Sunny Family 2009/2010

The Future of Solar Technology

» Each PV system is unique: SMA has the right solution for every application

SUNNY BOY
1 to 5 kW

Home Owner System
up to 20 kW

SUNNY MINI CENTRAL
5 to 11 kW

SUNNY TOWER
up to 66 kW

Commercial System
10 kW up to the MW Range

SUNNY CENTRAL
100 to 1250 kW

Solar Power Plant
100 kW up to the MW Range

SUNNY ISLAND
2 to 5 kW

Stand-alone System
up to 100 kW

SUNNY BACKUP
2 to 5 kW

PV Electricity – Even in the Event of Grid Failure
up to 100 kW

MONITORING SYSTEMS
Plant Monitoring

Everything under Control
for every PV System

CONTENTS

Günther Cramer,
Chief Executive Officer

Peter Drews,
Chief Operating Officer

Pierre-Pascal Urbon,
Chief Financial Officer

Marko Werner*,
Chief Sales & Marketing Officer

Roland Grebe*,
Chief Technology Officer

* Appointed as new members of the managing board of SMA Solar Technology AG for the 11th of June 2009 or respectively change of responsibility

Technologically
to always stay one step ahead ...

... and to continually develop our advantage: that is the drive and strategy for success at SMA. With an inverter output of more than two gigawatts sold in 2008, we are the world's largest manufacturer of solar inverters. The rule that we live by: identify market demands early and set the trends in solar technology. Our success proves us right. We have been shaping inverter technology for over 25 years and are often distinguished with awards for our services and products.

Above all, it is important to us that our customers have the choice. For example, whether they would like to implement their solar power plant with a central inverter or a decentralized concept. This is why we offer a product range that provides the appropriate inverter and the most suitable monitoring solution for every requirement. Due to our flexible and scalable production, we are also in the position to react quickly to customer requests, to guarantee short delivery times and implement product innovations promptly. This allows us to easily keep pace with the dynamic market trends of the photovoltaic industry and at the same time absorb short-term fluctuations in demand for solar inverters.

We also press our technological advantage forward by continually strengthening our development team: with more than 300 development engineers and technicians, we can introduce five or six product innovations to the market each year. At the same time, "Total Cost of Ownership" – that is to say, issues such as energy yield, reliability, durability and installation cost – plays a very important role.

In short: our innovations increase customer benefits, while at the same time lowering the price per watt. The SMA central inverter Sunny Central 630HE, for example, has an outstanding specific price and already complies with the requirements of the medium-voltage directive, which goes into effect by mid-2010. For in the future, the inverter, as an intelligent actuator, will take over complex additional tasks such as solar plant and grid monitoring and, most notably, power grid management. We are already technologically advanced enough today that we are able to offer solutions here in all power classes: The Sunny TriPower is designed for the feeding-in of reactive power and thus can also reliably participate in grid management.

Through technological innovation, we were also able to reduce the specific price of the new Sunny Mini Centrals 9000TL to 11000TL by a further ten percent. The newest generation of Sunny Boy inverters also demonstrates our innovative strengths. It was distinguished with both the Intersolar Award and the iF Design Award for its intelligent installation concept, tool-free wiring, communication via *Bluetooth*® and its design. Also, with the introduction of the new Sunny Backup-System, we have introduced a function, through the integration of a small battery bank, that could be of great additional interest after "Grid Parity" is achieved.

The wealth of know-how behind our solar inverters, as well as our technological advantage, forms the basis of the worldwide success.

We look forward to the new challenges that will come and a successful future with you!

Günther Cramer
Chief Executive Officer, SMA Solar Technology AG

SMA – The Future of Solar Technology

New technologies that make the worldwide deployment of photovoltaics increasingly economical. A tremendous rate of innovation. And a unique and diverse product range. SMA Solar Technology has been among the most successful companies in the solar technology field for over 25 years. A team of over 300 engineers and technicians develop state-of-the-art solar inverters – the heart of every photovoltaic power system.

The appropriate inverter for every application.

SMA, as the worldwide market leader, develops, produces and distributes solar inverters and monitoring systems for photovoltaic power plants. Since every PV system has to be individually designed, SMA has a broad product range: We are the only manufacturer to offer the appropriate inverter for every requirement, worldwide – whether for grid connection, stand-alone supply or back-up operation. From kilowatt to megawatt. For all module types – whether thin-film, crystalline or concentrator technology.

SMA inverters as intelligent system managers

The inverter is technologically the most important component in any solar power system: It converts the direct current generated in photovoltaic cells into alternating current suitable for the grid. In addition, it is also responsible for yield monitoring and grid management as an intelligent system manager. Solar inverters from SMA feature a particularly high efficiency: The Sunny Mini Central already features an efficiency of over 98 % and therefore makes greater electricity production possible.

Worldwide customer proximity and international experience

SMA is the market and technology leader in the solar inverter sector and is represented internationally with proprietary sales and service subsidiaries. Our strategy: proximity to customers in all major solar markets. SMA customers don't just benefit from our internationally-oriented processes, but also from our many years of experience in dealing with country-specific certification and grid compliance regulations.

SMA in Figures

SMA Solar Technology AG is headquartered in Niestetal, near Kassel, Germany, and is represented on four continents in eight countries. This group of companies employs more than 2,500 employees (incl. temporary staff) and has been distinguished several times in previous years with awards for its outstanding performance as an employer. Since June 27, 2008, the company has been listed in the Prime Standard of the Frankfurt Stock Exchange (S92), and since September 22, 2008, the company's shares have been listed in the TecDAX. In 2008, SMA generated a turnover of approx. 680 m Euros.

Solar Inverters from SMA: the Heart of every Solar Power System

A solar power system is only as good as its inverter. It operates the solar cells at the optimum electrical operating point (MPP) and transforms their direct current into grid-conforming alternating current. Its quality defines the yield, and as such it is the heart of a solar power system.

Solar power systems are just as individual as the buildings on which they are installed. Therefore, the installation engineer must be able to select the inverter which most optimally suits the respective generator and which guarantees the greatest yield from a broad product lineup.

SMA not only offers exceptional system oriented know-how, but also the appropriate solar inverter for every requirement: for grid-coupling or stand-alone electricity supply, for single or three-phase grids, from kilowatt to megawatt, with or without transformers and for each module type.

Efficiency

Greatest yields due to exceptional efficiency.

Flexibility

SMA inverters can be mounted both indoors and outdoors and feed into every electrical grid. The broad product range allows for a tailored system design.

Easy installation

Integrated DC circuit-breaker. Integrated grid disconnection unit. Simple adjustment to country-specific grid connection requirements.

Durability

Standard five year warranty (optionally extendable to 25 years), telephone consultation via the free Serviceline and additional services such as replacement devices and a wide variety of service agreements ensure a high level of investment security.

Reliability

We develop and manufacture our inverters for a life span of more than 20 years.

Control

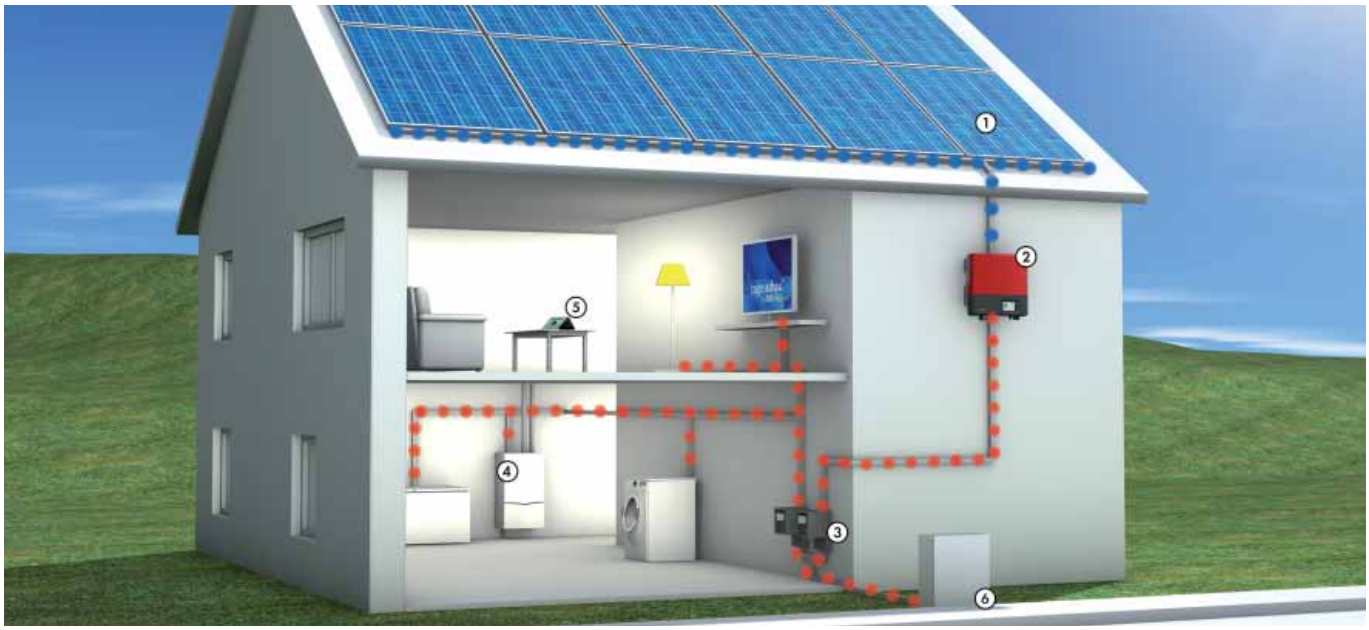
All SMA inverters can be combined with a wide range of components for system monitoring: from the radio-based Sunny Beam to the Sunny WebBox for diagnostics and maintenance over the Internet from any location in the world.

Safety

With the SMA Grid Guard and Electronic Solar Switch, SMA provides the most reliable safety systems currently on the market.

Made in Germany

All SMA inverters are developed and produced at the company headquarters in Niestetal, near Kassel, Germany.



Components: 1. solar panel, 2. SUNNY BOY solar inverter, 3. production meter, 4. consumers, 5. SUNNY BEAM, 6. grid connection

System Planning

Diligence pays off

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Through the skillful selection of suitable components, a solar system can be ideally adapted to local operating conditions. Planning of the system must include taking particularities of the chosen location into consideration and should therefore be conducted by an experienced specialist. The broad product range from SMA provides a multitude of attractive solutions, especially for this important first step.

Multi-string inverter

Whenever a solar generator is inhomogeneously lit, it should be divided into separate strings, as, for example, when varying roof angles form shadows on individual modules. This dividing avoids large losses in yield, since the individual sub-generators have varying MPPs. A multi-string inverter from SMA operates strings from PV modules with the same level of irradiation separately, in each case, with an individual MPP tracker, thus securing the maximum energy yield.

Grounding the PV generator

Some PV modules may only be operated when grounded. The choice of an inverter with galvanic isolation (with transformer) provides maximum flexibility in this case. With the appropriate grounding set, it can be customized to every imaginable recommendation of the module manufacturer, also retrospectively (see the "Know-how" section, page 180).

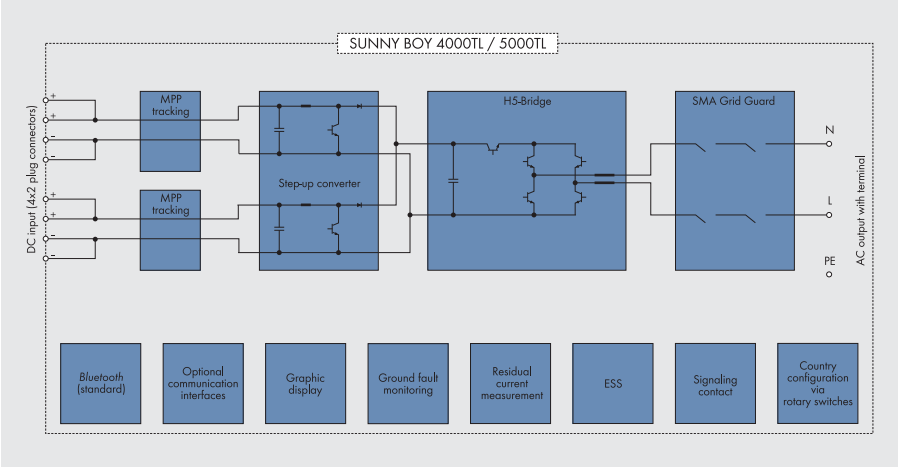
Maximum energy yield

If the energy yield is to be maximized, then a transformerless inverter is the only solution. In comparison to the galvanic isolating devices, SMA inverters with patented* H5 topology (see the "Know-how" section, page 182) provide approximately a two percent greater energy yield, without having to make cut-backs in personnel protection.

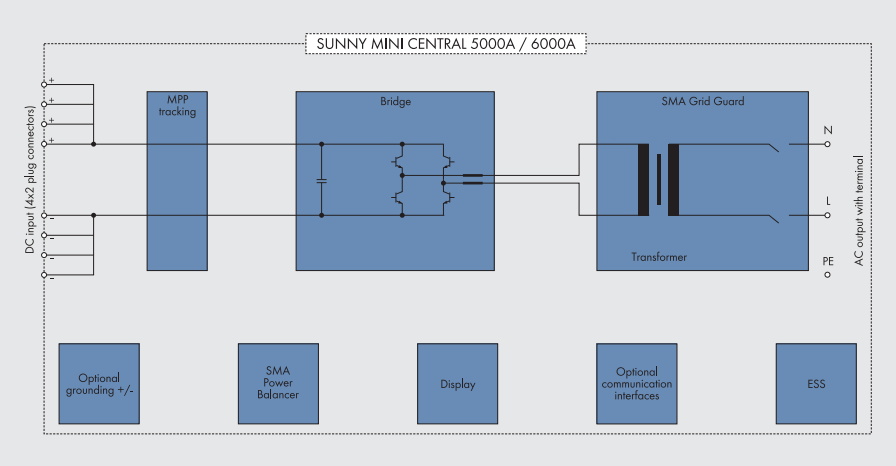
Grid feeding

A good grid compatibility means more than just grid-synchronized energy feed-in. For smaller PV systems, the symmetrical distribution of the feeding output across the three phases is adequate and a task for the planner. For PV systems in the upper power range, SMA inverters support the grid management of grid operators with the SMA Power Balancer, three-phase feeding-in, reactive power capability and other options.

The given examples demonstrate that various factors must be taken into consideration at the design stage of a solar system. We therefore recommend our free Sunny Design planning software for the designing of systems (see next page): It helps with optimization and calls the planner's attention to critical combinations.



Block circuit diagram of a multi-string inverter without transformer



Block circuit diagram of a galvanic isolating inverter of the Sunny Mini Central range

*U.S. Patent US7411802B2

Easy to use

- Optimal design for grid connected PV systems
- Target-oriented suggestions for system optimization
- Free download

Comprehensive

- Database with all common PV modules
- Use of high-resolution meteorological data
- Worldwide choice of location

- Automatic computation of the cable lengths and cable cross sections
- Energy analysis over an operating year

SUNNY DESIGN

System design made easy

With Sunny Design, the design of solar systems is easier than ever: simply enter all required details and within a few minutes you will receive the optimal system configuration. The free software gives installation engineers and system planners a user-friendly interface, and a practical input wizard helps with any questions. The software delivers data for an economic evaluation of the system along with a technical verification of the various components. Thus, the end customer gains a tailor-made PV system and the installation engineers save valuable time.

Sunny Design contains the most important data of all SMA inverters as well as currently existing PV modules. The program is intuitive to operate and menu-driven, systematically guiding the planner through the entire system design process. This saves time and allows different configuration options to be simulated without complicated calculations. Sunny Design computes all relevant values automatically and delivers a comprehensive result for each planning variation.

Operating states that could be critical are reliably detected and identified. This ensures that the planner is notified of any deviations from the standard design. Such a notification does not necessarily reflect the inadmissibility of a design, but should prompt a thorough assessment of whether this operating condition (e.g. too low a generator voltage) in the current system is actually of importance.

Sunny Design thus enables the system planner to fully concentrate on what system planning is all about. The software helps estimate the implications of the most important parameters on the yield and investment costs. In this way, the customer can be offered a tailor-made system.
Additionally, realistic operation is evaluated over a calendar year on the basis of the integrated meteorological database. Though, an accurate yield forecast cannot be expected from Sunny Design – for this, further simulation programs with complex adjustment possibilities are necessary. But, in addition to the technical inspection, the yield differences between the different designs can be determined. The best system design cannot only be found, it can also be evaluated for its economics.

Finally, the technical assessment of the system design is illustrated in an individual results sheet – clear and comprehensive for everybody. As a printout or a PDF file, this summary is the ideal supplement to a quotation.

Free download at
www.SMA.de/SunnyDesign

System requirements

Supported operating systems
Windows NT 4.0 (Servicepack 6.0a)
Windows 2000
Windows XP

Hardware (minimum requirements)
PIII 800 MHz
128 MB RAM
250 MB (hard disk space)
1024 x 768 pixels / 256 colors

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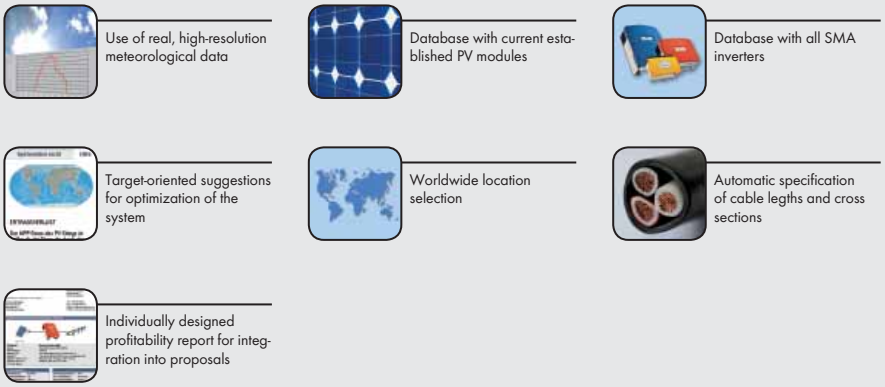



SUNNY BOY

INVERTERS WITHOUT TRANSFORMERS

Efficient

- Maximum efficiency of 98 %
- Highest yields through OptiTrac and OptiCool

Safe

- Compatible with the BDEW guidelines
- Integrated ESS DC load disconnecting unit
- Electronic String Fuse and String Failure Detection
- String Current Monitoring

Flexible

- DC Surge Protection Device (type II) can be integrated
- DC input voltage of up to 1000 V
- Flexible system design using two separate step-up converters

Simple

- Three-phase feed-in
- Cable connection without tools
- Innovative DC plug system
- Convenient wiring compartment
- *Bluetooth* Communication

SUNNY TRIPOWER 10000TL / 12000TL / 15000TL / 17000TL

With three phases for simple system planning

In a class of its own: packed with state-of-the-art technology, the Sunny Tripower makes for easy installation, high yield, and secure grid support. Thanks to its multi-string technology and the widest input voltage range, the three-phase inverter is suitable for every imaginable module configuration. In addition, it is highly flexible in terms of the plant design – from 10 kW up to the megawatt range. The Sunny Tripower presently fulfills the BDEW guideline requirements (medium voltage guideline), and in so doing, it participates in reliable grid management. A comprehensive security concept encompassing, among other things, string failure detection, electronic string fuses, and a surge protection function, providing the highest level of availability and reducing plant costs.

Technical Data

	Sunny Tripower 10000TL	Sunny Tripower 12000TL	Sunny Tripower 15000TL	Sunny Tripower 17000TL
Input (DC)				
Max. DC power (at cos φ = 1)	10.4 kW	12.5 kW	15.6 kW	17.6 kW
Max. DC voltage	1000 V	1000 V	1000 V	1000 V
PV-voltage range, MPPT	150 – 800 V	150 – 800 V	150 – 800 V	150 – 800 V
Max. input current (input A / input B)	22 A / 11 A	22 A / 11 A	33 A / 11 A	33 A / 11 A
Number of MPP trackers	2	2	2	2
Max. number of parallel strings (input A / input B)	4 / 1	4 / 1	5 / 1	5 / 1
Output (AC)				
Nominal AC ouput	10 kVA	12 kVA	15 kVA	17 kVA
Max. AC power	10 kVA	12 kVA	15 kVA	17 kVA
Max. output current	16 A	19.2 A	24 A	24.6 A
Nominal AC voltage	3 / N / PE, 230 / 400 V	3 / N / PE, 230 / 400 V	3 / N / PE, 230 / 400 V	3 / N / PE, 230 / 400 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz /± 4.5 Hz	50 Hz / 60 Hz /± 4.5 Hz	50 Hz / 60 Hz /± 4.5 Hz	50 Hz / 60 Hz /± 4.5 Hz
Phase shift (cos φ), adjustable	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging
AC connection	Three-phase	Three-phase	Three-phase	Three-phase
Efficiency				
Max. efficiency / Euro-Eta	98 % / 97.5 %	98 % / 97.5 %	98 % / 97.5 %	98 % / 97.5 %
Protection devices				
DC reverse polarity protection	●	●	●	●
ESS DC load-disconnecting switch	●	●	●	●
AC short-circuit protection	●	●	●	●
Ground fault monitoring	●	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●	●
All-pole sensitive residual-current monitoring unit	●	●	●	●
DC surge protection device (type II) can be integrated	●	●	●	●
Electronic string fuse	●	●	●	●
String failure detection	●	●	●	●
General Data				
Dimensions (W / H / D) in mm	665 / 690 / 265	665 / 690 / 265	665 / 690 / 265	665 / 690 / 265
Weight	approx. 65 kg	approx. 65 kg	approx. 65 kg	approx. 65 kg
Operating temperature range	–25 °C to +60 °C	–25 °C to +60 °C	–25 °C to +60 °C	–25 °C to +60 °C
Consumption: operating (standby) / night	< 12.5 W / < 1 W	< 12.5 W / < 1 W	< 12.5 W / < 1 W	< 12.5 W / < 1 W
Topology	transformerless	transformerless	transformerless	transformerless
Cooling concept	OptiCool	OptiCool	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics)	●/●	●/●	●/●	●/●
Features				
DC connection: Phoenix Contact	●	●	●	●
AC connection: spring-type terminal (without tools)	●	●	●	●
Graphic display	●	●	●	●
Interfaces: *Bluetooth* / RS485	●/❍	●/❍	●/❍	●/❍
Warranty: 5 years / 10 years	●/❍	●/❍	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de	www.SMA.de	www.SMA.de
● Standard ❍ Optional				
Data at nominal conditions – Last update: March 2009				
Type Designation	STP 10000TL-10	STP 12000TL-10	STP 15000TL-10	STP 17000TL-10

Accessories

RS485 interface

DC surge protection device (type II), input A

DC surge protection device (type II), inputs A and B

Future-proof

- Reactive power supply

High Yields

- Maximum efficiency of 97.7 %
- Transformerless, with H5 topology
- The best tracking efficiency with OptiTrac MPP tracking
- OptiCool active temperature management

Reliable

- SMA Power Balancer for three-phase grid connection
- Integrated ESS DC load-disconnecting unit

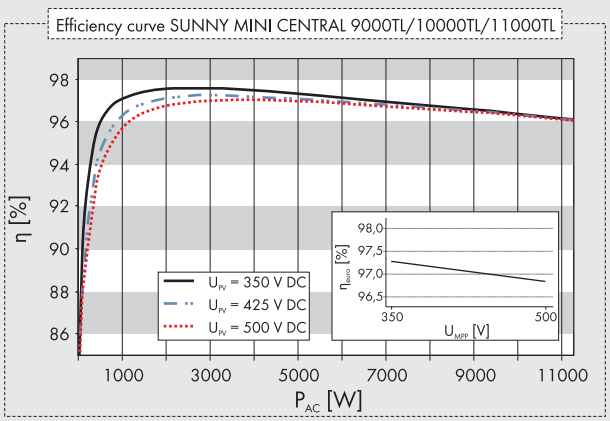
SUNNY MINI CENTRAL 9000TL / 10000TL / 11000TL with Reactive Power Control

Optimal grid integration with reactive power supply

Future-proof grids at a glance: the Sunny Mini Central 9000TL / 10000TL / 11000TL with Reactive Power Control are the ideal solutions if the energy supply company requires the provision of reactive power at the feed-in point. With these inverters, it is also now possible to realize system concepts where the phase shift, cos φ, and with it the reactive power component, is prescribed. In this way, large solar power systems, especially those in the megawatt range, can make optimal use of the distribution grid capacities provided. In so doing, they can significantly contribute to the success of renewable energy sources.

Technical Data

	Sunny Mini Central 9000TL	Sunny Mini Central 10000TL	Sunny Mini Central 11000TL
Input (DC)			
Max. DC power (at cos φ = 1)	9300 W	10350 W	11400 W
Max. DC voltage	700 V	700 V	700 V
PV-voltage range, MPPT	333 V – 500 V	333 V – 500 V	333 V – 500 V
Max. input current	28 A	31 A	34 A
Number of MPP trackers	1	1	1
Max. number of strings (parallel)	5	5	5
Output (AC)			
Nominal AC power / max. AC power	9000 VA / 9000 VA	10000 VA / 10000 VA	11000 VA / 11000 VA
Max. output current	40 A	44 A	48 A
Nominal AC voltage / range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz
Phase shift (cos φ), adjustable	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging
AC connection / power balancing	single-phase / ●	single-phase / ●	single-phase / ●
Efficiency			
Max. efficiency	97.7 %	97.7 %	97.7 %
Protection devices			
DC reverse polarity protection	●	●	●
ESS DC load-disconnecting switch	●	●	●
AC short-circuit protection	●	●	●
Ground fault monitoring	●	●	●
Monitored string fuses	❍	❍	❍
Grid monitoring (SMA Grid Guard)	●	●	●
All-pole sensitive residual-current monitoring unit	●	●	●
General Data			
Dimensions (W / H / D) in mm	468 / 613 / 242	468 / 613 / 242	468 / 613 / 242
Weight	approx. 35 kg	approx. 35 kg	approx. 35 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C
Noise emission (typical)	≤ 42 dB(A)	≤ 45 dB(A)	≤ 46 dB(A)
Consumption: operating (standby) / night	<10 W / 0.25 W	<10 W / 0.25 W	<10 W / 0.25 W
Topology	transformerless	transformerless	transformerless
Cooling concept	OptiCool	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics)	●/●	●/●	●/●
Features			
DC connection: MC3 / MC4 / Tyco	❍/●/❍	❍/●/❍	❍/●/❍
AC connection: screw terminal	●	●	●
LCD	●	●	●
Interfaces: *Bluetooth* / RS485	❍/❍	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de	www.SMA.de
● Standard ❍ Optional			
Data at nominal conditions – provisional data, last updated March 2009			
Type Designation	SMC 9000TLRP-10	SMC 10000TLRP-10	SMC 11000TLRP-10



Accessories

RS485 interface of type 485PB-NR

Bluetooth Piggy-Back

SMA Power Balancer
Y Cable PBL-YCABLE-10

Read more on the topic of the medium-voltage guidelines in the article "The SMA Inverter as Grid Manager", on page 178.

Efficient

- Maximum efficiency of 98 %
- The best tracking efficiency with OptiTrac MPP tracking
- OptiCool active temperature management

- Transformerless, with H5 topology
- Monitored string fuses

Safe

- SMA Power Balancer for three-phase grid connection
- Integrated ESS DC load disconnecting unit

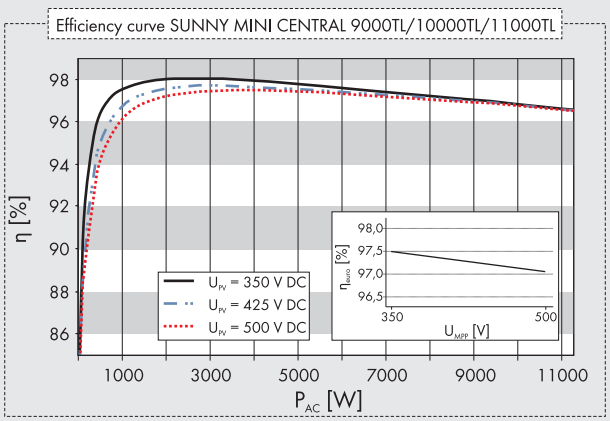
SUNNY MINI CENTRAL 9000TL / 10000TL / 11000TL

Precise system design for maximum yields

It has never been so easy to precisely plan mid-size and large solar plants. The Sunny Mini Central inverters from power classes nine to eleven kWp open up almost limitless possibilities in this respect. Whether dealing with mid-sized PV systems, 30 kW plants, or solar parks in the megawatt range: the devices fit perfectly into each and every plant concept of 27 kWp and above. Here, the combination of high efficiency and low specific price results in a short amortization time. In addition, the decentralized plant layout helps to keep maintenance costs low. SMA's Sunny Mini Central: state-of-the-art technology which pays off with every sunbeam.

Technical Data

	Sunny Mini Central 9000TL	Sunny Mini Central 10000TL	Sunny Mini Central 11000TL
Input (DC)			
Max. DC power	9300 W	10350 W	11400 W
Max. DC voltage	700 V	700 V	700 V
PV-voltage range, MPPT	333 V – 500 V	333 V – 500 V	333 V – 500 V
Max. input current	28 A	31 A	34 A
Number of MPP trackers	1	1	1
Max. number of strings (parallel)	5	5	5
Output (AC)			
Nominal AC power / max. AC power	9000 W / 9000 W	10000 W / 10000 W	11000 W / 11000 W
Max. output current	40 A	44 A	48 A
Nominal AC voltage / range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz
Phase shift (cos φ)	1	1	1
AC connection / power balancing	single-phase / ●	single-phase / ●	single-phase / ●
Efficiency			
Max. efficiency / Euro-Eta	98.0 % / 97.6 %	98.0 % / 97.5 %	98.0 % / 97.5 %
Protection devices			
DC reverse polarity protection	●	●	●
ESS DC load-disconnecting switch	●	●	●
AC short-circuit protection	●	●	●
Ground fault monitoring	●	●	●
Monitored string fuses	❍	❍	❍
Grid monitoring (SMA Grid Guard)	●	●	●
All-pole sensitive residual-current monitoring unit	●	●	●
General Data			
Dimensions (W / H / D) in mm	468 / 613 / 242	468 / 613 / 242	468 / 613 / 242
Weight	approx. 35 kg	approx. 35 kg	approx. 35 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C
Noise emission (typical)	≤ 42 dB(A)	≤ 45 dB(A)	≤ 46 dB(A)
Consumption: operating (standby) / night	<10 W / 0.25 W	<10 W / 0.25 W	<10 W / 0.25 W
Topology	transformerless	transformerless	transformerless
Cooling concept	OptiCool	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics)	●/●	●/●	●/●
Features			
DC connection: MC3 / MC4 / Tyco	❍/●/❍	❍/●/❍	❍/●/❍
AC connection: screw terminal	●	●	●
LCD	●	●	●
Interfaces: *Bluetooth* / RS485	❍/❍	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de	www.SMA.de
● Standard ❍ Optional			
Data at nominal conditions – Last update: March 2009			
Type Designation	SMC 9000TL-10	SMC 10000TL-10	SMC 11000TL-10



Accessories

RS485 interface of type 485PB-NR

Bluetooth Piggy-Back

SMA Power Balancer
Y Cable PBL-YCABLE-10

High-yield

- Maximum efficiency of 98 %
- The best tracking efficiency with OptiTrac MPP tracking
- Transformerless, with H5 topology

- OptiCool active temperature management

Safe

- SMA Power Balancer for three-phase grid connection
- Integrated ESS DC load disconnecting unit

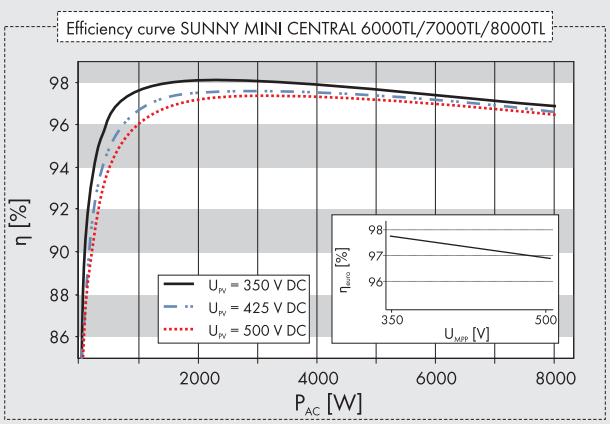
SUNNY MINI CENTRAL 6000TL / 7000TL / 8000TL

High-yield providers for multiple combinations

Top efficiency levels of up to 98 percent and a convenient specific price: the transformerless Sunny Mini Central 6000TL, 7000TL and 8000TL offer operators high yields. With the Sunny Mini Central family of transformerless inverters, it will be even easier to realize large plants from 18 kWp to the megawatt range. The finely graduated power classes are ideal for laying out large solar power plants precisely. The flexibility it provides for the layout of plants and a favorable cost-to-benefit ratio make the Sunny Mini Central the ideal inverter for mid-sized to large solar power plants.

Technical Data

	Sunny Mini Central 6000TL	Sunny Mini Central 7000TL	Sunny Mini Central 8000TL
Input (DC)			
Max. DC power	6200 W	7200 W	8250 W
Max. DC voltage	700 V	700 V	700 V
PV-voltage range, MPPT	333 V – 500 V	333 V – 500 V	333 V – 500 V
Max. input current	19 A	22 A	25 A
Number of MPP trackers	1	1	1
Max. number of strings (parallel)	4	4	4
Output (AC)			
Nominal AC ouput	6000 W	7000 W	8000 W
Max. AC power	6000 W	7000 W	8000 W
Max. output current	27 A	31 A	35 A
Nominal AC voltage / range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz
Phase shift (cos φ)	1	1	1
AC connection / power balancing	single-phase / ●	single-phase / ●	single-phase / ●
Efficiency			
Max. efficiency	98.0 %	98.0 %	98.0 %
Euro-Eta	97.7 %	97.7 %	97.7 %
Protection devices			
DC reverse polarity protection	●	●	●
ESS DC load-disconnecting switch	●	●	●
AC short-circuit protection	●	●	●
Ground fault monitoring	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●
Integrated all-pole sensitive leakage current monitoring unit	●	●	●
General Data			
Dimensions (W / H / D) in mm	468 / 613 / 242	468 / 613 / 242	468 / 613 / 242
Weight	31 kg	32 kg	33 kg
Operating temperature range	-25 °C ... +60 °C	-25 °C ... +60 °C	-25 °C ... +60 °C
Noise emission (typical)	≤ 31 dB(A)	≤ 33 dB(A)	≤ 40 dB(A)
Consumption: operating (standby) / night	<10 W / 0.25 W	<10 W / 0.25 W	<10 W / 0.25 W
Topology	transformerless	transformerless	transformerless
Cooling concept	OptiCool	OptiCool	OptiCool
Mounting location: indoors / outdoors (IP65)	●/●	●/●	●/●
Features			
DC connection: MC3 / MC4 / Tyco	❍/●/❍	❍/●/❍	❍/●/❍
AC connection: screw terminal	●	●	●
LCD	●	●	●
Interfaces: *Bluetooth* / RS485	❍/❍	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de	www.SMA.de
● Standard ❍ Optional			
Data at nominal conditions – Last update: March 2009			
Type Designation	SMC 6000TL	SMC 7000TL	SMC 8000TL



Accessories

RS485 interface of type 485PB-NR

Bluetooth Piggy-Back

SMA Power Balancer Plug PBL-SMC-10-NR

We could not have said it better ourselves; from the PHOTON editorial office: "The test results for the Sunny Mini Central 8000TL are not only the best results, by far, since the beginning of the PHOTON tests [...], they are also so exceptionally good that it is hard to imagine finding a better device on the market." (PHOTON 10/2007)

High-yield

- Maximum efficiency of 97 %
- Multi-String technology*
- Transformerless, with H5 topology
- OptiCool active temperature management*

Safe

- Integrated ESS DC load-disconnecting unit

Simple

- Easily accessible front wiring compartment
- Cable connection without tools

Communicative

- Easy country-specific configurations
- *Bluetooth* technology
- Multilingual graphic display

SUNNY BOY 3000TL / 4000TL / 5000TL

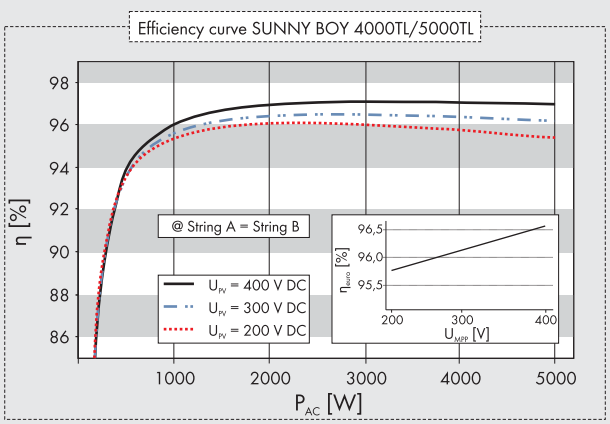
Perfection plus. Usability. The new generation of Sunny Boy

More communicative, user-friendly and efficient than ever, the Sunny Boy 3000TL, 4000TL and 5000TL are setting new standards in inverter technology. A modern graphic display, readout of daily values even after sunset, simplified installation concept and wireless communication via *Bluetooth*: the new Sunny Boy fulfill every wish. With a peak efficiency of 97 %, the transformerless devices Sunny Boy 4000TL and 5000TL provide an optimal solar yield, maximum flexibility in system planning and exceptional module compatibility, and they are the first choice for ambitious generator designs.

*Sunny Boy 4000TL / 5000TL

Technical Data

	Sunny Boy 3000TL	Sunny Boy 4000TL	Sunny Boy 5000TL
Input (DC)			
Max. DC power	3200 W	4200 W	5300 W
Max. DC voltage	550 V	550 V	550 V
PV-voltage range, MPPT	125 V – 440 V	125 V – 440 V	125 V – 440 V
Recommended range at nominal power	188 V – 440 V	175 V – 440 V	175 V – 440 V
Max. input current	17 A	2 x 15 A	2 x 15 A
Number of MPP trackers	1	2	2
Max. number of strings (parallel)	2	2 x 2	2 x 2
Output (AC)			
Nominal AC ouput	3000 W	4000 W	4600 W
Max. AC power	3000 W	4000 W	5000 W
Max. output current	16 A	22 A	22 A
Nominal AC voltage / range	220 V – 240 V / 180 V – 280 V	220 V – 240 V / 180 V – 280 V	220 V – 240 V / 180 V – 280 V
AC grid frequency / range	50 Hz, 60 Hz / ± 5 Hz	50 Hz, 60 Hz / ± 5 Hz	50 Hz, 60 Hz / ± 5 Hz
Phase shift (cos φ)	1	1	1
AC connection	single-phase	single-phase	single-phase
Efficiency			
Max. efficiency / Euro-Eta	97.0 % / 96.3 %	97.0 % / 96.4 %	97.0 % / 96.5 %
Protection devices			
DC reverse polarity protection	●	●	●
ESS DC load-disconnecting switch	●	●	●
AC short-circuit protection	●	●	●
Ground fault monitoring	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●
Integrated all-pole sensitive leakage current monitoring unit	●	●	●
General Data			
Dimensions (W / H / D) in mm	470 / 445 / 180	470 / 445 / 180	470 / 445 / 180
Weight	22 kg	25 kg	25 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C
Noise emission (typical)	≤ 25 dB(A)	≤ 29 dB(A)	≤ 29 dB(A)
Consumption: operating (standby) / night	<10 W / < 0.5 W	<10 W / < 0.5 W	<10 W / < 0.5 W
Topology	transformerless	transformerless	transformerless
Cooling concept	convection	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics / IP54 connection compartment)	●/●	●/●	●/●
Features			
DC connection: MC3 / MC4 / Tyco	❍/●/❍	❍/●/❍	❍/●/❍
AC connection: Terminals	●	●	●
Graphic display	●	●	●
Interfaces: *Bluetooth* / RS485	●/❍	●/❍	●/❍
Warranty: 5 years / 10 years	●/❍	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de	www.SMA.de
● Standard ❍ Optional			
Data at nominal conditions – Last update: March 2009			
Type Designation	SB 3000TL-20	SB 4000TL-20	SB 5000TL-20



Accessories

RS485 interface of type DM-485CB-10

Efficient

- 96 % efficiency
- Transformerless

Safe

- Integrated ESS DC load-disconnecting unit

Reliable

- Proven and tested technology
- Maintenance free, thanks to convection cooling

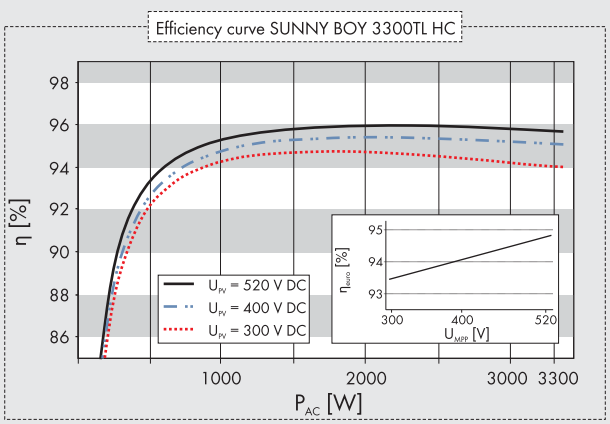
SUNNY BOY 2100TL / 3300TL HC

The little one with big returns

Combining a broad input voltage range and a broad input current range, the transformerless Sunny Boy 3300TL HC can be connected to all standard crystalline PV modules. The proven and reliable Sunny Boy 2100TL is the starter model among the transformerless inverters; its efficiency is nevertheless top-class. Its low weight and robust enclosure allow simple installation, both indoors and outdoors. The Sunny Boy 2100TL is the ideal inverter for smaller PV systems or for sub-generators in larger systems.

Technical Data

	Sunny Boy 2100TL	Sunny Boy 3300TL HC
Input (DC)		
Max. DC power	2200 W	3440 W
Max. DC voltage	600 V	750 V
PV-voltage range, MPPT (Rated power)	200 V – 480 V	125 V – 600 V
Max. input current	11 A	11 A
Number of MPP trackers	1	1
Max. number of strings (parallel)	2	2
Output (AC)		
Nominal AC ouput	1950 W	3000 W
Max. AC power	2100 W	3300 W
Max. output current	11 A	16 A
Nominal AC voltage / range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / ±4.5 Hz	50 Hz / 45.5 Hz – 52.5 Hz
Phase shift (cos φ)	1	1
AC connection	single-phase	single-phase
Efficiency		
Max. efficiency	96.0 %	96.0 %
Euro-Eta	95.2 %	94.6 %
Protection devices		
DC reverse polarity protection	●	●
ESS DC load-disconnecting switch	●	●
AC short-circuit protection	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Integrated all-pole sensitive leakage current monitoring unit	●	●
General Data		
Dimensions (W / H / D) in mm	434 / 295 / 214	470 / 490 / 225
Weight	16 kg	28 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C
Noise emission (typical)	≤ 33 dB(A)	≤ 29 dB(A)
Consumption: operating (standby) / night	< 7 W / 0.1 W	<10 W / 0.25 W
Topology	transformerless	transformerless
Cooling concept	convection	convection
Mounting location: indoors / outdoors (IP65)	●/●	●/●
Features		
DC connection: MC3 / MC4 / Tyco	●/❍/❍	●/❍/❍
AC connection: plug connector	●	●
LCD	●	●
Interfaces: *Bluetooth* / RS485	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de
● Standard ❍ Optional		
Data at nominal conditions – Last update: February 2009		
Type Designation	SB 2100TL	SB 3300TL HC



Accessories

RS485 interface of type 485PB-NR

Bluetooth Piggy-Back

INVERTERS WITH TRANSFORMERS


SUNNY MINI CENTRAL

Efficient

- OptiCool active temperature management
- The best tracking efficiency with OptiTrac MPP tracking

Safe

- Galvanic isolation
- Integrated ESS DC load-disconnecting unit
- SMA Power Balancer for three-phase grid connection

Flexible

- Input voltage range of up to 800 V
- Suitable for generator grounding

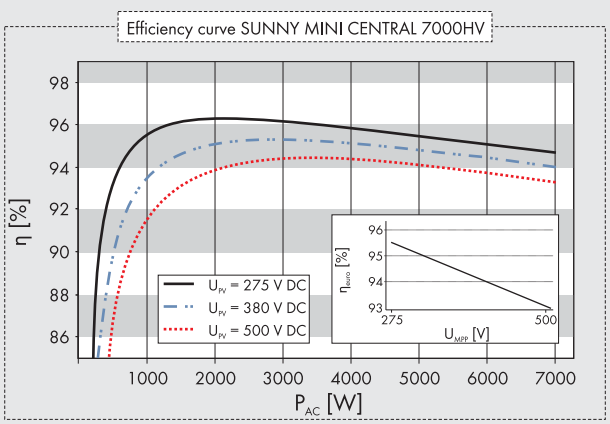
SUNNY MINI CENTRAL 7000HV

The champion for thin-film projects

Greater input voltage range – lower installation costs: with the Sunny Mini Central 7000HV, more modules can be connected in series than is possible with common inverters. This reduces cabling costs on the DC side and simplifies the installation. Because of its galvanic separation, the Sunny Mini Central 7000HV can be used with both crystalline cells and thin-film modules. Its performance range permits the installation of large PV systems made up of smaller units, which allows for detailed system monitoring.

Technical Data

	Sunny Mini Central 7000 HV	
Input (DC)		
Max. DC power	7500 W	
Max. DC voltage	800 V	
PV-voltage range, MPPT	335 V – 560 V	
Max. input current	23 A	
Number of MPP trackers	1	
Max. number of strings (parallel)	4	
Output (AC)		
Nominal AC ouput	6650 W	
Max. AC power	7000 W	
Max. output current	31 A	
Nominal AC voltage / range	220 V – 240 V / 180 V – 260 V	
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	
Phase shift (cos φ)	1	
AC connection / power balancing	single-phase / ●	
Efficiency		
Max. efficiency	96.1 %	
Euro-Eta	95.3 %	
Protection devices		
DC reverse polarity protection	●	
ESS DC load-disconnecting switch	●	
AC short-circuit protection	●	
Ground fault monitoring	●	
Grid monitoring (SMA Grid Guard)	●	
Galvanically isolated	●	
General Data		
Dimensions (W / H / D) in mm	468 / 613 / 242	
Weight	65 kg	
Operating temperature range	–25 °C ... +60 °C	
Noise emission (typical)	≤ 41 dB(A)	
Consumption: operating (standby) / night	<7 W / 0.25 W	
Topology	LF transformer	
Cooling concept	OptiCool	
Mounting location: indoors / outdoors (IP65)	●/●	
Features		
DC connection: MC3 / MC4 / Tyco	❍/●/❍	
AC connection: screw terminal	●	
LCD	●	
Interfaces: *Bluetooth* / RS485	❍/❍	
Warranty: 5 years / 10 years	●/❍	
Certificates and approvals	www.SMA.de	
● Standard ❍ Optional		
Data at nominal conditions – Last update: March 2009		
Type Designation	SMC 7000HV	



Accessories


RS485 interface of type 485PB-NR


Bluetooth Piggy-Back


SMA Power Balancer Plug PBL-SMC-10-NR


Grounding-Kit "Positive" ESHV-P-NR


Grounding-Kit "Negative" ESHV-P-NR

High-yield

- OptiCool active temperature management
- The best tracking efficiency with OptiTrac MPP tracking

Safe

- Galvanic isolation
- Integrated ESS DC load-disconnecting unit
- SMA Power Balancer for three-phase grid connection

Flexible

- Suitable for generator grounding

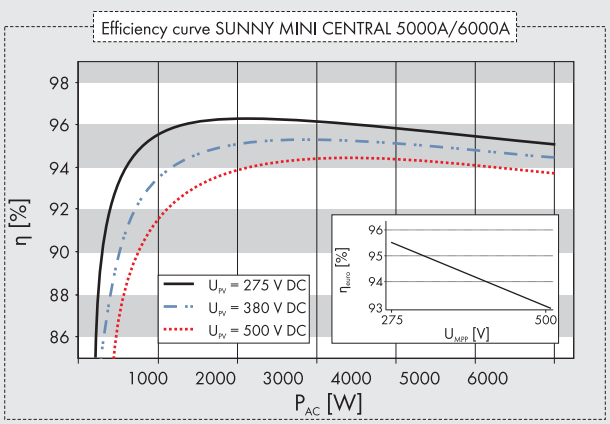
SUNNY MINI CENTRAL 4600A / 5000A / 6000A

Ideal for three-phase systems

The Sunny Mini Central 4600A, 5000A, and 6000A are convincing, above all, due to their first-rate efficiency: they reliably feed maximum energy yields into the public grid. Additionally, they offer the highest degree of flexibility in plant design due to their graduated power classes. They are suitable for use in smaller plants as well as in the implementation of solar parks with power outputs of several hundred kilowatts. Furthermore, the galvanic isolation provides flexible connection possibilities. In this way, the Sunny Mini Central can be used with crystalline cells as well as thin-film modules.

Technical Data

	Sunny Mini Central 4600A	Sunny Mini Central 5000A	Sunny Mini Central 6000A
Input (DC)			
Max. DC power	5250 W	5750 W	6300 W
Max. DC voltage	600 V	600 V	600 V
PV-voltage range, MPPT	246 V – 480 V	246 V – 480 V	246 V – 480 V
Max. input current	26 A	26 A	26 A
Number of MPP trackers	1	1	1
Max. number of strings (parallel)	4	4	4
Output (AC)			
Nominal AC ouput	4600 W	5000 W	6000 W
Max. AC power	5000 W	5500 W	6000 W
Max. output current	26 A	26 A	26 A
Nominal AC voltage / range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz
Phase shift (cos φ)	1	1	1
AC connection / Power balancing	single-phase / ●	single-phase / ●	single-phase / ●
Efficiency			
Max. efficiency	96.1 %	96.1 %	96.1 %
Euro-Eta	95.2 %	95.2 %	95.2 %
Protection devices			
DC reverse polarity protection	●	●	●
ESS DC load-disconnecting switch	●	●	●
AC short-circuit protection	●	●	●
Ground fault monitoring	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●
Galvanically isolated	●	●	●
General Data			
Dimensions (W / H / D) in mm	468 / 613 / 242	468 / 613 / 242	468 / 613 / 242
Weight	62 kg	62 kg	63 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C
Noise emission (typical)	≤ 42 dB(A)	≤ 42 dB(A)	≤ 42 dB(A)
Consumption: operating (standby) / night	<7 W / 0.25 W	<7 W / 0.25 W	<7 W / 0.25 W
Topology	LF transformer	LF transformer	LF transformer
Cooling concept	OptiCool	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics)	●/●	●/●	●/●
Features			
DC connection: MC3 / MC4 / Tyco	❍/●/❍	❍/●/❍	❍/●/❍
AC connection: screw terminal	●	●	●
LCD	●	●	●
Interfaces: *Bluetooth* / RS485	❍/❍	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de	www.SMA.de
● Standard ❍ Optional			
Data at nominal conditions – Last update: March 2009			
Type Designation	SMC 4600A	SMC 5000A	SMC 6000A



Accessories


RS485 interface of type 485PB-NR


Bluetooth Piggy-Back


SMA Power Balancer Plug PBL-SMC-10-NR


Grounding-Kit "Positive" ESHV-P-NR


Grounding-Kit "Negative" ESHV-P-NR

While the Sunny Mini Central 5000A and 6000A are ideal for three-phase systems, the Sunny Mini Central 4600A is designed for single-phase PV plants.

Powerful

- Efficiency of up to 95.6 %
- OptiCool active temperature management
- The best tracking efficiency with OptiTrac MPP tracking

Safe

- Galvanic isolation
- Integrated ESS DC load-disconnecting unit
- Rated nominal power at temperatures up to 45 °C

Flexible

- For indoor and outdoor installation
- Suitable for generator grounding

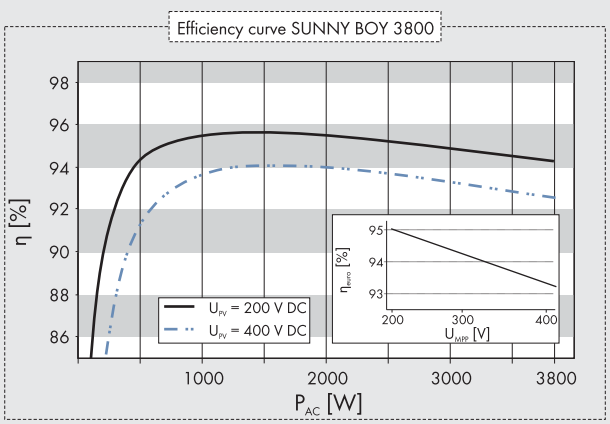
SUNNY BOY 3300 / 3800

The generalist

It is robust, easy-to-handle, and, thanks to its galvanic isolation, used in all kinds of AC grids: the Sunny Boy 3300 / 3800. Due to its suitability for generator grounding, it can be combined with all module types. The generously-proportioned die-cast aluminum housing together with the OptiCool active cooling system guarantee the highest yields and a long service life, even under extreme conditions.

Technical Data

	Sunny Boy 3300	Sunny Boy 3800	Sunny Boy 3800/V*
Input (DC)			
Max. DC power	3820 W	4040 W	4040 W
Max. DC voltage	500 V	500 V	500 V
PV-voltage range, MPPT	200 V – 400 V	200 V – 400 V	200 V – 400 V
Max. input current	20 A	20 A	20 A
Number of MPP trackers	1	1	1
Max. number of strings (parallel)	3	3	3
Output (AC)			
Nominal AC ouput	3300 W	3800 W	3680 W
Max. AC power	3600 W	3800 W	3680 W
Max. output current	18 A	18 A	16 A
Nominal AC voltage / range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ±4.5 Hz	50 Hz / 60 Hz /± 4.5 Hz	50 Hz / 60 Hz /± 4.5 Hz
Phase shift (cos φ)	1	1	1
AC connection	single-phase	single-phase	single-phase
Efficiency			
Max. efficiency / Euro-Eta	95.2 % / 94.4 %	95.6 % / 94.7 %	95.6 % / 94.7 %
Protection devices			
DC reverse polarity protection	●	●	●
ESS DC load-disconnecting switch	●	●	●
AC short-circuit protection	●	●	●
Ground fault monitoring	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●
Galvanically isolated	●	●	●
General Data			
Dimensions (W / H / D) in mm	450 / 352 / 236	450 / 352 / 236	450 / 352 / 236
Weight	38 kg	38 kg	38 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C
Noise emission (typical)	≤ 40 dB(A)	≤ 42 dB(A)	≤ 42 dB(A)
Consumption: operating (standby) / night	< 7 W / 0.1 W	< 7 W / 0.1 W	< 7 W / 0.1 W
Topology	LF transformer	LF transformer	LF transformer
Cooling concept	OptiCool	OptiCool	OptiCool
Mounting location: indoors / outdoors (IP65)	●/●	●/●	●/●
Features			
DC connection: MC3 / MC4 / Tyco	●/❍/❍	●/❍/❍	●/❍/❍
AC connection: plug connector	●	●	●
LCD	●	●	●
Interfaces: *Bluetooth* / RS485	❍/❍	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de	www.SMA.de
Certificate number (please include when ordering)	–	-	V0153
● Standard ❍ Optional			
Data at nominal conditions – Last update: March 2009	*Version for country requirements in accordance with EN 50438 with I_{AC} = 16 A		
Type Designation	SB 3300	SB 3800	SB 3800/V



Accessories

RS485 interface of type 485PB-NR

Bluetooth Piggy-Back

Grounding-Kit "Positive" ESHV-P-NR

Grounding-Kit "Negative" ESHV-P-NR

Safe

- Integrated ESS DC load-disconnecting unit
- Galvanic isolation

Universal

- For indoor and outdoor installation
- Suitable for generator grounding

Reliable

- Tried and tested technology
- Maintenance free, thanks to convection cooling

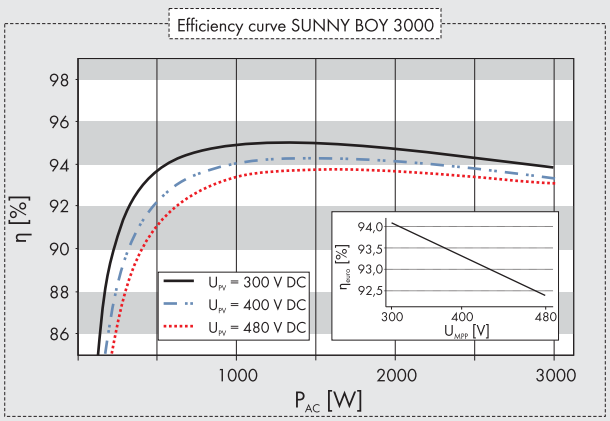
SUNNY BOY 1200 / 1700 / 2500 / 3000

Proven technology for secure investments

Universally applicable: the Sunny Boy inverters 1200, 1700, 2500 and 3000 are used in the most diverse AC grids thanks to their galvanic isolation. In addition, the devices are suitable for the simple grounding of the generator. Their integrated ESS DC load-disconnection switch simplifies installation and reduces its cost at the same time. Equipped with the OptiTrac MPP tracking process, it will always find the optimal working point, even under dynamic weather conditions. In this way, it reliably converts solar energy into solar earnings.

Technical Data

	Sunny Boy 1200	Sunny Boy 1700	Sunny Boy 2500	Sunny Boy 3000
Input (DC)				
Max. DC power	1320 W	1850 W	2700 W	3200 W
Max. DC voltage	400 V	400 V	600 V	600 V
PV-voltage range, MPPT	100 V – 320 V	139 V – 320 V	224 V – 480 V	268 V – 480 V
Max. input current	12.6 A	12.6 A	12 A	12 A
Number of MPP trackers	1	1	1	1
Max. number of strings (parallel)	2	2	3	3
Output (AC)				
Nominal AC ouput	1200 W	1550 W	2300 W	2750 W
Max. AC power	1200 W	1700 W	2500 W	3000 W
Max. output current	6.1 A	8.6 A	12.5 A	15 A
Nominal AC voltage / range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz
Phase shift (cos φ)	1	1	1	1
AC connection	single-phase	single-phase	single-phase	single-phase
Efficiency				
Max. efficiency / Euro-Eta	92.1 % / 90.7 %	93.5 % / 91.8 %	94.1 % / 93.2 %	95.0 % / 93.6 %
Protection devices				
DC reverse polarity protection	●	●	●	●
ESS DC load-disconnecting switch	●	●	●	●
AC short-circuit protection	●	●	●	●
Ground fault monitoring	●	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●	●
Galvanically isolated	●	●	●	●
General Data				
Dimensions (W / H / D) in mm	434 / 295 / 214	434 / 295 / 214	434 / 295 / 214	434 / 295 / 214
Weight	23 kg	25 kg	28 kg	32 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C
Noise emission (typical)	≤ 41 dB(A)	≤ 46 dB(A)	≤ 33 dB(A)	≤ 30 dB(A)
Consumption: operating (standby) / night	<4 W / 0.1 W	<5 W / 0.1 W	<7 W / 0.25 W	<7 W / 0.25 W
Topology	LF transformer	LF transformer	LF transformer	LF transformer
Cooling concept	convection	convection	convection	convection
Mounting location: indoors / outdoors (IP65)	●/●	●/●	●/●	●/●
Features				
DC connection: MC3 / MC4 / Tyco	●/❍/❍	●/❍/❍	●/❍/❍	●/❍/❍
AC connection: plug connector	●	●	●	●
LCD	●	●	●	●
Interfaces: *Bluetooth* / RS485	❍/❍	❍/❍	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de	www.SMA.de	www.SMA.de
● Standard ❍ Optional				
Data at nominal conditions – Last update: March 2009				
Type Designation	SB 1200	SB 1700	SB 2500	SB 3000



Accessories

RS485 interface of type 485PB-NR

Bluetooth Piggy-Back

Grounding-Kit "Positive" ESHV-P-NR

Grounding-Kit "Negative" ESHV-P-NR

UL certified

- For the American solar market (UL 1741/IEEE 1547)

Efficient

- 97 % peak efficiency
- OptiCool active temperature management

Safe

- Galvanic isolation due to integrated transformer

Simple

- Patented automatic grid voltage detection*
- Integrated DC load-disconnecting unit

SUNNY BOY 5000US / 6000US / 7000US

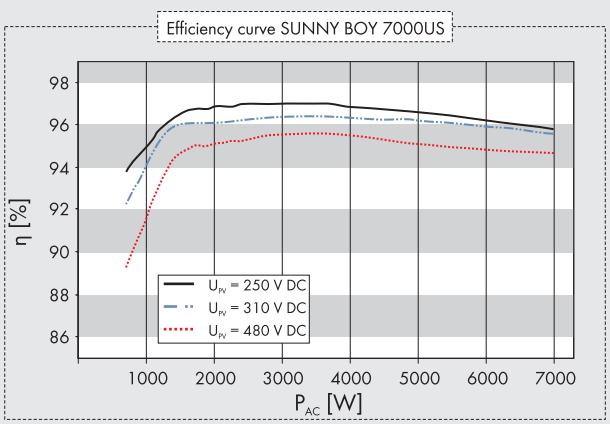
Profitable for the U.S. market

Maximum energy yields for a continuously expanding solar market: the Sunny Boy 5000US, 6000US and 7000US for the U.S. market are persuasive due to their first-rate efficiency. Additionally, they offer the highest degree of flexibility in plant design due to their finely graded power classes. The patented* automatic grid voltage detection allows for a straightforward and secure installation. Furthermore, the galvanic isolation provides flexibility meaning that Sunny Boy inverters can be used with crystalline cells as well as thin-film modules. In addition, the Sunny Boy 6000US and 7000US devices can be ordered pre-cabled as Sunny Towers: for easiest installation, even within large system concepts.

*U.S. Patent US7352549B1

Technical Data

	Sunny Boy 5000US	Sunny Boy 6000US	Sunny Boy 7000US
Input Values			
Recommended max. PV-power (modules at STC)	6250 W	7500 W	8750 W
Max. DC voltage	600 V	600 V	600 V
MPP voltage range	250 – 480 V	250 – 480 V	250 – 480 V
Max. DC input current	21 A	25 A	30 A
Max. number of fused string inputs	3 (inverter), 4 x 20 A (DC disconnect)	3 (inverter), 4 x 20 A (DC disconnect)	3 (inverter), 4 x 20 A (DC disconnect)
Output Values (AC)			
Nominal AC ouput	5000 W	6000 W	7000 W
Max. AC output power	5000 W	6000 W	7000 W
Max. AC output power (at 208, 240, 277 V)	24 A / 21 A / 18 A	29 A / 25 A / 22 A	34 A / 29 A / 25 A
Range / nominal AC voltage	183 V – 229 V at 208 V 211 V – 264 V at 240 V 244 V – 305 V at 277 V	183 V – 229 V at 208 V 211 V – 264 V at 240 V 244 V – 305 V at 277 V	183 V – 229 V at 208 V 211 V – 264 V at 240 V 244 V – 305 V at 277 V
AC frequency / range	60 Hz / 59.3 – 60.5 Hz	60 Hz / 59.3 – 60.5 Hz	60 Hz / 59.3 – 60.5 Hz
Phase shift	0.99 at nominal power	0.99 at nominal power	0.99 at nominal power
Efficiency			
Max. efficiency	96.8 %	97.0 %	97.1 %
Weighted efficiency (CEC) at 208 V / 240 V / 277 V	95.5 %	95.5 %/95.5 %/96.0 %	95.5 %/96.0 %/96.0 %
General information			
Dimensions (W / H / D) in mm	468 / 613 / 242	468 / 613 / 242	468 / 613 / 242
Weight / Shipping weight	65 kg / 67 kg	65 kg / 67 kg	65 kg / 67 kg
Ambient temperature	–25 °C ... +45 °C	–25 °C ... +45 °C	–25 °C ... +45 °C
Noise emission (typical)	≤ 44 dB(A)	≤ 45 dB(A)	≤ 46 dB(A)
Consumption: standby / night	< 7 W / 0.1 W	< 7 W / 0.1 W	< 7 W / 0.1 W
Topology	LF transformer	LF transformer	LF transformer
Cooling concept	OptiCool	OptiCool	OptiCool
Mounting Location In-/Outdoor (NEMA 3R)	●/●	●/●	●/●
Features			
LCD	●	●	●
Communication: RS 485 / *Bluetooth*	❍/❍	❍/❍	❍/❍
Warranty: 10 years	●	●	●
Compliance: IEEE-929, IEEE-1547,UL 1741, UL 1998, FCC Part 15 A & B	●	●	●
● Standard ❍ Optional			
Data at nominal conditions – Last update: March 2009			
Type Designation	SB 5000US	SB 6000US	SB 7000US



Accessories

RS485 interface of type 485USPB-SMC-NR

Bluetooth Piggy-Back

UL certified

- For the American solar market (UL 1741/IEEE 1547)

Efficient

- 96.8 % peak efficiency
- OptiCool active temperature management

Safe

- Galvanic isolation due to integrated transformer

Simple

- Patented automatic grid voltage detection*
- Integrated DC load-disconnecting unit

SUNNY BOY 3000US / 4000US

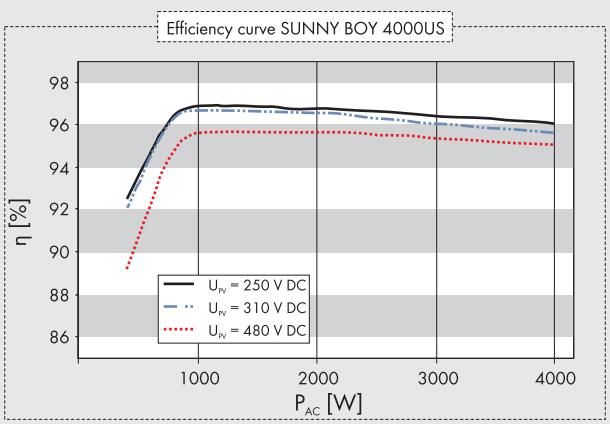
Dependable system managers for the U.S.

User-friendly, secure and robust: the 3000US and 4000US Sunny Boy inverters are specially certified for the U.S. market. For years, they have been reliably feeding solar yields into the public grid. With the patented* automatic grid voltage detection, a straightforward and secure installation is possible. The integrated DC separation device simplifies the installation and saves costs. Suitable for generator grounding, the inverters can be combined with all types of modules. The die-cast aluminum housing, with the OptiCool active cooling system, guarantees the highest yields and a long service life, even under extreme conditions.

*U.S. Patent US7352549B1

Technical Data

	Sunny Boy 3000US	Sunny Boy 4000US
Input Values		
Recommended max. PV power (modules at STC)	3750 W	4375 W at 208 V / 5000 W at 240 V
Max. DC voltage	500 V	600 V
MPP voltage range	175 V – 400 V at 208 V 200 V – 400 V at 240 V	220 V – 480 V at 208 V 250 V – 480 V at 240 V
Max. DC input current	17 A	18 A
Max. number of fused string inputs	2 (inverter), 4 x 20 A (DC disconnect)	2 (inverter), 4 x 20 A (DC disconnect)
Output Values (AC)		
Nominal AC ouput	3000 W	3500 W at 208 V / 4000 W at 240 V
Max. AC output power	3000 W	3500 W at 208 V / 4000 W at 240 V
Max. AC output current	15 A at 208 V, 13 A at 240 V	17 A
Nominal AC voltage / range	183 – 229 V at 208 V 211 – 264 V at 240 V	183 – 229 V at 208 V 211 – 264 V at 240 V
AC frequency / range	60 Hz / 59.3 Hz – 60.5 Hz	60 Hz / 59.3 Hz – 60.5 Hz
Phase shift	0.99 at nominal power	0.99 at nominal power
Efficiency		
Max. efficiency	96.5 %	96.8 %
CEC Weighted Efficiency	95.0 % at 208 V / 95.5 % at 240 V	95.5 % at 208 V / 96.0 % at 240 V
General information		
Dimensions (W / H / D) in mm	450 / 352 / 236	450 / 352 / 236
Weight / Shipping weight	38 kg / 44 kg	38 kg / 44 kg
Ambient temperature	–25 °C ... +45 °C	–25 °C ... +45 °C
Noise emission (typical)	≤ 40 dB(A)	≤ 37 dB(A)
Consumption: standby / night	< 7 W / 0.1 W	< 7 W / 0.1 W
Topology	LF transformer	LF transformer
Cooling concept	OptiCool	OptiCool
Mounting Location In-/Outdoor (NEMA 3R)	●/●	●/●
Features		
LCD	●	●
Communication: RS 485 / *Bluetooth*	❍/❍	❍/❍
Warranty: 10 years	●	●
Compliance: IEEE-929, IEEE-1547,UL 1741, UL 1998, FCC Part 15 A & B	●	●
● Standard ❍ Optional		
Data at nominal conditions – Last update: March 2009		
Type Designation	SB 3000US	SB 4000US



Accessories

RS485 interface of type 485USPB-NR

Bluetooth Piggy-Back

UL certified

- For the American solar market (UL 1741/IEEE 1547)

Safe

- Galvanic isolation due to integrated transformer

Simple

- Simple installation thanks to 3-point mounting assembly

Flexible

- Three different input voltage ranges
- Modular addition for all applications

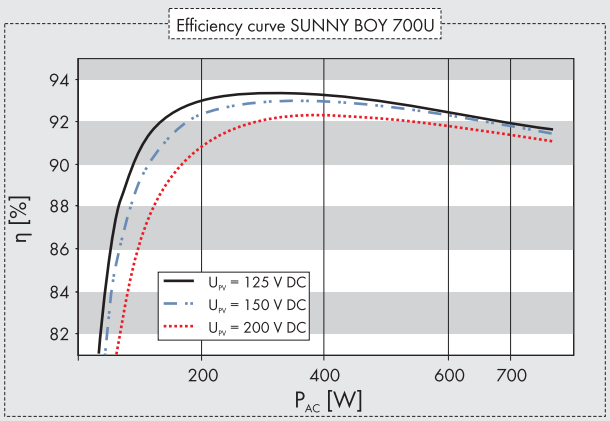
SUNNY BOY 700U

Flexible for modular plant concepts

Easily implement modular PV systems: this is not a problem with the U.S. certified Sunny Boy 700U. It is optimally suited for expanding new or already-existing plants in small increments. With its configurable input voltage range, it can be adjusted to individual system requirements in just a few simple steps. Three different input voltage ranges can be chosen. In addition, thanks to its protection rating in accordance with NEMA 3X, it is extremely robust, and the practical three-point mounting makes installation especially simple.

Technical Data

	Sunny Boy 700U (150 V_{DC})	Sunny Boy 700U (200 V_{DC})	Sunny Boy 700U (250 V_{DC})
Input Values			
Recommended max. PV power (modules at STC)	575 W	750 W	875 W
Max. DC voltage	150 V	200 V	250 V
MPP voltage range	77 V – 120 V	100 V – 160 V	125 V – 200 V
Max. DC input current	7 A	7 A	7 A
Max. number of fused string inputs	2	2	2
Output Values (AC)			
Nominal AC ouput	460 W	600 W	700 W
Max. AC output power	460 W	600 W	700 W
Max. AC output current	4 A	6 A	7 A
Nominal AC voltage / range	106 V – 132 V	106 V – 132 V	106 V – 132 V
AC frequency / range	60 Hz / 59.3 – 60.5 Hz	60 Hz / 59.3 – 60.5 Hz	60 Hz / 59.3 – 60.5 Hz
Phase shift	0.99 at nominal power	0.99 at nominal power	0.99 at nominal power
Efficiency			
Max. efficiency	93.6 %	93.6 %	93.6 %
CEC Weighted Efficiency	91.5 %	91.5 %	91.5 %
General information			
Dimensions (W / H / D) in mm	320 / 320 / 180	320 / 320 / 180	320 / 320 / 180
Weight / Shipping weight	23 kg / 26 kg	23 kg / 26 kg	23 kg / 26 kg
Ambient temperature	–25 °C ... +45 °C	–25 °C ... +45 °C	–25 °C ... +45 °C
Consumption: standby / night	<4 W / 0.1 W	<4 W / 0.1 W	<4 W / 0.1 W
Topology	LF transformer	LF transformer	LF transformer
Cooling concept	convection	convection	convection
Mounting Location In-/Outdoor (NEMA 3X)	●/●	●/●	●/●
Features			
LCD	●	●	●
Communication: RS485	❍	❍	❍
Warranty: 10 years	●	●	●
Compliance: IEEE-929, IEEE-1547,UL 1741, UL 1998, FCC Part 15 A & B	●	●	●
● Standard ❍ Optional			
Data at nominal conditions – Last update: March 2009			
Type Designation	SB 700U 150 VDC	SB 700U 200 VDC	SB 700U 250 VDC



Accessories

RS485 interface of type 485USPB-NR

SUNNY TOWER


SMA
SMA
SMA

Efficient

- Efficiency of up to 98 %
- Low specific price
- Increased yield due to multiple MPP trackers

Safe

- Integrated ESS DC load-disconnecting switch

Flexible

- Modular structure
- Allows combination of Sunny Mini Central and Sunny Boy inverters

Easy to Use

- Delivered as a turn-key solution
- Easy installation
- Integrated data acquisition with Sunny WebBox (optional)

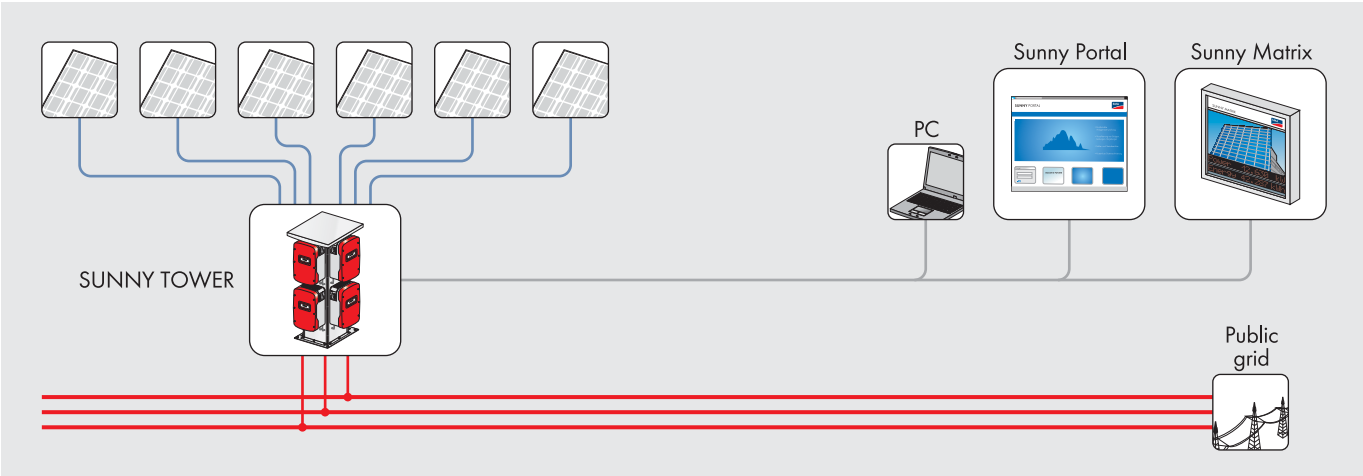
SUNNY TOWER

Easy installation – maximum yield

The Sunny Tower: as easy to install as a central inverter and as profitable as a Sunny Mini Central. Its excellent efficiency of up to 98 % and its easy installation ensure maximum energy yields. The OptiCool intelligent ventilation system makes the Sunny Tower suitable for installation in systems with high ambient temperatures. In addition, the modular structure provides the possibility of combining Sunny Mini Central and Sunny Boy inverters. In this way, it ensures maximum flexibility for system design and expansion.

Technical data (example configuration)

	Sunny Tower with 6 Sunny Mini Central 8000TL	Sunny Tower with 6 Sunny Mini Central 11000TL
Input (DC)		
Max. DC power	49.6 kW	68.4 kW
PV-voltage range	333 V – 500 V	333 V – 500 V
Max. DC voltage ($U_{DC,max}$)	700 V	700 V
Max. input current ($I_{PV,max}$)	6 x 25 A	6 x 34 A
DC voltage ripple (U_{PP})	< 10 %	< 10 %
Max. number of strings (parallel)	6 x 4	6 x 5
Pole Confusion Protection	Short-circuit diode	Short-circuit diode
Output (AC)		
Continuous AC power ($P_{AC,max}$)	48 kW at 40 °C	66 kW at 40 °C
Nominal AC ouput ($P_{AC,nom}$)	48 kW	66 kW
Max. output current ($I_{AC,max}$)	3 x 70 A	3 x 96 A
THD of grid current	< 4 %	< 4 %
Nominal AC voltage ($U_{AC,nom}$)	220 V – 240 V	220 V – 240 V
Nominal AC frequency ($f_{AC,nom}$)	50 Hz / 60 Hz	50 Hz / 60 Hz
Phase shift (cos φ)	1	1
Grid Connection	bolt clamp, max. 5 x 95 mm²	bolt clamp, max. 5 x 95 mm²
Efficiency		
Maximum efficiency (η_{Max})	98.0 %	98.0 %
Euro-Eta (η_{Euro})	97.7 %	97.5 %
Protection device		
Thermally monitored varistors	●	●
Ground fault monitoring	●	●
ESS DC load-disconnecting switch	●	●
Grid monitoring (SMA Grid Guard)	●	●
Short Circuit Proof (current regulation)	●	●
Line circuit breaker	6 x B50	6 x B63
General Data		
Inverter / Sunny Tower protection rating according to DIN EN 60529	IP65 / IP44	IP65 / IP44
Cooling System	OptiCool	OptiCool
Permissible ambient temperature	–25 °C ... +60 °C	–25 °C ... +60 °C
Topology	transformerless	transformerless
Number of Output Phases	3	3
Weight	320 kg	320 kg
Width / Height / Depth in mm	1100 / 1810 / 990	1100 / 1810 / 990
Features		
Warranty: 5 years / 10 years	●/❍	●/❍
Plant monitoring (pre-wired): RS485 / Sunny WebBox / SMA Power Balancer	❍/❍/❍	❍/❍/❍
● Standard ❍ Optional		
Data at nominal conditions – Last update: November 2008		
Type Designation	ST6	ST6



BACKUP SYSTEMS


SUNNY BACKUP
Utility Interactive Battery Inverter

Sunny Backup System: Solar Power – Even in the Event of Grid Failure

A power outage means: grid disconnection of the PV system

No light, no heating, no computer: today, it is very difficult to do anything without electricity. But how many solar power system operators are really aware that in the event of a power outage, the PV system is disconnected from the grid for reasons of safety? From that moment on, it ceases to provide solar power, neither for grid feeding nor for the internal power supply. And this is all the more irritating because, as the experts agree, throughout Europe, lengthy blackouts and temporary power outages are set to increase.

It is precisely this supply gap, which we are closing with the Sunny Backup system from SMA. As of now, this can be used by any PV system owner to power important loads in a reliable and environmentally friendly way, even in the event of grid failure.

Stand-alone power supply

Over 25 years of SMA experience in system technology for PV systems as well as off-grid solutions form the basis for the system that was awarded the "Innovationspreis 2007" (Innovation Award). The Sunny Backup system is a mixture of grid-connected operation and off-grid technology which guarantees you a very high degree of user reliability, as well as easy installation. The Sunny Backup system is not only equipped with the first backup inverter to be certified in accordance with the German standard DIN VDE 0126-1-1*, but it is also available as a completely pre-configured kit solution for different power classes up to 100 kW.

The optimal electricity insurance

Power outages can have terrible financial consequences, especially for companies – unless you have extended the PV system with the Sunny Backup system. In agricultural enterprises, stall ventilation and heat lamps will continue to be powered reliably. In refrigeration rooms, hotels, supermarkets and guesthouses, operations continue without any harm to reputation and without expensive interruptions in the cold chain. And in single-family homes, the heating, oven, PC and lighting all function without interruption, with the same quality of supply as during normal operation.

Furthermore: all PV systems with Sunny Boy inverters can be upgraded without any trouble.

* and for Australia in accordance with AS4777

Components: 1. SUNNY BOY solar inverter, 2. SUNNY BACKUP automatic switching device, 3. SUNNY BACKUP battery set, 4. SUNNY BACKUP 2200, 5. SUNNY REMOTE CONTROL, 6. grid connection

Straightforward

- Can be integrated into existing systems and new PV systems
- Pre-configured sets for different power classes

Flexible

- 1- and 3-phase systems can be realized
- Modularly extendable
- Capacities from 5 kW to approx. 100 kW available

Efficient

- Smaller battery capacity
- Power Supply and battery charging via the grid
- Continuously high PV efficiency

Reliable

- Automatic switching to backup power in approx. 20 milliseconds
- Independent disconnection device in accordance with DIN VDE 0126-1-1

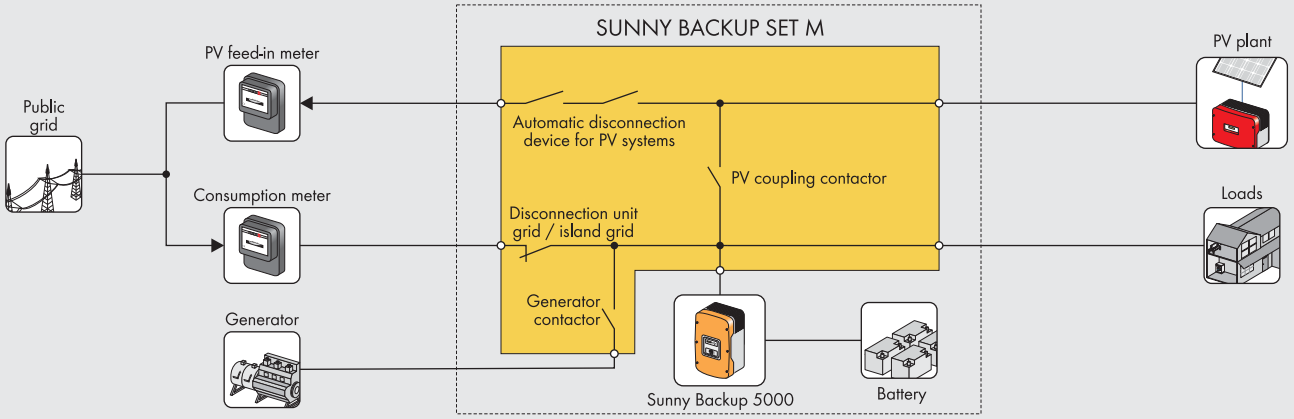
SUNNY BACKUP Set M / L / XL

Solar power – even in the event of grid failure

Best performance, greatest user benefits and lowest investment and operating costs: in comparison with conventional emergency power systems, the Sunny Backup System scores well. As an add-on to the PV system, the Sunny Backup automatically switches to off-grid supply within approx. 20 milliseconds in the event of a grid failure. New and existing PV-plants can be equipped with the Sunny Backup – without affecting system efficiency. And the best part: due to the integration of the PV system, a small and therefore low-cost battery can be implemented as it is usually only needed to bridge the night hours.

Technical Data

	Sunny Backup Set M	Sunny Backup Set L	Sunny Backup Set XL
Output (loads)			
Nominal power / current during grid operation	8 kW / 35 A	44 kW / 3 x 63 A	110 kW / 3 x 160 A
Backup power (continuous / 30 min / 1 min)	5 kW / 6.5 kW / 8.4 kW	15 kW / 19.5 kW / 25.2 kW	up to 60 kW / 78 kW / 100 kW
Number of phases (grid operation / backup operation)	3 / 1	3 / 3	3 / 3
Voltage (range)	230 V (172.5 – 264.5 V)	230 V (172.5 – 264.5 V)	230 V (172.5 – 264.5 V)
Frequency (range)	50 Hz (45 to 65 Hz)	50 Hz (45 to 65 Hz)	50 Hz (45 to 65 Hz)
Permitted grid structure (grid side / load side)	TN-C / TN-S	TN-C / TN-S	TN-C / TN-S
Typical interruption time in the event of power outage	20 ms	20 ms	20 ms
Input PV system			
Nominal AC PV output / current	5.7 kW / 25 A	30 kW / 3 x 44 A	110 kW / 3 x 160 A
Compatible PV inverters	all SB and SMC 4600A	all SB and SMC	all SB and SMC
Input battery			
Nominal voltage / number of blocks	48 V / 4 x 12 V	48 V / 8 x 12 V	48 V / 32 x 12 V
Type / energy / capacity per block	AGM/6.8 kWh/142 Ah	AGM/13.6 kWh/142 Ah	AGM/54.4 kWh/142 Ah
Service life (according to Eurobat)	> 12 years	> 12 years	> 12 years
Efficiency / operating consumption			
Max. efficiency backup operation	95 %	95 %	95 %
Internal consumption day / night (Silent Mode)	48 W / 32 W	114 W / 69 W	360 W / 230 W
Protective devices			
DC reverse polarity / excessive battery discharge	●/●	●/●	●/●
AC short-circuit / AC overload	●/●	●/●	●/●
Grid monitoring (SMA Grid Guard) / galvanic isolation	●/●	●/●	●/●
General Data			
Dimensions SBU (width / height / depth in mm)	467 / 612 / 235	467 / 612 / 235	467 / 612 / 235
Dimensions AS-Box (width / height / depth in mm)	600 / 600 / 210	600 / 760 / 210	1000 / 1600 / 300
Dimensions battery per block (width / height / depth in mm)	498 / 230 / 177	498 / 230 / 177	498 / 230 / 177
Weight per (SBU / AS-Box / battery block)	63 kg / 29 kg / 54.5 kg	63 kg / 41 kg / 54.5 kg	63 kg / 180 kg / 54.5 kg
Operating temperature range	–25 °C ... +50 °C	–25 °C ... +50 °C	–25 °C ... +50 °C
Protection rating (SBU, AS-Box)	IP30 / IP65	IP30 / IP65	IP30 / IP65
Features / function			
Integrated bypass for faults / test operation	●/●	●/●	●/●
State of charge calculation / generator input	●/❍	●/❍	●/❍
Warranty SBU 5000 (5 years / 10 years)	●/❍	●/❍	●/❍
Battery warranty (2 years), AS-Box warranty (5 years)	●	●	●
Certificates and permits	www.SMA.de	www.SMA.de	www.SMA.de
Accessories			
Battery cables / DC splitter / communication cables	3 m / ❍ / 5 m	6 m / ● / 5 m	6 m / ● / 5 m
Battery fuses "BATFUSE"	❍	❍	❍
Interfaces (RS485 PB / Multicluster PB)	❍/❍	❍/❍	●/●
Additional battery parallel / other battery	❍/❍	❍/❍	❍/❍
● Standard ❍ Optional			
Last updated: March 2009			
Type designation	SBU-Set-M	SBU-Set-L	SBU-Set-XL



Simple

- Can be integrated into existing systems and new PV systems
- Pre-configured set

Affordable

- Compact and affordable switching device
- Smaller battery size required due to utilization of the PV energy

Efficient

- Power supply and battery charging via the grid
- Unchanged high efficiency

Reliable

- Automatic switching to backup power supply in approx. 50 milliseconds
- Independent disconnection device in accordance with DIN VDE 0126-1-1

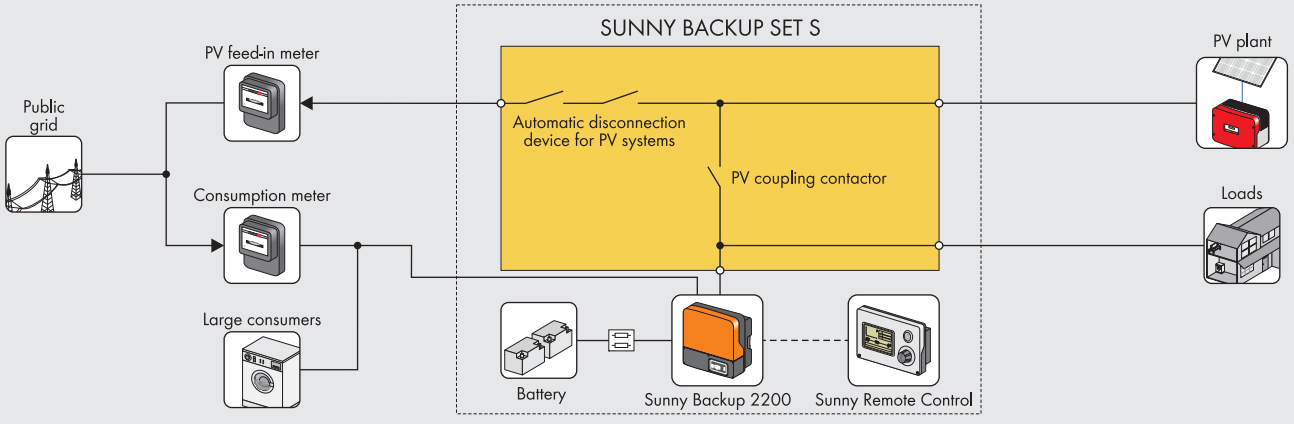
SUNNY BACKUP Set S

Reliable back-up electricity supply for single-family homes

Innovative electricity supply for home owners: as on add-on to the PV system, the Sunny Backup Set Small switches to off-grid mode within 50 milliseconds. For winter or summer: owners of small or medium-sized PV systems with inverters from SMA can supply the important loads self-sufficiently in the event of a power failure. The affordable complete solution is not only suitable for new solar power systems; existing PV systems can also be retrofitted with the certified Sunny Backup System without difficulty.

Technical Data

	Sunny Backup Set S	
Output (loads)		
Nominal power / current during grid operation	5.7 kW / 25 A	
Backup power (continuous / 30 min / 1 min)	2.2 kW / 2.9 kW / 3.8 kW	
Number of phases (grid operation / backup operation)	1 / 1	
Voltage (range)	230 V (172.5 – 264.5 V)	
Frequency (range)	50 Hz (45 to 65 Hz)	
Permitted grid structure (grid side / load side)	TN-C / TN-S	
Typical interruption time in the event of power outage	50 ms	
Input PV system		
Nominal AC PV output / current	4.6 kW / 20 A	
Compatible PV inverters	All Sunny Boy inverters *	
Input battery		
Nominal voltage / number of blocks	24 V / 2 x 12 V	
Type / energy / capacity per block	AGM / 3.4 kWh / 142 Ah	
Service life (according to Eurobat)	> 12 years	
Efficiency / operating consumption		
Max. efficiency backup operation	93.6 %	
Internal consumption day / night (Silent Mode)	40 W / 6 W	
Protective devices		
DC reverse polarity / excessive battery discharge	–/●	
AC short-circuit / AC overload	●/●	
Grid monitoring (SMA Grid Guard) / galvanic isolation	●/●	
General Data		
Dimensions SBU (width / height / depth in mm)	470 / 445 / 180	
Dimensions AS-Box (width / height / depth in mm)	200 / 300 / 120	
Dimensions battery per block (width / height / depth in mm)	498 / 230 / 177	
Weight per (SBU / AS-Box / battery block)	19 kg / 4.5 kg / 54.5 kg	
Operating temperature range	-25 °C ... +60 °C	
Protection rating (SBU, AS-Box)	IP54 / IP65	
Features / function		
Integrated bypass for faults / test operation	●/●	
State of charge calculation / generator input	●/–	
Warranty SBU 2200 (5 years / 10 years)	●/❍	
Battery warranty (2 years), AS-Box warranty (5 years)	●	
Certificates and permits	www.SMA.de	
Accessories		
Battery cables / DC splitter / communication cables	4 m / – / 5 m	
Battery fuses "BATFUSE"	●	
Interfaces (RS485 PB / Multicluster PB)	❍/–	
Additional battery parallel / other battery	❍/❍	
External user interface "SRC-1"	●	
* SB 2500, SB 2800, SB 3000, models from May 2005 and later		
● Standard ❍ Optional		
Last updated: March 2009		
Type designation	SBU-Set-S.1	



CENTRAL INVERTERS


EMERGENCY
STOP

Central Inverters from SMA: High Technology for Solar Power Stations

Larger, more powerful, more efficient. The success of photovoltaics has led to constantly growing system sizes in recent years. With the Sunny Central product line, SMA offers central inverters intended specifically for high performance class installations. Thanks to their special properties such as highest efficiency, string monitoring, medium voltage feed-in, grid management and the possibility of outdoor installation, the devices are optimally suited for use in solar power plants with homogenous structures.

An investment that pays off

From 100 kW Sunny Central up to series produced megawatt solar inverters – the Sunny Central inverters from SMA are particularly economical. Whether the Sunny Central 100 or the new HE class: SMA devices with efficiencies of over 98 % are the most powerful in their segment. Also, the HE class already fulfils the requirements of the new medium-voltage directive. And the direct feeding-in into the medium-voltage grid increases efficiency even more.

Central inverters with their own weather-proof housings allow for installation outdoors – immediately adjacent to the generator. As a result, long transmission distances and construction measures are eliminated. Also, installation near the coast is possible upon request, thanks to special filters.

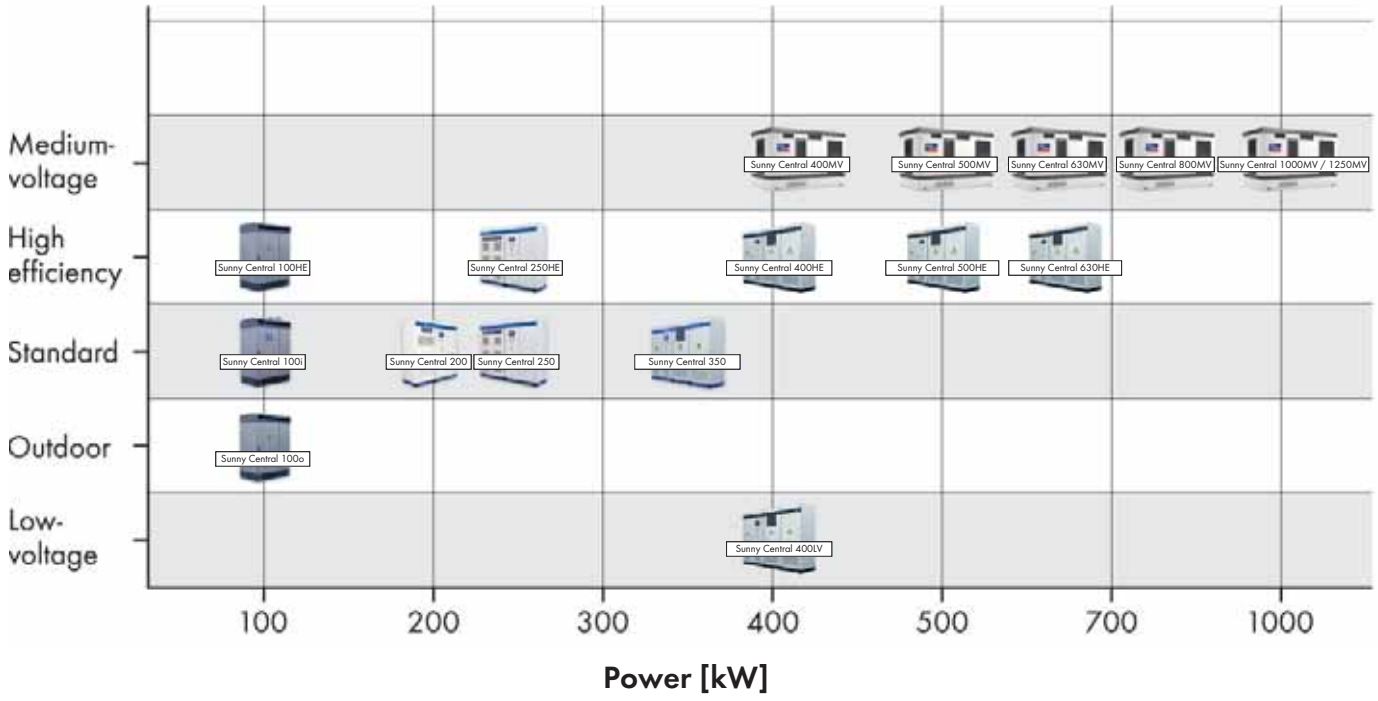
Highest reliability and durability

SMA central inverters have been developed for a minimum lifespan of 20 years. This is because maximum investment security is only ensured when inverters operate reliably and flawlessly over a long period of time. The SMA system monitoring assures additional safety: thanks to numerous communications interfaces, operators can monitor their system from any PC around the world via the Internet. Yield variations can therefore be recognized and resolved in good time.

» Comprehensive service worldwide

SMA not only has many years of experience in the implementation of large solar power plants, but it also offers the appropriate service to match for every application. For the greatest availability and secure investment.

Read more about the Sunny Central Service on page 162



High-yield

- Outstanding specific price
- Efficiency of more than 98 percent

Flexible

- Extended input voltage range for flexible system design
- Integrated DC main distribution for direct connection of the string monitors

- Connection of up to two external DC main distributors for diverse system configurations

Reliable

- Already fulfils the requirements of the new medium-voltage directive including static grid support
- Perfect monitoring of all PV strings in the field

SUNNY CENTRAL 400LV / 400HE / 500HE / 630HE

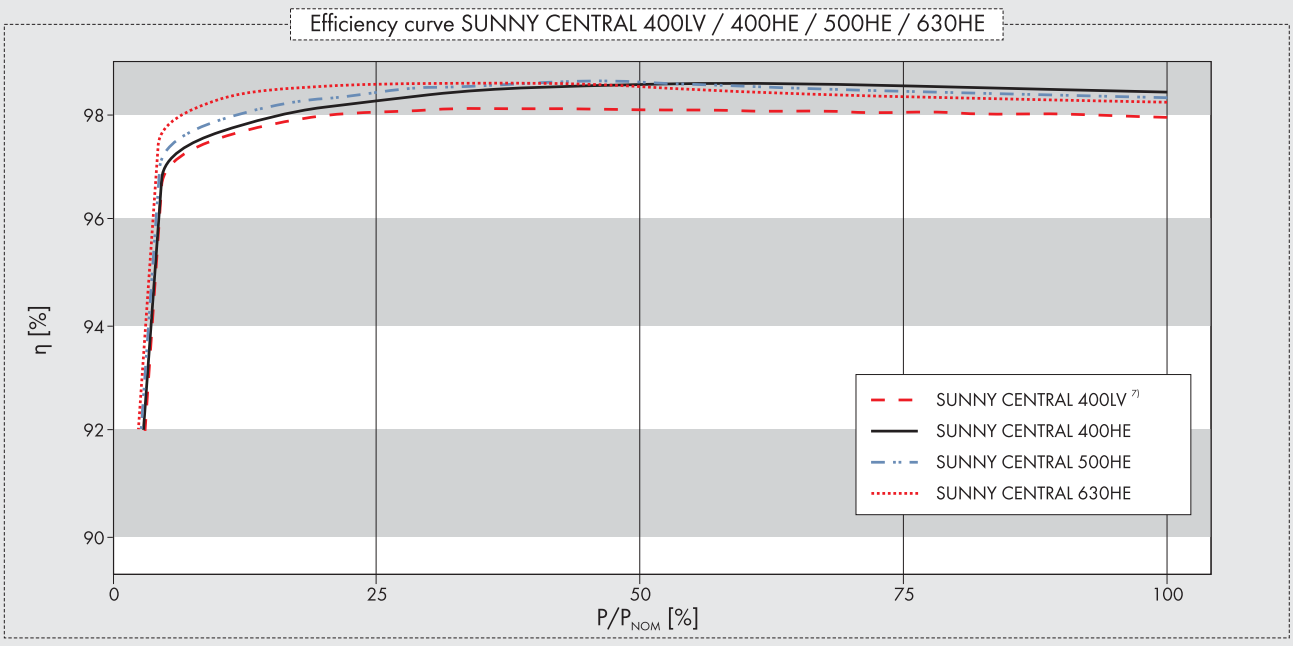
Grid management included

More power with lower system costs, high flexibility for system design and the best future prospects: being the further development of the successful HE series, the Sunny Central 400HE, 500HE and 630HE feature first class up-to-date technology. As a result of the up to 1000 Volt extended input voltage range, no additional costs are incurred for an EVR option. The integrated DC main distribution simplifies the system technology in the field with reduced installation costs. And: the new HE central inverter range is the first to comply with the requirements of the "medium-voltage directive". They stabilize the public grid, support the grid voltage and regulate electrical grid parameters. The Sunny Central 400LV is at the same time well suited for solar modules with a smaller allowable system voltage. An investment that pays off in the future.


SUNNY CENTRAL 630HE

Technical Data
Sunny Central 400LV / 400HE / 500HE / 630HE

	Sunny Central 400LV	Sunny Central 400HE	Sunny Central 500HE	Sunny Central 630HE
Input data				
Nominal power DC	409 kW	408 kW	509 kW	642 kW
Max. PV power (recommended), (P_{PV})	450 kWp [1]	450 kWp [1]	560 kWp [1]	705 kWp [1]
DC voltage range, MPPT (U_{DC})	300 V – 600 V [5]	450 V – 820 V [5]	450 V – 820 V [5]	500 V – 820 V [5]
Max. permissible DC voltage ($U_{DC, max}$)	600 V	1000 V	1000 V	1000 V
Max. permissible DC current ($I_{DC, max}$)	1400 A	1000 A	1200 A	1350 A
Voltage ripple, PV voltage (U_{PP})	< 3 %	< 3 %	< 3 %	< 3 %
Number of fused DC inputs	2 Connections for external DC main distribution board (SMB) / 8 per potential			
Output data				
Nominal AC output power (P_{AC})	400 kW [6]	400 kW [6]	500 kW [6]	630 kW [6]
Operating grid voltage ± 10 % (U_{AC})	200 V	270 V	270 V	315 V
Nominal AC current ($I_{AC, nom}$)	1155 A	855 A	1070 A	1155 A
Operating range, grid frequency (f_{AC})	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz
Distortion of the grid current	< 3 % at nominal power	< 3 % at nominal power	< 3 % at nominal power	< 3 % at nominal power
Phase shift (cos φ)	0.95 leading ... 0.95 lagging			
Efficiency [2]				
Maximum efficiency $P_{AC, max}$ (η)	98.2 % [7]	98.6 %	98.6 %	98.6 %
Euro-Eta (η)	98.0 % [7]	98.4 %	98.4 %	98.4 %
Dimensions and Weight				
Width / Height / Depth in mm (W / H / D)	1600 + 1200/2120/850	1600 + 1200/2120/850	1600 + 1200/2120/850	1600 + 1200/2120/850
Weight approx. (kg)	1900	1900	1900	1900
Power consumption				
Internal consumption in operation (P_{day})	< 2800 W [4]	< 2800 W [4]	< 2900 W [4]	< 3000 W [4]
Internal consumption in Standby (P_{night})	< 100 W	< 100 W	< 100 W	< 100 W
External auxiliary voltage / grid structure	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid
External back-up fuse for auxiliary supply	B 20 A, 3-pole	B 20 A, 3-pole	B 20 A, 3-pole	B 20 A, 3-pole
SCC (Sunny Central Control) interfaces				
Communication (NET Piggy Back, optional)	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet
Analog inputs	1 x PT 100, 3 x Ain [3]	1 x PT 100, 3 x Ain [3]	1 x PT 100, 3 x A_{in} [3]	1 x PT 100, 3 x A_{in} [3]
Overvoltage protection for analog inputs	Optional	Optional	Optional	Optional
Sunny String-Monitor connection (COM1)	RS485	RS485	RS485	RS485
PC connection (COM3)	RS232	RS232	RS232	RS232
Electrically separated relay (ext. alert signal)	1	1	1	1

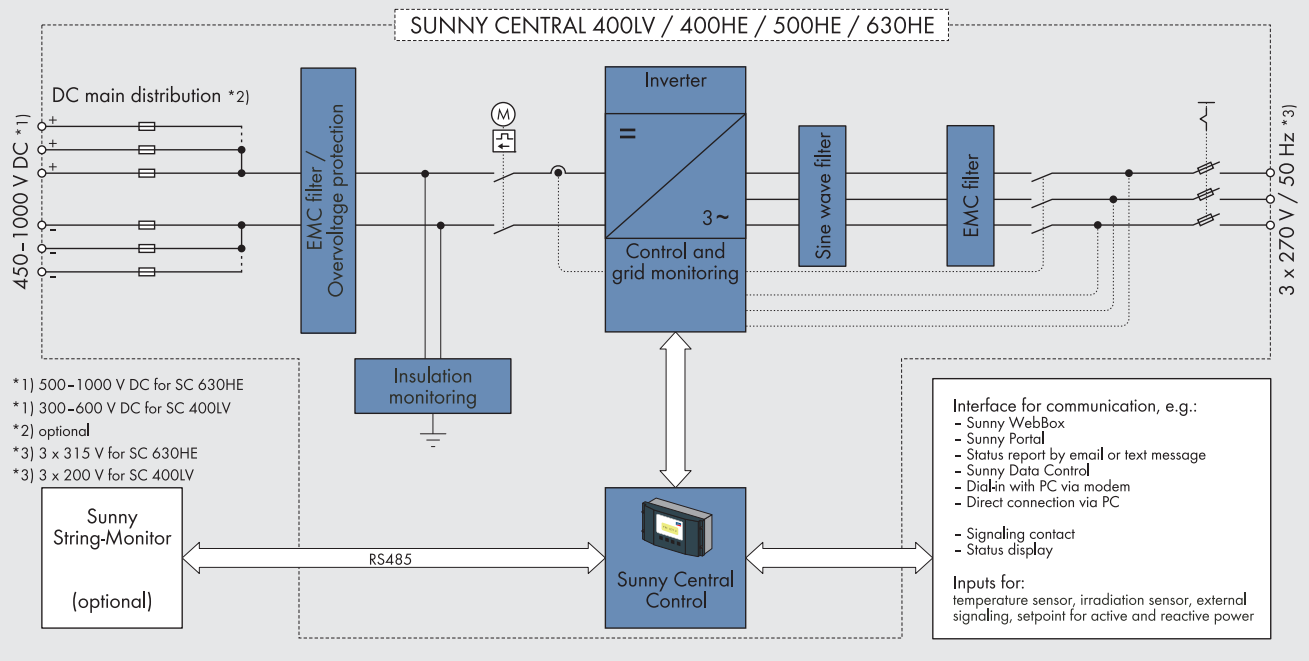


	Sunny Central 400LV	Sunny Central 400HE	Sunny Central 500HE	Sunny Central 630HE
Features				
Display (SCC)	Yes	Yes	Yes	Yes
Ground fault monitoring	Yes	Yes	Yes	Yes
Heating	Yes	Yes	Yes	Yes
Emergency stop	Yes	Yes	Yes	Yes
Power switch AC side	Fuse switch disconnector	Fuse switch disconnector	Fuse switch disconnector	Fuse switch disconnector
Power switch DC side	Load disc. switch with motor	Load disc. switch with motor	Load disc. switch with motor	Load disc. switch with motor
Monitored overvoltage protectors AC / DC	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
Monitored overvoltage protectors for aux. supply	Yes	Yes	Yes	Yes
Standards				
EMC	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
Grid monitoring	in acc. with BDEW directive	in acc. with BDEW directive	in acc. with BDEW directive	in acc. with BDEW directive
CE conformity	Yes	Yes	Yes	Yes
Protection rating and ambient conditions				
Protection rating as per EN 60529	IP20	IP20	IP20	IP20
Protection rating per EN 60721-3-3 Ambient Conditions: fixed location, weather protection	Classification of • chem. active substances: 3C1L • mech. active substances: 3S2	Classification of • chem. active substances: 3C1L • mech. active substances: 3S2	Classification of • chem. active substances: 3C1L • mech. active substances: 3S2	Classification of • chem. active substances: 3C1L • mech. active substances: 3S2
Permissible ambient temperatures (T)	–20 °C ... +50 °C	–20 °C ... +50 °C	–20 °C ... +50 °C	–20 °C ... +50 °C
Relative humidity, non condensing (U_{AIR})	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %
Max. altitude (above sea level)	1000 m	1000 m	1000 m	1000 m
Fresh air consumption (V_{AIR})	6200 m³/h	6200 m³/h	6200 m³/h	6200 m³/h
Type designation	SC 400LV-11	SC 400HE-11	SC 500HE-11	SC 630HE-11

HE: High Efficiency, inverter without galvanic isolation for connection to a medium-voltage transformer (taking into account the SMA specification for the transformer)

1) Specifications apply to irradiation values under STC
2) Efficiency measured without an internal power supply at U_{DC} = 500 V
3) Terminal for an analog sensor provided by the customer in two-wire and four-wire version
4) Internal consumption measured in clock-rate operation with activated AC fans, activated DC fans and stack fans at 100 %
5) $U_{DC\,min}$ at U_{ACN} ±5 % and cos φ = 1
6) P_{nom} at U_{ACN} ±5 % and cos φ = 1
7) Preliminary information: last updated March 2009

Please also read: Transport instructions for Sunny Central and the Sunny Central installation guide



Efficient

- Without low-voltage transformers: increased system efficiency due to direct connection to the medium-voltage grid

Turnkey Delivery

- With medium voltage transformer and concrete substation for outdoor installation

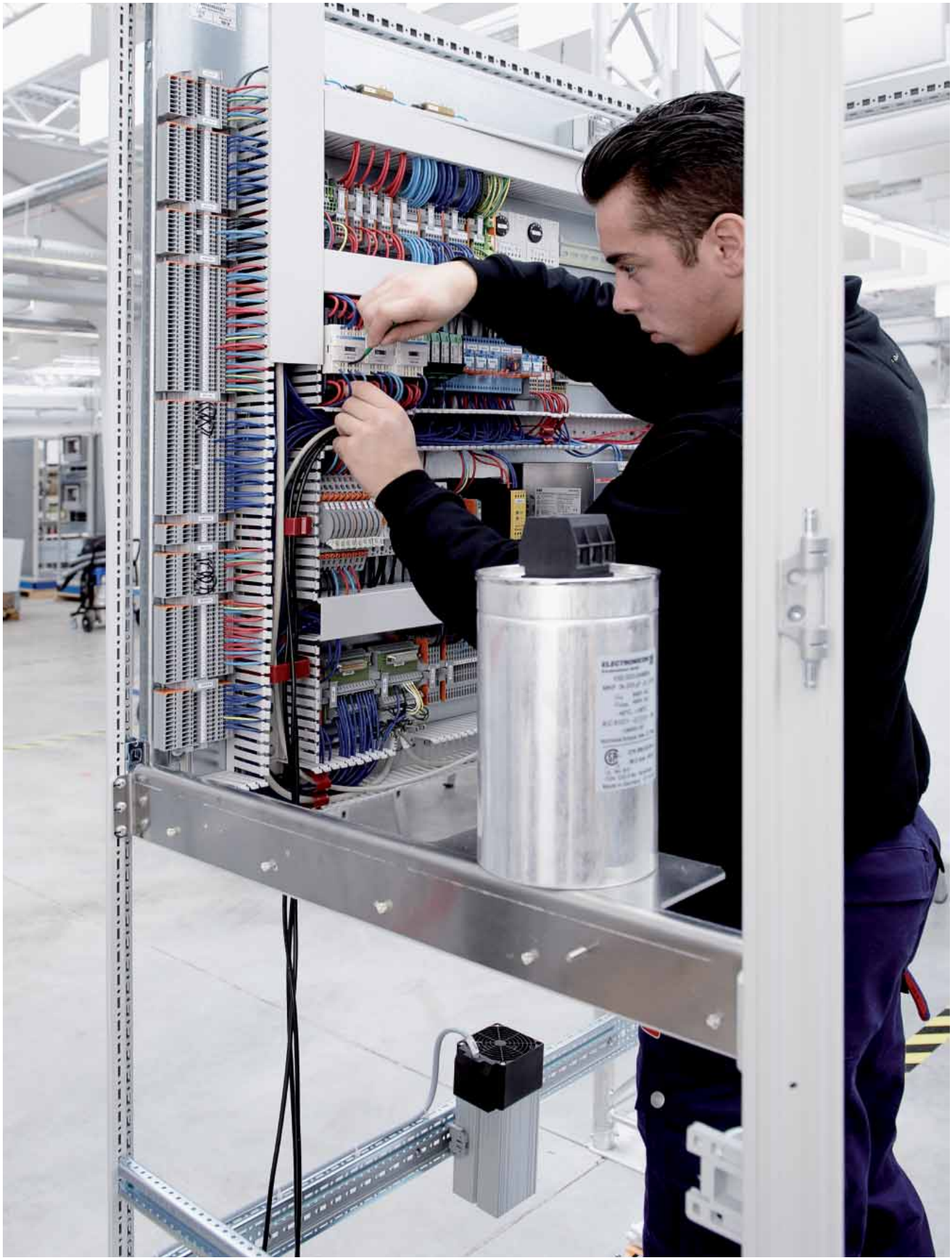
Optional

- Grid management
- Regulation of the reactive power
- Medium-voltage switching system for the flexible construction of large solar parks
- AC transfer station with measurement
- Medium-voltage transformers for other grid voltages (varying from 20 kV)

SUNNY CENTRAL for direct medium-voltage feed-in 800MV / 1000MV / 1250MV

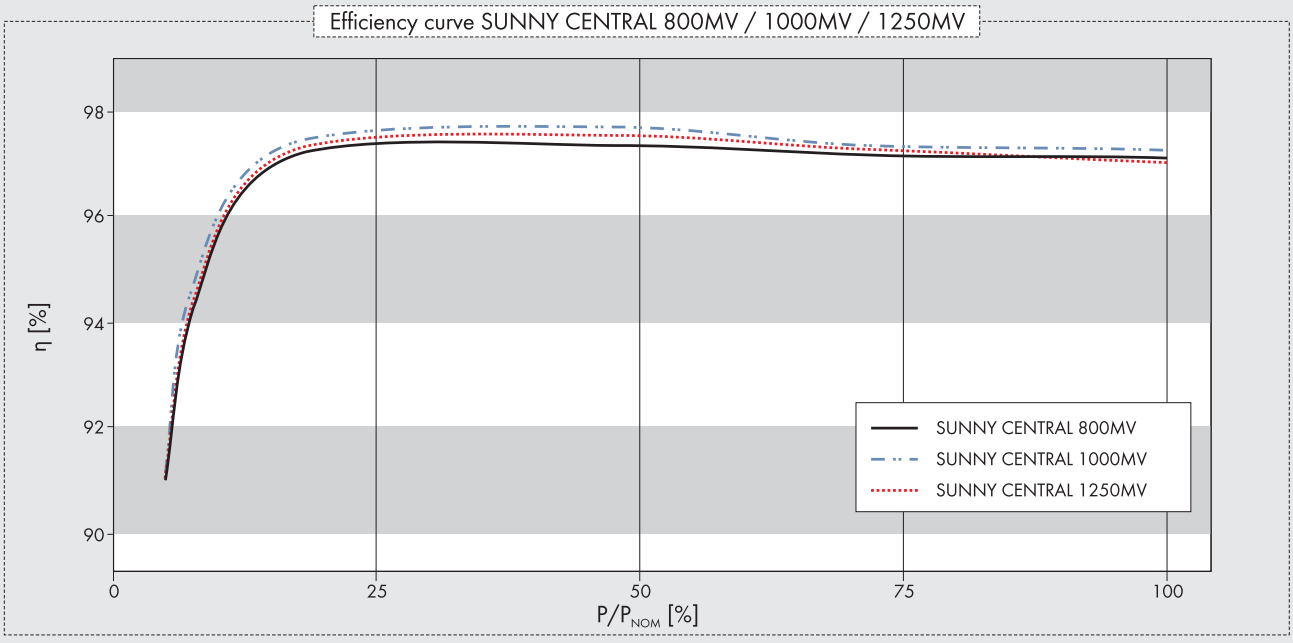
Powerful medium-voltage station

For even more power: two powerful Sunny Central HE inverters are components of a medium voltage station (MV) which feeds directly into a medium voltage transformer. Thus a Sunny Central 1250MV station is comprised of two Sunny Central 630HE inverters, for example. The advantage: by removing the need for low-voltage transformers, the efficiency is increased and at the same time the inverter costs are lower. In addition, the Sunny Central MV features the best prospects: as it is the first inverter to comply with all requirements of the medium-voltage directive. An investment that pays off today and in the future.



Technical Data
SUNNY CENTRAL 800MV / 1000MV / 1250MV

	Sunny Central 800MV	Sunny Central 1000MV	Sunny Central 1250MV
Input data			
Nominal power DC	816 kW	1018 kW	1284 kW
Max. PV power (recommended), (P_{PV})	900 kWp [1]	1120 kWp [1]	1410 kWp [1]
DC voltage range, MPPT (U_{DC})	450 V – 820 V [5]	450 V – 820 V [5]	500 V – 820 V [5]
Max. permissible DC voltage ($U_{DC, max}$)	1000 V	1000 V	1000 V
Max. permissible DC current ($I_{DC, max}$)	2000 A	2400 A	2700 A
Voltage ripple, PV voltage (U_{PP})	< 3 %	< 3 %	< 3 %
Number of fused DC inputs	4 Connections for external DC main distribution board (SMB) / 16 per potential		
Output data			
Nominal AC output power (P_{AC})	800 kW [6]	1000 kW [6]	1250 kW [6]
Operating grid voltage ± 10 % (U_{AC})	20 kV	20 kV	20 kV
Nominal AC current ($I_{AC, nom}$)	23.2 A	28.8 A	36.1 A
Operating range, grid frequency (f_{AC})	50 Hz – 60 Hz	50 Hz – 60 Hz	50 Hz – 60 Hz
Distortion of the grid current	< 3 % at nominal power	< 3 % at nominal power	< 3 % at nominal power
Phase shift (cos φ)	0.95 leading ... 0.95 lagging		
Efficiency [2]			
Max. efficiency PAC, max (η)	97.7 %	97.9 %	97.8 %
Euro-Eta (η)	97.3 %	97.5 %	97.4 %
Dimensions and Weight [4]			
Width / Height / Depth in mm (W / H / D)	5400 / 3620 / 3000	5400 / 3620 / 3000	5400 / 3620 / 3000
Weight approx. (m)	35 t	35 t	35 t
Power consumption			
Internal consumption in operation (P_{day})	< 5600 W	< 5800 W	< 6000 W
Internal consumption in Standby (P_{night})	< approx. 180 W + 1100 W	< approx. 180 W + 1100 W	< approx. 180 W + 1400 W
External auxiliary voltage / grid structure	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid
External back-up fuse for auxiliary supply	B 20 A, 3-pole	B 20 A, 3-pole	B 20 A, 3-pole
SCC (Sunny Central Control) interfaces			
Communication (NET Piggy Back, optional)	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet
Analog inputs	2 x PT 100, 6 x A_{in} [3]	2 x PT 100, 6 x A_{in} [3]	2 x PT 100, 6 x A_{in} [3]
Overvoltage protection for analog inputs	Optional	Optional	Optional
Sunny String-Monitor connection (COM1)	RS485	RS485	RS485
PC connection (COM3)	RS232	RS232	RS232
Electrically separated relay (ext. alert signal)	2	2	2

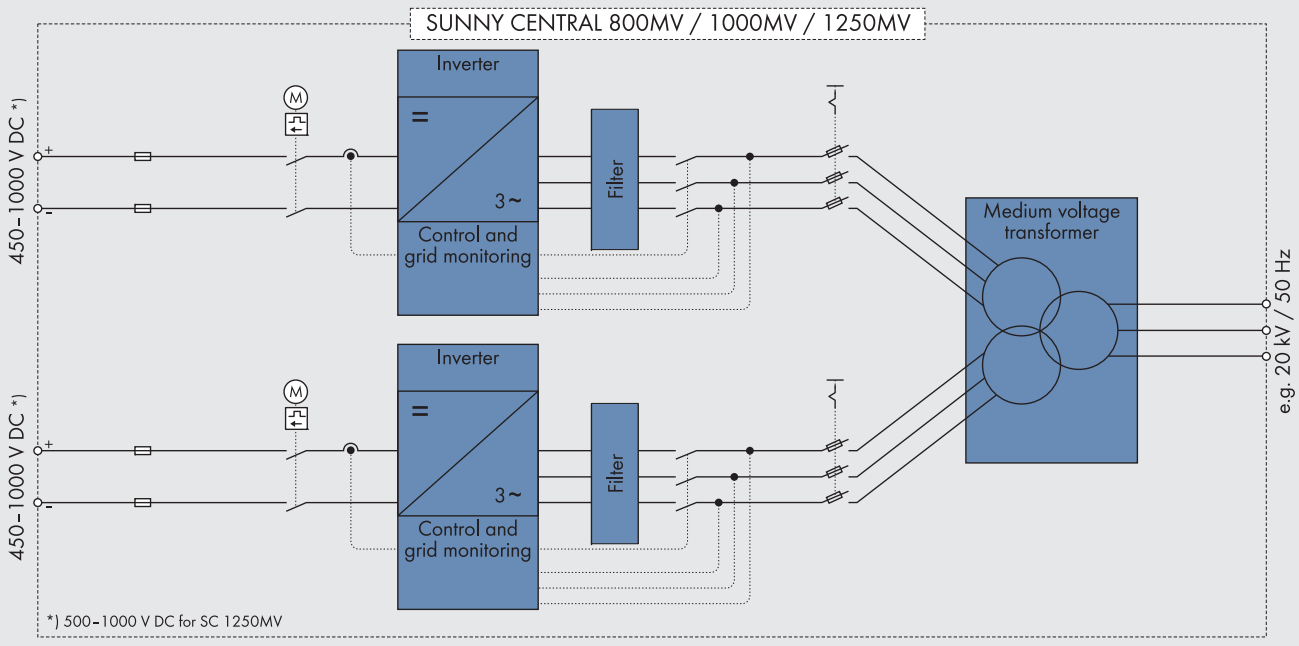


	Sunny Central 800MV	Sunny Central 1000MV	Sunny Central 1250MV
Features			
Display (SCC)	Yes	Yes	Yes
Ground fault monitoring	Yes	Yes	Yes
Heating	Yes	Yes	Yes
Emergency stop	Yes	Yes	Yes
Power switch AC side	Fuse switch disconnector 7)	Fuse switch disconnector 7)	Fuse switch disconnector 7)
Power switch DC side	Load disc. switch with motor	Load disc. switch with motor	Load disc. switch with motor
Monitored overvoltage protectors AC / DC	Yes 7) / Yes	Yes 7) / Yes	Yes 7) / Yes
Monitored overvoltage protectors for aux. supply	Yes	Yes	Yes
Standards			
EMC	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
Grid monitoring	in acc. with BDEW directive	in acc. with BDEW directive	in acc. with BDEW directive
CE conformity	Yes	Yes	Yes
Protection rating and ambient conditions			
Protection rating as per EN 60529	IP54	IP54	IP54
Protection rating per EN 60721-3-4 Ambient conditions: fixed location, without protection against wind and weather	Classification of • chem. active substances: 4C1 • mech. active substances: 4S2	Classification of • chem. active substances: 4C1 • mech. active substances: 4S2	Classification of • chem. active substances: 4C1 • mech. active substances: 4S2
Permissible ambient temperatures (T)	–20 °C ... +45 °C	–20 °C ... +45 °C	–20 °C ... +45 °C
Relative humidity, non condensing (U_{AIR})	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %
Max. altitude (above sea level)	1000 m	1000 m	1000 m
Fresh air consumption (V_{AIR})	12400 m³/ h	12400 m³/ h	12400 m³/ h
Type designation	SC 800MV-11	SC 1000MV-11	SC 1250MV-11

HE: High Efficiency, inverter without galvanic isolation for connection to a medium-voltage transformer (taking into account the SMA specification for the transformer)

1) Specifications apply to irradiation values under STC
2) Efficiency measured without an internal power supply at U_{DC} = 500 V
3) Terminal for an analog sensor provided by the customer in two-wire and four-wire version
4) Internal consumption measured in clock-rate operation with activated AC fans, activated DC fans and stack fans at 100 %
5) $U_{DC\,min}$ at U_{ACN} ±5 % and cos φ = 1
6) P_{nom} at U_{ACN} ±5 % and cos φ = 1
7) The SI-load disconnection switch and the AC overvoltage arrestor are located on the AC side of the inverter.

Please also read: Transport instructions for Sunny Central and the Sunny Central installation guide



Efficient

- Without low-voltage transformers: increased system efficiency due to direct connection to the medium-voltage grid

Turnkey Delivery

- Complete with medium-voltage transformer and concrete substation for outdoor installation

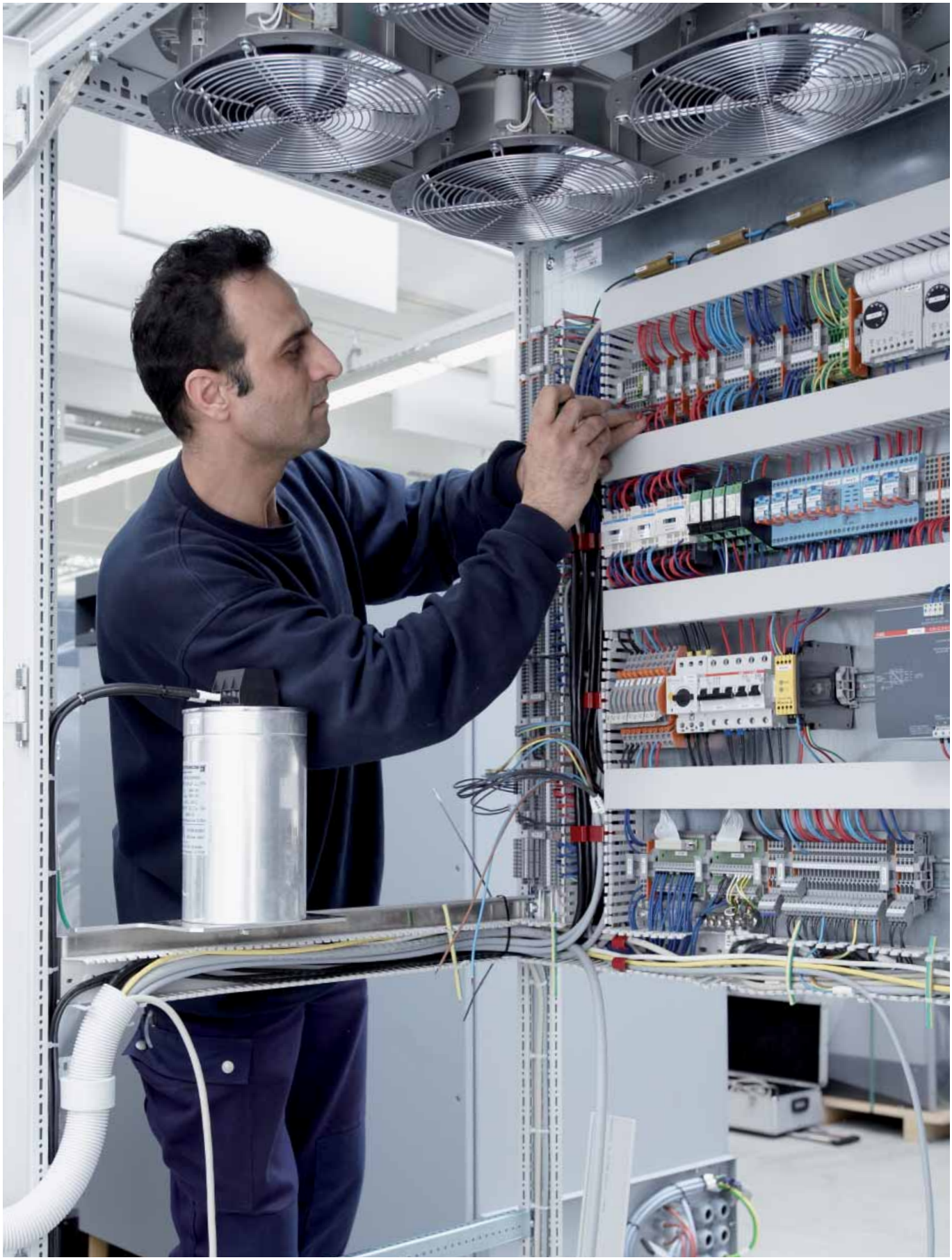
Optional

- Grid management
- Regulation of the reactive power
- Medium-voltage switching system for the flexible construction of large solar parks
- AC transfer station with measurement
- Medium-voltage transformers for other grid voltages (varying from 20 kV)

SUNNY CENTRAL for direct medium-voltage feed-in 400MV / 500MV / 630MV

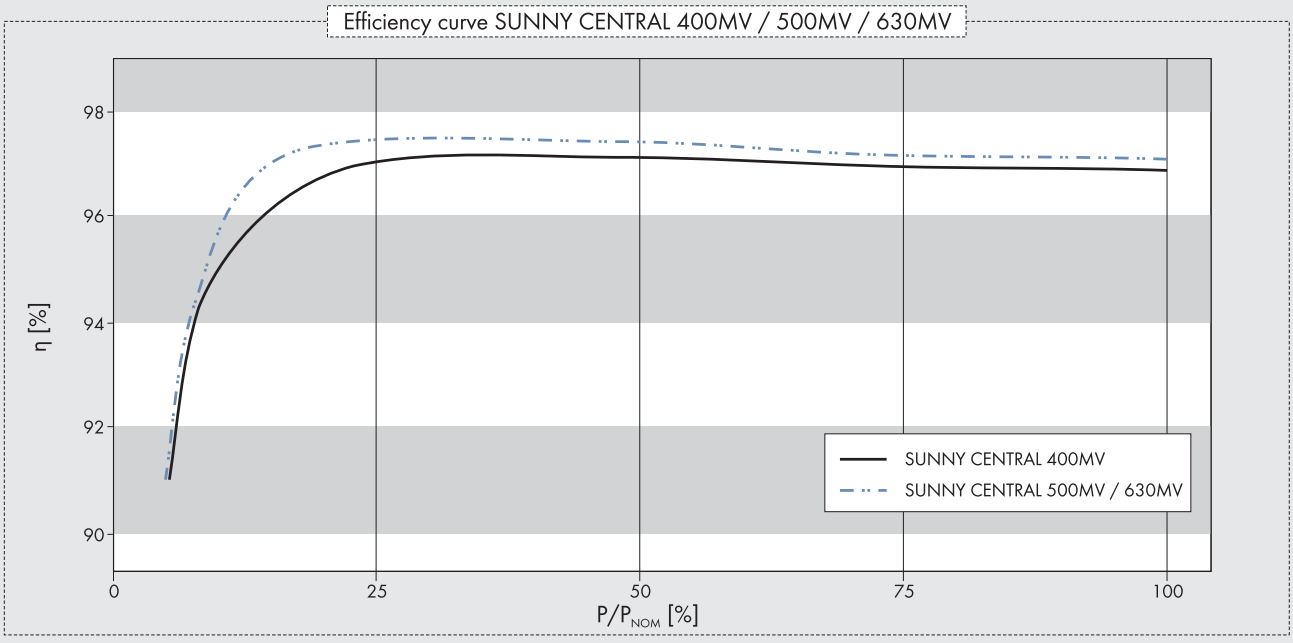
The compact station for safe grid management

The station has got it: equipped with an SMA central inverter of the new HE family and a medium-voltage transformer, the Sunny Central MV feeds directly into the medium-voltage grid. The advantage: by removing the need for the low-voltage transformer, the system operator realizes greater yields and at the same time lower inverter costs. The Sunny Central MV is delivered as a "turnkey" concrete substation for outside installation. On top of that, the Sunny Central MV actively participates in grid management. Thus, it fulfils all the requirements of the medium-voltage directive, valid from July 2010.



Technical Data
SUNNY CENTRAL 400MV / 500MV / 630MV

	Sunny Central 400MV	Sunny Central 500MV	Sunny Central 630MV
Input data			
Nominal power DC	408 kW	509 kW	642 kW
Max. PV power (recommended), (P_{PV})	450 kWp	560 kWp [1]	705 kWp [1]
DC voltage range, MPPT (U_{DC})	450 V – 820 V [5]	450 V – 820 V [5]	500 V – 820 V [5]
Max. permissible DC voltage ($U_{DC, max}$)	1000 V	1000 V	1000 V
Max. permissible DC current (IDC, max)	1000 A	1200 A	1350 A
Voltage ripple, PV voltage (U_{PP})	< 3 %	< 3 %	< 3 %
Number of fused DC inputs	2 Connections for external DC main distribution board (SMB) / 8 per potential		
Output data			
Nominal AC output power (P_{AC})	400 kW [6]	500 kW [6]	630 kW [6]
Operating grid voltage ± 10 % (U_{AC})	20 kV	20 kV	20 kV
Nominal AC current ($I_{AC, nom}$)	11.6 A	14.4 A	18.2 A
Operating range, grid frequency (f_{AC})	50 Hz – 60 Hz	50 Hz – 60 Hz	50 Hz – 60 Hz
Distortion of the grid current (K_{IAC})	< 3 % at nominal power	< 3 % at nominal power	< 3 % at nominal power
Phase shift (cos φ)	0.95 leading ... 0.95 lagging		
Efficiency [2]			
Maximum efficiency $P_{AC, max}$ (η)	97.5 %	97.7 %	97.8 %
Euro-Eta (η)	97.1 %	97.3 %	97.4 %
Dimensions and Weight [4]			
Width / Height / Depth in mm (W / H / D) with switching system	5300/ 3600/ 2500	5300/ 3600/ 2500	5300/ 3600/ 2500
Width / Height / Depth in mm (W / H / D) without switching system	4800 / 3600 / 2500	4800 / 3600 / 2500	4800 / 3600 / 2500
Weight approx. (m)	30 t	30 t	30 t
Power consumption			
Internal consumption in operation (P_{day})	< 2800 W	< 2900 W	< 3000 W
Internal consumption in Standby (P_{night})	< approx. 100 W + 720 W	< approx. 100 W + 720 W	< approx. 100 W + 860 W
External auxiliary voltage / grid structure	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid
External back-up fuse for auxiliary supply	B 20 A, 3-pole	B 20 A, 3-pole	B 20 A, 3-pole
SCC (Sunny Central Control) interfaces			
Communication (NET Piggy Back, optional)	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet
Analog inputs	1 x PT 100, 3 x A_{in} [3]	1 x PT 100, 3 x A_{in} [3]	1 x PT 100, 3 x A_{in} [3]
Overvoltage protection for analog inputs	optional	optional	optional
Sunny String-Monitor connection (COM1)	RS485	RS485	RS485
PC connection (COM3)	RS232	RS232	RS232
Electrically separated relay (ext. alert signal)	1	1	1

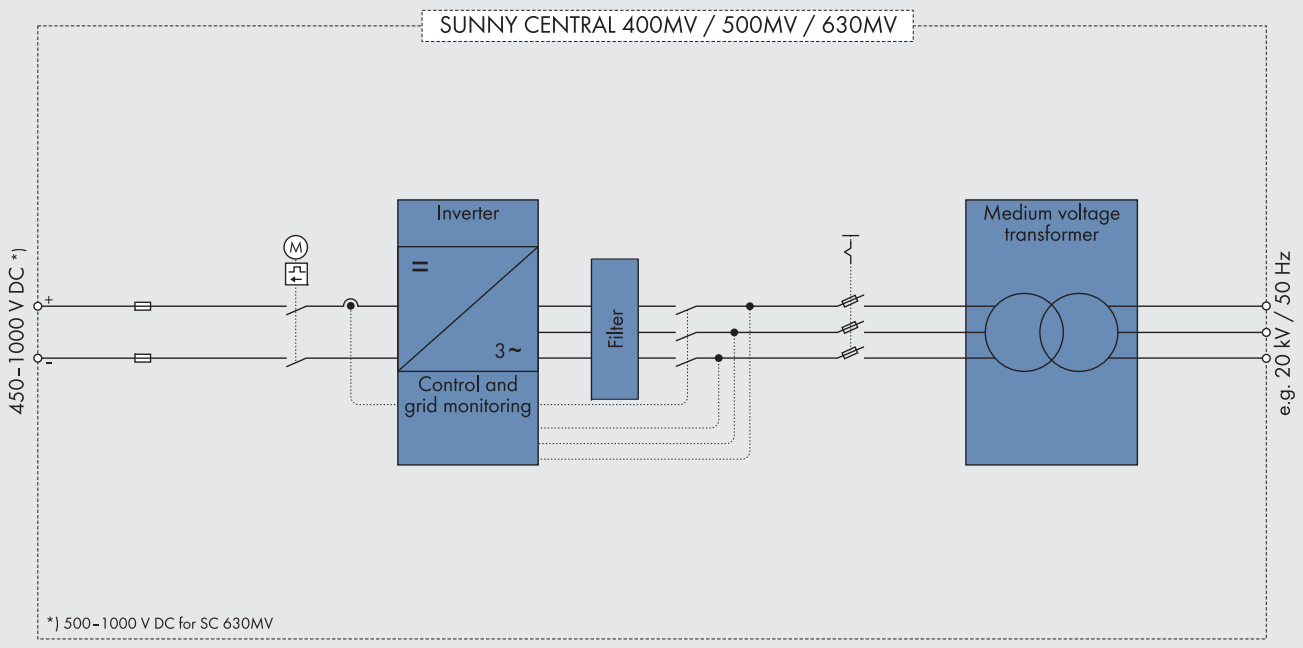


	Sunny Central 400MV	Sunny Central 500MV	Sunny Central 630MV
Features			
Display (SCC)	Yes	Yes	Yes
Ground fault monitoring	Yes	Yes	Yes
Heating	Yes	Yes	Yes
Emergency stop	Yes	Yes	Yes
Power switch AC side	Fuse switch disconnector 7)	Fuse switch disconnector 7)	Fuse switch disconnector 7)
Power switch DC side	Load disc. switch with motor	Load disc. switch with motor	Load disc. switch with motor
Monitored overvoltage protectors AC / DC	Yes 7) / Yes	Yes 7) / Yes	Yes 7) / Yes
Monitored overvoltage protectors for aux. supply	Yes	Yes	Yes
Standards			
EMC	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
Grid monitoring	in acc. with BDEW directive	in acc. with BDEW directive	in acc. with BDEW directive
CE conformity	Yes	Yes	Yes
Protection rating and ambient conditions			
Protection rating as per EN 60529	IP54	IP54	IP54
Protection rating per EN 60721-3-4, ambient conditions, fixed location, without protection against wind and weather	Classification of • chem. active substances: 4C1 • mech. active substances: 4S2	Classification of • chem. active substances: 4C1 • mech. active substances: 4S2	Classification of • chem. active substances: 4C1 • mech. active substances: 4S2
Permissible ambient temperatures (T)	–20 °C ... +45 °C	–20 °C ... +45 °C	–20 °C ... +45 °C
Relative humidity, non condensing (U_{AIR})	15 % ...95 %	15 % ...95 %	15 % ...95 %
Max. altitude (above sea level)	1000 m	1000 m	1000 m
Fresh air consumption (V_{AIR})	6200 m³/ h	6200 m³/ h	6200 m³/ h
Type designation	SC 400MV-11	SC 500MV-11	SC 630MV-11

HE: High Efficiency, inverter without galvanic isolation for connection to a medium-voltage transformer (taking into account the SMA specification for the transformer)

1) Specifications apply to irradiation values under STC
2) Efficiency measured without an internal power supply at U_{DC} = 500 V
3) Terminal for an analog sensor provided by the customer in two-wire and four-wire version
4) Internal consumption measured in clock-rate operation with activated AC fans, activated DC fans and stack fans at 100 %
5) $U_{DC\,min}$ at U_{ACN} ±5 % and cos φ = 1
6) P_{nom} at U_{ACN} ±5 % and cos φ = 1
7) The SI-load disconnection switch and the AC overvoltage arrestor are located on the AC side of the inverter.

Please also read: Transport instructions for Sunny Central and the Sunny Central installation guide



Flexible

- Suitable for indoor and outdoor installation
- Extended temperature range –20 °C to + 50 °C
- Compact dimensions – easier installation

Efficient

- 97.6 % peak efficiency

Reliable

- System monitoring via integrated data logger
- Easy remote querying using remote access

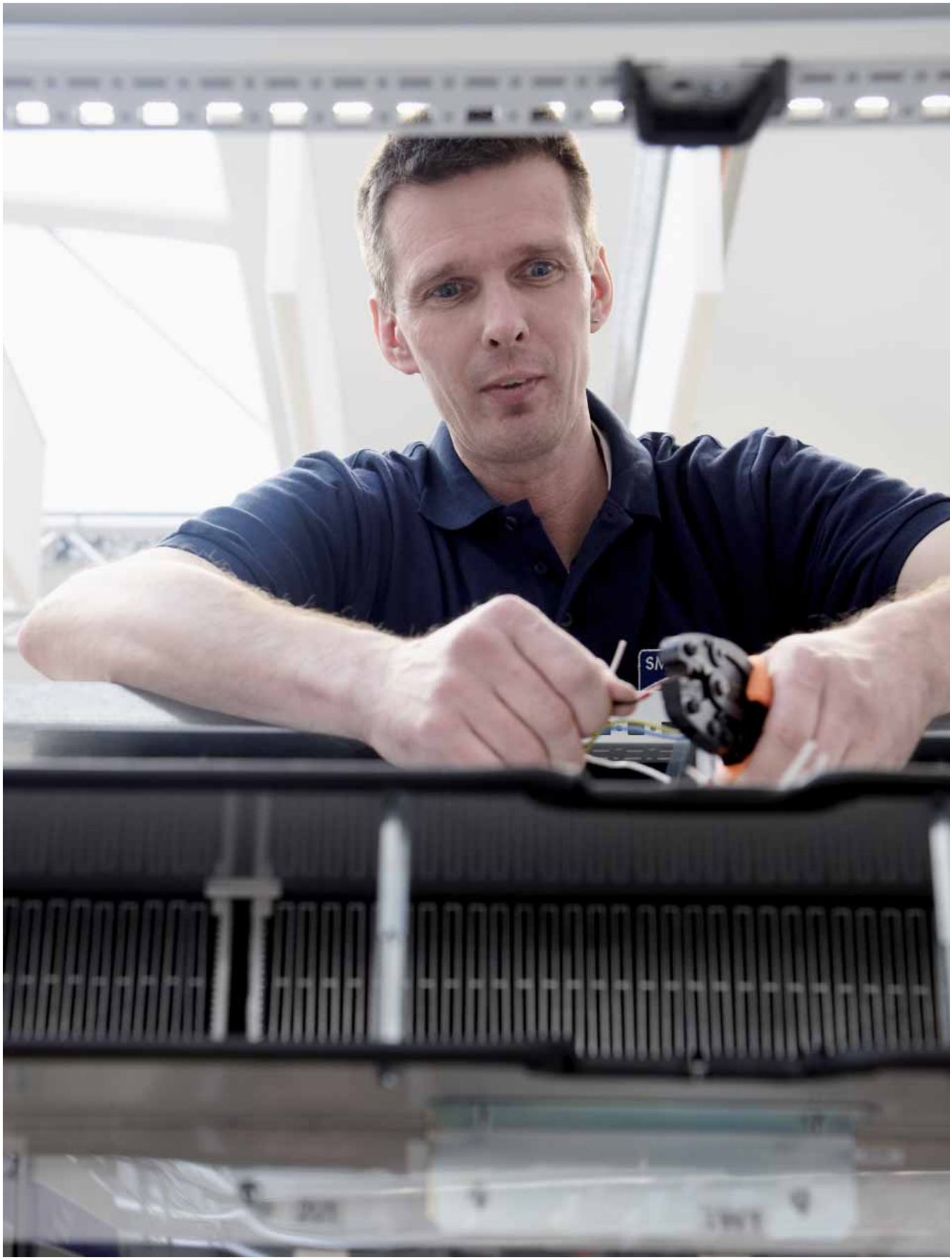
Optional

- String monitoring
- DC input voltage range up to 1000 V
- Operation with grounded PV generators

SUNNY CENTRAL 100 Outdoor / 100 Indoor

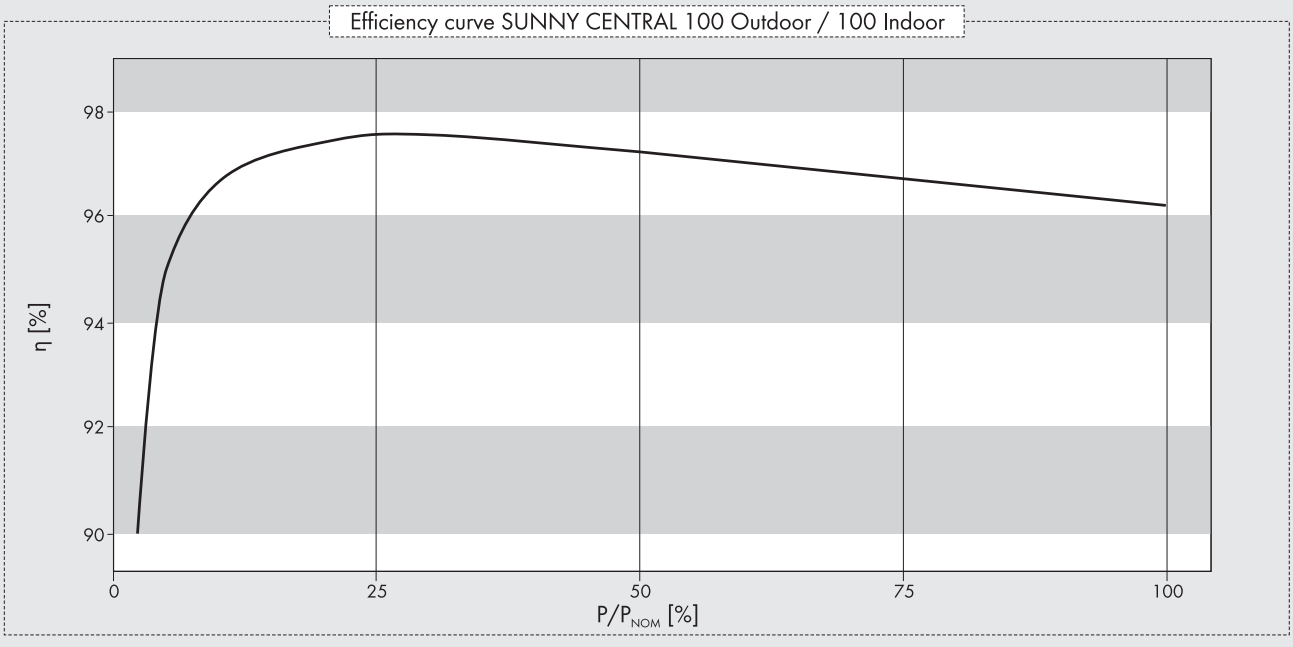
Concentrated power at an attractive price

Powerful and efficient: the Sunny Central 100 Outdoor is best suited for implementing large-scale solar power plants in open spaces. With a weather-proof enclosure and extended temperature range, it is the first choice for reliable outdoor operation – even under harsh climatic conditions. Plant operators benefit doubly: the compact design greatly reduces installation work, and thanks to innovative transformer technology, the peak efficiency has again been improved. As a result, it is the most efficient inverter in its class. The indoor device is outwardly the same; however, with its special cooling concept, it is designed for indoor use.



Technical Data
SUNNY CENTRAL 100 Outdoor / 100 Indoor

	Sunny Central 100 Outdoor / HE*	Sunny Central 100 Indoor / HE*
Input data		
Nominal power DC	105 kW / 103 kW*	105 kW / 103 kW*
Max. PV power (recommended), (P_{PV})	115 kWp [1]	115 kWp [1]
DC voltage range, MPPT (U_{DC})	450 V – 820 V [5]	450 V – 820 V
Max. permissible DC voltage ($U_{DC, max}$)	900 V / optional 1000 V *	900 V / optional 1000 V *
Max. permissible DC current ($I_{DC, max}$)	235 A	235 A
Voltage ripple, PV voltage (U_{PP})	< 3 %	< 3 %
Number of DC inputs (connection point without fuse)	3 x Plus, M12 screws 3 x Minus, M12 screws	3 x Plus, M12 screws 3 x Minus, M12 screws
Output data		
Nominal AC output power (P_{AC})	100 kW	100 kW
Operating grid voltage ± 10 % (U_{AC})	400 V / 300 V* [6]	400 V / 300 V*
Nominal AC current ($I_{AC, nom}$)	145 A / 193 A*	145 A / 193 A*
Grid structure	TT, TN-S, TN-C grid	TT, TN-S, TN-C grid
Operating range, grid frequency (f_{AC})	50 Hz – 60 Hz	50 Hz – 60 Hz
Distortion of the grid current	< 3 % at nominal power	< 3 % at nominal power
Phase shift (cos φ)	≥ 0.99 at nominal power	≥ 0.99 at nominal power
Efficiency [2]		
Max. efficiency $P_{AC, nom}$ (η)	97.6 % / 98.5 %*	97.6 % / 98.5 %*
Euro-Eta (η)	97.0 % / 98.3 %*	97.0 % / 98.3 %*
Dimensions and Weight		
Width / Height / Depth in mm (W / H / D)	1280 / 1835 / 830	1280 / 1835 / 830
Weight approx. (m)	925 kg / 505 kg*	925 kg / 505 kg*
Power consumption		
Internal consumption in operation (P_{day})	< 1000 W	< 1000 W
Internal consumption in Standby (P_{night})	< approx. 50 W	< approx. 50 W
External auxiliary voltage / grid structure	230 V, 50/60 Hz / TN-S, TN-C or TT grid (optional / Yes*)	230 V, 50/60 Hz / TN-S, TN-C or TT grid (optional / Yes*)
External back-up fuse for auxiliary supply	B 16 A, 1-pole	B 16 A, 1-pole
SCC (Sunny Central Control) interfaces		
Communication (NET Piggy-Back, optional)	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet
Analog inputs	Optional 1 x PT 100, 2 x A_{in} [3]	Optional 1 x PT 100, 2 x A_{in} [3]
Overvoltage protection for analog inputs	Optional	Optional
Sunny String-Monitor connection (COM1)	RS485	RS485
PC connection (COM3)	RS232	RS232
Electrically separated relay (ext. alert signal)	1	1

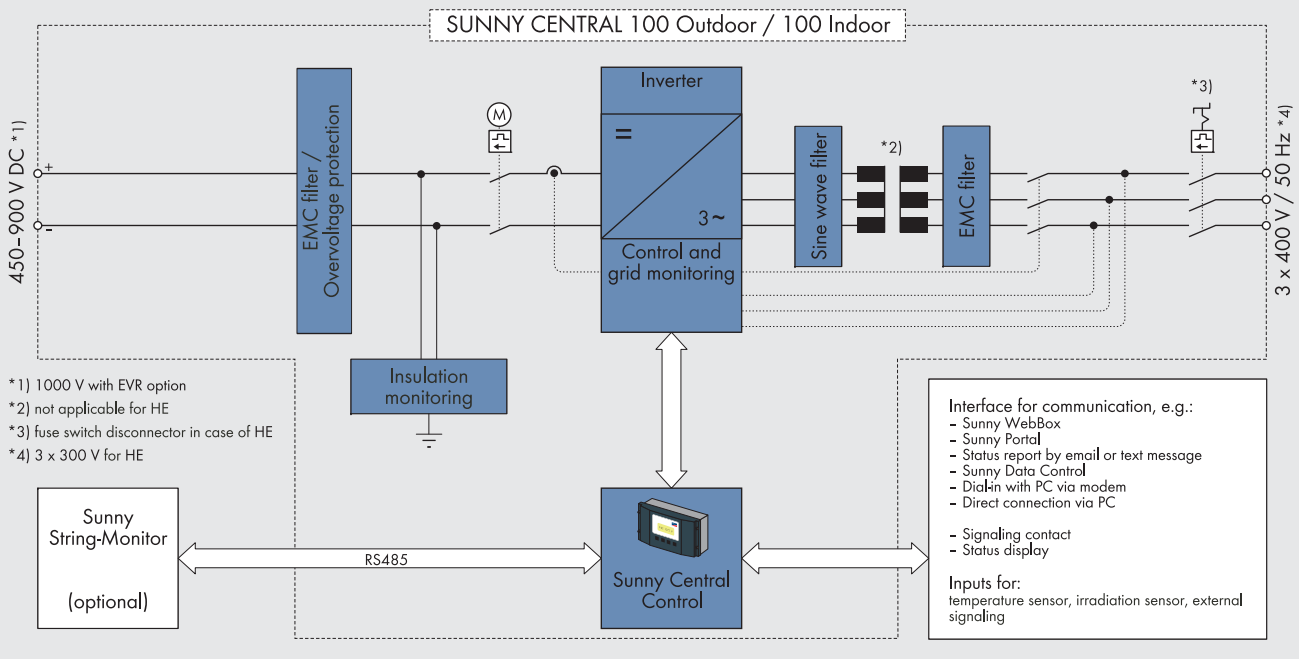


	Sunny Central 100 Outdoor / HE*	Sunny Central 100 Indoor / HE*
Features		
Display (SCC)	Yes	Yes
Ground fault monitoring	Yes (optionally configurable)	Yes (optionally configurable)
Heating	Yes	Yes
Emergency stop	No	Yes
Power switch AC side	Optional / load disconnecting switch*	Optional / load disconnecting switch*
Power switch DC side	Motor-driven	Motor-driven
Monitored overvoltage protectors AC / DC	Optional / Yes	Optional / Yes
Monitored overvoltage protectors for aux. supply	Optional	Optional
Standards		
EMC	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
CE conformity	Yes	Yes
Protection rating and ambient conditions		
Protection rating as per EN 60529	IP44 / IP54	IP21
1. Protection rating per EN 60721-3-4, ambient conditions: fixed location, without protection against wind and weather 2. Protection rating per EN 60721-3-3, ambient conditions: fixed location, with protection against wind and weather	1. Classification of • chem. active substances: 4C1 • mech. active substances: 4S2	2. Classification of • chem. active substances: 3C1L • mech. active substances: 3S2
Permissible ambient temperatures (T)	–20 °C ... +50 °C4)	–20 °C ... +50 °C4)
Relative humidity, non condensing (U_{AIR})	15 % ... 95 %	15 % ... 95 %
Max. altitude (above sea level)	1000 m	1000 m
Fresh air consumption (V_{AIR})	2300 m³/ h	2300 m³/ h
Air flow (Outdoor installation of SC 100 Outdoor)	Intake through roof Discharge through base	Intake and discharge through roof
Type designation	SC 100-10	SC 100-10

*HE: High Efficiency, inverter without galvanic isolation for connection to a medium-voltage transformer

1) Specifications apply to irradiation values = 1,000 (kWh/(kWp x year))
2) Efficiency measured without an internal power supply at UDC = 500 V
3) Terminal for an analog sensor provided by the customer in two-wire and four-wire version
4) Complies with nominal values up to an ambient temperature of +40 °C, at an ambient temperature of +50 °C the nominal values are held for two hours.
5) $U_{DC\,min}$ at U_{ACN} ±5 % and cos φ = 1
6) P_{nom} at U_{ACN} ±5 % and cos φ = 1

Please also read: Transport instructions for Sunny Central and the Sunny Central installation guide and please note that for installation of the SC 100 Outdoor, a suitable foundation as well as free ventilation and a suitable sun protection are necessary.



Reliable

- Motor-driven circuit breaker on the DC side
- Overvoltage protection on DC and AC sides

Communicative

- Easy remote querying using remote access
- Status messages sent via e-mail or text message

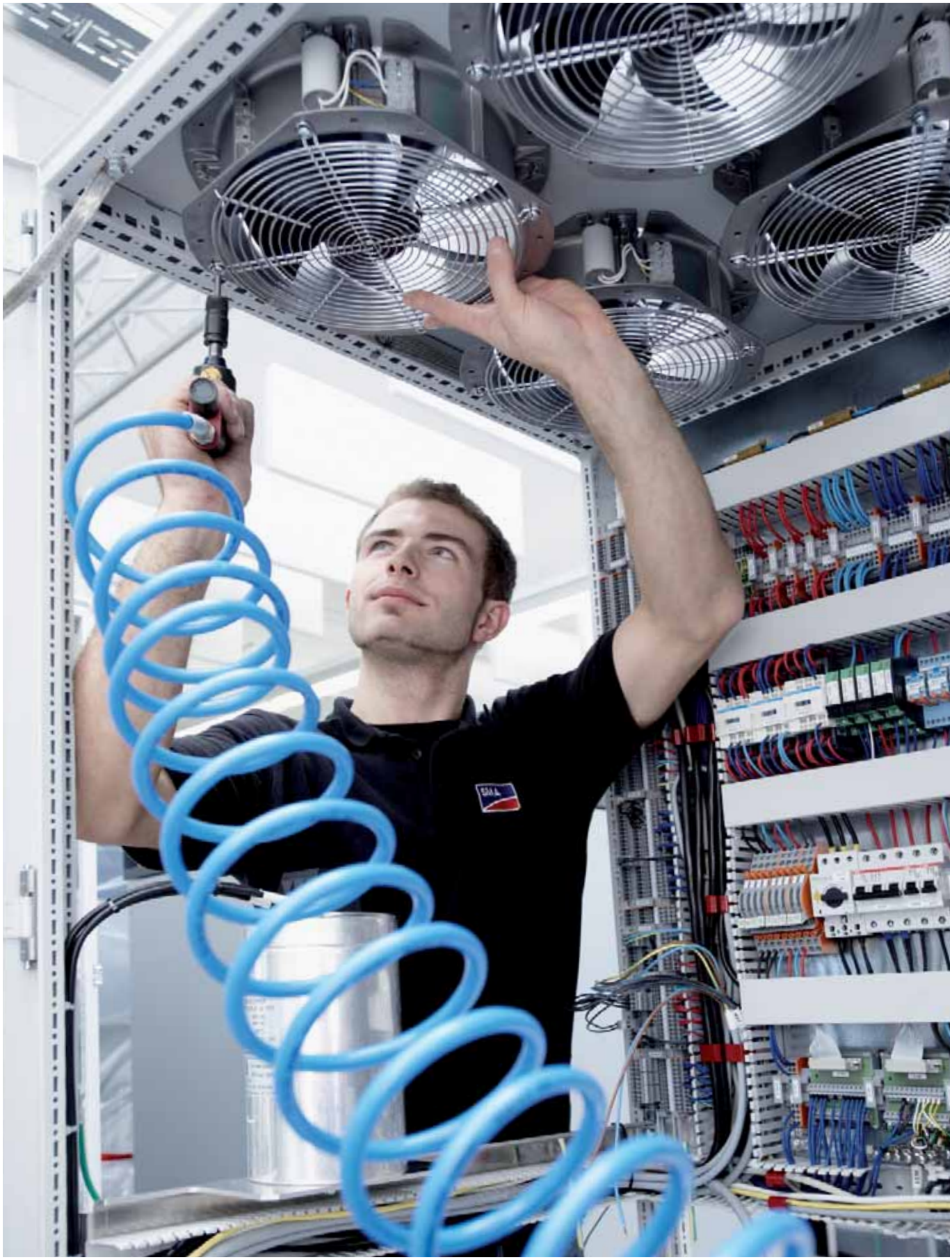
Optional

- String Current Monitoring
- Extended DC input voltage range up to 1000 V

SUNNY CENTRAL 200 / 250 / 250HE / 350

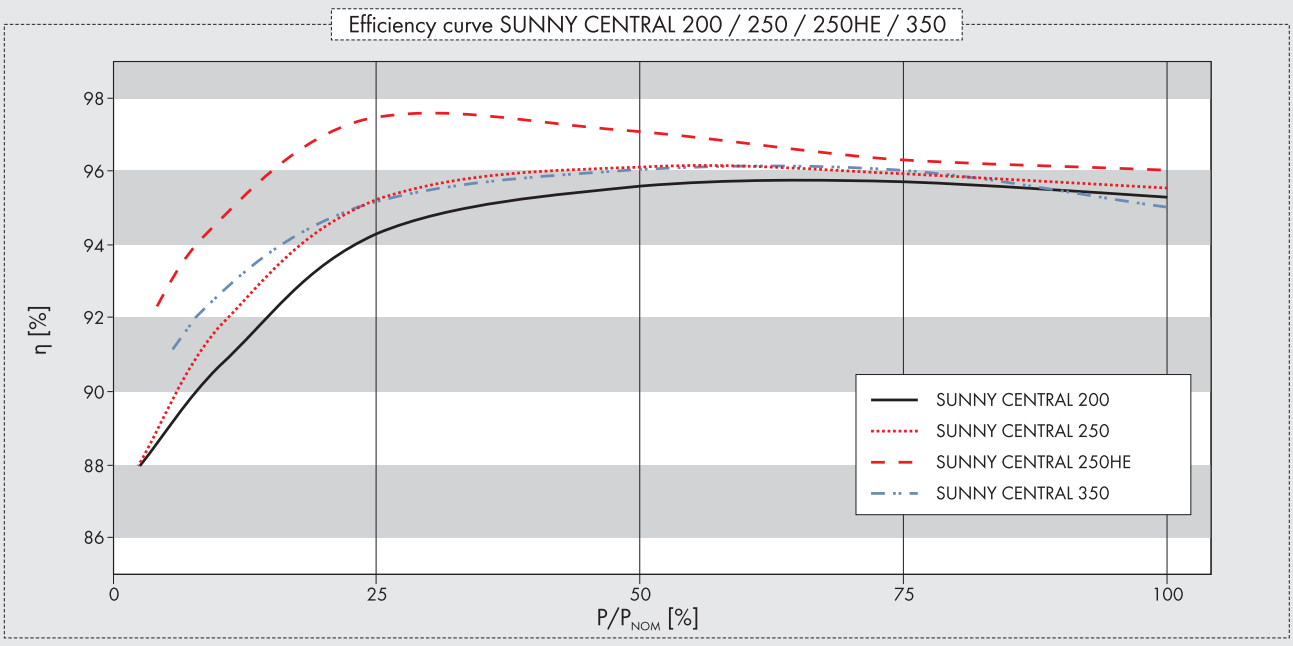
Direct line to the low-voltage grid

First choice for usage in medium-sized and large-scale PV power plants: with the Sunny Central 200, 250 and 350, system operators can realize very good solar yields, especially in large ground-mounted systems or very large roof systems with homogeneous structure. The central inverters have five, eight or twelve fused inputs respectively for the DC distributor box. Several devices can be connected together on the AC side. This makes output powers in the megawatt range possible. While the Sunny Centrals 200, 250 and 350 are connected directly to the low-voltage grid, the Sunny Central 250HE is suitable for direct feeding into the medium-voltage level.



Technical Data
Sunny Central 200 / 250 / 250HE / 350

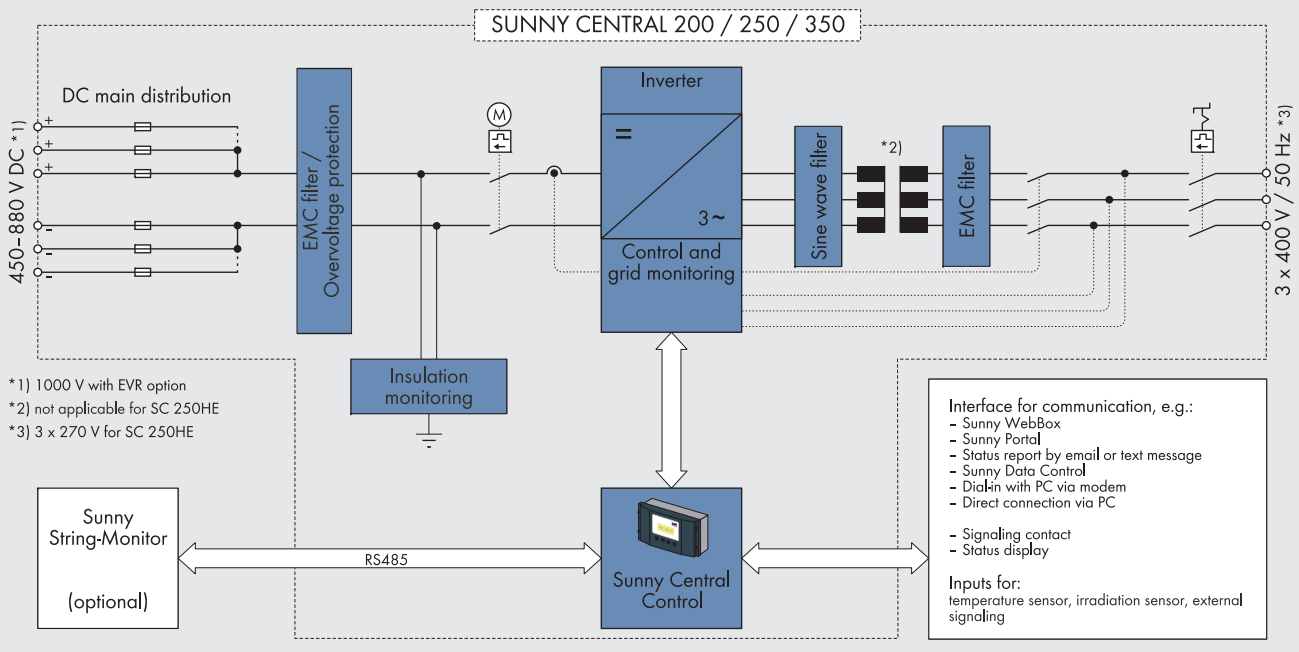
	Sunny Central 200	Sunny Central 250	Sunny Central 250HE	Sunny Central 350
Input data				
Nominal power DC	210 kW	262 kW	261 kW	369 kW
Max. PV power (recommended), (P_{PV})	230 kWp [1]	290 kWp [1]	285 kWp [1]	405 kWp [1]
DC voltage range, MPPT (U_{DC})	450 V – 820 V	450 V – 820 V	450 V – 820 V	450 V – 820 V
Max. permissible DC voltage ($U_{DC, max}$)	880 V	880 V	880 V	880 V
Max. permissible DC voltage ($U_{DC, EVR}$)	1000 V (optional)	1000 V (optional)	1000 V (optional)	1000 V (optional)
Max. permissible DC current ($I_{DC, max}$)	472 A	591 A	591 A	800 A
Voltage ripple, PV voltage (U_{PP})	< 3 %	< 3 %	< 3 %	< 3 %
Number of DC inputs / connection point	5 / DC fuse	8 / DC fuse	8 / DC fuse	12 / DC fuse
Output data				
Nominal AC output power (P_{AC})	200 kW	250 kW	250 kW	350 kW
Operating grid voltage ± 10 % (U_{AC})	400 V	400 V	270 V	400 V
Nominal AC current ($I_{AC, nom}$)	289 A	361 A	535 A	505 A
Grid structure	TT, TN-S, TN-C grid	TT, TN-S, TN-C grid	IT grid	TT, TN-S, TN-C grid
Operating range, grid frequency (f_{AC})	50 Hz – 60 Hz	50 Hz – 60 Hz	50 Hz – 60 Hz	50 Hz – 60 Hz
Distortion of the grid current	< 3 % at nominal power	< 3 % at nominal power	< 3 % at nominal power	< 3 % at nominal power
Phase shift (cos φ)	≥ 0.99 at nominal power	≥ 0.99 at nominal power	≥ 0.99 at nominal power	≥ 0.99 at nominal power
Efficiency [2]				
Maximum efficiency $P_{AC, max}$ (η)	95.7 %	96.1 %	97.5 %	96.0 %
Euro-Eta (η)	94.5 %	95.2 %	96.7 %	95.2 %
Dimensions and Weight				
Width / Height / Depth in mm (W / H / D) [4]	800 + 1200 / 2120 / 850	1200 + 1200 / 2120 / 850	1200 + 1200 / 2120 / 850	1600 + 1200 / 2120 / 850
Weight approx. (m)	1600 kg	2060 kg	1070 kg	2800 kg
Power consumption				
Internal consumption in operation (P_{day})	< 1500 W	< 2000 W	< 2000 W	< 2500 W
Internal consumption in Standby (P_{night})	< approx. 50 W	< approx. 50 W	< approx. 50 W	< approx. 50 W
External auxiliary voltage / grid structure	230 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid	3 x 400 V, 50/60 Hz / TN-S, TN-C or TT grid
External back-up fuse for auxiliary supply	B 20 A, 1-pole	B 20 A, 3-pole	B 20 A, 3-pole	B 20 A, 3-pole
SCC (Sunny Central Control) interfaces				
Communication (NET Piggy Back, optional)	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet
Analog inputs	1 x PT 100, 2 x A_{in} [3]	1 x PT 100, 2 x A_{in} [3]	1 x PT 100, 2 x A_{in} [3]	1 x PT 100, 2 x A_{in} [3]
Overvoltage protection for analog inputs	Optional	Optional	Optional	Optional
Sunny String-Monitor connection (COM1)	RS485	RS485	RS485	RS485
PC connection (COM3)	RS232	RS232	RS232	RS232
Electrically separated relay (ext. alert signal)	1	1	1	1



	Sunny Central 200	Sunny Central 250	Sunny Central 250HE	Sunny Central 350
Features				
Display (SCC)	Yes	Yes	Yes	Yes
Ground fault monitoring	Yes	Yes	Yes	Yes
Heating	Yes	Yes	Yes	Yes
Emergency stop	Yes	Yes	Yes	Yes
Power switch AC side	Yes	Yes	Fuse load disconnector	Yes
Power switch DC side	Motor-driven	Motor-driven	Motor-driven	Motor-driven
Monitored overvoltage protectors AC	Yes (not for TT grid)	Yes (not for TT grid)	Yes	Yes (not for TT grid)
Monitored overvoltage protectors DC	Yes	Yes	Yes	Yes
Monitored overvoltage protectors for aux. supply	Yes (not for TT grid)	Yes (not for TT grid)	Yes	Yes (not for TT grid)
Standards				
EMC	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
CE conformity	Yes	Yes	Yes	Yes
Protection rating and ambient conditions				
Protection rating as per EN 60529	IP20	IP20	IP20	IP20
Protection rating per EN 60721-3-3, Ambient conditions: fixed location, weather protection	Classification of • chem. active substances: 3C1L • mech. active substances: 3S2	Classification of • chem. active substances: 3C1L • mech. active substances: 3S2	Classification of • chem. active substances: 3C1L • mech. active substances: 3S2	Classification of • chem. active substances: 3C1L • mech. active substances: 3S2
Permissible ambient temperatures (T)	–20 °C ... +40 °C	–20 °C ... +40 °C	–20 °C ... +40 °C	–20 °C ... +40 °C
Relative humidity, non-condensing (UAIR)	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %	15 % ... 95 %
Max. altitude (above sea level)	1000 m	1000 m	1000 m	1000 m
Fresh air consumption (VAIR)	3300 m³/ h	4200 m³/ h	3500 m³/ h	6500 m³/ h
Type designation	SC 200-10	SC 250-10	SC 250-10	SC 350-10

1) Specifications apply to irradiation values = 1,000 (kWh/(kWp x year))
2) Efficiency measured without an internal power supply at U_{DC} = 500 V
3) Terminal for an analog sensor provided by the customer in two-wire and four-wire version
4) The EVR option increases the cabinet size by 210 mm
5) $U_{DC\,min}$ at U_{ACN} ±5 % and cos φ = 1
6) P_{nom} at U_{ACN} ±5 % and cos φ = 1

Please also read: Transport instructions for Sunny Central and the Sunny Central installation guide



Flexible

- Certification for U.S. solar market (UL 1741/IEEE 1547)
- Suitable for indoor and outdoor installation

Efficient

- 97.5 % peak efficiency
- Nominal power operation to 45°C

Reliable

- Galvanic isolation via integrated transformer
- System monitoring via integrated data logger

- Easy remote querying using remote access

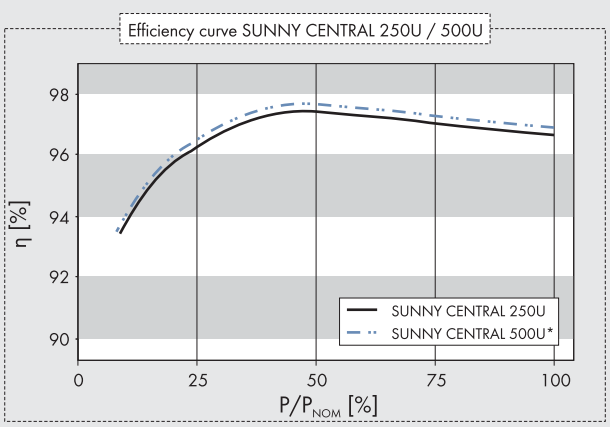
SUNNY CENTRAL 250U / 500U

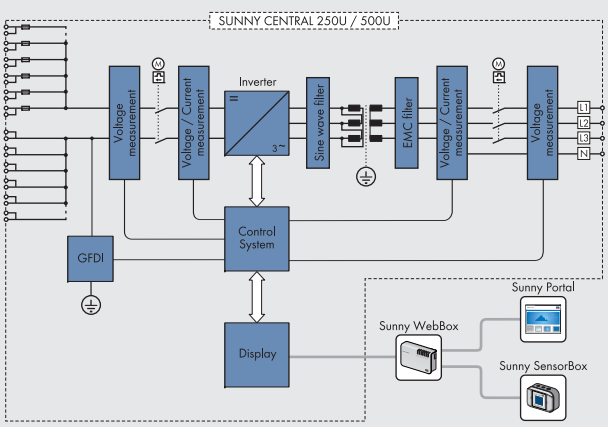
U.S. compliant

They broaden horizons: the SMA central inverters for the U.S. Through their UL-certified, specially approved components, the 250U and 500U are particularly suited for use in the U.S. solar market. Whether outdoor or indoor installation: the devices have a peak efficiency of over 97 % and are thus particularly efficient. In addition, the large graphic display gives system operators all the important measurement values and data at a glance. And the galvanic isolation makes them especially safe.

Technical Data

	Sunny Central 250U	Sunny Central 500U*
Input data		
Max. PV power (recommended)	295 kW	580 kW
DC voltage range MPPT	300 V – 600 V	300 V – 600 V
Max. permissible DC voltage	600 V	600 V
Max. permissible DC current	800 A	1600 A
Number of DC inputs / connection point	6 / DC fuse	9 / DC fuse
Output data		
Nominal AC output power	250 kW	500 kW
Operating grid voltage	480 V	480 V
Nominal AC current	300 A (@ 480 V)	600 A (@ 480 V)
Operating range grid frequency	60 HZ	60 HZ
Phase shift (cos φ)	> 0.99	> 0.99
Harmonic distortion of grid current	< 5 %	< 5 %
Power consumption		
Internal consumption in operation	< 800 W	< 1500 W
Internal consumption in Standby	< 69 W	< 69 W
Mechanics		
Width / height / depth (mm)	2027 / 2768 / 1900	3606 / 2768 / 1900
Weight	1905 kg	3050 kg
Efficiency		
Max. efficiency	97.5 %	97.5 %
CEC	97.0 %	97.0 %
Euro-Eta	96.6 %	96,9 %
Permits		
Certificates	UL 1741, UL 1998, IEEE 1547	UL 1741, UL 1998, IEEE 1547
EMC	FCC Part 15 Class A	FCC Part 15 Class A
Ambient conditions		
Ambient temperature	-20 °C ... +45 °C	-20 °C ... +45 °C
Max. Temperature for $_{Pnom}$	45 °C	45 °C
Protection rating	Nema 3R	Nema 3R
Rel. humidity	15 % ... 95 %	15 % ... 95 %
Interfaces		
Display	LCD	LCD
Communication (Sunny WebBox, optional)	Ethernet, analog, GSM	Ethernet, ISDN, GSM
Connection Sunny String-Monitor	RS485	RS485
System monitoring	Sunny Portal	Sunny Portal
*Preliminary information – last updated: March 2009		
Type designation	SC 250U	SC 500U





Precise

- System monitoring as with Sunny Boy via string current monitoring
- DC distributor box in accordance with IP54/65, with integrated current measurement

Flexible

- Sunny String-Monitor is deliverable with various connection possibilities for the string connections (Multi-Contact, Tyco, screw terminal)
- Connection of 8 or 16 strings possible
- On request deliverable with DC switch

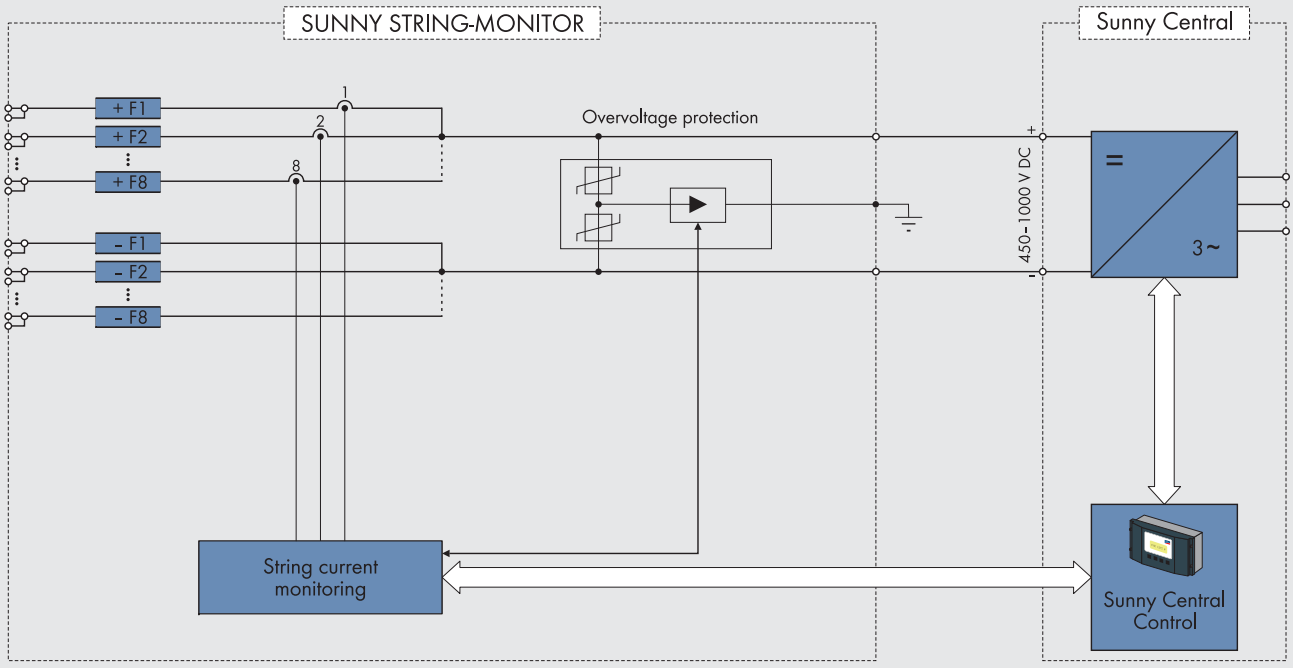
SUNNY STRING-MONITOR
SUNNY STRING-MONITOR CABINET

Insurance for greater solar yields

With the Sunny String-Monitor, SMA offers detailed monitoring of the PV generator. By measuring and comparing the individual string currents, power deviations in the solar generator are detected reliably and are analyzed directly by means of the Sunny Central Control. According to preference, the Sunny String-Monitor can be delivered either in a housing for wall mounting (protection rating IP65) or as a Sunny String-Monitor Cabinet, a standing distributor (IP54). Alongside the measurement of string currents, the device features a string fuse protection as well as an overvoltage protection device.

Technical Data

	Sunny String-Monitor	Sunny String-Monitor Cabinet
Input data		
Max. permissible DC voltage	1000 V / 900 V**	1000 V / 900 V**
Max. permissible DC current	112 A	224 A
Number of DC inputs	max. 16 per pole	max. 16 per pole
Max. string current per measuring channel	17.5 A	17.5 A
Nominal current string fuse	10 A, 12 A, 16 A, 20 A, 25 A *	10 A, 12 A, 16 A, 20 A, 25 A *
Communication		
	RS485	RS485
Protection rating		
according to EN 60529	IP65	IP54
Mechanical Data		
Width / height / depth in mm	750 / 435 / 230	750 / 1000 / 320
Weight	13 kg	65 kg
Ambient conditions		
Permissible ambient temperatures	–25 °C ... +40 °C	–25 °C ... +40 °C
Rel. humidity	15 % ... 95 %	15 % ... 95 %
General Information		
Power switch DC side	Direct drive; 130 A DC direct drive; 140 A DC	Direct drive; 140 A DC direct drive; 280 A DC
* In case of string currents I > 16.25 A, the larger power switch must be used ** When the larger power switch is used, the permissible DC input voltage is reduced to U_{DC} = 900 V		
Type designation	SSM	SSM-C



Efficient

- Optimum fault recognition for high yields
- Reduced system costs through use of up to nine devices

Precise

- System monitoring as with Sunny Boy via string current monitoring
- DC distributor box with Nema 3 with integrated current measurement

Flexible

- Three separate constructions for the best possible system design
- Optionally suitable for use near to the coast

Straightforward

- Convenient mounting preparation due to removable floor and side plates
- Simple configuration of the string current monitoring

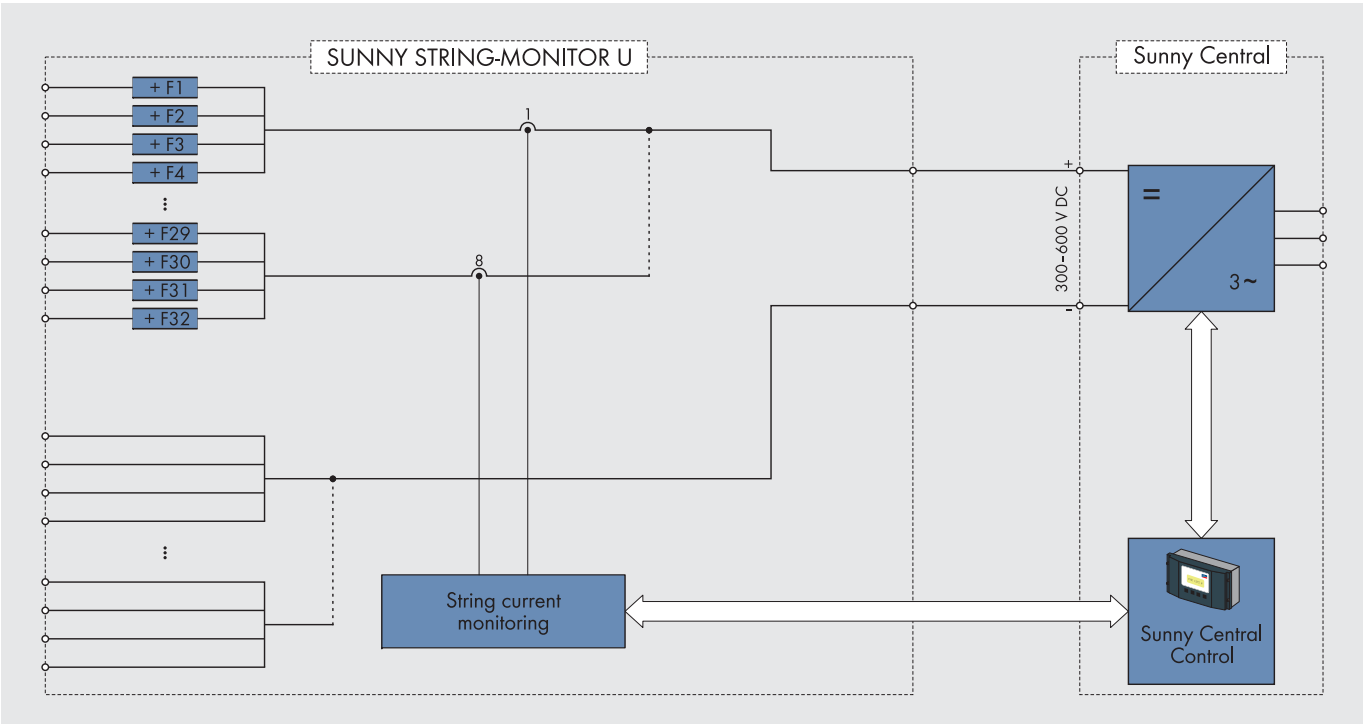
SUNNY STRING-MONITOR U

The U.S. insurance for even better solar yields

Detailed monitoring of the PV generator for the U.S.: the Sunny String-Monitor U. By measuring and comparing the individual string currents, power deviations in the solar generator are detected reliably and are analyzed directly in the Sunny Central. According to preference, the Sunny String-Monitor is delivered either in a housing for wall or tower mounting (protection rating Nema 3). For the measurement of the string currents, there are three variants of string fuse protection, all of which comply with the NEC standard. Thus, the Sunny String-Monitor is best suited for use in the U.S. solar market.

Technical Data

	Sunny String-Monitor U Version 24*	Sunny String-Monitor U Version 32*	Sunny String-Monitor U Version 64*
PV generator connection			
Input voltage range	0 ... 600 V DC	0 ... 600 V DC	0 ... 600 V DC
Max. PV short-circuit current per string	12.8 A	9.6 A	5.1 A
Max fuse size (10 x 38 class CC fuses)	20 A, 600 V DC	15 A, 600 V DC	8 A, 600 V DC
Max. number of strings	24	32	64
Fused inputs per measuring channel	3	4	8
PV array configuration	neg. or pos. grounded	neg. or pos. grounded	neg. or pos. grounded
Number of measuring channels	8	8	8
Sunny Central Connection			
DC short-circuit current	480 A	480 A	512 A
Max continuous DC current	308 A	308 A	328 A
Max. number of cables per output port	2	2	2
Mechanical Data			
Dimensions (W x H x D) in mm	800 x 800 x 250	800 x 800 x 250	800 x 1200 x 300
Weight	65 kg	65 kg	65 kg
Protection rating	NEMA 3	NEMA 3	NEMA 3
Housing material	Steel or Aluminum	Steel or Aluminum	Steel or Aluminum
Ambient conditions			
Permissible ambient temperatures	–25 °C ... +50 °C	–25 °C ... +50 °C	–25 °C ... +50 °C
Rel. humidity	up to 95 %, condensation possible	up to 95 %, condensation possible	up to 95 %, condensation possible
Communication			
Connection SSM-U	RS485	RS485	RS485
*Preliminary data. Device expected to be available from summer 2009			
Type designation	SSM-U	SSM-U	SSM-U



User-friendly

- Simple and detailed data recording and saving
- Status messages sent by email or text message

- Easy remote control and monitoring of the system

Flexible

- Fieldbus communication via RS232, RS422, RS485 or Ethernet

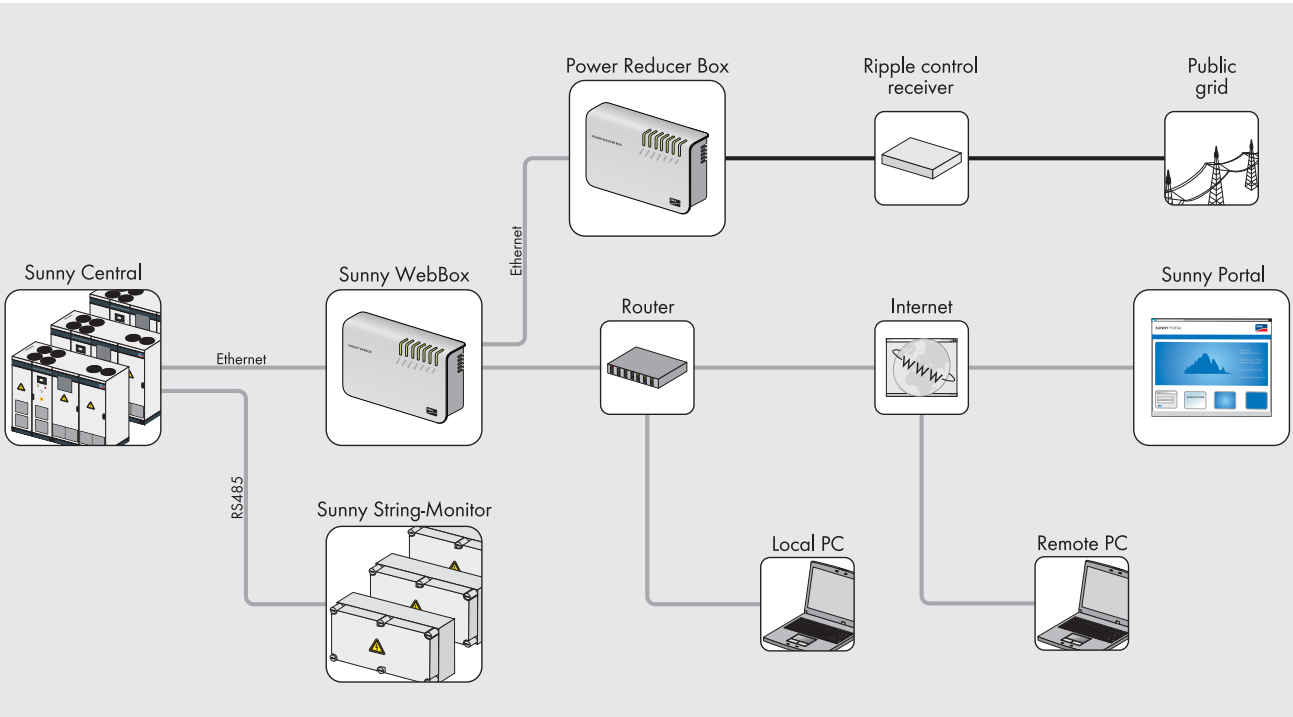
SUNNY CENTRAL CONTROL

Complete system monitoring

The Sunny Central Control, integrated as standard, enables detailed recording and analysis of data. If string current monitoring is employed, the individual DC sub-distribution boxes are connected with the Sunny Central Control via an RS485 data cable. A total of three analog inputs for the connection of external sensors are available for irradiation or temperature measurement. And via the Ethernet interface, the Sunny Central Control provides for remote access as well as the sending of status reports via email or text message.

Technical Data

	Sunny Central Control	
Interfaces		
Sunny String-Monitor (COM1)	RS232	
PC (COM2)	RS422 RS485 Ethernet	
Inputs for external sensors		
1 analog input	temperature sensor (Pt100)	
2 analog inputs	analog sensors with voltage output	
Outputs		
1 potential-free contact	fault messages	
Memory capacity		
Energy values per Sunny Central	1 year	
Measuring Channels	up to 250	
Type designation	SCC	



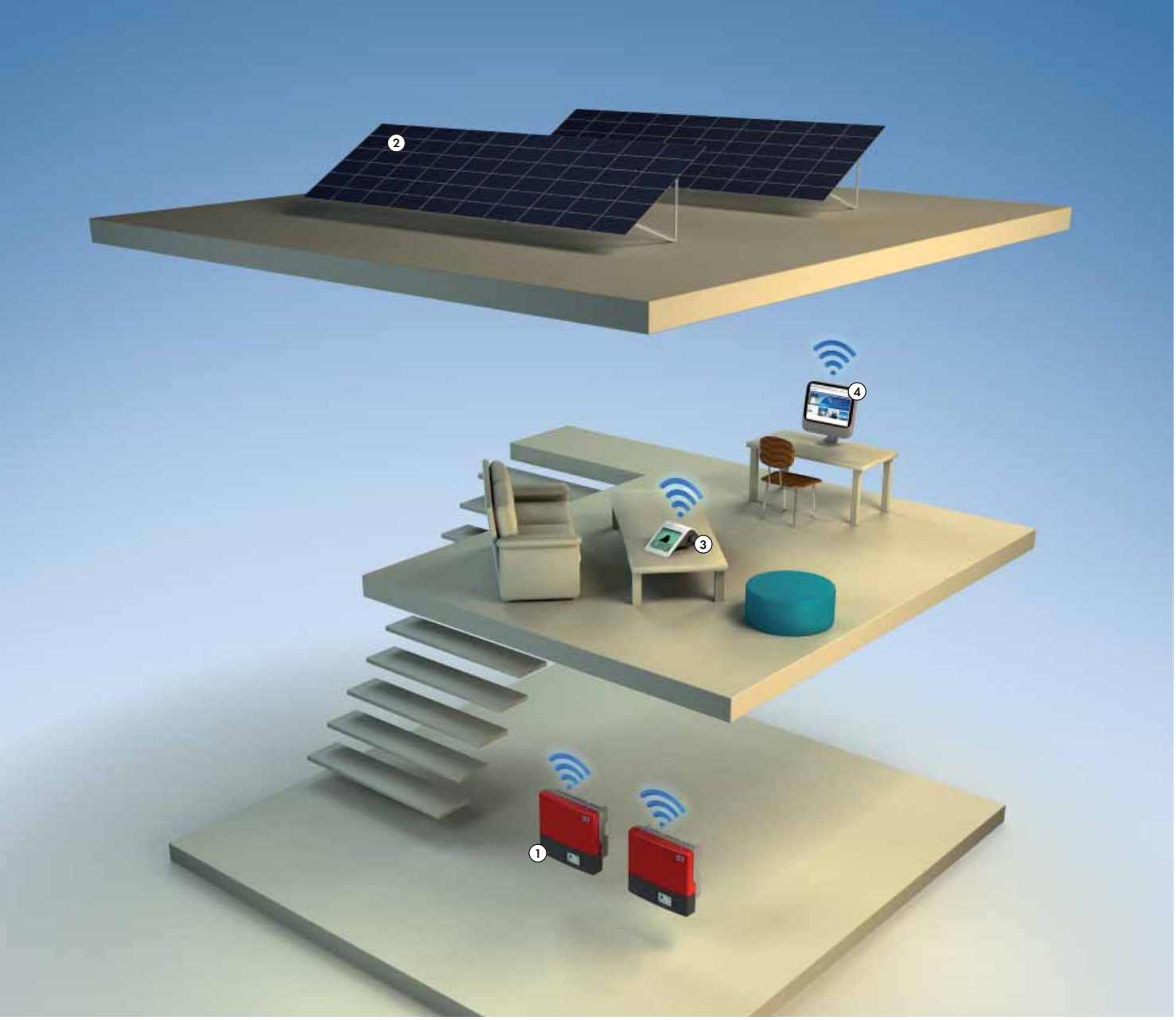
MONITORING SYSTEMS

Trust Is Good ...
System monitoring by SMA

They function without moving parts, work wear-free and are extremely durable: solar power systems are a sure way to generate electricity. All the same, there are always good reasons for keeping track of your system. Module clouding, contact problems or grid failures can all interfere with system performance and thus reduce yields. Even smaller-scale systems can be vulnerable to yield losses if an error goes undetected over a long period of time – that's why continuous system monitoring is always worth your while.

For this purpose, SMA offers a wide range of products: from the handy, wirelessly connected Sunny Beam to online plant monitoring via Sunny Portal in combination with the Sunny WebBox – there is a technical solution to meet every requirement. Easy integration and operation are, of course, standard, as is the utilization of tried and tested communication standards. New here is the fast wireless communication option via *Bluetooth*, which makes a radio-based network of up to 100 inverters possible. And with the Power Reducer Box, SMA is the first manufacturer to offer a communication product that requires PV systems to actively participate in grid security management.

Every solar plant is different: from small rooftop systems equipped with a Sunny Boy to large solar power stations with several central inverters, there are countless imaginable system configurations. For every system, SMA can supply the appropriate communication and monitoring solution – optionally based on the wireless standard *Bluetooth* or the fieldbus RS485. Based on their typical fields of application, the SMA communication products will be introduced briefly on the following pages.



Electricity generation

1. SUNNY BOY
2. Solar generator

Plant monitoring

3. SUNNY BEAM
4. SUNNY EXPLORER

Easy Monitoring

of rooftop systems on private houses

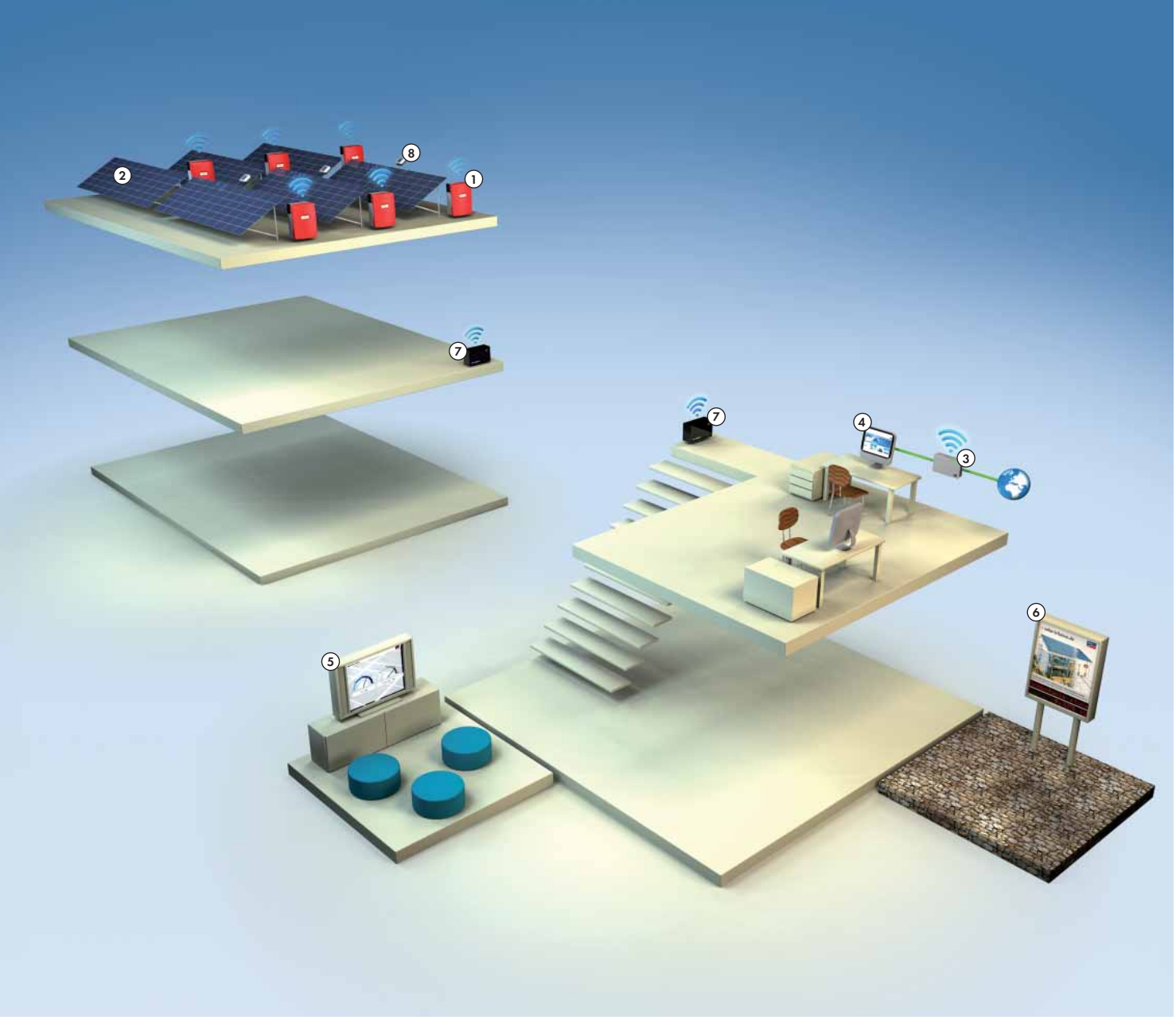
The Sunny Beam with *Bluetooth*® Wireless Technology makes it possible to monitor small-scale systems at low cost and with zero installation effort – 24 hours a day. The solar plant data is wirelessly transmitted to and displayed on the large, easy-to-read Sunny Beam screen. In this way, the operator always has the status of the system right at his or her fingertips. Optimum security is ensured by the audio alarm function which warns of possible yield losses and thus ensures the smooth operation of the system at all times. The free PC software Sunny Explorer enables operators to query and even configure inverters equipped with a *Bluetooth* interface.

**Sunny Beam –
nice and easy**

For the private operator with a small-scale rooftop system, the Sunny Beam with *Bluetooth* is the perfect communication solution: zero installation effort and easy to operate, while at the same time almost a designer model. Via its *Bluetooth* connection, it picks up the data from up to 12 inverters and displays them on its large graphic display. This is stored for at least 100 days in the device memory and can also be transferred to a computer via USB interface. The visual and optional audio alarm reliably protects against yield losses. And the integrated solar cell means that the Sunny Beam is not dependent on an electrical socket for power.

**Sunny Explorer –
wireless and free of charge**

Again, *Bluetooth* is the communication standard used by the free monitoring software Sunny Explorer to connect with the inverters. Thus, any PC or notebook can be employed for the wireless control, monitoring and configuration of inverters via *Bluetooth* – a valuable aid in the installation of solar systems.



Electricity generation

1. SUNNY MINI CENTRAL
2. Solar generator

Plant monitoring

3. SUNNY WEBBOX
4. SUNNY PORTAL
5. FLASHVIEW
6. SUNNY MATRIX
7. SMA *Bluetooth* REPEATER
8. SUNNY SENSORBOX

Comprehensive control

of commercial plants

All data from the connected inverters as well as the temperature and irradiation values from the Sunny SensorBox are stored by the Sunny WebBox and automatically transmitted to Sunny Portal. Here, they can be charted, analyzed or forwarded in the form of regular email reports. The continuous monitoring of system performance, the weekly yield report or the automatic notification of disruptions keep you up-to-date at all times. System performance can be visualized in real time on the large, easy-to-configure, all-weather display Sunny Matrix or by means of the display software Flashview. It works equally well via the local network or globally via the Internet – in other words, from anywhere in the world.

Sunny WebBox – the professional data logger

The Sunny WebBox is a sophisticated communications solution for large-scale solar systems. It is connected to the inverters via *Bluetooth* or alternatively via RS485, and continuously receives and stores all the measured values and data. The integrated web server enables this data to be displayed, evaluated or downloaded – given the necessary internet connection, from anywhere in the world. Via the web server, it is also possible to access the password-protected configuration menu of the linked inverters, as well as the event log. The Sunny WebBox stores all data internally as well as on the optional SD card and transfers it automatically to Sunny Portal when an internet connection is available. There, the data is plotted on custom tailorable HTML pages and permanently archived – a free service which is already used by nearly 13,000 system operators worldwide. The data, tables and diagrams can be recalled via the Internet, and operators can authorize access to each individual page for the general public or for individual users.

Sunny SensorBox – easy monitoring of generators

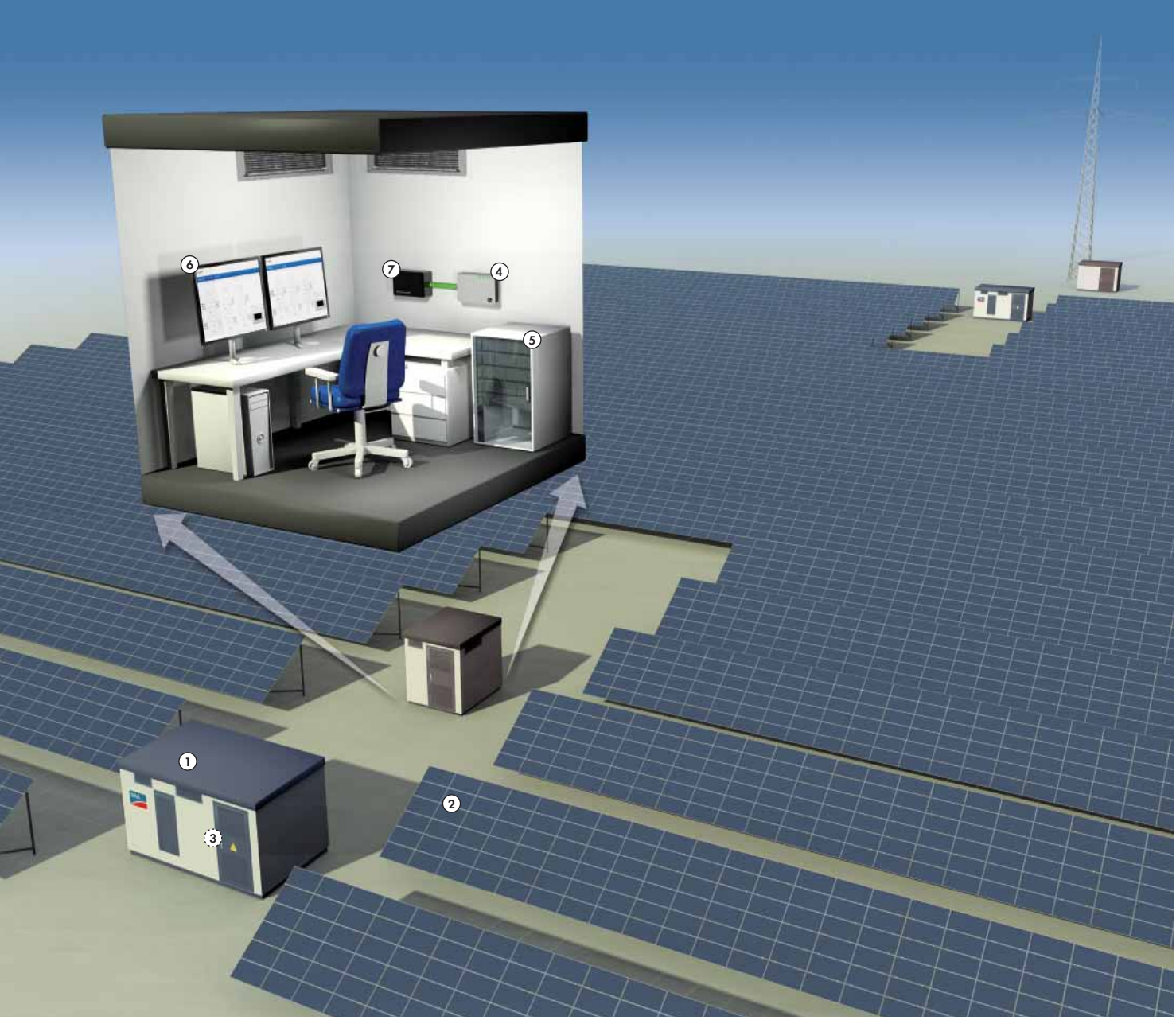
The compact Sunny SensorBox makes it possible to extend plant monitoring to include the solar generator. It is connected to the RS485 fieldbus and is fitted with a temperature sensor and a built-in reference cell to measure the level of irradiation. It gives you continuous performance monitoring of the entire system – with the option of automatic monitoring through Sunny Portal. Additionally, it is possible to connect an external temperature sensor and an anemometer (wind gauge).

SMA *Bluetooth* Repeater – for even greater range

The SMA *Bluetooth* Repeater increases the already large existing wireless range of max. 100 meters in the open air. This makes it possible to bridge larger distances between SMA *Bluetooth* devices or bypass ceilings and walls, without problems.

Sunny Matrix and Flashview – the presentation pros

Apart from Sunny Portal, there are two other available options for the visualization of system data: the free display software Flashview and the fully configurable LED display panel Sunny Matrix. Flashview helps you to visualize the most important data simply and clearly. All you need is a standard PC with a monitor. An RSS feed and your own plant image can also be integrated. By contrast, the Sunny Matrix is a robust large-format display for the public presentation of system data – for instance, in the foyer or outdoors. It is ideal not only for commercial suppliers, but also for public institutions such as schools. It is available in various sizes, and the display format for data, text and measured values is easy to configure with the built-in web server. Sunny Matrix and Flashview retrieve the data from the Sunny WebBox to which they are linked via the local network. With the appropriate configuration, you can even access the Sunny WebBox via the Internet and display whatever data you wish – anywhere in the world.



Electricity generation

1. SUNNY CENTRAL
2. Solar generator

Plant monitoring

3. SUNNY WEBBOX
4. POWER REDUCER BOX
5. OPC-SERVER
6. OPC Client
7. Ripple control receiver

Professional solutions

for solar power stations

With the Sunny WebBox, the OPC-Server and the Power Reducer Box, large-scale solar systems – all the way to power station size – can be comprehensively monitored and controlled. This not only makes integration into OPC-compatible control rooms possible, but also allows remote access to the inverters via the Sunny WebBox – which, if desired, will be taken care of by the SMA service. The Power Reducer Box is also a reliable way of implementing participation in grid stability management or static grid support based on reactive power as specified by the utility operator.

Sunny WebBox – perfect for industrial systems

Even for large-scale systems and PV power stations, the Sunny WebBox in its role as professional data logger is the key to reliable system monitoring: via the RS485 bus or the industrial Ethernet network for central inverters, up to 50 devices are able to communicate with one another. For both communications standards, we supply various system accessories – from the radio link to interface converters for optical fiber technology. At the same time, the Sunny WebBox offers maximum flexibility for data recording in industrial PV plants.

OPC-Server – Integration into control stations

The SMA OPC-Server takes integration one step further: the software links the SMA products with control station systems which support the OPC standard. Customer-specific control and observation concepts can also be realized on the basis of the OPC standard.

Power Reducer Box – feed-in management for large-scale systems

The Power Reducer Box is the solution for feed-in and grid stability management, for which a subsidy program, according to §6 EEG (Renewable Energy Act, Germany), has been in place since January 1, 2009. The Power Reducer Box picks up the nominal values on load limitation transmitted by the utility operator and translates these into control commands for the Sunny WebBox. Each change of status is logged both in the Power Reducer Box and in the Sunny WebBox. On request, the plant operator can receive real-time updates on the targets set by the utility operator.

Innovative

- Wireless communication with up to 12 inverters via *Bluetooth*
- Power supply via integrated solar cell

Simple

- Fast installation
- Intuitive operation by means of a rotary push button

User-friendly

- Mobile desktop device with large LCD display
- Archiving capacity for a minimum of 100 days data in device memory
- USB port for data transfer to PC and battery charge

Reliable

- Event log for up to 25 messages
- Audio alarm in case of error

SUNNY BEAM with *Bluetooth*® Wireless Technology

The mobile energy yield indicator for your home

Informative, compact and easy to operate: the Sunny Beam with *Bluetooth* not only looks good, but it is also full of innovative monitoring technology. The large graphic display shows you all the essential data at a glance: daily profile, current output, daily and overall energy yield. But there's more to the Sunny Beam than meets the eye: At the flick of a switch you can retrieve the performance data of up to 12 inverters, a monthly synopsis, the energy yield in euros or the saved quantity of CO_2. The data from a minimum of 100 days' performance is stored within the device and can be uploaded to a PC via USB interface – no additional software is required. And in case of plant disruption, the Sunny Beam comes equipped with an optional audio signal.

Technical Data

	Sunny Beam	
Communication		
Inverter communication	*Bluetooth*	
PC Communication	USB 2.0	
Maximum number of SMA devices		
Bluetooth	12	
Maximum communication range		
Bluetooth in the open air	Up to 100 m	
Power supply		
Power supply	Integrated solar cell, USB cable	
Number of batteries	2	
Type of battery	NiMH (1.2 V) with low self-discharge	
Ambient conditions during operation		
Ambient temperature	0 °C to +40 °C	
Degree of protection	IP20	
General Data		
Dimensions (W / H / D) in mm	127 / 75 / 195 (as desktop device)	
Weight	Approx. 350 g (with batteries)	
Installation site	Indoors	
Deployment options	Desktop device, wall mounting	
Status display	LCD display	
Number of inverters	max. 12	
Language versions – software / manual	German, English, French, Greek, Italian, Korean, Dutch, Portuguese, Spanish, Czech	
Features		
Display	LCD display	
Operation	Rotary push button	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
Information displayed		
General information	Time, date	
System data	Current performance, daily yield, total yield, specific annual yield, CO_2 savings, earnings	
Accessories		
USB cable	●	
USB plug-in power supply	❍	
Wall mounting bracket	❍	
Replacement batteries	❍	
SMA *Bluetooth* Repeater	❍	

● Standard features ❍ Optional features

Wireless **communication** with the inverters via *Bluetooth*

Large, easy to read **LC-Display**

Audio **alarm**

USB interface for data transmission to PC and charging of the batteries

Easy and intuitive operation by means of a **rotary push button**

Power supply via **solar cell** and battery

Compact and lightweight
Size: 127 x 75 x 195 mm
Weight: 350 g

Reliable

- Continuous control of the solar power system
- Radio-based system monitoring via *Bluetooth* wireless technology
- Early detection of operation failures

User-friendly

- System configuration and diagnostics using any PC (Windows, Linux or Mac OS)
- Automatic data transfer at predefinable time intervals
- Data processing free of charge via Sunny Portal
- Fieldbus communication via RS485 or *Bluetooth*

SUNNY WEBBOX

Professional data management for large-scale PV systems

Plant monitoring, remote diagnostics, data storage and visualization: the Sunny WebBox is the high-performance communication hub for medium to large-scale solar power plants. It continuously gathers all the data from the inverters on the system side, thereby keeping you informed of the system's status at any given time. The Sunny WebBox is a multi-functional, energy-efficient data logger which offers a wealth of options for displaying, archiving and processing data, even in networks with strict security regulations. Moreover, the model fitted with an integrated *Bluetooth* interface dispenses entirely with the process of laying cables to connect to the inverters. Even from remote locations where no DSL or telephone connection is available, measurement data can be transmitted to Sunny Portal via the optional GSM modem.

Technical Data

	Sunny WebBox	
Communication		
Inverter communication	RS485, *Bluetooth*, 10/100 Mbit Ethernet (for Sunny Central only)	
PC Communication	10/100 Mbit Ethernet	
Modem	Analog (optional), GSM (optional)	
Connections		
Inverter	1x SMACOM	
Ethernet	10/100 Mbit, RJ45	
Maximum number of SMA devices		
RS485 / Ethernet / *Bluetooth*	50 / 50 / 100	
Max. communication range		
RS485 / Ethernet	1,200 m / 100 m	
Bluetooth in the open air	Up to 100 m	
Power supply		
Power supply	External plug-in power supply	
Input voltage	100 V – 240 V AC, 50 / 60 Hz	
Power consumption	Typ. 4 W / max. 12 W	
Ambient conditions during operation		
Ambient temperature	–20 °C ... +65 °C	
Relative air humidity	5 % to 95 %, non-condensing	
Memory		
Internal	8 MB ring buffer	
External	SD card 128 MB / 512 MB / 1 GB / 2 GB	
General Data		
Dimensions (W / H / D) in mm	225 / 130 / 57	
Weight	750 g	
Installation site	Indoors	
Deployment options	DIN rail mounting, wall mounting, desktop device	
Status display	LEDs	
Language versions – software / manual	German, English, French, Greek, Italian, Korean, Dutch, Portuguese, Spanish, Czech	
Features		
Operation	Integrated web server (internet browser)	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
Accessories		
Sunny SensorBox / Sunny Matrix / SMA *Bluetooth* Repeater	❍/❍/❍	
SD card 128 MB / 512 MB / 1 GB / 2 GB	❍/❍/❍/❍	
Outdoor GSM antenna / GSM card	❍/❍	
RS485 communication cable	❍	
● Standard features ❍ Optional features		

Communication with the inverters via RS485 or *Bluetooth*

Presentation of system data with Sunny Matrix or Flashview

Automatic **visualization** of the measurement data in Sunny Portal – free of charge

SD card slot for optional **memory expansion** and data transfer to a PC

Integrated web server enables **online remote data access** from any web-enabled PC in the world

Integrated FTP server for data transfer and storage on a PC

Individual processing of the measuring data on the PC

Flexible data transfer to an arbitrary FTP server parallel to Sunny Portal possible

Reliable

- Rapid fault detection by monitoring generator performance

Informative

- Precise measurement of irradiation and module temperature (plus optional measurement of ambient temperature and wind speed)

Easy to use

- Easy installation onto the solar generator
- Straightforward integration into existing systems via RS485
- Data analysis on any PC or via Sunny Portal

SUNNY SENSORBOX

Comprehensive performance analysis for professionals

The Sunny SensorBox enables non-stop analysis of generator performance: it is installed directly on to the PV modules and measures solar irradiation and temperature. In combination with Sunny WebBox and Sunny Portal, it provides a continuous target-actual comparison of plant performance. This ensures easy detection of clouding, contamination or a creeping under-performance of the generator. Extra sensor interfaces for optional measurement of ambient temperature or wind speed will make your evaluations even more accurate.

Technical Data

	Sunny SensorBox	
Communication		
Data logger communication	RS485 to Sunny WebBox, RS485 to Sunny Boy Control	
Connections		
WebBox and Power Injector	1x SMACOM / spring terminals	
Max. communication range		
RS485	1,200 m	
Power supply		
Power supply	RS485 Power Injector	
Input voltage	100 V – 240 V AC, 50 / 60 Hz	
Power consumption	< 1 W	
Ambient conditions during operation		
Ambient temperature	–25 °C to +70 °C	
Relative humidity	5 % to 95 %, non-condensing	
Degree of protection	IP65	
General Data		
Dimensions (W / H / D) in mm	120 / 50 / 90	
Weight	500 g	
Installation site	Outdoors	
Deployment options	Mounting plate, roof bracket	
Language versions – manual	German, English, French, Greek, Italian, Korean, Dutch, Portuguese, Spanish, Czech	
Features		
Operation	Through the Sunny WebBox interface	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
Accessories		
Mounting plate	❍	
Roof bracket	❍	
Wind sensor	❍	
Wall mounting bracket for wind sensor	❍	
Pt100 ambient temperature sensor	❍	
Pt100 module temperature sensor	●	
RS485 Power Injector	●	

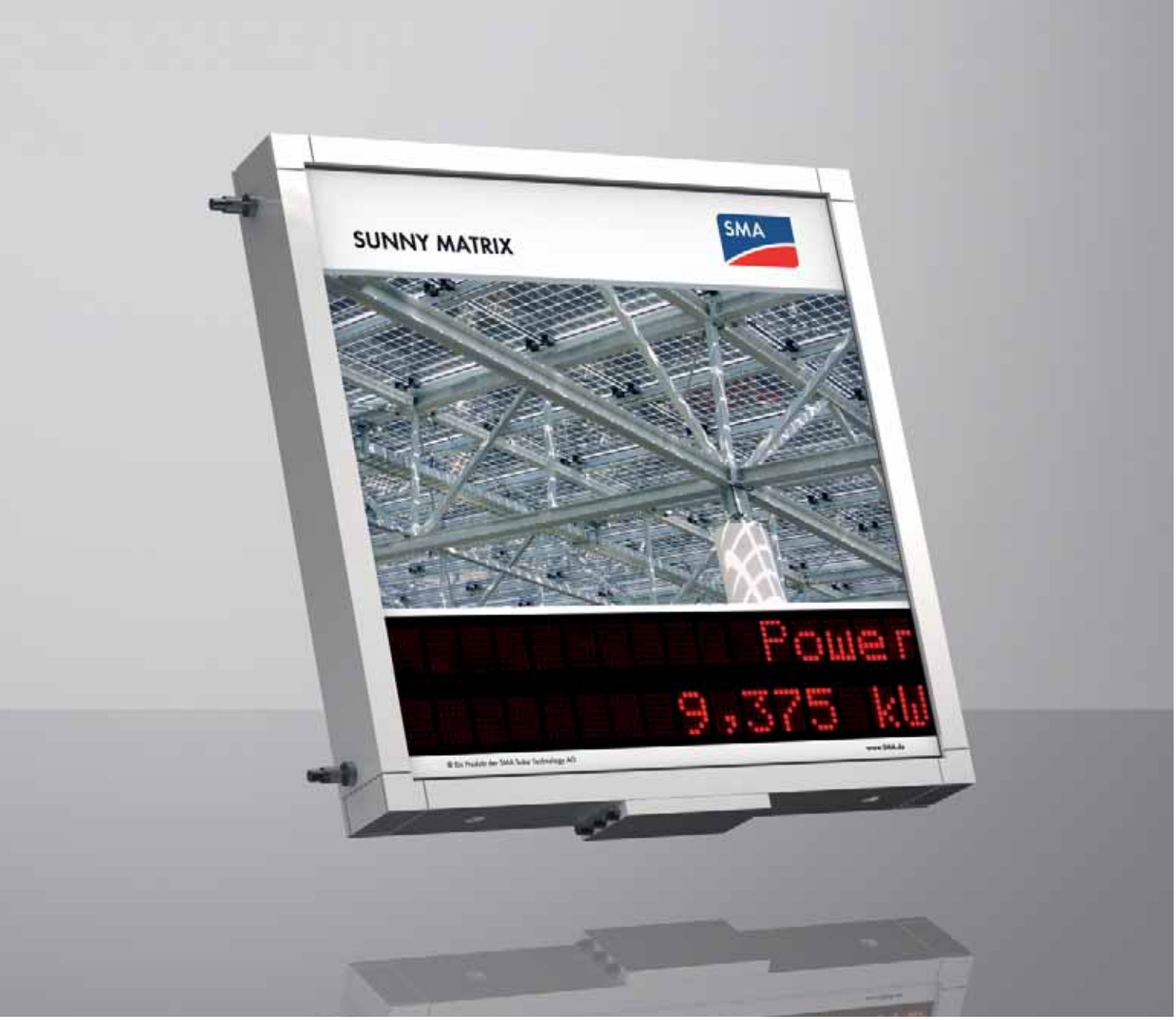
● Standard features ❍ Optional features

Communication with the Sunny WebBox via RS485

Continuous **monitoring** of generator performance via Sunny Portal

Measurement of irradiation and module temperature (plus optional measurement of ambient temperature and wind speed)

Easy installation: one single cable for both data transmission and power supply



Durable

- Die-cast aluminum housing for outdoor installation
- Weather-proof photo print

Flexible

- Individual artwork for front panels
- Various housing sizes for any application
- Texts can be freely edited and displayed
- Changing displays by means of innovative day/night switching

User-friendly

- Easy set-up, operation and remote maintenance through web interface
- Automatic data synchronization with Sunny WebBox

- Automatic brightness control of the LEDs
- Automatic ticker function for longer lines of text

SUNNY MATRIX

Custom large-format display for indoor and outdoor use

All solar energy yield parameters at a glance: the robust, large-format display Sunny Matrix visualizes yield, performance and CO_2 reduction of PV systems in large illuminated figures. Sunny Matrix derives the display data from the Sunny WebBox via the Ethernet interface: either through the local network or via the Internet – from any location in the world. If the solar plant is fitted with a Sunny SensorBox, the local weather data recorded there will also be available for display. Various formats, no restriction on layout of text modules, and variable numbers of lines and characters are features which make the Sunny Matrix the ideal information board for solar systems.

Technical Data

	Sunny Matrix	
Communication		
Data logger communication	Ethernet	
Connections		
Ethernet	10 / 100 Mbit, RJ45	
Max. number of devices		
Ethernet (Sunny WebBox)	1	
Maximum communication range		
Ethernet	100 m	
Power supply		
Input voltage	85 V – 265 V AC, 50 / 60 Hz	
Power consumption	Typ. 20 W + 5 W per 4-character display module	
Ambient conditions during operation		
Ambient temperature	–25 °C to +60 °C	
Degree of protection	IP54	
General Data		
Dimensions (W / H / D) in mm	800 / 400 / 120, 800 / 800 / 120, 800 / 1000 / 120	
Weight	15 kg / 20 kg / 25 kg	
Installation site	Outdoors	
Deployment options	Wall mounting	
Character height	51 mm	
Length of lines	4, 8, 12 or 16 characters	
Number of lines	max. 2 lines (400 mm model) max. 4 lines (800 / 1000 mm model)	
Line layout	Positioning to customer specification	
Panel design	Artwork to customer specification	
Language versions – software / manual	German, English, Italian, Spanish	
Features		
Operation	Integrated web server (internet browser)	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
Information displayed		
General information	Time, date, personal text, personal web text	
System data	Current output, daily yield, total yield, CO_2 savings	
Sunny SensorBox data	Ambient temperature, module temperature, internal solar irradiation, wind speed	
Sunny Island data	Battery charge level	
Accessories		
Optional software	LAN DEVICE FINDER – service tool	

Audience-grabbing presentation of system performance for indoor or outdoor application

Automatic data synchronization with Sunny WebBox

Virtually unlimited choice of **position and length of text modules**

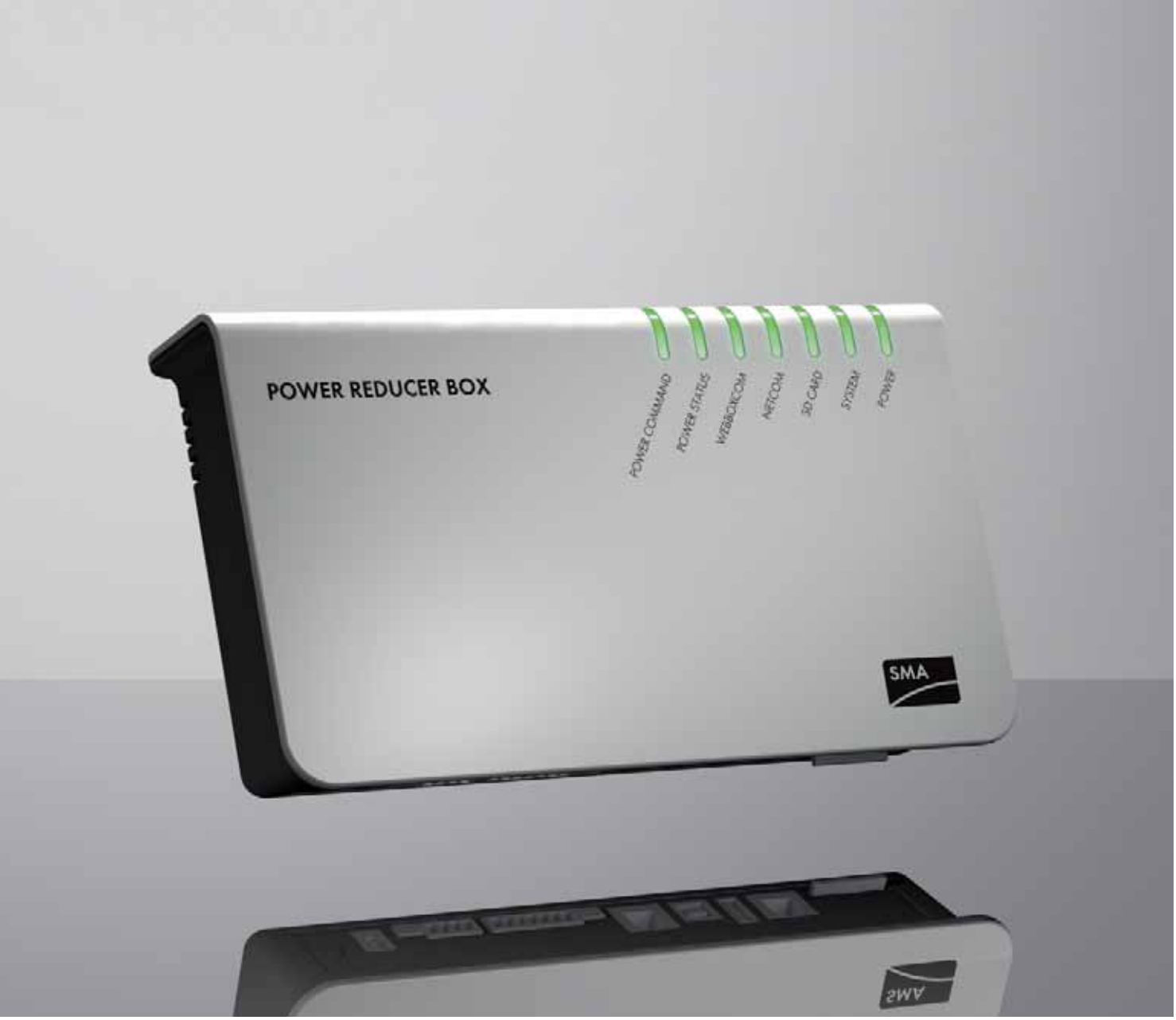
Integrated web server for set-up, operation and remote maintenance from any web-enabled PC in the world

Three different **housing sizes**

Display of wind, temperature and irradiation data in combination with the Sunny SensorBox

Individual design of front panel according to your specifications

Changing displays, freely editable and ticker text, automatic night switching



Simple

- Easy integration into existing systems
- Easy installation
- Free support from the SMA Serviceline
- Integrated web server

Flexible

- Active power output limitation and reactive power setpoint setting
- Signal input via digital interface or current loop
- Controls max.1,500 inverters through up to 30 Sunny WebBox

Reliable

- Complies with the directives of the EEG amendment on utility interaction
- Complies with the directives of the BDEW Medium Voltage Regulation on grid stability management

- Logging of all events and change of status

POWER REDUCER BOX

Utility interaction management for large-scale PV plants

With the Power Reducer Box, SMA provides the solution for large-scale PV plants which are obliged to engage in utility interaction management. It enables the operator to link the plant into the public utility grid in compliance with the EEG and the Medium Voltage Regulation. It achieves this by translating the nominal values transmitted via the ripple control receiver, for example, into control commands for the Sunny WebBox which relays them to the inverters. During this process, each change of status is logged twice: once in the Power Reducer Box and once in the Sunny WebBox. If required, the latter automatically transmits the data to Sunny Portal – thus, the operator is immediately informed of the utility operator's setpoint.

Technical Data

	Power Reducer Box	
Communication		
Communication with Sunny WebBox	Ethernet	
PC Communication	Ethernet	
Connections		
Ripple control receiver (AUX COM)	4 digital inputs, 4 ... 20 mA current interface in preparation	
Ethernet	10/100 Mbit, RJ45	
Maximum number of SMA devices		
Sunny WebBox	30	
Max. communication range		
Ethernet	100 m	
Power supply		
Power supply	Plug-in power supply	
Input voltage	100 V – 240 V AC, 50 / 60 Hz	
Power consumption	Typ. 4 W / max. 12 W	
Ambient conditions during operation		
Ambient temperature	–20 °C to +60 °C	
Relative air humidity	5 % to 95 %, non-condensing	
Memory		
Internal	16 MB ring buffer	
External	SD card (128 MB, 512 MB 1 GB, 2 GB)	
General Data		
Dimensions (W / H / D) in mm	225 / 130 / 57	
Weight	750 g	
Installation site	Indoors	
Deployment options	DIN rail mounting, wall mounting	
Status display	LEDs	
Language versions – software	German, English	
Language versions – manual	German, English	
Features		
Operation	Integrated web server (internet browser)	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
Accessories		
Plug-in power supply with adaptors	●	
Red Ethernet cable (patch cable)	●	
Blue Ethernet cable (crossover cable)	●	
Screwdriver	●	
Plug connector for AUXCOM (plug, connector shell, cable tie) with 2.5 meter cable	●	
2 screws and wall anchors each	●	
Technical Description with drilling template	●	
SD card 2 GB	❍	

● Standard features ❍ Optional features

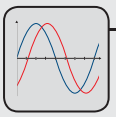
Suitable for large-scale plants with up to 1,500 inverters

Compliance with legislation **(§6 EEG 2009)**

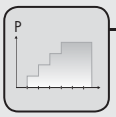
Rapid and simple commissioning

Double logging of all switching operations

Operating history can be recalled at any time **online via Sunny Portal.**



Default setting of **reactive power or cos φ**



Gradual connection of plant in compliance with the Medium Voltage Directive

Integrated web server for **remote online access** from any PC

Reliable

- Quick overview of the status of the PV plant
- Easy diagnostics due to event log display
- Safe data transfer through new password system

User-friendly

- Yield overview at a glance
- Graphical display of key system data
- Intuitive interface

Easy to use

- Wireless monitoring of the PV system with *Bluetooth* technology
- Free PC software for use on your existing PC

SUNNY EXPLORER

The free PC software solution

Switch on notebook or PC, activate the *Bluetooth* interface, start Sunny Explorer – and you have your PV plant status right at your fingertips. This free PC software is the ideal supplement to the new Sunny Boy generation: the essential plant data is displayed on your PC or notebook – thanks to *Bluetooth*, simply and wirelessly. Sunny Explorer also offers ideal support for inverter configuration: there is no longer any complex wiring involved, so plant maintenance is now a straightforward procedure done in a flash.

Technical Data

	Sunny Explorer	
Languages		
Available languages	German, English, Spanish, Italian, French, Greek, Korean, Portuguese, Dutch, Czech	
System requirements		
Supported operating systems	Windows XP (Servicepack 2) Windows Vista	
Supported *Bluetooth* Stacks	Microsoft, Toshiba, BlueSoleil, Broadcom	
Hardware (minimum requirements)		
Processor	PIII 800 MHz (XP) / P4 1 GHz (Vista)	
Computer memory	512MB (XP) / 1 GB (Vista)	
Available hard disk space	265 MB (240 MB free / 25 MB used)	
Resolution	1024 x 768 pixels	
Plant information		
System Overview	Ideal for keeping a close eye on the entire PV system through visualization of the essential data	
Plant Settings	Easy setting of parameters for an entire class of devices	
Current system values	Summary of current device data By depicting the minimum, maximum, total and mean values (derived from each device category), operators obtain a deeper insight into the current status of their PV system.	
Equipment Information		
Device overview	Essential device information at a glance	
Device Settings	Individual adjustment of parameters for each single device	
Current device values	Detailed information on the current values of the selected device	
Events	Fast event analysis by making use of the device evaluation functions and immediate visualization of the recorded events	

Quick overview of the status of the PV-plant

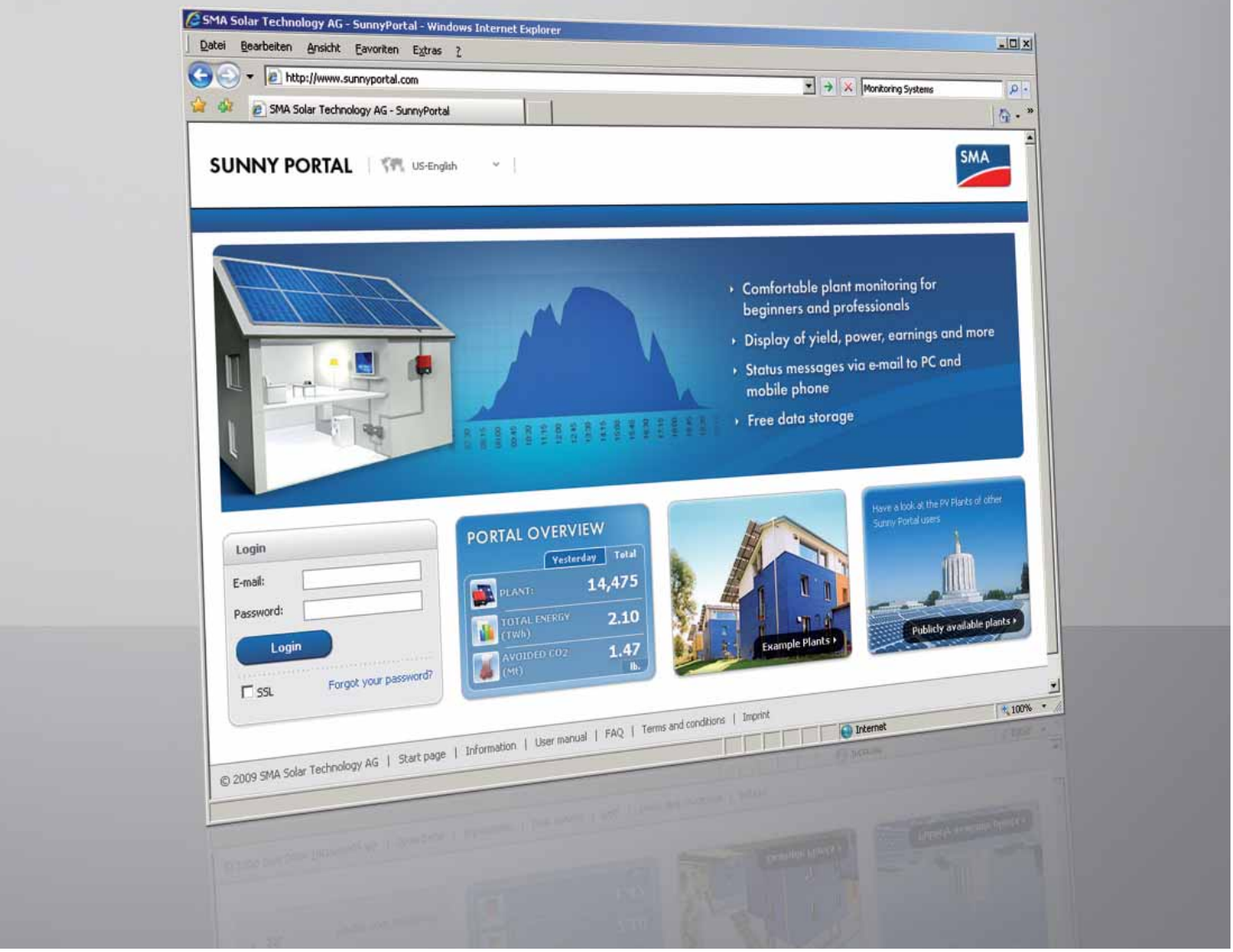
Display of essential plant data

Configuration of individual devices or an entire device category

Communication with the inverters via *Bluetooth*

Easy diagnostics due to event log display

Safe data transfer through new password system



Informative

- Access the key data of the system – via the Internet – all over the world
- Individual yield and event reports sent by email

- Evaluation of all data systems displayed in chart and table form
- Neutral link-in to own website

User-friendly

- One password for several systems
- Central management of customer and plant data
- Available in more than ten languages

Individual

- Individual configuration of pages and charts
- Insertion of personal plant images
- Easy configuration of individual access rights

SUNNY PORTAL

Professional management and monitoring of PV systems

Whether for small rooftop systems or large solar energy parks, the central management and monitoring of several PV systems saves time and money. Service staff, contractors and operators are thus able to access the data they need at any time and from any place. Automatically generated pages are customized to specifically meet customer needs; moreover, individual views of the plant or particular devices can be created. Whether displayed in table form or one of the other various types of configurable diagrams, Sunny Portal has the analysis of measured values and the visualization of yield down to a fine art. And the high-performance reporting system provides regular email updates and thus secures your yields.

Technical Data

	Sunny Portal
Languages	
Available languages	German, English, Spanish, Italian, French, Chinese, Greek, Korean, Portuguese, Czech
System requirements	
Supported operating systems	All
Software	
Recommended browser/s	Internet Explorer Version 7 and higher, Firefox, Safari
Other details	JavaScript and Cookies enabled
Data logger	
Supported data logger	Sunny WebBox
Plant management	
Plant list	Overview of all systems on Sunny Portal account
Sunny Portal Account	One password for the management and monitoring of all systems in Sunny Portal
Plant information	
Plant properties	Overview of the key properties of the PV system
System log	Access to system event messages
Device overview	Properties and parameters of the devices in the PV system
Page design	
Standard pages	Automatic creation of standard pages for the most frequent requirements of plant monitoring and presentation
Personalized pages	Wide selection of templates for individual page design
Page modules	Tables, diagrams, personal images, individual text, plant overview (CO_2, earnings, energy)
Visualization of yield and measured values	
Diagram types	Choice of six types of diagrams for the perfect presentation of yield and measured values bar, area and line charts (with, without or only markings) and XY diagrams
Tables	Individual configuration of charts for all yield and measured values
Time periods	From 5 minutes to 1 year, various time intervals selectable
Status reports	
Information reports	Daily or monthly email reports on energy yield, maximum performance, earnings, CO_2 reduction. An additional self-defined page from Sunny Portal can also be transmitted.
Event reports	Hourly or daily reports on plant status information, warnings, failures and errors. Content and recipient can be freely configured.
Report format	Text, PDF, HTML
Individual access	
Publication of specific pages	Any online user has access via the shared area on Sunny Portal. Perfect for individual presentation on your own website
User roles	Easy configuration of access rights in display based on the roles 'guest', 'standard user', 'contractor' and 'system administrator'.

Management of several PV systems from one central location

Monitoring without having to be on site

Quick overview of measured and yield values of the solar system

Easy diagnostics through display of measured values and event log

You can rely on high-performance reporting to help secure yields

Personalized access to screen options and functions

Flexible page design for individual presentation of your solar plant

Standard pages for the most common display options

Informative

- Up-to-date display of key system data
- Calculation of CO_2 prevention, conversion into kilometers driven

- Display of ambient data (provided a Sunny Sensorbox is available)

Easy to use

- Intuitive set-up and operation
- Constant updating of data via network link to the Sunny WebBox

- Standard hardware is sufficient for presentation
- Free download

FLASHVIEW

Professional plant presentation free of charge

Returns, current performance and ambient data: Flashview displays solar yields on any standard PC. Various display options allow for either automatic alternation or manual selection by the viewer. Flashview retrieves the plant data from the Sunny WebBox via an established network link – or optionally via the Internet from any location worldwide. And user-defined plant images or external RSS feeds can be easily integrated.

Technical Data

	Flashview	
Languages		
Available languages	German, English, Spanish, Italian, French, Chinese, Greek, Korean, Portuguese, Dutch, Czech	
System requirements		
Supported operating systems	Windows XP (Servicepack 2), Windows Vista, Apple Macintosh OS X	
Required SMA devices	Sunny WebBox	
Communication		
Data logger communication	Ethernet	
Type	IP address, URL (e.g. DynDns)	
Max. number of devices		
Ethernet	10	
Max. communication range		
Ethernet	100 m	
Software		
Other details	WinZip	
Hardware (minimum requirements)		
Processor	1 GHz	
Computer memory	256 MB	
Available hard disk space	12 MB	
Resolution	1280 x 1024 pixels	
Color depth	256 colors	
Information displayed		
General information	Time	
Plant data	Current output, daily yield, total yield, CO_2 saving	
SensorBox data	Ambient temperature, module temperature, internal solar irradiation, wind speed	
Other information	Kilometers driven	
Additional pages	Separate page for personal promotional activities, RSS newsfeed ticker	
Individual set-up options		
Values	CO_2 factor, vehicle CO_2 emissions, digit format, unit of length, unit of weight, unit of temperature	
Other details	Name of plant, personal wallpaper	
Features		
Operation	Manual keyboard, automatic slide show changeover after 5, 10, 20 and 30 seconds	

Easy to operate

Automatic data transfer with Sunny WebBox

Flexible set-up options

Free download

Display of key **plant data**

News ticker with **RSS feed**

Individual design with personal wall paper

Attractive **visual presentation**

Professional

- Visualization, control and monitoring of large-scale plants
- Integration of SMA devices into existing OPC-compatible control systems such as HMI and SCADA systems

Flexible

- Simple and quick installation
- Data interface in accordance with the communication standard OPC-DA / OPC-XML-DA

- Compatible with WinCC, InTouch, LabView, etc.

SMA OPC-SERVER

The standardized data interface for large-scale systems

Particularly for large-scale plants and PV power stations, customized monitoring solutions are called for which link up systems and components supplied by different manufacturers into one joint control system. OPC, the international communication standard in the field of automation technology, plays an important role in this: it enables simple and reliable data exchange between devices and applications supplied by different manufacturers. The SMA OPC-Server enables SMA devices to be integrated into OPC-compatible systems.

Technical Data

	SMA OPC-Server	
Communication		
Communication with Sunny WebBox	Ethernet, TCP/IP	
Max. number of Sunny WebBox units	50 (starting with firmware version 1.43)	
Communication with client application	Ethernet, TCP/IP	
Communication standard	OPC-DA / OPC-XML-DA	
System Requirements		
Supports the following operating systems	Windows Server 2003 (recommended), Windows XP Professional SP2	
	.NET Framework 2.0 Network connection to Sunny WebBox	
Verified support of the following clients		
	National Instruments LabVIEW	
	Siemens WinCC	
	Wonderware InTouch	
Two-way data exchange		
	Measured values	
	Parameters	
Scope of delivery		
	CDROM, documentation	

Professional visualization of **solar power stations**

International **OPC standard**

Easy installation and integration into existing systems

Standardized interface **to the PV system**

High-level security during data transmission

Bluetooth

- Automatic networking of up to 100 devices
- Range of up to 100 m in the open air
- Compatible with standard *Bluetooth* devices

RS485

- Highest reliability through symmetrical signal transmission
- Various accessories available (radio links, fiber optic converters)

Intelligent Connection

SMA communication solutions by comparison

Our customers have the choice: SMA offers two technical solutions for data transmission between the inverters and the plant monitoring devices: wireless communication via *Bluetooth* and wire-linked communication via the RS485-based fieldbus system.

Trend toward wireless transmission

There are advantages to both options; however, even for small-scale plants, the trend is going toward wireless communication. It is particularly simple and quick to install: just as in a WLAN ad hoc network, new inverters are automatically recognized and integrated into the system. The intelligent networking system used here bridges even great distances, while at the same time, it is configured as a redundant communications network, which makes for very high reliability.

Bluetooth first-class

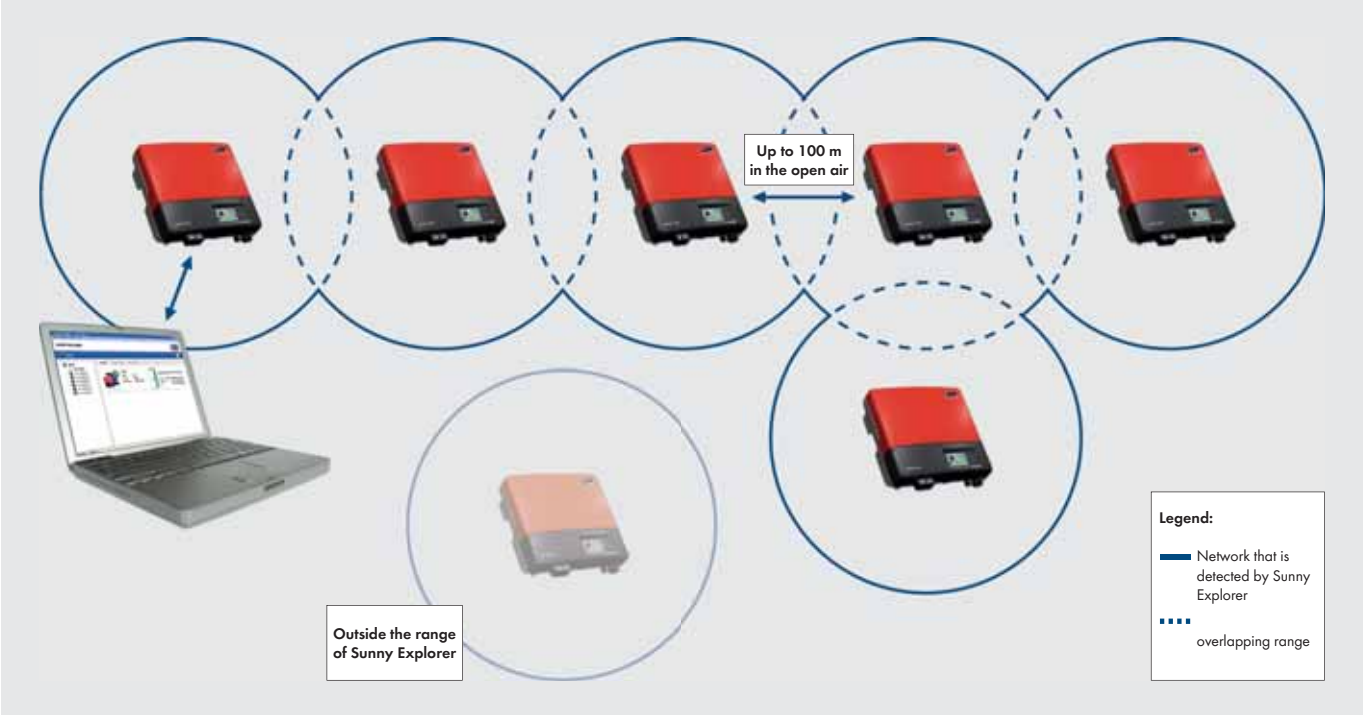
People usually associate the term *"Bluetooth"* with their hands-free car kit, cell phone or wireless computer accessories. However, SMA utilizes a much more powerful version: the so-called *Bluetooth* Class 1. Its range of up to 100 m in the open air is much larger than that of the standard *Bluetooth* Class 2. What's more, as many as 100 devices can be linked in a network, much more than the usual seven. As a result of the intelligent networking concept designed by SMA, each participant unit functions simultaneously as a repeater, automatically relaying the data of other devices. So if 99 inverters are linked together, each one can be queried and parameterized as soon as the communication device is brought within range of any single inverter in the chain. The maximum communication range in this example, then, is approximately ten kilometers.

RS485 – the established standard

Of course, if you wish to continue using wire-linked data communication, you are welcome to do so. The RS485 standard based on symmetrical signal transmission is extremely resistant to external disturbances and has proven its worth in industrial applications. Especially for the operation of large-scale plants and solar power stations, maximum security and reliability are crucial requirements. The RS485 is a long-established fieldbus – accordingly, it has been used for wiring up many existing systems. Special solutions such as RS485 radio links or converters to fiber optic cables enable straightforward integration into existing communications systems.

Our customers have the choice

As there are preferred areas of application for both types of communication, the new generation of *Bluetooth*-compatible inverters can be retrofitted with an additional RS485 interface. And finally, if you do not wish to use *Bluetooth*, you can of course deactivate the wireless interface.



ISLAND INVERTERS

SMA Island Inverters: System Managing for all Types of Energy Producers

Secure power supply for off-grid systems: the Sunny Island battery inverter forms a standard AC voltage grid into which all users and generators can be easily integrated. With this AC coupling and the Sunny Island as the system manager, SMA delivers an innovative solution for supplying electricity to remote locations and for creating an emergency supply for areas with unstable grids.

Functional principle

The Sunny Island is a battery inverter and is charged with setting up a stable stand-alone grid. In so doing, it constantly holds the voltage and frequency of the AC grid within the allowable limits. Both users and generators are connected directly to this grid. If there is an energy surplus, the Sunny Island charges the batteries; if there is a shortage, it supplies the grid with electricity from the batteries. Thanks to its highly developed battery management system, it can recognize the charge levels at any given moment and, through its function as system manager, it makes further decisions as well: if batteries are discharged or if there is a great demand for electricity, the Sunny Island can start a diesel generator or it can disconnect loads as needed. If the batteries are fully charged and there is little demand, it can reduce the solar plant's electricity production. It also determines the optimal strategy for charging the batteries, and in so doing, increases their lifespan.

Flexible grid layout

In addition to solar and wind power plants, diesel generators and other electricity generators, as well as all 230-volt loads, can be connected to the AC stand-alone grid. This avoids costly DC cabling and provides great flexibility. For smaller systems, SMA offers the Sunny Island Charger, an MPP charge regulator for a highly efficient DC connection of the PV plant and batteries. This makes SMA the only company in the world to offer coordinated solutions for both AC and DC connections. The special advantage: SMA stand-alone grids can be set up quickly and can be adapted to increasing demand without much expense.

Expandable up to 100 kW

Stand-alone grids using the Sunny Island 2012, 2224 or 5048 can be expanded without difficulty through the parallel connection of several devices – single-phase as well as three-phase. For systems with more than 15 kW, three Sunny Island and a battery are combined in a cluster. To reach the total power desired, several of these clusters can be connected in parallel. The advantage: even if a battery fails, only one portion of the system is affected, i.e., the stand-alone grid supply is markedly secure.

To find out more about the "Off-Grid" topic, read the "Know-how" section on page 186.

Components: 1. Solar generator, 2. SUNNY BOY, 3. SUNNY ISLAND, 4. Batteries, 5. Diesel generator, 6. Wind power plant

Flexible

- For systems from 3 to 100 kW
- 1- and 3-phase operation, connectable in parallel and modularly extendable
- AC and DC coupling

Simple

- Easy commissioning with the "Quick Configuration Guide"
- Complete off-grid management

Efficient

- High efficiency
- Intelligent battery management for maximum battery life-span
- State of charge calculation

Robust

- Extreme overload capability
- OptiCool
- 5-year SMA Warranty

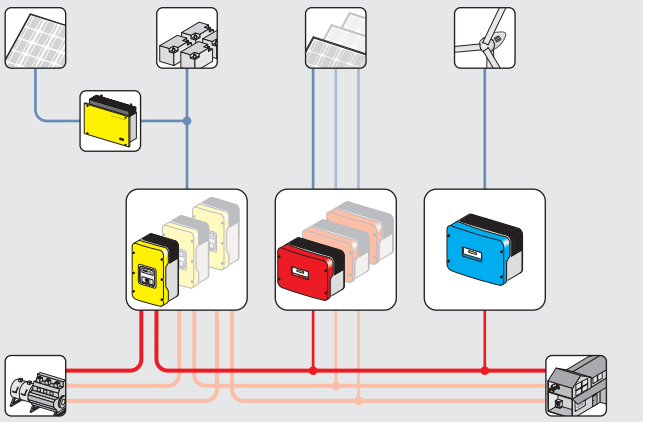
SUNNY ISLAND 5048 / 5048U

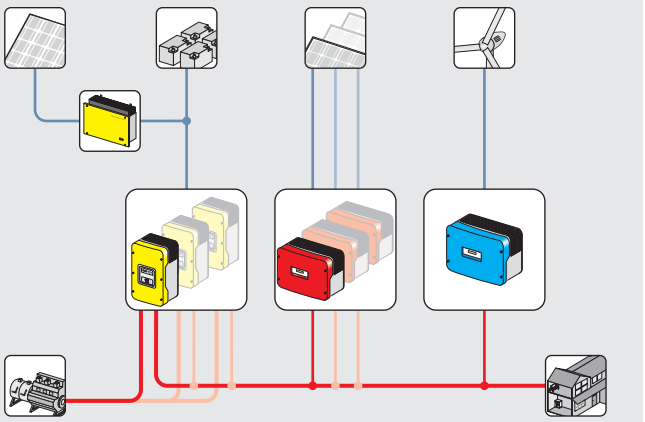
The island manager

Commissioning within minutes: the Sunny Island 5048 makes it possible. All required operational settings can be made quickly and easily. The Sunny Island 5048 is flexible in its application, extendable and takes on all control processes. Its first-class battery management ensures maximum battery life. In addition, the device's features are impressive, with its high efficiency, ergonomic die-cast aluminum housing and OptiCool active cooling system. The Sunny Island is also available in a UL-compliant 5048U version with an output rating of 120 V and 60 Hz.

Technical Data

	Sunny Island 5048	Sunny Island 5048U
AC output (users)		
Nominal AC voltage (adjustable)	230 V (202 V – 253 V)	120 V (105 V – 132 V)
Nominal frequency (adjustable)	50 Hz / 60 Hz (45 Hz – 65 Hz)	60 Hz (55 Hz – 65 Hz)
Continuous AC power at 25 °C / 45 °C	5000 W / 4000 W	5000 W / 4000 W
AC output power at 25 °C for 30 min / 1 min / 5 s	6500 W / 8400 W / 12000 W	6500 W / 8400 W / 11000 W
Nominal AC current / Max. AC current (peak)	21.7 A / 120 A for 60 ms	41.7 A /180 A for 60 ms
Total harmonic distortion / phase shift (cos φ)	< 3 % / -1 to +1	< 3 % / -1 to +1
AC input (generator or grid)		
Input voltage (range)	230 V (172.5 V – 264.5 V)	120 V (80 V – 150 V)
Input frequency (range)	50 Hz / 60 Hz (40 Hz – 70 Hz)	60 Hz (54 Hz – 66 Hz)
Max. input current (adjustable) / Max. input power	56 A (0 A – 56 A) / 12.8 kW	56 A (0 A – 56 A) / 6.7 kW
Battery DC input		
Battery voltage (range)	48 V (41 V – 63 V)	48 V (41 V – 63 V)
Max. battery charging current / continuous charging current at 25 °C	120 A / 100 A	120 A / 100 A
Battery type / battery capacity (range)	Lead acid, NiCd / 100 – 10,000 Ah	Lead acid, NiCd / 100 – 10,000 Ah
Charge control	IUoU process	IUoU process
Efficiency / Operating consumption		
Max. efficiency	95 %	95 %
Own consumption with no load / standby	25 W / 4 W	25 W / 4 W
Protection devices		
DC reverse polarity / DC fuse	●/●	●/●
AC short-circuit / AC overload	●/●	●/●
Overtemperature / excessive battery discharge	●/●	●/●
General Data		
Dimensions (Width / Height / Depth in mm)	467 / 612 / 235	467 / 612 / 235
Weight	63 kg	63 kg
Operating temperature range	-25 °C ... +50 °C	-25 °C ... +50 °C
Protection rating	Indoors (IP30)	Indoors (NEMA 1)
Features / Function		
Operation & display / multifunction relays	Internal / 2	Internal / 2
3-phase systems / parallel connection	●/●	●/●
Integrated bypass / multicluster operation	–/●	–/ starting Oct. 2009
State of charge calculation / Full- / Equalization charge	●/●/●	●/●/●
Integrated soft start / Generator support	●/●	●/●
Battery temperature sensor / Communication cables	●/●	●/●
Warranty (5 years / 10 years)	●/❍	●/❍
Certificates and permits	www.SMA.de	www.SMA.de
Accessories		
Battery cables / battery fuses	❍/❍	❍/❍
Interfaces (RS485 PB / Multicluster PB)	❍/❍	❍/❍
"GenMan" extended generator start	❍	❍
Load-shedding contactor / Battery current measurement	❍/❍	❍/❍
● Standard ❍ Optional		
Last update: March 2009		
Type Designation	SI 5048	SI 5048U





Simple

- For systems from 2 to 5 kW
- AC and DC coupling
- Simple installation

Efficient

- High efficiency
- Excellent price-performance ratio

Robust

- Extreme overload capability
- 5-year SMA Warranty

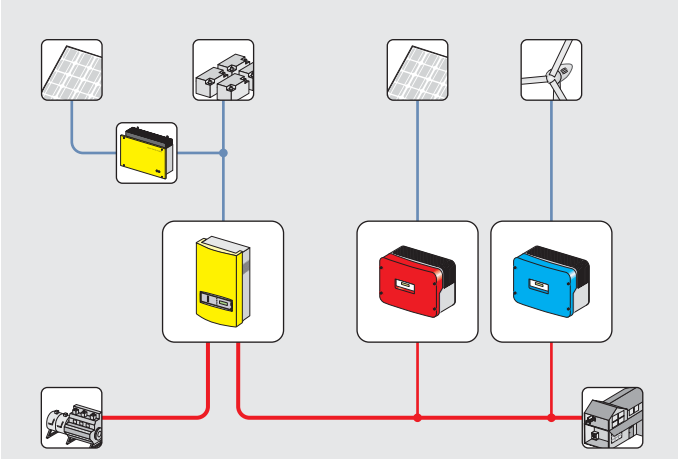
SUNNY ISLAND 3324 / 4248 / 4248U

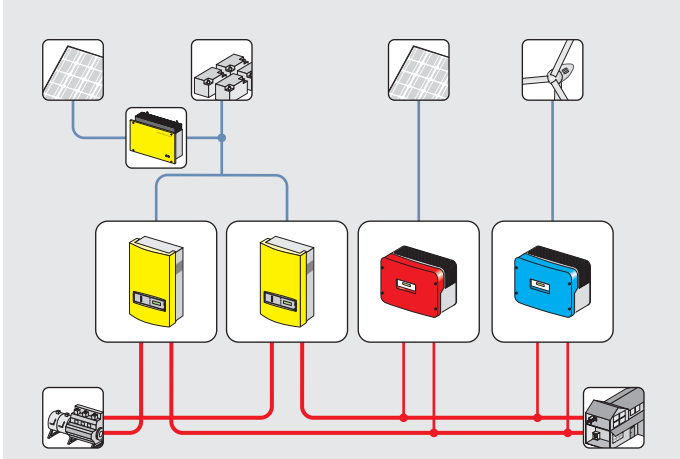
Stand-alone grids easier than ever

Easy installation, safe operation and outstanding cost-to-benefit ratio: the Sunny Island 3324 and 4248 battery inverters are especially suitable for use in small and mid-sized stand-alone grids. The Sunny Island 4248U model is available for countries with voltage systems compatible with the U.S. standard. The devices guarantee a reliable and high-quality power supply. Due to their outstanding overload capabilities and the fact that they are designed to withstand high ambient temperatures, these devices can be used under extreme weather conditions.

Technical Data

	Sunny Island 3324	Sunny Island 4248	Sunny Island 4248U
AC output (users)			
Nominal AC voltage (adjustable)	230 V (202 V – 253 V)	230 V (202 V – 253 V)	120 V (105 V – 132 V)
Nominal frequency (adjustable)	50 Hz (45 Hz – 55 Hz)	50 Hz (45 Hz – 55 Hz)	60 Hz (55 Hz – 65 Hz)
Continuous AC power at 25 °C / 45 °C	3300 W / 2300 W	4200 W / 3400 W	4200 W / 3400 W
AC output power at 25 °C for 30 min / 1 min / 5 s	4200 / 5000 / 7300 W	5400 / 7000 / 11400 W	5400 / 7000 / 11900 W
Nominal AC current / Max. AC current (peak)	14.5 A / 70 A for 100 ms	18 A / 100 A for 100 ms	35 A / 140 A for 5 s
Total harmonic distortion / phase shift (cos φ)	< 3 % / –1 to +1	< 3 % / –1 to +1	< 3 % / –1 to +1
AC input (generator or grid)			
Input voltage (range)	230 V (172.5 V – 250 V)	230 V (172.5 V – 250 V)	120 V (80 V – 150 V)
Input frequency (range)	50 Hz (40 Hz – 60 Hz)	50 Hz (40 Hz – 60 Hz)	60 Hz (54 Hz – 66 Hz)
Max. input current (adjustable) / Max. input power	56 A (2 – 56 A) / 12.8 kW	56 A (2 – 56 A) / 12.8 kW	56 A (2 – 56 A) / 6.7 kW
Battery DC input			
Battery voltage (range)	24 V (21 V – 32 V)	48 V (41 V – 63 V)	48 V (41 V – 63 V)
Max. battery charging current / continuous charging current at 25 °C	140 A / 104 A	100 A / 80 A	100 A / 80 A
Battery type / battery capacity (range)	Lead acid/100–6,000 Ah	Lead acid/100–6,000 Ah	Lead acid/100–6,000 Ah
Charge control	IUoU process	IUoU process	IUoU process
Efficiency / Operating consumption			
Max. efficiency	94.5 %	95 %	95 %
Own consumption with no load / standby	22 W / 4 W	22 W / 4 W	22 W / 4 W
Protection devices			
DC reverse polarity / DC fuse	●/●	●/●	●/●
AC short-circuit / AC overload	●/●	●/●	●/●
Overtemperature / excessive battery discharge	●/●	●/●	●/●
General Data			
Dimensions (Width / Height / Depth in mm)	390 / 590 / 245	390 / 590 / 245	390 / 590 / 245
Weight	39 kg	39 kg	39 kg
Operating temperature range	–25 °C ... +50 °C	–25 °C ... +50 °C	–25 °C ... +50 °C
Protection rating	Indoors (IP30)	Indoors (IP30)	Indoors (NEMA 1)
Features / Function			
Operation & display / multifunction relays	Internal / 2	Internal / 2	Internal / 2
3-phase systems / parallel connection	–/–	–/–	–/–
Integrated bypass / multicluster operation	–/–	–/–	–/–
State of charge calculation / Full- / Equalization charge	–/●/●	–/●/●	–/●/●
Integrated soft start / Generator support	–/–	–/–	–/–
Battery temperature sensor / Communication cables	●/–	●/–	●/–
Warranty (5 years / 10 years)	●/❍	●/❍	●/❍
Certificates and permits	www.SMA.de	www.SMA.de	www.SMA.de
Accessories			
Battery cables / battery fuses	❍/❍	❍/❍	❍/❍
Interfaces (RS485 PB / Multicluster PB)	❍/–	❍/–	❍/–
"GenMan" extended generator start	❍	❍	❍
Load-shedding contactor / Battery current measurement	❍/–	❍/–	❍/–
● Standard ❍ Optional			
Last update: March 2009			
Type Designation	SI 3324	SI 4248	SI 4248U





Flexible

- For systems from 1 to 9 kW
- 1- and 3-phase operation, connectable in parallel and modularly extendable
- AC and DC coupling

Simple

- Simple installation
- Complete off-grid management
- Easy and remote configuration and monitoring with Sunny Remote Control

Efficient

- High efficiency
- State of charge calculation
- Intelligent battery management for maximum battery life-span

Robust

- For indoor and outdoor installation
- Excellent overload characteristics
- Very wide temperature range
- 5-year SMA Warranty

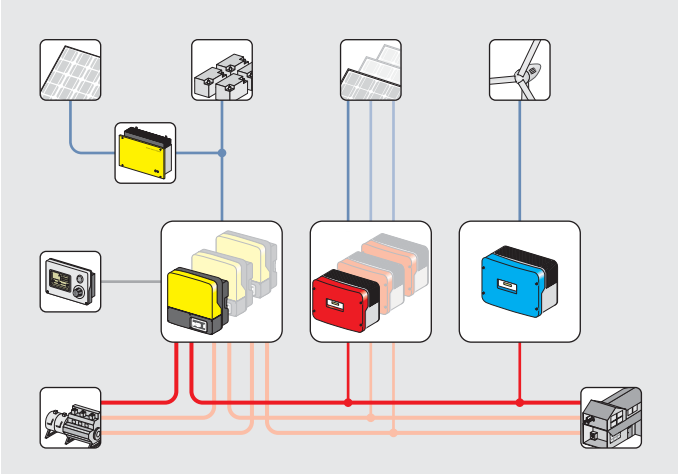
SUNNY ISLAND 2012 / 2224

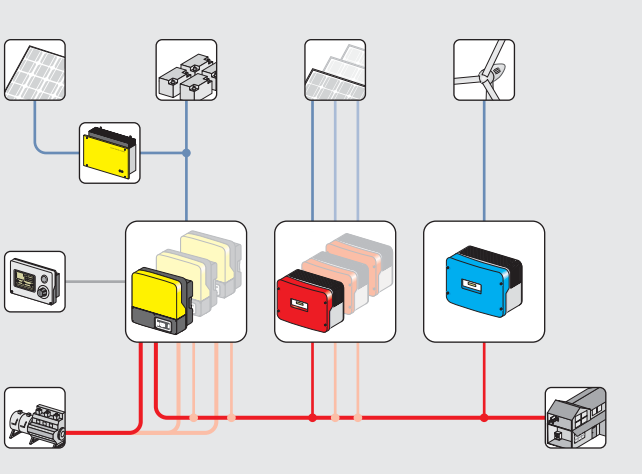
Compact and powerful for small off-grid systems

New Sunny Island products: the Sunny Island 2012 and 2224 extend the product range for the lower power range. The devices not only feature all the proven product characteristics of the Sunny Island 5048, but thanks to their reduced weight and compact design, the new family members are even easier to handle and install. The high IP54 protection rating and the Sunny Remote Control (SRC-1) give you full flexibility when choosing an installation location. Easy-to-use technology at its best: the unbeatable combination for off-grid systems of up to 9 kilowatts.

Technical Data

	Sunny Island 2012	Sunny Island 2224
AC output (users)		
Nominal AC voltage (adjustable)	230 V (202 V – 253 V)	230 V (202 V – 253 V)
Nominal frequency (adjustable)	50 Hz / 60 Hz (45 Hz – 65 Hz)	50 Hz / 60 Hz (45 Hz – 65 Hz)
Continuous AC power at 25 °C / 45 °C	2000 W / 1400 W	2200 W / 1600 W
AC output power at 25 °C for 30 min / 1 min / 5 s	2500 W / 3800 W / 3900 W	2900 W / 3800 W / 3900 W
Nominal AC current / Max. AC current (peak)	8.7 A / 25 A for approx. 500 ms	9.6 A / 25 A for approx. 500 ms
Total harmonic distortion / phase shift (cos φ)	< 4 % / –1 to +1	< 4 % / –1 to +1
AC input (generator or grid)		
Input voltage (range)	230 V (172.5 V – 264.5 V)	230 V (172.5 V – 264.5 V)
Input frequency (range)	50 Hz / 60 Hz (40 Hz – 70 Hz)	50 Hz / 60 Hz (40 Hz – 70 Hz)
Max. input current (adjustable) / Max. input power	25 A (0 A – 25 A) / 5.75 kW	25 A (0 A – 25 A) / 5.75 kW
Battery DC input		
Battery voltage (range)	12 V (8.4 V – 15.6 V)	24 V (16.8 V – 31.5 V)
Max. battery charging current / continuous charging current at 25 °C	180 A / 160 A	90 A / 80 A
Battery type / battery capacity (range)	Lead acid, NiCd / 100 – 10,000 Ah	Lead acid, NiCd / 100 – 10,000 Ah
Charge control	IUoU process	IUoU process
Efficiency / Operating consumption		
Max. efficiency	93 %	93.6 %
Own consumption with no load / standby	21 W / 6 W	21 W / 6 W
Protection devices		
DC reverse polarity / DC fuse	–/–	–/–
AC short-circuit / AC overload	●/●	●/●
Overtemperature / excessive battery discharge	●/●	●/●
General Data		
Dimensions (Width / Height / Depth in mm)	470 / 445 / 185	470 / 445 / 185
Weight	19 kg	19 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C
Protection rating	Outdoor installation (IP54)	Outdoor installation (IP54)
Features / Function		
Operation & display / multifunction relays	External via SRC-1 / 2	External via SRC-1 / 2
3-phase systems / parallel connection	●/●	●/●
Integrated bypass / multicluster operation	●/–	●/–
State of charge level calculation / Full- / Equalization charge	●/●/●	●/●/●
Integrated soft start / Generator support	●/●	●/●
Battery temperature sensor / Communication cables	●/●	●/●
Warranty (5 years / 10 years)	●/❍	●/❍
Certificates and permits	www.SMA.de	www.SMA.de
Accessories		
Battery cables / battery fuses	❍/❍	❍/❍
Interfaces (RS485 PB / Multicluster PB)	❍/–	❍/–
"GenMan" extended generator start	❍	❍
Load-shedding contactor / Battery current measurement	❍/❍	❍/❍
● Standard ❍ Optional		
Last update: March 2009		
Type Designation	SI 2012	SI 2224





Flexible

- For 12 / 24 / 48 V
- Up to four devices can be connected in parallel
- Modular and extendable

Simple

- Easy installation and commissioning
- Automatic control and single point of operation by the Sunny Island

Efficient

- Active MPP tracking
- Efficiency > 98 %

Robust

- Indoor and outdoor through IP65
- Fanless
- Nominal power up to 40 °C
- 5-year SMA Warranty

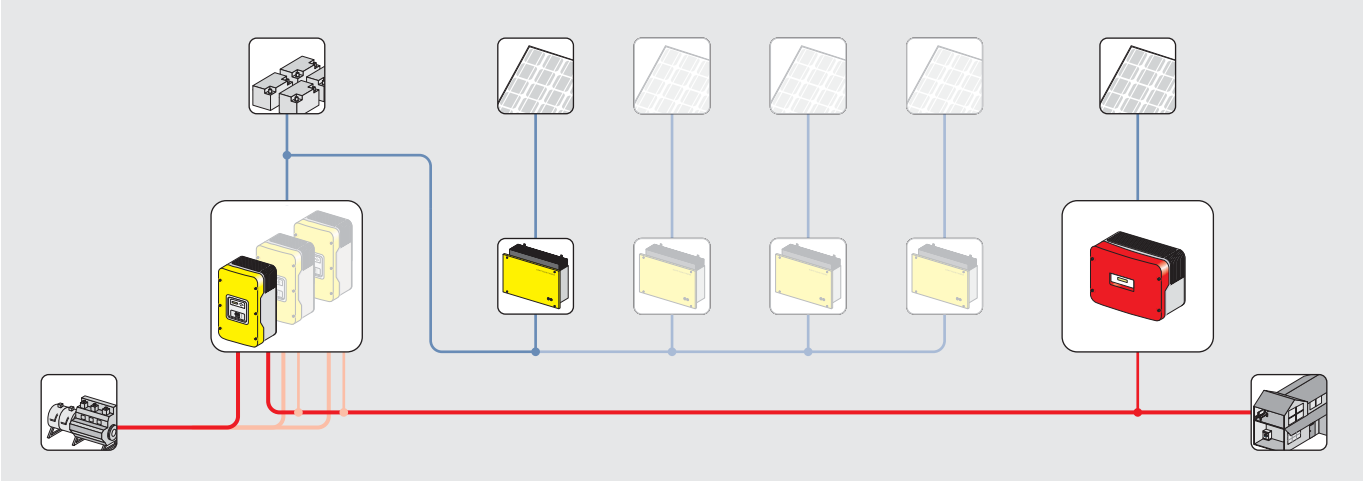
SUNNY ISLAND CHARGER 40

SMA DC coupling: maximum efficiency and applicable everywhere

AC and DC coupling optimally aligned and for the first time by one manufacturer: SMA's universally applicable Sunny Island Charger 40. Its wide DC input voltage range results in a perfect configuration for nearly all PV modules. Thanks to the integrated MPP tracking, the charger guarantees an energy yield that is 15 % – 30 % higher than that of conventional shunt and serial charge controllers. What makes charge controllers in this power range unique are the high protection rating, the fanless operation, and the broad temperature range that allow for its use even under harsh ambient conditions. The easy installation and automatic adjustment of the controller settings by the Sunny Island make for a foolproof startup.

Technical Data

	Sunny Island Charger 40 MPT		
	12 V	**24 V**	**48 V**
Input (PV generator)			
Max. PV power	630 W	1250 W	2100 W
Max. DC voltage	140 V DC	140 V DC	140 V DC
Optimal MPPT voltage range	25 V – 60 V	40 V – 80 V	70 V – 110 V
Number of MPP trackers	1	1	1
Max. PV current	40 A	40 A	30 A
Output (battery)			
Nominal DC power up to 40 °C	600 W	1200 W	2000 W
Nominal battery voltage	12 V	24 V	48 V
Battery voltage range	8 – 15.6 V	16 – 31.5 V	36 – 63 V
Battery type	Closed and sealed lead acid batteries	Closed and sealed lead acid batteries	Closed and sealed lead acid batteries
Max. charging current / continuous charging current	50 A / 50 A	50 A / 50 A	40 A / 40 A
Charge control	IUoU	IUoU	IUoU
Efficiency / Power consumption			
Max. efficiency	98.0 %	98.0 %	98.0 %
Euro ETA	97.3 %	97.3 %	97.3 %
Daytime operating consumption	< 5 W	< 5 W	< 5 W
Nighttime operating consumption	< 3 W	< 3 W	< 3 W
General			
Dimensions (Width / Height / Depth) in mm	421 x 310 x 143	421 x 310 x 143	421 x 310 x 143
Protection rating in accordance with DIN EN 60529	IP65	IP65	IP65
Weight	10 kg	10 kg	10 kg
Device protection	Short circuit / reverse polarity / overload / overvoltage and undervoltage / overtemperature and undertemperature	Short circuit / reverse polarity / overload / overvoltage and undervoltage / overtemperature and undertemperature	Short circuit / reverse polarity / overload / overvoltage and undervoltage / overtemperature and undertemperature
Certificates and permits	CE	CE	CE
Display	1 x multicolored LED	1 x multicolored LED	1 x multicolored LED
Setting parameters	Plug and play in combination with SI 5048, SI 2224, SI 2012 (SIC-PB required), DIL switch with stand-alone applications	Plug and play in combination with SI 5048, SI 2224, SI 2012 (SIC-PB required), DIL switch with stand-alone applications	Plug and play in combination with SI 5048, SI 2224, SI 2012 (SIC-PB required), DIL switch with stand-alone applications
Parallel operation	up to 4 devices over the Sync-Bus	up to 4 devices over the Sync-Bus	up to 4 devices over the Sync-Bus
Interface for Sunny Island Sync-Bus	optional (SIC-PB)	optional (SIC-PB)	optional (SIC-PB)
External temperature sensor	optional (KTY type)	optional (KTY type)	optional (KTY type)
Warranty	5 years	5 years	5 years
Ambient conditions			
Permissible ambient temperature during operation	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C
Air humidity	0 % – 100 %	0 % – 100 %	0 % – 100 %
Type Designation	SIC40-MPT	SIC40-MPT	SIC40-MPT



Flexible

- 3 different sizes from 30 to 110 kW
- Different generator, PV and load sizes

Simple

- Integrated AC distribution for Sunny Island, generator, PV
- Integrated load shedding contactor

Safe

- Active Anti-Islanding
- Reverse current monitoring
- Automatic bypass for the generator

Robust

- Due to IP65 high protection rating
- 5-year SMA Warranty

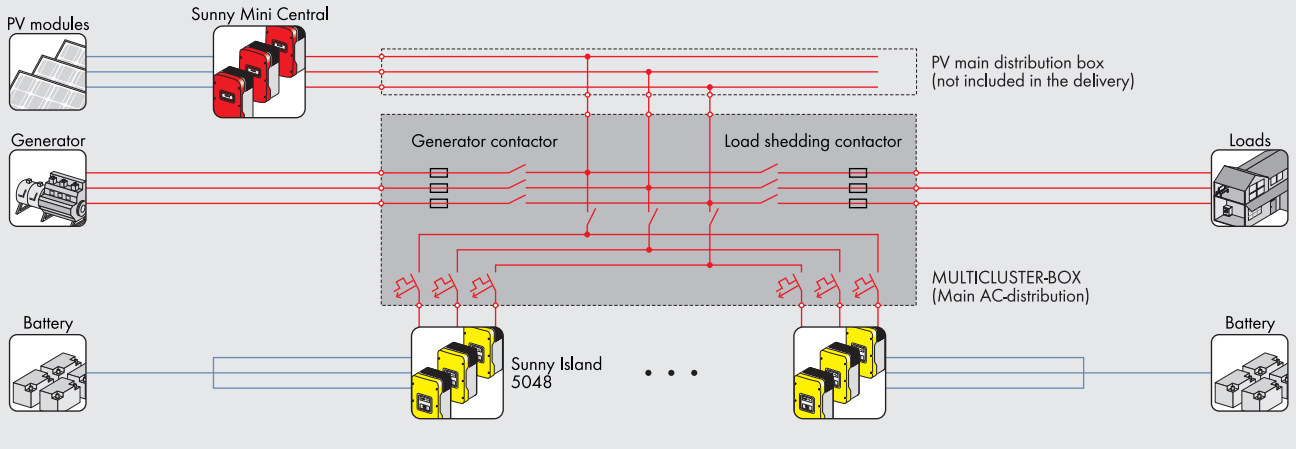
Multicluster Boxes for SUNNY ISLAND 5048

Simple setup of stand-alone and hybrid systems

Large off-grid systems with only a little effort: the new Multicluster Boxes for the Sunny Island 5048 are the ideal solution for the easy installation of stand-alone and hybrid systems from 30 to 100 kW. For this, two to four 3-phase clusters, each consisting of 3 Sunny Islands, are connected in parallel. Multicluster Boxes were specially developed for these systems as the AC main distribution unit with integrated generator and load contactors. To simplify installation, all Multicluster Boxes are completely wired and fitted at the factory with a main connector for PV or wind generators. All communication cables necessary for the installation are included with standard delivery.

Technical Data

	Multicluster Box 6	Multicluster Box 9	Multicluster Box 12
General			
Number of phases	3-phase	3-phase	3-phase
Nominal voltage	3 x 230 V / 400 V	3 x 230 V / 400 V	3 x 230 V / 400 V
Voltage range	172.5 – 265 V / 300 – 460 V	172.5 – 265 V / 300 – 460 V	172.5 – 265 V / 300 – 460 V
Nominal frequency (range)	50 Hz (40 – 70 Hz)	50 Hz (40 – 70 Hz)	50 Hz (40 – 70 Hz)
Dimensions (Width x Height x Depth) in mm	760 x 760 x 210 mm	1000 x 1200 x 300 mm	1000 x 1400 x 300 mm
Mounting type	suspended	standing on a base	standing on a base
Weight	approx. 55 kg	approx. 90 kg	approx. 110 kg
Connections for Sunny Island			
Number	6	9	12
Continuous AC output at 25 °C	30 kW	45 kW	60 kW
AC output for 30 min. / 1 min.	40 kW / 50 kW	60 kW / 75 kW	80 kW / 100 kW
Nominal AC current at 25 °C	3 x 44 A	3 x 65 A	3 x 87 A
Connection for PV system			
Number	1 x 3-phase	1 x 3-phase	1 x 3-phase
Nominal AC power / AC current	55 kW / 3 x 80 A	86 kW / 3 x 125 A	110 kW / 3 x 160 A
Load Connection			
Number	1 x 3-phase	1 x 3-phase	1 x 3-phase
Nominal power / current	55 kW / 3 x 80 A	86 kW / 3 x 125 A	110 kW / 3 x 160 A
Generator connection			
Number	1 x 3-phase	1 x 3-phase	1 x 3-phase
Nominal power / current	55 kW / 3 x 80 A	86 kW / 3 x 125 A	110 kW / 3 x 160 A
Ambient conditions			
Ambient temperature	–25 °C ... +50 °C	–25 °C ... +50 °C	–25 °C ... +50 °C
Protection rating in accordance with DIN EN 60529	IP65	IP65	IP65
Accessories			
Communication cable	4 x 5 m FTP Cat 5e	4 x 5 m FTP Cat 5e	4 x 5 m FTP Cat 5e
Multicluster Piggy-Back	optional	optional	optional
Last update: March 2009			
Type Designation	MC-Box-6.3	MC-Box-9.3	MC-Box-12.3



Flexible

- For use from 45 to 65 Hz
- Can be connected in parallel
- Suitable for 1- and 3-phase operation

Simple

- Ideal complement for energy sources without active power control
- Easy installation and commissioning

Safe

- Minimized AC interference emission thanks to phase shift control
- Integrated power and frequency control

Robust

- IP65 high protection rating
- 5-year SMA Warranty

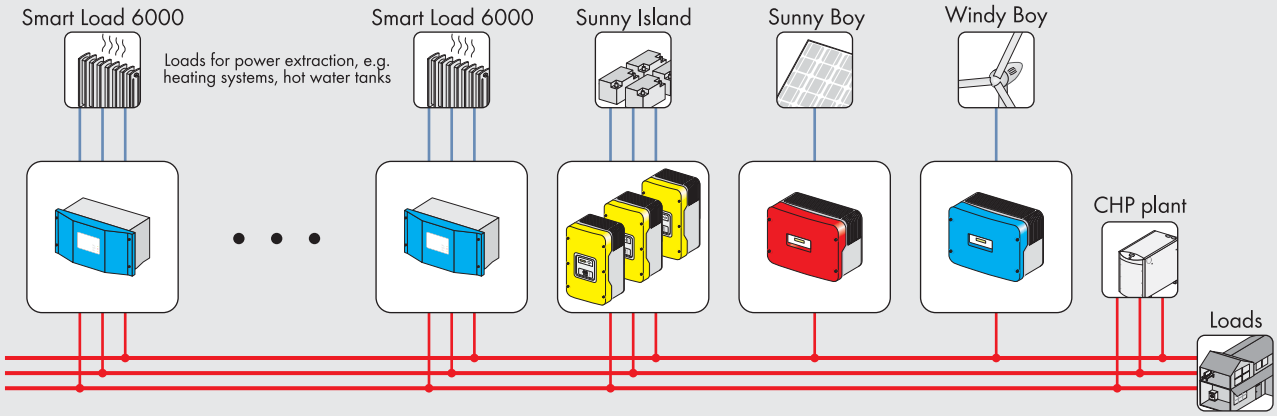
Smart Load for SUNNY ISLAND

Intelligent dumpload for stand-alone grids

The Smart Load forms the perfect complement to unregulated energy generators in stand-alone grids, e.g., small, directly-connected wind generators with passive stall power control. If there is an electricity surplus, the Smart Load feeds it into special loads, for example, heating cartridges in a hot water tank. The necessary arrangement is completely automatic, fast and free of retroactive effects for other loads. This continuous and quick energy consumption allows for ideal protection of system components and guarantees increased reliability.

Technical Data

	Smart Load 6000	
Input values		
Nominal input voltage	230 V (single-phase) / 3 x 400 V / 230 V with a load-withstanding neutral conductor	
System frequency	45 – 55 Hz, 55 – 65 Hz	
Input voltage range	3 x 180 – 270 V	
Device protection	Overvoltage protection, short circuit- and overload-proof	
Output Values		
Output voltage	3 x 0 – 230 V	
Output power per phase	3 x 2 kW / 1 x 6 kW	
Connections for	3 individual resistors at 2 kW, 1 individual resistor at 6 kW, open-circuit proof	
Ambient conditions		
Ambient temperature	–25 °C to +50 °C	
Protection rating in accordance with DIN EN 60529	IP65	
Mechanical Data		
Width / Height / Depth in mm	450 / 330 / 200	
Weight	14 kg	
Last update: March 2009		
Type Designation	SL-6000	



WIND ENERGY INVERTERS

WINDY BOY
Grid Connection of Small Wind Turbine Systems

Versatile

Relying on the experience gained from more than three gigawatts of worldwide installed inverter output, we have developed the Windy Boy product line, a new inverter family for connecting small wind turbines to the grid. Various device types are available with a power output ranging from 1000 to 6000 W, which are suitable for use with wind generators from various manufacturers in different performance categories.

High yields

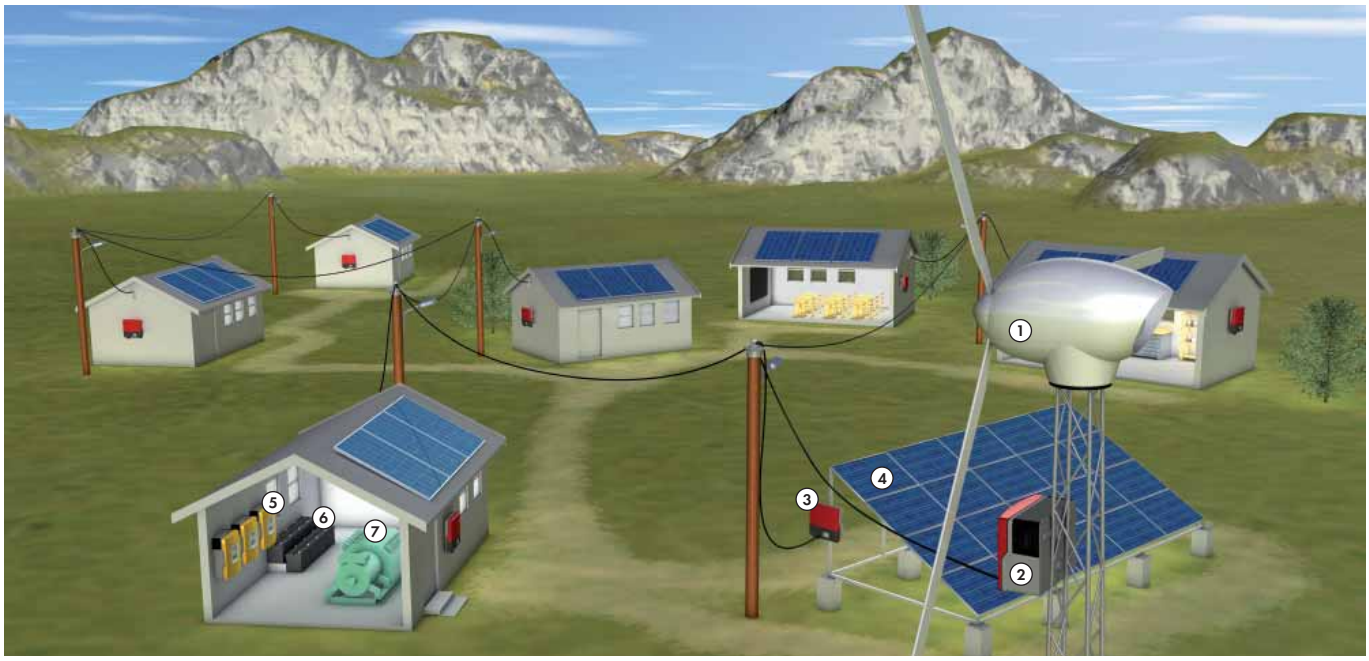
High yields can only be obtained from a wind turbine if the inverter is precisely synchronized with the output characteristics of the wind generator being used. Unlike photovoltaic applications, constant and quick load changes have to be taken into account. The Windy Boy inverter features a special operational mode for wind generators which allows an individual performance adjustment to the characteristic curves of generators from various manufacturers. Adjustments can also be made to accommodate varying wind strengths at the wind turbine locations.

Universal

The system can be used almost anywhere in the world with minimum installation cost and simplified authorization procedures thanks to its transformer-based concept, the Grid Guard automatic disconnection unit, its automatic 50 Hz / 60 Hz recognition, and a number of special country approvals.

Safe

The conversion of the variable-speed voltage from the turbine to grid-compliant AC current is easier than ever: The Windy Boy Protection Box and the Windy Boy allow the safe operation of small grid-connected wind turbines with permanent magnet generators. The Windy Boy Protection Box converts the variable-speed voltage of the wind generator into DC voltage and protects the Windy Boy from high input voltage at the same time. An external heating resistor is sufficient to dissipate possible surges. The Windy Boy then converts the DC voltage to grid-compliant voltage.



Components: 1. Wind turbine, 2. WINDY BOY, 3. SUNNY BOY, 4. Solar generator, 5. SUNNY ISLAND, 6. Batteries, 7. Diesel generator

Efficient

- Up to 95.6 % efficiency
- OptiCool: continuous operation even at high temperatures
- Freely configurable MPP characteristic curve

Simple

- Free choice of installation site
- Free choice of turbines thanks to programmable characteristic curve
- Certified for the most important countries of installation (SMA Grid Guard)

Safe

- Galvanic isolation
- Compatible with the Windy Boy Protection Box 500
- Protection of the turbine through smooth start

Reliable

- Worldwide SMA Service including Serviceline
- Comprehensive SMA warranty program

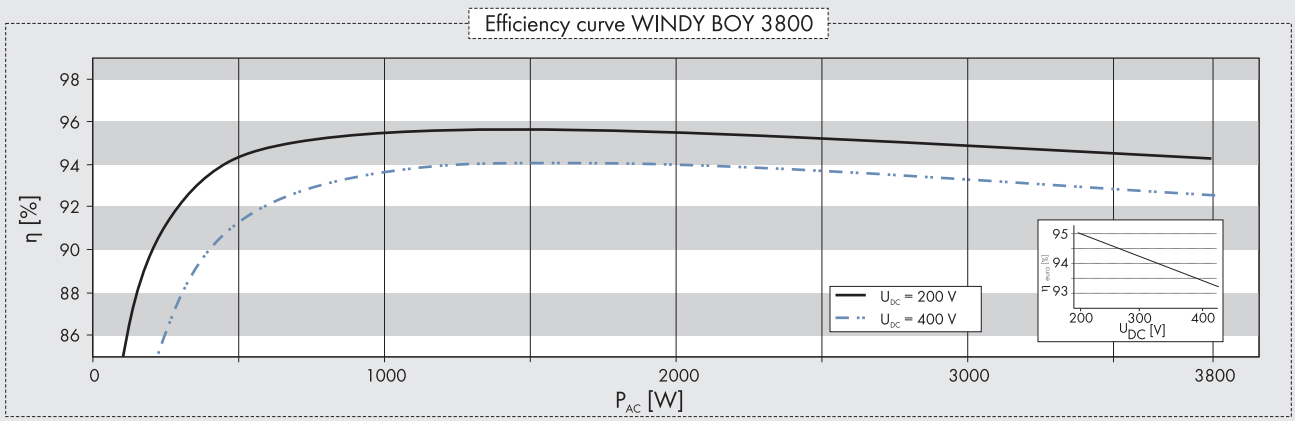
WINDY BOY 3300 / 3800

Highest yield in any climate

With a maximum efficiency of 95.6 %, the Windy Boy 3300 and 3800 rank among the most profitable inverters for small wind energy plants. The weather-proof casing and the wide temperature range enable installation at almost any location, and thanks to the OptiCool cooling system, the equipment works at outdoor temperatures of up to 45 °C with maximum output. The programmable MPP characteristic curve enables an optimal adjustment to the characteristic curve of the turbine and thus increases the yield. And should a problem arise: the worldwide SMA Service and comprehensive warranty program provide maximum security.

Technical Data

	Windy Boy 3300	Windy Boy 3800
Input (DC)		
Max. DC power	3820 W	4040 W
Recommended generator power at 2500 full-load hours per year	3100 W	3600 W
Recommended generator power at 5000 full-load hours per year	2800 W	3300 W
Max. DC voltage	500 V	500 V
Min. open circuit voltage for activating "turbine mode"	200 V	200 V
Operating range "turbine mode"	200 V – 500 V	200 V – 500 V
Max. input current	20 A	20 A
Output (AC)		
Nominal AC power	3300 W	3800 W
Max. AC power	3600 W	3800 W
Max. output current	18 A	18 A
Nominal AC voltage / AC operating range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz
Phase shift (cos φ)	1	1
AC connection	single-phase	single-phase
Efficiency		
Max. efficiency	95.2 %	95.6 %
Euro-Eta	94.4 %	94.7 %
Protection device		
DC reverse polarity protection	●	●
AC short-circuit strength	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Galvanically isolated	●	●
General Data		
Dimensions (W / H / D) in mm	450 / 352 / 236	450 / 352 / 236
Weight	41 kg	41 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C
Internal consumption: operating / standby	< 7 W / 0.1 W	< 7 W / 0.1 W
Topology	Low-frequency transformer	Low-frequency transformer
Cooling concept	OptiCool	OptiCool
Installation site: indoor / outdoor (IP65)	●/●	●/●
Features		
DC connection: MC3 / MC4 / Tyco	●/❍/❍	●/❍/❍
AC connection: plug connector	●	●
LCD	●	●
Color of lid: red	●	●
Interfaces: RS485 / radio	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de
● Standard equipment ❍ Optional		
Data at nominal conditions		



Efficient

- Up to 96.1 % efficiency
- Can be combined to form three-phase units with up to 18 kW output
- Integrated SMA Power Balancer
- OptiCool: continuous operation even at high temperatures

Simple

- Free choice of installation site
- Free choice of turbines thanks to programmable characteristic curve
- Certified for the most important countries of installation (SMA Grid Guard)

Safe

- Galvanic isolation
- Compatible with the Windy Boy Protection Box 600

Reliable

- Worldwide SMA Service including Serviceline
- Comprehensive SMA warranty program

WINDY BOY 5000A / 6000A

The performance class up to 18 kW

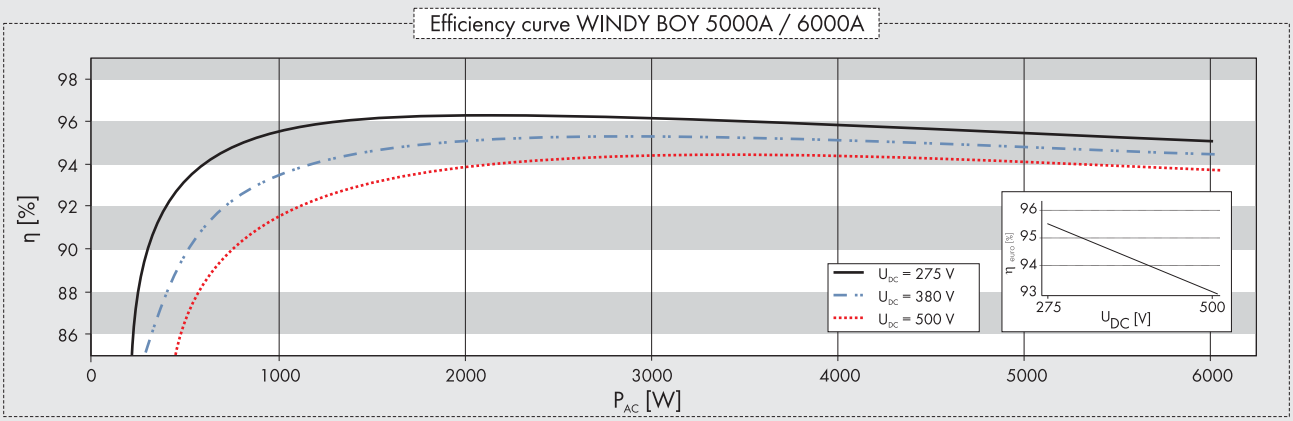
The Windy Boy 5000A and 6000A not only feature a maximum efficiency of 96.1 % but are also suited for the development of three-phase grid-feeding wind energy plants. The integrated SMA Power Balancer prevents undue load unbalance, and, in addition, the plant is able to feed-in even if individual phases fail. The weather-proof casing and the wide temperature range allow for installation at almost any location, and thanks to the OptiCool cooling system, the equipment works at outdoor temperatures of up to 45 °C with maximum output. And in case of a problem: The worldwide SMA Service and the comprehensive warranty program provide maximum security.

Technical Data

	Windy Boy 5000A	Windy Boy 6000A
Input (DC)		
Max. DC power	5750 W	6300 W
Recommended generator power at 2500 full-load hours per year	4600 W	5500 W
Recommended generator power at 5000 full-load hours per year	4200 W	5100 W
Max. DC voltage	600 V	600 V
Operating range "turbine mode"	246 V – 600 V	246 V – 600 V
Min. open circuit voltage for activating "turbine mode"	250 V	250 V
Max. input current	26 A	26 A
Output (AC)		
Nominal AC power	5000 W	6000 W
Max. AC power	5500 W	6000 W
Max. output current	26 A	26 A
Nominal AC voltage / AC operating range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz
Phase shift (cos φ)	1	1
AC connection	single-phase	single-phase
Efficiency		
Max. efficiency	96.1 %	96.1 %
Euro-Eta	95.2 %	95.2 %
Protection device		
DC reverse polarity protection	●	●
AC short-circuit strength	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Galvanically isolated	●	●
General Data		
Dimensions (W / H / D) in mm	468 / 613 / 242	468 / 613 / 242
Weight	62 kg	63 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C
Internal consumption: operating / standby	< 7 W / 0.25 W	< 7 W / 0.25 W
Topology	Low-frequency transformer	Low-frequency transformer
Cooling concept	OptiCool	OptiCool
Installation site: indoor / outdoor (IP65)	●/●	●/●
Features		
DC connection: MC3 / MC4 / Tyco	❍/●/❍	❍/●/❍
AC connection: screw terminal	●	●
LCD	●	●
Interfaces: RS485 / radio	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de

● Standard equipment ❍ Optional

Data at nominal conditions – Last updated: August 2008



Efficient

- Control optimized for wind energy plants
- Up to 95 % efficiency
- Protection of the turbine through smooth start
- Freely configurable MPP characteristic curve

Simple

- Free choice of installation site
- Certified for the most important countries of Installation (SMA Grid Guard)

Safe

- Galvanic isolation
- Compatible with the Windy Boy Protection Box 600
- Proven technology, 10,000 times tried and tested.

Reliable

- Worldwide SMA Service including Serviceline
- Comprehensive SMA warranty program

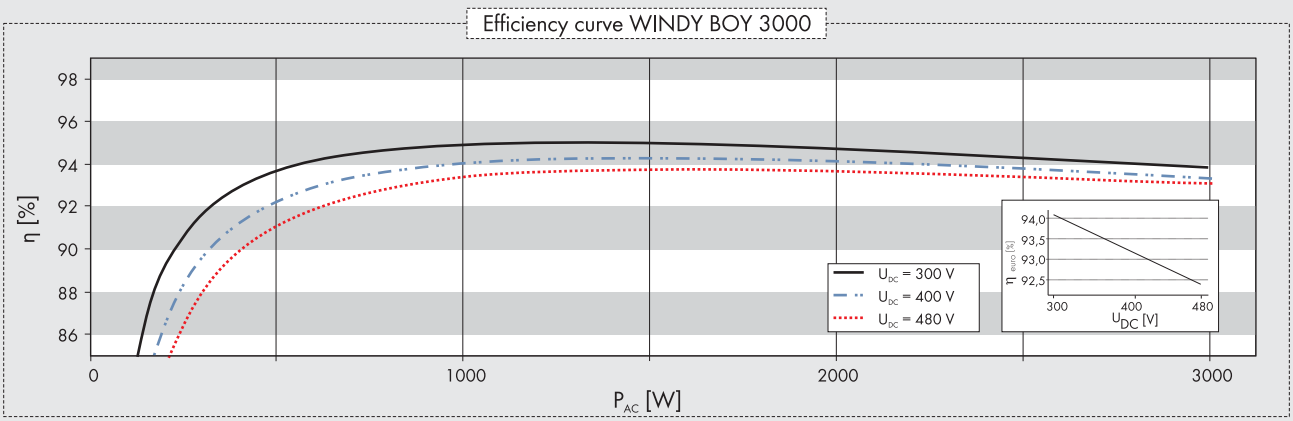
WINDY BOY 2500 / 3000

Worldwide proven technology

The Windy Boy 2500 and 3000 are ideal for small wind energy plants: with more than 10,000 units, they are successfully in use worldwide. They feature a maximum efficiency of 95 %. The programmable MPP characteristic curve enables an optimal adjustment to the characteristic curve of the turbine, which is also protected by a special smooth start device. The worldwide serviceable SMA Grid Guard interface is also used with this Windy Boy. It ensures maximum reliability for the operation of the wind energy plant and allows for the feeding-in to almost any public grid.

Technical Data

	Windy Boy 2500	Windy Boy 3000
Input (DC)		
Max. DC power	2700 W	3200 W
Recommended generator power at 2500 full hours per year	2100 W	2500 W
Recommended generator power at 5000 full hours per year	1900 W	2200 W
Max. DC voltage	600 V	600 V
Min. open circuit voltage for activating "turbine mode"	250 V	290 V
Operating range "turbine mode"	224 V – 600 V	268 V – 600 V
Max. input current	12 A	12 A
Output (AC)		
Nominal AC power	2300 W	2750 W
Max. AC power	2500 W	3000 W
Max. output current	12.5 A	15 A
Nominal AC voltage / AC operating range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ±4.5 Hz	50 Hz / 60 Hz / ±4.5 Hz
Phase shift (cos φ)	1	1
AC connection	single-phase	single-phase
Efficiency		
Max. efficiency	94.1 %	95.0 %
Euro-Eta	93.2 %	93.6 %
Protection device		
DC reverse polarity protection	●	●
AC short-circuit strength	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Galvanically isolated	●	●
General Data		
Dimensions (W / H / D) in mm	434 / 295 / 214	434 / 295 / 214
Weight	30 kg	32 kg
Operating temperature range	-25 °C ... +60 °C	-25 °C ... +60 °C
Internal consumption: operating / standby	< 7 W / 0.25 W	< 7 W / 0.25 W
Topology	Low-frequency transformer	Low-frequency transformer
Cooling concept	convection	convection
Installation site: indoor / outdoor (IP65)	●/●	●/●
Features		
DC connection: MC3 / MC4 / Tyco	●/❍/❍	●/❍/❍
AC connection: plug connector	●	●
LCD	●	●
Color of lid: red	●	●
Interfaces: RS485 / radio	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de
● Standard equipment ❍ Optional		
Data at nominal conditions		



Efficient

- Specially designed for small wind energy plants
- Excellent performance with weak wind

Simple

- Free choice of turbines thanks to programmable characteristic curve
- Free choice of installation site

Safe

- Galvanic isolation
- In accordance with almost all European grid connection guidelines

Reliable

- Worldwide SMA Service including Serviceline
- Comprehensive SMA warranty program

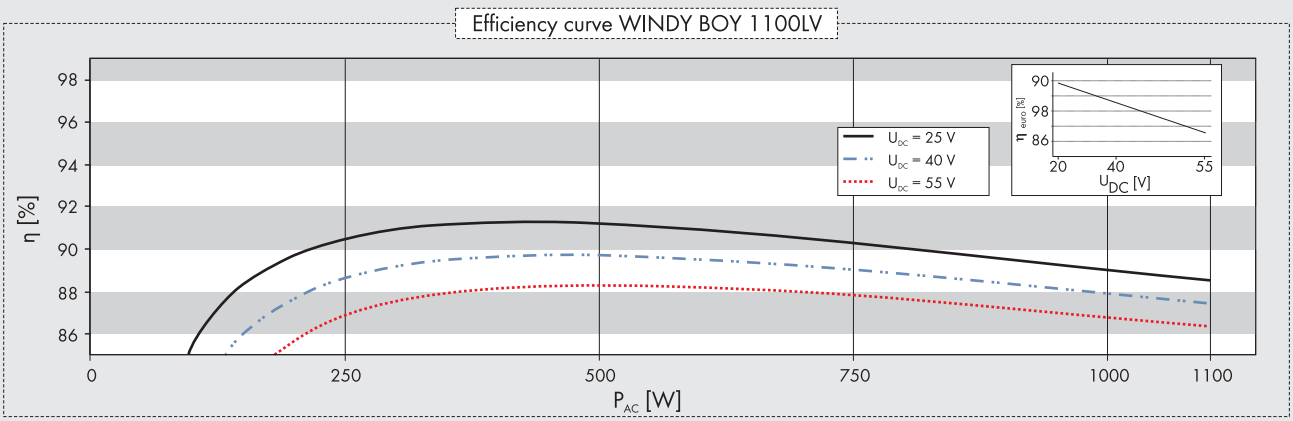
WINDY BOY 1100LV

The solution for low generator voltage

The Windy Boy 1100LV is the perfect solution for small wind power plants with low generator voltage: Turbines with 24 or 48 V nominal voltage can be connected without an additional voltage transformer. The programmable MPP characteristic curve offers the greatest possible freedom for choosing the turbine, while the weather-proof casing and the wide temperature range allow for installation at almost any location. As an inverter for wind power plants, the Windy Boy is optimally adjusted to the frequent load changes. Its minimal internal consumption during still air increases yield even more, which can be monitored at any time on the display or any of several communication interfaces.

Technical Data

	Windy Boy 1100LV	
Input (DC)		
Max. DC power	1210 W	
Recommended generator power at 2500 full-load hours per year	1000 W	
Recommended generator power at 5000 full-load hours per year	900 W	
Max. DC voltage	60 V	
Min. open circuit voltage for activating "turbine mode"	25 V	
Operating range "turbine mode"	21 V – 60 V	
Max. input current	62 A	
Output (AC)		
Nominal AC power	1000 W	
Max. AC power	1100 W	
Max. output current	5 A	
Nominal AC voltage / AC operating range	220 V – 240 V / 180 V – 260 V	
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	
Phase shift (cos φ)	1	
AC connection	single-phase	
Efficiency		
Max. efficiency	92.0 %	
Euro-Eta	90.4 %	
Protection device		
DC reverse polarity protection	●	
AC short-circuit strength	●	
Ground fault monitoring	●	
Grid monitoring (SMA Grid Guard)	●	
Galvanically isolated	●	
General Data		
Dimensions (W / H / D) in mm	434 / 295 / 214	
Weight	29 kg	
Operating temperature range	–25 °C ... +60 °C	
Internal consumption: operating / standby	< 5 W / 0.1 W	
Topology	Low-frequency transformer	
Cooling concept	convection	
Installation site: indoor / outdoor (IP65)	●/●	
Features		
DC connection: screw terminal	●	
AC connection: plug connector	●	
LCD	●	
Color of lid: red	●	
Interfaces: RS485 / radio	❍/❍	
Warranty: 5 years / 10 years	●/❍	
Certificates and approvals	www.SMA.de	
● Standard equipment ❍ Optional		
Data at nominal conditions		



Efficient

- Specially designed for small wind energy plants
- Freely configurable characteristic curve

Simple

- Free choice of installation site
- Certified for the most important countries of installation (SMA Grid Guard)

Safe

- Galvanic isolation
- Compatible with the Windy Boy Protection Box 400

Reliable

- Worldwide SMA Service including Serviceline
- Comprehensive SMA warranty program

WINDY BOY 1100 / 1700

The powerful compact devices

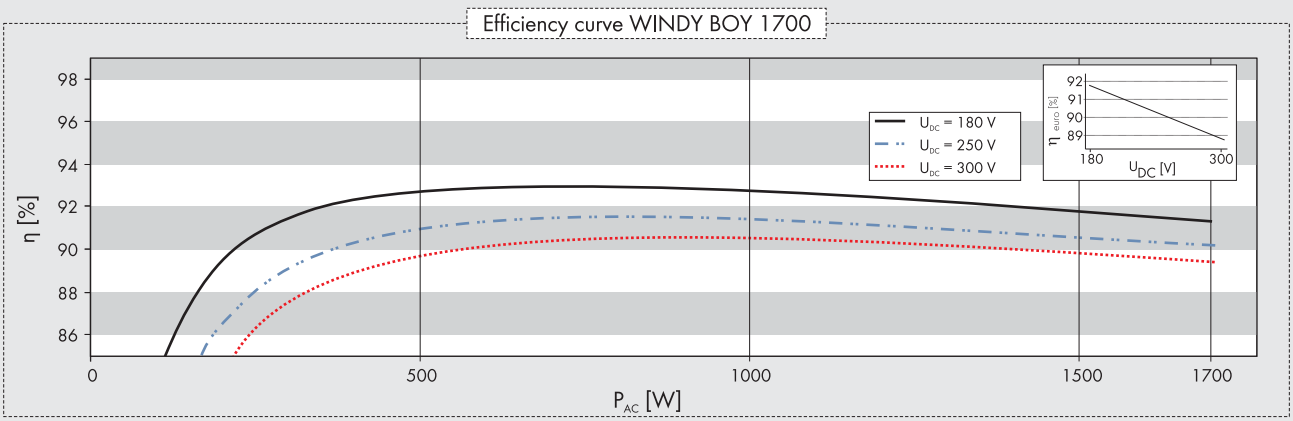
The Windy Boy 1100 and 1700 are ideally suited for small wind energy plants. The programmable characteristic curve enables an optimal adjustment to the characteristic curve of the turbine and thus increases the yield. The weather-proof casing and the wide temperature range allow for installation at almost any location. The equipment is optimized for fast and frequent load changes, and with the Windy Boy Protection Box, they are the perfect interface for any turbine. All data can be monitored at any time on the integrated display or any of several communication interfaces. And in case of a problem: The worldwide SMA Service and the comprehensive warranty program provide maximum security.

Technical Data

	Windy Boy 1100	Windy Boy 1700
Input (DC)		
Max. DC power	1210 W	1850 W
Recommended generator power at 2500 full-load hours per year	1000 W	1400 W
Recommended generator power at 5000 full-load hours per year	900 W	1300 W
Max. DC voltage	400 V	400 V
Min. open circuit voltage for activating "turbine mode"	150 V	150 V
Operating range "turbine mode"	139 V – 400 V	139 V – 400 V
Max. input current	10 A	12.6 A
Output (AC)		
Nominal AC power	1000 W	1550 W
Max. AC power	1100 W	1700 W
Max. output current	5.6 A	8.6 A
Nominal AC voltage / AC operating range	220 V – 240 V / 180 V – 260 V	220 V – 240 V / 180 V – 260 V
AC grid frequency (self-adjusting) / range	50 Hz / 60 Hz / ± 4.5 Hz	50 Hz / 60 Hz / ± 4.5 Hz
Phase shift (cos φ)	1	1
AC connection	single-phase	single-phase
Efficiency		
Max. efficiency	93.0 %	93.5 %
Euro-Eta	91.6 %	91.8 %
Protection device		
DC reverse polarity protection	●	●
AC short-circuit strength	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Galvanically isolated	●	●
General Data		
Dimensions (W / H / D) in mm	434 / 295 / 214	434 / 295 / 214
Weight	22 kg	25 kg
Operating temperature range	–25 °C ... +60 °C	–25 °C ... +60 °C
Internal consumption: operating / standby	< 4 W / 0.1 W	< 5 W / 0.1 W
Topology	Low-frequency transformer	Low-frequency transformer
Cooling concept	convection	convection
Installation site: indoor / outdoor (IP65)	●/●	●/●
Features		
DC connection: MC3 / MC4 / Tyco	●/❍/❍	●/❍/❍
AC connection: plug connector	●	●
LCD	●	●
Color of lid: red	●	●
Interfaces: RS485 / radio	❍/❍	❍/❍
Warranty: 5 years / 10 years	●/❍	●/❍
Certificates and approvals	www.SMA.de	www.SMA.de

● Standard equipment ❍ Optional

Data at nominal conditions



Safe

- Highly dynamic overvoltage protection
- Optimal start-up performance of the wind turbine

High-yields

- High efficiency of the integrated rectifier
- Feed-in even at excessive generator voltage

Easy to use

- Easy installation
- 3-phase generator connection
- Available in three voltage classes: 400, 500 and 600 V

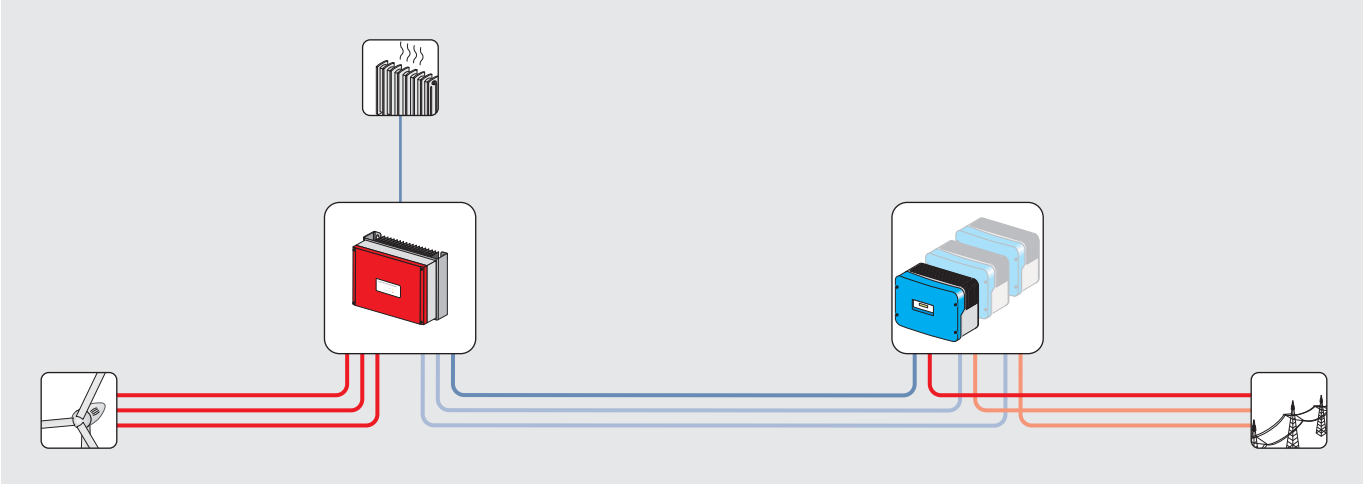
WINDY BOY PROTECTION BOX

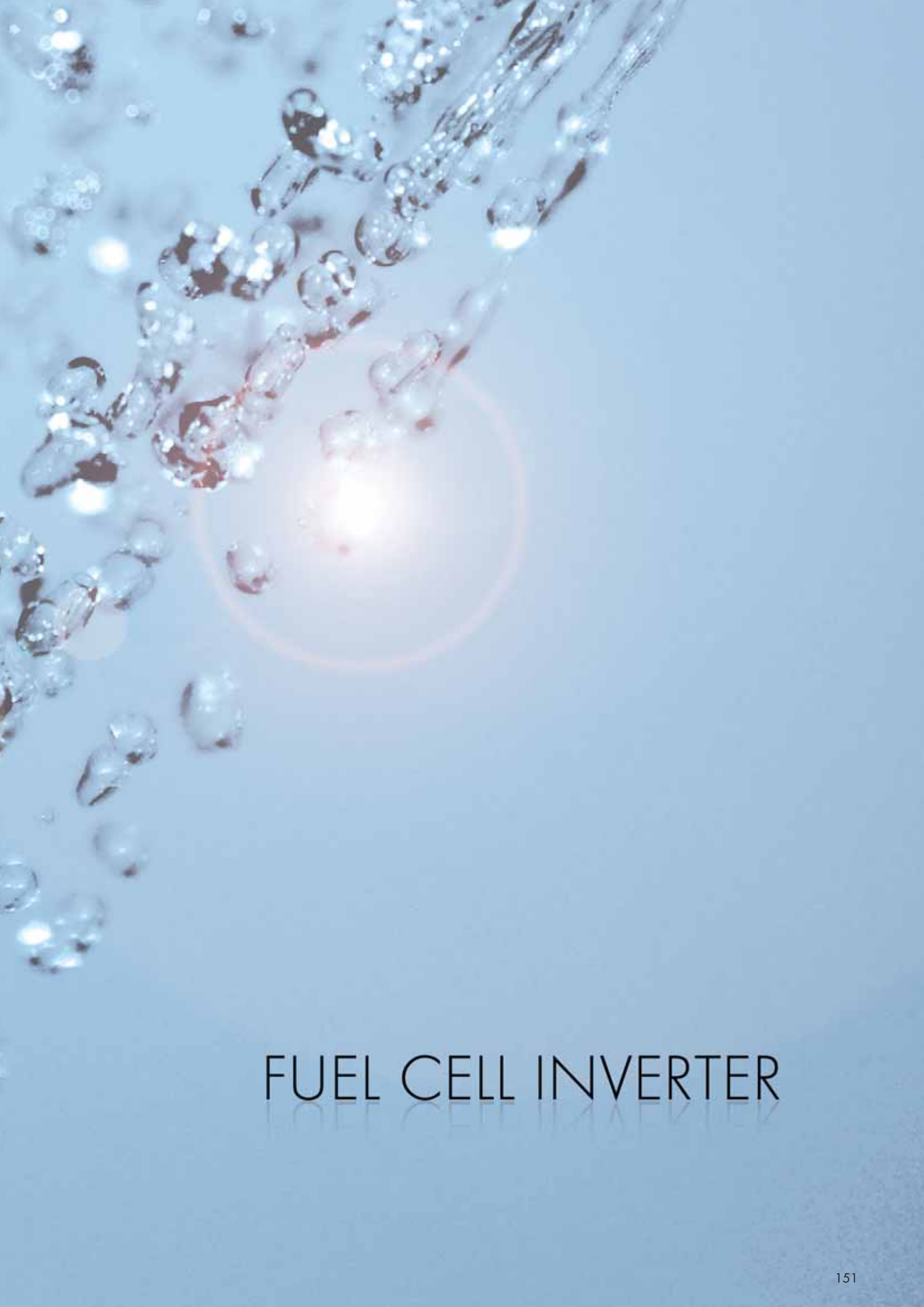
Optimal protection for small wind power plants

Rectifier and overvoltage protection – the Windy Boy Protection Box from SMA is multitalented: it protects the inverter from excessive generator voltage, while at the same time, it diverts excess power into a load resistor. In addition, the Windy Boy Protection Box features a 3-phase rectifier. It is delivered as a turnkey unit and can be used with nearly all types of generators from various manufacturers and with different power classes. This makes the Windy Boy Protection Box the optimal solution for wind power plants, but it also provides the perfect link between permanent magnet generators and the inverter.

Technical Data

	Windy Boy Protection Box 400	Windy Boy Protection Box 500	Windy Boy Protection Box 600
General			
Suitable for	WB 1100, WB 1700	WB 3300, WB 3800	WB 2500, WB 2800i, WB 3000, WB 5000A, WB 6000A
Rectifier	integrated	integrated	integrated
Size (W x H x D) in mm	280 x 220 x 130	280 x 220 x 130	280 x 220 x 130
Weight	5 kg	5 kg	5 kg
Generator connection			
Quantity	1 x 3-phase	1 x 3-phase	1 x 3-phase
AC voltage	3 x 0 to 500 V	3 x 0 to 500 V	3 x 0 to 500 V
AC current	3 x 0 to 11.5 A	3 x 0 to 11.5 A	3 x 0 to 11.5 A
Generator frequency	0 to 400 Hz	0 to 400 Hz	0 to 400 Hz
Nominal power	1 to 2 kW	3 to 4 kW	2 to 6 kW
Windy Boy connection			
Quantity	3	3	3
Voltage limitation (DC)	400 V	500 V	600 V
Total power	3 kW	4 kW	6 kW
Load resistor connection			
Quantity	1	1	1
Nominal voltage (DC)	400 V	500 V	600 V
Continuous power	3 kW	4.5 kW	6 kW
Efficiency			
Max. efficiency	> 99.95 %	> 99.95 %	> 99.95 %
Conduction losses at continuous power	15 W	20 W	30 W
Ambient conditions			
Ambient temperature	–25 °C ... +60 °C	–25 °C ... +60 °C	–25 °C ... +60 °C
Protection rating according to DIN EN 60529	IP54	IP54	IP54
Accessories			
Load resistor	optional	optional	optional





FUEL CELL INVERTER

Hydro Boy Inverter for Fuel Cells
The Clean Alternative to Diesel Generators

Trendsetting and efficient: the Hydro Boy inverters are ideal for an environmentally-friendly expansion of off-grid systems using SMA products. Whether it's to supply energy to remote regions far from the grid, or to provide electricity in case of emergency to unstable grids: the development of self-sufficient stand-alone systems is an important future market. Against the backdrop of rising diesel and heating oil prices, SMA inverters are in demand, forward thinking products.

Trend setting technology

The functional principle: the Hydro Boy efficiently converts the DC current produced by the fuel cell into AC current. This must be done using low voltage and strong electrical currents. The Hydro Boy from SMA meets these unique demands and has been tried and tested throughout our 25 years of experience with innovative energy supply systems.

Expansion of stand-alone systems

SMA is the only manufacturer in the world to offer AC coupled PV systems for self-sufficient energy supply systems ranging from one to 100 kW. Along with stand-alone and solar inverters from SMA, the Hydro Boy is an important component in a reliable standard AC voltage grid. The H_2 Island Extension complements the necessary batteries in a stand-alone grid with a fuel cell featuring a hydrogen accumulator.

Advantages of fuel cells

Compared to diesel generators, fuel cells are much more efficient. They make no noise and produce no CO_2, which makes them a very special renewable energy source. Since fuel cells emit heat, the H_2 Island Extension can be coupled with an auxiliary heating system. In this way, the excess heat can be used intelligently as heat energy.

SMA works in close cooperation with well-known manufacturers of heating systems and therefore can offer individually tailored custom solutions.

Everything from a single source

From the reliable island manager Sunny Island to the solar inverters Sunny Boy and Sunny Mini Central and from the inverter for wind power Windy Boy to the Hydro Boy: SMA is your one stop shop for perfectly matched components for an AC connected stand-alone grid. Assembling and setting up stand-alone grids has never been easier.

Flexible

- Grid-parallel operation
- Off-grid operation with frequency dependent control

Robust

- Input voltage range from 20 V to 60 V suitable for standard fuel cells
- High input current of up to 56 A

Reliable

- Disconnection from grid according to VDE 0126
- Certified for the most common standards

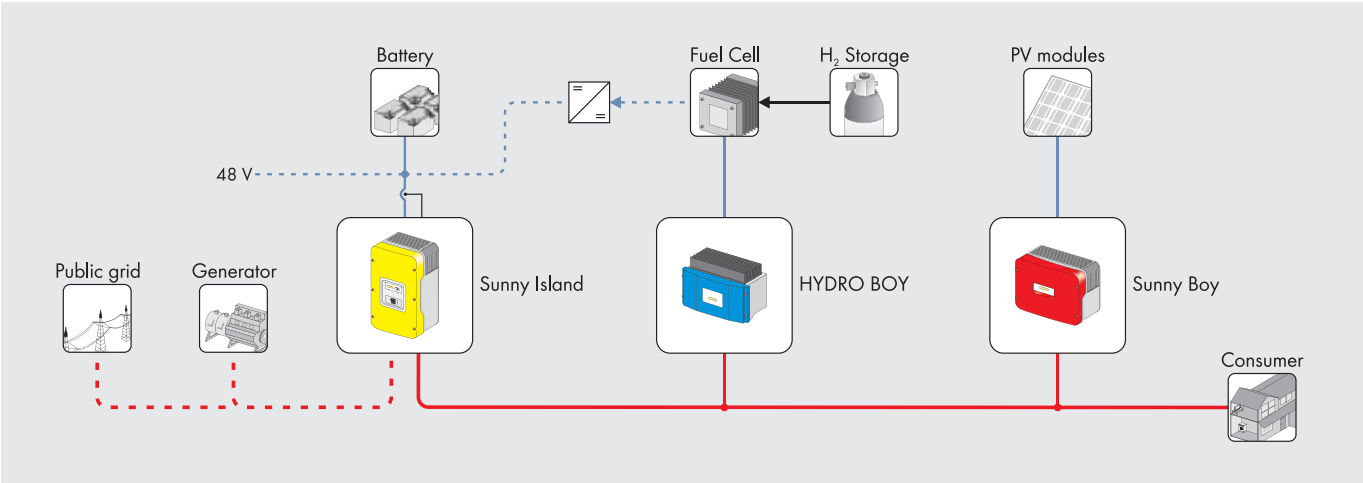
HYDRO BOY 1124 / 1324

The powerful compact devices

SMA has a long tradition with inverters for fuel cells. SMA modified the first solar inverters for use in fuel cell applications more than ten years ago. In the meantime, the Hydro Boy has become a huge market success. SMA has equipped the Hydro Boy 1324 with a fan, which makes it even more powerful. The devices possess a grid output side transformer, for which they are specialized for direct grid feeding throughout the world. The AC output can be scaled by simply connecting the devices in parallel.

Technical Data

	Hydro Boy 1124	Hydro Boy 1324
Input (DC)		
Input voltage	20 V – 55 V	20 V – 55 V
Nominal DC power at 30 °C	1200 W	1300 W
Max. input current	56 A	56 A
Output (AC)		
Max. AC power at 30 °C	1100 W	1200 W
Output voltage (adjustable range)	230 V (180 V – 300 V)	230 V (180 V – 300 V)
Nominal frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Adjustable frequency range	45.5 Hz – 54.2 Hz / 55.5 Hz – 64.5 Hz	45.5 Hz – 54.2 Hz / 55.5 Hz – 64.5 Hz
Max. efficiency	91 %	91 %
Interfaces		
CAN	●	●
RS485 / RS232	●/❍	●/❍
General Data		
Dimensions (W / H / D) in mm	434 / 295 / 214	434 / 295 / 214
Protection rating	IP42	IP20
Weight	approx. 29 kg	approx. 29 kg
Operating temperature range	0 °C ... +50 °C	0 °C ... +50 °C
Cooling concept	natural convection	with fans
Operating consumption	< 10 W	< 10 W
Protection device		
DC reverse polarity protection	●	●
Ground fault monitoring	●	●
AC short circuit monitoring	●	●
Features / Function		
Display	2-line / 3 LED	2-line / 3 LED
Warranty	2 Years	2 Years
Certificates and permits	www.SMA.de	www.SMA.de
● Standard ❍ Optional		
Type Designation	HB 1124	HB 1324



customer-tailored design BAXI INNOTECH

Efficient

- High frequency technology with potential separation
- High efficiency
- Optimized for heating systems

Compact

- Lighter weight compared with devices equipped with grid frequency transformers with comparable power
- Dimensions in 19" raster

Reliable

- Switches to internal backup operation during blackouts
- Consistent load of fuel cells through external load resistor (optional)

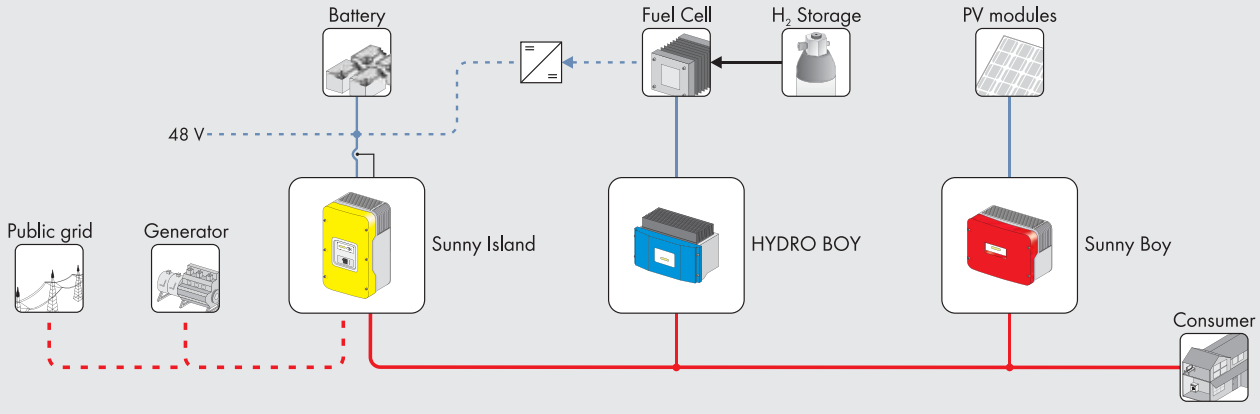
HYDRO BOY 1524HF / 2524HF

High-yield devices in lightweight housings

The new Hydro Boy generation: the 1524HF and 2524HF devices are equipped with modern, high frequency technology thus ensuring very high efficiency. By reducing the weight and size of the coil components, these inverters have become particularly light and easy to use. Thanks to the modular design of the power electronics, the Hydro Boy inverters also adapt flawlessly to external conditions. Thus, they combine the state-of-the-art SMA technologies and the highest efficiency in a 19" housing.

Technical Data

	Hydro Boy 1524HF	Hydro Boy 2524HF
Input (DC)		
Input voltage	25 V – 70 V	25 V – 70 V
Nominal DC power at 30 °C	1500 W	2500 W
Max. input current	60 A	100 A
Output (AC)		
Max. AC power at 30 °C	1150 W	2300 W
Output voltage (adjustable range)	230 V (184 V – 264 V)	230 V (184 V – 264 V)
Frequency (adjustable range)	50 Hz / 60 Hz (45 Hz – 65 Hz)	50 Hz / 60 Hz (45 Hz – 65 Hz)
Max. efficiency	> 93 %	> 93 %
Interfaces		
CAN	●	●
RS485 or RS232	❍	❍
General Data		
Dimensions (W / H / D) in mm	approx. 444 / 130 / 454	approx. 444 / 160 / 454
Protection rating	IP20	IP20
Weight	approx. 15 kg	approx. 17 kg
Operating temperature range	0 °C ... +70 °C	0 °C ... +70 °C
Cooling concept	Forced air cooling	Forced air cooling
Operating consumption	approx. 12 W	approx. 12 W
Protection device		
DC reverse polarity protection	●	●
AC short circuit monitoring	●	●
Features / Function		
Warranty	2 Years	2 Years
Certificates and permits	www.SMA.de	www.SMA.de
● Standard ❍ Optional		
Type Designation	HB 1524 HF	HB 2524HF




SERVICE
SMA

Customer-oriented

- Professional commissioning, maintenance and repair
- Telephone support through our Serviceline
- Text message call-back request service

High availability

- Fast and simple device replacement
- One year full warranty on every replacement device

Assured return

- Five-year warranty on Sunny Boy, Sunny Mini Central und Sunny Island inverters
- Extension of warranty to 10, 15, 20 or 25 years

SMA Service*

Comprehensive customer service for satisfied plant operators

All those who opt for a solar power plant are banking on a long-term return. However, supplying long-lasting solar inverters with peak efficiencies is not the only prerequisite. A reliable, flexible and competent service partner who will be at your side with advice and action is just as important. SMA provides the highest level technology and expert service from a single source. Whether through the SMA Serviceline, on-site or replacement delivery service, our flexible services are individually tailored to meet the specific needs of solar professionals – all over the world.

* The services listed on these two pages are applicable to our Sunny Boy, Sunny Mini Central und Sunny Island inverters.

Expert advice by telephone through the SMA Serviceline

The experts on our Serviceline support trade professionals during installation and start-up of PV plants, provide advice on technical questions, and give tips for plant monitoring. Various service line numbers are manned by a specially-trained team of experts on all questions concerning inverters, communication and Sunny Island products – weekdays from 8:00 a.m. to 6:00 p.m. CET and Saturdays from 10:00 a.m. to 4:00 p.m CET. If you cannot get through to our Serviceline immediately, you can use our SMS call-back request service*. Our staff will then contact you as soon as possible. This saves you waiting time and connection fees.

In Germany and around the world – SMA service on-site

Trade professionals can rely on our support. Currently with 19 service support locations in Germany, we are able to quickly be on site if service is required. We also have a well-established international service network in eight other countries, with four more under construction. Thus, we are ready to support our customers around the world, from on-site diagnosis to device replacement.

Device replacement for highest security of return

Should a failure occur, we will keep down times as short as possible by replacing your device. For calls received before 5:00 p.m. CET, the replacement inverter will normally be dispatched from SMA on the same day.* Our customers will receive an equivalent, state-of-the-art device including all updates and alterations. If a device is replaced within the warranty period, the remaining term of warranty will be transferred to the replacement device. A minimum warranty of one year will be accorded on any replacement device, whether or not the warranty is still valid. By the way, if device replacement is required, we have a special online service in place. You also have the option of directly commissioning the competent support of our service staff.

Registration of systems for even faster support

In order to serve our customers even faster and more precisely, we offer a convenient solution: you can register your solar power plant with us directly after installation. This means that in the event of a service requirement, we have all the necessary information at hand and can provide help even faster. On request, we can keep operators specifically informed on updates and other developments to increase yield. And this without any contractual obligations.

More security with long-term warranty programs

SMA products are of the highest quality and come equipped with a standard five-year warranty. Additionally, we offer an extended warranty for an additional five, ten, fifteen or twenty years, with which operators can assure themselves of the right to free repair or a replacement device.

Interested?

Whether for start-up, service work or tips for plant monitoring, the SMA service concept is always the right way to go for both operators and contractors. All services are available at www.SMA.de. Here, you can request or download our service brochure free of charge.

* Valid for Germany.

SERVICELINE

SMA America, Inc.
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www.SMA-America.com

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www.SMA-Australia.com.au

SMA Beijing Commercial Company Ltd.
Tel +86 10 5150 1685 499
www.SMA-China.com

SMA France S.A.S.
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www.SMA-Hellas.com

SMA Ibérica Tecnología Solar S.L.
Tel +34 900 14 22 22
www.SMA-Iberica.com

SMA Italia S.r.l.
Tel +39 02 89 34 72 99
www.SMA-Italia.com

SMA Technology Korea Co., Ltd.
Tel +82 2 508 8887 102
www. SMA-Korea.com

Customer-oriented

- Professional installation, commissioning and maintenance on the spot
- Telephone support by teams of experts through the Serviceline

High availability

- Technical availability up to 97, 98 or 99 percent
- Full Service Package: maintenance and repair work, material inclusive
- First Level Support Package: customer assumes responsibility for first-level support, SMA for any other repairs, maintenance material included

Assured return

- Two-year warranty
- Warranty extension up to 20 years: includes on-site repair service, spare parts and materials
- Availability of compatible spare parts guaranteed up to 20 years

The SMA SUNNY CENTRAL Service

Excellent service to ensure high plant availability

Solar power plants are cost-effective and safe investments. In combination with high-yield SMA central inverters, our service features ensure a very high level of plant reliability. Whether through the SMA Serviceline, on-site service, or warranty and maintenance contracts ensuring technical availability of up to 99 %, the SMA Sunny Central service concept safeguards plant operators' investments for the future.

Partnership and experience: from planning to commissioning

From the start, SMA offers support to large plant operators in project planning and component selection. Whether it be a question of wiring, the appropriate inverter, or a monitoring concept tailored to your plant, our experts will recommend the right components for every requirement. In addition to supplying, fitting and installing the inverters, you can depend on us to assist with your large turnkey projects right through to inspection and approval by the utility company.

A direct line to the experts: our Serviceline

One number, one contact, one solution: through the Serviceline, our Sunny Central team provides fast and efficient telephone support to the solar trade and plant operators. Aided by SMA plant monitoring devices such as the Sunny WebBox, our support staff can also perform rapid remote diagnostics on your plant.

In Germany and worldwide: Sunny Central on-site service

You can rely on our support – if service is required, we will be there fast. A well-established service network is also available in eight countries, with four more under construction. Thus, from on-site diagnosis to field maintenance and repair, we are available to our customers all over the world. Through our full-service warranty agreement or warranty extension, our services are fully included.

Peace of mind for the future: SMA service and maintenance contracts

Whether "all inclusive" or with individual responsibility, SMA can supply a suitable service package to meet any requirements. Our customers can, for instance, take advantage of a warranty extension of up to 20 years. Another worthwhile investment is a parts warranty, under which we keep compatible spare parts available for up to 20 years.

In order to meet the regular maintenance schedule recommended by SMA, there are two contract options available. Under the Full Service Package, maintenance is carried out by specially trained SMA service personnel. Under the First Level Support Package, the customer assumes responsibility for first-level support and SMA assumes any other repairs. We support contractors in performing maintenance work themselves by organizing a free, two-day training program and supplying the necessary materials. In both contract alternatives, operators can opt to include a technical availability guarantee for their plant of 97, 98 or 99 percent. This assures maximum yield security and a quick return on plant investment.

Interested?

Whether for start-up, service work or tips for plant monitoring, the SMA service concept is always the right way to go for both operators and trade professionals. All services are available at www.SMA.de. Here, you can request or download our service brochure free of charge.

SERVICELINE

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SMA Ibérica Tecnología Solar S.L.
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SMA Italia S.r.l.
Tel +39 02 89 34 72 99
www.SMA-Italia.com

SMA Technology Korea Co., Ltd.
Tel +82 2 508 8887 102
www. SMA-Korea.com

SUNNY PRO | Club

Making Strong Partners Stronger


SMA
NY PRO Club
cht starke Partner stärker
Sunlab
80331 München
Peter Mertens
Mitgliedsnummer SPC-DE-1236547

Profitable

- Active sales support through a wide range of professional and competitively-priced marketing measures

- Joint web profile for SMA solar trade partners with the market leader

- Gain more new customers by having your company listed as a solar professional on the end-customer website www.solar-is-future.de and www.SMA.de.

Time-saving

- Direct access to the latest product information
- Valuable time and cost-savings for solar professionals

The Sunny PRO Club

Professional marketing for solar professionals

Not only must power plants be planned and installed, they must also be marketed. The SMA partner program for trade professionals provides its members with active marketing support for targeting their regional solar market. This not only saves time but also attracts new customers.

Professional, tailored marketing support

All advertising measures are specifically tailored to the individual needs of the solar trade. Members receive practical marketing support such as leased fair booths, personalized brochures and hired consultants. The listing of businesses on our portal for end-customers www.solar-is-future.de and www.SMA.de is proving particularly popular. The search option, which allows customers to find solar professionals in their area, is an excellent way of raising Club members' local profile and attracting new customers.

The advantage of knowledge

Despite all the modern information technology we have at our disposal, human interaction and sharing of know-how is still the best source of knowledge. Members can address questions and comments directly to the staff using the Club Hotline, or, alternatively, they can visit one of the regular regional forums. Sunny PRO Club members also benefit from exclusive technology and communications seminars organized by the SMA Solar Academy.

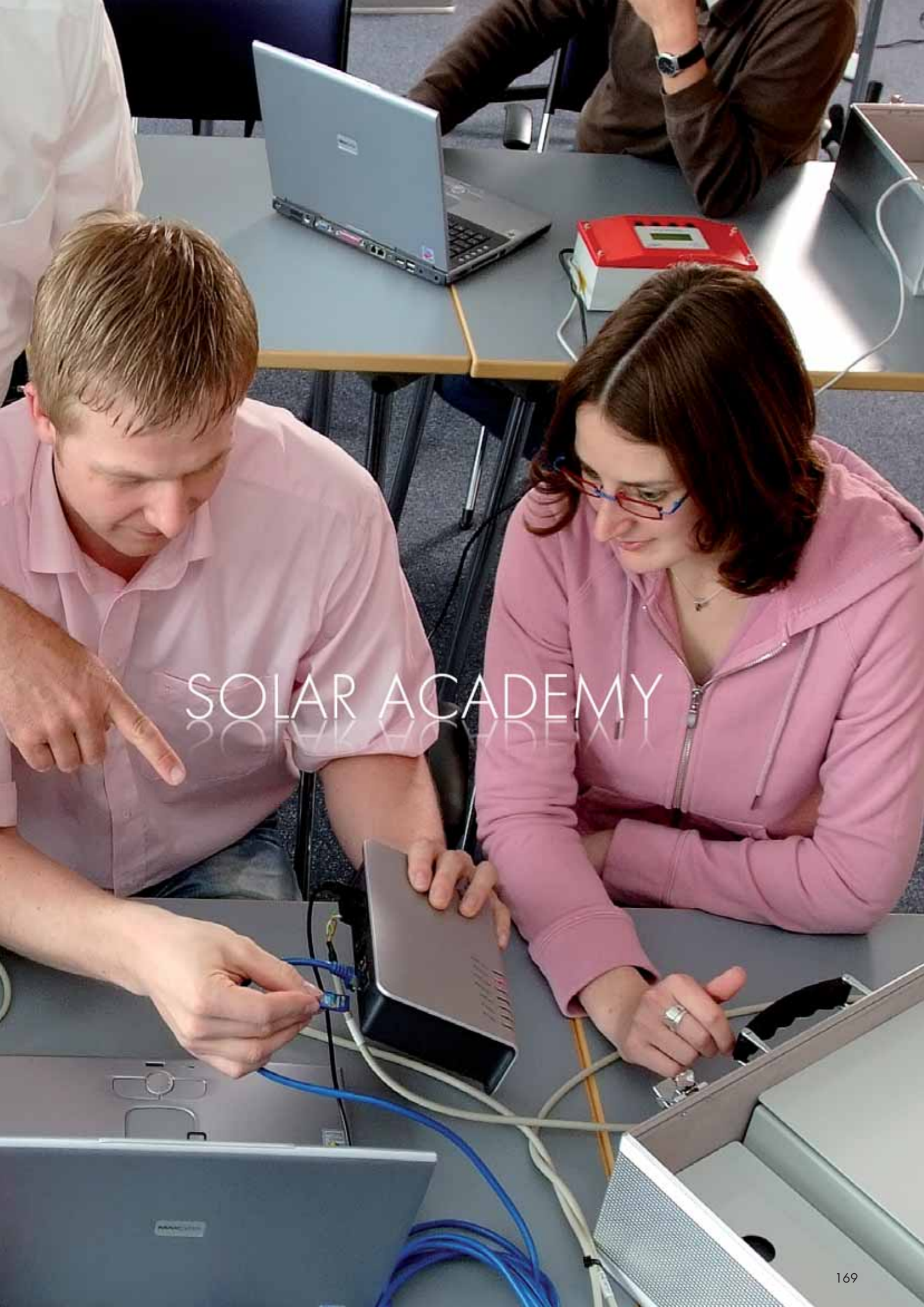
A partnership that pays off

The concept of the Sunny PRO Club is founded on the principle of give and take: SMA's solar trade partners not only benefit from professional marketing solutions on attractive terms. But as the world's leading manufacturer of solar inverters, SMA is also a strong and reliable partner for Sunny PRO Club members. Just as the image of the trade professionals benefits from the strength of the SMA brand, they in turn help to enhance the profile of SMA products.
As a point of interest: the Sunny PRO Club concept won a prize at the 2008 Industrial Awards granted by the Medium-sized Enterprises (SME) Initiative.

Interested?

It's easy to become a member of the Sunny PRO Club! Simply download the registration form at www.SunnyPRO-Club.de, fill it out and send it to the Sunny PRO Club service center. For an annual fee of only € 175 (plus VAT), members receive a welcome kit and a selection of attractive marketing services, as well as free registration on our online solar power professional search. For more information on objectives and services, please visit www.Sunny-PRO-Club.de.

Order the free
Sunny PRO Club brochure
now at **+ 49 561 9522 4774**


SOLAR ACADEMY

Comprehensive

- Sharing the latest expertise on SMA inverter technology and photovoltaics.
- 700 courses annually for newcomers and experienced users

Target-oriented

- Training courses tailored specifically for contractors, sales staff and plant designers
- Compact multi-day seminars in English

Hands-on

- Specially trained instruction team
- Close communication with developers and other trade professionals

User-friendly

- Easy to register online and sign up for a seminar reminder
- Company tour and lunch

The Solar Academy

Practical expertise for the solar sector

Always one step ahead: with expertise from SMA, the market leader. The Solar Academy is the first choice for advanced target-oriented training in photovoltaics. We have even revised the whole concept of our seminars. Now with new material, twice as many courses, and special training programs for technical staff, salespersons and architects.

Seminars

Our seminars are organized according to different topics and levels of experience. We offer modular courses for novices (basic seminars), advanced technicians (intensive seminars) and professionals (expert seminars). In addition, we hold compact seminars on isolated topics aimed at specific target groups. Thus, each participant will find the ideal seminar to meet his or her needs and can combine seminars to create a custom training program.

Modular technical training courses

(Each seminar is one day in duration and can be booked individually.)

» **Basic & Intensive Seminars "Inverter"**
The seminars provide up-to-date information on photovoltaics, inverter technology, plant design, installation and protection, and lightning protection.

» **Basic , Intensive & Expert Seminars "Communication"**
Communication via *Bluetooth*? Experts on plant communication explain the benefits of the new SMA wireless standard and all you need to know about plant monitoring with the Sunny Beam, Sunny WebBox, Sunny Portal, Sunny Matrix and Flashview systems.

» **Basic & Intensive Seminars " Large-scale PV plants with SUNNY CENTRAL"**
High tech for solar power plants: The seminars focus on how central inverters such as Sunny Central function. Further topics include: installation of large-scale plants, the requirements of the "medium voltage regulation", comparison of a centralized vs. a decentralized plant design, and plant communication.

» **Basic, Intensive & Expert Seminars "Remote-area electrification with SUNNY ISLAND"**
In-depth training for the various off-grid "Sunny Island" inverters, their installation, flexibility of use, single-phase/three-phase island grid, battery, load and system management, and plant configuration.

Compact seminars on isolated topics or products

» **"Marketing PV plants" (two-day seminar)**
How should customers decide when to install a Sunny Boy or a Sunny Mini Central? The most important (selling) points and information on all products or groups of products in one compact seminar.

» **"Planning and designing a solar system" (one-day seminar)**
Plant design made easy: the seminar explains how planners can use Sunny Design to instantly derive the optimum plant configuration.

» **"User forum" (one-day seminar)**
Networking between "professionals" and "newcomers to PV": existing and aspiring plant operators find out all they need to know about solar power and SMA products.

» **"Communication with SUNNY BOY CONTROL" (one-day seminar)**
Continuous plant monitoring: our instructors explain the functions of Sunny Boy Control (Plus), how to connect temperature and irradiation sensors, and how to evaluate the measurement data using SMA software.

» **"Back-up electricity supply with SUNNY BACKUP" (one-day seminar)**
Solar power during a blackout: the course presents the SMA back-up systems. Further topics include: integration of various additional energy sources (PV, generator) and plant configuration.

» **Interested?**
Registering for seminars at the SMA Solar Academy is very simple. Just select the required seminar at www.SMA.de/Solarakademie and register by phone at +49 (0)561 9522 4884 or send an e-mail to Solarakademie@SMA.de. We look forward to seeing you at one of our specialist seminars soon.

KNOW-HOW

Centralized or Decentralized?

SMA has the ideal inverter concept for any PV system

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From kilowatt to megawatt, SMA is the single source manufacturer for the right solar inverter of every size and for every site. Thereby, the customer can choose among various system concepts. While a central inverter concept may clearly be the best solution for one PV system, conditions in another system, even a system similar in size, may require a decentralized concept.

You should therefore always account for installation and system operating costs, in particular, when deciding whether to opt for a centralized or decentralized system structure. Under certain conditions, decentralized system design has been shown to offer a range of advantages over centralized design. A few of the important aspects typical of the power class above 100 kWp are noted in the following examples.

Decentralized system design: precise and effective

If a PV system is oversized or undersized, this can have just as much of an effect on the system's energy yield as the inverter efficiency. Specific system performance can be set precisely using small inverter units. Together with a high degree of efficiency, several smaller devices can present a better alternative than one large centralized unit.

Advantageous in mixed system structures

A centralized inverter such as the Sunny Central works most effectively with a homogenous solar generator. Decentralized concepts, such as those using Sunny Mini Centrals, are a better choice when generator units differ and should thus be operated separately. This can be caused by using mismatched PV modules or modules with a higher manufacturing tolerance, sub-generators that are oriented differently, or tracking sub-generators.

Maintenance-friendly operation under all conditions

Maintenance work on decentralized systems is much less complicated and economical compared to centralized systems, since, if needed, the entire inverter can be replaced. Installing smaller and lighter devices can be less expensive than a large heavy cement station if ground load capacity or site accessibility is limited.
However, the monitoring of a system with a centralized inverter is easy to set up and covered by the standard hardware. Even the required participation in grid management for large systems can be implemented quite easily. And for systems of a certain size, centralized inverters are primarily used due to economies of scale.

Comprehensive analysis is important

These examples show that you really must account for all costs (TCO: Total Cost of Ownership) when choosing the most economical solution and evaluate them when planning the specifics of your solution. Boundary conditions can mean that a system that is profitable at one site may have trouble paying for itself at another. It is therefore wise to take advantage of the technical consultation and experience of the SMA team when determining the optimum system structure and components for your project.

Design of PV Plants

Three steps to success

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The possibilities for system design are vast. There are many different module types, various inverters, roof pitches, locations and many more. The right design of a solar system is thus important for the anticipated yield. The most important design decisions can be summarized in the following three steps. You should consider the fundamental technical outline as well as guidelines and rules of thumb for the design of a standard PV system in supplementary grid feeding. If deviations from the required standard conditions occur, the specified guidelines must be modified accordingly.

1. Considering the inverter's electrical limiting values

First of all, the voltage of the generator must match the inverter. The limits are defined with the MPP voltage at the highest cell temperature (standard 70 °C) and the open circuit voltage at the lowest cell temperature (standard –10 °C). The maximum system voltage of the PV modules can also limit the open circuit voltage of the generator.

2. Choosing between optimizing the efficiency or optimizing the yield

The performance ratio (relation between the maximum input power of the inverter compared with the peak power of the PV generator) provides information concerning an oversizing or undersizing of the inverter. To utilize the full power of the PV generator, the inverter must be slightly oversized (power ratio 110 %) The economic optimum however can be found with just a slight undersizing. In Germany, this optimum is a power ratio of 90 to 100 percent. Since the energy yield and the economic performance depend on the financial investment, this value greatly depends on the economic conditions that influence the plant.

3. To use the inverter with the maximum degree of efficiency

Every inverter has an input voltage with maximum conversion efficiency. Where this voltage is depends on the type of inverter, the exact voltage is listed in the data sheet of the device. If possible, the MPP voltage of the PV modules at NOCT (Normal Operation Cell Temperature) should be close to this voltage.

The outcome of the three basic design decisions largely determines the anticipated yield; although, the professional design of a solar system includes many more steps. For this purpose, SMA offers the free software SUNNY DESIGN, which incorporates all the aspects of the system design (more on page 12).

SMA Inverters as Grid Managers

The requirements of the Medium-Voltage Guidelines are manifold. SMA is already offering solutions

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Beginning in 2009, all solar inverters must take part in grid management for the stability of the mains power supply Technology leader SMA already offers solutions to requirements which go into effect in mid-2010.

Photovoltaic electricity generation is still on the rise. The EPIA (European Photovoltaic Industry Association) has set a goal: the solar power industry will have a 12 % share in Europe by 2020. This would amount to approximately 50 to 60 gigawatts of installed PV power in Germany alone. The participation in grid management is thus an important requirement, as only a stable grid will allow for the unlimited expansion of renewable energies. As a leading technological manufacturer of solar inverters, SMA whole-heartedly supports this ambitious goal. SMA, as the first manufacturer to offer devices which meet the essential requirements of the BDEW (German Association of Energy and Water Industries) medium-voltage regulations. As an intelligent electronic control unit, the solar inverter will play an correspondingly important role in the future.

Grid management: success in steps

For decentralized power systems, participation in grid management means that they have to orient themselves to the current state of the distribution grid during feeding. This affects all solar systems that feed on the medium-voltage level. The medium-voltage guidelines require various system services that fall into three groups and proceed in chronological order: grid security management (as "feeding management" also a component of EEC-Novelle), static grid support and finally dynamic grid support. For all three, SMA offers suitable solutions:

1 Grid safety management with the Power Reducer Box

Sixty seconds: that is how long an inverter has to reset itself to the utility operator's load limitations specifications. In case of a potentially dangerous grid overload, it is an important contributor to the stability of the grid, as energy offered and consumption must be in constant balance. SMA's Power Reducer Box was developed for just such a case: it interprets the incoming setpoint value from the utility operator control commands for the Sunny WebBox. It leads the commands over the relevant fieldbus to the inverter, while simultaneously logging the external reference value units.

2 Static grid support with SMA inverters

The voltage must be maintained – this holds especially true for the power grid. The inverter must feed reactive power as well as active power into the grid or draw power from the grid. Typical cases are the start up of large motors or the idling of longer, unencumbered cable lines. To set the percentage of reactive power, there are several possibilities: either operators use a specified value from the utility operator or various reactive power values will be set according to an agreed upon schedule. The third possibility: the regulation of the percentage of reactive power over a characteristic curve independent of the grid voltage measured at the connection point or from the feeding of active power. The new Sunny Central 400HE, 500HE and 630HE, the Reactive Power Variations of Sunny Mini Central and the new Sunny Tripower devices can all provide reactive power. And for this purpose, the new generation Sunny Boy just needs a firmware update.

The frequency-dependent active power reduction inside the inverter is also described using the term static grid support. Independent of the grid safety management, the active power being fed is automatically reduced as soon as the grid frequency exceeds 50.2 Hertz. This requirement was not delayed, so, just like the grid security management, it must be fulfilled beginning January 1, 2009. Systems registered between January and May 2009 must be retrofitted accordingly by the end of the year.

3 Dynamic grid support with the Sunny Central HE family

Until now, solar systems had to immediately disconnect from the grid when there was even a short disruption in grid voltage. The result was that when a disruption in the grid occurred, nearly all feeding systems shut down one after the next, thus throwing the system further off balance. With the dynamic grid support, the inverters will have to feed a short-circuit current when a brief disruption occurs. For the so called "Fault Ride Through" (FRT) event, the exact voltage limits are defined, and if it falls below the limit, the system disconnects from the grid. The SMA centralized inverters of the new HE Family will meet these new requirements by the beginning of 2010. This is a full year before the requirement starts. And the limited dynamic grid support requirement which goes into effect starting on July 1, 2010, will already be met by May 2009.

Equipped for the future with SMA technology

An intelligent interface with the power grid: this is the solar inverter of the future. With its products, SMA makes an important contribution to this end. SMA's inverters are the first of their kind, which can actively take part in grid management. This is an important prerequisite for our ultimate goal of creating 60-gigawatt installed PV power and to secure a supply of clean energy.

Timetable for the Participation of PV Systems in Grid Management

2009-01-01	**Feeding Management** Short term output control in increments of 10 percent of system capability.	**Grid Safety Management** Short term output control of 60, 30 or 0 percent of the connection power.	**Active Power Control** Automatic reduction of the feeding active power, as soon as the grid frequency exceeds a certain value (systems registered between January and May 2009 must be retrofitted by the end of the year)	
2010-07-01	**Limited Dynamic Grid Support** Resumption of feeding immediately after the voltage drop ends	**Maintaining Voltage through Reactive Power** Set allocation of reactive power values from the utility operator	Schedule for setting the various reactive power values	Automatic regulation of the reactive power depending on the grid parameters measured on site
2011-01-01	**Dynamic Grid Support / Fault Ride Through (FRT)** Feed from short-circuit current during short term voltage drops			

* §6 EEG 2009: Applies to systems with more than 100 kW power

BDEW Medium-Voltage Guidelines: Applies to systems that feed on the medium-voltage level

Last updated: March 2009

For Every Module Technology

the right solar inverter

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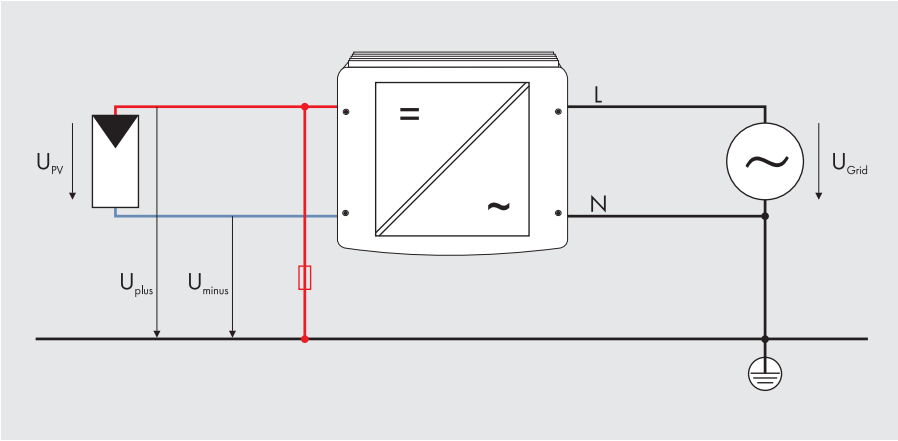
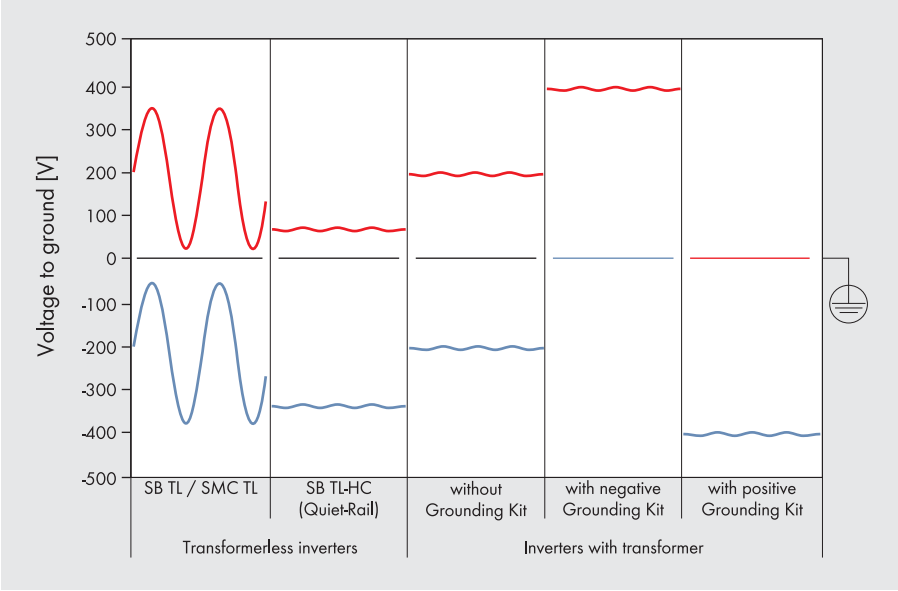
Besides conventional PV modules, new cell technologies and other advancements have been appearing on the market for quite some time. Of these, some can only be operated under certain conditions. For this reason, when employing PV modules, the manufacturer's application details must be observed.

The versatile range of different topologies makes a flexible application of SMA's inverters – combined with the suitable grounding set – possible, in order to provide the optimal device for any module technology. Moreover, SMA is in close contact with the module manufacturers, which means that current installation recommendations can be effortlessly observed.

For the selection of an inverter that meets the special PV module requirements, the generator potential must be observed in operation in various inverter topologies. In the adjacent diagram, you can see a chronological map of potential courses of the generator connections during operation using several different inverters.



Block circuit diagram: solar power system with positive generator grounding



Generation potential in different inverter topologies and grounding variations

In order to easier select the right inverter for each module type, we have put together for you the most important recommendations to date. They are covered in the technical information package "Module Technology" and are explained in detail.

1. Recommendation of the manufacturer

Check if the manufacturer of the PV modules issues recommendations on the grounding of the generator or the topology of the inverter to be used.

Example: The company Sunpower suggests grounding the positive terminal for PV generators including modules with the A-300 cell type. The right choice: Sunny Boy with transformer and a positive grounding set.

2. Choosing on the basis of module characteristics

Should the manufacturer of the PV module not offer any specifications for the use of its products, we recommend choosing an inverter based on the characteristics of the PV module.
Example: Thin layer modules with cells made of CdTe or amorphous silicone often use a TCO coated piece of glass as a substrate for cell construction. The right choice: Sunny Boy with transformer and a negative grounding set.

Example: In case of flexible thin-film cells, a stainless steel foil is often used as substrate. Employ an inverter topology by which the PV generator shows only a small amount of AC voltage against the ground. The right choice: Sunny Boy with a transformer or a device with no transformer with Quiet Rail Technology (e.g. Sunny Tripower).

The table below shows favorable combinations for many different cell technologies.

Cell Technologies / Module Design	Transformerless inverters		Inverters with Transformers		
	SB xxxxxTL SMC xxxxTL	STP xxxxTL	Series Device SB xxx, SMC xxxx	with negative Grounding-Kit	with positive Grounding-Kit
monocristaline Si	●	●	●	❍	❍
polycrystalline Si	●	●	●	❍	❍
CdTe	–	–	–	●	–
amorphous Si	–	–	–	●	–
amorphous Si (Substrat)	●	●	●	❍	❍
CIS / CIGS	●	●	●	❍	❍
monocrystalline Si A-300)	–	–	–	–	●
Metal foil as substrate or in module design	–	●	●	●	●

Legend: ● recommended, ❍ recommended with certain limitations, – not recommended

Recommended combinations of inverters and cell technologies.

Maximizing the Yields

with hightech by SMA

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The technical details of SMA inverters profit from the know how of our developers and their decades of experience. Many innovative SMA technologies either directly or indirectly immediately increase the system yield.

OptiTrac – highly efficient MPP tracking

Every solar inverter has at least one: the MPP tracker makes sure that the solar module is always operated at maximum performance (MPP). Since the MPP depends on the temperature and the strength of the irradiation, it must be recalculated again and again. It is essential that this process takes place as quickly and safely as possible. Irradiation conditions can change quickly and often – on sunny days, a passing patch of clouds can make this happen in just a few seconds.

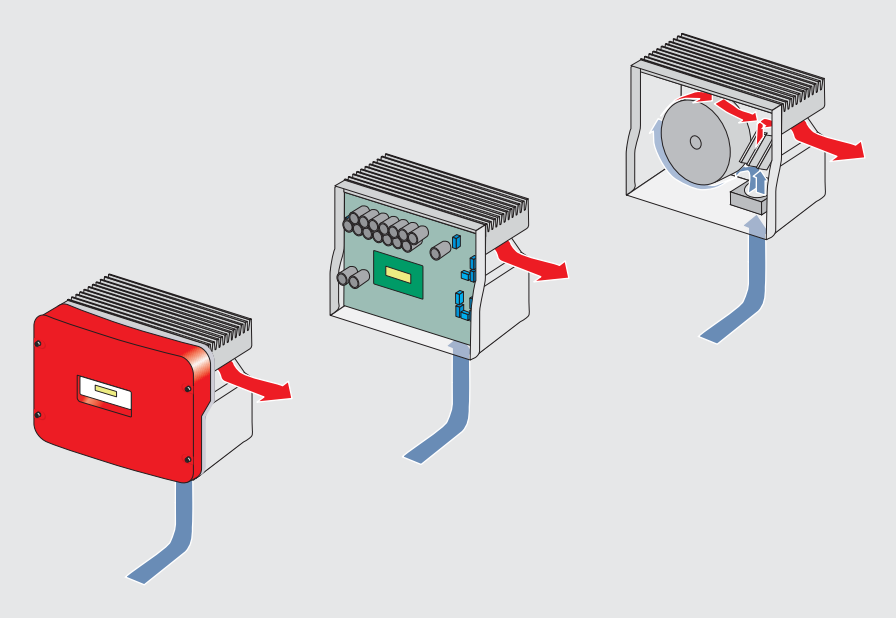
OptiTrac is SMA's solution for just this problem: sophisticated experiments at the SMA Testing Center have resulted in the refining of MPP tracking and further increase of its efficiency. It does not matter if crystalline or thin-layer modules are used. Extensive tests and field trials confirm that OptiTrac increases the energy yield of a PV system by up to 1.5 % per year on average – money for the system operator. OptiTrac is available for most of the inverters of models Sunny Boy, Sunny Mini Central and Sunny Central as well as Sunny Tripower.

Intelligent temperature management via OptiCool

The trend is clear: solar systems and inverters are becoming ever more powerful while installation conditions remain the same. The effective heat dissipation from the housing is thus increasingly important. This is because increasing temperatures reduce the operating capabilities and lifespan of the electronic components.

With the two chamber cooling system OptiCool, SMA offers inverters an ideal connection of passive and active cooling which has earned it the right to be called "intelligent temperature management." To create the maximum cooling effect, the entire inverter housing is a part of the cooling system. It is divided into two separate chambers: the front is sealed tight and thus offers the on-board electronics solid protection against penetration of water, dust and dirt. At the back on the housing, by contrast, all components with a functionally higher temperature can be found, such as chokes and transformers . A temperature-controlled fan leads the heat from this area though a special streaming tube to the outside. All in all, OptiCool produces a lower component temperature in inverters and assures maximum possible reliability and outstanding overload characteristics.

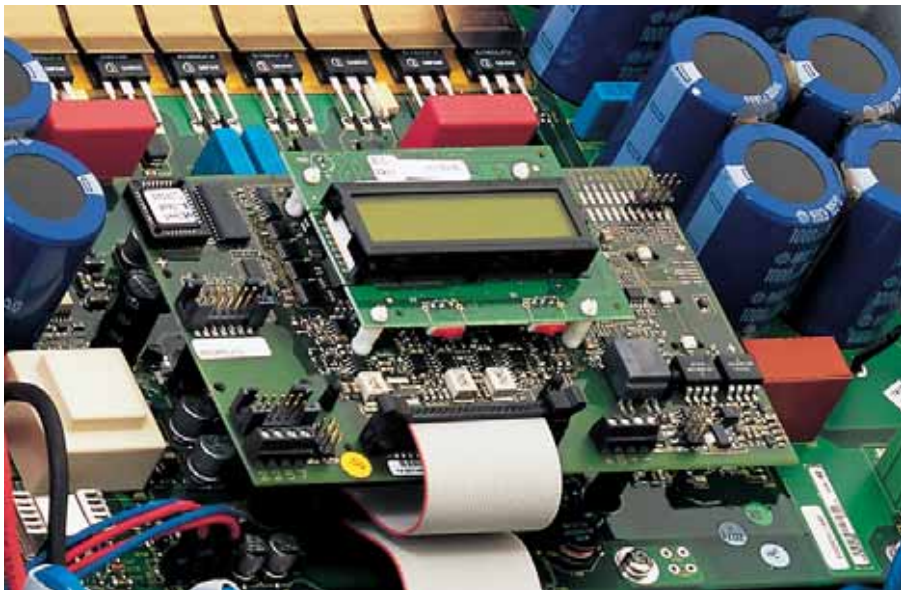
How OptiCool functions in the Sunny Boy 3800



H5 Topology – patented* inverter circuits for maximum efficiency

A modern inverter "consumes" between three and six percent of the direct current of the solar modules for the conversion into alternating current, which corresponds to an efficiency of between 94 and 97 percent. SMA's patented* H5 topology, a totally new circuit of the inverter bridge, optimizes the current flow in the inverter and thereby reduces the loss during conversion.

Basically, the sinusoidal mains current is produced using the high frequency scrambling and buffering of the DC current in the inverter bridge circuits. This leads to a costly oscillation of buffered energy. A special timing of the inverter bridges as well as the integration of a fifth semiconductor switch prevents the oscillation and reduces the conversion loss to less than two percent. This is how the new inverters based on this technology reach new levels of performance with efficiency rates above 98 percent. For the operator, this means more money. Solar systems feed more power into the public grid and produce a higher yield from the official feed-in tariff.



*U.S. Patent US7411802B2

With Safety

SMA protection concepts for installation and maintenance

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Safety first – this is especially important for the area of energy technology. A whole series of regulations and norms are there to protect operators, maintenance personnel, and the everyday user against power outages. SMA sets the benchmark by equipping all products with exemplary safety features.

SMA Grid Guard – utility interface for use worldwide

Most PV systems feed solar energy directly into the public grid using an inverter. The responsibility for this grid is held by the local grid operator. The grid operator ensures compliance with the predefined threshold values for voltage and frequency and ensures that the power grid can be used effectively and is serviced without difficulty in the event of a fault. Of course, this only works if those feeding into the grid comply with certain rules and can be selectively disconnected from the grid. The automatic grid activation device SMA Grid Guard prevents unintentional feeding when the power grid is turned off (islanding) as well as when the upper and lower thresholds for frequency or voltage are exceeded. In this way, it offers protection for both maintenance personnel and consumer alike against excessive voltage and frequency.

Recognized safety standard

As one of the first manufacturers, SMA observed the requirements for grid operators in the range of functions of its solar inverters. The maintenance-free automatic grid disconnection device has been a standard feature on the Sunny Boy inverter since 1995. The ongoing development of the "SMA Grid Guard" represents a recognized standard for safety: in this kind of active grid monitoring, the quality of the connected grid is constantly monitored – by testing voltage, frequency and impedance. Here, fail-safe operation must be guaranteed so that regu-

lar functionality tests are not necessary. The first requirements for this safety concept were described in the German Norm VDE 0126 -1 -1. Contained within is the vast experience we have attained over the course of more than a decade of safe feeding operations. Today utility operators in other countries refer to these requirements, and they modify them in order to fit the local grid conditions or extend the requirements with additional regulations. As the most modern type of automatic disconnection device, the grid monitoring SMA Grid Guard can be employed easily throughout the world.

Grid monitoring increases availability

The monitoring of the grid parameters guarantees a very high connection time of the inverters to the grid. In addition, the software adapts to difficult grid conditions using an autodidactic process. This process guarantees the greatest reliability of the solar system, since reoccurring grid events can be accurately identified.

Approval from the Professional Association

The trouble-free certification of SMA Grid Guard, as well as the approval for higher power classes from the German Professional Association for Precision Engineering and Electrotechnology demonstrates that all safety relevant aspects have been taken into account. SMA Grid Guard is available in the various Sunny Boy and Sunny Mini Central inverter models.

Electronic Solar Switch – the first integrated DC circuit breaker device for solar inverters

Working on an electrical device requires the power supply to be cut off. A DC circuit breaker, a separator that functions under load between the solar generator and inverter, is a strict requirement in most countries. The goal of the developers at SMA was an activation device which did not entail additional installation costs, that is simple and safe to handle, and has no effect on the efficiency of the PV system.

The patented* Electronic Solar Switch (ESS) is composed of a grip handle, which covers all socket outlets and plugs completely, which prevents operations under load. To disconnect the generator from the inverter, the complete grip handle must first be pulled off. At the same time, an electrical circuit is activated which prevents the occurrence of an electric arc. This electronics also work under load, and thus offer maximum protection in the event of faulty devices or when an improper procedure is followed during disconnection of the electrical components in a solar power system. Only now are the plug connections (now in zero-current state) accessible, and they can be disconnected without danger.

The ESS works passively during normal grid feeding, incurring absolutely no losses, and thus has no influence on the efficiency of the inverter. The ESS is thus the only DC disconnecting switch that guarantees the further use of the reliable PV plug connectors and the high standard of protection against accidental contact in generator cabling in accordance with protection rating II. This electronic switch, developed and patented* by SMA, brings added safety to all work carried out on the solar power system, which exceeds the standard requirements.

*U.S. Patent US7338311B2

Your Own Electrical Grid

AC and DC solutions for stand-alone systems

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Electrical current, anytime, anywhere – something we all take for granted. More than two billion people, however, live in another reality: in so called remote areas, far away from power plants and electrical grids. And for this reason, they simply must live without many of the conveniences of our civilization.

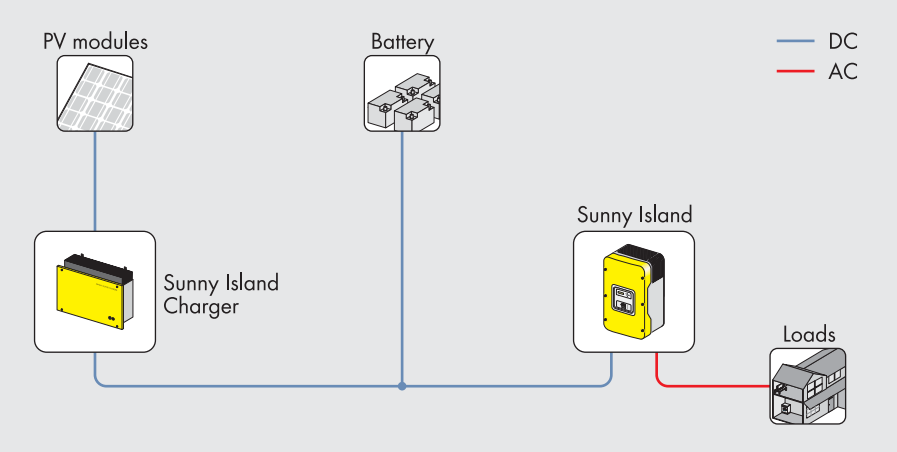
Photovoltaic offers solutions like no other technology: PV systems are robust, durable, easy to install and maintain. For years SMA has been motivated by the concept of a self-contained energy supply system based on solar power. As the only manufacturer in the world, SMA has followed not only the concept of DC coupling, but the AC coupling as well, which distinguishes itself with a host of advantages. With AC coupling, all consumers and generators are connected using an AC voltage bus, whereas with DC coupling, the interconnection takes place in a DC voltage grid. For residential as well as industrial power generation, AC coupling has been used throughout the world, while DC coupling systems have been employed mostly in small applications of up to 100 watts as well as for telecommunications purposes.

Different types of coupling

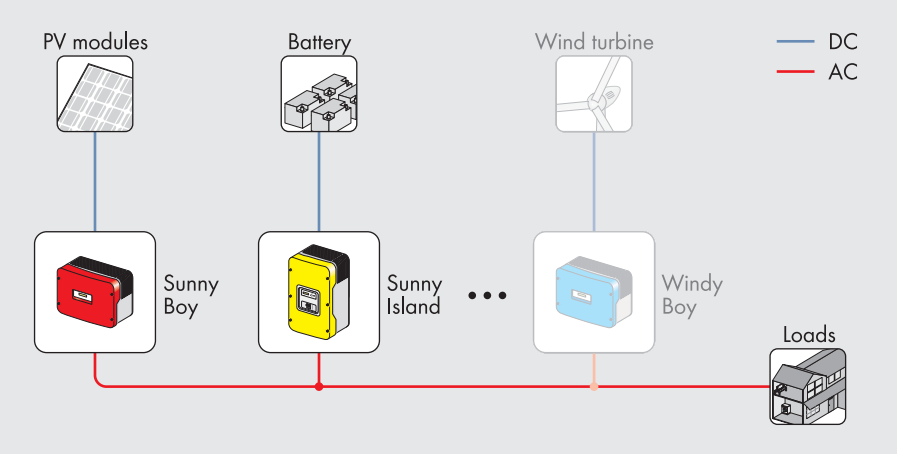
For the assembly of energy supply systems, which save the generated energy in batteries, there are three different concepts: pure DC coupling, mixed systems, and pure AC coupling. In the beginning, the first offerings were of a pure DC coupling variation: both the solar modules and the batteries were DC voltage sources, so that a conversion of the power with the, still expensive, inverter technology could be surrendered. With some 100 watts of power, the performance of this system was quite low and many of the appliances consuming the energy, such as lamps, radios or televisions, were also available in a DC voltage version.

Variants of the DC coupling

Powerful systems pose a difficult problem for pure DC coupling: since the voltage is generally limited to 48 volts for reasons of personal safety, there is a huge amperage. Sockets, cables and fuses with around 80 amps must be resilient in order to carry the around 3,700 watts of power put out by a common household socket. The costs for a setup of this type are noticeably higher. Moreover, there are very few 48 volt DC compatible appliances in the world.
For this reason, mixed systems are used, at least with regard to larger solar energy supply systems: inverters convert the lower DC voltage of the batteries into grid conforming AC voltage of 230 volts. Only the consumers were connected to this AC voltage, while the PV modules and batteries were still connected with DC cables. For small distances you can make up for it with a charge controller, which prevents battery overload.



DC coupling: better with the Sunny Island Charger



AC coupling: the basis for a highly flexible off-grid electricity supply

The SMA solution for DC coupling

Since the PV modular voltage varies with the battery voltage, the solar modules in such systems almost never reach their optimal operating point. In this way, as much as 30 percent of the valuable solar energy is lost. In order to avoid this, you need an MPP charge controller like the Sunny Island Charger. It increases or decreases the voltage coming from the battery to the current MPP voltage of the solar module. The somewhat higher costs can be recovered very quickly. The solar yield increases by 20 to 30 percent. The solar system can be built relatively smaller, which more than makes up for the additional costs of the charge controller.

Flexibility with AC coupling

Should the solar system and the batteries lie some distance apart, the optimal solution can be found in a complete AC coupling: instead of building a costly DC grid on the producer side, a solar inverter converts the solar power into AC current and feeds it into the preexisting AC island grid. This can create a number of advantages:

- Lower installation costs due to the lower amperage and the AC voltage technology.
- Simpler and more flexible planning, as the distance between solar generator and battery is unproblematic. Feeding energy into any point of the AC grid is now a de facto possibility.
- Better usage of solar power especially during high-use periods of the day.
- Utilization of technological benefits from the utility link-up, such as optimized MPP tracking processes, high efficiency, OptiCool, etc.
- Lower total costs for solar systems with more than four kilowatts of power

AC and DC solutions for stand-alone systems

SMA is the only manufacturer in the world to offer matched, AC coupled PV systems for self-sufficient energy supply systems ranging from one to 100 kW. Both the multiple award winning Sunny Boy and the Sunny Mini Central solar inverters are put into use. Smaller systems can also be built as DC coupled solar systems with the Sunny Island Charger. No compromising in terms of design, cost or installation: SMA offers optimal solutions for all off-grid systems ranging from one to 100 kW.

SMA – Partner for Successful Large-scale Projects

Inverter and system solutions for every system design

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SMA offers not just first class products and global service, but also comprehensive system solutions for solar power plants. Relying on our technological know-how and years of experience in project development, we skillfully support and advise our customers on their large-scale projects. The advantage: planning support, consulting, inverter technology and service all stem from a single source.

Complete product range for successful solar power plants

Whether centralized or decentralized, SMA provides the right inverter for all large-scale plants, accommodating all requirements, ranges of performance and module types. Be it a decentralized variety with Sunny Mini Central or centralized variations with Sunny Central inverters, SMA products are equipped with modern system technology. This makes them especially efficient and reliable. In combination with steadily decreasing system costs, we offer the best specific price on the market. In addition, SMA inverters for large-scale plants are the first to meet all the requirements specified in the new medium-voltage grid guidelines.

Everything under control with SMA system monitoring

Operators have a close eye on their large-scale plants with our system monitoring products. As a communications center, the Sunny WebBox serves as the foundation for every large-scale plant. Using RS485, *Bluetooth* or Ethernet, it receives and saves all measured values and data. The SMA OPC-Server integrates SMA devices into power plant control stations. And with the Power Reducer Box, SMA is the first manufacturer to offer a communications product which requires PV systems to actively participate in grid safety management.

First class service for highly reliable systems

Solar power plants are profitable investment opportunities. Our services guarantee particularly reliable devices. Among these are service and maintenance agreements for Sunny Central inverters with a reliability rating of 99 %, replacement service for Sunny Mini Central devices and extended warrantees valid for up to 20 years. With an international service network spanning across four continents, we are globally available to our customers, making us a fast and dependable service provider. To ensure the profitability of investments into the future.

Extensive project support with experience and know-how

From modular plug to grid connection: our experts advise during every phase of a project. Whether it's planning and design of a PV power plant, conception and installation of monitoring solutions or DC and AC cabling concepts: SMA assembles all the components for solar power plants individually and supports the customer during the approval procedure for the grid connection.

A strong partner with superior technology

Never stopping for a break, we manage to create up to six new innovations every year. We do this by working every single day to make our products more efficient and economical. With large plants, increased efficiency or simplified installation conditions have a huge impact. Our highly flexible manufacturing processes and experience in all the relevant target markets contributes to us being the leading provider of solar inverters and a strong partner for large-scale projects throughout the world.

REFERENCES

Solar Power Systems

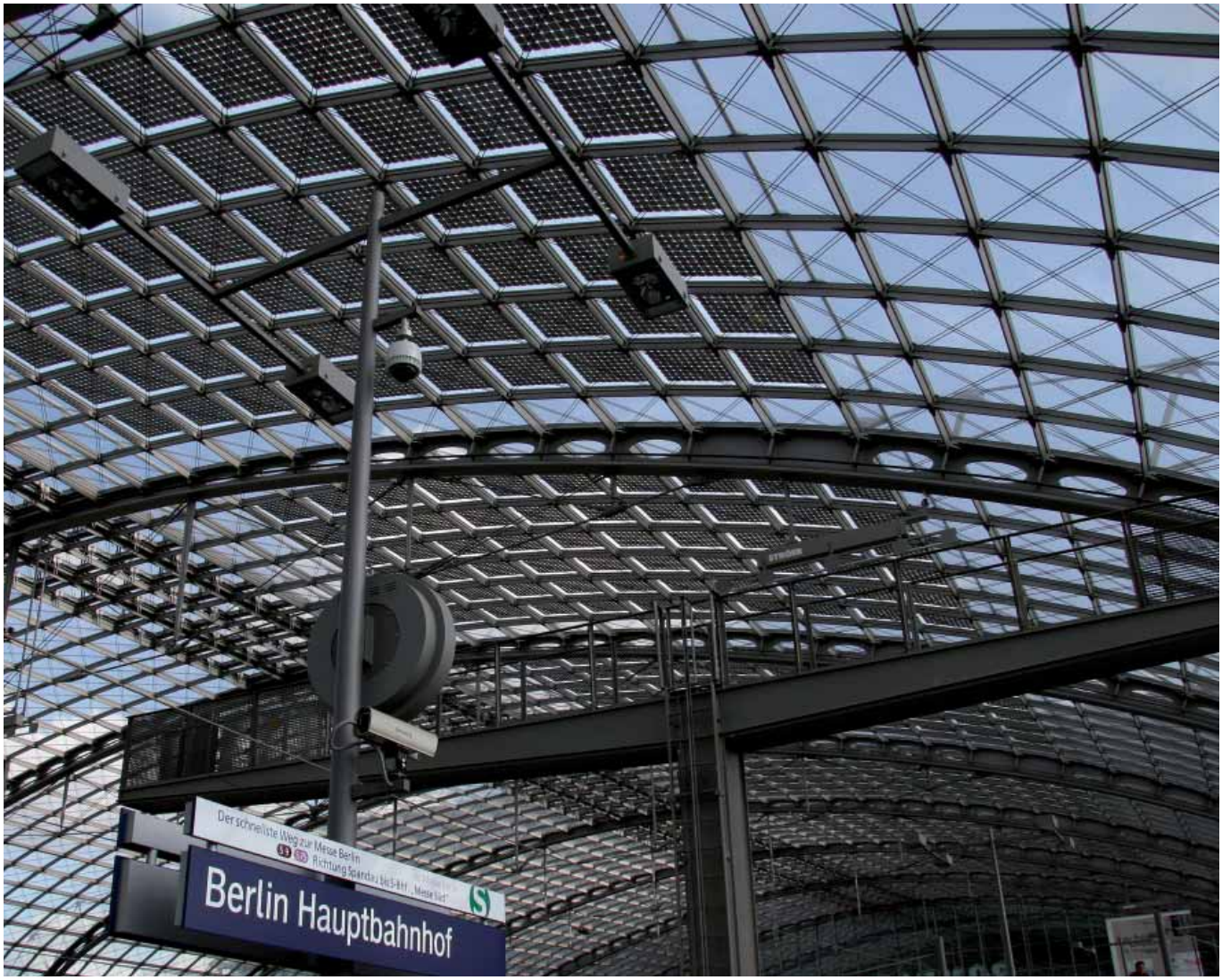
The appropriate inverter for every application, anywhere in the world

The successful development of photovoltaics over the past years is primarily due to the excellent political and financial framework. The Renewable Energy Act (German: EEG) had a fundamental impact on the acceptance of this technology. This has greatly promoted both investment in solar power systems and the technological progress in this sector.

The goal is to reduce dependency on fossil fuels, which are becoming scarce, and to reduce environmentally hazardous CO_2 emissions. Here, the use of photovoltaic systems is among the most effective measures, due to low wear and tear and good scalability.

Over the following pages, we show several examples demonstrating the successful integration of solar power systems into the visual makeup of our world. These systems are not unsightly and often add to the aesthetic value of many buildings. This is especially true of open spaces, which, as waste land with no previous use, gain a new practical social function by means of the construction of powerful solar power stations.

Photovoltaic systems are now used as the basis of solar stand-alone grid systems in many corners of the world in order to set up energy supplies in remote off-grid regions, which would otherwise be unthinkable.



Top:
Central Railway Station Berlin
190 kWp
with Sunny Boy 2000

Bottom left:
Galli Real Estate Guadeloupe
167.1 kWp
with Sunny Mini Central 7000HV

Bottom right:
Waldpolenz energy park Brandis
36 MWp
with Sunny Central 500HE

Top:
Alpine Hut
Italy
Sunny Boy 1700
and Sunny Island 4500

Bottom left:
Panades Solar
Spain
216 kWp
with Sunny Mini Central 6000 A

Bottom right:
Village power supply
Yunnan
6 kWp
with Sunny Boy 3000
and Sunny Island 4500

Top left:
Salem
USA
8.4 kWp
with Sunny Boy 2500U

Top right:
Pension Geiger
Zerfaus, Austria
26 kWp
with Sunny Boy 1100, 2100TL,
3800, 4200TL, 5000TL

Bottom:
Papal Audience Hall,
Paul VI, Vatican City
220 kWp
with Sunny Boy 5000TL HC
Sunny Mini Central 7000TL, 11000TL

Glossary

Explanations regarding solar technology

Central Inverters
Central inverters are particularly well suited for use in photovoltaic power systems with a homogenous structure (modules of the same kind with identical orientation and tilt) They are used for systems starting at 100 kW and, in most cases, are designed for outdoor installation.

Dumpload
Here: load which can be spontaneously activated in the event of an energy surplus; can also be used to balance out strong load fluctuations. Consumers with storage capability (spring pumps, cooling units, boilers) are the most energy sensible. However, for the actual technical function, appropriately cooled resistors suffice.

H5 – Topology
The bridge of inverters with H5 topology has a fifth semiconductor switch. This ensures very high efficiency in the conversion of current, at a factor of 98 %.

Maximum Power Point "MPP"
The operational point (current / voltage) of the PV generator under which the highest possible performance under the prevailing conditions is achieved. The actual MMP changes constantly depending, for example, on the level of irradiation and the temperature.

MPP tracker
A device that adjusts the voltage and current of a PV generator so that it is operated at its "Maximum Power Point".

MSD
Part of an "automatic disconnection device for power-generating systems". This is a mandatory safety device which prevents power from a solar energy system from being fed into an external power grid when the public supply grid is not functioning. This function is taken over by the Sunny Boy and Sunny Mini Central using SMA Grid Guard, thus making a regular test unnecessary due to their single fault characteristics.

Multi-String Inverter
An inverter which, to a great extent, combines the advantages of several string inverters (separate MPP tracking of individual strings) and a central inverter (low specific costs).

OptiCool
A housing concept by SMA, in which the interior of the housing is divided into two compartments. The chamber with the sensitive electronics is dustproof and waterproof. The second chamber contains transformers and chokes, as well as other unsusceptible components and can be actively cooled when necessary.

Power Balancer
The Power Balancer is a standard function of Sunny Mini Central inverters, which prevents unwanted asymmetrical loads during three-phase feeding: in addition, using a control line, three inverters are always connected for a three-phase feeding session.

SMA Grid Guard
The SMA grid guard concept monitors, among other things, the voltage and frequency of the connected AC grid according to predefined parameters in order to prevent the formation of a stand-alone grid upon grid disconnection (see "MSD") The SMA Grid Guard Concept allows for the smooth and reliable operation of SMA inverters on nearly every electrical power grid in the world.

String Inverters
In string technology, the photovoltaic generator is subdivided into individual module surfaces and each of these individual "strings" has its own string inverter allocated to it. This technology allows the system costs to be reduced while at the same time making installation a lot easier and increasing the energy yield and system availability.

» Innovations from SMA

2009

Sunny Tripower 17000TL
The three-phased inverter
for easy system design

Trend setting technology for easy installation, high yields and secure grid support

2009

Sunny Central 630HE
Grid management included

Best future prospects: more power with lower system costs, high flexibility for system design and compliance with the „Medium Voltage Directive"

2009

Sunny Island 2012
Compact and powerful
with excellent efficiency

Bidirectional HF-inverter, galvanic isolation, reduced weight, excellent efficiency

2008

Sunny Boy 5000TL
Perfection Plus. Usability.
The New Sunny Boy Generation.

Bluetooth technology, graphic display, worldwide usage and easy installation: leading-edge technology meets user convenience

2008

Sunny Mini Central 11000TL
Precision landing

Precise planning of PV systems – up to the megawatt class. With an efficiency of 98 % and low specific price

2007

Sunny Backup-System
Solar power even in the event
of grid failure

Awarded with the "Innovationspreis 2007" (innovation award) as best solar product

2006

ESS
Electronic Solar Switch

First device-integrated DC circuit breaker for safe disconnection of the PV generator from the inverter

2006

Sunny Mini Central 8000TL
The world champion
in terms of payback time

H5 topology, record efficiency of 98 %, low specific price: delivers shortest payback time

2005

Sunny Boy 3300
The test winner

The most powerful Sunny Boy with OptiCool, galvanic isolation and peak efficiency in an aluminum die-cast enclosure

2005

Sunny Portal
Internet portal
for presentation of system data

Customized system monitoring and individual visualization at www.SunnyPortal.com

2004

Sunny WebBox
Data logger of the new generation

Innovative monitoring and communication with the PV system via the Internet (Sunny Portal)

2003

Sunny Beam
Easy wireless monitoring of PV systems

Attractive design for the living area, power supply via integrated solar cell

2002

Sunny Central
Central inverter for large-scale PV plants

With string monitoring, Sunny Team, and optimal service, Sunny Central is the large-scale solution

2002

Sunny Boy 5000TL
Multi-String inverter
with three independent MPP trackers

Combines the advantages of string technology with cost reductions for larger inverters

2001

Sunny Island
The system solution
for stand-alone power supply

User-friendly coupling of all components on the AC side, simple installation and extension of the system

1999

First megawatt system
in string technology

World's largest roof-integrated PV system with 570 string inverters

1995

Sunny Boy 700
First string inverter

Cost reduction via minimized DC cabling, simpler installation and increased efficiency

1991

PV-WR
First PV inverter
designed for mass production

User display, communication and visualization with PC

Publication Information

Publisher
SMA Solar Technology AG

Photos
Stefanie Aumiller
Lucidmedia
Andreas Berthel

reddot design award
honourable mention 2009

Photon
sehr gut +

Testsieger
test 5/2006

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SOLARKAT-KEN091923 Subject to technical changes. No liability for printing errors. Printed on chlorine-free paper.