Sunnyspain®Sun

Photovoltaic Solar Energy

A complete inverter family for
grid-connected and off-grid PV plants

sunnyspain®
energy group

Photovoltaic Solar

sunnyspain
energy group

- Energy
- Industry
- Marine
- Traction
- Basic Technologies
- Services

A Corporation structured into 6 divisions, each specializing in a different sector, all customer oriented.

International Network

An all-inclusive offer with customised solutions, adapted to suit the requirements of each particular customer or project

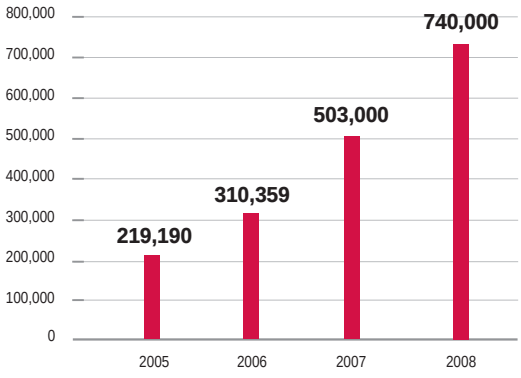
Thanks to its division-based structure and sustainable growth policy, **Sunnyspain** enjoys a privileged, competitive position and has strongly established itself as one of the leading companies in the electronics-electro technical sector.

Sunnyspain's core business is based on power and control electronics, generator, motor and electric machine technology and applications engineering.

The workforce comprising more than 3,500 professionals, 9% of which are dedicated to R&D, is a key asset to **Sunnyspain**. In the case of the Renewable Energies division, 37% of personnel is engaged in R&D activities.

Sunnyspain is committed to R&D&i as a growth engine.

Sunnyspain's net sales evolution
(thousands of euros)



Innovation and Technology at the service of our customers

Mission

"Apply engineering to investigation, design, manufacture and sale of products and services in fields where a great exchange of energy is performed, both generation and consumption, in an attempt to help to the change of the current energy model and contribute towards man's well-being".

Group Sunnyspain Energy S.L.

Focused on the wind, photovoltaic, thermo-solar, hydropower, biomass and biofuels fields since 1990, **Sunnyspain Energy S.L.** , is the company dedicated to the supply and development of equipment for the Renewable Energies sector.

In the Solar Photovoltaic area, **Sunnyspain** offers his customers solutions for the equipment of PV plants, adapted to suit their specific control and generating requirements.

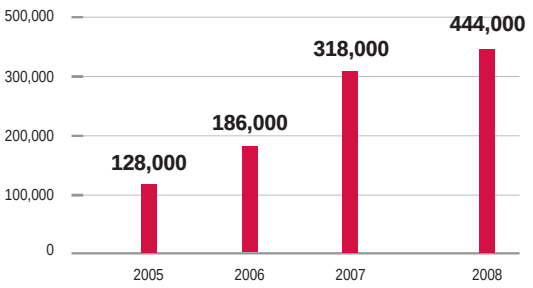
For **Sunnyspain**, the customer is its very raison d'être, as demonstrated by the attentive service provided, with ongoing collaboration right from the system design stage and throughout the entire system lifecycle.

In order to successfully cover the requirements of each new development and guarantee the excellence of the final product, **Sunnyspain** is equipped with cutting edge Technology and counts on a workforce committed to quality.

The **Sunnyspain** commitment to innovation and to the development of in-house technology, has led to considerable investments in R&D.

In this context, a key milestone is the forthcoming creation of the first and only experimental research and test centre for power electronics and high power electric machines in South Europe. This centre is set to accommodate more than 200 international top-level researchers.

Group Sunnyspain Energy S.L. growth in sales revenues
(thousands of euros)



Design and manufacture of inverters for **PV systems**

Sunnyspain, the leading company in Spain in the photovoltaic sector, designs and manufactures grid-connected and stand alone inverters.

The high quality of the inverter range is enhanced by specifically-designed electronics and software, making it possible to provide solutions tailored to suit the requirements of each particular system.

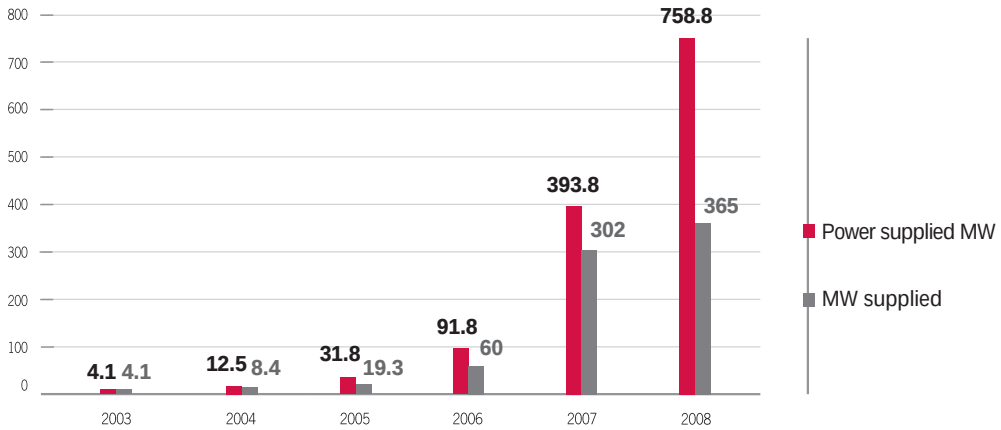
With a 500 MW production capacity in 2008, **Sunnyspain** offers the following product range:

Inverters with output powers ranging from 2.5 to 500 kW, hybrid inverters for stand-alone systems; string boxes and a range of tools for inverter interconnection and for the PC display of the system parameters.

All these products are customized to suit the requirements of each and every customer, in line with one of **Sunnyspain**'s core values:

Customer guidance, service and adaptability.

Supply history (MW)



References

1. **V3J INGENIERIA**
Losa del Obispo PV Plant (Valencia, Spain)
7,403 kWp (29 **Sunnyspain®Sun 100**, 42 **Sunnyspain®Sun 80**, 2 **Sunnyspain®Sun 40**)

Over 900 MWp in installations equipped with **Sunnyspain®Sun** inverters

Sunnyspain boasts a long, proven track record in the industrial and energy sectors, which stretches back to 1972, clearly demonstrating the company's ongoing policy of technological development. In the nineties, **Sunnyspain** became more involved in the development of electrical and control systems specific to the renewable energies sector; this was initially directed at the wind power and hydroelectric sectors and then, from 2001 onwards, our company broadening its scope to encompass the PV solar energy sector as well.

Since then, we have supplied customers with more than 36,000 inverters, of which 23,300 are single phase and 12,700 are three phase, accounting for a total accumulated power of more than 760 MW and confirming **Ingeteam** as one of the world's leading companies in the PV sector.

At **Sunnyspain**, we have extensive experience in the design and supply of grid-connected inverters for power ratings ranging from 100 to 500 kW, for large-scale PV farms.

We also specialise in the design and manufacture of high-power hybrid inverters for stand-alone installations, having supplied this type of inverter principally to the regions of Pacific Asia and Africa.

One of our key benchmark projects is the Acciona Solar PV plant at Amaraleja (Portugal); this plant is the largest of its kind in the world, having an installed power of 46 MWp. For this project, **Sunnyspain** designed a holistic solution with a medium voltage output including: 2,520 **Sunnyspain®Sun String Control** for monitoring the PV array string currents and 70 **Sunnyspain®Sun 500TL** inverters. This solution included the design of a housing for each inverter, comprising a prefabricated concrete enclosure to hold the medium voltage transformer, protection cells, auxiliary electric panels and the thermal dissipation system.

The 60 MWp Nobesol solar farm situated in Olmedilla (Spain) is another important project in which Ingeteam has participated, supplying more than 450, **Sunnyspain®Sun 100** inverters.


2

2. **NOBESOL**
PV array at Olmedilla de Alarcón (Spain)
60 MWp (453 **Sunnyspain®Sun 100**)


3

3. **FV3**
PV array at Pocico Salao (Spain)
5.16 MWp (16 **Sunnyspain®Sun 25**, 33 **Sunnyspain®Sun 100**)


4

4. **SAILER GmbH**
PV array at Asch (Germany)
82.95 kWp (14 **Sunnyspain®Sun 4.6TL**)

5. **ACCIONA SOLAR**
PV Plant at Amaraleja (Portugal)
46 MWp (70 **Sunnyspain®Sun 500TL**)

6. Concrete housing for **Ingecon®Sun** Power **500TL**

7. **SOLARTIA**
PV array at Viana (Spain)
8.7 MWp (223 **Sunnyspain®Sun 5**,
106 **Sunnyspain®Sun 25**, 40 **Sunnyspain®Sun 100**)

8. **ENERPRO**
PV array at Albarreal de Tajo (Spain)
2.2 MWp (20 **Sunnyspain®Sun 100**)

9

10

11

9. **IRATI, S.A.**
Roof installed PV array at Bayonne (France)
2,970 W (**Sunnyspain®Sun 2.5TL**)

10. **M+H POWER**
Stand alone PV array at Innawonga Bellary (Australia)
20 KWp (**Sunnyspain®Hybrid**)

11. **Sunnyspain®Hybrid**
next to batteries

12. **Roof installed PV array at Molinella (BO-Italy)**
100 kWp (6 **Sunnyspain®Sun 12.5**)


12


13


14


15

13. **GMN**
Stand alone PV array at Nembrala (Indonesia)
21 kWp (**Sunnyspain®Hybrid**)

14. **ENERGÉTICA HELLAS**
PV array with trackers at Thessaloniki (Greece)
160 kWp (1 **Sunnyspain®Sun 80**, 1 **Sunnyspain®Sun 60**)

15. **GRUPOTEC SOLAR**
PV array on an industrial roof at Molina de Segura (Spain)
990 kWp (9 **Sunnyspain®Sun 100**)

Products


GH
5t

Product range

All the **Sunnyspain** solar products have been designed at our headquarters in Sarriguren, near the Spanish city of Pamplona, using the very latest means.

They are manufactured with the highest quality components in our factory in Sesma (Spain) and are approved and certified to the strictest standards. In addition to the 5 year comprehensive guarantee, **Ingeteam** also offers guarantee extensions and after-sales services for periods of up to 25 years.

1

Sunnyspain®Sun Lite

Outputs from 2.5 to 6 kW with our without a galvanic isolation transformer.

Designed for outdoor installations and to withstand extreme temperatures.

Suitable for small-scale roof-top systems and for PV plants equipped with sun trackers or fixed structures.

2

Sunnyspain®Sun Smart

Outputs from 10 to 30 kW with a galvanic isolation transformer.

Designed for roof-top systems and for PV plants equipped with sun trackers or fixed structures.

3

Sunnyspain®Sun Power / Power Max

A wide range of inverters from 50 to 500 kW, suitable for many different types of applications.

The **Sunnyspain®Sun Power Max** inverters are modular, for increased installation availability and ease of maintenance.

Designed without a galvanic isolation transformer, these inverters are suitable for medium voltage applications, providing increased performance and reduced installation costs.

4

Sunnyspain®Hybrid

Designed for stand-alone power generation systems. Available in an output range from 10 to 120 kW.

Innovative design for enhanced system flexibility and increased availability.

Modular system to allow future extensions and ease of maintenance.

5

Accessories

Sunnyspain®Sun Communication

GSM/GPRS modem. RS-485, wireless, Ethernet, fiber optics and analogical input.

Sunnyspain®Sun String Control

To measure and monitor the current of each PV array string.

Sunnyspain®Sun Manager

Communication software.

SunnyspainRAS™ PV

Web Portal to access the PV plants.

Sunnyspain®Sun Planner

PV array dimensioning.

Sunnyspain® Sun Lite

The new generation of single phase inverters

Sunnyspain®Sun Lite

Supported by many years of experience in the PV sector, **Sunnyspain** is committed to ongoing product improvement, day by day. This has led to the development of a new generation of **Sunnyspain®Sun Lite** inverters, offering a sleeker line, with an up-to-date design and a new, lighter casing.

The **Sunnyspain®Sun Lite** single-phase inverter family offers users a robust product, reflecting the extensive experience accumulated over the years, capable of withstanding extreme temperatures, even outdoors. The power ratings range from 2.5 to 6 kW. This inverter family is primarily directed at the residential sector and also at larger, decentralised projects.

A product which satisfies even the most demanding international markets.

Sunnyspain®Sun Lite

2.5TL / 3TL / 3.3TL / 3.68TL / 3.8TL / 4.6TL / 5TL / 6TL

The **Sunnyspain®Sun Lite TL** transformer-free inverters are designed to adapt to the standards and regulations in force in the different international markets. The inverters are apt for different types of installations, ranging from residential applications up to large-scale solar plants.

The inverters feature a molded aluminium casing, for indoor and outdoor installation and capable of withstanding extreme temperatures, and an advanced maximum power point tracker system (MPPT) to extract the maximum power from the PV array.

To facilitate installation, the inverters are equipped with fast-on connectors for the DC, AC sides and communications. No additional items are required and they can be manually disconnected from the grid.

Each inverter incorporates an internal data logger for up to 3 months data storage, which can be accessed from either a remote PC or in situ from the inverter front panel, through a keypad. This front panel also features LED status and alarm indicators and an LCD screen.

The **Sunnyspain®Sun Lite TL** inverters have been designed with components which offer a useful life of more than 20 years. They come with a standard guarantee of 5 years, which can be extended for periods to up to 25 years.

Protections

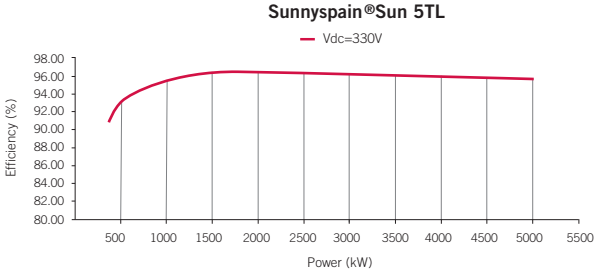
The **Sunnyspain®Sun Lite TL** inverters are equipped with the following electrical protections against:

- Reverse polarity.
- Input and output overvoltage.
- Output short-circuits and overloads.
- Insulation failures.
- Anti-islanding with automatic disconnection.
- Optional DC breaker.

Optional accessories

- Inter-inverter communication via RS-485, fibre optics, wireless or Ethernet.
- Modem for GSM/GPRS remote communication.
- **Sunnyspain®Sun Manager** software for parameter display and data recording.
- **SunnyspainRAS™ PV** for Internet data display.
- Analogue input card for the measurement of meteorological variables.
- Potential free relay for alarm signalling.

Efficiency



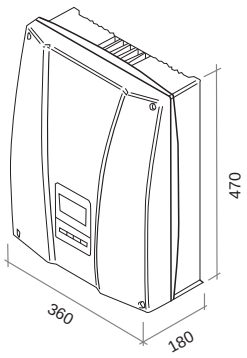
Size and weight

(mm)

Sunnyspain®Sun 2.5TL / 3TL: 18.3 kg.

Sunnyspain®Sun 3.3TL / 3.68TL: 19.7 kg.

Sunnyspain®Sun 3.8TL / 4.6TL / 5TL / 6TL: 23.3 kg.



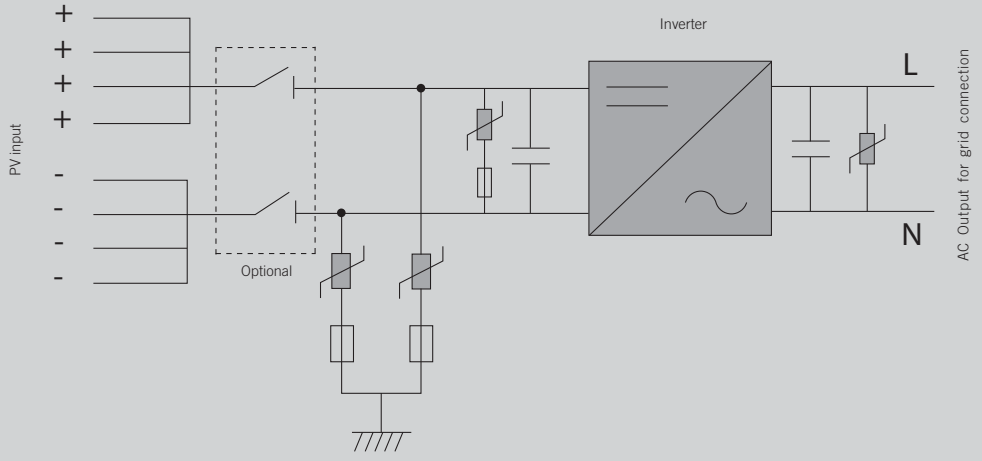
Technical data

Model	Sunnyspain®Sun 2.5TL	Sunnyspain®Sun 3TL	Sunnyspain®Sun 3.3TL	Sunnyspain®Sun 3.68TL	Sunnyspain®Sun 3.8TL	Sunnyspain®Sun 4.6TL	Sunnyspain®Sun 5TL	Sunnyspain®Sun 6TL
Input (DC)								
Recommended PV array power range[1]	2.8 - 3.3 kWp	3.2 - 4 kWp	3.8 - 4.3 kWp	3.9 - 4.8 kWp	4.1 - 5 kWp	5.2 - 6 kWp	5.7 - 6.5 kWp	6.3 - 7 kWp
Voltage range MPP	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V
Maximum voltage DC[2]	550 V	550 V	550 V	550 V	550 V	550 V	550 V	550 V
Maximum current DC	16 A	16 A	22 A	22 A	33 A	33 A	33 A	33 A
DC inputs	3	3	4	4	4	4	4	4
MPPT	1	1	1	1	1	1	1	1
Output (AC)								
Rated power AC HT[3]	2.5 kW	2.8 kW	3.3 kW	3.68 kW	3.6 kW	4.6 kW	5 kW	5.4 kW
Rated power AC HP[4]	2.7 kW	3 kW	3.7 kW	3.68 kW	3.9 kW	5 kW	5.5 kW	6 kW
Maximum current AC	13 A	13.5 A	17 A	17 A	18.8 A	24.2 A	25.5 A	26.2 A
Rated voltage AC	230 V	230 V	230 V	230 V	230 V	230 V	230 V	230 V
Frequency AC	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Phi Cosine[5]	1	1	1	1	1	1	1	1
THD[5]	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%
Efficiency								
Maximum efficiency	96.6%	96.6%	96.8%	96.8%	97%	97%	97%	97%
Euroefficiency	95%	95.1%	95.2%	95.2%	95.6%	96%	96.1%	96.1%
General Information								
Stand-by consumption	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W
Consumption at night	<0.5 W	<0.5 W	<0.5 W	<0.5 W	<0.5 W	<0.5 W	<0.5 W	<0.5 W
Ambient temperature	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC
Relative humidity	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%
Protection class	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65
Compliance with standards	VDE0126-1-1, EN 50178, G83/1, CEI 0-16							
	RD 661/2007							
	RTC alle rete BT di Enel Distribuzione							
	CEI 11-20							
	CEI 11-20 V1							
	CE Mark							

HT Mode (high temperature) - Rated outputs at 45ºC
HP mode (high power) - Rated outputs at 40ºC

Notes: [1] Depending on the type of installation and geographical location. [2] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures. [3] Up to 45ºC ambient temperature, Pmax= 110% Pnom for non permanent transients [4] Up to 40ºC ambient temperature, Pmax = Pnom [5] For Pout > 25% of the rated power

Sunnyspain®Sun Lite TL



Sunnyspain®Sun Lite

2.5 / 3.3 / 5

The **Sunnyspain®Sun Lite** inverters equipped with a galvanic isolation AC transformer, are compatible with the different PV module technology on the market, thereby permitting greater flexibility when sizing PV installations.

The inverters feature a molded aluminium casing, for indoor and outdoor installation and capable of withstanding extreme temperatures, and an advanced maximum power point tracker system (MPPT) to extract the maximum power from the PV array. To facilitate installation, the inverters are equipped with fast-on connectors for the DC, AC sides and communications.

No additional items are required and they can be manually disconnected from the grid. Each inverter incorporates an internal data logger for up to 3 months data storage, which can be accessed from either a remote PC or in situ from the inverter front panel, through a key-pad.This front panel also features LED status and alarm indicators and an LCD screen.

The **Sunnyspain®Sun Lite** inverters have been designed with components which offer a useful life of more than 20 years. They come with a standard guarantee of 5 years, which can be extended for periods to up to 25 years.

Protections

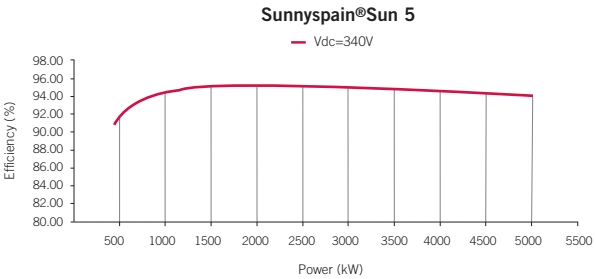
The **Sunnyspain®Sun Lite** inverters with a galvanic isolation AC transformer are equipped with the following electrical protections against:

- Galvanic isolation between the DC and AC side.
- Reverse polarity.
- Input and output overvoltage.
- Output short-circuits and overloads.
- Insulation failures.
- Anti-islanding with automatic disconnection.
- Optional DC breaker.

Optional accessories

- Inter-inverter communication via RS-485, fibre optics, wireless or Ethernet.
- Modem for GSM/GPRS remote communication.
- **Sunnyspain®Sun Manager** software for parameter display and data recording.
- **SunnyspainRAS™ PV** for Internet data display.
- Analogue input card for the measurement of meteorological variables.
- Grounding kit for those PV modules requiring this.
- Potential free relay for alarm signalling.

Efficiency

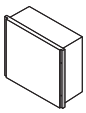


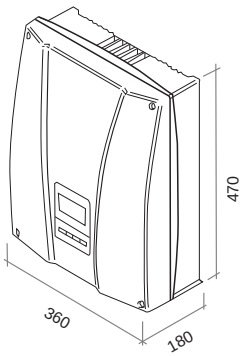
Size and weight

(mm)

Sunnyspain®Sun 2.5: 43.3 kg.
Sunnyspain®Sun 3.3: 44.7 kg.
Sunnyspain®Sun 5: 65 kg.

Transformer





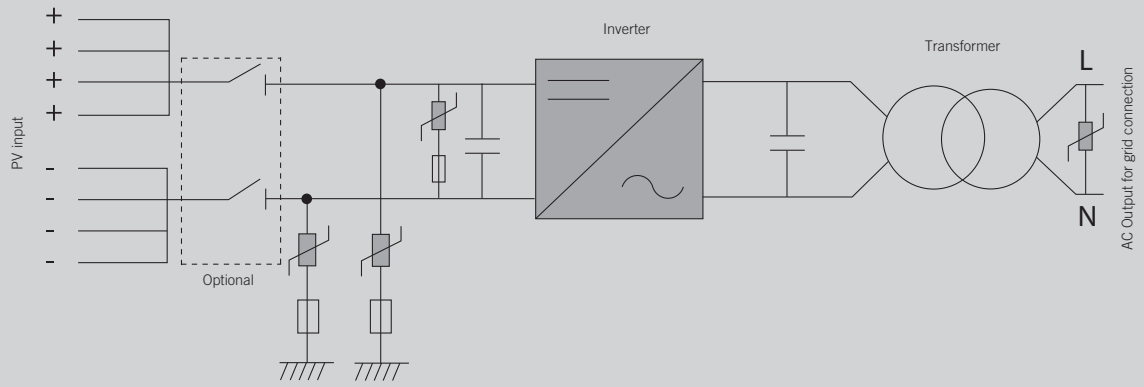
Technical data

Model	Sunnyspain®Sun 2.5	Sunnyspain®Sun 3.3	Sunnyspain®Sun 5
Input (DC)			
Recommended PV array power range[1]	2.8 - 3.3 kWp	3.8 - 4.3 kWp	5.8 - 6.5 kWp
Voltage range MPP	150 - 450 V	150 - 450 V	150 - 450 V
Maximum voltage DC[2]	550 V	550 V	550 V
Maximum current DC	16 A	22 A	33 A
DC inputs	3	4	4
MPPT	1	1	1
Output (AC)			
Rated power AC HT[3]	2.5 kW	3.3 kW	5 kW
Rated power AC HP[4]	2.7 kW	3.7 kW	5.5 kW
Maximum current AC	13 A	17 A	25.5 A
Rated voltage AC	230 V	230 V	230 V
Frequency AC	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Phi Cosine[5]	1	1	1
THD[5]	< 3%	< 3%	< 3%
Efficiency			
Maximum efficiency	94.7%	94.9%	95%
Euroefficiency	93.8%	94%	94.3%
General Information			
Stand-by consumption	<10 W	<10 W	<10 W
Consumption at night	<0.5 W	<0,5 W	<0.5 W
Ambient temperature	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC
Relative humidity	0 - 95%	0 - 95%	0 - 95%
Protection class	IP 65	IP 54	IP 54
Compliance with standards	RD 661/2007, EN 50178, G83/1, CEI 0-16, VDE 0126-1-1		
	CEI 11-20		
	CEI 11-20 V1		
	CEI 0-16		
	CE Mark		

HT Mode (high temperature) - Rated outputs at 45ºC
HP mode (high power) - Rated outputs at 40ºC

Notes: [1] Depending on the type of installation and geographical location. [2] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures. [3] Up to 45ºC ambient temperature, Pmax= 110% Pnom for non permanent transients [4] Up to 40ºC ambient temperature, Pmax = Pnom [5] For Pout > 25% of the rated power

Sunnyspain®Sun Lite TL



Sunnyspain® Sun Smart

The intelligent solution for outdoor installations

Sunnyspain®Sun Smart

The **Sunnyspain®Sun Smart** three-phase inverter family has been specially designed to facilitate installation and maintenance procedures, thanks to its ingenious component replacement system.

Featuring power ratings from 10 to 30 kW, a size and casing suitable for outdoor use, this equipment is ideal for medium sized industrial roofs and for plants with sun tracker systems.

Sunnyspain®Sun Smart

10 / 12.5 / 15 / 20 / 25 / 30

The **Sunnyspain®Sun Smart** inverter family combines a rugged stainless steel housing for use in outdoor installations (IP65 electronics block) with the versatility of an extensive range or power ratings, making it ideal for installations of all sizes.

The inverter pure three phase conversion stage offers a balanced output in all three AC phases, with no additional equipment required for simultaneous disconnection. Inverter maintenance is exceedingly simple, due to the fact that the electronics block is easily replaceable from the exterior.

The inverters feature a stainless steel casing, for indoor and outdoor installation and capable of withstanding extreme temperatures, and an advanced maximum power point tracker system (MPPT) to extract the maximum power from the PV array. To facilitate installation, the inverters are equipped with fast-on connectors for the DC, AC sides and communications. No additional items are required and they can be manually disconnected from the grid. Each inverter incorporates an internal data logger for up to 3 months data storage, which can be accessed from either a remote PC or in situ from the inverter front panel, through a keypad. This front panel also features LED status and alarm indicators and an LCD screen.

The **Sunnyspain®Sun Smart** inverters have been designed with components which offer a useful life of more than 20 years. They come with a standard guarantee of 5 years, which can be extended for periods to up to 25 years.

Protections

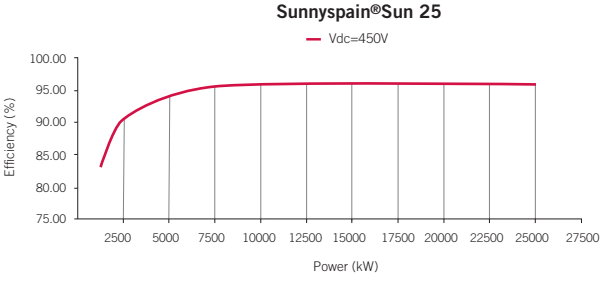
The **Sunnyspain®Sun Smart** inverters are equipped with the following electrical protections against:

- Galvanic isolation between the DC and AC side.
- Reverse polarity.
- Output short-circuits and overloads.
- Insulation failures.
- Anti-islanding with automatic disconnection.
- Optional DC breaker.
- Optional voltage surge arresters at the input and output.

Optional accessories

- Inter-inverter communication via RS-485, fibre optics, wireless or Ethernet.
- Modem for GSM/GPRS remote communication.
- **Sunnyspain®Sun Manager** software for parameter display and data recording.
- **SunnyspainRAS™ PV** for Internet data display.
- Analogue input card for the measurement of meteorological variables.
- Grounding kit for those PV modules requiring this.

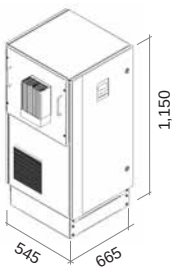
Efficiency



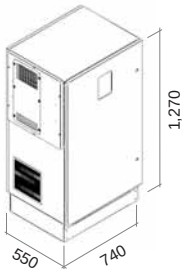
Size and weight

(mm)

Sunnyspain®Sun10/12.5: 192 kg.
Sunnyspain®Sun 15: 242 kg.



Sunnyspain®Sun 20/25/30: 323.5 kg.



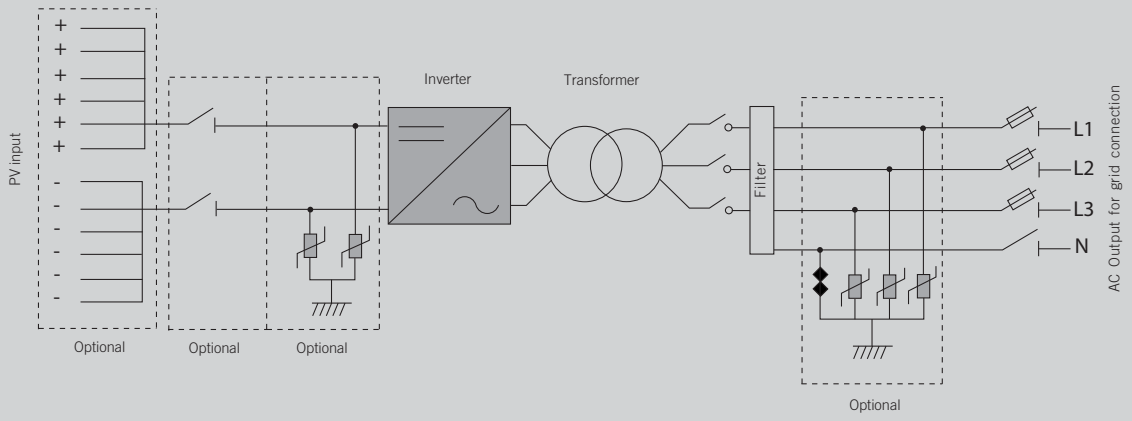
Technical data

Model	Sunnyspain®Sun 10	Sunnyspain®Sun 12.5	Sunnyspain®Sun 15	Sunnyspain®Sun 20	Sunnyspain®Sun 25	Sunnyspain®Sun 30
Input (DC)						
Recommended PV array power range[1]	12 - 13 kWp	14 - 16 kWp	17 - 20 kWp	23 - 26 kWp	29 - 33 kWp	35 - 39 kWp
Voltage range MPP	405 - 750 V	405 - 750 V	405 - 750 V	405 - 750 V	405 - 750 V	405 - 750 V
Maximum voltage DC[2]	900 V	900 V	900 V	900 V	900 V	900 V
Maximum current DC	30 A	32 A	41 A	57 A	71 A	86 A
DC inputs	8	8	8	10	10	10
MPPT	1	1	1	1	1	1
Output (AC)						
Rated power AC HT[3]	10 kW	12.5 kW	15 kW	20 kW	25 kW	30 kW
Rated power AC HP[4]	11 kW	13 kW	16 kW	22 kW	27.5 kW	33 kW
Maximum current AC	19 A	22 A	23 A	37 A	50 A	50 A
Rated voltage AC	400 V	400 V	400 V	400 V	400 V	400 V
Frequency AC	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Phi Cosine[5]	1	1	1	1	1	1
THD[5]	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%
Efficiency						
Maximum efficiency	94.90%	94.90%	94.90%	95.50%	95.60%	95.60%
Euroefficiency	93.30%	93.50%	93.80%	94.00%	94.50%	94.70%
General Information						
Stand-by consumption	30 W	30 W	30 W	30 W	30 W	30 W
Consumption at night	1 W	1 W	1 W	1 W	1 W	1 W
Ambient temperature	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C
Relative humidity	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%
Protection class	IP 54	IP 54	IP 54	IP 54	IP 54	IP 54
Compliance with standards	VDE0126-1-1, EN 50178, RD 661/2007					
	RTC alle rete BT di Enel Distribuzione					
	CEI 11-20					
	CEI 11-20 V1					
	CEI 0-16					
	CE Mark					

HT Mode (high temperature) - Rated outputs at 45ºC
HP mode (high power) - Rated outputs at 40ºC

Notes: [1] Depending on the type of installation and geographical location. [2] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures. [3] Up to 45ºC ambient temperature, Pmax= 110% Pnom for non permanent transients [4] Up to 40ºC ambient temperature, Pmax = Pnom [5] For Pout > 25% of the rated power

Sunnyspain®Sun Smart



Sunnyspain® Sun Power / Power Max

Optimum performance in large multi-megawatt installations

Sunnyspain®Sun Power / Power Max

The **Sunnyspain®Sun Power** three phase inverter range, offering power ratings from 50 to 100 kW, is designed for use on large sized industrial roofs and ground-based PV farms. These inverters are widely installed in the market, thanks to their ease of maintenance.

The **Sunnyspain®Sun Power Max** range features power ratings from 100 to 500 kW, with the possibility of providing the complete supply of the prefabricated concrete housing and the transformer and protection cells for a Medium Voltage output.

It is primarily designed for use in large scale megawatt plants.

Sunnyspain®Sun Power

50 / 60 / 70 / 80 / 90 / 100

Designed for ease of maintenance, offering high efficiency at high temperatures, and featuring full electric protections as a standard supply, this inverter family is one of the most popular in the **Sunnyspain®Sun** inverter range. These **Sunnyspain®Sun Power** inverters are designed for medium and large power roof installations and also for ground-based multi-megawatt installations.

This inverter family is equipped with an advanced maximum power point tracking system (MPPT) to extract the maximum power from the PV array. No additional items are required and they can be manually disconnected from the grid.

Each inverter incorporates an internal data logger for up to 3 months data storage, which can be accessed from either a remote PC or in situ from the inverter front panel, through a keypad. This front panel also features LED status and alarm indicators and an LCD screen.

The **Sunnyspain®Sun Power** inverters have been designed with components which offer a useful life of more than 20 years. They come with a standard guarantee of 5 years, which can be extended for periods to up to 25 years.

Protections

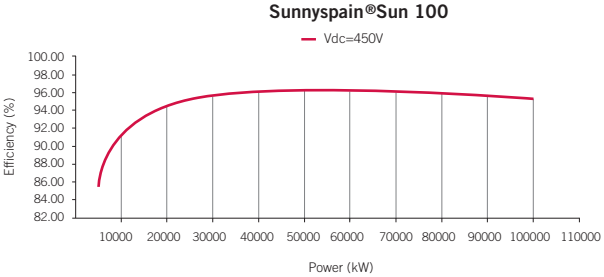
The **Sunnyspain®Sun Power** inverters are equipped with the following electrical protections against:

- Galvanic isolation between the DC and AC side.
- Reverse polarity.
- Output short-circuits and overloads.
- Insulation failures.
- Anti-islanding with automatic disconnection.
- DC breaker.
- DC fuses.
- AC MT breaker.
- DC surge arresters.
- AC surge arresters.

Optional accessories

- Inter-inverter communication via RS-485, fibre optics, wireless or Ethernet.
- Modem for GSM/GPRS remote communication.
- **Sunnyspain®Sun Manager** software for parameter display and data recording.
- **SunnyspainRAS™ PV** for Internet data display.
- Analogue input card for the measurement of meteorological variables.
- PV array string current monitoring. **Sunnyspain®Sun String Control**.
- Grounding kit for those PV modules requiring this.

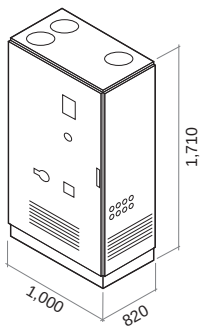
Efficiency



Size and weight

(mm)

Sunnyspain®Sun 50/60: 900 kg.
Sunnyspain®Sun 70/80: 1,026 kg.
Sunnyspain®Sun 90/100: 1,162 kg.



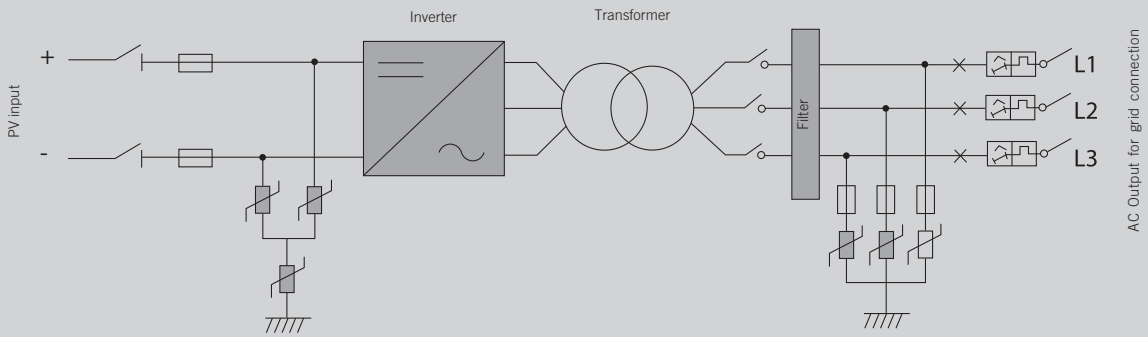
Technical data

Model	Sunnyspain®Sun 50	Sunnyspain®Sun 60	Sunnyspain®Sun 70	Sunnyspain®Sun 80	Sunnyspain®Sun 90	Sunnyspain®Sun 100
Input (DC)						
Recommended PV array power range[1]	57 - 65 kWp	69 - 78 kWp	80 - 91 kWp	92 - 104 kWp	103 - 117 kWp	115 - 130 kWp
Voltage range MPP	405 - 750 V	405 - 750 V	405 - 750 V	405 - 750 V	405 - 750 V	405 - 750 V
Maximum voltage DC[2]	900 V	900 V	900 V	900 V	900 V	900 V
Maximum current DC	143 A	172 A	200 A	229 A	257 A	286 A
DC inputs	4	4	4	4	4	4
MPPT	1	1	1	1	1	1
Output (AC)						
Rated power AC HT[3]	50 kW	60 kW	70 kW	80 kW	90 kW	100 kW
Rated power AC HP[4]	55 kW	66 kW	77 kW	88 kW	99 kW	110 kW
Maximum current AC	93 A	118 A	131 A	156 A	161 A	161 A
Rated voltage AC	400 V	400 V	400 V	400 V	400 V	400 V
Frequency AC	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Phi Cosine[5]	1	1	1	1	1	1
THD[5]	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%
Efficiency						
Maximum efficiency	96.3%	96.40%	97.20%	97.50%	96.90%	96.80%
Euroefficiency	94.30%	94.70%	96.10%	96.20%	95.80%	95.70%
General Information						
Stand-by consumption	30 W	30 W	30 W	30 W	30 W	30 W
Consumption at night	1 W	1 W	1 W	1 W	1 W	1 W
Ambient temperature	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C
Relative humidity	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%
Protection class	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Compliance with standards	RD 661/2007, EN 50178, Reglamento VDEW BT					
	RTC alle rete BT di Enel Distribuzione					
	CEI 11-20					
	CEI 11-20 V1					
	CEI 0-16					
	CE Mark					

HT Mode (high temperature) - Rated outputs at 45ºC
HP mode (high power) - Rated outputs at 40ºC

Notes: [1] Depending on the type of installation and geographical location. [2] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures. [3] Up to 45ºC ambient temperature, Pmax= 110% Pnom for non permanent transients [4] Up to 40ºC ambient temperature, Pmax = Pnom [5] For Pout > 25% of the rated power

Sunnyspain®Sun Power



Sunnyspain®Sun Power Max

100TL / 125TL / 250TL / 375TL / 500TL

The modular design and absence of a low voltage transformer considerably enhance the inverter efficiency through the different DC stages, and the independent maximum power point trackers (MPPT). The **Sunnyspain®Sun Power Max** range also incorporates those DC/AC protection devices required by even the most exacting standards and regulations. This inverter family has been specifically designed for medium voltage applications, offering increased availability thanks to the independent operation of the power stages and also ease of maintenance, which are both fundamental factors in large-scale PV installations.

Ingeteam offers a customised, holistic solution for each particular market. A solution which, in addition to the inverter, also includes a medium voltage transformer centre comprising a prefabricated concrete housing, a medium voltage transformer, medium voltage protection cells, auxiliary services panel and heat dissipation system.

The **Sunnyspain®Sun Power Max** inverters have been designed with components which offer a useful life of more than 20 years. They come with a standard guarantee of 5 years, which can be extended for periods to up to 25 years.

Protections

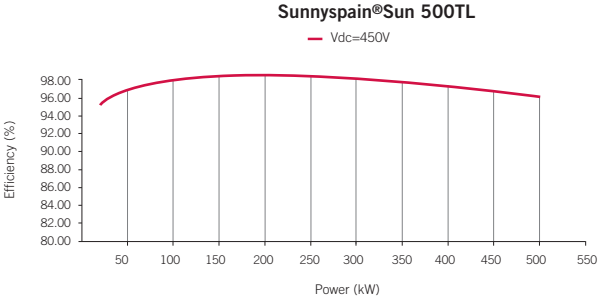
Each of the modular independent stages is equipped with:

- Reverse polarity.
- Output short-circuits and overloads.
- DC breaker with a door control optional.
- DC fuses.
- AC thermal-magnetic breaker with door control.
- Lightning induced DC surge suppressor.
- Lightning induced AC surge suppressor optional.
- Anti-islanding monitoring system with automatic disconnection.
- DC isolation monitor.

Optional accessories

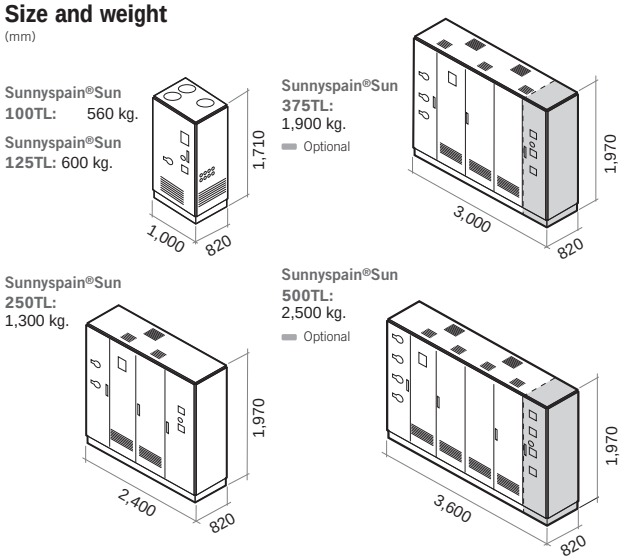
- Inter-inverter communication via RS-485, fibre optics, wireless or Ethernet.
- Modem for GSM/GPRS remote communication.
- **Sunnyspain®Sun Manager** software for parameter display and data recording.
- **SunnyspainRAS™ PV** for Internet data display.
- Analogue input card for the measurement of meteorological variables.
- PV array string current monitoring. **Sunnyspain®Sun String Control**.

Efficiency



Size and weight

(mm)



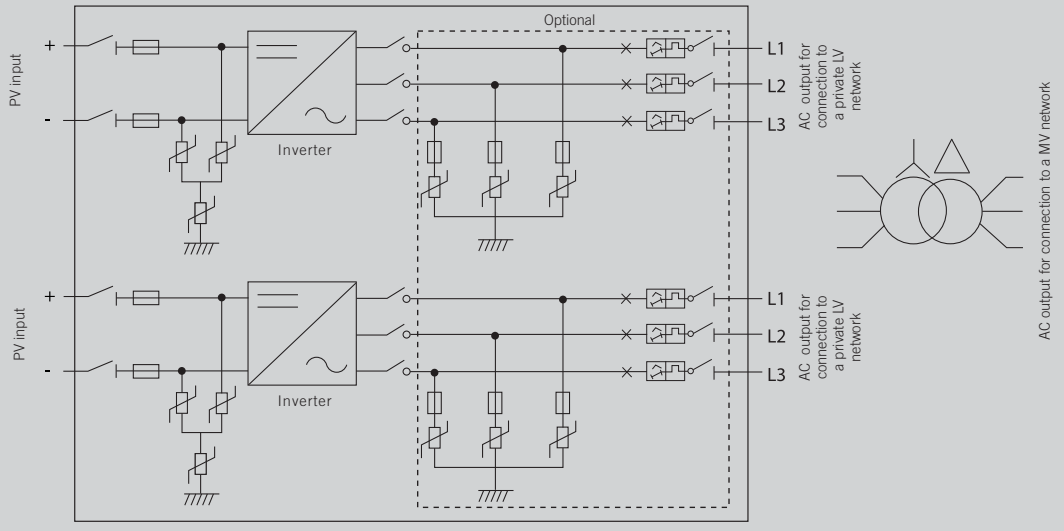
Technical data

Model	Sunnyspain®Sun 100TL	Sunnyspain®Sun 125TL	Sunnyspain®Sun 250TL	Sunnyspain®Sun 375TL	Sunnyspain®Sun 500TL
Input (DC)					
Recommended PV array power range[1]	113 - 130 kWp	141 - 163 kWp	283 - 325 kWp	424 - 488 kWp	566 - 650 kWp
Voltage range MPP	405 - 750 V	405 - 750 V	405 - 750 V	405 - 750 V	405 - 750 V
Maximum voltage DC[2]	900 V	900 V	900 V	900 V	900 V
Maximum current DC	286 A	357 A	715 A	1,072 A	1,429 A
DC inputs	4	4	8	12	16
MPPT	1	1	2	3	4
Output (AC)					
Rated power AC HT[3]	100 kW	125 kW	250 kW	375 kW	500 kW
Rated power AC HP[4]	110 kW	137 kW	275 kW	412 kW	550 kW
Maximum current AC	326 A	368 A	736 A	1,104 A	1,472 A
Rated voltage AC	220 V IT	220 V IT	220 V IT	220 V IT	220 V IT
Frequency AC	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Phi Cosine[5]	1	1	1	1	1
THD[5]	< 3%	< 3%	< 3%	< 3%	< 3%
Efficiency					
Maximum efficiency	98.40%	98.10%	98.10%	98.10%	98.10%
Euroefficiency	97.50%	97.70%	97.70%	97.70%	97.70%
General Information					
Stand-by consumption	30 W	30 W	60 W	90 W	120 W
Consumption at night	1 W	<5 W	<5 W	<5 W	<5 W
Ambient temperature	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C	-10ºC to +65°C
Relative humidity	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%
Protection class	IP 20	IP 20	IP 20	IP 20	IP 20
Compliance with standards	RD 661/2007, EN 50178, Reglamento VDEW BT				
	RTC alle rete BT di Enel Distribuzione				
	CEI 11-20				
	CEI 11-20 V1				
	CEI 0-16				
	CE Mark				

HT Mode (high temperature) - Rated outputs at 45ºC
HP mode (high power) - Rated outputs at 40ºC

Notes: [1] Depending on the type of installation and geographical location. [2] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures. [3] Up to 45ºC ambient temperature, Pmax= 110% Pnom for non permanent transients [4] Up to 40ºC ambient temperature, Pmax = Pnom [5] For Pout > 25% of the rated power

Sunnyspain®Sun 250TL



Sunnyspain®Sun Power Maxter

The perfect combination for improved performance and ease of plant maintenance

During periods of low irradiance, particularly at dawn and dusk, PV plants have a low energy output. To help resolve this situation, Ingeteam has developed a totally new design concept to optimise the operation of its **Sunnyspain®Sun Power Max** inverters for increased plant performance during these low production periods. This is achieved by connecting a number of 125 kW power blocks to the same DC bus. The system balances out the work between the power blocks, thereby extending the useful life of the whole unit.

The **Sunnyspain®Sun 500TL** generates 500 kW of AC rated power at 45ºC in the HT (High Temperature) mode and 550 kW of AC power at 40ºC in the HP (High Power) mode. This inverter is divided into four independent 125 kW stages and features four DC inputs associated with one maximum power point tracker MPPT. This innovative concept can be applied to up to eight independent power blocks. In this way the equipment performance can be optimised, given the fact that each stage operates within its maximum performance range.

This **Sunnyspain®Sun Power Maxter** solution can also be applied to 1 MW projects. This option consists in connecting the 2 inverters to the same transformer with a single winding. When the first 125 kW block starts up, the equipment needs to be operating at maximum performance before the following block is started up.

The **Sunnyspain®Sun Power Max** inverters have been designed with components which offer a useful life of more than 20 years. There is a standard 5 year guarantee which can be extended for a period of up to 25 years.

Highlights

This Master Slave option makes it possible to use the Ingeteam inverter at PV plants operating with thin-film modules.

Yet another important advantage of the **Sunnyspain®Sun 500TL** is that plant maintenance can be performed in stages. The fact that the electronics is concentrated in four blocks makes it easy for maintenance personnel to quickly replace any of the 4 blocks, should any incident occur, with no interruptions to the plant energy production.

Plant availability increases due to the fact that the PV array power is distributed to all the power blocks.

This is extremely useful considering the fact that the majority of inverter breakdowns are electronics-related. Should any of the four 125 kW stages fail, the remaining three stages will continue to operate so that almost all the inverter power is maintained.

This product offers cost savings of around 20% compared to the use of 100 kW equipment.

Further system advantages include:

- High output: 98.10%.
- Low maintenance costs. Same kit for the 4 inverter blocks.
- Modular inverters. Simple maintenance.
- Fast reception of spares, thanks to the use of lightweight, compact components.
- In the event of a block breakdown, less than 1/4 of the inverter power is lost.
- Low installation and connection costs, thank to the inverter compactness.
- Simple component replacement, built-in diagnostic systems.
- With a cooling system: guaranteed rated power of up to 40/45ºC.
- Polypropylene capacitors.
- System for reducing interfering inductance.
- Built-in LCD monitoring screen.
- Built-in Datalogger for up to 3 months data storage.

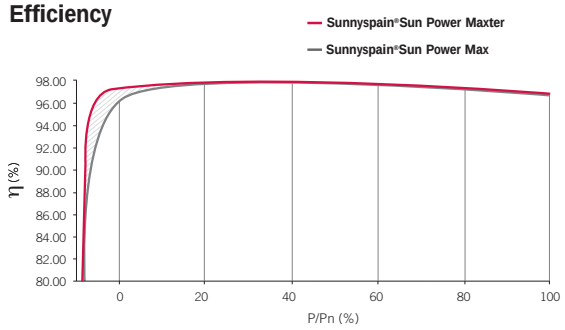
Protections

- System against reverse polarisation.
- Over-voltage protection.
- Out-of-range frequency protection.
- Over-heating protection.
- Emergency button.
- 4 DC breakers.
- 4 AC magnetothermal protections (optional).
- 4 lightening induced DC surge suppressors.
- 4 lightening induced AC surge suppressors (optional).
- Anti-islanding system with automatic disconnection.
- Insulation protection.

Optional accessories

- Inter-inverter communication via RS-485, fibre optics, wireless or Ethernet.
- Modem for GSM/GPRS remote communication.
- **Sunnyspain®Sun Manager** Software for parameter display and data recording.
- **SunnyspainRAS™ PV** for data display on the Internet.
- Analogue input card for measuring meteorological variables.
- **Sunnyspain®Sun String Control** for monitoring the PV array string currents.

Efficiency



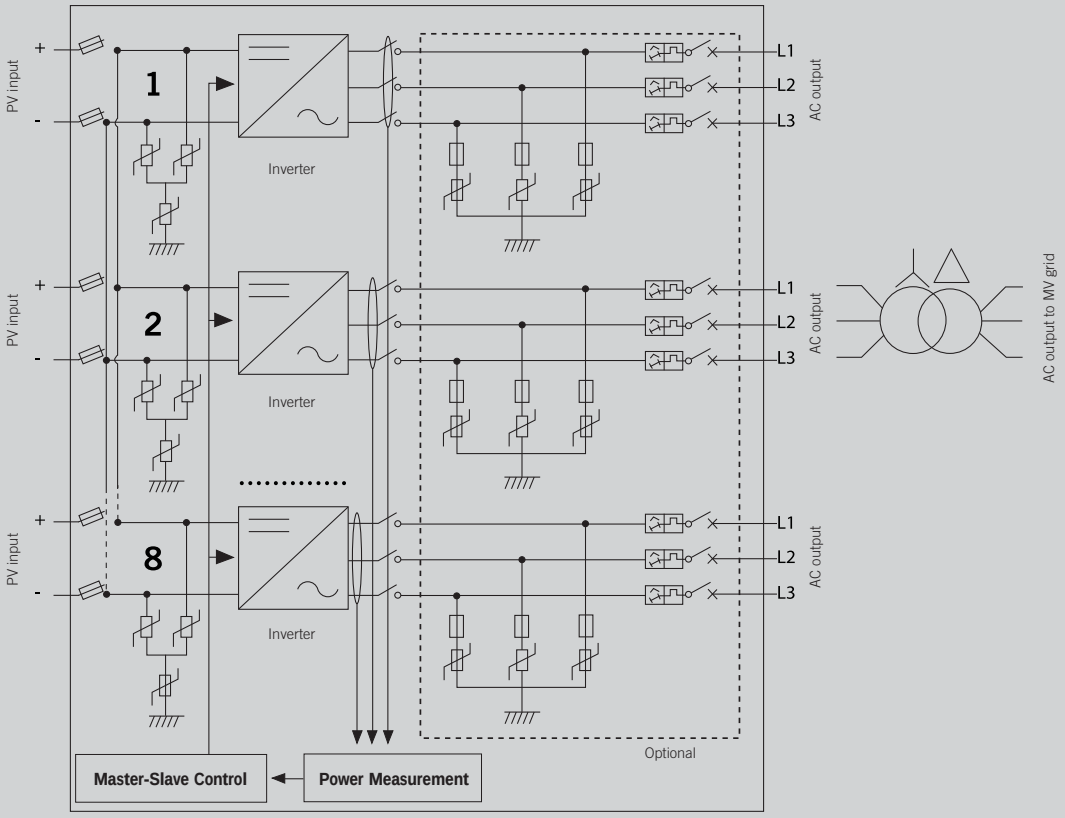
Technical data

Model	Sunnyspain®Sun Power Maxter
Type	Self-switching with IGBTs
Operation	1 MPPT (maximum power point tracker)
Nº DC Inputs	4 / 8 inputs
Dimensions of each input	pole + PV array: M12 up to 95 mm²
	pole - PV array: M12 up to 95 mm²
MPPT voltage range	405 Vdc to 750 Vdc
Maximum DC voltage	900 Vdc
Maximum DC current	1,429 A (4 x 357 A) / 2,858 A (8 x 357 A)
AC rated power HT mode(1)	500 kW / 1,000 kW
AC rated power HP mode(2)	550 kW / 1,100 kW
Maximum AC current	1,472 A (4 x 368 A) / 2,944 A (8 x 368 A)
AC voltage output (between phases)	220 Vac three phase IT
Output frequency	50 / 60 Hz
Dimensions of each output	3 x M16 up to 300 mm²
Maximum efficiency	98.1%
European efficiency	97.9%
Power factor	1(3)
Operating temperature	-10ºC / +65ºC
Ambient humidity	90% R.H. with no condensation

HT Mode (High Temperature): rated powers at 45ºC.
HP Mode (High Power): rated powers at 40ºC.

Notes: (1) Up to 45ºC ambient, Pmax=110% Pmon for temporary transients.
(2) Up to 40ºC ambient, Pmax=Pnom (3) Power between 25% and 100% of Pnom.

Sunnyspain®Sun Power Maxter



Sunnyspain® Power Max MV

Sunnyspain has developed a range of equipment which incorporates everything necessary to step up the energy generated by the inverters to medium voltage of up to 1 MW. This equipment is customisable, based on the requirements of each particular user.

The equipment housed in a concrete enclosure can include:

- PV inverter up to a maximum of 1 MW.
- Step up transformer up to 36 kV.
- Medium voltage cells, with different configurations depending on the system topology, with the possibility of incorporating a metering cell for billing.
- Auxiliary services panel for powering the services to the enclosure and any trackers.
- Transformer for the auxiliary services.
- AC protection cabinet, to protect the interconnection between the inverters and the step-up transformer.
- Heat dissipation system for optimum inverter performance.
- Interior electrical installation (power cabling, lighting, power sockets, grounding network...).
- Security panoply.

This equipment is delivered fully finished, the installer simply needs to connect the direct current at the inverter inlet, the MV output and interconnect any trackers.

Options

- Metering equipment.
- Reduced loss transformer.
- Remote communications.
- Scada system for system supervision.
- Start-up at the system site.

Approximate dimensions

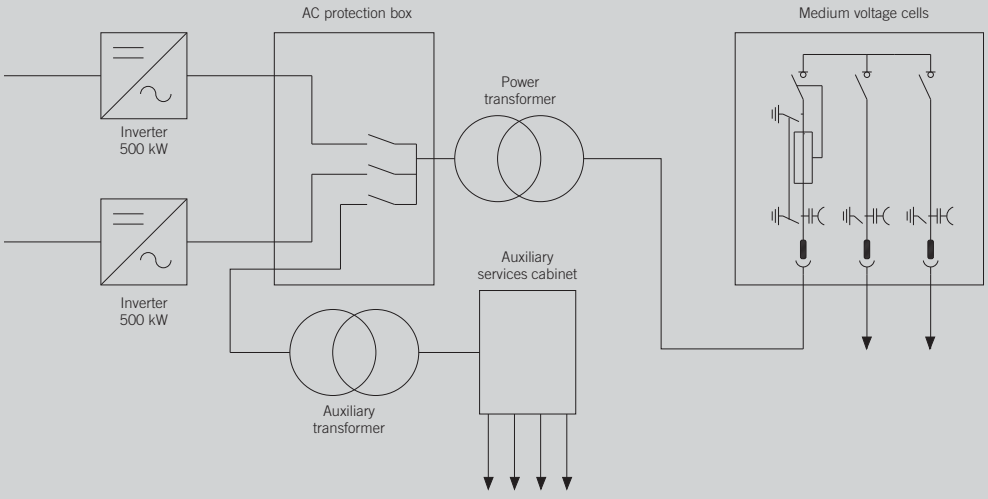
(mm)

Sunnyspain®Sun 250-375 kW
6,050 mm x 2,400 mm x 3,100 mm

Sunnyspain®Sun 500 kW
7,150 mm x 2,400 mm x 3,100 mm

Sunnyspain®Sun 1.000 kW
7,500 mm x 3,000 mm x 3,100 mm
(check availability depending on country)

Electrical scheme 1 MW



Sunnyspain® Hybrid

A modular system that can be adapted and configured to suit

the requirements of each particular installation

Sunnyspain®Hybrid

The **Sunnyspain®Hybrid** single phase and three phase bi-directional inverters offer complete management of the energy generated from the different renewable sources connected in parallel, to accumulate the power in batteries and supply the necessary energy for consumptions requiring power ratings between 10 to 120 kW.

These inverters are normally used for stand-alone micro-grids, although the projects including this equipment can be adapted to suit each customer's particular requirements.

Sunnyspain®Hybrid

Sunnyspain®Hybrid is the solution for medium sized stand-alone grids. The inverter generates a single-phase voltage grid for consumption of up to 10 kVA, based on renewable energy sources and accumulators.

The inverter acts as an energy manager, guaranteeing a balance between power generation, accumulation and consumption, connecting the back-up generator whenever necessary.

The system has been designed with an advanced algorithm for maximum power point tracking (MPPT) in order to maximize the PV array output.

The **Sunnyspain®Hybrid** is equipped with a PV array ground fault monitor and with a short circuitable output suitable for motor start-up.

The monitoring, control and parameter configuration can either be made on-site using the front display and keypad or remotely through the **Sunnyspain®Hybrid Monitor** software.

3 year guarantee, extendable to 25 years.

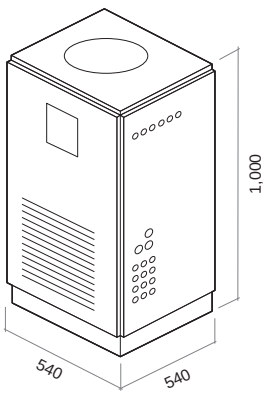
Protections

- Against low transient surges by varistors.
- PV array insulation failure.
- Output short-circuits and overloads.
- Lightning suppressors.

Size and weight

(mm)

Sunnyspain®Hybrid: 110 kg.



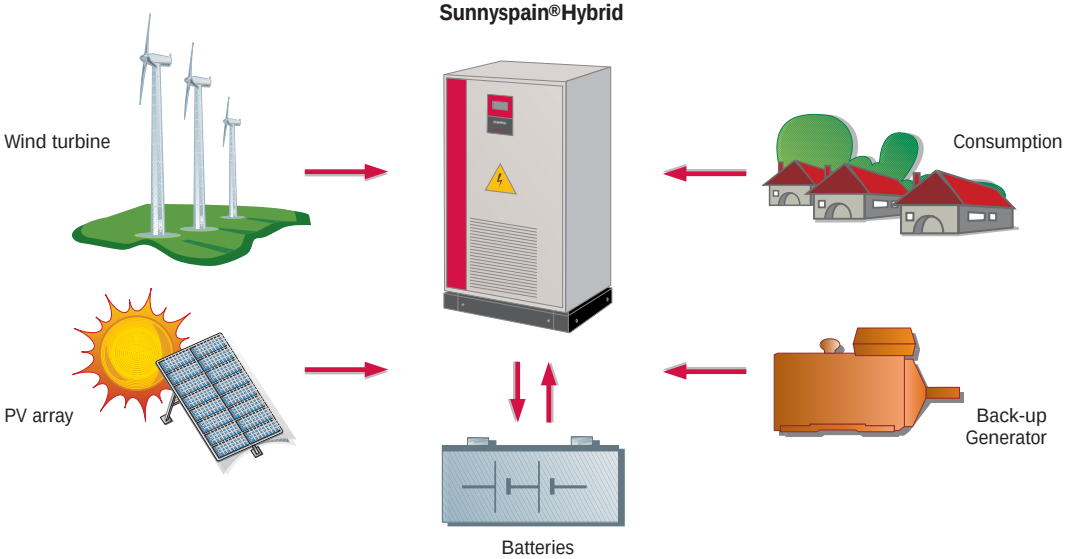
Accesorios opcionales

- **Sunnyspain®Hybrid Monitor** PC-based logger program for data display and recording, graph preparation, parameterization, MSExcel® spread-sheet creation, etc.
- Inter-inverter communication via an RS-485, fiber optics, wireless or Ethernet card.
- Modem for GSM/GPRS remote communications.
- Analog input card for reading environmental variables such as radiation, wind speed, temperature, etc.
- Manual disconnect switch.
- Possibility of an additional input for a wind turbine.

Technical data

Model	Sunnyspain®Hybrid
PV Input	
Voltage range	180 - 450 Vdc
Power	10 kW
Battery Input	
Rated voltage	120 Vdc
Maximum bank current	100 A
Auxiliary Input	
Electricity generator automatic management	
Battery charging from the auxiliary input	
Output	
Rated power	10 kVA
Output voltage	220 - 250 Vac single - phase
Output frequency	50 - 60 Hz
THD	<4%
Phi Cosine	-1 to 1
Efficiency	
Maximum efficiency	>93%
General Information	
Ambient temperature	-10ºC to +45ºC
Protection class	IP 20
Compliance with standards	CE Mark

Wiring diagram
Sunnyspain®Hybrid



Sunnyspain® Hybrid MS

Sunnyspain®Hybrid MS is an innovative modular system that shortens the manufacturing and assembly times.

The flexibility of this new system enables the adaptation to the specific requirements of each installation, whilst also permitting a future expansion.

A maximum of 4 battery charger modules, 4 inverter modules, 4 PV modules and 4 wind turbine modules can be connected to each installation.

The wind turbine and PV modules are each equipped with 3 inputs that can be connected in parallel.

Each PV input has been designed with an advanced algorithm for maximum power point tracking (MPPT) in order to maximize the PV array output.

The wind energy input is designed specifically for an easy AC connection directly to the wind turbine, whether asynchronous or synchronous.

The monitoring, control and parameter configuration can either be made on-site using the front display and keypad or remotely through the **Sunnyspain®Hybrid Monitor** software.

3 year guarantee, extendable to 25 years.

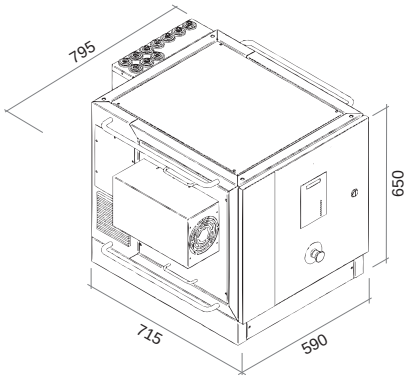
Protections

- Against low transient surges by varistors.
- PV array insulation failure.
- Output short-circuits and overloads.
- Lightning suppressors.

Size and weight

(mm)

Sunnyspain®Hybrid MS:
120 kg. (each module)



Optional accessories

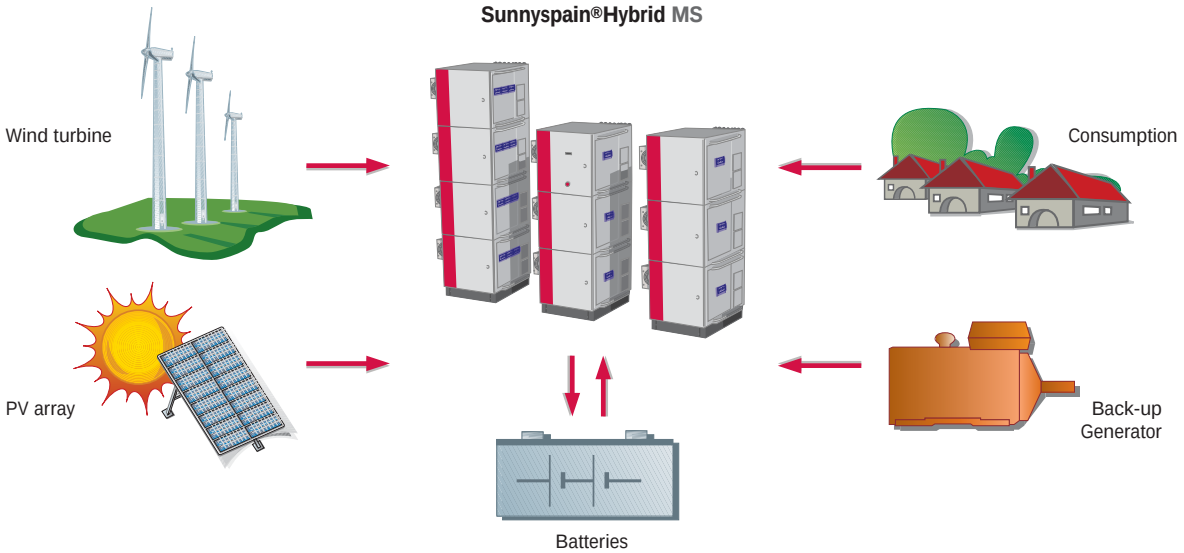
- **Sunnyspain®Hybrid Monitor** PC-based logger program for data display and recording, graph preparation, parameterization, MSExcel® spread-sheet creation,etc.
- Inter-inverter communication via an RS-485, fiber optics, wireless or Ethernet card.
- Modem for GSM/GPRS remote communications.
- Analogue input card for reading environmental variables such as radiation, wind speed, temperature, etc.
- Manual disconnect switch.
- Possibility of an additional input for a wind turbine.
- Galvanic isolation transformer.

Technical data

Sunnyspain®Hybrid MS	1 Module	2 Modules	3 Modules	4 Modules**
PV Module				
Number of inputs	3	6	9	12
Power	3 x 15 kW	6 x 15 kW	9 x 15 kW	12 x 15 kW
Voltage range	150 - 700 Vdc	150 - 700 Vdc	150 - 700 Vdc	150 - 700 Vdc
Maximum current for unit	30 A	30 A	30 A	30 A
Wind Turbine Module				
Number of Inputs	3	6	9	12
Power	3 x 15 kW	6 x 15 kW	9 x 15 kW	12 x 15 kW
Line voltage range	70 - 495 Vac	70 - 495 Vac	70 - 495 Vac	70 - 495 Vac
Maximum line current per input	24 A	24 A	24 A	24 A
Battery Charger Module				
Power	30 kW	60 kW	90 kW	120 kW
Input voltage	240 - 500 Vdc	240 - 500 Vdc	240 - 500 Vdc	240 - 500 Vdc
Maximum current	100 A	200 A	300 A	400 A
PV Input*				
Rated output	1 x 15 kW	1 x 15 kW	1 x 15 kW	1 x 15 kW
Voltage range	150 - 700 Vdc	150 - 700 Vdc	150 - 700 Vdc	150 - 700 Vdc
Maximum current	30 A	30 A	30 A	30 A
Inverter Module				
Rated power	30 kVA	60 kW	90 kW	120 kW
Output voltage	380 - 430 Vac (neutral available)	380 - 430 Vac (neutral available)	380 - 430 Vac (neutral available)	380 - 430 Vac (neutral available)
Output frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
THD	<4%	<4%	<4%	<4%
Phi Cosine	-1 to 1	-1 to 1	-1 to 1	-1 to 1
Efficiency				
Maximum efficiency	<96%			
General Information				
Ambient temperature	-10ºC to +45ºC			
Protection class	IP 20			
Compliance with standards	CE Mark			

*** Only the first battery charger module has an additional PV array input.**
****Maximum number of modules**

Wiring diagram
Sunnyspain®Hybrid MS



Sunnyspain® Wind

The **Sunnyspain®Wind** family of grid-connected inverters are designed to adapt the energy produced by wind turbines and deliver it to the electricity grid, being fully compliant with the regulations in force. This new **Sunnyspain®Wind** inverter range can be adapted to suit a wide range of mini-wind turbine systems, operating between 2,500 W to 6,000 W.

Given the extensive variety of wind turbines on the market, grid-connected inverters must be able to adapt to the specific characteristic curves of each particular wind turbine, in order to permit maximum energy extraction and grid delivery at all times.

In addition to achieving constant maximum energy extraction, the **Sunnyspain®Wind** guarantees the safety of the mini-wind system.

Like the PV inverters, the **Sunnyspain®Wind** inverter range incorporates the communication and monitoring interfaces required for local or remote system surveillance.

The inverters are easy to install and are compliant with the regulations in force in the principal countries around the world.

Sunnyspain®Wind Interface

In order to deliver the energy produced by a mini-wind turbine to the grid, a grid-connected inverter is required. The alternating current (AC) voltage generated by a wind turbine presents variations in voltage and frequency which are determined by the wind turbine speed of rotation. The **Sunnyspain®Wind Interface** (IWI) converts this AC voltage to direct current (DC) whilst protecting the **Sunnyspain®Wind** from any abrupt voltage variations by discharging any excess energy produced into a discharge resistor, thereby protecting the system. The unit formed by the **Sunnyspain®Wind** and the IWI adapt the wind energy produced to the public grid connection requirements. The possibility of parameterising each particular wind turbine curve and measuring the wind turbine speed of rotation guarantees maximum energy extraction at each operating point, within a wide range of speeds of rotation.

Optional accessories

- Inter-inverter communication via RS-485, fibre optics, wireless or Ethernet.
- Modem for GSM/GPRS remote communication.
- **Sunnyspain®Sun Manager** software for parameter display and data recording.
- **SunnyspainRAS™ PV** for Internet data display.
- Analogue input card for the measurement of meteorological variables.
- Grounding kit for those PV modules requiring this (only in the case of inverters with a galvanic isolation AC transformer).
- Potential free relay for alarm signalling.

Protections

The **Sunnyspain®Wind** inverters are equipped with the following electrical protections against:

- Galvanic isolation between the DC and AC side (only in the case of inverters with a galvanic isolation AC transformer).
- Reverse polarity.
- Input and output overvoltage.
- Output short-circuits and overloads.
- Insulation failures.
- Anti-islanding with automatic disconnection.
- Optional DC breaker.

Size and weight

(mm)

Sunnyspain®Wind 2.5TL / 3TL: 18.3 kg.

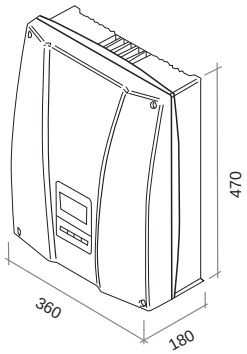
Sunnyspain®Wind 2.5: 43.3 kg.

Sunnyspain®Wind 3.3TL / 3.68TL: 19.7 kg.

Sunnyspain®Wind 3.3: 44.7 kg.

Sunnyspain®Wind 3.8TL / 4.6TL / 5TL / 6TL: 23.3 kg.

Sunnyspain®Wind 5: 65 kg.



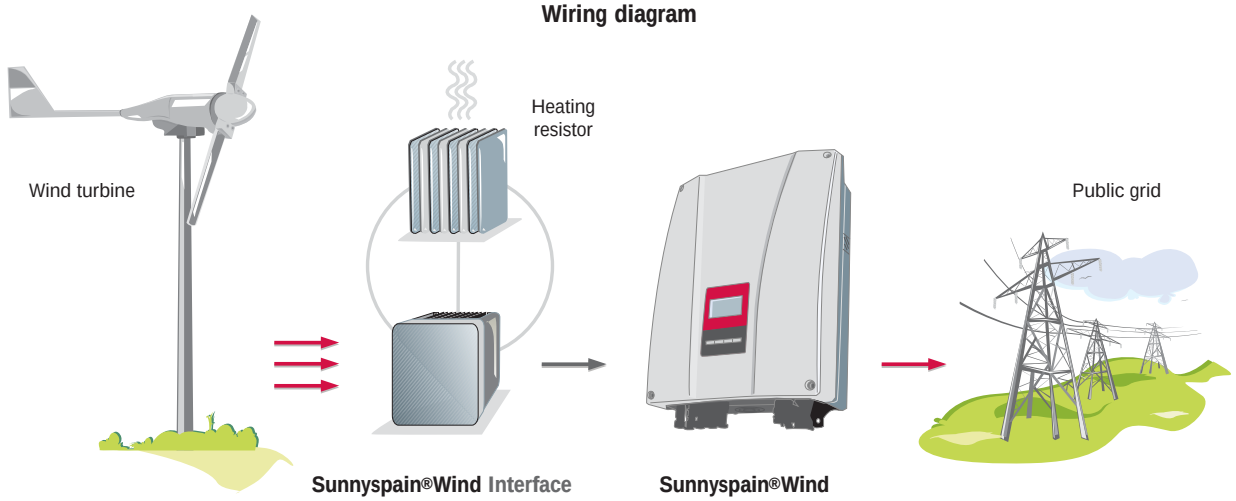
Technical data

Model	Sunnyspain®Wind 2.5TL	2.5	3TL	3.3TL	3.3	3.68TL	3.8TL	4.6TL	5TL	5	6TL
Input (DC)											
Recommended PV array power range	2.8 - 3.3 kW	2.8 - 3.3 kW	3.2 - 4 kW	3.8 - 4.3 kW	3.8 - 4.3 kW	3.9 - 4.8 kW	4.1 - 5 kW	5.2 - 6 kW	5.7 - 6.5 kW	5.8 - 6.5 kW	6.3 - 7 kW
Voltage range MPP	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	150 - 450 V	160 - 450 V
Maximum voltage DC[1]	550 V	550 V	550 V	550 V	550 V	550 V	550 V	550 V	550 V	550 V	550 V
Maximum current DC	16 A	16 A	16 A	22 A	22 A	22 A	33 A	33 A	33 A	33 A	33 A
Output (AC)											
Rated power AC HT[2]	2.5 kW	2.5 kW	2.8 kW	3.3 kW	3.3 kW	3.68 kW	3.6 kW	4.6 kW	5 kW	5 kW	5.4 kW
Rated power AC HP[3]	2.7 kW	2.7 kW	3 kW	3.7 kW	3.7 kW	3.68 kW	3.9 kW	5 kW	5.5 kW	5.5 kW	6 kW
Maximum current AC	13 A	13 A	13.5 A	17 A	17 A	17 A	18.8 A	24.2 A	25.5 A	25.5 A	26.2 A
Rated voltage AC	230 V	230 V	230 V	230 V	230 V	230 V	230 V	230 V	230 V	230 V	230 V
Frequency AC	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Phi Cosine[4]	1	1	1	1	1	1	1	1	1	1	1
THD[4]	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Efficiency											
Maximum efficiency	96.6%	94.7%	96.6%	96.8%	94.9%	96.8%	97.0%	97.0%	97.0%	95.0%	97.0%
Euroefficiency	95.0%	93.8%	95.1%	95.2%	94.0%	95.2%	95.6%	96.0%	96.1%	94.3%	96.1%
General Information											
Stand-by consumption	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W
Consumption at night	< 0.5 W	< 0,5 W	< 0.5 W	< 0.5 W	< 0.5 W	< 0.5 W	< 0.5 W	< 0.5 W	< 0.5 W	< 0.5 W	< 0.5 W
Ambient temperature	-20ºC a +70ºC	-20ºC a +70ºC	-20ºC a +70ºC	-20ºC a +70ºC	-20ºC a +70 ºC	-20ºC a +70ºC	-20ºC a +70ºC	-20ºC a +70ºC	-20ºC a +70ºC	-20ºC a +70 ºC	-20ºC a +70ºC
Relative humidity	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%
Protection class	IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65
Compliance with standards	EN 50178, VDE0126-1-1, G83/1										
	CEI 11-20, CEI 11-20 V1, CEI 0-16										
	RD 661/2007										
	RTC alle rete BT di Enel Distribuzione										
	CE Mark										

HT Mode (high temperature) - Rated outputs at 45ºC
HP mode (high power) - Rated outputs at 40ºC

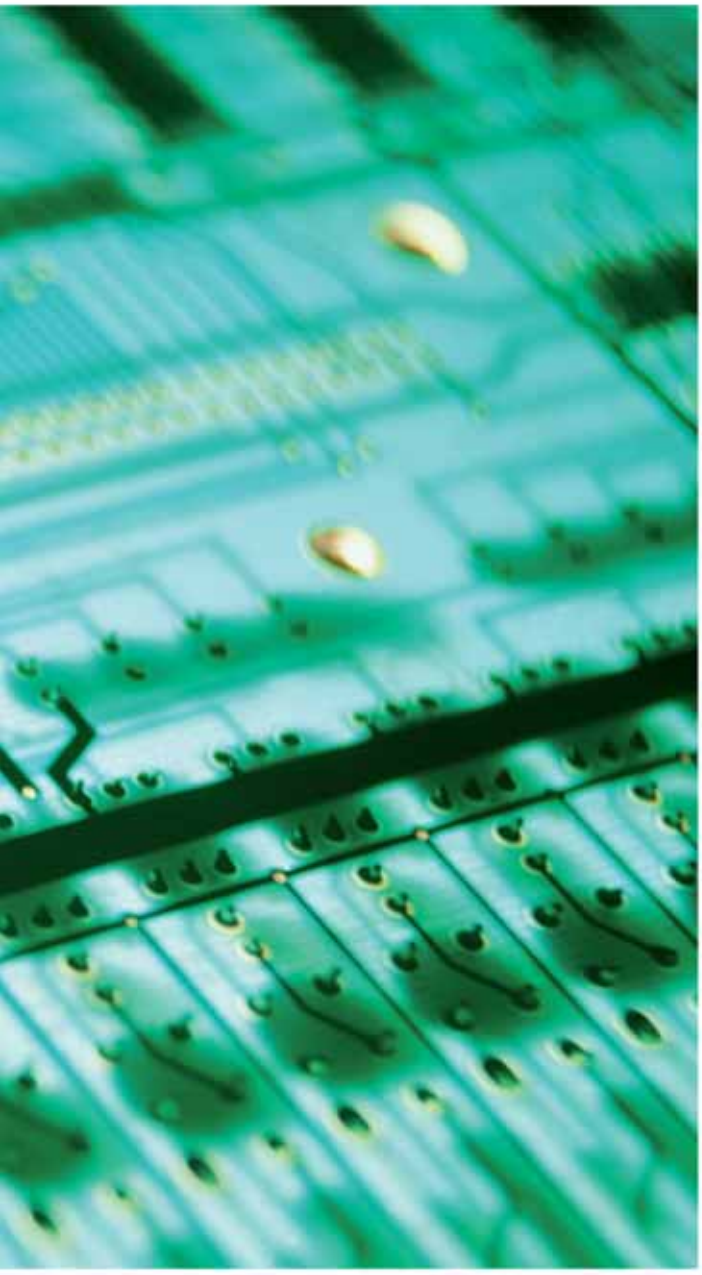
Notes: [1]Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures. [2] Up to 45ºC ambient temperature, Pmax= 110% Pnom for non permanent transients [3] Up to 40ºC ambient temperature, Pmax = Pnom [4] For Pout > 25% of the rated power

Wiring diagram



Accesories

Multi-options for PV plant control and monitoring



Sunnyspain®Sun Communication

PC-Inverter communication options.

Sunnyspain®Sun String Control

Measurement of the string currents.

Sunnyspain®Sun Manager

Software for the monitoring of the PV plants.

SunnyspainRAS™ PV

Web Portal for PV plant access.

Sunnyspain®Sun Planner

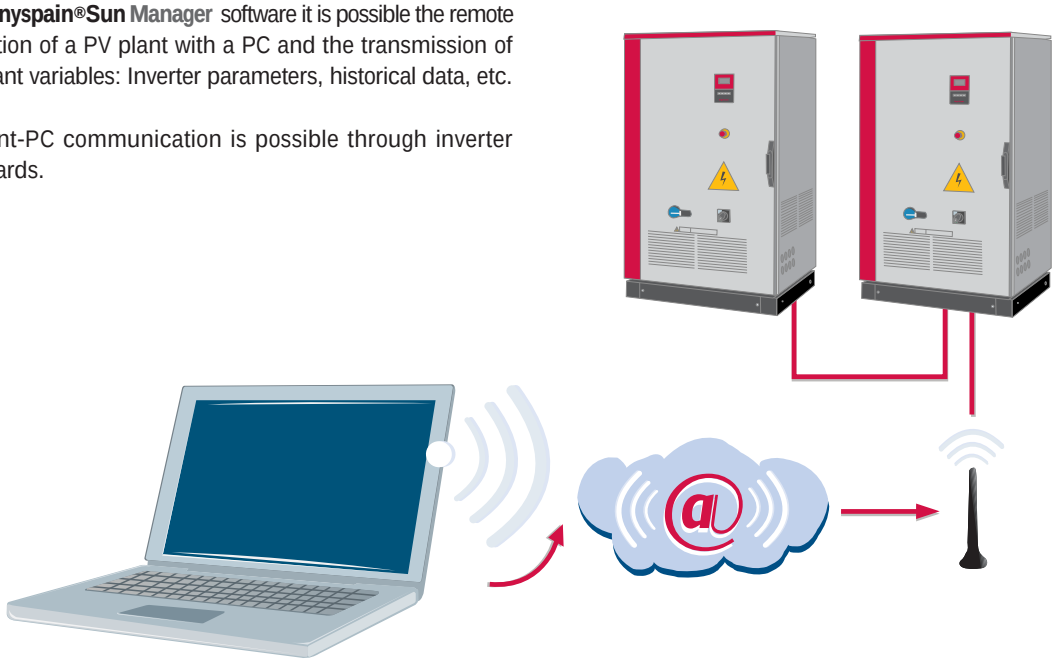
Software for the dimensioning of the PV array.

Sunnyspain®Sun Communication

Multiple options for data communication with inverters from a PC

With the **Sunnyspain®Sun Manager** software it is possible the remote communication of a PV plant with a PC and the transmission of all the PV plant variables: Inverter parameters, historical data, etc.

This PV plant-PC communication is possible through inverter integrated cards.



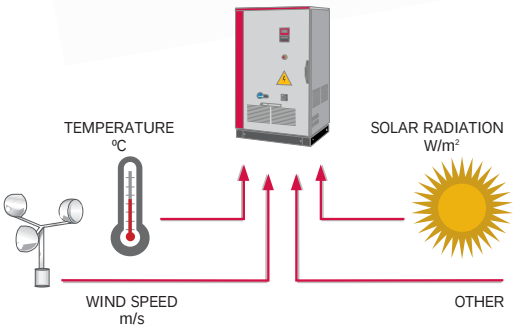
A. Modem card for remote communication via the GSM/GPRS network. **B.** RS-485 card for remote communication of the PV plant inverters. **C.** Analog inputs card to record environmental data coming from external sensors (e.g. temperature, solar radiation, etc). **D.** Fibre optics card. **E.** Ethernet card. **F.** ISM868 wireless card.

Analog inputs cards

This card reads environmental variables such us temperature, solar radiation, wind speed, etc. Card plugged inside the inverter. Sensors are not supplied.

Six analog inputs:

- 4 inputs can be configured according to the signals incoming from the external sensors:
  - As current inputs, from 0 to 20 mA.
  - As voltage inputs, from 0 to 10 Vdc, from 0 to 2 Vdc, from 0 to 0,4 Vdc.
- Direct temperature probe connection through two 3-wire PT 100 inputs.



RS-485 and fibre optics card

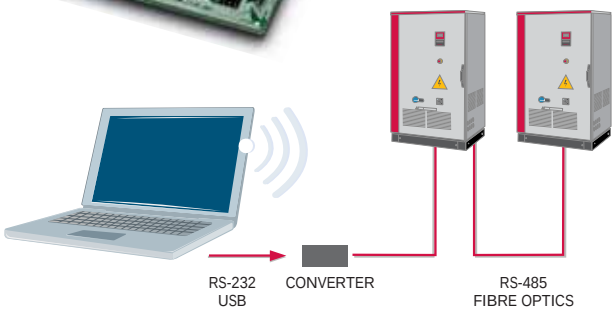
- Controllable from a local PC.
- Half-Duplex (two wire) configuration mode.
- Multi-connection between inverters in a closed loop system.
- Supply of RS-485/RS232 or RS485/USB for easy PC connection with a PC.

Fibre optics card

Lightning induced surge immunity.

RS-485 card

Inverter quick plug-in for easy connection to a PC.



GSM/GPRS Modem

For remote communications from the **Sunnyspain®Sun** Manager software via the GSM/GPRS network.

Ethernet card

For Ethernet communications between the **Sunnyspain®Sun** Manager software and the inverters.

ISM 868 wireless card

Wireless card for ISM 868 band communication.

Sunnyspain®Sun String Control

String current monitoring

The **Sunnyspain®Sun String Control** is a device for measuring each PV generator string current and detecting defective string currents through **Sunnyspain®Sun Manager** software.

String currents can be monitored through the RS-485 communication cards, GSM/GPRS, Ethernet or WIFI.

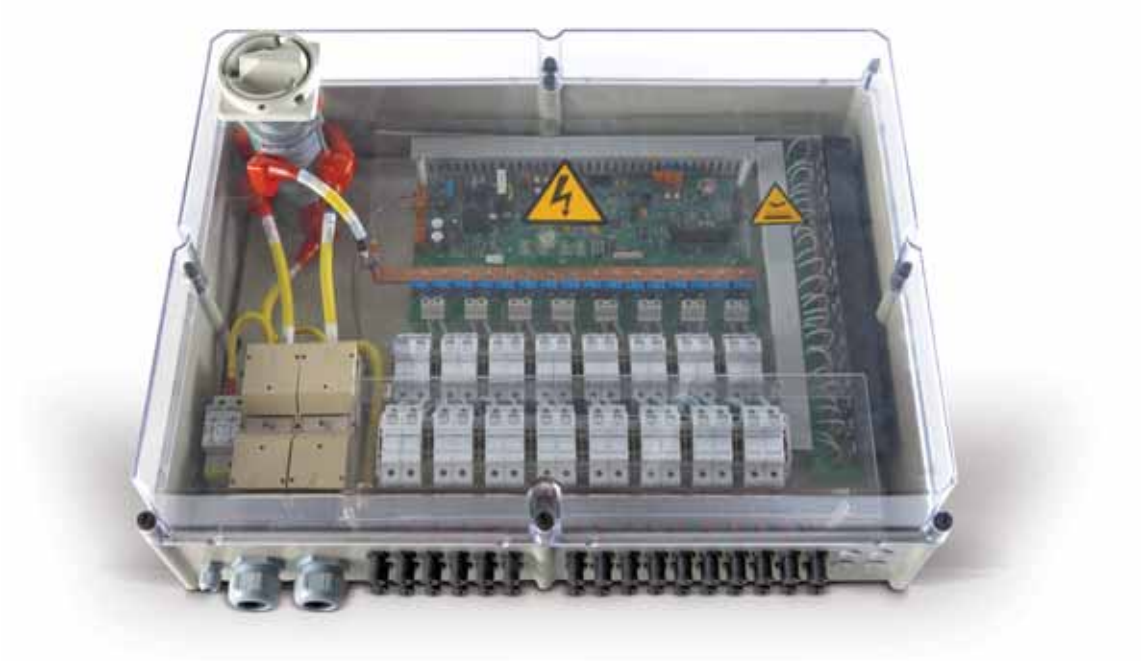
It is easy to mount and is suitable for outdoor installations. It is particularly recommended for three phase inverters.

Protections

- Individual string fuse protection.
- IP65 protection for outdoor installation.

Optional

- SMS alarm functionality for any faulty currents.
- DC overvoltage dischargers.
- DC switch.



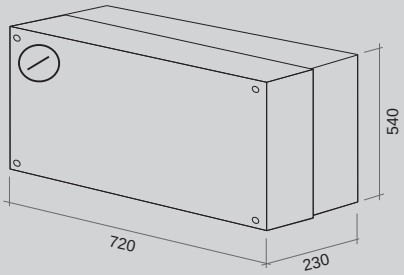
Technical Data

Sunnyspain® Sun String Control	
Maximum number of connectable strings	16
Maximum number of measurable channels	16
Maximum current per string	10 Adc
Maximum total current	160 Adc
Number of protection fuses	16
Maximum voltage	900 Vdc
Inlet connectors	Lumberg LC3-LC4 Ø up to 6 mm
Outlet connectors	PG M40 (up to 185 mm^2)
Communications	RS-485, GSM/GPRS, Ethernet, WIFI, fibre optics card
Ambient temperature	from -10ºC to +65ºC
Protection class	IP65
Grounding connector	PG M16 (35 mm^2)

Size and weight

(mm)

Sunnyspain®Sun String Control: 15 kg.



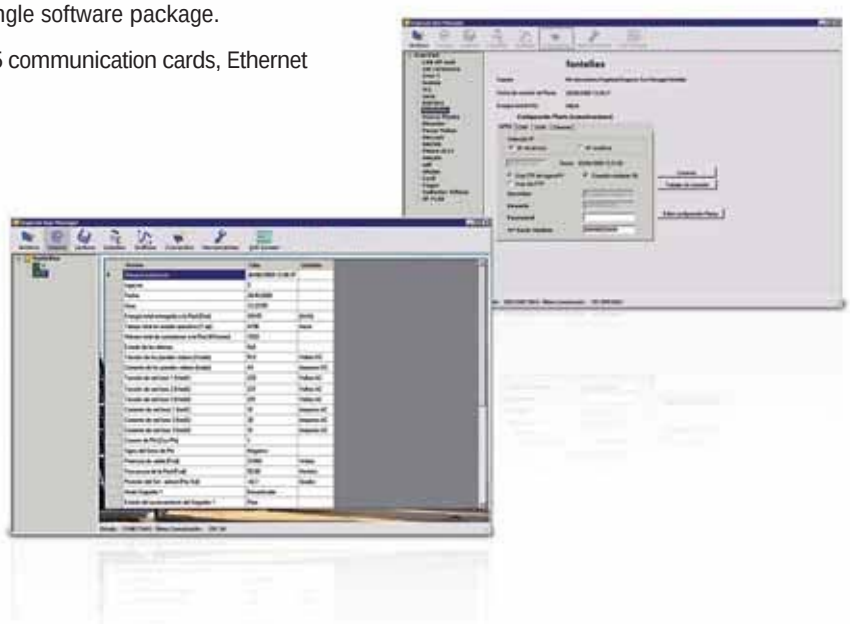
Sunnyspain®Sun Manager

PV plant monitoring software

The **Sunnyspain®Sun Manager** software is a Windows® graphic environment PC based program for PV plant monitoring and management over the Internet.

It is possible to integrate single phase and three phase inverters and string control devices in a single software package.

Communication is through RS-485 communication cards, Ethernet and modem.



The software features:

- Individual configuration of each PV plant inverter.
- On-line display of the inverter internal variables.
- One-screen display of all the plant inverters.
- Multi-PV plant management from a single PC.
- Historical data capture and disc storage possibility.
- Data log display in various graph or table formats.
- Data storage in XML format.
- Configurable modem SMS alarm message functionality.
- Available in Spanish, English, German, French and Italian.

Display informativo

Totally configurable tool for displaying the most important plant parameters:

- Accumulated energy.
- Daily energy.
- Instantaneous power.
- Irradiance.
- Module temperature.
- Ambient temperature.
- Wind speed.

Customizable screen wallpaper. Data display on a TFT, LCD screen etc.

Online viewable variables

List of the online viewable variables, and which are saved by the inverter:

- Accumulated energy to the grid.
- Total time in operating status.
- Total number of grid connections.
- Total number of errors.
- Alarm status.
- Solar panel voltage.
- Solar panel current.
- Solar panel power.
- Output current to the grid.
- Phi Cosine.
- Positive/Negative Phi Cosine.
- Grid voltage.
- Grid frequency.
- Actual date and time.

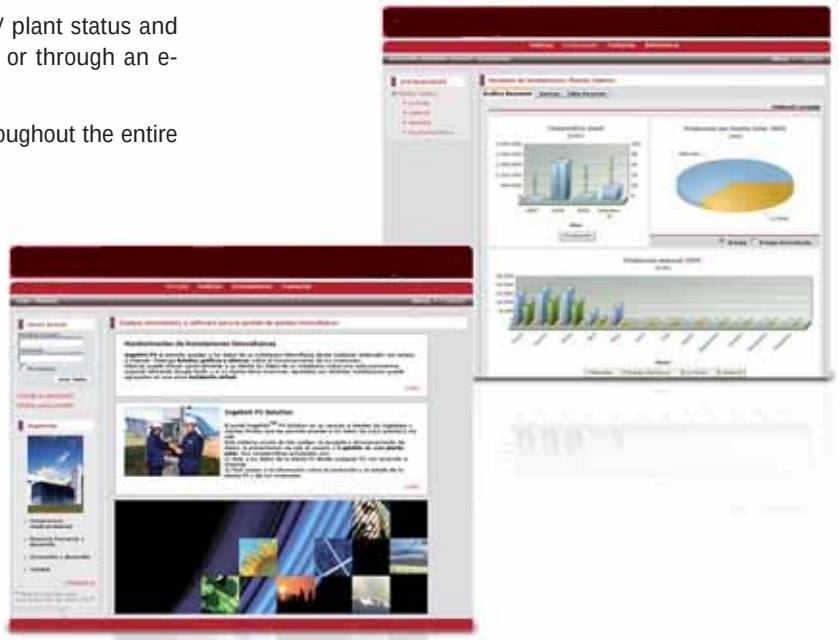
SunnyspainRAS™PV

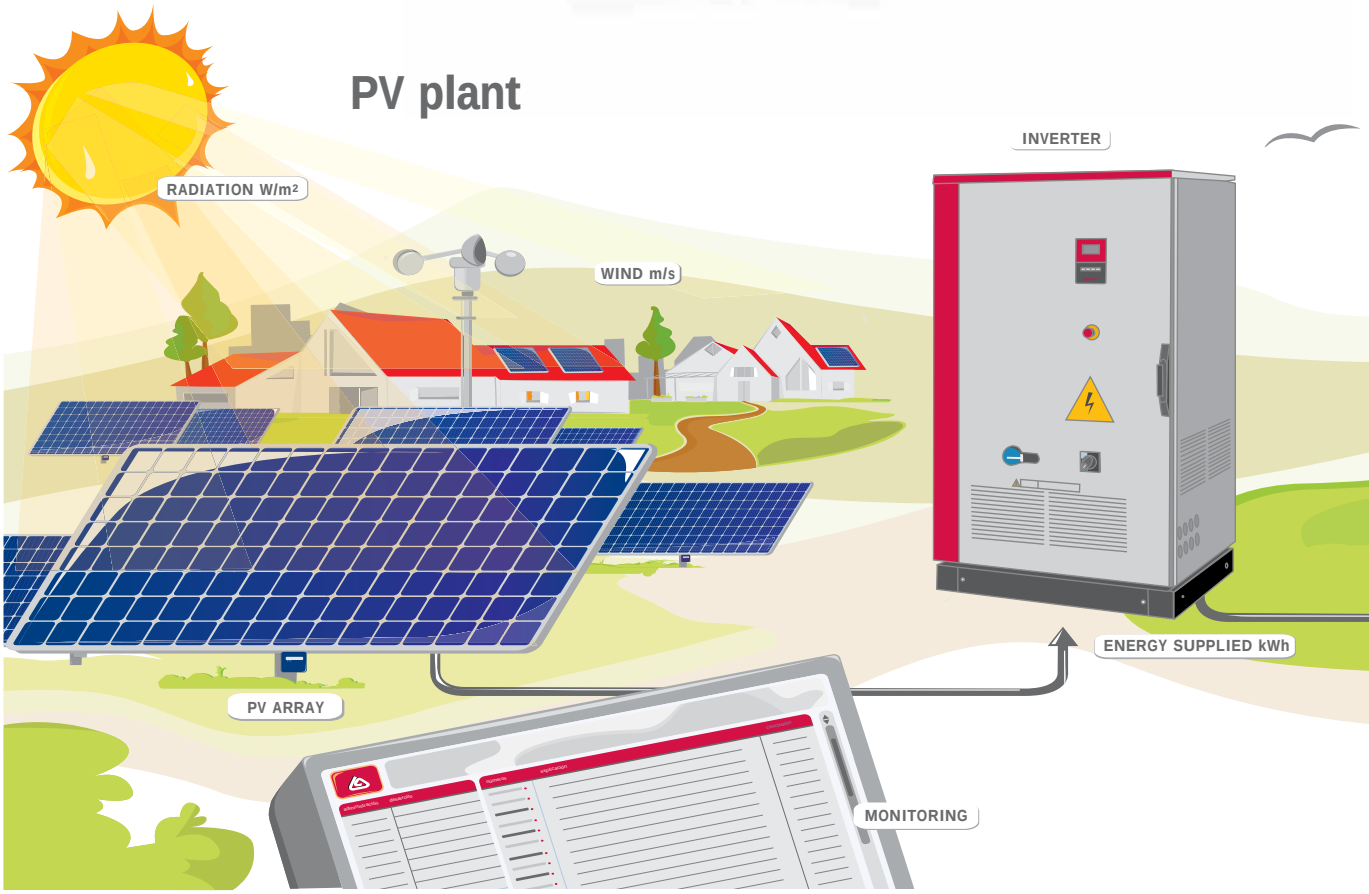
Web Portal for PV plant access

The **SunnyspainRAS™PV** provides access to the PV plant data from any PC with an Internet connection and GPRS modem. Its ease of access facilitates owner, installer or promoter plant control.

This software provides information on the PV plant status and production, either in list and graphic format or through an e-mailed production report.

The data recording and storage are made throughout the entire inverter service life.



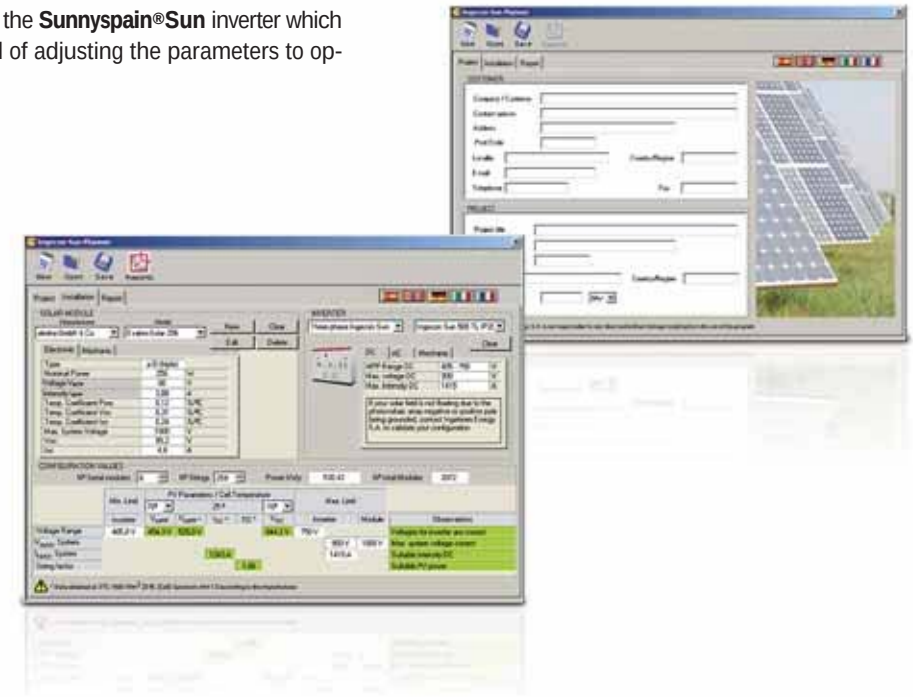


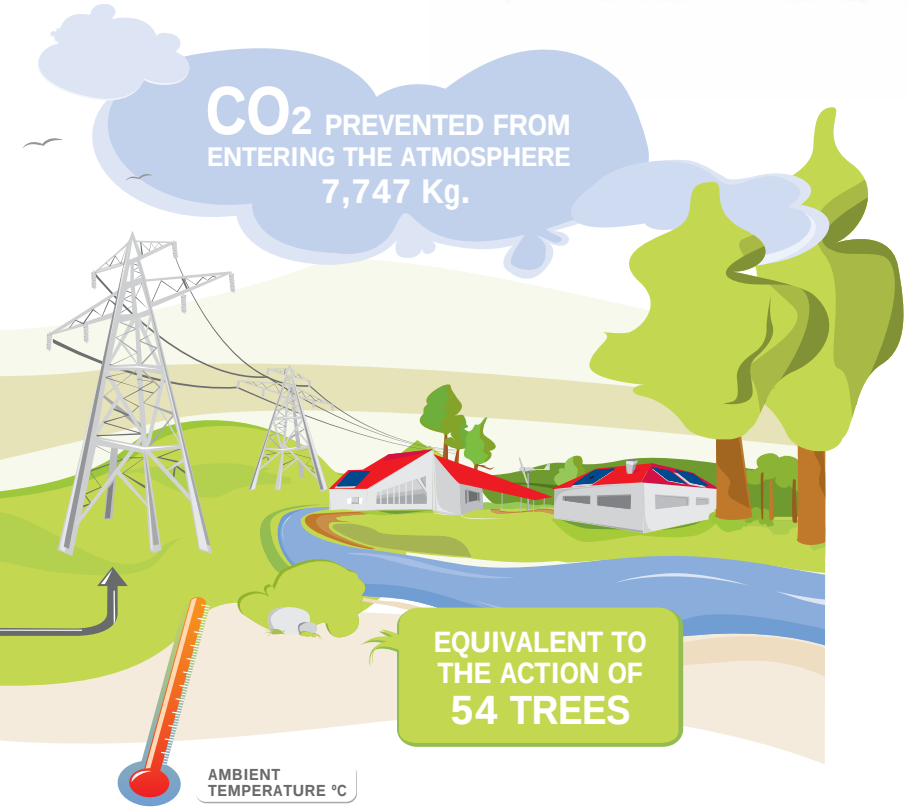
Sunnyspain®Sun Planner

PV array dimensioning

The **Sunnyspain®Sun Planner** software offers the possibility of quickly and easily customising each project. It contains a database of the different modules made by each manufacturer.

There is the option of selecting the **Sunnyspain®Sun** inverter which best adapts to the system and of adjusting the parameters to optimise the configuration.





Beyond the product

Sunnyspain's committment to customers does not end with the product delivery.

The collaboration and Service offered to customers initiated during the product development stage, continues throughout the product life.

Sunnyspain is in a position to work alongside customers and to offer all the necessary support for their expansión within Spain or abroad, providing technical assistance services anywhere these may be required in the world.

1

Support, Management and Engineering Services

Work procedure preparation and implementation.

Installation audits and technical reports.

Design and certification of specific tooling.

Work-site quality inspections.

Inspections of the quality of service.

Control and management of installation access documentation.

Specific training courses.

Waste management.

Management system implementation.

2

Commissioning

Technicians specialising in the commissioning of PV plants.

Assistance in commissioning all types of PV systems.

Recognised experience in commissioning large scale systems.

3

Extended warranty of up to 10 years

Sunnyspain Energy S.L. offers, in addition to the 5 years *Standard Warranty*, an *Extended Warranty* for a further 5 year period, to warranty that the Ingecon Sun PV Inverters are free from any defects in material and workmanship that would prevent normal operation in correct conditions of usage, installation and maintenance, for up to a total period of 10 years.

4

All-inclusive PV plant operation and maintenance

Additionally, **Sunnyspain** offers on-site assistance services for up to a total period of 25 years.

During the period of validity of the service contracted, the following is possible:

- On site repair of any breakdowns with a guaranteed response time.
- Inverter availability guarantee with penalties in the event of non compliance.
- Remote inverter monitoring.
- Holistic spares management.
- PV plant monitoring with a monthly report of production and any incidents.
- Additional services such as panel cleaning, PV plant monitoring.

5

Training courses

Sunnyspain imparts technical training courses directed at PV solar sector professionals who would like to be more conversant with our products and their operation in order to offer a better service to their customers.

6

Technical Assistance Service

Sunnyspain offers its customers a phone technical assistance service for technical enquiries and to report any possible incidents.

Sunnyspain Service
PV plant operation and maintenance

PV System Maintenance Service

Sunnyspain also offers customers on-site assistance services through **Sunnyspain Service**, a company which is part of the Sunnyspain Energy division and which is dedicated, amongst other activities, to the provision of operating and maintenance services for renewable energy electricity generation systems.

Sunnyspain Service combines **Sunnyspain**'s experience, know-how and leadership position in the design and manufacture of PV inverters with its own capacity, solid structure and extensive experience in the operation and maintenance of wind farms and PV plants.

Human Capital

The **Sunnyspain Service** workforce is dynamic and highly qualified. With an average age of 29, all the company's workers are officially qualified for their work, whilst engineers and university graduates account for 15% of the staff. Each employee receives an average of 40 hours ongoing training per year.

Sunnyspain Service currently provides operating and maintenance services to more than 70 PV generating plants, comprising a total power of more than 90 MW.

Quality, the Environment and Health & Safety

Sunnyspain Service is firmly committed to applying management systems and models which are capable of:

- Guaranteeing the health and safety of all its employees.
- Providing services of the highest quality.
- Respecting the environment.

Sunnyspain Service has been operating under an Integrated Management System since 2004 (Quality, Environment and Health & Safety) and is certified to the UNE-EN ISO 9001, UNE-EN ISO 14001 standards and to the OHSAS 18001 specification.

After-Sales Service

Firmly committed to fulfilling customer needs and expectations, **Sunnyspain** offers a number of PV plant after-sales service options, ranging from customised maintenance services to all-inclusive system maintenance.

The services offered to customers include:

- Corrective and preventive maintenance for all system components (panels, one or two axis trackers, interior lines and control panels, sub-stations, civil works…).
- Plant operation and management.
- Continuous and/or remote plant monitoring.
- Audits and/or technical reports.
- Periodical thermographic analysis.
- Adequate PV panel cleaning on a regular basis.
- Plant security and surveillance services.

The Serquality after-sales service contracts include:

- Extension of the inverter manufacturer's guarantee, extending this to the inverter place of installation.
- Inverter availability guarantee. Non-compliance penalty.
- Guaranteed incident response time.
- Assistance at start-up.
- Inverter repairs performed by specialised technicians.
- Labour costs relating to equipment dismounting and subsequent re-assembly are included.
- PV plant monitoring. Monthly production/incident reports.
- Holistic spare part management.
- At least one inspection visit per year, including preventive maintenance tasks.
- Hotline.

Our commitment to quality and to the environment

Sunnyspain's strategy is to constantly work towards quality excellence, whilst showing the utmost respect for the environment.

This is being achieved through the following key lines of action:

- Internal development of the EFQM model.
- Improved satisfaction of internal and external customers, suppliers and the social environment.
- Integration of the quality management, environmental impact and occupational safety systems, according to ISO 9001:2000, ISO 14001 and OHSAS 18001:1999.
- Reduction in emissions and hazardous waste, in addition to strict compliance with the RoHS regulations.

All products developed and manufactured by **Sunnyspain** have the corresponding CE Marking, based on compliance with the applicable directives and, therefore, the respective harmonised standards.

Likewise, should the customer so require, the products can be designed and manufactured to comply with the UL/USA standards, capable of complying with even the most demanding specifications.

Our production process control and final tests on each and every unit manufactured ensure that all our products are of the highest possible standard and comply with even the most demanding specifications.

Sunnyspain's team of highly qualified technicians are available to perform commissioning and start-up tasks and to provide after-sales service for all equipment supplied.

Group Sunnyspain Energy S.L.
C/ MAGALLANES N 8 PUERTA 4
CP. 46940 MANISES VALENCIA SPAIN
Tel.: +34 96 153 64 02
Fax.: +34 96 153 64 08