New Product

OMRON

Single-phase Voltage Relay
K8DT-VS

Detect abnormal voltages applies to equipment to protect against equipment failure.
Use in either overvoltage or undervoltage mode.

- Monitor AC or DC currents with one Relay.
- Settings for the operating value, hysteresis, and operating time.
- Width of 17.5 mm to reduce space required in panels.
- Push-In Plus Terminal Blocks that reduce wiring work.
  The use of cage clamps enables wiring with bare stranded wires.
  Double-insertion holes for crossover wiring (all terminals).
- UL listed for easy shipping to North America.
- Models added with transistor outputs for superior contact reliability.

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

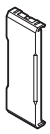
⚠ Refer to *Safety Precautions* on page 9.
Refer to page 8 for commonly asked questions.

Ordering Information

Single-phase Voltage Relay

Setting range	Power supply voltage	Output	Model
1 to 10 V AC/DC 3 to 30 V AC/DC 15 to 150 V AC/DC	24 VAC/DC	Relay: SPDT contact output	**K8DT-VS2CD**
		Transistor: NPN output	**K8DT-VS2TD**
	100 to 240 VAC	Relay: SPDT contact output	**K8DT-VS2CA**
		Transistor: NPN output	**K8DT-VS2TA**
20 to 200 V AC/DC 30 to 300 V AC/DC 60 to 600 V AC/DC	24 VAC/DC	Relay: SPDT contact output	**K8DT-VS3CD**
		Transistor: NPN output	**K8DT-VS3TD**
	100 to 240 VAC	Relay: SPDT contact output	**K8DT-VS3CA**
		Transistor: NPN output	**K8DT-VS3TA**

Optional Cover
Front Cover

Appearance	Model
	**Y92A-D1A**

Ratings and Specifications

Input Range

Model	Range ✻	Connection terminal	Setting range	Input impedance	Overload capacity
K8DT-VS2□□	0 to 10 V AC/DC	V1-COM	1 to 10 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	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	
K8DT-VS3□□	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

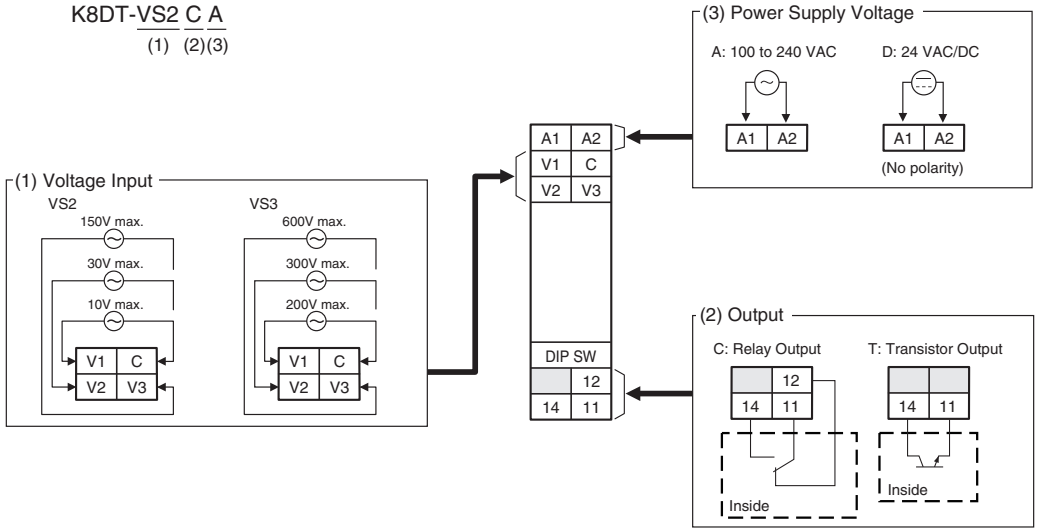
Power supply voltage	K8DT-VS□□D: 24 VAC 50/60Hz, 24 VDC K8DT-VS□□A: 100 to 240 VAC 50/60Hz
Power consumption	24 VAC/DC: 1.8 VA/1 W max. 100 to 240 VAC: 2.5 VA max.
Rated insulation voltage	600 VAC
Operating value setting range (SV)	10% to 100% of maximum setting range K8DT-VS2: 1 to 10 V AC/DC 3 to 30 V AC/DC 15 to 150 V AC/DC K8DT-VS3: 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 setting range (HYS)	5% to 50% of operating value
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	1 s or 5 s (Switched using DIP switch.)
Indicators	Power (PWR): Green, Relay output (RY): Yellow, Alarm outputs (ALM): Red
Input impedance	Refer to *Input Range* on page 2.
Output form	Relay: SPDT contact output Transistor: NPN output Switchable between normally open and normally closed with a DIP switch setting.
Output relay ratings	Rated load 5 A at 250 VAC (Resistive load) 5 A at 30 VDC (Resistive load) 1 A at 250 VAC (Inductive load) 0.2 A at 48 VDC (Inductive load) 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
Transistor output ratings	Contact form: SPST-NO (NPN transistor) Rated voltage: 24 VDC (maximum voltage: 26.4 VDC) Maximum current: 50 mA DC
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% RH (with no condensation)
Storage humidity	25% to 85% RH (with no condensation)
Altitude	2,000 m max.
Applicable wires	Stranded wires, solid wires, or ferrules
Applicable wire size	0.25 to 1.5 mm^2 (AWG24 to AWG16)
Wire insertion force	8 N max. for AWG20 wire
Screwdriver insertion force	15 N max.
Wire stripping length	8 mm
Ferrule length	8 mm
Recommended flat-blade screwdriver	XW4Z-00B (Omron) SZF 0.4 × 2.5 (Phoenix Contact) 210-719 (Wago) SDI 0.4 × 2.5 × 75 (Weidmuller)
Current capacity	10 A (per pole)
Number of insertions	50 times
Case color	N1.5
Case material	PC, UL 94 V-0
Weight	Approx. 100 g
Mounting	Mounts to DIN Track, or screw mounting
Dimensions	17.5 × 90 × 90 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 accuracy	**Operating value**	±0.5% full scale (at 25°C and 65% humidity, rated power supply voltage)
	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, Overvoltage category III)
	EMC	EN 60947-5-1
	Safety standards	UL 60947-5-1 (Listing), Korean Radio Waves Act (Act 10564), CCC (GB14048.5)
Insulation resistance		20 MΩ min. Between external terminals and case Between power supply terminals and input terminals Between power supply terminals and output terminals Between input terminals and output terminals
Dielectric strength		2,000 VAC for one minute Between external terminals and case Between power supply terminals and input terminals Between power supply terminals and output terminals Between input terminals and output terminals
Impulse withstand voltage		6 kV (between live terminals and exposed, non-charged metal parts)
Noise immunity		Square-wave noise of 1-μs/100-ns pulse width with 1-ns rise time 100 to 240 VAC: 1,500 V power supply terminal common/normal mode 24 VAC: 1,500 V power supply terminal common/normal mode 24 VDC: 480 V power supply terminal common
Vibration resistance		Frequency: 10 to 55 Hz, 0.35-mm single amplitude, 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

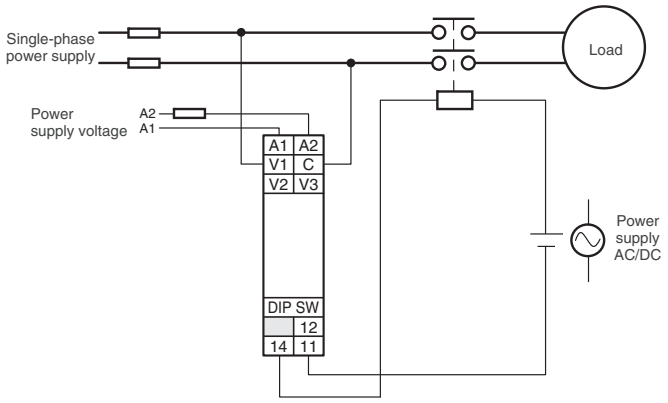
Terminal Diagram



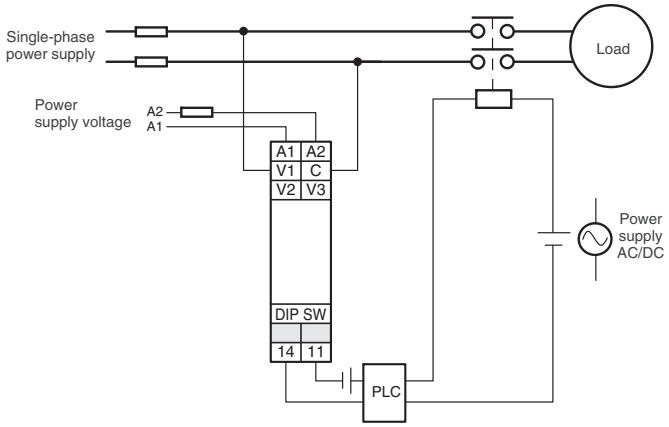
Note: 1. Do not connect anything to terminals that are shaded in gray.
2. There is no polarity for the DC power supply input.
3. For the voltage input, you can input only from the C terminal and one other terminal.
4. Refer to Setting Ranges and Wiring Connections for information on the V1, V2, and V3 voltage input terminals.

Wiring Example

Relay Output



Transistor Output

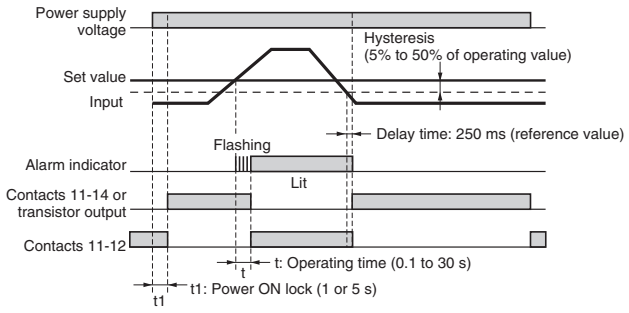


Note: Use copper wires with a rating of 75°C or an equivalent rating.

Timing Charts

Overvoltage Operation Diagram (Output Drive Method: Normally Closed)

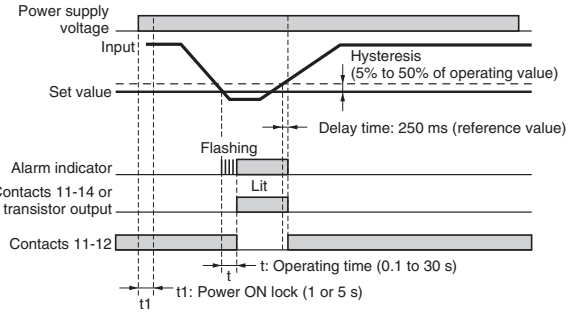
DIP switch setting: SW3 ON, SW4 OFF.



Note: The power ON lock prevents unnecessary alarms from being generated during the instable period when the power is first turned on. There is no contact output during timer operation.

Undervoltage Operation Diagram (Output Drive Method: Normally Open)

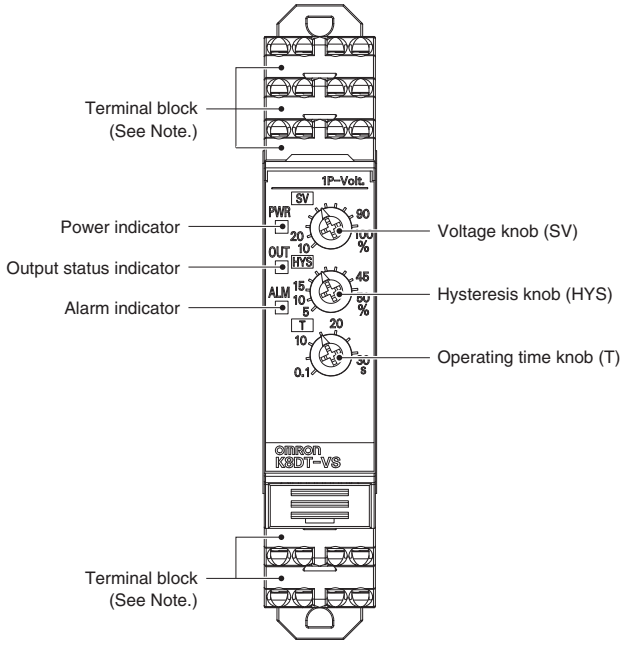
DIP switch setting: SW3 OFF, SW4 ON.



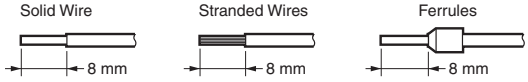
Note: The power ON lock prevents unnecessary alarms from being generated during the instable period when the power is first turned on. There is no relay output during timer operation.

Nomenclature

Front



Note: Use solid wires, stranded wires, or ferrules to connect to the terminals.
To maintain the withstand voltage after connecting the terminals, insert 8 mm of exposed conductor into the terminal.



Indicators

Item	Meaning
Power indicator (PWR: Green)	Lit when power is being supplied.
Output status indicator (OUT: Yellow)	Lights for output
Alarm indicator (ALM: 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 (SV)	Used to set the voltage to 10% to 100% of maximum setting range.
Hysteresis knob (HYS)	Used to set the rest value to 5% to 50% of the operating value.
Operating time knob (T)	Used to set the operating time to 0.1 to 30 s.

Operation Methods

Setting Ranges and Wiring Connections

Model	Setting range	Wiring connection
K8DT-VS2	1 to 10 V AC/DC	V1-COM
	3 to 30 V AC/DC	V2-COM
	15 to 150 V AC/DC	V3-COM
K8DT-VS3	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.

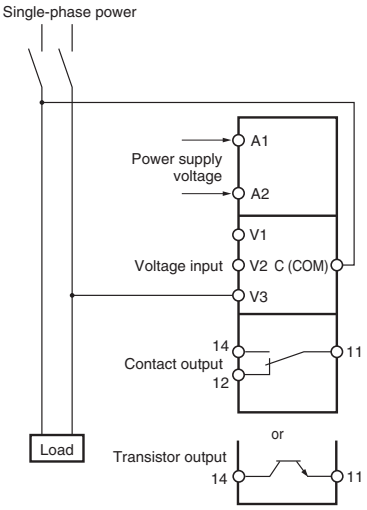
Power Supply

Connect the power supply to terminals A1 and A2.

Outputs

For a relay output, the SPDT contacts are output on terminals 11, 12, and 14. For a transistor output, the NPN output is on terminals 11 and 14.

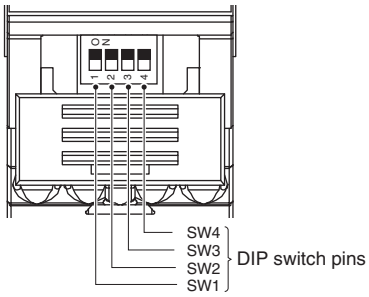
Do not use the transistor output for control applications. It is designed only to output a signal when an error is detected.



DIP Switch Settings

The power ON lock time, reset method, drive output method, and operating mode are set using the DIP switch located on the front of the Unit.

Note: Open the DIP switch cover to set the DIP switch.
Keep the DIP switch cover closed while the power supply to the Relay is ON.



DIP switch pins

Pin	ON ❍ ↑ / OFF ● ↓	1 (ON / OFF)	2	3	4
Power ON lock time	**5 s**	❍	---	---	---
	1 s	●	---	---	---
Resetting method	**Automatic reset**	---	❍	---	---
	Manual reset	---	●	---	---
Relay drive method	**Normally closed**	---	---	❍	---
	Normally open	---	---	●	---
Operating mode	**Undervoltage**	---	---	---	❍
	Overvoltage	---	---	---	●

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

Setting Method

Setting Voltage

The voltage knob (SV) 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: K8DT-VS3 Using Input Terminal V3-COM
The maximum setting range will be 600 VAC/VDC and the setting range will be 60 to 600 V.

Hysteresis

Hysteresis is set using the hysteresis knob (HYS)
The setting range is 5 to 50% of the operating value.
Example: Maximum Setting of 600 VAC/VDC, Voltage Set Value (SV) of 50%, and Overvoltage Operation
Operation will be at 300 V and resetting at 270 V when the hysteresis (HYS) is set to 10%.

Operating Time

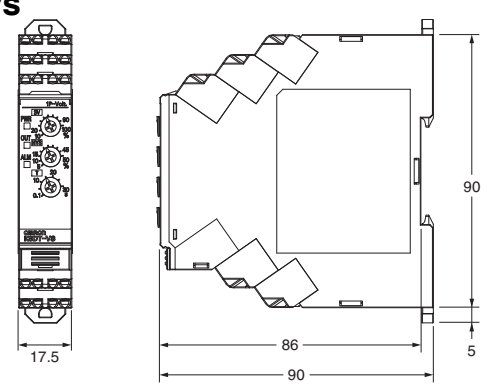
The operating time is set using the operating time knob (T).
The operating time can be set to between 0.1 and 30 s.
If the input voltage exceeds (or drops lower than) the voltage set value, the alarm indicator will start flashing for the set period and then stay lit.

Dimensions

(Unit: mm)

Single-phase Voltage Relays

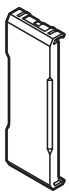
K8AK-VS2
K8AK-VS3

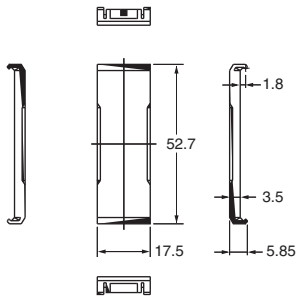


Options (Order Separately)

Front Cover

Y92A-D1A

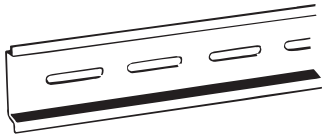


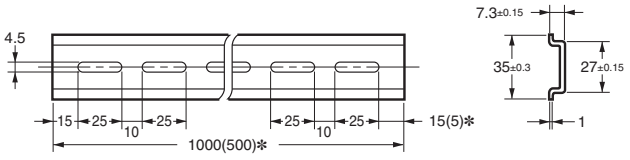


Optional Parts for DIN Track Mounting

DIN Tracks

PFP-100N
PFP-50N





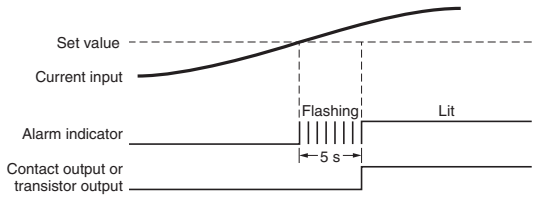
* Dimensions in parentheses are for the PFP-50N.

Questions and Answers

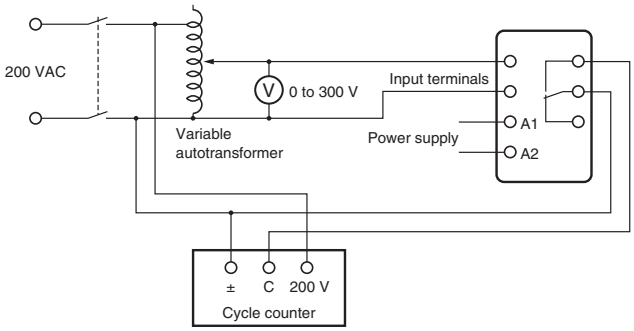
Q **Checking Operation**

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 contact 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 and an Operating Time of 5 s
Note: K8DT-VS□ 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.

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

Doing so may occasionally result in minor injury due to electric shock. Do not touch the Relay while the power supply is ON, except for the adjustment knob.

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.

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.

If the Relay is used with incorrect wiring, fire may occasionally occur, possibly resulting in physical damage. Check the wiring for mistakes before you turn ON the power supply.

If the Relay fails, monitoring and alarm outputs may fail to operate. This may result in physical damage to the facilities, equipment, or other devices that are connected to it. To reduce this risk, inspect the Relay regularly. To maintain safety in the event of malfunction of the Relay, take appropriate safety measures, such as installing a monitoring device on a separate line.

If the wire insertion length is insufficient, fire may occasionally occur, possibly resulting in physical damage. Insert the wires all the way to the back.

The terminal block may be damaged if you insert a flat-blade screwdriver in the release hole with excessive force. Insert the flat-blade screwdriver into the release holes with a force of 15 N or less.

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 (sulfurizing gases, ammonia gases, etc.)
   - Locations subject to rapid temperature changes
   - Locations prone to icing and dew condensation
   - Locations subject to vibration and large shocks
   - Locations subject to wind and rain
   - Locations subject to static electricity or noise
   - Locations subject to 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. Check terminal polarity when wiring and wire all connections correctly. The power supply terminals do not have polarity.
4. Do not wire the input and output terminals incorrectly.
5. Make sure the power supply voltage and loads are within the specifications and ratings for the product.
6. Make sure the ferrule terminals for wiring are of the specified size.
7. The stripping length is 8 mm. Insert the wires all the way to the back.
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.
24. Do not wire anything to the release holes.
25. Do not tilt or twist a flat-blade screwdriver while it is inserted into a release hole on the terminal block. The terminal block may be damaged.
26. Insert a flat-blade screwdriver into the release holes at an angle. The terminal block may be damaged if the screwdriver is inserted straight in.
27. Do not allow the flat-blade screwdriver to fall when you are holding it in a release hole.
28. Do not bend a wire past its natural bending radius or pull in it with excessive force. Doing so may break the wires.
29. Do not insert more than one wire into each terminal insertion hole.
30. To prevent wire materials from smoking or igniting, use the wiring materials given in the following table.

Recommended wire	Stripping length	
	With Ferrules	Without Ferrules
0.25 to 1.5mm^2/Equivalent to AWG24 to 16	10 mm	8 mm

Note: Please use Ferrules with UL certification (R/C).

31. Use only the specified wires for wiring.
32. When wiring the terminals, allow some leeway in the wire length.
33. Make sure that the power supply is turned OFF before you change any DIP switch setting.

Precautions for Correct Use

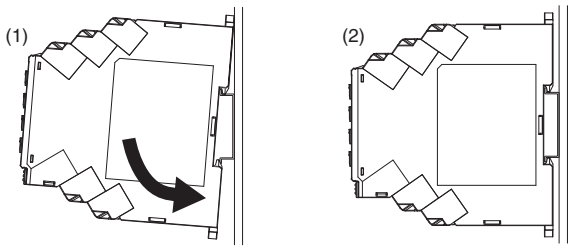
Observe the following operating methods to prevent failure and malfunction.

1. Use the power supply voltage, input power, and other power supplies and converters with suitable capacities and rated outputs.
2. Do not use the Relay in circuits with waveform distortion. Error will be large due to waveform distortion.
3. Error will be large if the product is used for thyristor or inverter control.
4. When cleaning the product, do not use thinners or solvents. Use commercial alcohol.
5. If you use stranded wires, make sure that there are no loose wire strands.
6. If you wire crossovers and connect terminal blocks in parallel, a large current will flow. Make sure that the current does not exceed 10 A.
7. The terminal block may be damaged if the recommended tool is not used. Use the recommended flat-blade screwdriver to operate the release holes.

Correct Mounting Direction, Mounting, and Removing

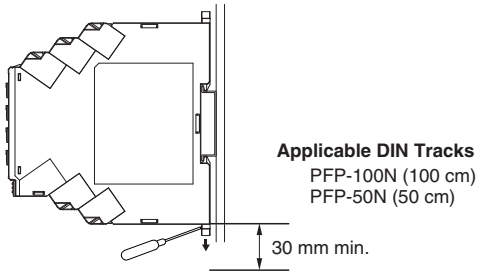
Mounting to DIN Track

To mount the Relay to a DIN Track, hook the Relay onto the DIN Track and press the Relay in the direction of the arrow until you hear it lock into place.



Removing from the DIN Track

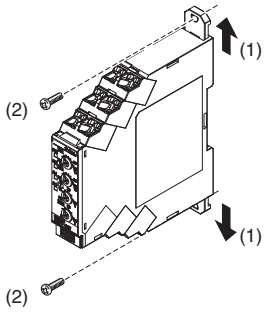
To remove the Relay, insert a screwdriver into the hook on the top or bottom and pull out the hook to release the Relay.



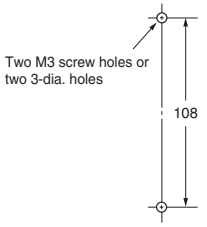
- Leave at least 30 mm of space between the product and other devices to allow easy installation and removal.

Screw Mounting

1. Pull out the two hooks on the back of the Relay to the outside until you hear them click in place.
2. Insert M3 screws into the hook holes and secure the Relay.



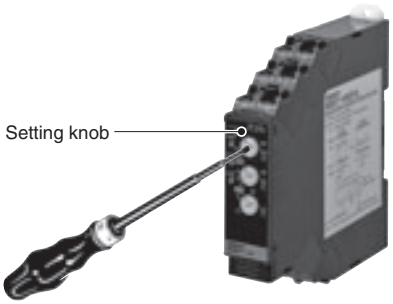
Mounting Hole Dimensions



Note: 1. Pull out the hooks to mount the Relay with screws.
2. Recommended tightening torque: 0.5 to 0.6 N·m.

Adjusting the Setting Knobs

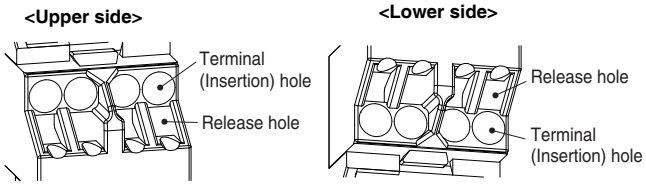
- Use a flat-blade screwdriver to adjust the setting knobs. The knobs have a stopper that prevents them from turning beyond the full right or left position. Do not force a knob beyond these points.



- To reduce the error in the setting knob, always turn the setting knob from the minimum setting toward the maximum setting.

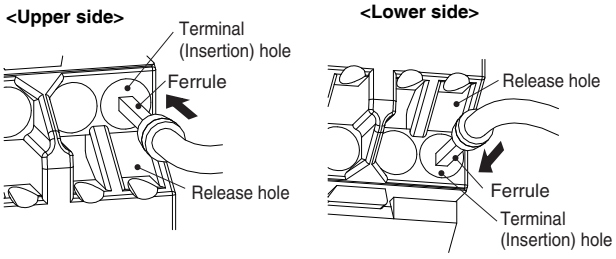
Connecting Wires to the Push-In Plus Terminal Block

Part Names of the Terminal Block



Connecting Wires with Ferrules and Solid Wires

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

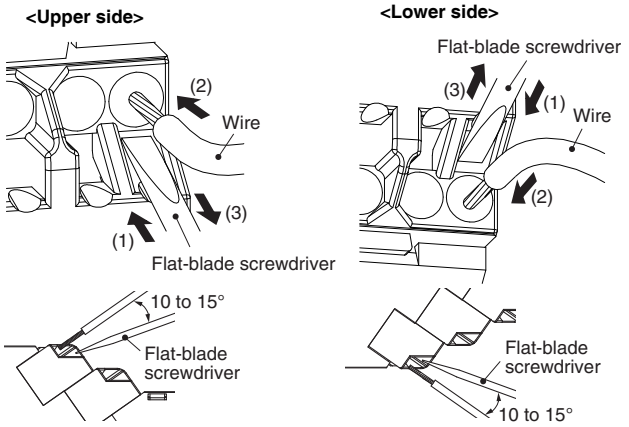


If a wire is difficult to connect because it is too thin, use a flat-blade screwdriver in the same way as when connecting stranded wire.

Connecting Stranded Wires

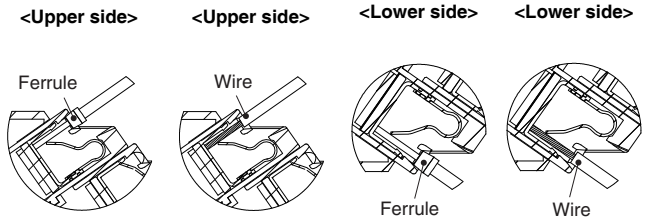
Use the following procedure to connect the wires to the terminal block.

1. Hold a flat-blade screwdriver at an angle and insert it into the release hole. The angle should be between 10° and 15°. If the flat-blade screwdriver is inserted correctly, you will feel the spring in the release hole respond.
2. With the flat-blade screwdriver still inserted into the release hole, insert the wire into the terminal hole until it strikes the terminal block.
3. Remove the flat-blade screwdriver from the release hole.



Checking Connections

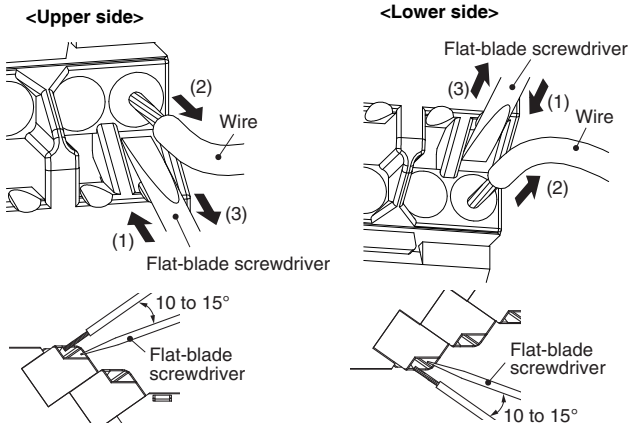
- After the insertion, pull gently on the wire to make sure that it will not come off and the wire is securely fastened to the terminal block.
- To prevent short circuits, insert the stripped part of a stranded or solid wire or the conductor part of a ferrule until it is hidden inside the terminal insertion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



Removing Wires from the Push-In Plus Terminal Block

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

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



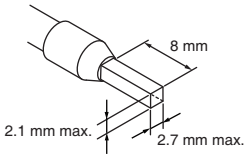
Recommended Ferrules and Tools

Recommended ferrules

Wire		Ferrule length (mm)	Recommended ferrules		
(mm^2)	(AWG)		Manufactured by Phoenix Contact	Manufactured by Weidmuller	Manufactured by Wago
0.25	24	8	AI0.25-8	H0.25/12	FE-0.25-8N-YE
0.34	22	8	AI0.34-8	H0.34/12	FE-0.34-8N-TQ
0.5	20	8	AI0.5-8	H0.5/14	FE-0.5-8N-WH
0.75	18	8	AI0.75-8	H0.75/14	FE-0.75-8N-GY
1	18	8	AI1-8	H1.0/14	FE-1.0-8N-RD
1.5	16	8	AI1.5-8	H1.5/14	FE-1.5-8N-BK
Recommended crimp tool			CRIMPFOX6 CRIMPFOX6T-F CRIMPFOX10S	PZ6 roto	Variocrimp4

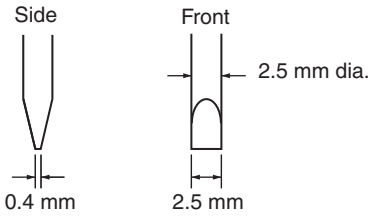
Note: 1. Make sure that the outer diameter of the wire coating is smaller than the inner diameter of the insulation sleeve of the recommended ferrule.

2. Make sure that the ferrule processing dimensions conform to the following figures.



Recommended Flat-blade Screwdriver

Use a flat-blade screwdriver to connect and remove wires.
Use the flat-blade screwdriver.
The following table shows manufacturers and models as of 2015/Dec.



Model	Manufacturer
XW4Z-00B	Omron
ESD0.40×2.5	Wera
SZF 0.4×2.5	Phoenix Contact
0.4×2.5×75 302	Wiha
AEF.2.5×75	Facom
210-719	Wago
SDI 0.4×2.5×75	Weidmuller

⚠ EN/IEC Standard Compliance

- Refer to the contents of this datasheet for cable selection and other conditions for compliance with EMC standards.

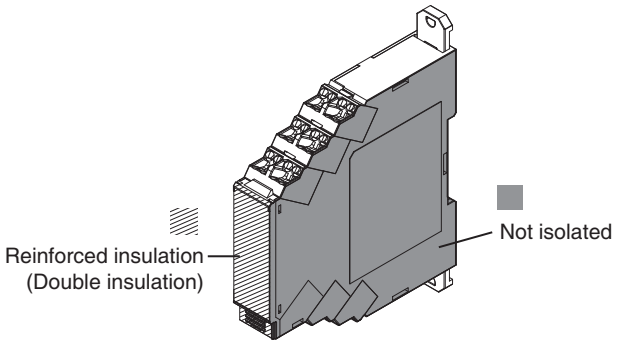
Precaution on EN Standard Compliance

The K8DT complies with EN 60947-5-1 when it is built into a panel, but observe the following handling methods to ensure compliance with the requirements of this standard.

Wiring

Overvoltage category III
Pollution degree 2

- Open-frame Device
- If basic, double, or reinforced insulation is required, use the basic, double, or reinforced insulation defined in IEC 60664 that is suitable for the maximum applied voltage for the clearance, solid insulation, and other factors.
- There is basic insulation between the power supply terminals and input terminals.
- There is basic insulation between the power supply terminals and output terminals.
- There is basic insulation between the input terminals and output terminals.
- Operating section must have reinforced or double insulation.
- The sides of the case are not isolated.
- Connect the output contacts (contacts with different polarity) so that they reach the same potential.



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