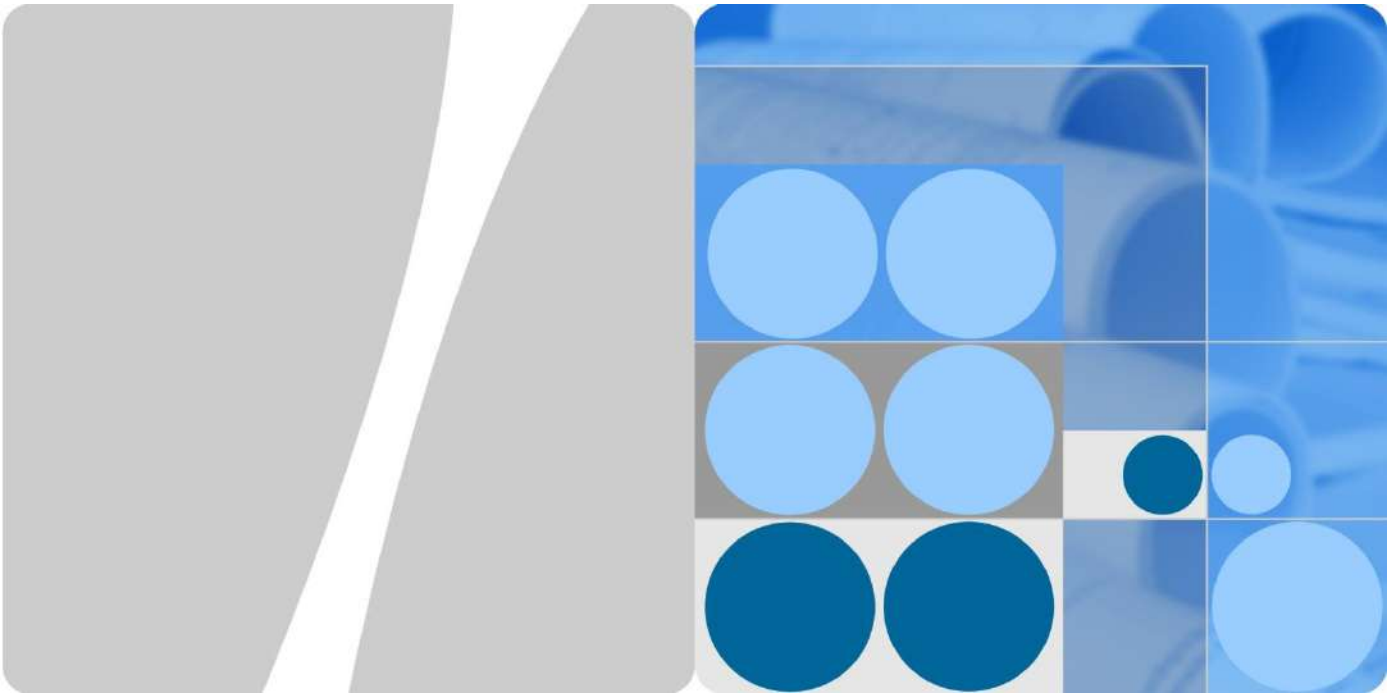


SUN2000 8-28KTL Planning Tool Guide

Issue V2.1

Release date 2014-07

Huawei Technologies Co., Ltd.

Contents

1 Introduction and Basic Information

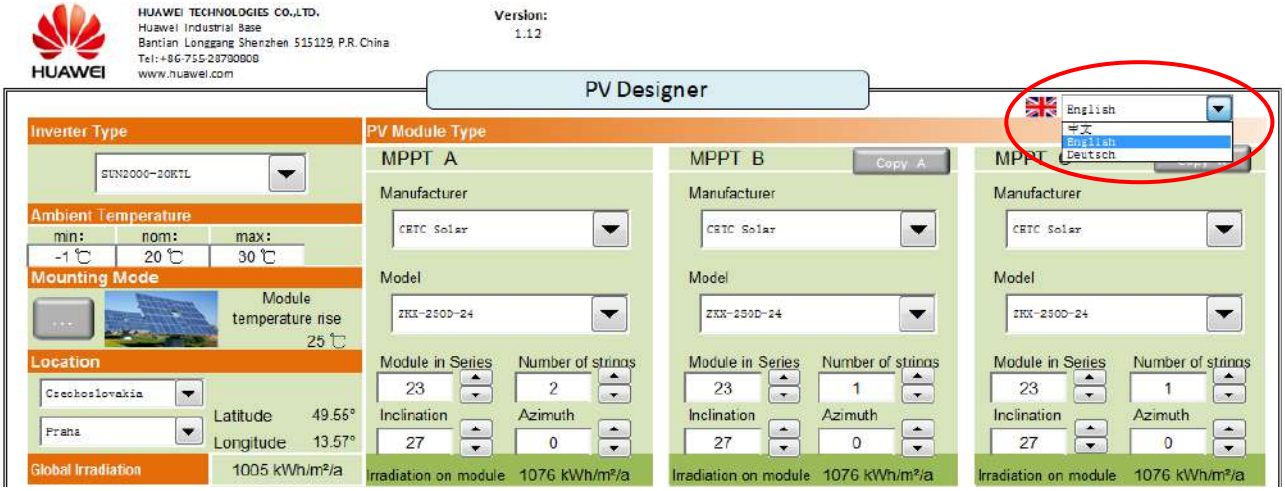
1.1 Introduction

SUN2000 Planning Tool is used for PV system designing with SUN2000 series string inverters. Based on different countries and regions, users can use it to do PV system designs with different PV panels. The objective of this document is to describe how to use SUN2000 Planning Tool.

1.2 Basic Information

1.2.1 Languages

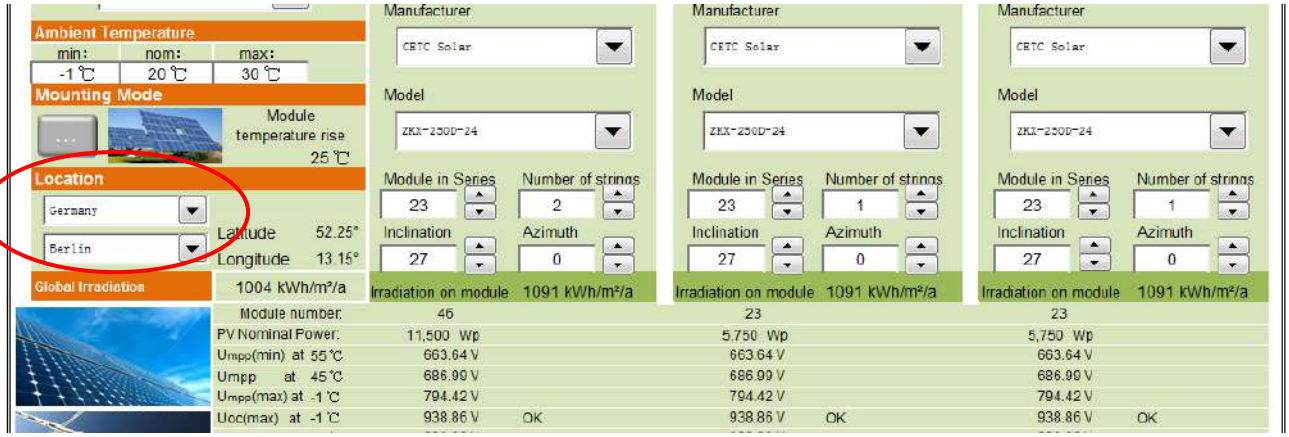
Three basic languages are provided: English, German and Chinese. Users can select the languages in the right side as shown in picture 1.



Picture 1 Languages Selection

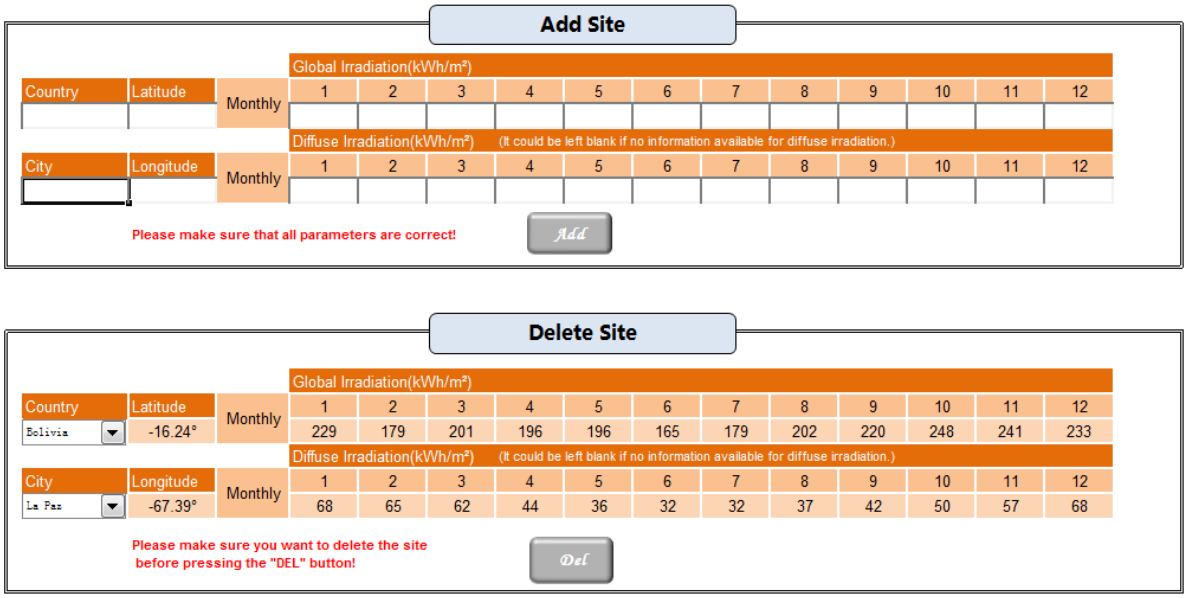
1.2.2 Location

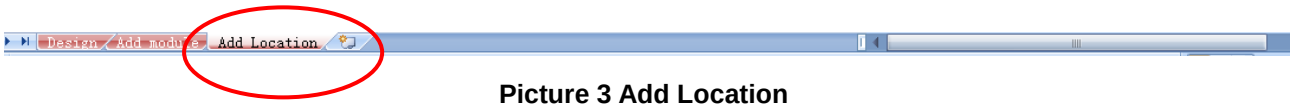
Over 90 country and regions are provided in the planning tool. In each country and region, main cites are provided. When the location is selected, the latitude and longtitude will be shown. The irradiation is decided by the location and the data is sourced from NASA.



Picture 2 Location Selection

If the loacion is not provided in the tool, you can add a new location as illustrated in picture 3.

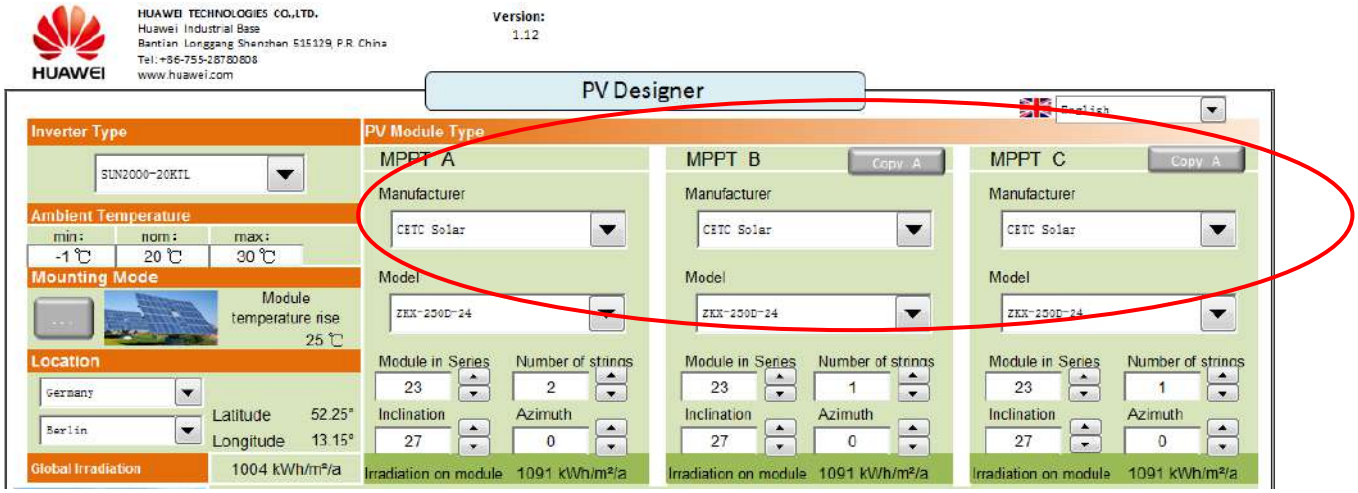




Picture 3 Add Location

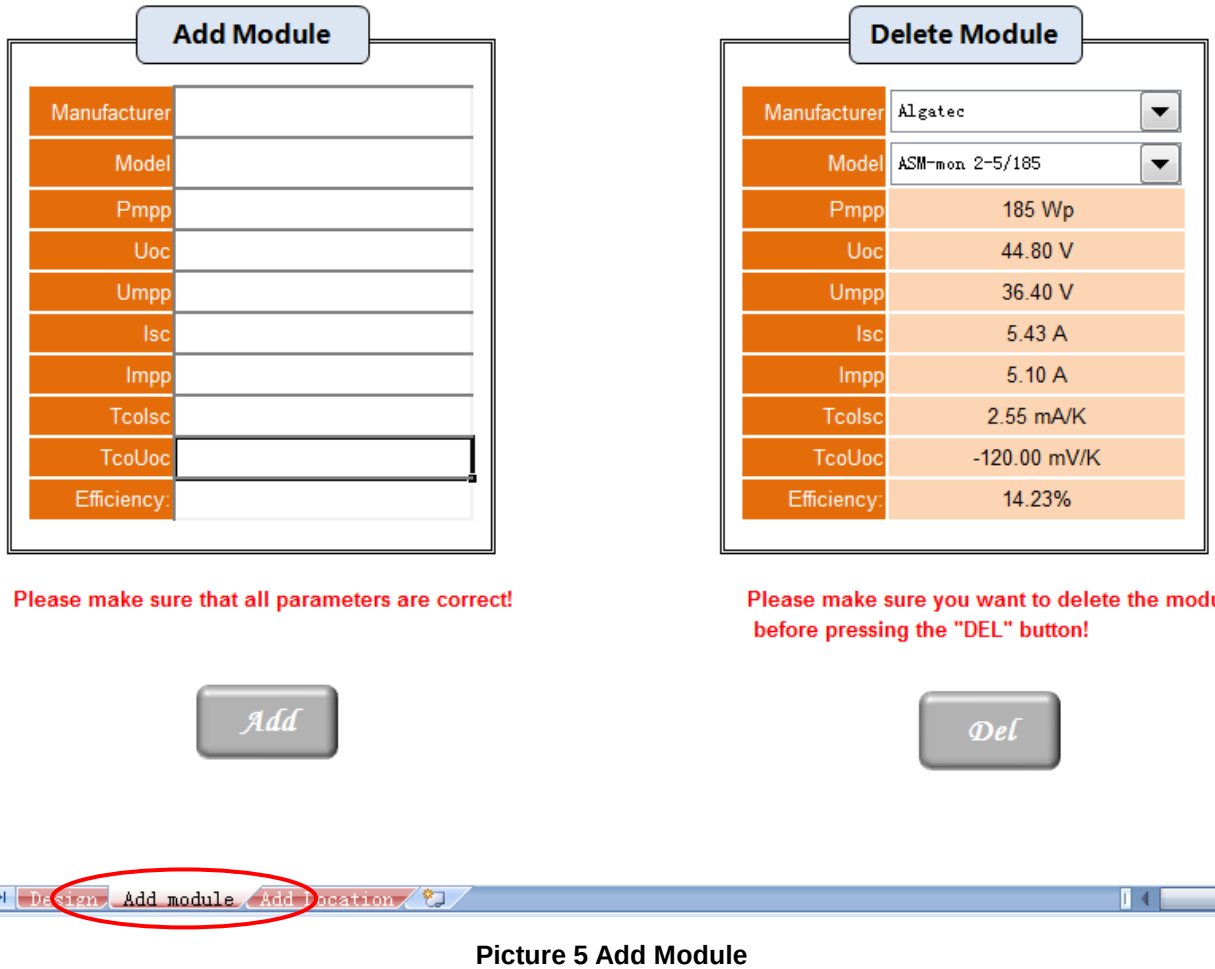
1.2.3 PV Module Type

Over 300 companies' are provided in the tool. And for each companiese, different type of products are provided. For different MPPTs, user can use different PV mdules.



Picture 4 PV Module Type

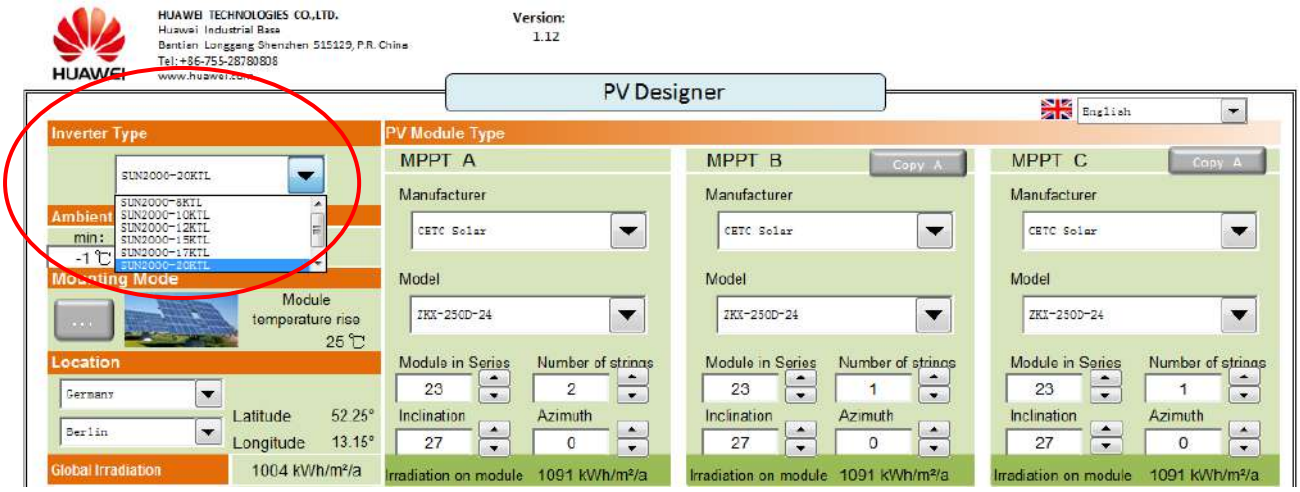
If the PV Module is not provided, new module types can be added to the database.



Picture 5 Add Module

1.2.4 Inverter Type

Inverter Type can be selected as follows:



Picture 6 Inverter Type

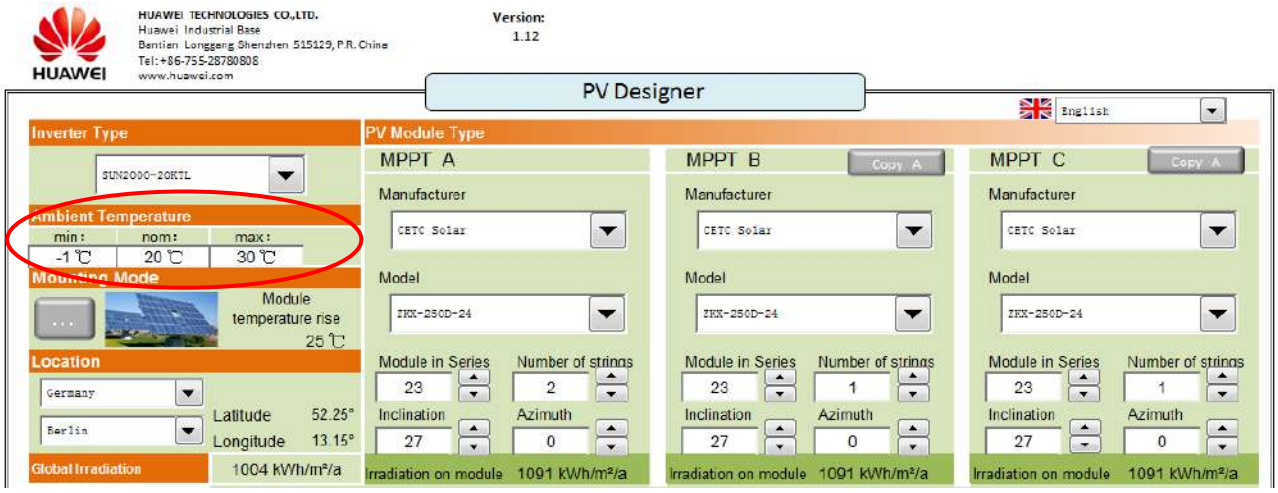
2 PV System Design

Several factors will affect Solar PV System's yield, they are: Temperature, DC voltage, DC power and PF. This section with coverall the factors.

2.1 Temperature Effects

2.1.1 Ambient Temperature

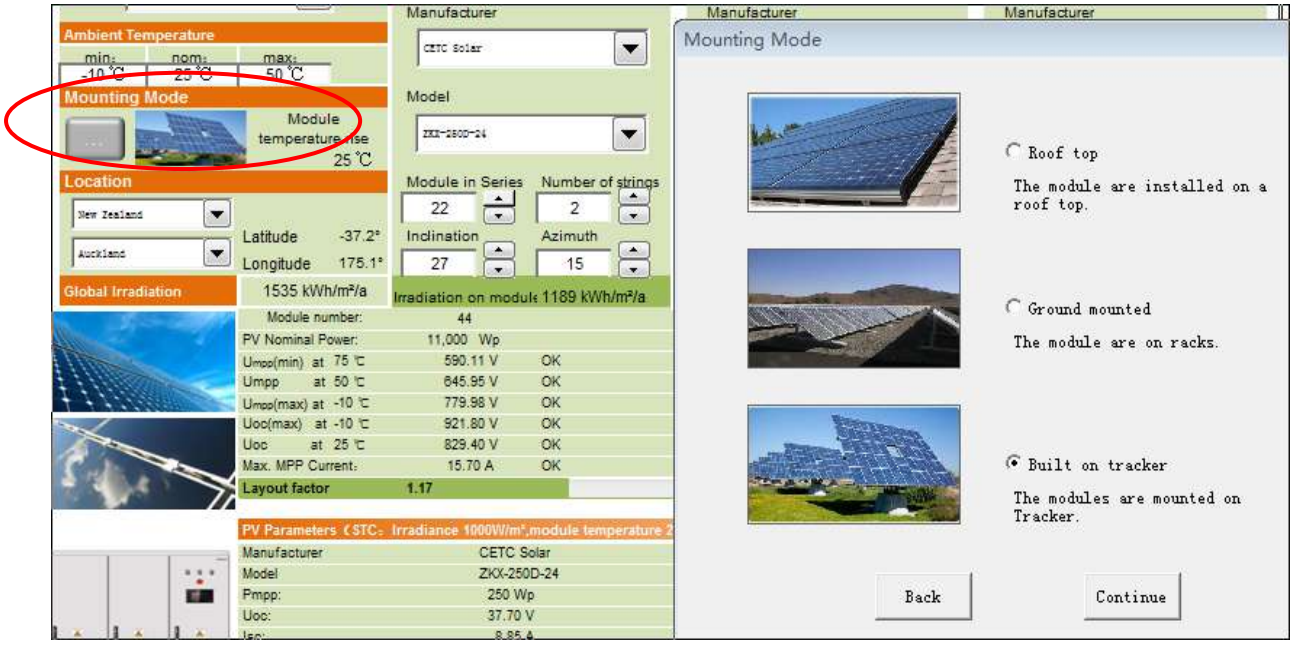
Ambient temperature should be edited by the user, according to local temperature.



Picture 7 Ambient Temperature

2.1.2 Mounting Mode

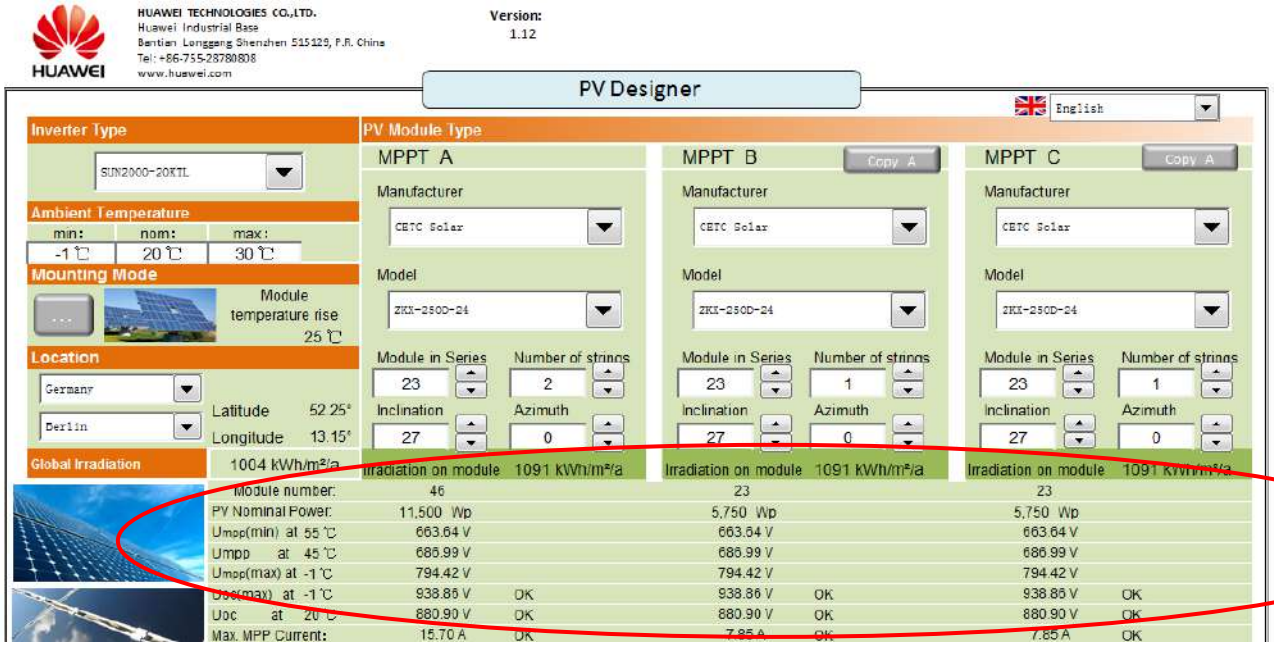
Three mounting modes are provided: Roof top, Ground mounted and Build-on-tracker. For different modes, temperature increases will vary.For Roof top, the temperature increase will be 40℃; for Ground mounted, the temperature rise will be 30℃ and for Built-on-trackers, the temperature increase will be 25℃.



Picture 8 Mounting Mode

2.1.3 DC Voltage Calculation

This calculation is base on PV modules temperature coefficient to avoid system DC voltage rising above the inverter specification. Normally Uoc voltage is not allowed to over 1000Vdc at minimum ambient temperature.



Picture 9 DC Voltage Calculation

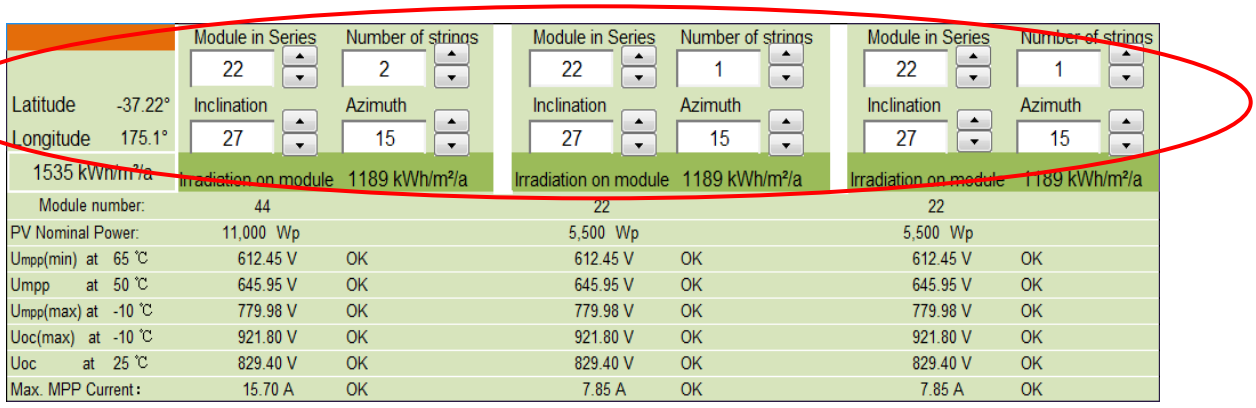
2.2 DC Input Voltage and MPPT Power Calculation

- **DC input voltage:** According to inverter efficiency curve, SUN2000 will have highest efficiency at MPP voltage 600Vdc (the inverter working at one stage, boost circuit is bypass). So the string voltage is designed at 600Vdc MPP voltage for higher efficiency. In some cases, to achieve optimum system costs, string voltage configurations may be lower than 600V and the numbers of strings will increase accordingly.

  For three inputs, it is recommended that the three input voltage is symmetrical. The reason being, when the MPPT voltage is symmetrical, it is easy to control them working at one stage condition and increase the efficiency. If one MPPT voltage is 500, and one is 600, the boost circuit of 500V input voltage will start to work and two stage conversion will be in operation.

- **MPPT input power:** There are two strings in parallel for each MPPTs. Normally, the maximum short current for each string is about 8.3A, Two strings is 16.6A. So the maximum current is limited at 18A. ThePower limit for each MPPT is shown within the table below for the different inverters. This setting can meet all the requirements of current PV modules in the market.

TYPE	SUN2000 8KTL	SUN2000 10KTL	SUN2000 12KTL	SUN2000 15KTL	SUN2000 17KTL	SUN2000 20KTL
Each MPPT Power Limit	6KW	8KW	9KW	9KW	10KW	12KW



Picture 10 DC input votage and MPPT Power Calculation

2.3 PF setting & DC Input Power Calculation

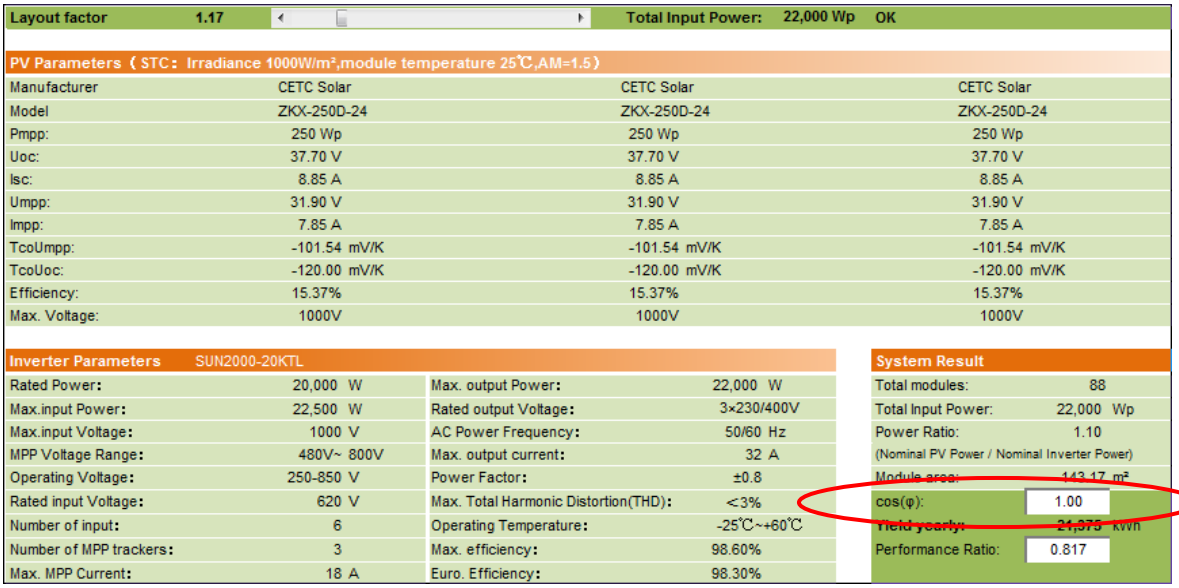
Layout factor: This factor is decided by the EPC engineer, basing on their experience in different locations. If the direction is South, the figure should be smaller. If the direction is east & west, it should be bigger.

Cos(φ) setting: This figure is decided by local electrical company. 0.9&0.95 is common but this must be confirmed locally..

DC input power alarm threshold:

If cos(φ)≥0.9, Maximum total input power will be: Max. AC output apparent power kVA*layout factor* cos (φ).

If cos(φ)＜ 0.9, Maximum total input power will be: Nominal AC ouput apparent power kVA* layout factor* cos(φ).



Layout factor	1.17		Total Input Power:	22,000 Wp	OK
PV Parameters（STC：Irradiance 1000W/m²,module temperature 25℃,AM=1.5）					
Manufacturer	CETC Solar		CETC Solar		CETC Solar
Model	ZKX-250D-24		ZKX-250D-24		ZKX-250D-24
Pmpp:	250 Wp		250 Wp		250 Wp
Uoc:	37.70 V		37.70 V		37.70 V
Isc:	8.85 A		8.85 A		8.85 A
Umpp:	31.90 V		31.90 V		31.90 V
Impp:	7.85 A		7.85 A		7.85 A
TcoUmpp:	-101.54 mV/K		-101.54 mV/K		-101.54 mV/K
TcoUoc:	-120.00 mV/K		-120.00 mV/K		-120.00 mV/K
Efficiency:	15.37%		15.37%		15.37%
Max. Voltage:	1000V		1000V		1000V

Inverter Parameters	SUN2000-20KTL			System Result	
Rated Power:	20,000 W	Max. output Power:	22,000 W	Total modules:	88
Max.input Power:	22,500 W	Rated output Voltage:	3×230/400V	Total Input Power:	22,000 Wp
Max.input Voltage:	1000 V	AC Power Frequency:	50/60 Hz	Power Ratio:	1.10
MPP Voltage Range:	480V~ 800V	Max. output current:	32 A	(Nominal PV Power / Nominal Inverter Power)	
Operating Voltage:	250-850 V	Power Factor:	±0.8	Module area:	143.17 m²
Rated input Voltage:	620 V	Max. Total Harmonic Distortion(THD):	<3%	cos(φ):	1.00
Number of input:	6	Operating Temperature:	-25℃~+60℃	Yield yearly:	24,375 kWh
Number of MPP trackers:	3	Max. efficiency:	98.60%	Performance Ratio:	0.817
Max. MPP Current:	18 A	Euro. Efficiency:	98.30%		

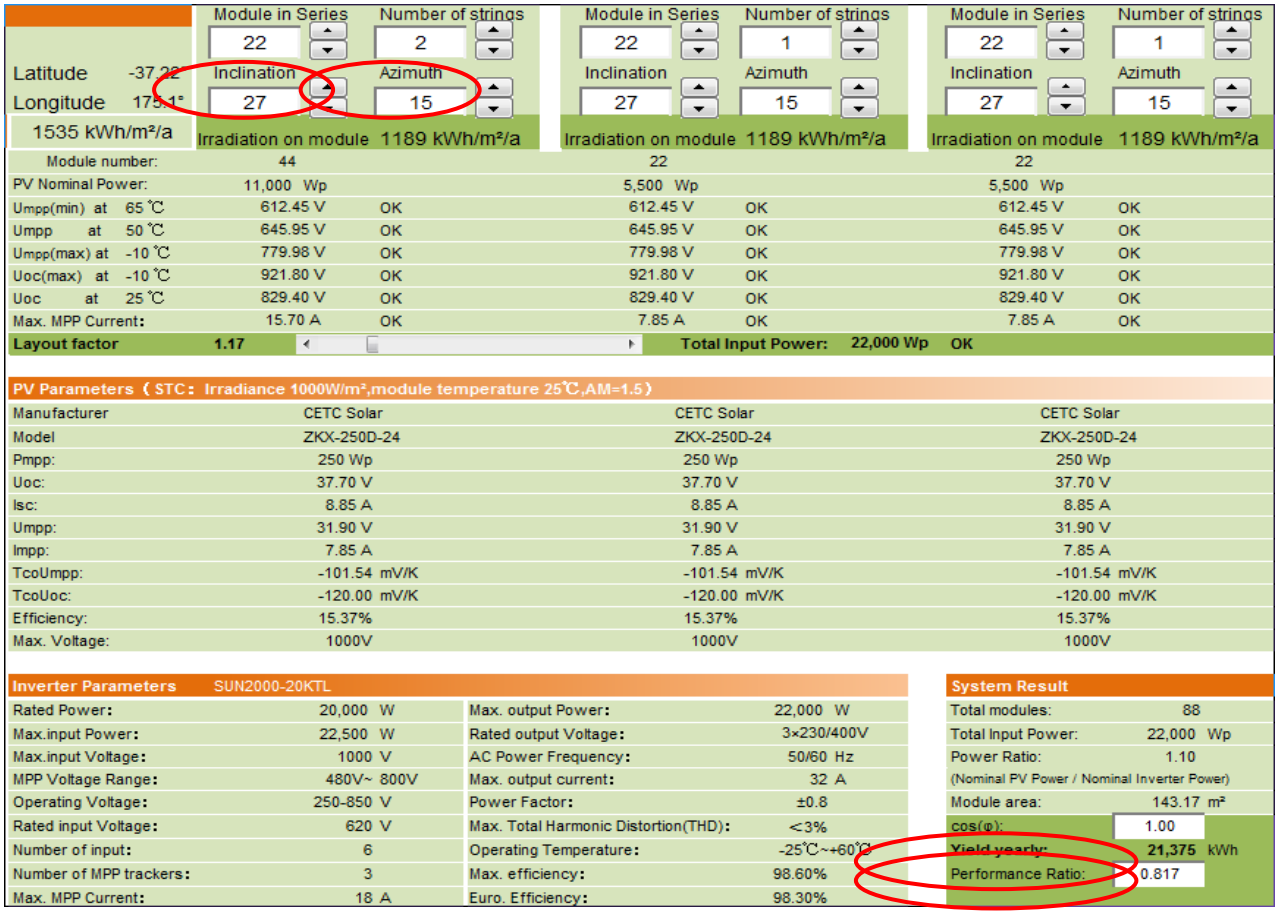
Picture 11 PF & DC input Power Calculation

3 Yield Yearly Calculation

Inclination: This is the angle for the PV module. Youcan adjust the angle at different location to capture more irradiation. **Azimuth:** This is the clockwise angle to the South. The figure should be 0~360. For example, West whould be 90 deg. whereas East whould be 270 deg. This figure will affect irradiation value.

Performance Ratio: This is total system efficiency. It should be decided by the system loss calculation result, which is calculated by the EPC design engineer. Normally the value should be 0.75~0.85.It is edited by user

Yield yearly: This value is decided by the irradiation, the input power and the performance ratio.



	Module in Series	Number of strings	Module in Series	Number of strings	Module in Series	Number of strings
	22	2	22	1	22	1
Latitude -37.2°	Inclination	Azimuth	Inclination	Azimuth	Inclination	Azimuth
Longitude 175.1°	27	15	27	15	27	15
1535 kWh/m²/a	Irradiation on module	1189 kWh/m²/a	Irradiation on module	1189 kWh/m²/a	Irradiation on module	1189 kWh/m²/a
Module number:	44		22		22	
PV Nominal Power:	11,000 Wp		5,500 Wp		5,500 Wp	
Umpp(min) at 65℃	612.45 V	OK	612.45 V	OK	612.45 V	OK
Umpp at 50℃	645.95 V	OK	645.95 V	OK	645.95 V	OK
Umpp(max) at -10℃	779.98 V	OK	779.98 V	OK	779.98 V	OK
Uoc(max) at -10℃	921.80 V	OK	921.80 V	OK	921.80 V	OK
Uoc at 25℃	829.40 V	OK	829.40 V	OK	829.40 V	OK
Max. MPP Current:	15.70 A	OK	7.85 A	OK	7.85 A	OK
Layout factor	1.17		Total Input Power:	22,000 Wp	OK	

PV Parameters（STC：Irradiance 1000W/m²,module temperature 25℃,AM=1.5）			
Manufacturer	CETC Solar	CETC Solar	CETC Solar
Model	ZKX-250D-24	ZKX-250D-24	ZKX-250D-24
Pmpp:	250 Wp	250 Wp	250 Wp
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Isc:	8.85 A	8.85 A	8.85 A
Umpp:	31.90 V	31.90 V	31.90 V
Impp:	7.85 A	7.85 A	7.85 A
TcoUmpp:	-101.54 mV/K	-101.54 mV/K	-101.54 mV/K
TcoUoc:	-120.00 mV/K	-120.00 mV/K	-120.00 mV/K
Efficiency:	15.37%	15.37%	15.37%
Max. Voltage:	1000V	1000V	1000V

Inverter Parameters	SUN2000-20KTL		
Rated Power:	20,000 W	Max. output Power:	22,000 W
Max.input Power:	22,500 W	Rated output Voltage:	3×230/400V
Max.input Voltage:	1000 V	AC Power Frequency:	50/60 Hz
MPP Voltage Range:	480V~ 800V	Max. output current:	32 A
Operating Voltage:	250-850 V	Power Factor:	±0.8
Rated input Voltage:	620 V	Max. Total Harmonic Distortion(THD):	<3%
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System Result	
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Total Input Power:	22,000 Wp
Power Ratio:	1.10
(Nominal PV Power / Nominal Inverter Power)	
Module area:	143.17 m²
cos(φ):	1.00
Yield yearly:	21,375 kWh
Performance Ratio:	0.817

Picture 11 Yield Yearly Calculation

If you have any queries, please contact our Technical Manager, Stephan Linz by email:

Stephan.Linz@huawei.com