SOLIVIA 3.3

Operation and installation manual

AP

DELTA

ENGLISH

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- SOLAR INVERTER SOLIVIA 3.3 AP G3
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2 General warnings / Notes on safety

Congratulations on the purchase of the SOLAR INVERTER SOLIVIA 3.3 AP G3.

These directions will help you become familiar with this product.

Please observe the safety regulations (see § 9) and technical connection conditions for local utility company). Careful handling of your product will contribute to its service life durability and reliability. These are essential prerequisites for maximum yield from your product.

Please observe the following notes on safety:

- During operation of electrical devices, certain parts are under dangerous voltage.
- Inappropriate handling can lead to physical injury and material damage!
- Adhere to the installation regulations.
- Installation and operational start-up work may be implemented only through qualified electrical experts.
- Repair work on the device should be carried out by the manufacturer only.
- Please observe all points in the operating and installation manual!
- Isolate the device from the grid and the PV modules before carrying out any work on it.
- As a result of very high temperatures, the device surface can become hot.
- Sufficient cooling is necessary.
- As the solar inverter is heavy (weight > 18 kg), it should be lifted by at least two persons.
- Remember that the unit has a high leakage current. The PE conductor MUST be connected prior to commencing operation.

To avoid risk of electrical shock, do not open the solar inverter. The inverter contains no user-serviceable parts. Opening the cover will invalidate the warranty.

Dangerous voltage is present for 5 minutes after disconnecting all sources of power.

3 Introduction

With this device you have acquired a solar inverter for connection of photovoltaic systems to the grid. This solar inverter is characterized by its advanced housing design and state-of-the-art high-frequency technology, which enable the highest levels of efficiency.

The solar inverter includes monitoring units, such as anti-islanding protection. The function of the anti-islanding protection (automatic isolation point for in-plant generation systems) stipulates compliance with all specifications required (see § 12).

The inverter is usable indoors and outdoors (IP65).

In the following technical description, the precise functions are explained to the installer, as well as the user, which are required for the installation, operational start-up and handling of the solar inverter.

4 System

The solar inverter converts direct current from the solar cells into alternating current. This enables you to feed your self-produced solar energy into the public grid.

Thanks to efficient MPP tracking, maximum capacity utilization of the solar energy plant is ensured even in the case of cloudy sky conditions.

The string concept means that PV modules are always connected in series (in a string) and/or that strings with the same voltage are connected in parallel to the solar inverter with the aim of significantly reducing the photovoltaic system's cabling requirements.

The fact that the modules are connected in strings also means that the photovoltaic system can be perfectly matched to the solar inverter's input voltage range.

4.1 Data evaluation and communication

The integrated data display, processing and communication of the device enables easy operation of the solar inverter. Monitoring of the operational status and signaling of operational failures are capable of being called up over the device display. The data interface enables the downloading of data which can be evaluated with a PC system and guarantees continuous recording of operating data.

The best way of accessing this functionality is via the available accessories; comprehensive and seamless solar inverter monitoring is ensured.

The data read-out over the integrated interface and the display is possible only in solar operation.

4.2 Technical structure of the solar inverter

A galvanical isolation of the solar inverter from the grid is achieved through a DC/AC converter with an integrated high-frequency transformer. The photovoltaic voltage is adjusted so that the maximum power output of the PV modules is also achieved with varying solar irradiation levels and temperatures (MPP-Tracking).

The MPP range of the solar inverter is between 150 V and 450 V. This facilitates the use of PV modules by a variety of manufacturers. Measures must be taken to ensure that the maximum open-circuit voltage of 500 VDC is never exceeded. Please note that the maximum open-circuit voltage will occur at the lowest temperatures anticipated. You will find more detailed information about temperature dependency in the data sheet of the PV modules. The device's power consumption is kept to a minimum.

The high-quality aluminum casing corresponds to protection class IP65 (water-jet-proof and dust-proof) and is protected against weathering processes by surface refinement. The cooling characteristic profile is designed so that operation of the inverter is possible with ambient temperatures from -25°C to +70°C.

A cooling characteristic profile is used for the removal of the power dissipation caused through the voltage conversion. An internal temperature control protects the device against excessive temperatures in the interior of the solar inverter. In case of high ambient temperatures, the maximum transferable power is limited.

The solar inverter is controlled by microcontrollers, which also implement interface communication and the monitoring of values and messages on the display.

Two independent and redundant microcontrollers control the monitoring of the grid, which is consistent with the feed-in directives of your local utility company. This enables an installation of the solar inverter in the in-house electrical grid.

Operator protection requirements are met by electrically isolating the grid from the PV module. The electrical isolation between the grid and the PV module is equivalent to basic insulation. Maximum operator protection is ensured by reinforced isolation between the grid, PV modules and accessible interfaces (display, RS485 interface). Relevant standards concerning electromagnetic compatibility (EMC) and safety are fulfilled.

The solar inverter is functional in on-grid operation exclusively. An automated isolation point, which is approved by a certification agency, guarantees secure disconnection in case of circuit isolation or interruptions in power supply and avoids isolated operation.

The disconnection equipment allows for automatic isolation for in-plant generation systems of nominal power ≤ 4.6 kVA, with single-phase parallel feed-in through the solar inverter into the grid.

4.3 Equipment overview

(1) Connections for PV modules
(2) Grid connection
(3) Interface connection RS485 (EIA485)
(4) Display for status messages and keypad for operation
(5) Light-emitting diodes for operational status display

5 Installation

Installation and commissioning must only be carried out by qualified electrical experts.

The recommended local and national safety regulations and the technical interface conditions (TAB 2000), should be complied with.

To carry out an energy measurement, a meter must be attached between the grid feed-in point and the solar inverter (in accordance with all local and national safety regulations).

By means of the integrated anti-islanding protection, the function of the recommended section switch is fulfilled in accordance with all local and national safety regulations.

For details, please refer to § 9.

Caution: The secondary short-circuit current rating is increased at the transfer connection point to the public electricity supply system by the nominal current of the connected solar inverter.

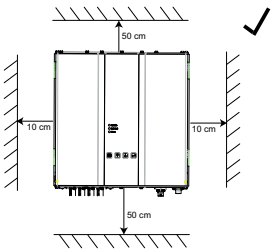
6 Installation of equipment

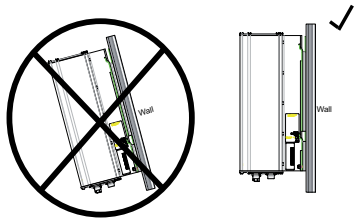
6.1 Installation location

- Install the device on a non-flammable support base.
- Avoid installation on resonating bodies (light construction walls etc.).
- Installation is possible both indoors and in protected outdoor areas.
- An increased ambient temperature can reduce the efficiency of the PV system.
- Noise generation is possible (avoid installation in residential areas).
- Ensure legibility of the LEDs and the display (check read-off angle and installation height).
- Although the unit is fitted with UV resistant components, direct exposure to sunlight should be avoided.
- Despite having an IP65 enclosure and being certified in accordance with soiling category III, the unit must not be allowed to become heavily soiled.
- Dusty conditions can impair the unit's performance.

6.2 Minimum requirements

- Free convection around the solar inverter must not be impaired.
- For proper air circulation to dissipate heat, allow a clearance of approx. 10 cm to the side and approx. 50 cm above and below the unit.
- The grid impedance requirement at the supply terminal is to be observed (cable length, cable cross-section).
- The recommended installation position is to be adhered to (vertical).
- Unused DC connectors and interfaces must be sealed airtight with sealing plugs to ensure protection class IP65 for the whole system (inverter & cables).





6.3 Maintenance

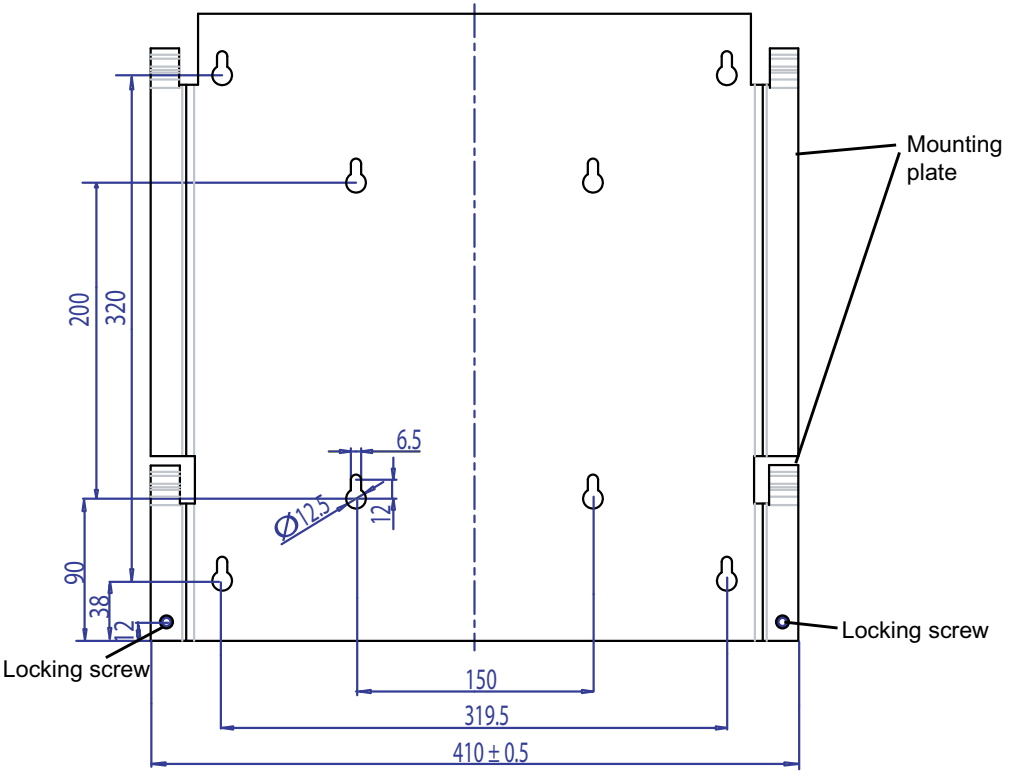
Make sure that the device remains uncovered while in operation. To avoid the casing of the solar inverter becoming soiled, it should be cleaned periodically.
User serviceable parts are not contained in the device. Under no circumstances should the solar inverter be opened!

6.4 Installation

You should utilize the delivered mounting plate for problem-free installation of the solar inverter. Installation to the wall should be implemented with the proper screws. Mount the wall bracket so that the solar inverter only has to be simply attached. After that, the device is to be bolted on securely.

Assembly instructions

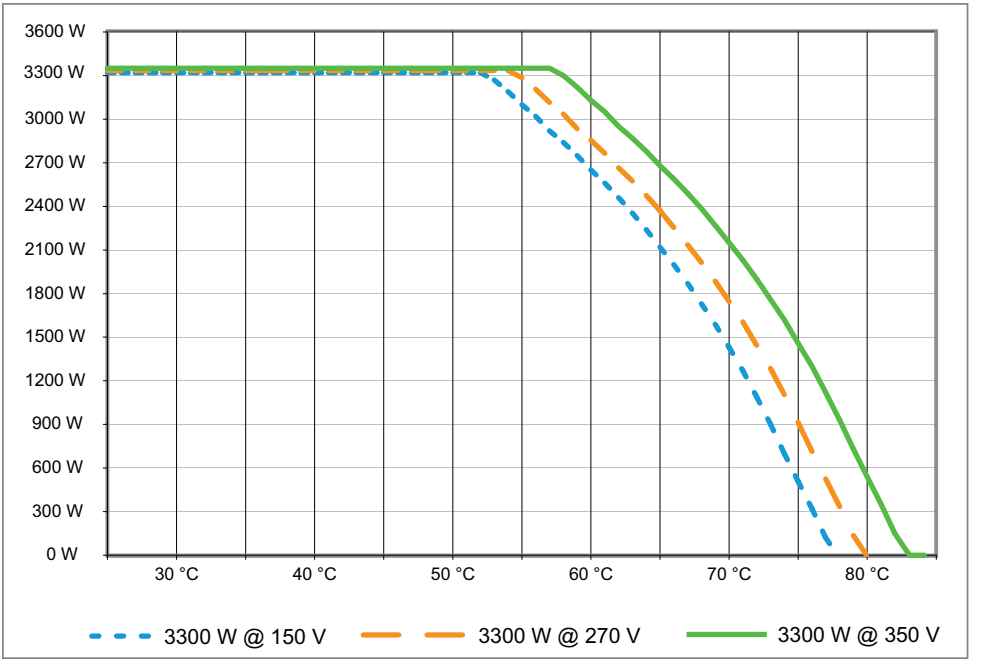
1. Mount the mounting plate with appropriate screws (max. Ø 6mm) into at least four of the eight holes to fix the wall bracket in place. You can employ the mounting plate as a template for marking the positions of the boreholes.
2. As the solar inverter weighs 21.5 kg, it should be lifted out of the transport crate by at least two persons.
3. Place the solar inverter onto the mounting plate with at least two persons.
4. Fasten the supplied mounting nuts and washers on the threaded bolt intended for securing the device.
5. Check that the solar inverter is securely sealed.



6.5 Ambient temperature

The solar inverter can be operated in an ambient temperature between -25°C to +70°C.
The following diagram illustrates how the power supplied by the solar inverter is reduced automatically in accordance with ambient temperature.

The device should be installed in a well-ventilated, cool and dry location.



6.6 Grid connection

The grid (AC output) is connected over a Wieland RST25i3S AC connector. You can find the correct allocation on the screw-type terminal connection of the connector. The solar inverter must be connected to the grid over a three-core line (L, N, PE). The connected AC line must be switched potential-free before the disconnection or the insertion of the AC connector.

The connection to the Wieland AC connector must be made with a flexible line and a conductor cross section of min. 2.5 mm² to max. 4.0 mm².

An automatic circuit breaker is to be provided in the line L upstream of every device, with a nominal current of 25 A and tripping characteristic type B. In addition, attention is to be paid to the selectivity of the fuse unit attached upstream of the automatic circuit breaker.

The solar inverter must be grounded via the AC connector's PE conductor. To do this, connect the PE conductor to the designated terminal. If you wish to integrate more than one inverter into the installation, please proceed as illustrated in the drawings in the appendix.

Please note the cable length and the cable cross-section, due to the risk of undesirable temperature rise and power losses.

The AC connector is protected from unintentional disconnection by a clip mechanism which can be released with a screwdriver.

6.7 Connection of PV modules

Before the photovoltaic system is connected, the polarity of the PV voltage at the Multicontact connectors must be checked to ensure that it is correct.

The connection of the PV module is implemented using Multicontact MC4 connectors, where the DC negative pole is located on the connector upper row and the DC positive pole on the connector lower row. The connectors are coded to prevent you from accidentally plugging them into the wrong terminal.

Please ensure the following at all times:

- That there is never any risk of anyone coming into contact with the solar inverter connection terminals, due to the risk of dangerous voltages across them.

- That under no circumstances are the PV modules to be disconnected from the solar inverter under load. If a disconnection should be necessary, first switch the grid off so that the solar inverter cannot absorb any further power. Next, open the upstream DC disconnector.

The maximum input voltage of the solar inverter is 500 V. The maximum current load of each individual Multicontact MC4 connector is 18 A.

The solar inverter has an insulation and grounding monitoring on the DC side. The options can be configured in the Setup menu “S -> Solar ISO / GND” (see § 7.3.7.1).

The insulation monitoring has two modes:

- ISO-ON-Error (the solar inverter is disconnected from the grid in the event of an insulation fault)
- ISO-ON-Warning (the solar inverter indicates the fault but is not disconnected from the grid).

Deltas solar inverters are factory-set to ISO-ON-Warning mode on delivery.

The grounding monitoring has two modes:

- PV+ grounding (grounding monitoring of the positive pole of the PV generator)
- PV- grounding (grounding monitoring of the negative pole of the PV generator).

In these modes the solar inverter remains in feed-in operation and will not be disconnected from the grid in case of a fault. The error message “PV+ grounding fault” or “PV- grounding fault” will appear on the display.

If you need to connect the positive or negative pole of the PV system to meet requirements set out by the module manufacturer, you can do this. Earth continuity must be implemented close to the inverter. We suggest using Deltas grounding kit “Grounding Set A Solar” (EOE99000275). The grounding connection is monitored and should be configured in the Setup menu (see above).

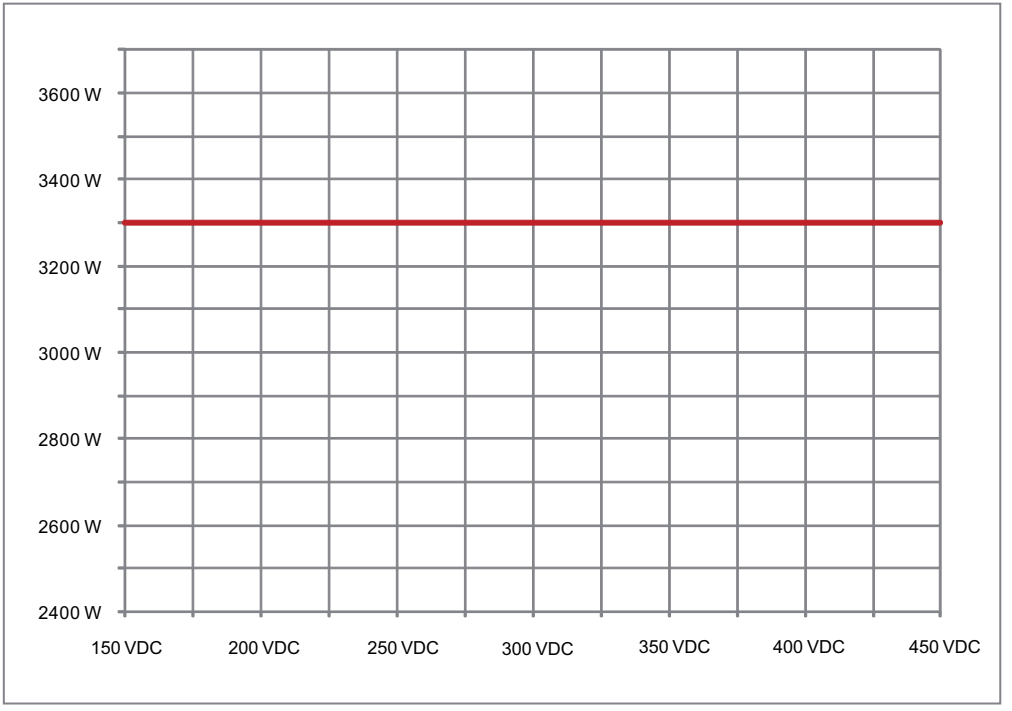
Alternatively, it is possible to turn off the insulation- and grounding monitoring:

- ISO / GND OFF.

Required cable coupler types for DC cable connection to inverter:

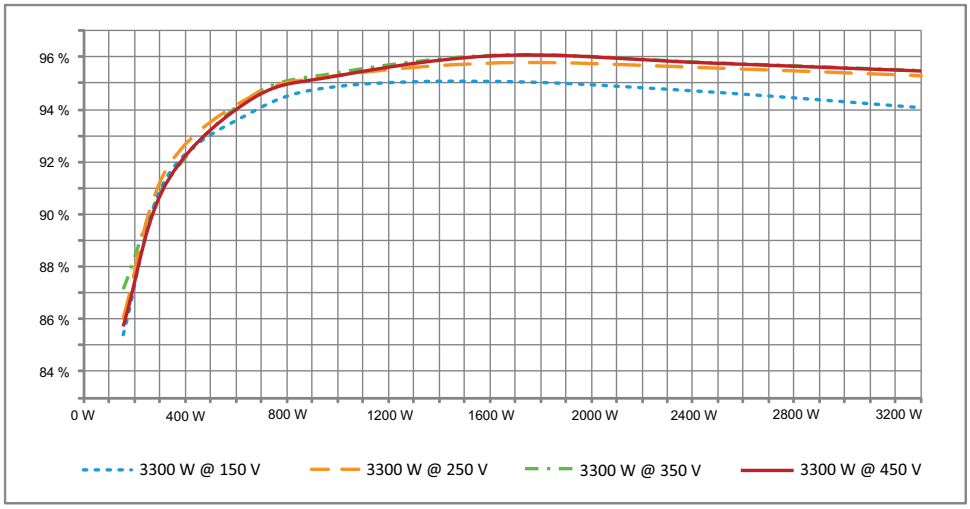
CABLE COUPLER POLARITY	WIRE SIZE 2.5 MM² (AWG 14)	WIRE SIZE 4.0 MM² - 6.0 MM² (AWG 12-10)	FEMALE CABLE COUPLER	MALE CABLE COUPLER	MULTICONTACT ORDER NUMBER
Plus coupler	●		●		32.0010P0001-UR 32.0012P0001-UR
Minus coupler	●			●	32.0011P0001-UR 32.0013P0001-UR
Plus coupler		●	●		32.0014P0001-UR 32.0016P0001-UR
Minus coupler		●		●	32.0015P0001-UR 32.0017P0001-UR

6.7.1 Output power over PV voltage



6.7.2 Efficiency

The best efficiency of the solar inverter is obtained at input voltages >250 V.

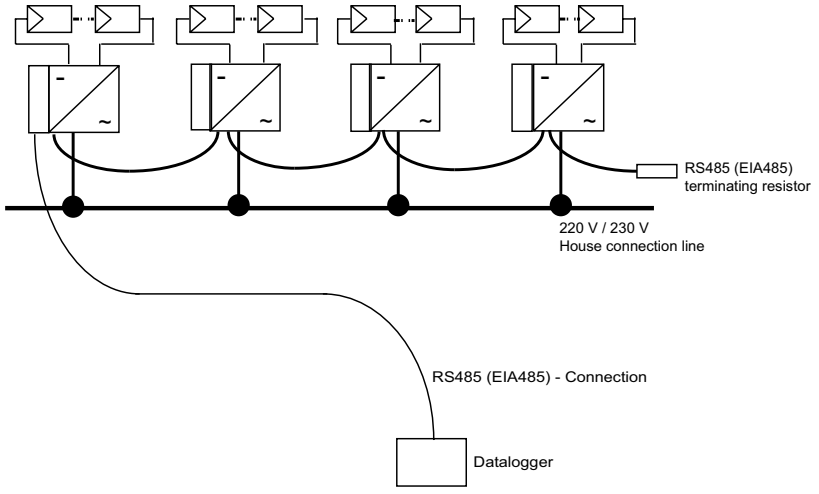


6.8 Interface connection RS485 (EIA485)

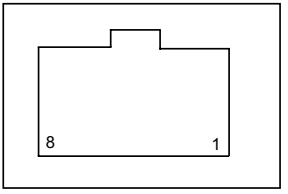
The interfaces not used must always be closed off. In case of utilization of an interface, only the counterpart fitting on the interface connector is to be employed.

Mating connector supplier HARTING Deutschland GmbH & Co. KG (P.O. 2451, 32381 Minden; Germany; www.harting.com).

Order designation: 09 45 145 1510, Cable Manager Blue IP67 Push-Pull Data Plug
09 45 145 1500, Cable Manager White IP67 Push-Pull Data Plug



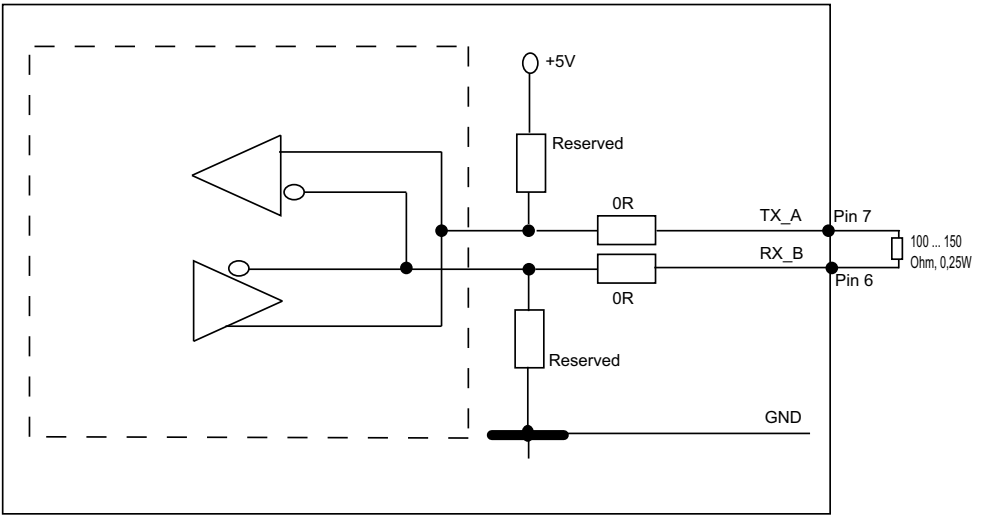
Connector pin assignment RS485 (EIA485)

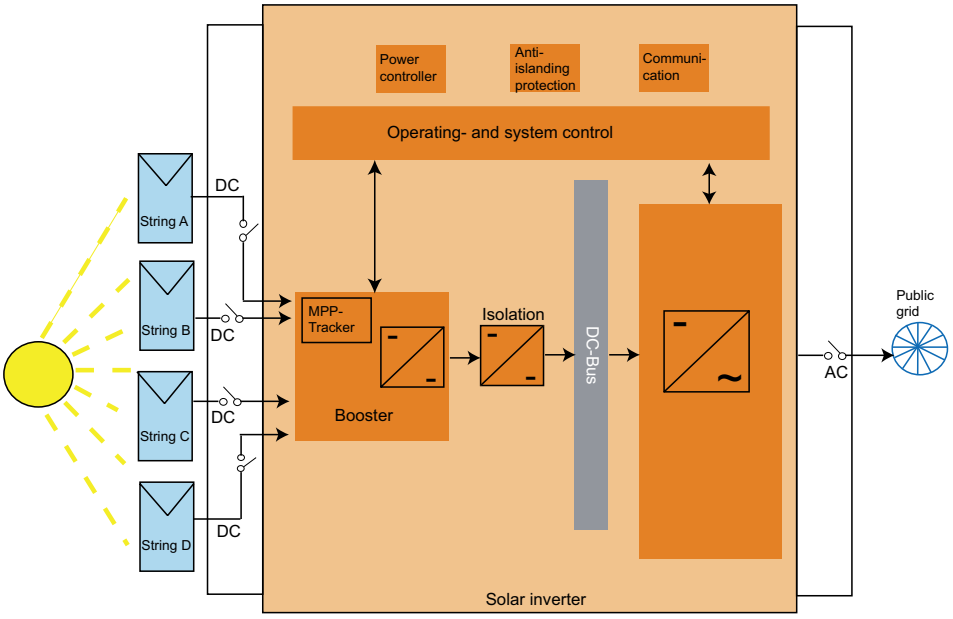


Top View

Pin	
1	Reserved
2	Reserved
3	Reserved
4	GND (RS485)
5	Reserved
6	RX_B (RS485)
7	TX_A (RS485)
8	Reserved

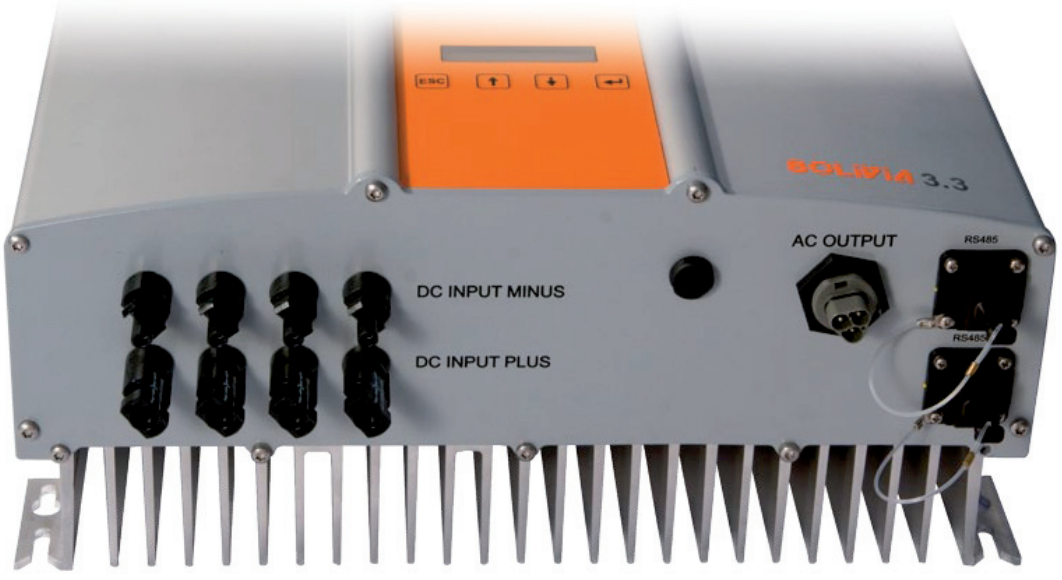
When several devices are connected in series and the total length of the data line measures 2 m or more, the following option is available for terminating the RS485 (EIA485) interface:





6.9 Electrical connection and operational start-up

The electrical connection is utilized on this solar inverter using the connector contacts which are attached to the casing. In no case must the device be opened!



In order to connect the device electrically, the following procedures must be followed:

1. DC connection: First, connect the PV module strings to the DC disconnector (not included in the scope of delivery).
2. Connect the DC disconnector to the solar inverter (ensure correct polarity).
3. AC connection: Please install the Wieland AC mating connector to the AC output cable and then put the AC connector to the solar inverter. Please make sure, that the sleeve nut is properly fixed and tighten.
4. Before switching on the power, check all feeders and connections one last time.
5. Close the DC disconnector.
6. Close the circuit breaker on the AC output side.
7. In case of sufficient PV voltage (UPV > 150 V), the device now goes into the start-up mode.
8. In case of a new installation the time and date have to be set in sub-menu S (Setup) (see § 7.3.7).

All unoccupied connectors and interfaces must be sealed using the provided sealing plugs.

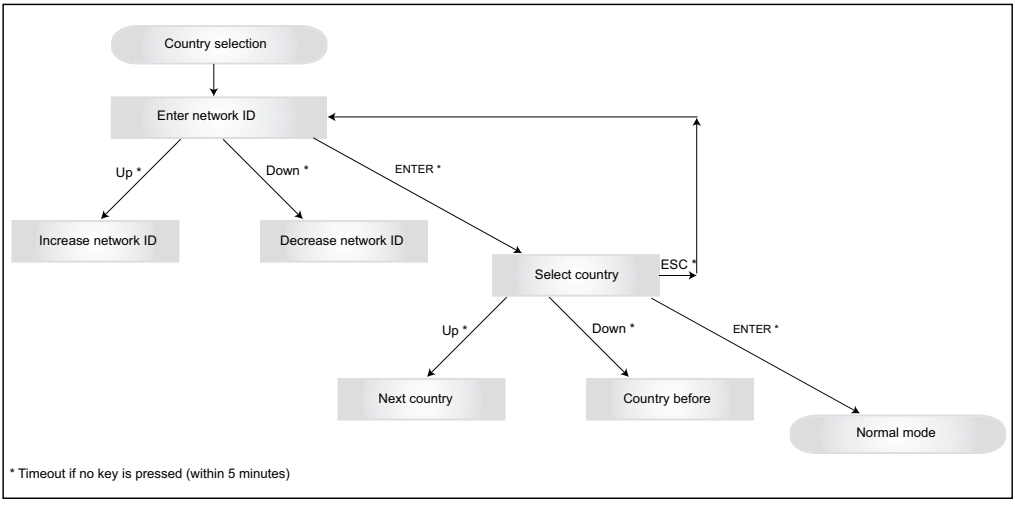
6.10 Setup / settings

The default display language for solar inverters leaving the Delta factory is set to English.

After connecting to correct DC voltage and running through self-test, you will be asked to specify the network ID and to select the desired country (see § 7.3.7.2) (countries available: Australia, China, India, Korea and Taiwan).

The selection has to be confirmed another time by the user. Once confirmed, the network ID and the country selection are stored to the controller memory – and the solar inverter is ready for operation.

Please note that the enter keys on the display are locked, if there is no input entry within 5 minutes. To unlock the enter keys, you need to switch off the DC voltage and then switch it on again.



Please note, that once the country has been selected and confirmed, it is only possible to change the country by following the steps as listed below:

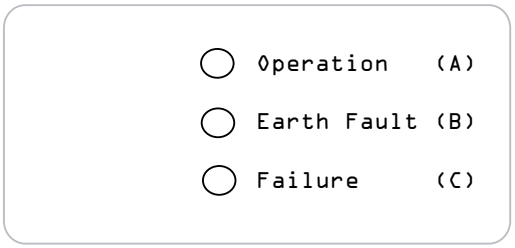
1. Please click ESC + ↑ for few seconds to get the key information.

2. Provide the key code to the Solar Support Team at support@solar-inverter.com to get the PIN code (valid for one use only!).
3. Once you get the PIN code, you need to press ESC + ↓ .
4. Then, you will be asked to insert the PIN code and to confirm it twice.
5. After confirmation, you will then be able to select the desired country.

Note: These steps must be executed without interruption. Otherwise, you will stay in the country selection mode.

6.11 LED operation and fault display

Three light-emitting diodes (LEDs), which display the operational state of the solar inverter, are attached on the front:



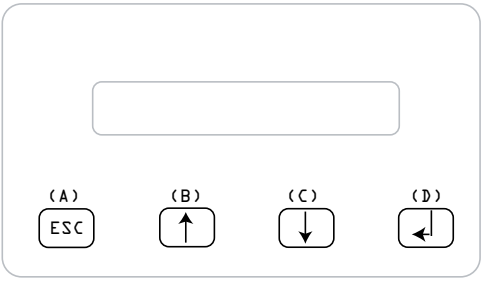
- LED (A), green: „Operation“ displays the operational state.
- LED (B), red: „Earth Fault“ displays an insulation resistance fault or PV grounding (GND) fault on the DC side.
- LED (C), yellow: „Failure“ displays existing faults internally or externally and whether the grid feed-in operation has been interrupted.

LED STATUS	OPERATIONAL STATE	EXPLANATION
green: <off> red: <off> yellow: <off>	Night disconnection.	The input voltage (UPV) is lower than 100 V. The solar inverter is not feeding power to the grid.
green: <on> red: <on> yellow: <on>	Initialization.	Input voltages: UPV: 100 V to 150 V (self test ongoing).
green: <flashes> red: <off> yellow: <off>	Input- and grid monitoring.	Starting conditions are tested.
green: <on> red: <off> yellow: <off>	Feed-in operation.	Normal operational state: UPV: 150 V to 450 V.
green: <off> red: <on/off> yellow: <on/off>	Equipment fault.	Internal or external fault (interrupted feed). See also display messages!
green: <off> red: <on/off> yellow: <on>	General error condition.	Solar inverter is not connected to the grid. No power is delivered. See also display messages!
green: <on/off> red: <on/off> yellow: <flashes>	Warning message.	You can carry on using the solar inverter. See also display messages!

7 Operating concept

7.1 The display

The display on the device indicates varied information. The enter keys are used for the adjustment of the device and for the retrieval of information. The indicated data can deviate with a tolerance of up to 5%.



Key (A), ESC: To switch from the menu items to the main menu and to exit each sub-menu.

Key (B) and (C): For scrolling in the individual menu items and/or carrying out adjustments in the setup menu.

Key (D), ENTER: ENTER key for changing into the menu levels and for input acknowledgement in the setup menu.

7.2 Navigation in the display

Lighting of the display

After pressing the ENTER key in automatic operation, the display lighting is switched on. If no key is pressed within 30 seconds, the display lighting automatically goes out. The setup menu enables selection between continuous or automatic lighting. Through pressing the ENTER key, the display lighting is switched on again.

7.3 Main menu

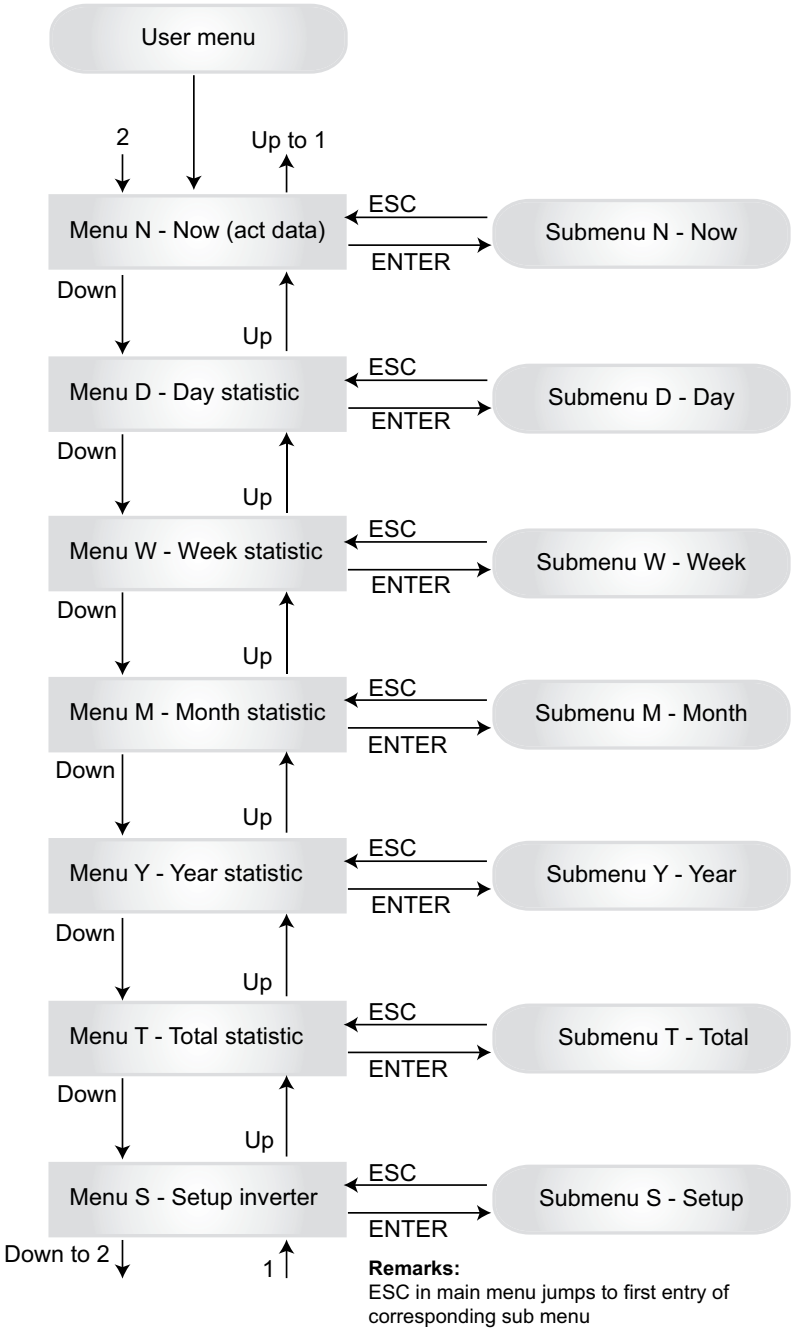
The main menu consists of 7 menu items which are subdivided into submenus:

- Menu N (Now)
- Menu D (Day)
- Menu W (Week)
- Menu M (Month)
- Menu Y (Year)
- Menu T (Total)
- Menu S (Setup)

Handling of the menu items:

You can scroll the main menu by activating the selector keys ⇧⇩.

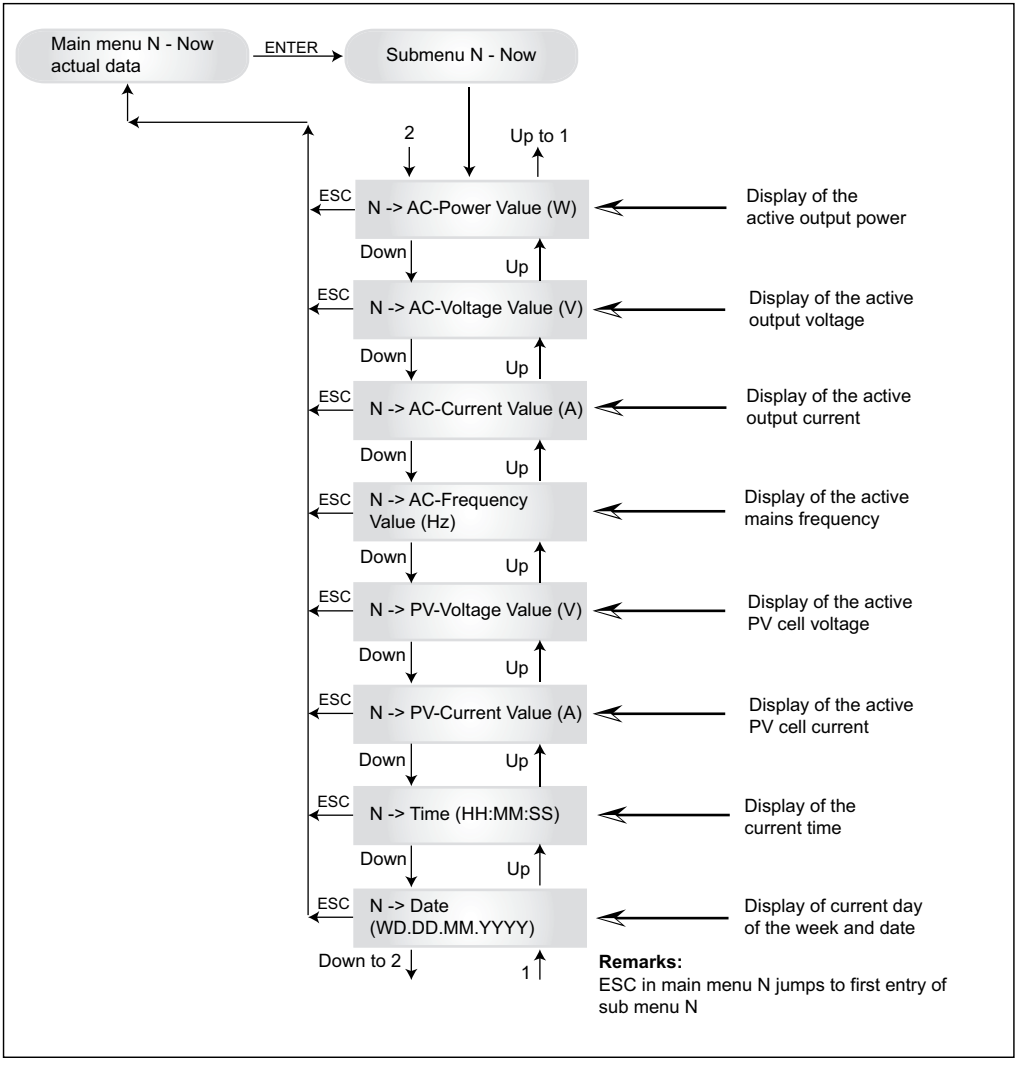
Press the ENTER key to select the submenus. In order to exit the menus again, activate the ESC key.



Remarks:
ESC in main menu jumps to first entry of corresponding sub menu

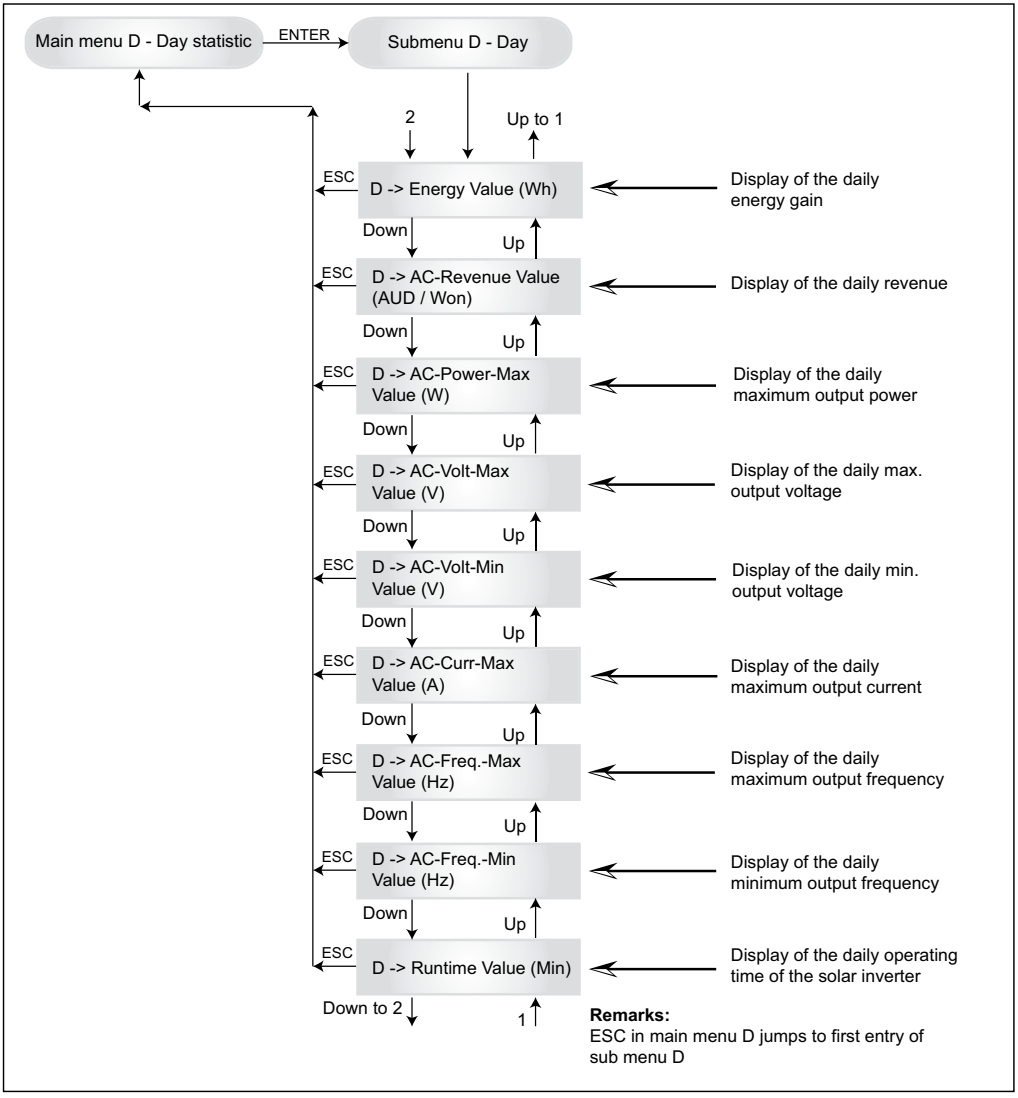
7.3.1 Submenu N (Now)

This menu item displays the active values.



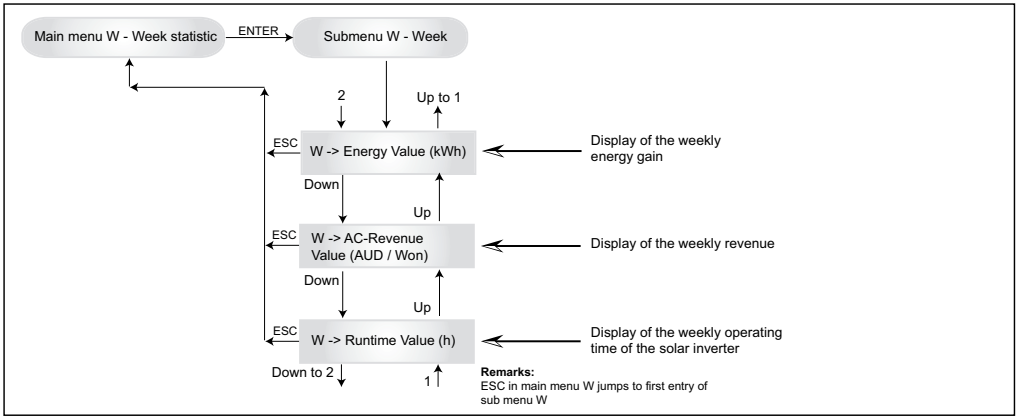
7.3.2 Submenu D (Day)

This menu item displays the daily values for the grid feed.



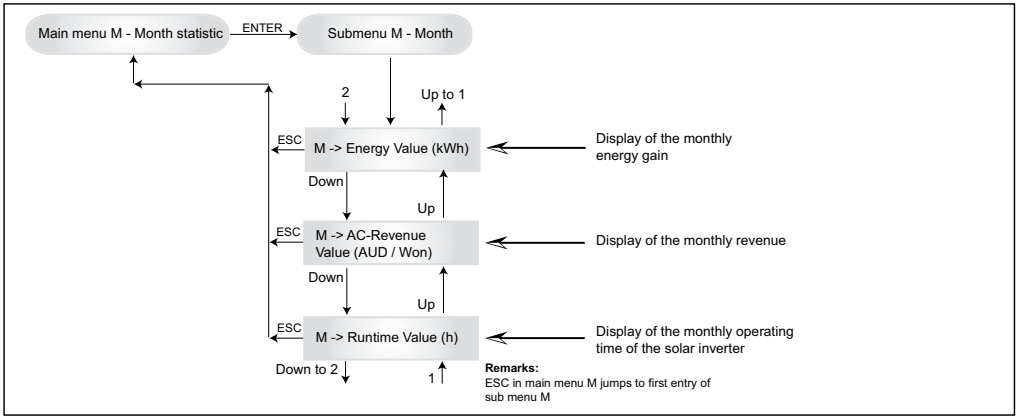
7.3.3 Submenu W (Week)

This menu item displays the average values of the current week.



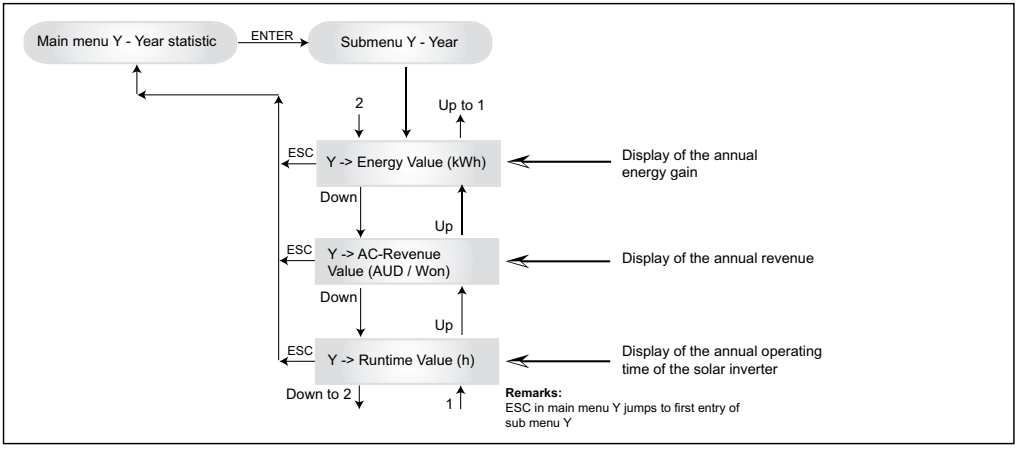
7.3.4 Submenu M (Month)

This menu item displays the average values of the current month.



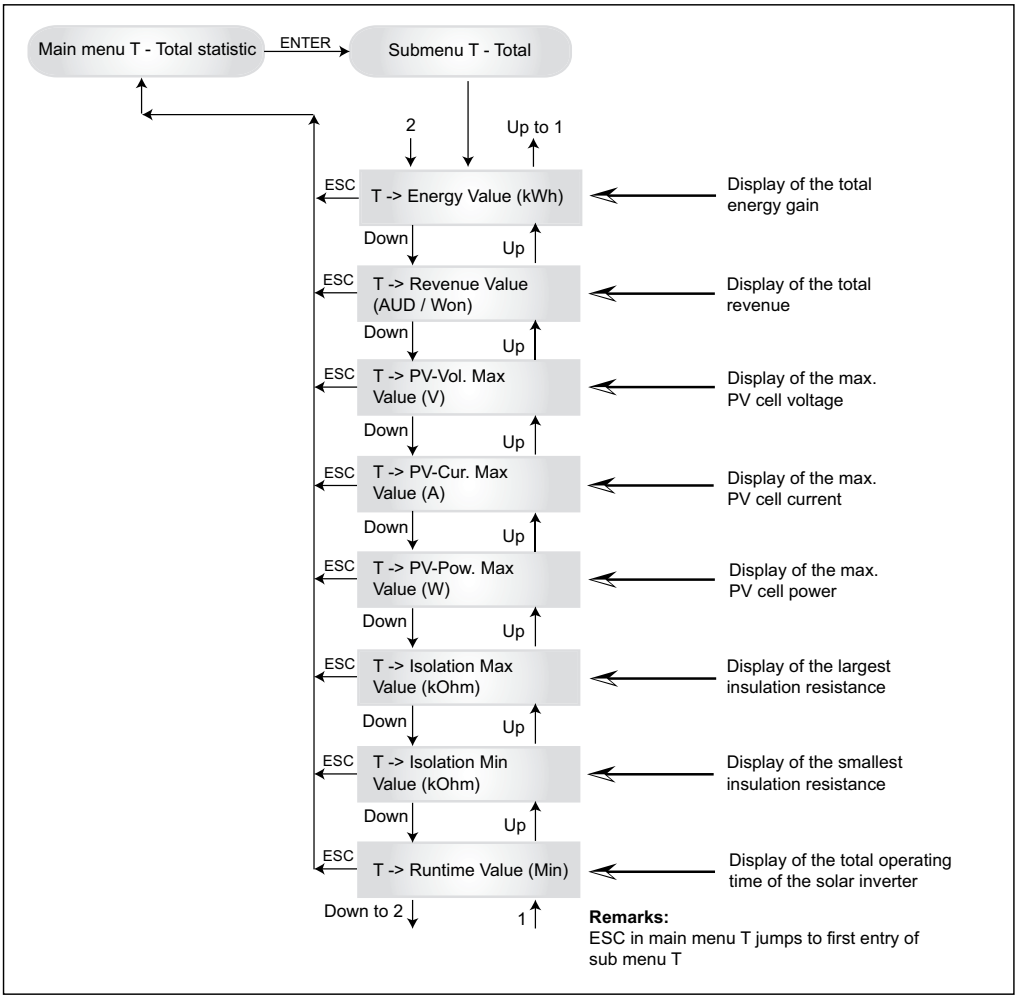
7.3.5 Submenu Y (Year)

This menu item displays the average values of the current year.



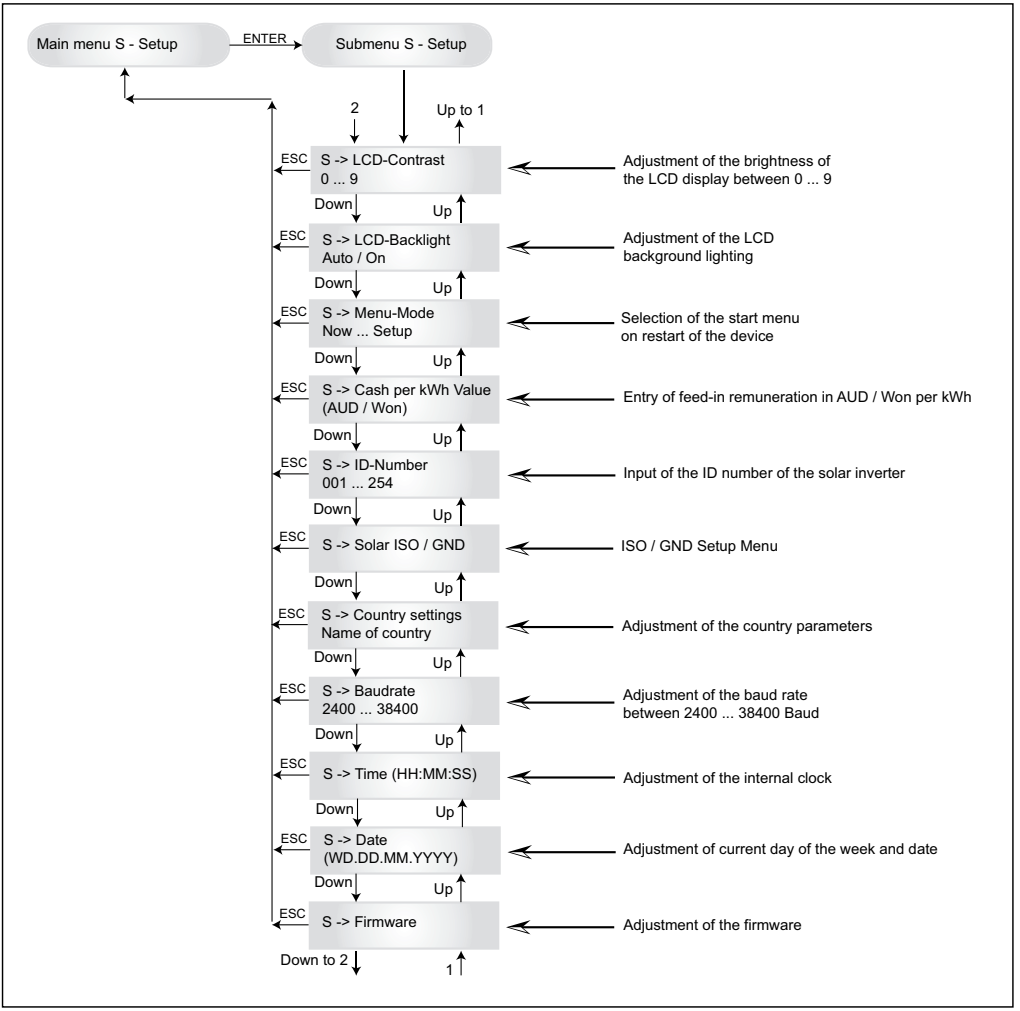
7.3.6 Submenu T (Total)

This menu item shows cumulated and maximum/minimum values since first use.



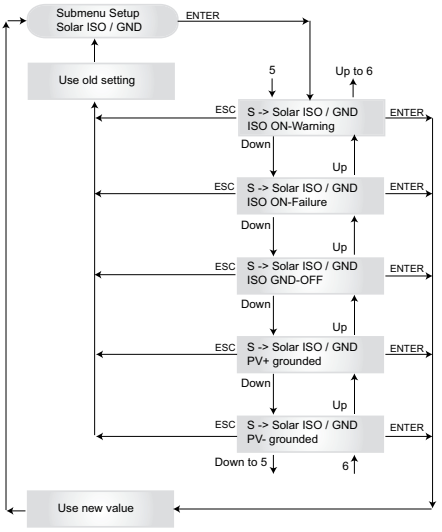
7.3.7 Submenu S (Setup)

This menu item is used for changing the presettings of the solar inverter.



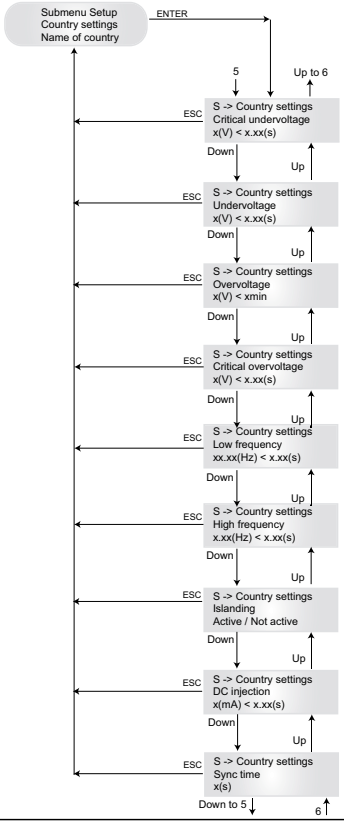
7.3.7.1 Submenu S: Solar ISO / GND

More detailed information on the Solar ISO / GND menu within the submenu S (Setup).



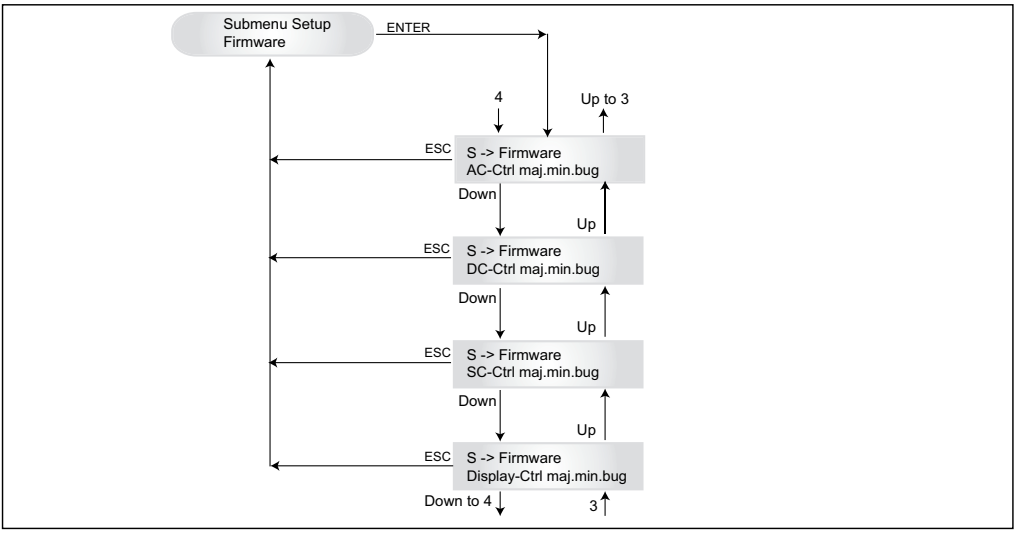
7.3.7.2 Submenu S: Country settings

More detailed information on the country settings menu within the submenu S (Setup).



7.3.7.3 Submenu S: Firmware

More detailed information on the firmware menu within the submenu S (Setup).



8 Diagnostics and data evaluation

8.1 Malfunction rectification

The solar inverter is provided with an automatic diagnostics system which independently identifies certain faults and which can make them visible on the display.

Troubleshooting in the field

In principle, it is always worth attempting a reset by reinitializing the solar inverter whenever an error message appears on the display.

To reset the device, proceed as follows:

1. Isolate the solar inverter from the grid (open automatic circuit breaker).
2. Switch off the DC disconnector.
3. Wait: approx. 1 minute.
4. Switch DC disconnector back on.
5. Switch in grid (close automatic circuit breaker).

(In the field, the first step is to scan for potential fault causes that could be picked up by the solar inverter and result in tripping.)

Various key parameters can be scanned via the display, thereby enabling conclusions to be drawn about potential fault causes.

Current values in the N menu

AC Voltage ->	Display of current output voltage ->	Voltage limiting values
AC Frequency ->	Display of current grid frequency ->	Frequency limiting values
Solar Voltage ->	Display of current PV cell voltage ->	Switch-in threshold

8.2 Display messages

LED STATUS	DISPLAY MESSAGE	CAUSE	ELIMINATION
green: <on> red: <on> yellow: <on>	-	Display communication faulty.	- If the fault persists after the device has been reset, please inform your service technician.
green: <off> red: <off> yellow: <on>	AC frequency failure	Grid frequency overshooting or undershooting specified limit range.	- Check the grid frequency via the display in the N menu.
green: <off> red: <off> yellow: <on>	AC voltage failure	Grid voltage overshooting or undershooting specified limit range.	- Check the grid voltage via the display in the N menu. - If no voltage present, check grid automatic circuit breaker.
green: <off> red: <off> yellow: <on>	AC relay failure	One of the anti-islanding protection output relays is faulty / defective.	- The solar inverter is defective. - Return the device.
green: <flashes> red: <off> yellow: <off>	Calibration ongoing	Check internal settings.	Normal function before input mode.
green: <off> red: <off> yellow: <on>	DC injection failure	DC component of input-side alternating current is too high.	- If the fault persists after the device has been reset, please inform your service technician.
green: <off> red: <off> yellow: <on>	Error # 301	Internal communication error or hardware fault.	- If the fault persists after the device has been reset, please inform your service technician.
green: <off> red: <off> yellow: <on>	Error # 302	The device trips and reverts to grid input mode once the temperature has dropped.	- Check the installation site (no direct sunlight, air circulation).
green: <off> red: <on> yellow: <off>	Error # 506 Error # 508	Isolation resistance fault on the DC side during start-up phase (# 508) or running phase (# 506).	- Check the isolation resistance on the DC side of the PV modules.
green: <on> red: <on> yellow: <off>	Isolation start-up warning Isolation running warning	Isolation resistance fault on the DC side during start-up phase or running phase.	- You must check the isolation resistance on the DC side of the PV modules. Solar inverter is still feeding!
green: <on> red: <on> yellow: <off>	PV+ grounding fault PV- grounding fault	Connection PV+ (PV-) to GND is interrupted or wrong pole is connected to GND.	- Check that the GND connection has been made correctly and/or check the fuse in the grounding path. Change the fuse if necessary. The solar inverter remains in feed-in operation.
green: <off> red: <off> yellow: <on>	Revision error	Versions of hard- and software are not compatible.	- If the fault persists after the device has been reset, please inform your service technician.
green: <on> red: <on> yellow: <on>	Self test ongoing	Initialization of solar inverter on start-up.	The first time the solar inverter is started up: - Normal function with a PV cell voltage of between 100 V and 150 V.
green: <flashes> red: <off> yellow: <off>	PV power too low	Insufficient input power.	- Insufficient insolation (dawn/twilight). - Check the PV cell voltage via the display in the N menu.
green: <flashes> red: <off> yellow: <off>	PV voltage too low	PV generator voltage between 100 V and 150 V.	- Insufficient insolation. - Check the PV cell voltage via the display in the N menu.
green: <flashes> red: <off> yellow: <off>	Synchronize to AC	Checks grid voltage and grid frequency for grid input mode.	- Normal function before input mode.

LED STATUS	DISPLAY MESSAGE	CAUSE	ELIMINATION
green: <on> red: <off> yellow: <flashes>	Varistor warning	Internal varistor at the DC input is defective.	- Although you can, in theory, carry on using the solar inverter, the varistors should be replaced at the earliest oppor tunity. This will involve returning the device.

Please follow the instructions above before contacting your service technician!

9 Technical data

INPUT (DC)	AUSTRALIA	CHINA	INDIA	KOREA	TAIWAN
Max. recommended PV power	4000 W				
Nominal power	3630 W				
Voltage range	125 ... 540 V	125 ... 540 V	125 ... 540 V	125 ... 500 V	125 ... 540 V
MPP range	150 ... 450 V				
Full power MPP range	150 ... 450 V				
Nominal current	13.0 A				
Max. current	24.0 A				
Stand-by power	< 0.2 W				

OUTPUT (AC)	AUSTRALIA	CHINA	INDIA	KOREA	TAIWAN
Max. power	3485 W				
Nominal power	3300 W				
Nominal voltage	230 V	220 V	230 V	220 V	220 V
Voltage range	210.0 ... 264.0 V	187.0 ... 242.0 V	184.0 ... 264.5 V	193.6 ... 242.0 V	193.6 ... 253.0 V
Nominal current	14.4 A	15.0 A	14.4 A	15.0 A	15.0 A
Max. current	15.7 A	17.0 A	15.7 A	17.0 A	17.0 A
Nominal frequency	50 Hz	50 Hz	50 Hz	60 Hz	60 Hz
Frequency range	48.0 ... 52.0 Hz	49.5 ... 50.5 Hz	47.3 ... 52.7 Hz	59.3 ... 60.5 Hz	58.0 ... 61.0 Hz
Power factor (cos φ)	> 0.99 @ nominal power				
Total harmonic distortion (THD)	< 5 %				

GENERAL SPECIFICATION	AUSTRALIA	CHINA	INDIA	KOREA	TAIWAN
Model name	SOLIVIA 3.3 AP G3				
Max. efficiency	96.0 %				
Efficiency EU	94.8 %				
Operating temperature	-25 ... +70°C				
Storage temperature	-25 ... +80°C				
Humidity	0 ... 98 %				

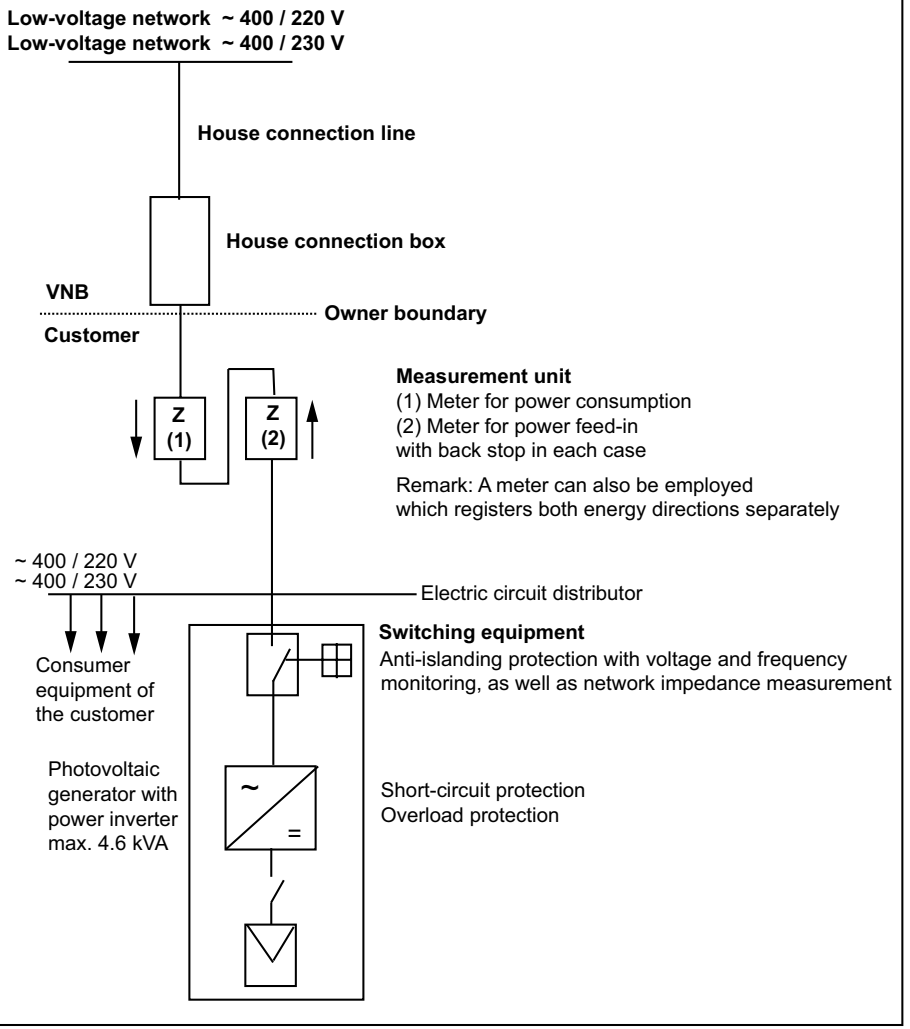
MECHANICAL DESIGN	AUSTRALIA	CHINA	INDIA	KOREA	TAIWAN
Size (L x W x D)	410 x 410 x 180 mm				
Weight	21.5 kg				
Cooling	Free convection				
AC connector	Wieland RST25i3S				
DC connector pairs	4 Multicontact MC4				
Communication interfaces	2 Harting RJ45 / RS485				
Display	LCD; 3 LEDs				

STANDARDS / DIRECTIVES	AUSTRALIA	CHINA	INDIA	KOREA	TAIWAN
Protection degree	IP65				
Safety class	1				
Overload behavior	Current limitation; power limitation				
Safety	AS/NZS 60950; AS/NZS 3100; AS 4777.2; AS 4777.3	CGC/ GF001:2009	IEC 62103:2003, EN 50178:1997, IEC 62109-1:2007, IEC 62109-2:2005	PV 501	IEC 62103:2003, EN 50178:1997, IEC 62109-1:2007, IEC 62109-2:2005
Anti-islanding protection	AS 4777.2; AS 4777.3; IEC 60255.5	Yes	VDE 0126-1-1	PV 501; KS C 8540	Yes
EMC	AS 4777.1; AS 4777.2; AS 4777.3; EN 61000-6-2; IEC / EN 61000-6-3	GB /T 17626; GB 17799	IEC / EN 61000-6-2; IEC / EN 61000-6-3	IEC 60725; KS C IEC 61000-4-5; KS C IEC 61000-6-1; KS C IEC 61000-6-2; KS C IEC 61000-6-3; KS C IEC 61000-6-4	IEC / EN 61000-6-2; IEC / EN 61000-6-3

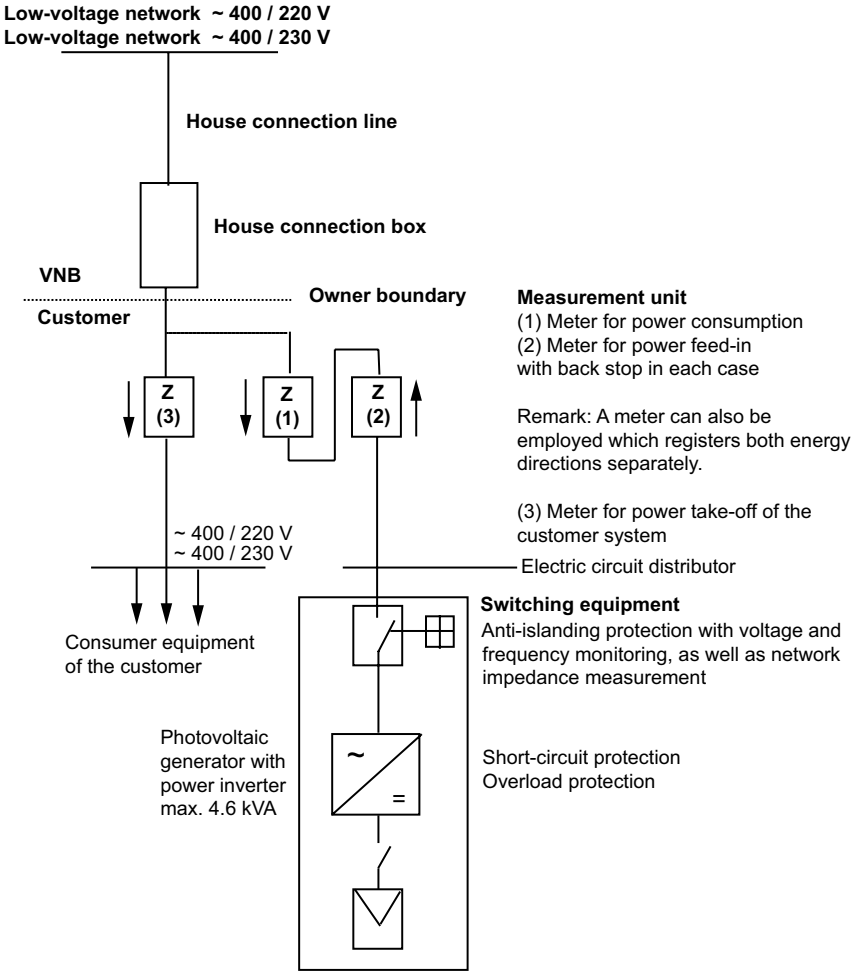
10 Appendix

10.1 Connection examples

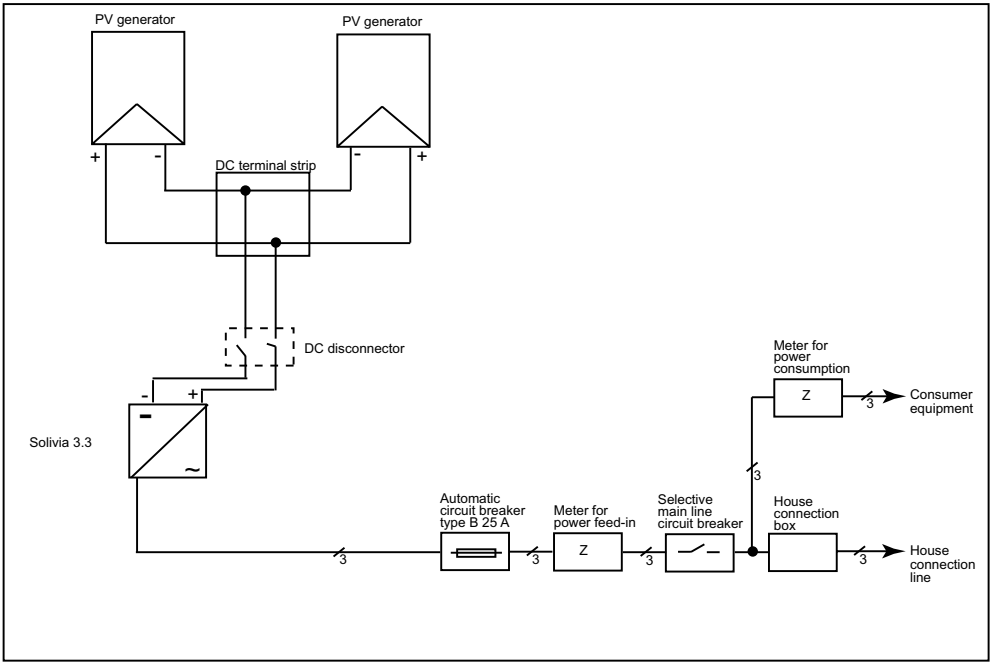
Individual in-plant generation system in parallel operation without isolated operation possibility, single-phase feed with anti-islanding protection.

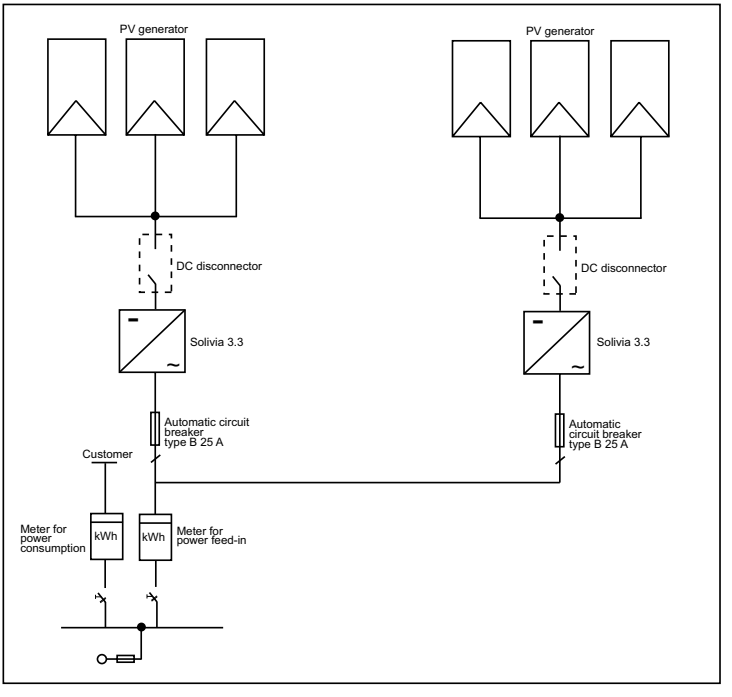


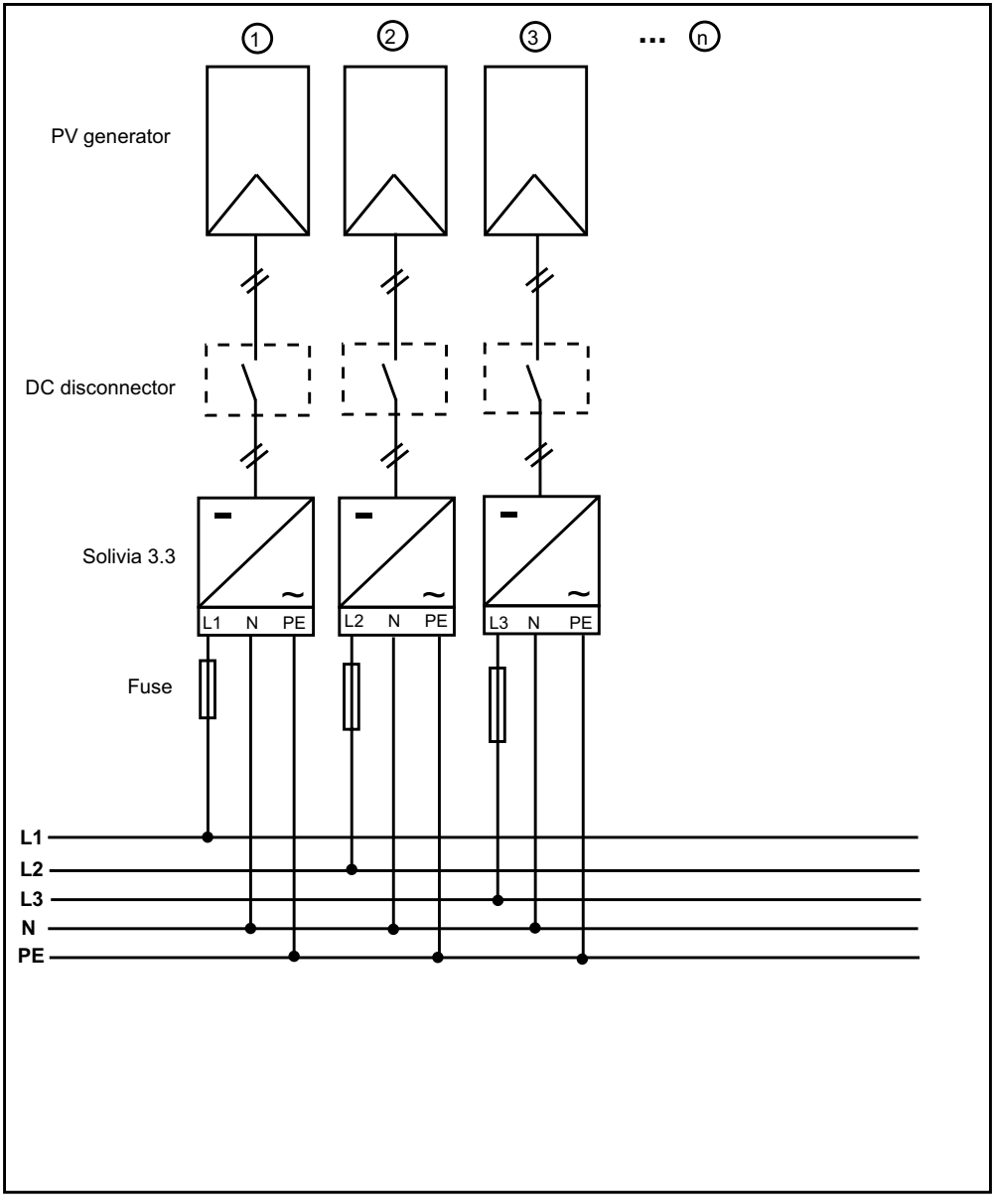
Individual in-plant generation system in parallel operation without isolated operation possibility, single-phase feed with anti-islanding protection, separate feed.



10.2 Overview of connection diagrams



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DC disconnector
Solivia 3.3
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L2 N PE
L3 N PE
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11 Glossary

AC
Abbreviation for „Alternating Current“.

Anti-islanding protection
This is a unit for grid monitoring with assigned switching elements (anti-islanding protection) and is an automatic isolation point for small power generation systems (to 30 kWp).

CE
With the CE identification code, the manufacturer confirms the conformity of the product with the valid EC Guideline and compliance with the significant requirements stipulated therein.

DC
Abbreviation for „Direct Current“.

EMC
The Electro-Magnetic Compatibility (EMC) concerns the technical and legal basics of the mutual influencing of electrical devices through electromagnetic fields caused by them in electrical engineering.

Initialization
Under initialization (cf. English to initialize) is understood the part of the loading process of a program, in which the storage space required for the execution (e.g. variable, code, buffers ...) for the program is reserved and is filled with initial values.

Local utility company
By local utility company is meant a company which generates electrical energy and distributes it over the public grid.

MPP
The Maximum Power Point is the point of the current-voltage diagram of a PV cell at which the largest power can be tapped off, i.e. the point at which the product of current and voltage has its maximum value.

Nominal power
Nominal power is the maximum permissible continuous power output indicated by the manufacturer for a device or a system. Usually the device is also optimized so that the efficiency is at its maximum in case of operation with nominal power.

Nominal current
Nominal current is the absorbed current in case of electrical devices if the device is supplied with the nominal voltage and yields its nominal power.

PE
In electric systems and cables a protective earth conductor is frequently employed. This is also called grounding wire, protective grounding device, soil, grounding or PE (English „protective earth“).

Photovoltaics (abbr.: PV)
The conversion of PV energy into electrical energy.
The name is composed of the component parts: Photos - the Greek word for light - and Volta - after Alessandro Volta, a pioneer in electrical research.

Potential isolation
No conductive connection between two component parts.

Power dissipation
Power dissipation is designated as the difference between absorbed power and power of a device or process yielded. Power dissipation is released mainly as heat.

PV cell
PV cells are large-surface photodiodes which convert light energy (generally sunlight) into electrical energy. This comes about by utilization of the photoelectric effect (photovoltaics).

PV generator
System comprising a number of PV modules.

PV module
Part of a PV generator; converts PV energy into electrical energy.

RJ45
Abbreviation for standardized eight-pole electrical connector connection. RJ stands for Registered Jack (standardized socket).

RS485 (EIA485)
Differential voltage interface on which the genuine signal is transmitted on one core and the negated (or negative) signal on the other core.

Separate grid system
Energy supply equipment which is completely independent of an interconnected grid.

Solar inverter
is an electrical device which converts DC direct voltage into AC voltage and/or direct current into alternating current.

String
Designates a group of electrical PV modules switched in series.

String solar inverter (solar inverter concept)
The PV generator is divided up into individual strings which feed into the grid over their own string solar inverters in each case. In this way, the installation is considerably facilitated and the gain decrease, which can arise from the installation or from different shading conditions of the PV modules, is considerably reduced.

TAB (2000)
The TAB 2000 are the technical regulations governing connection to the low-voltage grid operated by distribution system operators in Germany. These Technischen Anschlussbestimmungen or TAB for short have been in force since the year 2000. They define the requirements imposed by DSOs on the electrical systems operated by the end customers of utility companies.

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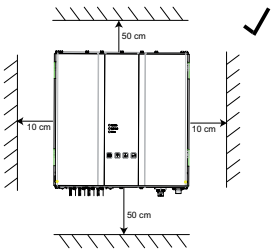

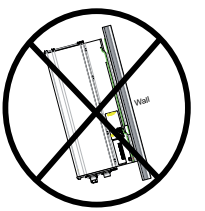

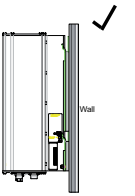

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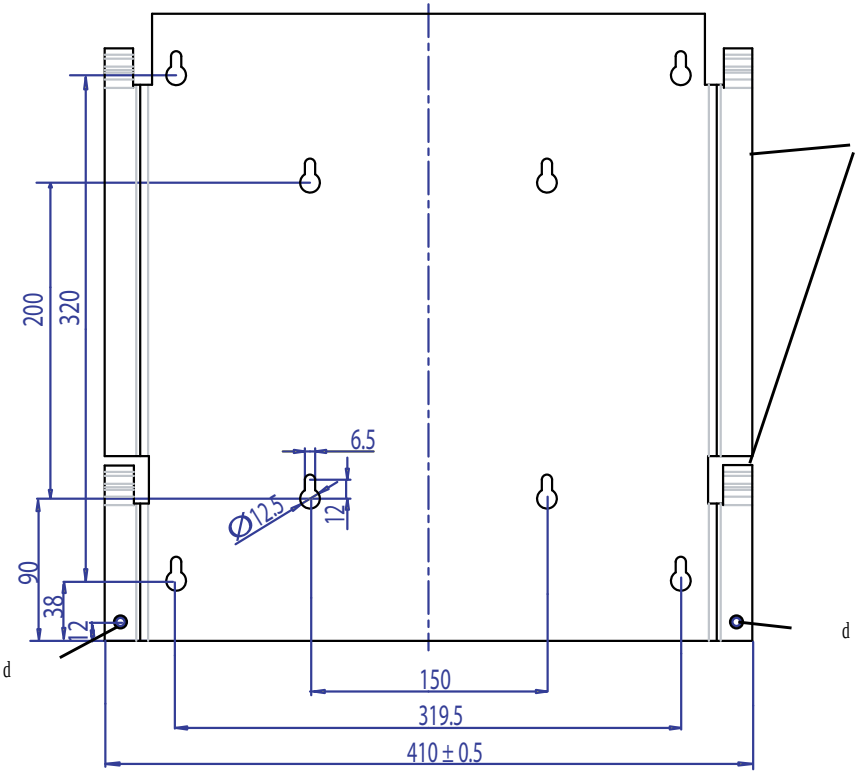

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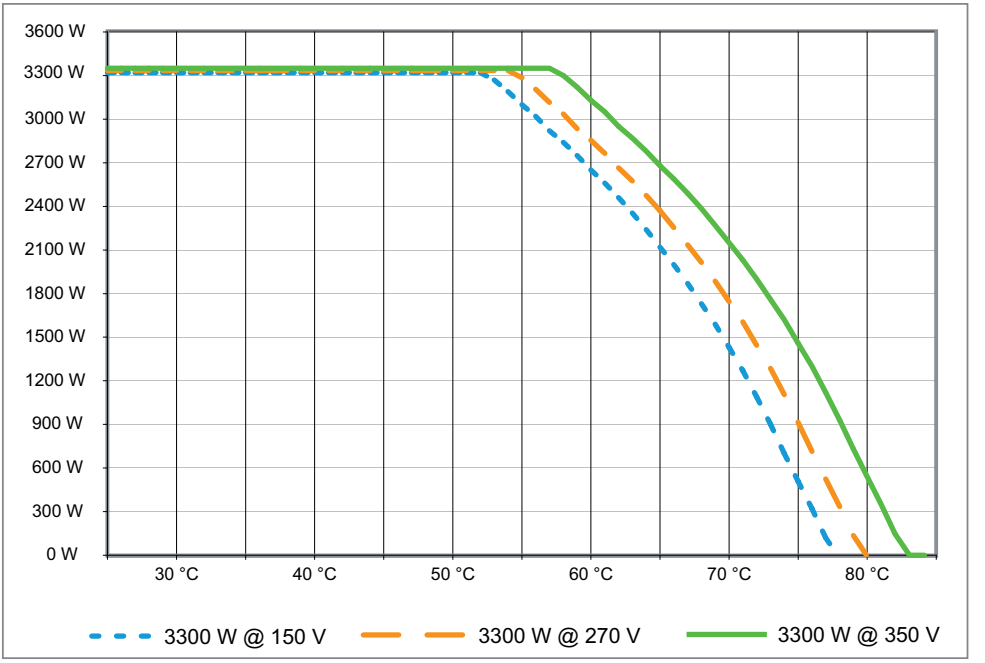

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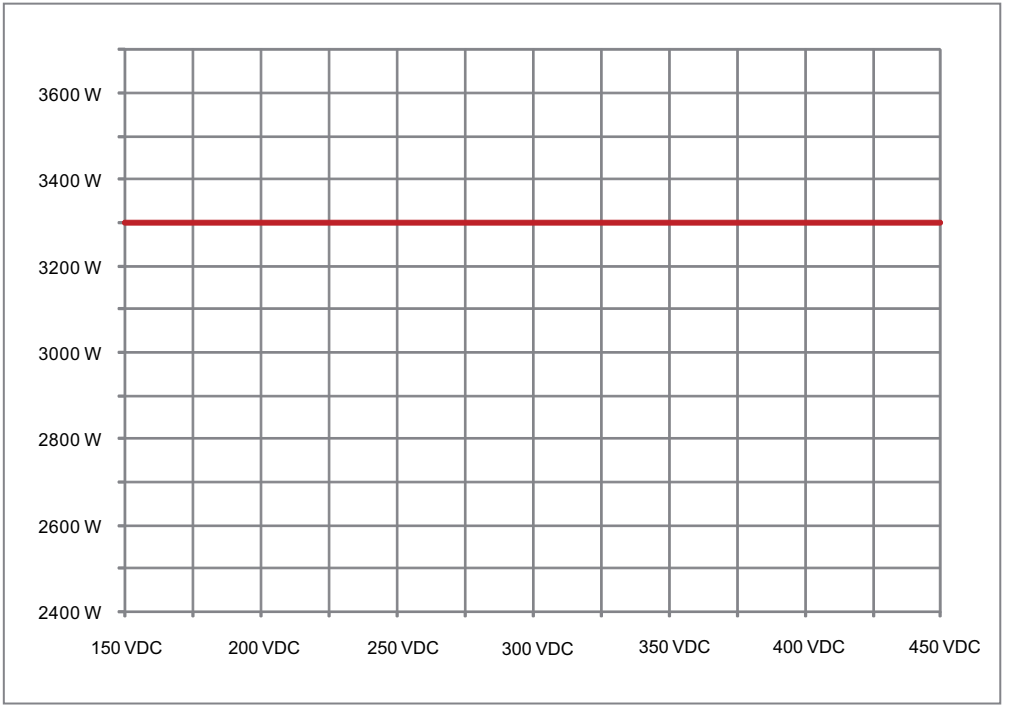

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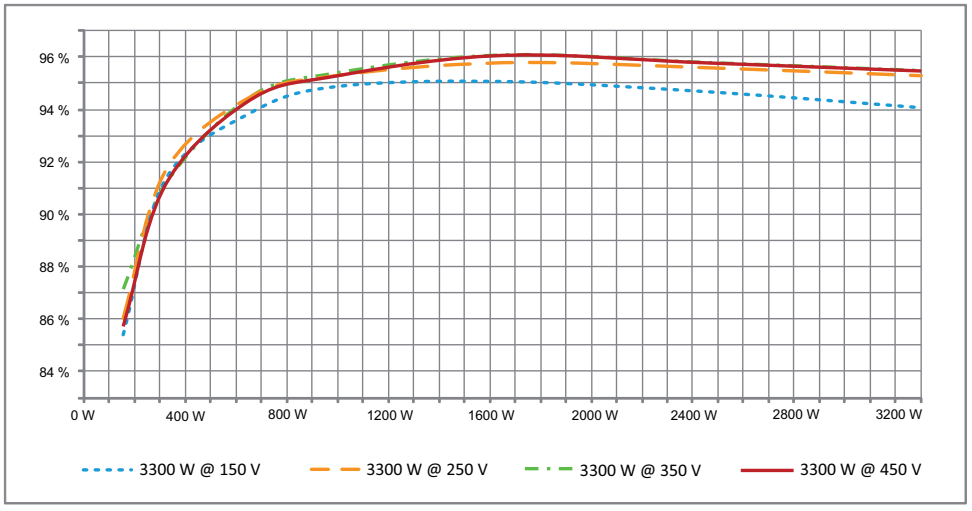

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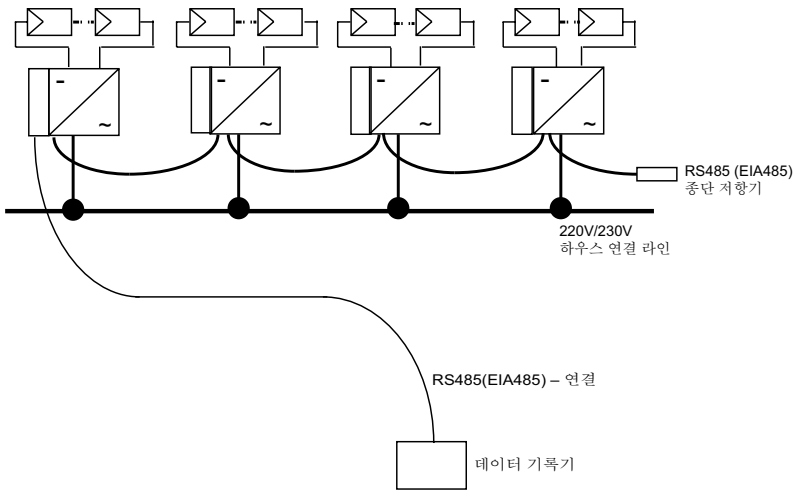
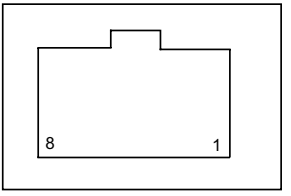


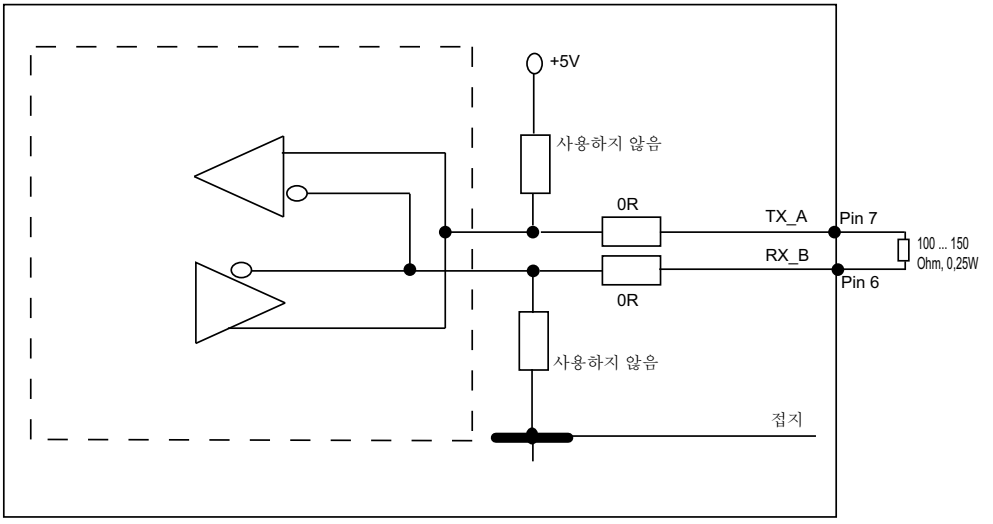
커넥터 핀 지정 **RS485(EIA485)**

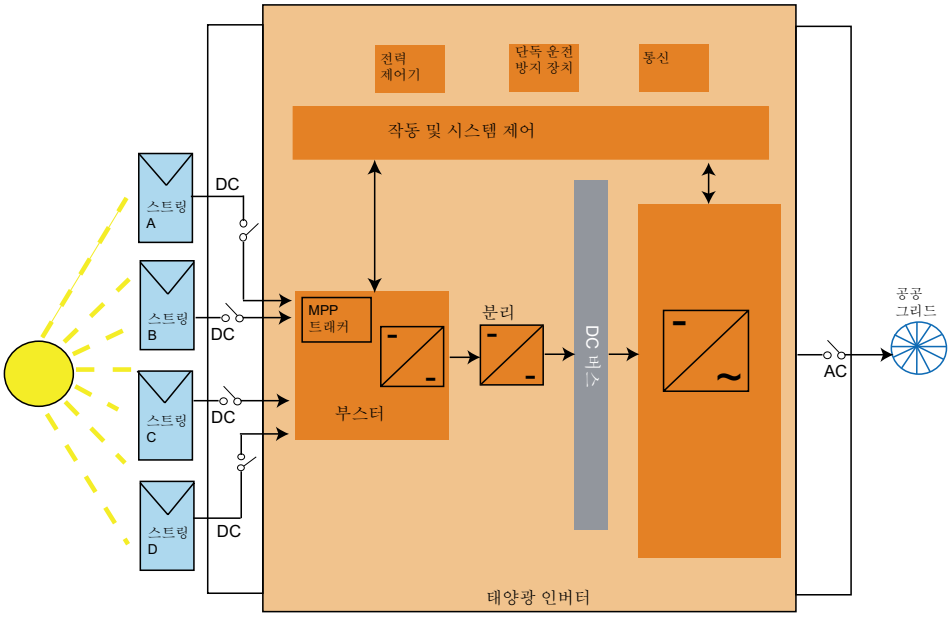


평면도

핀	
1	소유
2	소유
3	소유
4	접지 (RS485)
5	소유
6	RX_B (RS485)
7	TX_A (RS485)
8	소유

여러 개의 장치를 직렬로 연결하고 데이터 라인의 전체 길이가 **2m** 이상이라면 **RS485 (EIA485)** 인터페이스 종단을 위해 다음과 같은 옵션을 사용할 수 있습니다.





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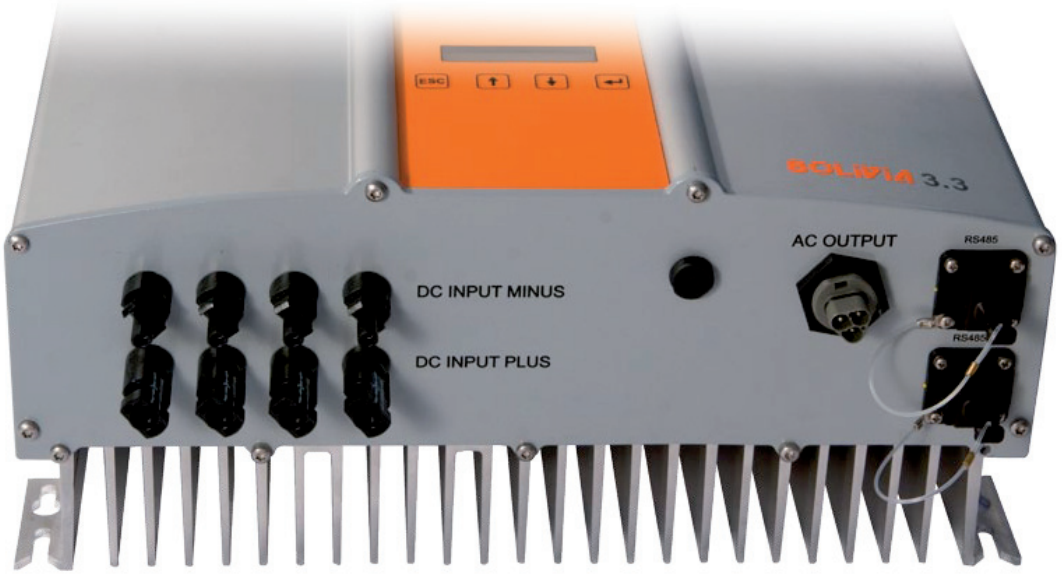

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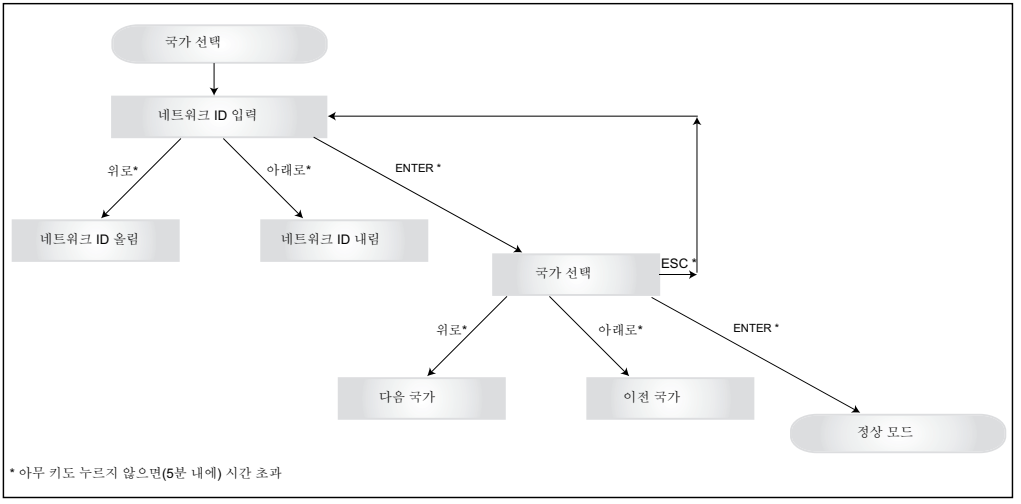

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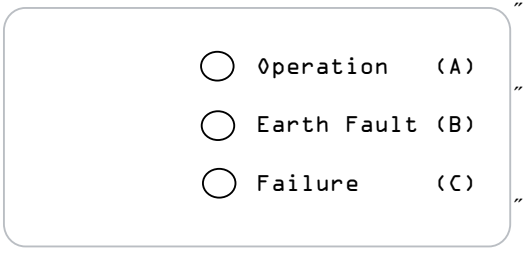

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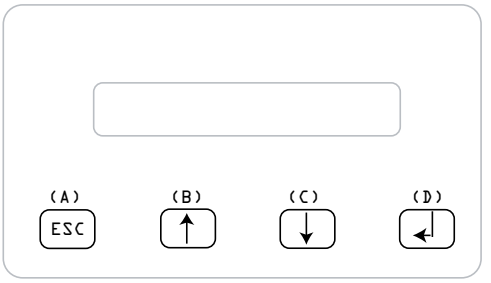

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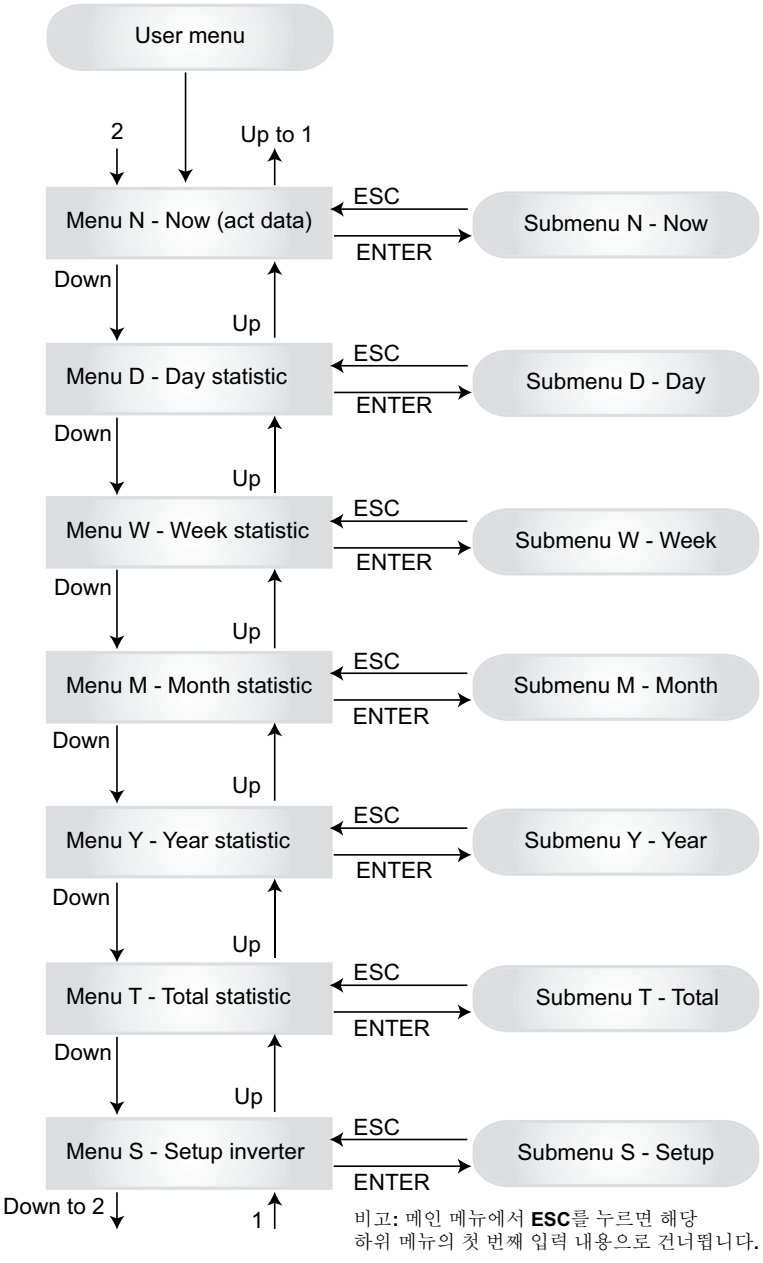

비고: 메인 메뉴에서 **ESC**를 누르면 해당
하위 메뉴의 첫 번째 입력 내용으로 건너뜁니다.

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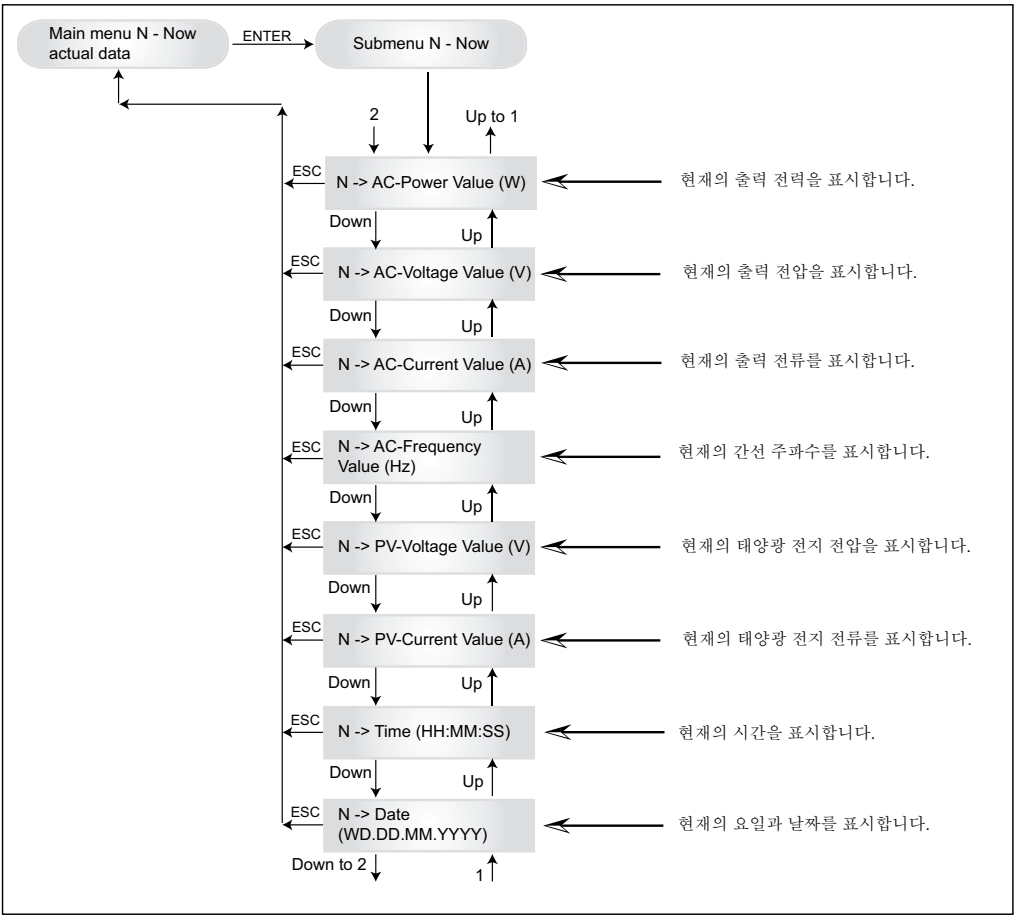

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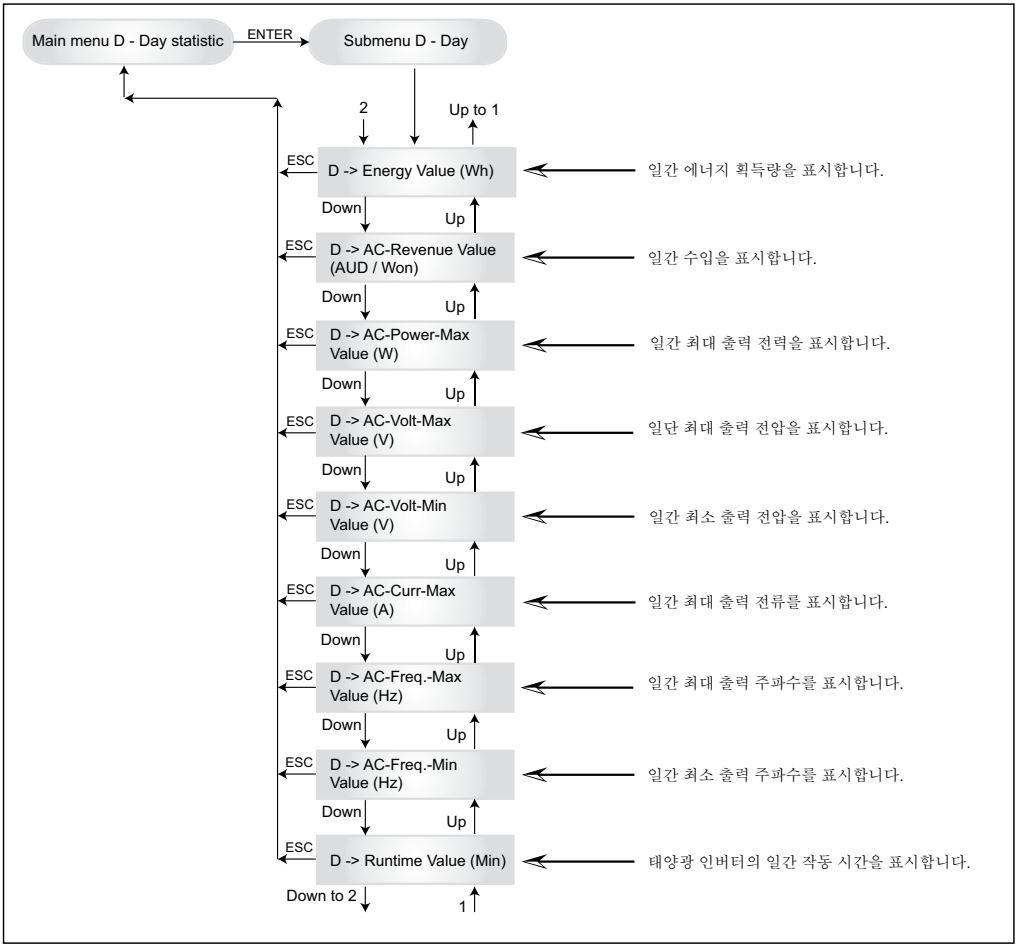

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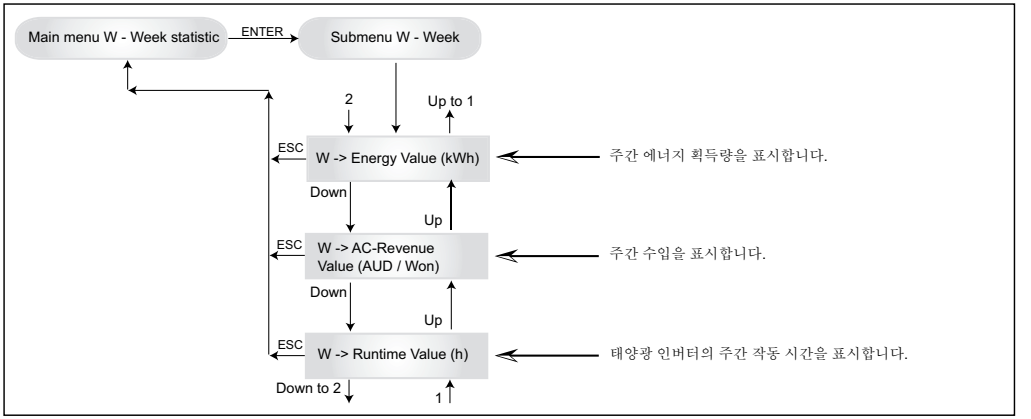

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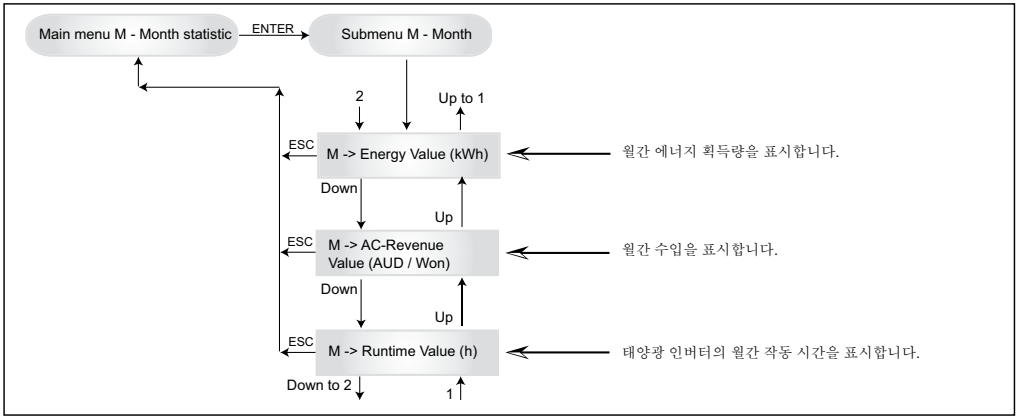

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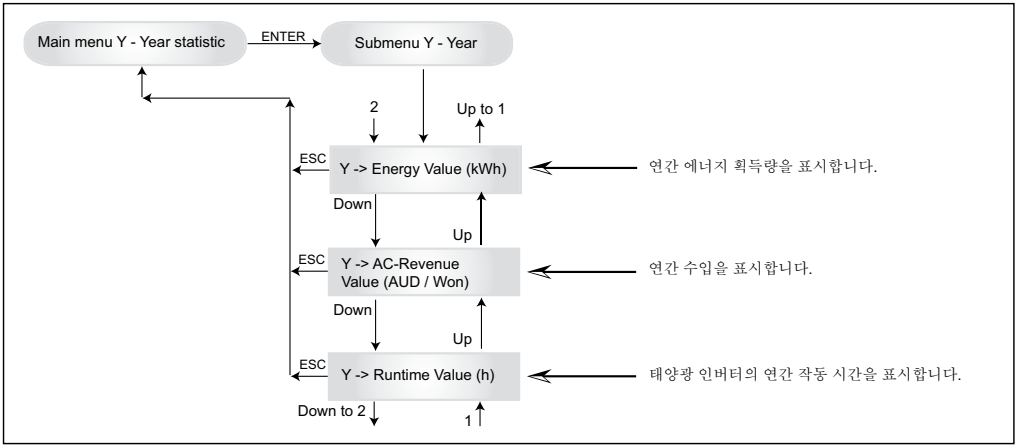

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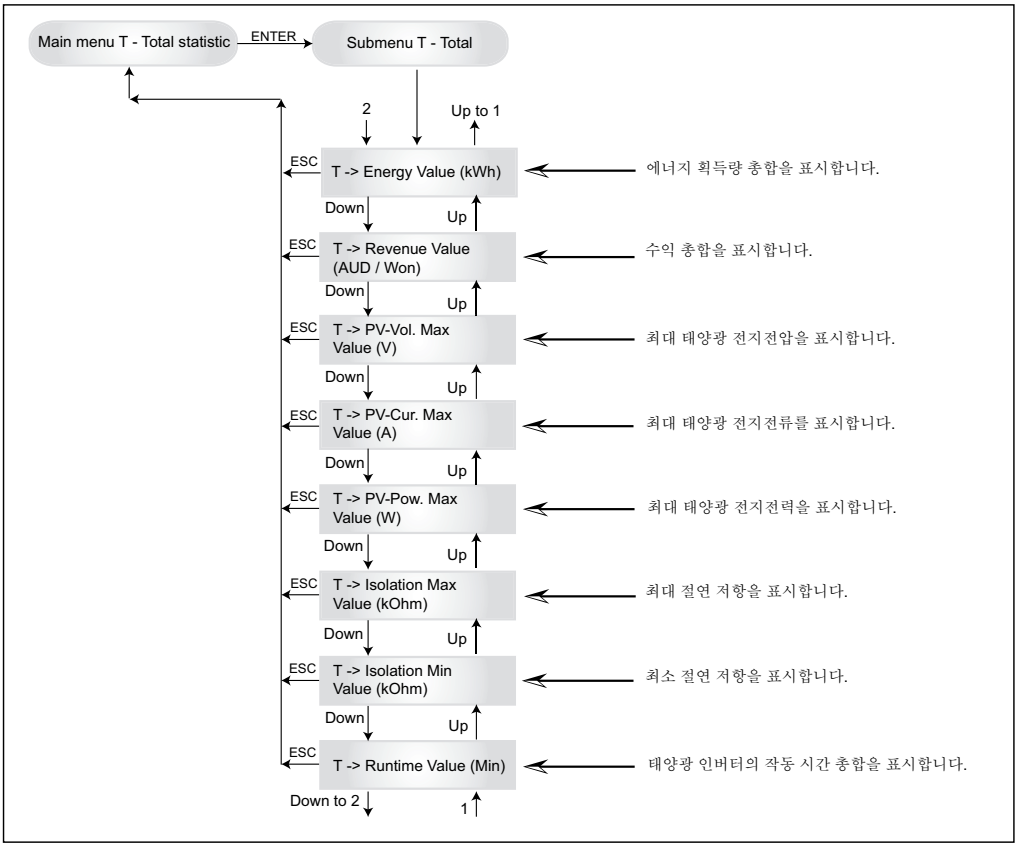

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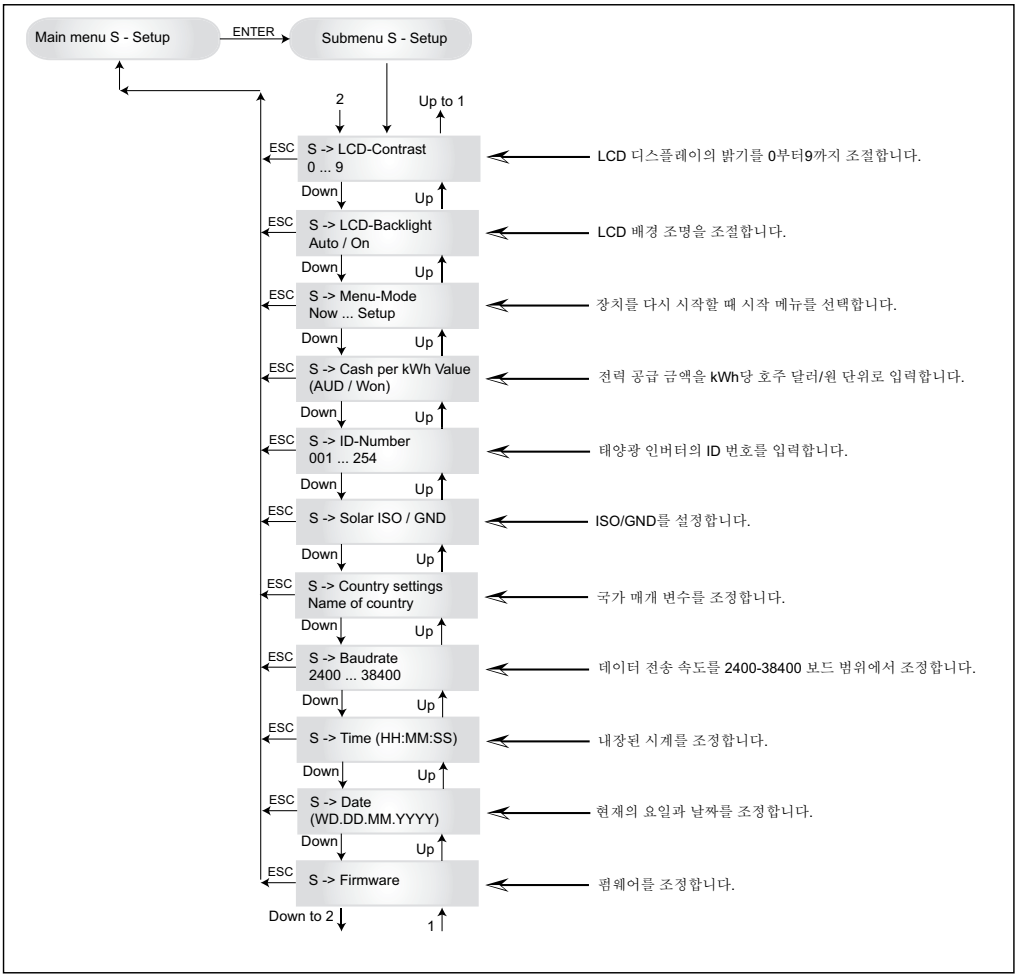

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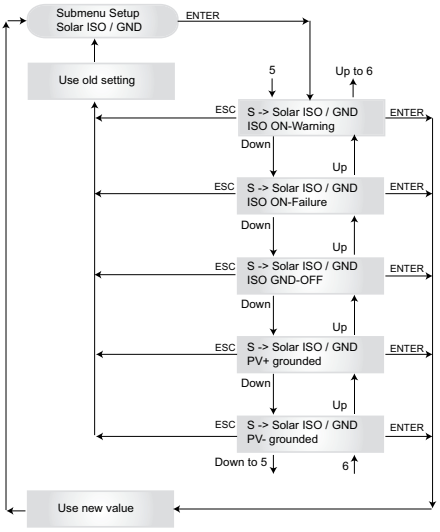

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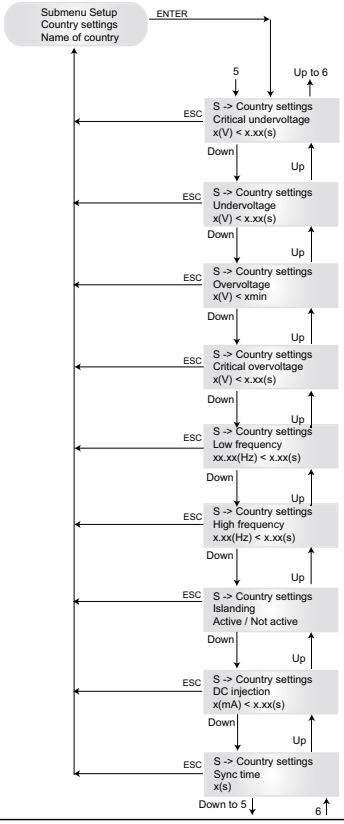

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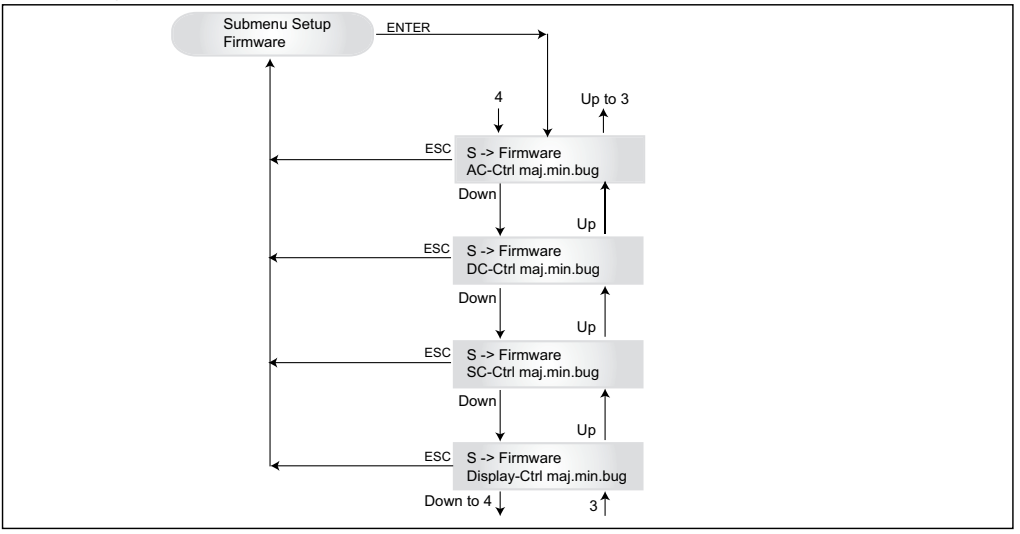

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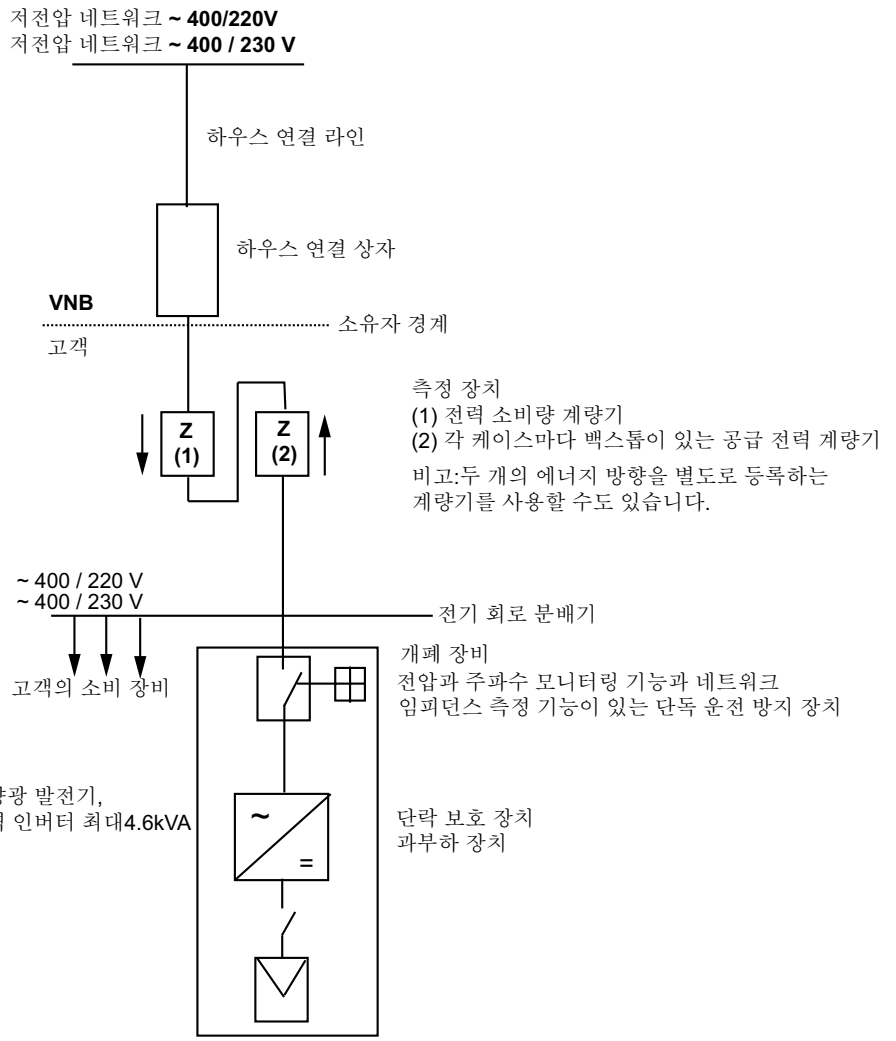
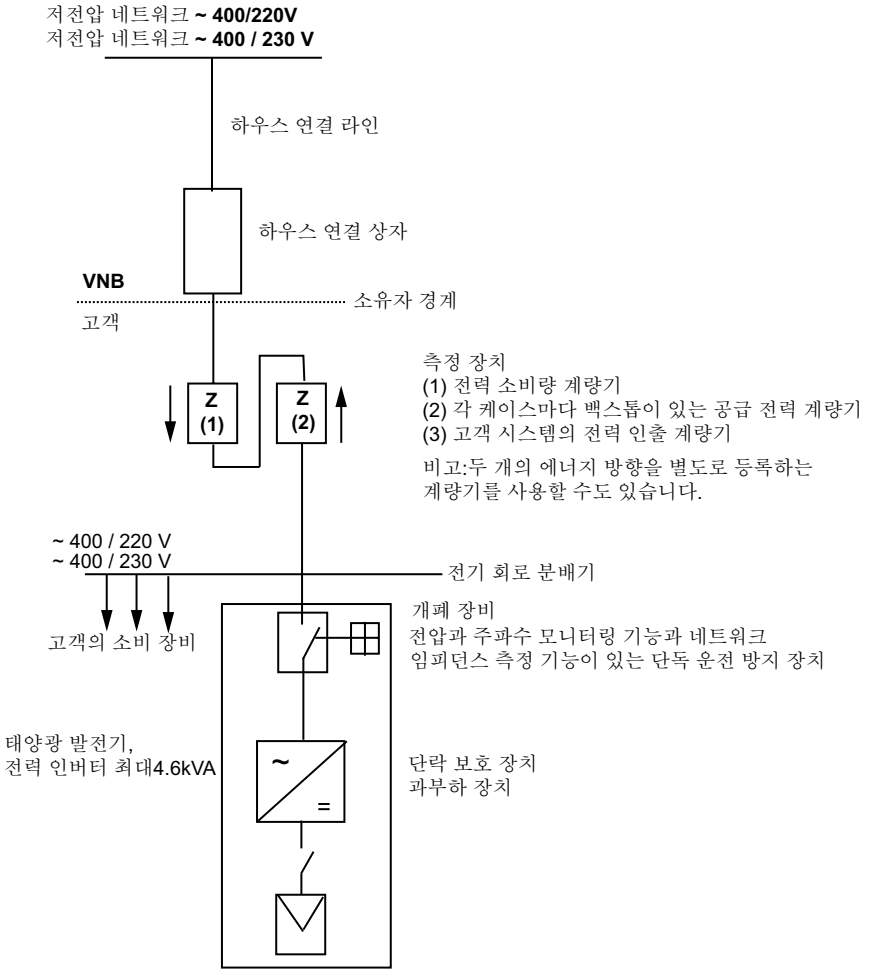
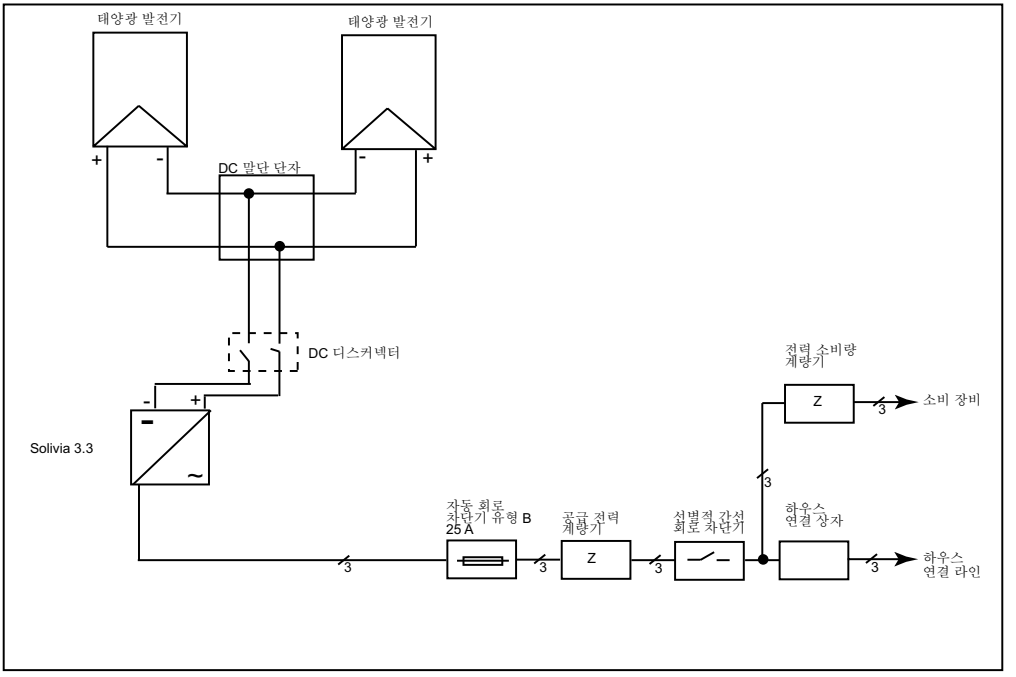
시설 내의 병렬 작동식 개별 발전 시스템, 개별 작동의 가능성이 없음,
단상 전력 공급, 단독 운전 방지 장치.



시설 내의 병렬 작동식 개별 발전 시스템, 개별 작동의 가능성이 없음,
단상 전력 공급, 단독 운전 방지 장치, 별도 전력 공급.

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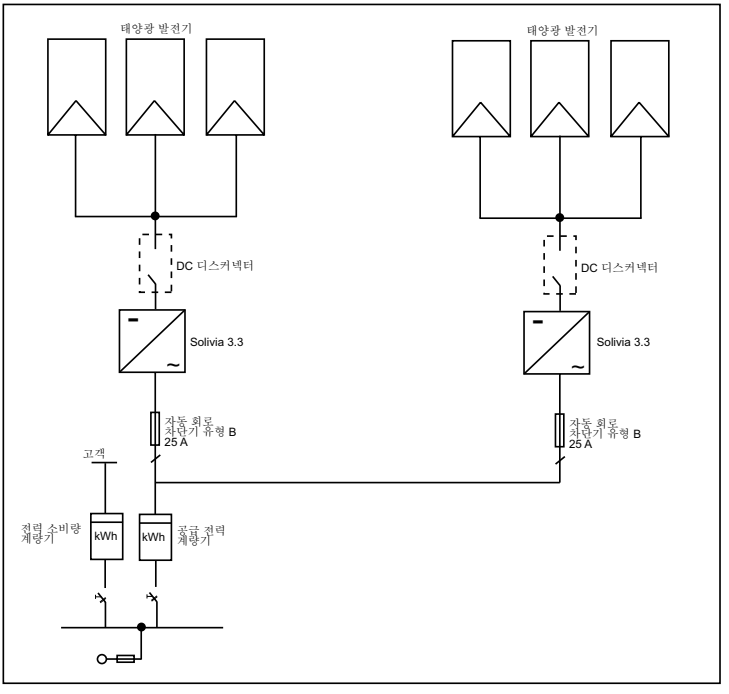
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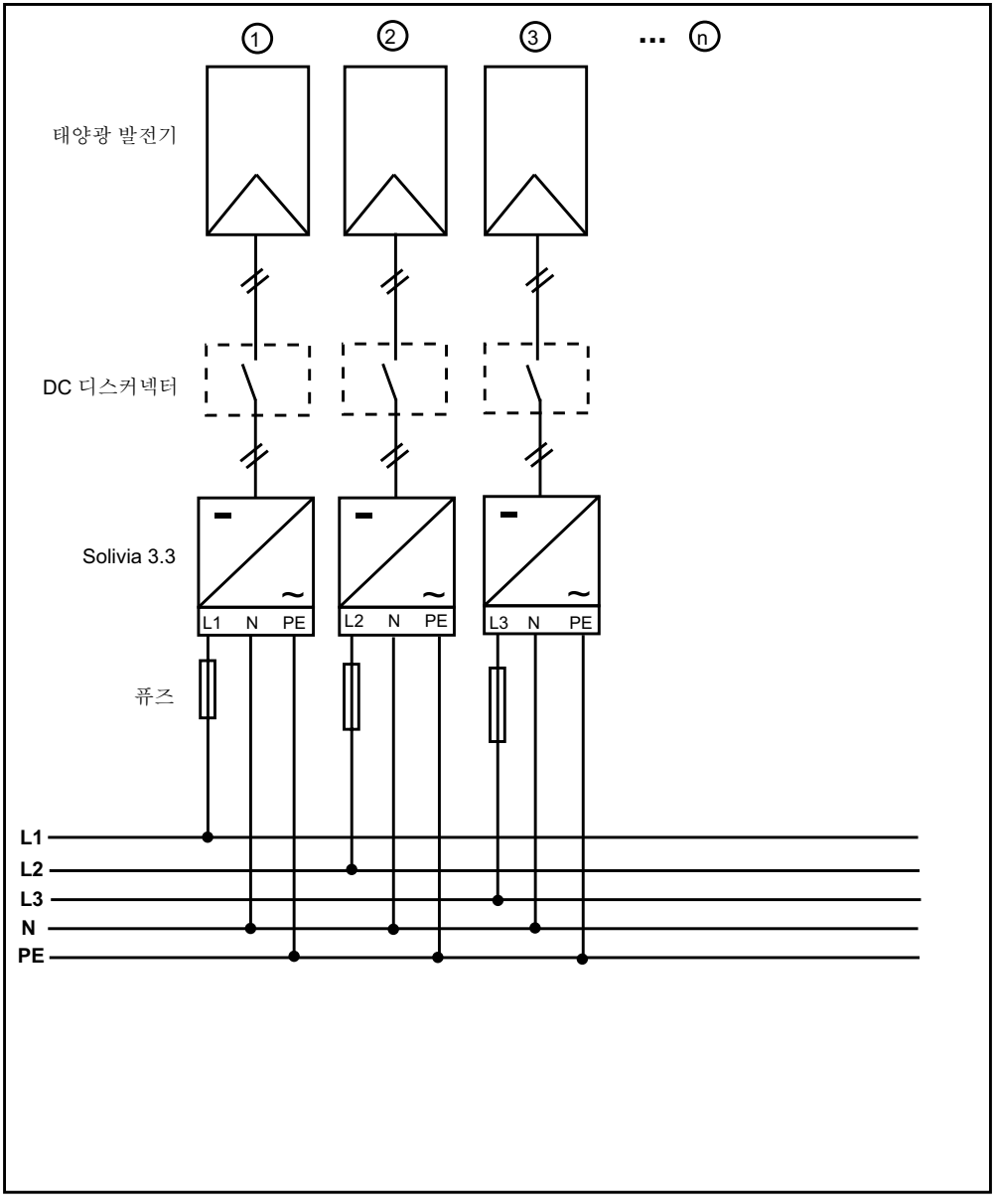
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d d d d d d d d d d d d d d d rd
d d d d d d d d d d r

d
d d d d d d d d d d d d d d d
d r

µ ª
d d d d d d d rd d d d pd d d
pd pd pd d dlµ ª md d r

l ~dµ»m
d d d d r
d dlµÍÔÙÔÛÔÑÙÆÎÈØmd d d d rdµÍÔÙÔØdq d d rd»ÔÑÙÆdqd
d d d¦ÑÊØØÆÓÉ×Ôd»ÔÑÙÆd d d r

d
d d d d d d r

d
d d d d d pd d d d d d rd d
d d d r

d
d d d d d d dl d md d d d
rd dl d md d r

d
d d d d d r

d
d d d d d d d r

·¯xy
d|d d d d d rd·¯d d·ÊÌÎØÙÊ×ÊÉd¯ÆÈÐdl d md d r

·¸x|ydl ª®¦x|ym
d d d d d dl md d d d d d d d
r

d d
d d d d d d r

d
©¨d d¦¨d d d d d d d r

d d d d d d r

d d dl d d m
d d d d rd d d d d d d d
d d rd d d d d d d d d d d
d d d d d d d d d d r

¹¦§dlvtttm
¹¦§dvtttd d d d d d d d d d d d d d d
d rd d d dvtttd d d d rd d d d d d
d d d d d©¸´d d d d d r

1

SOLIVIA 3.3 AP G3

2

SOLIVIA 3.3 AP G3

9

> 18

5

Delta Energy Systems

3

12

(IP65)

4

T

4.1

4.2

150 450
500

IP65

-25°C +70°C

RS485

(EMC)

4.6

4.3

1
2
3 RS485 (EIA485)
4
5

5

TAB 2000

9

6

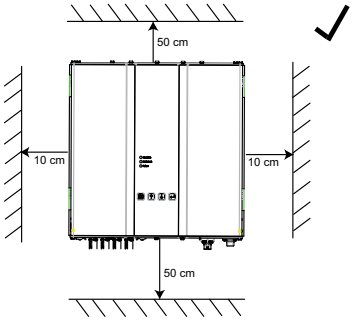
6.1

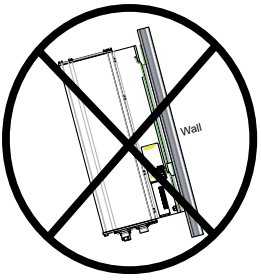
- LED
- IP65

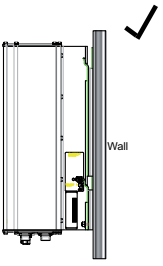
6.2

- 10 50
- (Tyco)

IP65



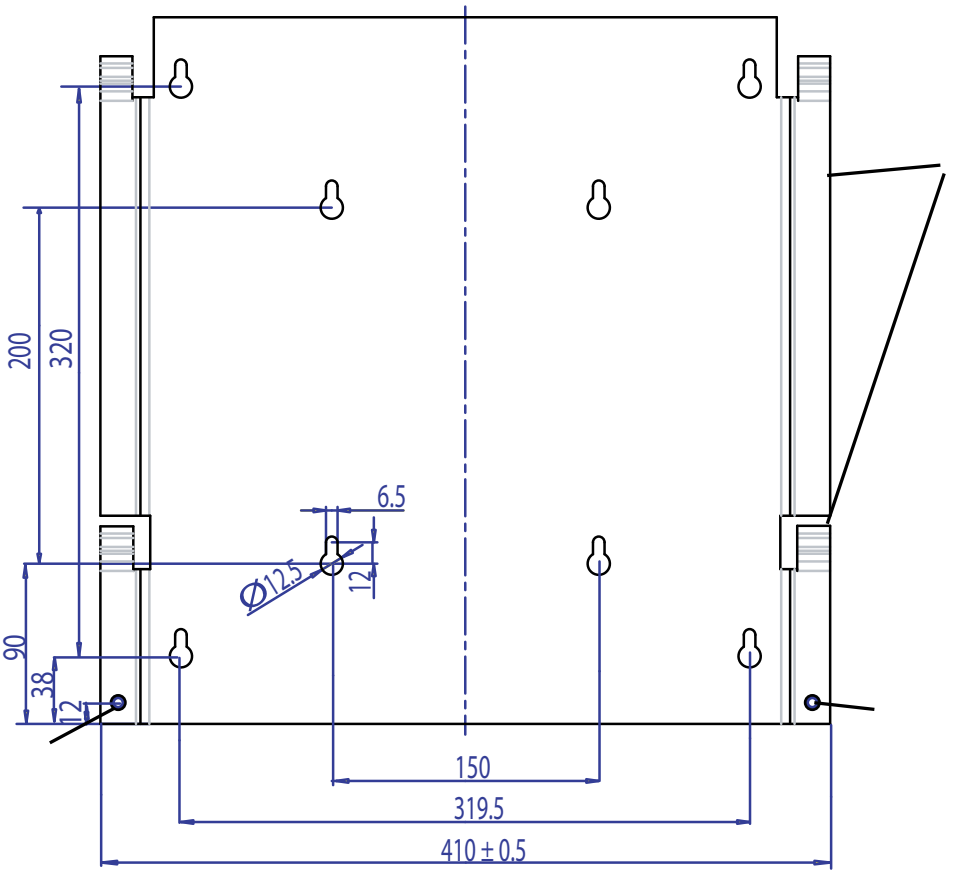




6.3

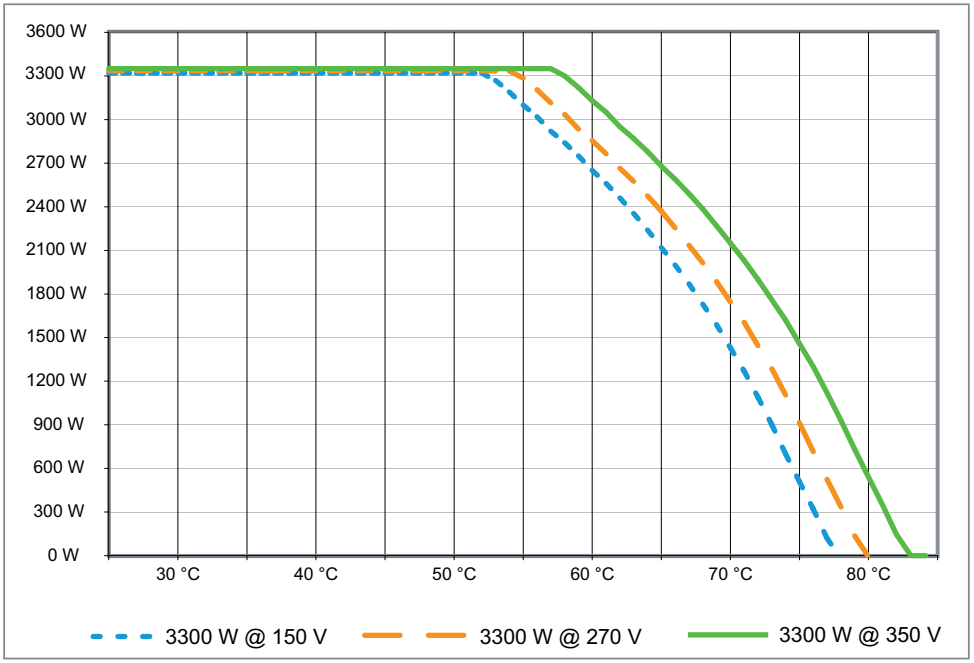
6.4

1. 6 4 8
2. 21.5
3.
4.
5.



6.5

-25°C +70°C



6.6

Wieland RST25i3S

L N PE

Wieland 2.5 4.0

L 25 B

6.7

MC4

ثم

ثم

500 MC4 18

S -> Solar ISO / GND

7.3.7.1

ثم ISO-ON-Error
ثم ISO-ON-Warning
Deltas ISO-ON-Warning

ثم PV+
ثم PV-

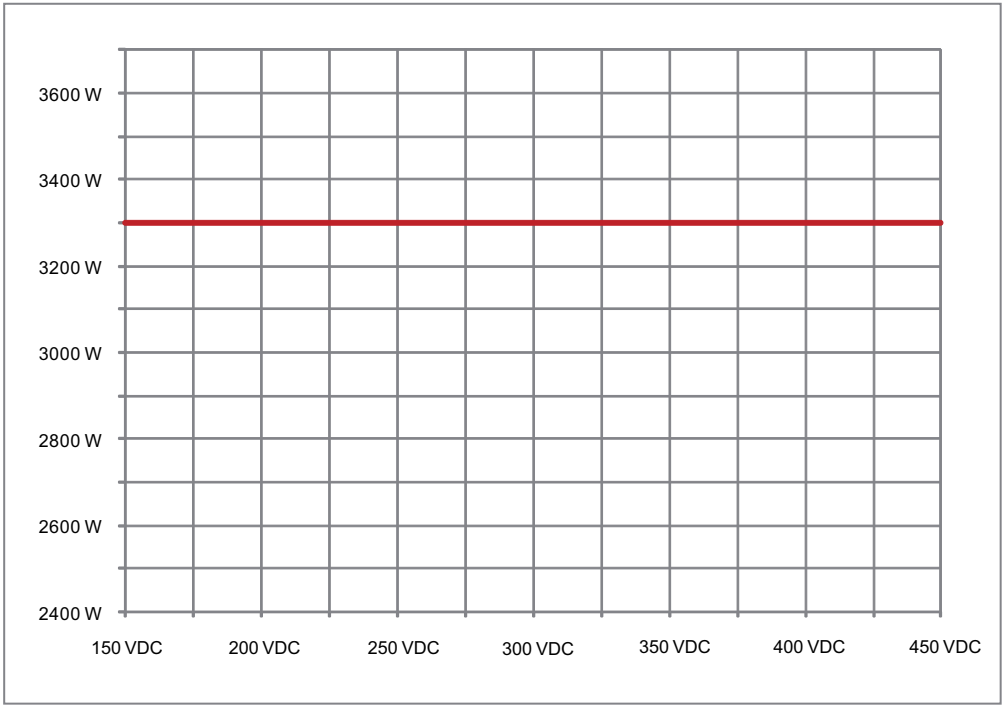
PV+ PV-

Deltas (EOE99000275)

ثم ISO / GND

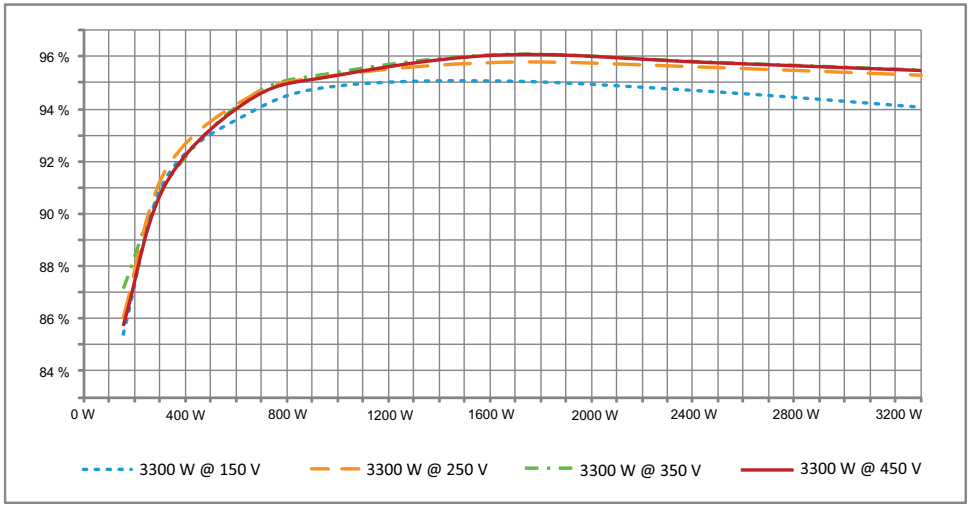
	2.5 MM2 (AWG 14)	4.0 MM2 - 6.0 MM² (AWG 12-10)			
	ثم		ثم		32.0010P0001-UR 32.0012P0001-UR
	ثم			ثم	32.0011P0001-UR 32.0013P0001-UR
		ثم	ثم		32.0014P0001-UR 32.0016P0001-UR
		ثم		ثم	32.0015P0001-UR 32.0017P0001-UR

6.7.1


3600 W
3400 W
3200 W
3000 W
2800 W
2600 W
2400 W
150 VDC
200 VDC
250 VDC
300 VDC
350 VDC
400 VDC
450 VDC

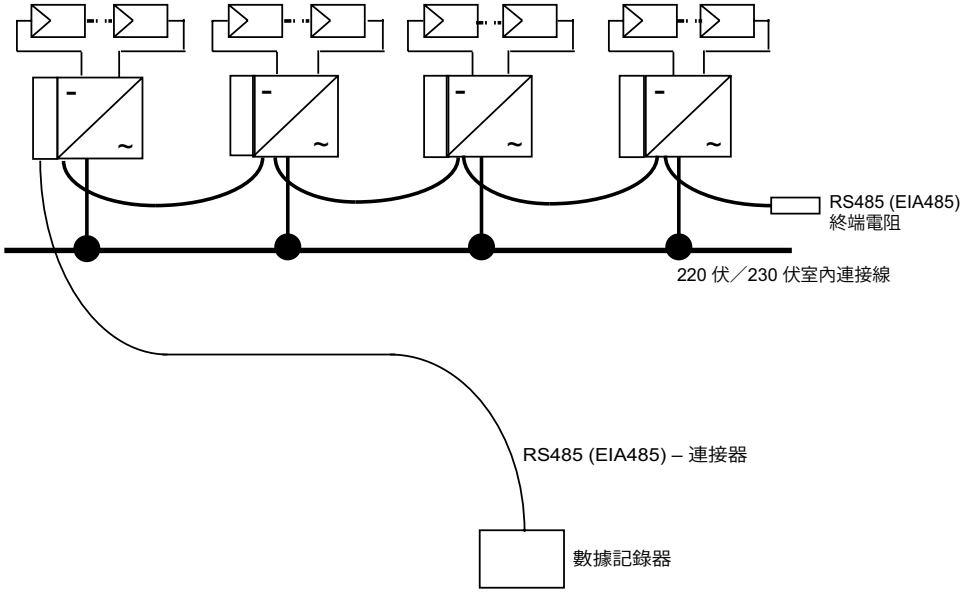
6.7.2

>250

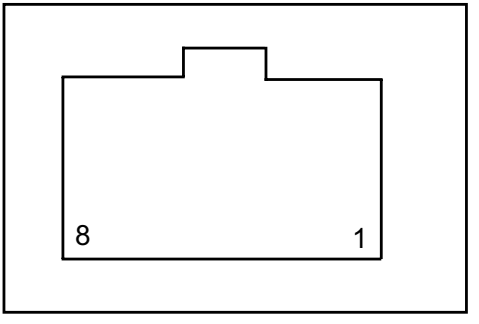

96 %
94 %
92 %
90 %
88 %
86 %
84 %
0 W
400 W
800 W
1200 W
1600 W
2000 W
2400 W
2800 W
3200 W
3300 W @ 150 V
3300 W @ 250 V
3300 W @ 350 V
3300 W @ 450 V

HARTING Deutschland GmbH & Co. KG (P.O. 2451, 32381 Minden; Germany; www.harting.com)

09 45 145 1510 Cable Manager Blue IP67 Push-Pull Data Plug
09 45 145 1500 Cable Manager White IP67 Push-Pull Data Plug



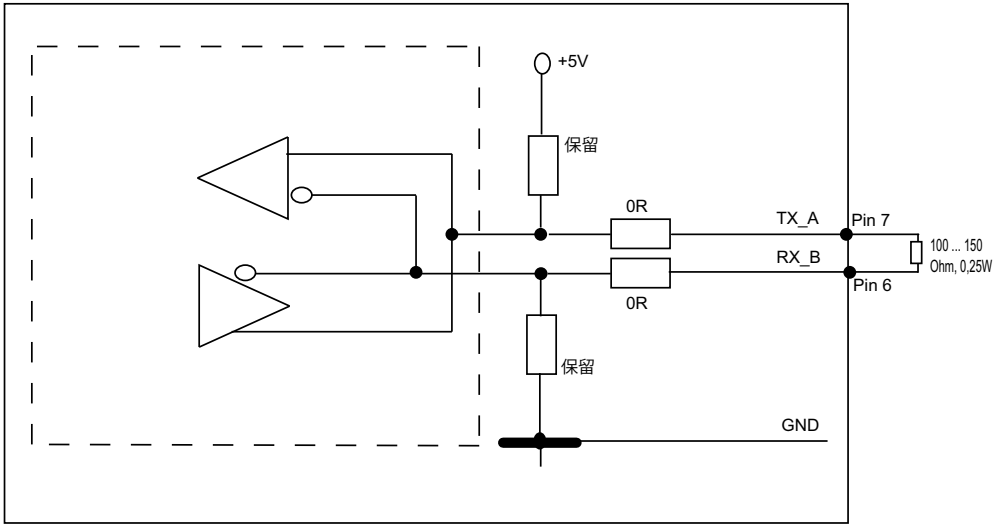
連接器引⊠分配 **RS485 (EIA485)**

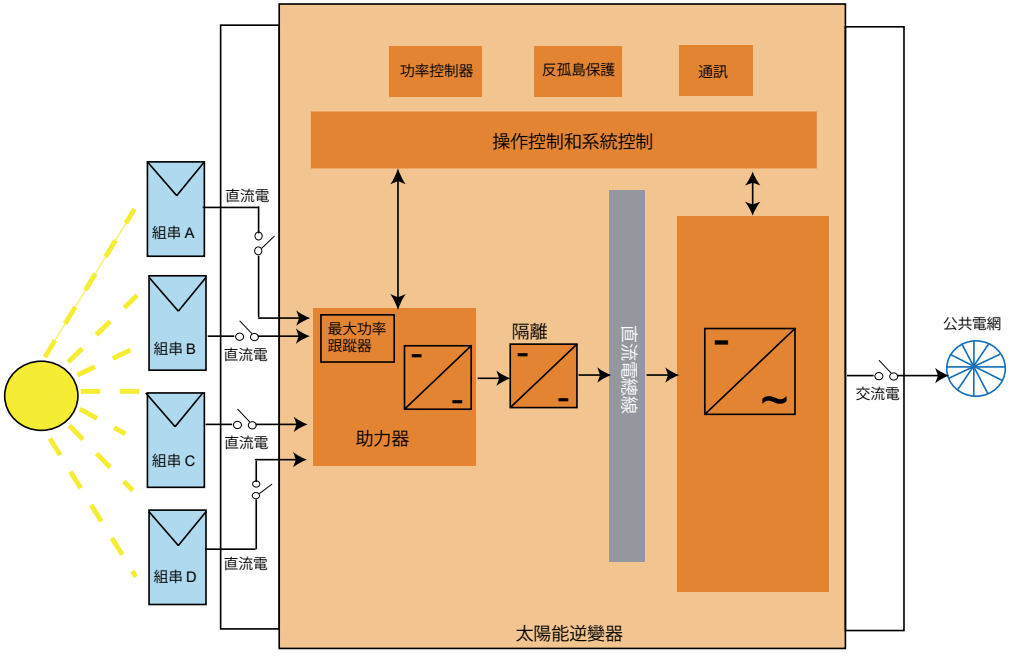


頂視圖

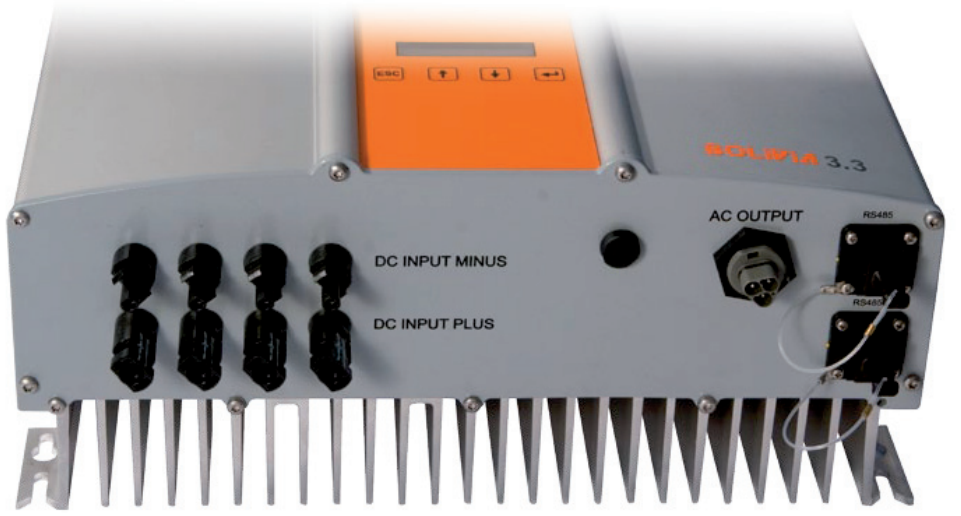
引⊠	
1	保留
2	保留
3	保留
4	GND（接地）(RS485)
5	保留
6	RX_B (RS485)
7	TX_A (RS485)
8	保留

當多個裝置串聯在一起, 而且數據線總長達到 **2** 米或以上, 可使用以下選件終接 **RS485 (EIA485)** 接口:





6.9



1.
2.
3. Wieland

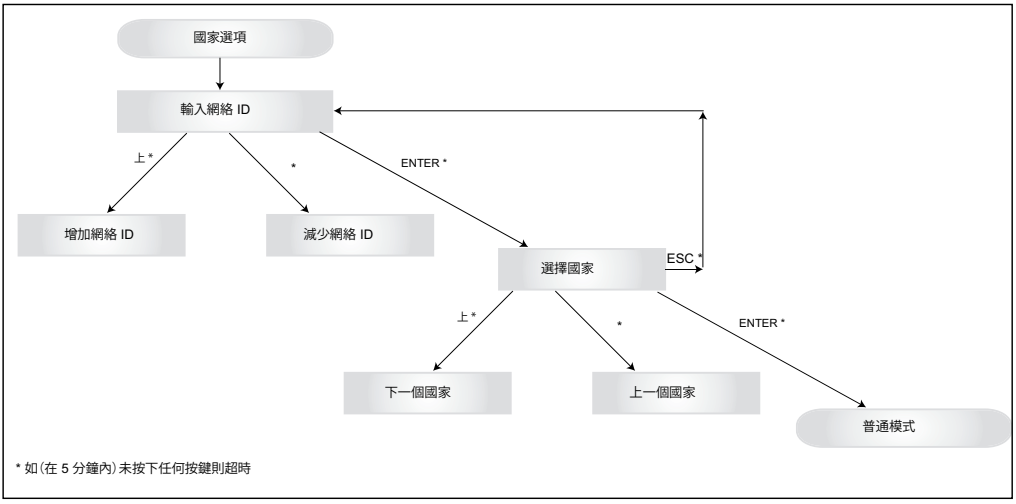
4.
5.
6.
7. UPV > 150
8. S (Setup) 7.3.7

6.10
Delta

ID 7.3.7.2

ID

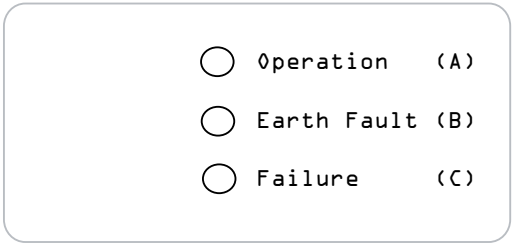
5



1. ESC +
2. support@solar-inverter.com PIN
3. PIN ESC +
4. PIN
5.

6.11 (LED)

(LED)



LED (A) Operation

LED (B) Earth Fault

(GND)

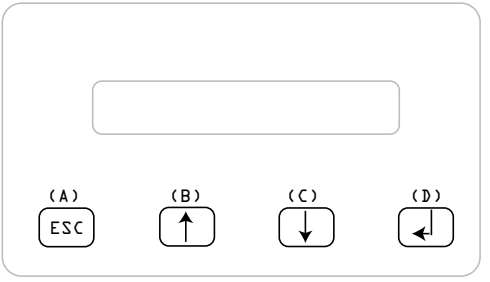
LED (C) Failur

LED		
< > < > < >		(UPV) 100
< > < > < >		UPV 100 150
< > < > < >		
< > < > < >		UPV 150 450
< > < > < >		
< > < > < >		
< > < > < >		

7

7.1

5%



(A) ESC

(B) (C)

(D) ENTER ENTER

7.2

ENTER 30
ENTER

7.3

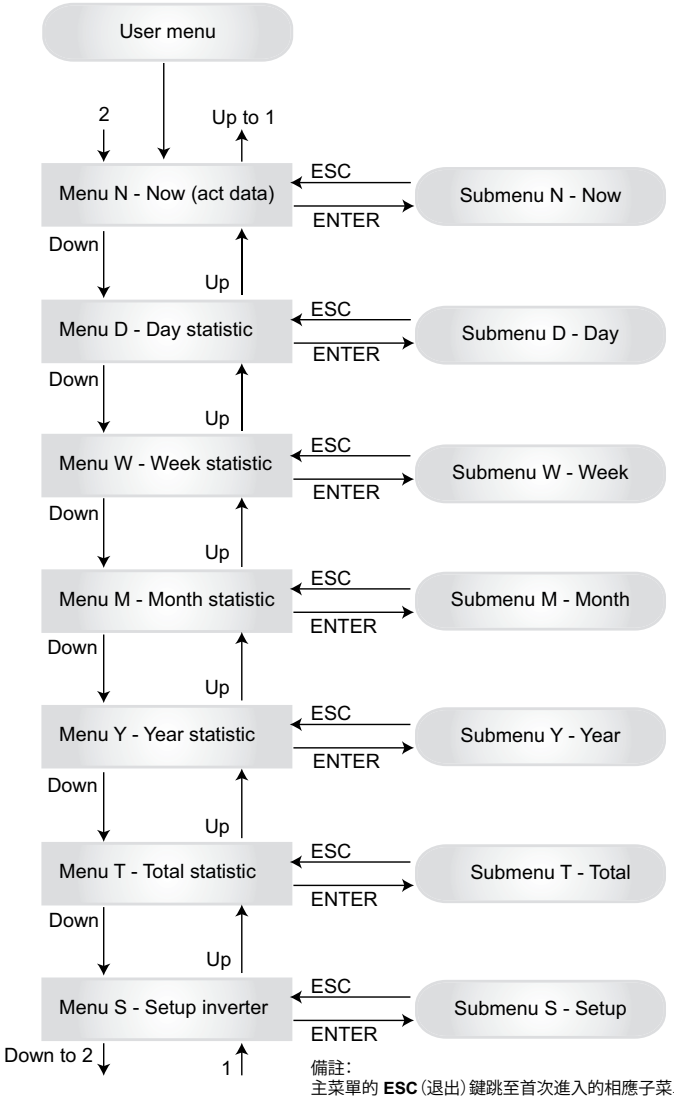
7

- N
- D
- W
- M
- Y
- T
- S

:

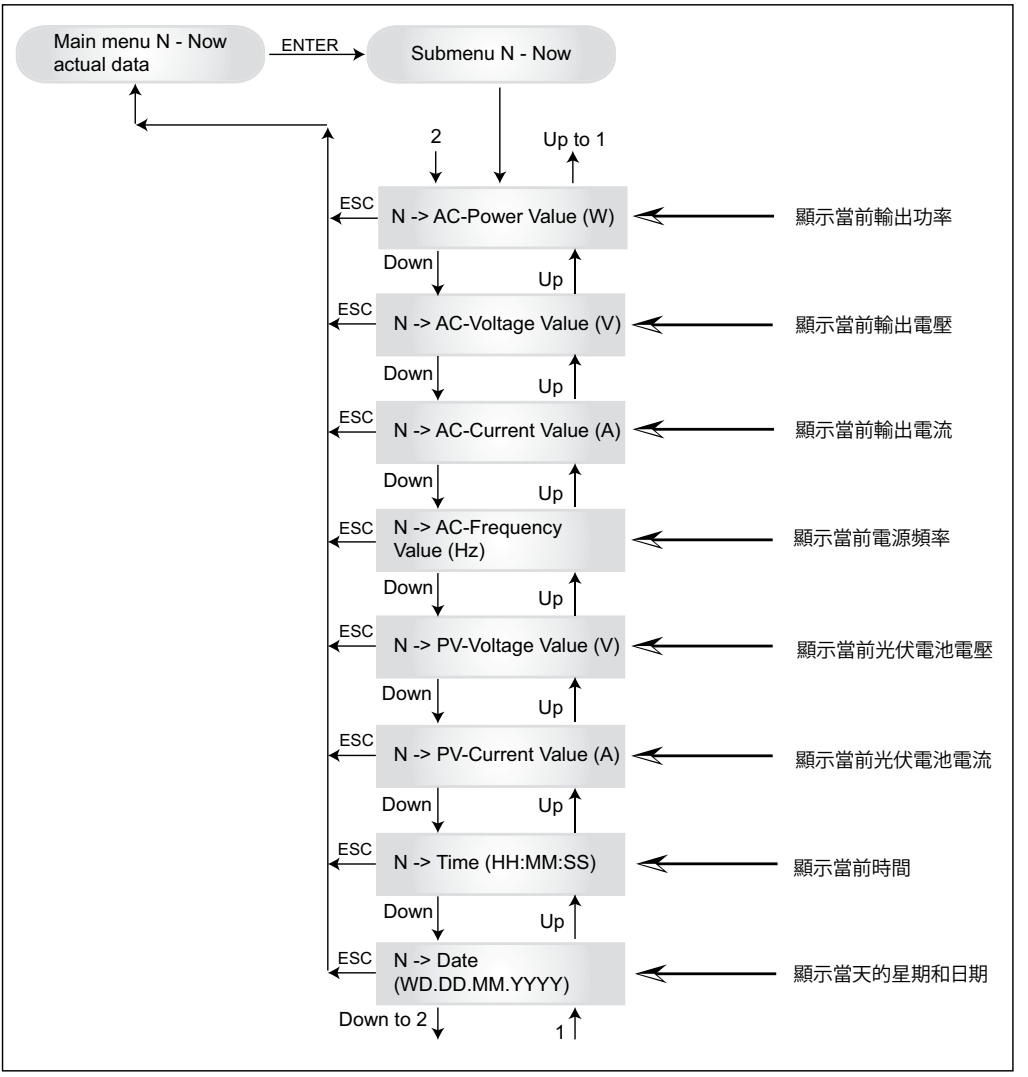
⇧⇩

ENTER ESC

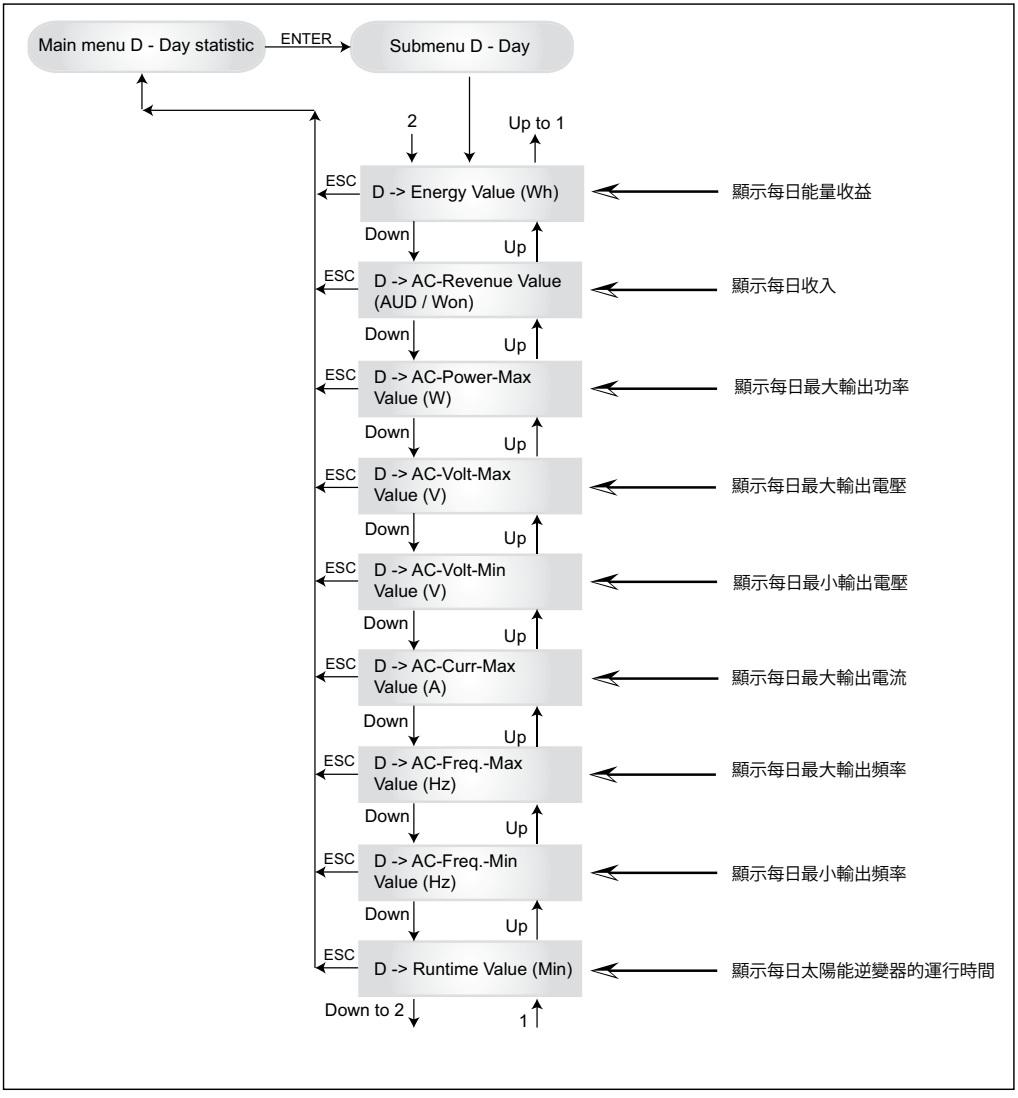


備註:
主菜單的 **ESC**（退出）鍵跳至首次進入的相應子菜單

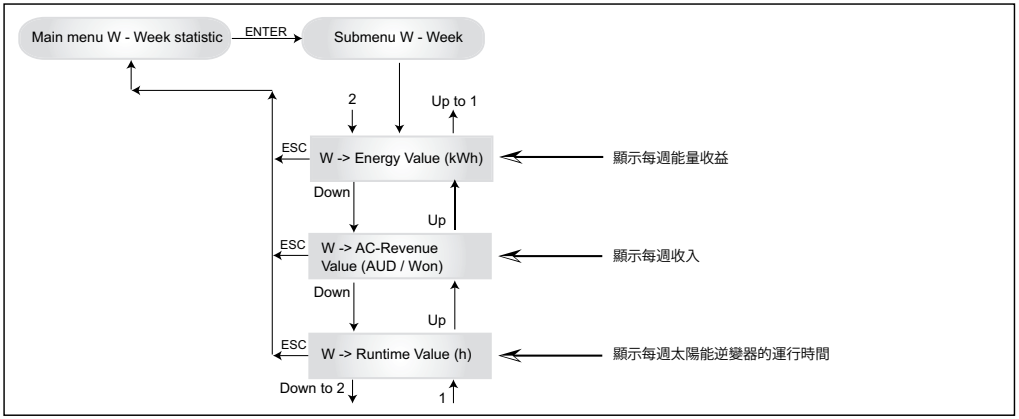
7.3.1 N


Main menu N - Now actual data
ENTER
Submenu N - Now
2
Up to 1
ESC
N -> AC-Power Value (W)
顯示當前輸出功率
Down
Up
ESC
N -> AC-Voltage Value (V)
顯示當前輸出電壓
Down
Up
ESC
N -> AC-Current Value (A)
顯示當前輸出電流
Down
Up
ESC
N -> AC-Frequency Value (Hz)
顯示當前電源頻率
Down
Up
ESC
N -> PV-Voltage Value (V)
顯示當前光伏電池電壓
Down
Up
ESC
N -> PV-Current Value (A)
顯示當前光伏電池電流
Down
Up
ESC
N -> Time (HH:MM:SS)
顯示當前時間
Down
Up
ESC
N -> Date (WD.DD.MM.YYYY)
顯示當天的星期和日期
Down to 2
1

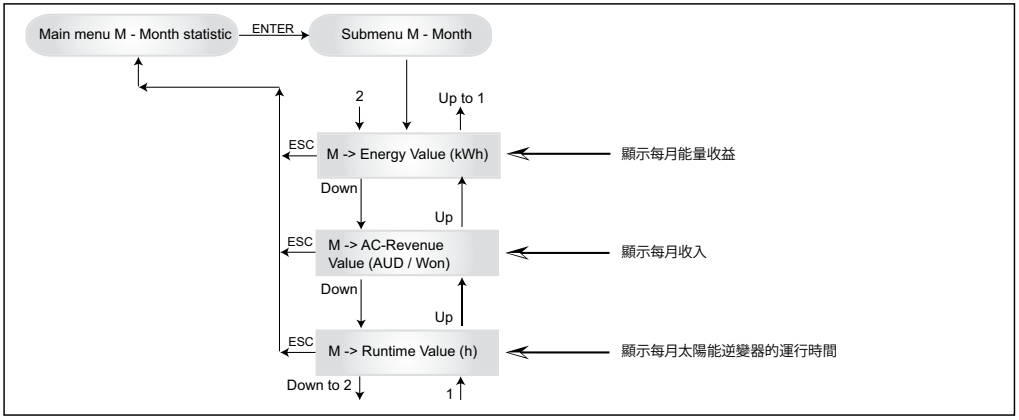
7.3.2 D


Main menu D - Day statistic
ENTER
Submenu D - Day
2
Up to 1
ESC
D -> Energy Value (Wh)
顯示每日能量收益
Down
Up
ESC
D -> AC-Revenue Value (AUD / Won)
顯示每日收入
Down
Up
ESC
D -> AC-Power-Max Value (W)
顯示每日最大輸出功率
Down
Up
ESC
D -> AC-Volt-Max Value (V)
顯示每日最大輸出電壓
Down
Up
ESC
D -> AC-Volt-Min Value (V)
顯示每日最小輸出電壓
Down
Up
ESC
D -> AC-Curr-Max Value (A)
顯示每日最大輸出電流
Down
Up
ESC
D -> AC-Freq.-Max Value (Hz)
顯示每日最大輸出頻率
Down
Up
ESC
D -> AC-Freq.-Min Value (Hz)
顯示每日最小輸出頻率
Down
Up
ESC
D -> Runtime Value (Min)
顯示每日太陽能逆變器的運行時間
Down to 2
1

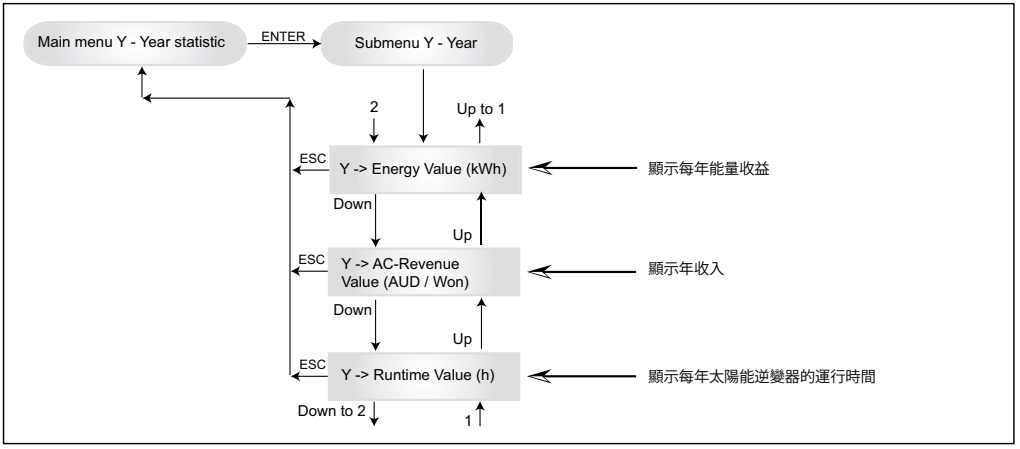
7.3.3 W



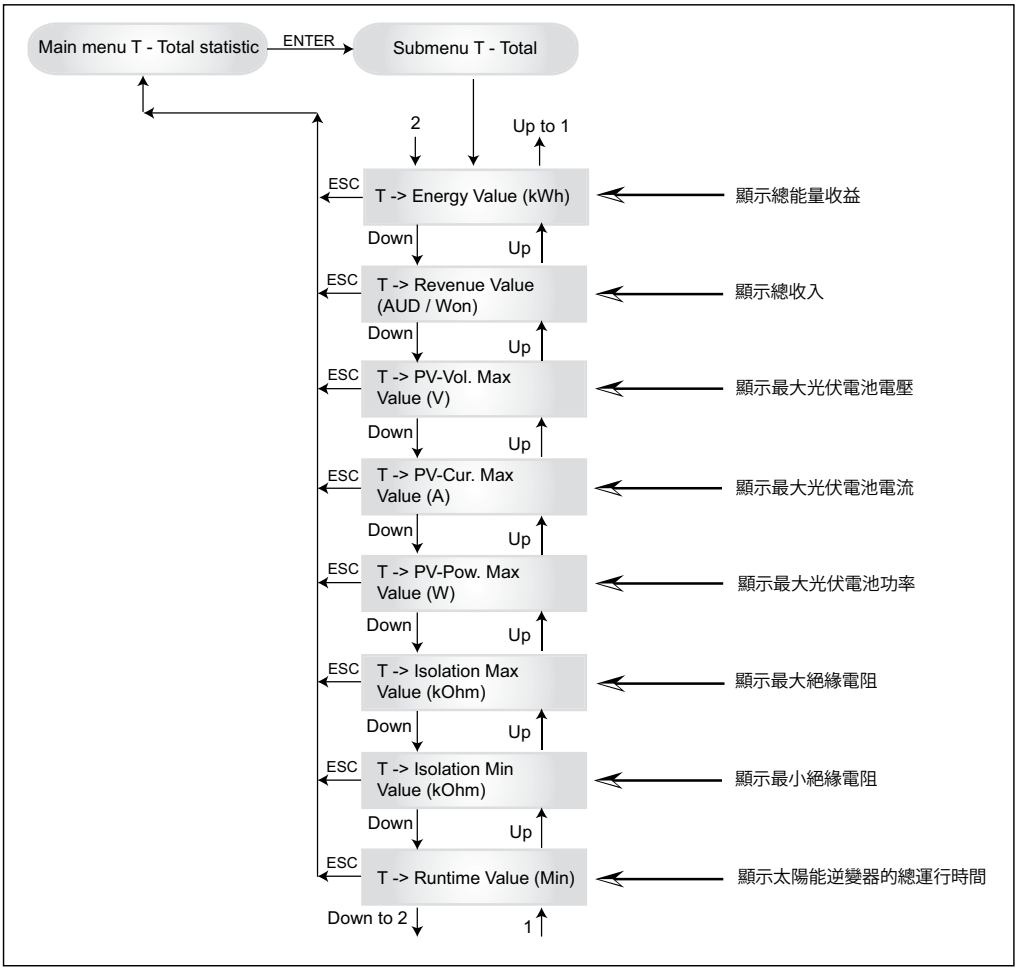
7.3.4 M



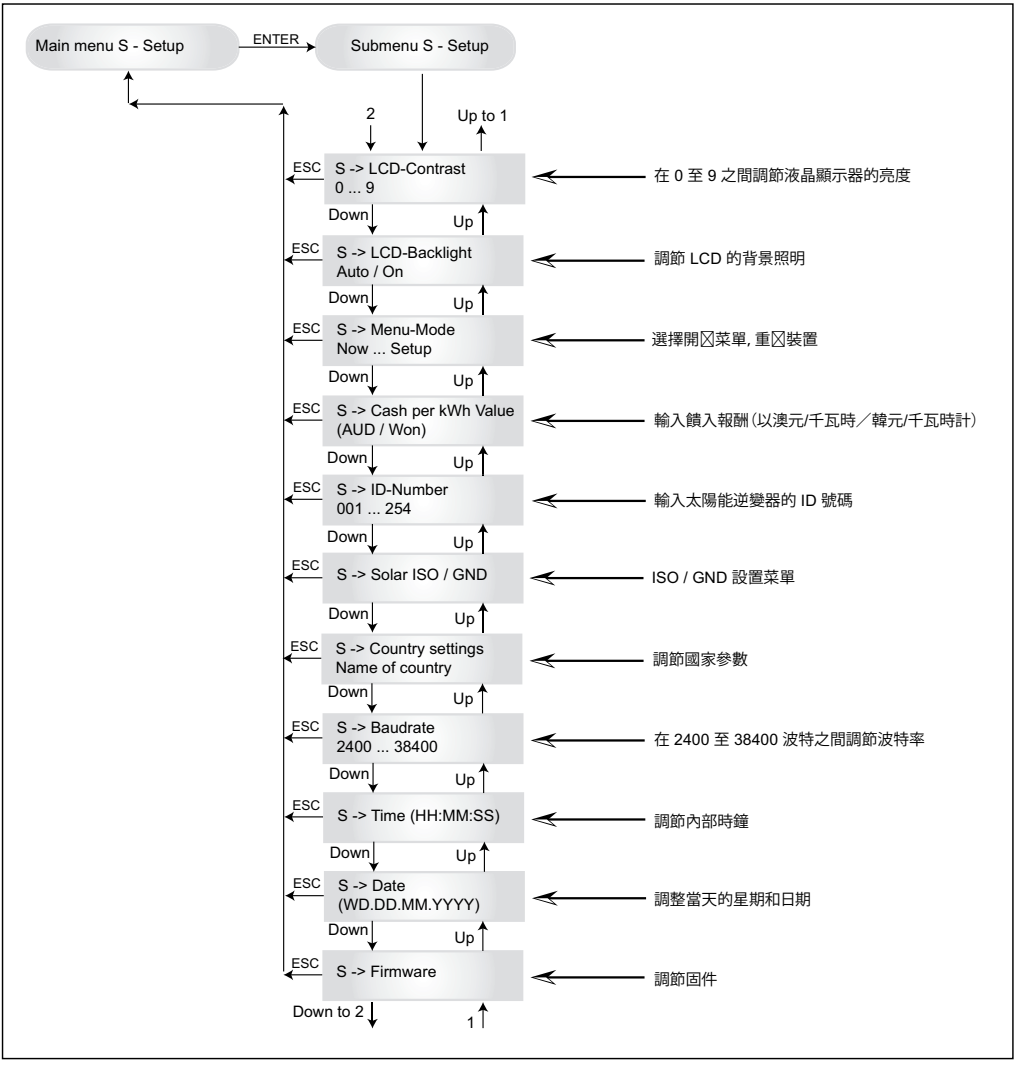
7.3.5 Y



7.3.6 T

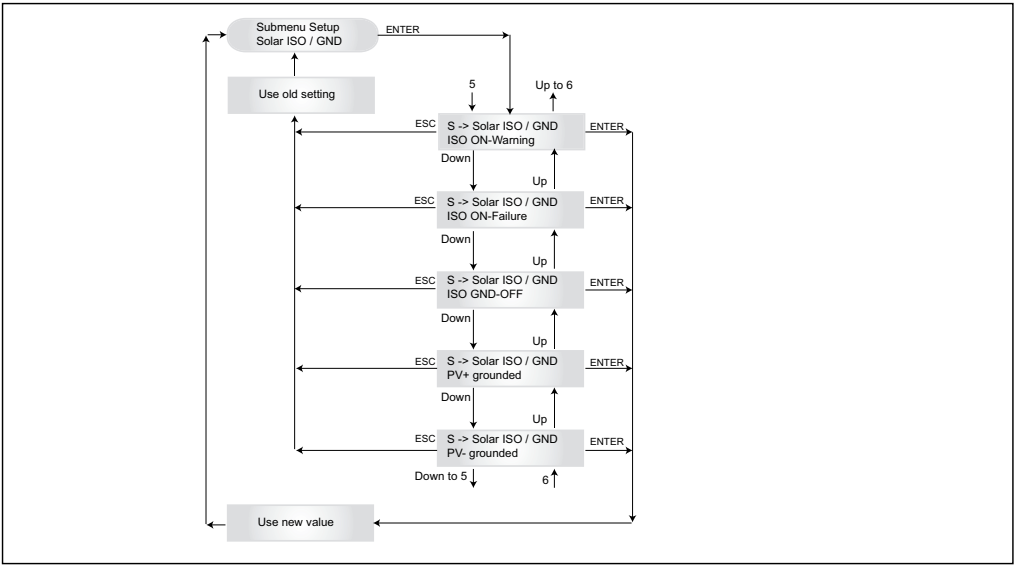

Main menu T - Total statistic
ENTER
Submenu T - Total
2
Up to 1
ESC
T -> Energy Value (kWh)
顯示總能量收益
Down
Up
ESC
T -> Revenue Value (AUD / Won)
顯示總收入
Down
Up
ESC
T -> PV-Vol. Max Value (V)
顯示最大光伏電池電壓
Down
Up
ESC
T -> PV-Cur. Max Value (A)
顯示最大光伏電池電流
Down
Up
ESC
T -> PV-Pow. Max Value (W)
顯示最大光伏電池功率
Down
Up
ESC
T -> Isolation Max Value (kOhm)
顯示最大絕緣電阻
Down
Up
ESC
T -> Isolation Min Value (kOhm)
顯示最小絕緣電阻
Down
Up
ESC
T -> Runtime Value (Min)
顯示太陽能逆變器的總運行時間
Down to 2
1

7.3.7 S


Main menu S - Setup
ENTER
Submenu S - Setup
2
Up to 1
ESC
S -> LCD-Contrast
0 ... 9
在 0 至 9 之間調節液晶顯示器的亮度
Down
Up
S -> LCD-Backlight
Auto / On
調節 LCD 的背景照明
S -> Menu-Mode
Now ... Setup
選擇開☒菜單, 重☒裝置
S -> Cash per kWh Value
(AUD / Won)
輸入饋入報酬(以澳元/千瓦時／韓元/千瓦時計)
S -> ID-Number
001 ... 254
輸入太陽能逆變器的 ID 號碼
S -> Solar ISO / GND
ISO / GND 設置菜單
S -> Country settings
Name of country
調節國家參數
S -> Baudrate
2400 ... 38400
在 2400 至 38400 波特之間調節波特率
S -> Time (HH:MM:SS)
調節內部時鐘
S -> Date
(WD.DD.MM.YYYY)
調整當天的星期和日期
S -> Firmware
調節固件
Down to 2
1

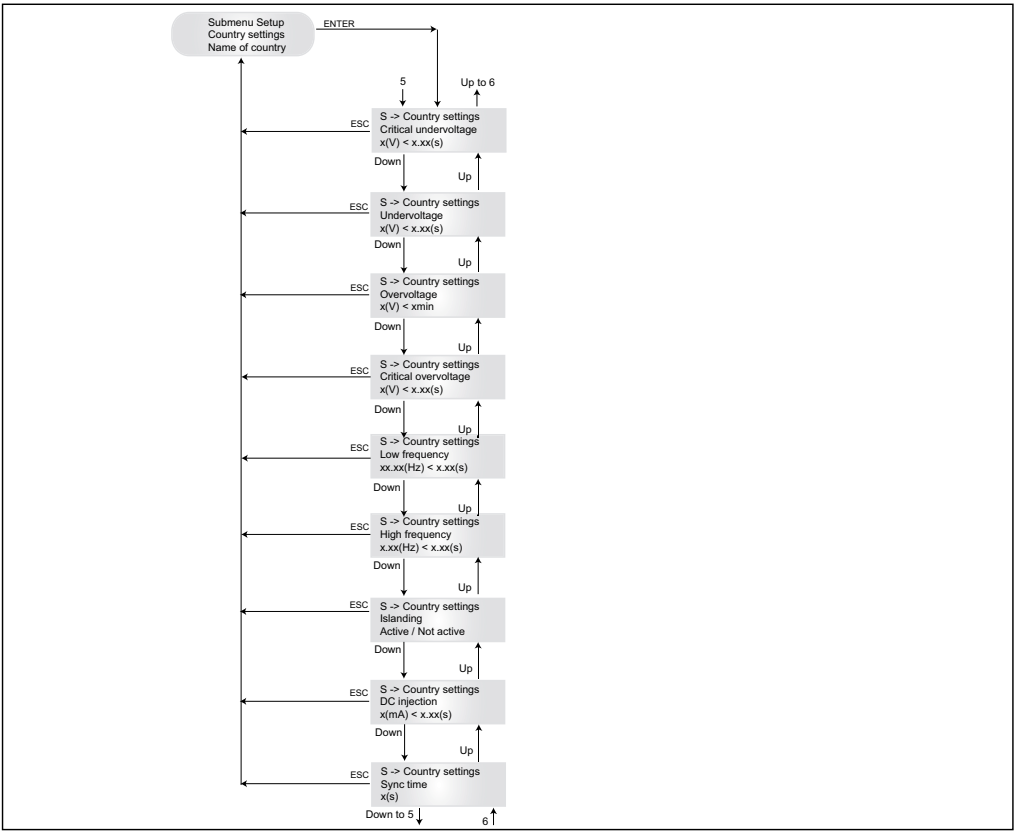
7.3.7.1 S Solar ISO / GND

Solar ISO / GND S



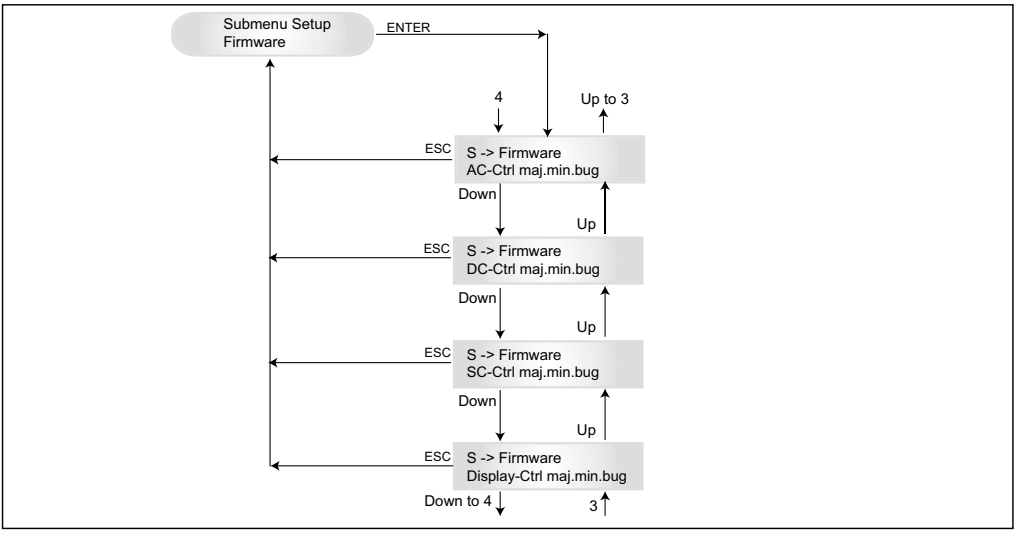
7.3.7.2 S

S



7.3.7.3 S

S



8

8.1

_____

1 .
2.
3. 1
4.
5.

N

-> ->
-> ->
-> ->

8.2

LED			
< > < > < >	-		يئ
< > < > < >	AC frequency failure		يئ N
< > < > < >	AC voltage failure		يئ يئ N
< > < > < >	AC relay failure		يئ يئ
< > < > < >	Calibration ongoing		
< > < > < >	DC injection failure		يئ
< > < > < >	Error # 301		يئ
< > < > < >	Error # 302		يئ
< > < > < >	Error # 506 Error # 508	(508) (506)	يئ
< > < > < >	Isolation start-up warning Isolation run-ning warning		يئ
< > < > < >	PV+ groun-ding fault PV- grounding fault	PV+ (PV-) GND GND	يئ GND
< > < > < >	Revision error		يئ
< > < > < >	Self test ongoing		يئ 100 150
< > < > < >	PV power too low		يئ يئ N
< > < > < >	PV voltage too low	100 150	يئ يئ N
< > < > < >	Synchronize to AC		يئ

LED			
< > < > < >	Varistor warning		أي

9

	4000				
	3630				
	125 ... 540	125 ... 540	125 ... 540	125 ... 500	125 ... 540
MPP	150 ... 450				
MPP	150 ... 450				
	13.0				
	24.0				
	0.2				

	3485				
	3300				
	230	220	230	220	220
	210.0 ... 264.0	187.0 ... 242.0	184.0 ... 264.5	193.6 ... 242.0	193.6 ... 253.0
	14.4	15.0	14.4	15.0	15.0
	15.7	17.0	15.7	17.0	17.0
	50	50	50	60	60
	48.0 ... 52.0	49.5 ... 50.5	47.3 ... 52.7	59.3 ... 60.5	58.0 ... 61.0
	0.99 @				
(THD)	5 %				

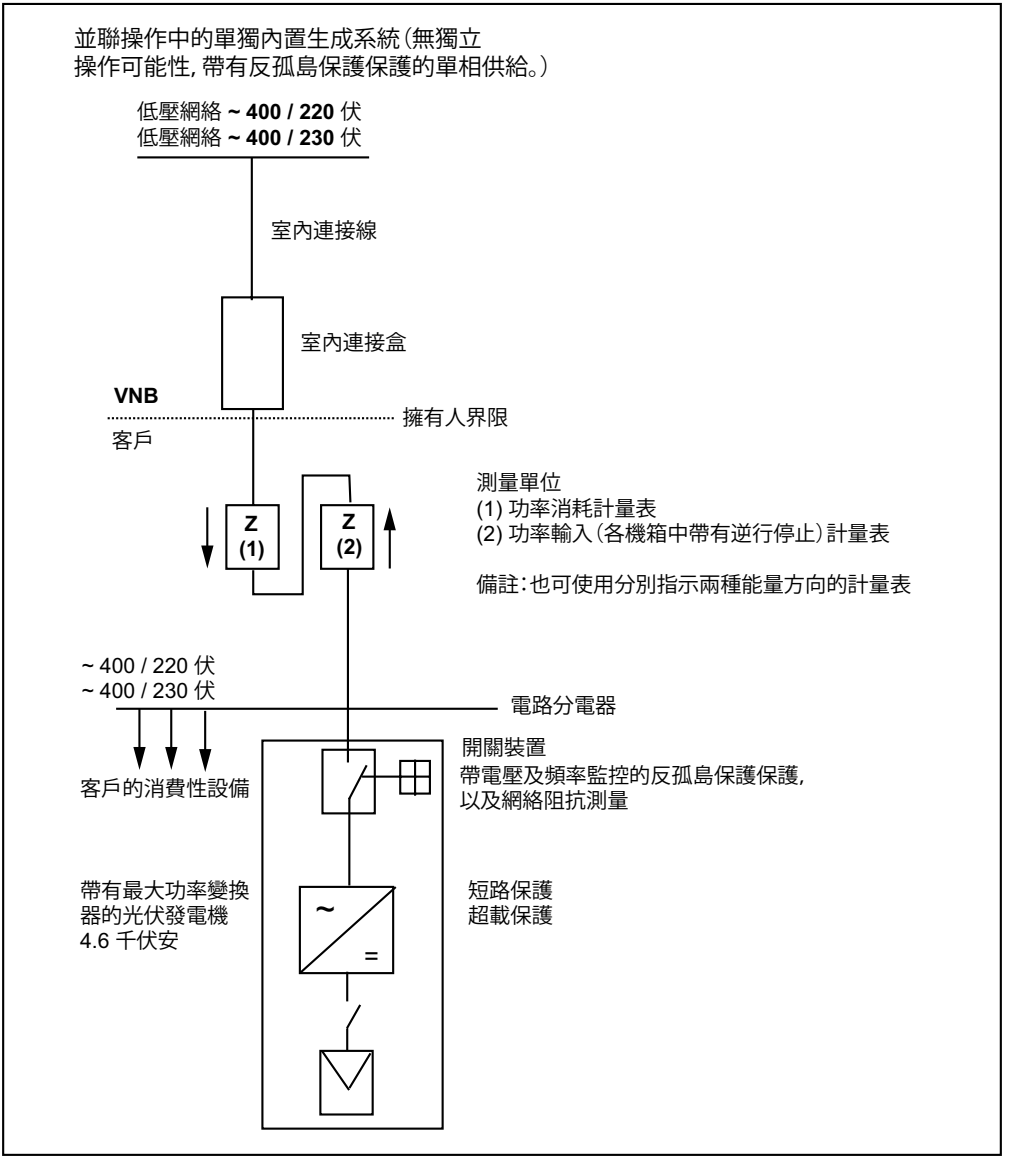
	SOLIVIA 3.3 AP G3				
	96.0 %				
EU	94.8 %				
	-25 ... +70°C				
	-25 ... +80°C				
	0 ... 98 %				

x x	410 x 410 x 180				
	21.5				
	Wieland RST25i3S				
	4 MC4				
	2 Harting RJ45 / RS485				
	3				

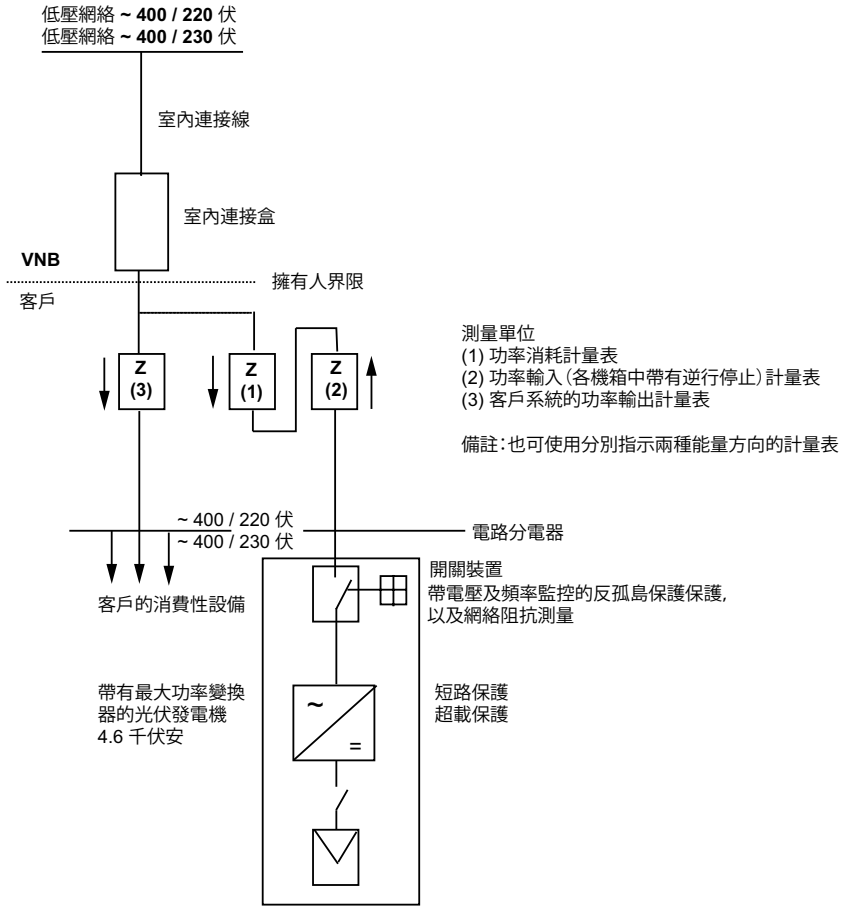
	IP65				
	1				
	AS/NZS 60950; AS/NZS 3100; AS 4777.2; AS 4777.3	CGC/ GF001:2009	IEC 62103:2003, EN 50178:1997, IEC 62109-1:2007, IEC 62109-2:2005	PV 501	IEC 62103:2003, EN 50178:1997, IEC 62109-1:2007, IEC 62109-2:2005
	AS 4777.2; AS 4777.3; IEC 60255.5		VDE 0126-1-1	PV 501; KS C 8540	
EMC	AS 4777.1; AS 4777.2; AS 4777.3; EN 61000-6-2; IEC / EN 61000-6-3	GB /T 17626; GB 17799	IEC / EN 61000-6-2; IEC / EN 61000-6-3	IEC 60725; KS C IEC 61000-4-5; KS C IEC 61000-6-1; KS C IEC 61000-6-2; KS C IEC 61000-6-3; KS C IEC 61000-6-4	IEC / EN 61000-6-2; IEC / EN 61000-6-3

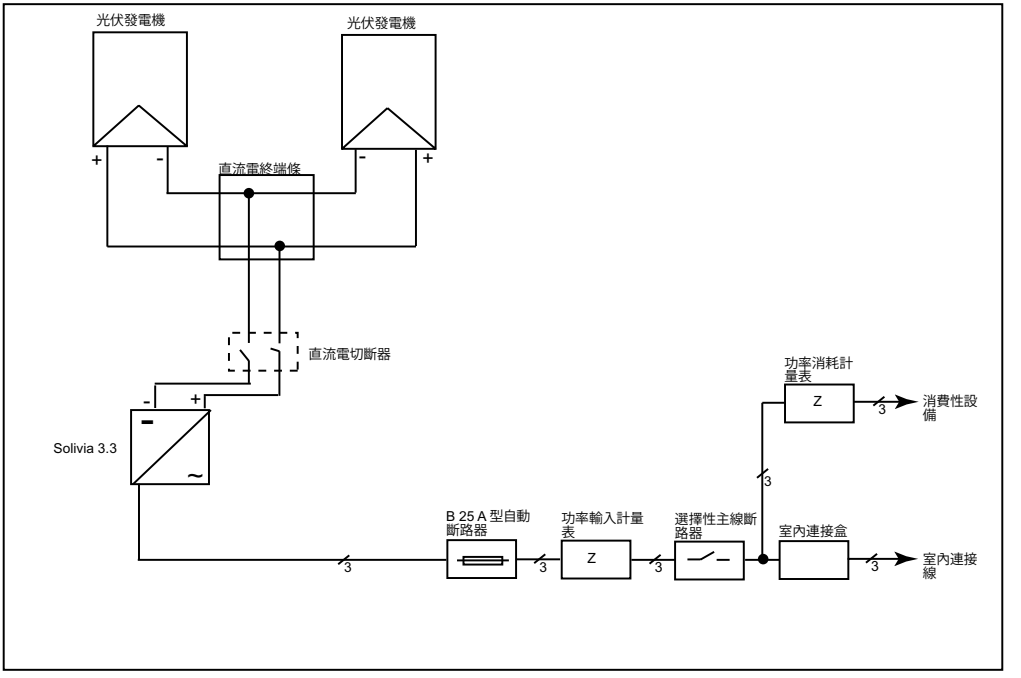
10

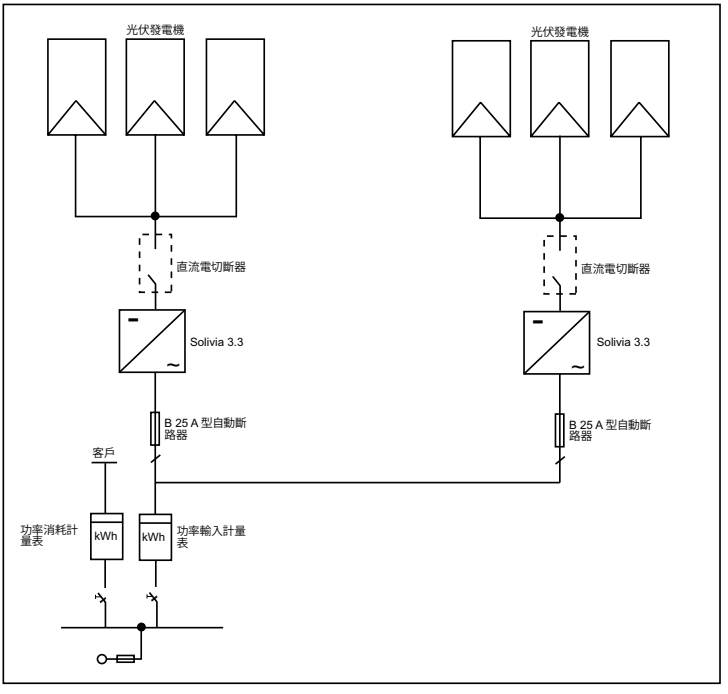
10.1

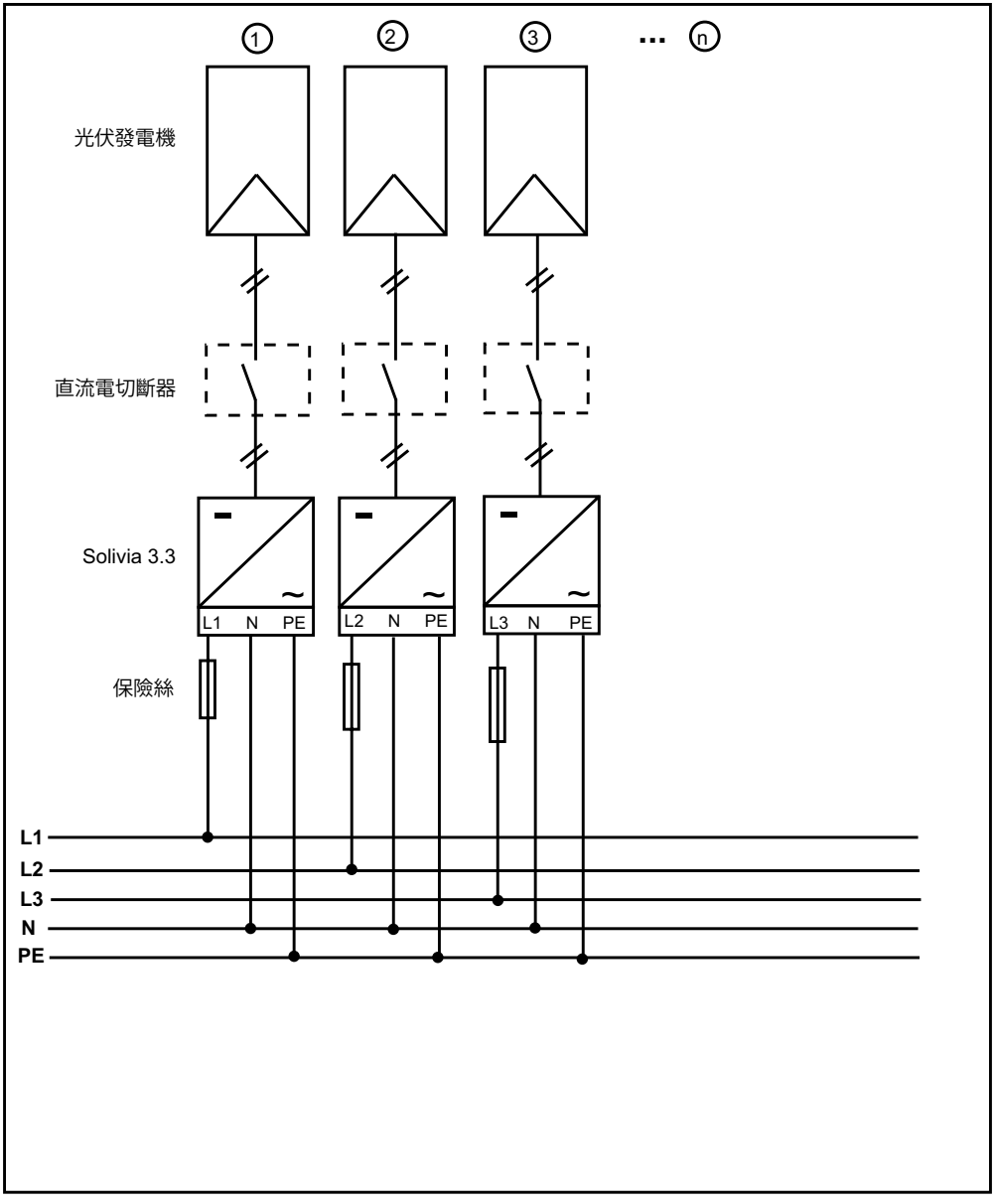

並聯操作中的單獨內置生成系統(無獨立
操作可能性, 帶有反孤島保護保護的單相供給。)
低壓網絡 ~ 400 / 220 伏
低壓網絡 ~ 400 / 230 伏
室內連接線
室內連接盒
VNB
擁有人界限
客戶
Z
(1)
Z
(2)
測量單位
(1) 功率消耗計量表
(2) 功率輸入(各機箱中帶有逆行停止)計量表
備註:也可使用分別指示兩種能量方向的計量表
~ 400 / 220 伏
~ 400 / 230 伏
電路分電器
開關裝置
帶電壓及頻率監控的反孤島保護保護,
以及網絡阻抗測量
客戶的消費性設備
帶有最大功率變換
器的光伏發電機
4.6 千伏安
~
=
短路保護
超載保護

並聯操作中的單獨內置生成系統（無獨立
操作可能性，帶有反孤島保護保護的單相供給。）




光伏發電機
光伏發電機
+
-
-
+
直流電終端條
直流電切斷器
-
+
Solivia 3.3
功率消耗計量表
Z
3
消費性設備
3
B 25 A 型自動斷路器
功率輸入計量表
Z
選擇性主線斷路器
室內連接盒
3
3
3
3
室內連接線


光伏發電機
光伏發電機
直流電切斷器
直流電切斷器
Solivia 3.3
Solivia 3.3
B 25 A 型自動斷路器
B 25 A 型自動斷路器
客戶
功率消耗計量表
kWh
kWh
功率輸入計量表


①
②
③
... ⓝ
光伏發電機
直流電切斷器
Solivia 3.3
L1 N PE
L2 N PE
L3 N PE
保險絲
L1
L2
L3
N
PE

11

Alternating Current

30 kWp

CE

CE EC

Direct Current

EMC

MPP

PE

PE (protective earth)

PV

Photos Volta Alessandro Volta

RJ45
RJ

RS485 (ELA485)

TAB (2000)
TAB 2000 TAB
2000 DSO

12 Certificates

Pending

Supplier's declaration of conformity

For compliance levels 1, 2 and 3 in Australia

As required by notices under:

- section 182 of the Australian *Radiocommunications Act 1992*.

Instructions for completion

- This completed form remains with the supplier as part of the documentation required for the compliance records. Do not return this form to the ACMA.

Supplier's details

Qualsure Consultants ACMA supplier code number **N136**

(AGENT)

of 18 Hood Street Rosedale Vic.

Product details

Product description – brand name, type, model, lot, batch or serial number (if available)

Brand Name	**Delta**
Model Number	**SOLIVIA3.3APG3**
Description	**Solar Inverter**

Compliance with *Radiocommunications (Electromagnetic Compatibility) Standard 2008*

The above mentioned product complies with the requirements of the *Radiocommunications (Electromagnetic Compatibility) Standard 2008*. Evidence of compliance is demonstrated by test reports to the following applicable standards.

Applicable standards

Standard title, number and, if applicable, number of the test report

Standard	Test Report Number
AS/NZS CISPR 11:2004	**06KFS054/VDE 0126-1-1**

Declaration

I hereby declare that the product mentioned above complies with the requirements of the *Radiocommunications (Electromagnetic Compatibility) Standard 2008*. All products supplied under this declaration will be identical to the product identified above.

Gordon Slimmon
Director

30 Nov 10

www.solar-inverter.com

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Support Email: support@solar-inverter.com
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Support Hotline: +49 180 16 SOLAR (76527)
Mondays to Fridays from 8 am to 5 pm (CET - apart from offical Bank Holidays) (3.9 ct/min)

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