Xinchi (China) Electric Co., LTD.

Add: Fangdouyan East Industrial Zone,Liushi Town,Yueqing,Zhejiang,China
Tel: 0086 577 62890205
Fax: 0086 577 62890578
Phone: 0086 13506679203
E-mail: julie@chinasuntree.com
Http: //www.chinasuntree.com

ShangHai XinChi Electric Co., LTD.

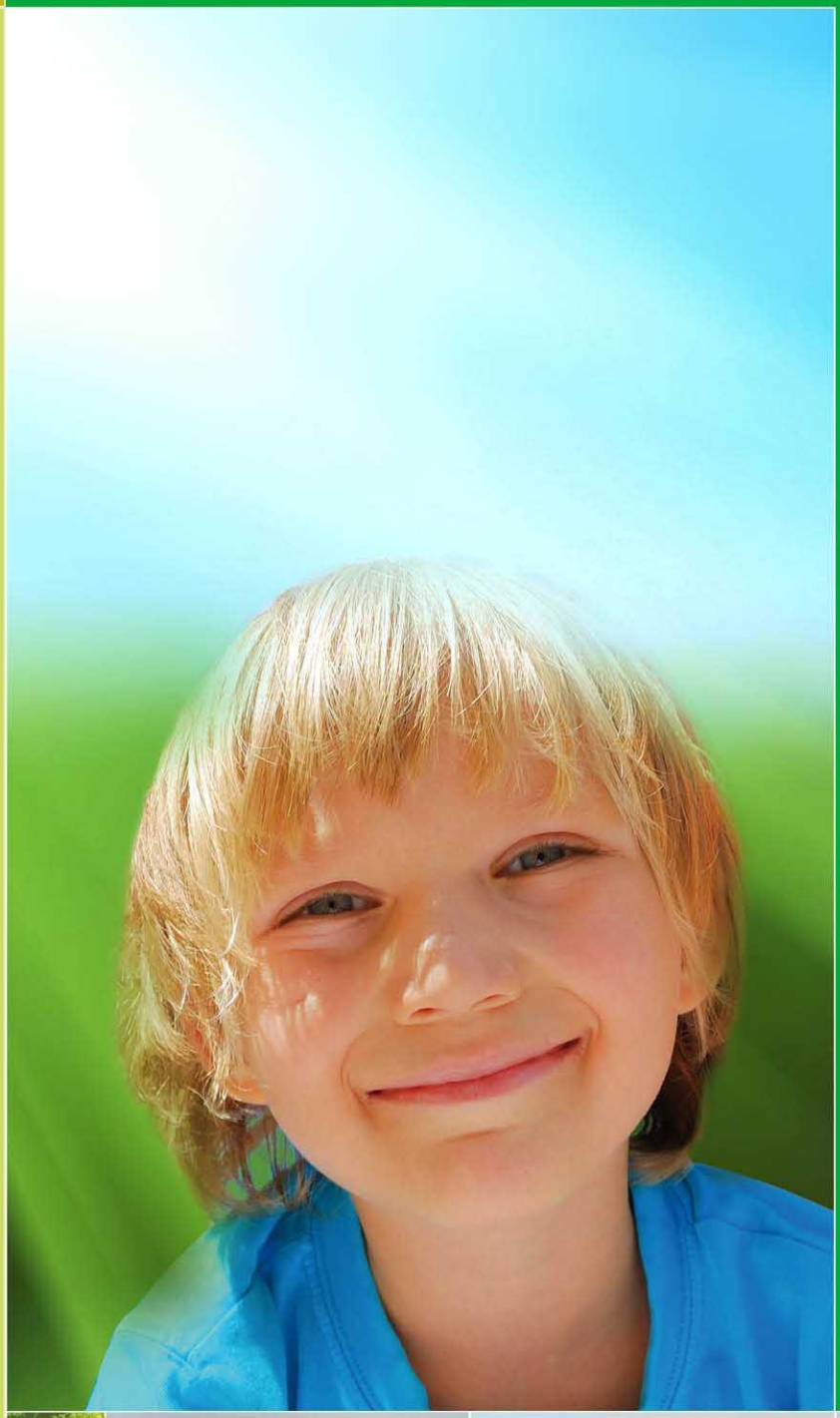
Add: No. 65 Haifeng Road, Baoshan District, Shanghai, China
Tel: 0086 21 51619313
Phone: 0086 13757784653
E-mail: tracy@chinasuntree.com
Http: //www.chinasuntree.com

YueQing XinChi IMP&EXP. Co.,LTD.

Add: Fangdouyan East Industrial Zone,Liushi Town,Yueqing,Zhejiang,China
Tel: 0086 577 61788115
Fax: 0086 577 62890578
Phone: 0086 13567768082
E-mail: tony@chinasuntree.com
Http: //www.chinasuntree.com

Suntree
New
Energy

ELECTRIC Suntree New Energy



PV DC Products


Innovative technology leads to better future.
professional working makes excellent quality.
www.chinasuntree.com


ELECTRIC
Suntree
New Energy

Company Profile

Xinchi Electric Co.,Ltd, is specialized in Intelligent electrical products, with world vision. Xinchi registered capital is RMB50,000,000, with six holding subsidiaries,annual output over RMB100 million,export over $10 million.

Xinchi Electric Co.,Ltd has been focusing on R&D and manufacture for DC power distribution systems and related products. Products including DC circuit breaker,DC Surge protector,PV combiner box,PV loaded isolating switch, DC multi-function meters, and other DC products special for DC PV systems. Meantime,we have been providing DC electrical system solutions for customers,regarding Photovoltaic power station, building integrated photovoltaic, wind power generation. These years, Xinchi has been concentrating on new energy development and application. With leading technical research and development capabilities, and high quality, Xinchi has been making outstanding contributions to Chinese new energy photovoltaic industry.

Xinchi global marketing strategy, making products hot sold to over 100 countries and regions. Products pass many international authoritative certifications. Including CE certificate,CB ,Nemko,SAA,VDE,ISI,CCC, and Golden-Sun certificates.As Xinchi products are very welcome to worldwide, Xinchi well known to more and more PV industrial companies, and set up deep business cooperation relationship with many world-class famous enterprises.

Xinchi fully implements ISO9001:2008 Quality management system, and ISO14001 environment management system, continues introducing more advanced production and testing equipments, and strengthening team management ability and professionalism. Also keep preferred investments for products technical R&D, to ensure Xinchi electrical products High-end,Precise,Top.

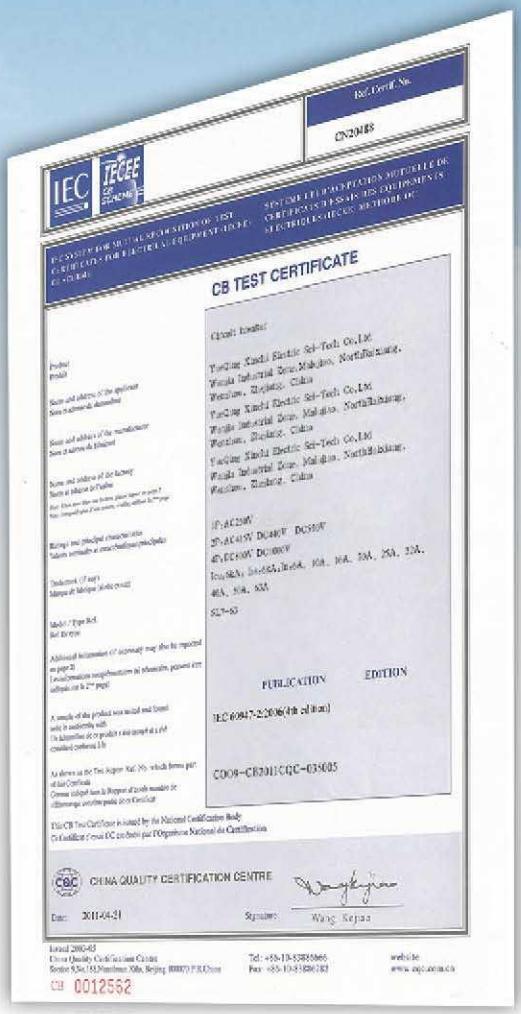
Xinchi company spirits are “pragmatic, integrity,Innovative,enterprising”, encouraging Xinchi toward “First class professional brand” . Sincerely invite you together to create a better future.

Qualification Certification

CB CE SAA APPROVALS TÜV

ROHS IEC Nemko

ELECTRIC Suntree XinChi Electric



PV DC Products

Suntree

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01-08

DC Isolating Switch

Each pole contact equiped with arc extinguish system, can eliminate arc immediately when switch off.

- UV Resistant IP66 Enclosure
- Extremely Short Power Shut off Time of Approx.2ms
- Lid only Removable In "off" Position
- Earth Terminal
- IEC60947-3,AS/NZS 3947.3: 2001
- DC21B 10A To 63A UP To DC1500V
- Easy To Install

09-17

PV Solar Dedicated DC Circuit Breaker

SL7 PV DC breaker supplementary protectors are designed to provide overcurrent protection within appliances or electrical equipment, where a branch circuit protection is already provided or not required. Devices are designed for direct current (DC) control circuit applications.

DC440V to DC1200V 6A to 400A

18-24

PV Surge Protector

The Cooper suntree three-module photovoltaic Surge Protective Device (SPD) (with three-step DC switching device) features easy visual indication and optional remote contact signaling (floating changeover contact) for use in PV systems.

These complete surge protective devices are suitable for all PV systems in accordance with IEC 60364-7-712. Includes a five year limited warranty.

DC600V to DC1200V

25-30

SHLX-Pv Junction Box of Lightning Protection

- The IP66 design is used for outdoor installation
- MC4 compatible input/output connectors for easy installation
- DC fuse for each PV string with fuse links meet PV standard
- DC isolator or DC MCB for isolatation or over-voltage protection with inside operation
- Anti-lighting and surge protector only for PV
- Each channels has 6 sets of input/output connectors
- The enclosure is made by polycarbonate and ABS,anti-UV

31-32

IP66 Distribution Enclosures

IP66 UV stabilised 4 way and 8 way weatherproof enclosures are avitally important party of any solar installation, if you are using DC circuit breaker as isolation.For this reason we have worked hard to produce a very high quality IP66 4 way and 8 way enclosures.This enclosure meets all the required standards and has thus been classed as IP66.

Contents

TECHNICAL TERMS
EXPLANATION OF PV TECHNICAL TERMS

- Solar modules: Solar modules use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture.
- Solar Cell: solar cell, or photovoltaic cell, is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect. It is a form of photoelectric cell, defined as a device whose electrical characteristics, such as current, voltage, or resistance, vary when exposed to light. Solar cells are the building blocks of photovoltaic modules, otherwise known as solar panels.
- PV strings:circuit string formed by PV modules in series, used to generate specific output voltage.
- Solar panel: the unit that is composed of PV strings and other components and generates direct current.
- PV combiner box: electrical connection of PV strings of solar panels is finished in the box, where you also can find the protective equipment.
- PV power generating set: assembly of PV power generation, also called PV field.
- PV power conversion equipment: convert direct current into alternating current, also called inverter.
- Standard test condition (STC): test conditions in accordance with NF EN60904-3 (C 57-323) for PV cells and modules.
- Open-circuit voltage UocSTC: under the condition of standard test, the terminal voltage of PV modules, PV strings, and solar panels with no loads, or terminal voltage of DC side of PV power conversion equipment.
- Short-circuit current IocSTC: under the condition of standard test, the short-circuit current of PV modules, PV strings, and solar panels, or short-circuit current of generating set.
- Max reverse current IRM: max reverse current that the module can withstand under the condition of no any damage. This value will be provided by the manufacturer.

  Note 1: this value has nothing to do with the withstand current of diversion diode, but it is the normal current flows through the PV cells in reverse direction.

  Note 2: IocSTC of modules whose typical value of crystalline silicon is 2~2.6 times.

  Maximum power point (MPP or MPPT)

  As shown in its name (track the maximum power point), in principle it can track nonlinear power generating system, such as the maximum power point of PV power generating set.

  MPPT or MPPTS also embodies an inverter assembly making use of solar energy to the largest extent by optimized matching the load characteristics with that of PV devices.

Normative reference

SL7-PV series miniature DC breaker for PV power generation meets the following standards:

IEC60947-2 Low-voltage switchgear and controlgear-Part 2: Circuit-breakers, IEC60898-2 (GB 10963.2-2008) Circuit-breakers for overcurrent protection for household and similar installation - Part 2: Circuit-breakers for a.c. and d.c. operation.

Normative reference

SM1-PV series high-performance circuit breaker meets the following standards:

IEC 60947-1 (GB 14048.1) General rules

IEC 60947-2 (GB 14048.2) Circuit breakers

Normative reference

SM1G-PV series disconnector meets the following standards:

IEC 60947-1 (GB 14048.1) General rules

IEC 60947-2 (GB 14048.2) Circuit breakers

Normative reference

SRD-PV series fuse meets the following standards:

GB13539.1-2008 Low-voltage fuses - Part 1: General requirements

GB13539.2-2008 Low-voltage fuses - Part 2: Supplementary requirements for fuses for use by authorized persons

IEC 60269-1-2006 Low-voltage fuses - Part 1: General requirements

IEC 60269-2-2010 Low-voltage fuses - Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)

Normative reference

SUP4-PV surge protective device meets the following standards:

IEC 60950-(GB 4943) Surge protective device

Normative reference

SGL-PV series load conversion isolating switch meets the following standards:

- International standards:

  IEC 60947-1(1998) Low-voltage switchgear and controlgear-Part 1: General rules

  IEC 60947-3(1999) Low-voltage switchgear and controlgear, switches, disconnectors, switch-disconnectors and fuse-combination units

- International standards:

  GB/T14048.1-2000 Low-voltage switchgear and controlgear-General rules

  GB/T14048.3-2002 Low-voltage switchgear and controlgear-Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units

SHLX PV combiner box meets the following standards:

CGC/GF002:2010(CNCA/CTS0001-2011) Technical specifications of PV combiner box

Executive standards

This scheme is mainly prepared according to the following national or industrial standards:

DL/T5044-2004 Technical code for designing DC system of power projects

DL/T5103-1999 Design code for unattended substation of 35kV~110kV

DL/T5120-2000 DC System design code for small electric power project

GB14285-1993 Technical code for relaying protection and security automatic equipment

DL/T5136-2001 Technical code for designing of electrical secondary wiring in fossil fuel power plants and substations

JB/T5777.4 The general specification and safety requirements for D.C power supply equipment of the power system

DL/T724-2000 Specification of operation and maintenance of battery DC power supply equipment for electric power system

DL/T459-2000 Specifications of D.C supply cabinet in power system

JB/T8456-1996 Low-voltage D.C switchgear assemblies

Guodian [2000] 589 Notice about printing and issuing The twenty-five key requirements to prevent serious accident and failure in electric power operation

YDB 037-2009 Technical requirements of 240V direct current power supply system for telecommunications

Applications

SL7 series high-performance miniature DC breakers and SM1 molded case circuit breakers are mainly developed for the solar PV field. In the following applications, they are the best protective devices:

- DC reverse current protection:Protect PV modules from the danger of DC reverse current;
- AC feedback current protection:Protect PV modules from harm of feedback current caused by defective inverter AC;
- DC load isolation switch:Under load condition, it can be safely switching-off. Due to the need of malfunction or maintenance work, single PV string can be safely and selectively put into and out of use under load condition;
- Remotely trip off and send alarm.
  Remote tripping function of Suntree series products can be realized by shunt release. Optional auxiliaries (switch on or off) can send out the status signals of breakers in each PV string.

Scope of application

Full range products are suitable for isolation

Suntree high-performance electrical circuit breakers can disconnect any PV string under load condition. Its rated current is up to 1250A, and its maximum working voltage is up to DC1500V.

Reliable remote control

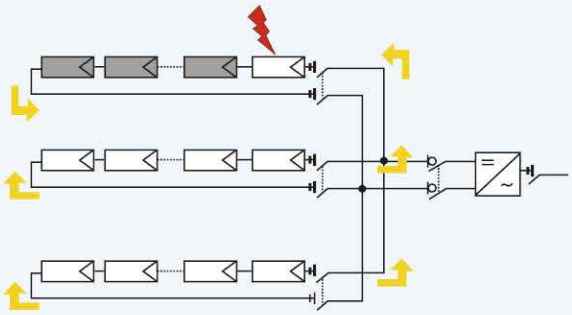
Shunt release can be installed to remotely control electrical tripping of Suntree high-performance electrical circuit breakers.
Auxiliary and alarm contacts and other optional accessories can upload clear status signals of Suntree high-performance electrical circuit breakers on each PV string.

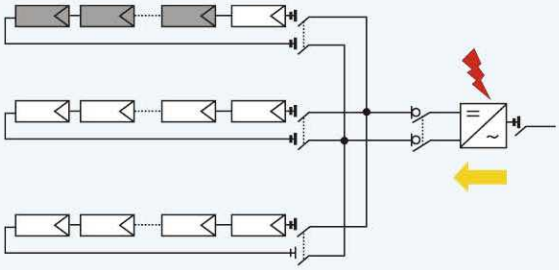
Technical features

Protect PV modules from the danger of DC reverse current

In a PV system without fault, the current going through each PV string are equal, there is no excessive reverse current. When the system is paralleled with more than three PV strings, generally there will be a critical reverse current. In a PV string, if one or more of the PV module are damaged, the current of entire string will decrease.
This means that the normal PV string feeds higher reverse current into a failed PV string, the heat generated by the reverse current may damage PV modules and wires in each PV string.
Such damage can be avoided through installing Suntree high-performance electrical circuit breakers, when dangerous reverse current is appeared, the breaker will be tripped which can protect PV modules from damage.

If the inverter is failed, the feedback current at AC side will be fed into the DC side and damage PV modules.
Suntree high-performance electrical circuit breakers can protect each PV string from the danger of feedback current brought by fault at AC side, it can cut off the circuit before PV module is damaged.





Advantages and benefits

- Rated current is up to 1250A, working voltage is up to DC1500V;
- Protect PV modules from the danger of DC reverse current;
- Protect PV modules from harm of feedback current caused by defective inverter AC;
- Each PV string can be safely and selectively put into and out of use under load condition.
- It can remotely control the disconnection of any PV string in the system, even in negative state;
- It can upload clear status signals of DC breakers in each PV string.
- Users can save the cost of series copper bars and installation, which significantly reduces the cost of manufacture.
- Internal preset series wiring can be avoided, high temperature caused by that the external series wiring does not meet the standard of GB14048.1-2006 main circuit terminal wiring standard, the circuit breaker needs to derate over 30% of its capacity, which makes it safer and more reliable.
- In accordance with the provisions in GB14048.1-2006, rated current 115A ~ 150A should choose two meters of 50mm² wire, we can calculate that the wire cooling area is 50340.48mm² which can use external series wiring if we can ensure sufficient cooling area.
- Use of copper bars can not guarantee its economical efficiency and safety.

Arc extinguishing principle of DC breaker

Arcing and arc extinguishing process of DC breaker is different from that of AC breaker. The AC arc generated by disconnection of AC breaker will go through the zero point 2f (f is the grid frequency) every second. It extinguishes the arc by polar effect. Only when AC breaker solved the re-strike of arc problem, it restores the recovery process of dielectric strength from conducting state back to the insulating state, It will not be elaborated.

The AC arc generated by breaking of DC breaker is constant, the greater the current is, the larger the time constant is, the more difficult to extinguish the arc.

There is no requirements for the contact of DC breaker because its performance of long-term carrying current is similar with general AC breaker. But the breaking current of DC breaker largely differs from AC breaker. The DC arc should be extinguished when contact of DC breaker is breaking. The followings are features of DC arc and measures to extinguishing DC arc:

When the contact of breaker is breaking, arc is immediately generated between static and moving contacts, which not only hinders timely breaking of the circuit, but also make contacts wear, the main problem at this time is electrical burning of contacts, on which AC and DC circuits are the same. In order to understand the arc cutting performance of DC circuit breaker, we must firstly analyze the arc generating process and the ability to extinguish the arc. When contact are breaking, at the beginning of separating of the contacts, the gap is very small, the electric field strength is great, which is easy to produce heat and strong electric field, free electrons in metal escapes from surface of the cathode to the anode. While free electrons hit the neutral gas molecules in the electric field, so it is excited and dissociated to produce positive ions and electrons, the electrons continue to move toward the anode in the strong electric field, it will also impact other neutral molecules, therefore, a large amount of ions and charged particles in the gap between contacts. These make gas conductive and forms hot electron flow, namely the arc.

After the arc is generated, there are ionization and de-ionization factors, ionization effect is due to the large amount of heat generated in the arc gap, it mainly hot ionization of gas, ely when the metal vapor on the contact surfaces gets into the arc gap, the gaseous heat ionization effect is more significant. The higher the voltage, the greater the current, which means that the larger arc power, the higher the arc zone temperature, and the stronger the arc of ionization factor. De-ionization is because the ionized positive ions and electrons will combine when they meet in space, and reform neutral gas molecules, and high temperature and intensive ions and electrons also spread towards other medium with less intensive and low temperature. As a result, the concentration of ions and free electrons decreases in the arc gap, the arc resistance increases, and the arc current is reduced, thereby hot ionization is weaken.

To extinguish the arc, it is necessary to restrain the ionization factor and strengthen the de-ionization factor, such as to pull the arc into the narrow space, to increase the distance between the moving contact and the gate films and so on, to narrow the diameter of the arc, so that the interior concentration of the ion is increased, it can enhance the proliferation and cooling effect, to stretch the arc, or to set up obstacles inside the arc to combine ions and electrons, which makes the de-ionization effect is greater than ionization effect, it will be able to extinguish the arc.

Arc distinguishing process of DC breaker

There are four processes while DC breaker completes limit test of breaking capacity:

1. Short-circuit current rises from 0 to instantaneous tripping current setting along an prospective exponential curve, the time is less than 0.5 ~ 4ms.
2. After tripping action, the contact is breaking after fixed operating time of switching mechanism, the current continues to rise, the time lasts about 1 ~ 4ms.
3. Arc are generated under cold and hot emitting effect, the arc is stretched and hot ionized and hot impacted in the arc column. The speed of gas ionization is accelerated and generated a large mount of heat and pressure, the time lasts about 0.3 ~ 6ms.
4. There is a permanent magnet or an electromagnetic coil between the static contact and moving contact of DC breaker, and it generates a magnetic field, the magnetic flux is relatively concentrated, it goes into arc extinguish space through the core plywood, and it forms layers of closed magnetic circuit with arc extinguishing plate, which quickly leads the arc through arcing ring from the contact to arc extinguishing space under a strong magnetic field.

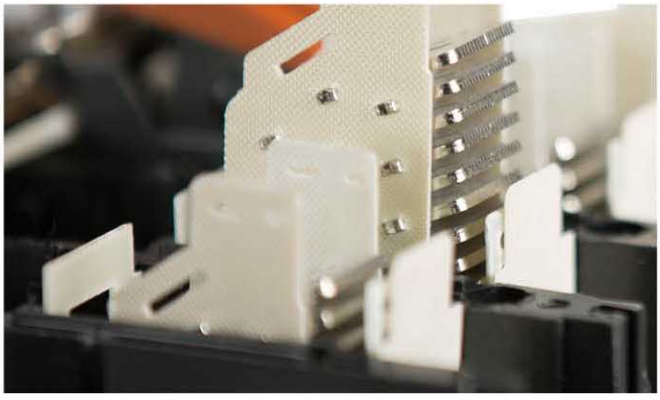
Magnetic arcing chamber is equipped with arc deflecting cover, which is made of plastic, it is used for:

First, leading the arc be blown out vertically;

Second, making the arc to contact with the insulated wall in arcing chamber, thereby rapidly cool down the arc, enhance the de-ionization effect, improve the voltage of arc column, and force the arc to be extinguished;

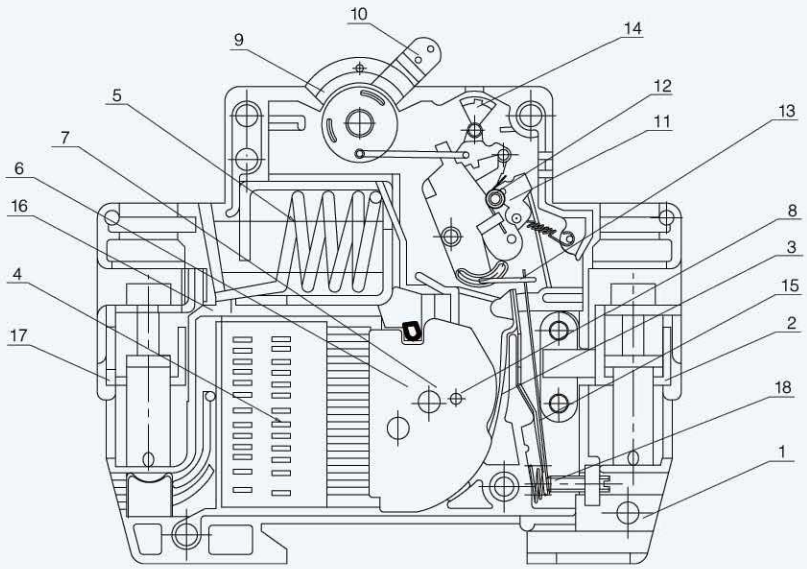
Third, producing inert gas to help extinguishing arc.

Arc slit can compress the diameter of arc column and make the arc to contact closely with the wall of the slit, and to enhance the cooling and de-ionization effect.The gate file is insulated, it can derive the heat of the arc, and increase the pressures-drop of the arc column, while the films divide the arc into sections , each film is the electrode of the short arc, thus there are a plurality of anode and cathode drops, when the voltage drop at the electrode near the arc column is large enough, the voltage can not maintain the arc, and thus the arc is extinguished. It will take about 2 ~ 30ms.



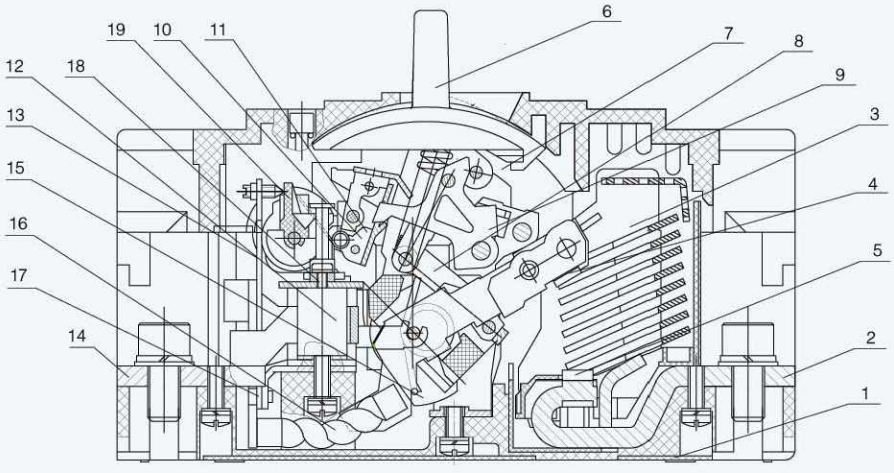
DC breaker is consisted of conductive loop, separable contacts, arc extinguishing devices, insulating parts, chassis, transmission mechanism, operation mechanism and other components.

Structure of SL7-63PV DC breaker



1.Shell
2.Wiring board
3.Arcing ring
4.Arcing chamber
5.Electromagnetic release
6.Permanent magnet
7.Moving contact
8.Static contact
9.Spring
10.Handle
11.Lock
12.Chain components of the release
13.Trip
14.Indicator
15.Bimetallic strip
16.Soft connection
17.Wiring board
18.Adjusting screw

Structure of SM1-125PV and SM1-225PV molded-case DC breaker

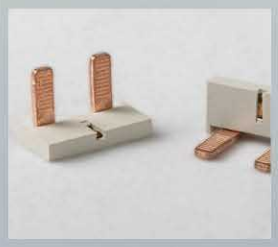


1.Shell
2.Upper wiring board
3.Arcing chamber
4.Moving contact
5.Static contact
6.Handle
7.Lever
8.Connecting rod
9.Trip
10.Chain pieces
11.Chain pieces
12.Magnetic release
13.Bimetallic strip
14.Lower wiring board
15.Shaft
16.Soft connection
17.Thermal elements
18.Lower push rod
19.Short time delay mechanism

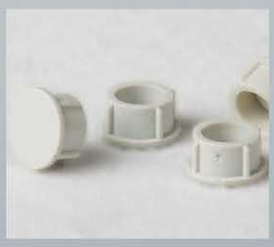
Each pole contact equiped with arc extinguish system , can eliminate arc immediately when switch off

Wall-mounted design, No need to open the cover mounting,Flexible installation

DC Isolating Switch



with bus-bar



Waterproof cover

Can connect to the MC4 connectors

3 YEAR WARRANTY

Rational Operational design prevents, reverse/ incorrect rotation

IP66

OFF 0

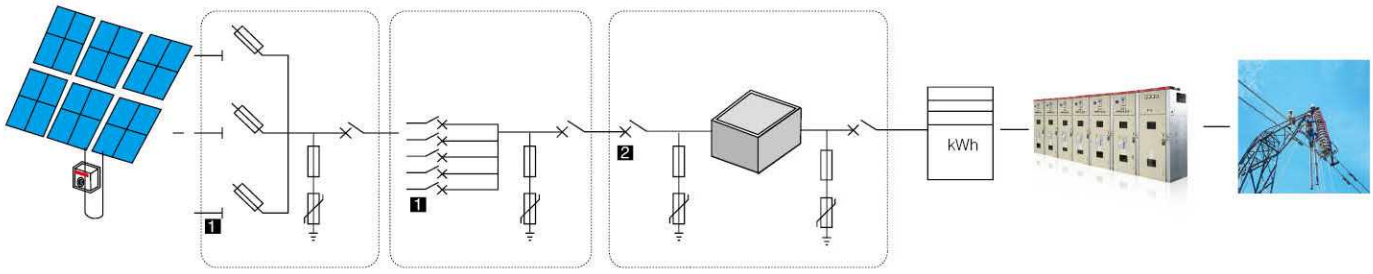
SISO SWITCH

SISO-32

DC distribution PV system used disconnector

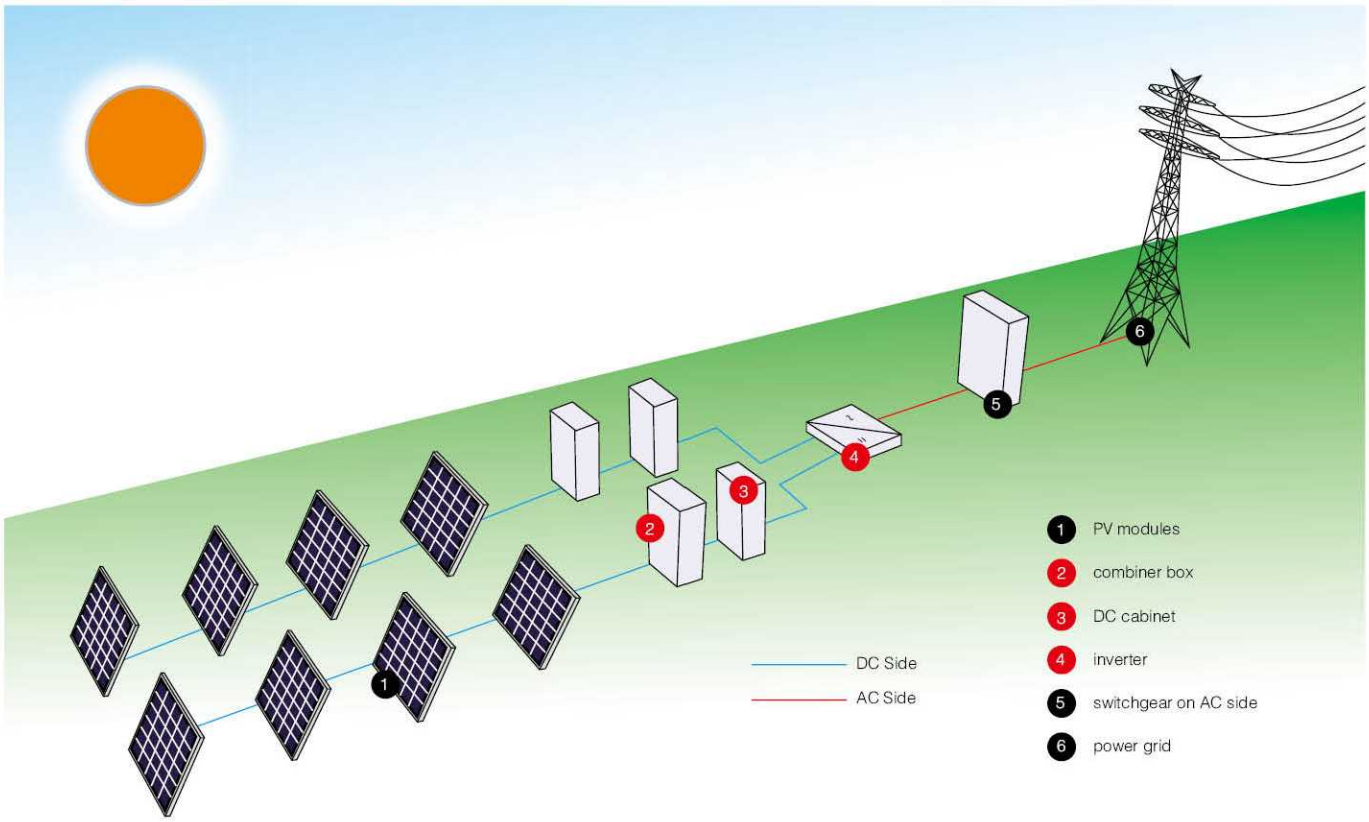
System requirements

Generally speaking, the voltage on DC side of PV system usually is higher, could be as high as 1000VDC. So we need switchgear of Ue=1000VDC. The branch circuit in combiner box needs protection, while the main circuit equipments in combiner box and DC cabinet need isolating function 1. Switching with load of 1000VDC or remote operation function. In addition, it needs to install switchgear 2 on DC side of inverter cabinet to switch with loads, plays a role of isolation for overhauling.



Solar tracking system | DC combiner box | DC cabinet | Inverter system | Metering and Monitoring system | AC distribution and On-grid system | Utility power grid

flow chart



PV DC Products

Suntree

DC ISOLATING SWITCH

SISO-63

SISO-63S

UV Resistant IP66 Enclosure
Extremely Short Power Shut Off Time Of Approx.2ms
Lid Only Removable In "off" Position
Earth Terminal
IEC60947-3,AS/NZS 3947.3: 2001
DC21B 10A To 63A UP To DC1500v
Easy To Install

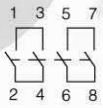
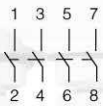
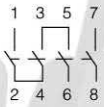
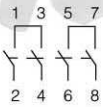
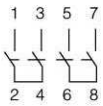
CE TÜV SAA IEC ROHS

Specifications

Rated Voltage	600VDC TO 1500VDC
IP Rating	IP66
Connection Type	M20 M25 MC4
Rated Current	10A,16A,20A,25A, 32A,40A,50A,63A
Working Temperature	-5°C~+60°C
Standard	IEC 60947-3, AS/NZS 3947.3:2001

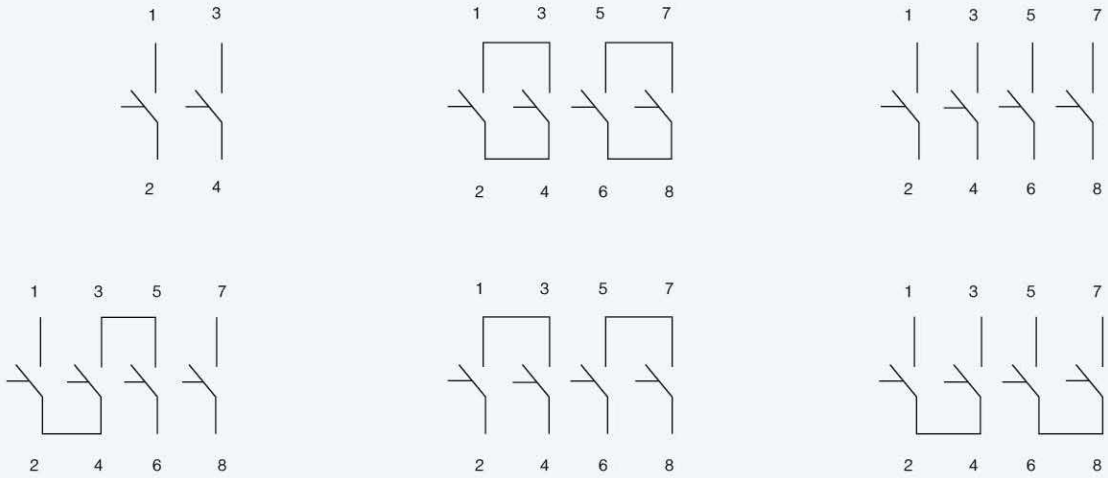
This product passed IEC authorized Lab IP66 waterproof testing. Also our company will take simulation tests irregularly, similar to customer's using environment, to make sure this product completely conforms to IP66 protection grade

Specifications

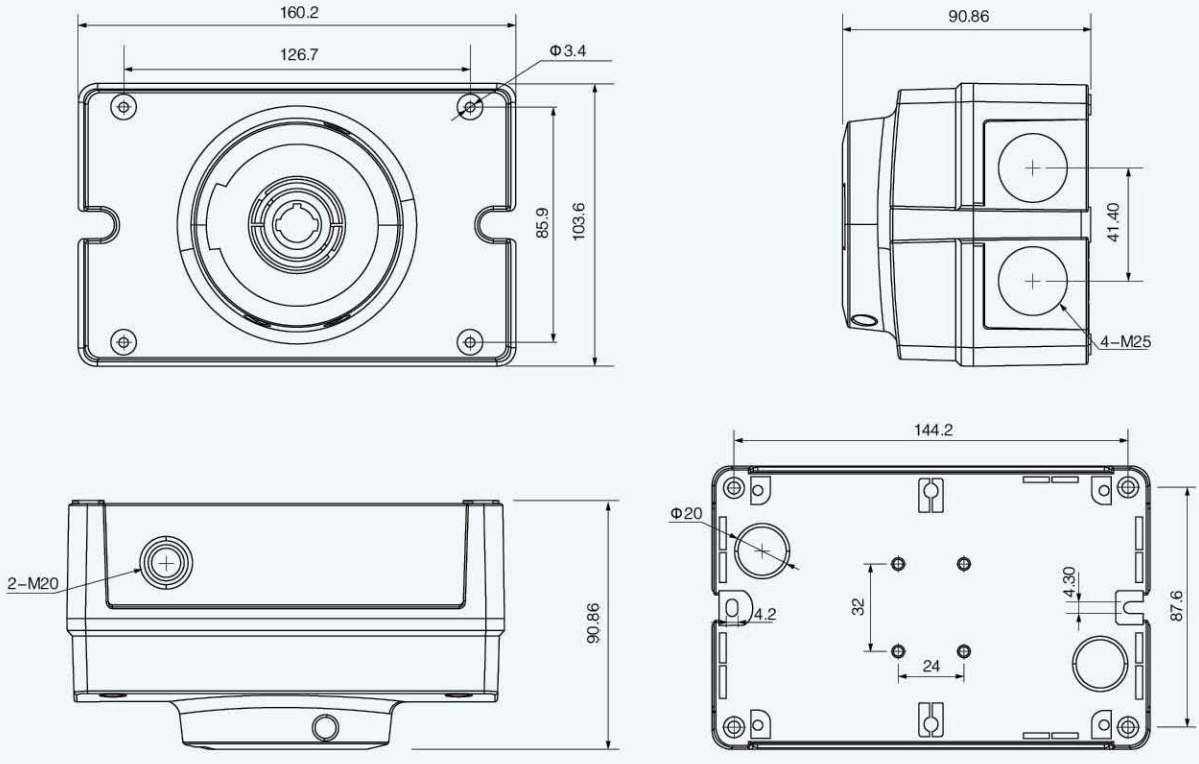
Contact configuration	600V	800V	1000V	1200V	Poles in series	Number of strings	Type Number
	16A	16A	9A	9A	2	1	SISO-16P2
	25A	20A	11A	11A	2	1	SISO-25P2
	32A	23A	13A	13A	2	1	SISO-32P2
	29A	16A	9A	9A	2	1	SISO-16P2H
	45A	20A	11A	11A	2	1	SISO-25P2H
	50A	23A	13A	13A	2	1	SISO-132P2H
	16A	16A	9A	9A	2	2	SISO-16P4
	25A	20A	11A	11A	2	2	SISO-125P4
	32A	23A	13A	13A	2	2	SISO-32P4
	16A	16A	16A	16A	4	1	SISO-16P4S
	25A	25A	25A	25A	4	1	SISO-25P4S
	32A	32A	32A	32A	4	1	SISO-32P4S
	16A	16A	16A	16A	4	1	SISO-16P4B
	25A	25A	25A	25A	4	1	SISO-25P4B
	32A	32A	32A	32A	4	1	SISO-32P4B
	16A	16A	16A	16A	4	1	SISO-16P4T
	25A	25A	25A	25A	4	1	SISO-25P4T
	32A	32A	32A	32A	4	1	SISO-32P4T

1500V DC voltage require customized

Contact Configuration



Dimensions(mm)



PV DC Products

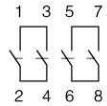
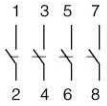
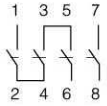
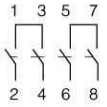
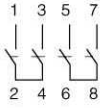
Suntree

Main Switch for DIN Rail Mounting

- DIN rail mounting
- Extremely short power shut off time of approx. 3ms
- 2 poles and 4 poles available
- IEC60947-3 standard
- DC21B: 16A, 25A and 32A up to 1500V DC

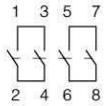
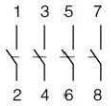
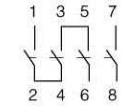
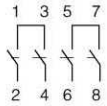
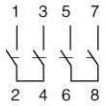
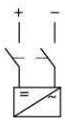
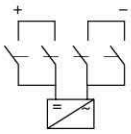
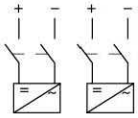
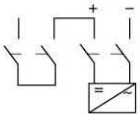
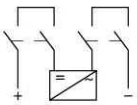
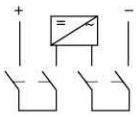
CE TÜV SAA IEC ROHS

Specifications

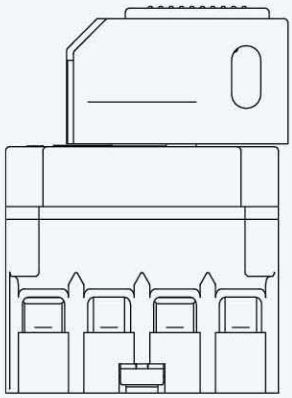
Contact configuration	600V	800V	1000V	1200V	Poles In serles	Number of strlngs	Type Number
	16A	16A	16A	9A	2	1	SISO.2-16 D2
	25A	25A	20A	11A	2	1	SISO.2-25 D2
	32A	32A	23A	13A	2	1	SISO.2-32 D2
	29A	29A	16A	9A	2	1	SISO.2-16 D2H
	45A	45A	20A	11A	2	1	SISO.2-25 D2H
	58A	58A	23A	13A	2	1	SISO.2-32 D2H
	16A	16A	16A	9A	2	2	SISO.2-16 D4
	25A	25A	20A	11A	2	2	SISO.2-25 D4
	32A	32A	23A	13A	2	2	SISO.2-32 D4
	16A	16A	16A	16A	4	1	SISO.2-16 D4S
	25A	25A	25A	25A	4	1	SISO.2-25 D4S
	32A	32A	32A	32A	4	1	SISO.2-32 D4S
	16A	16A	16A	16A	4	1	SISO.2-16 D4B
	25A	25A	25A	25A	4	1	SISO.2-25 D4B
	32A	32A	32A	32A	4	1	SISO.2-32 D4B
	16A	16A	16A	16A	4	1	SISO.2-16 D4T
	25A	25A	25A	25A	4	1	SISO.2-25 D4T
	32A	32A	32A	32A	4	1	SISO.2-32 D4T

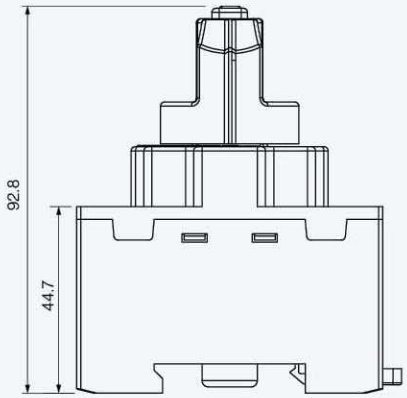
1500V DC voltage require customized

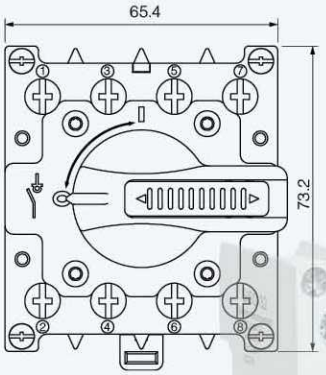
Switching Configurations

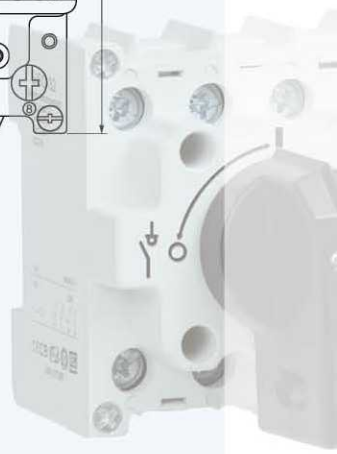
Type	2-pole	2-pole 4 paralleled poles	4-pole	4-pole with Input on top output bottom	4-pole with Input and output bottom	4-pole with Input and output on top
SISO.2-16	2	2H	4	4S	4B	4T
SISO.2-25	2	2H	4	4S	4B	4T
SISO.2-32	2	2H	4	4S	4B	4T
Contacts Wiring graph						
Switching example						

Dimensions(mm)



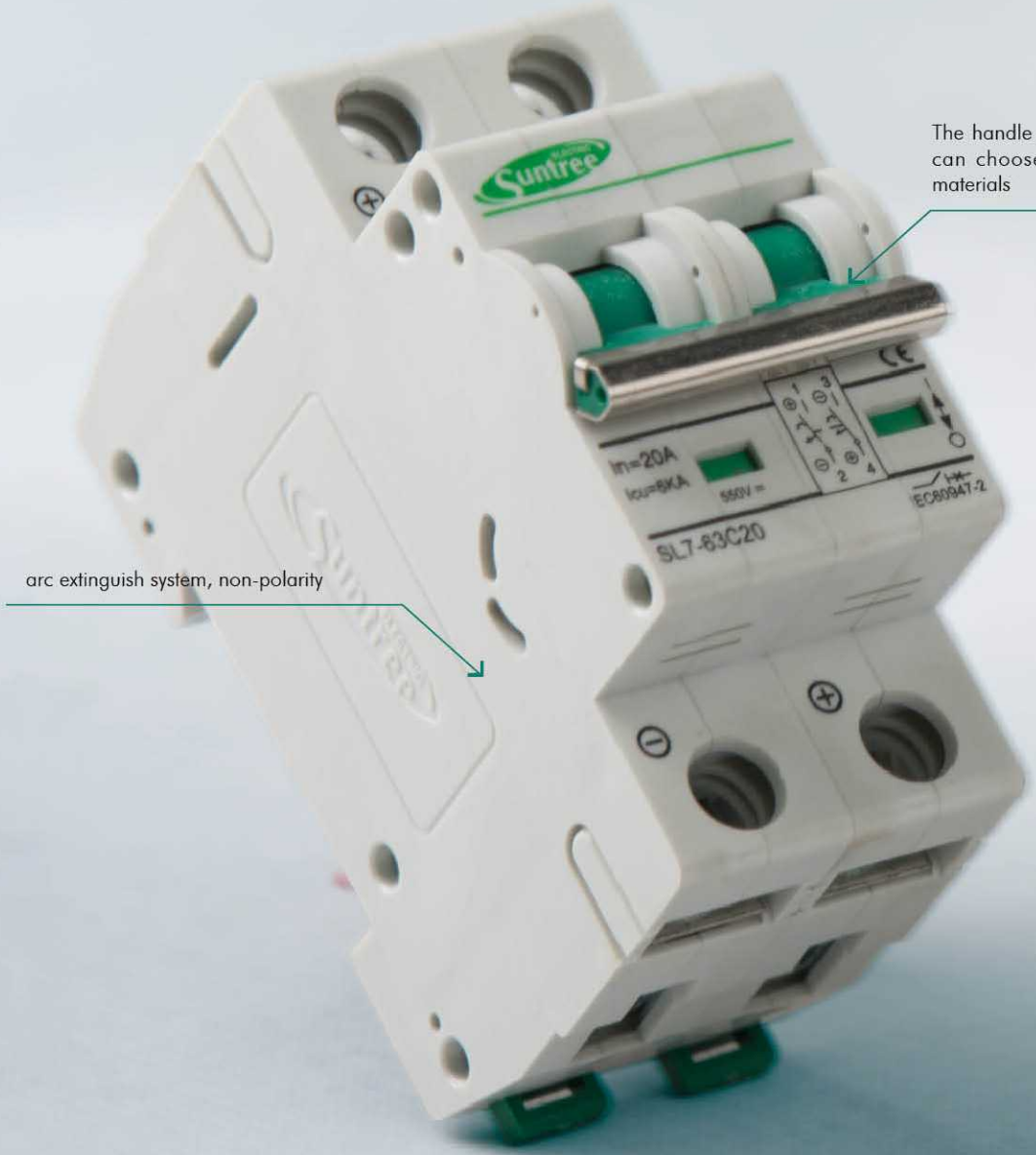






PV Solar Dedicated DC Circuit Breaker

3 YEAR WARRANTY



The handle connecting rod material you can choose stainless steel, or plastic materials

arc extinguish system, non-polarity

Busbar can be set up in advanced, nice looking and practical

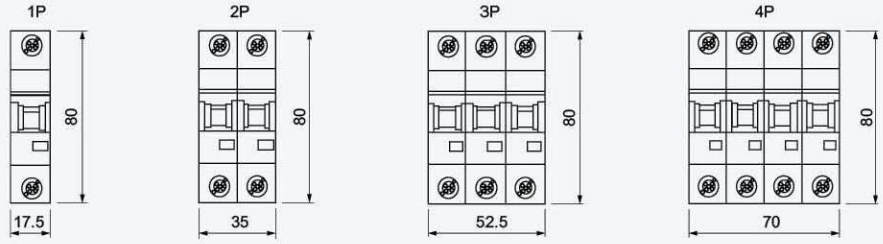
SL7 Non-Polarity DC circuit breaker

SL7 PV DC breaker supplementary protectors are designed to provide overcurrent protection within appliances or electrical equipment, where a branch circuit protection is already provided or not required. Devices are designed for direct current (DC) control circuit applications.

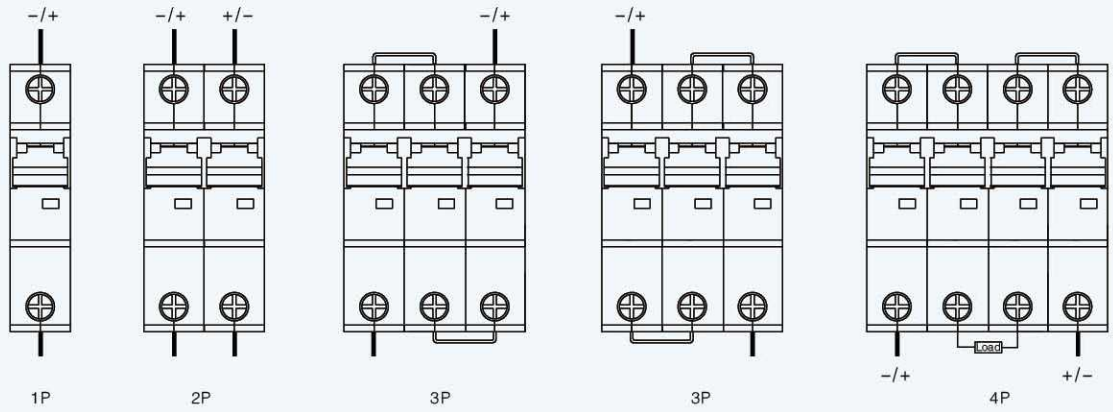
Specifications

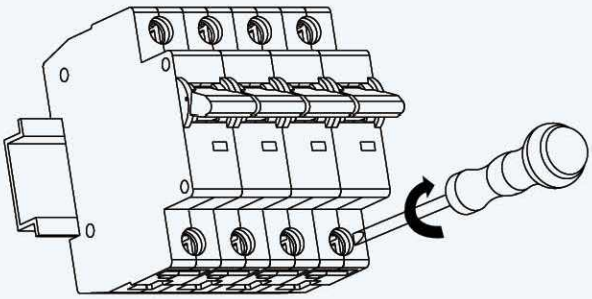
SL7 PV Series Circuit Breaker		SL7-63			
Frame degree rated current (A)		63			
Electrical performance					
Ue Rated operating voltage (V DC)		2P: DC440V DC550V DC800V 4P:DC800V DC1000V DC1200V			
Rated Current In (A)		6-10-16-20-25-32-40-50-63			
Rated insulation voltage Ui (V DC)		2P: 800V 4P: 1200V			
ated Impact voltage Uimp (kV)		4			
Ultimate breaking capacity Icu (kA)		6	6	6	6
Run breaking capacity Ics (%Icu)		75%	75%	75%	75%
Curve type		C			
Trip type		Thermal-magnetic			
MECHANICAL	Actual average value	20000			
	Standard value	8500			
ELECTRIC	Actual average value	2500			
	Standard value	1500			
Control and indication					
Shunt release (SHT)		Option			
Undervoltage release (UNT)					
Auxiliary contact (AX)					
Alarm contact (AL)					
Connection and installation					
Wiring capacity (mm²)		In≤32A,1~25 mm²,I≥40A,10~35mm²			
Ambient temperature (℃)		-20~70			
Altitude		≤2000			
Relative humidity		≤95%			
Pollution Level		3			
Installation Environment		No obvious shock and vibration			
Installation category		Class Ⅲ			
Installation		DIN Standard rail			
Dimensions(W)x(H)x(Deep)	W	17.5	35	52.5	70
	H	80	80	80	80
	Deep	71	71	71	71
Weight (kg)		0.12	0.24	0.36	0.48

Dimensions(mm)



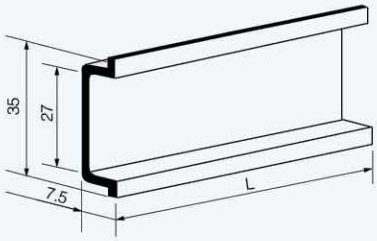
Wiring diagram



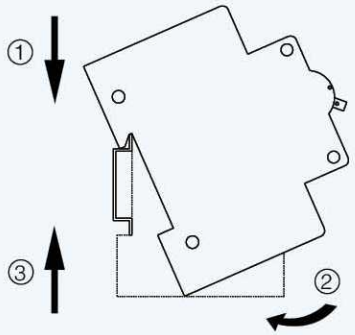


Rated current (A)	Sectional area of wire(mm^2)	Tightening torque of connecting wire(N.m)
1、2、3、4、5、6	1	Both the power side and load side are 2.0
10	1.5	
16、20	2.5	
25	4	
32	6	
40、50	10	
63	16	

Installation diagram



TH35−7.5 Mounting Din−Rail



SL7 Polarity DC circuit breaker

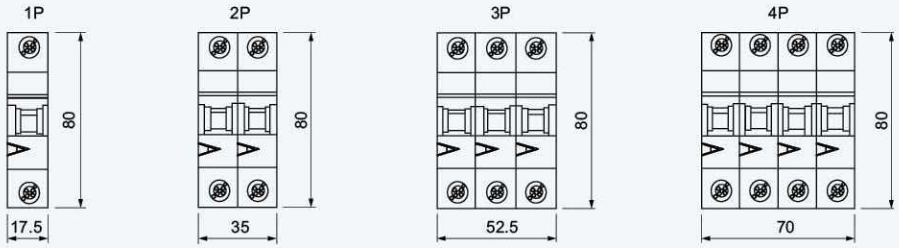
SL7 PV DC breaker supplementary protectors are designed to provide overcurrent protection within appliances or electrical equipment, where a branch circuit protection is already provided or not required. Devices are designed for direct current (DC) control circuit applications.

CE TÜV SAA IEC ROHS

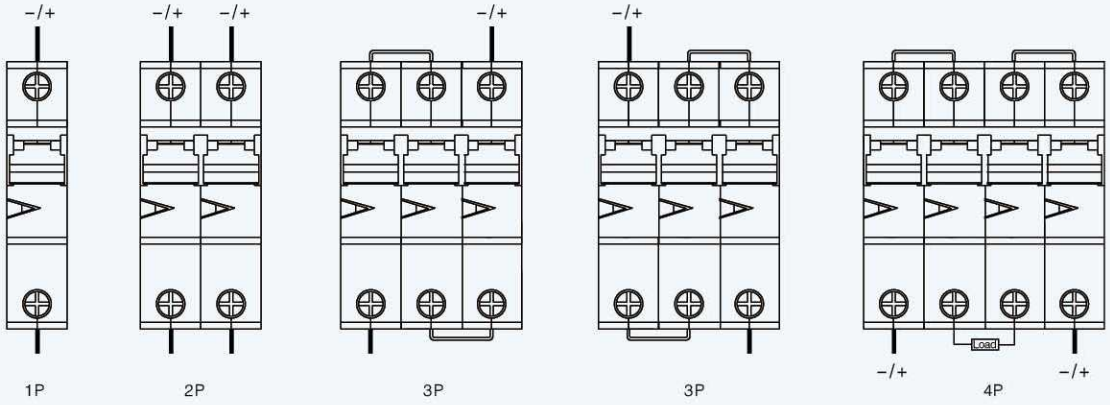
Specifications

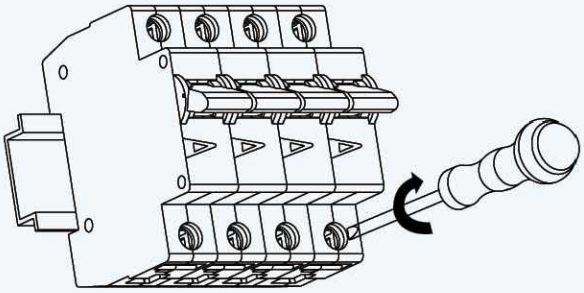
SL7 PV Series Circuit Breaker		SL7-63			
Frame degree rated current (A)		63			
Electrical performance					
Ue Rated operating voltage (V DC)		2P: DC440V DC550V DC800V 4P:DC800V DC1000V DC1200V			
Rated Current In (A)		6-10-16-20-25-32-40-50-63			
Rated insulation voltage Ui (V DC)		2P: 800V 4P: 1200V			
ated Impact voltage Uimp (kV)		4			
Ultimate breaking capacity Icu (kA)		6	6	6	6
Run breaking capacity Ics (%Icu)		75%	75%	75%	75%
Curve type		C			
Trip type		Thermal-magnetic			
MECHANICAL	Actual average value	20000			
	Standard value	8500			
ELECTRIC	Actual average value	2500			
	Standard value	1500			
Control and indication					
Shunt release (SHT)		Option			
Undervoltage release (UNT)					
Auxiliary contact (AX)					
Alarm contact (AL)					
Connection and installation					
Wiring capacity (mm²)		In≤32A,1~25 mm²,I≥40A,10~35mm²			
Ambient temperature (℃)		-20~70			
Altitude		≤2000			
Relative humidity		≤95%			
Pollution Level		3			
Installation Environment		No obvious shock and vibration			
Installation category		Class Ⅲ			
Installation		DIN Standard rail			
Dimensions(W)x(H)x(Deep)	W	17.5	35	52.5	70
	H	80	80	80	80
	Deep	71	71	71	71
Weight (kg)		0.12	0.24	0.36	0.48

Dimensions(mm)



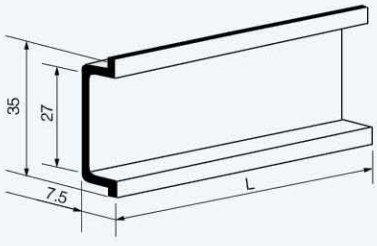
Wiring diagram



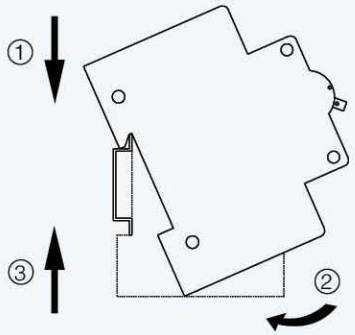


Rated current (A)	Sectional area of wire(mm²)	Tightening torque of connecting wire(N.m)
1、2、3、4、5、6	1	Both the power side and load side are 2.0
10	1.5	
16、20	2.5	
25	4	
32	6	
40、50	10	
63	16	

Installation diagram



TH35−7.5 Mounting Din−Rail



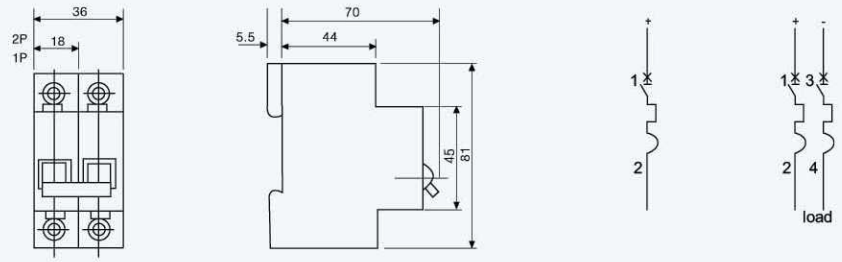
SCB2 Polarity DC circuit breaker

SCB2 PV DC breaker supplementary protectors are designed to provide overcurrent protection within appliances or electrical equipment, where a branch circuit protection is already provided or not required. Devices are designed for direct current (DC) control circuit applications.

Specifications

SCB2 PV Series Circuit Breaker		SCB2-63			
Frame degree rated current (A)		63			
Electrical performance					
Ue rated operating voltage (V DC)		DC24V DC48V			
Rated current In (A)		6-10-16-20-25-32-40-50-63			
Rated insulation voltage Ui (V DC)		800V			
ated impact voltage Uimp (kV)		4			
Ultimate breaking capacity Icu (kA)		6	6	6	6
Run breaking capacity Ics (%Icu)		75%	75%	75%	75%
Curve type		C			
Trip type		Thermal-magnetic			
Mechanical	Actual average value	20000			
	Standard value	8500			
Electric	Actual average value	2500			
	Standard value	1500			
Control and indication					
Shunt release (SHT)		Option			
Undervoltage release (UNT)					
Auxiliary contact (AX)					
Alarm contact (AL)					
Connection and installation					
Wiring capacity (mm²)		In≤32A,1~25 mm²,I≥40A,10~35mm²			
Ambient temperature (℃)		-20~70			
Altitude		≤2000			
Relative humidity		≤95%			
Pollution level		3			
Installation environment		No obvious shock and vibration			
Installation category		Class Ⅲ			
Installation		DIN Standard rail			

Dimensions(mm)



PV DC Products

Suntree

SM1-PV DC Breaker Non-Polarity

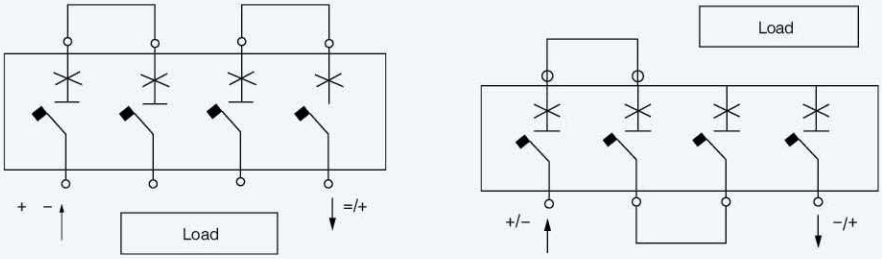
- Reliable protection at high ambient temperatures
- Loadable:string protection up to
  125 size:63A,80A,100A,125A
  250 size:160A,200A,225A,250A
  400 size:320A,400A
- Tested:Ultimate short circuit breaking capacity Icu of 25kA according to IEC IEC60947-2
- Fast: reclosable for minmum standstill times
- Safe: reliable disconnector properties,switching under load
- Approval:Provided on pequest

CE TÜV SAA IEC ROHS

Specifications

Rated Current In (A)	125:63A,80A,100A,125A, 250:160A,200A,225A,250A, 400:320A,400A
Ue Rated operating voltage (VDC)	3P 750V 4P DC1000V
Rated insulation voltage Ui (VDC)	DC1000V
Rated Impact voltage Uimp (kV)	8KV
Ultimate breaking capacity Icu (kV)	25KV
Trip type	Thermal-magnetic
Ambient temperature (℃)	-20℃ ~70℃
Altitude	2000M
Instalation	Fixed,plug-in
Accessories	Auxiliary,Alarm,Shunt release,Manually operated and electric operation

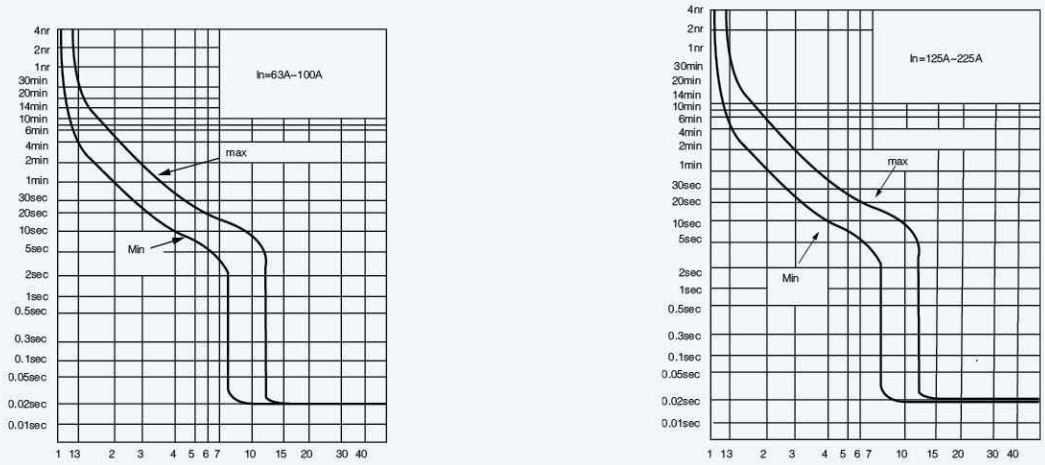
Wiring diagram



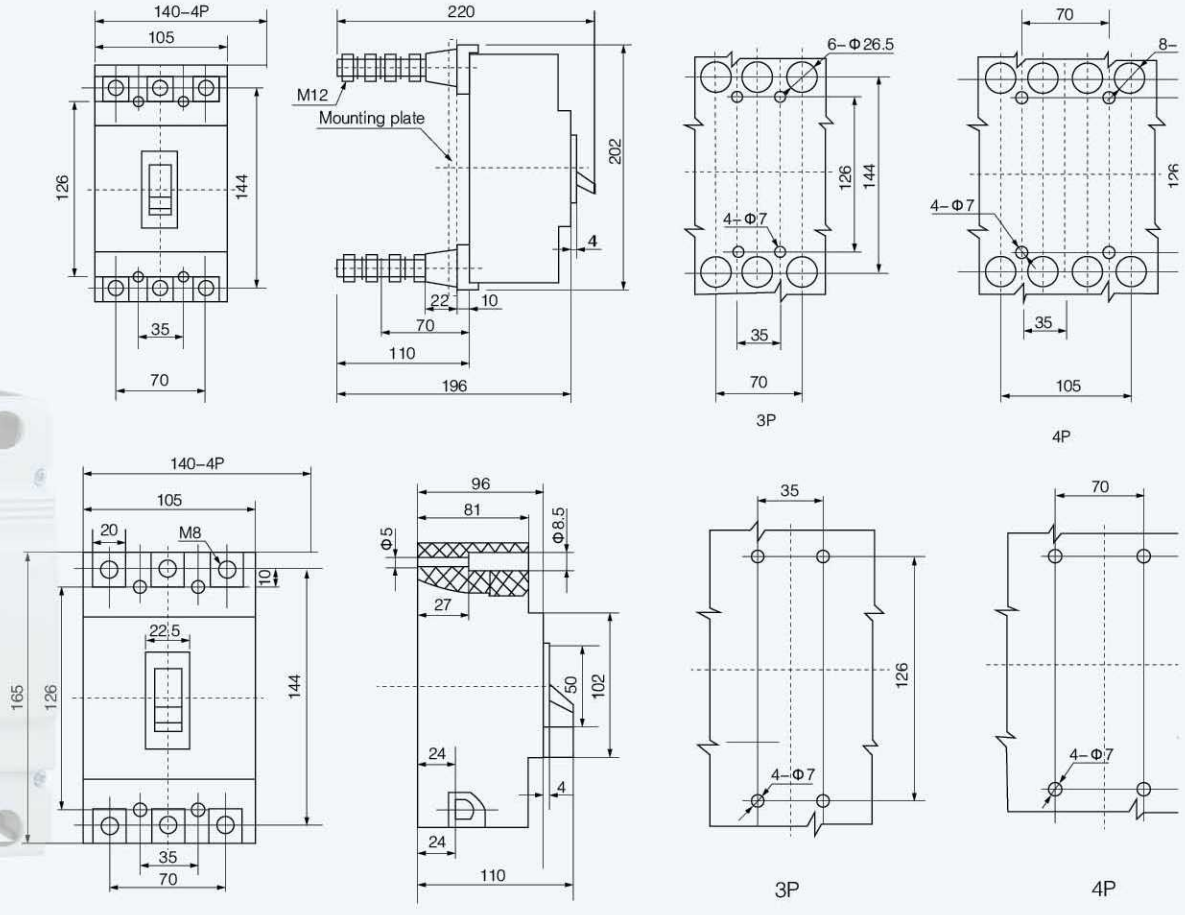
- Protection and Isolation wiring
- The load should be ⩽ DC1000V
  The connection considered for anetwork in which the middle point of the supply source is earthed
  In this case the breaker protects and isolates the load

- Protection and Isolation wiring
- The load should be ⩽ DC1000V
  The Negative pole (-) could be earthed,but in both cases the breaker protects and isolates the load

Curve chart



Installation dimensions

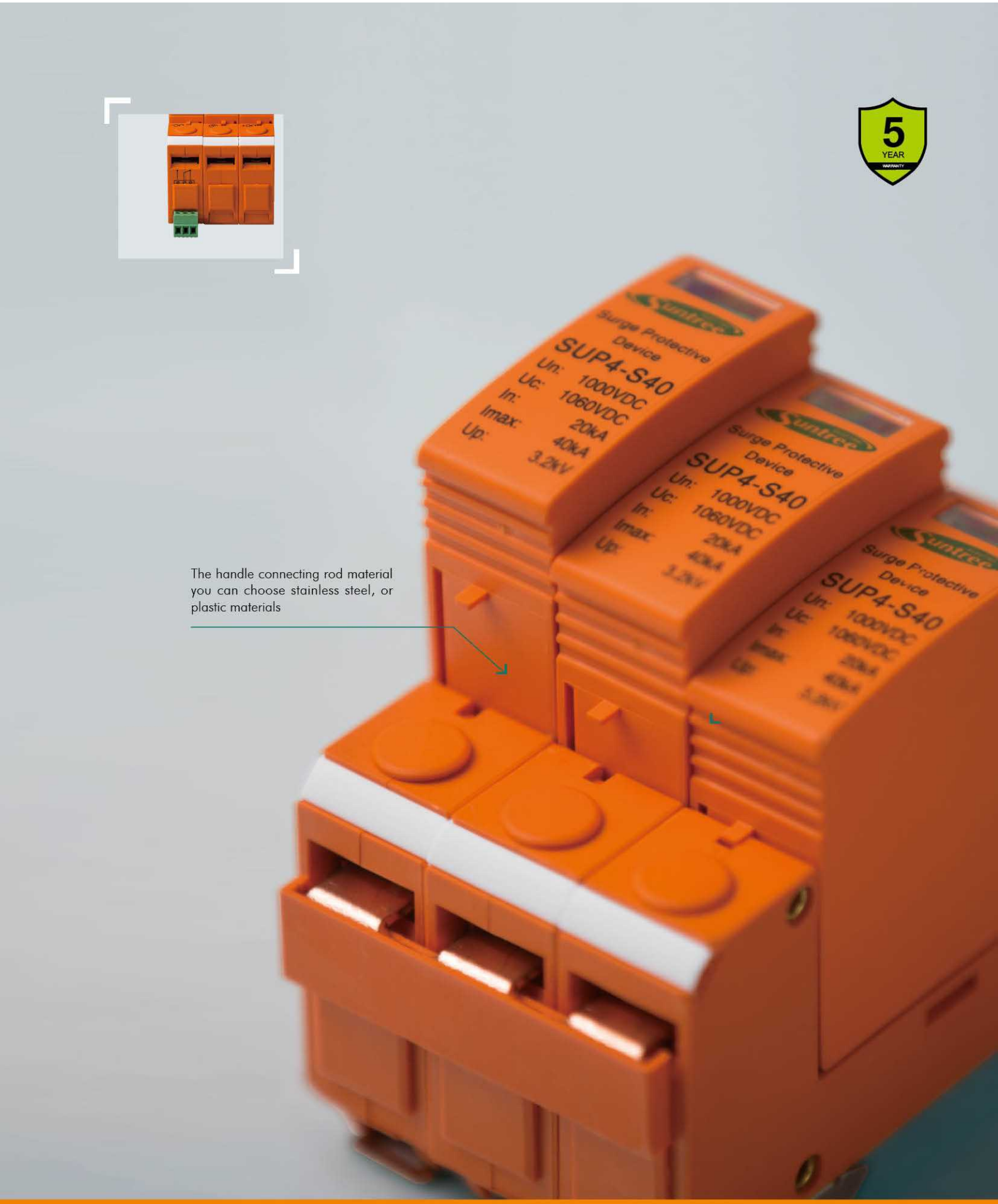


*400A installation dimensions please contact manufacturers

*Customizable isolating switch, the model is SM1G-PV

5 YEAR WARRANTY

The handle connecting rod material you can choose stainless steel, or plastic materials



PV Surge Protector

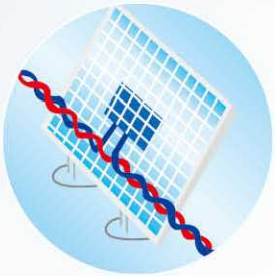
Lightning and surge protection for PV systems installed on buildings

Please take the following measures to protect the PV system from damage of lightning impulse or surge voltage:

- All metal parts (such as framework, support, etc) of PV system must be connected to the main equipotential bus to ensure reliable equipotential connection of the whole system.
- Must keep a safe distance (S) between all parts of PV systems and the external lightning protection system. The external lightning protection system can be connected to the main equipotential bus, fundamental earth screen or ground ring only.
- Adoption of twisted-pair wiring to reduce system jamming.
- For cables from outdoors, the surge protection device should be installed at the entrance of buildings. An all-round and systematic lightning protection should also protect other facilities on buildings from being damaged.

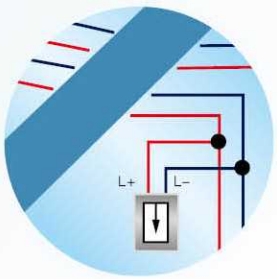
Reasonable wiring:

adoption of twisted-pair wiring with lines as short as possible, to avoid big loop and reduce induced voltage on circuits.



Surge protection device installed on the DC side:

for cables from outdoors, the surge protection device should be installed at the entrance of buildings.

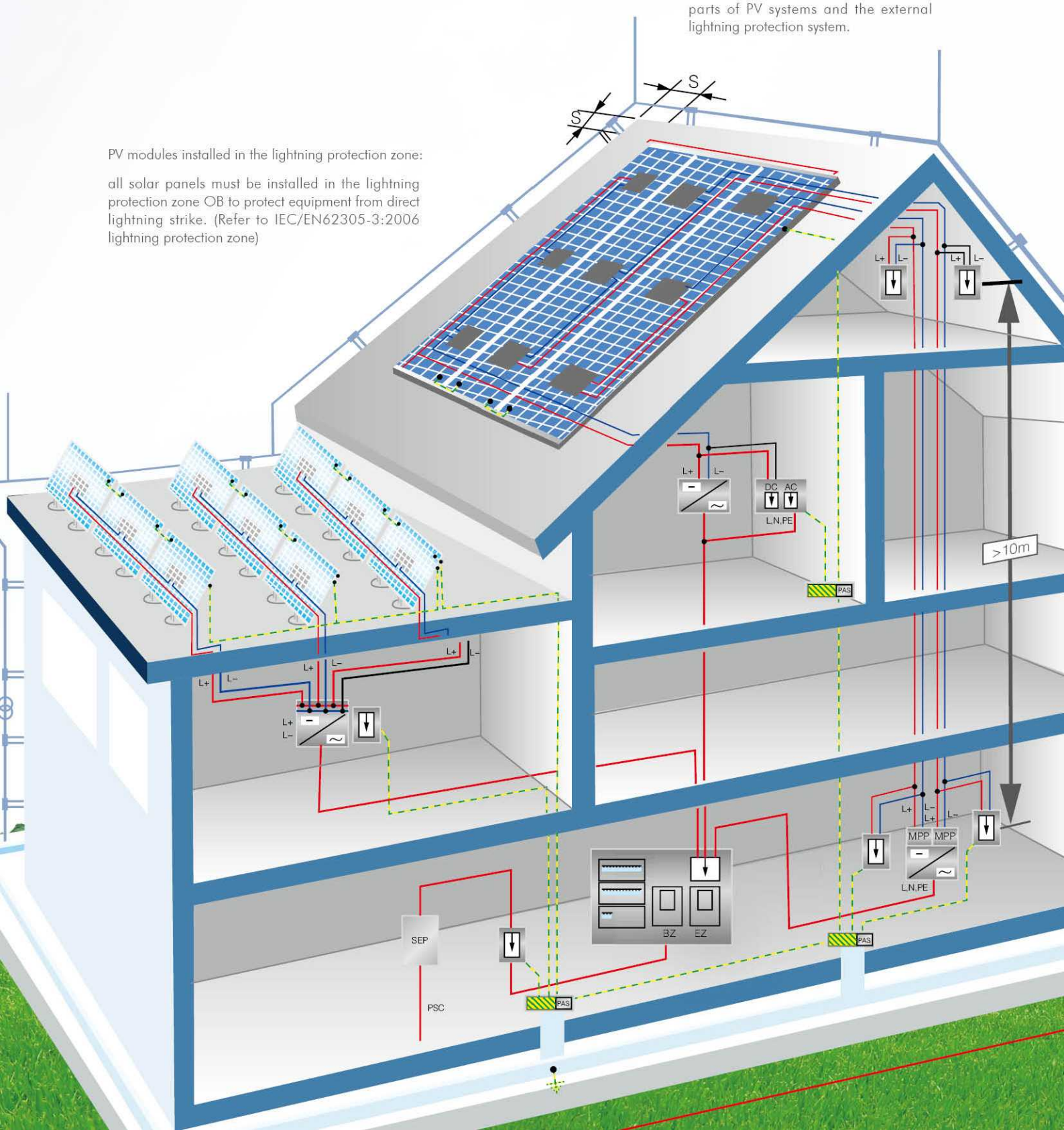


safe distance (S):

must keep a safe distance between all parts of PV systems and the external lightning protection system.

PV modules installed in the lightning protection zone:

all solar panels must be installed in the lightning protection zone OB to protect equipment from direct lightning strike. (Refer to IEC/EN62305-3:2006 lightning protection zone)



Suntree

SUP2-PV Series Surge Protector

SUP2-PV surge protective device, protect against lightning surge voltages in solar system (photovoltaic power supply system).

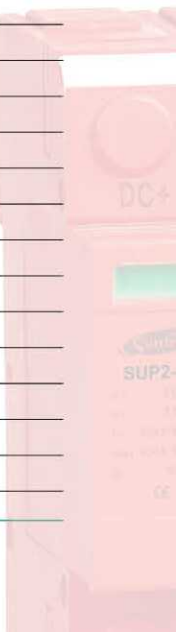
These units must be installed in parallel on the DC networks to be protected and provide common and different modes protection. Its installed location are recommended at both ends of the DC power supply line (solar panel side and inverter/converter side), ely if the line routing is external and long.

High energy MOVs equipped with specific thermal disconnectors and related failure indicators.

CE TÜV ROHS

Specifications

SUP2-PV series surge protector		SUP2-PV	
PV DC-specific (LEC 66143-1/EN 61643-11)			
Pole		2P	3P
Electrical Parameter			
Classified test		II	II
Uoc max (V DC)		500	900
Uc (V DC)		500	1000
In(8/20)us (kA)		20	20
Imax(8/20)us (kA)		40	40
Up (kV)		2.0	3.8
Remote control and indication			
Indication window			
Plug-in Module			
Remote signal contact			
Remote signal contact	maximum working voltage(V)	250 AC/30V DC	250AC/30V DC
	maximum working current (A) 1A(250V/ AC)	1A(250V/ AC)	1A(250V/ AC)
	1A (30V DC)	1A(30V/ AC)	1A(30V/ AC)
Wiring & installation			
Wiring capacity(mm^2)	Hard wire	4~25	4~25
	Flexible wire	4~16	4~16
Stripping length(mm)		10	10
Terminal screwa		M5	M5
Torque(Nm)	Main ciruit	3.5	3.5
	Remote signal contact	0.25	0.25
Protection class	All profile	IP40	IP40
	Connection port	IP20	IP20
Installation environment		No obvious shock and vibration	
Altitude (m)		≤2000	≤2000
Working Temperature		-3.0~+70	-3.0~+70
Relative humidity		30%~90%	30%~90%
How to Install		Installed with H35-7.5/DIN35 steel mounting rail	
Size(mm)(WxHxL)	W	36	54
	H	90	90
	L	67.6	67.6
Weight (kg)		0.24	0.36



Suntree

SUP4-PV Photovoltaic Surge Protective Device

Visual Status Indication

Remote Signal Contact Available

The Cooper suntree three-module photovoltaic Surge Protective Device (SPD) (with three-step DC switching device) features visual indication and optional remote contact signaling (floating changeover contact) for use in PV systems. These complete surge protective devices are suitable for all PV systems in accordance with IEC 60364-7-712. Includes a five year limited warranty.

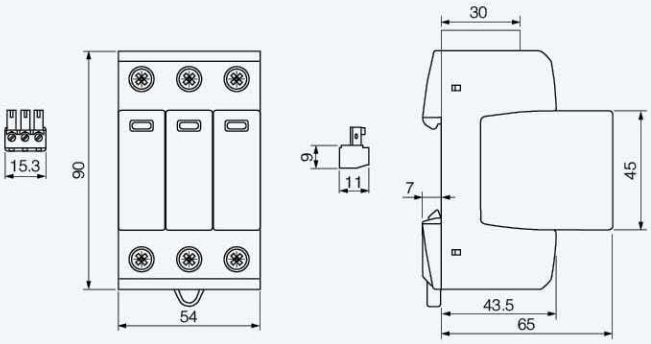
These prewired solutions consist of a base and locking modules that feature a combined disconnection and short-circuiting (shunting) device with safe electrical isolation to prevent fire damage due to DC arcs. An integrated DC fuse allows safe module replacement without arc formation.

In case of insulation faults in the generator circuit, a reliable and tested fault-resistant Y circuit prevents damage to the surge protective devices.

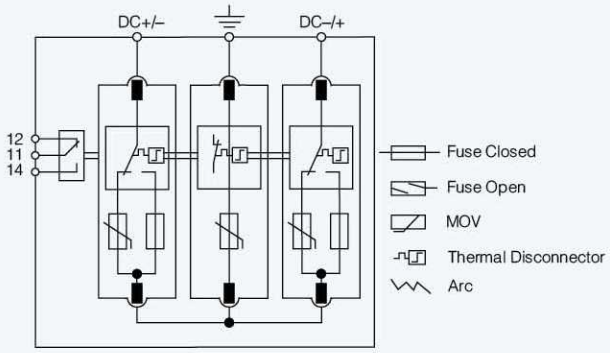
The green and red visual indicator flags show the module protective status (green = good, red = replace). Apart from this visual indication,the remote signaling option features a three terminal floating changeover contact that can be used as a make or break contact depending on the particular monitoring system design employed.

CE TUV ROHS

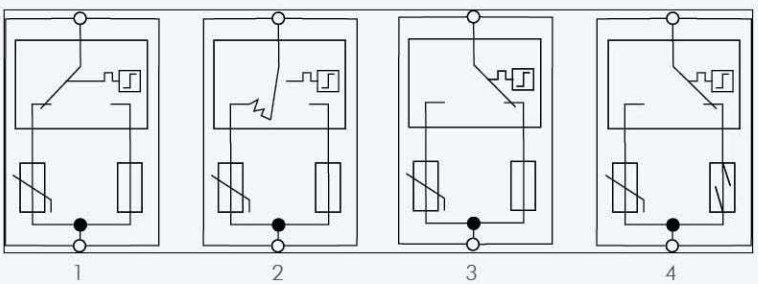
Dimensions(mm)



Module Circuit Diagrams



Short-Circuit Interrupting (SCI) Technology



1. Original State
2. Disconnection Device Response
3. Arc Extinguishes
4. Safe Electrical Isolation

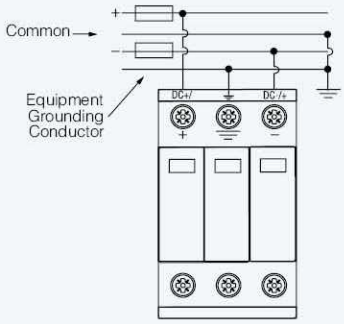
Specifications

Nominal PV System Voltage		600V	1000V	1200V
MCOV [UCPV]		700Vdc	1170Vdc	1200Vdc
Max System Discharge Current (8/20 μs) [Imax]		40kA	40kA	30kA
Voltage Protection Level [UP]		≤2.5kV	≤4.0kV	≤4.5kV
Voltage Protection Level at 5kA [UP]		≤2.0kV	≤3.5kV	≤4.0kV
Integrated Fuse Breaking Capacity/Interrupting Rating		30kA/1000Vdc	30kA/1000Vdc	30kA/1200Vdc
Technology		Short-Circuit Interruption (SCI) Overcurrent Protection		
Operating Temperature Range [TU]		-40°C to +80°C		
Nominal Discharge Current (8/20 μs) [(DC+/DC-) --> PE] [In]		12.5kA		
Response Time [tA]		<25ns		
Operating State/Fault Indication		Green (good)/Red (replace)		
Conductor Ratings and Cross-Sectional Area:	Minimum	60/75°C 1.5mm²/14AWG Solid/Flexible		
	Maximum	60/75°C 35mm²/2AWG Stranded/25mm²/4AWG Flexible		
Mounting		35mm DIN Rail per EN 60715		
Enclosure Material		UL 94V0 Thermoplastic		
Degree of Protection		IP20		
Capacity		3 Modules, DIN 43880		
Standards Information:		IEC 61643-11 Type 2, IEC 61643-1 Class II		
Product Warranty		Five Years**		

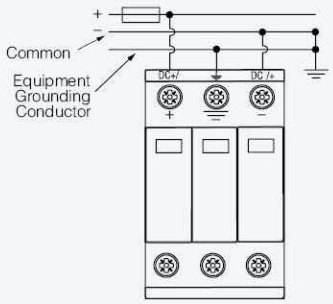
Remote Contact Signaling

Remote Contact Signaling Type	Changeover Contact
AC Switching Capacity (Volts/Amps)	250V/0.1A
DC Switching Capacity (Volts/Amps)	250V/0.1A; 125V/0.2A; 75V/0.5A
Conductor Ratings and Cross-Sectional Area for Remote Contact Signal Terminals	60/75°C Max. 1.5mm²/14AWG Solid/Flexible
Ordering Information	Order from Catalog Numbers Above

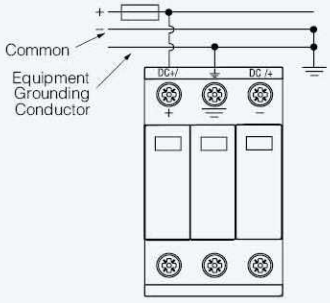
Typical Application Schematics



Application A
Two energized poles/modes
600, 1000 & 1200Vdc systems



Application B
One energized pole/mode
600Vdc & 1000Vdc*** systems only



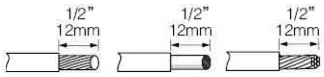
Application C
One energized pole/mode
600Vdc & 1000Vdc*** systems only
(Max. system discharge current
(8/20 μ s) [Imax] 25kA)

* Does not apply to 1200Vdc.

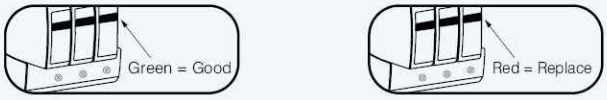
1. Use a suitable electrical insulator to keep a 10mm min. safety distance from the PV-SPD and other grounded parts in the housing.
2. No metal covers are in the area of the module release buttons as shown.

Conductors and Busbars for Use in Photovoltaic Systems

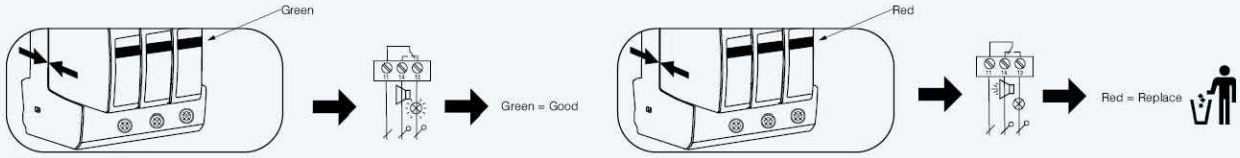
IEC 60364-7-712 (DIN VDE 0100 Part 712)

60/75°C Cu Conductors		
Min. ☐ DC±,DC±, ⏚	1.5mm²/14AWG	
Max. ☐ DC±,DC±, ⏚	25mm²/4AWG	35mm²/2AWG
Busbar	16mm² Cu  ≥15.5mm	

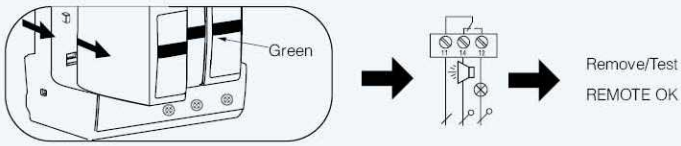
Visual Indication Status



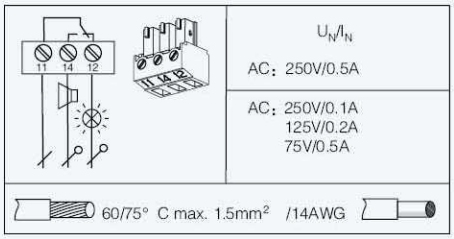
Fault Indication & Remote Contact Signaling (with modules installed)



Testing Remote Contact Signaling (with modules removed)



Remote Contact Signaling



U_N = Nominal Voltage
I_N = Nominal Current
= Audio Alarm/Alert
= PLC / Monitoring System Connection

Protection class IP65, with a waterproof and dustproof and UV
RS485/MODBUS-RTU serial communication

SHLX-PV Junction Box of Lightning Protection

SHLX-PV DC Combiner box

Combiner Box provides a means of combining multiple source circuits from a PV array into a single DC output. Each source circuit is fused separately using a touch-safe fuse holder. The combiner box allows for fail-safe operation of the system in the unlikely event that a problem with a source circuit leads to abnormally high current. In addition, the combiner box provides a convenient means of accessing the DC portion of a PV system for routine maintenance and troubleshooting.

Discription

- The IP66 design is used for outdoor installation
- MC4 compatible input/output connectors for easy installation
- DC fuse for each PV string with fuse links meet PV standard
- DC isolator or DC MCB for isolatation or over-voltage protection with inside operation
- Anti-lighting and surge protector only for PV
- Each channels has 6 sets of input/output connectors
- The enclosure is made by polycarbonate and ABS,anti-UV or Stainless steel material

Specifications

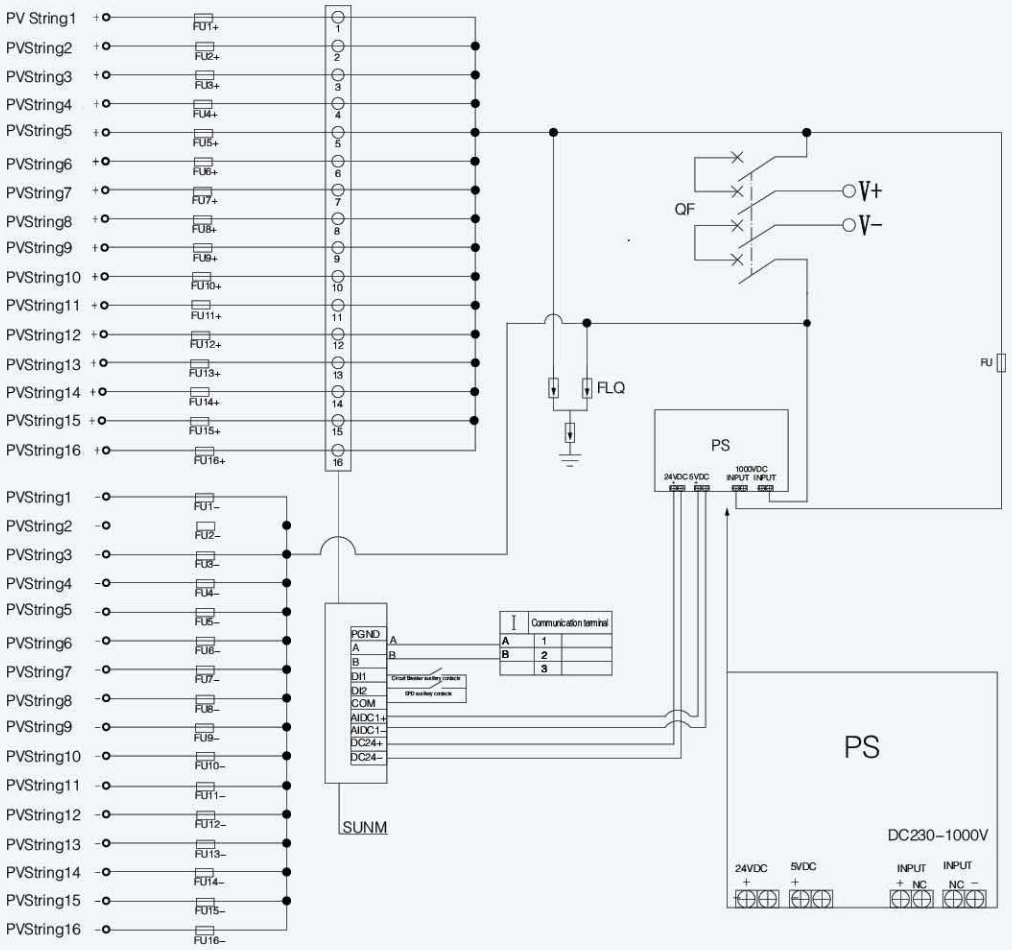
Electric Data		
Type No.	SHLX-PV2	SHLX-PV3
Max.input voltage	1000VDC	
No. of input/output array	2	3
Max.current on each input/output array	10A	
DC fuse rating	20A	
Connector type	MC4	MC4 compitable
Protectoin function		
PV DC isolator switch/mcb	SUNTREE brand: SISO-32	SUNTREE Brand:SISO-32
	International brand optional	
PV DC surge protection device	SUNTREE brand: SUP4-PV	
PV DC fuse	International brand optional	SUNTREE Brand:SRD-PV
	International brand optional	
Parameter		
Protection grade	IP65	
Operating temperature	-25℃～+70℃	
Reletive humidity	0~99%	
Anti-corrosion	anti-corrosion of rain,hail and snow	corrosion of rain, hail and snow
Temperature resistance(Box)	-40℃～120℃	
Poison-free material	conform to Rohs	exclusive of silicon & halogen
Flame retardance	conform to IEC60695-2-11,UL subjiect to 94V-2	
Chemical resistance	prevent 10% of acid,alakli,gasoline and heavy oil	
UV resistance	UV resistance for outdoor installation	
Impact resistance level	degree of resistance to impact IK08: IK08(5 Joule)	

SHLX-PV DC Combiner box

Electric Data		
Type No.	SHLX-PV6	SHLX-PV8
Max.input voltage	1000V DC	
No. of input/output array	3	-
Max.current on each input/output array	10A	
DC fuse rating	20A	
Connector type	MC4 compitable	-
Max. diameter of each input cable(mm)	-	10mm
Max. diameter of each output cable(mm)	-	40mm
Protectoin function		
PV only circuit breaker/switch	SUNTREE Brand:SL7-63	SUNTREE Brand:SM1-250
	International brand optioal	
PV only surge protection device	SUNTREE Brand:SUP4-PV	
	International brand optioal	
PV only fuse	SUNTREE Brand:SRD-PV	
	International brand optioal	
Parameter		
Protection grade	IP65	
Operating temperature	- 25~+70℃	
Reletive humidity	0~99%	
Anti-corrosion	corrosion of rain, hail and snow	
Temperature resistance(Box)	- 40℃ ~120℃	
Poison-free material	exclusive of silicon & halogen	
Flame retardance	conform to IEC60695-2-11, ULsubject to 94V-2	
Chemical resistance	prevent 10% of acid, alakli, gasoline and heavy oil.	
UV resistance	UV resistance for outdoor installation	
Impact resistance level	Degree of resistance to impact IK08:1K08(5 Joule)	

Electric Data		
Type No.	SHLX-PV10	SHLX-PV16
Max.input voltage	1000V DC	
No. of input/output array	10	16
Max.current on each input/output array	10A	
DC fuse rating	15A	20A
Max. diameter of each input cable(mm)	10mm	
Max. diameter of each output cable(mm)	40mm	
Smart communication		
Communication interface	Rs485 Modbus	
Each circuit current measurement	Default	
Voltage meaurement system	Default	
Switch state upload	Optional	
Surge protector state upload	Optional	
Temperature measurement inside box	Optional	
Alarm	Optional	
Parameter		
Protection grade	IP65	
Operating temperature	- 25℃ ~+70℃	
Reletive humidity	0~99%	
Anti-corrosion	corrosion of rain, hail and snow	
Temperature resistance(Box)	- 40℃ ~120℃	
Poison-free material	exclusive of silicon & halogen	
Flame retardance	conform to IEC60695-2-11, ULsubject to 94V-2	
Chemical resistance	prevent 10% of acid, alakli, gasoline and heavy oil.	
UV resistance	UV resistance for outdoor installation	
Impact resistance level	Degree of resistance to impact IK08:1K08(5 Joule)	

Schematic diagram

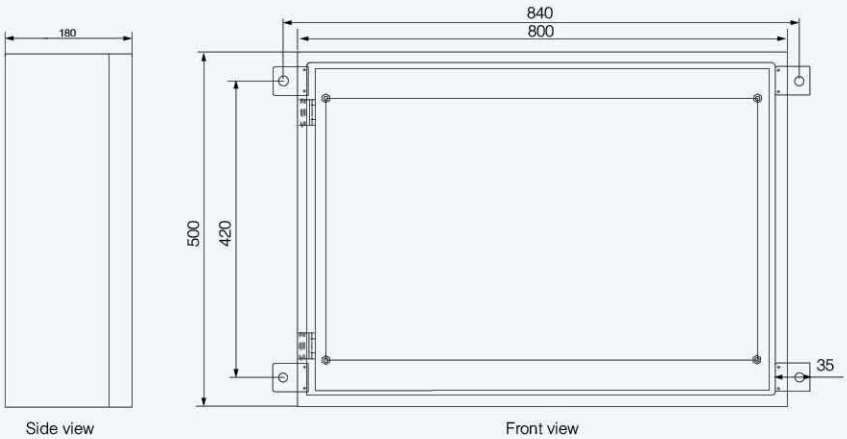


Note:

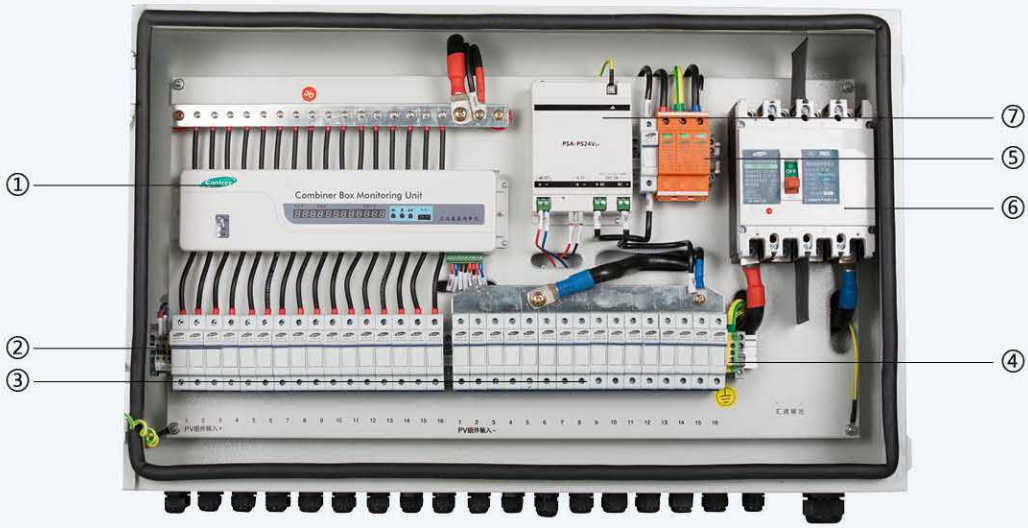
1.Can be customized according to customer requirements

2.Ground wire using a 16−square−yellow cable, grounding resistance cannot be greater than 4 Ohms

Dimensions(mm)



Layout diagram



Combiner box within the picture

① Monitoring unit
② + Input
③ -Output
④ RS485
⑤ SPD
⑥ DC circuit breaker
⑦ Self generating power

SCB56 Series IP66 Waterproof Box

Good sealing performance, protection grade IP66
2,4,8 ways optional

5 YEAR WARRANTY

IP66 Distribution Enclosures

IP66 UV stabilised 4 way and 8 way weatherproof enclosures are avitally important party of any solar installation, if you are using DC circuit breaker as isolation.For this reason we have worked hard to produce a very high quality IP66 4 way and 8 way enclosures.This enclosure meets all the required standards and has thus been classed as IP66.

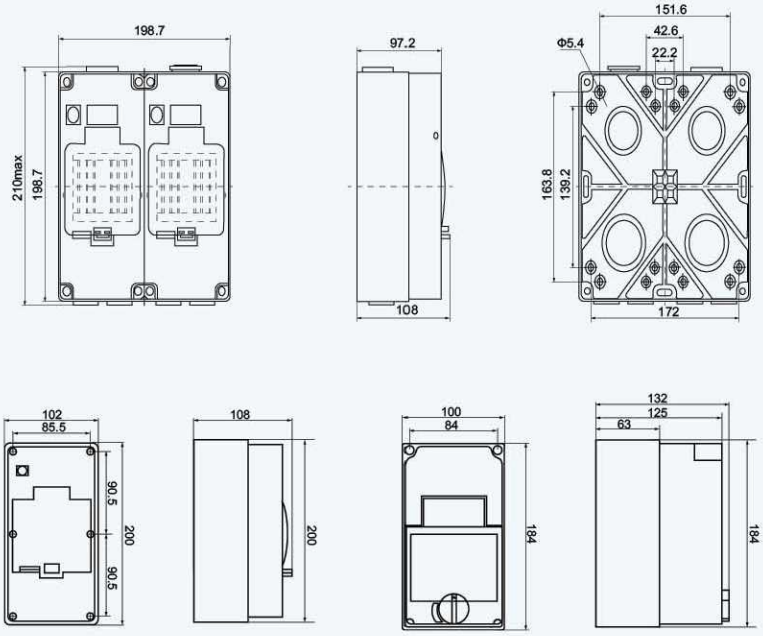
This IP66 4 way and 8 way enclosures are designed to house a range of DIN rail circuit breakers are complete with a storing loaded lockable lid.It also has top ,bottom and rear cable entry.

CE ROHS

Specifications

Catalogue Number	Module Type	No.of Poles	No.of Poles
56CB1N	MCB	1	4
56CB2N	MCB	2	4
56CB3N	MCB	3	4
56CB4N	MCB	4	4
56CB5N	MCB	5	8
56CB6N	MCB	6	8
56CB7N	MCB	7	8
56CB8N	MCB	8	8

Dimensions(mm)



* 8 ways distribution box can be selected from a separate and integral

PV DC Products

Suntree

SMC4 Solar Connector

- Simple on-site processing.
- Acomodates PV cable with different insulation diameters.
- Mating safety provided bykeyed housings.
- Multiple plugging and unplugging cycles .
- High current carrying capacity.
- TUV and UL approved.

CE TÜV ROHS

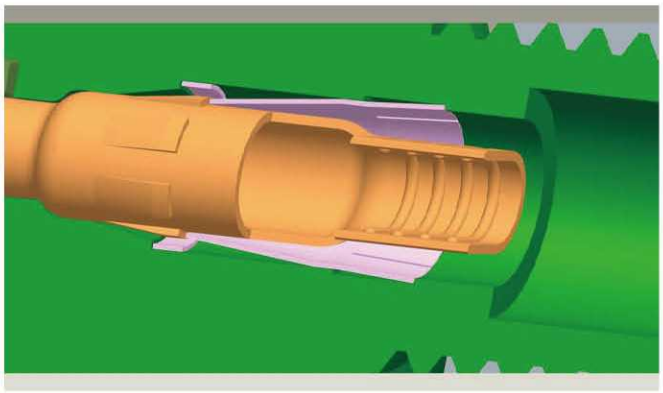
Specifications

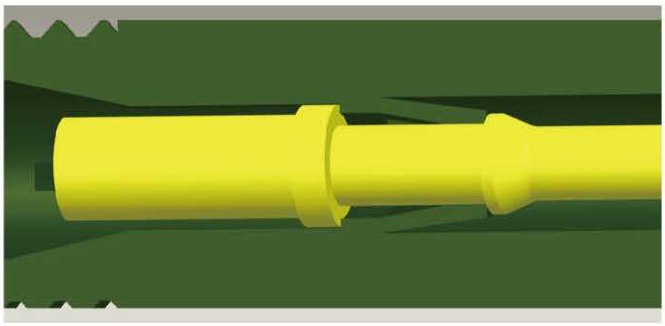
Order NO.	Part P/N		Cable	
	Connector	Terminal	Conductor size (mm²)	Cable OD (ΦDmm)
SMC4-CMMM-14	SMC4-CMMM-H	SMC4-CM-T14	AWG 14(2.5 mm²)	Φ4.5-Φ8.5
SMC4-CMMM-12		SMC4-CM-T12	AWG 12(4.0 mm²)	
SMC4-CMMM-10		SMC4-CM-T10	AWG 10(6.0 mm²)	
Order NO.	Part P/N		Cable	
	Connector	Terminal	Conductor size (mm²)	Cable OD (mm)
SMC4-CFPM-14	SMC4-CFPM-H	SMC4-CF-T14	AWG 14(2.5 mm²)	Φ4.5-Φ8.5
SMC4-CFPM-12		SMC4-CF-T12	AWG 12(4.0 mm²)	
SMC4-CFPM-10		SMC4-CF-T10	AWG 10(6.0 mm²)	

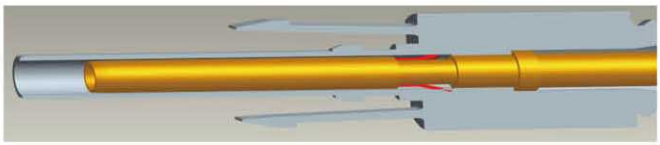
Rated current	30A(2.5-6mm²)
Rated voltage	1000v DC
Test voltage	6000V(50Hz,1min)
Overvoltage type/pollution degree	CAT Ⅲ /2
Contact resistance of plug connector	1mΩ
Contact material	Copper,Tin-plated
Insulation material	PPO
Degree of protection	IP2X/IP67
Flame class	UL94-VO
Safety class	Ⅱ
Suitable cable	OD 4.5-8.5(2.5-6.0 mm²)
Insertion force/withdrawal force	≤50N/≥50N
Connecting system	Crimp connection
Temperature range	-40℃～+125℃

comparation for internal structure

Connectors of other companies







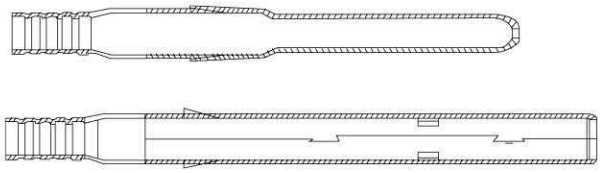
SMC4 Solar Connector

Structure:

Insulator design by forced demoulding Create a slot (red circle marked) to fix spring by forced demoulding. Using spring to position terminal.

Shortcoming:

- Forced demoulding is not very steady It can't ensure any products with same performance.
- Maintain force will change betwween7~20kgf.
- Must assemble spring . It is to be a risk that sometimes operator will miss the spring.



Process: Stamping , Tin plating

Strongpoint:

- Low cost ,high productive capacity.
- It can be continually rivet because of terminal have strip feeder .

Shortcoming

- Material is thin .
- It's easy to deform.
- It will be heat serious in a long time when using
- It need to solder after riveting to reach pull force 31kgf.

Strongpoint:Simple structure

Shortcoming:

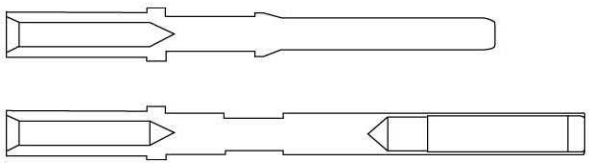
- The thread can't return back when screw open
- Because of first reason , it can't be reuse.
- The screw is easy to get open.

Structure:

Moulding a fixed structure to replace spring (red circle marked) .The fixed structure will be expand when terminal insert into insulator . It will be back to original position when terminal is to correct position and hold to terminal.

Shortcoming:

- All product is with same performance.
- Maintain force is 35kgf Min.
- Cut down the accessories.



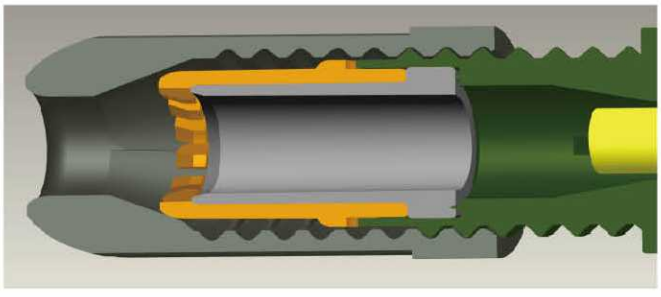
Process: Lathe Machining , Ag plating

Strongpoint:

- High cost ,low productive capacity
- It can't be continually rivet because it's without terminal rail.

Shortcoming

- Material is thin .
- It's easy to deform.
- It will be heat slight in a long time when using.
- Pull force can reach 31kgf after riveting.



Strongpoint:Add a part

Shortcoming:

- The thread can return back when screw open.
- It can be reuse.
- It's with an anti-loosen part ,screw is not easy to get open.

PV DC Products

Suntree

SMC3 Solar Connector

Simple on-site processing.
Accomodate PV cable with different insulation diameters.
Mating safety provided bykeyed housings.
Multiple plugging and unplugging cycles .
High current carrying capacity.
TUV and UL approved.

CE TUV ROHS

Specifications

Order No.	Part P/N		Cable	
	Connector	Terminal	Conductor size (mm²)	Cable OD (ΦDmm)
SMC3-CMMM-14	SMC3-CMMM-H	SMC3-CM-T14	AWG 14(2.5 mm²)	Φ4.5-Φ6.5
SMC3-CMMM-12		SMC3-CM-T12	AWG 12(4.0 mm²)	
SMC3-CMMM-10		SMC3-CM-T10	AWG 10(6.0 mm²)	
Order NO.	Part P/N		Cable	
	Connector	Terminal	Conductor size (mm²)	Cable OD (mm)
SMC3-CFPM-14	SMC3-CFPM-H	SMC3-CF-T14	AWG 14(2.5 mm²)	Φ4.5-Φ6.5
SMC3-CFPM-12		SMC3-CF-T12	AWG 12(4.0 mm²)	
SMC3-CFPM-10		SMC3-CF-T10	AWG 10(6.0 mm²)	

Rated current	30A(2-6mm²)
Rated vollage	1000V DC
Test vollage	6000V(50Hz,1min)
Overvollage type/pollution degree	CAT Ⅲ /2
Contact resistant of plug connector	1mΩ
Contact material	Copper,Tin-plated
Insulation material	PPO
Degree of protection	IP2X/IP67
Flame class	UL94-VO
Safety class	Ⅱ
Suitable cable	OD 4.5-6.5(2.5-6.0 mm²)
Insertion force/withdrawal force	≤50N/≥50N
Connecting system	Crimp connection
Temperature range	-40℃ ~+90℃

PV DC Products

Suntree

Twins core PV Cable

- Dual wall Insulation,electron beam cross-linked
- Excellent resistance to UV,water,ozone,fluids,salt,general weathering
- Excellent resistance to abrasion
- Halogen free,flame retardant,low toxicity
- Excellent flexibility and stripping performance
- High current carrying capacity
- TUV and UL approved

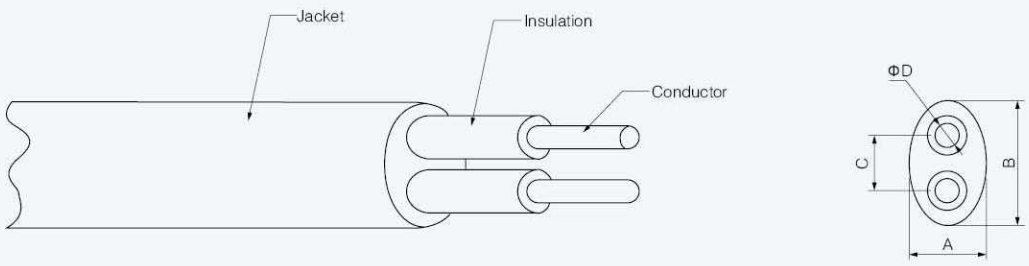
CE TUV ROHS

Specifications

Type	Cross section	Strand design	Conductor diameter	Conductor resistance	Outer diameter A×B	Rated voltage	Rated current
	mm²	No.×Φ(mm)	mm	Ω/km	mm	V AC/DC	A
PV-2x1.5 mm²	1.5	30×Φ0.25	1.6	13.9	5.80×9.30	1000/1800	20
PV-2x2.5 mm²	2.5	50×Φ0.25	2.0	8.06	6.20×9.90	1000/1800	30
PV-2x4.0 mm²	4.0	56×Φ0.3	2.6	4.97	6.9×11.30	1000/1800	50

Wire	Class 5,tinned
Insulation material	XLPE
Double insulated	
Halogen-free	
High resistance against oils,greases,oxygen and ozone	
Microbe-resistant	
UV resistant	
High wear and abrasion resistance	
Flam test according to	DIN EN 50265-2-1 UL1571(VW-1)
Smallest permissible bending radius	5XD
Temperature range	-40℃ ~ +90℃
Colours	Black/red

Dimensions(mm)



PV DC Products

Suntree

Single core PV Cable

- Dual wall Insulation,electron beam cross-linked
- Excellent resistance to UV,water,ozone,fluids,salt,general weathering
- Excellent resistance to abrasion
- Halogen free,flame retardant,low toxicity
- Excellent flexibility and stripping performance
- High current carrying capacity
- TUV and UL approved

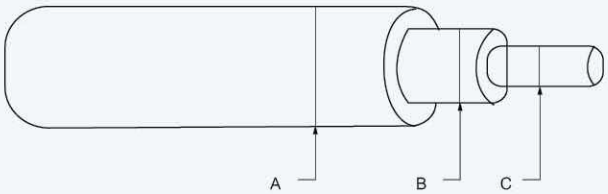
CE TÜV ROHS

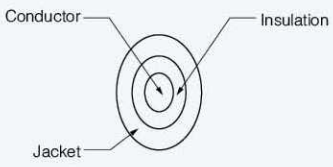
Specifications

Type	Cross section	Strand design	Conductor diameter	Conductor resistance	Outer diameter AxB	Rated voltage	Rated current
	mm²	No.×Φ(mm)	mm	Ω/km	mm	V AC/DC	A
PV-1x1.5 mm²	1.5	30×Φ0.25	1.6	13.9	4.5	1000/1800	20
PV-1x2.5 mm²	2.5	50×Φ0.25	2.0	8.06	5.3	1000/1800	30
PV-1x4.0 mm²	4.0	56×Φ0.3	2.6	4.97	6.4	1000/1800	50
PV-1x6.0 mm²	6.0	84×Φ0.3	3.3	3.52	7.2	1000/1800	70
PV-1x10.0 mm²	10.0	200×Φ0.25	4.4	2.12	8.3	1000/1800	95
PV-1x16.0 mm²	16.0	224×Φ0.3	5.2	1.95	9.5	1000/1800	140

Wire	Class 5,tinned
Insulation material	XLPE
Double insulated	
Halogen-free	
High resistance against oils,greases,oxygen and ozone	
Microbe-resistant	
UV resistant	
High wear and abrasion resistance	
Flam test according to	DIN EN 50265-2-1 UL1571(VW-1)
Smallest permissible bending radius	5XD
Temperature range	-40℃~ +90℃
Colours	Black/red

Dimensions(mm)





SMC3Y/SMC4Y Solar Connector

PV Branch

Plug SMC3Y/SMC4Y-2M1F

Socket SMC3Y/SMC4Y-2F1M

Specifications

Type And meaning·	
Rated current	30A
Rated voltage	1000V DC
Test voltage	6000V(50Hz,1min)
Overvoltage Category/pollution degree	CAT Ⅲ /2
Contact resistance of plug connector	1mΩ
Contact material	Copper,Tin-plated
Insulation material	PA/PRO
Degree of protection	IP2*/IP65
Flame class	UL94-VO
Safety class	Ⅱ
Insertion force	≤50N
withdrawal force	≥50N
Temperature range	-40℃ ~+110℃

CE ROHS

PV Cable Assembly

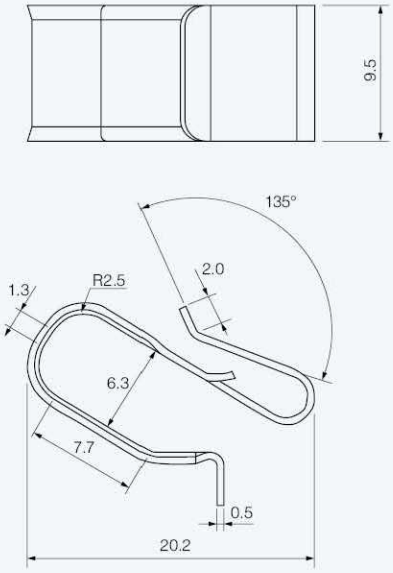
Examples of cable assemblies

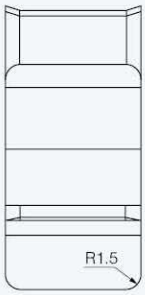
- Can be customized according to customer requirements

SMC3 TO SMC4

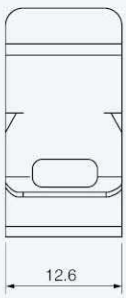
Panel Connector Series

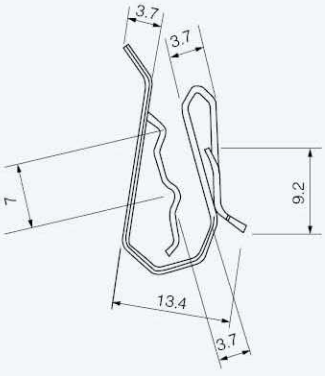
Cable Clips

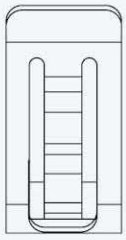


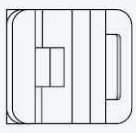


2 × 4mm²



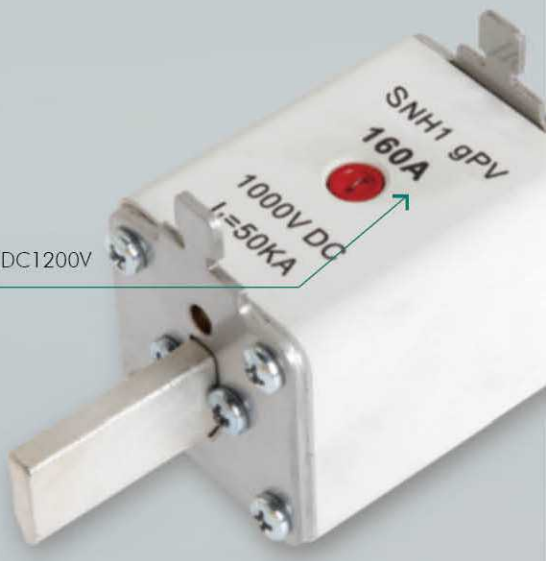






PV DC Fuse

DC Fuse mainly used in DC combiner box in solar PV systems. When PV panel or inverter causes overload or short circuit, it trip off immediately, to protect PV panels. DC fuse also used to protect other electrical parts in DC circuit, when overload or short circuit.



Maximum current 400A maximum voltage DC1200V

Nylon shell, resistant to high temperatures

Suntree

SRD-10gPV 1A-20A Photovoltaic Fuse

Standard:IEC 60269-6,GB/T 13539.6

Interrupting Capacity

30,000 amperes at 1000V DC (Time Constant: 1-3ms)

CE TÜV ROHS

Specifications

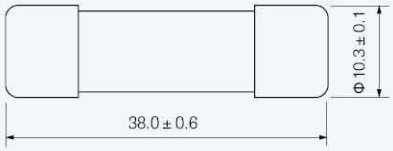
Catalog No.	Current Rating	Safety Approvals
		TUV
10gPV1U0	1A	●
10gPV2U0	2A	●
10gPV3U0	3A	●
10gPV3.5U0	3.5A	●
10gPV4U0	4A	●
10gPV5U0	5A	●
10gPV6U0	6A	●
10gPV8U0	8A	●
10gPV10U0	10A	●
10gPV12U0	12A	●
10gPV15U0	15A	●
10gPV16U0	16A	●
10gPV20U0	20A	●

U0 Denotes For 1000V DC:
● Denotes For Approval ○ Denotes For Pending

Electrical Characteristics

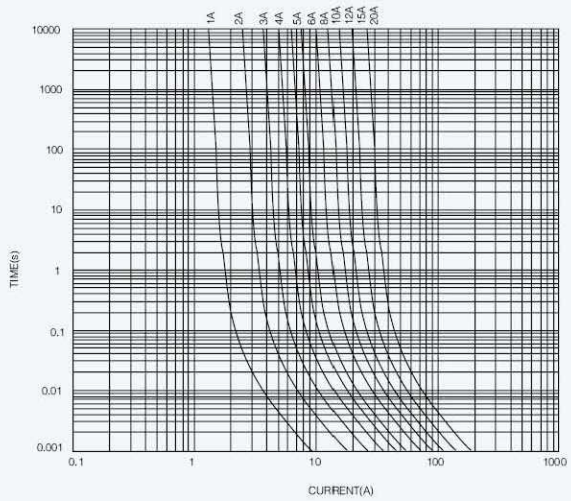
% of Current Rating	Blowing Time
113%	1 hour Min.
145%	1 hour Max.

Dimensions



SRD-10gPV

Average I-T Characteristics Curve
(For Reference Only)



SRD-10LgPV 1A-30A Photovoltaic Fuse

Standard:IEC 60269-6,GB/T 13539.6

Interrupting Capacity (Time Constant:1-3ms)

20,000 amperes at 1500V DC (1A-10A)
20,000 amperes at 1250V DC (12A-20A)
20,000 amperes at 1000V DC (25A-30A)

CE TUV ROHS

Specifications

Catalog No.	Current Rating	Safety Approvals	
		CGC	TUV
10LgPV1U15	1A	○	○
10LgPV2U15	2A	○	○
10LgPV3U15	3A	○	○
10LgPV4U15	4A	○	○
10LgPV5U15	5A	○	●
10LgPV6U15	6A	○	●
10LgPV8U15	8A	○	●
10LgPV10U15	10A	●	●
10LgPV12U15	12A	○	○
10LgPV15U15	15A	●	○
10LgPV16U15	16A	○	○
10LgPV20U15	20A	○	○
10LgPV25U0	25A	○	○
10LgPV30U0	30A	○	○

U15 Denotes For 1500V DC
U12 Denotes For 1250V DC
U0 Denotes For 1000V DC

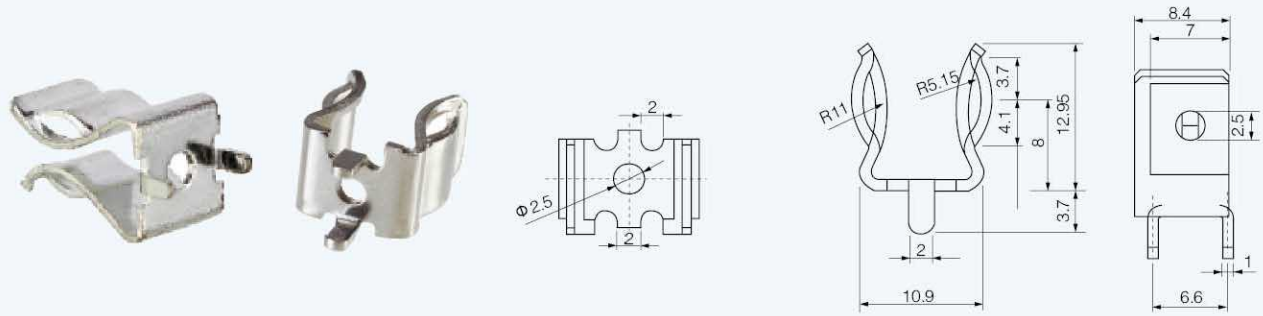
● Denotes For Approval
○ Denotes For Pending

Electrical Characteristics

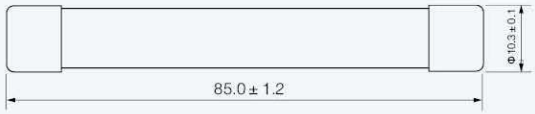
% of Current Rating	Blowing Time
113%	1 Hour Min.
145%	1 Hour Max.

Recommended fuse-base for 10mm×85mm fuses

See Model of product: SHF-103D SHF-104A

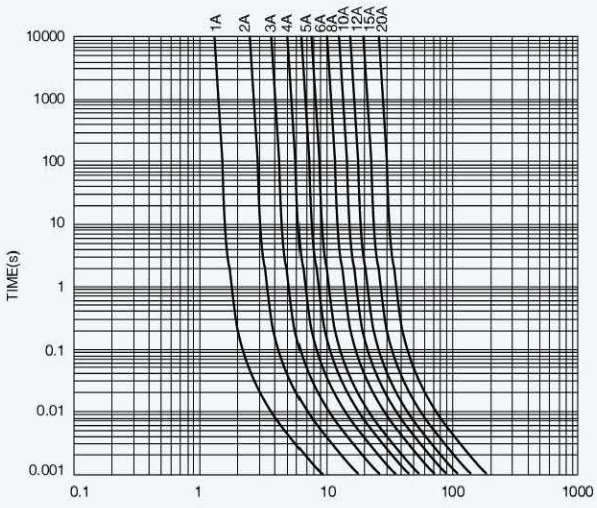


Dimensions(mm)



SRD-10LgPV

Average I-T Characteristics Curve(For Reference Only)



SNH1gPV 1000V DC 32A-160A Photovoltaic Fuse

Standard:IEC 60269-6,GB/T 13539.6

Interrupting Capacity

50,000 amperes at 1000V DC (Time Constant: 1-3 ms)

SNH1B

Recommended fuse-base for NH1 fuse

See Model of product: NH1B

CE TÜV ROHS

Specifications

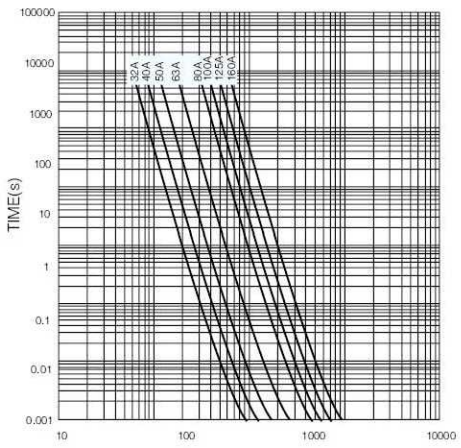
Catalog No.	Current Rating	Safety APprovals
		TUV
SNH1gPV32U0	32A	○
SNH1gPV40U0	40A	○
SNH1gPV50U0	50A	○
SNH1gPV63U0	63A	○
SNH1gPV80U0	80A	○
SNH1gPV100U0	100A	○
SNH1gPV125U0	125A	○
SNH1gPV160U0	160A	○

U0 Denotes For 1000V DC

● Denotes For Approval ○ Denotes For Pending

SNH1gPV

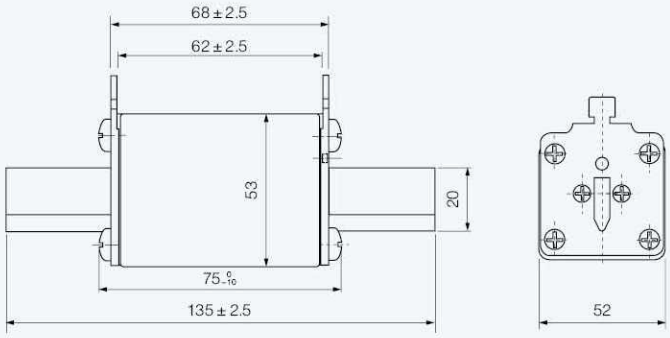
Average I-T Characteristics Curve(For Reference Only)



Electrical Characteristics

Rating	Blowing Time	
	1.13In	1.45In
In≤60	1 hour Min.	1 hour Max.
63 < In≤160	2 hour Min.	2 hour Max.

Dimensions(mm)



SNH2XLg PV 1100V DC 125A-400A Photovoltaic Fuse

Standard:IEC 60269-6,GB/T 13539.6

Interrupting Capacity

30,000 Amperes At 1100V DC(Time Constant: 1-3ms)

CE TÜV ROHS

Specifications

Catalog No.	Current Rating	Safety Approvals	
		CGC	TUV
2XLgPV125U11A/B	125A	●	●
2XLgPV160U11A/B	160A	●	●
2XLgPV200U11A/B	200A	●	●
2XLgPV250U11A/B	250A	●	●
2XLgPV315U11A/B	315A	●	●
2XLgPV350U11A/B	350A	●	●
2XLgPV400U11A/B	400A	●	●

U11 Denotes For 1100V

● Denotes For Approval ○ Denotes For Pending

Electrical Characteristics

Rating	Conventional TIME(H)	Conventional Current	
		Conventional Non-Fusing Current(A)	Conventional Fusing Current(A)
In≤60	2	1.13In	1.45In
160<In≤400	3		

SNH2XLB

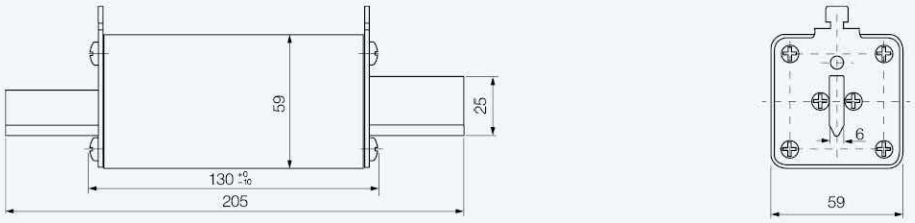
Recommended fuse-base for NH2XL fuse

See Model of product: NH2XLB NH3LB

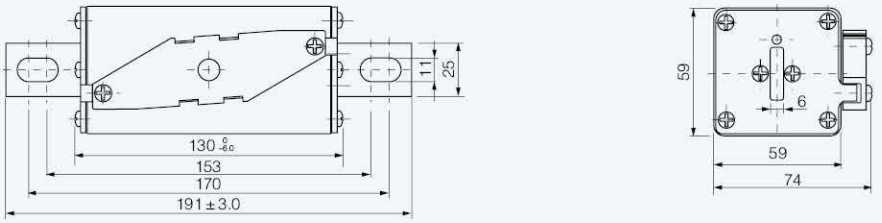
CE TÜV ROHS

Dimensions(mm)

Part No.:SNH2XLgPV (amp rating) U11A

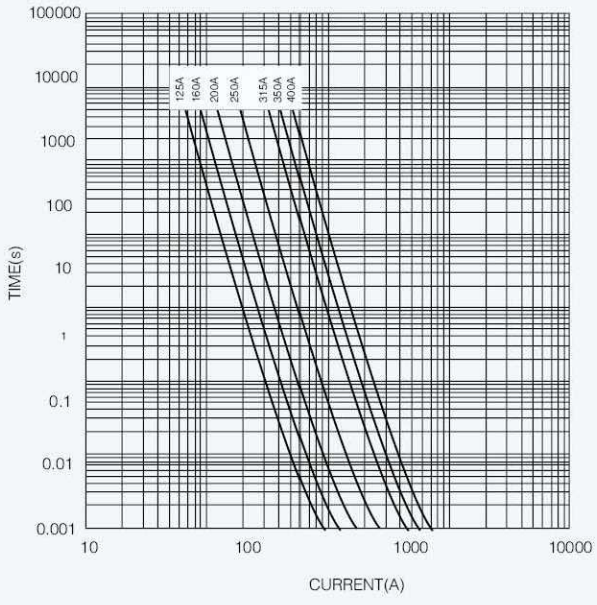


Part No.:SNH2XLgPV (amp rating) U11B



SNH2XLg PV 1100V

Average I-T Characteristics Curve(For Reference Only)



Suntree

Fuse-base with Blade Contacts

SNH00B

SNH1/2/3B

SNH1/2XLB,NH3LB

CE TÜV ROHS

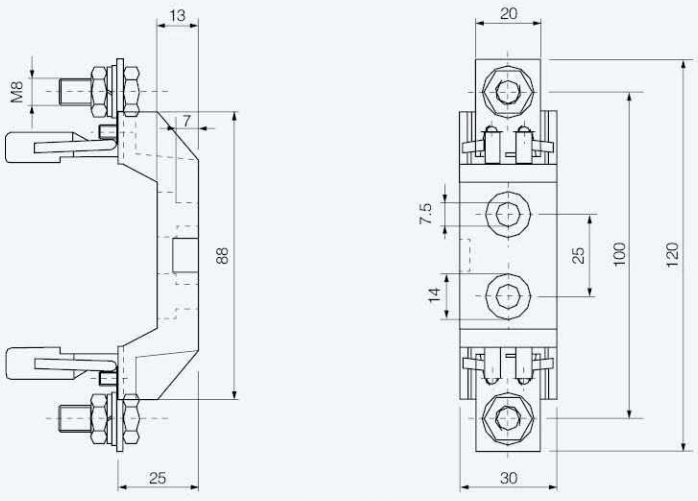
Specifications

Model of product	Applicable fuse link size	Rated voltage	Rated current	Safety Approvals
SNH00B	SNH000/NH00	690	160	CCC
		1000	160	

Model of product	Applicable fuse link size	Rated voltage	Rated current	Safety Approvals
SNH1B	SNH01	690	250	CCC
		1000	250	
SNH2B	SNH02	690	400	
SNH3B	SNH03	690	630	

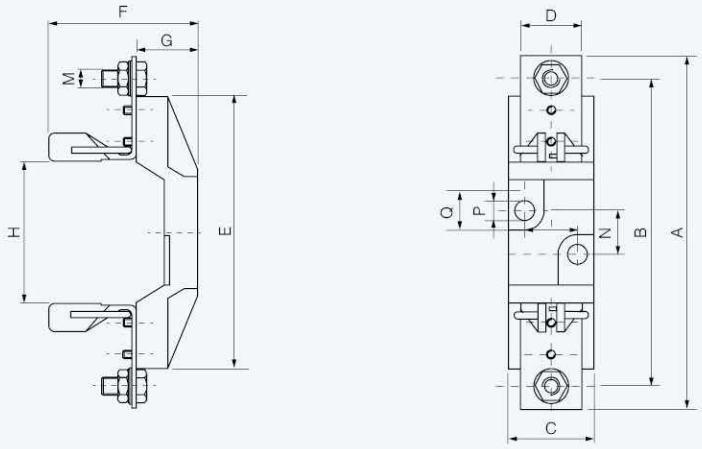
Model of product	Applicable fuse link size	Rated voltage	Rated current	Safety Approvals
SNH1XLB	SNH1XL	1000	250	
SNH2XLB	SNH2XL	1000	400	
SNH3LB	SNH2XL/NH3L	1000	400	TUV
SNH3LB	SNH2XL/NH3L	1000	630	

Dimensions(mm)



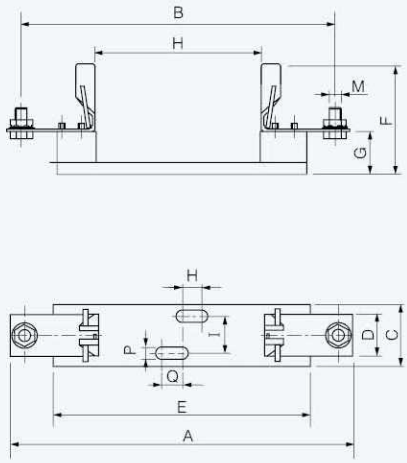
SNH00B

Dimensions(mm)



SNH1/2/3B

Size	A	B	C	D	E	F	G	H	I	M	N	P	Q
SNH1	200	175	60	35	155	85	35	80	30	M10	25	10.5	20.5
SNH2	225	200	60	35	155	90	35	80	30	M10	25	10.5	20.5
SNH3	240	210	60	35	155	100	35	80	30	M10	25	10.5	20.5



SNH1/2XLB,SNH3LB

Size	A	B	C	D	E	F	G	H	I	M	N	P	Q
SNH1XL	200	175	60	35	155	85	35	80	30	M10	25	10.5	20.5
SNH2XL	225	200	60	35	155	90	35	80	30	M10	25	10.5	20.5
SNH3XL	240	210	60	35	155	100	35	80	30	M10	25	10.5	20.5

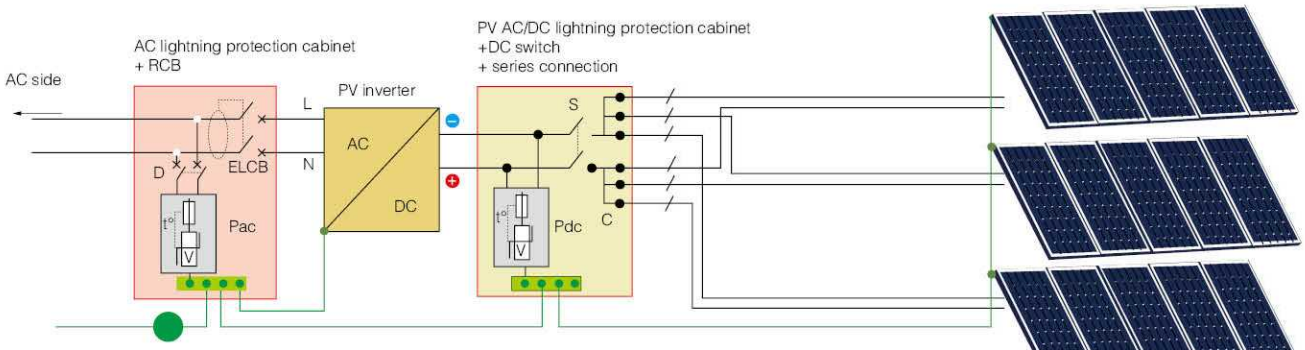
PV lightning protection cabinet

Various lightning protection cabinets with all kinds of functions launched only by Suntree involve surge protection, over-current protection, connection, switching and many other devices. Design of these lightning protection cabinets are fully in accordance with the standard CLC/TS 50539-12. The products are widely used on AC and DC sides of PV inverters. Custom made according to your requirements is available.

PV lightning protection cabinet

Distributed substation used lightning protection cabinet

Various lightning protection cabinets with all kinds of functions launched only by Suntree involve surge protection, over-current protection, connection, switching and many other devices. Design of these lightning protection cabinets are fully in accordance with the standard CLC/TS 50539-12. The products are widely used on AC and DC sides of PV inverters. Custom made according to your requirements is available.



Pac:Type 2 Single-phase surge protection device
D: SPD External disconnector (circuit breaker)
ELCB: earth leakage circuit breaker 25A, 30mA

Pad: Type 2 PV surge protection device
S: DC switch
C: terminal block

SPV240 Series
AC lightning protection cabinet

Model	SPV240-230-XXX-DDR
Power grid voltage Un	230V single-phase
Max current	16A-25A-32A
Circuit connection (input/output)	6mm^2 max

Safety	
Thermal disconnector	Built-in
Visible disconnecting index	Lightning protection indicator
Surge protection	Surge protection device
Over-current protection	Circuit breaker (16 or 32A)
Protect against indirect contact	Differential circuit breaker 30mA
Type2 Surge protection device	SUP2-230/G
Max continuous working voltage Uc	255VAC
Nominal discharge current In	20kA
Max discharge current Imax	40kA
Voltage protection level (common mode/differential mode) Up	1,5/1,25kV

Structural parameters	
Shell material	UL90-Vo
Waterproof grade	IP55

Distributed substation used lightning protection cabinet

SPV50-XXX-XXA-XST Series
DC lightning protection cabinet

Model		SPV50-500-40A-3ST	SPV50-600-40A-3ST	SPV50-800-40A-3ST
Array string number		3	3	3
Max PV voltage	Uocstc	500VDC	600VDC	800VDC
Max PV current	Imppstc	25A	25A	25A
Circuit connection (input/output)		Terminal 6,5/10mm^2	Terminal 6,5/10mm^2	Terminal 6,5/10mm^2
DC switch		Yes	Yes	Yes
Fuse wire protection of branch circuit		Optional	Optional	Optional

Type2 Surge protection device		SUP2-PV500/51	SUP4-PV800/51	SUP4-PV1000/51
Max PV voltage	Ucpv	600VDC	720VDC	960VDC
Nominal discharge current	In	15kA	15kA	15kA
Max discharge current	Imax	40kA	40kA	40kA
Voltage protection level	Up	2,2kV	2,8kV	2/3,6kV

Structural parameters	
Shell material	ABS PC
Ingress protection	IP65

SPV240-50 Series
AC/DC lightning protection cabinet

Model	SPV240-50-230-XX-DDR	
Power grid type	AC single-phase grid	2-string-DC grid
Working voltage Un/Uocstc	230V single-phase	600VDC
Max current	16A-25A-32A	25A
Connection mode	Max 6mm^2 screw terminal connection	Max 6mm^{2}MC interface connection

Type2 Surge protection device		SUP2-230/G	SUP4-600/51
Max continuous working voltage	Uc	255Vac	720Vdc
Nominal discharge current	In	20kA	15kA
Max discharge current	Imax	40kA	40kA
Protection level	Up	1,5/1,25kV	2,8kV

Structural parameters	
Shell material	UL90-Vo
Ingress protection	IP55

SMP208 Series DC Power Meter

SMP208 series power meter can be used for monitoring and controlling in DC systems. These meters can measure a wide range of parameters such as voltage, current, power and energy. It supports bi-directional current measurement, digital inputs for switch monitoring and relay outputs for remote controlling as well as an over-range alarming feature for voltage and current. Large signals, such as voltage and current can be converted to smaller signal using analog output. All data in the meter is accessible via RS485 using open Modbus RTU protocol. The large 3 line LCD display also provides easy to read real-time data directly on the meter front.

CE ROHS

Applications

- DC Energy Management Systems
- Power Distribution for Telecommunication Room
- Solar Photovoltaic Systems
- Industrial DC Control Systems
- Metallurgy and Electroplating Industries
- Wind Power Generation
- DC Excitation Systems
- Light Rail Transit Systems

Features

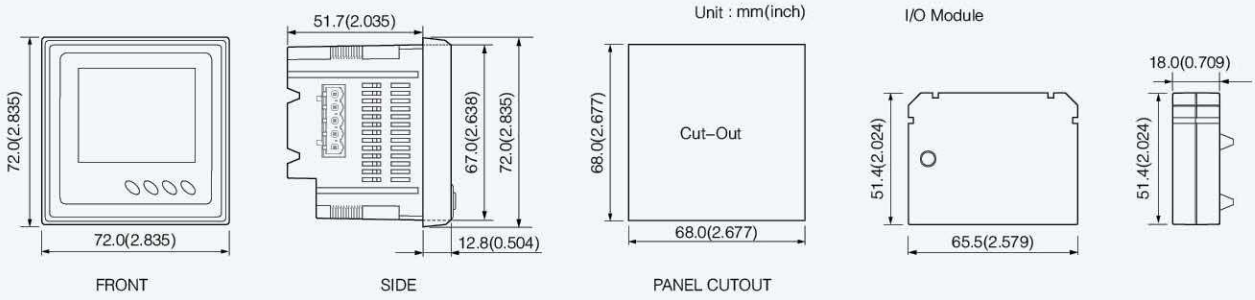
- DC power system metering
- Monitor and control power switches
- Alarming and analog output
- Standard 72x72mm, allows for drawer type panel installation
- Three line high-definition LCD display
- Accessible with SCADA, PLC systems
- Easy installation, simple wiring

Dimensions(mm)

Function			SMP2081	SMP2082	SMP2083
Metering	Voltage	V	●		●
	Current	I		●	●
	Power	P			●
	Energy	E			●
I/O	2DI+2AO		⊙	⊙	⊙
	2DI+2RO		⊙	⊙	⊙
	2DI+2DO		⊙	⊙	⊙
Communication Display	RS485 , Modbus RTU		⊙	⊙	⊙
Dimensions	LCD		●	●	●
Dimensions			72×72×64.5mm (Cutout: 68x68 mm) 2.835×2.835×2.539 inch (Cutout: 2.677×2.677 inch)		

Note: ● Standard; ⊙ Standard; Optional Blank: Not Available

Dimensions(mm)



Technical Specifications

Rated Voltage	Accuracy	Resolution	Range
IP Rating	0.2%	0.001V	0~1200V
Connection Type	0.2%	0.005A	0~±50000A
Rated Current	0.5%	0.001KW	0~±60000kW
Working Temperature	0.5%	0.01kWh	0~9999999.99kWh
Drift withTemperature	<100ppm/°C		
Standard	0.5‰/year		

Voltage	
Input Range	
Voltage	Direct Input0~1000V; Via Hall Effect Sensor0~1200V
Input Impedence	2MΩ
Load	<0.6W
Accuracy	0.2%
Current	
Input Range	0~±20A(Direct Input, pick up current 0.02A) 0~±50000A(Via Shunt or Hall Effect Sensor,programmable range)
Shunt	50~100mV(programmable)
Hall Effect Sensor	0~±5V/0-±4V, 4~20mA/12mA±8mA
Power Consumption	2W(Max)
Accuracy	0.2%
Digital Input	
Type	Dry Contact
Isolation Voltage	2500Vac

Environment	
Operation Temperature	-25°C ~ +70°C
Storage Temperature	-40°C ~ +85°C
Humidity	5%~95%Non-condensing

Technical Specifications

Output	
Relay Output (RO)	
Type	Mechanical contact, Form A
Max Load Voltage	250Vac/30Vdc
Max Load Current	3A
On Resistance	100mΩ (Max)
Isolation Voltage	4000Vac
Mechanical Life	5×10^6 times
Digital Output (Photo-Mos)	
Load Voltage Range	0~250Vac/dc
Load Current	100mA(Max)
Max Output Frequency	25Hz, 50% duty cycle
Isolation Voltage	2500Vac
Analog Output (AO)	
Range	4-20mA/0~20mA; 0~5V/1-5V
Accuracy	0.5%
Load Capacity	Current type, max load resistance: 750 Ohm Voltage type, max load current: 20 mA

Communication	
Type	RS485, half duplex, Optical Isolated
Protocol	Modbus-RTU
Baud rate	1200~38400bps
Isolation Voltage	2500Vac

Power Supply	
Input	(P1)100-240Vac, 50/60Hz, 100-300Vdc
	(P2) 20-60Vdc
Consumption	3W (typical value)

Installation	
72×72 mm	Panel mounted

PV DC Products

Suntree

Portable Solar power supply system

Photovoltaics (PV) - a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. Photovoltaic power generation employs solar panels composed of a number of solar cells containing a photovoltaic material.

Solar power is the solution for both disaster preparedness and for reducing the threats of climate change far into the future. And even small solar can make a large difference for a brighter tomorrow.

Up to 15% of electricity in an American home is consumed by electronic devices, from televisions and computers to constantly charging one's cell phone. A portable solar generator with regular daily use can result in a 15% reduction in one's electric bill.

Looking at the table, the total yearly consumption of electronic devices is 516 Kilowatt hours.

Average Home Yearly Consumption

Device	Kilowatt Hours
Desktop Computer	255
Laptop Computer	83
LCD TV (<40")	77
Power Tool	37
Hand-Held Vacuum	29
Cordless Phone	26
MP3 Player	6
Cell Phone	3
Source	ACEEE

Let's compare that number.

A coal fired plant at 40% efficiency uses about 700 pounds of coal to power a 100 watt light bulb for one year.

100 Watts x 10 = 1 Kilowatt

700 pounds x 10 = 7,000 pounds

7,000 pounds x 516 Kilowatts = 3,612,000 lbs

3,612,000 lbs = 1,806 tons of coal

The average American homeowner uses 1,806 tons of coal per year to power just the electronic devices listed. That's a lot of coal. It's also a lot of pollution contributing to global warming.

A ton of coal pollutes about 2.5 tons of carbon dioxide or more, depending on the grade of the coal.

1,806 x 2.5 = 4,514 tons of CO2 released into the atmosphere every year.

Now multiply that by millions upon millions of homes. All this, just for some electronic devices.

There's a better way to produce this energy. Portable solar generators can power our most used electronic devices. It reduces the electric bill, lowers air pollution, and slows climate change. It prevents storms from becoming much, much worse. And when the storms do come, we're ready.

And it's not about preparing for "doomsday." It's about preparing for a solar powered world. We have the technology. Let's build and use it.

Electricity Basics

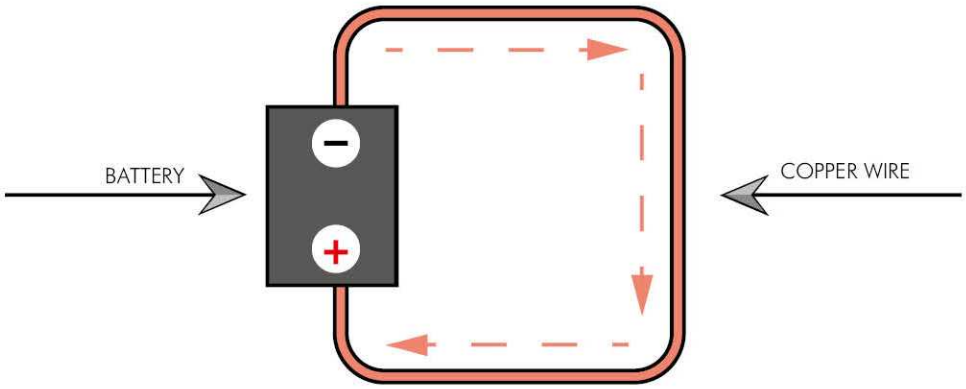


FIG1:Flow of Electrons

Ohm's Law

Voltage is the difference in electrical charge between two points. There must be more electrons at one point and fewer at the other point to maintain voltage.

Electrons carry a negative charge. When a wire is connected between the two points, electrons flow from the negative to the positive terminal.

Remember that Current is the electron flow in a conductor, such as copper wire.

Insulators are used to safely contain electricity. Plastic is an insulator, because it has high resistance to electron movement.

Resistance is measured in Ohms. The relationship between voltage, current and resistance is explained by Ohm's law.

OHM'S LAW: E = I x R

E = Voltage

I = Amps

R = Ohms

If the value of any two is known, then the third can be calculated.

To make it easier to remember these relationships, one can use Ohm's Triangle:

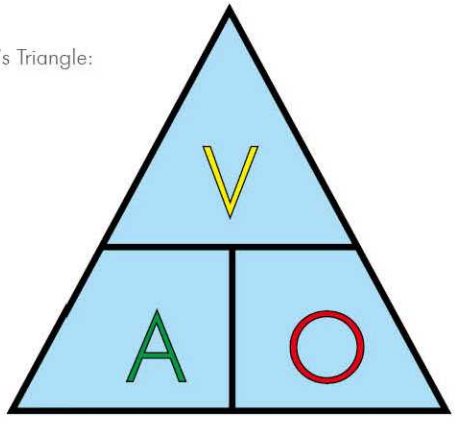


FIG1:Ohm's Triangle

E is the electromotive force (potential difference) which is moving electrons through the wire. It's measured in Volts.

I is the intensity of electron flow (current) moving through the wire. It's measured in Amps.

R is resistance of electron flow in the wire. It's measured in Ohms. Using Ohm's Law:

1) Current is directly proportional to voltage. If voltage goes up, so does current. Or if voltage goes down, so does current.

2) Current is inversely proportional to resistance. If resistance increases, then current decreases. And if resistance decreases, then current increases.

By covering the V, the triangle shows:Voltage = Amps x Ohms

By covering the A, the triangle shows:Amps = Volts / Ohms

By covering the O, the triangle shows:Ohms = Volts / Amps

Loads

A copper wire can be thought of as a pipe which electrons flow through.
In the same way, a battery can be thought of as a tank with a pump. It maintains a constant voltage (or "pump pressure") no matter if current is flowing or not.
A load is a main circuit resistance. It can be thought of as a valve.

FYI

Conventional current flow is shown from positive to negative because Ben Franklin thought current flowed this way.
Electrons actually move from negative to positive.

When electrons move through this "valve," voltage is lost because of the resistance of the load. Figure 3 shows all the voltage is lost to the load.

This is known as a voltage drop. It's where the resistance of a load in a circuit causes a voltage loss equal to the source voltage.

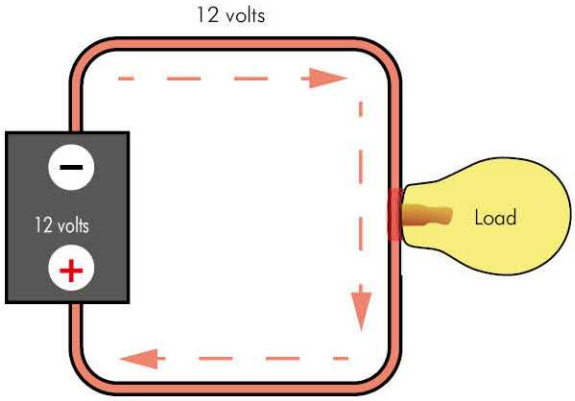


FIG3:Voltage Drop

Power

Power is the rate of energy conversion.
For practical purposes, the rate at which an electrical charge is produced or consumed can be found two ways.
One way is to determine Amp hours (Ah), and the other way is to determine Watt hours (Wh). We'll explore each.

Amp Hours

To find Amp hours, multiply Amps by hours. The storage capacity of a deep cycle battery is expressed in Amp hours. For most batteries, the standard means to compare this capacity is by using a 20 hour rate.

Looking at Figure 4, the battery's capacity is 100 Amp hours. A battery's capacity decreases as the load increases. This battery can maintain a 5 amp load for 20 hours before being completely discharged.

Tip: Never discharge a battery more than 50%, as it shortens the life of the battery.
The light bulb has a resistance of 6 Ohms. It consumes 2 amps of power. Over 20 hours, the load will consume 40 Amp hours of power.
The battery shouldn't be discharged more than half its capacity. The light bulb consumes less than 50 Ah.
In general, it's a safe load for the battery on this circuit.

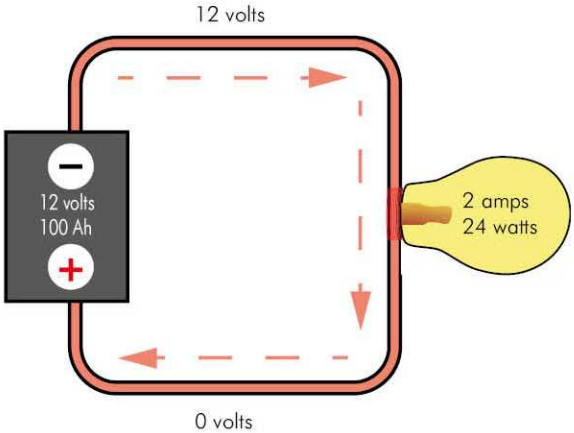


FIG4:Amp Hours

Watt Hours

To find watts, multiply volts by amps. Looking at Figure 4, we can find the wattage of the light bulb: 12 Volts x 2 Amps = 24 Watts.
To determine watt hours, multiply watts by hours: 24 Watts x 20 Hours = 480 Watt hours.

A more common unit is kilowatt hours, which is 1000 watts multiplied by time. Utility companies use kilowatt hours to determine what to charge customers on their electric bill. If the light bulb is on almost 42 hours, then it consumes 1 Kwh.

Which one to Use ?

In general, which measure to use is determined by the application and the load size.
For example, most electronic circuits use milliamps (thousandths of an amp). The electronic circuits in your smart phone use milliamps.
Individual appliances, from coffee makers and vacuum cleaners to refrigerators and televisions, use amps.

Kilowatts are used as an easier means to compare the consumption of combined appliance loads. It's used by electric utilities to help them better match their production and obtain a standard price rate.

With portable solar generators, we're mainly concerned with individual appliance use, so we'll focus on amps and Amp hours. Looking at Figure 4 again, we can plug the numbers into Ohm's triangle.

6 Ohms = 12 Volts / 2 Amps
2 Amps = 12 volts / 6 Ohms
12 Volts = 2 Amps x 6 Ohms

We've determined that the light bulb uses 24 Watts, or 2 Amps. It consumes 40 Ah in 20 hours.

24 Watts = 2 Amps x 12 volts
2 Ah = 2 Amps x 1 hour
40 Ah = 2 Amps x 20 hours

DC & AC

Figure 5 is a diagram of a solar generator. Notice that most of the wiring is direct current.

Direct current is where the flow of electrons flow in only one direction. The battery polarity is always the same where one terminal is always negative and the other terminal is always positive. Think of it as a pump flowing in one direction.

Alternating current produces a voltage that reverses regularly. The polarity of the voltage alternates and the current changes direction. It has a very rapid cycle of increase, decrease, and reversal, creating a sine wave.

Alternating current can be produced electronically with an inverter, which converts DC to AC. The solar generator in this manual makes use of a power pack with an inverter for AC loads. Discover more about solar electricity at our SolarPedia.

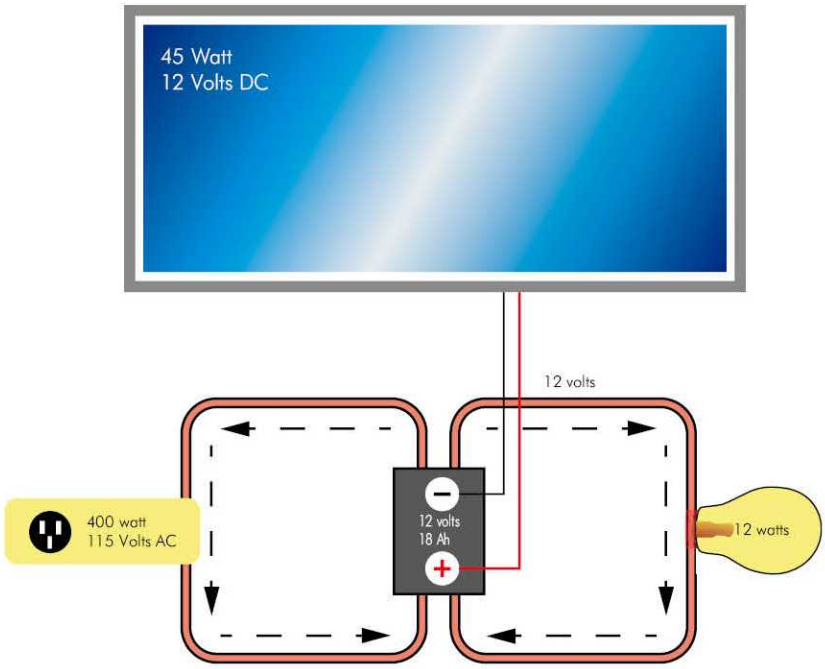


FIG5:Portable Solar Generator Diagram

Wattage Table

Below is a general list of the wattage of electronics, appliances, and tools. Use it to match the power pack, battery, and inverter to your purposes.

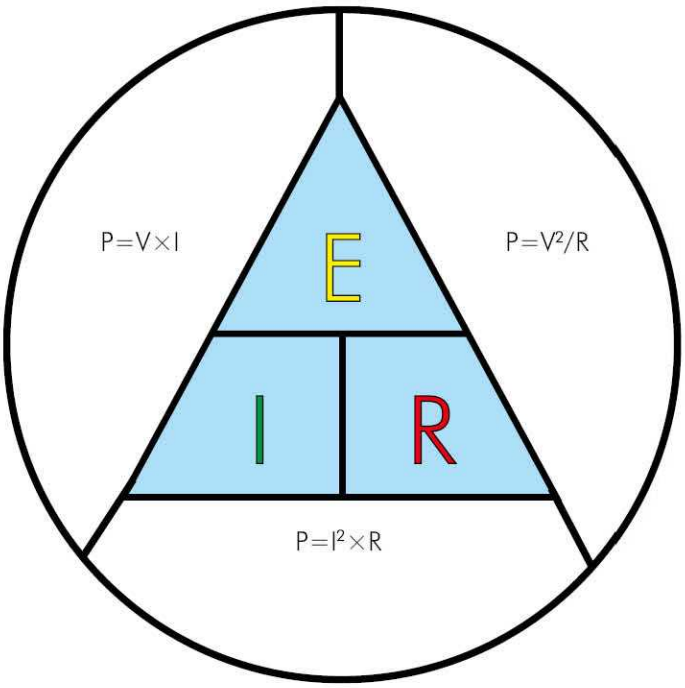
Electronics	Watts
Video Player	50-100
Clock Radio	50
Game Console	100
Satellite dish	40
Laptop/ Tablet	35-100
Desktop Computer	200-400
Inkjet Printer	50-75
25" Color TV	300
19" Color TV	150
13" Color TV/ VCR	240
12" Black & White TV	40

Appliances	Watter
Coffee Pot	1200
Cappuccino Maker	1250
Blender	350
Hot Plate	1200
Frying Pan	1200
Toaster Oven	1200
Blow dryer	900-1500
Space Heater	1000-1500
Washing machine	950
Refrigerator/ Freezer	600
Freezer	500-800

Tools	Watter
Jig Saw	300
Table Saw	1800
6 1/2" circ. saw	1000
7 1/4" circ. saw	1200
8 1/4" circ. saw	1800
Disc Sander	1200
1/4" drill	250
3/8" drill	500
1/2" drill	750
Power Saw	500
Air Compressor	2000

Electric Math

Use the electric math formulas below to determine energy production, storage and loads.



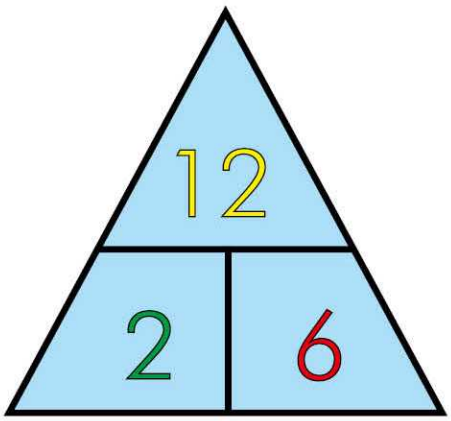
E = Volts

I = Amps

R = Ohms

P = Watts

If the value of any two are known, then one can find the other two. Examples:



P = V x I
24 watts = 12 volts x 2 amps
2 amps = 24 watts / 12 volts

P = I^2 x R
24 watts = (2 x 2) x R
24 watts = 4 x R
R = 6 ohms
E = I x R

12 volts = 2 amps x 6 ohms
P = V^2 / R
24 watts = (12 x 12) / R
R = 144 / 24
R = 6 ohms

The values inside Ohm's Triangle apply only to source voltage - whereas the formulas outside the triangle apply to both source and load voltage.

Suntree

Advantage

- Portable , can be used at home or traveling outside .
- Easy operation , plug in suitcase directly .
- Useful . charge for mobile, MP3, MP4, light, small fan etc. small household appliances.
- Efficiency , there is A grade solar panel for charging in short time.
- Maintenance free, don't need to maintain frequently.

Discription

- face solar panel to the Sun .
- connect the charge wire to the charge hole at the back of genertator .
- once the system can support some load , the green light will be on .
- once battery is fully charged , controller will automatically protectect the system .
- when the output overload or battery capacity inadequate, controller will cut off to protect .

Parameter

Model	SUPY-1206
Rated Charging Current	1A
Rated Discharge Current	2A
Rated Working Voltage	12V
Float Charge Voltage	14V
Low-voltage Protection	10.7V
USB Port	5V 500mA
Working Temperature	-10℃ ~50℃
Storage Temperature	-15℃ ~40℃
Solar Panel Voltage	≤25V
Panel Power	6W
BAT. Low Recovery	11.5V
No-load Loss	≤8mA
Product Size(mm)	160×100×124
Net Weight(Kgs)	3.5
QTY/Ctn	6PCS
Packing	Gift box
Carton Size(mm)/Weight(Kgs)	55.5×27.5×55.8CM/24
Certification	CE-EMC/LVD ,RoHS
Warranty	12 months

Accessories	QTY
12V/6W Solar panel(6m cable with DC plug)	1pc
12V/3W LED LAMP(4m cable with DC plug)	2pcs
4AH Dc power supply host	1pc
10 types mobile charger	1pc
3W USB Fan	Optional
Radio	Optional

Advantage :

- Portable. Can be used at home or traveling outside .
- Easy operation. Plug in suitcase directly .
- Useful. With DC and AC output, supply power for mobile, light, vedio, fan, small household appliances etc .
- Efficiency. There is A grade solar panel for charging in short time.
- Maintenance free. Don't need to maintain frequently.
- Two ways charging . Can be charged from solar panel or state grid .

Discription

- Face solar panel to the Sun .
- connect the charge wire to the charge hole at the back of genertator .
- once the system can support some load , the green light will be on .
- once battery is fully charged , controller will automatically protectect the system .
- when the output overload or battery capacity inadequate, controller will cut off to protect .

Parameter

Model	SUPY-12020
Rated Charging Current	5A
Rated Discharge Current	12.5A
Rated Working Voltage	12V
Float Charge Voltage	14V
Low-voltage Protection	10.7
USB Port	5V 500mA
Working Temperature	-10℃ ~50℃
Storage Temperature	-15℃ ~40℃
Solar Panel Voltage	≤25V
Panel Power	20W
BAT. Low Recovery	11.5V
No-load Loss	≤8mA
Inverter Rated Power	150W
Waveform	Modified Sine Wave
Inverter Output Voltage	100-120VAC or 220-240VAC
Product Size(mm)	240×142×162
Net Weight(Kgs)	11
QTY/Ctn	2PCS
Packing	Gift box
Carton Size(mm)/Weight(Kgs)	61×24×39/23
Certification	CE-EMC/LVD,RoHS
Warranty	12 months

Accessories	QTY
12V/20W Solar panel(6m cable with DC plug)	1pc
12V/3W LED LAMP(4m cable with DC plug)	2pcs
12AH DC and 150W AC power supply host	1pc
10 types mobile charger	1pc
DC Cable Clips	1set
3W USB Fan	Optional
15W DC Fan	Optional
Radio	Optional