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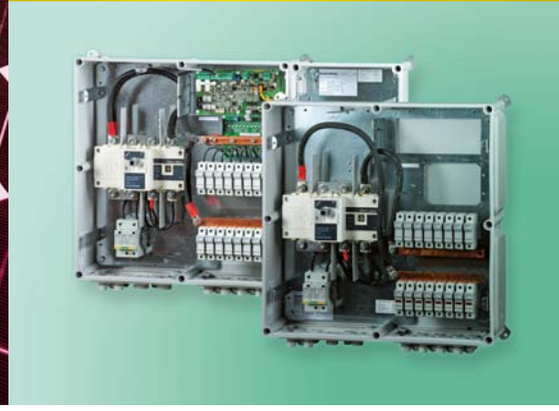
GENERAL CATALOGUE

Photovoltaic application solutions

2013



POWER CONTROL & SAFETY

SOLAR POWER

Photovoltaic application solutions

GENERAL CATALOGUE 2013

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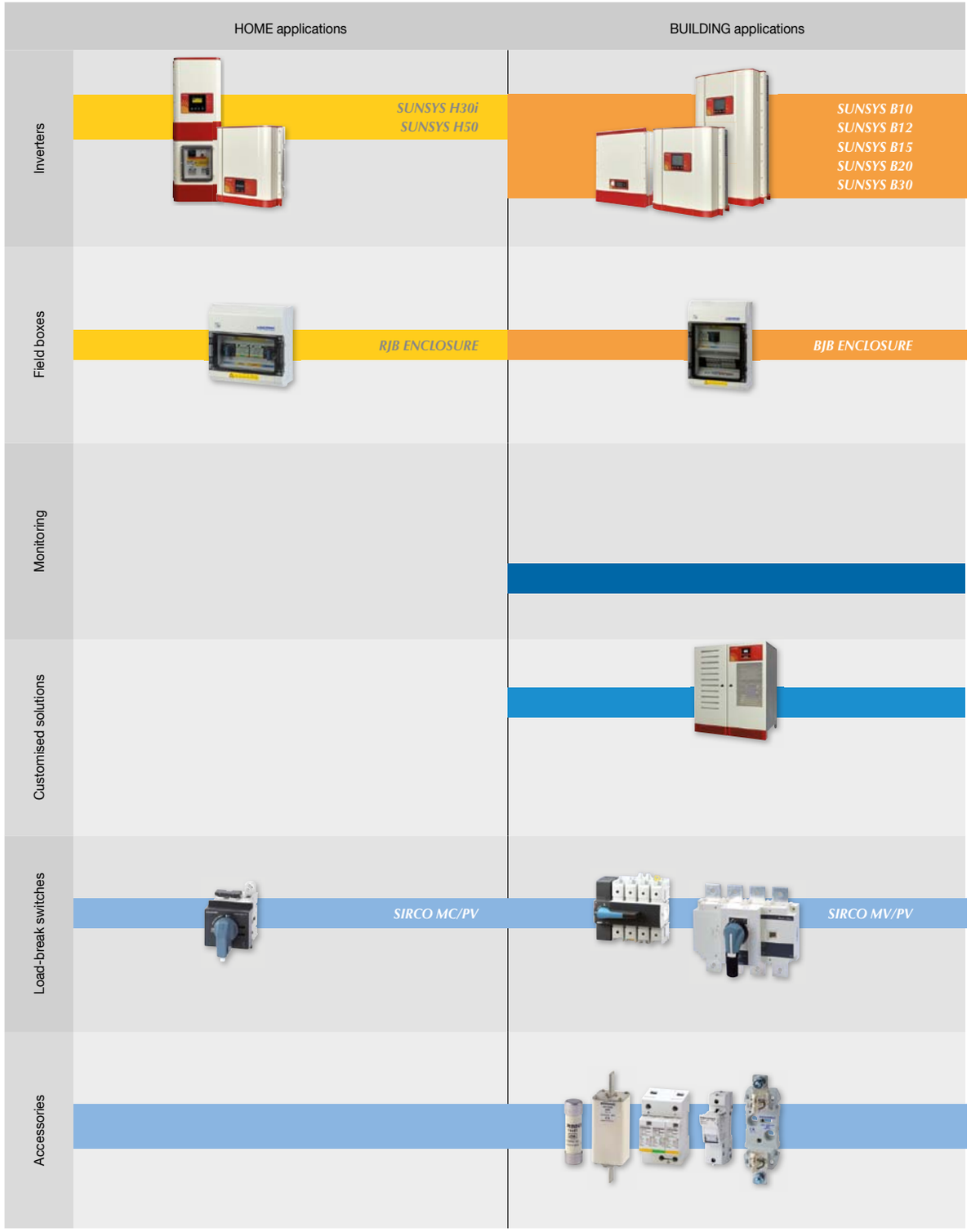
Selection guide



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Summary

PARK applications

SUNSYS P33TR
SUNSYS P66TR
SUNSYS P66TL
SUNSYS P100TR
SUNSYS P100TL

FJB ENCLOSURE

SUNSYS IFB

DIRIS

SUNSYS STORAGE

SUNSYS SHELTER

SIRCO PV
SIRCO MOT PV
SIRCOVER PV

RM, PV, PV, gPV FUSES
SURGYS G51-PV, D40, PV BASES

An independent manufacturer

the benefit of a specialist

Founded in 1922, SOCOMEC is an industrial group with a workforce of 3200 people.
Our core business: the availability, control and safety of low voltage electrical networks with increased focus on our customers' energy performance.

The culture of independence

The independence of the SOCOMEC Group ensures it retains control of the decision-making process, respecting the values advocated by its own family shareholders and shared by its employees.

With around 30 subsidiaries located on all five continents, SOCOMEC has developed internationally 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, source supply changeover, power conversion and measurement, SOCOMEC dedicates nearly 10% of its turnover to R&D. This means the group devotes the resources required to achieve its ambition: to always be at the cutting-edge of technology.

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 building on its fields of expertise in order to offer its customers increasingly customised, better adapted 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 in Tunisia, and locations in the major emerging markets (India and China).

All sites have implemented a policy of continuing development based on 'Lean management' principles; this ensures they are in a position to offer the quality, lead times and cost expected by our customers.

The focus on service

Our manufacturing expertise naturally extends to a complete range of services designed to facilitate the research, implementation and operation of our solutions. Our teams of engineers have built their reputation on reassuring closeness, specialist expertise and a focus on customer needs.

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 ensure the high availability of supply to critical facilities and buildings:

- uninterruptible power supplies (UPS) that provide high-quality power and reduce distortion and interruptions to the mains supply,
- 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.

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.

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 PV facilities, including:

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

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.

Increased energy efficiency

innovative solutions

A basic requirement

A high-quality power supply that is constantly available is absolutely vital in many industries, including applications in IT, industry and infrastructure. For many medical applications, power supply is a matter of life and death. SOCOMEC has more than 40 years experience in providing power supply protection for such sectors.

Solutions to meet every need

Thanks to our substantial R&D resources, our product range is continuously evolving based on our contact with clients.

To guarantee maximum availability we offer the most advanced technology, combined with innovative energy storage systems.

Our solutions have been approved by the most demanding users:
telecommunications industry operators around the world, ministries of defence, nuclear industry operators, etc.

Recognized expertise

SOCOMEC is not only a specialist manufacture; we also an award-winning company recognized for our customer focus. Awards include:

- Customer Service Excellence (2004),
- Product Innovation (2006),
- Best Practice Award for "European Energy & Power Systems Product Line Strategy" (2009),

- European UPS New Product Innovation Award (2011).

Focused on customer needs

Our sales and after-sales service network is on-hand for you ... anytime. Our clients/ partners recognize the quality of our products, our availability and rapid response to individual needs and the commitment which characterises everything we do.

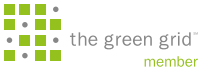
Continuous innovation

The facts speak for themselves:

- First French provider to offer static power supply units (1968),
- Designer of the first UPS with Pulse Width Modulation (PWM) technology (1980),
- Provider of the world's first UPS range with integrated IGBT technology (1990),
- Designer of the first modular, scalable, redundant UPS (2000),
- First company to integrate hybrid components (2001),
- First company to provide a 200 kVA UPS with IGBT rectifier (2003),
- New battery charger system (2004),
- Dynamic energy storage solution (flywheel) (2006),
- First UPS with 96% efficiency in online double conversion mode (2007),
- A more compact Static Transfer Switch (STS) in a 19" rack with hot-swap functionality (2009),
- A more compact 900 kVA UPS (2010),
- First complete UPS range (from 10 to 2400 kVA) with three-level technology, with 96% efficiency and power factor 1 (2012).

SOCOMEC joined the United Nations **"Global Compact"** in 2003 to tackle the social and environmental challenge of globalisation.

ISO 14001. This international standard recognize SOCOMEC's determination to pursue its goal of protecting the environment.



The Green Grid™ is an organisation dedicated to improving the efficiency of data centre resources and business computing ecosystems.

By signing the **European Code of Conduct** on data centres, SOCOMEC has agreed to adopt energy-saving solutions at its new data centres, while simultaneously saving the life cycle and availability of the system's performance.

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The solution for any requirement

whatever your system

SOCOMEC solutions for photovoltaic applications cover any requirement for low-voltage energy conversion, control and safety. Our inverters, monitoring, supervision, disconnection and protection systems, not forgetting the innovative storage and container solutions, provide maximum quality and energy efficiency for all types of photovoltaic systems.

For systems of any size

The different panel and conversion technologies available today allow you to choose the most suitable solutions for any application. SOCOMEC has the right solution regardless of the application – residential, building, solar park – and power.

Certified efficiency and reliability

SOCOMEC has two testing laboratories for testing and validating the technology developed and the solutions offered: one in France, accredited by Cofrac for tests on the equipment, and a 220 kW photovoltaic power station in Italy.

The expert touch

Certified quality products, continuous dialogue to understand customer requirements, maximum flexibility and dedication right by your side. Our experience at your service.

Essential know-how

Photovoltaic systems are a long-term investment. Different from each other in type and electrical parameters, each installation requires a detailed, complete analysis for proper sizing of the components necessary for conversion, distribution and management of photovoltaic energy.

The integration of photovoltaic solar energy production into an electrical energy system therefore requires specific expertise for maximum efficiency, safety and durability of the system.

Our know-how at your disposal

Trusting us with your project means you benefit from pre- and after-sales technical support, complete solutions specific to each type of photovoltaic architecture and which include protection and connection to both DC and AC voltages, DC/AC conversion and supervision of the production system.

ENERGY SPECIALIST SINCE 1922

The back-up of an expert

The specification of a photovoltaic system requires expert knowledge of all the phases necessary for ensuring the system's safety. This objective may only be reached if the system equipment components meet the different national standards and if the usage rules are strictly observed. SOCOMEC has all the necessary skills for the management of the entire project, from creation of the electrical architecture to supply of the products and their monitoring.

With you every step of the way

SOCOMEC's experts accompany you step by step in the installation and use of your system:

- Assistance with the sizing of projects,
- Assistance with installation,
- After-sales service,
- Maintenance services.

Optimised efficiency

Maximum overall efficiency is the aim of every photovoltaic system and the inverter, which converts the continuous energy into alternating energy, is the most critical component.

SUNSYS inverters use the latest technology to guarantee maximum efficiency, even when weather conditions are not particularly favourable.

BODY 383 A

A complete range

SOCOMEC SOLAR provides all the electrical PV system equipment downstream of the photovoltaic panels:

- DC panels,
- Smart string controllers,
- Inverters for photovoltaic systems,
- AC panels,
- Supervision solutions,
- Storage solutions,
- Container solutions.

BODY 336 A

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Well-designed systems

for optimum efficiency

The growth of renewable energies is an essential step towards a sustainable energy policy.
A photovoltaic system is a long-term investment that can bring excellent returns, but safety and durability can only be guaranteed by specialist personnel.

Residential applications

A residential installation generally produces a peak power level of 2 to 6 kWp in the form of an alternating single-phase output voltage of 230 V. The set of photovoltaic panels installed on the roof can occupy a maximum surface of around 20 m^2.

SITE 408 A

Wider range of applications

Solar power has always been a natural and renewable alternative energy source. It just needs to be captured and then converted.

The principles of PV have been known and utilised for some time in space applications and solar powered calculators. However, it is only recently that the industry has made real, rapid technological progress, making it possible for this energy source to become a viable alternative in a country's energy mix.

The different panel and conversion technologies currently available make it possible to choose the most suitable solutions for each application. Irrespective of the type of application – residential, building or solar park – SOCOMEC provides the correct solution and efficient use of the components.

Building applications

Photovoltaic systems for commercial use can produce maximum peak power levels of hundreds of kWp.

The photovoltaic panels are usually installed on roofs, terraces and the fronts of industrial buildings, shopping centres or public buildings, occupying a surface consisting of between tens and hundreds of square metres.

SITE 570 A - PHOTO SMA

Solar park applications

Solar parks are photovoltaic power stations built on areas covering thousands of square metres that can produce a peak power capacity of several tens of MWp.

The energy produced is injected into the electricity grid at medium and high voltage through a transformer unit. High-performance equipment is required to optimise the level of power injected into the network.

SITE 317 A

Inverters for residential photovoltaic solutions

A residential installation generally produces a peak power level of 2 to 6 kWp in the form of an alternating single-phase output voltage of 230 V. The photovoltaic panels installed on the roof can occupy a maximum surface of around 20 m^2.

Downstream of the panels the SOCOMEC solution covers:

- DC protection and connection,
- DC/AC conversion,
- AC protection and connection,
- Monitoring of the production installation.

SUNSYS H inverters

Crucial for photovoltaic system performance, SUNSYS H (HOME) inverters are specific to residential photovoltaic applications. Compatible with multiple configurations of solar modules, they have increased conversion efficiency for maximum energy output.

Optimised ventilation

Dust and humidity have always been a problem for a system's electronic components.

In order to guarantee long life and stability of the inverter's function, the air required for cooling the SUNSYS H inverters is channelled and pumped through a radiator located at the back of the inverter that is completely isolated from other components.

Highly flexible

The wide range of input voltages, protection against polarity inversion of the photovoltaic strings and monitoring of earth leakage guarantees extreme flexibility for planning and management of the system.

SUNSYS H30i

3 kW

the innovative residential solution

new

SUNSY 066 A

The solution for

- Installations in medium-sized residential buildings
- Installations in all types of environmental conditions

Certifications

The *SUNSYS Hi* solution is TÜV SÜD certified for product safety (EN 62109, EN 61439).

Advantages

97% MAXIMUM EFFICIENCY

WARRANTY 5 YEARS

The best, high-efficiency performance

- The SUNSYS H30i inverter is the ideal solution for residential photovoltaic installations with a power of 3 kW.
- The transformerless design offers an increased conversion efficiency.
- Light and robust, it is quick and easy to install in all operating conditions, ensuring:
  - DC protection and connection,
  - DC/AC conversion,
  - AC protection and connection,
  - monitoring of the photovoltaic system.

Benefits of the integrated solution

- Complete, integrated, safe solution which includes the protection and disconnection devices necessary for the system's operation.
- Extreme ease of installation and maintenance (Easy To Connect, Easy To Swap).
- Also suitable for harsh environments (IP65).
- LCD control panel for simple and immediate monitoring of the system.
- Easy to use.

Communication and supervision

- LCD high-resolution display with a multilingual menu: English, French, German, Spanish and Italian (for other languages, contact SOCOMEC).
- Capacitive keyboard.
- Integrated data logger with data storage on MicroSD Card.
- RS485 communication ports.
- WiFi connection (optional) with integrated web server.
- Software update through USB stick.

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Technical data

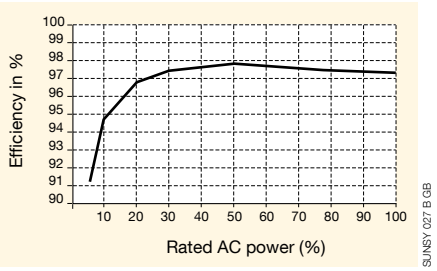
INPUT (DC)	
Maximum PV power (STC module conditions)	3,600 W
Rated voltage	360 VDC
Maximum voltage	630 VDC
Voltage range	150 to 600 VDC
MPPT voltage range	260 to 500 VDC
Start-up voltage	210 VDC
Number of independent MPPTs	1
Pairs of input connectors for MPPTs	1
Maximum input current	12 A
Maximum short-circuit current	13 A
OUTPUT (AC)	
Power rating	3,000 W
Maximum power	3,300 W (30 min)
Apparent power rating	3,000 VA
Maximum apparent power	3,300 VA (30 min)
Rated voltage	230 Vrms(1) 1ph + N
Voltage range	184 to 276 Vrms(1) 1ph + N
Rated frequency	50 Hz(1)
Frequency range	47.5 to 51.5 Hz(1)
Rated current	13 Arms
Maximum current	16 Arms
Total harmonic distortion of current	< 5%
Power factor range	0.9 to 1(2)
Topology	No transformer
LEVEL OF EFFICIENCY	
Maximum efficiency	97,10 %
EU efficiency	96,70 %
Consumption at night	1 W
Maximum dissipated power	100 W
Maximum dissipated power	340 BTU/h
Maximum dissipated power	86 kCal/h
GENERAL DATA	
Protection class (according to EN 62109)	Class I
Overvoltage category (according to EN 62109)	Class III
Environmental category (according to EN 62109)	External
Environmental degree of protection (according to EN 62109)	IP 65
Type of DC connectors	Sunclix (included)
Type of AC connector	Bayonet connector (included)
Operating temperature	-20 to +60 °C
Rated temperature	-20 to +40 °C
Storage temperature	-25 to +85 °C
Relative humidity	5% to 95% without condensation
Cooling system	Natural convection
Sound emission	< 36 dB 1 m from inverter
Altitude	0 to 2,000 m
Dimensions (L x D x H)	350 x 205 x 1,130 mm
Weight	34.5 kg
Certification and applicable standards	CEI 0-21, VDE AR-N 4105, VDE 0126-1-1, UTE C15-712-1
Warranty	5 years (standard), 10/15/20 years (optional extension)

(1) The accepted tolerance depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.

Technical data

PROTECTION DEVICES	
Output short-circuit protection	•
Reverse-polarity protection	•
Monitoring of earth leakage	•
Monitoring of faulty currents	•
Input surge protection devices	•
Output surge protection devices	•
Input isolator (DC)	•
Output isolator (AC)	•
Output magnetothermal switch	•
Output selective differential protection	Option
COMMUNICATION	
RS485 interface	•
WiFi interface	Option
Digital inputs/Dry contact outputs	•
MicroSD slot	•
USB port	•
Control panel	Graphic LCD with backlight

Efficiency curve



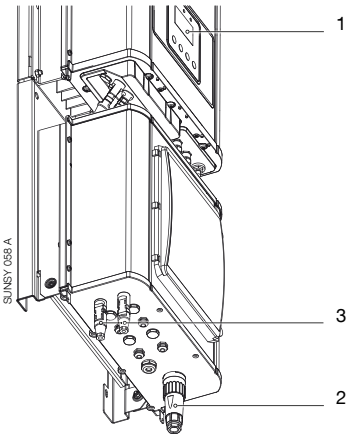
SUNSY 027 B GB

SUNSYS H30i

3 kW

Single-phase inverters

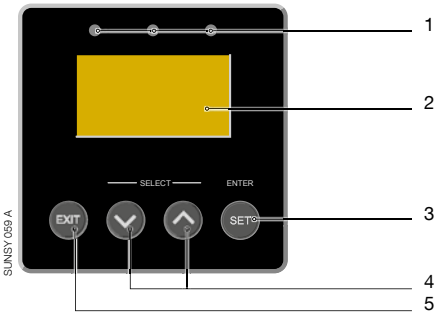
Connections



1. LCD Control panel
2. AC Output
3. DC Input

Assembly

Control panel

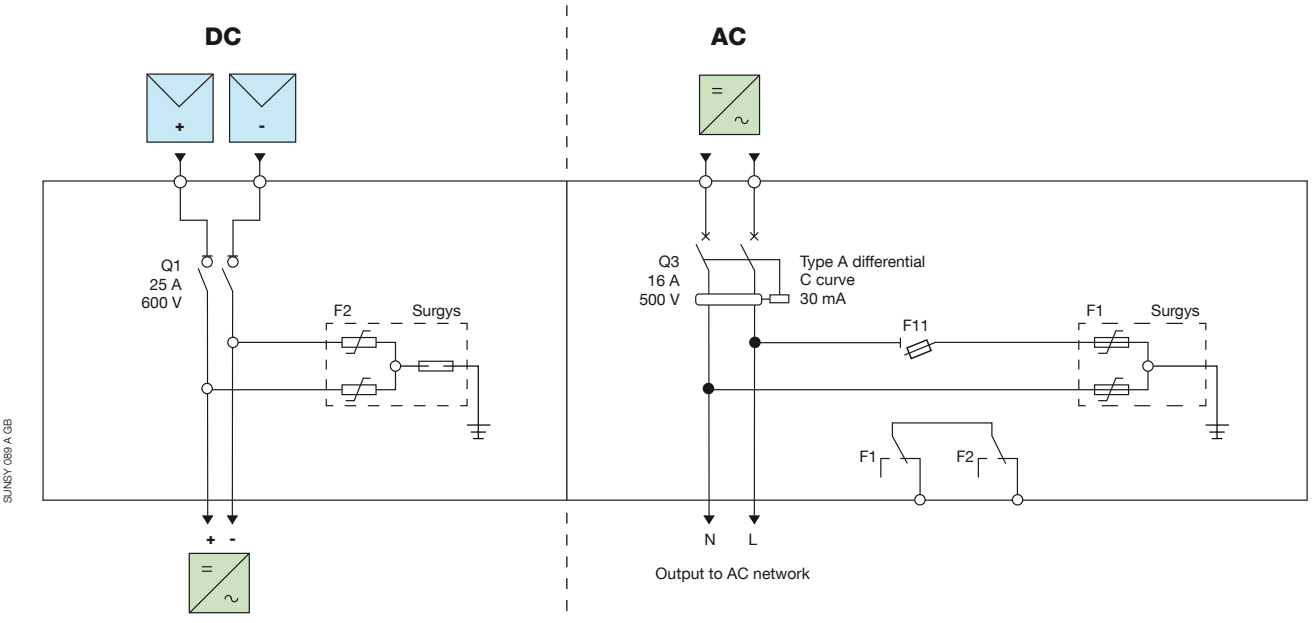


1. LED
2. LCD Display
3. ENTER/SET button
4. Selection buttons
4. EXIT button

Protection and isolation

UPSTREAM AND DOWNSTREAM PROTECTION OF THE INVERTER		AC PROTECTION	DC PROTECTION
SIRCO M PV Isolator switch		-	•
SURGYS PV overvoltage protection		•	•
Differential magnetothermal switch(1)		•	-

(1) Option.



N.B.: the differential paired with the Q3 button is optional

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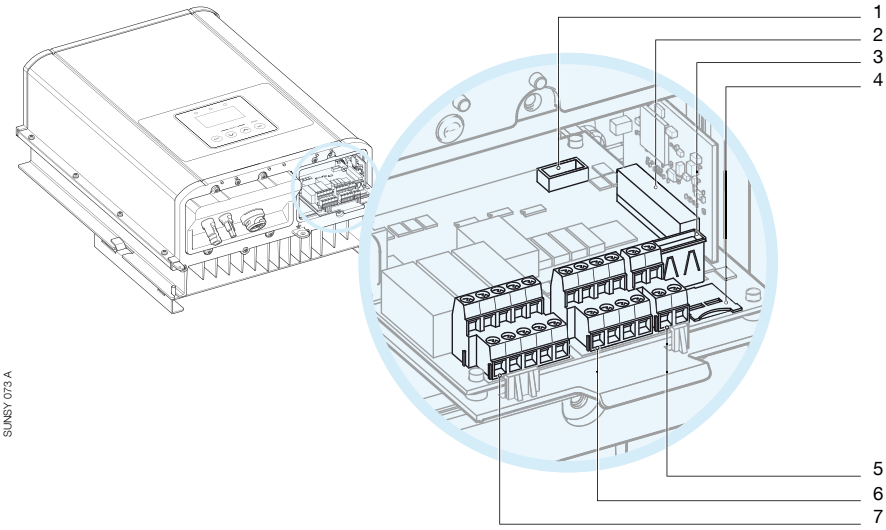
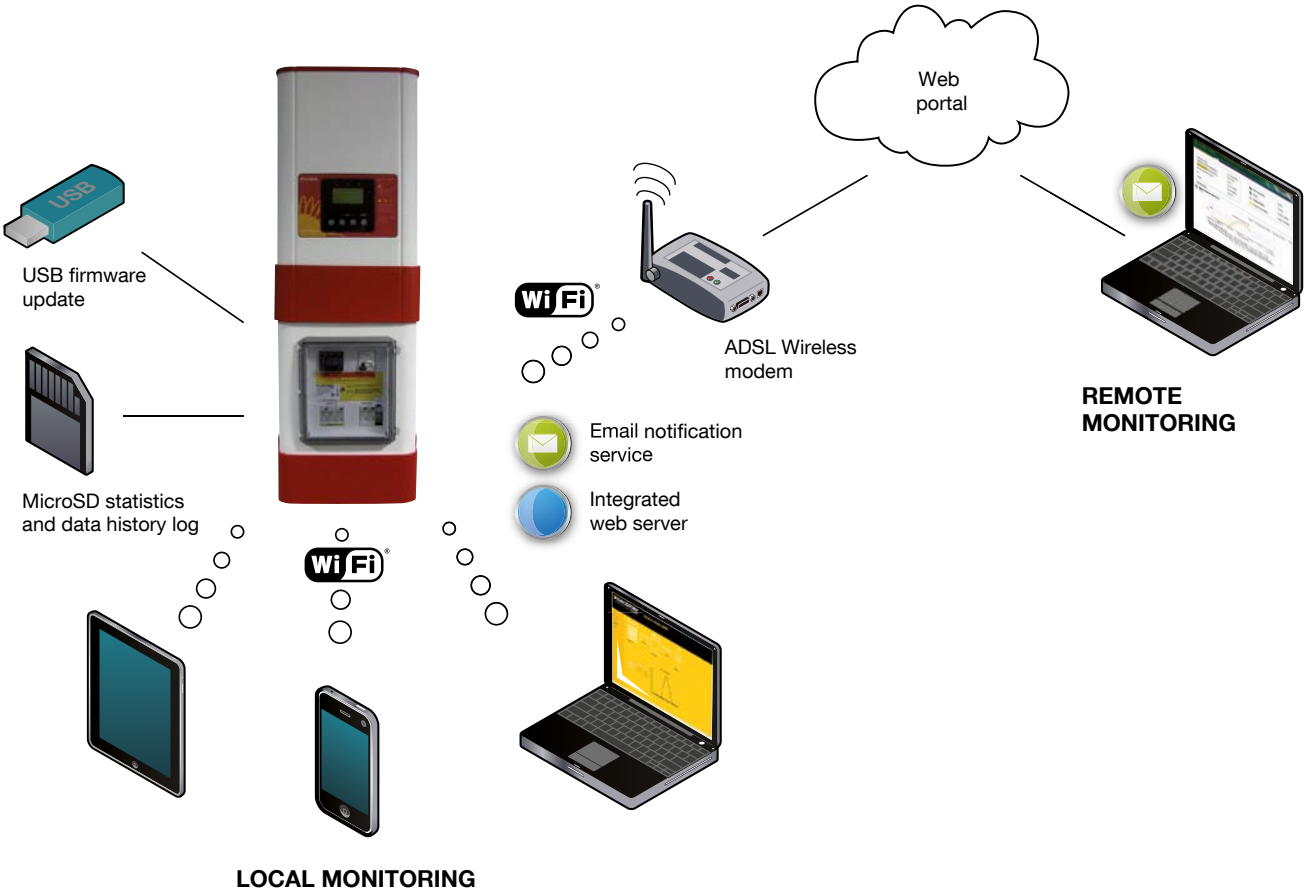
Diagram of communication ports



SUNSY 073 A

1. RS-232 Interface
2. WiFi connection (optional)
3. USB port
4. MicroSD card
5. RS485 communication port
6. Digital inputs
7. Dry contacts

Communication



SUNSY 064 A

SUNSYS H50

5 kW

Increased power density

The solution for

- Installations in medium-sized residential buildings
- Installations in all types of environmental conditions

Advantages

98% MAXIMUM EFFICIENCY

WARRANTY 5 YEARS

Related products

> RJB photovoltaic enclosures, page 16

The best, high-efficiency performance

- The SUNSYS H50 inverter is the ideal solution for residential photovoltaic applications with a power of 5 kW.
- The transformerless design offers a conversion efficiency which is amongst the best on the market.
- MPPT's broad voltage tolerance allows for excellent flexibility in combination with photovoltaic modules.

Benefits of the SUNSYS H50 solution

- The IP65 degree of protection makes it suitable for installation in both indoor and outdoor environments.
- Compact inverter with increased energy efficiency and increased power density.

Communication and supervision

- Equipped with LCD control panel with a multilingual menu: English, French, German, Spanish and Italian (for other languages, contact SOCOMEC).
- Optional RS485 connection for simple and immediate monitoring of the system.
- User-friendly.

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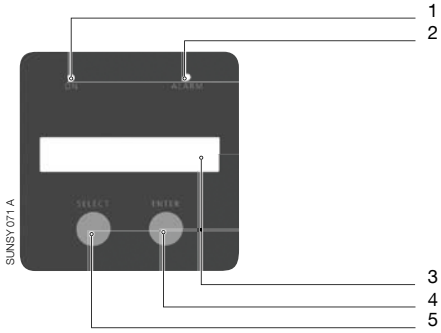
Technical data

INPUT (DC)	
Maximum PV power (STC module conditions)	5,500 W
Rated voltage	650 VDC
Maximum voltage	1,000 VDC
Voltage range	200 to 1,000 VDC
MPPT voltage range	310 to 820 VDC
Start-up voltage	250 VDC
Number of independent MPPTs	1
Pairs of input connectors for MPPTs	2
Maximum input current	17 A
Maximum short-circuit current	19 A
OUTPUT (AC)	
Power rating	5,000 W
Maximum power	5,250 W
Apparent power rating	5,000 VA
Maximum apparent power	5,250 VA
Rated voltage	230 Vrms(1) 1ph + N
Voltage range	184 to 265 Vrms(1) 1ph + N
Rated frequency	50 Hz(1)
Frequency range	47.5 to 51.5 Hz(1)
Rated current	22 Arms
Maximum current	25 Arms
Total harmonic distortion of current	< 3%
Power factor range	0.8 to 1(2)
Topology	No transformer
LEVEL OF EFFICIENCY	
Maximum efficiency	97,80 %
EU efficiency	97,20 %
Consumption at night	1 W
Maximum dissipated power	140 W
Maximum dissipated power	470 BTU/h
Maximum dissipated power	120 kCal/h
GENERAL DATA	
Protection class (according to EN 62109)	Class I
Overvoltage category (according to EN 62109)	Class III
Environmental category (according to EN 62109)	External
Environmental degree of protection (according to EN 62109)	IP 65
Type of DC connectors	MC4
Type of AC connector	Bayonet connector (included)
Operating temperature	-20 to +60 °C
Rated temperature	-20 to +40 °C
Storage temperature	-25 to +60 °C
Relative humidity	5% to 95% without condensation
Cooling system	Natural convection
Sound emission	< 36 dB 1 m from inverter
Altitude	0 to 2,000 m
Dimensions (L x D x H)	470 x 167 x 482 mm
Weight	24 kg
Certification and applicable standards	CEI 0-21, VDE AR-N 4105, VDE 0126-1-1, UTE C15-712-1
Warranty	5 years (standard), 10/15/20 years (optional extension)

(1) The accepted tolerance depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.

Control panel

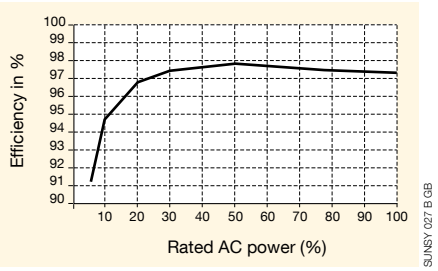


1. Green LED
2. Red LED
3. LCD Display
4. ENTER: menu or enter selection
5. SELECT: page selection

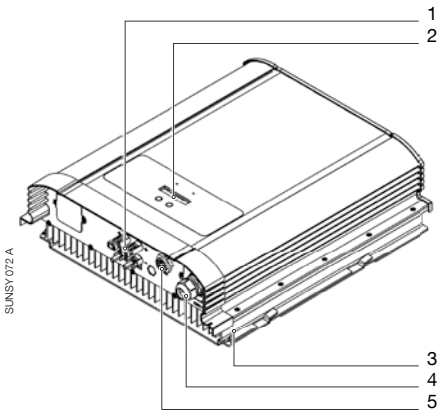
Technical data

PROTECTION DEVICES	
Output short-circuit protection	•
Reverse-polarity protection	•
Monitoring of earth leakage	•
Monitoring of faulty currents	•
Input surge protection devices	-
Output surge protection devices	-
Input isolator	-
Output isolator	-
Output magnetothermal switch	-
Output selective differential protection	-
COMMUNICATION	
RS485 interface	•
WiFi interface	-
Digital inputs/Dry contact outputs	-
MicroSD slot	-
USB port	-
Control panel	Graphic LCD with backlight

Efficiency curve



Connections



1. DC connectors
2. Display, buttons, LED
3. Earth connection (PE)
4. Communication connection
5. AC connector

RJB/BJB enclosures

Photovoltaic string protection enclosures for residential (RJB) and building (BJB) applications

From 1 to 6 strings/1 to 2 MPPT/DC or DC/AC

new

COFF-PV_067

BJB enclosure
4 Strings/1 MPPT

COFF-PV_070

RJB enclosure
DC/AC
2 Strings/2 MPPT

The solution for

- RJB: Residential applications
- BJB: Building applications

Main advantages

- A complete range for all your needs
- Simplicity of installation and use
- Installation safety
- Manufacturer's guarantee of reliability, services and safety

Conformity to standards(1)

- IEC 61439-3
- IEC 61439-2
- UTE C 15-712-1
- BT directive no. 2006/95/EC

Specific requests

- Contact SOCOMEC to request customised protection enclosures

Related products

- SUNSYS H50 inverter, page 14
- SUNSYS B10 inverter, page 22
- SUNSYS B12-B15-B20-B30 inverter, page 24

Function

The RJB and BJB string enclosures allow:

- parallel connection, protection and isolation of the photovoltaic strings,
- connection to the photovoltaic inverter,
- AC distribution (DC/AC RJB enclosures),
- protection against overvoltage,
- operational safety.

Advantages

A complete range for all your needs

- From 1 to 6 strings.
- DC or DC/AC IP65 enclosures.
- From 600 to 1000 VDC.
- Isc STC (max) = 9 A/string.
- From 1 to 2 MPPT.

Simplicity of installation and use

- Transparent port for analysis of the protection components (fuses, breaker and surge protection devices).
- String fuse fault signal (BJB).
- Pre-wired modular enclosure.
- Quick and safe connection for simplified installation.

Installation safety

- Insulation class II.
- Safe access voltage surge protection devices (4 and 6 string versions).
- Changeover and DC voltage isolation.
- Protection of both polarities (+/-) with fuse (BJB).
- Type II surge protection device.
- AC differential protection (30 mA in the DC/AC enclosure).
- Connection to PV connectors.

Manufacturer's guarantee of reliability, services and safety

- Guarantee of the design, qualification and production phases.
- Production according to current legislation.
- Production with Socomec parts, specifically designed for photovoltaics.
- Electrical and mechanical characteristics according to standard IEC 61439-2(1).

(1) The applicability of the regulations depends on the country of installation and the product.

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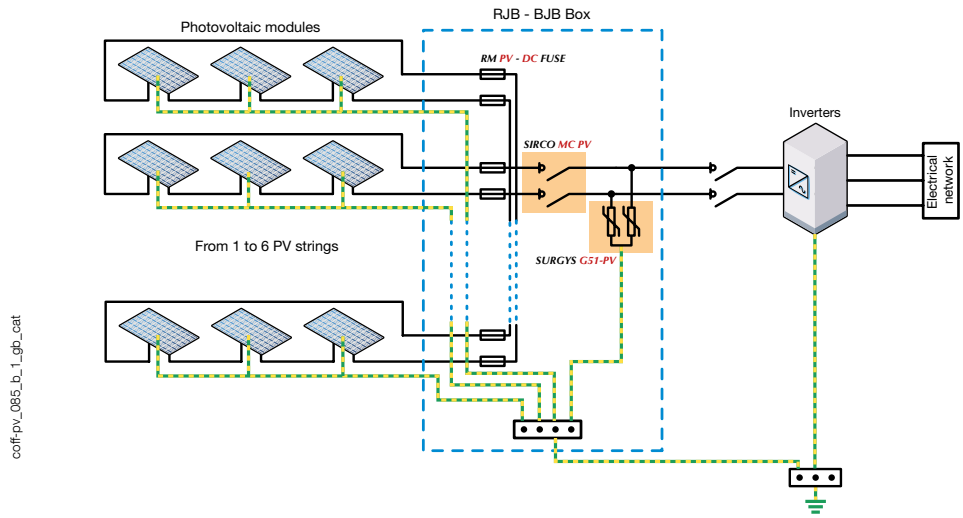
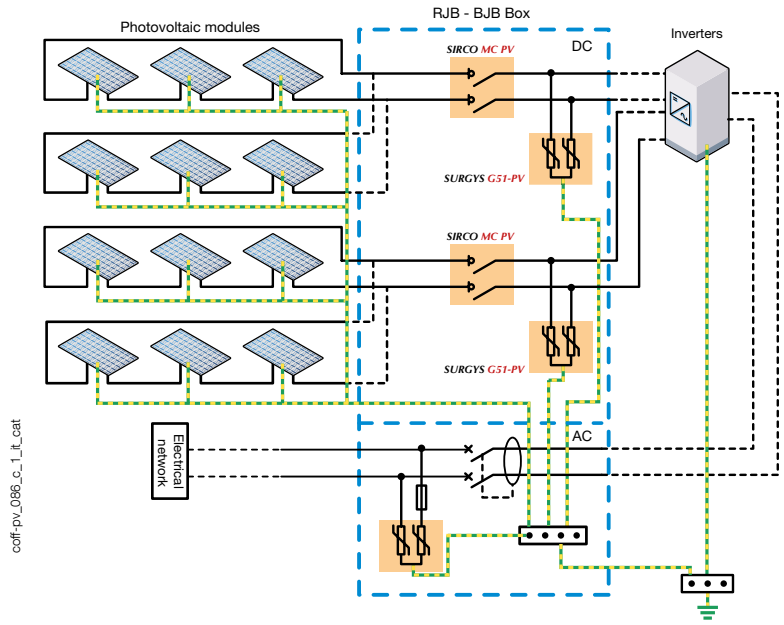
Functional diagram

RJB & BJB DC enclosures



* The 1 and 2-string RJB enclosures do not include any protection fuses in accordance with the UTE C 15-712-1 Guide.

RJB enclosures (DC/AC)



RJB/BJB enclosures

Photovoltaic string protection enclosures
for residential (RJB) and building (BJB) applications
Enclosed products and solutions

References

NUMBER OF STRINGS	MPPT NUMBER	VOLTAGE	DC CURRENT	AC CURRENT	DC RJB ENCLOSURE REFERENCE
1	1	600 VDC	25 A		34PV **6211**
2	1	600 VDC	25 A		34PV **6221**
2	2	600 VDC	25 A		34PV **6222**
1	1	1,000 VDC	25 A		34PV **1211**
2	1	1,000 VDC	25 A		34PV **1221**
2	2	1,000 VDC	25 A		34PV **1222**

NUMBER OF STRINGS	MPPT NUMBER	VOLTAGE	DC CURRENT	AC CURRENT	AC-DC RJB ENCLOSURE REFERENCE
2	1	600 VDC	25 A	16 A	35PV **6221**
2	2	600 VDC	25 A	16 A	35PV **6222**
2	1	600 VDC	25 A	25 A	35PV **6321**
2	2	600 VDC	25 A	25 A	35PV **6322**
2	1	1,000 VDC	25 A	16 A	35PV **1221**
2	2	1,000 VDC	25 A	16 A	35PV **1222**
2	1	1,000 VDC	25 A	25 A	35PV **1321**
2	2	1,000 VDC	25 A	25 A	35PV **1322**

NUMBER OF STRINGS	MPPT NUMBER	VOLTAGE	DC CURRENT	AC CURRENT	DC BJB ENCLOSURE REFERENCE
3	1	600 VDC	40 A		36PV 6431
4	1	600 VDC	40 A		36PV 6441
4	2	600 VDC	25 A		36PV 6242
3	1	1,000 VDC	40 A		36PV 1431
4	1	1,000 VDC	40 A		36PV 1441
4	2	1,000 VDC	25 A		36PV 1242
6	1	1,000 VDC	80 A		36PV 1661
6	2	1,000 VDC	40 A		36PV 1462

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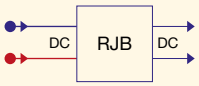
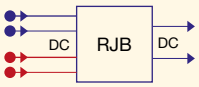
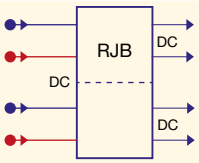
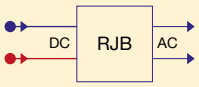
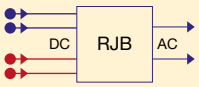
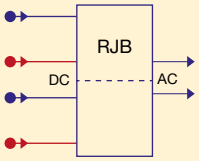
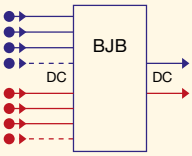
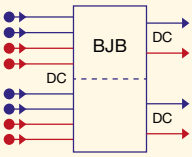
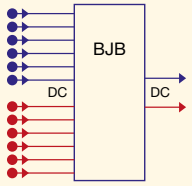
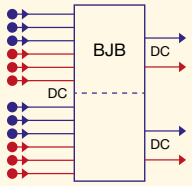
Configurations

TYPE OF ENCLOSURE	CONFIGURATION	DIAGRAM
RJB DC	1 PV string - 1 MPPT	
RJB DC	2 PV strings - 1 MPPT	
RJB DC	2 PV strings - 2 MPPT	
RJB DC/AC	1 PV string - 1 MPPT	
RJB DC/AC	2 PV strings - 1 MPPT	
RJB DC/AC	2 PV strings - 2 MPPT	

TYPE OF ENCLOSURE	CONFIGURATION	DIAGRAM
BJB DC	3/4 PV strings - 1 MPPT	
BJB DC	4 PV strings - 2 MPPT	
BJB DC	6 PV strings - 1 MPPT	
BJB DC	6 PV strings - 2 MPPT	

New configuration 3 x 4 strings/3 MPPT available (please contact SOCOMEC for information).

Inverters for commercial photovoltaic applications

Photovoltaic systems for commercial use can produce maximum peak power levels of hundreds of kWp.
The photovoltaic panels are usually installed on roofs, terraces and the fronts of industrial buildings, shopping centres or public buildings, occupying a surface consisting of between tens and hundreds of square metres.

Downstream of the panels the SOCOMEC solution covers:
- DC protection and connection,
- DC/AC conversion,
- AC protection and connection,
- Monitoring of the production installation.

Crucial for photovoltaic system performance, SUNSYS B (BUILDING) inverters are specific to commercial photovoltaic applications. The systems on roofs with large surfaces require additional functions, and provide greater power compared to residential systems. In particular, the photovoltaic inverters must be connected to a centralised management system for optimum output from the system.
The inverter is used in different ways, depending on the size of the installation and the choice of architecture:
- The PV strings are connected in parallel to a single centralised inverter,
- Each PV string is connected to its own inverter,
- Different groups of strings are managed by a single inverter with modular architecture.

Double tracker input section

The double tracker series input of the whole range of SUNSYS B inverters allows for:
- Optimisation of energy production of the system and maximisation of the output of different types of systems (extended roof systems with several layers, roof systems with different orientations, systems with areas of shade),
- Management of the same system divided into sections with different photovoltaic module technologies.

Control panel

The graphic display present on the inverter provides a maximum of system data, supplying detailed status messages and daily production graphs for quick and accurate analysis of the system.

RS485 interface

The RS485 connection allows for monitoring of the system with local or remote supervision systems and ensures a complete overview of system data from any workstation.

Signalling contacts

Buzzers and visual signalling contacts notify any changes in the system and inverter status.

SUNSYS B10

10 kW

Increased conversion efficiency

The solution for

> Installations in small-sized commercial buildings
> Installations in all types of environmental conditions

Advantages

98% MAXIMUM EFFICIENCY

WARRANTY 5 YEARS

Related products

> BJB photovoltaic enclosures, page 16

The best, high-efficiency performance

- The SUNSYS B10 inverter is the ideal solution for photovoltaic applications on buildings with a power of 10 kW.
- The transformerless design offers a conversion efficiency which is amongst the best on the market.
- The double tracker series input provides:

- optimisation of the system's energy production,
- maximisation of the output of extended roof systems with several layers, systems with different orientations, systems with areas of shade,
- management of a system divided into sections with different photovoltaic module technologies with a single inverter.

Benefits of the SUNSYS B10 solution

- MPPT's extensive voltage tolerance allows for excellent flexibility in combination with photovoltaic modules.
- The IP65 degree of protection makes it suitable for installation in both indoor and outdoor environments.

Communication and supervision

- Equipped with LCD control panel with a multilingual menu: English, French, German, Spanish and Italian (for other languages, contact SOCOMEC).
- Optional RS485 connection for simple and immediate monitoring of the system.
- User-friendly.

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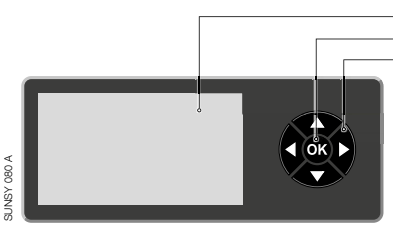
Technical data

INPUT (DC)	
Maximum PV power (STC module conditions)	11,000 W
Rated voltage	720 VDC
Maximum voltage	1,000 VDC
Voltage range	250 to 1,000 VDC
MPPT voltage range	350 to 850 VDC
Start-up voltage	350 VDC
Number of independent MPPTs	2
Pairs of input connectors for MPPTs	2
Maximum input current	16 A x2
Maximum short-circuit current	24 A x2
OUTPUT (AC)	
Power rating	10,000 W
Maximum power	10,250 W
Apparent power rating	10,000 VA
Maximum apparent power	10,250 VA
Rated voltage	400 Vrms(1) 3ph + N
Voltage range	320 to 480 Vrms(1) 3ph + N
Rated frequency	50 Hz(1)
Frequency range	47.5 to 51.5 Hz(1)
Rated current	14.5 Arms
Maximum current	16 Arms
Total harmonic distortion of current	< 3%
Power factor range	0.8 to 1(2)
Topology	No transformer
LEVEL OF EFFICIENCY	
Maximum efficiency	97.90%
EU efficiency	97.10%
Consumption at night	1 W
Maximum air demand	100 m³/h
Maximum dissipated power	290 W
Maximum dissipated power	990 BTU/h
Maximum dissipated power	250 kCal/h
GENERAL DATA	
Protection class (according to EN 62109)	Class I
Overvoltage category (according to EN 62109)	Class III
Environmental category (according to EN 62109	External
Environmental degree of protection (according to EN 62109)	IP 65
Type of DC connectors	MC4
Type of AC connectors	Screw terminals
Operating temperature	-20 to +60 °C
Rated temperature	-20 to +40 °C
Storage temperature	-25 to +60 °C
Relative humidity	5% to 95% without condensation
Cooling system	Smart cooling
Sound emission	< 55 dB 1 m from inverter
Altitude	0 to 2,000 m
Dimensions (L x D x H)	548 x 275 x 644 mm
Weight	46 kg
Certification and applicable standards	CEI 0-21, VDE AR-N 4105, VDE 0126-1-1, UTE C15-712-1
Warranty	5 years (standard), 10/15/20 years (optional extension)

(1) The accepted tolerance depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.

Control panel



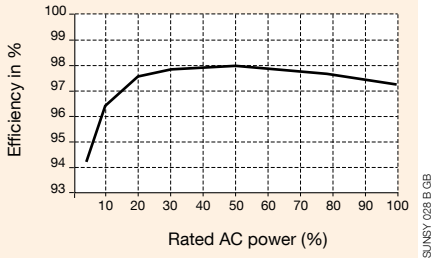
SUNSY 080 A

1. LCD display with multicoloured back lighting
2. Enter button
3. Selection buttons

Technical data

PROTECTION DEVICES	
Output short-circuit protection	•
Reverse-polarity protection	•
Monitoring of earth leakage	•
Monitoring of faulty currents	•
Input surge protection devices	-
Output surge protection devices	-
Input isolator	-
Output isolator	-
Output magnetothermal switch	-
Output selective differential protection	-
COMMUNICATION	
RS485 interface	Option
WiFi interface	-
Digital inputs/Dry contact outputs	-
MicroSD slot	-
USB port	-
Control panel	Graphic LCD with backlight

Efficiency curve



SUNSY 028 B GB

Connections

SUNSY 070 A

1. DC connectors
2. LCD Control panel
3. Earth connection (PE)
4. AC connector
5. Interface RS485 (optional)
6. Cooling fan

SUNSYS B12-B15-B20-B30

12-15-20-30 kW

Increased flexibility of use

The solution for

- Installations in medium-sized and large commercial buildings
- Installations in all types of environmental conditions

Advantages

98% MAXIMUM EFFICIENCY

WARRANTY 5 YEARS

Related products

- BJB photovoltaic enclosures, page 16

Benefits of the SUNSYS B12, B15, B20, B30 solution

- MPPT's broad voltage tolerance provides excellent flexibility in combination with photovoltaic modules.
- The IP65 degree of protection makes it suitable for installation in both indoor and outdoor environments.

The best, high-efficiency performance

- The SUNSYS B12, B15, B20 and B30 inverters are the ideal solution for photovoltaic applications on buildings with a power between 12 and 30 kW.
- The transformerless design offers a conversion efficiency which is amongst the best on the market.
- The double tracker series input provides:
  - optimisation of the system's energy production,
  - maximisation of the output of extended roof systems with several layers, systems with different orientations, systems with areas of shade,
  - management of a system divided into sections with different photovoltaic module technologies with a single inverter.

Communication and supervision

- High-resolution LCD display with a multilingual menu: English, French, German, Spanish and Italian (for other languages, contact SOCOMEC).
- Equipped with graphic LCD control panel with a datalogger and RS485 connection for simple and immediate monitoring of the system.

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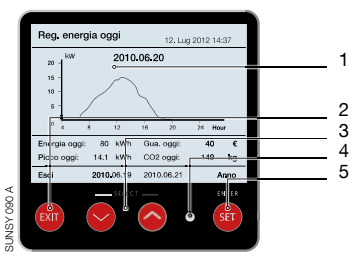
Technical data

	SUNSYS B12	SUNSYS B15	SUNSYS B20	SUNSYS B30
INPUT (DC)				
Maximum PV power (STC module conditions)	13,200 W	16,500 W	22,000 W	33,000 W
Rated voltage	650 VDC			
Maximum voltage	1,000 VDC			
Voltage range	200 to 1,000 VDC			
MPPT voltage range	420 to 850 VDC	350 to 800 VDC		480 to 800 VDC
Start-up voltage	250 VDC			
Number of independent MPPTs	2			
Pairs of input connectors for MPPTs	2			3
Maximum input current	20 A x2	23 A x2	30 A x2	34 A x2
Maximum short-circuit current	22 A x2	25 A x2	33 A x2	37 A x2
OUTPUT (AC)				
Power rating	12,000 W	15,000 W	20,000 W	30,000 W
Maximum power	12,600 W	15,750 W	21,000 W	31,500 W
Apparent power rating	12,000 VA	15,000 VA	20,000 VA	30,000 VA
Maximum apparent power	12,600 VA	15,750 VA	21,000 VA	31,500 VA
Rated voltage	400 Vrms(1) 3ph + N			
Voltage range	320 to 480 Vrms(1) 3ph + N			
Rated frequency	50 Hz(1)			
Frequency range	47.5 to 51.5 Hz(1)			
Rated current	17.4 Arms	22 Arms	29 Arms	43 Arms
Maximum current	19.2 Arms	25 Arms	32 Arms	46 Arms
Total harmonic distortion of current	< 3%			
Power factor range	0.8 to 1(2)			
Topology	No transformer			
LEVEL OF EFFICIENCY				
Maximum efficiency	98.10 %			
EU efficiency	97.5 %	97.60 %		
Consumption at night	2 W			
Maximum air demand	80 m³/h	320 m³/h		
Maximum dissipated power	300 W	360 W	480 W	720 W
Maximum dissipated power	1,025 BTU/h	1,230 BTU/h	1,620 BTU/h	2,460 BTU/h
Maximum dissipated power	260 kCal/h	310 kCal/h	410 kCal/h	620 kCal/h
GENERAL DATA				
Protection class (according to EN 62109)	Class I			
Overvoltage category (according to EN 62109)	Class III			
Environmental category (according to EN 62109)	External			
Environmental degree of protection (according to EN 62109)	IP 65			
Type of DC connectors	MC4			
Type of AC connector	Bayonet connector (included)			
Operating temperature	-20 to +60 °C			
Rated temperature	-20 to +40 °C			
Storage temperature	-25 to +60 °C			
Relative humidity	5% to 95% without condensation			
Cooling system	Smart cooling			
Sound emission	< 50 dB 1 m from inverter	< 55 dB 1 m from inverter		< 61 dB 1 m from inverter
Altitude	0 to 2,000 m			
Dimensions (L x D x H)	606 x 289 x 609 mm	612 x 278 x 960 mm		
Weight	41 kg	67 kg	67 kg	73 kg
Certification and applicable standards	CEI 0-21, CEI 0-16, VDE AR-N 4105, VDE 0126-1-1, UTE C15-712-1			
Warranty	5 years (standard), 10/15/20 years (optional extension)			

(1) The accepted tolerance depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.

Control panel

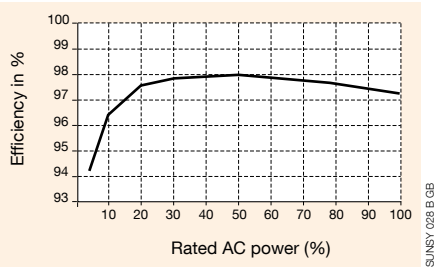


1. LCD Display
2. EXIT button
3. Selection buttons
4. LED
5. ENTER/SET button

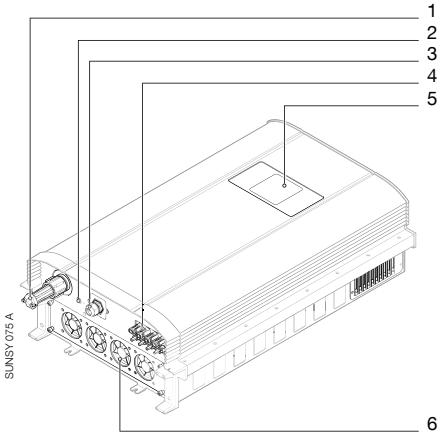
Technical data

PROTECTION DEVICES	
Output short-circuit protection	•
Reverse-polarity protection	•
Monitoring of earth leakage	•
Monitoring of faulty currents	•
Input surge protection devices	-
Output surge protection devices	-
Input isolator	-
Output isolator	-
Output magnetothermal switch	-
Output selective differential protection	-
COMMUNICATION	
RS485 interface	•
WiFi interface	-
Digital inputs/Dry contact outputs	•
MicroSD slot	-
USB port	-
Control panel	Graphic LCD with backlight

Efficiency curve



Connections



1. AC connector
2. Earth connection (PE)
3. Communication interface
4. DC connectors
5. LCD Control panel
6. Fans

Photovoltaic inverters for solar parks

Solar parks are photovoltaic power stations built on areas covering thousands of square metres that can produce a peak power capacity of several tens of MWp.
The energy produced is injected into the electricity grid at medium and high voltage through a transformer unit. High-performance equipment is required to optimise the level of power injected into the electricity grid.

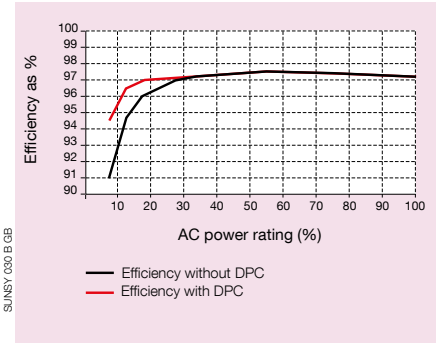
Downstream of the panels, the SOCOMEC solution covers:

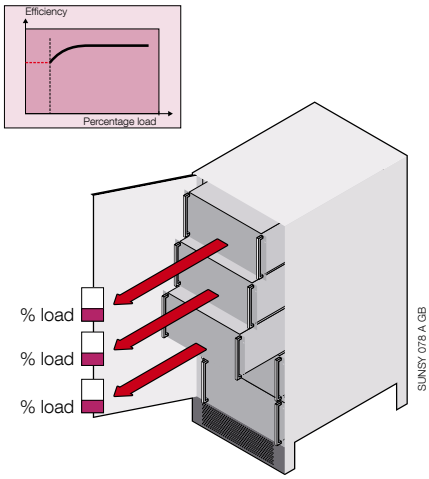
- DC protection and connection,
- DC/AC conversion,
- AC protection and connection,
- Monitoring of the production installation.

Photovoltaic inverters for solar parks
SUNSYS PARK

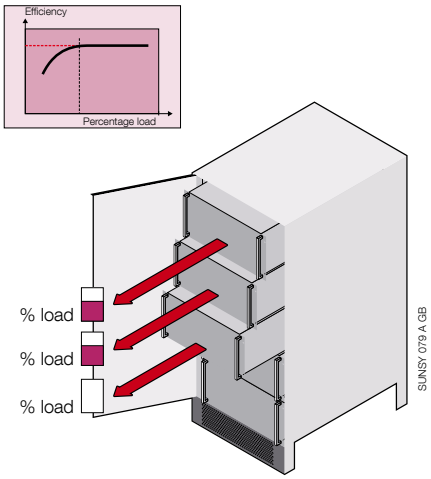
Dynamic Power Control

Considering the average annual sunlight levels observed in Europe, the photovoltaic plant mostly operates in conditions of reduced brightness. It is therefore essential that the inverter is efficient, despite the unfavourable weather conditions.





WITHOUT DPC



WITH DPC

Thanks to its modular architecture and **DPC (Dynamic Power Control)** function, the SUNSYS inverter optimises the efficiency of your plant.

Production from the inverter is very efficient, even at very low levels of sunlight.

Modular architecture optimises overall efficiency by only using the power modules it requires. In cases of partial sunlight, fewer modules are used which operate with a greater load and, consequently, with greater efficiency.

Rack 33 kW

Benefits of the “Dynamic Power Control” system

Best efficiency

The DPC optimises the efficiency of your plant, particularly for partial loads. The inverter starts to produce electricity at low levels of sunlight. The P100TL inverter is 96% efficient with a load of only 5%.

Increased lifetime

Thanks to the DPC, only the modules required for energy production are operational. In addition, use of the power modules is verified in a cyclical manner to share the load time. The duration of operation of a module is thus optimised, increasing the useful life of the inverter.

Better availability

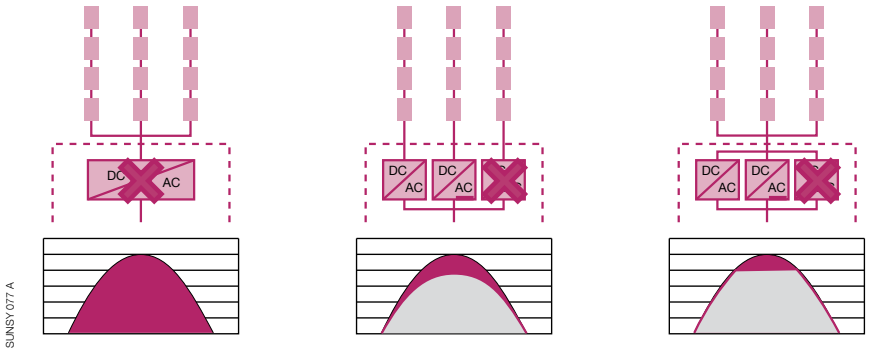
If one of the inverter power modules should stop (due to a fault), the system will automatically reconfigure in order to use the remaining modules as best possible, and to continue supplying the maximum possible amount of energy.

Integrated Earthing Kit option

An option is available on both the positive and negative poles, which earths the solar modules in total safety, and permanently controls the status of the photovoltaic field, signalling any irregularities and maintaining the operating status of the entire plant.

Benefits of the modular solution

When the centralised inverter is connected to one single tracker, there will be considerable loss in production in the event of fault, which will be increased by the time needed for repair or replacement. When there is a greater number of modular inverters, each with 3 x 33 kW modules, the daily peak loss due to fault will only be related to one part of the plant.



Centralised architecture | Distributed architecture | Modular architecture

Different operating modes

Cyclic operation of modules

The modular architecture, combined with the DPC function that increases efficiency at low levels of sunlight, allows the cyclic operation of the inverter modules. In the morning, evening and whenever the inverter is not fully operational, the modules are activated according to their operation time. Those with fewer operating hours take precedence. In this way, it is possible to increase the useful life of each module and, consequently, that of the inverter, and reduce maintenance.

Redundant operation

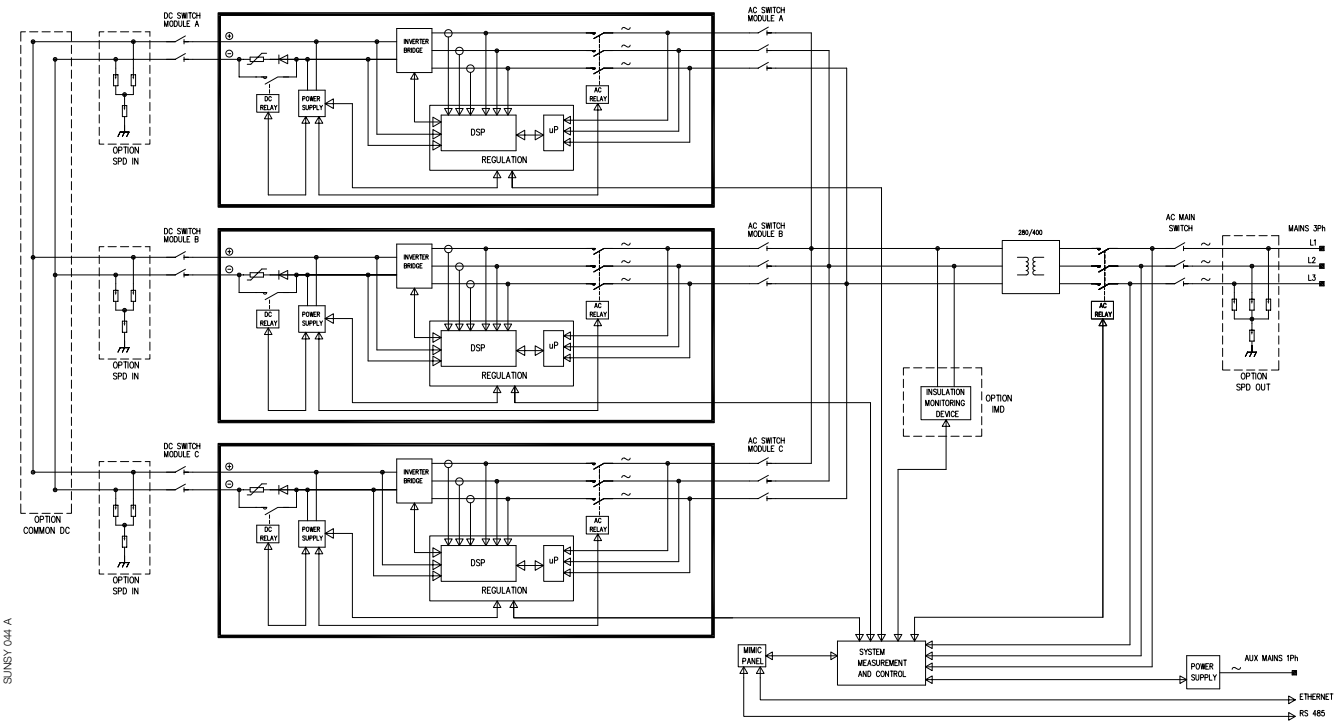
SUNSYS PARK inverters with the DPC mode activated (two or three shared inputs) divide the power from the field between the various inverter modules. If one module is faulty, the remaining modules can sustain the energy production to their maximum capacity, allowing the faulty module to be repaired and keeping energy loss to a minimum.

When only two modules are in operation, SUNSYS P100TL/P100TR inverters produce energy with sunlight up to 66%, and up to 80% per half hour, without any production loss.

Rapid repair

Hot-Swap power module. This module is is housed in a compact pull-out unit, allowing rapid extraction and replacement even while the inverter is in operation and the remaining modules are fully operational. Replacement is very quick and can even be carried out by non-Socomec qualified personnel (for example, by the contractor who built the plant). The modules can be stored as spares and used when required.

Example of the schematic diagram of the system (SUNSYS P100TR)



SUNSYS P33TR-P66TR

33 and 66 kW

Modular solution for medium power plants

The best, high-efficiency performance

- SUNSYS P33TR and P66TR inverters are the ideal solution for photovoltaic installations on large roofs with power ranging between 33 and 66 kW.
- The transformer design and three-phase output make them suitable for low-voltage networks.
- The modular architecture with a three-level converter and the DPC function (SUNSYS P66TR) allow improved energy production at low levels of sunlight.
- Thanks to the transformer, SUNSYS P33TR and P66TR are fully compatible with all photovoltaic module technologies. The earthing kit allows earthing of both positive and negative poles of the solar module, in complete safety.
- The Sunsys IFB and Sunguard supervision system facilitate the monitoring and maintenance of the photovoltaic installation.

The benefits of the “Dynamic Power Control” system

- **Increased efficiency**
  The DPC system optimises the efficiency of your installation, particularly for partial loads. The inverter starts to produce electricity at low levels of sunlight.
- **Increased lifetime**
  Thanks to the DPC, only the modules required for energy production are operational. In addition, use of the power modules is verified in a cyclical manner to share the load time. The duration of operation of a module is thus optimised, increasing the useful life of the inverter.
- **Better availability**
  If one of the inverter power modules should stop (due to a fault), the system will automatically reconfigure in order to use the remaining modules as best possible, and to continue supplying the maximum possible amount of energy.

The solution for

> Installations in large commercial buildings

Certifications

The SUNSYS P solution is TÜV SÜD certified for product safety (EN 62109).

Advantages

97% MAXIMUM EFFICIENCY

WARRANTY 5 YEARS

Related products

> FJB/IFB photovoltaic enclosures, page 36

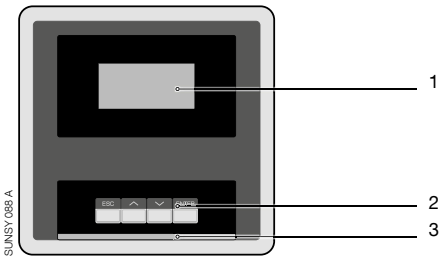
socomec Innovative Power Solutions

Technical data

	SUNSYS P33TR	SUNSYS P66TR
INPUT (DC)		
Maximum PV power (STC module conditions)	40,000 W	80,000 W
Rated voltage	550 VDC	
Maximum voltage	900 VDC	
Voltage range	350 to 900 VDC	
MPPT voltage range	450 to 850 VDC	
Start-up voltage	520 VDC	
Number of independent MPPTs	1	2
Number of input connections for MPPTs	2	
Maximum input current	80 A	80 A x 2
Maximum short-circuit current	96 A	96 A x 2
OUTPUT (AC)		
Power rating	33,300 W	66,600 W
Maximum power	36,600 W	73,400 W
Apparent power rating	33,300 VA	66,600 VA
Maximum apparent power	36,600 VA	73,400 VA
Rated voltage	400 Vrms(1) 3ph	
Voltage range	320 to 480 Vrms(1) 3ph	
Rated frequency	50 Hz(1)	
Frequency range	47.5 to 51.5 Hz(1)	
Rated current	48 Arms	96 Arms
Maximum current	53 Arms	106 Arms
Total harmonic distortion of current	< 3%	
Power factor range	0.8 to 1(2)	
Topology	50 Hz output transformer	
LEVEL OF EFFICIENCY		
Maximum efficiency	97 %	
EU efficiency	96 %	
Consumption at night	10 W	
Maximum air demand	480 m^3/h	1,280 m^3/h
Maximum dissipated power	1,750 W	3,500 W
Maximum dissipated power	5,980 BTU/h	11,950 BTU/h
Maximum dissipated power	1,500 kCal/h	3,000 kCal/h
GENERAL DATA		
Protection class (according to EN 62109)	Class I	
Overvoltage category (according to EN 62109)	Class III	
Environmental category (according to EN 62109)	Non-air-conditioned internal environments	
Environmental degree of protection (according to EN 62109)	IP 20	
Type of DC connectors	Copper bars for cables from 25 mm^2 to 120 mm^2 (M8)	Copper bars for cables from 50 mm^2 to 120 mm^2 (M8)
Type of AC connectors	Copper bars for cables from 16 mm^2 to 120 mm^2 (M8)	Copper bars for cables from 35 mm^2 to 120 mm^2 (M8)
Operating temperature	-5 to +60 °C	
Rated temperature	-5 to +45 °C	
Storage temperature	-5 to +60 °C	
Relative humidity	5% to 95% without condensation	
Cooling system	Smart cooling	
Sound emission	< 60 dB 1 m from inverter	< 64 dB 1 m from inverter
Altitude	0 to 1,000 m	
Dimensions (L x D x H)	600 x 795 x 1,400 mm	
Weight	330 kg	525 kg
Certification and applicable standards	CEI 0-21, CEI 0-16, VDE AR-N 4105, VDE 0126-1-1, UTE C15-712-1	
Warranty	5 years (standard), 10/15/20 years (optional extension)	

(1) The tolerance accepted depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.

Control panel

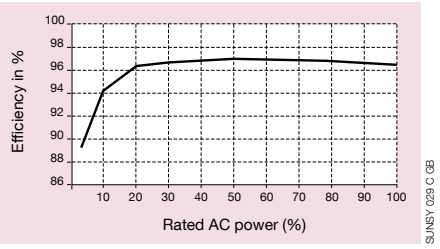


1. LCD graphic display
2. Navigation buttons
3. Inverter status light bar

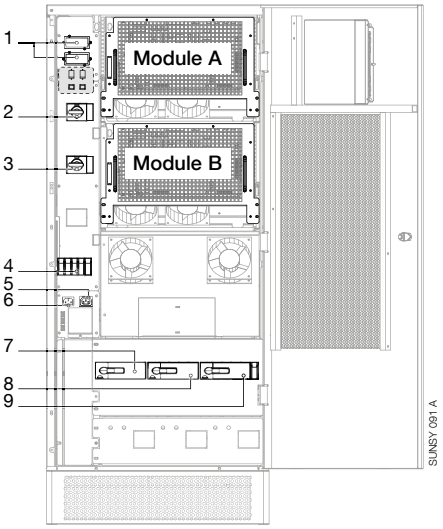
Technical data

PROTECTION DEVICES	
Output short-circuit protection	•
Reverse-polarity protection	•
Monitoring of earth leakage	•
Monitoring of faulty currents	•
Input surge protection devices	Option
Output surge protection devices	Option
Input isolator	•
Output isolator	•
Output magnetothermal switch	-
Output selective differential protection	-
Insulation controller	Option
Earthing kit	Option
COMMUNICATION	
RS485 interface: serial-to-Ethernet	•/•
WiFi interface	-
Digital inputs/Dry contact outputs	Option
MicroSD slot	-
USB port	•
Control panel	Graphic LCD with backlight

Efficiency curve



Connections



1. Communication slot
2. Module A output isolator
3. Module B output isolator
4. Isolators with fuse
5. IEC320 AUX output for assistance
6. IEC320 AUX power supply input
7. Inverter output isolator
8. Module B input isolator
9. Module A input isolator

SUNSYS P100TR

100 kW

Modular architecture for high power

The solution for

> Installations in large commercial buildings

Certifications

The SUNSYS P solution is TÜV SÜD certified for product safety (EN 62109).

Advantages

97% MAXIMUM EFFICIENCY

WARRANTY 5 YEARS

Related products

> FJB/IFB photovoltaic enclosures, page 36

The best, high-efficiency performance

- The SUNSYS P100TR inverter is the ideal solution for photovoltaic plants that are connected to a low-voltage network with 100 kW power.
- The modular architecture with a three-level converter and the DPC function allow improved energy production at low levels of sunlight.
- SUNSYS P100TR is compatible with all photovoltaic module technologies and with a wide range of string configurations.
- The Sunsys IFB and Sunsys Sunguard options facilitate system supervision and maintenance.

The benefits of the “Dynamic Power Control” system

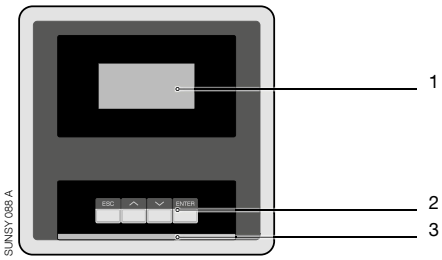
- **Increased efficiency**
  The DPC system optimises the efficiency of your installation, particularly for partial loads. The inverter starts to produce electricity at low levels of sunlight.
- **Increased lifetime**
  Thanks to the DPC, only the modules required for energy production are operational. In addition, use of the power modules is verified in a cyclical manner to share the load time. The duration of operation of a module is thus optimised, increasing the useful life of the inverter.
- **Better availability**
  If one of the inverter power modules should stop (due to a fault), the system will automatically reconfigure in order to use the remaining modules as best possible, and to continue supplying the maximum possible amount of energy.

Technical data

	SUNSYS P100TR
INPUT (DC)	
Maximum PV power (STC module conditions)	120,000 W
Rated voltage	550 VDC
Maximum voltage	900 VDC
Voltage range	350 to 900 VDC
MPPT voltage range	450 to 850 VDC
Start-up voltage	520 VDC
Number of independent MPPTs	3
Number of input connections for MPPTs	2
Maximum input current	80 A x 3
Maximum short-circuit current	96 A x 3
OUTPUT (AC)	
Power rating	100,000 W
Maximum power	110,000 W
Apparent power rating	100,000 VA
Maximum apparent power	110,000 VA
Rated voltage	400 Vrms(1) 3ph
Voltage range	320 to 480 Vrms(1) 3ph
Rated frequency	50 Hz(1)
Frequency range	47.5 to 51.5 Hz(1)
Rated current	144 Arms
Maximum current	160 Arms
Total harmonic distortion of current	< 3%
Power factor range	0.8 to 1(2)
Topology	50 Hz output transformer
LEVEL OF EFFICIENCY	
Maximum efficiency	97 %
EU efficiency	96 %
Consumption at night	10 W
Maximum air demand	1,760 m³/h
Maximum dissipated power	5,250 W
Maximum dissipated power	17,900 BTU/h
Maximum dissipated power	4,500 kCal/h
GENERAL DATA	
Protection class (according to EN 62109)	Class I
Overvoltage category (according to EN 62109)	Class III
Environmental category (according to EN 62109)	Non-air-conditioned internal environments
Environmental degree of protection (according to EN 62109)	IP 20
Type of DC connectors	Copper bars for cables from 95 mm² to 120 mm² (M8)
Type of AC connectors	Copper bars for cables from 70 mm² to 120 mm² (M8)
Operating temperature	-5 to +60 °C
Rated temperature	-5 to +45 °C
Storage temperature	-5 to +60 °C
Relative humidity	5% to 95% without condensation
Cooling system	Smart cooling
Sound emission	< 64 dB 1 m from inverter
Altitude	0 to 1,000 m
Dimensions (L x D x H)	1,200 x 795 x 1,400 mm
Weight	770 kg
Certification and applicable standards	CEI 0-21, CEI 0-16, VDE AR-N 4105, VDE 0126-1-1, UTE C15-712-1
Warranty	5 years (standard), 10/15/20 years (optional extension)

(1) The accepted tolerance depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.

Control panel

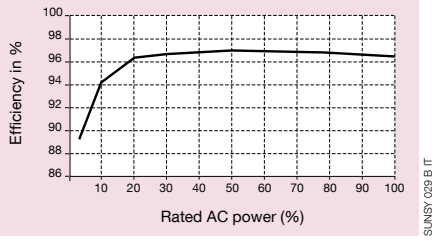


1. LCD graphic display
2. Navigation buttons
3. Inverter status light bar

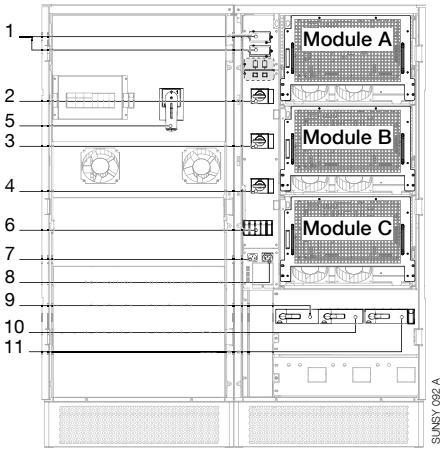
Technical data

PROTECTION DEVICES	
Output short-circuit protection	•
Reverse-polarity protection	•
Monitoring of earth leakage	•
Monitoring of faulty currents	•
Input surge protection devices	Option
Output surge protection devices	Option
Input isolator	•
Output isolator	•
Output magnetothermal switch	-
Output selective differential protection	-
Insulation controller	Option
Earthing kit	Option
COMMUNICATION	
RS485 interface: serial-to-Ethernet	•/•
WiFi interface	-
Digital inputs/Dry contact outputs	Option
MicroSD slot	-
USB port	•
Control panel	Graphic LCD with backlight

Efficiency curve



Connections



1. Communication slot
2. Module A output isolator
3. Module B output isolator
4. Module C output isolator
5. Inverter output isolator
6. Isolators with fuse
7. IEC320 AUX power supply input
8. IEC320 AUX output for assistance
9. Module C input isolator
10. Module B input isolator
11. Module A input isolator

SUNSYS P66TL-P100TL

66 and 100 kW

Maximum efficiency under all weather conditions

The best, high-efficiency performance

- SUNSYS P66TL and P100TL inverters are the ideal solution for photovoltaic applications in solar parks with power greater than 66 kW.
- The transformerless design and three-phase output make them suitable for connection to medium-voltage networks.
- The modular architecture with three-level conversion, the DPC function and the transformerless architecture, optimise energy production at all levels of sunlight.
- Thanks to the channelled ventilation, different units can be placed side by side, obtaining high levels of power in a more compact space.
- The Sunsys IFB and Sunguard supervision system facilitate the monitoring and maintenance of the photovoltaic installation.

The benefits of the “Dynamic Power Control” system

- **Increased efficiency**
  The DPC system optimises the efficiency of your installation, particularly for partial loads. The inverter starts to produce electricity at low levels of sunlight.
- **Increased lifetime**
  Thanks to the DPC, only the modules required for energy production are operational. In addition, use of the power modules is verified in a cyclical manner to share the load time. The duration of operation of a module is thus optimised, increasing the useful life of the inverter.
- **Better availability**
  If one of the inverter power modules should stop (due to a fault), the system will automatically reconfigure in order to use the remaining modules as best possible, and to continue supplying the maximum possible amount of energy.

The solution for

- Solar park installations
- Medium voltage network installations

Certifications

TÜV SÜD Production monitored Safety tested

The SUNSYS P solution is TÜV SÜD certified for product safety (EN 62109).

MADE IN EUROPE kiwa kQ

Advantages

98% MAXIMUM EFFICIENCY

WARRANTY 5 YEARS

Related products

- FJB/IFB photovoltaic enclosures, page 36

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Technical data

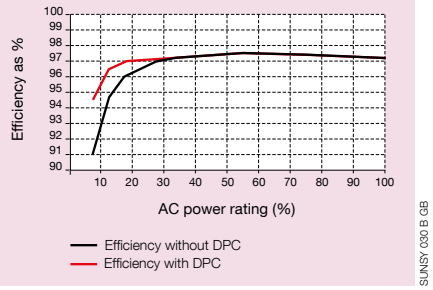
	SUNSYS P66TL	SUNSYS P100TL
INPUT (DC)		
Maximum PV power (STC module conditions)	80,000 W	120,000 W
Rated voltage	550 VDC	
Maximum voltage	900 VDC	
Voltage range	350 to 900 VDC	
MPPT voltage range	450 to 850 VDC	
Start-up voltage	520 VDC	
Number of independent MPPTs	2	3
Number of input connections for MPPTs	2	
Maximum input current	80 A x 2	80 A x 3
Maximum short-circuit current	96 A x 2	96 A x 3
OUTPUT (AC)		
Power rating	66,600 W	100,000 W
Maximum power	73,400 W	110,000 W
Apparent power rating	66,600 VA	100,000 VA
Maximum apparent power	73,400 VA	110,000 VA
Rated voltage	280 Vrms(1) 3ph	
Voltage range	224 to 336 Vrms(1) 3ph	
Rated frequency	50 Hz(1)	
Frequency range	47.5 to 51.5 Hz(1)	
Rated current	137 Arms	206 Arms
Maximum current	152 Arms	227 Arms
Total harmonic distortion of current	< 3%	
Power factor range	0.8 to 1(2)	
Topology	Transformerless	
LEVEL OF EFFICIENCY		
Maximum efficiency	98 %	
EU efficiency	97.6 %	
Consumption at night	10 W	
Maximum air demand	960 m^3/h	1,440 m^3/h
Maximum dissipated power	2,470 W	3,650 W
Maximum dissipated power	8,420 BTU/h	12,450 BTU/h
Maximum dissipated power	2,130 kCal/h	3,150 kCal/h
GENERAL DATA		
Protection class (according to EN 62109)	Class I	
Overvoltage category (according to EN 62109)	Class III	
Environmental category (according to EN 62109)	Non-air-conditioned internal environments	
Environmental degree of protection (according to EN 62109)	IP 20	
Type of DC connectors	Copper bars for cables from 50 mm^2 to 120 mm^2 (M8)	Copper bars for cables from 95 mm^2 to 120 mm^2 (M8)
Type of AC connectors	Copper bars for cables from 35 mm^2 to 120 mm^2 (M8)	Copper bars for cables from 70 mm^2 to 120 mm^2 (M8)
Operating temperature	-5 to +60 °C	
Rated temperature	-5 to +45 °C	
Storage temperature	-5 to +60 °C	
Relative humidity	5% to 95% without condensation	
Cooling system	smart cooling	
Sound emission	< 64 dB 1 m from inverter	
Altitude	0 to 1,000 m	
Dimensions (L x D x H)	600 x 795 x 1,400 mm	
Weight	155 kg	190 kg
Certification and applicable standards	CEI 0-21, CEI 0-16, VDE AR-N 4105, VDE 0126-1-1, UTE C15-712-1	
Warranty	5 years (standard), 10/15/20 years (optional extension)	

(1) The accepted tolerance depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.

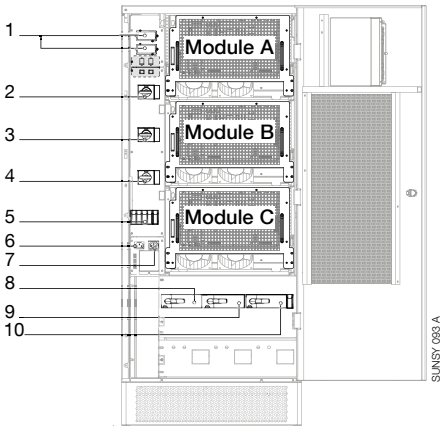
Technical data

PROTECTION DEVICES	
Output short-circuit protection	•
Reverse-polarity protection	•
Monitoring of earth leakage	•
Monitoring of faulty currents	Option
Input surge protection devices	Option
Output surge protection devices	•
Input isolator	•
Output isolator	-
Output magnetothermal switch	-
Output selective differential protection	-
Insulation controller	Option
Earthing kit	Option
COMMUNICATION	
RS485 interface: serial-to-Ethernet	•/•
WiFi interface	-
Digital inputs/Dry contact outputs	Option
MicroSD slot	-
USB port	•
Control panel	Graphic LCD with backlight

Efficiency curve

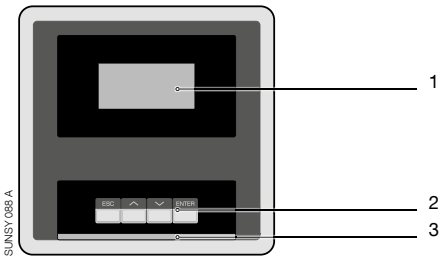


Connections



1. Communication slot
2. Module A output isolator
3. Module B output isolator
4. Module C output isolator
5. Isolators with fuse
5. IEC320 AUX power supply input
7. IEC320 AUX output for assistance
8. Module C input isolator
9. Module B input isolator
10. Module A input isolator

Control panel



1. LCD graphic display
2. Navigation buttons
3. Inverter status light bar

FJB/IFB enclosures

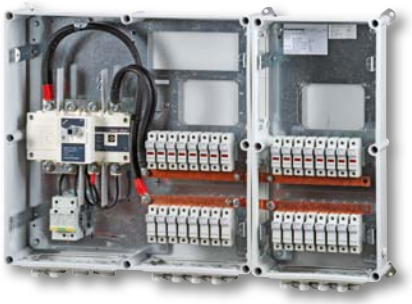
Photovoltaic string protection and monitoring enclosures for solar parks

from 8 to 32 strings

new

COFF-PV_018_A

16-string enclosure



COFF-PV_023_B

16-string enclosure

The solution for

> High-power photovoltaic installations (large buildings, fields, solar parks ranging from a few hundred kW to many MW)

Main advantages

> A complete range to meet your needs
> Simplicity of installation and use
> Installation safety
> Manufacturer's guarantee of reliability, services and safety

Conformity to standards

> IEC 61,439-2
> UTE C 15-712-1
> BT Directive no. 2006/95/EC

Specific requests

> Contact SOCOMEC to request customised protection enclosures

Related products

> SUNSYS P33TR-P66TR inverter, page 30
> SUNSYS P100TR inverter, page 32
> SUNSYS P66TL-P100TL inverter, page 34

Function

The FJB/IFB string enclosures allow:

- parallel connection, protection and isolation of the photovoltaic strings,
- connection to the photovoltaic inverter,
- protection against overvoltage,
- monitoring of the strings and photovoltaic installation.

Advantages

A complete range to meet your needs

- From 1 to 6 strings.
- Changeover and manual or remote isolation.
- 1000 VDC voltage.
- IMPPT max = 9 A/String.
- Use at temperatures of up to 60 °C (see table of technical specifications).

Simplicity of installation and use

- Fault signal of string fuse.
- Closing plate fitted on a removable base for input/output connection.
- Connection to PV connectors (optional).
- Accessories for wall mounting.
- Roof for protection in harsh environments (contact SOCOMEC).
- Remote monitoring (available on IFB enclosures).

Installation safety

- Insulation class II.
- Changeover and DC voltage isolation (1000 V DC21).
- Protection of both polarities (+/-) with fuse.
- Type II surge protection device.
- Polarity separation according to legislation.
- Route and fixing of safety cables with reinforced insulation.

Manufacturer's guarantee of reliability, services and safety

- Guarantee of the design, qualification and production phases.
- Production according to current legislation.
- Production with Socomec parts, specifically designed for photovoltaics.
- Electrical and mechanical characteristics according to standard IEC 61439-2.

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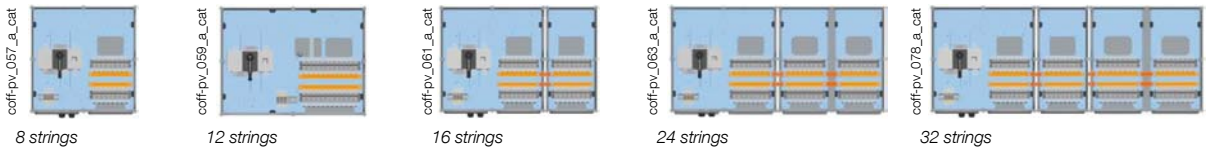
General description

The FJB/IFB range was designed with a modular architecture consisting of:

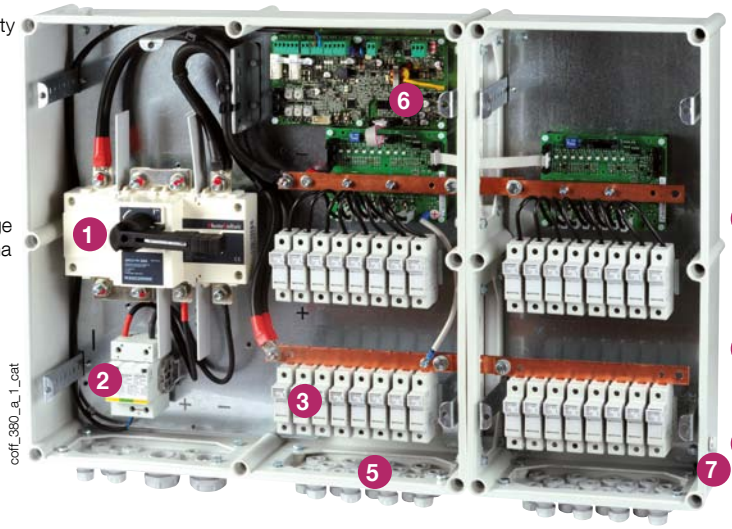


8 strings *12 strings* *16 strings* *24 strings* *32 strings*

1. Opening and manual or remote isolation with isolator to allow maintenance or safety operation procedures.

2. Protection against overvoltage from atmospheric phenomena (lightning) with type 2 SURGYS G51-PV.

3. - Connection of the strings on the PV RM fuse isolator.
   - gPV protection fuse (10 x 38) for the photovoltaic string.



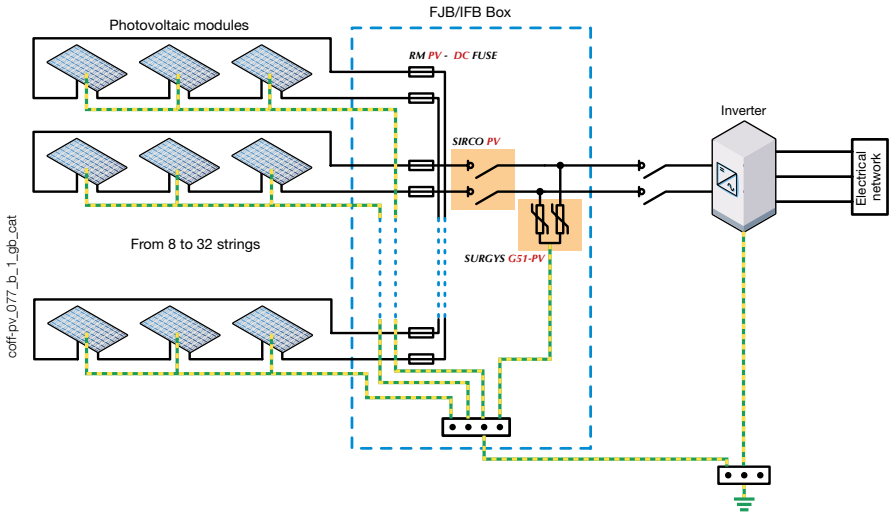
4. Fault signal of RM PV string fuse (FJB version without monitoring).

5. Closure plate with cable glands (optional with PV connectors, contact SOCOMEC).

6. Monitoring and sensing PCBs (consult us).

7. - Polyester enclosure IP65, IK09
   - Colour RAL 7035
   - Mounting support on wall bracket
   - Safety stickers

Functional diagram



References

Manual control and load break

DESCRIPTION	VOLTAGE (VDC)	CURRENT (A)	REFERENCE
8 strings	1000	160	SUNSYS-PFB-8M
12 strings	1000	160	Contact SOCOMEC
16 strings	1000	200	SUNSYS-PFB-16M
24 strings	1000	320	SUNSYS-PFB-24M
32 strings	1000	400	Contact SOCOMEC

Remote control and load break

DESCRIPTION	VOLTAGE (VDC)	CURRENT (A)	REFERENCE
8 strings	1000	160	SUNSYS-PFB-8R(1)
12 strings	1000	160	Contact SOCOMEC
16 strings	1000	200	SUNSYS-PFB-16R(1)
24 strings	1000	320	SUNSYS-PFB-24R(1)
32 strings	1000	400	Contact SOCOMEC

(1) Release coil not included (see accessories).

Manual control and load break

DESCRIPTION	VOLTAGE (VDC)	CURRENT (A)	REFERENCE
8 strings	1000	160	SUNSYS-IFB-8M
16 strings	1000	200	SUNSYS-IFB-16M
24 strings	1000	320	SUNSYS-IFB-24M

Remote control and load break

DESCRIPTION	VOLTAGE (VDC)	CURRENT (A)	REFERENCE
8 strings	1000	160	SUNSYS-IFB-8R(1)
16 strings	1000	200	SUNSYS-IFB-16R(1)
24 strings	1000	320	SUNSYS-IFB-24R(1)

(1) Release coil not included (see accessories).

Accessories

gPV fuse 10 x 38

SIZE	REFERENCE
Size from 2 to 16 A	Contact SOCOMEC

Release coils

DESCRIPTION	REFERENCE
No-volt release coil 208-240 V/50-60 Hz	SUN-OP-UV230VAC
Shunt release coil 208-250 VAC/DC	SUN-OP-ST230VAC

Technical data(1)

	SUNSYS IFB / FJB 8 strings	SUNSYS IFB / FJB 16 strings	SUNSYS IFB/FJB 24 strings
ELECTRICAL SPECIFICATIONS			
Open-circuit voltage (STC Voc)	1,000 VDC max		
Overvoltage protection	PV 40 kA 8/20 surge protection devices in modules to insert		
Emergency disconnect device	1,000 VDC 160 A	1,000 VDC 200 A	1,000 VDC 320 A
Impulse resistance voltage	8 kV		
Maximum current per string	10 A		
Fuse	2/4/6/8/10/12/16 A (specify on ordering)		
Signalling contacts	XB1 (detection of overvoltage/excess temperature)/ XB2 (string fault), 250 VAC 5 A		
MECHANICAL SPECIFICATIONS			
Size of input cable	ø 4-6 mm²		
Size of output cable	ø 35-120 mm²	ø 95-120 mm²	ø 120-240 mm²
Protection class	Class 2		
Degree of protection	IP65		
Impact resistance	IK09		
Dimensions (L x D x H)	540 x 201 x 540 mm	810 x 201 x 540 mm	1,080 x 201 x 540 mm
Weight	17 kg	26 kg	38 kg
MONITORING SYSTEM (IFB only)			
Voltage	24 VDC (12 to 27 VDC)		
Absorption	Nominal: 1.5 W, maximum: 3 W		
Level of power voltage	SELV (Safety Extra Low Voltage)		
COMMUNICATION (IFB only)			
Alarm data and output	Through RS485		
Distance of communication	Up to 500 m		
Number of nodes (serial connections)	From 1 to 254		
ENERGY SUPPLY OF SUNSYS GUARDIAN BOARD (IFB only)			
Absorption	0.7 W		
ENVIRONMENT			
Temperature range	From -20 °C to +40 °C without derating		
Storage temperature	From -20 °C to +70 °C (1 year maximum)		
Relative humidity/Altitude	95% without condensation at 40 °C/2,000 m		
STANDARDS			
Low voltage boxes	IEC 61439-2 (Edition 2; 2011)		
Photovoltaic system installation guide	UTE C 15-712-1		
EU conformity	Low voltage directive 2006/95/EC, electromagnetic compatibility directive 2004/108/EC		

(1) For technical data on 12-string and 32-string models, contact Socomec.

SUNSYS Guardian (IFB only)

Thanks to a fibre optic ring, the optional SUNSYS Guardian board constantly checks for any attempts to remove the photovoltaic panels.

If the fibre optic ring, installed as a single unit with the photovoltaic panel structure to be protected, is cut or tampered with, an alarm is immediately sounded.

The alarm signal is transmitted in three ways:

- RS485 serial communication,
- dry signalling point,
- variation in resistance for the connection to the alarm control unit.

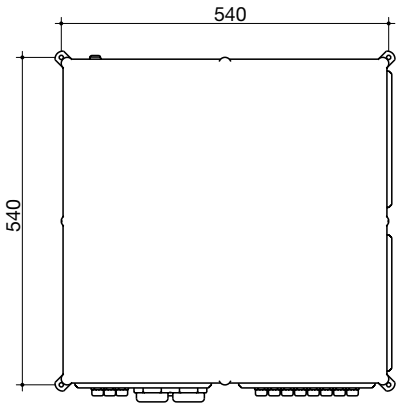
The board supports up to three fibre optic rings.

Monitored data

- Instantaneous power.
- VDC string voltage.
- I_{DC} current for each string and total output current.
- Power (Wh) generated each day per string.
- Status of the alarms, fuses and protective devices.

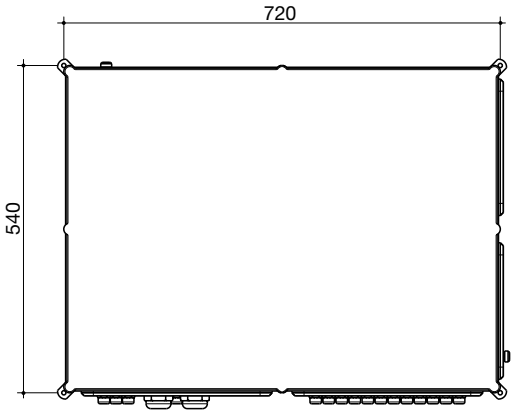
Dimensions

8 strings



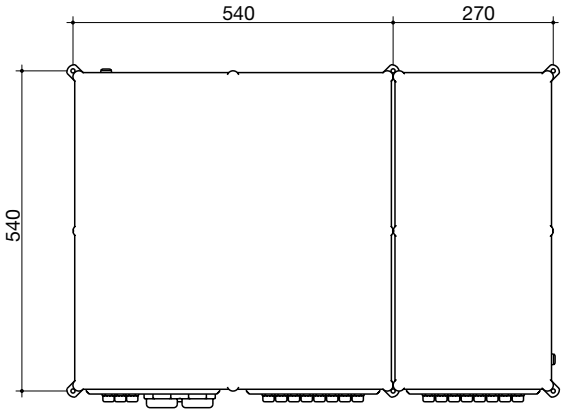
coff-pv_079_a_1_cat

12 strings



coff-pv_080_a_1_cat

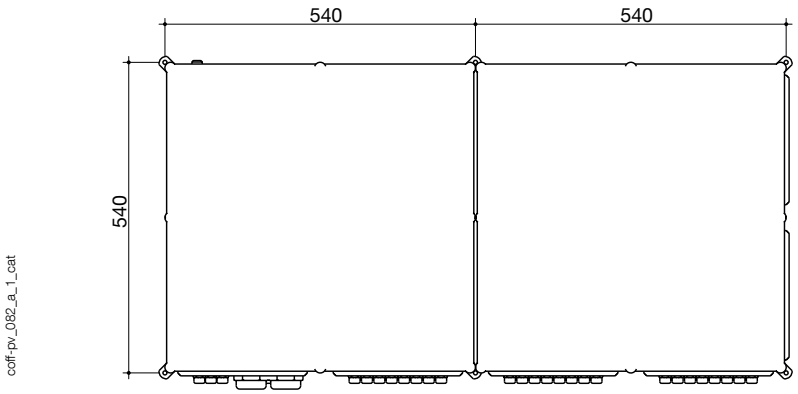
16 strings



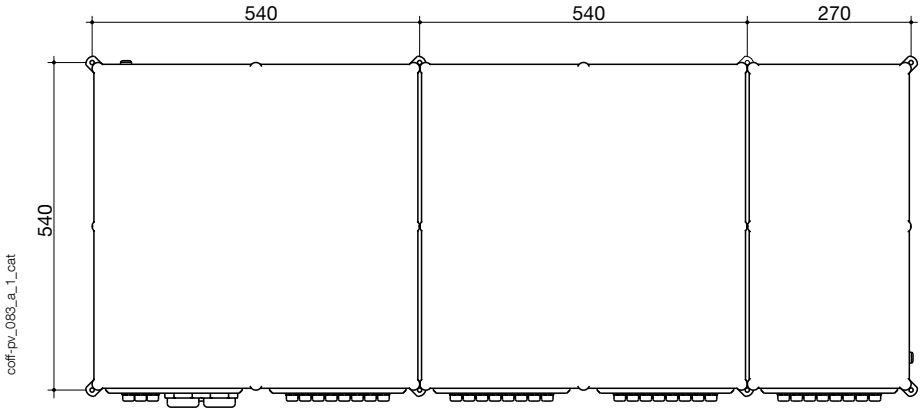
coff-pv_081_a_1_cat

Dimensions

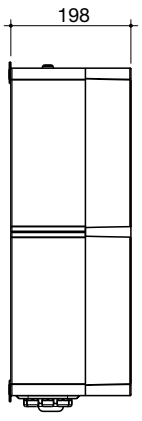
24 strings



32 strings



Side view (all versions)




Codice impianto: 159 - impianto: Roof - Potenza di picco dell'impianto: 173,82 kWp - Cliente: SOCOMEC - Impianto attivo dal: 03-08-2010
127.9 kW
Potenza attiva AC
635 W/m2
SGSB-A » Irraggiamento
35.3 C°
SGSB-A » Temperatura ambiente
Energia totale prodotta - inverter:
Energia totale
377.707,00 kWh
Energia prodotta giornaliera - inverter:
Energia totale
769,00 kWh
Barili di petrolio:
Alberi equivalenti:
CO2 evitata:
Inverter collegati:
Contatori collegati:
Stringhe collegate:
Numero SMS configurati: 250 - Numero SMS inviati:
Data ultimo aggiornamento:
15:25 - 31/07
Andamento Potenza attiva AC
Tempo: seleziona
Dal: 31/07/2012
al: 31/07/2012
Dalle: 05:00
Alle: 20:00
Elabora
Zoom:
PCC teorica impianto - Valore massimo: 94,78 kW - Valore minimo: 0 kW
Potenza attiva AC - Valore massimo: 136,20 kW - Valore minimo: 0 kW
chart by amCharts.com
120,00
100,00
80,00
60,00
40,00
20,00
0
06:00
12:00
18:00
06:00
12:00
18:00

Supervision

Large photovoltaic installations require constant monitoring of the energy production and operational parameters.

The SUNGUARD monitoring system is compatible with all SUNSYS inverters and allows:

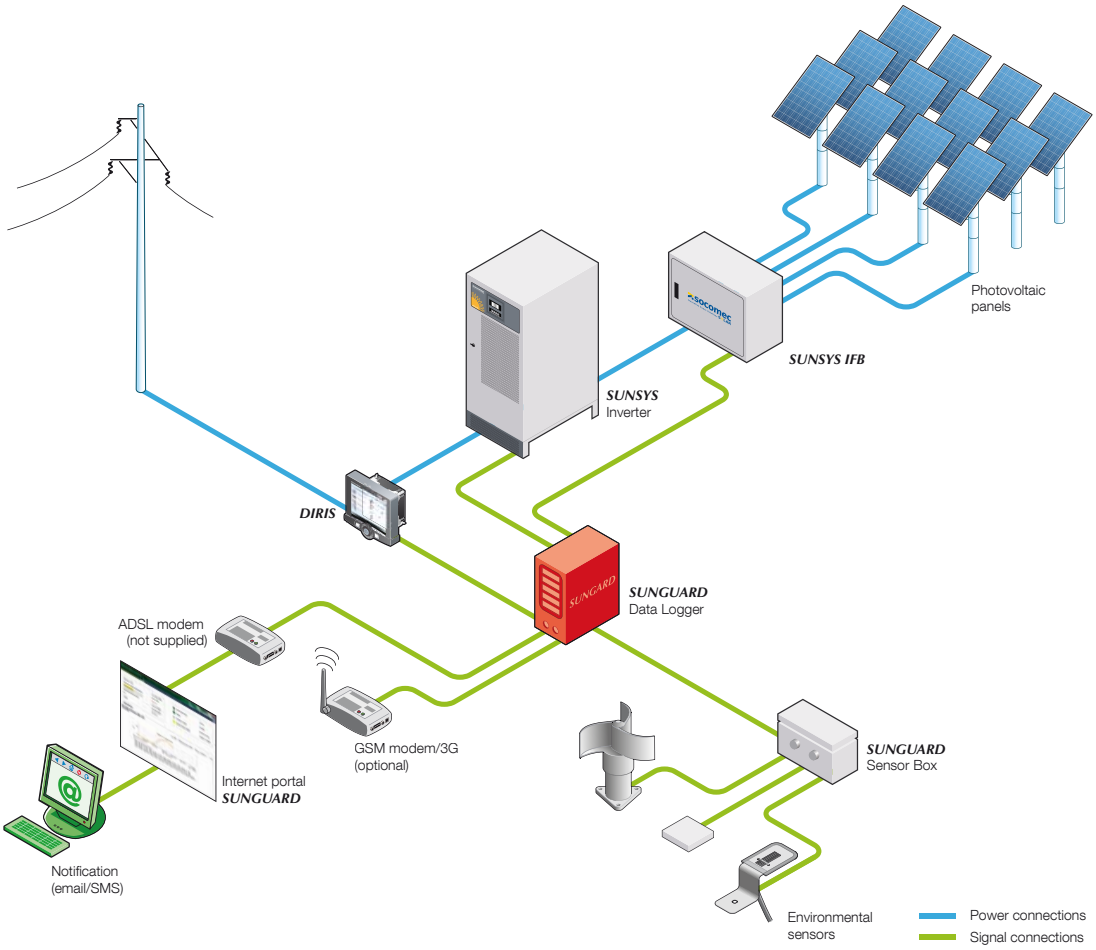
- Monitoring of the photovoltaic plant with a PC or mobile device (tablet, smartphone, etc.) with an Internet connection and browser,
- Checking of the daily production, the profitability of the plant and the contribution to environmental protection,
- Reduction of production downtime.

Benefits of SUNGUARD monitoring

- Simplicity of installation and use.
- Monitoring of all the devices on the photovoltaic installation.
- Reduction of maintenance time and troubleshooting.

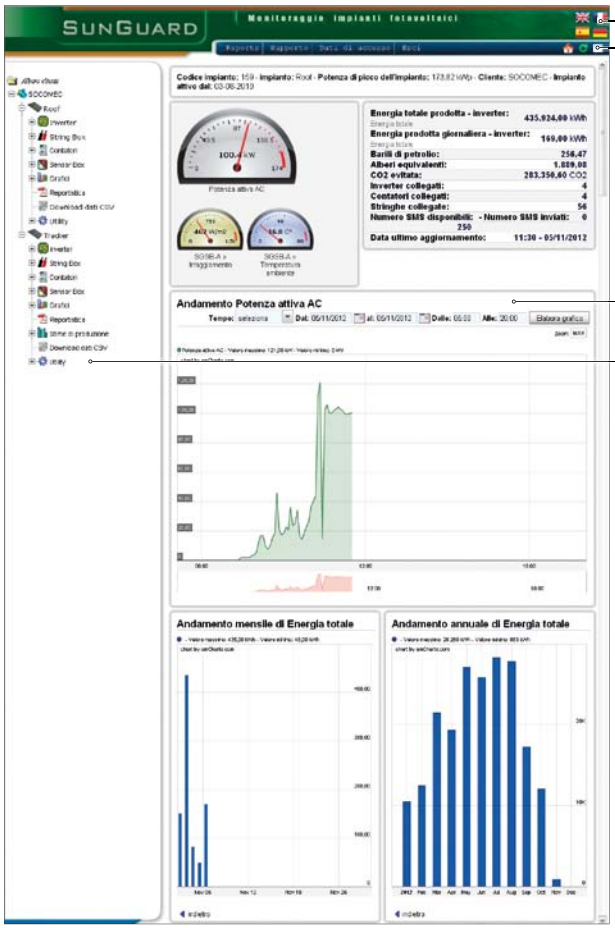
SUNGUARD monitoring devices

- Data logger: this is the centre of the monitoring facility, collecting installation data and sending the data to the SUNGUARD server to be viewed on the browser.
- Power supply, surge protection device and switchboard.
- Environmental sensors for the calculation of the theoretical power of the photovoltaic installation (power at maximum efficiency) and comparison with the real power generated by identifying malfunctions or system failure.
- Networking: connection of the monitoring system to the SUNGUARD server.
- LED or LCD display to view the information related to energy production in real time.



SUPVI 006 A IT

SUNGUARD portal web interface



SUPVI 007 A

1. Interface language

For setting the interface language to either English, French, Italian, Spanish or German (for other languages, contact SOCOMEC).

2. CONTENTS area

For viewing selected information through the navigation tree icons.

3. Horizontal navigation bar

- 'Graphs' button:
  For viewing the graphs related to the main installation parameters (e.g. kWh, sunlight, etc.) selected over a chosen period of time.
- 'Support' button:
  For sending and receive technical support messages.
- 'Report' button:
  For creating monthly or yearly reports (PDF) of the energy production.

4. Navigation tree

The navigation tree consists of icons organised on three levels.

The main level (level 1) is represented by the installation icon, allowing the following parameters to be viewed in the contents area:

- instantaneous power produced by the inverters in kW,
- power surge in kWp,
- total energy accumulated by the inverters in kWh,
- total energy of the counter,
- sunlight in W/m^2, module temperature, ambient temperature and wind speed,
- CO_2 emissions avoided, number of trees saved and equivalent number of barrels of oil,
- daily production and theoretical production graphs,
- comparison of production estimations with real production.

Level 2 allows access to information related to:

- each active photovoltaic device (SUNSYS inverter, SUNGUARD SENSOR BOX, SUNGUARD communication devices, SUNSYS IFB field boxes, electricity meters, DIRIS network analysers, etc.), in order to view the main electrical values,
- information related to Alarms and Events and related notifications (Messages) sent via email and/or SMS,
- viewing of the values of all monitored parameters, selected over a chosen period of time, and exportation of values in CSV format.

The Utility Section, which allows access to level-3 information, includes:

- monitoring of the photovoltaic installation, to activate and modify the monitoring parameters,
- monitoring of the photovoltaic strings, to set up the maximum gap in production percentages between each individual string. If the current values are less than the established threshold, the system sends an alert message,
- calculation of sunlight, to calculate the average daily sunlight (W/m^2) selected over a chosen period of time.

Communication interfaces

Datalogger SUNGUARD BOX HOME 20K 1PV

SUNSY 018 A

Application

- For photovoltaic installations of up to 20 kWp with one inverter.

Operation

- Reads data from the inverter.
- Reads data from the connected communication devices.
- Sends data to the SUNGUARD Internet portal via the ADSL router/modem (Ethernet port) or UMTS/3G SUNGUARD router/modem. The Reserved Area of the portal can be accessed with any Web Browser and an Internet connection, to monitor and analyse all the photovoltaic installations fitted with the SUNGUARD datalogger.

Specifications

- Ethernet interface.
- 2 RS232 serial ports.
- RS232/RS485 signal converter.
- Power supply included.
- 4 Gb CompactFlash with pre-installed software to manage the monitoring system.
- Dimensions (L x D x H): 115 x 35 x 155 mm.
- Weight: 0.5 kg.
- Operating temperature: +5 to +50 °C.

Datalogger SUNGUARD BOX HOME 20K 1PV WIFI

SUPVI 008 A

Application

- For photovoltaic installations of up to 20 kWp with one inverter.

Operation

- Reads data from the inverter.
- Reads data from the connected communication devices.
- Sends data to the SUNGUARD V Internet portal via the ADSL router/modem with WiFi connection. The Reserved Area of the portal can be accessed with any Web Browser and an Internet connection, to monitor and analyse all the photovoltaic installations fitted with the SUNGUARD datalogger.

Specifications

- Ethernet and WLAN interface.
- 2 RS232 serial ports.
- RS232/RS485 signal converter.
- Power supply included.
- 4 Gb CompactFlash with pre-installed software to manage the monitoring system.
- Dimensions (L x D x H): 115 x 35 x 155 mm.
- Weight: 0.5 kg.
- Operating temperature: +5 to +50 °C.

Datalogger SUNGUARD BOX HOME 20K

SUPVI 008 A

Application

- For photovoltaic installations of up to 20 kWp with an unlimited number of inverters.

Operation

- Reads data from the inverter.
- Reads data from the connected communication devices.
- Sends data to the SUNGUARD Internet portal via the ADSL router/modem (Ethernet port) or UMTS/3G SUNGUARD router/modem. The Reserved Area of the portal can be accessed with any Web Browser and an Internet connection, to monitor and analyse all the photovoltaic installations fitted with the SUNGUARD datalogger.

Specifications

- Ethernet interface.
- 2 RS232 serial ports.
- RS232/RS485 signal converter.
- 3 USB ports.
- Power supply included.
- 4 Gb CompactFlash with pre-installed software to manage the monitoring system.
- Dimensions (L x D x H): 115 x 35 x 155 mm.
- Weight: 0.5 kg.
- Operating temperature: +5 to +50 °C.

Datalogger SUNGUARD BOX HOME 20K WiFi

SUPVI 008 A

Application

- For photovoltaic installations of up to 20 kWp with an unlimited number of inverters.

Operation

- Reads data from the inverter.
- Reads data from the connected communication devices.
- Sends data to the SUNGUARD V Internet portal via the ADSL router/modem with WiFi connection. The Reserved Area of the portal can be accessed with any Web Browser and an Internet connection, to monitor and analyse all the photovoltaic installations fitted with the SUNGUARD datalogger.

Specifications

- Ethernet and WLAN interface.
- 2 RS232 serial ports.
- RS232/RS485 signal converter.
- Power supply included.
- 4 Gb CompactFlash with pre-installed software to manage the monitoring system.
- Dimensions (L x D x H): 115 x 35 x 155 mm.
- Weight: 0.5 kg.
- Operating temperature: +5 to +50 °C.

Datalogger SUNGUARD BOX SMALL 100K

SUPVI 009 A

Application

- For photovoltaic installations of up to 100 kWp.

Operation

- Reads from the inverter.
- Reads data from the connected communication devices.
- Sends data to the SUNGUARD Internet portal via the ADSL router/modem (Ethernet port) or UMTS/3G SUNGUARD router/modem. The Reserved Area of the portal can be accessed with any Web Browser and an Internet connection, to monitor and analyse all the photovoltaic installations fitted with the SUNGUARD datalogger.

Specifications

- Ethernet interface.
- 1 RS232 serial port and 3 RS485 serial ports to monitor the different types of equipment (for example: inverter, electricity meter, one or more SUNGUARD Sensor Boxes, and SOCOMEC IFB field boxes).
- 24 VDC power supply not included.
- 4 Gb CompactFlash with preinstalled software to manage the monitoring system.
- Aluminium enclosure.
- Installation on DIN rail or on wall.
- Dimensions (L x D x H): 189 x 41 x 130.6 mm.
- Weight: 1.5 kg.
- Operating temperature: -20 to +65 °C.

Communication interfaces

Datalogger SUNGUARD BOX PROFESSIONAL 3 300K

SUPV1 010 A

Application

- For photovoltaic installations of up to 300 kWp.

Operation

- Reads data from the inverter.
- Reads data from the connected communication devices.
- Sends data to the SUNGUARD Internet portal via the ADSL router/modem (Ethernet port) or UMTS/3G SUNGUARD router/modem. The Reserved Area of the portal can be accessed with any Web Browser and an Internet connection, to monitor and analyse all the photovoltaic installations fitted with the SUNGUARD datalogger.

Specifications

- Ethernet interface.
- 1 RS232 serial port and 3 RS485 serial ports to monitor the different types of equipment (for example: inverter, electricity meter, one or more SUNGUARD Sensor Boxes, and SOCOMEC IFB field boxes.)
- Communication port status via LED indicators.
- 24 VDC power supply not included.
- 4 Gb CompactFlash with pre-installed software to manage the monitoring system.
- Aluminium enclosure.
- Installation on DIN rail or on wall.
- Dimensions (L x D x H): 71 x 139 x 152 mm.
- Weight: 1.0 kg.
- Operating temperature: -20 to +75 °C.

Datalogger SUNGUARD BOX BUSINESS 2 > 300K

SUPV1 011 A

Application

- For photovoltaic installations > 300 kWp.

Operation

- Reads data from the inverter.
- Reads data from the connected communication devices.
- Sends data to the SUNGUARD Internet portal via the ADSL router/modem (Ethernet port) or UMTS/3G SUNGUARD router/modem. The Reserved Area of the portal can be accessed with any Web Browser and an Internet connection, to monitor and analyse all the photovoltaic installations fitted with the SUNGUARD datalogger.

Specifications

- Specifically for industrial environments.
- High-speed data processing.
- Ethernet interface.
- 2 RS232 serial ports and 4 RS485 serial ports to monitor different types of equipment (for example: inverter, electricity meter, one or more SUNGUARD Sensor Boxes, SOCOMEC IFB field boxes and dry contact modules).
- 24 VDC power supply not included.
- 1 GB RAM
- 4 Gb CompactFlash with pre-installed software to manage the monitoring system.
- Aluminium enclosure.
- Installation on DIN rail or on wall.
- Dimensions (L x D x H): 264.5 x 69.2 x 137.25 mm.
- Weight: 2.0 kg.
- Operating temperature: -20 to +60 °C.

Power supply: switchboard with surge protection device

POWER SUPPLY DIN 24 V 60 W

SUPVI 012 A

Specifications

- Input voltage: 230 VAC.
- Frequency range: 50-60 Hz.
- Output voltage: 24 V.
- Rated output current: 2.5 A.
- Rated output power: 60 W.
- Overload: 105-160% rated output power.
- Protection: limitation of constant current, automatic recovery on reactivation of normal operating conditions.
- Operating temperature: -20 to +60 °C.
- Humidity: 20 to 90% without condensation.
- Installation on DIN rail.
- Dimensions: 78 x 93 x 56 mm.
- Weight: 0.3 kg.

Switchboard IP65 8 modules: power supply, data line overvoltage discharge, magnetothermal switch

SUNSY 019 A

Switchboard specifications

- Switchboard 8 modules.
- Protection IP65.
- Dissipated power: 16 W.
- Colour: grey RAL 7035.
- Dimensions (L x D x H) 215 x 100 x 210 mm.

Power supply specifications

- Input voltage: 230 VAC.
- Frequency range: 50-60 Hz.
- Output voltage: 24 V.
- Rated output current: 2.5 A.
- Rated output power: 60 W.
- Overload: 105-160% rated output power.
- Protection: limitation of constant current, automatic recovery on reactivation of normal operating conditions.
- Operating temperature: -20 to +60 °C.
- Humidity: 20 to 90% without condensation.
- Installation on DIN rail.
- Dimensions: 78 x 93 x 56 mm.
- Weight: 0.3 kg.

Data line surge protection device specifications

- Network rated voltage: 6 V.
- Maximum network voltage: 8 V.
- Level of Protection: 25 V.
- Rated discharge current: 5 kA.
- Maximum discharge current: 20 kA.
- Current impulse: 5 kA.
- Installation on DIN rail.
- Dimensions (L x D x H) 18 x 68 x 90 mm.
- Earth connection: clamps and DIN rail.
- Clamp section: 0.4-1.5 mm^2.

Magnetothermal switch specifications

- Tripping specifications: C curve.
- Rated current: 10 A.
- Number of poles: 1P+N.
- Breaking capacity: 6 kA.
- Rated AC voltage: 230 V.
- Type of assembly: DIN rail.

Environmental sensors

SUNGUARD SENSOR BOX

SUPVI 016 A

Specifications

- Power supply: 24 VDC.
- Absorption: 150 mA.
- Serial port: RS485.
- Communication protocol: ModBUS.
- Enclosure: polycarbonate with IP68 cable glands (required for connection to environmental sensors).
- Degree of protection: IP65.
- Degree of protection of the sensors: IP65.
- Dimensions (L x D x H): 220 x 140 x 140 mm.
- Connectable sensors:
  - sunlight sensor,
  - module temperature sensor,
  - ambient temperature sensor,
  - wind gauge.
- Inputs:
  - mV input (range 0-10) for radiation sensor,
  - 2-wire or 3-wire PT1 and PT2 inputs for module temperature sensor and ambient temperature sensor,
  - wind gauge input.

Operation

- The Sensor Box SUNGUARD should be connected to the SunGuard Box with a RS485 connection. 24 VDC power supply required (power supply not included).
- Connection to the sunlight sensor and a temperature sensor (module or ambient), allows calculation of the theoretical power of the photovoltaic installation (power of maximum efficiency) and constant and automatic comparison with the power generated by the photovoltaic installation.
- Two or more SUNGUARD SENSOR BOXES can be connected to the same Bus line.

Sunlight sensor

SUPVI 017 A

Specifications

- Range of measurement: 0 to 1,500 W/m².
- Type of sensor: monocrystalline cell (20-24 mm).
- Precision of the sensor: ±5% on a yearly basis.
- Electrical output: 75 mV to 1,000 W/m².
- Sensor: Novaflon laminate and EVA foil.
- Enclosure: Z-profile aluminium corner, sealed connection head.
- Degree of protection: IP65.
- Type of connection: cable 3 m, 2 x 1.0 mm².
- Assembly: 6 mm perforation for screw mounting.
- Dimensions (L x D x H): 55 x 55 x 10 mm.
- Weight: 200 g (cable included).

Operation

- The sunlight sensor, fitted with a monocrystalline cell (13 x 33 mm), measures sun exposure on the basis of the angle and orientation of the photovoltaic modules. It can be used in all weather conditions.
- It should be connected to the Sensor Box SUNGUARD at a maximum distance of 2.5 m.

Module temperature sensor

SUNSY 020 A

Specifications

- Range of measurement: -20 to +150 °C.
- Measuring principle: platinum resistance wire, PT100, 3 wires.
- Precision: Class A.
- Execution: Skin Pad for flat surface measurements.
- Enclosure: aluminium plate, adhesive plate included.
- Degree of protection: IP65.
- Type of connection: cable, 3 m, connection for three conductors.
- Dimensions: 50 x 50 x 1 mm (thickness).

Operation

- The module temperature sensor should be applied on the photovoltaic panel and connected to the SUNGUARD Sensor Box at a maximum distance of 2.5 m.

Ambient temperature sensor

SUPVI 014 A

Specifications

- Range of measurement: -20 to +150 °C.
- Measuring principle: platinum resistance wire.
- Enclosure: Makrolon, Polycarbonate, UV resistance with PG screwing.
- Degree of protection: IP65.
- Type of connection: 2.5m cable, connection for two conductors.
- Dimensions (L x D x H): 52 x 50 x 32 mm.
- Weight 120 g.

Operation

- The ambient temperature sensor should be installed in the shade, in an area protected from water, and connected to the SUNGUARD Sensor Box at a maximum distance of 2.5 m.

Wind gauge

SUPVI 013 A

Specifications

- Power supply voltage: 5 to 24 VDC.
- Maximum current: 15 mA.
- Speed range: 2 to 200 km/h.
- Speed resolution: > 1 km/h.
- Precision: ±2%.
- Repeatability: 0.5%.
- Linearity: ±2%.
- Degree of protection: IP65.
- Operating temperature: -20 °C to +80 °C.
- Dimensions (Ø x h) 123.6 x 138.5 mm.
- Weight: 154 g (wind gauge only), 1.25 kg (wind gauge + 20 m cable).
- Aluminium mounting bracket included.

Operation

- The wind gauge is required in installations based in windy areas in order to monitor rapid reductions in energy production caused by strong gusts of wind.

Router/modem

ROUTER 3G-PRO

SUPVI 0115 A

Specifications

- WAN Wireless:
  - Integrated 3G UMTS module;
  - HSUPA speed (7.2 M Down, 5.76 M Up);
  - supporting EDGE/GPSR Class 12.
- WAN Ethernet:
  - RJ45, 10-100 Mbps, auto MDI/MIDX,
  - Static IP, PPPoE, Client DHCP, PPPTP, L2TP.
- LAN and WiFi:
  - switch, 4 RJ45, 10-100 Mbps, auto MDI/MIDX,
  - WiFi 802.11 b/g/n up to 300 Mbps,
  - WEP, WPA, WPA-PSK, WPA2, WPA2-PSK security,
  - WPS (WiFi Protected Setup),
  - WDS (Wireless Distribution System),
  - WMM (WiFi Multimedia).
- Functionality:
  - always-on, manual 3G WAN connection,
  - remote 3G WAN connection via SMS,
  - DHCP Server, NAT 1toN, Virtual Server, DMZ,
  - SPI Firewall, IP/Service Filter, URL Blocking, MAC control,
  - DoS (Denial of Service) detection and protection,
  - static and dynamic routing, DynDNS,
  - supporting VPN Passthrough for IPSEC, PPTP and L2TP,
  - sending and receiving SMS from WEB interface,
  - local and remote configuration from WEB interface,
  - supporting SNMP, UPnP, Syslog.
- Hardware:
  - removable 3G external antenna (SMA connector),
  - SIM/USIM port,
  - internal WiFi antennas,
  - WPS button,
  - button to return to factory settings,
  - ON-OFF button,
  - external 12 V 1 A power supply.

LCD/LED *display*

SUN-WM-DY-EXT

SUNSY 021 A

Specifications

- External dimensions (L x D x H): 1,500 x 75 x 700 mm.
- Weight: 15 kg.
- Display structure: aluminium.
- Anti-glare screen.
- For outdoor mounting.
- Pixels: High-brightness LED.
- Character size: 65 x 91 mm, size 13 mm.
- Number of lines: 2.
- Number of characters on display: Total 32.
- Number of characters on first alphanumeric line: 16.
- Number of characters on second alphanumeric line: 16.
- LED writing height: 91 mm.
- Type of display: scrolling pages or characters (512 max).
- Visibility: from 1 to 40 m.
- Number of pixels: 1 344.
- Number of colours: 1 (amber).
- Mounting the display: brackets for wall installation, screws and steel mounting.
- Brightness adjustment: automatic by means of a twilight sensor.
- Power supply voltage: 220 V 50 Hz.
- Communication: via RS485, Modbus/LAN Ethernet connection.

Operation

- SUNGUARD LED DISPLAY is an external monitor that is directly connected to the network through the Ethernet port, allowing operating data of the monitored photovoltaic installation to be viewed in real time. Up to 15 variables can be viewed (e.g. total energy, instantaneous power, number of trees saved, CO_2, equivalent number barrels of oil, etc.)

SUNGUARD INFO 22” display

SUNSY 022 A

Specifications

- Screen dimensions: 22” – 16:9 format.
- Display type: LCD.
- Resolution: 1,920 x 1,080 pixels.
- Brightness: 300 cd/m^2.
- Response time: 5 ms.
- Contrast: 1000:1.
- Horizontal viewing angle: 170°.
- Vertical viewing angle: 160°.
- Interface: DVI, HDMI, USB, VGA.
- Communication data: LAN, WLAN, UMTS, GPRS.
- Datalogger: included (SG-VIDEO-DISPLAY).
- PV installation data display: total energy produced, equivalent number of barrels of oil, number of trees saved, CO_2 emissions avoided, daily energy (digital value and operating graph), activation data, maximum power and total energy produced.
- Other display options: PV installations, customer name, company logo, etc.
- Operation: continuous or option to set up customised operation time.
- Mounting the display: wall installation, mounting bracket included.
- For indoor mounting.
- Colour: black.
- Weight: 4.9 kg.

Operation

- SUNGUARD INFO DISPLAY is an internal monitor that is directly connected to the network through the Ethernet port, allowing the operating data of one or more monitored photovoltaic installations to be viewed in real time.

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SUNGUARD INFO 32” DISPLAY

SUNSY 022 A

Specifications

- Screen dimensions: 32” – 16:9 format.
- Display type: LCD.
- Resolution: 1,366 x 768 pixels.
- Brightness: 450 cd/m^2.
- Response time: 5 ms.
- Contrast: 3500:1.
- Viewing angle: 178° max.
- Interface: DVI-D, HDMI, S-Video, VGA.
- Communication data: LAN, WLAN, UMTS, GPRS.
- Datalogger: included (SG-VIDEO-DISPLAY).
- PV installation data display: total energy produced, equivalent number of barrels of oil, number of trees saved, CO2 emissions avoided, daily energy (numerical value and progress graph), activation data, maximum power and total energy produced.
- Other display options: PV installations, customer name, company logo, etc.
- Operation: continuous or option to set up customised operation time.
- Mounting the display: wall installation, mounting bracket included.
- For indoor mounting.
- Colour: black.
- Weight: 11.95 kg.

Operation

- SUNGUARD INFO DISPLAY is an internal monitor that is directly connected to the network through the Ethernet port, allowing the operating data of one or more monitored photovoltaic installations to be viewed in real time.

SUNGUARD CONTROL 42” DISPLAY

SUNSY 022 A

Specifications

- Screen dimensions: 42” – 16:9 format.
- Display type: LCD.
- Resolution: 1,366 x 768 pixels.
- Brightness: 500 cd/m^2.
- Response time: 5 ms.
- Contrast: 3500:1.
- Viewing angle: 178° max.
- Interface: DVI-D, HDMI, S-Video, VGA.
- Communication data: LAN, WLAN, UMTS, GPRS.
- Datalogger: included (SG-VIDEO-CONTROL).
- Use: through a Web Browser.
- PV installation data display: installation name, location, kWp, instantaneous power, performance ratio, instantaneous radiation, operating inverters/installed inverters, active strings/installed strings, date and time of last update.
- Other display options: Independent management of the installation on-line registration.
- Operation: continuous or option to set up customised operation time.
- Mounting the display: wall installation, mounting bracket included.
- For indoor mounting.
- Colour: black.
- Weight: 11.95 kg.

Operation

- SUNGUARD INFO DISPLAY is an internal monitor that is directly connected to the network through the Ethernet port, allowing operating data of up to 24 monitored photovoltaic installations to be viewed in real time.

DIRIS

monitoring of energy efficiency

256 A RANGE

The solution for

- Reduction of operating costs
- Reduction of production loss
- Optimisation of maintenance costs
- Improvement of installation efficiency

Multi-function measuring units

In addition to providing energy production data, a complete supervision system is fundamental to ensure a data log of events and to guarantee the installation's overall operating efficiency.

Depending on the size of the installation, the DIRIS system allows:

- measuring of the energy consumed per building or manufacturing line, with the aim of distributing and optimising energy costs,
- measurement of all the electrical or analogue parameters (e.g. temperature) to verify the correct operation of the installation,
- supervision of the electricity networks through alarms management, continuous monitoring of the distribution parameters and remote control of the electrical equipment,
- analysis of the power supply quality through a detailed breakdown of the harmonics and identification of voltage dips, interruptions, overvoltage and overcurrent of the electricity network,
- communication of all available information via the ETHERNET network (Modbus TCP, Jbus/Modbus RTU over TCP) or RS485 (Jbus/Modbus, Profibus DP).

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Selection guide

	DIRIS A10	DIRIS A20	DIRIS A40/A41	DIRIS A60	DIRIS A80
REQUIREMENTS					
Check that the slots are of the correct size and are operating correctly	•	•	•	•	•
Check energy distribution	•	•	•	•	•
Check and ensure the distribution of energy is correct	-	-	•	•	•
Check and control any disturbance	-	-	•	•	•
Detect and store any hazardous events for the installations	-	-	-	•	•
Monitor the differential currents and earth fault currents depending on the load	-	-	-	-	•
Dimensions	4 modules	96 x 96 built-in	96 x 96 built-in	96 x 96 built-in	96 x 96 built-in

Functions

	DIRIS A10	DIRIS A20	DIRIS A40/A41	DIRIS A60	DIRIS A80
MEASUREMENTS					
Currents, Voltages, Frequency, Active, reactive and apparent power, Power factors	•	•	•	•	•
Power forecasting	-	-	•	•	•
Voltage/current imbalance; Tangent φ	-	-	-	•	•
Temperature	•	-	1 to 4 option	1 to 4 option	
Currents, voltages and average frequency	-	-	•	•	•
Average power	-	-	•	•	•
$I_{\Delta N}$ and I_{PE} currents	-	-	-	-	•
SOLUTIONS FOR ENERGY MANAGEMENT					
Energy meters (cl. 0.5S IEC 62053-22; cl. 2 IEC 62053-22)	•	•	•	•	•
Impulse meters	1*	-	2 to 6 option	2 to 6 option	-
Load curve	-	-	•	•	•
QUALITY ANALYSIS AND EVENT DETECTION					
THD 3U, 3V, 3 I/In	Up to level 51	Up to level 51	Up to level 63	Up to level 63	Up to level 63
Individual harmonic components up to level 63	-	-	•	•	•
Overvoltage, voltage dips, interruptions	-	-	-	•	•
Storing of the RMS 1/2 period curve	-	-	-	•	•
Alarm output	1*	1* optional	2 to 6 option	2 to 6 option	1 to 2 option
HISTORY LOG OF MEASUREMENTS AND EVENTS					
Load curve	-	-	Optional	•	•
Events/Alarm	-	-	-/•	•/•	•/•
Average maximum power	kW	kW	•	•	•
Average maximum current	•	•	•	•	•

** 1 configurable*

Standard functions

DIRIS A10


DIRIS 791 B

- Multi-function measurement and metering.
- THD of voltages and currents up to level 51.
- Programmable hour counter.
- Alarm management.
- RS485 Jbus/Modbus communication.
- Double tariff function.
- 4 DIN modules.
- Conforms to UL 61010-1.

DIRIS A20


DIRIS 744 A

- Multi-function measurement and metering.
- THD of voltages and currents up to level 51.
- Programmable hour counter.
- Alarm management.
- RS485 Jbus/Modbus communication.
- Additional module options.
- 96 x 96 mm casing.
- Conforms to UL 61010-1.

Standard functions (continued)

DIRIS A40/A41


DIRIS 743 A

- Multi-function measurement and advanced metering.
- Individual harmonics up to level 63.
- RS485 communication (Jbus/Modbus and Profibus-DP) and Ethernet (Modbus TCP and Jbus/Modbus over TCP).
- Additional module options.
- Alert management.
- Indication of power forecasting.
- 96 x 96 mm casing.
- Conforms to UL 61010-1.

DIRIS A60


DIRIS 824 A

- Same functions as DIRIS A40.
- Average power load curves (P, Q, S).
- Detection of overvoltage, voltage dips and interruptions.
- Overcurrent detection.
- History of RMS 1/2 period curves associated with events.
- Tangent φ.
- Voltage and current imbalance.

DIRIS A80


DIRIS 876 A

- Same functions as DIRIS A60.
- Permanent monitoring of differential currents and earth leakage.
- Dynamic alarm threshold as a function of the load.


ALTA TENSIONE
Volt
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Customised solutions

SOCOMEC uses its know-how to design and develop customised solutions for the management of energy production and storage when standard solutions do not meet the individual needs of customers, requiring projects that are tailor-made for each facility.

SUNSYS SHELTER is a tailor-made integrated solution that is installed between the photovoltaic park and MV (medium voltage) network for the conversion of solar energy.

SUNSYS STORAGE is an innovative energy storage solution that maximises the output of photovoltaic facilities and integrates them into the electricity grid.

SUNSYS Shelter

integrated solution in a shelter or container

The solution for

> Photovoltaic parks
> Large photovoltaic shelters

A perfect tailor-made solution

The SUNSYS Shelter solution is a complete infrastructure installed between the photovoltaic modules and MV network, suitable for specific customer requirements, with quick and easy installation and start-up.

The system includes:

- SUNSYS P photovoltaic inverters with modular architecture and DPC (Dynamic Power Control) function to optimise the efficiency of the photovoltaic installation, even at very low levels of sunlight,
- low-voltage protection enclosure including boxed magnetothermal switches or, alternatively, protection with fuses, insulation controller, surge protection devices, thermometric measurement switchboard for transformer protection and certified current transformers for measurements,
- network interface device,
- durable resin enclosure, for meters including the certified energy meter, conductors and accessories, placed close to the inverter's mains box,
- medium-voltage protection enclosure:
  - made with prefabricated NMG cells or similar,
  - 24 kV rated voltage,
  - 50 Hz/1 rated withstand voltage minimum efficiency value 50 kV,
  - operating voltage 20 kV,
  - rated frequency 50/60 Hz,
  - rated current of the bars 400 A,
  - admissible short-term rated current 16 kA,
  - peak rated current 40 kA,
  - switch breaking capacity at rated voltage 16 kA,
  - short-circuit rated duration 1 s.

  Also includes isolation box with fuses and transformer isolation cell with break switch.
- high output three-phase medium voltage transformer in epoxy resin, with power of 630/800/1,000/1,250 kVA (depending on the number of inverters), completed by three PT100 probes and a digital thermometric measurement panel. The main technical specifications are:
  - Vn1 primary voltage: 15/20/25 kV (according to the network voltage value),
  - Vn2 secondary voltage: 0.28 kV,
  - Dyn11 group
  - frequency: 50 Hz,
- high-efficiency, three-phase auxiliary server transformer in epoxy resin, with power of 20/40/60 kVA (depending on the number of inverters), with the following main specifications:
  - V_{n1} primary voltage: 0.40 kV,
  - V_{n2} secondary voltage: 0.28 kV,
  - frequency: 50 Hz.
- air conditioning: three-phase air-conditioner with 15/20 kW refrigerators with high-precision, free-cooling operating system,
- monitoring system.

Specialist service for your projects

The The SOCOMEC pre-sales service personnel will help develop a tailor-made solution for your installation site, optimising efficiency and reliability, as well the output of your investment.
Our engineers will design, develop and configure the project in collaboration with you - the customer - in mind.
Our technical assistance service is on-hand to commission and activate the site, configure the system and if necessary provide customer training

Quality of materials

SOCOMEC has selected partners that supply high-quality European-manufactured materials. The materials are designed to last in critical operating and environmental conditions and to guarantee continuous operation throughout the entire life of the installation.
The electrical dimensioning of components and the thermal adaptation of technical rooms ensure that components operate in favourable conditions and maximise their lifetime.

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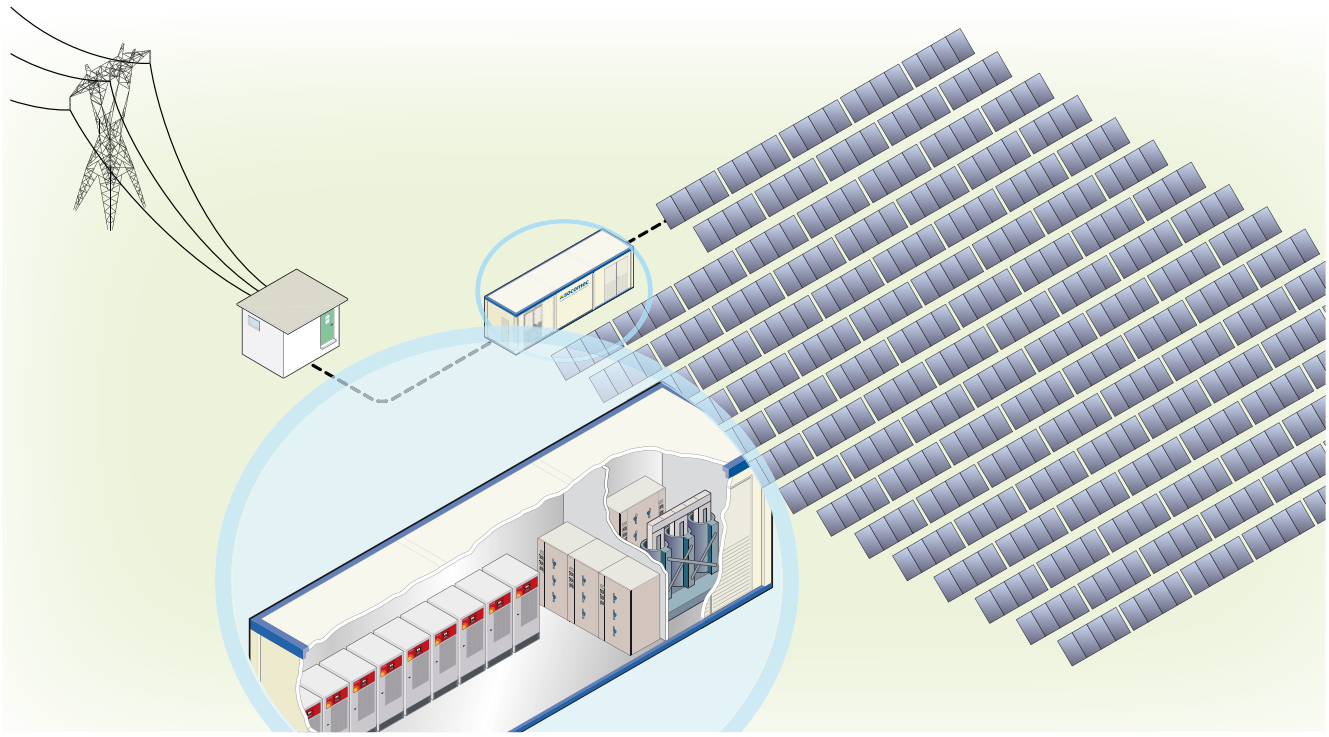
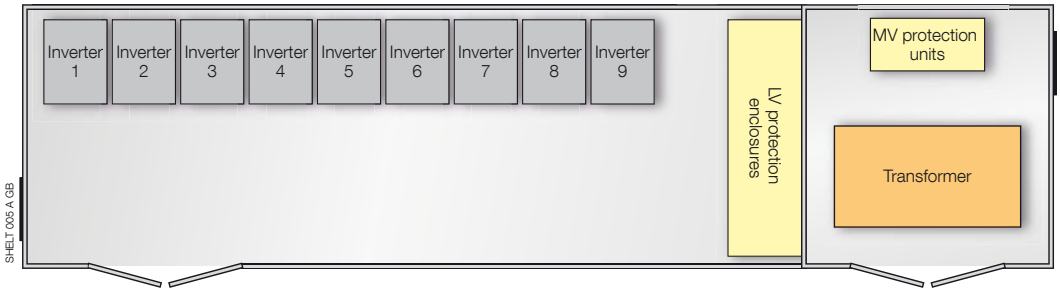
Example of application: solar park


SHELT 004 A

An example of the internal layout of SUNSYS Shelter



SHELT 005 A GB

APPLI 560 A

APPLI 561 A


APPLI 562 A

SUNSYS ESI (Energy Storage Industrial)

Three-phase storage system

new

The solution for

> Maximising energy management

Advantages

97% MAXIMUM EFFICIENCY

WARRANTY 5 YEARS

MADE IN EUROPE

Socomec offers an innovative storage solution, thanks to over 40 years of experience in energy storage and conversion.

SUNSYS STORAGE is the solution for maximising the output from renewable energy installations, easily integrating them into the existing electricity network and into future microgrid systems.

SUNSYS STORAGE is a modular “hot swap” scalable system, with power from a few kW to MW extendable through different parallel units, which are set up in a mixed configuration with the SOCOMEC photovoltaic inverter and different battery technologies depending on the applications to be covered.

With the totally innovative specifications of SUNSYS STORAGE, SOCOMEC is one of the first manufacturer in the world able to satisfy different applications with one single product (PV conversion, dynamic demand response, peak shaving, load shifting,outage protection).

The solution for optimum energy management

- Energy shifting, peak shaving and grid stabilising (active and reactive power) functions.
- Modular, flexible and scalable solutions.
- Highly efficient.
- Compatible with different battery technologies depending on the application (e.g. lead-acid, lithium-ion).
- Can be integrated with existing photovoltaic installations.
- Simple and rapid configuration.
- Easy to configure backup thanks to the scalable battery modules.
- Power and backup adaptable to the installation extensions.

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Technical data of models with transformer

	SUNSYS-ESI-33TR	SUNSYS-ESI-66TR	SUNSYS-ESI-100TR
INPUT (DC)			
Battery voltage range	450 to 850 VDC		
Number of independent convertors	1	2	3
Maximum battery discharge current	80 A	160 A	240 A
Maximum battery charge current	80 A	160 A	240 A
OUTPUT (AC)			
Power rating	33,300 W	66,600 W	100,000 W
Maximum power	36,600 W	73,400 W	110,000 W
Apparent power rating	33,300 VA	66,600 VA	100,000 VA
Maximum apparent power	36,600 VA	73,400 VA	110,000 VA
Output rated voltage	400 Vrms(1) 3ph		
Output voltage range	320 to 480 Vrms(1) 3ph		
Output rated frequency	50 Hz(1)		
Output frequency range	47.5 to 51.5 Hz(1)		
Rated output current	48 Arms	96 Arms	144 Arms
Maximum output current	53 Arms	106 Arms	160 Arms
Total harmonic distortion of current	< 3%		
Topology	Single conversion Output transformer 50 Hz		
LEVEL OF EFFICIENCY			
Maximum efficiency	97%		
EU efficiency	96%		
GENERAL DATA			
Environmental category	Non-air-conditioned internal environments		
Environmental degree of protection	IP 20		
Operating temperature range	-5 °C to +60 °C		
Rated temperature range	-5 °C to +45 °C		
Storage temperature range	-5 °C to +60 °C		
Relative humidity range	5% to 95% without condensation		
Cooling system	Smart cooling		
Sound emission	< 60 dB 1 m from inverter	< 64 dB 1 m from inverter	
Altitude range of use	0 to 1,000 m		
Dimensions (L x D x H)	600 x 795 x 1,400 mm		1,200 x 795 x 1,400 mm
Weight	330 kg	525 kg	770 kg

(1) The accepted tolerance depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.


SUNSY 054 A


SUNSY 056 A

SUNSYS ESI (Energy Storage Industrial)

Three-phase storage system

Technical data of transformerless models

	SUNSYS-ESI-66TL	SUNSYS-ESI-100TL
INPUT (DC)		
Battery voltage range	450 to 850 VDC	
Number of independent convertors	2	3
Maximum battery discharge current	160 A	240 A
Maximum battery charge current	160 A	240 A
OUTPUT (AC)		
Power rating	66,600 W	100,000 W
Maximum power	73400 W	110,000 W
Apparent power rating	66,600 VA	100,000 VA
Maximum apparent power	73,400 VA	110,000 VA
Output rated voltage	280 Vrms(1) 3ph	
Output voltage range	224 to 336 Vrms(1) 3ph	
Output rated frequency	50 Hz(1)	
Output frequency range	47.5 to 51.5 Hz(1)	
Rated output current	137 A rms	206 A rms
Maximum output current	152 A rms	227 A rms
Total harmonic distortion of current	< 3%	
Topology	Single conversion Transformerless	
LEVEL OF EFFICIENCY		
Maximum efficiency	98%	
EU efficiency	97.53%	
GENERAL DATA		
Environmental category	Non-air-conditioned internal environments	
Environmental degree of protection	IP 20	
Operating temperature range	-5 °C to +60 °C	
Rated temperature range	-5 °C to +45 °C	
Storage temperature range	-5 °C to +60 °C	
Relative humidity range	5% to 95% without condensation	
Cooling system	Smart cooling	
Sound emission	< 64 dB 1 m from inverter	
Altitude range of use	0 to 1,000 m	
Dimensions (L x D x H)	600 x 795 x 1,400 mm	
Weight	155 kg	190 kg

(1) The accepted tolerance depends on the country of installation and the regulations in force.
(2) Setup according to the requirements of the electricity supplier.

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The high-performance industrial storage solution

SUNSYS LITHIUM

- High rapid discharge performance (peak shaving applications).
- High energy density.
- Highly compact.
- Easy scalability.
- Easy to maintain (hot-swap plug-in).
- Long life cycle.
- Maintenance-free.
- Zero environmental impact.

	SUNSYS-LT-33	SUNSYS-LT-42
Technology	Lithium-ion	
Rated capacity	33 kWh	42 kWh
Rated voltage	616 V	784 V
Rated load time:	4 h	
Environmental degree of protection	IP 20	
Load temperature range	-0 °C to +40 °C	
Discharge temperature range	-20 °C to +60 °C	
Recommended operating temperature	25 °C	
Dimensions (L x D x H)	600 x 795 x 1,400 mm	600 x 795 x 1,925 mm

SUNSYS LEAD

- High performance (e.g. maintaining battery charge, high number of charge/discharge cycles, etc.)
- High energy density.
- Solution suitable for fast charge systems.
- Suitable for installations in harsh environments.
- Highly compact.
- Easy to service.
- No maintenance contract.

	SUNSYS-LA-22
Technology	Lead
Rated capacity	22 kWh
Rated voltage	528 V
Rated charging time	4 h
Environmental degree of protection	IP 20
Charging temperature range	-0 °C to +40 °C
Discharge temperature range	-20 °C - +60 °C
Recommended operating temperature	25 °C
Dimensions (L x D x H)	600 x 795 x 1,400 mm


ATEX

Equipment

A photovoltaic installation is composed of photovoltaic modules, one or more inverters, and isolation and protection devices.

The SOCOMEC isolation and protection solutions provide:

- total safety during maintenance and in the event of fire or electrical shock,
- protection from reverse-current of the photovoltaic modules and surge voltages caused by lightning.

Depending on the photovoltaic module technology and the size of the installation, the isolation and protection devices can be integrated into cabinets or photovoltaic string control enclosures.

Load-break switches
SIRCO PV

The use of dedicated switches is necessary to ensure electrical disconnection during maintenance operations or for cutting off the power in emergencies involving fire or electric shock.

These components must be installed in accordance with the architecture at each operational level. When disconnecting a photovoltaic string or the DC side of an inverter, only SIRCO PV devices are capable of:

- isolating the high DC voltages that occur in this context
- disconnecting, under loads of thousands of volts and in total safety, the high DC currents that vary according to daily solar radiation.

SIRCO MC PV 25 and 40 A

Function

SIRCO MC PV devices are manually operated multipolar load break switches. They ensure opening/closing under load and safely disconnect any low voltage electrical circuit for PV systems.

Compliance with standards

- IEC 60947-1.
- IEC 60947-3.
- IEC 60364-7-712, NF C 15-100 and UTE C 15-712-1 Guideline.
- IEC 60364-4-410.

General characteristics

- Modular and flexible device.
- AC/DC device for complete isolation of the inverter thanks to the simultaneous cut-off of the DC current input and AC current output.
- Fully visible opening.
- Double break per phase with arc fragmentation system.
- Rail mounting, panel or modular panel with 45 mm front cut-out.
- 600 and 1,000 VDC versions.

SIRCO MV PV 63 to 160 A

Function

SIRCO MV PV devices are manually operated multipolar load break switches.

They ensure opening/closing under load and safely disconnect any low voltage electrical circuit for PV systems.

Compliance with standards

- IEC 60947-3.
- EN 60947-3.
- VDE 0660-107 (1992).
- IEC 60364-4-410, IEC 60364-7-712, NF C 15-100 and UTE C 15-712-1 Guideline.

General characteristics

- Modular device.
- Fully visible opening.
- Rail mounting, panel or modular panel with 45 mm front cut-out.
- Up to 1,000 V DC.

SIRCO PV 100 to 1250 A

Function

SIRCO PV devices are manually operated multipolar load break switches.

They ensure opening/closing under load and safely disconnect any low voltage electrical circuit for PV systems.

Compliance with standards

- IEC 60947-3.
- EN 60947-3.
- VDE 0660-107 (1992).
- IEC 60364-4-410, IEC 60364-7-712, NF C 15-100 and UTE C 15-712-1 Guideline.

General characteristics

- Patented disconnect technology.
- Fully visible opening.
- Panel mounting.
- Up to 1,500 V DC.

SIRCO MOT PV 200 to 630 A

Function

SIRCO MOT PV devices are multipolar load break switches.

They ensure opening/closing under load and safely disconnect any low voltage electrical circuit for PV systems.

Compliance with standards

- IEC 60947-3.

General characteristics

- 2 stable positions (I, 0).
- Fully visible disconnection.
- AUTO/MANU operating modes.
- Padlocking in position 0 (I optional).
- Up to 1,000 V DC.
- IP20 devices and accessories.
- SIRCO MOT PV have up to 3 and 4 poles from 200 to 630 A.
- SIRCO MOT PV have a manual emergency command.

SIRCO DC UL98B 100 to 2000 A

Function

SIRCO DC UL98B devices are multipolar load-break switches for on-load breaking and safety disconnection of 600 and 1000 VDC solar PV photovoltaic circuits. They are suitable for use in photovoltaic installations in compliance with Article 690 of the NEC (American National Electric Code) and are extremely durable. They are tested and approved for use in a variety of applications and specifically designed for bipolar and floating applications with ground conductor. 3 poles in series allow the disconnection of up to 600 VDC and 4 poles in series up to 1000 VDC.

Compliance with standards

- NEC Art. 690 2011 Edition.
- UL 98B, Guide WHVA, file E346-418.
- CSA 22.2 no. 4, class 4651-02, file 112964.
- IEC 60947-3.

General characteristics

- Patented disconnect technology.
- Fully visible opening.
- Up to 1,000 V DC in accordance with UL 98B.
- Suitable for use in accordance with NEC Art. 690 2011 Edition.

SIRCOVER PV 200 to 630 A

Function

SIRCOVER PV devices are manually operated changeover switches.

They ensure source inversion or changeover under load of two photovoltaic installation circuits.

Compliance with standards

- IEC 60947-3.

General characteristics

- 3 stable positions (I, 0, II) with changeover under load.
- Fully visible disconnection.
- Up to 1,000 VDC
- IP20 devices and accessories.
- On models with 3 stable positions (I-0-II), the SIRCOVER PV devices are 3 or 4-pole from 200 to 630 A. They can be fitted in steel or polyester enclosures.
- SIRCOVER PV devices are available with direct front or external operation.

Fuses, PV fuse bases

RM PV 20 to 50 A

Function

RM PV are disconnectors with unipolar or bipolar modular fuses for 10 x 38 and 14 x 51 cylindrical fuses. They ensure safe disconnection and protection against overcurrents in all PV electrical circuits on the DC current side.

RM: fuse bases without signalling for fuses without striker.

Compliance with standards

- IEC 60947-3.
- IEC 60269-2-1.
- IEC 60269-1.
- IEC 60269-2.
- NF EN 60269-1.
- NF C 63-210.
- NF C 63211.
- VDE 0636-10.
- DIN 43620.

General characteristics

- Rated voltage 1,000 VDC.
- Multipolar and simultaneous disconnection.
- High dielectric withstand.
- Modular DIN 45 mm cut-out.
- Self-extinguishing thermoplastic material.
- High-capacity connection.

PV 32 to 600 A fuse bases

Function

SOCOMEC fuse bases are fixed, unipolar or multipolar supports for knife-edge fuses.

Compliance with standards

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

General characteristics

- High dielectric withstand.

gPV fuses 1 to 600 A

Function

SOCOMEC PV fuses protect the system against inverse overcurrents that can occur in photovoltaic installations. They are available in both cylindrical and blade form.

Compliance with standards

- IEC 60269-6.
- IEC 60269-1.
- IEC 60269-2.
- NF EN 60269-1.
- VDE 0636-10.

Performance

- Breaking capacity up to 1,000 VDC.
- Extensive operating range, suitable for the small over-currents typical of PV installations.
- Simple, reliable discrimination.

Reliability

- Total protection over time guaranteed by its simple, reliable design and operation (Joule effect).

Safety

- The energy released during a short circuit is contained within the sealed fuse cartridge.

SURGYS PV SURGE PROTECTION DEVICES

Photovoltaic panels and inverters account for a sizeable proportion of total investment.
Depending on its architecture, the surface of a photovoltaic field can act as a large antenna and can easily capture potentially damaging overvoltages in a storm.
The use of SURGYS surge protection device, specially designed for PV installations, can reduce this risk considerably. The specific design of these surge protective devices makes them fully capable of controlling the discharge of the transient current after a strike and disconnecting the DC currents, even at end of life.
The specific PV surge protective devices protect the panels and inverters against overvoltages of atmospheric origin.

SURGYS G51-PV

Function

The SURGYS G51-PV surge protective device is designed to protect your photovoltaic against atmospheric voltage surges.
It complies with the UTE 61-740-51 test guidelines and the UTE 15-712 installation guidelines of July 2010.

Compliance with standards

- NF EN 61643-11 Class 2 tests.
- IEC 61643-1 Class 2.
- UTE C 61-740-51.
- UTE C 15-712-1 (2010).

General characteristics

- Type 2 Surge Protective Device.
- Available with protection from 500 VDC to 1,500 VDC.
- Maximum discharge current 40 kA.
- Monobloc base.
- Common mode/differential mode protection.
- Extractable remote signalling contact (depending on model).
- End of service life indicator.
- Plug-in module.

SURGYS D40

Function

The SURGYS D40 surge protective device is designed to ensure the protection of LV distribution circuits and equipment against transient overvoltages.
It acts against the overvoltages produced by industrial processes or lightning.

Compliance with standards

- NF EN 61643-11 Class 2 tests.
- IEC 61643-1 Class 2.

General characteristics

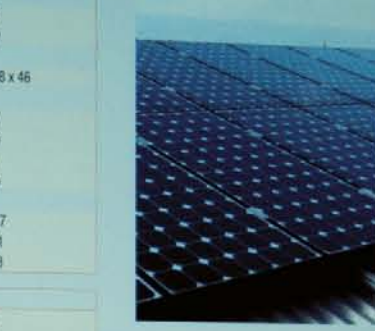
- Type 2 Surge Protective Device.
- Maximum discharge current 40 kA.
- Common mode/differential mode protection.
- Monobloc base.
- Extractable remote signalling contact.
- End of service life indicator.
- Plug-in module.
- Differential mode versions (only in TT and TN neutral systems).
- Fuse holder recommended: RM.

structure amorphous
rocrystalline modules

	Tandem structure amorphous and microcrystalline
(%)	128
	9
DATA	
x W) (mm)	1400 x 1000 x 46
CHARACTERISTICS	
ge Voc (V)	59,8
nt Isc (A)	3,45
volatge Vpm (V)	45,4
current Ipm (A)	2,82
OEFFICIENTS	
	-0,3
	0,07
	-0,24
eatures	
	5°
	14°
kWp)	29.18 - Nr. 228 modules installed
	319,2

High efficiency monocrystalline modules

Model	High efficiency monocrystalline
GENERAL	
Nominal output (Wp)	210
Module efficiency (%)	16,9
MECHANICAL DATA	
Dimensions (L x H x W) (mm)	1559 x 798 x 46
ELECTRICAL CHARACTERISTICS	
Open circuit voltage Voc (V)	47,7
Short circuit current Isc (A)	5,75
Maximum power volatge Vpm (V)	40
Maximum power current Ipm (A)	5,25
THERMAL COEFFICIENTS	
α Pm (%/°C)	-0,287
α Isc (%/°C)	0,061
α Voc (%/°C)	-0,38
Socomec plant features	
Azimuth	5°
Tilt	14°
Nominal Power (kWp)	36,96 - Nr. 176 modules installed
Surface (m²)	219,2



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NON APRIRE

Grid Tie Solar Inverter

Service, Training and Technology

Customer service

Training

CIM

Commissioning Inspection and Maintenance

APPLI 143 A

The solution for

- Service sector
- Industry
- Telecommunications
- Medical
- Etc.

For the availability of your energy needs

- As continuous energy supply in the availability of electrical energy is so important, service quality is just as important as product quality.

The experience of one single supplier for design, construction and maintenance.

- SOCOMEC has been developing products and services directed towards guaranteeing the quality and continuity of our customers' power supplies since 1968.
- Our technicians and engineers are on-hand for all your requirements, placing their expertise in electrical components, operating logic and industrial IT at your service.

Specialists at your service.

- The ***CIM service*** (Commissioning Inspection and Maintenance) is strategically present worldwide with over 250 SOCOMEC specialists, engineers and maintenance technicians at your disposal for:
- preventative maintenance,
- remedial maintenance,
- 24/7 availability,
- consultancy, design and implementation of plant modifications and updates.

Giving you the best service

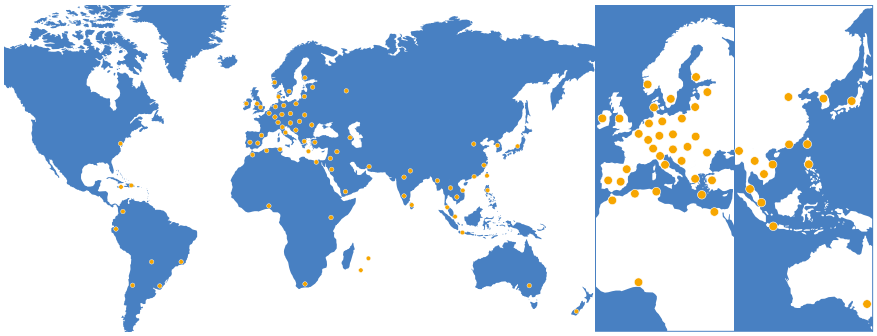
We know you need high quality energy that is available at all times. To provide this to you, our expert staff are at your disposal. In addition, your entire equipment base is managed by our customer service information system that offers even more monitoring of your installation's requirements.

Availability of parts

Readily available genuine spare parts and components guarantee that any faulty equipment can be rapidly and efficiently retrieved, while maintaining performance and reliability.

Proximity

Our widespread presence both nationally and worldwide ensures there will always be specialist technicians close to your site, for a fast, efficient response.



CARTE 021 A

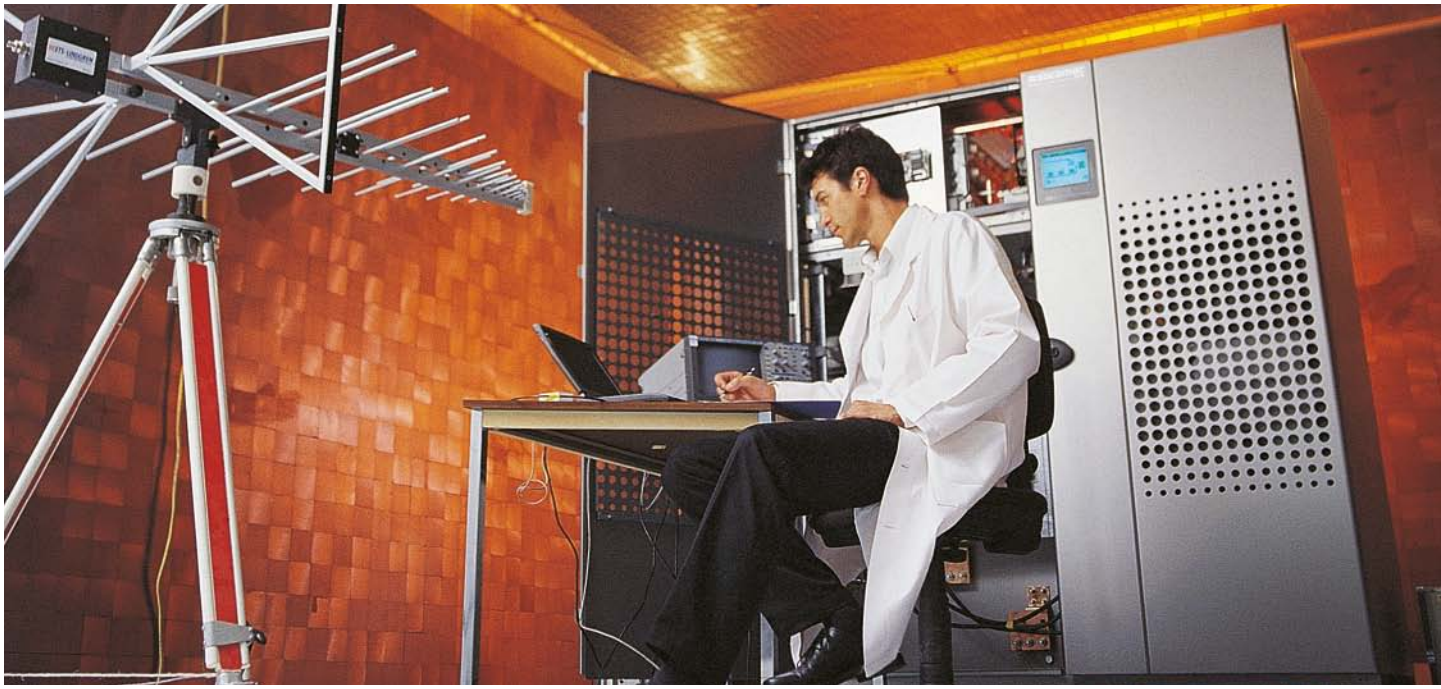
Guaranteed response time

Our customer service at your disposal: proximity, specialist personnel and spare parts in stock mean that we can contractually guarantee a response time up to and including 24/7 availability, depending on your operational constraints.

Respecting the environment

As a manufacturer, we are dedicated to protecting the environment and actively participate in the development of related laws and legislation.

This means that all our components and spare parts as well as their recycling are in full conformity with environmental legislation currently in force.



APPLI 112 B

CIM maintenance contracts

Preventative maintenance

Every piece of equipment, even the protection devices that supply power to your most critical installations, requires scheduled maintenance so they can operate as well as possible.

Preventative maintenance prevents malfunctioning and extends the life of your equipment. Consequently, the mean time between failures (MTBF) of your installation is improved.

Periodic visits

Depending on the type of contract, periodic visits are organised for:

- mechanical inspection,
- electrical inspection,
- dust removal,
- battery inspection,
- software updates,
- electronic checks,
- environmental checks.

A report is issued each time repairs are carried out.

Corrective maintenance

As your installation gets older, the likelihood of malfunctioning will increase, as will the need for specialist repairs.

Your maintenance contract allows you to benefit from:

- rapid, priority response,
- a choice of response times depending on your operational needs: within 6 hours or the next working day,
- assistance 24 hours a day, 365 days a year (depending on the contract),
- guaranteed response time.

You will be issued with a Preventative Maintenance Visit (PMV) report each time repairs are carried out.

Assistance on request

We offer various services, in addition to those set out in the contract, to meet your current and future needs throughout the lifecycle of your installations:

- replacement of consumables (battery, fans, condensers),
- moving equipment,
- assessment of industrial emissions,
- UPS leasing,
- implementation of turnkey installations,
- consultancy and expert advice for high-quality facilities,
- measurements and tests with and without charging racks,
- high-quality thermographic audit of distribution,
- harmonics verification,
- additional training courses for facility operators.

Management of operating costs

Our various contract packages give you the option to choose the services that suit your needs (parts, labour, response times), giving you total control of your operating costs with no surprises on your invoice.

Call centre

The ***CIM*** call centre offers priority access to customers with a maintenance contract.

It provides technical support to protect your high-quality power supply equipment.

A team of specialist electricians, technicians and IT engineers is at your disposal to respond to all your operational queries.

Personalised solutions

We tailor our services around your operating constraints. This means that for each of your contracts, we provide you with personalised solutions to meet your expectations.

Our solutions meet your needs by protecting and ensuring the electrical supply to your sensitive applications (offices, automation, servers, data-processing centres, NICT, security, etc.).

CIM Thermo(1)

Thermal technology for precise monitoring of the electrical installation.

Our ***CIM Thermo*** service consists of checking the components of your electrical facility with specialist equipment (Thermal Imaging Camera). It is therefore possible to perform a preventative diagnosis of the risk of faults by analysing the temperature (thermographic control) of the components including:

- transformers,
- electrical switchboards,
- rephasing systems
- distribution cables,
- joints,
- connections,
- clamps,
- terminals,
- protection devices, isolators, fuses, circuit breakers,
- UPS, photovoltaic inverters and converters,
- batteries,
- loads (motors and actuators, lighting).

APPLI 193 A

Transformer inspection

DEFYS 114 A

Inspection of UPS, photovoltaic inverters and converters

APPLI 195 A

Switchboard inspection

A preventative diagnosis service from a specialist manufacturer

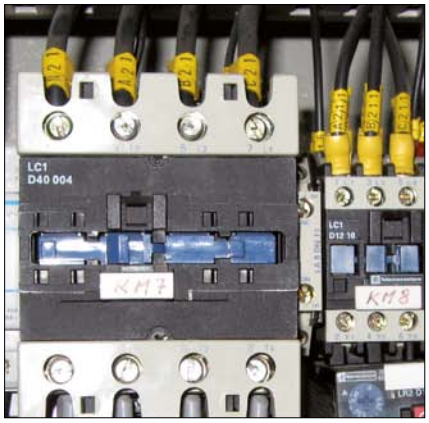
Maximising the overall effectiveness of an installation means above all optimising its availability by increasing its reliability (MTBF - Mean Time Between Failures) and reducing repair times (MTTR - Mean Time To Repair).

Thermography allows the checking of active installations and rapid identification of critical situations affecting the energy distribution and electrical components (loose or corroded connections, load imbalance, overloads, presence of harmonic currents).

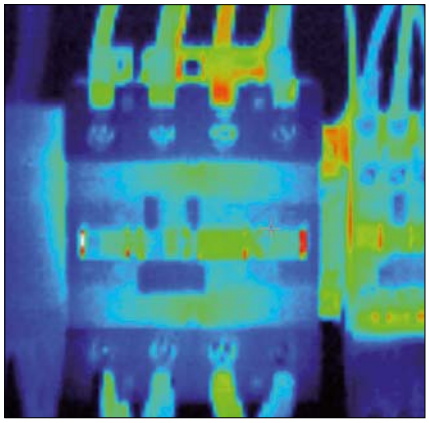
Specialist assistance from qualified technicians

SOCOMEC technicians are specially trained and certified, working in compliance with standards and procedures established by international authorities.

CIM 008 A



CIM 009 A



Infrared thermography

Thermography, also known as thermal imaging, is a technique that allows detection of infrared radiation produced by hot objects.

Infrared cameras are used to detect and photograph this radiation, enabling non-invasive analysis of the temperature of an object with a high level of precision (up to 1/10th of a degree).

(1) Please check availability of this service depending on your area.

CIM Thermo(1)

Infrared thermographic camera

The particular model of thermal camera used by our technicians to inspect components stores images and sequences for comparison with future checks.

The thermal camera identifies the critical components requiring immediate maintenance or simple verification.

APPLI 197 A

Application software for the thermographic analyser

The thermal images are displayed using thermographic software.

By comparing the various images, customised reports can be created for further analysis.

Temperature gradients, displayed as graphs and tables, facilitate future checks and the creation of reports identifying each critical component.

Key benefits that make the difference

The ***CIM Thermo*** thermography service offers the following benefits:

- Preventative:
  - fault prevention,
  - highly effective diagnostics thanks to the checking of cable connections and terminals, which is impossible using conventional visual checks,
  - maximum diagnostic reliability thanks to total system control, from the main distribution panel to the smallest functional details,
  - greater safety for personnel, users and customers.
- Reduction of costs:
  - reduction of costs caused by faults and power loss, which are prevented by ensuring the efficiency and effectiveness of installations,
  - reduction of costs caused during installation downtime.
- Uninterrupted power supply:
  - scheduled stop times and targeted maintenance interventions,
  - uninterrupted power thanks to checks carried out with the facility during operation, without cutting off the power supply.

SOCOMEC proposes a complete end-to-end diagnostic service:

- Analysis: visual check of the environment, installation and equipment,
- fault identification: readings taken from the equipment using thermographic cameras to identify and quantify faults,
- Solutions: identification of defective components and improvement solutions,
- Repairs: implementation of proposed solutions,
- Measurement of results: effectiveness of applied solutions checked by comparing them with measurements taken before maintenance using dedicated software programme.
- Report: definitive technical reports indicating the list of identified critical points, the state of the installation and the recommended frequency of monitoring.

Contract options

SOCOMEC proposes a variety of contract options to suit your needs:

- general: for the detection of faults and critical points,
- monitoring: for checking the effectiveness of maintenance procedures,
- periodic: for the monitoring of critical areas.

COUV 142 A

(1) Please check availability of this service depending on your area.

CIM leasing(1)

Inverter leasing: your temporary solution for high-quality power supply

Need high-quality, uninterrupted electrical energy for a limited period of time (weeks or months)? Then leasing is the most economical solution for your short-term needs.

Leasing enables you to draw on the global expertise of SOCOMEC, not only ensuring inverter availability, but also providing you with an all-inclusive service to guarantee a clean, uninterrupted energy supply.

The user chooses the required power and lease term, which can be extended as needed.

You no longer need to spend time and resources on inverter management: the CIM service (Consulting, Inspection and Maintenance) will take care of everything, from activation to maintenance, including removal at the end of the contract.

Applications

- Data processing,
- Event-based technical platforms.
- Sound and lighting consoles,
- Industrial processes.

Events

- Temporary work phases,
- Unforeseen damage, accidents, etc.,
- Exhibitions and shows,
- When investment is not possible.

Specific needs

To activate the lease, simply specify:

- the required power,
- the number of inverters,
- the lease period,
- the site/address of installation,
- any additional options,
- related services.

Standard services included in the lease

- Environmental consultancy: ventilation, positioning, electrical distribution and protection ratings,
- Transport,
- Commissioning,
- Call centre (freephone),
- Next-day repair service,
- Inverter dismantling and removal.

Additional services

- On-site maintenance,
- Installation and cabling,
- Maintenance response within 6 hours or the next working day,
- 24-hour on-call maintenance,
- Training for operational personnel.


APPLI_135_A

Advantages

- Reduced investment: solution supplied with a reduced operating budget, with no obligation to purchase,
- Quick: rapid delivery and commissioning,
- Simple: leasing, transport, commissioning and return of materials included,
- Ready: priority response from the SOCOMEC after-sales service in the event of faults,
- Compliance with legislation: guaranteed by SOCOMEC,
- Tax benefits: leasing fees can be allocated to an operating budget.

Our specific leasing packages

Long-term leasing

We provide all the necessary equipment for long-term leasing requirements.

SOCOMEC also provides consultancy on environmental issues (ventilation and space disposal, cable sections and protection devices, etc.). SOCOMEC will also take charge of installing the associated equipment in the designated area before commissioning. This procedure, carried out according to applicable regulations and safety legislation, ensures efficient operation of the system.

The solution of the installed system means you can select:

- power,
- backup,
- optional accessories,
- related services.

Contract flexibility

The contract can be modified:

- there is no maximum leasing term,
- the leasing term can be extended during the contract.

APPLI205_A

(1) Please check availability of this service depending on your area.

The refresher course programme

SYDIV 032 A

The refresher course programme is aimed at SOCOMEC personnel and commercial partners.

SOCOMEC designers, contractors, surveyors, architects, energy managers, retailers, wholesalers and commercial partners		Designers, contractors, maintenance staff, project leaders and managers		Area managers, sales reps, agents, pre-sales technical staff and sales force
BASIC	ADVANCED	SERVICE	ADVANCED	SALES
BASIC Scheduled	**ADVANCED** Scheduled or on request	**SERVICE** On request	**ADVANCED** Scheduled or on request	**SALES** Scheduled

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A complete training programme

Training in 3 phases

The technical course is divided into three phases providing you with:
- complete knowledge of SOCOMEC's sales products and equipment,
- the ability to understand customer needs and to suggest the best solution,
- knowledge of competitor products,
- the ability to compare the SOCOMEC offer with that of the competition.

BASIC

BASIC course
Basic notions of photovoltaic technology and an overview of its main components (PV modules, field boxes and inverters).

SERVICE

SERVICE course
Operations necessary for the commissioning of inverters and related accessories.

ADVANCED

ADVANCED course
Technical-commercial update on the Sunsys inverter range.
Suitable for those who have completed the Service course.

Training specifically for sales reps

SALES

SALES course
Advantages and special features of the SOCOMEC offer, decision criteria and comparison of the different architectures, benefits for contractors.
Specifically for those who have completed the Basic course.

The learning process

- Courses organised according to level of knowledge
- Market oriented
- Quick guide for those taking part for the first time (sales reps and distributors)
- Monitoring of level of knowledge

BASIC course

SYDIV 037 A

Basic notions of photovoltaic technology and an overview of its main components (PV modules, field boxes and inverters).

Content

- Solar radiation, characteristics and photovoltaic module technology.
- Inverter architecture and technology.
- Architectures: string, centralised and modular.
- Presentation of the SUNSYS H, SUNSYS B and SUNSYS P ranges.
- Presentation of the SUNSYS IFB field boxes.
- Sizing (e.g. for residential and industrial installations).
- PV CAD.
- Local and remote monitoring: specifications and choice of components.
- Communication: SUNSYS H and SUNSYS P supervision.
- SOCOMEC references.

Aimed at

- Designers and contractors.
- Architects, surveyors and energy managers.
- Retailers/Wholesalers interested in photovoltaics.
- SOCOMEC's commercial partners.

Level required

- Basics of electronics and electrical systems.

Note

- Maximum number of participants: 15 people.
- Includes end-of-test course and certificate of attendance.
- Participants are asked to fill out a satisfaction questionnaire.
- The course includes a visit to the SOCOMEC company site and photovoltaic installation.

SERVICE course

Operations necessary for the commissioning of inverters and related accessories.

Content

- Correct installation of the inverters and interconnection to the PV field and AC enclosure, auxiliary service power supply.
- Installation, positioning of the technical compartment and inverter area.
- AC system component choice.
- Communication with the inverters: PV monitoring software.
- SUNGUARD supervision system (specifications, performance, options and modes of use).

Section A: SUNSYS H and SUNSYS B range

- Start-up of a demo inverter.
- Inverter maintenance.
- Troubleshooting (Level 1).

Section B: SUNSYS P range

- Start-up of a demo inverter.
- Assembly accessories.
- Sunsys IFB field boxes: specifications and string monitoring of the photovoltaic installation.
- Inverter maintenance.
- Troubleshooting (Level 1).

Aimed at

- Designers, contractors and maintenance staff.
- Project leaders and managers.

Level required

- Basics of electronics and electrical systems.
- Participation in the Basic course.

Note

- Maximum number of participants: 6 people.
- Includes end-of-test course and certificate of attendance.
- Participants are asked to fill out a satisfaction questionnaire.

ADVANCED course

Technical-commercial update on the Sunsys inverter range.
Suitable for those who have completed the Service course.

Content

- Presentation of latest updates of the SUNSYS H, SUNSYS B and SUNSYS P ranges.
- Sizing (e.g. related to product updates).
- Local and remote monitoring: specifications and choice of components.
- Product supervision.
- Correct installation of the inverters and interconnection to the PV field and AC enclosure, auxiliary service power supply.
- Installation, positioning of the technical compartment and inverter area.
- Start-up of a demo inverter.
- Inverter maintenance.

Aimed at

- Designers, contractors and maintenance staff.
- Project leaders and managers.

Level required

- Basics of electronics and electrical systems.
- Participation in the Basic and Service course.

Note

- Maximum number of participants: 6 people.
- Includes end-of-test course and certificate of attendance.
- Participants are asked to fill out a satisfaction questionnaire.

SALES course

Advantages and special features of the SOCOMEC offer, decision criteria and comparison of the different architectures, benefits for contractors.
Specifically for those who have completed the Basic course.

Content

- Presentation of the SOCOMEC group.
- Presentation of the SUNSYS H, SUNSYS B and SUNSYS P ranges.
- Advantages of the SOCOMEC products and services offering.
- Product offers: ease of installation and flexible sizing.
- Competitive advantages: company structure, network proximity of customer service network.
- Reasons for choosing SOCOMEC:
  - technical reasons,
  - commercial reasons.
- SOCOMEC references.

Level required

- Basics of electronics and electrical systems.
- Participation in the Basic course.

Aimed at

- Area managers, sales reps, agents, pre-sales technical staff and general sales force.

Note

- Maximum number of participants: 15 people.
- Includes end-of-test course and certificate of attendance.
- Participants are asked to fill out a satisfaction questionnaire.
- The course includes a visit to the SOCOMEC company site and photovoltaic installation.

Technical guide

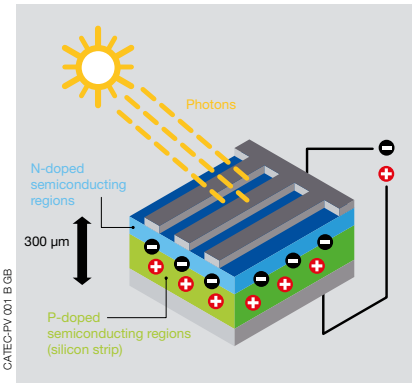
Photovoltaic installations

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 Q1 and Q3.

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

Q3 => I > Isc: 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 reverse voltage'.

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

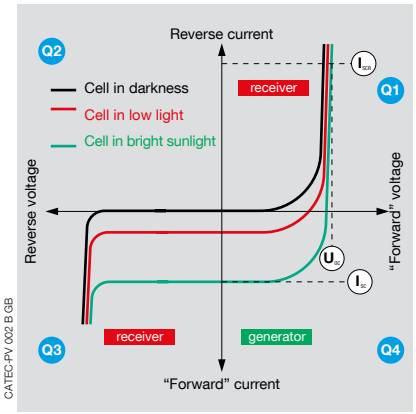
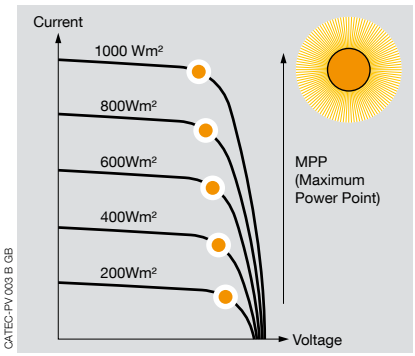
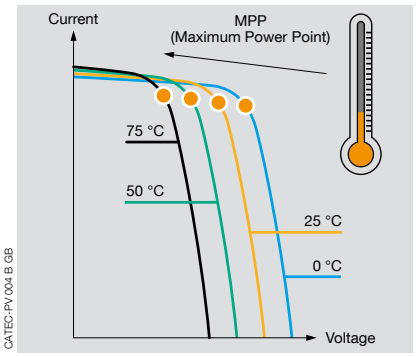


Fig. 1.

The influence of light and temperature

The available power on a photovoltaic generator is linked to the increase in sunlight having a direct impact on the current that is generated.

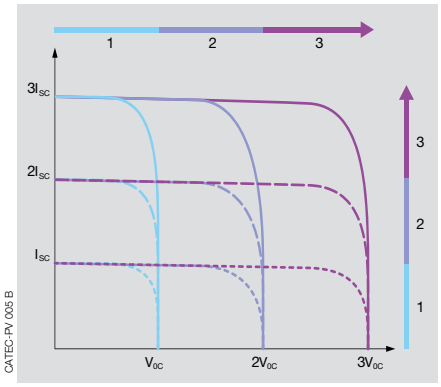


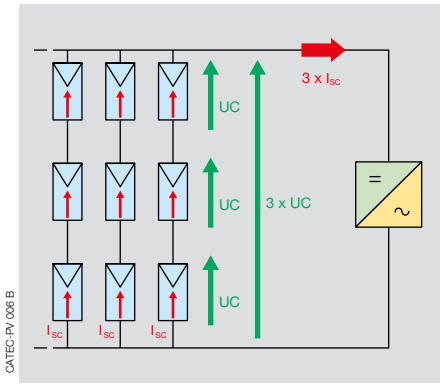


Photovoltaic architecture

Module and PV Chain (or PV string)

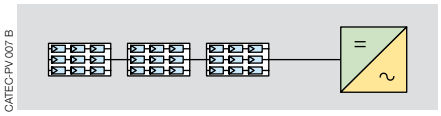
Placing the cells in series enables a module's available voltage to be increased, whereas placing the cells in parallel increases its available current.



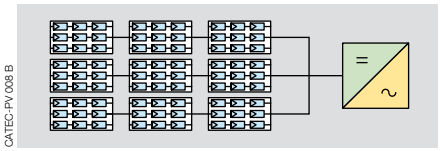


Photovoltaic generator

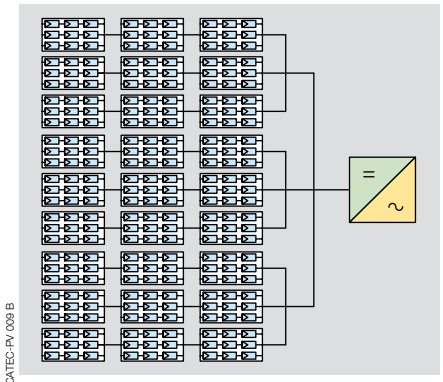
A chain's voltage is created when the modules are placed in series. The coupling of chains of the same voltage in parallel will form groups making it possible to increase the current and therefore the power of the generator.



Example: generator and 3-chain module.



Example: generator and a group of three 3-chain modules.



Example: generator and three groups of 3-chain modules.

Photovoltaic architecture (continued)

Inverters

A photovoltaic installation generally consists of the following functions:

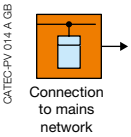
CATEC-PV 010 A GB

- DC energy generation, with photovoltaic panels,

CATEC-PV 012 A GB

- DC/AC conversion, with inverters,

CATEC-PV 014 A GB

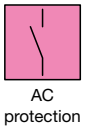


- Connection to the mains with:
  - a metering device,
  - and depending on power:
    - interface systems with the mains,
    - transformation of low voltage to high voltage,
    - high-voltage isolation and protection.

CATEC-PV 011 A GB

- DC protection, with equipment for:
  - isolation,
  - protection against overcurrents,
  - protection against overvoltages (atmospheric or from the mains),
  - additional surveillance of insulation degradation,

CATEC-PV 013 A GB



- AC protection, with equipment for:
  - isolation,
  - protection against overcurrents,
  - protection against overvoltages (atmospheric or from the mains),
  - control or protection against insulation faults,

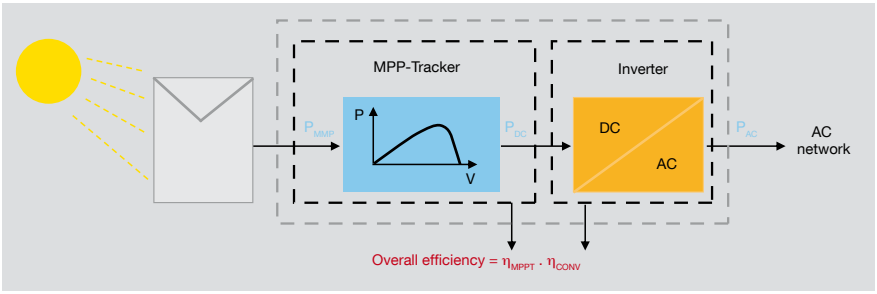
Basics

Overall efficiency of the inverter

The inverter converts energy from the modules into alternating energy.

Overall efficiency is caculated by multiplying MPPT (Maximum Power Point Tracker) efficiency and conversion efficiency.

CATEC-PV 045 A GB

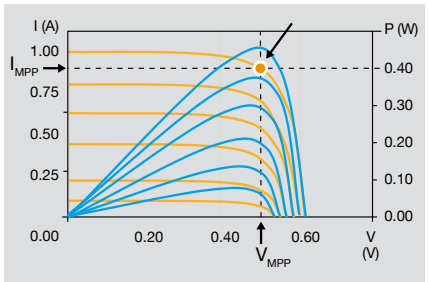


MPPT

1st function

The inverter ensures maximum power point tracking (MPPT).

CATEC-PV 046 A IT



Maximum power point
PMPP = VMPP. IMPP

Calculation of inverter efficiency

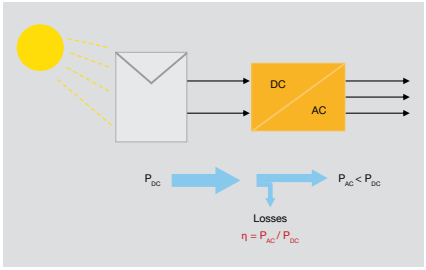
Efficiency is one of the parameters that is usually taken more into consideration in the choice of an inverter. It is calculated by making the ratio between incoming power (DC) and outgoing power (AC).

There are two main types of losses in an inverter: losses of changeover in the conversion bridge and losses due to dissipation in the electro-mechanical components.

Even though the losses in the copper, power poles and electro-mechanical components are generally invariable, it is still possible to to modify the conversion bridge so as to improve their efficiency. In the more technologically advanced inverters with a three-level conversion bridge, the losses owing to power electronics are around 2%.

Inverters with two-level technology and with conversion bridges derived from continuous power systems can also have losses of 6-7%.

CATEC-PV 050 A IT

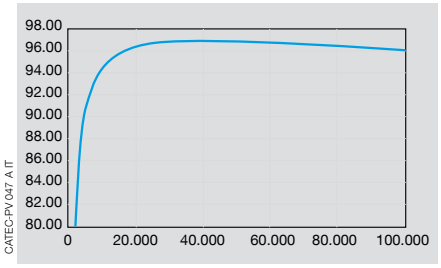


Basics (continued)

MPPT (continued)

2nd function

The inverter ensures maximum conversion efficiency.



EU efficiency

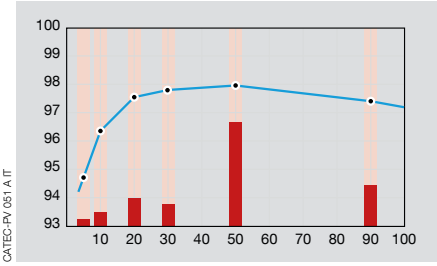
One of the parameters that is mainly used to evaluate an inverter's validity is EU efficiency.

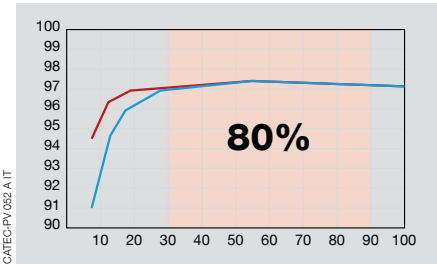
This is one of the few values that each constructor is obliged to declare and is a weighted average calculated by taking only 6 points of the efficiency curve: 5%, 10%, 20%, 30%, 50% and 90% of the nominal power.

Each of these points is weighted in a different way in this calculation: for example at 5% of the load only 3% of efficiency is received, whilst at 50% it is as much as 48%, as shown in the figure given here.

80% of EU efficiency is therefore calculated on the inverter's output between 30% and 100%: not much importance is given to the output below 30% of the load even though, as clearly demonstrated, the energy produced in a year at low loads is considerable.

Modular inverters are therefore penalised by EU efficiency since equivalents with centralised inverters have a lower annual output for the same declared efficiency.





ηEuro

0.03 x η5% + 0.06 x η10% + 0.13 x η20% + 0.10 x η30% + 0.48 x η50% + 0.20 x η100%

Operation %	Efficiency	Efficiency	Efficiency
5	90.28	0.03	2.708
10	94.40	0.06	5.664
20	96.27	0.13	12.515
30	96.77	0.10	9.677
50	96.87	0.48	46.497
100	96.04	0.20	19.208
			96.270

Topology of converters

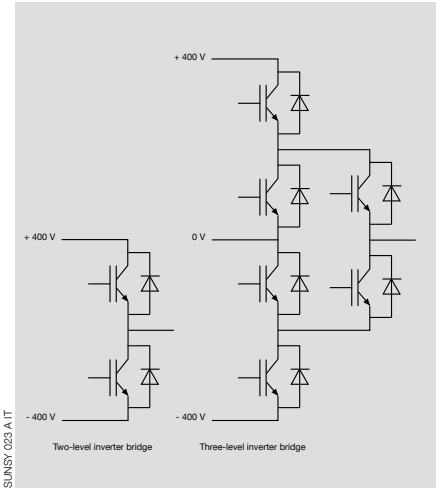
Three-level conversion bridge.

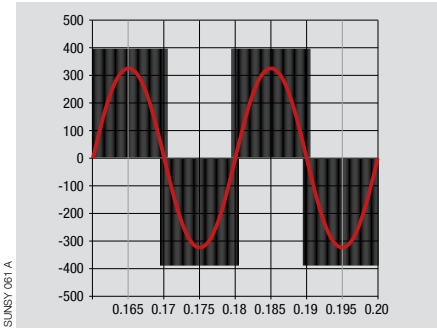
This innovative technology uses 6 IGBTs (power breakers) per phase.

Instead of switching between the positive and negative, as occurs in the more traditional architecture, a virtual zero is generated with this new conversion bridge: the positive half-wave is generated by switching between zero and higher whilst the negative half-wave is generated by switching between zero and lower.

Halving the voltage at the IGBT heads reduces the changeover losses by around 40%, as shown in the table opposite.

In addition, it is possible to use standard IGBTs instead of special components that are capable of supporting voltages of around 1,000 VDC: this halved voltage range contributes to a lengthening of the average lifetime of the inverter's power section.





Three-level inverter bridge	
IGBT: total losses per "leg"	118 W
Recirculation diode total losses	28 W
Total losses per "leg"	146 W

Two-level inverter bridge	
IGBT: total losses per "leg"	176.1 W
Total losses of the diodes	53 W
Total losses per "leg"	229 W

Basics (continued)

Type of inverters

Inverter with transformer

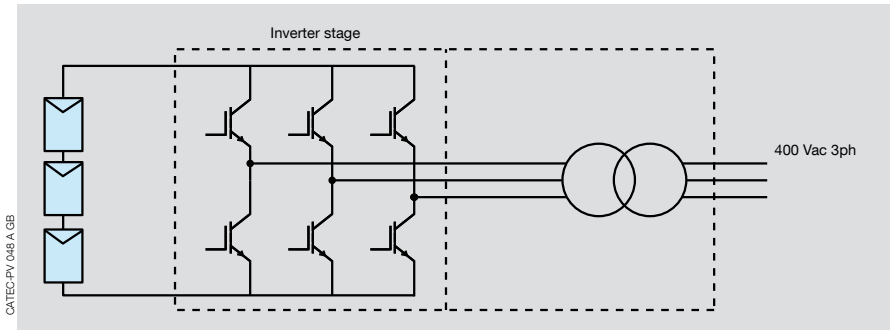
Specifications

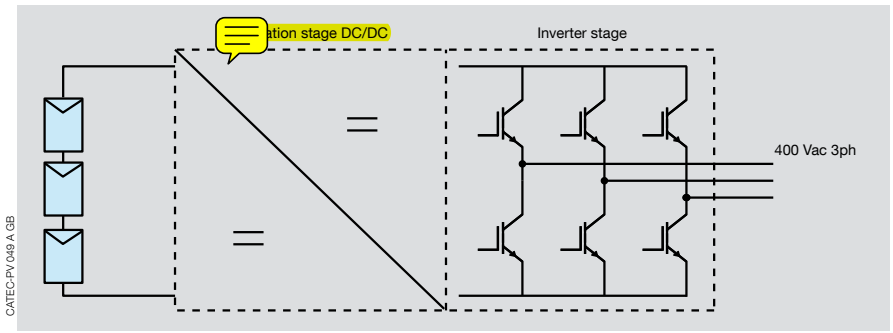
- Galvanic isolation
- Earth connection of the +/- poles
- Safety and immunity to interference
- Compatibility with all types of modules

Inverter without transformer

Specifications

- Efficiency
- Footprint
- Extended DC field





Types of inverters

Systems with a centralised inverter

These systems are characterised by the fact that a fault risks stopping all of production. This type of architecture is used for residential applications with single-phase connection.

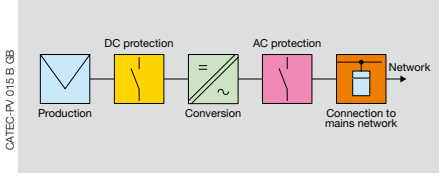
From one to three strings in parallel, this configuration allows for the limitation of the DC protection function to the isolation system upstream of the inverter.

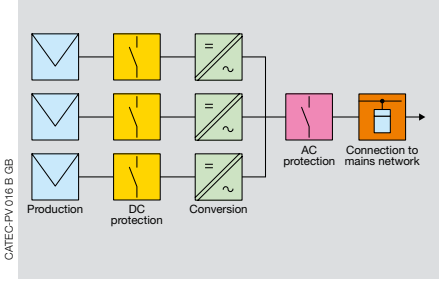
Individual multi-inverter management

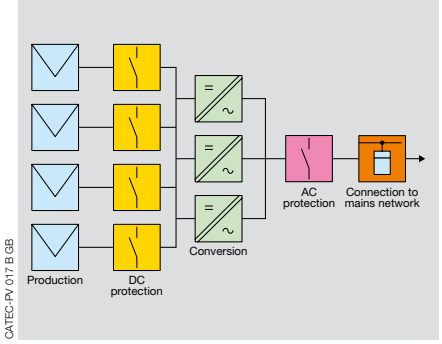
This type of architecture has the advantage of simplicity, thanks to the use of smaller inverters compared to those that it would have been necessary to install by regrouping the generators in parallel.

Centralised multi-inverter management

This type of architecture allows greater flexibility in maintenance and management of usage time of the machines by only using the necessary number of inverters. This arrangement also ensures the use of inverters at their optimum power depending on sunlight levels.







Multi-inverter systems

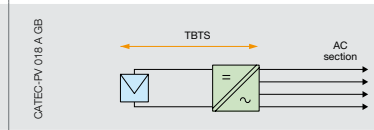
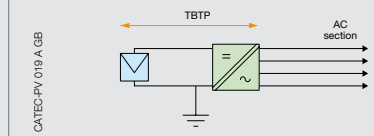
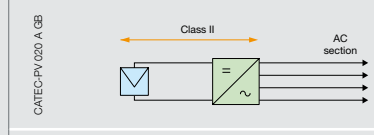
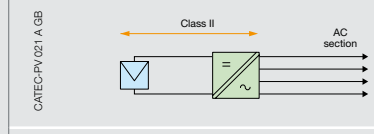
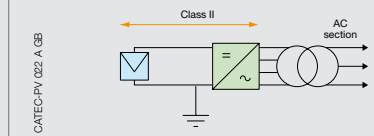
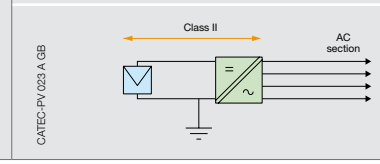
In the event of a fault or maintenance, loss of production is limited to the individual machine. This choice is made for industrial systems with several hundreds of kWp of power for systems on roofs to a few MWp for systems on the ground. For high powers, the connection to the mains is done via a BT/MT or AT transformer.

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

Direct current side (DC)		Single unit diagram	Alternate current side (AC)
Udc	Protection against indirect contact		Protection against indirect contact IT, TN or TT
120 V	SELV		Galvanic separation required to ensure SELV or PELV protection.
120 V	PELV		
> 120	Class II		Without galvanic insulation, DC polarisation is not possible.
			
			Galvanic separation compulsory because of DC polarisation.
			

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 chains, 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 air circuit breaking distance	Impulse voltage (U^{imp})	5 x U_{oc}
Guarantee the creepage distance values	Isolation voltage (U_i)	1.2 U_{oc}
Provide foolproof indication of the open position and ensure decommissioning	Fully visualised breaking	3 F or visible breaking

Emergency load break

The purpose of emergency disconnection is to ensure the safety of operators 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 60 947-3 Time constant (L/R)	1.2 Uoc From 0 to 1.25 Isc (non-standard) 1 ms
Ensure omnipolar disconnection	Simultaneous Galvanic isolation	 Air circuit breaking
Allow access to the controls	Directly, for domestic applications Directly or by remote control in all fields other than domestic	Direct manual action Direct manual action, or current emitting or undervoltage remote control
Grouping together of controls	If possible, DC and AC controls are grouped together in the same location	

Fire service disconnection

A general disconnection for the intervention of firefighters can be provided on request.

Ideally this disconnection should be made as close as possible to the PV field.

This function must be provided on the condition that:

- the DC cables are routed on the outside (with mechanical protection if accessible) and enter directly each building's 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 according to the destination of the technical rooms.

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

- The disconnection must act indiscriminately on all the "sources" of the building to be protected:
  - the building's consumption supply (e.g.: public distribution network),
  - the supply of the AC part of the inverter(s),
  - the supply of the DC part of the inverter(s),
- The control components must be grouped together and their number limited (generally to two, AC and DC).
- The sequencing of the manoeuvres should be indiscriminate.
- The devices to be put into operation are electromagnetic disconnection devices (static disconnection is not permitted).
- Certain fire services supplement this action by short circuiting and earthing the DC installation in order to secure (for the operators) the part of the panel installation not affected by the fire.

Protecting against electrical shocks

Protecting against direct and indirect contact

Protection against direct contact

The DC circuit's PV equipment should always be considered as live and active parts should be protected by insulation or enclosures. This provision is not necessary if the PV voltage remains limited to 60 and 30 V DC in SELV and PELV respectively.

Protection against indirect contact

The protection methods should integrate the provisions implemented on the DC and AC circuits as well as the presence or otherwise of galvanic separation by transformer between the DC and AC sections;

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

- The technical-economic impossibility of monitoring and isolating each generator (PV module) individually in cases where it is required such as in 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 adverse weather with the limitations imposed by the day/night cycles,
- the presence of direct current which can damage insulation and ducting more rapidly over time than alternating current.

Protection from indirect contact is provided by installing class II or strengthened 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).

In the case of the installation of DC enclosures in a technical room or electrical service location 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 photovoltaic generators against voltage surges

Protecting against surges caused by lightning

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

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

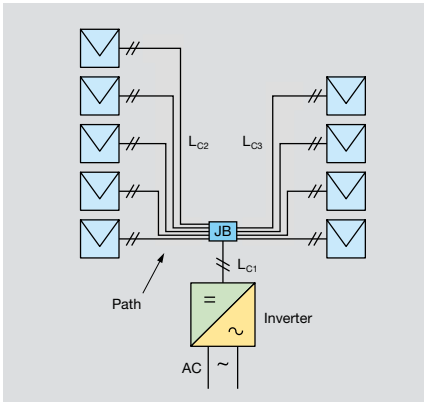
Implementation of or exemption from DC lightning arresters

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 determine L 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 consider is the sum of all the lengths.



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Protecting photovoltaic generators

Protecting photovoltaic generators against voltage surges (continued)

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).

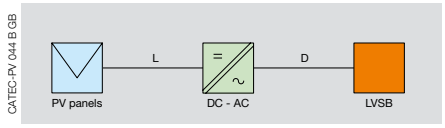
Function	Domestic	Ground installation	Large roofs
Critical L. (ml)	1150 / Nk	2000 / Nk	4500 / Nk
L ≥ crit L.	Lightning arrester compulsory		
L < crit L.	Lightning arrester not compulsory		
With lightning conductor	Lightning arrester compulsory		

Example Crit. L. in Strasbourg: domestic= 57.5 - ground installation = 100 - large roofs = 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 the LV master panel (or the general control and protection device):
  - either if 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 master panel (or the general control and protection device) and the inverter D > 10 m.



		DC		AC	
		PV panels — DC inverter		AC inverter — LV master panel	
		L < 10 m	L > 10 m	D < 10 m	D > 10 m
Installation with lightning conductor	Non isolated	— 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.

Current surges on photovoltaic generators

Shade on the generator

Photovoltaic generators in partial shade

The partial shading of a cell will force it to work in quadrant Q3 (see figure 1), i.e. reversing the element's voltage polarity and raising it to the reverse voltage threshold of the junction (UC ≈ -15 V to -25 V).

The power absorbed by the shaded cells significantly exceeds the power normally dissipated and causes hot spots.

The hot spots can seriously damage the PV module. Protection against voltage surges will not serve any purpose as the increase in power to dissipate is linked to the appearance of an reverse voltage in the affected cell and not to a significant increase in Isc current.

The solution is to use a bypass diode that allows the current of the other elements in series to bypass the "shaded" cell. This will:

- avoid inverter voltage surges as well as hot spots linked to the shading,
- allow the other non-shaded cells of the chain to generate their normal current, instead of the current that is roughly the same as the reduced current supplied by the shaded cell.

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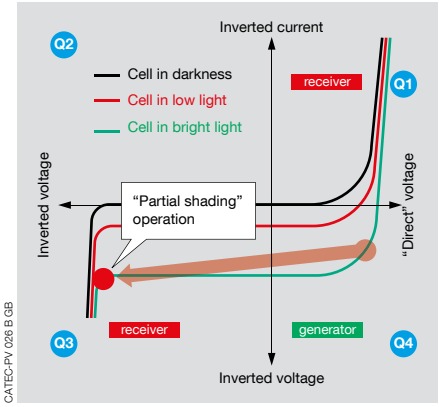

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Fig. 1.

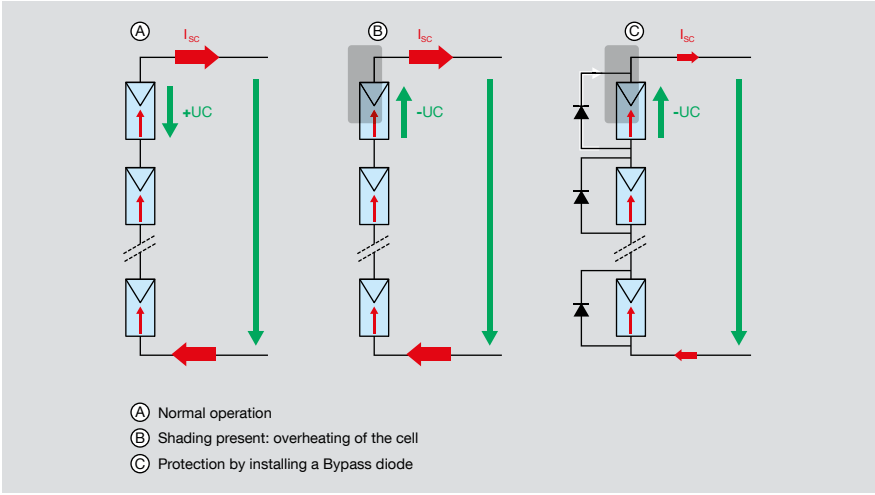

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Fig. 2.: partial shading

Protecting photovoltaic generators

Current surges on photovoltaic generators (continued)

Photovoltaic generators in total shade

Inverted current can be imposed on a module with a weaker voltage, for example a complete module in the shade with modules in parallel exposed to very high levels of sunlight.

The module in the shade represents a load and uses quadrant Q1 of figure 1.

Under normal conditions, the operating voltage is limited to the voltage in a U_{oc} no load circuit.

As a result, the maximum inverted current barely exceeds the short-circuit current at the module and does not constitute a dangerous overload for the module and the DC installation.

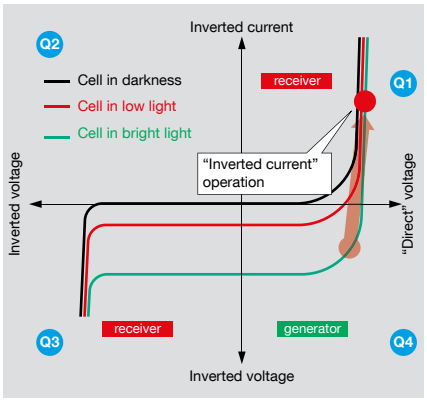


Fig. 1.: inverted current

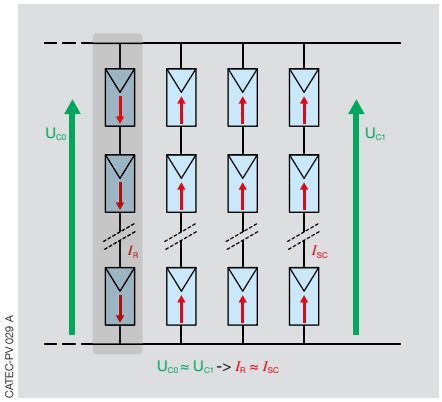


Fig. 2.: complete shading

Total short circuit of photovoltaic generators

Unlike other energy sources, a short circuit of a complete PV generator with no storage facility does not generate dangerous current surges in the generator. The fault current will be limited to the generator's total Isc.

All the ducting and equipment must be sized accordingly for this eventuality, to avoid having to implement complex protection devices that do not serve any purpose.

Partial short circuit of generators

If an internal short circuit fault in the generator is established, it will reduce the output voltage of the chain at fault and will subject it to inverted current surges that are dangerous to modules, supplied by:

- one or more of the chains in parallel,
- external sources such as the storage cells,
- or both of the above.

Short circuits in the modules can arise in the junction boxes or the cables, following an earth fault in the generator network. Furthermore, it is essential to consider the "blowing" of one of the generator's or the inverter's lightning protectors, or of the inverter itself.

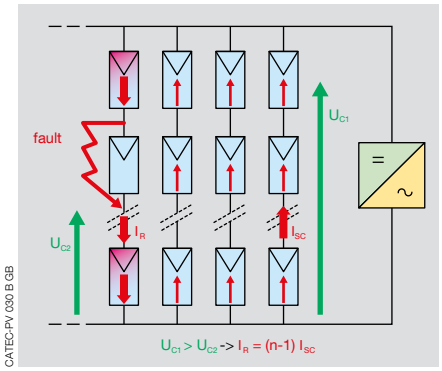


Fig. 1.: short circuit in a chain

A partial short circuit can be caused by two earth faults in an installation that is isolated from ground (figure 2) or by an earth fault in an installation where a polarity is connected to ground for functional reasons (figure 3).

In this case, current surges that are dangerous for the modules can occur: the loop current rises to Ifault ≈ n I_{scSTC} and the inverted current in the faulty chain to IR ≈ (n - 1) I_{scSTC}.

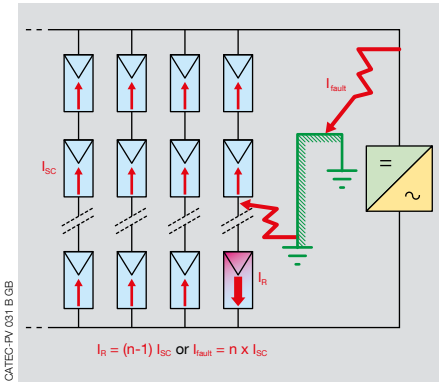


Fig. 2.: double earth fault

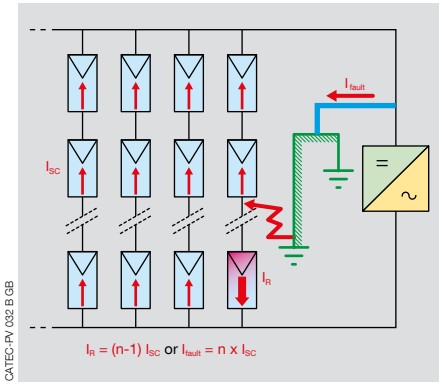


Fig. 3.: single earth fault on an installation with functional polarisation

Protecting photovoltaic generators against voltage surges

Protection against inverted current

The sizing of the chain's cables depends very much on the voltage drops; the notions of permissible currents for the protection of the ducting against voltage surges 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 inverted current) that the module can withstand temporarily until the selected fuse breaks the faulty current generated following a fault (see figures 2 and 3 on the previous page).

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

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

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

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

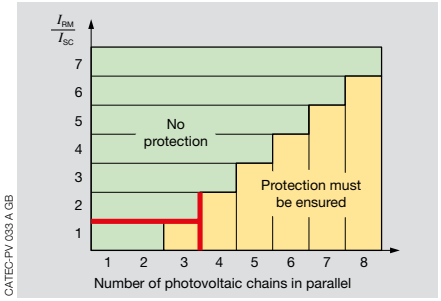


Fig. 1.

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 chain is protected individually by a protection device. In certain cases with modules having very high resistance to inverted current, Np chains can be connected in parallel to a single protection device.

Np max: **Maximum number of chains in parallel per protection device**

Resistance of the module to inverted current	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 I_{RM} given by manufacturers of photovoltaic modules

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

Apparently, this low inverted current is supposed to define defrosting currents or currents to remove a fine layer of snow, the fuse value therefore providing protection in fault conditions.

When the manufacturer defines a max fuse rating, this information must be taken into consideration. However, should there be any doubt over the exact fuse type, this should be clarified with the manufacturer's customer services department.

Protection against excessive sunlight exposure

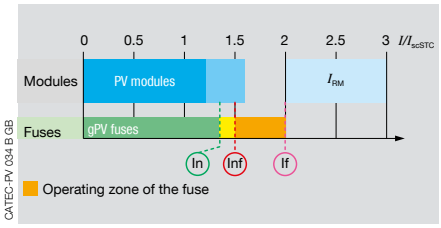
The use of a fuse over its nominal rating should be avoided. This critical zone is the zone between the nominal current and the non-fusing current (Inf).

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

The nominal current In of the chain's PV fuse should be higher than the maximum operating current of the chain, 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 chain is selected.



Inf: fusing current of the fuses
If or I2: maximum fusing current of the fuses

$$In \geq 1.4\ I_{scSTC}$$

Protection according to module resistance to inverted current (I_{RM})

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

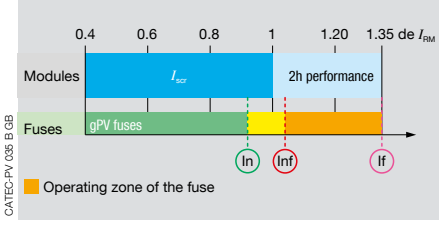
The conventional If (or I_2) disconnection time of a fuse is 1 hour, so greater than the 2 hours of the module, which provides a safety margin by giving a max fuse current for a specific module.

The different conventional fusing times and currents for the various types of fuses available should be checked against these coordination rules:

$In \leq 0.85\ I_{RM}$ for gR, gS or gG fuses ≥ 16 A

$In \leq 0.7\ I_{RM}$ for gG fuses < 16 A

"gPV" fuses that are compliant with the forthcoming standard IEC 60 269-6, provide PV protection, If =1.45 In and can be selected at $In \leq I_{RM}$.



Inf: fusing current of the fuses
If or I_2: maximum fusing current of the fuses

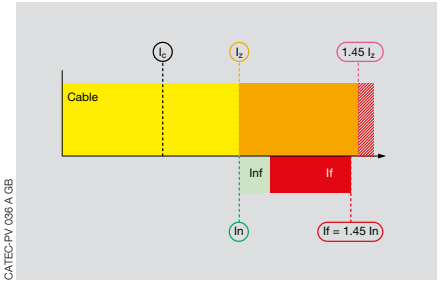
$$If \leq 1.35\ I_{RM} \text{ or}$$

Protecting photovoltaic generators

Protecting photovoltaic generators against voltage surges (continued)

Selecting the generator ducting protection

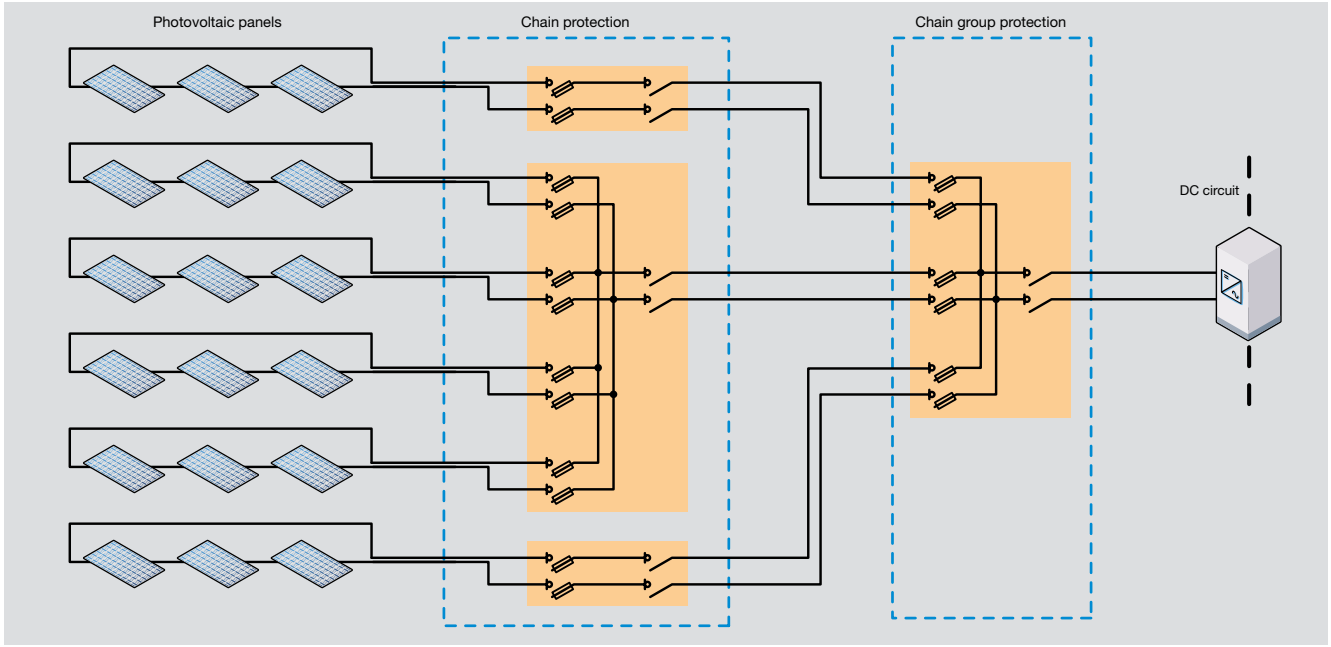
Selecting the ducting protection involves defining a fuse which will eliminate a voltage surge before it damages the ducting due to overheating. This function is ensured if the fusing current of the fuse is less than 1.45 times the permissible current in the ducting (I_z). This current value Iz should include all the usual de-rating factors such as ambient temperature, the amount of ducting in parallel, etc.



Selection of the fuse for the ducting of the group of chains (N: no. of chains)

$In \geq 1.4\ I group = N \times 1.4\ I chain$
$I_2 \leq 1.45\ I_z$

Photovoltaic generator protection fuse (N: no. of groups)



$In \geq 1.4\ I_{scSTC}$ generator = N x 1.4 I_{scSTC} group

This generator protection is only necessary if there is a storage battery.

Summary

Permissible currents of PV chain cables and selection of the associated protection devices.

Nc Number of chains on the generator	Maximum inverted current of a chain	Obligation of Protection	In Assigned current of the chain protection devices	I_z Permissible current of the PV chain 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	$(Nc -1)\ 1.25\ I_{scSTC}$	Yes	$In \geq 1.4\ I_{scSTC}$ $In \leq I_{RM}$	$I_z \geq I_2$
$Nc > Nc_{max}$ and	$(Nc -1)\ 1.25\ I_{scSTC}$		$In \geq 1.4\ I_{scSTC}$ $In \leq I_{RM} - (Np -1)\ I_{scSTC}$	$I_z \geq I_2$

Protecting photovoltaic generators against voltage surges (continued)

Breaking capacity of the photovoltaic fuses

The chain'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 on 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 fusing 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 much more disarray than the required protection level.

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 chain

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 chains 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 61 439 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 at temperatures recommended by the fuse manufacturer should be applied.

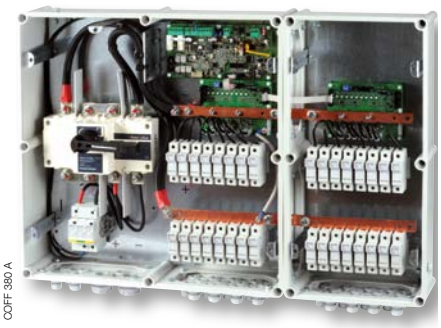
Double-pole protection

Regardless of the DC network, polarised or floating, protection against inverted currents should be provided for both "+" and "-" poles. 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 disconnect the load from the upstream PV and safety disconnection (isolation distance, guaranteed creepage distances, certain or visible disconnection, etc.).

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.



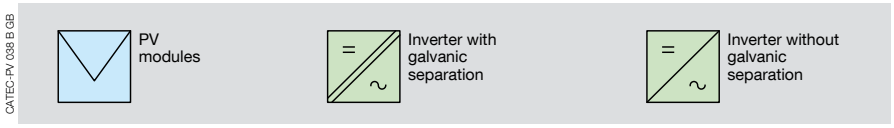
COFF 380 A

Protecting photovoltaic generators

Protecting photovoltaic installations from damage

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.

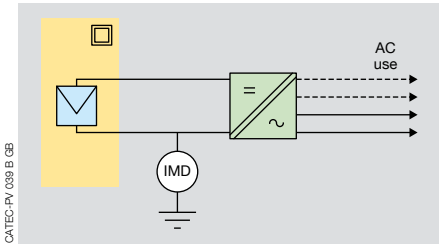
The main protections to be used are class II IEC 61730-2 standardised modules, and an installation upstream of the class II inverters or with strengthened insulation. The use of inverters with or without galvanic isolation should also be considered.



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 provide monitoring of faults in a DC installation for U_{oc} 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.

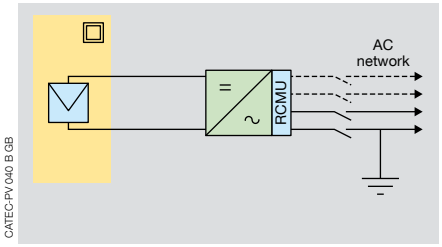


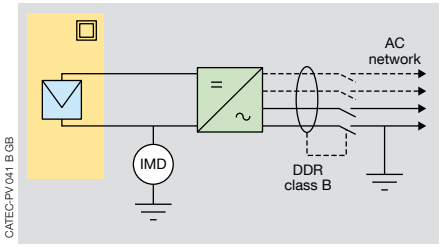
Preventing arcs in a non-polarised installation and inverter without galvanic separation

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 draft standard VDE 0126-1.





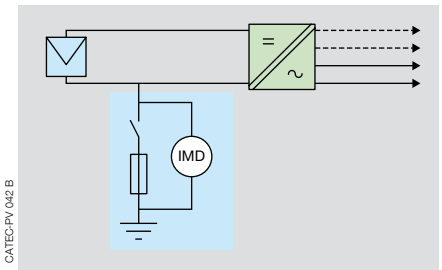
Prevention of arcs in an installation polarised directly to earth

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 damage (continued)

Prevention of arcs in a polarised installation via earth resistance

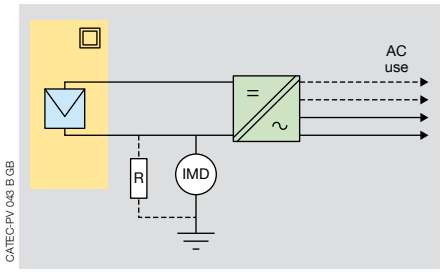
This selection requires inverters with galvanic separation to be used.

In this case, the supplementary protection devices consist of an added permanent isolation monitor with an audible and/or visual alarm; it should cover the damage of the isolation for voltages 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 restarting of the installation 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 chain

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 chains and other components to make up a DC electrical current production unit.

PV group junction box

Enclosure inside which all the PV chains 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 an 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}

Voltage in standardised test conditions, at the terminals of a PV module, a PV chain, a non-charged PV group (open) or at the terminals of the DC circuit of the PV conversion equipment.

Short circuit current I_{scSTC}

Short circuit current of a module, a chain, 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 actual sunlight.

References

Regardless of the architecture of the photovoltaic installation, the type of modules used or the amount of energy produced, SOCOMEC's innovative solutions are synonymous with high levels of efficiency and reliability.

Below is a selection of customers who have chosen SOCOMEC for their photovoltaic projects.

SOCOMEC photovoltaic installation

Every company's environmental policy has an impact on the area in which it is located. Every production process has an effect on people, not only employees, but also those who live in the surrounding area.

Having a "Green Attitude" means respecting our environment, protecting what is most precious: air, water, natural resources and biodiversity, but also our human environment, and the health and safety of people.

SOCOMEC supports the ethos of eco-sustainability.

From the outset, the company has been involved in research into solutions which minimise the impact of its own activities on the environment, especially in the reduction of CO_2 emissions and the optimisation of energy consumption, having installed three different photovoltaic systems for the production of most of the energy used in the Isola Vicentina factory.

Roof installation:

- Power: 175 kWp.
- Inverters: 3x SUNSYS P33TR, 1x SUNSYS P66TR.
- Field boxes: 4x SUNSYS IFB.
- Remote monitoring system: SUNSYS SUNGUARD.
- Panel technology:
  - microamorphous,
  - high-efficiency monocrystalline back-contact,
  - HIT monocrystalline,
  - polycrystalline.
- Production: 195,500 kWh/year.
- CO_2 emissions avoided: 110,000 kg/year.

BODY 283 B

Roof installation:

- Power: 30 kWp.
- Inverter with field box: 10x SUNSYS H30i.
- Remote monitoring system: SUNSYS H30i wireless communication.
- Panel technology: polycrystalline.
- Production: 31,000 kWh/year.
- CO_2 emissions avoided: 17,500 kg/year.


BODY 382 A

Installation on two-axle trackers with two-axle astronomical control

- Power: 14.5 kWp.
- Inverters: 1x SUNSYS B15.
- Field boxes: 1x SUNSYS IFB.
- Remote monitoring system: SUNSYS SUNGUARD.
- Panel technology: HIT monocrystalline.
- Production: 17,000 kWh/year.
- CO_2 emissions avoided: 9,500 kg/year.


BODY 338 A

socomec
Innovative Power Solutions

A selection of customer references

Taglio di Po - Italy

Installation: solar park.
Power: 300 kWp.
Inverters: 3x SUNSYS P100TL.
Field boxes: 6x SUNSYS IFB.
Panel technology: polycrystalline.


SITE 583 A


APPLI 436 A

Adria - Italy

Installation: on the roof.
Power: 240 kWp.
Inverters: 2x SUNSYS P100TL.
Field boxes: 4x SUNSYS IFB.
Panel technology: polycrystalline.


SITE 584 A

APPLI 440 A

Ferrara - Italy

Installation: photovoltaic shelters.
Power: 2 MWp.
Inverters: 18x SUNSYS P100TL.
Panel technology: polycrystalline.

APPLI 441 A


APPLI 437 A

Berlin - Germany

Installation: on the roof.
Power: 418 kWp.
Inverters: 1x SUNSYS P66TR,
3x SUNSYS P100TR.
Field boxes: 22x SUNSYS IFB.
Panel technology: CIS.


SITE 578 A


SITE 579 A

A selection of customer references

Strasbourg - France

Installation: on the roof.
Power: 900 kWp.
Inverters: 8x SUNSYS P100TL.
Field boxes: 16x SUNSYS IFB.
Panel technology: semi-transparent monocrystalline.


SITE 580 A


APPLI 438A

Cornedo - Italy

Installation: on the roof.
Power: 5 kWp.
Inverter with field box:
2x SUNSYS H30i.
Panel technology: HIT monocrystalline.


APPLI 551 A


APPLI 552 A

Brescello - Italy

Installation: on the roof.
Power: 920 kWp.
Inverters: 8x SUNSYS P100TL.
Field boxes: 19x SUNSYS IFB.
Panel technology: polycrystalline.


APPLI 452 A


APPLI 444 A

Colognola ai colli - Italy

Installation: on the roof.
Power: 500 kWp.
Inverters: 5x SUNSYS P100TR.
Field boxes: 11x SUNSYS IFB.
Panel technology: polycrystalline.


SITE 580 A


APPLI 438A

Foggia - Italy

Installation: on the roof.
Power: 100 kWp.
Inverters: 2x SUNSYS P66TR.
Field boxes: 2x SUNSYS IFB.
Panel technology: polycrystalline.


APPLI 553 A


APPLI 554 A

Cernay - France

Installation: on the roof.
Power: 235 kWp.
Inverters: 3x SUNSYS P66TR,
1x SUNSYS P33TR.
Field boxes: 7x SUNSYS IFB.
Panel technology: polycrystalline.


APPLI 549 A

APPLI 550 A

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