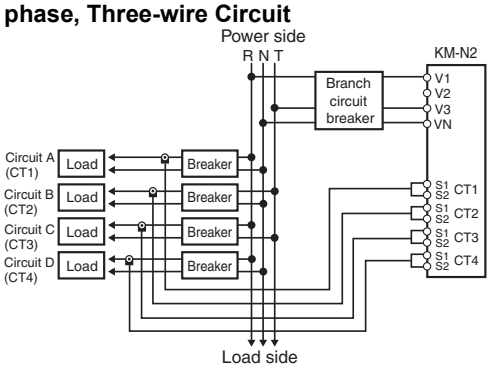
No.	Item		Description
(1)	Power indicator (green)		Lights when the power supply is turned ON.
(2)	Error indicator (red)		Flashes when there is an abnormality, such as a failure.
(3)	Alarm indicator (orange)		Flashes when there is an alarm.
(4)	Communications indicator (yellow)		Lit during communications.
(5)	Pulse indicator (yellow)		Lit while pulses are being output from OUT1 (circuit A).
(6)	Communications address and menu display		When ADDRESS is lit (Measurement Mode), the communications address is being displayed.
			When MENU is lit (Setting Mode), the menu number is being displayed.
(7)	Status Indicators	SET	Lit in Setting Mode.
		OUTPUT	Lit while a pulse output is being set up.
		1	Lit while pulses are being output from OUT1.
		2	Lit while pulses are being output from OUT2.
		3	Lit while pulses are being output from OUT3.
		4	Lit while pulses are being output from OUT4.
(8)	Measured value/set value display	Main display	Displays the measured value or set value.
		Sub display	Displays the measurement unit or setting name.
(9)	Tariff display		Displays the tariff number (T1 to T4) a total active power consumption is being saved.
(10)	CT usage display		Displays the numbers of the CTs (CT1 to CT4) for which measurement or setting operations are in progress.
(11)	<</MODE Key		Short press: Changes the circuit or moves the digit. Long press: Changes the mode.
(12)	⩓ Key		Increments the item or value.
(13)	⩔ Key		Decrements the item or value.
(14)	ENTER Key		Enters the item or value.
(15)	ESC Key		Cancel
(16)	Rotary switches		Set the communications address for circuit A. The left switch (x10) sets the tens place and the right switch (x1) sets the ones place.
(17)	RS-485 communications terminals	RS-485 + (1)	RS-485 + terminal
		RS-485 – (1)	RS-485 – terminal
		RS-485 + (2)	RS-485 + terminal for crossover wiring
		RS-485 – (2)	RS-485 – terminal for crossover wiring
		RS-485 E	RS-485 terminating resistance terminal
(18)	Pulse output terminals	OUT1	Pulse output terminal for circuit A
		OUT2	Pulse output terminal for circuit B
		OUT3	Pulse output terminal for circuit C
		OUT4	Pulse output terminal for circuit D
		COM	Pulse output common terminal
(19)	Voltage input terminals		Terminal used to input the power supply voltage. These terminals are also used for the measured voltage inputs.
(20)	CT input terminals		Terminals used to connect the CT cables for CT1 to CT4
(21)	DIN hook		Hook used to mount the Power Monitor to a DIN Track
(22)	Terminal block covers		Sealed terminal block covers
(23)	Terminal arrangement label		Label that provides information, such as the model number, power supply voltage, terminal arrangement, and serial number

Connection Wiring Diagrams

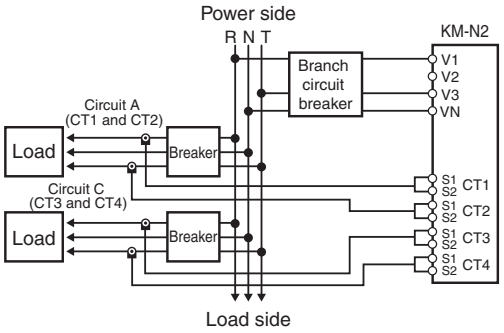
Three-phase, Four-wire Circuit



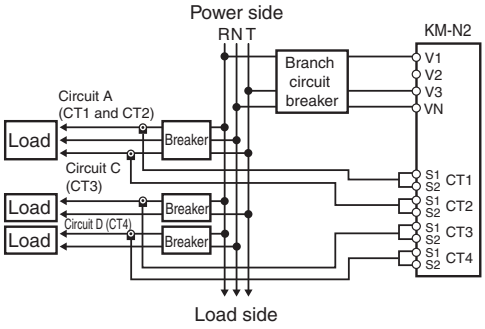
Single-phase, Two-wire Circuit Branched from Single-phase, Three-wire Circuit



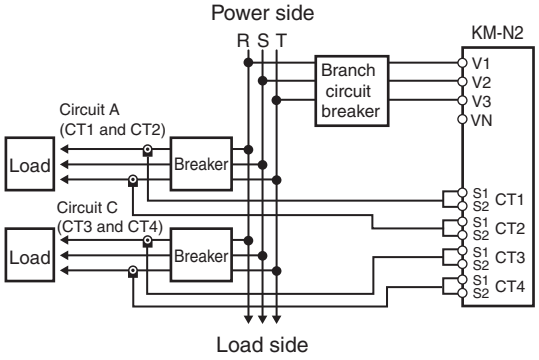
Single-phase, Three-wire Circuit



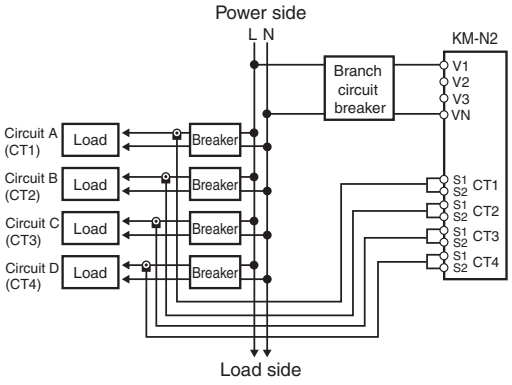
Single-phase, Three-wire Circuit and Single-phase, Two-wire Circuit Branched from Single-phase, Three-wire Circuit



Three-phase, Three-wire Circuit



Single-phase, Two-wire Circuit



CT Wiring

- For each circuit, one CT is required to measure single-phase two-wire power, two CTs are required to measure single-phase three-wire power or three-phase three-wire power, and three CTs are required to measure three-phase four-wire power.
- Use AWG18 to AWG14 (cross-sectional area: 0.75 to 2.0 mm^2) wires with a heat resistance of 85°C min. to connect to the CT input terminals.
- Use ferrules suitable for the wire diameter to connect to the CT input terminals.
- The recommended tightening torque for M3 terminal screws is 0.5 to 0.6 N·m. Push ferrules all the way in and tighten the screws securely.

Voltage Wiring (Power supply voltage and measurement voltage are shared.)

- The Power Monitor has voltage input terminals V1, V2, V3, and VN, which function as both the operating power supply terminals and voltage measurement terminals.
- Connect a branch circuit breaker between the voltage input terminals and the wiring so that the power supply can be turned OFF immediately.
- For safety, always work with the power supply turned OFF both at the main power supply and at the branch circuit breaker.
- Connect the wires in the correct phase sequence. Otherwise, the power and power consumption cannot be measured correctly.
- When wiring the power supply and measured voltage terminals, use round or forked crimp terminals (6.7 mm wide or less) suitable for M3.5 screws and AWG24 to AWG14 (cross-sectional area: 0.2 to 2.0 mm^2) wires.
- Recommended tightening torque for M3.5 terminal screws: 0.8 N·m. Push crimp terminals all the way in and tighten the screws securely After securing the wiring, gently pull on the cables to check that they are held securely.
- Always use the Power Monitor with the terminal covers closed.

Wiring Diagram

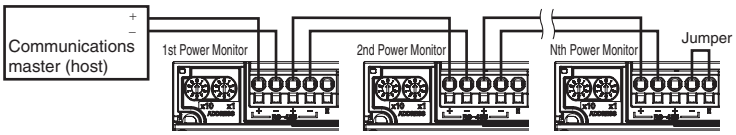
The following table shows the relationship between the wire phases connected to the voltage input terminals and CT input terminals for each phase wiring method.

	Phase wires connected to voltage input terminals				Phase wires connected to CT input terminals				Number of measured circuits
	V1	V2	V3	VN	CT1	CT2	CT3	CT4	
Single-phase, 2-wire	Phase L (VR)	---	---	Phase N (VN)	Phase L 1	Phase L 2	Phase L 3	Phase L 4	4
Single-phase, 3-wire	Phase R (VR)	---	Phase T (VT)	Phase N (VN)	Phase R 1	Phase T 1	Phase R 2	Phase T 2	2
Three-phase, 3-wire	Phase R (VR)	Phase S (VS)	Phase T (VT)	---	Phase R 1	Phase T 1	Phase R 2	Phase T 2	2
Three-phase, 4-wire	Phase R (VR)	Phase S (VS)	Phase T (VT)	Phase N (VN)	Phase R	Phase S	Phase T	---	1

Note: The numbers in “phase L 1” and “phase L 2” indicate the number of the circuit.

RS-485 Communications Wiring Diagram

- The connection configuration is 1:1 or 1:N. For a 1:N configuration, up to 99 nodes can be connected for Modbus and up to 31 nodes can be connected for CompoWay. If you measure more than one circuit with one Power Monitor, the number of circuits is treated as the number of connected Power Monitors.
- The terminal block has push-in terminals. When wiring, observe the Precautions for Correct Use in *Wires and Precautions for Using Push-in Plus Terminal Blocks (RS-485 Communications Terminals and Pulse Output Terminals)*.
- The KM-N2 does not have a FG terminal. Connect only the positive and negative lines for RS-485.

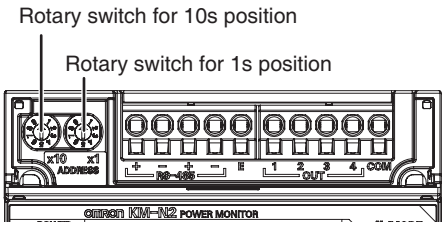


- Use twisted-pair cables.
- Wire the RS-485 communications lines and power lines separately to prevent the influences of noise.
- The maximum transmission distance is 1,200 m.
- Always test communications on the actual system regardless of the transmission distances and number of connected Power Monitors.
- Always close the terminal block covers before you use the Power Monitor.

Communications Address Setting

Turn the rotary switches for the 1s and 10s positions and set the communications address for circuit A.

- The value on the rotary switches is assigned as the communications address for circuit A (1st circuit). When multiple addresses are used, the values given in the following table are allocated automatically.
- The communications addresses for circuit B through circuit D cannot be set individually.



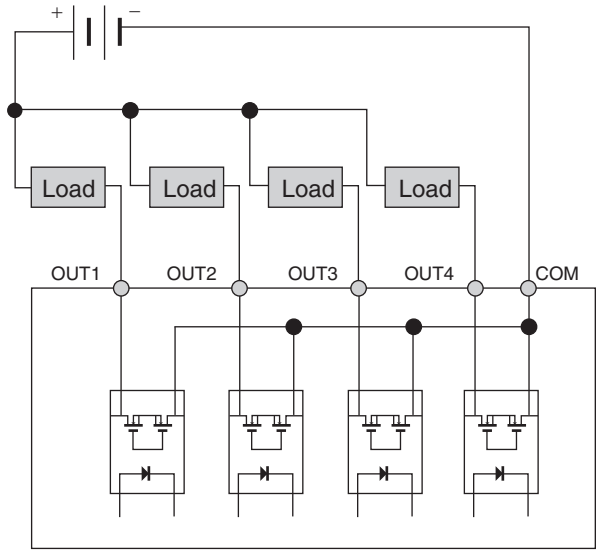
	Circuit A	Circuit B	Circuit C	Circuit D
Three-phase, four-wire	Set value	---	---	---
Single-phase, two-wire circuit branched from single-phase, two-wire circuit or single-phase, three-wire circuit	Set value	Set value +1	Set value +2	Set value +3
Single-phase, three-wire circuit or three-phase, three-wire circuit	Set value	---	Set value +1	---
Single-phase, three-wire circuit and single-phase, two-wire circuit branched from single-phase, three-wire circuit	Set value	---	Set value +1	Set value +2

Terminating Resistance Setting

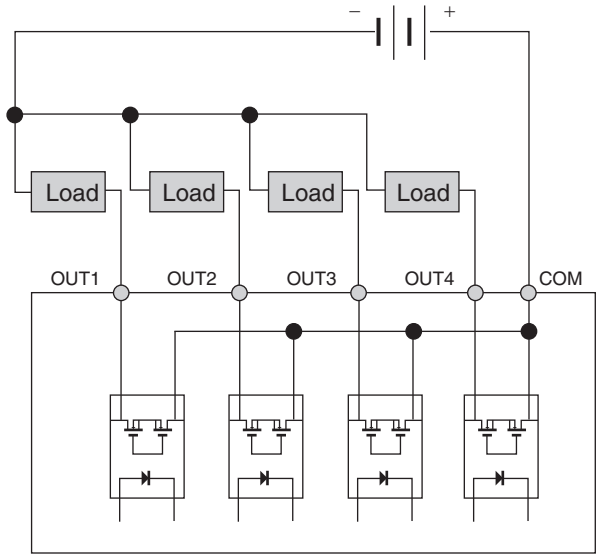
- The Power Monitor has terminating resistance built in. On the last node on the communications line, connect a jumper between the RS-485 negative terminal and the RS-485 E terminal. The internal terminating resistance will be connected.
- When using a host that does not have built-in terminating resistance, connect terminating resistance to the host as well. The terminating resistance is 120 Ω (1/2 W).
- Do not wire terminating resistance to the KM-N2 partway along the transmission path. Communications failures may occur.

Pulse Output Wiring Diagrams

NPN Output Connection Diagram



PNP Output Connection Diagram



The Power Monitor provides four pulse output terminals. One common is used.

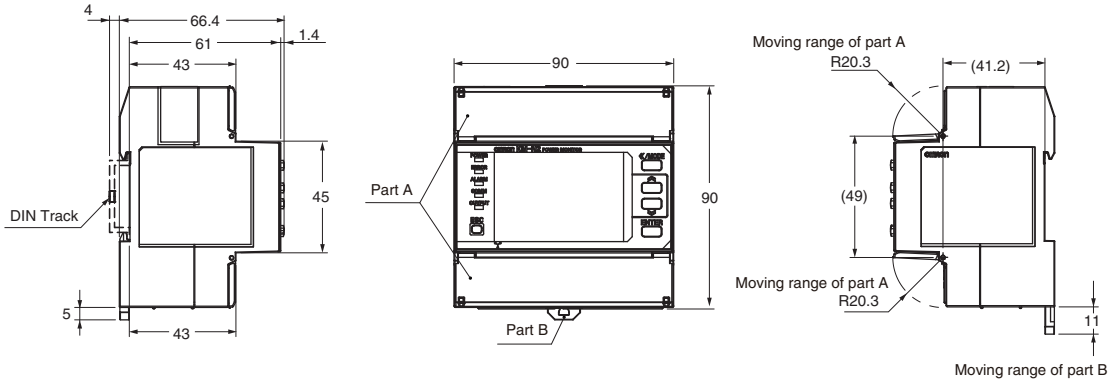
- The terminal block has push-in terminals. When wiring, observe the Precautions for Correct Use in *Wires and Precautions for Using Push-in Plus Terminal Blocks (RS-485 Communications Terminals and Pulse Output Terminals)*.
- Never connect an external power supply directly between an output terminal and the common. Always connect a load.
- Wire signal lines and power lines separately to prevent the influences of noise.
- The outputs are assigned as follows and cannot be changed: OUT1 is for circuit A, OUT2 is for circuit B, OUT3 is for circuit C, and OUT4 is for circuit D.

Dimensions

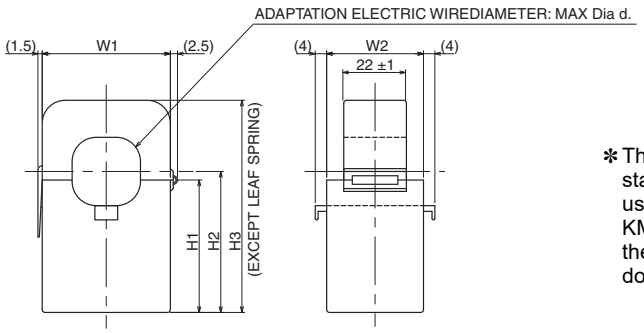
(Unit: mm)

Power Monitor

KM-N2-FLK



KM-NCT-E100A
KM-NCT-E250A
KM-NCT-E500A
(CE marking compliant KM-N2/N3 dedicated products ✻)



✻ The KM-NCT-E conforms to the standards shown above ONLY when it is used with a power monitor KM-N2-FLK or KM-N3-FLK to which it is attached. Use of the KM-NCT-E without a power monitor does not conform to these standards.

Dimension (mm)	Dia. d	W1	W2	H1	H2	H3
KM-NCT-E100A	24	45±2	34±2	46.5±1	49.5±1	74.5±1
KM-NCT-E250A	24	45±2	34±2	46.5±1	49.5±1	74.5±1
KM-NCT-E500A	36	57±2	40.5±2	56.5±1	61±1.5	91±2