



# INTELLIGENT BATTERY CHARGER

FOR V-LOCK LITHIUM ION BATTERIES ONLY

Model

**CVTR2P - SIMULTANEOUS**

## **OPERATING INSTRUCTIONS**

Revision 1.0

## **Please read these instructions concerning your safety**

BLUESHAPE lithium-ion battery chargers have been designed to provide a superior performance by managing relatively high currents during their operation in order to reduce charging time.

As may be expected, the chargers become warm during operation and it is therefore very important to keep their ventilation openings unobstructed.

Moreover, please follow the safety instructions below.

- Protect the equipment from humid environments. Avoid any contact with water or other fluids. Do not use if any liquid has been accidentally spilled inside the equipment .Contact qualified service personnel for inspection or repair
- Clean only by using a dry cloth
- Unplug when not in use and avoid damage by power surges
- Read the supplied instructions thoroughly and keep handy
- Avoid setting up near heat sources such as fire places, radiators, stoves or other heat generating equipment
- NEVER use without proper grounding
- Protect the AC mains power plug, connector and cord
- If the equipment develops a fault, have it repaired by qualified service personnel only
- NEVER block the ventilation openings or obstruct cooling fan air flow
- Use only as instructed by the manufacturer
- Do not remove cover or dismantle the apparatus. No user-serviceable parts inside

### **WARNING**

**THIS EQUIPMENT MUST BE EARTHED**



**TO PREVENT FIRE OR SHOCK HAZARD DO NOT EXPOSE THE UNIT TO RAIN OR MOISTURE**

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**TO AVOID ELECTRIC SHOCK, DO NOT OPEN THE APPARATUS AND ALWAYS REFER ANY SERVICING TO QUALIFIED PERSONNEL**



The user is being alerted of the importance of going through the literature accompanying this product and getting familiarised with the important safety and operating instructions, included.

## **ADDITIONAL SAFETY NOTES**



Chargers and/or batteries may become hot during charging. This is normal. The charger is also equipped with over-temperature protection. Please consult your BLUESHAPE dealer if you notice that either a charger or a battery become excessively hot during the charging operation.

Be careful not to block the equipment's ventilation outlets or the fan inlet.

Never insert any metallic or any other objects inside the equipment through the ventilation openings or otherwise.

## **BLUESHAPE CHARGERS ARE INTENDED FOR OPERATION WITH LINE VOLTAGES BETWEEN 100V AND 240V AC AND LINE FREQUENCIES BETWEEN 47Hz AND 63 Hz**

The equipment is being supplied with a compatible AC mains power cord. In the case when the UK plug is fitted, this plug is equipped with a 13A replaceable fuse.

### **Package contents**

- CVTR2P simultaneous dual position charger with Aux output
- AC power cord [according to region]
- Safety operating instructions

## CVTR2P graphic description



1. Mains socket with fuse
2. Fan switch (on/off)
3. Cooling fan outlet
4. Auxiliary power XLR 4pin
5. Data socket (for computer connectivity and FW upgrades if needed)
6. V-Lock battery #2 installation bay
7. Carrying handle
8. LEDs (Bat #1, AC on/off, Bat #2)
9. V-Lock battery #1 installation bay
10. Battery release button
11. Extending foot support on both sides
12. Foot extender push button

## Introduction

The BLUESHAPE CVTR2P intelligent lithium ion battery chargers have been specifically designed and optimized for fast, safe and reliable charging of BLUESHAPE batteries. The charging speed depends on the type of batteries on charge since the charger communicates and acquires information from the batteries during operation. The CVTR2P is capable of delivering up to a maximum of 6 Amps in constant current (CC) mode on both channels simultaneously. This makes it ideal for fast turnaround, especially when using higher capacity batteries. However, when charging smaller batteries, the charger never exceeds currents higher than 0.5C\* to avoid overheating and stress to the Lithium Ion cells.

Nevertheless, these chargers can also charge 3<sup>rd</sup> party, non-communicative batteries but at a fixed rate. A precaution is included by design in order not to overcharge 3<sup>rd</sup> party batteries or render them unsafe.

For the users' convenience, the external dimensions have been kept as compact as possible for better portability.

\*0.5C is equivalent to half the battery Ah capacity

## Properties of the CVTR2P

- Modern, original but robust design. Ideal for regular daily use
- Sophisticated electronics for accurately detecting the charging requirements and applying the correct charging rate accordingly
- Switchable fan for selection of 'FAST' or 'SILENT' charging modes
- Simultaneous charging of 2 batteries at a maximum of 6A each battery when fan is switched to 'ON'
- Three-colour LED indicators for individual charge-station monitoring
- LED for 'AC on' indication. No power switch has been provided
- Pre-charge function for protecting heavily discharged cells against high currents until their voltages rise to a safe level.
- Precise constant current (CC) and constant voltage (CV) charging algorithms to match the battery programmed charging voltage.
- Maximum compactness and space utilisation. Extendable, spring loaded support foot for excellent stability even when there is just 1 large battery installed. The foot extension is activated by pressing a push button underneath the charger.
- Powerful auxiliary output at a nominal 14.5V\* through a 4-pole XLR. The auxiliary output is available if AC is connected or if a battery with terminal voltage >12.5V is inserted in any channel.
- If AC mains is not present or is suddenly cut off, the AUX power is drawn from the batteries and the equipment operates like a UPS and continues delivering power.

- If the battery is placed on charge, the AUX power will be derived from both mains and battery if necessary.
- Data connector for computer connectivity and monitoring of BLUESHAPE batteries through BSCVMON free software, directly downloadable from our website

Note: The special data cable is not included in the kit but is available as a separate product.

This socket can also be used for firmware updates if necessary.



\*The output voltage of the auxiliary output is dependent on the battery voltage. It can therefore range between 12.5V up to 17V

### **BLUESHAPE battery charging and performance features**

The electronic circuitry provides a very accurate lithium ion charge algorithm. Initially, the chargers will only apply a pre-charge current of a few mA to batteries that are heavily discharged. Once the cells inside the batteries reach a safe level, the full (maximum) charging current is delivered at a maximum rate of 6A (but less than 0.5C) until the batteries reach almost 90% state of charge (SOC). This charging rate is only applied when the fan is set to ON.

If the fan is switched to OFF for silent operation, the charging current is reduced to not exceed 3.5A (but less than 0.5C - see table).

After the constant current (CC) phase is completed, a constant voltage (CV) phase initiates with the current tapering slowly to 150mA until full cut-off.

## CVTR2P charging performance

CVTR2P charging performance with fan set to 'ON'				
Approximate charging time per channel (minutes)				
Battery Model	Battery Capacity	CC rate (0.5C)	State of Charge (SOC)%	
			90% (mins)	100% (mins)
BV095HDmini	6.6Ah - 95Wh	3.3A	110	150
BV140HDmini	9.9Ah - 143Wh	4.95A	110	150
BV090	6.6Ah - 95Wh	3.3A	110	150
BV100HDplus	6.7Ah - 100Wh	3.35A	110	150
BV150	10Ah - 150Wh	5A	110	150
BV190HDplus	13.4Ah - 193Wh	6A	120	180
BV290HDplus	20.2Ah - 290Wh	6A	180	260

CVTR2P charging performance with fan set to 'OFF'				
Approximate charging time per channel (minutes)				
Battery Model	Battery Capacity	CC rate (0.5C)	State of Charge (SOC)%	
			90% (mins)	100% (mins)
BV095HDmini	6.6Ah - 95Wh	3.3A	110	150
BV140HDmini	9.9Ah - 143Wh	3.5A	150	190
BV090	6.6Ah - 95Wh	3.3A	110	150
BV100HDplus	6.7Ah - 100Wh	3.35A	110	150
BV150	10Ah - 150Wh	3.5A	150	200
BV190HDplus	13.4Ah - 193Wh	3.5A	210	270
BV290HDplus	20.2Ah - 290Wh	3.5A	310	390

## Operating Instructions - CVTR2P

This charger *simultaneously* charges two batteries with charging currents of up to 6A, depending on the battery capacity.

How to proceed:

- From underneath the charger, push the centre push button to extend the foot support. When not in use, or for transport, the foot support can be pushed back in to lock once again.
- The unit has been designed to remain in balance with just one battery or with both batteries installed.
- Plug and switch on the AC power cord provided into the charger AC input (note: there is no power switch in the charger). The AC mains LED will change from Red to Green
- Insert a battery inside any one of the two V-plates
- Observe the battery LED. In addition, the charge status may be read in 20% steps through the BLUESHAPE battery LED array or continuously, using the Wi-Fi features of the battery (see the battery operating manual for the activation of the internal Wi-Fi transmitter).
- Leave the battery to charge for the appropriate time (see table on page 7)
- The battery is fully charged when the LED becomes steady Green.

You may want to charge 2 batteries at the same time. Just insert the second battery into the second V-plate adapter. This second battery will start charging immediately and at the correct rate according to its capacity. Once again, observe the LED or monitor the battery status using the Wi-Fi feature.

The LEDs will accurately display the correct status of the charging process for each battery.

In the case when an accessory is plugged into the auxiliary XLR port, the charging process may continue but can be slowed down, depending on the power taken by the AUX port that has the priority.

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When an accessory is powered into the AUX port and at least a battery is installed, the unit operates as an UPS: in case of a sudden AC power cut, the accessory remains powered if at least a battery is installed and its voltage is higher than 12500mV.

Once the accessory has been unplugged, the charger will continue the previous charging sequence and from the same point of interruption.

## AUX port management

The AUX port is always available whenever AC is connected or at least one battery is present and with a voltage greater than 12500mV.

### Working without AC

When operating without AC the available power on the AUX port is limited by the power of the installed batteries but up to a controlled maximum of 8A.

The AUX output is always in parallel with one battery at a time. If two batteries are connected, they are discharged sequentially up to a bottom limit of 12500mV. When this threshold is reached by the first battery, the load is automatically connected to the second battery without interruption.

### Working with AC

When AC is present and no batteries are installed, the power available on the AUX port depends on the fan state:

- with fan set ON - 14.5V regulated @ max 6A
- with fan set OFF - 14.5V regulated @ max 4A

On the other hand, whenever a battery is connected in charge, the max available power on the AUX port depends on the power of the installed battery since if the load on AUX exceeds the available current, the extra power is provided by the battery that in such case is getting discharged. The maximum current is capped @ 8A.

When a battery is in charge and the AUX is powered, it has to be noted that:

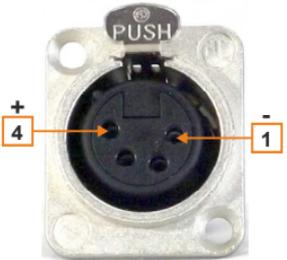
- AUX takes priority
- The available current is shared between the battery on charge and the load on the AUX port. Therefore, the charging current is reduced when the AUX is draining power.
- If the AUX port demand is less than the current that is able to be drawn from the charger then the remaining current will be used to charge the battery
- If the AUX port demand greater than the current that is able to be drawn from the charger then the battery will go into discharge to supply the rest of the demand

See the technical specifications on page 11 to understand the different current handling under different conditions.

## Battery LED indications

#	LED	INDICATION	EXPLANATION
1	AC	Steady Red	There is no AC present
		Steady Green	There is AC present
2	Bat #1 Bat #2	Steady Green	Battery is full
3	Bat #1 Bat #2	Flashing Green	AC is not present and the blinking channel is ready to power or is actually powering the load on the AUX port
4	Bat #1 or Bat #2	Flashing Orange	The battery is in charge and is charging at less than 1000mA. Two possible conditions: 1. The battery is in pre-charge mode because of low voltage, and is limiting the charging current 2. The load connected to AUX is absorbing current available and therefore there is not enough power to charge the battery at full rate. The available power is shared between charging and AUX power and the charging current is reduced.
5	Bat #1 Bat #2	Steady Orange	Battery is in constant current (CC) phase
6	Bat #1 Bat #2	Flashing Orange-Green	Battery is in constant voltage (CV) and has just reached the ~90% of capacity, and is completing the charge
7	Bat #1 Bat #2	Flashing Red	Premature charge termination - the battery stopped before it was supposed to. This may be due to the battery not enabled to charge for a temporary condition. The charger will keep retrying every 30 seconds for approximately 2 hours.
8	Bat #1 Bat #2	Steady Red	Battery failure: several causes. The battery should have charged but did not after 2 hours of retrying because of an internal failure.  The battery ID resistor is incorrect and not recognised. (applicable range is 10K<ID<60K)
9	AC Bat #1 Bat #2	Flashing Red	All the 3 LEDs flashing together. Operation halted because charger has overheated. The charger will automatically resume operation when it cools down.

## Technical specifications

Type	Li-ion constant current and voltage control system	
CC-MODE: Output with BLUESHAPE battery	Max 6000mA $\pm$ 5% with fan set to ON Max 3500mA $\pm$ 5% with fan set to OFF	
CC-MODE: Output with Alien battery	Max 4000mA $\pm$ 5% with fan set to ON Max 3000mA $\pm$ 5% with fan set to OFF	
CC-MODE: Vmax with BLUESHAPE battery	Max 16800 $\pm$ 50mV (0.3%) regulated based on battery programmed charging voltage	
CC-MODE: Vmax with Alien battery	16600 $\pm$ 50mV (0.3%)	
CV-MODE: Vmax with BLUESHAPE battery	Max 16800 $\pm$ 50mV (0.3%) regulated based on battery programmed charging voltage	
CV-MODE: Vmax with Alien battery	16600 $\pm$ 50mV (0.3%)	
CV-MODE: Cut-off current	150mA $\pm$ 10mA	
Auxiliary power (XLR 4 pin)	<p>With no battery:</p> <ul style="list-style-type: none"> <li>- Fan state ON: regulated 14.5V @ 6A max <math>\pm</math> 5%</li> <li>- Fan state OFF: regulated 14.5V @ 4A max <math>\pm</math> 5%</li> </ul> <p>With battery: nominal 12.5V – 17V @ 8A max <math>\pm</math> 5% depending on the battery available power</p>	
XLR polarity		<p>Pin 1: -ve Pin 2: nc Pin 3: nc Pin 4: +ve</p>
Short circuit protection	Available	
Overcharge protection	Available	
Overtemperature protection	Available	
LEDS	3-colour type for Bat #1, Bat #2, AC	
Special features	Charging current and voltage regulated according to battery capacity for BLUESHAPE or compatible batteries only	
Power supply	AC mains 100V - 240V ~ 47 - 63 Hz autoselect	
Fuse	1 x 220V 2.5A (5x20mm quick blow) + 1 spare	
Power consumption	230W max / 195W typical	
Operating temperature range	0°C - 45°C	
Storage temperature range	-20°C - 65°C (-4°F - 149°F)	
Dimensions	260 x 150 x 85mm (10.24" x 5.91" x 3.35")	
Weight	1250g (2.75lbs)	

The CVTR2P is pending CE certification.

## **Notes concerning charger usage with BLUESHAPE battery packs**

It is recommended that the users always have at least another spare battery readily available.

It is preferable to charge batteries immediately before use. Some loss from self-discharge would result if the batteries are charged several weeks in advance of their use. However, this slight loss can be topped up at any time without any degradation of battery performance (no memory effect)

It is recommended to store batteries in a cool and dry place. Charging should be done at temperatures above 0°C and below 45°C.

Slight heating of the battery is expected to occur during charge. However if for some reason, the pack temperature reaches 60°C, then the charge activity is suspended.

The pack resumes normal charging once the temperature drops back to below 50°C. This is a safety feature incorporated in all BLUESHAPE battery packs.

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## **Warranty**

BLUESHAPE chargers are warranted to be free from defects in materials, workmanship and functionality for a period of 18 months commencing from the date of purchase.

This warranty shall not apply to any products or parts of, that have been subjected to misuse, negligence, accidental or abnormal conditions of operation.

The buyer should always contact the place of purchase for any return of defective product. It is important that the buyer provides us with as much information as possible about the failure being claimed.

In the event of product failure for which warranty applies, we will repair or replace the product free of charge. In these cases, all expenses including transport charges will be borne by us.

In the case where the failure has been caused by one of the causes explained above, repairs should be billed at a nominal cost. Prior to the carrying out of any repairs, we will inform the customer of the estimated costs of these repairs.

These warranty conditions are the only ones applicable to our products and overrule any other expressed or implied warranties. We shall not be held liable for any damages resulting from warranty statements other than those contained in this declaration.

In all warranty claims, the buyer must reproduce the original purchase invoice.



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