Phoenix Inverter VE.Direct

12 | 250	12 | 375	12 | 500	12 | 800	12 | 1200
24 | 250	24 | 375	24 | 500	24 | 800	24 | 1200
48 | 250	48 | 375	48 | 500	48 | 800	48 | 1200

1. Safety instructions

WARNING: RISK OF ELECTRIC SHOCK
The product is used in constant connection with batteries. The input and/or output may remain live even when the device is switched off. Always disconnect the batteries before carrying out maintenance or repairs on the product.

The product has no internal components that can be repaired by the end user. Do not remove the front panel or work on the device with the cover panels removed. All servicing must be carried out by a qualified person.

Please read this user manual and the installation instructions before using and installing the product.

This product is designed to safety class I (supplied with a protective earth terminal). The enclosure must be earthed. The earth terminal is located on the outside of the product. Whenever there is a possibility that the earthing has been damaged, the inverter must be switched off, secured against unintended operation, and a qualified service technician called in to repair this protection.

The AC output voltage is isolated from the DC input voltage and the unit's enclosure. Some local regulations may require true neutral bonding. In this case, one of the AC output conductors must be connected to the inverter enclosure, **and the inverter enclosure MUST be reliably earthed!!!** See Figure 1. Please note that effective protection by earthing is necessary for the correct operation of the current protection devices.

Ensure that the product is operated under the correct conditions.
Never operate the product in a damp or dusty environment.
Never use the product where there is a risk of gas or dust explosion.

Ensure there is sufficient space around the product for ventilation (approximately 10 cm) and check that none of the product's ventilation openings are blocked.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they are supervised by a person responsible for their safety and are instructed on how to use the appliance.

Keep children away and ensure that they do not play with or have played with this appliance.

2. Description

VE.Direct communication port
The VE.Direct port can be connected to:
- A computer (VE.Direct -> USB interface required, not included)
- Apple and Android mobiles, tablets and other devices running Android or iOS (VE.Direct -> Bluetooth Smart interface required, not included)

Fully configurable
- Battery under-voltage and over-voltage alarms and reset level
- Inverter shutdown level for low and high battery voltage and reset level
- Output voltage: 210 – 245V
- Frequency 50Hz or 60Hz
- ECO mode on/off and sensitivity settings (power level at which the inverter 'sleeps' and 'wakes up')

Monitoring
Battery voltage, AC output voltage and current, alarms

Proven reliability
The high, proven reliability of Phoenix inverters is due to the inverter topology, which has been tried and tested over many years and utilises a toroidal transformer at the output. The inverter is short-circuit proof and protected against overheating, whether due to overload or high ambient temperatures.

High starting power
Whenever you need high starting power to supply LED lights, halogen lights, switching power supplies or tools, you can rely on Phoenix converters.

ECO mode
Once the inverter is switched to ECO mode, it automatically switches to standby mode as soon as the power consumption falls below a set threshold. The inverter automatically switches on briefly once every 2.5 seconds (adjustable), for a brief moment. As soon as consumption rises above the set limit, the inverter remains switched on. This reduces the inverter's own power consumption several times over.

Connector for remote on/off
Remote control (switch) can be easily connected to the inverter's two-pin connector, or between the battery positive terminal and the left pin of the connector.

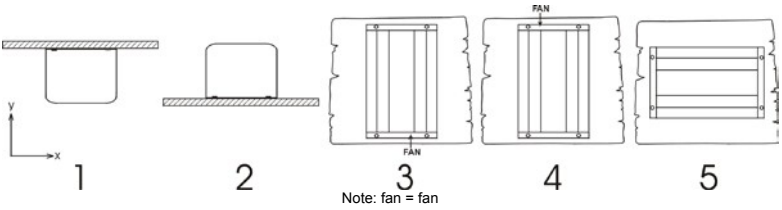
LED diagnostics
The red and green LEDs on the inverter indicate the status and operation of the inverter and signal any faults (activated protections).

Switching the load to another AC power source: automatic AC power transfer switch For our lower-power inverters, we recommend the Filax Automatic Transfer Switch. Filax ensures the load is switched between the mains and the inverter in a very short time (less than 20 milliseconds), so that, for example, computers or other loads will continue to operate without interruption in the event of a power failure.

Inverters are available with various plug types
Schuko, UK (BS-1363), AU/NZ (3112) or IEC-320 (plug included)

3. Installation

3.1 Placement of the inverter



Note: fan = fan

1	Ceiling mounting (upside down). *Not recommended*	
2.	Standard installation, bottom down.	**OK**
3	Vertical installation, fan positioned at the bottom.	**OK** (beware of small objects that could fall through the ventilation grille into the inverter). *Not recommended*
4	Vertical installation, fan positioned at the top.	
5	Horizontal wall mounting.	**OK**

You will achieve the best operating results if you place the inverter on a flat surface. To ensure trouble-free operation, the following conditions must be met:

a) Do not expose the inverter to water. Do not expose it to rain, drizzle or high humidity.

b) Do not place or operate the inverter in direct sunlight. The ambient temperature should be between -20°C and +40°C (humidity less than 95%, non-condensing). Please note that in extreme conditions, the temperature of the inverter housing may reach up to 70°C

c) Do not obstruct the free flow of air around the inverter. Leave at least 10 cm of space around the inverter. If the inverter overheats, it will switch back on automatically.

3.2 Connection to the battery

To fully utilise the inverter's capabilities and performance, it must be connected using cables of adequate cross-section and to a battery of sufficient capacity. See table:

	12/250	24/250	48/250		12/375	24/375	48/375
Minimum battery capacity	30 Ah	20 Ah	10 Ah		40 Ah	30 Ah	15 Ah
Internal DC fuse	60A	30A	25A		80A	40A	25A
Recommended DC cable cross-section for lengths							
0 – 1.5 m	4 mm²	2.5 mm²	1.5 mm²		6 mm²	4 mm²	2.5 mm²
1.5 – 3 m	6 mm²	4 mm²	2.5 mm²		10 mm²	6 mm²	4 mm²

	12/500	24/500	48/500		12/800	24/800	48/800
Minimum battery capacity	60 Ah	40 Ah	20 Ah		100 Ah	50 Ah	30 Ah
Internal DC fuse	120A	80A	30A		200A	120A	60A
Recommended DC cable cross-section for lengths							
0 – 1.5 m	6 mm²	6 mm²	4 mm²		16 mm²	6 mm²	4 mm²
1.5–3 m	10 mm²	10 mm²	6 mm²		25 mm²	10 mm²	6 mm²

	12/1200	24/1200	48/1200
Minimum battery capacity	150 Ah	60 Ah	30 Ah
Internal DC fuse	200A	150A	80A
Recommended DC cable cross-section for lengths			
0 – 1.5 m	25 mm²	10 mm²	6 mm²
1.5–3 m	35 mm²	16 mm²	10 mm²

The inverters are fitted with internal DC fuses (see table above). If the supply cable is longer than 1.5 m, a fuse or DC circuit breaker must be fitted in the circuit, close to the battery.

Connecting the input with reverse polarity (polarity reversal) will destroy the inverter's internal fuse and may result in the inverter being damaged. The inverter's internal fuse is non-replaceable; this damage is not covered by the warranty.

3.3 Connection to the appliance

Never connect the inverter output to another AC power source (such as a mains socket, generator, etc.).

3.4 Remote on/off switch

The remote control (switch) can be simply connected to the inverter's two-pin connector, or between the positive battery terminal and the left pin of the connector. This connection can be used in automotive applications by connecting the left pin of the connector to the ignition switch; the inverter will then only operate when the ignition key is turned on.

Note: please bear in mind that for the inverter to be switched on, it must also be switched on via the switch on the front panel (or in the ECO position).

3.5 Configuration

The inverter is ready for immediate use upon purchase. Some parameters can be changed later using a computer (requires a VE.Direct-USB cable, not included) or Apple and Android devices, tablets, etc. (requires a VE.Direct-Bluetooth interface, not included).

4. Operation

4.1 LED indicators

Green LED	Status	Troubleshooting
●●●●●●●● Steady light	The inverter is switched on	**The red LED is not lit** Everything is OK **The red LED is lit or flashing** The inverter is still on, but will switch off if the condition worsens. See the table of explanations for the red LED
●●−−−−−− Slow single flash	The inverter is in ECO mode	If the inverter switches on and off as soon as an appliance is connected to it, it is possible that the appliance's power consumption is too low compared to the ECO mode setting. Increase the appliance's power consumption or change the inverter's settings. (The minimum ECO mode setting is 15W)
●−●−−−−− Rapid double flashes	The inverter is switched off and on standby	The inverter has switched off due to a safety protection mechanism. It will restart automatically once the problem has been resolved. Please refer to the explanation table for the red LED.
−−−−−−−− Not lit	The inverter is switched off	**The red LED is not lit** Check the ECO/On/Off switch; it should be in the On or ECO position. Check the connector for the remote switch. Check the DC power cables and fuses. If the internal fuse is damaged, the inverter must be sent for repair. **The red LED is lit or flashing** The inverter has switched off due to a protection mechanism. It will restart automatically once the . Remove the cause of the problem and restart the inverter by switching it off and on again.

Red LED	Description	Troubleshooting
●●●●●●●● Steady light	Overload	Reduce the load on the inverter (power consumption of appliances).
●●●●−−−− Slow flashing	Battery flat	Charge or replace the battery. Check the connection to the battery. Check the cross-section of the DC cables to ensure they are of the correct size. See Section 4.3 'Protections and Automatic Restarts' for the procedure when the inverter restarts.
●−●−●−●− Rapid flashing	Battery overvoltage	Reduce the battery voltage; check the battery charger for faults
●−●−−−−− Double flash	High temperature	Reduce the load on the inverter and/or place it in a better-ventilated and cooler location.
●−−−●−−− Single short flash	Large ripple of DC voltage	Check the condition of the DC power connection and the cross-section of the power cables

4.2 ECO mode

Set the front switch to the ECO position; this will reduce the inverter's own power consumption several times over when no load is connected. The inverter switches on briefly every 2.5 seconds to check whether a load has been connected. If a load is connected, the inverter will remain switched on and will supply power until the load is switched on.

The default minimum power setting for switching on the inverter is 15W. If the appliance's power consumption is lower, the inverter will switch off.

The default setting for the interval between pulses is 2.5 seconds.

Please note that the ECO mode settings depend heavily on the type of appliance (induction, resistance, capacitive). Different settings may be required.

4.3 Protections and automatic restarts

Overload
Some types of appliances (typically motors, compressors, switched-mode power supplies, halogen lights, etc.) may require a high inrush current. In such circumstances, the inrush current may exceed the inverter's set maximum value. The inverter will then rapidly reduce the output voltage to limit the output current. If the current remains higher than the maximum value, the inverter will switch off and remain off; wait at least 30 seconds and restart the inverter

After three restarts within 30 seconds due to overload, the inverter will switch off and remain off. The LEDs will indicate that the unit has switched off due to overload. To restart, you must now switch the inverter off using the switch and switch it on again.

Low battery voltage (adjustable)
The inverter will switch off if the battery voltage drops below the set "low battery shutdown level". As soon as the voltage rises above the "low battery restart level – Restart & low battery voltage alarm", the inverter will switch on again, but not sooner than 30 seconds after the previous shutdown.

After three restarts within 30 seconds due to low battery voltage, the inverter will switch off and remain off. The LEDs will indicate that the inverter has switched off due to low battery voltage. To restart, the inverter must now be switched off using the switch and switched on again. Alternatively, recharge the battery. As soon as the battery voltage exceeds the set value for "Charged detect level" for a period longer than 30 seconds, the inverter will switch on.

The default settings for shutdown due to low battery voltage and the values for restarting the inverter can be found in the Technical Specifications table below. These values can be changed using the VictronConnect app.

High battery voltage
Reduce the battery voltage and/or check the battery charger or solar controller in the system. After shutting down due to high battery voltage, the inverter will first wait 30 seconds, and then attempt to switch on again as soon as the battery voltage drops to an acceptable level. The inverter will not remain switched off after several restarts.

Overheating
High inverter temperature or excessive load can lead to overheating and the inverter switching off. The inverter will restart after 30 seconds and will not remain switched off even after several restarts. Reduce the power consumption of the appliances and/or place the inverter in a better-ventilated location.

High DC supply voltage ripple
High ripple is usually caused by high voltage drops across the supply cables due to poor contact or small conductor cross-sections. Once the inverter has shut down due to high supply voltage ripple, it will restart automatically after 30 seconds.

After three restarts due to high DC supply voltage ripple, the inverter will remain switched off. The LEDs will indicate that the inverter has been switched off due to high supply voltage ripple. To restart, the inverter must now be switched off using the switch and then switched on again.

Persistent high ripple in the supply voltage reduces the inverter's service life!

5. Technical specifications

Phoenix Inverter	12 Volt 24 Volt 48 Volt	12/250 24/250 48/250	12/375 24/375 48/375	12/500 24/500 48/500	12/800 24/800 48/800
Continuous power at 25°C (1)		250 VA	375 VA	500 VA	800 VA
Continuous power at 25°C / 40°C		200 / 175 W	300 / 260 W	400 / 350 W	650 / 560 W
Peak power		400 W	700 W	900 W	1500 W
AC output voltage / frequency (adjustable)		230 VAC or 120 VAC ±3% 50 Hz or 60 Hz ±0.1%			
Input voltage range		9.2–17 / 18.4–34.0 / 36.8–62.0 VDC			
Shutdown - low battery voltage (adjustable)		9.3 / 18.6 / 37.2 VDC			
Restart & low battery voltage alarm (adjustable)		10.9 / 21.8 / 43.6 VDC			
Battery charge detection (adjustable)		14.0 / 28.0 / 56.0 VDC			
Maximum efficiency		87/88/88%	89/89/90%	90/90/91%	90/90/91%
Idle power consumption		4.2/5.2/7.9 W	5.6/6.1/8.5 W	6/6.5/9 W	6.5/7/9.5 W
Default idle power consumption in ECO mode (default test interval: 2.5 sec, adjustable)		0.8/1.3/2.5 W	0.9/1.4/2.6 W	1 / 1.5 / 3 W	1 / 1.5 / 3 W
Power settings for start-up and shutdown in ECO mode		Adjustable			
Protections (2)		a – f			
Operating temperature range		-40 to +60°C (fan-forced cooling) (reduction of 1.25% for every °C above 40°C)			
Humidity (non-condensing)		max. 95%			
DESIGN					
Material & Colour		Metal chassis and plastic cover (blue RAL 5012)			
Battery connection		Screw terminals			
Maximum conductor cross-section		10 mm² / AWG8			25/10/10 mm² / AWG 4/8/8
Standard AC sockets		230V: Schuko (CEE 7/4), IEC-320 (plug included in the pack) UK (BS 1363), AU/NZ (AS/NZS 3112) 120V: Nema5-15R			
Device protection rating		IP 21			
Weight		2.4 kg/5.3 lbs	3.0 kg/6.6 lbs	3.9 kg/8.5 lbs	5.5 kg/12 lbs
Dimensions (HxWxD, mm) (HxWxD, inches)		86x165x260 3.4x6.5x10.2	86x165x260 3.4x6.5x10.2	86x172x275 3.4 x 6.8 x 10.8	105x216x305 4.1 x 8.5 x 12.1 (12V model: 105x230x325)
ACCESSORIES					
Remote on/off		Yes			
Automatic AC power source switch		Filax or Multi			
STANDARDS					
Safety		EN/IEC 60335-1 / EN/IEC 62109-1			
EMC		EN 55014-1 / EN 55014-2 IEC 61000-6-1 / IEC 61000-6-3			
Automotive industry guidelines		ECE R10-4 EN 50498			

1) Non-linear load, crest factor 3:1
2) Protections:
   a) output short-circuit
   b) overload
   c) excessive battery voltage
   d) excessively low battery voltage
   e) excessive temperature
   f) excessive ripple in the DC supply voltage

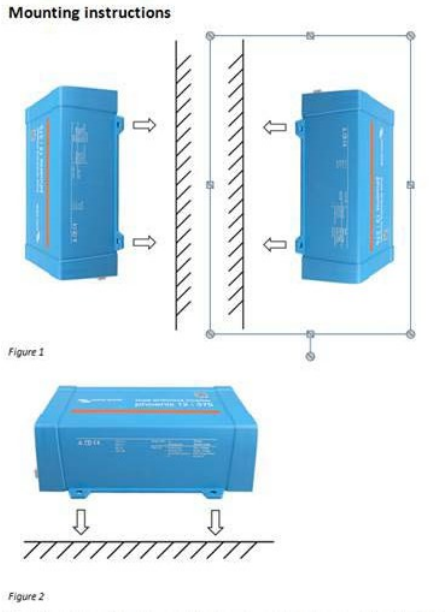
5. Technical specifications, continued

Phoenix Inverter	12 Volt 24 Volt 48 Volt	12/1200 24/1200 48/1200
Continuous power at 25°C (1)		1200 VA
Continuous power at 25°C / 40°C		1000 / 900 W
Peak power		2400 W
AC output voltage / frequency (adjustable)		230 VAC or 120 VAC ± 3% 50 Hz or 60 Hz ± 0.1%
Input voltage range		9.2–17 / 18.4–34.0 / 36.8–62.0 VDC
Shutdown - low battery voltage (adjustable)		9.3 / 18.6 / 37.2 VDC
Restart & low battery voltage alarm (adjustable)		10.9 / 21.8 / 43.6 VDC
Battery charge detection (adjustable)		14.0 / 28.0 / 56.0 VDC
Maximum efficiency		92 / 94 / 94 %
No-load power consumption		8 / 9.5 / 10 W
Default no-load power consumption in ECO mode (default test interval: 2.5 sec, adjustable)		1 / 1.7 / 2.7 W
Power settings for start-up and shutdown in ECO mode		Adjustable
Protections (2)		a – f
Operating temperature range		-40 to +60°C (fan-forced cooling) (reduction of 1.25% for every °C above 40°C)
Humidity (non-condensing)		Max. 95%
ENCLOSURE		
Material & Colour		Metal chassis and plastic cover (blue RAL 5012)
Battery connection		Screw terminals
Maximum conductor cross-section		35/25/25 mm² / AWG 2/4/4
Standard AC sockets		230V: Schuko (CEE 7/4), IEC-320 (plug included in the pack) UK (BS 1363), AU/NZ (AS/NZS 3112) 120V: Nema5-15R
Device protection rating		IP 21
Weight		7.7 kg/17 lbs
Dimensions (HxWxD, mm) (HxWxD, inches)		117x232x327 4.6x9.1x12.9 (12V model: 117x232x367)
ACCESSORIES		
Remote on/off		Yes
Automatic AC power source switch		Filax or Multi
STANDARDS		
Safety		EN/IEC 60335-1 / EN/IEC 62109-1
EMC		EN 55014-1 / EN 55014-2 IEC 61000-6-1 / IEC 61000-6-3
Automotive industry guidelines		ECE R10-4 EN 50498

1) Non-linear load, crest factor 3:1
2) Protections:
   a) output short-circuit
   b) overload
   c) excessive battery voltage
   d) excessively low battery voltage
   e) excessive temperature
   f) excessive ripple in the DC supply voltage

Figure 1: Front and rear views

Figure 2: Installation instructions



Mount the inverter vertically using four screws, with the fan facing downwards (recommended) or upwards (not recommended), as shown in *Figure 1*. Take care to ensure that small objects do not fall through the ventilation grille into the inverter. Or mount it horizontally on a flat surface as shown in *Figure 2*. Always leave at least 10 cm of space around the converter. **Never mount the converter upside down or horizontally against a wall.**

Victron Energy Blue Power

Supplier:

Serial number:

Version : 00
Date : 15 June 2017

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