



Australian catalogue | April 2017

# String combiners for solar photovoltaic systems

## A plug & play solution for photovoltaic solar installations



# String combiners for solar photovoltaic systems

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# String combiners

## Unmatched protection and control

In a photovoltaic system the modules are arranged in strings and fields depending on the type of inverter used, the total power and the technical characteristics of the modules. The connection of modules in series is made on the modules themselves, while the parallel connection of the strings is made inside string boxes that accommodate, along with the interconnection systems, also the overcurrent protection devices, disconnectors and surge protection devices.

### String boxes

The installation of a photovoltaic system often occurs in complex logistic situations, critical from the environmental and time perspective. The availability of tested and certified pre-assembled components allows the installer to avoid unnecessary on site assembly, wiring and certification activities for the string boxes. String boxes enclose functions such as string protection, protection against overvoltage and disconnect, with components suitable for the string's various voltage levels and the number of connected strings.

### Multi-output string boxes

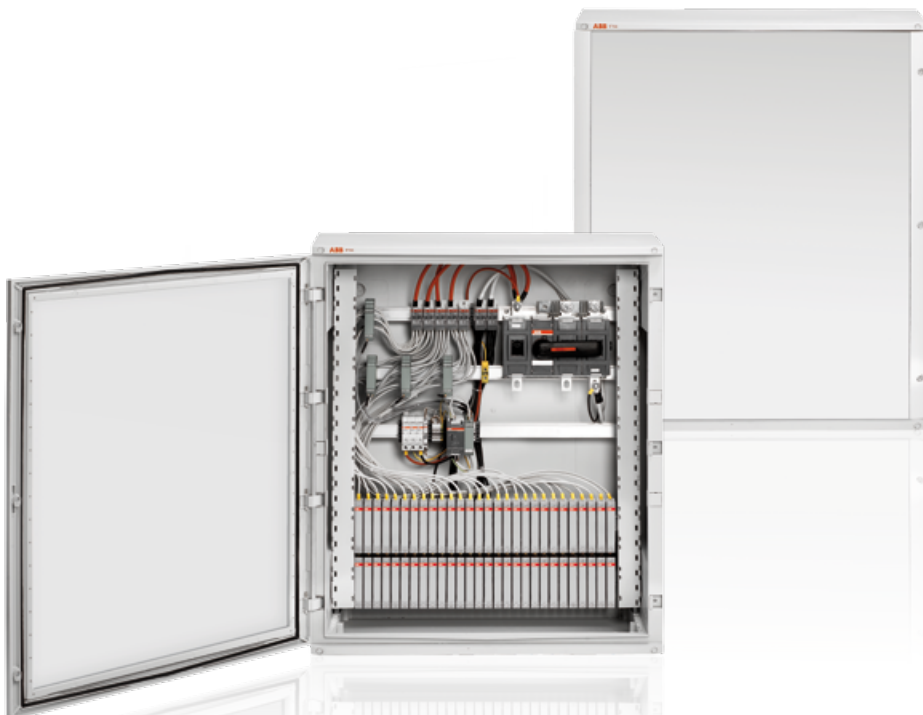
The development and the increasingly frequent adoption of multi-string inverters has made it necessary to reduce the costs and the space occupied by the string boxes, to bring together in a single switchboard the protective devices and disconnectors of multiple strings intended to be connected to a specific inverter input. Multi-string inverters resolve in an easy and cost-effective way system conditions characterized by modules installed in different leaning and exposure positions or minimize the problems related to systematic shading of parts of the system.



The string boxes form subsystems that can be standardized according to the number of strings, voltage and rated current. ABB offers different product ranges, each dedicated to specific installation conditions with typical configurations.

#### **String boxes for monitoring**

The string monitoring is an important function in running medium and large size installations, since it allows to improve the manufacturability and maintenance of the system. ABB offers a series of pre-wired string boxes for all installation conditions: they are equipped both with devices necessary for string protection, surge protection and disconnection, and with useful devices for string monitoring.

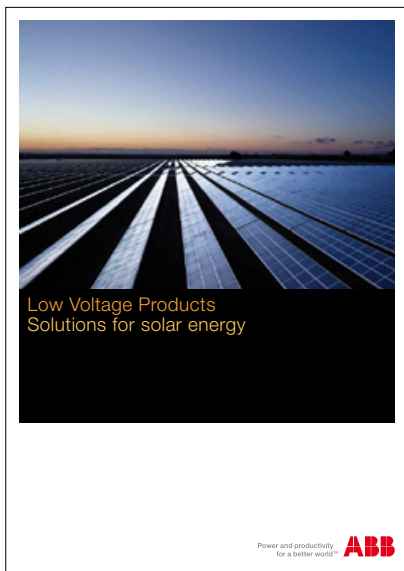


# A complete set of information, a touch away from your fingers

Value added services in combination with products and solutions make ABB offer unique. ABB also provides a wide range of documents and information intended for the renewable energy industry. With services like publications, catalogs, websites, blogs and video tutorials, in digital or printed versions, you can always find a tailor made solution for your requirement and for your applications.

## Catalog

Low-voltage Products.  
Solutions for solar energy



## Panorama

Solar power. Low-voltage solutions for  
a safe and reliable photovoltaic system



A valuable technical resource accompanying the designer during the engineering stage for implementation of a photovoltaic installation, from initial specifications to commissioning. This publication describes in depth the aspects concerning not only the basic architectures, but also the specific components required for engineering, inspection and management of a photovoltaic system, both on the DC and AC sides. In addition to schematics and detailed circuit diagrams, the catalog illustrates the complete offer for ABB photovoltaic applications, ranging from safety assemblies to string combiners and recombiners, through switches, disconnecting switches, panels and accessories.

A streamlined publication intended for installers, which describes the architecture and products for photovoltaic installations by ABB.

Numerous examples are complemented by a practical analysis of the aspects related to system protection and management. In this scenario, ABB is showcasing not only its assemblies, but also a set of pre-assembled “plug & play” solutions conceived to speed up the activity in your installations.

## Magazines

### Day by DIN

A valuable publication available in paper or electronic format to deal with topics related to installations. Specifically, it is worth to point out the monographic issues dedicated to renewable energies and issued on the occasion of the main events of the industry.



## Video tutorials

### Garage Nuggets



These video tutorials provide the user with a clear and direct approach to the applications of the solar energy industry, taking advantage of a large impact audiovisual communication. Information on installations, products and regulations are offered in a graphically attractive appearance for a quick learning. In Garage Nugget No. 5 and 6 “Multipurpose outdoor enclosures” and “Gemini challenges the sun” the narrating voice describes the ABB product portfolio for photovoltaic market. Specifically, the videos provide a detailed description of Gemini enclosure features, manufactured with techniques and materials conceived to withstand the environmental conditions and safety of photovoltaic systems, both outdoor and indoor.



**GEMINI**  
challenges  
the sun.

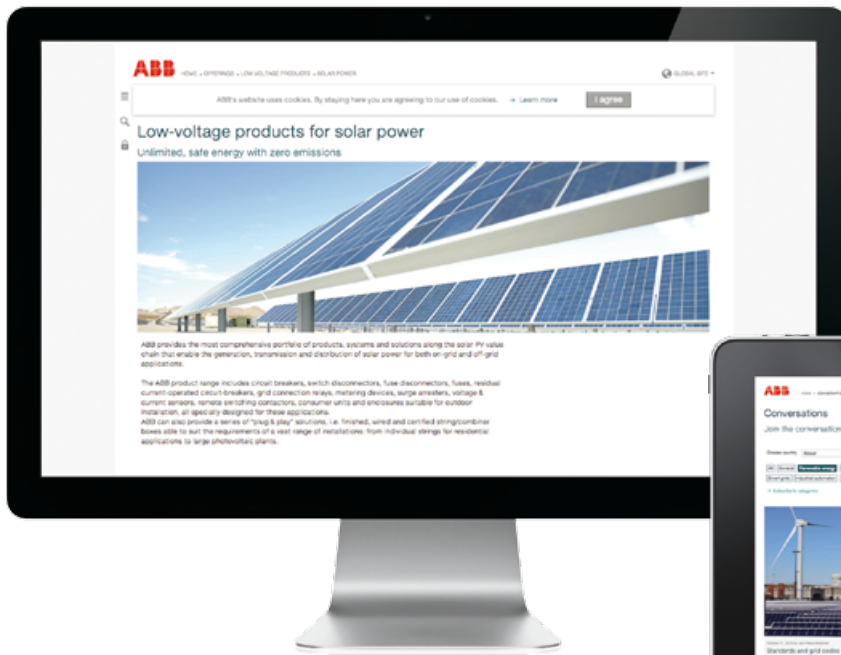


**Multipurpose**  
outdoor  
enclosures.



# A complete set of information, a touch away from your fingers

A website gathering all of the digital resources related to low-voltage products for photovoltaic applications. Product specifications, Application Notes, regulatory studies, case studies, social network groups, newsletters... a contribution towards the culture of renewable energies, capitalizing not only the know-how of the experts of our group, but also the expertise of installers and designers who use ABB products worldwide.



## Website

### Low-voltage products for solar power

An online resource providing the opportunity to navigate through the wide portfolio of products, system and low-voltage solutions by ABB. A valuable tool for an in-depth analysis of the aspects related to the value of photovoltaic chain, with dedicated contents concerning creation, transmission and distribution of energy in both on-grid and off-grid applications.



## Blog

### Conversations

Join the conversation on the current changes in trends and technologies. In this tagged blog you can subscribe the channel dedicated to renewable energies or any thematic channel to ask questions, share your opinions with other users of the community and download documentation concerning solar and wind-power applications.



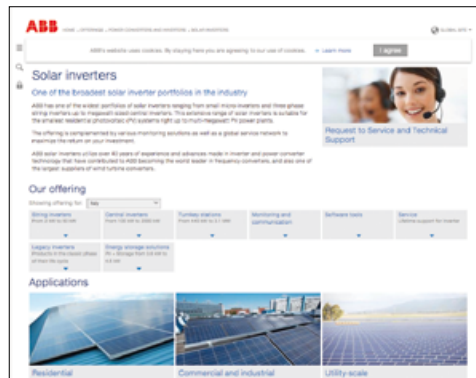


**Website**  
Solar power solutions



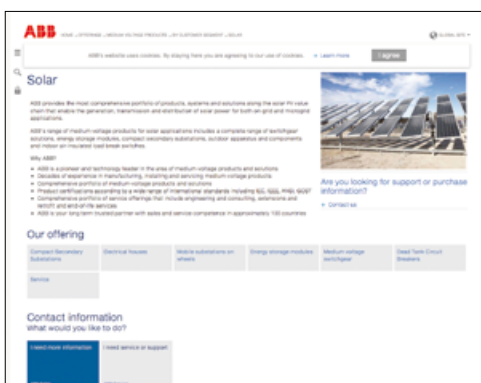
ABB provides the widest portfolio of products, solutions and services available in the photovoltaic industry. The “Solar power solutions” website is a portal which provides access to every information resources of the ABB group, giving the opportunity to navigate among case histories, references of projects, catalogs, news, service proposals and much more.

**Website**  
Solar inverters



A link dedicated to the widest and most complete portfolio of photovoltaic inverters in the industry. From the small string inverters in single-phase to three-phase inverters and up to the multi megawatt for centralized installations. Product specifications, informational resources, but also the ABB technical and the sales support services are just a click away.

**Website**  
Medium-voltage products



A portal dedicated to medium-voltage photovoltaic applications, specifically to the systems related to networks and micro-networks. The medium-voltage product range for solar applications includes a complete range of switchgear solutions, energy storage modules, compact secondary substations, outdoor apparatus and components and indoor air-insulated load break switches, specifically designed to meet the most stringent specifications of medium-voltage photovoltaic applications.

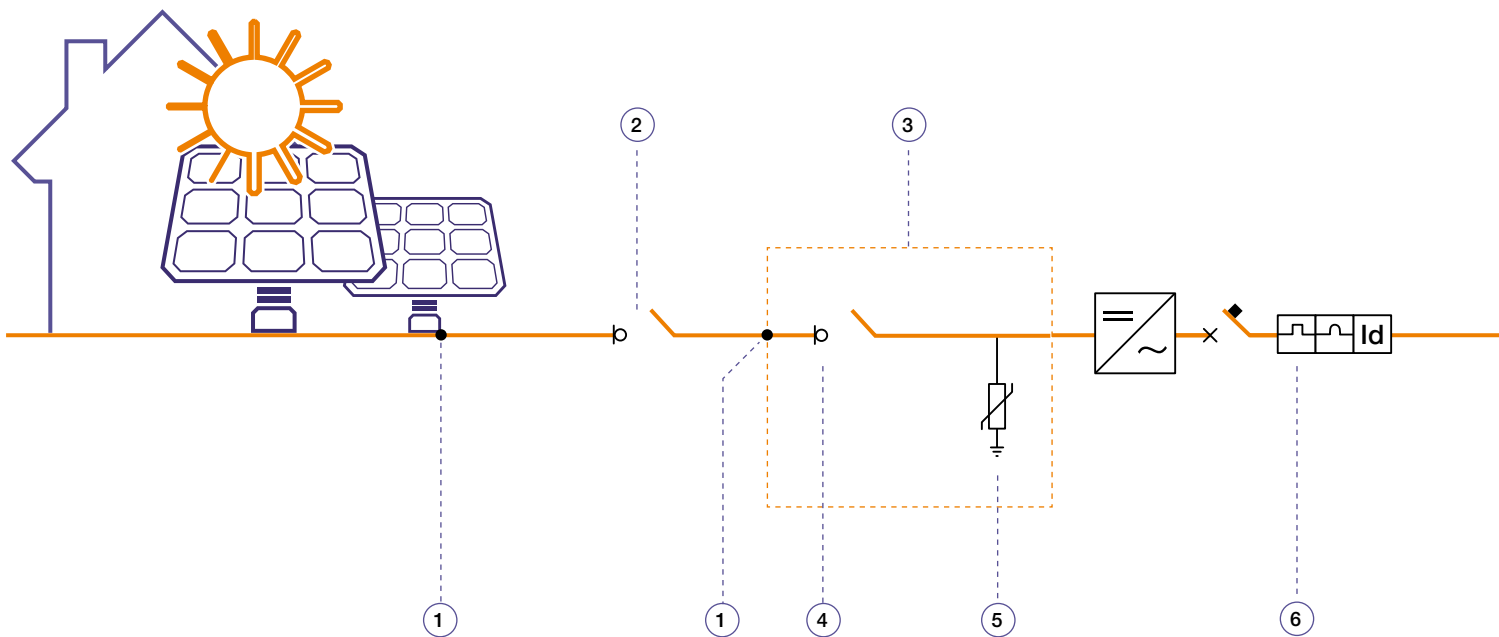
**Website**  
Turnkey stations



In an increasingly dynamic and challenging context, ABB “turnkey” solutions allow the users to implement plug-and-play photovoltaic stations, already equipped with all of the active and passive components required for one-click commissioning. This website is specifically dedicated to low voltage cabinets, components and inverters for indoor and outdoor applications in the range between 440 kW and 3.1 MW.

# Examples of photovoltaic applications

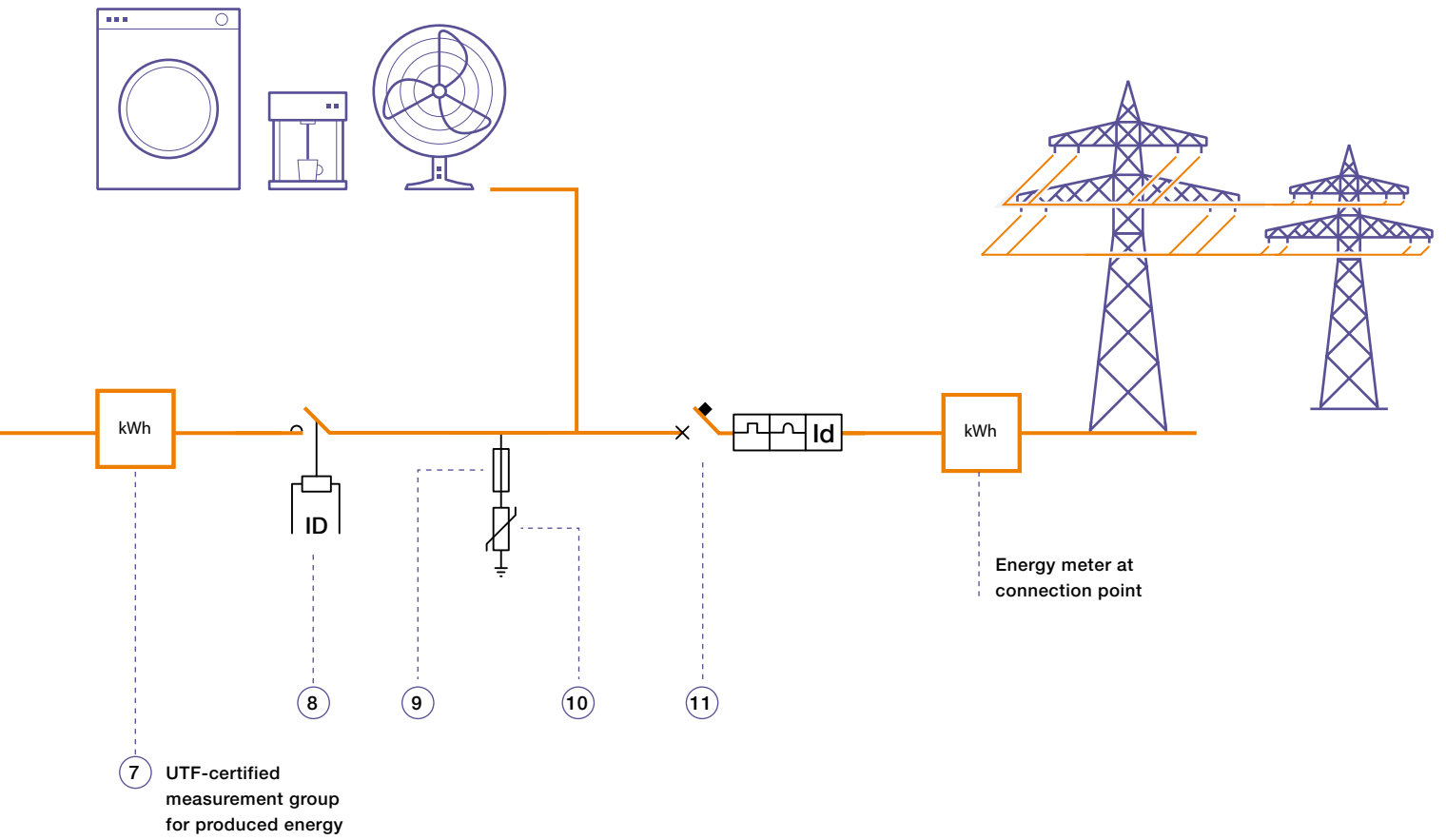
## Residential system $\leq 20$ kW LV



### Low-voltage products:

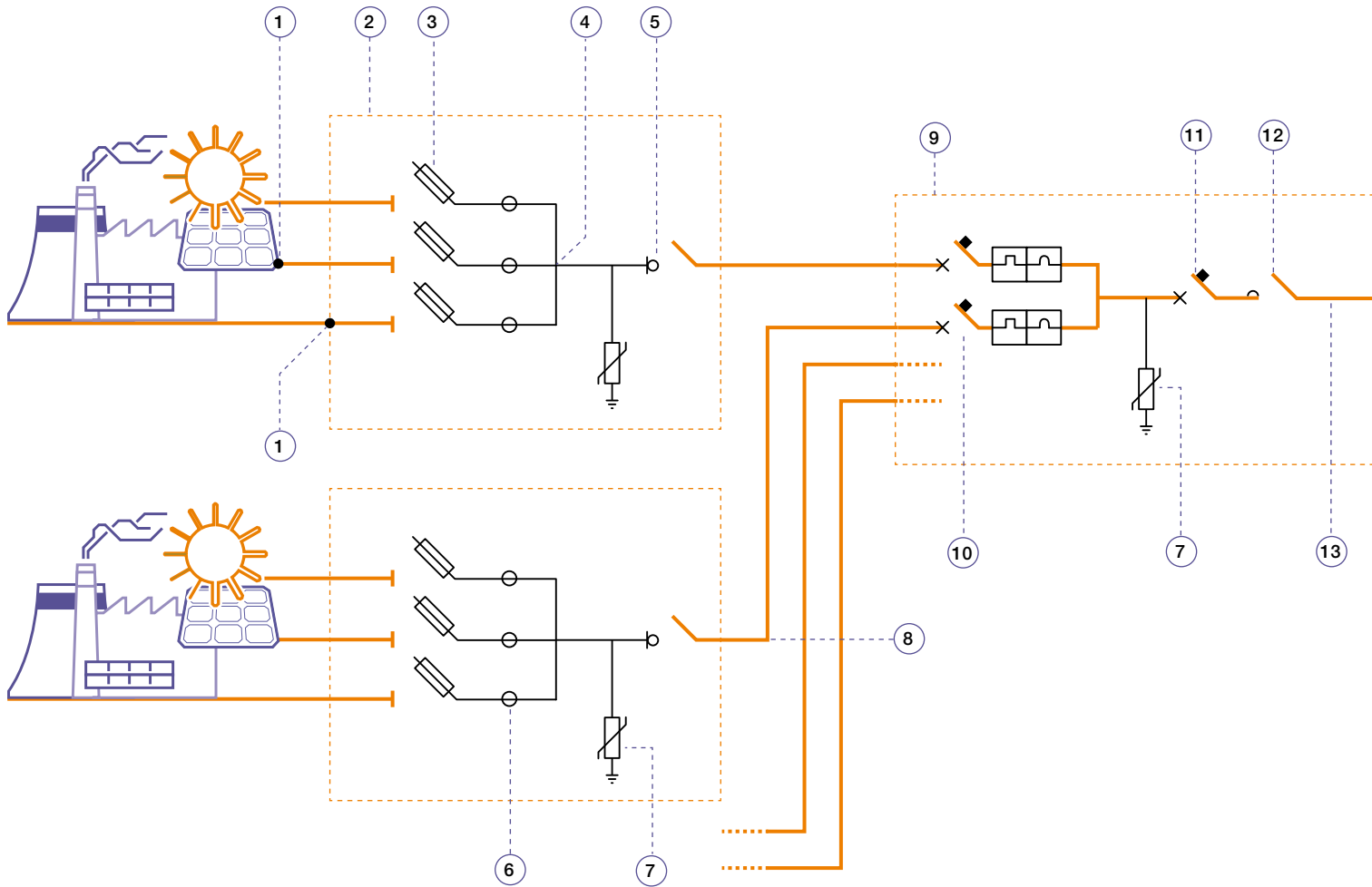
- 1 - Connectors: MC4-EVO2 PV
- 2 - PV Vault rapid shutdown
- 3 - **String boxes**  
Switchboards: Gemini  
Consumer units: Europa  
Circuit breakers: S200 M UC Z, S800 PV-S  
Fuse disconnectors: E 90 PV  
Fuses: E 9F PV  
Spring and screw terminal blocks: SNK PI
- 4 - Switch-disconnectors: OTDC, S800 PV-M
- 5 - Surge protection devices: OVR PV QS
- 6 - Residual current devices: F202B, F204B
- 7 - Energy meters: EQmeters and current transformers
- 8 - Contactors: AF Series  
Grid-feeding monitoring relays: CM-UFD.Mxx  
Power supplies: CP-x
- 9 - Fuse disconnectors: E 90
- 10 - Surge protective devices: OVR T1 / T1-T2 / T2 QS
- 11 - Residual current circuit breakers: DS202C





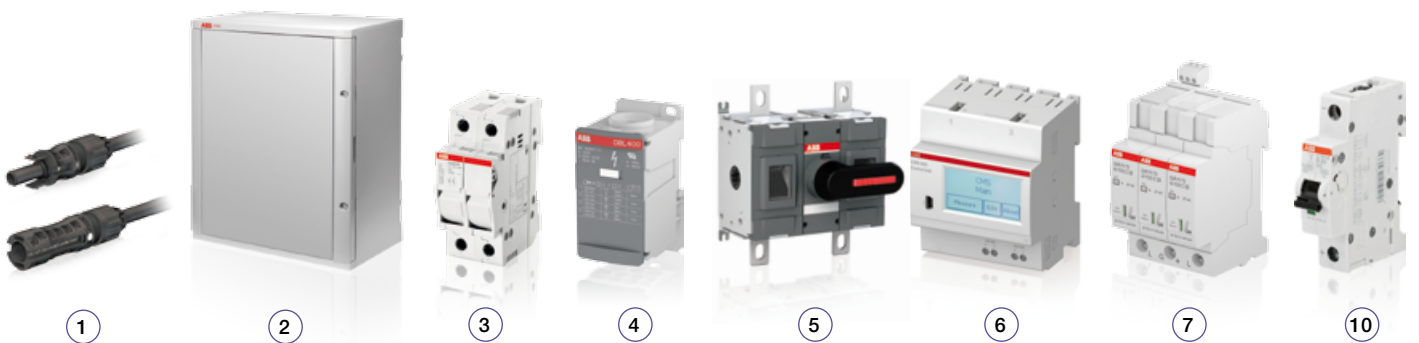
# Examples of photovoltaic applications

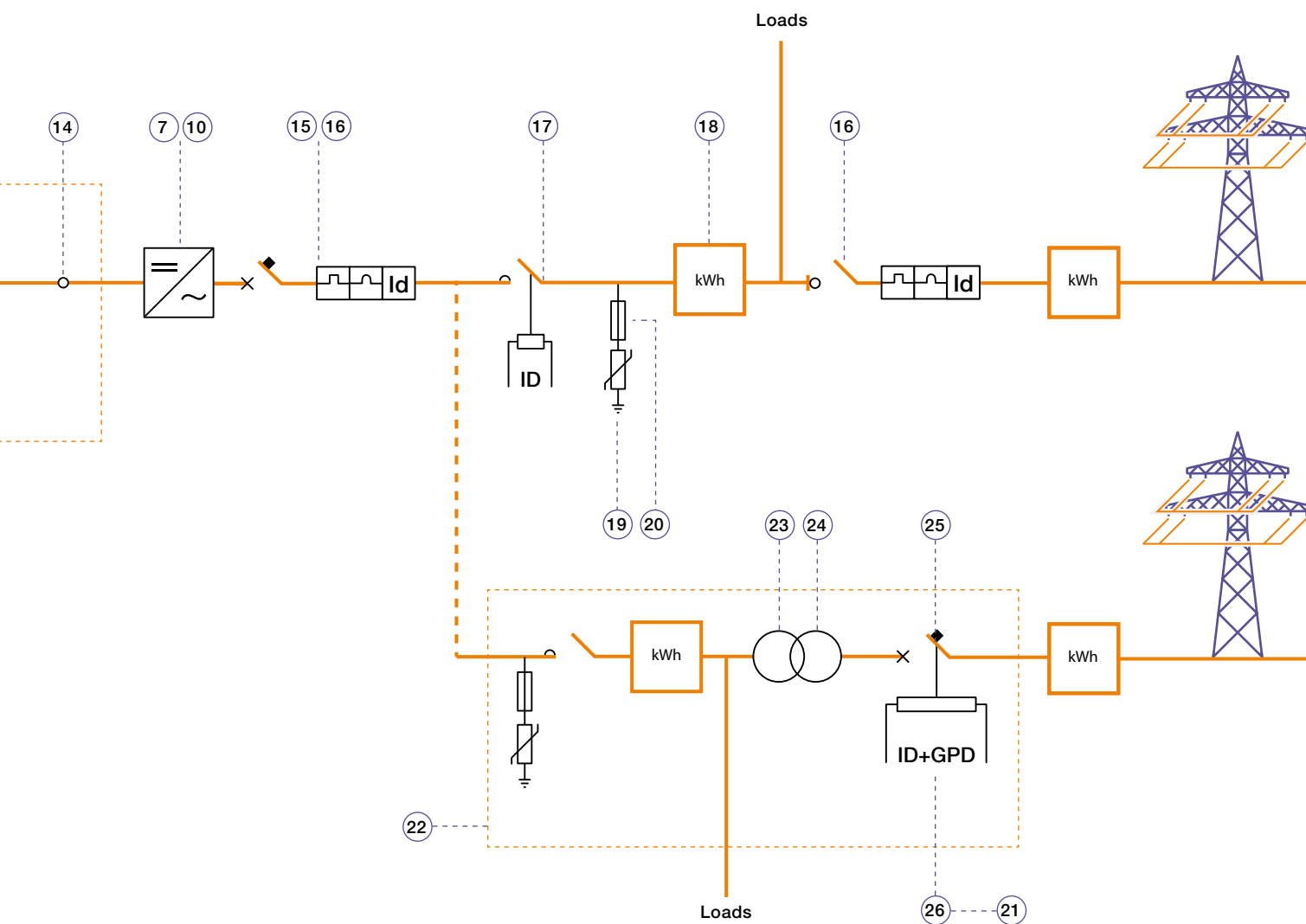
## Commercial system 20 - 1000 kW LV/MV



### Low-voltage products:

- 1 - Connectors: MC4-EVO2 PV
- 2 - **String combiners 1000 VDC**  
Switchboards: Gemini; Consumer units: Europa, Gemini
- 3 - Fuse disconnectors: E 90 PV; Fuses: E 9F PV
- 4 - Distribution blocks: DBL
- 5 - Switch-disconnectors: OTDC; S800 PV-M
- 6 - Current measurement system: CMS  
Power supplies: CP-x
- 7 - Surge protection devices: OVR PV QS
- 8 - String monitoring controller
- 9 - Recombiner
- 10 - Miniature circuit breakers: S200 M UC Z, S800 PV-S
- 11 - Switch-disconnectors: Tmax PV, OTDC series
- 12 - Contactors: GAF Series + IOR Series rail contactor
- 13 - Insulation monitoring devices: CM-IWx
- 14 - GFDI Application: S804U-PVS5
- 15 - Residual current devices: F202B, F204B





- 16 - Residual current blocks: DDA 200 B;  
Residual current circuit breakers: F200 type B;  
Miniature circuit breakers: S 200;  
Moulded case circuit breakers: Tmax XT, Tmax T
- 17 - Contactors: AF Contactor Series; Grid-feeding monitoring relays:  
CM-UFD.Mxx; Power supplies: CP-x
- 18 - Energy meters: EQ meters and current transformers
- 19 - Surge protective devices: OVR T1 / T1-T2 / T2 QS
- 20 - Fuse disconnector: E 90

21 - GSM telephone actuator: ATT

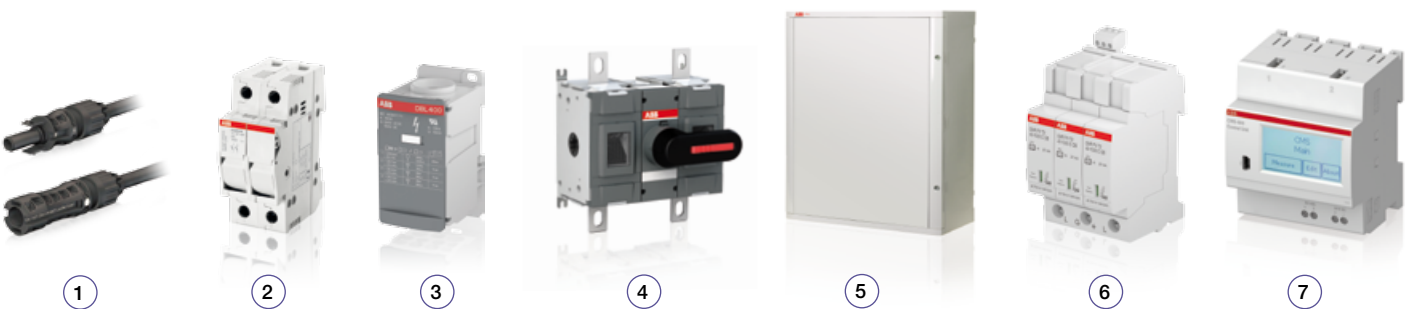
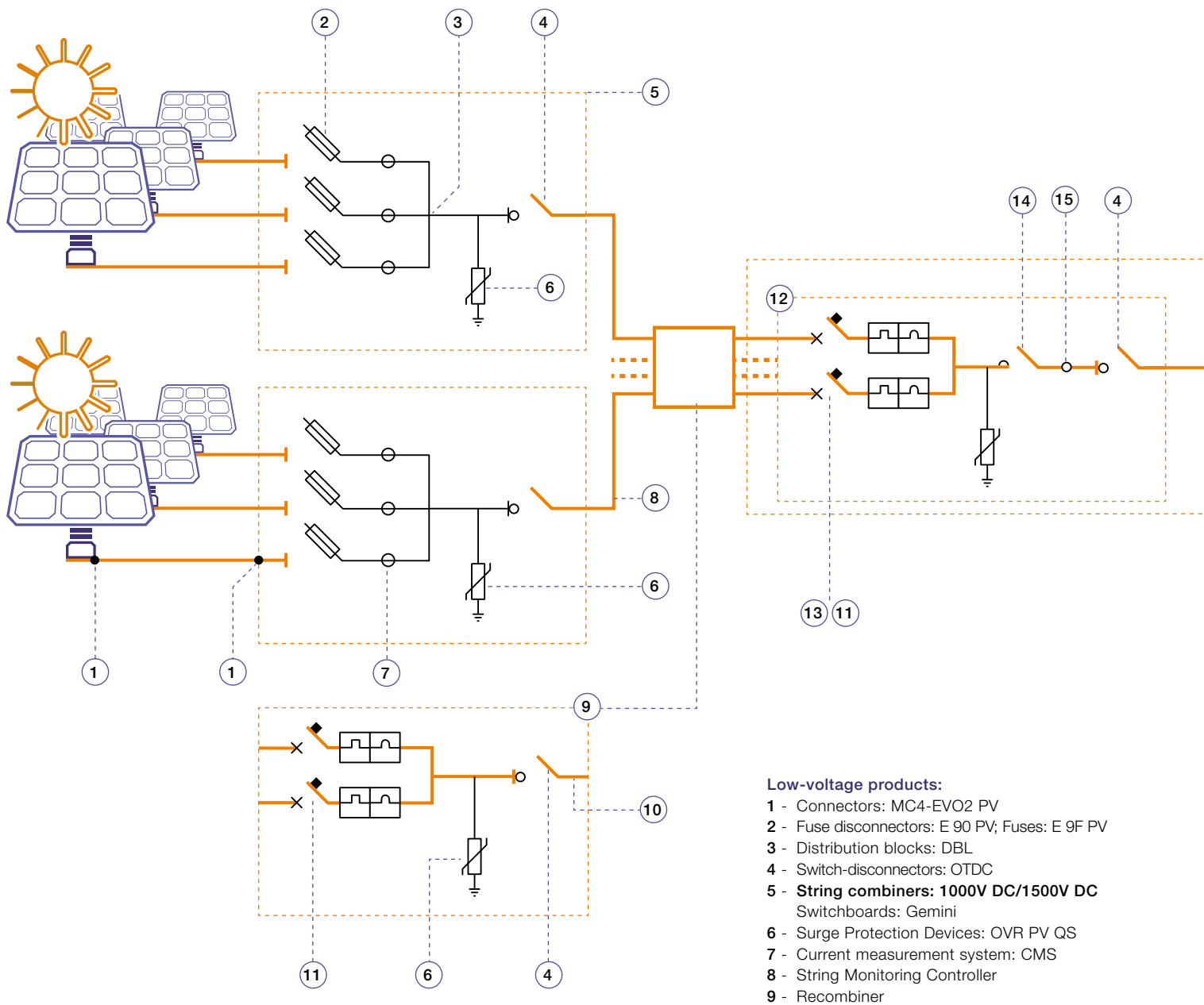
**Medium-voltage products:**

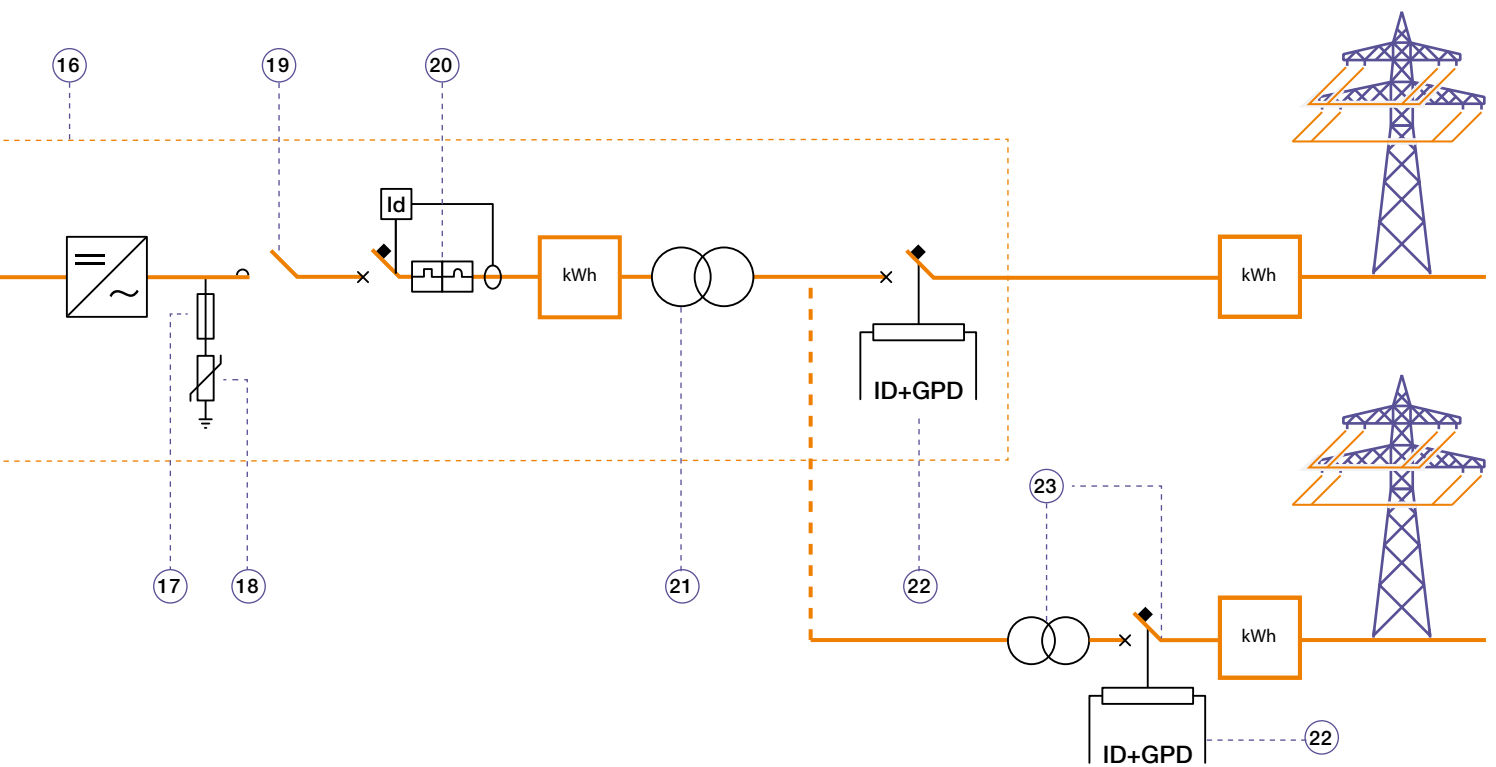
- 22 - Secondary substations
- 23 - Dry-type transformers
- 24 - Oil-immersed transformers
- 25 - Secondary switchboards
- 26 - Interface protection system: REF 542plus



# Examples of photovoltaic applications

## Utility scale systems > 1000 kW MV/HV



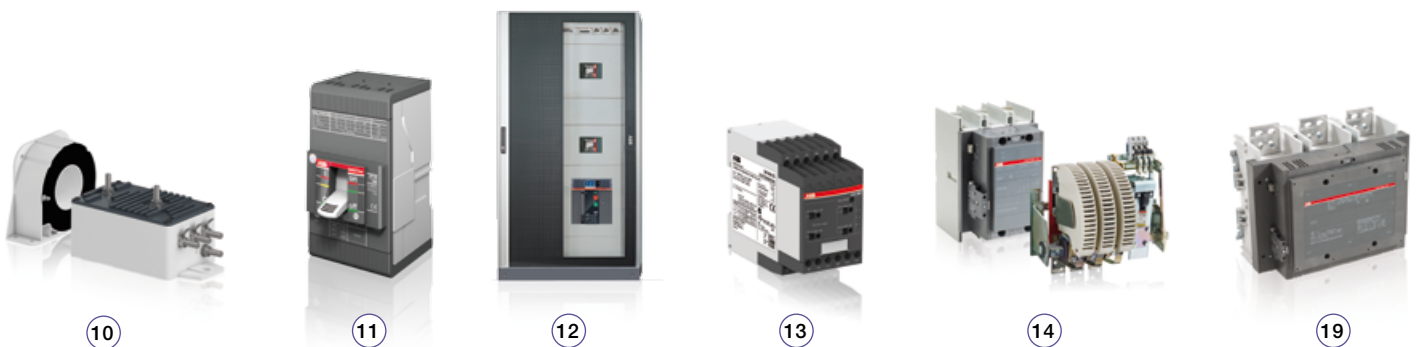


- 10 - Current and voltage sensors: ES-VS Series
- 11 - Moulded Case Circuit Breakers: Tmax PV
- 12 - Switchboards: System pro E power
- 13 - Insulation monitoring devices: CM-IWx
- 14 - Contactors: GAF Series, IOR Series rail contactors
- 15 - GFDI Application: S804U-PVS5
- 16 - Megawatt station
- 17 - Fuse disconnectors: E 90
- 18 - Surge protection devices: OVR T1 / T1-T2 / T2 QS

- 19 - Contactors: AF Series
- 20 - Moulded case circuit breakers: Tmax XT, Tmax T  
Air circuit breakers: Emax 2

**Medium-voltage products:**

- 21 - Dry-type or oil filled transformers
- 22 - MV Switchgear + Interface protection system: REF 542plus
- 23 - Substation

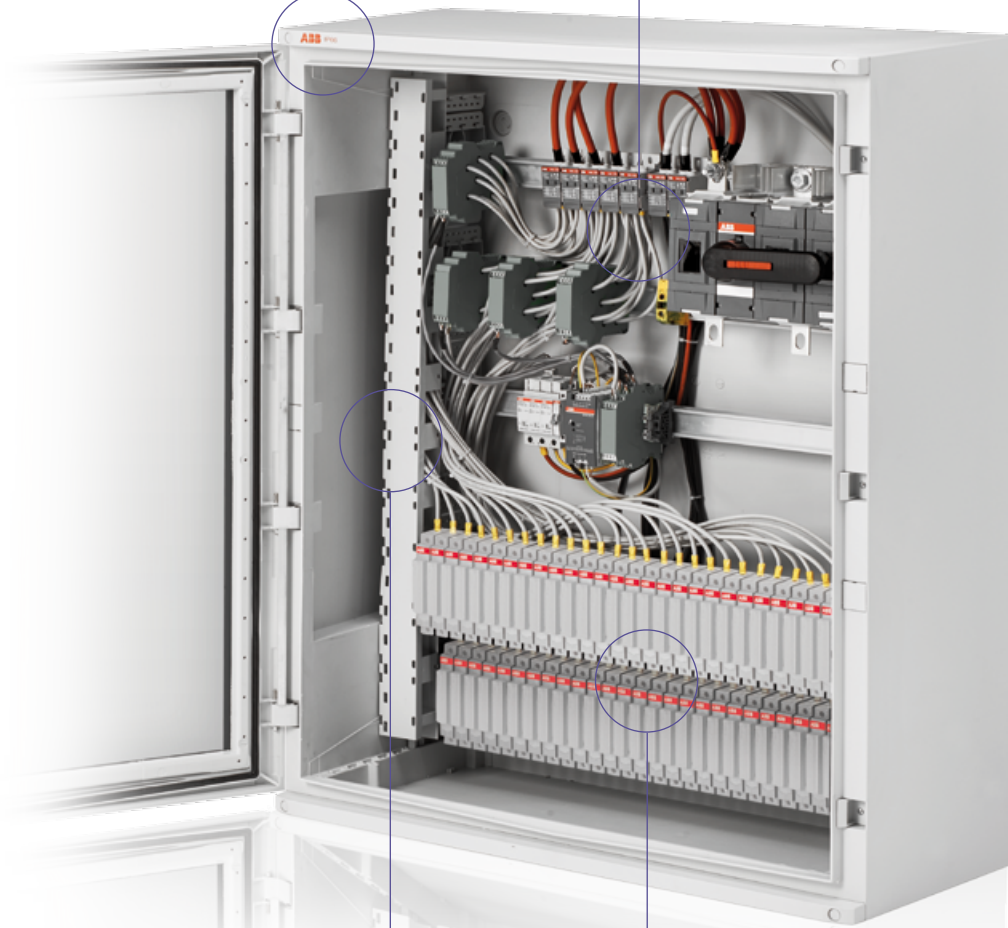




# String combiner Range plus

IP66 enclosures for extreme outdoor conditions resistant to atmospheric conditions and dusty environments. Thermoplastic material, 100% recyclable make it environmentally friendly

Components selected for protection are based on best in class photovoltaic products (OTDC Disconnectors, OVR PV SPDs, E 90 PV Fuse Holders, Gemini thermoplastic outdoor enclosures).



Efficient design enabling to have configurations from 1 to 32 strings in a single enclosure, making it easy for logistics and installation at site.

IP20 protection of components inside the combiner - No live parts are accessible directly inside the combiners ensuring safety of the installers.

## Design, production, quality and service

An essential factor in determining the success of a photovoltaic system is the accurate selection of its components, with particular attention to connections, and protections from the modules to the inverters.

As the photovoltaic system has to perform for more than 20 years in harsh environments, the products used should be considered of high quality and as a good investment for long lasting performance.

The string combiners are particularly important as they are usually installed under the photovoltaic panels and therefore exposed to the most harsh environment.

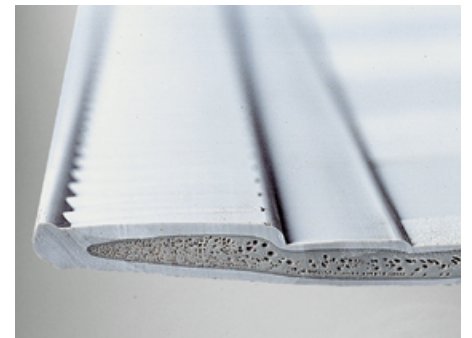
- ABB combiners host ABB components specifically made for photovoltaic applications, making it easy during maintenance to rely on one single producer and supplier, from components to the whole system.
- Capacity to deliver all over the world at your site.
- Comprehensive documentation for easy assembly at site.
- Service and support through ABB local sales organization worldwide.



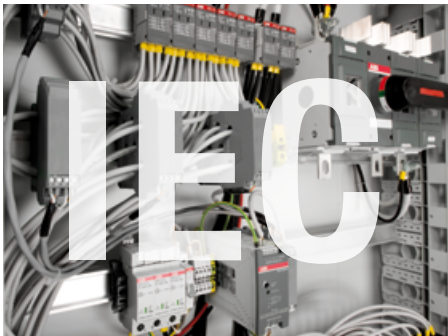
Complete range to address the requirements in residential, commercial and utility scale projects in 1000V DC and 1500V DC applications.



To meet the demands of extreme climatic conditions up to 50 °C.



Thermoplastic manufactured with co-injection technique ensuring highest sturdiness but very lite in total weight as compared to metal enclosures.



Development and assembly process in accordance to the latest IEC Standards.



100% quality Inspection before dispatch, ensuring highest level of reliability.



String combiner box with monitoring options. Available with monitoring of current, voltage, temperature and status of disconnectors and/or surge protection devices. Communication over RS485 ensuring easy integration with the plant / inverter monitoring systems.

# String combiner 1000V DC

## Technical features

String combiner type	1 st.	2 st.	3 st.	4 st.	6 st.	8 st.	10 st.	12 st.	14 st.	16 st.	18 st.	20 st.	24 st.	28 st.	32 st.
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### General Data

Maximum Voltage	1000VDC														
No of DC Input (+ & -, optional)	1	2	3	4	6	8	10	12	14	16	18	20	24	28	32
SPD protection	Type 2 Pluggable														
String protection	No			Per each incoming string											
Monitoring	No										Optional				
Monitoring Parameters	No										Current, temperature and SPD signal as standard. Optional to include Voltage and Disconnecter signal				
Communication Protocol	No										Modbus RTU				

### Enclosure Type

Model	Europa				Gemini										
Material Type	Thermoplastic														
Door Type/ Opening	Transparent, Hinged Door						Opaque, Hinged Door openable 180 Deg								
Lock Type	Click on push to lock						Doors supplied with 2 standard double bit locks (3 for sizes 5 and 6)								
Rated Service Voltage	1000VDC														
Degree of resistance to impacts	IK 10														
Degree of protection	IP65						IP66								
Recyclable	100%														

### Environmental data

Operating Temperature °C	-20°C upto +50°C														
Storage temperature °C	-20°C upto +60°C														
Resistance to Abnormal heat and fire	upto 750°C														
Height above Sea level	Up to 2000m														
Humidity	up to 95%														

### DC Input

Input Cable entry	M16 Cable Gland, 2,5 - 16 mm <sup>2</sup>														
Input Connection	Terminals				Directly on the Fuse Holder										
Fuse Type	No fuse				Cylindrical 10x38 gPV										
Fuse Size	15A														

### DC Output

Output Cable gland +/-	M16	M16	M16	M16	M25	M25	M25	M32	M32	M32	M32	M40	M40	M40	M40
Clamping cable diameter (m <sup>2</sup> )	2,5-16				25-50			70-120			150-240				
Conductor material	Copper/Alluminium														
Terminal Type	Pipe terminal							Ring Terminal							
Voltage DC	1000VDC														
Maximum current output	10A	20A	30A	40A	60A	80A	100A	120A	140A	160A	180A	200A	240A	280A	320A

# String combiner 1000V DC

## Order code

### 1000V DC without monitoring (No fuses) for ungrounded or floating earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)	Description	Order code
1	EUROPA65	12M	275x242x140	String box DC 1 str 1000V (no fuse)	1SLM300100A0790
2	EUROPA65	12M	275x242x140	String box DC 2 str 1000V (no fuses)	1SLM300200A0790

### 1000V DC without monitoring (2 fuses + -) for ungrounded or floating earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)	Description	Order code
3	EUROPA65	18M	380x242x140	Stringbox DC 3str 1000V 2F 15A	1SLM300300A0740
4	EUROPA65	36M2	380x392x140	Stringbox DC 4str 1000V 2F 15A	1SLM300400A0740
6	Gemini	2	460x583x260	Stringbox DC 6str 1000V 2F 15A	1SLM300600A0740
8	Gemini	2	460x583x260	Stringbox DC 8str 1000V 2F 15A	1SLM300800A0740
10	Gemini	2	460x583x260	Stringbox DC 10str 1000V 2F 15A	1SLM301000A0740
12	Gemini	3	460x742x260	Stringbox DC 12str 1000V 2F 15A	1SLM301200A0740
14	Gemini	3	460x742x260	Stringbox DC 14str 1000V 2F 15A	1SLM301400A0740
16	Gemini	4	590x742x260	Stringbox DC 16str 1000V 2F 15A	1SLM301600A0740
18	Gemini	4	590x742x260	Stringbox DC 18str 1000V 2F 15A	1SLM301800A0740
20	Gemini	4	590x753x260	Stringbox DC 20str 1000V 2F 15A	1SLM302000A0740
24	Gemini	6	840x1058x360	Stringbox DC 24str 1000V 2F 15A	1SLM302400A0740
28	Gemini	6	840x1058x360	Stringbox DC 28str 1000V 2F 15A	1SLM302800A0740
32	Gemini	6	840x1058x360	Stringbox DC 32str 1000V 2F 15A	1SLM303200A0740

### 1000V DC with monitoring (2 fuses + -) for ungrounded or floating earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)	Description	Order code
12	Gemini	4	590x742x260	Stringbox DC 12str Monitor 1000V 2F 15A	1SLM301200A3740
14	Gemini	4	590x742x260	Stringbox DC 14str Monitor 1000V 2F 15A	1SLM301400A3740
16	Gemini	4	590x742x260	Stringbox DC 16str Monitor 1000V 2F 15A	1SLM301600A3740
18	Gemini	6	840x1047x360	Stringbox DC 18str Monitor 1000V 2F 15A	1SLM301800A3740
20	Gemini	6	840x1058x360	Stringbox DC 20str Monitor 1000V 2F 15A	1SLM302000A3740
24	Gemini	6	840x1058x360	Stringbox DC 24str Monitor 1000V 2F 15A	1SLM302400A3740
28	Gemini	6	840x1058x360	Stringbox DC 28str Monitor 1000V 2F 15A	1SLM302800A3740
32	Gemini	6	840x1058x360	Stringbox DC 32str Monitor 1000V 2F 15A	1SLM303200A3740

# String combiner 1000V DC

## Order code

### 1000V DC without monitoring (1 fuse + ) for grounded earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)		Description	Order code
3	EUROPA65	18M	380x242x140	M16	Stringbox DC 3str 1000V 1F 15A	1SLM300300A4740
4	EUROPA65	36M2	380x392x140	M16	Stringbox DC 4str 1000V 1F 15A	1SLM300400A4740
6	Gemini	2	460x583x260	M25	Stringbox DC 6str 1000V 1F 15A	1SLM300600A4740
8	Gemini	2	460x583x260	M25	Stringbox DC 8str 1000V 1F 15A	1SLM300800A4740
10	Gemini	2	460x583x260	M25	Stringbox DC 10str 1000V 1F 15A	1SLM301000A4740
12	Gemini	3	460x742x260	M32	Stringbox DC 12str 1000V 1F 15A	1SLM301200A4740
14	Gemini	3	460x742x260	M32	Stringbox DC 14str 1000V 1F 15A	1SLM301400A4740
16	Gemini	3	460x742x260	M32	Stringbox DC 16str 1000V 1F 15A	1SLM301600A4740
18	Gemini	3	460x742x260	M32	Stringbox DC 18str 1000V 1F 15A	1SLM301800A4740
20	Gemini	3	460x753x260	M40	Stringbox DC 20str 1000V 1F 15A	1SLM302000A4740
24	Gemini	4	590x753x260	M40	Stringbox DC 24str 1000V 1F 15A	1SLM302400A4740
28	Gemini	6	840x1058x360	M40	Stringbox DC 28str 1000V 1F 15A	1SLM302800A4740
32	Gemini	6	840x1058x360	M40	Stringbox DC 32str 1000V 1F 15A	1SLM303200A4740

### 1000V DC with monitoring (1 fuse + ) for grounded earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)		Description	Order code
12	Gemini	4	590x742x260	M32	Stringbox DC 12str Monitor 1000V 1F 15A	1SLM301200A5740
14	Gemini	4	590x742x260	M32	Stringbox DC 14str Monitor 1000V 1F 15A	1SLM301400A5740
16	Gemini	4	590x742x260	M32	Stringbox DC 16str Monitor 1000V 1F 15A	1SLM301600A5740
18	Gemini	4	840x1047x360	M32	Stringbox DC 18str Monitor 1000V 1F 15A	1SLM301800A5740
20	Gemini	6	840x1058x360	M40	Stringbox DC 20str Monitor 1000V 1F 15A	1SLM302000A5740
24	Gemini	6	840x1058x360	M40	Stringbox DC 24str Monitor 1000V 1F 15A	1SLM302400A5740
28	Gemini	6	840x1058x360	M40	Stringbox DC 28str Monitor 1000V 1F 15A	1SLM302800A5740
32	Gemini	6	840x1058x360	M40	Stringbox DC 32str Monitor 1000V 1F 15A	1SLM303200A5740

### 1000V DC multioutput without monitoring (2 fuses + - ) for ungrounded or floating earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)	Description	Order code
2	EUROPA65	36M2	380x392x140	Stringbox Multi output 2 IN-2 OUT 1000Vdc 2 Fuses 15A	1SLM300200A1740
4	EUROPA65	36M2	380x392x140	Stringbox Multi output 4 IN-2 OUT 1000Vdc 2 Fuses 15A	1SLM300400A1740
6	EUROPA65	36M2	424x392x140	Stringbox Multi output 6 IN-2 OUT 1000Vdc 2 Fuses 15A	1SLM300600A1740

# String combiner 1500V DC

## Technical features

String combiner type	16 st.	18 st.	20 st.	24 st.	28 st.	32 st.
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### General Data

Maximum Voltage (VDC)	1500					
No of DC Input	16	18	20	24	28	32
DC input for + & -	Optional available					-
SPD protection	Type 2 Pluggable					
Monitoring	Optional					-
Monitoring Parameters	Current, temperature and SPD signal as standard. Optional to include Voltage and Disconnecter signal					-
Communication Protocol	Modbus RTU					-

### Enclosure Type

Model	Gemini					
Material Type	Thermoplastic					
Door Type/ Opening	Opaque, Hinged Door openable 180 Deg					
Lock Type	Doors supplied with 2 standard double bit locks (3 for sizes 5 and 6)					
Rated Service Voltage	1500VDC					
Degree of resistance to impacts	IK10					
Degree of protection	IP66					
Recyclable	100%					

### Environmental data

Operating Temperature °C	-20°C upto +50°C					
Storage temperature °C	-20°C upto +60°C					
Resistance to Abnormal heat and fire	upto 750°C					
Height above Sea level	Up to 2000m					
Humidity	up to 95%					

### DC Input

Input Cable entry	M16 Cable Gland, 2,5 - 16 mm <sup>2</sup>					
Input Connection	Directly on the Fuse Holder					
Fuse Type	Cylindrical 10x85 gPV					
Fuse Size (A)	15					

### DC Output

Output Cable gland	M32	M32	M40	M40	M40	M40
Clamping area	70-120		150-240			
Conductor material	Copper/Alluminium					
Terminal Type	Ring Terminal					
Voltage DC	1500					
Maximum Current Output (A)	160A	180A	200A	240A	280A	320A



# String combiner 1500V DC

## Order code

### 1500V DC without monitoring (2 fuses + -) for ungrounded or floating earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)	Description	Order codes
16	Gemini	5	590x897x360	Stringbox DC 16str 1500V 2F 15A	1SLM301600A0940
18	Gemini	5	590x897x360	Stringbox DC 18str 1500V 2F 15A	1SLM301800A0940
20	Gemini	6	840x1058x360	Stringbox DC 20str 1500V 2F 15A	1SLM302000A0940
24	Gemini	6	840x1058x360	Stringbox DC 24str 1500V 2F 15A	1SLM302400A0940
28	Gemini	6	840x1058x360	Stringbox DC 28str 1500V 2F 15A	1SLM302800A0940

### 1500V DC with monitoring (2 fuses + -) for ungrounded or floating earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)	Description	Order codes
16	Gemini	6	840x1047x360	Stringbox DC 16str Monitor 1500V 2F 15A	1SLM301600A3940
18	Gemini	6	840x1047x360	Stringbox DC 18str Monitor 1500V 2F 15A	1SLM301800A3940
20	Gemini	6	840x1058x360	Stringbox DC 20str Monitor 1500V 2F 15A	1SLM302000A3940
24	Gemini	6	840x1058x360	Stringbox DC 24str Monitor 1500V 2F 15A	1SLM302400A3940
28	Gemini	6	840x1058x360	Stringbox DC 28str Monitor 1500V 2F 15A	1SLM302800A3940

### 1500V DC without monitoring (1 fuse +) for grounded earthing systems

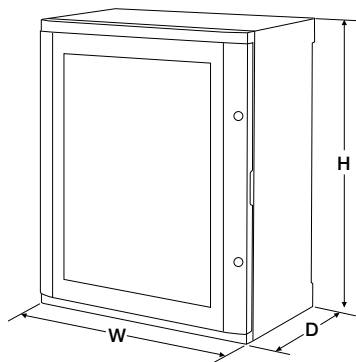
Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)	Description	Order codes
16	Gemini	6	840x1047x360	Stringbox DC 16str 1500V 1F 15A	1SLM301600A4940
18	Gemini	6	840x1047x360	Stringbox DC 18str 1500V 1F 15A	1SLM301800A4940
20	Gemini	6	840x1058x360	Stringbox DC 20str 1500V 1F 15A	1SLM302000A4940
24	Gemini	6	840x1058x360	Stringbox DC 24str 1500V 1F 15A	1SLM302400A4940
28	Gemini	6	840x1058x360	Stringbox DC 28str 1500V 1F 15A	1SLM302800A4940
32	Gemini	6	840x1058x360	Stringbox DC 32str 1500V 1F 15A	1SLM303200A4940

### 1500V DC with monitoring (1 fuse +) for grounded earthing systems

Strings incoming	Enclosure	Size	External dimension, including cable glands WxHxD (mm)	Description	Order codes
16	Gemini	6	840x1047x360	Stringbox DC 16str Monitor 1500V 1F 15A	1SLM301600A5940
18	Gemini	6	840x1047x360	Stringbox DC 18str Monitor 1500V 1F 15A	1SLM301800A5940
20	Gemini	6	840x1058x360	Stringbox DC 20str Monitor 1500V 1F 15A	1SLM302000A5940
24	Gemini	6	840x1058x360	Stringbox DC 24str Monitor 1500V 1F 15A	1SLM302400A5940
28	Gemini	6	840x1058x360	Stringbox DC 28str Monitor 1500V 1F 15A	1SLM302800A5940



# Overall dimensions

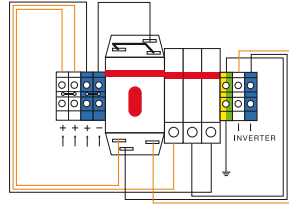
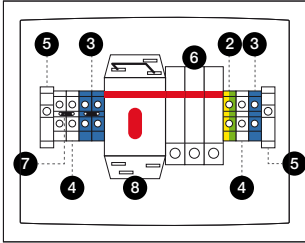


Dimensions (mm)					
Combiner with	W	H	Cable gland	H with cable gland	D
<b>EUROPA65 12M</b>	275	220	M16	248	140
<b>EUROPA65 18M</b>	380	220	M16	248	140
<b>EUROPA65 32M2</b>	380	370	M16	398	140
<b>Gemini 2</b>	460	550	M25	583	260
	460	550	M32	592	260
<b>Gemini 3</b>	460	700	M25	733	260
	460	700	M32	742	260
<b>Gemini 4</b>	590	700	M32	742	260
	590	700	M40	753	260
<b>Gemini 5</b>	590	855	M32	897	360
	590	855	M40	908	360
<b>Gemini 6</b>	840	1005	M32	1047	360
	840	1005	M40	1058	360

# Connection examples

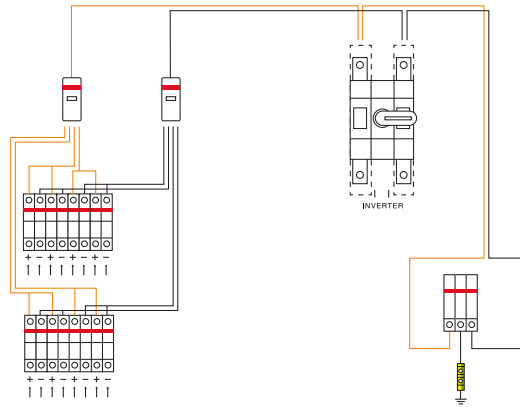
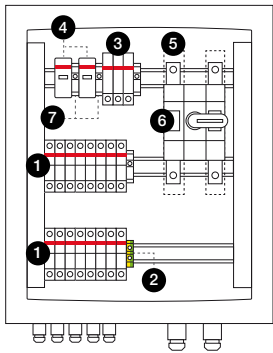
## Single output

### 2 strings, 1000V DC without monitoring



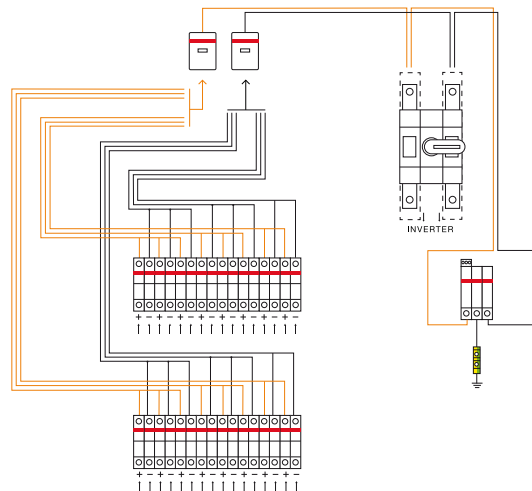
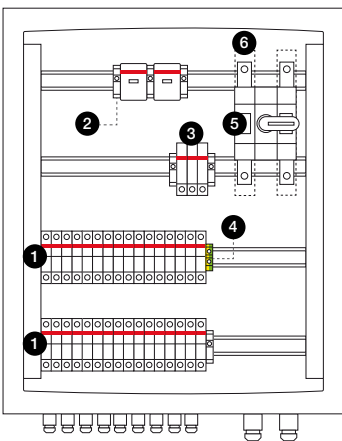
- 1 Fuse holder
- 2 Terminal block M15 PE
- 3 Terminal block M16 BLU
- 4 Terminal block M16 GREY
- 5 Stop BAM3
- 6 Surge protection OVR Q5
- 7 Jumper bar
- 8 Switch disconnecter OTDC 32 F3

### 8 strings, 1000V DC without monitoring



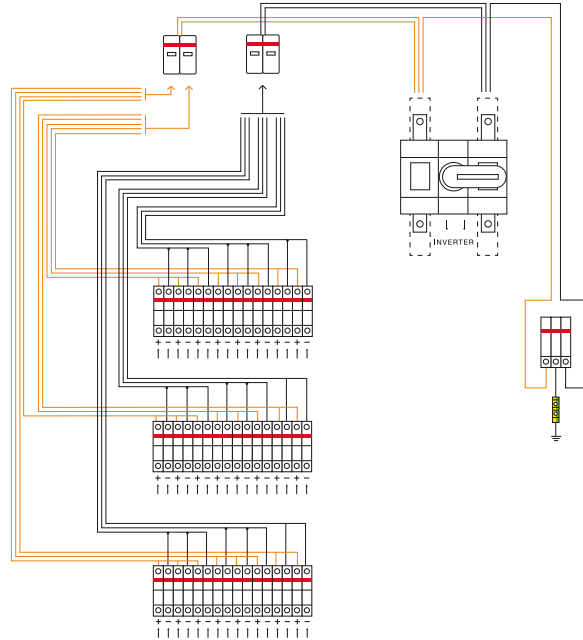
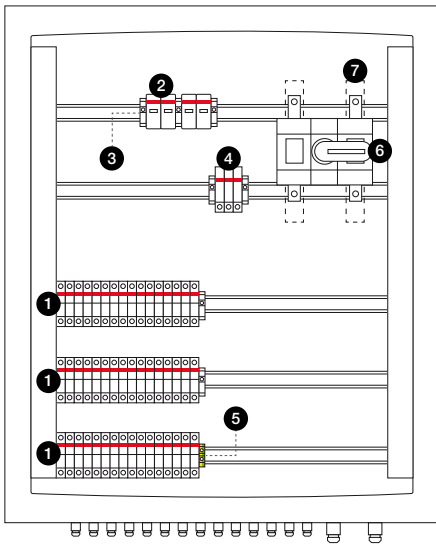
- 1 Fuse holder
- 2 Terminal block M35 PE
- 3 Surge protection OVR QS
- 4 Stop BAM3
- 5 Shroud for OTDC
- 6 Switch disconnecter OTDC250E11K
- 7 Distribution block DBL160

### 16 strings, 1000V DC without monitoring



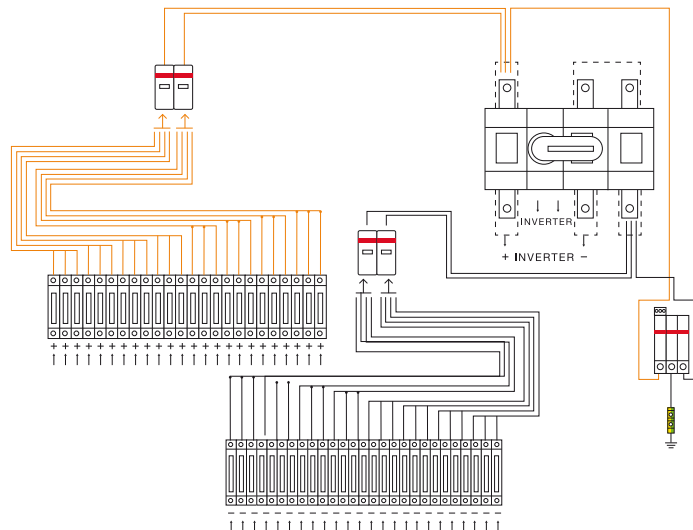
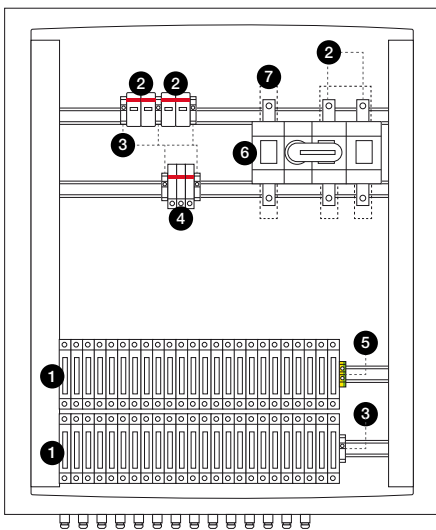
- 1 Fuse holder
- 2 Stop BAM3
- 3 Surge protection OVR
- 4 Terminal block M35 PE
- 5 Switch disconnecter OTDC250E11K
- 6 Shroud for OTDC

24 strings 1000V DC, without monitoring



- 1 Fuse holder
- 2 Distribution block DBL160
- 3 Stop BAM3
- 4 Surge protection OVR
- 5 Terminal block M35 PE
- 6 Switch disconnecter OTDC400E11K
- 7 Shroud for OTDC

24 strings 1500V DC, without monitoring

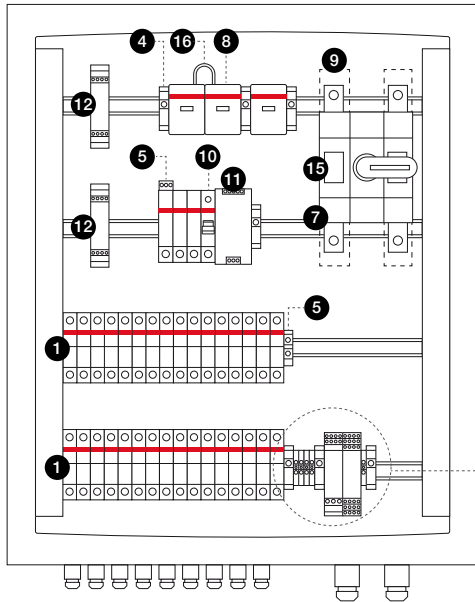


- 1 Fuse holder
- 2 Distribution block DBL160
- 3 Stop BAM3
- 4 Surge protection OVR
- 5 Terminal block M35 PE
- 6 Switch disconnecter OTDC400EV012K
- 7 Shroud for OTDC

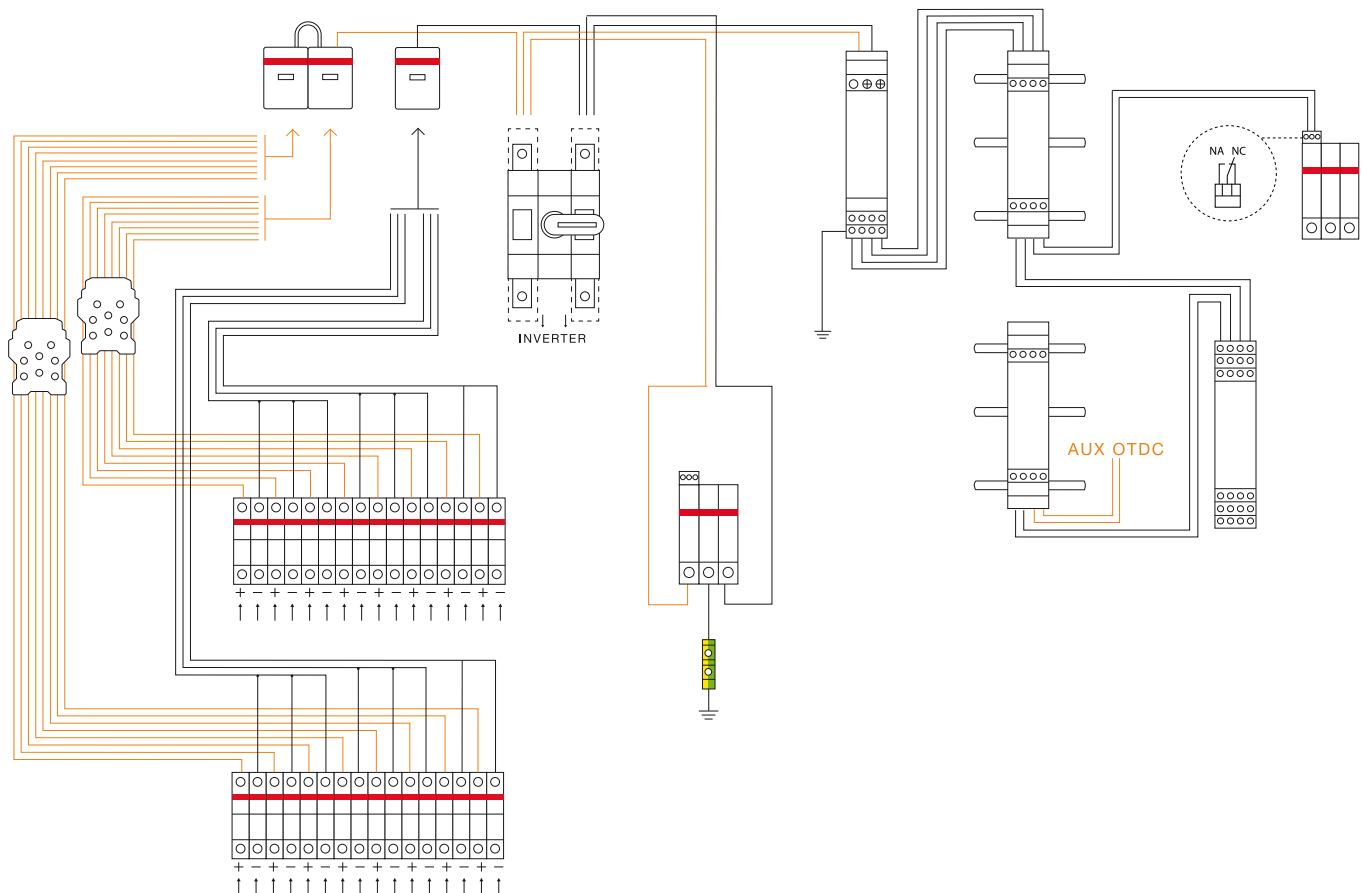
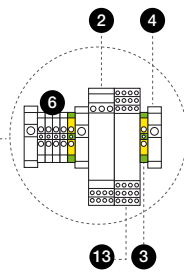
# Connection examples

## Single output

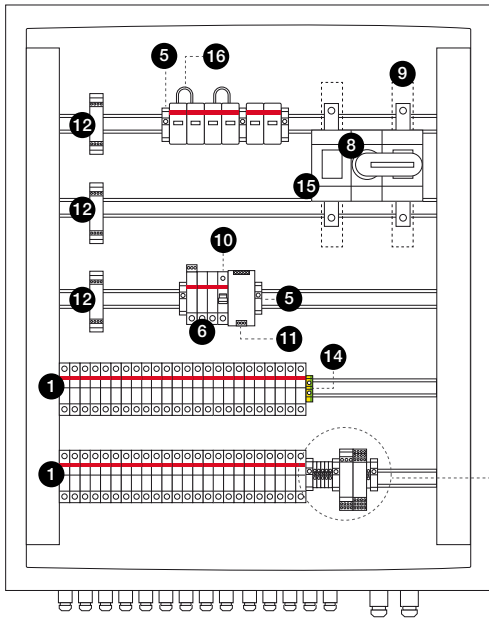
16 strings, 1000V DC with monitoring



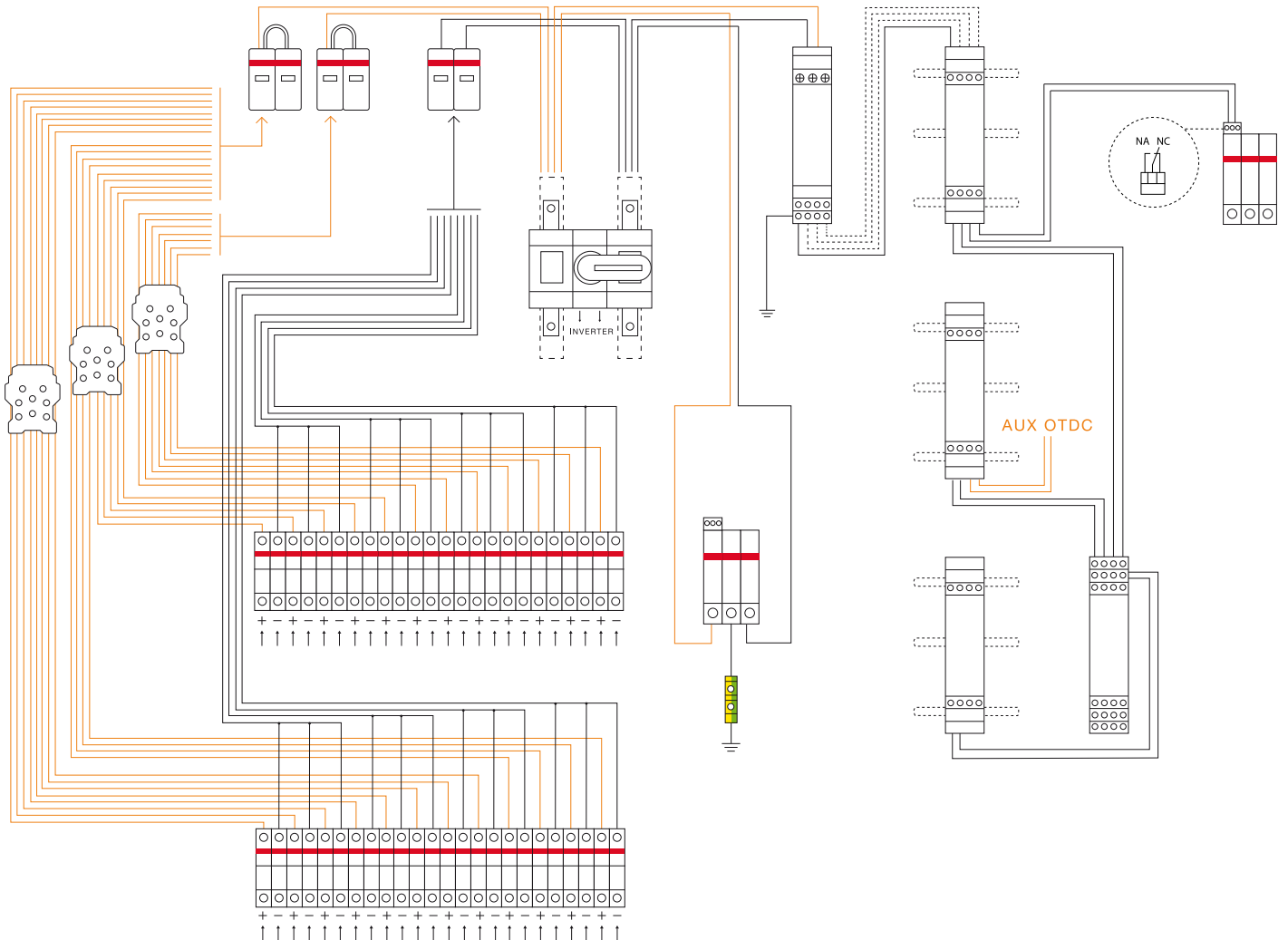
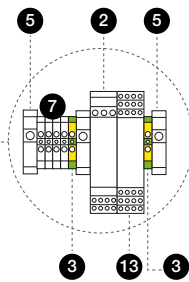
- 1 Fuse holder
- 2 SCK-M-1500V (special accessory)
- 3 Terminal block M4 PE
- 4 Stop BAM3
- 5 Surge protection OVR TS
- 6 Terminal block M4 GREY
- 7 Switch disconnector OTDC250E11K
- 8 Distribution block DBL175
- 9 Shroud for OTDC
- 10 Switch E211
- 11 Power supplier CP-E 2,5 24V
- 12 SCK-M-I-8S-20A
- 13 SCK-C-MODBUS
- 14 Terminal block M35 PE
- 15 Aux contact OTDC (special accessory)
- 16 Erico 1ST622



24 strings, 1000V DC with monitoring



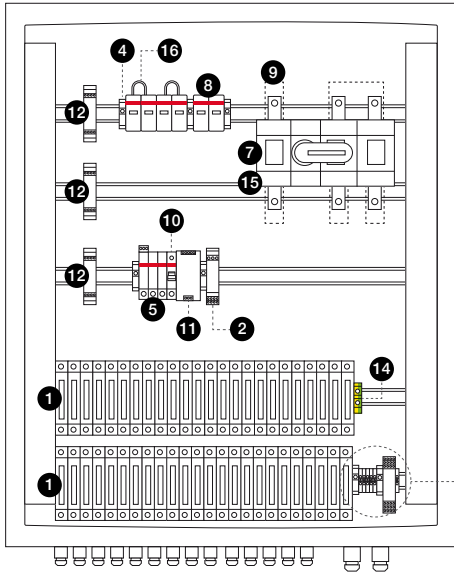
- 1 Fuse holder
- 2 SCK-M-1500V (special accessory)
- 3 Terminal block M4 PE
- 4 Distribution block DBL160
- 5 Stop BAM3
- 6 Surge protection OVR TS
- 7 Terminal block M4 GREY
- 8 Switch disconnecter OTDC400EV11K
- 9 Shroud for OTDC
- 10 Switch E211
- 11 Power supplier CP-E 2,5 24V
- 12 SCK-M-I-8S-20A
- 13 SCK-C-MODBUS
- 14 Terminal block M35 PE
- 15 Aux contact OTDC (special accessory)
- 16 Erico 1ST622



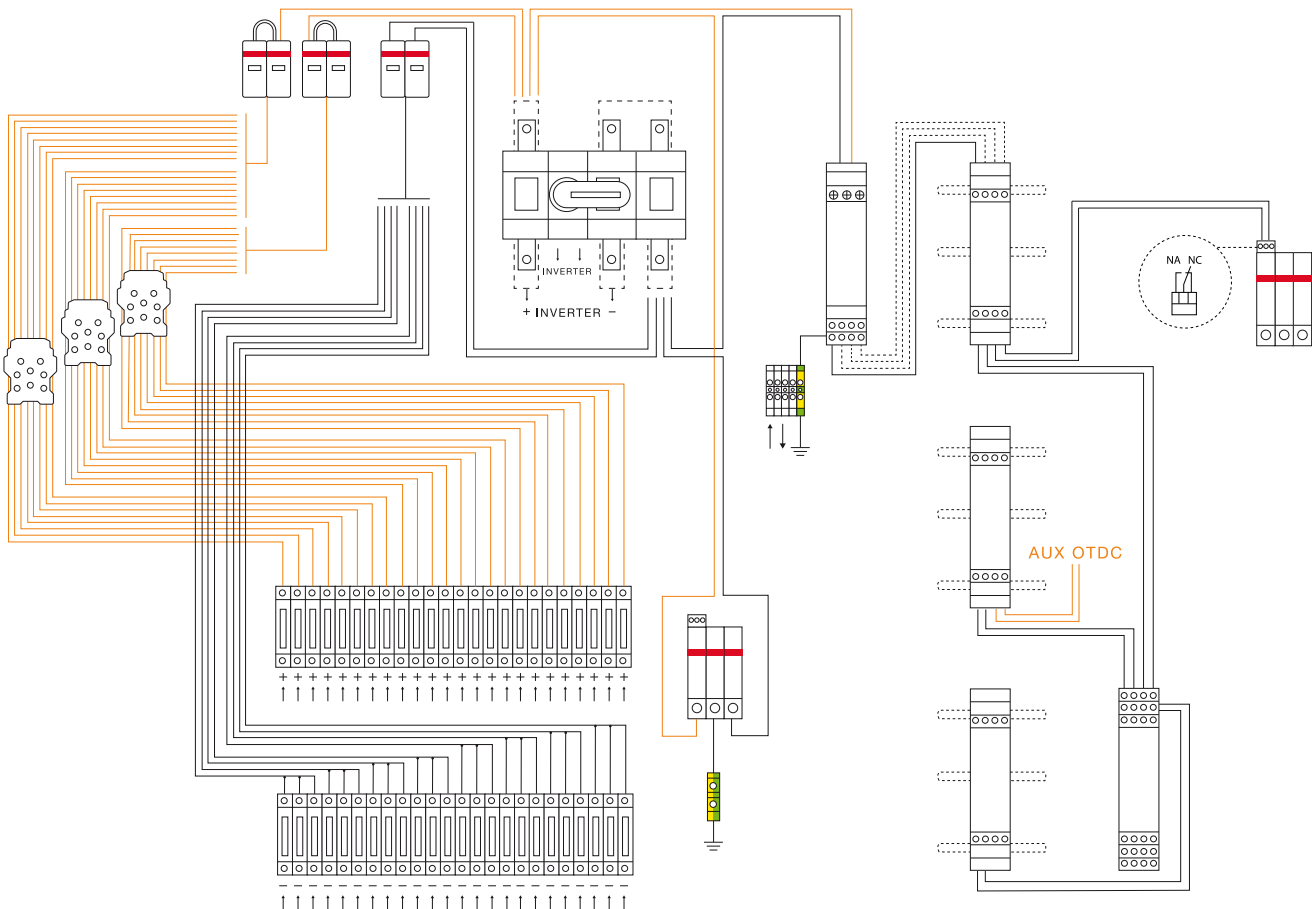
# Connection examples

## Single output

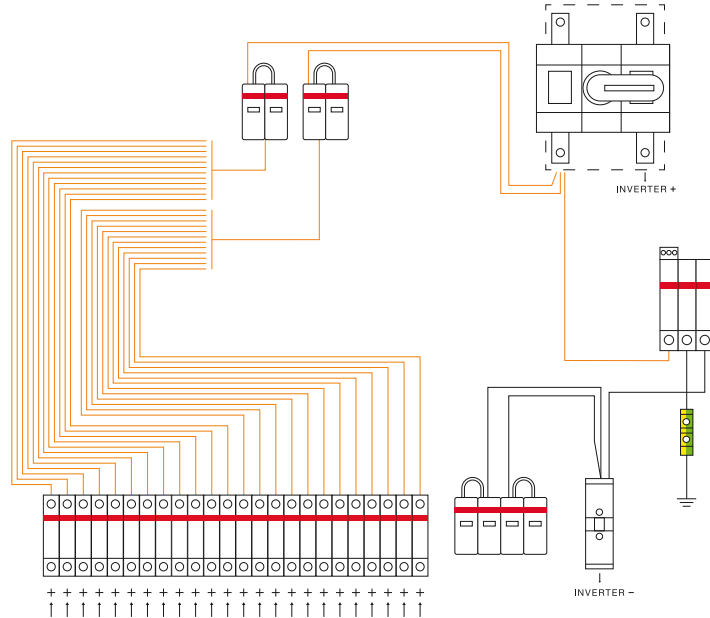
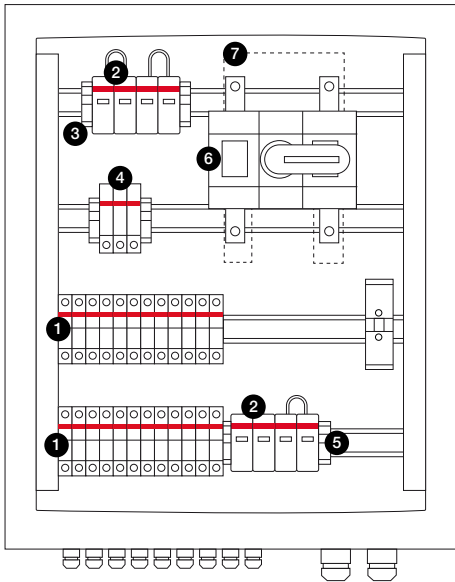
24 strings, 1500V DC with monitoring



- 1 Fuse holder
- 2 SCK-M-1500V (special accessory)
- 3 Terminal block M4 PE
- 4 Stop BAM3
- 5 Surge protection OVR TS
- 6 Terminal block M16 GREY
- 7 Switch disconnecter OTDC400EV12K
- 8 Distribution block DBL160
- 9 Shroud for OTDC
- 10 Switch E211
- 11 Power supplier CP-E 2,5 24V
- 12 SCK-M-I-8S-20A
- 13 SCK-C-MODBUS
- 14 Terminal block M35 PE
- 15 Aux contact OTDC (special accessory)
- 16 Erico 1ST622



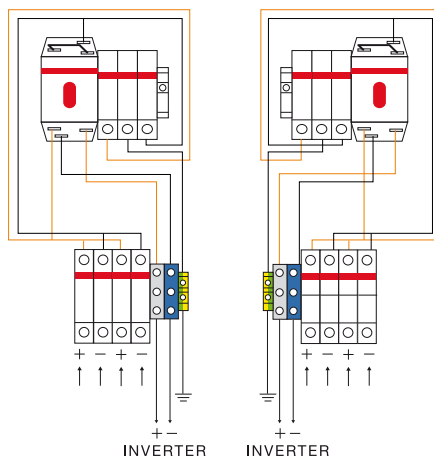
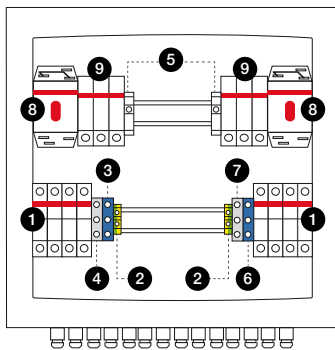
## 24 strings, 1000V DC without monitoring for grounded systems



- 1 Fuse holder
- 2 Distribution block DBL160
- 3 Stop BAM3
- 4 Surge protection OVR
- 5 Terminal block M35 PE
- 6 Switch disconnector OTDC400E11K
- 7 Shroud for OTDC

## Connection examples Multi-output

### 4 strings, 2 out 100V DC Multi-output



- 1 Fuse holder
- 2 Terminal block M16 PE
- 3 Terminal block M16 BLU
- 4 Terminal block M16 GREY
- 5 Stop BAM3
- 6 Terminal block M35 BLU
- 7 Terminal block M35 GREY
- 8 OTDC
- 9 Surge protection OVR QS



# Fuse disconnectors

## E 90 PV



The E 90 PV series of fuse disconnectors has been designed for up to 1000 V DC applications in DC-20B category. The E 90 PV series is specifically focused on overcurrents protection of photovoltaic systems. It provides a reliable, compact and effective solution due to its 10.3 x 38 mm gPV cylindrical fuses.

The main features of E 90 PV fuse disconnectors include:

- 90° opening handle for an easy insertion of fuse even wearing gloves or using the thumb
- Only 17 mm difference in depth between open and closed position
- 25 mm<sup>2</sup> terminals with knurled cage for a better cable clamp
- Fully compatible with electrical screwdrivers
- Pozidriv screws for flat or cross screwdrivers
- Lockable in open position through standard padlocks, for a safer maintenance
- Sealable in closed position with lead seals to prevent unauthorized access
- Cooling chambers and ventilation slots improve heat dissipation
- Available with indicator LED lights to signal if the fuse is blown

Main technical specifications		E 90/32 PV
Reference Standards		IEC 60947-3, UL 4248-1, UL 4248-18
Rated Voltage	V DC	1000
Utilization category		DC-20B
Fuse	mm	10 x 38 gPV curve
Current		DC
Rated Current	A	30
Tightening torque	Nm	PZ2 2-2.5
Protection Class		IP20
Lockable (open position)		Yes
Sealable (closed position)		Yes
Approvals		UL, CCC, EAC, GOST UKR, BV

# Cylindrical fuses

## E 9F PV

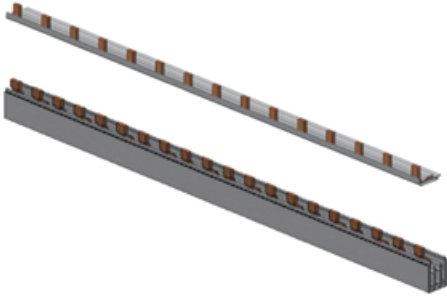


The new E 9F PV range of cylindrical fuses has been designed to protect DC circuits up to 1000 V DC according to gPV trip characteristic specific for PV systems.

E 9F PV 10.3 x 38 mm fuses offer the best solution for protecting strings, inverters and surge arresters in photovoltaic systems with nominal currents up to 30 A.

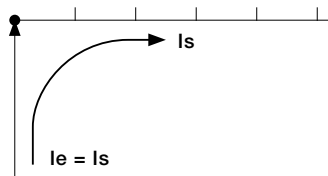
Main technical specifications		E 9F PV
Reference Standards		IEC 60269-6, UL 4248-1, UL 4248-18
Rated voltage	V DC	1000
Rated current	A	1...30
Breaking capacity	kA	10
Minimum breaking capacity		From 1 A up to 7 A = 1,35 x I <sub>n</sub> From 8 A up to 30 A = 2,0 x I <sub>n</sub>
Dimensions	mm	10.3 x 38
Weight	g	7

# Busbars for E90 PV Fuse disconnectors

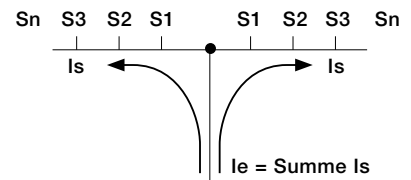


Main technical specifications		DC-Busbar 30mm <sup>2</sup>	
Type	1 Phase	2 Phase	
Material	Copper	Copper	
Surface	Plain	Plain	
Insulation	ABS Grey RAL 7035		
End Cap	ABS Grey RAL 7035		
<b>Technical data</b>			
Heat deflection Temp. Long Term	90°C UL 94V0		
Heat deflection Temp. Short term	113°C UL94V0		
Comparative Tracking Index	600V		
Standards	EN60947-1:2007/IEC 60947-1:2007		
Insulation Coordination	Overvoltage Category III/ Degree of Pollution 2		
<b>Electrical Data</b>			
Max. electrical load	690V AC/1000V DC	690V AC/1000V DC	
Protection Class:	IP20		
Short Circuit Rating	IPK=25kA/0.1s (Surge Energy Capacity IPK) ICC 100kA-NH3 355A gC500V JM		
Impulse Voltage Strength	≥8.5KV		
Dielectric Strength	>32 kV/mm		
<b>Capacity at 35°C ambient temperature depending on the feeding point</b>			
Cross Section	30 mm <sup>2</sup>		
Busbar Length	max. 1000mm	max. 300mm	
Feeding at beginning/ending	120A	200A	
Max Current Is/Phase			
Other Feeding Max current Is/Phase	160A	250A	

## Feeding at beginning or end of busbar



## Other Feedings



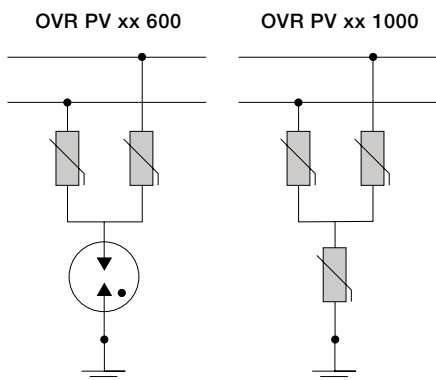
In case of center-feeding, please note that the sum of junction currents S1.. Sn per rail branch may not be bigger than the above named max. busbar current Is/Phase.

# Surge protective devices OVR PV, OVR TC



ABB offers a wide range of surge protection devices specifically designed for photovoltaic systems. The main features of the OVR PV SPDs include:

- OVR PV T1 and T2 version
- Auto-protected from end-of-life short circuits up to 10 kA DC thanks to the integrated thermal protection with direct current breaking capacity
- pluggable cartridges for easy maintenance, no need to disconnect the line
- auxiliary contact for remote signaling of line status ("TS" version)
- absence of short circuit follow current
- absence of risk for reversed polarity
- "Y" configuration for a safer protection
- bottom wiring to improve safety when there is humidity issues in enclosure
- QS Quick Safe® Technology- Fast disconnection in case of end of life of the SPD avoiding thermal runaway.



Main technical specifications		OVR PV T1	OVR PV T2 40 QS
Reference standards		IEC 61643-11 / UTE C 61740-51 prEN 50539-11 UL 1449 4th edition*	
Configuration		Y	Y
SPDs Type / Test Class		T1 / I	T2 / II
Max. cont. Operating voltage Ucpv	V	670 / 1000	600 / 1000 / 1500
Nominal discharge current In (8/20 μs)	kA	6.25	20
Impulse current Iimp (10/350 μs)	kA	6.25	-
Maximum discharge current Imax (8/20 μs)	kA	-	40
Voltage protection level Up	kV	1.9 / 2.5	2.8 / 3.8
Short circuit DC current withstand Iscwpv	A	100	10000
Back-up protection:			
- if Iscwpv ≤100A		- not required	- not required
- if Iscwpv >100A		- 10A gPV fuse	- autoprotected up to 10 kA
Response time	ns	≤25	≤25
Specific integrated PV thermal disconnector		Yes	QuickSafe Technology
Pluggable		Yes	QuickSafe Technology
Auxiliary contact		TS	TS

\*UL version only for OVR PV 40

## OVR TC

With increasing request of monitoring systems, OVR TC data line SPDs are right choice to protect the monitoring lines of the PV plants from surges. They are installed in series with the network and have removable cartridges, making maintenance simple, without having to cut the power to the telecommunications line.



Main technical specifications		OVR TC
Reference Standard		IEC/EN 61643-21 - UL497B
IEC type		C2
Max. cont. operating voltage Uc	V	7 to 220V (AC/DC)
Nominal Discharge current In (8/20us)	kA	5
Max. discharge current Imax (8/20us)	kA	10
Response time	ns	1
Pluggable		Yes

# Miniature circuit-breakers

## S800 PV-SP



The S800 PV-SP modular miniature circuit-breakers can be used in networks up to 1200 V DC (4-poles execution). The S800 PV-SP circuit breakers and its range of accessories (auxiliary contacts, undervoltage releases, motorized commands) allow for a wide spectrum of configurations.

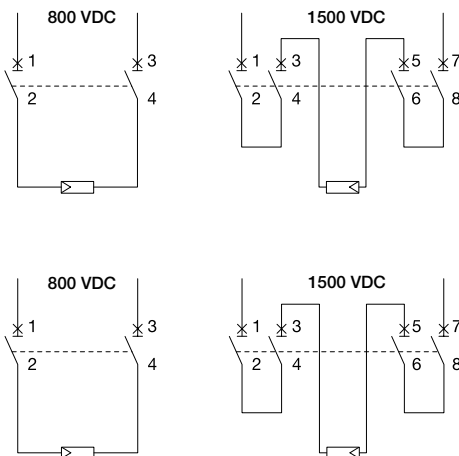
The main features of the S800 PV-SP circuit breakers include:

- interchangeable terminals
- central trip safe disconnection of all poles
- contact status displayed for each pole
- polarity independent wiring

Main technical specifications		S800 PV-SP	
Reference Standards		IEC EN 60947-2 and Annex P	
Rated current	A	5...125	125
Number of poles		2, 4	
Rated voltage Ue			
(DC) 2 poles*	V	800	
(DC) 4 poles*	V	1500	
Ultimate rated short-circuit breaking capacity Icu			
5...16A acc. IEC 60947-2 Annex P	kA	5	
20...125A acc. IEC 60947-2	kA	5	
20...125A acc. IEC 60947-2 Annex P	kA	3	
Thermomagnetic release characteristic		4 In ≤ Im ≤ 7 In	
Class of use		A	
Operating temperature	°C	-25...+60	
Mounting		DIN rail EN 60715 (35 mm) by means of fast clip device	

\* Please refer to the wiring diagrams

### Panel network in earth-insulated systems



# Switch-disconnectors

## S800 PV-SD, S802 PV-M-H



The S800 PV-SD modular switch-disconnectors can be used in networks up to 1500 V DC (4-poles execution). The S800 PV-SD switch-disconnectors and its range of accessories (auxiliary contacts, undervoltage releases, motorized commands) allow for a wide spectrum of configurations.

The main features of the S800 PV-SD switch-disconnectors include:

- interchangeable terminals
- contact status displayed for each pole
- polarity independent wiring

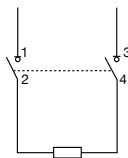
Main technical specifications		S800 PV-SD
Reference Standards		IEC EN 60947-3 and Annex D
Rated current $I_n$	A	32, 63, 125
Number of poles		2, 4
Rated voltage $U_e$		
(DC) 2 poles*	V	800
(DC) 4 poles*	V	1500
Rated short-time withstand current $I_{cw}$		
(DC) 2 poles* 800 V	kA	1.5
(DC) 4 poles* 1500 V	kA	1.5
Class of use		DC-21A
Operating temperature	°C	-25...+60
Mounting		on DIN rail EN 60715 (35 mm) by means of fast clip device

\* Please refer to the wiring diagrams

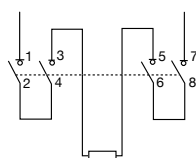
### Panel network in earth-insulated systems

#### S800 PV-M

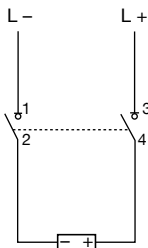
32...125 A  
800 VDC



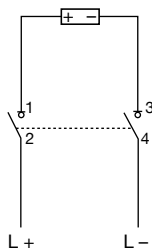
32...125 A  
1500 VDC



#### S802 PV-M-H



Comply with polarity and supply direction in wiring.



The S802 PV-M-H polarized switch-disconnectors are specially designed for networks up to 1000 V DC. They are equipped with permanent magnets which provide the switch polarity, therefore a correct supply voltage is required. S802 PV-M-H switch-disconnectors and its range of accessories (auxiliary contacts, undervoltage releases, motorized commands) allow for a wide spectrum of configurations.

The main features of the S802 PV-M-H switch-disconnectors include:

- interchangeable terminals
- contact status displayed for each pole

Main technical specifications		S802 PV-M-H
Reference Standards		IEC EN 60947-3
Rated current $I_n$	A	32, 63, 100
Number of poles		2
Rated voltage $U_e$		
(DC) 2 poles*	V	1000
Rated short-time withstand current $I_{cw}$		
(DC) 2 poles* 1000 V	kA	1.5
Class of use		DC-21A
Operating temperature	°C	-25...+60
Mounting		on DIN rail EN 60715 (35 mm) by means of fast clip device

\* Please refer to the wiring diagrams

\*According to AS/NZS 5033 polarity dependent switch-disconnectors must not be used on PV arrays less than 240kW

# Switch-disconnectors

## OTDC16...32



OTDC16...32F



OTDC16...32U



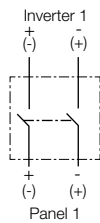
OTDCP16...32F

OTDC16...32 disconnect switches are available up to 32 amperes and 1000V. The modular structure offers a simple and cost effective solution for disconnecting up to 1, 2, or 3 PV circuits within the same footprint area.

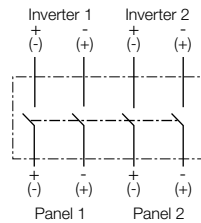
- The main features of the OTDC16...32 disconnect switches include:
  - Patented design of DC main contacts offer:
    - Low temperature rise for minimal contribution to overall heat-rise within any enclosure.
    - High operational performance, 32A up to 1000V, in high ambient temperatures.
    - Increased energy efficiency
  - Compactness and modularity: allow for consistent and optimized mounting in switchboard equipment, therefore reducing implementation costs and increased space savings.
  - DINrail, base, or door-mounted versions for simple installation in a variety of enclosure designs.
  - Compliant with many global standards, including UL 508i.
  - OTDC16...32US versions are factory pre-connected for single-wire breaking applications.
  - Enclosed OTDCP16...32 versions are suitable for outdoor use in harsh environments.

### Examples

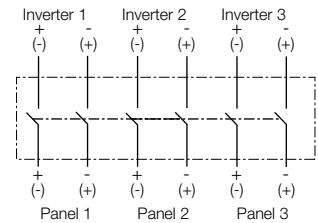
**One PV Circuit  
2 Pole**  
OTDC\_F2, FT2  
OTDC\_U2, UT2



**Two PV Circuit  
4 Pole**  
OTDC\_F4, FT4  
OTDC\_U4, UT4



**Three PV Circuit  
6 Pole**  
OTDC\_F6, FT6  
OTDC\_U6, UT6





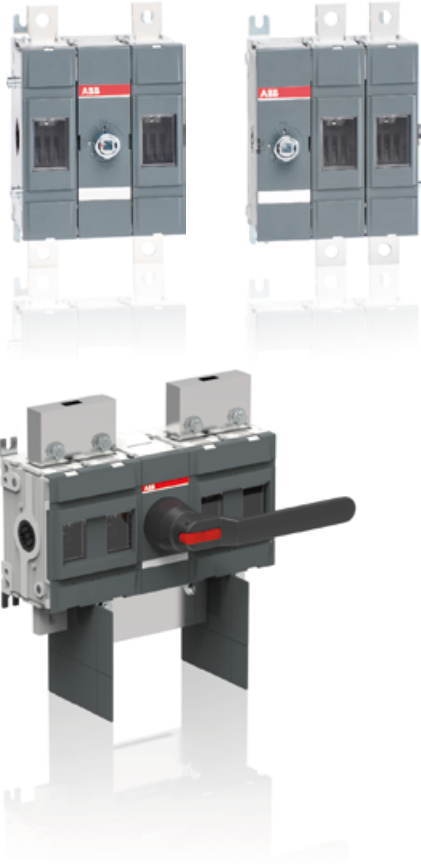
Main technical specifications <sup>1)</sup>		OTDC16...32	
		F Type	U Type
Mounting Versions	Base and Din Mount	OTDC_F_	OTDC_U_, OTDC_US_
	Door Mount	OTDC_FT_	OTDC_UT_, OTDC_UST_
<b>Reference Standards</b>		<b>IEC 60947-3</b>	
Rated Insulation Voltage (Ui)	V	1000	
Pollution degree 3			
Rated Impulse Voltage (Uimp)	kV	8	
Nominal Current In (Amps)		16, 25, 32	16, 25, 32
Rated Thermal Current	in open air	25...45	40...63
Ith (Amps)	in enclosure 40°C	25...45	32...50
	in enclosure 60°C	25...32	25...40
Utilization Category		DC-21B	
Number of Poles		2...4	2...6
Rated Operational Current Ie (Amps) at 660 V DC	1 circuit	16...32	16...32
	2 circuits	16...32	16...32
	3 circuits		16...32
Rated Operational Current Ie (Amps) at 1000 V DC <sup>2)</sup>	1 circuit	10...32	10...20
	2 circuits	10...32	10...20
	3 circuits		10...20
Wire Size Range	mm <sup>2</sup>	2.5...16	
<b>Reference Standards</b>		<b>UL508i</b>	
Number of Poles		-	2...6
Rated Current (Amps) at 600 V DC	1 circuit	-	10...25
	2 circuits	-	16...32
	3 circuits	-	16
Ambient temperature	°C	-	-20...+60
Short Circuit Rating	kA, 600V	-	5
	Protection Type	-	RK5 Fuse
	A, Max Fuse Size	-	70
Wire Size Range	AWG	-	12-6 AWG

1) For additional technical details, refer to OTDC Main Catalog

2) 1000 V DC not applicable to OTDC\_US, UST versions.

# Switch-disconnectors

## 1000 V DC and up to 1600A: OTDC100...1600



The OTDC series of switch-disconnectors is available with nominal currents from 100 to 1600 A.

**OTDC 100...800:** Two poles in series provides compact performance up to 1000 V DC. Up to three 1000 V circuits can be operated with a single device. It is also possible to use the switch as a combiner, with separate inputs and a combined output of up to 1500A.

**OTDC1000...1600:** Four poles in series provides compact performance up to 1000 V DC for use in high power applications

The main features of the OTDC100...1600 switch-disconnectors include:

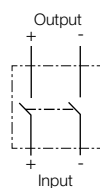
- Compactness: thanks to the patented DMB (Dual Magnetic Breaking) technology, the switches reach 1000 V DC with two poles in series for most sizes.
- Easy to install: connections are simple and independent from polarity, for providing greater wiring flexibility. The operating mechanism can be located between the poles or on the left side of the switch.
- Factory-installed or jumper kits available.
- Safety: Visible contacts allow a clear indication of position.

### Examples

#### Single PV Circuit

**1000 V DC** IEC: 100-500A

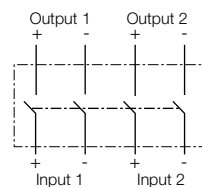
**1000 V DC** UL: 100-400A



#### Double PV Circuit

**1000 V DC** IEC: 100-500A

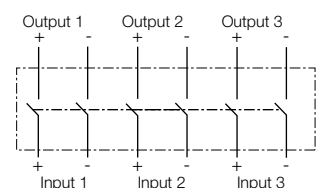
**1000 V DC** UL: 100-400A



#### Triple PV Circuit

**1000 V DC**

IEC: 315-500A



Main technical specifications <sup>1)</sup>		OTDC100...250		OTDC250...800	
		OTDC100...250E_	OTDC100...200U_	OTDC315...800E_	OTDC250...600U_
Wiring configuration	Two-wire breaking	E types	U types	E types	U types
	Single-wire breaking		US types		US types
<b>Reference Standard</b>		<b>IEC 60947-3</b>		<b>IEC 60947-3</b>	
Nominal Current In (Amps)		100, 160, 200, 250	160, 200, 250	315, 400, 500, 630, 800	250, 320, 400, 600
Rated Insulation Voltage (Ui)	V	1000		1500	
Pollution degree 3					
Rated Impulse Voltage (Uimp)	kV	12		12	
Number of Poles		2...6		2...6	
Rated Thermal Current Ith (A)	in open air	100...250		315...800	
	in enclosure 40°C	100...250		315...800	
	in enclosure 60°C	100...200		315...680	
Utilization Category		DC-21B		DC-21B	
Rated Operational Current Ie (A) at 1000 V DC	1 circuit	100...250		315...800	
	2 circuits	100...250		315...500	
	3 circuits	–		315...500	
Rated Operational Current Ie of combined output (A) at 1000 V DC	2 input circuits, 1 output	–		315...500, 630...1000	
	3 input circuits, 1 output	–		315...500, 945...1500	
<b>Reference Standard</b>		<b>UL 98B</b>		<b>UL 98B</b>	
Number of Poles		–	2...4	–	2...4
Rated Current (A) at 1000 V DC	1 circuit	–	100...200	–	250...600
	2 circuits	–	100...180	–	250...400
Rated Current (A) at 1000 V DC	2 input circuits, 1 output	–	–	–	250...400, 500...800
Ambient temperature	°C	–	-20...+50	–	-20...+50
Short Circuit Rating	kA per input, 1000V	–	5	–	10
	Protection Type	–	Circuit breaker	–	Circuit breaker
Wire Size Range	MCM		#4-300		#2-600

# Switch-disconnectors

## 1500 V DC and up to 500A: OTDC250...500



The OTDC series of switch-disconnectors is also available for operating voltages up to 1500 V DC from 250A to 500A. Up to two separate 1500 V DC circuits can be operated with a single device.

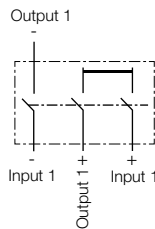
The main features of the OTDC250...500 switch-disconnectors include:

- Compactness: thanks to the patented DMB (Dual Magnetic Breaking) technology, the switches reach 1500 V DC with only 3 poles and a small footprint.
- Easy to install: connections are simple and independent from polarity, for providing greater wiring flexibility. The operating mechanism can be located between the poles or on the left side of the switch.
- Factory-installed or jumper kits available.
- Safety: Visible contacts allow a clear indication of position.

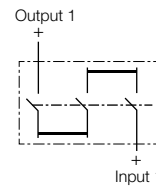
### Examples

#### Single PV Circuit

**1500 V DC** IEC: 315-500A  
**1500 V DC** UL: 250-400A  
 Ungrounded System

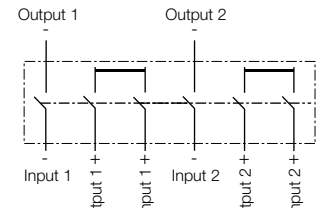


**1500 V DC** IEC: 315-500A  
**1500 V DC** UL: 250-400A  
 Grounded System



#### Double PV Circuit

**1500 V DC** IEC: 315-500A  
 Ungrounded System



Main technical specifications		OTDC250...500	
1500 V DC basic versions		OTDC315...500E_	OTDC250...400U_
Wiring configuration	Two-wire breaking	E types	U types
	Single-wire breaking		US types
Reference Standard		IEC 60947-3	
Nominal Current In (Amps)		315, 400, 500	250, 320, 400
Rated Insulation Voltage (Ui)	V	1500	
Pollution degree 3			
Rated Impulse Voltage (Uimp)	kV	12	
Rated Thermal Current Ith (Amps)	in open air	315...630	
	in enclosure 40°C	315...550	
	in enclosure 60°C	315...440	
Number of Poles		3..6	
Utilization Category		DC-21B	
Rated Operational Current Ie (Amps) at 1500 V DC	One circuit	315...500	
	Two circuits	315...500	
Reference Standard		UL 98B	
Number of Poles		-	3
Rated Current (Amps) at 1500 V DC	One circuit	-	250...400
Ambient temperature	°C	-	-20...+50
Short Circuit Rating	kA, 1500V	-	10
	Protection Type	-	Circuit breaker
Wire Size Range	MCM	-	#2-600

# Monitoring system

## Main technical specifications

### General data

Degree of protection	IP20
Ambient temperature range (operation)	-20°C ... 70°C
Ambient temperature range (storage)	-40°C ... 85°C
Dimensions W / H / D	22.5 / 102 / 128.5 mm
Screw connection solid / stranded / AWG	0.2 ... 2.5 mm <sup>2</sup> / 0.2 ... 2.5 mm <sup>2</sup> / 24 - 12
Tightening torque	0.5 - 0.6 Nm
Humidity at 25°C, no condensation	≤ 95%
Altitude	≤ 2000 m
Installation on DIN rail	35 mm (DIN EN 50022)
Pollution degree	2
Conformance/approvals	CE-compliant Conformance with EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC
Referenced standard	EN 61010-01:2011-7

### Current measuring modules

#### Supply

Supply voltage	Via SCK-C-MODBUS
Typical internal power consumption	43 mA
Maximum internal power consumption	50 mA

#### Measuring inputs

Current measuring range	0 ... 20 A DC
Maximum transmission error from measuring range final value	±1%
Temperature coefficient TC20	0.02% / K
Reverse current detection	-1 ... 0 A DC
Number of measuring channels	8
Overload capacity	5 x IN
Connection method	9.5 mm through connection

#### Digital input

Controlled by external floating contact	Yes
Cable length	≤ 30 m

#### Analog input

Input voltage range 0 ... 10 V -	
----------------------------------	--

#### Analog output

Output voltage range	24 V supply for 2903591 -
Cable length (for 0.15 mm <sup>2</sup> )	0.5 m, maximum -
Cable type Twisted, shielded -	

#### Data interface for SCK-C-MODBUS

Cable length (for 0.15 mm <sup>2</sup> ) ≤ 300 m	
Cable length (for 1.5 mm <sup>2</sup> ) ≤ 500 m	
Cable type Twisted, shielded	
Communication protocol Proprietary	

The monitoring system will be factory fitted with combiners as a complete solution and will not be available for sale as a separate component.

# Monitoring system

## Voltage measuring module

Voltage measurement SCK-M-U-1500V (Order No. 2903591)

Supply	
Supply voltage	24 V DC (-10% ... +25%) or via current monitoring module
Typical internal power consumption	8 mA
Maximum internal power consumption	65 mA

Measuring inputs	
Voltage measuring range	0 ... 1500 V DC
Maximum transmission error from measuring range final value	1% after additional adjustment (valid for 100 ... 1500 V DC)
Temperature coefficient from T > 25°C	0.01% / K
Number of measuring channels	1
Connection method	Screw connection
Minimum terminal block distance	32 mm
Surge voltage	6 kV

Analog output	
Output voltage range	2 ... 10 V
Cable length (for 0.15 mm <sup>2</sup> )	0.5 m, maximum
Cable type	Twisted, shielded

Communication module	
Supply	
Supply voltage	24 V DC (-10% ... +25%)
Typical internal power consumption	22 mA
Maximum internal power consumption	45 mA
Maximum current consumption	800 mA

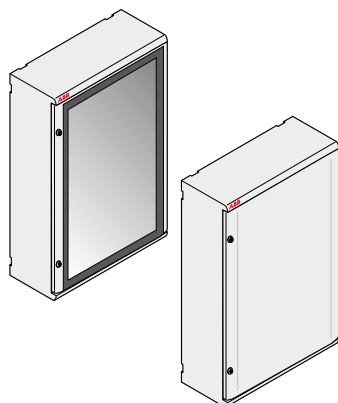
Data interface for SCK bus	
Cable type	Twisted, shielded
Communication protocol	Proprietary

Serial interface (RS-485)	
Serial transmission speed	9.6 / 14.4 / 19.2 / 38.4 kbps
Cable length	1200 m, maximum
Cable type	Twisted, shielded
Communication protocol	Modbus RTU
Optional termination resistor (not supplied as standard)	180 Ω
Operating mode	Half duplex

# Switchboards Gemini IP 66



Main technical specifications	Gemini IP 66
<b>Protection</b>	
Protection class	IP 66 (CEI EN 60529)
Insulation	class II
<b>Strength</b>	
Material	joint-injection moulded thermo-plastic
Heat and fire resistance	up to 750 °C (IEC EN 60695-2-11)
Shock resistance	IK10 (IEC EN 50102)
Protection against chemicals and weather conditions	water, saline solutions, acids, basics, mineral oils, UV rays
Operating temperature	-25 °C...+100 °C
<b>Performance</b>	
Nominal insulation voltage	1000 V AC – 1500 V DC
Flexibility WxHxD, external dimensions	6 sizes from 335 x 400 x 210 mm to 840 x 1005 x 360 mm DIN modules from 24 to 216
Installation	Snap-in assembly of all components
Standards, quality, environment	IEC EN 50298, IEC 23-48, IEC 23-49, IEC 60670, IEC EN 60439-1 IMQ Mark according to the IEC EN 50298 standard. Fully recyclable



## Boxes and doors

– RAL 7035 grey color

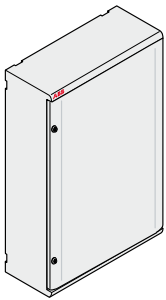
Size	External WxHxD (mm)	Internal WxHxD (mm)	Max num. DIN mod.
1	335x400x210	250x300x180	24 (12x2)
2	460x550x260	375x450x230	54 (18x3)
3	460x700x260	375x600x230	72 (18x4)
4	590x700x260	500x600x230	96 (24x4)
5	590x855x360	500x750x330	120 (24x5)
6	840x1005x360	750x900x330	216 (36x6)

# Switchboards

## Gemini UL IP 66



Main technical specifications	Gemini UL IP 66
<b>Protection</b>	
Protection class	UL IP 66 (CEI EN 60529)
Insulation	class II
<b>Strength</b>	
Material	joint-injection moulded thermo-plastic
Heat and fire resistance	up to 960 °C (IEC EN 60695-2-11)
Shock resistance	IK10 (IEC EN 50102)
Protection against chemicals and weather conditions	water, saline solutions, acids, basics, mineral oils, UV rays
Operating temperature	-4°F up to 158°F (-20°C up to 70°C)
<b>Performance</b>	
Nominal insulation voltage	690 V DC
Flexibility WxHxD, external dimensions	6 sizes from 335 x 400 x 210 mm to 840 x 1005 x 360 mm DIN modules from 24 to 216
Installation	Snap-in assembly of all components
Standards, quality, environment	NEMA Types: 1, 3R, 4, 4X UL Listed: UL508A, UL50, UL50E CSA Listed: C22.2 Nr14



### Boxes and doors

- RAL 7035 grey color
- only opaque door available

Size	External WxHxD (mm)	Internal WxHxD (mm)	Max num. DIN mod.
1	335x400x210	250x300x180	24 (12x2)
2	460x550x260	375x450x230	54 (18x3)
3	460x700x260	375x600x230	72 (18x4)
4	590x700x260	500x600x230	96 (24x4)
5	590x855x360	500x750x330	120 (24x5)
6	840x1005x360	750x900x330	216 (36x6)



## Wall mounting consumer units EUROPA65 series



The Europa series wall-mounting units feature IP65 protection which makes them ideal for outdoor installation. This means that they can be used for making string boxes on the load side of photovoltaic strings.

The main features of the Europa series wall-mounted units include:

- class II insulation
- manufactured in self-extinguishing thermoplastic material able to withstand abnormal heat and fire up to 960 °C (glow wire test) in compliance with IEC 60695-2-11 standards
- installation temperature: -25 °C to +60 °C
- nominal insulation voltage: 1000 V AC; 1500 V DC
- shock resistance: 20 joules (IK 10)
- pull-out DIN rails holder frame for more convenient bench wiring.  
Can be disassembled (and re-assembled by means of a snap-fit mechanism) to make the individual wires easier to route
- 53, 68 and 75 mm depth switchgear can be installed
- consumer units in compliance with IEC 23-48, IEC 23-49 and IEC 60670 standards

Description Type	Dimensions (mm)
IP65 consumer unit P/smoke grey 8M	205x220x140
IP65 consumer unit P/smoke grey 12M	275x220x140
IP65 consumer unit P/smoke grey 18M 1 row	380x220x140
IP65 consumer unit P/smoke grey 24M 2 rows	275x370x140
IP65 consumer unit P/smoke grey 36M 2 rows	380x370x140

## EUROPA65 junction boxes



ABB provides IP65 polycarbonate junction boxes that are perfect for use in outdoor installations.

The main features of the junction boxes include:

- class II insulation
- manufactured in self-extinguishing thermoplastic material able to withstand abnormal heat and fire up to 960 °C (glow wire test) in compliance with IEC 60695-2-11 standards
- installation temperature: -25 °C to +60 °C
- nominal insulation voltage: 1000 V AC; 1500 V DC
- shock resistance: 20 joules (IK 10 degrees)
- junction boxes in compliance with IEC 23-48 and IEC 60670 standards
- IMQ approved

Description Type	Dimensions (mm)
Box IP65 PC	140x220x140
Box IP65 PC	205x220x140
Box IP65 PC	275x220x140
Box IP65 PC	275x370x140
Box IP65 PC	275x570x140
Box IP65 PC	380x570x140

# Distribution blocks

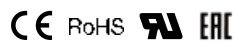
## DBL



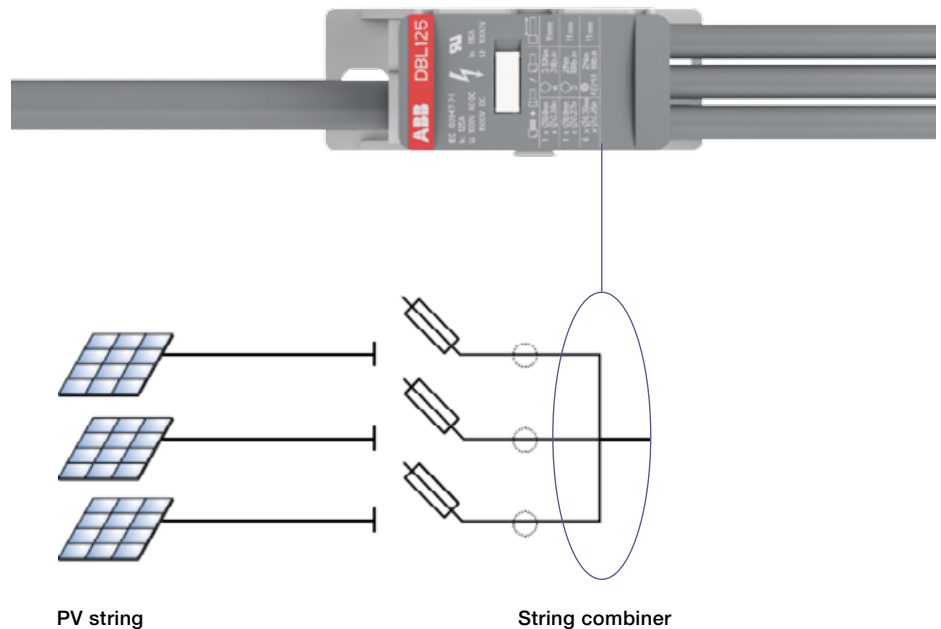
The DBL distribution blocks are adapted to the most recent solar inverters requirements with a voltage rating going up to 1500V DC IEC (1000V DC UL). They provide the benefit of 3 configurations in 1 single product: grouping several inputs into one output for DC applications, or single and multipole splitting for AC power applications.

The reversible cover facilitates identification and wiring tasks, and the modular and touch proof design eliminates the need for bus bars, isolators, fasteners or protection screens.

Finally it saves up to 50% rail space compared to conventional distribution bars.



Main technical specifications						DBL
Section			Number of inputs	Rated voltage		
16 mm <sup>2</sup>	4 AWG	80A	7	1500 V DC (IEC)	1000 V DC (UL)	DBL80
35 mm <sup>2</sup>	2 AWG	125A	8			DBL125
50 mm <sup>2</sup>	2/0 AWG	160A	8			DBL160
		175A	12			DBL175
95 mm <sup>2</sup>	250 Kcmil	250A	12			DBL250
150 mm <sup>2</sup>	400 Kcmil	400A	12			DBL400



# Connection devices SNK terminal blocks



The SNK terminal blocks are suitable for AC power applications and DC photovoltaic systems with a voltage rating going up to 1250V DC IEC and 1000V DC UL.

2 technologies are available with common accessories:

- The screw clamp technology is the most accepted technology providing the highest choice of functions and enabling to connect 2 wires in 1 clamp.
- The PI-Spring technology is a screwless technology that combines 2 connection modes: direct push-in for 50% time saving compared to screw, and connection using a screwdriver for improved comfort. It is particularly well adapted for high demanding environment with vibration and shock.

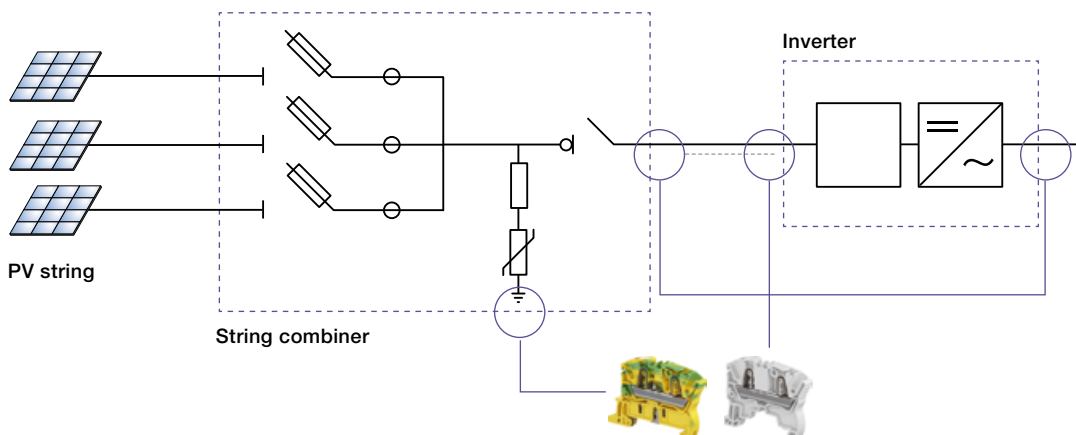


## DC side

	Main technical specifications							SNK
	Section (mm <sup>2</sup> )	AWG	Current		N. of connections	Rated voltage		
			IEC (A)	UL (A)		IEC	UL	
Screw clamp	2.5 to 10	14 to 6	32 to 57	20 to 42	2	1030V DC	600V DC	ZS4...10
	16	4	76	67		1050V DC		ZS16
	25	3	101	100			1000V DC *	ZS25
	50 to 95	1/0 to 3/0	150 to 232	140 to 230		1250V DC	1000V DC	ZS50...95
PI-Spring	2.5 to 10	12 to 6	24 to 57	20 to 55	2/3	1000V DC	600V DC	ZK2.5...10
	2.5 and 4	12 and 10	24 and 32	20 to 30	4	1000V DC	600V DC	ZK2.5-4P
	10 and 16	6 and 4	57 and 76	55 to 75	2	1000V DC	600V DC	ZK10
				3	1250V DC	1000V DC	ZK10-3P	
								ZK16-3P

\* With dedicated accessories

For AC side, all the SNK terminal blocks can be used.



# Primary switch mode power supplies

## CP-E and CP-C.1 range



### CP-C.1 range

The CP-C.1 power supplies are ABB's higher performance and most advanced range. With excellent efficiency, high reliability and innovative functionality it is prepared for the most demanding industrial applications. These power supplies have a 50 % integrated power reserve and operate at an efficiency of up to 94 %. They are equipped with overheat protection and active power factor correction. Combined with a broad AC and DC input range and extensive worldwide approvals the CP-C.1 power supplies are the preferred choice for professional DC applications. Giving the power to control.


### Key features

- Rated output voltage 24 V DC
- Power reserve design delivers up to 150 % at  $T_a \leq 40 \text{ }^\circ\text{C}$
- Output voltage adjustable via front-face rotary potentiometer "OUTPUT Adjust", 22.5-28.5 V
- Input voltage range 100-240 V AC, 90-300 V DC
- High efficiency
- Low power dissipation and low heating
- Free convection cooling (no forced cooling)
- Ambient temperature range during operation  $-25\dots+70 \text{ }^\circ\text{C}$
- Open-circuit, overload and short-circuit stable
- Integrated input fuse
- DC OK - signaling output "13-14" (Relay),
- Power reserve signaling output " $I > I_R$ " (Transistor)
- Redundancy unit CP-A RU offering true redundancy, available as accessory

### CP-E range for 24 V DC applications

The CP-E range offers enhanced functionality while the number of different types has been considerably reduced. Now all power supply units can be operated at an ambient temperature of up to  $+70 \text{ }^\circ\text{C}$ .

### Key features

- Output voltage 24 V DC
- Adjustable output voltages
- Output currents 0.75 A / 1.25 A / 2.5 A / 5 A / 10 A / 20 A
- Power range 15 W, 30 W, 60 W, 120 W, 240 W, 480 W
- High efficiency of up to 90 %
- Low power dissipation and low heating
- Free convection cooling (no forced cooling with ventilators)
- Ambient temperature range during operation  $-40\dots+70 \text{ }^\circ\text{C}$
- Open-circuit, overload and short-circuit stable
- Integrated input fuse
- U/I characteristic curve on devices  $> 18 \text{ W}$   
(fold-forward behaviour at overload – no switch-off)
- Redundancy units offering true redundancy
- LED(s) for status indication
  - Signalling output/contact for output voltage OK
  - Transistor on 24 V devices  $> 18 \text{ W}$  and  $< 120 \text{ W}$
  - Solid-state on 24 V devices  $\geq 120 \text{ W}$
- Approvals / Marks  
(depending on device, partly pending)
- 



# Connection devices

## PV connectors



With a voltage rating up to 1500 V DC IEC and 1500V DC UL, ABB's MC4-EVO2 PV connectors can be installed in any environment including commercial, industrial and residential rooftop PV installations.

They enable to connect the DC circuits from the inverter to the PV modules, in compliance with the standards IEC 62852:2014 and UL 6703.

Their housing is made in impact-resistant polyamide and can withstand UV radiation, salt spray and ammonia vapors. They are fully compatible with MC4-type PV connectors.



### Plug connector

Ø insulation section	Section				Female	Male
4.7-6.1 mm	4-6 mm <sup>2</sup>	12-10 AWG	1500V DC (IEC)	1500V DC (UL)	PV-PLUG-F6/6.1	PV-PLUG-M6/6.1
6.1-7.6 mm	4-6 mm <sup>2</sup>	12-10 AWG			PV-PLUG-F6/7.6	PV-PLUG-M6/7.6
7.6-8.5 mm	4-6 mm <sup>2</sup>	12-10 AWG			PV-PLUG-F6/8.5	PV-PLUG-M6/8.5
7.6-8.5 mm	10 mm <sup>2</sup>	8 AWG			PV-PLUG-F10/8.5	PV-PLUG-M10/8.5

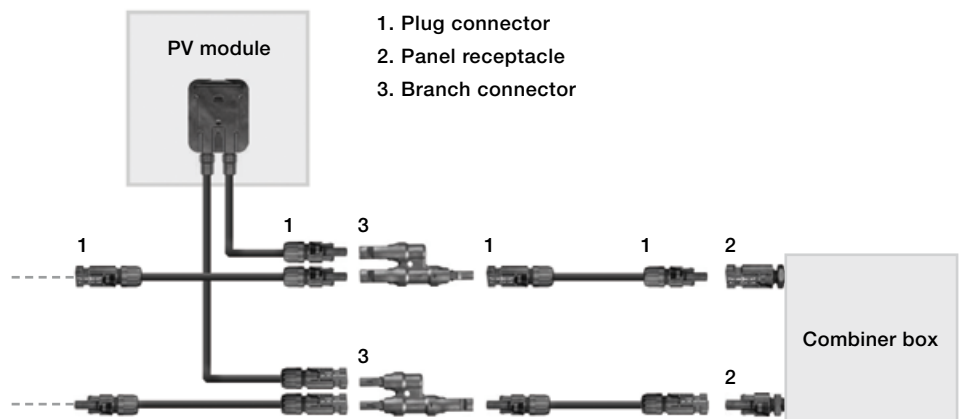
### Panel receptacle

Section				Female	Male
4.6 mm <sup>2</sup>	12-10 AWG	1250V DC (IEC*)	1000V DC (UL)	PV-RECEP-F6	PV-RECEP-M6
10 mm <sup>2</sup>	12-10 AWG			PV-RECEP-F10	PV-RECEP-M10

\*MC4-EVO2 version (1500V dc IEC and 1500V dc UL) available at the end of 2016

### Branch connector

In / Out			Female	Male
2 females / 1 male	1000V DC (IEC)	1500V DC (UL)	PV-BRANCH-F	-
2 males / 1 female			-	PV-BRANCH-M



# For your notes

A series of horizontal dotted lines for taking notes.



# Contact us

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