INGECON SUN

Solar Energy Solutions

Product Catalogue

Ingeteam

INDEX

MORE THAN 42 GW SUPPLIED TO THE RENEWABLE ENERGY MARKET WORLDWIDE

Energy

Industry

Marine

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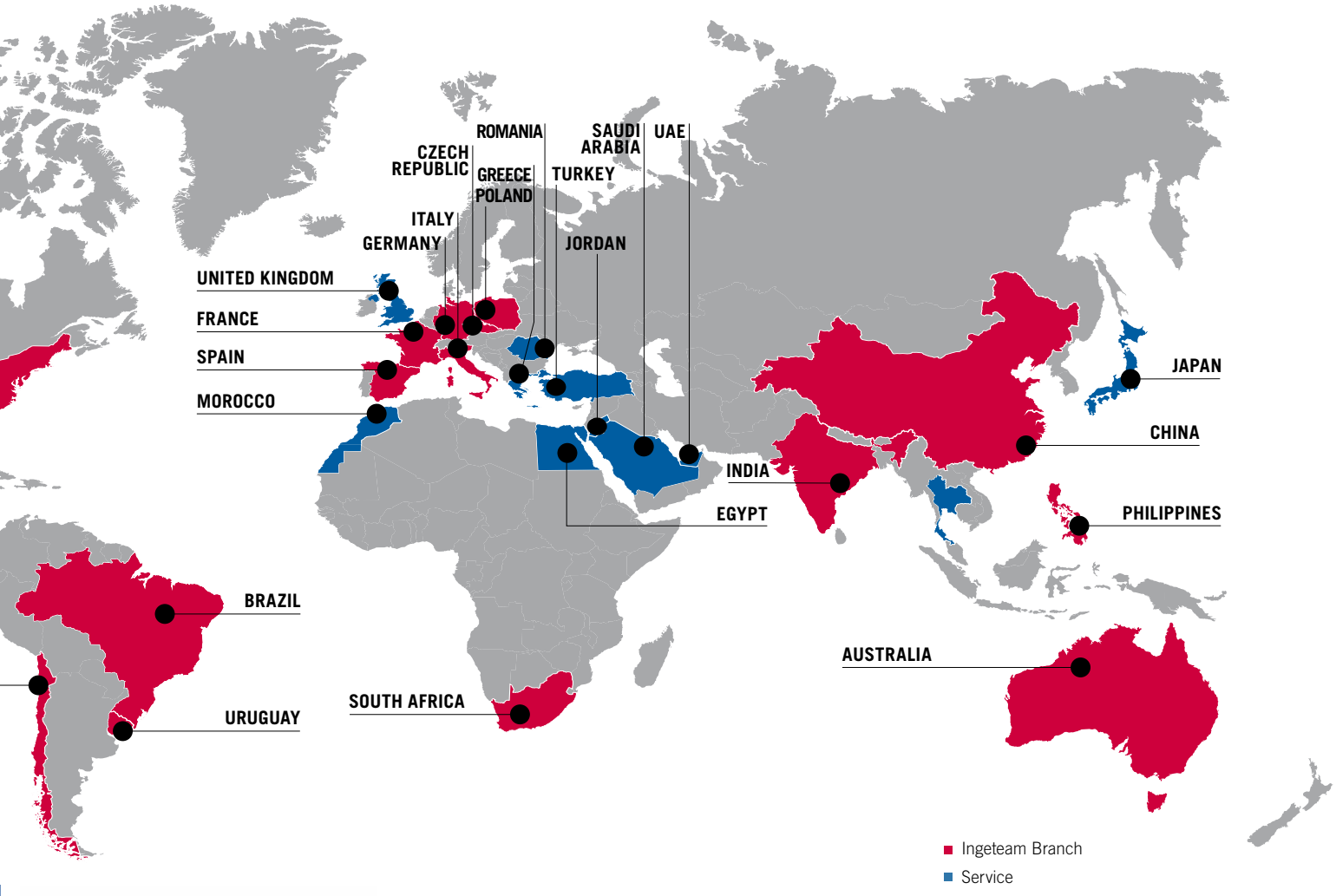

Ingeteam is a global corporation specialized in 4 different sectors (Energy, Industry, Marine and Railway Traction), all customer oriented and based on power and control electronics, electrical machines and application engineering.

With more than 60 years experience in the electricity sector, more than 3000 professionals dedicated to engineering and project development, and more than 42 GW supplied to the renewable energy market worldwide, Ingeteam is committed to investing in technology and innovation as the drivers of future growth.

Since 1990, the Energy business unit of Ingeteam Power Technology, S.A. has been dedicated to supplying equipment for the renewable energies sector (wind power, photovoltaic, solar thermal, hydropower, biomass and biofuels).

WE DESIGN AND MANUFACTURE A WIDE RANGE OF INVERTERS

MORE THAN 5 GW SUPPLIED TO THE SOLAR PV MARKET WORLDWIDE

Ingeteam is a leading company in the PV sector worldwide. The electronics and software have been especially developed for the INGECON® inverters, resulting in a high-quality end product, adaptable to the specific characteristics of each plant.

With an annual 5 GW production capacity, Ingeteam offers the following product range:

- Grid-connected inverters from 2.5 to 6560 kVA.
- Battery inverters from 3 to 1640 kVA.
- Energy management solutions.
- String currents monitoring equipment.
- Communications, software and hardware.

All these products are customized to suit the requirements of each and every customer, in line with one of Ingeteam's core values: **Customer guidance, service and adaptability.**

PRODUCT RANGE

ALL OUR PRODUCTS ARE CERTIFIED ACCORDING TO INTERNATIONAL STANDARDS

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Visit our webpage to access all the technical information:
www.ingeteam.com

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INGECON SUN

SOLAR INVERTERS

INGECON SUN 1Play

TL M Series

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

Single-phase TL inverter with a double MPPT system

The INGECON® SUN 1Play TL M inverters have been designed to maximize the power generation and also to facilitate user access to the PV plant. This solar inverter family is valid for low kilowatt residential applications, and also for decentralized commercial and industrial systems rated up to several hundred kilowatts.

In domestic installations, these inverters present the great advantage of being compatible with 30 mA RCDs, the most commonly used to protect the people against electric discharges.

High efficiency system

Ingeteam has developed its own technology to maximize the efficiency rates of the INGECON® SUN 1Play TL M inverter family.

Thanks to this *High efficiency system* and to the use of innovative electronic conversion topologies, values of up to 98% can be achieved. Furthermore, an advanced double-MPPT algorithm makes it possible to harness the maximum energy from the PV array at all times, even in difficult situations, such as scattered clouds and partial shadings.

Easy to install

The INGECON® SUN 1Play TL M inverters feature fast-on connectors on the DC side (type 4) and the AC side for a fast and easy connection to the system. Every country-specific configuration and language can be easily selected from the inverter screen. Moreover, the INGECON® SUN 1Play TL M inverters are compatible with all the PV module technologies on the market.

Simple operation and maintenance
Ingeteam is at the forefront of innovative firmware. As a result, the INGECON® SUN 1Play TL M inverters are extremely easy to operate. The menu displayed on the LCD screen has been designed so that it is simple and easy to use. These inverters feature an internal datalogger for several months data storage, accessible from a PC.

Every inverter can be accessed from either a remote PC or onsite from the inverter front touch key-pad through its LCD screen. The display also features a number of LEDs to indicate the inverter operating status.

These LED indicators light up whenever any incident is detected, thereby simplifying and facilitating equipment maintenance tasks.

Firmware updating
The INGECON® SUN 1Play TL M inverters allow the user to perform the firmware (FW) updating himself. It is as easy as to download the latest version of the firmware from the Ingeteam website: **www.ingeteam.com,** and update it using a simple SD memory card.

Monitoring and communication
The internal operating variables and the internal datalogger can be monitored through a number of media such as USB communications, supplied as standard. Also, RS-485, Ethernet, Wi-Fi, and 3G communications are available upon demand.

Included at no extra cost are the INGECON® SUN Manager, INGECON® SUN Monitor and its Smartphone version iSun Monitor -available on the App Store- for monitoring and recording the inverter data over the Internet.

Able to withstand extreme conditions
The INGECON® SUN 1Play TL M inverter housing is suitable for outdoor use (IP65 protection rating). Likewise, it can be used under extreme atmospheric conditions with temperature ranges from -25 ºC to +65 ºC, although its main cooling system is air convection.

SiC technology
This solar inverter presents silicon carbide (SiC) components. SiC technology allows higher efficiency levels and also a more reliable, light and compact equipment.

Long life expectancy
Ingeteam takes every care in the selection and sizing of the electronic components used for its inverters. The 1Play inverters have been designed to guarantee a long life expectancy, as demonstrated as demonstrated by the stress tests they are subjected to.

Standard 5 year warranty, extendable for up to 25 years

OPTIONAL ACCESSORIES

- Inverter communication via RS-485, Ethernet, Wi-Fi or 3G.
- DC switch.
- INGECON® SUN WeatherBox for meteorological values measurement and registration.
- Four additional digital inputs.
- Self-consumption kit.

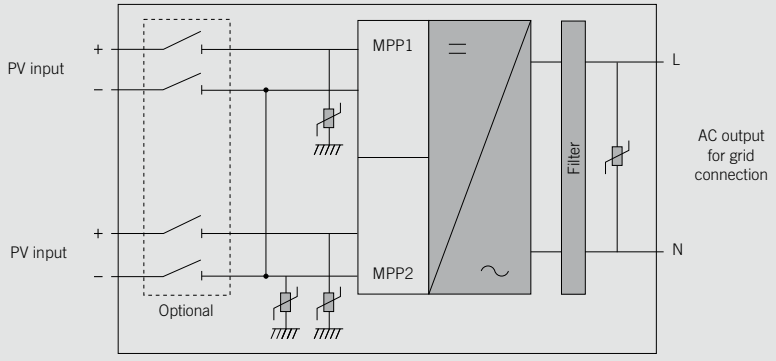
PROTECTIONS

- Reverse polarity.
- Input and output overvoltages with type 3 surge arresters.
- Output shortcircuits and overloads.
- Anti-islanding with automatic disconnection.
- Insulation failures.

MAIN FEATURES

- Compatible with 30 mA RCDs.
- Double-MPPT system.
- Available from 2.5 up to 6 kW.
- 98% maximum efficiency.
- SiC Technology inside.
- Inverter updating by the user through a SD memory card.
- USB communications supplied as standard.
- Two digital inputs as standard.
- Software INGECON® SUN Manager for PV plant access and data registration.
- Software INGECON® SUN Monitor for PV plant monitoring.
- LCD Display.
- Easy maintenance.
- Suitable for indoor and outdoor installations (IP65).
- Display-configurable potential free contact, to indicate insulation fault or grid connection.
- Compact design.
- Language, Country Code and rated voltage configurable by display.

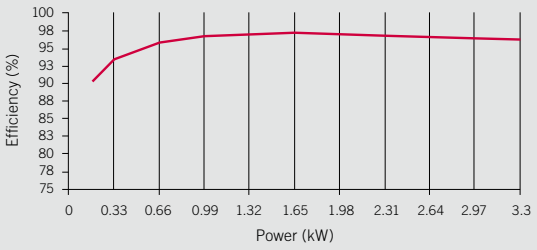
1Play TL M



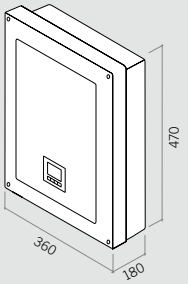
	2.5TL M	3TL M	3.3TL M	3.68TL M
Input (DC)				
Recommended PV array power range[1]	2.8 - 3.3 kWp	3.2 - 4 kWp	3.8 - 4.4 kWp	3.9 - 4.8 kWp
Voltage range MPP1[2]	125 - 750 V			
Voltage range MPP2[2] [3]	90 - 750 V			
Maximum voltage[4]	850 V			
Maximum current (Input 1 / Input 2)	11 / 11 A			
Inputs (Input 1 / Input 2)[5]	1 / 1			
MPPT	2			
Output (AC)				
Rated power	2.5 kW	3 kW	3.3 kW	3.68 kW
Max. temperature at rated power[6]	60 °C	55 °C	52 °C	50 °C
Maximum current	16 A			
Rated voltage	230 V			
Voltage range	122 - 265 V			
Frequency	50 / 60 Hz			
Power Factor	1			
Power Factor adjustable	Yes. Smax=2.5 kVA	Yes. Smax=3 kVA	Yes. Smax=3.3 kVA	Yes. Smax=3.68 kVA
THD	<3%			
Efficiency				
Maximum efficiency	97.6%	97.7%	97.7%	97.8%
Euroefficiency	97.3%	97.4%	97.4%	97.5%
General Information				
Refrigeration system	Air convection			
Stand-by consumption[7]	<10 W			
Consumption at night	0 W			
Ambient temperature	-25 °C to +65 °C			
Relative humidity (non-condensing)	0 - 100%			
Protection class	IP65			
Marking	CE			
EMC & Security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100			
Grid connection standards	RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-21, VDE-AR-N 4105:2011-08, G59/2, G83/2[8], P.O.12.3, AS4777.2, AS4777.3, IEC 62116, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, South African Grid code, Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, DEWA (Dubai) Grid Code, Jordan Grid Code			

Notes: [1] Depending on the type of installation and geographical location [2] The output power will be conditioned by the voltage and current configuration selected at each input [3] To drop to 90 V, the other input must be at least at 125 V [4] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures [5] Optionally, the DC inputs could be duplicated [6] For each °C of increase, the output power will be reduced at the rate of 1.8% [7] Consumption from PV field [8] Related only inverters up to 16 A.

Efficiency INGECON® SUN 3.3TL M Vdc = 680 V



Size and weight (mm)

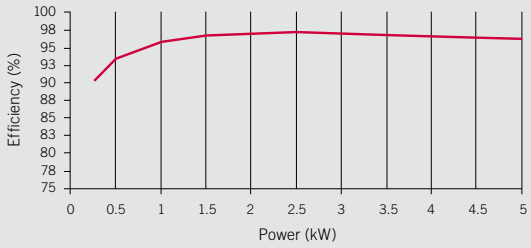


2.5TL M / 3TL M / 3.3TL M / 3.68TL M
20 kg.

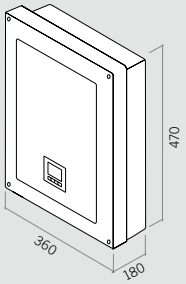
	4.6TL M	5TL M	6TL M
Input (DC)			
Recommended PV array power range[1]	5.2 - 6 kWp	5.7 - 6.5 kWp	6.3 - 7 kWp
Voltage range MPP1[2]	125 - 750 V		
Voltage range MPP2[2] [3]	90 - 750 V		
Maximum voltage[4]	850 V		
Maximum current (Input 1 / Input 2)	11 / 11 A		
Inputs (Input 1 / Input 2)[5]	1 / 1		
MPPT	2		
Output (AC)			
Rated power	4.6 kW	5 kW	6 kW
Max. temperature at rated power[6]	58 °C	55 °C	45 °C
Maximum current	26.2 A		
Rated voltage	230 V		
Voltage range	122 - 265 V		
Frequency	50 / 60 Hz		
Power Factor	1		
Power Factor adjustable	Yes. Smax=4.6 kVA	Yes. Smax=5 kVA	Yes. Smax=6 kVA
THD	<3%		
Efficiency			
Maximum efficiency	97.9%	98%	98%
Euroefficiency	97.5%	97.6%	97.6%
General Information			
Refrigeration system	Air convection		
Stand-by consumption[7]	<10 W		
Consumption at night	0 W		
Ambient temperature	-25 °C to +65 °C		
Relative humidity (non-condensing)	0 - 100%		
Protection class	IP65		
Marking	CE		
EMC & Security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100		
Grid connection standards	RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-21, VDE-AR-N 4105:2011-08, G59/2, G83/2[8], P.O.12.3, AS4777.2, AS4777.3, IEC 62116, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, South African Grid code, Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, DEWA (Dubai) Grid Code, Jordan Grid Code		

Notes: [1] Depending on the type of installation and geographical location [2] The output power will be conditioned by the voltage and current configuration selected at each input [3] To drop to 90 V, the other input must be at least at 125 V [4] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures [5] Optionally, the DC inputs could be duplicated [6] For each °C of increase, the output power will be reduced at the rate of 1.8% [7] Consumption from PV field [8] Related only inverters up to 16 A.

Efficiency INGECON® SUN 5TL M Vdc = 680 V



Size and weight (mm)



4.6TL M / 5TL M / 5.5TL M / 6TL M
21 kg.

INGECON SUN 1Play

TL U M Series

UL 1741 COMPLIANT

2.8TL U M / 3.3TL U M / 5TL U M / 6TL U M

Single-phase TL inverter with a double MPPT system

The INGECON® SUN 1Play TL U M inverters have been designed to maximize the power generation and also to facilitate user access to the PV plant. This solar inverter family is valid for low kilowatt residential applications, and also for decentralized commercial and utility-scale systems rated up to several hundred kilowatts. In domestic installations, these inverters present the great advantage of integrating an arc fault circuit interruption system (AFCI). Moreover, they are compatible with 30 mA RCDs, the most commonly used to protect the people against electric discharges.

High efficiency system

Ingeteam has developed its own technology to maximize the efficiency rates of the INGECON® SUN 1Play TL U M inverter family. Thanks to this high efficiency system and to the use of innovative electronic conversion topologies, values of up to 98.9% can be achieved. Furthermore, an advanced double-MPPT algorithm makes it possible to harness the maximum energy from the PV array at all times, even in difficult situations, such as scattered clouds and partial shadings.

Easy to install

Every country-specific configuration and language can be easily selected from the inverter screen. Moreover, the INGECON® SUN 1Play TL U M inverters are compatible with all the PV module technologies on the market.

Simple operation and maintenance

Ingeteam is at the forefront of innovative firmware. As a result, the INGECON® SUN 1Play TL U M inverters are extremely easy to operate. The menu displayed on the LCD screen has been designed so that it is simple and easy to use. These inverters feature an internal datalogger for several months data storage, accessible from a PC. Every inverter can be accessed from either a remote PC or on-site from the inverter front touch keypad through its LCD screen. The display also features a number of LEDs to indicate the inverter operating status. These LED indicators light up whenever any incident is detected, thereby simplifying and facilitating equipment maintenance tasks.

Firmware updating

The INGECON® SUN 1Play TL U M inverters allow the user to perform the firmware (FW) updating himself. It is as easy as to download the latest version of the firmware from the Ingeteam website: **www.ingeteam.com,** and update it using a simple SD memory card. These photovoltaic inverters feature a SD input slit to facilitate the firmware updating by the user.

INGECON SUN 1Play

TL U M Series

Monitoring and communication
The internal operating variables and the internal datalogger can be monitored through a number of media such as USB communications, supplied as standard. Also, RS-485, Ethernet, Wi-Fi, and GSM / GPRS communications are available upon demand. Included at no extra cost are the INGECON® SUN Manager, INGECON® SUN Monitor and its Smartphone version Web Monitor -available on the App Store- for monitoring and recording the inverter data over the Internet.

Able to withstand extreme conditions
The INGECON® SUN 1Play TL U M inverter housing is suitable for outdoor use (NEMA 4). Likewise, it can be used under extreme atmospheric conditions with temperature ranges from -13 °F to +149 °F, although its main cooling system is natural air convection.

SiC technology
This solar inverter presents silicon carbide (SiC) components. SiC technology allows higher efficiency levels and also a more reliable, light and compact equipment.

Easy rooftop installation
Vertical or horizontal mounting, enabling the location of the inverter next to the PV modules and avoiding the installation of any additional rapid shutdown device.

Standard 10 year warranty, extendable for up to 20 years

OPTIONAL ACCESSORIES

- Inverter communication via RS-485, Ethernet or GSM / GPRS.
- Combiner Box with DC switch.
- INGECON® SUN WeatherBox for meteorological values measurement and registration.
- Four additional digital inputs.
- Self-consumption kit.

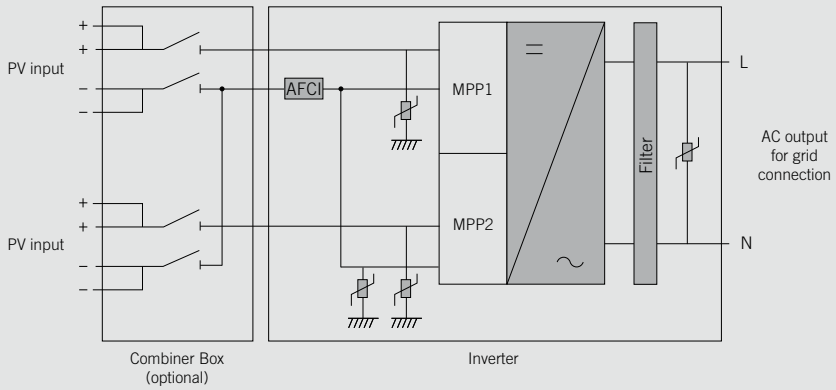
PROTECTIONS

- Reverse polarity.
- Input and output overvoltages with type 3 surge arresters.
- Out shortcircuits and overloads.
- Anti-islanding with automatic disconnection.
- Insulation failures.

MAIN FEATURES

- AFCI (Arc Fault Circuit Interrupt).
- Compatible with 30 mA RCDs.
- Easy rooftop installation.
- Double-MPPT system.
- Available from 2.8 up to 6 kW.
- 98.9% maximum efficiency.
- SiC Technology inside.
- Inverter updating by the user through a SD memory card.
- USB communications.
- Two digital inputs as standard.
- Software INGECON® SUN Manager for PV plant access and data registration.
- Software INGECON® SUN Monitor for PV plant monitoring.
- LCD Display.
- Easy maintenance.
- Suitable for indoor and outdoor installations (NEMA 4).
- Display-configurable potential free contact, to indicate insulation fault or grid connection.
- Compact design.
- Plug & Play technology.
- Language, Country Code and rated voltage configurable by display.

1Play TL U M

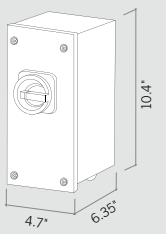


Combiner Box
The Combiner Box is supplied with two inputs per MPPT, DC switch.

COMBINER BOX MAIN FEATURES

- DC switch.
- 2 MPPTs (2 inputs per MPPT).
- Fuses not required, according to NEC 2014 690.9.

Size and weight (inches)

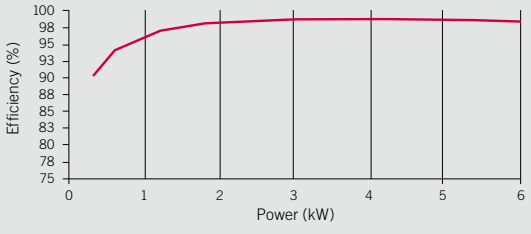


Combiner Box
4 lbs

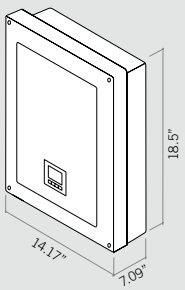
	2.8TL U M	3.3TL U M	5TL U M	6TL U M
Input (DC)				
Recommended PV array power range[1]	2.8 - 3.6 kW	3.4 - 4.3 kW	5.1 - 6.5 kW	6.1 - 7.8 kW
Voltage range MPP[2]	125 - 750 V			
Voltage range MPP2[2][3]	90 - 750 V			
Maximum voltage[4]	850 V			
Maximum current (Input 1 / Input 2)	11 / 11 A			
Inputs (Input 1 / Input 2)	1 / 1			
MPPT	2			
Output (AC)				
Rated power	2.8 kW	3.3 kW	5 kW	6 kW
Max. temperature at rated power[5]	113 °F			
Maximum current	16 A	16 A	26.2 A	26.2 A
Rated voltage	208 / 240 V	208 / 240 V	208 / 240 V	240 V
Frequency	60 Hz			
Power Factor	1			
Power Factor adjustable	Yes. Smax=2.8 kVA	Yes. Smax=3.3 kVA	Yes. Smax=5 kVA	Yes. Smax=6 kVA
THD	<3%			
Efficiency				
Maximum efficiency	98.6%	98.5%	98.4%	98.9%
CEC - Weighted efficiency	97%	97.5%	97.5%	98%
General Information				
Refrigeration system	Natural air convection		Forced ventilation	
Stand-by consumption[6]	<10 W			
Consumption at night	0 W			
Ambient temperature	-13 °F to 149 °F			
Relative humidity (non-condensing)	0 - 100%			
Protection class	NEMA 4			
DC AFCI	✓			
Marking	CE, ETL			
EMC & Security standards	UL1741, FCC Part 15, IEEE C37.90.1, IEEE C37.90.2			
Grid connection standards	IEC 62116, UL1741, IEEE1547, IEEE1547.1, NEC CODE			

Notes: [1] Depending on the type of installation and geographical location [2] The output power will be conditioned by the voltage and current configuration selected at each input [3] To drop to 90 V, the other input must be at least at 125 V [4] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures [5] The output power will be reduced at the rate of 1% for each 1 °F of increase [6] Consumption from PV field.

Efficiency INGECON® SUN 6TL U M Vdc = 680 V



Size and weight (mm)



2.8TL U M / 3.3TL U M
44.1 pounds

5TL U M / 6TL U M
46.3 pounds

INGECON SUN 3Play

TL Series

10TL / 15TL / 20TL / 28TL / 33TL

Three-phase TL inverters with the maximum efficiency at the best price

A three-phase inverter family for domestic, industrial and large-scale PV plants.

Maximum efficiency at the best price
A single DC-to-AC power conversion stage with an advanced single maximum power point tracking system (MPPT), that makes it possible to harness the maximum energy from the PV array at the most competitive price.

Plug & Play technology
Extremely easy to install. The inverter connection is fast and simple. The country-specific configuration and language can be easily selected from the inverter screen.

Rugged design
Steel casing, especially designed for indoor and outdoor applications (IP65). Able to withstand extreme temperatures.

The INGECON® SUN 3Play TL inverters have been designed to guarantee a inverters have been designed to guarantee a long life expectancy, as demonstrated as demonstrated by the stress tests they are subjected to.

Ease of maintenance
Internal datalogger for up to 3 months data storage. Control either from a remote PC or on-site from the inverter front keypad. Status and alarm LED indicators. LCD screen.

Easy to operate
The INGECON® SUN 3Play TL inverters feature a LCD screen for the simple and convenient monitoring of the inverter status and a range of internal variables. The display also includes three LEDs to show the inverter operating status. All this helps to simplify and facilitate maintenance tasks.

Software included
Included at no extra cost are the INGECON® SUN Manager, INGECON® SUN Monitor and its smartphone version Web Monitor for monitoring and recording the inverter data over the internet. RS-485 communications are supplied as standard. In addition, users can download the latest version of the firmware from the Ingeteam website: **www.ingeteam.com,** and update it using a simple SD memory card.

Standard 5 year warranty, extendable for up to 25 years


Ingeteam

INGECON SUN 3Play

TL Series

Different versions to choose from
In order to satisfy its clients' needs, Ingeteam has created different versions for the INGECON® SUN 3Play TL family:

- "S": Standard version
- "S+": Advanced Standard version
- "P": Premium version
- "P+": Advanced Premium version

All the versions are supplied with DC and AC surge arresters type 3. The "S" version represents the most basic model of all. It features a single MPPT input with terminal blocks. The Advanced Standard version also integrates a DC switch.

On the other hand, the Premium version includes two options for DC connection: conventional terminal blocks or fused and monitored PV connectors.

Moreover, it also features DC fuses, the input current measuring kit and a DC switch. The Advanced Premium version "P+" is supplied with DC surge arresters, type 2.

MAIN FEATURES

- MPPT system.
- 98.5% maximum efficiency.
- Digital inputs.
- RS-485 communications supplied as standard.
- Inverter firmware updating by the user through a SD memory card.
- Software INGECON® SUN Manager for PV plant access and data registration.
- Software INGECON® SUN Monitor for PV plant monitoring.
- LCD display.
- Easy maintenance.
- Display-configurable potential-free contact, to indicate insulation fault or grid connection.
- Plug & Play technology.
- Suitable for indoor and outdoor installations (IP65).
- High temperature performance.
- Different versions to satisfy every project needs.
- Compact design.
- Language, rated voltage and Country Code configurable by display.

PROTECTIONS

- Reverse polarity.
- Shortcircuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation faults.
- Input and output overvoltages with type 3 surge arresters.

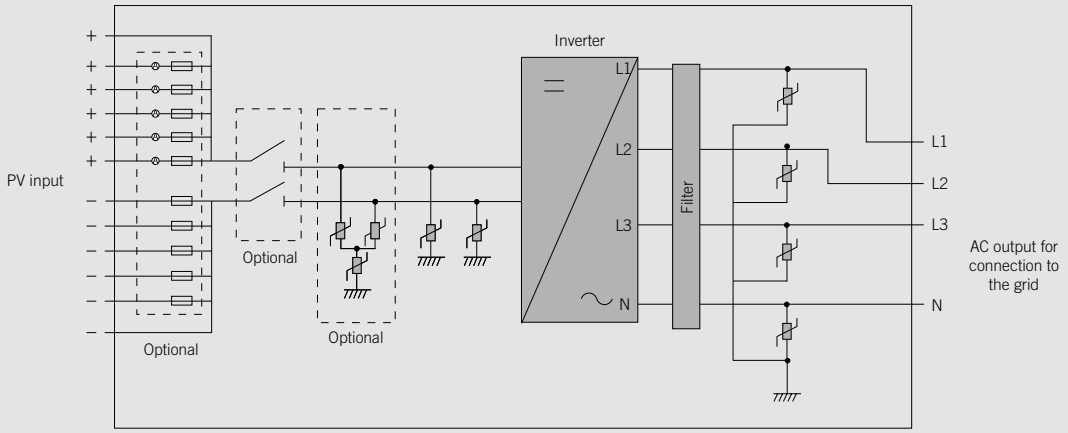
OPTIONAL ACCESORIES

- Inverter communication via Ethernet, GSM / GPRS or Wi-Fi. A second RS-485 communication card is available.
- Self-consumption kit.

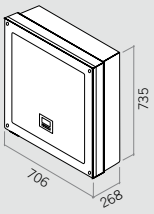
BENEFITS

- The best possible price.
- High efficiency rates.
- Easy maintenance.

3Play TL P+ version (33 kW)



Size and weight (mm)



10TL / 15TL / 20TL
46.8 kg.

28TL / 33TL
51.5 kg.

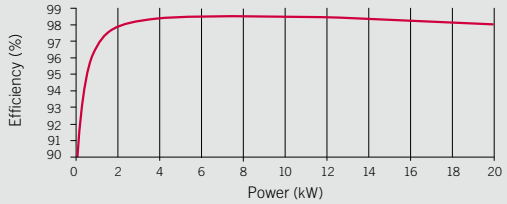
	10TL	15TL	20TL	28TL	33TL
Input (DC)					
Recommended PV array power range[1]	10.3 - 13.4 kW	15.5 - 20.1 kW	20.6 - 26.8 kW	28.9 - 37.5 kW	34 - 45 kW
Voltage range MPP[2]	560 - 820 V				
Min. voltage for Pnom at rated Vac	560 V				
Maximum voltage[3]	1,000 V				
Maximum current[4]	19 A	28 A	37 A	52 A	61 A
Inputs with terminal blocks (Input 1 / Input 2)	1				
Inputs with PV connectors (Input 1 / Input 2)[5]	5	5	5	8	8
MPPT	1				
Output (AC)					
Rated power	10 kW	15 kW	20 kW	28 kW	33 kW
Max. temperature at rated power[6]	55 ºC	55 ºC	55 ºC	51 ºC	51 ºC
Maximum current	15 A	22 A	29 A	41 A	48 A
Rated voltage	400 V				
Voltage range	187 - 528 V	187 - 528 V	187 - 528 V	304 - 528 V	304 - 528 V
Frecuency	50 / 60 Hz				
Power Factor	1				
Power Factor adjustable	Yes. Smax=10 kVA; Qmax=10 kVAR	Yes. Smax=15 kVA; Qmax=15 kVAR	Yes. Smax=20 kVA; Qmax=20 kVAR	Yes. Smax=28 kVA; Qmax=20 kVAR	Yes. Smax=33 kVA; Qmax=20 kVAR
THD	<3%				
Efficiency					
Maximum efficiency	98.5%				
Euroefficiency	98.3%	98.4%	98.3%	98.3%	98.3%
General Information					
Refrigeration system	Forced ventilation				
Air flow	200 m³/h	200 m³/h	200 m³/h	400 m³/h	400 m³/h
Stand-by consumption[7]	10 W				
Consumption at night	1 W				
Ambient temperature	-25 ºC to 65 ºC				
Relative humidity (non-condensing)	0 - 100%				
Protection class	IP65				
Marking	CE				
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100				
Grid connection standards	RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-16 Ed. III, CEI 0-21, VDE-AR-N 4105:2011-08, G59/2, G83/2[8], P.O.12.3, AS4777.2, AS4777.3, IEC 62116, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, South African Grid code, Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, DEWA (Dubai) Grid Code, Jordan Grid Code				
Versions available					
Standard version S		✓	✓	✓	✓
Standard version S+		✓	✓	✓	✓
Premium version P	✓	✓	✓	✓	✓
Premium version P+		✓	✓	✓	✓

	Standard version		Premium version	
	S	S+	P	P+
Terminal blocks	✓	✓	✓ (*)	✓ (*)
PV connectors			✓	✓
DC switch		✓	✓	✓
DC surge arresters, type 2				✓
DC and AC surge arresters, type 3	✓	✓	✓	✓
DC fuses			✓	✓
Current measuring kit			✓	✓

(*) Terminal blocks not available for the Premium versions of the INGECON® SUN 28TL and 33TL inverters.

Notes: [1] Depending on the type of installation and geographical location [2] $V_{mpp,min}$ = 560 V when Vac = 400 V. Otherwise: $V_{mpp,min}$ = 1.4 x Vac [3] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures [4] The maximum current per PV connector is 11 A for Premium versions [5] Branch plugs and sockets available to connect two cables to each input [6] For each ºC of increase, the output power will be reduced at the rate of 1.8% [7] Consumption from PV field [8] Related only to inverters up to 16 A.

Efficiency INGECON® SUN 20TL Vdc = 600 V



INGECON SUN 3Play

TL M Series

10TL M / 15TL M / 20TL M / 28TL M / 33TL M / 24TL M480 / 40TL M480

Maximum efficiency with Multi-MPPT three-phase technology

A three-phase inverter family for domestic, industrial and large-scale PV plants.

Maximum efficiency with two independent MPPT inputs
A single DC-to-AC power conversion stage with an advanced maximum power point tracking system (MPPT), making it possible to harness the maximum energy from the PV array at all times, including difficult situations such as scattered clouds and partial shading. Great flexibility for configuring the solar array, thanks to the two independent MPPT trackers with a wide input voltage range. Moreover, it enables to connect different DC input powers to each MPP tracker (asymmetric configuration).

Plug & Play technology
Extremely easy to install. The inverter connection is fast and simple. The country-specific configuration and language can be easily selected from the inverter screen.

Rugged design
Steel casing, especially designed for indoor and outdoor applications (IP65). Able to withstand extreme temperatures. The 3Play TL M inverters have been designed to guarantee a service life of more than 20 years, as demonstrated by the stress tests they are subjected to.

Ease of maintenance
Internal datalogger for up to 3 months data storage. Control either from a remote PC or on-site from the inverter front keypad. Status and alarm LED indicators. LCD screen.

Easy to operate
The INGECON® SUN 3Play TL M inverters feature a LCD screen for the simple and convenient monitoring of the inverter status and a range of internal variables.

The display also includes three LEDs to show the inverter operating status. All this helps to simplify and facilitate maintenance tasks.

Software included
Included at no extra cost are the INGECON® SUN Manager, INGECON® SUN Monitor and its smartphone version iSun Monitor for monitoring and recording the inverter data over the internet. In addition, users can download the latest version of the firmware from the Ingeteam website **www.ingeteam.com,** and update it using a simple SD memory card. RS-485 communications are supplied as standard.

Standard 5 year warranty, extendable for up to 25 years

Different versions to choose from
In order to satisfy its clients' needs, Ingeteam has created different versions for the INGECON® SUN 3Play TL M family:

- "S": Standard version
- "S+": Advanced Standard version
- "P": Premium version
- "P+": Advanced Premium version

All the versions are supplied with DC and AC surge arresters type 3. The "S" version represents the most basic model of all. It features a double MPPT input with terminal blocks. The Advanced Standard version also integrates a DC switch.

On the other hand, the Premium version includes two options for DC connection: conventional terminal blocks or fused and monitored PV connectors.

Moreover, it also features DC fuses, the input current measuring kit and the DC. The Advanced Premium version "P+" is supplied with DC surge arresters, type 2.

MAIN FEATURES

- Double-MPPT system.
- 98.5% maximum efficiency.
- Digital inputs.
- RS-485 communications supplied as standard.
- Inverter firmware updating by the user through a SD memory card.
- Software INGECON® SUN Manager for PV plant access and data registration.
- Software INGECON® SUN Monitor for PV plant monitoring.
- LCD display.
- Easy maintenance.
- Display-configurable potential-free contact, to indicate insulation fault or grid connection.
- Plug & Play technology.
- Suitable for indoor and outdoor installations (IP65).
- High temperature performance.
- Different versions to satisfy every project needs.
- Compact design.
- Language, rated voltage and Country Code, rated voltage configurable by display.

PROTECTIONS

- Reverse polarity.
- Shortcircuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation faults.
- Input and output overvoltages with type 3 surge arresters.

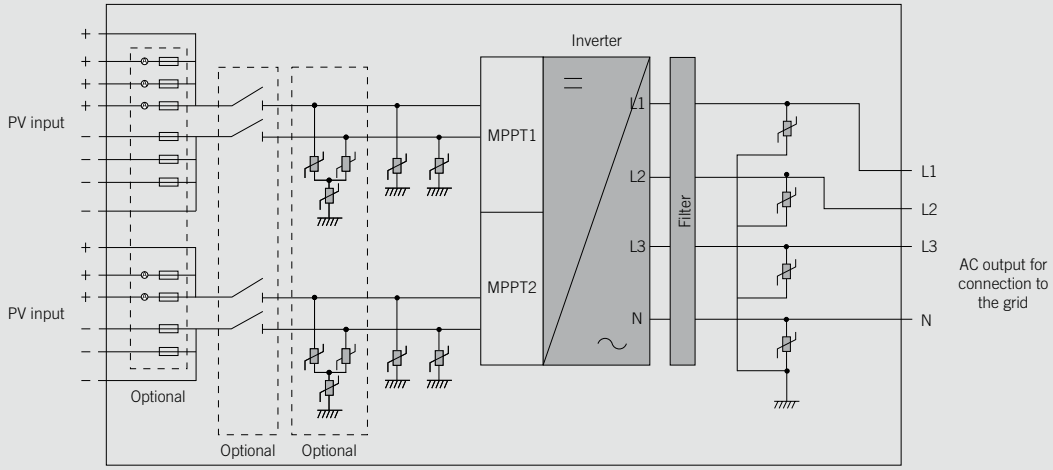
OPTIONAL ACCESORIES

- Inverter communication via Ethernet, GSM / GPRS or Wi-Fi. A second RS-485 communication card is available.
- Self-consumption kit.

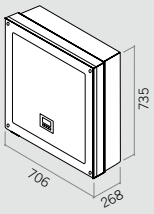
BENEFITS

- Greater performance thanks to the double MPPT system.
- Easy maintenance.
- Higher inverter life expectance.

3Play TL M P+ version (20 kW)



Size and weight (mm)



10TL M /15TL M / 20TL M / 24TL M480
57.8 kg.

28TL M / 33TL M / 40TL M480
62.5 kg.

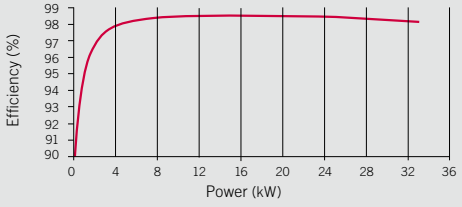
	10TL M	15TL M	20TL M	28TL M	33TL M
Input (DC)					
Recommended PV array power range[1]	10.3 - 13.4 kW	15.5 - 20.1 kW	20.6 - 26.8 kW	28.9 - 37.5 kW	34 - 45 kW
Voltage range MPP1[2]	200 - 820 V				
Voltage range MPP2[2]	200 - 820 V				
Maximum voltage[3]	1,000 V				
Maximum current (Input 1 / Input 2)[4]	30 / 20 A	30 / 20 A	30 / 20 A	40 / 40 A	40 / 40 A
Inputs with terminal blocks (Input 1 / Input 2)	1 / 1				
Inputs with PV connectors (Input 1 / Input 2)[5]	3 / 2	3 / 2	3 / 2	5 / 5	5 / 5
MPPT	2				
Output (AC)					
Rated power	10 kW	15 kW	20 kW	28 kW	33 kW
Max. temperature at rated power[6]	55 ºC	55 ºC	55 ºC	51 ºC	51 ºC
Maximum current	15 A	22 A	29 A	41 A	48 A
Rated voltage	400 V				
Voltage range	187 - 528 V	187 - 528 V	187 - 528 V	304 - 528 V	304 - 528 V
Frecuency	50 / 60 Hz				
Power Factor	1				
Power Factor adjustable	Yes. Smax=10 kVA; Qmax=10 kVAR	Yes. Smax=15 kVA; Qmax=15 kVAR	Yes. Smax=20 kVA; Qmax=20 kVAR	Yes. Smax=28 kVA; Qmax=20 kVAR	Yes. Smax=33 kVA; Qmax=20 kVAR
THD	<3%				
Efficiency					
Maximum efficiency	98.5%				
Euroefficiency	98.3%				
General Information					
Refrigeration system	Forced ventilation				
Air flow	200 m³/h	200 m³/h	200 m³/h	400 m³/h	400 m³/h
Stand-by consumption[7]	10 W				
Consumption at night	1 W				
Ambient temperature	-25 ºC to 65 ºC				
Relative humidity (non-condensing)	0 - 100%				
Protection class	IP65				
Marking	CE				
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100				
Grid connection standards	RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-16 Ed. III, CEI 0-21, VDE-AR-N 4105:2011-08, G59/2, G83/2[8], P.O.12.3, AS4777.2, AS4777.3, IEC 62116, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, South African Grid code, Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, DEWA (Dubai) Grid Code, Jordan Grid Code				
Versions available					
Standard version S		✓	✓	✓	✓
Standard version S+		✓	✓	✓	✓
Premium version P	✓	✓	✓	✓	✓
Premium version P+		✓	✓	✓	✓

	Standard version		Premium version	
	S	S+	P	P+
Terminal blocks	✓	✓	✓ (*)	✓ (*)
PV connectors			✓	✓
DC switch		✓	✓	✓
DC surge arresters, type 2				✓
DC and AC surge arresters, type 3	✓	✓	✓	✓
DC fuses			✓	✓
Current measuring kit			✓	✓

(*) Terminal blocks not available for the Premium versions of the INGECON® SUN 28TL M, 33TL M and 40TL M480 inverters.

Notes: [1] Depending on the type of installation and geographical location [2] The output power will be conditioned by the voltage and current configuration selected at each input [3] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures [4] The maximum current per PV connector is 11 A for Premium versions [5] Branch plugs and sockets available to connect two cables to each input [6] For each ºC of increase, the output power will be reduced at the rate of 1.8% [7] Consumption from PV field [8] Related only to inverters up to 16 A.

Efficiency INGECON® SUN 33TL M Vdc = 720 V



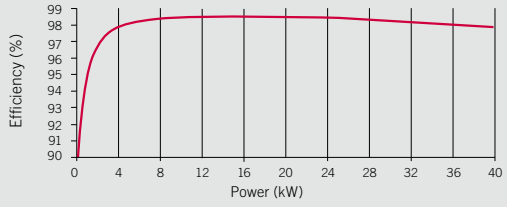
	24TL M480	40TL M480
Input (DC)		
Recommended PV array power range[1]	24.7 - 32.2 kW	41.2 - 53.6 kW
Voltage range MPP1[2]	200 - 820 V	
Voltage range MPP2[2]	200 - 820 V	
Maximum voltage[3]	1,000 V	
Maximum current (Input 1 / Input 2)[4]	30 / 20 A	40 / 40 A
Inputs with terminal blocks (Input 1 / Input 2)	1 / 1	
Inputs with PV connectors (Input 1 / Input 2)[5]	3 / 2	5 / 5
MPPT	2	
Output (AC)		
Rated power	24 kW	40 kW
Max. temperature at rated power[6]	55 ºC	51 ºC
Maximum current	29 A	48 A
Rated voltage	480 V	
Voltage range	187 - 528 V	304 - 528 V
Frecuency	50 / 60 Hz	
Power Factor	1	
Power Factor adjustable	Yes. Smax=24 kVA; Qmax=24 kVAR	Yes. Smax=40 kVA; Qmax=24 kVAR
THD	<3%	
Efficiency		
Maximum efficiency	98.5%	
Euroefficiency	98.3%	
General Information		
Refrigeration system	Forced ventilation	
Air flow	200 m³/h	400 m³/h
Stand-by consumption[7]	10 W	
Consumption at night	1 W	
Ambient temperature	-25 ºC to 65 ºC	
Relative humidity (non-condensing)	0 - 100%	
Protection class	IP65	
Marking	CE	
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100	
Grid connection standards	RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-16 Ed. III, CEI 0-21, VDE-AR-N 4105:2011-08, G59/2, G83/2[8], P.O.12.3, AS4777.2, AS4777.3, IEC 62116, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, South African Grid code, Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, DEWA (Dubai) Grid Code, Jordan Grid Code	
Versions available		
Standard version S	✓	✓
Standard version S+	✓	✓
Premium version P	✓	✓
Premium version P+	✓	✓

	Standard version		Premium version	
	S	S+	P	P+
Terminal blocks	✓	✓	✓ (*)	✓ (*)
PV connectors			✓	✓
DC switch		✓	✓	✓
DC surge arresters, type 2				✓
DC and AC surge arresters, type 3	✓	✓	✓	✓
DC fuses			✓	✓
Current measuring kit			✓	✓

(*) Terminal blocks not available for the Premium versions of the INGECON® SUN 28TL M, 33TL M and 40TL M480 inverters.

Notes: [1] Depending on the type of installation and geographical location [2] The output power will be conditioned by the voltage and current configuration selected at each input [3] Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures [4] The maximum current per PV connector is 11 A for Premium versions [5] Branch plugs and sockets available to connect two cables to each input [6] For each ºC of increase, the output power will be reduced at the rate of 1.8% [7] Consumption from PV field [8] Related only to inverters up to 16 A.

Efficiency INGECON® SUN 40TL M480 Vdc = 72 0 V



INGECON SUN 3Play

TL U M Series

UL 1741 COMPLIANT

24TL U M480 / 40TL U M480

Maximum efficiency with Multi-MPPT three-phase technology

A three-phase inverter family for residential, commercial and large-scale PV plants. It integrates an arc fault circuit interruption system (AFCI).

Maximum efficiency with two independent MPPT inputs
A single DC-to-AC power conversion stage with an advanced maximum power point tracking system (MPPT), making it possible to harness the maximum energy from the PV array at all times, including difficult situations such as scattered clouds and partial shading. Great flexibility for configuring the solar array, thanks to the two independent MPPT trackers with a wide input voltage range. Moreover, it enables to connect different DC input powers to each MPP tracker (asymmetric configuration).

Plug & Play technology
Extremely easy to install. The inverter connection is fast and simple. The country-specific configuration and language can be easily selected from the inverter screen.

Rugged design
Steel casing, especially designed for indoor and outdoor applications (NEMA 4). It with stands extreme temperatures. The 3Play inverters have been designed to guarantee a long life expectancy.

Ease of maintenance
Internal datalogger for up to 3 months data storage. Control either from a remote PC or on-site from the inverter front keypad. Status and alarm LED indicators. LCD screen. Integrated DC arc-fault circuit interruption system.

Easy to operate
The INGECON® SUN 3Play TL U M inverters feature a LCD screen for the simple and convenient monitoring of the inverter status and a range of internal variables. The display also includes three LEDs to show the inverter operating status. All this helps to simplify and facilitate maintenance tasks.

Software included
Included at no extra cost are the INGECON® SUN Manager, INGECON® SUN Monitor and its smartphone version Web Monitor for monitoring and recording the inverter data over the internet. In addition, users can download the latest version of the firmware from the Ingeteam website **www.ingeteam.com,** and update it using a simple SD memory card. RS-485 communications are supplied as standard.

Standard 10 year warranty, extendable for up to 20 years

INGECON SUN 3Play

TL U M Series

A versatile equipment
The INGECON® SUN 3Play TL U M inverters integrate an arc-fault circuit interruption system.

The standard inverter features a double MPPT input with terminal blocks. It also integrates DC and AC surge arresters, type 3. Optionally, it can be supplied with DC surge arresters, type 2.

Easy rooftop installation
Vertical or horizontal mounting, enabling the location of the inverter next to the PV modules and avoiding the installation of any additional rapid shutdown device.

MAIN FEATURES

- AFCI (Arc Fault Circuit Interrupt).
- Double-MPPT System.
- Easy rooftop installation.
- 98.5% maximum efficiency.
- Inverter firmware updating by the user through a SD memory card.
- Software INGECON® SUN Manager for PV plant access and data registration.
- Software INGECON® SUN Monitor for PV plant monitoring.
- LCD display.
- RS-485 communications supplied as standard.
- Display-configurable potential-free contact, to indicate insulation fault or grid connection.
- Plug & Play technology.
- Suitable for indoor and outdoor installations (NEMA 4).
- High temperature performance. Rated power up to 131 °F (55 °C) for the 24 kW inverters.
- Language, rated voltage and Country Code configurable by display.

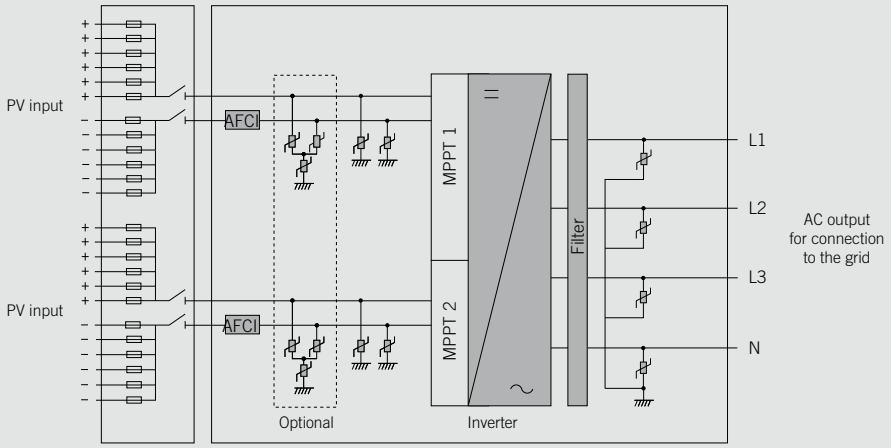
PROTECTIONS

- Reverse polarity.
- DC arc-fault circuit interruption.
- Shortcircuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation faults.

OPTIONAL ACCESSORIES

- Inter-inverter communication via Ethernet, GSM / GPRS or Wi-Fi.
- Combiner Box with DC fuses and DC switch.
- DC surge arresters, type 2.

3Play TL U M (40 kW)

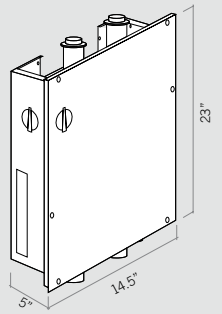


Combiner Box
The Combiner Box is supplied with four or six inputs per MPPT with fuses on each pole and a DC switch. It can be located immediately under the PV inverter or in a different place.

COMBINER BOX MAIN FEATURES

- DC switch.
- 2 MPPTs (4 inputs / MPPT for the 24 kW models, and 6 inputs / MPPT for the 40 kW model).
- 4 fuses per pole for the 24 kW models and 6 fuses per pole for the 40 kW model.
- Max. short-circuit current per input: 12 A.
- Max. current per MPPT: 30 A for the 24 kW models, and 40 A for the 40 kW model.

Size and weight (inches)

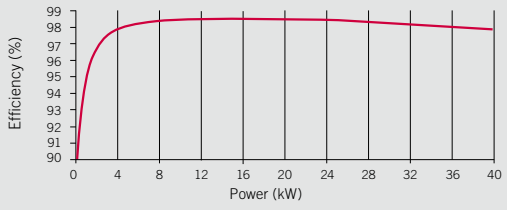


Combiner Box
15 lbs

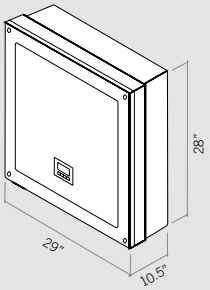
	24TL U M480	40TL U M480
Input (DC)		
Recommended PV array power range[1]	24.7 - 32.2 kW	41.2 - 53.6 kW
Voltage range MPP1[2]	200 - 820 V	
Voltage range MPP2[2]	200 - 820 V	
Maximum voltage[3]	1,000 V	
Maximum current (Input 1 / Input 2)	27 / 27 A	40 / 40 A
Inputs (Input 1 / Input 2)	1 / 1	
MPPT	2	
Output (AC)		
Rated power	24 kW	40 kW
Temperature at rated power[4]	131 °F	124 °F
Maximum current	29 A	48 A
Rated voltage	480 V	
Frequency	60 Hz	
Power Factor[5]	1	
Power Factor adjustable	Yes. Smax=24 kVA	Yes. Smax=40 kVA; Qmax=24 kVAR
THD	<3%	
Efficiency		
Maximum efficiency	98.5%	
CEC - Weighted efficiency	98%	
General Information		
Refrigeration system	Forced ventilation	
Air flow	200 m³/h	400 m³/h
Stand-by consumption[6]	10 W	
Consumption at night	1 W	
Ambient temperature	-13 °F to 149 °F	
Relative humidity (non-condensing)	0 - 100%	
Protection class	NEMA 4	
DC AFCI	✓	
Marking	CE, ETL	
EMC and security standards	UL1741, FCC Part 15, IEEE C37.90.1, IEEE C37.90.2	
Grid connection standards	IEC 62116, UL1741, IEEE1547, IEEE1547.1, NEC CODE	

Notes: (1) Depending on the type of installation and geographical location (2) The output power will be conditioned by the voltage and current configuration selected at each input (3) Must not be exceeded under any circumstances. Consider the voltage increase of the 'Voc' at low temperatures (4) The output power will be reduced at the rate of 1% for each 1 °F of increase (5) For Pout>25% of the rated power (6) Consumption from PV field.

Efficiency INGECON® SUN 40TL U M480 V_{DC} = 720 V



Size and weight (inches)



24TL U M / 40TL U M
129 / 137.8 lbs

INGECON SUN PowerMax

Transformerless central inverters from 300 to 1640 kVA

The PV inverter family installed in the world's largest PV plants

The INGECON® SUN PowerMax central inverters are designed for multi-megawatt plants with a direct connection to a medium voltage transformer. The economies of scale achieved with the development of installations of this type, make it possible to reduce and optimise the $/Wp ratio.

Enhanced performance
The key strengths of the Ingeteam central inverters lie in their high maximum efficiency rating which can be as high as 99.1%.

Furthermore, the improved cooling system allows for a greater air flow through the inverter's most critical electronic components, such as the IGBTs, ensuring that the rated power can be delivered up to an operating temperature of 50 ºC (122 ºF).

Grid support
This family of central inverters performs grid support functions and complies with the grid connection requirements for countries throughout the world, contributing to the quality and stability of the electricity system.

The INGECON® SUN PowerMax family offers a low voltage ride-through capability, allowing for continuous operation through short periods of low grid voltage.

Working in combination with the INGECON® SUN EMS Plant Controller, the inverters are able to control the active power delivered to the grid.

Model versatility
These central inverters can be supplied in a number of topologies, making them suitable for all kinds of projects. The inverters are available in three configurations: monoblock (B series), master-slave (X series) and multi-MPPT (M series).

Further options include indoor or outdoor models, and inverters with an integrated DC-AC cabinet or without the AC lines.

– B Series

Inverters with a single power block. This new inverter has been designed to be cost effective and to facilitate maintenance tasks.

Available in a range of power outputs from 830 to 1,640 kVA, as it is available in both 1,050 Vdc and 1,500 Vdc.

– X Series

Modular inverters with a master-slave configuration. The inverter has either two, three or four power blocks connected in parallel to the same PV array and to the same MV transformer.

Available in a wide range of power outputs from 300 to 1,164 kVA.

– M Series

Modular inverters with a multi-MPPT configuration. The inverter can be supplied with either two, three or four independent power blocks, each with its own maximum power point tracking system (MPPT).
It is possible to connect up to two 4 block inverters to the same medium voltage transformer winding.

Available from 300 to 1,164 kVA.

Jasper PV Plant (South Africa). 75 MW PV plant with INGECON® SUN PowerMax inverters

INGECON SUN PowerMax

B Series

Transformerless central inverters with a single power block

DC and AC supplies in the same cabinet
The input and output lines are integrated into the same cabinet, facilitating maintenance and repair work.

Maximum protection
These three phase inverters are equipped with a motorized DC switch to decouple the PV generator from the inverter. Optionally, these inverters can be supplied with an AC circuit breaker with door control, in addition to fuses, grounding kit and input current monitoring.

Maximum efficiency values
Through the use of innovative electronic conversion topologies, efficiency values of up to 98.9% can be achieved. Thanks to a sophisticated control algorithm, this equipment can guarantee maximum efficiency depending on the PV power available.

A complete range of equipment for all types of projects
Versions available:

- Indoor inverters with integrated DCAC cabinet.
- Outdoor inverters with integrated DCAC cabinet.
- Symmetrical indoor inverters, with the connection cabinet on the opposite side, to make it possible to install two inverters facing each other, with a common power supply point.

Enhanced functionality
This new INGECON® SUN PowerMax range features a revamped, improved enclosure which, together with its innovative air cooling system, makes it possible to increase the ambient operating temperature to deliver its rated power up to 50 °C.

Long-lasting design
The inverters have been designed to guarantee a long life expectancy, as demonstrated by the stress tests they are subjected to. Standard 5 year warranty, extendable for up to 25 years.

Grid support
The INGECON® SUN PowerMax B Series has been designed to comply with the grid connection requirements in different countries, contributing to the quality and stability of the electric system. These inverters therefore feature a low voltage ride-through capability, and can deliver reactive power and control the active power delivered to the grid.

Ease of maintenance
All the elements can be removed or replaced directly from the inverter's front side, thanks to its new design.

Easy to operate
The INGECON® SUN PowerMax inverters feature an LCD screen for the simple and convenient monitoring of the inverter status and a range of internal variables.

The display also includes a number of LEDs to show the inverter operating status with warning lights to indicate any incidents. All this helps to simplify and facilitate maintenance tasks.

Monitoring and communication
Ethernet communications supplied as standard. The following applications are included at no extra cost: INGECON® SUN Manager, INGECON® SUN Monitor and its Smartphone version Web Monitor, available on the App Store. These applications are used for monitoring and recording the inverter's internal operating variables through the Internet (alarms, real time production, etc.), in addition to the historical production data.

Two communication ports available (one for monitoring and one for plant controlling), allowing fast and simultaneous plant control.

PROTECTIONS

- DC Reverse polarity.
- Short-circuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation failure DC.
- Up to 15 pairs of fuse-holders.
- Lightning induced DC and AC surge arrestors, type 2 (type 1 also available).
- Motorized DC switch to automatically disconnect the inverter from the PV array.
- Low-voltage ride-through capability.
- Hardware protection via firmware.
- IP66 protection class for the electronics.

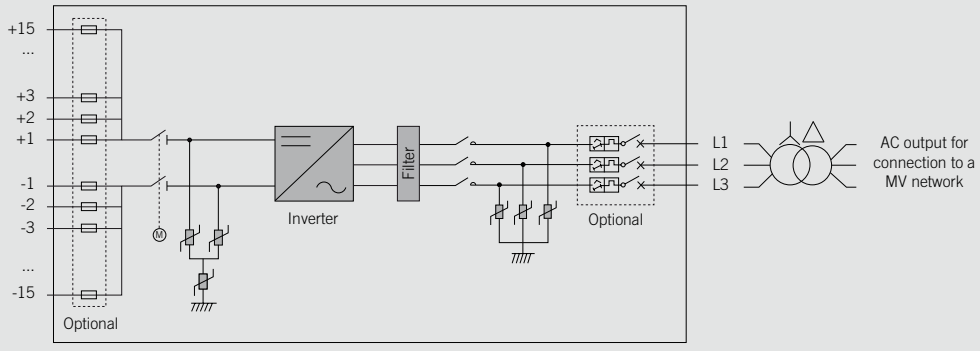
OPTIONAL ACCESSORIES

- AC circuit breaker with remote tripping.
- Motorization kit for the AC circuit breaker.
- Insulation failure AC.
- Grounding kit.
- Heating kit, for operating at an ambient temperature of down to -30 °C.
- DC fuses.
- Monitoring of the DC currents.
- Wattmeter on the AC side.
- PID prevention kit (PID: Potential Induced Degradation).
- Nighttime reactive power injection.

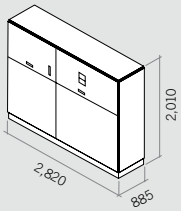
ADVANTAGES OF THE MONOBLOCK VERSION

- Higher power density.
- Latest generation electronics.
- More efficient electronic protection.
- Night time supply to communicate with the inverter at night.
- Enhanced performance.
- Easier maintenance thanks to its new design and enclosure.
- Lightweight spares.
- It allows to ground the PV array.
- Components easily replaceable.
- IP66 protection class for the electronics.

PowerMax B Series

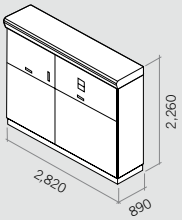


Size and weight (mm)



Indoor inverter 1,000 Vdc
1,500 kg.

Indoor inverter 1,500 Vdc
1,650 kg.



Outdoor inverter 1,000 Vdc
1,560 kg.

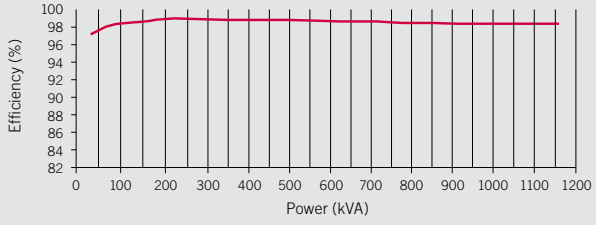
Outdoor inverter 1,500 Vdc
1,710 kg.

PowerMax B Series 300 / 360 / 385 / 400 / 410 / 420 Vac

	830TL B300	1000TL B360	1070TL B385	1110TL B400	1140TL B410	1165TL B420
Input (DC)						
Recommended PV array power range[1]	845 - 1,081 kWp	1,013 - 1,297 kWp	1,084.3 - 1,387 kWp	1,124.2 - 1,441.1 kWp	1,151 - 1,476.8 kWp	1,179.3 - 1,513.2 kWp
Voltage Range MPP[2]	440 - 820 V	524 - 820 V	560 - 820 V	580 - 820 V	595 - 820 V	610 - 820 V
Maximum voltage[3]	1,050 V					
Maximum current	2,000 A					
Nº inputs with fuse holders	5 up to 15					
Fuse dimensions	63 A / 1,000 V to 630 A / 1,000 V fuses (optional)					
Type of connection	Connection to copper bars					
Power blocks	1					
MPPT	1					
Max. current at each input	From 40 A to 410 A for positive and negative poles					
Input protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
DC switch	Motorized DC load break disconnect					
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton					
Output (AC)						
Power @35 °C / @50 °C[4]	831.4 kVA / 765 kVA	997.7 kVA / 918 kVA	1,066.9 kVA / 981.8 kVA	1,108.5 kVA / 1,020 kVA	1,136.2 kVA / 1,045.5 kVA	1,163.9 kVA / 1,071 kVA
Current @35 °C / @50 °C	1,600 A / 1,472 A					
Rated voltage	300 V IT System	360 V IT System	385 V IT System	400 V IT System	410 V IT System	420 V IT System
Frequency	50 / 60 Hz					
Power Factor[5]	1					
Power Factor adjustable	Yes. Smax=831.4 kVA	Yes. Smax=997.7 kVA	Yes. Smax=1,066.9 kVA	Yes. Smax=1,108.5 kVA	Yes. Smax=1,136.2 kVA	Yes. Smax=1,163.9 kVA
THD (Total Harmonic Distortion)[6]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
AC breaker	Optional AC circuit breaker with door control, remote trip or motorized					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.7%	98.9%				
Euroefficiency	98.3%	98.5%	98.5%	98.6%	98.5%	98.5%
Max. consumption aux. services	2,500 VA					
Stand-by or night consumption[7]	60 W					
Average energy consumption per day	18 kWh					
General Information						
Ambient temperature	-20 °C to +55 °C					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	IP50 (Indoor) / IP56 (Outdoor)					
Maximum altitude[8]	3,000 m					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	6,200 m³/h					
Acoustic emission	< 77 dB (A) at 1 m					
Marking	CE					
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Ecuadorian Grid Code, Peruan Grid code, Thailand PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid code, Jordan Grid Code					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For each °C of increase between 35 °C and 50 °C, the output power will be reduced at the rate of 0.53%. Over 50 °C, the output power will be reduced at the rate of 1.8% / °C [5] For P_{out}>25% of the rated power [6] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [7] Consumption from PV field when there is PV power available [8] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Efficiency INGECON® SUN 1165TL B420 Vdc = 650 V

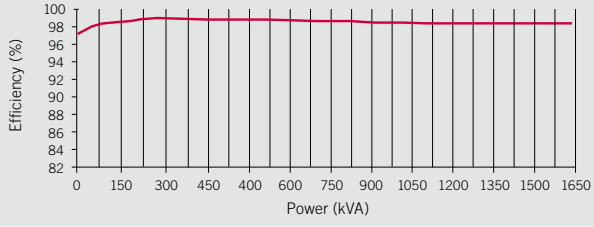


PowerMax B Series 450 / 540 / 578 / 600 / 615 / 630 Vac

	1170TL B450	1400TL B540	1500TL B578	1560TL B600	1600TL B615	1640TL B630
Input (DC)						
Recommended PV array power range[1]	1,072 - 1,469 kWp	1,286 - 1,763 kWp	1,377 - 1,887 kWp	1,429 - 1,959 kWp	1,465 - 2,008 kWp	1,500 - 2,057 kWp
Voltage Range MPP[2]	660 - 1,300 V	786 - 1,300 V	840 - 1,300 V	870 - 1,300 V	889 - 1,300 V	915 - 1,300 V
Maximum voltage[3]	1,500 V					
Maximum current	2,000 A					
Nº inputs with fuse holders	6 up to 15					
Fuse dimensions	63 A / 1,500 V to 400 A / 1,500 V fuses (optional)					
Type of connection	Connection to copper bars					
Power blocks	1					
MPPT	1					
Max. current at each input	From 40 A to 320 A for positive and negative poles					
Input protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
DC switch	Motorized DC load break disconnect					
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton					
Output (AC)						
Power @25 °C / @50 °C[4]	1,169 kVA / 975 kVA	1,403 kVA / 1,169 kVA	1,502 kVA / 1,251 kVA	1,559 kVA / 1,299 kVA	1,598 kVA / 1,332 kVA	1,637 kVA / 1,364 kVA
Current @25 °C / @50 °C	1,500 A / 1,250 A					
Rated voltage	450 V IT System	540 V IT System	578 V IT System	600 V IT System	615 V IT System	630 V IT System
Frequency	50 / 60 Hz					
Power Factor[5]	1					
Power Factor adjustable	Yes. Smax=1,169 kVA	Yes. Smax=1,403 kVA	Yes. Smax=1,502 kVA	Yes. Smax=1,559 kVA	Yes. Smax=1,598 kVA	Yes. Smax=1,637 kVA
THD (Total Harmonic Distortion)[6]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
AC breaker	Optional AC circuit breaker with door control, remote trip or motorized					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%					
Euroefficiency	98.5%					
Max. consumption aux. services	2,500 VA					
Stand-by or night consumption[7]	60 W					
Average energy consumption per day	18 kWh					
General Information						
Ambient temperature	-20 °C to +55 °C					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	IP50 (Indoor) / IP56 (Outdoor)					
Maximum altitude[8]	2,000 m					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	6,200 m³/h					
Acoustic emission	< 77 dB (A) at 1 m					
Marking	CE					
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Ecuadorian Grid Code, Peruan Grid code, Thailand PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid code, Jordan Grid Code					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For each °C of increase between 25 °C and 50 °C, the output power will be reduced at the rate of 0.66%. Over 50 °C, the output power will be reduced at the rate of 1.8% / °C [5] For P_{out}>25% of the rated power [6] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [7] Consumption from PV field when there is PV power available [8] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Efficiency INGECON® SUN 1640TL B630 Vdc = 1000 V



INGECON SUN PowerMax

U B Series

UL 1741 COMPLIANT

Transformerless central inverters with a single power block

Maximum power density
These PV central inverters feature more power per cubic foot. Thanks to the use of high-quality components, this inverter series performs at the highest possible level.

Latest generation electronics
The B Series inverters integrate an innovative control unit that runs faster and performs a more efficient and sophisticated inverter control, as it uses a last-generation digital signal processor. Furthermore, the hardware of the control unit allows some more accurate measurements and very reliable protections.

These inverters feature a low voltage ride-through capability and also a lower power consumption thanks to a more efficient power supply electronic board.

Integrated DC and AC connections
The input and output connections are integrated into the same cabinet, facilitating connection, maintenance and repair work.

Maximum protection
These three phase inverters are equipped with a motorized DC switch to decouple the PV generator from the inverter.

These inverters are supplied with an AC circuit breaker. Optionally, they can be supplied with DC fuses, grounding kit and input current monitoring.

Maximum efficiency values
Through the use of innovative electronic conversion topologies, efficiency values of up to 98.9% can be achieved.

A complete range of equipment for all types of projects
Versions available:

- Indoor inverters.
- Outdoor inverters.
- Symmetrical inverters, with the connection cabinet on the opposite side, to make it possible to install two inverters facing each other, with a common power supply point.

Enhanced functionality
This new INGECON® SUN PowerMax range features a revamped, improved enclosure which, together with its innovative air cooling system, makes it possible to increase the ambient operating temperature.

Long-lasting design
These inverters have been designed to guarantee a long life expectancy. Standard 5 year warranty, extendable for up to 25 years.

Grid support
The INGECON® SUN PowerMax B Series has been designed to comply with the grid connection requirements UL1741, IEEE1547 and RULE21, contributing to the quality and stability of the electric system. These inverters therefore feature a low voltage ride-through capability, and can deliver reactive power and control the active power delivered to the grid.

Ease of maintenance
All the elements can be removed or replaced directly from the inverter's front side, thanks to its new design.

Easy to operate
The INGECON® SUN PowerMax inverters feature an LCD screen for the simple and convenient monitoring of the inverter status and a range of internal variables. The display also includes a number of LEDs to show the inverter operating status with warning lights to indicate any incidents. All this helps to simplify and facilitate maintenance tasks.

Monitoring and communication
Ethernet communications supplied as standard. The following applications are included at no extra cost: INGECON® SUN Manager, INGECON® SUN Monitor and its Smartphone version Web Monitor, available on the App Store. These applications are used for monitoring and recording the inverter's internal operating variables through the Internet (alarms, real time production, etc.), in addition to the historical production data.

Two communication ports available (one for monitoring and one for plant controlling), allowing fast and simultaneous plant control.

PROTECTIONS

- DC Reverse polarity.
- Short-circuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation failure DC.
- Up to 15 pairs of fuse holders.
- Lightning induced DC and AC surge arrestors, type 2 (type 1 also available).
- Motorized DC switch to automatically disconnect the inverter from the PV array.
- Low voltage ride-through capability.
- AC circuit breaker.
- Hardware protection via firmware.
- NEMA 4 / IP66 protection class for the electronics.

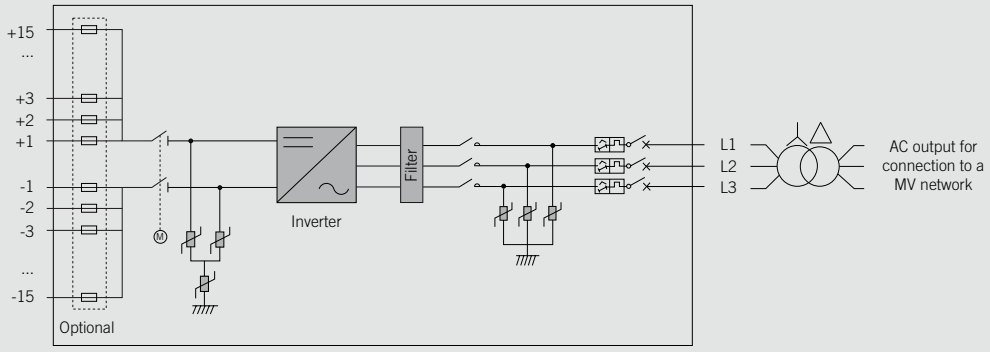
OPTIONAL ACCESSORIES

- Motorization kit for the AC circuit breaker.
- Insulation failure AC.
- Grounding kit.
- Heating kit, for operating at an ambient temperature of down to -22 ºF.
- DC fuses.
- Monitoring of the group currents at the DC input.
- Remote tripping of the AC circuit breaker.
- Wattmeter on the AC side.
- Extendable up to 15 fuse holders per inverter.
- PID prevention kit (PID: Potential Induced Degradation).
- Night time reactive power injection.

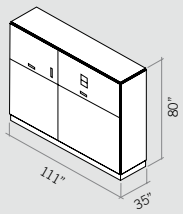
ADVANTAGES OF THE MONOBLOCK VERSION

- Higher power density.
- Latest generation electronics.
- More efficient electronic protection.
- Night time supply to communicate with the inverter at night.
- Enhanced performance.
- Easier maintenance thanks to its new design and enclosure.
- Lightweight spares.
- It allows to ground the PV array.
- Components easily replaceable.

PowerMax B Series

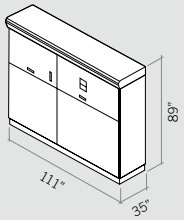


Size and weight (inches and lbs)



Indoor inverter 1,000 Vdc
3,300 pounds

Indoor inverter 1,500 Vdc
3,640 pounds



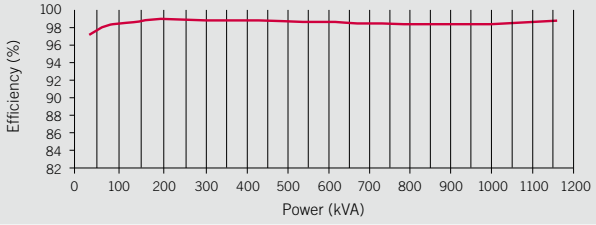
Outdoor inverter 1,000 Vdc
3,440 pounds

Outdoor inverter 1,500 Vdc
3,770 pounds

	610TL U B220	830TL U B300	1000TL U B360	1110TL U B400	1165TL U B420
Input (DC)					
Recommended PV array power range[1]	618.4 - 792.6 kWp	775.8 - 994.4 kWp	1,011.9 - 1,297 kWp	1,034.3 - 1,325.7 kWp	1,084.9 - 1,392 kWp
Voltage Range MPP[2]	440 - 820 V	440 - 820 V	524 - 820 V	580 - 820 V	610 - 820 V
Maximum voltage[3]	1,050 V				
Maximum current	2,000 A				
Nº inputs with fuse holders	5 up to 15				
Fuse dimensions	63 A / 1,000 V to 630 A / 1,000 V fuses (optional)				
Type of connection	Connection to copper bars				
Power blocks	1				
MPPT	1				
Input protections					
Overvoltage protections	Type 2 surge arresters (type 1 optional)				
DC switch	Motorized DC load break disconnect				
Other protections	Up to 15 pairs of DC fuses (optional) / Reverse polarity / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton				
Output (AC)					
Power @95 °F / @122 °F[4]	609.7 kVA / 560.9 kVA	831.4 kVA / 764.9 kVA	997.7 kVA / 917.8 kVA	1,108.5 kVA / 1,019.8 kVA	1,163.9 kVA / 1,070.8 kVA
Current @95 °F / @122 °F	1,600 A / 1,472 A				
Rated voltage	220 V IT System	300 V IT System	360 V IT System	400 V IT System	420 V IT System
Frequency	50 / 60 Hz				
Power Factor[5]	1				
Power Factor adjustable	Yes. Smax=609.7 kVA	Yes. Smax=831.4 kVA	Yes. Smax=997.7 kVA	Yes. Smax=1,108.5 kVA	Yes. Smax=1,163.9 kVA
THD (Total Harmonic Distortion)[6]	<3%				
Output protections					
Overvoltage protections	Type 2 surge arresters (type 1 optional)				
AC breaker	AC circuit breaker with door control, remote trip or motorized				
Anti-islanding protection	Yes, with automatic disconnection				
Other protections	AC short circuits and overloads				
Features					
Maximum efficiency	98.9%				
CEC	98.5%				
Max. consumption aux. services	2,500 VA				
Stand-by or night consumption[7]	60 W				
Average energy consumption per day	18 kWh				
General Information					
Ambient temperature	-4 °F to +149 °F				
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)				
Protection class	NEMA12 (Indoor) / NEMA3 (Outdoor)				
Max. altitude[8]	9,842 ft				
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)				
Air flow	22 m³/s (7,200 m³/h)				
Acoustic emission	<77 dB				
Marking	CE, ETL				
EMC and security standards	UL1741, FCC Part 15, IEEE C37.90.1, IEEE C37.90.2				
Grid connection standards	IEC 62116, UL1741, IEEE1547, IEEE1547.1, NEC CODE, Electric Rule 21: 2015				

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For each degree of increase between 95 °F and 122 °F, the output power will be reduced at the rate of 0.38%. Over 122 °F, the output power will be reduced at the rate of 1% for each degree of increase [5] For P_{out}>25% of the rated power [6] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [7] Consumption from PV field when there is PV power available [8] Over 3,300 ft, temperature for rated power is reduced at the rate of 2.42 °F for each 3,300 ft. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Efficiency INGECON® SUN 1165TL U B420 Vdc = 650 V

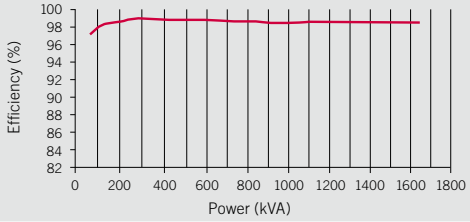


PowerMax U B Series 450 / 540 / 578 / 600 / 615 / 630 Vac

	1170TL U B450	1400TL U B540	1500TL U B578	1560TL U B600	1600TL U B615	1640TL U B630
Input (DC)						
Recommended PV array power range[1]	1,072 - 1,469 kWp	1,286 - 1,763 kWp	1,377 - 1,887 kWp	1,429 - 1,959 kWp	1,465 - 2,008 kWp	1,500 - 2,057 kWp
Voltage Range MPP[2]	660 - 1,300 V	786 - 1,300 V	840 - 1,300 V	870 - 1,300 V	889 - 1,300 V	915 - 1,300 V
Maximum voltage[3]	1,500 V					
Maximum current	2,000 A					
N° inputs with fuse holders	6 up to 15					
Fuse dimensions	63 A / 1,500 V to 400 A / 1,500 V fuses (optional)					
Type of connection	Connection to copper bars					
Power blocks	1					
MPPT	1					
Input protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
DC switch	Motorized DC load break disconnect					
Other protections	Up to 15 pairs of DC fuses (optional) / Reverse polarity / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton					
Output (AC)						
Power @77 °F / @122 °F[4]	1,169 kVA / 975 kVA	1,403 kVA / 1,169 kVA	1,502 kVA / 1,251 kVA	1,559 kVA / 1,299 kVA	1,598 kVA / 1,332 kVA	1,637 kVA / 1,364 kVA
Current @77 °F / @122 °F	1,500 A / 1,250 A					
Rated voltage	450 V IT System	540 V IT System	578 V IT System	600 V IT System	615 V IT System	630 V IT System
Frequency	50 / 60 Hz					
Power Factor[5]	1					
Power Factor adjustable	Yes. Smax=1,169 kVA	Yes. Smax=1,403 kVA	Yes. Smax=1,502 kVA	Yes. Smax=1,559 kVA	Yes. Smax=1,598 kVA	Yes. Smax=1,637 kVA
THD (Total Harmonic Distortion)[6]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
AC breaker	AC circuit breaker with door control, remote trip or motorized					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%					
CEC	98.5%					
Max. consumption aux. services	2,500 VA					
Stand-by or night consumption[7]	60 W					
Average energy consumption per day	18 kWh					
General Information						
Ambient temperature	-4 °F to +131 °F					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	NEMA12 (Indoor) / NEMA3 (Outdoor)					
Max. altitude[8]	6,562 ft (2,000 m)					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	66.77 ft³/s (6,200 m³/h)					
Acoustic emission	<77 dB					
Marking	CE, ETL					
EMC and security standards	UL1741, FCC Part 15, IEEE C37.90.1, IEEE C37.90.2					
Grid connection standards	IEC 62116, UL1741, IEEE1547, IEEE1547.1, NEC CODE, Electric Rule 21: 2015					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For each degree of increase between 77 °F and 122 °F, the output power will be reduced at the rate of 0.37%. Over 122 °F, the output power will be reduced at the rate of 1% for each degree of increase [5] For P_{out}>25% of the rated power [6] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [7] Consumption from PV field when there is PV power available [8] Over 3,300 ft, temperature for rated power is reduced at the rate of 2.42 °F for each 3,300 ft. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Efficiency INGECON® SUN 1640TL U B630 Vdc = 650 V



INGECON SUN PowerMax

X Series

Indoor / Outdoor

Central inverters with a Master-Slave configuration and integrated DCAC cabinet

DC and AC supplies in the same cabinet

The input and output lines are integrated into the same cabinet, facilitating maintenance and repair work.

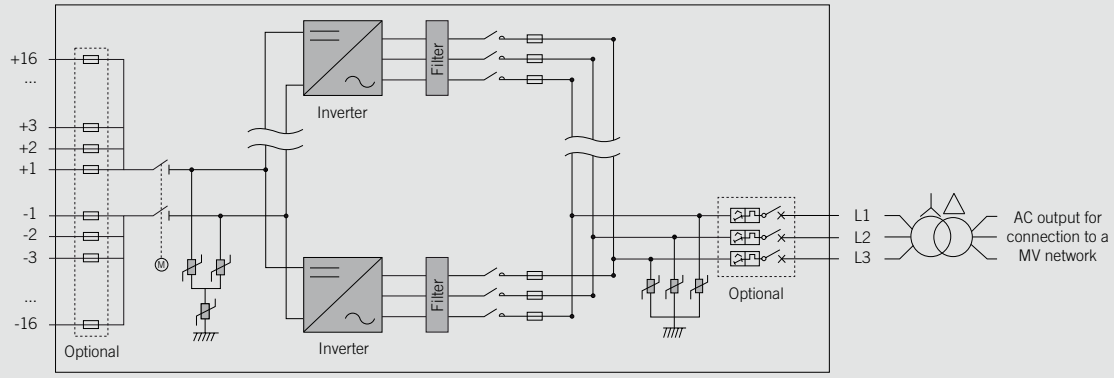
Available in indoor and outdoor versions

These Master-Slave central inverters feature an innovative ventilation system for the internal circulation of fresh air. Furthermore, the selection of casings makes these inverters suitable for indoor (IP20) and outdoor (IP54) installation.

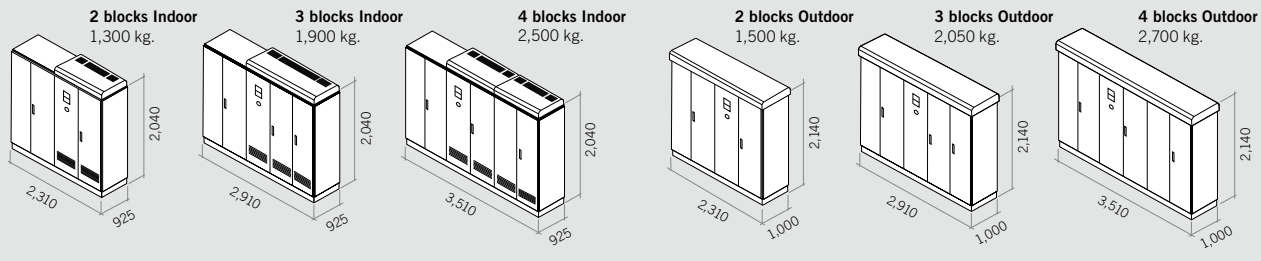
Maximum protection

These three phase inverters are equipped with a motorized DC switch to decouple the PV generator from the inverter. Optionally, the inverters can be supplied with an AC circuit breaker with door control, in addition to fuses, grounding kit and input current monitoring.

PowerMax X DCAC



Size and weight (mm)

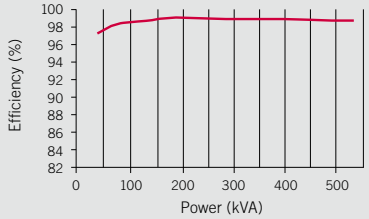


PowerMax X Series 2 Power blocks

	380TL X300	400TL X320	440TL X345	460TL X360	500TL X400	535TL X420
Input (DC)						
Recommended PV array power range[1]	388.6 - 497.1 kWp	413.7 - 530.3 kWp	445.8 - 571.7 kWp	464.7 - 596.6 kWp	515.8 - 662.9 kWp	541.1 - 696 kWp
Voltage Range MPP[2]	437 - 820 V	468 - 820 V	502 - 820 V	528 - 820 V	581 - 820 V	611 - 820 V
Maximum voltage[3]	1,050 V					
Maximum current	900 A					
N° inputs with fuse holders	8					
Fuse dimensions	63 A / 1,000 V to 630 A / 1,000 V					
Type of connection	Connection to copper bars					
MPPT	1					
Max. current at each input	From 40 A to 410 A for positive and negative poles					
Input protections						
Overvoltage protections	Type 2 surge arresters					
DC switch	Motorized DC load break disconnect					
Other protections	Reverse polarity / Insulation failure monitoring / Anti-islanding protection					
Output (AC)						
Power @30 °C / @45 °C[4]	415.7 kVA / 382.4 kVA	443.4 kVA / 407.9 kVA	478 kVA / 439.8 kVA	498.8 kVA / 458.9 kVA	554.3 kVA / 509.9 kVA	582 kVA / 535.4 kVA
Current @30 °C / @45 °C	800 A / 736 A					
Rated voltage	300 V IT System	320 V IT System	345 V IT System	360 V IT System	400 V IT System	420 V IT System
Frequency	50 / 60 Hz					
Power Factor[5]	1					
Power Factor adjustable	Yes. Smax=415.7 kVA	Yes. Smax=443.4 kVA	Yes. Smax=478 kVA	Yes. Smax=498.8 kVA	Yes. Smax=554.3 kVA	Yes. Smax=582 kVA
THD (Total Harmonic Distortion)[6]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters					
AC breaker	Optional AC circuit breaker with door control, remote trip or motorized (only DCAC models)					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%	99%	99.1%	99.1%	99.1%	99.1%
Euroefficiency	98.7%	98.8%	98.8%	98.8%	98.8%	98.8%
Stand-by consumption[7]	60 W					
Consumption at night	60 W					
General Information						
Operating temperature	-20 °C to +55 °C					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	IP20 / IP54					
Maximum altitude[8]	3,000 m					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	2,670 m^3/h (fans: 1,000 VA)					
Acoustic emission	< 67 dB (A) at 1 m with fans working at maximum power					
Marking	CE					
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid Code, Jordan Grid Code					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For each °C of increase between 30 °C and 45 °C, the output power will be reduced at the rate of 0.53% / °C. Over 45 °C, the output power will be reduced at the rate of 1.8% / °C [5] For P_{out}>25% of the rated power [6] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [7] Consumption from PV field [8] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

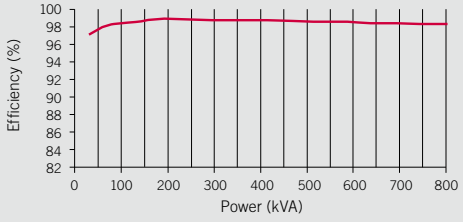
Efficiency INGECON® SUN 535TL X420 Vdc = 550 V



	570TL X300	605TL X320	660TL X345	690TL X360	750TL X400	805TL X420
Input (DC)						
Recommended PV array power range[1]	583 - 745.8 kWp	620.6 - 795.5 kWp	668.7 - 857.6 kWp	697.1 - 894.9 kWp	773.7 - 994.4 kWp	811.7 - 1,044 kWp
Voltage Range MPP[2]	437 - 820 V	468 - 820 V	502 - 820 V	528 - 820 V	581 - 820 V	607 - 820 V
Maximum voltage[3]	1,050 V					
Maximum current	1,350 A					
N° inputs with fuse holders	12 (extendable up to 16)					
Fuse dimensions	63 A / 1,000 V to 630 A / 1,000 V					
Type of connection	Connection to copper bars					
MPPT	1					
Max. current at each input	From 40 A to 410 A for positive and negative poles					
Input protections						
Overvoltage protections	Type 2 surge arresters					
DC switch	Motorized DC load break disconnect					
Other protections	Reverse polarity / Insulation failure monitoring / Anti-islanding protection					
Output (AC)						
Power @30 °C / @45 °C[4]	623.5 kVA / 573.7 kVA	665.1 kVA / 611.9 kVA	717.1 kVA / 659.7 kVA	748.2 kVA / 688.4 kVA	831.4 kVA / 764.9 kVA	873 kVA / 803.1 kVA
Current @30 °C / @45 °C	1,200 A / 1,104 A					
Rated voltage	300 V IT System	320 V IT System	345 V IT System	360 V IT System	400 V IT System	420 V IT System
Frequency	50 / 60 Hz					
Power Factor[5]	1					
Power Factor adjustable	Yes. Smax=623.5 kVA	Yes. Smax=665.1 kVA	Yes. Smax=717.1 kVA	Yes. Smax=748.2 kVA	Yes. Smax=831.4 kVA	Yes. Smax=873 kVA
THD (Total Harmonic Distortion)[6]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters					
AC breaker	Optional AC circuit breaker with door control, remote trip or motorized (only DCAC models)					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%	99%	99.1%	99.1%	99.1%	99.1%
Euroefficiency	98.7%	98.8%	98.9%	98.8%	98.7%	98.9%
Stand-by consumption[7]	90 W					
Consumption at night	90 W					
General Information						
Operating temperature	-20 °C to +55 °C					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	IP20 / IP54					
Maximum altitude[8]	3,000 m					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	4,640 m^3/h (fans: 1,300 VA)					
Acoustic emission	< 67 dB (A) at 1 m with fans working at maximum power					
Marking	CE					
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid Code, Jordan Grid Code					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For each °C of increase between 30 °C and 45 °C, the output power will be reduced at the rate of 0.53% / °C. Over 45 °C, the output power will be reduced at the rate of 1.8% / °C [5] For P_{out}>25% of the rated power [6] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [7] Consumption from PV field [8] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Efficiency INGECON® SUN 805TL X420 Vdc = 550 V

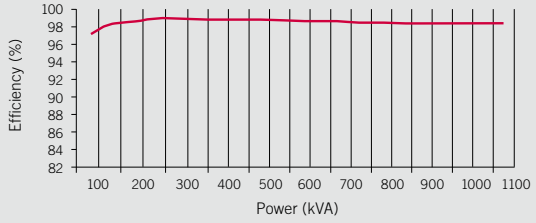


PowerMax X Series 4 Power blocks

	760TL X300	800TL X320	880TL X345	920TL X360	1000TL X400	1070TL X420
Input (DC)						
Recommended PV array power range[1]	777.3 - 994.4 kWp	827.5 - 1,060.7 kWp	891.6 - 1,143.5 kWp	928.9 - 1,193.1 kWp	1,031.6 - 1,325.7 kWp	1,082.3 - 1,392 kWp
Voltage Range MPP[2]	437 - 820 V	468 - 820 V	502 - 820 V	528 - 820 V	581 - 820 V	611 - 820 V
Maximum voltage[3]	1,050 V					
Maximum current	1,800 A					
N° inputs with fuse holders	12 (extendable up to 16)					
Fuse dimensions	63 A / 1,000 V to 630 A / 1,000 V					
Type of connection	Connection to copper bars					
MPPT	1					
Max. current at each input	From 40 A to 410 A for positive and negative poles					
Input protections						
Overvoltage protections	Type 2 surge arresters					
DC switch	Motorized DC load break disconnect					
Other protections	Reverse polarity / Insulation failure monitoring / Anti-islanding protection					
Output (AC)						
Power @30 °C / @45 °C[4]	831.4 kVA / 764.9 kVA	886.8 kVA / 815.9 kVA	956.1 kVA / 879.6 kVA	997.7 kVA / 917.8 kVA	1,108.5 kVA / 1,019.8 kVA	1,163.9 kVA / 1,070.8 kVA
Current @30 °C / @45 °C	1,600 A / 1,472 A					
Rated voltage	300 V IT System	320 V IT System	345 V IT System	360 V IT System	400 V IT System	420 V IT System
Frequency	50 / 60 Hz					
Power Factor[5]	1					
Power Factor adjustable	Yes. Smax=831.4 kVA	Yes. Smax=886.8 kVA	Yes. Smax=956.1 kVA	Yes. Smax=997.7 kVA	Yes. Smax=1,108.5 kVA	Yes. Smax=1,163.9 kVA
THD (Total Harmonic Distortion)[6]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters					
AC breaker	Optional AC circuit breaker with door control, remote trip or motorized (only DCAC models)					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%	99%	99.1%	99.1%	99.1%	99.1%
Euroefficiency	98.8%	98.9%	98.9%	99%	99%	98.9%
Stand-by consumption[7]	120 W					
Consumption at night	120 W					
General Information						
Operating temperature	-20 °C to +55 °C					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	IP20 / IP54					
Maximum altitude[8]	3,000 m					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	5,340 m^3/h (fans: 1,500 VA)					
Acoustic emission	< 67 dB (A) at 1 m with fans working at maximum power					
Marking	CE					
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid Code, Jordan Grid Code					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For each °C of increase between 30 °C and 45 °C, the output power will be reduced at the rate of 0.53% / °C. Over 45 °C, the output power will be reduced at the rate of 1.8% / °C [5] For P_{out}>25% of the rated power [6] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [7] Consumption from PV field [8] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Efficiency INGECON® SUN 1070TL X420 Vdc = 625 V



INGECON SUN PowerMax

M Series

Indoor / Outdoor

Central multi-MPPT inverters with an integrated DCAC cabinet

DC and AC supplies in the same cabinet

The input and output lines are integrated into the same cabinet, facilitating maintenance and repair work, whilst still maintaining the highest level of safety.

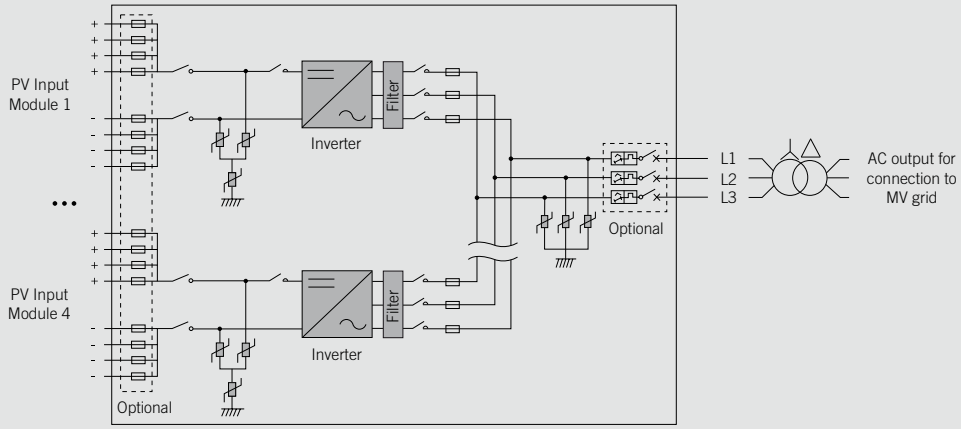
Available in indoor and outdoor versions

These multi-string central inverters can be supplied with either an indoor (IP20) or outdoor (IP54) casing.

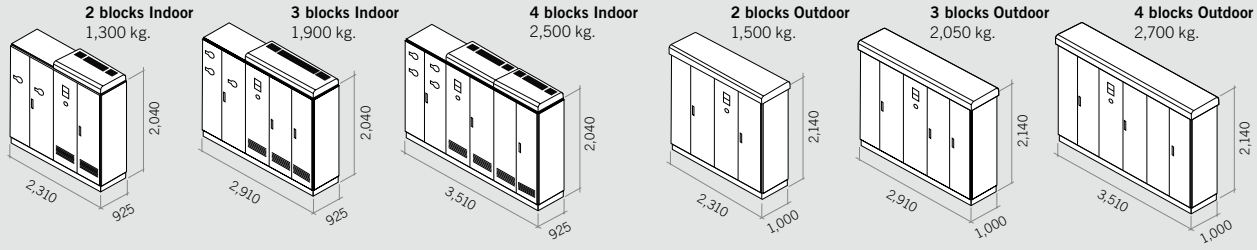
Maximum protection

These three phase inverters are equipped with a manual DC switch and a DC automatic contactor for each power block, in order to decouple the PV generator from the inverter. Optionally, the inverters can be supplied with an AC circuit breaker with door control, in addition to fuses and current monitoring.

PowerMax M DCAC



Size and weight (mm)

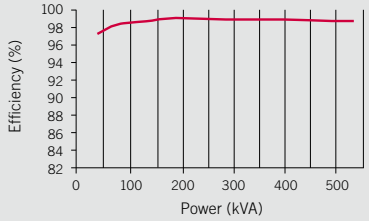


PowerMax M Series **2 Power blocks**

	380TL M300	400TL M320	440TL M345	460TL M360	500TL M400	535TL M420
Input (DC)						
Recommended PV array power range[1]	388.6 - 197.1 kWp	413.7 - 530.3 kWp	445.8 - 571.7 kWp	464.7 - 596.6 kWp	515.8 - 662.9 kWp	541.1 - 696 kWp
Voltage Range MPP[2]	437 - 820 V	468 - 820 V	502 - 820 V	528 - 820 V	581 - 820 V	611 - 820 V
Maximum voltage[3]	1,050 V					
Maximum current	900 A					
N° inputs with fuse holders	8					
Fuse dimensions[4]	63 A / 1,000 V to 400 A / 1,000 V					
Type of connection	Connection to copper bars					
MPPT[5]	2					
Max. current at each input	From 40 A to 216 A for positive and negative poles					
Input protections						
Overvoltage protections	Type 2 surge arresters					
DC switch	Motorized DC load break disconnect					
Other protections	Reverse polarity / Insulation failure monitoring / Anti-islanding protection					
Output (AC)						
Power @30 °C / @45 °C[6]	415.7 kVA / 382.4 kVA	443.4 kVA / 407.9 kVA	478 kVA / 439.8 kVA	498.8 kVA / 458.9 kVA	554.3 kVA / 509.9 kVA	582 kVA / 535.4 kVA
Current @30 °C / @45 °C	800 A / 736 A					
Rated voltage	300 V IT System	320 V IT System	345 V IT System	360 V IT System	400 V IT System	420 V IT System
Frequency	50 / 60 Hz					
Power Factor[7]	1					
Power Factor adjustable	Yes. Smax=415.7 kVA	Yes. Smax=443.4 kVA	Yes. Smax=478 kVA	Yes. Smax=498.8 kVA	Yes. Smax=554.3 kVA	Yes. Smax=582 kVA
THD (Total Harmonic Distortion)[8]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters					
AC breaker	Optional AC circuit breaker with door control, remote trip or motorized (only DCAC models)					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%	99%	99.1%	99.1%	99.1%	99.1%
Euroefficiency	98.5%	98.6%	98.7%	98.7%	98.7%	98.6%
Stand-by consumption[9]	60 W					
Consumption at night	60 W					
General Information						
Operating temperature	-20 °C to +55 °C					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	IP20 / IP54					
Maximum altitude[10]	3,000 m					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	2,670 m^3/h (fans: 1,000 VA)					
Acoustic emission	< 67 dB (A) at 1 m with fans working at maximum power					
Marking	CE					
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid Code, Jordan Grid Code					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For other configurations, consult with Ingeteam [5] The MPPT connected to the same transformer throught TL inverters must have the same voltage configuration [6] For each °C of increase between 30 °C and 45 °C, the output power will be reduced at the rate of 0.53% / °C. Over 45 °C, the output power will be reduced at the rate of 1.8% / °C [7] For P_{out}>25% of the rated power [8] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [9] Consumption from PV field [10] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

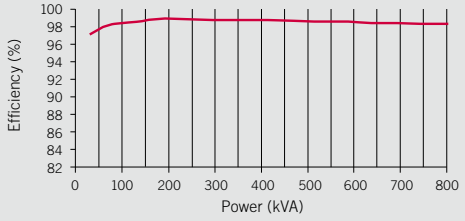
Efficiency INGECON® SUN 535TL M420 Vdc = 650 V



	570TL M300	605TL M320	660TL M345	690TL M360	750TL M400	805TL M420
Input (DC)						
Recommended PV array power range[1]	583 - 745.8 kWp	620.6 - 795.5 kWp	668.7 - 857.6 kWp	697.1 - 894.9 kWp	773.7 - 994.4 kWp	811.7 - 1,044 kWp
Voltage Range MPP[2]	437 - 820 V	468 - 820 V	502 - 820 V	528 - 820 V	581 - 820 V	611 - 820 V
Maximum voltage[3]	1,050 V					
Maximum current	1,350 A					
Nº inputs with fuse holders	12 (extendable up to 16)					
Fuse dimensions[4]	63 A / 1,000 V to 400 A / 1,000 V					
Type of connection	Connection to copper bars					
MPPT[5]	3					
Max. current at each input	From 40 A to 216 A for positive and negative poles					
Input protections						
Overvoltage protections	Type 2 surge arresters					
DC switch	Motorized DC load break disconnect					
Other protections	Reverse polarity / Insulation failure monitoring / Anti-islanding protection					
Output (AC)						
Power @30 ºC / @45 ºC[6]	623.5 kVA / 573.7 kVA	665.1 kVA / 611.9 kVA	717.1 kVA / 659.7 kVA	748.2 kVA / 688.4 kVA	831.4 kVA / 764.9 kVA	873 kVA / 803.1 kVA
Current @30 ºC / @45 ºC	1,200 A / 1,104 A					
Rated voltage	300 V IT System	320 V IT System	345 V IT System	360 V IT System	400 V IT System	420 V IT System
Frequency	50 / 60 Hz					
Power Factor[7]	1					
Power Factor adjustable	Yes. Smax=623.5 kVA	Yes. Smax=665.1 kVA	Yes. Smax=717.1 kVA	Yes. Smax=748.2 kVA	Yes. Smax=831.4 kVA	Yes. Smax=873 kVA
THD (Total Harmonic Distortion)[8]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters					
AC breaker	Optional AC circuit breaker with door control, remote trip or motorized (only DCAC models)					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%	99%	99.1%	99.1%	99.1%	99.1%
Euroefficiency	98.5%	98.6%	98.7%	98.7%	98.7%	98.6%
Stand-by consumption[9]	90 W					
Consumption at night	90 W					
General Information						
Operating temperature	-20 ºC to +55 ºC					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	IP20 / IP54					
Maximum altitude[10]	3,000 m					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	4,640 m^3/h (fans: 1,300 VA)					
Acoustic emission	< 67 dB (A) at 1 m with fans working at maximum power					
Marking	CE					
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid Code, Jordan Grid Code					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For other configurations, consult with Ingeteam [5] The MPPT connected to the same transformer throught TL inverters must have the same voltage configuration [6] For each ºC of increase between 30 ºC and 45 ºC, the output power will be reduced at the rate of 0.53% / ºC. Over 45 ºC, the output power will be reduced at the rate of 1.8% / ºC [7] For P_{out}>25% of the rated power [8] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [9] Consumption from PV field [10] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 ºC for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Efficiency INGECON® SUN 805TL M420 Vdc = 650 V

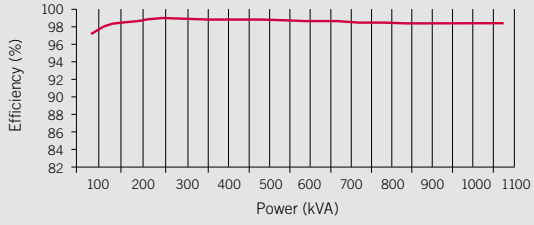


PowerMax M Series 4 Power blocks

	760TL M300	800TL M320	880TL M345	920TL M360	1000TL M400	1070TL M420
Input (DC)						
Recommended PV array power range[1]	777.3 - 994.4 kWp	827.5 - 1,060.7 kWp	891.6 - 1,143.5 kWp	929.4 - 1,193.1 kWp	1,031.6 - 1,325.7 kWp	1,082.3 - 1,392 kWp
Voltage Range MPP[2]	437 - 820 V	468 - 820 V	502 - 820 V	528 - 820 V	581 - 820 V	611 - 820 V
Maximum voltage[3]	1,050 V					
Maximum current	1,800 A					
N° inputs with fuse holders	12 (extendable up to 16)					
Fuse dimensions[4]	63 A / 1,000 V to 400 A / 1,000 V					
Type of connection	Connection to copper bars					
MPPT[5]	4					
Max. current at each input	From 40 A to 216 A for positive and negative poles					
Input protections						
Overvoltage protections	Type 2 surge arresters					
DC switch	Motorized DC load break disconnect					
Other protections	Reverse polarity / Insulation failure monitoring / Anti-islanding protection					
Output (AC)						
Power @30 °C / @45 °C[6]	831.4 kVA / 764.9 kVA	886.8 kVA / 815.9 kVA	956.1 kVA / 879.6 kVA	997.7 kVA / 917.8 kVA	1,108.5 kVA / 1,019.8 kVA	1,163.9 kVA / 1,070.8 kVA
Current @30 °C / @45 °C	1,600 A / 1,472 A					
Rated voltage	300 V IT System	320 V IT System	345 V IT System	360 V IT System	400 V IT System	420 V IT System
Frequency	50 / 60 Hz					
Power Factor[7]	1					
Power Factor adjustable	Yes. Smax=831.4 kVA	Yes. Smax=886.8 kVA	Yes. Smax=956.1 kVA	Yes. Smax=997.7 kVA	Yes. Smax=1,108.5 kVA	Yes. Smax=1,163.9 kVA
THD (Total Harmonic Distortion)[8]	<3%					
Output protections						
Overvoltage protections	Type 2 surge arresters					
AC breaker	Optional AC circuit breaker with door control, remote trip or motorized (only DCAC models)					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%	99%	99.1%	99.1%	99.1%	99.1%
Euroefficiency	98.5%	98.6%	98.7%	98.7%	98.7%	98.6%
Stand-by consumption[9]	120 W					
Consumption at night	120 W					
General Information						
Operating temperature	-20 °C to +55 °C					
Relative humidity (non-condensing)	0-95% (Indoor) / 0-100% (Outdoor)					
Protection class	IP20 / IP54					
Maximum altitude[10]	3,000 m					
Cooling system	Air forced with temperature control (230 V phase + neutral power supply)					
Air flow	5,340 m³/h (fans: 1,500 VA)					
Acoustic emission	< 67 dB (A) at 1 m with fans working at maximum power					
Marking	CE					
EMC and security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid Code, Jordan Grid Code					

Notes: [1] Depending on the type of installation and geographical location. Data for STC conditions [2] Vmpp.min is for rated conditions (Vac=1 p.u. and Power Factor=1) [3] Consider the voltage increase of the 'Voc' at low temperatures [4] For other configurations, consult with Ingeteam [5] The MPPT connected to the same transformer throught TL inverters must have the same voltage configuration [6] For each °C of increase between 30 °C and 45 °C, the output power will be reduced at the rate of 0.53% / °C. Over 45 °C, the output power will be reduced at the rate of 1.8% / °C [7] For P_{out}>25% of the rated power [8] For P_{out}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [9] Consumption from PV field [10] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Efficiency INGECON® SUN 1070TL M420 Vdc = 650 V



INGECON SUN

MEDIUM VOLTAGE SOLUTIONS

INGECON SUN PowerStation

SHE 22

From 760 to 3280 kVA

The complete turnkey solution, customized & fully equipped up to 4 MWp, 22 ft. shelter with Forced Air cooling system

The very latest technological development by Ingeteam. All the devices required for a multi-megawatt system incorporated into a single shelter with three separate compartments and different cooling systems, easily transportable by road thanks to its small dimensions and low weight.

Maximize your investment with minimal effort
INGECON® SUN PowerStation SHE 22 is a compact, customisable and flexible solution that can be configured to suit each customer's requirement. Thanks to its panel-based structure, the internal layout can be customised to incorporate various INGECON® SUN inverters. Ideal for low environmental impact applications.

Extremely robust and long-lasting
The shelter can be easily transported by road, thanks to its small dimensions and low overall weight. The hot galvanised steel structure is designed to guarantee maximum mechanical strength and durability. The walls and roof contain a 50 mm rigid fire-proof polyurethane foam filling, to guarantee perfect water resistance and correct thermal insulation.

Equipped with everything necessary
High efficiency inverters, auxiliary services switchgear, Medium Voltage cubicle and LV / MV transformer. Available with High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to PV Plant Controller, monitoring and SCADA systems.

Maximum stability
All the devices are anchored to the base, to guarantee the maximum stability of the structure. The varnish used guarantees maximum protection against adverse weather conditions.

Complete accessibility
Thanks to its innovative design, all devices are readily accessible, thereby making it easier to inspect, maintain and repair the INGECON® SUN PowerStation SHE 22. The MV transformer compartment door is equipped with AREL safety lock with a blocking code.

Innovative ventilation system
The internal temperature of inverter compartment is controlled by high efficiency hot air extraction plenums and centrifugal fan systems. A number of internal and external probes guarantee a constant ambient temperature. The incoming air is filtered through special grids mounted on the bottom of the walls.

SHE 22 FA / NA / FA

SHE 22 FA / FA / FA

SHE 22 FA / NA / FA

SHE 22 FA / FA / FA

MAIN FEATURES

- Output power up to 3,280 kVA.
- Available up to 36 kV output voltage.
- Available with cast resin or oil immersed hermetically sealed LV / MV transformers.
- Protection degree: IP54 / NEMA 3R for inverter compartment.
- Extremely compact design.
- Plug & Play solution.
- Maximum reliability, higher safety and reduced maintenance thanks to flexible copper busbars for Low Voltage power distribution.
- Fully customizable.
- Operating Temperature Range: from -20 °C to +60 °C. (1)
- Relative Humidity (non-condensing): 0-100%.
- Installation Altitude: 3000 m above sea level. (1)

(1) *Refer to Technical Characteristics table for further details.*

ELECTRICAL PROTECTIONS

- Reverse polarity.
- Output short-circuits and overloads.
- DC fuses.
- Motorized DC switches with door control.
- AC thermal-magnetic breakers with door control.
- DC and AC overvoltage suppressors.
- Anti-islanding monitoring system with automatic disconnection.
- Insulation monitoring system.
- Automatic disconnection system in case of LV/MV transformer overheat.
- Emergency disconnection button, accessible from outside.
- DGPT2 protection relay included in the transformer.
- MV protection with fuse or circuit breaker protections.

STANDARD EQUIPMENT

- Internal lighting system.
- Emergency lighting system.
- Auxiliary power outlet.
- Fire detection system with automatic disconnection (both DC and AC sides).
- Safety interlocks for MV transformer compartment door.
- Fire safety kit.
- Medium Voltage safety kit.
- First aid kit and safety signals.

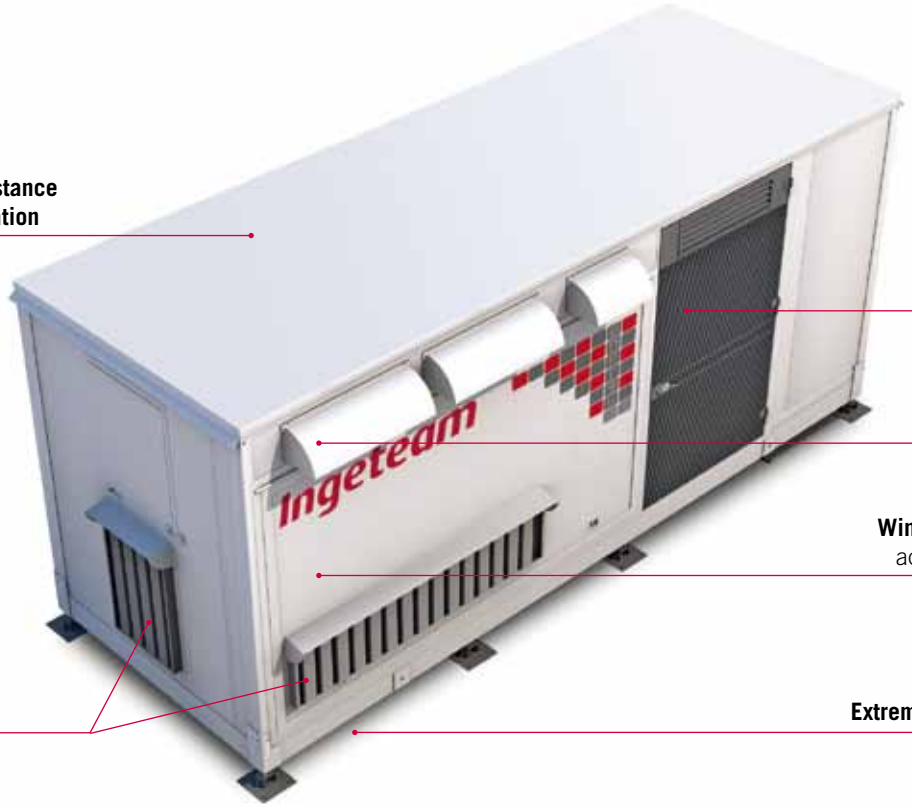
OPTIONAL EQUIPMENT

In addition to the standard equipment, the INGECON® SUN PowerStation can be supplied with the following options:

- LV / MV transformer for the power supply to the auxiliary services panel.
- UPS for auxiliary services.
- INGECON® SUN String Control 16 / 32 string combiner boxes.
- Energy meter with 3G system for remote metering.
- Meteo Station.
- High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to PV Plant Controller and SCADA systems.
- SCADA supervision, control and data acquisition system.
- PV Plant Controller compliant with the most widely international Grid Codes.
- Gateway for monitoring and control of the PV Plant by the Grid Operator using standard protocols (like IEC 61850, IEC 60870-5-101/104, DNP 3.0, etc.).
- HV surge arresters.
- Anti-rodent system.
- Human intrusion detection system.
- External lighting system.

INGECON SUN PowerStation

SHE 22



Perfect **water resistance** and **thermal insulation**

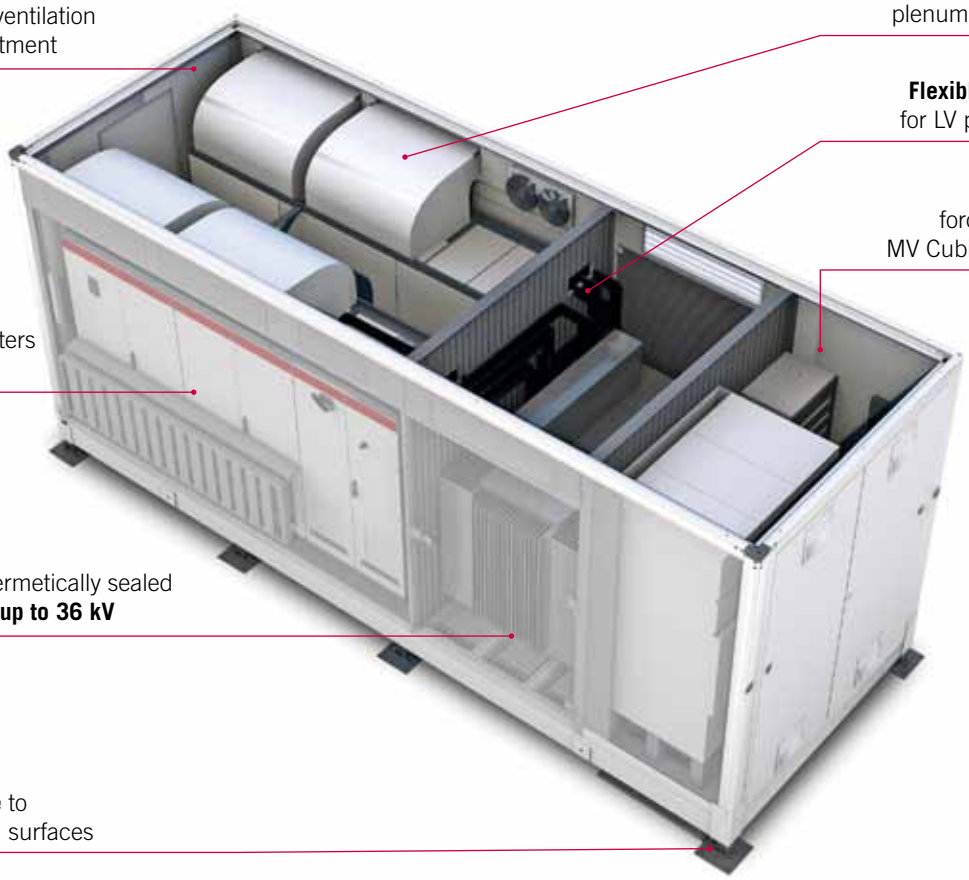
IP21 high efficiency natural air ventilation MV Transformer compartment

Air extraction **anti-rain covers**

Wing side doors for easy access to the inverters

Air Intake filtered **sand trap grids**

Extremely compact solution



High efficiency hot air extraction plenums for the inverters

IP54 forced air ventilation Inverter compartment

Flexible copper busbars for LV power distribution

IP55 forced air ventilation MV Cubicle compartment

INGECON® SUN PowerMax inverters **up to 3280 kVA**

Oil immersed hermetically sealed **MV Transformer up to 36 kV**

Easily adaptable to different ground surfaces

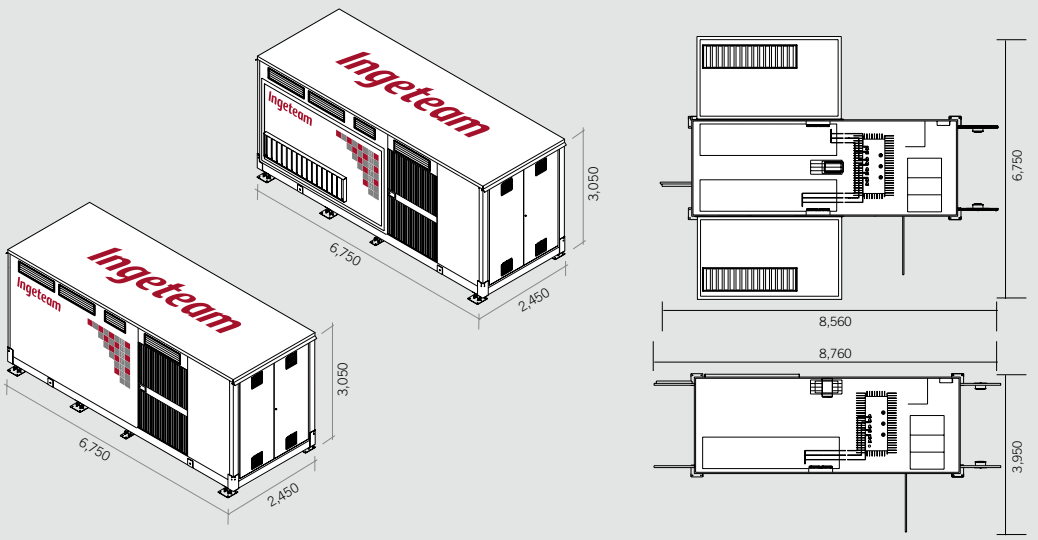
		SHE 22 - FA / FA / FA	SHE 22 - FA / NA / FA
General Information			
Inverter Compartment	Cooling system	Forced air with temperature control	
	Air extraction / Air intake	Overpressure dampers with anti-rain covers / Filtered sand trap grids	
	Max. power consumption	400 W	
	Protection degree	IP54	
	Max. Power @ 1000 Vdc (X, M Series)	2,328 kVA @ 30 °C 2,142 kVA @ 45 °C	
	Max. Power @ 1000 Vdc (B Series)	2,328 kVA @ 35 °C 2,142 kVA @ 50 °C	
	Max. Power @ 1500 Vdc (B Series)	3,275 kVA @ 25 °C 2,728 kVA @ 50 °C	
Tranformer Compartment	Cooling system	Forced air with temperature control	Natural air ventilation
	Air extraction / Air intake	Overpressure dampers with anti-rain covers / Filtered sand trap grids	Protective metal grids
	Max. power consumption	2,720 W	0 W
	Protection degree	IP54	IP21
MV Cubicle compartment[2]	Cooling system	Forced air with temperature control	
	Air extraction / Air intake	Filtered anti-rain grids	
	Max. power consumption	130 W	
	Protection degree	IP55	
Operating temperature range[3]		from -30 °C to +60 °C	
Relative Humidity (non-condensing)		0 - 100%	
Installation altitude[4]		3,000 m above sea level	
Equipment			
Inverter version		X series (Master-Slave), M series (Multi-MPPT), B series (Monoblock)	
BT-AUX switchgear		BASE version (FULL version and high-speed communication infrastructure optional)	
LV / MV Transformer		Dry type cast resin or Oil immersed hermetically sealed	
MV Switchgear		0L1P, 1L1P or 2L1P cells with either fuses or circuit breaker protection	
Mechanical Information			
Structure Material		Steel	
Insulation		Sandwich panels containing a 50 mm rigid fire-proof polyurethane foam filling	

Notes: [1] Equipped with oil immersed hermetically sealed LV / MV transformers [2] Including instrumentation, auxiliary services switchgear, monitoring systems [3] INGECON® SUN PowerMax, "M" and "X" series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 45 °C operating temperature. Derating above 45 °C of 1.8% for each °C of increase until 60 °C operating temperature. -30 °C with optional kit [3] INGECON® SUN PowerMax, "B" series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 50 °C operating temperature. Derating above 50 °C of 1.8% for each °C of increase until 60 °C operating temperature. -30 °C with optional kit [4] Please contact Ingeteam for altitudes higher than 1,000 m.

	Length	Width	Height
Size (mm)			
Body dimensions	6,750	2,450	3,050
Overall dimensions with doors open (Tunnel)	8,760	3,950	3,050
Overall dimensions with doors open (Wing)	8,560	6,750	3,050
Foundation dimensions	9,000	5,000	300

SHE 22 Wing

SHE 22 Tunnel



INGECON SUN PowerStation

CON 20 / Outdoor inverters

From 830 to 2330 kVA

The complete outdoor turnkey solution customized up to 2330 kVA. 20 ft. container fully tested in factory and easily transportable overseas

Thanks to its CSC approval for overseas shipment, the INGECON® SUN PowerStation CON 20 can be marketed and installed everywhere in the world. It is a fully equipped outdoor solution fully assembled into a 20 ft container (up to 2,330 kVA).

Different compartments
The INGECON® SUN PowerStation CON 20 is a standard solution designed to maximise the compactness and cost-effectiveness of the overall equipment. Thus, the transformer is naturally air-cooled, as it is located in an outdoor compartment. The switchgear and communications panels are installed in an IP54 compartment to ensure their maximum protection. The sandwich panels of this compartment are made of galvanised painted steel, filled with a 40 mm layer of rigid fire proof polyurethane foam, ensuring perfect waterproofness over time and efficient thermal insulation.

Equipped with everything necessary
High-efficiency outdoor central inverters, auxiliary services switchgear, Medium Voltage cubicle and LV / MV transformer. Available with High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to PV Plant Controller, monitoring and SCADA systems.

Complete accessibility
Thanks to its innovative design, all the devices are readily accessible. The use of outdoor central inverters provides full access and the possibility of maintenance for all the equipment from the external part of the Power Station.

Maximum power density
This INGECON® SUN PowerStation CON 20 features two B Series Power Max PV inverters, Ingeteam's most compact PV inverter, as it provides more power per cubic foot. This makes it possible to achieve up to 2,330 kVA in only 20-foot Power Station.

Grid support
These PV inverters have been designed to comply with the most demanding international grid codes, contributing to the quality and stability of the electric system. Low voltage ride-through capability, reactive power deliverance and active power control are just some of their main features.

Solution up to 2,330 kVA (Up to 2 PV inverters)

MAIN FEATURES

- Output power up to 2,330 kVA.
- Available up to 36 kV output voltage.
- Available with outdoor mounted hermetically sealed LV / MV transformer (up to 2,330 kVA).
- Outdoor compartments for inverters and transformer. IP54 compartment for MV and LV Switchear and controlgear.
- Protected against direct solar radiation.
- CSC certification for container shipping.
- Plug & Play solution.
- Maximum reliability, higher safety and reduced maintenance.
- Relative Humidity (non-condensing): 0-100%.
- Installation Altitude: 3000 m above sea level.(1)

(1) *Refer to Technical Characteristics tables for further details.*

ELECTRICAL PROTECTIONS

- Reverse polarity.
- Output short-circuits and overloads.
- DC fuses.
- DC switch with door control.
- AC circuit breaker with door control.
- DC and AC overvoltage suppressors.
- Anti-islanding monitoring system with automatic disconnection.
- Insulation monitoring system.
- Emergency disconnection button, accessible from outside.
- DGPT2 relay included in the transformer.
- MV protection with fuses or circuit breaker.

STANDARD EQUIPMENT

- LV / MV transformer with reduced power losses.
- Two INGECON® SUN PowerMax B Series central PV inverters.
- MV switchgear.
- Internal lighting system.
- Auxiliary power outlet.
- Fully equipped auxiliary services panel.
- Fire safety kit.
- Medium Voltage safety kit.
- First aid kit and safety signals.

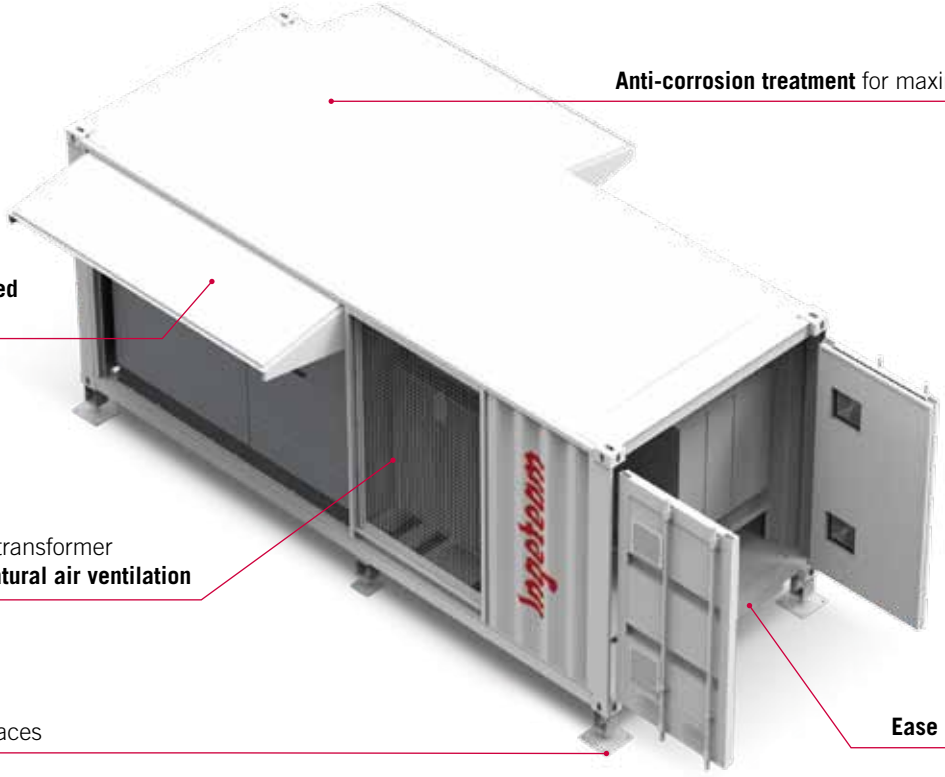
OPTIONAL EQUIPMENT

In addition to the standard equipment, the INGECON® SUN PowerStation can be supplied with the following options:

- LV / LV transformer for the power supply to the auxiliary services panel.
- LV / MV transformer with reduced power losses according to EU 548/2014.
- UPS for auxiliary services.
- High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to Power Plant Controller and / or SCADA systems.
- INGECON® SUN StringControl 16 / 24 / 32 channels intelligent or passive string combiner boxes.
- INGECON® SUN SCADA supervision, control and data acquisition system.
- INGECON® SUN EMS Plant Controller compliant with the most widely international Grid Codes.
- Gateway for monitoring and control of the PV Plant by the Grid Operator using standard protocols (like IEC 61850, IEC 60870-5- 101/104, DNP 3.0, etc.).
- Meteo station.
- HV surge arresters.
- Anti-rodent system.
- Human intrusion detection system.
- External lighting system.
- Oil retention tank (separately supplied).
- Energy meter for auxiliary services and/or energy production.
- Insulation Monitoring Relay for continuous monitoring of IT systems insulation.
- Three-phase Capacitors with blocking inductances for Power Factor correction.
- DC and AC cable terminals.
- Reactive power regulation with no PV array power.
- Ground connection of the PV array.
- Painted with specific RAL upon request.

INGECON SUN PowerStation

Solution up to 2330 kVA (Up to 2 PV inverters)



Anti-corrosion treatment for maximum durability

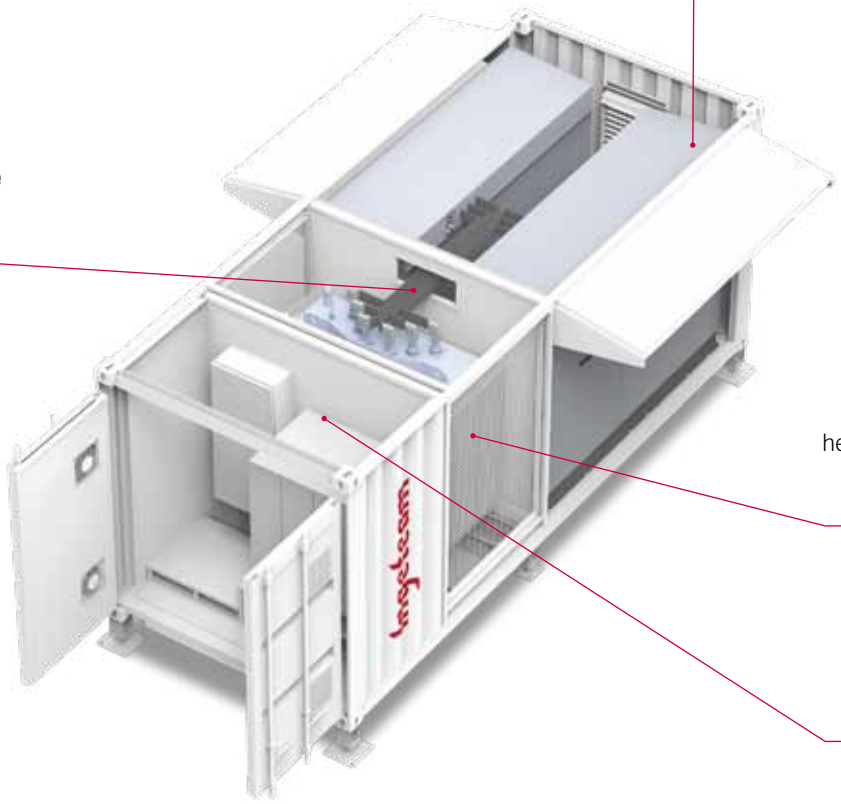
Dust and rain protected
Sand storm protected

IP21 high efficiency transformer compartment with **natural air ventilation**

Easily adaptable to different ground surfaces

Ease of maintenance

INGECON® SUN PowerMax B series Outdoor inverters **up to 2330 kVA**



Solid aluminium and **flexible copper busbars** for LV power distribution

Oil immersed hermetically sealed **MV Transformer up to 36 kV**

IP55
Forced Air ventilation MV Cubicle and LV Auxiliary compartment

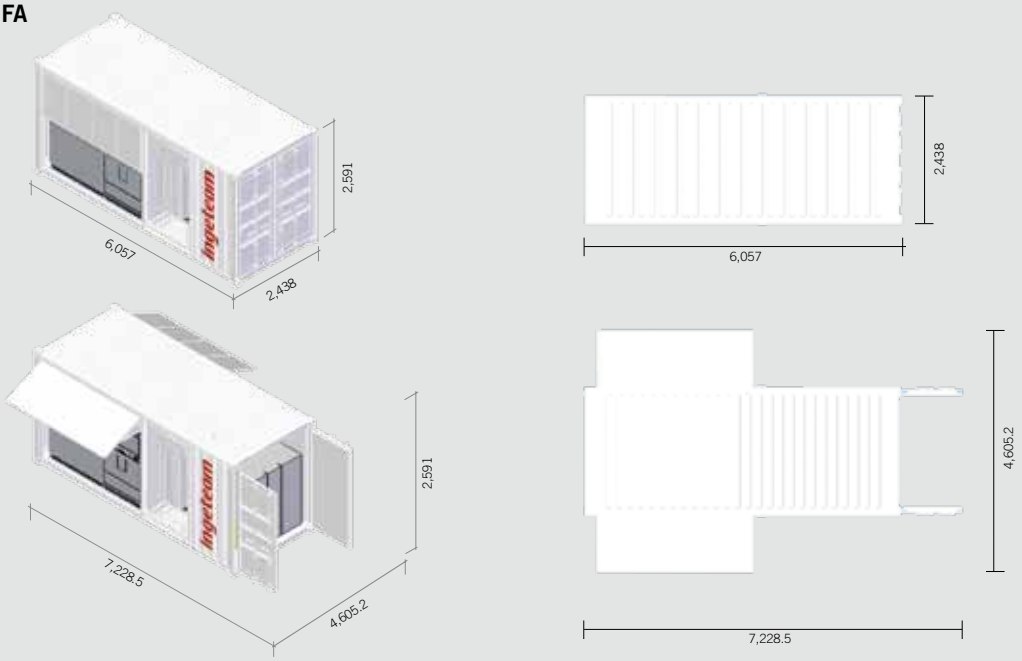
** Illustrative image. It might not correspond with the basic configuration.*

		CON 20 NA / NA / FA
General Information		
Inverter Compartment	Cooling system	Natural air ventilation (forced air ventilation inside the inverters)
	Max. power consumption	6 kVA
	Protection degree	Outdoor PV inverters (IP56)
	Max. power @ 1,000 Vdc	2,328 kVA @ 35 °C 2,142 kVA @ 50 °C (with 2 inverters)
	Max. power @ 1,500 Vdc	1,637 kVA @ 25 °C 1,364 kVA @ 50 °C (with 1 inverter)
LV / MV Transformer compartment[1]	Cooling system	Natural air ventilation
	Air extraction / Air intake	Protective metal grids
	Max. power consumption	0 W
	Protection degree	IP21 (outdoor transformer)
MV Cubicle compartment[2]	Cooling system	Forced air with temperature control
	Air extraction / Air intake	Filtered anti-rain grids
	Max. power consumption	65 W
	Protection degree	IP55 / NEMA 3R
Operating temperature range[3]		-20 °C to +55 °C[4]
Relative humidity (non-condensing)		0-100%
Installation altitude[5]		3,000 m above sea level
Equipment		
Inverter version		B series (Monoblock)
Auxiliary Services Switchgear		Standard version (Full version and high-speed communication infrastructure optional)
LV / MV Transformer		Oil immersed hermetically sealed
MV Switchgear		0L1P, 1L1P or 2L1P cells with either fuses or circuit breaker protection
Mechanical Information		
Structure Material		Steel
MV Switchgear insulation grade		Sandwich panels containing a rigid fire-proof polyurethane foam filling

Notes: [1] Including instrumentation, auxiliary services switchgear, monitoring systems [2] Equipped with oil immersed hermetically sealed LV / MV transformer [3] For INGECON® SUN PowerMax, "B" series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 50 °C operating temperature. Derating above 50 °C of 1.8% for each °C of increase until 55 °C operating temperature [4] -30 °C with optional kit [5] Please contact Ingeteam for altitudes higher than 1,000 m.

	Length	Width	Height
Size (mm)			
Body dimensions	6,057	2,438	2,591
Overall dimensions with all doors open	7,228.5	4,605.2	2,591
Foundation dimensions	8,000	5,000	300

CON 20 NA / NA / FA



INGECON SUN PowerStation

CON 40 / Outdoor inverters

From 2500 to 3500 kVA

The complete turnkey solution, customized up to 4.2 MWp, 40 ft. container with three outdoor central inverters

Thanks to its CSC approval for overseas shipment, The INGECON® SUN PowerStation CON 40 can be marketed and installed everywhere in the world. It is a fully equipped container with three separate compartments.

Robust and long-lasting design
The INGECON® SUN PowerStation CON 40 is a standard solution specifically designed to maximise the compactness and cost-effectiveness of the overall equipment. Thus, the transformer is naturally air-cooled, as it is located in an outdoor compartment. The switchgear and communications panels are installed in an IP54 compartment to ensure their maximum protection. The sandwich panels of this compartment are made of galvanised painted steel, filled with a 40 mm layer of rigid fire proof polyurethane foam, ensuring perfect waterproofness over time and efficient thermal insulation.

Equipped with everything necessary
High efficiency inverters, auxiliary services switchgear, Medium Voltage cubicle and LV / MV transformer. Available with High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to PV Plant Controller, monitoring and SCADA systems.

Complete accessibility
Thanks to its innovative design, all devices are readily accessible, thereby making it easier to inspect, maintain and repair the INGECON® SUN PowerStation CON 40. The transformer compartment door is equipped with a safety lock with a blocking code.

Ideal for adverse environments
The INGECON® SUN PowerStation CON 40 is a standard solution able to withstand adverse environmental conditions without any loss of performance.

Maximum power density
This INGECON® SUN PowerStation CON 40 features three B Series Power Max PV inverters, Ingeteam's most compact PV inverter, as it provides more power per cubic foot. This makes it possible to achieve up to 3,500 kVA in only 40-foot power Station.

Grid support
These PV inverters have been designed to comply with the most demanding international grid codes, contributing to the quality and stability of the electric system. Low voltage ride-through capability, reactive power deliverance and active power control are just some of their main features.

Solution up to 3500 kVA (Up to 3 PV inverters)

MAIN FEATURES

- Output power up to 3,500 kVA.
- Available up to 36 kV output voltage.
- Available with hermetically sealed LV / MV transformer (up to 3,500 kVA).
- Rated power up to 50 °C ambient temperature. (1)
- Protected against direct solar radiation.
- CSC certification for container shipping.
- Plug & Play solution.
- Maximum reliability, higher safety and reduced maintenance.
- Relative Humidity (non-condensing): 0-100%.
- Installation Altitude: 3000 m above sea level. (1)

(1) *Refer to Technical Characteristics tables for further details.*

ELECTRICAL PROTECTIONS

- Reverse polarity.
- Output short-circuits and overloads.
- DC fuses.
- DC switch with door control.
- AC circuit breaker with door control.
- DC and AC overvoltage suppressors.
- Anti-islanding monitoring system with automatic disconnection.
- Insulation monitoring system.
- Automatic disconnection system in case of LV / MV transformer overheat.
- Emergency disconnection button, accessible from outside.
- DGPT2 relay included in the transformer.
- MV protection or circuit breaker.

STANDARD EQUIPMENT

- Internal and emergency lighting system.
- LV / MV transformer with reduced power losses.
- Three INGECON® SUN PowerMax B Series central PV inverters.
- MV switchgear.
- Auxiliary power outlet.
- Fire safety kit.
- Medium Voltage safety kit.
- First aid kit and safety signals.

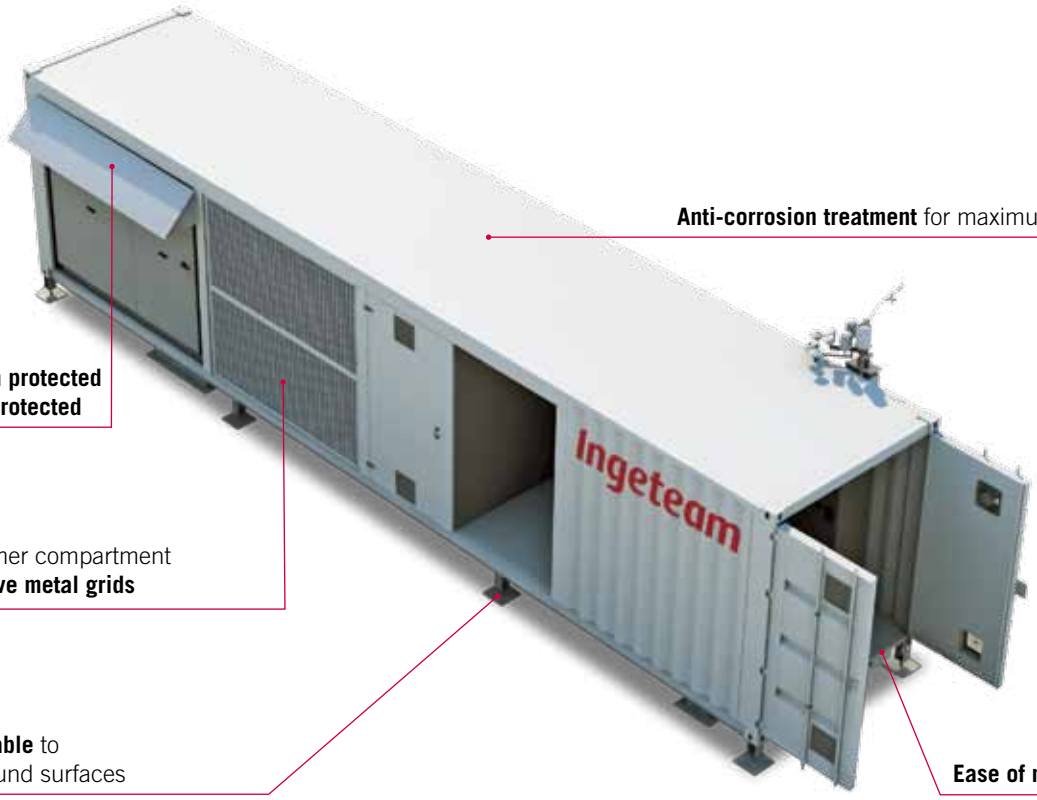
OPTIONAL EQUIPMENT

In addition to the standard equipment, the INGECON® SUN PowerStation can be supplied with the following options:

- LV / LV transformer for the power supply to the auxiliary services panel.
- LV / MV transformer with reduced power losses according to EU 548/2014.
- Oil deposit (delivered separatedly).
- PLC for Power Station data connection.
- UPS for auxiliary services.
- INGECON® SUN String Control 16 / 32 inputs string combiner boxes.
- Meteo Station.
- Energy meter with 3G system for remote metering.
- High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to PV Plant Controller and SCADA systems.
- INGECON® SUN SCADA supervision, control and data acquisition system.
- INGECON® SUN EMS Plant Controller compliant with the most widely international Grid Codes.
- Gateway for monitoring and control of the PV Plant by the Grid Operator using standard protocols (like IEC 61850, IEC 60870-5-101/104, DNP 3.0, etc.).
- HV surge arresters.
- External lighting system.

INGECON SUN PowerStation

Solution up to 3500 kVA (Up to 3 PV inverters)



Anti-corrosion treatment for maximum durability

Dust and rain protected
Sand storm protected

MV transformer compartment
with **protective metal grids**

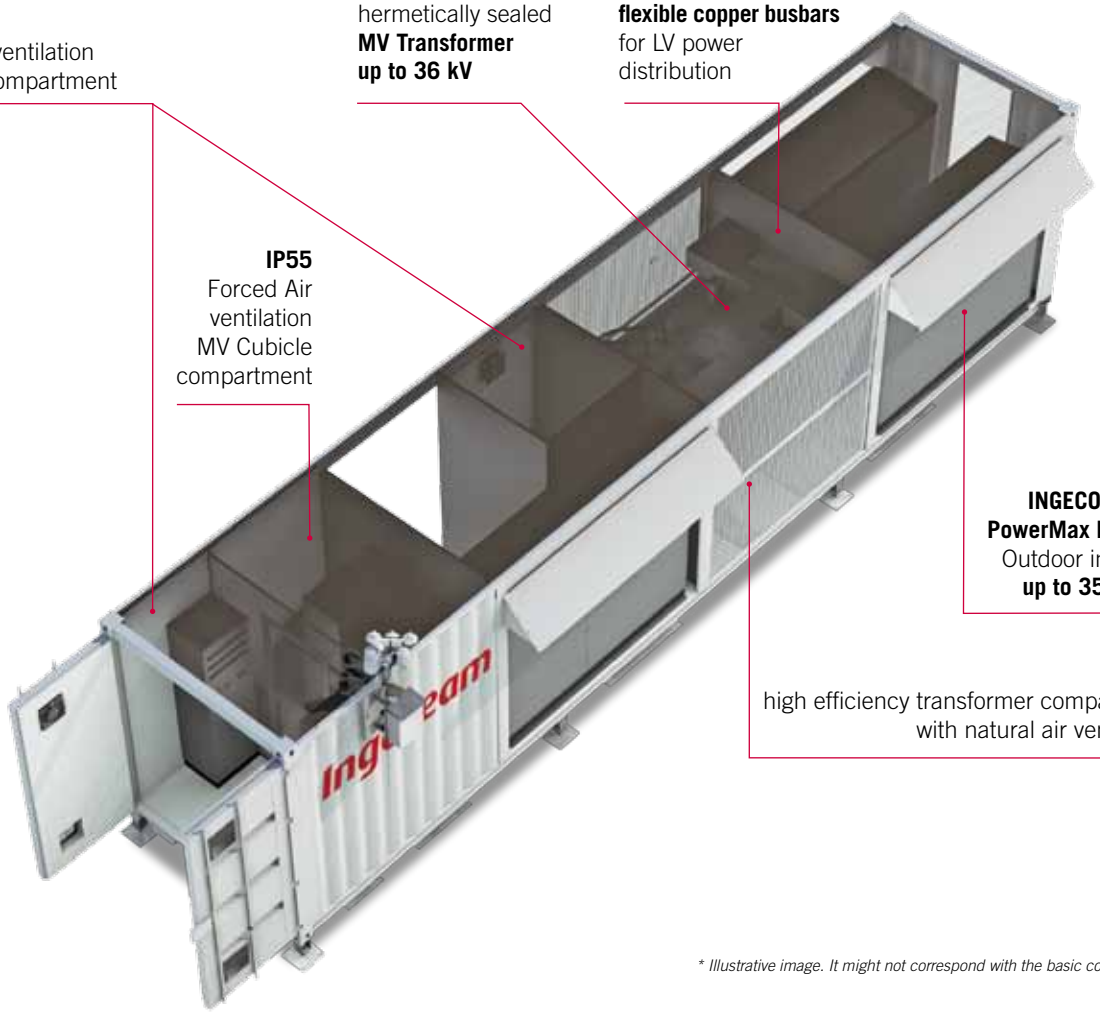
Easily adaptable to
different ground surfaces

Ease of maintenance

IP55
forced air ventilation
Auxiliary compartment

Oil immersed
hermetically sealed
MV Transformer
up to 36 kV

Solid aluminium and
flexible copper busbars
for LV power
distribution



IP55
Forced Air
ventilation
MV Cubicle
compartment

INGECON® SUN
PowerMax B series
Outdoor inverters
up to 3500 kVA

IP21
high efficiency transformer compartment
with natural air ventilation

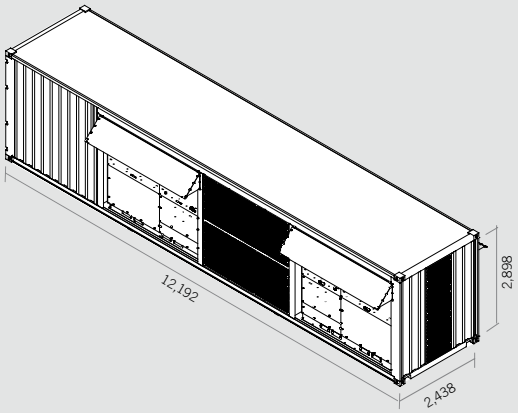
** Illustrative image. It might not correspond with the basic configuration.*

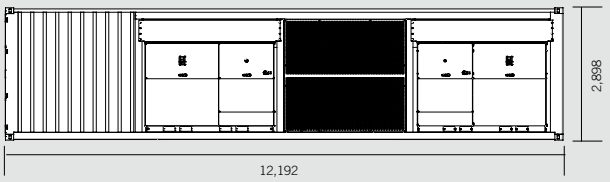
		CON 40 NA / NA / FA
General Information		
Inverter Compartment	Cooling system	Natural air ventilation (forced air ventilation inside the inverters)
	Max. power consumption	9 kVA
	Protection degree	Outdoor PV inverters (IP56)
	Max. power @ 1,000 Vdc	3,492 kVA @ 35 °C 3,213 kVA @ 50 °C (with 3 inverters)
	Max. power @ 1,500 Vdc	3,275 kVA @ 25 °C 2,728 kVA @ 50 °C (with 2 inverters)
LV / MV Transformer compartment[1]	Cooling system	Natural air ventilation
	Air extraction / Air intake	Protective metal grids
	Max. power consumption	0 W
	Protection degree	IP21
MV Switchgear compartment[2]	Cooling system	Forced air with temperature control
	Air extraction / Air intake	Filtered anti-rain grids
	Max. power consumption	65 W
	Protection degree	IP55
Operating temperature range[3]		-20 °C to +55 °C[4]
Relative humidity (non-condensing)		0-100%
Installation altitude[5]		3,000 m above sea level
Equipment		
Inverter version		B series (Monoblock)
Auxiliary Services Switchgear		Standard version (Full version and high-speed communication infrastructure optional)
LV / MV Transformer		Oil immersed hermetically sealed
MV Switchgear		0L1A, 1L1A or 2L1A cells with circuit breaker protection
Mechanical Information		
Structure Material		Steel
Insulation		Sandwich panels containing a rigid fire-proof polyurethane foam filling

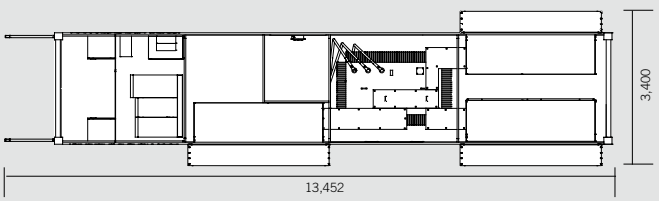
Notes: [1] Equipped with oil immersed hermetically sealed LV / MV transformer [2] Including instrumentation, auxiliary services switchgear, monitoring systems [3] For INGECON® SUN Power-Max, B series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 50 °C operating temperature. Derating above 50 °C of 1.8% for each °C of increase until 55 °C operating temperature [4] -30 °C with optional kit [5] Please contact Ingeteam for altitudes higher than 1000 m.

	Length	Width	Height
Size (mm)			
Body dimensions	12,192	2,438	2,898
Overall dimensions with all doors open	13,452	3,400	2,898
Foundation dimensions	13,500	4,450	300

CON40 NA / NA / FA







INGECON SUN PowerStation

CON 40 / Indoor inverters

From 760 to 4920 kVA

The complete turnkey solution, customized up to 5.7 MWp, 40 ft. container with innovative forced air or air conditioned cooling systems for adverse environmental conditions

Thanks to its CSC approval for overseas shipment, The INGECON® SUN PowerStation CON 40 can be marketed and installed everywhere in the world. It is a fully equipped container with three separate compartments and different cooling systems (up to 3,275 kVA) or two separate compartments with different cooling systems and outdoor mounted LV / MV transformer (up to 4,900 kVA).

Robust and long-lasting design
The INGECON® SUN PowerStation CON40 is a standard solution specifically designed for dusty areas with innovative cooling systems to ensure the nominal output power up to 60 °C. Moreover, this solution avoid any problem regarding the corrosion generated from sandstorms. To ensure the maximum protection against weather conditions, external sides are coated with a galvanized layer and painted with polyurethane lacquer. The load-bearing structure is single-block made of welded steel, to ensure top resistance and durability over time. Rooftop and walls are coated with insulated sandwich panels. The sandwich panels are made of galvanized painted steel, filled with a 50 mm layer of rigid fireproof polyurethane foam, ensuring perfect waterproofness over time and efficient thermal insulation.

Equipped with everything necessary
High efficiency inverters, auxiliary services switchgear, Medium Voltage cubicle and LV / MV transformer. Available with High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to PV Plant Controller, monitoring and SCADA systems.

Complete accessibility
Thanks to its innovative design, all devices are readily accessible, thereby making it easier to inspect, maintain and repair the INGECON® SUN PowerStation CON 40. The transformer compartment door is equipped with AREL safety lock with a blocking code on the cabling box.

Ideal for adverse environments
The INGECON® SUN PowerStation CON40 is a standard solution able to withstand adverse environmental conditions without any loss of performance. Thanks to its recirculation air conditioning system, the “RC” version can provide its rated power up to 60 °C (ambient temperature) without derating and IP65 protection degree.

Innovative cooling systems
FA type: the internal temperature of inverters compartment is controlled by high efficiency hot air extraction plenums and centrifugal fan systems.

A number of internal and external probes guarantee a constant ambient temperature. The incoming air is filtered through special sand trap grids mounted on the bottom of the walls.

AC type: the container is equipped with an internal cooling system featuring a Free Cooling function for inverters compartment. The air conditioning units, sized for each of the inverters, feature the following operating modes:

- Pure Free Cooling: Compressor in OFF mode. The outdoor air temperature is low and the conditioner operates like a ventilation system, with an air inflow and outflow.
- Assisted Free Cooling: Compressor operates in ON-OFF mode. The outdoor air temperature is relatively low to allow operation in Free Cooling mode. However, it is not low enough to maintain the desired interior temperature.
- Cooling Compressor in ON mode: The system operates like a normal air conditioner.

RC type: the container is equipped with an internal Recirculation Air Conditioning system for inverters compartment, to maintain the correct internal temperature over the entire operating temperature range.

CON 40 FA / NA / FA

CON 40 FA / FA / FA

CON 40 AC-RC / NA / FA

CON 40 AC-RC / FA / FA

MAIN FEATURES

- Output power up to 4,920 kVA.
- Available up to 36 kV output voltage.
- Available with embedded cast resin or oil immersed hermetically sealed LV / MV transformer (up to 3,275 kVA).
- Available with outdoor mounted hermetically sealed LV / MV transformer (up to 4,920 kVA).
- Up to IP65 protection degree for inverter compartment. (1)
- Rated power up 60 °C ambient temperature. (1)
- Protected against solar and sand corrosion.
- CSC certification for container shipping.
- Plug & Play solution.
- Maximum reliability, higher safety and reduced maintenance thanks to solid aluminium and flexible copper busbars for Low Voltage power distribution.
- Different cooling systems for inverter compartment (1):

  Type FA: Forced Air ventilation, operating temperature range from -20 °C to +55 °C.

  Type AC: Free Cooling Air Conditioning system, operating temperature range from -20 °C to +55 °C without derating.

  Type RC: Recirculation Air Conditioning system, operating temperature range from -20 °C to +60 °C without derating.
- Relative Humidity (non-condensing): 0-100%.
- Installation Altitude: 3000 m above sea level.(1)

(1) *Refer to Technical Characteristics tables for further details.*

ELECTRICAL PROTECTIONS

- Reverse polarity.
- Output short-circuits and overloads.
- DC fuses.
- DC switch with door control.
- AC circuit breaker with door control.
- DC and AC overvoltage suppressors.
- Anti-islanding monitoring system with automatic disconnection.
- Insulation monitoring system.
- Automatic disconnection system in case of LV / MV transformer overheat.
- Emergency disconnection button, accessible from outside.
- DGPT2 relay included in the transformer.
- MV protection with fuses or circuit breaker.

STANDARD EQUIPMENT

- Fully equipped auxiliary services panel.
- Internal and emergency lighting systems.
- LV / MV transformer with reduced power losses.
- Fire detection system with automatic disconnection (both DC and AC sides).
- Safety interlocks for MV transformer compartment door on the cabling box.
- Fire safety kit.
- Medium Voltage safety kit.
- First aid kit and safety signals.

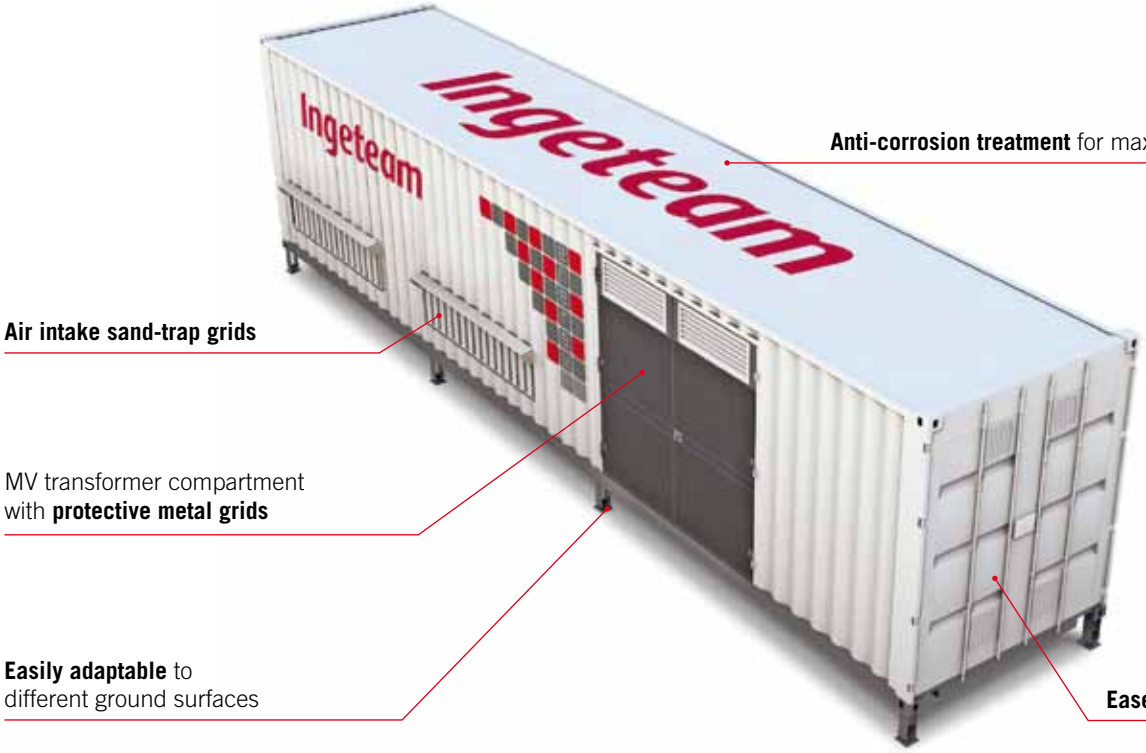
OPTIONAL EQUIPMENT

In addition to the standard equipment, the INGECON® SUN PowerStation can be supplied with the following options:

- LV / LV transformer for the power supply to the auxiliary services panel.
- LV / MV transformer with reduced power losses according to EU 548/2014.
- UPS for auxiliary services.
- INGECON® SUN StringControl 16 / 24 / 32 channels intelligent or passive string combiner boxes.
- Meteo station.
- High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to PV Plant Controller and SCADA systems.
- INGECON® SUN SCADA supervision, control and data acquisition system.
- INGECON® SUN EMS Plant Controller compliant with the most widely international Grid Codes.
- Gateway for monitoring and control of the PV Plant by the Grid Operator using standard protocols (like IEC 61850, IEC 60870-5-101/104, DNP 3.0, etc.).
- HV surge arresters.
- Anti-rodent system.
- Human intrusion detection system.
- External lighting system.
- Oil retention tank (separately supplied).
- Energy meter for auxiliary services and/or energy production.
- Reactive power regulation with no PV array power.

INGECON SUN PowerStation

Solution up to 3275 kVA (2 PV inverters)



Anti-corrosion treatment for maximum durability

Air intake sand-trap grids

MV transformer compartment with **protective metal grids**

Easily adaptable to different ground surfaces

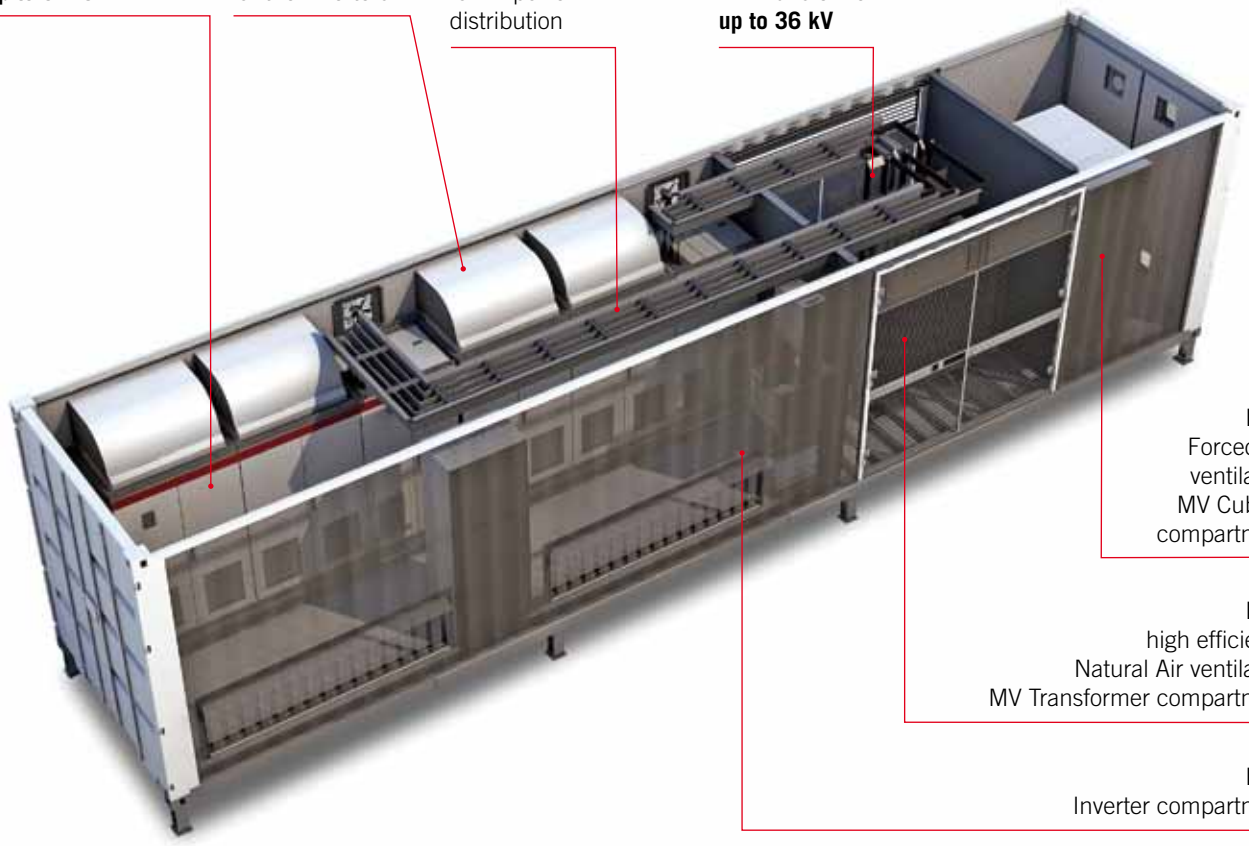
Ease of maintenance

INGECON® SUN PowerMax inverters **up to 3275 kVA**

High efficiency air extraction plenums for the inverters

Solid aluminium and **flexible copper busbars** for LV power distribution

Oil immersed hermetically sealed **MV Transformer up to 36 kV**



IP55 Forced Air ventilation MV Cubicle compartment

IP21 high efficiency Natural Air ventilation MV Transformer compartment

IP54 Inverter compartment

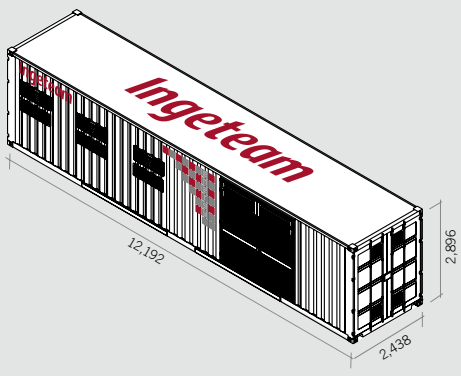
** Illustrative image. It might not correspond with the basic configuration.*

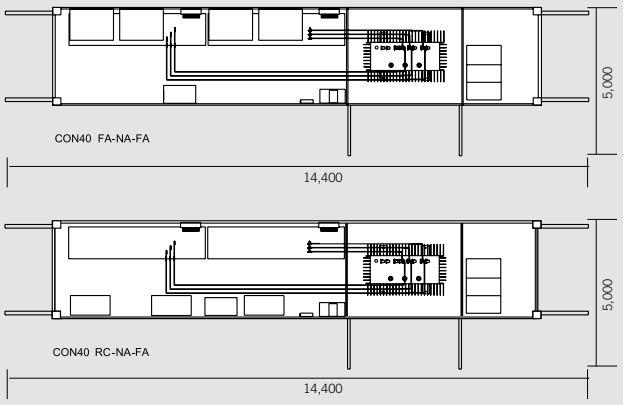
		CON 40 FA / xx / FA	CON 40 AC / xx / FA	CON 40 RC / xx / FA
General Information				
Inverter Compartment [1]	Cooling system	Forced air ventilation	Air conditioning with Free Cooling function	Recirculation air conditioning
	Air extraction / Air intake	Overpressure Dampers with anti-rain covers / Filtered sand trap grids	Overpressure Dampers / Filtered grids with anti-rain covers	
	Max. power consumption	420 W	5,400 / 18,000 W[2]	18,000 W
	Protection degree	IP54	IP54	IP65
	Max. power @ 1,000 Vdc (X, M Series)	2,328 kVA @ 30 °C 2,142 kVA @ 45 °C		
	Max. power @ 1,000 Vdc (B Series)	2,328 kVA @ 35 °C 2,142 kVA @ 50 °C		
	Max. power @ 1,500Vdc (B Series)	3,275 kVA @ 25°C / 2,728 kVA @ 50°C		
LV / MV Transformer compartment **CON 40 FA or AC or RC/FA/FA**	Cooling system	Forced air with temperature control		
	Air extraction / Air intake	Overpressure dampers with anti-rain covers / Filtered sand trap grids		
	Max. power consumption	2,720 W		
	Protection degree	IP54		
LV / MV Transformer compartment[3] **CON 40 FA or AC or RC/NA/FA**	Cooling system	Natural air ventilation		
	Air extraction / Air intake	Protective metal grids		
	Max. power consumption	0 W		
	Protection degree	IP21		
MV Cubicle compartment	Cooling system	Forced air with temperature control		
	Air extraction / Air intake	Filtered anti-rain grids		
	Max. power consumption	65 W		
	Protection degree	IP55		
Operating temperature range [5]		from -20 °C to +55 °C[4]	from -20 °C to +55 °C	from -20 °C to +60 °C
Relative humidity (non-condensing)		0-100%		
Installation altitude [6]		3,000 m above sea level		
Equipment				
Inverter version		X series (Master-Slave), M series (Multi-MPPT), B series (Monoblock) [7]		
BT-AUX switchgear		Standard version (Full version and high-speed communication infrastructure optional)		
LV / MV Transformer		Dry type cast resin or Oil immersed hermetically sealed		
MV Switchgear		0L1P, 1L1P or 2L1P cells with either fuses or circuit breaker protection		
Mechanical Information				
Structure Material		Steel		
Insulation		Sandwich panels containing a 50 mm rigid fire-proof polyurethane foam filling		

Notes: [1] Including inverters, instrumentation, auxiliary services switchgear, monitoring systems [2] Pure Free Cooling function / Cooling function [3] Equipped with oil immersed hermetically sealed LV / MV transformers [4] For INGECON® SUN PowerMax, "M" and "X" series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 45 °C operating temperature. Derating above 45 °C of 1.8% for each °C of increase until 60 °C operating temperature [4] For INGECON® SUN PowerMax, "B" series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 50 °C operating temperature. Derating above 50 °C of 1.8% for each °C of increase until 60 °C operating temperature [5] -30 °C with optional kit [6] Please contact Ingeteam for altitudes higher than 1,000 m [7] Not available with air conditioning.

	Length	Width	Height
Size (mm)			
Body dimensions	12,192	2,438	2,896
Overall dimensions with all doors open	14,400	3,700	2,896
Foundation dimensions	14,142	5,000	300

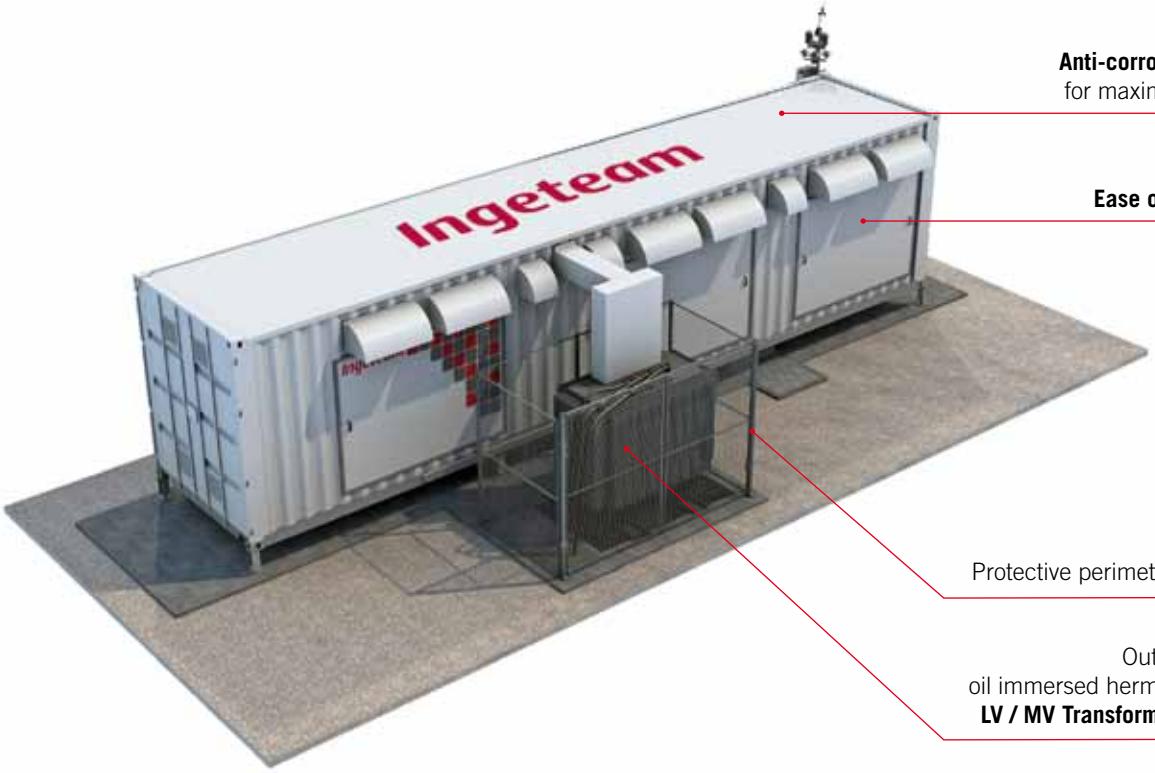
CON 40





INGECON SUN PowerStation

Solution up to 4920 kVA (3 PV inverters)



Anti-corrosion treatment
for maximum durability

Ease of maintenance

Protective perimeter metal fence

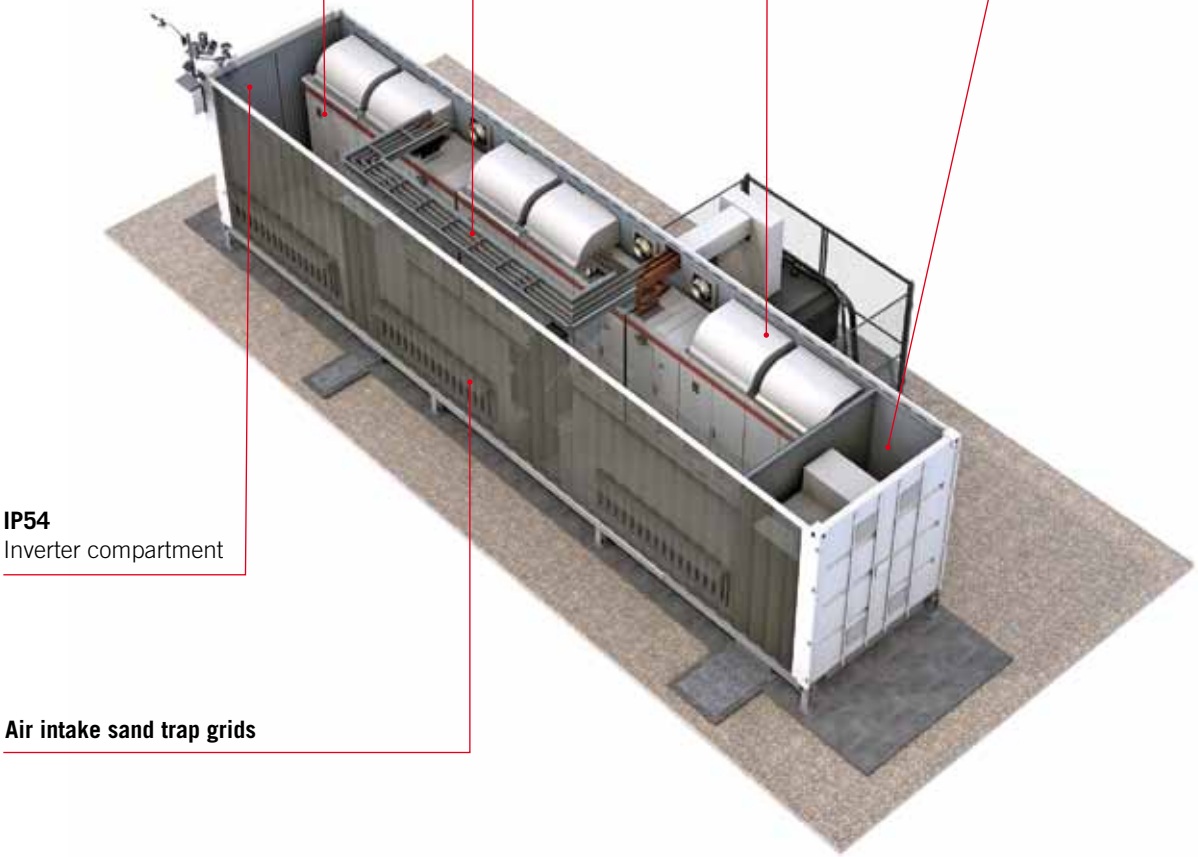
Outdoor mounted
oil immersed hermetically sealed
LV / MV Transformer up to 36 kV

INGECON® SUN
PowerMax inverters
up to 4920 kVA

Solid aluminium and
flexible copper busbars for
LV power distribution

High efficiency air
extraction plenums
for the inverters

IP55
Forced Air ventilation
MV Cubicle compartment



IP54
Inverter compartment

Air intake sand trap grids

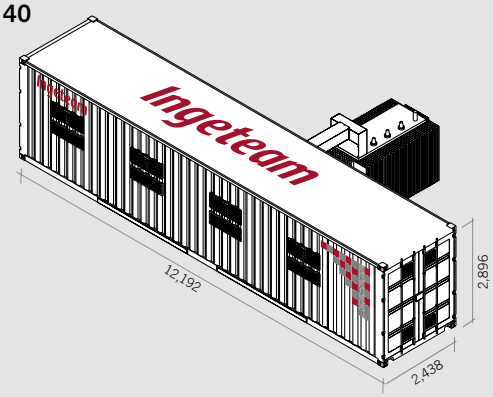
** Illustrative image. It might not correspond with the basic configuration.*

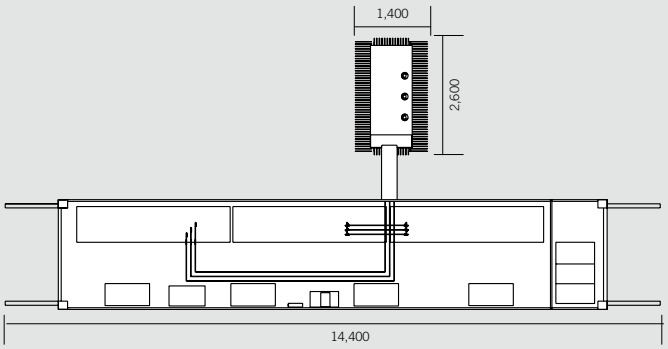
		CON 40 FA / OD / FA	CON 40 AC / OD / FA	CON 40 RC / OD / FA
General Information				
Inverter Compartment[1]	Cooling system	Forced air ventilation	Air conditioning with Free Cooling function	Recirculation air conditioning
	Air extraction / Air intake	Overpressure dampers with anti-rain covers / Filtered sand trap grids	Overpressure Dampers / Filtered grids with anti-rain covers	Overpressure Dampers / Standard grids with anti-rain covers
	Max. power consumption	630 W	7,200 / 24,000 W[2]	24,000 W
	Protection degree	IP54	IP54	IP65
	Max. power @ 1,000 Vdc (X, M Series)	3,492 kVA @ 30 °C 3,213 kVA @ 45 °C		
	Max. power @ 1,000 Vdc (B Series)	3,492 kVA @ 35 °C 3,213 kVA @ 50 °C		
	Max. power @ 1,500 Vdc (B Series)	4,911 kVA @ 25°C / 4,092 kVA @ 50°C		
MV Cubicle compartment	Cooling system	Forced air with temperature control		
	Air extraction / Air intake	Filtered anti-rain grids		
	Max. power consumption	65 W		
	Protection degree	IP55		
LV / MV Transformer	Mounting type	Outdoor mounting with protective perimeter metal fence		
	Cooling system	Natural air ventilation		
Operating temperature range[4]		from -20 °C to +55 °C[3]	from -20 °C to +55 °C	from -20 °C to +60 °C
Relative humidity (non-condensing)		0-100%		
Installation altitude[5]		3,000 m above sea level		
Equipment				
Inverter version		X series (Master-Slave), M series (Multi-MPPT), B series (Monoblock)[6]		
BT-AUX switchgear		Standard version (Full version and high-speed communication infrastructure optional)		
LV / MV Transformer		Oil immersed hermetically sealed		
MV Switchgear		0L1A, 1L1A or 2L1A cells with circuit breaker protection		
Mechanical Information				
Structure Material		Steel		
Insulation		Sandwich panels containing a 50 mm rigid fire-proof polyurethane foam filling		

Notes: [1] Including inverters, instrumentation, auxiliary services switchgear, monitoring systems [2] Pure Free Cooling function / Cooling function [3] For INGECON® SUN PowerMax, "M" or "X" series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 45 °C operating temperature. Derating above 45 °C of 1.8% for each °C of increase until 55 °C operating temperature [3] For INGECON® SUN PowerMax, "B" series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 50 °C operating temperature. Derating above 50 °C of 1.8% for each °C of increase until 55 °C operating temperature [4] -30 °C with optional kit [5] Please contact Ingeteam for altitudes higher than 1,000 m [6] Not available with air conditioning.

	Length	Width	Height
Size (mm)			
CON 40 dimensions	12,192	2,438	2,896
CON 40 overall dimensions with doors open	14,400	3,700	2,896
LV / MV transformer indicative dimensions	2,600	1,400	2,700
Foundation dimensions	14,142	7,500	300

CON 40





INGECON SUN PowerStation

FULL SKID

UL 1741 COMPLIANT

From 610 to 4900 kVA

Fully integrated turnkey solution, customized up to 4900 kVA

This brand new medium voltage solution integrates all the devices required for a multi-megawatt system.

Maximize your investment with a minimal effort

INGECON® SUN PowerStation U is a compact, customizable and flexible solution that can be configured to suit each customer's requirements. It features from one to three PV central inverters from Ingeteam's PowerMax B Series. All the equipment is suitable for outdoor installation, so there is no need of any kind of housing.

Higher adaptability and power density

This PowerStation is now more versatile, as it can be integrated using a concrete or steel base frame. Moreover, it features a greater adaptability and power density, as it can fit one, two or three PV inverters into the same skid.

Plug & Play technology

This MV turnkey solution integrates power conversion equipment –up to 4,900 kVA-, liquid-filled pad-mounted transformer up to 35 kV class and the frame for the low voltage equipment. It is delivered fully furnished for its Plug & Play installation at the site.

Complete accessibility

Thanks to the lack of housing, the inverters can have immediate access. Furthermore, the design of the B Series central inverters has been conceived to facilitate maintenance and repair works.

Maximum protection

Ingeteam's B Series central inverters integrate the latest generation electronics and a much more efficient electronic protecion. Apart from that, they feature the main electrical protections and they deploy grid support functionalities, such as low voltage ride-through capability, reactive power deliverance and active power injection control.

INGECON SUN PowerStation

Three possible configurations

Single Inverter Power Station

From 610 kVA up to 1,164 kVA at 1,000 Vdc.
From 1,170 kVA up to 1,637 kVA at 1,500 Vdc.

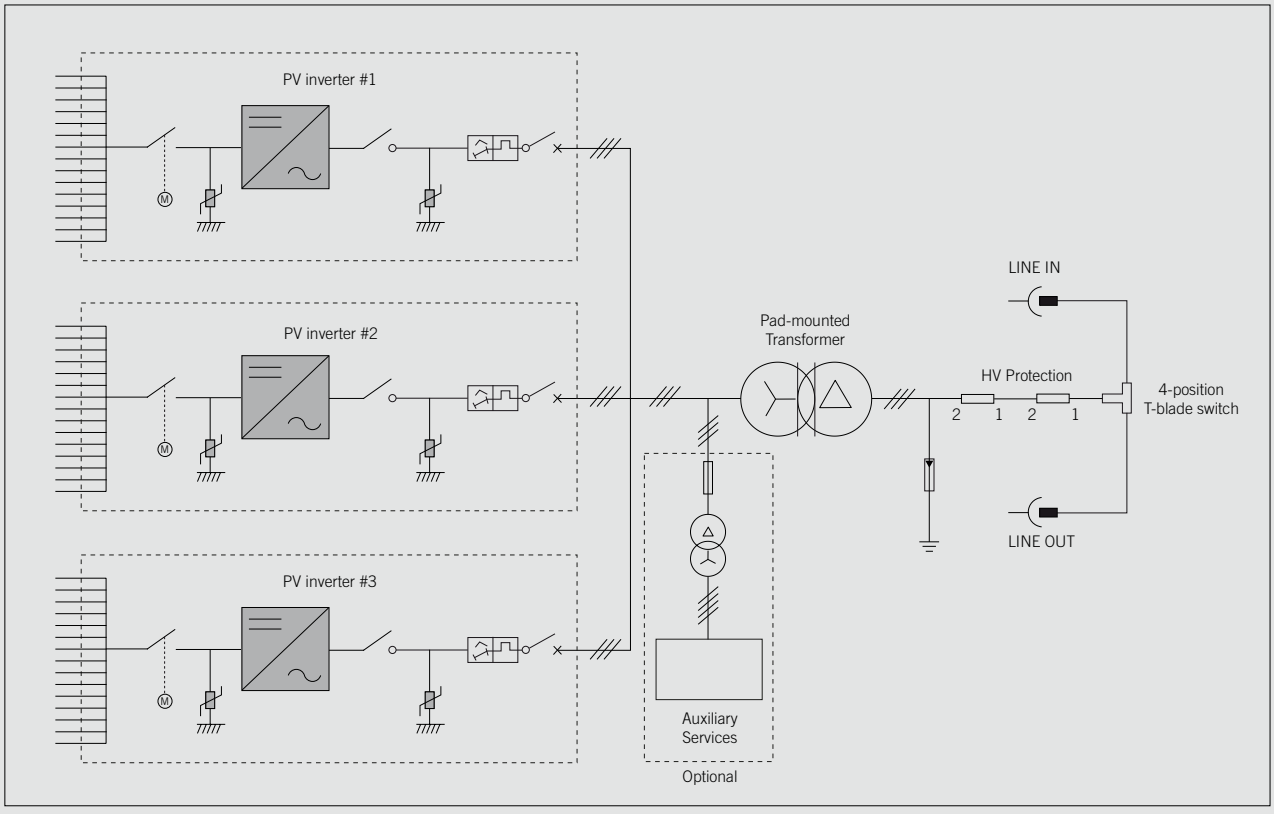
Double Inverter Power Station

From 1,220 kVA up to 2,328 kVA at 1,000 Vdc.
From 2,340 kVA up to 3,275 kVA at 1,500 Vdc.

Triple Inverter Power Station

From 1,830 kVA up to 3,492 kVA at 1,000 Vdc.
From 3,510 kVA up to 4,911 kVA at 1,500 Vdc.

Configuration with three PowerMax B Series inverters



CONSTRUCTION

- Concrete or steel base frame.
- Suitable for slab or piers mounting.
- Compact design, minimizing freight costs.

STANDARD EQUIPMENT

- Up to 3 outdoor central inverters with an output power of 4.75 MVA
- Liquid-filled pad-mounted transformer up to 35 kV class (ask Ingeteam for transformer details).
- Frame for installation of LV equipment.
- Complete integration for faster installation at project site.

OPTIONS UPON REQUEST

- Electrical gear as per customer necessities: low voltage distribution panels, auxiliary transformers, SCADA panels, and integration on metal frame.
- Integration of DC recombiners (ask Ingeteam for modifications on the power station design).
- Metering equipment.
- Remote communications.
- DOE 2016 transformer.
- SCADA for system supervision.
- Start-up at the system site.

	FSK 20 - Single Inverter	FSK 20 - Double Inverter	FSK 30 - Triple Inverter
Number of inverters	1	2	3
Rated power @ 50 °C / 122 °F	1,070 kVA	2,140 kVA	3,210 kVA
Max. power @ 25 °C / 77 °F	1,164 kVA	2,328 kVA	3,492 kVA
Skid Size	20 x 7 ft	20 x 8 ft	30 x 8 ft
Max. Estimated weight (metal version)	20,000 - 25,000 lbs	30,000 - 35,000 lbs	40,000 - 45,000 lbs
Transformer arrangemet	Dead front loop feed	Dead front loop feed	Dead front loop feed
Transformer target efficiency (50% load)	99.2%	99.31%	99.23%
Voltage class	15 / 25 / 35 kV	15 / 25 / 35 kV	15 / 25 / 35 kV
Installation altitude	Up to 3,000 m	Up to 3,000 m	Up to 3,000 m
Operating temperature range	-4 °F to +131 °F / -20 °C to +55 °C	-4 °F to +131 °F / -20 °C to +55 °C	-4 °F to +131 °F / -20 °C to +55 °C
Protection class	NEMA 3	NEMA 3	NEMA 3

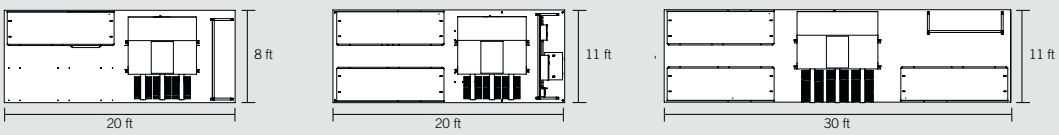
1,000 Vdc

Footprint and layout

	FSK 20 - Single Inverter	FSK 20 - Double Inverter	FSK 30 - Triple Inverter
Number of inverters	1	2	3
Rated power @ 50 °C / 122 °F	1,364 kVA	2,728 kVA	4,092 kVA
Max. power @ 25 °C / 77 °F	1,637 kVA	3,275 kVA	4,911 kVA
Skid Size	20 x 8 ft	20 x 11 ft	30 x 11 ft
Max. Estimated weight (metal version)	24,000 - 29,000 lbs	36,000 - 41,000 lbs	51,000 - 56,000 lbs
Transformer arrangemet	Dead front loop feed	Dead front loop feed	Dead front loop feed
Transformer target efficiency (50% load)	99.2%	99.31%	99.23%
Voltage class	15 / 25 / 35 kV	15 / 25 / 35 kV	15 / 25 / 35 kV
Installation altitude	Up to 6,562 ft (2,000 m)	Up to 6,562 ft (2,000 m)	Up to 6,562 ft (2,000 m)
Operating temperature range	-4 °F to +131 °F / -20 °C to +55 °C	-4 °F to +131 °F / -20 °C to +55 °C	-4 °F to +131 °F / -20 °C to +55 °C
Protection class	NEMA 3	NEMA 3	NEMA 3

1,500 Vdc

Footprint and layout



INGECON SUN PowerStation

CON 20 Base concrete

From 1660 to 6560 kVA

Complete turnkey solution designed for utility-scale plants.
20 ft. container with outdoor PV inverters and outdoor MV transformer

Thanks to its CSC approval for overseas shipment, The INGECON® SUN PowerStation CON 20 can be marketed and installed everywhere in the world. This MV turnkey solution integrates up to four transformerless PV central inverters, liquid-filled step up transformer, Medium Voltage switchgear, Low Voltage distribution panels and monitoring equipment. It is delivered fully equipped for Plug & Play installation at project site.

Robust and long-lasting design
The INGECON® SUN PowerStation CON 20 is a standard solution specifically designed to maximise the compactness and cost-effectiveness of the overall equipment. The Medium Voltage switchgear, Low Voltage panels and monitoring equipment are installed in an IP55 compartment to ensure their maximum protection. The sandwich panels of this compartment are made of galvanized painted steel, filled with a 50 mm layer of rigid fire proof polyurethane foam, ensuring perfect waterproofness over time and efficient thermal insulation.

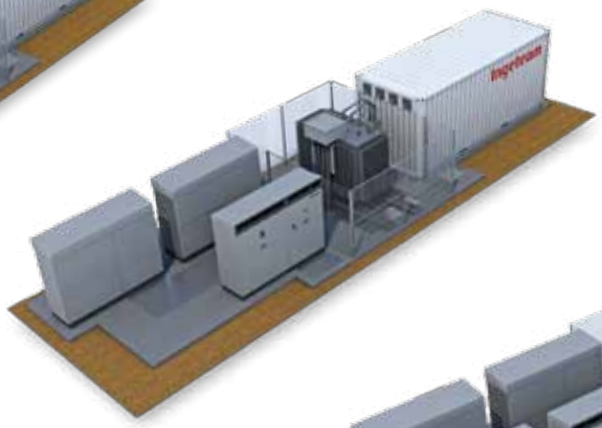
Equipped with everything necessary
High efficiency inverters, auxiliary services switchgear, Medium Voltage cubicle and LV / MV transformer. Available with high-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to Power Plant Controller, monitoring and SCADA systems.

Complete accessibility
Thanks to its innovative design, all devices are readily accessible. The use of outdoor central inverters and outdoor mounted MV transformer provides full access for maintenance of the equipment. The transformer perimeter fence is equipped with a safety lock with a blocking code.

Maximum power density
This INGECON® SUN PowerStation CON 20 is available with two, three or four INGECON® SUN PowerMax B Series 1,000 Vdc or 1,500 Vdc inverters, Ingeteam's most compact PV inverters, as they provide the maximum power per cubic foot. This makes it possible to achieve up to 6,560 kVA in a single inverter station.

Grid support
The INGECON® SUN PowerMax PV inverters have been designed to comply with the most demanding international grid codes, contributing to the quality and stability of the electric system. Low voltage and High voltage ride-through capability, reactive power deliverance and active power control are just some of their main features.

CON 20 OD / OD / FA
(up to 3280 kVA)



CON 20 OD / OD / FA
(up to 4920 kVA)

CON 20 OD / OD / FA
(up to 6,560 kVA)

MAIN FEATURES

- Output power up to 6,560 kVA.
- Equipped with two, three or four outdoor central inverters.(1)
- Equipped with oil immersed hermetically sealed LV / MV transformer (up to 36 kV).
- IP55 protection rating compartment for MV Switchgear and LV equipment.
- Rated power up to 50 °C ambient temperature.(1)
  Suitable for concrete slab or piers mounting.
- CSC certification for container shipping.
- Plug & Play solution.
- Maximum reliability, higher safety and reduced maintenance.
- Installation Altitude: 3000 m above sea level. (1)

ELECTRICAL PROTECTIONS

- Reverse polarity.
- Output short-circuits and overloads.
- DC fuses.
- Motorized DC switches with door control.
- AC thermal-magnetic breakers with door control.
- DC and AC overvoltage suppressors.
- Anti-islanding monitoring system with automatic disconnection.
- Insulation monitoring system.
- Automatic disconnection system in case of LV / MV transformer overheat.
- Emergency disconnection button, accessible from outside.
- DGPT2 protection relay included in the transformer.
- MV protection with fuse or circuit breaker protections.

STANDARD EQUIPMENT

- LV / MV transformer with reduced power losses.
- Up to four INGECON® SUN PowerMax B series central PV inverters.
- MV switchgear.
- Auxiliary power outlet.
- Fully equipped auxiliary services panel.
- Internal and emergency lighting systems.
- Fire detection system with automatic disconnection (both DC and AC sides).
- Safety interlocks for MV transformer compartment door.
- Fire safety kit.
- Medium Voltage safety kit.
- First aid kit and safety signals.

OPTIONAL EQUIPMENT

In addition to the standard equipment, the INGECON® SUN PowerStation can be supplied with the following options:

- LV / LV transformer for the power supply to the auxiliary services panel.
- LV / MV transformer with reduced power losses according to EU 548/2014.
- UPS for auxiliary services.
- High-speed Ethernet / Fiber Optic communication infrastructure for Plug & Play connection to Power Plant Controller and / or SCADA systems.
- INGECON® SUN series 16/24/32 channels intelligent or passive string combiner boxes.
- INGECON® SUN SCADA supervision, control and data acquisition system.
- INGECON® SUN EMS Plant Controller compliant with the most widely international Grid Codes.
- Gateway for monitoring and control of the PV Plant by the Grid Operator using standard protocols (like IEC 61850, IEC 60870-5-101/104, DNP 3.0, etc.).
- Central and field meteo stations.
- HV surge arresters.
- Anti-rodent system.
- Human intrusion detection system.
- External lighting system.
- Oil retention tank (separately supplied).
- Energy meter for auxiliary services and / or energy production.
- Insulation monitoring relay for continuous monitoring of IT systems insulation.
- Three-phase capacitors with blocking inductances for Power Factor correction.
- Reactive power regulation with no PV array power.
- Ground connection of the PV array.
- Painted with specific RAL upon request.

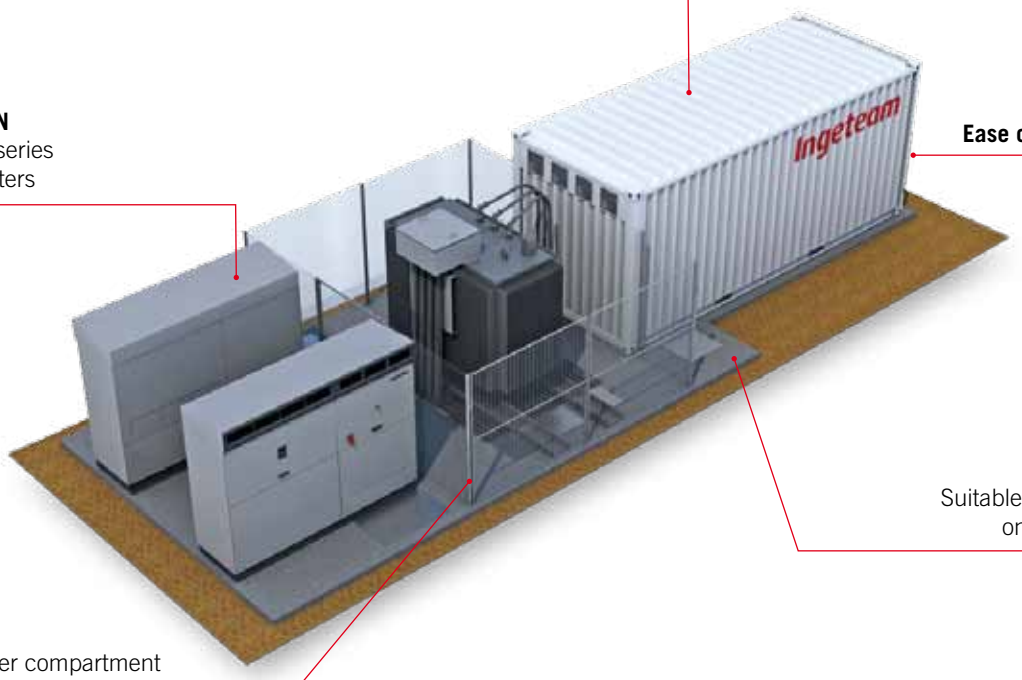
(1) *Refer to Technical Characteristics tables for further details.*

INGECON SUN PowerStation

Anti-corrosion treatment for maximum durability

INGECON® SUN
PowerMax B series
Outdoor inverters

Ease of maintenance

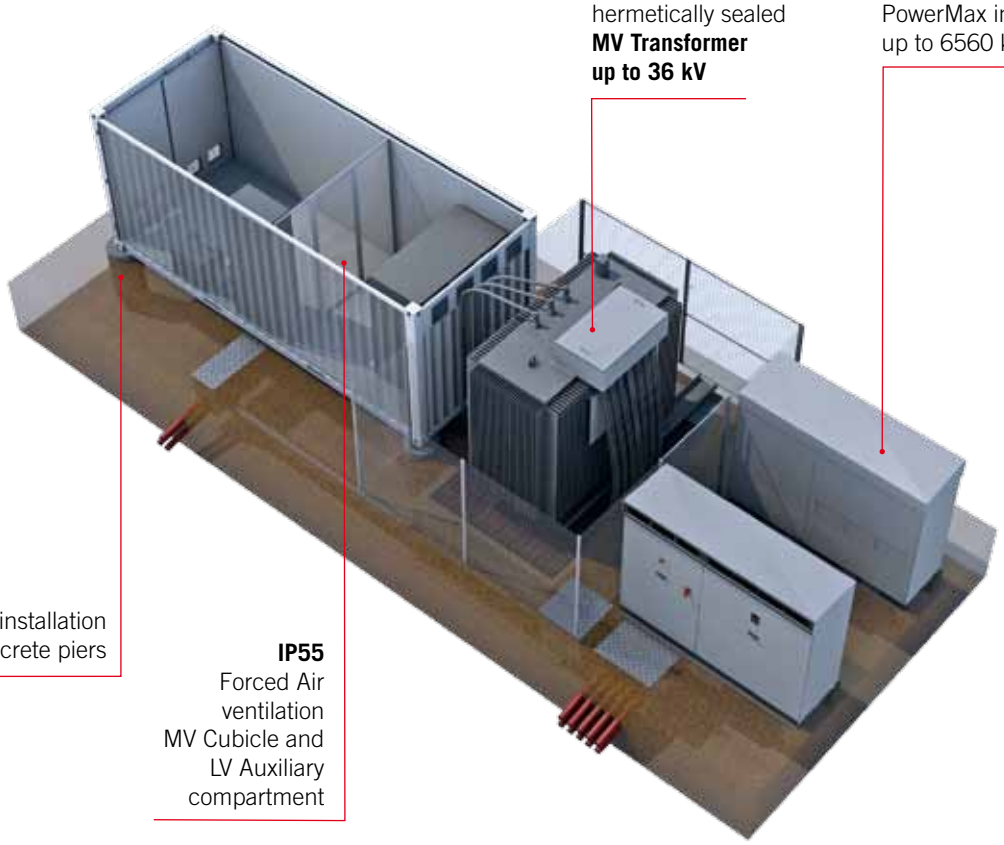


Suitable for installation
on concrete slab

MV transformer compartment
with **protective metal grids**

Oil immersed
hermetically sealed
MV Transformer
up to 36 kV

INGECON® SUN
PowerMax inverters
up to 6560 kVA



Suitable for installation
on concrete piers

IP55
Forced Air
ventilation
MV Cubicle and
LV Auxiliary
compartment

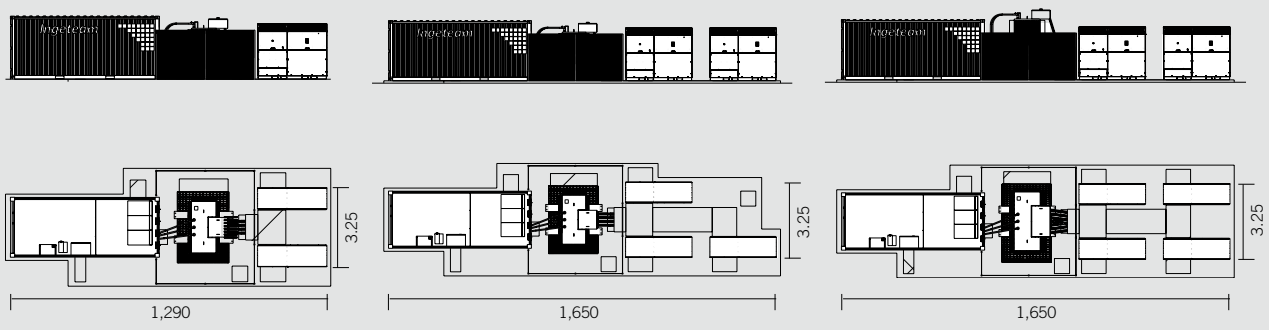
** Illustrative image. It might not correspond with the basic configuration.*

		CON20 OD / OD / FA		
General Information				
Number of inverters		2	3	4
Max. output power @ 1,000 Vdc (B series)		2,328 kVA @ 35 °C 2,142 kVA @ 50 °C	3,492 kVA @ 35 °C 3,213 kVA @ 50 °C	4,660 kVA @ 35 °C 4,284 kVA @ 50 °C
Max. output power @ 1,500 Vdc (B series)		3,274 kVA @ 25 °C 2,728 kVA @ 50 °C	4,910 kVA @ 25 °C 4,092 kVA @ 50 °C	6,548 kVA @ 25 °C 5,456 kVA @ 50 °C
Central Inverters	Cooling system	Natural air ventilation (forced air ventilation inside the inverters)		
	Max. power consumption	5 kVA	7.5 kVA	10 kVA
	Protection rating	IP56		
LV / MV Transformer	Cooling system	Natural air ventilation		
	Max. power consumption	0 W		
	Protection rating	Hermetically sealed		
LV and MV Switchgear compartment [1]	Cooling system	Forced air with temperature control		
	Air extraction / Air intake	Filtered anti-rain grids		
	Max. power consumption	260 W		
	Protection rating	IP55		
Operating temperature range[2]		-20 to +55 °C [3]		
Relative humidity		0 - 100%		
Installation altitude [6]		3,000 m above sea level		
Equipment				
Inverter version		INGECON® SUN PowerMax B series 1,000 V or 1,500 V (Monoblock)		
LV Auxiliary Switchgear		Standard version (Full version and high-speed communication infrastructure optional)		
LV / MV Transformer		Oil immersed hermetically sealed		
MV Switchgear		0L1P, 1L1P or 2L1P cells with either fused or circuit breaker protection		
Mechanical Information				
Structure Material		Steel		
Insulation		Sandwich panels containing a 50 mm rigid fire-proof polyurethane foam filling		

Notes: [1] Including instrumentation, auxiliary services switchgear, monitoring systems [2] For INGECON® SUN PowerMax B series 1,000 V and 1,500 V series: rated output power indicated in the Technical Characteristics tables is guaranteed up to 50 °C operating temperature. Derating above 50 °C of 1.8% for each °C of increase until 55 °C operating temperature [3] -30 °C with optional kit [4] Please contact Ingeteam for altitudes higher than 1,000 m.

	2 inverters	3 inverters	4 inverters
Size (cm)			
Length	1,290	1,650	1,650
Length (with doors open)	1,400	1,760	1,760
Width	3.25	3.25	3.25
Width (with doors open)	4.66	4.66	4.66

CON20 OD / OD / FA



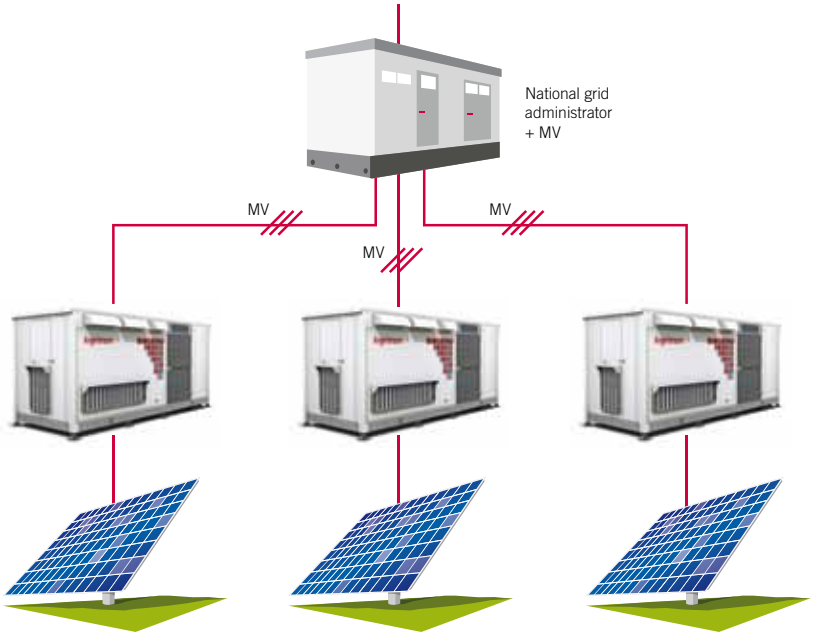
2 inverters 3 inverters 4 inverters

Different installation configurations

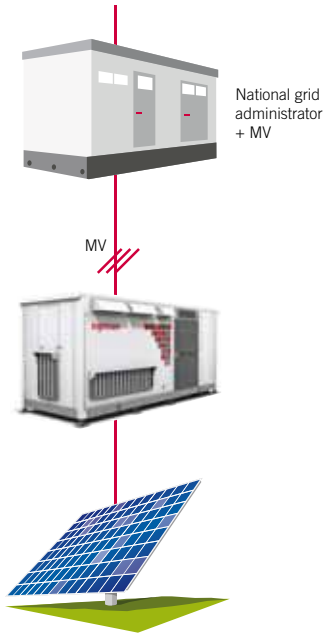
Configuration

This system is very flexible and offers different configuration possibilities. A single component can control all the elements, reducing production times, facilitating the maintenance and making repairing processes more efficient.

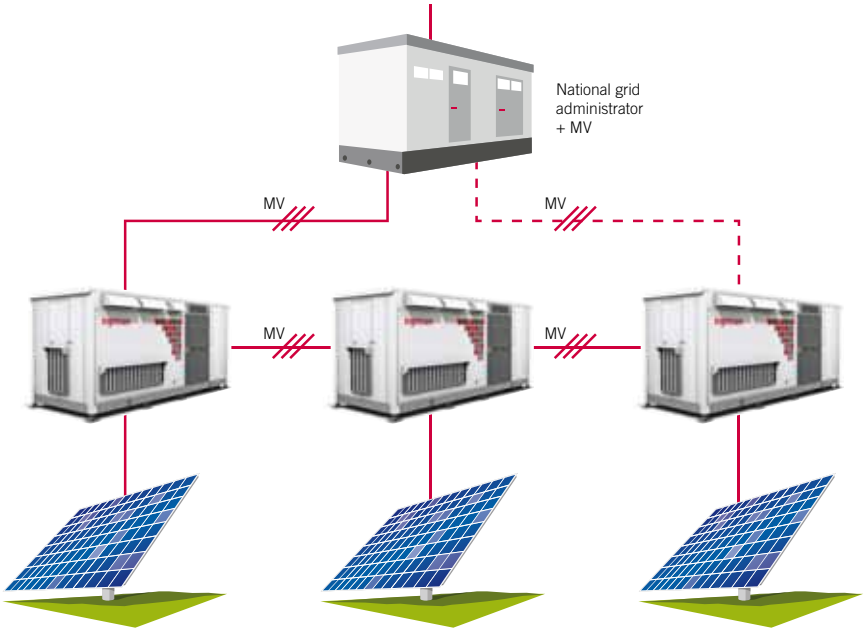
Installation with multiple INGECON® SUN PowerStations in star connection



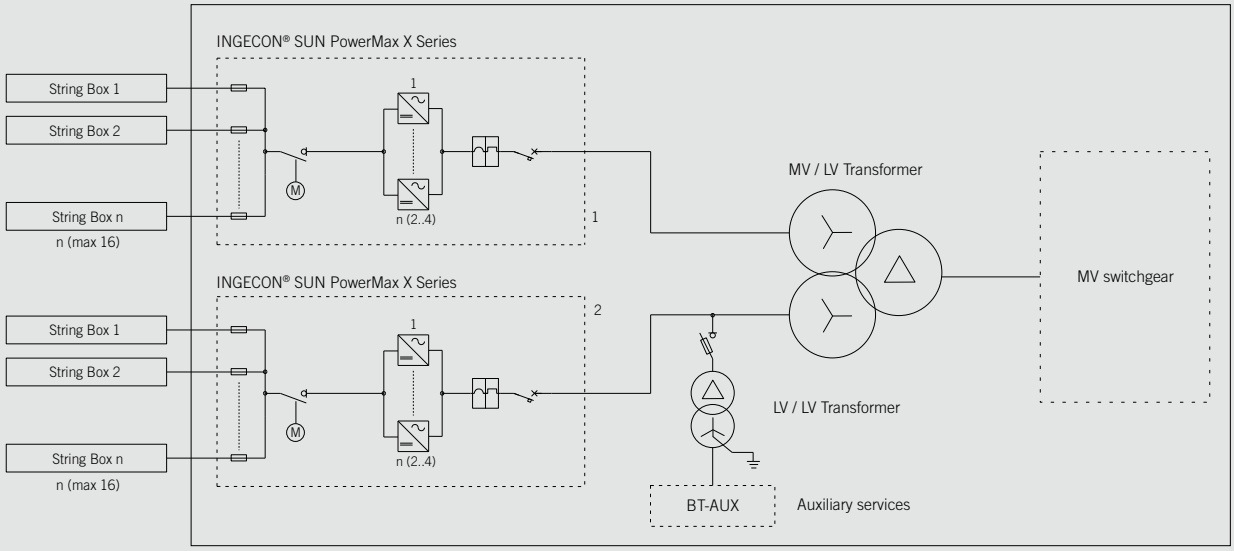
Installation with single INGECON® SUN PowerStation



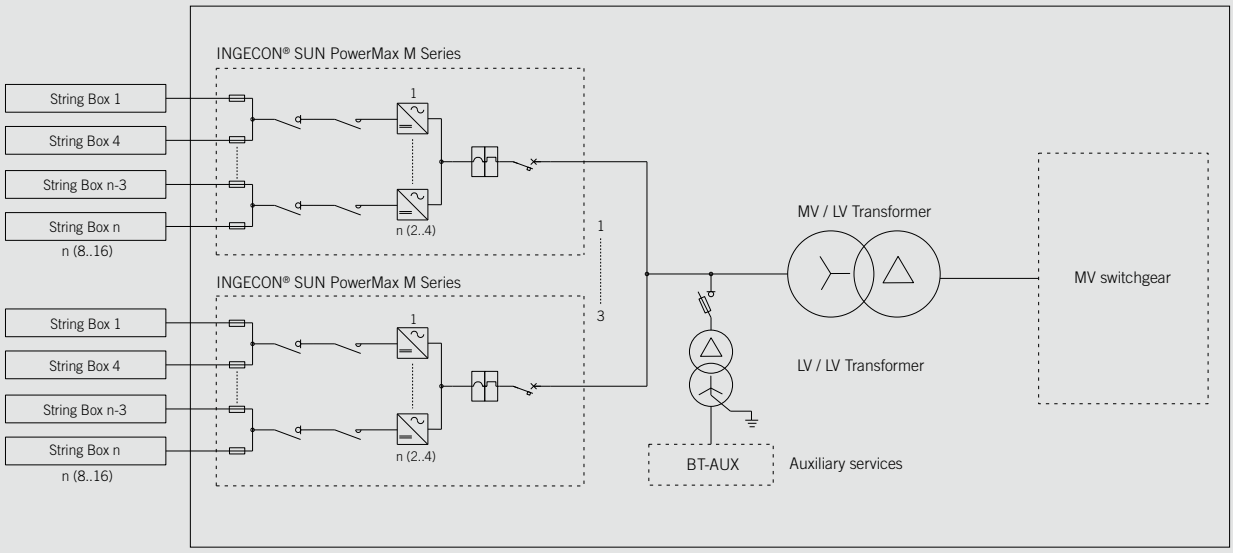
Installation with multiple INGECON® SUN PowerStations in delta connection



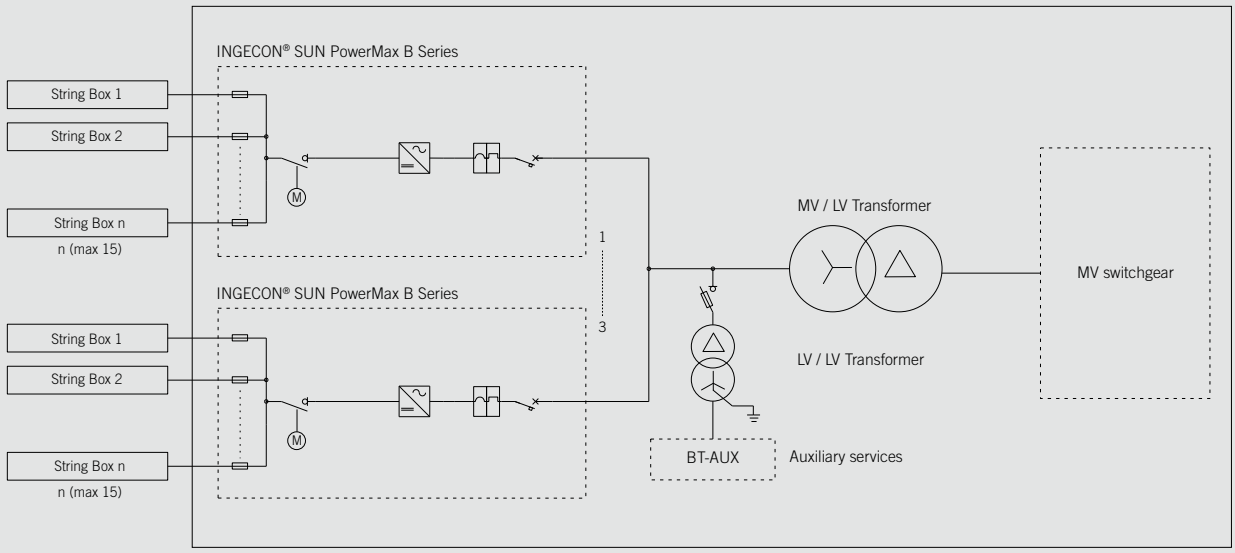
Configuration with PowerMax X Series (Master-Slave) inverters



Configuration with PowerMax M Series (Multi-MPPT) inverters



Configuration with PowerMax B Series (Monoblock) inverters



INGECON SUN STORAGE

BATTERY INVERTERS (ON- / OFF-GRID)

Smart solutions for stand-alone systems

A large number of remote villages all over the world are still forced to resort to alternative energy generation solutions to supply their needs. Due to economic factors, pollution and, of course, dependence, the power generation systems based solely on fossil fuels, no longer appear to be the best option.

Ingeteam has applied all its experience in the electrical engineering sector in order to develop solutions for these alternative energy generation systems.

As a result, Ingeteam is proud to offer a wide range of products capable of meeting all types of needs and requirements.

Based on the premise of making an uninterrupted energy supply available, Ingeteam has designed some robust, easy-to-install equipment, with priority given to the generation of electricity through renewable energy sources.

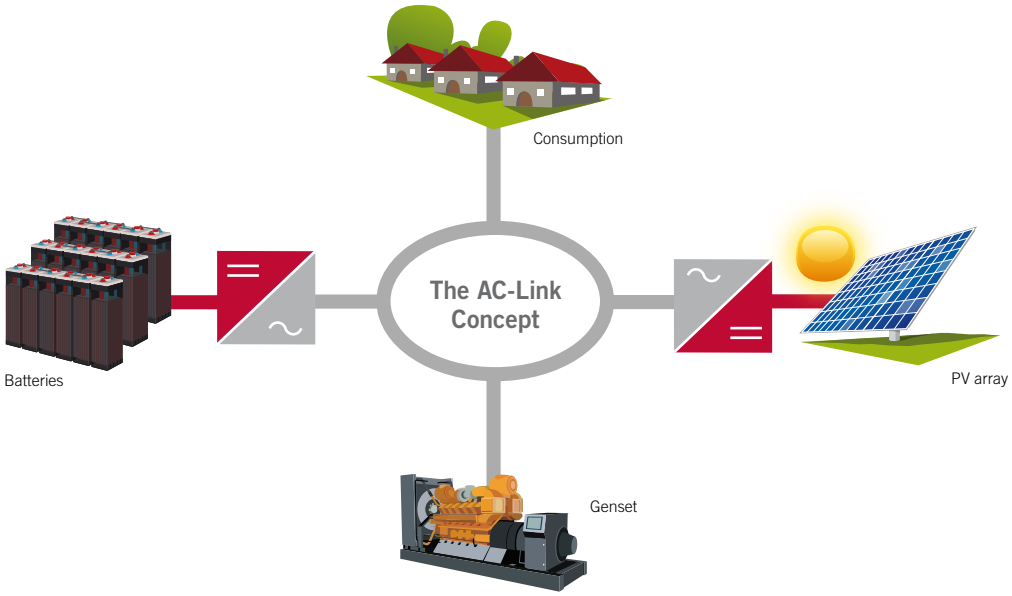
The sun and the wind are resources that are as old as they are plentiful in our environment and, as such, they form the base that supports our systems.

We are referring to converters capable of generating energy by means of these resources, and supported by a system of batteries in order to ensure that power is delivered to the mini-grid whenever the photovoltaic and wind power systems are unable to power the loads.

Within our range of products for off-grid systems we include single-phase and three-phase solutions being able to fit in all type of load demands.

The AC-Link Concept

The AC-Link Concept consists of an off-grid AC network to which the loads and the renewable energy sources are coupled. This AC grid is generated by a battery inverter that acts as a grid manager by establishing the voltage's amplitude and frequency.



The INGECON® SUN STORAGE battery inverter controls the energy coming from the sources and the energy flows inside the AC grid, by modifying the frequency of the grid voltage. As a result, it guarantees the correct balance between generation, consumption and the storage system.

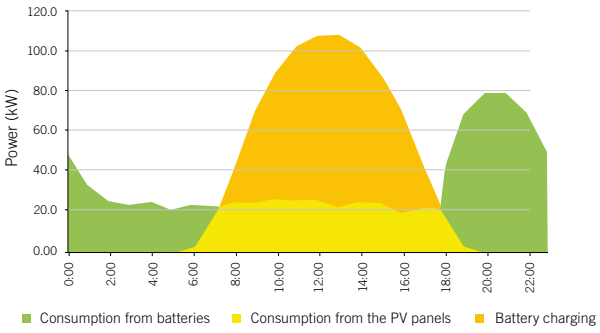
Apart from that, the battery inverter manages the batteries' state of charge and the operation of an optional auxiliary AC source (a genset or the public grid).

When the renewable sources are available the energy generated feeds the loads, while the excess is stored in the batteries. But if the loads demand more energy than the one available, the batteries will provide the amount of energy needed.

Regarding the operation of an auxiliary genset, it will only be connected when the batteries' state of charge is lower than a certain programmable threshold.

ADVANTAGES

- 100% Renewable energy.
- The AC-Link Concept allows to use standard grid-connected INGECON® SUN PV inverters.
- Thanks to the management system that controls the power generated, no communication is required between the PV and the battery inverters.
  This enables to locate the energy generation sources in a distributed manner, e.g., rooftop installations in an island, where there is not much land available.
- If the public grid reaches the installation, the micro-grid could be coupled to it. In that case, the energy coming from renewable sources will be prioritised to satisfy the demand of the loads.



INGECON SUN STORAGE 1Play

With transformer

3 / 6

Single-phase battery inverter with transformer

The INGECON® SUN STORAGE 1Play battery inverter is a single-phase, two-way unit that can either be used in off-grid systems or connected to the general supply network.

Battery management
The INGECON® SUN STORAGE 1Play inverters feature cutting-edge technology to control the charging and discharging of the storage system in order to maximise the battery service life. The battery temperature could be controlled at all times, ensuring correct battery operation and durability. The inverter incorporates a pre-charge system to avoid battery inrush currents.

Back-up genset
The INGECON® SUN STORAGE 1Play permits the connection of a back-up genset, should this be necessary. Furthermore, the inverter can be started-up using this generator, in order to charge the batteries when these are completely discharged.

PV input
INGECON® SUN STORAGE 1Play inverters incorporate a PV input. Thanks to this input, the PV array can be connected directly to the inverter.

Energy Management System
Optionally, the inverter can integrate an energy management system (EMS Board or EMS Manager). The EMS Board can be integrated inside the inverter. It enables some more advanced features, like peak shaving. Additionally, the EMS Manager offers load control possibilities.

3 year warranty, extendible up to 25 years

PROTECTIONS

- Galvanic isolation between the DC and AC sides.
- AC overvoltages.
- Insulation faults.
- Output shortcircuits and overloads.

OPTIONAL ACCESSORIES

- Inverter communication via RS-485 and Ethernet.
- DC switch for the PV field.
- AC power supply system.
- INGECON® SUN EMS Board.
- INGECON® SUN EMS Manager.
- USB port for Wi-Fi communication (in combination with EMS Board).

MAIN FEATURES

- PV input.
- CAN communication for smart batteries.
- Configurable potential-free inputs.
- Configurable potential-free outputs, some for the connection and disconnection of the back-up genset.
- DC pre-charge system.
- Battery temperature measurement circuit built-in. PT100 (3-wire) needed.

Operating modes:

- **Stand-alone mode**
  The INGECON® SUN STORAGE 1Play inverter generates a stand-alone AC grid and acts as a grid manager, guaranteeing the correct balance between generation, consumption and the storage system. To do so, it controls the energy flow between the grid and the batteries, based on the status at any given time.

  The INGECON® SUN STORAGE 1Play inverter makes it possible to integrate a solar energy source into the grid, as it integrates a photovoltaic input. An advanced control system, requiring no communications, manages the power generated by the PV inverters, based on consumption data and the battery charge status. The back-up power source (a genset or the public grid) only connects when the battery state of charge is below a certain programmable threshold.

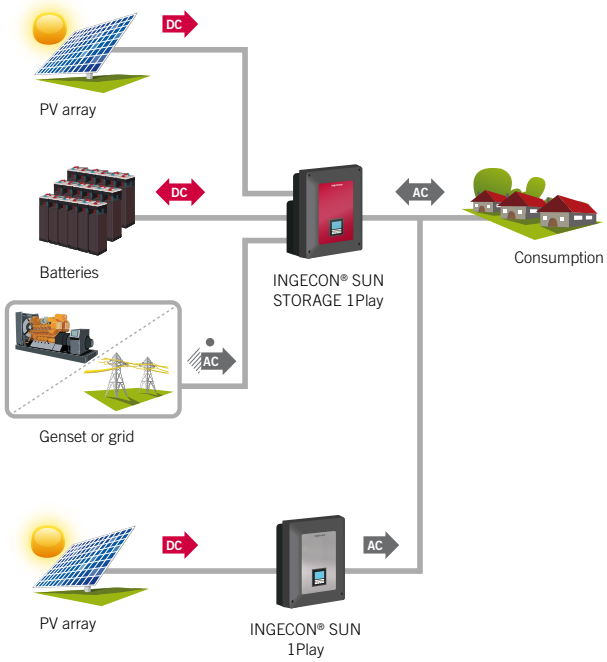
- **Back-up mode**
  This operating mode has been designed for grid-connected systems, where grid outages are long and frequent, meaning that a back-up power source is required. The INGECON® SUN STORAGE 1Play inverter operates through a connection to the AC grid. In order to guarantee a power source, the inverter maintains the batteries charged. During a grid outage, the battery inverter generates the AC network and the energy stored in the batteries is used to power the loads. If any renewable energy sources are connected to the grid and the energy generated is greater than the one demanded, then the surplus could be injected into the grid.

- **Self-consumption mode**
  This operating mode is conceived for grid-connected systems with renewable energy sources, in order to minimise grid consumption. If the energy generated is greater than the one demanded, any surplus energy could charge the batteries or, if they are fully charged, the energy could be injected into the grid.If the loads demand more energy than the one produced by the renewable sources, then the batteries would cover this demand, increasing the self-consumption ratio.

- **Grid support**
  In this operating mode the inverter operates under the instructions of an external controller (EMS). Thus, in combination with the EMS Board or the EMS Manager and an external wattmeter, the inverter is able to adapt the output power to a required value. In this way, different options are available: ramp rate control, self-consumption or constant power output in a PV plant. Furthermore, this operating mode makes it possible to implement peak-shaving strategies to reduce the electricity bill by decreasing the contracted power.

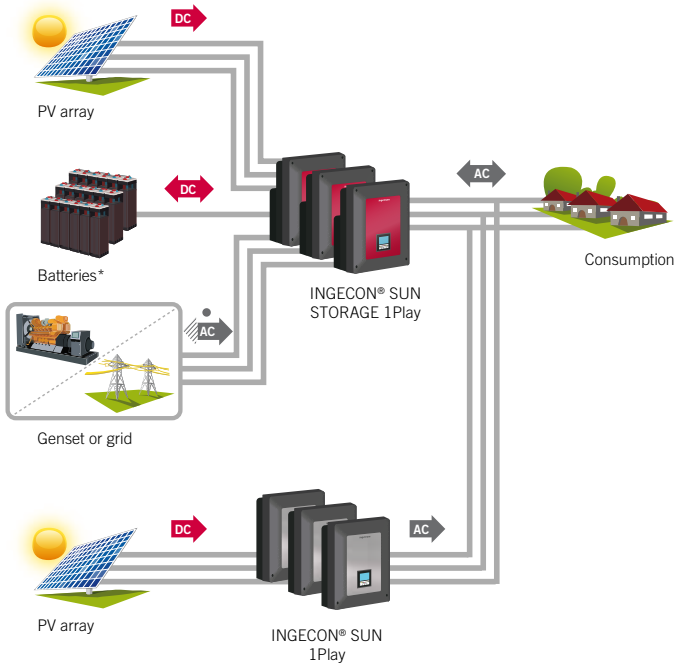
CONNECTION SCHEMA

Single-phase



● *Bidirectional only when grid is connected.*

Three-phase



** It must be a single battery bank.*

● *Bidirectional only when grid is connected.*

INGECON SUN STORAGE 1Play

Transformerless

3TL / 6TL

Single-phase transformerless battery inverter

The INGECON® SUN STORAGE 1Play TL battery inverter is a single-phase, two-way unit that can either be used in off-grid systems or connected to the general supply network.

Battery management
The INGECON® SUN STORAGE 1Play TL inverters feature cutting-edge technology to control the charging and discharging of the storage system in order to maximise the battery service life. The battery temperature could be controlled at all times, ensuring correct battery operation and durability. The inverter incorporates a pre-charge system to avoid battery inrush currents.

Back-up genset
The INGECON® SUN STORAGE 1Play TL permits the connection of a back-up genset, should this be necessary. Furthermore, the inverter can be started-up using this generator, in order to charge the batteries when these are completely discharged.

PV input
INGECON® SUN STORAGE 1Play TL inverters incorporate a PV input. Thanks to this input, the PV array can be connected directly to the inverter.

Energy Management System
Optionally, the inverter can integrate an energy management system (EMS Board or EMS Manager). The EMS Board can be integrated inside the inverter. It enables some more advanced features, like peak shaving. Additionally, the EMS Manager offers load control possibilities.

3 year warranty, extendible up to 25 years

PROTECTIONS

- AC overvoltages.
- Insulation faults.
- Output shortcircuits and overloads.

OPTIONAL ACCESSORIES

- Inverter communication via RS-485 and Ethernet.
- DC switch for the PV field.
- AC power supply system.
- INGECON® SUN EMS Board.
- INGECON® SUN EMS Manager.
- USB port for Wi-Fi communication (in combination with EMS Board).

MAIN FEATURES

- PV input.
- CAN communication for smart batteries.
- Configurable potential-free inputs.
- Configurable potential-free outputs, some for the connection and disconnection of the back-up genset.
- DC pre-charge system.
- Battery temperature measurement circuit built-in. PT100 (3-wire) needed.

Operating modes:

- **Stand-alone mode**
  The INGECON® SUN STORAGE 1Play TL inverter generates a stand-alone AC grid and acts as a grid manager, guaranteeing the correct balance between generation, consumption and the storage system. To do so, it controls the energy flow between the grid and the batteries, based on the status at any given time.

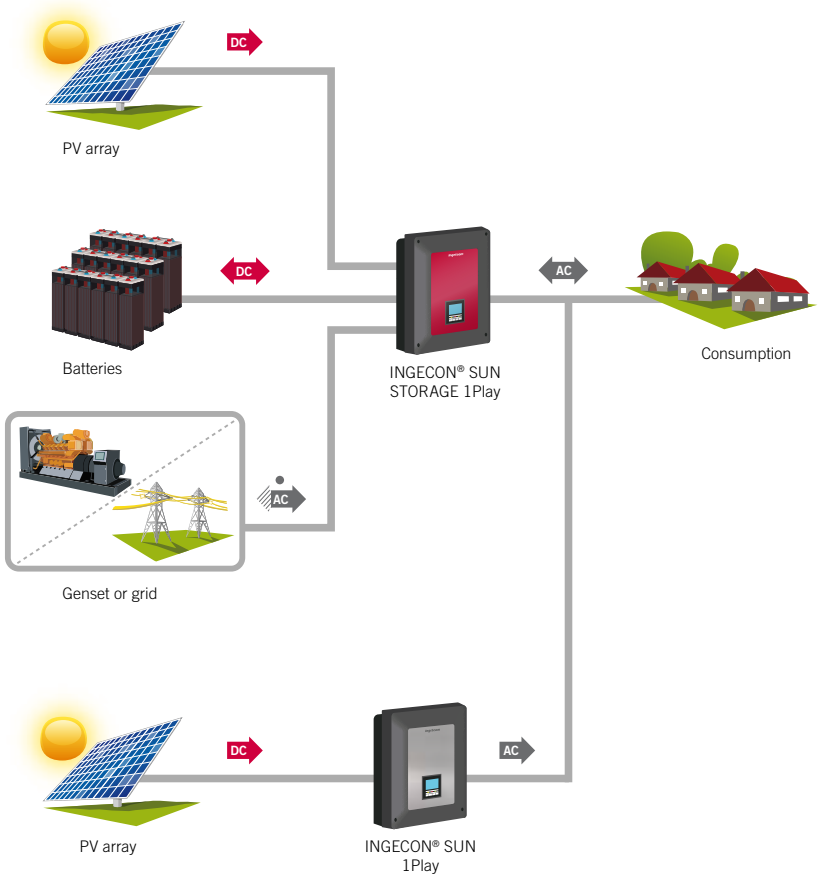
  The INGECON® SUN STORAGE 1Play TL inverter makes it possible to integrate a solar energy source into the grid, as it integrates a photovoltaic input. An advanced control system, requiring no communications, manages the power generated by the PV inverters, based on consumption data and the battery charge status. The back-up power source (a genset or the public grid) only connects when the battery state of charge is below a certain programmable threshold.

- **Back-up mode**
  This operating mode has been designed for grid-connected systems, where grid outages are long and frequent, meaning that a back-up power source is required. The INGECON® SUN STORAGE 1Play TL inverter operates through a connection to the AC grid. In order to guarantee a power source, the inverter maintains the batteries charged. During a grid outage, the battery inverter generates the AC network and the energy stored in the batteries is used to power the loads. If any renewable energy sources are connected to the grid and the energy generated is greater than the one demanded, then the surplus could be injected into the grid.

- **Self-consumption mode**
  This operating mode is conceived for grid-connected systems with renewable energy sources, in order to minimise grid consumption. If the energy generated is greater than the one demanded, any surplus energy could charge the batteries or, if they are fully charged, the energy could be injected into the grid.If the loads demand more energy than the one produced by the renewable sources, then the batteries would cover this demand, increasing the self-consumption ratio.

- **Grid support**
  In this operating mode the inverter operates under the instructions of an external controller (EMS). Thus, in combination with the EMS Board or the EMS Manager and an external wattmeter, the inverter is able to adapt the output power to a required value. In this way, different options are available: ramp rate control, self-consumption or constant power output in a PV plant. Furthermore, this operating mode makes it possible to implement peak-shaving strategies to reduce the electricity bill by decreasing the contracted power.

CONNECTION SCHEMA



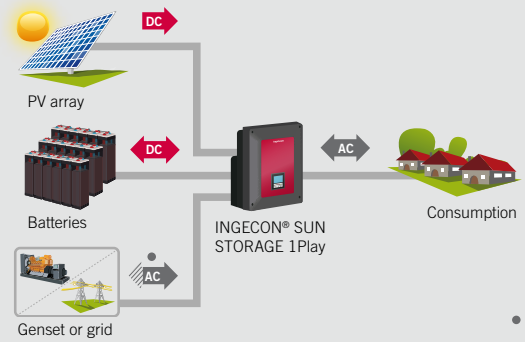
● *Bidirectional only when grid is connected.*

	3	6
PV Input (DC)		
PV array max. power	7.5 kWp	11.5 kWp
Voltage range MPP for stand-alone mode	300 - 480 V	300 - 480 V
Voltage range MPP for grid-connected modes[1]	330 - 480 V	330 - 480 V
Maximum open circuit voltage	550 V	550 V
Maximum current	20 A	30 A
Inputs	2	2
MPPT	1	1
Battery Input (DC)		
Voltage range with PV installation[2]	40 - 300 V	40 - 300 V
Voltage range without PV installation[2]	40 - 450 V	40 - 450 V
Maximum charge / discharge current	50 A	50 A
Battery type	Lead, Ni-Cd, Li-ion	Lead, Ni-Cd, Li-ion
Generator / Grid Input (AC)		
Rated voltage	230 V	230 V
Voltage range	172 - 264 V	172 - 264 V
Rated frequency	50 / 60 Hz	50 / 60 Hz
Frequency range	40 - 70 Hz	40 - 70 Hz
Charge current range	0 - 13 A	0 - 26 A
Generator or grid maximum power	11,500 W	11,500 W
Output (AC)		
Rated power[3]	3 kW	6 kW
Power (25 °C) 30 min, 2 min, 3 s[4]	3,500 / 3,900 / 5,080 W	6,400 / 6,900 / 7,900 W
Current	13 A	26 A
Rated voltage[5]	200 - 240 V	200 - 240 V
Rated frequency[5]	50 / 60 Hz	50 / 60 Hz
Efficiency		
Maximum efficiency	95.5%	96%
General Information		
Stand-by consumption	<10 W	<10 W
Ambient temperature	-20 °C to +65 °C	-20 °C to +65 °C
Relative humidity (non-condensing)	0-100%	0-100%
Protection class	IP65	IP65

Compliance with standards: EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-12, EN 61000-3-11, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS 3100*, RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-21*, VDE-AR-N 4105:2011-08, G59/2, G83/2[6], AS4777.2*, AS4777.3*, IEC 62116, IEC 61727, UNE 206007-1, NRS 097-2-1.

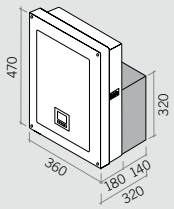
Notes: [1] Grid-connected modes include Back-up, Self-consumption and Grid Support. Minimum voltage DC ($V_{DC,\ min}$) for $V_{grid,max}$ = 1.1 p.u. If $V_{grid,max}$ is higher than this value, the minimum voltage should be corrected as $V_{DC,\ min}$ * $V_{grid,max}$ / 1.1 [2] The inverter's maximum power will be the battery voltage multiplied by the maximum discharge current (50 A) [3] AC power up to 40 °C ambient temperature [4] This power is only available if the battery voltage multiplied by the maximum discharge current reaches these values [5] This parameter is configurable through the display [6] Related only to inverters up to 16 A.

SUN STORAGE 1Play



● *Bidirectional only when grid is connected.*

Size and weight (mm)

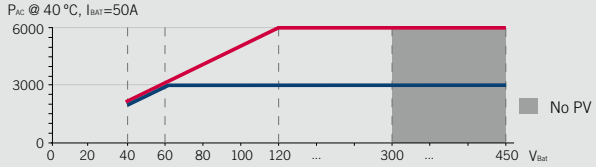


3
43.3 kg.

6
65 kg.

Transformer

Output power versus battery voltage

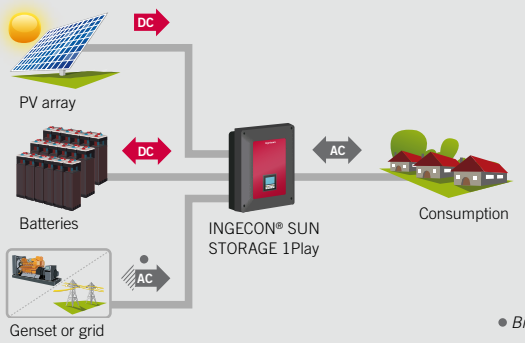


	3TL	6TL
PV Input (DC)		
PV array max. power	7.5 kWp	11.5 kWp
Voltage range MPP for stand-alone mode	300 - 480 V	300 - 480 V
Voltage range MPP for grid-connected modes[1]	330 - 480 V	330 - 480 V
Maximum open circuit voltage	550 V	550 V
Maximum current	20 A	30 A
Inputs	2	2
MPPT	1	1
Battery Input (DC)		
Voltage range with PV installation[2]	40 - 300 V	40 - 300 V
Voltage range without PV installation[2]	40 - 450 V	40 - 450 V
Maximum charge / discharge current	50 A	50 A
Battery type	Lead, Ni-Cd, Li-ion	Lead, Ni-Cd, Li-ion
Generator / Grid Input (AC)		
Rated voltage	230 V	230 V
Voltage range	172 - 264 V	172 - 264 V
Rated frequency	50 / 60 Hz	50 / 60 Hz
Frequency range	40 - 70 Hz	40 - 70 Hz
Charge current range	0 - 13 A	0 - 26 A
Generator or grid maximum power	11,500 W	11,500 W
Output (AC)		
Rated power[3]	3 kW	6 kW
Power (25 ºC) 30 min, 2 min, 3 s[4]	3,500 / 3,900 / 5,080 W	6,400 / 6,900 / 7,900 W
Current	13 A	26 A
Rated voltage[5]	200 - 240 V	200 - 240 V
Rated frequency[5]	50 / 60 Hz	50 / 60 Hz
Efficiency		
Maximum efficiency	95.5%	96%
General Information		
Stand-by consumption	<10 W	<10 W
Ambient temperature	-20 ºC to +65 ºC	-20 ºC to +65 ºC
Relative humidity (non-condensing)	0-100%	0-100%
Protection class	IP65	IP65

Compliance with standards: EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-12, EN 61000-3-11, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS 3100*, RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-21*, VDE-AR-N 4105:2011-08, G59/2, G83/2[6], AS4777.2*, AS4777.3*, IEC 62116, IEC 61727, UNE 206007-1, NRS 097-2-1.

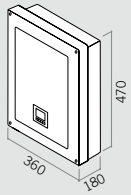
Notes: [1] Grid-connected modes include Back-up, Self-consumption and Grid Support. Minimum voltage DC ($V_{DC, min}$) for $V_{grid,max}$ = 1.1 p.u. If $V_{grid,max}$ is higher than this value, the minimum voltage should be corrected as $V_{DC, min}$ * $V_{grid,max}$ / 1.1 [2] The inverter's maximum power will be the battery voltage multiplied by the maximum discharge current (50 A) [3] AC power up to 40 ºC ambient temperature [4] This power is only available if the battery voltage multiplied by the maximum discharge current reaches these values [5] This parameter is configurable through the display [6] Related only to inverters up to 16 A.

SUN STORAGE 1Play TL



● *Bidirectional only when grid is connected.*

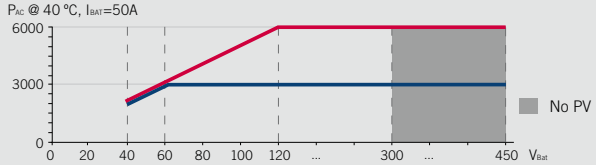
Size and weight (mm)



3TL
18.3 kg.

6TL
23.3 kg.

Output power versus battery voltage



INGECON SUN STORAGE PowerMax

2.5 MW PV plant with 2 MWh energy storage system in Martinique (France)

Power management at large PV plants with an energy storage system

Smart solutions for seamless integration into the electricity grid

Ingeteam has developed the INGECON® SUN STORAGE PowerMax (EMS: *Energy Management Solutions*) family of inverters, designed to integrate energy storage systems into PV plants.

Integration of batteries into PV plants

The use of energy storage systems at PV plants helps to improve the integration of solar energy into the electricity grid, particularly in the case of a weak grid or one with a high solar energy penetration.

The INGECON® SUN STORAGE PowerMax inverters are compatible with the range of battery technologies currently available, such as Lead, Ni-Cd, Redox and Lithium, ensuring that the most suitable technology can be used for each specific application.

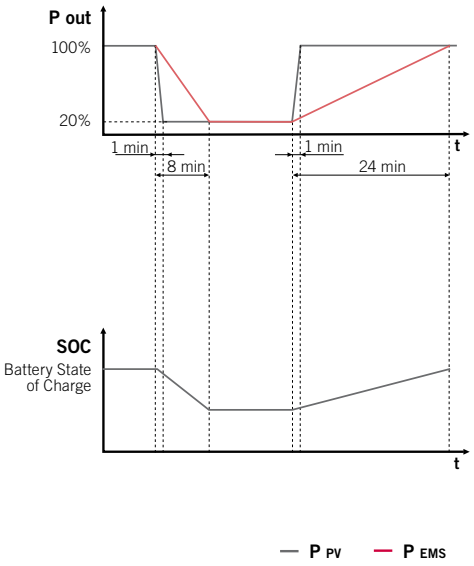
The use of energy storage systems makes it possible to implement different plant operating strategies, such as the control of the plant power output variability or the generation of a constant power output.

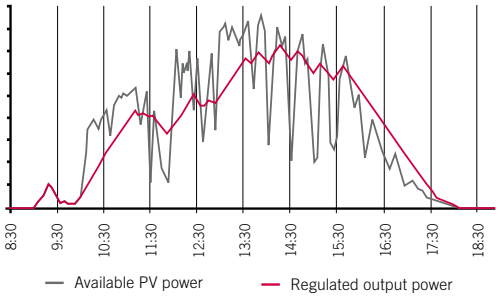
Control of the power output variability

The variation in irradiance caused by passing clouds produces power output variations that can be as great as 80% of the rated power of the plant per minute, depending on the size of the plant and the weather conditions at the site.

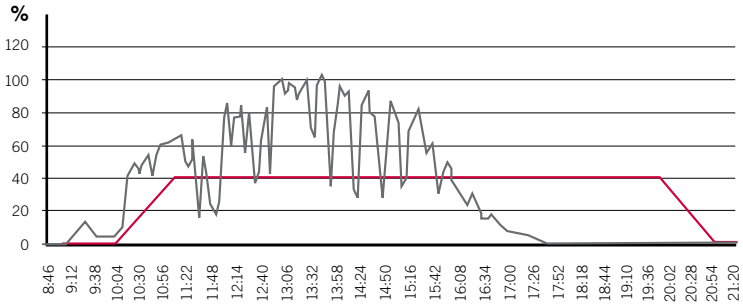
The use of INGECON® SUN STORAGE PowerMax inverters, together with their corresponding batteries, makes it possible to reduce the dynamics of these variations and to adapt to the requirements imposed by grid operators, improving the quality of supply and ensuring the high integration of solar energy into the electricity system.

An energy storage system makes it possible to control the plant power output ramps, based on pre-established values. Whenever a cloud passes over, with the subsequent loss of irradiance, the storage system provides the energy required to offset the energy shortfall, whilst the power output is progressively reduced until it is equal to the PV power. Once the cloud has gone, the available power increases sharply and this is used to charge the batteries whilst smoothly increasing the power output.





Output power at an actual 1 MW PV plant on a day with scattered clouds, with and without energy storage systems, implementing output power regulation.



Output power on a day with scattered clouds, with and without energy storage systems, implementing constant power control.

Constant power control. Shifting the power curve

With the INGECON® SUN STORAGE PowerMax inverters, it is also possible to control the plant output power to ensure that this remains at a constant, pre-determined value. This value can be calculated on the basis of grid operator requirements or weather forecasts. Furthermore, the power curve can be shifted if required by the grid operator.

High penetration for diesel-PV hybrid plants

The INGECON® SUN STORAGE PowerMax inverters can be used to support diesel-PV hybrid systems, to achieve high PV penetration levels. In this way, the PV production variations caused by passing clouds are offset with the power supplied from the storage systems, thereby allowing greater response time to either vary the diesel load balance system or to start up new generators.

DC and AC supplies together

The input and output supplies are integrated into the same cabinet, facilitating maintenance and repair works.

Solutions available

- Indoor inverters with an integrated DCAC cabinet.
- Indoor inverters with a DC cabinet.
- Outdoor inverters with an integrated DCAC cabinet.

This system is based on conventional grid-connected inverters for PV generation and dedicated inverters to connect the batteries to the electricity grid. This option can be installed in PV plants that are already operating. It also offers the possibility of providing reactive energy with the battery inverters, thereby avoiding the need to over-size the PV inverters should there be strict reactive power delivery requirements. For this topology, a plant controller manages the energy flow between the grid and the batteries, adjusting the plant generation to a pre-established pattern.

INGECON SUN STORAGE Power

With transformer

125 / 250

Three-phase battery inverter with transformer

The INGECON® SUN STORAGE Power battery inverter is a three-phase, two-way unit that can either be used in off-grid systems or connected to the general supply network. This inverter offers a high power density in a single power block, providing a choice of configurable operating modes.

Battery management
The INGECON® SUN STORAGE Power features high-tech battery management in order to maximise the useful life of the storage system. The battery temperature can be monitored at all times, guaranteeing a correct operation.

Back-up genset
Furthermore, the INGECON® SUN STORAGE Power permits the connection of a back-up generator, should this be necessary. It is possible to start-up the inverter by using the genset, in order to charge the batteries.

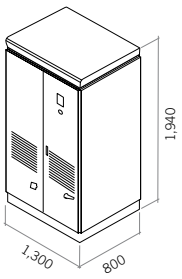
Maximum compatibility
This inverter is 100% compatible with the INGECON® SUN inverters, making it possible to integrate a solar energy source into the AC grid. To do so, additional PV inverters are required.

Software included
The INGECON® SUN Manager software is included at no extra charge. This can be used to monitor and record the inverter data over the Internet. Ethernet communications are supplied as standard.

The INGECON® SUN STORAGE Power three-phase inverter complies with the most demanding international standards and regulations.

Standard 3 year warranty, extendable for up to 25 years

Size (mm)



INGECON SUN STORAGE Power

With transformer

Operating modes:

- **Stand-alone mode**
  The INGECON® SUN STORAGE Power generates a stand-alone AC grid and acts as a grid manager, guaranteeing the correct balance between generation, consumption and the storage system. To achieve this, the INGECON® SUN STORAGE Power is able to control the energy flows between the grid and the batteries, based on the status at any given time. The INGECON® SUN STORAGE Power inverter allows a solar energy source to be integrated into the grid, through the use of INGECON® SUN inverters.
  An advanced control system, requiring no communications, manages the power generated by the INGECON® SUN inverters, based on consumption data and the battery state of charge status. The back-up power source (a genset or the public grid) only connects when the battery state of charge is below a certain programmable threshold.
- **Grid-connected mode**
  In this operating mode the inverter is connected to the grid and operates under the instructions of an external controller (EMS: Energy Management System). Thus, in combination with the EMS Board, the EMS Manager or the EMS Plant Controller and an external wattmeter, the battery inverter is able to adapt the output power to a required value. In this way, different options are available: ramp rate control, self-consumption or constant power output in a PV plant. Furthermore, this operating mode makes it possible to implement peak-shaving strategies to reduce the electricity bill by decreasing the contracted power.

PROTECTIONS

- Galvanic isolation between the DC and AC sides.
- Short-circuits and overloads at the output.
- Insulation faults.
- DC switch.
- AC circuit breaker.

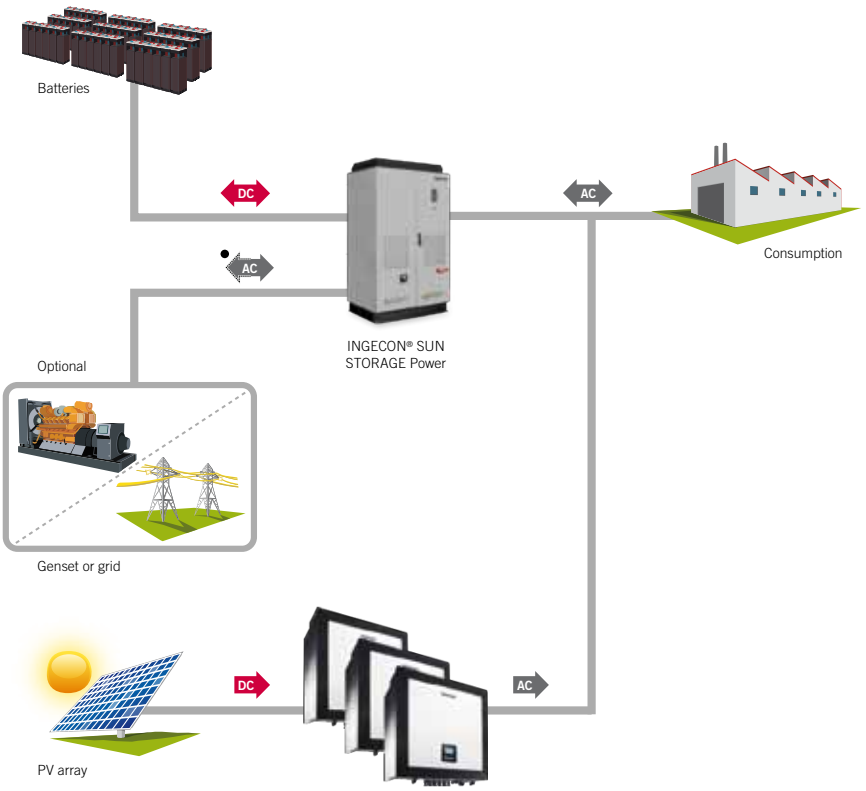
ACCESSORIES SUPPLIED AS STANDARD

- Ethernet-TCP communication.
- CAN communication for smart batteries.
- Configurable potential free inputs.
- Configurable potential-free outputs, some for the connection and disconnection of a back-up genset.
- DC pre-charge system.
- Type 2, AC surge arresters.
- AC pre-charge system.
- AC wattmeter and switch for the auxiliary AC input.

OPTIONAL ACCESSORIES

- DC fuses.

Schema for the Stand-alone mode



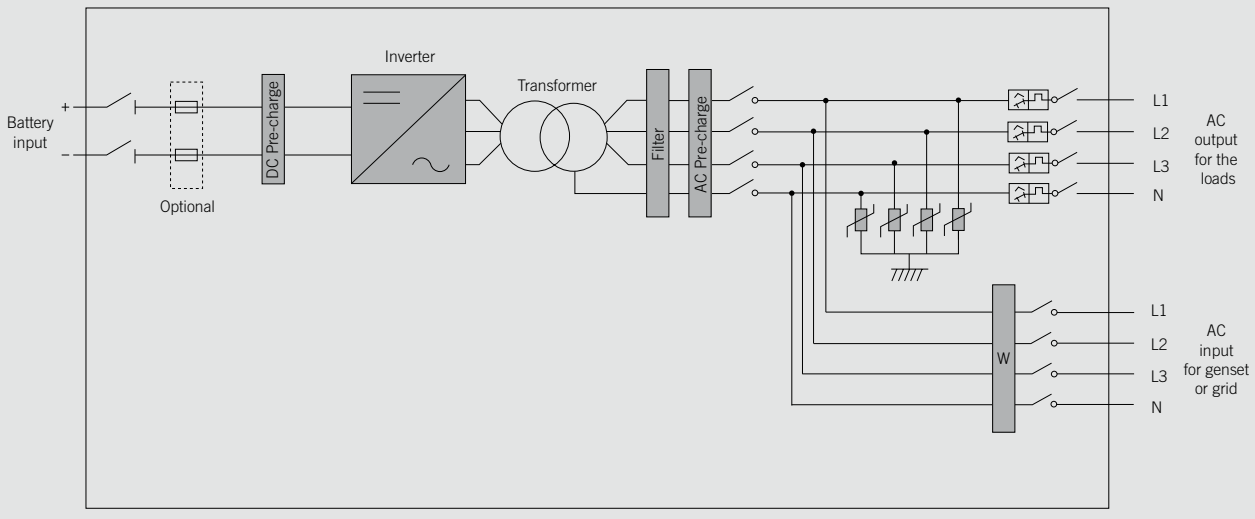
● *Bidirectional only when grid is connected.*

	125	250
Batteries (DC)		
Voltage range for stand-alone mode	330 - 820 V	578 - 820 V
Voltage range for grid-connected mode[1]	330 - 820 V	637 - 820 V
Maximum voltage[2]	1,000 V	1,000 V
Maximum current	400 A	450 A
Inputs	4	
Type of battery	Lead, Ni-Cd, Li-ion	
Grid / Genset Input (AC)		
Rated voltage	400 V	
Voltage range	320 - 480 V	
Frecuency	50 / 60 Hz	
Frecuency Range	40 - 70 Hz	
Charging curent range	0 - 200 A	0 - 368 A
Maximum power	250 kVA	
Output (AC)		
Rated power[3]	125 kVA	250 kVA
Maximum current	200 A	368 A
Rated voltage	400 V	
Frequency	50 / 60 Hz	
Efficiency		
Maximum efficiency	96.9%	97.5%
General Information		
Galvanic isolation	Yes	
Air cooling	2,600 m³/h	
Stand-by consumption	30 W	
Ambient temperature	-20 °C to +65 °C	
Relative Humidity (Non-condensing)	0 - 95%	
Maximum altitude[4]	3,000 m	
Protection Class	IP20	
Weight	1,162 kg	1,500 kg

Compliance with standards: EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-12, EN 61000-3-11, EN 62109-1, EN 62109-2, IEC 62103, EN 50178, FCC Part 15, EN 50438, IEC 62116, IEC 61727, VDE 0126-1-1

Notes: [1] Minimum voltage DC (Vdc,min) for Vgrid,max=1.1 p.u. and Power Factor=1. If Vgrid,max is higher than this value, the minimum voltage should be corrected as Vdc,min * Vgrid,max / 1.1 [2] Above 820 V, the maximum current decreases gradually [3] AC Power for 40 °C ambient temperature [4] Over 1,000 m temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m.

SUN STORAGE Power



INGECON SUN STORAGE PowerMax

B Series

From 830 to 1640 kVA

Three-phase transformerless battery inverter

The INGECON® SUN STORAGE PowerMax is a three-phase bidirectional battery inverter for grid-connected systems. This inverter offers a high-power density in a single power block, providing different configurable operating modes. Besides, it features the same technology as Ingeteam's PV inverters, facilitating the supply of spare parts.

Easy maintenance
String inverter philosophy has been applied in the design of this central inverter, facilitating the inverter usage. Moreover, the input and output lines are integrated into the same cabinet, in order to make maintenance work easier.

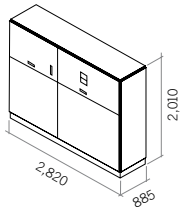
Battery management
The INGECON® SUN STORAGE Power Max features a highly advanced battery control technology, ensuring the maximum life of the storage system. The battery temperature could be controlled at all times ensuring an enhanced lifespan of the accumulator. This inverter is 100% compatible with Ingeteam's PV inverters.

Software included
Included at no extra cost the software INGECON® SUN Manager for monitoring and recording the inverter data over the Internet. Ethernet communications are supplied as standard.

The INGECON® SUN STORAGE PowerMax three-phase inverter complies with the most demanding international standards.

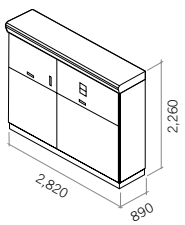
Standard 3 year warranty, extendable for up to 25 years

Size (mm)



Indoor inverter 1,000 Vdc
1,500 kg.

Indoor inverter 1,500 Vdc
1,650 kg.



Outdoor inverter 1,000 Vdc
1,560 kg.

Outdoor inverter 1,500 Vdc
1,710 kg.

INTEGRATED ACCESSORIES

- Ethernet communication.
- DC and AC surge arresters, type 2.
- DC pre-charge system.

OPTIONAL ACCESSORIES

- DC fuses.
- DC and AC surge arresters, type 1.
- AC pre-charge system.
- Heating kit, for operating at an ambient temperature of -30 °C (-22 °F).
- AC circuit breaker with remote tripping.

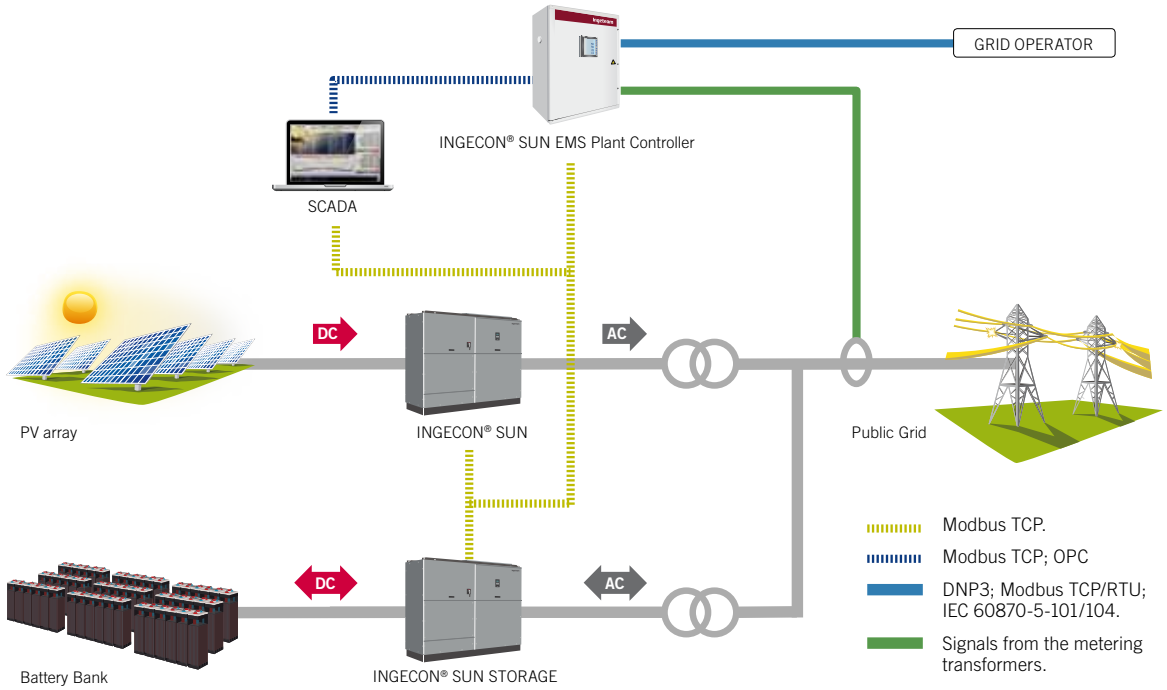
PROTECTIONS

- Output short-circuits and overloads.
- Insulation failures.
- Motorized DC load break disconnect.
- IP66 protection class for the electronics.

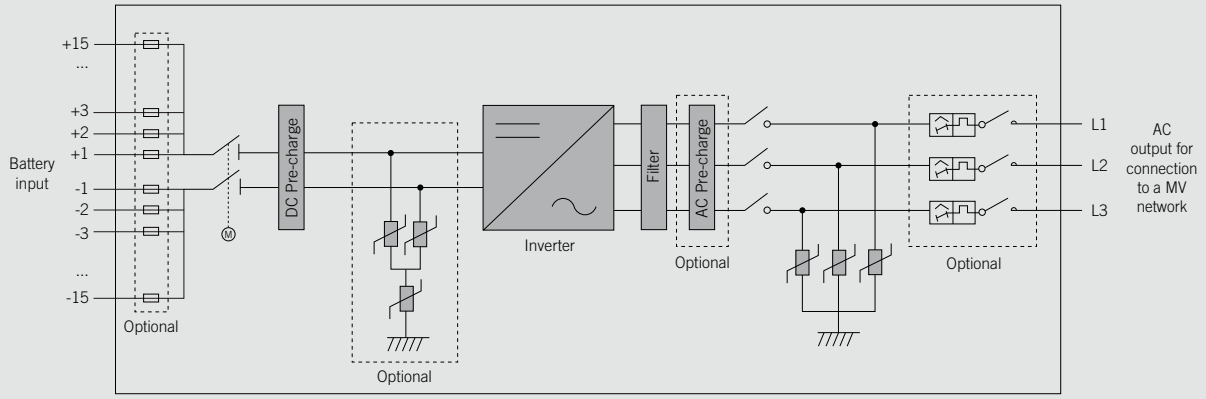
Operating modes:
The INGECON® SUN STORAGE PowerMax B Series inverters usually work in combination with Ingeteam's INGECON® SUN PV inverters and INGECON® SUN EMS Plant Controller. With such a schema both inverter types (PV and batteries) could inject active and reactive power into the grid at the same time, resulting in a much more efficient system.

These are the main strategies for the INGECON® SUN STORAGE PowerMax B Series inverter:

- **Energy Time Shifting**
  The inclusion of an energy storage system makes it possible to inject during the night some of the solar energy produced during the day.
- **Ramp Rate Control**
  In order to adapt the plant's power output rate to an established setpoint, the battery inverter will minimize the impact of any power variation by absorbing the energy surpluses or by injecting energy into the grid when the PV resource is not enough.
- **Peak-shaving**
  The energy stored in the batteries could be used to reduce the peaks of power consumption, for those installations with loads coupled to the system.
- **Frequency Regulation**
  In the event of an underfrequency, an additional power injection is needed. The battery inverter will provide this extra power for a certain period of time.
- **Active Power Reserve**
  Some of the energy stored can be saved in order to feed it to the grid during short periods of time when it is needed.
- **Digital Q Compensation**
  The battery inverter can control the reactive power output and it can inject reactive power into the grid also during the night.



STORAGE PowerMax



STORAGE PowerMax B Series 300 / 360 / 385 / 400 Vac

	830TL B300	1000TL B360	1070TL B385	1110TL B400
Input (DC)				
Battery voltage range[1]	480 - 820 V	574 - 820 V	614 - 820 V	637 - 820 V
Maximum voltage[2]	1,050 V			
Maximum current	2,000 A			
Type of battery	Li-ion, lead, Ni-Cd			
Nº inputs with fuse holders	5 up to 15			
Fuse dimensions	Up to 630 A / 1,000 V fuses (optional)			
Type of connection	Single copper bar (up to 30 cables) or mulitple copper bars with fuse holders			
Input protections				
Overvoltage protections	Type 2 surge arresters (type 1 optional)			
DC switch	Motorized DC load break disconnect			
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton			
Output (AC)				
Power @ 35 °C / @ 50 °C[3]	831.4 kVA / 765 kVA	1,000 kVA / 918 kVA	1,066.9 kVA / 981.8 kVA	1,108.5 kVA / 1,020 kVA
Current @ 35 °C / @ 50 °C	1,600 A / 1,472 A			
Rated voltage	300 V IT System	360 V IT System	385 V IT System	400 V IT System
Frequency	50 / 60 Hz			
Power Factor[4]	1			
Power Factor adjustable	Yes. Smax=831.4 kVA	Yes. Smax=1,000 kVA	Yes. Smax=1,066.9 kVA	Yes. Smax=1,108.5 kVA
THD (Total Harmonic Distortion)[5]	<3%			
Type of connection	Connection to copper bars			
Output protections				
Overvoltage protections	Type 2 surge arresters (type 1 optional)			
AC breaker	Optional AC circuit breaker with door control, motorized or remote trip			
Anti-islanding protection	Yes, with automatic disconnection			
Other protections	AC short circuits and overloads			
Features				
Maximum efficiency	98.7%	98.9%	98.9%	98.9%
Euroefficiency	98.3%	98.5%	98.5%	98.6%
Max. consumption aux. services	2,500 VA			
Average energy consumption per day	18 kWh			
Stand-by or night consumption[6]	60 W			
General Information				
Ambient temperature	-20 °C to +55 °C			
Relative humidity (non-condensing)	0 - 100%			
Protection class	IP50 (Indoor) / IP56 (Outdoor)			
Max. altitude[7]	3,000 m			
Cooling system	Forced air with temperature control (230 V phase + neutral power supply)			
Air volume	6,200 m^3/h			
Noise emission	<77 dB(A) at 1 m			
Marking	CE, ETL			
EMC & Security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100			
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Ecuadorian Grid Code, Peruvian Grid code, Thailand PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid code, Jordan Grid Code			

Notes: [1] Minimum voltage DC ($V_{DC, min}$) for $V_{grid,max}$ = 1.1 p.u. and Power Factor=1. If $V_{grid,max}$ is higher than this value, the minimum voltage should be corrected as $V_{DC, min}$ * $V_{grid,max}$ / 1.1 [2] Beyond 820 V, the maximum current decreases gradually [3] For each °C of increase between 35 °C and 50 °C, the output power will be reduced at the rate of 0.53% / °C. Over 50 °C, the output power will be reduced at the rate of 1.8% / °C [4] For P out >25% of the rated power [5] For P out >25% of the rated power and voltage in accordance with IEC 61000-3-4 [6] Consumption from battery [7] Over 1,000 m, temperature for rated power is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

STORAGE PowerMax B Series 450 / 540 / 578 / 600 / 615 / 630 Vac

	1170TL B450	1400TL B540	1500TL B578	1560TL B600	1600TL B615	1640TL B630
Input (DC)						
Battery voltage range[1]	715 - 1,300 V	856 - 1,300 V	916 - 1,300 V	950 - 1,300 V	974 - 1,300 V	998 - 1,300 V
Maximum voltage[2]	1,500 V					
Maximum current	2,000 A					
Type of battery	Li-ion, lead, Ni-Cd					
Nº inputs with fuse holders	6 up to 15 (optional)					
Fuse dimensions	Up to 400 A / 1,500 V fuses (optional)					
Type of connection	Single copper bar (up to 30 cables) or multiple copper bars with fuse holders					
Input protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
DC switch	Motorized DC load break disconnect					
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton					
Output (AC)						
Power @ 25 °C / @ 50 °C[3]	1,169 kVA / 975 kVA	1,403 kVA / 1,169 kVA	1,502 kVA / 1,251 kVA	1,559 kVA / 1,299 kVA	1,598 kVA / 1,332 kVA	1,637 kVA / 1,364 kVA
Current @ 25 °C / @ 50 °C	1,500 A / 1,250 A					
Rated voltage	450 V IT System	540 V IT System	578 V IT System	600 V IT System	615 V IT System	630 V IT System
Frequency	50 / 60 Hz					
Power Factor[4]	1					
Power Factor adjustable	Yes. Smax=1,169 kVA	Yes. Smax=1,403 kVA	Yes. Smax=1,502 kVA	Yes. Smax=1,559 kVA	Yes. Smax=1,598 kVA	Yes. Smax=1,637 kVA
THD (Total Harmonic Distortion)[5]	<3%					
Type of connection	Connection to copper bars					
Output protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
AC breaker	Optional AC circuit breaker with door control, motorized or remote trip					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%					
Euroefficiency	98.5%					
Max. consumption aux. services	2,500 VA					
Average energy consumption per day	18 kWh					
Stand-by or night consumption[6]	60 W					
General Information						
Ambient temperature	-20 °C to +55 °C					
Relative humidity (non-condensing)	0 - 100%					
Protection class	IP50 (Indoor) / IP56 (Outdoor)					
Max. altitude[7]	2,000 m					
Cooling system	Forced air with temperature control (230 V phase + neutral power supply)					
Air volume	6,200 m³/h					
Noise emission	<77 dB(A) at 1 m					
Marking	CE, ETL					
EMC & Security standards	EN 61000-6-1, EN 61000-6-2, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100					
Grid connection standards	IEC 62116, Arrêté 23-04-2008, CEI 0-16 Ed. III, Terna A68, G59/2, BDEW-Mittelspannungsrichtlinie:2011, P.O.12.3, South African Grid code (ver 2.6), Chilean Grid Code, Ecuadorian Grid Code, Peruvian Grid code, Thailand PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, GGC&CGC China, DEWA (Dubai) Grid code, Jordan Grid Code					

Notes: [1] Minimum voltage DC ($V_{DC, min}$) for $V_{grid,max}$ = 1.1 p.u. and Power Factor=1. If $V_{grid,max}$ is higher than this value, the minimum voltage should be corrected as $V_{DC, min}$ * $V_{grid,max}$ / 1.1 [2] Beyond 820 V, the maximum current decreases gradually [3] For each ºC of increase between 25 ºC and 50 ºC, the output power will be reduced at the rate of 0.66% / ºC. Over 50 ºC, the output power will be reduced at the rate of 1.8% / ºC [4] For P out >25% of the rated power [5] For P out >25% of the rated power and voltage in accordance with IEC 61000-3-4 [6] Consumption from battery [7] Over 1,000 m, temperature for rated power is reduced at the rate of 4.5 ºC for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

INGECON SUN STORAGE PowerMax

U B Series

UL 9540 & UL 1741 COMPLIANT

From 610 to 1640 kVA

Three-phase transformerless battery inverter

The INGECON® SUN STORAGE Power Max is a three-phase bidirectional battery inverter for grid-connected systems. This inverter offers a high-power density in a single power block, providing different configurable operating modes. Besides, it features the same technology as Ingeteam's PV inverters, facilitating the supply of spare parts.

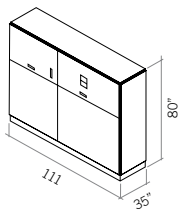
Easy maintenance
String inverter philosophy has been applied in the design of this central inverter, facilitating the inverter usage. Moreover, the input and output lines are integrated into the same cabinet, in order to make maintenance work easier.

Battery management
The INGECON® SUN STORAGE Power Max features a highly advanced battery control technology, ensuring the maximum life of the storage system. The battery temperature could be controlled at all times ensuring an enhanced lifespan of the accumulator. This inverter is 100% compatible with Ingeteam's PV inverters.

Software included
Included at no extra cost the software INGECON® SUN Manager for monitoring and recording the inverter data over the Internet. Ethernet communications are supplied as standard.The INGECON® SUN STORAGE PowerMax three-phase inverter complies with the most demanding international standards.

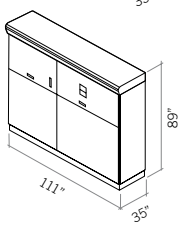
Standard 3 year warranty, extendable for up to 25 years

Size (inches)



Indoor inverter 1,000 Vdc
3,300 pounds

Indoor inverter 1,500 Vdc
3,640 pounds



Outdoor inverter 1,000 Vdc
3,440 pounds

Outdoor inverter 1,500 Vdc
3,770 pounds

INTEGRATED ACCESSORIES

- Ethernet communication.
- Lightning induced DC and AC surge arresters, type 2.
- DC pre-charge system.
- AC circuit breaker with remote tripping.

OPTIONAL ACCESSORIES

- DC fuses.
- DC and AC surge arresters, type 1.
- AC pre-charge system.
- Heating kit, for operating at an ambient temperature of -30 °C (-22 °F).

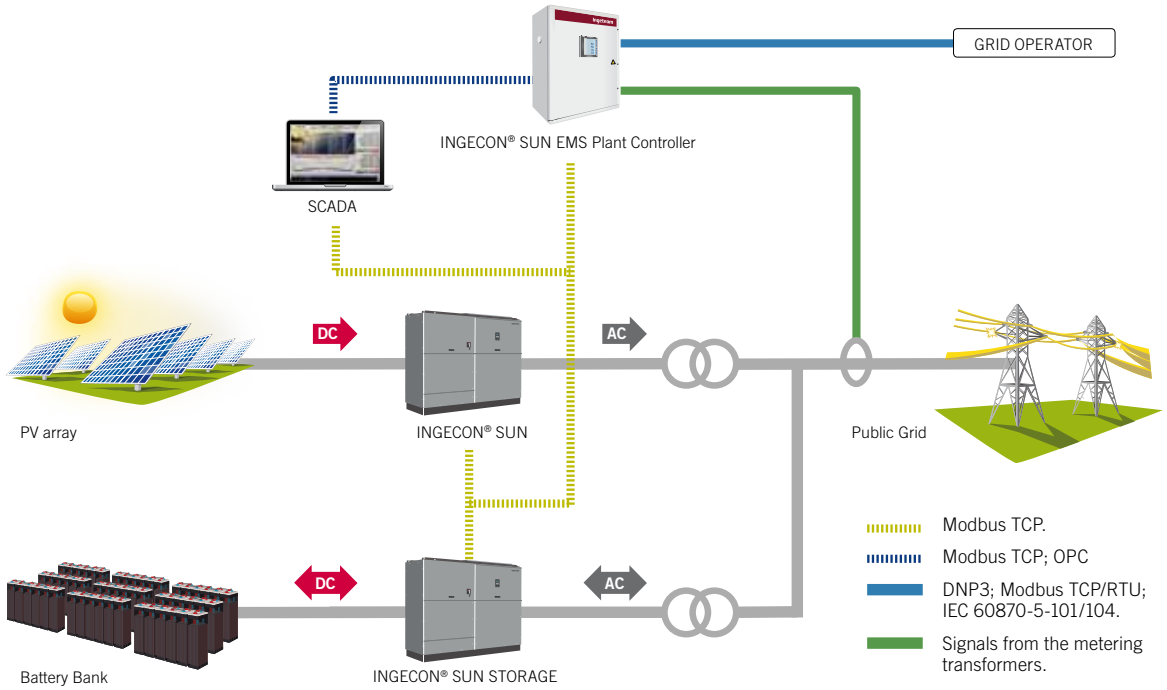
PROTECTIONS

- Output short-circuits and overloads.
- Insulation failures.
- Motorized DC load break disconnect.
- NEMA 4 / IP66 protection class for the electronics.

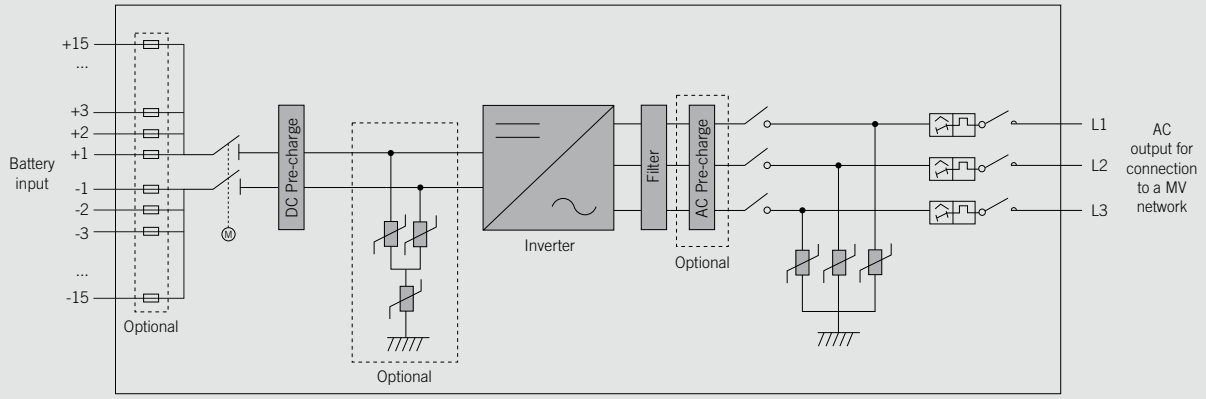
Operating modes:
The INGECON® SUN STORAGE PowerMax B Series inverters usually work in combination with Ingeteam's INGECON® SUN PV inverters and INGECON® SUN EMS Plant Controller. With such a schema both inverter types (PV and batteries) could inject active and reactive power into the grid at the same time, resulting in a much more efficient system.

These are the main strategies for the INGECON® SUN STORAGE PowerMax B Series inverter:

- **Energy Time Shifting**
  The inclusion of an energy storage system makes it possible to inject during the night some of the solar energy produced during the day.
- **Ramp Rate Control**
  In order to adapt the plant's power output rate to an established setpoint, the battery inverter will minimize the impact of any power variation by absorbing the energy surpluses or by injecting energy into the grid when the PV resource is not enough.
- **Peak-shaving**
  The energy stored in the batteries could be used to reduce the peaks of power consumption, for those installations with loads coupled to the system.
- **Frequency Regulation**
  In the event of an underfrequency, an additional power injection is needed. The battery inverter will provide this extra power for a certain period of time.
- **Active Power Reserve**
  Some of the energy stored can be saved in order to feed it to the grid during short periods of time when it is needed.
- **Digital Q Compensation**
  The battery inverter can control the reactive power output and it can inject reactive power into the grid also during the night.



STORAGE PowerMax



STORAGE PowerMax U B Series 220 / 300 / 360 / 385 / 400 Vac

	610TL U B220	830TL U B300	1000TL U B360	1070TL U B385	1110TL U B400
Input (DC)					
Battery voltage range[1]	438 - 820 V	480 - 820 V	574 - 820 V	614 - 820 V	637 - 820 V
Maximum voltage[2]			1,050 V		
Maximum current	2,000 A				
Type of battery	Li-ion, lead, Ni-Cd				
N° inputs with fuse holders	5 up to 15				
Fuse dimensions	Up to 630 A / 1,000 V fuses (optional)				
Type of connection	Connection to copper bars				
Input protections					
Overvoltage protections	Type 2 surge arresters (type 1 optional)				
DC switch	Motorized DC load break disconnect				
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton				
Output (AC)					
Power @ 95 °F / @ 122 °F[3]	609.7 kVA / 560.9 kVA	831.4 kVA / 765 kVA	1,000 kVA / 918 kVA	1,066.9 kVA / 981.8 kVA	1,108.5 kVA / 1,020 kVA
Current @ 95 °F / @ 122 °F			1,600 A / 1,472 A		
Short-circuit capability	3,440 A @ 11 ms				
Rated voltage	220 V IT System	300 V IT System	360 V IT System	385 V IT System	400 V IT System
Frequency	50 / 60 Hz				
Power Factor[4]	1				
Power Factor adjustable	Yes. Smax=609.7 kVA	Yes. Smax=831.4 kVA	Yes. Smax=1,000 kVA	Yes. Smax=1,066.9 kVA	Yes. Smax=1,108.5 kVA
THD (Total Harmonic Distortion)[5]	<3%				
Type of connection	Connection to copper bars				
Output protections					
Overvoltage protections	Type 2 surge arresters (type 1 optional)				
AC breaker	Optional AC circuit breaker with door control, motorized or remote trip				
Anti-islanding protection	Yes, with automatic disconnection				
Other protections	AC short circuits and overloads				
Features					
Maximum efficiency	98.9%	98.9%	98.9%	98.9%	98.9%
CEC	98.5%	98.5%	98.5%	98.5%	98.5%
Max. consumption aux. services	2,500 VA				
Stand-by consumption[6]	60 W				
Average energy consumption per day	18 kWh				
General Information					
Ambient temperature	-4 °F to +131 °F				
Relative humidity (non-condensing)	0 - 100%				
Protection class	NEMA 12 (Indoor) / NEMA 3 (Outdoor)				
Max. altitude[7]	9,842 ft				
Cooling system	Forced air with temperature control (230 V phase + neutral power supply)				
Air volume	60.77 ft³/s (6,200 m³/h)				
Noise emission	<70 dB(A) at 1 m				
Marking	CE, ETL				
EMC & Security standards	UL9540, UL1741, FCC Part 15, IEEE C37.90.1, IEEE C37.90.2				
Grid connection standards	IEC 62116, UL1741, IEEE 1547, IEEE 1547.1, NEC CODE, Electric Rule 21: 2015				

Notes: [1] Minimum voltage DC ($V_{DC, min}$) for $V_{grid,max}$ = 1.1 p.u. and Power Factor=1 If $V_{grid,max}$ is higher than this value, the minimum voltage should be corrected as $V_{DC, min} * V_{grid,max} / 1.1$ [2] Beyond 820 V, the maximum current decreases gradually [3] For each °F of increase between 95 °F and 122 °F, the output power will be reduced at the rate of 0.22%. Over 122 °F, the output power will be reduced at the rate of 1% for each 1°F of increase [4] For P out >25% of the rated power [5] For P out >25% of the rated power and voltage in accordance with IEC 61000-3-4 [6] Consumption from battery [7] Over 3,300 ft, temperature for rated power is reduced at the rate of 2.42 °F for each 3,300 ft.

STORAGE PowerMax U B Series 450 / 540 / 378 / 600 / 615 / 630 Vac

	1170TL U B450	1400TL U B540	1500TL U B578	1560TL U B600	1600TL U B615	1640TL U B630
Input (DC)						
Battery voltage range[1]	717 - 1,300 V	858 - 1,300 V	917 - 1,300 V	952 - 1,300 V	975.5 - 1,300 V	999 - 1,300 V
Maximum voltage[2]	1,500 V					
Maximum current	2,000 A					
Type of battery	Li-ion, lead, Ni-Cd					
N° inputs with fuse holders	6 up to 15 (optional)					
Fuse dimensions	Up to 400 A / 1,500 V fuses (optional)					
Type of connection	Single copper bar (up to 30 cables) or multiple copper bars with fuse holders					
Input protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
DC switch	Motorized DC load break disconnect					
Other protections	Up to 15 pairs of DC fuses (optional) / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton					
Output (AC)						
Power @ 77 °F / @ 122 °F[3]	1,169 kVA / 975 kVA	1,403 kVA / 1,332 kVA	1,502 kVA / 1,251 kVA	1,559 kVA / 1,299 kVA	1,598 kVA / 1,332 kVA	1,637 kVA / 1,364 kVA
Current @ 77 °F / @ 122 °F	1,500 A / 1,250 A					
Short-circuit capability	3,440 A @ 11 ms					
Rated voltage	450 V IT System	540 V IT System	578 V IT System	600 V IT System	615 V IT System	630 V IT System
Frequency	50 / 60 Hz					
Power Factor[4]	1					
Power Factor adjustable	Yes. Smax=1,169 kVA	Yes. Smax=1,403 kVA	Yes. Smax=1,502 kVA	Yes. Smax=1,559 kVA	Yes. Smax=1,598 kVA	Yes. Smax=1,637 kVA
THD (Total Harmonic Distortion)[5]	<3%					
Type of connection	Connection to copper bars					
Output protections						
Overvoltage protections	Type 2 surge arresters (type 1 optional)					
AC breaker	Optional AC circuit breaker with door control, motorized or remote trip					
Anti-islanding protection	Yes, with automatic disconnection					
Other protections	AC short circuits and overloads					
Features						
Maximum efficiency	98.9%					
Euroefficiency	98.5%					
Max. consumption aux. services	2,500 VA					
Stand-by consumption[6]	60 W					
Average energy consumption per day	18 kWh					
General Information						
Ambient temperature	-4 °F to +131 °F					
Relative humidity (non-condensing)	0 - 100%					
Protection class	NEMA 12 (Indoor) / NEMA 3 (Outdoor)					
Max. altitude[7]	6,562 ft (2,000 m)					
Cooling system	Forced air with temperature control (230 V phase + neutral power supply)					
Air volume	60.77 ft³/s (6,200 m³/h)					
Noise emission	<70 dB(A) at 1 m					
Marking	CE, ETL					
EMC & Security standards	UL9540, UL1741, FCC Part 15, IEEE C37.90.1, IEEE C37.90.2					
Grid connection standards	IEC 62116, UL1741, IEEE 1547, IEEE 1547.1, NEC CODE, Electric Rule 21: 2015					

Notes: [1] Minimum voltage DC ($V_{DC, min}$) for $V_{grid,max}$ = 1.1 p.u. and Power Factor=1 If $V_{grid,max}$ is higher than this value, the minimum voltage should be corrected as $V_{DC, min} * V_{grid,max} / 1.1$ [2] Beyond 820 V, the maximum current decreases gradually [3] For each °F of increase between 77 °F and 122 °F, the output power will be reduced at the rate of 0.37%. Over 122 °F, the output power will be reduced at the rate of 1% for each 1°F of increase [4] For P_{AC}>25% of the rated power [5] For P_{AC}>25% of the rated power and voltage in accordance with IEC 61000-3-4 [6] Consumption from battery [7] Over 3,300 ft, temperature for rated power is reduced at the rate of 2.42 °F for each 3,300 ft.

INGECON SUN EMS

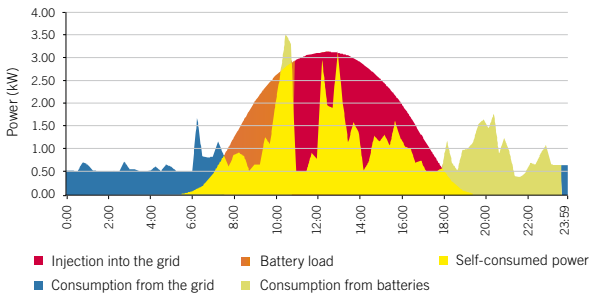
ENERGY MANAGEMENT SOLUTIONS

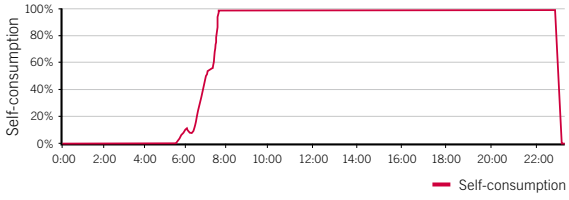
Self-consumption with energy storage

For those installations in which power generation is not in line with demand, then the self-consumption ratio can be increased by adding an energy storage system. Each installation is unique, with its own specific consumption profile, characterised not only by actual consumption but also by its energy generating potential (basically depending on geographical location, orientation to the sun, the available roof surface area, the presence of shading, etc.) and other factors.

Self-consumption with batteries:
Ingeteam Smart House

The inclusion of an energy storage system makes it possible to optimise the use of all the energy produced from renewable sources and to achieve higher rates of self-consumption, given the fact that the energy generated during the day can then be consumed at peak demand times in most homes: in other words, in the evening. This is the goal of the Ingeteam Smart House. The inclusion of an energy storage system makes it feasible to reduce the power contracted with the utility and to make monthly savings in the electricity bill.



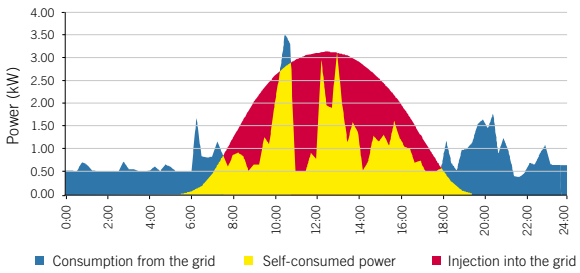


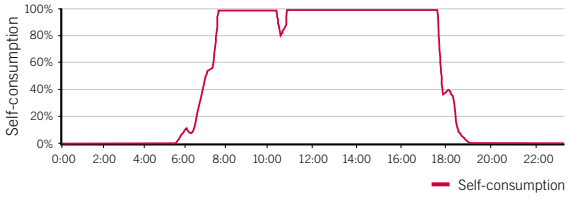
Direct self-consumption

Self-consumption systems are more attractive and cost-effective when generation and consumption occur at the same time, given the fact that the energy produced can then be consumed on the spot, with no need for storage. For this reason, the workplace is generally considered to be more conducive for systems of this type, although it can also be of interest in certain domestic environments.

Self-consumption without batteries: *Ingeteam Smart Industry*

The *Ingeteam Smart Industry* offers a non-storage solution, based solely on PV inverters. This is valid for net metering systems and also for those countries in which it is not permitted to feed any excess energy produced into the public grid. In this second case, which is the most problematic in technical terms, Ingeteam has implemented an operating mode in its string inverters (single-phase and three-phase alike) so that the actual PV inverter is responsible for limiting and adjusting the power produced in order to meet the instantaneous demand of the installation. This prevents the production of excess energy, thereby ensuring that no PV power is fed into the grid.





INGECON SUN EMS Manager

The most efficient energy management solution for self-consumption

This innovative energy management solution developed by Ingeteam Power Technology, for the domestic, commercial and industrial markets, allows for increased self-consumption, by matching energy production and consumption.

The smart energy manager
The INGECON® SUN EMS Manager controls the energy generation from renewable sources, based on the power production data obtained from the power converters and on total system consumption. Furthermore, it allows the connection and disconnection of controllable loads. The INGECON® SUN EMS Manager implements management strategies based on the different devices connected to the system, making it possible to plan how and when to consume the power produced. The INGECON® SUN EMS Manager is designed to optimise any electricity system in terms of energy usage and cost savings.

Consumption management
Consumption management is the basis of a truly effective energy management system. Thanks to the potential-free outputs it is possible to determine the connection and disconnection times for the various loads coupled to the system. This allows for the connection of electric boilers, radiators, pumps, electric vehicles etc, constantly adapting total system consumption to the renewable energy produced.

Maximum control of the energy consumed
The system energy manager constantly controls the amount of energy exchanged with the public grid. This information is transferred in real time to the INGECON® SUN EMS Manager. Furthermore, in the event of a grid shortage, the system can operate in standalone mode if there is a storage system coupled to the installation.

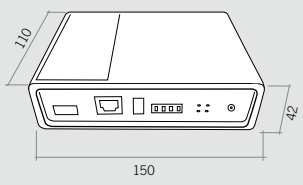
Multiple installations
There are several types of systems that can be controlled by an INGECON® SUN EMS Manager:

- PV (optionally + EV charging station).
- Batteries (optionally + EV charging station).
- PV+Batteries(optionally+EVcharging station).
- Diesel + PV.
- Diesel + PV+ Grid.
- Multiple diesel gensets.

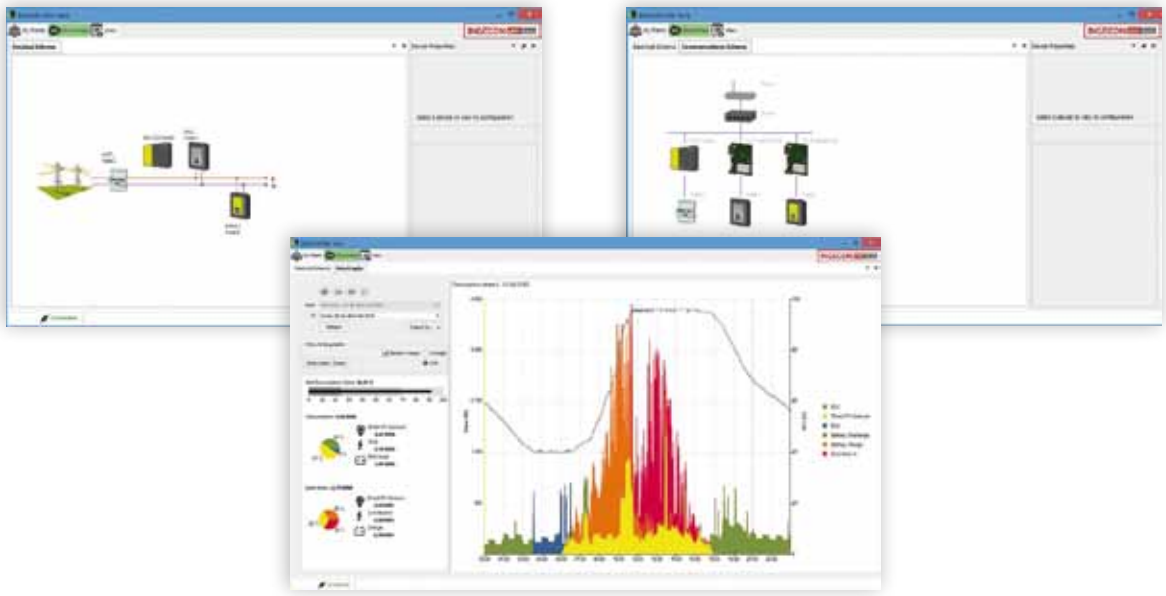
Standard 3-year warranty

	EMS Manager
Power supply	
Input voltage	100 - 240 Vac
Nominal frequency	50 / 60 Hz
Power consumption	5 - 8 W
Connectivity	
Ethernet	1
RS-485	1
USB	1
Potential free outputs	2 x (250 V, 10 A)
Communication interface with other equipment	
Ingeteam inverters	RS-485, Ethernet
Monitoring systems	Ethernet, GPRS
Power Meter	RS-485

Size and weight (mm)
280 g.



INGECON SUN EMS Tools



Software to configure and monitor self-consumption systems

The INGECON® SUN EMS Tools software is the PC application for the monitoring and configuration of self-consumption systems governed by the INGECON® SUN EMS Manager.

This tool seeks to offer users a software close to the Plug & Play philosophy: a very simple, intuitive interface with regard to installation and operation.

This program can be downloaded free of charge from our website: **www.ingeteam.com.** Compatible with 32 and 64 bit configurations, the software requires the Microsoft .NET Framework 4.0 platform (normally included as part of the operating system) and Windows XP or higher.

Operating modes

- On-line mode: a direct connection is established with the INGECON® SUN EMS Manager device with all functionalities available to the user. Communication with the INGECON® SUN EMS Manager can either be made remotely through the Ingeteam servers or directly by TCP / IP using the device IP address.
- Off-line mode: users can view the parameters configured and the historical data previously downloaded.

THE SOFTWARE ALLOWS USERS TO

- Configure the INGECON® SUN EMS Manager.
- Individually configure each PV plant inverter and other devices.
- Control the loads.
- View the plant wiring diagrams and communications network.
- View the production data.
- Start-up and manage the various PV plants from a PC.
- Data capture, save a file to the disc and get a graphic display of the historical data.

Configuration of the system in 3 simple steps

Step 1
Installation of the software

Step 2
Configuration of the INGECON® SUN EMS Manager

Step 3
Plant configuration and start-up

INGECON SUN EMS Plant Controller

PV plant control system

The INGECON® SUN EMS Plant Controller helps the grid operator to manage the PV plant performance and to guarantee the quality and stability of the electricity supply.

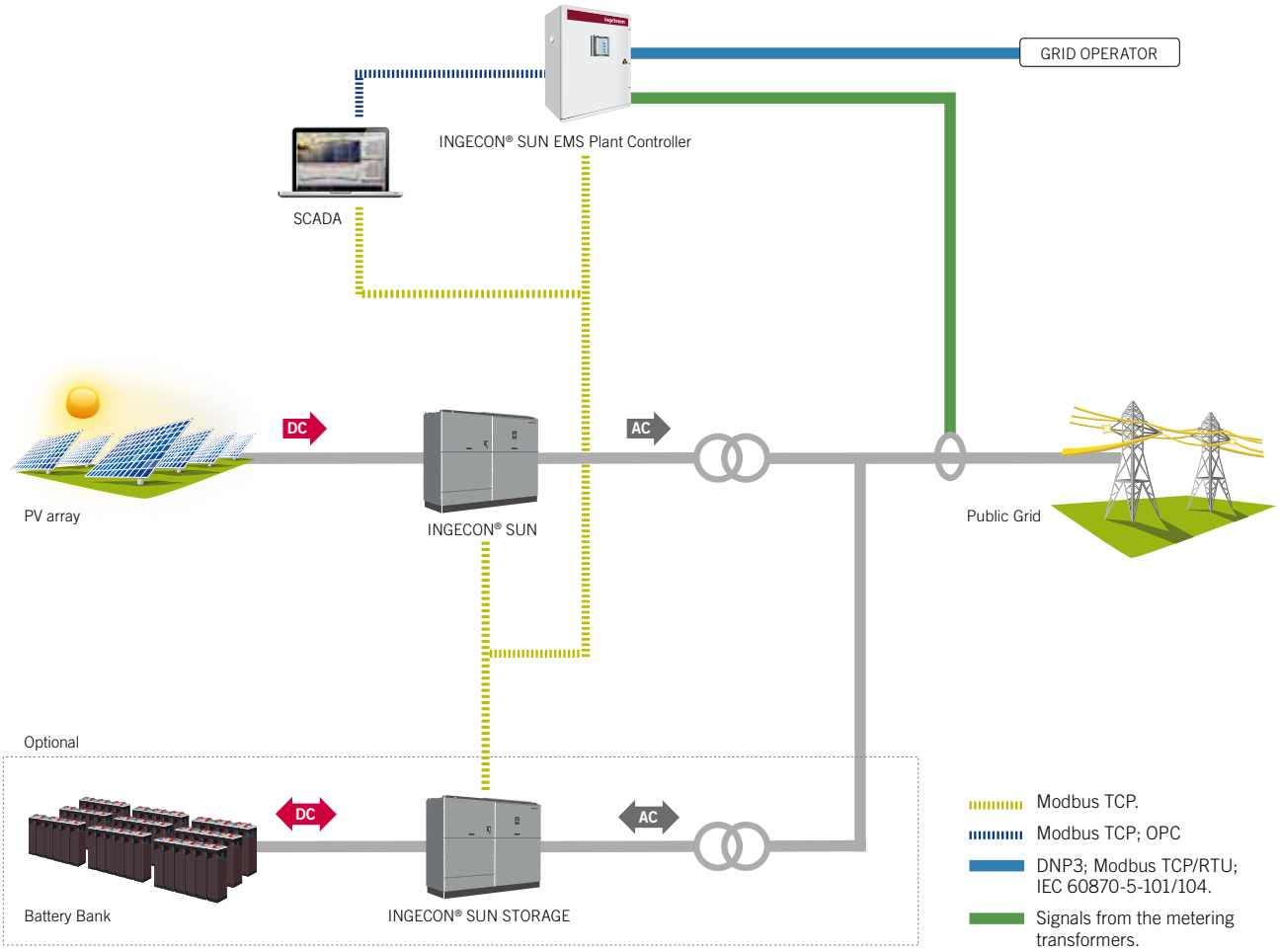
Maximum PV plant control
An advanced algorithm combined with a fast and efficient communications system, with response times of less than one second, permit precise control of the active and reactive power delivered by the plant to the grid.

The INGECON® SUN EMS Plant Controller controls the PV inverters, ensuring compliance with the grid operator's requirements at the PV plant connection point. It is also possible to manage energy storage systems and other devices such as diesel generators, through the use of INGECON® SUN STORAGE Power Max inverters.

This is a flexible system that can easily be adapted to the needs and configurations of each particular plant, whilst complying with the country-specific standards and regulations.

Description of the complete system
A PV plant with a plant controller typically consists of:

- INGECON® SUN EMS Plant Controller, comprising two basic systems: metering and control. It can additionally incorporate a communication channel with the grid operator in order to receive the operating setpoints.
- INGECON® SUN PV inverters connected to the PV array.
- INGECON® SUN STORAGE battery inverters connected to the energy storage system. Only when energy storage systems are required to cover situations in which the solar radiation is too low or to provide energy for night-time use.
- SCADA, plant monitoring system.
- Communications network. Connecting the INGECON® SUN EMS Plant Controller with the different inverters, transmitting the operating setpoints and monitoring the status of the equipment.



Continuous communication with all the devices

The Power Plant Controller permits the dynamic reception of the grid operator's setpoints. For this purpose, a number of communication protocols are incorporated such as Modbus TCP / RTU, DNP3, IEC 60870-5-101 and IEC 60870-5-104. Likewise, it is also possible to add digital and analogue I/O modules in order to extend the communication capabilities with third-party devices.

Furthermore, the INGECON® SUN EMS Plant Controller permits communication with the plant SCADA to transmit the connection point data. It is also possible a manual control for temporary maintenance or engineering operations.

Operating mode

For the control, the INGECON® SUN EMS Plant Controller takes the following data:

- Active power, reactive power, voltage and frequency at the connection point, provided by the integrated measurement unit.
- Grid operator requirements. To establish references for parameters such as voltage at the point of connection, active and reactive power, power ramps, active power reserve, etc. These requirements can be predetermined either by the grid operator or by the plant operator or dynamically modified through an external setpoint.
- Instantaneous values of the various elements inside the plant: inverters, batteries, meteo stations, reactive power compensation systems.
- With all these data, the control can determine the operating setpoints for each inverter integrated into the system and transmit the setpoints through the communications network.

INGECON SUN EMS Plant Controller

Two models available:

Standard version

Premium version

Regulation types

Production Control
Some of the active power control functions that can be implemented in the INGECON® SUN EMS Plant Controller are:

- On-Demand Production. It controls the PV plant's output power, limiting it to a desired value.
- Ramp Rate Control. It controls the power generated by the inverters, ensuring that the variation in the plant power output conforms to the established setpoint. So as to control variations in power shortfalls, it is necessary to add energy storage systems and INGECON® SUN STORAGE inverters to the plant in order to deliver energy the system when no PV resources are available.
- Fast Frequency Regulation. The system can adjust the power production depending on the frequency variations. In the event of a under frequency an additional power injection is needed. This additional supply can come from an ESS or from the Active Power Reserve control.
- Active Power Reserve. The INGECON® SUN EMS Plant Controller incorporates a patented innovative control strategy (PCT/ES 2008/000560) to guarantee an active power reserve with no need to include storage systems (depending on the availability of the PV resource), although it is also compatible with the addition of an ESS.

Grid Support
Some of the reactive power control functions that can be implemented in the INGECON® SUN EMS Plant Controller are:

- Digital Q compensation. The system developed by Ingeteam allows to control the reactive power output, adjusting it to a given reference, including the possibility of providing reactive power at night time.
- Power Factor Control. Regulation of the power factor at the connection point.
- Automatic Voltage Regulation. The INGECON® SUN EMS Plant Controller makes it possible to regulate the plant voltage at the connection point through a control system applied to the voltage closed loop.
- Voltage Droop Control. According to an established Droop gain, the system selects the necessary reactive power at the point of connection, depending on the existing voltage difference.
- Power Oscilations Damping. In those places where the grid is divided in different interconnected zones, the power plant can suffer from low-frequency active power and frequency oscilations. The Plant Controller allows to implement a control strategy to minimise these oscilations in both stationary and transitory regimes.

INCLUDED ITEMS

- PLC.
- Power meter.
- Communications switch.
- Power supply.
- Protections.

SYSTEM FEATURES

- Fast Frequency Regulation.
- Active power reserve regulation.
- On-demand production.
- Ramp rate control.
- Digital Q compensation.
- Power factor control.
- Automatic voltage regulation.

COMPATIBILITY

- Inverters: IS 3Play, IS PowerMax, ISS Power, ISS PowerMax.
- Accessories: INGECON® SUN EMS Manager and INGECON® SUN WeatherBox.
- Batteries: main manufacturers.
- SCADA: main industry protocols.

OPTIONAL INPUTS / OUTPUTS

- Analogue inputs V/I.
- Analogue outputs V/I.
- Digital inputs.
- Digital outputs @24 Vdc or potential-free digital outputs.

	Standard version	Premium version
Power Analyzer		
Voltage and current metering accuracy	Class 0.2 S (Class 0.1 A optional)	
Frequency metering accuracy	10 mHz[1]	
Power metering accuracy	Class 0.5 S	
Energy metering accuracy	Class 0.5 S (Class 0.2 A optional)	
Power factor metering accuracy	Class 1 S	
THD metering accuracy	Class 0.5 S	
Voltage and current harmonics metering	Up to level 40 (optionally up to level 50)	
Input voltage metering range	0 ... 480 V @50 Hz / 0 ... 347 V @60 Hz	
Input current metering range	0 ... 5 A	
Other measurements	Short- and Long-term Flickers / unbalances	
Production quality registration (PQ)	Optional	
Redundancy	Not available	Optional
Power Supply		
Voltage supply	85 Vac ... 264 Vac, 50 Hz ... 60 Hz	
Typical consumption	33 W	120 W[2]
Maximum consumption	50 W	280 W[2]
Input fuse	6.3 A	
Autonomy in case of a supply cutoff	20 min[3]	
Redundancy	Not available	Optional
Communication		
Standard protocols	Modbus / TCP, FTP, NTP	
Compatible protocols	Modbus / RTU, 101 (Server), 104 (Server), DNP3 (Server), OPC UA	
Outer connectivity	10 / 100BaseT(X), 100BaseFX (MM) with patch panels	
Managed communication	Optional	Yes, with SNMP v1/2/3, VLAN, DHCP, Flow control, STP, MAC filter
Redundancy	Not available	Optional
Regulation		
Production Control	On-Demand Production, Active Power Reserve, Ramp Rate Control, Energy Time Shifting, Peak Shaving	
Grid Support	Digital Q Compensation, Power Factor Control, Automatic Voltage Regulation, Voltage Droop Control, Power Oscilations Damping	
Grid Code Configurations[4]		
Active power	PF limitation curve	
Reactive power	QV limitation curve, QP limitation curve	
O&M Functions		
Datalogger	Over 1 month data storage in Compact Flash memory	
Equipment start up / stop	General start up or stop of the inverters, BESS and capacitor banks	
Power plant surveillance	Monitoring of the status of every single element inside the plant	
Others	Web server	
CPU		
Typical processing time	10 ms	
Clock	Internal RTC sinchronizable through NTP	
Surveillance system	Watchdog, working times surveillance, CPU temperature and input/output status	
Redundancy	Not available	Optional
General Data		
Dimensions (H/W/D)	855 / 600 / 360 mm	2.150 / 800 / 800 mm
Weight	40 kg	150 kg
Protection class	IP65	IP55
Impact resistance	IK10	
Overvoltage protection	Type 2	
Installation	Wall	Ground
Operating temperature	-10 / 45 °C (14 / 113 °F)	
Storage temperature	-20 / 60 °C (-4 / 140 °F)	
Relative humidity (non-condensing)	10 - 95%	
Maximum altitude[5]	2,000 m	
Marking	CE	
Standards	IEC 61000-4-30, IEC 62586-1, IEC 61131-3, IEC 60204-1, IEC 61439	

Notes: [1] For voltages greater than 30% of the nominal voltage [2] Values measured with the highest redundancy level [3] If the installation features an energy storage system. Otherwise, the autonomy is 2 seconds [4] For other configurations, please contact Ingeteam's solar sales department [5] For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

PV-DIESEL SOLUTIONS

Evolution of the price of Diesel and Solar systems

PV-Diesel Solutions

Integration of photovoltaics into diesel grids

The power generation from diesel gensets plays a key role for industrial companies and rural communities all over the world, especially in remote regions without a good grid infrastructure. They permit to create simple off-grid networks with a moderate initial investment.

However these applications have some disadvantages. First, the grid they create is totally dependent on diesel, which is a non-renewable and scarce energy source. On the other hand, the energy generated is expensive due to high prices of fuel and the difficulty of supplying and storing it. Furthermore, diesel-based systems have to face constant price increases and high OPEX -Operational Expenditures- directly related to the use of fuel.

Apart from that, CO_2 emissions increase with the use of gensets. This fact has to be taken into account, not only as a moral exigence towards global warming, but also because it could entail governmental fines, affecting operational expenditures.

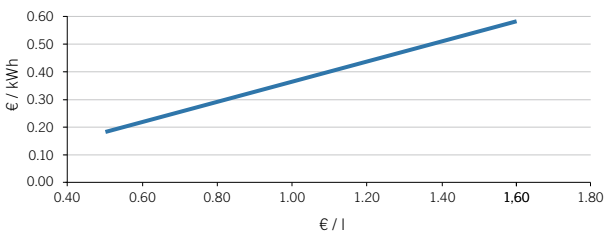
PV system prices have fallen in the last years, allowing nowadays generating energy to a more competitive cost compared to fuel. In regions with high solar irradiation levels and expensive fuel prices, PV systems can be amortized in less than four years. Furthermore, PV plants require little maintenance and they can be configured according to specific energy demands. Moreover, photovoltaics do not produce CO_2 emissions.

The integration of PV systems into diesel grids offers large industries and rural communities a way of saving fuel with a natural and renewable resource. This can be achieved by adding INGECON® SUN PV inverters and Ingeteam's PV-Diesel controllers to the diesel grid. The use of photovoltaics reduces the energy generated by the gensets and, therefore, the fuel consumption.

Challenges of PV-Diesel integration:

- To guarantee a minimum load for the generators, to ensure longer engine life.
- To protect against reverse power, in case of a total load disconnection.
- To ensure stability against irradiance variations due to cloud shading.

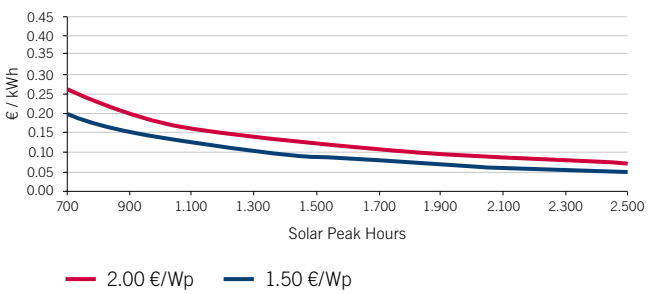
Levelized cost of energy on genset systems

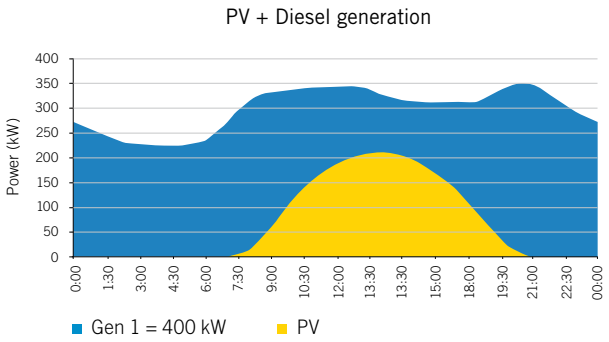


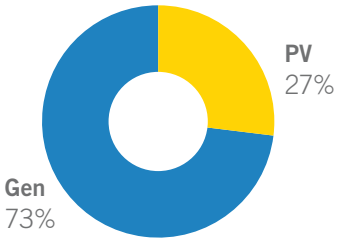
PV_{CapEX}= 2 - 1.5 €/Wp (> 1 MW); PV_{OpEx}:1.5% annual; Degradation: 0.4 annual; PR=0.85; Diesel CapEX=0.3 €/W (> 1 MW); O&M=3% annual; Diesel cost: actual price + 3% annual Interest loan= 6.4%; 12 years

Time: 20 years

Levelized cost of energy on PV based systems







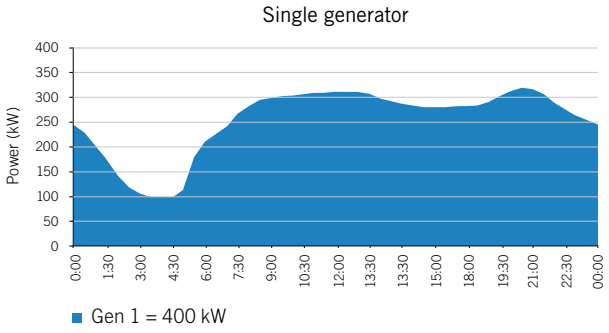
A scalable system to satisfy every project needs

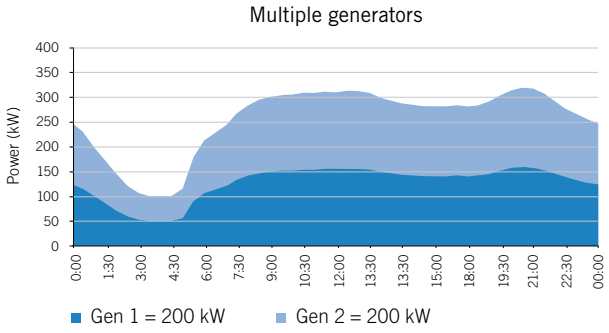
Ingeteam's PV-Diesel controllers monitor the power flows of the system and manage the PV injected to the diesel grid in order to guarantee the system stability, allowing achieving up to a 70 percent of PV penetration compared to the total diesel capacity.

Diesel systems can be classified in two main types depending on the generators operation: continuous operation diesel systems or on-demand diesel systems. Continuous operation diesel systems are based on one or more gensets operating permanently, no matter the load level. On-demand diesel systems feature an external controller that selects the number of gensets that will operate depending on the load requirement.

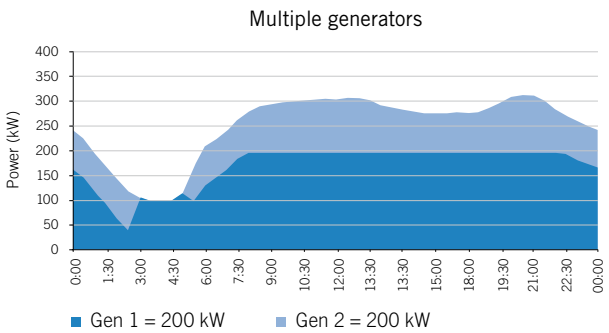
Ingeteam has developed different solutions for each system type that can be easily implemented in both new and already existing diesel systems.

Continuous operation diesel systems



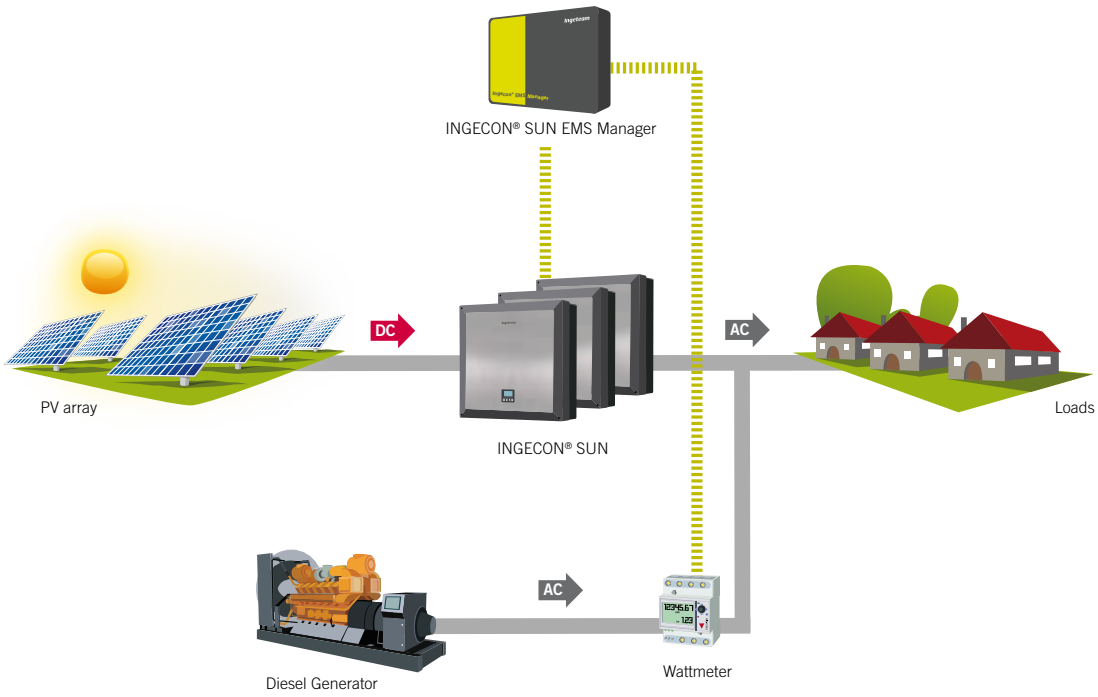


On-demand diesel systems



Continuous operation diesel systems

Schema with INGECON® SUN EMS Manager



Operating mode
In those cases in which one or more gensets are operating permanently to satisfy the energy demand, the INGECON® SUN EMS Manager can be used to control the PV inverters.

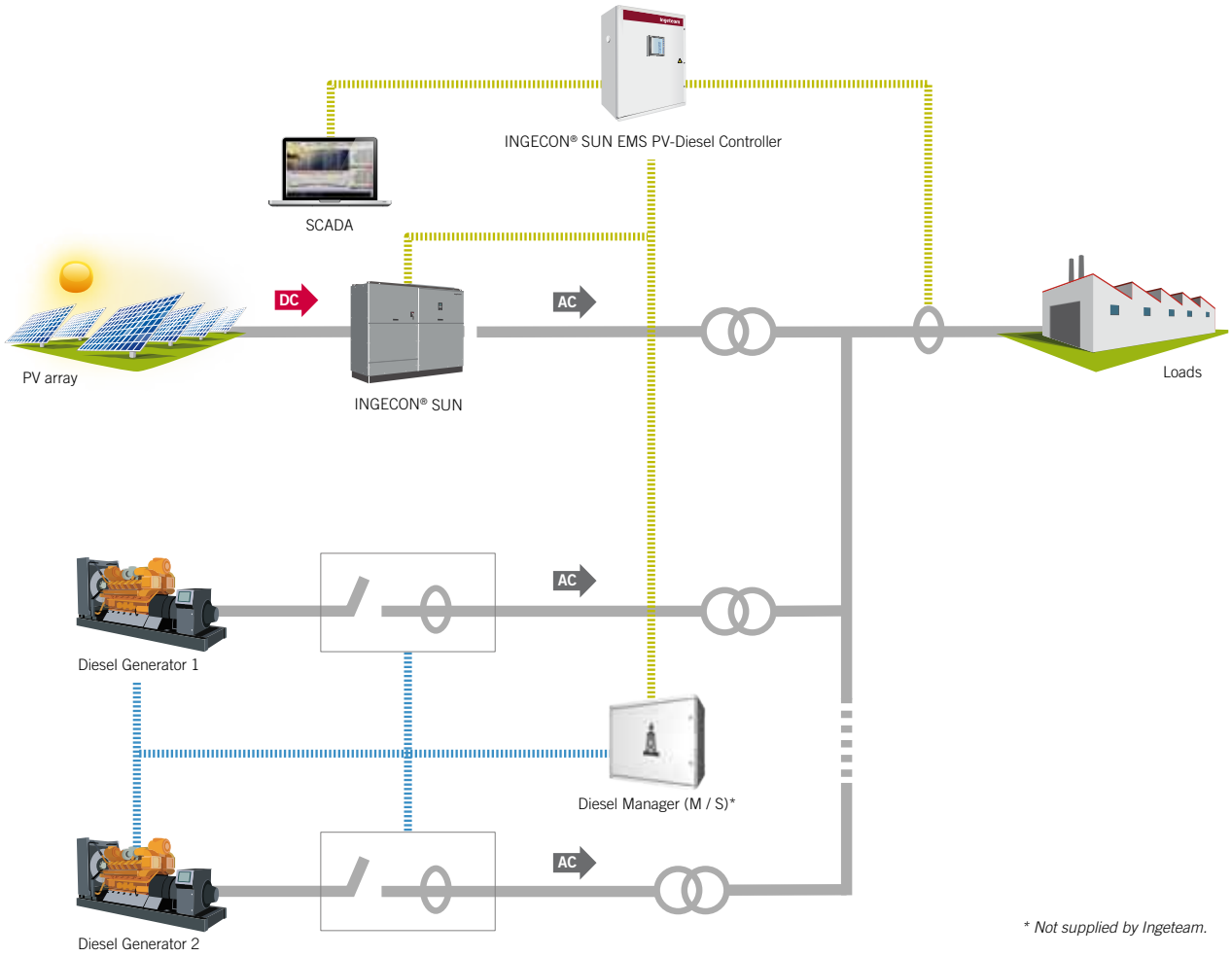
Photovoltaic inverters inject current to the diesel grid, being detected by the genset as a load reduction. INGECON® SUN EMS Manager will control the energy production of the PV inverters depending on the energy required by the loads. Moreover, it will also act as a communications center, as it enables to remotely access all the system's relevant data.

Elements of the PV-Diesel Solution:
- INGECON® SUN PV inverters
- INGECON® SUN EMS Manager
- Wattmeter

System features:
- Minimum diesel load
  It guarantees that the diesel generator does not operate under a minimum load level, in order to ensure a longer engine life.
- Reverse power protection
  It avoids a power flow from the inverter to the genset, for example, in the event of a total load disconnection.
- Stability against irradiance variations
  In continuous operation diesel systems, stability against irradiance variation it is guaranteed by the spinning reserve of the genset, previously sized for the maximum possible load.
- Monitoring
  The installation can be monitored by using the software INGECON® SUN EMS Tools. Also, an internal datalogger allows to store more than 30 days historical data.
- Load control
  The INGECON® SUN EMS Manager allows switching loads on when the genset load level is low and there is a PV generation surplus.

On-demand diesel systems

Schema with INGECON® SUN EMS PV-Diesel Controller



** Not supplied by Ingeteam.*

Operating mode

In those cases in which an external diesel controller determines the number of operating gensets, the INGECON® SUN EMS PV-Diesel Controller is used to guarantee a proper PV integration in the diesel grid.

Photovoltaic inverters inject current to the diesel grid, being detected by the genset as a load reduction. INGECON® SUN EMS PV-Diesel Controller monitors the genset units, obtaining which ones are operating as well as their load level. This information is used to determine the maximum power that the solar inverters can supply in order to guarantee the system stability, i.e. in a cloud shading event.

The monitoring process of the genset units can be made by a Power Meter device or by an Ethernet Modbus / TCP straight from the genset (if available). The general system can be monitored via SCADA or dedicated software.

The INGECON® SUN EMS PV-Diesel Controller features an auto-learning algorithm that allows maximizing the PV energy injected and minimizing the number of connections and disconnections of the gensets.

Elements of the PV-Diesel Solution:

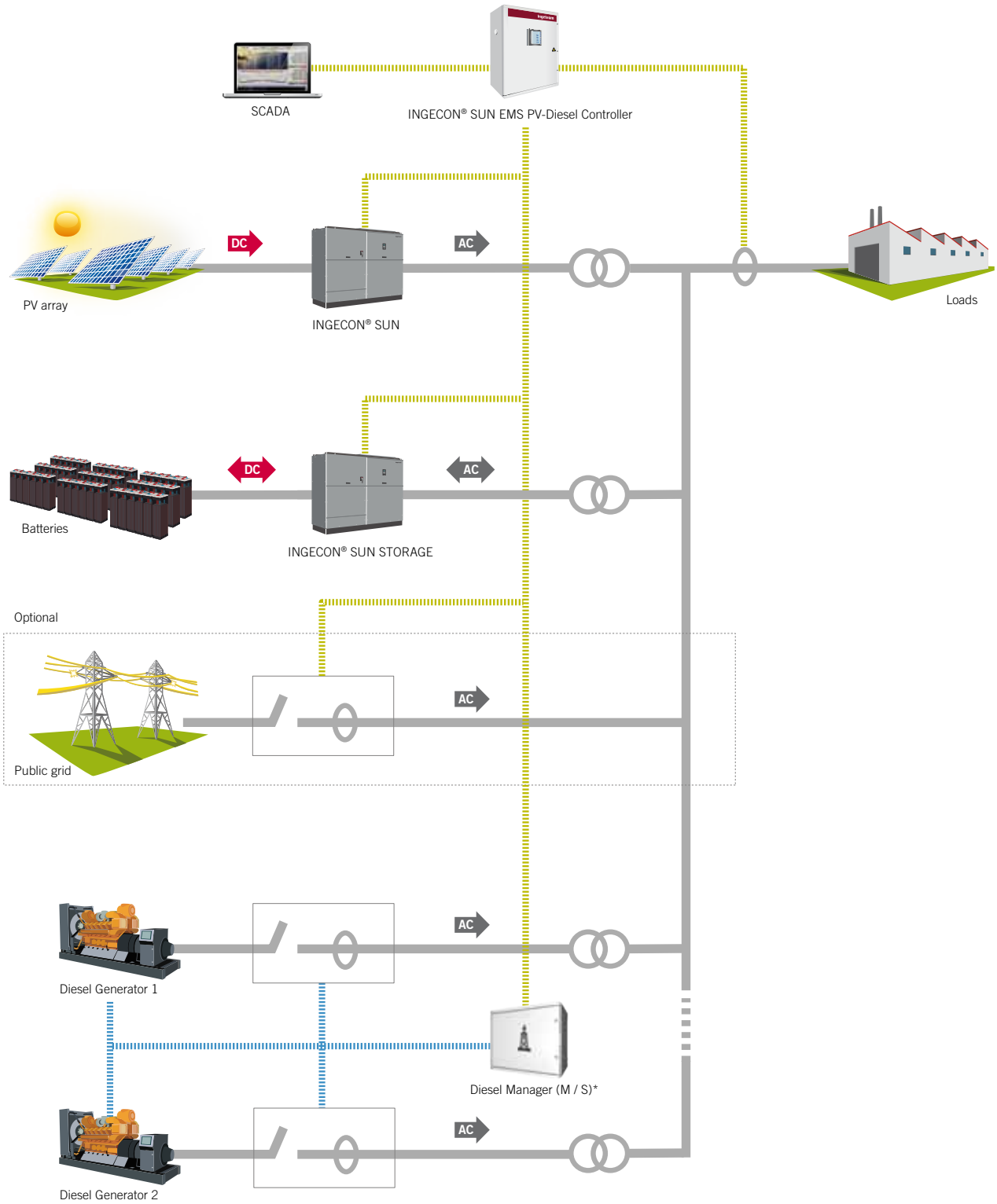
- INGECON® SUN PV inverters
- INGECON® SUN EMS PV-Diesel Controller
  (PLC, communication switch, power supply and protections).
- Power Meter Unit
  (Wattmeter, communication switch, power supply and protections).

System features:

- Minimum diesel load
  It guarantees that the diesel generators do not operate under a minimum load level, in order to ensure a longer engine life.
- Reverse power protection
  It avoids a power flow from the inverter to the genset, for example, in the event of a total load disconnection.
- Stability against irradiance variations
  INGECON® SUN EMS PV-Diesel Controller limits the PV output power to guarantee that the available spinning reserve is enough to meet the energy demand in a cloud shading event.
- Monitoring
  The installation can be monitored by using a SCADA.
- Reactive Power Support
  from the PV inverters, for those installations with high reactive power consumption.

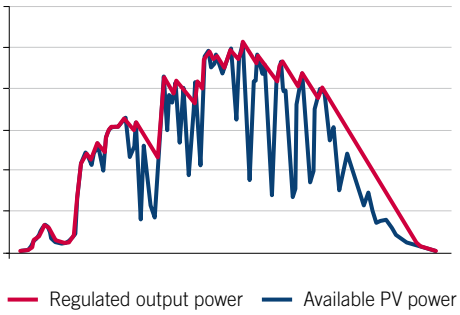
On-demand diesel systems

Schema with INGECON® SUN EMS PV-Diesel Controller and energy storage



** Not supplied by Ingeteam.*

A battery bank adds many advantages
The addition of an energy storage system allows increasing the PV penetration. In this case, the spinning reserve is not needed to absorb the irradiance variations in the plant, because the batteries supply the necessary power when PV generation decreases due to passing clouds.



Operating mode
Photovoltaic inverters inject current to the diesel grid, being detected by the genset as a load reduction. INGECON® SUN EMS PV-Diesel Controller monitors the loads and determines the maximum PV power that can be injected into the diesel grid. Furthermore, in a cloud shading event, the INGECON® SUN EMS PV-Diesel Controller together with the battery inverters INGECON® SUN STORAGE PowerMax, reduce the output power with a established ramp rate, that will allow to the diesel controller to switch-on the required generators.

In these installations, the storage system has to provide the energy needed for the genset start-up.

The system can be monitored via SCADA or dedicated software.

The INGECON® SUN EMS PV-Diesel Controller features an auto-learning algorithm that allows maximizing the PV energy injected and minimizing the number of connections and disconnections of the gensets.

Elements of the PV-Diesel Solution:
- INGECON® SUN PV inverters
- INGECON® SUN EMS PV-Diesel Controller
  (PLC, communication switch, power supply and protections).
- INGECON® SUN STORAGE PowerMax battery inverters
- Power Meter Unit
  (Wattmeter, communication switch, power supply and protections).

System features:
- Minimum diesel generation.
  It guarantees that the diesel generators provide a minimum energy level, in order to guarantee the grid stability when load steps happen, or the loads are unbalanced or they present current harmonics.
- Reverse power protection
  It avoids a power flow from the inverter to the genset, for example, in the event of a total load disconnection.
- Stability against irradiance variations
  INGECON® SUN EMS PV-Diesel Controller together with the battery inverters INGECON® SUN STORAGE PowerMax, guarantee system stability in a cloud shading event.
- Monitoring
  The installation can be monitored by using a SCADA.
- Reactive Power Support
  from the PV inverters, for those installations with high reactive power consumption.

OPTIONAL

- Public grid power flow management (if available).


Ingeteam

Accessories

MULTI-OPTIONS FOR PV PLANT CONTROL AND MONITORING

INGECON SUN StringControl

160 / 320

String current monitoring

The INGECON® SUN StringControl is a device for measuring each PV generator string current and detecting defective string currents through INGECON® SUN Manager software, INGECON® SUN SCADA and / or other monitoring systems. String currents can be monitored through the RS-485, Ethernet Modbus / TCP and GSM / GPRS communication interfaces.

Flexibility
Available in models ranging from 16 to 32 inputs and equipped with PV connectors type 4 (standard) or cable glands inlet connections, the INGECON® SUN StringControl provide the maximum flexibility and expandability in system design. The compact and rugged IP65 enclosure is designed for installation in outdoor environments, such as roof-mounted systems and large-scale solar farms.

Maximum protection
The INGECON® SUN StringControl intelligent combiner boxes can be equipped with touch-safe DC fuse holders, DC fuses, lightning induced DC surge arresters and load disconnector switch.

MAIN FEATURES

- Built to minimize system costs by providing the maximum flexibility.
- Available with RS-485, Ethernet or GSM / GPRS communication (optional).
- Available in 16 and 32 input configurations.
- Rated for 1,000 Vdc maximum voltage.
- Simplifies input and output wiring.
- String polarity verifier function.
- Self-powering from DC strings.
- Capability to connect up to 2 strings per input (StringControl 320 models).
- Capability to connect up to 2 DC output cables per polarity.
- IP65 protection rating.
- Maximum protection to corrosion and pollution thanks to the isolating polyester enclosure reinforced with fiberglass.

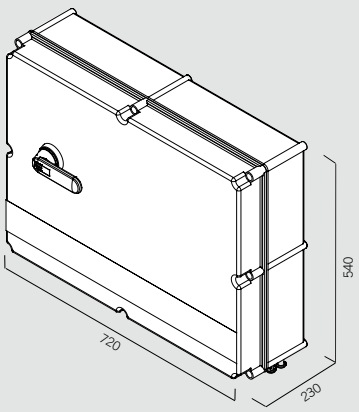
PROTECTIONS

- Up to 16 pairs of DC fuses.
- Lightning induced DC surge arresters, type 2 (optional).
- Lightning induced DC surge arresters, type 1 (optional).
- Manual DC isolating switch (optional).
- DC isolating switch with remote tripping (optional).

	StringControl 160	StringControl 320
Input		
Max number of connectable input strings	16	32[1]
Maximum number of measurable channels	16	16
Maximum current per string[2]	10 A	20 A
Number of protection fuses	2 x 16	2 x 16
Type of fuses	gPV fuses, 10 x 38 mm, 30 kA	gPV fuses, 10 x 38 mm, 30 kA
Available fuses	10 A, 12 A, 15 A, 16 A (15 A standard)	20 A, 25 A, 30 A (30 A standard)
Maximum DC voltage	1,000 V	1,000 V
Inlet connections	PV connectors type 4 (standard) or M12 cable glands (3.5 to 7 mm) with direct connection on fuse holders (on request)	PV connectors type 4 (standard) or M12 cable glands (3.5 to 7 mm) with direct connection on fuse holders (on request)
Output		
Maximum total current[2]	160 A	320 A
Outlet connections	M50 cable glands (cable diameter: 27 to 35 mm) with direct connection on copper plates	M50 cable glands (cable diameter: 27 to 35 mm) with direct connection on copper plates
DC switch disconnect rating	250 A (standard)[3]	450 A (standard)[4]
Communication		
Communication interface	RS-485, Ethernet, GSM / GPRS	RS-485, Ethernet, GSM / GPRS
Inlet connection	M16 cable glands (cable diameter: 4.5 to 10 mm)	M16 cable glands (cable diameter: 4.5 to 10 mm)
Grounding		
Grounding connection	M16 cable gland (cable diameter: 4.5 to 10 mm)	M16 cable gland (cable diameter: 4.5 to 10 mm)
General Information		
Enclosure type	Outdoor use, insulating cabinet (polyester reinforced with fiberglass)	Outdoor use, insulating cabinet (polyester reinforced with fiberglass)
Protection rating	IP65	IP65
Impact strength	IK10	IK10
Ambient temperature	-20 °C to +55 °C	-20 °C to +55 °C
Relative humidity (non-condensing)	0 to 95%	0 to 95%
Maximum altitude[5]	3,000 m a.s.l.	3,000 m a.s.l.
DC switch handle	External (front) access, lockable in open position	External (front) access, lockable in open position
Weight	25 kg	25 kg
Marking	CE	
EMC and security standards	EN 61000-6-4, EN 61000-6-2, EN 50178	
LV Switchgear standards	IEC 61439-1, IEC 61439-2	
Electric shock protection	Class II equipment	

Notes: [1] Type 4 Y connectors for parallel connection of two string cables to the same input channel not included in the supply [3] Up to 50 °C [3] 250 A disconnect rating for DC isolating switch with remote tripping (optional) [4] 450 A disconnect rating for DC isolating switch with remote tripping (optional) [5] Over 1,000 m temperature for maximum current is reduced at the rate of 4.5 °C for each 1,000 m. For installations beyond the maximum altitude, please contact Ingeteam's solar sales department.

Size (mm)



StringControl 160 / 320

** Illustrative image. It might not correspond with the basic configuration.*

INGECON SUN StringBox

160 / 240 / 320

Simple and safe connection of photovoltaic strings

The new INGECON® SUN StringBox is a cost-effective PV string combiner box series designed for central inverter-based PV systems. The INGECON® SUN StringBox features efficient input and output DC wiring with fully rated DC disconnect switches for safe maintenance. When used in combination with INGECON® SUN PowerMax central inverters, the INGECON® SUN StringBox outputs can be monitored by means of the optional DC input groups monitoring kit available for B, X and M series.

A complete range of equipment for all types of projects

Available in models ranging from 16 to 32 inputs and from 1,000 to 1,500 Vdc, the INGECON® SUN StringBox provide the maximum flexibility and expandability in system design. The compact and rugged IP65 enclosure is designed for installation in outdoor environments, such as roof-mounted systems and large-scale solar farms.

Maximum protection

The INGECON® SUN StringBox combiner boxes are equipped with touch-safe DC fuse holders, DC fuses, lightning induced DC surge arresters and load disconnector switch.

MAIN FEATURES

- Built to minimize system costs by providing the maximum flexibility.
- Available in 16, 24 and 32 input configurations.
- Rated for 1,000 Vdc or 1,500 Vdc maximum voltage.
- Simplifies input and output wiring.
- Capability to connect up to 2 DC output cables per polarity.
- IP65 protection rating.
- Maximum protection to corrosion and pollution thanks to the isolating polyester enclosure reinforced with fiberglass.

PROTECTIONS

- Up to 32 pairs of DC fuses.
- Lightning induced DC surge arresters, type 2.
- Manual DC isolating switch.

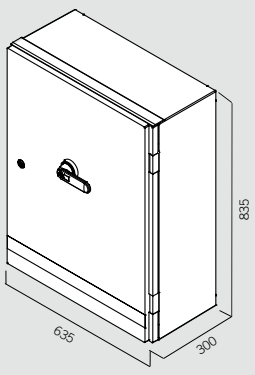
OPTIONAL ACCESORIES

- Lightning induced DC surge arresters, type 1.

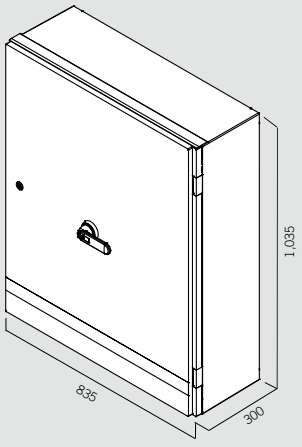
	1,000 V			1,500 V		
Input	**StringBox 160**	**StringBox 240**	**StringBox 320**	**StringBox 160**	**StringBox 240**	**StringBox 320**
Maximum number of input strings	16	24	32	16	24	32
Rated current per string	10 A					
Maximum current per string	12 A					
Number of protection fuses	2 x 16	2 x 24	2 x 32	2 x 16	2 x 24	2 x 32
Type of fuses	gPV fuses, 10 x 38 mm, 30 kA			gPV fuses, 10 x 85 mm, 30 kA		
Maximum DC voltage	1,000 V			1,500 V		
Inlet connections	M32 cable glands (n.4 cables entry diameter: 3.5 to 7 mm for each cable gland) with Direct connection on fuse holders			M32 cable glands (n.4 cables entry diameter: 3.5 to 7 mm for each cable gland) with Direct connection on fuse holders		
Output						
Rated total current	160 A	240 A	320 A	160 A	240 A	320 A
Maximum total current [1]	192 A	288 A	384 A	192 A	288 A	360 A
Outlet connections	Up to 2 pairs of M50 cable glands (cable diameter: 27 to 35 mm) with direct connection on copper plates			Up to 2 pairs of M50 cable glands (cable diameter: 27 to 35 mm) with direct connection on copper plates		
DC switch disconnect rating	200 A	315 A	400 A	315 A	315 A	400 A
Grounding						
Grounding connection	M16 cable gland (cable diameter: 4.5 to 10 mm)			M16 cable gland (cable diameter: 4.5 to 10 mm)		
General Information						
Enclosure type	Outdoor use, insulating cabinet (polyester reinforced with fiberglass)			Outdoor use, insulating cabinet (polyester reinforced with fiberglass)		
Protection rating	IP65					
Impact strength	IK10					
Operating temperature range	-20 °C to +55 °C					
Relative humidity (non-condensing)	0 to 100%					
Maximum altitude[2]	2,000 m a.s.l.					
DC switch handle	External (front) access, lockable in open position					
Consumption	0 W					
Weight	27 kg	43 kg	44 kg	32 kg	46 kg	48 kg
Marking	CE					
LV Switchgear standards	IEC 61439-1, IEC 61439-2					
Electric shock protection	Class II equipment					

Notes: [1] Over 50 °C ambient temperature, the current will be reduced at the rate of 3.5% every °C up to 55°C. [2] Please contact Ingeteam for altitudes higher than 2,000 m.

Size (mm)



StringBox 160



StringBox 240 / 320

INGECON SUN WeatherBox

Maximum control over the PV system parameters

INGECON® SUN WeatherBox offers the possibility of storing meteorological data for up to 30 days.

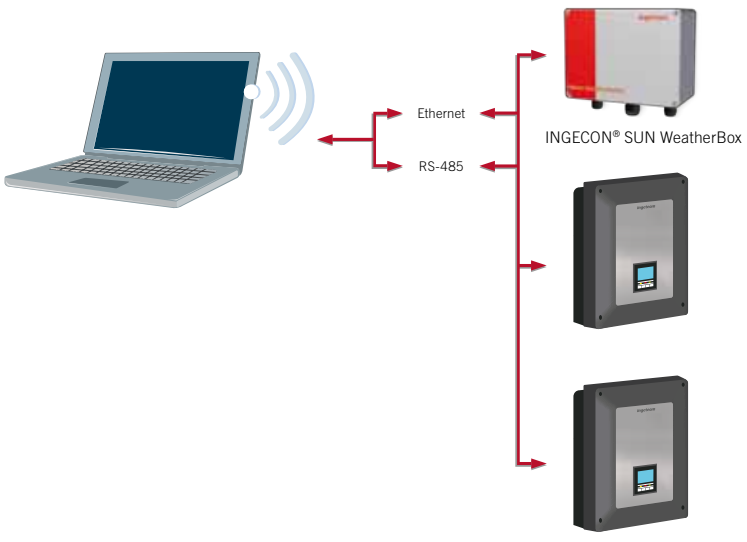
Outdoor installation
The INGECON® SUN WeatherBox has been especially designed for outdoor installation, with a protection rating of IP65. Sensors can be connected to measure a number of parameters such as module irradiation, wind speed, module temperature, etc., for optimum PV plant control.

Easy communication
INGECON® SUN WeatherBox acts as one more slave in the communication network, in addition to the PV inverters. Communication with the INGECON® SUN WeatherBox can be established either by RS-485 or Ethernet boards.

Meteorological values measurement
The WeatherBox integrates the functions of measuring and storing data received from analog inputs with a greater precision than normal boards.

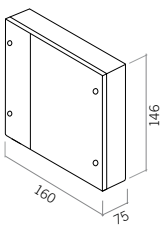
The following inputs are available:

- 2 inputs for PT100.
- 4 inputs 0..10 V o 0..20 mA.



Size and weight (mm)

340 g.



INGECON SUN Communication

A range of PC-to-Inverter communication options

Ingeteam offers its customers the very latest technology in communication boards. Thanks to the hardware developed by the Ingeteam engineers, it is possible to establish local communication with the PV inverters and / or remote communication through a PC. In this way, all the PV system variables (operating parameters and historical data files) can be monitored simply and conveniently. This communication can be made through a number of boards that can be incorporated into the inverter. All these boards feature a unified connector in order to facilitate the connection of any of them in every inverter from Ingeteam's product range.

RS-485 communication is the easiest and fastest way to interconnect a number of inverters and is supplied as standard in many inverter families. For those inverters that do not feature standard RS-485 communication, Ingeteam can optionally supply an RS-485 board to provide this.

This comm board is the best way to establish **Ethernet-TCP** communication with Ingeteam's inverters and it enables some more advanced control strategies.

One of Ingeteam's latest developments in communication boards is the **Wi-Fi** board, for wireless communication, and which also includes conversion to RS-485.

On the other hand, the **dual Modbus-TCP Protocol board** is a ready-to-use high-quality box that has been designed for Ingeteam's central inverters.

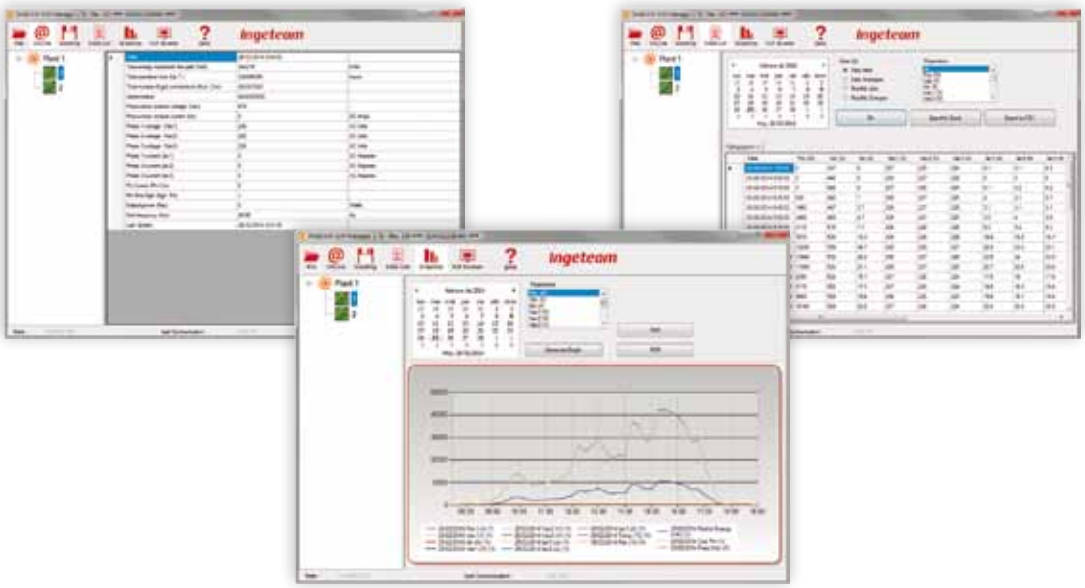
1 **Wi-Fi board**

2 **Ethernet-TCP Board**

3 **RS-485 Board**

4 **Dual Modbus-TCP Protocol converter board**

INGECON SUN Manager



PV plant monitoring software

PC software operating in a Windows® graphical environment for PV plant management and monitoring.

Integration of single phase and three phase inverters and string control devices in a single software package.

Communication through different ways: RS-485, Ethernet and modem.

This software can be downloaded, free of charge, from the **www.ingeteam.com** website.

SOFTWARE FEATURES

- Individual configuration of each PV plant inverter.
- On-line display of the inverter internal variables.
- Display of all the plant inverters on a single screen.
- Multi-PV plant management from a single PC.
- Historical data capture and disc storage possibility.
- Data log display in a number of graph or table formats.
- Data storage in XML format.
- Modem configuration for receiving SMS alarm messages.
- Available in English, Spanish, German, French, Italian, Czech and Chinese.
- Configuration of the INGECON® SUN EMS Manager.

ON-SCREEN DATA DISPLAY

Full-screen data display, with customisable wallpaper, for viewing the most important plant parameters:

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

** If a ComBox with the appropriate sensors has been installed.*

VARIABLES VIEWABLE ON-LINE

List of the variables that are viewable on-line, stored in the inverter memory:

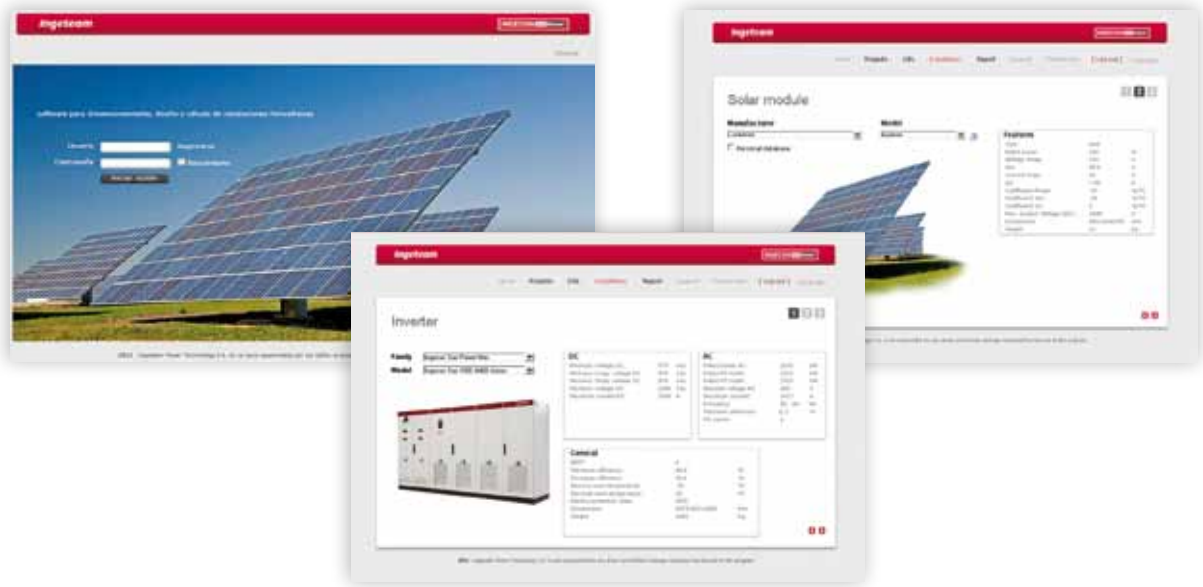
- Total energy delivered to the grid.
- Total time in operating status.
- Total number of grid connections.
- Total number of errors.
- Alarm status.
- Internal operating status.
- Solar panel voltage.
- Solar panel current and power.
- Output current and power to the grid.
- Power Factor.
- Phi sine positive / negative.
- Grid voltage.
- Grid frequency.
- Actual date and time.

INGECON SUN Monitor

Web portal for PV plant access

With the INGECON® SUN Monitor software, PV plant data can be accessed from any PC with an Internet connection **(www.ingeconsunmonitor.com)**. 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. This software has been designed to facilitate owner, installer or promoter plant control, providing information on the PV plant status in the form of lists and graphs, whilst there is also the possibility of receiving an e-mailed production report. Data are recorded and stored throughout the useful life of the inverter. An iSun Monitor iPhone application is available at the App Store.

INGECON SUN Planner



PV plant dimensioning

The new INGECON® SUN Planner software offers the possibility of optimally customising each specific project. In just three fast, simple steps users can correctly dimension a PV plant, by selecting the type of PV module and INGECON® SUN inverter that best suits the system, using a database comprising an extensive range of different modules for each manufacturer. There is also the option of selecting different parameters for the plant, for customized dimensioning, to meet the end customer's requirements. Registration and access are free of charge and can be quickly and easily made through one of the following websites: **www.ingeconsunplanner.com** or **www.ingeteam.com**, to quickly enjoy all the advantages offered by this software tool from any web browser, IPod, IPhone, IPad or Android tablet.

Plant configuration in just 3 simple steps

Step 1
Select the INGECON® SUN Inverter

Step 2
Select the PV panel

Step 3
Dimensioning of the PV plant completed

INGECON SUN SCADA

Remote operation and SCADA

Remote control enables real time operation and supervision of the PV installations and is an essential tool for guaranteeing the highest level of availability.

It is adapted to the requirements of each installation and can incorporate new features based on modular SCADA architecture.

It is scalable and flexible thanks to its OPC based client / server architecture.

The Remote Controller can integrate the Substation and any other device that may be remotely controlled. It is compatible with a multitude of protocols and supports (ADSL, RDSI, GSM, GPRS, Internet, fibre optics, radio, microwaves, and satellite).

Remote Communication

In the case that signals not coming from the inverter should be implemented in the SCADA, such as the status of automatics, temperatures, etc., communication remotes would need to be installed in each of the enclosures. In the case of INGECON® SUN PowerMax Inverters, this remote would need to be installed in the AC and auxiliary services enclosure.

SOME POSSIBLE COMMUNICATION PROTOCOLS

- Interbus-S.
- Profibus-DP.
- CAN.
- OPC DA & OPC XML Data Client and Server.
- IEC 61850 Client and Server.
- IEC 61400-25 Client and Server.
- IEC 60870-5- 101/104 – 102 Master-Slave.
- DNP 3.0 Master-Slave.
- Modbus ASCII-RTU/TCP Master-Slave.
- Other protocols can be done through a Client / Server architecture based on OPC.

INGECON SUN

INTEGRATED AND OPTIONAL ACCESSORIES

	1Play TL M	1Play TL U M	3Play TL	3Play TL M	3Play TL U M	PowerMax TL B	PowerMax TL U B	PowerMax TL X	PowerMax TL M
Protections									
Galvanic isolation DC-AC	–	–	–	–	–	–	–	–	–
Reverse Polarity	✓	✓	✓	✓	✓	✓	✓	✓	✓
Input overvoltage (type 2 surge arresters)	–	–	○	○	○	✓	✓	✓	✓
Output overvoltage (type 2 surge arresters)	–	–	–	–	–	✓	✓	✓	✓
Output shortcircuits and overloads	✓	✓	✓	✓	✓	✓	✓	✓	✓
Insulation failure DC	✓	✓	✓	✓	✓	✓	✓	✓	✓
Insulation failure AC	–	–	–	–	–	○	○	○	○
Anti-islanding with automatic shutdown	✓	✓	✓	✓	✓	✓	✓	✓	✓
DC fuse-holders	–	–	○	○	○	○	○	✓	✓
DC fuses	–	–	○	○	○	○	○	○	○
DC switch	○	○	○	○	○	✓	✓	✓	✓
AC circuit breaker	–	–	–	–	–	○	✓	○	○
Accessories									
Multicontact 4	✓	✓	○	○	–	–	–	–	–
Potential-free contact	✓	✓	✓	✓	✓	✓	✓	✓	✓
Self-consumption kit	○	○	○	○	○	–	–	–	–
Self-consumption kit with EMS Manager	○	○	○	○	○	–	–	–	–
Heating kit (-30 °C / -22 °F)	–	–	–	–	–	○	○	○	○
Grounding kit	–	–	–	–	–	○	○	○	–
Sync kit	–	–	–	–	–	✓ [1]	✓ [1]	✓ [1]	✓ [1]
Night-time power supply	○	○	○	○	○	✓	✓	○	○
AC wattmeter	–	–	–	–	–	○	○	○	○
DC string current measurement	✓	–	○	○	–	○	○	○	○
Firmware updatable via SD card	✓	✓	✓	✓	✓	–	–	–	–
Firmware updatable via communication	✓	✓	✓	✓	✓	✓	✓	✓	✓
Low-voltage ride-through capability	✓	✓	✓	✓	✓	✓	✓	○	○
Digital inputs	✓	✓	✓	✓	✓	✓	✓	–	–
Communications									
RS-485	○	○	✓	✓	✓	–	–	✓	✓
Ethernet	○	○	○	○	○	✓	✓	○	○
3G Router	○	○	○	○	○	○	○	○	○
USB	✓	✓	–	–	–	–	–	–	–
Wi-Fi	○	○	○	○	○	–	–	–	–
Plant power control [2]	✓	✓	✓	✓	✓	✓	✓	✓	✓
Software									
INGECON® SUN Manager for plant management	✓	✓	✓	✓	✓	✓	✓	✓	✓
INGECON® SUN Monitor for plant monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: [1] For inter-inverter synchronization, request a quote [2] Equipment prepared. An external controller is required [3] For other output options, please contact Ingeteam [4] It also integrates digital outputs and analogue inputs [5] AC protections.

	STORAGE 1Play	STORAGE 1Play TL	STORAGE Power	STORAGE PowerMax TL B	STORAGE PowerMax TL U B	STORAGE PowerMax TL X	EMS Manager	EMS Plant Controller	SUN Weather-Box	SUN String-Control
Protections										
Galvanic isolation DC-AC	✓	–	✓	–	–	–	–	–	–	–
Reverse Polarity	–	–	–	✓	✓	–	–	–	–	–
Input overvoltage (type 2 surge arresters)	–	–	○	✓	✓	✓	–	✓ [5]	–	○
Output overvoltage (type 2 surge arresters)	✓	✓	✓	✓	✓	✓	–	–	–	–
Output shortcircuits and overloads	✓	✓	✓	✓	✓	✓	–	✓ [5]	–	–
Insulation failure DC	✓	✓	✓	✓	✓	✓	–	–	–	–
Insulation failure AC	–	–	–	✓	✓	○	–	–	–	–
Anti-islanding with automatic shutdown	✓	✓	✓	✓	✓	✓	–	–	–	–
DC fuse-holders	–	–	○	○	○	✓	–	–	–	✓
DC fuses	–	–	○	○	○	○	–	✓	–	✓
DC switch	○	○	✓	✓	✓	✓	–	✓	–	○
AC circuit breaker	–	–	✓	○	✓	○	–	✓	–	–
Accessories										
Multicontact 4	○	○	–	–	–	–	–	–	–	✓ [3]
Potential-free contact	✓	✓	✓	✓	✓	✓	–	○	–	–
Self-consumption kit	○	○	–	–	–	–	–	–	–	–
Self-consumption kit with EMS Manager	○	○	–	–	–	–	–	–	–	–
Heating kit (-30 °C / -22 °F)	–	–	○	○	○	○	–	○	–	–
Grounding kit	–	–	○	○	○	○	–	–	–	–
Sync kit	–	–	–	✓ [1]	✓ [1]	✓ [1]	–	–	–	–
Night-time power supply	○	○	✓	✓	✓	○	–	–	–	–
AC wattmeter	–	–	○	○	○	○	–	✓	–	–
DC string current measurement	–	–	–	○	○	○	–	–	–	✓
Firmware updatable via SD card	–	–	–	–	–	–	–	–	–	–
Firmware updatable via communication	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Low-voltage ride-through capability	○	○	○	✓	✓	○	–	✓	–	–
Digital inputs	✓	✓	✓	✓	✓	–	–	✓ [4]	–	–
Communications										
RS-485	○	○	✓	–	–	✓	✓	○	✓	○
Ethernet	○	○	○	✓	✓	○	✓	✓	✓	○
3G Router	○	○	○	○	○	○	–	–	–	○
USB	○	○	–	–	–	–	✓	✓	–	–
Wi-Fi	○	○	–	–	–	–	○	○	–	–
Plant power control[(2)]	–	–	–	✓	✓	✓	–	–	–	–
Software										
INGECON® SUN Manager for plant management	✓	✓	✓	✓	✓	✓	✓	–	✓	✓
INGECON® SUN Monitor for plant monitoring	✓	✓	✓	✓	✓	✓	✓	–	–	✓

✓ Integrated ○ Optional – Not available

INGECON SUN Training

THE BEST TRAINING PLATFORM FOR PROFESSIONALS

INGECON SUN Training

Training for professionals in the PV sector

INGECON® SUN Training is a training platform directed at facilitating the work of all those professionals whose job involves handling the Ingeteam PV inverters.

At INGECON® SUN Training, we aim to share our knowledge and experience in the belief that this is the best way for all of us to progress together.

What's more, the site is intended to serve as a meeting point for all those professionals working in the PV sector, whatever their area of specialisation.

More info at:

www.ingeconsuntraining.com

training.energy@ingeteam.com

TRAINING COURSES

On-site courses

General and specific, commercial and technical; free and subsidised. Get more information on the training available at: **www.ingeconsuntraining.com**

Tailored courses

Tell us your needs and we'll design a customised training program. We can even give the course at your facilities.

Live webinars

You can also do a course from your own home or office. You simply need a computer, Internet connection and a microphone headset.

ADDITIONAL SUPPORT

Visits

You're welcome to visit our facilities. We'd like you to get to know our equipment right from its origins.

Audiovisual material

Our website offers access to videos, presentations and technical documentation with relevant information on technological developments, technical support etc.

FAQ

The FAQ section on our website allows you to check out the answers to the main doubts raised by our customers. You even have the opportunity to ask us about any other doubts or question you may have.

Technical articles

Keep up-to-date with technical articles on the very latest technological developments achieved by our team of engineers.

Efficiency
Our goal is to ensure that our inverters deliver the highest energy efficiency rates possible. We'll help you to get the most out of our products.

Certification
Our training courses are certified by the most reputed solar education and renewable energy training organizations worldwide.

Flexibility
We can adapt to suit your own particular needs and circumstances, with customised courses, either online or face-to-face, depending on your own specific requirements.

Excellence
Our training personnel are involved in R&D work, and are therefore always up-to-date with the very latest PV technology.

INGECON SUN
Service partner

Becoming an INGECON® SUN Service Partner is fast and easy. You simply need to attend a special course and meet the minimum requirements.

You will get a certification which licences you to perform specific handling and manipulation tasks on the INGECON® SUN equipment.

BENEFITS OF BEING A SERVICE PARTNER

- Technical support 24 hours a day, 365 days a year.
- Access to specific technical documentation.
- Specific training courses.
- Immediate availability of spares.
- Authorisation to use our logo on your communications.
- Marketing and Merchandising support.
- Worldwide authorised installers.

SERVICE AND MAINTENANCE

CHOOSE FROM A COMPLETE PORTFOLIO OF SERVICE SOLUTIONS

At Ingeteam, as well as the design and manufacture of PV plant Inverters, we are also concerned with providing an excellent maintenance service to guarantee an increased equipment lifespan and maximum performance.

Ingeteam offers solutions for any PV system configuration, ensuring that our inverters maintain their robustness, reliability and efficiency.

Our concept is based on providing a tailored, flexible service. Combine the modules as you please, to ensure that all your maintenance requirements are covered.

Select your combination

Extended warranty | Commissioning | Online supervision | Maintenance

Diagnostics and repair | Spares guarantee | Availability

Ingeteam Service
We offer you 7 service modules to cover each and every PV inverter maintenance requirement. Select those modules that are best suited to your system and combine them to ensure a reliable operation.

Services offered after-sales

Extended Warranty:

- A full guarantee for your inverter.
- Repair of parts under warranty.
- Return expenses included.
- Diagnostic and advisory services.

Commissioning:

- Commissioning based on the manufacturer's protocol.
- Assistance in planning the commissioning process.
- Troubleshooting during commissioning.

Online Supervision:

- Support service through our call centre.
- Pro-active service from the control centre.
- Regular monitoring reports.

Maintenance:

- All costs included.
- Manufacturer's protocol.
- Flexibility when selecting the type of maintenance.

Diagnostics and Repair:

- On-site assistance at your plant.
- Assistance within 24 hours.[1]

Spares guarantee:

- Guaranteed stock for the contract duration.
- Shipping costs included.
- Supply in less than 48 hours.[2]
- Diagnostic and advisory service.

Availability:

- Compensation for loss of the established availability.

[1]Depending on the contract conditions.
[2] For the countries selected in the map.

Ingeteam Service Centers

Ingeteam maintains strategic centres covering the entire country so as to provide rapid efficient service for any of our customers' solar energy installations.

Our international brand expansion makes us capable of offering these services any place in the world.

TAILORED SOLUTIONS

As well as designing and manufacturing the power and control electronics for PV plants and other renewable energy generation systems, Ingeteam has also been concerned with offering the best possible maintenance service to ensure optimum plant performance and continuous operation.

Maximum performance

The PV plant must achieve maximum performance, with as few interruptions as possible. Get the most from your PV plant through correct maintenance.

At Ingeteam, efficiency is a core value.

Right from commissioning and start-up, and throughout the entire useful life of your plant, we can offer you an all-inclusive maintenance service that is the result of our experience, assurance and specialization. Our secret is based on proactivity.

A key factor that sets us apart from the rest.

Guaranteed optimization

In the knowledge that it is essential to get the best performance out of the PV plant at the lowest operating cost, the maintenance service provided by Ingeteam allows you to adjust and lower your operating costs, for greater profitability.

Our strategy is based on an optimum all-inclusive maintenance policy, to ensure the continuous operation of your plant.

Risk-free financial returns

The solvency, technical capability and financial standing of a sector leader, such as Ingeteam, with its extensive track record and experience, represent a real guarantee when considering plant profitability.

With its expertise in maintenance engineering, on-going investment in R&D&I and commitment to developing optimum programs that adequately cover the existing risk, Ingeteam is ideally positioned to work alongside its customers.

Optimum plant maintenance also signifies maintaining the business risk well under control.

Spares always on hand

A smooth running supply chain and the continuous availability of all those parts required for your PV system, are both key aspects in our all-inclusive maintenance service. You can rest assured in the knowledge that we will handle all the logistics to ensure the rapid replacement of any equipment parts. We offer continuous status monitoring and information reporting so as to anticipate your needs.

Ingeteam can always guarantee the supply of parts, regardless of the system technology.

True adaptability

The solutions provided by Ingeteam for any type of PV system, guarantee reliability and maximum efficiency.

Tell us what you want, and we will tailor our service to meet your requirements, right from the contract conclusion stage, to offer you the best possible service at all times.


AMERYKA
POŁNOCNA
ZIEMIA
GLOBUS FIZYCZNY

REFERENCES

OVER 5 GW OF PV INVERTERS SUPPLIED WORLDWIDE

Ingeteam 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, Ingeteam 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 2000 onwards, our company broadened its scope to encompass the PV solar energy sector as well.

Since then we have provided our customers with more than 5 GW of power with INGECON® SUN photovoltaic inverters. This confirms Ingeteam as one of the world leaders in the PV sector.

At Ingeteam, we have extensive experience in the design and supply of on-grid inverters for power ratings ranging from 2.5 to 3500 kW, for large-scale PV plants. We also specialize in the design and manufacture of highpower battery inverters for stand-alone installations, having supplied this type of inverters principally to the regions of Pacific Asia and Africa.

One of our key benchmark projects is the 94 MW Sishen Solar Facility in South Africa.

The 60 MWp Nobesol solar plant situated in Olmedilla de Alarcón (Spain) is another important project in which Ingeteam has participated, supplying more than 450 INGECON® SUN 100 inverters.

Ingeteam has also supplied battery inverters to some of the most relevant projects in the world, like the 9 MWh energy storage system coupled to a 9 MW PV plant in Réunion island.

1

1. **ISOLUX CORSÁN**

PV plant at San Bellino (Italia)
70 MWp (60 INGECON® SUN PowerMax)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QUADRAN
2. **PV plant at Roquefort (France)**
9.7 MWp (8 INGECON® SUN PowerMax)

ACCIONA SOLAR
3. **PV array at Amareleja (Portugal)**
46 MWp (70 INGECON® SUN PowerMax)

4. **AKUO ENERGY**
PV installation with energy storage in La Réunion island (France)
9 MW PV + 9 MWh batteries
(10 INGECON® SUN PowerMax,
6 INGECON® SUN STORAGE PowerMax)

FRV
2. **Royalla Solar Farm (Australia)**
20 MW (10 INGECON® SUN PowerStation)

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6. **SINERGIA SISTEMI**

PV on-roof installation at the Lamborghini factory in Sant'Agata Bolognese (Italy)
1.2 MWp (20 INGECON® SUN Lite, 2 INGECON® SUN PowerMax, 1 INGECON® SUN Power)

7. **GENERAL ELECTRIC AND MOSER BAER CLEAN ENERGY**

Installation in Sardegna (Italy)
20 MWp (14 INGECON® SUN PowerStation with 28 INGECON® SUN PowerMax inverters)

8. **RISING SUN SOLAR**

PV array at Hawaii (USA)
250 kW (2 INGECON® SUN Power U, 2 INGECON® SUN Smart U)


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9. **CTF-Solar GmbH**
PV plant located in Ravensthorpe (England)
40 MW (20 INGECON® SUN PowerStation SHE22, 40 INGECON® SUN PowerMax)

10. **FRONTINI Srl**
PV plant in Marnate (Italy)
260 kW (13 INGECON® SUN 3Play)

11. **EFACEC**
San Pedro III PV plant (Chile)
30 MW (15 INGECON® SUN PowerStation, 30 INGECON® SUN PowerMax)

12. **ISOLUX CORSÁN**
Installation in the county of Cornwall (England)
15 MWp (24 INGECON® SUN PowerMax)

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13. **GES s.p.a**

PV plant at Villasor (CA) (Italy)
20 MW (27 INGECON® SUN PowerMax)

14. **EMCO LIMITED**

PV array at Fatepur (Gujarat, India)
5 MW (7 INGECON® SUN PowerMax)

15. **GRANSOLAR**

Santolina Solar Energy Center (NM, USA)
10.5 MW (10 INGECON® SUN PowerMax)

16. **SOLARCENTURY**

Divisa Solar. PV plant in Panama
9.9 MWp (4 INGECON® SUN PowerStation)


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17. **EOSOL**

PV plant at Villeneuve de Marsan (France)
8 MWp (14 INGECON® SUN PowerMax)

18. **ASSYCE**

PV array at Mae Chan (Thailand)
8 MW (16 INGECON® SUN PowerMax)

19. **CEGELEC**

PV array at Midi-Pyrénées (France)
8 MWp (13 INGECON® SUN PowerMax)

20. **SUNEDISON**

PV array at Copiapó (Chile)
46.7 MW (68 INGECON® SUN PowerMax)

21. **MARTIFER**

PV on-roof installation at Mineirao Stadium (Brazil)
1.5 MW (89 INGECON® SUN Smart TL)

22. **GREEN APPLE ENERGY**

Domestic installation at New Jersey (USA)
25 kW (5 INGECON® SUN Lite TL U)

23. **SUNCO Sistemi Fotovoltaici**

PV array at Pichincha (Ecuador)
2 MW (1 INGECON® SUN PowerStation CON 20)

24. **SYDIS**

Stand-alone installation at Albacete (Spain)
5 kW FV + 45 kWh batteries (3 INGECON® SUN STORAGE 1Play, 3 INGECON® SUN Lite)

25. **SUNPOWER**

PV industrial system for self-consumption at Valdemoro (Spain)
100 kW (18 INGECON® SUN Lite, 2 INGECON® SUN EMS Manager)

26. **INGENIERÍA Y SOLUCIONES FOTOVOLTAICAS**

PV domestic system for self-consumption at Zizur Mayor (Spain)
3.3 kW (1 INGECON® SUN Lite, 1 INGECON® SUN EMS Manager)

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27. **AKUO ENERGY**

PV installation with energy storage in Martinique island (France)
2.5 MW PV + 2 MWh batteries (INGECON® SUN PowerMax, INGECON® SUN STORAGE PowerMax, INGECON® SUN EMS Plant Controller)

28. **GROUPE VALECO**

PV installation in Gers (France)
10 MWp (9 INGECON® SUN PowerMax)

29. **ABM**

PV plant in Baltimore, MD (USA)
1 MW (2 INGECON® SUN PowerMax TL U)

30. **ACCIONA**

Sishen Solar (South Africa)
78 MW (39 INGECON® SUN PowerStation)

31. **HALF MOON VENTURES**

PV plant in Jefferson, WI (USA)
1.2 MW (2 INGECON® SUN PowerMax TL U)

32. **ENERPRO**

Diesel-PV installation in Baltra airport (Galapagos, Ecuador)
75 kW (3 INGECON® SUN Smart U)

33. **WINDMAR RENEWABLE ENERGY INC.**

PV plant in Aguada (Puerto Rico)
500 kW (1 INGECON® SUN PowerMax T U)

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