

SIRCO *DC UL 98 & 98B* listed Solar Disconnect Switches 1000 Vdc ON LOAD



An international Specialist Manufacturer

The SOCOMEC Group employs 2700 people and has a turnover close to 521 million USD.
Its core activities are the manufacture of electrical products and electronic equipment.



Listening to our customers...

Teams of specialised designers, a highly integrated production and a dedicated sales network have led the SOCOMEC group to develop the most extensive ranges on the market for high-quality low-voltage industrial switching & protection components, as well as associated service and technical support.

This “Solutions for Control & Power” division is today centred on three distinct fields:

- low-voltage switchgear components,
- electronic control & protection,
- mounting & cabling, and integrated distribution systems.



COFRAC 163A

Pierre Siat power electrical tests

SOCOMEC's test laboratory is internationally recognized:

- client Test Data Program with UL (UL98, UL508...),

- shared certification with CSA (22.2 N°4, 14...),
- SMT with KEMA for IEC standards.

For quality insurance, the laboratory is accredited to ISO17025 by COFRAC (French accreditation body) and is partner of many certifications bodies.



Standards requests

NEC and photovoltaic

A few PV systems are owned and operated by utility companies, but most of the PV systems fall under the provisions of the National Electrical Code (NEC).

The requirement for disconnects for PV systems are covered in Article 690 of the National Electrical Code.

NEC limits one and two family dwellings, with certain limitations, to 600 V, NEC 690.7 (C). Other installations with maximum photovoltaic system voltage over 600 Vdc shall comply with Article 690, Part IX.

Even if the most common voltage for large systems is still below 600 Vdc the trend is for higher voltage in order to improve the efficiencies of the system.

UL98: Standard for Disconnect Switches.

98B: Standard Solar Disconnect.

The new standard 98B covers the disconnect switches up to 1000 Vdc, intended for use in DC photovoltaic systems.

Main differences between UL98 and 98B

Voltage: Up to 1000 Vdc for 98B, with UL98 the maximum voltage is 600 V.

Heating tests: 98B limits the temperature rise at 40°C, with UL98 50°C is accepted.

Overload tests: Time constant (L/R) = 1 ms, Socomec did the tests at 2.5 ms. With UL98 the load is resistive.

Overload test: 200% of nominal current, 150% with UL98.

Temperature: From minus 20 to +50°C.

PV applications requests

Higher DC voltage

The most common voltage in the U.S. is 600 V but PV Systems voltage is increasing in order to improve efficiency.

Systems up to 1000 V dc are more and more common, with the trend to exceed this value.

Direct current interruption

There is a fundamental difference in current interruption between AC and DC applications.

Contrary to AC which has two zero crossings per cycle (16.6 ms) DC current is more difficult to interrupt. When a DC circuit is open an arc is generated between the switch contacts, this arc must be broken as fast as possible to avoid the destruction of the device and surrounding equipment.

SIRCO DC

SIRCO DC is a range of manually operated disconnect switches. Socomec has specially developed and tested this range in order to be certified to the latest standards. Additionally they have also been tested to meet the specific and arduous switching conditions found in real PV applications such as breaking current / voltage combinations under specific conditions.

Other UL products



GAWME 130 A

Low voltage switchgear components, electronic control and protection, mounting & cabling and integrated distribution systems: efficient and competitive ranges of standard products adapted to meet your specific requirements to control and manage your electrical installation and contribute to the safety measures of people and property.

The specifics of a PV installation

Series connection and heat transfer

In AC applications cables can act as heatsinks and consequently reduce the potential thermal effect on the assembly.

To switch higher DC voltages it is necessary to put poles in series and this type of connection will introduce a heat transfer effect from pole to pole that must be taken into account when sizing jumpers that are used to put the poles in series.



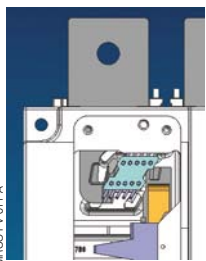
AC application, 6 cables can act as heatsinks.



Series and short connections introduce heat transfer between poles that must be taken into account when sizing jumpers.

The jumpers temperature must be taken into account. The maximum **temperature rise allowed by 98B standard is an increase of 40 K (40°C)** on all current carrying parts, as opposed to 50K for UL98. Socomec has defined and tested jumpers in order to meet this requirement as well as optimize the physical size, cost, installation time and minimize the risk of incorrect connections.

Patented contact technology



The patented switching concept allows the fast extinction of the electrical arc and interruption of the current.

The switch contacts are encapsulated in a glass reinforced polyester which provides very efficient mechanical and electrical arc containment properties. Thus enabling the switch to be used in industrial applications as well as harsh operating environments.

External handles 3R,12, 4, 4X UV UL Listed



ACCES 164 A - 150 A



A complete range of handles is available for all products. Door interlocking is standard in the ON position. This facility can be bypassed if required by authorized personnel with the use of an appropriate tool.

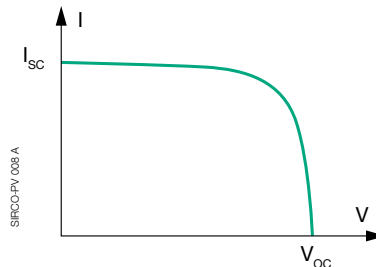
Padlocking in the OFF position is standard with up to 3 padlocks and by scissors. The door is also interlocked when the handle is padlocked and cannot be bypassed as an additional safety feature.

All our external handle are UV tested according to UL 50 Standard. If the handle is not UV resistant it prematurely ages and may fail over the time.

Switching low DC current at elevated voltage

With photovoltaic devices there is a direct link between voltage and current at any point along the curve. When the current is low (cloudy, evening...) the voltage remains high and these low currents are extremely difficult to interrupt at higher voltages.

A disconnect switch may be efficient in standard AC or DC applications but could be unable to interrupt low currents at high DC voltage as seen in photovoltaic applications. If the electrical arc produced is not interrupted it may result in operator injury or fire. The Socomec DC range has been specifically designed and tested to interrupt the current under all current / voltage conditions.



Current (A) / Voltage (V) curve of a PV system.
When the current decreases (in the evening or when it is cloudy) the voltage may increase.
SC = Short circuit, OC = Open circuit

Isolation; an important safety issue at 600 Vdc and 1000 Vdc

At 1000 Vdc the risk of tracking becomes a real issue in solar installation location. Condensation caused by hot / cold & dust and sand can reduce the tracking parameter of the insulating material. it can result in dramatic failures.

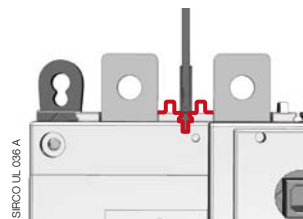
Our switches are designed for maximum safety, in order to avoid tracking all the spacings over surface are minimum 2 inches. All our insulating materials have a high tracking resistance, tested according to the ASTM D 2303.

(US Tracking and erosion of insulated material Standard)

Article 6.6 from UL98 and article 7 from 98B request a **minimum spacing of 2 inches** over surface between two polarities

Spacings \geq 2 inches:

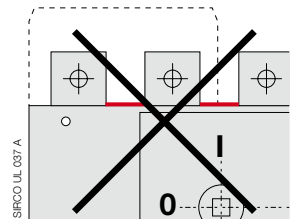
Product complies with UL98 and 98B



Our products are designed in order to fulfill the requirements of spacing and manufactured with high quality material having the best tracking resistance.

Spacings < 2 inches:

Product does not comply with UL98 and 98B



When the spacing over surface is less than two inches between two polarities the product does not comply with UL98 and 98B and voltage is limited at 250 Vdc.

SIRCO DC UL 98 & 98B listed

Your guarantee for **safe & reliable** switching of PV circuits

Suitable for NEC Article 690
Application UL1741



SIRCO DC 200A
with optional jumpers

GAMME 154 A



Up to 1000 Vdc UL98 and 98B listed, Up to 1500 Vdc On load

The SIRCO DC range is fully tested and UL Listed according to UL98 and 98B for PV applications. The SIRCO range meets ALL the requirement of these Standards

The SIRCO DC range has been tested to meet the specific and arduous switching conditions found in actual PV applications where voltage up to 1000 Vdc will become more and more common, with a trend to exceed this voltage, up to 1500 Vdc.

Compact

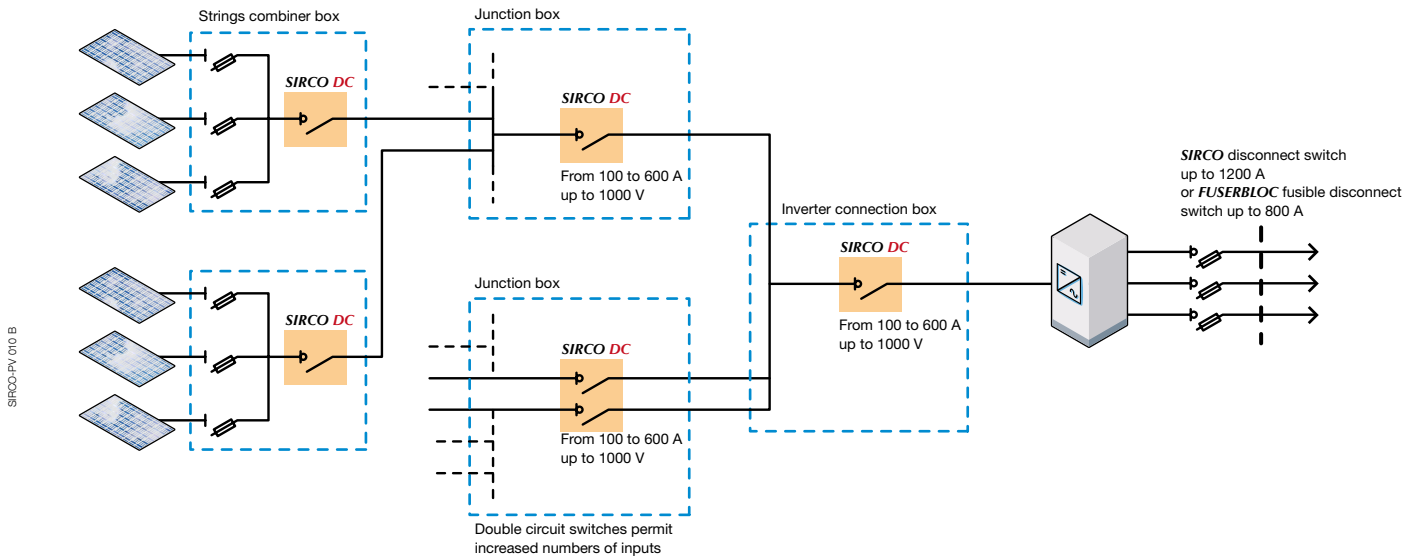
Thanks to the patented switching concept coupled with back to back switch mounting configurations, the SIRCO DC range is a very compact range of 3, 4, 6 & 8 pole on load dc switches.



© SAFT SOLAR PHOTOVOLTAIC SYSTEMS

Location of Disconnect Switches

Simplified large photovoltaic system layout



Innovative solutions

Double stacked Switch

It is possible to operate on load two switches with one handle.

Space saving: the overall footprint is similar to the footprint of a standard 3 or 4 pole device. Thus providing significant space saving opportunities within the overall assembly and specifically compared to using separate switches.

Easier connection and integration

Higher voltage: by connecting the two switches in series it is possible to switch on load higher voltage than 1000vdc.

Double the rating: by connecting the two switches in parallel on the outgoing side.



Double the current: by connecting the two switches in parallel.

Two different circuits up to 1000 vdc operated with one handle.

Higher voltage: by connecting the two switches in series.

Dual rated UL and IEC

All our products are IEC 947-1-3 certified and UL98 and 98B listed



Our SIRCO DC solar disconnect range meets both UL and IEC Standards. They also bear the CE mark. Using Socomec range in your design is therefore a unique chance to standardize your components and use the same switch on the 5 continents.

IEC (International Electrical Commission) Standards

IEC is the world's leading organization for international standards for all electrical, electronic and related technologies. IEC 947 is the applicable standard for low voltage switchgear components.

The SIRCO DC range is tested according to the on-load utilization category DC22 as defined in IEC 947-3 (standard for on load Disconnectors).

Utilization categories take into account the load inductivity. DC21 for resistive loads, DC22 for mixed resistive & inductive loads and DC23 for highly inductive loads such as motors.

PV systems are considered as non-inductive loads and the utilization category of the Disconnect must be a minimum of DC21. This requirement is covered by the DC22 category.

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