Panasonic
ideas for life

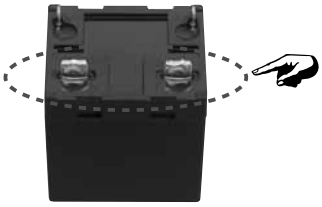
Ideal for Solar inverter
Compact size, 1 Form A 48A Power Relay

HE RELAYS PV Type

Compliance with RoHS Directive

FEATURES

• 48 A current at 250 V AC achieved in compact size (L: 33 × W: 38 × H: 36.3 mm L: 1.299 × W: 1.496 × H: 1.429 inch)
Due to improved conduction efficiency, wide terminal blades are used.



• Contact gap: 2.5 mm (VDE0126 compliant)
Compliant with European photovoltaic standard VDE0126
Compliant with EN61810-1 2.5 kV surge voltage (between contacts)

• Contributes to energy saving in devices thanks to reduced coil hold voltage
Coil hold voltage can be reduced down to 40% of the nominal coil voltage (ambient temperature 20°C 68°F). This equals to power consumption of approximately 310 mW.
*Coil hold voltage is the coil voltage after 100 ms following application of the nominal coil voltage.

• High insulation and 10,000 V surge breakdown voltage (between contacts and coil) achieved.

• Conforms to various safety standards
UL, C-UL and VDE

TYPICAL APPLICATIONS

• Photovoltaic power generation systems (Solar inverter)

ORDERING INFORMATION

HE [1a] [N] - [P] - DC [ ] - [Y5]

Contact arrangement
1a: 1 Form A (Single side stable type)

Pick-up voltage
N: 70% of nominal voltage

Terminals
P: Blade terminal type

Coil voltage (DC)
6, 9, 12, 24V

Type, contact material and switching capacity
Y5: PV type, AgNi type and 1 Form A 48A

Note: UL/C-UL and VDE approved type is standard.

HE PV Type

TYPES

Nominal coil voltage	Part No.
6V DC	HE1aN-P-DC6V-Y5
9V DC	HE1aN-P-DC9V-Y5
12V DC	HE1aN-P-DC12V-Y5
24V DC	HE1aN-P-DC24V-Y5

Standard packing: Carton: 20 pcs.; Case: 100 pcs.

RATING

1. Coil data

Nominal coil voltage	Pick-up voltage (at 20°C 68°F) (Initial)	Drop-out voltage (at 20°C 68°F) (Initial)	Nominal operating current [±10%] (at 20°C 68°F)	Coil resistance [±10%] (at 20°C 68°F)	Nominal operating power	Max. applied voltage (at 20°C 68°F)
6V DC	70%V or less of nominal voltage	10%V or more of nominal voltage	320mA	18.8Ω	1,920mW	110%V of nominal voltage
9V DC			213mA	42.2Ω		
12V DC			160mA	75.0Ω		
24V DC			80mA	300.0Ω		

2. Specifications

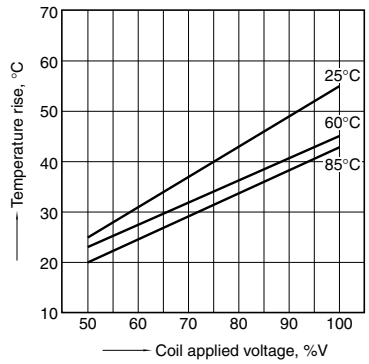
Characteristics	Item		Specifications
Contact	Arrangement		1 Form A
	Contact resistance (Initial)		Max. 100 mΩ (By voltage drop 6 V DC 1A)
	Contact material		AgNi type
Rating	Nominal switching capacity		48 A 250 V AC (resistive load)
	Contact carring power		12,000 VA (resistive load)
	Max. switching voltage		250 V AC
	Max. switching current		48 A (AC)
	Nominal operating power		1,920 mW
	Min. switching capacity (Reference value)*1		100 mA 5 V DC
Electrical characteristics	Insulation resistance (Initial)		Min. 1,000MΩ (at 500V DC) Measurement at same location as “Breakdown voltage” section.
	Breakdown voltage (Initial)	Between open contacts	2,000 Vrms for 1 min. (Detection current: 10 mA)
		Between contact and coil	5,000 Vrms for 1 min. (Detection current: 10 mA)
	Surge breakdown voltage*2 (Between contact and coil)		10,000 V (initial)
	Temperature rise		Max. 60°C 140°F (By resistive method, contact carrying current: 48A, 100%V of nominal coil voltage at 55°C 131°F.)
			Max. 30°C 86°F (By resistive method, contact carrying current: 48A, 60%V of nominal coil voltage at 85°C 185°F.)
	Coil hold voltage*3		40 to 100%V (Contact carrying current: 48A, at 20°C 68°F), 50 to 100%V (Contact carrying current: 48A, at 55°C 131°F), 50 to 60%V (Contact carrying current: 48A, at 85°C 185°F)
	Operate time (at 20°C 68°F)		Max. 30 ms (nominal coil voltage, excluding contact bounce time)
	Release time (at 20°C 68°F)*5		Max. 10 ms (nominal coil voltage, excluding contact bounce time) (without diode)
Mechanical characteristics	Shock resistance	Functional	Min. 98 m/s² (Half-wave pulse of sine wave: 11 ms; detection time: 10 µs.)
		Destructive	Min. 980 m/s² (Half-wave pulse of sine wave: 6 ms.)
	Vibration resistance	Functional	10 to 55 Hz at double amplitude of 1.0 mm (Detection time: 10 µs.)
		Destructive	10 to 55 Hz at double amplitude of 1.5 mm
Expected life	Mechanical		Min. 10^6 (at 180 cpm)
	Electrical	Resistive load	Min. 3×10^4 (48 A 250 V AC) (ON : OFF = 1s : 9s)
		Inductive load	Endurance: 48 A 250 V AC ($\cos\phi$ = 0.8), Min. 3×10^4 (ON : OFF = 0.1s : 10s) Overload: 72 A 250 V AC ($\cos\phi$ = 0.8), Min. 50 (ON : OFF = 0.1s : 10s)
Conditions	Conditions for operation, transport and storage*4		Ambient temperature: –50 to +55°C –58 to +131°F (When nominal coil voltage applied) –50 to +85°C –58 to +185°F (When applied coil hold voltage is 50% to 60% of nominal coil voltage) Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature); Atmospheric pressure: 86 to 106 kPa
	Max. operating speed		6 cpm (at nominal switching capacity ON : OFF = 1s : 9s)
Unit weight			Approx. 80 g 2.82 oz

Notes: *1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.
*2. Wave is standard shock voltage of ±1.2×50µs according to JEC-212-1981
*3. Coil hold voltage is the coil voltage after 100 ms following application of the nominal coil voltage.
*4. The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. Refer to Usage, transport and storage conditions in NOTES.
*5. Release time will lengthen if a diode, etc., is connected in parallel to the coil. Be sure to verify operation under actual conditions.

REFERENCE DATA

1. Coil temperature rise

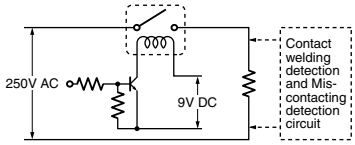
Sample: HE1aN-P-DC9V-Y5, 6 pcs.
Point measured: coil inside
Ambient temperature: 25°C 77°F, 60°C 140°F, 85°C 185°F
Contact carrying current: 48A



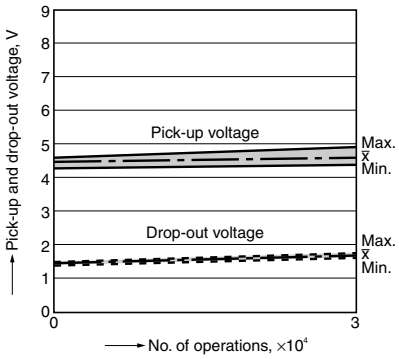
2. Electrical life test (Resistive load 250V AC, 48A at 85°C 185°F)

Sample: HE1aN-P-DC9V-Y5, 6 pcs.
Operation frequency: 6 times/min.
(ON/OFF = 1.0s : 9.0s)

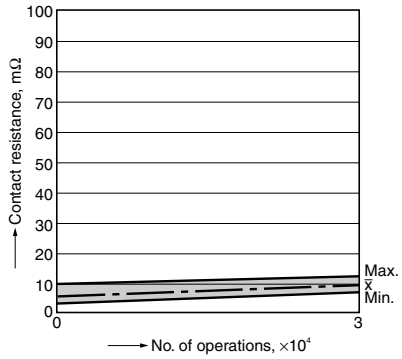
Circuit:



Change of pick-up and drop-out voltage

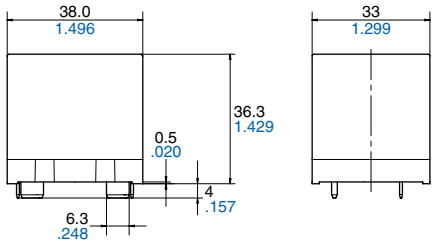


Change of contact resistance



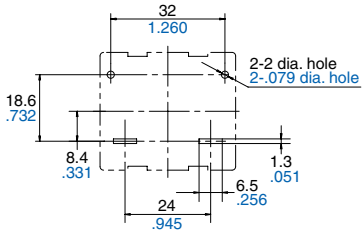
DIMENSIONS (Unit: mm inch)

External dimensions



General tolerance: ±0.3 ±.012

PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

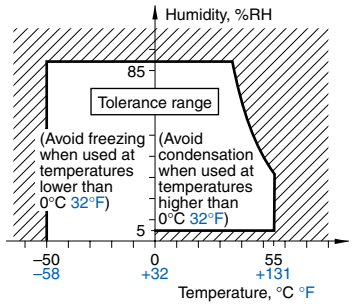
SAFETY STANDARDS

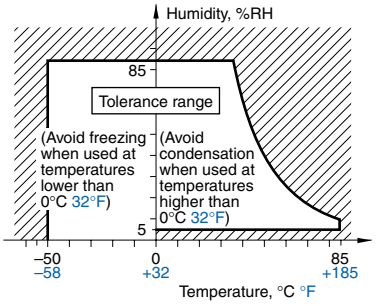
Certification authority	
C-UL	48 A 277 V AC (at 85°C 185°F)
VDE (VDE0435)	48 A 250 V AC cosϕ = 0.8 (at 85°C 185°F)

NOTES

■ Usage, transport and storage conditions

1) Temperature:
–50 to +55°C –58 to +131°F
–50 to +85°C –58 to +185°F (When applied coil hold voltage is 50% to 60% of nominal coil voltage)
2) Humidity: 5 to 85% RH
(Avoid freezing and condensation.)
The humidity range varies with the temperature. Use within the range indicated in the graph below.
3) Atmospheric pressure: 86 to 106 kPa
Temperature and humidity range for usage, transport, and storage





∗ –50 to +85°C –58 to +185°F (When applied coil hold voltage is 50% to 60% of nominal coil voltage)

4) Condensation
Condensation forms when there is a sudden change in temperature under high temperature and high humidity conditions. Condensation will cause deterioration of the relay insulation.

5) Freezing
Condensation or other moisture may freeze on the relay when the temperatures is lower than 0°C 32°F. This causes problems such as sticking of movable parts or operational time lags.
6) Low temperature, low humidity environments
The plastic becomes brittle if the relay is exposed to a low temperature, low humidity environment for long periods of time.

■ Certification

This relay is C-UL certified.
48 A 277 V AC
This relay is certified by VDE as an electromagnetic relay that complies with VDE0435.
48 A 250 V AC cosϕ = 0.8

■ Others

1) For precautions regarding use and explanations of technical terminology, please refer to our web site.
(panasonic-electric-works.net/ac)
2) To ensure good operation, please keep the voltage on the coil ends to ±5% (at 20°C 68°F) of the rated coil operation voltage. Also, please be aware that the pick-up voltage and drop-out voltage may change depending on the temperature and conditions of use.
3) Keep the ripple rate of the nominal coil voltage below 5%.
4) The cycle lifetime is defined under the standard test condition specified in the JIS C 5442 standard (temperature 15 to 35°C 59 to 95°F, humidity 25 to 85%). Check this with the real device as it is affected by coil driving circuit, load type, activation frequency, activation phase, ambient conditions and other factors. Also, be especially careful of loads such as those listed below.
(1) When used for AC load-operating and the operating phase is synchronous.
Rocking and fusing can easily occur due to contact shifting.
(2) Highly frequent load-operating
When highly frequent opening and closing of the relay is performed with a load that causes arcs at the contacts, nitrogen and oxygen in the air is fused by the arc energy and HNO_3 is formed. This can corrode metal materials.
Three countermeasures for these are listed here.
• Incorporate an arc-extinguishing circuit.
• Lower the operating frequency
• Lower the ambient humidity
5) This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.
6) Heat, smoke, and even a fire may occur if the relay is used in conditions outside of the allowable ranges for the coil ratings, contact ratings, operating cycle lifetime, and other specifications. Therefore, do not use the relay if these ratings are exceeded.
7) If the relay has been dropped, the appearance and characteristics should always be checked before use.
8) Incorrect wiring may cause unexpected events or the generation of heat or flames.