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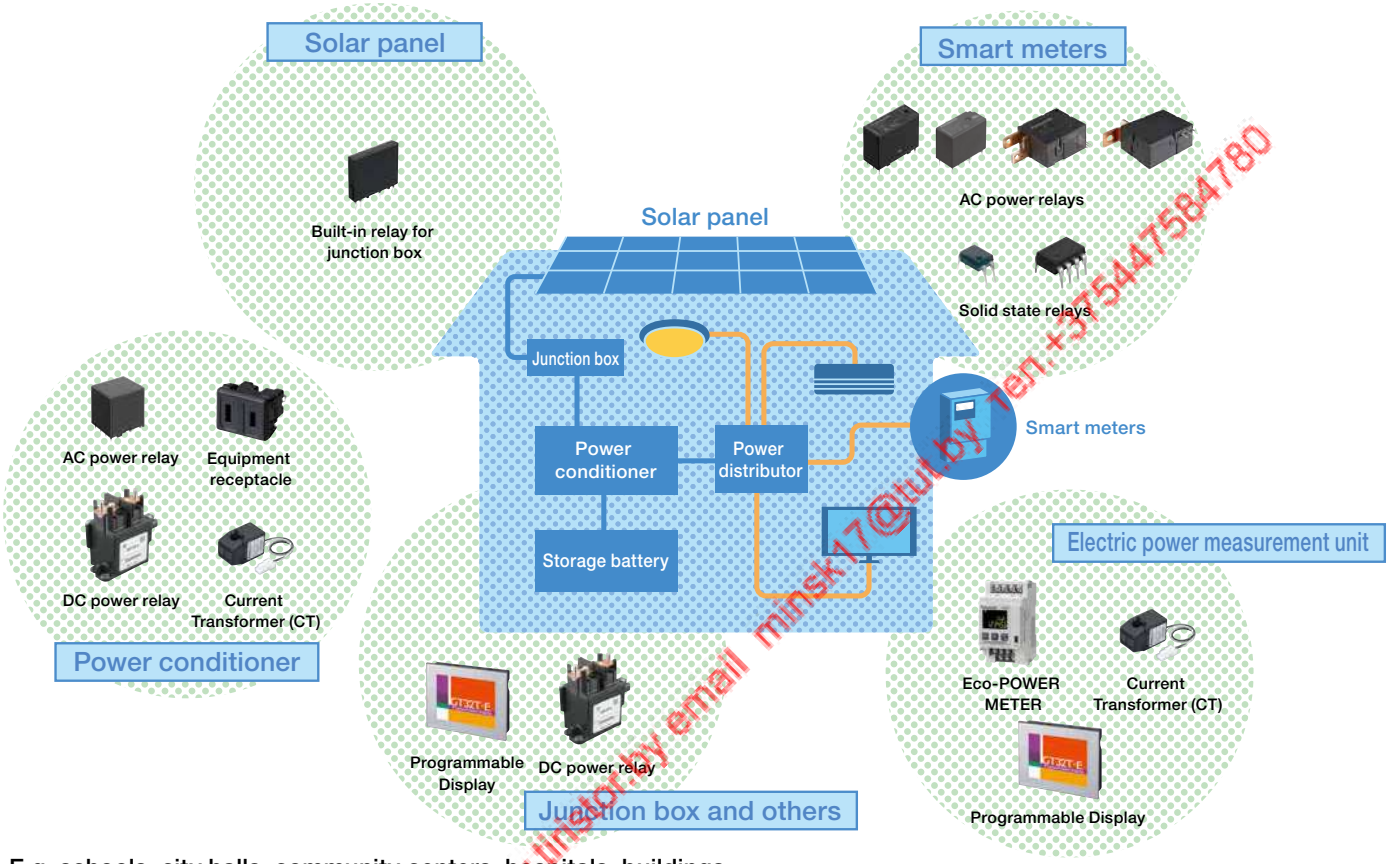
Products for Smart Grids

Application example

E.g. houses

For Photovoltaic Power Generation System For details, see P.6

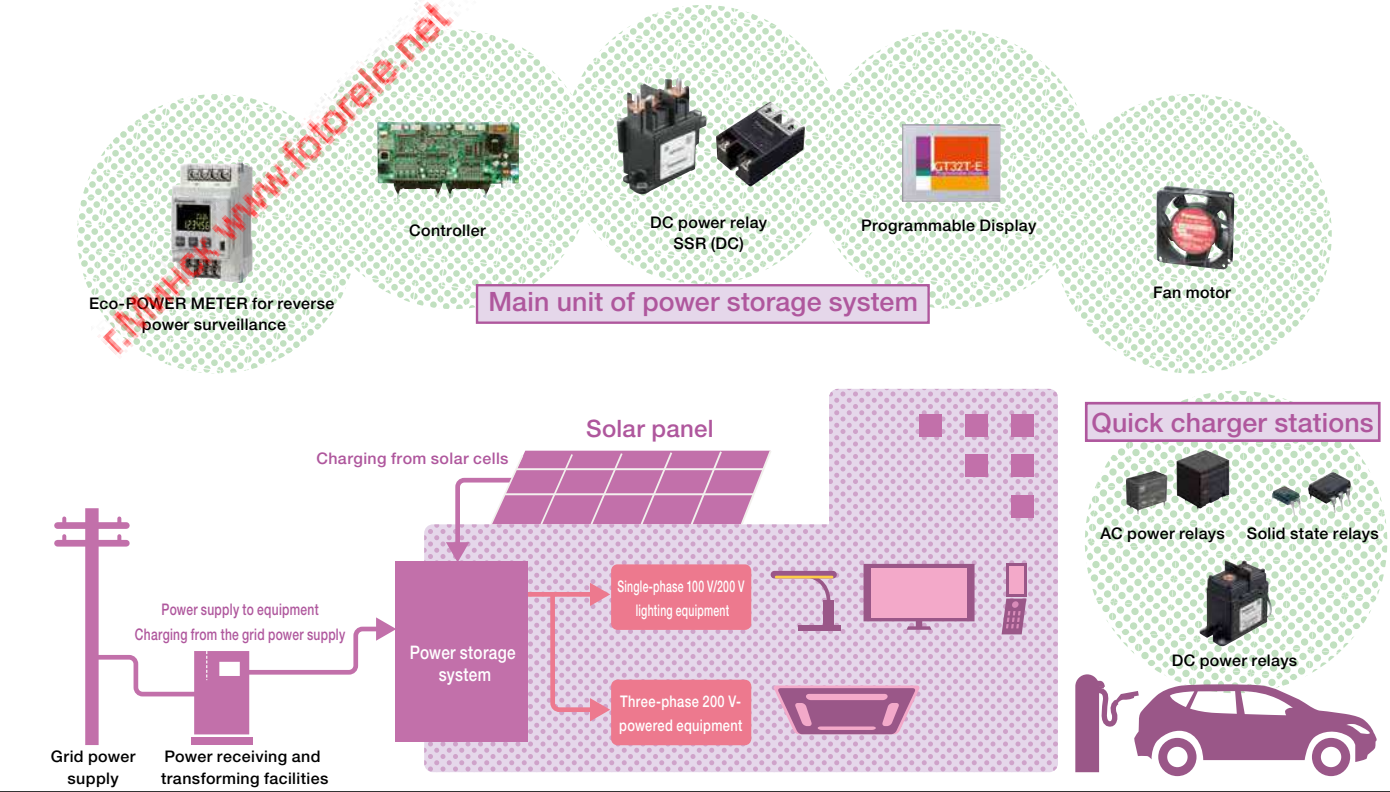
For Smart Meters For details, see P.13



E.g. schools, city halls, community centers, hospitals, buildings

For Power Storage System For details, see P.9

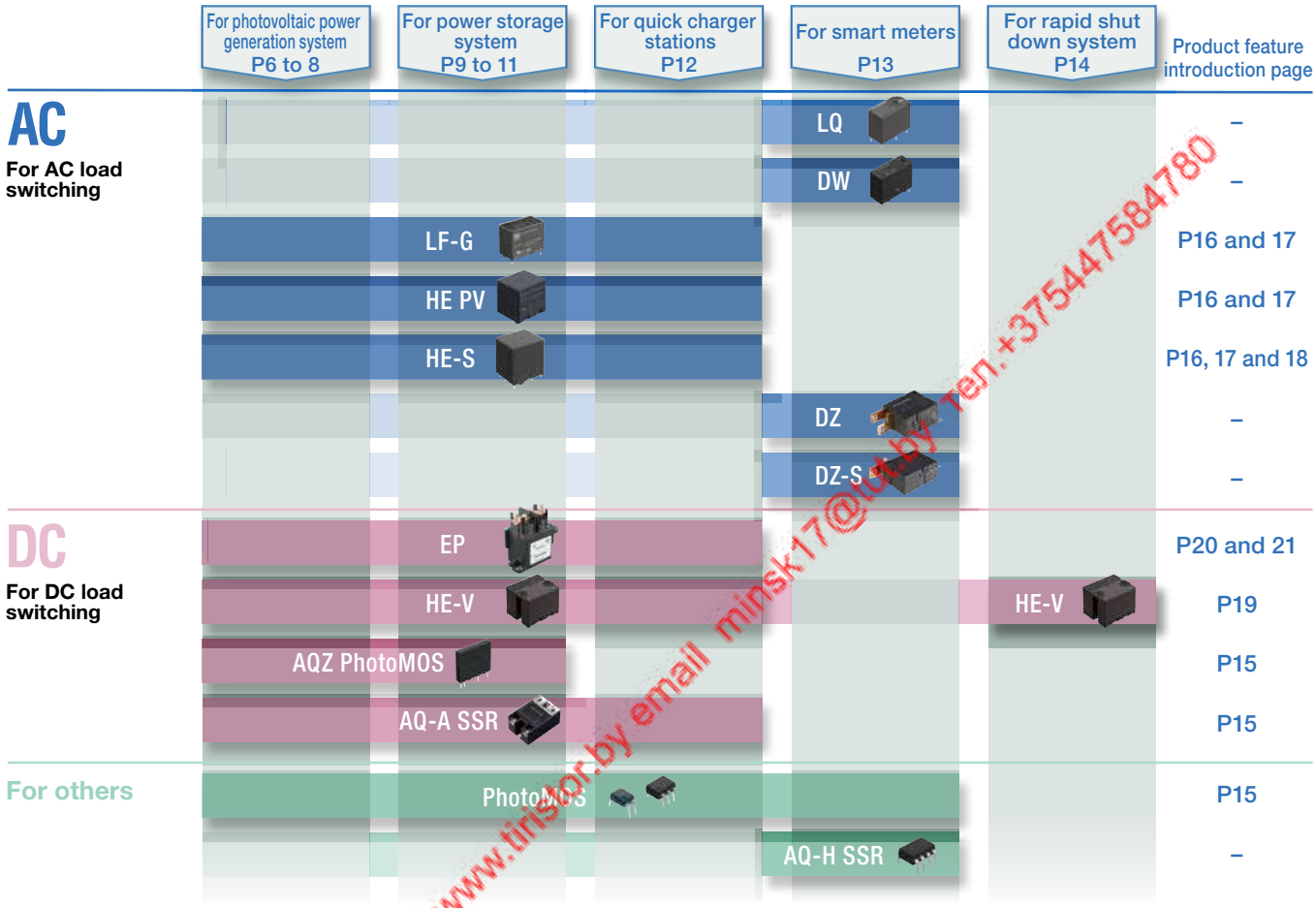
For Quick Charger Stations For details, see P.12



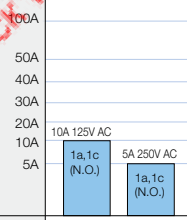
Products for Smart Grids

Product examples for specific applications

Recommended products for specific applications



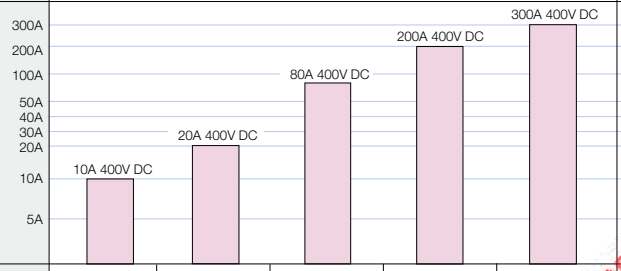
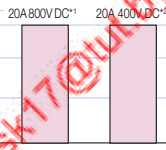
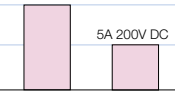
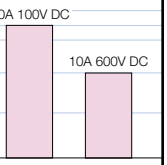
For AC Load Switching

Product name	LQ	DW	LF-G	HE-S	HE PV	DZ-S	DZ
Appearance							
Contact arrangement	1 Form A and 1 Form C	1 Form A	1 Form A	2 Form A and 2 Form A 1 Form B	1 Form A	1 Form A	1 Form A
Max. switching capacity							
Latching type availability	–	●	–	–	–	●	●
Nominal operating power	0.2W(1a)	0.2W(1L) 0.4W(2L)	1.4W (when input) 0.17W (when retained)	1.88W (when input) 0.17W (when retained)	1.92W (when input) 0.31W (when retained)	1.5W(1L) 3.0W(2L)	1.4W (1L) 2.8W (2L)
Max. allowable voltage	250V AC	250V AC	250V AC	277V AC	277V AC	276V AC	250V AC
Contact gap	–	–	1.5mm and 1.8mm	3.2mm *1	2.5mm and 3.0mm	–	–
Ambient temperature	–40°C to +85°C	–40°C to +85°C	–40°C to +85°C	–40°C to +85°C	–50°C to +85°C	–40°C to +85°C	–40°C to +85°C
Safety standards	UL/C-UL, VDE	UL/C-UL, VDE	UL/C-UL, VDE	UL/C-UL, VDE	UL/CSA, VDE / UL/C-UL, VDE / UL/C-UL	Please consult us.	VDE
Product feature introduction page	–	–	P16 and 17			–	–

*1 Contact gap for each between 1 Form A contacts

Product examples for specific applications

For DC Load Switching

Product name	EP					HE-V	AQZ PhotoMOS	AQ-A SSR
Appearance	 10A 20A 80A 200A 300A							
Contact arrangement	1 Form A					2 Form A	1 Form A	1 Form A
Max. switching capacity	 300A 200A 100A 50A 40A 30A 20A 10A 5A; 10A 400V DC; 20A 400V DC; 80A 400V DC; 200A 400V DC; 300A 400V DC					 20A 800V DC*1; 20A 400V DC*2	 10A 60V DC; 5A 200V DC	 30A 100V DC; 10A 600V DC
Nominal operating power	1.24W	3.9W	4.2W	6W (when input) 1.5W (when retained)	45W (when input) 4W (when retained)	1.9W (when input) 0.2W (when retained)	0.01W (Input current: 10 mA)	0.08 - 0.64W (Input voltage: 4 to 32 V)
Max. allowable voltage	1,000V DC					1,000V DC	60V DC / 200V DC	100V DC / 600V DC
Contact gap	— (Capsule contact construction)					3.8mm (for 1 Form A)	No contact	No contact
Ambient temperature	–40°C to +80°C					–40°C to +85°C	–40°C to +85°C	–20°C to +80°C
Safety standards	UL/C-UL(20A type: only UL)			–	–	UL/C-UL, VDE	UL/C-UL, VDE	UL/C-UL, VDE
Product feature introduction page	P20 and 21					P19	P15	P15

*1 Each 1 Form A contact connected in series.
*2 When using each 1 Form A contact independently

Product name	PhotoMOS					AQ-H SSR
Applications	Insulation detection	Battery monitoring		Communication	Main relay driving	Main relay driving
Part No.	AQV258*	AQW214EH	AQW216EH	AQY210EH	AQY212EH	AQH2223
Appearance						
Contact arrangement	1 Form A	2 Form A	2 Form A	1 Form A	1 Form A	1 Form A
Continuous load current	20mA	100mA	40mA	130mA	550mA	–
ON-state RMS current	–	–	–	–	–	0.9A
Load voltage	1,500V	400V	600V	350V	60V	–
Repetitive peak OFF-state voltage	–	–	–	–	–	600V
I/O isolation voltage	1,500V AC	5,000V AC	5,000V AC	5,000V AC	5,000V AC	5,000V AC
Safety standards	UL/C-UL, BSI	UL/C-UL, BSI	UL/C-UL, BSI	UL/C-UL, BSI	UL/C-UL, BSI	UL/C-UL, VDE
Product feature introduction page	P15					–

*If you require the high I/O isolation voltage type, please consult us.

New Product Introduction

HE relay PV type 90 A

NEW

1. High capacity

- Max. switching current: 90 A
- Electrical expected life: • 80 A 277V AC Min. 1×10^4
  • 90 A 250V AC Min. 1×10^3

2. Compact size and low operating power

- W: 38 × L: 33 × H: 38.8mm W: 1.496 × L: 1.299 × H: 1.528inch
- Nominal operating power: 1,920 mW
- Holding power: 310 mW
  (when applied 40%V of coil holding voltage)

3. Safety standards

- Compliant with European photovoltaic standard VDE0126
- Contact gap: 3.0 mm .118 inch

HE-S relay

NEW

1. High-capacity and long life (Form A contact)

- 35 A 277V AC 3×10^4 (Standard type),
  5×10^4 (Long life type)
- 20 A 277V AC 1×10^5 (Standard type),
  2×10^5 (Long life type)

2. Compact size and low operating power

- W: 30 × L: 36 × H: 40 mm W: 1.181 × L: 1.417 × H: 1.575 inch
- Operating power: 1,880 mW
- Holding power: 170 mW
  (when applied 30%V of coil holding voltage)

3. Safety standards

- Mirror contact mechanisms
  (Compliant with EN60947-4-1)
- Contact gap: 3.2 mm .126 inch (VDE0126 compliant)

DZ relay

NEW

Horizontal terminal type

Vertical terminal type

1. High capacity

- 120 A 250 VAC (Resistive load)
- Electrical expected life: • 120 A 250V AC Min. 1×10^3
  • 100 A 276V AC Min. 1×10^4

2. Compact size and low operating power

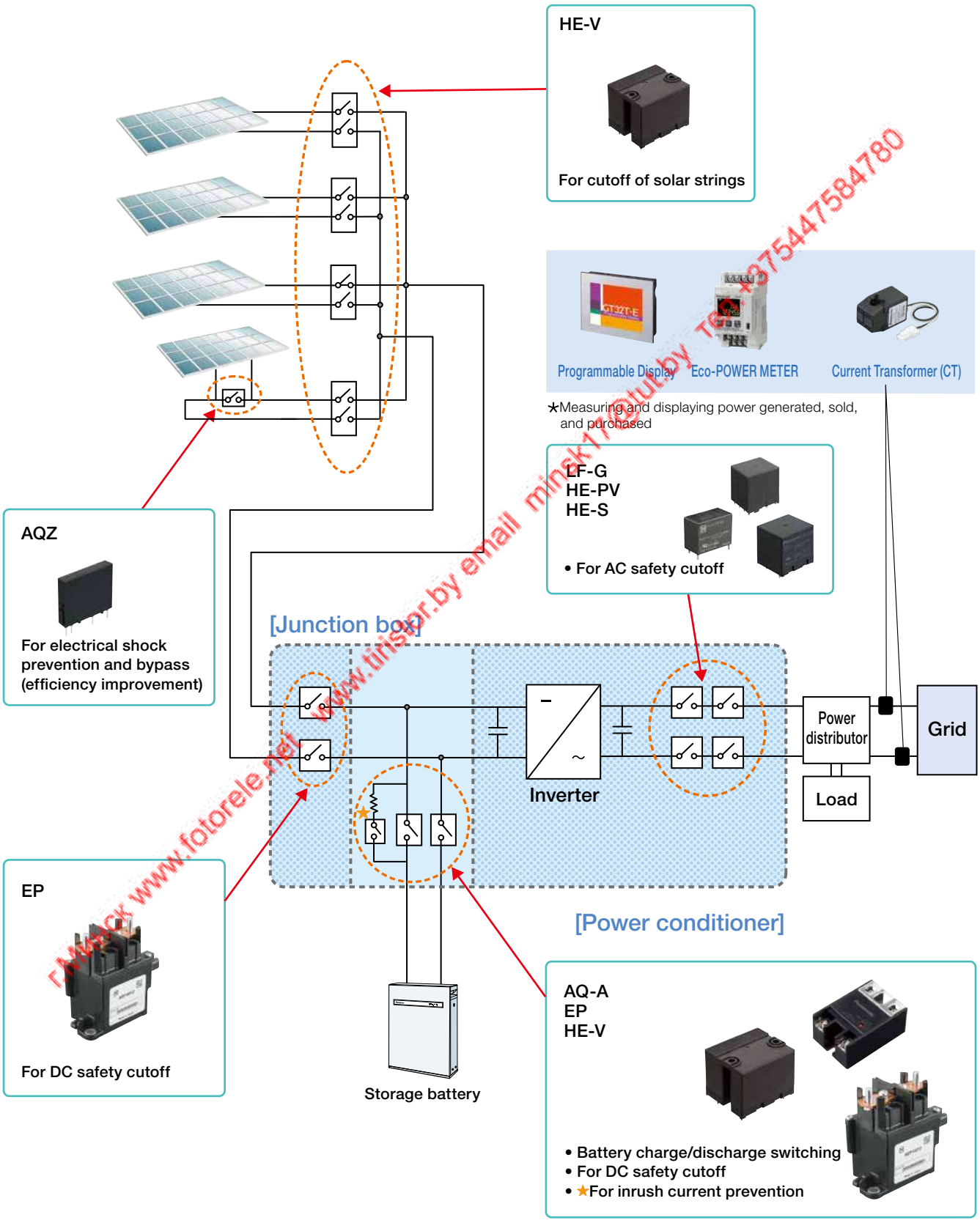
- W: 41 x L: 35 x H: 22 mm W: 1.614 x L: 1.378 x H: .866 inch
- Nominal operating power: 1,400 mW (1 coil latching type)
  2,800 mW (2 coil latching type)

3. Safety standards

- IEC62055-31 UC3 compliant (short current 3,000 A)

Photovoltaic Power Generation System

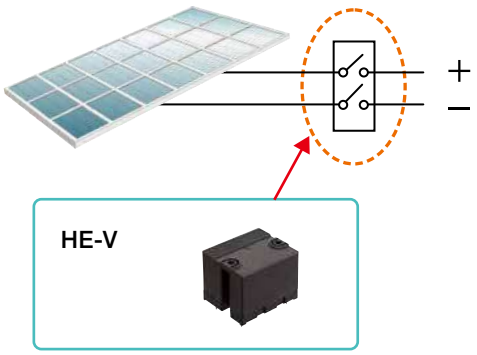
Recommended products



Photovoltaic Power Generation System

Recommended products (DC side)

For Solar strings

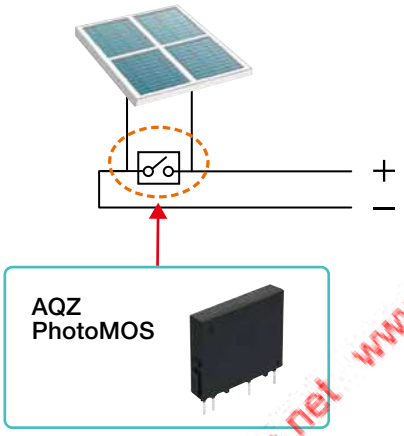


Recommended relay	HE-V (2a 20A 1,000V DC*)
	High-voltage cutoff relay capable of simultaneously cutting off the positive (+) and negative (-) terminals by serially connecting the 1 Form A contact. Up to 1,000V DC cutoff

*1,000 V DC is the maximum allowable voltage when each 1 Form A contact is connected in series. The rating is 800 V DC.

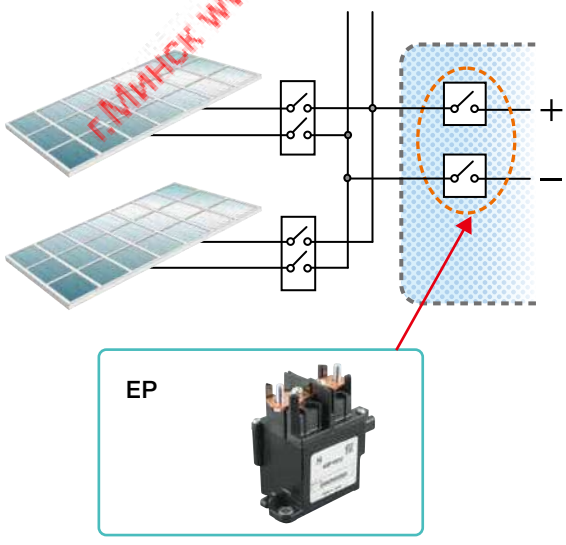
- When something shades the solar panels or a defect occurs, the total power generation efficiency of the system decreases. In such cases, the total power generation efficiency can be maintained by bypassing low-efficiency panels or cutting off strings using relays.
- In case of a disaster, such as fire, system safety can be maintained by shorting each solar panel. (E.g. electrical shock prevention of firefighters)
- Remote control is possible for maintenance work, reducing maintenance costs.

For Junction box connectors



Recommended relay	AQZ PhotoMOS (1a 10A 60V DC)
	PhotoMOS capable of frequent switching, improving system reliability

For Junction boxes and Power conditioners

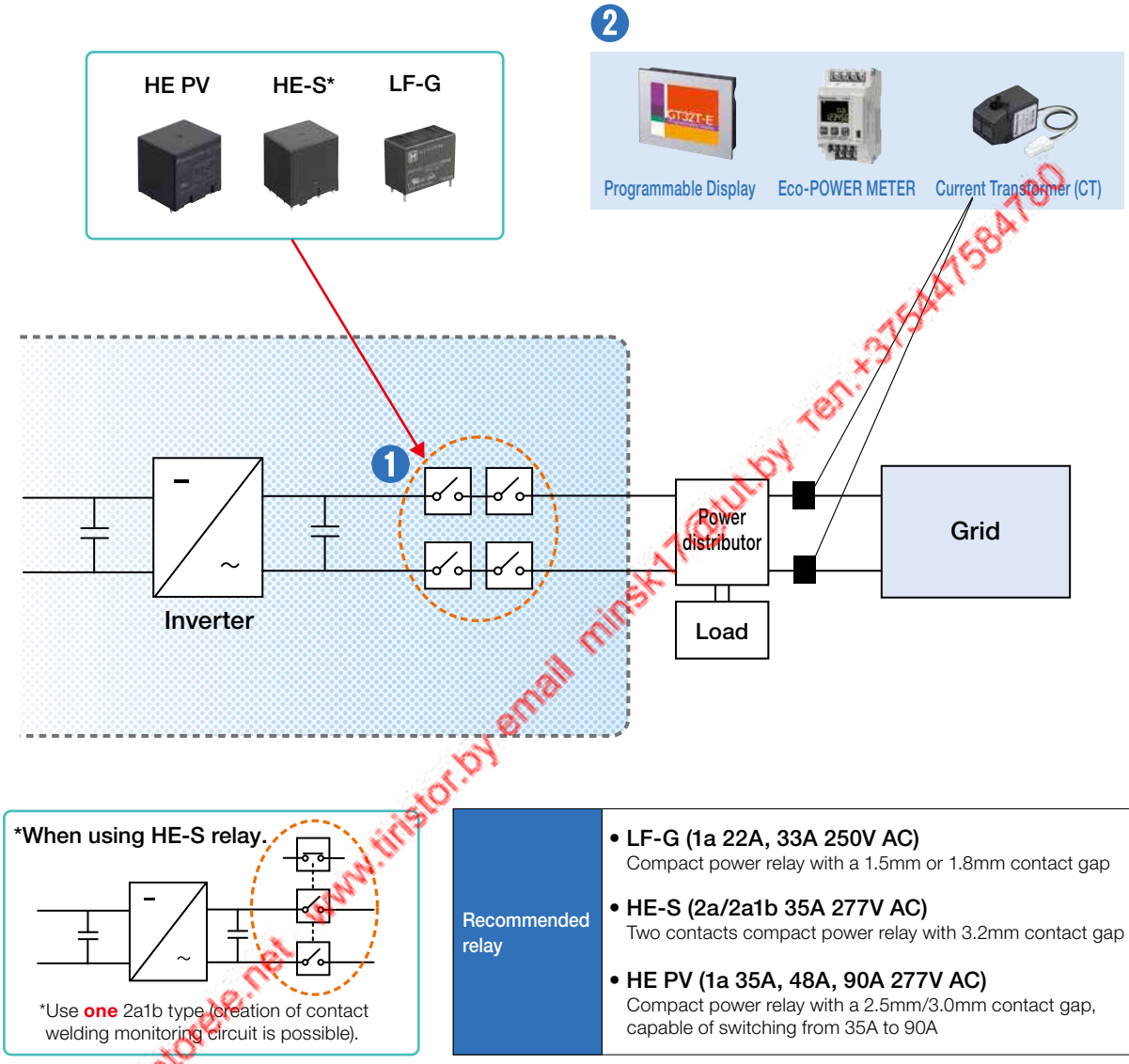


- In case of a disaster, such as fire, system safety can be maintained by cutting off the DC line.
- Remote control is possible for maintenance work, reducing maintenance costs.
- Large current cuttoff possible during malfunction when connecting storage battery. (80 to 300A type)

Recommended relay	EP (1a 10A~300A 1,000V DC*)
	High-voltage cutoff relay with capsule contact construction, which provide high reliability

*1,000 V DC is the maximum allowable voltage. The rating is 400 V DC.

Recommended products (AC side)



1 For Safety Cutoff on the AC side

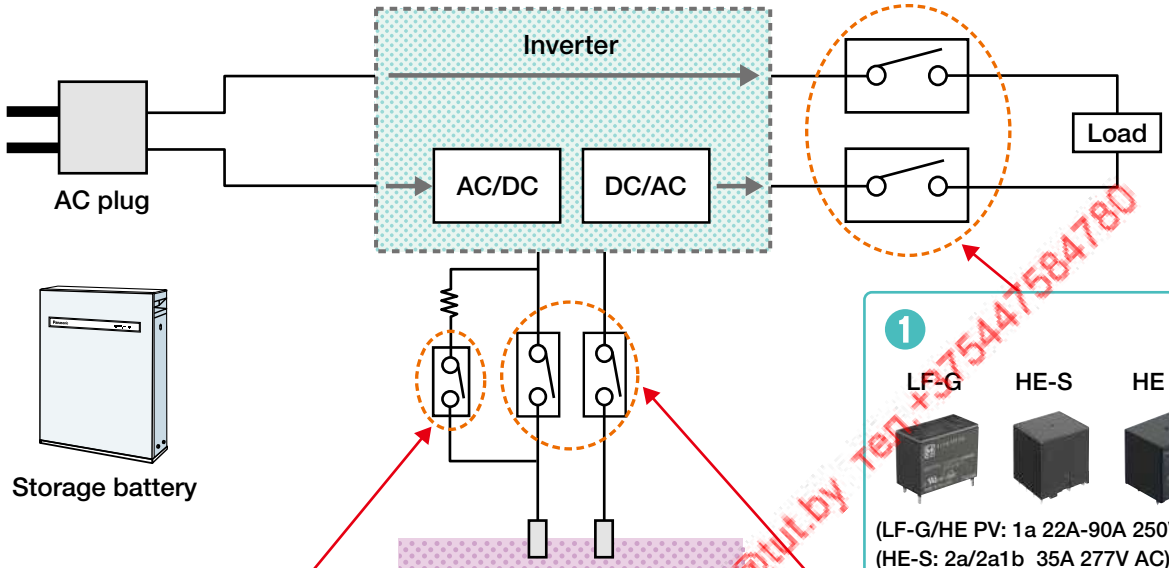
● Relays are used for safety cutoff on the grid (power network). The relay must cutoff the circuit to prevent abnormal currents that occur from affecting the commercial power supply. Power relays are required as safety measures to protect the power supply system.

2 Eco-POWER METERs/Programmable Displays

● These are used for displaying the amount of sold/purchased power of a photovoltaic power generation system and power generated by a power conditioner. Photovoltaic power generation systems and fuel cell systems linked to storage batteries require surveillance of reverse power (tidal current) to grids. Equipped with a fine current detection function, Eco-POWER METERs are ideal for reverse power (tidal current) surveillance.

Power Storage System

Recommended products



1

LF-G HE-S HE PV

(LF-G/HE PV: 1a 22A-90A 250V AC)
(HE-S: 2a/2a1b 35A 277V AC)

4

EP HE-V AQ-A SSR

(EP : 1a 10A-20A 1,000V DC*1)
(HE-V : 2a 20A 1,000V DC*2)
(AQ-A : 1a 10A 600V DC)

*1 1,000 V DC is the maximum allowable voltage.
The rating is 400 V DC.
*2 1,000 V DC is the maximum allowable voltage when each 1 Form A contact is connected in series.
The rating is 800 V DC.

5 **6**

PhotoMOS

Max. load voltage 1,500 V are available.
For available types, please consult us.
For detailed application, see page 11.

2 **3**

EP AQ-A SSR

(EP : 1a 20A-300A 1,000V DC*)
(AQ-A : 1a 10A 600V DC)

*1,000 V DC is the maximum allowable voltage.
The rating is 400 V DC.

Other recommended product

Equipment receptacle

1 For Safety Cutoff on the AC side

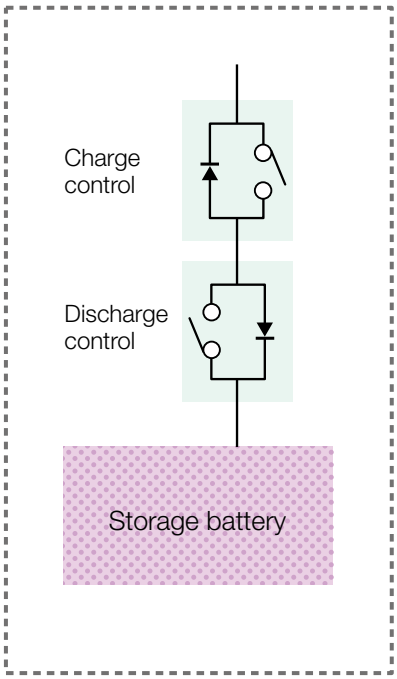
●Relays are used for safety cutoff on the grid (power network). The relay must cutoff the circuit to prevent abnormal currents that occur from affecting the commercial power supply. Power relays are required as safety measures to protect the power supply system.

2 For Safety Cutoff on the DC Side

●Power relays are required as safety measures in the event of a defect in or malfunction of the battery or system.

3 For Charge and Discharge

●AQ-A SSR (PhotoMOS) is used to switch charge and discharge. We recommend solid state relays for applications where there will be frequent ON/OFF switching.



1 Regular operation
Turn ON both solid state relays for charge and discharge control.
Current flows in both directions.

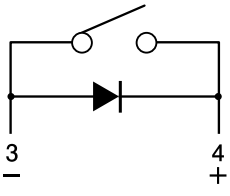
2 Over-charge prevention
In order to prevent over charging, the solid state relay on the charge control side turns OFF.
On the discharge side, current will flow because there is a diode.

3 Over-discharge prevention
In order to prevent over discharging, the solid state relay on the discharge control side turns OFF.
On the charge side, current will flow because there is a diode.

Charge and discharge control is possible by effectively utilizing the internal diodes of the solid state relay.

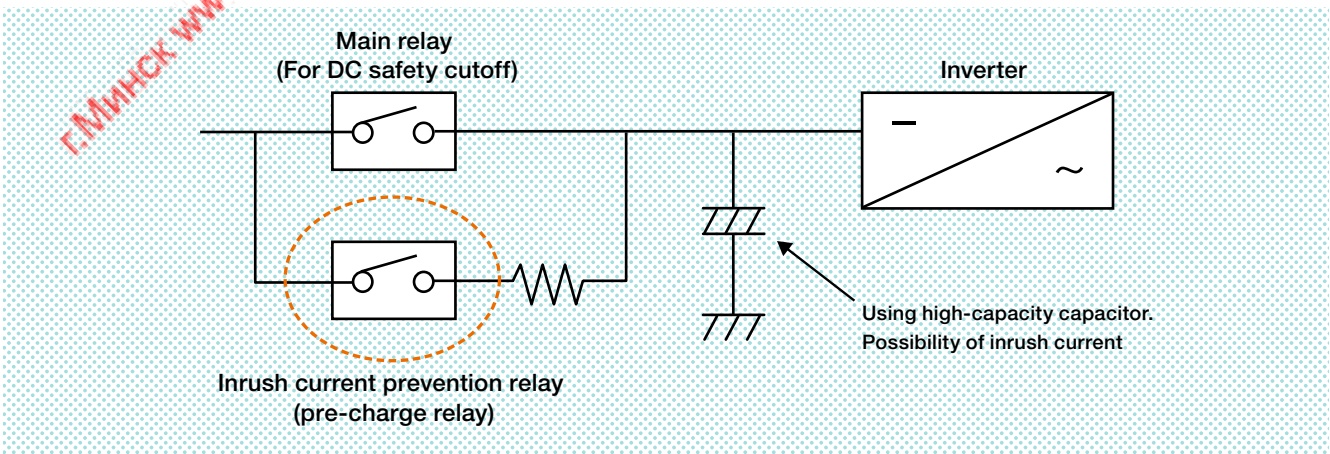
*If you want to use charge and discharge control by internal diodes of the solid state relay, please contact our sales team.
(Maximum switching capacity differs from output section.)

Equivalence circuit of output side



4 For preventing an inrush current into capacitors when charging (pre-charge circuit)

●AQ-A SSR (PhotoMOS), HE-V relay, and 10A and 20A types of EP relays are used for preventing an inrush current into capacitors when charging. We recommend solid state relays for miniaturization and HE-V relay and 10A and 20A types of EP relays for high voltages.



During device startup, the inrush current prevention relay turns ON and the main relay turns ON after the capacitor is charged.
Effective for protection against inrush currents that occur when charging the capacitor.

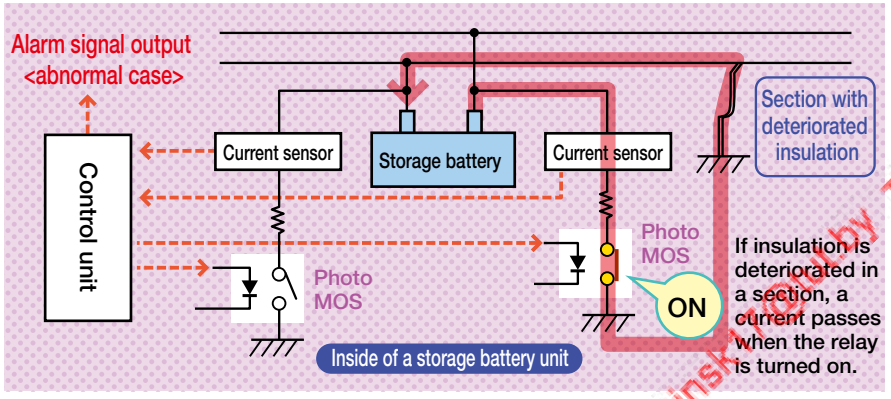
Power Storage System

5 For Insulation Detection

●PhotoMOS are used for monitoring storage battery units for insulation deterioration

If the insulation in a unit deteriorates, a ground-fault current passes when the relay is turned on, and a sensor detects the current.

High load voltage type PhotoMOS are ideal for use with storage batteries, which carry high voltage.



(When insulation of high voltage area and chassis is deteriorated)

1. PhotoMOS is turned on.
2. The current sensor detects a ground-fault current.
3. An alarm signal is output.

→ Current

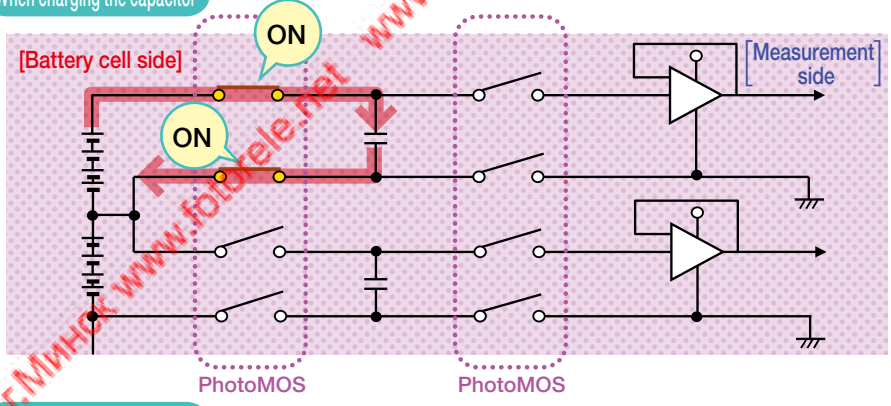
6 For Battery Monitoring

●PhotoMOS are used in a circuit for monitoring charging voltages of a battery cell group.

Compact PhotoMOS capable of frequent switching are ideal for this type of use.

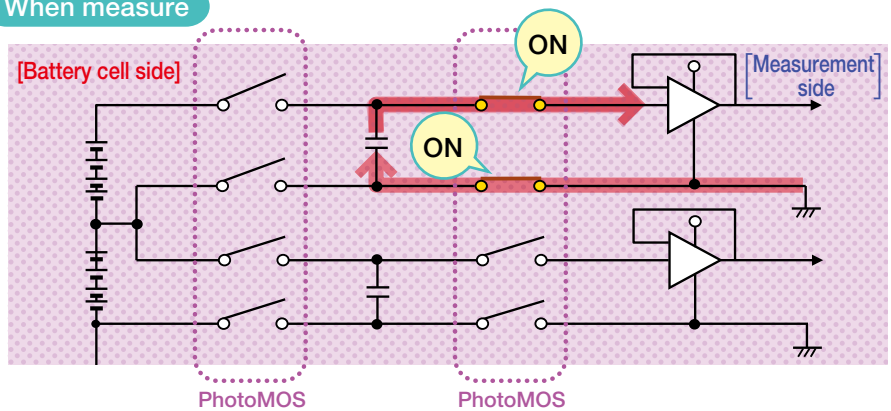
Use of the relays allows for insulation from high voltage areas.

When charging the capacitor



1. PhotoMOS on the battery cell side are turned on.
2. The capacitor is charged.

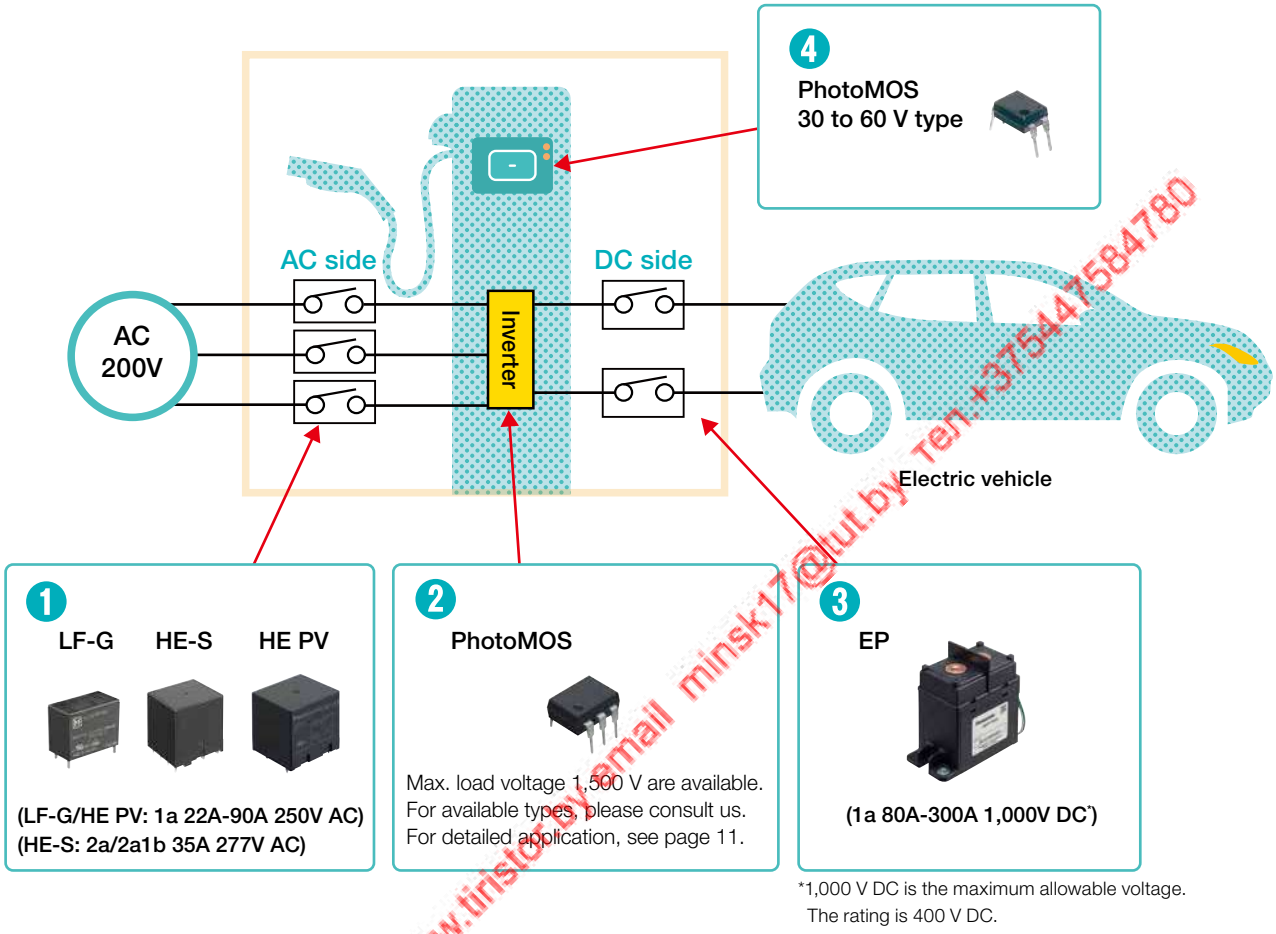
When measure



1. PhotoMOS on the battery cell side are turned off.
2. PhotoMOS on the measurement side are turned on.
3. The voltage of capacitor (= voltage of battery cell group) is measured.

Quick Charger Stations

Recommended products



*1,000 V DC is the maximum allowable voltage.
The rating is 400 V DC.

1 For Safety Cutoff on the AC side

●Relays are used for safety cutoff on the grid (power network). The relay must cutoff the circuit to prevent abnormal currents that occur from affecting the commercial power supply. Power relays are required as safety measures to protect the power supply system.

2 For Insulation Detection

●PhotoMOS are used for monitoring quick charger stations for insulation deterioration.
If the insulation in a station deteriorates, a ground-fault current passes when the relay is turned on, and a sensor detects the current. High load voltage type PhotoMOS are ideal for use with quick charger stations, which carry high voltage.

3 For Safety Cutoff on the DC Side

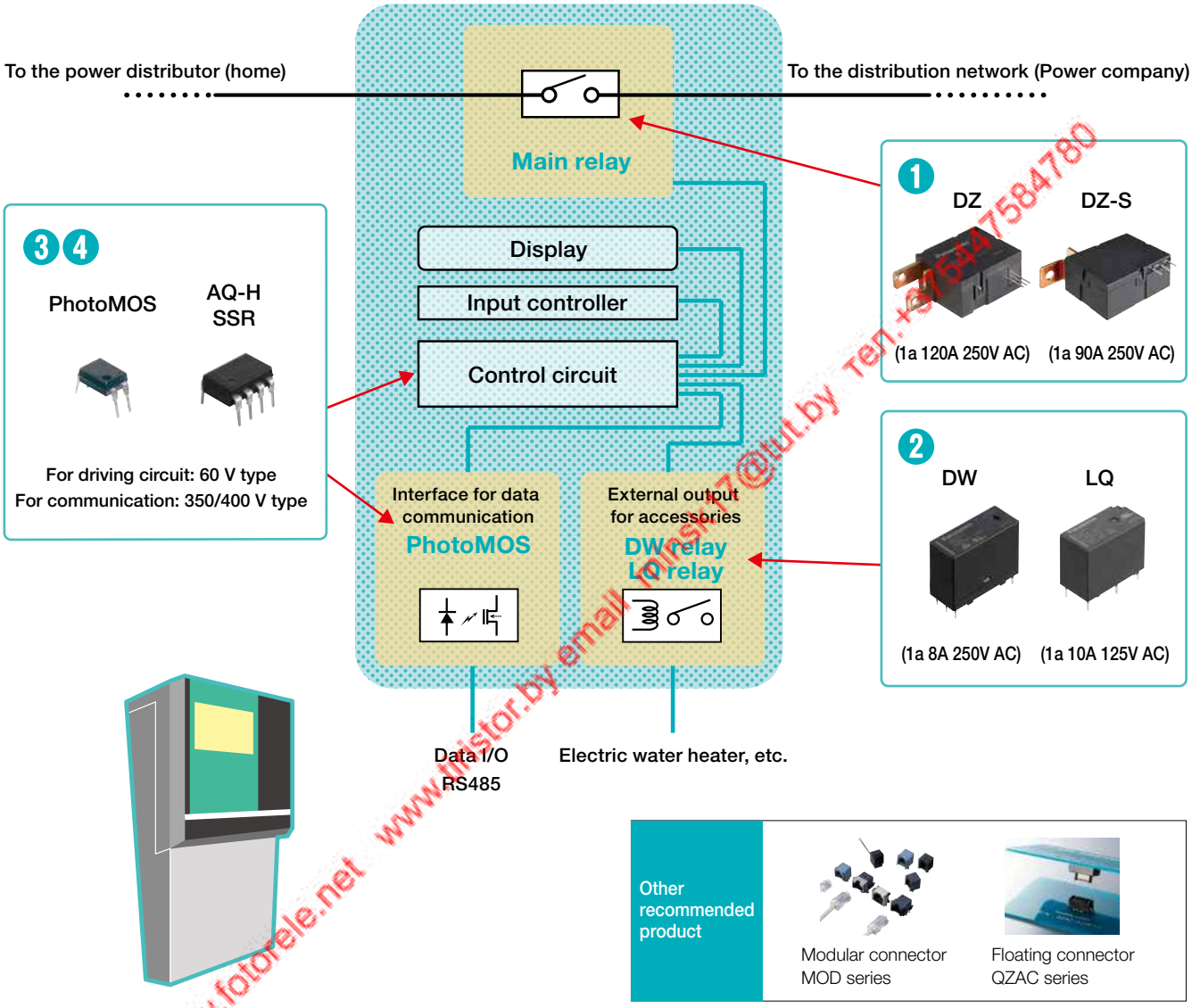
●Power relays are required as safety measures in the event of a defect in or malfunction of the battery or system.

4 For Signal Control For IC card activation

●For models that require the use of IC cards for charge control, etc.,
low on-resistance type PhotoMOS are used for signal control.

Smart Meters

Recommended products



1 For Main Power Cutoff

●Main relays are used for cutting off the main power. There is demand for a remote cutoff function for rolling blackouts, a prepaid system, safety measures, responses to non-payment of electric bills, etc.

2 For External Output of Accessories

●Relays are used for driving a contactor to turn on a electric water heater using power at night.

3 For Driving Main Relays

●PhotoMOS and AQ-H SSRs are used for driving main relays.

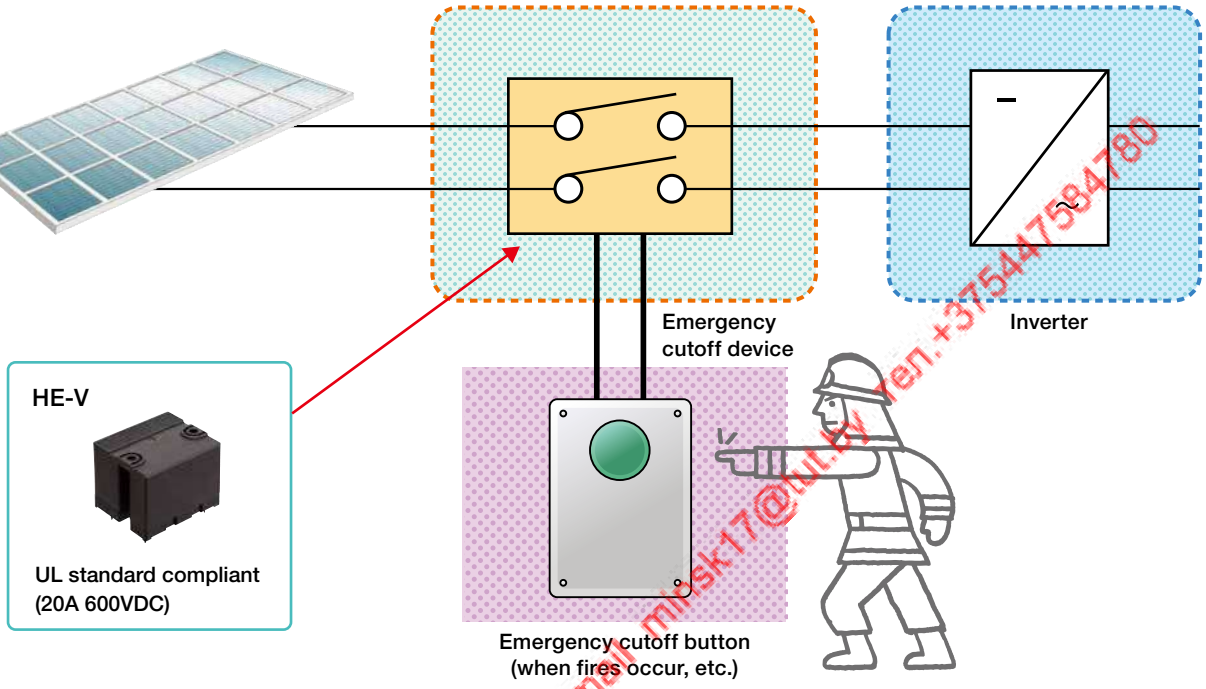
4 For Data Communications

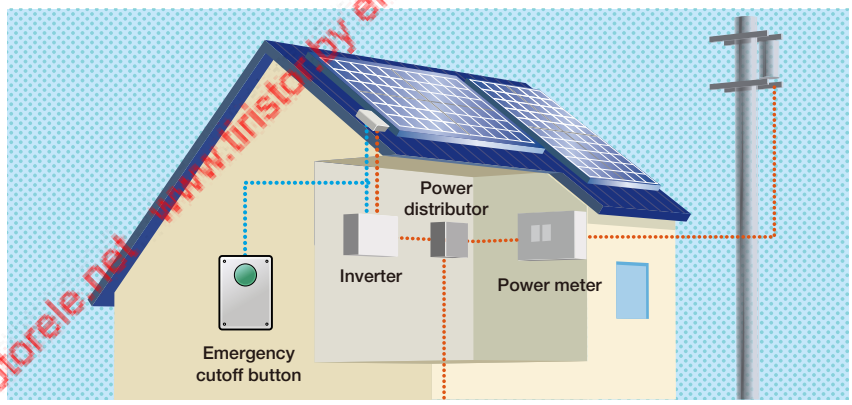
●PhotoMOS are used as output contacts for external communications.

Rapid Shutdown System (NEC2014 690.12)

Recommended products

For power line emergency cutoff device of photovoltaic power generation system





For power line cutoff during firefighting

[What is a rapid shutdown system?]

This is a system designed to cut off the DC power line on the panel side of photovoltaic power generation equipment. In North America, the NFPA (National Fire Protection Association) is likely to soon define this (690.12) and legislate it into law within NEC2014 (National Electric Code 2014), due to the occurrence of electrocution among firefighters when putting out fires. Also, in Germany installation of this system is a requirement to obtain fire insurance.

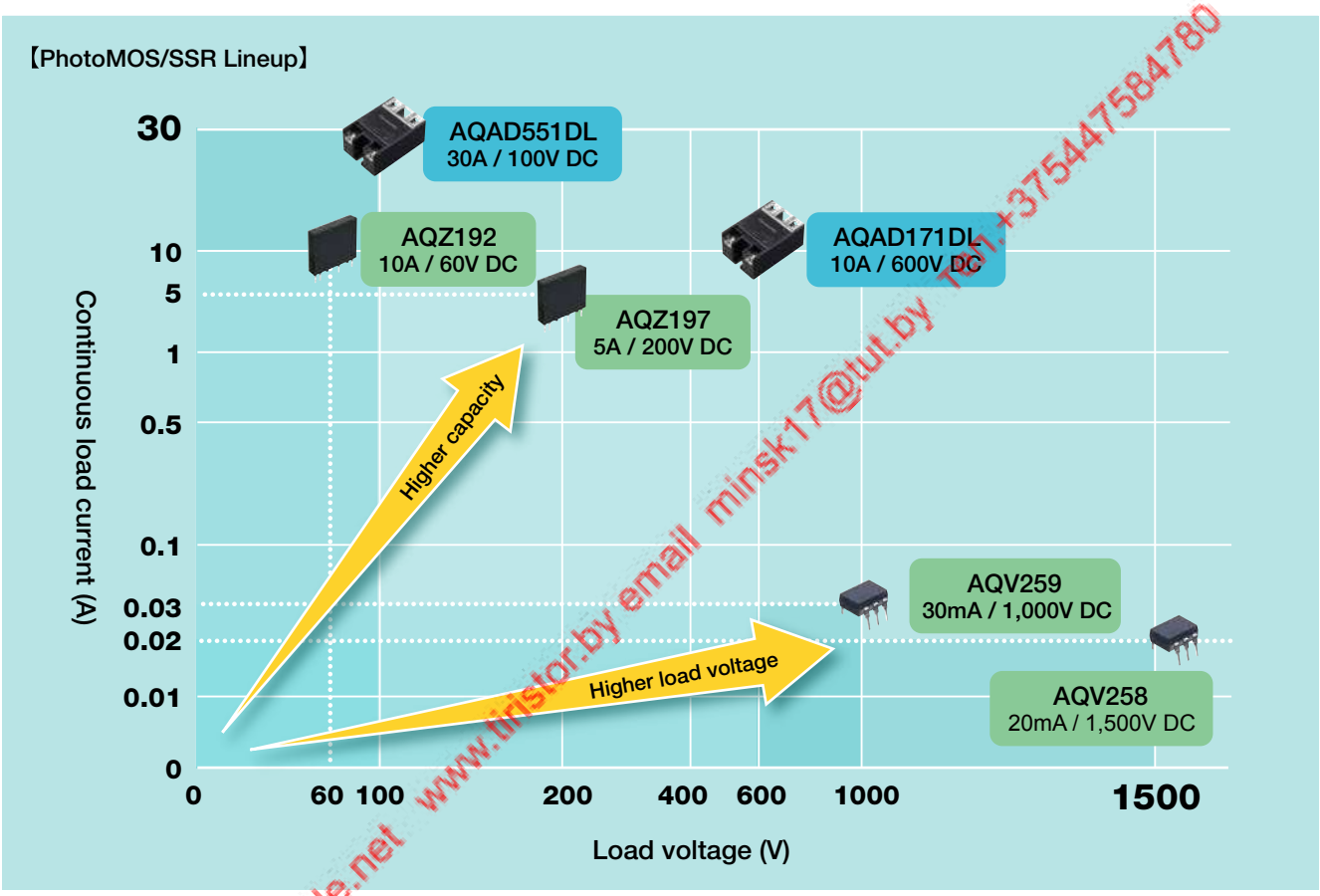
[NEC2014 690.12 definition (summary)]

- Emergency cutoff device (controlled by relay) shall install in less than 1.5 m (5 ft) in length inside a building, or less than 3 m (10 ft) in length outside a building from a PV array.
- Controlled conductors shall be limited to less than 30 V and 240 VA within 10 seconds of rapid shutdown initiation.
- The use of UL standard certified components is a requirement in system configurations.

PhotoMOS /SSR AQ-A

MOSFET, phototriac coupler, etc., is used inside internal element.
This facilitates customer needs for “High load voltage”, “High capacity”, and “Long life”.

【PhotoMOS/SSR Lineup】



High load voltage

Compared to other markets, there is a need for high load voltage products in the energy management market. Therefore PhotoMOS/SSRs can handle maximum load voltages up to 1,500 V.

Typical Part No. **AQV258 (1,500V load voltage), AQV259 (1,000V load voltage)**

High capacity

It supports large current control of DC loads, a need that has been increasing in recent years. It is also effective for frequent contact switching and reducing of power consumption.

Typical Part No. **AQZ192 (10A/60V DC), AQZ197 (5A/200V DC), AQAD551DL (30A/100V DC) and AQAD171DL (10A/600V DC)**

Long life

Problems such as switching life are solved by using semiconductors in contacts. Cut of device running cost is possible because they are maintenance free.

Please note
①Standard specification products are shown in this catalog. For additional specifications, please consult us.
②If you are considering applications that involve energy management, please consult us at the planning stage.

LF-G/HE-S/HE PV
Relay

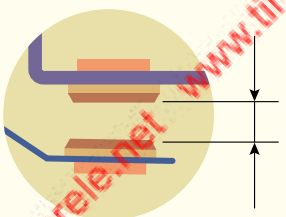
■Suitable for European photovoltaic generation standard IEC62109 and VDE0126
(Maintain a contact gap of at over 1.8 mm.)

Over 1.8mm contact gap is required for the AC circuit side on photovoltaic generation equipment in the European market.

Background that contact gap over 1.8 mm is required in Europe market

The condition of the altitude stipulation (2,000m or more) was added to the current demand of contact gap over 1.8mm [over 2.5kV surge breakdown voltage (between contacts)].

Contact gap over 1.8 mm is required for power relays.



LF-G

Min. 1.8mm

HE PV

Min. 2.5mm

*90A type: 3.0mm

HE-S

Min. 3.2mm

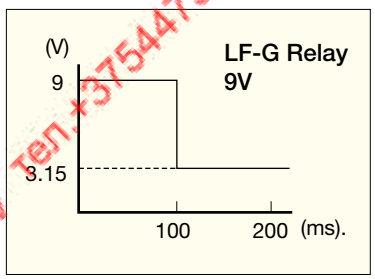
Contribute to energy saving with reduced coil holding voltage

In existing products, nominal coil voltage had to be implied to the coil side. However LF-G Relay, HE-S Relay, HE Relay PV and HE-V Relay will operated with reduced coil voltage (coil holding voltage *1), so a lower power consumption could be achieved.
Reduce the coil holding voltage after applying the nominal coil voltage for 100 ms or longer in that way you could reduce the energy consumption.

Condition: Max. contact carrying current (LF-G, HE, HE-S and HE-V)

Product	Nominal operating power	Ratio in which coil holding voltage can be decreased at 20°C	Power consumption when coil holding voltage decreases at 20°C	Ratio in which coil holding voltage can be decreased at 85°C	Power consumption when coil holding voltage decreases at 85°C
LF-G Relay	1,400mW	35%V of nominal coil voltage	approx. 170mW	45%V of nominal coil voltage	approx. 280mW
HE Relay PV	1,920mW	40%V of nominal coil voltage	approx. 310mW	50%V of nominal coil voltage	approx. 480mW
HE-S Relay	1,880mW	30%V of nominal coil voltage	approx. 170mW	30%V of nominal coil voltage	approx. 170mW
HE-V Relay	1,920mW	33%V of nominal coil voltage	approx. 210mW	33%V of nominal coil voltage	approx. 210mW

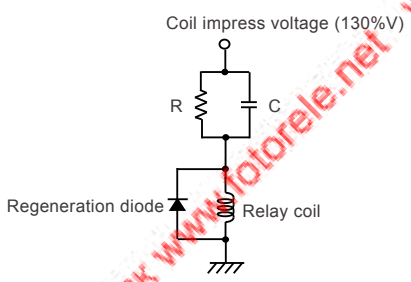
*1 Coil holding voltage is the coil voltage after 100ms following application of the nominal coil voltage.



How to reduce coil holding Voltage

Please refer to the circuit examples below for reducing the coil holding voltage of AC load relays.
Please note, that the methods shown for holding voltage reduction are just examples and do not constitute any guarantee. Be sure to verify operation in your actual device.
Also, please consult us if you are considering a holding voltage reduction circuit using DC load relays (HE-V relay and EP relay). (Please note that for switching DC loads, if a diode is used in the coil surge absorbing element in the relay, the contact opening velocity will slow down and sufficient cutoff performance cannot be guaranteed.)

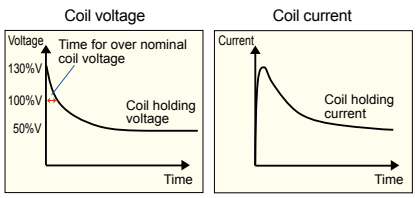
1. Example of CR circuit method



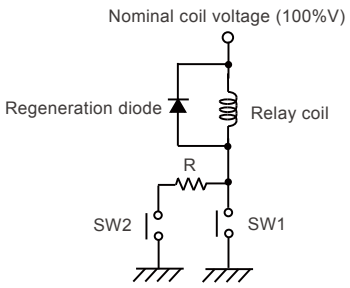
【Operation explanation】
(1) Apply voltage of over nominal coil voltage (around 130%V).
(2) Power consumption when relay is ON is controlled using the values of relay coil resistance, C, and R.

*For application time of voltages over the nominal voltage, please set value of capacitor C to 50 ms or greater.
*Set the coil holding voltage using resistance R, and the relay coil resistance to reach the voltage you are aiming for (around 50%V).

[Depiction of coil voltage/current waveform]



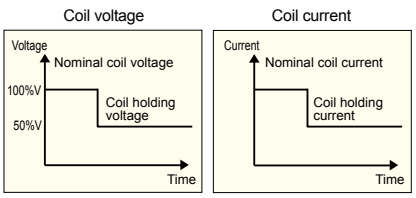
2. Example of switch method



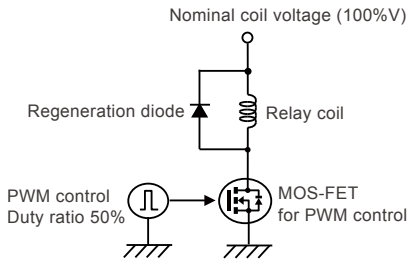
【Operation explanation】
(1) Operate by turning SW1 ON and applying nominal voltage (100%V) to relay coil.
(2) After at least 0.1 s in (1) , turn SW2 ON, turn SW1 OFF and control the power consumption when the relay is ON using the value of resistance R.

*Set the coil holding voltage using resistance R, and the relay coil resistance to reach the voltage you are aiming for (around 50%V).

[Depiction of coil voltage/current waveform]



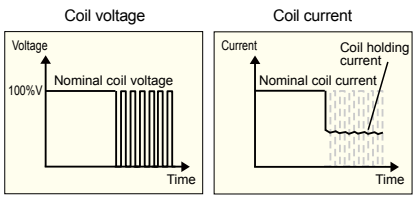
3. Example of PWM method



【Operation explanation】
(1) MOS-FET→ON (Voltage supplied to relay coil)
Make sure MOS-FET is completely ON (Duty ratio 100%)
(2) After at least 0.1 s of (1) , start PWM control with MOS-FET (Duty ratio 50%), and control the power consumption when the relay is ON.

*We recommend a PWM control frequency of 20 kHz to 100 kHz.

[Depiction of coil voltage/current waveform]



HE-S Relay
2 Form A/ 2 Form A 1 Form B type

The HE-S relay is a 2 Form A and 2 Form A 1 Form B relay that is miniature and features high capacity, built-in auxiliary contacts. In particular, the 2 Form A 1 Form B contact type supports mirror contact mechanisms and can be used to create safety circuits.

2 Form A 1 Form B contact type supports the mirror contact mechanisms. Detect welding of main contact and create safety circuit. Contact gap of 3.2 mm .126 inch or higher.

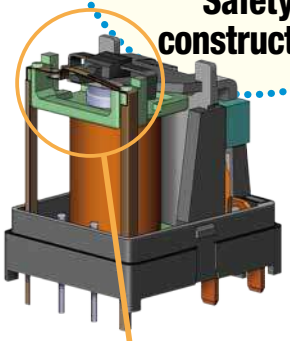
Safety construction

Miniature size attained compared to using two 1 Form A contact relays. Enhanced freedom of design

Space saving

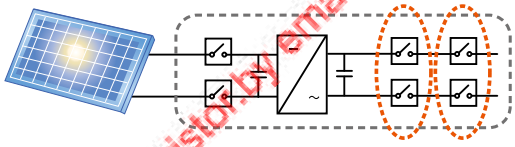
Reduction of power consumption is achieved by reducing the coil holding voltage after applying nominal coil voltage for at least 100 ms during relay operation.

Energy-saving



When using 1 Form A/2 Form A relay

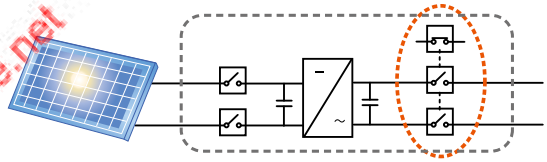
For failsafe applications, use **four** 1 Form A type or **two** 2 Form A type.

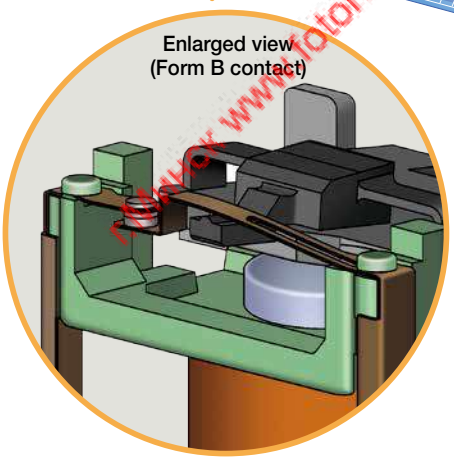


Nominal operating power	Ratio in which coil holding voltage can be decreased	Power consumption when coil holding voltage decreases
1,880mW	30%V of nominal coil voltage	approx. 170mW

When using HE-S (2 Form A 1 Form B contact)

Use **one** 2 Form A 1 Form B type
(creation of contact welding monitoring circuit is possible).





Explanation of mirror contact mechanism (2 Form A 1 Form B type)

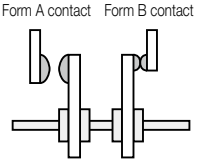
Compliant with EN60947-4-1 mirror contact

- Designed so that Form A contact and Form B contact will not close at the same time.
- When From A contact welded, Form B contact gap of at least 0.5 mm .020 inch is maintained.

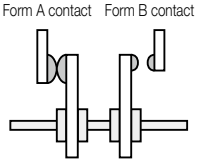
*Form B contact, when used to monitor the condition of Form A contact, can be used exclusively as an auxiliary contact.

Normal operation

1 Non-excitation (Normal operation)

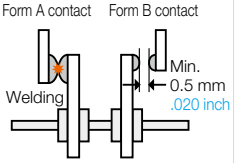


2 Excitation (Normal operation)



Malfunction

3 Non-excitation (When main contact welded)



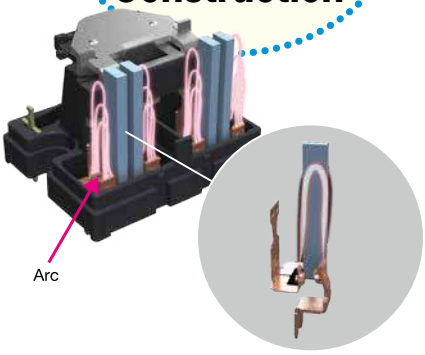
HE-V relay

HE-V Relay

The HE-V relay is a miniature power relay that can conduct and cut off high DC voltage or high currents. Using a 2 Form A contact, it is capable of both plus and minus line cutoff on the DC side.

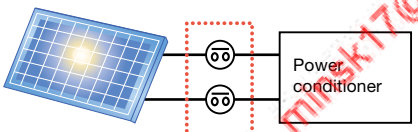
Safety Construction

Using a blow-out magnet mechanism and serial contact connection, the required arc and gap length is maintained for high DC voltage cutoff. Over 3.8 mm contact gap (for each 1 Form A contact)



Small

Miniature size attained compared to using two 1 Form A contact relays. Enhanced freedom of design



*Serial connection example

Energy-saving

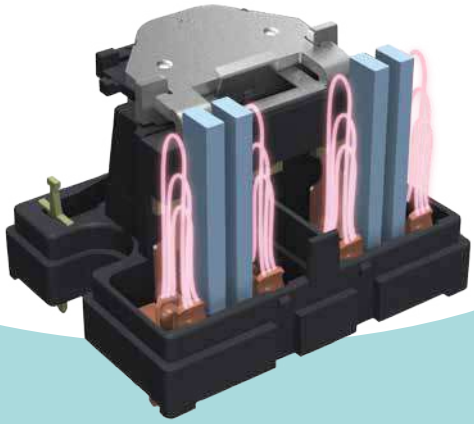
Reduction of power consumption is achieved by reducing the coil holding voltage after applying nominal coil voltage for at least 100 ms during relay operation.

Nominal operating power	Ratio in which coil holding voltage can be decreased	Power consumption when coil holding voltage decreases
1,920mW	33%V of nominal coil voltage	approx. 210mW

Operation explanation(interception mechanism)

1 Power to relay is ON.

2 Arc is generated when power to relay contact is cut.



3 The arc extends by applying transverse field.

4 The arc extends inside the arc extinction space and completes cutoff. The arc does not get out.

Inside arc extinction space

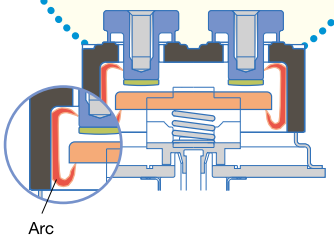
EP relay

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.

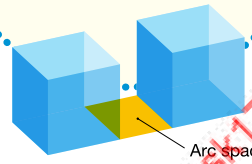
Sealed construction keeps the arc inside

Safety Construction



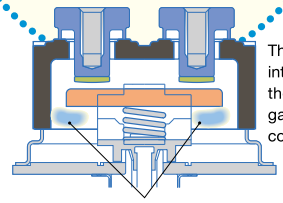
Free arc space

Space saving



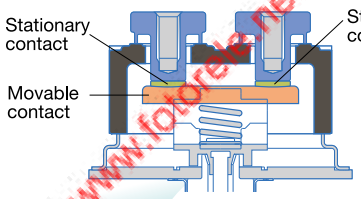
The capsule contact construction is filled with H2 gas which provides a large cutoff capacity with a small contact gap.

Small

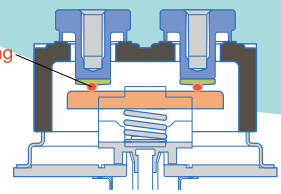


Operation explanation(interception mechanism)

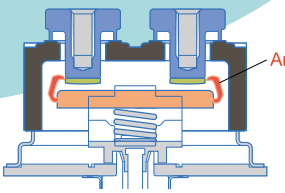
1 power to relay is ON.



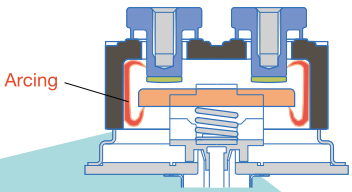
2 Arc is generated when power to relay is cut.



3 Due to external magnetic force, arc runs horizontally over contact surface.



4 Arc is attracted to the inner wall of sealed capsule contact, preventing arc from running side.



Terminal Protect Cover (80A only)

*Terminal protect cover shape may change without any notification.

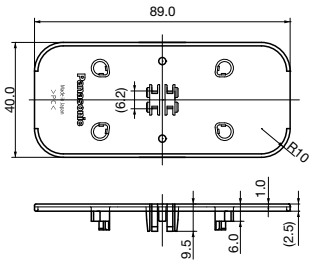
"Terminal protect covers" to protect DC high voltage system is now available. Please contact us.

●Terminal protect cover

80A type

●Dimensions (Unit : mm)

80A type



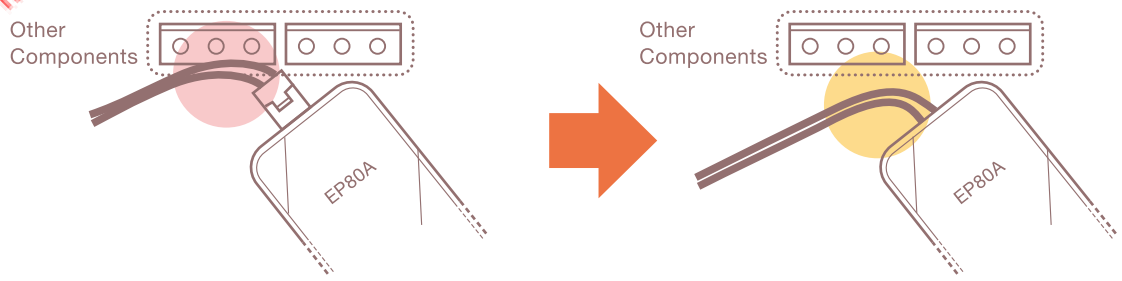
Terminal protect cover on relay

80A type

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

Lead wire type is available to avoid insulation failure from other components with high voltage. Please contact us.

In case of some high voltage risks near the input side



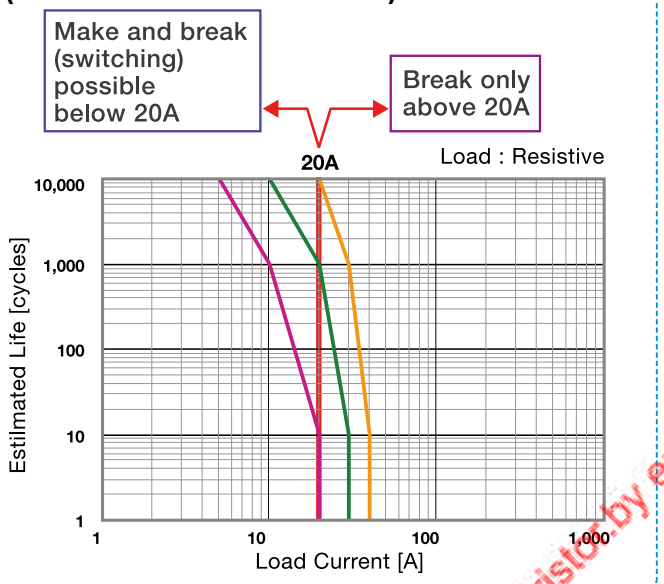
Insulation distance is not enough with existing connector type.

Enough insulation distance can be created with lead wire type.

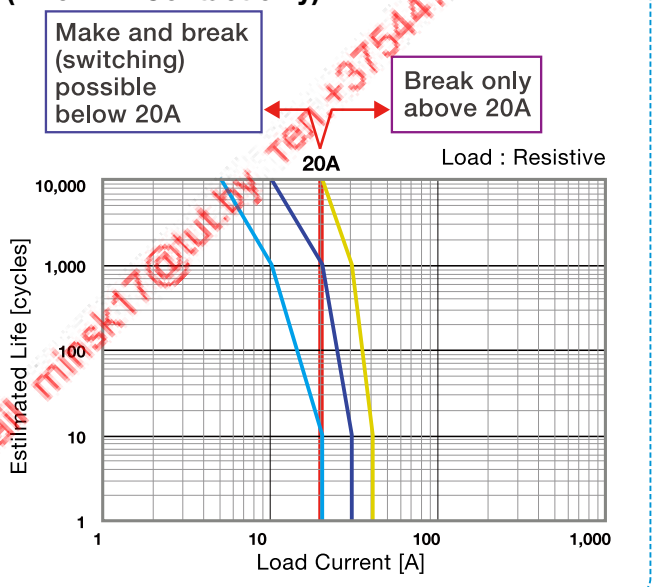
HE-V relay/EP relay estimated life (cycles)

Notes:In case of using over the rating, the data is only reference use. please test the actual condition befor use.

HE-V relay (Contact connected in series)

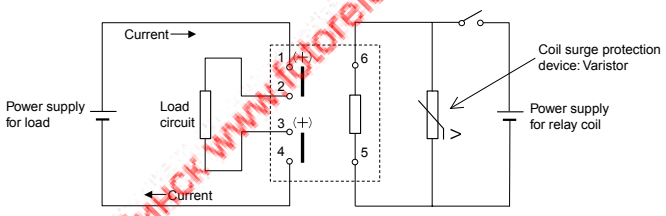


HE-V relay (1 Form A Contact only)

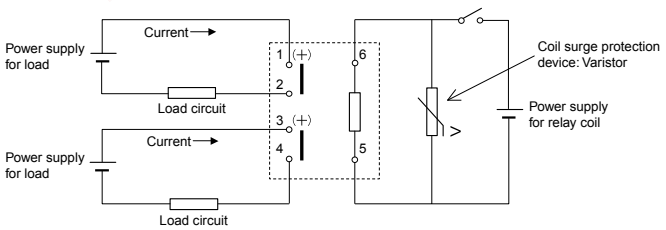


HE-V relay Recommended circuit
Positive polarity of load should be connected to pin 1 and pin 3, refer to the following circuit schematics.

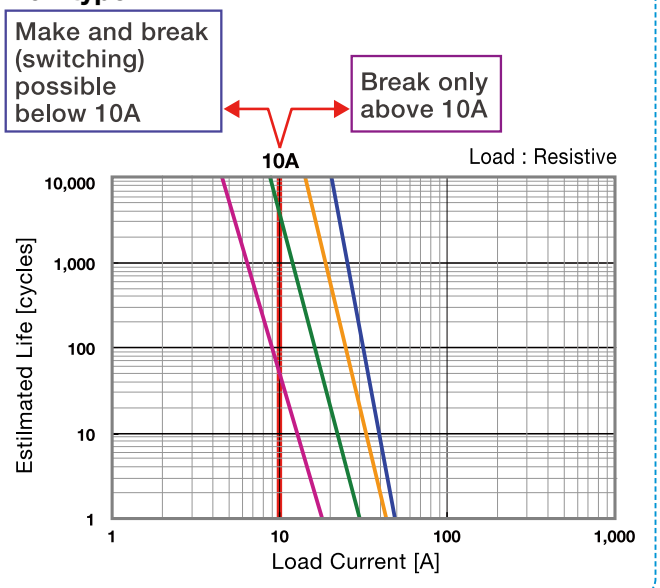
1. Each 1 Form A contact connected in series (Bottom view)



2. 1 Form A contact only (Bottom view)

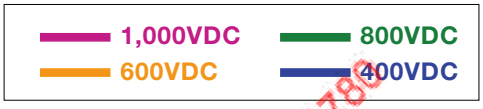


EP relay 10A type

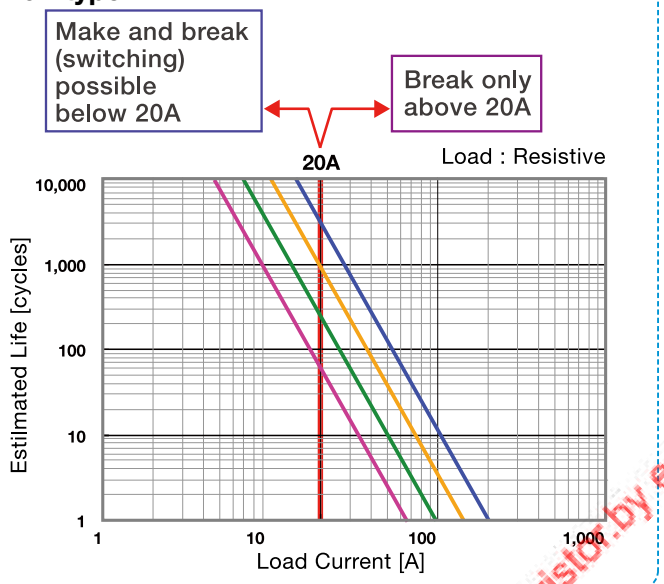


EP relay estimated life (cycles)

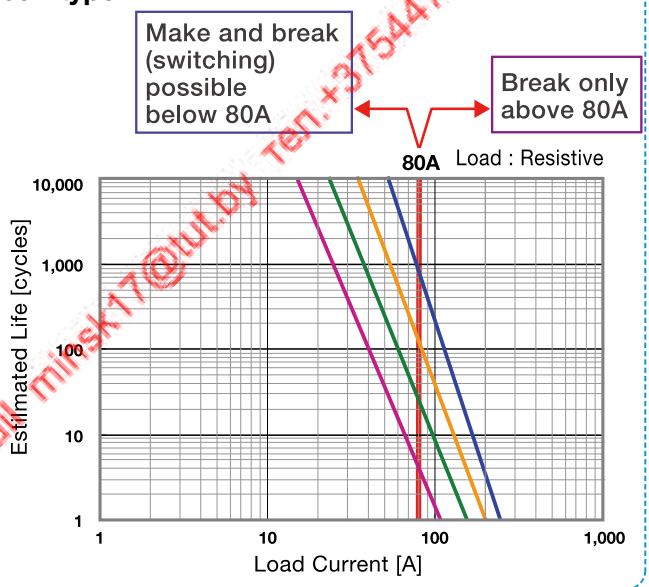
Notes:In case of using over the rating, the data is only reference use. please test the actual condition befor use.



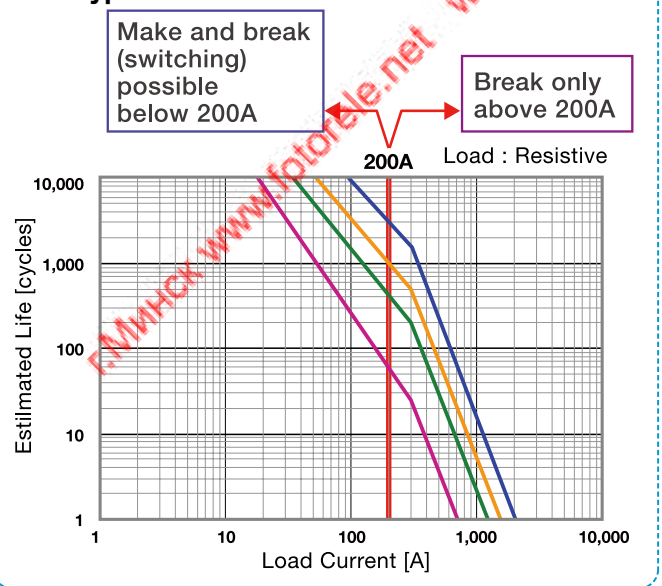
EP relay 20A type



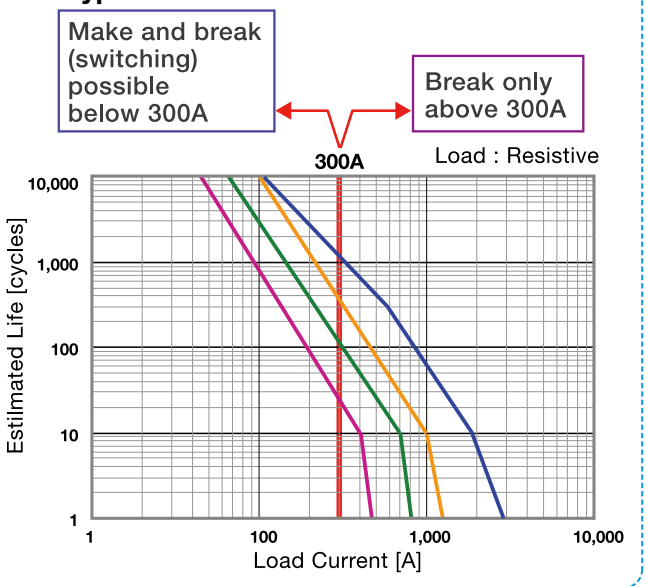
EP relay 80A type



EP relay 200A type



EP relay 300A type



The application examples in this document are for reference. Be sure to verify safety on the actual device before using.

DC load switching capacity that is possible on AC load relay

Even on some AC load relays, support for DC loads is possible.

*Guideline for when using DC loads. Please test the actual condition before use.

DC load switching capacity that is possible on AC load relay (reference value)

Appearance	Product name	Contact	Load voltage	Current	Electrical expected life (resistive load)	Remark
	LF-G (33A type)	1 Form A	30V DC	33A	1×10^4	
			60V DC	10A		
	HE PV (48A type)	1 Form A	60V DC	60A		
			75V DC	35A		
			110V DC	10A		
	HE-S (35A type)	2 Form A	75V DC	35A		When using independent 1 Form A contact
			110V DC	10A		When using independent 1 Form A contact
			220V DC	10A		When contacts connected in series

Maximum value of DC load switching capacity that is possible on AC load relay

(Conditions: resistive load, electrical expected life of 10,000 times) (reference value)