Three-phase Voltage and Phase-sequence Phase-loss Relay

K8AK-PM

Ideal for Monitoring 3-phase Power Supplies for Industrial Facilities and Equipment.

- Greater resistance to inverter noise. ***NEW***
- Monitor overvoltages, undervoltages, phase sequence, and phase loss for three-phase 3-wire or 4-wire power supplies with just one Unit.
  Switch setting for 3-phase 3-wire or 3-phase 4-wire power supply.
- Two SPDT output relays, 5 A at 250 VAC (resistive load).
  Output overvoltages and undervoltages using separate relays.
- World-wide power specifications supported by one Unit (switchable).
- Output status can be monitored using LED indicator.

Refer to *Safety Precautions* on page 10.
Refer to page 8 to 9 for commonly asked questions.

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

Ordering Information

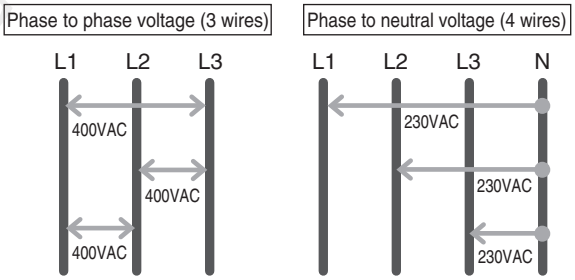
List of Models

Rated input*		Model
3-phase 3-wire mode	200, 220, 230, 240 VAC	**K8AK-PM1**
3-phase 4-wire mode	115, 127, 133, 138 VAC	
3-phase 3-wire mode	380, 400, 415, 480 VAC	**K8AK-PM2**
3-phase 4-wire mode	220, 230, 240, 277 VAC	

Note: Three-phase 3-wire or 4-wire and the input range are switched using a DIP switch.
* The power supply voltage is the same as the rated input voltage.

●Single K8AK Monitors 3-phase Power Supply with 3 or 4 Wires

Monitoring Relays can be used to monitor 3-phase power supplies with 3 or 4 wires simply by changing DIP switch settings.



A Single K8AK Can Monitor a 3-phase Power Supply Anywhere in the World

Reduces Maintenance Parts Inventory

	SW3			ON	OFF	ON	OFF
	SW4			ON	ON	OFF	OFF
K8AK-PM1	SW2	ON	P-N	138 V	133 V	127 V	115 V
		OFF	P-P	240V	230 V	220 V	200 V
K8AK-PM2	SW2	ON	P-N	277 V	240 V	230 V	220 V
		OFF	P-P	480 V	415 V	400 V	380 V

K8AK-PM

Ratings and Specifications

Ratings

Rated input voltage	**K8AK-PM1**	Three-phase, three-wire Mode: 200, 220, 230 and 240 VAC Three-phase, four-wire Mode: 115, 127, 133 and 138 VAC
	K8AK-PM2	Three-phase, three-wire Mode: 380, 400, 415 and 480 VAC Three-phase, four-wire Mode: 220, 230, 240 and 277 VAC
Input load		K8AK-PM1: Approx. 4.4 VA K8AK-PM2: Approx. 4.4 VA
Operating value setting range (OVER, UNDER)		Overvoltage –30% to 25% of rated input voltage Undervoltage –30% to 25% of rated input voltage **Note:** The rated input voltage can be switched using the DIP switch.
Operating value		100% operation at set value
Reset value		5% of operating value (fixed)
Reset method		Automatic reset
Operating time setting range (T)	**Overvoltage/undervoltage**	0.1 to 30 s
	Phase sequence	0.1 s±0.05 s
	Phase loss	0.1 s max.
Power ON lock time (LOCK)		1 s or 5 s (Switched using DIP switch.)
Indicators		Power (PWR): Green, Relay output (RY): Yellow, OVER/UNDER: Red
Output relays		Two SPDT relays (NC operation)
Output relay ratings		Rated load Resistive load 5 A at 250 VAC 5 A at 30 VDC Maximum switching capacity: 1,250 VA, 150 W Minimum load: 5 VDC, 10 mA (reference values) Mechanical life: 10 million operations min. Electrical life: 5 A at 250 VAC or 30 VDC: 50,000 operations 3 A at 250 VAC/30 VDC: 100,000 operations
Ambient operating temperature		–20 to 60°C (with no condensation or icing)
Storage temperature		–25 to 65°C (with no condensation or icing)
Ambient operating humidity		25% to 85% (with no condensation)
Storage humidity		25% to 85% (with no condensation)
Altitude		2,000 m max.
Terminal screw tightening torque		0.49 to 0.59 N·m
Terminal wiring method		Recommended wire Solid wire: 2.5 mm^2 Twisted wires: AWG16, AWG18 **Note:** **1.** Ferrules with insulating sleeves must be used with twisted wires. **2.** Two wires can be twisted together. Recommended ferrules AI 1,5-8BK (for AWG16) manufactured by Phoenix Contact AI 1-8RD (for AWG18) manufactured by Phoenix Contact AI 0,75-8GY (for AWG18) manufactured by Phoenix Contact
Case color		N1.5
Case material		PC and ABS, UL 94 V-0
Weight		Approx. 150 g
Mounting		Mounts to DIN Track.
Dimensions		22.5 × 90 × 100 mm (W×H×D)

Specifications

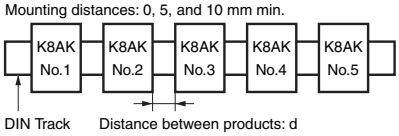
Input frequency		50/60 Hz
Overload capacity		Continuous input at 115% of maximum input, 10 s at 125% (up to 600 VAC).
Repeat accuracy	**Operating value**	±0.5% full scale (at 25°C and an ambient humidity of 65% at the rated power supply voltage, DC and 50/60 Hz sine wave input)
	Operating time	±50 ms (at 25°C and 65% humidity, rated power supply voltage)
Applicable standards	**Conforming standards**	EN 60947-5-1 Installation environment (pollution level 2, installation category III)
	EMC	EN 60947-5-1
	Safety standards	UL 508 (Recognition), Korean Radio Waves Act (Act 10564), CSA: C22.2 No.14, CCC: GB/T 14048.5
Insulation resistance		20 MΩ Between all external terminals and the case Between all input terminals and all output terminals
Dielectric strength		2,000 VAC for 1 min Between all external terminals and the case Between all input terminals and all output terminals
Noise immunity		1,500 V power supply terminal common/normal mode Square-wave noise of ±1 μs/100 ns pulse width with 1-ns rise time
Vibration resistance		Frequency: 10 to 55 Hz, 0.35-mm single amplitude 10 sweeps of 5 min each in X,Y, and Z directions
Shock resistance		100 m/s^2, 3 times each in 6 directions along 3 axes
Degree of protection		Terminals: IP20

●Relationship of Mounting Distance between K8AK-PM Relays and Ambient Temperature (Reference Values)

The following diagram shows the relationship between the mounting distances and the ambient temperature.
If the relay is used with an ambient temperature that exceeds these values, the temperature of the K8AK may rise and shorten the life of the internal components.

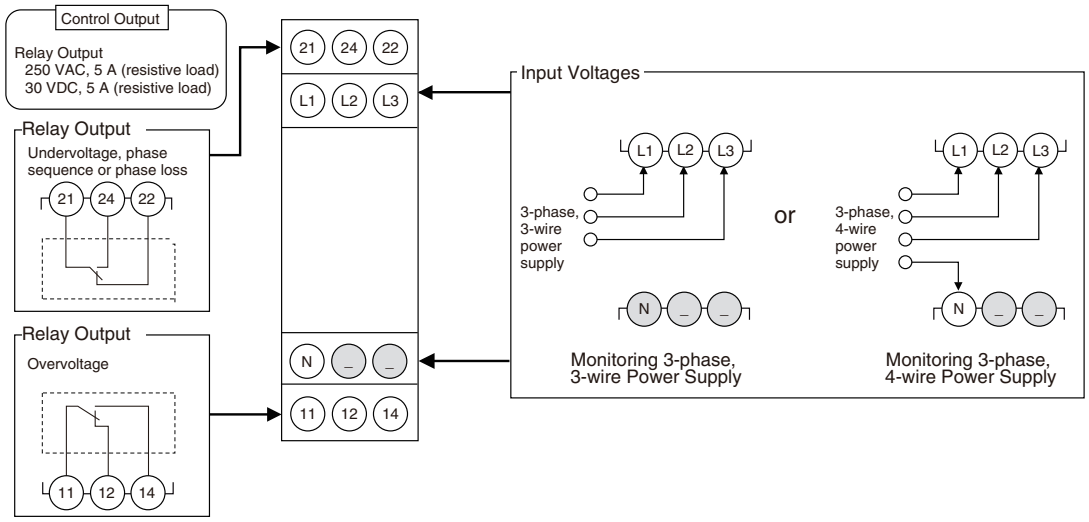
Test method

Sample: K8AK-PM
Mounting distances: 0, 5, and 10 mm min.



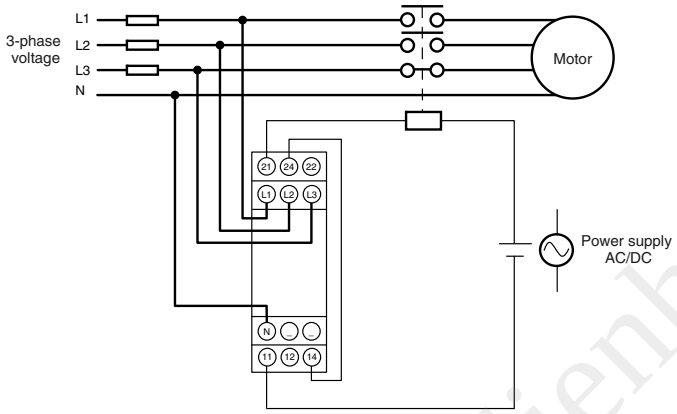
Connections

Terminal Diagram



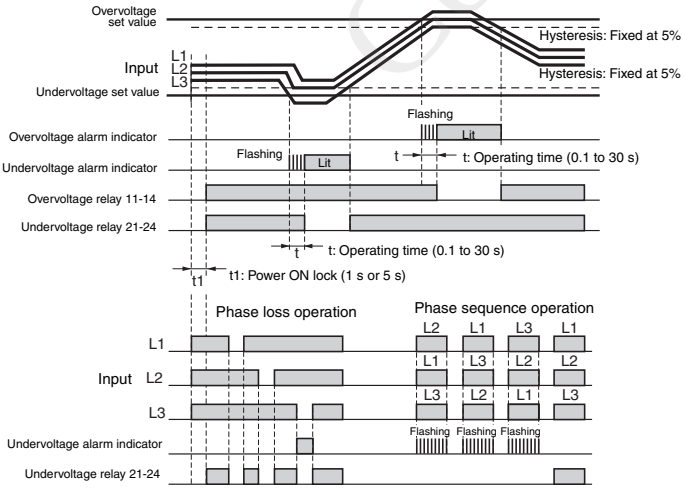
Note: 1. Do not connect anything to terminals that are shaded in gray.
2. Use the recommended ferrules if you use twisted wires.

Wiring Example



Timing Charts

●Overvoltage/Undervoltage and Phase Sequence/Phase Loss Operation Diagram



Note: 1. The K8AK-PM□ output relay is normally operative.
2. The power ON lock prevents unnecessary alarms from being generated during the instable period when the power is first turned on. There is no relay output during timer operation.
3. Phase loss is detected by L1, L2, and L3 voltage drops. A phase loss will exist if any of the phases drops below 60% of the rated input.

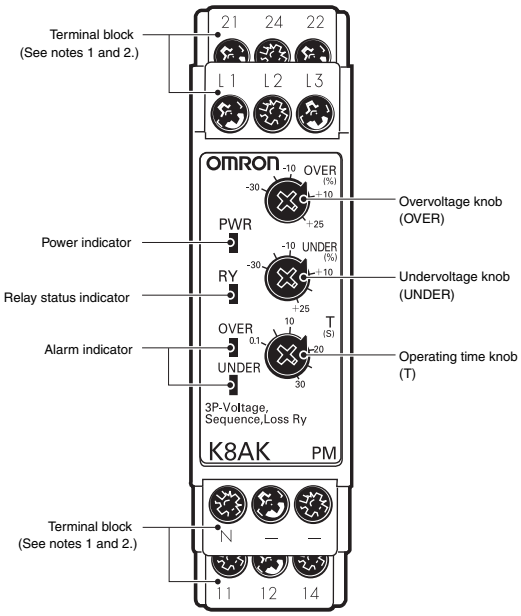
Operation Indicators

Item		Display			Contact operation	
		Ry indicator	Over indicator	Under indicator	Over relay	Under relay
Overvoltage		ON	ON	OFF	OFF	ON
Undervoltage		ON	OFF	ON	ON	OFF
Phase loss		OFF	OFF*1	ON*2	OFF *1	OFF
Phase sequence	**Incorrect phase**	ON	OFF	Flashing*3	ON	OFF
	Correct phase	ON	OFF	OFF	ON	ON

*1 Over_Ry turns OFF when phase loss is detected.
*2 L1 and L2 are also used for the power supply. If the voltage becomes very low, the indicator will turn OFF.
*3 The indicator will flash once per second after an incorrect phase is detected and once per 0.5 second during the detection time.

Nomenclature

Front



●Indicators

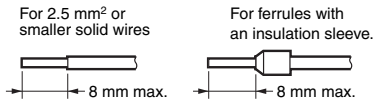
Item		Meaning
Power indicator (PWR: Green)		Lit when power is being supplied*
Relay status indicator (RY: Yellow)		Lit when relay is operating (normally lit).
Alarm indicator	Overvoltage: Red	Lit when there is an overvoltage. The indicator flashes to indicate the error status after the overvoltage has exceeded the set value while the operating time is being clocked.
	Undervoltage: Red	• Lit when there is an undervoltage or phase loss. The indicator flashes to indicate the error status after the undervoltage has exceeded the set value while the operating time is being clocked. • Lit when there is a phase sequence error.

* The input across L1 and L2 is used for the internal power supply. Therefore, the power indicator will not be lit if there is no input across L1 and L2.

●Setting Knobs

Item	Usage
Overvoltage knob (OVER)	Can be set between –30% and 25% of the rated input.
Undervoltage knob (UNDER)	Can be set between –30% and 25% of the rated input.
Operating time knob (T)	Used to set the operating time to 0.1 to 30 s.

Note: 1. Use either a solid wire of 2.5 mm^2 maximum or a ferrule with insulating sleeve for the terminal connection.
The length of the exposed current-carrying part inserted into the terminal must be 8 mm or less to maintain dielectric strength after connection.



Recommended ferrules
Phoenix Contact
- Al 1,5-8BK (for AWG16)
- Al 1-8RD (for AWG18)
- Al 0,75-8GY (for AWG18)

2. Screw tightening torque: 0.49 to 0.59 N·m
3. The terminal screw is a Pozidriv screw.

Operation Methods

Connections

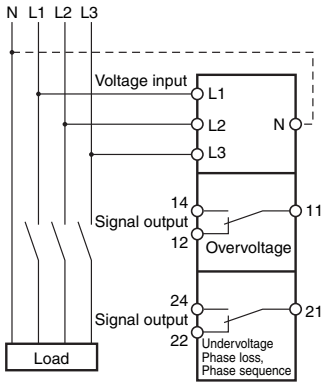
●Input

Connect to L1, L2, and L3 (for three-phase three-wire mode) or L1, L2, L3, and N (for three-phase four-wire mode), depending on the mode selected using pin 2 on the DIP switch.
The Unit will not operate correctly if the DIP switch setting and the wiring do not agree.
Make sure the phase sequence is wired correctly. The Unit will not operate normally if the phase sequence is incorrect.

●Outputs

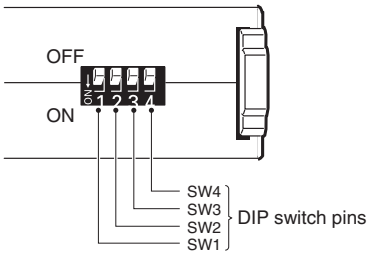
Terminals 11, 12, and 14 are the output terminals for overvoltage (SPDT).
Terminals 21, 22, and 24 are the output terminals for undervoltage, phase loss, and phase sequence (SPDT).

* Use the recommended ferrules if you use twisted wires.



DIP Switch Settings

The power ON lock time, number of wires, and rated voltage are set using the DIP switch located on the bottom of the Unit.



●DIP Switch Functions

K8AK-PM1

Pin	OFF ● ↑ / ON ○ ↓		1	2	3	4
Power ON lock time	1 s		●	---	---	---
	5 s		○	---	---	---
Number of wires	3-wire 3-phase		---	●	---	---
	4-wire 3-phase		---	○	---	---
Rated voltage	3-wire 3-phase	4-wire 3-phase				
	200 V	115 V	---	---	●	●
	220 V	127 V	---	---	○	●
	230 V	133 V	---	---	●	○
	240 V	138 V	---	---	○	○

Note: All pins are set to OFF at the factory.

K8AK-PM2

Pin	OFF ● ↑ / ON ○ ↓		1	2	3	4
Power ON lock time	1 s		●	---	---	---
	5 s		○	---	---	---
Number of wires	3-wire 3-phase		---	●	---	---
	4-wire 3-phase		---	○	---	---
Rated voltage	3-wire 3-phase	4-wire 3-phase				
	380 V	220 V	---	---	●	●
	400 V	230 V	---	---	○	●
	415 V	240 V	---	---	●	○
	480 V	277 V	---	---	○	○

Note: All pins are set to OFF at the factory.

Setting Method

●Overvoltage

The overvoltage knob (OVER) is used to set the overvoltage threshold.
The overvoltage can be set to between −30% and 25% of the rated input voltage.
Turn the knob while there is an input to the input terminals until the alarm indicator flashes (when the set value and the input have reached the same level.)
Use this as a guide to set the voltage.
The rated input depends on the model and DIP switch setting.

Example: K8AK-PM1 with Pin 2 Turned OFF (Three-phase, Three-wire Mode) and Pins 3 and 4 Turned OFF (Rated Voltage of 200 V)
The rated input voltage is 200 VAC and the setting range is 140 to 250 V.

●Undervoltage

Undervoltage is set using the undervoltage knob (UNDER).
The undervoltage can be set to between −30% and 25% of the rated input.
Turn the knob while there is an input to the input terminals until the alarm indicator flashes (when the set value and the input have reached the same level.)
Use this as a guide to set the voltage.
The rated input depends on the model and DIP switch setting.

Example: K8AK-PM1 with Pin 2 Turned OFF (Three-phase, Three-wire Mode) and Pins 3 and 4 Turned OFF (Rated Voltage of 200 V)
The rated input voltage is 200 VAC and the setting range is 140 to 250 V.

●Operating Time

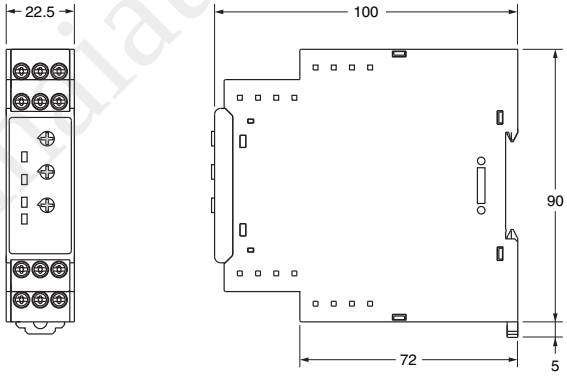
The operating time is set using the operating time knob (T).
The operating time can be set to between 0.1 and 30 s.
If the input exceeds (or drops lower than) the voltage set value, the alarm indicator will start flashing for the set period and then stay lit.

Dimensions

(Unit: mm)

Three-phase Voltage and Phase-sequence Phase-loss Relays

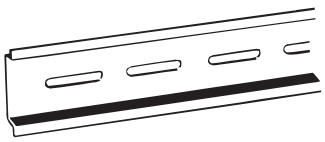
K8AK-PM1
K8AK-PM2

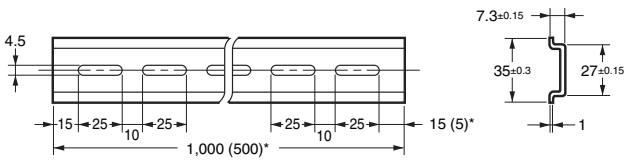


Optional Parts for DIN Track Mounting

●DIN Tracks

PFP-100N
PFP-50N





*Dimensions in parentheses are for the PFP-50N.