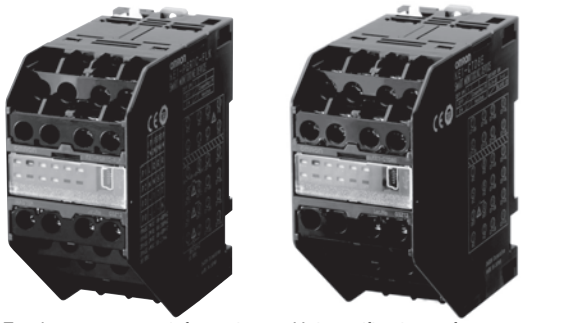
Smart Measurement and Monitor Units
KE1

Unit structure that enables Power and Earth Leakage Monitoring with just one Unit.*
Use just one Unit to implement multi-circuit measurements.



For the most recent information on Unit certification, refer to your OMRON website.

- Connect CT and ZCT Expansion Units for multi-circuit measurements.
- Many standard features: Open phase, reversed phase, undercurrent, overcurrent, undervoltage, and overvoltage protection and RS-485 communications (Modbus and CompoWay/F).
- Voltage fluctuation data before and after momentary voltage sags is logged in memory. Alarms can be output for momentary voltage sags as short as 25 ms (with the Momentary Voltage Sag Monitor Unit).
- Expansion with DeviceNet Communications Unit to enable reading 30 words of instantaneous power in 100 ms.
- Monitor operation from a computer with the Easy KM-Manager Data Collection Software. (Download it from our website.)

Features

Monitor Power and Earth Leakage with Just One Unit

KE1-PGR1C-FLK

You can monitor power to save energy and monitor earth leakage for electrical equipment all with just one Unit. You can flexibly add CT or ZCT Units to measure multiple circuits as required.

There is an increasing need to detect problems in advance to protect against extensive losses from production line and production facility stoppage due to earth leakage faults.

There is also a need to introduce power monitoring to save energy.

There is a need to measure both earth leakage and power from a switch panel or distribution panel with only one infrastructure investment.

The KE1 is the first product line in the world to respond to the need for smart multi-circuit measurements for power monitoring and earth leakage monitoring.

Save Energy
Monitor power for large facilities.

Protect Motors
Alarm outputs are provided for open phases, reversed phases, overcurrents, and earth leakage in power equipment.

Monitor Earth Leakage
Constantly monitor insulation deterioration from cutting oil mist and equipment cleaning water.

Monitor Facilities
DeviceNet communications for 30 words of power information in 100 ms.

Alarms for 25-ms Voltage Sags and

Power Fluctuation Logging

KE1-PVS1C-FLK and KE1-VSU1B-FLK

Momentary voltage sags are a serious problem for precision equipment, such as semiconductor and liquid crystal manufacturing facilities. The power grid in emerging countries is often unstable, resulting in problems such as facility stoppage and failure due to momentary voltage sags. The KE1 detects momentary voltage sags and outputs an alarm in 25 ms. It also logs voltage fluctuations in the Unit's internal memory for 1,000 ms before and after a voltage sag so that you can check for the impact of the voltage sag on quality. You can also use it for SEMI-F47 traceability information to enable effective facility maintenance.

Monitor for Momentary Voltage Sags
High-speed alarm output in 25 ms.

Protect Equipment
Alarm output for open phases, reversed phases, overvoltages, and undervoltages.

Log Data
Voltage fluctuations before and after momentary power sags are recorded in the Unit's internal memory. This data is ideal for traceability.

System Configuration

The KE1 is built by combining four types of Units: Measurement Masters, Function Slaves, CT Expansion Slaves, and Communications Slaves. The Measurement Masters and Function Slaves can also be used for standalone operation.
You can connect a Measurement Master and Slaves to save both wiring work and space.

Maximum Configuration

You can connect up to four Function Slaves and CT Expansion Slaves and one Communications Slave (i.e., a total of five Slaves) to one Measurement Master. You cannot connect only Function Slaves together.

KE1 Unit Combination Table

OK: Can be added, No: Cannot be added.

		Master	
		KE1-PGR1C-FLK (Power/Earth Leakage)	KE1-PVS1C-FLK (Power/Momentary Voltage Sag)
Slaves	KE1-VSU1B-FLK (Momentary Voltage Sag)	OK	OK
	KE1-VAU1B-FLK (Voltage/ Current)	OK	OK
	KE1-CTD8E (CT Expansion)	OK	OK
	KE1-ZCT8E (ZCT Expansion)	OK	No
	KE1-DRT-FLK (DeviceNet Communications)	OK	OK

Note: Refer to the KM1 Product Catalog (Cat. No. N170) for details on the KM1.

Model Number Structure

Model Number Legend

K E 1 - □ □ □ □ - □□□

1 2 3 4 5 6

1. Basic Model

Code	Series
KE	Measurement and Monitor Units

2. Basic Model

Code	Series
1	Series number

3. Unit Type

Code	Unit type
PGR	Power/Earth Leakage Monitor Unit
PVS	Power/Momentary Voltage Sag Monitor Unit
VSU	Momentary Voltage Sag Monitor Unit
VAU	Voltage/Current Monitor Unit
CTD	CT Expansion Unit
ZCT	ZCT Expansion Unit
DRT	DeviceNet Communications Unit

4. Number of Input Circuits

Code	Number of input circuits
Blank	No input circuits
1	1 input circuit
8	8 input circuits

5. Output Form

Code	Output form
Blank	No output
B *1	Two SPST-NO relay outputs
C *2	One SPST-NO output and one NPN transistor output
E	One small-signal SPST-NO relay output

✻1. The KE1-VSU1B-FLK has one SPST-NO relay output and one SSR output.
✻2. The KE1-PVS1C-FLK has one SSR output and one NPN transistor output.

6. Communications Specification

Code	Communications specification
Blank	No communications
FLK	RS-485 (Modbus and CompoWay/F)

Ordering Information

Main Units

Model	Unit type	Unit category	Power supply voltage	Communications
KE1-PGR1C-FLK	Power/Earth Leakage Monitor Unit	Measurement Master	100 to 240 VAC	RS-485
KE1-PVS1C-FLK	Power/Momentary Voltage Sag Monitor Unit			
KE1-VSU1B-FLK	Momentary Voltage Sag Monitor Unit	Function Slave		
KE1-VAU1B-FLK	Voltage/Current Monitor Unit			
KE1-CTD8E	CT Expansion Unit	CT Expansion Slave	Not required.*	---
KE1-ZCT8E	ZCT Expansion Unit			
KE1-DRT-FLK	DeviceNet Communications Unit	Communications Slave	100 to 240 VAC	RS-485 DeviceNet

* The CT and ZCT Expansion Units cannot be used in standalone operation. They must be used together with a Measurement Master Unit. Power is supplied to the CT and ZCT Expansion Units from the Measurement Master Unit. Power supply wiring is not required.

Options (Order Separately)
CT Input
Current Transformers (CTs)

Model	Rated primary current	Rated secondary current	Installation
KM20-CTF-5A	5 A	Special output	Split-type
KM20-CTF-50A	50 A		
KM20-CTF-100A	100 A		
KM20-CTF-200A	200 A		
KM20-CTF-400A	400 A		
KM20-CTF-600A	600 A		
KM20-CTB-5A/50A	5 A/50 A		In-panel mounting (through-hole)

Note: CT Cables are not included with the CTs.

Current Transformer (CT) Cable

Model	Specification
KM20-CTF-CB3	3-m cable

Note: Use only the CT Cable specified by OMRON.

ZCT Input
Zero-phase Current Transformers (Compatible ZCTs)

Structure	Indoor, through-hole		Indoor, split-type		Outdoor, through-hole		Outdoor, split-type	
Rated current	Through-hole diameter (mm)	Model	Through-hole diameter (mm)	Model	Through-hole diameter (mm)	Model	Through-hole diameter (mm)	Model
50 A	21	**OTG-L21**	---	---	---	---	---	---
100 A	30	**OTG-L30**	---	---	30	**OTG-LA30W**	---	---
150 A	---	---	---	---	---	---	36	**TG-CN36W**
200 A	42	**OTG-L42**	52	**OTG-CN52**	---	---	---	---
400 A	68	**OTG-L68**	77	**OTG-CN77**	---	---	---	---
600 A	82	**OTG-L82**	112	**OTG-CN112**	---	---	---	---
1,000 A	156	**TG-L156**	---	---	---	---	---	---

Current Transformer for Ground Wires

Structure	Indoor, split-type	
Rated current	Through-hole diameter (mm)	Model
2 A	22	**K6ER-CN22**

Related Devices (Sold Separately)
When Connected to a Computer
Communications Interface Converters

Model	Size (mm)	Communications conversion	Power supply voltage
K3SC-10 AC100-240	30 × 80 × 78 (W×H×D)	RS-232C, USB <-> Half-duplex RS-485	100 to 240 VAC
K3SC-10 AC/DC24			24 VAC/DC

Specifications

Ratings

Item	Model	KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Applicable phase wiring method		Single-phase two-wire, single-phase three-wire, three-phase three-wire, and three-phase four-wire					
Power supply	**Rated power supply voltage**	100 to 240 VAC, 50/60 Hz				---	
	Allowable supply voltage range	85% to 110% of rated power supply voltage				---	
	Power supply fluctuation frequency range	45 to 65 Hz				---	
	Power consumption	Standalone: 10 VA max., Maximum connections: 14 VA max.		10 VA max.			
	Power interruption compensation method	---	Backup for 1.2 seconds min. with electric double-layer capacitor for voltage measurement only.		---		
Input	**Rated input voltage**	100 to 480 VAC (single-phase, 2-wire): Line voltage 100/200 VAC (single-phase, 3-wire): Phase voltage/line voltage 100 to 480 VAC (3-phase, 3-wire): Line voltage 58 to 277 VAC/100 to 480 VAC (3-phase, 4-wire): Phase voltage/line voltage				---	
	Rated input current for CT	5 A, 50 A, 100 A, 200 A, 400 A, or 600 A Special CTs used.		---	5 A, 50 A, 100 A, 200 A, 400 A, or 600 A Special CTs used.		---
	Rated input current for ZCT	50 A, 100 A, 150 A, 200 A, 400 A, 600 A, or 1,000 A	---				50 A, 100 A, 150 A, 200 A, 400 A, 600 A, or 1,000 A
	Rated input power	With 5-A CT: 4 kW With 50-A CT: 40 kW With 100-A CT: 80 kW With 200-A CT: 160 kW With 400-A CT: 320 kW With 600-A CT: 480 kW		---		With 5-A CT: 4 kW With 50-A CT: 40 kW With 100-A CT: 80 kW With 200-A CT: 160 kW With 400-A CT: 320 kW With 600-A CT: 80 kW	---
	Rated input frequency	50/60 Hz				---	
	Input frequency fluctuation range	45 to 65 Hz				---	
	Input leakage current	1,000 mA	---				1,000 mA
	Allowable input voltage	110% of rated input voltage (continuous)				---	
	Allowable input current	120% of rated input current (continuous)		---	120% of rated current (continuous)		---
	Rated input load	Voltage input: 0.5 VA max. (excluding power supply)				---	
		Current input: 0.5 VA max. (for each input)			---	Current input: 0.5 VA max. (for each input)	---
Clock	**Clock setting**	2012 to 2099 (Adjusted for leap years during this period.)				---	
	Clock accuracy	±1.5 min./month (at 23°C)				---	
	Clock backup period	Seven-day backup with an electric double-layer capacitor (after being powered for at least 24 hours and when the power is interrupted at 23°C)				---	
Ambient operating temperature		−10 to 55°C (with no condensation or icing)					
Storage temperature		−25 to 65°C (with no condensation or icing)					
Ambient operating humidity		25% to 85%					
Storage humidity		25% to 85%					
Altitude		2,000 m max.					
Installation environment		Overvoltage category II, pollution degree 2, measurement category II					

Item	Model	KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Compliant standards	All KE1 Units	EN 61010-2-030 (IEC 61010-2-030) EN61326-1 Industrial electromagnetic environment UL61010-1 UL61010-2-030					

Characteristics

Item		Model	KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Accuracy *1	Voltage		±1.0% FS ±1 digit The accuracy of the voltage across the Vtr is ±2.0% FS ±1 digit under the same conditions.				---	
	Current		±1.0% FS ±1 digit However, the accuracy is ±2.0% FS ±1 digit for the phase-S current for a three-phase, three-wire circuit and the phase-N current for a single-phase, three-wire circuit under the same conditions.		---	±1.0% FS ±1 digit However, the accuracy is ±2.0% FS ±1 digit for the phase-S current for a three-phase, three-wire circuit and the phase-N current for a single-phase, three-wire circuit under the same conditions.		---
	Leakage current		30 to 200 mA: ±5% rdg ±1 digit 200 to 1,000 mA: ±1%FS ±1 digit	---				30 to 200 mA: ±5% rdg ±1 digit 200 to 1,000 mA: ±1%FS ±1 digit
	Power (active power and reactive power)		Active power and reactive power ±2.0% FS ±1 digit (power factor = 1)		---		Active power and reactive power ±2.0% FS ±1 digit (Power factor = 1)	---
	Frequency		±0.3 Hz ±1 digit				---	
	Power factor*2		±5.0% FS (power factor = 0.5 to 1 to 0.5)		---		±5.0% FS (Power factor = 0.5 to 1 to 0.5)	---
	Temperature		---					
Temperature influence*1			±1.0% FS (percentage of the measurement value at an ambient temperature of 23°C, rated input, rated frequency, and a power factor of 1 in the operating temperature range)					
Frequency influence*1			±1.0% FS (percentage of the measurement value at an ambient temperature of 23°C, rated input, rated frequency, and a power factor of 1 in the rated frequency ±5 Hz range)					
Influence of harmonics*1			±0.5% FS (at ambient temperature of 23°C, error for superimposed 2nd, 3rd, 5th, 7th, 9th, 11th, and 13th harmonics for a content percentage of 30% for current and 5% for voltage of the basic wave)					
Low-cut current set value			0.1% to 19.9% of rated input in 0.1% increments		---	0.1% to 19.9% of rated input in 0.1% increments		---
Low-cut leakage current set value			Variable in 0.1-mA increments between 0.1 and 30.0 mA	---				Variable in 0.1-mA increments between 0.1 and 30.0 mA
Sampling cycle			100 ms for measurement voltage at 50 Hz and 83.3 ms for measurement voltage at 60 Hz					
Insulation resistance			Insulation resistance: 20 MΩ (at 500 VDC)					
Dielectric strength			All models: Locations to which 2,000 V was applied for one minute: Between all terminals and case KE1-PGR1C-FLK: Between the power supply terminals and RS-485/transistor/relay outputs Between the power supply terminals and current/voltage/earth leakage inputs Between current/voltage/earth leakage inputs and RS-485/relay/transistor outputs KE1-PVS1C-FLK: Between the power supply terminals and RS-485/transistor/relay outputs Between the power supply terminals and current/voltage input Between current/voltage inputs and RS-485/relay/transistor outputs KE1-VSU1B-FLK: Between power supply terminals and RS-485/relay outputs Between the power supply terminals and voltage inputs Between voltage inputs and RS-485/relay outputs KE1-VAU1B-FLK: Between power supply terminals and RS-485/relay outputs Between the power supply terminals and current/voltage input Between current/voltage inputs and RS-485/relay outputs KE1-CTD8E: Between current inputs and relay outputs KE1-ZCT8E: Between earth leakage inputs and relay outputs					

Item \ Model	KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Vibration resistance	Single-amplitude: 0.35 mm, Acceleration: 50 m/s^2 Vibration: 10 to 55 Hz, 10 sweeps of 5 minutes each along 3 axes					
Shock resistance	150 m/s^2, 3 times each in 6 directions (up/down, left/right, forward/backward)					
Weight	Approx. 230 g					
Memory backup	No. of writes to non-volatile memory: 1,000,000 times					

***1.** Based on JISC1111, without special CT error, at ambient temperature of 23°C, rated input, and rated frequency. Applicable to 2nd, 3rd, 5th, 7th, 9th, 11th, and 13th harmonics.

***2.** Power factor formula: Power factor = Active power/Apparent power

$$\text{Apparent power} = \sqrt{(\text{Active power})^2 + (\text{Reactive power})^2}$$

Item \ Model		KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Event inputs	**Number of inputs**	---					
	No-voltage inputs	---					
	Voltage input	---					
Temperature inputs	**Thermistor inputs**	---					
	Applicable thermistor	---					
Combinations		Capable of supporting 7 event inputs and 1 temperature input when connected with the KM1-EMU8A-FLK.		---			
Transistor outputs	**Number of outputs**	One open-collector output (OUT2)		---			
	Output capacity	30 VDC, 30 mA		---			
	ON residual voltage	1.2 V max.		---			
	OFF leakage current	100 μA max.		---			
	Total power consumption pulse output	Outputs one pulse when the power consumption reaches the set pulse output unit (1, 10, 100, 1k, 2k, 5k, 10k, 20k, 50k, 100k W/h).		---			
	Alarm output	Outputs an alarm based on the set alarm output threshold.		---			
	Alarm recovery method	Automatic recovery only		---			
Relay outputs	**Number of outputs**	One NO contact output (OUT1)	---	One NO contact output (OUT1)	Two NO contact outputs (OUT1 and OUT2)	One NO contact output (OUT1)	
	Rated load	Resistance load, 250 VAC, 3 A; 30 VDC, 3 A Inductive load (cosϕ = 0.4, L/R = 7 ms): 250 VAC, 1 A; 30 VDC, 1 A	---	Resistance load, 250 VAC, 3 A; 30 VDC, 3 A Inductive load (cosϕ = 0.4, L/R = 7 ms): 250 VAC, 1 A; 30 VDC, 1 A		Resistance load, 125 VAC, 3 A; 30 VDC, 3 A	
	Mechanical life expectancy	10,000,000 operations	---	10,000,000 operations		5,000,000 operations min.	
	Electrical life expectancy	50,000 operations min. (rated load switching frequency: 1,800 times/h)	---	50,000 operations min. (rated load switching frequency: 1,800 times/h)		200,000 times min. (rated load switching frequency: 1,800 times/h)	
	Failure rate P level	5 VDC, 10 mA (at a switching frequency of 120 times/min)	---	5 VDC, 10 mA (at a switching frequency of 120 times/min)			
	Alarm output	Turns output ON or OFF based on the alarm set value.	---	Turns output ON or OFF based on the alarm set value.			
	Recovery method	Automatic recovery only	---	Automatic recovery only			

Item	Model	KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Semiconductor relay outputs	Number of outputs	---	One MOS FET output (OUT1)	One MOS FET output (OUT2)	---		
	Maximum load voltage	---	Peak: 24 VAC/DC		---		
	Continuous load current	---	Peak: 80 mA AC/DC		---		
	ON resistance	---	15 Ω max.		---		
	Open-circuit leakage current	---	1 nA max.		---		
	Alarm output	---	Turns output ON or OFF based on the alarm set value.		---		
	Recovery method	---	Automatic recovery only		---		
Communications	Protocols	Communications protocol setting OFF: CompoWay/F, ON: Modbus					
	Unit number setting	CompoWay/F: 0 to 99, Modbus:1 to 99 When a switch operation is performed to set the protocol to Modbus when the node number is set to 0, the node number is automatically changed to 1.					
	Communication items	Refer to the *KM1/KE1 Communications Manual*.					
RS-485	Sync method	Start-stop				---	
	Baud rate	9,600 bps, 19,200 bps, or 38,400 bps				---	
	Transmission code	CompoWay/F: ASCII, Modbus: Binary				---	
	Data length	CompoWay/F: 7 bits, 8 bits; Modbus: 8 bits				---	
	Stop bits	CompoWay/F: 1 bits or 2 bits Modbus: 1 bit with priority, 2 bits without priority				---	
	Parity	Even, odd, or none				---	
	Maximum transmission distance	500 m				---	
	Maximum number of nodes	CompoWay/F: 31, Modbus: 99				---	
USB		USB 1.1 compliant					
Memory retention for power interruptions		Parameter data, alarm history, logged data, and backup data	Parameter data, alarm history, logged data, backup data, and momentary voltage sag history	Parameter data, alarm history, logged data, and momentary voltage sag history	Parameter data, alarm history, and logged data	Parameter data, alarm history, and backup data	Parameter data and alarm history
Number of connect connector insertions/removals		25 times					

Protection

Item	Model	KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Voltage monitoring	Alarm threshold (overvoltage/ undervoltage)	0.0 to 12,100.0 V				---	
	Operation characteristic	±1.0% FS ±1 digit The accuracy of the voltage across the Vtr is ±2.0% FS ±1 digit under the same conditions.				---	
	Alarm ON delay (overvoltage/ undervoltage)	0.1 to 10.0 s				---	
	Operating time characteristic	±0.2 s				---	
	Alarm hysteresis (overvoltage/ undervoltage)	0.0 to 2,200.0 V				---	
	Resetting time	0.5 s (Cannot be changed.)				---	
	Resetting time characteristic	±0.2 s				---	

Item	Model	KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Current monitoring	Alarm threshold (overcurrent/ undercurrent)	0.0 to 6,000.0 A		---	0.0 to 6,000.0 A		---
	Operation characteristic	±1.0% FS ±1 digit However, the accuracy is ±2.0% FS ±1 digit for the phase-S current for a three-phase, three-wire circuit and the phase-N current for a single-phase, three-wire circuit under the same conditions.		---	±1.0% FS ±1 digit However, the accuracy is ±2.0% FS ±1 digit for the phase-S current for a three-phase, three-wire circuit and the phase-N current for a single-phase, three-wire circuit under the same conditions.		---
	Alarm ON delay (overcurrent/ undercurrent)	0.1 to 10.0 s		---	0.1 to 10.0 s		---
	Operation characteristic	±0.2 s		---	±0.2 s		---
	Alarm hysteresis (overcurrent/ undercurrent)	0.0 to 1,000.0 A		---	0.0 to 1,000.0 A		---
	Resetting time	0.5 s (Cannot be changed.)		---	0.5 s (Cannot be changed.)		---
	Resetting time characteristic	±0.2 s		---	±0.2 s		---
Active power monitoring	Alarm thresholds (upper limit/lower limit)	• 120,000,000 to 120,000,000 W		---		• 120,000,000 to 120,000,000 W	---
	Operation characteristic	±2.0% FS ±1 digit		---		±2.0% FS ±1 digit	---
	Alarm ON delay (upper limit/lower limit)	0.5 to 10.0 s		---		0.5 to 10.0 s	---
	Operation characteristic	±0.2 s		---		±0.2 s	---
	Alarm hysteresis (upper limit/lower limit)	0 to 24,000,000 W		---		0 to 24,000,000 W	---
	Resetting time	0.5 s (Cannot be changed.)		---		0.5 s (Cannot be changed.)	---
	Resetting time characteristic	±0.2 s		---		±0.2 s	---
Reactive power monitoring	Alarm thresholds (upper limit/lower limit)	–120,000,000 to 120,000,000 W		---		–120,000,000 to 120,000,000 W	---
	Operation characteristic	±2.0% FS ±1 digit		---		±2.0% FS ±1 digit	---
	Alarm ON delay (upper limit/lower limit)	0.5 to 10.0 s		---		0.5 to 10.0 s	---
	Operation characteristic	±0.2 s		---		±0.2 s	---
	Alarm hysteresis (upper limit/lower limit)	0 to 24,000,000 W		---		0 to 24,000,000 W	---
	Resetting time	0.5 s (Cannot be changed.)		---		0.5 s (Cannot be changed.)	---
	Resetting time characteristic	±0.2 s		---		±0.2 s	---
Power factor monitoring	Alarm threshold	–1.00 to 1.00		---		–1.00 to 1.00	---
	Operation characteristic	±5.0% FS (Power factor = 0.5 to 1 to 0.5)		---		±5.0% FS (Power factor = 0.5 to 1 to 0.5)	---
	Alarm ON delay	0.5 to 10.0 s		---		0.5 to 10.0 s	---
	Operation characteristic	±0.2 s		---		±0.2 s	---
	Alarm hysteresis	0.00 to 1.00		---		0.00 to 1.00	---

Item	Model	KE1-PGR1C-FLK (Power/ Earth Leakage)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/ Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Earth leakage monitoring	Earth leakage comparison value	30 to 1,000 mA	---				30 to 1,000 mA
	Operation characteristic	±5% rdg ±1 digit for 30 to 200 mA, ±1% FS ±1 digit for 200 to 1,000 mA	---				±5% rdg ±1 digit for 30 to 200 mA, ±1% FS ±1 digit for 200 to 1,000 mA
	Earth leakage operating time	0.1 to 20.0 s	---				0.1 to 20.0 s
	Operation characteristic	±0.2 s	---				±0.2 s
	Resetting condition	95% of operating value	---				95% of operating value
	Resetting time	0.5 s (Cannot be changed.)	---				0.5 s (Cannot be changed.)
Momentary voltage sag monitoring	Momentary voltage sag detection voltage	---	0 to 480.0 V		---		
	Allowable error in detection voltage	---	±2.5% FS ±1 digit		---		
	Continuation time for momentary voltage sag	---	Without backup: 0.02 to 0.2 s With backup: 0.02 to 1.00 s		---		
	Relay output operating time accuracy	---	±5 ms		---		
Open phase monitoring	Open phase detection condition	(Largest error between any phase voltage and average voltage) ÷ Average voltage × 100 ≤ 85%				---	
	Operation characteristic	±1.0% FS ±1 digit The accuracy of the voltage across the Vtr is ±2.0% FS ±1 digit under the same conditions.				---	
	Operating time	0.1 s				---	
	Operation characteristic	±0.2 s				---	
	Resetting condition	Non-balance ratio: Less than 13%				---	
	Resetting time	0.5 s (Cannot be changed.)				---	
	Resetting time characteristic	±0.2 s				---	
Reversed phase monitoring	Reversed phase detection condition	Change in voltage phase sequence lasts for 0.1 second or longer.				---	
	Operating time	0.1 s				---	
	Operation characteristic	±0.2 s				---	
	Resetting condition	Phase offset within ±45°				---	
	Resetting time	0.5 s (Cannot be changed.)				---	
	Resetting time characteristic	±0.2 s				---	

Special CTs
Current Transformers (CTs)

Structure / Item / Model	Split-type						Through-hole
	KM20-CTF-5A	KM20-CTF-50A	KM20-CTF-100A	KM20-CTF-200A	KM20-CTF-400A	KM20-CTF-600A	KM20-CTB-5A/50A
Rated primary current	5 A	50 A	100 A	200 A	400 A	600 A	5A/50 A
Secondary winding	3,000 turns				6,000 turns	9,000 turns	3,000 turns
Applicable frequency	10 Hz to 5 kHz						
Insulation resistance	Between output terminals and case: 50 MΩ min. (at 500 VDC)						
Dielectric strength	Between output terminals and case: 2,000 VAC for 1 minute						
Protective element	7.5-V clamp element						
Allowable number of connections/ disconnections	100 times						
Mountable wire diameter	7.4 mm max.	8.5 mm max.	11 mm max.	24 mm max.	35.5 mm max.		8.4 mm max.
Operating temperature and humidity ranges	–20 to 60°C, 85% max. (with no condensation)						
Storage temperature and humidity ranges	–30 to 65°C, 85% max. (with no condensation)						

Note: Operate the Special CTs at a low voltage of 600 V or less.

General Specifications

Item	Specification
Rated power supply voltage	100 to 240 VAC, 50/60 Hz
Allowable voltage range	85% to 110% of rated power supply voltage
Power consumption (at maximum load)	6 VA max.
Current consumption (DeviceNet power supply)	45 mA max. (24 VDC)
Vibration resistance	10 to 55 Hz, 10 m/s^2 for 2 hours along 3 axes
Shock resistance	Single-amplitude: 0.35 mm, Acceleration: 50 m/s^2 Vibration: 10 to 55 Hz, 10 sweeps of 5 minutes each along 3 axes
Dielectric strength	2,000 V for 1 min between all terminals and case, and between power supply terminals and temperature input/RS-485 output/USB output/DeviceNet output/transistor output
Insulation resistance	20 MΩ min. (at 500 VDC)
Ambient operating temperature	–10 to 55°C (with no condensation or icing)
Ambient operating humidity	25% to 85%
Ambient storage temperature	–25 to 65°C (with no condensation or icing)
Dimensions	45 × 90 × 110 mm (W×H×D) (excluding protrusions)
Memory backup	EEPROM (non-volatile memory), No. of writes: 1,000,000
Weight	Approx. 170 g

Current Transformer (CT) Cable

Model	KM20-CTF-CB3
Cable length	3 m

Note: Use only the CT Cable specified by OMRON.

Special ZCTs
Zero-phase Current Transformers (Compatible ZCTs)

Item \ Structure	Indoor, through-hole					
Model	**OTG-L21**	**OTG-L30**	**OTG-L42**	**OTG-L68**	**OTG-L82**	**OTG-L156**
Rated current	50 A	100 A	200 A	400 A	600 A	1,000 A
Through-hole diameter	21	30	42	68	82	156
Rated load	600 VAC max, 50/60 Hz, Single-phase/three-phase					
Output terminal polarity	Polarity (Connect CT output terminal k to terminal 5 or 7 and terminal l to terminal 6 or 8.)					
Secondary connection	Terminals (with test terminals kt and lt)					
Insulation resistance	100 MΩ min. (between charged metal parts and ground)					
Dielectric strength	2,200 VAC at 50/60 Hz for 1min (between charged metal parts and ground)					
Ambient operating temperature	−10 to 60°C (with no icing)					
Ambient operating humidity	45% to 85%					
Weight	Approx. 90 g	Approx. 130 g	Approx. 230 g	Approx. 480 g	Approx. 700 g	Approx. 6.6 kg

Item \ Structure	Indoor, split-type			Outdoor, through-hole	Outdoor, split-type
Model	**OTG-CN52**	**OTG-CN77**	**OTGCN112**	**OTG-LA30W**	**OTG-CN36W**
Rated current	200 A	400 A	600 A	100 A	150 A
Through-hole diameter	52	77	112	30	36
Rated load	600 VAC max, 50/60 Hz, Single-phase/three-phase				
Output terminal polarity	Polarity (Connect CT output terminal k to terminal 5 or 7 and terminal l to terminal 6 or 8.)				
Secondary connection	Terminals (with test terminals kt and lt)			Lead wire l = 500	Lead wire l = 450
Insulation resistance	100 MΩ min. (between charged metal parts and ground)				
Dielectric strength	2,200 VAC at 50/60 Hz for 1min (between charged metal parts and ground)				
Ambient operating temperature	−10 to 60°C (with no icing)				
Ambient operating humidity	45% to 85%				
Weight	Approx. 1.3 kg	Approx. 2.5 kg	Approx. 3.5 kg	Approx. 140 g	Approx. 650 g

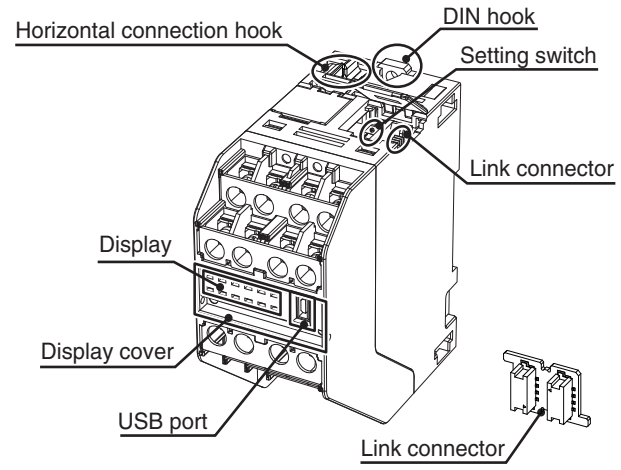
Note: Operate the Special ZCTs at a low voltage of 600 V or less.

Current Transformer for Ground Wires

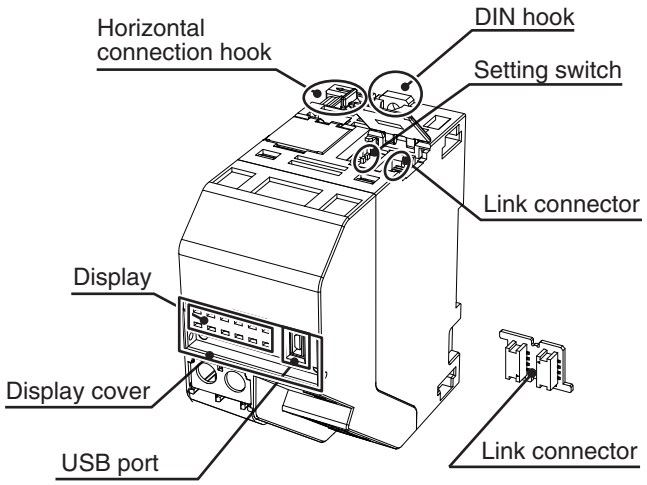
Item \ Structure	Indoor, split-type
Model	**K6ER-CN22**
Rated current	2 A
Through-hole diameter	22
Rated load	600 VAC max, 50/60 Hz, Single-phase/three-phase
Output terminal polarity	Polarity (Connect CT output terminal k to terminal 5 or 7 and terminal l to terminal 6 or 8.)
Secondary connection	Lead wire l: 150, Enclosed cable: 3,000 mm
Insulation resistance	100 MΩ min. (between core and output lead wire)
Dielectric strength	1,000 VAC at 50/60 Hz for 1 min (between core and output lead wire)
Ambient operating temperature	−10 to 60°C (with no icing)
Ambient operating humidity	80% max.
Weight	Approx. 65 g

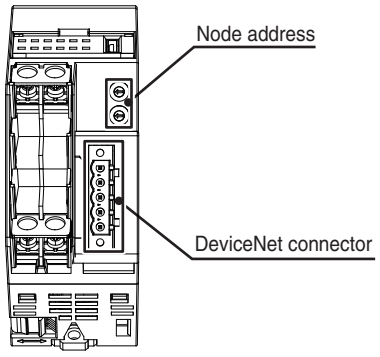
Nomenclature

Measurement Masters, Function Slaves, and CT Expansion Slaves



Communications Slave



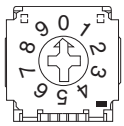


✻ The Link Connector is provided with the Slave Units only and is not provided with the Master Unit.

Setting Switches

There are two setting switches, one for the slave ID and one for the communications protocol.
Before you make the initial settings, always set the slave ID and communications protocol.

- Slave ID (Rotary Switch)



Set the switch to between 1 and 4. (Do not set it to 0 or to between 5 and 9.)
Do not set the same ID more than once within the same system.
Only the Function Slaves and CT Expansion Slaves have a rotary switch.

- Communications Protocol Switch (DIP Switch)

Pin 1: Not used.
Pin 2 ON: Modbus
OFF: CompoWay/F

- Simple Assignment/Communications Protocol Switch (DIP Switch)

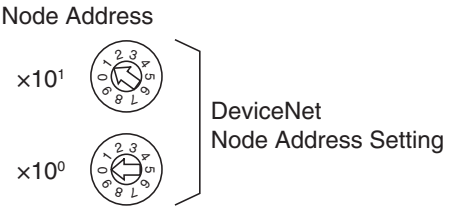
Pin 1 ON: Manual assignment
OFF: Simple assignment
Pin 2 ON: Modbus
OFF: CompoWay/F

- Simple Assignment Setting

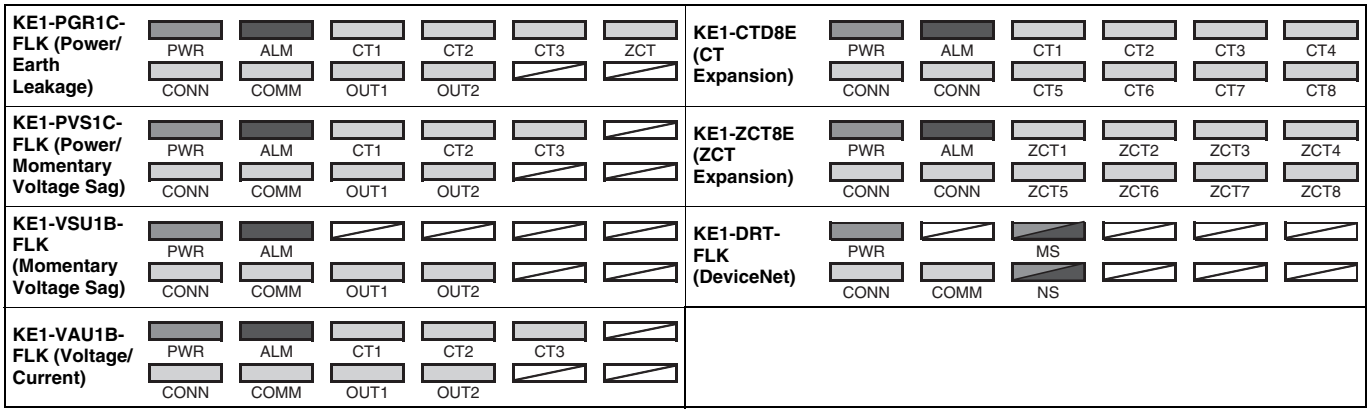
Turn OFF DIP switch pin 1 to set simple assignment.
The setting is read only once when the power supply is turned ON. Any changes while power is ON are ignored. To change the setting, turn OFF the power supply, set the switch, and then turn ON the power supply.

- Node Address Setting

Set the address of the Unit as a slave on the DeviceNet network to a decimal number between 00 and 63. (Do not set addresses 64 to 99.) Set the 1s digit on the bottom rotary switch ($\times 10^0$) and set the 10s digit on the top rotary switch ($\times 10^1$). You can set any node address that is within the specified range as long as the same address is not set for another node (Master, Slave, or Configurator) on the same network.



Display

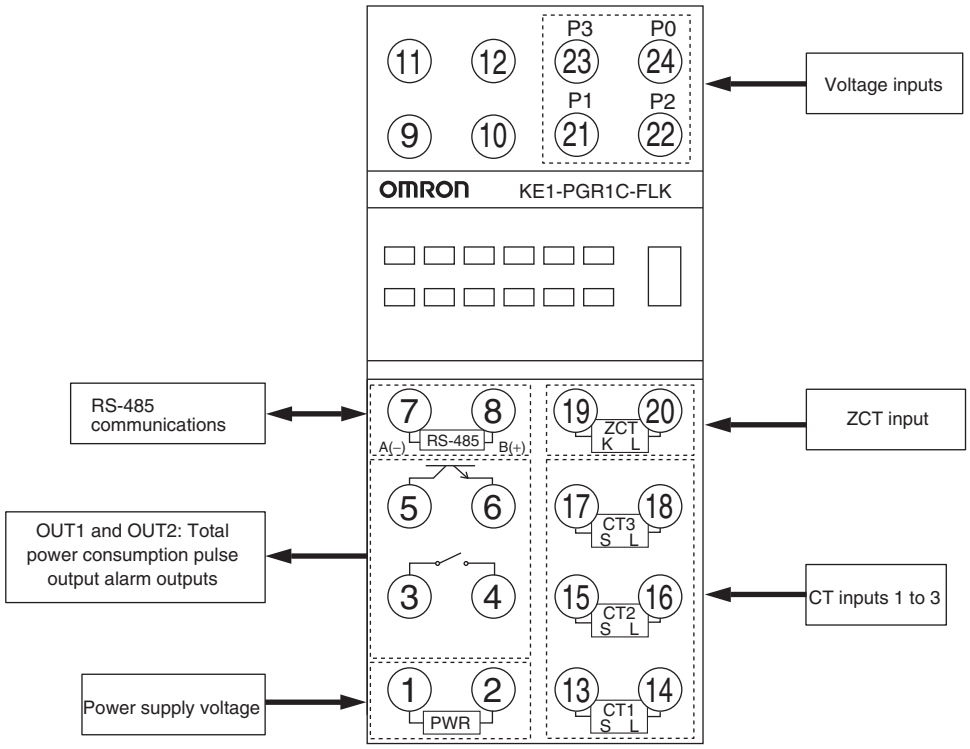


Indicator	Name	Color	Indication	Status
PWR	Power Supply	Green	☐	Power is ON.
			◪	An error has occurred.
			■	Power is not supplied.
CONN	Internal Bus Communications	Yellow	☐	Internal bus is connected (multiple Units are connected).
			■	Internal bus is not connected (multiple Units are not connected).
ALM	Alarm	Red	☐	An alarm was detected.
COMM	RS-485 Communications	Yellow	☐	RS-485/USB communications are in progress.
			■	RS-485/USB communications are not in progress.
CT	CT Input	Yellow	☐	The indicator for the relevant input lights if the current measurement value for a CT input is 2% of the rated current or higher for 10 seconds or longer. • The indicator lights for the above condition even if the current measurement value is forced to 0 by the low-cut function.
ZCT	ZCT Input	Yellow	☐	The indicator for the relevant input lights if the earth leakage measurement value for a ZCT input is 2% of the rated current or higher for 10 seconds or longer. • The indicator lights for the above condition even if the current measurement value is forced to 0 by the low-cut function.
OUT	Output	Yellow	☐	The indicators light according to the alarm settings for individual output terminals.
MS	Module Status	Green	☐	Normal (DeviceNet Communications Unit is normal.)
			◪	Not set (when I/O assignments are made with the Configurator). • Connected configuration is not set. • I/O assignments are not set.
		Red	☐	Fatal Error • Watchdog timer error • RAM error
			◪	EEPROM Failure • Non-volatile memory checksum error • Non-volatile memory hardware error
		---	■	There is no network power supply (24 VDC). • There is no power supply to the DeviceNet Communications Unit. • A reset is in progress. • Waiting for initialization to start.
NS	Network Status (DeviceNet)	Green	☐	The Unit is online and communications settings were completed. (The network is normal.)
			◪	The Unit is online but communications settings have not been completed (waiting for connection from host).
		Red	☐	Communications error (The Unit has detected an error that indicates network communications are not possible.) • Node address duplication • Busoff was detected.
			◪	Minor communications error • Communications timeout
		---	■	The Unit is offline and the power supply is OFF. • Waiting for the host to complete a node address duplication check. • There is no power supply to the DeviceNet Communications Unit.

☐: Lit. ◪: Flashing. ■ : Not lit.

Connections

Power/Earth Leakage Monitor Unit
KE1-PGR1C-FLK
Terminal Arrangement and I/O Configuration

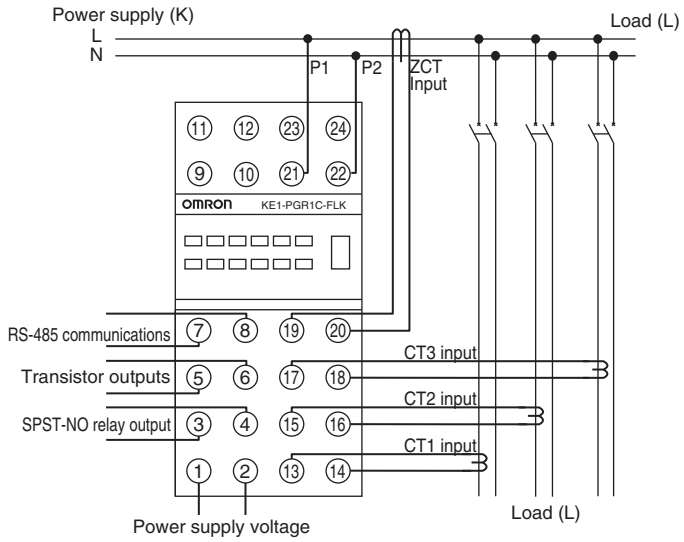


Terminal Functions

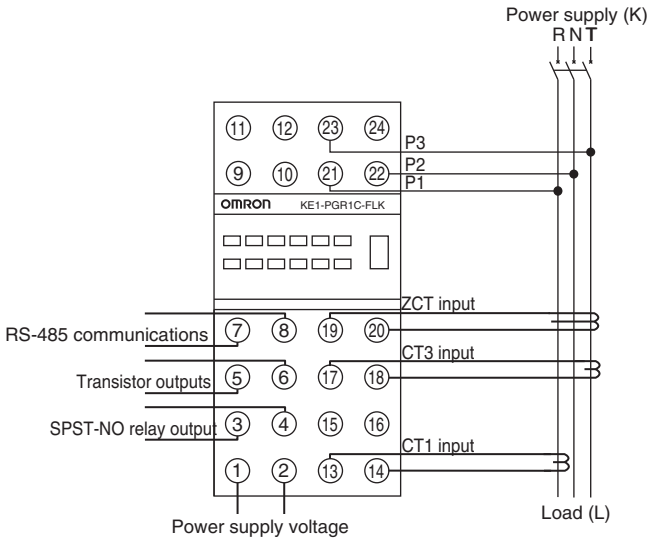
①	Power supply voltage (100 to 240 VAC)	⑨	NC	⑰	CT-3S
②		⑩	NC	⑱	CT-3L
③	SPST-NO relay output	⑪	NC	⑲	ZCT-K
④		⑫	NC	⑳	ZCT-L
⑤	Transistor outputs	⑬	CT-1S	㉑	Measurement voltage input P1
⑥	Transistor output COM	⑭	CT-1L	㉒	Measurement voltage input P2
⑦	RS-485 A (–)	⑮	CT-2S	㉓	Measurement voltage input P3
⑧	RS-485 B (+)	⑯	CT-2L	㉔	Measurement voltage input P0

Wiring Diagram Examples

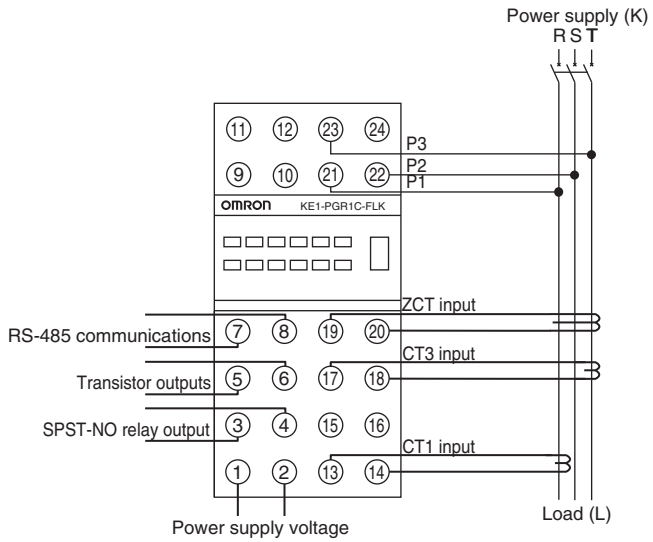
- **Single-phase, Two-wire**



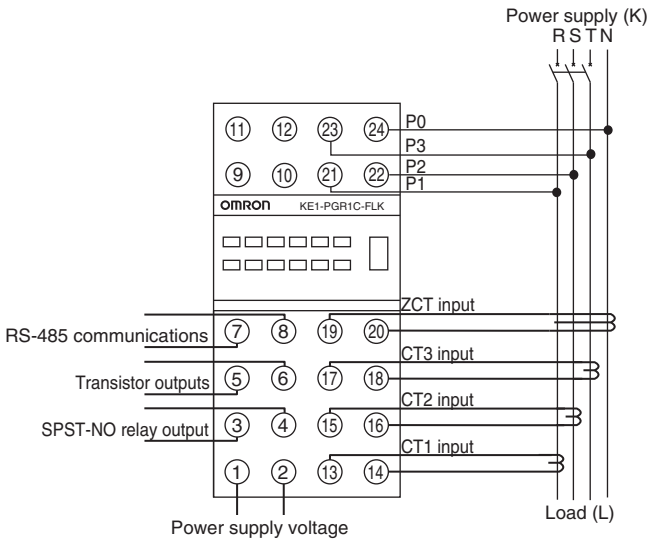
- **Single-phase, Three-wire**



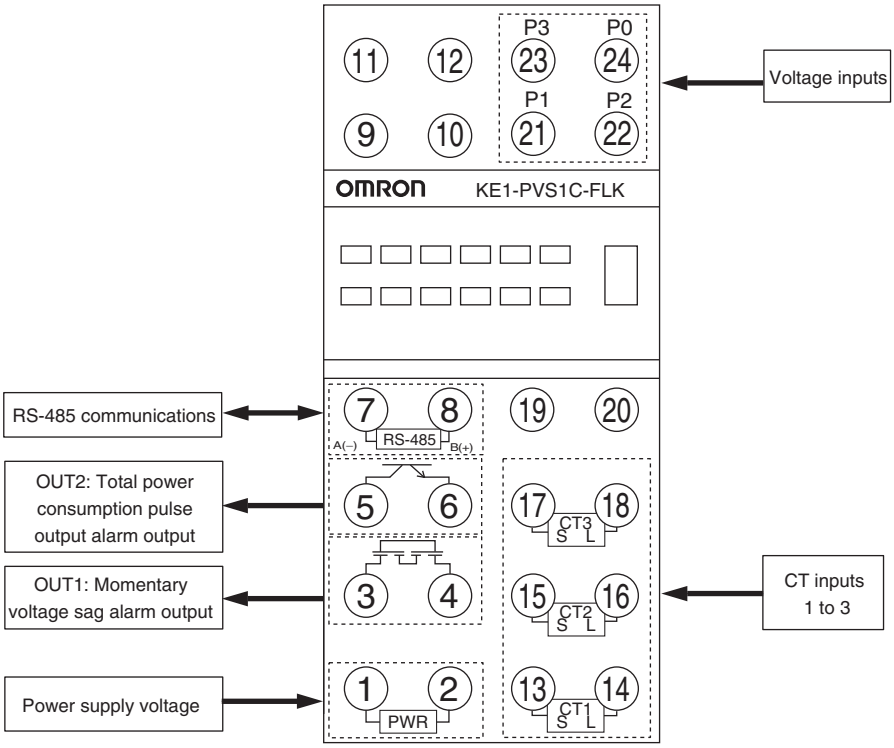
- **Three-phase, Three-wire**



- **Three-phase, Four-wire**



Power/Momentary Voltage Sag Monitor Unit
KE1-PVS1C-FLK
Terminal Arrangement and I/O Configuration

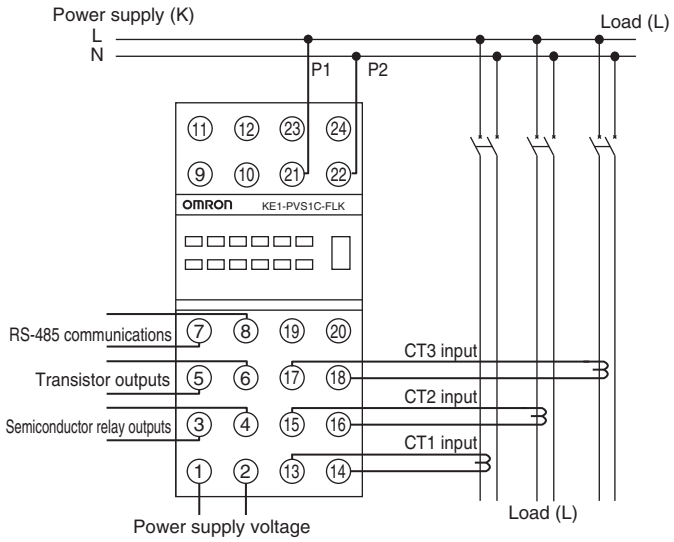


Terminal Functions

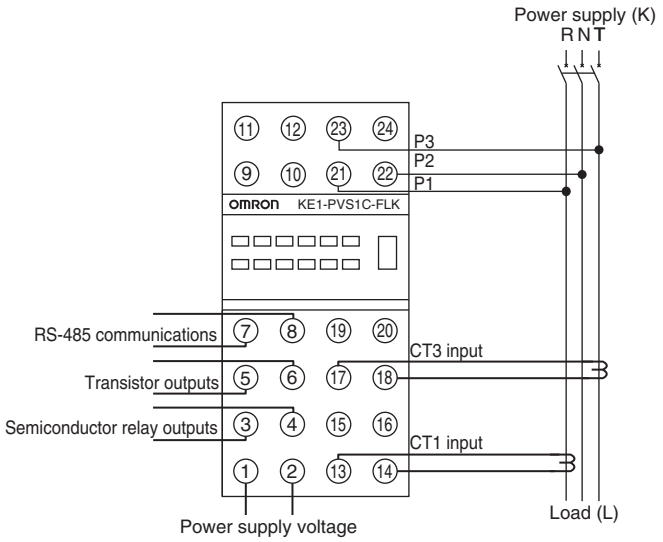
①	Power supply voltage (100 to 240 VAC)	⑨	NC	⑰	CT-3S
②		⑩	NC	⑱	CT-3L
③	Semiconductor relay outputs	⑪	NC	⑲	NC
④		⑫	NC	⑳	NC
⑤	Transistor outputs	⑬	CT-1S	㉑	Measurement voltage input P1
⑥	Transistor output COM	⑭	CT-1L	㉒	Measurement voltage input P2
⑦	RS-485 A (–)	⑮	CT-2S	㉓	Measurement voltage input P3
⑧	RS-485 B (+)	⑯	CT-2L	㉔	Measurement voltage input P0

Wiring Diagram Examples

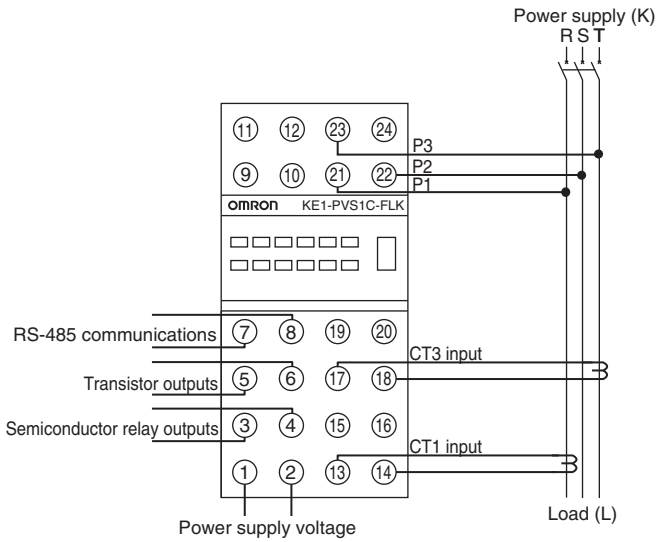
- **Single-phase, Two-wire**



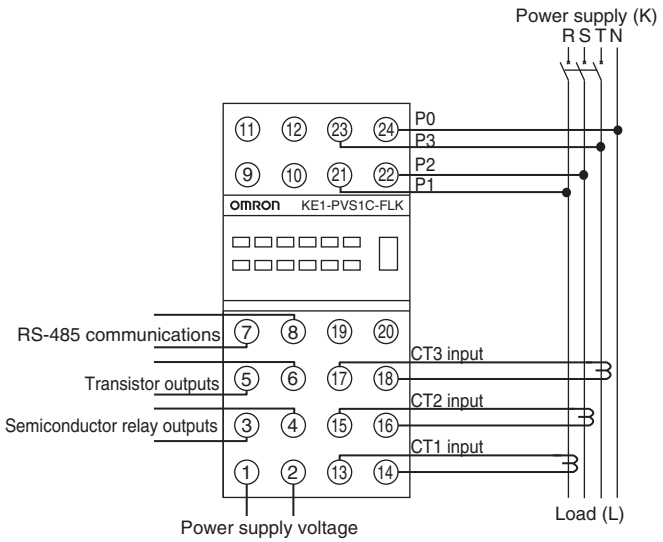
- **Single-phase, Three-wire**



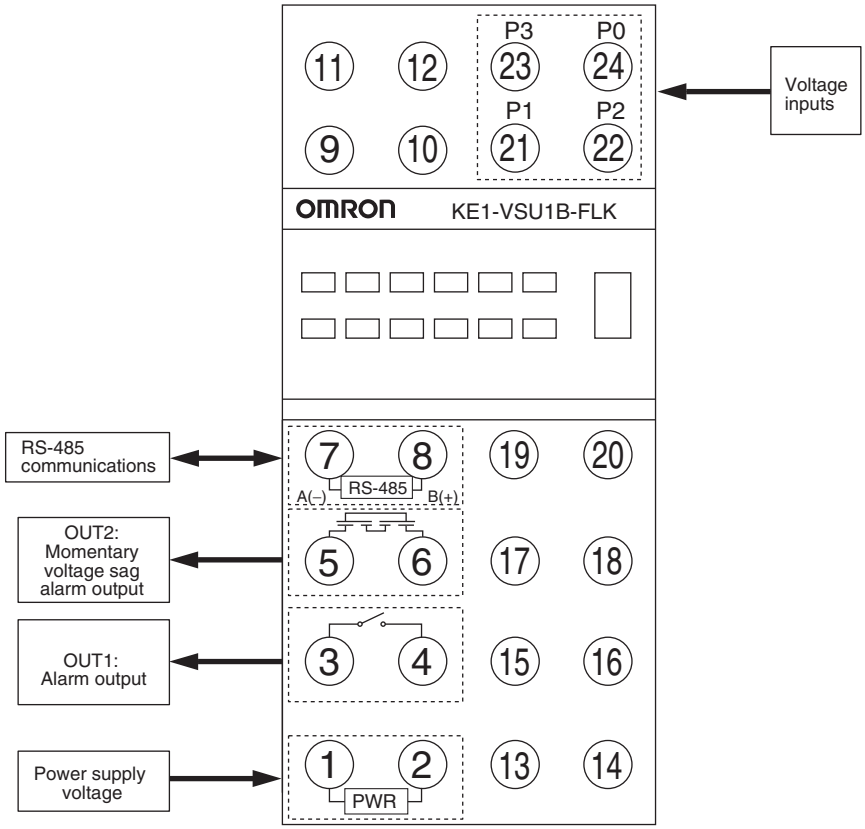
- **Three-phase, Three-wire**



- **Three-phase, Four-wire**



Momentary Voltage Sag Monitor Unit
KE1-VSU1B-FLK
Terminal Arrangement and I/O Configuration

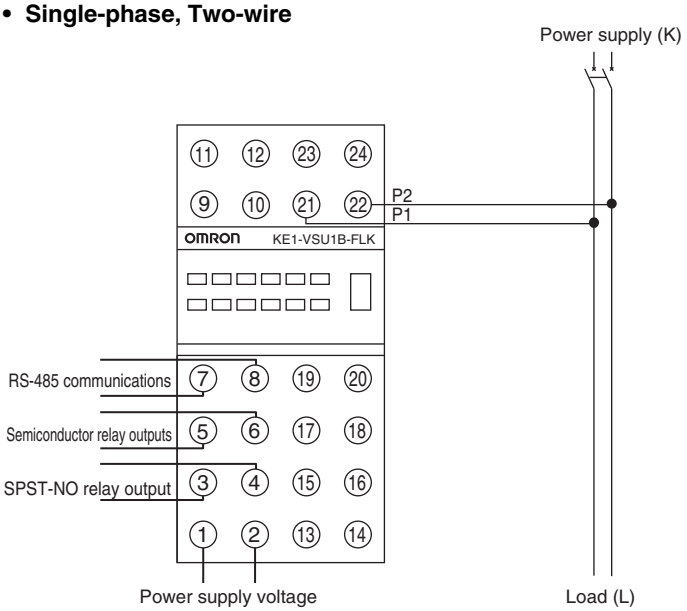


Terminal Functions

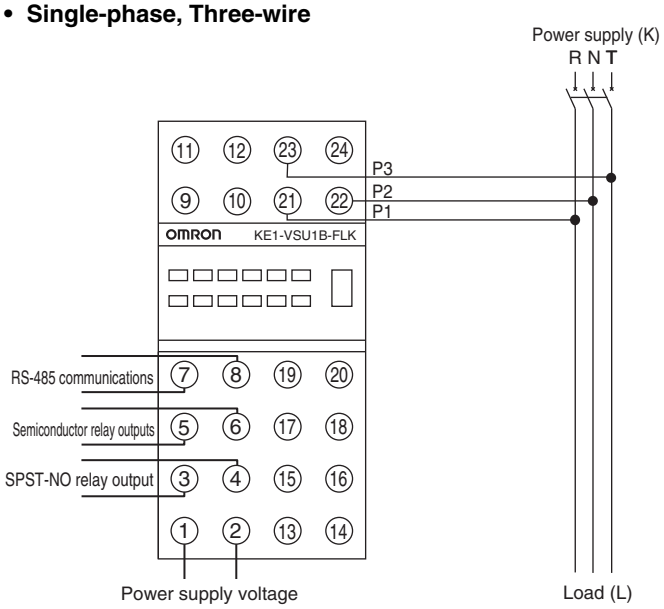
①	Power supply voltage (100 to 240 VAC)	⑨	NC	⑰	NC
②		⑩	NC	⑱	NC
③	SPST-NO relay output	⑪	NC	⑲	NC
④		⑫	NC	⑳	NC
⑤	Semiconductor relay outputs	⑬	NC	㉑	Measurement voltage input P1
⑥		⑭	NC	㉒	Measurement voltage input P2
⑦	RS-485 A (–)	⑮	NC	㉓	Measurement voltage input P3
⑧	RS-485 B (+)	⑯	NC	㉔	Measurement voltage input P0

Wiring Diagram Examples

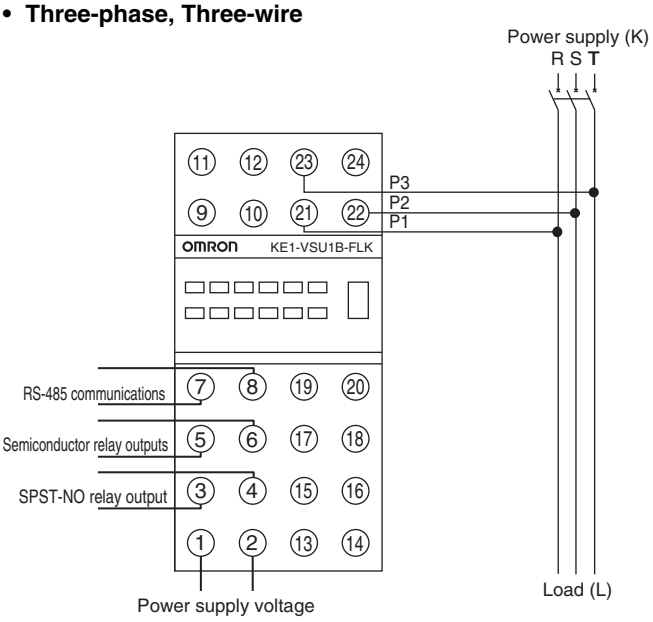
- **Single-phase, Two-wire**



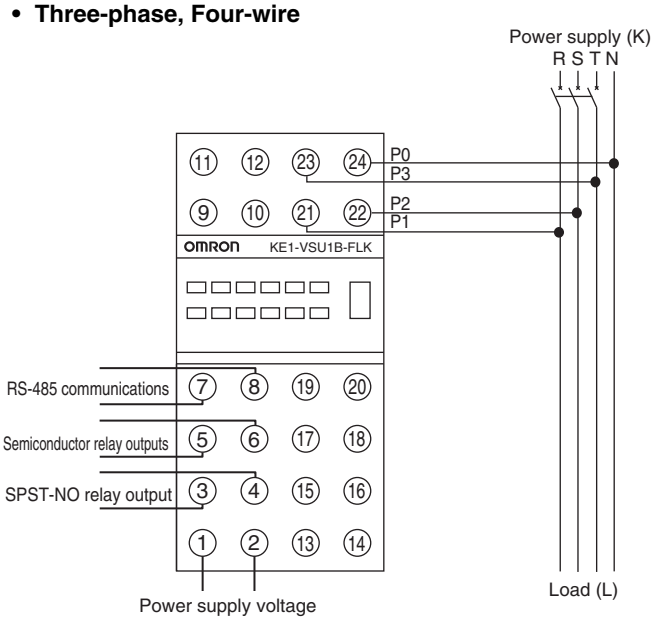
- **Single-phase, Three-wire**



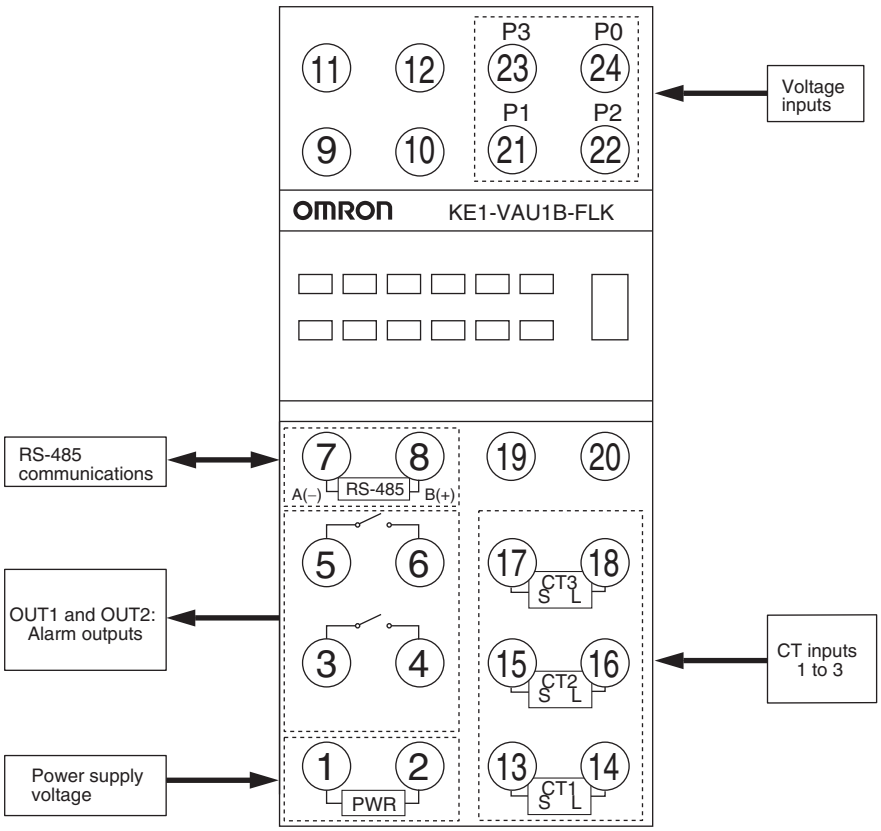
- **Three-phase, Three-wire**



- **Three-phase, Four-wire**



Voltage/Current Monitor Unit
KE1-VAU1B-FLK
Terminal Arrangement and I/O Configuration

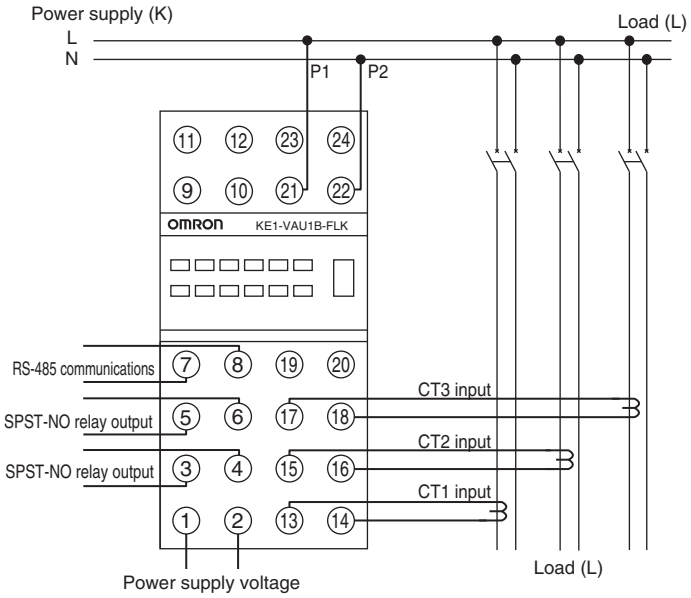


Terminal Functions

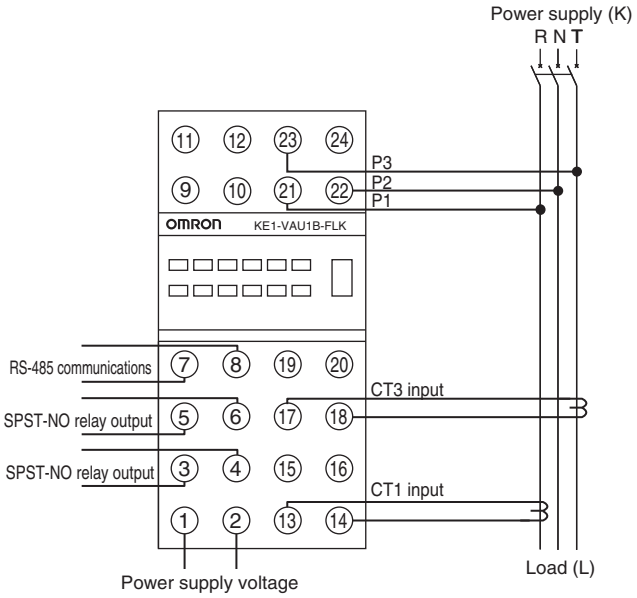
①	Power supply voltage (100 to 240 VAC)	⑨	NC	⑰	CT-3S
②		⑩	NC	⑱	CT-3L
③	SPST-NO relay output 1	⑪	NC	⑲	NC
④		⑫	NC	⑳	NC
⑤	SPST-NO relay output 2	⑬	CT-1S	㉑	Measurement voltage input P1
⑥		⑭	CT-1L	㉒	Measurement voltage input P2
⑦	RS-485 A (–)	⑮	CT-2S	㉓	Measurement voltage input P3
⑧	RS-485 B (+)	⑯	CT-2L	㉔	Measurement voltage input P0

Wiring Diagram Examples

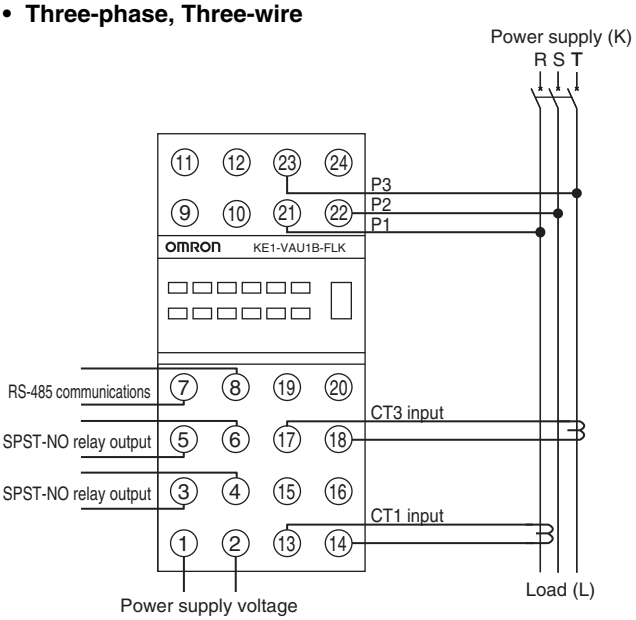
- **Single-phase, Two-wire**



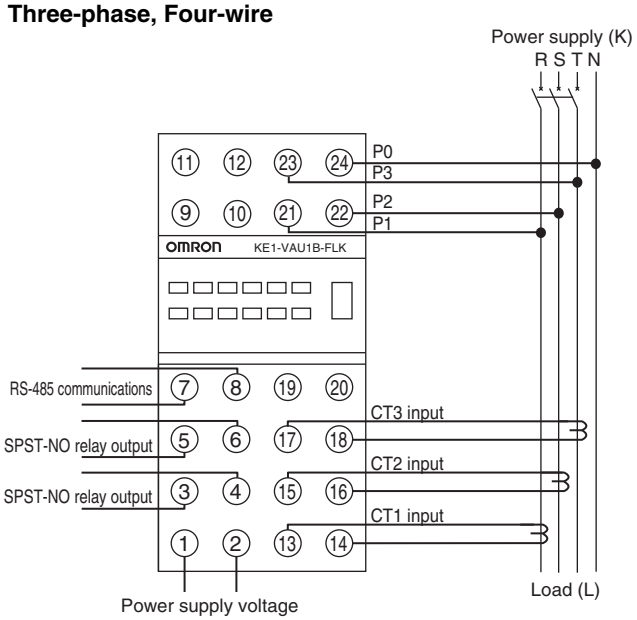
- **Single-phase, Three-wire**



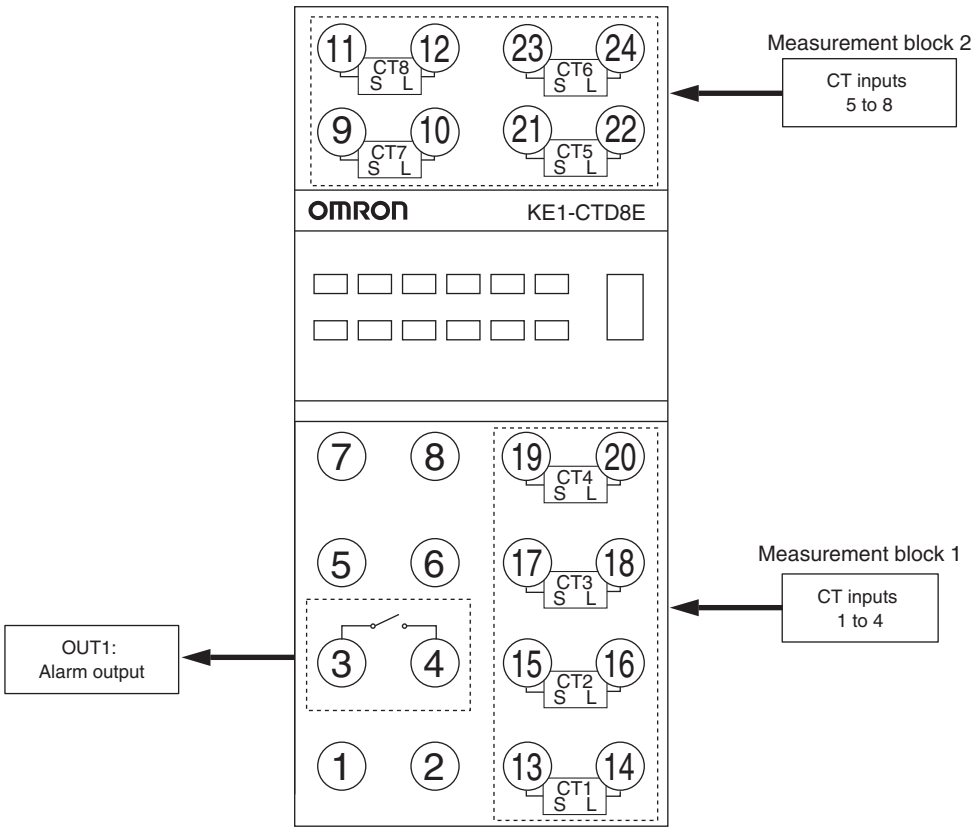
- **Three-phase, Three-wire**



- **Three-phase, Four-wire**



CT Expansion Unit
KE1-CTD8E
Terminal Arrangement and I/O Configuration



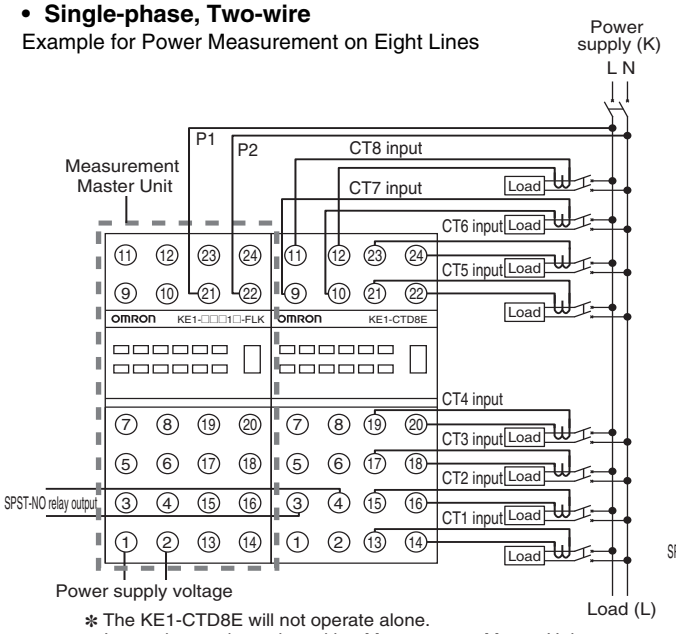
Terminal Functions

①	NC	⑨	CT-7S	⑰	CT-3S
②	NC	⑩	CT-7L	⑱	CT-3L
③	SPST-NO 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

Wiring Diagram Examples

• Single-phase, Two-wire

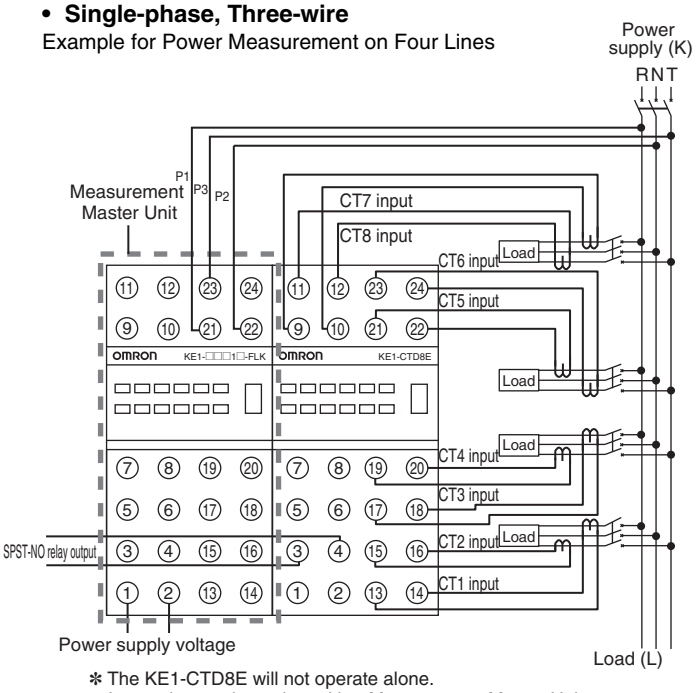
Example for Power Measurement on Eight Lines



✻ The KE1-CTD8E will not operate alone.
It must be used together with a Measurement Master Unit.
✻ The required number of CT inputs depends on the wiring method.
Single-phase, two-wire: 1 input
✻ The number of circuits that one KE1-CTD8E Unit can measure is as follows:
Single-phase, two-wire: 8 circuits max.

• Single-phase, Three-wire

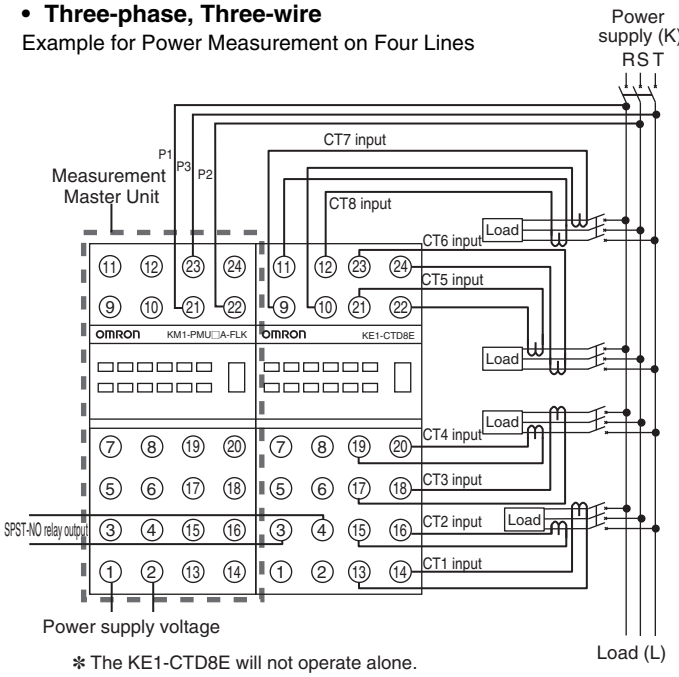
Example for Power Measurement on Four Lines



✻ The KE1-CTD8E will not operate alone.
It must be used together with a Measurement Master Unit.
✻ The required number of CT inputs depends on the wiring method.
Single-phase, three-wire: 2 inputs
✻ The number of circuits that one KE1-CTD8E Unit can measure is as follows:
Single-phase, three-wire: 4 circuits max.

• Three-phase, Three-wire

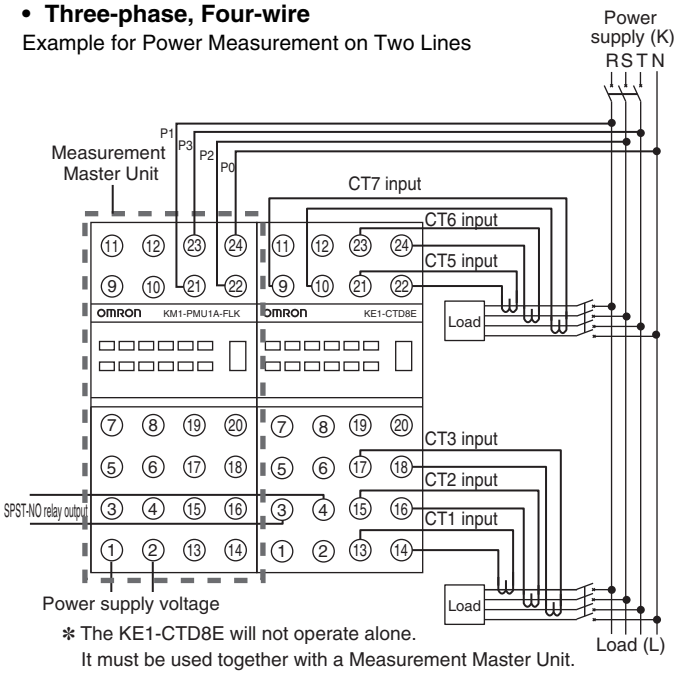
Example for Power Measurement on Four Lines



✻ The KE1-CTD8E will not operate alone.
It must be used together with a Measurement Master Unit.
✻ The required number of CT inputs depends on the wiring method.
Three-phase, three-wire: 2 inputs
✻ The number of circuits that one KE1-CTD8E Unit can measure is as follows:
Three-phase, three-wire: 4 circuits max.

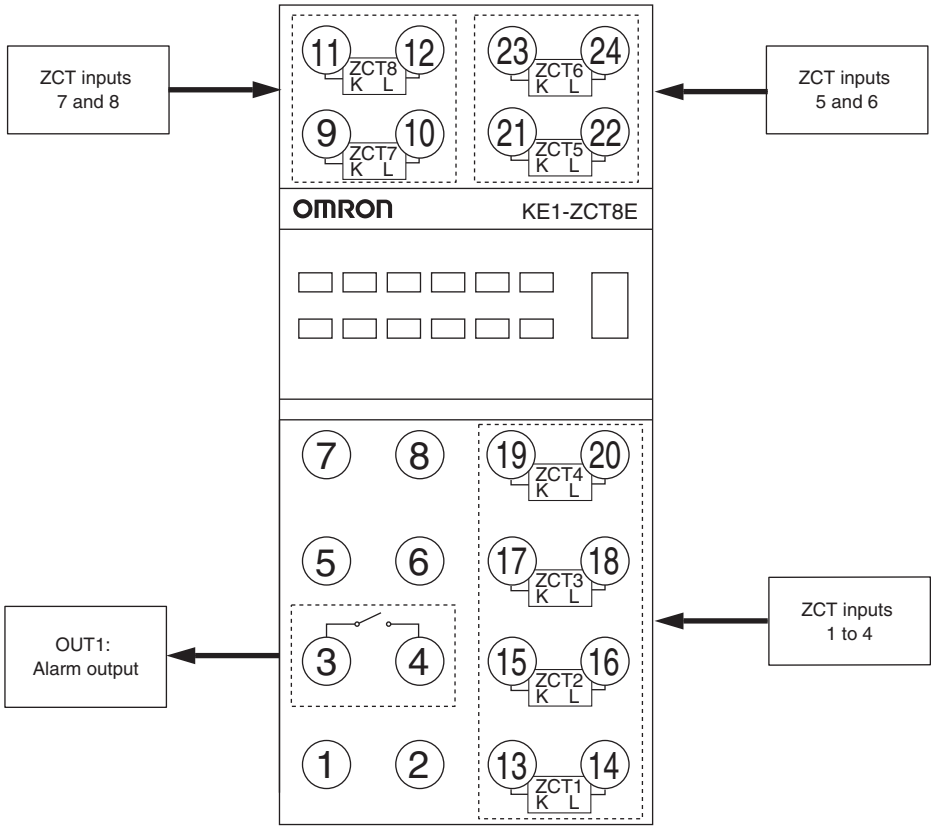
• Three-phase, Four-wire

Example for Power Measurement on Two Lines



✻ The KE1-CTD8E will not operate alone.
It must be used together with a Measurement Master Unit.
✻ The required number of CT inputs depends on the wiring method.
Three-phase, four-wire: 3 inputs
✻ The number of circuits that one KE1-CTD8E Unit can measure is as follows:
Three-phase, four-wire: 2 circuits max.

ZCT Expansion Unit
KE1-ZCT8E
Terminal Arrangement and I/O Configuration

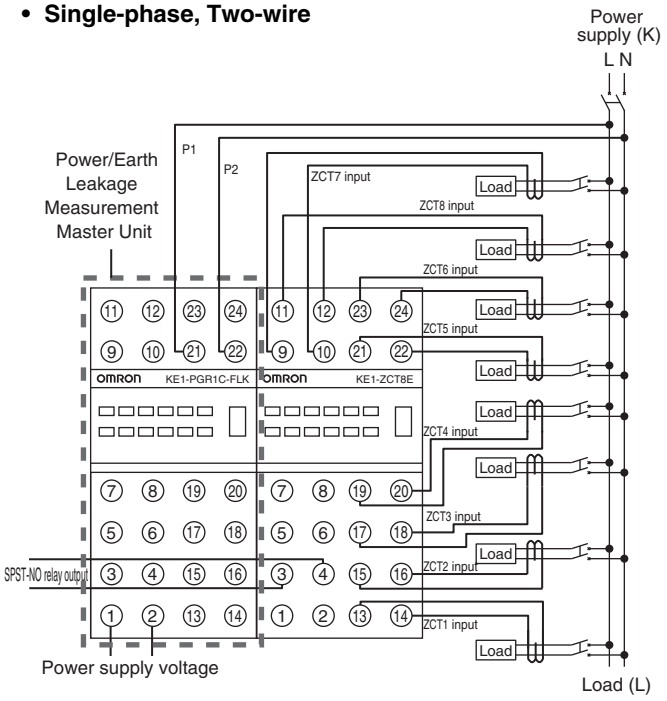


Terminal Functions

①	NC	⑨	ZCT-7K	⑰	ZCT-3K
②	NC	⑩	ZCT-7L	⑱	ZCT-3L
③	SPST-NO relay output	⑪	ZCT-8K	⑲	ZCT-4K
④		⑫	ZCT-8L	⑳	ZCT-4L
⑤	NC	⑬	ZCT-1K	㉑	ZCT-5K
⑥	NC	⑭	ZCT-1L	㉒	ZCT-5L
⑦	NC	⑮	ZCT-2K	㉓	ZCT-6K
⑧	NC	⑯	ZCT-2L	㉔	ZCT-6L

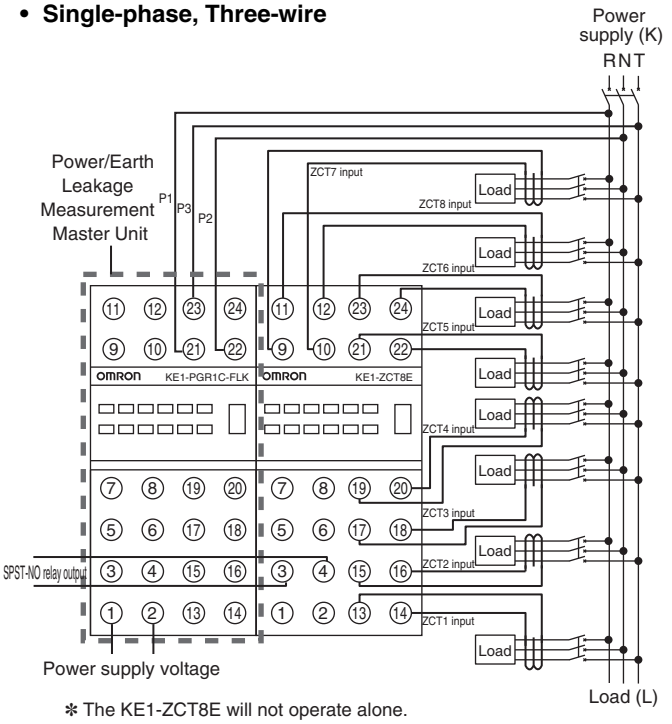
Wiring Diagram Examples

- **Single-phase, Two-wire**



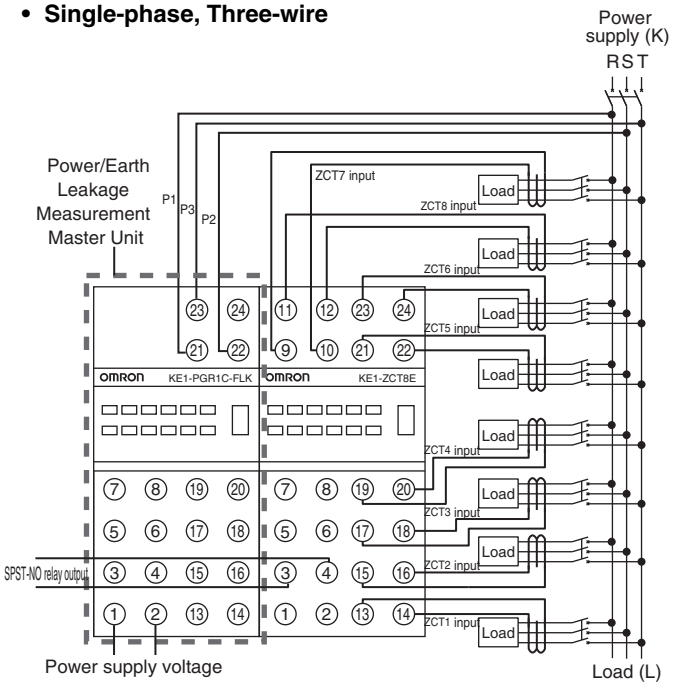
✻ The KE1-ZCT8E will not operate alone.
It must be used together with a Measurement Master Unit.
✻ One input is required for each circuit regardless of the wiring method.
✻ The number of circuits that one KE1-ZCT8E Unit can measure is as follows:
Single-phase, two-wire: 8 circuits max.

- **Single-phase, Three-wire**



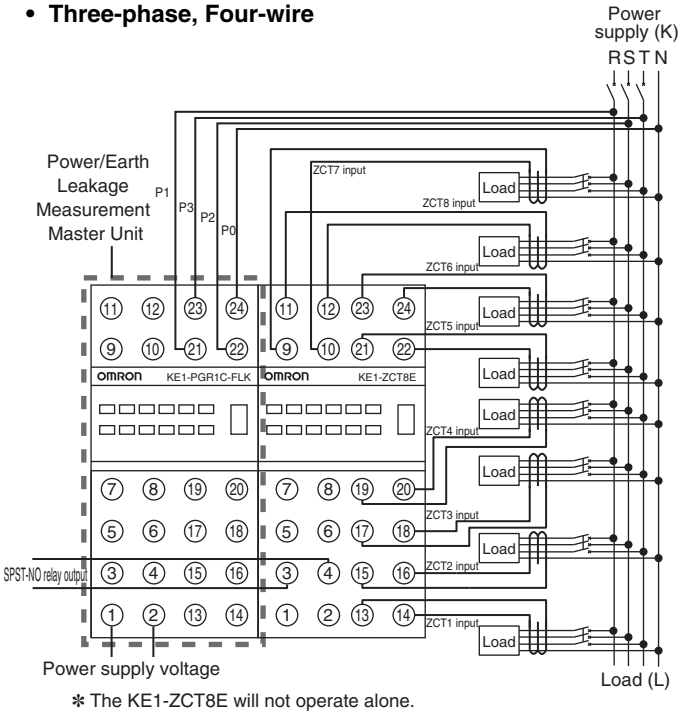
✻ The KE1-ZCT8E will not operate alone.
It must be used together with a Measurement Master Unit.
✻ One input is required for each circuit regardless of the wiring method.
✻ The number of circuits that one KE1-ZCT8E Unit can measure is as follows:
Single-phase, three-wire: 8 circuits max.

- **Single-phase, Three-wire**



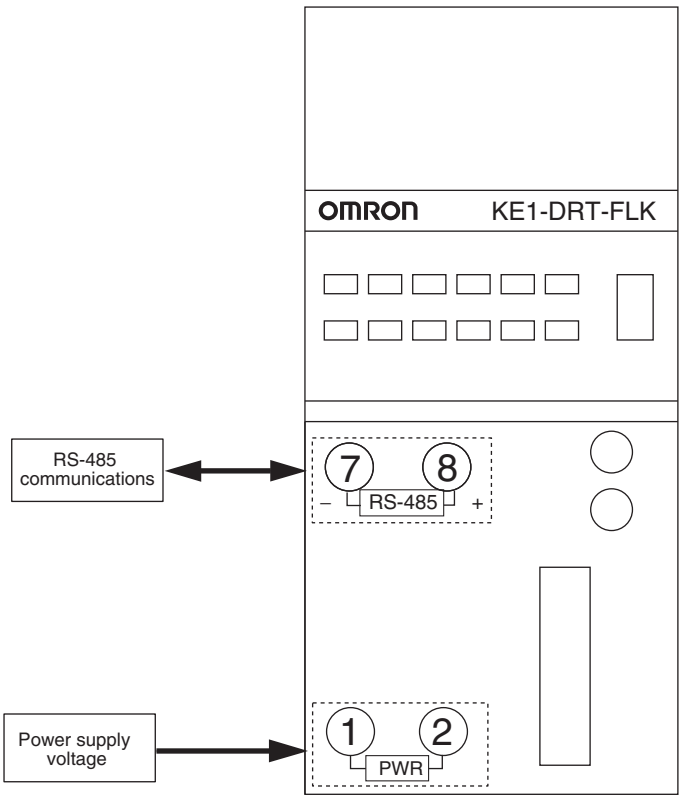
✻ The KE1-ZCT8E will not operate alone.
It must be used together with a Measurement Master Unit.
✻ One input is required for each circuit regardless of the wiring method.
✻ The number of circuits that one KE1-ZCT8E Unit can handle is as follows:
Three-phase, three-wire: 8 circuits max.

- **Three-phase, Four-wire**



✻ The KE1-ZCT8E will not operate alone.
It must be used together with a Measurement Master Unit.
✻ One input is required for each circuit regardless of the wiring method.
✻ The number of circuits that one KE1-ZCT8E Unit can handle is as follows:
Three-phase, four-wire: 8 circuits max.

DeviceNet Communications Unit
KE1-DRT-FLK
Terminal Arrangement and I/O Configuration

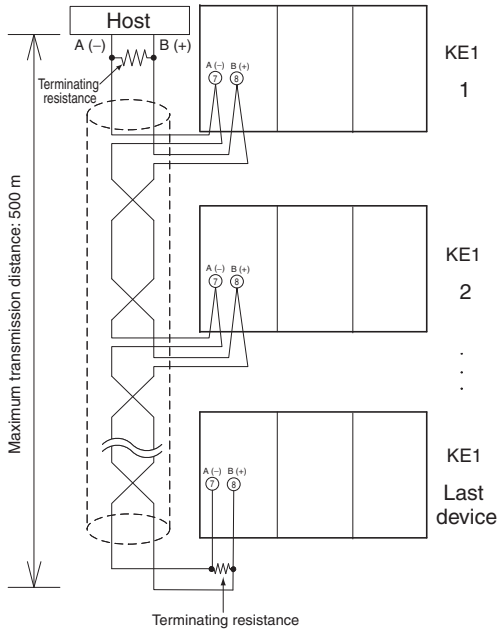


Terminal Functions

①	Power supply voltage
②	Power supply voltage
③	NC
④	NC
⑤	NC
⑥	NC
⑦	RS-485 B (+)
⑧	RS-485 A (–)

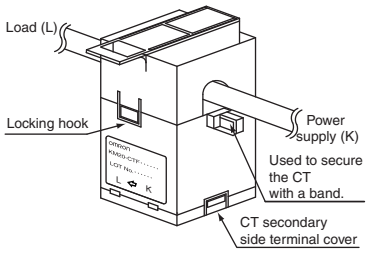
Communications Connections

- Separate RS-485 cables and power lines to prevent the influence of noise.
- Use a twisted-pair cable of AWG24 (cross-sectional area: 0.205 mm^2) to AWG14 (cross-sectional area: 2.081 mm^2). (The stripping length is 5 to 6 mm)
- Do not ground the RS-485 communications cable. Failure may occur.
- Connect terminating resistance (120 Ω (1/2 W)) between the positive and negative RS-485 pins on the host device and the last device (normally a KE1). When connecting terminating resistance to the host device, check the manual provided with the host device.



Special CT Connections

- One Special CT is required to measure a single-phase, two-wire circuit. Two CTs are required to measure a single-phase, three-wire circuit or three-phase, three-wire circuit. Three CTs are required to measure a three-phase, four-wire circuit.
- Make sure that the ratings of the Special CTs and the Special CT setting in the KE1 are the same.
- Check the directions of the power supply (K) and load (L) before making the connections. Correct measurements will not be possible if they are connected in the wrong directions.
- Release the locking hook and clamp the CT on the line. Do this for each phase. Then, press the hook firmly until you hear it lock into place.
- Make sure that the terminal cover on the secondary side of the CT is closed securely.
- Do not ground the Special CTs. Failure may occur.
- The Special CTs have polarity. Correctly wire the K terminal on the Special CT to the S side of the KE1 Unit and the L terminal on the Special CT to the L side on the KE1 Unit.



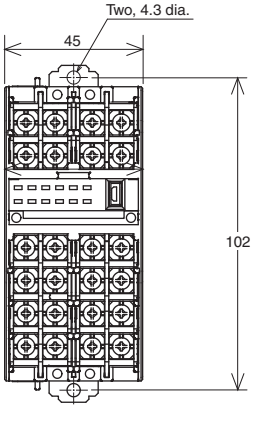
- Use the Special CT Cable (KM20-CTFCB3: 3 m) to connect the Special CT. Connect the Special CT to the end with the shrinking tube.
- Electric shock may occasionally occur.
  Always use a sheathed cable with basic insulation of 600 V or higher for the primary cable clamped by the CT.
  If you clamp onto a busbar or other conductive item, cover it with insulation or otherwise provide at least the required basic insulation.

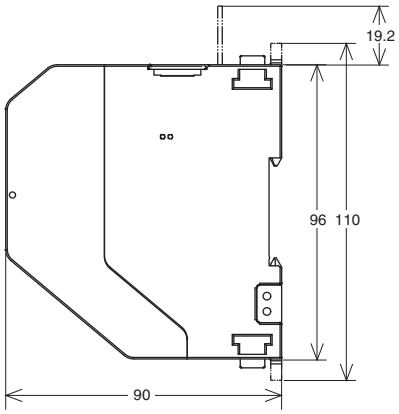
Dimensions

(Unit: mm)

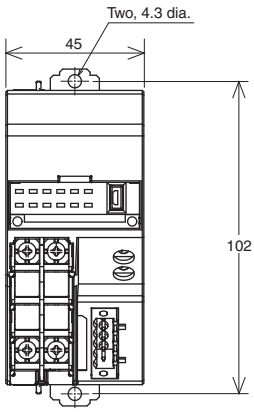
Main Units

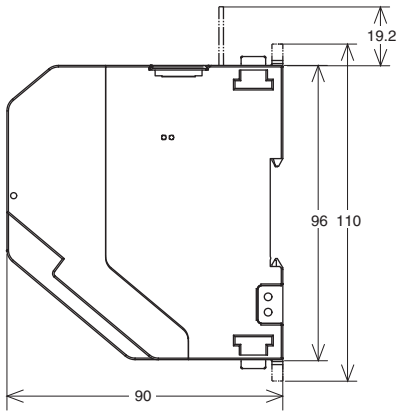
KE1-PGR1C-FLK/PVS1C-FLK/VSU1B-FLK/ VAU1B-FLK/CTD8E/ZCT8E





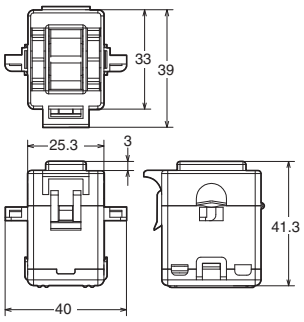
KE1-DRT-FLK



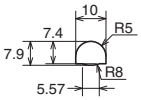


Split-type Current Transformers (CTs)

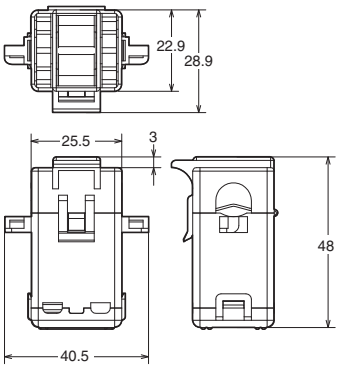
KM20-CTF-5A



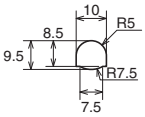
CT Through-hole Dimensions



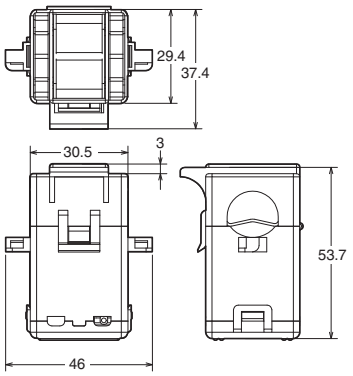
KM20-CTF-50A



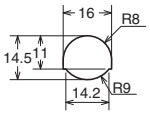
CT Through-hole Dimensions



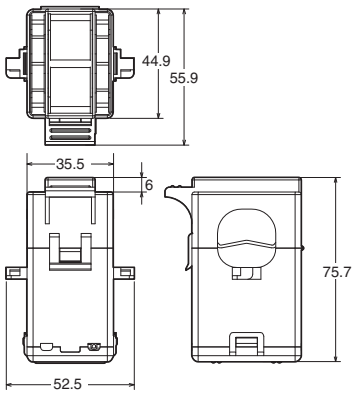
KM20-CTF-100A



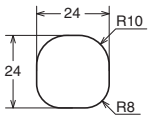
CT Through-hole Dimensions



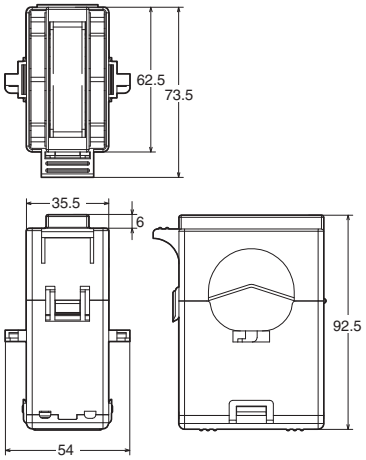
KM20-CTF-200A



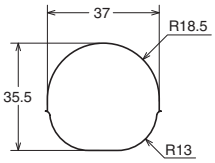
CT Through-hole Dimensions



KM20-CTF-400A/600A

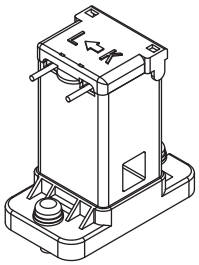


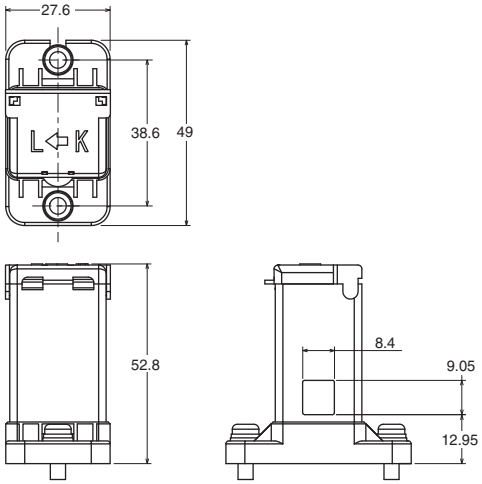
CT Through-hole Dimensions



CT Through-hole Dimensions

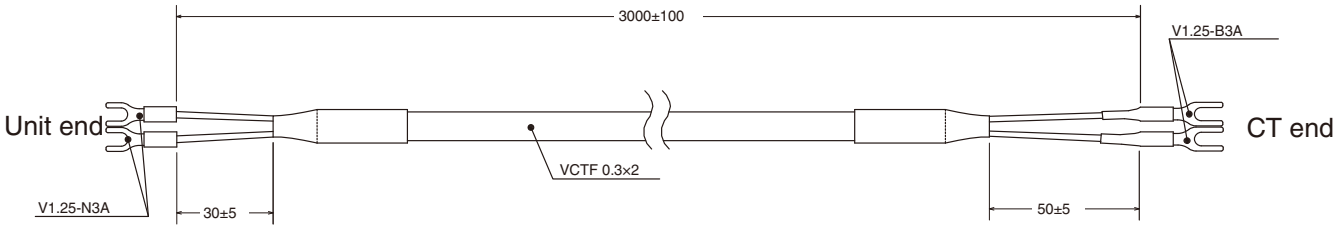
KM20-CTB-5A/50A





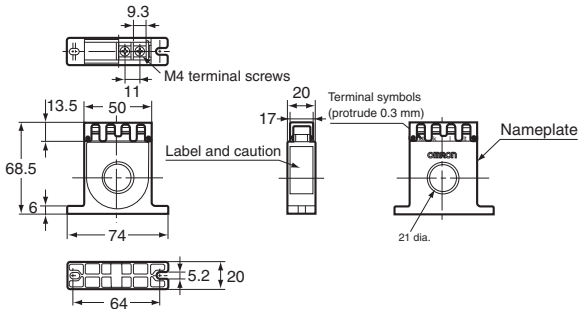
CT Cable

KM20-CTF-CB3 (Special CT cable)

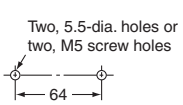


Zero-phase Current Transformers (Compatible ZCTs)

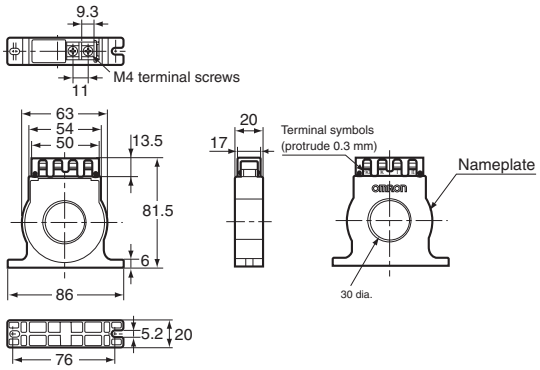
Indoor, through-hole
OTG-L21 (50A)



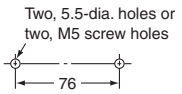
Installation Hole Dimensions



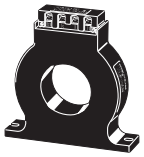
Indoor, through-hole
OTG-L30 (100A)

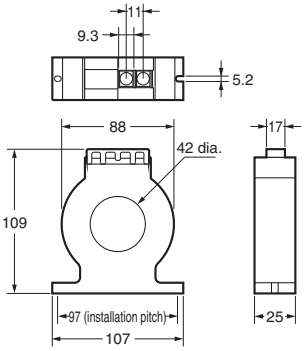


Installation Hole Dimensions

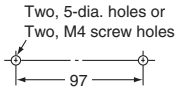


Indoor, through-hole
OTG-L42 (200A)

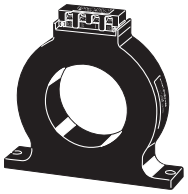


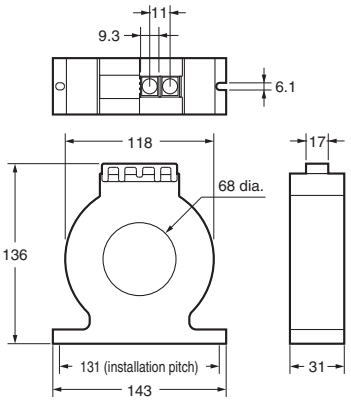


Installation Hole Dimensions

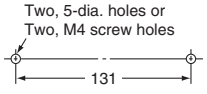


Indoor, through-hole
OTG-L68 (400A)

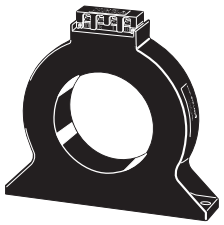


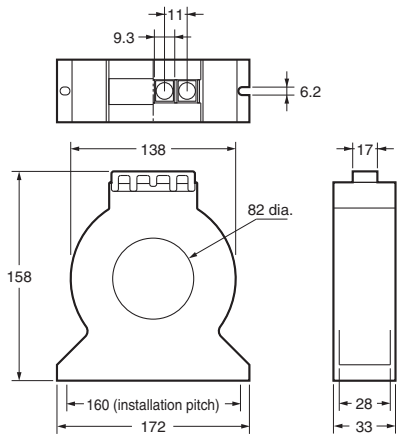


Installation Hole Dimensions

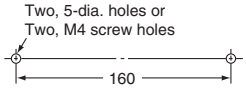


Indoor, through-hole OTG-L82 (600A)

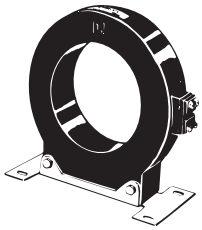


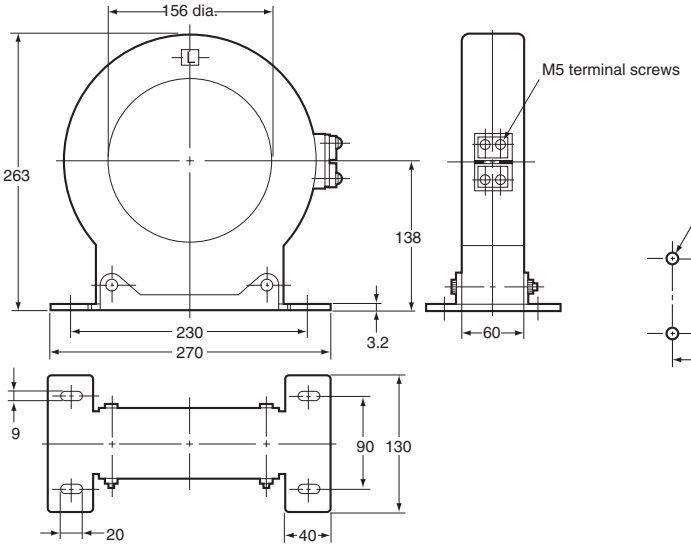


Installation Hole Dimensions

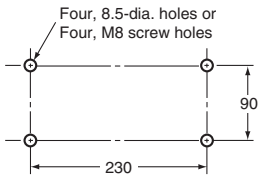


Indoor, through-hole OTG-L156 (1,000A)

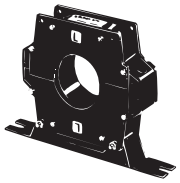


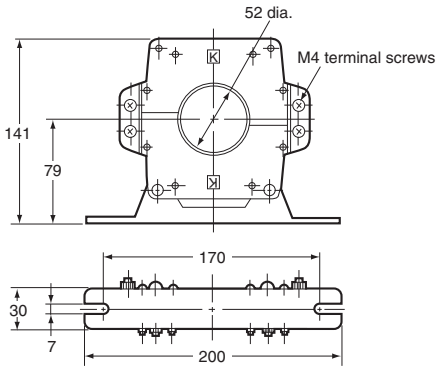


Installation Hole Dimensions

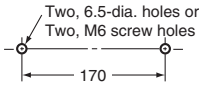


Indoor, split-type OTG-CN52 (200A)

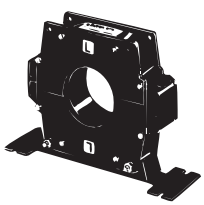


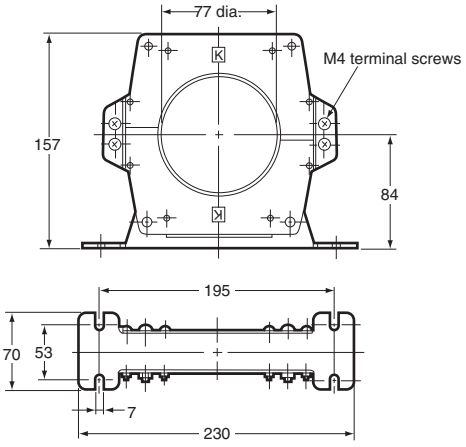


Installation Hole Dimensions

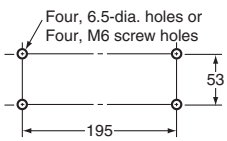


Indoor, split-type OTG-CN77 (400A)

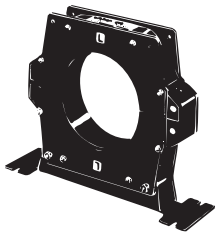


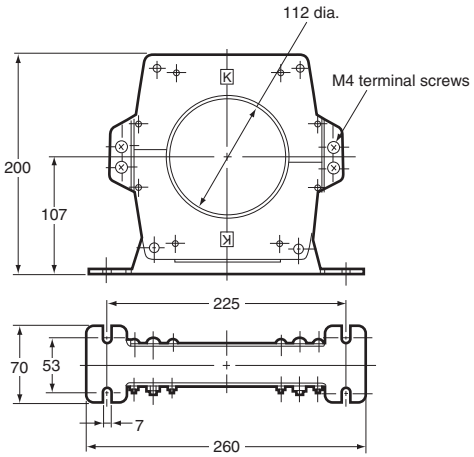


Installation Hole Dimensions

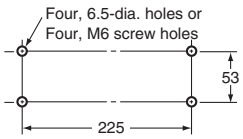


Indoor, split-type
OTG-CN112 (600A)

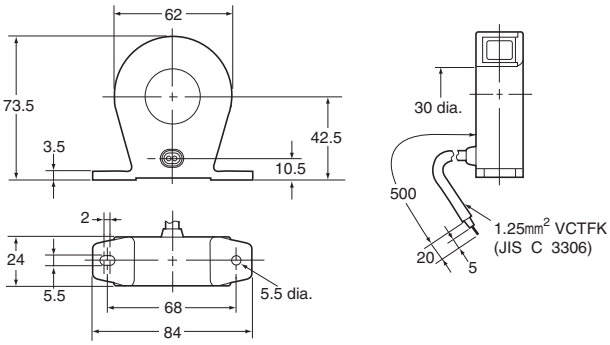




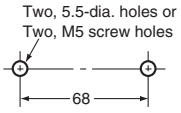
Installation Hole Dimensions



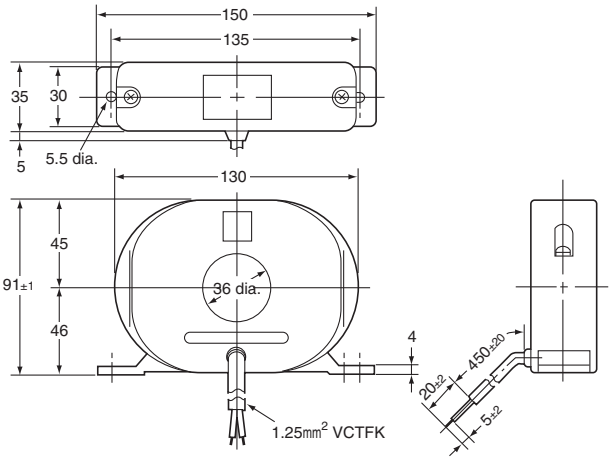
Outdoor, through-hole
OTG-LA30W (100A)



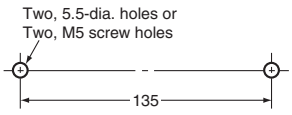
Installation Hole Dimensions



Outdoor, split-type
OTG-CN36W (150A)



Installation Hole Dimensions

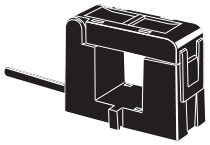


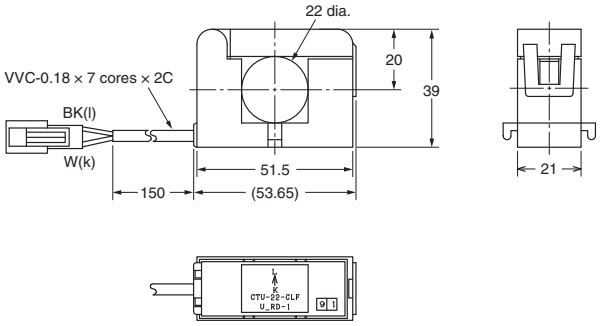
Largest Applicable Wire Sizes for CTs

Model	Rated current	Power cable: Through-hole diameter	600-V vinyl-insulated cable (IV): 2 wires	600-V vinyl-insulated cable (IV): 3 wires	VVR cable: 2 wires	VVR cable: 3 wires
OTG-L21	**50 A**	**21 mm**	22 mm²	14 mm²	8 mm²	5.5 mm²
OTG-L30	**100 A**	**30 mm**	60 mm²	38 mm²	38 mm²	38 mm²
OTG-L42	**200 A**	**42 mm**	100 mm²	100 mm²	100 mm²	60 mm²
OTG-L68	**400 A**	**68 mm**	400 mm²	325 mm²	325 mm²	250 mm²
OTG-L82	**600 A**	**82 mm**	500 mm²	500 mm²	400 mm²	400 mm²
OTG-L156	**1,000 A**	**156 mm**	500 mm²	500 mm²	1,000 mm²	1,000 mm²
OTG-CN52	**200 A**	**52 mm**	200 mm²	200 mm²	150 mm²	100 mm²
OTG-CN77	**400 A**	**77 mm**	500 mm²	400 mm²	400 mm²	325 mm²
OTG-CN112	**600 A**	**112 mm**	500 mm²	500 mm²	1,000 mm²	1,000 mm²
OTG-LA30W	**100 A**	**30 mm**	60 mm²	38 mm²	38 mm²	38 mm²
OTG-CN36W	**150 A**	**36 mm**	60 mm²	38 mm²	60 mm²	38 mm²

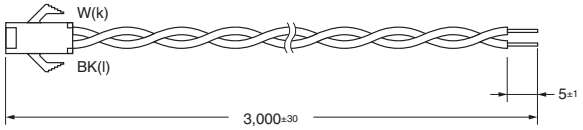
Current Transformer for Ground Wires

Indoor, split-type
K6ER-CN22 (2A)

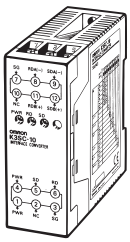


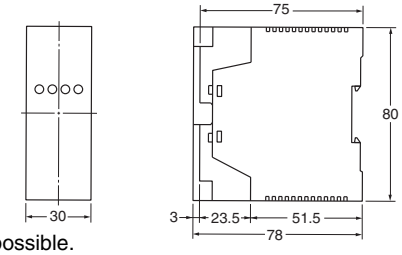


The following connection cable is included.

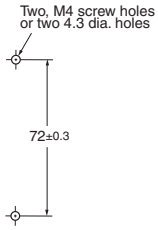


Communications Interface Converter
K3SC-10



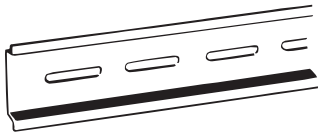


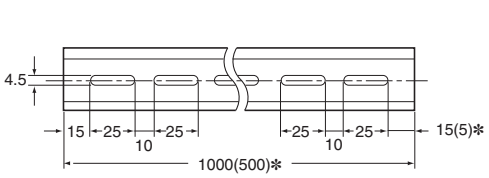
Mounting Hole Dimensions for Direct Mounting

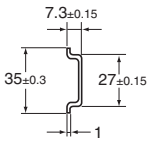


Note: DIN Track mounting is also possible.

DIN Track
PFP-100N
PFP-50N





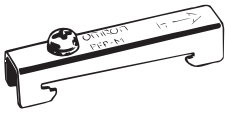


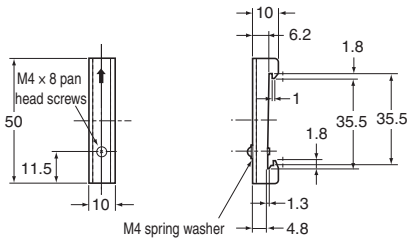
Model
PFP-100N
PFP-50N

*The dimensions for the PFP-50N DIN Track are given in parenthesis.

Clamp (End Plate)

PFP-M





Model
PFP-M

Operating Procedure

Workflow to Prepare for Application

Initial Settings

- **Communications protocol and slave ID settings . . . . . Refer to *Nomenclature* on page 13**
- **Initializing settings . . . . . Implement initialization with USB communications.**
- **Initial settings with the Setup Software . . . . . Implement the settings with USB communications or RS-485 communications.**

Note: 1. Apply the specified power supply voltage if you use RS-485 communications to make the settings.
2. There are no RS-485 communications terminals on CT Expansion Units or ZCT Expansion Units. Use USB communications or make the settings through the Measurement Master Unit.

⇩

Connections

- **Use the horizontal connection hooks to connect the Unit cases to each other.**
- **Connect the Units to each other with the link connectors.**

⇩

Installation

- **Mount the KE1 Units to a DIN Track or on a wall.**

Note: If you connect more than one Unit together, install them on a DIN Track.

⇩

Wiring

- **Wire the Units starting from the bottom of the terminal block.**

Main Functions

Functions

Yes: Function is supported. ---: Function is not supported.

		Measurement Master Units (1 Unit max.)		Function Slaves (4 Units max.)		CT Expansion Slaves (4 Units max.)		Communications Slaves (1 Unit max.)
		KE1-PGR1C-FLK (Power/ Earth Leakage Monitor Unit)	KE1-PVS1C-FLK (Power/ Momentary Voltage Sag Monitor Unit)	KE1-VSU1B-FLK (Momentary Voltage Sag Monitor Unit)	KE1-VAU1B-FLK (Voltage/ Current Monitor Unit)	KE1-CTD8E (CT Expansion Unit)	KE1-CTD8E (ZCT Expansion Unit)	KE1-DRT-FLK (DeviceNet Communications Unit)
Measurement functions	Active power	Yes	Yes	---	---	Yes	---	---
	Reactive power	Yes	Yes	---	---	Yes	---	---
	Power factor	Yes	Yes	---	---	Yes	---	---
	Current	Yes	Yes	---	Yes	Yes	---	---
	Voltage	Yes	Yes	Yes	Yes	---	---	---
	Frequency	Yes	Yes	Yes	Yes	---	---	---
	Total power consumption	Yes	Yes	---	---	Yes	---	---
Alarm output functions	Momentary voltage sag	---	Yes	Yes	---	---	---	---
	Earth leakage	Yes	---	---	---	---	Yes	---
	Overcurrent/undercurrent	Yes	Yes	---	Yes	Yes	---	---
	Overvoltage/undervoltage	Yes	Yes	Yes	Yes	---	---	---
	Open phase	Yes	Yes	Yes	Yes	---	---	---
	Reversed phases	Yes	Yes	Yes	Yes	---	---	---
Data logging		Yes	Yes	Yes	Yes	---	---	---
Other functions	Setting Special CTs	Yes	Yes	---	Yes	Yes	---	---
	Setting CT ratios	Yes	Yes	---	Yes	Yes	---	---
	Setting VT ratios	Yes	Yes	Yes	Yes	---	---	---
	Low-cut function	Yes	Yes	---	Yes	Yes	Yes	---
	Average count	Yes	Yes	Yes	Yes	Yes	Yes	---
	CT signal detection	Yes	Yes	---	Yes	Yes	---	---
	ZCT signal detection	Yes	---	---	---	---	Yes	---
	DeviceNet communications	---	---	---	---	---	---	Yes

Power Measurement Functions

KE1-PGR1C-FLK/-PVS1C-FLK/-CTD8E

The active power, reactive power, power factor, and total power consumption are measured on the circuits to measure.

By combining the Units with KE1-CTD8E CT Expansion Units, you can measure up to 35 circuits.

(The number of circuits that can be measured depends on the wiring methods of the circuits that are measured.)

Just set the detection values in advance to detect upper and lower limits and save alarms in an alarm history in the Unit.

Also, the KE1-PGR1C-FLK (Power/Earth Leakage Monitor Unit) and KE1-PVS1C-FLK (Power/Momentary Voltage Sag Monitor Unit) Measurement Masters can log various types of measurement data. (The number of days for which data can be logged depends on the logging period.)

The measured power values and alarm records can be sent via communications to a computer or other host system.

Note: You can connect a computer on which OMRON's EasyKM Manager is installed to constantly monitor power and calculate the total demand.

Earth Leakage Monitoring

KE1-PGR1C-FLK/-ZCT8E

Earth leakage from insulation deterioration of the circuits to monitor can be detected.

By combining with KE1-ZCT8E ZCT Expansion Units, you can monitor earth leakage on up to 33 circuits.

If the detected earth leakage current reaches or exceeds the preset value, the detection time and alarm type are stored in the alarm history.

Alarm settings can also be made to output alarms.

The measured earth leakage currents and alarm records can be sent via communications to a computer or other host system.

Note: You can connect a computer on which OMRON's EasyKM Manager is installed to constantly monitor earth leakage and earth leakage trends.

Note: Do not use this function for the secondary side of an inverter.

Momentary Voltage Sag Detection

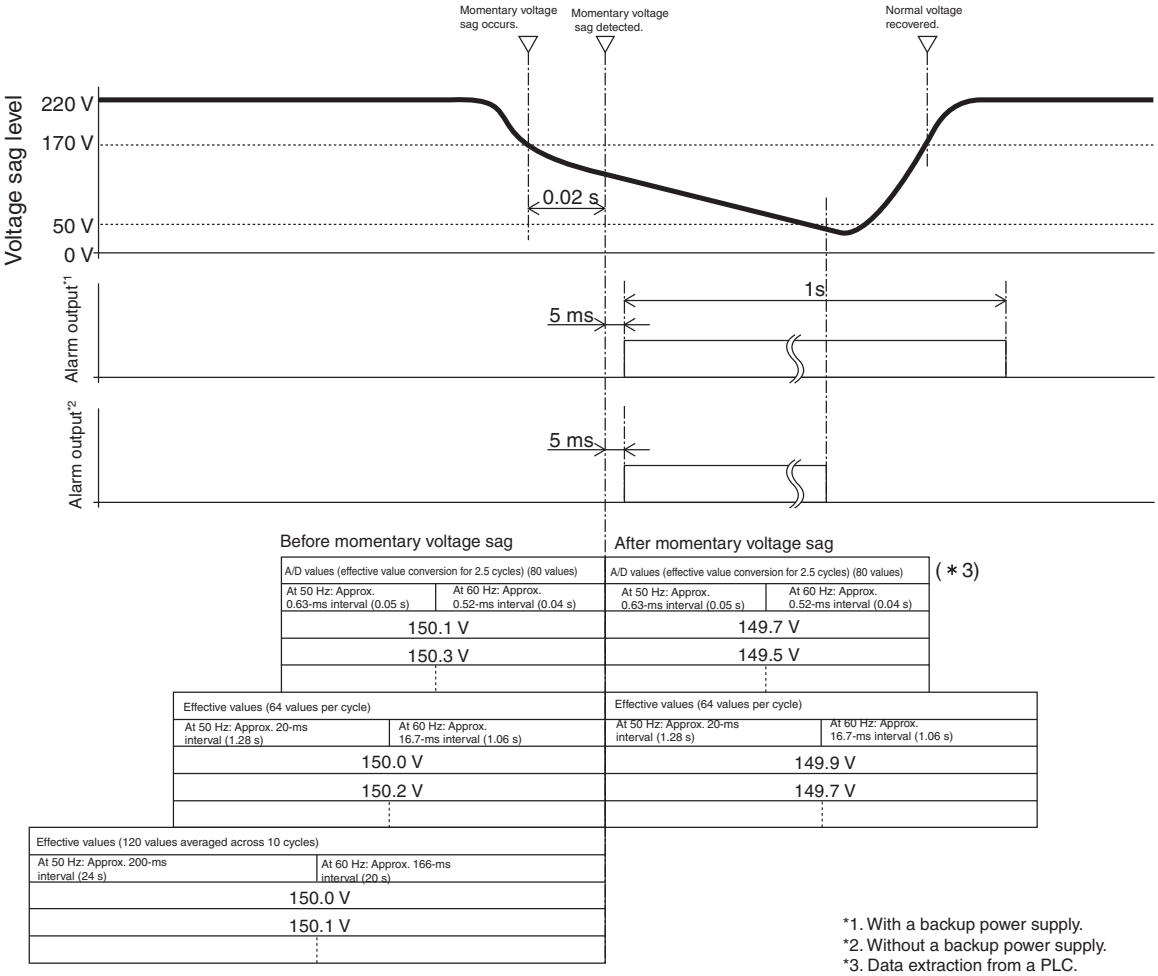
KE1-PVS1C-FLK/-VSU1B-FLK

If a voltage sag that conforms to SEMI-F47 continues for the specified time or longer, it is detected as a momentary voltage sag, the actual voltages before and after it are recorded in memory, and an alarm is recorded in the alarm history.

Alarm settings can also be made to output alarms.

If you connect a UPS or other backup power supply that is not affected by momentary voltage sags, you can output an alarm for up to 1 second after the momentary voltage sag occurs.

Example: If the momentary voltage sag detection function is set to Vrs, the momentary voltage sag detection voltage is set to 170 V, and the momentary voltage sag time is set to 0.02 seconds, a momentary voltage sag is detected when the voltage between the R and S lines of the three-phase, three-wire system if the voltage drops below 170 V for the momentary voltage sag detection time or longer. The output turns ON within 5 ms of when the momentary voltage sag is detected.



*1. With a backup power supply.
*2. Without a backup power supply.
*3. Data extraction from a PLC.

Voltage/Current Monitoring

KE1-PGR1C-FLK/-PVS1C-FLK/-VSU1B-FLK/-VAU1B-FLK/-CTD8E

Note: 1. The KE1-VSU1B-FLK can monitor only voltages.
2. The KE1-CTD8E can monitor only currents.

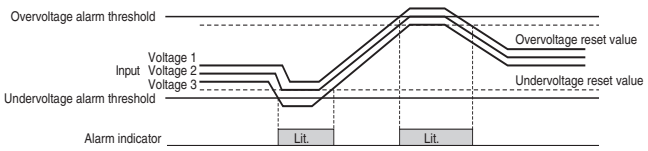
The circuit is monitored for overvoltages, undervoltages, overcurrents, and undercurrents.

With single-phase circuits with three wires or more, you can detect if the voltage or current for any of the phases exceeds a set value.

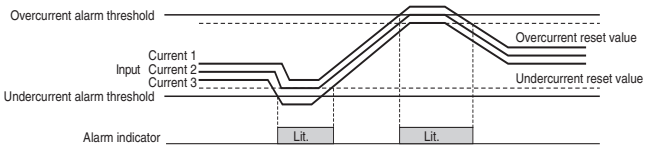
Detection dates and alarm types are recorded in the alarm history.

Alarm settings can also be made to output alarms.

Overvoltages/Undervoltages



Overcurrents/Undercurrents



Open Phase Detection

KE1-PGR1C-FLK/-PVS1C-FLK/-VSU1B-FLK/-VAU1B-FLK

The voltage balance on three-phase, three-wire circuits or three-phase, four-wire circuits is monitored to detect open phases.

An open phase is detected if the following open phase detection condition is met for any of the phases.

Alarm settings can also be made to output alarms.

$$\frac{\text{(Largest error between any phase voltage and the average voltage)}}{\text{Average voltage}} \times 100 \leq 85\%$$

Three-phase Reverse Phase Detection

KE1-PGR1C-FLK/-PVS1C-FLK/-VSU1B-FLK/-VAU1B-FLK

The phase sequence on three-phase, three-wire circuits or three-phase, four-wire circuits is monitored to detect reversed phases. Alarm settings can also be made to output alarms.

Alarm Outputs

Alarm output support depends on the Unit.

Refer to *Functions* on page 35.

You can set alarm outputs for the detection functions.

You can assign alarm outputs to relay or transistor outputs to output signals.

For a momentary voltage sag alarm, you can assign the alarm to a semiconductor relay output to output an alarm. You can set an ON delay to delay the alarm output signal.

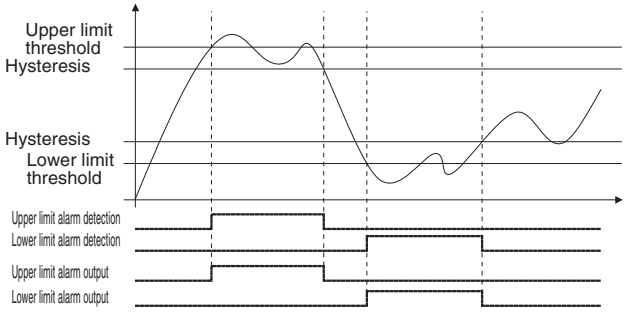
You can set hysteresis to help prevent chattering.

You can set alarm outputs for the detection functions that are given in the following table.

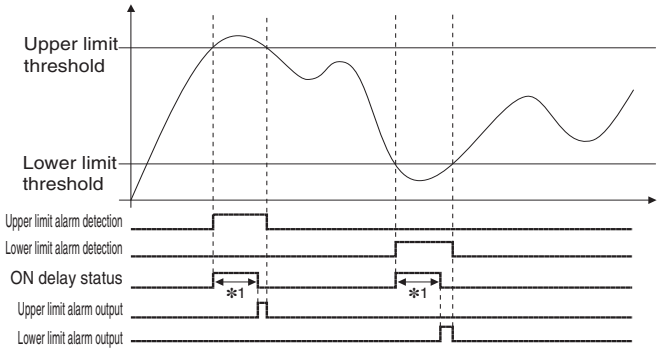
Detection function	Alarm type
Momentary voltage sag	Momentary voltage sag alarm
Earth leakage	Earth leakage alarm
Active/reactive power	Upper limit alarm
	Lower limit alarm
Power factor	Power factor alarm
Voltage monitoring	Overvoltage alarm
	Undervoltage alarm
Current monitoring	Overcurrent alarm
	Undercurrent alarm
Open phase	Open phase alarm
Reversed phases	Reverse phase alarm

Alarm Output Time Charts

1. Hysteresis Setting



2. ON Delay Setting



Saving Data

KE1-PGR1C-FLK/-PVS1C-FLK/-VSU1B-FLK/-VAU1B-FLK/-CTD8E/-ZCT8E

Four types of data is saved in the Unit's memory: backup data, logging data, a momentary voltage sag detection history, and an alarm history. The following table gives the measurement data that is saved, when the data is saved, and how long the data is saved.

Name	Measurement data	Saved when	Number of records/save period	Reading method
Backup data	Total active power consumption Total regenerated energy Total reactive power consumption	5 min	---	RS-485 communications (**✻1**)
Logging data	Various types of total power consumption Voltages Currents Earth leakage currents Power Power factor	5 min, 10 min, 30 min, 1 h, 2 h, 6 h, 12 h, or 24 h	2 days, 4 days, 12 days, 24 days, 49 days, 147 days, 294 days, or 588 days	RS-485 communications (**✻1**)
Momentary voltage sag detection history	Momentary voltage sag occurrence date and time Voltage measurement values before and after occurrence	At momentary voltage sag detection	8 occurrences per condition (4 conditions max.)	Provided tool (KM1_KE1-Setting) (**✻3**) RS-485 communications (**✻1**)
Alarm history	Date and time of occurrence for alarms for trip factors	5 min (**✻2**)	20 alarms	Provided tool (KM1_KE1-Setting) (**✻3**) RS-485 communications (**✻1**)

✻1. Separate software must be created to read the data. For details, refer to the *Model KM1/KE1 Smart Power Monitor Communication Manual for Smart Measurement* and *Monitoring Instrument*.

✻2. After the alarms are reset, alarms are saved every 5 minutes starting from 0 hours on the Unit's clock.

✻3. For details, refer to *KM1/KE1- Setting Tool*.

Special CTs

KE1-PGR1C-FLK (Power/Earth Leakage)	KE1-PVS1C-FLK (Power/Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Yes	Yes	Yes	Yes	Yes	No

Yes: Setting, No: No setting

Set the Special CT to use.
The Special CTs are listed below.

Split-type CTs

CT model	Rating
KM20-CTF-5A	5 A
KM20-CTF-50A	50 A
KM20-CTF-100A	100 A
KM20-CTF-200A	200 A
KM20-CTF-400A	400 A
KM20-CTF-600A	600 A

Through-hole (panel-installed) CTs

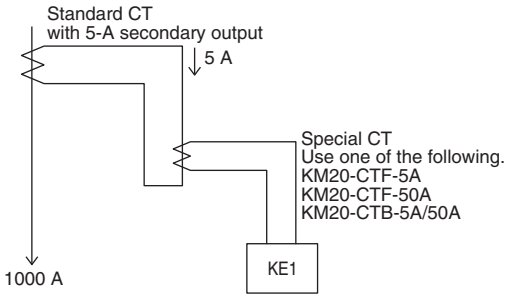
CT model	Rating
KM20-CTB-5A/50A	5 A/50 A

CT Ratios

KE1-PGR1C-FLK (Power/Earth Leakage)	KE1-PVS1C-FLK (Power/Momentary Voltage Sag)	KE1-VSU1B-FLK (Momentary Voltage Sag)	KE1-VAU1B-FLK (Voltage/Current)	KE1-CTD8E (CT Expansion)	KE1-ZCT8E (ZCT Expansion)
Yes	Yes	No	Yes	Yes	No

Yes: Setting, No: No setting

You can set the CT ratio for a standard CT to measure currents that are higher than the ratings of the Special CTs.
If you combine Special CTs with previous installed standard CTs, set the CT ratio of the standard CTs.
To use a Special CT with a previously installed standard CT, combine it with the KM20-CTF-5A, or combine it with the KM20-CTB-5A/50A (5 A on primary side).



Setting CT Ratios

(KE1-PGR1C-FLK, KE1-PVS1C-FLK, KE1-VAU1B-FLK, or KE1-CTD8E)
Set the CT ratio if you use a commercially available standard CT.
You can combine one of the following CTs with a standard CT to measure currents that are 600 A or higher.
KM20-CTF-5A
KM20-CTF-50A
KM20-CTF-5/50A

Setting VT Ratios

KE1-PGR1C-FLK/-PVS1C-FLK/-VSU1B-FLK/-VAU1B-FLK
Set the VT ratio if you use a commercially available VT.
You can use commercially available VTs to measure voltages that are higher than the voltage ratings.

Low-cut Current and Earth Leakage Low-cut Current

KE1-PGR1C-FLK/-PVS1C-FLK/-VAU1B-FLK/-CTD8E/-ZCT8E
You can force the measurement value to 0 A if the current flow is lower than the set value.
The effective value is used for detection, so inputs with high crest values, such as for noise, can be cut.

Average Count

KE1-PGR1C-FLK/-PVS1C-FLK/-VSU1B-FLK/
-VAU1B-FLK/-CTD8E/-ZCT8E
You can average measurement values to stabilize them.
You can average active power values, reactive power values, power factors, currents, and voltages.

CT and ZCT Signal Detection

KE1-PGR1C-FLK/-PVS1C-FLK/-VAU1B-FLK/-CTD8E/-ZCT8E
An indicator is lit then a signal from a CT or ZCT is detected so that you can confirm connection status and signal status.
An indicator lights for the following condition.

- When the signal input is 2% or higher of the rated current for 10 seconds or longer.

Time

KE1-PGR1C-FLK/-PVS1C-FLK/-VSU1B-FLK/-VAU1B-FLK
The time is used for timestamps for measurement data and the alarm history. You can set a year between 2012 and 2099 (adjusted for leap years) and the data is backed up for power interruptions lasting up to 7 days.

Initialization

KE1-PGR1C-FLK/-PVS1C-FLK/-VSU1B-FLK/
-VAU1B-FLK/-DRT-FLK/-CTD8E/-ZCT8E
The following table gives the types of initialization that you can perform.
The previous data cannot be recovered after initialization.

Initialized item	Initialized data
Initialize maximum/minimum values	Initializes the maximum and minimum values.
Initialize total power consumptions	Initializes the backup data.
Initialize measurement log	Initializes the items that are to be logged
Initialize alarm history	Initializes the alarm history.
Initialize settings	Initializes all parameters except for the Time Setting parameter.
Initialize all	Initializes all parameters except for the Time Setting parameter.

Safety Precautions

- **Be sure to read the precautions for all E5CC/E5EC/E5AC/E5DC models in the website at: http://www.ia.omron.com/.**

Warning Indications

⚠ CAUTION	**Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.**
Precautions for Safe Use	**Supplementary comments on what to do or avoid doing, to use the product safely.**
Precautions for Correct Use	**Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.**

Meaning of Product Safety Symbols

	**Used for general CAUTION, WARNING, or DANGER precautions for which there is no specified symbol. (This symbol is also used as the alerting symbol, but shall not be used in this meaning on the product.)**
	**Used for general mandatory action precautions for which there is no specified symbol.**
	**Used to warn of the risk of explosion under specific conditions.**
	**Used to warn of the risk of electric shock under specific conditions.**
	**Used to indicate prohibition when there is a risk of minor injury from electrical shock or other source if the product is disassembled.**

⚠ CAUTION

Property damage may occasionally occur due to fire.
Tighten terminal screws to the specified tightening torque.
The recommended tightening torque is 0.69 to 0.88 N·m. Confirm that the screws are straight (i.e., not at an angle) after tightening them.

Minor or moderate bodily harm or property damage may occasionally occur due to explosion.
Do not use the Units 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.

Destruction or rupture may occasionally occur.
The voltage input circuit and CT secondary circuit are not isolated. If a Special CT is grounded, incorrect wiring will short-circuit the voltage input and the secondary circuit of the CT. To prevent failure, do not ground a Special CT or ZCT.
The Power Monitor uses a Special CT or ZCT. Therefore, correct measurements can be made even if the CT or ZCT is not grounded.

Electric shock may occasionally occur.
Always turn OFF the power supply before connecting CTs.

Electric shock may occasionally occur.
Do not touch any of the terminals while the power is being supplied.

Electric shock may occasionally occur.
Always use a sheathed cable with basic insulation or better for the primary cable clamped by the CT.
If you clamp onto a busbar or other conductive item, cover it with insulation or otherwise provide at least the required basic insulation.

Electrical shock, minor injury, fire, or equipment malfunction may occasionally occur.
Do not attempt to disassemble, modify, or repair any Unit.

Precautions for Safe Use

The following items must be observed to prevent failure to operate and malfunctions of the Units and to prevent adverse effects on performance and functions of the Units.

1. Do not use, store, or transport the Units 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
   - Locations that are subject to direct sunlight.
   - Outdoors or locations that are subject to wind or rain
   - Locations that are affected by static electricity or noise
   - Locations that are subject to water, oil or saltwater.
   - Locations that are subject to corrosive gas (particularly sulfide or ammonia gas)
   - Locations that are subject to dust or iron powder
   - Locations that are affected by electric or magnetic fields
2. When you install DIN tracks, make sure that the screws are tightened securely. Mount the Units securely to the DIN Track. If any Units are loose, vibration or shock can cause the DIN Track, Units, or wires to become disconnected.
3. Use DIN Tracks with a width of 35 mm (OMRON PFP-50N/-100N).
4. Use crimp terminals that are suitable for M3.5 screws to wire the Units.
5. Check the specifications and wiring to be sure there are no mistakes before you turn ON the power supply.
6. Read and understand the Unit manuals before attempting to install, use, or maintain the Units. Electric shock, injury, accidents, failure, or malfunction may occur.
7. Install and suitably label a switch or circuit breaker that complies with relevant requirements of IEC 60947-1 and IEC 60947-3 so that the operator can immediately turn OFF the power supply.
8. Understand the manuals when you set the Units.
9. Install the Units separated as far as possible from devices with strong high-frequency noise or devices that generate surge.
10. Touch grounded metal to discharge any static electricity before touching the Units.
11. To prevent inductive noise, wire the lines connected to the Units separately from power lines carrying high voltages or currents. Do not wire in parallel with or on the same cable as power lines. Other measures for reducing noise include running lines in separate ducts and using shields.
12. Do not install the Units near sources of heat, such as devices with coils or windings.
13. Do not allow metal objects, conductors, or cuttings from

installation work to enter the Units.

14. Do not use solvents, such as paint thinners, to clean the Units. Use commercially available alcohol instead.

15. Use a power supply voltage and wires with suitable specifications for the control power supply and the power supply for inputs and other parts of the system. Failure, burning, or electrical shock may result.

16. If you install a Unit on a wall, install it so that the screws are not loose. If any Units are loose, vibration or shock may cause the Unit or wires to become disconnected.

17. If you use more than one Unit together, slide them together until the horizontal connection hooks audibly lock in place.

18. If you mount the Units on DIN Track, slide them until the DIN hooks audibly lock in place.

19. Use only the Special CTs, Special ZCTs, and Special CT Cable specified by OMRON.

Special CTs

Split-type	**KM20-CTF-5A**	**KM20-CTF-50A**	**KM20-CTF-100A**
	KM20-CTF-200A	**KM20-CTF-400A**	**KM20-CTF-600A**
Through-hole	**KM20-CTB-5A/50A**		
For ground line	**K6ER-CN22 (with cable)**		

Special ZCTs

Split-type	**OTG-CN52**	**OTG-CN77**	**OTG-CN112**
	OTG-CN36W		
Through-hole	**OTG-L21**	**OTG-L30**	**OTG-L42**
	OTG-L68	**OTG-L82**	**OTG-L156**
	OTG-LA30W		

Special CT Cable: KM20-CTF-CB3 (3 m) (This Cable can also be used with the Special ZCTs.)

20. Do not use the Units for measurement on the secondary side of an inverter.

21. Do not block the ventilation holes in or the areas around the Units to ensure proper dissipation of heat.

22. Check all terminal numbers before wiring. Do not connect anything to unused terminals.

23. The Units are a Class A products (for use in industrial environments). In residential environment areas, they may cause radio interference. If they cause radio interference, the user may be required to take adequate measures to reduce interference.

24. Use the Special CTs and Special ZCTs at a low voltage of 600 V or less.

Installation Precautions

Maintaining Product Life

Use the KE1 within the following temperature and humidity ranges.
Temperature: −10 to 55°C (with no icing or condensation)
Humidity: 25% to 85%
Do not let the ambient temperature around the Units exceed 55°C. (This is not the ambient temperature around the panel.)
Some of the electronic components used in the Units have limited service lives. The life of these components depends on the ambient temperature. The service lives will be shorter at higher temperatures and longer at lower temperatures. The life of the Units can thus be extended by lowering the internal temperature. If more than one KE1 Unit is mounted side by side or top to bottom, you must consider using forced cooling, such as fans that circulate air around the Units.

Noise Countermeasures

To prevent inductive noise, wire the lines connected to the terminal block on the Units separately from power lines carrying high voltages or currents. Do not wire in parallel with or on the same cable as power lines. Other measures for reducing noise include running lines in separate ducts and using shields.
Attach surge absorbers or noise filters to nearby equipment that generates noise (particularly equipment with a high inductance component, such as motors, transformers, or magnetic coils).
Install the Units as far as possible away from devices with strong high-frequency noise (such a high-frequency welders or sewing machines) or devices that generate surge.

Precautions for Correct Use

1. Make sure that all parameters are set suitably for the monitor targets.

2. Do not pull on the cables.

3. When discarding the Units, dispose of them according to all local laws and ordinances as they apply. Dispose of the Units as industrial waste.

4. When using the Units in an Overvoltage Category III environment, externally install varistors between the power supply and voltage measurement inputs to the Units.

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