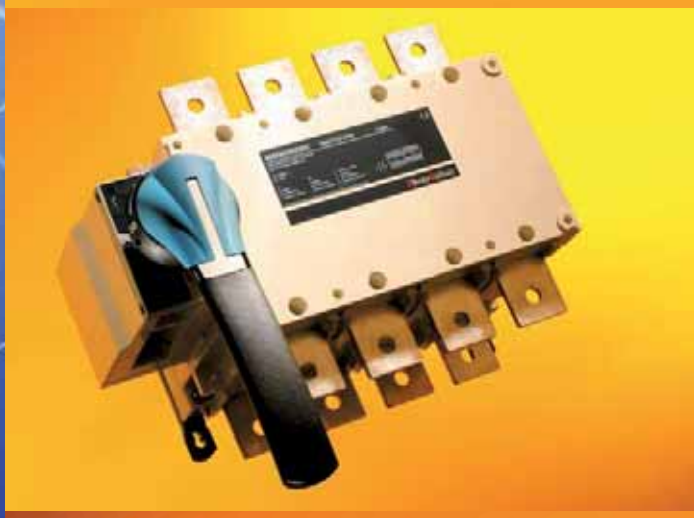
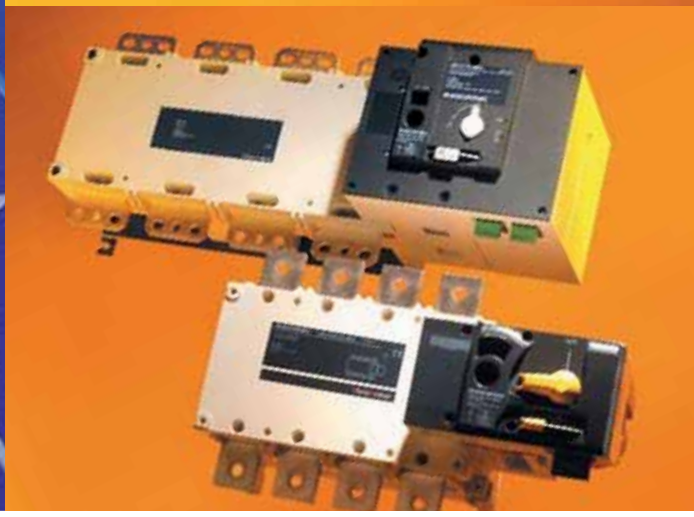
CATALOGUE

Solutions for Power Control & Safety of photovoltaic applications

2014





POWER CONTROL & SAFETY

SOLAR POWER

ENERGY EFFICIENCY

socomec
Innovative Power Solutions

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Photovoltaic Application Guide

An independent manufacturer

The benefit of a specialist

Founded in 1922, SOCOMEC is an industrial group with a workforce of 3000 people. Our core business - the availability, control and safety of low voltage electrical networks with increased focus on our customers' power performance.

CORPO 308 A

The culture of independence

The SOCOMEC Group's independence ensures control over its own decision-making, respecting the values advocated by its own family shareholders and shared by its employees.

With around 30 subsidiaries located on all five continents, SOCOMEC pursues international development by targeting industrial and service applications where the quality of its expertise makes all the difference.

The spirit of innovation

As undisputed specialists in UPS systems, mains supply changeover, power conversion and measurement, SOCOMEC dedicates nearly 10% of its turnover to R&D. As a result the Group can achieve its ambition of always being one technological step ahead.

The vision of a specialist

As a manufacturer with complete control over its technological processes, SOCOMEC is quite unlike the more general providers. The Group is constantly improving its fields of expertise in order to offer its clients increasingly customised, appropriate solutions.

A flexible manufacturing structure

Backed by two European centres of excellence (France and Italy), the Group also benefits from competitive production sites such as Tunisia and locations in the major emerging markets (India and China).

These sites have all implemented a system of continuous improvement based on Lean Management principles, and are therefore in a position to provide high levels of quality, and meet the deadlines and cost requirements expected by customers.

The focus on service

Our manufacturer's expertise naturally extends to a complete range of services designed to facilitate the research, implementation and operation of our solutions. Our service teams have built their reputation on reassuring guidance, flexible skills and reactivity.

Responsible growth

As a Group which is open to all cultures and firmly committed to human values, SOCOMEC promotes employee initiative and commitment. Working relationships are based on the idea of partnerships and respect for shared ethics. Through the company's commitment to achieving harmonious, lasting development, SOCOMEC fully embraces its responsibilities not only towards its shareholders, employees, customers and partners, but also towards society as a whole and its environment.

SOCOMEC has been a signatory to the Global Compact since 2003.

ENERGY SPECIALIST SINCE 1922

THE GLOBAL COMPACT WE SUPPORT

Four key applications: the know-how of a specialist

Critical Power

Ensuring the availability of high-quality power for critical applications.

Thanks to the company's wide range of continuously evolving products, solutions and services, SOCOMEC are experts in the three essential technologies that can ensure the high availability of supply to critical facilities and buildings i.e.:

- uninterruptible power supplies (UPS) that provide high-quality power and reduce distortion and interruptions to the mains supply due to their power storage backup,
- changeover of high availability sources to transfer supply to an operational backup source,
- continuous monitoring of installation facilities to prevent failures and reduce operating losses.


SITE 628A

Power Control & Safety

Managing power and protecting individuals and property.

SOCOMEC's expertise in this domain is unquestionable; the company is an undisputed leader in power switching and changeover functions, and has been a specialist manufacturer of electrical equipment since 1922. The company has long defended the benefits of fuse protection for individuals and property, and has become a major player in cutting-edge technology such as the monitoring and detection of insulation defects. SOCOMEC guarantees solutions and services which are both relevant and efficient.


APPLI 575A

Solar Power

Guaranteeing the safety and durability of photovoltaic (PV) facilities.

As experts in the solar energy equipment field, SOCOMEC has all the specialist know-how for implementing key strategic functions in on-grid and off-grid PV facilities, including:

- safety, through specially designed switch disconnectors to cut the DC current generated by solar panels regardless of the facility configuration and operating conditions,
- the reliability of DC facilities thanks to solutions preventing the degradation of insulation and electric arc failure in DC current,
- control of very high-efficiency energy conversion, via PV inverters, to transform all energy generated by the solar panels into power to be consumed locally or re-injected into the national grid,
- PV production and energy storage solutions for on-grid and off-grid applications.


SITE 441A

Energy Efficiency

Improving building and facility energy efficiency.

SOCOMEC solutions, ranging from sensors to the wide choice of innovative, modular software packages, are driven by experts in energy efficiency. They meet the essential requirements of managers or operators of tertiary, industrial or local authority buildings, and make it possible to:

- measure power consumption, identify sources of excess consumption, and raise occupant awareness,
- limit reactive energy and prevent associated tariff penalties,
- use the best tariffs, check supplier invoicing and accurately distribute energy bills amongst consumer entities.


APPLI 576A

Services & Technical Assistance

the manufacturer's guarantee

Over several decades, SOCOMEC Systems have acquired a distinguished reputation in the control, safety and performance of low voltage electrical distribution equipment. Our manufacturer's expertise naturally extends to a complete offer of services designed to help you select, implement and get the most out of our solutions.

APPLI 566 A

Specially adapted skills

Our service team consists of field personnel specialising in our specific domains and experienced in the maintenance of industrial electrical systems. This means you benefit from a dual skills base:

- technical expertise relating to the products that have been installed,
- practical knowledge of your usage needs.

Reassuringly close at hand

Our geographical coverage means that we are close to each user and can respond quickly to all requests. We can provide a complete service from the technical diagnostics before repair right up to implementation of the most suitable solutions for your installation.

Customer-oriented service

True to our own principles, we encourage direct and friendly contact. Our interventions offer solutions targeted to a single problem: Yours. Our engineers are always very attentive to your needs, to ensure that we provide the most relevant technical support and advice. So you can plan your investments with confidence.

Customised support…

Assessment and sizing

Depending on your requirements, our experts collect and analyse all the relevant data in order to recommend the system best adapted to your installation.

Commissioning

Installation of your equipment is carried out by a specialist, and is totally compatible with and adapted to your use.

Maintenance

A wide range of preventive or corrective maintenance options designed to suit your installation and its environment, and to ensure continuity of service of your electrical networks.

Training

You will receive training, specially adapted to your needs, in order to familiarise yourself with our equipment and enable you to use it to your best advantage.

VALID FOR FRANCE

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… to ensure you a successful project

Source inversion in complete safety

Changeover switches are strategic components that ensure continuity of service of supplies In order to guarantee **complete operational safety**, we will implement our range of innovative source transfer solutions.

Your energy consumption efficiently and comprehensively managed

Monitoring of energy consumption within a production unit is one of your primary operational considerations From the preliminary assessment of your installation to the adaptation of the software, dedicated SOCOMEC experts are on hand to assist you throughout the entire energy performance process.

Effective insulation monitoring for your electrical installation

To ensure that your fault monitoring and location system operates to its optimum capacity, our team of specialists perform all operations on site.

This means that you benefit from renowned expertise, as well as solutions tailored to the specific monitoring requirements of your electrical installation.

The control of reactive energy on your electricity bill

In terms of power factor correction, **the support of a specialist is essential to appropriately size your system** and meet the desired efficiency.

SOCOMEC will help you to make the right choices and therefore to benefit from a long-term solution. A real return on investment.

For more information, please see pages "Reactive energy power factory correction'.

CORPO 164 A

APPLI 540 A

A cutting-edge laboratory

The backing of an expert

Since 1965, the Pierre Siat test laboratory has used its expertise to guarantee the reliability and conformity of SOCOMEC products and solutions. Our customers are also welcome…

CORPO 342 A

A decisive link

Located at the Company's headquarters in Benfeld (France), the Pierre Siat test laboratory is one of SOCOMEC's main quality pillars: its contribution to the development, qualification and certification phases plays a decisive role in the process leading to the creation of a product or solution.

Global scale

This totally independent laboratory is recognised by the major certification bodies worldwide: a member of the ASEFA(1) and the LOVAG(2), it is accredited by COFRAC(3), UL (CTDP(4)), CSA (shared certification) and KEMA (SMT/WMT(5)). It also works in partnership with numerous international certification organisations(6). The quality and safety requirements specific to each country are therefore fully taken into account.

Specialist facilities

With its 100 MVA (Idc 100 kA rms 1 s) short-circuit platform, three 10 kA overload platforms and numerous other test instruments in facilities covering 1500 m^2, the Pierre Siat laboratory is currently the 2nd French power laboratory. It combines expertise in electricity and mechanics, pneumatics and computing.

Ongoing commitment

To adapt to the increasingly demanding standards and ever more innovative and high-performance products, the Pierre Siat laboratory is permanently extending the scope of its tests, investing whenever necessary in new equipment.

A vast range of tests

The laboratory submits all SOCOMEC products and solutions (including those in enclosures) to numerous tests in the following fields:

- functional: component resistance and operating tests,
- dielectric: immunity to interference, dielectric insulation, overvoltage, overcurrent,
- mechanical: endurance and mechanical shocks, etc.,
- environment: functional or electrical tests under extreme conditions (temperatures, salt spray, etc.), vibrations,
- AC/DC endurance: in operation and under controlled temperatures (arcs, LV/HV power cuts, etc.),
- temperature rise,
- electromagnetic compatibility (EMC),
- metrology,
- safety: flammability, etc.

Conducted during the design and production phases, these tests guarantee the long-term reliability of the equipment sold.

Customized services

These test facilities and expertise are also available to our partners who require assistance with the qualification and certification of their products or equipment.

We issue certificates of conformity and performance declarations upon request.

For more information, visit our web site: www.socomec.com/testing-laboratory_en.html

(1) Association des Stations d'Essais Françaises d'Appareils électriques basse tensio (French association of low voltage electrical equipment test stations)
(2) Low Voltage Agreement Group
(3) Comité Français d'Accréditation (French accreditation body)
(4) Client test data programme
(5) Supervised Manufacturer's testing/Witnessed manufacturer's testing
(6) KEMA, CEBEC, UL, CSA, ASTA, Lloyd's Register of Shipping, Bureau Véritas, BBJ-SEP, EZU, GOST-R, etc.

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References list

Photovoltaic range

Load break switches

SIRCO MC PV IEC
25 to 40 A
p. 14

SIRCO MC PV UL
25 to 45 A
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SIRCO MV PV
63 to 80 A
p. 34

SIRCO PV IEC
100 to 3200 A
p. 40

SIRCO PV UL
100 to 2000 A
p. 58

Remotely operated

SIRCO MOT PV
200 to 3200 A
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Pneumatically operated

SIRCO PV PA
160 to 800 A
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Fuse protection

gPV fuses
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RM PV
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PV fuse bases
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Electronic protection

Protection against overvoltages

SURGYS G51-PV
p. 106

Services & Technical Assistance: second nature!

For further information, see page 6.

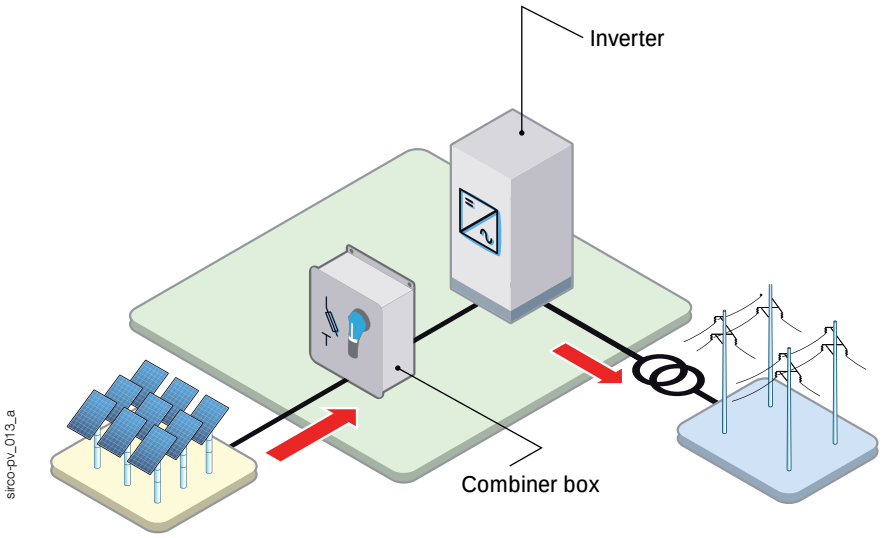
More about our products

FUSERBLOCs LMDC are designed to perform the maintenance of PV inverters without stopping the entire installation.

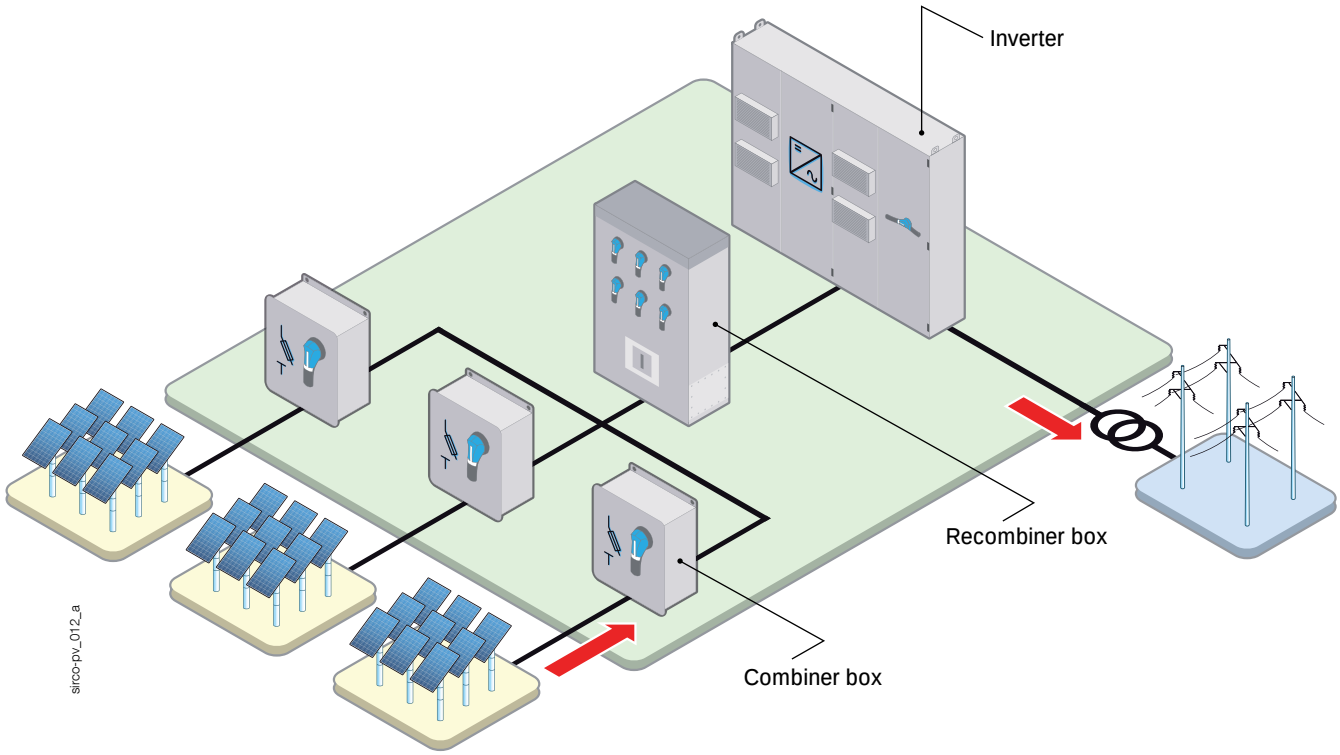
See page 111

The right components for all PV installations

PV installations for residential buildings



PV installations for commercial and solar parks



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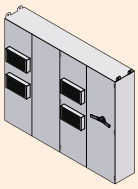
Inverter



PV load break switches, manually operated

- SIRCO PV, 100 to 3200 A, 1000 & 1500 VDC
- SIRCO MV PV, 63 & 80 A, 1000 VDC
- SIRCO MC PV, 20 to 45 A, 1000 VDC

PV load break switches, remotely operated

- SIRCO Mot PV, 100 to 3200 A, 1000 VDC, motorised
- SIRCO PV PA, 160 to 800 A, 1000 VDC, pneumatically operated

AC non fusible and fusible load break switches

- SIRCO M, 16 to 125 A, 690 VAC
- SIRCO, 100 to 5000 A, 690 VAC
- FUSERBLOC, 25 to 1250 A, 690 VAC

PV fuses and holder

- 1 to 600 A, 1000 & 1500 VDC

Surge protection devices

- SURGYS, 1000 & 1500 VDC

Recombiner box

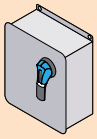
PV load break switches for 1 to 4 circuits

- SIRCO PV, 100 to 3200 A, 1000 & 1500 VDC

PV fuses and holder

- 1 to 600 A, 1000 & 1500 VDC

Combiner box



PV load break switches, manually operated

SIRCO PV, 100 to 3200 A, 1000 & 1500 VDC
SIRCO MV PV, 63 & 80 A, 1000 VDC
SIRCO MC PV, 20 to 45 A, 1000 VDC

Fuse holder

- RM PV up to 32 A, 1000 VDC

PV fuses

- 10x38 PV, 1 to 32 A, 1000 VDC

Surge protection devices

- SURGYS, 1000 & 1500 VDC

SIRCO MC PV IEC 60947-3

Load break switches for photovoltaic applications

from 25 to 40 A, up to 1000 VDC

sirco-mc_002_a_1_cat

***SIRCO MC PV** 25 A - 1000 VDC*
DIN-rail mounting

sirco-mc_003_a_1_cat

***SIRCO MC PV** 25 A - 1000 VDC*
Door mounting

Function

SIRCO MC PV are DC load break switches. They make and break under load conditions and provide optimum safety isolation for any PV circuit.

Advantages

Compact

Thanks to its compact design, the space needed within the combiner box or the solar inverter is greatly reduced.

High breaking capacity up to 1000 VDC

- Making and breaking capacity under load conditions up to 1000 VDC.
- Specific photovoltaic test beyond requirements of IEC 60947-3 standard.

Safety

- Bridging bars are factory fitted for easier, quicker and safer connection.
- Direct access to connection terminals for adequate tightening.

Easy mounting

Three mounting possibilities are available for optimum integration and time saving:

- DIN-rail or back plate mounting.
- Door mounting.
- “Quick Fix” mounting (quarter turn fixation without tools).

SIRCO MC PV
DIN-rail mounting

SIRCO MC PV
Door mounted

The solution for

> Residential buildings
> Buildings
> Solar parks

Strong points

> Compact
> High breaking capacity up to 1000 VDC
> Safety
> Easy assembling

Check it out

> Need an enclosed switch? No problem with our specific product department. We have solutions for any requirement.

coff_380_a_1_cat

Conformity to standards

> IEC 60947-3
> UL508i[1]

(1) See UL version p. 26.

Approvals and certifications[1]

(1) Product reference on request.

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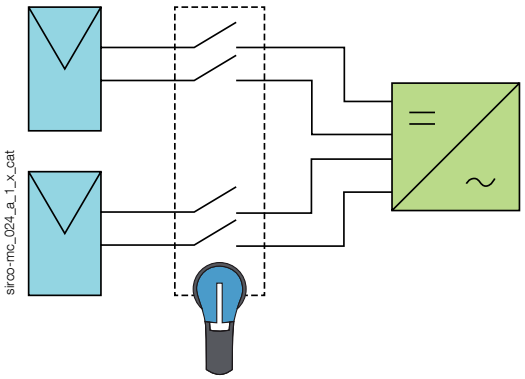
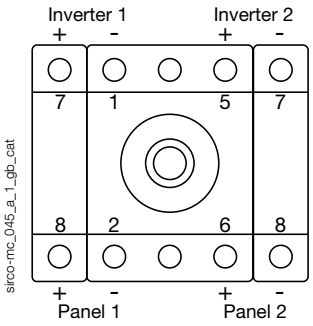
Multi-circuit switching

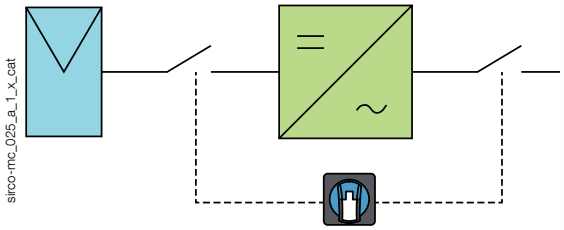
- The SIRCO MC PV for dual circuits (2 MPPT: Maximum Power Point Tracking) enables connection of two independent photovoltaic circuits to a single switch in order to reduce the costs of the global solution.

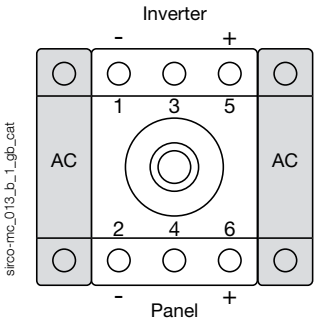




Completely isolate the inverter within one operation

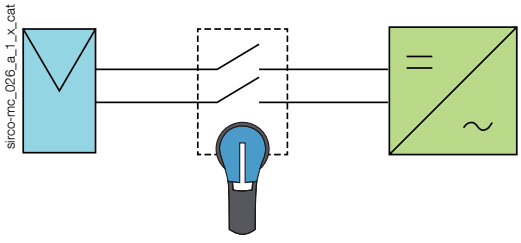
- The SIRCO MC PV with two additional AC poles can be integrated into the inverter to provide complete and simultaneous isolation of the PV and AC circuits. This improves safety and reduces the overall product size.

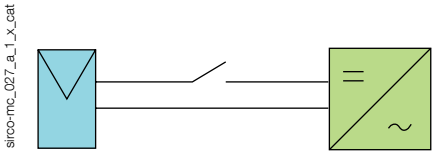




What you need to know

For grounded or ungrounded networks:
It is possible to use the SIRCO MC PV in both network systems, either switching one or both polarities.





References

SIRCO MC PV 600 VDC - DIN rail or back plate mounting

Rating (A)	Circuit type	Number of poles by PV polarity(3)	No of poles AC current	Switch body	Direct handle(1)	External handle	Shaft for external handle	Auxiliary contact
30 A	Single PV circuit	1 P+, 1 P-	-	21PV **2102**	MC0 type Blue 2119 **0012**(2) MC01 type Blue **2119 1012**	MC1 type Black IP65 2119 **3312**(2) Red / Yellow IP65 2119 **3313**	165 … 200 mm 2107 **0516**	1 contact NC+NO 2119 **0001**
	PV + AC circuit	1 P+, 1P-	2 P	21PV **2162**				
	Dual PV circuit	2 x (1P+, 1P-)	-	21PV **5102**				
40 A	Single PV circuit	2 P+, 1 P-	-	21PV **3124**				
	PV + AC circuit	2 P+, 1 P-	2 P	21PV **3184**				
	Dual PV circuit	2 x (1P+, 1P-)	-	21PV **6124**	MC01 type Blue 2119 **1412**			

(1) 45 mm modular DIN front plate included.
(2) Standard handle.
(3) Default connected device (see "Connection of poles" page 24).

SIRCO MC PV 1000 VDC - DIN rail or back plate mounting

Rating (A)	Circuit type	Number of poles by PV polarity(3)	No of poles AC current	Switch body	Direct handle(1)	External handle	Shaft for external handle	Auxiliary contact
25 A	Single PV circuit	2 P+, 1 P-	Please consult us	21PV **3722**	MC0 type Blue 2119 **0012**(2) MC01 type Blue 2119 **1012**	Black MC1 type IP65 2119 **3312**(2) Red / Yellow IP65 2119 **3313**	165 … 200 mm 2107 **0516**	1 contact NO + NC 2119 **0001**
	Dual PV circuit	2 x (1P+, 1P-)		21PV **6722**	MC01 type Blue 2119 **1412**			
40 A	Single PV circuit	2 P+, 2 P-		21PV **4754**	MC0 type Blue 2119 **0012**(2) MC01 type Blue 2119 **1012**			
	Dual PV circuit	2 x (2 P+, 2 P-)		21PV **8154**	MC01 type Blue 2119 **1412**			

(1) 45 mm modular DIN front plate included.
(2) Standard handle.
(3) Default connected device (see "Connection of poles" page 24).

SIRCO MC PV 600 VDC - Door mounting

Rating (A)	Circuit type	Number of poles by PV polarity(1)	No of poles AC current	Switch body(3)	External handle(3)	Switch body "Quick Fix"	External handle "Quick Fix"	Auxiliary contact
30 A	Single PV circuit	1 P+, 1 P-	-	21PV **2202**	MC2 type Blue IP55 2129 **0112**(2)	21PV **2302**	MC3 type Blue IP65 2139 **1212**(2) MC4 type Black IP65 2139 **3312** Red/Yellow IP65 2139 **3313**	1 contact NC+NO 2129 **0001**
	PV + AC circuit	1 P+, 1 P-	2 P	21PV **2262**		21PV **2362**		
	Dual PV circuit	2 x (1P+, 1P-)	-	21PV **5202**		21PV **5302**		
40 A	Single PV circuit	2 P+, 1 P-	-	21PV **3224**		21PV **3324**		
	PV + AC circuit	2 P+, 1 P-	2 P	21PV **3284**		21PV **3384**		

(1) Default connected device (see "Connection of poles" page 24).
(2) Standard handle.
(3) Door mounted standard.

SIRCO MC PV 1000 VDC - Door mounting

Rating (A)	Circuit type	Number of poles by PV polarity(1)	No of poles AC current	Switch body(3)	External handle(3)	Switch body "Quick Fix"	External handle "Quick Fix"	Auxiliary contact
25 A	Single PV circuit	2 P+, 1 P-	Please consult us	21PV **3822**	MC2 type Blue IP55 2129 **0112**	21PV **3922**	MC3 type Blue IP65 2139 **1212**(2) MC4 type Black IP65 2139 **3312** Red/Yellow IP65 2139 **3313**	1 contact NC+NO 2129 **0001**
40 A	Single PV circuit	2 P+, 2 P-		21PV **4854**		21PV **4954**		

(1) Default connected device (see "Connection of poles" page 24).
(2) Standard handle.
(3) Door mounted standard.

Accessories

Direct operation handle

Use

The direct operation conversion kit requires an additional 4 mm distance on each side of the 2 and 3 pole device.

Rating (A)	Handle colour	Type of locking	Handle	45 mm modular DIN front plate	Reference
25 … 40	Blue	-	MC0 type	yes	2119 **0012**(1)
25 … 40	Blue	1 padlock Ø 5 mm	MC01 type	yes	2119 **1012**

(1) Standard handle.

MC0 handle

acces_305_a_1_cat

2 MPPT 600 V

Rating (A)	Handle colour	Type of locking	Handle	45 mm modular DIN front plate	Reference
30	Blue	-	MC0 type	yes	2119 **0012**
30	Blue	1 padlock Ø 5 mm	MC01 type	yes	2119 **1012**
40	Blue	1 padlock Ø 5 mm	MC01 type	yes	2119 **1412**

MC01 handle

acces_293_a_1_cat

2 MPPT 1000 V

Rating (A)	Handle colour	Type of locking	Handle	45 mm modular DIN front plate	Reference
25 … 40	Blue	1 padlock Ø 5 mm	MC01 type	yes	2119 **1412**

Door interlocked external operation handle

Use

The external control will allow the operator to safely disconnect and isolate the solar strings prior to any intervention.

External controls are user-friendly and adapted to meet requirements of residential installations, large roofs and ground-based generators.

S000 handle

acces_307_a_1_cat

DIN-rail or back plate mounting

Rating (A)	Handle	Handle colour	Type of locking	External IP(1)	Reference
25 … 40	MC1 type	Black	3 padlocks Ø9 mm	IP65	2119 **3312**(2)(3)
25 … 40	MC1 type	Red/Yellow	3 padlocks Ø9 mm	IP65	2119 **3313**(3)
25 … 40	S000 type	Black	3 padlocks Ø6 mm	IP55	1461 **5111**
25 … 40	S000 type	Black	3 padlocks Ø6 mm	IP65	1463 **5111**
25 … 40	S000 type	Red/Yellow	3 padlocks Ø6 mm	IP65	1464 **5111**

(1) IP: protection degree according to IEC 60529 standard.
(2) Standard handle.
(3) No padlocking.

MC4 handle

acces_302_a_1_cat

Door mounting

Rating (A)	Handle	Handle colour	Type of locking	External IP(1)	Reference
25 … 40	MC2 type	Blue	-	IP55	2129 **0112**(2)

(1) IP: protection degree according to IEC 60529 standard.
(2) Standard handle

MC2 handle

acces_306_a_1_cat

"Quick Fix" door mounting

Rating (A)	Handle	Handle colour	Type of locking	External IP(1)	Reference
25 … 40	MC3 type	Blue	1 padlock Ø5 mm	IP65	2139 **1212**(2)
25 … 40	MC4 type	Black	3 padlocks Ø9 mm	IP65	2139 **3312**
25 … 40	MC4 type	Red/Yellow	3 padlocks Ø9 mm	IP65	2139 **3313**

Shaft for external handle

Use

MC1 and S000 shafts can be adjusted and cut depending on the need.

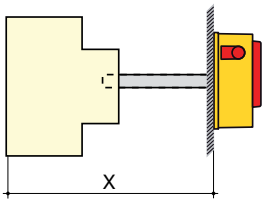
Shaft length

MC1 type:
- 165 mm (ajustable up to 177 mm)

S000 type:
- 150 mm
- 200 mm
- 320 mm

acces_297_a_1_cat

S000 type shaft



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DIN-rail or back plate mounting

Rating (A)	Handle	Dimension X (mm)	Length (mm)	Reference
25 … 40	MC1 type	249 … 259	165	2107 **0516**
25 … 40	S000 type	234 … 246	150	2107 **0515**
25 … 40	S000 type	284 … 496	200	2107 **0520**
25 … 40	S000 type	404 … 416	320	2107 **0532**

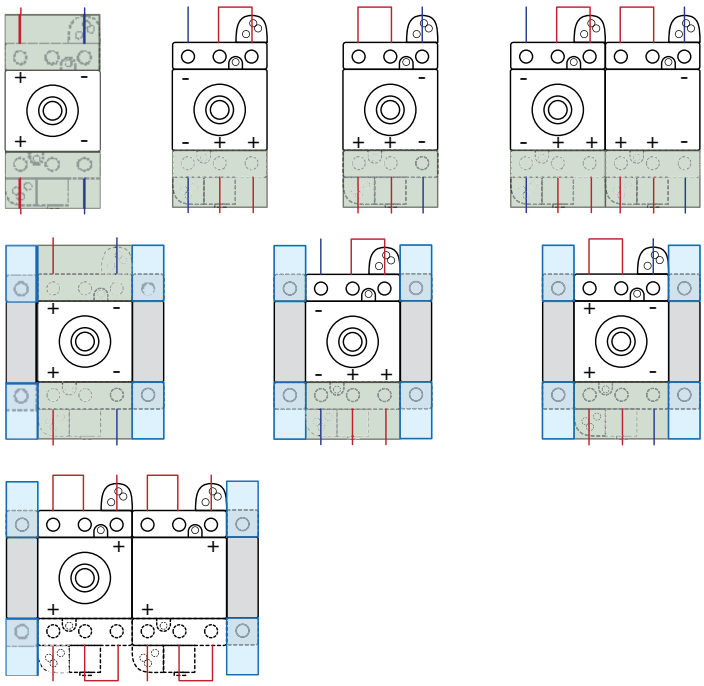
Terminal shrouds

Use

Top or bottom protection against direct contact with the terminals or connection parts.
1 and 3 poles are available.
The SIRCO MC PV load break switch is pre-bridged. Terminal covers are mounted on the top or bottom free space of the device.
Possibility to assemble a terminal shroud on the bridge side by removing the insulating material of the series connection bar (irreversible step).

For SIRCO MC PV

Rating (A)	Type of mounting	No. of poles	Position	Reference
25 … 40	rail / door mounting	1 P	top or bottom	2194 **1004**
25 … 40	rail / door mounting	3 P	top or bottom	2194 **3004**



sirco-mc_011_e_1_cat

acces_299_a_1_cat

Terminal shrouds 1 pole

acces_300_a_1_cat

Terminal shrouds 3 pole

Accessories (continued)

Auxiliary contact

Use

These auxiliary contacts signalling position 0 and 1 can be normally open or normally closed contacts. They can be fixed on the left or right side of the switch body and/or on the power additional pole.

Connections

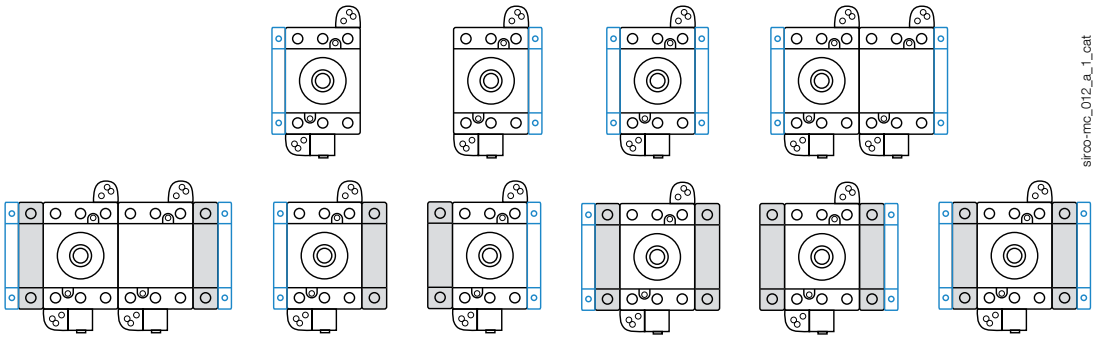
Min./max cross-sections: 1 mm²/4 mm²
Tightening torque: 0.6 Nm

Rating (A)	Type of mounting	Contact(s)	Contact type	Reference
25 … 40	DIN-rail / back plate mounted	1 contact	NO + NC	2119 **0001**
25 … 40	Door mounted	1 contact	NO + NC	2129 **0001**

Characteristics according to IEC 60947-5-1

Rating (A)	Contact type	Thermal current I_{th} (A)	Operating current I_e (A) 230 VAC AC-15	400 VAC AC-15	690 VAC AC-15
25 … 40	NO + NC	16	6	4	2

Auxiliary contacts configurations



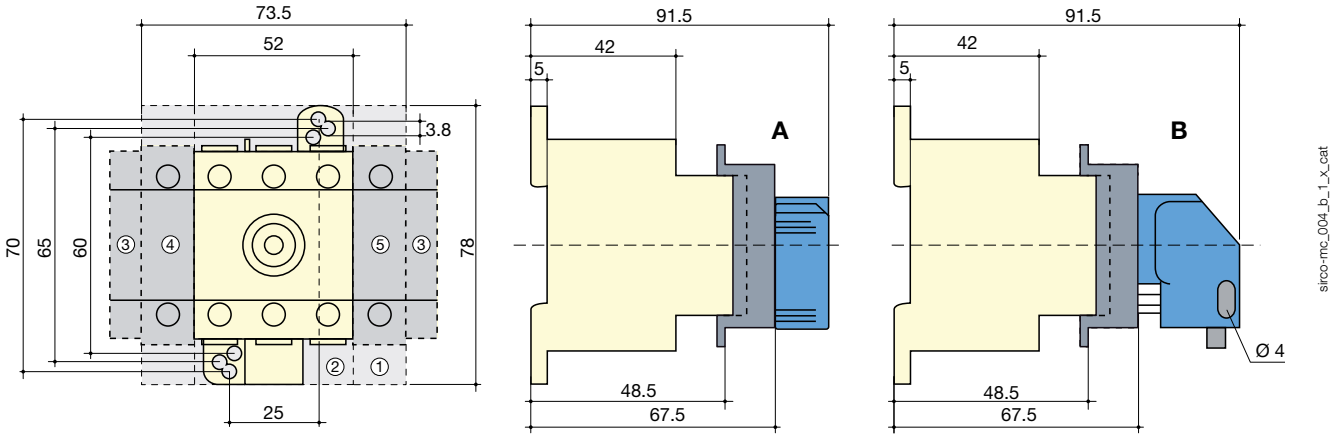
Characteristics according to IEC 60947-3

25 to 40 A

Rated current					25 A	30 A	40 A
Thermal current I_{th} at 40°C (A)					**25**	**30**	**40**
Thermal current at 50°C (A)					**25**	**30**	**40**
Thermal current at 60°C (A)					**25**	**30**	**40**
Rated insulation voltage U_i (V)					1000	1000	1000
Rated impulse withstand voltage U_{imp} (kV)					8	8	8
Rated operational currents I_e (A)							
Rated voltage	**Utilisation category**	**Circuit type**	**Number of poles of the device**	**Number of pole(s) in series per polarity**	**(A)**	**(A)**	**(A)**
600 VDC	DC-21 B	Single PV circuit	2 P	1 P+ and 1 P-	-	30	-
600 VDC	DC-21 B	Single PV circuit	3 P	2 P + and 1 P -	-	-	40
600 VDC	DC-21 B	Dual PV circuit	4 P	2 x (1 P+ and 1 P-)	-	30	-
600 VDC	DC-21 B	Dual PV circuit	6 P	2 x (2 P+ and 1 P-)	-	-	40
1000 VDC	DC-21 B	Single PV circuit	3 P	2 P + and 1 P -	25	-	-
1000 VDC	DC-21 B	Single PV circuit	4 P	2 P + and 2 P -	-	-	40
1000 VDC	DC-21 B	Dual PV circuit	6 P	2 x (2 P+ and 1 P-)	25	-	-
1000 VDC	DC-21 B	Dual PV circuit	8 P	2 x (2 P+ and 2 P-)	-	-	40
Connection							
Minimum Cu cable cross-section					1.5	1.5	1.5
Maximum Cu cable cross-section (mm²)					10	10	10
Tightening torque mini / maxi (Nm)					2	2	2
Mechanical characteristics							
Durability (number of operating cycles)					30000	30000	30000
Operating torque (Nm)					0.8	0.8	0.8
Weight of a 2 pole PV device (kg)					0.110	0.110	-
Weight of a 3 pole PV device (kg)					0.125	0.125	0.125
Weight of a 2 pole PV and 2 pole AC device (kg)					0.180	0.180	-
Weight of a 3 pole PV and 2 pole AC device (kg)					-	-	0.195
Weight of a 4 pole PV device (kg)					-	-	0.160
Weight of a 4 pole PV device, dual PV circuit (kg)					0.145	0.145	-
Weight of a 6 pole PV device, dual PV circuit (kg)					-	-	0.250
Weight of an 8 pole PV device, dual PV circuit (kg)					-	-	0.320

Dimensions

DIN-rail mounting - Direct operation

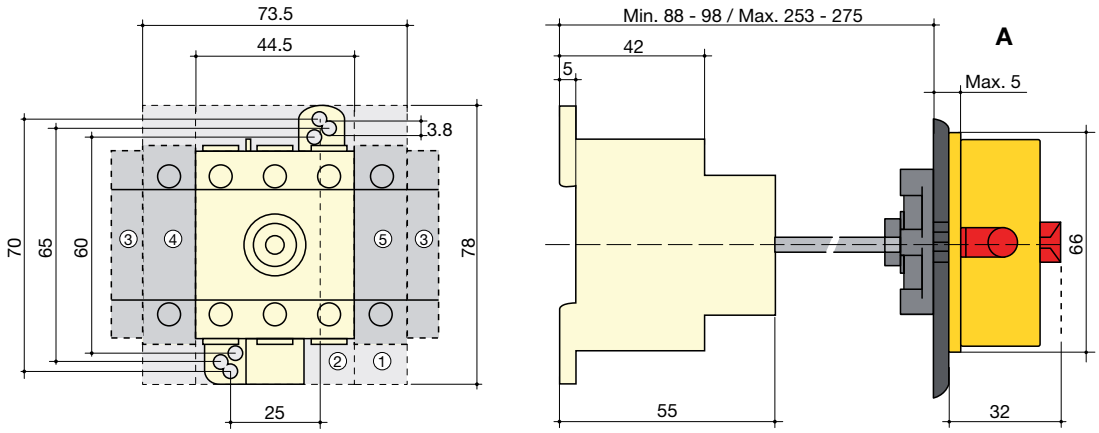


sirco-mc_004_b_1_x_cat

1. Terminal shrouds 1P.
2. Terminal shrouds 3P.
3. Auxiliary contact.
4. AC power pole.
5. AC or PV power pole.

A. MC0 handle.
B. MC01 handle.

DIN-rail mounting - External operation

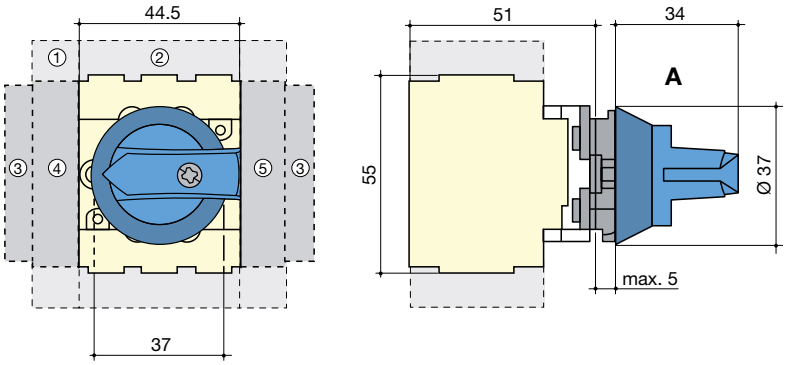


sirco-mc_005_b_1_x_cat

1. Terminal shrouds 1P.
2. Terminal shrouds 3P.
3. Auxiliary contact.
4. AC power pole.
5. AC or PV power pole.

A. MC1 handle.

Door mounting



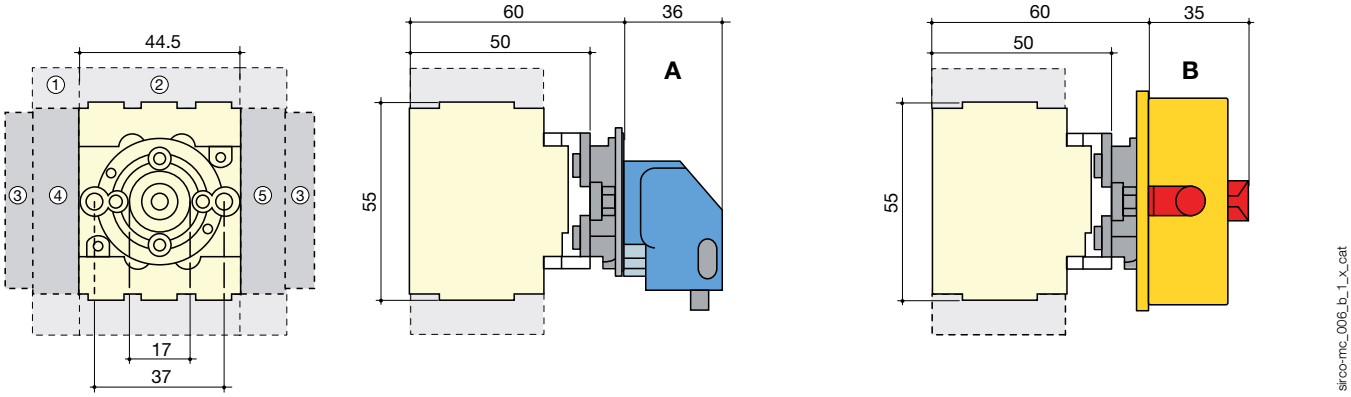
sirco-mc_007_b_1_x_cat

1. Terminal shrouds 1P.
2. Terminal shrouds 3P.
3. Auxiliary contact.
4. AC power pole.
5. AC or PV power pole.

A. MC2 handle.

Dimensions

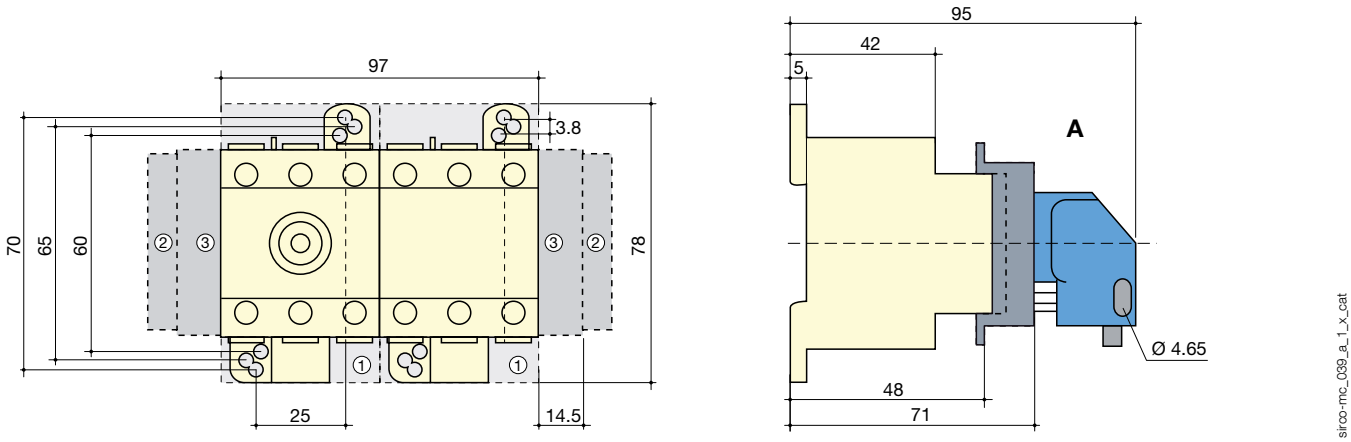
"Quick Fix" door mounting



1. Terminal shrouds 1P.
2. Terminal shrouds 3P.
3. Auxiliary contact.
4. AC power pole.
5. AC or PV power pole.

A. MC3 handle.
B. MC4 handle.

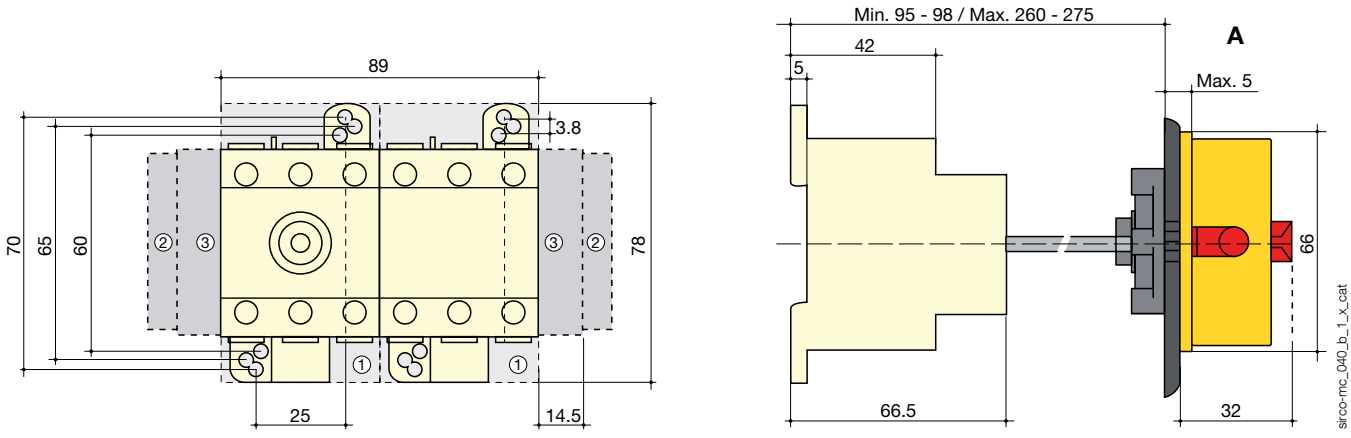
2 MPPT - 40 A - 600 VDC and 25 and 40 A - 1000 VDC - DIN-rail mounting - Direct operation



1. Terminal shrouds 3P.
2. Auxiliary contact.
3. PV power pole.

A. MC01 handle.

DIN-rail mounting - External operation

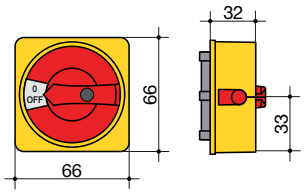
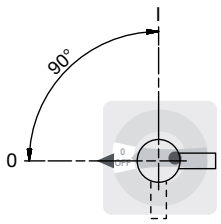
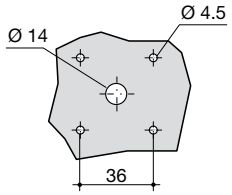
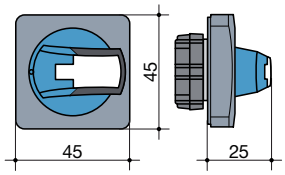
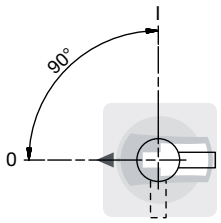
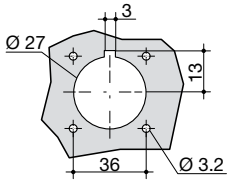


1. Terminal shrouds 3P.
2. Auxiliary contact.

A. MC1 handle.

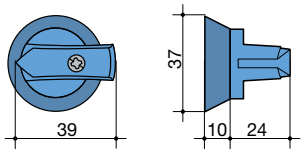
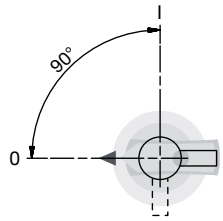
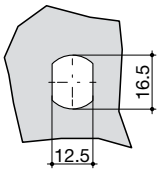
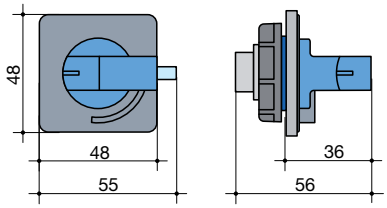
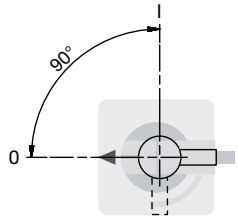
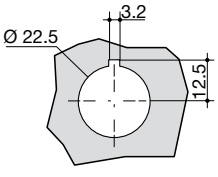
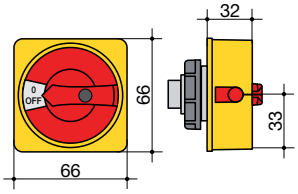
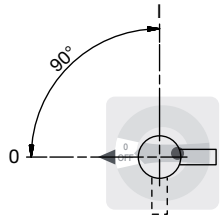
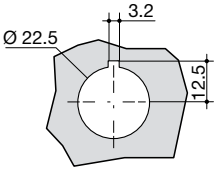
Dimensions for external handles

DIN-rail or back plate mounting

Handle type	Front operation Direction of operation	Door drilling
MC1 type 		
S000 type 		

poign_006_a_1_gb_cat

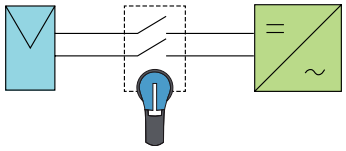
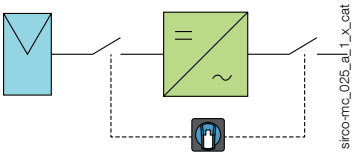
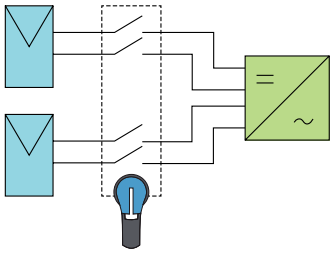
Door mounting

Handle type	Front operation Direction of operation	Door drilling
MC2 type 		
MC3 type Quick Fix 		
MC4 type Quick Fix 		

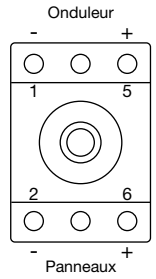
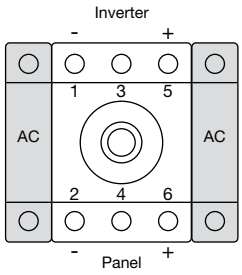
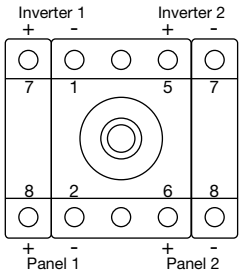
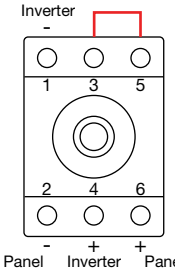
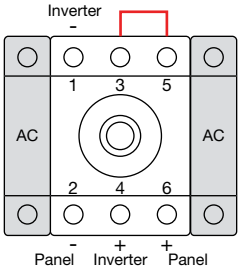
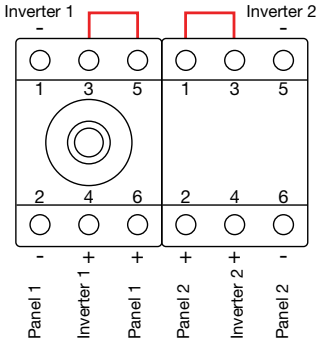
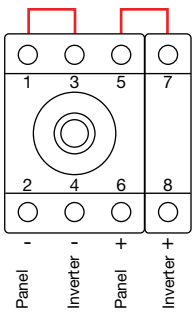
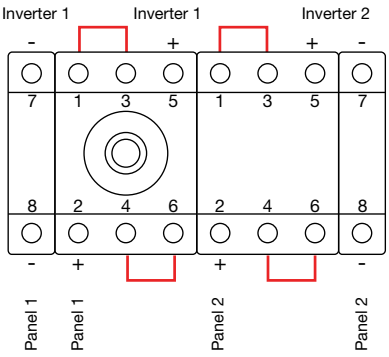
poign_007_a_1_gb_cat

Poles connections

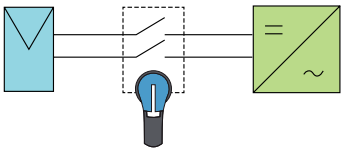
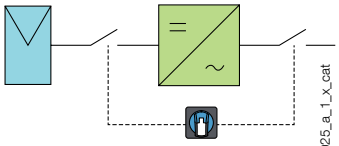
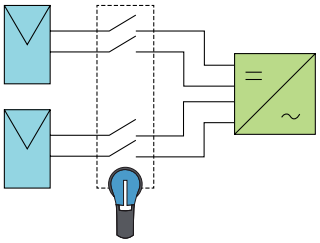
Switching of polarities + and -

Single PV circuit	PV and AC circuit	Dual PV circuit
 sirco-mc_026_a_1_x_cat	 sirco-mc_025_a_1_x_cat	 sirco-mc_024_a_1_x_cat

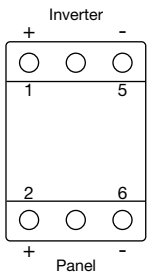
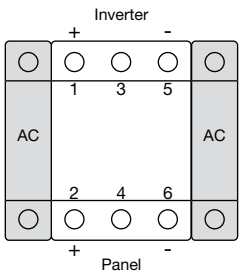
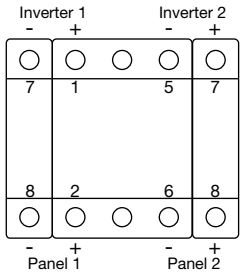
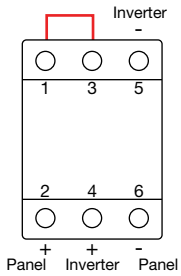
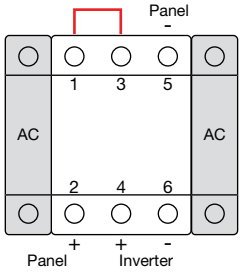
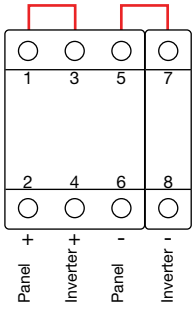
Direct operation

Rating	Single PV circuit	PV and AC circuit	Dual PV circuit
25 A - 600 VDC	21PV **2102**  sirco-mc_044_a_1_gb_cat	21PV **2162**  sirco-mc_013_a_1_gb_cat	21PV **5102**  sirco-mc_045_a_1_gb_cat
40 A - 600 VDC 25 A - 1000 VDC	21PV **3124** 21PV **3722**  sirco-mc_046_a_1_gb_cat	21PV **3184**  sirco-mc_009_a_1_gb_cat	21PV **6124** 21PV **6722**  sirco-mc_047_b_1_gb_cat
40 A - 1000 VDC	21PV **4754**  sirco-mc_048_a_1_gb_cat		21PV **8154**  sirco-mc_065_a_1_gb_cat

Switching of polarities + and -

Single PV circuit	PV and AC circuit	Dual PV circuit
		

Door mounting

Rating	Single PV circuit	PV and AC circuit	Dual PV circuit
25 A - 600 VDC	21PV **2202** 21PV **2302** 	21PV **2262** 21PV **2362** 	21PV **5202** 21PV **5302** 
40 A - 600 VDC 25 A - 1000 VDC	21PV **3224** 21PV **3324** 21PV **3822** 21PV **3922** 	21PV **3284** 21PV **3384** 	
40 A - 1 000 VDC	21PV **4854** 21PV **4954** 		

SIRCO MC PV UL508i

Load break switches for photovoltaic applications
from 25 to 45 A, up to 1000 VDC

new

siroo-mc_002_a_1_cat

***SIRCO MC PV** 25 A - 1000 VDC*
DIN-rail mounting

The solution for

> Residential
> Buildings
> Solar parks

Strong points

> Compact
> High breaking capacity up to 1000 VDC
> Safety
> Easy mounting

Conformity to standards

> UL508i
> IEC 60947-3

Approvals and certifications(1)

(1) Product reference on request.

Function

SIRCO MC PV are DC load break switches. They make and break under load conditions and provide optimum safety isolation for any PV circuit.

Advantages

Compact

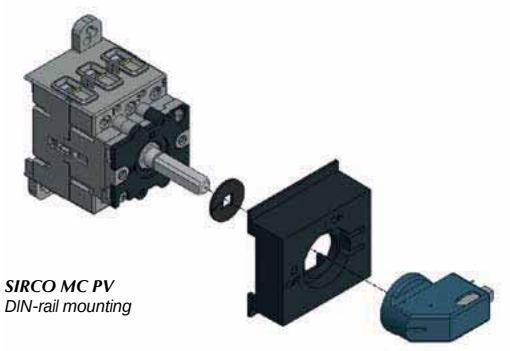
Thanks to its compact design, the space needed within the combiner box or the solar inverter is greatly reduced.

High breaking capacity up to 1000 VDC

- Making and breaking capacity under load conditions up to 1000 VDC.
- Specific photovoltaic test beyond requirements of UL508i and IEC 60947-3 standard.

Safety

- Bridging bars are factory fitted for easier, quicker and safer connection.
- Direct access to connection terminals for adequate tightening.

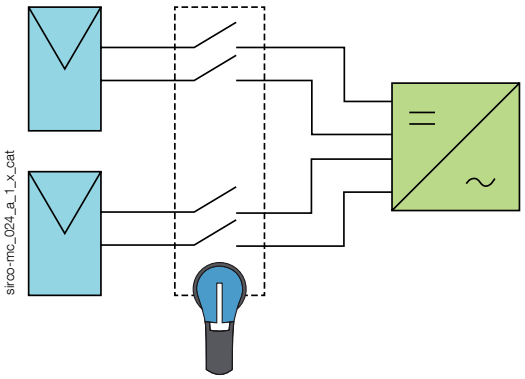


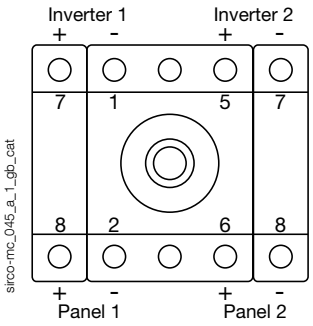
SIRCO MC PV
DIN-rail mounting

socomec
Innovative Power Solutions

Multi-circuit switching

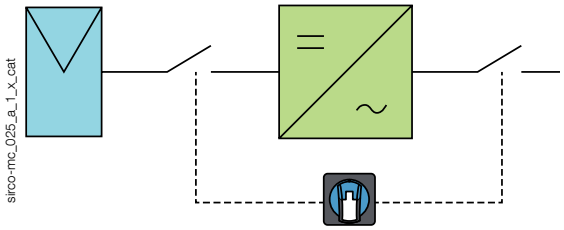
- The SIRCO MC PV for dual circuits (2 MPPT: Maximum Power Point Tracking) enables connection of two independent photovoltaic circuits to a single switch in order to reduce the costs of the global solution.

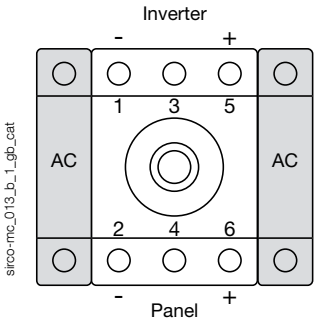




Completely isolate the inverter within one operation

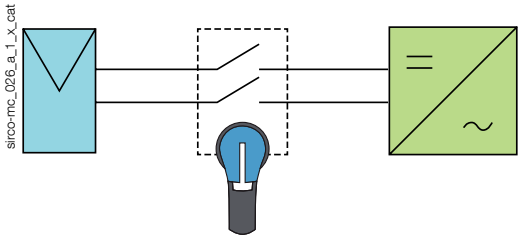
- The SIRCO MC PV with two additional AC poles can be integrated into the inverter to provide complete and simultaneous isolation of the PV and AC circuits. This improves safety and reduces the overall product size.

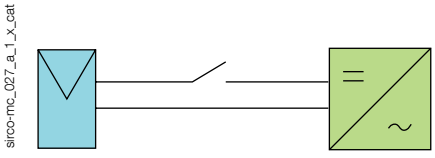




What you need to know

For grounded or ungrounded networks:
It is possible to use the SIRCO MC PV in both network systems, either switching one or both polarities.





References

SIRCO MC PV 600 VDC

Rating (A)	Circuit type	No. of poles	Switch body	Direct handle	External handle	Shaft for external handle	Auxiliary contact
25 A	Single PV circuit	2 P	21PV **2102-UL**	MC01 type Blue 2119 **1012**	S00 type Black 4.4X 147D **0111**(1) Red 4.4X 147R **0111**(1)	S00 type 265 mm 2107 **0517**	1 contact NC+NO 2110 **0001**
	Dual PV circuit	4 P	21PV **5102-UL**				
45 A	Single PV circuit	4 P	21PV **4144**				
	Dual PV circuit	8 P	21PV **8144**	MC01 type Blue 2119 **1412**			

(1) Door interlocking.

SIRCO MC PV 1000 VDC

Rating (A)	Circuit type	No. of poles	Switch body	Direct handle	External handle	Shaft for external handle	Auxiliary contact
32 A	Single PV circuit	4 P	21PV **4144**	MC01 type Black 2119 **1012**	S00 type Black 4.4X 147D **0111**(1) Red 4.4X 147R **0111**(1)	S00 type 265 mm 2107 **0517**	1 contact NC+NO 2110 **0001**
	Dual PV circuit	8 P	21PV **8144**	MC01 type Black 2119 **1412**			

(1) Door interlocking.

Accessories

Direct operation handle

Use

The direct operation conversion kit requires an additional 4 mm distance on each side of the 2 and 3 pole device.

Rating (A)	Handle colour	Type of locking	Handle type	45 mm modular DIN front plate	Reference
25 … 45	Blue	-	MC0	yes	2119 **0012**(1)
25 … 45	Blue	1 padlock Ø 5 mm	MC01	yes	2119 **1012**

(1) Standard handle.

MC0 handle

acces_305_a_1_cat

2 MPPT 600 V

Rating (A)	Handle colour	Type of locking	Handle type	45 mm modular DIN front plate	Reference
25	Blue	-	MC0	yes	2119 **0012**
25	Blue	1 padlock Ø 5 mm	MC01	yes	2119 **1012**
45	Blue	1 padlock Ø 5 mm	MC01	yes	2119 **1412**

MC01 handle

acces_293_a_1_cat

External operation handle

Use

The external control will allow the operator to safely disconnect and isolate the solar strings prior to any intervention.

External controls are user-friendly and adapted to meet requirements of residential installations, large roofs and ground-based generators.

acces_341_a_1_cat

S00 handle

acces_302_a_1_cat

MC1 handle

DIN-rail or back plate mounting

Rating (A)	Handle type	Handle colour	Type of locking	Protection degree(1)	Reference
25 … 45	MC1	Black	3 padlocks Ø 9 mm	4.4X	2119 **3312**
25 … 45	MC1	Red/Yellow	3 padlocks Ø 9 mm	4.4X	2119 **3313**
25 … 45	S00	Black	3 padlocks Ø 8 mm	4.4X	147D **0111**
25 … 45	S00	Red/Yellow	3 padlocks Ø 8 mm	4.4X	147R **0111**

(1) NEMA protection degree.

Shaft for external handle

Use

The shaft can be adjusted and cut depending on the need.

Shaft length

Device + shaft:
- 265 mm

acces_297_a_1_cat

DIN-rail or back plate mounting

Rating (A)	Device + shaft Length (mm)	Reference
25 … 45	265	2107 **0517**(1)

(1) Shaft for door interlocking.

Terminal shrouds

Use

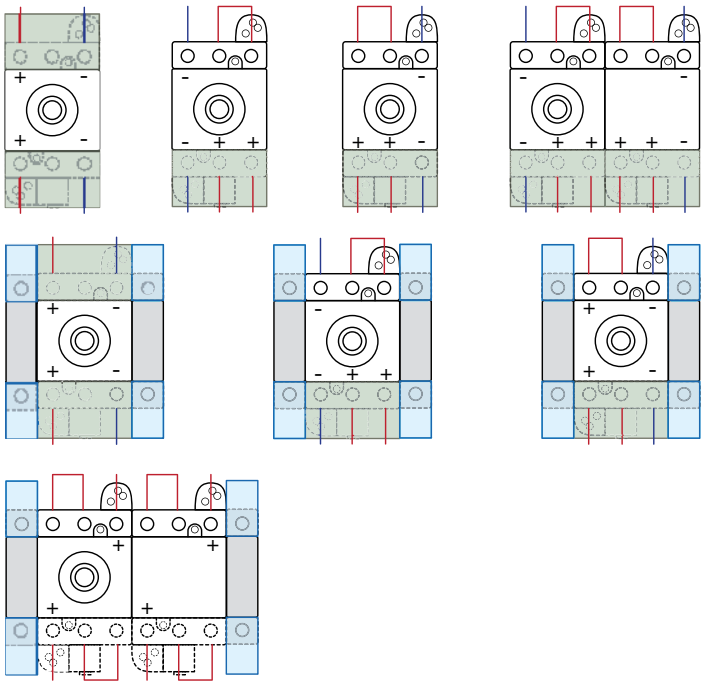
Top or bottom protection against direct contact with the terminals or connection parts. 1 and 3 poles are available.

The SIRCO MC PV load break switch is pre-bridged. Terminal covers are mounted on the top or bottom free space of the device.

Possibility to assemble a terminal shroud on the bridge side by removing the insulating material of the series connection bar (irreversible step).

For SIRCO MC PV

Rating (A)	Type of mounting	No. of poles	Position	Reference
25 … 45	DIN-rail	1 P	top or bottom	2194 **1004**
25 … 45	DIN-rail	3 P	top or bottom	2194 **3004**



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acces_299_a_1_cat

Terminal shrouds 1 pole

acces_300_a_1_cat

Terminal shrouds 3 pole

Characteristics

as per standard UL508i

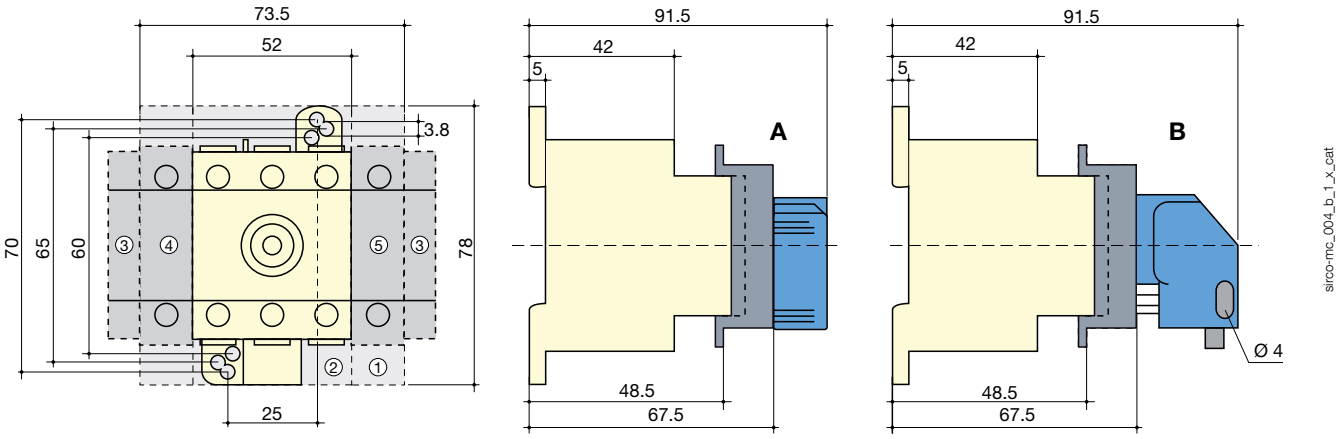
			25 A	45 A
General use rating with 200% overload extra test				
Rated voltage	**Number of poles of the device**	**Number of PV circuits**	**(A)**	**(A)**
600 VDC	2 P	1	25	-
600 VDC	4 P	1	-	45
600 VDC	2 x 2 P	2	25	-
600 VDC	2 x 4 P	2	-	45
1000 VDC	4 P	1	-	32
1000 VDC	2 x 4 P	2	-	32
Short-circuit capacity at 600 VDC				
Prospective short-circuit current (kA rms)			5	5
Type of fuse			gPV	gPV
Associated fuse rating (A)			25	80
Short-circuit capacity at 1000 VDC				
Prospective short-circuit current (kA rms)			5	5
Connection terminals				
Min. connection wire range / AWG (solid or stranded)			14-7	14-3
Mechanical characteristics				
Durability (number of operating cycles)			30 000	30 000
Tightening torque (Nm)			2	2

as per standard IEC 60947-3

Rated current			**25 A**	**45 A**
Thermal current I_{th} at 40°C (A)			**25**	**45**
Thermal current at 50°C (A)			**25**	**45**
Thermal current at 60°C (A)			**25**	**45**
Rated insulation voltage U_i (V)			1000	1000
Rated impulse withstand voltage U_{imp} (kV)			8	8
Rated operational currents I_e (A)				
Rated voltage	**Number of poles of the device**	**Number of PV circuits**	**(A)**	**(A)**
600 VDC	2 P	1	30	-
600 VDC	4 P	1	-	40
600 VDC	2 x 2 P	2	30	-
600 VDC	2 x 4 P	2	-	40
1000 VDC	2 P	1	10	-
1000 VDC	4 P	1	-	40
1000 VDC	2 x 2 P	2	10	-
1000 VDC	2 x 4 P	2	-	40

Dimensions

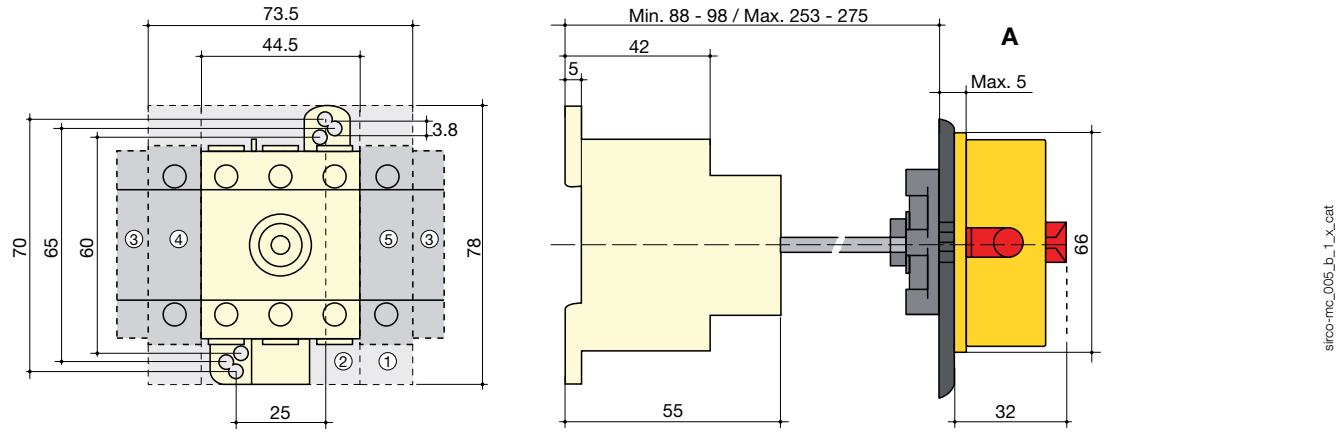
DIN-rail mounting - Direct operation



1. Terminal shrouds 1P.
2. Terminal shrouds 3P.
3. Auxiliary contact.
4. AC power pole.
5. AC or PV power pole.

A. MC0 handle
B. MC01 handle

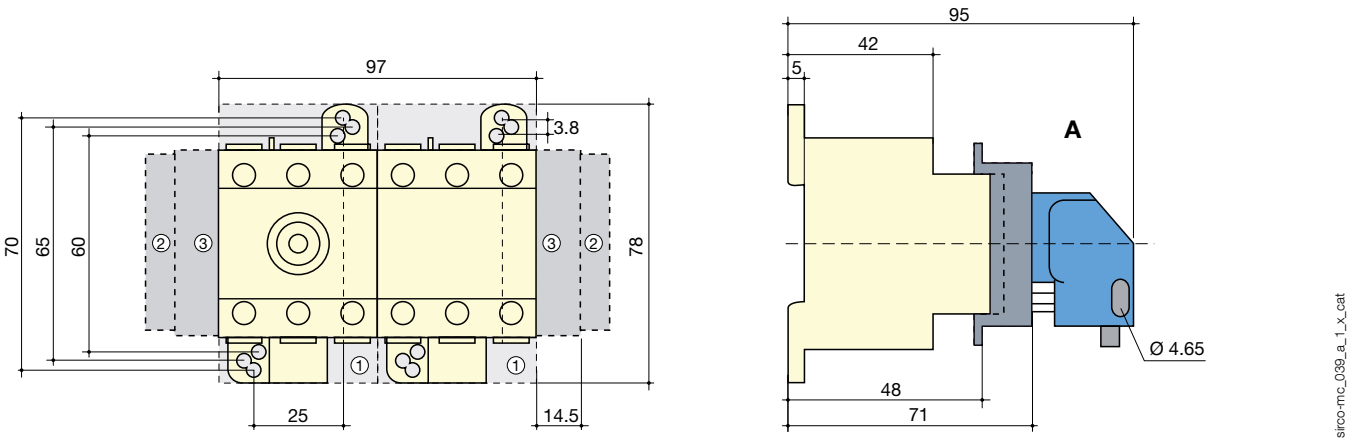
DIN-rail mounting - External operation



1. Terminal shrouds 1P.
2. Terminal shrouds 3P.
3. Auxiliary contact.
4. AC power pole.
5. AC or PV power pole.

A. MC1 handle

2 MPPT - 45 A - 600 VDC and 32 A - 1000 VDC - DIN-rail mounting - Direct operation

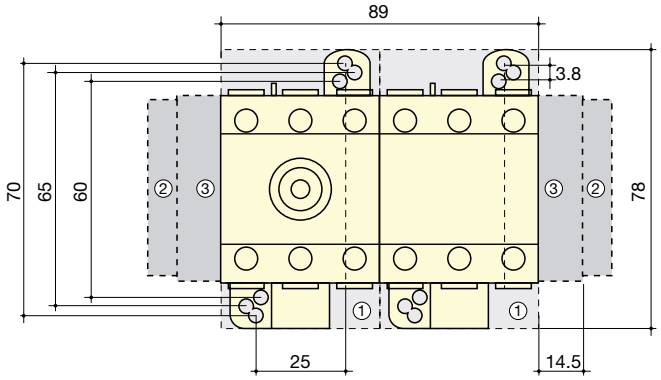


1. Terminal shrouds 3P.
2. Auxiliary contact.
3. PV power pole.

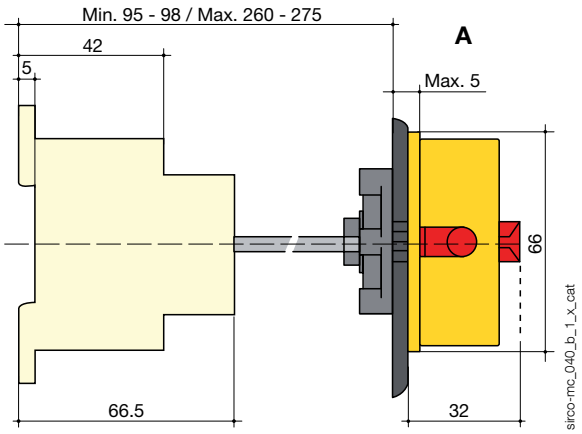
A. MC01 handle.

Dimensions (continued)

DIN-rail mounting - External operation



1. Terminal shrouds 3P.

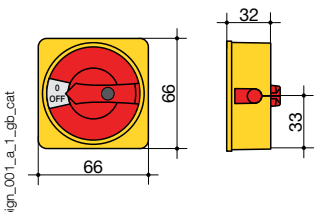
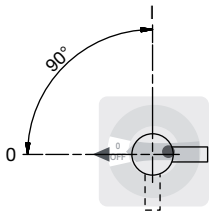
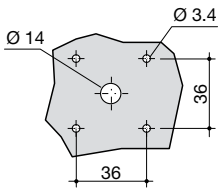


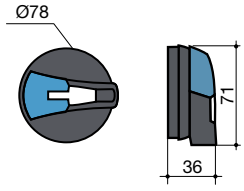
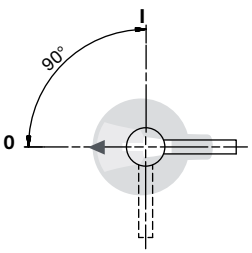
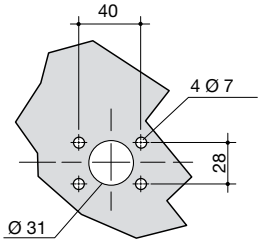
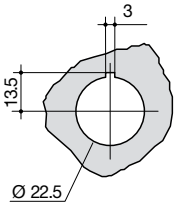
2. Auxiliary contact.

A. MC1 handle.

Dimensions for external handles

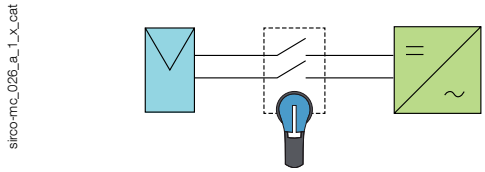
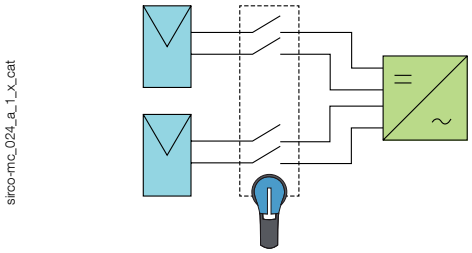
DIN-rail or back plate mounting

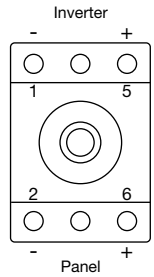
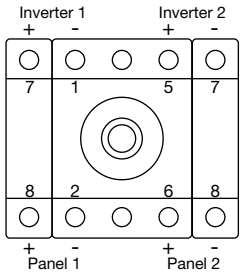
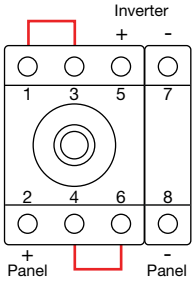
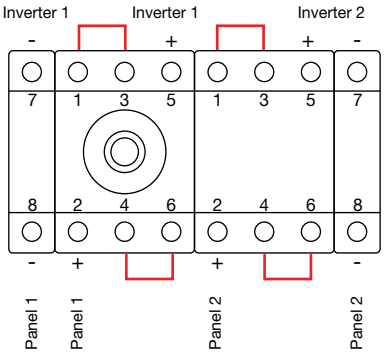
Handle type	Front operation Direction of operation	Door drilling
MC1 type 		

Handle type	Front operation Direction of operation	Door drilling
S00 type 		With 4 fixing screws  With fixing nut 

Poles connections

Switching of polarities + and - (1)

	Single PV circuit	Dual PV circuit
	 sirco-mc_026_a_1_x_cat	 sirco-mc_024_a_1_x_cat

Rating	Single PV circuit	Dual PV circuit
25 A - 600 VDC	21PV **2102-UL**  sirco-mc_044_a_1_gb_cat	21PV **5102-UL**  sirco-mc_045_a_1_gb_cat
45 A - 600 VDC 32 A - 1000 VDC	21PV **4144**  sirco-mc_083_a_1_gb_cat	21PV **8144**  sirco-mc_065_a_1_gb_cat

(1) For grounded systems, single polarity switching, a bridge shall be added.

SIRCO MV PV

Load break switches for photovoltaic applications

for use up to 1000 VDC from 63 to 80 A

***SIRCO MV PV** 1000 V - 80 A*
direct operation

The solution for

- Residential buildings
- Buildings
- Solar parks

Strong points

- Modular device
- Patented switching technology
- Performance - 1000 VDC

Conformity to standards

- IEC 60947-3
- IEC 60364-4-410
- IEC 60364-7-712

Approvals and certifications(1)

(1) Product reference on request.

Function

SIRCO MV PV are manually operated multipolar load break switches. They make and break under load conditions and provide optimum safety isolation for any PV circuit.

Advantages

Modular device

SIRCO MV PV are devices which are DIN rail or backplate mountable and can be integrated into a modular panel with a 45 mm front cut-out.

Patented switching technology

SIRCO MV PV with benefit from proven breaking technology based on a system of double break contacts with arc extinguishing chambers.

References

SIRCO MV PV 1000 VDC - DIN rail or back plate mounting

Rating (A)	Circuit type	No. of poles	Switch body	Direct handle	External front handle	Shaft for external front handle	Auxiliary contact	Bridging bar
63 A	Single PV circuit	4 P	22PV **4106**	M0b type Blue 2299 **5042**(1) M0 type Blue 2299 **5022**	S0 type Black IP55 1491 **0111**(1)(2) Black IP65 1493 **0111**(2) Red / Yellow IP65 1494 **0111**(2) S1 type Black IP55 1411 **2111**(2) Black IP65 1413 **2111**(2) Red / Yellow IP65 1414 **2111**(2)	S0 type 150 mm 1409 **0615** 200 mm 1409 **0620** 320 mm 1409 **0632** S1 type 200 mm 1401 **0620** 320 mm 1401 **0632** 400 mm 1401 **0640**	1 contact NC+NO 2299 **0001**(3) 1 contact 2 NC 2299 **0011**(3) 1 contact NO 3999 **0701** 1 contact NC 3999 **0702**	2 pieces 2209 **2016**
80 A		4 P	22PV **4108**					

(1) Standard.
(2) Defeatable handle.
(3) Signalling contact only.

Accessories

Direct operation handle

M0b type direct operation handle		
Rating (A)	**Handle colour**	**Reference**
63 ... 80	Blue	2299 **5042**(1)

(1) Standard.

Compact M0 type direct operation handle		
Rating (A)	**Handle colour**	**Reference**
63 ... 80	Blue	2299 **5022**

M0b handle

M0 handle

Accessories

Door interlocked external operation handle

Use

Door interlocked external operation handles include an escutcheon, are padlockable and must be utilised with an extension shaft.

In a combiner box, located close to the solar cell strings, or located close to the inverter, we recommend to use a door interlocked external handle for safety.

Example

The locking function of the enclosure in the "ON" position will force the operator to safely disconnect and isolate the solar cell strings prior to any intervention.

Opening the door when the switch is on "ON" position is possible by defeating the interlocking function with the use of a tool (authorised persons only). The interlocking function is restored when the door is re-closed.

acces_343_a

S0 type handle

acces_149_a_1_cat

S1 type handle

S0 type handle - Front operation I - 0

Rating (A)	Handle type	Handle colour	External IP[1]	Reference
63 ... 80	S0	Black	IP55	1491 **0111**[2]
63 ... 80	S0	Black	IP65	1493 **0111**[2]
63 ... 80	S0	Red/Yellow	IP65	1494 **0111**[2]

S1 type handle - Front operation I - 0

Rating (A)	Handle type	Handle colour	External IP[1]	Reference
63 ... 80	S1	Black	IP55	1411 **2111**[2]
63 ... 80	S1	Black	IP65	1413 **2111**[2]
63 ... 80	S1	Red/Yellow	IP65	1414 **2111**[2]

(1) IP: protection degree according to IEC 60529 standard.
(2) Defeatable handle.

Shaft for external handle

Use

Standard lengths:
- 150 mm
- 200 mm
- 320 mm
- 400 mm

Other lengths: please consult us.

acces_280_a_2_cat

Shaft for S0 type handle for SIRCO MV PV 63 ... 80 A

acces_369_a_1_cat

Shaft for S1 type handle for SIRCO MV PV 63 ... 80 A

For SIRCO MV PV

Rating (A)	Handle type	Length (mm)	Reference
63 ... 80	S0	150 mm	1409 **0615**
63 ... 80	S0	200 mm	1409 **0620**
63 ... 80	S0	320 mm	1409 **0632**
63 ... 80	S1	200 mm	1401 **0620**
63 ... 80	S1	320 mm	1401 **0632**
63 ... 80	S1	400 mm	1401 **0640**

Auxiliary contact

Use

M type

Signalisation of positions 0 and I by NO+NC or 2 NO auxiliary contacts. They can be mounted on the right side on the SIRCO MV PV. Up to 2 auxiliary contact modules can be installed.

U type

Pre-break and signalisation by NO or NC auxiliary contact.
Max 2 auxiliary contacts.

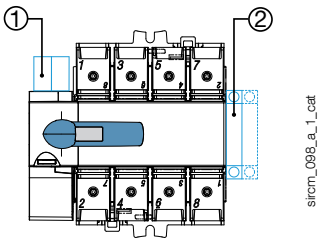
M type

U type

M type			
Rating (A)	**Contact(s)**	**Contact type**	**Reference**
63 ... 80	1 contact	NO + NC	2299 **0001**(1)
63 ... 80	1 contact	2 NC	2299 **0011**(1)

(1) Signalling contact only.

U type			
Rating (A)	**Contact(s)**	**Contact type**	**Reference**
63 ... 80	1 AC	NO	3999 **0701**
63 ... 80	1 AC	NC	3999 **0702**



M type
Auxiliary contacts configurations for SIRCO MV PV
1. Maximum 2 "U" type auxiliary contacts
2. Maximum 2 "M" type auxiliary contact modules

Terminal shrouds

Use

Top and bottom protection against direct contact with the connection parts (set of 2 units).

Advantage

Perforations allow remote thermographic inspection without the need to remove the shrouds.
The terminal shrouds also provide phase separation.

For SIRCO MV PV			
Rating (A)	**No. of poles**	**Position**	**Reference**
63 ... 80	4 P	top and bottom	2294 **4016**

Bridging bars for connecting poles in series

Use

The bridging bars facilitate the connection of poles in series, allowing the below configurations:

- Bottom/Bottom
- Top/Top
- Bottom /Top
- Top/Bottom

Connection diagrams, see “Pole connections in series” page 39.

For SIRCO MV PV		
Rating (A)	**Pack**	**Reference**
63 ... 80	1 piece	2209 **0016**
63 ... 80	2 pieces	2209 **2016**

Characteristics according to IEC 60947-3

63 to 80 A

Rated current					63 A	80 A
Thermal current I_{th} at 40°C (A)					**63**	**80**
Thermal current I_{th} at 50°C (A)					**63**	**80**
Thermal current I_{th} at 60°C (A)					**63**	**80**
Rated insulation voltage U_i (V)					1000	1000
Rated impulse withstand voltage U_{imp} (kV)					8	8
Rated operational currents I_e (A)						
Rated voltage	**Utilisation category**	**Circuit type**	**No. of poles**	**Number of pole(s) in series per polarity**	**(A)**	**(A)**
1000 VDC(1)	DC-21 B	Single PV circuit	4 P	2 P + and 2 P -	63	80
Short-circuit capacity at 1000 VDC						
Rated short-time withstand current 1s. I_{cw} (kA rms)					5	5
Prospective short-circuit making capacity without fuses I_{cm} (kA peak)					5	5
Connection						
Maximum Cu rigid cable cross-section (mm^2)					70	70
Tightening torque min (Nm)					4	4
Tightening torque max (Nm)					5,5	5,5
Mechanical characteristics						
Operating effort (Nm)					4,2	4,2
Weight of a 3 pole device (kg)					0,7	0,7
Weight of a 4 pole device (kg)					0,9	0,9

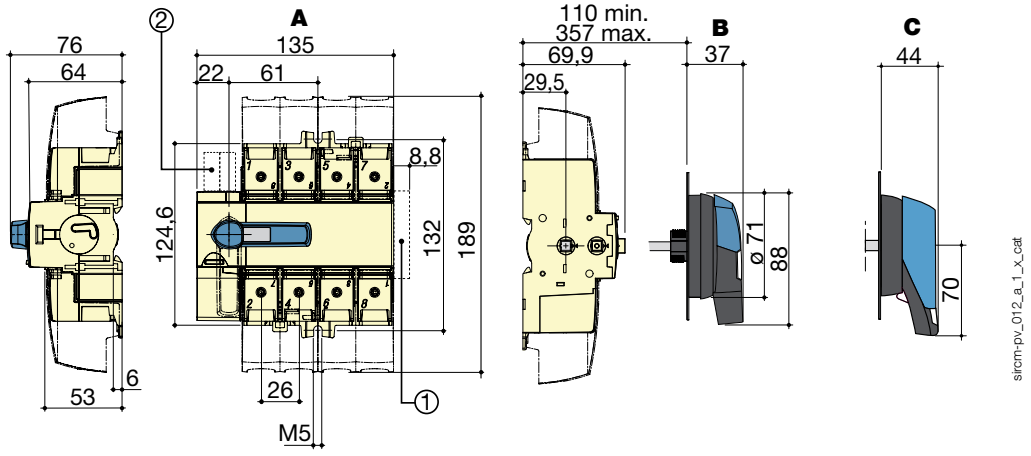
(1) Photovoltaic load break swiches SIRCO MV PV are subject to overvoltage test conditions which are 5% higher than the rated voltage. They can therefore be used at 1050 VDC in non-permanent operating conditions.

Dimensions

SIRCO MV PV 63 to 80 A

Direct front operation

External front operation

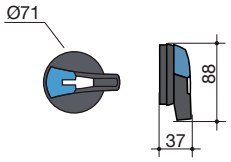
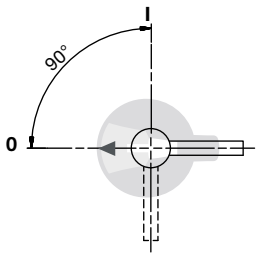
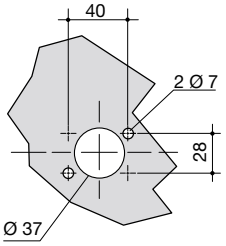
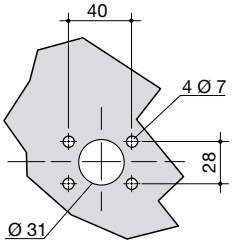
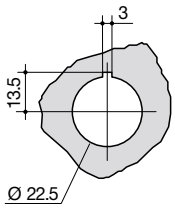


A. 4 poles
B. S0 type handle
C. S1 type handle

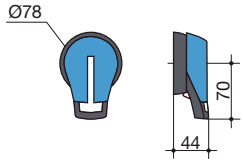
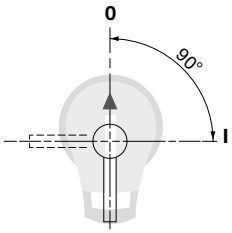
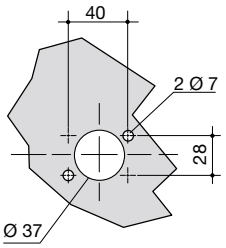
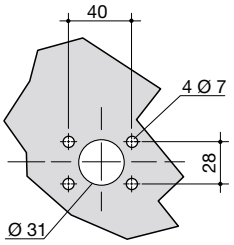
1. Maximum 2 "M" type auxiliary contact modules
2. Maximum 2 "U" type auxiliary contacts

Dimensions for external handles

SIRCO MV PV 63 to 80 A

Handle type	Front operation Direction of operation	Door drilling		
S0 type		IP55 with 2 fixing clips	IP65 with 4 fixing screws	With fixing nut
				

sircm_038_a_1_gb_cat

Handle type	Front operation Direction of operation	Door drilling	
S1 type		IP55 with 2 fixing clips	IP65 with 4 fixing screws
			

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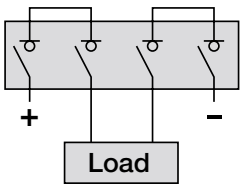
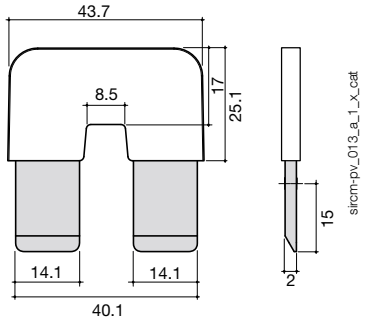
Pole series connection(1)

4 poles - bottom / bottom



(1) Other connections: refer to mounting instructions.

Bridging bars 63 to 80 A



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sircm-pv_013_a_1_x_cat

SIRCO PV IEC 60947-3

Load break switches for photovoltaic applications
from 100 to 3200 A, up to 1500 VDC

new

The solution for

- > Combiner box
- > Recombiner box
- > Inverter

Strong points

- > Patented switching technology up to 1500 VDC/pole
- > Positive break indication
- > Up to 1500 VDC as per IEC 60947-3
- > Up to 4 circuits on a single switch

Conformity to standards

- > IEC 60947-3
- > IEC 60364-7-712
- > UL 98B(1)

(1) See page 58.

Approvals and certifications(1)

(1) Product reference on request.

Function

SIRCO PV are manually operated multipolar load break switches, dedicated to photovoltaic application, able to make and break under load up to 500 VDC per poles.
These switches are extremely durable and are tested and approved for use in the most demanding applications.
They are available in 2, 3, 4, 6 and 8 poles for all configurations from one to 4 circuits, in order to suit all your requirements.

Advantages

Optimise your investment
High switching performances means less poles in series to reach the operating voltage, consequently:
- Less bridging bars required, limiting installation costs and time.
- Less heat dissipation, making it possible to be installed in a smaller enclosure.

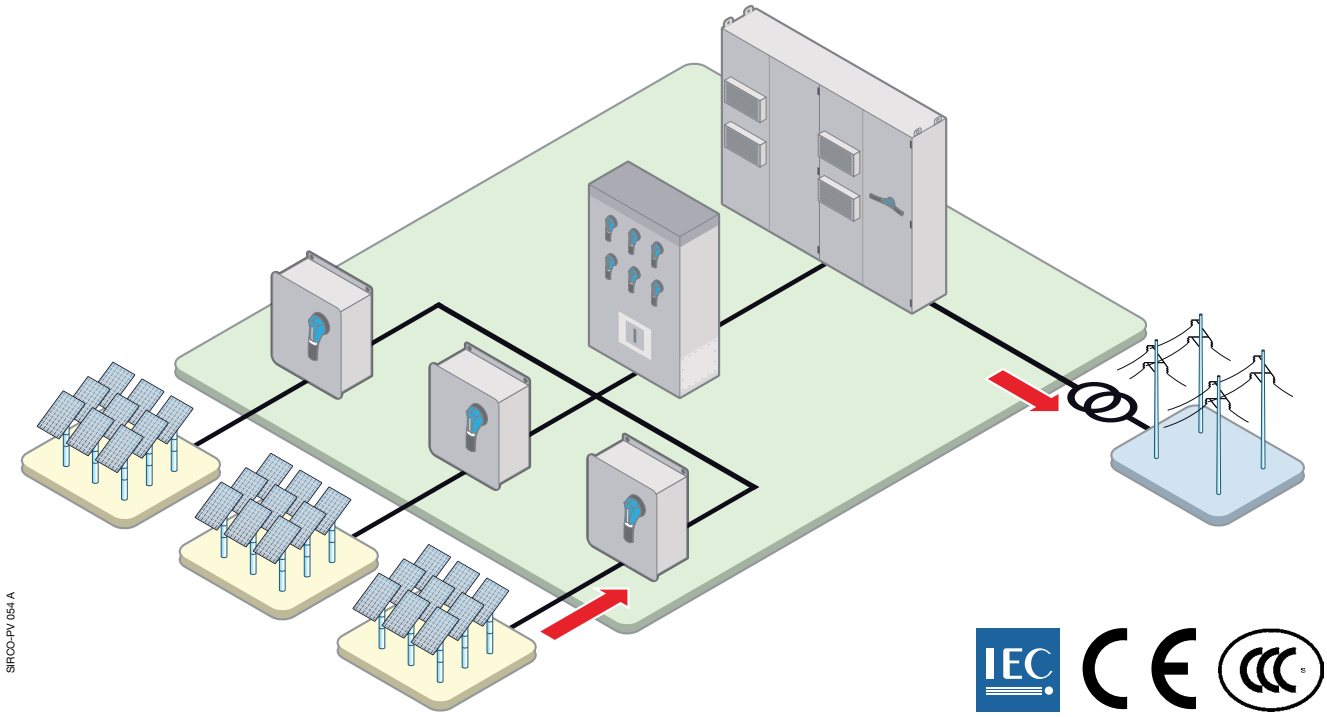
Guarantee safety over time
SIRCO PV are extremely robust products, with all casings made from fiber glass reinforced polyester materials that allows:
- High mechanical withstand.
- High stability to temperatures (RTI of 130 °C).
- High dielectric performance (high CTI / tested according to ASTM D 2303).

Take advantage of an innovative design
The Sirco PV are able to operate on and off load up to 500 VDC per poles, providing extremely compact solutions:
- 1500 VDC on a 3 poles switch.
- Up to 4 circuits each at 1000 VDC on an 8 poles switch.

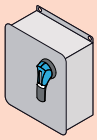
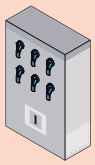
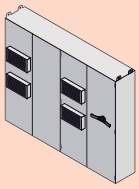
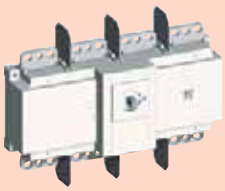
Reliability and performance
Our range of SIRCO PV load break switches is compliant with UL98B and IEC 60947-3 standards and have been tested above standards expectation, ensuring no critical current.
They are as well able to withstand 10 kA, 50 ms, allowing the use of any overcurrent protection device for line protection.

Typical PV architecture

The SIRCO PV range provides safe disconnection and isolation at all levels of your PV installation.



The SOCOMEC solutions

LEVEL OF INSTALLATION	SOCOMEC SOLUTIONS	
Combiner box		
		SIRCO PV One circuit up to 500 A at 1500 VDC
Recombiner box		
		SIRCO PV 4 circuits up to 500 A at 1000 VDC 2 circuits up to 500 A at 1500 VDC
Inverter		
		SIRCO PV One circuit up to 3200 A at 1000 VDC up to 2000 A at 1500 VDC

References

1000 VDC - Back plate mounting

Rating (A)	Frame size	Number of poles	Switch body	Direct handle	External handle	Shaft for external handle	Quantity to be ordered to connect 2 poles in series
1 PV circuit							
100 A	B4	2 P	26PV **2010**	J1 type Black 1112 **1111** Red 1113 **1111**	S2 type (1) Black IP55 1421 **2111** Black IP65 1423 **2111** Red IP65 1424 **2111**	200 mm 1400 **1020** 320 mm 1400 **1032** 400 mm 1400 **1040**	-
160 A	B4	2 P	26PV **2016**				
250 A	B4	2 P	26PV **2025**				
315 A	B4	2 P	26PV **2031**				
400 A	B4	4 P	26PV **4040**				2x 2609 **0025**
500 A	B4	4 P	26PV **4050**				
630 A	B5	4 P	26PV **4063**				1x 2609 **0080**
800 A	B5	4 P	26PV **4080**				
1250 A	B6	4 P	26PV **4120**	C2 type Black 2799 **7012** Red 2799 **7013**	S4 type (1) Black IP65 1443 **3111** Red IP65 1444 **3111**	200 mm 1401 **1520** 320 mm 1401 **1532** 400 mm 1401 **1520**	1x 2609 **1100**
2000 A	B7	4 P	26PV **4200**				2x 2609 **1200**
3200 A	B8	4 P	please consult us		V1 type Black IP65 2799 **7145**	320 mm 2799 **3018** 450 mm 2799 **3019**	please consult us
2 PV circuits							
100 A	$B4_{DS}$	4 P	26PV **5010**	J2 type Black 1122 **1111** Red 1123 **1111**	S2 type (1) Black IP55 1421 **2111** Black IP65 1423 **2111** Red IP65 1424 **2111**	200 mm 1400 **1020** 320 mm 1400 **1032** 400 mm 1400 **1040**	-
160 A	$B4_{DS}$	4 P	26PV **5016**				
250 A	$B4_{DS}$	4 P	26PV **5025**				
315 A	$B4_{DS}$	4 P	26PV **5031**				
400 A	B5	4 P	27PV **4032**	J1 type Black 1112 **1111** Red 1113 **1111**			1x 2709 **0045**
500 A	B5	4 P	27PV **4039**				
630 A	$B5_{DS}$	8 P	26PV **8063**	J2 type Black 1122 **1111** Red 1123 **1111**			1x 2609 **0080**
800 A	$B6_{DS}$	8 P	26PV **8080**	C2 type Black 2799 **7012** Red 2799 **7013**	V1 type Black IP65 2799 **7145**	320 mm 4199 **3018**	1x 2609 **1100**
1250 A	$B6_{DS}$	8 P	26PV **8120**				
2000 A	$B7_{DS}$	8 P	26PV **8200**				1x 2609 **1200**
4 PV circuits							
275 A	$B5_{DS}$	8 P	27PV **8026**	J2 type Black 1122 **1111** Red 1123 **1111**	S2 type (1) Black IP55 1421 **2111** Black IP65 1423 **2111** Red IP65 1424 **2111**	200 mm 1400 **1020** 320 mm 1400 **1032** 400 mm 1400 **1040**	4x 2709 **0045**
400 A	$B5_{DS}$	8 P	27PV **8032**				
500 A	$B5_{DS}$	8 P	27PV **8039**				

(1) With defectable door interlock.

1500 VDC - Back plate mounting

Rating (A)	Frame size	Number of poles	Switch body	Direct handle	External handle	Shaft for external handle	Quantity to be ordered to connect 2 poles in series
1 PV circuit							
275 A	B5	3 P	27PV **3026**	J2 type Black 1122 **1111** Red 1123 **1111**	S2 type (1) Black IP55 1421 **2111** Black IP65 1423 **2111** Red IP65 1424 **2111**	200 mm 1400 **1020**	1x 2709 **0027**
400 A	B5	3 P	27PV **3032**			320 mm 1400 **1032**	1x 2709 **0045**
500 A	B5	3 P	27PV **3039**				
630 A	$B5_{DS}$	8 P	26PV **8063**			400 mm 1400 **1040**	1x 2609 **0080**
800 A	$B6_{DS}$	8 P	26PV **8080**	C2 type Black 2799 **7012** Red 2799 **7013**	V1 type Black IP65 2799 **7145**	320 mm 4199 **3018**	1x 2609 **1100**
1250 A	$B6_{DS}$	8 P	26PV **8120**				
2000 A	$B7_{DS}$	8 P	26PV **8200**				1x 2609 **1200**
2 PV circuits							
275 A	$B5_{DS}$	6 P	27PV **6026**	J2 type Black **1122 1111** Red **1123 1111**	S2 type (1) Black IP55 1421 **2111** Black IP65 1423 **2111** Red IP65 1424 **2111**	200 mm 1400 **1020**	1x 2709 **0027**
400 A	$B5_{DS}$	6 P	27PV **6032**			320 mm 1400 **1032**	1x 2709 **0045**
500 A	$B5_{DS}$	6 P	27PV **6039**			400 mm 1400 **1040**	

(1) With defectable door interlock.

Accessories

Direct operation handle

Frame size	Handle type	Handle colour	Reference
B4 ... B7	J1 type	Black	1112 **1111**
B4 ... B5	J1 type	Red	1113 **1111**
B6 ... B7	C2 type	Black	2799 **7012**
B6 ... B7	C2 type	Red	2799 **7013**
$B4_{DS}$ ... $B5_{DS}$	J2 type	Black	1122 **1111**
$B4_{DS}$ ... $B5_{DS}$	J2 type	Red	1123 **1111**
$B4_{DS}$ ... $B7_{DS}$	C2 type	Black	2799 **7012**
$B4_{DS}$ ... $B7_{DS}$	C2 type	Red	2799 **7013**

J1 type handle

C2 type handle

Door interlocked external operation handle

Use

Door interlocked external operation handles include an escutcheon, are padlockable and must be utilised with an extension shaft.

In a combiner box, located close to the solar cell strings, or located close to the inverter, we recommend to use a door interlocked external handle for its safety features.

Example

The locking function of the enclosure in the "ON" position will force the operator to safely disconnect and isolate the solar cell strings prior to any intervention.

Opening the door when the switch is on "ON" position is possible by defeating the locking function using a tool (authorised persons only).

The interlocking function is restored when the door is closed back.

Front operation

Frame size	Handle type	Handle colour	Degree of protection	Reference
B4 ... B5 - $B4_{DS}$	S2	Black	IP55	**1421 2111**
B4 ... B5 - $B4_{DS}$	S2	Black	IP65	**1423 2111**
B4 ... B5 - $B4_{DS}$	S2	Red	IP65	**1424 2111**
$B5_{DS}$ - B6 ... B7	S4	Black	IP65	**1443 3111**
$B5_{DS}$ - B6 ... B7	S4	Red	IP65	**1444 3111**
B8 - $B6_{DS}$ - $B7_{DS}$	V1	Black	IP65	**2799 7145**

Reinforced S2 type handle

S4 type handle

V1 type handle

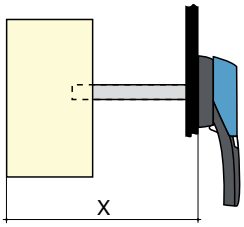
Accessories (continued)

Shaft for external handle

Use

Standard lengths:
- 200 mm,
- 320 mm,
- 400 mm.

Other lengths: please consult us.



Frame size	Handle type	Dimension Y (mm)	Length (mm)	Reference
B4	S2	150 … 295	200	1400 **1020**
B4	S2	150 … 415	320	1400 **1032**
B4	S2	150 … 495	400	1400 **1040**
B5	S2	203 … 328	200	1400 **1020**
B5	S2	203 … 448	320	1400 **1032**
B5	S2	203 … 525	400	1400 **1040**
B6	S4	220 … 343	200	1401 **1520**
B6	S4	220 … 463	320	1401 **1532**
B6	S4	220 … 543	400	1401 **1540**
B7	S4	305 … 366	200	1401 **1520**
B7	S4	305 … 485	320	1401 **1532**
B7	S4	305 … 564	400	1401 **1540**
$B4_{DS}$	S2	305 … 363	200	1400 **1020**
$B4_{DS}$	S2	305 … 485	320	1400 **1032**
$B4_{DS}$	S2	305 … 561	400	1400 **1040**
$B5_{DS}$	S4	406 … 467	200	1401 **1520**
$B5_{DS}$	S4	406 … 589	320	1401 **1532**
$B5_{DS}$	S4	406 … 668	400	1401 **1540**
$B6_{DS}$	V1	508 … 714	320	4199 **3018**
$B6_{DS}$	V1	508 … 795	400	4199 **3019**
$B7_{DS}$	V1	508 … 714	320	4199 **3018**
$B7_{DS}$	V1	508 … 795	400	4199 **3019**
B8	V1	415...690	320	2799 **3018**
B8	V1	415...820	450	2799 **3019**

Shaft guide for external operation

Use

To guide the shaft extension into the external handle.

This accessory enables the handle to engage the extension shaft with a misalignment of up to 15 mm.

Required for shaft lengths over 320 mm.

Description	Reference
Shaft guide	1429 **0000**

S-type handle adapter

Use

Enables S-type handles to be fitted in place of existing older style Socomec handles. Adapter can also be utilised as a spacer to increase the distance between the panel door and the handle lever.

Dimensions

Adds 12 mm to the depth.

acces_187_a_1_cat

Handle colour	External IP(1)	To be ordered in multiples of	Reference
Black	IP65	1	1493 **0000**

(1) IP: protection degree according to IEC 60529 standard.

Alternative S-type handle cover colours

Use

For single lever handles type S1, S2, S3. Other colours: please consult us.

acces_198_a_1_cat

Handle colour	Handle	To be ordered in multiples of	Reference
Light grey	S1, S2, S3 type	50	1401 **0001**
Dark grey	S1, S2, S3 type	50	1401 **0011**
Light grey	S4 type	50	1401 **0031**
Dark grey	S4 type	50	1401 **0041**

Auxiliary contact

Use

Pre-break and signalling of positions 0 and I:
- 1 to 2 NO/NC auxiliary contacts,
- 1 to 4 NO + NC auxiliary contacts,
- 1 to 2 low level NO/NC auxiliary contacts.

Characteristics

NO/NC AC: IP2 with front operation.

Connection to the control circuit

By 6.35 mm fast-on terminal.

Electrical characteristics

30 000 operations.

acces_076_a_1_cat

NO/NC changeover auxiliary contacts

Frame size	Position AC	Type	Reference
B4 ... B8	1 contact	NO/NC	2699 **0031**
B4 ... B8	2 contacts	NO/NC	2600 **0032**
$B4_{DS}$ ... $B7_{DS}$	1 contact	NO/NC	2699 **0061**
$B4_{DS}$ ... $B7_{DS}$	2 contacts	NO/NC	2699 **0062**

Low level NO/NC auxiliary contacts

Frame size	Position AC	Type	Reference
B4 ... B7	1 contact	NO/NC	2699 **0301**
B4 ... B7	2 contacts	NO/NC	2600 **0302**

NO+NC contact

Frame size	Position AC	Type	Reference
B4 ... B7	1 contact	NO + NC	2699 **0061**
B4 ... B7	2 contacts	NO + NC	2699 **0062**

Terminal screen

Use

Top and bottom protection against direct contact with terminals or connection parts.

Frame size	No. of poles	Position	Pack	Reference
B4	2 P	top or bottom	1 unit	2698 **3020**
B4	4 P	top or bottom	1 unit	2698 **4020**
B5	3 P	top or bottom	1 unit	2698 **3050**
B5	4 P	top or bottom	1 unit	2698 **4050**
B6	4 P	top or bottom	1 unit	2698 **4080**
B7	4 P	top or bottom	1 unit	2698 **4120**
B8	4 P	top or bottom	1 unit	2698 **4200**
$B4_{DS}$	2 P	top or bottom	1 unit	1509 **3025**
$B5_{DS}$	6 P	top and bottom	2 units	1509 **3063**
$B5_{DS}$	8 P	top and bottom	2 units	1509 **4063**
$B6_{DS}$	8 P	top and bottom	2 units	1509 **4080**
$B7_{DS}$	8P	top and bottom	2 units	1509 **4199**

acces_079_a_1_cat

Accessories (continued)

Bridging bars for connecting poles in series

Use

The bridging bars will make easy the connection of the poles in series, allowing the following configurations(1).

(1) Other connections: refer to mounting instructions.

1000 VDC

Frame size	Rating (A)	Quantity to be ordered to connect 2 poles in series	Fig.	Reference
1 PV circuit				
B4	100	-(1)	-	-(1)
B4	160	-(1)	-	-(1)
B4	250	-(1)	-	-(1)
B4	315	-(1)	-	-(1)
B4	400	2	1	2609 **0025**
B4	500	2	1	2609 **0025**
B5	630	1	2	2609 **0080**
B5	800	1	2	2609 **0080**
B6	1250	1	3	2609 **1100**
B7	2000	1	3	2609 **1200**
B8	3200			please consult us
2 PV circuits				
$B4_{DS}$	100	-(1)	-	-(1)
$B4_{DS}$	160	-(1)	-	-(1)
$B4_{DS}$	250	-(1)	-	-(1)
$B4_{DS}$	315	-(1)	-	-(1)
B5	400	1	4	2709 **0045**
B5	500	1	4	2709 **0045**
$B5_{DS}$	630	1	2	2609 **0080**
$B6_{DS}$	800	1	3	2609 **1100**
$B6_{DS}$	1250	1	3	2609 **1100**
$B7_{DS}$	2000	1	3	2609 **1200**
4 PV circuits				
$B5_{DS}$	500	1	4	2709 **0045**

1500 VDC

Frame size	Rating (A)	Quantity to be ordered to connect 2 poles in series	Fig.	Reference
1 PV circuit				
B5	275	1	5	2709 **0027**
B5	315	1	5	2709 **0027**
B5	400	1	4	2709 **0045**
B5	500	1	4	2709 **0045**
$B5_{DS}$	630	1	2	2609 **0080**
$B6_{DS}$	800	1	3	2609 **1100**
$B6_{DS}$	1250	1	3	2609 **1100**
$B7_{DS}$	2000	1	3	2609 **1200**
2 PV circuits				
$B5_{DS}$	275	1	5	2709 **0027**
$B5_{DS}$	400	1	4	2709 **0045**
$B5_{DS}$	500	1	4	2709 **0045**

(1) Bridging bars not needed.

Bridging bars for connecting poles in series (continued)

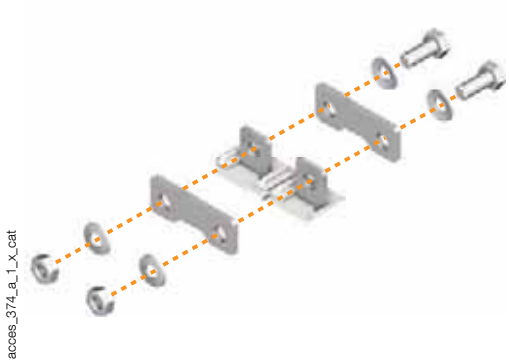


Fig. 1

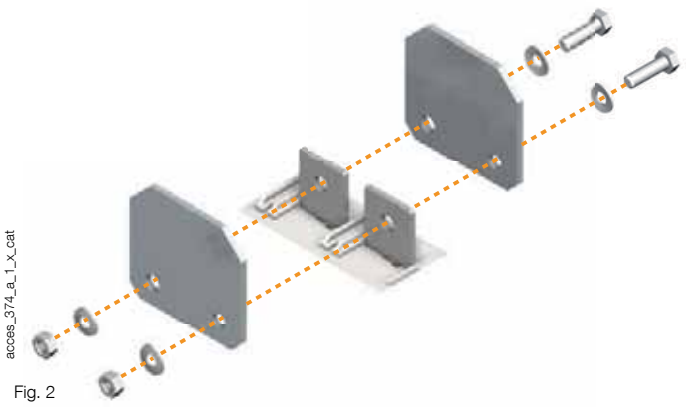


Fig. 2

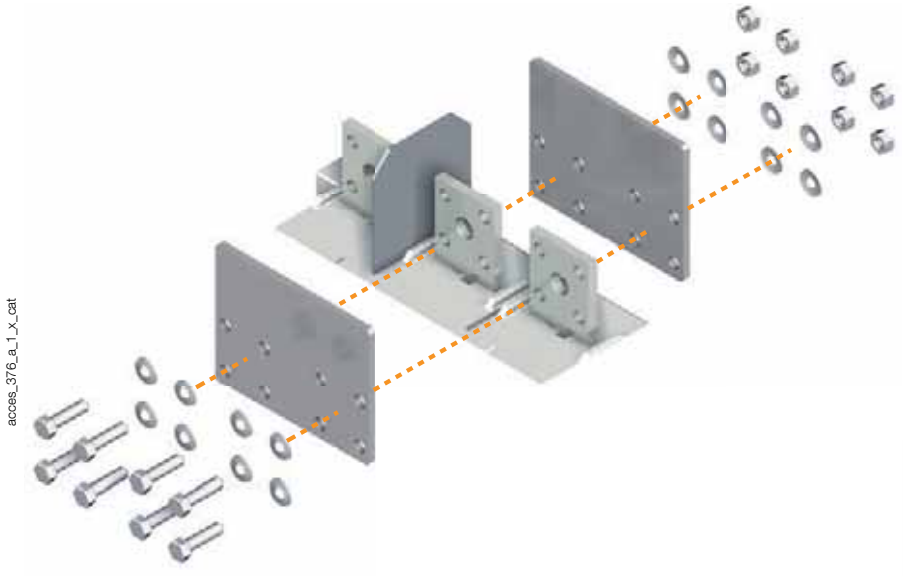


Fig. 3

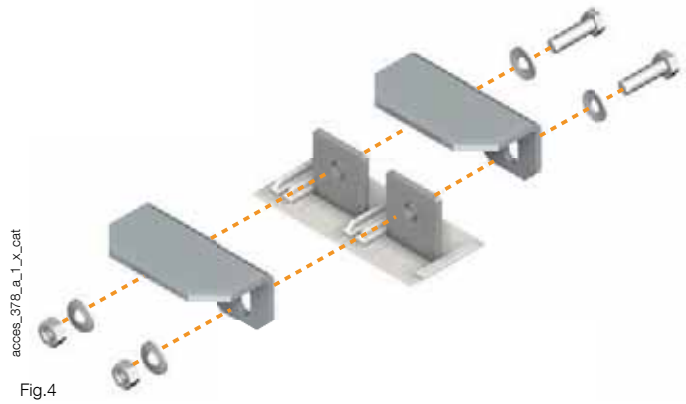


Fig.4

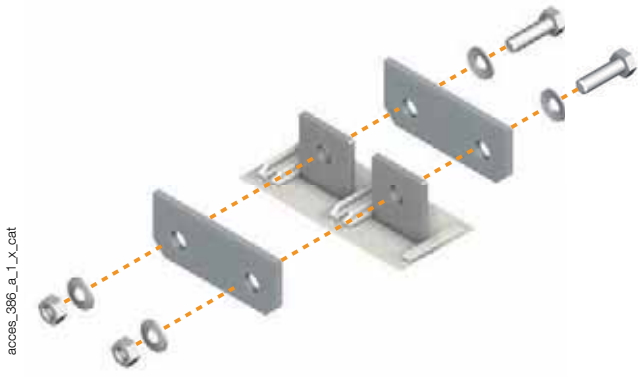


Fig. 5

Characteristics

Characteristics according to IEC 60947-3

Rated current In			**100 A**				**160 A**			
Thermal current at 40°C (A)			**100**				**160**			
Thermal current at 50°C (A)			**100**				**160**			
Thermal current at 60°C (A)			**100**				**160**			
Rated insulation voltage U_i (V)			1500				1500			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	100	1 P + ; 1 P	2 P	B4	160	1 P + ; 1 P	2 P	B4
1 circuit	1500 VDC	DC-21 B	100	3 P + ; 1 P -	4 P	$B4_{DS}$	160	3 P + ; 1 P	4 P	$B4_{DS}$
2 circuits	1000 VDC	DC-21 B	100	1 P + ; 1 P	4 P	$B4_{DS}$	160	1 P + ; 1 P	4 P	$B4_{DS}$
Short-circuit capacity (without protection)										
Rated short-time withstand current 0.3 s. (kA eff)			10				10			
Rated short-time withstand current 1 s. (kA eff)			5				5			
Rated short-circuit making capacity I_{cm} (kA peak) - 50ms			10				10			
Connection										
Maximum Cu rigid cable cross-section (mm^2)			35				70			
Maximum Cu busbar width (mm)			32				32			
Tightening torque min (Nm)			20				20			
Tightening torque max (Nm)			26				26			
Mechanical characteristics										
Durability (number of operating cycles)			10 000				10 000			
Tightening torque (Nm)			10				10			
Weight of a 2 pole device (kg)			1.8				1.8			
Weight of a 4 pole device (kg)			4.3				4.3			

Rated current In			**250 A**				**275 A**			
Thermal current at 40°C (A)			**250**				**275**			
Thermal current at 50°C (A)			**250**				**275**			
Thermal current at 60°C (A)			**250**				**275**			
Rated insulation voltage U_i (V)			1500				1500			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	250	1 P + ; 1 P	2 P	B4	275	1 P + ; 1 P -	3 P	B5
1 circuit	1500 VDC	DC-21 B	250	3 P + ; 1 P	4 P	$B4_{DS}$	275	2 P + ; 1 P -	3 P	B5
2 circuits	1000 VDC	DC-21 B	250	1 P + ; 1 P -	4 P	$B4_{DS}$	275	1 P + ; 1 P -	6 P	$B5_{DS}$
2 circuits	1500 VDC	DC-21 B	-	-	-	-	275	2 P + ; 1 P -	6 P	$B5_{DS}$
4 circuits	1000 VDC	DC-21 B	-	-	-	-	275	1 P + ; 1 P -	8 P	$B5_{DS}$
Short-circuit capacity (without protection)										
Rated short-time withstand current 0.3 s. (kA eff)			10				10			
Rated short-time withstand current 1 s. (kA eff)			5				5			
Rated short-circuit making capacity I_{cm} (kA peak) - 50ms			10				10			
Connection										
Maximum Cu rigid cable cross-section (mm^2)			120				185			
Maximum Cu busbar width (mm)			32				32			
Tightening torque min (Nm)			20				20			
Tightening torque max (Nm)			26				26			
Mechanical characteristics										
Durability (number of operating cycles)			10 000				10 000			
Tightening torque (Nm)			10				10			
Weight of a 2 pole device (kg)			1.8				-			
Weight of a 3 pole device (kg)			-				6			
Weight of a 4 pole device (kg)			4.3				-			
Weight of a 6 pole device (kg)			-				12.3			
Weight of an 8 pole device (kg)			-				15			

Characteristics according to IEC 60947-3 (continued)

Rated current In			**315 A**				**400 A**			
Thermal current at 40°C (A)			**315**				**400**			
Thermal current at 50°C (A)			**315**				**400**			
Thermal current at 60°C (A)			**315**				**400**			
Rated insulation voltage U_i (V)			1500				1500 (1)			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	315	1 P + ; 1 P -	2 P	B4	400	2 P + ; 2 P -	4 P	B4
1 circuit	1500 VDC	DC-21 B	315	2 P + ; 1 P -	3 P	B5	400	2 P + ; 1 P -	3 P	B5
2 circuits	1000 VDC	DC-21 B	315	1 P + ; 1 P -	4 P	$B4_{DS}$	400	1 P + ; 1 P -	4 P	B5
2 circuits	1500 VDC	DC-21 B	-	-	-	-	400	2 P + ; 1 P -	6 P	$B5_{DS}$
4 circuits	1000 VDC	DC-21 B	-	-	-	-	400	1 P + ; 1 P -	8 P	$B5_{DS}$
Short-circuit capacity (without protection)										
Rated short-time withstand current 0.3 s. (kA eff)			10				-			
Rated short-time withstand current 1 s. (kA eff)			5				10			
Rated short-circuit making capacity I_{cm} (kA peak) - 50ms			10				10			
Connection										
Maximum Cu rigid cable cross-section (mm^2)			185				240			
Maximum Cu busbar width (mm)			32				32			
Tightening torque min (Nm)			20				20			
Tightening torque max (Nm)			26				26			
Mechanical characteristics										
Durability (number of operating cycles)			10 000				5 000			
Tightening torque (Nm)			10				10			
Weight of a 2 pole device (kg)			1.8				-			
Weight of a 3 pole device (kg)			6				6 (B4) / 3.8 (B5)			
Weight of a 4 pole device (kg)			4.3				2.3			
Weight of a 6 pole device (kg)			-				12.3			
Weight of an 8 pole device (kg)			-				15			

Rated current In			**500 A**				**630 A**			
Thermal current at 40°C (A)			**500**				**630**			
Thermal current at 40°C (A)			**500**				**630**			
Thermal current at 60°C (A)			**B4: 475 / B5: 500**				**560**			
Rated insulation voltage U_i (V)			1500(1)				1500			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	500	2 P + ; 2 P -	4 P	B4	630	2 P + ; 2 P -	4 P	B5
1 circuit	1500 VDC	DC-21 B	500	2 P + ; 1 P -	3 P	B5	630	4 P + ; 4 P -	8 P	$B5_{DS}$
2 circuits	1000 VDC	DC-21 B	500	1 P + ; 1 P -	4 P	B5	630	2 P + ; 2 P -	8 P	$B5_{DS}$
2 circuits	1500 VDC	DC-21 B	500	2 P + ; 1 P -	6 P	$B5_{DS}$	-	-	-	-
4 circuits	1000 VDC	DC-21 B	500	1 P + ; 1 P -	8 P	$B5_{DS}$	-	-	-	-
Short-circuit capacity (without protection)										
Rated short-time withstand current 1 s. (kA eff)			10				10			
Rated short-circuit making capacity I_{cm} (kA peak) - 50ms			10				10			
Connection										
Maximum Cu rigid cable cross-section (mm^2)			2x150				2x185			
Maximum Cu busbar width (mm)			32				40			
Tightening torque min (Nm)			20				40			
Tightening torque max (Nm)			26				40			
Mechanical characteristics										
Durability (number of operating cycles)			5 000				5 000			
Tightening torque (Nm)			10				14.5			
Weight of a 3 pole device (kg)			6 (B4) / 3.8 (B5)				-			
Weight of a 4 pole device (kg)			2.3				3.8			
Weight of a 6 pole device (kg)			12.3				-			
Mass of a 8 pole device (kg)			15				15			

(1) For B4 frame, the delivered spacers have to be installed.

Characteristics (continued)

Characteristics according to IEC 60947-3 (continued)

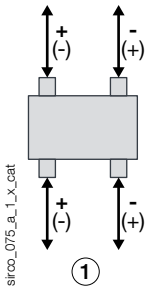
Rated current In			**800 A**				**1250 A**			
Thermal current at 40°C (A)			**800**				**1250**			
Thermal current at 50°C (A)			**800**				**1250**			
Thermal current at 60°C (A)			**B5: 650 / B6: 800**				**1125**			
Rated insulation voltage U_i (V)			1500				1500			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	800	2 P + ; 2 P -	4 P	B5	1250 A	2 P + ; 2 P -	4 P	B6
1 circuit	1500 VDC	DC-21 B	800	4 P + ; 4 P -	8 P	$B6_{DS}$	1250 A	4 P + ; 4 P -	8 P	$B6_{DS}$
2 circuits	1000 VDC	DC-21 B	800	2 P + ; 2 P -	8 P	$B6_{DS}$	1250 A	2 P + ; 2 P -	8 P	$B6_{DS}$
Short-circuit capacity (without protection)										
Rated short-time withstand current 1 s. (kA eff)			10				10			
Rated short-circuit making capacity I_{cm} (kA peak) - 50ms			10				10			
Connection										
Maximum Cu rigid cable cross-section (mm^2)			2x240				2x240			
Maximum Cu busbar width (mm)			50				63			
Tightening torque min (Nm)			40				40			
Tightening torque max (Nm)			45				45			
Mechanical characteristics										
Durability (number of operating cycles)			5 000				4 000			
Tightening torque (Nm)			14.5				37			
Weight of a 4 pole device (kg)			3.8				3.8			
Weight of an 8 pole device (kg)			15				15			

Rated current In			**2000 A**				**3200 A**			
Thermal current at 40°C (A)			**2000**				**3200**			
Thermal current at 50°C (A)			**1850**				**3200**			
Thermal current at 60°C (A)			**1600**				**2700**			
Rated insulation voltage U_i (V)			1500							
Rated impulse withstand voltage U_{imp} (kV)			12							
Number of circuits	**Rated voltage**	**Utilisation category**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**	**I_e (A)**	**Number of pole(s) in series per circuit**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	2000 A	2 P + ; 2 P -	4 P	B7	3200 A	2 P + ; 2 P -	4 P	B8
1 circuit	1500 VDC	DC-21 B	2000 A	4 P + ; 4 P -	8 P	$B7_{DS}$	-	-	-	-
2 circuits	1000 VDC	DC-21 B	2000 A	2 P + ; 2 P -	8 P	$B7_{DS}$	-	-	-	-
Short-circuit capacity (without protection)										
Rated short-time withstand current 1 s. (kA eff)			10				10			
Rated short-circuit making capacity I_{cm} (kA peak) - 50ms			10				10			
Connection										
Maximum Cu busbar width (mm)			100				4 x 100 x 5			
Tightening torque min (Nm)			40				40			
Tightening torque max (Nm)			45				45			
Mechanical characteristics										
Durability (number of operating cycles)			4000				2000			
Tightening torque (Nm)			56				75			
Weight of a 4 pole device (kg)			22				25			
Mass of a 8 pole device (kg)			50				-			

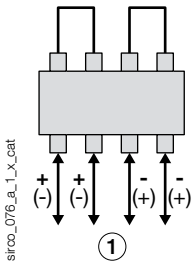
Pole connection in series

1 PV circuit - 1000 VDC

B4 - 2P

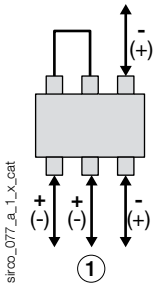


B4-B8 - 4P

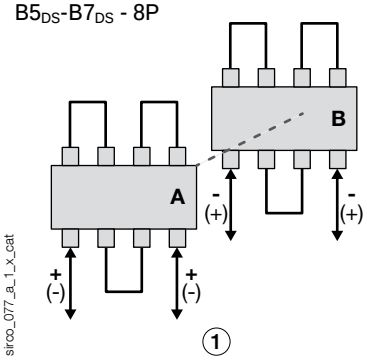


1 PV circuit - 1500 VDC

B5 - 3P

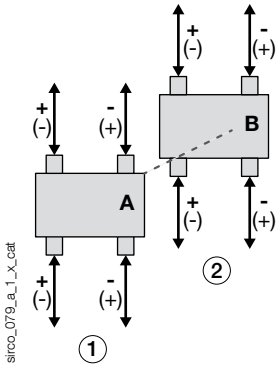


$B5_{DS}$-$B7_{DS}$ - 8P

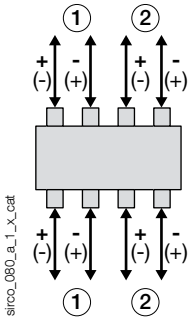


2 PV circuits - 1000 VDC

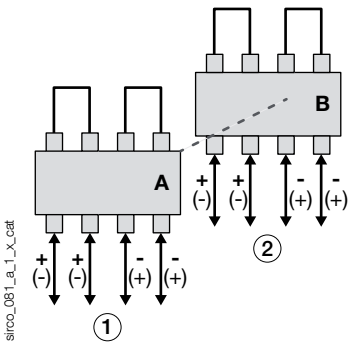
$B4_{DS}$ - 4P



B5 - 4P

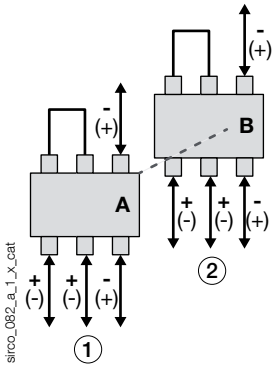


$B5_{DS}$-$B7_{DS}$ - 8P



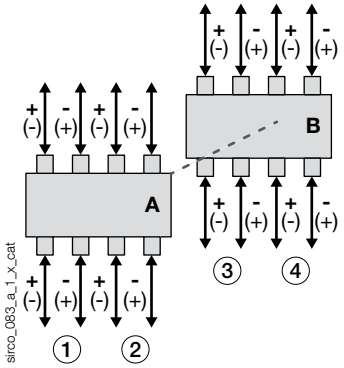
2 PV circuits - 1500 VDC

$B5_{DS}$ - 6P



4 PV circuits- 1000 VDC

$B5_{DS}$ - 8P



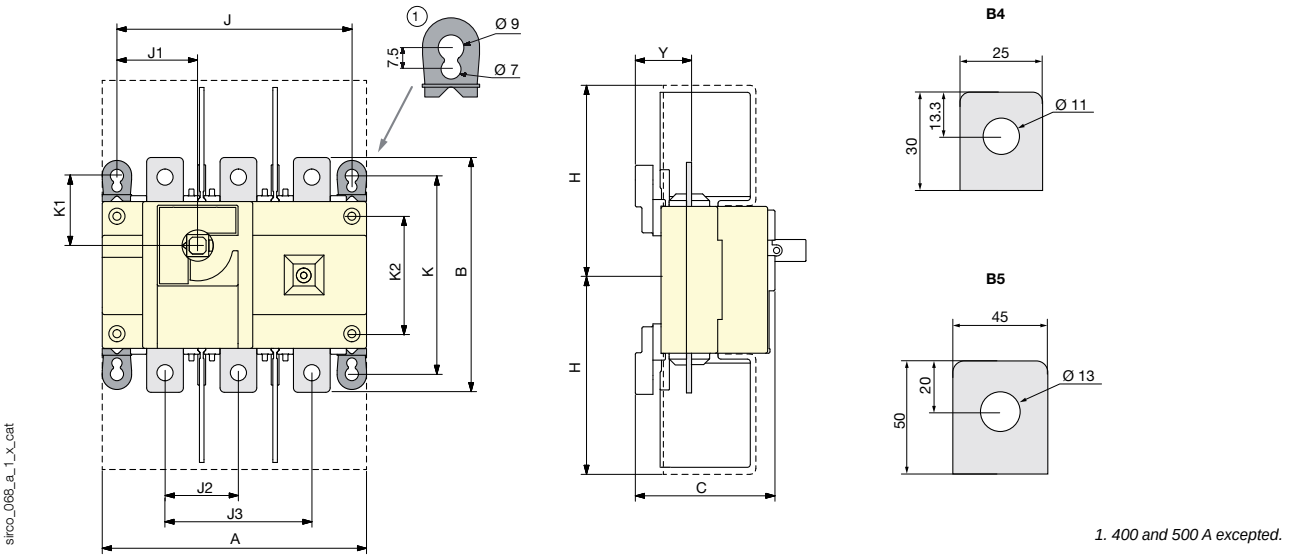
A. Front switch.
B. Rear switch.

1. Circuit 1
2. Circuit 2

3. Circuit 3
4. Circuit 4

Dimensions (mm)

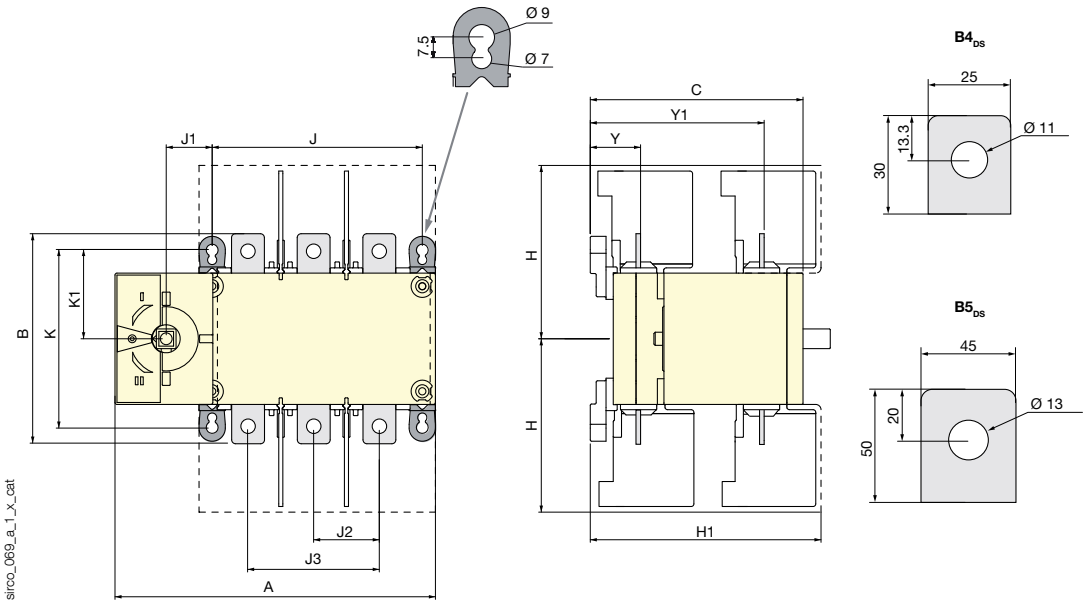
Frame size B4-B5



1. 400 and 500 A excepted.

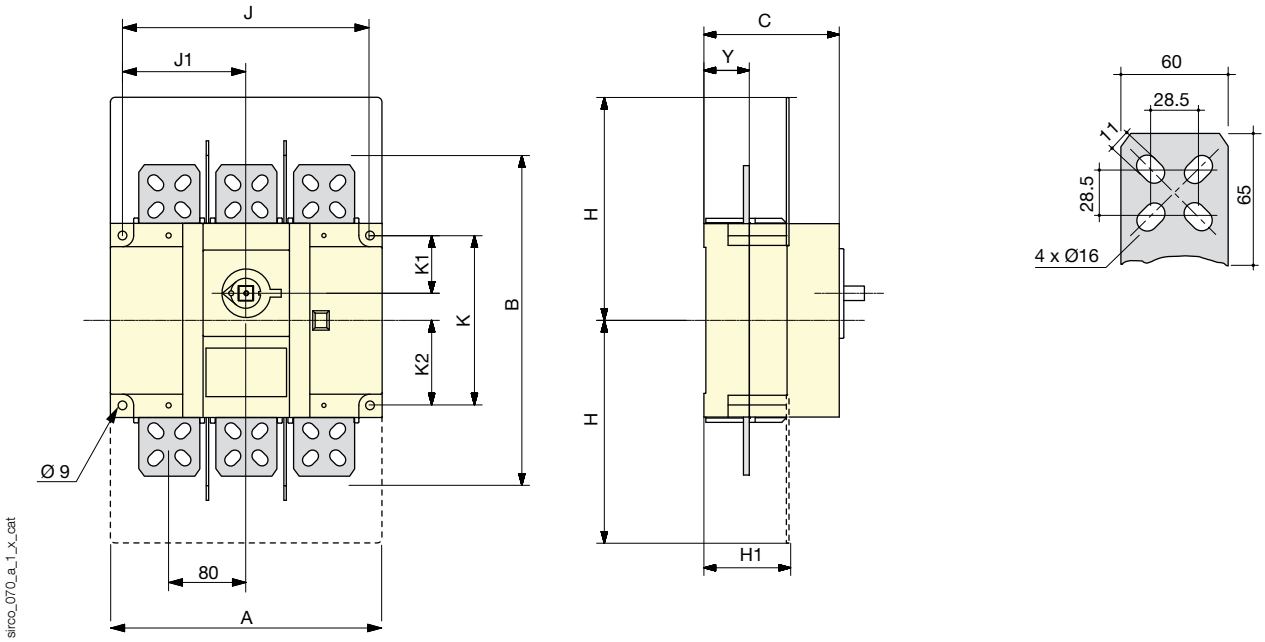
Frame size	No. of poles	A	B	C	H	J	J1	J2	J3	K	K1	K2	Y
B4	2 P	180	160	95	132.5	160	55	-	100	135	48	80	38.5
B4	4 P	230	170	79	132.5	210	105	50	-	-	-	80	22.5
B5	2 P	230	260	128	203	210	75	-	130	195	67.5	80	53
B5	3 P	230	260	126.5	203	210	75	65	-	195	67.5	80	51.5
B5	4 P	290	260	126.5	203	270	135	65	-	195	67.5	80	51.5

$B4_{DS}$ - $B5_{DS}$



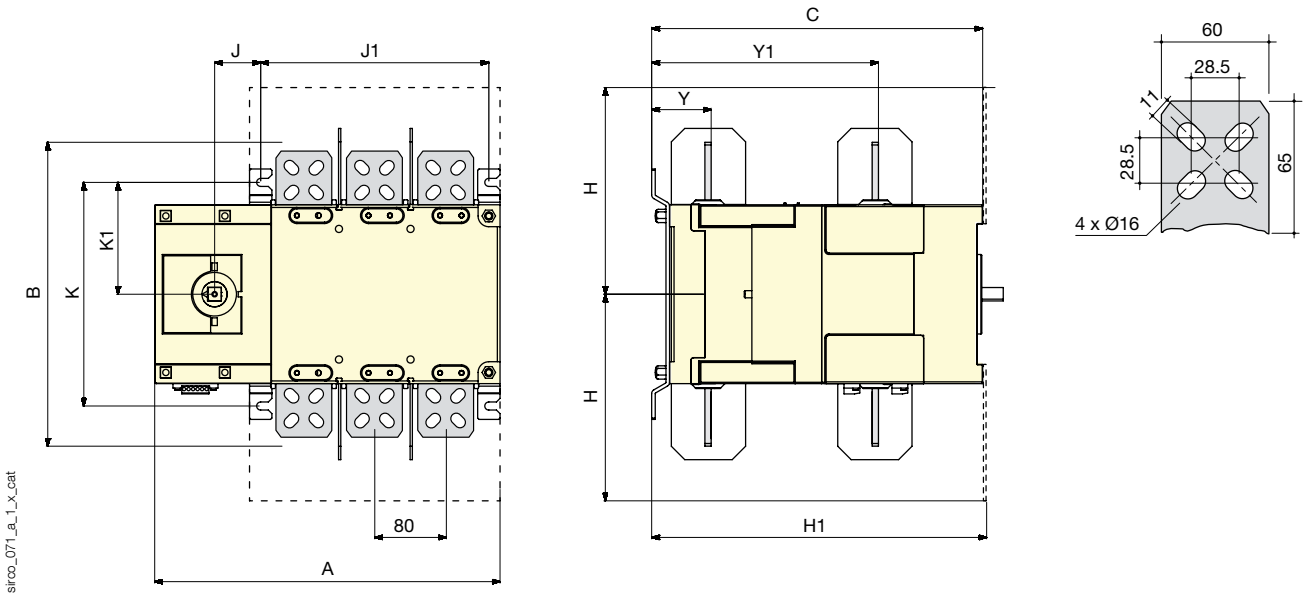
Frame size	No. of poles	A	B	C	H	H1	J	J1	J2	J3	K	K1	Y	Y1
$B4_{DS}$	4 P	244	160	162	129	176	160	35	-	100	135	67.5	38.5	132.5
$B5_{DS}$	6 P	301	260	238.5	203	165.5	210	35	65	-	195	68.5	51.5	189
$B5_{DS}$	8 P	361	260	238.5	203	165.5	270	35	65	-	195	68.5	51.5	189

Frame size B6



Frame size	No. of poles	A	B	C	H	H1	J	J1	K	K1	K2	Y
B6	4 P	630	340	139	270	145	335	167.5	175	59.5	28	46.5

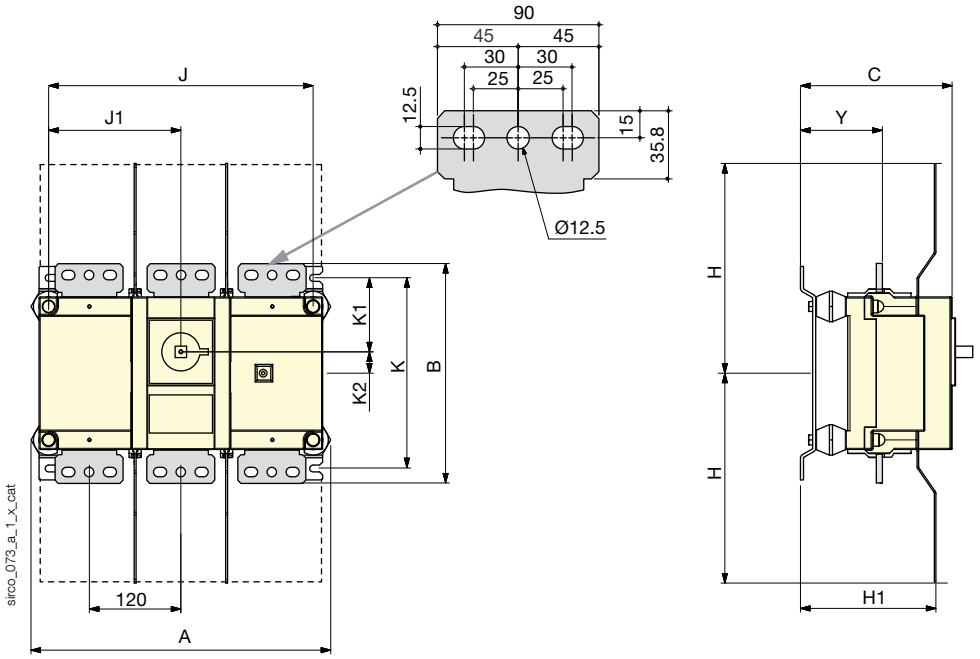
Frame size $B6_{DS}$



Frame size	No. of poles	A	B	C	H	H1	J	J1	K	K1	Y	Y1
$B6_{ds}$	8 P	466	340	370	270	347	335	51.5	250	125	66.5	253.5

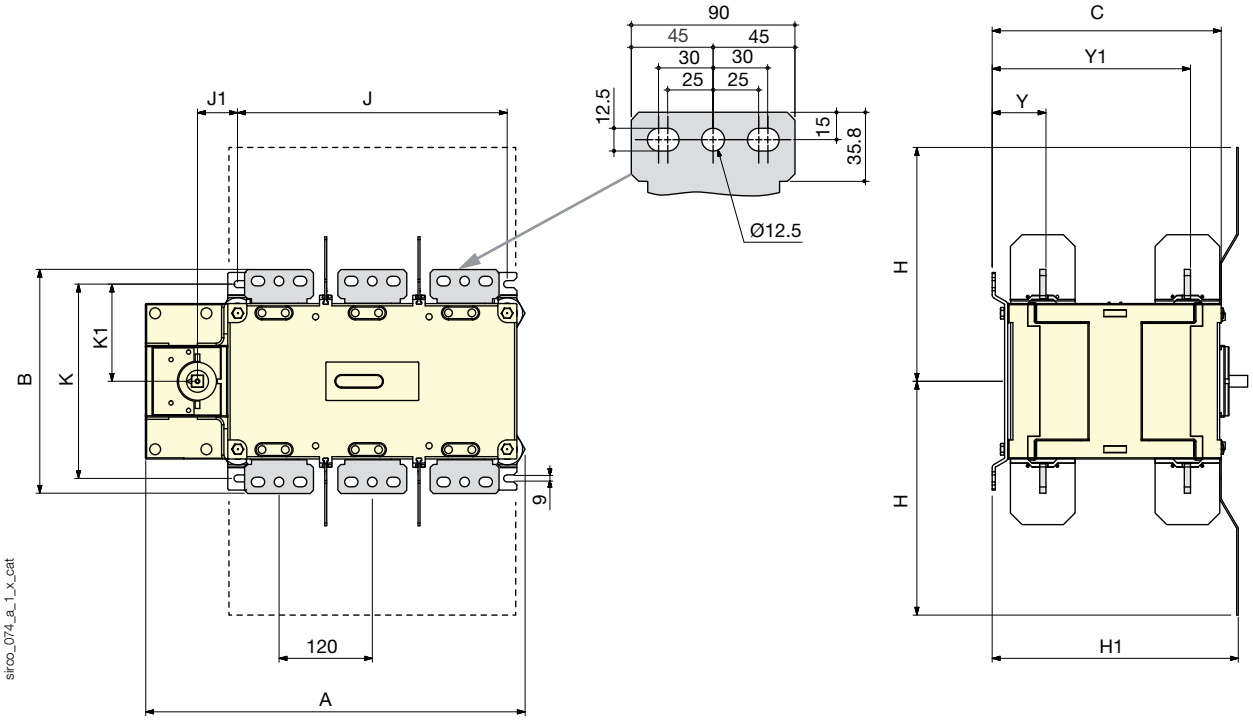
Dimensions (mm) (continued)

Frame size B7



Frame size	No. of poles	A	B	C	H	H1	H2	J	J1	K	K1	K2	Y
B7	4 P	513	288	200	302	211	203.5	467	233.5	250	97	28	107.5

Frame size $B7_{DS}$

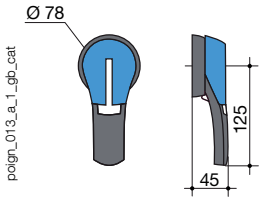
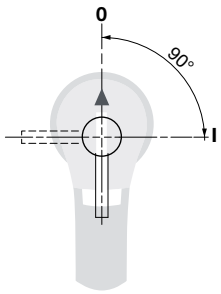
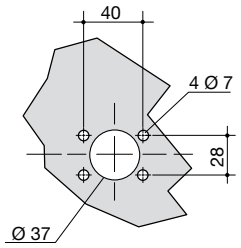


Frame size	No. of poles	A	B	C	H	H1	J	J1	K	K1	Y	Y1
$B7_{DS}$	8 P	608.5	288	333	301	389	467	51.5	250	125	107.5	293.5

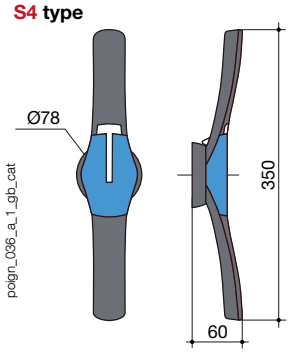
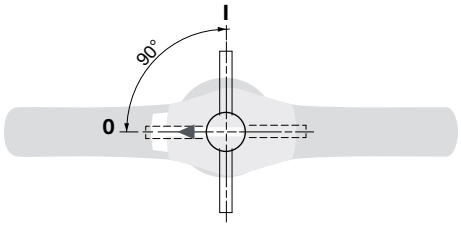
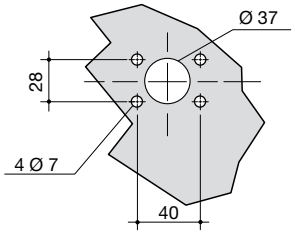
Pour les dimensions du SIRCO PV 3200A - 1000 VDC - B8, veuillez nous consulter.

Dimensions for external handles (mm)

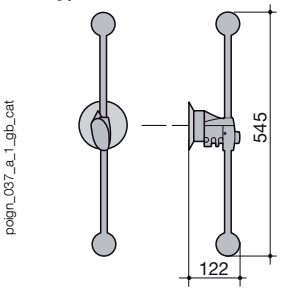
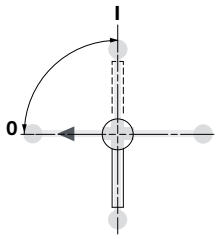
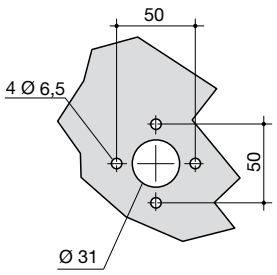
B4 - $B4_{DS}$ - B5

Handle type	Front operation Direction of operation	Door drilling
S2 type 		

$B5_{DS}$ - B6 - B7

Handle type	Front operation Direction of operation	Door drilling
S4 type 		

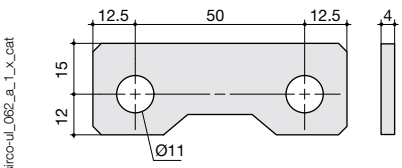
$B8$ - $B6_{DS}$ - $B7_{DS}$

Handle type	Front operation Direction of operation	Door drilling
V1 type 		

Bridging bars (mm)

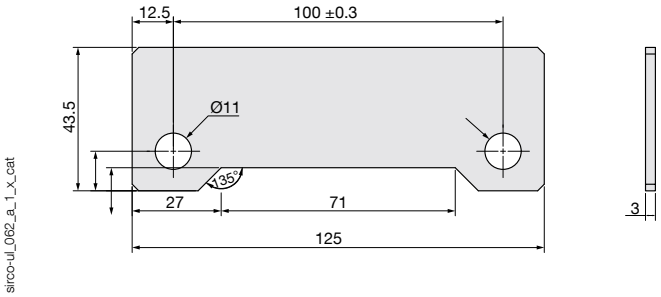
B4

2609 0025



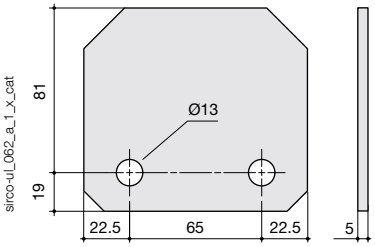
B4 - $B4_{DS}$

2709 0045

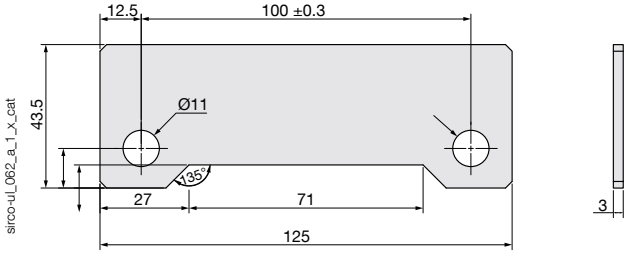


B5

2609 0080

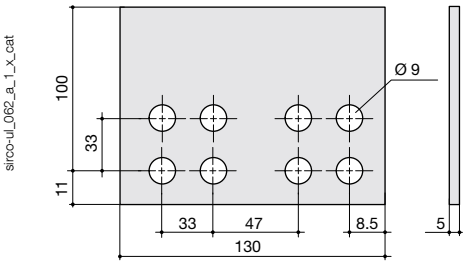


2709 0027



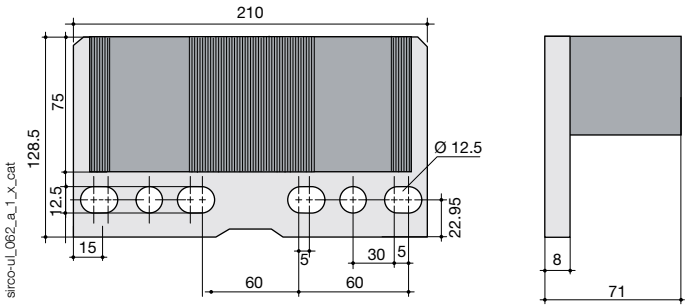
B6

2609 1100



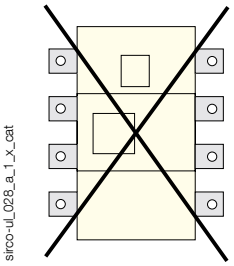
B7

2609 1200

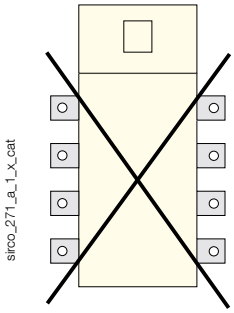


Mounting orientation

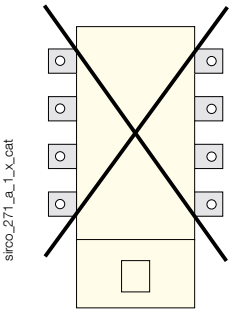
All frames



$B4_{DS}$ - $B5_{DS}$



$B6_{DS}$ - $B7_{DS}$



SIRCO PV UL98B

Load break switches for photovoltaic applications
from 100 to 2000 A, up to 1500 VDC

new

The solution for

- Combiner box
- Recombiner box
- Inverter

Strong points

- Patented switching technology
- Positive break indication
- Up to 1000 VDC as per UL98B
- Up to 1500 VDC as per IEC 60947-3
- Suitable for use in accordance with NEC Art. 690

Conformity to standards

- UL98B Guide WHVA, file E346418
- CSA C22.2#4, Class 4651-02, file 112964
- NEC Art 690
- IEC 60947-3

Approvals and certifications(1)

(1) Product reference on request.

Function

SIRCO PV UL98B non fusible disconnect switches are heavy duty switches that break and make DC photovoltaic circuits on and off load. They are suitable for use in accordance with NEC Art. 690 Photovoltaic Installations.

These switches are extremely durable and are tested and approved for use in the most demanding applications.

They are available in 2, 3, 4, 6 and 8 poles for all configurations from one to 4 circuits and can be used in all types of earthing systems (floating or grounded systems, single or double polarity switching), in order to suit all your requirements.

Advantages

Optimise your investment

High switching performances means less poles in series to reach the operating voltage, consequently:

- Less bridging bars required, limiting installation costs and time.
- Less heat dissipation, making it possible to be installed in a smaller enclosure.

Guarantee safety over time

SIRCO PV are extremely robust products, with all casings made from fiber glass reinforced polyester materials that allows:

- High mechanical withstand.
- High stability to temperatures (RTI of 130 °C).
- High dielectric performance (high CTI / tested according to ASTM D 2303).

Take advantage of an innovative design

The SIRCO PV are able to operate on and off load up to 500 VDC per poles, providing extremely compact solution:

- 1000 VDC (UL 98B) on a 2 poles switch.
- 1500 VDC (IEC 60947-3) on a 3 poles switch.
- Up to 4 circuits each at 1000 VDC on an 8 poles switch.

Reliability and performance

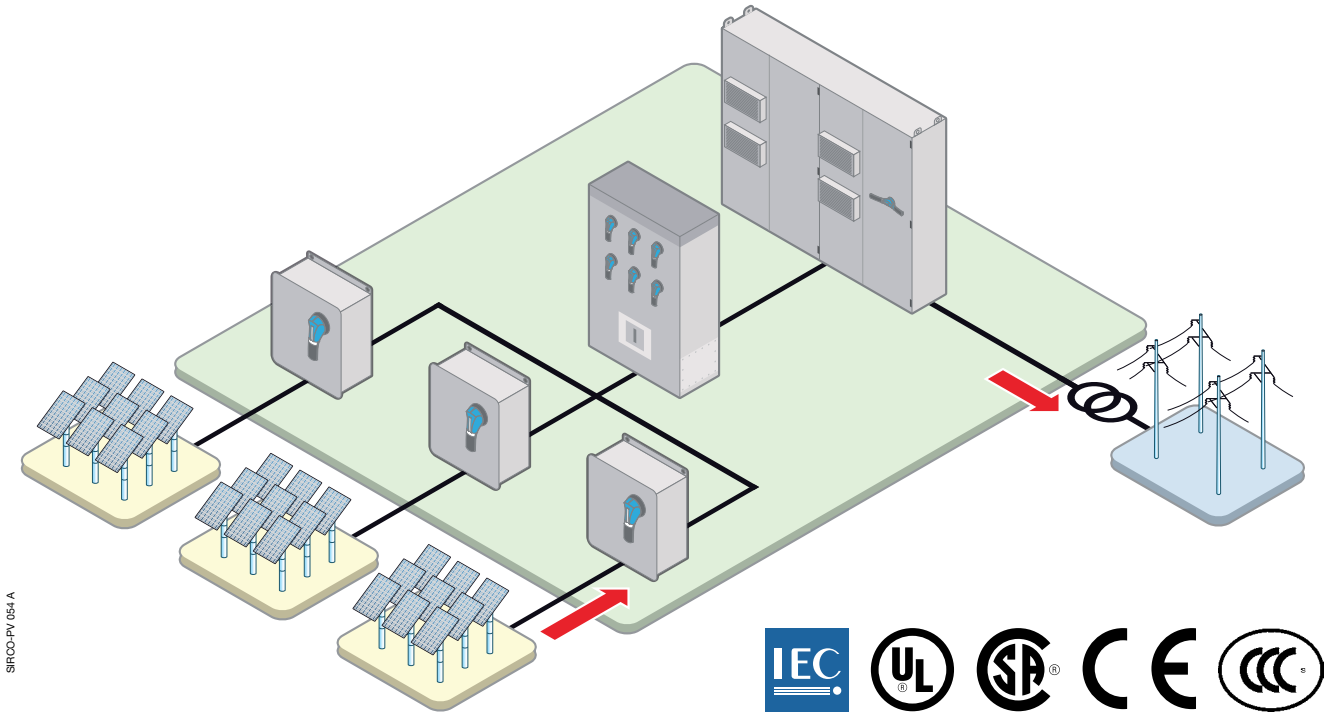
Our range of SIRCO PV load break switches is compliant with UL98B and IEC 60947-3 standards and have been tested above standards expectation, ensuring no critical current.

They are as well able to withstand 10 kA, 50 ms, allowing the use of any overcurrent protection device for line protection.

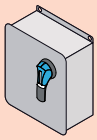
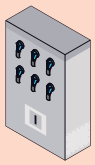
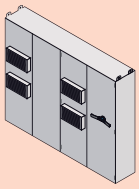
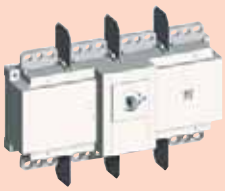
socomec
Innovative Power Solutions

Typical PV architecture

The SIRCO PV range provides safe disconnection and isolation at all levels of your PV installation.



The SOCOMEC solutions

LEVEL OF INSTALLATION	SOCOMEC SOLUTIONS	
Combiner box		
		SIRCO PV One circuit up to 500 A at 1500 VDC
Recombiner box		
		SIRCO PV 4 circuits up to 500 A at 1000 VDC 2 circuits up to 500 A at 1500 VDC
Inverter		
		SIRCO PV One circuit up to 2000 A at 1000 VDC up to 2000 A at 1500 VDC

References

1000 VDC - Back plate mounting

Rating (A)	Frame size	No. of poles	Switch body	External handle	Shaft for external handle	Bridging bar
1 PV circuit						
100 A	B4	2P	27PV **2009**	S2 type Black 1, 3R, 12 142F **2111**(1) Red/Yellow 1, 3R, 12 142G **2111**(1) Black 4, 4X 142D **2111**(1) Red/Yellow 4, 4X 142E **2111**(1)	200 mm 7.9 inches 1400 **1020** 320 mm 12.6 inches 1400 **1032** 400 mm 15.7 inches 1400 **1040**(2)	1x 2709 **1020**
200 A	B4		27PV **2019**			
250 A	B4		27PV **2024**			
325 A	B5		27PV **2032**			1x 2709 **1041**
400 A	B5		27PV **2039**			2x 2709 **1041**
600 A	B6	4 P	27PV **4060**	S3 type Black 4, 4X 143D **3111**(1) Red/Yellow 4, 4X 143E **3111**(1)	200 mm 7.9 inches 1401 **1520** 320 mm 12.6 inches 1401 **1532** 400 mm 15.7 inches 1401 **1540**(2)	2x 2709 **0062**
800 A	B7		27DC **4081**	S4 type Black 4, 4X 144D **3111**(1) Red/Yellow 4, 4X 144E **3111**(1)		2x 2709 **0081**
1200 A	B7		27DC **4121**			2x 2709 **0121**
2000 A	$B7_{DS}$	8 P	27DC **4201**	V1 type Black 3R, 12 2799 **7145**	320 mm 12.6 inches 4199 **3018**	
2 PV circuits						
100 A	$B4_{DS}$	4 P	27PV **5009**	S2 type Black 1, 3R, 12 142F **2111**(1) Red/Yellow 1, 3R, 12 142G **2111**(1) Black 4, 4X 142D **2111**(1) Red/Yellow 4, 4X 142E **2111**(1)	200 mm 7.9 inches 1400 **1020** 320 mm 12.6 inches 1400 **1032** 400 mm 15.7 inches 1400 **1040**(2)	2x 2709 **1020**
200 A	$B4_{DS}$		27PV **5024**			4x 2709 **1020**
325 A	B5		27PV **4032**			2x 2709 **0027**
400 A	B5		27PV **4039**			2x 2709 **0045** (2 units)
600 A	$B6_{DS}$	8 P	27PV **8060**	V1 type Black 3R, 12 2799 **7145**	320 mm 12.6 inches 4199 **3018**	4x 2709 **0062**
800 A	$B7_{DS}$		27DC **8081**			4x 2709 **0121**
1000 A	$B7_{DS}$		27DC **8101**			
4 PV circuits						
350 A	$B5_{DS}$	8 P	27PV **8039**	S3 type Black 4, 4X 143D **3111**(1) Red/Yellow 4, 4X 143E **3111**(1)	200 mm 7.9 inches 1401 **1520** 320 mm 12.6 inches 1401 **1532** 400 mm 15.7 inches 1401 **1540**(2)	4x 2709 **0045**

(1) Defeatable handle.
(2) Shaft guide reference 1429 0000 is required for shaft length over 15.7 inches (400mm).

1500 VDC - Back plate mounting

Due to UL98B voltage limitation at 1000 VDC, these switches are certified per UL at 1000 VDC and self-certified at 1500 VDC.

Rating (A)	Frame size	No. of poles	Switch body	External handle	Shaft for external handle	Bridging bar
1 PV circuit						
275 A	B5	3 P	27PV **3026**	S2 type Black 1, 3R, 12 142F **2111**(1) Red/Yellow 1, 3R, 12 142G **2111**(1) Black 4, 4X 142D **2111**(1) Red/Yellow 4, 4X 142E **2111**(1)	200 mm 7.9 inches 1400 **1020** 320 mm 12.6 inches 1400 **1032** 400 mm 15.7 inches 1400 **1040**(2)	2x 2709 **0027** (1 unit)
325 A	B5		27PV **3032**			
400 A	B5		27PV **3039**			2x 2709 **0045** (3 units)
600 A	$B6_{DS}$	8 P	27PV **8060**	V1 type Black 3R, 12 2799 **7145**	320 mm 12.6 inches 4199 **3018**	4x 2709 **0062** (3 units)
800 A	$B7_{DS}$		27DC **8081**			4x 2709 **0121** (2 units)
1000 A	$B7_{DS}$		27DC **8101**			
2 PV circuits						
275 A	$B5_{DS}$	6 P	27PV **6026**	S3 type Black 4, 4X 143D **3111**(1) Red/Yellow 4, 4X 143E **3111**(1)	200 mm 7.9 inches 1401 **1520** 320 mm 12.6 inches 1401 **1532** 400 mm 15.7 inches 1401 **1540**(2)	4x 2709 **0027** (1 unit)
350 A	$B5_{DS}$		27PV **6039**			4x 2709 **0045** (2 units)

(1) Defeatable handle.
(2) Shaft guide reference 1429 0000 is required for shaft length over 15.7 inches (400mm).

Accessories

External operation

Use

In a combiner box, located close to the solar cell strings, or located close to the inverter, we recommend to use a door interlocked external handle for its safety features.

Door interlocked external operation handles include an escutcheon, are padlockable and must be utilised with an extension shaft.

Example

The locking function of the enclosure in the "ON" position will force the operator to safely disconnect and isolate the solar cell strings prior to any intervention. Opening the door when the switch is on "ON" position is possible by defeating the locking function using a tool (authorized persons only). The interlocking function is restored when the door is closed back.

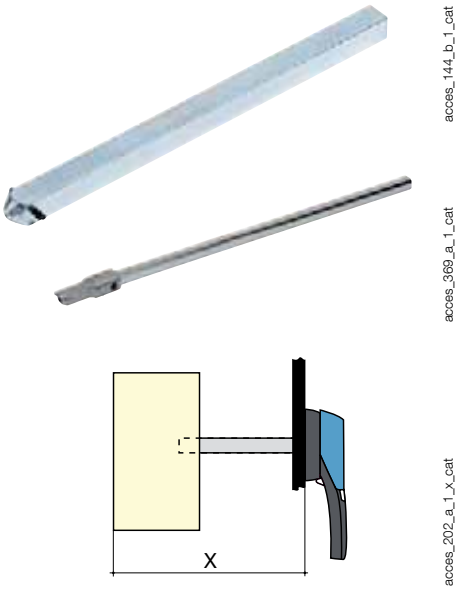
Frame size	Handle type	Handle colour	Nema degree of protection	Reference
B4 … B5 $B4_{DS}$	S2	Black	1, 3R, 12	142F **2111**
		Red/Yellow		142G **2111**
		Black	4, 4X	142D **2111**
		Red/Yellow		142E **2111**
$B5_{DS}$ B6	S3	Black		143D **3111**
		Red/Yellow		143E **3111**
B7	S4	Black		144D **3111**
		Red/Yellow		144E **3111**
$B6_{DS}$ … $B7_{DS}$	V1	Black	1, 3R, 12	2799 **7145**

Shaft for external handle

Use

Standard lengths:
- 7.9 in / 200 mm,
- 12.6 in / 320 mm,
- 15.7 in / 400 mm.

Other lengths: please consult us.



Frame size	Handle type	Dimension (inches)	Dimension X (mm)	Length (inches)	Length (mm)	Reference
B4	S2	6 … 11.6	150 … 295	7.9	200	1400 **1020**
		6 … 16.3	150 … 415	12.6	320	1400 **1032**
		6 … 19.4	150 … 495	15.7	400	1400 **1040**
B5		8 … 12.9	203 … 328	7.9	200	1400 **1020**
		8 … 17.6	203 … 448	12.6	320	1400 **1032**
		8 … 20.7	203 … 525	15.7	400	1400 **1040**
B6	S3	8.70 … 13.50	220 … 343	7.9	200	1401 **1520**
		8.70 … 18.23	220 … 463	12.6	320	1401 **1532**
		8.70 … 21.38	220 … 543	15.7	400	1401 **1540**
B7	S4	12 … 14.4	305 … 366	7.9	200	1401 **1520**
		12 … 19.1	305 … 485	12.6	320	1401 **1532**
		12 … 22.2	305 … 564	15.7	400	1401 **1540**
$B4_{DS}$	S2	12 … 14.3	305 … 363	7.9	200	1400 **1020**
		12 … 19	305 … 483	12.6	320	1400 **1032**
		12 … 22.10	305 … 561	15.7	400	1400 **1040**
$B5_{DS}$	S3, S4	16 … 18.4	406 … 467	7.9	200	1401 **1520**
		16 … 23.1	406 … 589	12.6	320	1401 **1532**
		16 … 26.3	406 … 668	15.7	400	1401 **1540**
$B6_{DS}$	V1	20 … 28.1	508 … 714	12.6	320	4199 **3018**
		20 … 31.3	508 … 795	15.7	400	4199 **3019**
$B7_{DS}$		20 … 28.1	508 … 714	12.6	320	4199 **3018**
		20 … 39.4	508 … 795	15.7	400	4199 **3019**

S-type handle adapter

Use
For handles S2, S3 and S4.

Dimensions
Increases the distance between the handle grip and the door by 12 mm, for better handling.

Colour	Nema degree of protection	To be ordered in multiples of	Reference
Black	1, 3R, 12	10	1493 **0000**


acces_187_a_3_cat

Alternative S-type handle cover colours

Use
For handles S2, S3 and S4.

Other colours: please consult us.

Handle colour	Handle type	To be ordered in multiples of	Reference
Light grey	S2, S3	50	1401 **0001**
Dark grey	S2, S3	50	1401 **0011**
Light grey	S4	50	1401 **0031**
Dark grey	S4	50	1401 **0041**


acces_198_a_3_cat

Auxiliary contact

Use
Pre-break and signalling of positions 0 and I:
- 1 to 2 NO/NC auxiliary contacts,
- 1 to 2 low level NO/NC auxiliary contacts.

Electrical characteristics
A300.


acces_076_a_1_cat

NO/NC contact

Frame size	Position AC	Type	Reference
B4 … B7	1 contact	NO/NC	2799 **0021**
	2 contacts		2799 **0022**
$B4_{DS}$ … $B7_{DS}$	1 contact		4159 **0021**

Low level NO/NC auxiliary contacts

Frame size	Position AC	Type	Reference
B4 … B7	1 contact	NO/NC	2799 **0121**
	2 contacts		2799 **0122**
$B4_{DS}$ … $B7_{DS}$	1 contact		4199 **0022**

Terminal screen

Use
Top or bottom protection against direct contact with terminals or connection parts.

Frame size	No. of poles	Position	Pack	Reference
B4	2 P	top or bottom	1 unit	2798 **3021**
B5	3 P	top or bottom	1 unit	2798 **3041**
B5	4 P	top or bottom	1 unit	2798 **4041**
B6	4 P	top or bottom		2798 **4061**
B7	4 P	top or bottom	1 unit	2798 **4121**
$B4_{DS}$	2 P	top or bottom	1 unit	4158 **3021**
$B5_{DS}$	6 P	top or bottom	1 unit	4158 **3041**
	8 P	top or bottom	1 unit	4158 **4041**
$B6_{DS}$	8 P	top and bottom	2 units	2798 **8061**
$B7_{DS}$	8 P	top or bottom	1 unit	2798 **4121**


acces_079_a_1_cat

Accessories (continued)

Bridging bars for connecting poles in series

Use

The bridging bars will make easy the connection of the poles in series, allowing the following configurations(1).

(1) Other connections: refer to mounting instructions.

1000 VDC

Frame size	Rating (A)	Quantity to be ordered	Fig.	Reference
1 PV circuit				
B4	100	1	1	2709 **1020**
B4	200	1	1	2709 **1020**
B4	250	1	1	2709 **1020**
B5	325	1	1	2709 **1041**
B5	400	2	2	2709 **1041**
B6	600	2	3	2709 **0062**
B7	800	2	3	2709 **0081**
B7	1200	2	3	2709 **0121**
$B7_{DS}$	2000	2	3	2709 **0121**
2 PV circuits				
$B4_{DS}$	100	2	1	2709 **1020**
$B4_{DS}$	200	4	4	2709 **1020**
B5	325	2	5	2709 **0027**
B5	400	2	6	2709 **0045**
B5	400	2	6	2709 **0045**
$B6_{DS}$	600	4	3	2709 **0062**
$B7_{DS}$	800	4	3	2709 **0121**
$B7_{DS}$	1200	4	3	2709 **0121**
4 PV circuits				
$B5_{DS}$	350	2	6	2709 **0045**

1500 VDC

Frame size	Rating (A)	Quantity to be ordered	Fig.	Reference
1 PV circuit				
B5	275	2	5	2709 **0027**
B5	325	2	5	2709 **0027**
B5	400	2	6	2709 **0045**
$B6_{DS}$	600	4	3	2709 **0062**
$B7_{DS}$	800	4	3	2709 **0121**
$B7_{DS}$	1000	4	3	2709 **0121**
2 PV circuits				
$B5_{DS}$	275	4	5	2709 **0027**
$B5_{DS}$	350	4	6	2709 **0045**

Bridging bars for connecting poles in series (continued)

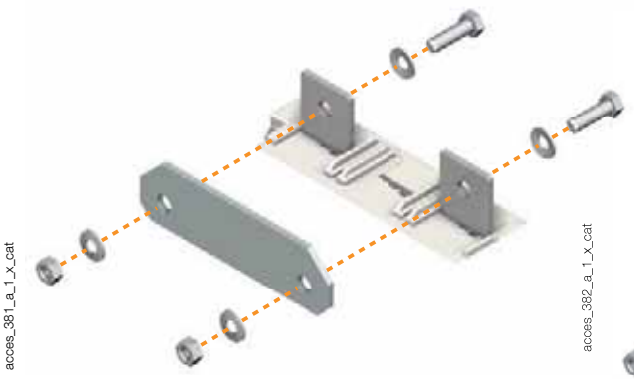


Fig. 1

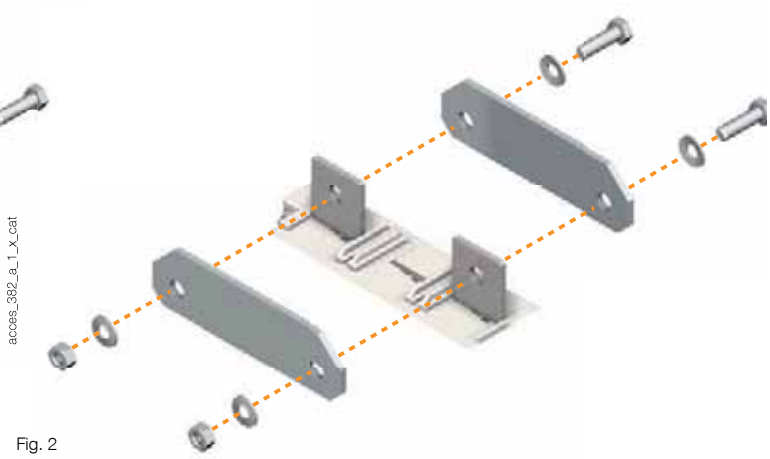


Fig. 2

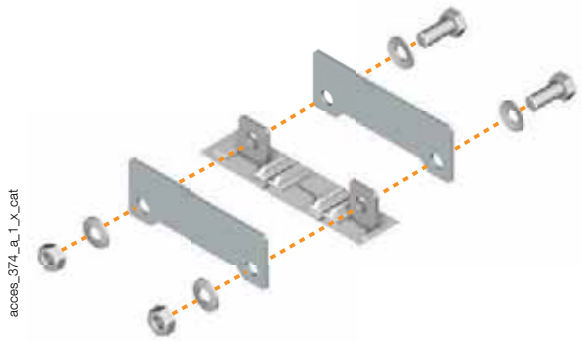


Fig.4

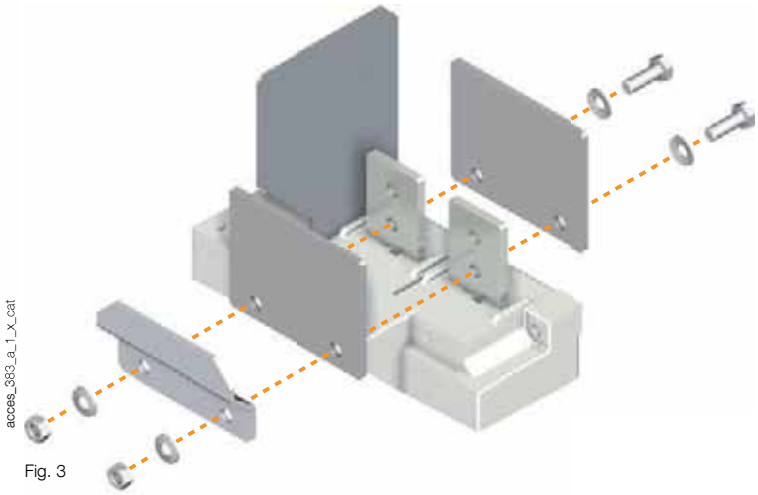


Fig. 3

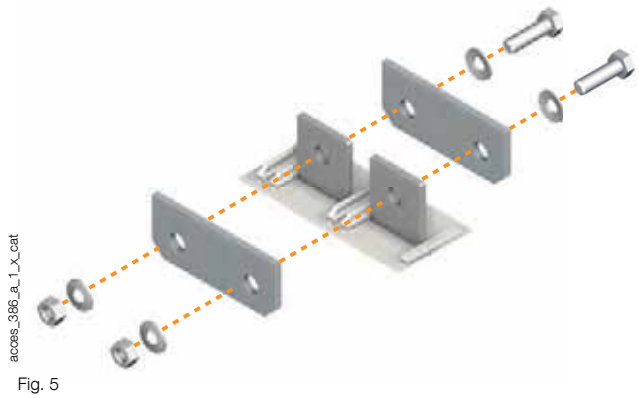


Fig. 5

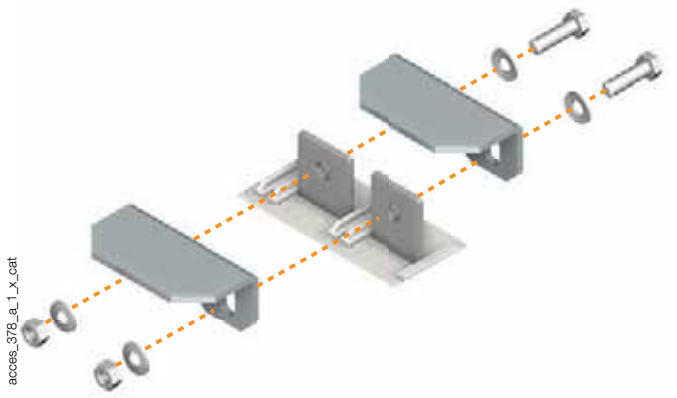


Fig. 6

Accessories (continued)

Cage terminals

Use

Connection of bare copper cables onto the terminals (without lugs).
Optional fan out kit for ratings of 800 to 1200 A for connecting several cables to the switch.

Frame size	Rating max (A)	Numbrer and size of cables	Max. number of connections per terminal	Type of cable	Quantity	Reference
B4 - $B4_{DS}$	100 … 200	1 conductor (#6-300MCM)	1	Cu / Al	2 lugs	3954 **2020**
		2 conductors (#4-2/0)	1	Cu / Al	2 lugs	3954 **2025**
B4 - $B4_{DS}$	325 … 400	1 conductor (#2-600MCM)	1	Cu / Al	2 lugs	3954 **2040**
		2 conductors (#6-350MCM)	1	Cu / Al	2 lugs	3954 **2041**
B6 - $B6_{DS}$	600	2 conductors (#2-600MCM)	1	Cu / Al	2 lugs	3954 **2060**
B7	800 … 1200	2 conductors (#2-600MCM)	2	Cu / Al	2 lugs	3954 **2060**
		2 conductors (#2-600MCM)	3(1)	Cu / Al	3 lugs	3954 **3060**
$B7_{DS}$	2000	2 conductors (#2-600MCM)	2(2)	Cu / Al	2 lugs	3954 **2060**
		2 conductors (#2-600MCM)	3(3)	Cu / Al	3 lugs	3954 **3060**

(1) Order a fan out kit reference 2709 1203 for connecting 3 connectors per terminal (6 in total for the switch).
(2) 2 connectors per terminal with the connection kit 2729 1200.
(3) 3 connectors per terminal with the connection kits 2729 1201 and 2709 1202.

Copper bar connection kits

Use

To allow connection between the two power terminals from a same pole for 2000 A ratings. (Fig. 1, Fig. 2 and Fig. 3)

Top or bottom flat connection

Frame size	Rating (A)	Figure	Quantity to order per pole	Number of terminals	Reference
$B7_{DS}$	800 … 1000	1	1	2	2729 **1200**
		2	1	3	2729 **1202**
	2000	1	1	2	2729 **1200**
		2	1	3	2729 **1202**

Top or bottom edgewise connection

Frame size	Rating (A)	Figure	Quantity to order per pole	Number of terminals	Reference
$B7_{DS}$	800 … 2000	3	1	3	2729 **1201**

Fig. 1

Fig. 3

Fig. 2

Characteristics

SIRCO PV UL98B switches have dual UL98B and IEC 60947-3 approval. Due to the difference in the standard test conditionS, an identical product can have 2 different ratings:

- a "rating" as per UL98B
- a "rated current" as per IEC 60947-3

as per standard UL98B

Rating (A)		**100 A**				**200 A**			
Number of circuits	**Rated voltage**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	100	2 P	2 P	B4	200	2 P	2 P	B4
2 circuits	600 VDC	100	1 P	2 P	B4	130	1 P	2 P	B4
2 circuits	1000 VDC	100	2 P	4 P	$B4_{DS}$	200	2 P	4 P	$B4_{DS}$
4 circuits	600 VDC	100	1 P	4 P	$B4_{DS}$	130	1 P	4 P	$B4_{DS}$
Short-circuit capacity at 1000 VDC (any circuit breaker)									
Prospective short-circuit current (kA rms DC)		10(1)				10(1)			
Connection terminals									
Min. connection wire range/ AWG		#6				#6			
Max. connection wire range/ AWG		300MCM				300MCM			
Mechanical characteristics									
Durability (number of operating cycles)		10 000				10 000			
Tightening torque (lbs.in/Nm)		88.5/10				88.5/10			
Auxiliary contact									
Electrical characteristics		A300				A300			

as per standard IEC 60947-3

Rated current			**160 A**				**250 A**			
Thermal current at 40°C (A)			**160**				**250**			
Thermal current at 50°C (A)			**160**				**250**			
Thermal current at 60°C (A)			**160**				**250**			
Rated insulation voltage U_i (V)			1500				1500			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	160	2 P	2 P	B4	250	2 P	2 P	B4
1 circuit	1500 VDC	DC-21 B	160	4 P	4 P	$B4_{DS}$	250	4 P	4 P	$B4_{DS}$
2 circuits	1000 VDC	DC-21 B	160	2 P	4 P	$B4_{DS}$	250	2 P	4 P	$B4_{DS}$
4 circuits	600 VDC	DC-21 B	125	1 P	4 P	$B4_{DS}$	160	1 P	4 P	$B4_{DS}$

(1) Without fuse during 50 ms.

Characteristics (continued)

as per standard UL98B

Rating		250 A				275 A			
Number of circuits	**Rated voltage**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	250	2 P	2 P	B4	275	2 P	2 P	B5
2 circuits	600 VDC	130	1 P	2 P	B4	215	1 P	2 P	B5
2 circuits	1000 VDC	250	2 P	4 P	$B4_{DS}$	275	2 P	4 P	B5
4 circuits	600 VDC	130	1 P	4 P	$B4_{DS}$	215	1 P	4 P	B5
4 circuits	1000 VDC	-	-	-	-	215	2 P	8 P	$B5_{DS}$
6 circuits	600 VDC	-	-	-	-	215	1 P	6 P	$B5_{DS}$
8 circuits	600 VDC	-	-	-	-	215	1 P	8 P	$B5_{DS}$
Short-circuit capacity at 1000 VDC (any circuit breaker)									
Prospective short-circuit current (kA rms DC)		10(1)				10(1)			
Connection terminals									
Min. connection wire range/ AWG		#6				2x#6			
Max. connection wire range/ AWG		300MCM				600MCM			
Mechanical characteristics									
Durability (number of operating cycles)		10 000				6 000			
Tightening torque (lbs.in/Nm)		88.5/10				128.3/14.5			
Auxiliary contact									
Electrical characteristics		A300				A300			

as per standard IEC 60947-3

Rated current			**315 A**				**275 A**			
Thermal current at 40°C (A)			**315**				**275**			
Thermal current at 50°C (A)			**315**				**275**			
Thermal current at 60°C (A)			**315**				**275**			
Rated insulation voltage U_i (V)			1500				1500			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	315	2 P	2 P	B4	275	2 P	2 P	B5
1 circuit	1500 VDC	DC-21 B	315	4 P	4 P	$B4_{DS}$	275	2 P	3 P	B5
2 circuits	1000 VDC	DC-21 B	315	2 P	4 P	$B4_{DS}$	275	2 P	4 P	B5
4 circuits	600 VDC	DC-21 B	160	1 P	4 P	$B4_{DS}$	275	1 P	4 P	B5
4 circuits	1000 VDC	DC-21 B	-	-	-	-	275	2 P	8 P	$B5_{DS}$
6 circuits	600 VDC	DC-21 B	-	-	-	-	275	1 P	6 P	$B5_{DS}$
8 circuits	600 VDC	DC-21 B	-	-	-	-	275	1 P	8 P	$B5_{DS}$

(1) Without fuse during 50 ms.

as per standard UL98B

Rating		325 A				350 A			
Number of circuits	**Rated voltage**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	325	2 P	2 P	B5	-	-	-	-
2 circuits	600 VDC	215	1 P	2 P	B5	-	-	-	-
2 circuits	1000 VDC	325	2 P	4 P	B5	350	3 P	6 P	$B5_{DS}$
4 circuits	600 VDC	215	1 P	4 P	B5	-	-	-	-
4 circuits	1000 VDC	325	2 P	8 P	$B5_{DS}$	350	2 P	8 P	$B5_{DS}$
6 circuits	600 VDC	215	1 P	6 P	$B5_{DS}$	215	1 P	6 P	$B5_{DS}$
8 circuits	600 VDC	215	1 P	8 P	$B5_{DS}$	215	1 P	8 P	$B5_{DS}$
Short-circuit capacity at 1000 VDC (any circuit breaker)									
Prospective short-circuit current (kA rms DC)		10[1]				10[1]			
Connection terminals									
Min. connection wire range/ AWG		2x#6				2x#6			
Max. connection wire range/ AWG		600MCM				600MCM			
Mechanical characteristics									
Durability (number of operating cycles)		6 000				6 000			
Tightening torque (lbs.in/Nm)		128.3/14.5				128.3/14.5			
Auxiliary contact									
Electrical characteristics		A300				A300			

as per standard IEC 60947-3

Rated current			**400 A**				**500 A**			
Thermal current at 40°C (A)			**400**				**500**			
Thermal current at 50°C (A)			**400**				**500**			
Thermal current at 60°C (A)			**400**				**500**			
Rated insulation voltage U_i (V)			1500				1500			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	400	2 P	2 P	B5	-	-	-	-
2 circuits	1000 VDC	DC-21 B	400	2 P	4 P	B5	500	3 P	6 P	$B5_{DS}$
4 circuits	600 VDC	DC-21 B	275	1 P	4 P	B5				
4 circuits	1000 VDC	DC-21 B	400	2 P	8 P	$B5_{DS}$	500	2 P	8 P	$B5_{DS}$
6 circuits	600 VDC	DC-21 B	275	1 P	6 P	$B5_{DS}$	275	1 P	6 P	$B5_{DS}$
8 circuits	600 VDC	DC-21 B	275	1 P	8 P	$B5_{DS}$	275	1 P	8 P	$B5_{DS}$

(1) Without fuse during 50 ms.

Characteristics (continued)

as per standard UL98B

Rating		400 A				600 A			
Number of circuits	**Rated voltage**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	400	2 P	2 P	B5	600	4 P	4 P	B6
2 circuits	600 VDC	215	1 P	2 P	B5	600	3 P	6 P	$B6_{DS}$
2 circuits	1000 VDC	400	2 P	4 P	B5	600	4 P	8 P	$B6_{DS}$
4 circuits	600 VDC	215	1 P	4 P	B5	-	-	-	-
Short-circuit capacity at 1000 VDC (any circuit breaker)									
Prospective short-circuit current (kA rms DC)		10(1)				10(1)			
Connection terminals									
Min. connection wire range/ AWG		2x#6				2x #2			
Max. connection wire range/ AWG		600MCM				2 x 600MCM			
Mechanical characteristics									
Durability (number of operating cycles)		6 000				6 000			
Tightening torque (lbs.in/Nm)		128.3/14.5				327.5/37			
Auxiliary contact									
Electrical characteristics		A300				A300			

as per standard IEC 60947-3

Rated current			500 A				800 A			
Thermal current at 40°C (A)			**500**				**800**			
Thermal current at 50°C (A)			**500**				**800**			
Thermal current at 60°C (A)			**500**				**800**			
Rated insulation voltage U_i (V)			1500				1200			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	500	2 P	2 P	B5	800	4 P	4 P	B6
1 circuit	1500 VDC	DC-21 B	500	2 P	3 P	B5	800	8 P	8 P	$B6_{DS}$
2 circuits	1000 VDC	DC-21 B	275	1 P	4 P	B5	800	4 P	8 P	$B6_{DS}$
4 circuits	600 VDC	DC-21 B	275	1 P	4 P	B5	-	-	-	-

(1) Without fuse during 50 ms.

as per standard UL98B

Rating		800 A				1200 A			
Number of circuits	**Rated voltage**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	800	4 P	4 P	B7	1200	4 P	4 P	B7
2 circuits	600 VDC	800	3 P	6 P	$B7_{DS}$	1200	3 P	6 P	$B7_{DS}$
2 circuits	1000 VDC	800	4 P	8 P	$B7_{DS}$	1200	4 P	8 P	$B7_{DS}$
Short-circuit capacity at 1000 VDC (any circuit breaker)									
Prospective short-circuit current (kA rms DC)		10(1)				10(1)			
Connection terminals									
Min. connection wire range/ AWG		4x#2				4x#2			
Max. connection wire range/ AWG		6x 600MCM(2)				6x 600MCM(2)			
Mechanical characteristics									
Durability (number of operating cycles)		3 500				3 500			
Tightening torque (lbs.in/Nm)		495.7/56				663.9/75			
Auxiliary contact									
Electrical characteristics		A300				A300			

as per standard IEC 60947-3

Rated current			**1000 A**				**1400 A**			
Thermal current at 40°C (A)			**1000**				**1400**			
Thermal current at 50°C (A)			**1000**				**1400**			
Thermal current at 60°C (A)			**1000**				**1400**			
Rated insulation voltage U_i (V)			1200				1200			
Rated impulse withstand voltage U_{imp} (kV)			12				12			
Number of circuits	**Rated voltage**	**Utilisation category**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	1000	4 P	4 P	B7	1400	4 P	4 P	$B7_{DS}$
1 circuit	1500 VDC	DC-21 B	1000	8 P	8 P	$B7_{DS}$	1000	8 P	8 P	$B7_{DS}$
2 circuits	1000 VDC	DC-21 B	1000	4 P	8 P	$B7_{DS}$	1000	4 P	8 P	$B7_{DS}$

(1) Without fuse during 50 ms.
(2) Maximum 6 x 600MCM with fan out kit 2729 1203.

Characteristics (continued)

as per standard UL98B

Rating		2000 A			
Number of circuits	**Rated voltage**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	2000	8 P	8 P	$B7_{DS}$
Short-circuit capacity at 1000 VDC (any circuit breaker)					
Prospective short-circuit current (kA rms DC)		10(1)			
Connection terminals					
Min. connection wire range/ AWG		4x#2			
Max. connection wire range/ AWG		6x 600MCM(2)			
Mechanical characteristics					
Durability (number of operating cycles)		3 500			
Tightening torque (lbs.in/Nm)		663.9/75			
Auxiliary contact					
Electrical characteristics		A300			

as per standard IEC 60947-3

Rated current			2200 A			
Thermal current at 40°C (A)			**2200**			
Thermal current at 50°C (A)			**1850**			
Thermal current at 60°C (A)			**1600**			
Rated insulation voltage U_i (V)			1200			
Rated impulse withstand voltage U_{imp} (kV)			12			
Number of circuits	**Rated voltage**	**Utilisation category**	**(A)**	**Number of pole(s) in series per polarity**	**Number of pole(s) of the device**	**Frame size**
1 circuit	1000 VDC	DC-21 B	2200	8 P	8 P	$B7_{DS}$

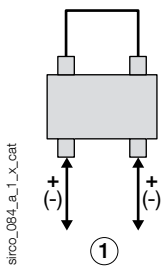
(1) Without fuse during 50 ms.
(2) Maximum 6 x 600MCM with fan out kit 2729 1203.

Pole connections in series

1 PV circuit - 1000 VDC

B4-B5 - 2P

Grounded



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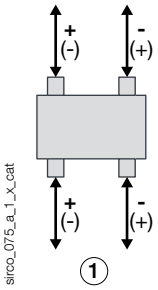
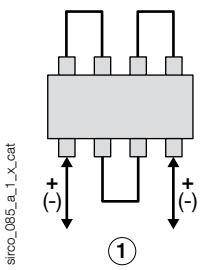


B6-B7 - 4P

Grounded



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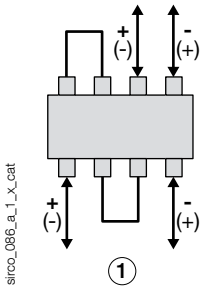

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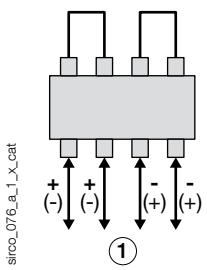
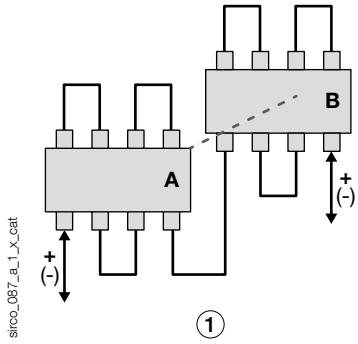


$B7_{DS}$ - 8P

Grounded



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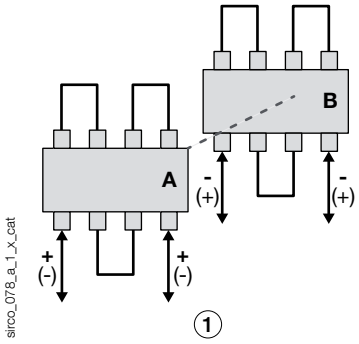
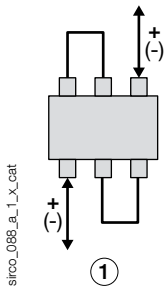


A. Front switch.
B. Rear switch.
1. Circuit 1.

1 PV circuit - 1500 VDC

B4-B5 - 2P

Grounded



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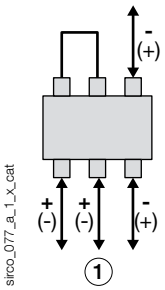
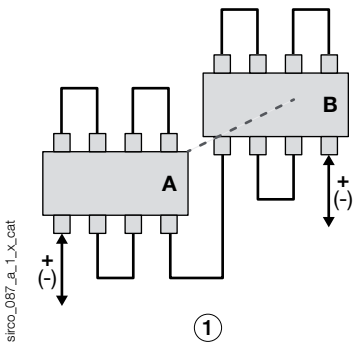


$B6_{DS}$-$B7_{DS}$- 8P

Grounded



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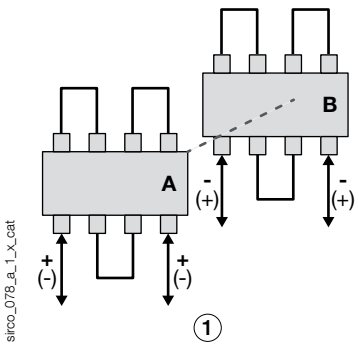


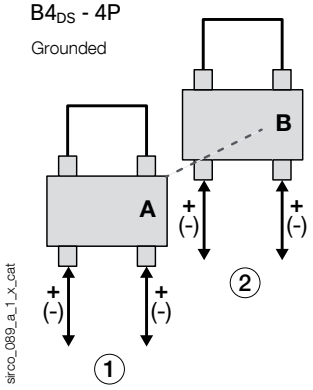
A. Front switch.
B. Rear switch.
1. Circuit 1.

Pole connections in series (continued)

2 PV circuits - 1000 VDC

$B4_{DS}$ - 4P

Grounded



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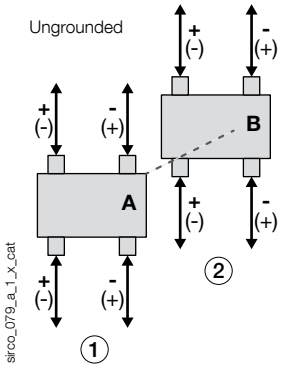
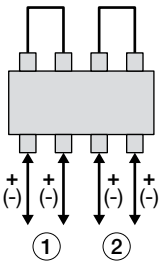
Ungrounded



sirco_079_a_1_x_cat

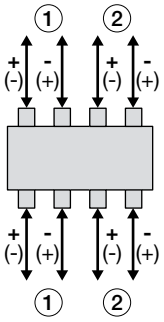
B5 - 4P

Grounded



sirco_080_a_1_x_cat

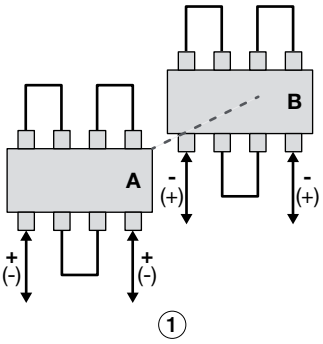
Ungrounded



sirco_080_a_1_x_cat

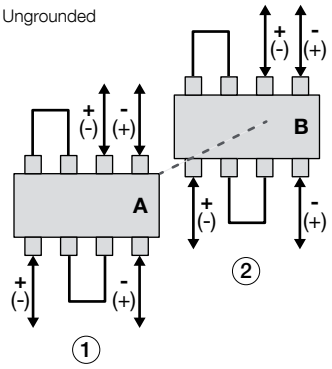
$B5_{DS}$-$B7_{DS}$ - 8P

Grounded

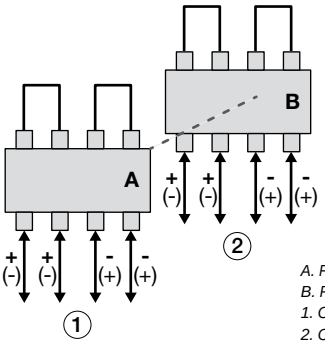


sirco_078_a_1_x_cat

Ungrounded



sirco_091_a_1_x_cat



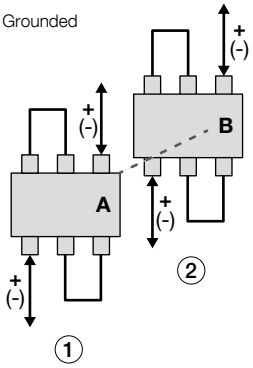
sirco_081_a_1_x_cat

A. Front switch.
B. Rear switch.
1. Circuit 1.
2. Circuit 2.

2 PV circuits - 1500 VDC

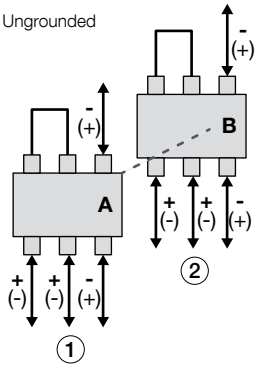
$B5_{DS}$ - 6P

Grounded



sirco_092_a_1_x_cat

Ungrounded



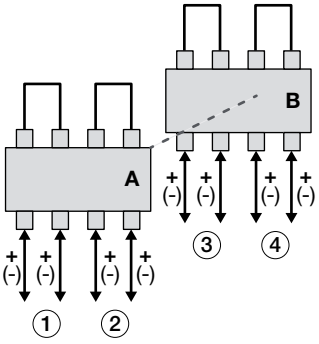
sirco_082_a_1_x_cat

A. Front switch.
B. Rear switch.
1. Circuit 1.
2. Circuit 2.

4 PV circuits - 1000 VDC

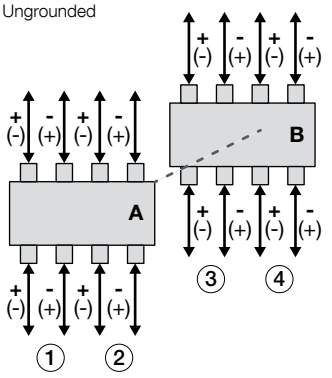
$B5_{DS}$ - 8P

Grounded



sirco_093_a_1_x_cat

Ungrounded

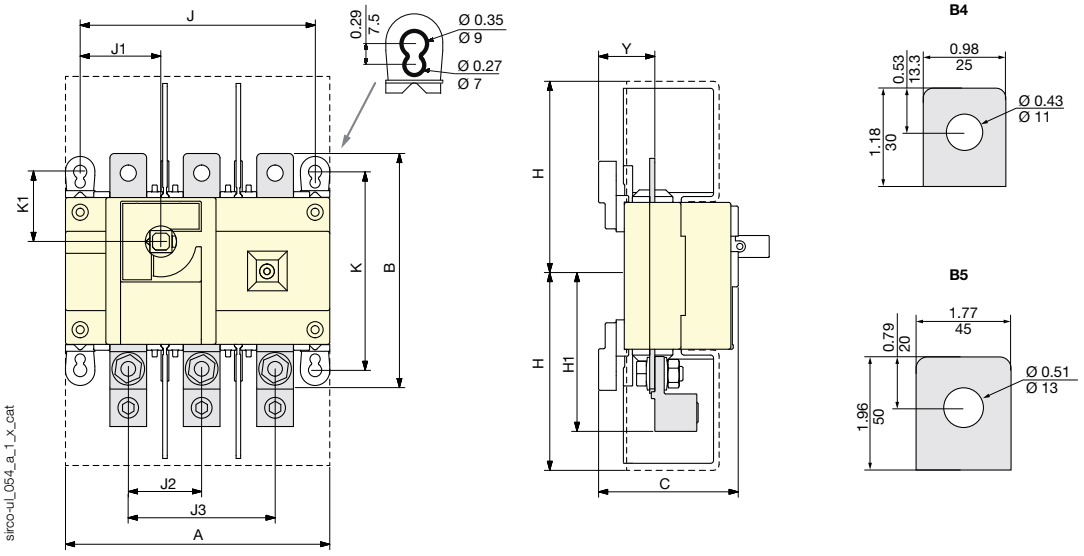


sirco_083_a_1_x_cat

A. Front switch.
B. Rear switch.
1. Circuit 1.
2. Circuit 2.
3. Circuit 3.
4. Circuit 4.

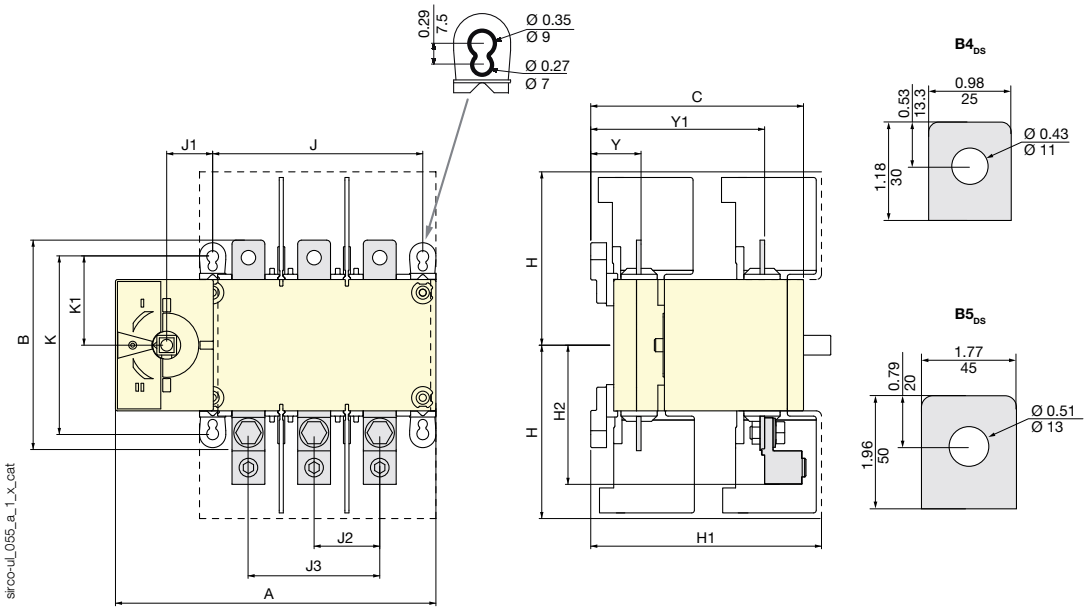
Dimensions (in / mm)

Frame size B4-B5



Frame size	No. of poles	Unit	A	B	C	H	H1 max.	J	J1	J2	J3	K	K1	Y
B4	2 P	inches	7.08	6.30	3.74	5.21	4.21	6.30	2.16	-	3.94	5.31	1.89	1.51
		mm	180	160	95	132.5	107	160	55	-	100	135	48	38.5
B5	2 P	inches	9.05	10.23	5.04	8	6.53	8.26	2.95	-	5.12	7.67	2.65	2.08
		mm	230	260	128	203	166	210	75	-	130	195	67.5	53
B5	3 P	inches	9.05	10.23	4.98	8	6.53	8.26	2.95	2.56	-	7.67	2.65	2.02
		mm	230	260	126.5	203	166	210	75	65	-	195	67.5	51.5
B5	4 P	inches	11.41	10.23	4.98	8	6.53	10.63	5.31	2.56	-	7.67	2.65	2.02
		mm	290	260	126.5	203	166	270	135	65	-	195	67.5	51.5

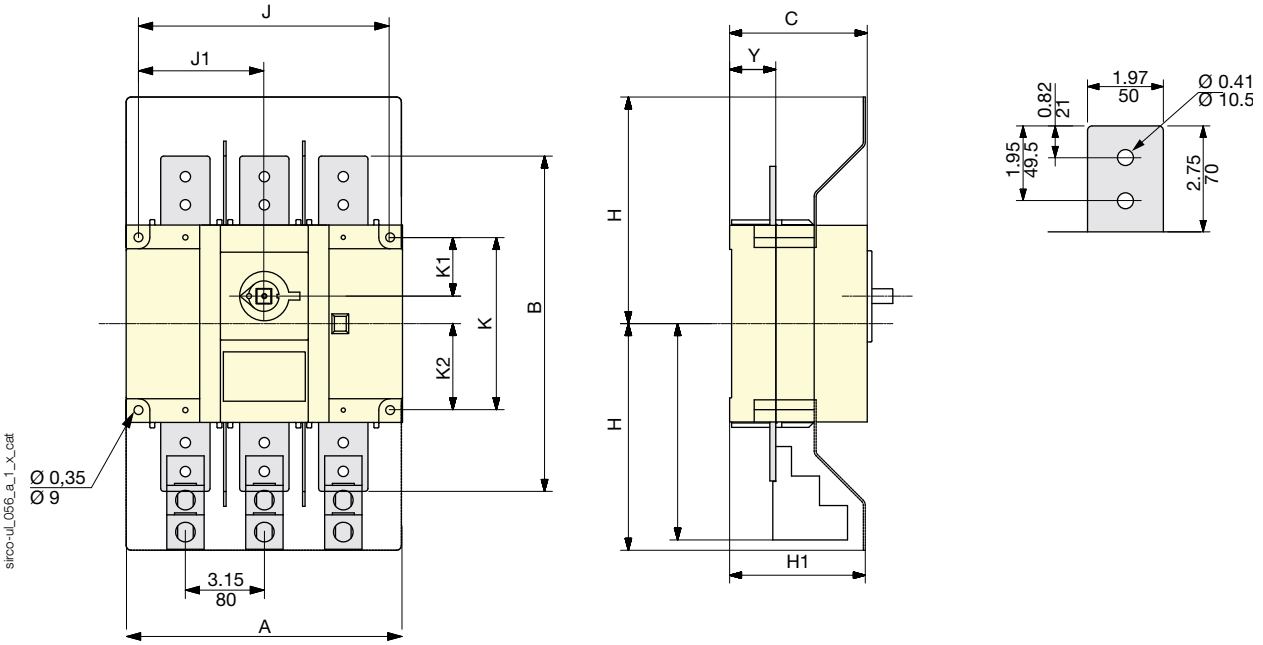
Frame size $B4_{DS}$-$B5_{DS}$



Frame size	No. of poles	Unit	A	B	C	H	H1	H1 max.	J	J1	J2	J3	K	K1	Y	Y1
$B4_{DS}$	4 P	inches	9.60	6.30	6.37	5.08	6.93	4.21	6.30	1.37	-	3.93	5.31	2.65	1.51	5.21
		mm	244	160	162	129	176	107	160	35	-	100	135	67.5	38.5	132.5
$B5_{DS}$	6 P	inches	11.85	10.23	9.39	8	6.51	6.53	6.26	1.37	2.56	-	7.67	2.70	2.02	7.44
		mm	301	260	238.5	203	165.5	166	210	35	65	-	195	68.5	51.5	189
$B5_{DS}$	8 P	inches	14.21	10.23	9.39	8	6.51	6.53	10.63	1.37	2.56	-	7.67	2.70	2.02	7.44
		mm	361	260	238.5	203	165.5	166	270	35	65	-	195	68.5	51.5	189

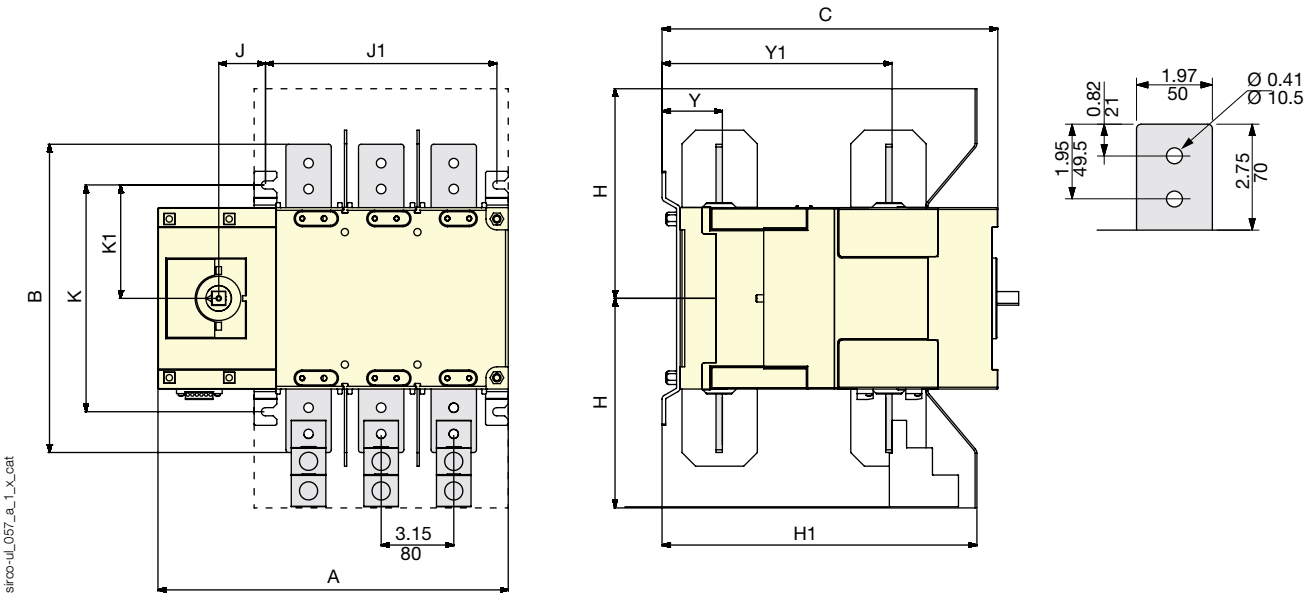
Dimensions (in / mm) (continued)

Frame size B6



Frame size	No. of poles	Unit	A	B	C	H	H1	J	J1	K	K1	K2	Y
B6	4 P	inches	24.80	13.38	5.47	10.63	5.70	13.19	6.59	6.88	2.34	1.10	1.83
		mm	630	340	139	270	145	335	167.5	175	59.5	28	46.5

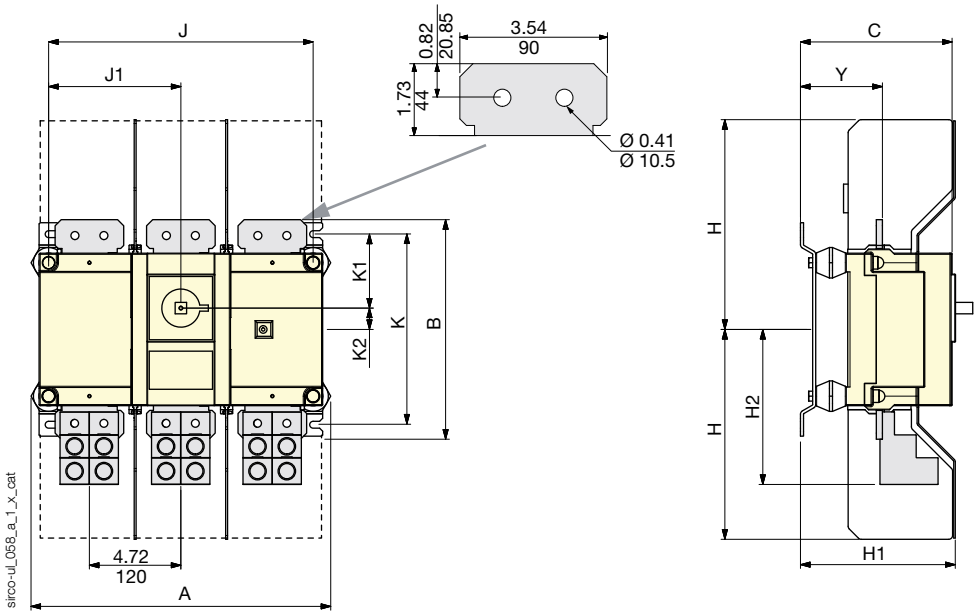
Frame size $B6_{DS}$



Frame size	No. of poles	Unit	A	B	C	H	H1	J	J1	K	K1	Y	Y1
$B6_{ds}$	8 P	inches	18.34	13.38	14.56	10.63	13.66	13.18	2.02	9.84	4.92	2.61	9.98
		mm	466	340	370	270	347	335	51.5	250	125	66.5	253.5

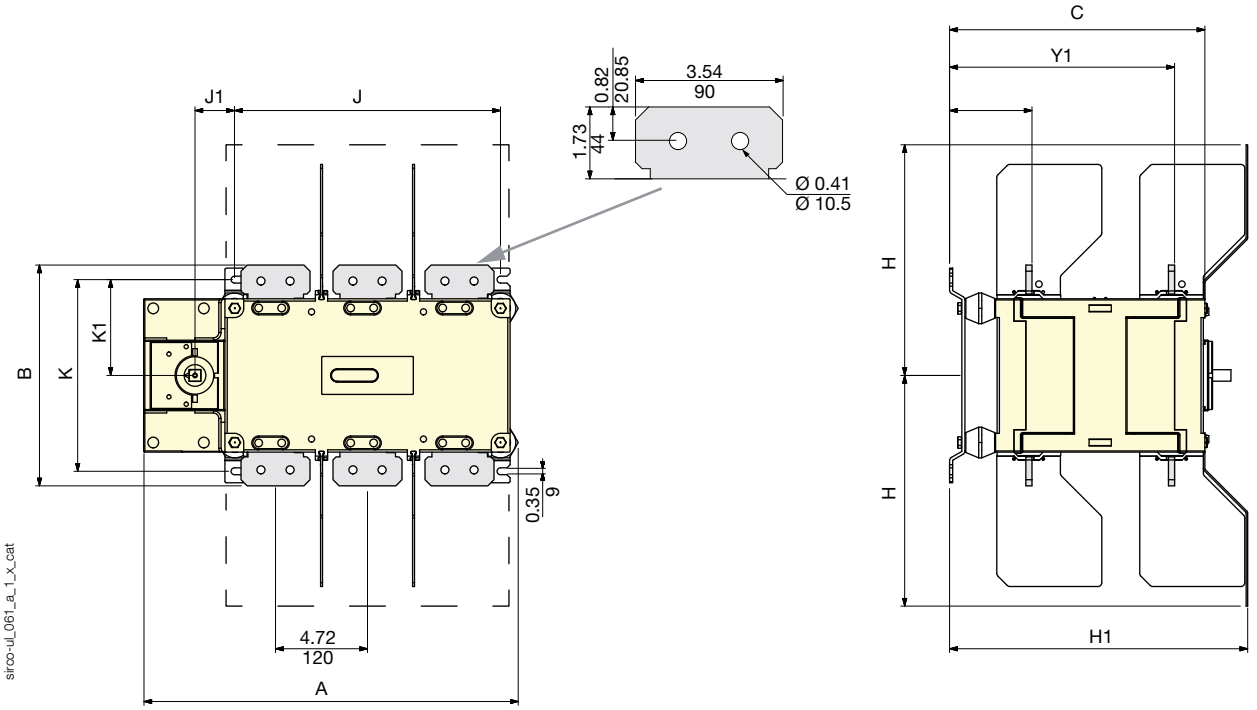
Dimensions (in / mm) (continued)

Frame size B7



Frame size	No. of poles	Unit	A	B	C	H	H1	H2	J	J1	K	K1	K2	Y
B7	4 P	inches	20.19	11.33	7.97	11.89	8.30	8.01	18.38	9.19	9.84	3.82	1.10	4.23
		mm	513	288	200	302	211	203.5	467	233.5	250	97	28	107.5

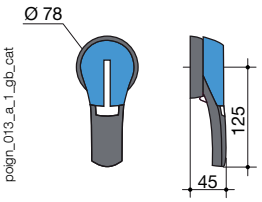
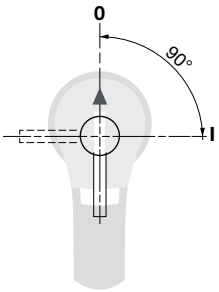
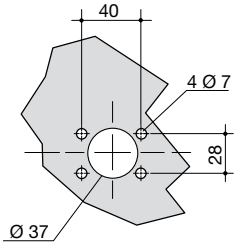
Taille de boîtier $B7_{DS}$



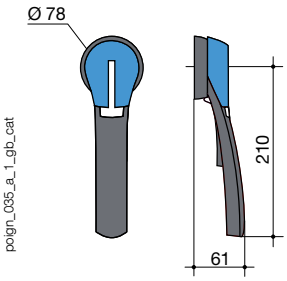
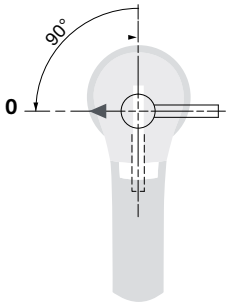
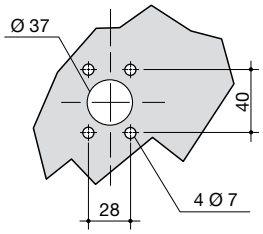
Frame size	No. of poles	Unit	A	B	C	H	H1	J	J1	K	K1	Y	Y1
$B7_{DS}$	8 P	inches	23.95	11.33	13.11	11.85	15.31	18.38	2.02	9.84	4.92	4.23	11.55
		mm	608.5	288	333	301	389	467	51.5	250	125	107.5	293.5

Dimensions for external handles (in / mm)

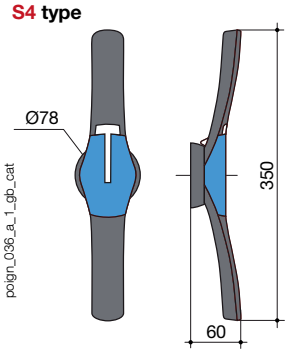
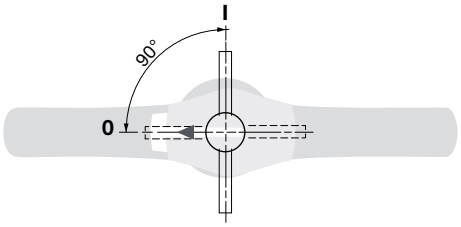
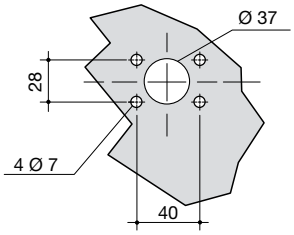
B4 - $B4_{DS}$ - B5

Handle type	Front operation Direction of operation	Door drilling
S2 type 		

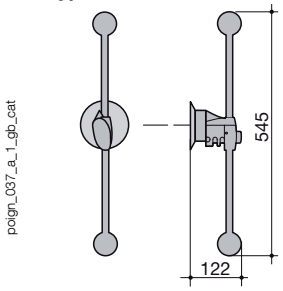
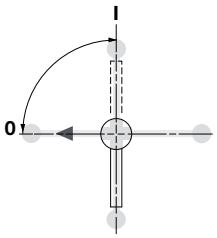
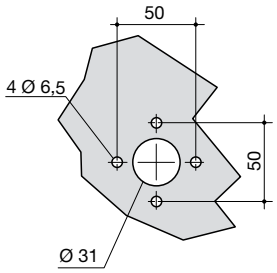
$B5_{DS}$ - B6

Handle type	Front operation Direction of operation	Door drilling
S3 type 		

B7

Handle type	Front operation Direction of operation	Door drilling
S4 type 		

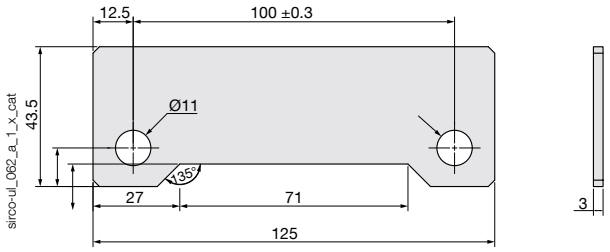
B6DS - B7DS

Handle type	Front operation Direction of operation	Door drilling
V1 type 		

Bridging bars (in / mm)

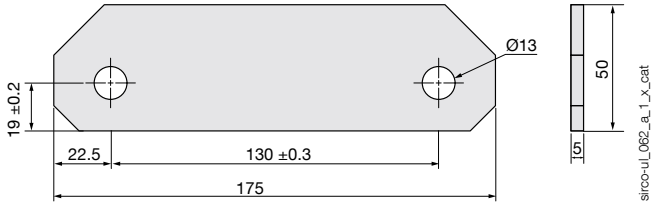
B4 - B4$_{DS}$

2709 1020

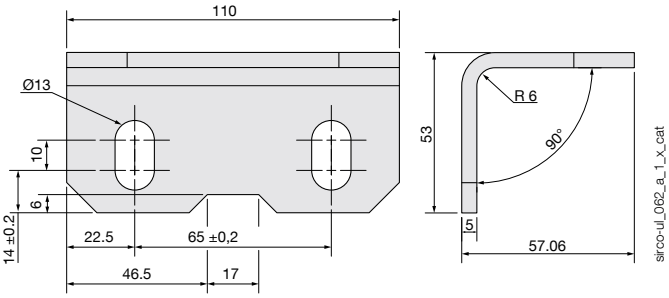


B4 - B4$_{DS}$

2709 1041

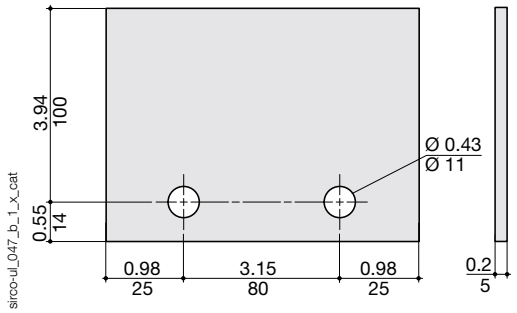


2709 0045

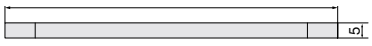


B6 - B6$_{DS}$

2709 0062

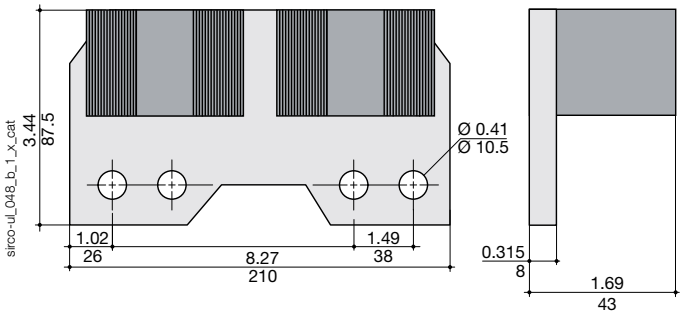


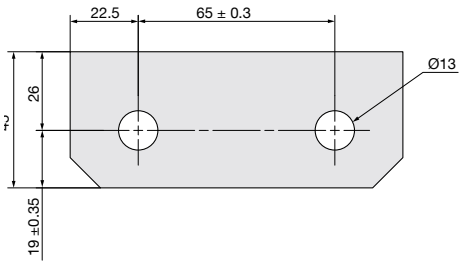
2709 0027



B7

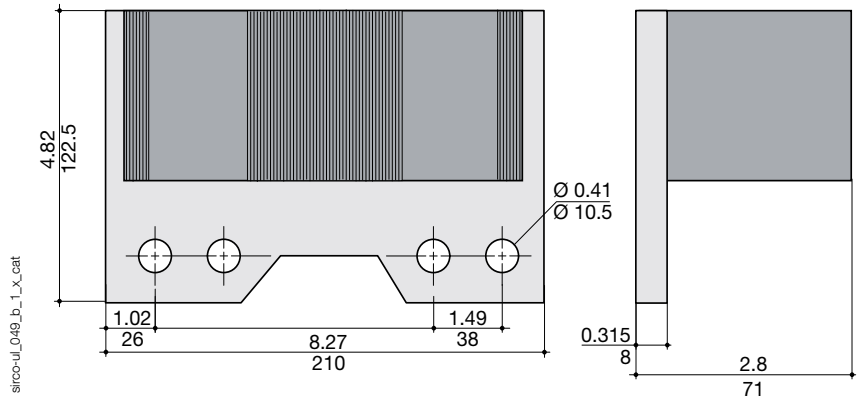
2709 0081





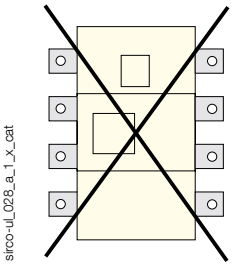
B7 - B7$_{DS}$

2709 0121

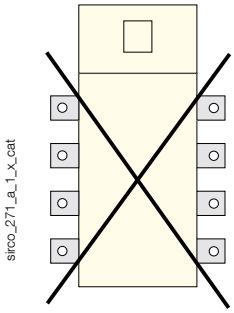


Mounting orientation

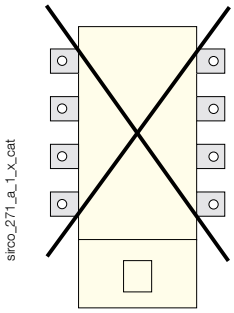
All frames



B4DS - B5DS

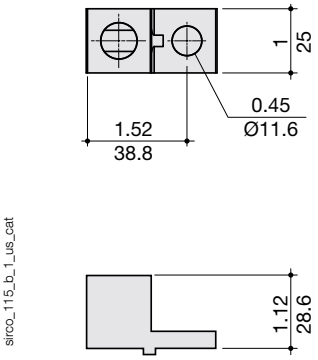


B6DS - B7DS



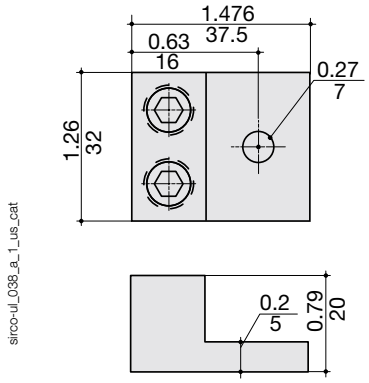
Terminal lugs (in / mm)

100 to 250 A



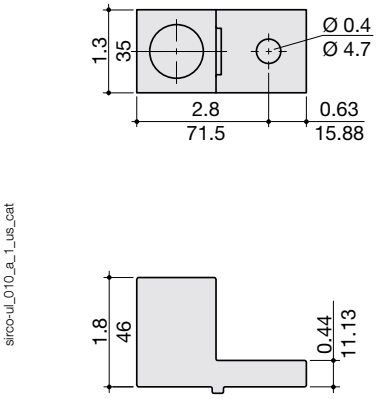
300MCM

100 to 250 A



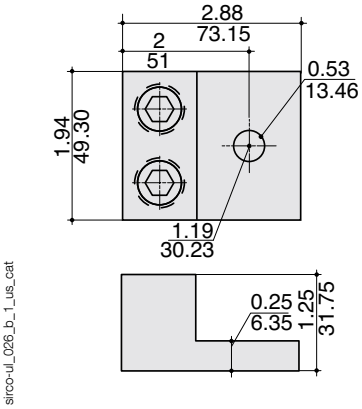
2/0

400 A



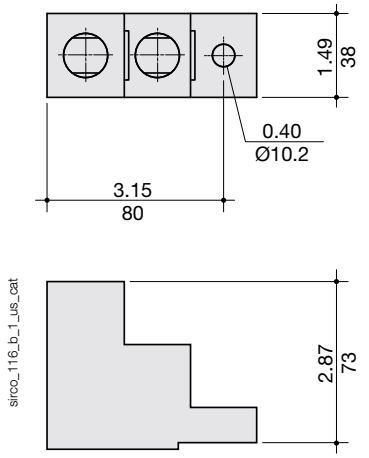
600MCM

400 A



2 x 350MCM

600 to 2000 A



2 x 600MCM

SIRCO MOT PV

Load break switches for photovoltaic applications
from 200 to 3200 A, up to 1000 VDC

new

SIRCO MOT PV
4 x 400 A

SIRCO MOT PV
4 x 2000 A

The solution for

> Buildings
> Solar parks
> Solar inverters

Strong points

> High breaking performance - up to 3200 A, 1000 VDC
> Motorised remote control
> Manual emergency operation

Conformity to standards

> IEC 60947-3

Function

SIRCO MOT PV are three or four pole motorised load break switches, to be used to remotely disconnect the installation or a part of it.
They make and break under load conditions and provide safety isolation for any low voltage circuit dedicated to photovoltaic applications up to 1000 VDC.

Advantages

High breaking performance
A glass fibre reinforced polyester break chamber with an arc extinguishing system provides a patented safety disconnection system offering rapid extinguishing of the electric arc up to 1000 VDC and current interruption up to 3200 A.

Motorised remote control
SIRCO MOT PV are intended for use in photovoltaic installations within and solar inverters. They can be remotely controlled via volt-free contacts, from either an external automatic controller or a switch.

Manual emergency operation
In addition to its motorised operation, the SIRCO MOT PV also includes a manual operation handle, enabling the switch position to be changed directly on the device if required.

General characteristics
- Up to 1000 VDC from 200 to 3200 A.
- Patented switching technology.
- Motorised remote control.
- Positive break indication.
- 2 stable positions (I, 0).

References

SIRCO MOT PV 1000 VDC - Back plate mounting

Rating (A) / Frame size	Circuit type	No. of poles	Switch body	Bridging bars for connecting poles in series	Auxiliary contact	Terminal screens	Terminal shrouds
200 A / B4	Single PV circuit	4 P	19PV **4020**	2 P 2609 **0025**(1) 4 P 2609 **2025**(1)	1st contact NO/NC included 2nd contact NO/NC 1999 **1002**	4 P 1509 **4025**(2)	4 P 2694 **4021**(3)
250 A / B4			19PV **4025**				
400 A / B5			19PV **4040**	2 P 2609 **0063**(1) 4 P 2609 **2063**(1)		4 P 1509 **4063**	4 P 2694 **4051**(3)
500 A / B5			19PV **4050**				
630 A / B5			19PV **4063**				
800 A / B6			19PV **4080**	2 P 2609 **1100**(1)	1st contact NO/NC included 2nd contact NO/NC **1999 1032**	4 P 1509 **4080**	
1000 A / B6			19PV **4100**				
1600 A / B7			19PV **4160**	2 P 2609 **1160**(1)		4 P 1509 **4160**	
2000 A / B7			19PV **4200**	2 P 2609 **1200**(1)			
3200 A / B8			19PV **4320**		included	4 P 1509 **4200**	

(1) Connection in series of 2 or 4 poles of the device

(2) 2 pieces: one for top side and another for bottom side.

(3) Terminal shrouds cannot be mounted when bridging bars for connecting poles in series are present.

Accessories

Bridging bars for connecting poles in series

Use

The bridging bars will make easy the connection of poles in series, allowing the following configurations:

- Bottom/Bottom
- Top/Top
- Top/Bottom
- Bottom/Top

Connection diagrams: see “Pole connections in series” page 89.

Bridging bar 200 … 250 A

acces_334_a_1_cat

Rating (A)	Number of poles of the device in series	Pack	Reference
200 ... 250	2	1 piece	2609 **0025**
200 ... 250	4	2 pieces	2609 **2025**
400 ... 630	2	1 piece	2609 **0063**
400 ... 630	4	2 pieces	2609 **2063**
800 ... 1000	2	1 piece	2609 **1100**
1600	2	1 piece	2609 **1160**
2000 ... 3200	2	1 piece	2609 **1200**

Bridging bar 2000 … 3200 A

acces_392_a_1_cat

Auxiliary contact

Use

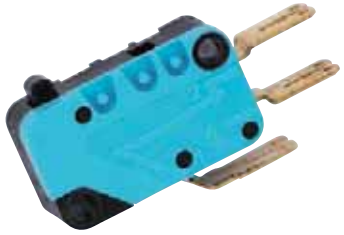
Pre-break and signalisation of position I:
1 to 2 NO/NC auxiliary contacts (1 as standard).
Low level auxiliary contacts: please consult us.

Connection to the control circuit

By 6.35 mm fast-on terminal.

Electrical characteristics

30 000 operations.



acces_065_a_1_cat

Characteristics

Rating (A)	Nominal current (A)	Operating current Ie (A) 250 VAC AC-13	400 VAC AC-13	24 VDC AC-13	48 VDC AC-13
200 … 630	16	12	8	14	6

References

NO/NC changeover contact

Rating (A)	Contact(s)	Reference
200 … 630	2nd	1999 **1002**
800 ...1600	2nd	1999 **1032**
2000 ... 3200	2nd	included

svr_058_a_1_cat

Accessories (continued)

Terminal shrouds

Use
Protection against direct contact with terminals or connecting parts.
Not compatible for terminals with bridging bars connected.

Advantage of terminal shrouds
Perforations allow remote thermographic inspection without the need to remove the shrouds.


acces_206_a_2_cat

Rating (A)	No. of poles	Position	Reference
200 ... 250	4 P	top and bottom	2694 **4021**
400 ... 630	4 P	top and bottom	2694 **4051**

Terminal screens

Use
Top and bottom protection against direct contact with terminals or connection parts.


acces_207_a_2_cat

Rating (A)	No. of poles	Position	Reference
200 ... 250	4 P	top and bottom	1509 **4025**
400 ... 630	4 P	top and bottom	1509 **4063**
800 ... 1000	4 P	top and bottom	1509 **4080**
1600 ... 3200	4 P	top and bottom	1509 **4200**

2 position padlocking (I - 0)

Use
Enables padlocking in position I (product can be padlocked in position 0 as standard).
Factory fitted.


atys_854_a_1_cat

Rating (A)	Reference
200 ... 630	1599 **0003**
800 ... 3200	1599 **0004**

Key handle interlocking system

Use
With the product in manual mode, it enables locking in position 0 using a RONIS EL11AP lock.
Factory fitted.

As standard, locking in position 0.
Optional padlocking in 2 positions: Locking in position 0 and I.


atys_853_a_1_cat

Rating (A)	Reference
200 ... 630	1509 **1006**
800 ... 3200	1509 **1004**

Other specific accessories

- Low level auxiliary contacts.

Characteristics according to IEC 60947-3

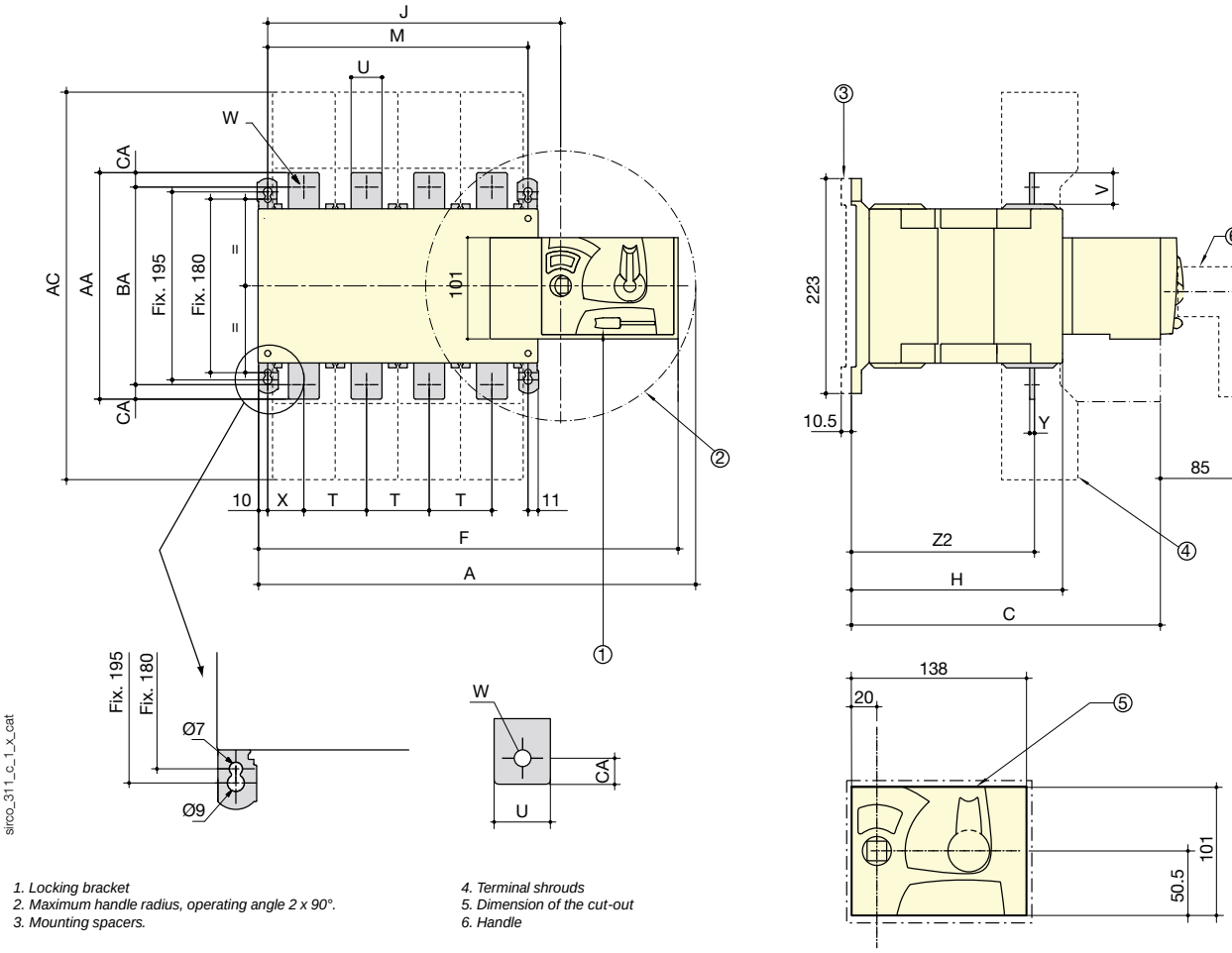
200 to 3200 A

Thermal current I_{th} at 40°C					200 A	250 A	400 A	500 A	630 A	800 A	1000 A	1600 A	2000 A	3200 A
Rated insulation voltage U_i (V)					1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Rated impulse withstand voltage U_{imp} (kV)					8	8	12	12	12	12	12	12	12	12
Rated operational currents I_e (A)														
Rated voltage	**Utilisation category**	**Number of poles of the device**	**Number of pole(s) in series per polarity**	**Ambient temperature (°C)**	**(A)**	**(A)**	**(A)**	**(A)**	**(A)**	**(A)**	**(A)**	**(A)**	**(A)**	**(A)**
1000 VDC	DC-21 B	4 P	2 P + and 2 P -	40	200	250	400	500	630	800	1000	1600	2000	3200
1000 VDC	DC-21 B	4 P	2 P + and 2 P -	50	200	250	400	500	630	800	1000	1600	1800	3200
1000 VDC	DC-21 B	4 P	2 P + and 2 P -	60	200	250	400	500	560	800	1000	1600	1600	2700
1000 VDC	DC-21 B	4 P	2 P + and 2 P -	65	-	-	400	500	540	800	950	1520	1520	2550
Switching time														
I - 0					0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Power supply														
Alim. 230 VAC min. / max. (VAC)					176/288	176/288	176/288	176/288	176/288	176/288	176/288	176/288	176/288	176/288
Control supply power demand														
Supply 230 VAC inrush / nominal (VA)					420/100	420/100	420/100	420/110	450/120	450/120	450/120	450/120	550/390	550/390
Connection														
Rigid Cu cable cross-section (mm^2)					95	120	240	2 x 150	2 x 185	2 x 300	4 x 185	6 x 185	-	-
Maximum Cu busbar width (mm)					32	32	50	50	50	63	63	100	100	100
Tightening torque min/max (Nm)					20/26	20/26	40/45	40/45	40/45	40/45	40/45	40/45	40/45	40/45
Mechanical characteristics														
Durability (number of operating cycles)(1)					8000	8000	5000	5000	5000	4000	4000	3000	3000	3000
Weight of a 4 pole device (kg)					7	7	8	13	14	33	33	42	42	69

(1) Improved endurances: Please consult us.

Dimensions

200 to 630 A



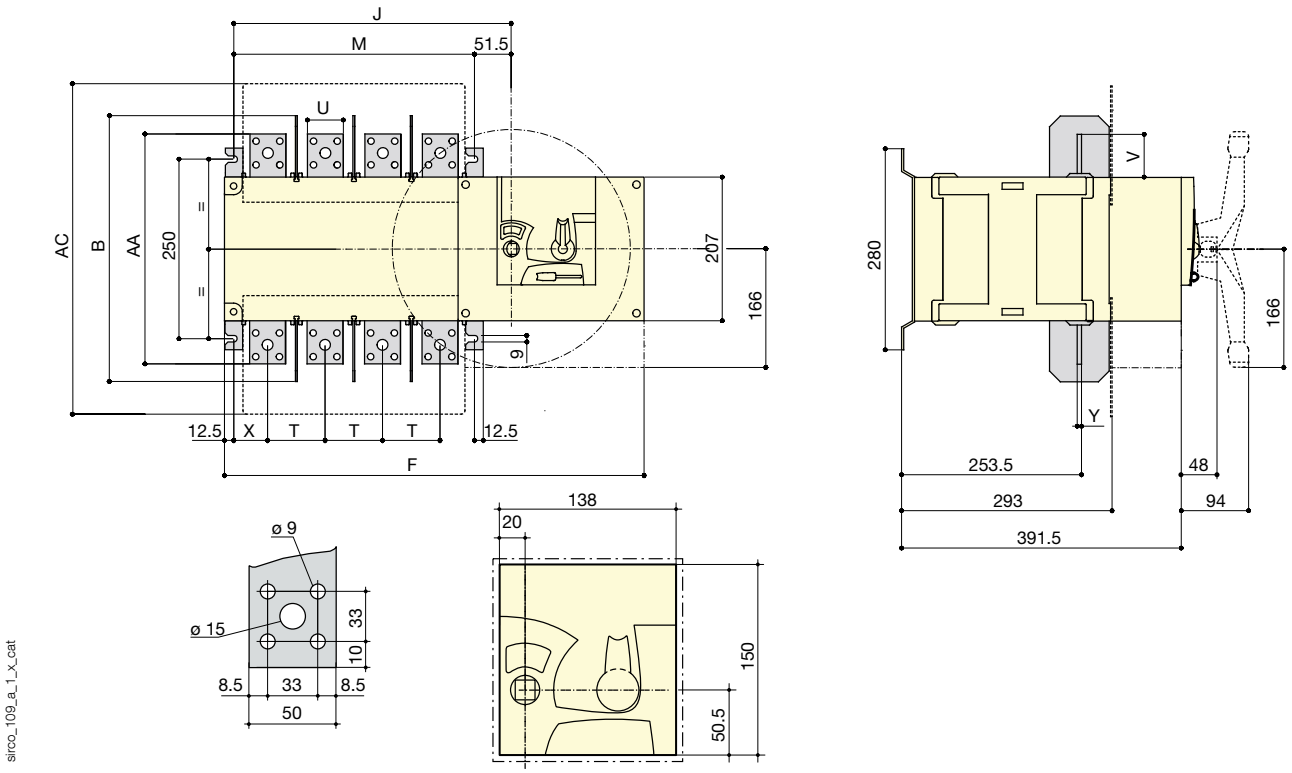
sirco_311_c_1_x_cat

1. Locking bracket
2. Maximum handle radius, operating angle 2 x 90°.
3. Mounting spacers.

4. Terminal shrouds
5. Dimension of the cut-out
6. Handle

	Overall dimensions		Terminal shrouds	Switch body			Switch mounting	Connection									
Rating (A)	**A 4p.**	**C**	**AC**	**F 4p.**	**H**	**J**	**M 4p.**	**T**	**U**	**V**	**X 4p.**	**Y**	**Z**	**Z3**	**AA**	**BA**	**CA**
200	395	244.5	280	378	151	245	210	50	25	30	33	3.5	39.5	134.5	160	130	15
250	395	244.5	280	378	151	245	210	50	25	30	33	3.5	39.5	134.5	160	130	15
400	459	320.5	400	437	221	304	270	65	45	50	37.5	5	53	190	260	220	20
500	459	320.5	400	437	221	304	270	65	45	50	37.5	5	53	190	260	220	20
630	459	320.5	400	437	221	304	270	65	45	50	37.5	5	53	190	260	220	20

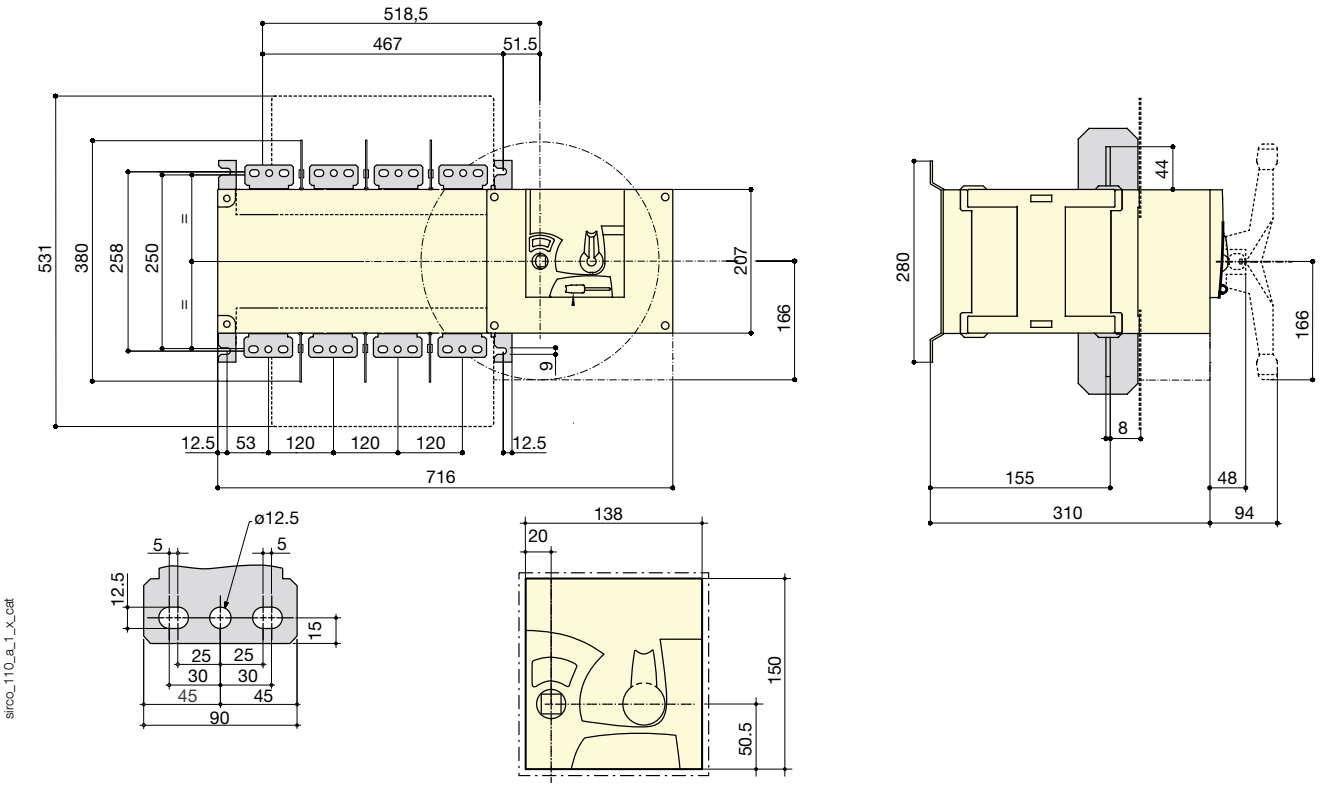
800 to 1000 A



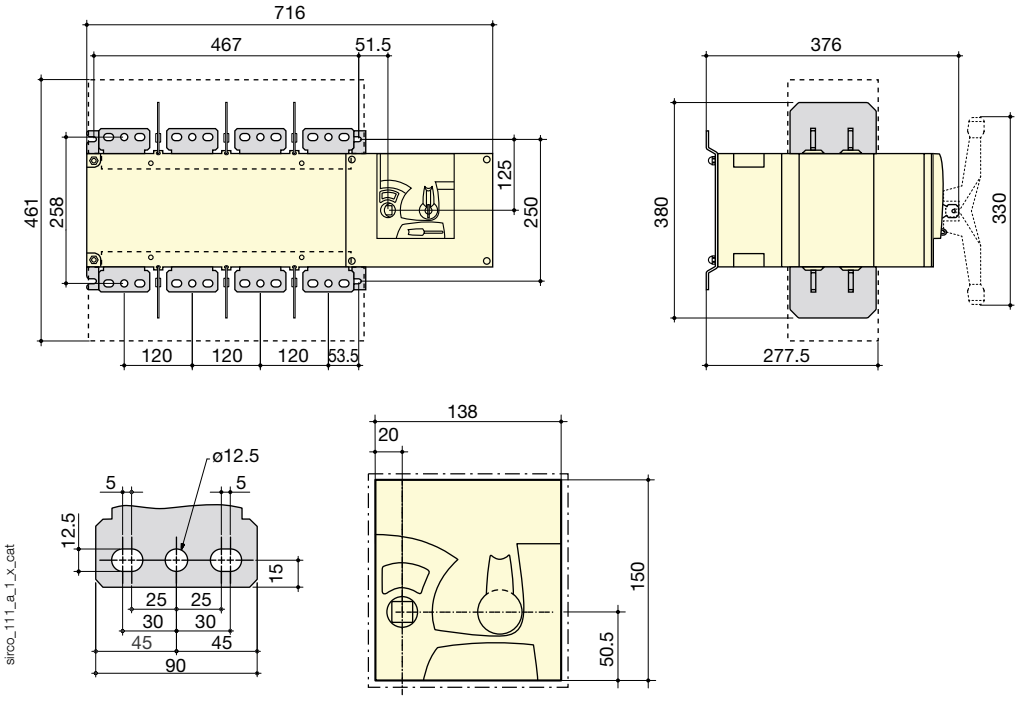
Rating (A)	Overall dimensions B	Terminal shrouds AC	Switch body F 4p.	Switch body J 4p.	Switch mounting M 4p.	Connection T	U	V	X	Y	Z3	AA
800	370	461	584	386.5	335	80	50	60.5	60	7	66.5	321
1000	370	461	584	386.5	335	80	50	60.5	60	7	66.5	321

Dimensions (continued)

1600 to 2000 A

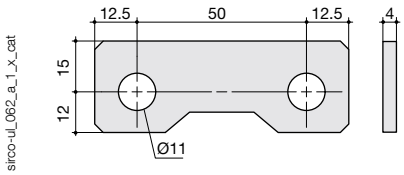


3200 A

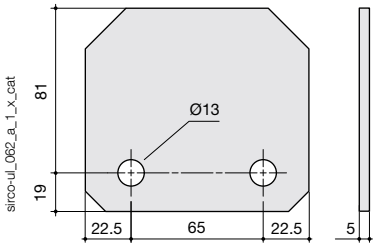


Bridging bar

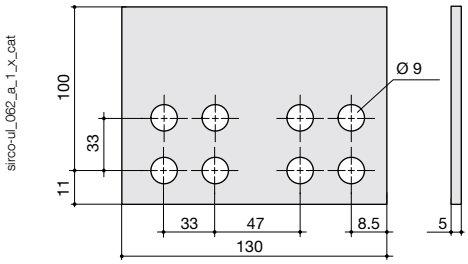
200 - 250 A



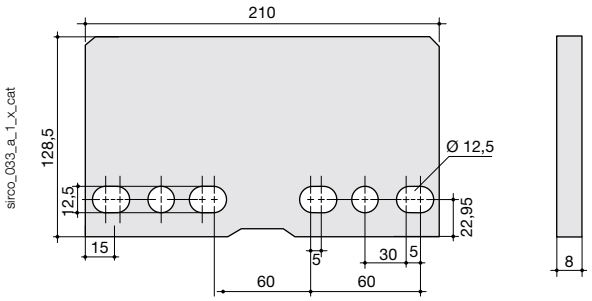
400 - 630 A



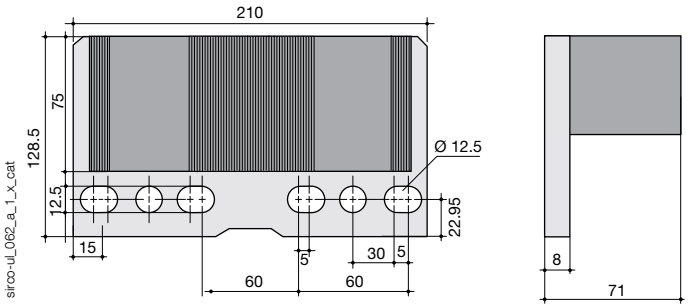
800 - 1000 A



1600 A

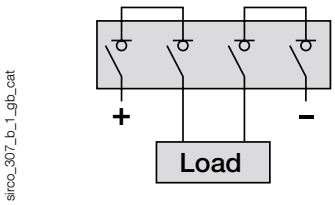


2000 - 3200 A



See pole connections in series (1)

4 poles - bottom / bottom



(1) Other connections: refer to mounting instructions

SIRCO PV PA

Pneumatic Actuator for Fire Safety in photovoltaic applications
from 160 to 800 A, 1000 VDC

new

The solution for

> Roof-mounted PV installations in public buildings, hospitals, shopping malls, etc.

Strong points

> Ultra high reliability
> Flexibility
> Disconnection via remote control
> Tested and certified solution

Conformity to standards

> IEC 947-3
> UTE C 15-712-1/-2
> NF S 61-937

Function

SIRCO PV PA (Pneumatic Actuator) are PV switch disconnectors actuated by a pneumatic cylinder. They ensure safe on-load breaking and making to provide safe isolation of PV circuits. The pneumatic power supply safety systems are recognized and recommended by firefighters. Sirco PV PA work in a similar way to smoke extraction systems systems and can be connected directly to the same air network.

Advantages

Ultra high reliability
- Making and breaking performed with well proven secured air network (no coils with poor reliability).
- Wide operating temperature from -10 °C to +70 °C.
- On-off positions available even in the absence of pneumatic power supply (by manual handle).

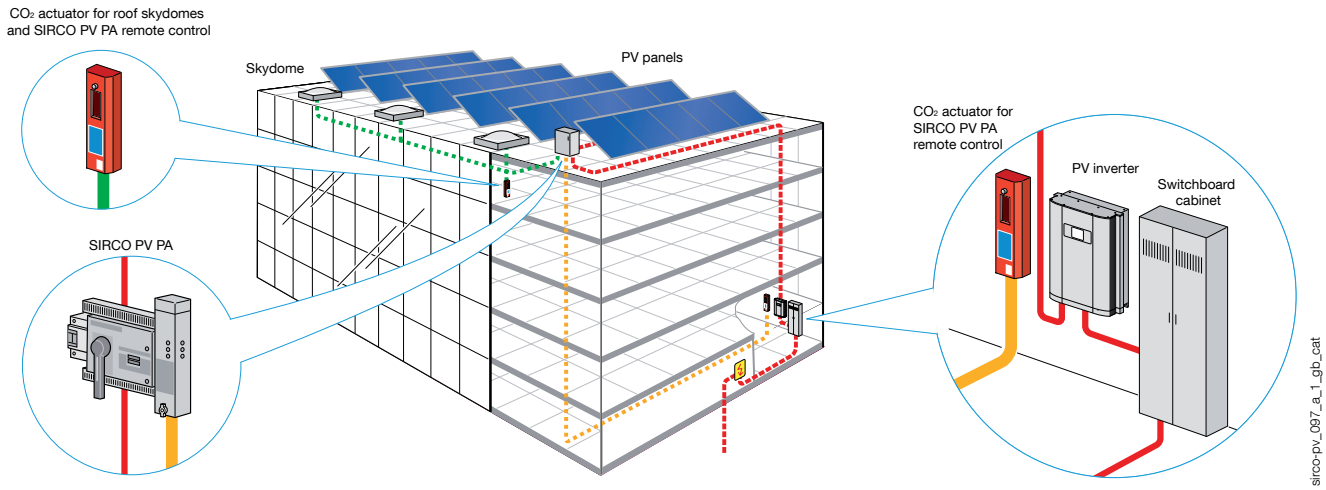
Flexibility
- Power supply may be provided by CO_2 cartridge, compressed air network or both working together.
- It can be used in combination with the fire-safety system's pneumatic roof skydomes.
- Manual or motorized operating modes, local or remote control, single or multiple actuations.
- Integration in different PV system architectures.

Disconnection via remote control
- Safety disconnection performed by secured pneumatic power supply.
- Pneumatic operating pressure from 6 to 12 bars.
- Remote making and breaking with no need to access the roof in case of fire or maintenance operations.

Tested and certified solution
- Safety CO_2 power supply tested and verified at 90 bars according to UTE C 15-712-1/-2.
- CO_2 cartridge meets NF S61-939 standard requirements for fire systems

socomec Innovative Power Solutions

Example of application

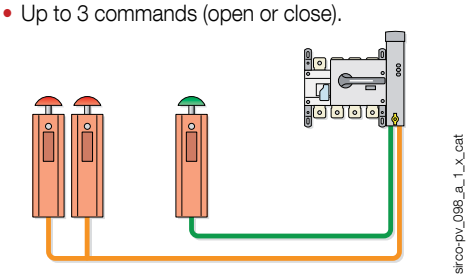


Operating modes

Connected directly to compressed air network and/or safety CO_2 cartridges

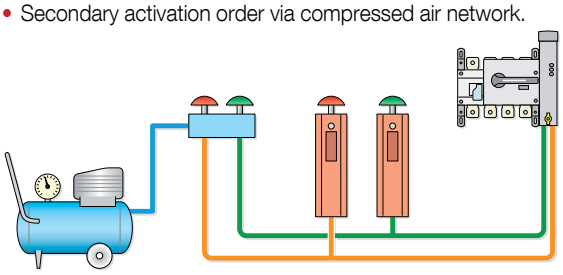
Remote control – single activation

- Manual CO_2 activation.
- Up to 3 commands (open or close).



Remote control – dual function

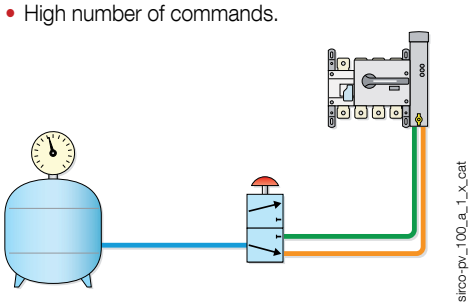
- Primary safety activation order via CO_2 cartridge (open or close).
- Secondary activation order via compressed air network.



Operated manually or electrically

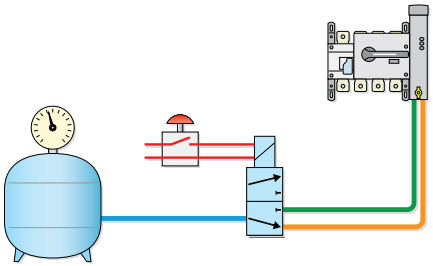
Remote control via compressed air - manual command

- Manual or local command.
- High number of commands.



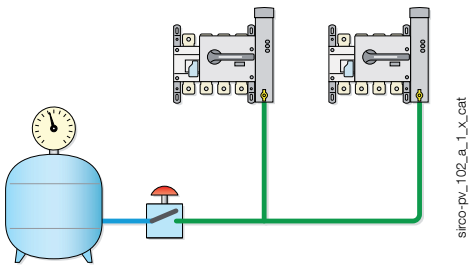
Remote control via compressed air - electric command

- Local + electric or pneumatic remote commands.
- High number of commands.
- Compatible with positive safety.



Multiple tilting ON and/or OFF

- Only one operation to disconnect several PV switches safely.



SIRCO PV PA

Pneumatic Actuator for Fire Safety in photovoltaic applications
from 160 to 800 A, 1000 VDC

References

SIRCO PV PA

Rating (A)	Circuit type	Number of poles	Number of poles in series per polarity	Switch body	Direct handle	Bridging bars	Terminal shrouds
250 A	Single PV circuit	4P	2P+, 2P-	26PV **9025**	Included	2609 **2025**	2694 **4040**
400				26PV **9040**		2609 **4050**	
630[1]				26PV **9063**		2609 **2080**	2694 **4051**
800[1]				26PV **9080**			

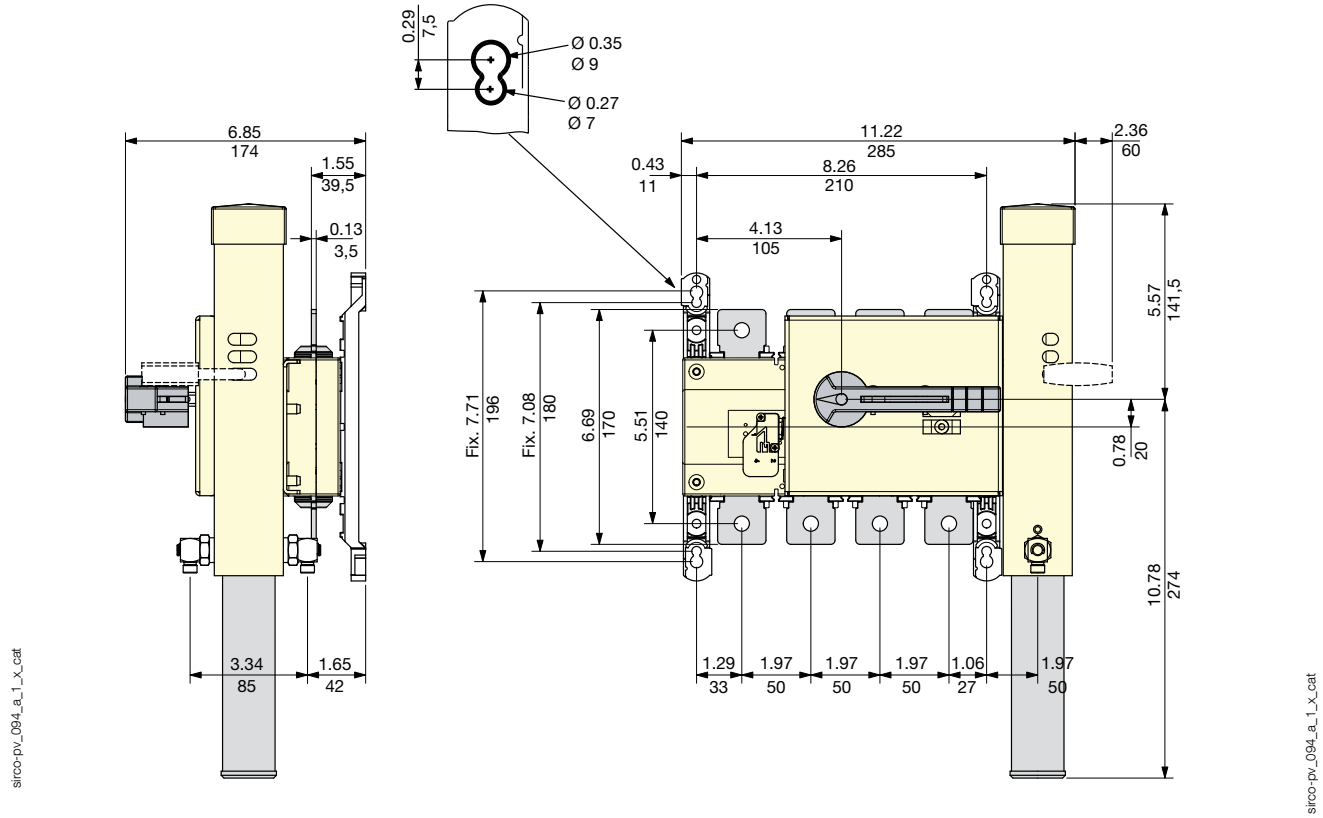
(1) Please contact us.

Characteristics

Characteristics according to IEC 60947-3

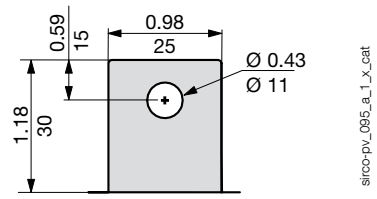
Rated current I (A)				**250 A**	**400 A**	**630 A**	**800 A**
Rated insulation voltage Ui (V)				1200	1200	1200	1200
Rated impulse withstand voltage Uimp (kV)				12	12	12	12
Rated operational currents I_e (A)							
Rated voltage	**Utilisation category**	**Circuit type**	**No. of poles**	**(A)**	**(A)**	**(A)**	**(A)**
1000 VDC	DC-22 B	Single PV circuit	4 P	250	400	630	800
Connection							
Maximum Cu rigid cable cross-section (mm²)				120	240	2x185	2x240
Maximum Cu busbar width (mm)				32	32	40	50
Tightening torque min (Nm)				20	20	40	40
Tightening torque max (Nm)				26	26	45	45
Mechanical characteristics							
Durability (number of operating cycles)				10 000	5 000	5 000	5 000
Operating effort (Nm)				10	10	14.5	14.5
Weight of a 3 pole device (kg)				2	3.5	3.5	3.5

Dimensions

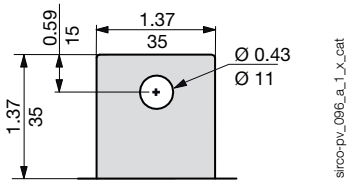


Connections and installation

250 A



400 A



Photovoltaic fuses

gPV curve

from 1 to 600 A, up to 1500 VDC

Function

SOCOMEC **gPV fuses** protect the installation against the inverse over-currents which could occur in photovoltaic installations.

Advantages

High breaking capacity
Up to 50 kA at 1000 VDC, 30 kA at 1500 VDC.

Product dedicated to PV installations
Operating ranges adjusted for small over-currents specific to PV installations.

High reliability
- Absolute protection over time guaranteed by the simplicity of manufacture and function (Joule effect).
- No downgrading of fuse characteristics over time.

Improved safety
The energy released whilst eliminating the fault (fuse blowing) is contained within the cartridge (no degassing).

What you need to know

Used characteristics
- I_{SC}:short circuit current of the string
- $I_{SC\ MAX}$: short circuit current of the string related to maximum sunlight density
- I_{RM}: maximum admitted reverse current
- I_n: fuse rating or fuse rated current (at 25C in a RM disconnect switch)
- N_c: number of strings connected in parallel
- U_e: maximum fuse rated voltage
- $U_{OC\ MAX}$: maximum open circuit voltage in the lowest temperature conditions.

When to protect
A PV string requires an over-current protection when its own maximum admissible reverse current characteristic (Irm) is less than the current generated by the rest of the installation (current generated by the "Nc-1" other strings).

How to protect
The overload protection is to be applied at each of the two polarities, regardless of whether the DC installation is earthed or not.

The solution for

> Photovoltaic protection

Strong points

> Breaking capacity up to 1500 VDC
> Product dedicated to PV installations
> High reliability
> Improved safety

Large range

> Additional range of disconnect switches and fuse bases - dedicated connection accessories.

Conformity to standards

> IEC 60269-6
> IEC 60269-1
> IEC 60269-2

How to choose the fuse protection (see Technical Guide p. 121)

Voltage

$U_e > U_{OC\ MAX}$

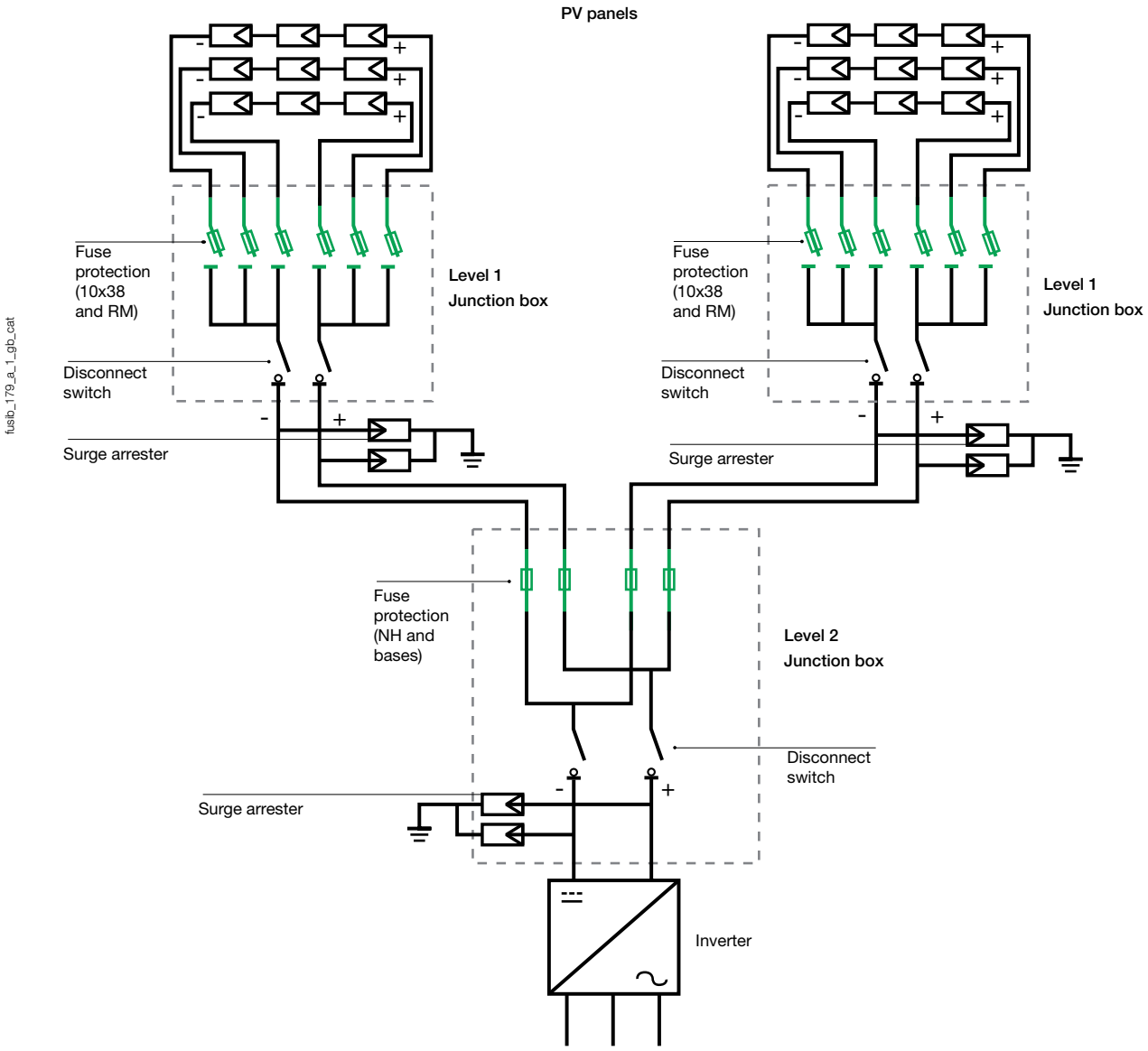
In the absence of complementary information use $U_{OC\ MAX} = 1,2\ U_{OC}$.

Fuse rating determination

Determination of the fuse rated current consists of choosing a protection capable of:

- Supporting without fusing the normal overload current during the periods of maximum sunlight density at the ambient temperature of the enclosure in which the fuse is installed, $I_n > I_{SC\ MAX}$
  In the absence of complementary information, use $I_{SC\ MAX} = 1,4\ I_{SC}$

- Melting and reliably clearing the fault before the PV modules are damaged by the reverse current. $I_n < I_{RM}$



Photovoltaic fuses

gPV curve

from 1 to 600 A

References

Rated voltage 1000 VDC

Rating (A)	Fuse size	Dissipated power W@ In	Dissipated power W @ 0.8 In	Breaking capacity	Reference
1	10 x 38	0,76	0,43	30 kA	60PV **0001**
2	10 x 38	1,54	0,84	30 kA	60PV **0002**
3	10 x 38	1,35	0,74	30 kA	60PV **0003**
4	10 x 38	1,84	1,08	30 kA	60PV **0004**
6	10 x 38	2,50	1,40	30 kA	60PV **0006**
8	10 x 38	2,57	1,47	30 kA	60PV **0008**
10	10 x 38	2,58	1,51	30 kA	60PV **0010**
12	10 x 38	2,61	1,42	30 kA	60PV **0012**
15	10 x 38	2,44	1,08	30 kA	60PV **0015**
16	10 x 38	2,70	1,56	30 kA	60PV **0016**
20	10 x 38	2,99	1,75	30 kA	60PV **0020**
25	14 x 51	5,1	2,7	10 kA	60PV **0C25**
32	14 x 51	6,2	3,3	10 kA	60PV **0C25**
32	NH1	8,5	4,3	50 kA	60PV **0032**
40	NH1	9	4,6	50 kA	60PV **0040**
50	NH1	10,5	5,4	50 kA	60PV **0050**
63	NH1	12	6,1	50 kA	60PV **0063**
80	NH1	15,5	7,9	50 kA	60PV **0080**
100	NH1	16,5	8,4	50 kA	60PV **0100**
125	NH1	17,5	8,9	50 kA	60PV **0125**
160	NH1	24	12,2	50 kA	60PV **0160**
200	2XL	50	28	33 kA	60PV **0200**
250	2XL	60	34	33 kA	60PV **0250**
315	2XL	66	40	33 kA	60PV **0315**
355	2XL	68	42	50 kA	60PV **0355**
400	3L	82	48	50 kA	60PV **0400**
500	3L	85	50	50 kA	60PV **0500**
600	3L	118	92	50 kA	60PV **0600**

Rated voltage 1500 VDC

Rating (A)	Fuse size	Dissipated power W@ In	Dissipated power W @ 0,7 In	Dissipated power W @ 0.8 In	Breaking capacity	Reference
2	10x85	3,42	1,28		10	61PV **0002**
4	10x85	2,91	1,16		10	61PV **0004**
6	10x85	2,65	1,1		10	61PV **0006**
8	10x85	2,79	1,16		10	61PV **0008**
10	10x85	4,38	1,81		10	61PV **0010**
12	10x85	4,43	1,83		10	61PV **0012**
16(1)	10x85	4,13	1,75		10	61PV **0016**
20(1)	10x85	5,14	2,13		10	61PV **0020**
25(1)	10x85	5,48	2,28		10	61PV **0025**
200	1XL	61		31	30	61PV **0200**
400	3L	91		49	30	61PV **0400**

(1) Rated voltage 1200 VDC.

gPV knife edge fuse

Description of accessories	Size NH1 Reference	Size 1XL Reference	Size 2XL Reference	Size 3L Reference
Fuse blown auxiliary contact	56PV **9901**	56PV **9901**	56PV **9901**	56PV **9901**
Fuse base recommended	65PV **1011**	-	65PV **1112**	65PV **1113**

Ambient temperature derating factor

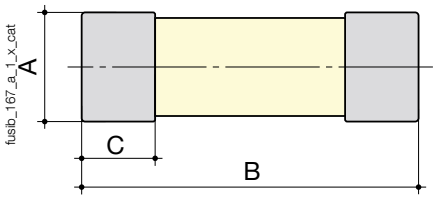
$$I_{nf} = I_{cgens}/K_t$$

I_{nf} - *gPV fuse rated current.*
I_{scgen} - *PV generator short circuit current under STC.*
K_t - *derating factor.*

Max. ambient temperature (C)	Kt: Derating factor
20	1
40	0,92
45	0,90
50	0,87
55	0,85
60	0,82
65	0,79
70	0,76

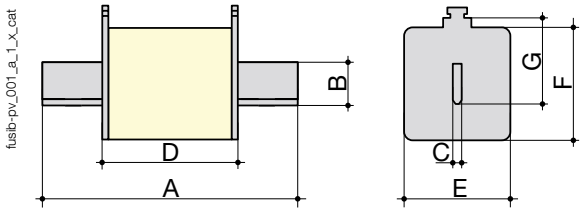
Standard dimensions (mm) as per IEC 60269-2

gPV cylindrical Fuses



Size	Striker	A	B	C
10 x 38	without	10,3	38	10,5
14 x 51	without	14,3	51,5	10,10
10 X 85	without	10,3	85	10,5

gPV knife edge fuse



Size	Striker	A maxi	B	C	D maxi	E maxi	F maxi	G
NH1	without	137	20	6	67,7	39,65	52,9	40
1XL	without	189,8	20	5,8	127,8	51	51	39,8
2XL	without	204,5	26	5,8	123,3	59,2	59,2	47,9
3L	without	204,9	32,3	6	122,3	73,5	73,5	60

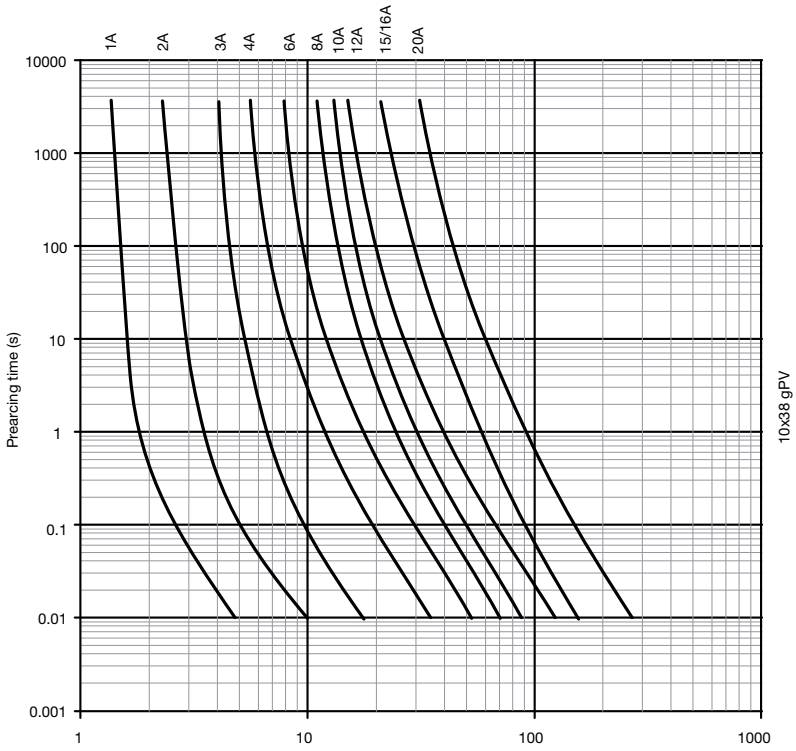
Photovoltaic fuses

gPV curve

from 1 to 600 A

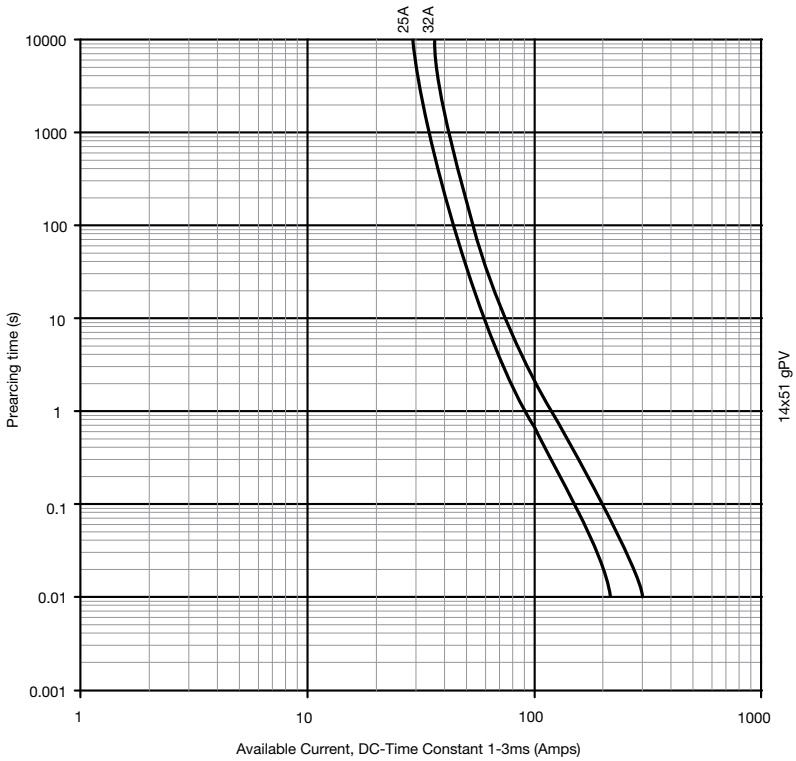
Time/current operation characteristics

gPV cylindrical fuses 10x38



fusib-pv_002_a_1_gb_cat

gPV cylindrical fuses 14x51



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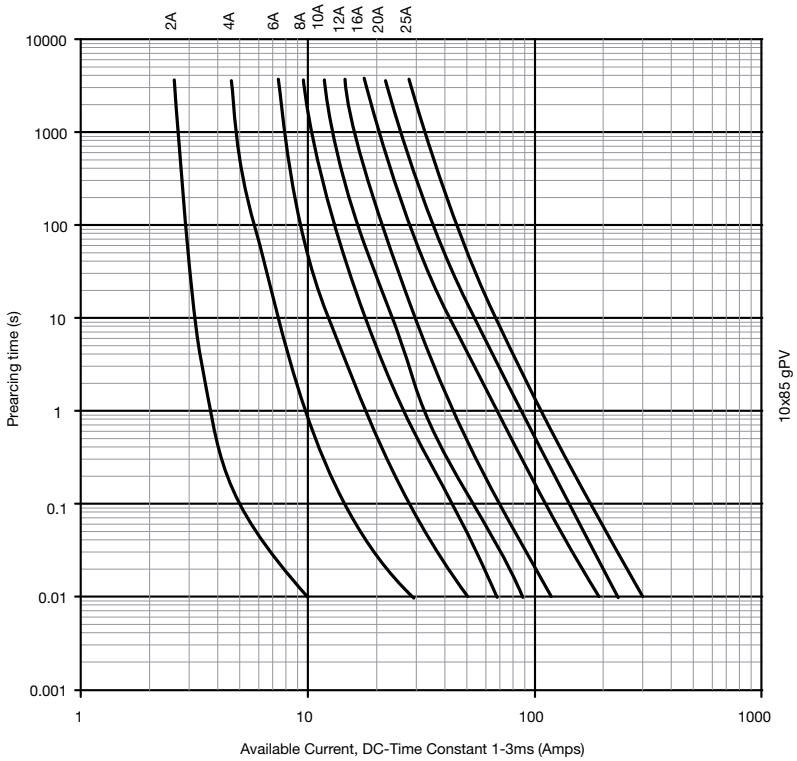
socomec Innovative Power Solutions

gPV cylindrical fuses 10x85 gPV



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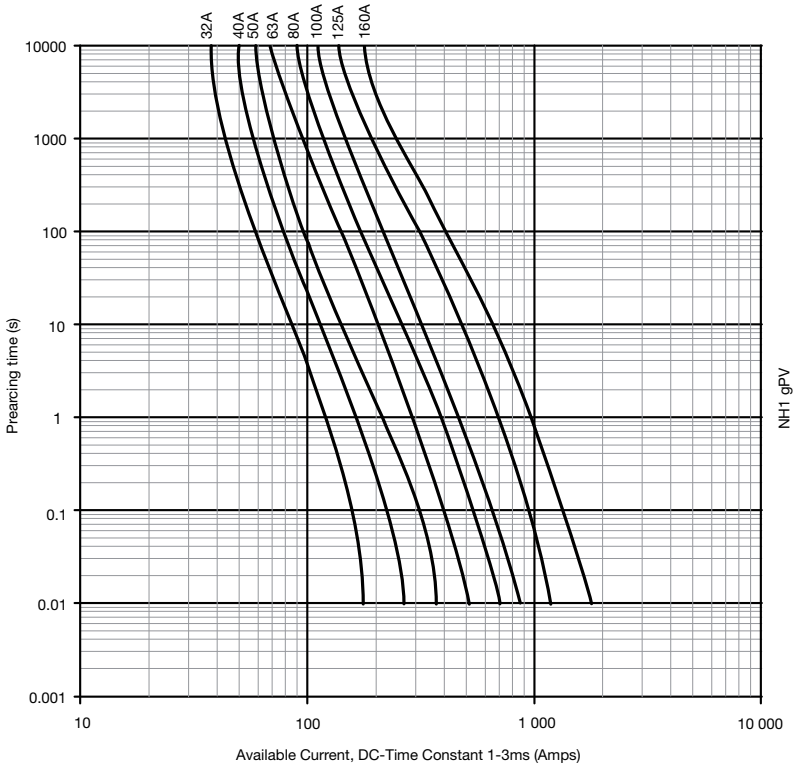
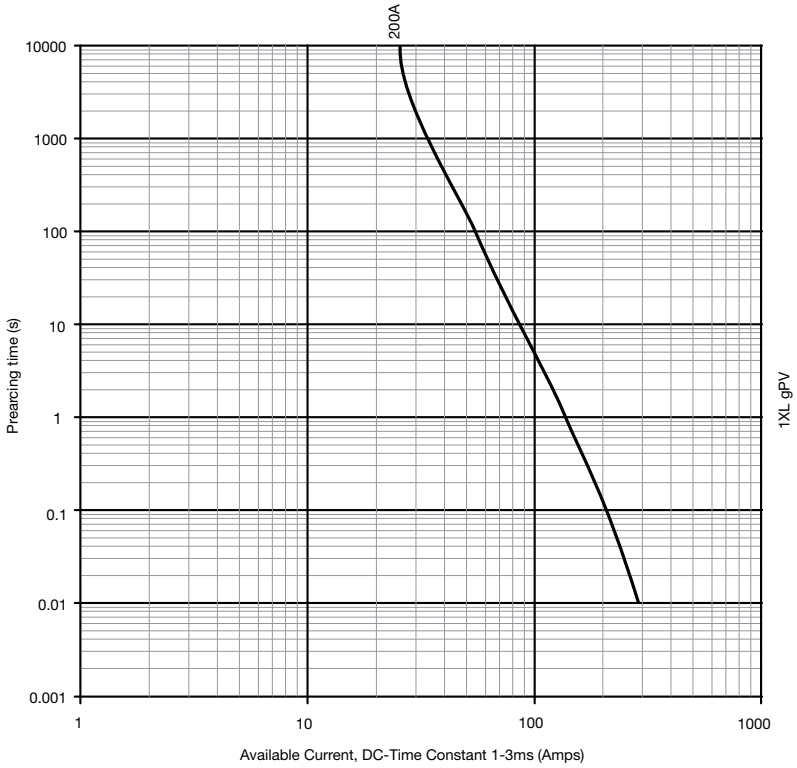
gPV knife edge fuse (NH1)



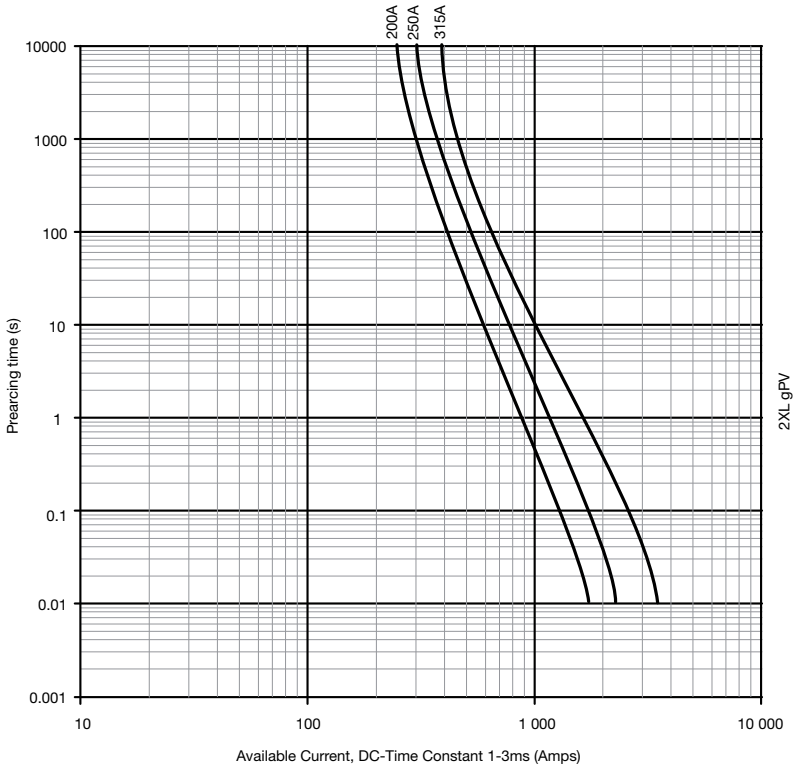
fusib-pv_004_b_1_gb_cat

Time/current operation characteristics (continued)

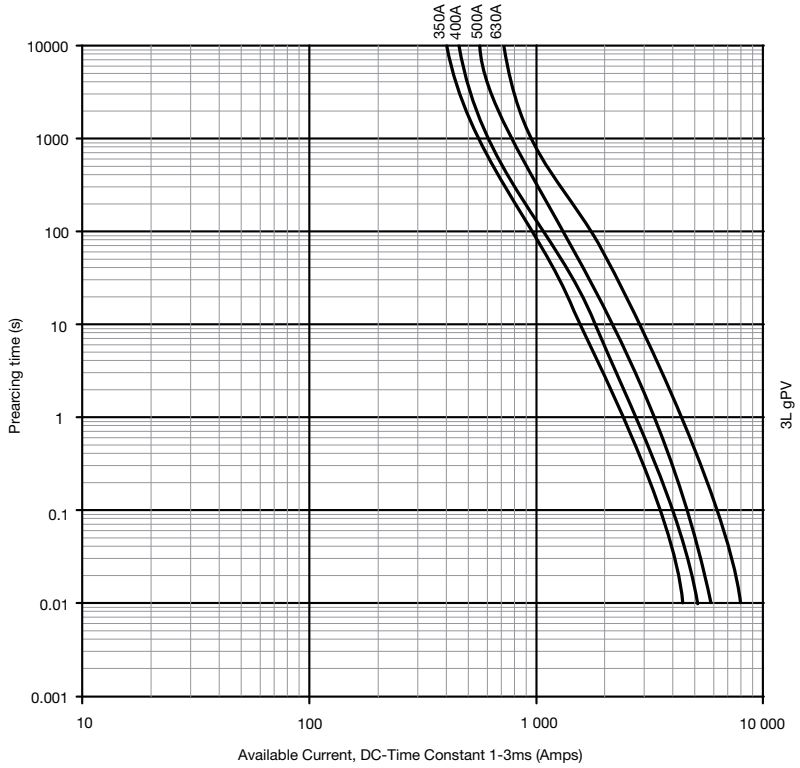
gPV knife edge fuse (1XL)



gPV knife edge fuse (2XL)

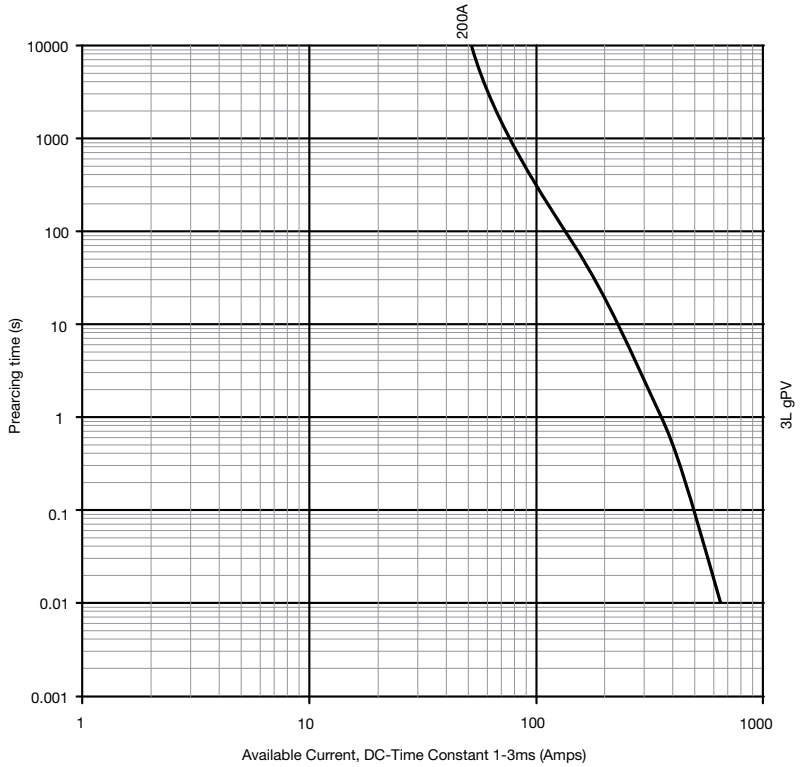


gPV knife edge fuse (3L) - Rated voltage 1000 VDC



fusb-pv_006_b_1_gb_cat

gPV knife edge fuse (3L) - Rated voltage 1500 VDC



fusb-pv_029_a_1_gb_cat

RM PV

Fuse disconnect switches
for PV cylindrical fuses 10x38 and 14x51

***RM PV** 10x38*
32 A

***RM PV** 10x38*
50 A

The solution for

> Small installations up to large PV farms

Strong points

> Improved safety
> Product dedicated to PV applications
> Specific format and accessories

Conformity to standards

> IEC 60947-3
> IEC 60269
> NF EN 60269-1
> VDE 0636-10
> DIN 43620

Function

RM PV are modular fuse disconnect switches for cylindrical gPV fuses. They provide safety disconnection and protection against overcurrents in any low DC voltage photovoltaic applications.
RM PV are fuse disconnect switches with or without light indicators for fuses without striker.

Advantages

Improved safety
- Rated voltage of 1000 VDC.
- Self-extinguishing thermoplastic material.
- Protection IP2X.

Product dedicated to PV applications.
Protection against reverse currents thanks to gPV fuses dedicated to PV applications.

Specific format and accessories.
- Modular DIN 45 mm cut-out.
- Interlocking with accessory available.

References

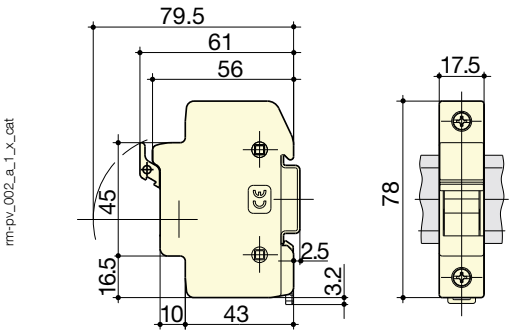
No. of poles	32 A 10 x 38 Reference	50 A 14 x 51 Reference
1 P	57PV **0015**	57PV **0020**
1 P with signalling	57PV **0L15**	

Characteristics according to IEC 60947-3

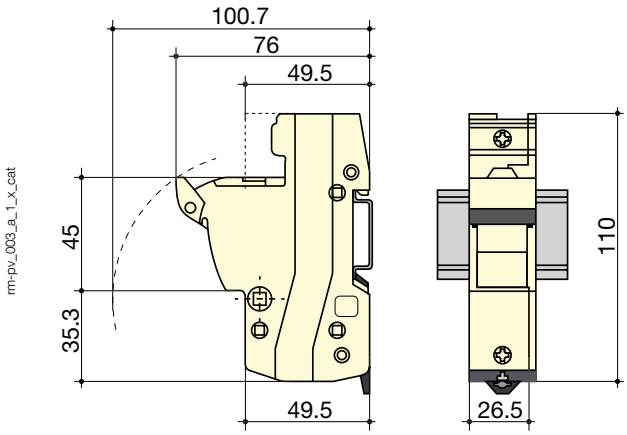
Thermal current I_{th}	**32 A**	**50 A**
Fuse size	10 x 38	14 x 51
Rated insulation voltage U_i (V)	1000	1000
Fuse rating		
Fuse rating (A)	1 … 20	25 … 32
Power		
Rated dissipated power (W)	3	5
Design current derating coefficient for N pole side by side		
N = 1 … 3	1	1
N = 4 … 6	0.8	0.8
N = 7 … 9	0.7	0.7
N ≥ 10	0.6	0.6
Connection		
Minimum Cu cable cross-section (mm^2)	0.75	1.5
Maximum Cu rigid cable cross-section (mm^2)	10	35
Tightening torque (Nm)	2.5	2.5 … 3
Mechanical characteristics		
Weight of 1 P (kg)	0.1	0, 15

Dimensions

RM PV 10 x 38



RM PV 14 x 51



PV fuse bases

Fuse bases for PV applications

for NH gPV fuses 32 to 600 A

socle-pv_002_a_1_cat

Base
size 1

socle-pv_004_a_1_cat

Base
size 2

The solution for

> Small installations up to large PV farms

Strong points

> Improved safety
> Product dedicated to PV applications
> Fuse blown indication
> Different fixing types

Conformity to standards

> IEC 60269
> NF EN 60269-1
> VDE 0636-10
> DIN 43620

Function

SOCOMEC **fuse bases** provide fixed, unipolar or multipolar support for knife edge fuses dedicated to PV applications.

Advantages

Improved safety
- Rated voltage of 1000 VDC.
- Self-extinguishing thermoplastic material.
- Kit IP2X (depending on models).

Product dedicated to PV applications.
Protection against reverse currents thanks to gPV fuses dedicated to PV applications.

Fuse blown indication
Possibility to collect the fuse blown indication (Please see section PV fuses).

Different fixing types
DIN rail or back plate mounting available (depending on models).

References

Back plate mounted device

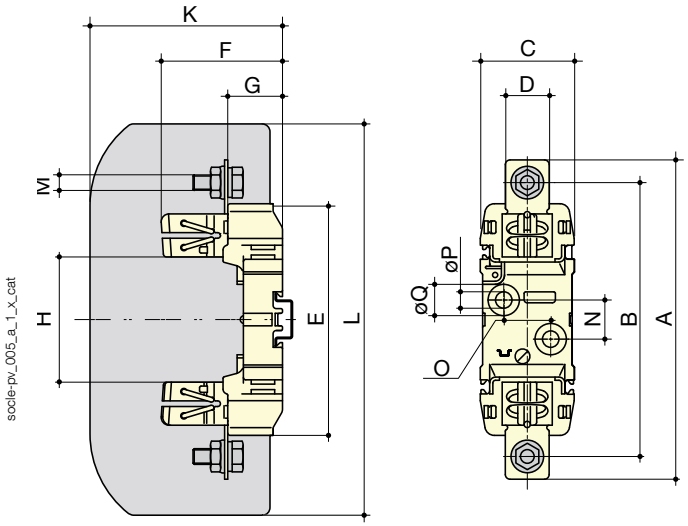
Rating Fuse size No. of poles	30-160 A NH1 Reference	200-355 A 2XL Reference	400-600 A 3L Reference
1 P	65PV **1011**	65PV **1112**	65PV **1113**

Accessories for NH1 fuses	Reference
Connecting block - set of 1 piece	6500 **0031**
Phase separation shield - set of 1 piece	6500 **0003**
Terminal shrouds - set of 1 piece	6500 **0012**
Fuse cover - set of 1 piece	6500 **0022**
Kit IP20 1 P	6511 **1011**(1)

(1) IP20 single-pole kit consisting of 2 connecting blocks, 2 phase separation shields, 2 terminal shrouds and 1 fuse cover.

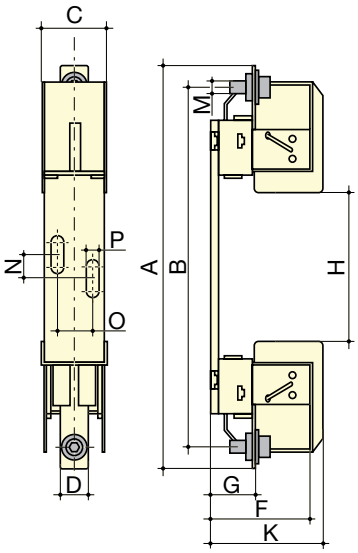
Dimensions

Fuse bases 30 to 160 A - NH1 size



socle-pv_005_a_1_x_cat

Fuse bases 200 to 600 A - 2XL and 3L sizes



socle-pv_001_a_1_x_cat

Rating (A)	Fuse size	A	W	C	D	E	F	G	H	K	L	M	N	O	P	Q
30 … 160	NH1	200	175	60	28	148	77.5	35	80	123	250	M10	25	30	10.5	20.5
200 … 355	2XL	287	257	64	30	-	100	37	140	103	-	M10	17.5	30	10.5	-
400 … 600	3L	307	270	68	40	-	103	38	140	-	-	M12	25	30	10.5	-

SURGYS® G51-PV

Surge arrester - Type 2
for photovoltaic installations

SURGYS G51 - 1000 PV

The solution for

> Solar energy

Strong points

> Monobloc base with plug-in module
> Remote signalling
> New 1500 VDC version

Approvals and certifications

> Compliant with test guide UTE C61-740-51 and NF EN 50 539-11
> Compliant with installation guide UTE C15-712-1 (2010)

Function

SURGYS G51-PV surge Protective Device is designed to ensure protection for photovoltaic supply networks against transient overvoltages. It is compliant with test requirements UTE 61-740-51 and EN 50-539-11 as well as with installation requirements UTE C 15-712-1.

Advantages

Monobloc base with plug-in module

The SURGYS is supplied complete and ready for installation. Its Monobloc base is fitted with replaceable plug-in modules which, at the end of their service life, can be easily and quickly replaced without having to disconnect the Monobloc base.

Remote signalling

The remote plug-in signalling contact allows alarm report to a supervision station.

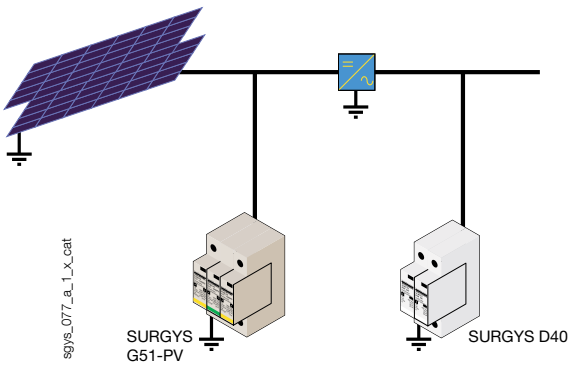
New 1500 VDC version

Adapted to the protection of high power installations.

Applications

Main incoming protection in a photovoltaic network:

- SURGYS G51-PV is installed on the DC side, in the combiner box, close to the solar cell strings, for protecting the downstream DC equipment from the indirect effects of lightning.
- SURGYS AC, SURGYS D40 for instance, is installed downstream of the inverter for load protection.



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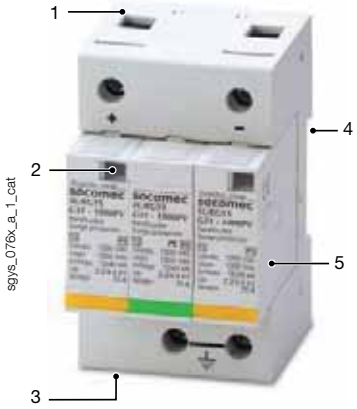
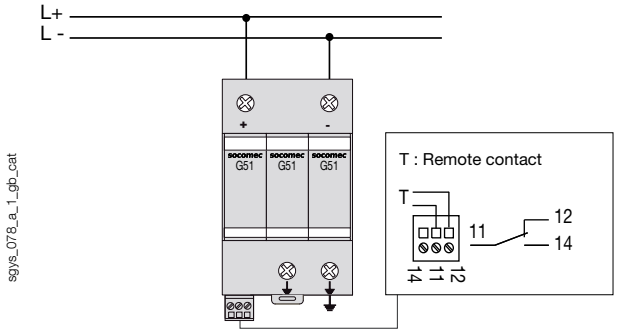
Front panel



1. Monobloc base.
2. End of service life indicator.
3. Remote signalling contact.
4. DIN rail mounting.
5. Plug-in module.

Connection

Common mode / differential mode protection

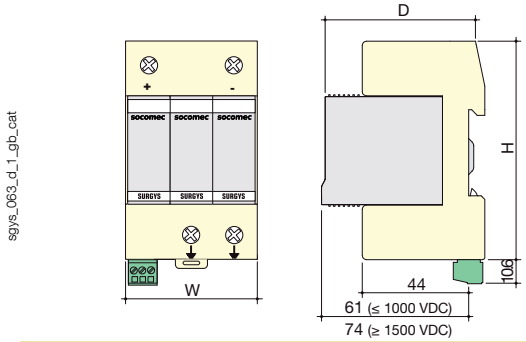


Characteristics

Network	
Network type	500 VDC / 600 VDC / 800 VDC / 1000 VDC / 1500 VDC
PV voltage U_{ocSTC}	500 VDC / 600 VDC / 800 VDC / 1000 VDC / 1500 VDC
Max. voltage U_{CPV}	600 VDC (version 500 V) / 720 VDC (version 600 V) / 960 VDC (version 800 V) / 1200 VDC (version 1000 V) / 1500 VDC (version 1500 V)
Protection characteristics	
Mode of protection	MC(1): 500 V / 600 V / 800 V / 1000 V / 1500 V MD(2): 800 V / 1000 V / 1500 V
Level of protection MC ($U_{p\ MC}$)	2,2 kV (500 V) / 2,8 kV (600 V) / 2 kV (800 V) / 2,2 kV (1000 V) / 3,2 kV (1500 V)
Level of protection MD ($U_{p\ MD}$)	- / - / 3,6 kV (800 V) / 4,4 kV (1000 V) / 4,5 kV (1500 V)
Short circuit current (I_{SCWPV})	1000 A
Maximum discharge current (1 shock 8/20 µs) I_{max}	40 kA
Nominal discharge current (15 shocks 8/20 µs) I_n	15 kA
Associated characteristics	
Residual current I_c	500 / 600 V : < 0.1 mA 800 / 1000 / 1500 V : 0 mA
Response time t_r	< 25 ns
Follow current I_f	none
End of life mode	thermal disconnection
Type of disconnection indicator	mechanical
Number of disconnection indicators	1
Remote signalling contact	
Contact type	inverter
AC making capacity	0.5 A
DC making capacity	3 A
AC nominal voltage	250 VAC
DC nominal voltage	30 VDC
Sustained current	2 A
Connection type	plug-in screw terminal
Max. cross-section of terminal connections	1.5 mm²
Operating conditions	
Operating temperature	-40 … +85 °C
Storage temperature	-40 … +85 °C

(1) Common mode. (2) MD: Differential mode.

Case



Type	monobloc design
2 modules dimensions W x H x D ≤ 800 VDC	36 x 90 x 67 mm
3 modules dimensions W x H x D ≤ 1000 VDC	54 x 90 x 67 mm
3 modules dimensions W x H x D ≥ 1500 VDC	54 x 90 x 77 mm
Case degree of protection	IP20
Terminal block degree of protection	IP20
Case material	UL94-V0 thermoplastic
Network connection cross-section	4 ... 25 mm²
Earth connection cross-section	6 ... 25 mm²

References

Network voltage	Description	No. of poles	Mode of protection	Number of modules	SURGYS® G51-PV Reference
500 VDC	without remote signal	2	MC(1)	2	4982 **2500**
500 VDC	with remote signal	2	MC(1)	2	4982 **2501**
600 VDC	without remote signal	2	MC(1)	2	4982 **2530**
600 VDC	with remote signal	2	MC(1)	2	4982 **2531**
800 VDC	without remote signal	2	MC / MD(2)	3	4982 **2510**
800 VDC	with remote signal	2	MC / MD(2)	3	4982 **2511**
1000 VDC	without remote signal	2	MC / MD(2)	3	4982 **2520**
1000 VDC	with remote signal	2	MC / MD(2)	3	4982 **2521**
1500 VDC	without remote signal	2	MC / MD(2)	3	4982 **2540**
1500 VDC	with remote signal	2	MC / MD(2)	3	4982 **2541**

Description of accessories	Mode of protection	Reference
Spare plug-in module m-G51 for 500 VDC	MC(1)	4982 **2509**
Spare plug-in module m-G51 for 600 VDC	MC(1)	4982 **2539**
Spare plug-in module m-G51 for 800 VDC	MC / MD(2)	4982 **2519**
Spare plug-in module m-G51 for 1000 VDC	MC / MD(2)	4982 **2529**
Spare plug-in module m-G51 for 1500 VDC	MC / MD(2)	4982 **2549**

(1) Common mode. *(2) MD: Differential mode.*

The complete product range

Load break switches

Manually operated switches

SIRCO M

- From 16 to 125 A
- 3, 4, 6 or 8 poles


SIRCM 132 A

SIRCO MV

- From 100 to 160 A
- 3 or 4 poles


SIRCM 099 A

SIRCO

- From 125 to 5000 A
- 3, 4, 6, 8, 9 or 12 poles
- Direct operation or external front or side operation


SIRCO 456 A

SIRCO AC

- From 200 to 4000 A
- 690 VAC - AC 23


SIRCO AC 001 A

Visible breaking switches

SIDER

- From 125 to 3150 A
- 3 or 4 poles (N poles for SIDER ND)


SIDER 089 A

SIRCO MV

- From 100 to 160 A
- 3 or 4 poles


SIRCM 099 A

Tripping load break switches

IDE

- From 32 to 160 A
- 3 or 4 poles


IDE 021 A

SIDERMAT

- From 250 to 1800 A
- 3 or 4 poles
- Direct operation or external front or side operation


SIDMAT 066 A

Motorised operation switches

SIRCO MOT AT M

- From 40 to 160 A
- 4 poles


SIMOT 010 A

SIRCO MOT AT

- From 125 to 3200 A
- 3 or 4 poles


SIRCO 310 B

To find out more

Download the SIRCO and SIRCO M brochure: www.socomec.com/en/brochure-sircom-mv

FLCD-URL 031 A GB

Your peace of mind assured

Our Services & Technical Assistance department will study and define your installation, commission selected equipment and train the personnel in charge of its use.


APPLI 077 B

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Fuse protection

Fuse switches

FUSERBLOC

- From 25 to 1250 A
- 2, 3 or 4 poles
- Direct operation or external front or side operation
- Rear connections

FUSER 532 A FUSER 539 A FUSER 548 B

Visible breaking and tripping fuse switches

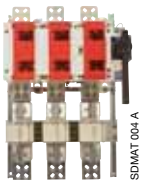
FUSOMAT

- From 250 to 1250 A
- 3 or 4 poles
- Multi-standard IEC, NF, DIN, BS and UR fuses
- Direct operation or external front or side operation
- Tripping via a shunt trip or undervoltage coil

FUSOM 063 B

SIDERMAT combination

- Visible breaking
- From 630 to 1800 A
- 3 or 4 poles
- IEC, NF and DIN fuses
- Direct operation or external front or side operation



SDMAT 004 A

Fuse switches to protect power semi-conductors

FUSERBLOC UR

- UR fuses from 10 to 2000 A
- 2, 3 or 4 poles
- Direct operation or external front or side operation

FUSER 437 A

UL / CSA range

FUSERBLOC

- Fuses from 30 to 800 A
- 2, 3 or 4 poles
- CC, J, K fuses
- Direct operation or external front or side operation
- "Flange" type handle
- Accessories for compliance with the modifications to the standard UL 508 A and NFPA 79

FUSER-UL 005 A

Pre-charge fuse switches

FUSERBLOC Live Maintenance DC

- From 63 to 1600 A
- DIN 43620 UR fuses

FUSER-LM 002 A

To find out more

For more information on the fuse protection range, visit our website: www.socomec.com/en/fuse-protection

FLCD-URL 032 A GB

"Janus de l'industrie"

In 2008, our range of S-type handles received the "Janus de l'industrie", awarded by the French design institute with the backing of the Ministry of Foreign Trade. This prestigious label recognised a range that has been very popular with our customers.

Pro Fuse international association

To make smart choices about electrical protection, visit the website: www.profuseinternational.com

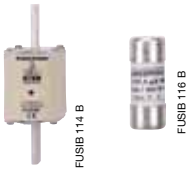
profuse INTERNATIONAL

Fuse protection (continued)

Fuses

gG and *aM* FUSES

- From 0.16 to 125 A in sizes 10 x 38, 14 x 51 and 22 x 58
- From 6 to 1250 A in sizes T000, T00, T0, T1, T2, T3 and T4
- 500 or 690 VAC
- With or without striker



BS FUSES

- From 2 to 1250 A, in sizes F1 to F2, A1 to A4, B1 to B4, C1 to C3, D1
- 415, 550 or 660 VAC

UR FUSES

- From 10 to 2000 A, in sizes 14 x 51, 22 x 58, 0000, 000, 00, 0, 1, 1*, 2, 3
- 690 or 1250 VAC
- With or without striker

M FUSES

- From 1250 A to 3200 A

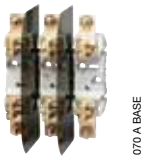
Fuse disconnectors and bases

RM/RMS

- From 1 to 100 A, in sizes 10 x 38, 14 x 51, 22 x 58
- 1 to 4 poles
- With or without signalisation on RMS version (14 x 51 and 22 x 58) and locking cradle on RMSC version (14 x 51)

Fuse bases

- From 160 to 2500 A, in sizes 00, 0, 1, 2, 3, 4
- 1, 2, 3 or 4 poles
- With or without signalisation
- IP2 from 160 to 630 A



Your peace of mind assured

Our Services & Technical Assistance department will study and define your installation, commission selected equipment and train the personnel in charge of its use.

Transfer switch equipment

Manual transfer switch equipment

COMO C

- From 25 to 100 A
- 3 or 4 poles
- Positions: I/II, I/0/II, I/I+II/II

SIRCO M changeover switches

- From 25 to 125 A
- 3 or 4 poles
- Positions: I/0/II

SIRCO VM1 changeover switches

- From 63 to 125 A
- 3 or 4 poles
- Positions: I/0/II, I/I+II/II

To find out more about the *ATyS M*

Download the ATyS M brochure:
www.socomec.com/en/brochure-atys-m

FLCD-URL 033 A GB

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Innovative Power Solutions

Transfer switch equipment (continued)

Manual transfer switch equipment

SIRCOVER

- From 125 to 3200 A
- 3 or 4 poles
- Positions: I/0/II, I/I+II/II

Manual bypass transfer switch equipment

COMO C Bypass

- From 25 to 100 A
- 3+6 or 4+8 poles
- Positions: I/0/II

SIRCOVER Bypass

- From 125 to 1600 A
- 3+6 or 4+8 poles
- Positions: I/0/II, I/I+II/II

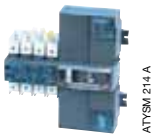
SIRCOVER ATS Bypass

- From 125 to 1600 A
- 12+4 poles
- Positions: I/0/II

Remotely operated transfer switch equipment

ATyS M 3

- From 40 to 160 A
- 2 or 4 poles
- External control command



ATyS S & ATyS Sd

- From 40 to 125 A
- 4 poles
- ATyS Sd: Integrated Dual supply (DPS)
- DC versions available

ATyS & ATyS d

- From 125 to 3200 A
- ATyS d: Integrated Dual supply (DPS)

Automatic transfer switch equipment

ATyS M6s & ATyS M6e

- From 40 to 160 A
- 2 or 4 poles
- Integrated control command
- ATyS M6e: with communication options

ATyS p, g & t

- From 125 to 3200 A
- ATyS p: transformer/generating set application, model with energy management functions, communication options and integrated web server
- ATyS t: transformer/transformer application
- ATyS g: transformer/genset application

Universal N / E controllers

ATyS C20/C30

- 2-source changeover switches

ATyS C40

- 2-genset changeover switches

Added value of IEC 60947-6-1

The ATyS M, ATyS S and ATyS ranges meet the requirements of IEC 60947-6-1. The purpose of this international standard, which governs manually, remotely or automatically controlled transfer connection equipment, is to define:

1. the equipment specifications,
2. the equipment behaviour under normal and abnormal conditions (e.g. short circuits),
3. the tests designed to confirm that the conditions have been met and the methods for carrying out these tests,
4. the information to be marked on the equipment.

Electronic protection

Earth leakage relays

RESYS M40/RESYS M40R
RESYS P40

- Type A
- Modular or flush-mounted unit

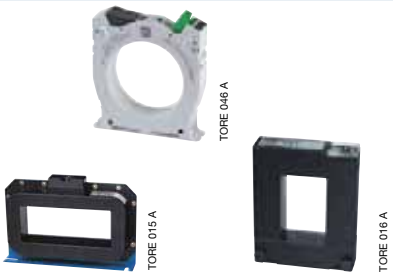
Core balance transformers

Circular closed core balance transformers (ΔIC)

- Diameter from 15 to 300 mm
- Different fixing types
- Patented cable locator

Rectangular closed transformers

Rectangular split-core transformers



Protection against overvoltages

SURGYS G100-F/G140-F/ G40-FE/G50-FE

- Surge protection at the top of low voltage installations

SURGYS G70/D40/E10

- Surge protection for distribution and equipment protection

SURGYS RS-3/mA-3/TEL-3

- Low current surge protection to protect equipment connected to telecommunication and data transmission networks
- Available in 1 or 2-pair versions

To find out more about the core balance transformers

Download the product sheet for core balance transformers: www.socomec.com/en/fiche-tores-differentiels

FLCD-URL 039 A GB

Your peace of mind assured

Our Services & Technical Assistance department will study and define your installation, commission selected equipment and train the personnel in charge of its use.

socomec Innovative Power Solutions

Energy management and measurement

Active and reactive energy meters

Single-phase kWh meters

COUNTIS E00, E02, E03 & E04

- Connection up to 32 A
- Class 1 in accordance with IEC 62053-21
- 1 pulse output
- E02: MID EN50470 certified B+D class B modules
- E03: Modbus protocol RS485 communication
- E04: MID EN50470 certified B+D modules, Modbus protocol RS485 communication

COUNTIS E10, E11, E12, E13, E14, E15 & E16

- Connection 63 A and 80 A
- Class 1 in accordance with IEC 62053-21
- 1 pulse output
- E11: dual tariff
- E12: MID EN50470 certified B+D class B modules
- E13: Modbus protocol RS485 communication
- E14: MID EN50470 certified B+D modules, Modbus protocol RS485 communication
- E15: RS485 M-BUS protocol communication
- E16: MID EN50470 certified B+D modules, M-BUS protocol RS485 communication

Three-phase kWh meters

COUNTIS E20, E21, E23, E24, E25 & E26

- Connection up to 63 A
- Class 1 in accordance with IEC 62053-21
- 1 pulse output
- E21: dual tariff
- E23: Modbus protocol RS485 communication
- E24: MID EN50470 certified B+D modules, Modbus protocol RS485 communication
- E25: RS485 M-BUS protocol communication
- E26: MID EN50470 certified B+D modules, M-BUS protocol RS485 communication

COUNTIS E30, E31, E32, E33, E34, E35 & E36

- Connection up to 100 A
- Class 1 in accordance with IEC 62053-21
- 1 pulse output (except E33 and E34)
- E31: dual tariff
- E32: MID EN50470 certified B+D class B modules
- E33: Modbus protocol RS485 communication, 4 tariffs
- E34: MID EN50470 certified B+D class B modules, Modbus protocol RS485 communication, 4 tariffs
- E35: M-BUS protocol communication, 4 tariffs
- E36: MID certified, M-BUS protocol communication, 4 tariffs

Your peace of mind assured

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MID certification

What are the advantages of a B+D module MID meter?

- It guarantees a high-quality product.
- It allows electricity to be resold.
- It guarantees a standardised measurement accuracy.

Measurement & energy management (continued)

Active and reactive energy meters (continued)

Three-phase kWh meters (continued)

COUNTIS E40, E41, E42, E43, E44, 45 & 46

- Connection via 5 A CT up to 6000 A
- Display of kWh and kVArh
- Class 1 in accordance with IEC 62053-21
- 1 pulse output (except for E43 and E44)
- E41: dual tariff
- E42: MID EN50470 certified B+D class C modules
- E43: Modbus protocol RS485 communication, 4 tariffs
- E44: MID EN50470 certified B+D class C modules, Modbus protocol RS485 communication, RS485 4 tariffs
- E45: M-BUS protocol RS485 communication, 4 tariffs
- E46: MID EN50470 certified B+D class C modules, M-BUS protocol RS485 communication, RS485 4 tariffs

COUNTIS E50 & E53

- Connection via 5 A CT up to 6000 A
- Display of 3I, 3U, 3V, F, kW, kVAh, kVA, PF
- Display of ±kWh, ±kVArh and kVAh
- Class 0.5s in accordance with IEC 62053-22
- 1 pulse output (E53 as an option)
- E53: Modbus protocol RS485 communication, 4 tariffs

COUNTIS E63

- 3 independent inputs in direct connection up to 100 A
- Class 1 in accordance with IEC 62053-21
- Modbus protocol RS485 communication
- 4 tariffs

Multi-utility concentrators

COUNTIS ECi2 & ECi3

- Up to 9 multi-utility meters: 7 logical inputs + 2 analogue inputs
- Available load curves for each of the 9 inputs
- Monthly consumption and 10 min average powers stored for 170 days
- RS485 communication through Modbus protocol
- Maximum customisation (choice of the metering unit, currency, etc.)

MID certification

What are the advantages of a B+D module MID meter?

- It guarantees a high-quality product.
- It allows electricity to be resold.
- It guarantees a standardised measurement accuracy.

To find out more about the *COUNTIS ECi*

Download the COUNTIS ECi product sheet:
www.socomec.com/en/fiche-countis-eci

FLCD-URL 035 A GB

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Measurement & energy management (continued)

Multifunction measurement units

Multifunction measurement (MFM)

DIRIS A10, A17 & A20

- Multi measurement
- Metering
- Alarm management
- DIRIS A10: 4 modules
- DIRIS A17: 72 x 72 mm dimensions
- DIRIS A20: 96 x 96 mm dimensions

Optional modules

- Modbus protocol RS485 communication
- 1 logical output

Energy monitoring (PMD)

DIRIS A40, A41, A60 & A80

- 96 x 96 mm
- Multi measurement
- Metering
- Power management (load curves, etc.)
- Harmonic analysis up to level 63
- DIRIS A41 (designed for highly distorted networks): neutral current measurement
- DIRIS A60: detection of events (voltages/currents) and storage of ½ period RMS curves
- DIRIS A80: A60 + monitoring of differential currents - RCM (Residual Current Monitoring)

Optional modules

- 2 pulse outputs
- JBUS/MODBUS RS485 communication
- PROFIBUS/DP RS485 communication
- Ethernet with webserver
- Temperature
- Memory (DIRIS A40/A41)
- 2 analogue outputs
- 2 configurable inputs + 2 configurable outputs

DIRIS BCMS 720

- Compact distribution circuit monitoring system: up to 72 outputs + 10 inputs
- Measurement and alarms
- MODBUS or SNMP communication
- Block of current transformers or split-core current transformers

Energy measurement for your existing installations

RETROFIT line

A measurement device (COUNTIS or DIRIS) and three compact split current transformers are combined and **optimised to ensure easy commissioning.**

The Retrofit Line allows you to easily add metering and measurement points in electrical enclosures which are very restricted in terms of integration.

To find out more about the *DIRIS A80*

Download the DIRIS A80 product sheet:
www.socomec.com/en/fiche-diris-a80

FLCD-URL 038 A GB

61557-12 certification

A precise reference, IEC 61557-12 is the common denominator for all PMDs (Performance Monitoring Devices), devices designed to measure and monitor electrical parameters in distribution networks.

Respecting this standard ensures your equipment offers a high level of performance.

CEI/IEC 61557-12

Current transformers

Socomec offers a complete, high-performance range of current transformers capable of meeting all the requirements of your installations.

COUNTIS et *DIRIS* management software

- **Webserver** (included in all Ethernet optional modules): monitors and uses data remotely and without the need for special software, via a web browser.
- **Easy Config:** configures COUNTIS E, COUNTIS ECi and DIRIS A simply and quickly on a PC.
- **Analysis:** analyses data to improve the reliability of your electrical installation.

Easy Config and Analysis are available to download from the SOCOMEC website: www.socomec.com

Measurement & energy management (continued)

Network analysers

DIRIS N300

- Acquisition, processing and back-up module for measurements, harmonics, alarms, load curves, dips, outages and overvoltages and vector diagrams
- Connectivity via Ethernet
- RS485
- USB Port


DIRIS 754 A

DIRIS N600

- DIRIS N300 + interharmonic measurements, analysis of transients, flicker and EN 50160 report

DIRIS D600 display

- Graphic colour LCD display module with local display and programming of the DIRIS N300 and N600


DIRIS 762 A

Optional *DIRIS O* modules

- Remote modules for centralisation or control/command from analogue or logical outputs/inputs
- Programming of logical functions to create true automatic process functions


DIRIS 755 A

Associated software and services

VERTELIS VISION
POWER MONITORING

VERTELIS VISION

Centralised monitoring software for electrical installations

The first step in your Energy efficiency policy, VERTELIS VISION is software preinstalled on an industrial PC (box).

It allows information from SOCOMEC metering and measurement devices to be read remotely and displayed on a normal web browser.

Main functions

- Real-time monitoring and logging of SOCOMEC devices
- Remote reading of energy indices with automatic export of reports (xls, pdf)
- Alarm management

VERTELIS VISION can be easily upgraded to the VERTELIS HYPERVIEW software package.

VERTELIS HYPERVIEW
ENERGY MANAGEMENT

VERTELIS HYPERVIEW

Multi-utility energy management software

Compile and make sense of your energy data and display the results.

With VERTELIS HYPERVIEW, all the information from the instrumentation is uploaded, aggregated and analysed. The Hyperview© concept means you can easily identify the relevant indicators and meet your energy performance objectives.

Main functions

- Optimises your installation to reduce the energy bill by up to 30 %
- Provides remote reading of the metering points
- Monitors multi-utility consumption (electricity, water, gas, etc.)
- Analyses the data to identify malfunctions
- Communicates energy savings and environmental benefits
- Automatically sends reports by mail, SMS or shared space.


VERTE 034 A

VERTELIS HYPERVIEW, multi-utility energy management software package (EMS)

To find out more

Download the DIRIS N brochure:
www.socomec.com/en/brochure-diris-n

FLCD-URL 037 A GB

Your peace of mind assured

Socomec offers a full range of customised services for your energy efficiency requirements and can help you find the best solution:

- study & diagnostics,
- advice & guidance,
- adaptation & customisation,
- implementation,
- training,
- operational support and maintenance.

SYDV 069 A GB

VERTELIS box

VERTELIS software is preinstalled on a dedicated box, which ensures it is reliable and secure.


VERTE 001 D

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Measurement & energy management (continued)

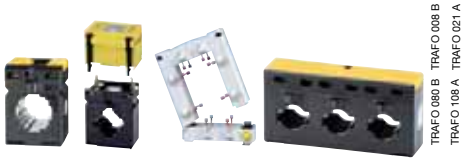
Sensors

Shunt

- From 1 to 6000 A, at 100 mV
- Class 0.5

Current transformers

- From 5 to 5000 A
- Coiled primary, routing of cables and busbars, and split-cores
- Three-phase version
- Class 0.5 - 1 - 0.2S
- Transformers with integrated or snap-on converter



Current transformer automatic short circuit device

Indicators and transducers

- Digital and analogue in DIN, Rotex and modular unit
- Ammeters and voltmeters, AC/DC
- Frequency meters, phase-meters and wattmeters
- Digital multi-indicators: MULTIS LMp and LMg (modular) and L72 (72x72)
- Hours run meters
- Phase changeover switches
- Programmable transducers

To find out more

For more information about our measurement solutions, visit our website: www.socomec.com/en/current-transformers

FLCD-URL 034 A GB


U=R

Photovoltaic Application Guide

Photovoltaic installations

Disconnecting photovoltaic generators

Protecting photovoltaic generators

Glossary of common photovoltaic terms

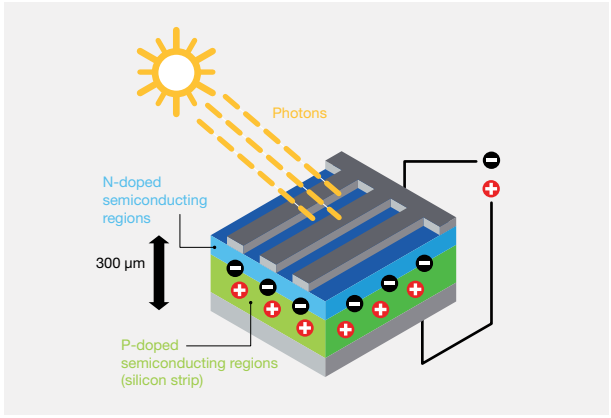
Photovoltaic installations

General photovoltaic principles

The photovoltaic cell

Converting solar energy

In simple terms, energy from the sun is converted into electricity when the photons present in sunlight are absorbed by silicon-based semiconductors (or other appropriate materials) that form the solar panel, thus creating a DC current of a few amps with voltage in the range of a few hundred millivolts.



The photovoltaic "diode"

A photovoltaic diode exposed to light acts as a DC current generator, as shown in quadrant Q4 of figure 1.

In the dark, this cell behaves like a normal diode.

If a fault were to occur in the installation or in the cell, this diode can act as a receiver as shown in quadrants Q1and Q3.

Q1 => U > U_{OC}: this situation arises when the direct voltage (U) applied to the PV cell is greater than the voltage in an open circuit (U_{OC}), as with a diode polarised "in direct voltage".

Q3 => I > I_{SC}: in this case, the direct current (I) sent to the module is greater than the Isc current that it can generate, in short circuit and according to the sunlight it is exposed to, as with a diode polarised "in reversed voltage".

Generally, quadrant Q4 is used reversed to facilitate reading of the behaviour of the photovoltaic generators in "normal"operation.

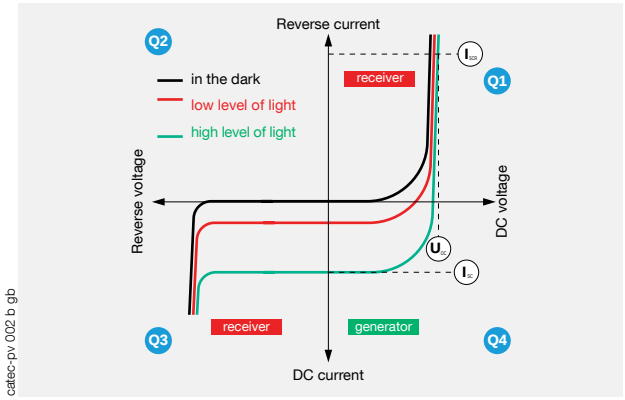
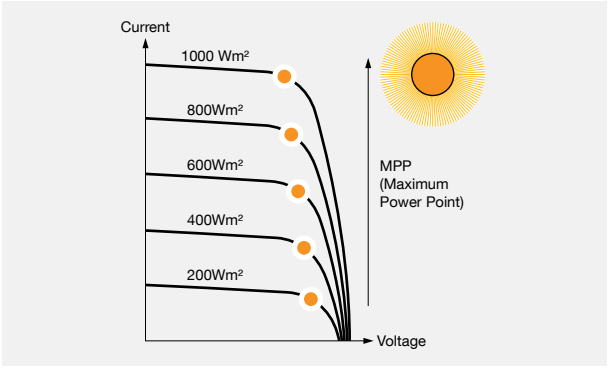
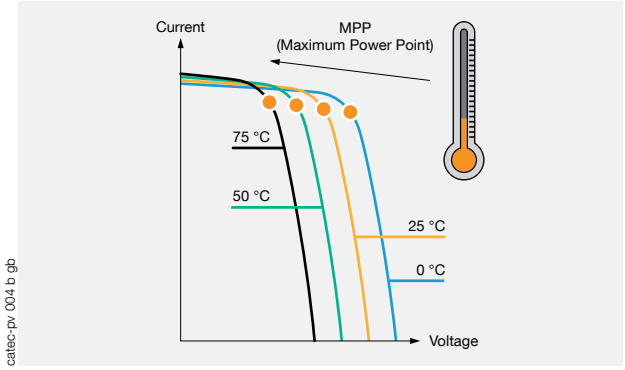


Fig. 1.

The influence of light and temperature

The available power of a photovoltaic generator is linked to the increase in sunlight, which have a direct impact on the generated current.
An increase in temperature will reduce the available power (MPP) by affecting the voltage of the cells.

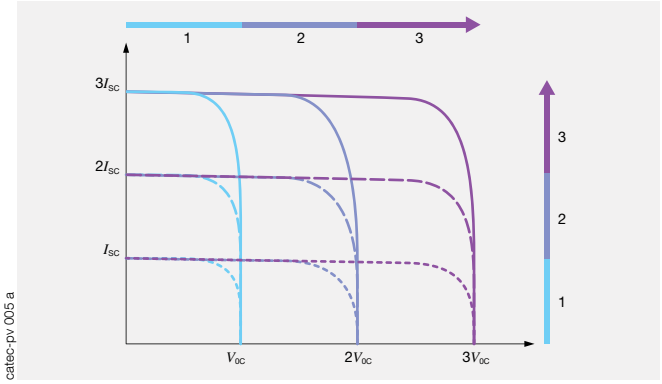




Photovoltaic architecture

Module and PV string

Placing the cells in series enables a module's available voltage to be increased, whereas placing the cells in parallel increases its available current.



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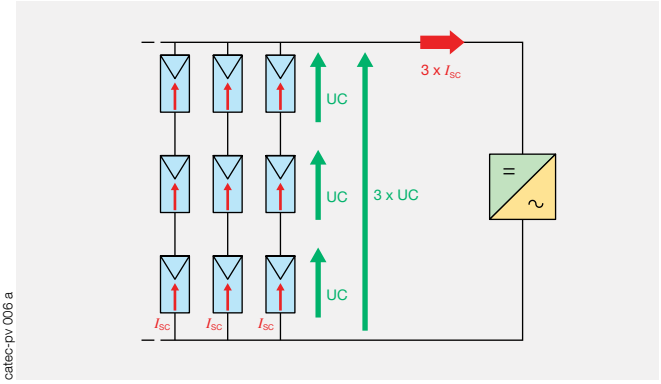
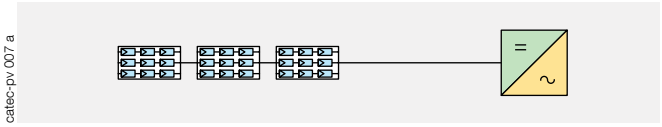


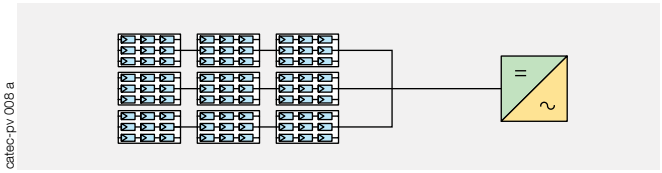
catec-pv 006 a

Photovoltaic generator

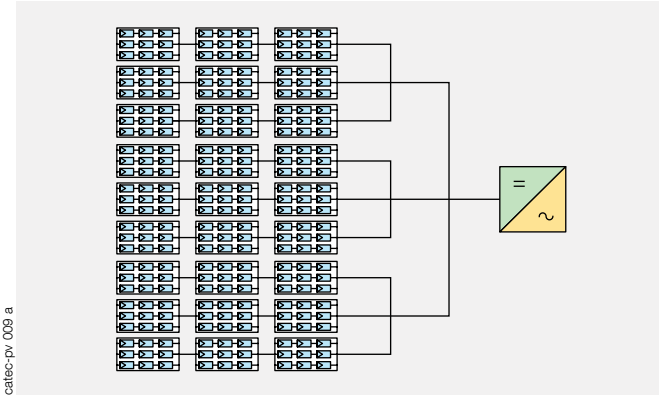
A string's voltage is created when the modules are placed in series. The coupling of strings of the same voltage in parallel will form groups making it possible to increase the current and therefore the power of the generator.


catec-pv 007 a

Example: generator and 3-module string.


catec-pv 008 a

Example: generator and a group of three 3-module string.


catec-pv 009 a

Example: generator and three groups of three 3-module string.

Photovoltaic architecture (continued)

Components of a photovoltaic installation

catec-pv 010 a gb

- Generating DC electricity via photovoltaic panels,

catec-pv 011 a gb

- DC protection with appropriate equipment for:
  - disconnection,
  - protection against overcurrents,
  - protection against voltage surges (atmospheric or from operation),
  - additional monitoring of insulation fault,

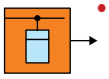
catec-pv 012 a gb

- DC / AC conversion with inverters,

catec-pv 013 a gb

- AC protection with appropriate equipment for:
  - disconnection,
  - protection against overcurrents,
  - protection against voltage surges (atmospheric or from operation),
  - insulation fault detection / checking,

catec-pv 014 a gb



- Connection to the mains with appropriate equipment for:
  - metering,
  - and depending on the power:
    - any external disconnection,
    - transforming low voltage to high voltage,
    - high voltage disconnection and protection.

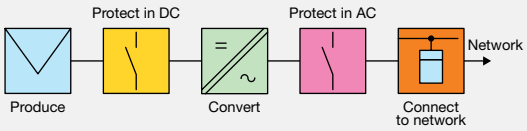
Inverters

Centralised inverter installations

These installations are prone to production stoppage when a fault occurs. This type of architecture is used in domestic applications with power limited to 3 kWc in France and 6kWc in other countries.

With one to three strings in parallel, this configuration can limit the DC protection function to disconnection upstream of the inverter.

catec-pv 015 agb



Multi-inverter installations

In case of a fault or maintenance, the loss of production is limited to the machine concerned. Opting for this type of architecture is done for industrial installations where power can go from several hundred kWc for large roof areas, and several MWc for stations on the ground. Above 250 kWc, connection to the mains would be done via a LV-H step transformer.

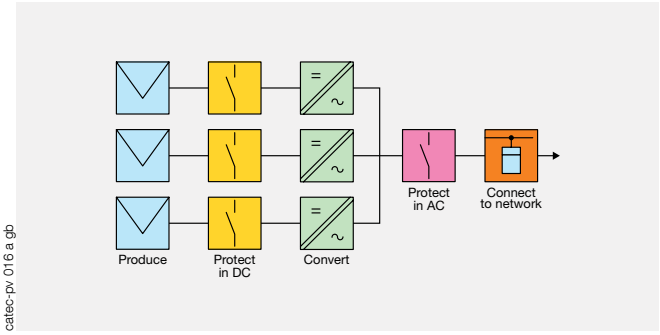
- Multi-inverters with individual control

  The advantage of this type of architecture is its of simplicity, with the use of inverters that are smaller than those that would have been required with the generators in parallel.

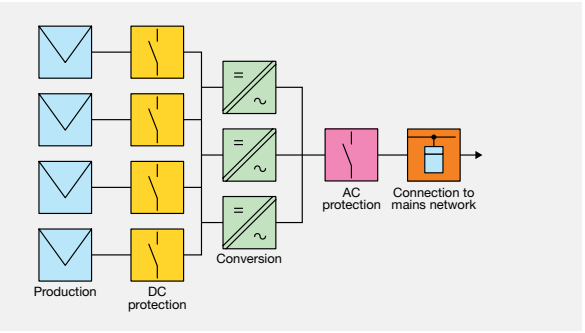
- Multi-inverters with central control

  This type of architecture enables highly flexible maintenance and management of machine operating time by using only the inverters needed. This method also ensures the inverters are used at their optimum power depending on the sunlight.

catec-pv 016 a gb



catec-pv 017 b gb

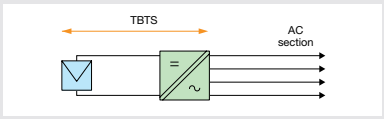
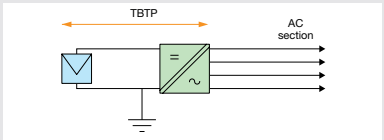
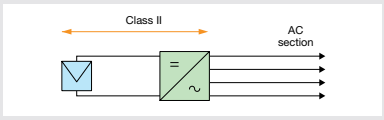
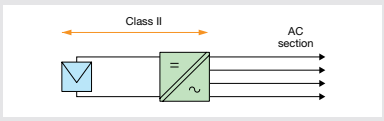
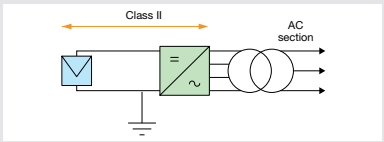
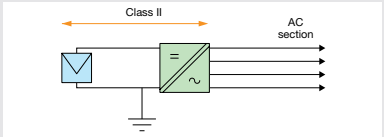


DC / AC galvanic separation

The choice of whether or not to implement galvanic separation will determine the selection of protection and monitoring devices on both the DC and AC circuits.

The table hereafter shows all the possibilities:

- DC side:
  - the voltage class (VLV or LV),
  - the installation, "floating or insulated",
  - direct functional polarisation or through a resistor.
- AC side:
  - the selection of TT, TN or IT neutral systems

DC side		Functional diagram	AC side
Udc	Protection principle against indirect contact		Protection principle against indirect contact: IT, TN or TT
120 V	SELV	catec-pv 018 a gb 	Galvanic separation required to ensure SELV or PELV protection.
120 V	PELV	catec-pv 019 a gb 	
> 120	Class II	catec-pv 020 a gb 	Without galvanic insulation, DC polarisation is not possible.
		catec-pv 021 a gb 	
		catec-pv 022 a gb 	Galvanic separation compulsory because of DC polarisation.
		catec-pv 023 a gb 	

Disconnecting photovoltaic generators

Disconnection

The purpose of disconnection is to ensure the safety of operators by guaranteeing effective separation from the source. This function must be provided for both connections of the inverter(s) on the DC and AC circuits. If the generator has several groups of strings, this function should also be provided so that each group can be individually operated.

This disconnection must fulfil the three following functions:

Function	Characteristic	Value
Ensure disconnection distance in the air	Impulse voltage (U_{imp})	5 x U_{oc}
Guarantee the creepage distance values	Isolation voltage (U_i)	1.2 U_{oc}
Provide safe indication of the open position and ensure insulation	Positive break indication	3 F or visible breaking

Emergency disconnection

The purpose of emergency disconnection is to ensure the safety of operators and installations in case of electrical shock, burns or fire on or in the equipment. The controls for these devices must be quickly and easily accessible, located near the inverter(s) for the DC and AC circuits.

This disconnection must fulfil the following four functions

Function	Characteristic	Value
Guarantee on-load disconnection	Operating voltage (Ue) Operating current (Ie) This characteristic requires the manufacturer to respect the current values (low current, critical current of the device), as well as the data set out in standard IEC 60947-3 Time constant (L/R)	1.2 U_{oc} From 0 to 1.25 I_{sc} (non-standard) 1 ms
Ensure omnipolar disconnection	Simultaneous Galvanic isolation	 Air gap
Allow access to the controls	Directly, for domestic applications Directly or by remote control in all fields other than domestic via pneumatic control	Direct manual operation / remote operation with shunt trip or undervoltage release / motor / pneumatic actuator
Centralisation of controls	DC and AC controls are possible if gathered in the same place	

Fire safety systems

A general disconnection for the intervention of firefighters can be required. Ideally this disconnection should be made as close as possible to the PV field.

This function must be provided unless:

- the DC cables are routed externally and entry is direct in each inverter technical room,
- the inverters are positioned externally, on the roof, as close as possible to the modules,
- the DC cables are routed inside the building, with additional protection devices specified depending on the type of technical rooms.

The "fire service disconnection" must generally meet the following requirements:

- The disconnection must act on all the "sources" of the building to be protected:
  - the building's consumption supply (e.g.: public supply network),
  - the supply of the AC part of the inverter(s), if independent of the consumption mentioned above,
  - the supply of the DC part of the inverter(s) or possible batteries.
- The control components must be grouped together.
- The sequencing of the operations should be indiscriminate.
- The devices to be put into operation are electromagnetic disconnection devices (static disconnection is not permitted).
- Control can be direct or via remote control with:
  - undervoltage release or
  - shunt trip or motor(*)
  - pneumatic actuation.
- In case of light indication, a white led should indicate the position of the remotely controlled devices(s)(*)

Note:

(*) in order to ensure real efficiency, power supply circuits should be achieved by a secured source of energy (UPS) and adequate fire-resistant cables.

Switching devices in PV installations

Handling of functional or emergency switching devices for general use or maintenance operations in the PV field, should take into account the risk of reverse currents appearing in case of default. The non-compliance of this criteria can cause high electrical hazard during operator handling.

A DC switching device is usually based on an arc extinguishing technology ensuring current flow breaking in one direction, hence the notion of DC “polarised” devices.

In PV applications, possible reverse currents imposes the need to interrupt the current flow in both directions. This notion is taken into account in the forthcoming IEC PV 60947-3 standard (Appendix D).

Moreover, as mentioned in the standard, devices should be able to withstand a minimum of operation for at least 100 full load cycles, 2900 off-load cycles and 100 cycles when subject to critical current (values depending on the device rating).

In a PV field, a ground leakage failure can occur on a single pole and not simultaneously on both polarities. In such a case the device should ensure breaking on one pole the full U_{oc} voltage. The function is achieved by a 1000V PV fuse; if a circuit breaker is used, this means the number of poles in series should be multiplied to reach the requested voltage per pole. This precaution first apply to strings or group of strings protections, as well as to general devices in combiner or recombiner boxes.

Protecting photovoltaic generators

Protecting photovoltaic generators against electric shocks

Protection against direct contact

The DC part of a PV installation must always be considered as live and all active parts must be protected against directs contacts through isolation material or through integratin within an enclosure. This provision is not necessary if the PV voltage remains limited to 60 and 30 VDC in SELV and PELV respectively.

Protection against indirect contact

The protection methods should take into account the provisions implemented on the DC and AC circuits as well as the presence or not of galvanic separation between the DC and AC sections.

The protection devices should also take into account the following four constraints:

- The impossibility (for costs reason) to monitor and isolate each generator (PV module) individually, to the contrary of a LV installation supplied by centralised sources (HV/LV station, running generator, UPS, etc),
- the level of short circuit current of the photovoltaic generators, when near to their nominal current, makes it difficult to detect faults,
- exposure to weather conditions and the day/night cycles,
- the presence of direct current which can damage insulation and wiring more rapidly over time than alternating current.

Protection from indirect contact is provided by installing class II or reinforced insulation in the entire DC section of the installation. This provision is not necessary if the PV voltage is in SELV and PELV (< 120 V DC).

If DC enclosures are installed in a technical room with access restricted to qualified personnel, this enclosure can be class I, where the protection against indirect contact is supplemented by Supplementary Equipotential Bonding in the room.

Protecting against voltage surges caused by lightning

Surges can occur in several ways in a PV installation. They can be:

- Ttransmitted by the distribution network and be of atmospheric origin (lightning) and/or due to operations,
- Generated by lightning strikes near to the buildings and PV installations, or on the building's lightning arresters,
- Generated by electrical field variations due to lightning.

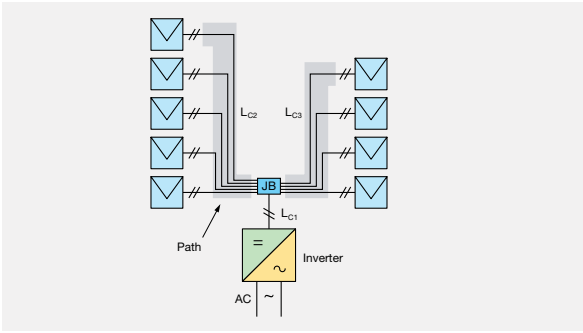
Conditions to implement DC lightning arresters

The decision whether to implement lightning arresters depends on the length of the installations exposed to danger and the keraunic level (Nk) of the area. (Nk: lightning strike density).

This critical length varies depending on the types of installation.

For an inverter the length of the installations to be considered is L = Lc1 + Lc2 + Lc3.

For an installation with several individual inverters, the length to be taken into account is the length per inverter; for an installation with several inverters with central control, the length to be considered is the sum of all the lengths.



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Protecting photovoltaic generators against voltage surges

The table below sets out exemptions from lightning conductors.
This approach, based on a risk analysis, does not limit the implementation of protection devices should the protection value become inadequate compared with the value of the installation (P > ten or so kW).

Function	Domestic	Ground installation	Large roofs
L crit. (ml)	1150 / Nk	2000 / Nk	4500 / Nk
L ≥ L crit.	Lightning arrester compulsory		
L < L crit.	Lightning arrester not compulsory		
With lightning conductor	Lightning arrester compulsory		

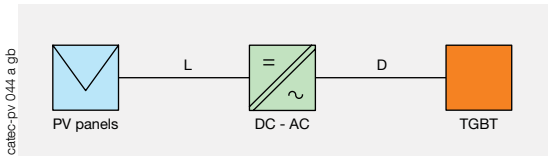
Example
L crit. in Strasbourg: domestic = 57.5 - ground installation = 100 - large roof = 225.

Conditions for implementing lightning arresters on AC and DC circuits

According to NT C15-100 and the UTE C 15-712-1 guide, the installation conditions for lightning arresters on DC and AC circuits depend on the following different criteria:

- On the DC circuit, a lightning arrester is compulsory for the inverter:
  - either when there is a lightning conductor,
  - or when the length L between the PV panels and the inverter is > crit. L.
  A second lightning arrester is recommended to protect the PV panels if L > 10 m.
- On the AC circuit, a lightning arrester is compulsory for LV switchboard panel (or the general control and protection device):
  - either when there is a lightning conductor,
  - or when the keraunic level is > 25.

A second lightning arrester is necessary to protect the inverter if the distance between the LV switchboard panel (or the general control and protection device) and the inverter D > 10 m.



		DC		AC	
		PV panels — DC inverter		AC inverter — LV switchboard panel	
		L < 10 m	L > 10 m	D < 10 m	D > 10 m
Installation with lightning conductor	not insulated	— T1	T1 — T1	— T1	T2 — T1
	insulated	— T2	T2 — T2	— T1	T2 — T1
Installation with no lightning conductor		— T2	T2 — T2	— T2	T2 — T2

Note T1 = type 1 or class 1 lightning arrester, T2 = type 2 or class 2 lightning arrester.

Protecting photovoltaic generators against overcurrents

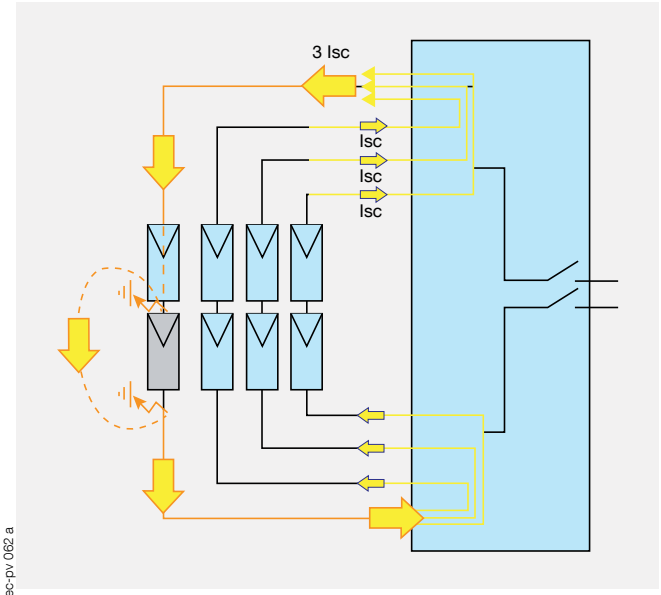
Overcurrents on photovoltaic generators

In a photovoltaic installation, short-circuits can appear in junction boxes or cables following a ground fault in the generator network. Furthermore, a fault can appear on the lightning arrester of the generator or the one of the inverter, or even on the inverter itself.

Short-circuit at the PV string level

If a short-circuit appears in the PV generator, the faulty string voltage is going to be reduced and modules can be damaged by reverse overcurrents produced by:

- one or several strings in parallel,
- external sources such as batteries,
- or both.



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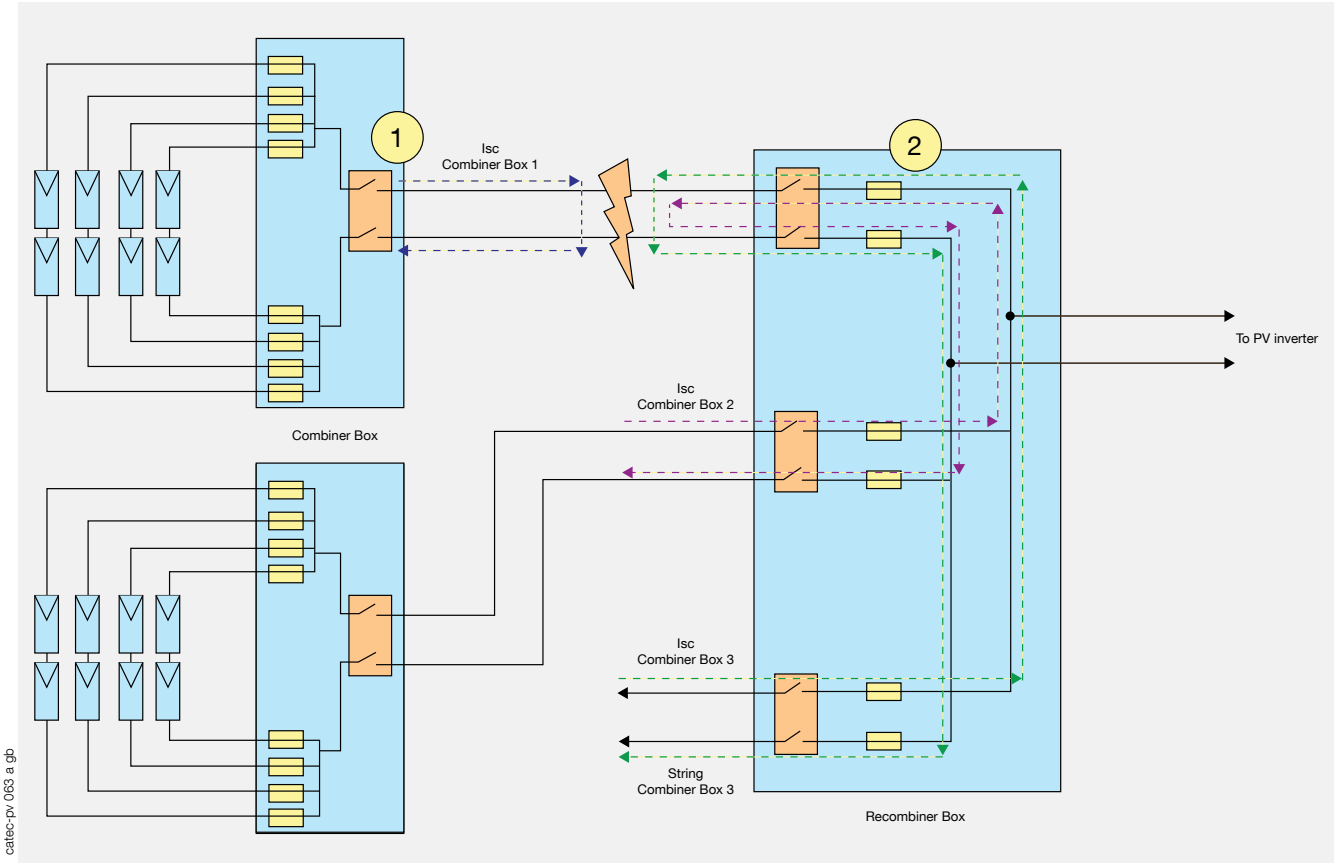
A fuse on two polarities protects the string cables and PV modules.

Protecting photovoltaic generators against overcurrents (continued)

Short-circuit at the level of a string recombiner box wiring

In extended installations including a recombiner box, a short-circuit can occur on the string wiring system.



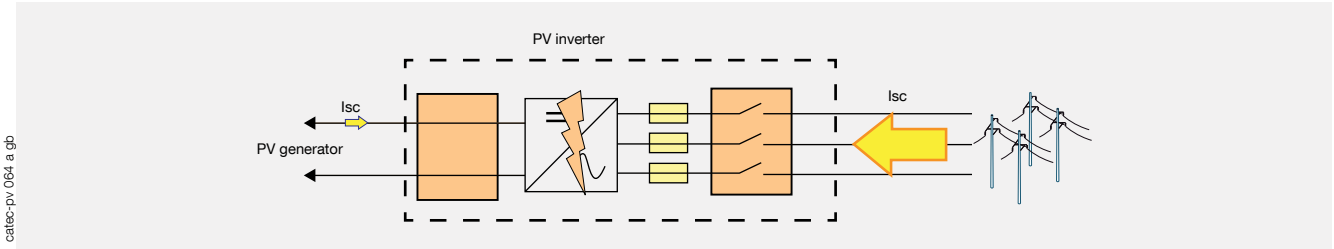
This short-circuit is supplied by several power sources.

1) The short-circuit current supplying the fault is more or less equal to the rated current. The wiring system and devices are sized to withstand the rated current with a safety factor, there is no need to add an overcurrent protection on the output of the string combiner box.

2) The fault is supplied by short-circuit currents from several string recombiner boxes. The wiring system and devices must be protected by an overcurrent protection in the recombiner box.

Short-circuit at the inverter level

In case of inverter internal fault, the short-circuit is supplied by the PV generator and the AC side.



On the AC side, the short-circuit current can be ten times greater than the rated current.
On the DC side, the total short-circuit current is more or less equal to the rated current.
The inverter must be protected by an overcurrent protection on the AC side.

Protecting photovoltaic generators against overcurrents (continued)

Sizing overcurrent protections against reverse current in PV strings

The sizing of the string's cables depends very much on the voltage drops; the notions of permissible currents for the wiring protection against overcurrents are generally met automatically and do not require the implementation of protection to provide this function.

The main selection criteria for fuses is the value of I_{RM} (maximum PV reverse current) that the module can withstand temporarily until the selected fuse breaks the faulty current generated following a fault (see figures 2 and 3 below).

The decision whether to use a fuse should be based on the following equation:

$$(Nc_{max} - 1)\ I_{scSTC} \leq I_{RM} < Nc_{max}\ I_{scSTC}$$

Protection devices against reverse current should be used for PV generators with a number of Nc strings above Nc_{max}.

Figure 1 gives the number of strings in parallel NC_{max} that do not require protection according to the value of the current I_{RM} of a string in an installation with no storage batteries:

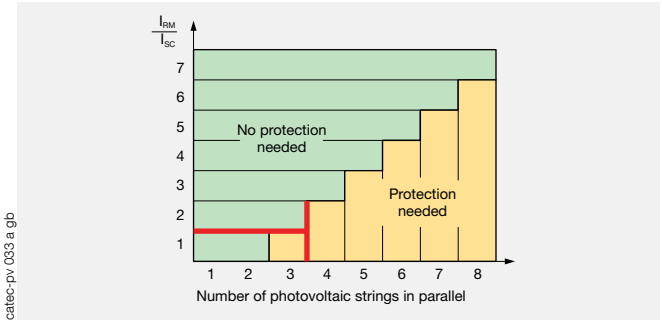


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Fig. 1.

Note: generally, in an installation with no storage batteries, the I_{RM} values of PV modules in crystalline silicon are presumed to be between 2 and 3 I_{scSTC}.

The general rule is that each string is protected individually by a protection device. If modules have a very high withstand to reverse current, Np strings can be connected in parallel to a single protection device.

Np max : Maximum number of strings in parallel per protection device

Reversed current withstand of the module	Npmax
$1.4\ I_{scSTC} \leq I_{RM} < 3.8\ I_{scSTC}$	1
$3.8\ I_{scSTC} \leq I_{RM} < 6.2\ I_{scSTC}$	2
$6.2\ I_{scSTC} \leq I_{RM} < 8.6\ I_{scSTC}$	3
General case: $(2.4\ Np_{max} - 1)\ I_{scSTC} \leq I_{RM} < (2.4\ Np_{max} + 1.4)\ I_{scSTC}$	

Information on the IRM given by manufacturers of photovoltaic modules

Some manufacturers specify a max reverse current more or less equal to the nominal short circuit current and a significantly higher fuse rating.

Protecting photovoltaic generators against overcurrents (continued)

Protection against excessive sunlight exposure

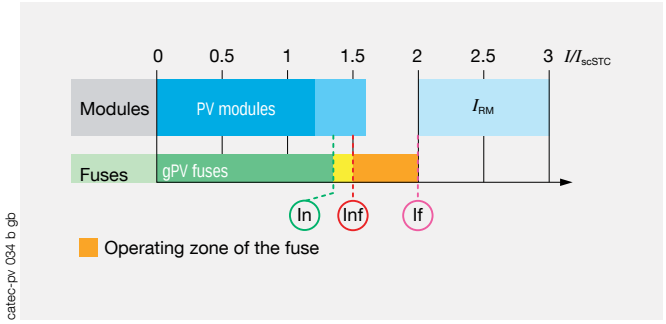
The use of a fuse over its nominal rating should be avoided. The critical zone is the zone between the nominal current and the non-fusing current (Inf).

This is particularly important for fuses subjected to cyclic temperature fluctuations, typical of PV systems.

The nominal current In of the string's PV fuse should be higher than the maximum operating current of the string, which varies between 1.25 and 1.6 I_{scSTC} depending on the climatic conditions and the sunlight levels.

The PV fuses should not operate, or damage the installation in normal operating conditions in order to avoid operating losses.

In order to meet this requirement, a fuse with a nominal current that is 40% higher than the I_{sc} of the PV string is selected.



Inf: non-fusing current of fuses

If or I2: maximum fusing current of fuses

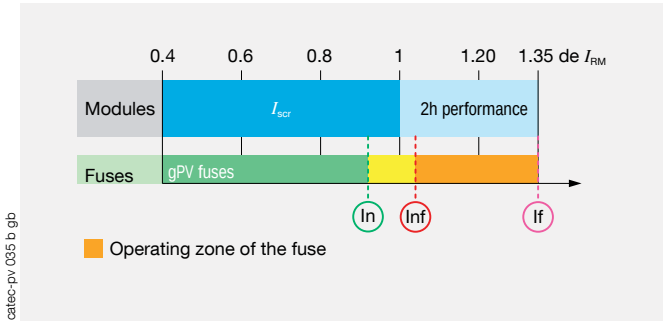
In ≥ 1.4 IscSTC

Selecting the protection as per the module withstand to reverse current (I_{RM})

According to IEC 61730 standard, the I_{RM} current corresponds to a 2 hour test at 1.35 IRM; therefore, protection is ensured if the selected fuse operates correctly at a value lower than 1.35 I_{RM}.

The conventional If (or I_2) disconnection time of a fuse is 1 hour, so greater than the 2 hours of the module, which provides a safety margin by giving a max fuse current for a specific module.

"gPV" fuses that are compliant with IEC 60269-6 standard, provide PV protection, If =1.45 In and can be selected at In ≤ I_{RM}.



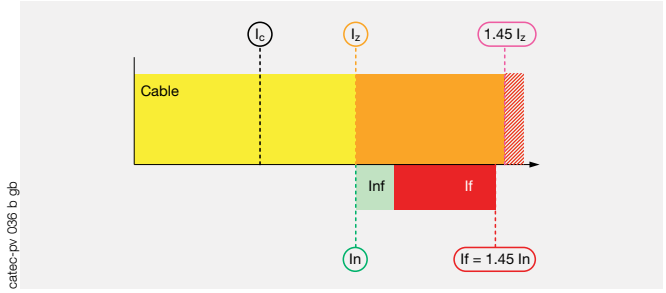
Inf: non-fusing current of fuses

If or I2: maximum fusing current of fuses

If ≤ 1.35 IRM or In ≤ IRM

Selecting the generator cable protection

Selecting the cable protection means to define a fuse which will eliminate an overcurrent before it damages the wiring system due to overheating. This function is ensured if the melting current of the fuse is less than 1.45 times the permissible current in the cables (I_Z). This current value I_Z should include all the usual derating factors such as ambient temperature, the amount of cables in parallel, etc.



Selection of the fuse for the cables of the group of strings (N: no. of strings)

In ≥ 1.4 I group = N x 1.4 I string

I_2 ≥1.45 I_Z

Protecting photovoltaic generators against overcurrents (continued)

Breaking capacity of the photovoltaic fuses

The string's PV fuses should have a breaking capacity greater than or equal to the maximum fault current of the PV system. A value of 25 kA DC is recommended to include any possible provisions for energy storage or possible returns of energy from the distribution network. The time constant of a PV circuit is generally less than 2 ms (L/R), the PV fuses accept much higher time constants.

Type of fuses to use

The PV fuses must be selected with a type "g" general usage curve, as they will safely disconnect all the current ranges, from the minimum melting value to the maximum breaking capacity.

"a" series fuses (supplementary type) are totally inappropriate and must not be used under any circumstances, as they risk failing to manage arcs above their minimum breaking capacity.

The use of inappropriate fuses in a PV installation can cause damages to the installation.

Photovoltaic fuse operating voltage

To include the influence of the temperature in "cold" conditions, it is recommended to increase the operating voltage of the fuse to be fitted by 20 %.

$$Un \geq U_{ocSTC} \times 1.2$$

U_{ocSTC}: voltage in open circuit of the PV string

Note: the coefficient 1.2 allows variations in voltage UocSTC to be included according to low temperatures down to -25 °C for mono or polycrystalline panels. This coefficient can be adapted for installations when the minimum temperatures are different.

Thermal derating

Although PV fuses dissipate relatively little heat, the internal temperatures of the junction boxes protecting the strings should be taken into account because of the exposure to high ambient temperatures and the large amount of equipment such as blocking diodes or other monitoring equipment.

The rated diversity factors (RDF) specified by standard IEC 61439 are not applicable, as it is necessary to take into account all the circuits at their maximum load and at the same time (diversity factor =1).

The derating factors depending on the temperature recommended by the fuse manufacturer should be applied.

Bipolar protection

Regardless of the DC network, polarised or floating, protection against reverse currents should be provided for both "+" and "-" polarities. With functional polarisation that can be disconnected, the faulty currents can be looped back by one or the other of the poles.

Furthermore, it is strongly recommended to pair these fuses with adapted fuse breakers to ensure complete safety for the replacement of fuses (IPxxB).

This operation should be carried out off-load and therefore it is essential to provide, in close proximity to these fuse protections, a disconnection switch to ensure on-load breaking of the upstream PV and to provide safety disconnection (isolation distance, guaranteed creepage distances, certain or visible disconnection, etc.). In the recombiner boxes, a switch-disconnector can be added downstream of the fuses to ensure the disconnection function and to avoid the need to access the combiner.

In an installation that is accessible to persons other than authorised or experienced personnel, access to the fuse breaker, lightning arrester and other devices that do not disconnect the installation should be connected to a switch that gives access to this equipment.

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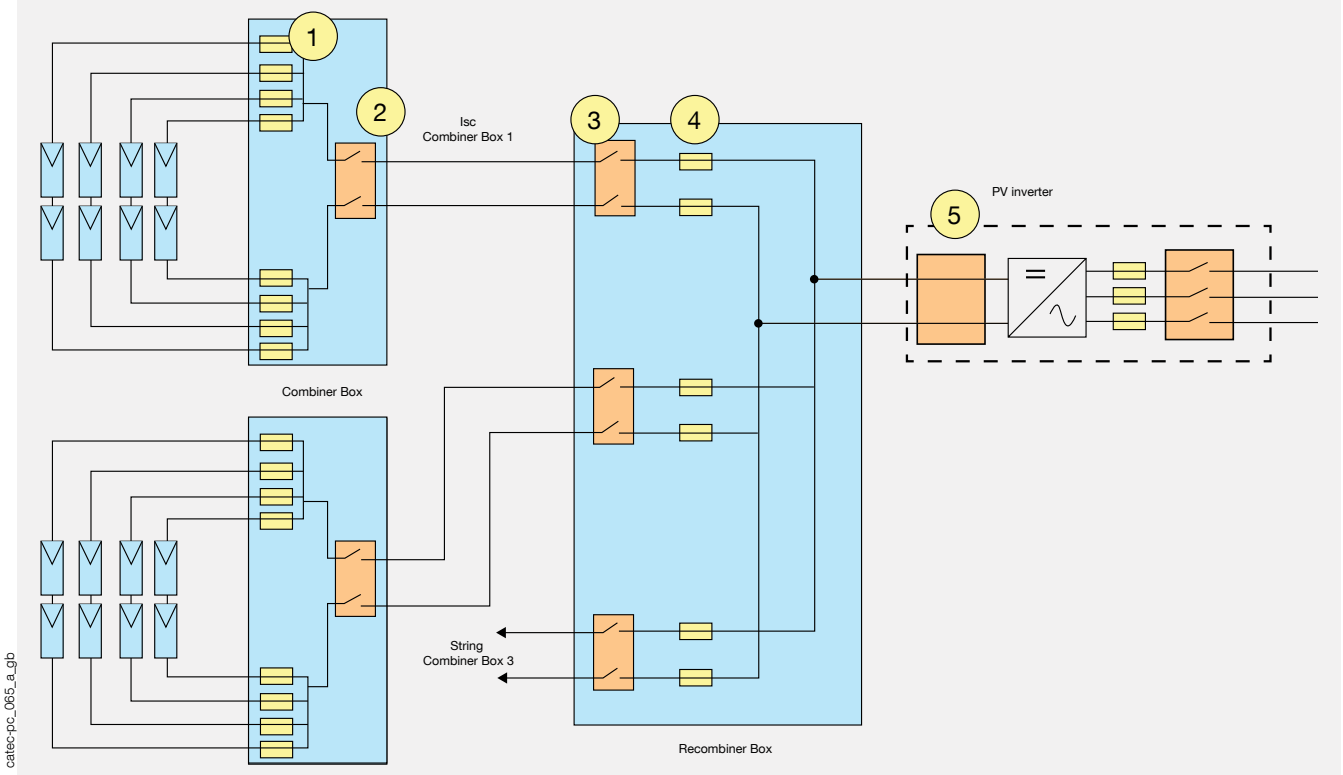
Protecting photovoltaic generators against overcurrents (continued)

Summary



1) Overcurrents protection for reverse current on each string and each polarity if (Ncmax – 1) I_{sc}STC < Irm < Nc_{Max} I_{sc}STC.

2) Load break switches for current flowing in both directions. Enables on-load breaking and provides safety isolation of the group from the PV field. At this level, the reverse current protection is ensured by all the fuses in 1. No other protection is needed at this level of the installation

3) Load break switches for current flowing in both directions. Enables on-load breaking downtream of the fuse and provides safety isolation to achieve maintenance remotely without the need to access the combiner box. No other protection other than 4 is needed at this level of the installation.

4) Overcurrent protection by reverse current on the combiner box and on each polarity if field rated current is > 1,4 Igroup.

5) Load break switches without overcurrent protection. Enables on-load breaking and provides safety isolation of the inverter.

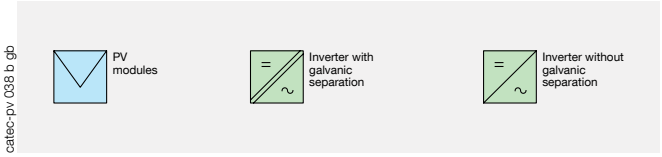
Nc Number of strings on the generator	Maximum reverse current of a string	Obligation of protection	I_n rated current of the string protection devices	I_z permissible current of the PV string cables
1	-	No	-	$I_z \geq 1.25\ I_{scSTC}$
2	$1.25\ I_{scSTC}$		-	$I_z \geq 1.25\ I_{scSTC}$
$Nc \leq Nc_{max}$	$(Nc -1)\ 1.25\ I_{scSTC}$		-	$I_z \geq (Nc -1)\ 1.25\ I_{scSTC}$
$Nc > Nc_{max}$ and Np =1	$(Nc -1)\ 1.25\ I_{scSTC}$	Yes	$In \geq 1.4\ I_{scSTC}$ $In \leq I_{RM}$	$I_z \geq I_2$
$Nc > Nc_{max}$ and Np >1	$(Nc -1)\ 1.25\ I_{scSTC}$		$In \geq Np\ 1.4\ I_{scSTC}$ $In \leq I_{RM} – (Np -1)\ I_{scSTC}$	$I_z \geq I_2$

Protecting photovoltaic installations from insulation fault

Fault currents in PV generators are strongly dependent on sunlight levels and can be below the I_{scSTC}. Electrical arcs can occur with currents that will not trigger the device protecting against voltage surges.

For this reason, appropriate devices should be utilised to protect against faults that may generate electrical arcs in a PV generator.

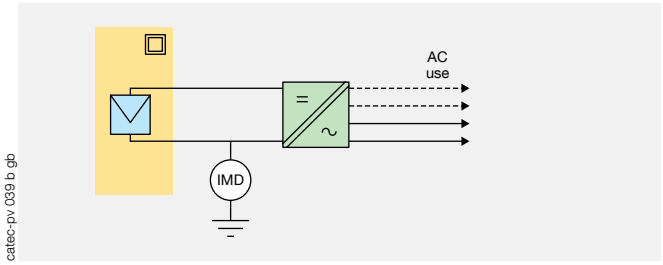
The main protections to be used are class II IEC 61730-2 standardised modules, and an installation upstream of the class II inverters or with strengthened insulation. The use of inverters with or without galvanic isolation should also be considered.



Preventing arcs in a non-polarised installation and inverter with galvanic separation

In this case, the supplementary prevention devices to be installed are permanent insulation testers with audible and/or visual alarms; this equipment should to provide monitoring of faults in a DC installation for Uoc x 1.2 voltages.

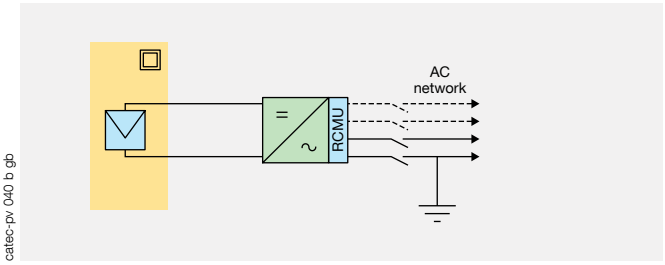
In the case of an extended generator (> 100 kWc), it is strongly recommended that provision be made for the locating of isolation faults when the system is live.

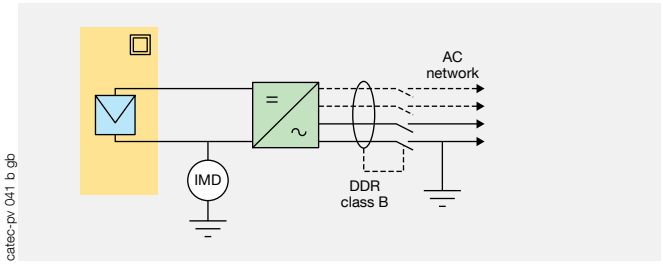


Preventing arcs in a non-polarised installation and inverter without galvanic separation

In this case, the supplementary protection devices to be used consist of a detection device for direct components that control the automatic disconnection of the connection of the inverter to the network.

It is necessary to add to this device equipment that provides for daily measurement of the isolation of the entire installation (generator and inverter). This measurement is taken when the inverter disconnection system on the AC circuit is in the open position.





Note: These provisions are provided in particular by the RCMU device of the inverters in compliance with prenorm VDE 0126-1.

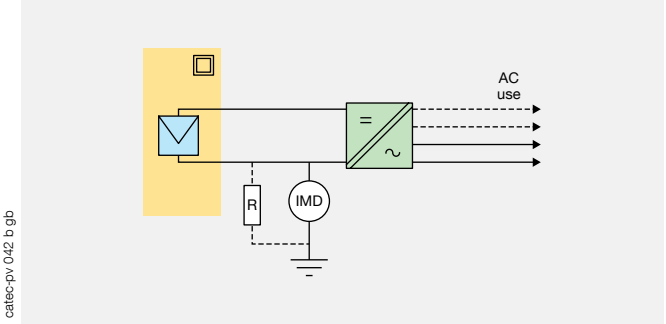
Preventing arcs in an installation polarised directly to earth

This selection requires inverters with galvanic separation to be used.

In this case, the supplementary prevention equipment consists of a fuse added in series with the functional earth to limit the fault current, or an automatic disconnection device controlled by a type B differential relay.

In order to avoid the blinding of this detection principle by a fault on the connected polarity, monitoring of the isolation of the entire installation, generator and inverter should be carried out daily with the functional earth in open position.

Opening of the protection against voltage surges in series, or the isolation threshold being reached, should trigger a visual and/or audible alarm to alert the operator.



Preventing photovoltaic installations from insulation fault (continued)

Preventing arcs in a polarised installation via earth resistance

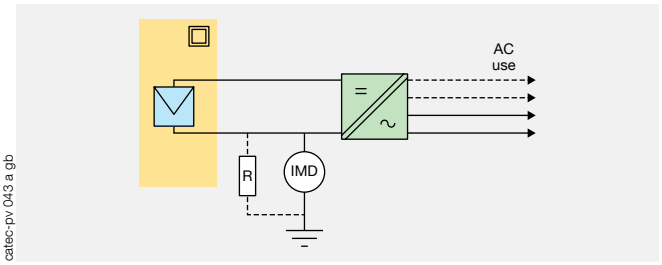
This selection requires inverters with galvanic separation to be used.

In this case, the supplementary protection devices consist of an insulation monitoring device with an audible and/or visual alarm; it should cover the damage of the isolation for voltages Uoc x 1.2.U_{oc} x 1.2.

The alarm threshold includes this resistance.

The resistance should be sized according to the specifications of the panel manufacturer (value and power).

Note: In the case of an installation not monitored during production by BA4 or BA5 personnel (e.g.: domestic), the fault detection inhibits the restarting of the installation on the next day.



Glossary of common photovoltaic terms

PV cell
Fundamental PV device able to generate electricity when it is exposed to light such as sunlight.

PV module
The smallest component of interconnected solar cells completely protected against the environment.

PV string
Circuit where the PV modules are connected in series to form assemblies, in order to generate the specified output voltage.

PV group
Integrated mechanical and electrical assembly of strings and other components to make up a DC electrical current production unit.

PV group junction box
Enclosure inside which all the PV strings of all the PV groups are electrically connected and where any protection devices can be placed.

PV generator
Assembly of PV generators, also called PV field.

PV conversion equipment
Device that transforms DC voltage into AC voltage, also called inverter.

Standard test conditions (STC)
Test conditions prescribed in NF EN 60904-3 (C 57-323) for PV cells and modules.

Open circuit voltage U_{ocSTC}
Standard test conditions
- at the terminals of a PV module, a PV string, a non-charged PV group (open)
- at the terminals of the DC circuit of the PV conversion equipment.

Short-circuit current I_{scSTC}
Short circuit current of a module, a string, a PV group or a PV generator under standardised test conditions.

Maximum inverted current I_{RM}
Maximum value of inverted current which a module can withstand without any damage. This value is supplied by the manufacturer.

Note 1: This value does not concern the current withstood by the diverting diodes, but the current going through the PV cells in the inverted direction of the normal current.

Note 2: The typical value for crystalline silicon is between 2 and 2.6 I_{scSTC} of the module.

Maximum Power Point (MPP or MPPT)
This principle, as indicated by its name (Maximum Power Point Tracker), makes it possible to track the maximum power point of a non-linear electrical generator such as a photovoltaic generator.

The MPPT or MPPTs also generally represent a component of the inverter allowing optimised use of solar radiation, by adapting its load to the characteristics of the PV generator according to the sunlight level.

Note

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