

Products for Energy Management

2nd edition



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Products for Energy Management

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Products for Energy Management

Application example

For Photovoltaic Power Generation System For details, see [P.8](#)

For Lighting/Outlet Control For details, see [P.23](#)

Solar panel
AQZ HE-V

Solar inverter
AC power relays DC power relays

Lighting/Outlet control
AC power relays

Smart meter

For Battery Storage System For details, see [P.11](#)

For Charging Station For details, see [P.16](#)

For public use
ENERGY STORAGE

For household use

Battery storage system
DC power relays
AC power relays
SSR (DC)

Charging station



















For Data Center For details, see [P.22](#)

Data center
AC power relays

Charging station
AC power relays Solid state devices
DC power relays

Product examples for specific applications






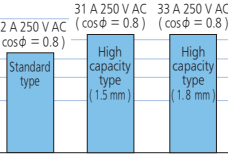
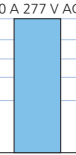
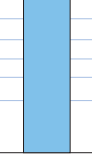
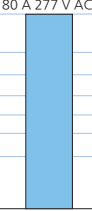
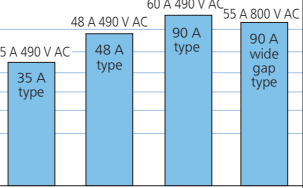
Recommended products for specific applications







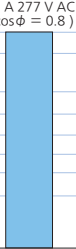
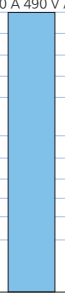
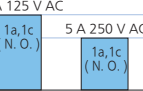
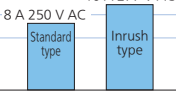

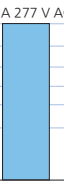
	For photovoltaic power generation system	For battery storage system	For charging station	For smart meter	For lighting/outlet control	For data center	
AC For AC load switching		LF-G  *					
		HE-PV  *					
		HE-S 					
		HE-R 					
		HE-A 					
		HE-N 					
					LQ 		
						DW 	
						DJ-H 	
					LZ 		LZ 
DC For DC load switching		EP 					
		EV-A 					
		HE-V 					
		AQZ PhotoMOS 					
		AQ-A SSR 					
For others		PhotoMOS 					
					AQ-H SSR 		

Note) If you are considering applications for charging stations, please contact our sales representative.

Products for Energy Management

■ For AC Load Switching

Product name	LF-G*1	HE-S	HE-R*1	HE-R*1	HE-PV*1
Appearance					
Contact arrangement	1 Form A	2 Form A/ 2 Form A 1 Form B	4 Form A/ 4 Form A 1 Form B	2 Form A/ 2 Form A 1 Form B	1 Form A
Max. switching capacity	 <p>22 A 250 V AC (cos φ = 0.8) Standard type 31 A 250 V AC (cos φ = 0.8) High capacity type (1.5 mm) 33 A 250 V AC (cos φ = 0.8) High capacity type (1.8 mm)</p>	 <p>40 A 277 V AC</p>	 <p>50 A 480 V AC</p>	 <p>80 A 277 V AC</p>	 <p>35 A 490 V AC 35 A type 48 A 490 V AC 48 A type 60 A 490 V AC 90 A type 55 A 800 V AC 90 A wide gap type</p>
Latching type availability	—	—	—	—	—
Rated operating power	When input : 1.4 W when retained: 0.17 W	When input : 1.88 W when retained: 0.17 W	When input : 4.0 W when retained: 0.49 W	When input : 4.0 W when retained: 0.49 W	When input : 1.92 W when retained: 0.31 W
Max. allowable voltage	250 V AC	480 V AC	480 V AC	277 V AC	490 V AC 48 V DC 490 V AC 60 V DC 800 V AC 60 V DC
Contact gap	1.5 mm/1.8 mm	3.2 mm *2	3.6 mm *2	3.6 mm *2	2.5 mm 3.0 mm 3.6 mm
Ambient temperature*3	−40 to +85 °C	−40 to +85 °C	−40 to +85 °C	−40 to +85 °C	−50 to +85 °C
Safety standards	UL/C-UL, VDE	UL/C-UL, VDE, CQC	UL/C-UL, VDE	UL/C-UL, VDE	UL, CSA, VDE UL/C-UL, VDE


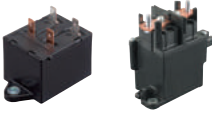



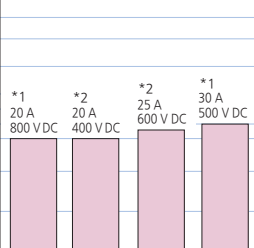
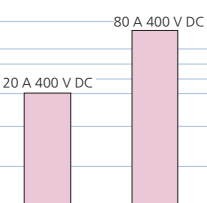
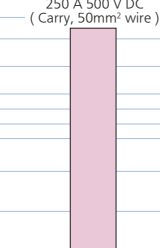
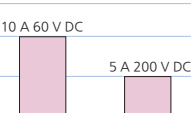
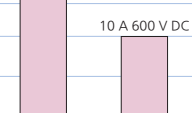
Product name	HE-A*1	HE-N	LQ	DW	LZ	DJ-H
Appearance						
Contact arrangement	1 Form A/ 1 Form A 1 Form B	1 Form A	1 Form A/1 Form C	1 Form A	1 Form A/1 Form C	1 Form A
Max. switching capacity	 <p>90 A 277 V AC (cos φ = 0.8)</p>	 <p>120 A 490 V AC</p>	 <p>10 A 125 V AC 1a,1c (N.O.) 5 A 250 V AC 1a,1c (N.O.)</p>	 <p>8 A 250 V AC Standard type 16 A 277 V AC Inrush type</p>	 <p>16 A 250 V AC</p>	 <p>50 A 277 V AC</p>
Latching type availability	—	—	—	●	—	●
Rated operating power	When input : 1.92 W when retained: 0.31 W	When input : 2.5 W when retained: 0.4 W	When input: 0.2 W (1a) When input: 0.4 W (1c)	When input: 0.2 W (1L) When input: 0.4 W (2L)	When input: 0.4 W	When input: 1.0 W (1L) When input: 2.0 W (2L)
Max. allowable voltage	800 V AC 60 V DC	800 V AC 60 V DC	250 V AC 30 V DC	250 V AC (8 A) 277 V AC (16 A)	440 V AC	480 V AC
Contact gap	3.6 mm *2	3.6 mm	—	—	—	—
Ambient temperature	−40 to +85 °C	−40 to +85 °C	−40 to +85 °C	−40 to +85 °C	−40 to +85 °C	−40 to +85 °C
Safety standards	UL/C-UL, VDE	UL/C-UL, VDE	UL/C-UL, VDE, CQC	UL/C-UL, VDE, CQC	UL/C-UL, VDE	UL/C-UL, VDE

*1: LF-G, HE-PV, HE-R and HE-A Standard Items are not compliant with Japanese electrical safety standards. Compliant options are available, please contact our sales representative.

*2: Contact gap for each between 1 Form A (1a) contacts

*3: For details of ambient temperature, please refer to the product catalog.







■ For DC Load Switching

Product name	HE-V	EP	EV-A	AQZ PhotoMOS®	AQ-A SSR (DC)
Appearance		 20 A 80 A			
Contact arrangement	2 Form A	1 Form A	1 Form A	1 Form A	1 Form A
Max. switching capacity					
Rated operating power	When input : 1.9 W when retained: 0.21 W	3.9 W 4.2 W	6.0 W	0.01 W (Input current: 10 mA)	0.08 to 0.64 W (Input voltage: 4 to 32 V)
Max. allowable voltage	1,000 V DC	1,000 V DC	1,000 V DC	60 V DC 200 V DC	100 V DC 600 V DC
Contact gap	—	— (Capsule contact construction)	— (Capsule contact construction)	No contact	No contact
Ambient temperature	−40 to +85 °C	−40 to +80 °C	−40 to +85 °C	−40 to +85 °C	−20 to +80 °C
Safety standards	UL/C-UL, VDE	UL/C-UL (20 A type: only UL)	—*3	UL, VDE	UL/C-UL, VDE

*1: Each 1 Form A (1a) contact connected in series.

*2: When using each 1 Form A (1a) contact independently

*3: The EV-A relay is not compliant with Japanese safety standards. For details, please contact our sales representative.

Product name	PhotoMOS®					AQ-H SSR
Applications	Insulation detection	Battery monitoring		Communication	Main relay driving	Main relay driving
Part No.	AQV258H5*1	AQW214EH	AQW216EH	AQY210EH	AQY212EH	AQH2223
Appearance*2						
Contact arrangement	1 Form A	2 Form A	2 Form A	1 Form A	1 Form A	1 Form A
Continuous load current	20 mA	100 mA	40 mA	130 mA	550 mA	—
ON-state RMS current	—	—	—	—	—	0.9 A
Load voltage	1,500 V	400 V	600 V	350 V	60 V	—
Repetitive peak OFF-state voltage	—	—	—	—	—	600 V
I/O isolation voltage	5,000 V AC	5,000 V AC	5,000 V AC	5,000 V AC	5,000 V AC	5,000 V AC
Safety standards	UL	UL, VDE	UL, VDE	UL, VDE	UL, VDE	UL/C-UL, VDE

*1: If you require the high I/O isolation voltage type, please contact our sales representative.

*2: Also available in the SMD type.

New Product Introductions

HE-R relays [4 Form A/4 Form A 1 Form B (4a/4a1b)]



1. High capacity

- Max. carrying current: 50 A
- Max. switching current: 40 A
- Electrical expected life: 40 A 480 V AC Min. 30×10^3 ope.
32 A 480 V AC Min. 50×10^3 ope.

2. Compact size and low operating power

- W: 35 × L: 58 × H: 47 mm
- Rated operating power: 4,000 mW
- Holding power: 490 mW (when applied 35 %V of coil holding voltage)

3. Safety standards

- UL/C-UL and VDE recognized (UL508, IEC61810-1)
- Short circuit capacity: $I_p = 2.5$ kA, $I^2t = 6.5$ kA²s (Compliant with IEC62955)
- Contact gap: Min. 3.6 mm
- Mirror contact mechanisms (Compliant with EN60947-4-1)

HE-R relays [2 Form A/2 Form A 1 Form B (2a/2a1b)]



1. High capacity

- Max. carrying current and Max. switching current: 80 A
- Electrical expected life: 70 A 277 V AC Min. 30×10^3 ope.
80 A 277 V AC Min. 10×10^3 ope.
63 A 277 V AC Min. 50×10^3 ope.

2. Compact size and low operating power

- W: 37 × L: 60 × H: 47 mm
- Rated operating power: 4,000 mW
- Holding power: 490 mW (when applied 35 %V of coil holding voltage)

3. Safety standards

- UL/C-UL and VDE recognized (UL508, IEC61810-1)
- Short circuit capability: $I_{rms} = 5$ kA (Compliant with UL508)
- Contact gap: Min. 3.6 mm
- Mirror contact mechanisms (Compliant with EN60947-4-1)

HE relays PV type 90 A wide gap



1. High capacity

- Max. carrying current and Max. switching current: 90 A
- Electrical expected life: 80 A 277 V AC Min. 10×10^3 ope.
90 A 277 V AC Min. 10^3 ope.
55 A 800 V AC Min. 10^3 ope.

2. Compact size and low operating power

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

3. Safety standards

- UL/C-UL recognized (UL508)
- VDE recognized (IEC61810-1)
- Contact gap: Min. 3.6 mm

HE-A relays



1. High capacity

- Max. carrying current: 110 A
- Max. switching current: 90 A
- Electrical expected life: 60 A 490 V AC Min. 10×10^3 ope.
90 A 277 AC Min. 10^3 ope. $\cos\phi = 0.8$

2. Compact size and low operating power

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

3. Safety standards

- UL/C-UL and VDE recognized (UL508, IEC61810-1)
- Short circuit capability: $I_{rms} = 5$ kA (Compliant with UL508)
- Contact gap: Min. 3.6 mm
- Mirror contact mechanisms (Compliant with EN60947-4-1)

EV-A relays



1. High capacity

- 1,800 A 500 V DC, Min. 1 ope. (No polarity)
- Rated switching capacity: 250 A 500 V DC (Carry, 50 mm² wire)

2. High short circuit capacity

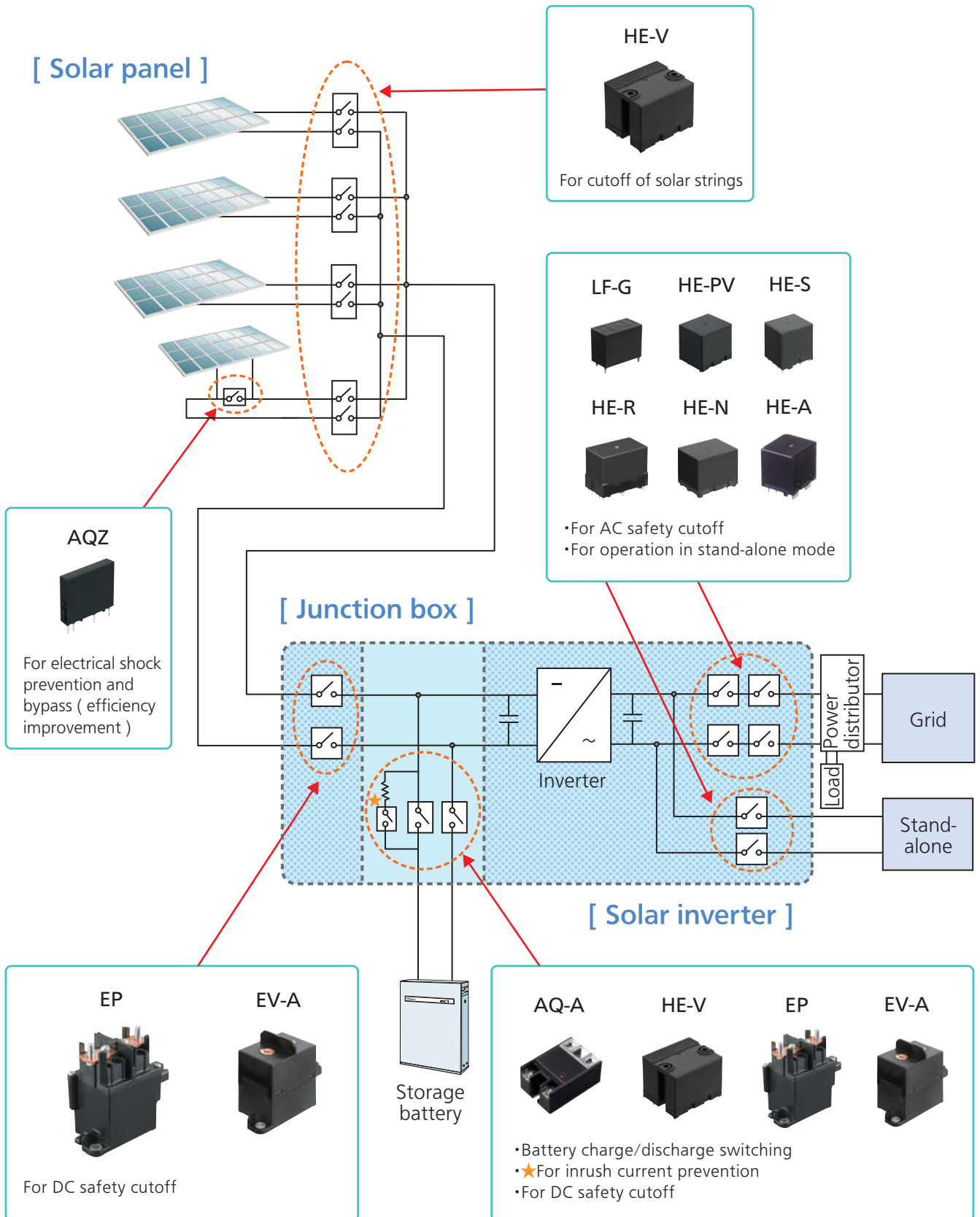
- Electromagnetic repulsion suppression mechanism. Realized 8,000 A short circuit tolerance

3. Compact size and lightweight

- One of the smallest and lightest weight in 250 A class
W: 47.5 × L: 56.5 × H: 63.0 mm
Unit weight: 400 g

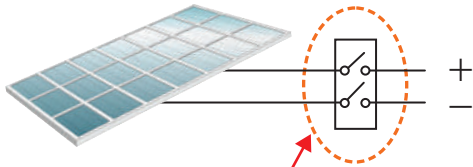
Photovoltaic Power Generation System

Recommended products



Recommended products (DC side)

For Solar strings



HE-V



Recommended relay

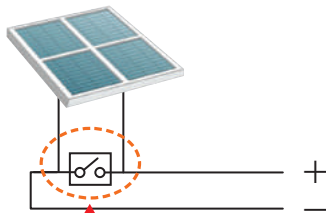
HE-V (2a 20 A 1,000 V DC*1)

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

*1: 1,000 V DC is the maximum allowable voltage when each 1 Form A (1a) 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 the event of an emergency, 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. Reduces maintenance costs.

For Junction box connectors*2



AQZ PhotoMOS



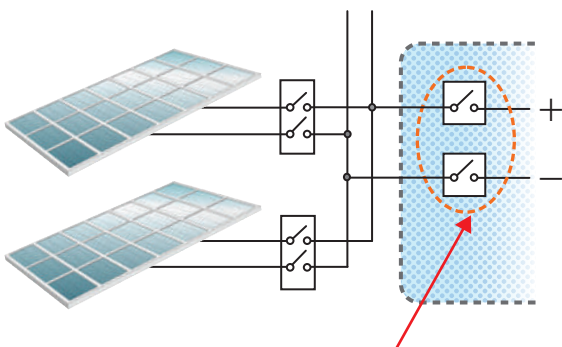
Recommended relay

AQZ PhotoMOS (1a 10 A 60 V DC)

PhotoMOS capable of frequent switching, improving system reliability

*2: A junction box is a box that protects terminals that are used for joining, branching, or relaying electrical wires.

For Junction boxes and Solar inverter



EP



EV-A



Recommended relays

EP/EV-A (1a 20 A, 80 A, 250 A 1,000 V DC*3)

High-voltage cutoff relay with capsule contact construction, which provide high reliability

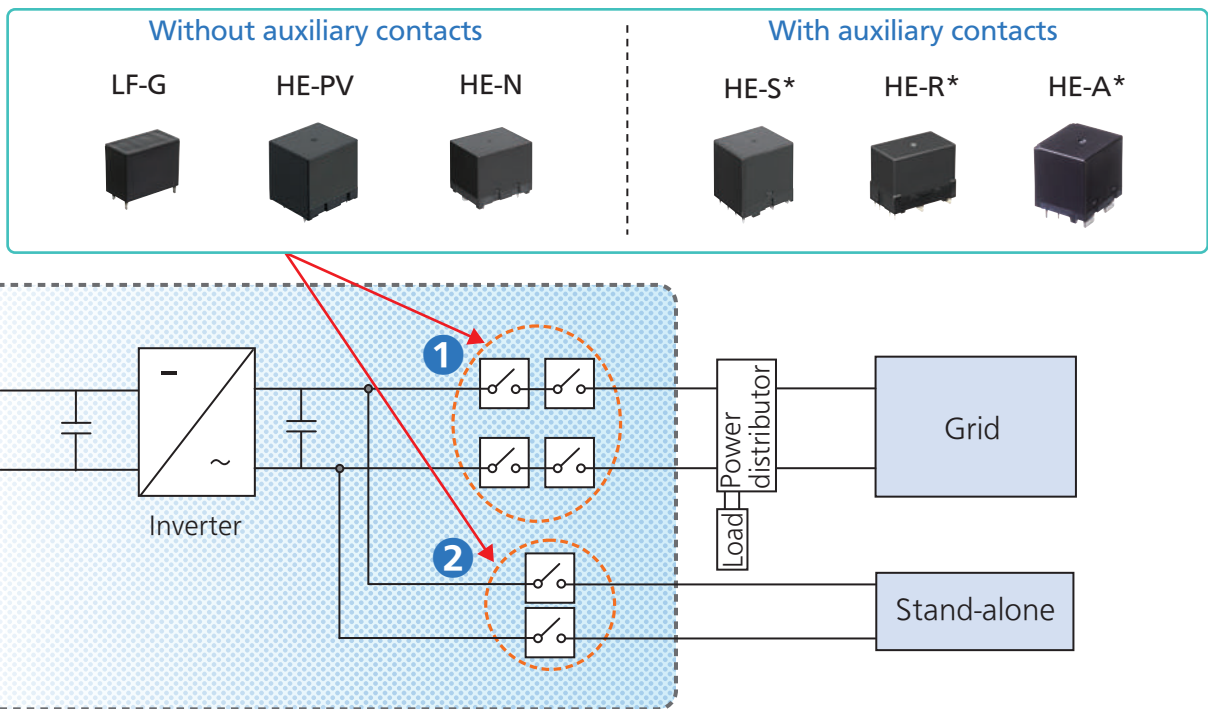
*3: 1,000 V DC is the maximum contact allowable voltage. The rating of EP relay is 400 V DC, and the rating of EV-A relay is 500 V DC.

- In the event of an emergency, such as fire, system safety can be maintained by cutting off the DC line.
- Remote control is possible for maintenance work. Reduces maintenance costs.
- Large current cutoff possible during malfunction when connecting storage battery.

Photovoltaic Power Generation System

Recommended products (AC side)

Recommended relays	<ul style="list-style-type: none"> • LF-G (1a 22 A, 33 A 250 V AC) Compact power relay with a 1.5 mm/1.8 mm contact gap 	<ul style="list-style-type: none"> • HE-S (2a/2a1b 40 A 277 V AC) Two contacts compact power relay with 3.2 mm contact gap
	<ul style="list-style-type: none"> • HE-PV (1a 35 A, 48 A 490 V AC, 60 A 490 V AC (90 A, 90 A wide gap), 55 A 800 V AC (90 A wide gap) Compact power relay with a 2.5 mm/3.0 mm/3.6 mm contact gap, capable of switching from 35 A to 90 A 	<ul style="list-style-type: none"> • HE-R (2a/2a1b 80 A 277 V AC 4a/4a1b 40 A 480 V AC) Compact power relay with a 3.6 mm contact gap
	<ul style="list-style-type: none"> • HE-N (1a 120 A 490 V AC) Compact power relay with a 3.6 mm contact gap 	<ul style="list-style-type: none"> • HE-A (1a/1a1b 90 A 270 V AC $\cos\phi = 0.8$) Compact power relay with a 3.6 mm contact gap



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 operation in stand-alone mode

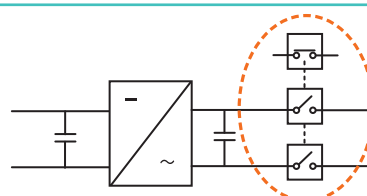
- Relay contacts will be ON during a power outage and use of the stand-alone function is possible. The relays are used for stand-alone mode.

For welding detection with mirror contact mechanisms

- If the relay's main contact, Form A (a) contact, is welded, the mechanically connected Form B (b) contact on the auxiliary contact side retains contact gap of 0.5 mm or more without returning to the closed position. This mechanism enables monitoring of the state of the Form A (a) contact, which is the main contact, at the Form B (b) contact.

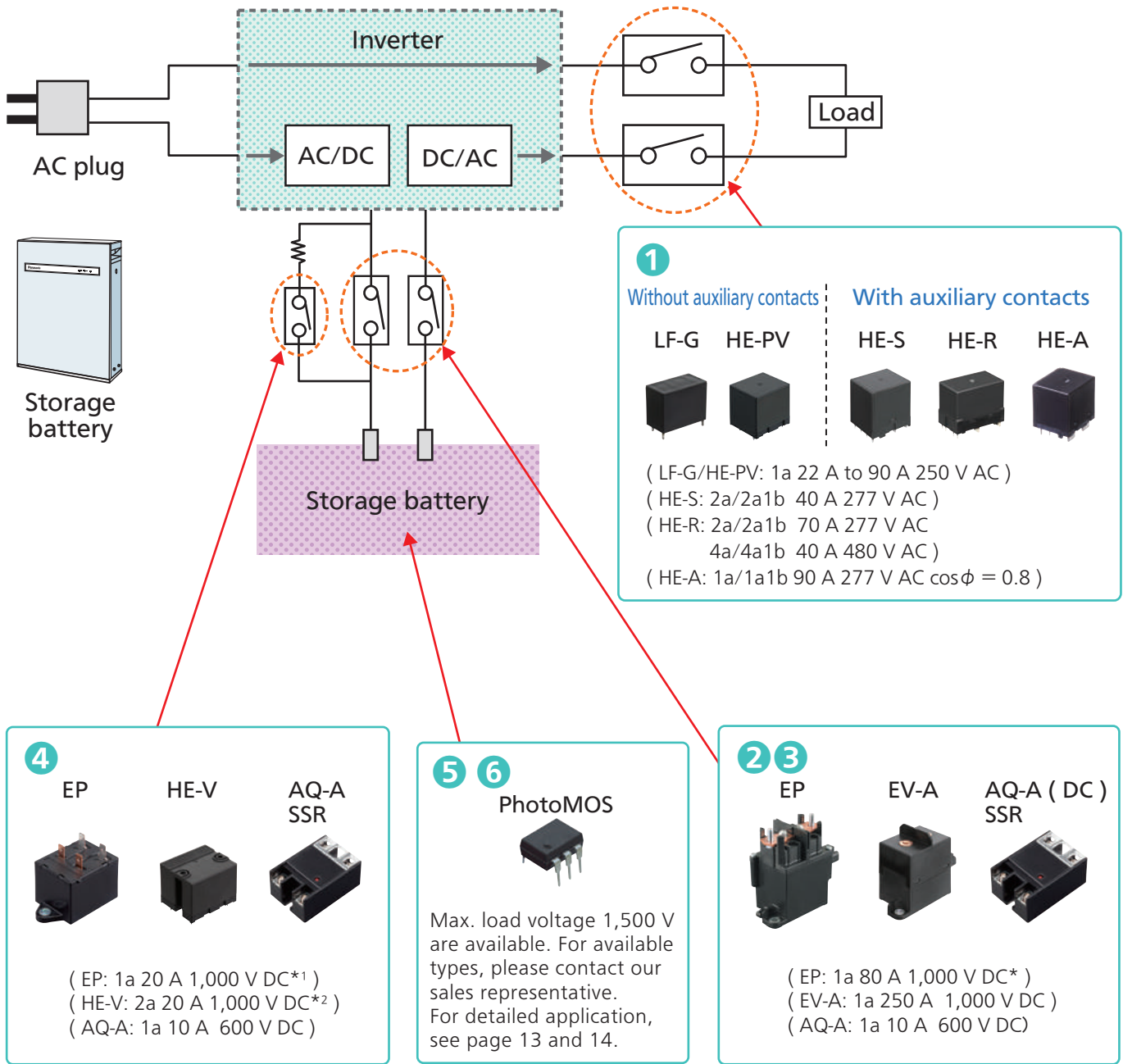
*When using HE-S relay (HE-R and HE-A relays have the same function.)

*Use one 2 Form A 1 Form B (2a1b) type (creation of contact welding monitoring circuit is possible).



Battery Storage System

Recommended products



*1: 1,000 V DC is Max. allowable voltage. The rating is 400 V DC.

*2: 1,000 V DC is Max. allowable voltage when each 1 Form A (1a) contact is connected in series. The rating is 800 V DC.

*1,000 V DC is Max. allowable voltage.

The rating of EP relay is 400 V DC, and the rating of EV-A relay is 500 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 safety cutoff on the DC side

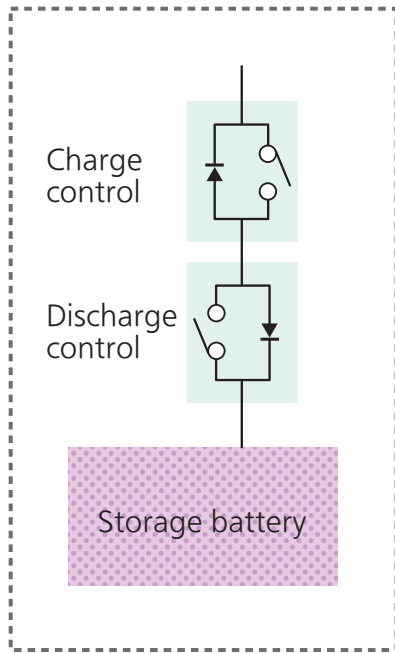
- The emergency circuit cutoff function is essential in case of overcurrent or overcharge caused by failures such as battery or system malfunctions. A DC high-voltage cutoff relay is also required on the DC side as a safety measure.

Battery Storage System

Recommended products

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

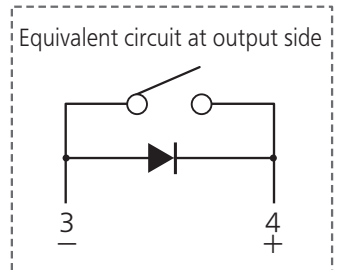
In order to prevent over charging, the solid state relay on the charge control side turns OFF. On the discharge side, current will flow because there is a diode.

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.

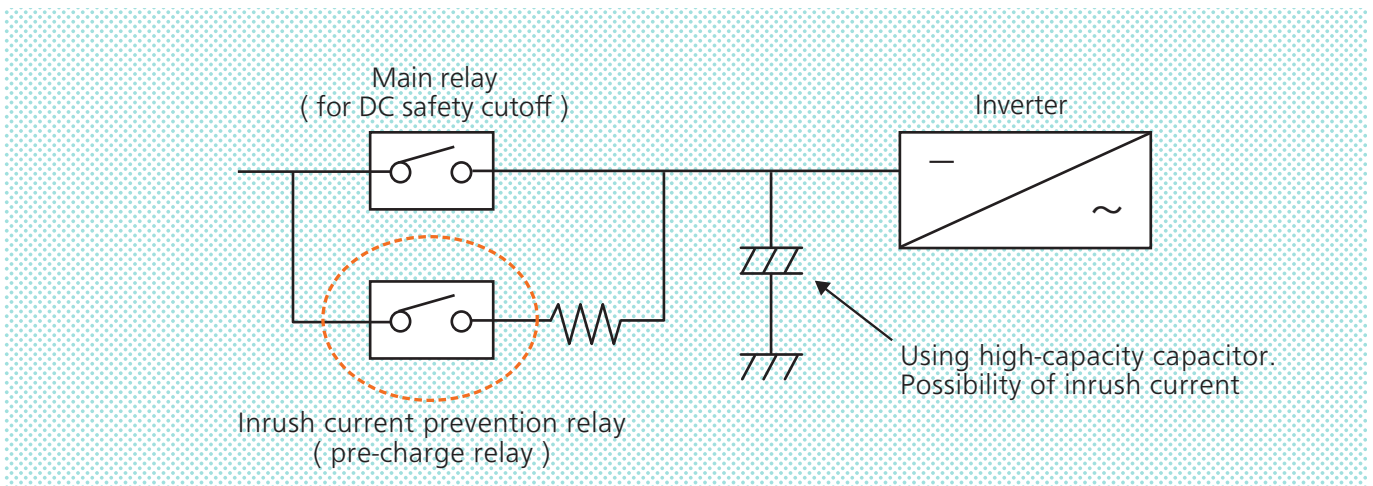
Charge and discharge control is possible by effectively utilizing the internal diodes of the solid state relay.

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



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

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



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.

Recommended products

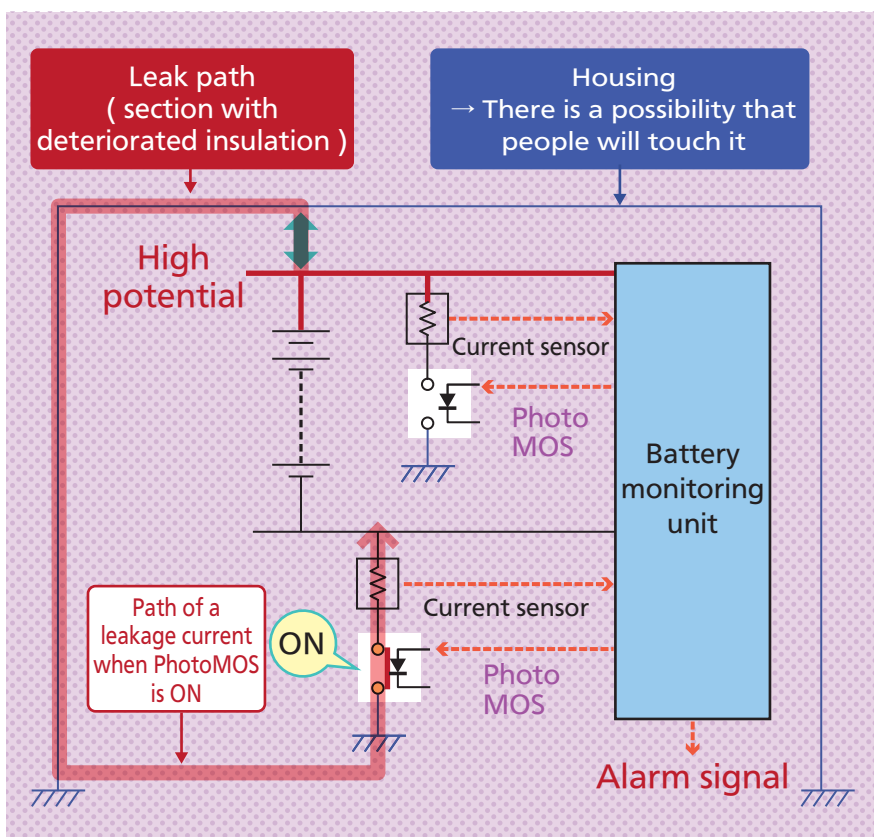
5 For insulation detection

● Need for insulation deterioration detection

A high voltage section with a battery requires insulation to the housing for safety.

An abnormality in the insulation between the high-voltage section and the housing may lead to an electric shock or other dangers.

Therefore, the battery monitoring unit must be capable of detecting the insulated condition between the high-voltage section and the housing.



- When insulation deteriorates
- 1. Turn ON PhotoMOS.
- 2. The current sensor detects a ground-fault current.
- 3. An alarm signal is output.

→ Current

Battery Storage System

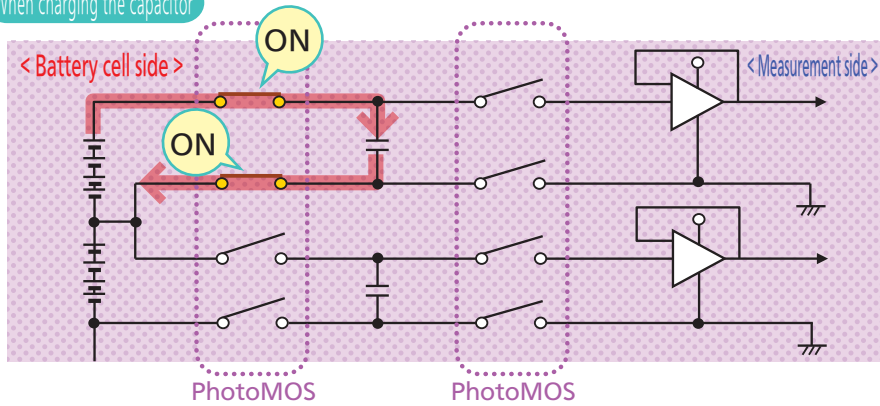
Recommended products

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.

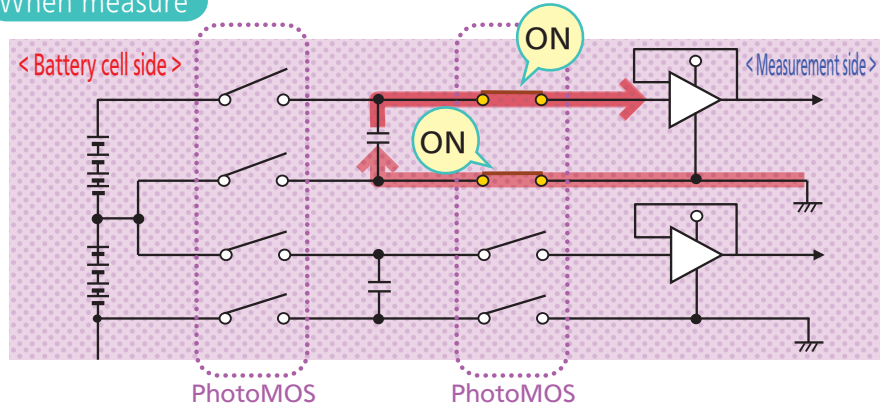
① Monitoring of each battery cell

When charging the capacitor



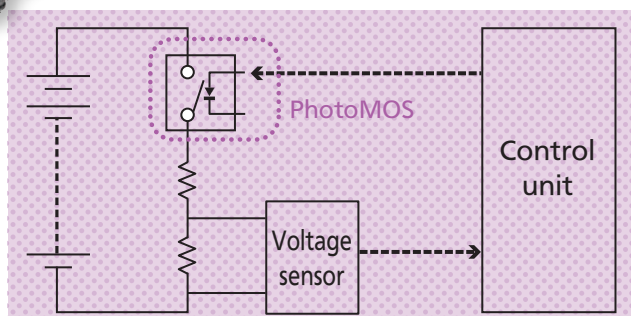
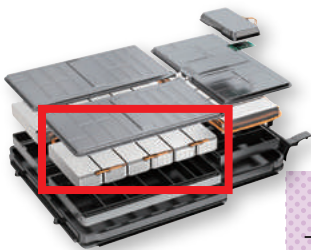
1. PhotoMOS on the battery cell side are turned ON.
2. The capacitor is charged.

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.

② Total voltage monitoring



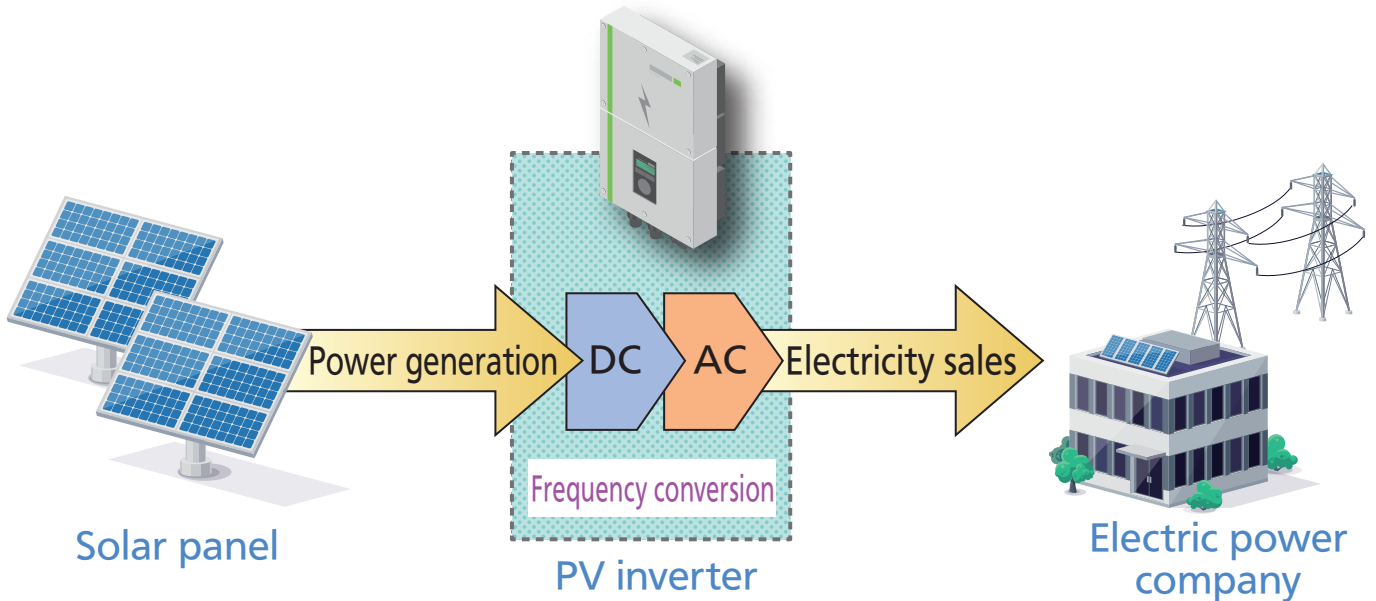
1. Turn ON PhotoMOS at the timing of monitoring the total voltage
2. Sending a sensing signal to the control unit to understand the total voltage

What is an inverter?

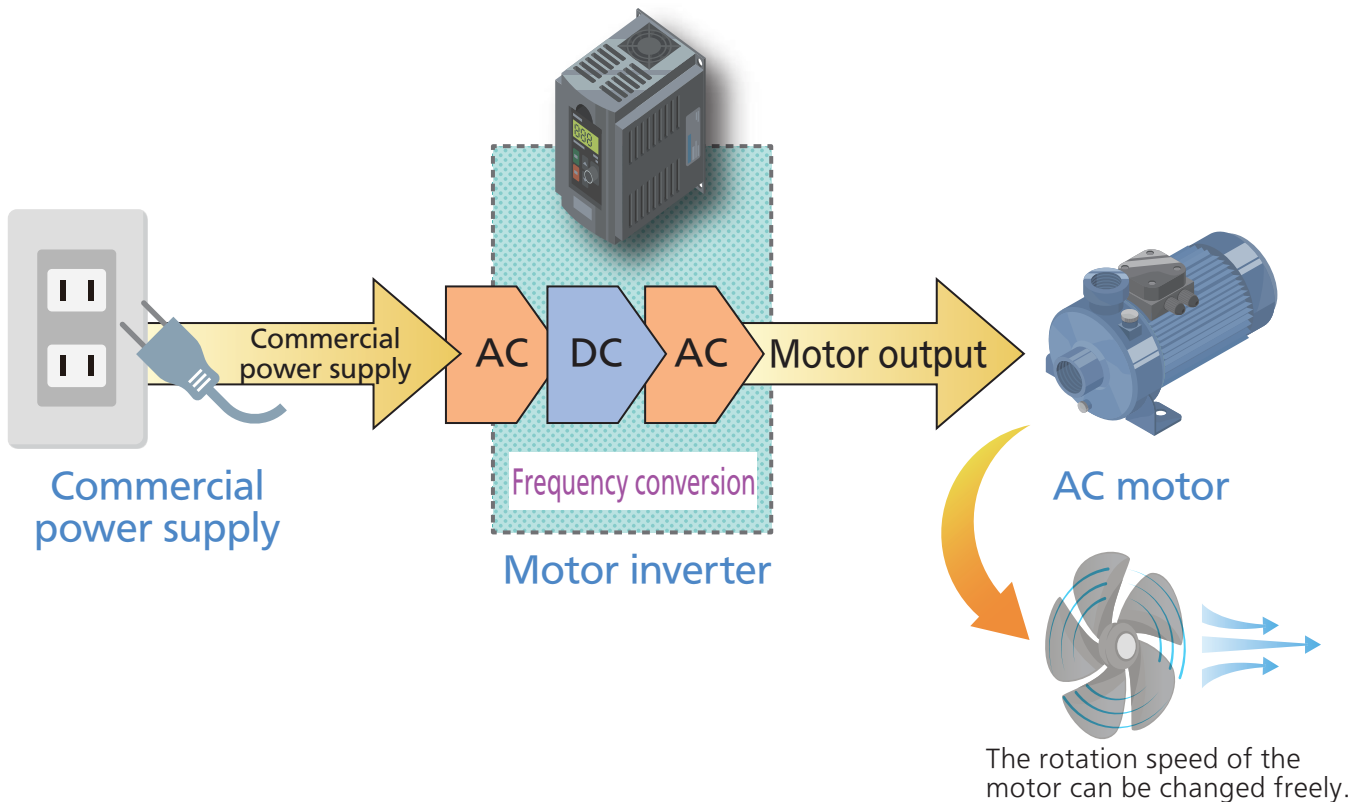
Inverter: A device that converts DC (Direct Current) to AC (Alternating Current).

* **Converter:** A device that converts AC (Alternating Current) to DC (Direct Current) .

PV inverter



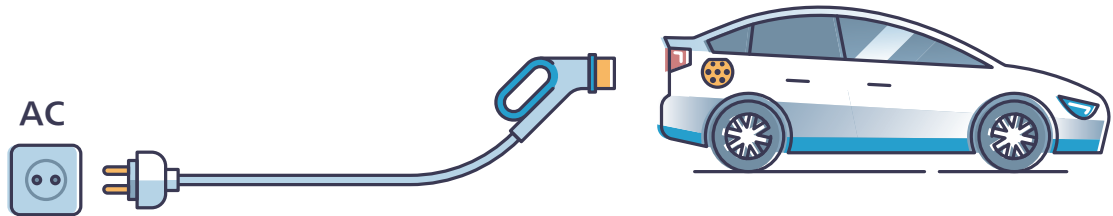
Motor inverter



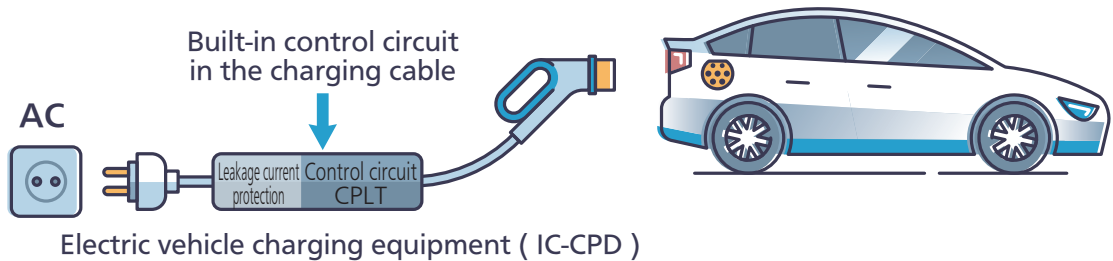
Charging Station

Charging station modes

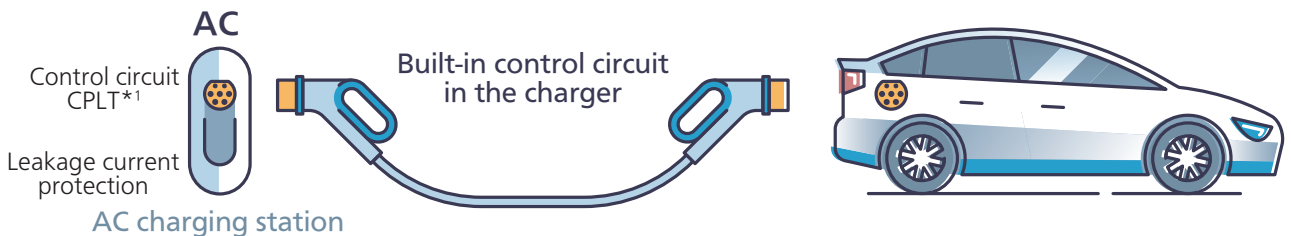
Mode 1



Mode 2

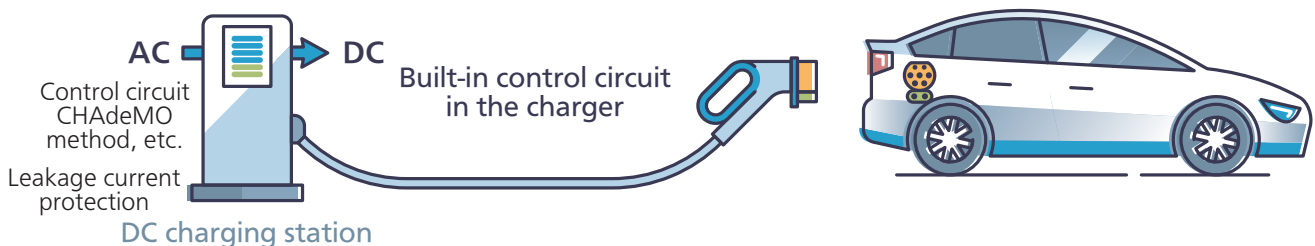


Mode 3



*1: CPLT = Control Pilot A function that confirms the reliable connection between the charging facility and the vehicle side, and starts energizing by checking the vehicle side.

Mode 4

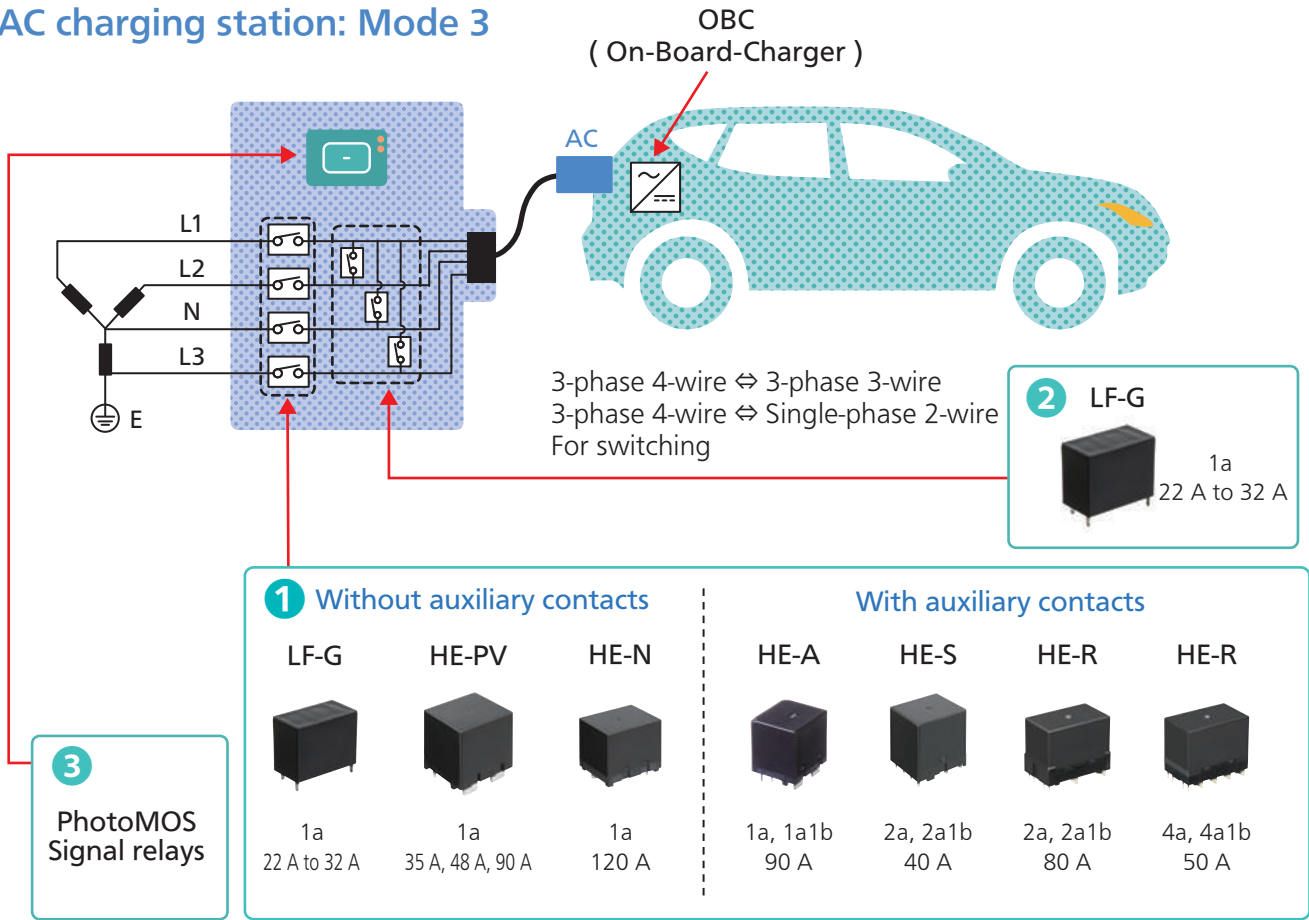


< Application examples for Europe >

	Application
7 k to 11 kW 22 kW	AC charging station
From 30 kW	DC charging station

AC charging station circuit (example)

AC charging station: Mode 3



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 single-phase and 3-phase switching

Note) For more information on how to use the LF-G relay, please contact our sales representative.

3 For signal control & alarm output

- PhotoMOS and signal relays are used for signal control for each function, and signal control with the vehicle (e.g., an image that checks the charge level and gives a signal).

■ For welding detection with mirror contact mechanisms

- If the relay's main contact, Form A (a) contact, is welded, the mechanically connected Form B (b) contact on the auxiliary contact side retains contact gap of 0.5 mm or more without returning to the closed position. This mechanism enables monitoring of the state of the Form A (a) contact, which is the main contact, at the Form B (b) contact. (Supported relays: HE-S, HE-A, HE-R)

Charging Station

For short circuit capacity

● Applications for short circuit capacity require relays that comply with IEC/UL for short circuit capacity.

◆ AC charging station Safety standard

Market demands			Supported relays Short circuit withstand time			
Market	Standards (Judgment method)	Condition	HE-S (2a, 2a1b)	HE-R (4a, 4a1b)	HE-R (2a, 2a1b)	HE-A (1a, 1a1b)
Europe EVSE	IEC62955 Charging station	Energization and insertion (I_n) \leq 32 A	0.57 kA (0.68 kA ² s)	2.6 kA (6.5 kA ² s)	—	—
North American EVSE	UL2231 UL508	Energization	—	—	5.0 kA RMS	5.0 kA RMS

◆ IEC62955 Excerpt: Short circuit withstand time Details

I_{nc} and $I_{\delta c}$		I_n					
		\leq 16 A	\leq 20 A	\leq 25 A	\leq 32 A	\leq 40 A	\leq 63 A
500 A	I_p [kA]	0.45	0.47	0.50	0.57	—	—
	I^2t [kA ² s]	0.40	0.45	0.53	0.68	—	—
1,000 A	I_p [kA]	0.65	0.75	0.90	1.18	—	—
	I^2t [kA ² s]	0.5	0.9	1.5	2.7	—	—
1,500 A	I_p [kA]	1.02	1.1	1.25	1.5	1.9	2.1
	I^2t [kA ² s]	1.0	1.5	2.4	4.1	9.75	22.0
3,000 A	I_p [kA]	1.1	1.2	1.4	1.85	2.35	3.3
	I^2t [kA ² s]	1.2	1.8	2.7	4.5	8.7	22.5
4,500 A	I_p [kA]	1.15	1.3	1.5	2.05	2.7	3.9
	I^2t [kA ² s]	1.45	2.1	3.1	5.0	9.7	28.0
6,000 A	I_p [kA]	1.3	1.4	1.7	2.3	3.0	4.05
	I^2t [kA ² s]	1.6	2.4	3.7	6.0	11.5	25.0
10,000 A	I_p [kA]	1.45	1.8	2.2	2.6	3.4	4.3
	I^2t [kA ² s]	1.9	2.7	4.0	6.5	12.0	24.0

HE-S (2a, 2a1b)

HE-R (4a, 4a1b)

◆ Related standard: EVSE (Electric vehicle supply equipment)

- IEC62955: EVSE mode3 Leakage detection device standard

◆UL2231 Excerpt: Short circuit withstand time Details

Protector type and / or rating	Current	Power factor	Time constant
	[A]	[%]	[s]
Permanently-connected rated up to 100 A	5,000	45 to 50	0.003
Permanently-connected rated > 100 A	10,000	45 to 50	0.003
Portable rated up to 50 A	2,000	90 to 100	0.003
Portable rated > 50 A	5,000	90 to 100	0.003

◆UL508 Excerpt: Short circuit withstand time Details

Max horsepower rating, hp ^c	Number of Phases	Equivalent motor full load current,max amperes							Test Current	Power factor
		110 to 120 V	200 V	208 V	220 to 240 V	380 to 415 V	440 to 480 V	550 to 600 V		
		[A]	[A]	[A]	[A]	[A]	[A]	[A]		
0 to 1	1	16	9.2	8.8	8.0	5.1	4.0	3.2	1,000	0.7 to 0.8
over 1 to 2	1	24	13.8	13.2	12.0	7.7	6.0	4.8	5,000	0.7 to 0.8
over 2 to 50	1	—	—	—	216	139	108	86	5,000	0.7 to 0.8

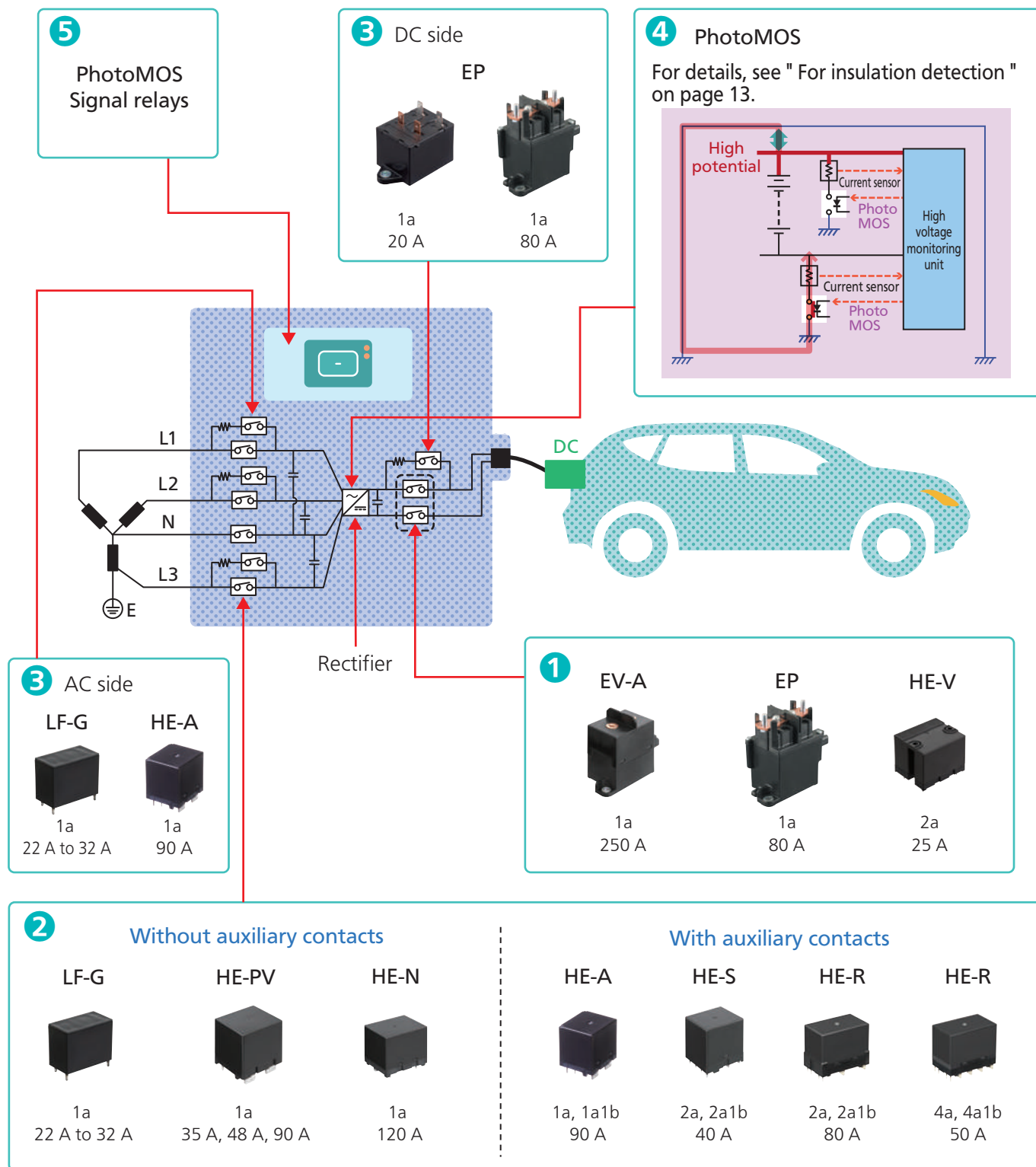
HE-R (2a, 2a1b)
HE-A (1a, 1a1b)

- UL2231 : Standard of human protection devices for charging circuit
- UL508 : Standard for industrial control equipment

Charging Station

DC charging station circuit (example)

DC charging station: Mode 4



DC charging station circuit (example)

1 For safety cutoff on the DC side

- The emergency circuit cutoff function is essential in case of overcurrent or overcharge caused by failures such as battery or system malfunctions.
A DC high-voltage cutoff relay is also required on the DC side as a safety measure.

2 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.

Note) For more information on how to use the LF-G, HE-S, HE-PV, and HE-N relays, please contact our sales representative.

3 For inrush current prevention

- Relays are used to prevent the inrush current of the capacitor during charging. (AC side/DC sides)

Note) For more information on how to use the LF-G relay, please contact our sales representative.

4 For insulation detection

- PhotoMOS are used for monitoring DC charging stations for insulation deterioration.
Also, 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 DC charging stations, which carry high voltage.

5 For signal control & alarm output (PhotoMOS, signal relay)

- PhotoMOS and signal relays are used for signal control for each function, and signal control with the vehicle (e.g., an image that checks the charge level and gives a signal).

For welding detection with mirror contact mechanisms [For relays with Form B (b) contact]

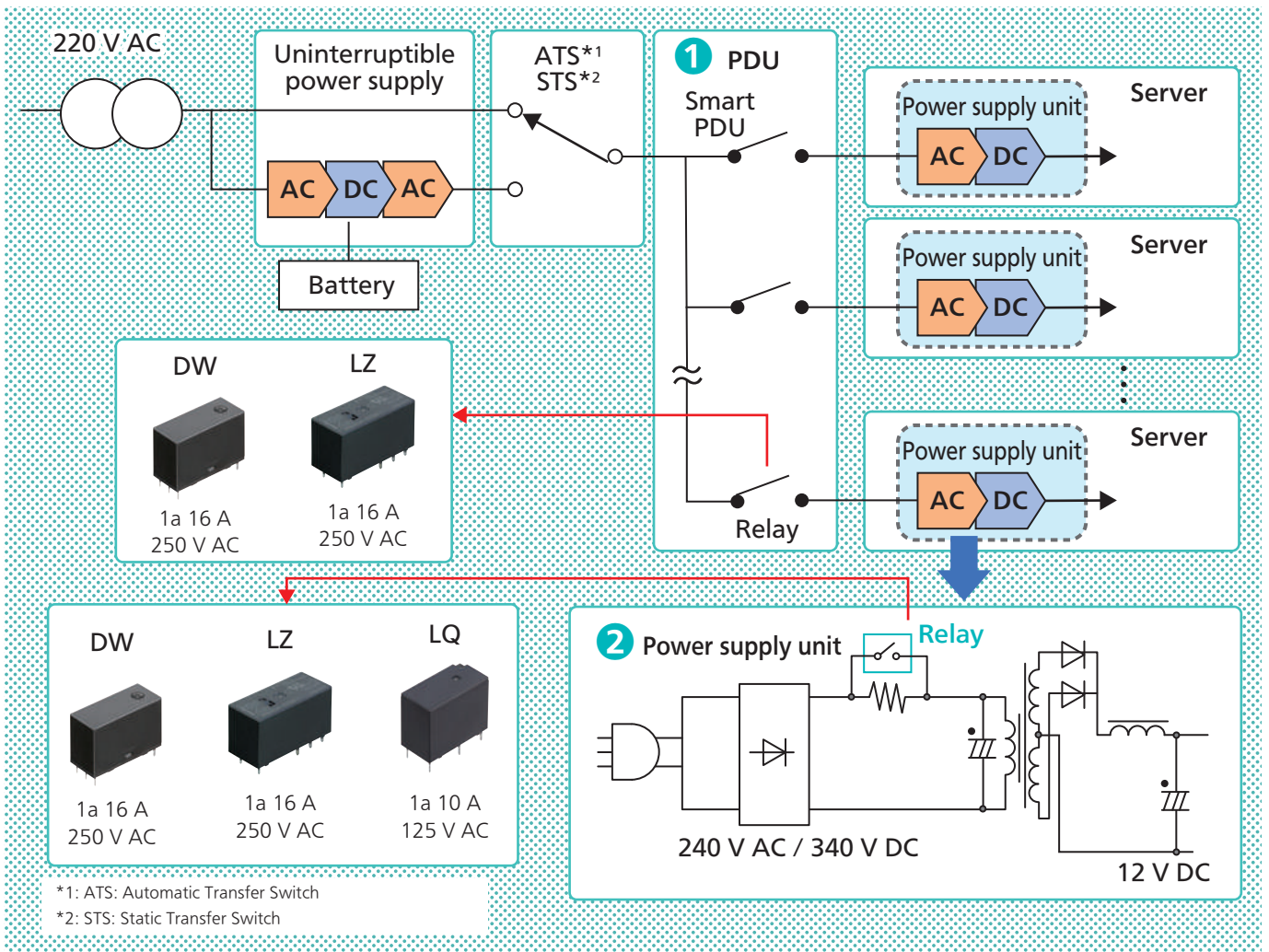
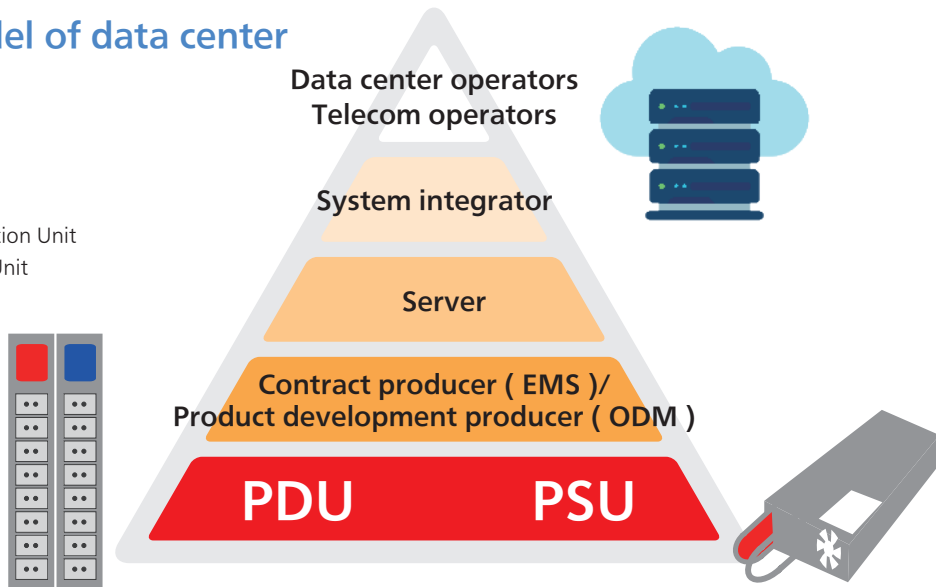
- If the relay's main contact, Form A (a) contact, is welded, the mechanically connected Form B (b) contact on the auxiliary contact side retains contact gap of 0.5 mm or more without returning to the closed position. This mechanism enables monitoring of the state of the Form A (a) contact, which is the main contact, at the Form B (b) contact.
(Supported relays: HE-S, HE-R, HE-A)

Data Center

Recommended products

Business model of data center

PDU: Power Distribution Unit
PSU: Power Supply Unit

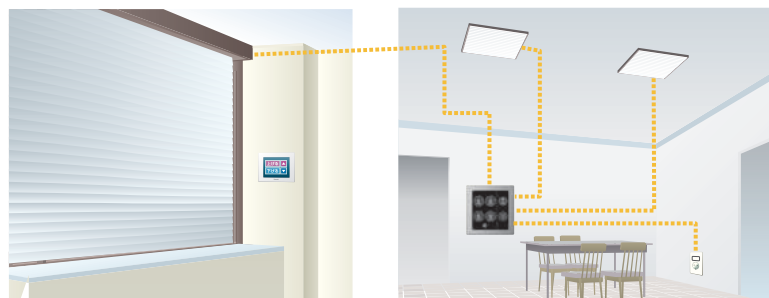
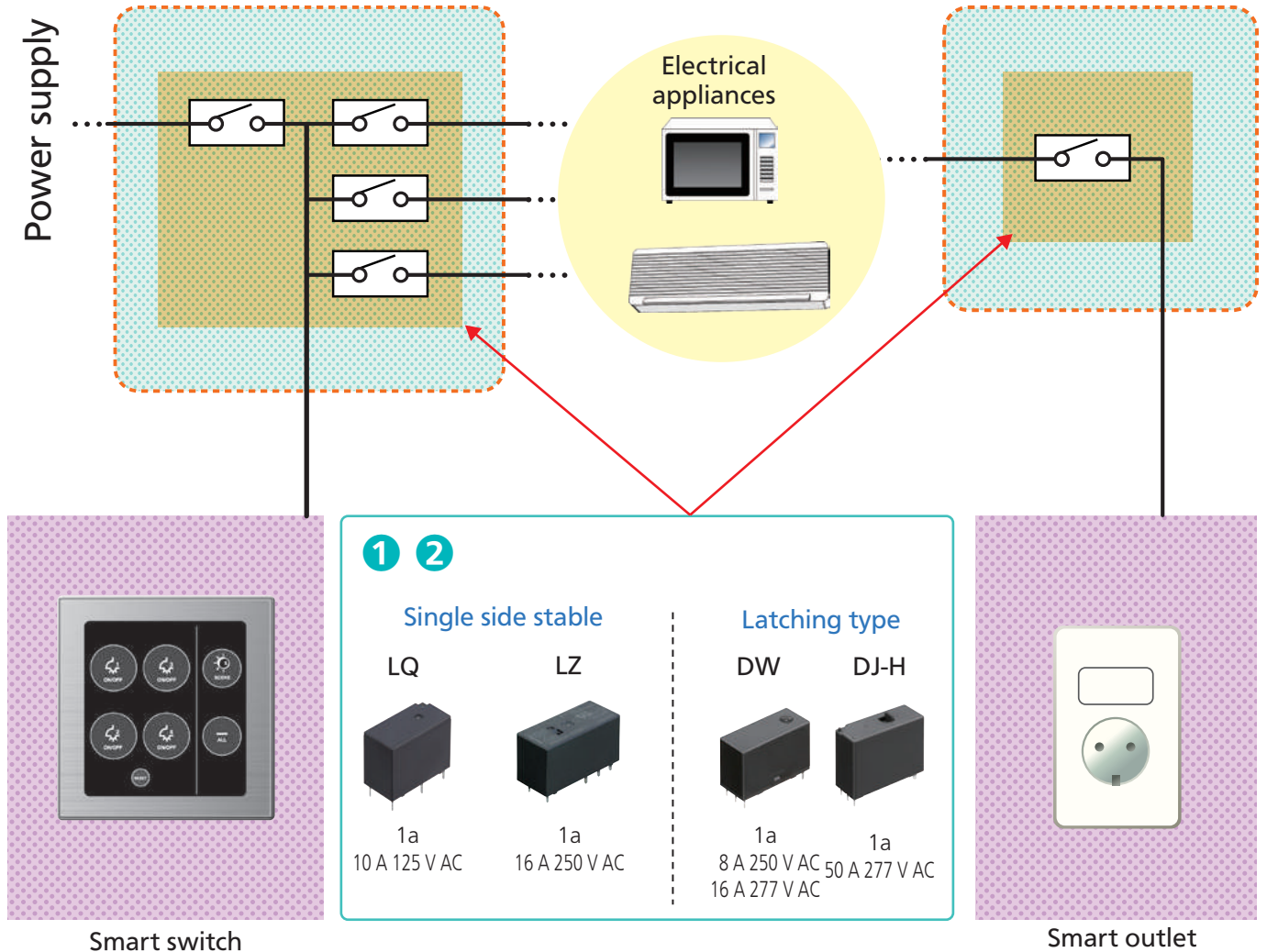


① For remote ON/OFF of server power supply (PDU)

② For inrush current prevention circuit (PSU)

Lighting/Outlet Control

Recommended products



1 For remote control

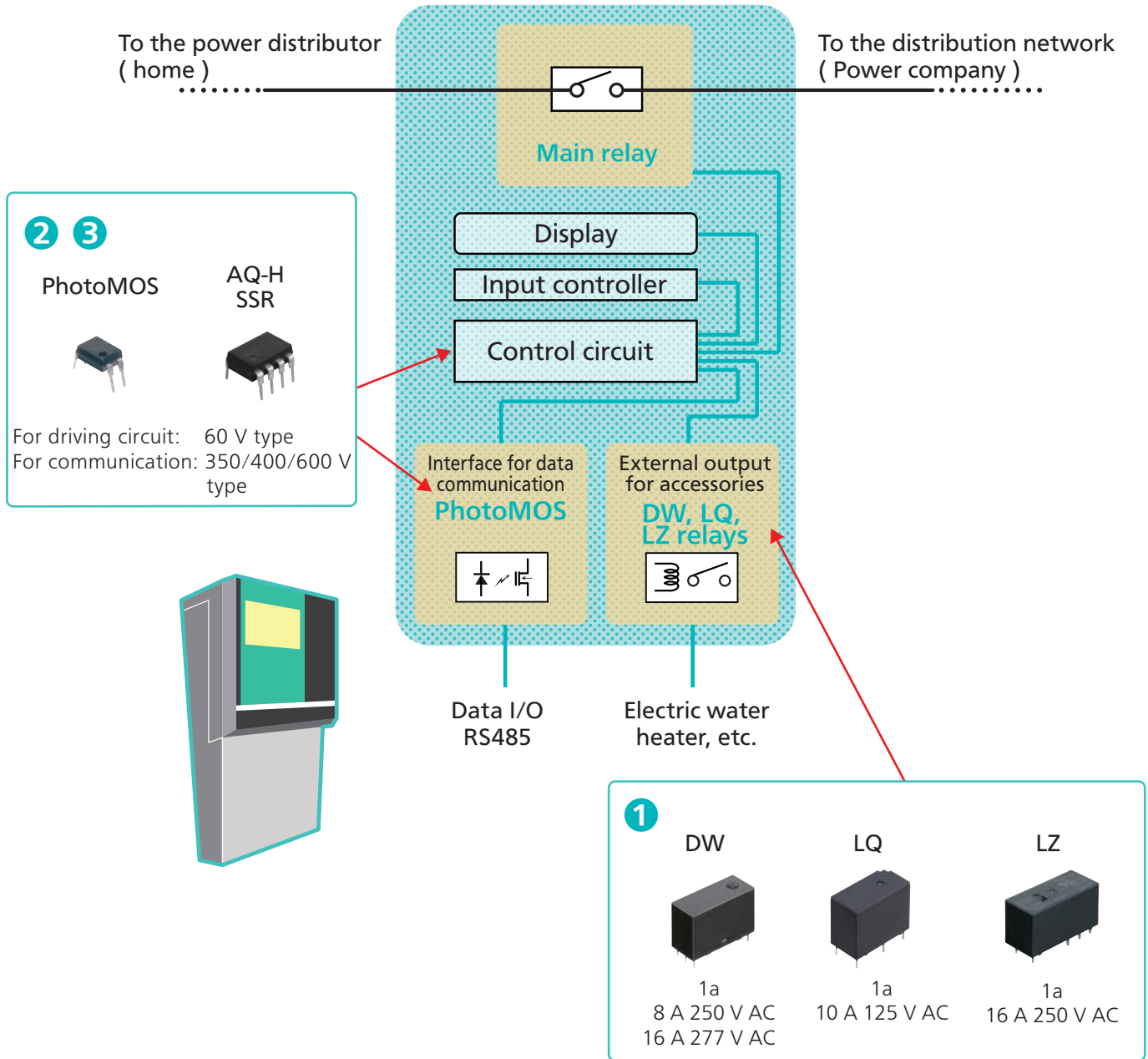
- Relays are used in remote control applications. Smart switches with built-in relays make remote control, collective control and visualization of electricity usage possible.

2 For automatic cutoff during earthquakes

- Power relays can be used in safety cutoff applications when earthquake tremors are detected.

Smart Meter

Recommended products



1 For external output of accessories

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

2 For driving main relays

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

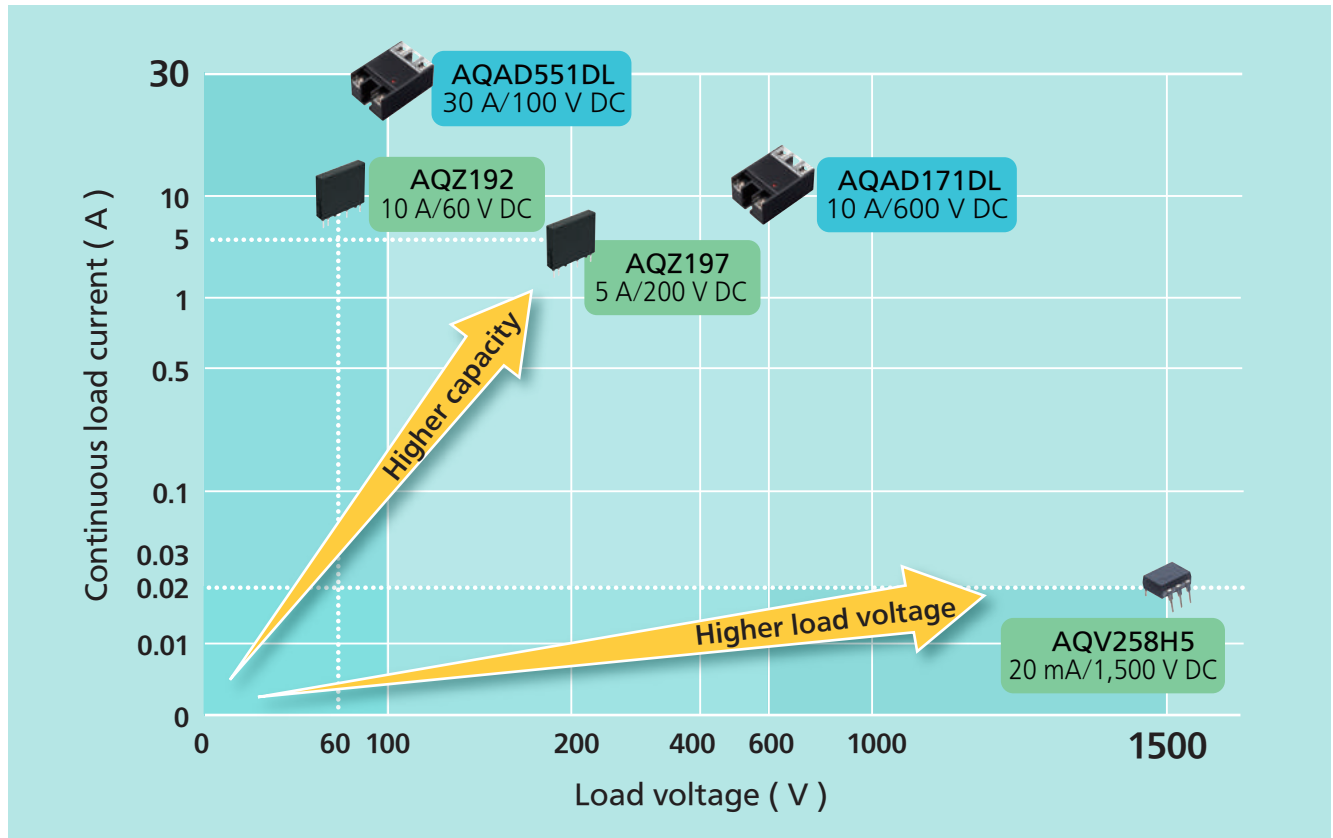
3 For data communications

- PhotoMOS are used as output contacts for external communications.

PhotoMOS/SSR Lineup

PhotoMOS / SSR

MOSFET, phototriac coupler, etc., are soldered onto the PCB and are mounted within the device as an internal component. This facilitates customer needs for high load voltage, high capacity and long life.



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. AQV258H5 (1,500 V 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 (10 A/60 V DC) , AQZ197 (5 A/200 V DC)
AQAD551DL (30 A/100 V DC) /AQAD171DL (10 A/600 V DC)

Long life

Problems such as switching life are solved by using semiconductors in contacts.

Reduction of device running cost is possible because they are maintenance free.

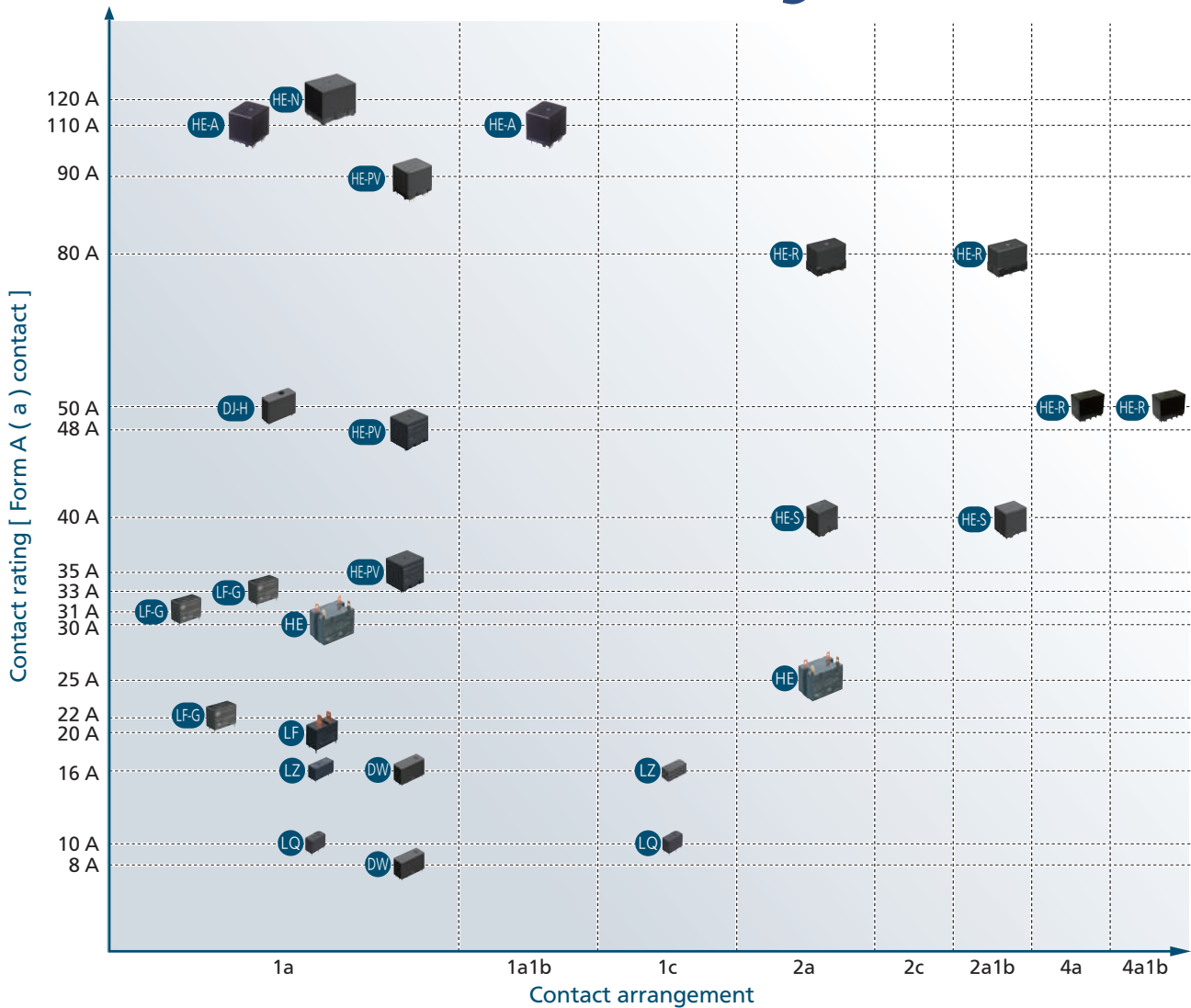


①Standard specification products are shown in this catalog. For additional specifications, please contact our sales representative.

②If you are considering applications that involve energy management, please contact our sales representative at the planning stage.

Power Relay Lineup

AC Power Relays



Compact size and high capacity

Various lineup of compact and high-capacity AC/DC relays ideal for the energy management market.

Low operating power

Lineup of relays that are ideal for reducing energy consumption, which has been in increasing demand in recent years.

Safety standards

Lineup of relays that comply with safety standards for the photovoltaic power generation, industrial, and EV charging station markets

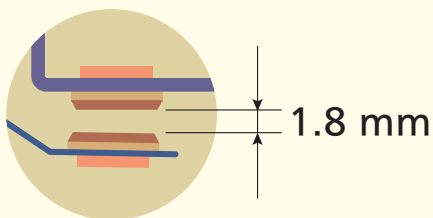
LF-G/HE-S/HE-PV/HE-R/HE-A/HE-N

LF-G/HE-S/HE-PV/HE-R/HE-A/HE-N Relays

■ Secure the contact GAP required by the market!

In order to meet the required surge resistance, a contact GAP is required for the relay depending on your application.
(The required contact GAP varies depending on the altitude of use and the required surge breakdown voltage.)

European photovoltaic generation standard Requirements of IEC62109 and VDE02



* For 2.5 kV surge breakdown voltage (between contacts)

Altitude stipulation	Contact gap
Up to 2,000 m	1.5 mm
Up to 3,000 m	1.8 mm

LF-G



Min.
1.8 mm

HE-PV (35 A/48 A/90 A)



Min.
2.5 mm

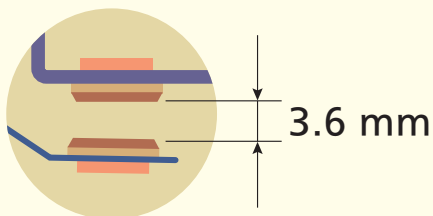
*90 A type: Min. 3.0 mm
90 A Wide gap: Min. 3.6 mm

HE-S



Min.
3.2 mm

European electric vehicle charging equipment standard Requirements of IEC61851-1



* For Mode 3 charging station [4 kV surge breakdown voltage (between contacts)]

Altitude stipulation	Contact gap
Up to 2,000 m	3.0 mm
Up to 3,000 m	3.6 mm

HE-PV (90 A Wide gap)



Min.
3.6 mm

HE-R



HE-A



HE-N



Note) For details, please contact our sales representative.

HE-S relays

HE-S Relays

2 Form A/2 Form A 1 Form B (2a/2a1b) type

The HE-S relay is a 2 Form A (2a) and 2 Form A 1 Form B (2a1b) relay that is miniature and features high capacity, built-in auxiliary contacts. In particular, the 2 Form A 1 Form B (2a1b) contact type supports mirror contact mechanisms and can be used to create safety circuits.

2 Form A 1 Form B (2a1b) contact type supports the mirror contact mechanisms. Detect welding of main contact and create safety circuit. Contact gap of 3.2 mm or higher.

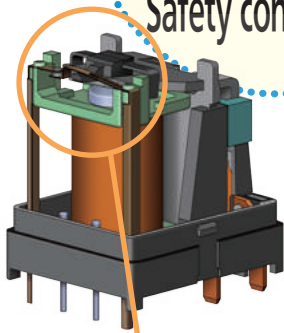
Safety construction

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

Space saving

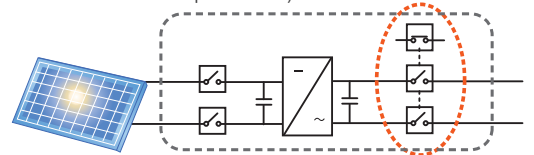
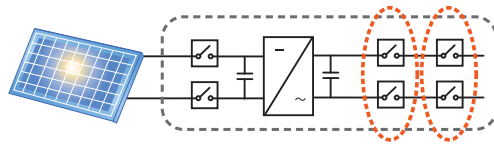
Reduction of power consumption is achieved by reducing the coil holding voltage after applying rated coil voltage for at least 100 ms during relay operation.

Energy-saving



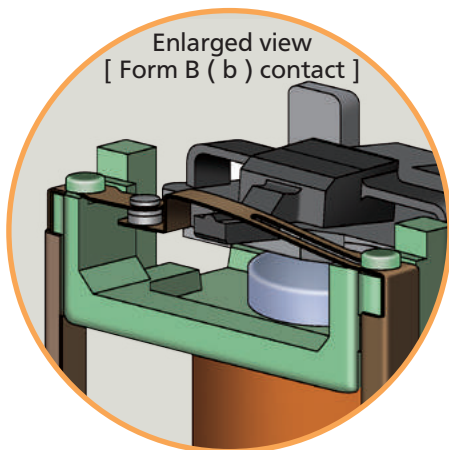
■ When using 1 Form A/2 Form A (1a/2a) relay
For failsafe applications, use **four** 1 Form A (1a) type or **two** 2 Form A (2a) type.

■ When using HE-S [2 Form A 1 Form B (2a1b)]
Use **one** 2 Form A 1 Form B (2a1b) type (Creation of contact welding monitoring circuit is possible.)



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

Enlarged view [Form B (b) contact]

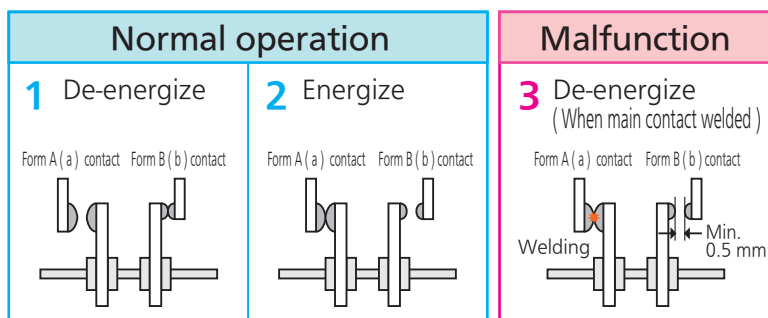


Explanation of mirror contact mechanism [2 Form A 1 Form B (2a1b) type]

Compliant with EN60947-4-1 mirror contact

- Designed so that Form A (a) contact and Form B (b) contact will not close at the same time.
- When Form A (a) contact welded, Form B (b) contact gap of at least 0.5 mm is maintained.

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



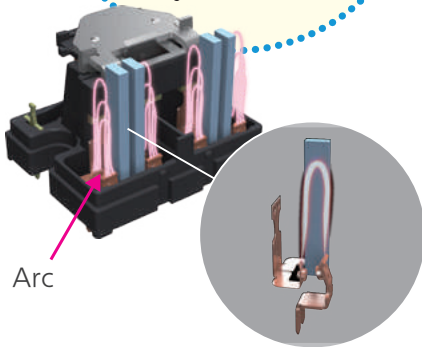
HE-V relays

HE-V Relays 2 Form A (2a) type

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 (2a) contact, it is capable of both plus and minus line cutoff on the DC side.

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

Safety construction



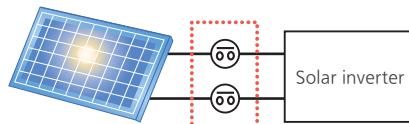
Arc

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

Space saving

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

Energy-saving

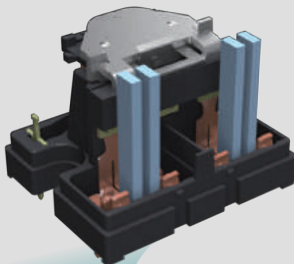


*Serial connection example

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

Operation explanation (interception mechanism)

1 Power to relay is ON.



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



Inside arc extinction space

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



3 The arc extends by applying transverse field.



HE-R relays [4 Form A/4 Form A 1 Form B (4a/4a1b) type]

HE-R Relays

4 Form A/4 Form A 1 Form B (4a/4a1b) type

The HE-R relay is a 4 Form A (4a) and 4 Form A 1 Form B (4a1b) relay that is miniature and features high capacity, built-in auxiliary contacts. The Form B (b) contact supports mirror contact mechanisms and can be used to create safety circuits.

The HE-R relay supports the mirror contact mechanisms. Detect welding of main contact and create safety circuit. Form A (a) contact gap of 3.6 mm or higher.

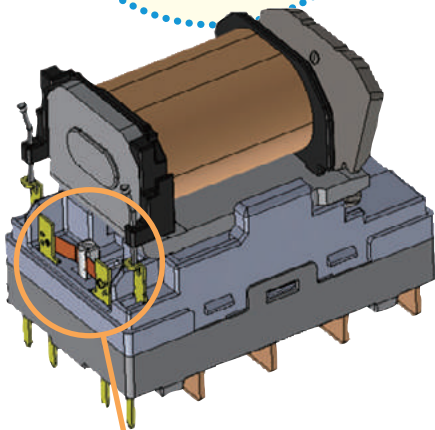
Safety construction

Miniature size attained compared to using two 2 Form A/2 Form A 1 Form B (2a/2a1b) contact relays. Enhanced freedom of design

Space saving

Reduction of power consumption is achieved by reducing the coil holding voltage after applying rated coil voltage for at least 200 ms during relay operation.

Energy-saving

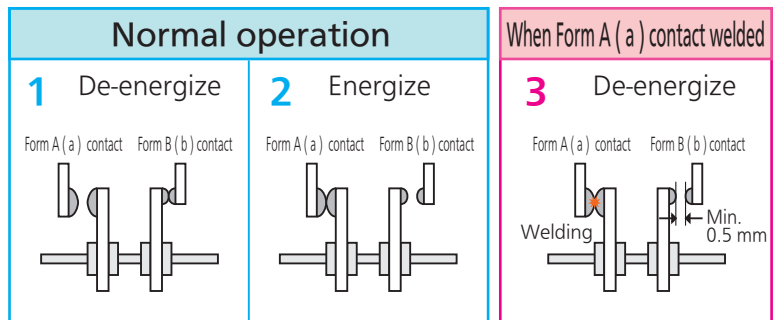
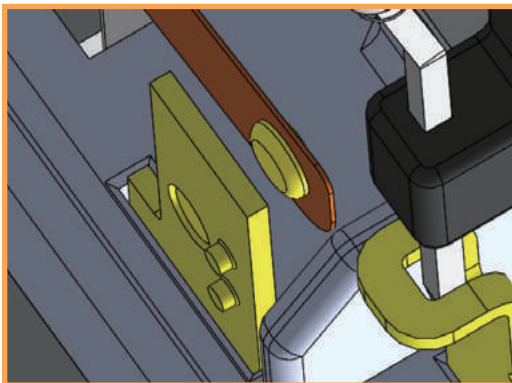


Rated operating power	Ratio in which coil holding voltage can be decreased	Power consumption when coil holding voltage decreases
4,000 mW	35 %V of rated coil voltage	approx. 490 mW

Explanation of mirror contact mechanism

Contributes to cost reduction and easy safety design!

- Designed so that Form A (a) contact and Form B (b) contact will not close at the same time.
 - Structure that maintains a contact gap of 0.5 mm or more.
- *Form B (b) contact, when used to monitor the condition of Form A (a) contact, can be used exclusively as an auxiliary contact function.



HE-R relays [2 Form A/2 Form A 1 Form B (2a/2a1b) type]

HE-R Relays

2 Form A/2 Form A 1 Form B (2a/2a1b) type

The HE-R relay is a 2 Form A (2a) and 2 Form A 1 Form B (2a1b) relay that is miniature and features high capacity, built-in auxiliary contacts. The Form B (b) contact supports mirror contact mechanisms and can be used to create safety circuits.

The HE-R relay supports the mirror contact mechanisms. Detect welding of main contact and create safety circuit. Form A (a) contact gap of 3.6 mm or higher.

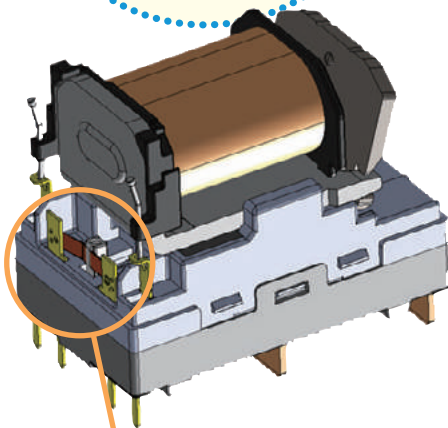
Safety construction

Short-circuit resistance, compatible with UL508 short-circuit current of 5,000 A rms.

Improve short circuit resistance

Reduction of power consumption is achieved by reducing the coil holding voltage after applying rated coil voltage for at least 200 ms during relay operation.

Energy-saving

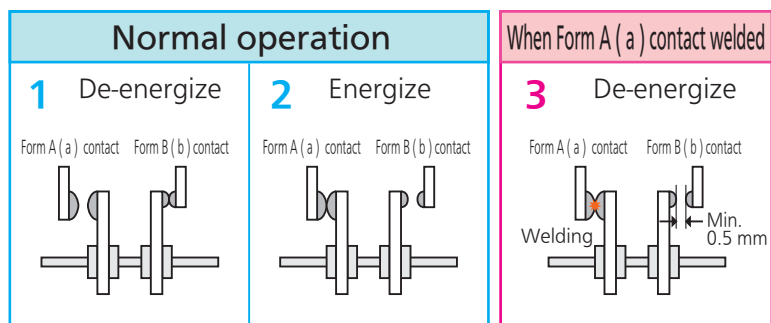
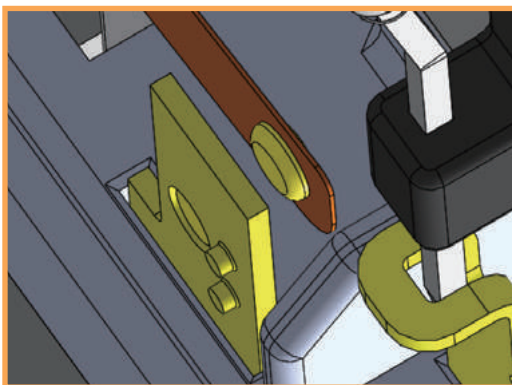


Rated operating power	Ratio in which coil holding voltage can be decreased	Power consumption when coil holding voltage decreases
4,000 mW	35 %V of rated coil voltage	approx. 490 mW

Explanation of mirror contact mechanism

Contributes to cost reduction and easy safety design!

- Designed so that Form A (a) contact and Form B (b) contact will not close at the same time.
 - Structure that maintains a contact gap of 0.5 mm or more.
- *Form B (b) contact, when used to monitor the condition of Form A (a) contact, can be used exclusively as an auxiliary contact function.



HE-A relays

HE-A Relays 1 Form A/1 Form A 1 Form B (1a/1a1b) type

The HE-A relay is a 1 Form A (1a) and 1 Form A 1 Form B (1a1b) relay that is miniature, features high capacity, built-in auxiliary contacts and short-circuit resistance. The Form B (b) contact supports mirror contact mechanisms and can be used to create safety circuits.

1 Form A 1 Form B (1a1b) contact type supports the mirror contact mechanisms. Detect welding of main contact and create safety circuit. Contact gap of 3.6 mm or higher.

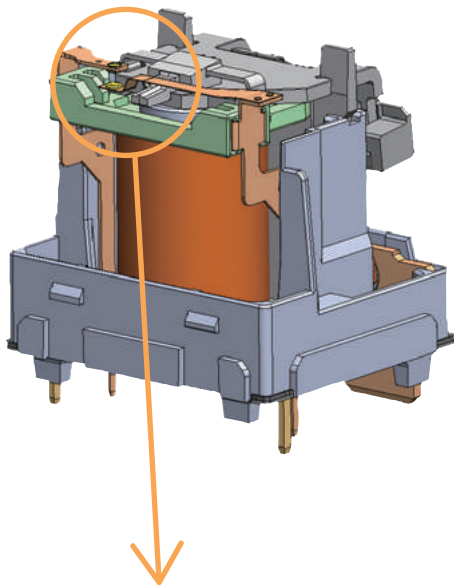
Safety construction

Short-circuit resistance, compatible with UL508 short-circuit current of 5,000 A rms.

Improve short circuit resistance

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

Energy-saving

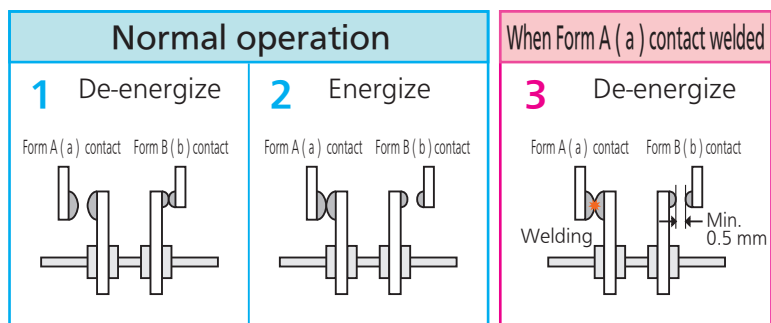
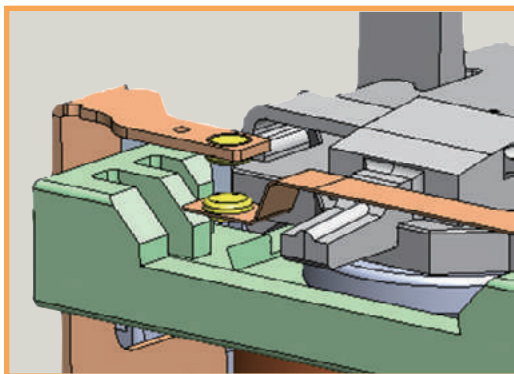


Rated operating power	Ratio in which coil holding voltage can be decreased	Power consumption when coil holding voltage decreases
1,920 mW	40 %V of rated coil voltage	approx. 310 mW

Explanation of mirror contact mechanism

Contributes to cost reduction and easy safety design!

- Designed so that Form A (a) contact and Form B (b) contact will not close at the same time.
 - Structure that maintains a contact gap of 0.5 mm or more.
- *Form B (b) contact, when used to monitor the condition of Form A (a) contact, can be used exclusively as an auxiliary contact function.



LF-G relays/HE-S relays/HE relays PV type/HE-R relays/HE-A relays/HE-V relays features

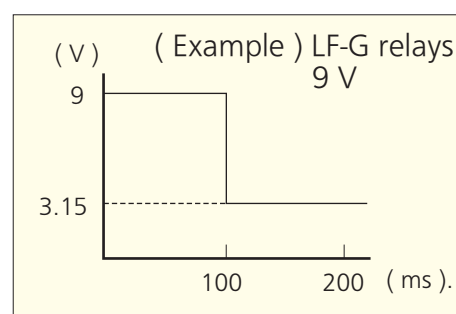
■ Contribute to energy saving with reduced coil holding voltage

In existing products, rated coil voltage had to be applied to the coil side. However LF-G relays, HE-S relays, HE relays PV type, HE-R relays, HE-A relays and HE-V relays will be operated with reduced coil voltage (coil holding voltage) *1, so that lower power consumption could be achieved.

Condition: Max. contact carrying current (LF-G, HE-S, HE relays PV type, HE-R, HE-A and HE-V)

Product name	Rated 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 relays	1,400 mW	35 %V of rated coil voltage	approx. 170 mW	45 %V of rated coil voltage	approx. 280 mW
HE-S relays	1,880 mW	30 %V of rated coil voltage	approx. 170 mW	30 %V of rated coil voltage	approx. 170 mW
HE relays PV type	1,920 mW	40 %V of rated coil voltage	approx. 310 mW	50 %V of rated coil voltage	approx. 480 mW
HE-R relays [4 Form A/4 Form A T Form B (4a/4a1b)]	4,000 mW	35 %V of rated coil voltage	approx. 490 mW	35 %V of rated coil voltage	approx. 490 mW
HE-R relays [2 Form A/2 Form A T Form B (2a/2a1b)]	4,000 mW	35 %V of rated coil voltage	approx. 490 mW	35 %V of rated coil voltage	approx. 490 mW
HE-A relays	1,920 mW	40 %V of rated coil voltage	approx. 310 mW	40 %V of rated coil voltage	approx. 310 mW
HE-V relays	1,920 mW	33 %V of rated coil voltage	approx. 210 mW	33 %V of rated coil voltage	approx. 210 mW

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



How to reduce coil holding voltage

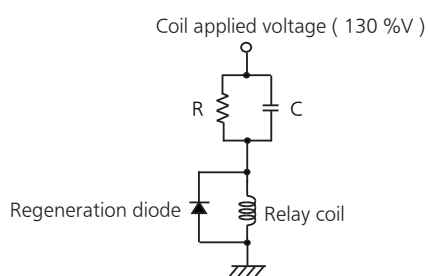
Please refer to the circuit examples below for reducing the coil holding voltage of AC load relays.

Please note, that the methods shown below are just examples and do not constitute any guarantee. Be sure to verify operation in your actual device.

Also, please contact our sales representative 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



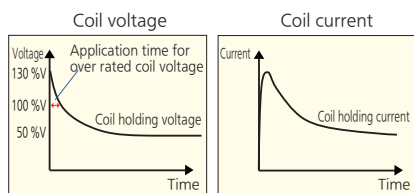
【Operation explanation】

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

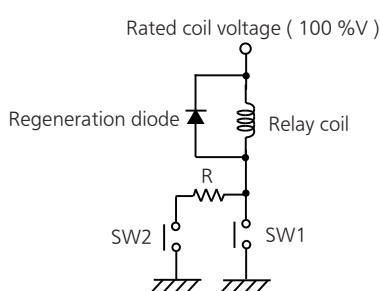
*For application time of voltages over the rated voltage, please set value of capacitor C to 50 ms or greater.

*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

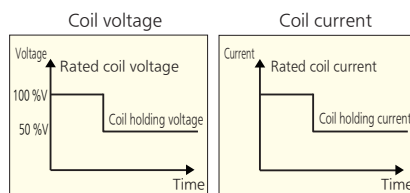


【Operation explanation】

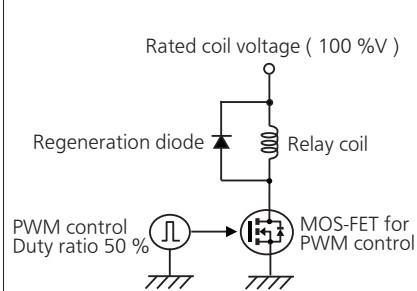
- ① Operate by turning SW1 ON and applying rated voltage (100 %V) to relay coil.
- ② After at least 0.1 s in ①, turn SW2 ON, turn SW1 OFF and control the power consumption when the relay is ON using the value of resistance R.

*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

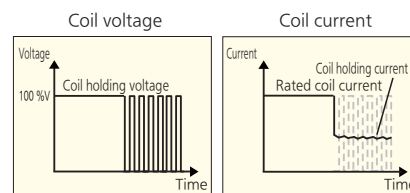


【Operation explanation】

- 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]



DJ-H relays

DJ-H Relays 1 Form A (1a) type

This is a 1 Form A (1a) 50 A high capacity latching relay that can handle lighting and motor loads. Manual operation verification is possible with the manual switch type.

Supports inrush resistance and all types of lighting loads
Equipped with manual switch for operation verification

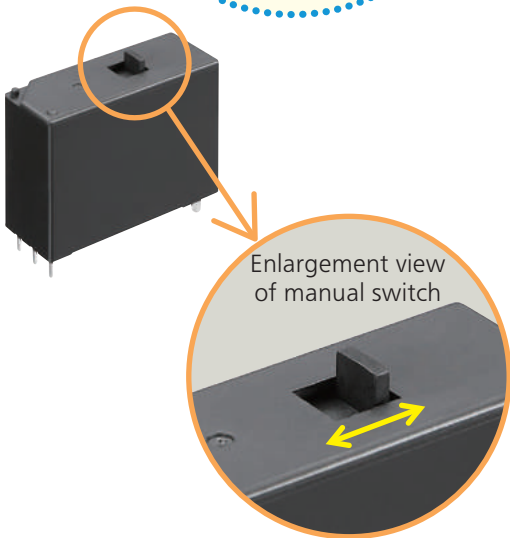
Safety construction

Low power consumption:
1 coil latching: 1.0 W
2 coil latching: 2.0 W

Energy saving

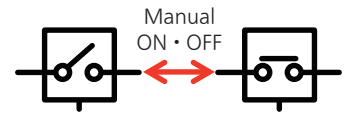
Compliant with safety standards for inrush resistance and all types of lighting loads. (UL and VDE)

Safety standard



Manual switch

Equipped with manual switch for operation verification
Manual relay ON/OFF is possible (when there is De-energize).



Application examples



Lighting control



Smart homes (shutters/blinds)

Supports inrush current loads

- Supports all types of inrush current loads such as tungsten loads (TV-20 equivalent), electronic ballast loads (NEMA410), and capacitor loads (IEC60669-1), etc.

Load	Tungsten load	Electronic ballast load	Capacitor load
Switching capacity	2,400 W 120 V AC	20 A 277 V AC	20 A 250 V AC 200 μ F
Expected electrical life	Min. 25×10^3 ope.	Min. 6×10^3 ope.	Min. 30×10^3 ope.
Inrush current waveform			

DW relays

DW Relays 1 Form A (1a) type

The DW relay is a 1 Form A (1a) polarized latching type that can open and close 8 A and 16 A despite its small size.

Inrush current 100 A 600 W
120 V AC more than 25,000
times (switching frequency ON:
OFF = 1 s : 59 s), Compatible
with tungsten loads

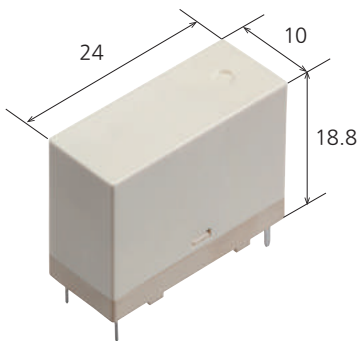
**Inrush current
resistance**

Mounting area of
240 mm² (24 × 10 mm)
contributes to mounting efficiency.
In addition, a low profile type
with a height of 15.8 mm is also
available in the lineup

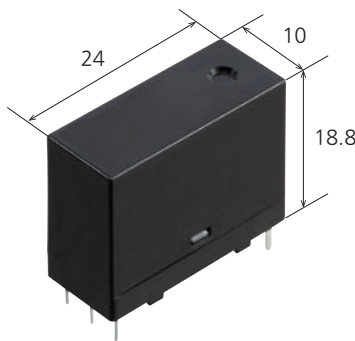
Space saving

The relay contact can be
kept ON or OFF (latched)
by pulse input, reducing
coil power consumption

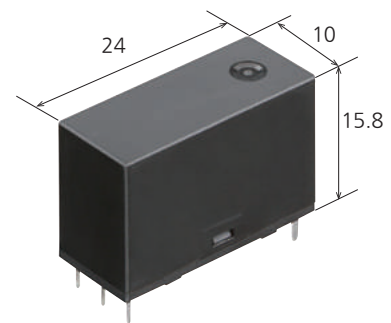
Low operating power



Reflow compatible type
(Standard type)



IEC60335-1 compliant type
(Standard & Inrush type)



Low profile type

With a wide variety of variations, we offer the perfect latching relay for a variety of applications!

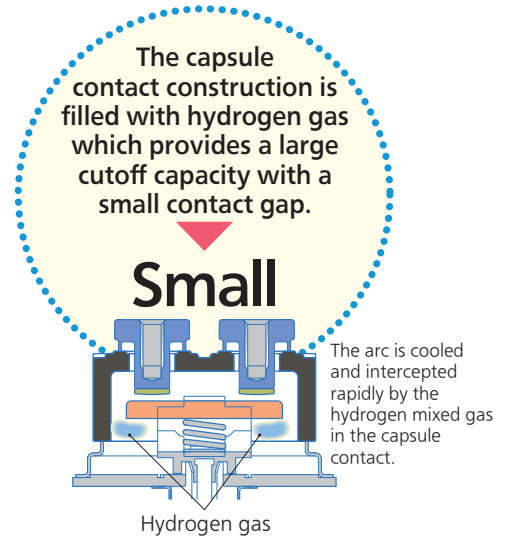
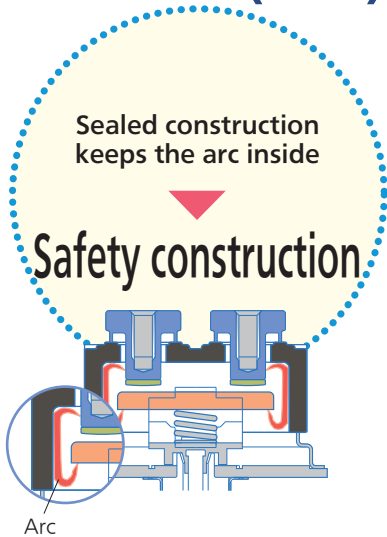
Type	Standard 8 A	Inrush 16 A	Inrush 16 A low profile type
Inrush current 100 A	—	○	○
IEC60335-1 compliant type	○	○	—
Reflow compatible type	○	—	—
Electronic ballast Corresponding to inrush current 320 A	—	—	(○)*

* Since it is a customized product, please contact your sales representative.

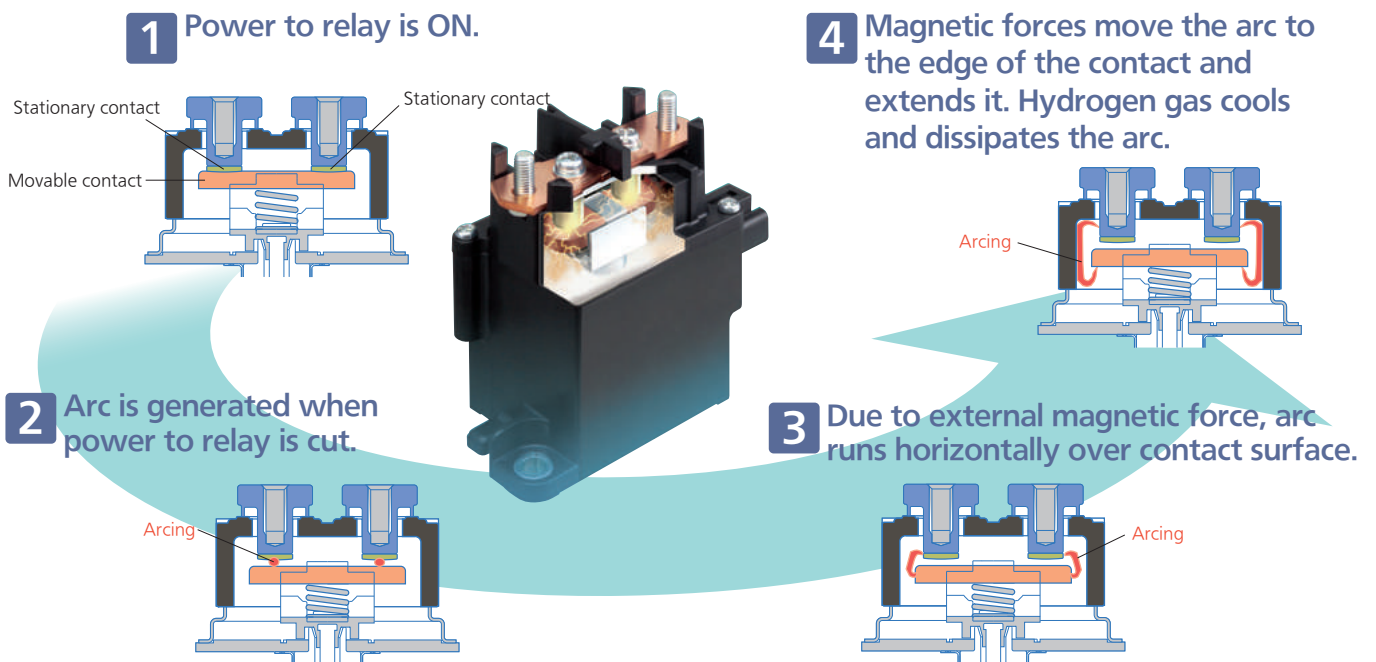
EP relays

EP Relays 1 Form A (1a) type

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 contact or of existing products generally used in the DC high voltage area.



Operation explanation (interception mechanism)

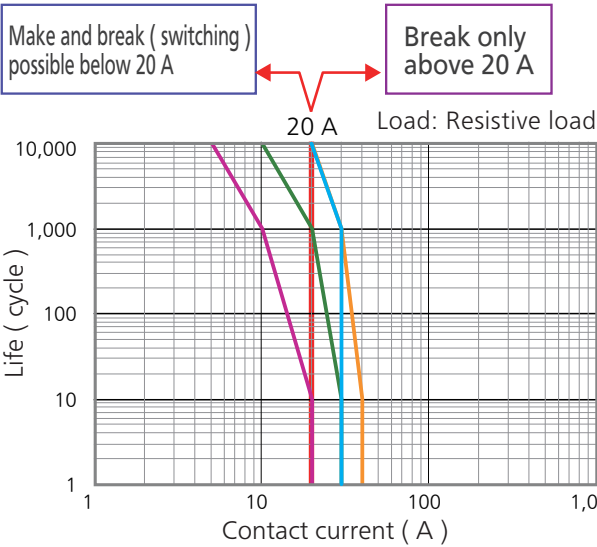


HE-V relays switching and switch-off life curve/bidirectional connection data

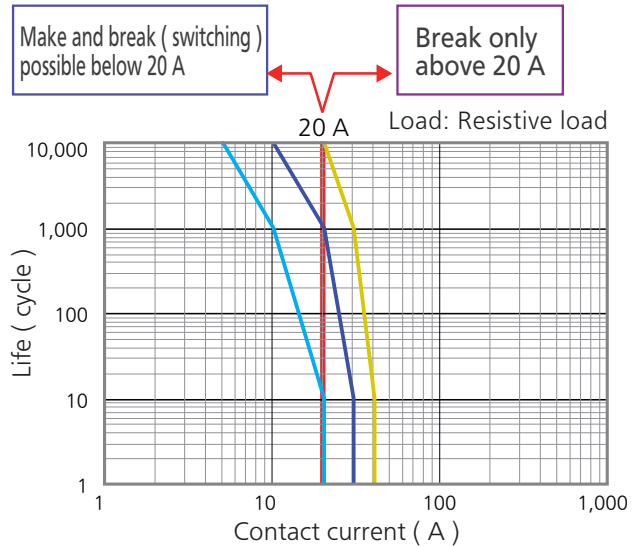
Note) The data is for reference only. Please test and confirm suitability of relay before use.



HE-V relays (When contacts connected in series)



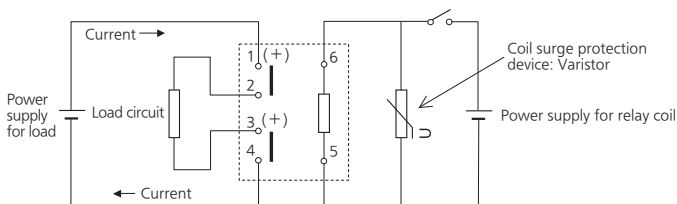
HE-V relays [When using independent 1 Form A (1a) contact]



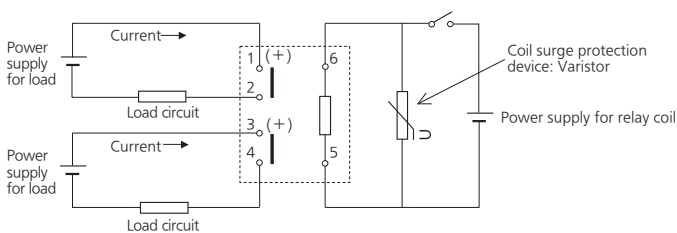
HE-V relays Recommended circuit

Positive polarity of load should be connected to pin 1 and pin 3, refer to the following circuit schematics.

1. When contacts connected in series (Bottom view)

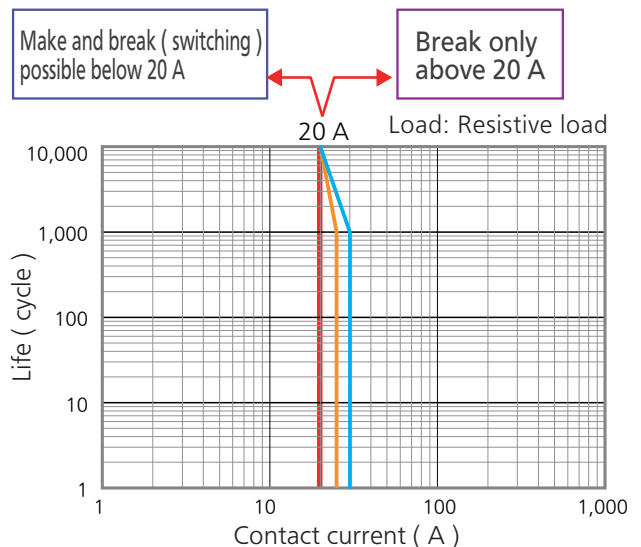


2. When using independent 1 Form A (1a) contact (Bottom view)



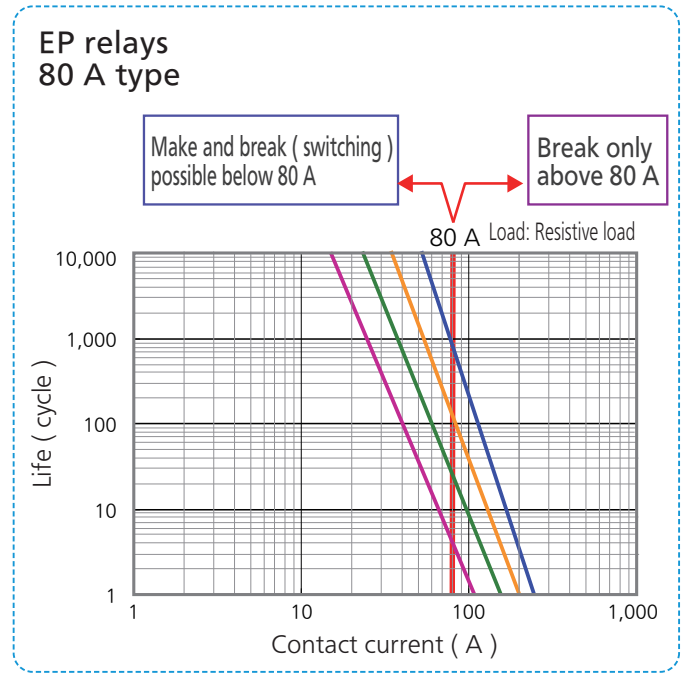
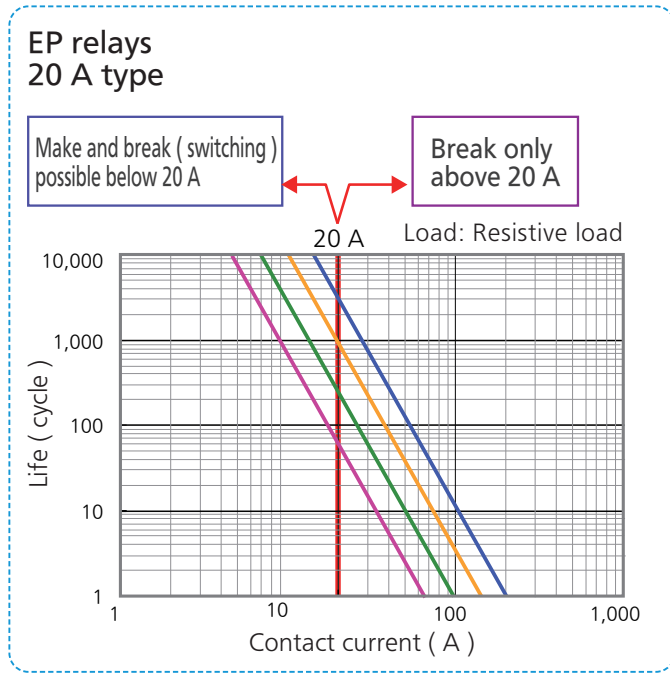
HE-V relays bidirectional connection data

Switch-off life curve (When using bidirectional contact connection)



EP relays switching and switch-off life curve

Note) The data is for reference only. Please test and confirm suitability of relay before use.

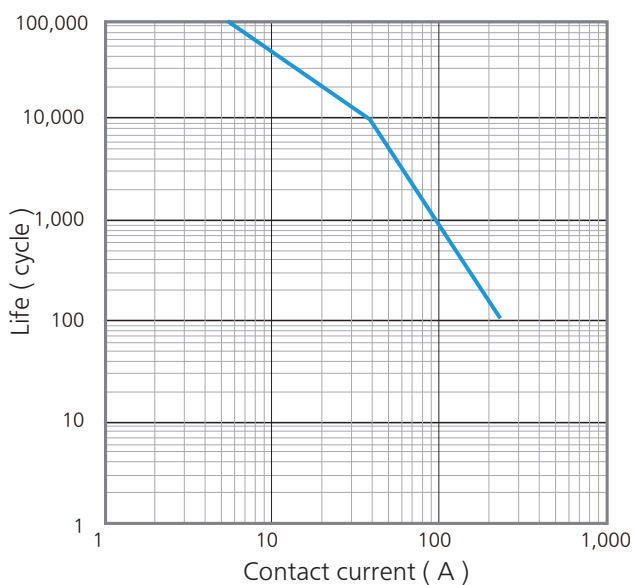


* The application examples in this document are for reference. Be sure to verify safety on the actual device before using.

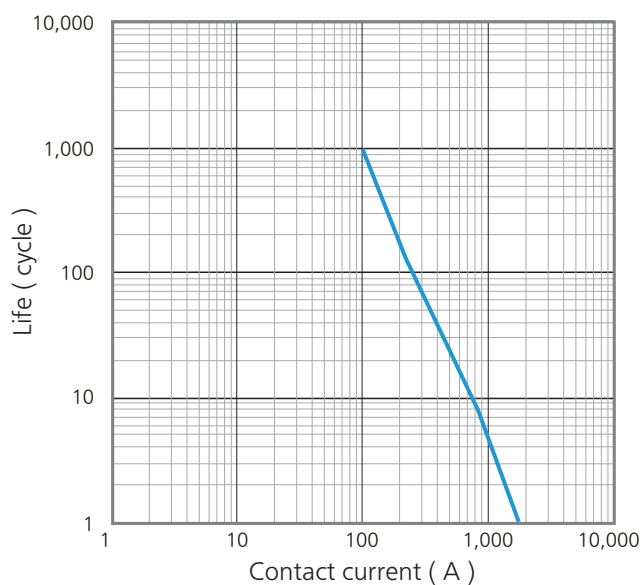
EV-A relays switching and switch-off life curve

500 VDC

Switching life curve Sample: AEVA1251



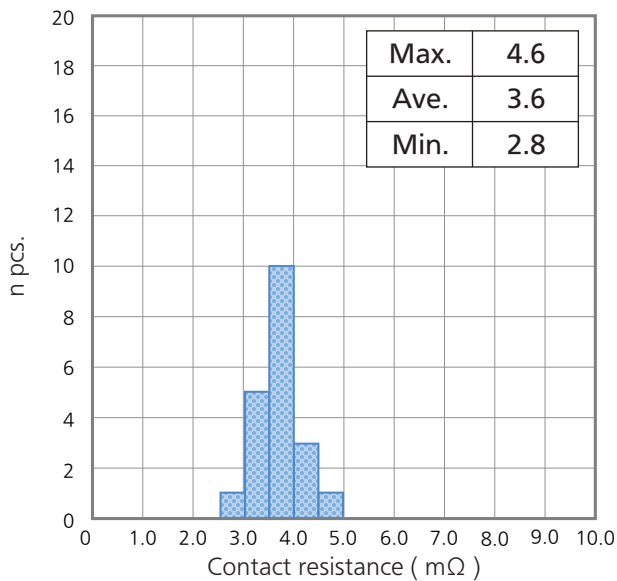
Switch-off life curve Sample: AEVA1251



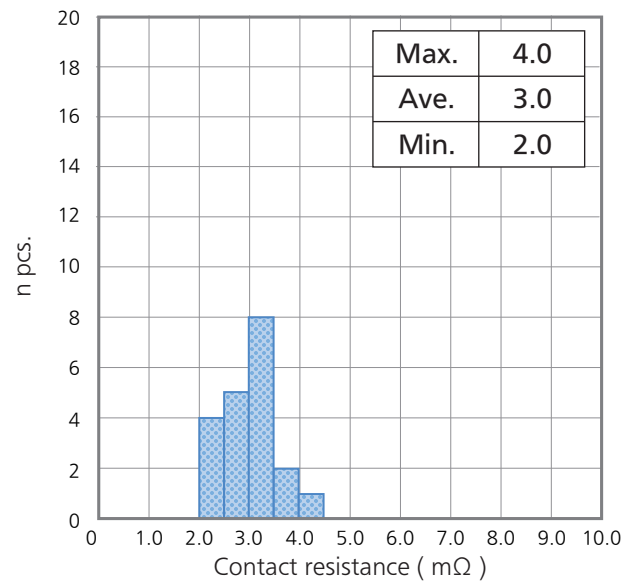
Contact resistance value data (LF-G, HE-PV)

LF-G relay: ALFG2PF121

Conditions: 6 V DC 20 A, n = 20 pcs.

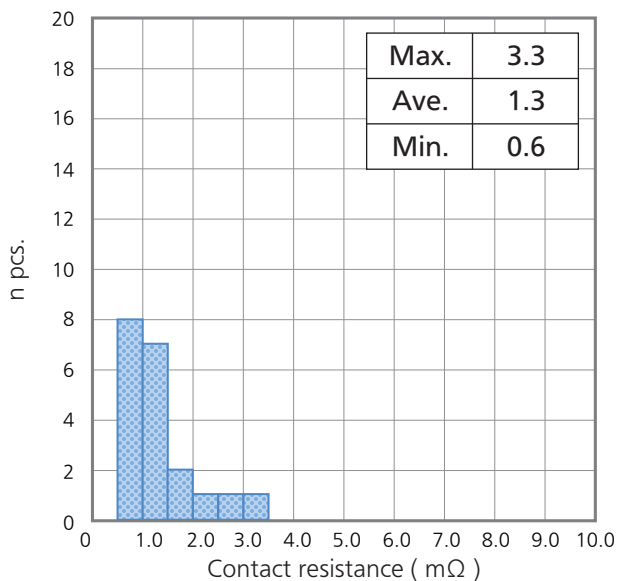


Conditions: 6 V DC 33 A, n = 20 pcs.

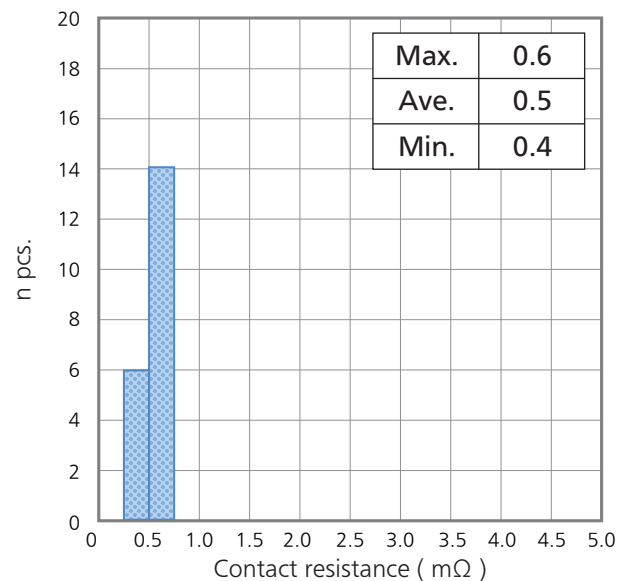


HE relay PV type 90 A: AHE52X1N

Conditions: 6 V DC 20 A, n = 20 pcs.



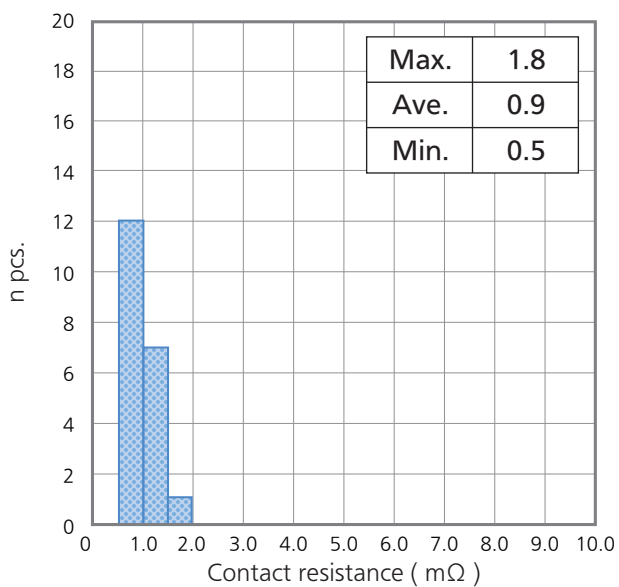
Conditions: 6 V DC 90 A, n = 20 pcs.



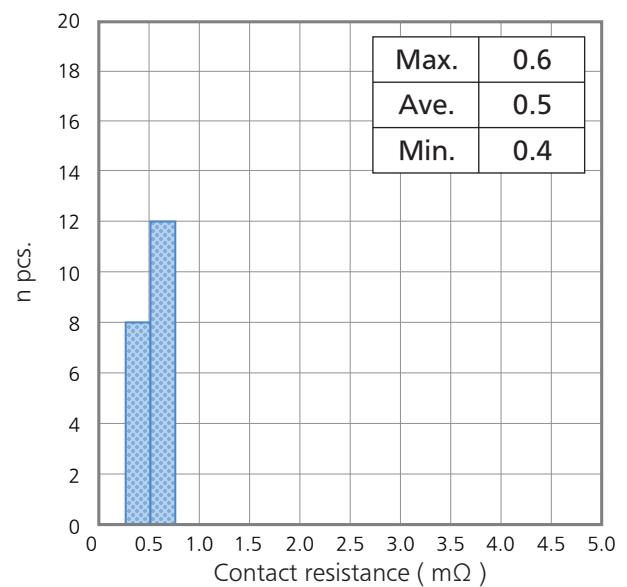
Contact resistance value data (HE-N)

HE-N relay: AHE62X1N

Conditions: 6 V DC 20 A, n = 20 pcs.



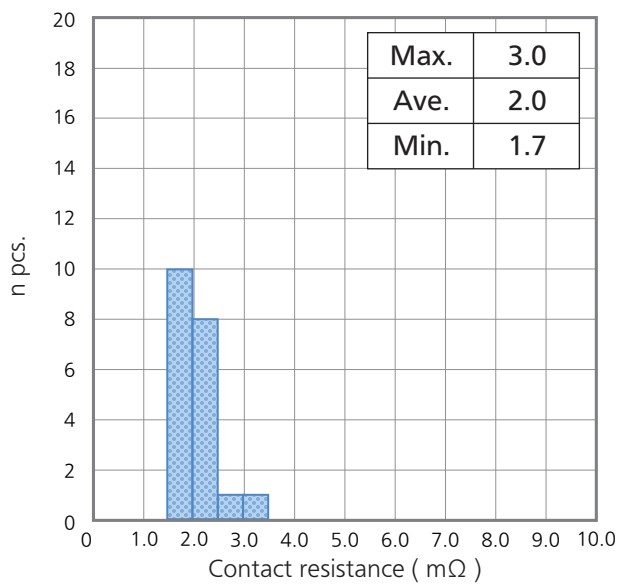
Conditions: 6 V DC 120 A, n = 20 pcs.



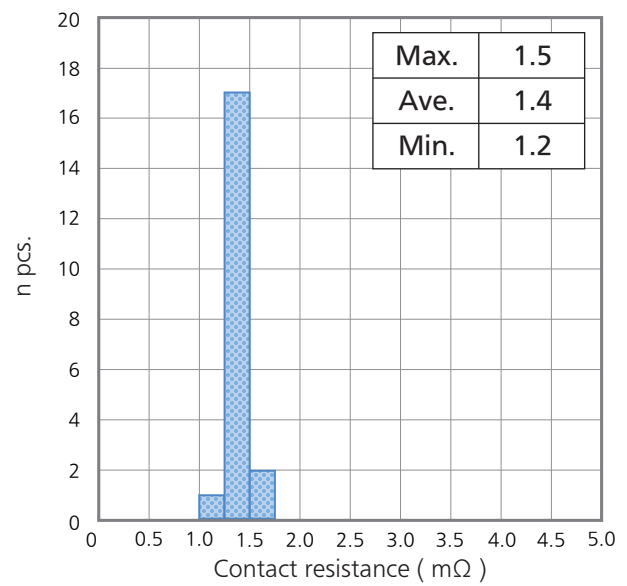
Contact resistance value data (HE-S)

HE-S relay: AHES4291

Conditions: 6 V DC 20 A, n = 20 pcs.



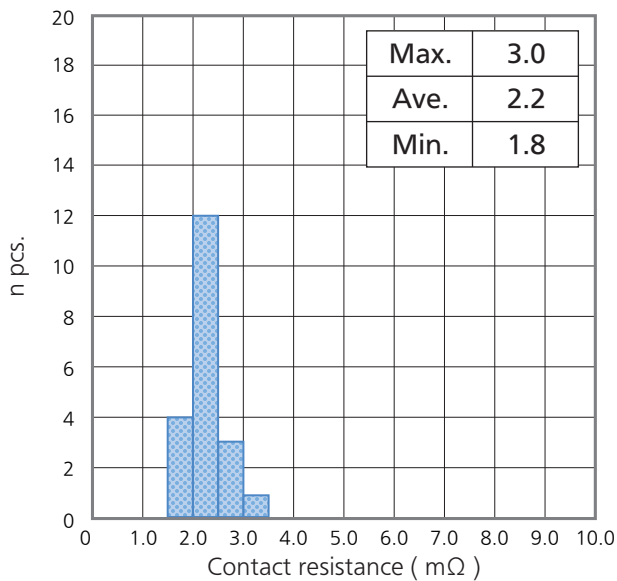
Conditions: 6 V DC 40 A, n = 20 pcs.



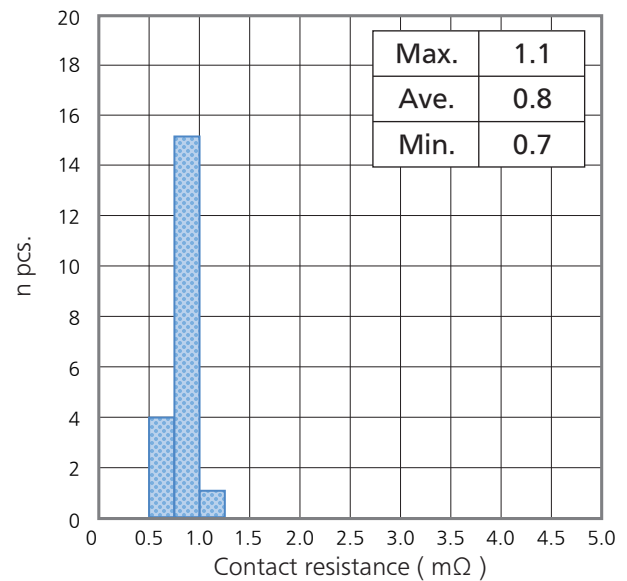
Contact resistance value data (HE-R)

HE-R relay 4 Form A 1 Form B (4a1b) : AHER4191

Conditions: 6 V DC 20 A, n = 20 pcs.

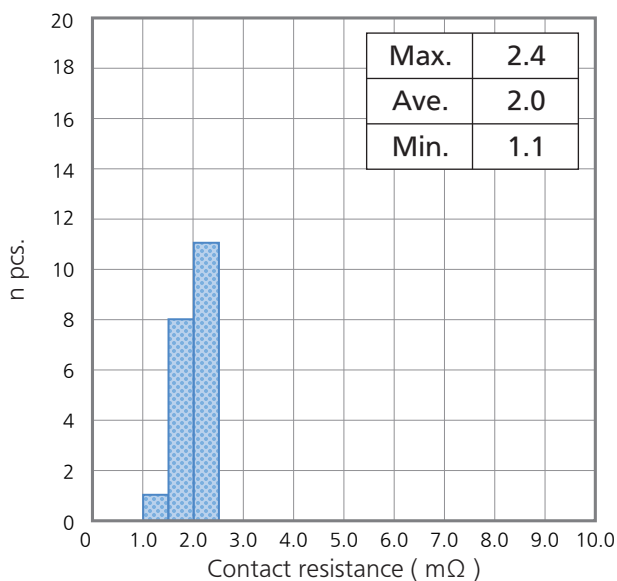


Conditions: 6 V DC 50 A, n = 20 pcs.

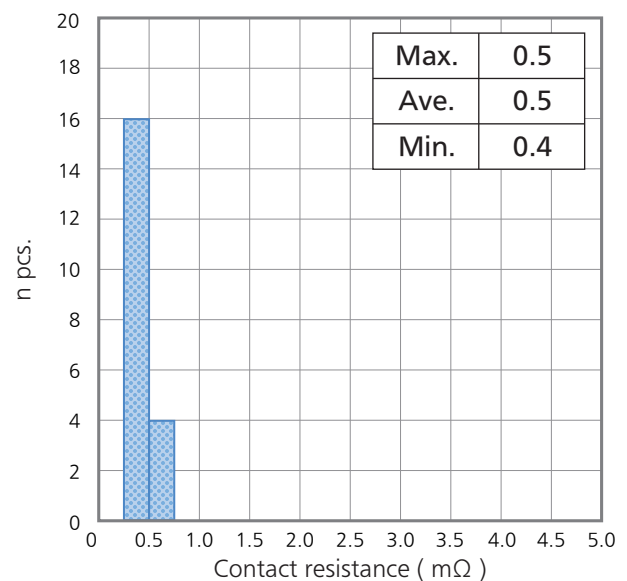


HE-R relay 2 Form A 1 Form B (2a1b) : AHER2281

Conditions: 6 V DC 20 A, n = 20 pcs.



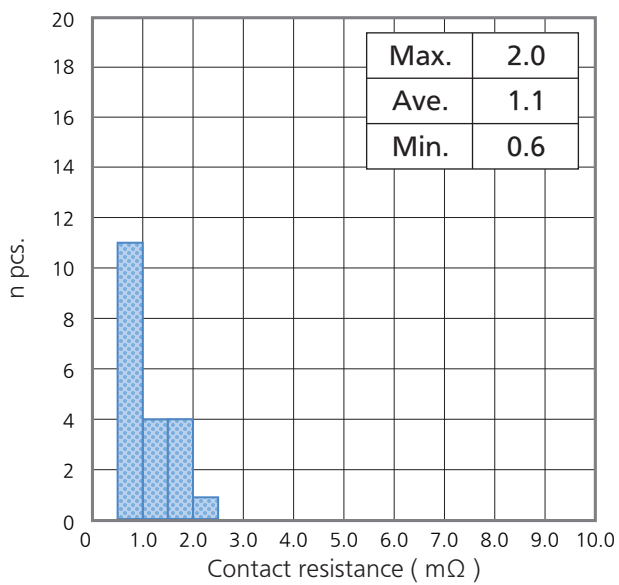
Conditions: 6 V DC 80 A, n = 20 pcs.



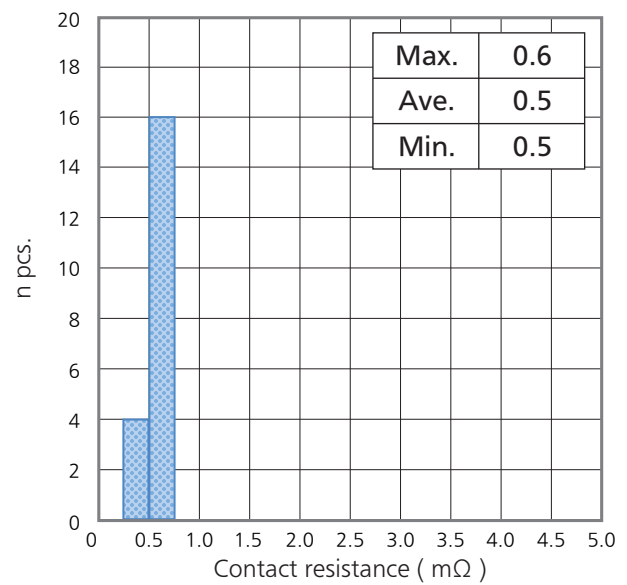
Contact resistance value data (HE-A)

HE-A relay: AHEA4191

Conditions: 6 V DC 20 A, n = 20 pcs.



Conditions: 6 V DC 110 A, n = 20 pcs.



DC load switching capacity on AC load relay

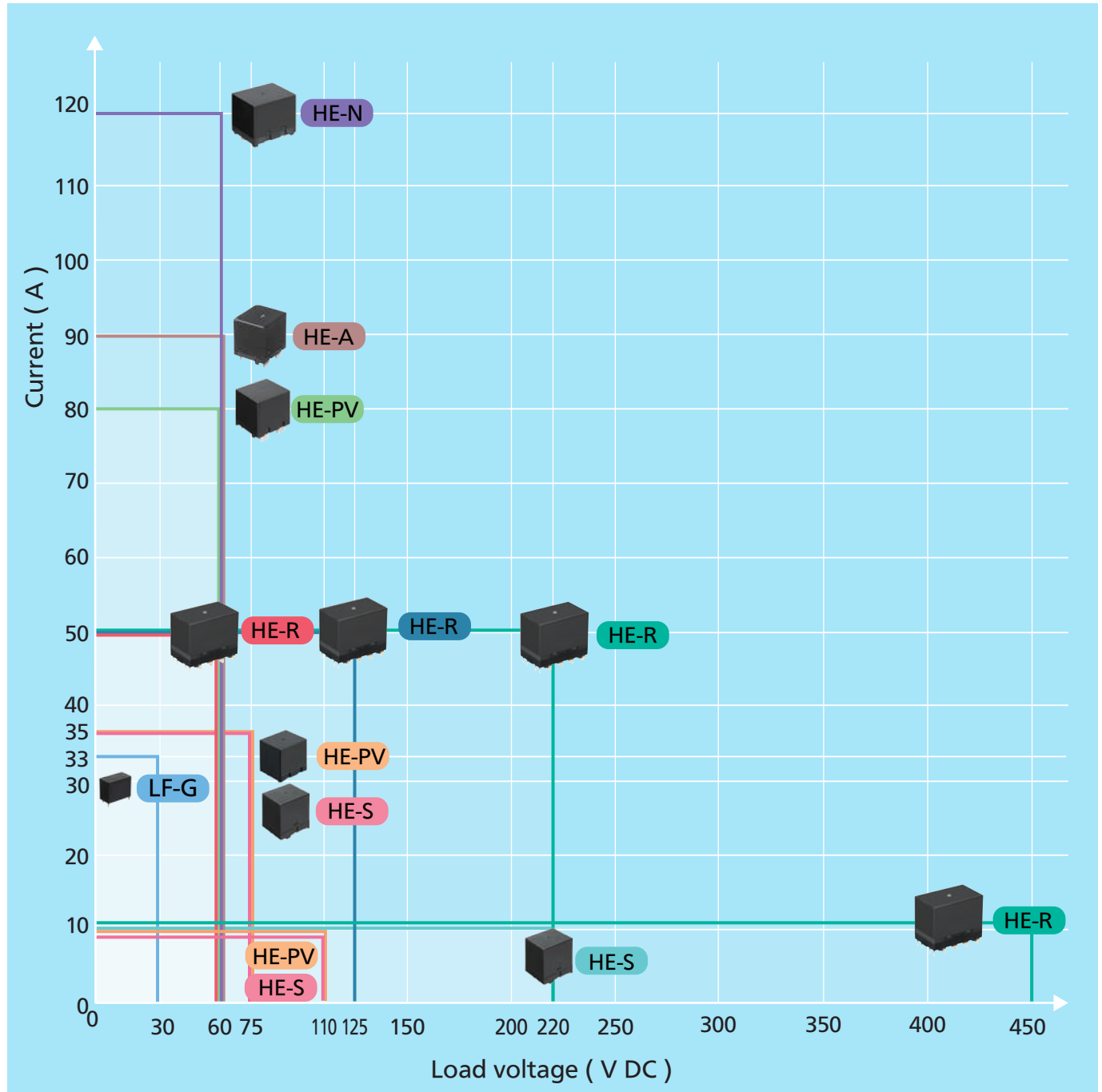
Even on some AC load relays, support for DC loads is possible.

* 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)

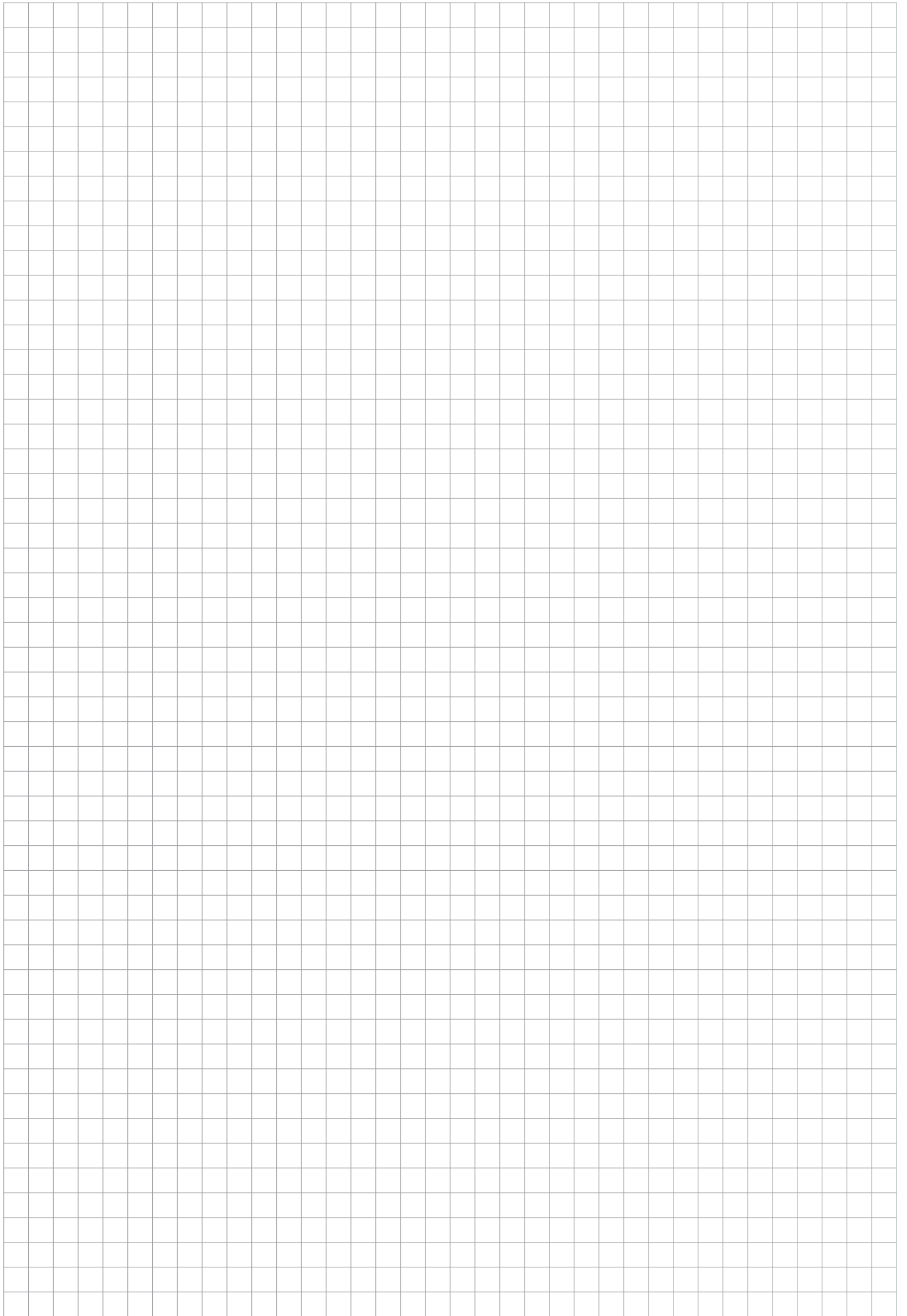
Appearance	Product name	Contact	Load voltage	Current	Expected electrical life (resistive load)	Remark
	LF-G (33 A)	1 Form A	30 V DC	33 A	10 × 10 ³ ope.	—
	HE-PV (48 A)	1 Form A	75 V DC	35 A		—
			110 V DC	10 A		—
	HE-PV (90 A)	1 Form A	60 V DC	80 A		—
	HE-N (120 A)	1 Form A	60 V DC	120 A		—
	HE-A (110 A)	1 Form A/ 1 Form A 1 Form B	60 V DC	90 A		—
	HE-S (35 A)	2 Form A/ 2 Form A 1 Form B	75 V DC	35 A		When using independent 1 Form A (1a) contact
			110 V DC	10 A		When using independent 1 Form A (1a) contact
			220 V DC	10 A		When contacts connected in series
	HE-R (40 A)	4 Form A/ 4 Form A 1 Form B	60 V DC	50 A		When using independent 1 Form A (1a) contact
			125 V DC	50 A	When 2 Form A (2a) contacts connected in series	
			220 V DC	50 A	When 4 Form A (4a) contacts connected in series	
			450 V DC	10 A	When 4 Form A (4a) 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)



- LF-G (33 A)
- HE-PV (48 A)
- HE-S [When using independent 1 Form A (1a) contact]
- HE-S [When 2 Form A (2a) contacts connected in series]
- HE-PV (90 A)
- HE-A (90 A)
- HE-N (120 A)
- HE-R* [When using independent 1 Form A (1a) contact]
- HE-R* [When 2 Form A (2a) contacts connected in series]
- HE-R* [When 4 Form A (4a) contacts connected in series]

* HE-R 4 Form A (4a) and 4 Form A 1 Form B (4a1b) only



Panasonic
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