

Ingeteam

USER'S MANUAL INGECON® SUN PLANNER

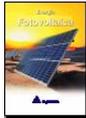
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Note: As a result of the company's commitment to an ongoing product improvement program, Ingeteam S.A. reserves the right to amend this document without prior notice.

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Related documentation

CATÁLOGOS



Catálogo Comercial
Ingecon Sun

AAP0000IFA



Catálogo Técnico
Ingecon Sun
Monofásicos

AAP2001IFA01



Catálogo Técnico
Ingecon Sun Trifásicos

**AAS2001IFA01
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MANUALES



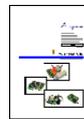
Manual de Instalación
Ingecon Sun
Monofásicos

AAP2000IKH01



Manual de Instalación
Ingecon Sun
Trifásicos

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Manual de Instalación
de Accesorios
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Manual de Instalación
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Manual de Usuario
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Manual de Usuario
Software de
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Manual de Usuario
Ingecon Hybrid
Monitor

AAR2002IKE02

1. INTRODUCTION

This document refers to the PC program:

Ingecon®Sun Planner

The Ingecon® Sun Planner software has been conceived to serve as a design guide for those users responsible for sizing grid-connected PV systems incorporating Ingecon® Sun inverters.

1.1 Hardware and Software requirements

To use Ingecon® Sun the following are required:

- PC with the Windows® XP operating system.
- Adobe Acrobat 7.0 or higher.

1.2 Usage regulations

Copyright

The Ingecon® Sun Planner software is the property of Ingeteam, S.A.



IMPORTANT

Ingeteam is not liable for any direct or indirect damage caused by the use of this program.

2. INSTALLATION.

The software shall be installed via the Internet.

The installation process is as follows:

1. Download the software from the Ingeteam website (www.ingeteam.es or www.ingeteam.com).
2. Execute file Setup.exe and commence installation.
3. Follow the installation instructions given.



3. ICONS AND LANGUAGES.

ICONS

The following icons appear in the Ingecon® Sun Planner main menu:



(New) To create a new project.



(Open) To open an earlier project that has already been saved.



(Save) To save the current project on the selected path.



(Reports) To generate a report in pdf format.

Click on "informe" (report) to open a text box to save the data to the selected path.



Click on this icon for a drop down user help menu.



LANGUAGES

Click on the appropriate flag to select the desired language for the Ingecon® Sun Planner. The following languages are available:



- Spanish, English, German, Italian and French.

4. PV SYSTEM DESIGN WITH THE INGECON® SUN PLANNER

The aim of the Ingecon® Sun Planner is to automatically provide the PV configuration that is best suited to the Ingecon® Sun inverter selected, based on the operating conditions indicated in the following table.

Extreme operating temperatures	Irradiance
Cell temperature from -10°C to +70°C	1000 W/m²

Although the software proposes a PV system configuration, the user also has the possibility of manually creating an alternative solution, and can modify the extreme operating temperatures and decide whether the system voltage and current values are adequate. However, it is only possible to analyse the performance of module configurations for irradiance levels of 1000 W/m².

 IMPORTANT	<p><i>When designing the PV system, the user should also take into account any specific characteristics of the PV system in question given the fact that the system automatically sized by the Ingecon® Sun Planner does not do so. Such characteristics include: voltage drops along the wiring, shadows, system cooling, length, latitude and PV array tilt angle.</i></p>
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5. PROJECT PROCESS.

5.1. Project

The "Proyecto" or Project tab offers the possibility of customising the grid-connected PV system design for each customer and project. However, for the PV system sizing, completion of the fields under this tab is optional; it is therefore possible to go directly to the "Instalación" or system tab, if desired.

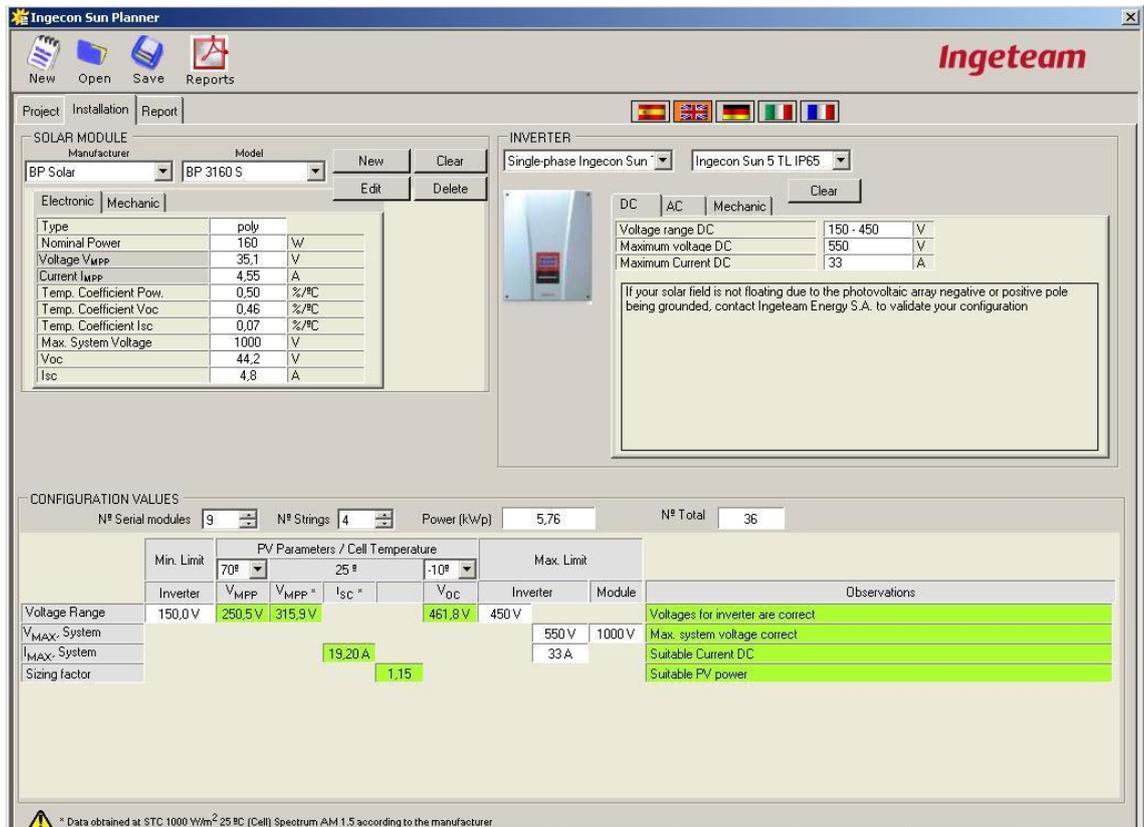
The screenshot displays the 'Ingecon Sun Planner' software window. The title bar includes the Ingeteam logo and standard window controls. The menu bar contains 'New', 'Open', 'Save', and 'Reports'. Below the menu bar, there are tabs for 'Project', 'Installation', and 'Report', with the 'Project' tab selected. A row of flags (Spain, Portugal, Germany, Italy, France) is visible. The main area is divided into two sections: 'CUSTOMER' and 'PROJECT'. The 'CUSTOMER' section contains fields for Company / Customer, Contact person, Address, Post Code, City, Country/Region, E-mail, Telephone, and Fax. The 'PROJECT' section contains fields for Project title, Address, Post Code, City, Country/Region, and PV plant size (with a dropdown menu set to 'MWp'). To the right of the form is a photograph of solar panels in a field. At the bottom, a disclaimer states: 'Disclaimer. Ingeteam Energy S.A. is not responsible for any direct and indirect damage resulting from the use of this program.'

The user is completely free to solely fill in those fields desired or considered advisable. There are no mandatory fields to be completed.

5.2. System.

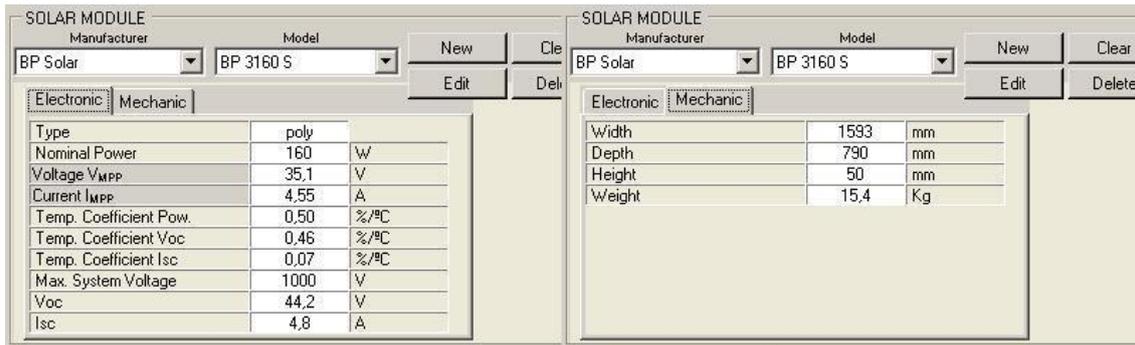
It is possible to distinguish three different areas within the “Instalación” or system tab:

- Solar module.
- Inverter
- Configuration values.



SOLAR MODULE

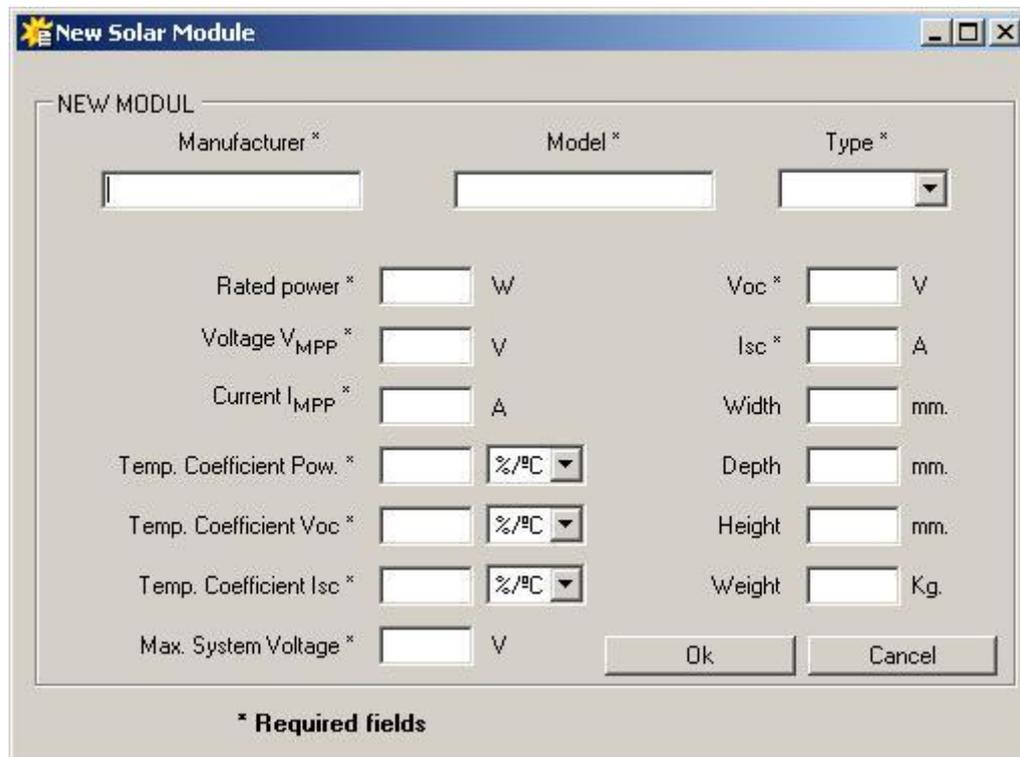
The “módulo solar” or solar module area displays the electrical and mechanical characteristics of the solar modules. As can be seen in the following figure, there is a tab to select the type of characteristics to be displayed. By default, the PV module electrical characteristics are shown.



The Ingecon® Sun Planner incorporates a database which includes the different module models available on the PV sector market.

Due to the ongoing growth of the PV sector, the Ingecon® Sun Planner database could possibly become outdated. To overcome this problem, database updates can be downloaded when the button is enabled with the text “Hay una versión más reciente en la base de datos” (There is a more recent version in the database). For system sizing with a model not included in the database, this new model can be incorporated using the buttons available in the solar module section. These buttons have the following functionalities:

- **New:** New. To add a new module to the database.



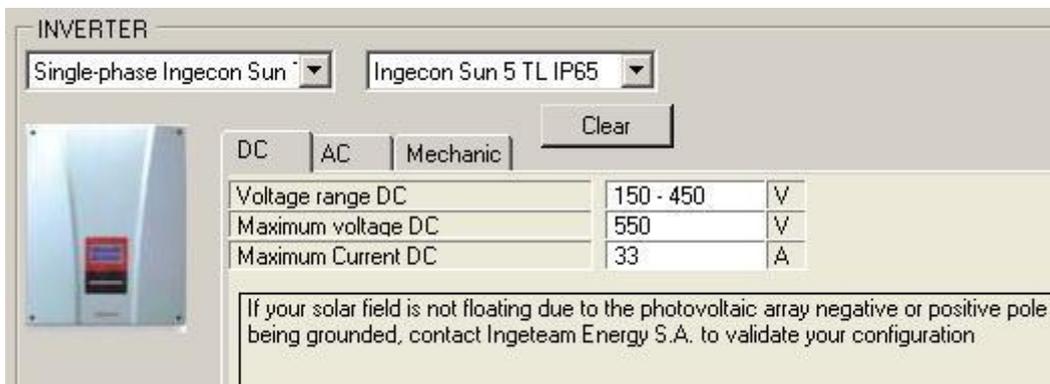
 IMPORTANT	<p>The fields: "Coeficiente de temp.Pot", "Coeficiente de temp.Voc" and "Coeficiente de temp.Isc" are, respectively, the temperature coefficients for: Power; open circuit voltage; and short-circuit current. All these coefficients should be entered as an absolute value, in other words, with no sign.</p>
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- **Edit:** Edit. To modify any of the electrical or mechanical characteristics of any PV module.
- **Clear:** Clear. To delete the data appearing on the screen associated with the solar module.
- **Delete:** Delete. To delete the selected module from the database.

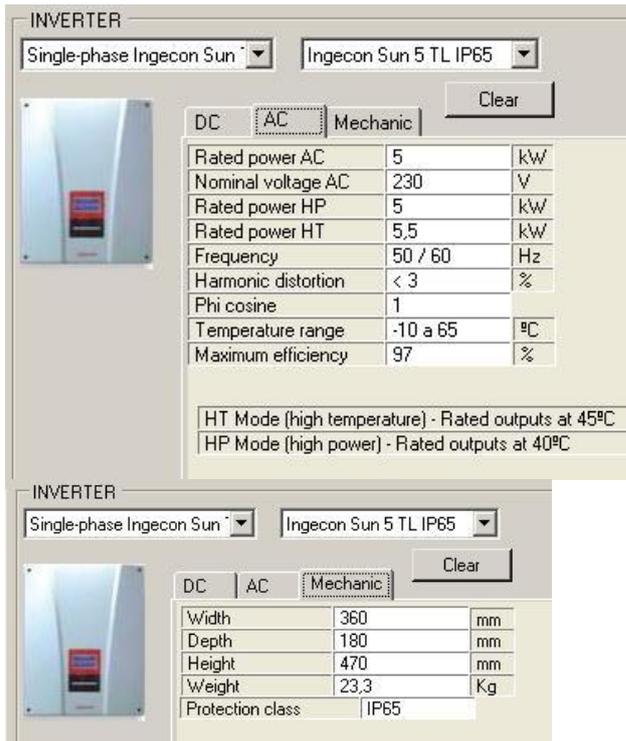
INVERTER

In the "Inversor" or inverter area, the Ingecon® Sun inverter desired for the PV system is selected. The inverter characteristics are then shown: the "DC" and "AC" tabs for the electrical characteristics and the "Mecánica" tab for the mechanical characteristics.

To delete the data associated with the Inverter section of the screen, click on the clear button: **Clear**.



INVERTER		
Single-phase Ingecon Sun		
Ingecon Sun 5 TL IP65		
Clear		
DC	AC	Mechanic
Voltage range DC	150 - 450	V
Maximum voltage DC	550	V
Maximum Current DC	33	A
If your solar field is not floating due to the photovoltaic array negative or positive pole being grounded, contact Ingeteam Energy S.A. to validate your configuration		



If you look at the figures above, in the figure showing the inverter DC information, the following warning message appears:

“Si su campo solar no es flotante por conexión a tierra del polo positivo o del polo negativo del campo fotovoltaico, contacte con INGETEAM ENERGY S.A para validar su configuración” (If your solar field is not floating due to the PV array negative or positive pole being grounded, contact INGETEAM ENERGY SA in order to validate your configuration).

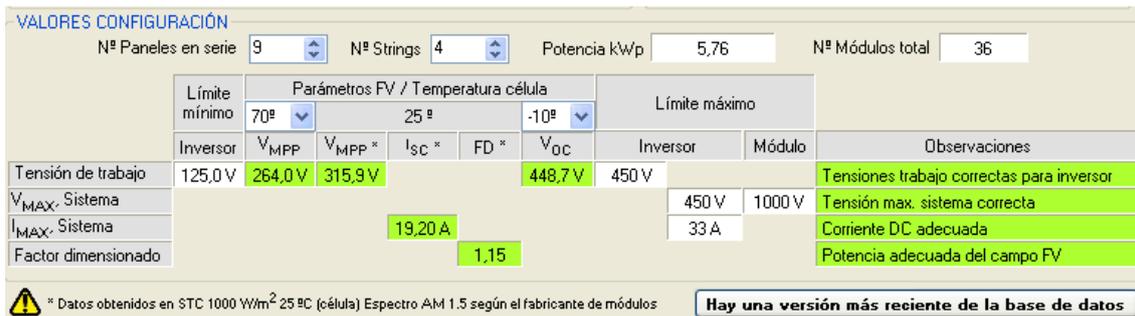
For correct operation, some solar modules need to have their positive pole or negative pole grounded. When this connection is made, the PV array is no longer floating.

If the module specifications require a non-floating connection for the solar array, then the Ingecon® Sun inverters require an additional kit that is not included with the equipment and must be requested from Ingeteam S.A. For this reason, the above mentioned warning message indicates that it is necessary to contact Ingeteam S.A.

The Ingecon® Sun Planner does not include the data sheets provided by the solar module manufacturers and which indicate whether the solar array should have a non floating configuration.

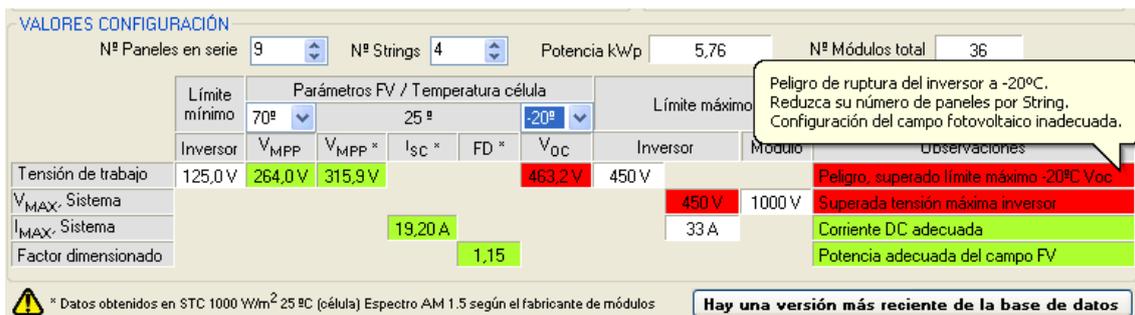
CONFIGURATION VALUES.

A PV array configuration automatically appears once the panel has been selected in the SOLAR MODULE area and the Ingecon® Sun inverter has been selected in the INVERTER area, or vice versa. The figure below shows an example of a configuration automatically made by an Ingecon® Sun 5.



Although the Ingecon® Sun Planner gives a PV array configuration by default, the user always has the possibility of modifying the number of panels connected in series and the number of strings, in addition to the extreme temperature conditions for which the system is to be sized, which by default are for a solar module cell temperature ranging from + 70°C to - 10°C.

For any configuration whatsoever, whether given by default by the Ingecon® Sun Planner or user-created, the “Observaciones” or observations section provides an analysis of the quantities of various PV array variables, indicating whether there is any possibility of damaging the PV modules and / or the inverter. Below it is possible to see how, when the extreme design temperature for the cell is changed to -20°C, for the configuration of the figure shown above, a message appears indicating that this situation would cause damage to the inverter.



Design software for grid connected PV systems

VALORES CONFIGURACIÓN

Nº Paneles en serie: 9 Nº Strings: 4 Potencia kWp: 5,76 Nº Módulos total: 36

	Límite mínimo	Parámetros FV / Temperatura célula					Límite máximo		Observaciones
	Inversor	V _{MPP}	V _{MPP} *	I _{SC} *	FD*	V _{OC}	Inversor	Módulo	
Tensión de trabajo	125,0 V	264,0 V	315,9 V			463,2 V	450 V	1000 V	Peligro de ruptura del inversor. Superada tensión máxima inversor
V _{MAX} - Sistema							450 V	1000 V	Superada tensión máxima inversor
I _{MAX} - Sistema				19,20 A			33 A		Corriente DC adecuada
Factor dimensionado				1,15					Potencia adecuada del campo FV

* Datos obtenidos en STC 1000 W/m² 25 °C (célula) Espectro AM 1.5 según el fabricante de módulos [Hay una versión más reciente de la base de datos](#)

As can be seen in the two figures above, in addition to the comments which appear in the observations table, more detailed information is also provided as to the potential repercussions that the various parameter quantities could have on the inverter in the specific PV system sizing.

IMPORTANT

In the observations section, in order to see whether there is any additional information for any of the PV system parameters, move the mouse pointer over the comments. The information shown for the PV system parameters can range from recommendations to improve the system operation to messages warning of the possibility of damaging the modules or the inverter.

Provided below is an explanation of each of the parameters indicated in the valuation table. In order to read the table correctly, it should always be read in two directions. For each line, read the enabled columns as shown below.

VALORES CONFIGURACIÓN

Nº Paneles en serie: 9 Nº Strings: 4 Potencia kWp: 5,76 Nº Módulos total: 36

	Límite mínimo	Parámetros FV / Temperatura célula					Límite máximo		Observaciones
	Inversor	V _{MPP}	V _{MPP} *	I _{SC} *	FD*	V _{OC}	Inversor	Módulo	
Tensión de trabajo	125,0 V	264,0 V	315,9 V			463,2 V	450 V	1000 V	Peligro, superado límite máximo -20°C Voc
V _{MAX} - Sistema							450 V	1000 V	Superada tensión máxima inversor
I _{MAX} - Sistema				19,20 A			33 A		Corriente DC adecuada
Factor dimensionado				1,15					Potencia adecuada del campo FV

* Datos obtenidos en STC 1000 W/m² 25 °C (célula) Espectro AM 1.5 según el fabricante de módulos [Hay una versión más reciente de la base de datos](#)

Tensión de trabajo – operating voltage

This line indicates the PV array operating voltages.

Starting from left to right, the information enabled in this line is:

Limite mínimo inversor - Minimum inverter limit: This parameter indicates the minimum value of the MPP voltage range for the inverter.

VMPP +70°C: This is the MPP voltage shown by the PV system sized at a cell temperature of 70°C and 1000 W/m². It is possible to analyse the MPP voltage for a value other than + 70°C for the cell, which is the value given by default by the Ingecon® Sun Planner for the automatic configuration.

VMPP +25°C: MPP voltage of PV system sized at a cell temperature of 25 °C for and 1000 W/m².

Voc -10°C: This is the open circuit voltage shown by the PV system sized at a cell temperature of -10 °C and 1000 W/m². As can be seen in the table, it is possible to analyse the open circuit voltage Voc for a cell temperature value other than -10 °C , which is the value given by default by the Ingecon® Sun Planner for the automatic configuration.

Límite máximo - Maximum limit: This column is sub-divided into the Inverter and module. This sub-division enabled will show the most restrictive voltage value in order not to damage the module or inverter.

Observaciones - Observations: A check is made of the PV system values: VMPP+70°C, VMPP+25°C, and Voc -10°C to ensure their adequacy. Should different temperature conditions be taken for the extreme values, such as, VMPP+80°C and Voc -20°C, the observations are also made for these operating conditions.

Vmax, Sistema – Vmax, System

This line checks that the PV array configuration does not have a voltage that could damage the PV modules or the inverter.

Límite máximo – maximum limit: This is subdivided into Inverter and Module. In this case, the maximum voltage values are given, going upwards, that the PV system elements can withstand, in other words the module and inverter, or vice versa.

Observaciones - observations: A check is made to ensure that the PV system is within the maximum voltage limits of the elements making up the system.

I_{max, Sistema} – I_{max, System}

The line corresponding to I_{max, System} is responsible for analysing the direct current value which the PV array delivers to the inverter.

I_{max,Sistema} – I_{max System}: This parameter indicates the short-circuit current of the PV array at a cell temperature of 25°C and 1000 W/m².

Observaciones - observations: The idea of the I_{max, System} line is to verify that at conditions of 25°C and 1000 W/m² the maximum permitted PV inverter input current is not exceeded.

Factor dimensionado - Sizing factor

In the Ingecon® Sun Planner, the sizing factor line aims to show the ratio between the size of the PV system and the rated power of the Ingecon® Sun inverter used.

Factor dimensionado - Sizing factor: The sizing factor (FD) is defined as the ratio between the peak power of the PV array at a cell temperature of 25 °C and 1000 w/m² and the AC rated power of the inverter.

Observaciones - observations: Here the FD value is analysed in order to avoid excessively high or low values.

5.3. Informe - Report.

The report tab displays a compilation of the information provided under the Project and System tabs. By clicking on the “Informes” or report icon in the main menu, a PDF document is generated with all the information appearing on screen with regard to the configuration of the PV system obtained.

Design software for grid connected PV systems

Ingecon Sun Planner **Ingeteam**

New Open Save Reports

Project Installation Report

CUSTOMER Company / Customer: Ingeteam Energy S.A. Contact person: Address: Avenida Ciudad de la innovación, nº13 Post code: 31621 City: Pamplona Country/Region: Navarra E-mail: solar.energy@ingteam.com Telephone: 948288000 Fax: 948288001		PROJECT Project title: xxxxxxxxxxxx Address: xxxxxxxxxxxx Post code: 12345 City: xxxxxxxx Country/Region: xxxxxxxx PV plant size: 52,80 kWp THE SYSTEM IS CORRECTLY DIMENSIONED	
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Total	10 inverters	PV Rated outputs	50 Kw	PV plant size	52,80 kWp	32 Modules
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SYSTEM						
Nº Serial modules	16	Nº Strings	2	Modules	32	
Voc till -10 °C	549,6 V	VMPP *	376,0 V	VMPP till 70 °C	316,8 V	Isc * 14,70 A
Power (kWp)	5,28	AC Power	5 kW	Sizing factor *	1,06	
Observations						
Voltage Range	Voltages for inverter are correct					
Vmax, System	Max. system voltage correct					
Imax, System	Suitable Current DC Photovoltaic field Current Isc at 25°C cell temperature and 1000 W/m2 in allowed range					
Sizing factor	Suitable PV power					

SOLAR MODULE					
Manufacturer	Aleo Solar AG	Model	aleo 150-6-XL	Type	poly
Rated power	165 W	Voltage VMPP	23,5 V	Current IMPP	7 A
Temp. Coefficient Pow.	0,43 %/°C	Temp. Coefficient Voc	0,35 mV/°C	Temp. Coefficient Isc	0,03 mA/°C
Max. System Voltage	1000 V	Voc	30,6 V	Isc	7,35 A
Width	800 mm	Depth	50 mm	Height	1600 mm
Weight	16 kg				

INVERTER					
Ingecon Sun 5 TL IP65					
Voltage range DC	150 - 450 V	Maximum voltage DC	550 V	Maximum Current DC	33 A
Rated power AC	5 kW	Nominal voltage AC	230 V	Frequency	50 / 60 Hz
Harmonic distortion	< 3 %	Phi cosine	1	Temperature range	-10 a 65 °C
Maximum efficiency	97	Protection class	IP65	Width	360 mm

Ingecon Sun Planner **Ingeteam**

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solar.energy@ingteam.com
www.ingteam.es

Fecha: 28-07-2018

CLIENTE		PROYECTO	
Empresa / Cliente	Ingeteam S.A.	Título de proyecto	XX XXXX XXXX XXXX XXXX XXXX
Persona de contacto		Tamaño planta PV	0123456789 kWp
Dirección	Avenida Ciudad de la innovación, nº13	Ciudad	XXXX XXXX XXXX
Código Postal	31621	Código Postal	12345
Localidad	Pamplona	Localidad	XXXXXXXXXX
País/Región	España/ Navarra	País/Región	XXXXXXXXXX
E-mail	solar.energy@ingteam.com		
Teléfono	948288000		
Fax	948288001		

EL SISTEMA ESTA DIMENSIONADO CORRECTAMENTE

SISTEMA			
Nº Plantas en serie	9	Nº Strings	4
VMPP a -10°C	448,7 V	VMPP *	316,8 V
Isc	19,20 A	Potencia MPP	5,78
Nº Módulos total	36	Voc a -10 °C	284,0 V
Factor dimensionado *		Factor dimensionado *	1,10

Observaciones

Tensión de trabajo: Tensión trabajo correcta para inverter

Vmax, Sistema: Tensión max. sistema correcta

Imax, Sistema: Corriente DC adecuada
Corriente Isc de campo fotovoltaico a 25°C de célula y 1000 W/m2 dentro del rango permitido.

Factor dimensionado: Potencia adecuada del campo PV

INVERTER		MÓDULO SOLAR	
Ingecon Sun 5 IP65		Aleo Solar	
Rango MPPT DC	125 - 480 V	Potencia	80 (160) W
Máxima Tensión DC	450 V	Modelo	BP 1500 G
Máxima Corriente DC	33 A	Tipo	poly
Potencia Nominal AC	5 kW	Potencia nominal	160 W
Tensión Nominal AC	230 V	Tensión VMPP	23,5 V
Frecuencia	50/60 Hz	Corriente IMPP	4,55 A
Distorsión Armónica	< 3 %	Coefficiente de temp. Pnk	0,50 %/°C
Coeficiente de Pnk	+ 3 %	Coefficiente de temp. Voc	0,48 mV/°C
Temperatura de trabajo	-10 a 65 °C	Coefficiente de temp. Isc	0,07 mA/°C
Eficiencia Máxima	97	Tensión max. sistema	1000 V
Grado de Protección	IP65	Voc	44,2 V
Alto	370 mm	Isc	4,8 A
Profundidad	280 mm	Ancho	790 mm
Año	430 mm	Profundidad	90 mm
Peso	82 kg	Año	1950 mm
		Peso	15,4 kg

Si el campo solar no es fijo para conectar a tierra del polo positivo o del polo negativo del campo fotovoltaico, contacte con INGETEAM S.A. para validar su configuración.

Aviso Legal: Ingeteam no se responsabiliza por los daños directos e indirectos que pueda ocasionar el uso de este programa.

* Datos obtenidos en STC: 1000 W/m2 (25 °C) (célula) (Espectro AM 1.5 según el fabricante de células)

6. PV PANEL DATABASE.

The technical data for the PV modules included in the Ingecon® Sun Planner were obtained from the Solar Module 2008 Professional database of the Photon magazine. Ingeteam is in no way liable for any data inaccuracy.

Ingeteam

Ingeteam, S.A.

www.ingeteam.com