



Photovoltaic energy
A tailor-made offering for protection
and isolation of photovoltaic systems
from ABB

The components of photovoltaic systems

The effectiveness and quality of a system are measured by the effectiveness and quality of each single component.

An essential factor in determining the success of a photovoltaic system is the accurate selection of its components, with particular attention to modules and inverters. It should be recalled that for a photovoltaic system to be considered as a good investment, it needs to continue to operate “in good health” for at least 20 years in bad weather and hot sun.

What is commonly called the “BOS” (Balance of System), i.e. protection, control and isolation of electromechanical devices and cables, definitely plays a role in ensuring both an adequate protection of people and of the assets related to the system, and an adequate production of energy over the years. From an economic viewpoint, and even more in comparison with a common electric system, each single component of a photovoltaic system must be chosen above all according to the warranties given by the product and by its manufacturer, because every device must keep its operating features unchanged throughout the useful life of the system and of the related investment.



Feed-in Tariff - Italian experience

The value of “clean energy” is measured in terms of environmental impact reduction, cost savings and government incentives

The current incentive system to encourage the creation of photovoltaic systems is based on the remuneration of the energy produced. In Italy, for example, the rules defining this incentive structure have been laid down by the Italian Ministerial Decree of 19/02/2007, also known as “nuovo conto energia” (new feed-in tariffs) and the resulting resolutions issued by the Autorità per l’Energia Elettrica ed il Gas (the Italian electricity and gas authority) setting forth in detail three important aspects: responsibility in measuring the energy produced, the system of relations with the electricity network provider to connect the system to the public grid, the system of relations with the Gestore dei Servizi Elettrici (Managing Authority of Power Services) to request the feed-in tariffs. These feed-in tariffs are the money value paid for each kWh produced by the system for 20 years, starting from the day of connection to the grid. This value is defined by a table, according to the degree of architectural integration of the system with reference to the building on which it is installed and to the rated power.

In Italy, the feed-in tariffs paid for the systems connected to the public grid during 2009 will be reduced by 2% starting from 1st January 2010. The power subject to feed-in tariffs was established at 1200 MW, with a 14-month extension to connect other systems after said limit has been reached. Administrative procedures are divided into 2 different steps: first of all the photovoltaic system must be connected to the public grid through a special connection procedure set forth in the AEEG 99/08 resolution. Once the system has been connected to the grid, there is a 60-day term for submitting the request for the feed-in tariffs to GSE. This can be done by a special online procedure available on the Web site: www.gse.it.

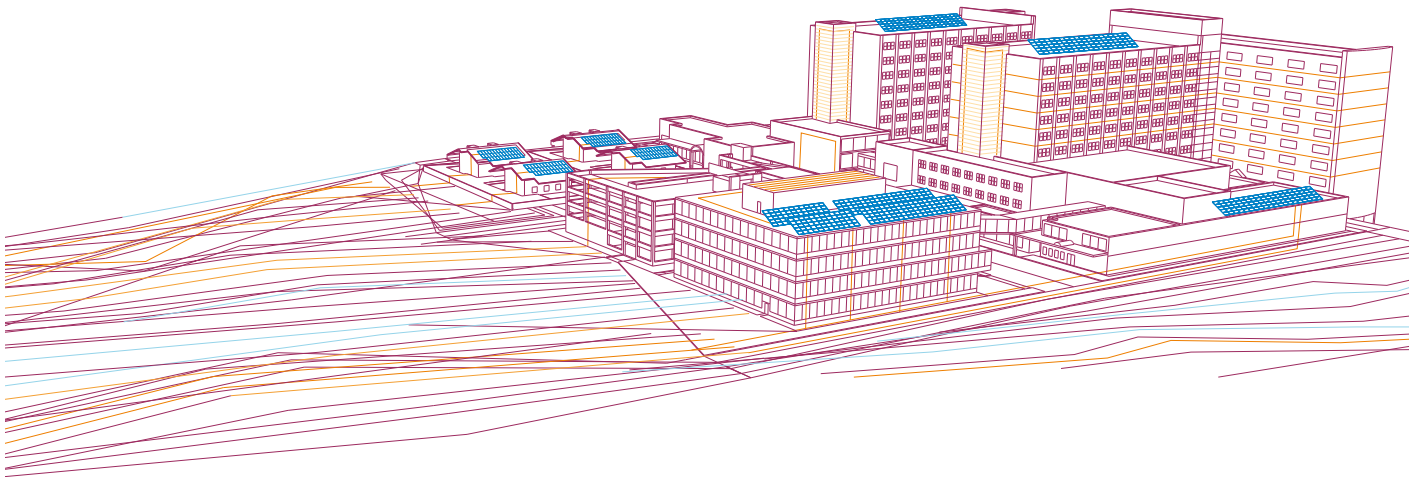
Due to the “Feed-in Tariff” incentives and to the growing public awareness of the need to promote the development of “clean” energy sources, photovoltaic systems for electricity generation are becoming increasingly widespread in Italy.

Euro value reimbursed per kWh produced (Italy)

Types of photovoltaic systems			
Rated power of the system (kW)	1 Non-integrated	2 Partially integrated	3 Integrated
A $1 \leq P \leq 3$	0,392	0,431	0,480
B $3 < P \leq 20$	0,372	0,412	0,451
C $P > 20$	0,353	0,392	0,431

ABB experience about solar energy

Products for the photovoltaic industry from a company that has always offered the best solutions in the field of electric power.



The variety of photovoltaic systems in terms of power, inverter type (with mains-frequency transformer, with high-frequency transformer or with no transformer) and type of public grid connection (single-phase, three-phase, low or medium voltage) requires careful selection of the components by designers and installers.

The presence of high direct current voltage values, together with the unique characteristics of photovoltaic systems (i.e. the system can be powered down only by screening the solar panels and the strings generate short-circuit currents with values very close to the currents generated in standard conditions), make the selection of protection, control and isolation devices particularly critical. In line with the new market requirements, ABB developed a complete and reliable

range of products specifically dedicated to photovoltaic applications that meets every system engineering need, from the string on direct current side to the alternate current network connection point.

The ABB offering includes fuse disconnectors, circuit breakers, switch-disconnectors, surge protection devices (SPD), and watertight consumer units and enclosures for outdoor use, all specifically designed for these types of applications.



Equipment for the direct current system section

Effectiveness and cost-savings: a complete and reliable range of products from ABB experience.

Since increasingly higher values tend to be used (to reduce losses), ABB developed specific products to meet the various system engineering needs, reducing the costs for systems up to 500 V and optimizing performance for higher voltage values.

S800 PVs are available both in the switch-disconnector version (S800 PV-M) and in the circuit-breaker version (S800 PV-S) and are the most compact circuit breakers in the market for protecting direct current circuits. This line is now complemented by the miniature circuit-breaker S284 UC, Z curve, that can reach 500 V d.c. with sizes up to 16A.

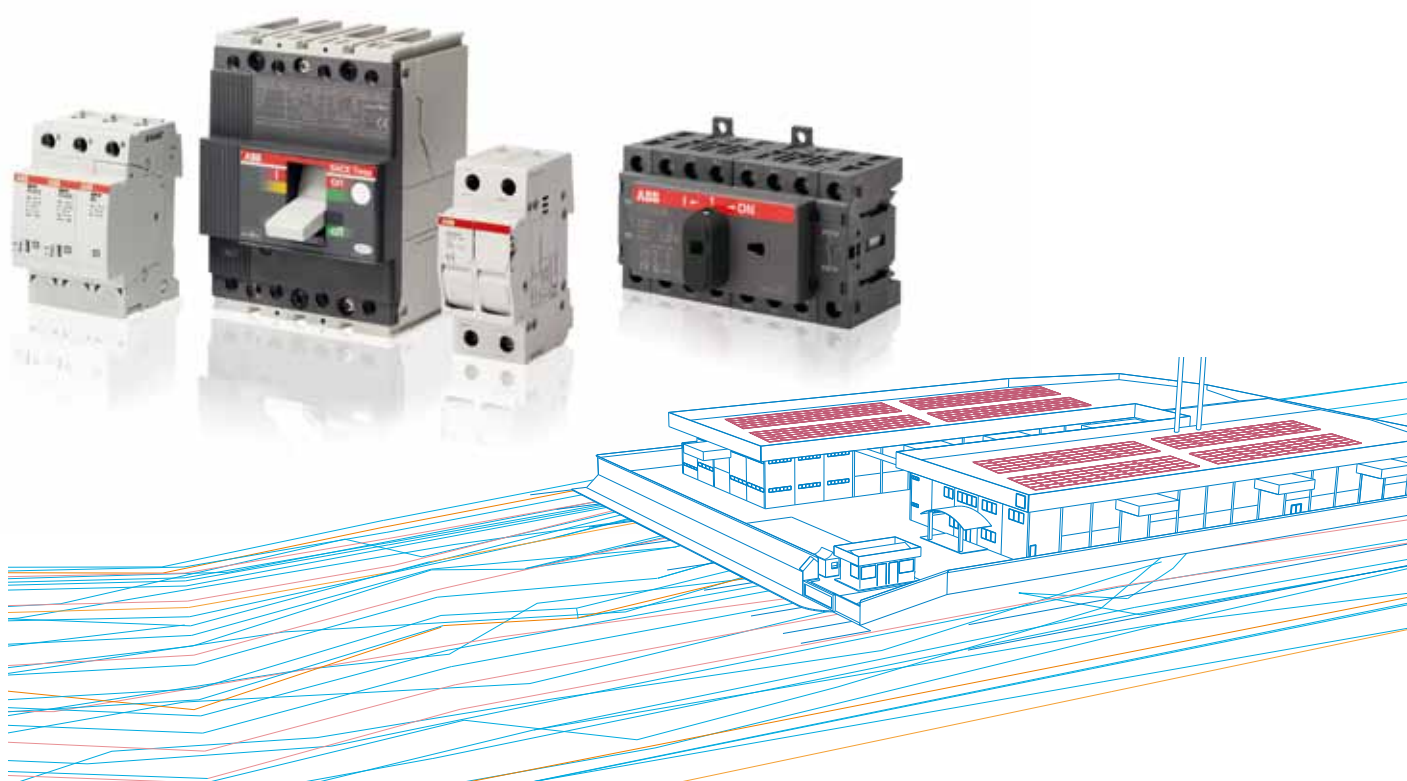
All the accessories typically provided with the standard modular products are available: voltmeter shunt trip or undervoltage releases, auxiliary contacts and fault signal contacts.

For single string protection in large-sized systems, compact modular fuse disconnectors are provided, capable of housing 10x38mm fuses with voltage up to 1000 V d.c.

To guarantee maintenance operators safety, the use of the DC20 fuse disconnecter (i.e. that can operate on the circuit only with no load) must be combined with DC21 switch-disconnectors.

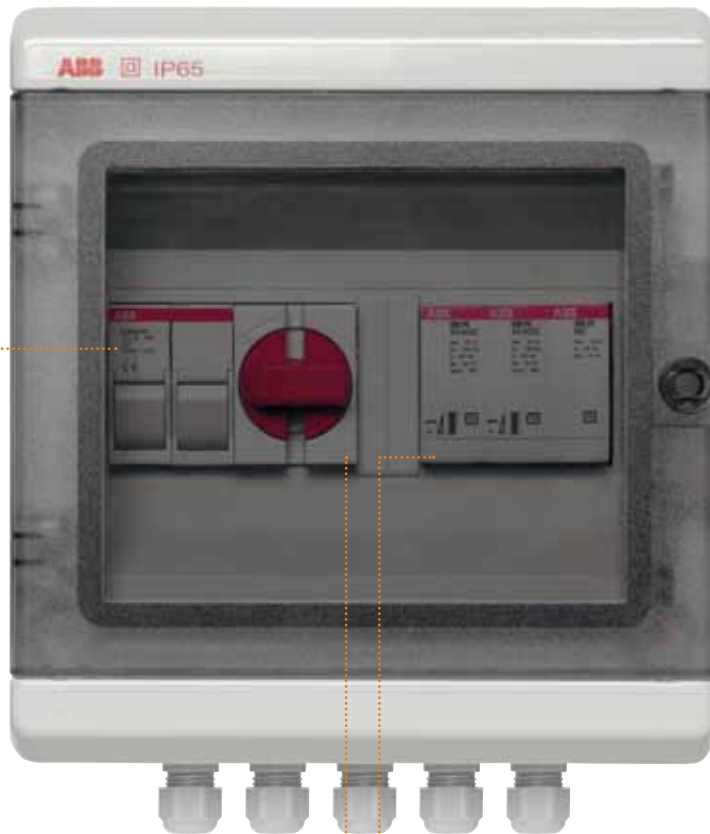
For string and inverter protection, ABB also developed a range of products dedicated to the complex protection against surges of atmospheric origin on DC side.

The OVR PV surge protection devices are specifically targeted at this kind of application, with a Y connection for systems up to 1000 V. The Gemini series IP66 switchboards can be optimally used as string boxes or parallel boxes, i.e. for installation outdoors next to the modules. With its unequalled range, ABB developed a number of "plug & operate" solutions, that is a number of finished, wired and certified switchboards to meet the needs of the most varied types of installations: from the single string for residential applications to the large solar farms.



String boxes, 1 string 16 A 500 V

Example 1



E 90 PV fuse disconnectors

The E 90 PV fuse disconnectors, designed to make voltages of up to 1000 V d.c. (cat. DC-20B) with no load, are ideally suited for photovoltaic systems, where they are used to isolate the single strings and protect them against short circuit. All the ABB string boxes are provided with fuses for photovoltaic plants.

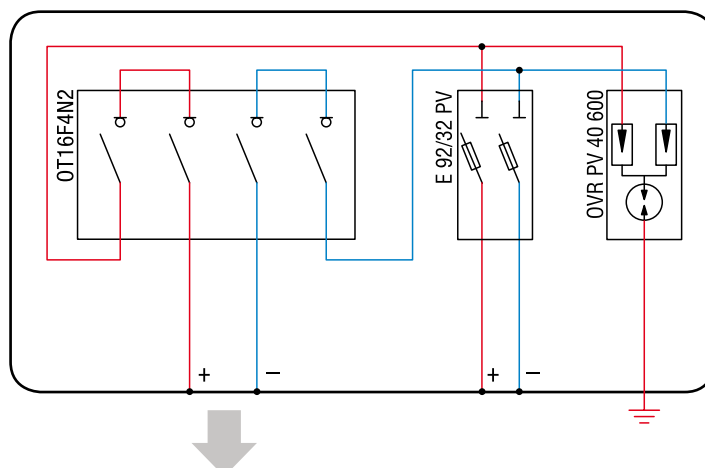
OT switch disconnectors

The OT Series of high-performance and easily available disconnectors is characterized by high voltage values and compliance with the most advanced international standards, which make these disconnectors ideal in terms of cost and performance for small-sized installations.

OVR PV

All the ABB string boxes are provided with surge protection devices, specifically designed for photovoltaic applications of the OVR PV series. Only a specific product can ensure the proper operation of the cartridge until the end of its useful life, with no risks of short circuit or danger in case of polarity inversion.

Europa 8 modules



String boxes, 2 strings 16 A 500 V

Example 2



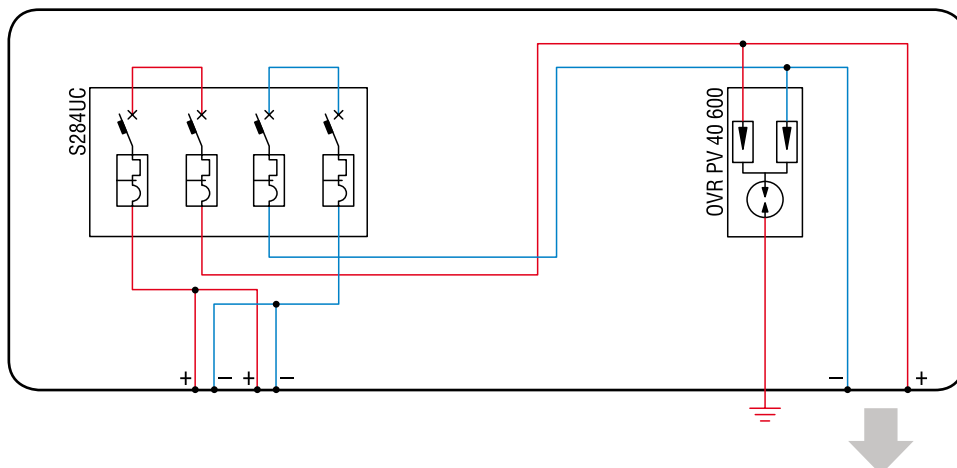
S284 UC-Z miniature circuit-breakers.

The range of S280 UC miniature circuit breakers is equipped with permanent magnets on the internal arc chutes that enable the extinction of the electric arc up to 500 V d.c. with $I_{cu}=4.5\text{kA}$, making them ideal for small home photovoltaic systems.

Europa series consumer units

The Europa series consumer units ensure IP65 protection class and are perfectly suited also for outdoor applications, typical of photovoltaic systems.

Europa 12 modules



String boxes, 4 strings 40 A 800 V

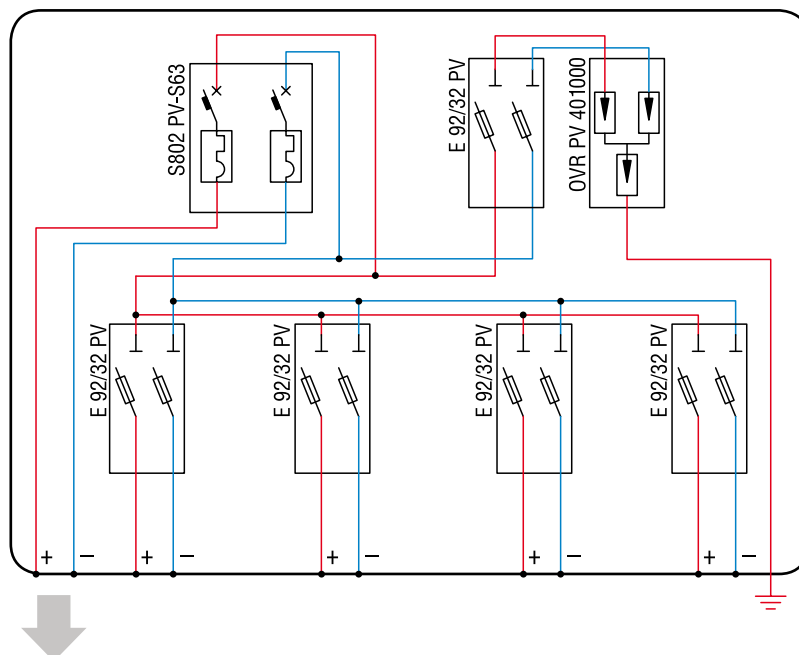
Example 3



S800 PV

Available both in switch-disconnector version (S800 PV-M) and in miniature circuit-breaker version (S800 PV-S), they provide high performance in a very small space.

Europa 36 modules



String boxes, 6 strings 63 A 800 V

Example 4



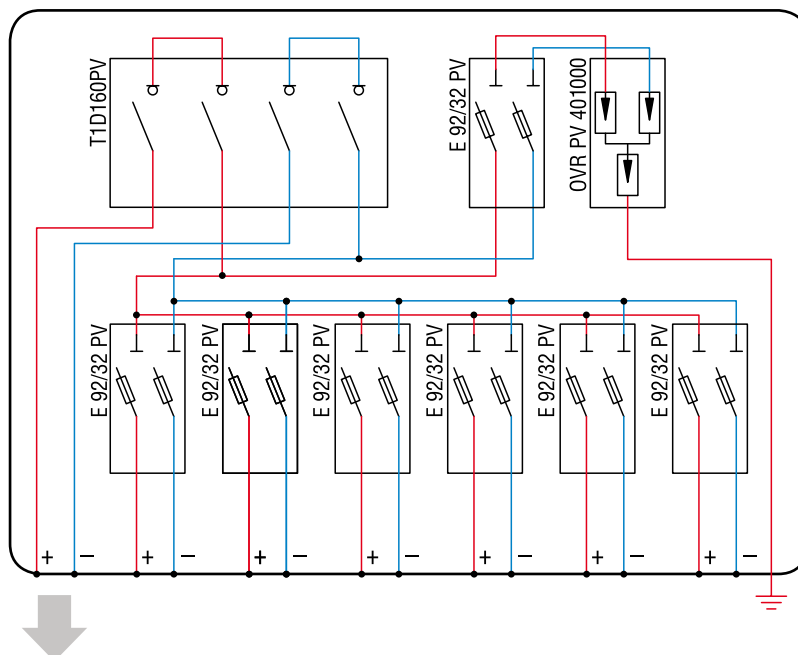
Gemini switchboards

The Gemini switchboards enable the installation of parallel boxes outdoors, thanks to the IP66 protection class. The high structural quality ensures their durability over time, even in environments with considerable thermal stress.

Tmax PV

The range of Tmax disconnectors for photovoltaic systems is characterized by high voltage values obtainable in a compact space.

Gemini 2



Direct current string boxes for photovoltaic applications



One string 10 A 500 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 8-module consumer unit, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S284 UC Z10
- surge protection device OVR PV 40 600 P
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 1str 10 A 500 V cb S284UC-Z10	205x220x140	1SL0601A00



One string 16 A 500 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 8-module consumer unit, with IP 68 metric cable glands and nuts
- OT 16 F4 N2 disconnector
- surge protection device OVR PV 40 600 P
- fuse disconnectors E 92/32 PV 10.3x38 mm fuses – 1000 V d.c. 10 A
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 1str 16 A 500 V sd OT 16 F4 N2	205x220x140	1SL0602A00



One string 10 A 800 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 8-module consumer unit, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S802 PV-S10
- surge protection device OVR PV 40 1000 P
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 1str 10 A 800 V cb S802PV-S10	205x220x140	1SL0603A00



Two strings 16 A 500 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 12-module consumer unit, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S284 UC Z16
- surge protection device OVR PV 40 600 P
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 2str 16 A 500 V cb S284UC-Z16	275x220x140	1SL0607A00



Two strings 16 A 500 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 12-module consumer unit, with IP 68 metric cable glands and nuts
- OT 16 F4 N2 disconnecter
- surge protection device OVR PV 40 600 P
- fuse disconnecter E 92/32 PV 10.3x38 mm fuses – 1000 V d.c. 8 A
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 2str 16 A 500 V sd OT 16 F4 N2	275x220x140	1SL0606A00



Two strings 16 A 800 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 12-module consumer unit, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S802 PV-S16
- surge protection device OVR PV 40 1000 P
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 2str 16 A 800 V cb S802PV-S16	275x220x140	1SL0608A00

Direct current string boxes for photovoltaic applications



Three strings 25 A 750 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 18-module consumer unit, with IP 68 metric cable glands and nuts
- OT 25 F8 disconnector
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 8 A
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 3str 25 A 750 V sd OT 25 F8	380x220x140	1SL0611A00



Three strings 32 A 800 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 18-module consumer unit, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S802 PV-S32
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 3str 32 A 800 V cb S802PV-S32	380x220x140	1SL0612A00



Four strings 32 A 750 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 36-module consumer unit, with IP 68 metric cable glands and nuts
- OT 40 F8 disconnector
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 4str 32 A 750 V sd OT 40 F8	380x370x140	1SL0615A00



Four strings 32 A 800 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 36-module consumer unit, with IP 68 metric cable glands and nuts
- S802 PV-M32 switch-disconnector
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 4str 32 A 800 V sd S802PV-M32	380x370x140	1SL0616A00



Four strings 40 A 800 V

DC string box for string protection and isolation consisting of:

- Europa series IP 65 wall-mounted 36-module consumer unit, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S802 PV-S40
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 4str 40 A 800 V cb S802PV-S40	380x370x140	1SL0617A00

Direct current string boxes for photovoltaic applications



Five strings 50 A 800 V

DC string box for string protection and isolation consisting of:

- Gemini switchboard size 1 IP 66, with IP 68 metric cable glands and nuts
- Tmax T1D 160 PV disconnecter
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 5str 50 A 800 V sd T1D160 PV	335x400x210	1SL0621A00



Five strings 50 A 800 V

DC string box for string protection and isolation consisting of:

- Gemini switchboard size 1 IP 66, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S802 PV-S50
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 5str 50 A 800 V cb S802PV-S50	335x400x210	1SL0620A00



Six strings 63 A 800 V

DC string box for string protection and isolation consisting of:

- Gemini switchboard size 2 IP 66, with IP 68 metric cable glands and nuts
- Tmax T1D 160 PV disconnecter
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 6str 63 A 800 V sd T1D160 PV	460x550x260	1SL0625A00



Six strings 63 A 800 V

DC string box for string protection and isolation consisting of:

- Gemini switchboard size 2 IP 66, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S802 PV-S63
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 6str 63 A 800 V cb S802PV-S63	460x550x260	1SL0624A00



Eight strings 80 A 1000 V

DC string box for string protection and isolation consisting of:

- Gemini switchboard size 2 IP 66, with IP 68 metric cable glands and nuts
- Tmax T1D 160 PV disconnecter
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32 PV
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 8str 80 A 1000 V sd T1D160 PV	460x550x260	1SL0628A00



Eight strings 80 A 1000 V

DC string box for string protection and isolation consisting of:

- Gemini switchboard size 2 IP 66, with IP 68 metric cable glands and nuts
- miniature circuit-breaker S804 PV-S80
- surge protection device OVR PV 40 1000 P
- fuse disconnecter E 92/32
10.3x38 mm fuses – 1000 V d.c. 10 A
4A gR fuses for OVR surge protection device
- screw-clamp terminal blocks from 2.5 to 10 mm² (57 A) or above, for voltage up to 1000 V

Description	Dimensions (WxHxD mm)	Order code
String box 8str 80 A 1000 V cb S804PV-S80	460x550x260	1SL0627A00

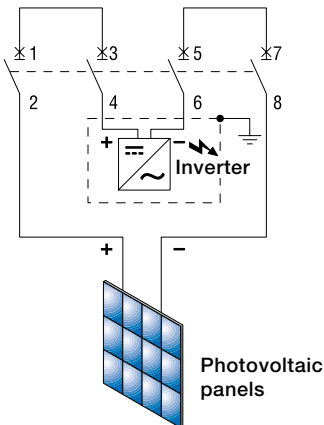
Miniature circuit-breakers S284 UC Z



The range of S280 UC miniature circuit breakers is equipped with permanent magnets on the internal arc chutes that enable the extinction of the electric arc up to 500 V d.c. with $I_{cu}=4.5kA$.

The presence of these elements, however, defines the circuit breaker polarity. That is why their power supply must comply with a given direction.

Here on the side is the diagram showing the right connection of string and inverter



Main technical data		S284 UC Z
Standards		IEC EN 60947-2
Rated current I_n	[A]	$6 \leq I_n \leq 63$
Number of poles		4
Max operating voltage (d.c.) 4P	[V]	500
Ultimate rated breaking capacity I_{cu} 4P - 500 V d.c.	[kA]	4,5
Thermomagnetic release characteristic		Z: $3 I_n \leq I_m \leq 4,5 I_n$
Ambient temperature	[°C]	-25...+55
Mounting		on DIN rail EN 60715 (35) by means of a quick coupling device

Poles	Rated current I_n [A]	Description Type	Order code
4	6	S284-UC Z 6	GHS2840164R0378
4	8	S284-UC Z 8	GHS2840164R0408
4	10	S284-UC Z10	GHS2840164R0428
4	16	S284-UC Z16	GHS2840164R0468
4	20	S284-UC Z20	GHS2840164R0488
4	25	S284-UC Z25	GHS2840164R0518
4	32	S284-UC Z32	GHS2840164R0538
4	40	S284-UC Z40	GHS2840164R0558
4	50	S284-UC Z50	GHS2840164R0578
4	63	S284-UC Z63	GHS2840164R0608

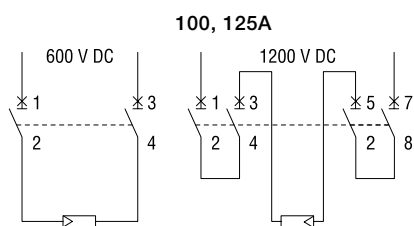
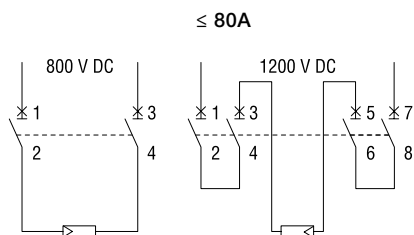
Miniature circuit-breakers S800 PV-S



The S800 PV-S miniature circuit breakers can be used in networks up to 1200 V d.c. (four-pole version); these products and their wide range of accessories (auxiliary contacts, release coils) support countless system configurations.

The main features of the S800 PV-S circuit breakers are:

- interchangeable adapter kit
- lever in a central position for fault signalling
- contact position unit display for each single pole
- no restrictions of polarity and power direction in wiring
- use of the rotary handle for door assembly



Connection
Photovoltaic panel network
in earth-insulated systems

Main technical data		S800 PV-S	
Standards		IEC EN 60947-2	
Rated current I_n	[A]	10...80	100, 125
Number of poles		2, 4	
Rated voltage U_e (d.c.) 2 poles* (d.c.) 4 poles*	[V]	800	600
	[V]	1200	1200
Ultimate rated short-circuit breaking capacity I_{cu} (d.c.) 600/800V (2 poles) * (d.c.) 1200V (4 poles) *	[kA]	5	5
	[kA]	5	5
Thermomagnetic release characteristic		$4 I_n \leq I_m \leq 7 I_n$	
Utilisation category		A	
Ambient temperature	[°C]	-25...+60	
Mounting		on DIN rail EN 60715 (35) by means of a quick coupling device	

* Please refer to the wiring diagrams

Poles	Rated current I_n [A]	Description Type	Order code
2	10	S802PV-S10	2CCP842001R1109
2	13	S802PV-S13	2CCP842001R1139
2	16	S802PV-S16	2CCP842001R1169
2	20	S802PV-S20	2CCP842001R1209
2	25	S802PV-S25	2CCP842001R1259
2	32	S802PV-S32	2CCP842001R1329
2	40	S802PV-S40	2CCP842001R1409
2	50	S802PV-S50	2CCP842001R1509
2	63	S802PV-S63	2CCP842001R1639
2	80	S802PV-S80	2CCP842001R1809
2	100	S802PV-S100	2CCP842001R1829
2	125	S802PV-S125	2CCP842001R1849
4	10	S804PV-S10	2CCP844001R1109
4	13	S804PV-S13	2CCP844001R1139
4	16	S804PV-S16	2CCP844001R1169
4	20	S804PV-S20	2CCP844001R1209
4	25	S804PV-S25	2CCP844001R1259
4	32	S804PV-S32	2CCP844001R1329
4	40	S804PV-S40	2CCP844001R1409
4	50	S804PV-S50	2CCP844001R1509
4	63	S804PV-S63	2CCP844001R1639
4	80	S804PV-S80	2CCP844001R1809
4	100	S804PV-S100	2CCP844001R1829
4	125	S804PV-S125	2CCP844001R1849

Modular switch-disconnectors

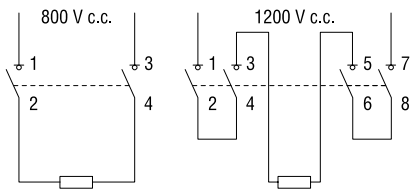
S800 PV-M



The S800 PV-M modular switch disconnectors can be used in networks up to 1200 V d.c. (four-pole version); these products and their wide range of accessories (auxiliary contacts, release coils) support countless system configurations.

The main features of the S800 PV-M disconnectors are:

- interchangeable adapter kit
- contact position unit display for each single pole
- no restrictions of polarity and power direction in wiring
- use of the rotary handle for door assembly



Connection

Photovoltaic panel network
in earth-insulated systems

Main technical data		S800 PV-M
Standards		IEC EN 60947-3
Rated current I_n	[A]	32, 63, 125
Number of poles		2, 4
Rated voltage U_e (d.c.) 2 poles*	[V]	800
(d.c.) 4 poles*	[V]	1200
Rated short-time withstand current I_{cw} (d.c.) 800V (2 poles) *	[kA]	1,5
(d.c.) 1200V (4 poles) *	[kA]	1,5
Utilisation category		DC-21A
Ambient temperature	[°C]	-25...+60
Mounting		on DIN rail EN 60715 (35) by means of a fast clip device

* Please refer to the wiring diagrams

Poles	Rated current I_n [A]	Description Type	Order code
2	32	S802PV-M32	2CCP812001R1329
2	63	S802PV-M63	2CCD842001R1590
2	125	S802PV-M125	2CCP812001R1849
4	32	S804PV-M32	2CCP814001R1329
4	63	S804PV-M63	2CCD844001R1590
4	125	S804PV-M125	2CCP814001R1849

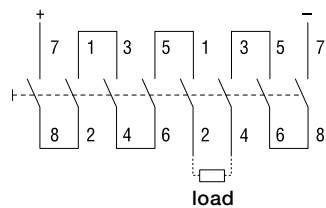
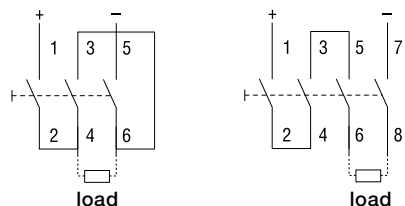
Switch Disconnectors OT



The OT series disconnectors are available with rated currents from 16A to 125A, in 3-, 4-, 6- and 8-pole version according to the voltage used in direct current.

The main features of the OT disconnectors are:

- Quick-make, quick-break contacts from 45A
- accessories are snap-mounted onto the circuit breakers
- OT 45...125 switch-disconnectors mechanism for installation on DIN rail that can be locked by a blocking adaptor



Circuit diagrams

Main technical data		OT		
Reference standards		IEC EN 60947-3		
Rated current I _n	[A]	16, 25, 32		
Number of poles		4	6	8
Rated voltage U _e (DC) 4 poles* (DC) 6 poles* (DC) 8 poles*	[V] [V] [V]	500	550	800
Usage class		DC-21A		
Operating ambient temperature	[°C]	-25...+45		
Mounting		on DIN rail EN 60715 (35) by means of a quick coupling device		

* Please refer to the wiring diagrams

Poles	I _{th} (open)	Rated current / DC21 [A/V DC] voltage	Description Type	Order code
4	16	16/440	OT16F4N2	1SCA104829R1001
6	16	16/550	OT16F6	1SCA104834R1001
6	25	25/550	OT25F6	1SCA104880R1001
6	32	32/550	OT40F6	1SCA104936R1001
8	16	16/750	OT16F8	1SCA104836R1001
8	25	25/750	OT25F8	1SCA104882R1001
8	32	32/750	OT40F8	1SCA104938R1001
8	16	16/800	OT16F8	1SCA104836R1001
8	25	25/800	OT25F8	1SCA104882R1001
8	32	32/800	OT40F8	1SCA104938R1001

Disconnectors

Tmax PV



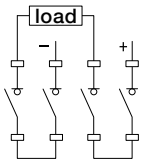
The Tmax PV series disconnecters are available with rated operating currents in DC-22B class up to 1600 A, for a maximum rated operating voltage of 1100 V d.c.

The switchgear of the Tmax PV series are the first in-box disconnecters for continuous high voltage available in the market. They are suitable for use in any type of photovoltaic installations, proving ideal for any disconnecting needs.

The main features of the Tmax PV disconnecters are:

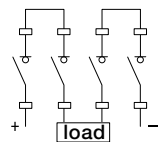
- Complete range. 6 different sizes available - from compact T1 (mountable on DIN rail) to T7, available in the two versions with toggle control and motor control.
- Excellent performance-dimensions ratio
- Wide choice of accessories for every need

Main technical data		Tmax PV
Reference standards		IEC EN 60947-3
Operating current [DC 22B]	[A]	160 – 1600
Number of poles		4
Rated voltage Ue	[V d.c.]	1100
Rated isolation voltage Ui	[V d.c.]	1150
Short-time current Icw	[kA]	1,5 – 19,2
Usage class		DC-22B



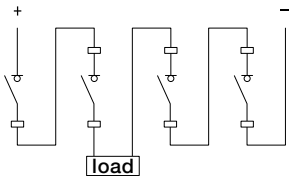
Circuit diagrams

Valid for T1D PV, T3D PV, T6D PV and T7D PV



Circuit diagrams

Valid for T4D PV and T5D PV



Circuit diagrams

Valid for all Tmax PV sizes

Poles	I _{th}	Operating current DC 22B [A/V DC]	Description Type	Order code
4	160	160/1100	T1D 160 PV	1SDA066881R1000
4	250	200/1100	T3D 200 PV	1SDA066882R1000
4	250	250/1100	T4D 250 PV	1SDA066883R1000
4	630	500/1100	T5D 500 PV	1SDA066884R1000
4	800	800/1100	T6D 800 PV	1SDA066885R1000
4	1600	1600/1100	T7D 1600 PV	1SDA066886R1000
4	1600	1600/1100	T7D 1600 PV M	1SDA066887R1000

Fuse disconnectors

E 90 PV



The E 90 PV series of fuse disconnectors has been designed for voltage up to 1000 V in direct current, with DC-20B usage class.

The E 90 PV series is specifically applied in surge protection in photovoltaic systems and provides a reliable, compact and inexpensive solution because it uses 10.3 x 38 mm cylindrical fuses.

The main features of the E 90 PV disconnectors are:

- Handle with 90° opening for easier insertion of the horizontal fuse, even when wearing gloves or using the thumb
- Only 17mm additional footprint in open position vs. closed position
- 25mm² terminals with knurled terminal cage for better cable tightening
- 100% compatible with electrical screwdrivers
- Pozidriv screws for flathead and cross-point screwdrivers
- Lockable in open position with common commercial padlocks, to ensure safe maintenance operations
- Sealable in closed position to prevent improper use
- Cooling chambers and ventilation louvers to facilitate heat dissipation
- Versions with indicator light are available

Main technical data		E 90/32 PV
Reference standards		IEC EN 60947-3
Rated operating voltage	[V d.c.]	1000
Usage class		DC-20B
Fuse	[mm]	10 x 38
Current type		DC
Rated current	[A]	32
Tightening torque	[Nm]	PZ2 2-2.5
Protection degree		IP20
Lockable (when open)		yes
Sealable (when closed)		yes

Poles	Rated current I _n [A]	Modules	Description Type	Order code
1	32	1	E 91/32 PV	2CSM204713R1801
1	32	1	E 91/32 PVs*	2CSM204693R1801
2	32	2	E 92/32 PV	2CSM204703R1801
2	32	2	E 92/32 PVs*	2CSM256913R1801

*s: version with LED for blown fuse indication

Surge protection devices

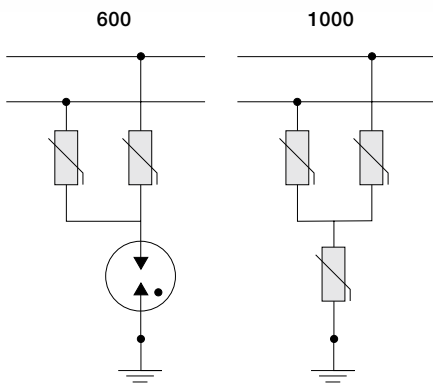
OVR PV



ABB provides a wide range of surge protection devices that are specifically designed for photovoltaic systems.

The main features of the OVR PV surge protection devices are:

- built-in thermal protection with breaking capacity of 25A d.c. *
- removable cartridges for easy maintenance with no need to isolate the line
- remote signal contact for operating status monitoring (TS versions)
- no subsequent short-circuit current
- no risk if poles are inverted



Main technical data		OVR PV
Electrical features		
Network type		Photovoltaic systems
Type		2
Response time	[ns]	25
Residual current	[mA]	< 1
Protection degree		IP20
Built-in thermal protection		max. 25A d.c.
Back-up protection		
gR DC fuse	[A]	4
Mechanical features		
L/PE terminal blocks		
rigid	[mm ²]	2,5...25
flexible	[mm ²]	2,5...16
L Tightening torque	[Nm]	2,80
Status indicator		yes
Remote signal contact		TS versions
Type		1 NO/NC
Minimum rating		12 V d.c. - 10 mA
Maximum rating		250 V a.c. - 1 A
Cable section	[mm ²]	1,5
Operating temperature	[°C]	-40...+80
Storage temperature	[°C]	- 40...+80
Maximum altitude	[m]	2000
Housing material		PC RAL 7035
Fire resistance UL94		V0
Reference standards		IEC 61643-1 / EN 61643-11

Rated discharge current per pole In	Rated system voltage	Maximum system voltage	Protection level (L-L/L-PE)	Signal contact	Description	Order code
kA	V DC	V DC	kV		Type	
20	600	700	2,8 / 1,4	-	OVR PV 40 600	2CTB803953R5300
20	600	700	2,8 / 1,4	built-in	OVR PV 40 600 P TS	2CTB803953R5400
20	1000	1120	3,8	-	OVR PV 40 1000	2CTB803953R6400
20	1000	1120	3,8	built-in	OVR PV 40 1000 P TS	2CTB803953R6500

* Note: for surge protection devices installed in points of the network where short-circuit current exceeds 25A d.c. suitable protection must be provided

Wall-mounted consumer units Europa Series



The Europa series wall-mounted consumer units have IP65 protection class making them particularly suited for installation outdoors. They can be used to make string boxes downstream of the photovoltaic strings. The main features of the Europa series wall-mounted consumer units are:

- class II insulation
- manufactured in self-extinguishing thermoplastic material resistant to abnormal heat and to fire up to 650 °C (glow wire test), in conformity with the IEC 60695-2-11 standard
- installation temperature: -25 °C ÷ +60 °C
- rated isolation voltage: 1000 V a.c.; 1500 V d.c.
- shock resistance: 6 joules (IK 08 class)
- extractable DIN rail support structure for easier bench wiring, that can be disassembled (and reassembled by snap mechanism) to facilitate the wiring of single rows
- switchgear with depth of 53, 68 and 75 mm can be installed
- models with 8 or more modules, equipped with rigid bi-material flanges for easier pipes and cables insertion
- control boards in conformity with the IEC 60670 standards

Description	Dimensions	Order code
IP65 consumer unit P/smoke grey 4M	140x220x140	12744
IP65 consumer unit P/smoke grey 8M	205x220x140	12748
IP65 consumer unit P/smoke grey 12M	275x220x140	12752
IP65 consumer unit P/smoke grey 18M 1 row	380x220x140	12753
IP65 consumer unit P/smoke grey 24M 2 rows	275X370X140	12754
IP65 consumer unit P/smoke grey 36M 2 rows	380x370x140	12755

Junction boxes

The ABB offering also includes IP polycarbonate junction boxes that are particularly suited for outdoor applications.

The main features of the junction boxes are:

- class II insulation
- manufactured in self-extinguishing polycarbonate resistant to abnormal heat and to fire up to 960 °C (glow wire test), in conformity with the IEC 60695-2-11 standard
- installation temperature: -25 °C ÷ +125 °C
- rated isolation voltage: 1000 V a.c.; 1500 V d.c.
- shock resistance: 20 joules (IK 10 class)
- junction boxes in conformity with the IEC 60670 standards



Description	Dimensions	Order code
Box IP65 PC	140x220x140	12804
Box IP65 PC	205x220x140	12808
Box IP65 PC	275x220x140	12812

Switchboards

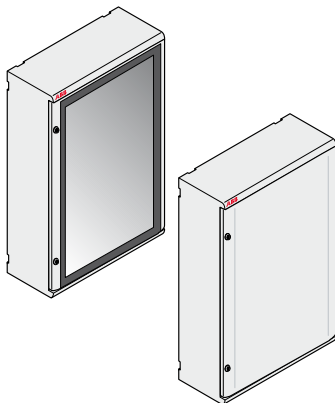
Gemini IP 66



Main technical data	Gemini IP 66
Protection	
Protection class	IP 66 (IEC EN 60529)
Insulation	Class II
Strength	
Material	Co-injection moulded thermoplastic material
Heat and fire resistance	Up to 750 °C (IEC EN 60695-2-11)
Shock resistance	IK10 (IEC EN 50102)
Protection against chemical and atmospheric agents	Water, saline solutions, acids, bases, mineral oils, UV rays
Operating temperature	-25 °C...+100 °C
Performance	
Rated isolation voltage	1000 V a.c. – 1500 V d.c.
Flexibility	6 sizes
WxHxD, external dimensions	from 335x400x210 mm to 840x1005x360 mm DIN modules from 24 to 216
Installation	Snap-on mounting of all components
Standards, quality, environment	IEC EN 50298, IEC 60670, IEC EN 60439-1 IMQ mark according to the IEC EN 50298 standard 100% recyclable

Boxes and doors

- RAL 7035 grey colour

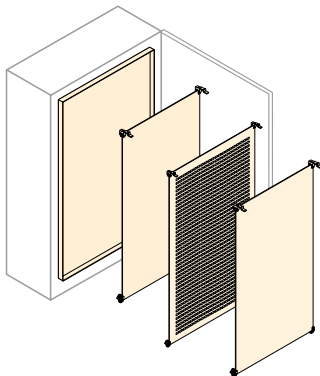


Size	External dimensions WxHxD (mm)	Internal dimensions WxHxD (mm)	Max no. DIN mod.	Code with transparent door	Code with opaque door
1	335x400x210	250x300x180	24 (12x2)	1SL0211A00	1SL0201A00
2	460x550x260	375x450x230	54 (18x3)	1SL0212A00	1SL0202A00
3	460x700x260	375x600x230	72 (18x4)	1SL0213A00	1SL0203A00
4	590x700x260	500x600x230	96 (24x4)	1SL0214A00	1SL0204A00
5	590x855x360	500x750x330	120 (24x5)	1SL0215A00	1SL0205A00
6	840x1005x360	750x900x330	216 (36x6)	1SL0216A00	1SL0206A00

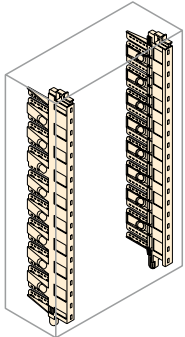
Base plate and inner doors

- Positioning of the base plate at 3 different depths for size 1, at 4 depths for sizes 2-3-4, at 7 depths for sizes 5-6 (adjustments with 30 mm pitch)

- Inner doors are made of insulating material

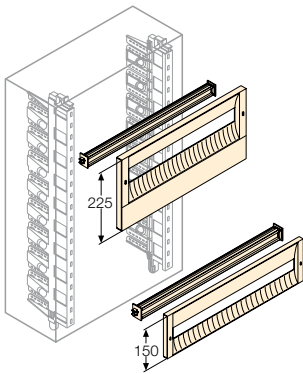


Size	Code for blank metal base plate	Code for drilled metal base plate	Code for blank insulating material base plate	Code for inner door
1	1SL0259A00	1SL0275A00	1SL0267A00	1SL0251A00
2	1SL0260A00	1SL0276A00	1SL0268A00	1SL0252A00
3	1SL0261A00	1SL0277A00	1SL0269A00	1SL0253A00
4	1SL0262A00	1SL0278A00	1SL0270A00	1SL0254A00
5	1SL0263A00	1SL0279A00	1SL0271A00	1SL0255A00
6	1SL0264A00	1SL0280A00	1SL0272A00	1SL0256A00



Uprights and DIN rail

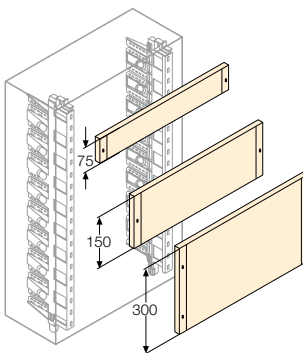
Size	Code for Uprights	Code for DIN rail	Modules per row DIN rail
1	1SL0283A00	1SL0290A00	12
2	1SL0284A00	1SL0291A00	18
3	1SL0285A00	1SL0291A00	18
4	1SL0285A00	1SL0292A00	24
5	1SL0286A00	1SL0292A00	24
6	1SL0287A00	1SL0293A00	36



Drilled panel

- Supplied with DIN rail complete with supports to snap onto uprights and adjustable in depth
- Available in two dimensions: 1 module (H 150 mm) and 1+1/2 module (H 225 mm, sizes 2-6)

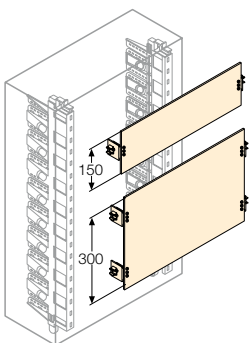
Size	Code for drilled panel, 1 module	Code for drilled panel, 1 + 1/2 module
1	1SL0307A00	-
2	1SL0308A00	1SL0313A00
3	1SL0308A00	1SL0313A00
4	1SL0309A00	1SL0314A00
5	1SL0309A00	1SL0314A00
6	1SL0310A00	1SL0315A00



Blank panel

- Available in three dimensions: 1/2 module (H 75 mm), 1 module (H 150 mm) and 2 modules (H 300 mm)

Size	Code for blank panel, 1/2 module	Code for blank panel, 1 module	Code for blank panel, 2 modules
1	1SL0318A00	1SL0324A00	1SL0330A00
2	1SL0319A00	1SL0325A00	1SL0331A00
3	1SL0319A00	1SL0325A00	1SL0331A00
4	1SL0320A00	1SL0326A00	1SL0332A00
5	1SL0320A00	1SL0326A00	1SL0332A00
6	1SL0321A00	1SL0327A00	1SL0333A00



Partial modular plates

- Available in two dimensions: 1 module (H 150 mm) and 2 modules (H 300 mm, sizes 2-6)

Size	Code for modular plates, 1 module	Code for modular plates, 2 module
1	1SL0296A00	-
2	1SL0297A00	1SL0302A00
3	1SL0297A00	1SL0302A00
4	1SL0298A00	1SL0303A00
5	1SL0298A00	1SL0303A00
6	1SL0299A00	1SL0304A00

Modular terminal blocks



ABB offers a complete range of modular terminal blocks, from the conventional screw-clamp and spring-clamp terminal blocks to the most technologically advanced self-stripping connection that, by means of a dedicated tool, enables quick, safe and reliable connection (ADO). More suitable for photovoltaic applications are screw-clamp or ADO (self-stripping technology) terminal blocks; the latter ensure higher connection reliability in the long term.

The new innovative and compact ABB terminal blocks SNK Series feature modern design and a lot of accessories to meet the various needs of the customers; they have certifications recognized worldwide.

Modular terminal blocks

Connection Technology	screw new SNK Series	self-stripping (ADO System)*	spring
Voltage	max 1000V	max 1000V	max 800V
Current	max 232 A	max 32 A	max 125 A
Wire size	max 95 mm ²	max 4 mm ²	max 35 mm ²

In conformity with the IEC 60947-7-1, IEC 60947-7-2 standards
Parallel interconnections are available
V0 self-extinguishing material

*Also available in ADO-screw version.

Type	Application	Section	I [A]	V [V]	Order code
Screw-screw terminal block					
ZS4	F	4 mm ²	32	1000	1SNK505010R0000
ZS6	F	6 mm ²	41	1000	1SNK506010R0000
ZS10	F	10 mm ²	57	1000	1SNK508010R0000
ZS4-BL	N	4 mm ²	32	1000	1SNK505020R0000
ZS6-BL	N	6 mm ²	41	1000	1SNK506020R0000
ZS10-BL	N	10 mm ²	57	1000	1SNK508020R0000
ZS4-PE	PE	4 mm ²	480A/1s		1SNK505150R0000
ZS6-PE	PE	6 mm ²	720A/1s		1SNK506150R0000
ZS10-PE	PE	10 mm ²	1200A/1s		1SNK508150R0000
ADO-ADO terminal block					
D 2,5/8.ADO	F	2,5 mm ²	24	1000	1SNA199059R0600
D 4/8.ADO	F	4 mm ²	32	1000	1SNA399244R1400
D 2,5/8.N.ADO	N	2,5 mm ²	24	1000	1SNA199061R2000
D 4/8.N.ADO	N	4 mm ²	32	1000	1SNA399318R1600
D 2,5/8.P.ADO	PE	2,5 mm ²	300A/1s		1SNA199091R1700
D 4/8.P.ADO	PE	4 mm ²	480A/1s		1SNA399250R2600
ADO-screw terminal block					
D 6/8.ADO	F	2,5 mm ²	24	1000	1SNA199042R2500
D 6/8.ADO3	F	4 mm ²	32	1000	1SNA399245R1500
D 6/8.N.ADO	N	2,5 mm ²	24	1000	1SNA199044R2700
D 6/8.N.ADO3	N	4 mm ²	32	1000	1SNA399319R1700
D 6/8.P.ADO	PE	2,5 mm ²	300A/1s		1SNA199118R2600
D 6/8.P.ADO3	PE	4 mm ²	480A/1s		1SNA399251R1300

Cable glands and nuts

Metric pitch



Main technical features of the metric gauge cable glands and nuts:

- IP 68 protection class
- material: 6.6 polyamide, self-extinguishing material according to the L94 V2 standard, resistant to abnormal heat and to fire up to 750 °C (glow wire test), in conformity with the IEC 60695-2-11 standard
- usage temperature: from -20 °C to +120 °C (short period)
- neoprene seal
- tightening by lamellar crown on the whole diameter of the cable (preventing any damage to the cable itself)
- cable glands can be reused without reducing their effectiveness

Metric pitch cable glands and nuts

Cable gland	Cable gland order code	Nut	Nut order code	Gauge M	Min [mm]	Max [mm]
Metric pitch M12 cable gland	00 951	Nut for M12 cable gland	00 961	12X1,5	3,5	7
Metric pitch M16 cable gland	00 952	Nut for M16 cable gland	00 962	16X1,5	5,5	10
Metric pitch M20 cable gland	00 953	Nut for M20 cable gland	00 963	20X1,5	7	13
Metric pitch M25 cable gland	00 954	Nut for M25 cable gland	00 964	25X1,5	10	17
Metric pitch M32 cable gland	00 955	Nut for M32 cable gland	00 965	32X1,5	12	21
Metric pitch M40 cable gland	00 956*	Nut for M40 cable gland	00 966	40X1,5	19	28
Metric pitch M50 cable gland	00 957*	Nut for M50 cable gland	00 967	50X1,5	27	35
Metric pitch M63 cable gland	00 958*	Nut for M63 cable gland	00 968	63X1,5	34	45

* M40, M50 and M63 cable glands and nuts are available on request.

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