Photovoltaic panel shutdown with SOLARCHECK RSD

Electrical safety in photovoltaic systems

PHOENIX CONTACT
INSPIRING INNOVATIONS

The risks of working with high voltage

Even in low-light conditions, photovoltaic rooftop systems generate lethal voltages. This is normally not a problem, however, it can become very dangerous if the system is damaged.

People are exposed to a high safety risk during installation, maintenance and in hazardous situations.

Danger – high voltage!

Access to a photovoltaic system must be strictly limited to authorized personnel only.

Installation, maintenance, hazardous situations – the risks of working with high voltage

Installation engineers and maintenance technicians

During the installation and wiring of the panels to the strings, as well as during maintenance, cleaning and repair of the system, special measures must be taken to ensure safe working with high voltages.

Roofers and carpenters

People who are not trained as electricians must also take hazardous voltages of the photovoltaic system into account when working on the roof or on the substructure.

Fire departments

Emergency responses to fire, flooding, rescue operations and cleanup efforts are especially difficult and dangerous due to potential system defects.

Danger – high voltage!

The facts:

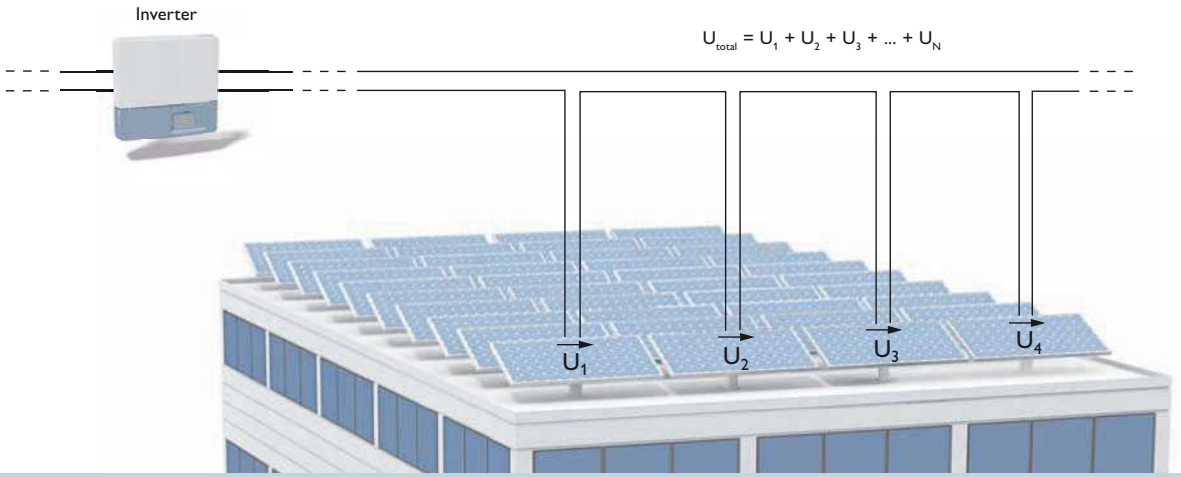
The series connection of photovoltaic panels to strings generates system voltages of up to 1000 V DC.

Note: voltages as low as 120 V DC can be fatal!

Potential risks for people:

- Electric shock due to contact with defective panels and cables
- Electric shock due to current bridges between exposed parts of the system and extinguishing water or flooding
- Burns caused by electric arcs

Danger!
Up to 1000 volts



How to ensure electrical safety in photovoltaic systems?

As a general health and safety measure to protect against electric shock, electrical equipment with a voltage of 120 V DC or more must always be disconnected.

Ideally, it should also be possible to put the photovoltaic systems automatically into a safe state as a result.

What must be done in a photovoltaic system?

The usual disconnection method at the inverter does not provide a sufficient level of safety. High voltages continue to be present in DC cables.

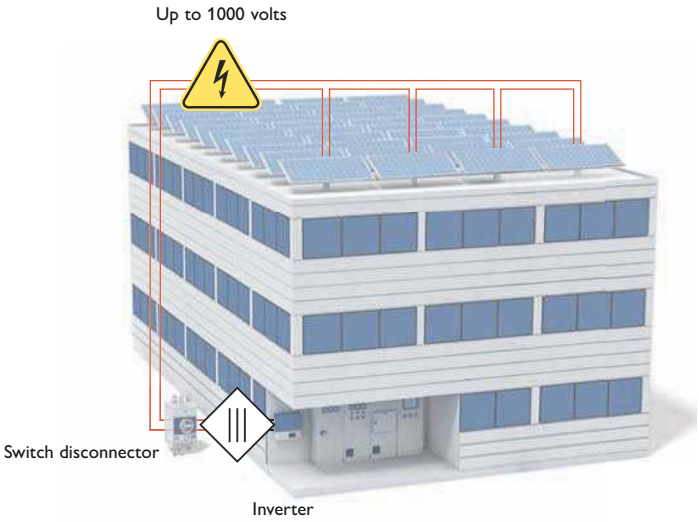
Switch-off solutions for photovoltaic systems

1. Switch disconnectors on the inverter

Switch disconnectors, which have been required on inverters since 2006, only interrupt the current flow on the DC side of the inverter.

Note! The full system voltage continues to be present on the string and DC bus cables.

Danger!
Up to 1000 volts

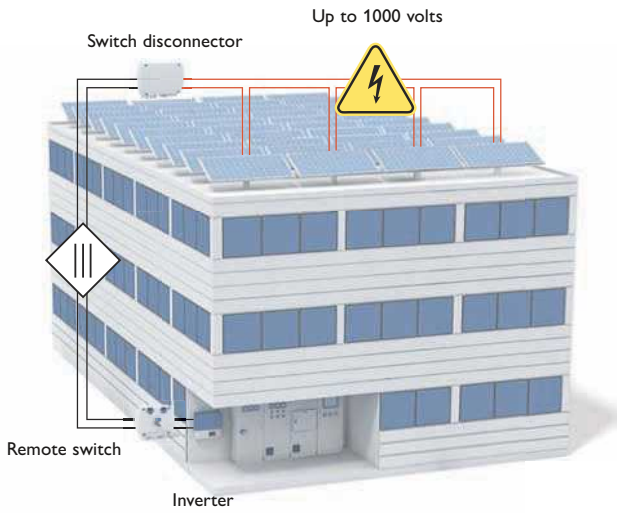


2. Switch-off on the string combiner box (SCB)

Switch disconnectors in the SCB, for example, are actuated via a central remote switch on the inverter. They interrupt the current flow of the individual string lines when the electricity is transferred to the panel field.

Note! Full system voltage is still present from the photovoltaic panels to the switch disconnectors.

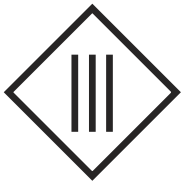
Danger!
Up to 1000 volts



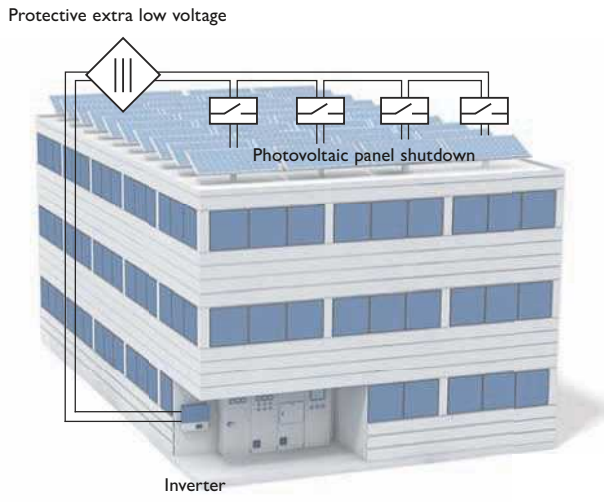
3. Photovoltaic panel shutdown

Switching off each photovoltaic panel individually disconnects each panel from the string.

Safety is ensured: maximum system voltage is within the range of protective extra low voltage.



Danger avoided!
Protective extra low voltage provided



Electrical safety in photovoltaic systems SOLARCHECK RSD

The intelligent photovoltaic panel shutdown SOLARCHECK RSD shuts down your system during installation, maintenance or in hazardous situations.

Safe working conditions
Use SOLARCHECK RSD to easily switch off the photovoltaic system via the inverter, ensuring protection against life-threatening electric shocks.

Maximum safety with SOLARCHECK RSD

Extinguish fires and carry out rescue operations safely

In dangerous situations, such as fires and flooding, a maximum level of safety is provided for emergency personnel. The fire department can act immediately, safely rescue people and minimize damage to buildings considerably.

Protection of personnel

With SOLARCHECK RSD, each operator can shut down his or her system for cleaning and maintenance purposes. In doing so, the operator is taking responsibility for the safety of his/her personnel.

Save on insurance premiums

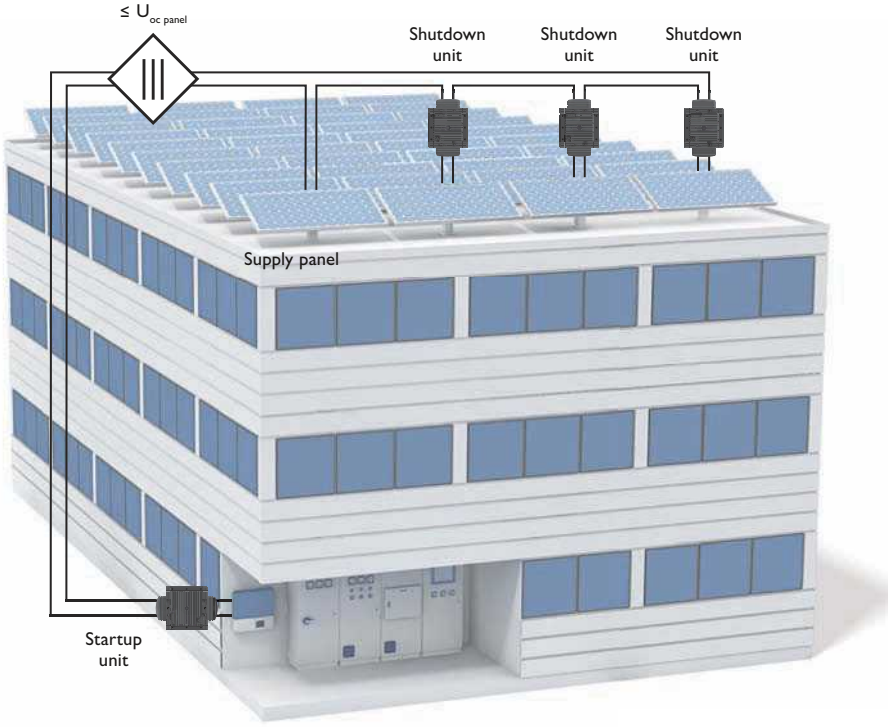
Insurance companies must calculate the risk of damage or personal injury that can result from defects in the system.

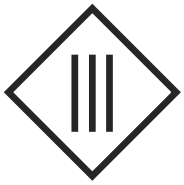
A lower risk potential is consequently reflected in reduced insurance premiums.

SOLARCHECK RSD photovoltaic panel shutdown

SOLARCHECK RSD consists of shutdown units for the individual photovoltaic panels and startup units used to restart the system. Each shutdown unit disconnects the corresponding photovoltaic panel from the string group. The disconnection is carried out automatically in cases of defects and during each shutdown of the inverter.

At most, the entire DC side of the photovoltaic system is at the maximum off-load voltage of a panel, i.e. in the protective extra low voltage range. There is no risk of an electric shock.





Danger avoided!
Protective extra low voltage provided

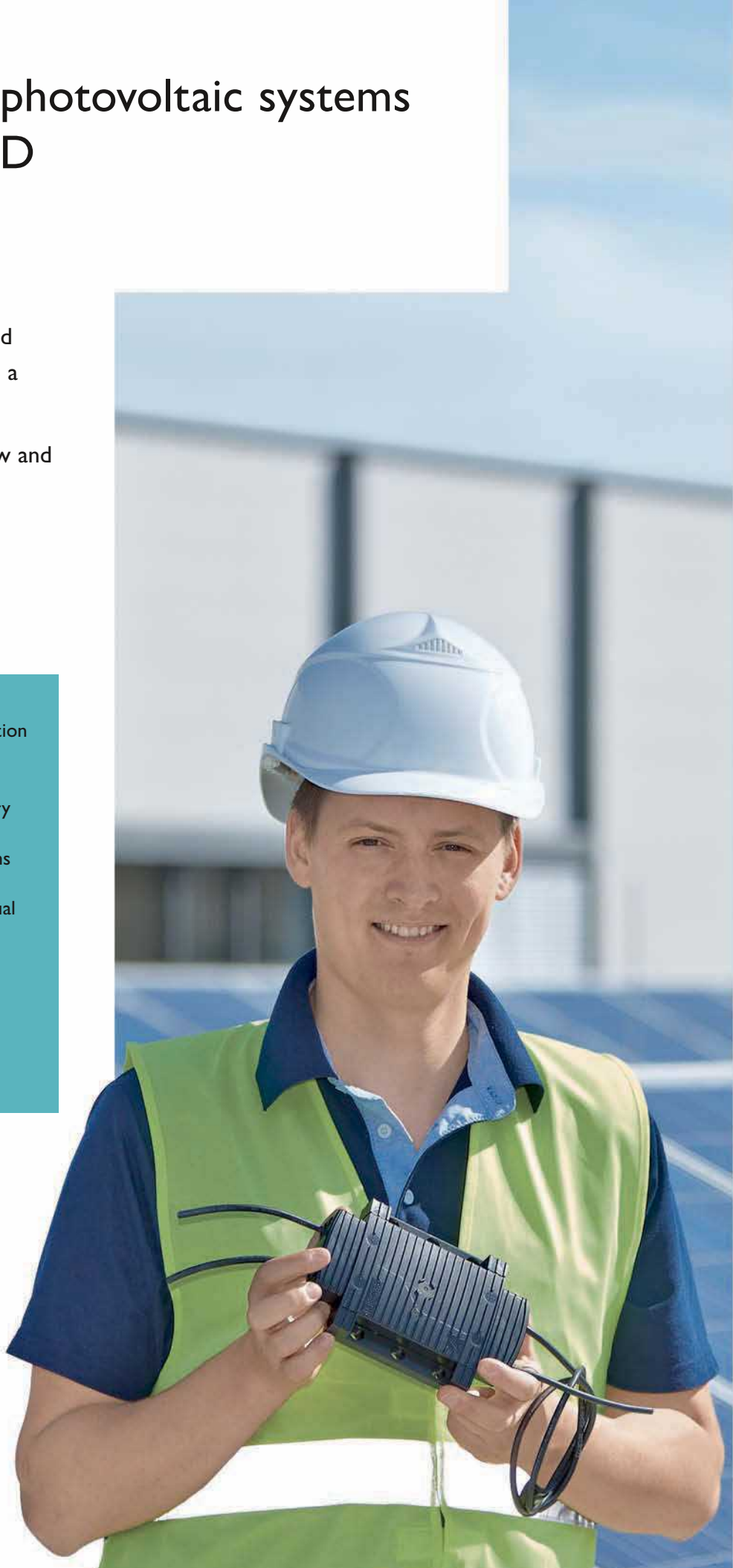
Electrical safety in photovoltaic systems SOLARCHECK RSD

SOLARCHECK RSD independently detects typical defects in the string and automatically switches your system to a safe state.

The system can be integrated into new and existing systems effortlessly.

Your advantages

- Safety as a result of patented fault detection and safe photovoltaic panel shutdown
- Controlled restart via safe autostart
- No additional communication is necessary via cables or wirelessly
- Easy to install in new and existing systems using existing DC cables
- Simple startup: no programming or manual set-up necessary



Phoenix Contact – quality from a single source

Tested quality

The development and production of SOLARCHECK RSD is carried out completely in-house. This is the only way we can ensure the highest level of quality. Numerous tests in our in-house reference systems demonstrate the system's suitability for long-term daily use and ensure our high quality standards, which go well beyond the standard requirements in place.

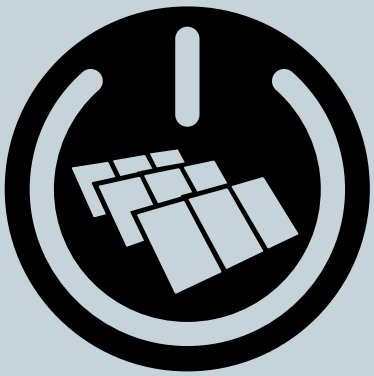
Intelligent photovoltaic panel shutdown with Auto Rapid Shutdown

Based on the analysis of current and voltage conditions in the string lines and in the individual panels, the SOLARCHECK RSD system shutdown units are able to distinguish between the various operating states.

In accordance with the fail-safe principle, any deviation from a normal operating state leads to a shutdown, regardless of whether the inverter is shut down, a string line or panel is defective, etc. The intelligent startup unit automatically puts the system back into operation when a safe and technically faultless system environment is present.

SOLARCHECK RSD tracks the operating state of the inverter. For purposes such as maintenance tasks, this allows the system to easily be switched on and off manually using the inverter.

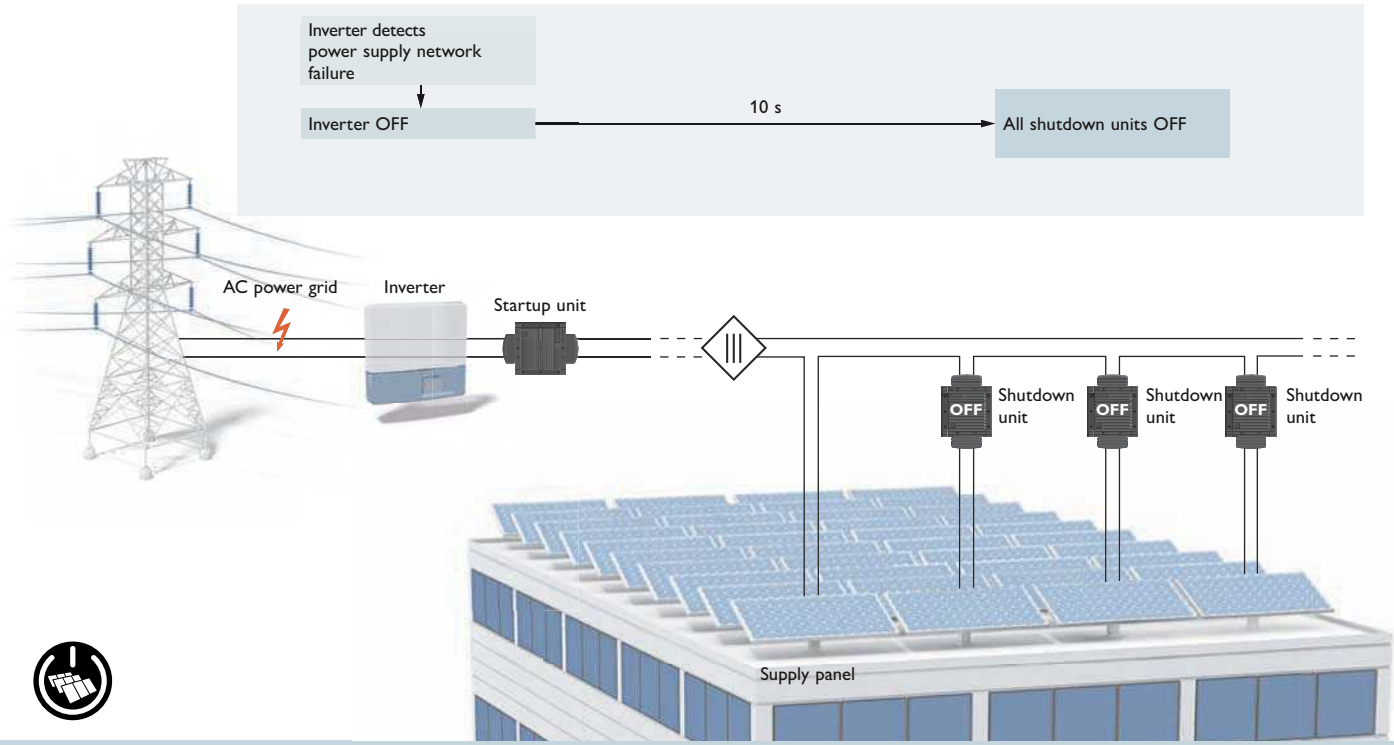
This technology, developed and patented by Phoenix Contact, is more reliable and faster than any human assessment or manual intervention.



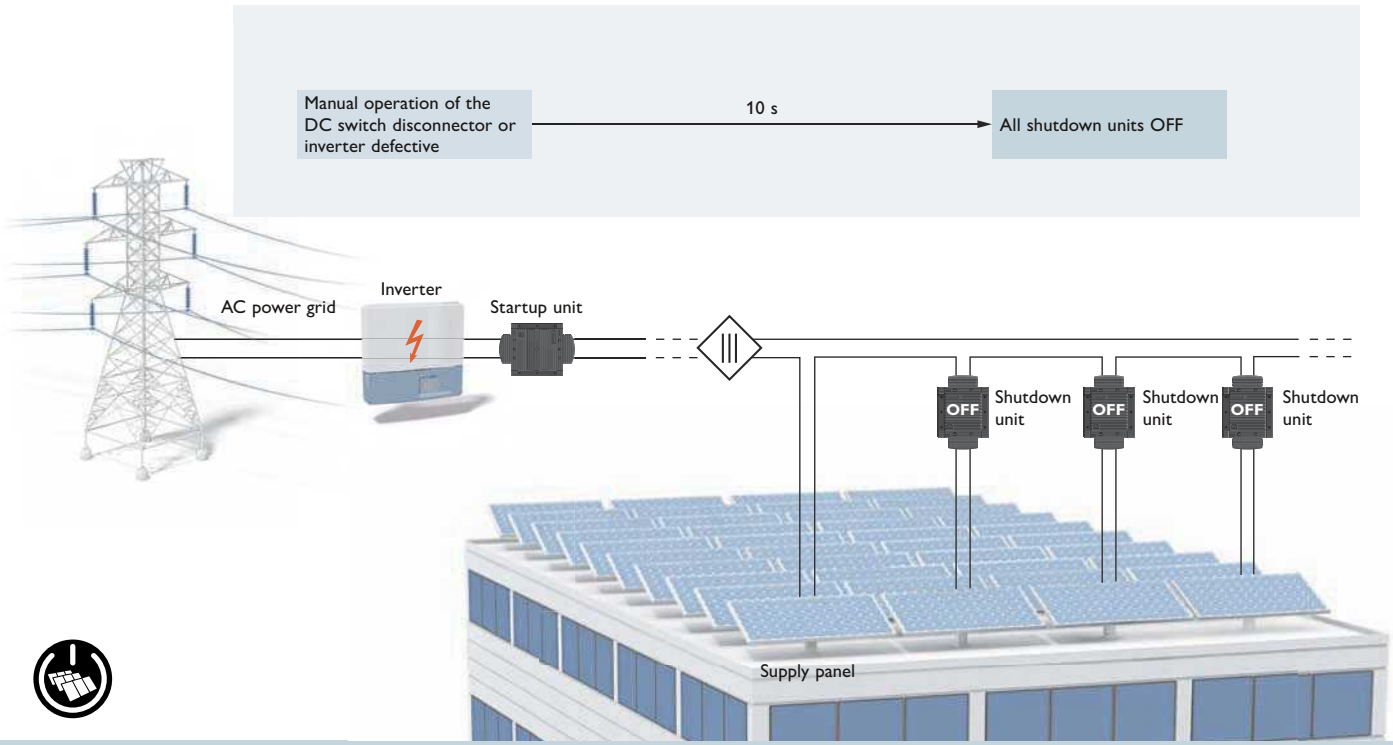
Auto Rapid Shutdown

Auto Rapid Shutdown – shutdown functions

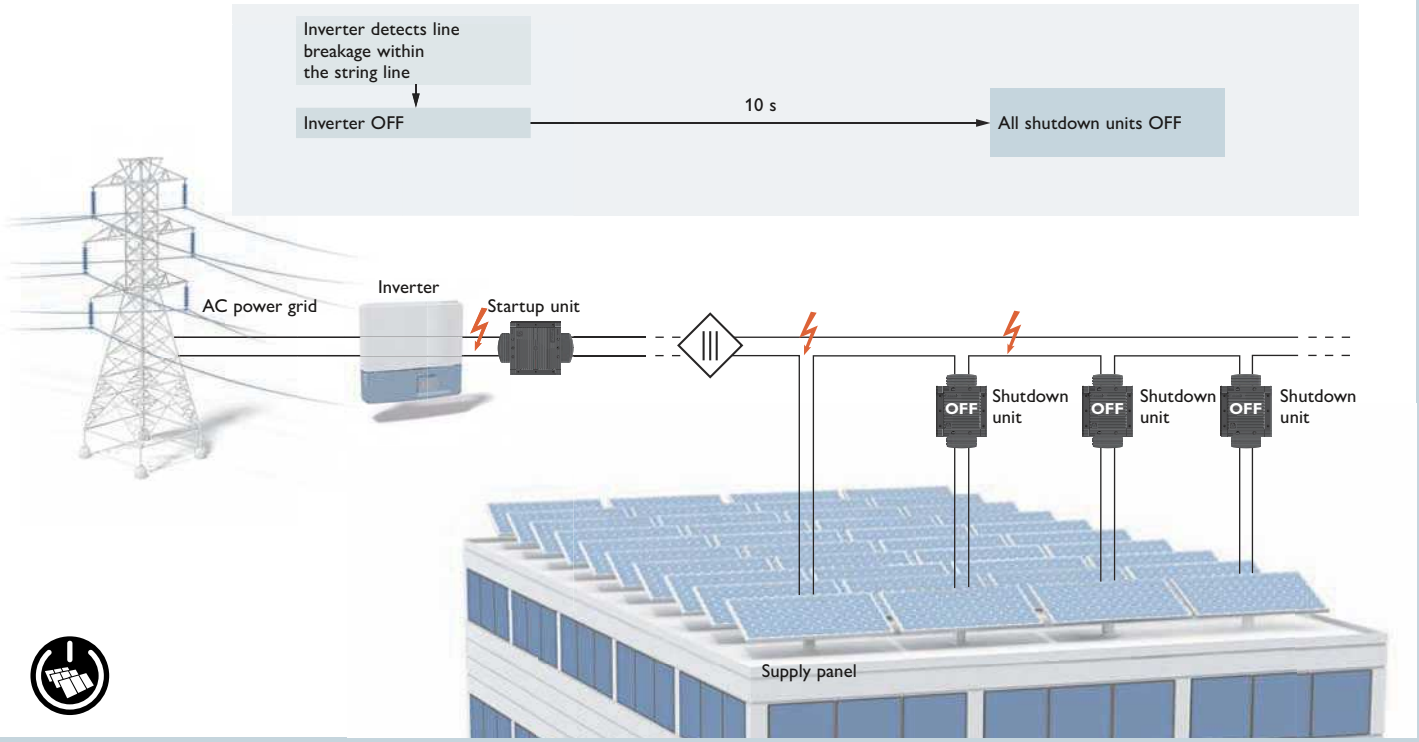
Photovoltaic panel shutdown in the event of power supply network failure



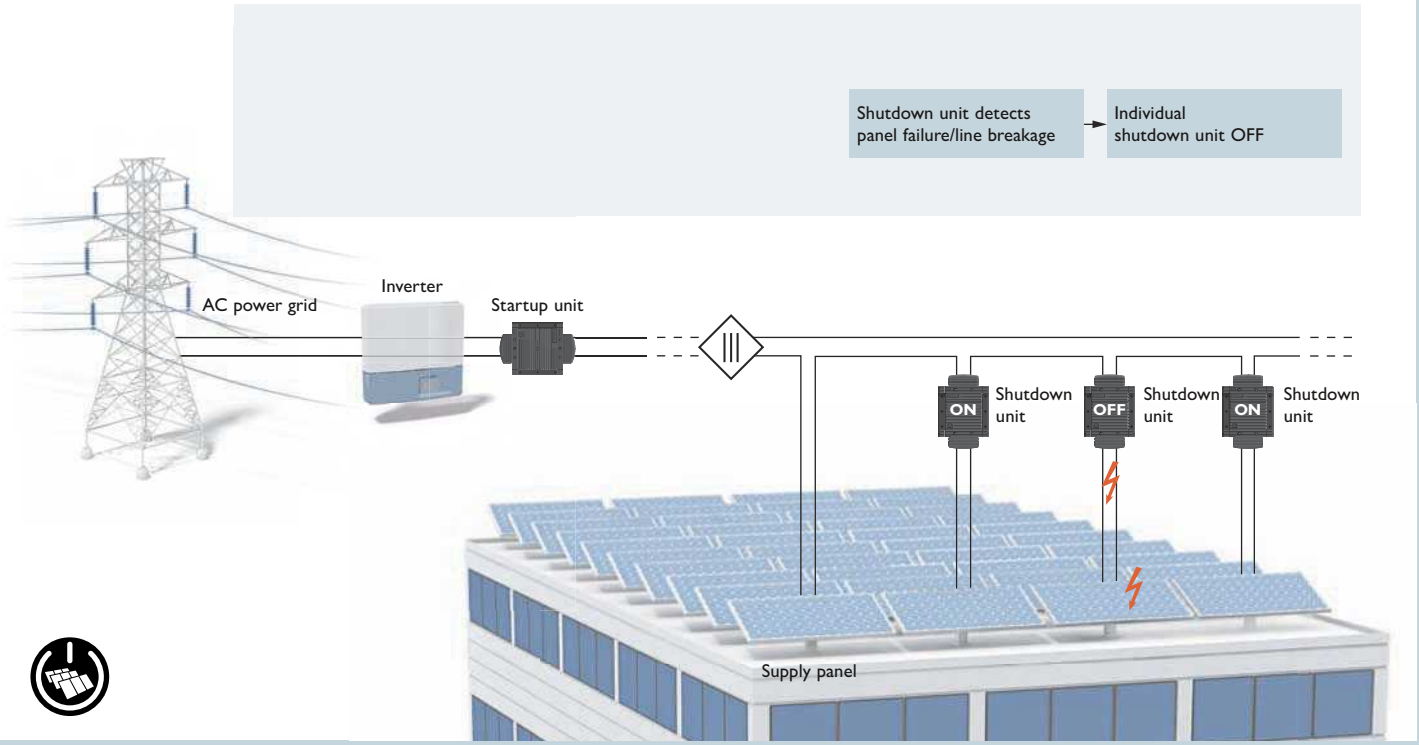
Photovoltaic panel shutdown in the event of manual operation or a defective inverter



Photovoltaic panel shutdown in the event of line breakage within the string line

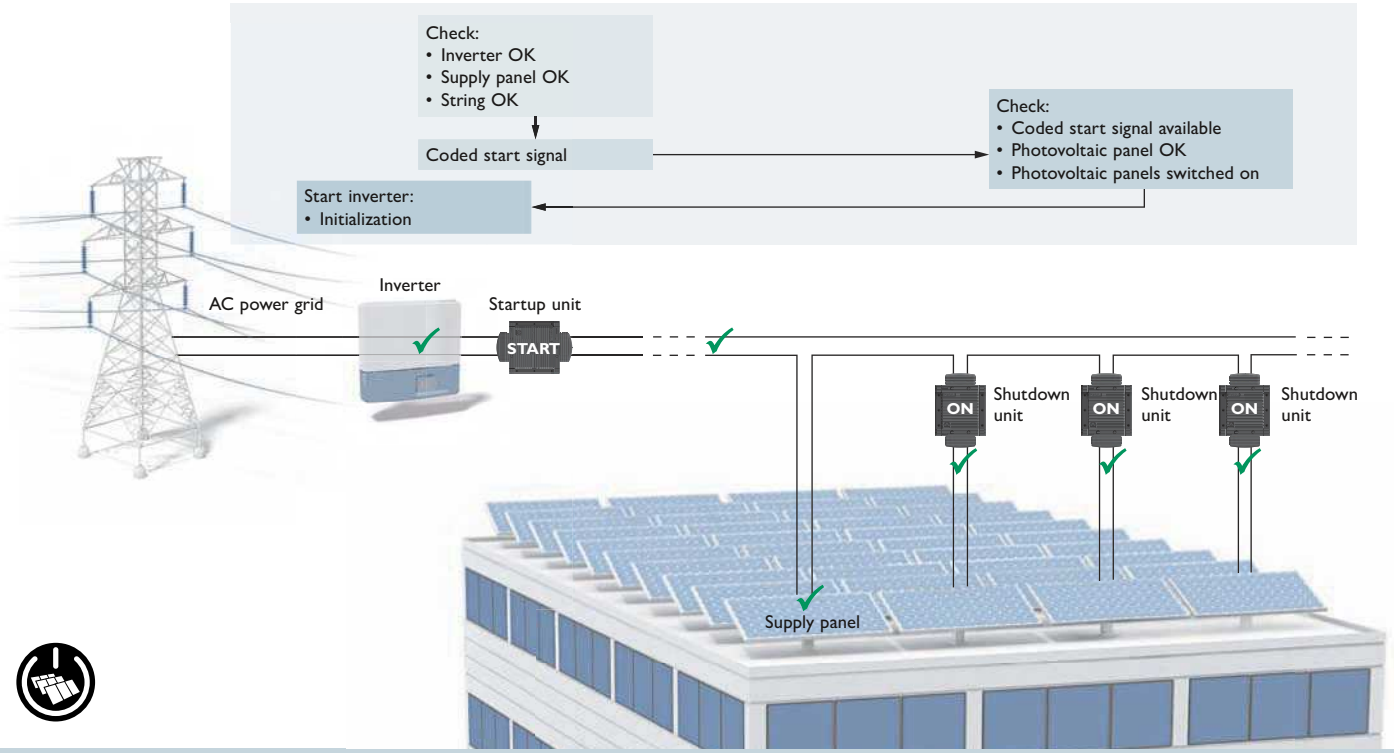


Photovoltaic panel shutdown in the event of a defective photovoltaic panel or line breakage right on the photovoltaic panel

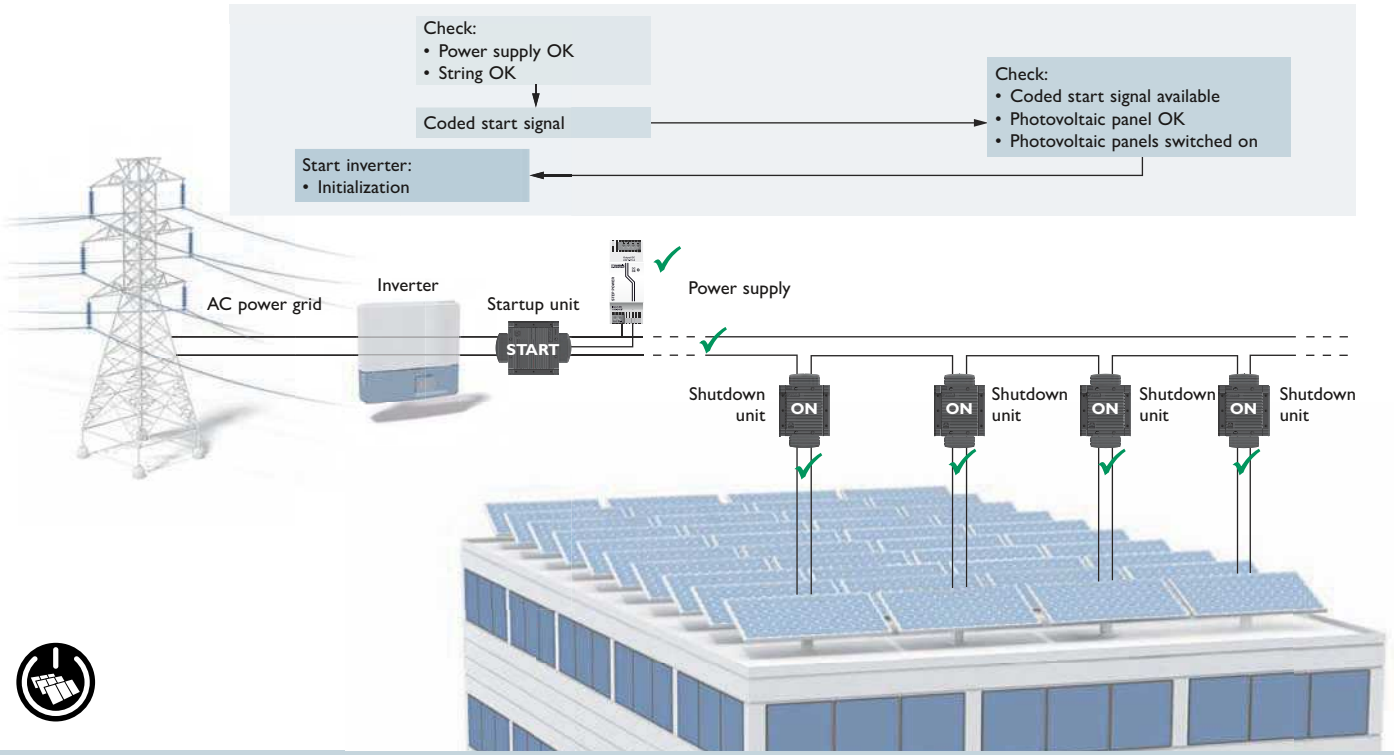


Auto Rapid Shutdown – start functions

Autostart with autonomous system topology



Autostart with externally supplied startup unit



SOLARCHECK RSD product overview

SOLARCHECK RSD has been tested using a multitude of commercial types of inverters. You can find a list of these demonstrably compatible devices at phoenixcontact.com

	Shutdown unit	Startup unit, autonomous	Startup unit, supplied externally
Type	SCK-RSD-100	SCK-RSD-400	SCK-RSD-600
Order No.	2905029	2905030	2906273
Output signal, current	–	–	≤ 10 mA
Input voltage range	20 V DC ... 50 V DC	40 V DC ... 800 V DC	40 V DC ... 800 V DC
System voltage	≤ 1000 V DC	≤ 1000 V DC	≤ 1000 V DC
Nominal current	8 A	8 A	8 A
Max. input current	10 A	10 A	10 A
Power consumption	< 1 W	< 4 W	< 4 W
Nominal supply voltage	–	–	24 V DC ±20 %
Power consumption (with external supply)	–	–	1 A
Output signal, voltage	–	–	5 V
Number of photovoltaic panels that can be connected	1	20	20
Connection method	Photovoltaic connector	Photovoltaic connector	Photovoltaic connector
Release	Via startup unit	Auto RSD	Auto RSD
General data			
Rated surge voltage	6 kV	6 kV	6 kV
Rated insulation voltage	1000 V	1000 V	1000 V
Overvoltage category	III	III	III
Pollution degree	2	2	2
Ambient temperature (operating)	-40 °C ... +85 °C	-40 °C ... +85 °C	-40 °C ... +85 °C
Humidity	10 % ... 95 %	10 % ... 95 %	10 % ... 95 %
Altitude	≤ 4000 m	≤ 4000 m	≤ 4000 m

Accessories

	SUNCLIX photovoltaic connector, male/female set	SUNCLIX photovoltaic connector	SUNCLIX photovoltaic connector
Type	PV-CF/M-S-2,5-6 SET EC SUNCLIX photovoltaic connector, male/female set	PV-CF-S 2,5-6 (+) SUNCLIX photovoltaic connector	PV-CM-S 2,5-6 (-) SUNCLIX photovoltaic connector
Order No.	1706821	1774674	1774687
	SUNCLIX photovoltaic Y-distributor	**SUNCLIX photovoltaic Y-distributor**	**Power supply for externally supplied startup unit**
Type	PV-YC 4/ 1-0,12-SO2 (-/++)	PV-YC 4/1-0,12T-0,12D-S02-NA	UNO-PS/1AC/24DC/ 30W
Order No.	1795019	1463067	2902991

Solutions for roof-mounted systems

The set solutions protect your photovoltaic system against damage caused by lightning strikes or surge voltages couplings.

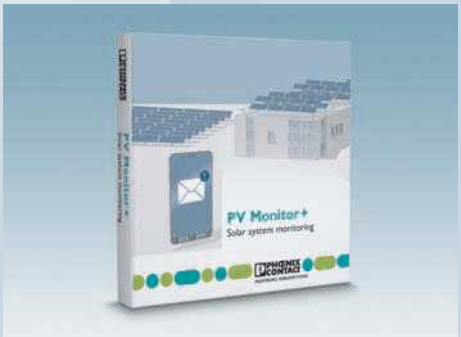
Discover all system defects instantaneously and react immediately when needed with monitoring software specifically tailored to roof-mounted systems of up to 500 kW. Wire photovoltaic panels and inverters quickly and easily on site – without special tools.

Your advantages

- Reliable and efficient operation, thanks to simple connection technology which is stable over the long term
- High degree of flexibility, thanks to the comprehensive product portfolio for cable cross sections ranging from 2.5 mm² to 16 mm²
- All photovoltaic sets are available in IP65 dust- and water jet-proof housings
- Fast installation, thanks to the pre-assembly of the photovoltaic sets
- Information always at your fingertips wherever you are, thanks to alarm generation via e-mail or SMS

Surge protection

With its photovoltaic sets, Phoenix Contact offers reliable system solutions that protect the inverter right in front of the DC and AC voltage inputs. As a result, surge voltage couplings are diverted directly to the ground potential. This reliably protects inverters and other sensitive devices against surge voltage.



Monitoring

The monitoring software PV Monitor+ is the efficient solution for ensuring long-term yields on your roof-mounted photovoltaic systems.

Voltages and currents are captured by a modular small-scale controller. If values exceed or fall below the set parameters, an alert is sent out by e-mail or SMS. This enables you to keep an eye on system performance at all times and intervene in processes if required.

Connection technology

Panel feed-throughs, connectors, and comprehensive accessories – the product range from Phoenix Contact provides you with innovative connection technology from a single source. In addition to fast connectors for assembly for conductor cross sections from 2.5 mm² to 16 mm², the range includes a miniature connection system for building-integrated photovoltaics (BIPV).

Photovoltaics – safe energy for the future

Global energy demands are increasing. Both from an environmental and from an economic perspective, renewable energies will play a major role in the future. Leading institutes are forecasting annual growth of between eight and twelve percent by 2020. Consequently, in the energy mix of the future, solar power, including that generated by solar thermal power plants, will meet up to 30% of total energy requirements. In order to achieve this, reliable and efficient photovoltaic systems are required.

Design an environmentally-friendly and cost-effective energy supply together with Phoenix Contact. Operate your systems safely and efficiently with industrial solutions and services provided by Phoenix Contact.

Always up-to-date, always available to you. Here you'll find everything on our products, solutions and service:

phoenixcontact.com

Product range

- Cables and wires
- Connectors
- Controllers
- Electronics housings
- Electronic switchgear and motor control
- Fieldbus components and systems
- Functional safety
- HMIs and industrial PCs
- I/O systems
- Industrial communication technology
- Industrial Ethernet
- Installation and mounting material
- Lighting and signaling
- Marking and labeling
- Measurement and control technology
- Monitoring
- PCB terminal blocks and PCB connectors
- Power supply units and UPS
- Protective devices
- Relay modules
- Sensor/actuator cabling
- Software
- Surge protection and interference filters
- System cabling for controllers
- Terminal blocks
- Tools
- Wireless data communication

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