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 3 to 30 V AC/DC 15 to 150 V AC/DC	24 VAC/DC	**K8AK-VW2 24 VAC/DC**
	100 to 240 VAC	**K8AK-VW2 100-240 VAC**
20 to 200 V AC/DC 30 to 300 V AC/DC 60 to 600 V AC/DC	24 VAC/DC	**K8AK-VW3 24 VAC/DC**
	100 to 240 VAC	**K8AK-VW3 100-240 VAC**

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 3 to 30 V AC/DC 15 to 150 V AC/DC	Approx. 120 kΩ	Continuous input at 115% of maximum input. 10 s at 125% (up to 600 VAC)
	0 to 30 V AC/DC	V2-COM		Approx. 320 kΩ	
	0 to 150 V AC/DC	V3-COM		Approx. 1.6 MΩ	
K8AK-VW3	0 to 200 V AC/DC	V1-COM	20 to 200 V AC/DC 30 to 300 V AC/DC 60 to 600 V AC/DC	Approx. 1.2 MΩ	
	0 to 300 V AC/DC	V2-COM		Approx. 1.7 MΩ	
	0 to 600 V AC/DC	V3-COM		Approx. 3.1 MΩ	

* The range is selected using connected terminals.

Ratings

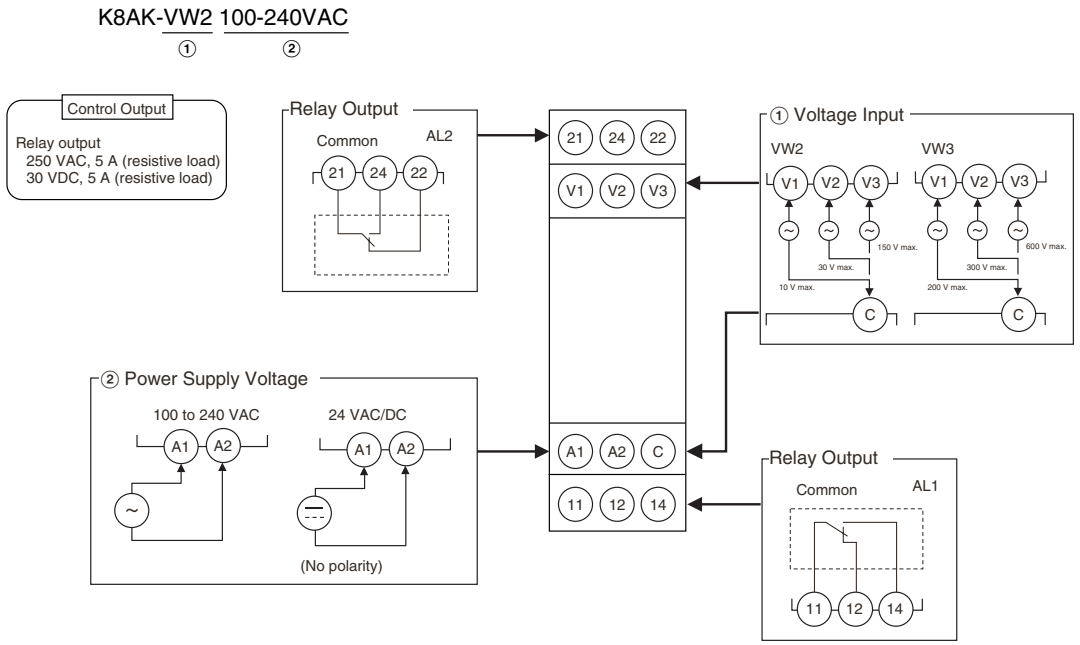
Power supply voltage	**Isolated power supply**	24 VAC/DC 100 to 240 VAC
Power consumption		24 VAC/DC: 2.0 VA/1.1 W max. 100 to 240 VAC: 4.6 VA max.
Operating value setting range (AL1 and AL2)		10% to 100% of the maximum value of the setting range K8AK-VW2: 1 to 10 V AC/DC 3 to 30 V AC/DC 15 to 150 V AC/DC K8AK-VW3: 20 to 200 V AC/DC 30 to 300 V AC/DC 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) **Note:** 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 *Input Range* on previous page.
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 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 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

Allowable operating voltage range		85% to 110% of rated power supply voltage
Allowable operating frequency range		50/60 Hz ±5 Hz
Input frequency range		40 to 500 Hz
Overload capacity		Continuous input at 115% of maximum input, 10 s at 125% (up to 600 VAC).
Repeat error	**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: GB14048.5
Insulation resistance		20 MΩ min. Between all external terminals and the case Between all power supply terminals and all input terminals Between all power supply terminals and all output terminals 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 power supply terminals and all input terminals Between all power supply terminals and all output terminals 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, acceleration 50 m/s^2 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

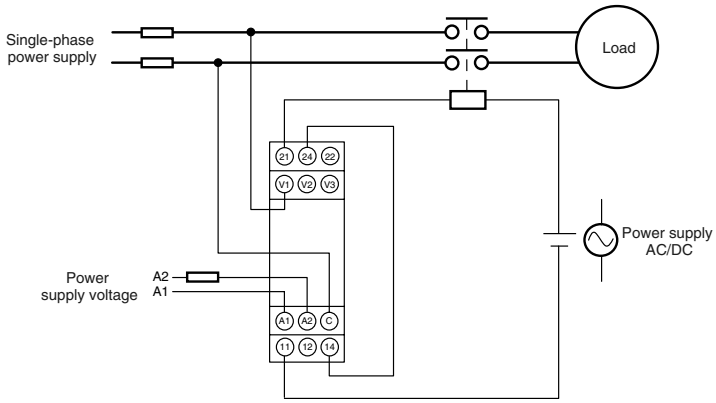
Connections

Terminal Diagram



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.

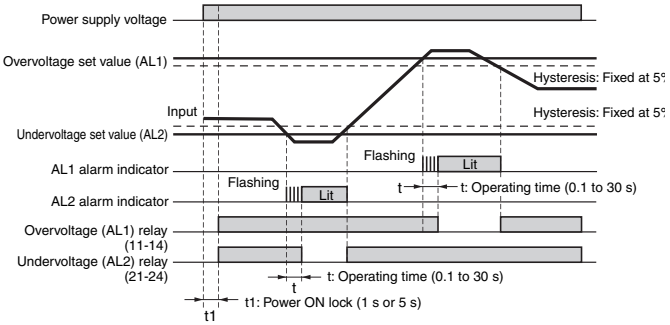
Wiring Example



Timing Charts

●Overvoltage and Undervoltage Operation Diagram

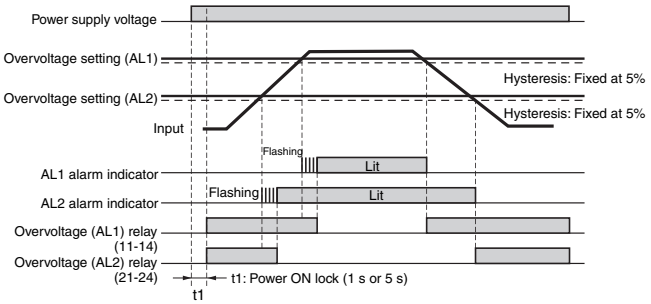
DIP switch settings: SW3 and SW4 both ON or both OFF.



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)

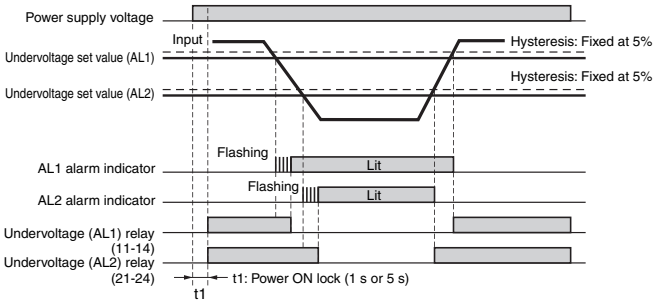
DIP switch settings: SW3 ON and SW4 OFF.



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)

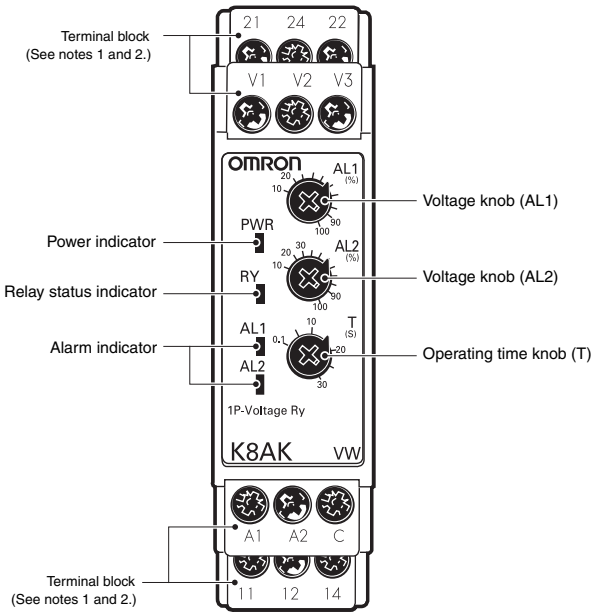
DIP switch settings: SW3 OFF and SW4 ON.



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



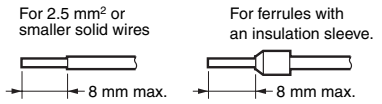
●Indicators

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^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

- AI 1,5-8BK (for AWG16)
- AI 1-8RD (for AWG18)
- AI 0,75-8GY (for AWG18)

2. Screw tightening torque: 0.49 to 0.59 N·m

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

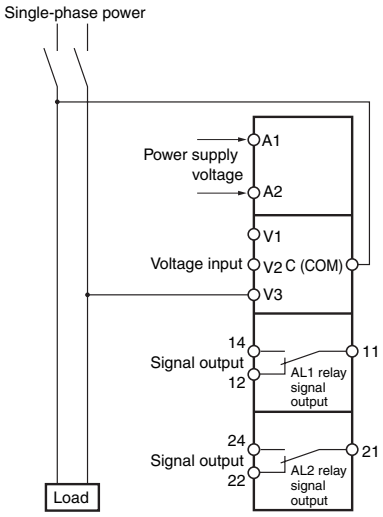
Connect the power supply to terminals A1 and A2.

●Outputs

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

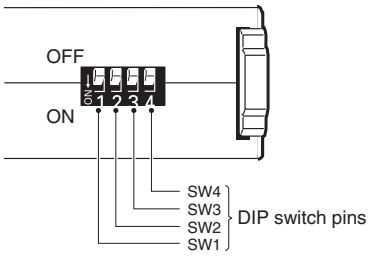
AL2 (SPDT relay) is output to terminals 21, 22, and 24.

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 ● ↑ / ON ❍ ↓		1 (OFF / ON)	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

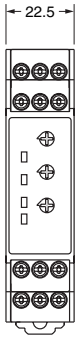
The operating time is set using the operating time knob (T).
The operating time can be set to between 0.1 and 30 s.
Turn the knob while there is an input to the input terminals until the alarm indicator flashes (when the set value and the input have reached the same level.)
Use this as a guide to set 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.

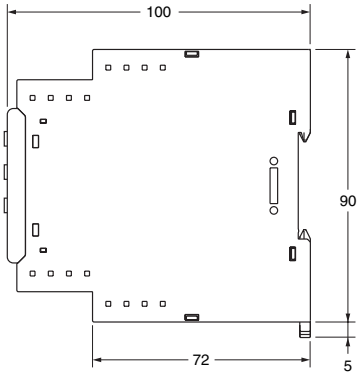
Dimensions

(Unit: mm)

Single-phase Overvoltage/Undervoltage Relays

K8AK-VW2
K8AK-VW3

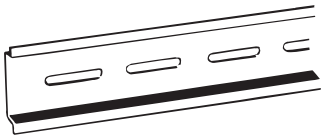


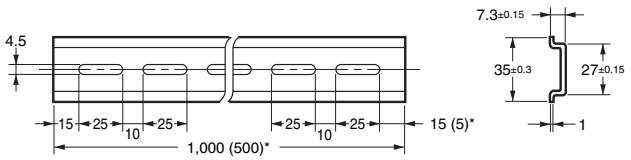


Optional Parts for DIN Track Mounting

●DIN Tracks

PFP-100N
PFP-50N





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

Questions and Answers

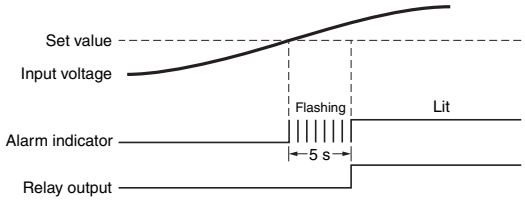
Q Checking Operation

A

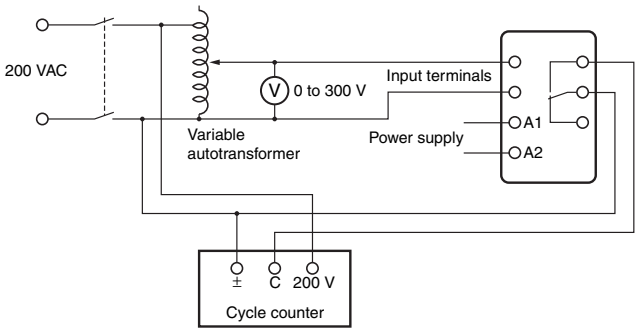
Overvoltages
Gradually increase the input from 80% of the set value. The input will equal the operating value when the input exceeds the set value and the alarm indicator starts flashing. Operation can be checked by the relay outputs that will start after the operating time has passed.
Undervoltage
Gradually 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

⚠ WARNING	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.
⚠ 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 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.

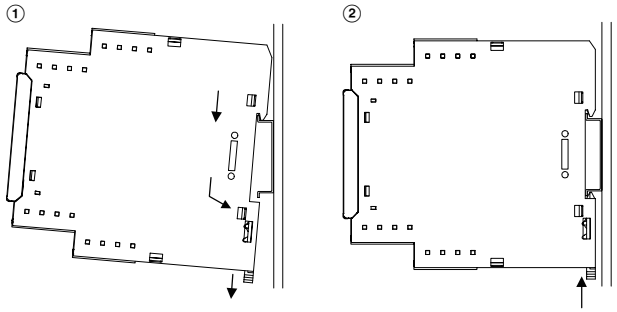
Precautions for Correct Use

Observe the following operating methods to prevent failure and malfunction.

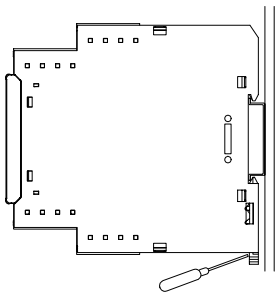
1. Use the power supply voltage, input power, and other power supplies and converters with suitable capacities and rated outputs.
2. Use a precision screwdriver or similar tool to adjust the setting knobs.
3. Do not use the product in circuits with waveform distortion. Error will be large due to waveform 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.



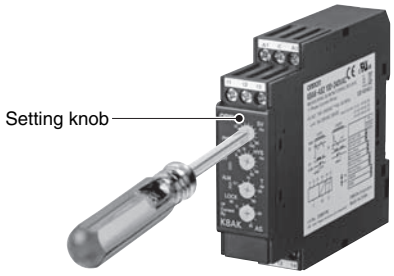
- Removing from the DIN Track
  Pull down on the bottom hook with a flat-blade screwdriver and lift up on the product.



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.



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