

# Single-phase Overvoltage/Undervoltage Relay

## K8AK-VW

### Ideal for Voltage Monitoring for Industrial Facilities and Equipment.

- Monitor for overvoltages and undervoltages simultaneously. Separate settings and outputs supported for overvoltages and undervoltages.
- Manual resetting and automatically resetting supported by one Relay.
- Pre-alarm Monitoring Mode.
- Two SPDT output relays, 5 A at 250 VAC (resistive load).
- Process control signal (0 to 10 V) and current splitter input supported.
- Output status can be monitored using LED indicator.
- Input frequency of 40 to 500 Hz supported.
- Inputs are isolated from the power supply.



Refer to *Safety Precautions* on page 9.  
Refer to page 8 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

| Setting range     | Power supply voltage | Model                |
|-------------------|----------------------|----------------------|
| 1 to 10 V AC/DC   | 24 VAC/DC            | K8AK-VW2 24 VAC/DC   |
| 3 to 30 V AC/DC   | 100 to 240 VAC       | K8AK-VW2 100-240 VAC |
| 15 to 150 V AC/DC |                      |                      |
| 20 to 200 V AC/DC | 24 VAC/DC            | K8AK-VW3 24 VAC/DC   |
| 30 to 300 V AC/DC | 100 to 240 VAC       | K8AK-VW3 100-240 VAC |
| 60 to 600 V AC/DC |                      |                      |

## Ratings and Specifications

### Input Range

| Model    | Range*           | Connection terminal | Setting range     | Input impedance | Overload capacity                                                          |
|----------|------------------|---------------------|-------------------|-----------------|----------------------------------------------------------------------------|
| K8AK-VW2 | 0 to 10 V AC/DC  | V1-COM              | 1 to 10 V AC/DC   | Approx. 120 kΩ  | Continuous input at 115% of maximum input.<br>10 s at 125% (up to 600 VAC) |
|          | 0 to 30 V AC/DC  | V2-COM              | 3 to 30 V AC/DC   | Approx. 320 kΩ  |                                                                            |
|          | 0 to 150 V AC/DC | V3-COM              | 15 to 150 V AC/DC | Approx. 1.6 MΩ  |                                                                            |
| K8AK-VW3 | 0 to 200 V AC/DC | V1-COM              | 20 to 200 V AC/DC | Approx. 1.2 MΩ  |                                                                            |
|          | 0 to 300 V AC/DC | V2-COM              | 30 to 300 V AC/DC | Approx. 1.7 MΩ  |                                                                            |
|          | 0 to 600 V AC/DC | V3-COM              | 60 to 600 V AC/DC | Approx. 3.1 MΩ  |                                                                            |

\* The range is selected using connected terminals.

## Ratings

|                                             |                       |                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply voltage                        | Isolated power supply | 24 VAC/DC<br>100 to 240 VAC                                                                                                                                                                                                                                                                                                                                                                                           |
| Power consumption                           |                       | 24 VAC/DC: 2.0 VA/1.1 W max.<br>100 to 240 VAC: 4.6 VA max.                                                                                                                                                                                                                                                                                                                                                           |
| Operating value setting range (AL1 and AL2) |                       | 10% to 100% of the maximum value of the setting range<br>K8AK-VW2: 1 to 10 V AC/DC<br>3 to 30 V AC/DC<br>15 to 150 V AC/DC<br>K8AK-VW3: 20 to 200 V AC/DC<br>30 to 300 V AC/DC<br>60 to 600 V AC/DC                                                                                                                                                                                                                   |
| Operating value                             |                       | 100% operation at set value                                                                                                                                                                                                                                                                                                                                                                                           |
| Reset value                                 |                       | 5% of operating value (fixed)                                                                                                                                                                                                                                                                                                                                                                                         |
| Reset method                                |                       | Manual reset/automatic reset (switchable)<br><b>Note:</b> Manual reset: Turn OFF power supply for 1 s or longer.                                                                                                                                                                                                                                                                                                      |
| Operating time setting range (T)            |                       | 0.1 to 30 s                                                                                                                                                                                                                                                                                                                                                                                                           |
| Power ON lock time (LOCK)                   |                       | 1 s or 5 s (Switched using DIP switch.)                                                                                                                                                                                                                                                                                                                                                                               |
| Indicators                                  |                       | Power (PWR): Green, Relay output (RY): Yellow, Alarm outputs (AL1, AL2): Red                                                                                                                                                                                                                                                                                                                                          |
| Input impedance                             |                       | Refer to <i>Input Range</i> on previous page.                                                                                                                                                                                                                                                                                                                                                                         |
| Output relays                               |                       | Two SPDT relays (NC operation)                                                                                                                                                                                                                                                                                                                                                                                        |
| Output relay ratings                        |                       | Rated load<br>Resistive load<br>5 A at 250 VAC<br>5 A at 30 VDC<br>Maximum switching capacity: 1,250 VA, 150 W<br>Minimum load: 5 VDC, 10 mA (reference values)<br>Mechanical life: 10 million operations min.<br>Electrical life: 5 A at 250 VAC or 30 VDC: 50,000 operations<br>3 A at 250 VAC or 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<br>Solid wire: 2.5 mm <sup>2</sup><br>Twisted wires: AWG16, AWG18<br><b>Note:</b> 1. Ferrules with insulating sleeves must be used with twisted wires.<br>2. Two wires can be twisted together.<br>Recommended ferrules<br>Al 1,5-8BK (for AWG16) manufactured by Phoenix Contact<br>Al 1-8RD (for AWG18) manufactured by Phoenix Contact<br>Al 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

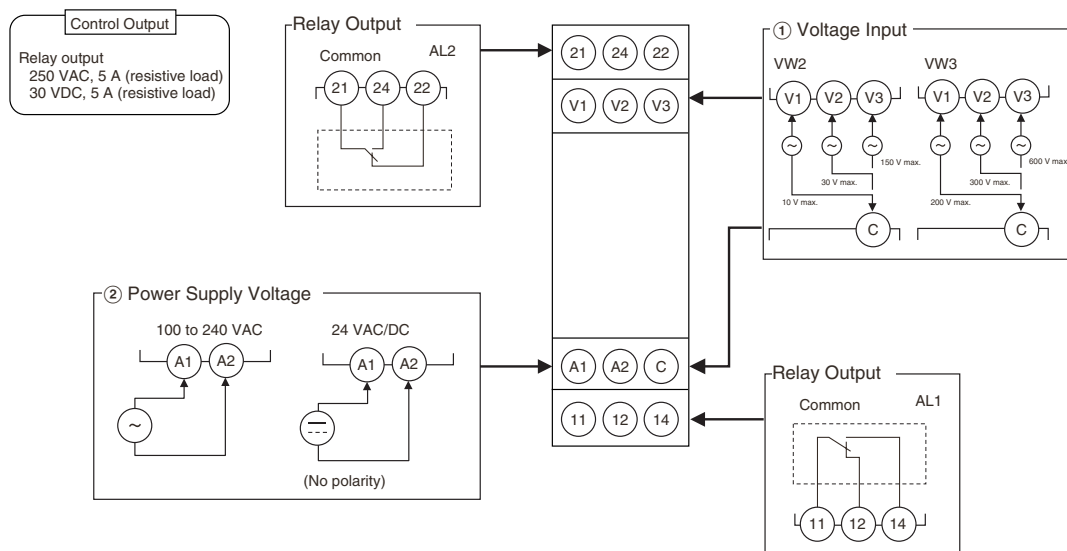
|                                            |                             |                                                                                                                                                                                                                                                         |
|--------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Allowable operating voltage range</b>   |                             | 85% to 110% of rated power supply voltage                                                                                                                                                                                                               |
| <b>Allowable operating frequency range</b> |                             | 50/60 Hz $\pm 5$ Hz                                                                                                                                                                                                                                     |
| <b>Input frequency range</b>               |                             | 40 to 500 Hz                                                                                                                                                                                                                                            |
| <b>Overload capacity</b>                   |                             | Continuous input at 115% of maximum input, 10 s at 125% (up to 600 VAC).                                                                                                                                                                                |
| <b>Repeat error</b>                        | <b>Operating value</b>      | $\pm 0.5\%$ 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)                                                                                                                      |
|                                            | <b>Operating time</b>       | $\pm 50$ ms (at 25°C and 65% humidity, rated power supply voltage)                                                                                                                                                                                      |
| <b>Applicable standards</b>                | <b>Conforming standards</b> | EN 60947-5-1<br>Installation environment (pollution level 2, installation category III)                                                                                                                                                                 |
|                                            | <b>EMC</b>                  | EN 60947-5-1                                                                                                                                                                                                                                            |
|                                            | <b>Safety standards</b>     | UL 508 (Recognition), Korean Radio Waves Act (Act 10564),<br>CSA: C22.2 No.14, CCC: GB14048.5                                                                                                                                                           |
| <b>Insulation resistance</b>               |                             | 20 M $\Omega$ min.<br>Between all external terminals and the case<br>Between all power supply terminals and all input terminals<br>Between all power supply terminals and all output terminals<br>Between all input terminals and all output terminals  |
| <b>Dielectric strength</b>                 |                             | 2,000 VAC for 1 min<br>Between all external terminals and the case<br>Between all power supply terminals and all input terminals<br>Between all power supply terminals and all output terminals<br>Between all input terminals and all output terminals |
| <b>Noise immunity</b>                      |                             | 1,500 V power supply terminal common/normal mode<br>Square-wave noise of $\pm 1$ $\mu$ s/100 ns pulse width with 1-ns rise time                                                                                                                         |
| <b>Vibration resistance</b>                |                             | Frequency: 10 to 55 Hz, acceleration 50 m/s <sup>2</sup><br>10 sweeps of 5 min each in X, Y, and Z directions                                                                                                                                           |
| <b>Shock resistance</b>                    |                             | 100 m/s <sup>2</sup> , 3 times each in 6 directions along 3 axes                                                                                                                                                                                        |
| <b>Degree of protection</b>                |                             | Terminals: IP20                                                                                                                                                                                                                                         |

## Connections

### Terminal Diagram

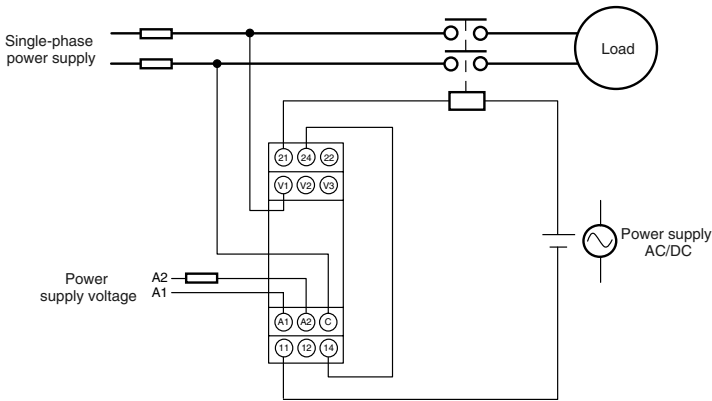
K8AK-VW2 100-240VAC

① ②



- Note:**
1. There is no polarity for the DC power supply input.
  2. For the voltage input, you can input only from the C terminal and one other terminal.
  3. Refer to *Setting Ranges and Wiring Connections* for information on the V1, V2, and V3 voltage input terminals.
  4. Use the recommended ferrules if you use twisted wires.

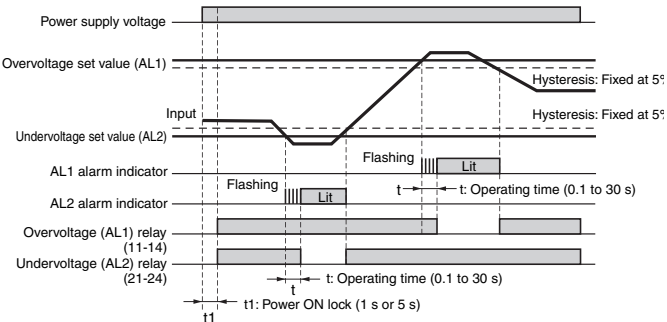
Wiring Example



Timing Charts

●Overvoltage and Undervoltage Operation Diagram

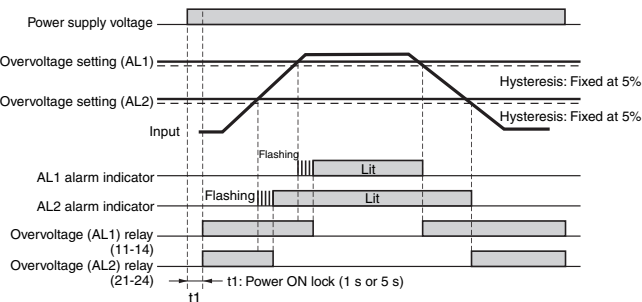
DIP switch settings: SW3 and SW4 both ON or both OFF.



- Note:** 1. The K8AK-VW□ 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.

●Overvoltage and Overvoltage Operation Diagram (Overvoltage Pre-alarm Mode)

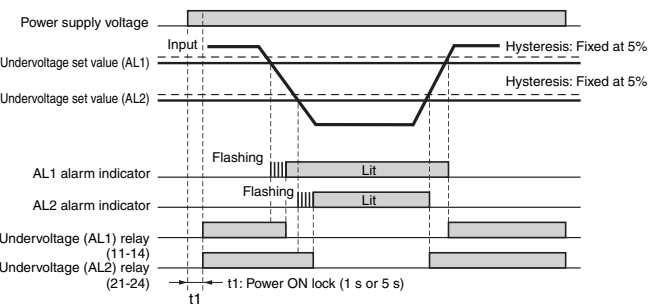
DIP switch settings: SW3 ON and SW4 OFF.



- Note:** 1. The K8AK-VW□ 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.

●Undervoltage and Undervoltage Operation Diagram (Undervoltage Pre-alarm Mode)

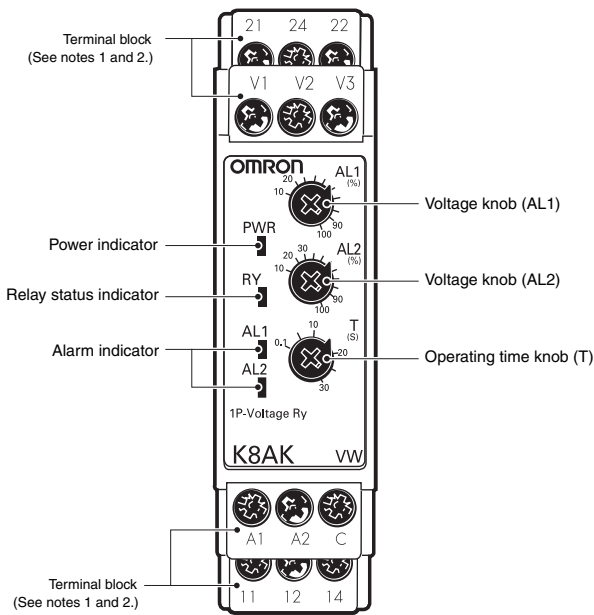
DIP switch settings: SW3 OFF and SW4 ON.



- Note:** 1. The K8AK-VW□ 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.

Nomenclature

Front



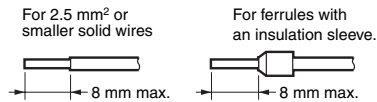
●Indicators

| Item                                | Meaning                                                                                                                                                                                    |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power indicator (PWR: Green)        | Lit when power is being supplied.                                                                                                                                                          |
| Relay status indicator (RY: Yellow) | Lit when relay operates (Not light when both AL1 and AL2 are in error status) (Normally lit)                                                                                               |
| Alarm indicators (AL1 and AL2: Red) | Lit when there is an overvoltage or undervoltage. The indicator flashes to indicate the error status after the input has exceeded the set value while the operating time is being clocked. |

●Setting Knobs

| Item                    | Usage                                                            |
|-------------------------|------------------------------------------------------------------|
| Voltage knob (AL1)      | Used to set the voltage to 10% to 100% of maximum setting range. |
| Voltage knob (AL2)      | Used to set the voltage to 10% to 100% of maximum setting range. |
| 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<sup>2</sup> 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

# K8AK-VW

## Operation Methods

### Setting Ranges and Wiring Connections

| Model    | Setting range     | Wiring connection |
|----------|-------------------|-------------------|
| K8AK-VW2 | 1 to 10 V AC/DC   | V1-COM            |
|          | 3 to 30 V AC/DC   | V2-COM            |
|          | 15 to 150 V AC/DC | V3-COM            |
| K8AK-VW3 | 20 to 200 V AC/DC | V1-COM            |
|          | 30 to 300 V AC/DC | V2-COM            |
|          | 60 to 600 V AC/DC | V3-COM            |

### Connections

#### ●Input

Connect the input between terminals V1-COM, V2-COM, or V3-COM, depending on the input voltage.  
Malfunctions may occur if the input is connected to unused terminals and the Unit will not operate correctly.

#### ●Power Supply

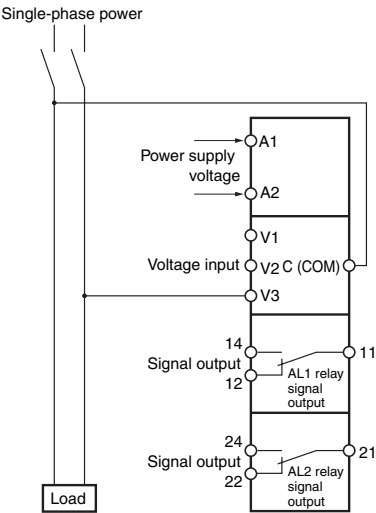
Connect the power supply to terminals A1 and A2.

#### ●Outputs

AL1 (SPDT relay) is output to terminals 11, 12, and 14.

AL2 (SPDT relay) is output to terminals 21, 22, and 24.

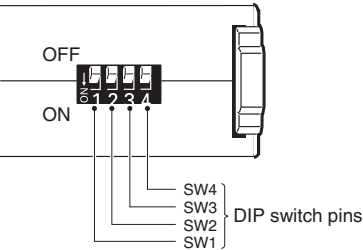
**Note:** Use the recommended ferrules if using twisted wires.



### DIP Switch Settings

The power ON lock time, resetting method and operating mode are set using the DIP switch located on the bottom of the Unit.

#### ●DIP Switch Functions



| Pin                | OFF ● ↑<br>ON ○ ↓ |              | 1   | 2   | 3   | 4   |
|--------------------|-------------------|--------------|-----|-----|-----|-----|
| Power ON lock time | 1 s               | ●            | --- | --- | --- | --- |
|                    | 5 s               | ○            | --- | --- | --- | --- |
| Resetting method   | Manual reset      | ---          | ●   | --- | --- | --- |
|                    | Operating mode    | ---          | ○   | --- | --- | --- |
| Operating mode     | AL1               | AL2          |     |     |     |     |
|                    | Overvoltage       | Undervoltage | --- | --- | ●   | ●   |
|                    | Overvoltage       | Overvoltage  | --- | --- | ○   | ●   |
|                    | Undervoltage      | Undervoltage | --- | --- | ●   | ○   |
|                    | Overvoltage       | Undervoltage | --- | --- | ○   | ○   |

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

## Setting Method

### ●Setting Voltage

The voltage knob (AL1 and AL2) is used to set the voltage.

The voltage can be set to 10% to 100% of the maximum setting range.

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 maximum setting range will differ depending on the model and the input terminal.

Example: K8AK-VW3 Using Input Terminal V3-COM

The maximum setting range will be 600 VAC/VDC and the setting range will be 60 to 600 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.

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 operating time.

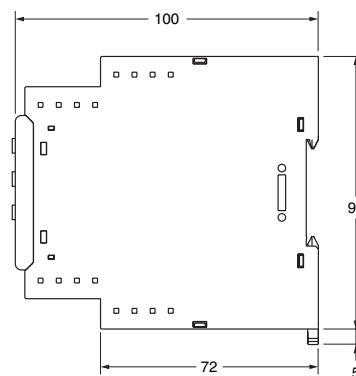
If the input exceeds (or drops lower than) the voltage set value, the alarm indicator will start flashing for the set period and then stay lit.

## Dimensions

(Unit: mm)

### Single-phase Overvoltage/Undervoltage Relays

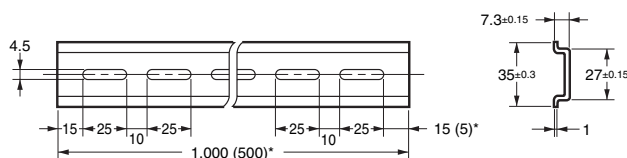
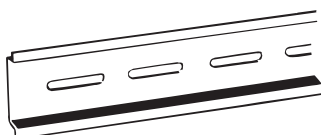
K8AK-VW2  
K8AK-VW3



### Optional Parts for DIN Track Mounting

#### ●DIN Tracks

PFP-100N  
PFP-50N



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

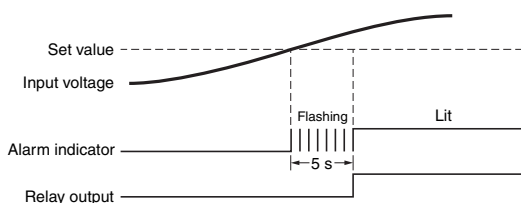
## Questions and Answers

### Q Checking Operation

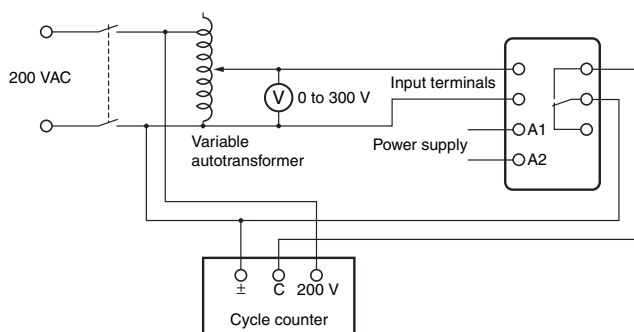
**A** Overvoltages  
Gradually increase the input from 80% of the set value. The input will equal the operating value when the input exceeds the set value and the alarm indicator starts flashing. Operation can be checked by the relay outputs that will start after the operating time has passed.  
Undervoltage  
Gradually decrease the input from 120% of the set value and check the operation using the same method as for overvoltage.

Example: Overvoltage Operating Mode, Undervoltage Operating Mode and an Operating Time of 5 s

**Note:** K8AK-VW□ output relays are normally operative.



### Connection Diagram



### Q How to Measure the Operating Time

**A** Overvoltage  
Change the input suddenly from 0% to 120% of the set value and measure the time until the Unit operates.  
Undervoltage  
Change the input suddenly from 120% to 0% of the set value and measure the time until the Unit operates.

### Q Setting the Pre-alarm Monitoring Mode

**A** Use the DIP switch to set the operating mode pins both to overvoltage (SW3 ON and SW4 OFF) or both to undervoltage (SW3 OFF and SW4 ON).

Example: Both Pins Set to Overvoltage

AL1 can be used as the pre-alarm for AL2 by setting a smaller voltage set value for AL1 than for AL2.

## Safety Precautions

Be sure to read the precautions for all models in the website at the following URL: <http://www.ia.omron.com/>.

### Warning Indications

|                                                                                                  |                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>WARNING</b> | Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage. |
|  <b>CAUTION</b> | Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.                                                                             |
| <b>Precautions for Safe Use</b>                                                                  | Supplementary comments on what to do or avoid doing, to use the product safely.                                                                                                                              |
| <b>Precautions for Correct Use</b>                                                               | Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction, or undesirable effects on product performance.                                                              |

### Meaning of Product Safety Symbols

|                                                                                     |                                                                                                                                         |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|    | Used to warn of the risk of electric shock under specific conditions.                                                                   |
|    | Used for general prohibitions for which there is no specific symbol.                                                                    |
|   | Used to indicate prohibition when there is a risk of minor injury from electrical shock or other source if the product is disassembled. |
|  | Used for general mandatory action precautions for which there is no specified symbol.                                                   |

#### **WARNING**

Electrical shock may occasionally cause serious injury. Confirm that the input voltage is OFF before starting any wiring work and wire all connections correctly.



#### **CAUTION**

Electrical shock may cause minor injury. Do not touch terminals while electricity is being supplied.



There is a risk of minor electrical shock, fire, or device failure. Do not allow any pieces of metal, conductors, or cutting chips that occur during the installation process to enter the product.



Explosions may cause minor injuries. Do not use the product in locations with inflammable or explosive gases.

There is a risk of minor electrical shock, fire, or device failure. Do not disassemble, modify, repair, or touch the inside of the product.



Loose screws may cause fires. Tighten terminal screws to the specified torque of 0.49 to 0.59 N·m.



Use of excessive torque may damage the terminal screws. Tighten terminal screws to the specified torque of 0.49 to 0.59 N·m.



Use of the product beyond its life may result in contact welding or burning. Make sure to consider the actual operating conditions and use the product within its rated load and electrical life count. The life of the output relay varies significantly with the switching capacity and switching conditions.



## Precautions for Safe Use

1. Do not use or store the product in the following locations.
  - Locations subject to water or oil
  - Outdoor locations or under direct sunlight
  - Locations subject to dust or corrosive gases (particularly sulfurizing gases, ammonia, etc.)
  - Locations subject to rapid temperature changes
  - Locations prone to icing and dew condensation
  - Locations subject to excessive vibration or shock
  - Locations subject to wind and rain
  - Locations subject to static electricity and noise
  - Habitats of insects or small animals
2. Use and store the product in a location where the ambient temperature and humidity are within the specified ranges. If applicable, provide forced cooling.
3. Mount the product in the correct direction.
4. Check terminal polarity when wiring and wire all connections correctly. The power supply terminals do not have polarity.
5. Do not wire the input and output terminals incorrectly.
6. Make sure the power supply voltage and loads are within the specifications and ratings for the product.
7. Make sure the crimp terminals for wiring are of the specified size.
8. Do not connect anything to terminals that are not being used.
9. Use a power supply that will reach the rated voltage within 1 second after the power is turned ON.
10. Keep wiring separate from high voltages and power lines that draw large currents.  
Do not place product wiring in parallel with or in the same path as high-voltage or high-current lines.
11. Do not install the product near equipment that generates high frequencies or surges.
12. The product may cause incoming radio wave interference. Do not use the product near radio wave receivers.
13. Install an external switch or circuit breaker and label it clearly so that the operator can quickly turn OFF the power supply.
14. Make sure the indicators operate correctly. Depending on the application environment, the indicators may deteriorate prematurely and become difficult to see.
15. Do not use the product if it is accidentally dropped. The internal components may be damaged.
16. Be sure you understand the contents of this catalog and handle the product according to the instructions provided.
17. Do not install the product in any way that would place a load on it.
18. When discarding the product, properly dispose of it as industrial waste.
19. When using the product, remember that the power supply terminals carry a high voltage.
20. The product must be handled only by trained electrician.
21. Prior to operation, check the wiring before you supply power to the product.
22. Do not install the product immediately next to heat sources.
23. Perform periodic maintenance.

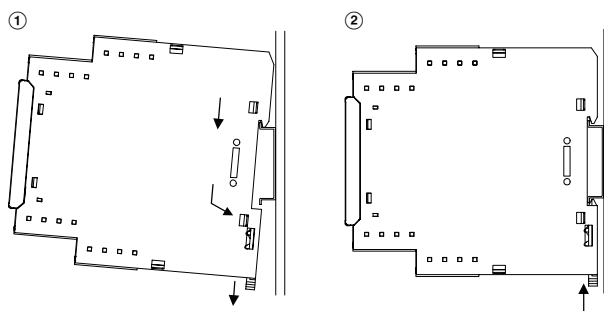
## Precautions for Correct Use

### Observe the following operating methods to prevent failure and malfunction.

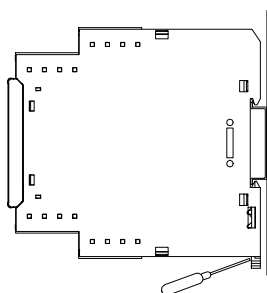
1. Use the power supply voltage, input power, and other power supplies and converters with suitable capacities and rated outputs.
2. Use a precision screwdriver or similar tool to adjust the setting knobs.
3. Do not use the product in circuits with waveform distortion. Error will be large due to waveform distortion.
4. Error will be large if the product is used for thyristor or inverter control.
5. To reduce the error in the setting knob, always turn the setting knob from the minimum setting toward the maximum setting.
6. When cleaning the product, do not use thinners or solvents. Use commercial alcohol.

### Mounting and Removing

- Mounting to DIN Track
  1. Catch the upper hook on the DIN Track.
  2. Push the product onto the Track until the hooks lock into place.



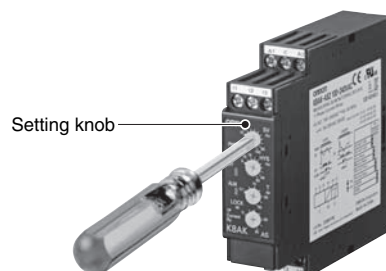
- Removing from the DIN Track  
Pull down on the bottom hook with a flat-blade screwdriver and lift up on the product.



Applicable DIN Tracks:  
PFP-100N (100 cm)  
PFP-50N (50 cm)

### Adjusting the Setting Knobs

- Use a screwdriver to adjust the setting knobs. The knobs have a stopper that prevents them from turning beyond the full right or left position. Do not force a knob beyond these points.



# Terms and Conditions of Sale

1. **Offer; Acceptance.** These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiary companies ("Omron"). Omron objects to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.
2. **Prices; Payment Terms.** All prices stated are current, subject to change without notice by Omron. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are due net 30 days unless otherwise stated in the invoice.
3. **Discounts.** Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.
4. **Interest.** Omron, at its option, may charge Buyer 1-1/2% interest per month or the maximum legal rate, whichever is less, on any balance not paid within the stated terms.
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6. **Governmental Approvals.** Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or sale of the Products.
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8. **Financial.** If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Omron may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
9. **Cancellation; Etc.** Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.
10. **Force Majeure.** Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
11. **Shipping; Delivery.** Unless otherwise expressly agreed in writing by Omron:
  - a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
  - b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
  - c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
  - d. Delivery and shipping dates are estimates only; and
  - e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. **Claims.** Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
13. **Warranties.** (a) **Exclusive Warranty.** Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied. (b) **Limitations.** OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) **Buyer Remedy.** Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty. See <http://www.omron247.com> or contact your Omron representative for published information.
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18. **Miscellaneous.** (a) **Waiver.** No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) **Assignment.** Buyer may not assign its rights hereunder without Omron's written consent. (c) **Law.** These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) **Amendment.** These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) **Severability.** If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) **Setoff.** Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) **Definitions.** As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

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1. **Suitability of Use.** Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given:
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  - (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.
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2. **Programmable Products.** Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
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