

Power Monitor KM-N3

Multi-circuit compact Power Monitor for on panel installation

- Over 20 years of history in Power Monitoring Technology
- Compact with multi-circuit capabilities (up to 4 circuits connected to one unit)
- Solve design, installation, wiring, and commissioning issues with only one model
- IEC 62053-22 accuracy class 0.5S
- Push-in plus technology for easy wiring
- Clear indication in case of incorrect wiring
- Large, easy-to-read, white and green LCD
- On panel mounting
- Bi-directional power measurement



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

Refer to *Safety Precautions* on page 7.

Ordering Information

Power Monitor

Model	Applicable circuits	Power supply voltage	Dimensions	Communications
KM-N3-FLK	Single-phase, 2-wire: 100 to 277 VAC Single-phase, 3-wire: 100 to 240 VAC (L-N) or 200 to 480 VAC (L-L) Three-phase, 3-wire: 173 to 480 VAC (L-L) Three-phase, 4-wire: 100 to 277 VAC (L-N) or 173 to 480 VAC (L-L)	100 to 240 VAC Separate from measurement voltage.	96 × 96 × 64 mm (W×H×D) (excluding protrusions)	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.

Specifications

Ratings

Item	Model	KM-N3-FLK
Applicable circuits		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 supply voltage (operating frequency)		100 to 240 VAC (50/60 Hz)
Power supply allowable voltage range		85% to 110% of rated power supply voltage
Power consumption		7 VA max.
Input	Rated input voltages	Single-phase, 2-wire: 100 to 277 VAC Single-phase, 3-wire: 100 to 240 VAC (L-N) or 200 to 480 VAC (L-L) Three-phase, 3-wire: 173 to 480 VAC (L-L) Three-phase, 4-wire: 100 to 277 VAC (L-N) or 173 to 480 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 Series) cannot be used. Use general-purpose CTs with a secondary-side output of 1 A or 5 A.

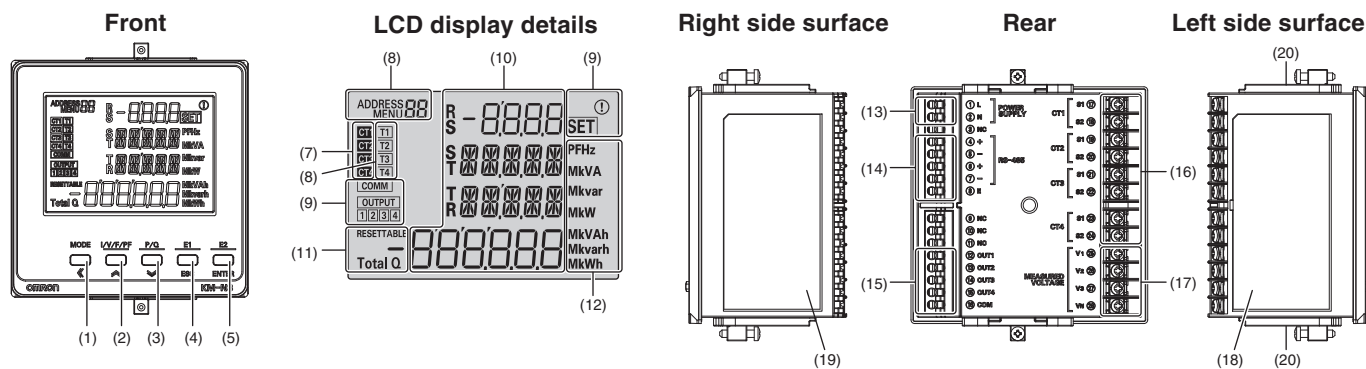
Performance

Item	Model	KM-N3-FLK
Measured items		Energy 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: 1,400 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		LCD indications and operation buttons
Weight		Approx. 350 g (Power Monitor only)
Degree of protection		Front: IP65, Rear case: IP20, Terminal: IP00
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 (W×H×D)		96 × 96 × 64 mm (excluding protrusions)
Installation method		On-panel installation
Accessories		Instruction Manual and Compliance Sheet, Mounting adapter and waterproof packing

* 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

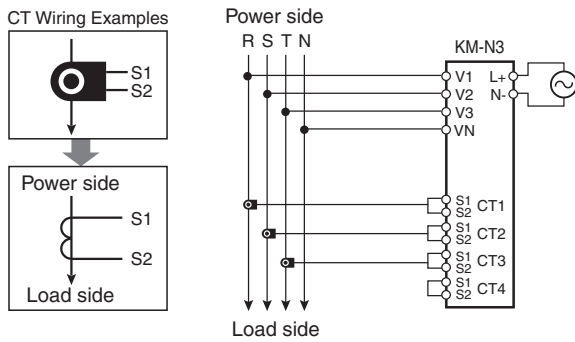


No.	Item	Description	
(1)	MODE• << key	Long press: The measurement mode is switched with the setup mode. [MODE] key (measurement mode): The measurement circuit is changed. [<<] key (setup mode): Change of the measurement circuit / Digit shifting when a numerical value is input	
(2)	I/V/F/PF• >> key	[I/V/F/PF] key (measurement mode): The display of current, voltage, frequency, or power factor is switched. [>>] key (setup mode): Items or values are changed (up)	
(3)	P/Q >> key	[P/Q] key (measurement mode): The display of effective power or reactive power is switched. [>>] key (setup mode): Items or values are changed (down)	
(4)	E1•ESC key	[ESC] key (measurement mode): Cancel [E1] key (setup mode): The display of each integrated electric energy is switched.	
(5)	E2•ENTER key	[ENTER] key (measurement mode): Select/Determine [E2] key (setup mode): The display of each resettable integrated electric energy is switched.	
(6)	Communication address / Menu display	When ADDRESS is lit (in the measurement mode): The communication address is displayed. When MENU is lit (in the setup mode): The menu number is displayed.	
(7)	In-operation CT display	The CT number in the condition of measurement or setup (CT1 to CT4) is displayed.	
(8)	Tariff display	The tariff number which is saving the integrated effective energy (T1 to T4) is displayed.	
(9)	State display	COMM	Blinks when RS-485 communications are in progress.
		OUTPUT	Lit when the pulse output is set.
		1	Lit when pulse is output from OUT 1.
		2	Lit when pulse is output from OUT 2.
		3	Lit when pulse is output from OUT 3.
		4	Lit when pulse is output from OUT 4.
	SET	Lit in the setup mode.	
	ⓘ	Blinks when a warning occurs.	
(10)	Measured value display / instantaneous value display / Setup value display	First display / instantaneous value display	Instantaneous values or setup values are displayed (on rows No. 1-3).
		Second display / Integrated value display	The integrated value is displayed (on row No. 4).
(11)	Measurement auxiliary display	RESETTABLE	Lit when resettable integrated electric energy is displayed.
		---	Lit when integrated leading reactive electric energy is displayed.
		Total Q	Lit when total integrated reactive electric energy is displayed.
(12)	Unit display	The unit of each measured value is lit.	
(13)	Power supply terminal	Power supply voltage is input to this terminal	
(14)	RS-485 communication terminal	RS-485 + (1)	RS-485 + terminal
		RS-485 - (1)	RS-485 - terminal
		RS-485 + (2)	RS-485 + terminal (for transition wiring)
		RS-485 - (2)	RS-485 - terminal (for transition wiring)
		RS-485E	RS-485 terminating resistor terminal
(15)	Pulse output terminal	OUT1	Circuit A pulse output terminal
		OUT2	Circuit B pulse output terminal
		OUT3	Circuit C pulse output terminal
		OUT4	Circuit D pulse output terminal
		COM	Common terminal for outputting pulse
(16)	Current input terminal	Terminal to connect the CT cable for CT1 to CT4	
(17)	Measured voltage input terminal	Measured voltage is input to this terminal.	
(18)	Terminal array label	Model, power supply voltage, terminal array, serial number, and so on are written on this label.	
(19)	Wiring label	A wiring diagram of voltage and current is written on this label.	
(20)	Mounting adapter	Adapter to fix the main unit to the panel	

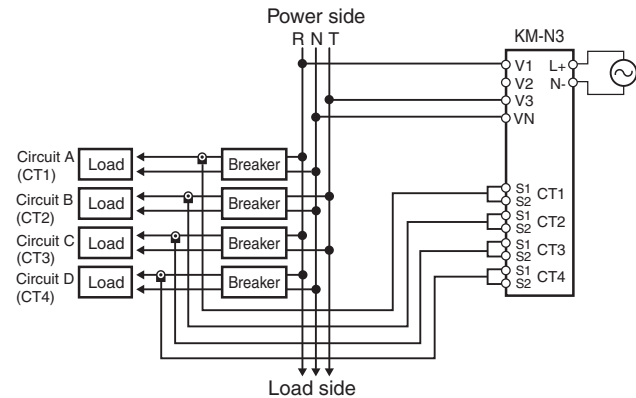
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Connection Wiring Diagrams

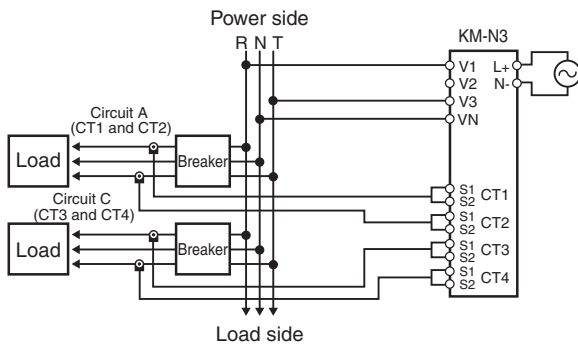
Three-phase, Four-wire Circuit



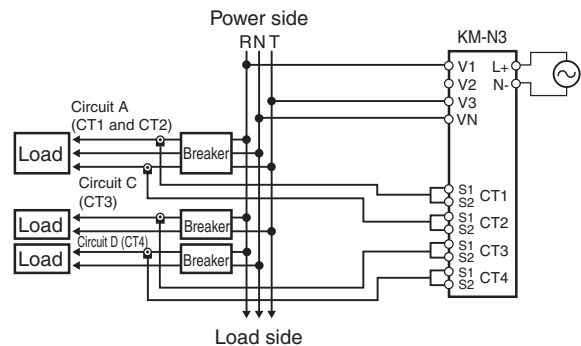
Single-phase, Two-wire Circuit Branched from Single-phase, Three-wire Circuit



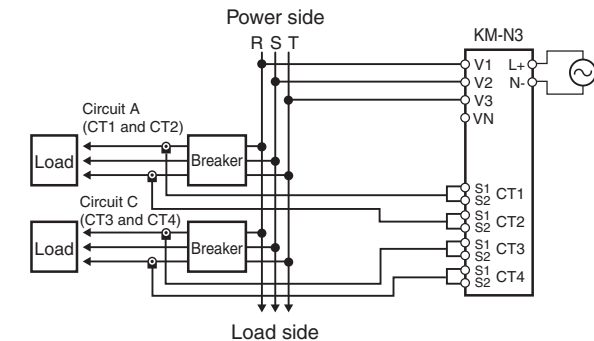
Single-phase, Three-wire Circuit



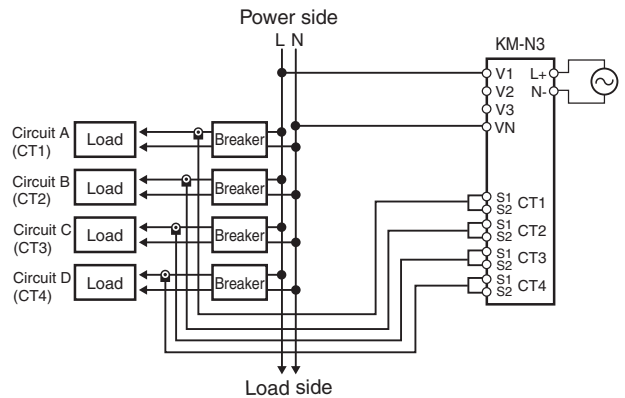
Single-phase, Three-wire Circuit and Single-phase, Two-wire Circuit Branched from Single-phase, Three-wire Circuit



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 mm²) wires and round or forked crimp terminals suitable for M3 screws to connect to the CT input terminals.
- The recommended tightening torque for M3 terminal screws is 0.5 to 0.6 N·m. Push crimp terminals all the way in and tighten the screws securely. After you secure the wires, confirm that they are securely held in place.

Power Supply Wiring

- For safety, always turn OFF the main power supply and work while no power is supplied.
- When wiring the push-in plus technology terminals, 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)*.

Wiring Measurement Voltages

- For safety, always work with the power supply turned OFF both at the main power supply.
- Connect the wires in the correct phase sequence. Otherwise, the power and power consumption cannot be measured correctly.
- When wiring the measured voltage terminals, use round or forked crimp terminals suitable for M3 screws and AWG18 to AWG14 (cross-sectional area: 0.75 to 2.0 mm²) wires.
- Recommended tightening torque for M3 terminal screws: 0.5 to 0.6 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.

Wiring Diagram

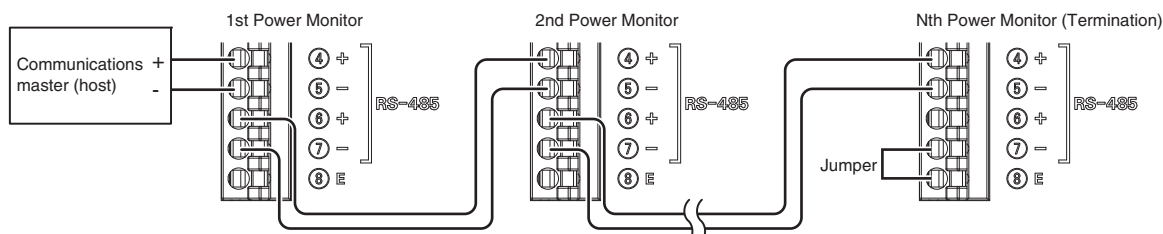
The following table shows the relationship between the wire phases connected to the voltage input terminals and CT input terminals for each phase wiring method.

	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.
- When wiring the push-in plus technology terminals, 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-N3 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.

Communications Address Setting

- Change to Setting Mode and set the communications address for circuit A. Refer to the Instruction Manual for the communications address setting method. If the multi-address function is used, the addresses in the following table are automatically allocated based on the communications address set for circuit A (the first circuit).
- 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

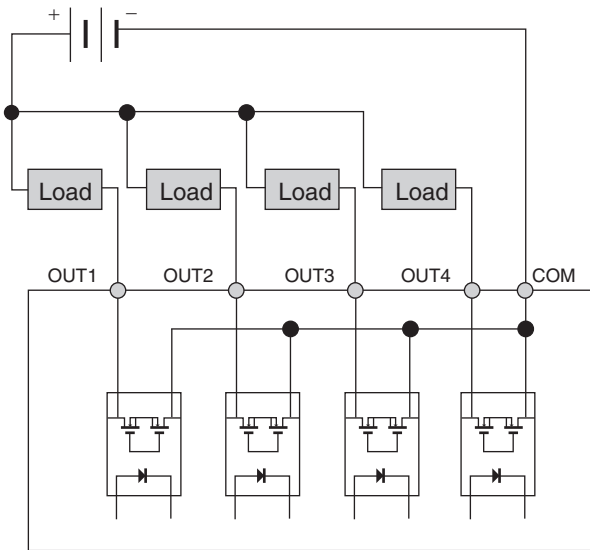
Terminating Resistance Setting

- 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-N3 partway along the transmission path. Communications failures may occur.

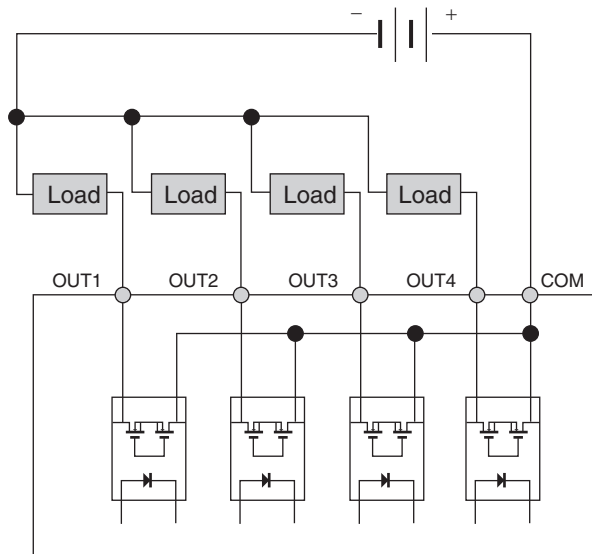
KM-N3

Pulse Output Wiring Diagrams

NPN Output Connection Diagram



PNP Output Connection Diagram



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

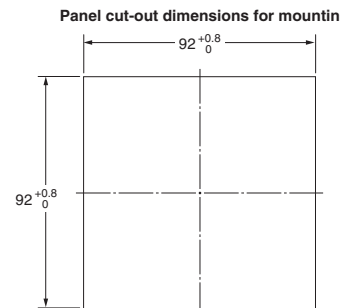
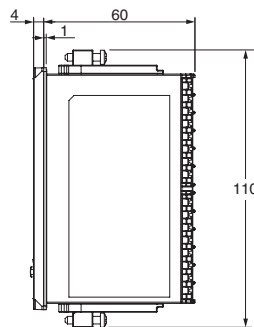
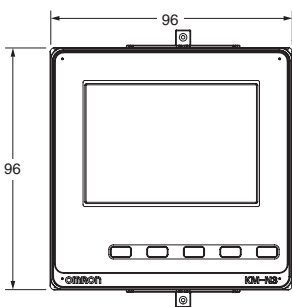
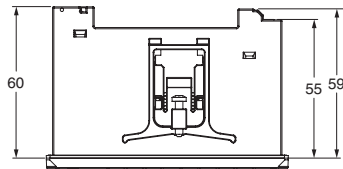
- When wiring the push-in plus technology terminals, observe the Precautions for Correct Use in *Wires and Precautions for Using Push-in Plus Terminal Blocks (RS-485 Communications Terminals and Pulse Output Terminals)*.
- Never connect an external power supply directly between an output terminal and 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-N3-FLK




Safety Precautions

Warning Indications

	CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.
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Caution

Property damage may occasionally occur due to fire. Tighten terminal screws to the specified tightening torque. 


Confirm that there is no looseness in the screws after tightening them.

M3.5 screws: 0.8 N·m


M3 screws: 0.5 to 0.6 N·m

Minor or moderate bodily harm or property damage may occasionally occur due to explosion. 


Do not use the Power Monitor near inflammable or explosive gas.

Destruction or rupture may occasionally occur. 


Make sure that the power supply voltages and loads are within specifications and ratings.

Electrical shock may occasionally occur. 


Do not touch any of the terminals while the power is being supplied.

Electric shock may occasionally occur. 

Always turn OFF the power supply to the circuit where a CT is mounted before you connect the CT terminals on the Power Monitor.


Electrical shock, minor injury, fire, or equipment malfunction may occasionally occur. 

Do not apply a current that exceeds the maximum current for the CT secondary side to the CT input terminals.

Electrical shock, minor injury, fire, or equipment malfunction may occasionally occur. 

Do not disassemble, repair, or modify the Power Monitor.

* CT: Current transformer

	<p>Meaning of Warning Symbols on the KM-N2</p> <p>Electric shock may occasionally occur.</p> <p>Use wires with a heat resistance of 85°C min. to connect to the voltage input, CT input, and communications terminals.</p>
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Precautions for Safe Use

Observe the following precautions to ensure the safe usage of the KM-N2/N3.

- Do not store, install, or use the Power Monitor in the following locations.
 - Locations that are greatly affected by vibration or shock
 - Unstable locations
 - Locations where the specified range of temperature or humidity would be exceeded
 - Locations that are subject to rapid changes in temperature or humidity where condensation or icing may occur
 - Outdoors or locations that are subject to direct sunlight, wind, or rain
 - Locations that are affected by static electricity or noise
 - Locations that are affected by electric or magnetic fields
 - Locations that are subject to flooding or oil
 - Locations that are subject to splashing brine
 - Locations that are subject to corrosive gas (particularly sulfide or ammonia gas)
 - Locations that are excessively dusty or dirty
 - Locations with miscible liquids
 - Be sure to wire properly with the terminals with correct symbols.
 - For the KM-N2 voltage input terminals and KM-N3 power supply wiring, use AWG24 to AWG16 (cross-sectional area: 0.25 to 1.5 mm²) stranded or solid wires.
 - When wiring with the CT and for measuring voltage of the KM-N3, use AWG18-14 twisted or solid wire (with a crosssection of 0.75 to 2.0 mm²).
 - Be sure to check that the wiring is correct before turning on the power.
 - Before using or maintaining the product, thoroughly read and understand this manual.
 - Understand the user manuals when you set the Power Monitor.
 - Do not pull on the cables.
 - Do not use any application methods that are not given in the operation manual. Protection implemented in the equipment could be lost.
 - Install and suitably label a switch or circuit breaker that is appropriate for the voltage that is being used and complies with the relevant standards for your country so that the operator can immediately turn OFF the power supply. (USA: Use a UL-listed switch or circuit breaker, Canada: Use a cUL-listed switch or circuit breaker, Other countries: Use a branch circuit breaker that complies with IEC 60947-1 and IEC 60947-3 or with other relevant standards.)
- We recommend that you use a branch circuit breaker with a rated current of 1 A.
- Always check the wiring and confirm that it is correct before turning ON the power supply. Incorrect or improper wiring may result in electrical shock, injury, accidents, failure, or malfunction.
 - Do not touch any of the terminals while the power is being supplied.
 - Do not install the Power Monitors near sources of heat, such as devices with coils or windings.
 - When you install the DIN Tracks, make sure that the screws are tightened securely. Mount the Power Monitor securely to the DIN Track. If the Power Monitor is loose, vibration or shock can cause the DIN Track, Power Monitor, or wires to become disconnected (for the KM-N2).
 - Use DIN Tracks with a width of 35 mm (OMRON PFP-50N/-100N) (for the KM-N2).
 - If you mount the Power Monitor on DIN Track, slide the DIN hook until it securely and audibly locks in place (for the KM-N2).
 - To prevent inductive noise, wire the lines connected to the Power Monitor separately from power lines carrying high voltages or currents. Do not wire in parallel with or in the same cable as power lines. Other measures for reducing noise include running lines in separate ducts and using twisted-pair cables.
 - The Power Monitor is a Class A product (for use in industrial environments). In residential environment areas, it may cause radio interference. If it causes radio interference, the user may be required to take adequate measures to reduce interference.
 - Install the product in a panel with a panel thickness of 1 to 8 mm. If a suitable panel thickness is not used or the product is installed incorrectly, the product may come free from the mounting (for the KM-N3).

Precautions for Correct Use

- This Power Monitor is not a Special Measuring Instrument that has passed testing by a specified body under the Measurement Act of Japan. It cannot be used to certify power consumption under Japanese law.
- Make sure that all settings are set suitably for the measurement targets.
- Mount the Power Meter to a DIN Track (for the KM-N2).
- When using the Power Monitor in an Overvoltage Category III environment, externally install varistors between the power supply and voltage measurement inputs to the Power Monitor.
- Do not use the Power Monitor for measurement on the secondary side of an inverter.
- Make sure the rated voltage is reached within 2 seconds after the power is turned ON.
- Always turn OFF all power before cleaning the Power Monitor. Dry wipe the surfaces of the Power Monitor with a soft, dry cloth. Never use any chemical that contains solvents such as paint thinner, benzene, or alcohol.
- OMRON's KM-series CTs (e.g., the KM20-CTF) cannot be used. Use CTs with a secondary-side output of 1 A or 5 A.
- To comply with standards, always use ferrules when you connect to the input terminals on CTs (for the KM-N2).
- The total power consumption and other data is saved every 5 minutes. When the power supply to the Power Monitor is turned OFF, the last 5 minutes worth of data may not have been saved.
- When discarding the Power Meter, properly dispose of it as industrial waste according to all applicable local ordinances.

Wires and Precautions for Using Push-in Plus Terminal Blocks (RS-485 Communications Terminals and Pulse Output Terminals)

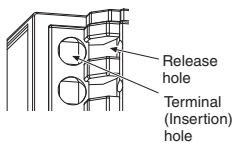
1. Applicable Wires

- Use stranded or solid wires of AWG24 to AWG16 (cross-sectional area: 0.25 to 1.5 mm²).
- Strip the wires for 10 mm if you use ferrules and for 8 mm if you do not use ferrules.
- Use UL-recognized (RC) ferrules.

2. Connecting Wires to the Push-In Plus Terminal Block Part Names of the Terminal Block

When connecting Push-in Plus Terminal Blocks (RS-485 communications terminals and pulse output terminals), use the following procedure.

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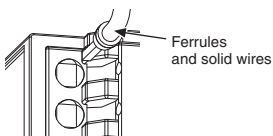


Connecting Wires with Ferrules and Solid Wires

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

- If a wire is difficult to connect because it is too thin, use a flat-blade screwdriver in the same way as when connecting stranded wire.

KM-N3

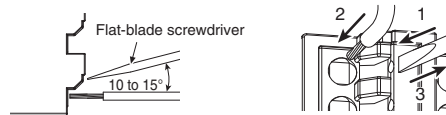


Connecting Stranded Wires

Use the following procedure to connect the wires to the terminal block.

1. Hold a flat-blade screwdriver at an angle and insert it into the release hole.
The angle is the diagram below. If the flat-blade screwdriver is inserted correctly, you will feel the spring in the release hole.
2. With the flat-blade screwdriver still inserted into the release hole, insert the wire into the terminal hole until it strikes the terminal block.
3. Remove the flat-blade screwdriver from the release hole.

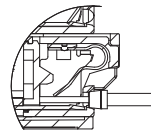
KM-N3



Checking Connections

- After the insertion, pull gently on the wire to make sure that it will not come off and the wire is securely fastened to the terminal block.
- To prevent short circuits, insert the stripped part of a stranded or solid wire or the conductor part of a ferrule until it is hidden inside the terminal insertion hole. (See the following diagram.)

KM-N3

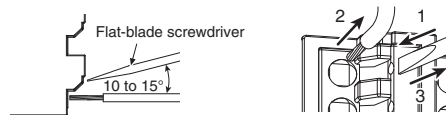


3. Removing Wires from the Push-In Plus Terminal Block

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

1. Hold a flat-blade screwdriver at an angle and insert it into the release hole.
2. With the flat-blade screwdriver still inserted into the release hole, remove the wire from the terminal insertion hole.
3. Remove the flat-blade screwdriver from the release hole.

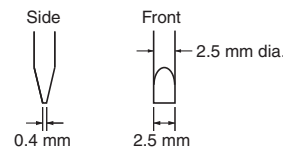
KM-N3



4. Recommended Crimp Tools

Recommended Flat-blade Screwdriver

Use a flat-blade screwdriver to connect and remove wires. Use the following flat-blade screwdriver.



Model	Manufacturer
XW4Z-00B	Omron

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