



Electrical components for photovoltaic applications

**We make rays to
resources work.**



Powering Business Worldwide



We make what matters work.

At Eaton, we believe that power is a fundamental part of our world. That's why we're dedicated to helping our customers find sustainable solutions to manage power more efficiently, safely and reliably. To improve people's lives, the communities where we live and work, and the planet for future generations. Because this is what really matters. And we're here to make sure it works.

To learn more go to: Eaton.com/whatmatters



Follow us on social media to get the latest product and support information.



We make what matters work.

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Introduction

Empowering safe, reliable and intelligent solar energy systems

As the global transition to renewable energy accelerates, photovoltaic (PV) systems are becoming a core element of residential, commercial, and utility-scale power infrastructures. Beyond panels and inverters, safe and reliable PV installations rely on a well-engineered electrical infrastructure that ensures protection, control, and compliance throughout the system.

Eaton is a global leader in energy management, supporting the full lifecycle of photovoltaic and hybrid energy systems. Our comprehensive portfolio of electrical components enables installers, OEMs, and system operators to design, build, and operate PV systems that deliver long-term safety, performance, and regulatory compliance.

The role of electrical components in PV systems

To meet these challenges, PV installations rely on coordinated electrical components that provide:

- **Protection** of people, equipment, and cabling on both DC and AC sides
- **Control and isolation** for safe installation, operation, and maintenance
- **Monitoring and automation** for system transparency, diagnostics, and optimisation
- **Compliance** with international electrical, fire-safety, and grid-connection standards

Eaton's solutions cover all critical electrical functions, from DC string level through to AC distribution and grid interface, ensuring consistent protection concepts and reliable system behaviour across all PV applications.

One portfolio. Multiple solar applications.

Eaton supports photovoltaic systems across a wide range of power levels and installation types, including:

- Residential and light commercial rooftop systems
- Commercial and industrial PV installations
- Utility-scale solar plants
- Hybrid systems combining PV, energy storage, and electrified loads
- Inverters OEMs

Our modular, scalable product portfolio enables standardised designs for OEMs and system integrators, while offering flexibility to adapt to local requirements, site conditions, and future expansion.

Designed for the full system lifecycle

Eaton's solar solutions are developed to support every stage of a PV project:

Specification ⇒ Installation ⇒ Operation ⇒ Expansion

Engineering support and customization

Every solar project presents unique challenges. Our engineering and support teams offer design consultation, product customization, and field service to ensure system compatibility and performance. Their global presence means help is available throughout planning, installation, and maintenance phases.

Who we support

Supporting every stakeholder across the solar value chain

One coordinated portfolio , from design and installation to long-term operation

OEMs

Building scalable, compliant solar platforms

We help OEMs design and deploy standardised PV and inverter platforms with confidence. A coordinated portfolio of protection, control, and automation components reduces development risk, simplifies certification, and accelerates global market entry.

- ✓ Scalable architectures up to 1500 V DC
- ✓ Complete solar components portfolio
- ✓ Compliance with international standards and grid codes

Installers

Simplifying installation, commissioning and service

Our solutions are designed for the realities of on-site work. Clear system architectures and installer-friendly components reduce installation time, improve safety, and make commissioning and maintenance straightforward.

- ✓ Clear and consistent DC and AC protection solutions
- ✓ Pre-configured enclosures and distribution boards
- ✓ Faster installation and safer maintenance

Applications

PV systems are deployed across residential, commercial/industrial, and utility-scale environments. These applications differ in system size, installation structure, and energy output.



Residential and light commercial installations <20kW

Residential and light commercial photovoltaic systems are typically installed on single-family homes, small apartment buildings, offices, and small commercial properties. These systems are increasingly combined with battery storage, EV chargers, heat pumps, and smart energy management, making electrical safety and integration more critical than ever.

Although system power levels are lower than in commercial installations, residential PV systems operate at high DC voltages and are often installed in close proximity to occupants. As a result, simplicity, safety, and compliance are the primary design and installation drivers.

Typical system architecture

A residential PV system generally consists of:

- One or more PV strings connected directly to a string inverter
- DC cabling routed across rooftops and into the building
- AC connection to the household distribution board
- Optional integration with battery storage and EV charging

Clear isolation points and robust protection devices are essential to ensure safe installation, maintenance, and emergency intervention.

Key electrical requirements

1. DC-side isolation and emergency shutdown

Purpose: Ensure safe disconnection of PV strings during maintenance, faults, or emergency situations.

Key needs

- Manual and emergency DC isolation between PV modules and inverter
- Clear and visible shutdown points for installers and first responders
- Compliance with fire-safety and electrical regulations

Eaton's solutions

- PV fireman's switches for emergency DC shutdown
- DC switch-disconnectors for safe manual isolation
- Polarity-free devices to simplify wiring and reduce installation errors

3. Surge protection on DC and AC sides

Purpose: Protect sensitive PV equipment from transient overvoltages caused by lightning or switching events.

Key needs

- Surge protection tailored to rooftop installations
- Protection for both PV strings and inverter electronics
- Compact, easy-to-install devices

Eaton's solutions

- DC surge protective devices for PV inputs
- AC surge protective devices at the inverter output and distribution board

2. DC String protection

Purpose: Protect PV modules and cabling from short circuits and reverse currents.

Key needs

- String level overcurrent protection
- Reliable operation at typical residential DC Voltages
- Compact devices suitable for limited installation space

Eaton's solutions

- DC string fuses or compact DC circuit-breakers
- Integrated solutions for string boxes and small enclosures
- Polarity-free devices to simplify wiring and reduce installation errors

4. AC Protection and grid connection

Purpose: Ensure safe connection of the PV system to the household electrical installation and public grid.

Key needs

- Overcurrent protection for inverter output
- Residual current protection for personal safety
- Safe isolation for maintenance

Eaton's solutions

- Miniature circuit-breakers (MCBs) and residual current devices (RCDs / RCBOs)
- PV maintenance switches for safe AC isolation

5. Enclosures and distribution boards

Purpose: Protect electrical components from environmental influences and unauthorised access.

Key needs

- IP-rated enclosures for indoor and outdoor use
- Compact distribution boards for residential environments
- Compliance with IEC enclosure and assembly standards

Eaton solution approach

- Enclosures and pre-assembled PV distribution boards
- Ready-to-install solutions for fast on-site commissioning



Why Eaton for residential PV applications

For installers

- Installer-friendly, compact and pre-wired solutions
- Clear product selection for typical residential architectures
- Reduced installation time and improved safety

For OEMs

- Scalable residential component portfolio
- Standardised solutions suitable for series production
- Compliance with international residential PV standards

With Eaton's residential PV portfolio, installers and OEMs can deliver safe, compliant, and future-ready rooftop solar systems, supporting today's energy needs and tomorrow's electrified homes.



Commercial and industrial (C&I) photovoltaic systems typically serve offices, logistics centres, factories, retail buildings, and public infrastructure. These installations operate at higher DC and AC power levels than residential systems and are often integrated with building electrical infrastructure, energy storage, EV charging, and building management systems.

As system size and complexity increase, electrical safety, selectivity, and maintainability become critical. C&I PV systems must ensure safe operation for personnel, minimise downtime, and comply with local grid and fire-safety regulations, while remaining cost-effective and scalable.

Typical system architecture

A C&I PV installation generally includes:

- Multiple PV strings connected via combiner or recombiner stages
- One or more string or central inverters
- AC distribution and grid connection at the point of common coupling (PoC)
- Optional integration with energy storage, EV chargers, or backup generation

Key electrical requirements

1. DC-side protection and isolation

Purpose: Protect PV strings and enable safe maintenance and emergency shutdown.

Key needs

- Safe manual and emergency DC disconnection between PV strings and inverters
- String-level protection against short circuits and reverse currents
- Surge protection against lightning-induced overvoltages

Eaton's solutions

- DC switch-disconnectors for string and inverter isolation
- String fuses or DC circuit-breakers for individual string protection
- DC surge protective devices (SPDs) for equipment protection

3. AC distribution and point of connection (PoC)

Purpose: Safely connect multiple inverters to the building or utility grid.

Key needs

- Overcurrent and short-circuit protection
- Residual current protection for personnel safety
- Accurate energy metering
- Compliance with local grid codes

Eaton's solutions

- MCCBs and ACBs for inverter paralleling and main distribution
- Residual current devices (RCDs / RCBOs) for enhanced safety
- MID-(Measuring Instruments Directive) certified meters for energy measurement and reporting
- Grid protection relays integrated into LV or MV switchgear

2. Inverter protection and isolation

Purpose: Enable safe servicing and protect high-value inverter assets.

Key needs

- Safe DC and AC isolation of the inverter
- Protection against surges and overcurrents
- Clear visual indication of switching status

Eaton's solutions

- DC and AC switch-disconnectors positioned at inverter inputs and outputs
- DC and AC SPDs to protect sensitive power electronics
- Circuit-breakers and contactors sized for inverter output currents

4. Grid protection and compliance

Purpose: Ensure safe interaction with the public grid and regulatory compliance.

Key needs

Depending on the country and utility requirements, C&I PV systems may require:

- Voltage and frequency monitoring
- Remote disconnection capability
- Safe isolation for maintenance

Eaton's solutions

- Dedicated grid protection relays
- Integrated protection and switching assemblies
- Pre-assembled, tested solutions for simplified approval



Why Eaton for C&I PV applications

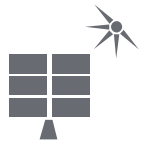
For installers

- Installer-friendly, compact and pre-wired solutions
- Clear product selection across DC, AC, and grid interfaces
- Local technical support and application guidance

For OEMs

- Scalable component portfolio covering 20 kW to 1 MW
- Global standards compliance (IEC / EN)
- Design-in support for repeatable inverter and distribution architectures

With Eaton's coordinated DC and AC protection portfolio, commercial and industrial PV systems achieve **high safety, regulatory compliance, and long-term operational reliability**, from rooftop installations to complex multi-inverter buildings.



Utility-scale photovoltaic installations are designed to generate large volumes of electricity for direct injection into the public grid. These systems typically serve solar parks, independent power producer (IPP) projects, and utility-owned renewable assets. They operate at high DC and AC power levels, integrate medium-voltage (MV) infrastructure, and must comply with strict grid codes and utility requirements.

At this scale, system availability, grid compliance, and long-term asset protection are critical. Electrical components must support continuous operation, selective protection, and safe maintenance, often in remote or harsh environments.

Typical system architecture

A utility-scale PV plant generally includes:

- Large numbers of PV strings connected via string or recombiner boxes
- Central or multiple string inverters
- Step-up transformers for medium-voltage connection
- Medium-voltage switchgear and protection at the substation
- Grid protection and control at the point of common coupling (PCC)

Key electrical requirements

1. DC string protection and recombination

Purpose: Safely manage high DC power flows and protect PV arrays from fault conditions.

Key needs

- String-level protection against short circuits and reverse currents
- Reliable recombination of multiple strings
- Protection against DC surges caused by lightning or switching events

Eaton's solutions

- DC string fuses or DC circuit-breakers for string-level protection
- Recombiner and recombiner-to-inverter protection architectures
- DC surge protective devices (SPDs) for PV array protection

3. AC power collection and low-voltage distribution

Purpose: Collect and distribute power from multiple inverters prior to MV transformation.

Key needs

- High-current AC switching and protection
- Selective coordination between feeders
- Reliable isolation for maintenance

Eaton's solutions

- Molded case circuit-breakers (MCCBs) and air circuit-breakers (ACBs)
- Low-voltage switchgear assemblies for inverter grouping
- Integrated metering and monitoring where required

2. Inverter protection and isolation

Purpose: Protect high-value inverters and enable safe maintenance operations.

Key needs

- Safe DC and AC isolation of inverter stages
- Protection of power electronics against overcurrent and surge events
- Clear, lockable isolation points

Eaton's solutions

- DC switch-disconnectors and DC overcurrent protection upstream of inverters
- AC circuit-breakers and contactors on inverter outputs
- Surge protection on both DC and AC sides

4. Medium voltage transformation and switching

Purpose: Step up voltage levels and safely interface with the distribution or transmission grid.

Key needs

- Reliable MV switching and protection
- Safe isolation of transformers and feeders
- Compliance with utility and grid operator requirements

Eaton's solutions

- Medium-voltage switchgear for feeder protection and isolation
- Transformer protection and switching solutions
- SF₆-free MV technologies supporting sustainability objectives

5. Grid protection and compliance at PCC

Purpose: Ensure safe interaction with the public grid and adherence to grid codes.

Key needs

- Voltage, frequency, and anti-islanding protection
- Controlled disconnection during grid disturbances
- Utility-approved protection schemes

Eaton solution approach

- Grid protection relays integrated into LV or MV systems
- Pre-assembled and tested protection and switching assemblies
- Solutions tailored to regional grid requirements



Why Eaton for utility-scale PV applications

For installers and EPCs

- Complete electrical BoS portfolio from DC field to MV grid connection
- Robust, low-maintenance solutions for demanding environments
- Support for fast commissioning and safe long-term operation

For OEMs and system designers

- Scalable, standardised architectures for large solar plants
- Compliance with international and regional grid standards
- Proven expertise across LV, MV, and protection technologies

With Eaton's comprehensive electrical portfolio, utility-scale PV plants achieve high availability, grid compliance, and long-term operational security, supporting reliable renewable energy generation over the full asset lifecycle.



Inverter platforms are at the heart of photovoltaic systems, converting DC energy into grid-compatible AC power while ensuring safe, stable, and efficient operation. Used across residential, commercial, and utility-scale installations, these systems must combine high power density, long service life, and consistent performance across different applications and markets.

Electrical components designed into an inverter platform must therefore support:

- High DC and AC power densities
- Long operational lifetimes
- Modular system architectures
- Fast, repeatable manufacturing and commissioning

Typical system architecture

An inverter platform typically interfaces with the PV system at four critical electrical stages:

- DC input and recombination
- Power electronics protection and control
- AC output and grid interface
- Auxiliary power, control, and signalling

Key electrical requirements

1. DC input stage – Protection and isolation

Purpose: Safely manage incoming DC power and protect upstream PV assets and inverter electronics.

Key needs

- Reliable isolation of DC sources for maintenance and safety
- Protection against short-circuit and reverse-current conditions
- Compact, polarity-independent designs for flexible layouts

Eaton's solutions

- DC switch-disconnectors for manual and emergency isolation
- DC string fuses or DC circuit-breakers for overcurrent protection
- Compact solutions suitable for inverter housings or external enclosures

3. AC output stage – Protection and grid interface

Purpose: Safely connect inverter output to LV or MV distribution systems.

Key needs

- Overcurrent and short-circuit protection
- Selective coordination with upstream and downstream devices
- Clear isolation points for servicing and commissioning

Eaton's solutions

- MCCBs and ACBs for AC output protection and isolation
- Contactors for frequent switching and controlled disconnection
- AC surge protective devices to protect inverter electronics

2. Power electronic protection and control

Purpose: Protect high-value semiconductor devices and ensure stable inverter operation.

Key needs

- Fast-acting protection for IGBTs and power modules
- Reliable switching under high DC loads
- Integrated control and monitoring capabilities

Eaton's solutions

- High-speed DC fuses for semiconductor protection
- DC contactors designed for high switching endurance
- PLCs, HMIs, and communication components for inverter control and diagnostics

4. Grid protection and compliance

Purpose: Ensure inverter systems meet utility and grid-code requirements.

Key needs

- Anti-islanding protection
- Voltage and frequency monitoring
- Controlled disconnection during grid disturbances

Eaton's solutions

- Grid protection relays integrated into LV or MV systems
- Pre-assembled protection and switching assemblies
- Region-specific solutions aligned with local grid codes

5. Auxiliary systems, enclosures, and integration

Purpose: Support safe, efficient operation and ease of installation.

Key needs

- Robust enclosures for indoor and outdoor use
- Clear segregation of power and control circuits
- Ease of assembly and service access

Eaton solution approach

- Enclosures and distribution systems for inverter integration
- Modular control and signalling components
- Accessories supporting fast assembly and wiring



Why Eaton as a design-in partner for OEMs

Engineering support

- Application-level design assistance
- Component selection aligned with inverter architecture
- Support for compliance and certification strategies

Portfolio breadth

- Coordinated DC, AC, control, and MV solutions
- One partner across multiple power levels and applications

Scalability

- From residential string inverters
- Through commercial and industrial platforms
- To utility-scale inverter and substation solutions

By designing Eaton components directly into inverter platforms, OEMs benefit from reduced development risk, faster time-to-market, and globally compliant solutions, while delivering safe, reliable, and scalable PV systems to installers and operators worldwide.

Eaton's solutions

		Residential	Commercial and industrial	Utility scale	OEM Inverters
		<20kW	20kW to 1000kW	> 1MW	
DC Protection					
DC isolation and emergency shutdown	SQL30 SAFETY PV Fireman's switch	✓	✓		
	M22-SOL Emergency PV Off stop button	✓	✓	✓	-
	Dumeco DC Switch-disconnector	✓	✓	✓	✓
	P-SOL DC Switch-disconnector	✓	✓	-	✓
	SQL-DC Switch-disconnector	✓	✓	✓	-
	DIL DC Contactors	✓	✓	✓	-
DC String protection	PKZ-SOL DC Switch-disconnector	✓	✓	✓	-
	Bussmann series PV Fuse links	-	✓	✓	-
DC Overcurrent protection	Bussmann series DC Fuses	-	✓	✓	✓
	NZM Molded case circuit breaker thermo magnetic	-	✓	✓	-
	PXS Semi-conductor Hybrid DC Circuit breaker	-	✓	✓	-
	PLS6-DC xPole Miniature circuit breaker	✓	-	-	-
	FAZ - DC Miniature circuit breakers	✓	✓	✓	✓
	FAZ - RT-DC Miniature circuit breakers	✓	✓	✓	✓
DC Surge protection	SPPVRT Surge protective devices	✓	✓	✓	✓
AC Protection					
AC isolation	MTS Manual transfer switch	✓	-	-	-
	PV Maintenance switch	✓	-	-	-
AC Overcurrent protection	xPole Miniature circuit breakers (MCBs)	✓	-	-	-
	xEffect FAZ Miniature circuit breakers	✓	✓	✓	✓
	Air Circuit Breakers (ACBs) - IZMR	-	✓	✓	✓
AC Residual current and fire protection	xEffect Mechanical and digital Residual Current Circuit Breakes (RCCBs)	✓	✓	✓	✓
	Residual Current Breakers with Overcurrent protection (RCBOs)	✓	✓	✓	✓
	xEffect FI/LS Residual Current Devices (RCDs)	✓	✓	✓	✓
	AFDD+ Arc Fault Detection Device	✓	✓	✓	✓
AC Surge protection	SPCT2-280	✓	✓	✓	✓
	SPBT12-280	✓	✓	✓	✓
Energy storage					
	Bussmann series 1500 VDC Fuses	-	✓	✓	✓

		Residential	Commercial and industrial	Utility scale	OEM Inverters
		<20kW	20kW to 1000kW	> 1MW	
Transformers					
	Liquid immersed transformer	-	✓	✓	-
	xGreen transformer	-	✓	✓	-
Switchgear					
Medium voltage switchgear	Power Xpert	-	✓	✓	-
	Xiria 630	-	✓	✓	-
	Xiria NGX	-	✓	✓	-
Low voltage switchgear	xEnergy safety Ci	-	✓	-	-
Enclosures and distribution boards					
Enclosures	xEffect CI, CP and CS	✓	✓	-	-
	xEnergy Basic	-	✓	✓	-
	xComfort KLV	✓	-	-	-
	xComfort IKA	✓	-	-	-
Distribution boards	xComfort IKA Solar	✓	-	-	-
Grid and power system protection					
	NAS Contactor combination	-	-	✓	-
Vizualisation and monitoring					
	HMIs, HMI/PLCs and Webpanels	-	✓	✓	✓
Automation and control					
	Programmable logic controls (PLCs)	-	✓	✓	✓
	Programmable relay easyE4	-	✓	✓	✓

DC protection

Safe and reliable protection for photovoltaic DC circuits

Purpose

Ensure safe, compliant, and reliable operation of photovoltaic systems by protecting DC circuits from faults, overcurrents, and transient overvoltages.

Why it matters

DC circuits remain energised whenever sufficient irradiance is present. Without coordinated protection, DC faults can result in electric shock, fire hazards, equipment damage, and extended downtime.

Key DC Protection functions

- **DC disconnection & emergency shutdown** - Safe isolation for maintenance and emergency response
- **DC string protection** - Prevents fault propagation between parallel PV strings
- **DC overcurrent protection** - Limits damage to cables, busbars, and power electronics
- **DC surge protection** - Protects equipment from lightning- and switching-induced overvoltages

Our solutions

We offer a coordinated DC protection portfolio covering string-level, inverter-level, and system-level protection. Solutions support modern 600 V, 1000 V, and 1500 V DC architectures while ensuring compliance with international IEC standards.

Typical applications



Residential PV



C&I Buildings



Utility Scale PV Plants



OEM Inverter

DC disconnection and emergency shutdown

Safe disconnection of DC circuits is essential for maintenance, fault isolation, and emergency intervention. Clearly identifiable shutdown points enable installers and emergency services to eliminate electrical hazards during critical situations.

Typical requirements

- Devices need to ensure reliable connection during normal operation
- Rapid and reliable disconnection with local and remote actuation
- Fire-service-compliant shutdown is a regulatory requirement in many regions

SOL30-SAFETY - PV Fireman switch -

The installation of our SOL30-SAFETY fireman switch is a vital safety measure. It disconnects the solar panels from the rest of the electrical system, eliminating the risk of electric shock and enabling emergency personnel to respond safely and effectively.

- **Rated operational voltage:** 1000 VDC
- **Utilization category** DC-PV1 and DC-PV2
- **Rated operational current** I_e up to 30A
- Remote actuation by undervoltage release 230V, 50Hz
- Feedback auxiliary contacts 1NO and 1NC
- MC4 plugs or metric glands available



SOL30-SAFETY					
Number of disconnectors	Current per disconnector	Input	Output	Model code	Art. No
1	30 A	2 x MC4	1 x MC4	SOL30-SAFETY/2MC4-U(230V50HZ)	144122
1	26 A	2 x M12	1 x M16	SOL30-SAFETY/2MV-U(230V50HZ)	144123
2	30 A	2 x MC4	2 x MC4	SOL30X2-SAFETY-MC4-U(230V50HZ)	168098
2	26 A	2 x M12	2 x M12	SOL30X2-SAFETY-MV-U(230V50HZ)	168099
3	30 A	3 x MC4	3 x MC4	SOL30X3-SAFETY-MC4-U(230V50HZ)	168100
3	26 A	3 x M12	3 x M12	SOL30X3-SAFETY-MV-U(230V50HZ)	168101
4	30 A	4 x MC4	4 x MC4	SOL30X4-SAFETY-MC4-U(230V50HZ)	168102
4	26 A	4 x M12	4 x M12	SOL30X4-SAFETY-MV-U(230V50HZ)	168103
6	30 A	6 x MC4	6 x MC4	SOL30X6-SAFETY-MC4-U(230V50HZ)	168104
6	30 A	6 x M12	6 x M12	SOL30X6-SAFETY-MV-U(230V50HZ)	168105

[Eaton.com link](http://Eaton.com/link)

M22-SOL Emergency PV Off button

Our M22-SOL emergency stop buttons are visually prominent, easy to locate, and instantly recognizable as a safety device. This is critical in solar installations, where rapid shutdown may be needed due to fire or electric shock hazards.

- Degree of protection IP 65
- Reset by pulling or turning
- Red enclosure upper section



M22-SOL PV Fireman switch fitted in red and black surface mounting enclosure			
Description	Contacts	Model code	Art. No
With SOLAR OFF SOLAR ON laser inscription	1 NO, 1 NC	M22-SOL-PVT45PMP111Q	150644
	2 NC	M22-SOL-PVT45PMP102Q	150645
	-	M22-SOL-PVT45P-MPIQ	150673
With transparent button latch cover	1 NO, 1 NC	M22-SOL-PVLPL11-230Q	152627

M22-SOL PV Fireman switch, enclosure and guard rings		
Description	Model code	Art. No
PV Fireman switch with SOLAR OFF SOLAR ON laser inscription	M22-SOL-PVT45P-MPI	150672
Surface mounting enclosure red and black cover	M22-SOL-IR1Q	150646
Red protective collar with SOLAR laser inscription	M22R-SOL-XGPVQ	150647
Red protective collar	M22R-XGPVQ	150648

DC Disconnection and emergency shutdown

Dumeco DC Switch-disconnector

Our Dumeco DC switch-disconnectors are specifically designed for low-voltage DC applications: residential, light commercial and DC battery storage.

Rated voltage: 800 VDC and 1000 VDC

Rated current: 125 to 1250 A

Frame sizes: 1, 2 and 3

Standard/approval: IEC 60947-3, CE, RoHS, CCC



2-pole with pre-mounted grey-handle

Current	Voltage	Frame	Model code	Art. No
125 A	800 VDC	1	DDC-125/2	6098930
160 A	800 VDC	1	DDC-160/2	6098933
200 A	800 VDC	1	DDC-200/2	6098936
250 A	1000 VDC	2	DDC-250/2	6098940
400 A	1000 VDC	2	DDC-400/2	6098943
630 A	1000 VDC	2	DDC-630/2	6098946
800 A	1000 VDC	3	DDC-800/2	6098950
1000 A	1000 VDC	3	DDC-1000/2	6098953
1250 A	1000 VDC	3	DDC-1250/2	6098956

2-pole without shaft and handle

Current	Voltage	Frame	Model code	Art. No
125 A	800 VDC	1	DDC-125/2-SK	6098931
160 A	800 VDC	1	DDC-160/2-SK	6098934
200 A	800 VDC	1	DDC-200/2-SK	6098937
250 A	1000 VDC	2	DDC-250/2-SK	6098941
400 A	1000 VDC	2	DDC-400/2-SK	6098944
630 A	1000 VDC	2	DDC-630/2-SK	6098947
800 A	1000 VDC	3	DDC-800/2-SK	6098951
1000 A	1000 VDC	3	DDC-1000/2-SK	6098954
1250 A	1000 VDC	3	DDC-1250/2-SK	6098957

2-pole with 300 mm shaft and D/P Padlockable grey handle with interlock function

Current	Voltage	Frame	Model code	Art. No
125 A	800 VDC	1	DDC-125/2/M4/P-G	6098932
160 A	800 VDC	1	DDC-160/2/M4/P-G	6098935
200 A	800 VDC	1	DDC-200/2/M4/P-G	6098938
250 A	1000 VDC	2	DDC-250/2/M4/P-G	6098942
400 A	1000 VDC	2	DDC-400/2/M4/P-G	6098945
630 A	1000 VDC	2	DDC-630/2/M4/P-G	6098948
800 A	1000 VDC	3	DDC-800/2/M4/P-G	6098952
1000 A	1000 VDC	3	DDC-1000/2/M4/P-G	6098955
1250 A	1000 VDC	3	DDC-1250/2/M4/P-G	6098958

[Eaton.com link](https://www.eaton.com)

P-SOL DC Switch-disconnector

Our open switch-disconnectors P-SOL are intended for customized enclosures or inverters. These switches are also available for nominal currents of 20 A, 30 A and 63 A.

Separate rotary handles and shaft extensions enable flexible installation. An auxiliary contact can be attached for indication of the switch state. A shunt release module as well as an undervoltage release module are available for remote tripping.

Rated operational voltage 1000 VDC

Utilization category DC-PV1, DC-PV2



P-SOL	Ue: 1000VDC		
In	Voltage	Model code	Art. No
20 A	1000 VDC	P-SOL20	120934
30 A*	1000 VDC	P-SOL30	120935
63 A	1000 VDC	P-SOL60	120936

[Eaton.com link](https://www.eaton.com)

* (30A) when using the power terminal BK25/3-PKZ0 (032720) and cables with a cross-section of 10 mm² on the power supply side.

DC Disconnection and emergency shutdown

SOL DC Switch-disconnector

Our SOL switch-disconnectors are available with two or four strings and two common types of connectors. MC 4 or metric cable glands allow easy integration into various system designs. An integrated pressure compensation element prevents condensation, which might otherwise lead to flashover-induced malfunctions.

Rated voltage: 1000 VDC

Rated operational current: 20 A or 30 A

Standards/Approvals: IEC/EN 60947-3

SOL20			
Current	Voltage	Model code	Art. No
20 A	1000 VDC	SOL20/2MC4	120915
20 A	1000 VDC	SOL20/2MV	120919
30 A	1000 VDC	SOL30/2MC4	120922

Eaton.com/link



DIL DC Contactors

The DIL DC contactors, rated at 1000 V DC, can be used at each PV String or on the inverter DC inputs.

The proven hybrid technology ensures a long-life span of the devices. Compared to similar DC contactors, our contactors are characterized by much higher electrical switching cycles. This makes the DIL DC contactors a maintenance-free and reliable part of any machine or system.

Rated voltage: 1000 VDC

Rated current: Up to 600 A

Standards/Approvals: UL/CSA, CCC, UKCA, IEC, CE and DNV-GL

DILDC			
Current	Voltage	Model code	Art. No
300 A	1000 VDC	DILDC300/22(RDS250)	183314
400 A	1000 VDC	DILDC400/22(RDS250)	186872
500 A	1000 VDC	DILDC500/22(RDS250)	186873
600 A	1000 VDC	DILDC600/22(RDS250)	183315

Eaton.com/link



DC String protection

Individual PV strings must be protected against short circuits and reverse currents, particularly in systems with parallel string configurations. Correct string protection prevents local faults from propagating through the array.

PKZ-SOL String circuit breaker

Our PKZ-SOL string circuit-breaker offers a fuseless solution for protection against short-circuit currents. To ensure maximum protection, each PKZ-SOL device is installed within a customer-specific junction box. An optional auxiliary contact provides information on the switching status.

Rated operational voltage 900 VDC

Rated current In 12, 20 and 30 A

For permissible string short-circuit currents Ics of 8 up to 30 A



PKZ-SOL		Ue: 900VDC	
Current	Ir	Model code	Art. No
12 A	5..9 A	PKZ-SOL12	120937
20 A	14..20 A	PKZ-SOL20	120938
30 A	23..30 A	PKZ-SOL30	120939

[Eaton.com link](#)

Bussmann series PV fuse links

Specifically designed to challenges of solar, our fuse and fuse holder range can be used throughout the solar application from array and combiner box protection though to the solar inverter. Providing a high level of protection your investment and users.

Rated voltage: Up to 1500 VDC (2000 VDC Under development)

Rated current: Up to 600 A

Interrupting rating: up to 100 kA

Operating class: gPV

Compatible fuses holders and bases available



Bussmann series PV Fuse links				
Type	Fuse body size	Voltage	Current	Data sheet
PV-A10	10 X 38 mm	1000 VDC	1 to 20 A	720110
PV-ANH	NH DIN	1000 VDC	32 to 400 A	720133
PV-AF	Flush end	1000 VDC	160 to 400 A	10370
PV-14F	14 x 51 mm	1000/1100 VDC	15 to 32 A	720132
PV-A10F85L	10 x 85 mm	1500 VDC	2.25 to 30 A	10658
PV-14L	14 x 65 mm	1300/1500 VDC	2.25 to 32 A	10080
PV-XL and PVS-3L	XL	Up to 1500 VDC	50 to 600 A	10201 for PV XL Fuse links TD135020 for PVS fuse links
		2000 VDC	Under-development	

DC Overcurrent protection

High-power DC circuits require fast and dependable interruption to protect cabling, busbars, and power electronics from excessive fault currents.

Typical requirements

- High DC voltage ratings for modern PV architectures
- High breaking capacity for large installations
- Selective coordination across DC distribution levels
- Power conversion systems
- Battery Energy Storage System (BESS)
- DC to DC Converters protection
- AC to DC Rectifier protection
- DC to AC Inverter protection

Bussmann series DC Fuses

Our range of high-speed square body fuses are specifically designed to provide DC short circuit over current protection for a variety of applications including, DC to AC inverters used as part of Battery Energy storage systems (BESS), DC common bus systems, regenerative drives and rectifiers.

Rated voltage: Up to 1500 VDC (2000 VDC Under development)

Rated current: Up to 3000 A

Interrupting rating: up to 250 kA at 3ms L/R

Operating class: aR, aBat, gR, gBat

Compatible fuses holders and bases available



Please refer to our DC Fuses catalog CA135009EN

NZM Molded case circuit-breaker (MCCB) thermo-magnetic

The NZM thermomagnetic DC circuit-breaker portfolio provides reliable overcurrent protection for photovoltaic power distribution systems, from string and combiner boxes to inverter inputs and main DC boards.

Based on our proven DC protection technology, NZM circuit breakers are designed for demanding PV environments, ensuring safe and dependable operation under high DC voltages and variable load conditions. A broad range of accessories, including DC-rated terminals, bridge kits and door-coupled rotary handles, supports flexible system design and seamless integration into a wide variety of PV installations.

Rated voltage: 750 VDC

Rated current: Up to 500 A

Standard/Approvals: IEC/EN 60947



DC Overcurrent protection

PXSDC Semiconductor Hybrid DC Circuit-breaker

Our PXSDC, semiconductor hybrid DC circuit breaker is a versatile measuring and protective device for voltage, current, power, temperature, and fault current.

- Fully bidirectional
 - Two-pole protection
 - Simple integration with energy storage and green energy
 - Safety wire function
 - Real time info: Current, voltage, power, energy
- Dual control safety protection
 - Adjustable protection parameters
 - Very fast actuation
 - Integrated pre-charging option
 - Low fault energy (arc-free DC switching)



Standards/Approvals: IEC 60947-10 Semiconductor Circuit-breakers (soon-to-be-published)

Voltage rating: 800 VDC

Current rating: 100 A

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PLS6-DC xPole Miniature Circuit-breaker

Our PLS6-DC miniature circuit-breakers provide reliable protection for DC circuits. They combine a thermal release for overload protection with an electromagnetic release for fast and dependable short-circuit interruption.

Designed for straightforward and cost-effective DC protection, the PLS6-DC range is available in 1- and 2-pole versions with Type C tripping characteristics, covering rated currents from 1 A to 50 A and rated voltages of up to 500 V DC. Busbar compatibility and robust terminal design support efficient installation in compact DC distribution systems.

Rated voltage: Up to 500 VDC

Rated current: Up to 50 A

Standards/Approvals: IEC 60947-2



PLS6-DC 1-pole		
Current	Model code	Art. No
1 A	PLS6-C1-DC	243115
2 A	PLS6-C2-DC	243116
3 A	PLS6-C3-DC	243117
4 A	PLS6-C4-DC	243118
6 A	PLS6-C6-DC	243119
10 A	PLS6-C10-DC	243120
13 A	PLS6-C13-DC	243121
16 A	PLS6-C16-DC	243122
20 A	PLS6-C20-DC	243123
25 A	PLS6-C25-DC	243124
32 A	PLS6-C32-DC	243125
40 A	PLS6-C40-DC	243126
50 A	PLS6-C50-DC	243127

PLS6-DC 2-pole		
Current	Model code	Art. No
1 A	PLS6-C1/2-DC	243128
2 A	PLS6-C2/2-DC	243129
3 A	PLS6-C3/2-DC	243130
4 A	PLS6-C4/2-DC	243131
6 A	PLS6-C6/2-DC	243132
10 A	PLS6-C10/2-DC	243133
13 A	PLS6-C13/2-DC	243134
16 A	PLS6-C16/2-DC	243135
20 A	PLS6-C20/2-DC	243136
25 A	PLS6-C25/2-DC	243137
32 A	PLS6-C32/2-DC	243138
40 A	PLS6-C40/2-DC	243139
50 A	PLS6-C50/2-DC	243140

For use in DC auxiliary and control circuits with defined polarity and current direction within the device ratings.

[Eaton.com link](#)

DC Overcurrent protection

FAZ-DC Miniature circuit-breakers

Our FAZ-DC miniature circuit-breakers are engineered for demanding DC applications requiring extended functional safety and high resistance to mechanical and environmental stresses. The combined thermal and electromagnetic trip unit ensures precise protection against overloads and short-circuits in critical DC systems.

Available in 1- and 2-pole versions, the FAZ-DC range offers Type B, C, K, and Z tripping characteristics, providing exceptional flexibility for different load profiles. Rated currents from 2 A to 50 A and rated voltages of up to 500 V DC make FAZ-DC well suited for advanced solar installations, mobile systems, and infrastructure exposed to vibration and harsh operating conditions. Busbar compatibility and robust terminal design support efficient installation in compact DC distribution systems.

Rated voltage: Up to 500 VDC

Rated current: Up to 50 A

Standards/Approvals: IEC 60947-2, EN 45545, IEC 61373



FAZ-DC 1-pole (Type B)		
Current	Model code	Art. No
2A	FAZ-B2/1-DC	176063
3A	FAZ-B3/1-DC	176064
4A	FAZ-B4/1-DC	176065

32A	FAZ-B32/1-DC	176072
40A	FAZ-B40/1-DC	176073
50A	FAZ-B50/1-DC	176074

FAZ-DC 2-pole (Type B)		
Current	Model code	Art. No
2A	FAZ-B2/2-DC	176075
3A	FAZ-B3/2-DC	176076
4A	FAZ-B4/2-DC	176077

32A	FAZ-B32/2-DC	176084
40A	FAZ-B40/2-DC	176085
50A	FAZ-B50/2-DC	176086

FAZ-DC 1-pole (Type C)		
Current	Model code	Art. No
2A	FAZ-C2/1-DC	279122
3A	FAZ-C3/1-DC	279123
4A	FAZ-C4/1-DC	279124

32A	FAZ-C32/1-DC	279131
40A	FAZ-C40/1-DC	279132
50A	FAZ-C50/1-DC	279133

FAZ-DC 2-pole (Type C)		
Current	Model code	Art. No
2A	FAZ-C2/2-DC	279134
3A	FAZ-C3/2-DC	279135
4A	FAZ-C4/2-DC	279136

32A	FAZ-C32/2-DC	279143
40A	FAZ-C40/2-DC	279144
50A	FAZ-C50/2-DC	279145

FAZ-DC 1-pole (Type K)		
Current	Model code	Art. No
4A	FAZ-K4/1-DC	EP-505580
6A	FAZ-K6/1-DC	EP-505581
8A	FAZ-K8/1-DC	EP-505582

32A	FAZ-K32/1-DC	EP-505588
40A	FAZ-K40/1-DC	EP-505589
50A	FAZ-K50/1-DC	EP-505590

FAZ-DC 2-pole (Type K)		
Current	Model code	Art. No
4A	FAZ-K4/2-DC	EP-505591
6A	FAZ-K6/2-DC	EP-505592
8A	FAZ-K8/2-DC	EP-505593

32A	FAZ-K32/2-DC	EP-505599
40A	FAZ-K40/2-DC	EP-505600
50A	FAZ-K50/2-DC	EP-505601

FAZ-DC 1-pole (Type Z)		
Current	Model code	Art. No
4A	FAZ-Z4/1-DC	EP-505602
6A	FAZ-Z6/1-DC	EP-505603
8A	FAZ-Z8/1-DC	EP-505604

32A	FAZ-Z32/1-DC	EP-505610
40A	FAZ-Z40/1-DC	EP-505611
50A	FAZ-Z50/1-DC	EP-505612

FAZ-DC 2-pole (Type Z)		
Current	Model code	Art. No
4A	FAZ-Z4/2-DC	EP-505613
6A	FAZ-Z6/2-DC	EP-505614
8A	FAZ-Z8/2-DC	EP-505615

32A	FAZ-Z32/2-DC	EP-505621
40A	FAZ-Z40/2-DC	EP-505622
50A	FAZ-Z50/2-DC	EP-505623

For use in DC auxiliary and control circuits with defined polarity and current direction within the device ratings.

[Eaton.com link](https://www.eaton.com)

DC Overcurrent protection

FAZ-RT-DC Miniature circuit-breakers

Our FAZ-RT-DC miniature circuit-breakers are designed for globally compliant DC systems where international acceptance and enhanced functional safety are essential. They provide reliable overload and short-circuit protection through a proven thermal-magnetic trip mechanism, ensuring dependable performance in regulated and safety-critical environments.

The FAZ-RT-DC range is available with Type B and C tripping characteristics, covering rated currents from 2 A to 50 A. It supports rated voltages of up to 250 V DC for DC systems designed to device-based approval requirements and up to 500 V DC for systems designed to installation-level certification frameworks, making it ideal for globally deployed solar and energy installations requiring a single, internationally recognized solution. Busbar compatibility and robust terminal design, including a built-in ring-tongue terminal, ensure secure, vibration-resistant connections and flexible integration into demanding DC installations.

Rated voltage: Up to 500 VDC

Rated current: Up to 50 A

Standards/Approvals: IEC 60947-2, UL489, EN 45545, IEC 61373



FAZ-RT-DC 1-pole (Type B)		
Current	Model code	Art. No
2A	FAZ-B2/1-RT-DC	305912
3A	FAZ-B3/1-RT-DC	305913
4A	FAZ-B4/1-RT-DC	305914
...		
35A	FAZ-B35/1-RT-DC	305928
40A	FAZ-B40/1-RT-DC	305929
50A	FAZ-B50/1-RT-DC	305930

FAZ-RT-DC 2-pole (Type B)		
Current	Model code	Art. No
2A	FAZ-B2/2-RT-DC	305931
3A	FAZ-B3/2-RT-DC	305932
4A	FAZ-B4/2-RT-DC	305933
...		
35A	FAZ-B35/2-RT-DC	305948
40A	FAZ-B40/2-RT-DC	305949
50A	FAZ-B50/2-RT-DC	305950

FAZ-RT-DC 1-pole (Type C)		
Current	Model code	Art. No
2A	FAZ-C2/1-RT-DC	305869
3A	FAZ-C3/1-RT-DC	305870
4A	FAZ-C4/1-RT-DC	305871
...		
35A	FAZ-C35/1-RT-DC	305884
40A	FAZ-C40/1-RT-DC	305885
50A	FAZ-C50/1-RT-DC	305886

FAZ-RT-DC 2-pole (Type C)		
Current	Model code	Art. No
2A	FAZ-C2/2-RT-DC	305891
3A	FAZ-C3/2-RT-DC	305892
4A	FAZ-B4/2-RT-DC	305933
...		
35A	FAZ-C35/2-RT-DC	305909
40A	FAZ-C40/2-RT-DC	305910
50A	FAZ-C50/2-RT-DC	305911

For use in DC auxiliary and control circuits with defined polarity and current direction within the device ratings.

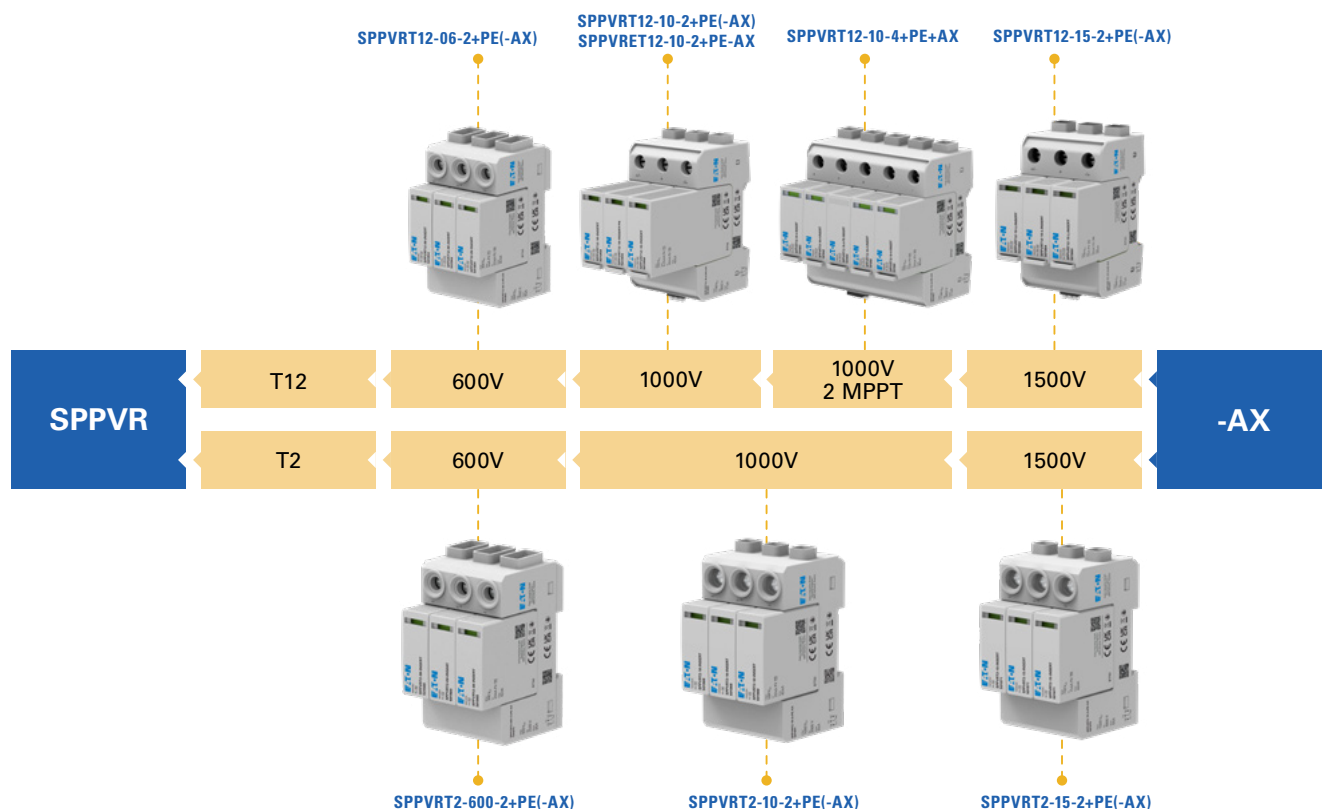
[Eaton.com link](#)

DC Surge protection

Lightning strikes and switching events can induce transient overvoltages that damage inverter electronics and monitoring systems. DC surge protection improves system resilience, particularly in exposed and rooftop installations.

Typical requirements

- Surge protection for insulated and earthed PV systems
- Coordination between DC and AC surge protection zones
- Compliance with PV-specific SPD standards



Class 1 and 2

600 VDC / SPPVRT12-06...PE(AX)

- Surge protection type T1/T2 for PV
- For insulated and earthed systems
- UC: 600 VDC
- Nominal discharge current (8/20) μ s: 20 kA
- Maximum discharge current (8/20) μ s: 40 kA
- Impulse discharge current (10/350) μ s: 5kA

SPPVRT	600 VDC	Class I/II	T1/T2
Uc	Model code	Art. No	
600 VDC	SPPVRT12-06-2+PE	EP-501952	
600 VDC	SPPVRT12-06-2+PE-AX	EP-501953	

1000 VDC / SPPVRT12-10...PE(AX)

- Surge protection type T1/T2 for PV
- For insulated and earthed systems
- UC: 1000 VDC
- Nominal discharge current (8/20) μ s: 20 kA
- Maximum discharge current (8/20) μ s: 40 kA
- Impulse discharge current (10/350) μ s: 6.25 kA (5 kA for SPPVRET12-10-2+PE-AX)

SPPVRT	1000 VDC	Class I/II	T1/T2
Uc	Model code	Art. No.	
1000 VDC	SPPVRT12-10-2+PE	EP-501955	
1000 VDC	SPPVRT12-10-2+PE-AX	EP-501956	
1000 VDC	SPPVRET12-10-2+PE	EP-502585	
1000 VDC	SPPVRET12-10-2+PE-AX	EP-502588	

[Eaton.com link](https://www.eaton.com)

DC Surge protection

Class 1 and 2

1000 VDC / SPPVRT12-10+4+PE+AX

- Surge protection type T1/T2 for PV
- For insulated and earthed systems
- UC: 1000 VDC
- Nominal discharge current (8/20) μ s: 20 kA
- Maximum discharge current (8/20) μ s: 40 kA
- Impulse discharge current (10/350) μ s: 5 kA

SPPVRT	1000 VDC	Class I/II	T1/T2
Uc	Model code	Art. No.	
1000 VDC	SPPVRT12-10-4+PE+AX	EP-501957	

Class 2

600 VDC / SPPVRT2-06...PE(AX)

- Surge protection type T1/T2 for PV
- For insulated and earthed systems
- UC: 600 VDC
- Nominal discharge current (8/20) μ s: 20 kA
- Maximum discharge current (8/20) μ s: 40 kA

SPPVRT	600 VDC	Class II	T2
Uc	Model code	Art. No.	
600 VDC	SPPVRT2-600-2+PE	EP-501972	
600 VDC	SPPVRT2-600-2+PE+AX	EP-501973	

1500 VDC / SPPVRT2-15...PE(AX)

- Surge protection type T1/T2 for PV
- For insulated and earthed systems
- UC: 1500 VDC
- Nominal discharge current (8/20) μ s: 20 kA
- Maximum discharge current (8/20) μ s: 40 kA

SPPVRT	1500 VDC	Class II	T2
Uc	Model code	Art. No.	
1500 VDC	SPPVRT2-15-2+PE	EP-501969	
1500 VDC	SPPVRT2-15-2+PE+AX	EP-501970	

1500 VDC / SPPVRT12-15...PE(AX)

- Surge protection type T1/T2 for PV
- For insulated and earthed systems
- UC: 1500 VDC
- Nominal discharge current (8/20) μ s: 20 kA
- Maximum discharge current (8/20) μ s: 30 kA
- Impulse discharge current (10/350) μ s: 5 kA

SPPVRT	1500 VDC	Class I/II	T1/T2
Uc	Model code	Art. No.	
1500 VDC	SPPVRT12-15-2+PE	EP-501960	
1500 VDC	SPPVRT12-15-2+PE-AX	EP-501961	

1000 VDC / SPPVRT2-10...PE(AX)

- Surge protection type T1/T2 for PV
- For insulated and earthed systems
- UC: 1000 VDC
- Nominal discharge current (8/20) μ s: 20 kA
- Maximum discharge current (8/20) μ s: 40 kA

SPPVRT	600 VDC	Class II	T2
Uc	Model code	Art. No.	
1000 VDC	SPPVRT2-10-2+PE	EP-501966	
1000 VDC	SPPVRT2-10-2+PE+AX	EP-501967	

[Eaton.com link](#)

AC protection

Safeguarding power conversion and grid connection in photovoltaic systems

Purpose

Ensure safe power conversion and reliable connection of photovoltaic systems to building loads and the electrical grid.

Why it matters

Once solar power is converted by the inverter, AC circuits become the interface between generation, loads, and the public grid. AC faults can therefore result in electric shock, fire hazards, equipment damage, and grid disturbances—making correct AC protection essential for safety, availability, and compliance.

Key AC Protection functions

- ✓ **AC disconnection & maintenance isolation** - Safe isolation for commissioning, service and fault intervention
- ✓ **Overcurrent and short-circuit protection** - Protects inverters, cabling, and distribution equipment
- ✓ **Residual current & fire protection** - Reduces the risk of electric shock and fire caused by earth faults
- ✓ **AC surge protection** - Protects equipment from lightning and switching induced transients

Our solutions

We deliver scalable and coordinated AC protection solutions from residential installations to utility-scale PV plants. Selective protection concepts support high system availability while ensuring compliance with IEC standards and local grid connection requirements.

Typical applications



Residential PV



C&I Buildings PV



Utility Scale PV plants

AC Disconnection and maintenance isolation

Safe isolation on the AC side is required for commissioning, maintenance, and fault intervention. Clearly accessible disconnection points support controlled shutdown and safe working conditions.

Typical requirements

- Load break disconnection for inverter outputs
- Lockable isolation points for maintenance
- Compliance with applicable IEC and local installation standards

MTS Manual transfer switch

Our Manual Transfer Switches (MTS) provide safe isolation in a wide range of low voltage applications where 3- or 4-pole are required. Thanks to their excellent making and breaking capacity under load conditions they are particularly suited for use in distribution panels and for machine controls. They are perfect for residential and light commercial applications fitted with solar panels.



Standards: DIN EN 60947-3 and DIN 60947-6-1

Number of poles: 3- and 4

Available in enclosures

3 and 4-pole				
Current	Voltage	Poles	Model code	Art. No
16 A	690 VAC	3	MTS-16/Z/3	EP-401727
32 A	690 VAC	3	MTS-32/Z/3	EP-401728
40 A	690 VAC	3	MTS-40/Z/3	EP-401729
63 A	690 VAC	3	MTS-63/Z/3	EP-401730
16 A	690 VAC	4	MTS-16/Z/4	EP-401735
32 A	690 VAC	4	MTS-32/Z/4	EP-401736
40 A	690 VAC	4	MTS-40/Z/4	EP-401737
63 A	690 VAC	4	MTS-63/Z/4	EP-401738

[Eaton.com link](#)

3 and 4-pole in enclosures				
Current	Voltage	Poles	Model code	Art. No
16 A	690 VAC	3	MTS-16/ENC/3	EP-401731
32 A	690 VAC	3	MTS-32/ENC/3	EP-401732
40 A	690 VAC	3	MTS-40/ENC/3	EP-401733
63 A	690 VAC	3	MTS-63/ENC/3	EP-401734
16A	690 VAC	4	MTS-16/ENC/4	EP-401739
32 A	690 VAC	4	MTS-32/ENC/4	EP-401740
40 A	690 VAC	4	MTS-40/ENC/4	EP-401741
63 A	690 VAC	4	MTS-63/ENC/4	EP-401742

PV Maintenance switch

Our PV maintenance switch is designed in close collaboration with installers to enable faster, safer installation in photovoltaic systems. It allows quick connection of AC and DC earthing conductors without opening the switch, supports flexible cable entry options, and can be securely locked in the off position for safe maintenance.



Rated voltage: 690 VAC

Rated current: 20 A to 32 A

Standard: IEC 60947-1

Number of poles: 2- and 4

3 and 4-pole				
Current	Voltage	Poles	Model code	Art. No
20 A	690 VAC	2	PV-20A-2P-AC-I1/SVB-SW	199535
25 A	690 VAC	4	PV-25A-4P-AC-I2/SVB-SW/N	199536
32 A	690 VAC	2	PV-32A-2P-AC-I2/SVB-SW	199537

AC Overcurrent and short circuit protection

Overcurrent protection limits damage to conductors and equipment caused by short circuits or overloads on the AC side of the system. Selective coordination is particularly important in commercial and utility scale installations.

Typical requirements

- Protection for inverter outputs and distribution feeders
- Coordination with upstream and downstream protection devices
- Suitability for a wide range of fault levels

Miniature circuit-breakers (MCBs)

Our miniature circuit-breakers portfolio covers standardized installation requirements as well as higher-performance solutions for more demanding applications. A wide choice of tripping characteristics, breaking capacities, pole configurations, and functional variants allows precise alignment with different load profiles, system architectures, and application requirements across residential, commercial, industrial, OEM, and utility-scale installations.

A comprehensive range of accessories, including auxiliary switches, shunt releases, undervoltage releases, reset devices, and intelligent busbar systems, further extends functionality, enabling flexible system design, simplified installation, and advanced automation solutions.

xPole Miniature circuit breakers

Our xPole miniature circuit-breakers are designed for residential and commercial applications, providing reliable protection for standardized AC distribution systems. They combine proven protection technology with installation-friendly features to support efficient panel design and fast installation.

- Designed in accordance with IEC/EN 60898-1
- Rated currents up to 63 A with short-circuit capacities from 4.5 kA to 10 kA
- Available in Type B, C, and D tripping characteristics
- Wide range of configurations: 1P, 1P+N, 2P, 3P, 3P+N, and 4P
- Contact position indicator - Red/Green
- Compact 1P+N solutions in 1 module width and versions with plug-in load terminals for space-saving layouts and faster installation



PLS			
In	Type	Model code	Art. No
10	B	PLS4-B10/2-MW	243248
20	C	PLS4-C20/2-MW	243279
16	B	PLS6-B16-MW	242655
16	C	PLS6-C16/3N-MW	243018
25	D	PLS6-D25/3N-MW	243043
13	B	PLSM-B13/1N-MW	242247
16	C	PLSM-C16-MW	242206
20	D	PLSM-D20/2-MW	242429
Eaton.com.link			

PLN - 1+N in 1MU			
In	Type	Model code	Art. No
16	B	PLN6-B16/1N-MW	263164
16	C	PLN6-C16/1N-MW	263174
10	C	PLN6-C10/1N-MW	263172
10	B	PLN6-B10/1N-MW	263162
16	B	PLN4-B16/1N-MW	263182
16	C	PLN4-C16/1N-MW	263192
10	C	PLN4-C10/1N-MW	263190
6	C	PLN4-C6/1N-MW	263189
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PLI - Plug-in terminal			
In	Type	Model code	Art. No
16	B	PLI-B16/1	101251
10	B	PLI-B10/1	101249
10	C	PLI-C10/1	101256
16	C	PLI-C16/3	101321
16	D	PLI-D16/1	101265
16	D	PLI-D16/3	101328

[Eaton.com.link](#)

AC Overcurrent and short circuit protection

xEffect Miniature Circuit Breakers

Our xEffect miniature circuit-breaker range is engineered for commercial, industrial, OEM, and utility-scale applications, where higher performance, extended current ranges, and broader approval coverage are required. xEffect MCBs are designed to perform reliably in regulated, safety-critical, and mechanically demanding environments.

This range combines IEC- and UL-oriented variants under a single performance concept, enabling flexible use across different system approval frameworks while maintaining consistent functionality.

- Designed in accordance with IEC/EN 60898-1, IEC/EN 60947-2, UL 489, and UL 1077, depending on series variant
- Rated currents from 0.16 A up to 125 A with short-circuit capacities from 6 kA up to 25 kA
- Broad selection of Type B, C, D, K, S, and Z tripping characteristics, depending on variant
- Comprehensive pole configurations including 1P, 1P+N, 2P, 3P, 3P+N, and 4P
- Contact position indicator - Red/Green
- Variants with compact 1P+N designs, integrated isolation function, and mechanically reinforced terminals, including versions with built-in ring-tongue terminals for vibration-resistant connections
- Designed for safety-critical and mechanically demanding installations, compliant with EN 45545 and IEC 61373
- Most series variants approved for use in A2L refrigerant environments according to UL 60335-1 and UL 60335-2-40

FAZ			
In	Type	Model code	Art. No
6	B	FAZ-B6/1	278529
10	B	FAZ-B10/1	278531
4	C	FAZ-C4/1	278553
10	C	FAZ-C10/1	278557
10	D	FAZ-D10/1	278580
10	D	FAZ-D10/2	278779
10	K	FAZ-K10/1	278597
16	K	FAZ-K16/3	278911
2	S	FAZ-S2/1	278607
4	S	FAZ-S4/1	278609
2	Z	FAZ-Z2/1	278620
4	Z	FAZ-Z4/1	278622

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FAZ6			
In	Type	Model code	Art. No
2	B	FAZ6-B2/1	177376
4	B	FAZ6-B4/1	177380
16	C	FAZ6-C16/2	239103
16	C	FAZ6-C16/1	239037
6	D	FAZ6-D6/3	168079
10	D	FAZ6-D10/2	168071
10	K	FAZ6-K10/3	EP-505706
16	K	FAZ6-K16/2	EP-505686
10	Z	FAZ6-Z10/2	EP-505804
16	Z	FAZ6-Z16/3	EP-505823

[Eaton.com link](#)

FAZ-NA/RT - UL 489			
In	Type	Model code	Art. No
16	B	FAZ-B16/1-NA	132686
10	B	FAZ-B10/1-NA	132683
6	C	FAZ-C6/1-NA	102084
10	C	FAZ-C10/1-NA	102087
10	D	FAZ-D10/2-NA	102187
10	D	FAZ-D10/3-NA	102267
10	D	FAZ-D10/2-RT	102227
15	D	FAZ-D15/2-RT	102229
10	C	FAZ-C10/2-RT	102207
4	C	FAZ-C4/3-RT	102282
20	B	FAZ-B20/1-RT	132744
20	B	FAZ-B20/2-RT	132763

[Eaton.com link](#)

FAZT - 1MU/Pole HPMCB			
In	Type	Model code	Art. No
6	B	FAZT-B6/1	240782
10	B	FAZT-B10/1	240787
10	C	FAZT-C10/1	240803
16	C	FAZT-C16/2	240861
4	D	FAZT-D4/3	240901
32	D	FAZT-D32/3	142499

[Eaton.com link](#)

AZ - 1.5MU/Pole HPMCB			
In	Type	Model code	Art. No
80	B	AZ-3-B80	174512
100	B	AZ-3-B100	174513
80	C	AZ-3-C80	211801
125	C	AZ-C125	211809
50	D	AZ-3-D50	211816
63	D	AZ-3-D63	211820

[Eaton.com link](#)

FAZ-PN - 1+N in 1MU			
In	Type	Model code	Art. No
13	B	FAZ-PN-B13/1N	279148
16	B	FAZ-PN-B16/1N	279149
10	C	FAZ-PN-C10/1N	279157
16	C	FAZ-PN-C16/1N	279159

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FAZ



FAZ6



FAZ-NA/RT



FAZT



AZ



FAZ-PN

AC Overcurrent and short circuit protection

Air circuit-breakers (ACBs) - IZMR

IZMR air circuit breakers provide high-power AC protection for photovoltaic systems, combining high current capacity up to 4000 A with intelligent PT trip units for precise protection, monitoring, and easy configuration in grid-connected PV installations.



Rated voltage: 1500 VAC

Rated current: 4000 A

Switching capacity: Up to 85 kA

Optional modbus for the PT20/25 units

IZMR						
Number of poles	Current	Voltage	PT Unit	Mounting	Model code	Art. No
3-pole	4000 A	1150 VAC	PT10	Fixed	IZMR40N3-A40F-S11	EP-503636
3-pole	4000 A	1150 VAC	PT10	Withdrawable	IZMR40N3-A40W-S11	EP-503644
3-pole	4000 A	1150 VAC	PT20	Fixed	IZMR40N3-V40F-S11	EP-503652
3-pole	4000 A	1150 VAC	PT20	Withdrawable	IZMR40N3-V40W-S11	EP-503660
3-pole	4000 A	1150 VAC	PT25	Fixed	IZMR40N3-P40F-S11	EP-503668
3-pole	4000 A	1150 VAC	PT25	Withdrawable	IZMR40N3-P40W-S11	EP-503676
4-pole	4000 A	1150 VAC	PT10	Fixed	IZMR40N4-A40F-S11	EP-503684
4-pole	4000 A	1150 VAC	PT10	Withdrawable	IZMR40N4-A40W-S11	EP-503692
4-pole	4000 A	1150 VAC	PT20	Fixed	IZMR40N4-V40F-S11	EP-503700
4-pole	4000 A	1150 VAC	PT20	Withdrawable	IZMR40N4-V40W-S11	EP-503708
4-pole	4000 A	1150 VAC	PT25	Fixed	IZMR40N4-P40F-S11	EP-503716
4-pole	4000 A	1150 VAC	PT25	Withdrawable	IZMR40N4-P40W-S11	EP-503724

AC Residual current and fire protection

Residual current protection reduces the risk of electric shock and fire caused by earth faults. In PV systems with power electronics, correct device selection is essential to ensure reliable operation and minimise nuisance tripping.

Typical requirements

- Personal protection using 30 mA residual current devices
- Fire protection for sensitive or high risk installations
- Compatibility with inverter generated leakage currents

xEffect Residual current circuit-breakers (RCCBs)

We are a leading manufacturer of Residual Current Circuit Breakers (RCCBs) designed to protect people and property from electric shock and fire hazards caused by earth faults. Our RCCB range includes both mechanical and digital variants to suit various needs.

- **FRCmM Mechanical RCCBs:** Our traditional devices use electromechanical technology to detect current imbalances and disconnect circuits when necessary. They are renowned for their robustness, simplicity, and reliability across residential and industrial applications.
- **FRCdM Digital RCCBs:** By incorporating microprocessor technology, our advanced units offer enhanced sensitivity and accuracy, as well as optional features such as self-testing with automatic reclosing device and remote monitoring with auxiliary contacts. This improves diagnostics, maintenance, and operational efficiency.



FRCmM
Mechanical RCCB

FRCdM
Digital RCCB

Range overview by type

Type B+ devices offer enhanced fire protection thanks to a specially designed tripping curve that limits the tripping current to a maximum of 420 mA for frequencies up to 20 kHz.

Type Bfq devices are suitable for environments with high-frequency leakage currents, tolerating operational leakage currents at frequencies up to 50 kHz. They are ideal for applications involving frequency converters or high-frequency power electronics.

Type G devices feature a 10 ms time-delayed tripping curve and can withstand surge currents up to 3 kA. They are recommended for installations where system availability is crucial. The “G” designation refers to the tripping curve, not sensitivity, and these devices are available as F Type RCCBs (-G/F) and B/Bfq/B+ Type RCCBs (-G/B(fq/+)).

Type S devices offer a 40 ms time-delayed tripping curve and surge current proof capabilities up to 5 kA. Known as “selective” types, they are mainly used in root applications with additional RCDs installed in series. The “S” refers to the tripping curve, not sensitivity, and these devices are available as F Type RCCBs (-S/F).

	Mechanical	Digital
Type	FRCmM	FRCdM
B	-	✓
Bfq	-	✓
B+	-	✓
G/F	✓	✓
S/F	✓	✓

FRCmM Mechanical RCCB - 4-Poles				
Type	Fault current	Current	Model code	Art. No
G/F	30 mA	25 A	FRCmM-25/4/003-G/F	187408
G/F	30 mA	40 A	FRCmM-40/4/003-G/F	187409
G/F	30 mA	63 A	FRCMM-63/4/003-G/F	187410
S/F	300 mA	25 A	FRCmM-25/4/03-S/F	187438
S/F	300mA	40 A	FRCmM-40/4/03-S/F	187439
S/F	300 mA	63 A	FRCmM-63/4/03-S/F	187440
Eaton.com link				

FRCdM Digital RCCB - 4-Poles				
Type	Fault curent	Current	Model code	Art. No
G/B	30 mA	25 A	FRCdM-25/4/003-G/B	167892
G/B	30 mA	40 A	FRCdM-40/4/003-G/B	167893
G/B	30 mA	63 A	FRCdM-63/4/003-G/B	167894
G/B	300 mA	40 A	FRCdM-40/4/03-G/B	167897
G/B+	30 mA	40 A	FRCdM-40/4/003-G/B+	167881
G/B+	30 mA	63 A	FRCdM-63/4/003-G/B+	167882
S/B+	300 mA	25 A	FRCdM-25/4/03-S/B+	167888
S/B+	300 mA	40 A	FRCdM-40/4/03-S/B+	167889
S/B+	300mA	63 A	FRCdM-63/4/03-S/B+	167890
Eaton.com link				

AC Residual current and fire protection

Residual current breakers with overcurrent protection (RCBO)

Our RCBO combines the advantages of a miniature circuit-breaker and a residual current device in one unit. It saves space and offers complete protection. Benefits are fire protection, protection of persons (type 30 mA) as well as flexible and generous space for wiring. Additional features:

- Contact position indicator red/green
- A- and G/A-types are available
- Can be sealed with leads in the ON or OFF position
- Twin-purpose terminal (lift/open mouthed) above and below

Surge-current protected designs prevent unwanted shutdown, selective types facilitate discriminative shutdown of the defective system section.

- 1P+N
- Type A
- Icn 10kA
- According to EN61009



PKNM - A		IDn 30mA
In	Model code	Art. No
16 A	PKNM-16/1N/C/003-A	236217
20 A	PKNM-20/1N/C/003-A	236249
25 A	PKNM-25/1N/C/003-A	236279
32 A	PKNM-32/1N/C/003-A	236309

PKNM - A		IDn 300mA
In	Type	Art. No
16 A	PKNM-16/1N/C/03-A	236219
20 A	PKNM-20/1N/C/03-A	236251
25 A	PKNM-25/1N/C/03-A	236281
32 A	PKNM-32/1N/C/03-A	236311

- 1P+N
- Type A
- Icn 10kA
- According to EN61009 and Ics/Icu acc. to EN60947-2



FRBmM - A		IDn 30mA
In	Type	Art. No
16 A	FRBmM-C16/1N/003-A	170619
20 A	FRBmM-C20/1N/003-A	170620
25 A	FRBmM-C25/1N/003-A	170621
32 A	FRBmM-C32/1N/003-A	170622

FRBmM - A		IDn 300mA
In	Type	Art. No
16 A	FRBmM-C16/1N/03-A	170576
20 A	FRBmM-C20/1N/03-A	170577
25 A	FRBmM-C25/1N/03-A	170578
32 A	FRBmM-C32/1N/03-A	170579

[Eaton.com link](https://www.eaton.com)



AC Residual current and fire protection

xEffect FI/LS combined protective switch, 3-pole + neutral, in only 4 modular units (4 TE)

Our advanced residual-current circuit breaker with integrated overcurrent protection brings together the full safety benefits of an RCD and an MCB in one compact, high-performance device. Its voltage-independent tripping technology ensures reliable protection at all times, while a wide selection of rated tripping currents makes it suitable for diverse applications.

The clear LED indicators provide instant diagnostics at a glance:

Blue : residual-current trip detected

White : the MCB section has tripped or been switched off Designed for effortless installation, the innovative double comfort terminal (lift/clamp design) saves time on site and guarantees a secure, professional connection every time.

Rated current: 40 A

Standards: IEC/EN 61009 compliant



FRBM6				
Current	MCB Trip Type	RCCB Trip type	Model code	Art. No
16 A	B	A	FRBM6-B16/3N/003-A	170988
16 A	C	A	FRBM6-C16/3N/003-A	170999

[Eaton.com link](#)

AFDD+ Arc fault detection device

AFDD+ arc fault detection devices provide enhanced residual current and fire protection for residential and small PV-connected installations by continuously monitoring wiring for dangerous arc faults and automatically disconnecting affected circuits.

By combining residual current protection, overcurrent and short-circuit protection, and arc fault detection in one compact device, AFDD+ helps reduce the risk of electrically ignited fires while improving safety for people and property.

- **Rated voltage:** 240 VAC
- **Rated current:** 10 to 40 A
- **Designed according to** IEC/EN 62606 and 61009



AFDD+			
Current	Type	Model code	Art. No
10 A	A	AFDD-10/2/B/003-A	187168
13 A	A	AFDD-13/2/B/003-A	187180
16 A	A	AFDD-16/2/B/003-A	187204
16 A	F	AFDD-16/2/B/003-F	187263
13 A	F	AFDD-13/2/B/003-F	187253

[Eaton.com link](#)

AC Surge protection

Transient overvoltages caused by lightning strikes or switching events can damage inverters and monitoring equipment. AC surge protection limits the impact of these events and improves system resilience.

Typical requirements

- Protection against indirect lightning and switching surges
- Coordination with DC surge protection zones
- Compliance with surge protection standards

AC Surge protection SPCT2-280...+NPE

- Test class II according to IEC 61643-1+A1
- SPD-type T2 , according to EN 61643-11
- UC: 280 VAC
- Nominal discharge current (8/20) μ s L-N/N-PE/L-PE: 20 kA
- Max. discharge current L-N/N-PE/L-PE: 40 kA

SPCT2 Type 2		
No. of poles	Model code	Art. No
1+NPE	SPCT2-280-1+NPE	167619
3+NPE	SPCT2-280-3+NPE	167620

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AC Surge protection SPBT12-280-...NPE50

- Test class I II according to IEC 61643-1
- SPD-type T1/ T2 according to EN 61643-11
- UC: 280 VAC
- Nominal discharge current (8/20) μ s L-N/N-PE: 25/50 kA
- Max. discharge current
- L-N/N-PE: 50/100 kA
- Impulse current (10/350) μ s L-N/N-PE: 12,5/50 kA

SPBT12 Type 1 + 2		
No. of poles	Model code	Art. No
1+NPE	SPBT12-280-1+NPE50	184752
3+NPE	SPBT12-280-3+NPE50	184750

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Energy storage

Safeguarding battery systems for safe, reliable, and resilient energy storage

Purpose

Ensure safe, compliant, and reliable operation of battery energy storage systems (BESS) by protecting high-power DC circuits from faults, overcurrents, and abnormal operating conditions.

Why it matters

Unlike photovoltaic generation, battery systems remain energised at all times. In the event of a fault, batteries can deliver extremely high fault currents within milliseconds, increasing the risk of fire, thermal runaway, equipment damage, and extended downtime. Robust, coordinated protection is therefore essential for safety, availability, and asset protection.

Key energy storage protection functions

- ✓ **Battery disconnection and emergency isolation** - Safe isolation of battery strings and DC buses for maintenance, fault handling, and emergency response.
- ✓ **Battery string and module protection** - Prevents fault propagation between parallel battery strings and limits damage within battery racks.
- ✓ **DC overcurrent and short-circuit protection** - Limits damage to cables, busbars, battery connectors, and power electronics
- ✓ **Fault containment and selective protection** - Enables fast, selective isolation of the affected battery section while maintaining system availability

Our solutions

We provide coordinated protection solutions specifically developed for battery energy storage systems. High-performance DC protection supports modern 1000 V and 1500 V DC BESS architectures, combining proven Bussmann® fuse technologies with compliance to IEC and UL battery, fuse, and installation standards.

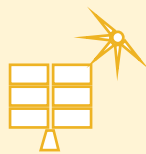
Typical applications



Residential



C&I Buildings PV



Utility Scale PV plants

Battery string and busbar overcurrent protection

Protect battery modules, interconnection cabling, busbars, and power conversion equipment from damage caused by short circuits, overloads, and internal battery faults. Unlike PV strings, battery systems can sustain fault current until protection devices operate. DC overcurrent protection must therefore interrupt high fault energy quickly and safely.

Typical requirements

- Very high DC breaking capacity for battery fault conditions
- Fast-acting protection to limit thermal and mechanical stress
- Suitability for parallel battery strings and modular architectures
- Selective coordination between string, rack, and system-level protection

Bussmann series 1500 VDC Fuses

Our Bussmann series Battery Energy Storage Systems (BESS) fuses, with their 1500 VDC rating, stand as a cornerstone in safeguarding the future of energy and powering innovations.

Rated voltage: 1500 VDC

Rated current: 100 A to 3000 A

Breaking capacity: 250 kA at 3ms or 4 ms L/R

Standard: IEC 60269-4; -7 (180D) and UL 248-13

Operating class: Fast acting aR type for semiconductor protection and aBat type for battery energy storage protection



Fuse size	180D	ESS	CBMG
1	TD135025EN		
2	TD135026EN	TD135030EN	
3	TD135027EN	TD135031EN	
4		TD135032EN	
24	TD135029EN		
5			TD135035EN

Transformers

Enabling safe, efficient, and compliant voltage transformation

Purpose

Enable safe and efficient voltage transformation to integrate photovoltaic and hybrid energy systems with building electrical networks and the public grid.

Why it matters

Photovoltaic inverters and energy storage systems operate at voltage levels that are not suitable for direct grid connection. Transformers form the critical interface between generation, storage, and distribution networks, ensuring electrical compatibility, system safety, and regulatory compliance. As long-life assets within solar installations, transformer reliability and correct integration are essential to minimise downtime and protect overall system performance.

Key transformer functions

- ✓ **Voltage transformation** - Steps voltage up or down to enable efficient power transfer and grid compatibility
- ✓ **Electrical isolation** - Provides galvanic separation to improve safety and limit fault propagation
- ✓ **System reliability and scalability** - Supports stable operation and modular expansion of PV and hybrid systems
- ✓ **Grid integration** - Forms the electrical interface between inverters, storage systems, and distribution networks

Our solutions

We offer transformer solutions designed for renewable energy applications, supporting commercial, industrial, and utility-scale systems. IEC-compliant designs, flexible power and voltage ratings, and optional biodegradable insulating fluids enable reliable operation, regulatory compliance, and alignment with sustainability objectives.

Typical applications



C&I Buildings PV



Utility Scale PV plants

Liquid immersed transformer

Liquid-immersed transformers are a proven solution for commercial, industrial, and utility-scale PV and hybrid systems, offering high efficiency, reliability, and long service life. Their liquid-based cooling and insulation make them well suited for higher power ratings and medium-voltage grid connection, with designs compliant with international standards such as IEC 60076.

Typical requirements

- Efficient cooling and thermal performance
- Electrical insulation and safety
- Suitability for outdoor and grid-connected installations
- Compliance with international standards

Eaton liquid-immersed type transformers are manufactured and tested in accordance with the IEC 60076 standard and can be further customised upon request. The standard power range is 25 kVA to 5 MVA with a maximum voltage level of 36 kV. Requests greater than 5 MVA will be evaluated on a project basis.

Rated power: Up to 5MW

Rated voltage: Up to 36 kV

Manufactured in accordance with EN, IEC, IEEE, CENELEC EN, BS EN 60076-7, BS EN 50588-1

Tested in accordance with IEC 60076

Different fluid options available: Mineral Oil, Natural Ester (Midel EN or FR3), Synthetic Ester (Midel 7131)

[Eaton.com link](#)



xGreen transformer

Our xGreen liquid-immersed transformer combines high efficiency, sustainable materials, and provides option to use biodegradable insulating oils to deliver optimized performance with minimal environmental impact. Designed for utilities and industries committed to reducing carbon emissions and meeting global sustainability goals.

Technical highlights

- High-Efficiency: Optimized to minimize no-load and load losses.
- Biodegradable Insulating Oil: Tested for reliability and environmental safety.
- Customizable Ratings: Available in multiple power and voltage configurations.

Sustainability impact

- CO2 Reduction Calculator: Quantifies lifetime carbon savings for transparent reporting.
- Lifecycle Approach: Designed for recyclability and reduced waste at end-of-life.
- Supports ESG Goals: Helps customers meet sustainability and regulatory requirements.

Switchgear

Enabling safe connection, protection, and grid integration

Purpose

Control, protect, and isolate electrical equipment to ensure safe, reliable, and compliant operation of photovoltaic and hybrid energy systems across low- and medium-voltage levels.

Why it matters

As system sizes increase and solar installations become more complex, switchgear plays a critical role in plant safety, availability, and grid interaction. Effective LV and MV switchgear ensures selective fault clearance, safe maintenance, and reliable power distribution—while supporting regulatory compliance and long-term operational stability.

Key switchgear functions

- ✓ **Power switching and isolation** - Safe connection and disconnection of feeders, transformers, and grid interfaces
- ✓ **Fault protection** - Fast isolation of short circuits and overloads to prevent equipment damage and minimise downtime
- ✓ **System segmentation** - Sectionalising large PV plants into manageable zones for maintenance and fault containment
- ✓ **Grid interface control** - Secure and compliant connection at the point of common coupling (PCC)

Low and medium voltage coverage

- **Low Voltage (LV) switchgear (< 1 kV)**
Protects inverter outputs, AC collection systems, and on-site distribution while enabling selective protection and safe maintenance close to generation equipment.
- **Medium Voltage (MV) switchgear (up to 36 kV)**
Interfaces solar plants and hybrid systems with utility networks, protecting transformers and MV feeders and ensuring stable, compliant grid connection—particularly in utility-scale installations.

Our solutions

We offer a coordinated portfolio of LV and MV switchgear solutions for solar applications. Modular, IEC-compliant designs support scalable architectures, simplified integration, and safe operation, while SF₆-free MV technologies contribute to sustainability goals.

Typical applications



Residential



C&I Buildings PV



Utility Scale PV plants

Medium voltage switchgear

	Power Xpert UX	Xiria 630	Xiria NGX
Medium voltage role	Primary MV Switchgear	Secondary MV Switchgear / RMU	High end secondary MV Switchgear
Typical voltage	Up to 24 kV (36 kV variants available)	Up to 24 kV	Up to 24 kV
Grid position in a Utility scale installation	Solar substation Points of Common Coupling (PCC) Between step-up transformer and grid	MV Feeder distribution Ring Main Units (RMUs) Between inverter step-up transformers and secondary MV Network	Compact indoor distribution substations Within solar power plants (secondary MV network) Between inverter step-up transformers and MV Feeders Utility secondary distribution substations
Solar plant function	Main MV connection and protection	Local MV switching and distribution	Secondary MV switching and protection
Relation to inverter	Grid/Primary side of the transformer	Secondary MV distribution side of the transformer	Downstream of inverter transformer

Power Xpert

Our Power Xpert FMX, UX, and UX36 switchgear solutions are engineered for reliability, safety, and adaptability in a variety of medium voltage power distribution scenarios. With features such as modularity, advanced monitoring, and strong environmental credentials, these products support the evolving needs of modern electrical networks in commercial, industrial, and utility sectors.

Power Xpert			
	FMX	UX	UX 36
Rated voltage	Up to 24 kV	Up to 24 kV	Up to 36 kV
Rated current	Up to 2000 A	Up to 4000 A	Up to 2500 A
Rated short-circuit level	Up to 25 kA - 3s	Up to 50 kA - 3s	Up to 31.5 kA - 3s
Eaton.com link	FMX	UX	UX36



FMX



UX



UX 36

Xiria 630

Our Xiria 630 compact switchgear up to 24kV – 20kA delivers reliability and sustainability. Based on over 20 years of market-proven SF₆-free Air-GIS technology, it ensures optimized maintenance and safety while significantly reducing the number of costly end-of-life disposal procedures. Xiria is IEC certified and ENA-TS and GOST approved.

- Rated voltage: 3.6 kV to 24 kV
- Impulse withstand voltage: 40 kV to 125 kV
- Standards: IEC 622271

[Eaton.com link](#)



Xiria NGX

Our Xiria NGX is an IEC certified, SF₆ free, medium voltage switchgear platform for high end secondary distribution applications, building on proven Air-GIS technology, offering higher ratings and indoor focused designs.

Xiria NGX is well suited for commercial solar installations requiring MV connection, especially where:

- Higher short circuit levels are present
- Indoor secondary substations are required
- Reliability, safety, and low maintenance are critical
- Rated voltage: up to 24 kV
- Rated current/short-circuit : up to 1250 A / 25 kA

[Eaton.com link](#)



Low voltage switchgear

xEnergy Safety Ci

Eaton's xEnergy Safety modular power distribution system is a multi-box-type, low-voltage switchgear assembly. Made from polycarbonate, it has been designed to meet the most stringent requirements, including corrosion protection, for applications up to 1600 A. These fully insulated distribution enclosures can withstand almost any type of environmental impact, such as dust, moisture and water.renovation projects.

- Degree of protection IP65
- Standards: IEC 61439
- Surface mounted, flush mounted and semi-recessed

[Eaton.com link](#)



Enclosures and distribution boards

Providing safe, organised, and compliant housing for electrical systems

Purpose

Provide safe, compliant, and structured housing for protection, switching, monitoring, and control components, enabling reliable power distribution across photovoltaic and hybrid energy systems.

Why it matters

Enclosures and distribution boards form the physical backbone of electrical installations. Correct selection directly impacts safety, reliability, and long-term performance. Well-designed enclosures protect equipment from environmental influences, support clear circuit segregation, and simplify installation, commissioning, and maintenance—while ensuring compliance with applicable standards.

Key enclosure and distribution board functions

- ✓ **Environmental protection** - Shields electrical components from dust, moisture, temperature extremes, and mechanical impact
- ✓ **Electrical safety** - Prevents accidental contact, reduces shock risk, and supports safe operation and maintenance
- ✓ **Power distribution** - Organises and routes circuits efficiently for reliable energy flow and fault isolation
- ✓ **System integration** - Enables structured wiring, device mounting, and modular system expansion

Our solutions

We offer a comprehensive portfolio of enclosures and distribution boards for indoor and outdoor applications. IEC-compliant designs, modular architectures, and pre-configured solutions reduce installation effort, support standardised system layouts, and improve reliability across residential, commercial, and utility-scale installations.

Application coverage

- **Residential and light commercial PV**
Compact, pre-assembled distribution boards for fast installation
Indoor and outdoor enclosures with appropriate IP ratings
- **Commercial and industrial PV**
Modular enclosure systems supporting higher power levels
Clear segregation of DC, AC, protection, and control circuits
- **Utility-scale installations**
Robust outdoor cabinets and distribution assemblies
Integration with LV switchgear, grid protection, and monitoring systems

Typical applications



Residential



C&I Buildings PV



Utility Scale PV plants

Enclosures

xEffect enclosures

Our xEffect enclosures are designed to provide robust and reliable protection for a range of electrical installations, ensuring both safety and efficient operation in commercial, industrial, and residential environments. As part of Eaton's commitment to quality and innovation, the xEffect series offers solutions that meet stringent standards for durability, flexibility, and ease of use.

xEffect enclosures				
	IP Protection	Material	Standards	Eaton.com link
Ci	IP65	Polycarbonate	IEC/EN 62208	
CP	IP66	Polycarbonate	IEC/EN 62208, IEC/EN 61439-1, IEC/EN 61439-4	CP
CS	IP66	Steel	IEC/EN 62208, IEC/EN 61439-4	CS



xEffect - CP



xEffect - Ci

xEffect - CS

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xEnergy Basic

Designed to perform in the toughest outdoor conditions, our xEnergy Basic outdoor cabinets with IP44 and IK10 ratings offers long-term durability, flexibility and compatibility. Whether exposed to salty coastal air, industrial pollution, or harsh weather, this cabinet ensures reliable protection and long-term performance. The cabinet is made of aluminium, which is lightweight, durable, and better at handling heat than plastic alternatives. Fully compatible with Eaton's ProfiSNAP system, it also allows vertical partitioning for 800 mm and 1100 mm widths using BPZ-USF accessories.

- 14 different sizes
- Mounting options: ground, platform, wall and pole mounting
- 180° door opening angle to fit in xEnergy Basic range
- External doors include swing handel for double-cylinder lock



xEnergy Basic				
Dimensions (mm)			Model code	Article number
Width	Height	Depth		
400	760	250	BP-VF/DZ-400/7-S00	EP-505010
400	1060	250	BP-VF/DZ-400/10-S00	EP-505011
400	1260	250	BP-VF/DZ-400/12-S00	EP-505012
600	760	320	BP-VF/DZ-600/7-S0	EP-505013
600	1060	320	BP-VF/DZ-600/10-S0	EP-505014
600	1260	320	BP-VF/DZ-600/12-S0	EP-505015
600	1560	320	BP-VF/DZ-600/15-S0	EP-505016
800	760	320	BP-VF/DZ-800/7-S1	EP-505017
800	1060	320	BP-VF/DZ-800/10-S1	EP-505018
800	1260	320	BP-VF/DZ-800/12-S1	EP-505019
800	1560	320	BP-VF/DZ-800/15-S1	EP-505020
1120	1060	320	BP-VF/DZ-1100/10-S2	EP-505021
1120	1260	320	BP-VF/DZ-1100/12-S2	EP-505022
1120	1560	320	BP-VF/DZ-1100/15-S2	EP-505023
Eaton.com link				

Enclosures

xComfort KLV

Our xComfort KLV is a flush and hollow-wall mounted compact distribution enclosure for residential and small commercial applications. In addition to an extensive range of 1- to 5-row energy distribution cabinets designed and approved according to IEC/EN 62208 and IEC/EN 60670-24, the series also includes multimedia and hybrid enclosures. In combination with Eaton's established range of modular switching and protection devices and our innovative online configurator, the system offers the perfect solution for energy distribution according to IEC/EN 61439-3 for both new builds and renovation projects.



- Degree of protection IP30
- Protection class II, fully insulated
- 1 to 5 rows, 12 module units and 2 spare MU in each row
- Hollow-wall and flush-mounted version

[Eaton.com link](#)

xComfort IKA

Our xComfort IKA is a surface mounted enclosure series for residential, commercial and industrial applications. It offers 12 different size options and durable plastic materials like ABS and UV-resistant polycarbonate. High degree of protection (IP65) and the foam all-round sealing ensures safe operation even in harsh environments. Paired with Eaton's modular devices and xWire configurator, it's ideal for IEC/EN 61439-compliant energy distribution.



- Protection class II, totally insulated
- Industrial version (PC) or PRO/Standard version (ABS)
- 1 to 4-rows, 12 and 18 module units

[Eaton.com link](#)

Distribution boards

xComfort IKA Solar

Our xComfort IKA SOLAR range provides pre-assembled, ready-to-connect DC string boxes for single-family homes and smaller buildings, tested to IEC 61439-2 Annex DD standards. These boxes are designed to protect photovoltaic systems, including panels and inverters, from overvoltage and electrical surges, thereby helping to prevent costly damage and failures as the installation of PV systems on residential and small commercial rooftops increases.



EP-501983



EP-501990

With DC String circuit breaker and DC Surge arrester - Indoor installation					
Rated current InA	PV String	Surge arrester type	Connection	Model code	Art No.
19.5 A	1 x IN + 1 x OUT	Type 2	Directly on device	IKA-SOL20-X11-PKZ-T2-1/8-VM-A	EP-501983
19.5 A	1 x IN + 1 x OUT	Type 2	MC4	IKA-SOL20-X11-PKZ-T2-1/8-MC4-A	EP-501984
2 x 20 A	2 x IN + 2 x OUT	Type 2	Directly on device	IKA-SOL20-X22-PKZ-T2-1/18-VM-A	EP-501985
2 x 20 A	2 x IN + 2 x OUT	Type 2	MC4	IKA-SOL20-X22-PKZ-T2-1/18-MC4-A	EP-501986
With DC Surge arrester - Outdoor installation					
Rated current InA	PV String	Surge arrester type	Connection	Model code	Art No.
19.5 A	1 x IN + 1 x OUT	Type 2	MC4	IKA-SOL20-X11-T2-1/8-MC4-B	EP-501987
19.5 A	1 x IN + 1 x OUT	Type 1+2	MC4	IKA-SOL20-X11-T12-1/8-MC4-B	EP-501988
2 x 20 A	2 x IN + 2 x OUT	Type 2	MC4	IKA-SOL20-X22-T2-1/8-MC4-B	EP-501989
2 x 20 A	2 x IN + 2 x OUT	Type 1+2	MC4	IKA-SOL20-X22-T12-1/8-MC4-B	EP-501990

[Eaton.com link](#)

Grid and power system protection

Ensuring safe, compliant, and stable interaction with the electrical grid

Purpose

Ensure safe, compliant, and stable operation of grid-connected photovoltaic and hybrid energy systems by monitoring grid conditions and disconnecting generation assets when required.

Why it matters

As decentralised power generation continues to grow, photovoltaic systems must operate in strict coordination with the public grid. Abnormal grid conditions, such as voltage or frequency deviations, can endanger personnel, damage equipment, and disrupt network stability. Grid protection is therefore a mandatory requirement to ensure safety, regulatory compliance, and reliable grid

Key grid protection functions

- ✓ **Grid monitoring** - Continuous supervision of voltage, frequency, and phase conditions
- ✓ **Fault detection and isolation** - Rapid disconnection during grid disturbances or internal faults
- ✓ **Anti-islanding protection** - Prevents unintended energisation of the grid during outages
- ✓ **Controlled reconnection** - Enables safe system restart once grid conditions return to normal

Our solutions

We provide proven, pre-assembled grid and power system protection solutions aligned with international and regional grid codes. Coordinated relay- and contactor-based concepts simplify system design, approval, and commissioning while ensuring reliable operation across low- and medium-voltage grid interfaces.

Application coverage

- **Residential and light commercial PV**
Mandatory grid disconnection in case of voltage or frequency deviations
Protection devices integrated close to the inverter
- **Commercial and industrial PV**
Dedicated grid protection relays and switching devices
Compliance with local grid codes and utility requirements
- **Utility-scale installations**
Protection schemes at the point of common coupling (PCC)
Coordination with MV/LV switchgear, transformers, and substations

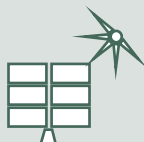
Typical applications



Residential



C&I Buildings PV



Utility Scale PV plants

NAS Contactor combination

Our NAS compact, plug-and-play network and system protection combinations are suitable for systems from 30 kVA to 135 kVA and come in a plastic housing with IP65 protection. Both series meet the requirements of VDE-AR-N 4105:2018-11. The devices consist of one or two contactors connected in series, which are controlled via an NAS protection relay and come pre-wired and mounted in enclosure. If only one breaker is used, the generator system must be switched off via a control line in the event of a fault. No UPS or buffer storage is necessary when using NAS. The network and system protection combinations must be installed between the inverter and the supply terminal.



- **Power:** 30 and 135 kVA
- **Rated current AC-1:** Up to 160 A
- **Number of poles:** 4-pole (3-pole + Neutral)
- **Standards:** VDE-AR-N 4105:2018-11
- **Degree of protection:** IP65

NAS First generation (with two decoupling units)			
Current	Power	Model code	Art. No
63 A	43 kVA	NAS63-CI-1	168106
80 A	55 kVA	NAS80-CI-1	168107
125 A	86 kVA	NAS125-CI-1-K95	168110
160 A	100 kVA	NAS160-CI-1-K95	168111



NAS Second generation (with one decoupling unit)			
Current	Power	Model code	Art. No
63 A	43 kVA	NAS63-CI-2	198273
80 A	55 kVA	NAS80-CI-2	198274
125 A	86 kVA	NAS125-CI-2-K95	198275
160 A	100 kVA	NAS160-CI-2-K95	198276
190 A	130 kVA	NAS190-CI-2-K150	198277



[Eaton.com link](https://www.eaton.com)

Vizualisation and monitoring

Providing clear insight and operational control across energy systems

Purpose

Enable clear system visibility, real-time monitoring, and operational control for photovoltaic and energy storage installations to support safe, efficient, and reliable operation.

Why it matters

As PV and hybrid energy systems increase in size and complexity, operational transparency becomes critical. Clear visualisation and monitoring allow operators to understand system performance at a glance, detect faults early, and respond quickly to abnormal conditions, reducing downtime, improving safety, and optimising energy yield over the system lifecycle.

Key visualisation and monitoring functions

- ✓ **Real-time monitoring** - Continuous visibility of electrical values, system status, and alarms
- ✓ **Visualisation of energy flows** - Clear representation of power flows between PV generation, storage, loads, and the grid
- ✓ **Local and remote access** - On-site HMIs and remote access via web panels and networked systems
- ✓ **Diagnostics and fault indication** - Faster troubleshooting and reduced service effort
- ✓ **Data collection and communication** - Interface to higher-level energy management or SCADA systems

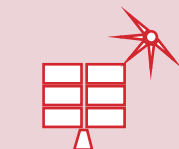
Our solutions

We provide scalable visualisation solutions ranging from compact HMIs to advanced web-based panels. Integrated HMI, PLC, and HMI/PLC platforms simplify system architectures, support standard industrial communication protocols, and integrate seamlessly with Eaton protection, control, and power distribution solutions.

Typical applications



C&I Buildings PV



Utility Scale PV plants



OEM Inverter

HMIs, HMI/PLCs and Webpanels

Our HMI portfolio (XV100, XV300, XH300, and XP500) caters to a wide range of industrial automation needs. From cost-effective, compact panels for simple tasks to ruggedised and high-performance HMIs for complex and challenging environments, Eaton provides reliable solutions to support modern manufacturing and process operations.

HMI	XV100	XV300	XH300	XP500
Display size (inches)	3.5, 5.7 and 7"	7, 10.1 and 15.6"	7"	10.1, 15.6 and 21.5"
Operating system	Linux	Linux	Linux	Windows 10 Enterprise LTSC
Eaton.com links	XV100	XV300	XH300	XP500



XV100



XV300



XH300



XP500

Automation and control

Enabling intelligent, stable, and compliant system operation

Purpose

Enable coordinated control, system logic, and communication to ensure safe, stable, and efficient operation of photovoltaic and hybrid energy systems under all operating conditions.

Why it matters

Modern PV and energy storage installations are dynamic systems, with continuously changing generation, loads, and grid conditions. Automation and control systems coordinate these interactions in real time, executing control logic, enforcing protection and interlocking functions, and ensuring compliant system behaviour. Effective automation is essential to maintain stability, maximise availability, and support reliable operation throughout the system lifecycle.

Key automation and control functions

- ✓ **System control and logic** - Coordinated control of PV generation, energy storage, loads, and grid interaction
- ✓ **Sequence control and interlocking** - Safe start-up, shutdown, and fault handling across system components
- ✓ **Grid-compliance functions** - Execution of disconnection, reconnection, and operating limits as required by grid codes
- ✓ **Communication and data exchange** - Interface with inverters, protection devices, meters, and higher-level systems

Scalable automation architectures - From local control to plant-level automation for large installations

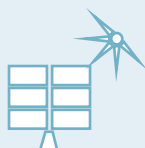
Our solutions

We provide a broad automation and control portfolio ranging from compact programmable relays to high-performance PLC platforms. Integrated solutions enable standardised, repeatable system designs, support open communication protocols, and integrate seamlessly with Eaton protection, visualisation, and power distribution technologies.

Typical applications



C&I Buildings PV



Utility Scale PV plants



OEM Inverter

Programmable logic controllers

Our Programmable Logic Controllers (PLCs) play a key role in the automation and control of modern photovoltaic (PV) and hybrid energy systems. They execute control logic, manage system sequencing, and enable reliable communication between inverters, protection devices, energy storage systems, and grid interfaces. From simple local control to complex plant-level automation, PLCs help ensure safe, stable, and compliant operation under all operating conditions.

easyE4 Nano, XC100, XC200 and XC300 PLCs

	easyE4 Nano PLC	XC100 PLC	XC200 PLC	XC300 PLC
Product class	Nano PLC / smart relay	Entry-level modular PLC	Mid-range modular PLC	High-performance modular PLC
Typical application size	Small, localized control	Simple automation tasks	Medium-complexity systems	Large and complex systems
Controller architecture	Integrated base with expansions	Modular CPU + snap-on I/O	Modular CPU + expanded I/O	Modular CPU + high-density I/O
Programming environment	easySoft	CODESYS 3 (IEC 61131-3)	CODESYS 3 (IEC 61131-3)	CODESYS 3 (IEC 61131-3)
Performance level	Basic sequencing & logic	Low to medium performance	Medium performance	High performance, fast cycle times
Base I/O (typical)	12 I/O (model dependent)	Integrated I/O on CPU	Integrated I/O on CPU	Integrated I/O on CPU
Supported protocols	Modbus TCP, Modbus RTU (optional)	Modbus TCP, OPC UA	Modbus TCP, OPC UA, CANopen	Modbus TCP, OPC UA, EtherNet/IP, CANopen, EtherCAT
Web visualization	Integrated web server	HTML5 web visualization	HTML5 web visualization	Advanced HTML5 web visualization
Eaton.com links	easyE4 Nano PLC	XC100 PLC	XC200 PLC	XC300 PLC



easyE4 Nano



XC100



XC200



XC300

easyE4 Programmable relays

Our easyE4 is a compact, modular control relay for implementing logic, monitoring, and communication functions in photovoltaic and hybrid energy systems. It enables OEMs to integrate control tasks such as inverter interfacing, grid-compliance logic, energy flow control, and system supervision within standardised hardware platforms. With expandable I/O and support for industrial communication interfaces, easyE4 supports scalable design-in architectures across PV, storage, and energy management applications while reducing development effort and platform complexity.

Description	Input		Output		Features			Supply voltage	Part No. Article No	
	Digital	Digital analog	Transistor	Relay (8 A)	Display + Keypad	Real-time clock	Ethernet		Screw terminal	Push-in terminal
Base device, 12/24 VDC, 24 VAC, display, keypad	8	4	-	4	✓	✓	✓	12/24 VDC 24 VAC	EASY-E4-UC-12RC1 197211	EASY-E4-UC-12RC1P 197504
Base device 12/24 VDC, 24 VAC	8	4	-	4	-	✓	✓	12/24 VDC 24 VAC	EASY-E4-UC-12CX1 197212	EASY-E4-UC-12CX1P 197505
Base device, 24 VDC, display, keypad	8	4	8	-	-	✓	✓	24 VDC	EASY-E4-DC-12TC1 197213	EASY-E4-DC-12TC1P 197506
Base device, 24 VDC	8	4	8	-	-	✓	✓	24 VDC	EASY-E4-DC-12TCX1 197214	EASY-E4-DC-12TCX1P 197507
Base device, 100-240 VAC/VDC, display, keypad	8	-	-	4	-	✓	✓	100/240 VAC / VDC	EASY-E4-AC-12RC1 197215	EASY-E4-AC-12RC1P 197508
Base device, 100-240 VAC/VDC	8	-	-	4	-	✓	✓	100/240 VAC / VDC	EASY-E4-AC-12RCX1 197216	EASY-E4-AC-12RCX1P 197509

[Eaton.com link](#)



Notes

[illegible]

Eaton is an intelligent power management company dedicated to protecting the environment and improving the quality of life for people everywhere. We make products for the data center, utility, industrial, commercial and institutional, machine building, residential, aerospace and mobility markets. We are guided by our commitment to do business right, to operate sustainably and to help our customers manage power - today and well into the future. By capitalizing on the global growth trends of electrification and digitalization, we're helping to solve the world's most urgent power management challenges and building a more sustainable society for people today and generations to come.

Founded in 1911, Eaton has continuously evolved to meet the changing and expanding needs of our stakeholders. With revenues of \$27.4 billion in 2025, the company serves customers in 180 countries.

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Eaton

EMEA Headquarters
Route de la Longeraie 7
1110 Morges
Switzerland
[Eaton.com](https://www.eaton.com)

Electrical Sector

Eaton Industries GmbH
Hein-Moeller-Str. 7-11
53115 Bonn
Germany

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