



Manual

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Appendix

**Blue Power IP22 Charger
One (1) or three (3) outputs**

12/15 24/08

12/20 24/12

12/30 24/16

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Safety instructions



- Always provide proper ventilation during charging.
- Avoid covering the charger.
- Never try to charge non-rechargeable or frozen batteries.
- Never place the charger on top of the battery when charging.
- Prevent sparks close to the battery. A battery being charged could emit explosive gasses.
- Battery acid is corrosive. Rinse immediately with water if acid comes into contact with skin.
- This appliance is not designed for use by young children or people who cannot read or understand the manual unless they are under the supervision of a responsible person to ensure that they can use the battery charger safely. Store and use the battery charger out of the reach of children, and ensure that children cannot play with the charger.
- Connection to the mains supply must be in accordance with the national regulations for electrical installations. In case of a damaged supply cord please contact the manufacturer or your service agent.
- The charger must only be plugged in an earthed socket.



1. Quick user guide

A. Connect the charger to the battery or batteries (see figure 1).

B. Connect the charger to the wall socket. The BULK LED will indicate that the mains cable is connected to the wall socket.

C. If required, press the MODE-button to select another charging algorithm (the charger remembers the mode when disconnected from the mains and/or the battery).

If reconditioning is selected, the RECONDITION LED will be on, and will flash when reconditioning is active.

The charger switches to NIGHT by pressing the MODE button during 3 seconds. The NIGHT LED will turn on. The NIGHT mode automatically ends after 8 hours, and can be ended earlier by again pressing the MODE button during 3 seconds.

The charger switches to LOW by pressing the MODE button during 6 seconds. The NIGHT LED will blink twice per second.

The LOW mode remains activated until the MODE button is pressed again during 6 seconds.

When NIGHT or LOW are on, the output current is reduced to max. 50% of the nominal output and the charger will be totally noiseless.

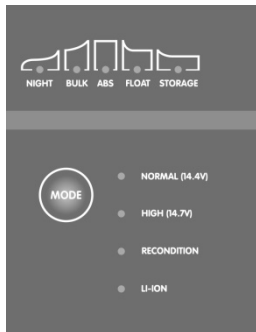
D. The battery is about 80% charged and ready for use when the absorption LED switches on.

E. The battery is fully charged when the FLOAT or STORAGE LED is on.

F. Stop charging at any time by interrupting the AC supply.



Figure 1



2. 'Must know' features and facts

2.1 Ultra high efficiency 'green' battery charger

With up to 95% efficiency, these chargers generate up to four times less heat when compared to the industry standard.

And once the battery is fully charged, power consumption reduces to 0,5 Watt, some five to ten times better than the industry standard.

2.2 Durable, safe and silent

- Low thermal stress on the electronic components.
- Protection against overheating: the output current will reduce as temperature increases up to 60°C, but the charger will not fail.
- When the NIGHT or LOW mode are activated, the maximum output current is reduced to 50% of nominal, and the fan will be off.

2.3 Temperature compensated charging

The optimal charge voltage of a lead-acid battery varies inversely with temperature. The *Blue Power IP22 Charger* measures ambient temperature during the test phase and compensates for temperature during the charge process. The temperature is measured again when the charger is in low current mode during float or storage. Special settings for a cold or hot environment are therefore not needed.

2.4 Adaptive Battery Management

Lead-acid batteries should be charged in three stages, which are [1] *bulk or constant-current charge*, [2] *absorption or topping charge* and [3] *float charge*.

Several hours of absorption charge are needed to fully charge the battery and prevent early failure to sulfation¹.

The relatively high voltage during absorption does however accelerate aging due to grid corrosion on the positive plates.

Adaptive Battery Management limits corrosion by reducing absorption time when possible, that is: when charging a battery that is already (nearly) fully charged.

2.5 Storage mode: less corrosion of the positive plates

Even the lower float charge voltage that follows the absorption period will cause grid corrosion. It is therefore essential to reduce the charge voltage even further when the battery remains connected to the charger during more than 48 hours.

2.6 Reconditioning

A lead-acid battery that has been insufficiently charged or has been left discharged during days or weeks will deteriorate due to sulfation¹. If caught in time, sulfation can sometimes be partially reversed by charging the battery with low current up to a higher voltage.

Remarks:

- a) Reconditioning should be applied only occasionally to flat plate VRLA (gel and AGM) batteries because the resulting gassing will dry out the electrolyte.
- b) Cylindrical cell VRLA batteries build more internal pressure before gassing and will therefore lose less water when subjected to reconditioning. Some manufacturers of cylindrical cell batteries therefore recommend the reconditioning setting in case of cyclic application.
- c) Reconditioning can be applied to flooded batteries to 'equalise' the cells and to prevent acid stratification.
- d) Some battery charger manufactures recommend pulse charging to reverse sulfation. However, most battery experts agree that there is no conclusive proof that pulse charging works any better than low current / high voltage charging. This is confirmed by our own tests.

2.7 Lithium-ion (LiFePO₄) batteries

NEVER attempt to charge a Li-ion battery when its temperature is below 0°C.

¹ For more information about batteries, please refer to our book 'Energy Unlimited' (downloadable from www.victronenergy.com), or http://batteryuniversity.com/learn/article/sulfation_and_how_to_prevent_it

² For more information about Li-ion batteries please see <http://www.victronenergy.com/batteries/lithium-battery-12.8v/>



3. Charge algorithms

3.1 Smart charge algorithm with optional reconditioning for lead-acid batteries

Charge voltages at room temperature:

MODE	ABS V	FLOAT V	STORAGE V	RECONDITION Max V@% of Inom
NORMAL	14,4	13,8	13,2	16,2@8%, max 1h
HIGH	14,7	13,8	13,2	16,5@8%, max 1h
LI-ION	14,2	13,5	13,5	n.a.

For 24V chargers: multiply all voltage values by 2.

The MODE button

After connecting the charger to the AC supply, press the MODE-button to select another charging algorithm if required (the charger remembers the mode when disconnected from the mains and/or the battery).

If reconditioning is selected, the RECONDITION LED will be on, and will flash when reconditioning is active.

The charger switches to NIGHT by pressing the MODE button during 3 seconds. The NIGHT LED will turn on. The NIGHT mode automatically ends after 8 hours, and can be ended earlier by again pressing the MODE button during 3 seconds.

The charger switches to LOW by pressing the MODE button during 6 seconds. The NIGHT LED will blink twice per second. The LOW mode remains activated until the MODE button is pressed again during 6 seconds.

When NIGHT or LOW are on, the output current is reduced to max. 50% of the nominal output and the charger will be totally noiseless.

Seven step charge sequence for lead-acid batteries:

1. **BULK**

Charges the battery with maximum current until absorption voltage is reached. The battery will then be about 80% charged and is ready for use.

2. **ABS - Absorption**

Charges the battery at constant voltage and with decreasing current until it is fully charged. See table above for absorption voltage at room temperature.

Adaptive battery management:

The absorption time is short (minimum 30 minutes) if the battery was (nearly) fully charged and increases to 8 hours in case of a deeply discharged battery.

3. **RECONDITION**

Optional reconditioning for deeply discharged lead-acid batteries.

Reconditioning is applicable to the charge algorithms NORMAL and HIGH and can be selected by pressing the MODE button one more time after selection of the required algorithm.

When in RECONDITION mode the battery will be charged with low current up to a higher voltage at the end of the absorption phase.

The RECONDITION LED will be on during charging, and will blink during the reconditioning period.

During reconditioning the maximum current is equal to 8% of the nominal current until the maximum voltage is reached. Reconditioning is terminated after one hour or when the maximum voltage is reached, whichever comes first. See table.

Example:

For a 12/30 charger: the recondition current is $30 \times 0,08 = 2,4A$.

4. **FLOAT**

Keeps the battery at constant voltage and fully charged.

5. **STORAGE**

Keeps the battery at reduced constant voltage to limit gassing and corrosion of the positive plates.

6. **READY (battery fully charged)**

The battery is fully charged when the FLOAT or STORAGE LED is on.

7. **REFRESH**

Slow self discharge is prevented by an automatic weekly refresh of the battery with a short absorption charge.

3.2 Lithium-ion (LiFePO₄) batteries

When charging a Lithium-ion battery, the *Blue Power Charger* uses a specific charging algorithm for Lithium-ion batteries, to ensure optimum performance. *Select LI-ION with the mode button.*

3.3 When a load is connected to the battery

A load can be applied to the battery while charging. Please note that the battery will not be charged if the current to the load is higher than the output current of the charger.

Reconditioning is not possible when a load is connected to the battery.

3.4 Triggering a new charge cycle

A new charge cycle will start when:

- The charger has reached float or storage, and, due to a load, current increases up to maximum current during more than four seconds.
- The MODE button is pressed during charging.
- The AC supply has been disconnected and reconnected.

3.5 Estimating charge time

A lead-acid battery is about 80% charged at the beginning of the absorption period.

The time **T** to 80% charged can be calculated as follows:

$$T = Ah / I$$

Where:

I is the charge current (= charger output minus load current).

Ah is the amount of Ah to be charged.

A full absorption period of up to 8 hours is needed to charge the battery to 100%.

Example:

Charge time to 80% of a fully discharged 220Ah battery when charged with a 30A Charger: $T = 220 / 30 = 7,3$ hours. Charge time to 100%: $7,3 + 8 = 15,3$ hours.

A Li-ion battery is more than 95% charged at the beginning of the absorption period, and reaches 100% charge after approximately 30 minutes absorption charge.

3.6 High internal resistance

When a battery reaches the end of its cycle- or float life, or when it dies prematurely due to sulfation or corrosion, capacity will dramatically drop and internal resistance will increase. The charger will not reject such a battery during the test phase (it could as well be a nearly fully charged battery).

A very short bulk phase when charging a supposedly discharged battery does however indicate that the battery has reached the end of its useful life.

Remark: sulfation can sometimes be partially reversed by repeated application of the RECONDITION MODE.

3.7 Can be used as a power supply

The charger will supply DC loads when no battery is connected.

4. Technical specifications

Blue Power Charger IP22	12V 15/20/30A	24V 8/12/16A
Input voltage range	180-265VAC	
Output current, normal mode	15 / 20 / 30A	8 / 12 / 16A
Output current, NIGHT or LOW	7,5 / 10 / 15A	4 / 6 / 8A
Efficiency	94%	95%
Standby power consumption	0,5W	
Minimum battery voltage	Starts charging from 0V ('dead battery')	
Charge voltage 'absorption'	Normal: 14,4V High: 14,7V Li-ion: 14,2V	Normal: 28,8V High: 29,4V Li-ion: 28,4V
Charge voltage 'float'	Normal: 13,8V High: 13,8V Li-ion: 13,5V	Normal: 27,6V High: 27,6V Li-ion: 27,0V
Charge voltage 'storage'	Normal: 13,2V High: 13,2V Li-ion: 13,5V	Normal: 26,4V High: 26,4V Li-ion: 27,0V
Min. battery capacity, normal mode	30/40/60Ah	16/24/32Ah
Min. battery capacity, night on low	15/20/30Ah	8/12/16Ah
Temperature compensation (lead-acid batteries only)	16mV/°C	32mV/°C
Can be used as power supply	Yes	
Back current drain	0,4Ah/month (0,6mA)	
Protection	Reverse polarity (fuse)	Output short circuit Over temperature
Cooling	low rpm (silent) fan (12/15 and 24/08 are without fan)	
Operating temp. range	-20 to +50°C (full rated output up to 40°C)	
Humidity (non condensing)	Max 95%	
ENCLOSURE		
Battery-connection	Connector 13mm ² (AWG6)	
230V AC-connection	Cable of 1,5 meter with CEE 7/7, BS 1363 plug (UK) or AS/NZS 3112 plug	
Protection category	IP22 (indoor use)	
Weight	1,3kg	
Dimensions (h x w x d)	235 x 108 x 65mm	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29	
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2	
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3	

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Five year limited warranty

This limited warranty covers defects in materials and workmanship in this product, and lasts for five years from the date of original purchase of this product. The customer must return the product together with the receipt of purchase to the point of purchase.

This limited warranty does not cover damage, deterioration or malfunction resulting from alteration, modification, improper or unreasonable use or misuse, neglect, exposure to excess moisture, fire, improper packing, lightning, power surges, or other acts of nature.

This limited warranty does not cover damage, deterioration or malfunction resulting from repairs attempted by anyone unauthorized by Victron Energy to make such repairs.

Victron Energy is not liable for any consequential damages arising from the use of this product.

The maximum liability of Victron Energy under this limited warranty shall not exceed the actual purchase price of the product.



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