ORDERING INFORMATION

AHES ☐ ☐ **9** ☐

- Contact arrangement/Operating function
  3 : 2 Form A Single side stable type
  4 : 2 Form A 1 Form B Single side stable type
- Contact specifications
  1 : Standard type
  2 : Long life type
- Terminals shape
  9 : PC board terminal type
- Nominal coil voltage (DC)
  0 : 6V, 1 : 12V,
  2 : 24V, 3 : 48V, 5 : 9V

Note : Certified by UL/C-UL and VDE

TYPES

Contact arrangement	Nominal coil voltage	Part No.	
		Standard type	Long life type
2 Form A	6V DC	AHES3190	AHES3290
	9V DC	AHES3195	AHES3295
	12V DC	AHES3191	AHES3291
	24V DC	AHES3192	AHES3292
	48V DC	AHES3193	AHES3293
2 Form A 1 Form B	6V DC	AHES4190	AHES4290
	9V DC	AHES4195	AHES4295
	12V DC	AHES4191	AHES4291
	24V DC	AHES4192	AHES4292
	48V DC	AHES4193	AHES4293

Standard packing: Carton: 25 pcs.; Case: 100 pcs.

RATING

1.Coil data

- Operating characteristics such as 'Operate voltage' and 'Release voltage' are influenced by mounting conditions, ambient temperature, etc. Therefore, please use the relay within ± 5% of rated coil voltage.
- 'Initial' means the condition of products at the time of delivery.

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 (at 20°C 68°F)	Max. applied voltage (at 55°C 131°F)
6V DC	75%V or less of nominal voltage	5%V or more of nominal voltage	313mA	19.1Ω	ON: 1,880mW Holding: 170mW*1	110%V of nominal coil voltage 150%V of nominal coil voltage*2
9V DC			209mA	43.1Ω		
12V DC			157mA	76.6Ω		
24V DC			78mA	306.4Ω		
48V DC			39mA	1,225.5Ω		

Notes: *1. With 30%V coil holding voltage
*2. With no more than 24 hours per time with non-consecutive voltage application time.

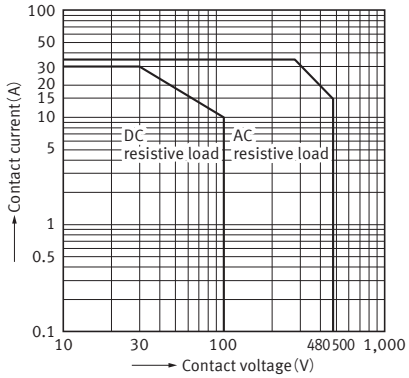
2. Specifications

Characteristics	Item		Specifications	
			Standard type	Long life type
Contact	Arrangement		2 Form A, 2 Form A 1 Form B	2 Form A, 2 Form A 1 Form B
	Form A contact	Contact resistance (Initial)	Max. 100mΩ (By voltage drop 6V DC 1A), Max. 3mΩ (By voltage drop 6V DC 20A, Reference value)	
		Contact material	$AgSnO_2$ type	
	Form B contact*6	Contact resistance (Initial)	Max. 100mΩ (By voltage drop 6V DC 1A)	
		Contact material	Au flashed AgNi type	
Rating	Form A contact	Nominal switching capacity (Resistive load)	35A 277V AC	
		Max. switching voltage	480V AC, 110V DC	
		Contact carring power (Resistive load)	9,695VA	
		Max. switching current	35A	
		Min. switching capacity (Reference value)*1	100mA 5V DC	
	Form B contact*6	Nominal switching capacity (Resistive load)	1A 277V AC, 1A 30V DC	
		Max. switching voltage	277V AC, 30V DC	
		Contact carring power (Resistive load)	277VA	
		Max. switching current	1A	
		Min. switching capacity (Reference value)*1	10mA 5V DC	
	Nominal operating power		1,880mW (after applying min.100ms coil nominal voltage)	
			170mW (30%V of coil holding voltage)	
Electrical characteristics	Insulation resistance (Initial)		Min. 1,000MΩ (at 500 V DC) Measurement at same location as “Breakdown voltage” section.	
	Short current (A contact, Initial)		Max. 1,000A 1 ms, 3 times (Reference value)	
	Breakdown voltage (Initial)	Between open Form A contacts	2,000 Vrms for 1 min. (Detection current: 10mA)	
		Between Form A contact and coil	5,000 Vrms for 1 min. (Detection current: 10mA)	
		Between Form A contact sets	5,000 Vrms for 1 min. (Detection current: 10mA)	
		Between open Form B contacts	1,000 Vrms for 1 min. (Detection current: 10mA)	
		Between Form B contact and coil	2,000 Vrms for 1 min. (Detection current: 10mA)	
		Between Form A contact and Form B contact	5,000 Vrms for 1 min. (Detection current: 10mA)	
	Surge breakdown voltage*2 (Between contact and coil)		10,000V (Between Form A contact and coil) (Initial) 2,500V (Between Form B contact and coil) (Initial)	
	Coil holding voltage*3		30 to 110%V (Form A contact carrying current: 35A, at –40 to +55°C –40 to +131°F)	
			30 to 60%V (Form A contact carrying current: 35A, at –40 to +85°C –40 to +185°F)	
	Operate time (at 20°C 68°F) (Initial)		Max. 30 ms (at nominal coil voltage, excluding contact bounce time)	
	Release time (at 20°C 68°F)*4 (Initial)		Max. 10 ms (at nominal coil voltage, excluding contact bounce time, without diode)	
Mechanical characteristics	Shock resistance	Functional	98 m/s^2 (Half-wave pulse of sine wave: 11 ms; detection time: 10 μs)	
		Destructive	980 m/s^2 (Half-wave pulse of sine wave: 6 ms)	
	Vibration resistance	Functional	10 to 55 Hz at double amplitude of 1.0 mm .039 inch (Detection time: 10 μs)	
		Destructive	10 to 55 Hz at double amplitude of 1.5 mm .059 inch	
Expected life	Mechanical		Min. 5×10^6 (at 180 times/min.)	
	Electrical (Form A contact)	Resistive load	Min. 3×10^4 (35A 277V AC) (ON : OFF = 1s : 9s)	Min. 5×10^4 (35A 277V AC) (ON : OFF = 1s : 9s)
			—	Min. 1×10^5 (30A 220V AC) (ON : OFF = 1s : 9s)
			Min. 1×10^5 (20A 277V AC) (ON : OFF = 1s : 9s)	Min. 2×10^5 (20A 277V AC) (ON : OFF = 1s : 9s)
		Inductive load	Min. 3×10^4 (35A 250V AC) (cosφ = 0.8) (ON : OFF = 0.1s : 10s)	Min. 5×10^4 (35A 250V AC) (cosφ = 0.8) (ON : OFF = 0.1s : 10s)
	Electrical (Form B contact)*6	Resistive load	Min. 1×10^5 (1A 277V AC) (ON : OFF = 1s : 9s)	
			Min. 1×10^5 (1A 30V DC) (ON : OFF = 1s : 9s)	
Conditions	Conditions for operation, transport and storage*5		Temperature: –40 to +55°C –40 to +131°F (Coil holding voltage 30 to 110%V) Temperature: –40 to +85°C –40 to +185°F (Coil holding voltage 30 to 60%V or storage) Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature) Air pressure: 86 to 106 kPa	
Unit weight			Approx. 64 g 2.26 oz	

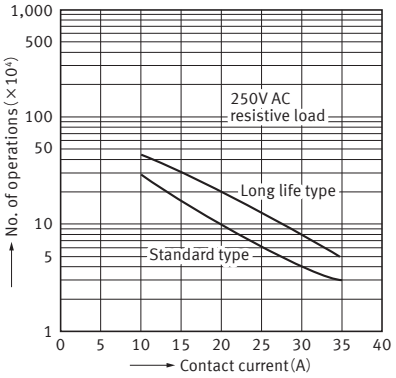
Notes: *1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.
*2. Wave is standard shock voltage of ±1.2×50μs according to JEC-212-1981
*3. Coil holding voltage is the coil voltage after 100 ms from the applied nominal coil voltage.
*4. Release time will lengthen if a diode, etc., is connected in parallel to the coil. Be sure to verify operation under actual conditions.
*5. 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.
*6. Regarding Form B contact, only the 2 Form A 1 Form B type applies.

REFERENCE DATA

1. Maximum switching power

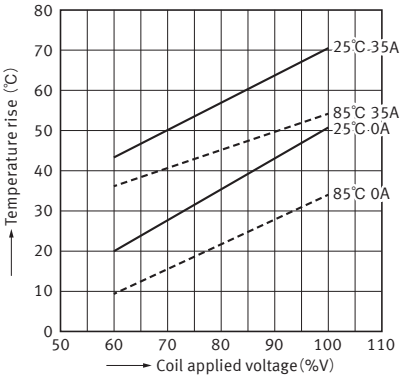


2. Life curve



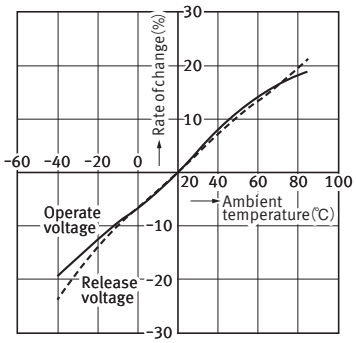
3. Coil temperature rise

Measured portion : Coil inside
Contact current : 35A, 0A
Ambient temperature : 25℃, 85℃



4. Ambient temperature characteristics

Tested sample : AHES3191, 6 pcs.



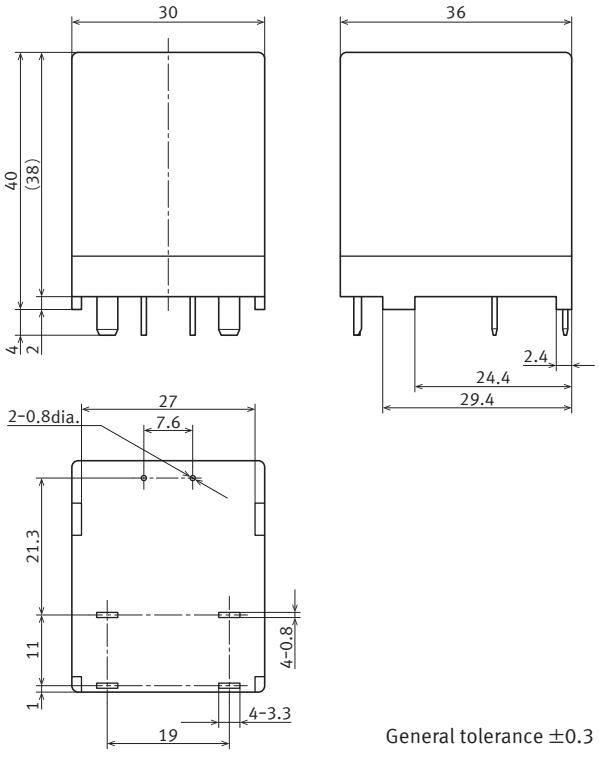
DIMENSIONS (mm)

CAD The CAD data of the products with a “CAD” mark can be downloaded from our Website.

1. 2 Form A type

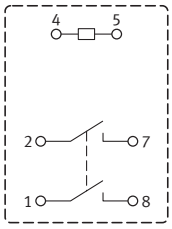
CAD

External dimensions

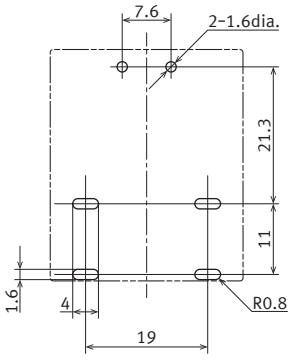


General tolerance ±0.3

Schematic (Bottom view)



Recommended PC board pattern (Bottom view)

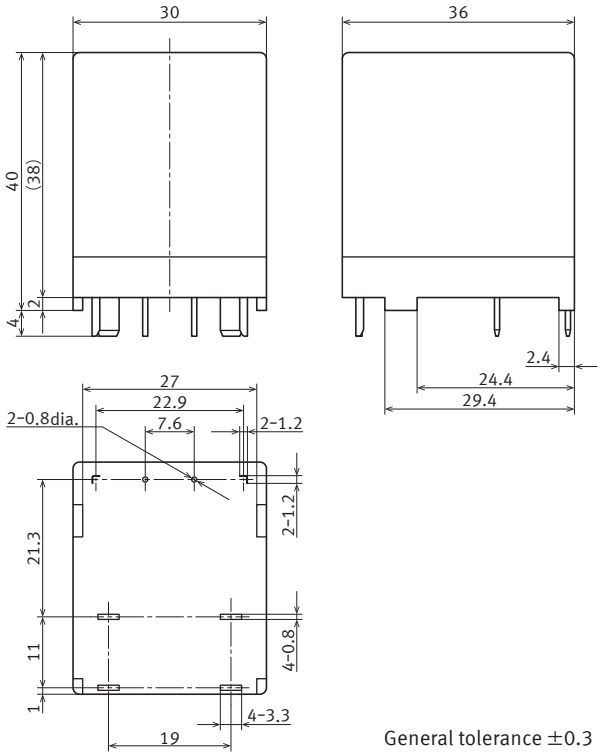


Tolerance ±0.1

2. 2 Form A 1 Form B type

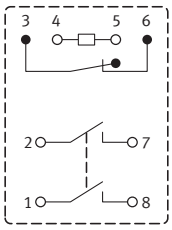
CAD

External dimensions

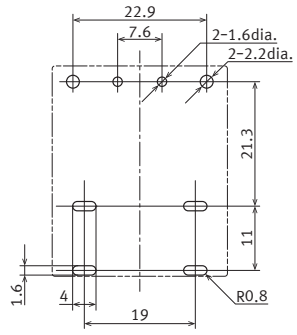


General tolerance ±0.3

Schematic (Bottom view)



Recommended PC board pattern (Bottom view)



Tolerance ±0.1

SAFETY STANDARDS

Item		Certification	File No.	N.O. contact (Form A contact)			N.C. contact (Form B contact)		
				Contact rating	Temp.	Cycles	Contact rating	Temp.	Cycles
Standard type (AHES*19*)	2 Form A	UL/C-UL (Recognized)	E43149	35A, 277VAC, Resistive 20A, 277VAC, Resistive	85°C 185°F 85°C 185°F	3×10^4 10^5	—	—	—
	2 Form A 1 Form B			15A, 480VAC, Resistive TV-8	85°C 185°F 40°C 104°F	10^5 25×10^3	1A, 30VDC, Resistive 1A, 277VAC, Resistive	85°C 185°F 85°C 185°F	10^5 10^5
	2 Form A	VDE (Certified)	40042442	AC-7a: 35A, 250VAC, cosφ = 0.8 AC-3: 12A, 230VAC, cosφ = 0.45 AC-3: 8A, 480VAC, cosφ = 0.45	85°C 185°F 85°C 185°F 85°C 185°F	3×10^4 3×10^4 3×10^4	—	—	—
	2 Form A 1 Form B						DC-13: 1A, 24VDC, L/R = 48ms	85°C 185°F	8×10^4

Item		Certification	File No.	N.O. contact (Form A contact)			N.C. contact (Form B contact)		
				Contact rating	Temp.	Cycles	Contact rating	Temp.	Cycles
Long life type (AHES*29*)	2 Form A	UL/C-UL (Recognized)	E43149	35A, 277VAC, Resistive 20A, 277VAC, Resistive	85°C 185°F 85°C 185°F	5×10^4 2×10^5	—	—	—
	2 Form A 1 Form B			15A, 480VAC, Resistive TV-10	85°C 185°F 40°C 104°F	10^5 25×10^3	1A, 30VDC, Resistive 1A, 277VAC, Resistive	85°C 185°F 85°C 185°F	10^5 10^5
	2 Form A	VDE (Certified)	40042442	AC-7a: 35A, 250VAC, cosφ = 0.8 AC-3: 12A, 230VAC, cosφ = 0.45 AC-3: 8A, 480VAC, cosφ = 0.45	85°C 185°F 85°C 185°F 85°C 185°F	3×10^4 3×10^4 3×10^4	—	—	—
	2 Form A 1 Form B						DC-13: 1A, 24VDC, L/R = 48ms	85°C 185°F	8×10^4

EN/IEC VDE Certified INSULATION CHARACTERISTIC (IEC61810-1)

Item	Characteristic (Form A contact)
Clearance/Creepage distance (IEC61810-1)	Min. 5.5mm .217inch/8.0mm .315inch
Category of protection (IEC61810-1)	RT II
Tracking resistance (IEC60112)	PTI 175
Insulation material group	III a
Over voltage category	III
Rated voltage	250V
Pollution degree	3
Type of insulation (Between contact and coil)	Reinforced insulation
Type of insulation (Between open contacts)	Full disconnection

NOTES

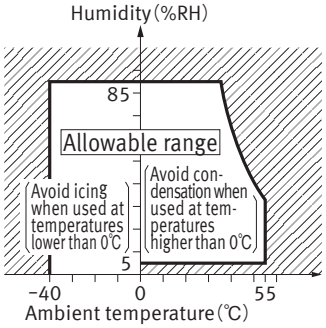
1. **For cautions for use, please refer to our web site.**
   (https://www3.panasonic.biz/ac/e/control/relay/cautions_use/index.jsp)

2. **When coil holding voltage controlled by PWM, check coil holding voltage and operation of relay under the actual condition.**

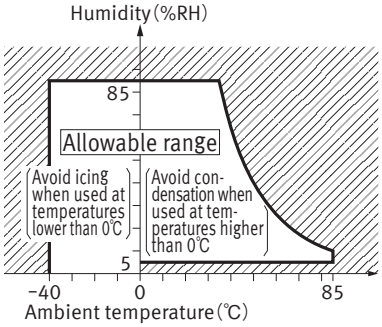
3. **Usage, transport and storage conditions**
   1) Temperature:
      –40 to +55°C –40 to +131°F (When applied coil holding voltage is 30% to 110%V of nominal coil voltage)
      –40 to +85°C –40 to +185°F (When applied coil holding voltage is 30% to 60%V of nominal coil voltage or storage)
   2) Humidity: 5 to 85% RH (Not freezing and condensing at low temperature)
      In addition the humidity range depends on temperature. The allowable ranges are as follows;
   3) Air pressure: 86 to 106 kPa

   Allowable range of temperature and humidity for operation, transport and storage.

   [Coil holding voltage: 30% to 110%V]



   [Coil holding voltage: 30% to 60%V]



4. **Solder and cleaning conditions**
   1) Please obey the following conditions when soldering automatically.
      (1) Pre-heating: within 120°C 248°F (solder surface terminal portion) and within 120 seconds
      (2) Soldering iron: 260°C±5°C 500°F±41°F (solder temperature) and within 10 seconds (soldering time)
   2) In case of manual soldering, following conditions should be observed.
      • Max. 270°C 518°F (solder temperature) within 10 seconds (soldering time)
      • Max. 350°C 662°F (solder temperature) within 5 seconds (soldering time)
      * Effects of soldering heat on the relays vary depending on the PC board. So please confirm actual soldering condition with the PC board used for assembling.
   3) Do not clean this relay by immersion, since the relay is not sealed.
      Also, be careful not to allow flux to overflow above the PC board or enter the inside of the relay.

Please refer to **"the latest product specifications"** when designing your product.
• Requests to customers :
https://industrial.panasonic.com/ac/e/salespolicies/

GUIDELINES FOR POWER RELAYS AND HIGH-CAPACITY DC CUT OFF RELAYS USAGE

For cautions for use, please read "GUIDELINES FOR RELAY USAGE".
https://industrial.panasonic.com/ac/e/control/relay/cautions_use/index.jsp

Precautions for Coil Input

■Long term current carrying

A circuit that will be carrying a current continuously for long periods without relay switching operation. (circuits for emergency lamps, alarm devices and error inspection that, for example, revert only during malfunction and output warnings with form B contacts) Continuous, long-term current to the coil will facilitate deterioration of coil insulation and characteristics due to heating of the coil itself.
For circuits such as these, please use a magnetic-hold type latching relay. If you need to use a single stable relay, use a sealed type relay that is not easily affected by ambient conditions and make a failsafe circuit design that considers the possibility of contact failure or disconnection.

■DC Coil operating power

Steady state DC current should be applied to the coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%.
However, please check with the actual circuit since the electrical characteristics may vary. The rated coil voltage should be applied to the coil and the set/reset pulse time of latching type relay differs for each relays, please refer to the relay's individual specifications.

■Coil connection

When connecting coils of polarized relays, please check coil polarity (+,-) at the internal connection diagram (Schematic). If any wrong connection is made, it may cause unexpected malfunction, like abnormal heat, fire and so on, and circuit do not work. Avoid impressing voltages to the set coil and reset coil at the same time.

■Maximum allowable voltage and temperature rise

Proper usage requires that the rated coil voltage be impressed on the coil. Note, however, that if a voltage greater than or equal to the maximum continuous voltage is impressed on the coil, the coil may burn or its layers short due to the temperature rise. Furthermore, do not exceed the usable ambient temperature range listed in the catalog.

■Operate voltage change due to coil temperature rise

(Hot start)

In DC relays, after continuous passage of current in the coil, if the current is turned OFF, then immediately turned ON again, due to the temperature rise in the coil, the pick-up voltage will become somewhat higher. Also, it will be the same as using it in a higher temperature atmosphere. The resistance/temperature relationship for copper wire is about 0.4% for 1°C, and with this ratio the coil resistance increases. That is, in order to operate of the relay, it is necessary that the voltage be higher than the pick-up voltage and the pick-up voltage rises in accordance with the increase in the resistance value. However, for some polarized relays, this rate of change is considerably smaller.

Ambient Environment

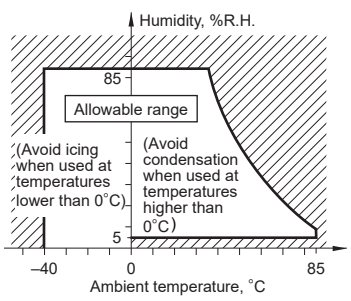
●Usage, Transport, and Storage Conditions

During usage, storage, or transportation, avoid locations subjected to direct sunlight and maintain normal temperature, humidity and pressure conditions.

●Temperature/Humidity/Pressure

When transporting or storing relays while they are tube packaged, there are cases the temperature may differ from the allowable range. In this case be sure to check the individual specifications. Also allowable humidity level is influenced by temperature, please check charts shown below and use relays within mentioned conditions. (Allowable temperature values differ for each relays, please refer to the relay's individual specifications.)

1) Temperature:
The tolerance temperature range differs for each relays, please refer to the relay's individual specifications
2) Humidity:
5 to 85 % RH
3) Pressure:
86 to 106 kPa



●Dew condensation

Condensation occurs when the ambient temperature drops suddenly from a high temperature and humidity, or the relay is suddenly transferred from a low ambient temperature to a high temperature and humidity. Condensation causes the failures like insulation deterioration, wire disconnection and rust etc. Panasonic Corporation does not guarantee the failures caused by condensation.
The heat conduction by the equipment may accelerate the cooling of device itself, and the condensation may occur. Please conduct product evaluations in the worst condition of the actual usage. (Special attention should be paid when high temperature heating parts are close to the device. Also please consider the condensation may occur inside of the device.)

●Icing

Condensation or other moisture may freeze on relays when the temperature become lower than 0°C.This icing causes the sticking of movable portion, the operation delay and the contact conduction failure etc. Panasonic Corporation does not guarantee the failures caused by the icing.
The heat conduction by the equipment may accelerate the cooling of relay itself and the icing may occur. Please conduct product evaluations in the worst condition of the actual usage.

●Low temperature and low humidity

The plastic becomes brittle if the switch is exposed to a low temperature, low humidity environment for long periods of time.

●High temperature and high humidity

Storage for extended periods of time (including transportation periods) at high temperature or high humidity levels or in atmospheres with organic gases or sulfide gases may cause a sulfide film or oxide film to form on the surfaces of the contacts and/or it may interfere with the functions. Check out the atmosphere in which the units are to be stored and transported.

●Package

In terms of the packing format used, make every effort to keep the effects of moisture, organic gases and sulfide gases to the absolute minimum.

●Silicon

When a source of silicone substances (silicone rubber, silicone oil, silicone coating materials and silicone filling materials etc.) is used around the relay, the silicone gas (low molecular siloxane etc.) may be produced.

This silicone gas may penetrate into the inside of the relay. When the relay is kept and used in this condition, silicone compound may adhere to the relay contacts which may cause the contact failure. Do not use any sources of silicone gas around the relay (Including plastic seal types).

●NOx Generation

When relay is used in an atmosphere high in humidity to switch a load which easily produces an arc, the NOx created by the arc and the water absorbed from outside the relay combine to produce nitric acid. This corrodes the internal metal parts and adversely affects operation. Avoid use at an ambient humidity of 85%RH or higher (at 20°C). If use at high humidity is unavoidable, please contact our sales representative.

Others

■Cleaning

1) Although the environmentally sealed type relay (plastic sealed type, etc.) can be cleaned, avoid immersing the relay into cold liquid (such as cleaning solvent) immediately after soldering. Doing so may deteriorate the sealing performance.
2) Cleaning with the boiling method is recommended(The temperature of cleaning liquid should be 40°C or lower).
   Avoid ultrasonic cleaning on relays. Use of ultrasonic cleaning may cause breaks in the coil or slight sticking of the contacts due to ultrasonic energy.

Please refer to **"the latest product specifications"** when designing your product.
•Requests to customers:
https://industrial.panasonic.com/ac/e/salespolicies/

Please contact .....

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