Manual EN

BlueSolar Grid Inverter

1500 / 230
2000 / 230
2800 / 230
4000 / 230
5000 / 230

Before you start

This manual contains important information regarding installation and safe operation of this unit. Please read this manual carefully before use.

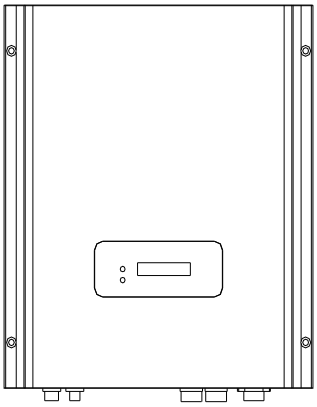
The BlueSolar grid-tied solar inverters are professional products that need to be installed by qualified personnel only. Please read the safety instructions for more information.

Inside the inverter very high voltages are present which are dangerous for life.

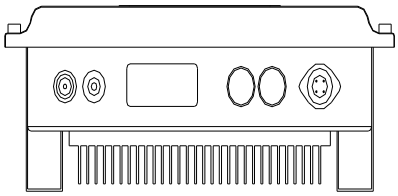
If you encounter any problems during installation or operation of this unit, first check this manual before contacting your local dealer or a Victron energy representative. Instructions inside this manual will help you solve most installation and operation difficulties.

1. Content

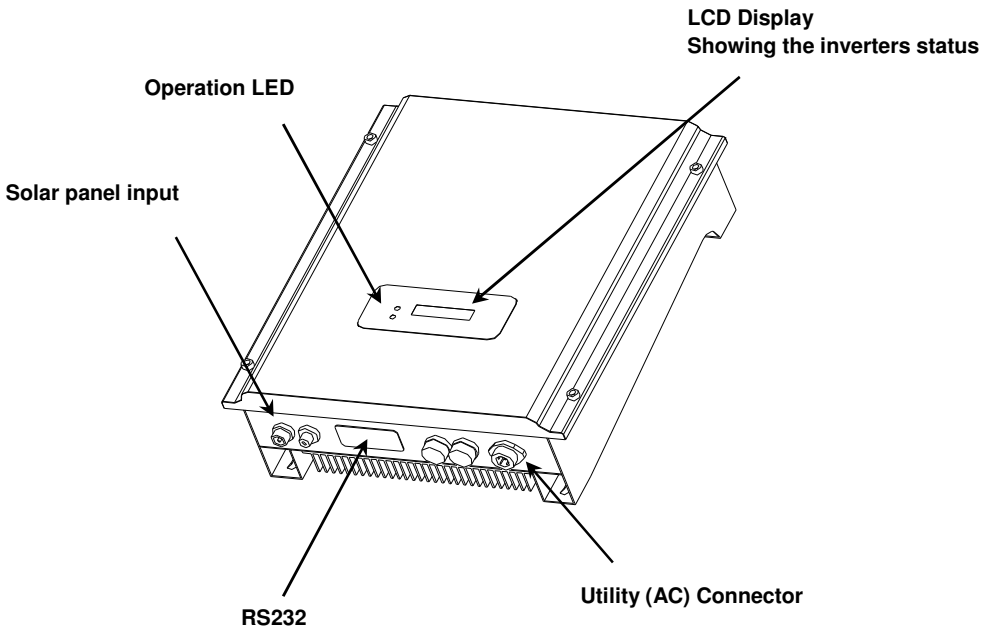
BlueSolar 1500, 2000 and 2800 overview



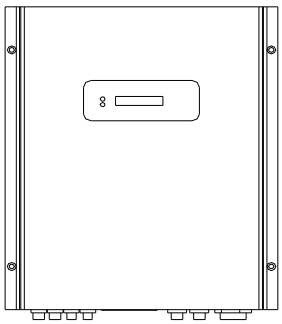
Front View



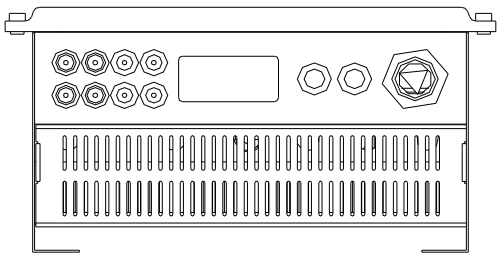
Bottom View



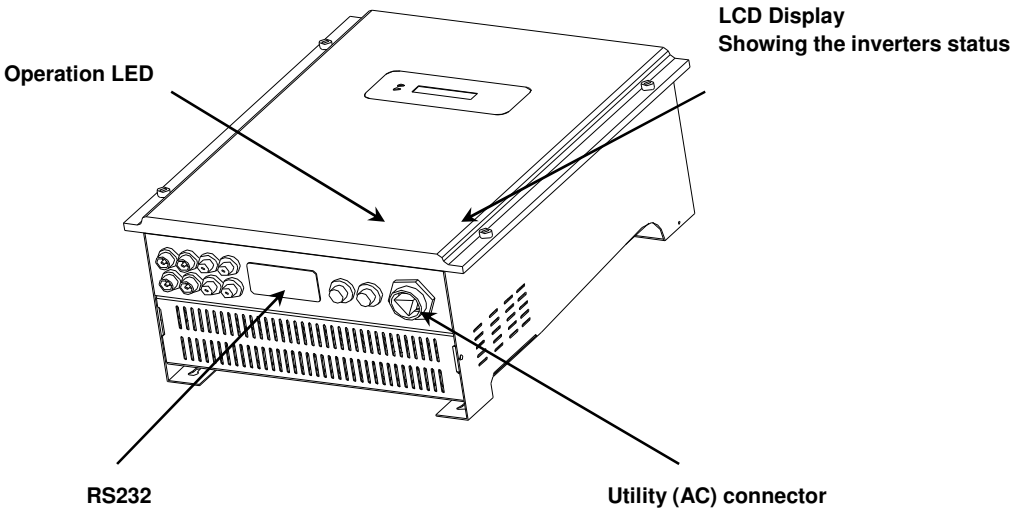
BlueSolar 4000 and 5000 overview



Front View



Bottom View



Opening the package

After opening the package, please check the contents of the box. It should contain the following items:

Item	Name	Quantity
1	BlueSolar inverter	1
2	Mounting frame	1
3	Mounting screws	4
4	Safety-lock screws	2
5	AC socket assembly	1
6	Instruction manual	1

2. INSTALLATION

2.1 Safety instructions

The solar panels and cables should have Protection Class-II

Do not disconnect the DC-cables when the inverter is connected to the utility mains!
DC arcs will damage the connectors and could lead to serious burns and risk of fire.

Qualified personnel must install the inverter.
This inverter should be connected to a separate fuse in the breaker-box. No other household devices should be connected to this.

Do not open the inverter!
High voltages inside the inverter are dangerous for life.
Even after the unit is disconnected from the grid and photovoltaic panels, high voltages may still exist inside the PV-inverter.

Some parts and surfaces of the Inverter can become hot during operation. To reduce the risk of injury, do not touch the heat sink at the back of the PV-Inverter or nearby surfaces while Inverter is operating.

Do not install the inverter near explosive vapors or flammable items.

This unit is designed for outdoor usage（IP65.

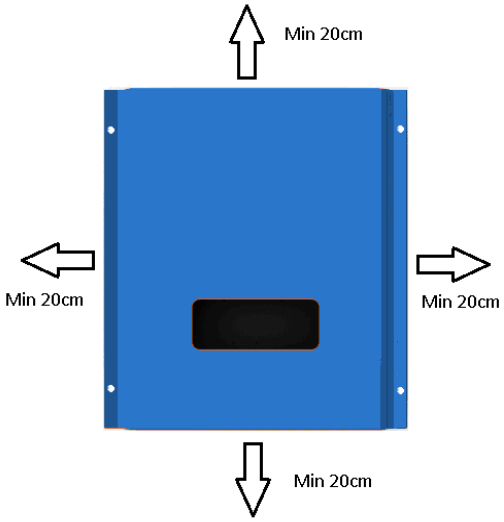
Do not expose the inverter to direct sunlight.
Direct sunlight increases the internal temperature which may reduce conversion efficiency.

Do not expose the inverter to rain.
Direct exposure to rain may, in course of time, increase humidity in the product, and ultimately result in failure.

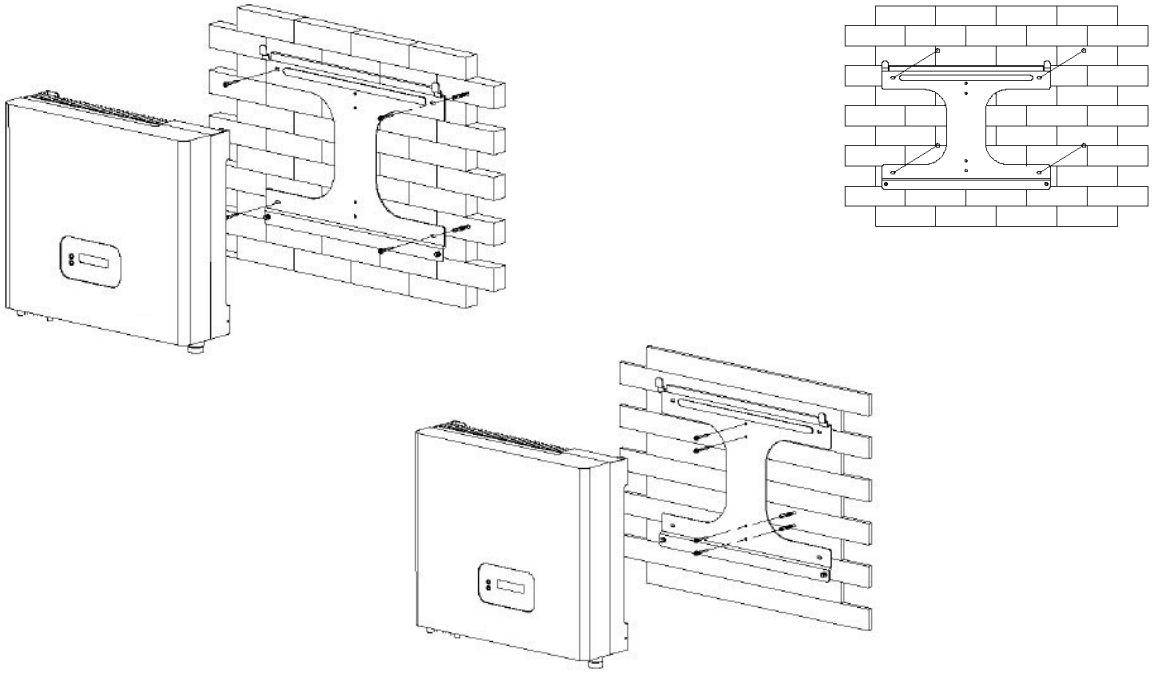
2.2 Mounting instructions

A. Select a wall or solid vertical surface that can support the inverter.

B. The inverter uses natural convection for cooling. Allow at least 20cm space above, below and on the sides of the inverter.



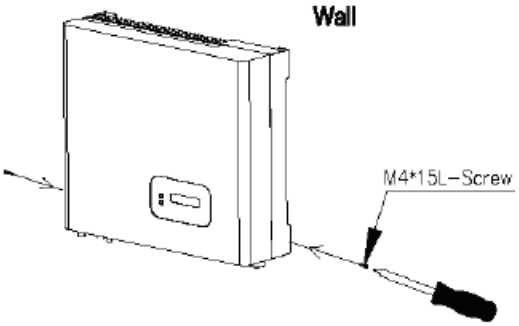
C. Using the mounting frame as a template, drill 4 holes as illustrated in the following figures.



D. Fix the mounting frame to the wall with the 4 screws.

E. Hang the inverter on the mounting frame.

F. Insert the safety-lock screws to the bottom leg to secure the inverter.



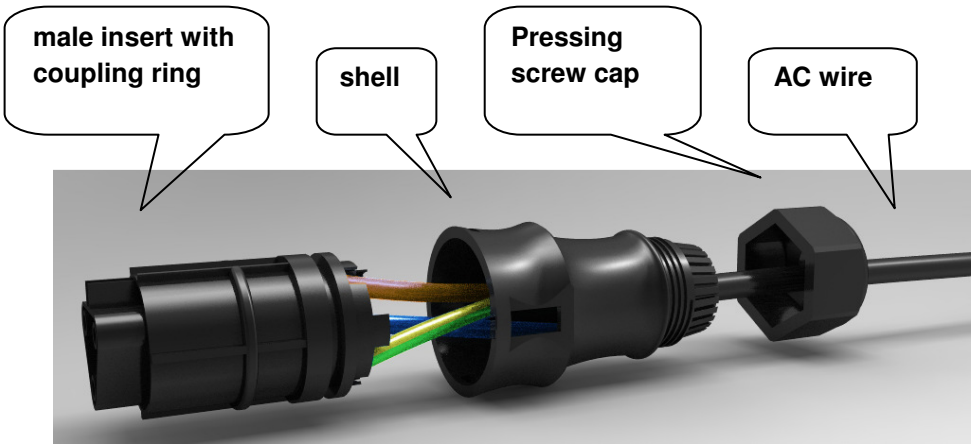
G. Check the mounting of the inverter securely by trying to raise it from the bottom.
The inverter should remain firmly attached.

When the mounting is done, the inverter can be connected.

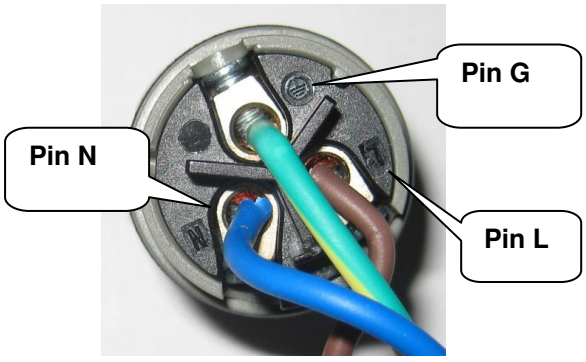
2.3 Connecting the inverter to the public grid

A. Install a separate AC-line on a dedicated breaker from the breaker-box to the solar-inverter.
No other appliances should be connected to this line!
Open the breaker or fuse to disconnect power from the line.

B. Connect a mains-cable to the AC-plug as described below:



- Insert ac-wire through the pressing screw-cap and the shell. Connect wires according to polarities indicated on terminal block. L→LINE (brown or black), N→Neutral (blue) and G→system ground (yellow-green).
- Fasten the gland plate with attached screws.
- Twist the gland so that the cable is firmly fixed.
- Insert Line wire to Pin L, Neutral wire to Pin N and Ground wire to Pin G.



Recommended wire size for AC wire

Model	Minimum wire size (mm^2)
BueSolar 1500	1.50
BueSolar 2000	2.50
BueSolar 2800	2.50
BueSolar 4000	4.00
BueSolar 5000	4.00

C. Connect the mains-cable to the inverter.

D. Connect the mains-cable to the dedicated power outlet.

Do not close the circuit breaker or fuse while working on the inverter.

2.4 Connecting the inverter to the photovoltaic panels

A. The connectors from the photovoltaic panels should be MC4 (Multi-Contact 4mm

When more than one PV-string is connected to the inverter (for the 2800, 4000 and 5000W) models, make sure the strings are identical. The total open circuit voltage and short circuit current must be equal.

Connecting these plugs to the solar-cables requires special tooling, and should only be done by qualified personnel. Improper connection can cause fire.
Most solar panels have these connectors already attached to the cables.

B. The voltage from the photovoltaic panels should never exceed the maximum input voltage of the inverter.

Blue Solar 1500: The open circuit voltage of the solar array (Voc) should never exceed 450V under any condition!
Blue Solar 2000 and 2800: Voc should never exceed 500V under any condition!
Blue Solar 4000 and 5000: Voc should never exceed 550V under any condition!
The inverter will be permanently damaged if the Voc is too high.

Notice that the Voc is at its highest when the solar-panels are at the lowest local temperature that can be xpected, and do not carry current (inverter unplugged from public grid), with maximum sunlight (1000W/m2).

C. Verify if the polarity of the DC-plugs is correct. Incorrect polarity connection could permanently damage the unit.

D. Connect the positive and negative terminals from the PV panel to positive (+) terminals and negative (-) terminals on the inverter. The maximum current rating of DC terminals is 20A.

Verify that the short-circuit-current of the solar array is below the maximum DC input current of the inverter.

The inverter will not draw more current form the panels than I PV max (see specification). If more current is available from the panels, the inverter will not consume this extra current / power. The total system power will be lower then expected.

2.5 System start-up

When the PV panels are connected and their output voltage is greater than 100 VDC but the AC grid is not yet connected, the message on the LCD display produces the following messages: “MODEL= XkW”-> “Waiting” -> “Disconnect grid”. The display repeats “Disconnect grid” and the red LED “Fault” turns on.

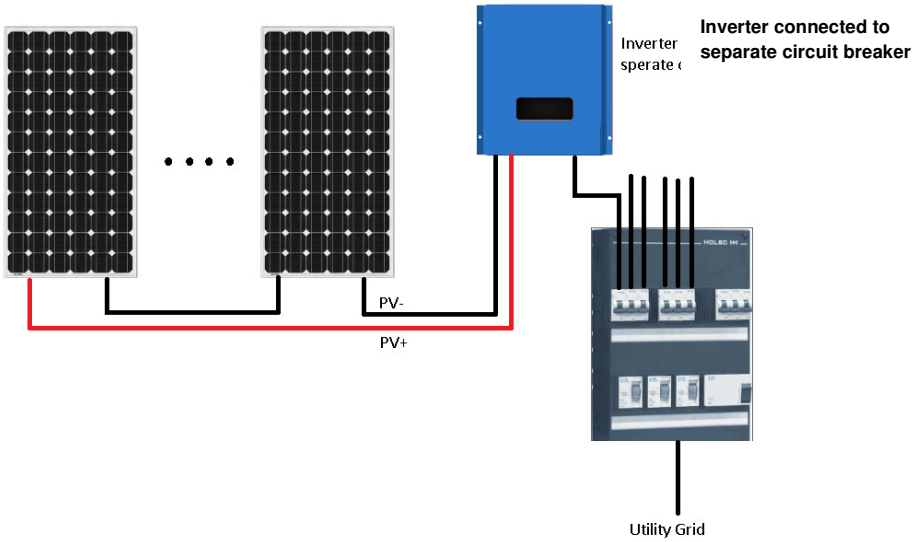
Close the AC breaker or fuse between PV-Inverter and grid.

If the mains-voltage and frequency are within limits, a countdown will start (visible on the display).

When the countdown has reached 0s, the inverter will connect to the grid and deliver energy.

The LCD displays “Pac=xxxx.xW”, which is the power fed into the grid. The green LED will be on indicating a normal condition.

2.6 System Diagram



3. MODES OF OPERATION

There are 5 different modes of operation.

Standby mode

If the voltage from the photovoltaic panels is <100VDC the inverter has just enough power to start-up the internal controller, but the voltage is too low to start energy conversion.

Waiting mode
When the voltage from the photovoltaic panels is >100VDC, the inverter enters a “waiting-state” and attempts to connect to the grid.

Normal mode
In this mode the inverter works normally. Whenever the voltage from PV panel is sufficient (voltage>150VDC), the inverter converts power into the grid. In normal mode the green LED is on.

Fault mode
The internal controller continuously monitor the system status. In case of unexpected conditions such as grid problems or an internal failure, it will display the information on its LCD-display and light up the red “Fault” LED.

Shutdown mode
During periods of little or no sunlight, the inverter automatically stops. The display and LED’s on the front panel do not work.

Starting-up display sequence: Once the PV power is sufficient, the inverter displays information as follows:

“User: xxxx”→ “Spec:xxxx” → “Model:x.xkW” → “SW Version :xx.xx” → “Checking xxS” → “Normal State” → “Pac= xxx.x W”.

The LCD display backlight automatically turns off after 30 seconds to save power.

LCD display

The first line of LCD		
State	Display content	Remark
Wait State	Waiting	Initial waiting
	Checking xxS	System checking
	Reconnect in xxS	System checking
	Standby	PV voltage low
Normal State	Pac = xxxx.x W	Inverter output power
Auto Test State	Auto testing	Protection auto test
Fault State	System xx Fault	System fault
Permanent State	Inverter xx Damaged	Inverter fault
Program State	Programing	Update software

The second line of LCD		
Cycle display	Display time /s	Remark
User: xxxx	1	The user type
Spec: xxxx	1	The inverter spec type
Model:x.xkW	1	The inverter model
SW Version:xx.xx	1	The software version
Etotal: xxxkWh	2	The energy total
Etoday: xx.xkWh	2	The energy today
Ttoday:xxhxxmin	2	Operation hours today
PV:xxxV BUS:xxxV	2	The PV and Bus voltage
AC:xxxV xx.xHz	2	The Grid voltage and frequency

4. TROUBLE SHOOTING

In case of a malfunction/system failure, the red (Fault) LED on the front panel turns on and the LCD displays the cause of the problem.
Please refer to the following table for a list of all possible LCD-warnings.

Warning:	**Grid V Fault**
Explanation:	The utility mains voltage is too high or too low
Action:	Check the mains-voltage on the display. Wait for 5 minutes. If the grid voltage returns to normal the inverter will automatically restart. If the voltage increases and becomes too high when the inverter is starting up, it possibly means that the mains-connection has too much resistance, or has bad connections. It is possible to monitor the mains-voltage with the data-logging software supplied with your inverter. A mains-voltage that increases with more then 10V when the inverter goes from 0W to full output power indicates a high impedant mains network. If the problem persists, call an electrician.
Warning:	**Grid F Fault**
Explanation:	The utility mains frequency is too high or too low
Action:	Check the mains-frequency on the display. Wait for 5 minutes. If the grid frequency returns to normal the inverter will automatically restart. If the mains-frequency remains outside the limits of this inverter, call an electrician.
Warning:	**Disconnected grid**
Explanation:	There is no mains-voltage present on the inverter.
Action:	Check if the fuse or circuit -breaker for the solar-inverter in the circuit breaker-box is closed. If the circuit breaker or fuse is closed call service.
Warning:	**High PV Voltage**
Explanation:	The voltage coming from the solar-panels is too high.
Action:	Check the value on the LCD which refers to the PV-voltage, (PV:xxxV). If this value is close to or more then the value in the specification referred to as “Max input voltage”, open the circuit-breaker and then remove all cables from the PV-inverter immediately! Call service. Your PV-inverter will be damaged if no action is taken.
Warning:	**High Temperature**
Explanation:	The temperature of the inverter is too high.
Action:	Check if the ambient temperature of the inverter is not too high. Check if the inverter is mounted according to the specification, and that there is sufficient room around the inverter for convection. Check if the black cooling bracket behind the inverter is clean and has no obstructions. If the problem persists, call service.
Warning:	**Not Consistent**
Explanation:	The 2 micro controllers in the inverter have contradicting data.
Action:	Call service.
Warning:	**Eeprom damaged**
Explanation:	The Eeprom memory in the inverter is damaged.
Action:	Call service.
Warning:	**Low Isolation**
Explanation:	During start-up of the inverter, the inverter measures the electrical isolation between the solar-panels to protective earth / ground. If the isolation is insufficient, the inverter will not start up to prevent an unsafe situation.
Action:	Open the circuit breaker, and then disconnect the DC-plugs from the inverter for 5 minutes. After 5 minutes reconnect DC-plugs and close AC breaker.

Warning:	**High ground I**
Explanation:	The GFCI (Ground Fault Current Interrupter) is active due to a fault current from live parts to the earth. The inverter will shut down.
Action:	Open the circuit breaker, and then disconnect the DC-plugs from the inverter for 5 minutes. After 5 minutes reconnect DC-plugs and close AC breaker. If the problem persists, call service.
Warning:	**Please Initiate**
Explanation:	The inverter has not been initiated for the first time in the factory.
Action:	Call service
Warning:	**GFCI Damaged**
Explanation:	The GFCI-protection unit is damaged.
Action:	Call service
Warning:	**Sensor Damaged**
Explanation:	The DC current sensor in the inverter is damaged.
Action:	Call service
Warning:	**SCI damaged**
Explanation:	The communication between the two micro controllers in the inverter has failed.
Action:	Call service
Warning:	**High DC INJ**
Explanation:	Normally the inverter injects AC-current into the public grid. When the warning “high DC INJ” is on, for some reason the injection of DC-current into the grid is higher then acceptable, and the inverter shuts down.
Action:	Open the circuit breaker, and then disconnect the DC-plugs from the inverter for 5 minutes. After 5 minutes reconnect DC-plugs and close AC breaker. If the problem persists, call service.
Warning:	**High Bus Voltage**
Explanation:	The internal BUS-voltage is too high.
Action:	Open the circuit breaker, and then disconnect the DC-plugs from the inverter for 5 minutes. After 5 minutes reconnect only the DC-plugs (do not close the circuit-breaker!). Is the warning “High Bus Voltage” visible on the display? Yes→ the voltage from the solar panels is too high, or there is an internal failure (Call service). No→ close the circuit-breaker and wait for the inverter to reconnect to the grid. If the “High Bus Voltage”-warning comes back again after reconnecting to the grid, there is probably something wrong with the grid. (Call an electrician).
Warning:	**Relay Damaged**
Explanation:	The internal relays used for connecting the inverter to the grid are damaged.
Action:	Open the circuit breaker. Call service
Warning:	**Auto test failed**
Explanation:	The self-test of the inverter has failed. There is an internal failure.
Action:	Open the circuit breaker, and then disconnect the DC-plugs from the inverter for 5 minutes. After 5 minutes reconnect DC-plugs and close AC breaker. If the problem persists, call service.
Warning:	**2.5V Ref Fault**
Explanation:	The internal voltage reference of the inverter is defect.
Action:	Call service.
Warning:	**There is nothing visible on the display.**
Explanation:	
Action:	The display power is coming from the solar panels. Check if the DC-plugs are firmly connected to the inverter. If there is sufficient daylight and the LCD does not give any indication / value → call service.

5. SPECIFICATIONS

BluePower Grid Inverter	1500	2000	2800	4000	5000
GRID OUTPUT (AC)					
Nominal output power	1500W	2000W	2800W	4000W	5000W
Maximum output power	1650W	2200W	3000W	4400W	5500W
Nominal output current	6.52A	8.7A	12A	17.5A	22A
Maximum output current	7.2A	9.5A	13A	19A	24A
Maximum fuse protection	16A	16A	16A	25A	25A
Harmonic distortion of output current	<3% at nominal power <5% at 50% power				
Nominal AC output voltage	220V - 230V - 240V				
Power factor	>0,99% at nominal power				
Operating AC voltage range	190-260V				
Nominal AC frequency	50Hz				
Operating AC frequency range	45.5-54.5Hz				
Internal consumption at night	<0,1W				
Short circuit proof	Yes				
SOLAR INPUT (DC)					
Maximum Input voltage	450V	500V	500V	550V	550V
Input Voltage MPPT range	110-430V	110-480V	110-480V	110-530V	110-530V
Maximum input current	9A	10A	13A	18A	20A
Maximum input power	1750W	2280W	3160W	4500W	5200W
Number of MPPT trackers	1	1	1	1	1
Number of strings	1	1	2	4	4
Start-up power	7W	7W	7W	10W	10W
Ground fault monitoring	RCMU (residual current monitoring unit)				
Reverse polarity protection	Yes, with short circuit diode				
EFFICIENCY					
Maximum efficiency	95.5%	96.4%	96.4%	97.6%	97.8%
European standard efficiency	94.5%	95.4%	95.5%	96.7%	96.9%
GENERAL					
Topology	Transformerless				
Communication port	RS232				
Operating temperature range	-20°C to 60°C (automatic power limit in case of internal over temperature)				
Nominal power temperature range	-20°C to 55°C				
Storage temperature range	-20°C to 70°C				
Maximum operating altitude	2000 m (5% derating at 4000 m)				
Cooling method	Natural convection				
Relative humidity	Max 95%				
ENCLOSURE					
Protection degree	IP54				
DC connectors	MC4 (Multi Contact 4mm)				
Weight (kg)	14.8 kg	14.8 kg	14.8 kg	20.7 kg	20.7 kg
Dimensions (hxwxd, mm))	376x415x125	376x415x125	376x415x125	368x475x195	368x475x195
STANDARDS					
Safety	EN 50178				
EMC, Emission	EN 61000-6-3				
EMC, Immunity	EN 61000-6-2				
EMC, Harmonics and Flicker	EN 61000-3-2, EN 61000-3-3				
Automatic Grid Disconnection	VDE 0126-1-1 (2006)				

Victron Energy Blue Power

Distributor:

Serial number:

Version : 00
Date : 14 February 2011

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