



# Product Guide 2009/2010



The Future of Solar Technology

» **Welcome to the SMA Product Guide. This new catalog contains the complete worldwide product offering from SMA. When selecting an inverter, be sure it is suitable for use in your particular region.**

Each PV system is unique: From California to Korea, SMA has the right solution for every application. Use this table to find products that are UL-listed and/or ETL-listed specifically for US applications.

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Look for these symbols throughout the Guide.



They identify products that are suitable for use where UL-listed and/or ETL-listed products are required.



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**Günther Cramer,  
Chief Executive Officer**



**Peter Drews,  
Chief Operating Officer**



**Pierre-Pascal Urbon,  
Chief Financial Officer**



**Marko Werner,  
Chief Sales Officer**



**Roland Grebe,  
Chief Technology Officer**



## 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 10 year warranty (optionally extendable to 20 years), telephone consultation via the free Service Line 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

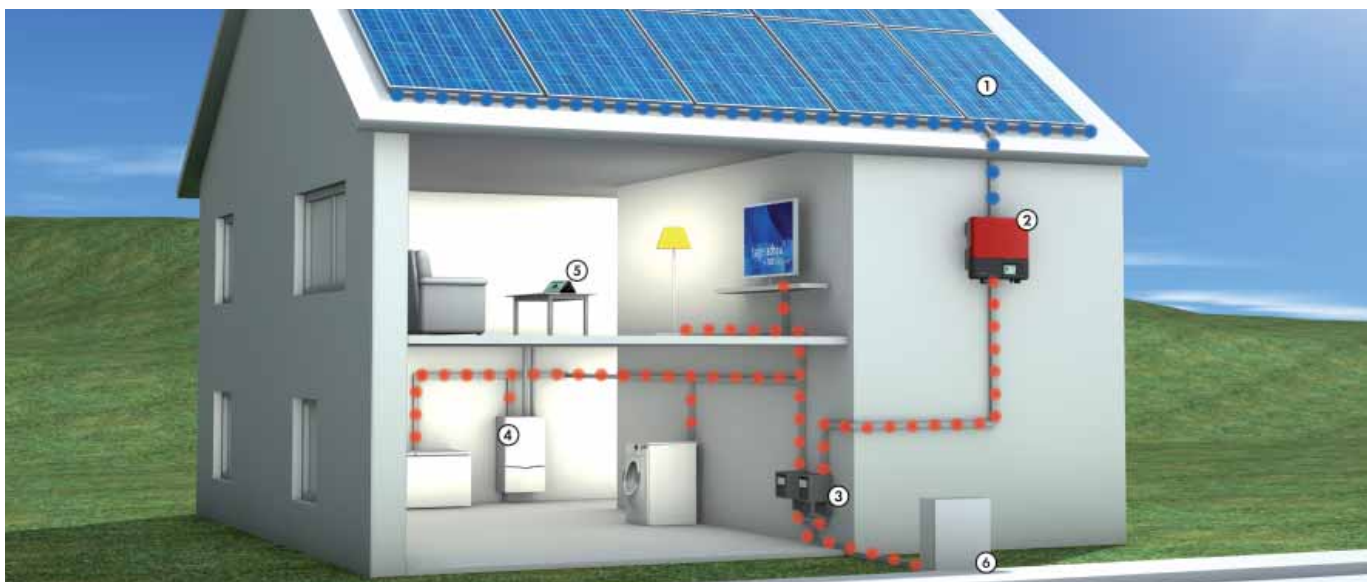
All SMA inverters can be combined with a wide range of components for system monitoring: from the radio-based Sunny Beam to the Sunny WebBox for diagnostics and maintenance over the Internet from any location in the world.

## Safety

In the United States, SMA inverters are compliant with all UL standards for PV inverters. In the rest of the world, SMA inverters are equipped with the SMA Grid Guard and Electronic Solar Switch, which 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. loads, 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 192).

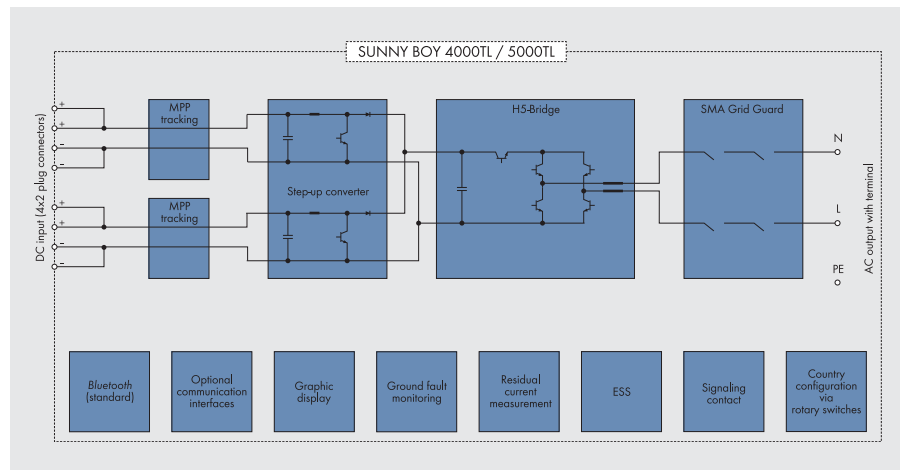
## Maximum energy yield

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 194) provide approximately a two percent greater energy yield, without having to make cut-backs in personnel protection.

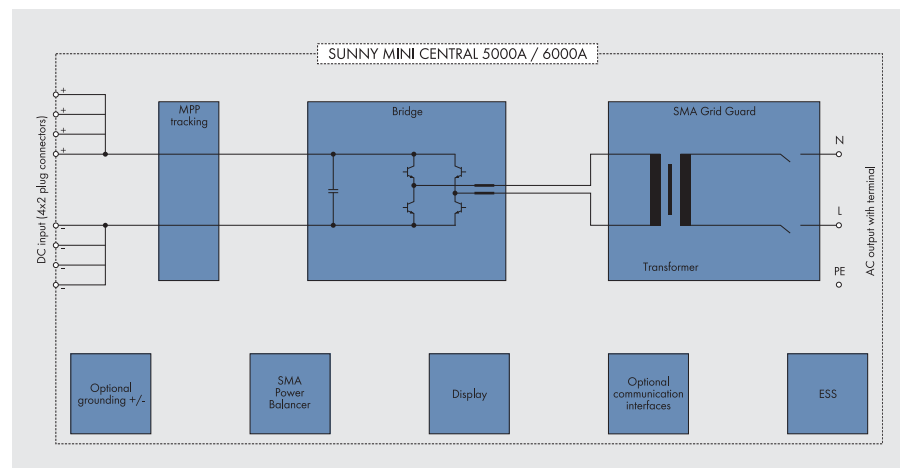
## Grid feeding

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.

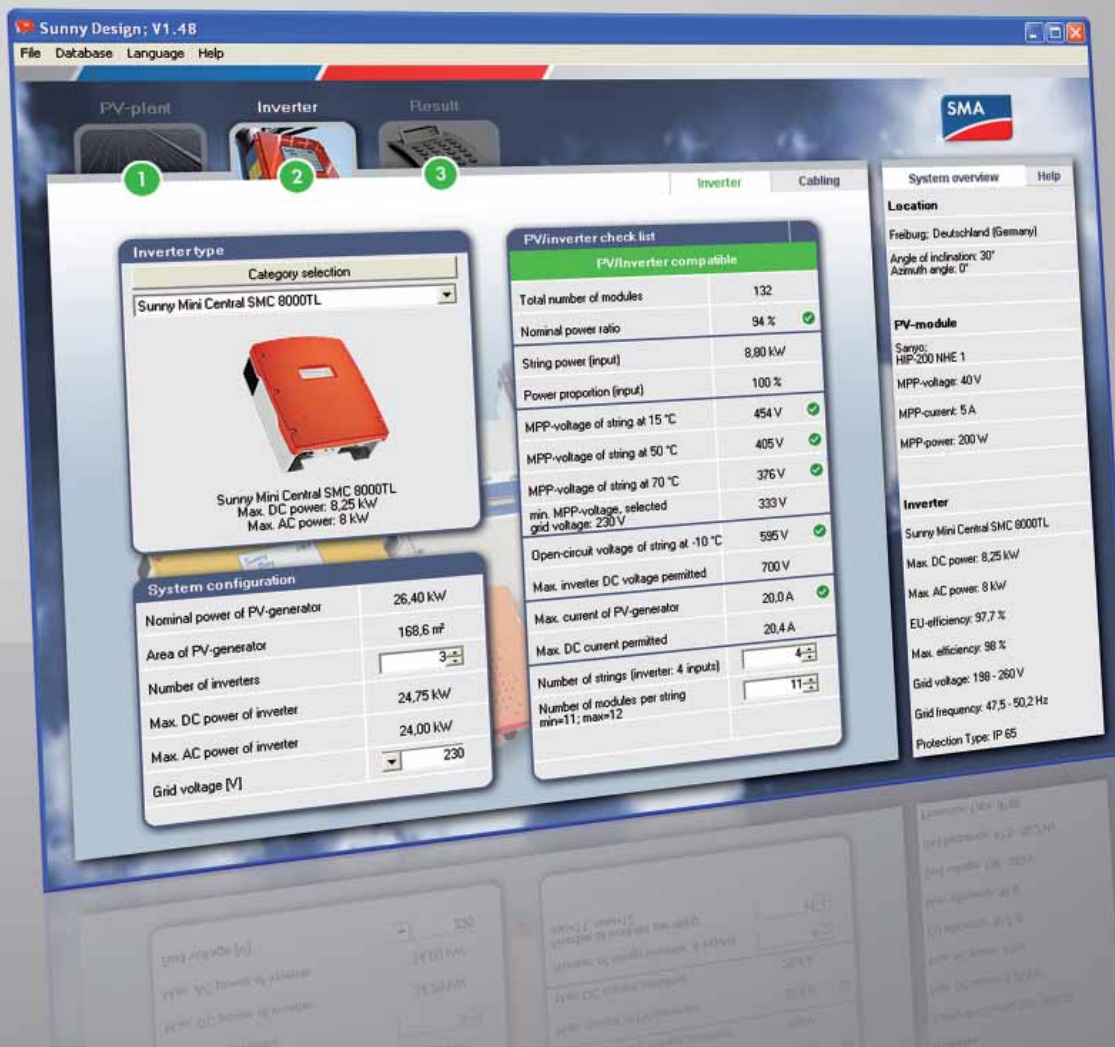


Block circuit diagram of a multi-string inverter without transformer



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 utilizing 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-America.com](http://www.SMA-America.com)

## 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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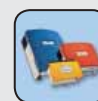
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Use of real, high-resolution meteorological data



Database with current established PV modules



Database with all SMA inverters



Target-oriented suggestions for optimization of the system



Worldwide location selection



Automatic specification of cable lengths and cross sections



Individually designed profitability report for integration into proposals

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, provides the highest level of performance and reduces plant costs.

# Technical Data

	Sunny Tripower 10000TL	Sunny Tripower 12000TL	Sunny Tripower 15000TL	Sunny Tripower 17000TL
<b>Input (DC)</b>				
Max. DC power (at $\cos \phi = 1$ )	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
<b>Output (AC)</b>				
Nominal AC output	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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift ( $\cos \phi$ ), 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
<b>Efficiency</b>				
Max. efficiency / Euro-Eta	98% / 97.5%	98% / 97.5%	98% / 97.5%	98% / 97.5%
<b>Protection devices</b>				
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	●	●	●	●
<b>General Data</b>				
Dimensions (W / H / D) in inches	26.2 / 29.2 / 10.4	26.2 / 29.2 / 10.4	26.2 / 29.2 / 10.4	26.2 / 29.2 / 10.4
Weight	approx. 143 lbs	approx. 143 lbs	approx. 143 lbs	approx. 143 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
Power consumption at night	< 1 W	< 1 W	< 1 W	< 1 W
Topology	transformerless	transformerless	transformerless	transformerless
Cooling concept	OptiCool	OptiCool	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics)	●/●	●/●	●/●	●/●
<b>Features</b>				
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 ADC surge protection device  
(type II), inputs A and B



#### REACTIVE POWER CONTROL

#### 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

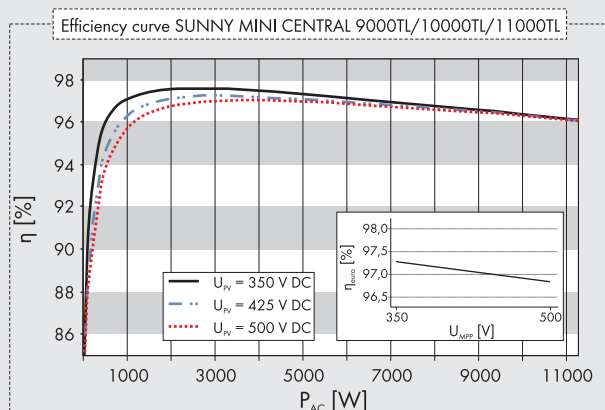
## SUNNY MINI CENTRAL 9000TL / 10000TL / 11000TL with Reactive Power Control

Optimal grid integration with reactive power supply

Future-proof grids at a glance: the Sunny Mini Central 9000TL / 10000TL / 11000TL with Reactive Power Control is the ideal solution if the utility company requires the provision of reactive power at the feed-in point. With these inverters, it is now possible to realize an intelligent interface with the grid where the phase shift,  $\cos \varphi$ , and the reactive power component, are prescribed. In this way, large solar power systems, especially those in the megawatt range, can make optimal use of grid capacities and can significantly contribute to the success of renewable energy sources.

# Technical Data

	Sunny Mini Central 9000TL	Sunny Mini Central 10000TL	Sunny Mini Central 11000TL
<b>Input (DC)</b>			
Max. DC power (at $\cos \phi = 1$ )	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 MPPT trackers	1	1	1
Max. number of strings (parallel)	5	5	5
<b>Output (AC)</b>			
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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift ( $\cos \phi$ ), 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 / ●
<b>Efficiency</b>			
Max. efficiency	97.7%	97.7%	97.7%
<b>Protection devices</b>			
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	●	●	●
<b>General Data</b>			
Dimensions (W / H / D) in inches	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5
Weight	approx. 77 lbs	approx. 77 lbs	approx. 77 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
Noise emission (typical)	$\leq 42$ dB(A)	$\leq 45$ dB(A)	$\leq 46$ dB(A)
Power consumption at night	0.25 W	0.25 W	0.25 W
Topology	transformerless	transformerless	transformerless
Cooling concept	OptiCool	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics)	●/●	●/●	●/●
<b>Features</b>			
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 190.



#### 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

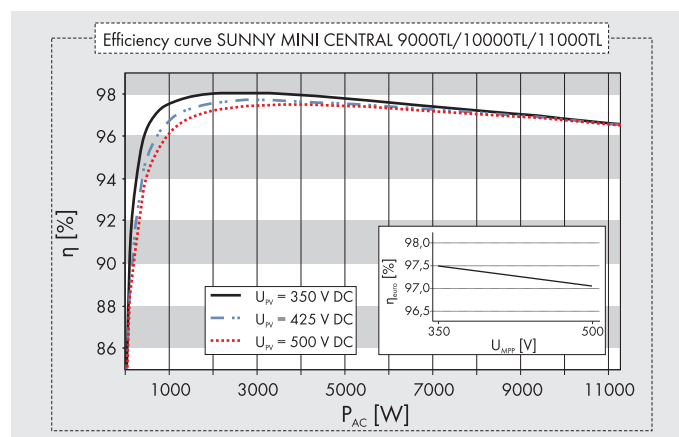
Precise system design for maximum yields

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. 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. The combination of high efficiency and low specific price results in a short amortization time and 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
<b>Input (DC)</b>			
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
<b>Output (AC)</b>			
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 / ●
<b>Efficiency</b>			
Max. efficiency / Euro-Eta	98.0% / 97.6%	98.0% / 97.5%	98.0% / 97.5%
<b>Protection devices</b>			
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	●	●	●
<b>General Data</b>			
Dimensions (W / H / D) in inches	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5
Weight	approx. 77 lbs	approx. 77 lbs	approx. 77 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
Noise emission (typical)	≤ 42 dB(A)	≤ 45 dB(A)	≤ 46 dB(A)
Power consumption at night	0.25 W	0.25 W	0.25 W
Topology	transformerless	transformerless	transformerless
Cooling concept	OptiCool	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics)	●/●	●/●	●/●
<b>Features</b>			
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

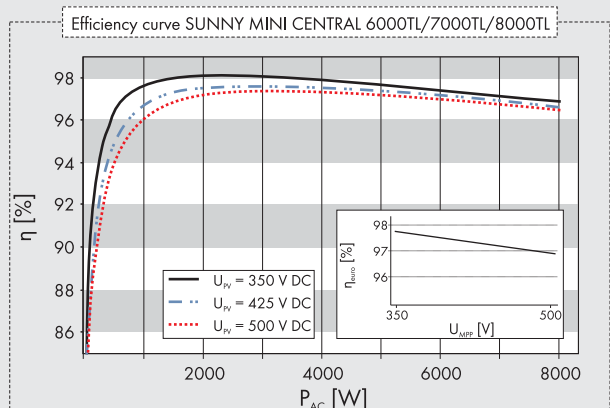
## SUNNY MINI CENTRAL 6000TL / 7000TL / 8000TL

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. The Sunny Mini Central family of transformerless inverters makes it easy to design large plants—from 18 kWp to the megawatt range. The finely graduated power classes are ideal for precisely laying out large solar power plants. The flexibility it provides for plant design 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
<b>Input (DC)</b>			
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
<b>Output (AC)</b>			
Nominal AC output	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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift (cos $\phi$ )	1	1	1
AC connection / power balancing	single-phase / ●	single-phase / ●	single-phase / ●
<b>Efficiency</b>			
Max. efficiency	98.0%	98.0%	98.0%
Euro-Eta	97.7%	97.7%	97.7%
<b>Protection devices</b>			
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	●	●	●
<b>General Data</b>			
Dimensions (W / H / D) in inches	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5
Weight	68 lbs	70 lbs	73 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
Noise emission (typical)	$\leq 31$ dB(A)	$\leq 33$ dB(A)	$\leq 40$ dB(A)
Power consumption at night	0.25 W	0.25 W	0.25 W
Topology	transformerless	transformerless	transformerless
Cooling concept	OptiCool	OptiCool	OptiCool
Mounting location: indoors / outdoors (IP65)	●/●	●/●	●/●
<b>Features</b>			
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)



reddot design award  
honourable mention 2009

#### 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

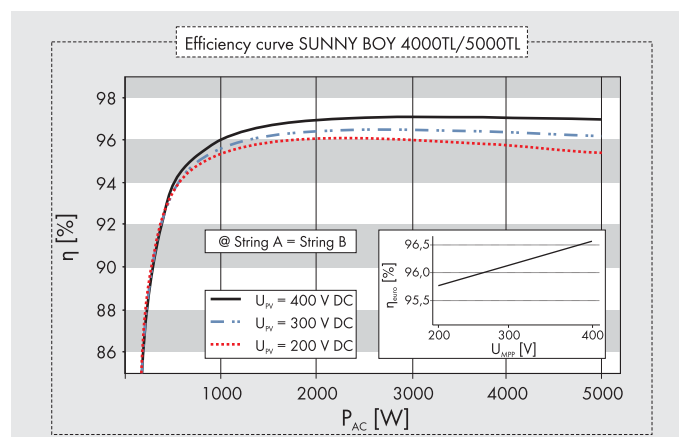
Perfection plus. Usability. The new generation of Sunny Boy

More communicative, user-friendly and efficient than ever, the Sunny Boy 3000TL, 4000TL and 5000TL are setting new standards in inverter technology. A modern LCD screen displays a readout of daily values, even after sunset. Employing a simplified installation concept and wireless communication via Bluetooth®: the new Sunny Boy fulfill every wish. With a peak efficiency of 97 percent, the transformerless 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
<b>Input (DC)</b>			
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
<b>Output (AC)</b>			
Nominal AC output	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 / $\pm 5$ Hz	50 Hz, 60 Hz / $\pm 5$ Hz	50 Hz, 60 Hz / $\pm 5$ Hz
Phase shift (cos $\phi$ )	1	1	1
AC connection	single-phase	single-phase	single-phase
<b>Efficiency</b>			
Max. efficiency / Euro-Eta	97.0% / 96.3%	97.0% / 96.4%	97.0% / 96.5%
<b>Protection devices</b>			
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	●	●	●
<b>General Data</b>			
Dimensions (W / H / D) in inches	18.5 / 17.5 / 7.1	18.5 / 17.5 / 7.1	18.5 / 17.5 / 7.1
Weight	51 lbs	55 lbs	55 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
Noise emission (typical)	$\leq 25$ dB(A)	$\leq 29$ dB(A)	$\leq 29$ dB(A)
Power consumption at night	< 0.5 W	< 0.5 W	< 0.5 W
Topology	transformerless	transformerless	transformerless
Cooling concept	convection	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics / IP54 connection compartment)	●/●	●/●	●/●
<b>Features</b>			
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

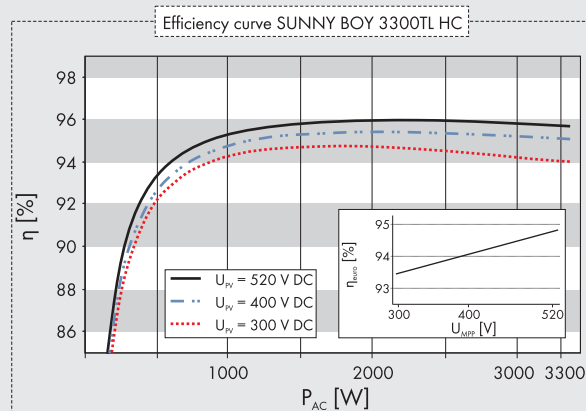
## SUNNY BOY 2100TL / 3300TL HC

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
<b>Input (DC)</b>		
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
<b>Output (AC)</b>		
Nominal AC output	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 / $\pm 4.5$ Hz	50 Hz / 45.5 Hz – 52.5 Hz
Phase shift (cos $\phi$ )	1	1
AC connection	single-phase	single-phase
<b>Efficiency</b>		
Max. efficiency	96.0%	96.0%
Euro-Eta	95.2%	94.6%
<b>Protection devices</b>		
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	●	●
<b>General Data</b>		
Dimensions (W / H / D) in inches	17.1 / 11.6 / 8.4	18.5 / 19.3 / 8.9
Weight	35 lbs	62 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F
Noise emission (typical)	$\leq 33$ dB(A)	$\leq 29$ dB(A)
Power consumption at night	0.1 W	0.1 W
Topology	transformerless	transformerless
Cooling concept	convection	convection
Mounting location: indoors / outdoors (IP65)	●/●	●/●
<b>Features</b>		
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







#### 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

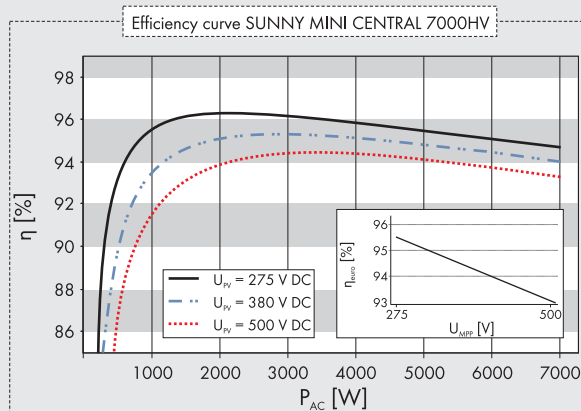
## SUNNY MINI CENTRAL 7000HV

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	
<b>Input (DC)</b>		
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	
<b>Output (AC)</b>		
Nominal AC output	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 / $\pm 4.5$ Hz	
Phase shift ( $\cos \phi$ )	1	
AC connection / power balancing	single-phase / ●	
<b>Efficiency</b>		
Max. efficiency	96.1%	
Euro-Eta	95.3%	
<b>Protection devices</b>		
DC reverse polarity protection	●	
ESS DC load-disconnecting switch	●	
AC short-circuit protection	●	
Ground fault monitoring	●	
Grid monitoring (SMA Grid Guard)	●	
Galvanically isolated	●	
<b>General Data</b>		
Dimensions (W / H / D) in inches	18.4 / 24.1 / 9.5	
Weight	143 lbs	
Operating temperature range	-13 °F to 140 °F	
Noise emission (typical)	$\leq 41$ dB(A)	
Power consumption at night	0.25 W	
Topology	LF transformer	
Cooling concept	OptiCool	
Mounting location: indoors / outdoors (IP65)	●/●	
<b>Features</b>		
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

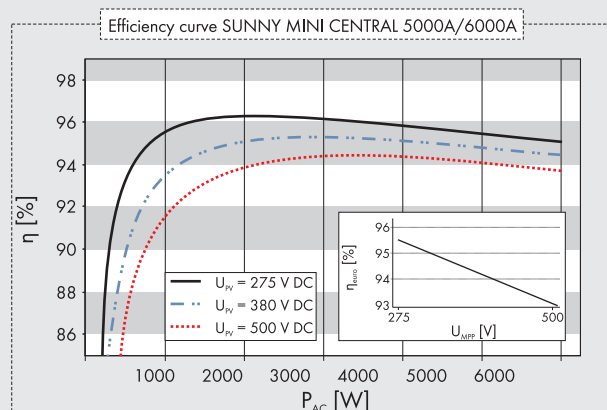
## SUNNY MINI CENTRAL 4600A / 5000A / 6000A

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, allowing the Sunny Mini Central to 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
<b>Input (DC)</b>			
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
<b>Output (AC)</b>			
Nominal AC output	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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift (cos $\phi$ )	1	1	1
AC connection / Power balancing	single-phase / ●	single-phase / ●	single-phase / ●
<b>Efficiency</b>			
Max. efficiency	96.1%	96.1%	96.1%
Euro-Eta	95.2%	95.2%	95.2%
<b>Protection devices</b>			
DC reverse polarity protection	●	●	●
ESS DC load-disconnecting switch	●	●	●
AC short-circuit protection	●	●	●
Ground fault monitoring	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●
Galvanically isolated	●	●	●
<b>General Data</b>			
Dimensions (W / H / D) in inches	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5
Weight	137 lbs	137 lbs	139 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
Noise emission (typical)	$\leq 42$ dB(A)	$\leq 42$ dB(A)	$\leq 42$ dB(A)
Power consumption at night	0.25 W	0.25 W	0.25 W
Topology	LF transformer	LF transformer	LF transformer
Cooling concept	OptiCool	OptiCool	OptiCool
Installation: Indoors / Outdoors (IP65 electronics)	●/●	●/●	●/●
<b>Features</b>			
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-N-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 113 °F

#### Flexible

- For indoor and outdoor installation
- Suitable for generator grounding

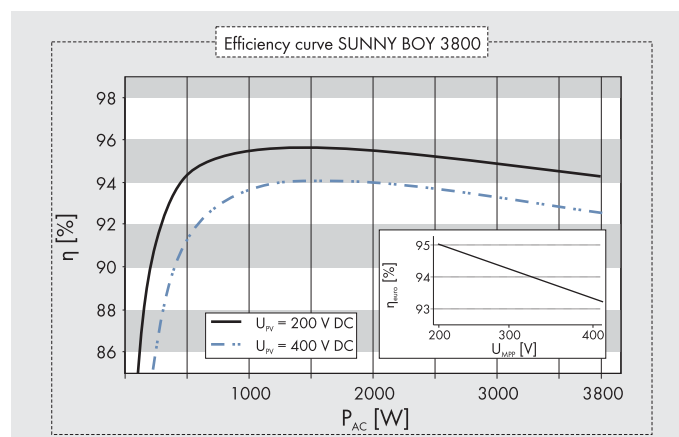
## SUNNY BOY 3300 / 3800

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 and 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*
<b>Input (DC)</b>			
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
<b>Output (AC)</b>			
Nominal AC output	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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift (cos $\phi$ )	1	1	1
AC connection	single-phase	single-phase	single-phase
<b>Efficiency</b>			
Max. efficiency / Euro-Eta	95.2% / 94.4%	95.6% / 94.7%	95.6% / 94.7%
<b>Protection devices</b>			
DC reverse polarity protection	●	●	●
ESS DC load-disconnecting switch	●	●	●
AC short-circuit protection	●	●	●
Ground fault monitoring	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●
Galvanically isolated	●	●	●
<b>General Data</b>			
Dimensions (W / H / D) in inches	17.7 / 13.9 / 9.3	17.7 / 13.9 / 9.3	17.7 / 13.9 / 9.3
Weight	84 lbs	84 lbs	84 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
Noise emission (typical)	$\leq 40$ dB(A)	$\leq 42$ dB(A)	$\leq 42$ dB(A)
Power consumption at night	0.1 W	0.1 W	0.1 W
Topology	LF transformer	LF transformer	LF transformer
Cooling concept	OptiCool	OptiCool	OptiCool
Mounting location: indoors / outdoors (IP65)	●/●	●/●	●/●
<b>Features</b>			
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-N-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

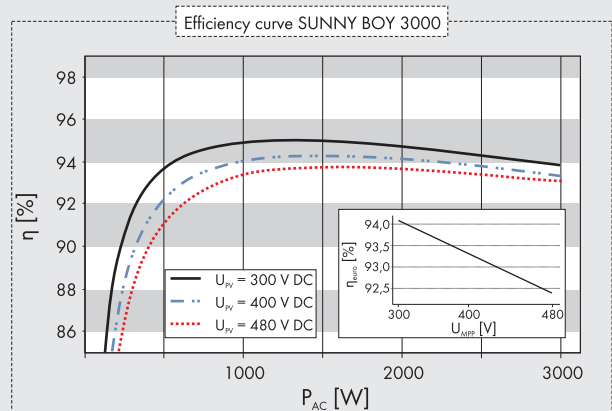
Proven technology for secure investments

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
<b>Input (DC)</b>				
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
<b>Output (AC)</b>				
Nominal AC output	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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift (cos $\phi$ )	1	1	1	1
AC connection	single-phase	single-phase	single-phase	single-phase
<b>Efficiency</b>				
Max. efficiency / Euro-Eta	92.1% / 90.7%	93.5% / 91.8%	94.1% / 93.2%	95.0% / 93.6%
<b>Protection devices</b>				
DC reverse polarity protection	●	●	●	●
ESS DC load-disconnecting switch	●	●	●	●
AC short-circuit protection	●	●	●	●
Ground fault monitoring	●	●	●	●
Grid monitoring (SMA Grid Guard)	●	●	●	●
Galvanically isolated	●	●	●	●
<b>General Data</b>				
Dimensions (W / H / D) in inches	17.1 / 11.6 / 8.4	17.1 / 11.6 / 8.4	17.1 / 11.6 / 8.4	17.1 / 11.6 / 8.4
Weight	51 lbs	55 lbs	62 lbs	71 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
Noise emission (typical)	$\leq 41$ dB(A)	$\leq 46$ dB(A)	$\leq 33$ dB(A)	$\leq 30$ dB(A)
Power consumption at night	0.1 W	0.1 W	0.1 W	0.1 W
Topology	LF transformer	LF transformer	LF transformer	LF transformer
Cooling concept	convection	convection	convection	convection
Mounting location: indoors / outdoors (IP65)	●/●	●/●	●/●	●/●
<b>Features</b>				
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-PNR



Grounding-Kit "Negative"  
ESHV-PNR



#### 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 lockable DC load disconnect switch

## SUNNY BOY 5000US / 6000US / 7000US / 8000US

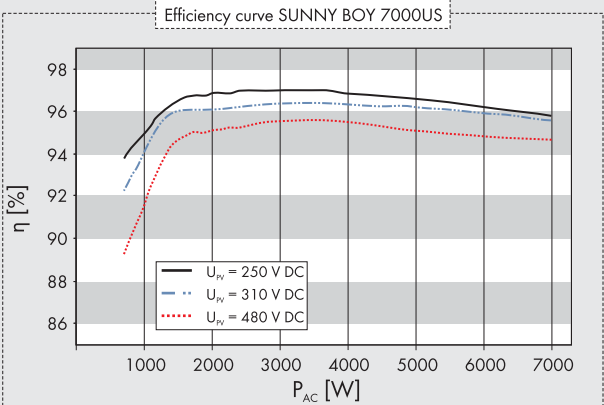
The best in their class

Our US series inverters utilize our proven technology and are designed specifically to meet IEEE-1547 requirements. Sunny Boy 6000US, Sunny Boy 7000US and Sunny Boy 8000US are also compatible with the Sunny Tower. Increased efficiency means better performance and shorter payback periods. All four models are field-configurable for positive ground systems making them more versatile than ever. With over 750,000 fielded units, Sunny Boy is the benchmark for PV inverter performance and reliability throughout the world.

\*U.S. Patent US7352549B1

## Technical Data

	Sunny Boy 5000US	Sunny Boy 6000US	Sunny Boy 7000US	Sunny Boy 8000US
Input Values				
Recommended max. PV-power (modules at STC)	6250 W	7500 W	8750 W	10000 W
Max. DC voltage	600 V	600 V	600 V	600 V
MPP voltage range	250 – 480 V	250 – 480 V	250 – 480 V	300 - 480 V
Max. DC input current	21 A	25 A	30 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)	3 (inverter), 4 x 20 A (DC disconnect)
Output Values (AC)				
Nominal AC ouput	5000 W	6000 W	7000 W	8000 W
Max. AC output power	5000 W	6000 W	7000 W	8000 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	N/A / 32 A / 29 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	N/A at 208 V 211 – 264 V at 240 V 244 – 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	60 Hz / 59.3 – 60.5 Hz
Phase shift	0.99 at nominal power	0.99 at nominal power	0.99 at nominal power	0.99 at nominal power
Efficiency				
Max. efficiency	96.8%	97.0%	97.1%	96.5%
Weighted efficiency (CEC) at 208 V / 240 V / 277 V	95.5%/95.5%/95.5%	95.5%/95.5%/96.0%	95.5%/96.0%/96.0%	N/A/96.0%/96.0%
General information				
Dimensions (W / H / D) in inches	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5
Weight / Shipping weight	143 lbs / 148 lbs	143 lbs / 148 lbs	143 lbs / 148 lbs	148 lbs / 152 lbs
Ambient temperature	–13 to 113 °F	–13 to 113 °F	–13 to 113 °F	–13 to 113 °F
Noise emission (typical)	≤ 44 dB(A)	≤ 45 dB(A)	≤ 46 dB(A)	TBD
Power consumption at night	0.1 W	0.1 W	0.1 W	0.1 W
Topology	LF transformer	LF transformer	LF transformer	LF transformer
Cooling concept	OptiCool	OptiCool	OptiCool	OptiCool
Mounting Location In-/Outdoor (NEMA 3R)	●/●	●/●	●/●	●/●
Features				
LCD	●	●	●	●
Communication: RS 485 / Bluetooth®	○/○	○/○	○/○	○/○
Warranty: 10 years / 15 years / 20 years	●/○/○	●/○/○	●/○/○	●/○/○
Compliance: IEEE-929, IEEE-1547,UL 1741, UL 1998, FCC Part 15 A & B	●	●	●	●
NOTE: US inverters ship with gray lids.				
● Standard    ○ Optional				
Data at nominal conditions				
Last update: March 2009				
Type Designation	SB 5000US	SB 6000US	SB 7000US	SB 8000US



## 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 lockable DC load disconnect switch

## SUNNY BOY 3000US / 4000US

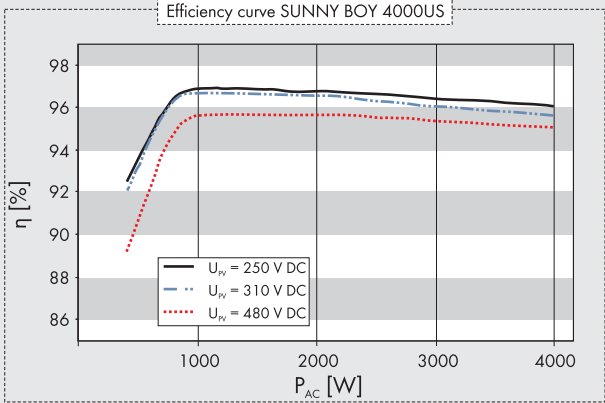
The best in their class

Our US series inverters utilize our proven technology and are designed specifically to meet IEEE-1547 requirements. Their compact design makes them ideal for residential use and the integrated lockable DC disconnect makes installation more cost effective. They are field-configurable for positive ground systems making them more versatile than ever. Increased efficiency means better performance and shorter payback periods. With over 750,000 fielded units, Sunny Boy is the benchmark for PV inverter performance and reliability throughout the world.

\*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 at 208 V / 500 V at 240 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 inches	17.8 / 13.8 / 9.3	17.8 / 13.8 / 9.3
Weight / Shipping weight	84 lbs / 97 lbs	84 lbs / 97 lbs
Ambient temperature	–13 to 113 °F	–13 to 113 °F
Noise emission (typical)	≤ 40 dB(A)	≤ 37 dB(A)
Power consumption at night	0.1 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 / 15 years / 20 years	●/○/○	●/○/○
Compliance: IEEE-929, IEEE-1547,UL 1741, UL 1998, FCC Part 15 A & B	●	●
**Also available in 16 A current limited configuration for use in 100 A service applications		
NOTE: US inverters ship with gray lids.		
● 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



#### High Yields

- Maximum efficiency 95.5 %
- Best tracking efficiency with Opti-Trac MPP control
- OptiCool active temperature management

#### Safe

- Galvanic isolation
- Integrated lockable DC load disconnect switch

#### User-friendly

- Slim enclosure mounts in between wall studs
- Plug-in grounding with GFDI
- Reduced weight

#### Communicative

- New graphic display
- *Bluetooth®* technology

## SUNNY BOY 2000HFUS / 2500HFUS / 3000HFUS

Easy installation, simple communication and maximum performance

The new Sunny Boy high frequency inverters represent the next step in innovative SMA technology. Featuring world-class efficiency, a slim-line enclosure and reduced weight, the Sunny Boy HF series of inverters can be mounted in between wall studs, making it perfect for new construction, in addition to space-constrained retrofits. Installation is made simple by automatic grid detection\*\*, plug-in generator grounding with GFDI and a wide input voltage range of 175 to 600 volts, which provides exceptional system design flexibility. The modern graphic display and wireless *Bluetooth®* communication system also makes the new Sunny Boy easy to use.

\*\*U.S. patent US7352549B1

# Technical Data

	Sunny Boy 2000HFUS		Sunny Boy 2500HFUS		Sunny Boy 3000HFUS	
	208 V	240 V	208 V	240 V	208 V	240 V
Input Values						
Recommended max. PV power (modules at STC)	2500 W		3125 W		3750 W	
Max. DC voltage	600 V		600 V		600 V	
PV voltage range, MPPT*	175 V – 480 V		215 V – 480 V		220 V – 480 V	
DC Minimum Start Voltage	220		220		220	
Max. input current	12.2 A		12.4 A		14.8 A	
Number of MPP trackers / max. number of strings (parallel), extendable	1 / 2		1 / 2		1 / 2	
Output Values (AC)						
Nominal AC power / max. AC power	2000 W / 2000 W		2500 W / 2500 W		3000 W / 3000 W	
Max. output current	10.0 A	8.5 A	12.0 A	10.4 A	14.4 A	12.5 A
Nominal AC voltage range	183 V – 229 V	211 V – 264 V	183 V – 229 V	211 V – 264 V	183 V – 229 V	211 V – 264 V
Nominal AC voltage / automatic grid type detection	208 V & 240 V / ●		208 V & 240 V / ●		208 V & 240 V / ●	
THD of grid current	< 4%		< 4%		< 4%	
AC grid frequency: nominal / range	60 Hz / 59.3 – 60.5 Hz		60 Hz / 59.3 – 60.5 Hz		60 Hz / 59.3 – 60.5 Hz	
Power factor (cos φ)	0.99 at nominal power		0.99 at nominal power		0.99 at nominal power	
Efficiency						
Max. efficiency	> 95.5%		> 95.5%		> 95.5%	
CEC*	≥ 95%		≥ 95%		≥ 95%	
Protection devices						
Electromagnetic compliance	FCC, Part 15, Class A & B		FCC, Part 15, Class A & B		FCC, Part 15, Class A & B	
Certification*	UL1741, UL1998 IEEE 1547		UL1741, UL1998 IEEE 1547		UL1741, UL1998 IEEE 1547	
DC reverse polarity protection	●		●		●	
AC short-circuit protection	●		●		●	
General data						
Dimensions (W / H / D) in inches	13.7 / 28.6 / 7.2		13.7 / 28.6 / 7.2		13.7 / 28.6 / 7.2	
Packing dimensions in inches	17.7 / 23.6 / 15.7		17.7 / 23.6 / 15.7		17.7 / 23.6 / 15.7	
Weight*	< 50 lbs		< 50 lbs		< 50 lbs	
Operating temperature range (CEC)	-13 °F to 113 °F		-13 °F to 113 °F		-13 °F to 113 °F	
Power consumption at night	TBD		TBD		TBD	
Topology	HF-transformer		HF-transformer		HF-transformer	
Cooling concept*	TBD		OptiCool		OptiCool	
Installation location: indoor / outdoor (NEMA 3R)	●/●		●/●		●/●	
Features						
Graphic display	●		●		●	
Interfaces: Bluetooth® / RS485	●/○		●/○		●/○	
Warranty: 10 years / 15 years / 20 years	●/○/○		●/○/○		●/○/○	
*Preliminary data as of September 2009						
● Standard    ○ Optional						
Type Designation	SB 2000HFUS-30		SB 2500HFUS-30		SB 3000HFUS-30	

## Accessories



Installation frame for integration in wood-framed walls



Communication unit RS485 + multi-function relay





#### 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

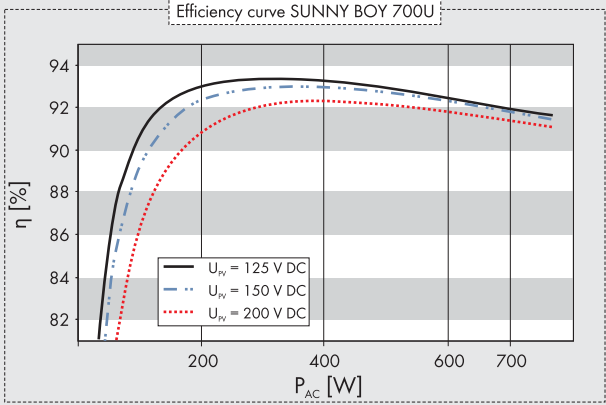
## SUNNY BOY 700U

The versatile choice for any system configuration

The SMA Sunny Boy 700U was SMA's first mass-produced string inverter and it continues to enjoy immense popularity in today's solar market. Its compact size and economical price make it ideal for starter or demonstration systems. It is also perfectly suited for adding a bit more power to an existing solar system. Its modular design makes expansion to almost any size system easy. Three different configurable input voltage ranges make the Sunny Boy 700U a versatile choice, whatever your system configuration.

## Technical Data

	Sunny Boy 700U (150 V <sub>DC</sub> )	Sunny Boy 700U (200 V <sub>DC</sub> )	Sunny Boy 700U (250 V <sub>DC</sub> )
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 output	460 W	600 W	700 W
Max. AC output power	460 W	600 W	700 W
Max. AC output current	4.4 A	5.7 A	6.6 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 inches	12.7 / 12.6 / 7.1	12.7 / 12.6 / 7.1	12.7 / 12.6 / 7.1
Weight / Shipping weight	51 lbs / 57 lbs	51 lbs / 57 lbs	51 lbs / 57 lbs
Ambient temperature	–13 °F to 113 °F	–13 °F to 113 °F	–13 °F to 113 °F
Power consumption at night	0.1 W	0.1 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 / 15 years / 20 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





#### 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)

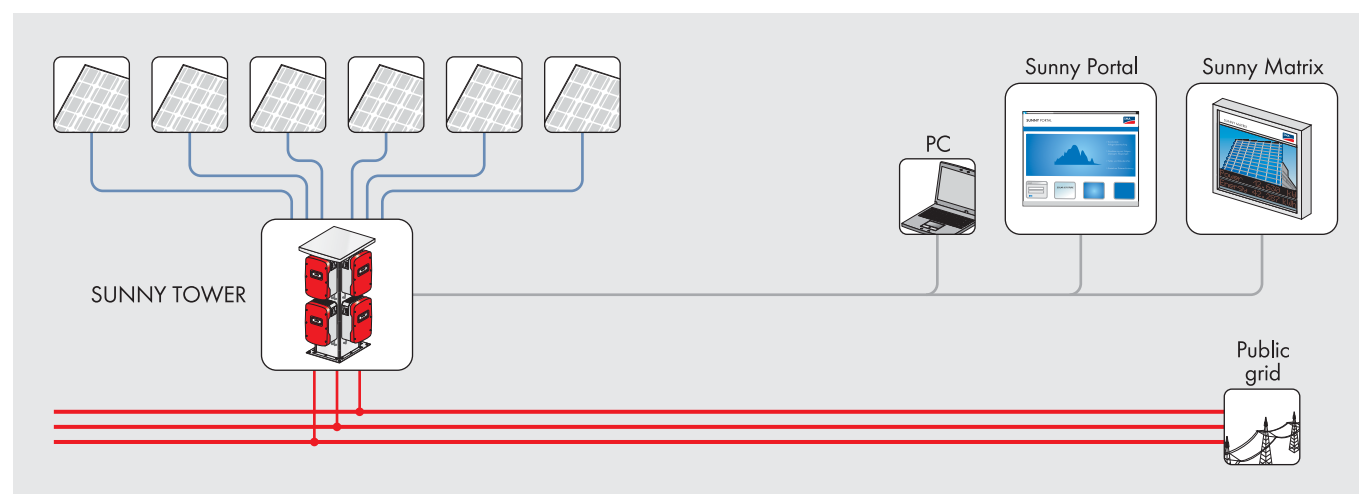
## SUNNY TOWER

Easy installation – maximum yield

The Sunny Tower: easy to install and profitable. Its excellent efficiency of up to 98 percent 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 allows for combining Sunny Mini Central and Sunny Boy inverters, ensuring 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
<b>Input (DC)</b>		
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
<b>Output (AC)</b>		
Continuous AC power ( $P_{AC,max}$ )	48 kW at 40 °C	66 kW at 40 °C
Nominal AC output ( $P_{AC,nom}$ )	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 ( $\cos \phi$ )	1	1
Grid Connection	bolt clamp, max. 5 x 95 mm <sup>2</sup>	bolt clamp, max. 5 x 95 mm <sup>2</sup>
<b>Efficiency</b>		
Maximum efficiency ( $\eta_{Max}$ )	98.0%	98.0%
Euro-Eta ( $\eta_{Euro}$ )	97.7%	97.5%
<b>Protection device</b>		
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
<b>General Data</b>		
Inverter / Sunny Tower protection rating according to DIN EN 60529	IP65 / IP44	IP65 / IP44
Cooling System	OptiCool	OptiCool
Permissible ambient temperature	-13 °F to 113 °F	-13 °F to 113 °F
Topology	transformerless	transformerless
Number of Output Phases	3	3
Weight	705 lbs	705 lbs
Width / Height / Depth in inches	43.3 / 71.3 / 39.0	43.3 / 71.3 / 39.0
<b>Features</b>		
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





- UL 1741/IEEE-1547 compliant
- 10 year standard warranty
- Prewired at factory for 3-phase utility interconnection

- Integrated load-break rated lockable AC/DC disconnect switch
- Internet-ready with Sunny WebBox

- Improved CEC efficiency
- Integrated fused series string combiner
- Sealed electronics enclosure & Opticool™

- Ideal for commercial applications
- Rugged stainless steel outdoor-rated enclosure

## SUNNY TOWER US

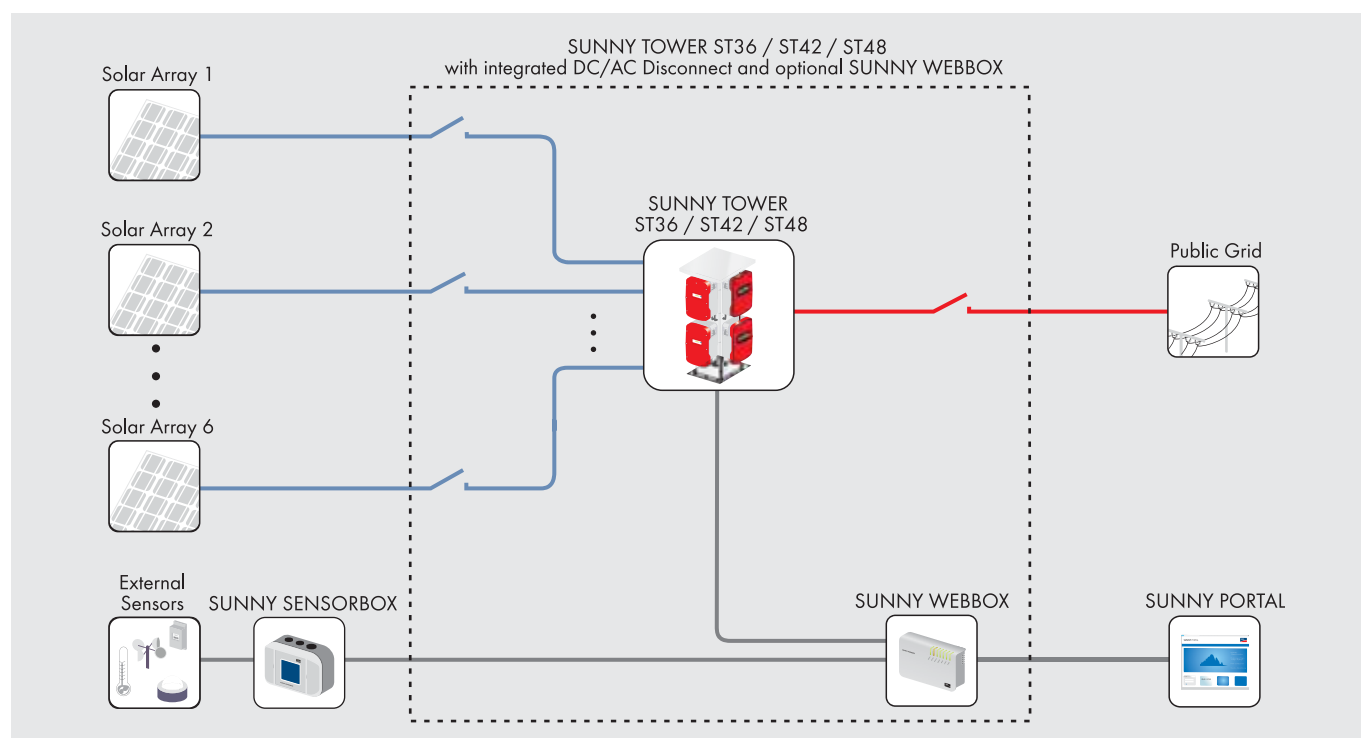
The flexible solution for commercial PV systems

SMA brings you the best in commercial inverter solutions: the Sunny Tower. Designed with the installer in mind, we've combined ease of installation, lowest specific cost (\$/watt), and the highest efficiency to maximize rebates and power production while minimizing your payback period. The Sunny Tower combines all the advantages of string inverters with the installation advantages of central inverters. The Sunny Tower offers you the flexibility and reliability you've come to expect from SMA.



# Technical data (example configuration)

	Sunny Tower with 6 Sunny Boy 6000US	Sunny Tower with 6 Sunny Boy 7000US	Sunny Tower with 6 Sunny Boy 8000US
Recommended Maximum PV Power (Module STC)	45.0 kW	52.5 kW	60 kW
DC Maximum Voltage	600 V	600 V	600 V
Peak Power Tracking Voltage	250 - 480 V	250 - 480 V	300 - 480 V
DC Maximum Input Current	150 A	180 A	180 A
Number of Fused String Inputs	24 x 15 A (AC / DC disconnect)	24 x 15 A (AC / DC disconnect)	24 x 15 A (AC / DC disconnect)
PV Start Voltage (Adjustable)	300 V	300 V	365 V
AC Nominal Power / Maximum Power	36.0 kW / 36.0 kW	42.0 kW / 42.0 kW	48.0 kW / 48.0 kW
AC Maximum Output Current (3-Phase Only) (per phase @ 208 V, 240 V, 277 V)	100 A, 87 A, 44 A	117 A, 101 A, 51 A	N/A, 117 A, 100 A
AC Nominal Voltage Range (3-Phase Only)	187 - 229 V @ 208 V Delta or WYE 211 - 264 V @ 240 V Delta 244 - 305 V @ 277 V WYE	187 - 229 V @ 208 V Delta or WYE 211 - 264 V @ 240 V Delta 244 - 305 V @ 277 V WYE	N/A @ 208 V 211 - 264 V @ 240 V Delta 244 - 305 V @ 277 V WYE
AC Frequency: nominal / range	60 Hz / 59.3 - 60.5 Hz	60 Hz / 59.3 - 60.5 Hz	60 Hz / 59.3 - 60.5 Hz
Power Factor (Nominal)	0.99	0.99	0.99
Peak Inverter Efficiency	97.0%	97.1%	96.5%
CEC Weighted Efficiency	95.5% @ 208 V, 240 V 96.0% @ 277 V	95.5% @ 208 V 96.0% @ 240 V, 277 V	N/A @ 208 V 96.0% @ 240 V, 277 V
Dimensions: W / H / D in inches	43.3 / 70.5 / 39	43.3 / 70.5 / 39	43.3 / 70.5 / 39
Weight: Tower / 6 Inverters / Total Shipping	330 lbs / 846 lbs / 1388 lbs	330 lbs / 846 lbs / 1388 lbs	330 lbs / 888 lbs / 1430 lbs
Ambient Temperature Range	-13 to 113 °F	-13 to 113 °F	-13 to 113 °F
Power consumption at night	0.6 W	0.6 W	0.6 W
Topology	LF transformer	LF transformer	LF transformer
Cooling Concept	OptiCool™, forced active cooling	OptiCool™, forced active cooling	OptiCool™, forced active cooling
Mounting Location: indoor / outdoor (NEMA 3R)	●/●	●/●	●/●
LCD Display	●	●	●
Communication: RS485 / wireless	○/○	○/○	○/○
Warranty: 10-year	●	●	●
Compliance: IEEE-929, IEEE-1547, UL 1741, UL 1998, FCC Part 15 A & B	●	●	●
NOTE: US inverters ship with gray lids.			
● Standard ○ Optional			
Data at nominal conditions			
Type Designation	ST36	ST42	ST48





# BACKUP SYSTEMS





# 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 home use. 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

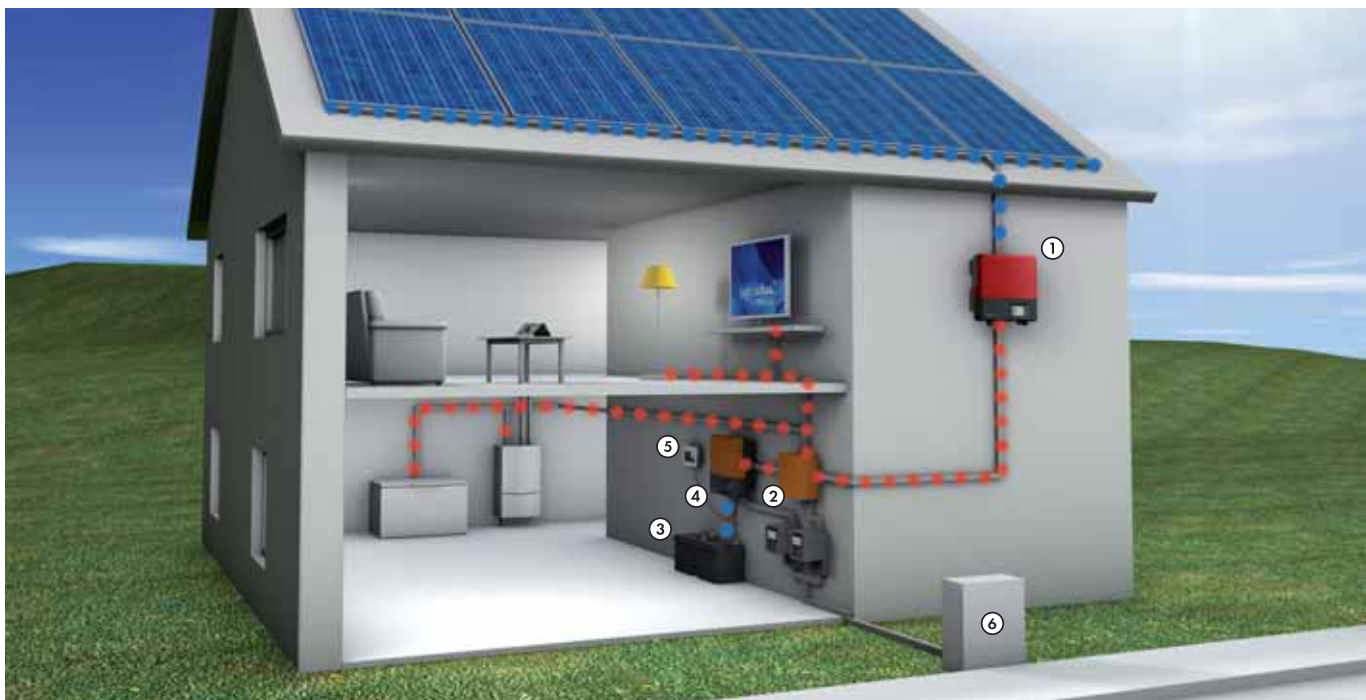
Over 25 years of SMA experience in system technology for PV systems as well as off-grid solutions form the basis for the system that was awarded the "Innovationspreis 2007" (Innovation Award 2007). The Sunny Backup system is a mixture of grid-connected operation and off-grid technology which guarantees 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 guest-houses, 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**

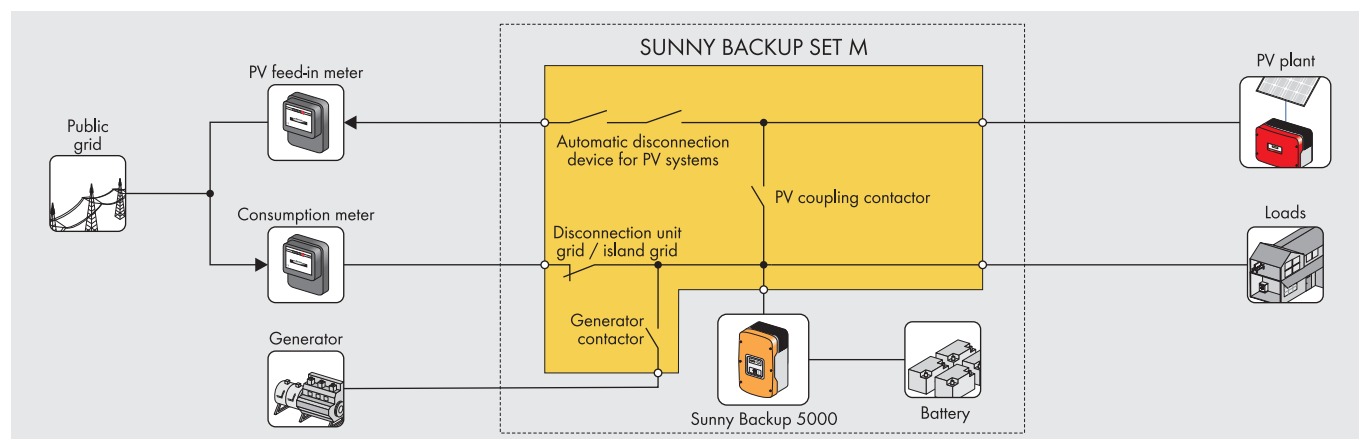
Solar power – even in the event of grid failure

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
<b>Output (loads)</b>			
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
<b>Input PV system</b>			
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
<b>Input battery</b>			
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
<b>Efficiency / operating consumption</b>			
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
<b>Protective devices</b>			
DC reverse polarity / excessive battery discharge	●/●	●/●	●/●
AC short-circuit / AC overload	●/●	●/●	●/●
Grid monitoring (SMA Grid Guard) / galvanic isolation	●/●	●/●	●/●
<b>General Data</b>			
Dimensions SBU (width / height / depth in inches)	18.4 / 24.1 / 9.3	18.4 / 24.1 / 9.3	18.4 / 24.1 / 9.3
Dimensions AS-Box (width / height / depth in inches)	23.6 / 23.6 / 8.3	23.6 / 29.9 / 8.3	39.4 / 63.0 / 11.3
Dimensions battery per block (width / height / depth in inches)	19.6 / 9.1 / 7.0	19.6 / 9.1 / 7.0	19.6 / 9.1 / 7.0
Weight per (SBU / AS-Box / battery block)	139 lbs / 64 lbs / 120 lbs	139 lbs / 90 lbs / 120 lbs	139 lbs / 397 lbs / 120 lbs
Operating temperature range	-13 °F to 122 °F	-13 °F to 122 °F	-13 °F to 122 °F
Protection rating (SBU, AS-Box)	IP30 / IP65	IP30 / IP65	IP30 / IP65
<b>Features / function</b>			
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
<b>Accessories</b>			
Battery cables / DC splitter / communication cables	3 m / ○ / 5 m	6 m / ● / 5 m	6 m / ● / 5 m
Battery fuses "BATFUSE"	○	○	○
Interfaces (RS485 PB / Multicluseter 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

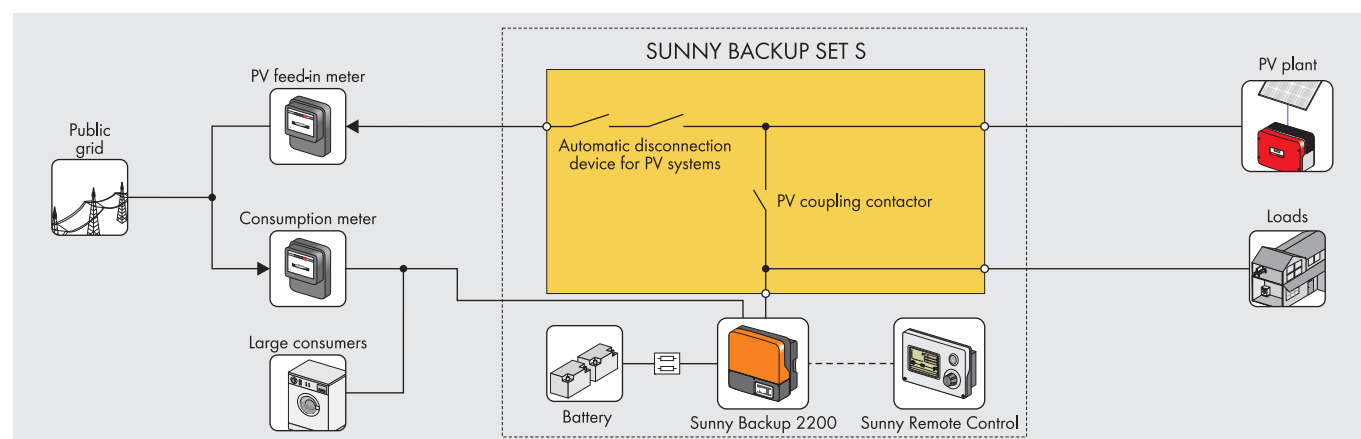
## SUNNY BACKUP Set S

Reliable back-up electricity supply for single-family homes

Innovative electricity supply for home owners: as an 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 SMA inverters 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 easily retrofitted with the certified Sunny Backup System.

# Technical Data

	Sunny Backup Set S	
<b>Output (loads)</b>		
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	
<b>Input PV system</b>		
Nominal AC PV output / current	4.6 kW / 20 A	
Compatible PV inverters	All Sunny Boy inverters *	
<b>Input battery</b>		
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	
<b>Efficiency / operating consumption</b>		
Max. efficiency backup operation	93.6%	
Internal consumption day / night (Silent Mode)	40 W / 6 W	
<b>Protective devices</b>		
DC reverse polarity / excessive battery discharge	–/●	
AC short-circuit / AC overload	●/●	
Grid monitoring (SMA Grid Guard) / galvanic isolation	●/●	
<b>General Data</b>		
Dimensions SBU (width / height / depth in inches)	18.5 / 17.5 / 7.1	
Dimensions AS-Box (width / height / depth in inches)	7.9 / 11.8 / 4.7	
Dimensions battery per block (width / height / depth in inches)	19.6 / 9.1 / 7.0	
Weight per (SBU / AS-Box / battery block)	42 lbs / 10 lbs / 120 lbs	
Operating temperature range	–13 °F to 140 °F	
Protection rating (SBU, AS-Box)	IP54 / IP65	
<b>Features / function</b>		
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	
<b>Accessories</b>		
Battery cables / DC splitter / communication cables	4 m / – / 5 m	
Battery fuses "BATFUSE"	●	
Interfaces (RS485 PB / Multicluseter 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







# 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. 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 application, for the greatest availability and secure investment.

Read more about the Sunny Central Service on page 174







#### High-yield

- Outstanding specific price
- Efficiency of more than 98%

#### 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: the successful HE series, the Sunny Central 400HE, 500HE and 630HE feature first class state-of-the-art 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.

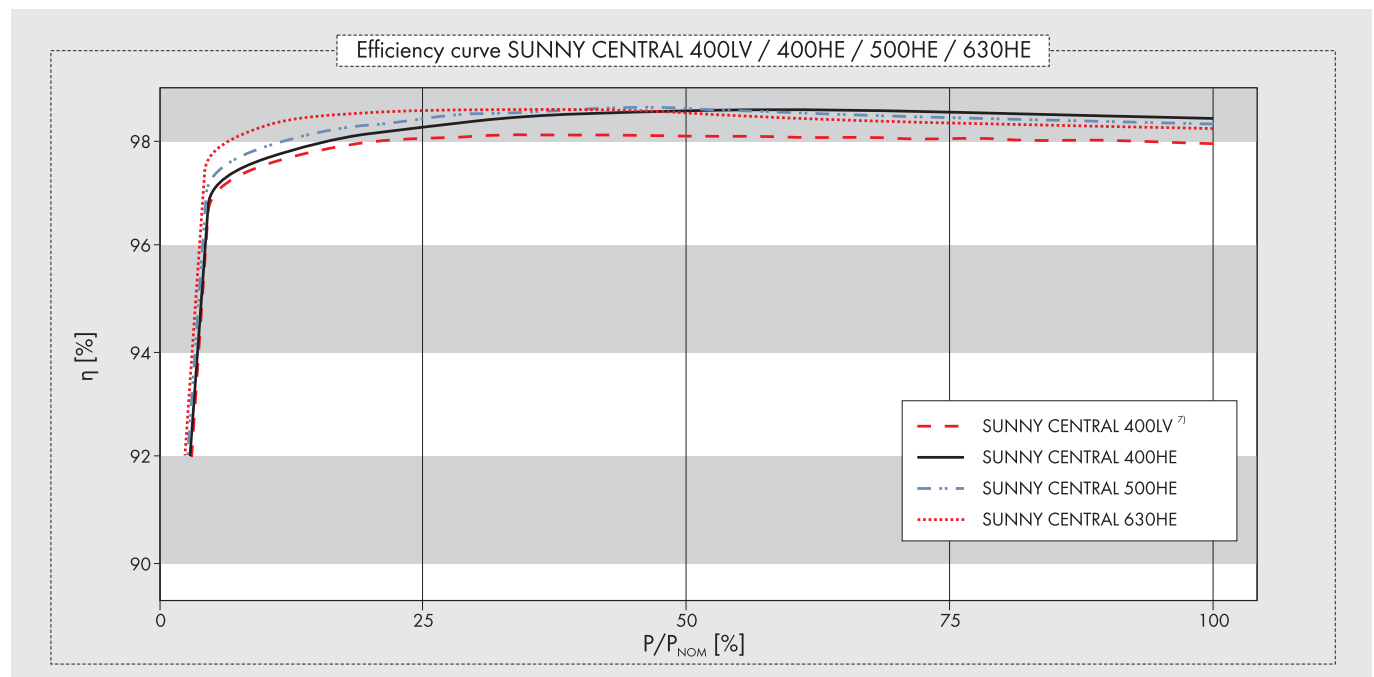




# Technical Data

## 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 <sub>PV</sub> )	450 kW <sub>p</sub> <sup>1)</sup>	450 kW <sub>p</sub> <sup>1)</sup>	560 kW <sub>p</sub> <sup>1)</sup>	705 kW <sub>p</sub> <sup>1)</sup>
DC voltage range, MPPT (U <sub>DC</sub> )	300 V – 600 V <sup>5)</sup>	450 V – 820 V <sup>5)</sup>	450 V – 820 V <sup>5)</sup>	500 V – 820 V <sup>5)</sup>
Max. permissible DC voltage (U <sub>DC, max</sub> )	600 V	1000 V	1000 V	1000 V
Max. permissible DC current (I <sub>DC, max</sub> )	1400 A	1000 A	1200 A	1350 A
Voltage ripple, PV voltage (U <sub>PP</sub> )	< 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 <sub>AC</sub> )	400 kW <sup>6)</sup>	400 kW <sup>6)</sup>	500 kW <sup>6)</sup>	630 kW <sup>6)</sup>
Operating grid voltage ± 10% (U <sub>AC</sub> )	200 V	270 V	270 V	315 V
Nominal AC current (I <sub>AC, nom</sub> )	1155 A	855 A	1070 A	1155 A
Operating range, grid frequency (f <sub>AC</sub> )	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 <sup>2)</sup>				
Maximum efficiency P <sub>AC, max</sub> (η)	98.2% <sup>7)</sup>	98.6%	98.6%	98.6%
Euro-Eta (η)	98.0% <sup>7)</sup>	98.4%	98.4%	98.4%
Dimensions and Weight				
Width / Height / Depth in inches (W / H / D)	63.0 + 47.2/83.5/33.5	63.0 + 47.2/83.5/33.5	63.0 + 47.2/83.5/33.5	63.0 + 47.2/83.5/33.5
Weight approx. (lb)	4189	4189	4189	4189
Power consumption				
Internal consumption in operation (P <sub>day</sub> )	< 2800 W <sup>4)</sup>	< 2800 W <sup>4)</sup>	< 2900 W <sup>4)</sup>	< 3000 W <sup>4)</sup>
Internal consumption in Standby (P <sub>night</sub> )	< 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 A <sub>in</sub> <sup>3)</sup>	1 x PT 100, 3 x A <sub>in</sub> <sup>3)</sup>	1 x PT 100, 3 x A <sub>in</sub> <sup>3)</sup>	1 x PT 100, 3 x A <sub>in</sub> <sup>3)</sup>
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

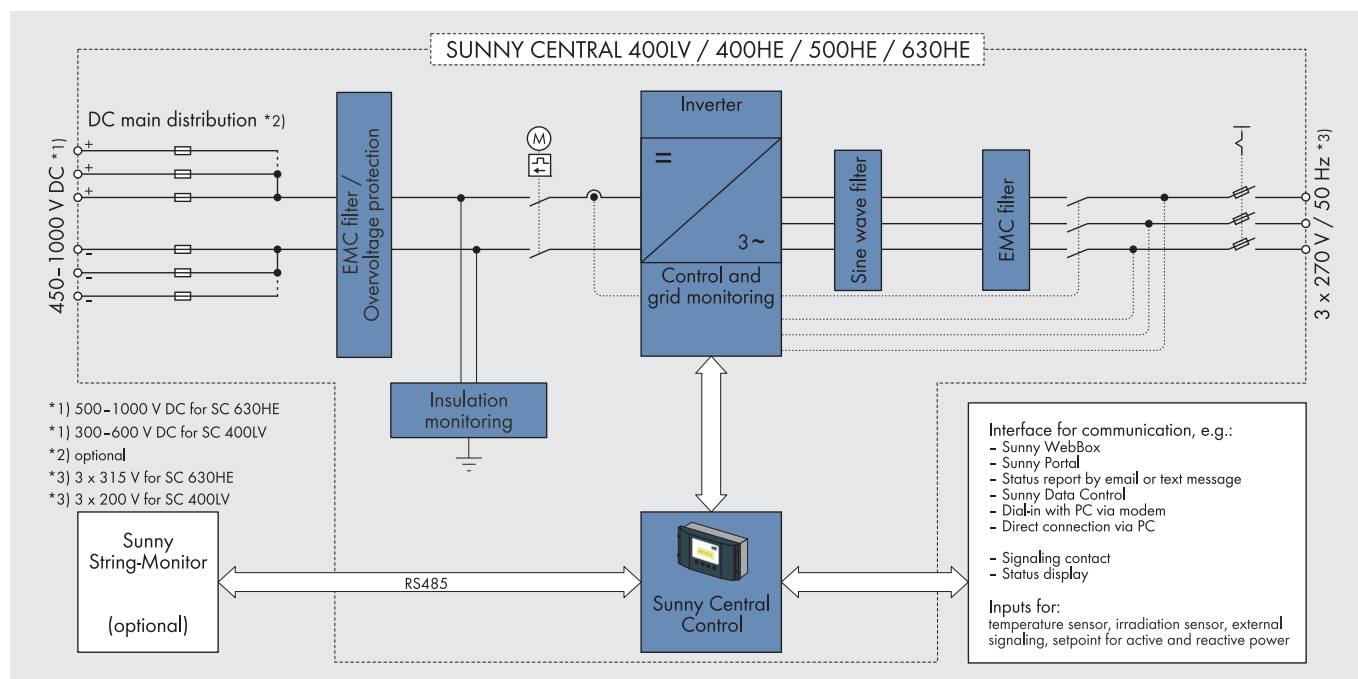


	Sunny Central 400LV	Sunny Central 400HE	Sunny Central 500HE	Sunny Central 630HE
<b>Features</b>				
Display (SCC)	Yes	Yes	Yes	Yes
Ground fault monitoring	Yes	Yes	Yes	Yes
Heating	Yes	Yes	Yes	Yes
Emergency stop	Yes	Yes	Yes	Yes
Power switch AC side	Fuse switch disconnector	Fuse switch disconnector	Fuse 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
<b>Standards</b>				
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
<b>Protection rating and ambient conditions</b>				
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)	-4 °F to 122 °F	-4 °F to 122 °F	-4 °F to 122 °F	-4 °F to 122 °F
Relative humidity, non condensing (U <sub>AIR</sub> )	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 <sub>AIR</sub> )	6200 m <sup>3</sup> /h	6200 m <sup>3</sup> /h	6200 m <sup>3</sup> /h	6200 m <sup>3</sup> /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  $U_{ACN} \pm 5\%$  and  $\cos \varphi = 1$
- 6)  $P_{rom}$  at  $U_{ACN} \pm 5\%$  and  $\cos \varphi = 1$
- 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, creating a Sunny Central 1250MV station comprised of two Sunny Central 630HE inverters. The advantage: by removing the need for low-voltage transformers, the efficiency is increased and 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.

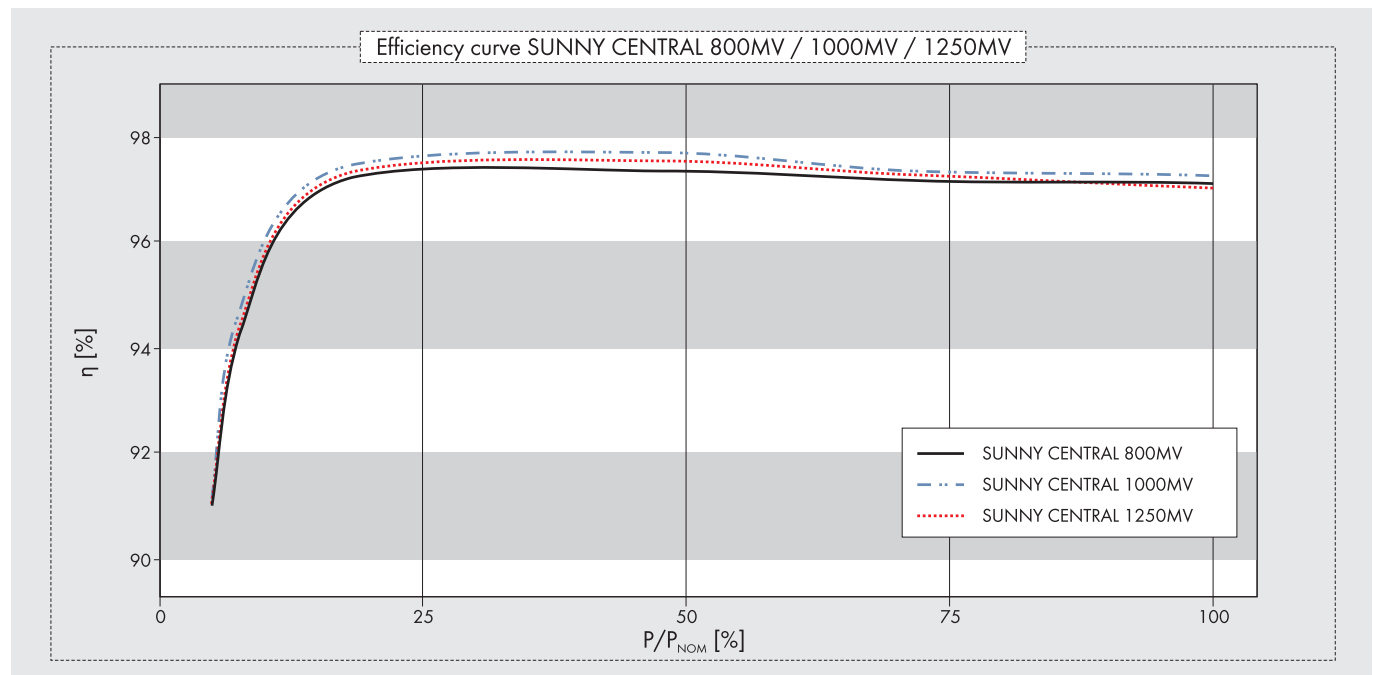




# Technical Data

## 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 <sub>PV</sub> )	900 kW <sub>P</sub> <sup>1)</sup>	1120 kW <sub>P</sub> <sup>1)</sup>	1410 kW <sub>P</sub> <sup>1)</sup>
DC voltage range, MPPT (U <sub>DC</sub> )	450 V – 820 V <sup>5)</sup>	450 V – 820 V <sup>5)</sup>	500 V – 820 V <sup>5)</sup>
Max. permissible DC voltage (U <sub>DC, max</sub> )	1000 V	1000 V	1000 V
Max. permissible DC current (I <sub>DC, max</sub> )	2000 A	2400 A	2700 A
Voltage ripple, PV voltage (U <sub>PP</sub> )	< 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 <sub>AC</sub> )	800 kW <sup>6)</sup>	1000 kW <sup>6)</sup>	1250 kW <sup>6)</sup>
Operating grid voltage ± 10% (U <sub>AC</sub> )	20 kV	20 kV	20 kV
Nominal AC current (I <sub>AC, nom</sub> )	23.2 A	28.8 A	36.1 A
Operating range, grid frequency (f <sub>AC</sub> )	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 <sup>2)</sup>			
Max. efficiency PAC, max (η)	97.7%	97.9%	97.8%
Euro-Eta (η)	97.3%	97.5%	97.4%
Dimensions and Weight			
Width / Height / Depth in inches (W / H / D)	212.6 / 142.5 / 118.1	212.6 / 142.5 / 118.1	212.6 / 142.5 / 118.1
Weight approx. (tons)	38.6	38.6	38.6
Power consumption			
Internal consumption in operation (P <sub>day</sub> )	< 5600 W <sup>4)</sup>	< 5800 W <sup>4)</sup>	< 6000 W <sup>4)</sup>
Internal consumption in Standby (P <sub>night</sub> )	< 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 <sub>in</sub> <sup>3)</sup>	2 x PT 100, 6 x A <sub>in</sub> <sup>3)</sup>	2 x PT 100, 6 x A <sub>in</sub> <sup>3)</sup>
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

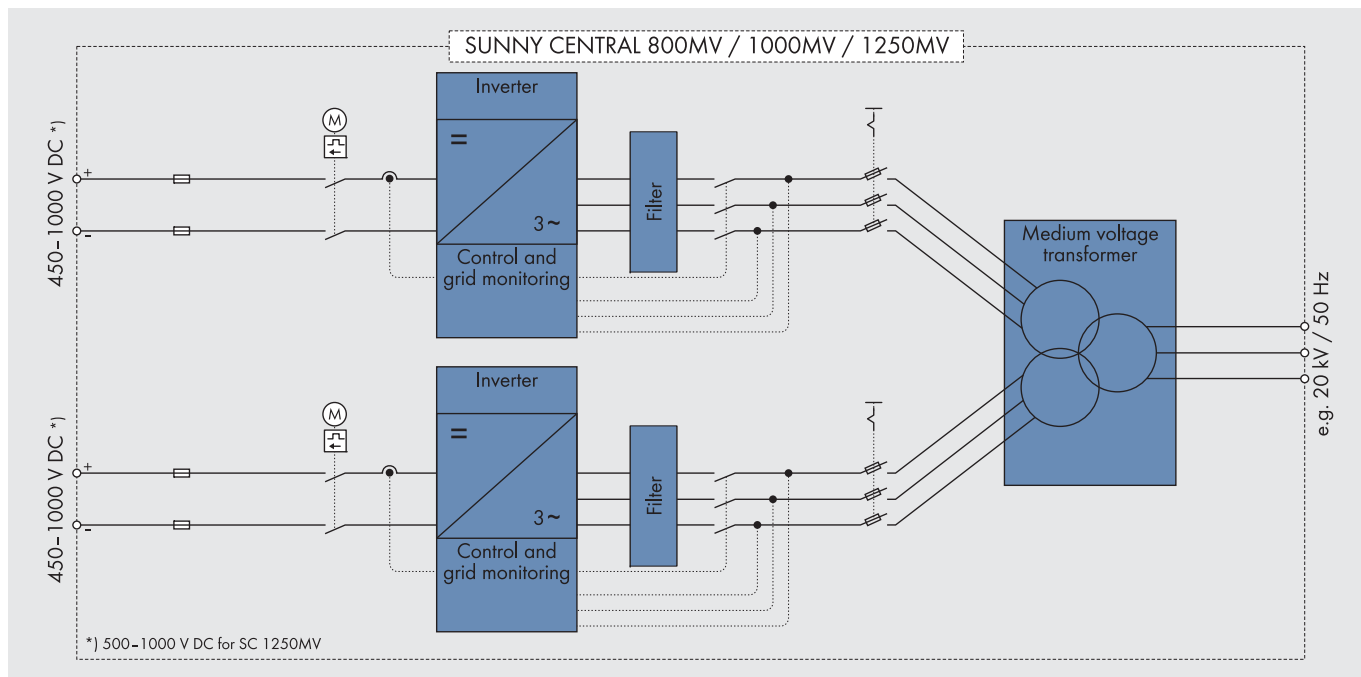


	Sunny Central 800MV	Sunny Central 1000MV	Sunny Central 1250MV
<b>Features</b>			
Display (SCC)	Yes	Yes	Yes
Ground fault monitoring	Yes	Yes	Yes
Heating	Yes	Yes	Yes
Emergency stop	Yes	Yes	Yes
Power switch AC side	Fuse switch disconnect <sup>7)</sup>	Fuse switch disconnect <sup>7)</sup>	Fuse switch disconnect <sup>7)</sup>
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 <sup>7)</sup> / Yes	Yes <sup>7)</sup> / Yes	Yes <sup>7)</sup> / Yes
Monitored overvoltage protectors for aux. supply	Yes	Yes	Yes
<b>Standards</b>			
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
<b>Protection rating and ambient conditions</b>			
Protection rating as per EN 60529	IP54	IP54	IP54
Protection rating per EN 60721-3-4	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
Ambient conditions: fixed location, without protection against wind and weather			
Permissible ambient temperatures (T)	-4 °F to 113 °F	-4 °F to 113 °F	-4 °F to 113 °F
Relative humidity, non condensing (U <sub>AIR</sub> )	15% ... 95%	15% ... 95%	15% ... 95%
Max. altitude (above sea level)	1000 m	1000 m	1000 m
Fresh air consumption (V <sub>AIR</sub> )	12400 m <sup>3</sup> /h	12400 m <sup>3</sup> /h	12400 m <sup>3</sup> /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  $U_{ACN} \pm 5\%$  and  $\cos \varphi = 1$
- 6)  $P_{rom}$  at  $U_{ACN} \pm 5\%$  and  $\cos \varphi = 1$
- 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

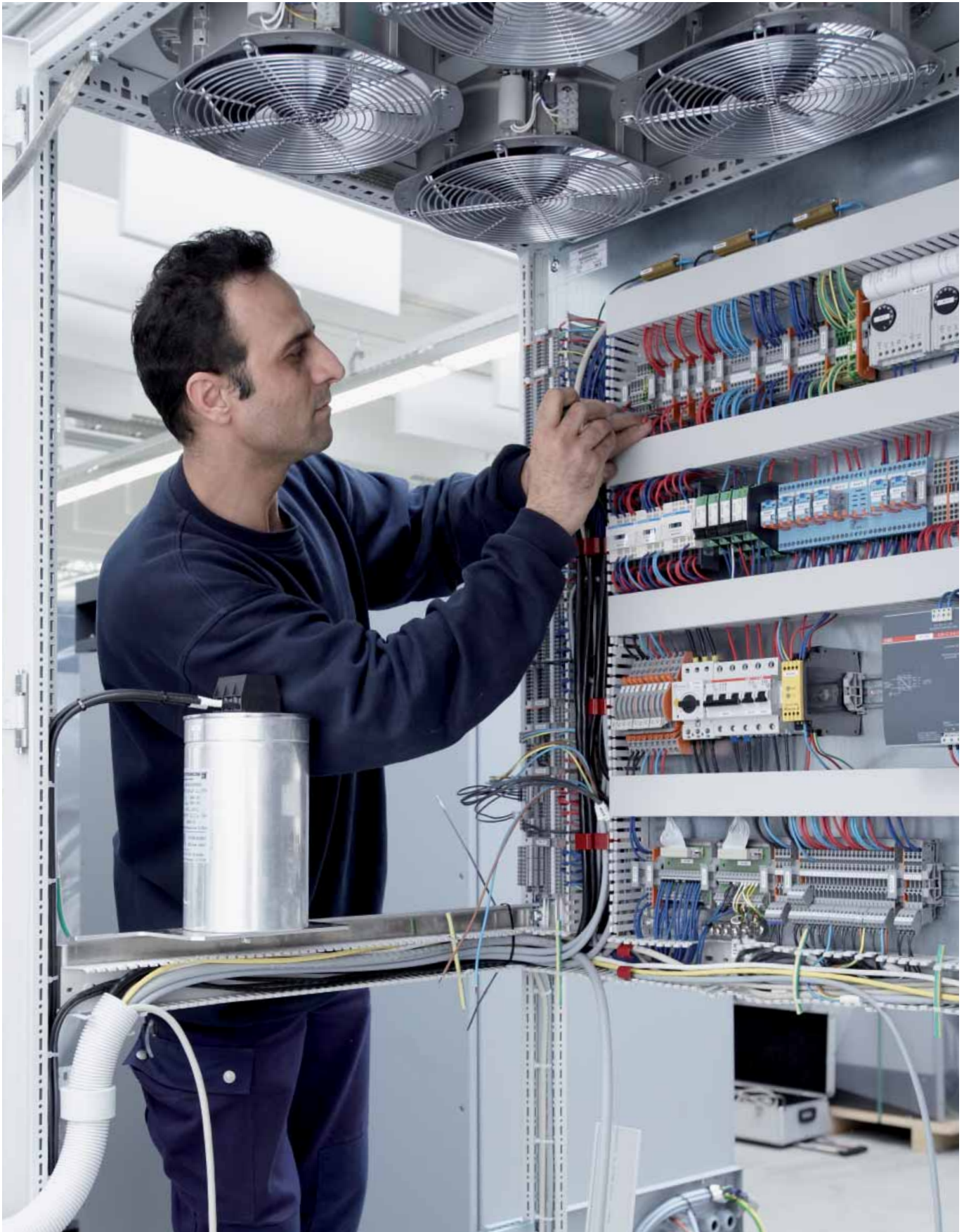
#### Optional

- 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

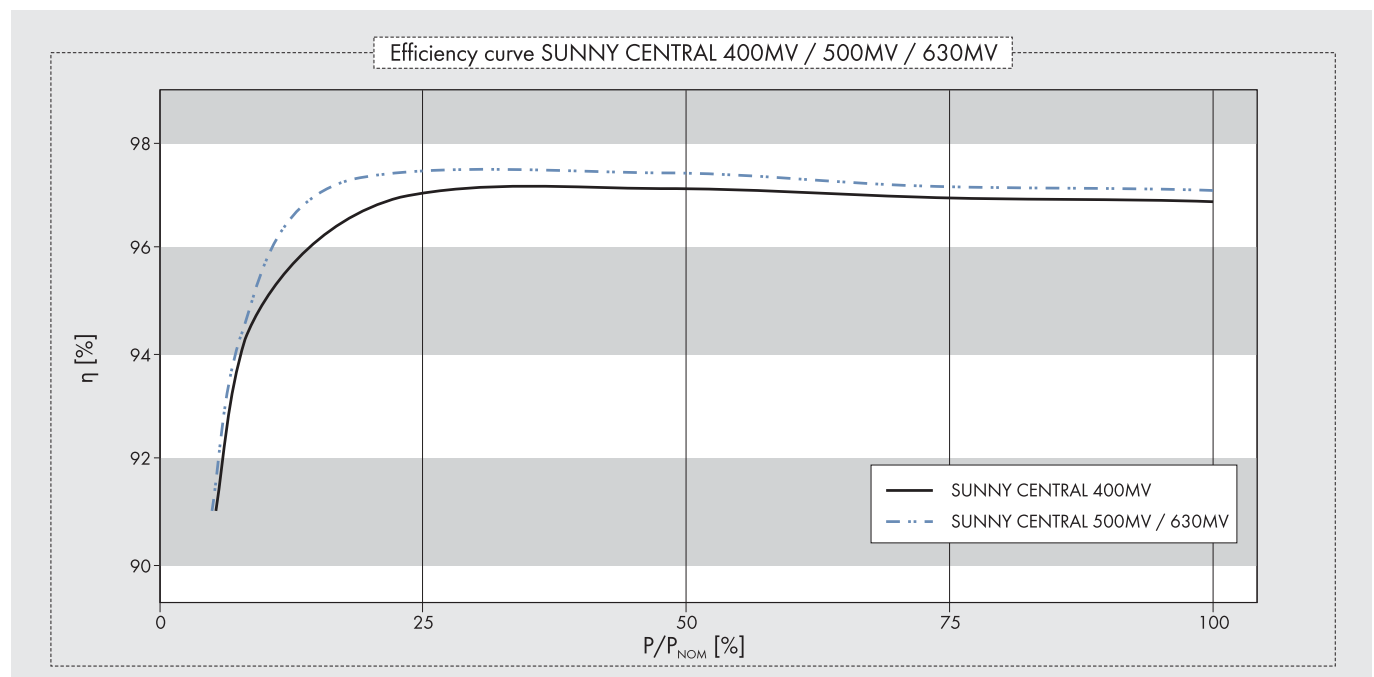
The station has got it: equipped with an SMA central inverter of the new HE family and a medium-voltage transformer, the Sunny Central MV feeds directly into the medium-voltage grid. The advantage: by removing the need for the low-voltage transformer the system operator realizes greater yields and lowers 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, fulfilling 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 <sub>PV</sub> )	450 kW <sub>p</sub>	560 kW <sub>p</sub> <sup>1)</sup>	705 kW <sub>p</sub> <sup>1)</sup>
DC voltage range, MPPT (U <sub>DC</sub> )	450 V – 820 V <sup>5)</sup>	450 V – 820 V <sup>5)</sup>	500 V – 820 V <sup>5)</sup>
Max. permissible DC voltage (U <sub>DC, max</sub> )	1000 V	1000 V	1000 V
Max. permissible DC current (IDC, max)	1000 A	1200 A	1350 A
Voltage ripple, PV voltage (U <sub>pp</sub> )	< 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 <sub>AC</sub> )	400 kW <sup>6)</sup>	500 kW <sup>6)</sup>	630 kW <sup>6)</sup>
Operating grid voltage ± 10% (U <sub>AC</sub> )	20 kV	20 kV	20 kV
Nominal AC current (I <sub>AC, nom</sub> )	11.6 A	14.4 A	18.2 A
Operating range, grid frequency (f <sub>AC</sub> )	50 Hz – 60 Hz	50 Hz – 60 Hz	50 Hz – 60 Hz
Distortion of the grid current (K <sub>IAC</sub> )	< 3% at nominal power	< 3% at nominal power	< 3% at nominal power
Phase shift (cos φ)	0.95 leading ... 0.95 lagging		
Efficiency <sup>2)</sup>			
Maximum efficiency P <sub>AC, max</sub> (η)	97.5%	97.7%	97.8%
Euro-Eta (η)	97.1%	97.3%	97.4%
Dimensions and Weight			
Width / Height / Depth in inches (W / H / D) with switching system	208.7 / 141.7 / 98.4	208.7 / 141.7 / 98.4	208.7 / 141.7 / 98.4
Width / Height / Depth in inches (W / H / D) without switching system	189.0 / 141.7 / 98.4	189.0 / 141.7 / 98.4	189.0 / 141.7 / 98.4
Weight approx. (tons)	33	33	33
Power consumption			
Internal consumption in operation (P <sub>day</sub> )	< 2800 W <sup>4)</sup>	< 2900 W <sup>4)</sup>	< 3000 W <sup>4)</sup>
Internal consumption in Standby (P <sub>night</sub> )	< 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 <sub>in</sub> <sup>3)</sup>	1 x PT 100, 3 x A <sub>in</sub> <sup>3)</sup>	1 x PT 100, 3 x A <sub>in</sub> <sup>3)</sup>
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

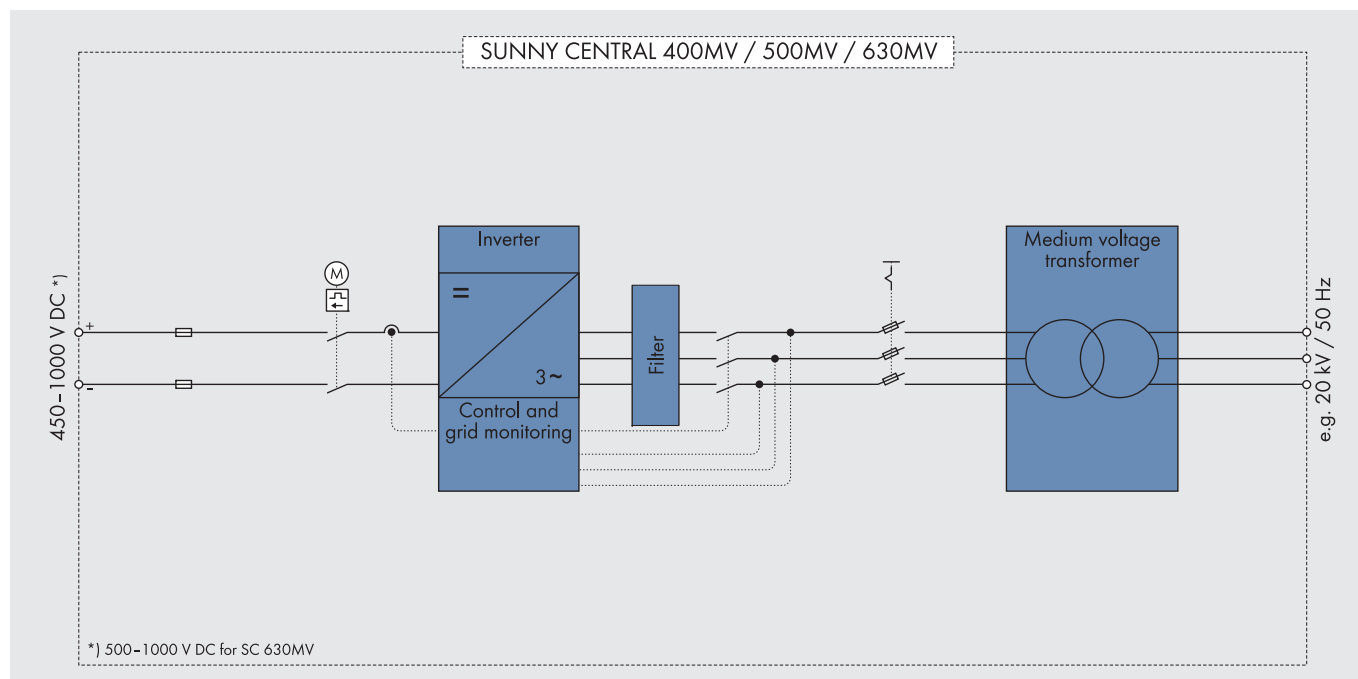


	Sunny Central 400MV	Sunny Central 500MV	Sunny Central 630MV
<b>Features</b>			
Display (SCC)	Yes	Yes	Yes
Ground fault monitoring	Yes	Yes	Yes
Heating	Yes	Yes	Yes
Emergency stop	Yes	Yes	Yes
Power switch AC side	Fuse switch disconnect <sup>7)</sup>	Fuse switch disconnect <sup>7)</sup>	Fuse switch disconnect <sup>7)</sup>
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 <sup>7)</sup> / Yes	Yes <sup>7)</sup> / Yes	Yes <sup>7)</sup> / Yes
Monitored overvoltage protectors for aux. supply	Yes	Yes	Yes
<b>Standards</b>			
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
<b>Protection rating and ambient conditions</b>			
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)	-4 °F to 113 °F	-4 °F to 113 °F	-4 °F to 113 °F
Relative humidity, non condensing (U <sub>AIR</sub> )	15% ...95%	15% ...95%	15% ...95%
Max. altitude (above sea level)	1000 m	1000 m	1000 m
Fresh air consumption (V <sub>AIR</sub> )	6200 m <sup>3</sup> /h	6200 m <sup>3</sup> /h	6200 m <sup>3</sup> /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  $U_{DC} = 500\text{ V}$
- 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  $U_{ACN} \pm 5\%$  and  $\cos \varphi = 1$
- 6)  $P_{rom}$  at  $U_{ACN} \pm 5\%$  and  $\cos \varphi = 1$
- 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  
–4 °F to 122 °F
- Compact dimensions – easier installation

#### Efficient

- 97.6% peak efficiency

#### Reliable

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

#### Optional

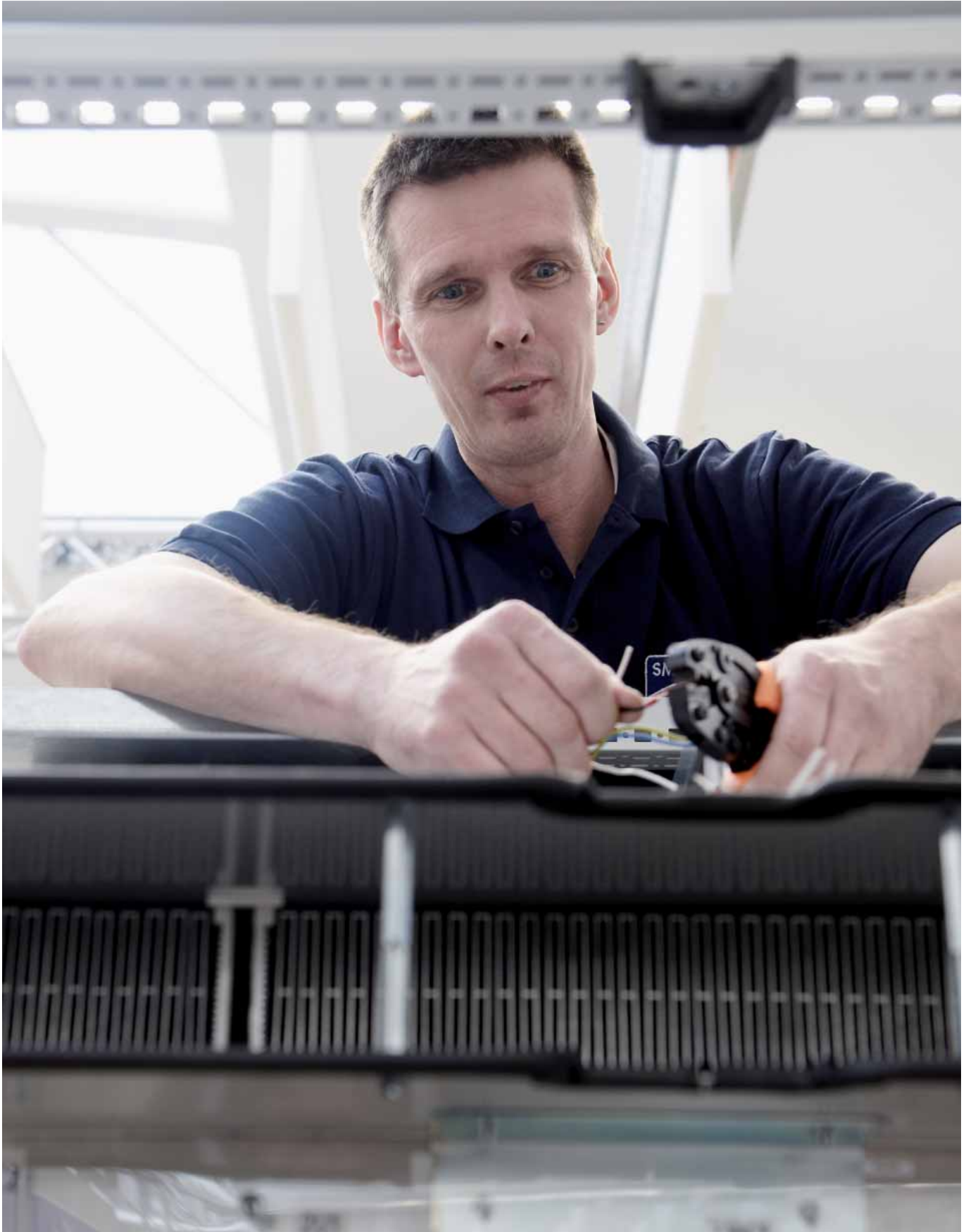
- String monitoring
- DC input voltage range up to 1000 V
- Operation with grounded PV generators

## 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 looks the same; however, with its special cooling concept, it is designed for indoor use.

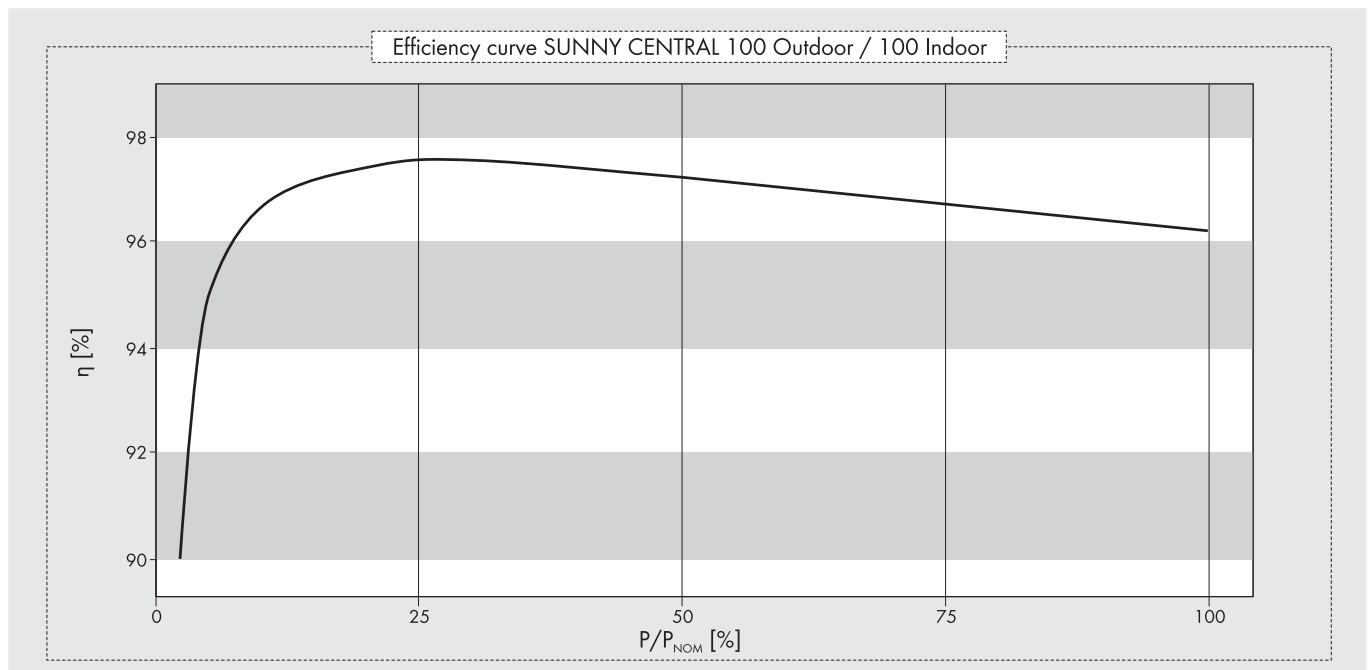




# Technical Data

## SUNNY CENTRAL 100 Outdoor / 100 Indoor

	Sunny Central 100 Outdoor / HE*	Sunny Central 100 Indoor / HE*
<b>Input data</b>		
Nominal power DC	105 kW / 103 kW*	105 kW / 103 kW*
Max. PV power (recommended), ( $P_{PV}$ )	115 kWp <sup>1)</sup>	115 kWp <sup>1)</sup>
DC voltage range, MPPT ( $U_{DC}$ )	450 V – 820 V <sup>5)</sup>	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
<b>Output data</b>		
Nominal AC output power ( $P_{AC}$ )	100 kW	100 kW
Operating grid voltage $\pm 10\%$ ( $U_{AC}$ )	400 V / 300 V* <sup>6)</sup>	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 ( $\cos \phi$ )	$\geq 0.99$ at nominal power	$\geq 0.99$ at nominal power
<b>Efficiency <sup>2)</sup></b>		
Max. efficiency $P_{AC, nom}$ ( $\eta$ )	97.6% / 98.5%*	97.6% / 98.5%*
Euro-Eta ( $\eta$ )	97.0% / 98.3%*	97.0% / 98.3%*
<b>Dimensions and Weight</b>		
Width / Height / Depth in inches (W / H / D)	50.4 / 72.2 / 32.7	50.4 / 72.2 / 32.7
Weight approx. (lbs)	2039 / 1113*	2039 / 1113*
<b>Power consumption</b>		
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
<b>SCC (Sunny Central Control) interfaces</b>		
Communication (NET Piggy-Back, optional)	Analog, ISDN, Ethernet	Analog, ISDN, Ethernet
Analog inputs	Optional 1 x PT 100, 2 x $A_{in}$ <sup>3)</sup>	Optional 1 x PT 100, 2 x $A_{in}$ <sup>3)</sup>
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*
<b>Features</b>		
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
<b>Standards</b>		
EMC	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
CE conformity	Yes	Yes
<b>Protection rating and ambient conditions</b>		
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	1. Classification of • chem. active substances: 4C1 • mech. active substances: 4S2	2. Classification of • chem. active substances: 3C1L • mech. active substances: 3S2
2. Protection rating per EN 60721-3-3, ambient conditions: fixed location, with protection against wind and weather		
Permissible ambient temperatures (T)	-4 °F to 122 °F <sup>4)</sup>	-4 °F to 122 °F <sup>4)</sup>
Relative humidity, non condensing (U <sub>AIR</sub> )	15% ... 95%	15% ... 95%
Max. altitude (above sea level)	1000 m	1000 m
Fresh air consumption (V <sub>AIR</sub> )	2300 m <sup>3</sup> /h	2300 m <sup>3</sup> /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 U<sub>DC</sub> = 500 V

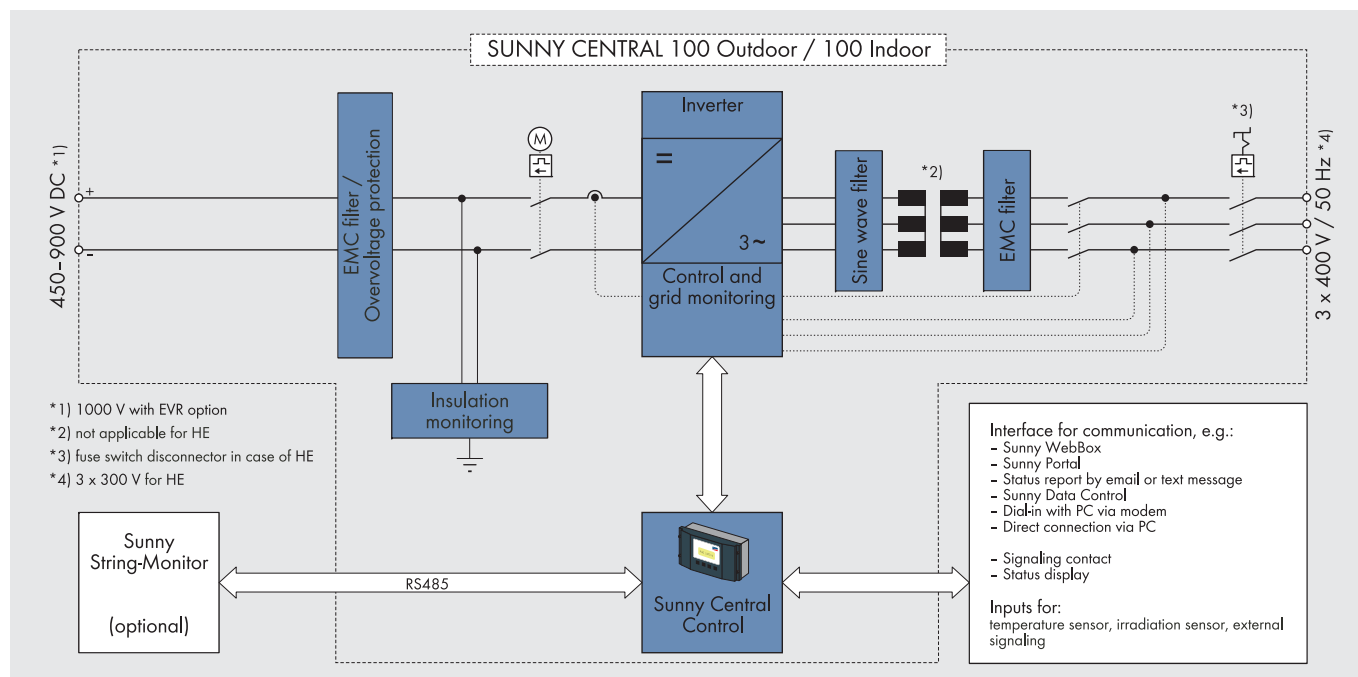
3) Terminal for an analog sensor provided by the customer in two-wire and four-wire version

4) Complies with nominal values up to an ambient temperature of 104 °F, at an ambient temperature of 122 °F the nominal values are held for two hours.

5) U<sub>DC min</sub> at U<sub>ACN</sub> ±5% and cos φ = 1

6) P<sub>nom</sub> at U<sub>ACN</sub> ±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

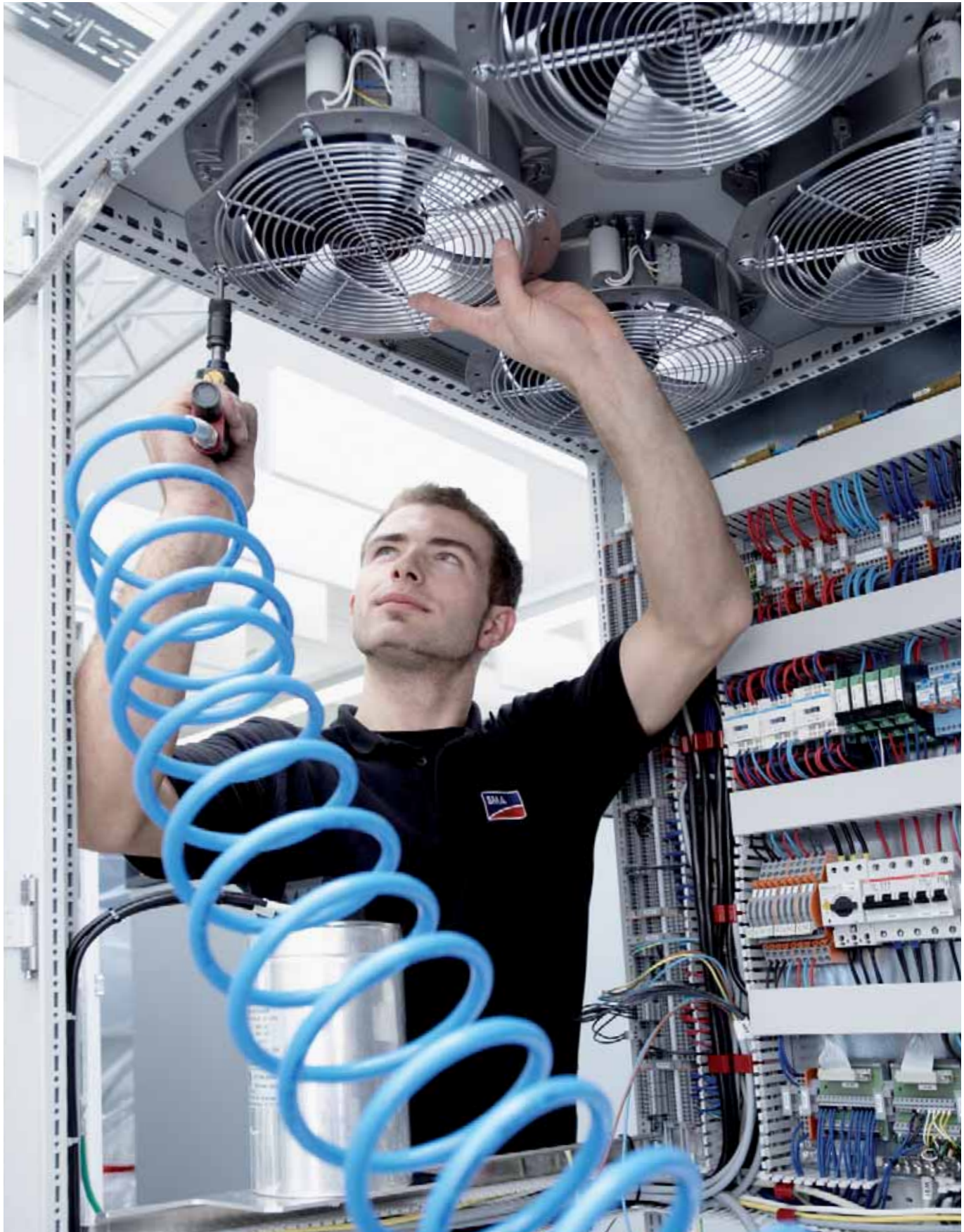
#### Optional

- 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

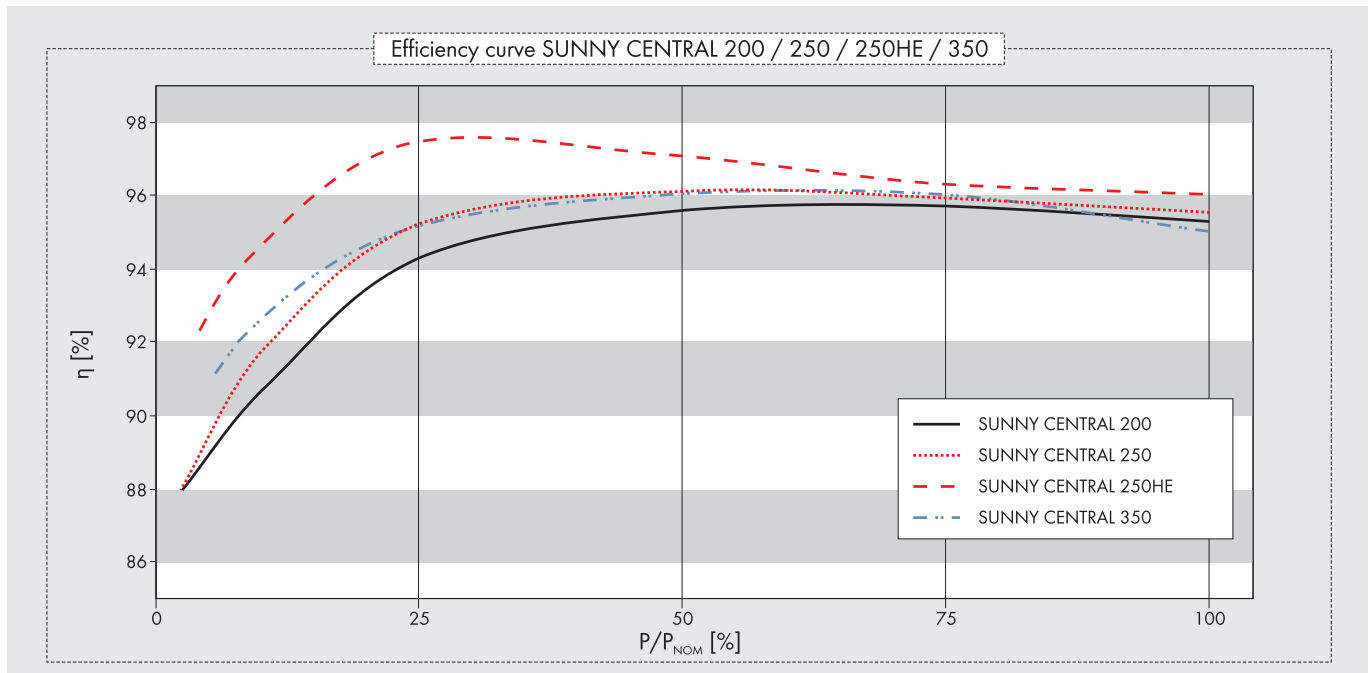
First choice for usage in medium-sized and large-scale PV power plants: with the Sunny Central 200, 250 and 350, system operators can realize very good solar yields, especially in large ground-mounted systems or very large roof systems with a homogeneous structure. The central inverters have five, eight 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
<b>Input data</b>				
Nominal power DC	210 kW	262 kW	261 kW	369 kW
Max. PV power (recommended), ( $P_{PV}$ )	230 kW <sub>p</sub> <sup>1)</sup>	290 kW <sub>p</sub> <sup>1)</sup>	285 kW <sub>p</sub> <sup>1)</sup>	405 kW <sub>p</sub> <sup>1)</sup>
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
<b>Output data</b>				
Nominal AC output power ( $P_{AC}$ )	200 kW	250 kW	250 kW	350 kW
Operating grid voltage $\pm$ 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 ( $\cos \phi$ )	$\geq 0.99$ at nominal power	$\geq 0.99$ at nominal power	$\geq 0.99$ at nominal power	$\geq 0.99$ at nominal power
<b>Efficiency <sup>2)</sup></b>				
Maximum efficiency $P_{AC, max}$ ( $\eta$ )	95.7%	96.1%	97.5%	96.0%
Euro-Eta ( $\eta$ )	94.5%	95.2%	96.7%	95.2%
<b>Dimensions and Weight</b>				
Width / Height / Depth in inches (W / H / D) <sup>4)</sup>	31.5 + 47.2 / 83.5 / 33.5	47.2 + 47.2 / 83.5 / 33.5	47.2 + 47.2 / 83.5 / 33.5	63.0 + 47.2 / 83.5 / 33.5
Weight approx.	3527 lbs	4542 lbs	2359 lbs	6173 lbs
<b>Power consumption</b>				
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
<b>SCC (Sunny Central Control) interfaces</b>				
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 $A_{in}$ <sup>3)</sup>	1 x PT 100, 2 x $A_{in}$ <sup>3)</sup>	1 x PT 100, 2 x $A_{in}$ <sup>3)</sup>	1 x PT 100, 2 x $A_{in}$ <sup>3)</sup>
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

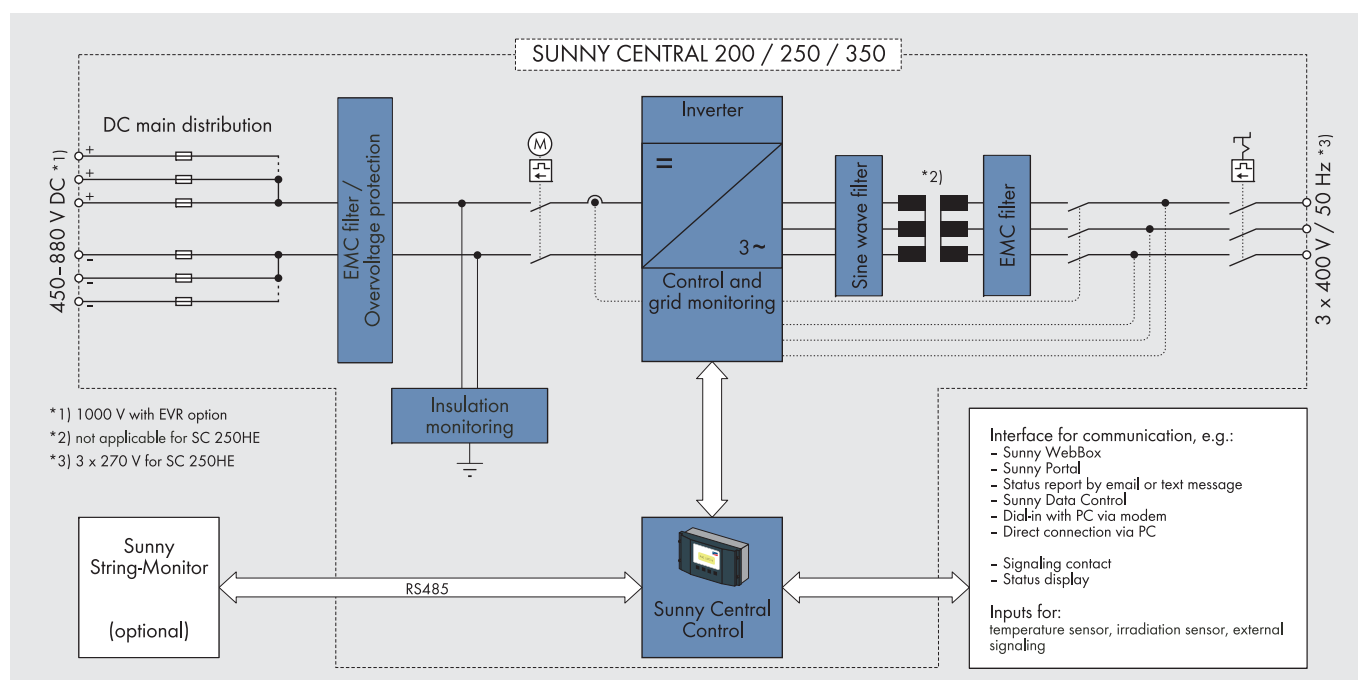




	Sunny Central 200	Sunny Central 250	Sunny Central 250HE	Sunny Central 350
<b>Features</b>				
Display (SCC)	Yes	Yes	Yes	Yes
Ground fault monitoring	Yes	Yes	Yes	Yes
Heating	Yes	Yes	Yes	Yes
Emergency stop	Yes	Yes	Yes	Yes
Power switch AC side	Yes	Yes	Fuse load disconnect	Yes
Power switch DC side	Motor-driven	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)
<b>Standards</b>				
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
<b>Protection rating and ambient conditions</b>				
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)	-4 °F to 113 °F	-4 °F to 113 °F	-4 °F to 113 °F	-4 °F to 113 °F
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 m <sup>3</sup> /h	4200 m <sup>3</sup> /h	3500 m <sup>3</sup> /h	6500 m <sup>3</sup> /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 8.3 in
- 5)  $U_{DC\ min}$  at  $U_{ACN} \pm 5\%$  and  $\cos \varphi = 1$
- 6)  $P_{nom}$  at  $U_{ACN} \pm 5\%$  and  $\cos \varphi = 1$

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





#### Flexible

- UL 1741 / IEEE-1547 certified\*\*
- Suitable for indoor and outdoor installation

#### Efficient

- 98% CEC efficiency\*
- Nominal power operation to 113 °F

#### Reliable

- Sunny WebBox, Modbus® & OPC compatible
- Optional combiner boxes with string monitoring

- Optional DC & AC disconnects
- Graphical LCD interface

## SUNNY CENTRAL 500HE-US

The ideal inverters for large scale PV power systems

The new Sunny Central 500HE-US couples to an external medium voltage transformer to accommodate long distance power feeds to distribution substations and delivers the highest efficiency available for large PV inverters. An updated user interface features a large LCD that provides a graphical view of the daily plant production as well as the status of the inverter and the utility grid. With the optional Sunny WebBox, users can now choose from either RS485 or Ethernet based communications. Designed for easy installation, operation and performance monitoring, the new SC 500HE-US is the ideal choice for your large scale PV project.

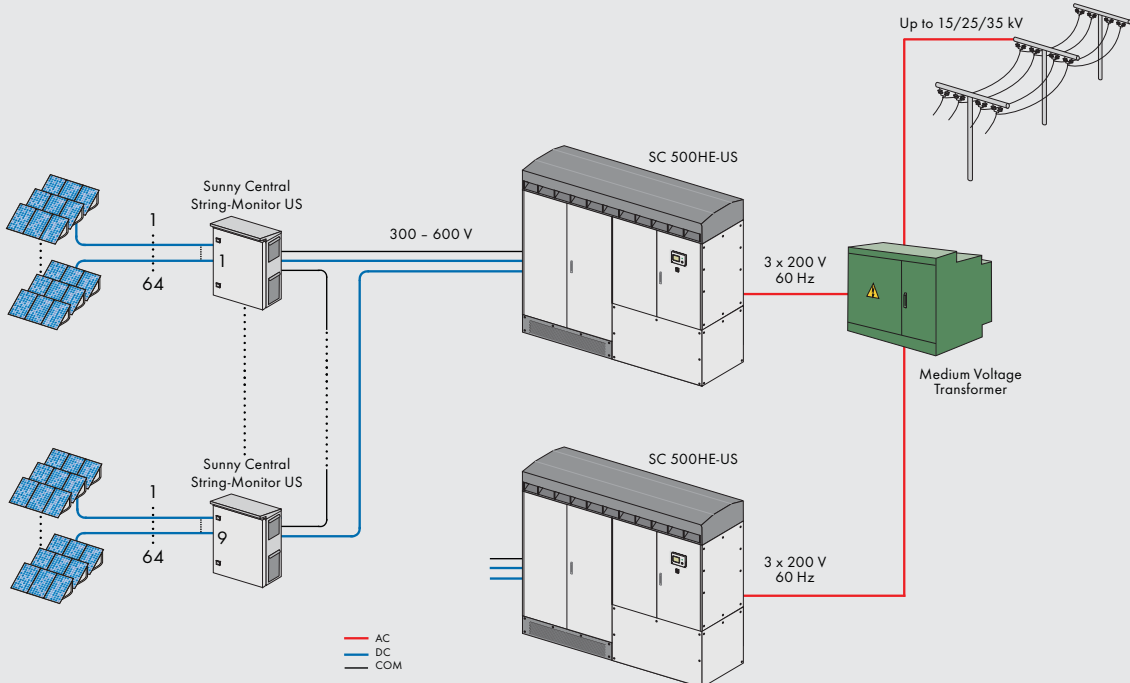
\* Preliminary data

\*\* Pending

## Technical Data

	Sunny Central 500HE-US
Inverter Technology	True sine wave, high frequency PWM
AC Power Output	500 kW
AC Voltage	200 V (range 180 – 220 V)
AC Frequency	60 Hz
Current THD	< 5%
Power Factor at Nominal Power	> 0.99
AC Output Current Limit	1470 A at 200 V
DC Input Voltage Range	300 – 600 V <sub>DC</sub>
MPP Tracking	330 – 600 V <sub>DC</sub>
PV Start Voltage (Configurable from 300 – 600 V <sub>DC</sub> )	300 V <sub>DC</sub>
Maximum DC Current	1600 A <sub>DC</sub>
Peak Efficiency*	98.6%
CEC Weighted Efficiency*	98.0%
Power Consumption	<110 W Standby, <1600 W with fans
Ambient Operating Temperature	-13 to 113 °F at full power output up to 122 °F at reduced power
Cooling	Variable-speed forced air (temperature controlled)
Enclosure	NEMA 3R
Dimensions: W x H x D in inches	98 x 90 x 35
Weight	3970 lbs
Certification**	UL 1741, IEEE-1547
*Preliminary data	
**Pending	
Type designation	SC 500HE-US

## Sample System Diagram







#### 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 113 °F

#### Reliable

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

- Easy remote querying using remote access

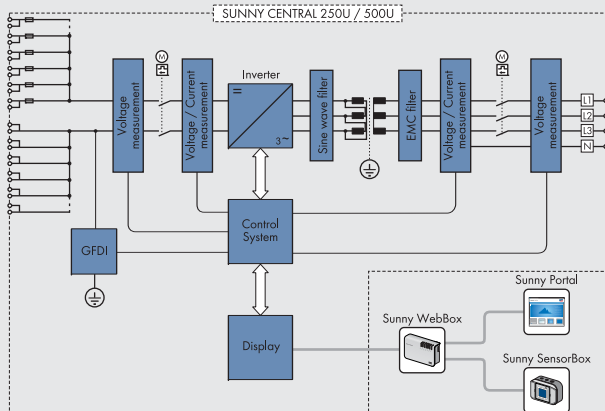
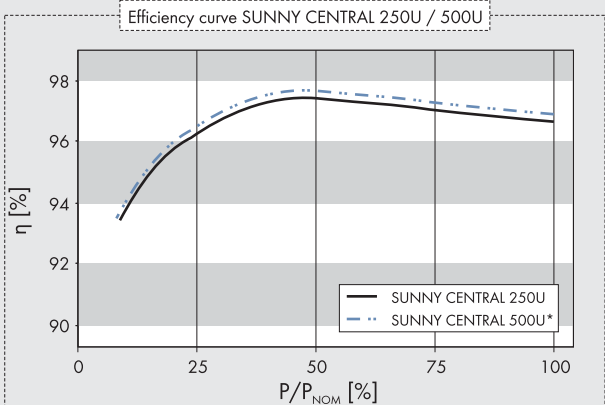
## SUNNY CENTRAL 250U / 500U

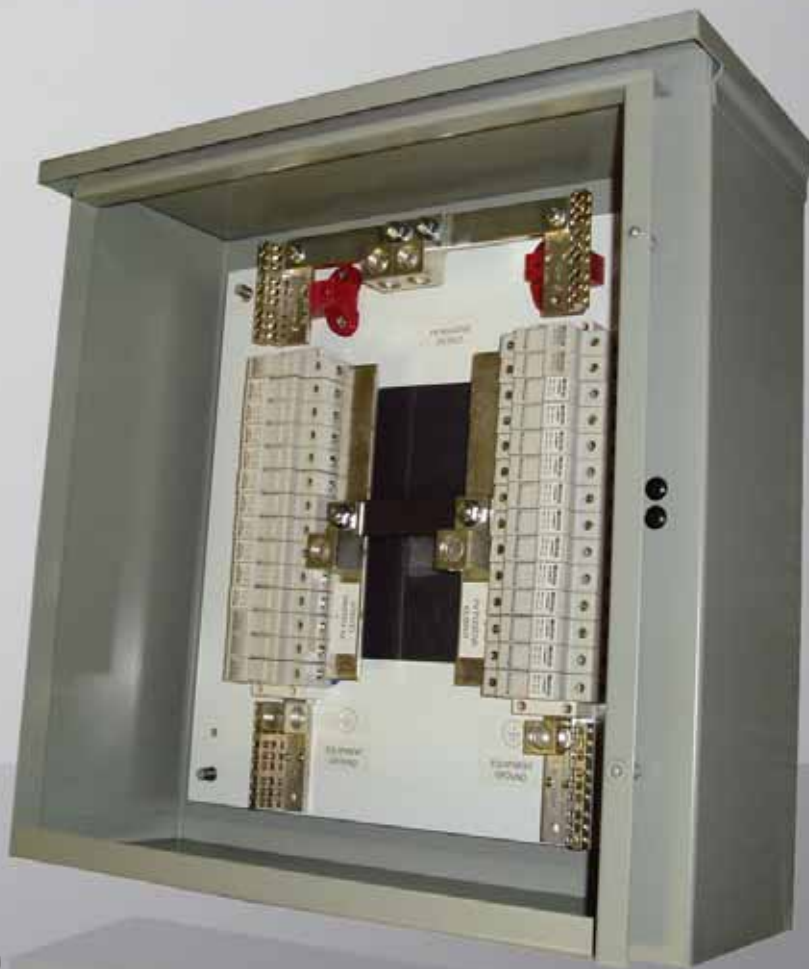
The ideal inverters for large scale PV power systems

The new Sunny Centrals have integrated isolation transformers and deliver the highest efficiencies available for large PV inverters. A completely updated user interface features a large LCD that provides a graphical view of the daily plant production as well as the status of the inverter and the utility grid. With the optional Sunny WebBox, users can now choose from either RS485 or Ethernet based communications. Designed for easy installation, operation and performance monitoring, the new Sunny Central is the ideal choice for your large scale PV project.

## Technical Data

	Sunny Central 250U	Sunny Central 500U
Input data		
Max. PV power (recommended)	295 kW	580 kW
DC voltage range MPPT	330 V – 600 V	330 V – 600 V
PV start voltage (Configurable from 300 – 600 V)	400 V	400 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 WYE / Δ*	480 V WYE / Δ
Nominal AC current	300 A (@ 480 V)	600 A (@ 480 V)
AC frequency (nominal)	60 Hz	60 Hz
Power factor	> 0.99	> 0.99
Harmonic distortion of grid current	< 5%	< 5%
Power consumption		
Internal consumption in operation	< 1000 W	< 1500 W
Internal consumption in Standby	< 69 W	< 69 W
Mechanics		
Width / height / depth (in)	110 / 80 / 33	140 / 80 / 37
Weight	4200 lbs	7165 lbs
Efficiency		
Peak efficiency	97.5%	97.4%
CEC weighted efficiency	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	-4 °F to 113 °F	-4 °F to 113 °F
Max. Temperature for <sub>P<sub>nom</sub></sub>	113 °F	113 °F
Enclosure	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 U	RS485	RS485
System monitoring	Sunny Portal	Sunny Portal
*Quarter 1, 2010		
Type designation	SC 250U	SC 500U





- Greatly simplifies input and output wiring
- Available in 6 to 52 circuit configurations

- Compact, rugged low cost design
- Reliable bus-work for efficient high current conductor combining

- PV positive wires all land directly on Touch Safe™ fuse holders
- Sturdy NEMA 3R/4 wall mount steel enclosure

- ETL listed to UL 1741

## SB/SC COMBINER BOXES

Simplify wiring for added convenience and safety

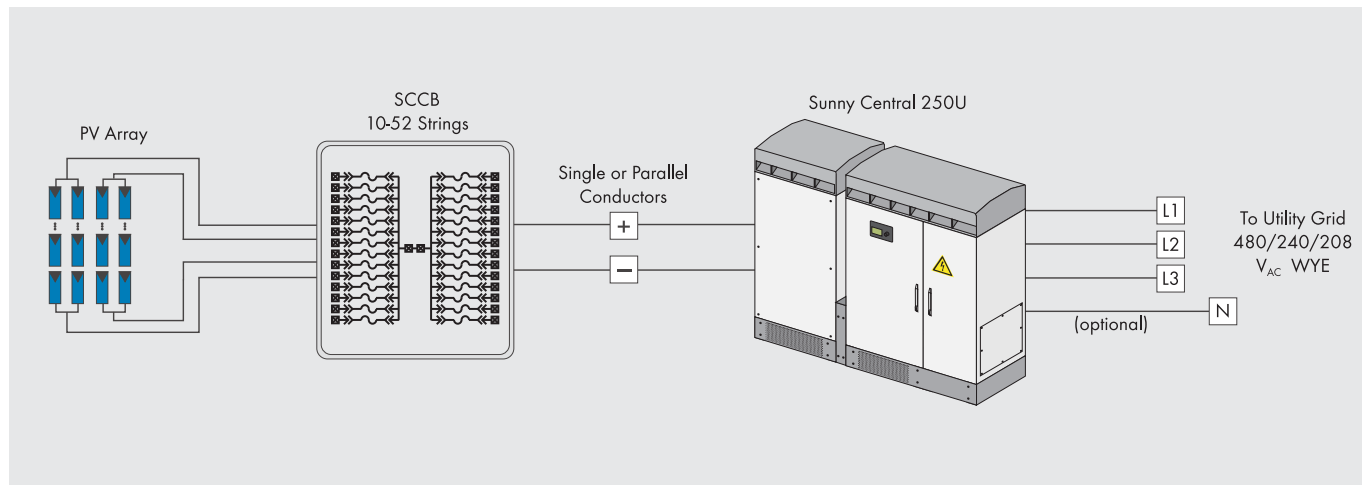
SMA America's SB/SC Combiner Boxes are available in sizes ranging from 6 to 52 PV inputs to provide greater flexibility and expandability in system design. Oversized bus-work adds high efficiency and dependability where it's needed most. The large NEMA 3R/4 enclosure provides ample room for conductors which reduces installation time. Designed with installers in mind, we know you'll find the SB/SC Combiner Boxes a welcome addition to our great line of inverter products.

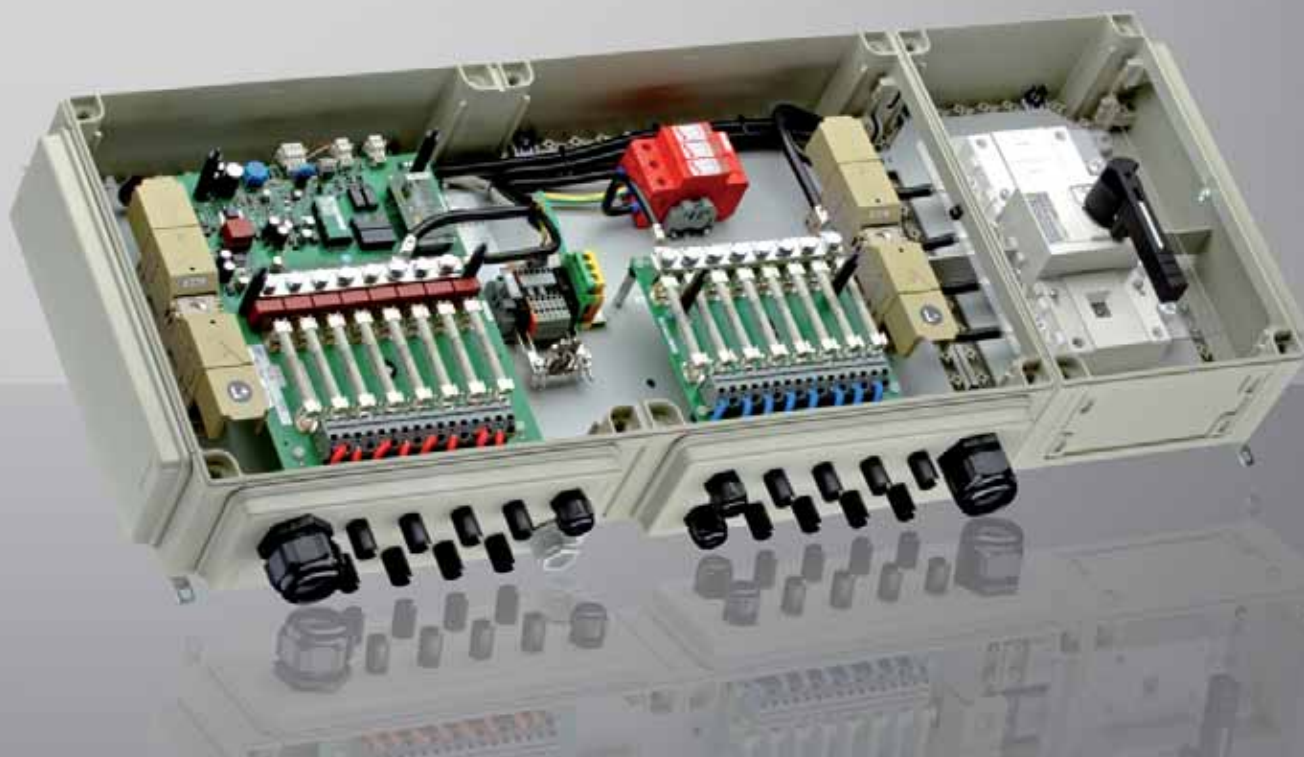
## Technical Data

[illegible]

Other sizes and designs available upon request.

\*Fusing available on positive or negative input, specify when ordering





#### 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

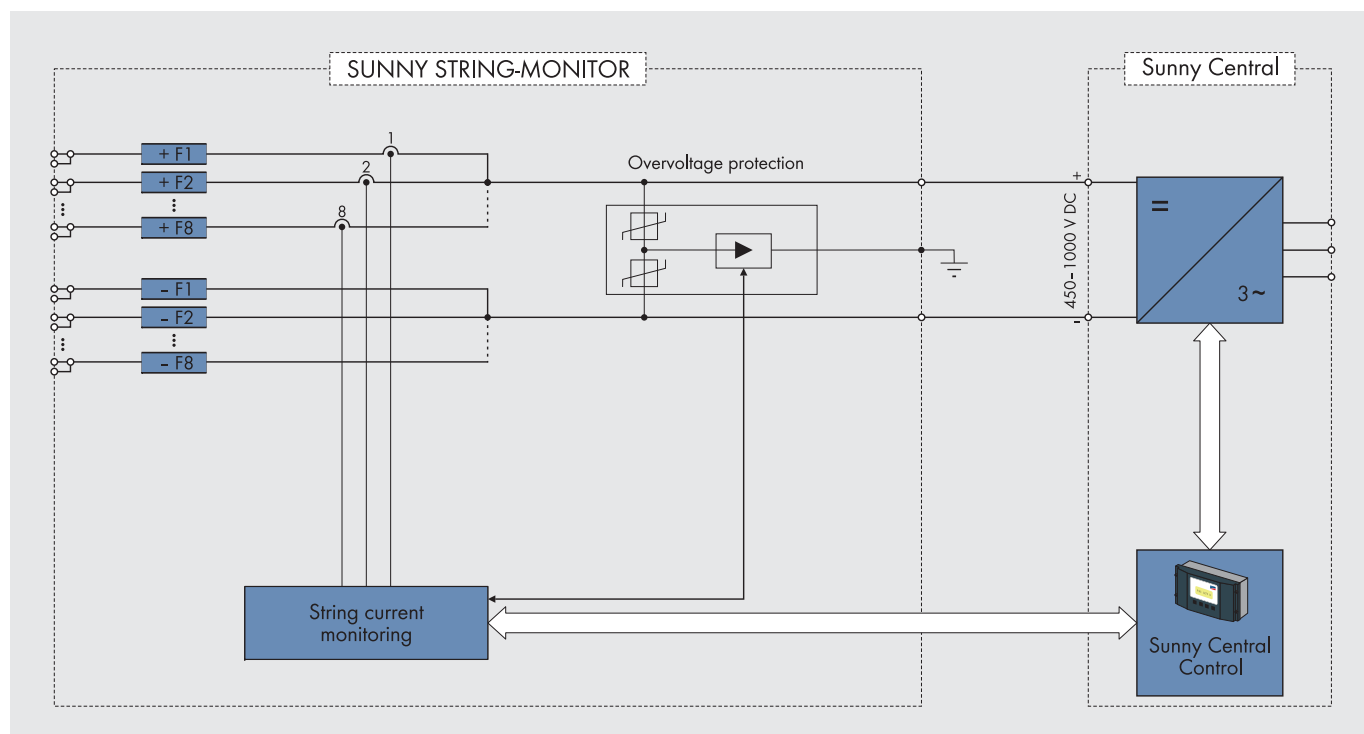
## SUNNY STRING-MONITOR SUNNY STRING-MONITOR CABINET

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
<b>Input data</b>		
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 *
<b>Communication</b>		
	RS485	RS485
<b>Protection rating</b>		
according to EN 60529	IP65	IP54
<b>Mechanical Data</b>		
Width / height / depth in inches	29.5 / 17.1 / 9.1	29.5 / 39.4 / 12.6
Weight	29 lbs	143 lbs
<b>Ambient conditions</b>		
Permissible ambient temperatures	-13 °F to 104 °F	-13 °F to 104 °F
Rel. humidity	15% ... 95%	15% ... 95%
<b>General Information</b>		
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 <sub>DC</sub> = 900 V		
Type designation	SSM	SSM-C





#### Efficient

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

#### Precise

- System monitoring as with Sunny Boy via string current monitoring
- DC distributor box with NEMA 3R 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 CENTRAL STRING-MONITOR US

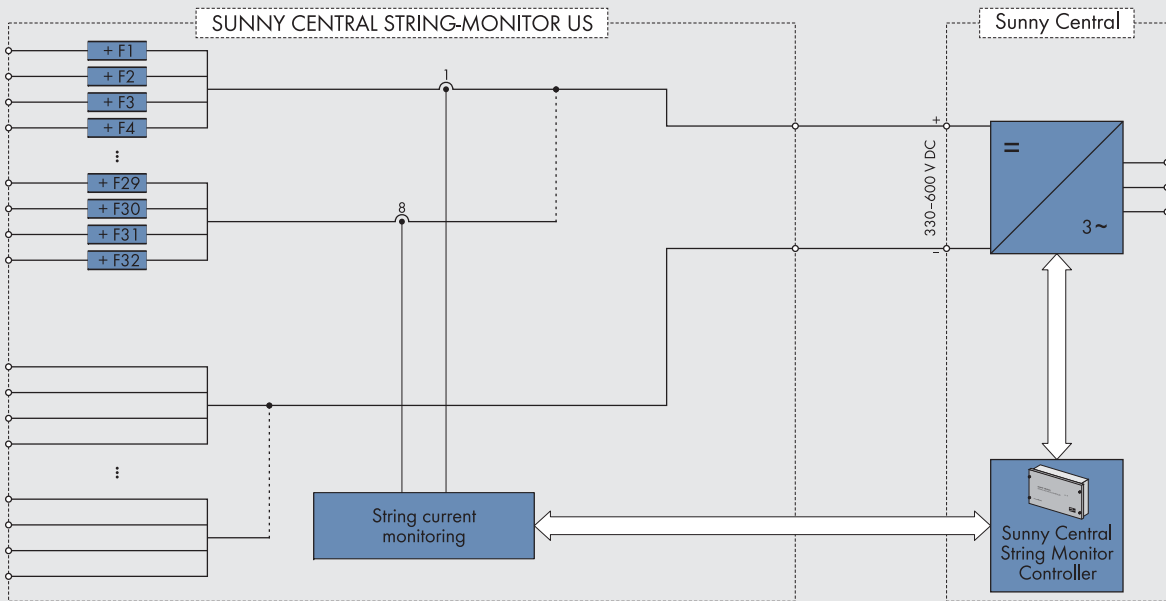
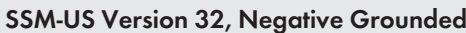
The U.S. insurance for even better solar yields

Detailed monitoring of the PV generator for the U.S.: the Sunny Central String-Monitor US. 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 Central String-Monitor US is delivered either in a housing for wall or tower mounting (protection rating NEMA 3R). For the measurement of the string currents, there are three variants of string fuse protection, all of which comply with the NEC standard, making the Sunny Central String-Monitor US well suited for use in the U.S. solar market.



## Technical Data

	Sunny Central String-Monitor US Version 24	Sunny Central String-Monitor US Version 32	Sunny Central String-Monitor US Version 64
<b>PV generator connection</b>			
Input voltage range	0 ... 600 V DC	0 ... 600 V DC	0 ... 600 V DC
Max fuse size (10 x 38 class CC fuses)	20 A, 600 V DC <sup>1)</sup>	15 A, 600 V DC <sup>1)</sup>	8 A, 600 V DC <sup>1)</sup>
Max. PV short-circuit current per string	12.8 A <sup>2)</sup>	9.6 A <sup>2)</sup>	5.1 A <sup>2)</sup>
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
<b>Sunny Central Connection</b>			
DC short-circuit current	480 A	480 A	512 A
Max. operating output current, A DC, continuous	308 A	308 A	328 A
Max. number of cables per output port	2	2	2
<b>Mechanical Data</b>			
Dimensions: W x H x D in inches	31.5 x 31.5 x 9.8	31.5 x 31.5 x 9.8	31.5 x 47.2 x 11.8
Weight	143 lbs	146 lbs	194 lbs
Protection rating	NEMA 3R	NEMA 3R	NEMA 3R
Housing material	Steel or Aluminum	Steel or Aluminum	Steel or Aluminum
<b>Ambient conditions</b>			
Permissible ambient temperatures	-13 °F to 113 °F	-13 °F to 113 °F	-13 °F to 113 °F
Rel. humidity	up to 95%, condensation possible	up to 95%, condensation possible	up to 95%, condensation possible
<b>Communication</b>			
Connection SSM-US	RS485	RS485	RS485
1) These values indicate input current without the derating factor of NEC articles 690.8(A)(1) and 690.8 (8)(1) applied.			
2) These values indicate input current with the derating factor of NEC articles 690.8(A)(1) and 690.8 (8)(1) applied.			
Type designation	SSM-US	SSM-US	SSM-US





#### 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

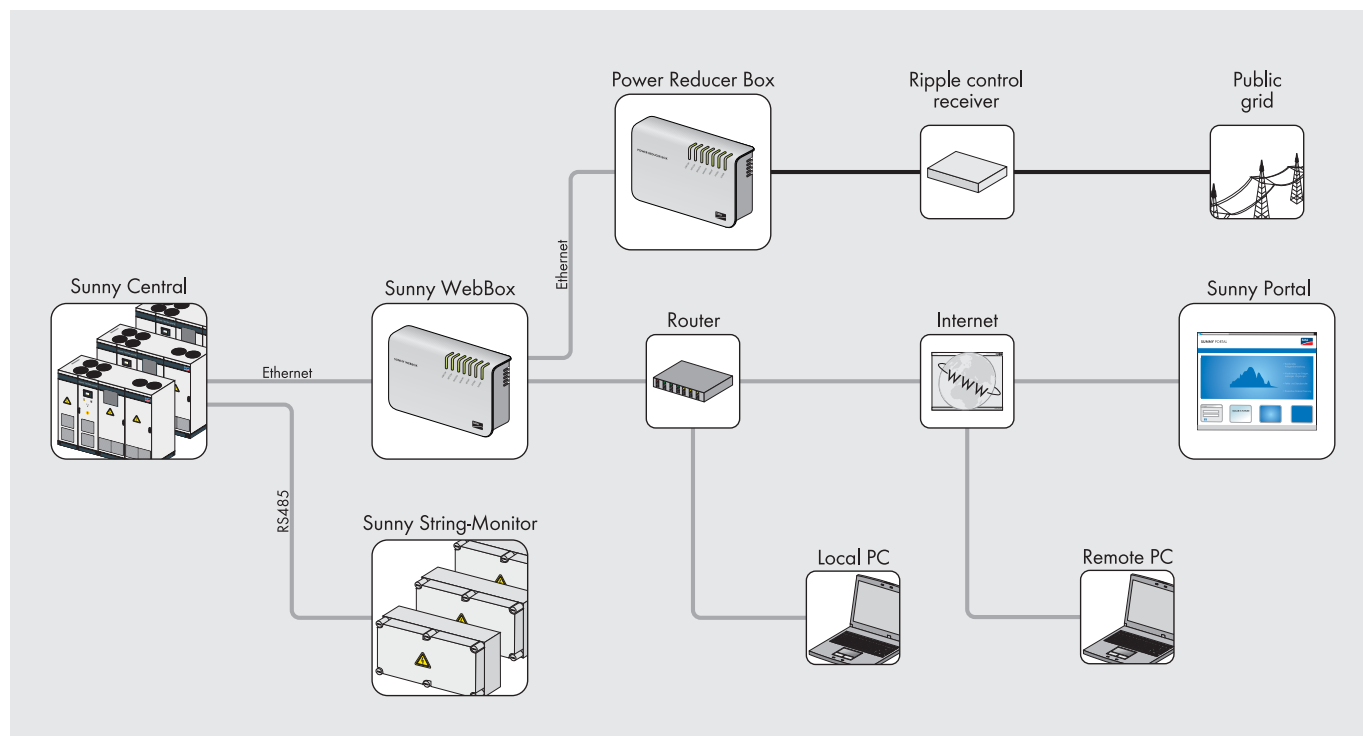
## SUNNY CENTRAL CONTROL

### 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 remote access, as well as sending email or text message status reports.

## 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

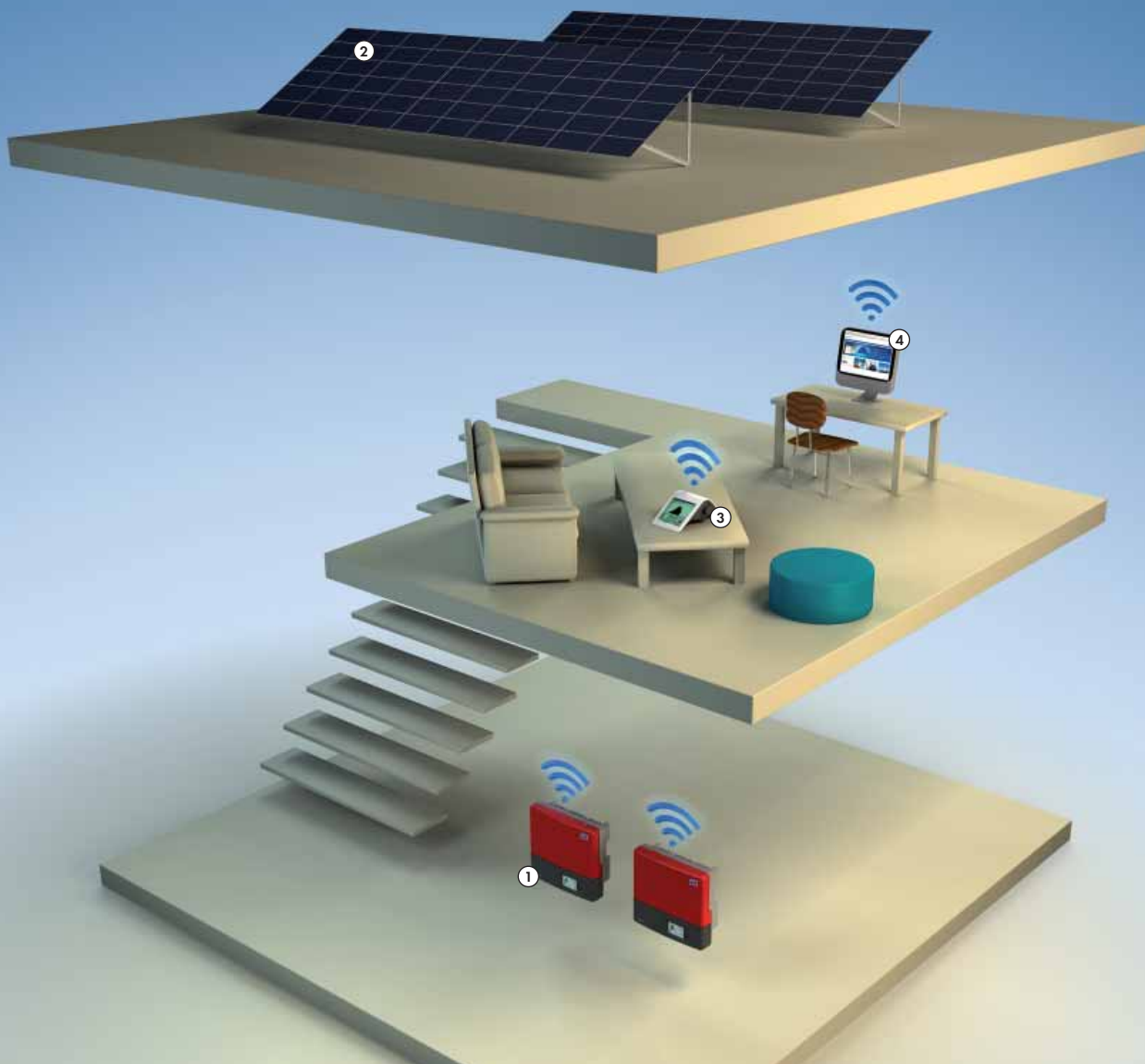
They function without moving parts, work wear-free and are extremely durable: solar power systems are a sure way to generate electricity. All the same, there are always good reasons for keeping track of your system. Module shading, connection problems or grid failures can all interfere with system performance 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 on-line 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, is a 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.

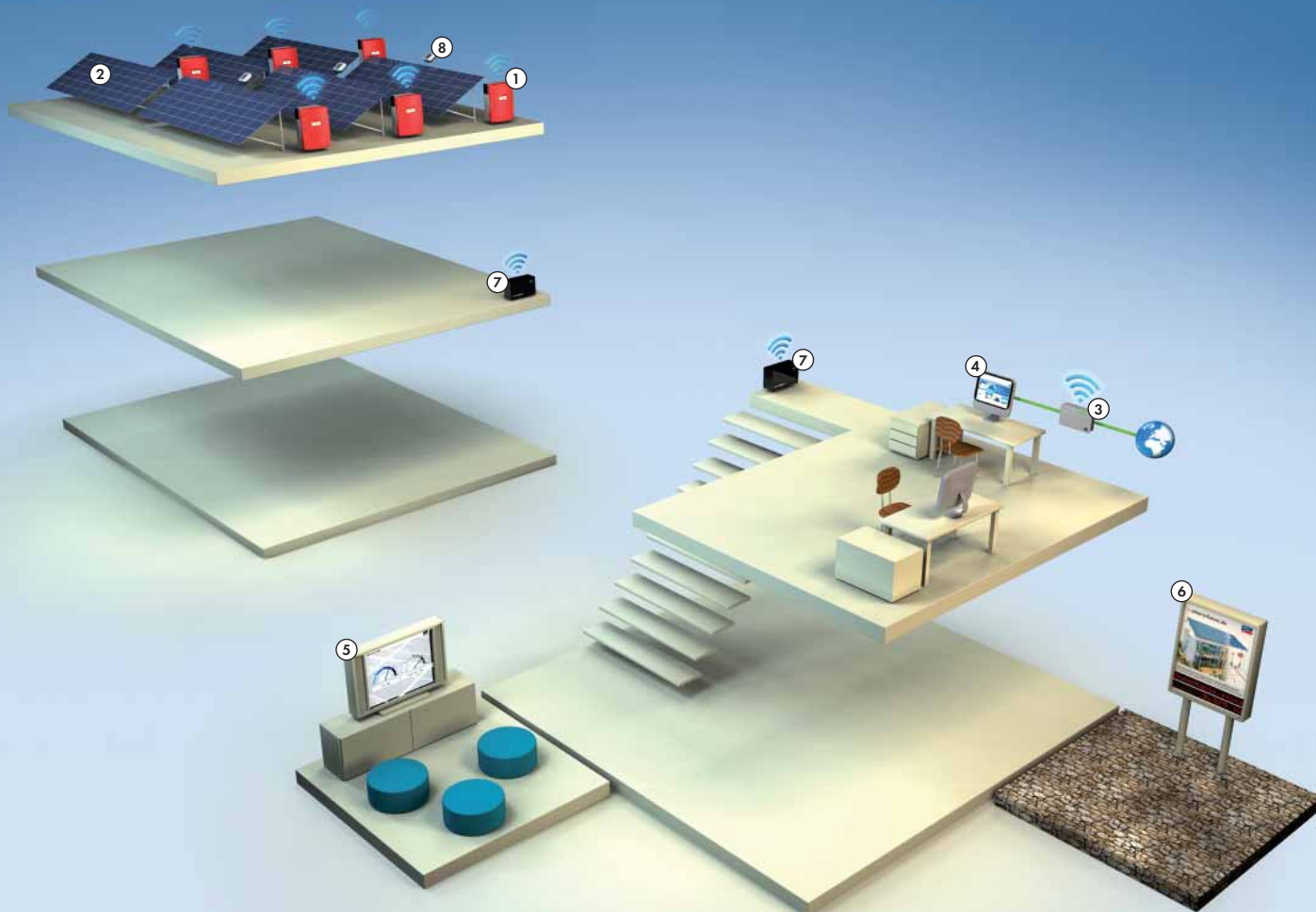
**Sunny Beam –  
nice and easy**

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. 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**

*Bluetooth®* is the wireless communication standard used by the free monitoring software Sunny Explorer to connect with the inverters, allowing any PC or notebook to control, monitor and manage the configuration of inverters – 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 modules**

The compact Sunny SensorBox makes it possible to extend plant monitoring to include the solar array. 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**

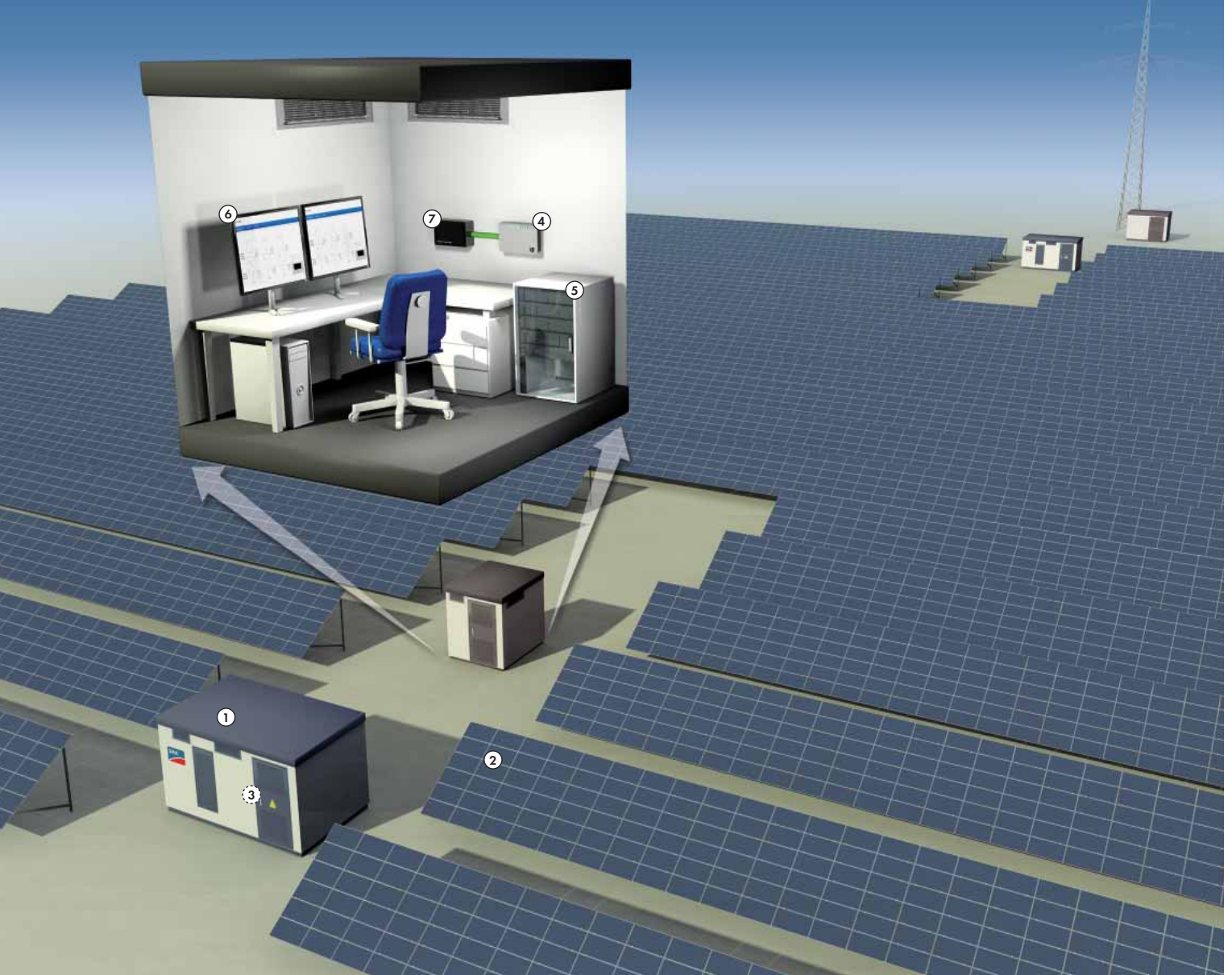
The SMA *Bluetooth®* Repeater increases the already large existing wireless range of max. 100 meters in the open air. This makes it possible to bridge larger distances between SMA *Bluetooth®* devices or bypass ceilings and walls, without problems.

### **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 an office 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 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. Through 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 maximum 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

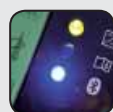
## SUNNY BEAM with *Bluetooth®* Wireless Technology

Wireless system performance monitoring for Sunny Boys

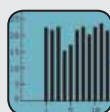
The new Sunny Beam represents the ultimate in wireless system performance monitoring. Completely updated, the Sunny Beam now features *Bluetooth®* wireless technology for improved performance and versatility. It communicates with up to 12 Sunny Boy inverters and graphically displays all of the key performance data of your solar system. It also automatically records and stores system information for the last 100 days. Setup is quick and easy via an intuitive interface and menu system. Its sleek design makes the Sunny Beam a welcome addition to any home or office, with system performance available at a glance—wirelessly.

# Technical Data

	Sunny Beam	
<b>Communication</b>		
Inverter communication	Bluetooth®	
PC Communication	USB 2.0	
<b>Maximum number of SMA devices</b>		
Bluetooth®	12	
<b>Maximum communication range</b>		
Bluetooth® unobstructed	Up to 109 yd	
<b>Power supply</b>		
Power supply	Integrated solar cell, USB cable	
Number of batteries	2	
Type of battery	NiMH (1.2 V) with low self-discharge	
<b>Ambient conditions during operation</b>		
Ambient temperature	-32 °F to 104 °F	
Degree of protection	IP20	
<b>General Data</b>		
Dimensions (W / H / D) in inches	5.0 / 3.0 / 7.7 (as desktop device)	
Weight	Approx. 0.8 lb (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	
<b>Features</b>		
Display	LCD display	
Operation	Rotary push button	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
<b>Information displayed</b>		
General information	Time, date	
System data	Current performance, daily yield, total yield, specific annual yield, CO <sub>2</sub> savings, earnings	
<b>Accessories</b>		
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: 5.0 x 3.0 x 7.7 in  
Weight: 0.8 lb



#### 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

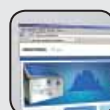
	Sunny WebBox	
<b>Communication</b>		
Inverter communication	RS485, <i>Bluetooth</i> ®, 10/100 Mbit Ethernet (for Sunny Central only)	
PC Communication	10/100 Mbit Ethernet	
Modem	Analog (optional), GSM (optional)	
<b>Connections</b>		
Inverter	1x SMACOM	
Ethernet	10/100 Mbit, RJ45	
<b>Maximum number of SMA devices</b>		
RS485 / Ethernet / <i>Bluetooth</i> ®	50 / 50 / 100	
<b>Max. communication range</b>		
RS485 / Ethernet	1312 yd / 109 yd	
<i>Bluetooth</i> ® unobstructed	Up to 109 yd	
<b>Power supply</b>		
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	
<b>Ambient conditions during operation</b>		
Ambient temperature	–20 °C ... +65 °C	
Relative air humidity	5% to 95%, non-condensing	
<b>Memory</b>		
Internal	8 MB ring buffer	
External	SD card 128 MB / 512 MB / 1 GB / 2 GB	
<b>General Data</b>		
Dimensions (W / H / D) in inches	10.0 / 5.1 / 2.24	
Weight	1.5 lbs	
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	
<b>Features</b>		
Operation	Integrated web server (internet browser)	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
<b>Accessories</b>		
Sunny SensorBox / Sunny Matrix / SMA <i>Bluetooth</i> ® 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



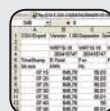
SD card slot for optional **memory expansion** and data transfer to a PC



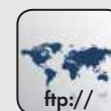
Integrated web server enables **online remote data access** from any web-enabled PC in the world



**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

- Early fault detection by monitoring array 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 array
- Straightforward integration into existing systems via RS485

- Data analysis on any PC or via Sunny Portal

## SUNNY SENSORBOX

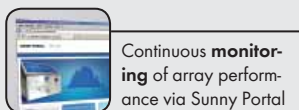
Comprehensive performance analysis for professionals

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 shading or the accumulation of dirt that may lead to a reduction in the performance of the solar array. Extra sensor interfaces for optional measurement of ambient temperature or wind speed will make your evaluations even more accurate.

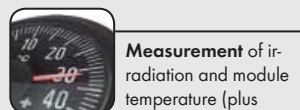
## Technical Data

[illegible]

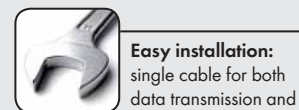
### Communication with the Sunny WebBox via RS485



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

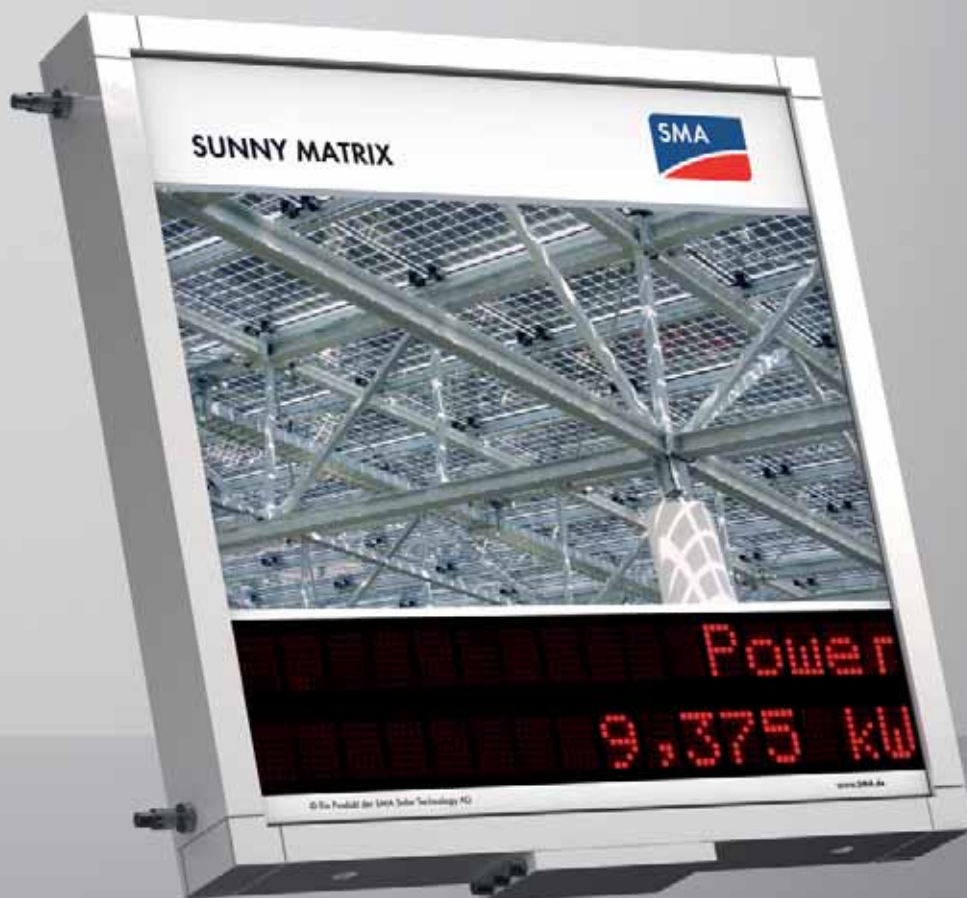


**Measurement** of irradiation and module temperature (plus optional measurement of ambient temperature and wind speed)



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





#### Durable

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

#### Flexible

- Customized artwork for front panels
- Various housing sizes for any application
- Text can be easily 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 or outdoor use

Solar energy data at a glance: the robust, large-format Sunny Matrix displays yield, performance and CO<sub>2</sub> 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	
<b>Communication</b>		
Data logger communication	Ethernet	
<b>Connections</b>		
Ethernet	10 / 100 Mbit, RJ45	
<b>Max. number of devices</b>		
Ethernet (Sunny WebBox)	1	
<b>Maximum communication range</b>		
Ethernet	109 yd	
<b>Power supply</b>		
Input voltage	85 V – 265 V AC, 50 / 60 Hz	
Power consumption	Typ. 20 W + 5 W per 4-character display module	
<b>Ambient conditions during operation</b>		
Ambient temperature	-13 °F to 140 °F	
Degree of protection	IP54	
<b>General Data</b>		
Dimensions (W / H / D) in inches	31.5 / 15.7 / 4.7 31.5 / 31.5 / 4.7 31.5 / 39.4 / 4.7	
Weight	33 lbs / 44 lbs / 55 lbs	
Installation site	Outdoors	
Deployment options	Wall mounting	
Character height	2.0 in	
Length of lines	4, 8, 12 or 16 characters	
Number of lines	max. 2 lines (15.7 in model) max. 4 lines (31.5 in / 39.4 in model)	
Line layout	Positioning to customer specification	
Panel design	Artwork to customer specification	
Language versions – software / manual	German, English, Italian, Spanish	
<b>Features</b>		
Operation	Integrated web server (internet browser)	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
<b>Information displayed</b>		
General information	Time, date, personal text, personal web text	
System data	Current output, daily yield, total yield, CO <sub>2</sub> savings	
Sunny SensorBox data	Ambient temperature, module temperature, internal solar irradiation, wind speed	
Sunny Island data	Battery charge level	
<b>Accessories</b>		
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 Service Line
- 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 require 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 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	
<b>Communication</b>		
Communication with Sunny WebBox	Ethernet	
PC Communication	Ethernet	
<b>Connections</b>		
Ripple control receiver (AUX COM)	4 digital inputs, 4 ... 20 mA current interface in preparation	
Ethernet	10/100 Mbit, RJ45	
<b>Maximum number of SMA devices</b>		
Sunny WebBox	30	
<b>Max. communication range</b>		
Ethernet	109 yd	
<b>Power supply</b>		
Power supply	Plug-in power supply	
Input voltage	100 V – 240 V AC, 50 / 60 Hz	
Power consumption	Typ. 4 W / max. 12 W	
<b>Ambient conditions during operation</b>		
Ambient temperature	–4 °F to 140 °F	
Relative air humidity	5% to 95%, non-condensing	
<b>Memory</b>		
Internal	16 MB ring buffer	
External	SD card 128 MB / 512 MB / 1 GB / 2 GB	
<b>General Data</b>		
Dimensions (W / H / D) in inches	10.0 / 5.1 / 2.2	
Weight	1.7 lbs	
Installation site	Indoors	
Deployment options	DIN rail mounting, wall mounting	
Status display	LEDs	
Language versions – software	German, English	
Language versions – manual	German, English	
<b>Features</b>		
Operation	Integrated web server (internet browser)	
Warranty	5 years	
Certificates and approvals	www.SMA.de	
<b>Accessories</b>		
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**)



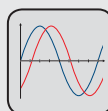
**Quick and easy** commissioning



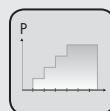
**Double logging** of all switching operations



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



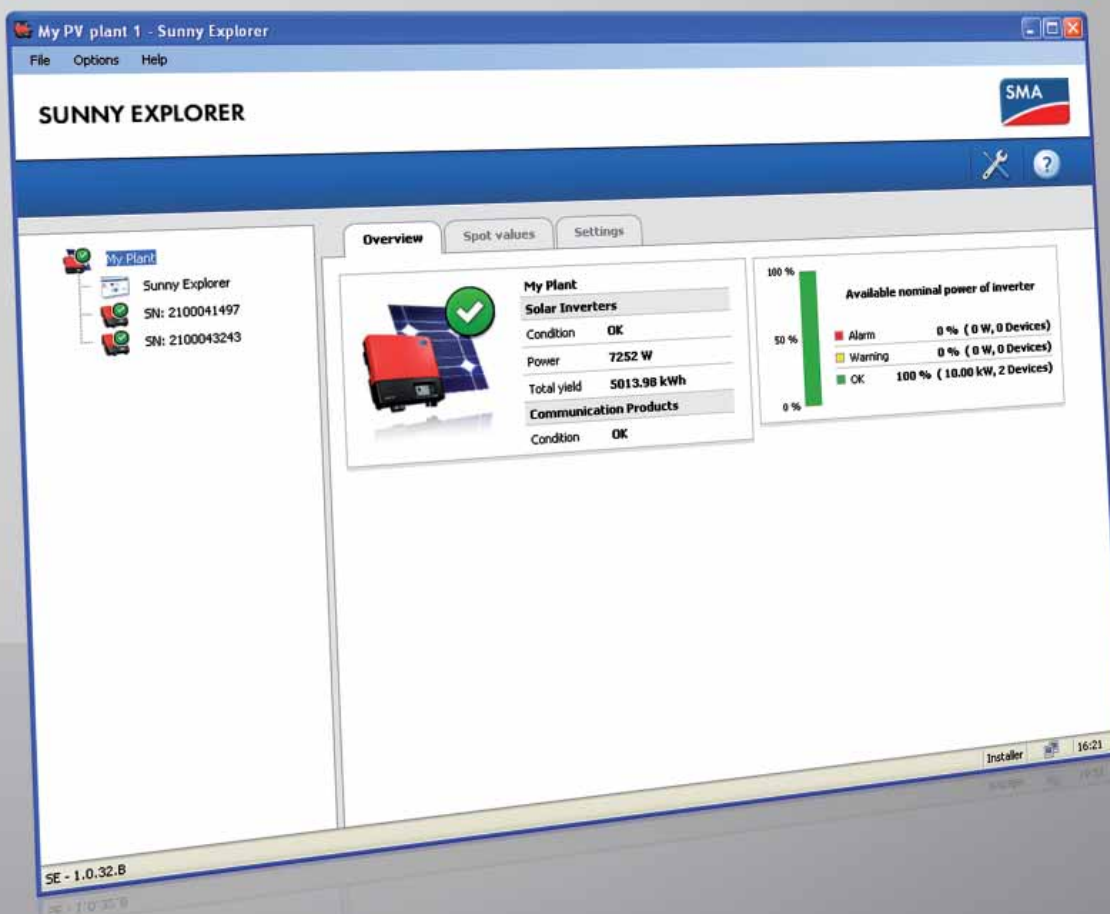
Default setting of **reactive power or cos φ**



**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 a laptop 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 laptop – 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	
<b>Languages</b>		
Available languages	German, English, Spanish, Italian, French, Greek, Korean, Portuguese, Dutch, Czech	
<b>System requirements</b>		
Supported operating systems	Windows XP (Servicepack 2) Windows Vista	
Supported Bluetooth® Stacks	Microsoft, Toshiba, BlueSoleil, Broadcom	
<b>Hardware (minimum requirements)</b>		
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	
<b>Plant information</b>		
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.	
<b>Equipment Information</b>		
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** essential plant  
data



**Configure** individual  
devices or an entire  
device category



**Communication** with  
the inverters via  
Bluetooth®

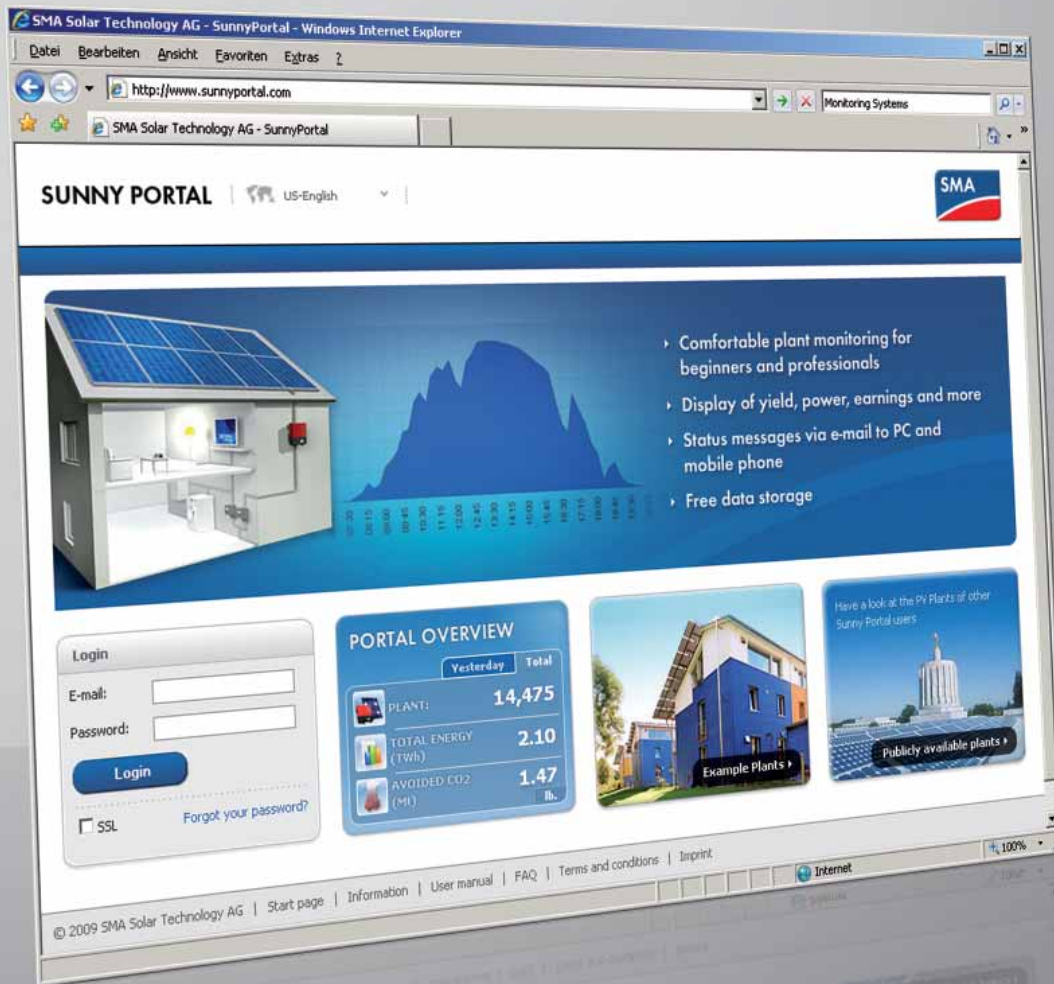


**Easy diagnostics** due  
to event log display



**Safe data transfer**  
through new password  
system





### Informative

- Access the key system data – 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 data analysis and energy production presentation down to a fine art. And, the high-performance reporting system provides regular email updates, securing your yields.

# Technical Data

	Sunny Portal
<b>Languages</b>	
Available languages	German, English, Spanish, Italian, French, Chinese, Greek, Korean, Portuguese, Czech
<b>System requirements</b>	
Supported operating systems	All
<b>Software</b>	
Recommended browser/s	Internet Explorer Version 7 and higher, Firefox, Safari
Other details	JavaScript and Cookies enabled
<b>Data logger</b>	
Supported data logger	Sunny WebBox
<b>Plant management</b>	
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
<b>Plant information</b>	
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
<b>Page design</b>	
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 <sub>2</sub> , earnings, energy)
<b>Visualization of yield and measured values</b>	
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
<b>Status reports</b>	
Information reports	Daily or monthly email reports on energy yield, maximum performance, earnings, CO <sub>2</sub> 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
<b>Individual access</b>	
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<sub>2</sub> 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

### Free professional plant presentation

Returns, current performance and ambient data: Flashview displays solar yields on any standard PC. Various display options allow for either automatic 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	
<b>Languages</b>		
Available languages	German, English, Spanish, Italian, French, Chinese, Greek, Korean, Portuguese, Dutch, Czech	
<b>System requirements</b>		
Supported operating systems	Windows XP (Servicepack 2), Windows Vista, Apple Macintosh OS X	
Required SMA devices	Sunny WebBox	
<b>Communication</b>		
Data logger communication	Ethernet	
Type	IP address, URL (e.g. DynDns)	
<b>Max. number of devices</b>		
Ethernet	10	
<b>Max. communication range</b>		
Ethernet	109 yd	
<b>Software</b>		
Other details	WinZip	
<b>Hardware (minimum requirements)</b>		
Processor	1 GHz	
Computer memory	256 MB	
Available hard disk space	12 MB	
Resolution	1280 x 1024 pixels	
Color depth	256 colors	
<b>Information displayed</b>		
General information	Time	
Plant data	Current output, daily yield, total yield, CO <sub>2</sub> 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	
<b>Individual set-up options</b>		
Values	CO <sub>2</sub> factor, vehicle CO <sub>2</sub> emissions, digit format, unit of length, unit of weight, unit of temperature	
Other details	Name of plant, personal wallpaper	
<b>Features</b>		
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

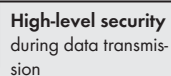
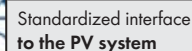
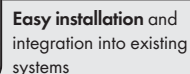
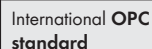
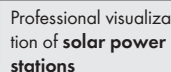
- Simple and quick installation
- Data interface in accordance with the communication standard OPC-DA / OPC-XML-DA
- Compatible with WinCC, InTouch, LabView, etc.

## SMA OPC-SERVER

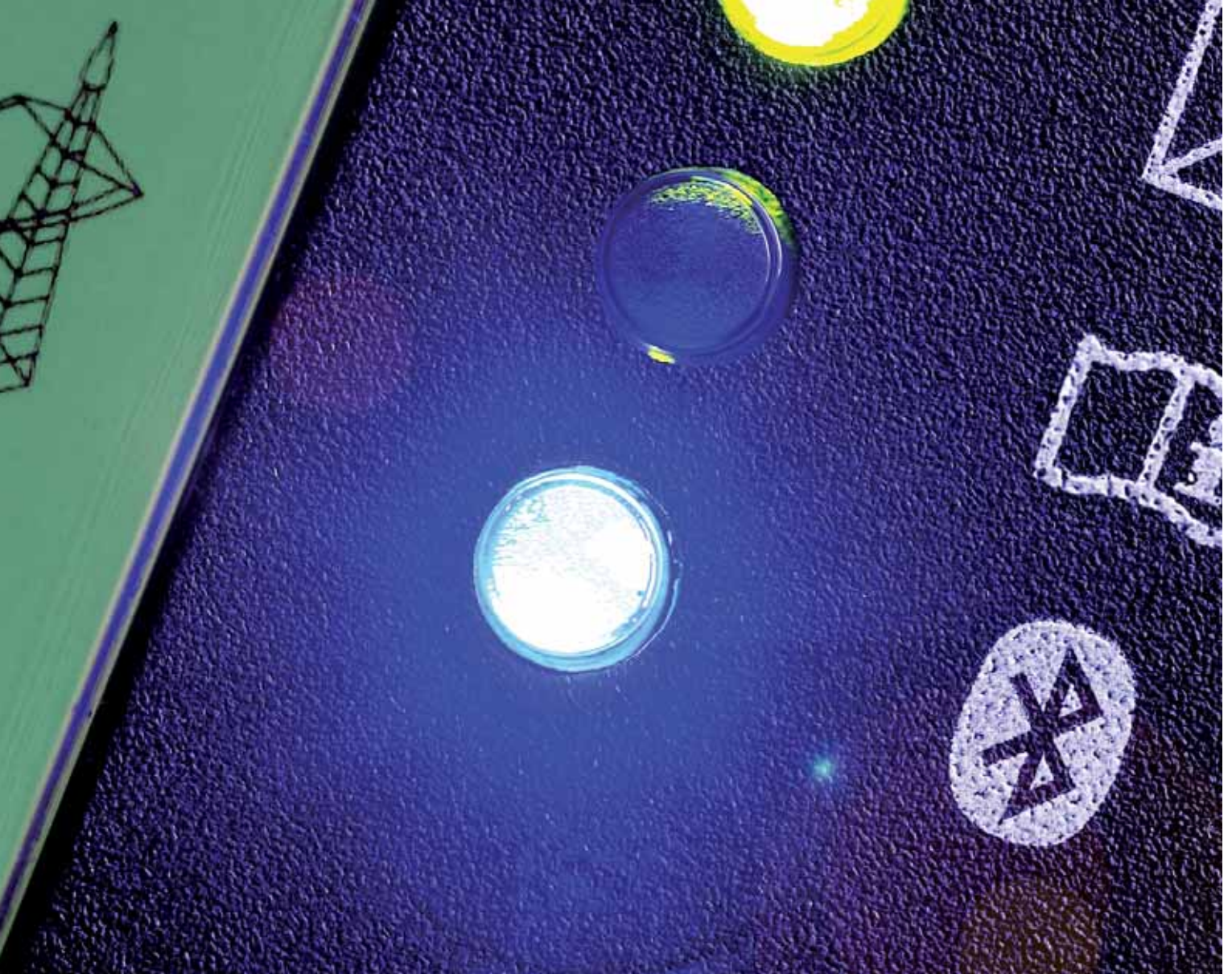
The standardized data interface for large-scale systems

Large-scale plants and PV power stations require customized monitoring solutions 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

[illegible]





#### **Bluetooth®**

- Automatic networking of up to 100 devices
- Range of up to 109 yd unobstructed
- 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 bridges great distances, while at the same time, it is configured as a redundant communications network, making it very reliable.

### 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: *Bluetooth®* Class 1. Its range of up to 109 yards unobstructed 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 six miles.

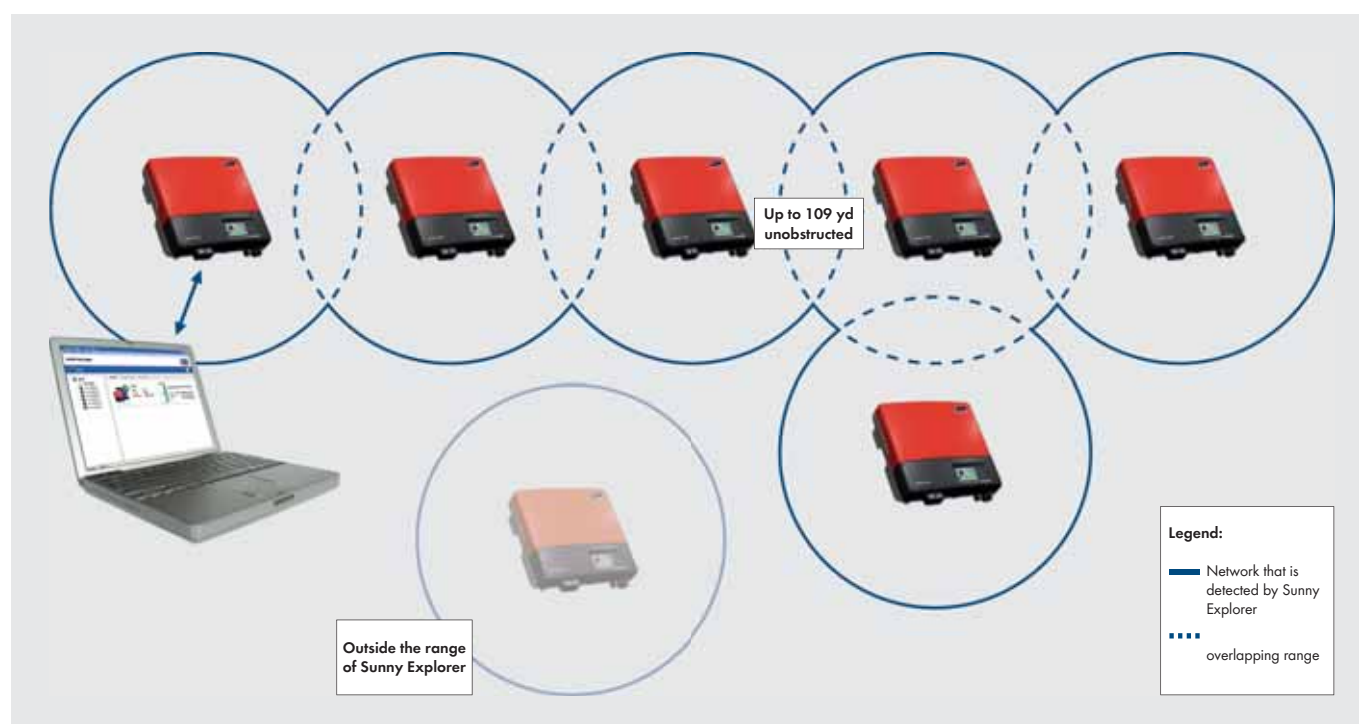
### RS485 – the established standard

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

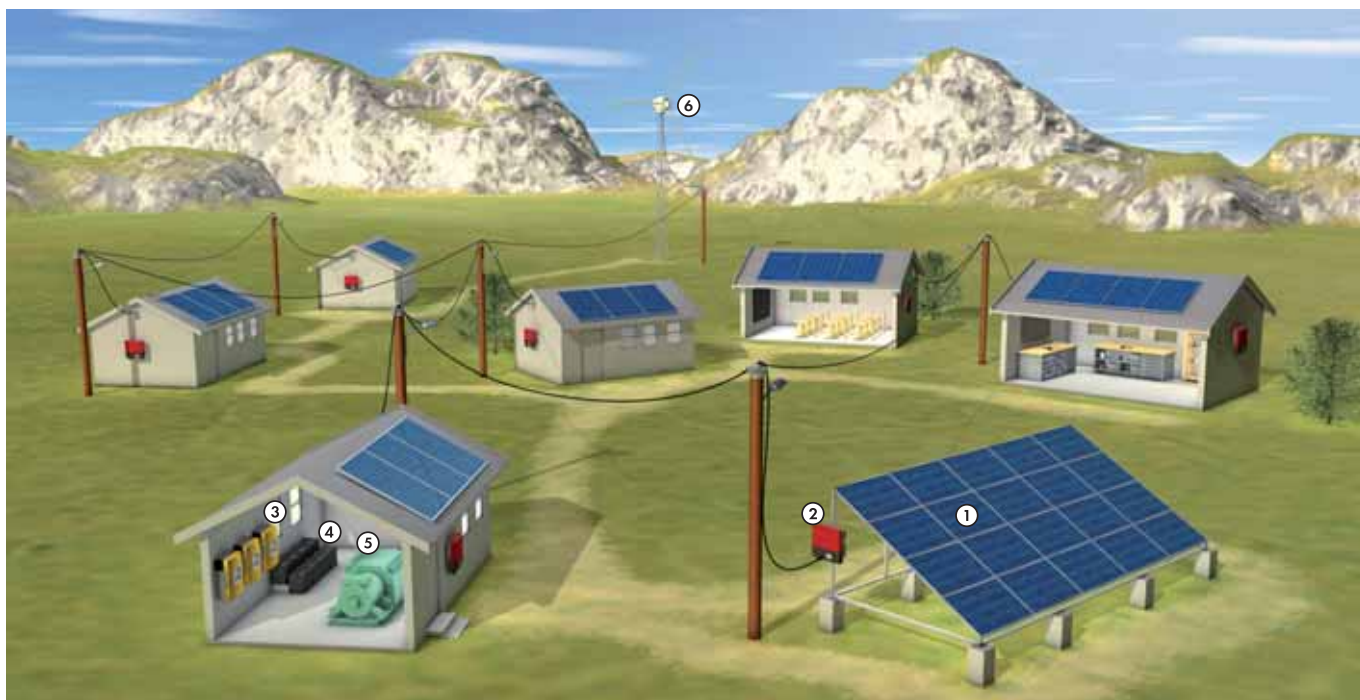
In addition to solar and wind power plants, diesel generators and other electricity generators, as well as all 230-volt loads, can be connected to the AC stand-alone grid. This avoids costly DC cabling and provides great flexibility. For smaller systems, SMA offers the Sunny Island Charger, an MPP charge 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 Islands 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 198.



**Components:** 1. Solar array, 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

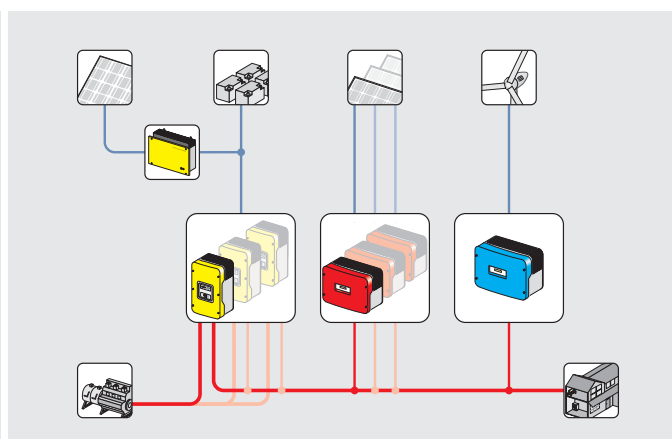
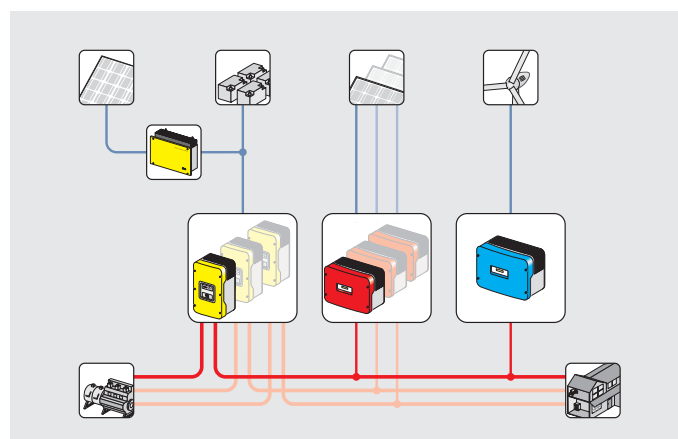
## SUNNY ISLAND 5048 / 5048U

### 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
<b>AC output (users)</b>		
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
<b>AC input (generator or grid)</b>		
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
<b>Battery DC input</b>		
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
<b>Efficiency / Operating consumption</b>		
Max. efficiency	95%	95%
Own consumption with no load / standby	25 W / 4 W	25 W / 4 W
<b>Protection devices</b>		
DC reverse polarity / DC fuse	●/●	●/●
AC short-circuit / AC overload	●/●	●/●
Overtemperature / excessive battery discharge	●/●	●/●
<b>General Data</b>		
Dimensions (W / H / D) in inches	18.4 / 21.4 / 9.3	18.4 / 21.4 / 9.3
Weight	139 lbs	139 lbs
Operating temperature range	-13 °F to 122 °F	-13 °F to 122 °F
Protection rating	Indoors (IP30)	Indoors (NEMA 1)
<b>Features / Function</b>		
Operation & display / multifunction relays	Internal / 2	Internal / 2
3-phase systems / parallel connection	●/●	●/●
Integrated bypass / multicaster 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
<b>Accessories</b>		
Battery cables / battery fuses	○/○	○/○
Interfaces (RS485 PB / Multicaster PB)	○/○	○/○
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

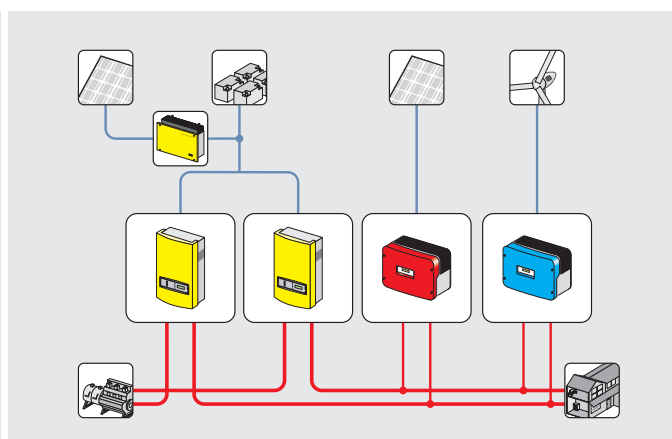
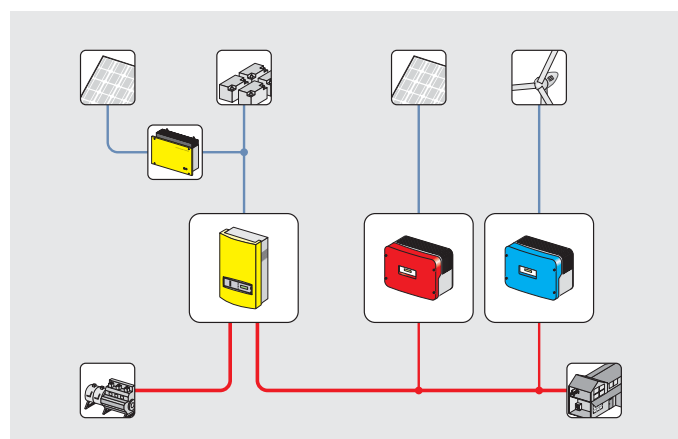
## SUNNY ISLAND 3324 / 4248 / 4248U

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
<b>AC output (users)</b>			
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
<b>AC input (generator or grid)</b>			
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
<b>Battery DC input</b>			
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
<b>Efficiency / Operating consumption</b>			
Max. efficiency	94.5%	95%	95%
Own consumption with no load / standby	22 W / 4 W	22 W / 4 W	22 W / 4 W
<b>Protection devices</b>			
DC reverse polarity / DC fuse	●/●	●/●	●/●
AC short-circuit / AC overload	●/●	●/●	●/●
Overtemperature / excessive battery discharge	●/●	●/●	●/●
<b>General Data</b>			
Dimensions (W / H / D) in inches	15.4 / 23.2 / 9.6	15.4 / 23.2 / 9.6	15.4 / 23.2 / 9.6
Weight	86.0 lbs	86.0 lbs	86.0 lbs
Operating temperature range	-13 °F to 122 °F	-13 °F to 122 °F	-13 °F to 122 °F
Protection rating	Indoors (IP30)	Indoors (IP30)	Indoors (NEMA 1)
<b>Features / Function</b>			
Operation & display / multifunction relays	Internal / 2	Internal / 2	Internal / 2
3-phase systems / parallel connection	-/-	-/-	-/-
Integrated bypass / multicuster 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
<b>Accessories</b>			
Battery cables / battery fuses	○/○	○/○	○/○
Interfaces (RS485 PB / Multicuster PB)	○/-	○/-	○/-
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

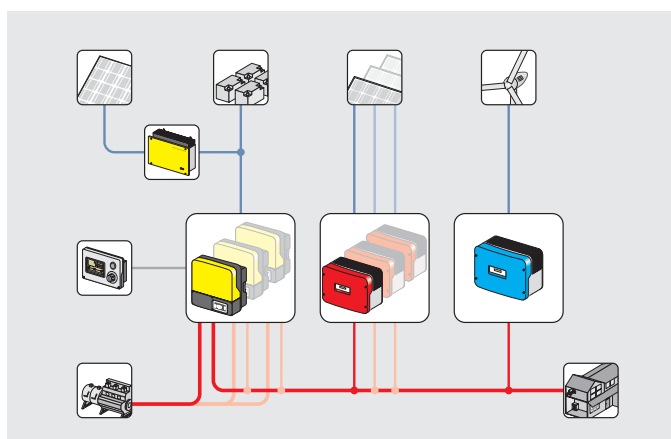
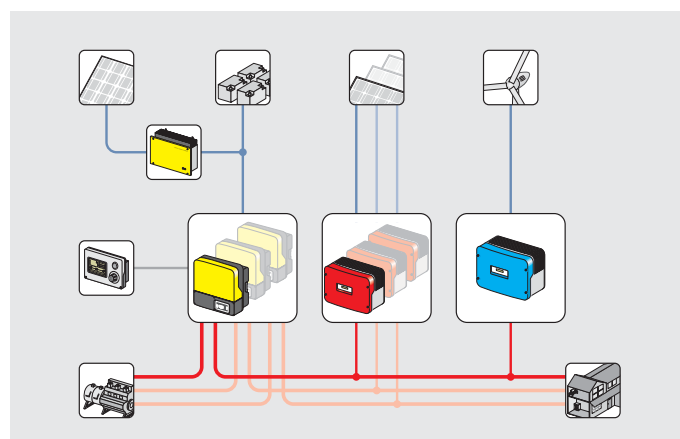
## SUNNY ISLAND 2012 / 2224

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 nine kilowatts.

# Technical Data

	Sunny Island 2012	Sunny Island 2224
<b>AC output (users)</b>		
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 $\phi$ )	< 4% / -1 to +1	< 4% / -1 to +1
<b>AC input (generator or grid)</b>		
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
<b>Battery DC input</b>		
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
<b>Efficiency / Operating consumption</b>		
Max. efficiency	93%	93.6%
Own consumption with no load / standby	21 W / 6 W	21 W / 6 W
<b>Protection devices</b>		
DC reverse polarity / DC fuse	–/–	–/–
AC short-circuit / AC overload	●/●	●/●
Overtemperature / excessive battery discharge	●/●	●/●
<b>General Data</b>		
Dimensions (W / H / D) in inches	18.5 / 17.5 / 7.3	18.5 / 17.5 / 7.3
Weight	42 lbs	42 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F
Protection rating	Outdoor installation (IP54)	Outdoor installation (IP54)
<b>Features / Function</b>		
Operation & display / multifunction relays	External via SRC-1 / 2	External via SRC-1 / 2
3-phase systems / parallel connection	●/●	●/●
Integrated bypass / multicuster 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
<b>Accessories</b>		
Battery cables / battery fuses	○/○	○/○
Interfaces (RS485 PB / Multicuster 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 104 °F
- 5-year SMA Warranty

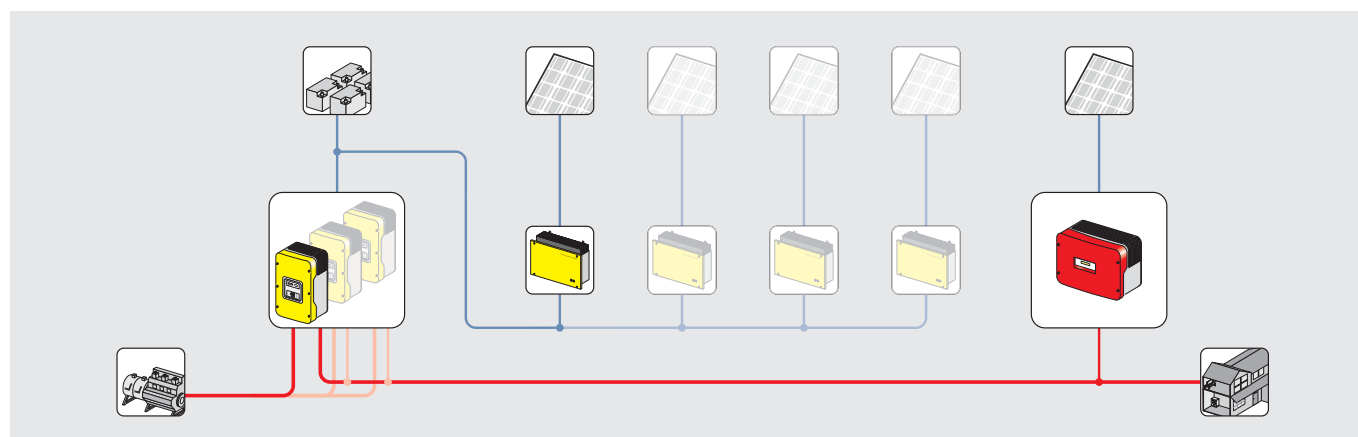
## SUNNY ISLAND CHARGER 40

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 per cent 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
<b>Input (PV generator)</b>			
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	25 V – 60 V	25 V – 60 V
Number of MPP trackers	1	1	1
Max. PV current	40 A	40 A	30 A
<b>Output (battery)</b>			
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
<b>Efficiency / Power consumption</b>			
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
<b>General</b>			
Dimensions (W / H / D) in inches	16.6 / 12.2 / 5.6	16.6 / 12.2 / 5.6	16.6 / 12.2 / 5.6
Protection rating in accordance with DIN EN 60529	IP65	IP65	IP65
Weight	22.0 lbs	22.0 lbs	22.0 lbs
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
<b>Ambient conditions</b>			
Permissible ambient temperature during operation	-13 °F to 140 °F	-13 °F to 140 °F	-13 °F to 140 °F
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

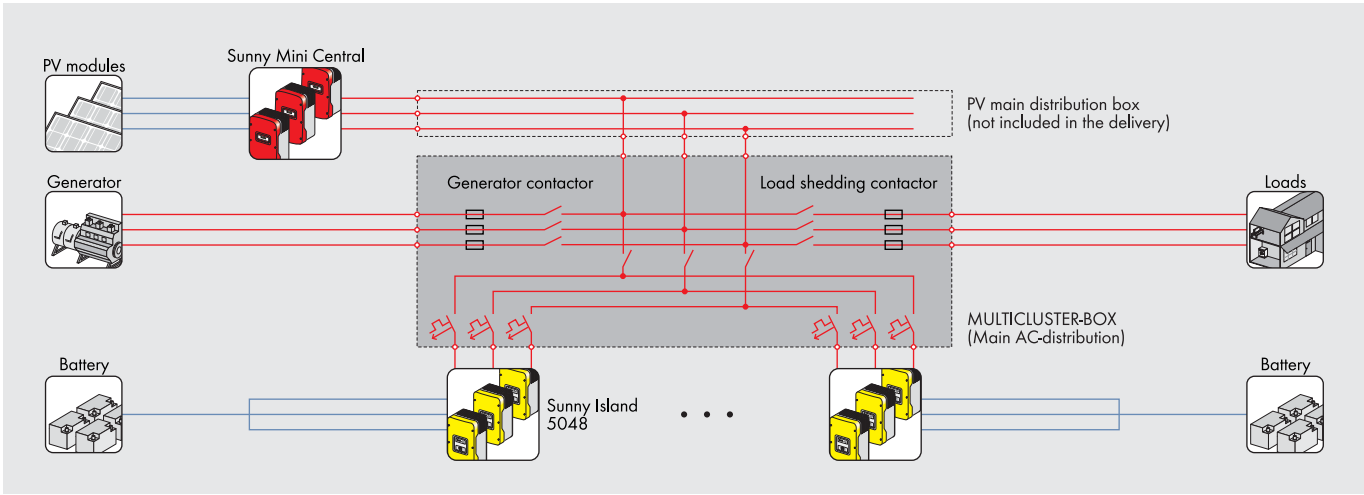
## Multicluster Boxes for SUNNY ISLAND 5048

Simple setup of stand-alone and hybrid systems

Simplified large off-grid systems: 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 three 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

	Multiclus-ter Box 6	Multiclus-ter Box 9	Multiclus-ter 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 (W / H / D) in inches	29.9 / 29.9 / 8.3	39.4 / 47.2 / 11.8	39.4 / 55.1 / 11.8
Mounting type	suspended	standing on a base	standing on a base
Weight	approx. 121 lbs	approx. 198 lbs	approx. 243 lbs
Connections for Sunny Island			
Number	6	9	12
Continuous AC output at 77 °F	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 77 °F	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	- 13 °F to 122 °F	- 13 °F to 122 °F	- 13 °F to 122 °F
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
Multiclus-ter 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

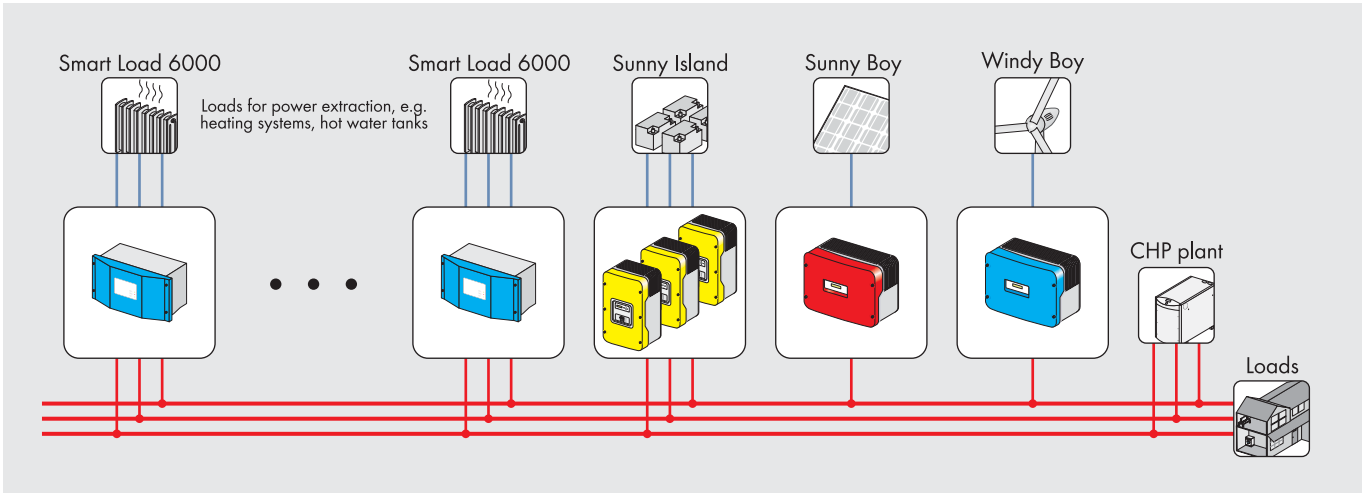
## Smart Load for SUNNY ISLAND

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 such as 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

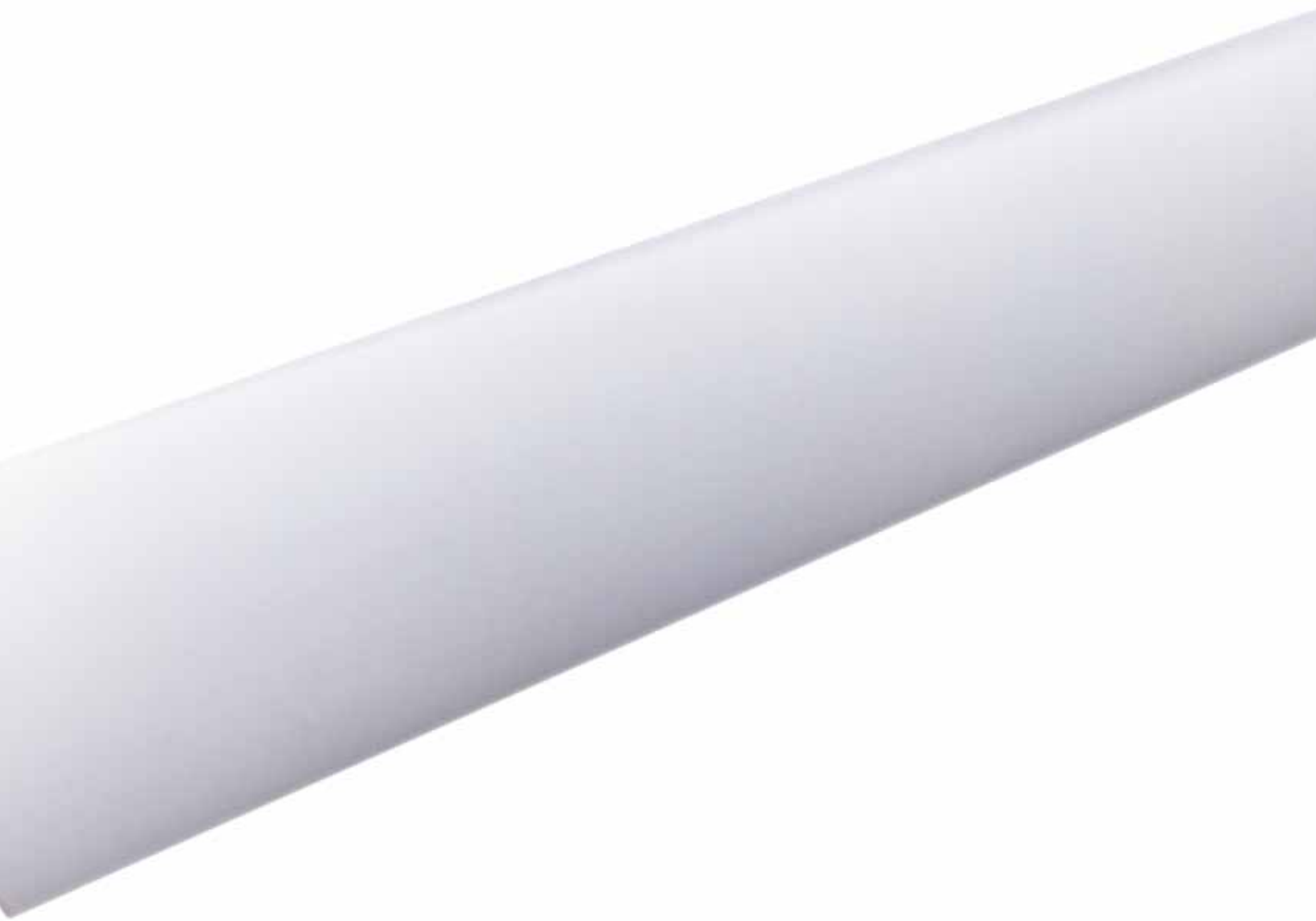
	Smart Load 6000	
<b>Input values</b>		
Nominal input voltage	230 V (single-phase) / 3 x 400 V / 230 V with a load-withstanding neutral conductor	
System frequency	45 - 55 Hz, 55 - 65 Hz	
Input voltage range	3 x 180 - 270 V	
Device protection	Overvoltage protection, short circuit- and overload-proof	
<b>Output Values</b>		
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 individu- al resistor at 6 kW, open-circuit proof	
<b>Ambient conditions</b>		
Ambient temperature	- 13 °F to 122 °F	
Protection rating in accordance with DIN EN 60529	IP65	
<b>Mechanical Data</b>		
Dimensions (W / H / D) in inches	17.7 / 13.0 / 7.9	
Weight	31 lbs	
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.

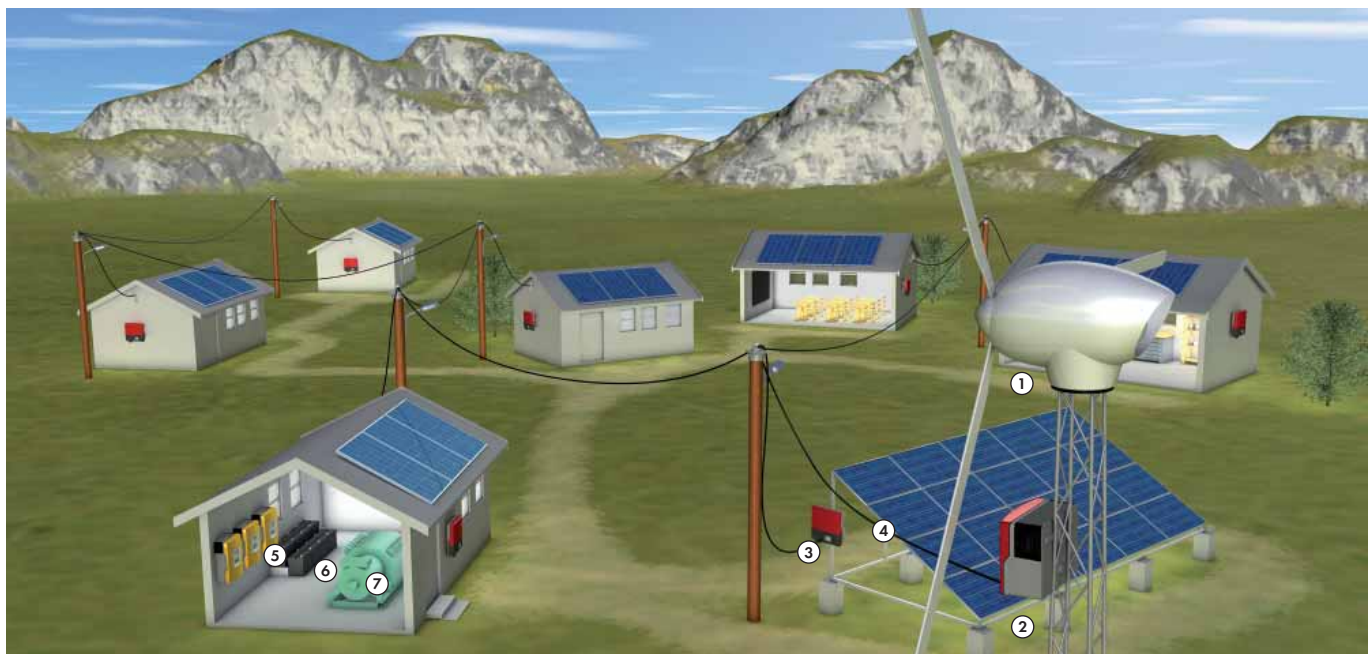
### Universal

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 array, 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 Service Line
- Comprehensive SMA warranty program

## WINDY BOY 3300 / 3800

Highest yield in any climate

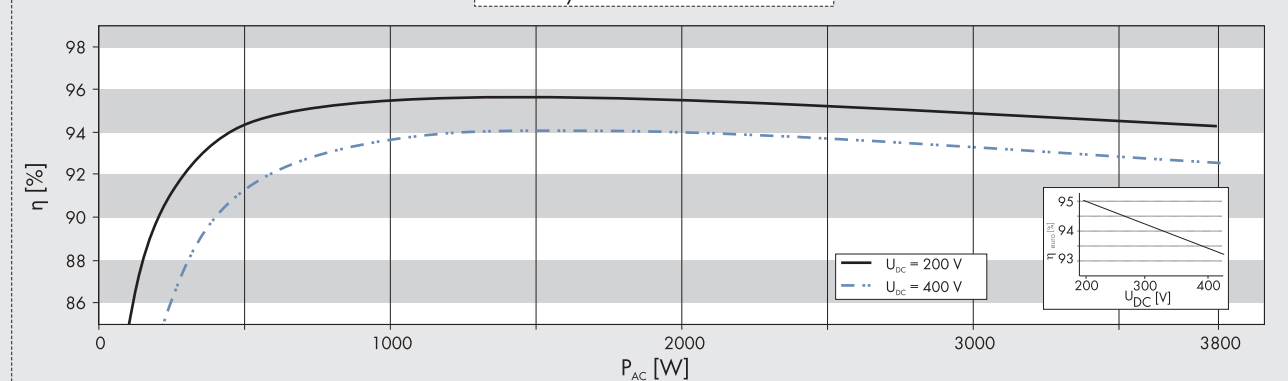
With a maximum efficiency of 95.6%, the Windy Boy 3300 and 3800 rank among the most profitable inverters for small wind energy plants. The weather-proof casing and the wide temperature range enable installation at almost any location, and thanks to the OptiCool cooling system, the equipment works at outdoor temperatures of up to 113 °F 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
<b>Input (DC)</b>		
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
<b>Output (AC)</b>		
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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift ( $\cos \phi$ )	1	1
AC connection	single-phase	single-phase
<b>Efficiency</b>		
Max. efficiency	95.2%	95.6%
Euro-Eta	94.4%	94.7%
<b>Protection device</b>		
DC reverse polarity protection	●	●
AC short-circuit strength	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Galvanically isolated	●	●
<b>General Data</b>		
Dimensions (W / H / D) in inches	17.7 / 13.9 / 9.3	17.7 / 13.9 / 9.3
Weight	90 lbs	90 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F
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)	●/●	●/●
<b>Features</b>		
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		

Efficiency curve WINDY BOY 3800







#### 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 Service Line
- Comprehensive SMA warranty program

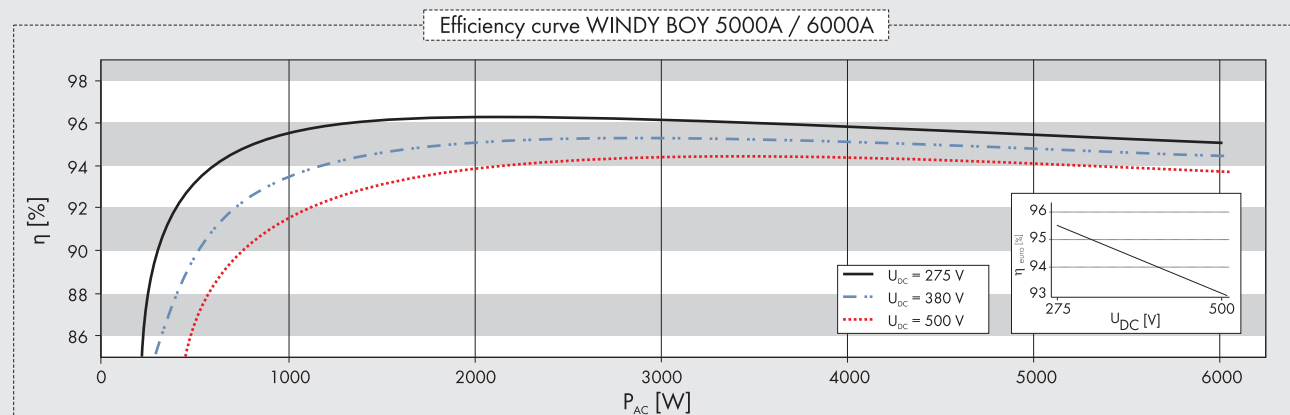
## WINDY BOY 5000A / 6000A

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 113 °F 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
<b>Input (DC)</b>		
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
<b>Output (AC)</b>		
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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift ( $\cos \phi$ )	1	1
AC connection	single-phase	single-phase
<b>Efficiency</b>		
Max. efficiency	96.1%	96.1%
Euro-Eta	95.2%	95.2%
<b>Protection device</b>		
DC reverse polarity protection	●	●
AC short-circuit strength	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Galvanically isolated	●	●
<b>General Data</b>		
Dimensions (W / H / D) in inches	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5
Weight	137 lbs	137 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F
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)	●/●	●/●
<b>Features</b>		
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 Service Line
- Comprehensive SMA warranty program

## WINDY BOY 2500 / 3000

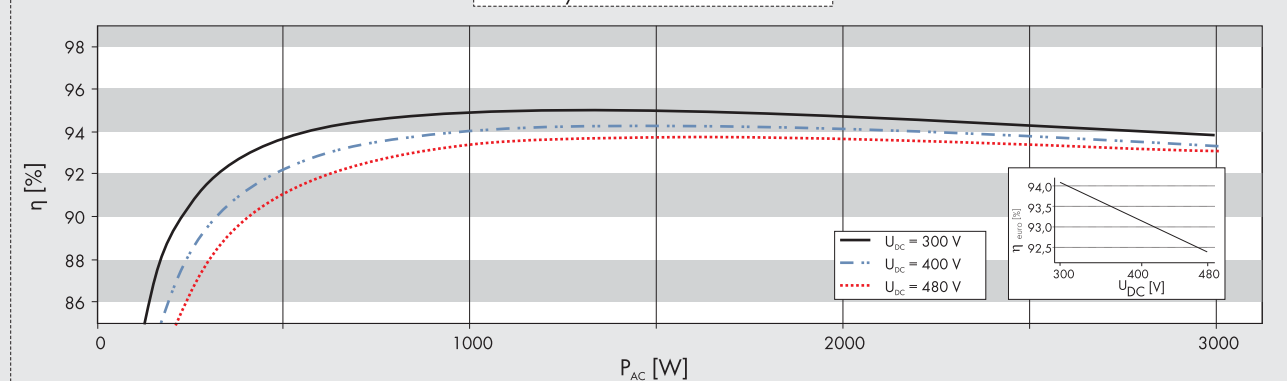
Worldwide proven technology

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
<b>Input (DC)</b>		
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
<b>Output (AC)</b>		
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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift ( $\cos \phi$ )	1	1
AC connection	single-phase	single-phase
<b>Efficiency</b>		
Max. efficiency	94.1%	95.0%
Euro-Eta	93.2%	93.6%
<b>Protection device</b>		
DC reverse polarity protection	●	●
AC short-circuit strength	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Galvanically isolated	●	●
<b>General Data</b>		
Dimensions (W / H / D) in inches	17.1 / 11.6 / 8.4	17.1 / 11.6 / 8.4
Weight	66 lbs	71 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F
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)	●/●	●/●
<b>Features</b>		
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		

Efficiency curve WINDY BOY 3000





#### 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 Service Line
- Comprehensive SMA warranty program

## WINDY BOY 1100LV

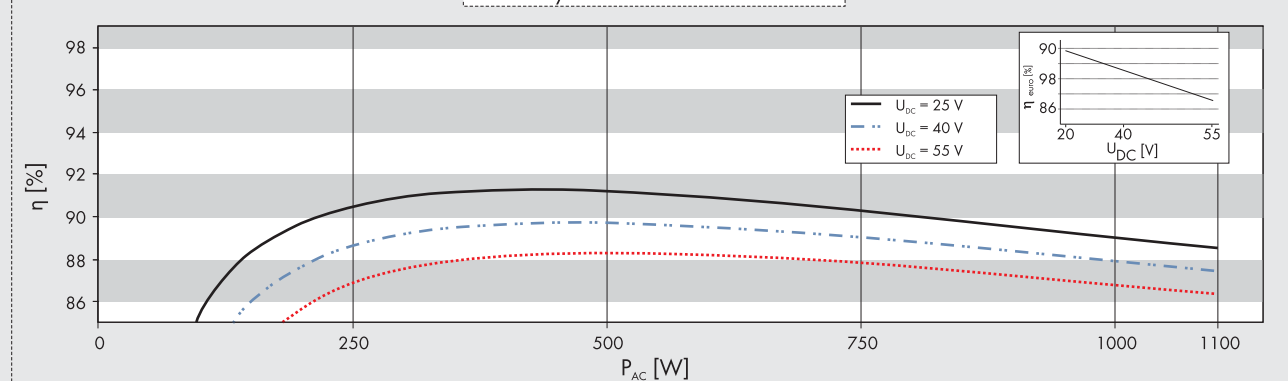
The solution for low generator voltage

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	
<b>Input (DC)</b>		
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	
<b>Output (AC)</b>		
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 / $\pm 4.5$ Hz	
Phase shift ( $\cos \phi$ )	1	
AC connection	single-phase	
<b>Efficiency</b>		
Max. efficiency	92.0%	
Euro-Eta	90.4%	
<b>Protection device</b>		
DC reverse polarity protection	●	
AC short-circuit strength	●	
Ground fault monitoring	●	
Grid monitoring (SMA Grid Guard)	●	
Galvanically isolated	●	
<b>General Data</b>		
Dimensions (W / H / D) in inches	17.1 / 11.6 / 8.4	
Weight	64 lbs	
Operating temperature range	-13 °F to 140 °F	
Internal consumption: operating / standby	< 5 W / 0.1 W	
Topology	Low-frequency transformer	
Cooling concept	convection	
Installation site: indoor / outdoor (IP65)	●/●	
<b>Features</b>		
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		

Efficiency curve WINDY BOY 1100LV







#### 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 Service Line
- Comprehensive SMA warranty program

## WINDY BOY 1100 / 1700

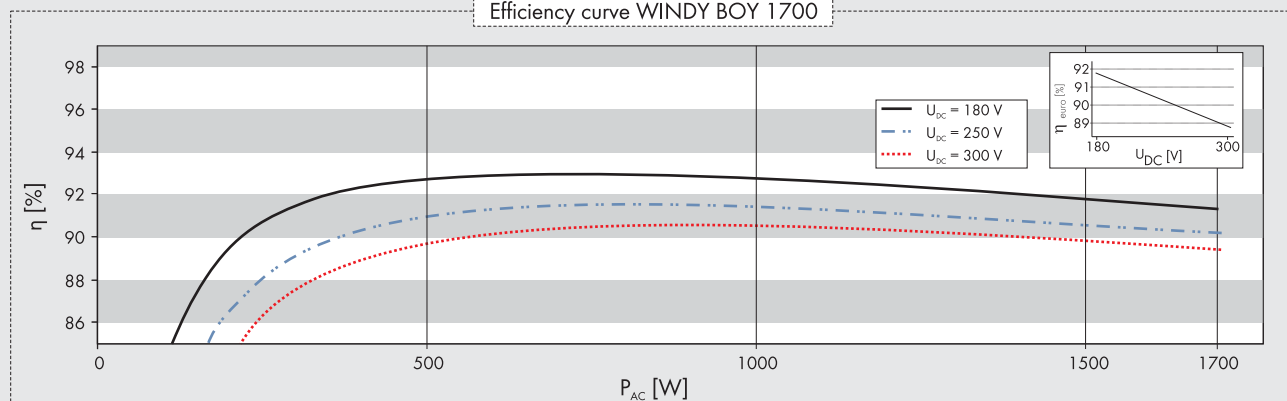
Powerful compact devices

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
<b>Input (DC)</b>		
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
<b>Output (AC)</b>		
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 / $\pm 4.5$ Hz	50 Hz / 60 Hz / $\pm 4.5$ Hz
Phase shift ( $\cos \phi$ )	1	1
AC connection	single-phase	single-phase
<b>Efficiency</b>		
Max. efficiency	93.0%	93.5%
Euro-Eta	91.6%	91.8%
<b>Protection device</b>		
DC reverse polarity protection	●	●
AC short-circuit strength	●	●
Ground fault monitoring	●	●
Grid monitoring (SMA Grid Guard)	●	●
Galvanically isolated	●	●
<b>General Data</b>		
Dimensions (W / H / D) in inches	17.1 / 11.6 / 8.4	17.1 / 11.6 / 8.4
Weight	49 lbs	55 lbs
Operating temperature range	-13 °F to 140 °F	-13 °F to 140 °F
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)	●/●	●/●
<b>Features</b>		
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		

Efficiency curve WINDY BOY 1700





**WB 8000US AVAILABLE IN 2010**



- UL 1741/IEEE-1547 compliant
- 10-year limited standard warranty
- CEC efficiency of up to 96%

- Sealed electronics enclosure & OptiCool™
- Comprehensive SMA communications and data collection options

- Rugged cast aluminum outdoor rated enclosure

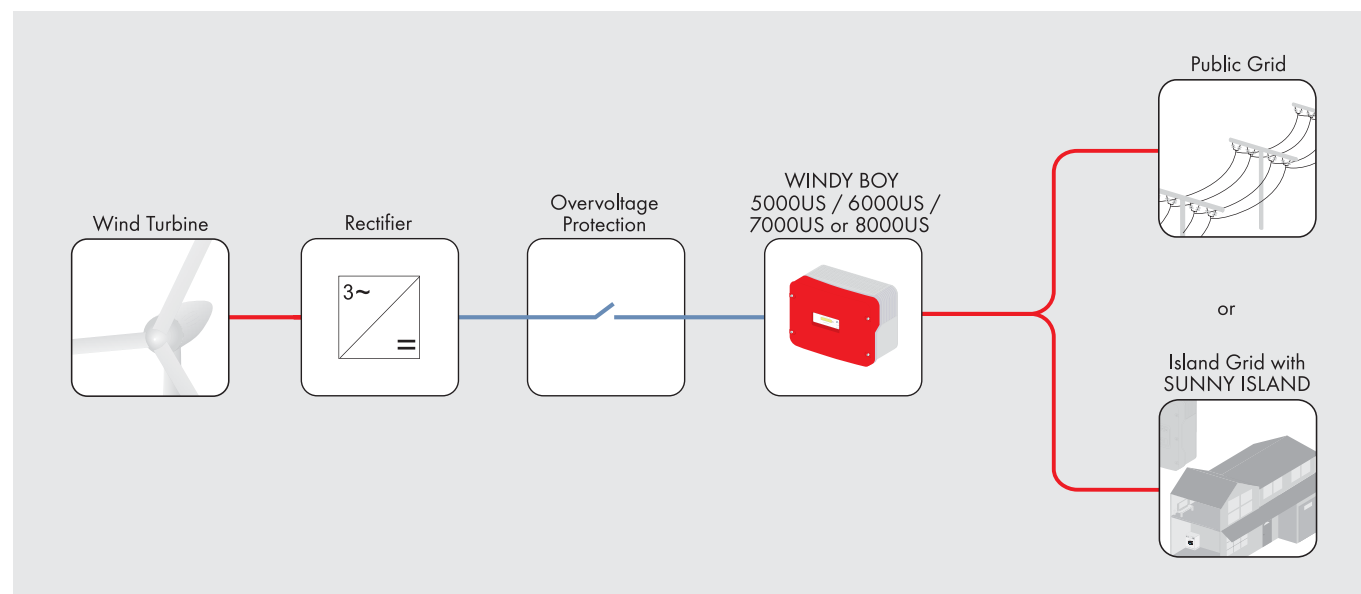
## **WINDY BOY 5000US / 6000US / 7000US / 8000US**

The customized solution for wind turbine systems

SMA's larger Windy Boy inverters combine the advanced technology present in our new US series of Sunny Boy inverters with special firmware that permits direct grid-tied operation with a broad range of wind turbines – without batteries. This greatly reduces the overall system cost because components such as the charge controller, batteries and associated switch gear can be eliminated. Increased total energy capture combined with a reduction of balance of system components greatly reduces the installation and operating costs of a grid-tied wind system. We recommend contacting your local wind turbine supplier for information on compatible wind turbine models and system design considerations.

# Technical Data

	Windy Boy 5000US	Windy Boy 6000US	Windy Boy 7000US	Windy Boy 8000US
Maximum Recommended DC Input Power	5300 W	6350 W	7450 W	8000 W @ 240 V <sub>AC</sub> 8400 W @ 277 V <sub>AC</sub>
Maximum DC Voltage	600 V	600 V	600 V	600 V
Peak Power Tracking Voltage	250 – 550 V	250 – 550 V	250 – 550 V	300 – 550 V
DC Maximum Input Current	21 A	25 A	30 A	30 A
DC Voltage Ripple	< 10%	< 10%	< 10%	< 10%
Number of Fused String Inputs	4	4	4	4
DC Start Voltage (adjustable)	300 V	300 V	300 V	300 V
AC Nominal Power	5000 W	6000 W	7000 W	7680 W @ 240 V <sub>AC</sub> 8000 W @ 277 V <sub>AC</sub>
AC Maximum Output Power	5100 W	6100 W	7100 W	7680 W @ 240 V <sub>AC</sub> 8100 W @ 277 V <sub>AC</sub>
AC Maximum Output Current (@ 208, 240, 277 V)	27.9 A, 24.2 A, 20.9 A	33.3 A, 28.9 A, 25.0 A	34.0 A, 34.0 A, 32.0 A	34.0 A, 34.0 A, 32.0 A
AC Nominal Voltage / Range	183 – 229 V @ 208 V 211 – 264 V @ 240 V 244 – 305 V @ 277 V	183 – 229 V @ 208 V 211 – 264 V @ 240 V 244 – 305 V @ 277 V	183 – 229 V @ 208 V 211 – 264 V @ 240 V 244 – 305 V @ 277 V	N/A 211 – 264 V @ 240 V 244 – 305 V @ 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	60 Hz/59.3–60.5 Hz
Power Factor	1	1	1	1
Peak Inverter Efficiency	96.8%	97%	97.1%	96.5%
CEC Weighted Efficiency (208/240/277 V)	95.5% / 95.5% / 95.5%	95.5% / 96.0% / 96.0%	95.5% / 95.5% / 96.0%	N/A / 96.0% / 96.0%
Dimensions W / H / D in inches	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5	18.4 / 24.1 / 9.5
Weight / Shipping Weight	141 lbs / 148 lbs	141 lbs / 148 lbs	141 lbs / 148 lbs	148 lbs / 152 lbs
Ambient Temperature Range	-13 °F to 113 °F	-13 °F to 113 °F	-13 °F to 113 °F	-13 °F to 113 °F
Power Consumption (standby)	< 7 W (0.1 W)	< 7 W (0.1 W)	< 7 W (0.1 W)	< 7 W (0.1 W)
Topology	Low frequency transformer, true sine wave	Low frequency transformer, true sine wave	Low frequency transformer, true sine wave	Low frequency transformer, true sine wave
Cooling Concept	OptiCool™, forced active cooling	OptiCool™, forced active cooling	OptiCool™, forced active cooling	OptiCool™, forced active cooling
Mounting Location In-/Outdoor (NEMA 3R)	●/●	●/●	●/●	●/●
LCD Display	●	●	●	●
Communication: RS485 / Wireless	○/○	○/○	○/○	○/○
Warranty: 10-year / 15-year / 20-year	●/○/○	●/○/○	●/○/○	●/○/○
Compliance: IEEE-929, IEEE-1547, UL 1741, UL 1998, FCC Part 15 A & B	●	●	●	●
NOTE: US inverters ship with gray lids.				
● Standard equipment ○ Optional				
Data at nominal conditions				





- UL 1741/IEEE-1547 compliant
- 10-year limited standard warranty
- Comprehensive SMA communications and data collection options

- Rugged stainless steel enclosure
- Exceptional reliability and energy capture ratio

- Easy to install three-point mounting system
- Modular design is easily expandable

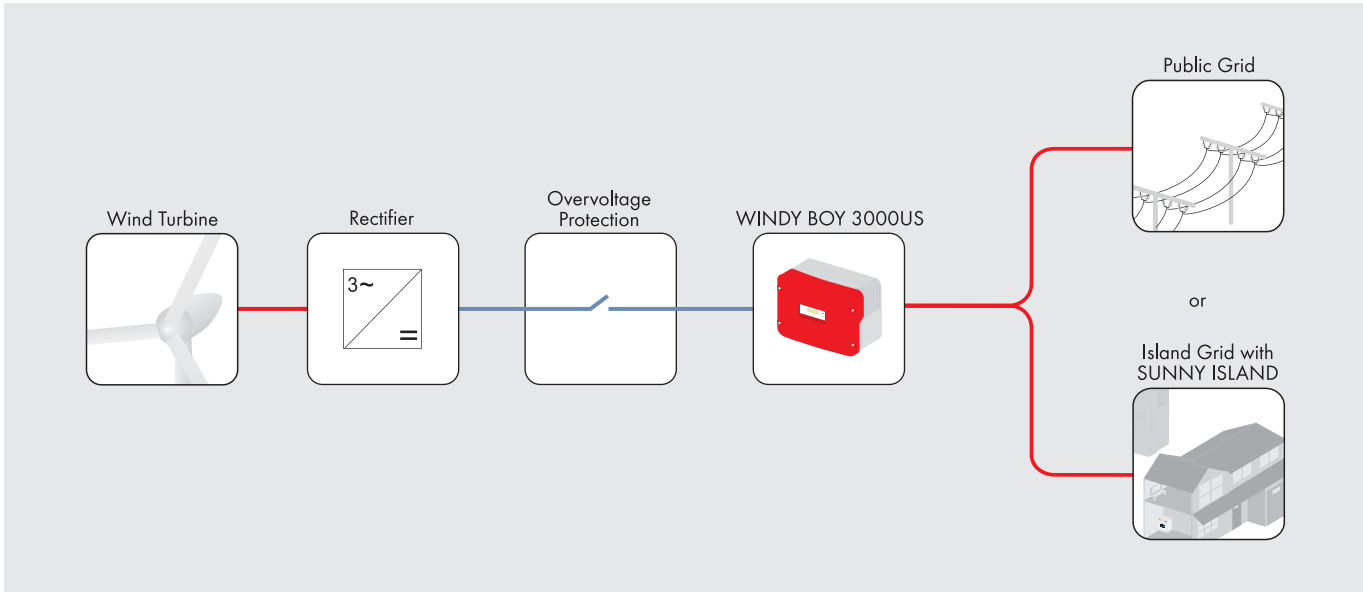
## WINDY BOY 3000US

The customized solution for wind turbine systems

SMA's Windy Boy inverters combine the same proven technology present in all Sunny Boy inverters with special firmware that permits direct grid-tied operation with a broad range of wind turbines – without batteries. This greatly reduces the overall system cost because components such as the charge controller, batteries and associated switch gear can be eliminated. Increased total energy capture combined with a reduction of balance of system components greatly reduces the installation and operating costs of a grid-tied wind system. We recommend contacting your local wind turbine supplier for information on compatible wind turbine models and system design considerations.

## Technical Data

	Windy Boy 3000US
Maximum Recommended DC Input Power	3200 W
Maximum DC Voltage	500 V
Peak Power Tracking Voltage	180 – 500 V @ 208 V 200 – 500 V @ 240 V
DC Maximum Input Current	17 A
DC Voltage Ripple	< 10%
Number of Fused String Inputs	4
DC Start Voltage (adjustable)	228 V
AC Nominal Power	3000 W
AC Maximum Output Power	3050 W
AC Maximum Output Current (@ 208, 240, 277 V)	15 A
AC Nominal Voltage / Range	183 – 229 V @ 208 V 211 – 264 V @ 240 V
AC Frequency / Range	60 Hz/59.3–60.5 Hz
Power Factor	1
Peak Inverter Efficiency	96.6%
CEC Weighted Efficiency (208/240/277 V)	95.0% / 95.5% / N/A
Dimensions: W x H x D in inches	17.8 x 13.8 x 9.3
Weight / Shipping Weight	84 lbs / 97 lbs
Ambient Temperature Range	-13 °F to 113 °F
Power Consumption (at night)	< 7 W (0.1 W)
Topology	Low frequency transformer, true sine wave
Cooling Concept	OptiCool™, forced active cooling
Mounting Location In-/Outdoor (NEMA 3R)	●/●
LCD Display	●
Lid Color: red / aluminum	●/○
Communication: RS485 / Wireless	○/○
Warranty: 10-year / 15-year / 20-year	●/○/○
Compliance: IEEE-929, IEEE-1547, UL 1741, UL 1998, FCC Part 15 A & B	●
NOTE: US inverters ship with gray lids.	
● 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

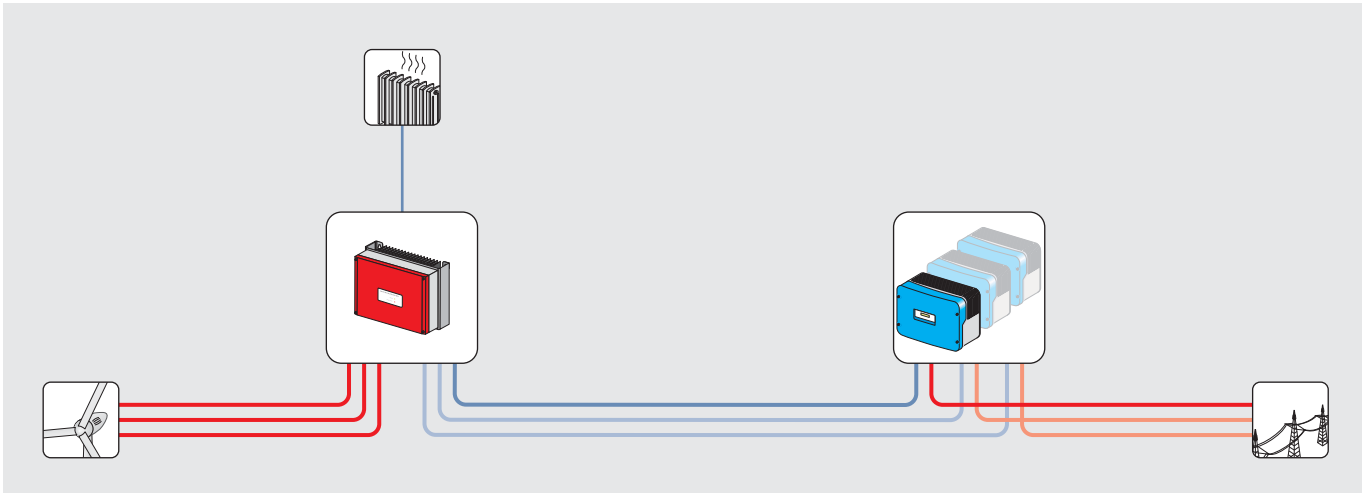
- Easy installation
- 3-phase generator connection
- Available in three voltage classes: 400, 500 and 600 V

## WINDY BOY PROTECTION BOX

Optimal protection for small wind power plants

Rectifier and overvoltage protection – the Windy Boy Protection Box from SMA is multitasking: 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

[illegible]





# 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<sub>2</sub> 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<sub>2</sub>, which makes them a very special renewable energy source. Since fuel cells emit heat, the H<sub>2</sub> 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

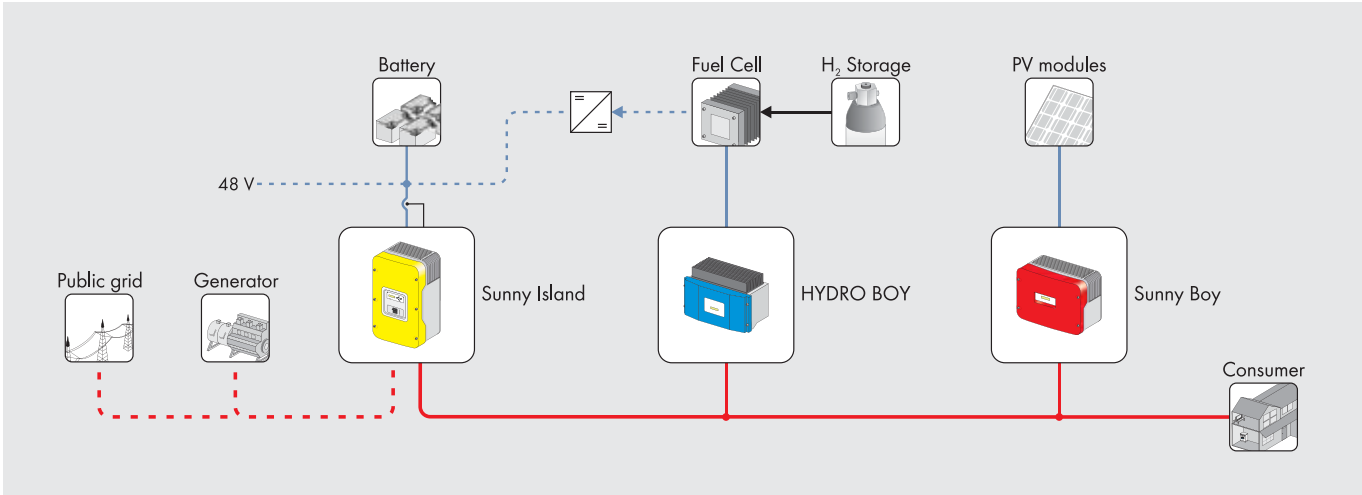
## HYDRO BOY 1124 / 1324

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
<b>Input (DC)</b>		
Input voltage	20 V – 55 V	20 V – 55 V
Nominal DC power at 86 °F	1200 W	1300 W
Max. input current	56 A	56 A
<b>Output (AC)</b>		
Max. AC power at 86 °F	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%
<b>Interfaces</b>		
CAN	●	●
RS485 / RS232	●/○	●/○
<b>General Data</b>		
Dimensions (W / H / D) in inches	17.1 / 11.6 / 8.4	17.1 / 11.6 / 8.4
Protection rating	IP42	IP20
Weight	approx. 64 lbs	approx. 64 lbs
Operating temperature range	-32 °F to 122 °F	-32 °F to 122 °F
Cooling concept	natural convection	with fans
Operating consumption	< 10 W	< 10 W
<b>Protection device</b>		
DC reverse polarity protection	●	●
Ground fault monitoring	●	●
AC short circuit monitoring	●	●
<b>Features / Function</b>		
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)

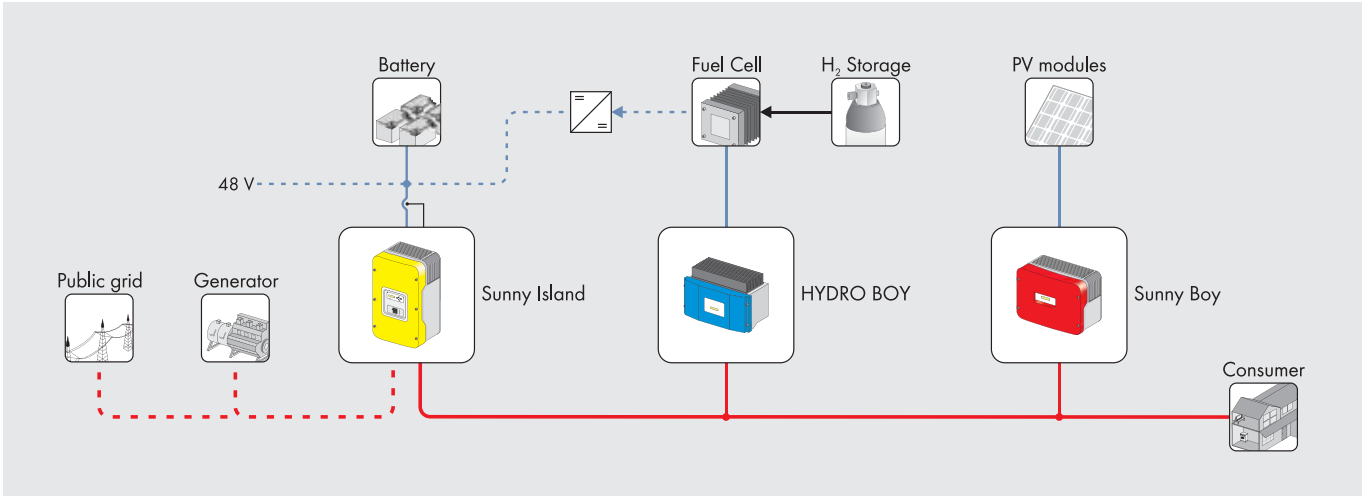
## HYDRO BOY 1524HF / 2524HF

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
<b>Input (DC)</b>		
Input voltage	25 V – 70 V	25 V – 70 V
Nominal DC power at 86 °F	1500 W	2500 W
Max. input current	60 A	100 A
<b>Output (AC)</b>		
Max. AC power at 86 °F	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%
<b>Interfaces</b>		
CAN	●	●
RS485 or RS232	○	○
<b>General Data</b>		
Dimensions (W / H / D) in inches	approx. 17.5 / 5.1 / 17.9	approx. 17.5 / 6.3 / 17.9
Protection rating	IP20	IP20
Weight	approx. 33 lbs	approx. 37 lbs
Operating temperature range	-32 °F to 158 °F	-32 °F to 158 °F
Cooling concept	Forced air cooling	Forced air cooling
Operating consumption	approx. 12 W	approx. 12 W
<b>Protection device</b>		
DC reverse polarity protection	●	●
AC short circuit monitoring	●	●
<b>Features / Function</b>		
Warranty	2 Years	2 Years
Certificates and permits	www.SMA.de	www.SMA.de
● Standard    ○ Optional		
Type Designation	HB 1524 HF	HB 2524HF





# SERVICE







#### Customer-oriented

- Professional commissioning, maintenance and repair
- Telephone support through our Service Line
- Text message call-back request service\*\*

#### High availability

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

#### Assured return

- Standard five- or ten-year warranty on Sunny Boy, Sunny Mini Central and Sunny Island inverters\*\*
- Extension of warranty up to 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 Service Line, 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 and Sunny Island inverters.

\*\* Service availability varies by region. Please contact your local SMA office for details.

### Expert advice by telephone through the SMA Service Line

The experts on our Service Line 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 6:00 a.m. to 5:00 p.m. PST. If you cannot get through to our Service Line 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-time as short as possible by replacing your device. For calls received before 3:30 p.m. PST, 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.\*\*

### 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- or ten-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 highest possible up-time, energy yield and return on investment.

### Interested?

Whether for start-up, service work or advice 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](http://www.SMA.de). Here, you can request or download our service brochure free of charge.

## SERVICE LINE

**SMA America, LLC**  
Tel +1 877 MY SMA TECH  
Tel +1 877 697 6283  
[www.SMA-America.com](http://www.SMA-America.com)

**SMA Technology Australia Pty. Ltd.**  
Tel +61 2 9669 2889  
[www.SMA-Australia.com.au](http://www.SMA-Australia.com.au)

**SMA Beijing Commercial Company Ltd.**  
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[www.SMA-China.com](http://www.SMA-China.com)

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[www.SMA-France.com](http://www.SMA-France.com)

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[www.SMA-Hellas.com](http://www.SMA-Hellas.com)

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[www.SMA-Iberica.com](http://www.SMA-Iberica.com)

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[www.SMA-Italia.com](http://www.SMA-Italia.com)

**SMA Technology Korea Co., Ltd.**  
Tel +82 2 508 8887 102  
[www.SMA-Korea.com](http://www.SMA-Korea.com)



#### Customer-oriented

- Professional installation, commissioning and maintenance on-site
- Telephone support by teams of experts through the Service Line

#### Assured return

- Five-year warranty
- Availability of compatible spare parts guaranteed up to 20 years

#### High availability

- Technical availability up to 99 percent
- Preventive Maintenance Package
- Operator Participation Package

- Full Service Package
- Full Service Package with 99% Uptime Guarantee

## 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 Service Line, 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.

\* Service availability varies by region. Please contact your local SMA office for details.

### **SMA knows power plants: 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 Service Line**

One number, one contact, one solution: through the Service Line, 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.

### **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 service packages of up to 20 years.

In order to meet the regular maintenance schedule recommended by SMA, there are four package options available. Under the Preventive Maintenance Package, maintenance is carried out by specially trained SMA service personnel on a scheduled basis. Under the Operator Participation Package, the SMA-trained operator performs repairs with SMA-provided parts. The Full Service Package includes maintenance, repair work and materials, while the Full Service Package with 99% Uptime Guarantee provides all the coverage of the Full Service package with reimbursement for down-time exceeding 1%. These packages assure 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](http://www.SMA.de). Here, you can request or download our service brochure free of charge.

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**SMA Technology Korea Co., Ltd.**  
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[www.SMA-Korea.com](http://www.SMA-Korea.com)

## **OPENING SOON**

**SMA Benelux SPRL**  
Brussel  
Benelux

**SMA Czech Republic s.r.o.**  
Prague  
Czech Republic

**SMA Service**  
Masdar City, Abu Dhabi  
United Arab Emirates

**SMA Service**  
Lisbon  
Portugal



# SUNNY PRO | Club

Making Strong Partners Stronger



**Y PRO** Club  
Strong Partners Stronger

SMA

**Sunlab**  
3255 Main Street  
Phoenix, AZ

**Brian Johnson**

SPC-US-1236547





#### Benefits

- Free Annual Training
- Online Solar Professional Listing
- Invites to Exclusive Events
- Monthly Email Updates
- SMA Sales Leads
- Priority Technical Service

## The Sunny PRO Club

Professional marketing support for solar professionals

As the world leader of solar inverter technology and manufacturing, SMA is dedicated to supporting and guiding the growth of the solar industry. To this end, the Sunny PRO Club helps you grow your business!

## Build your business when you partner with SMA

With unprecedented growth projected in the renewable energy industry, competition is getting fierce. Are you ready?

Joining the Sunny PRO Club gives your business the edge it needs to surpass the competition and provides you the professional marketing power, confidence and ability to work to your full potential. SMA is committed to supporting the growth of the solar industry—and that starts with you.

### Your expertise. Our resources. The perfect partnership.

As a member of the Sunny PRO Club you can select materials and campaigns, and customize your strategy to specifically target potential customers in your market. These tools are designed to systematically increase your market presence and ultimately drive sales. With our help, you will have the freedom to focus on doing what you do best—selling and installing solar systems.

## World-class marketing materials

As a Sunny PRO Club Member, your marketing toolbox will be larger and more powerful than it's ever been before. Member Services are specially designed to support your business with the global strength of the SMA brand. By combining your expertise and our resources, you can easily maximize your business potential.

Gain access to world-class marketing materials and services including:

- Personalized Brochures
- Presentation Folders
- Tradeshow Displays
- Personalized Service Stickers
- Direct Mail Support
- Giveaway Items
- Custom Reference Sheets
- Banner Design/Production
- Advertising Templates
- Vehicle Signage
- Logo Design Services
- Custom Mailers

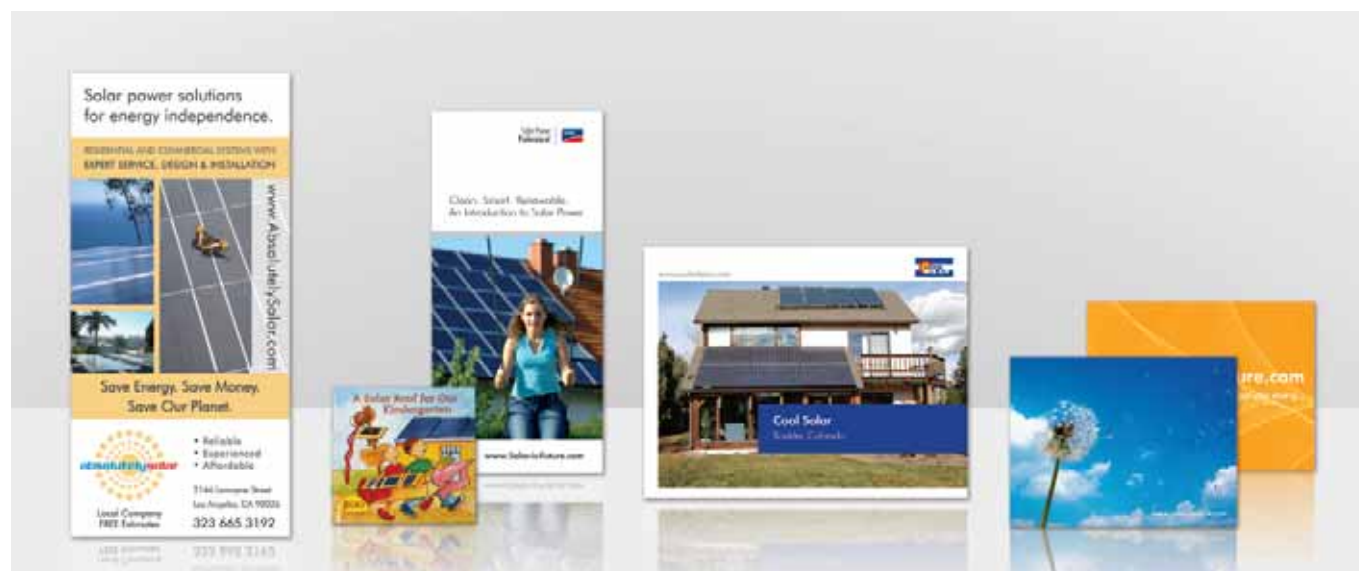
## How to apply

It's easy to become a Sunny PRO Club Member! Simply apply online at [www.SunnyPROClub.com](http://www.SunnyPROClub.com). Once your application is processed and approved, you will receive an exclusive Member Package including membership card, certificate and detailed club information.

### Membership Requirements:

- Maintain a Licensed Electrician or NABCEP Installer on staff
- Annual Membership Fee: \$175.00
- Attend an SMA Technical Training each year

For more information  
visit [www.SunnyPROClub.com](http://www.SunnyPROClub.com)









# SOLAR ACADEMY



#### **Comprehensive**

- Learn the latest in SMA inverter technology and photovoltaics.
- Courses for newcomers and experienced users

#### **Target-oriented**

- Training courses tailored specifically for installers, sales staff and system designers

#### **Hands-on**

- Practice wiring disconnects and inverters, as well as configuring data logging devices

#### **User-friendly**

- View schedules online and download registration forms
- Company tour and lunch included

## **The Solar Academy**

Practical knowledge for the solar professional

The SMA Solar Academy offers a comprehensive range of seminars on photovoltaics and provides information on SMA products, their use in PV systems, as well as the numerous data communication options available. The program also addresses current topics and recent developments in the solar industry. Classes are held at the SMA America headquarters in Rocklin, California, and at rotating sites all over North America.



## Seminars

SMA America, Inc. has expanded its educational initiative aimed at supporting current and prospective solar industry professionals. The Academy now offers 11 seminars on photovoltaic systems and sales, most of which qualify for NABCEP (North American Board Certified Energy Practitioners) continuing education credit. The curriculum consists of a broad range of classes covering grid-tied and off-grid products, commercial systems, communication devices, sales and marketing, code compliance and installation best practices. Each course is designed to meet the demands of increasingly complex industry requirements and provide a level of technical detail sufficient for both beginners and experienced professionals.

### Training courses

**INTRODUCTION TO PHOTOVOLTAICS\*** This course offers a simple overview of electricity and electronics as it relates to photovoltaics. Topics include basic understanding of AC and DC circuits, AC and DC electrical components, photovoltaic cell, module and array parameters, utility transformers and electrical safety.

**INTRODUCTION TO SMA PRODUCTS** This short seminar focuses on a technical overview of Sunny Boy inverters and their interaction with the utility grid. Topics include grid-tied photovoltaic components, inverter MPP tracking characteristics, single phase and three phase utility applications, SMA DC disconnect and inverter installation and troubleshooting. This seminar also provides an introduction to the Sunny Central series of inverters.

**SALES & MARKETING TRAINING\*** The focus of this training is on growing your business through the effective marketing and sales of SMA products. Topics include product features and benefits, current product line, product comparisons, the economics of selling solar and in depth product knowledge.

**SUNNY BOY 1** This course offers a basic understanding of Sunny Boy inverters and their interaction with the utility grid. Topics include Sunny Boy product knowledge, U.S. utility transformer integration, SMA DC disconnect, components of grid-tied PV systems, residential grid-tied backup, inverter safeguards per UL1741. It also covers installation requirements based on the National Electrical Code and introduces safe installation practices for high DC and AC voltages. Hands-on training provides reinforcement of training concepts.

**SUNNY BOY 2** This is an advanced-level course on multiple Sunny Boy inverters and Sunny Tower installations in three phase. Topics include the design and sizing of the PV array using Sunny Design software, sizing of DC and AC over-current protection devices, as well as wiring to comply with UL and the National Electrical Code safety standards. Hands-on training provides reinforcement of training concepts.

**SUNNY CENTRAL 1** This course provides in-depth knowledge of the Sunny Central family of inverters with and without internal transformers. Applications include large-scale PV plants ranging from hundreds of kilowatts to utility scale megawatt installations. This training session provides an overview of the National Electrical Code requirements

and safety in dealing with high voltages. It also provides a broad perspective of data logging, monitoring, command and control options for interaction with plant operators and utilities.

**SUNNY ISLAND 1** This course provides an in-depth understanding of the Sunny Island battery backup inverter, its response to a grid failure and its role in a grid-tied backup system. Topics include battery management, battery types, generator management, generator types, system management and additional system components, system design. Hands on training provides reinforcement of training concepts.

**SUNNY ISLAND 2** This course provides a review of grid-tied backup systems using AC and DC coupled energy sources and a hands-on exercise on battery, generator, grid, and system management configuration. It also covers design, installation, and troubleshooting guidelines for single phase and three phase off-grid systems with an overview of system diagnostic codes.

**COMMUNICATIONS 1** This course provides an overview of inverter communication options including displays, user interfaces, data logging, monitoring and control of renewable energy plants. Topics include RS-232, RS-485, wired and wireless hardware and communication protocol standards. The course includes an introduction to data logging using WebBox, Sunny Beam and SMA software for single and multiple inverters.

**REVENUE GRADE METERING** This course provides an introduction to power measurement, modbus command and control as well as demand monitoring options for large photovoltaic plants. It also provides an in-depth look at SMA's Power Measurement Kit, a solution for applications where ANSI C12 revenue-grade metering is required for production based incentive (PBI) markets.

**WEBBOX** This course provides an in-depth look at the installation and setup of the Sunny WebBox, a data logging and monitoring system. This session focuses on wiring and configuring the WebBox to monitor single and multiple SMA inverters locally and over the Internet. Attendees will also learn how to register the WebBox to the Sunny Portal to post and customize renewable energy plant web pages.

\*Does not qualify for NABCEP credit

#### » Interested?

Registering for seminars at the SMA Solar Academy is very simple. Just visit [www.SMA-America.com](http://www.SMA-America.com) and click on the Solar Academy tab or register by phone at +1 916 625 0870 or send an e-mail to [Training@SMA-America.com](mailto:Training@SMA-America.com). We look forward to seeing you at one of our seminars soon.





A woman with blonde hair, wearing a red polo shirt and grey work gloves, is focused on operating a machine in a factory setting. She is adjusting a component on a grey machine frame. A large red banner is draped across the top of the frame. The background shows industrial equipment and a bright, well-lit environment.

# 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 158 °F) and the open circuit voltage at the lowest cell temperature (standard 14 °F). 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 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**

	Feeding Management	Grid Safety Management	Active Power Control	
2009-01-01	Short term output control in increments of 10 percent of system capability.	Short term output control of 60, 30 or 0 percent of the connection power.	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

**Author:**

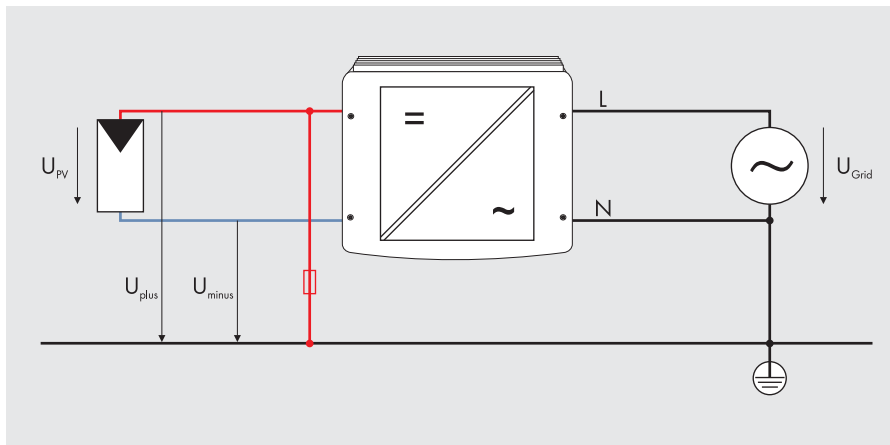
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Besides conventional PV modules, new cell technologies and other advancements have been appearing on the market for quite some time. Of these, some can only be operated under certain conditions. For this reason, when employing PV modules, the manufacturer's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

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.

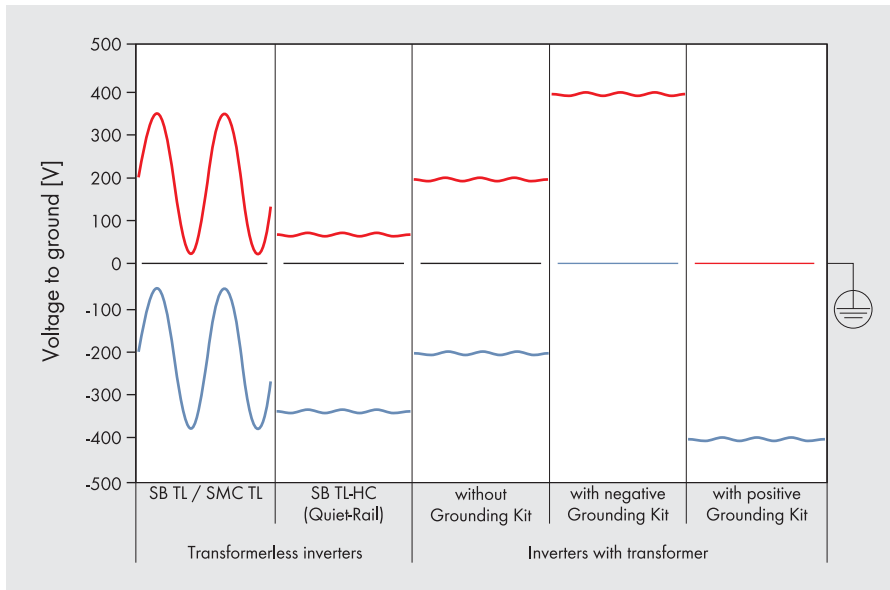


Block circuit diagram: solar power system with positive generator grounding

## 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.



Generation potential in different inverter topologies and grounding variations

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.

## 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 in-

verter 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.

Cell Technologies / Module Design	Transformerless inverters		Inverters with Transformers		
	SB xxxxxTL SMC xxxxxTL	STP xxxxxTL	Series Device SB xxx, SMC xxxxx	with negative Grounding-Kit	with positive Grounding-Kit
monocrystalline 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



# 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.

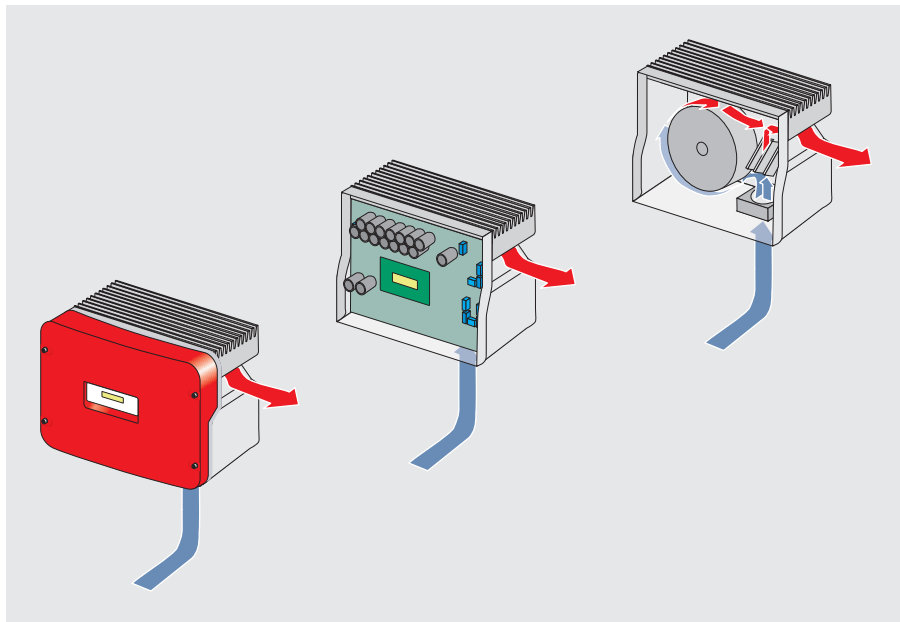
OptiTrac is SMA's solution for just this problem: sophisticated experiments at the SMA Testing Center have resulted in the refining of MPP tracking and further increase of its efficiency. It does not matter if crystalline or thin-layer modules are used. Extensive tests and field trials confirm that OptiTrac 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

### How OptiCool functions in the Sunny Boy 3800



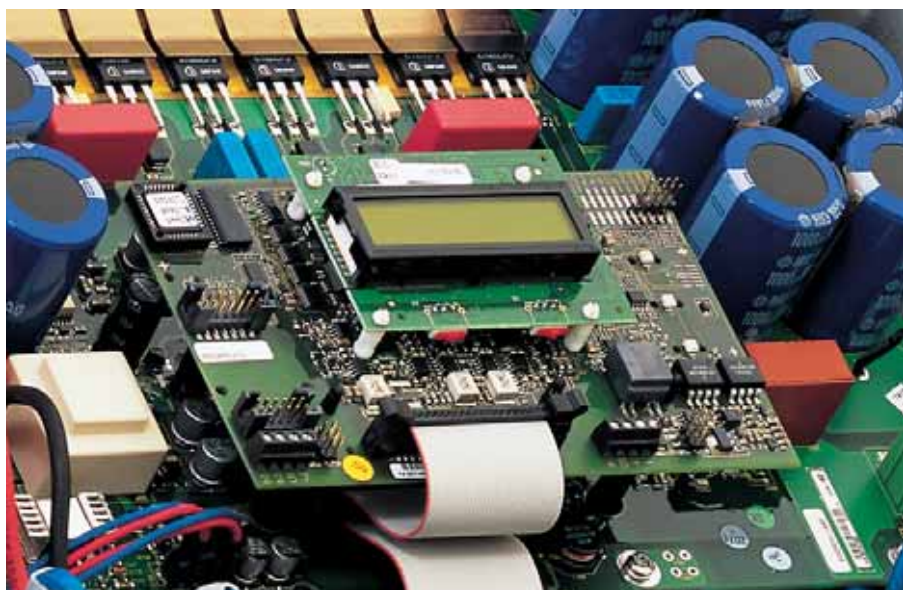
temperature can be found, such as chokes and transformers. A temperature-controlled fan leads the heat from this area through a special streaming tube to the outside. All in all, OptiCool produces a lower component

temperature in inverters and assures maximum possible reliability and outstanding overload characteristics.

## 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 per-



formance 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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### **NOTE:**

In the United States, SMA inverters are compliant with all UL standards for PV inverters. In the rest of the world, SMA inverters are equipped with the SMA Grid Guard and Electronic Solar Switch, which provides the most reliable safety systems currently on the market.

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 moni-

toring, the quality of the connected grid is constantly monitored – by testing voltage, frequency and impedance. Here, fail-safe operation must be guaranteed so that regular 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.

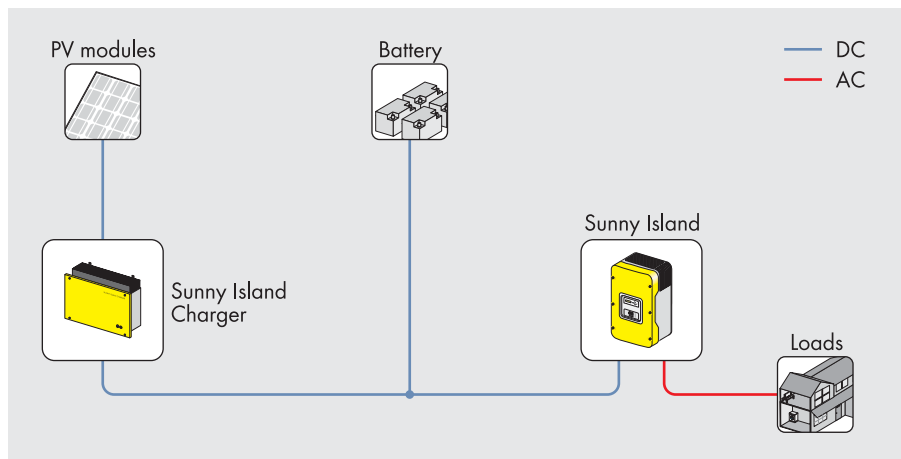
For this reason, mixed systems are used, at least with regard to larger solar energy supply systems: inverters convert the lower DC voltage of the batteries into grid conforming AC voltage of 230 volts. Only the consumers were connected to this AC voltage, while the PV modules and batteries were still connected with DC cables. For small distances you can make up for it with a charge controller, which prevents battery overload.

## The SMA solution for DC coupling

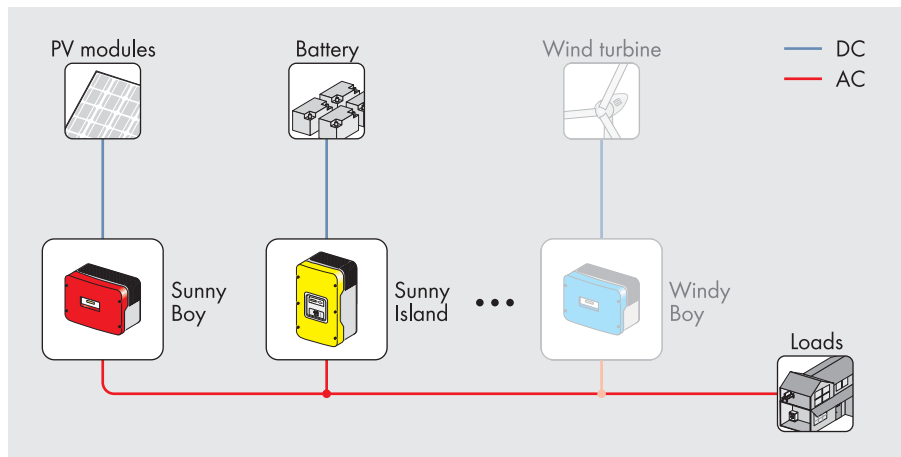
Since the PV modular voltage varies with the battery voltage, the solar modules in such systems almost never reach their optimal operating point. In this way, as much as 30 percent of the valuable solar energy is lost. In order to avoid this, you need an MPP charge controller like the Sunny Island Charger. 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



DC coupling: better with the Sunny Island Charger



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

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, Opti-Cool, 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 warranties 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<sub>2</sub> 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 visu-

al 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:

**State Capital**  
**Salem, Oregon, 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 MPP 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 of 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



**2005**

## **Sunny Portal**

Internet portal  
for presentation of system data

Customized system monitoring  
and individual visualization at  
[www.SunnyPortal.com](http://www.SunnyPortal.com)



**2004**

## **Sunny WebBox**

Data logger of the new generation

Innovative monitoring and communica-  
tion with the PV system via the Internet  
(Sunny Portal)



**2003**

## **Sunny Beam**

Easy wireless monitoring of PV systems

Attractive design, power supply via  
integrated solar cell



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

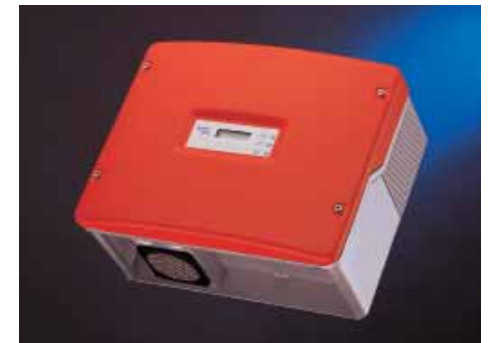


2006

### 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



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 compo-  
nents 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 in-  
creased efficiency



1991

### PV-WR

First PV inverter  
designed for mass production

User display, communication and  
visualization with PC

# Publication Information

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**SMA America, LLC**

Photos

**Stefanie Aumiller**

**Lucidmedia**

**Andreas Berthel**

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