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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) and the most common voltage level for large systems in the U.S. is 600 V.

PV applications requests

Higher DC voltage

Even if 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 are more and more common

Direct current interruption

There is an 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

SIRCO DC

up to 600 A - 1000 Vdc

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



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.

Solar applications

UL listed Disconnect Switches

UL 98 600 Vdc ON LOAD



The SOCOMEC Group employs 2300 people and has a turnover close to 400 million USD. Its core activities are the manufacture of electrical products and electronic equipment.



3 factories in France (Alsace), 2 factories in Italy

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 "Industrial Switching & Protection Systems" division is today centred on three distinct fields:

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



Pierre Siat power electrical tests

SOCOMECS'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.



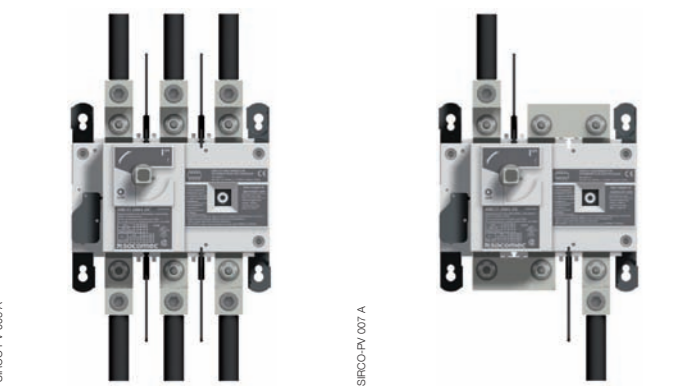
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The specifics of a DC installation

Series connection and heat transfer

In AC applications cables can act as heatsinks and consequently reduce the potential thermal affect on the assembly. To switch higher DC voltages it is often necessary to put poles in series and this type of connection will introduce a heat transfer affect 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.

Jumpers

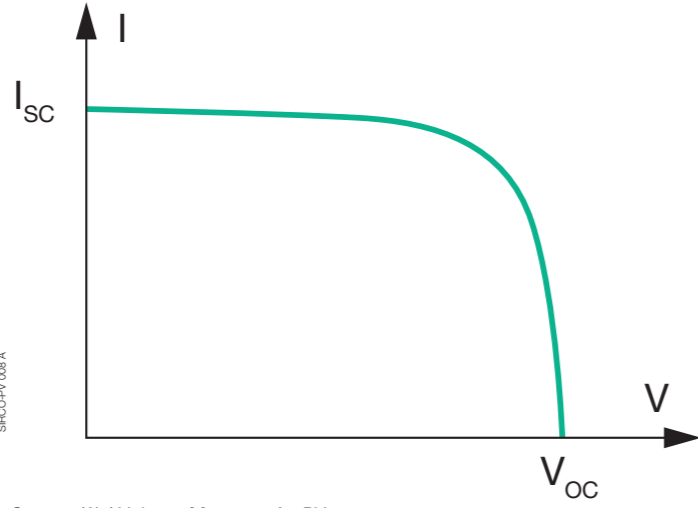
The jumper temperature must be taken into account as the maximum temperature rise allowed according to the UL98 standard is an increase of 50° C. Socomec has defined and tested jumpers in order to meet this requirement as well as optimising the physical size, cost, installation time and minimising the risk of incorrect connection.

Benefits of reduced number of poles

- > Reduced product size allowing overall assembly reduction
 - > Less connections
 - > Cost reduction (materials, labor, time...)
 - > Increased reliability due to reduced risk of bad connection
 - > Improved thermal performance as less contacts = less dissipated heat
- Sirco DC can switch up to:
- 600 Vdc, 3 poles in series, UL98 listed
 - 750 Vdc, 3 poles in series, IEC 947
 - 1000 Vdc, 4 poles in series, IEC 947

Switching elevated voltage and low current

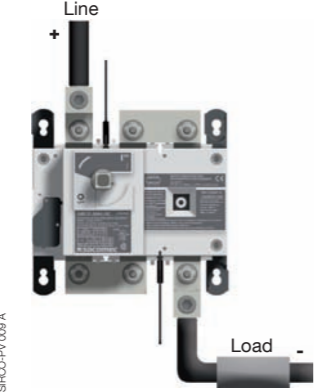
With photovoltaic devices there is a direct link between voltage and current at any point along the curve. When the current is low (cloudy, evening...) the voltage remains high. This is contrary to what one would imagine and these low currents are extremely difficult to interrupt at higher voltages.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

NEC, grounding systems

As per article 690.13 A switch, circuit breaker, or other device, either ac or dc, shall not be installed in a grounded conductor if operation of that switch, circuit breaker, or other devices leaves the marked, grounded conductor in an ungrounded and energized state.

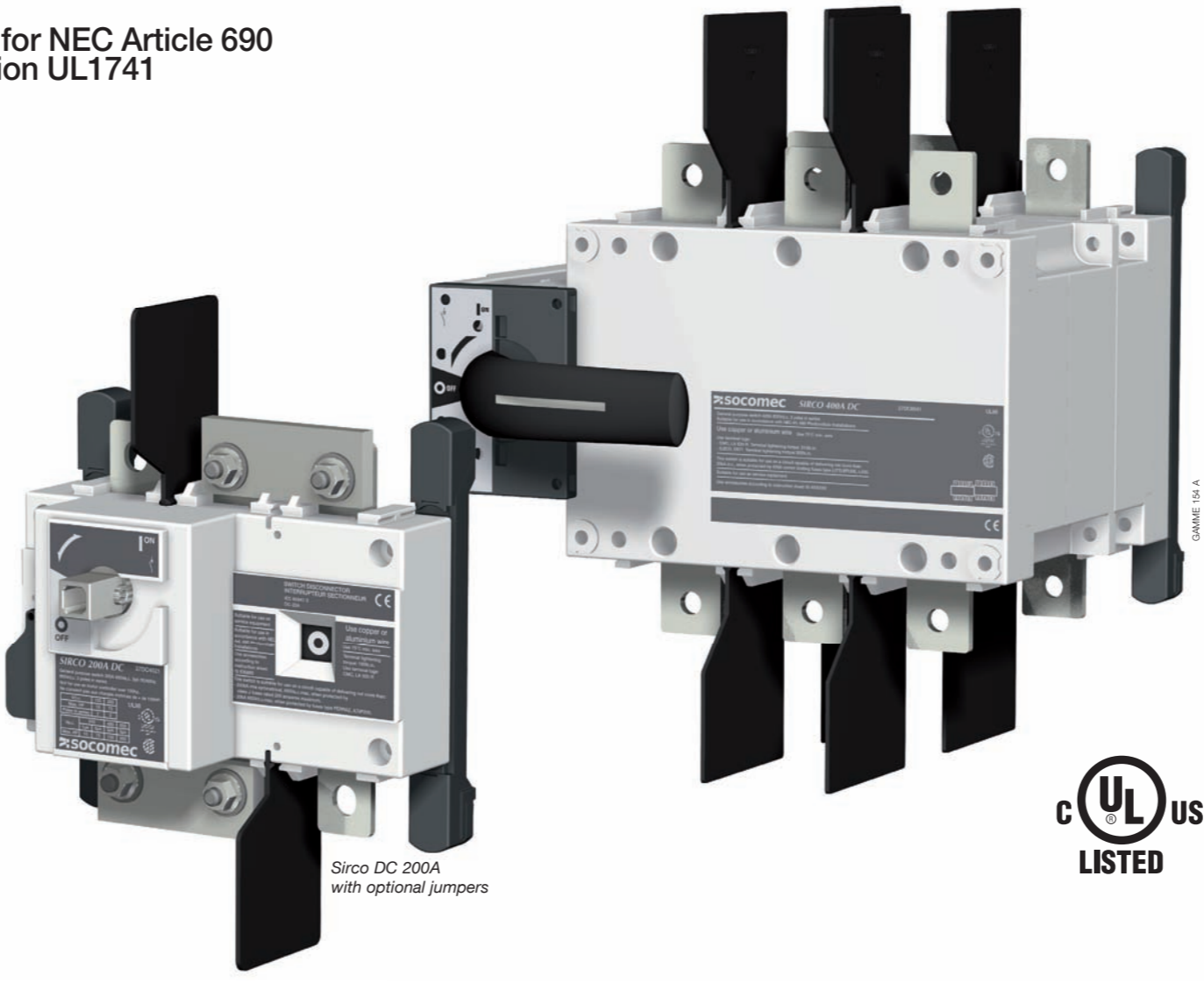


According to NEC Article 690, at least one pole of the disconnect must be grounded for safety purposes.

SIRCO DC

Your guarantee for safe & reliable switching of PV circuits

Suitable for NEC Article 690 Application UL1741

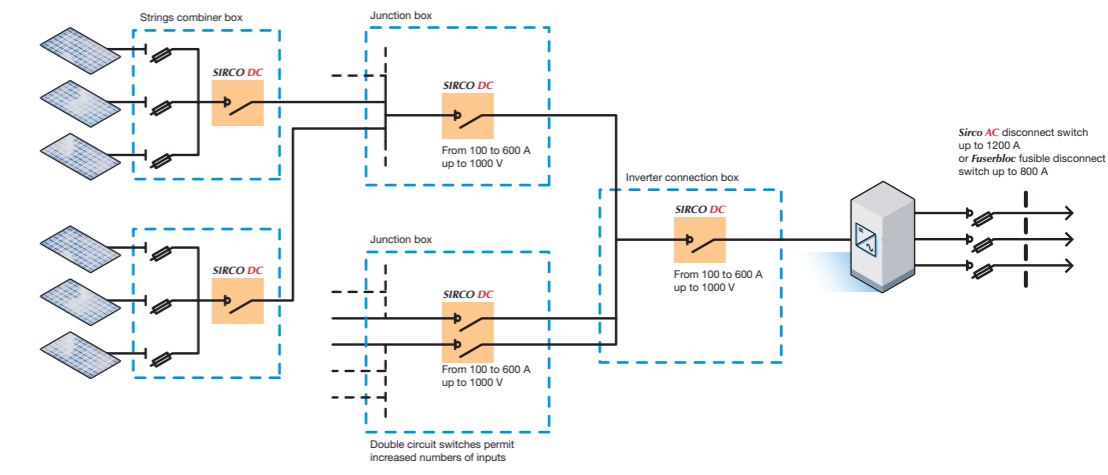


- UL 98 listed 600 Vdc On-load**
The Sirco DC range is fully tested and UL 98 certified for 600 Vdc applications. Additional supplementary tests have been carried out in order to fulfil the future UL98 requirements which guarantees high performance in DC applications.
- Up to 1000 Vdc**
The Sirco DC range has been tested to meet the specific and arduous switching conditions found in actual PV applications where voltages up to 1000 Vdc are becoming more common.
- 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 & 8 pole on load dc switches.



Location of Disconnect Switches

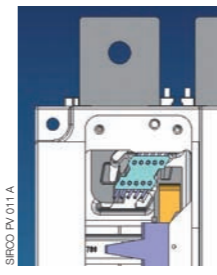
Simplified large photovoltaic system layout



Socomec DC switching solutions

On load breaking capacity up to 1000 Vdc, tested according to IEC 947 Standard

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 polyster 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



A patented switching principle designed for DC current switching on load.

Two circuits disconnect switch

The switch construction concept allowstwo ciferrent circuits up to 1000 Vdc to be switched on load with one operating handle. This can be achieved without increasing the overall footprint compared to a standard Sirco DC 3 or 4 pole device. Thus providing significant space saving opportunities within the overall assembly and specifically compared to using separte switches or alternative multi pole devices.



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 stanard 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 consideredas non-inductive loads and the utilization category of the Disconnect must be a minimum of DC21. This requirement is covered by the DC22 category.

Operator independent mechanism

The spring assisted switch operating mechanism enable fast opening & closing of the switch contacts totally independent from the speed of the operator. This fast operation also provides very high on-load breaking capacity characteristics.

Operator safety

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.