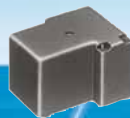


PANASONIC RELAYS

FOR PHOTOVOLTAIC POWER SOLUTIONS



LF-G Relay
1a 22A/31A 250V AC



JT-G Relay
1a 26A 250V AC



HE Relay PV
1a 35A/48A 250V AC









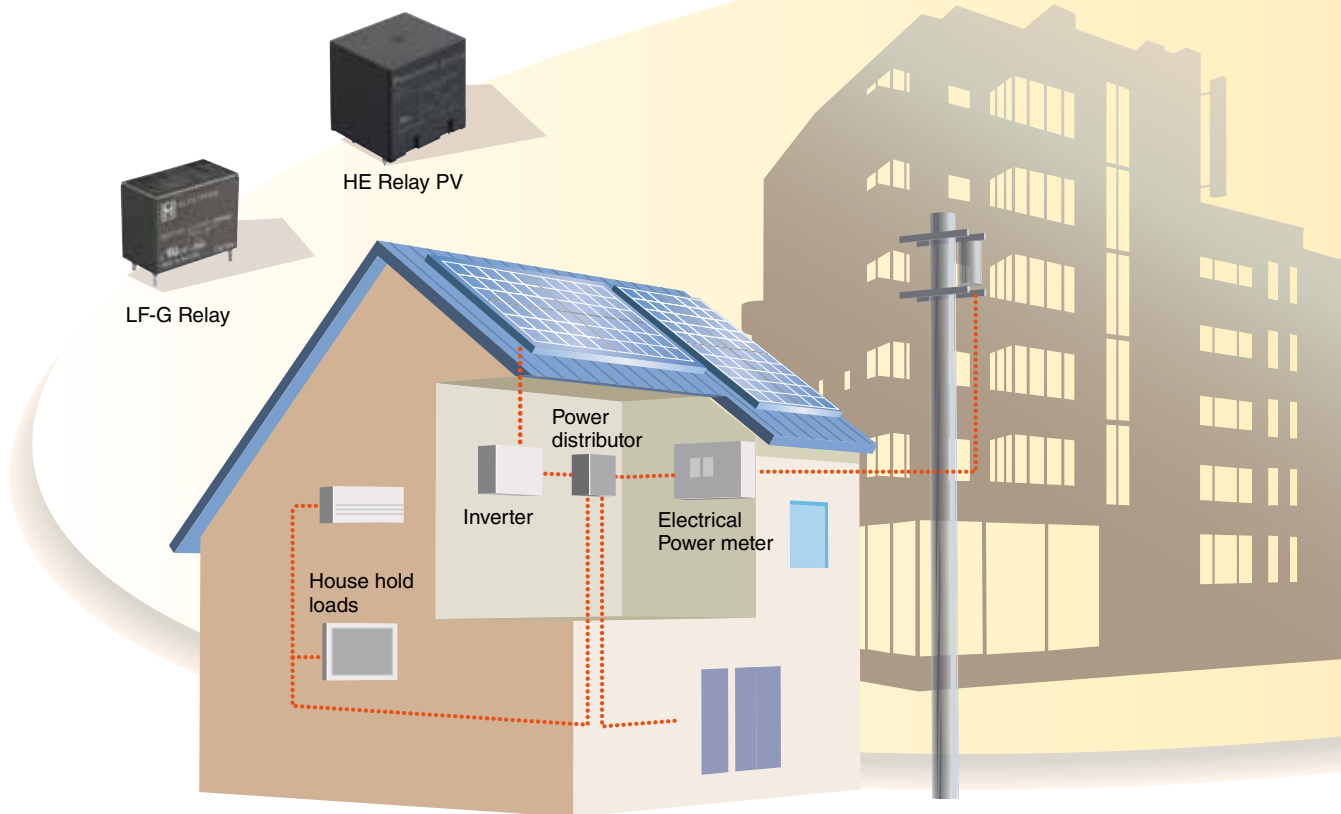
EP Relay 20A
1a 20A 1,000V DC



EP Relay 80A
1a 80A 1,000V DC

AC side

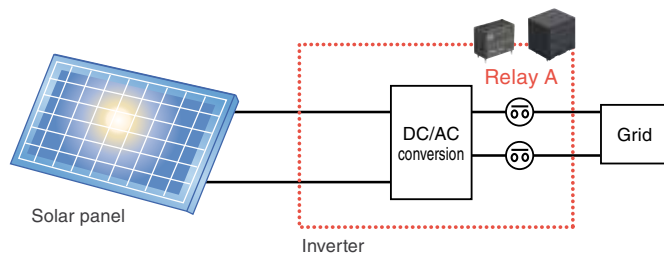
LF-G Standard	JT-G	LF-G High capacity	HE PV standard	HE PV High capacity	HE 2 Form A (PCB type)
					
22A	26A	31A	35A	48A	27A








Application 1 Relay A (for safety shutoff on the AC side)

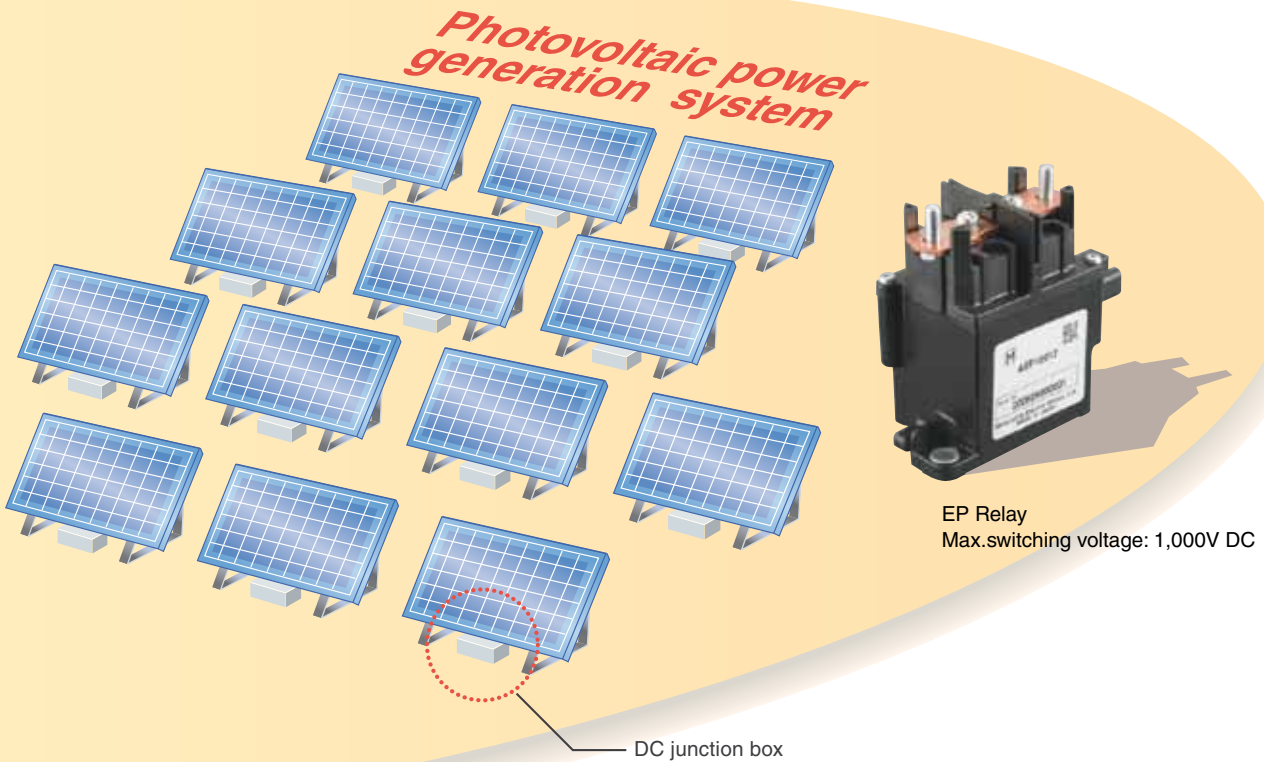
Relays are used for safety shutoff on the commercial power supply line (grid).

The relay must shut off the circuit to prevent abnormal currents that occur from affecting the commercial power supply. Power relays are required as a safety measure to protect the power supply system.



DC side

EP 10A (TM type)	EP 10A (PCB type)	EP 20A	EP 80A	EP 300A
				
10A	10A	20A	80A	300A



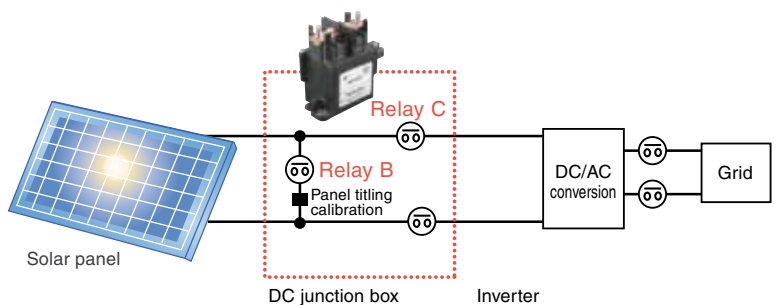
Application 1 Relay B (detection of the solar position)

When the inclination is calibrated, relay B is turned on and relay C is turned off.







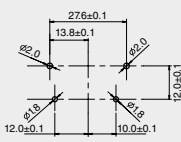
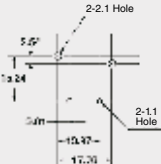
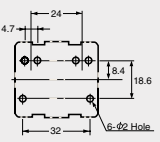
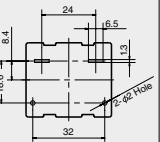
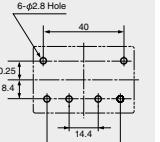
The current generated is detected by a current sensor and the inclination of solar panels is calculated and optimized.

Application 2 Relay C (safety shutoff on the DC side)

Many such relays, not manual breakers, are used in various fields. They must be able to control high voltages remotely.



AC side

		AC side					
Market		Residential, commercial			commercial		
Output (Inverter)		1~4kW	5~7kW	1~4kW	8~10kW		
Corresponding relay		LF-G Standard 	LF-G High capacity 	JT-G  Under development	HE PV Standard 	HE PV High capacity 	HE 2 Form A PCB type 
Contact	Arrangement	1a		1a	1a		2a
	Nominal switching capacity	22A 250V AC	31A 250V AC	26A 250V AC	35A 250V AC 35A 30V DC *1	48A 250V AC 48A 30V DC *1	27A 250V AC
	Contact GAP	1.5mm *7		1.85mm	2.5mm		3.0mm
Coil	Coil voltage (DC)	9, 12, 18, 24 V		12 V	9 V	6, 9, 12, 24 V	9, 24 V
	Nominal operating power	1,400mW		1,000mW	1,920mW		1,920mW
	Coil holding voltage *2 (Max. contact carrying current: at 20°C)	170mW 35%V of nominal coil voltage at 20°C		*5	310mW 40%V of nominal coil voltage at 20°C		310mW 40%V of nominal coil voltage at 20°C
Breakdown voltage (Between contact and coil)		4,000V AC		3,500V AC	5,000V AC		5,000V AC
Size (mm)		15.7(L)×30.1(W)×23.3(H)		26.9(L)×31.9(W)×20.2(H)	33(L)×38(W)×36.3(H)		33(L)×50(W)×39(H)
Terminal layout (Bottom view)		 General tolerance ±0.1		 General tolerance ±0.1	 General tolerance ±0.1	 General tolerance ±0.1	 General tolerance ±0.1
Ambient temperature		-40°C~+85°C *3		-55°C~+85°C *6	-50°C~+85°C *4		-50°C~+80°C *4
Standards		UL, C-UL, VDE					VDE
RoHS		RoHS compliant					

*1 The IGBT must be combined with HE relay in order to incorporate the DC breaker function into an inverter.

The switching is carried out on the IGBT and the relay is used only for conduction.

*2 Coil hold voltage is the coil voltage after 100ms following application of the nominal coil voltage.

*3 When applied coil hold voltage is 45% to 80% of nominal coil voltage.





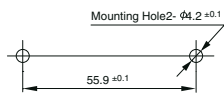
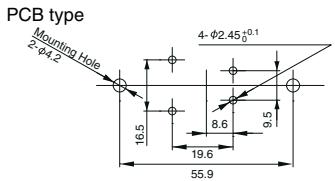
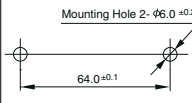
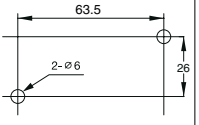
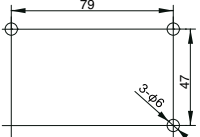
*4 When applied coil hold voltage is 50% to 60% of nominal coil voltage.

*5 250mW 50%V of nominal voltage at 85°C.

*6 In case of 50% to 70%V of nominal coil voltage.

*7 1.8mm is under development.

DC side

		DC side			
Market		Residential commercial, power plant			
Corresponding relay		<p>EP 10A</p>  <p>TM type PCB type</p>	<p>EP 20A</p>  <p>Under development</p>	<p>EP 80A</p> 	<p>EP 300A</p> 
Contact	Arrangement	1a	1a	1a	1a
	Nominal switching capacity	10A, 400VDC	20A, 400VDC	80A, 400VDC	300A, 400VDC
	Max. switching voltage	1,000V DC			
Coil	Coil voltage (DC)	12, 24, 48, 100 V	12 V	12, 24 V	12, 24 V
	Nominal operating power	1.4W or less	3.9W	5W or less	when input: 40w max (0.1 sec. from time of input when retained: 4w max)
Breakdown voltage (Between contact and coil)		2,500V AC			
Size (mm)		37.9(L)×62.4(W)×31.3(H) (PCB) 37.9(L)×66.8(W)×31.7(H) (TM)	40(L)×78(W)×48.1(H)	40(L)×75.5(W)×79(H)	63(L)×111(W)×74.7(H)
Terminal layout (Bottom view)		<p>TM type</p>  <p>PCB type</p> 	<p>Mounting Hole 2-$\phi 6.0^{+0.2}$</p>  <p>General tolerance ± 0.1</p>	<p>63.5</p>  <p>2-$\phi 6$</p> <p>26</p> <p>General tolerance ± 0.1</p>	<p>79</p>  <p>47</p> <p>3-$\phi 6$</p> <p>General tolerance ± 0.1</p>
Ambient temperature		-40°C~+80°C			
Options		-	-	Terminal protection cover is available (please contact us)	
Standards		C-UL	-	C-UL	-
RoHS		RoHS compliant			

Panasonic Relays for Photovoltaic Power Solutions

Ordering information

LF-G Relay

Standard packing-Carton: 50 pcs.; Case: 200 pcs.

Arrangement	Nominal coil voltage	Part No.	
		Standard	High capacity
1a	DC9V	ALFG1PF09	ALFG2PF09
	DC12V	ALFG1PF12	ALFG2PF12
	DC18V	ALFG1PF18	ALFG2PF18
	DC24V	ALFG1PF24	ALFG2PF24

HE Relay PV

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

Arrangement	Nominal coil voltage	Part No.	
		Standard	High capacity
1a	DC6V	—	HE1aN-P-DC6V-Y5
	DC9V	HE1aN-P-DC9V-H18	HE1aN-P-DC9V-Y5
	DC12V	—	HE1aN-P-DC12V-Y5
	DC24V	—	HE1aN-P-DC24V-Y5

EP Relay

Standard packing-10A Carton: 25 pcs.; Case: 100 pcs.,
80A Carton; 1 pcs.; Case: 20 pcs., 300A Carton: 1 pcs.; Case: 5 pcs.

Arrangement	Type	Nominal coil voltage	Part No.
1a	10A PCB type	DC12V	AEP31012
		DC24V	AEP31024
		DC48V	AEP31048
		DC100V	AEP310X0
	10A TM	DC12V	AEP51012
		DC24V	AEP51024
		DC48V	AEP51048
		DC100V	AEP510X0
	80A	DC12V	AEP18012
		DC24V	AEP18024
	300A	DC12V	AEP19012
		DC24V	AEP19024

JT-G relay, HE relay 2 Form A PCB type, EP relay 20A, EP relay terminal cover are available. Please contact us.

LF-G/JT-G/HE Relay

■ Suitable for European photovoltaic generation standard VDE0126

1.5mm contact gap is required for the AC circuit side on photovoltaic generation equipment in the European market.

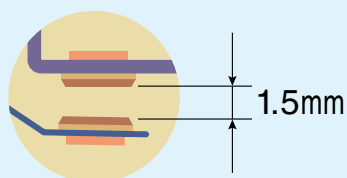
Background that contact GAP over 1.5 mm is required in Europe.

06/2 Compliance of European Photovoltaic standard (VDE0126) has changed.

The condition of the contact GAP over **1.5mm** was added to the current demand of over 2.5kV surge breakdown voltage (between contacts).



Contact GAP over 1.5mm is required for power relays.



LF-G Relay



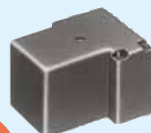
1.8mm*

HE Relay
PV type



2.5mm

JT-G Relay **



1.85mm

HE Relay
2 Form A
PCB type



2.5mm

* 1.5mm is standard, 1.8mm is under development
** Under development

Panasonic Relays for Photovoltaic Power Solutions

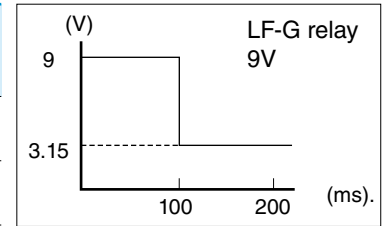
LF-G/JT-G/HE relay PV features

Contributes to energy saving in devices with reduced coil holding voltage

In existing products, nominal coil voltage had to be implied to the coil side. However LF-G Relay, JT-G Relay and HE Relay PV can be operated with reduced coil voltage (coil holding voltage *1). For that reason, a lower power consumption can be achieved.

Condition: Max. contact carrying current at 20°C (LF-G, HE), 85°C (JT-G)

Product	Nominal operating power	Ratio in which coil hold voltage can be decreased	Power consumption when coil holding voltage decreases
LF-G relay	1,400mW	35%V of nominal coil voltage	approx. 170mW
JT-G relay	1,000mW	50%V of nominal coil voltage	approx. 250mW
HE relay PV	1,920mW	40%V of nominal coil voltage	approx. 310mW



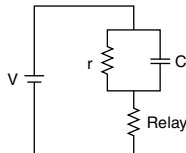
*1 Coil holding voltage is the coil voltage after 100ms following application of the nominal coil voltage.

How to reduce coil holding Voltage

To reduce coil holding voltage, one way is to set nominal coil voltage over 100ms. However you shall have a similar result using below way also.

1) LF-G relay

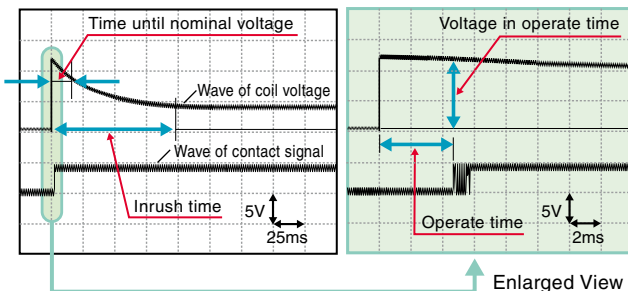
- Sample: **ALFG1PF09** (9V type)
- Circuit



3. Recommended condition (Ambient temperature: 20°C)

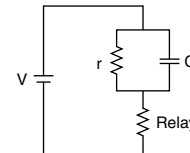
Coil impress voltage		Coil holding voltage		R (Relay)	C	r	Inrush time	Time until nominal voltage	Voltage in operate time	Operate time
[V]	[%V]	[V]	[%V]	[Ω]	[μF]	[Ω]	[ms]	[ms]	[V]	[ms]
12	133.3	4.05	45.0	58.0	640	113.9	107.5	15.0	11.1	4.50
12	133.3	4.05	45.0	58.0	470	113.9	95.5	10.5	11.0	4.54
10.8	120.0	4.05	45.0	58.0	640	96.7	99.0	10.0	10.1	4.98

Wave of coil voltage



2) HE relay PV

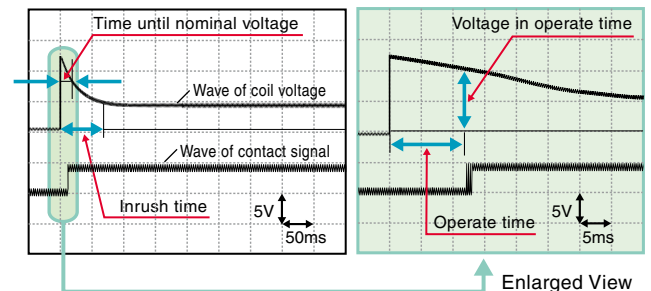
- Sample: **HE1aN-P-DC9V-Y5** (9V type)
- Circuit



3. Recommended condition (Ambient temperature: 20°C)

Coil impress voltage		Coil holding voltage		R (Relay)	C	r	Inrush time	Time until nominal voltage	Voltage in operate time	Operate time
[V]	[%V]	[V]	[%V]	[Ω]	[μF]	[Ω]	[ms]	[ms]	[V]	[ms]
12	133.3	4.5	50.0	42.2	640	70.3	76.5	18.0	10.0	11.85

Wave of coil voltage

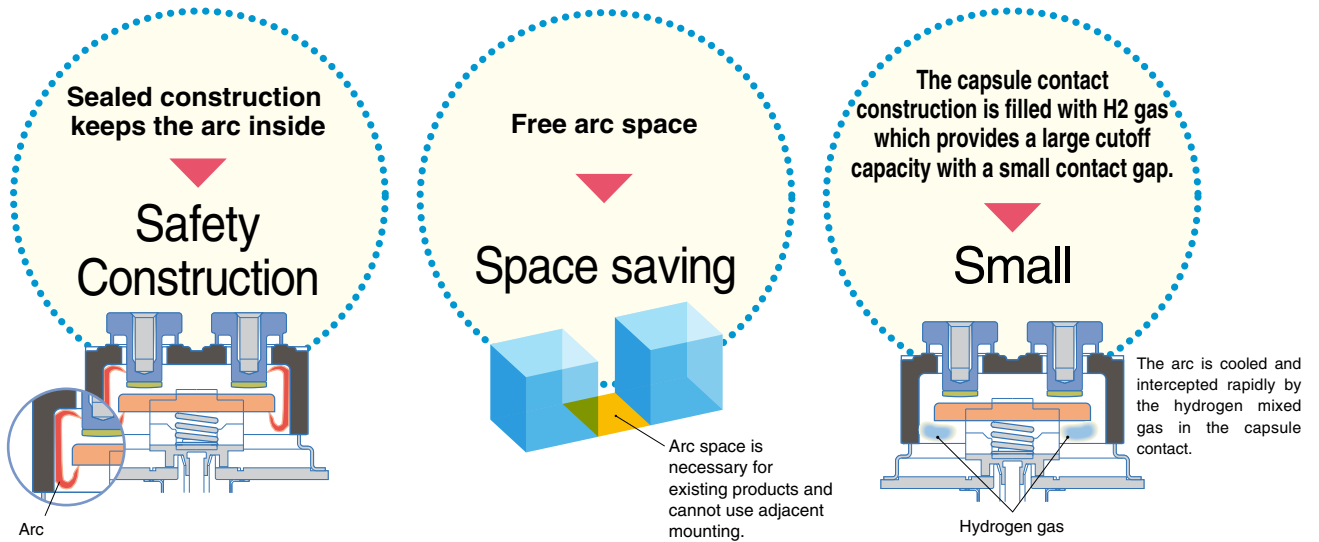


* In case of LF-G, time until nominal voltage is more than 2 times of operate time. In case of HE PV, time until nominal voltage is more than 1.5 times of operate voltage. The method of reducing the coil holding voltage is only a reference. Not guaranteed. Please check under the most stringent conditions in the actual application.

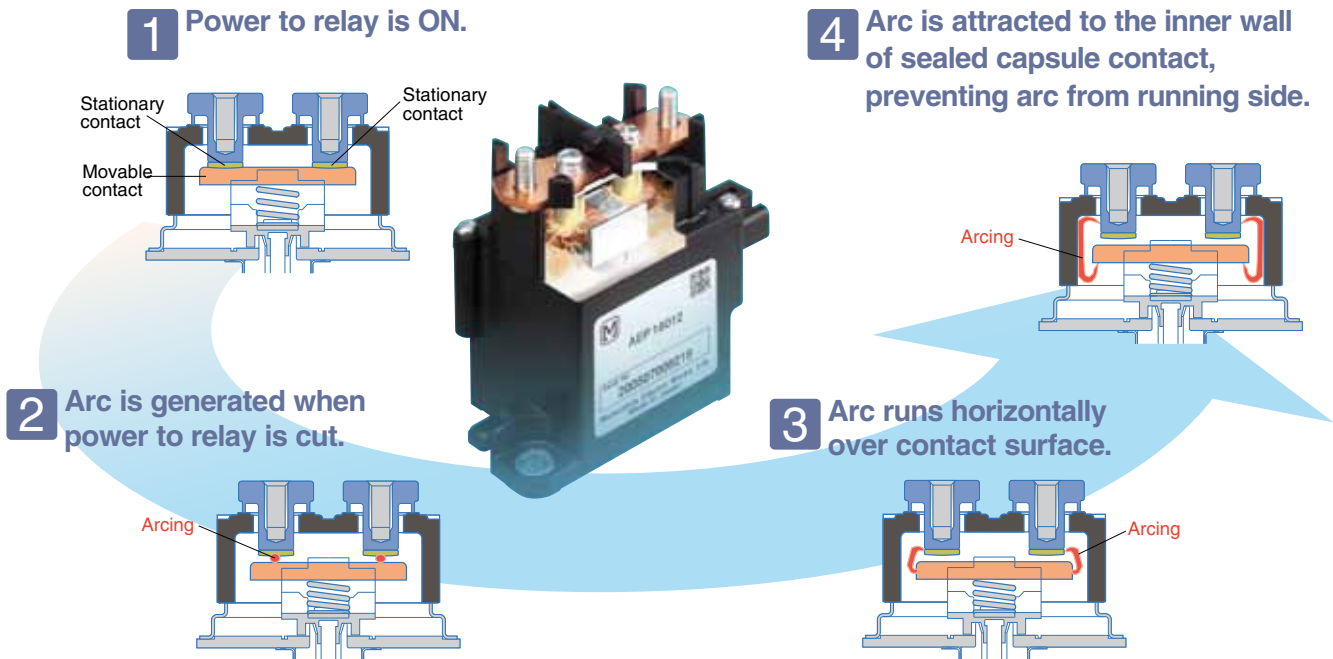
EP relay features

EP Relay

The EP relay is a power relay that enables DC high voltage and a high current interruption in small size. Below listed are features compared to DC contactor of existing products generally used in the DC high voltage area.



Operation explanation (interception mechanism)



Panasonic Relays for Photovoltaic Power Solutions

EP relay options

Terminal Protect Cover (80A, 300A only)

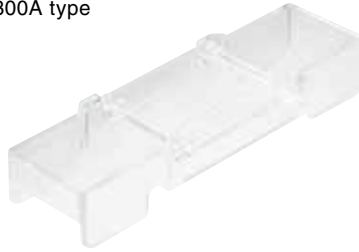
“Terminal protect covers” to protect high DC voltage risks (80A, 300A only) are now available. Please contact us.

● Terminal protect cover

80A type



300A type



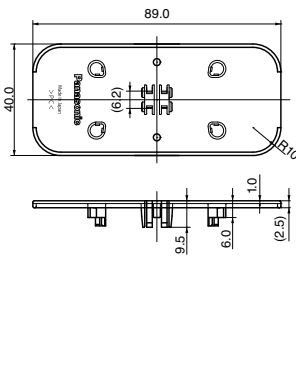
Terminal protect cover on relay



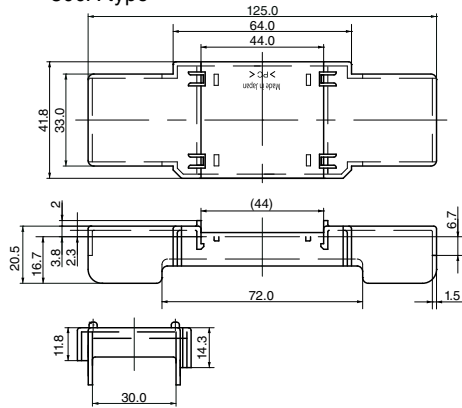
80A type

● Dimensions (Unit: mm)

80A type



300A type



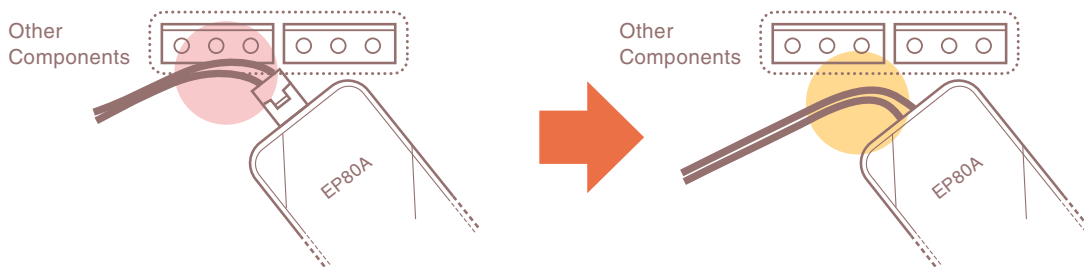
300A type



Lead wire type (Input side) (80A only)

A lead wire type is available to avoid insulation failure from other components with high voltage.

In case of some high voltage risks near the input side



Insulation distance is not sufficient with existing connector type.

Sufficient insulation distance can be created with lead wire type.

EP relay estimated life (cycles)

Reference data

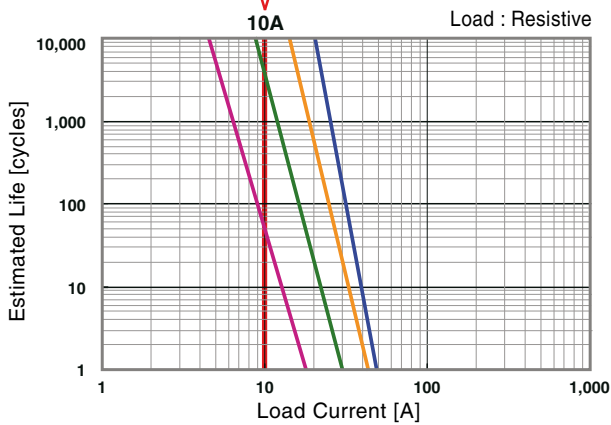
Notes: In case of using over the rating, the data is only a reference. Please test the actual condition before use.

1,000VDC 800VDC
600VDC 400VDC

10A type

Make and break (switching) possible below 10A

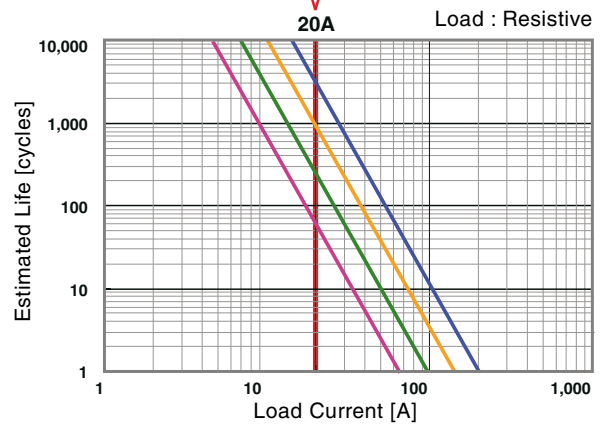
Break only above 10A



20A type

Make and break (switching) possible below 20A

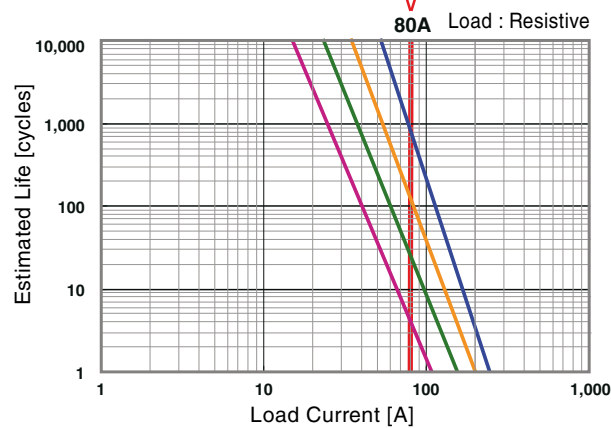
Break only above 20A



80A type

Make and break (switching) possible below 80A

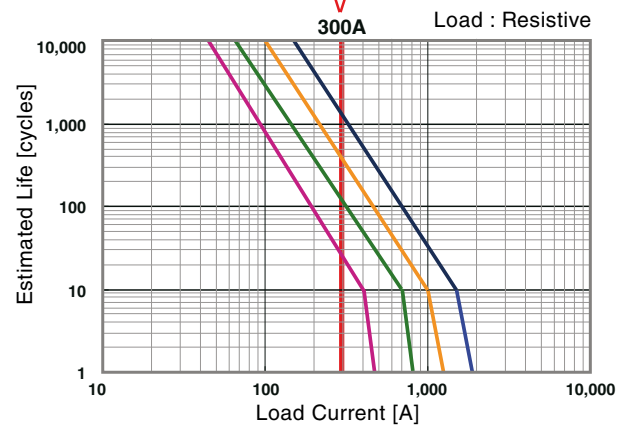
Break only above 80A



300A type

Make and break (switching) possible below 300A

Break only above 300A



North America

Europe

Asia Pacific

China

Japan

Panasonic Electric Works

Please contact our Global Sales Companies in:

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	PEW Electronic Materials Europe GmbH	Ennshafenstraße 30, 4470 Enns, Tel. +43 (0) 7223 883, Fax +43 (0) 7223 88333, www.panasonic-electronic-materials.com
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▶ Poland	Panasonic Electric Works Polska sp. z o.o	Jungmansgatan 12, 21119 Malmö, Tel. +46 40 697 7000, Fax +46 40 697 7099, www.panasonic-fire-security.com
▶ Portugal	Panasonic Electric Works España S.A.	ul. Wołoska 9A, 02-583 Warszawa, Tel. +48 (0) 22 338-11-33, Fax +48 (0) 22 338-12-00, www.panasonic-electric-works.pl
▶ Spain	Panasonic Electric Works España S.A.	Portuguese Branch Office, Avda Adelino Amaro da Costa 728 R/C J, 2750-277 Cascais, Tel. +351 214812520, Fax +351 214812529
▶ Switzerland	Panasonic Electric Works Schweiz AG	Barajas Park, San Severo 20, 28042 Madrid, Tel. +34 913293875, Fax +34 913292976, www.panasonic-electric-works.es
▶ United Kingdom	Panasonic Electric Works UK Ltd.	Grundstrasse 8, 6343 Rotkreuz, Tel. +41 (0) 41 7997050, Fax +41 (0) 41 7997055, www.panasonic-electric-works.ch
		Sunrise Parkway, Linford Wood, Milton Keynes, MK14 6 LF, Tel. +44 (0) 1908 231555, Fax +44 (0) 1908 231599, www.panasonic-electric-works.co.uk

North & South America

▶ USA	PEW Corporation of America	629 Central Avenue, New Providence, N.J. 07974, Tel. 1-908-464-3550, Fax 1-908-464-8513, www.pewa.panasonic.com
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Asia Pacific/China/Japan

▶ China	Panasonic Electric Works (China) Co., Ltd.	Level 2, Tower W3, The Towers Oriental Plaza, No. 2, East Chang An Ave., Dong Cheng District, Beijing 100738, Tel. (010) 5925-5988, Fax (010) 5925-5973
▶ Hong Kong	Panasonic Electric Works (Hong Kong) Co., Ltd.	RM1205-9, 12/F, Tower 2, The Gateway, 25 Canton Road, Tsimshatsui, Kowloon, Hong Kong, Tel. (0852) 2956-3118, Fax (0852) 2956-0398
▶ Japan	Panasonic Electric Works Co., Ltd.	1048 Kadoma, Kadoma-shi, Osaka 571-8686, Japan, Tel. (06) 6908-1050, Fax (06) 6908-5781, http://panasonic-electric-works.net
▶ Singapore	Panasonic Electric Works Asia Pacific Pte. Ltd.	101 Thomson Road, #25-03/05, United Square, Singapore 307591, Tel. (06255) 5473, Fax (06253) 5689