INTELLIGENT BATTERY CHARGER

FOR V-LOCK LITHIUM ION BATTERIES ONLY

Model

CVS8XW – Wall Mount

OPERATING INSTRUCTIONS

Revision 1.1

www.blueshape.net

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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 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

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

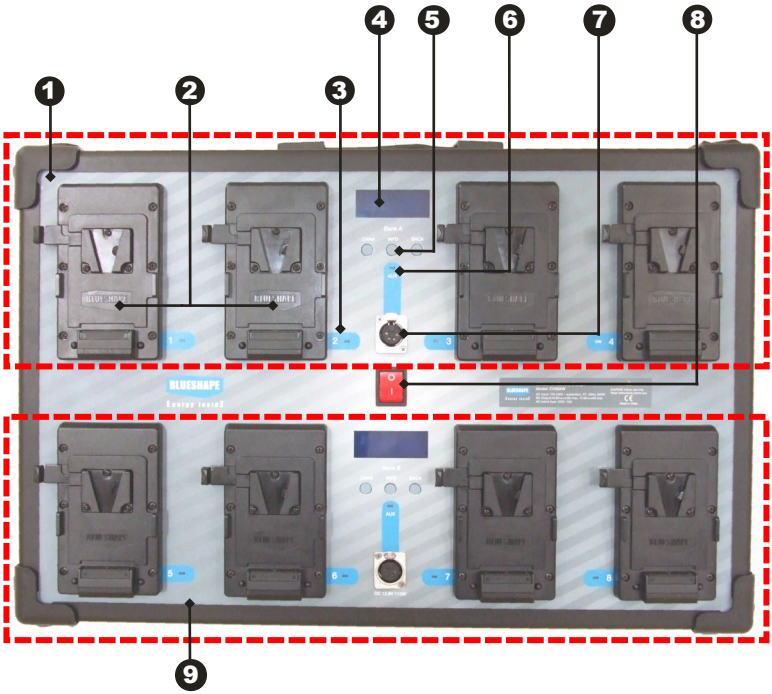
The user is being alerted of the importance of going through the literature accompanying this product and familiarising himself with the important safety and operating instructions, included.

BLUESHAPE CHARGERS ARE INTENDED FOR OPERATION WITH LINE VOLTAGES BETWEEN 100V AND 240V AC AND LINE FREQUENCIES BETWEEN 43Hz AND 60 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.

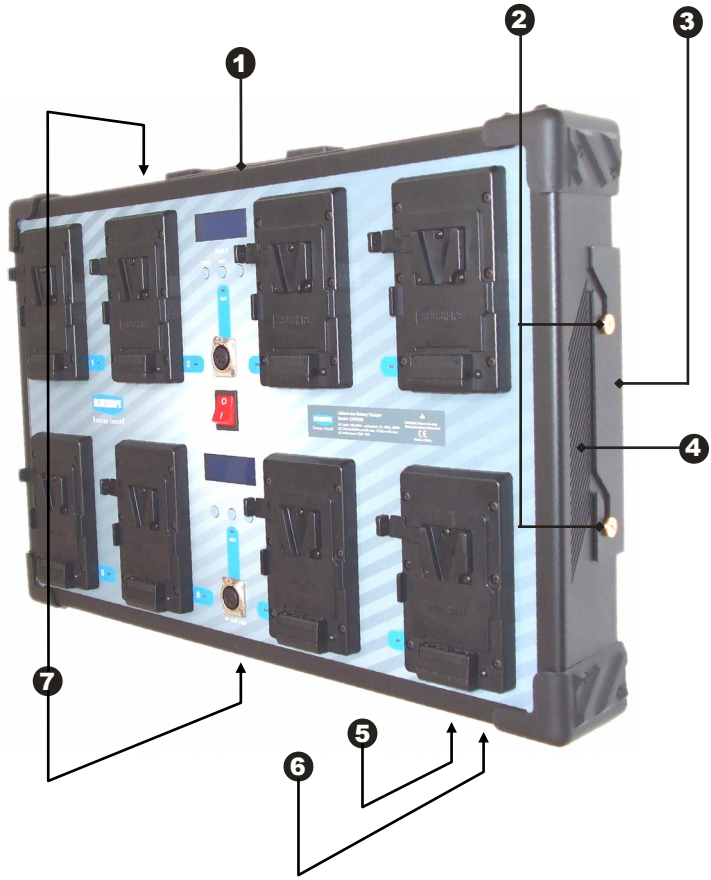
Package contents
- CVS8XW simultaneous eight position charger - Wall hanging bracket - AC power cord - Safety operating instructions - USB data cable to be used with BSCVMon software downloadable from our website at the following address: http://www.blueshape.net/index.php/products/software/bscvmon.html

CVS8XW graphic description – Front view



1. Upper Bank-A (channels from #1 to #4)
2. Battery charging bays
3. Battery LED indicators (see page 15 for explanation)
4. LCD display
5. LCD keys
6. AUX output LED indicator (see page 16 for explanation)
7. AUX output connector (13.8V 110W)
8. Mains switch
9. Lower Bank-B (channels from #5 to #8)

CVS8XW graphic description – Side View

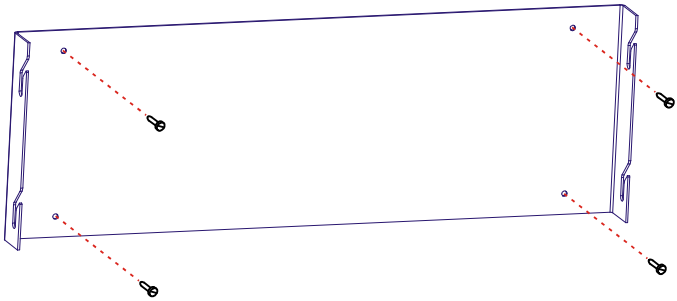


1. Carrying handle
2. Supporting lateral studs
3. Wall mount bracket (see page 6 for explanation)
4. Ventilation inlets
5. Data connector
6. AC Mains input, 100V-240V
7. Ventilation outlets

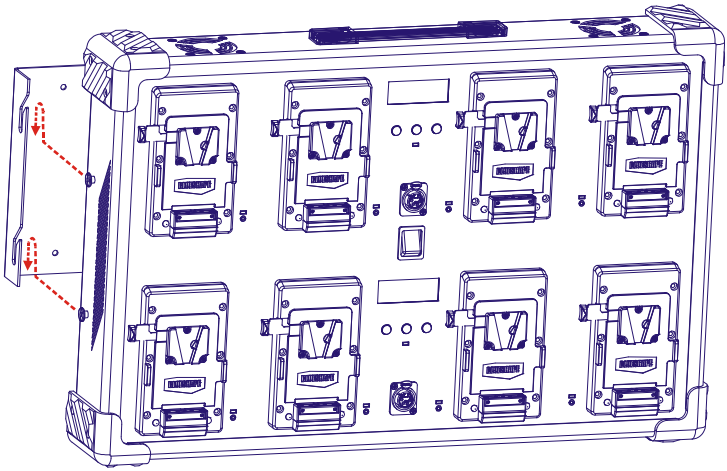
Installation

This charger is designed to ideally be installed on a wall.
We suggest you identify a suitable site, where the charger can be located allowing easy access and at the same time keeping the ventilation inlets free from obstruction:

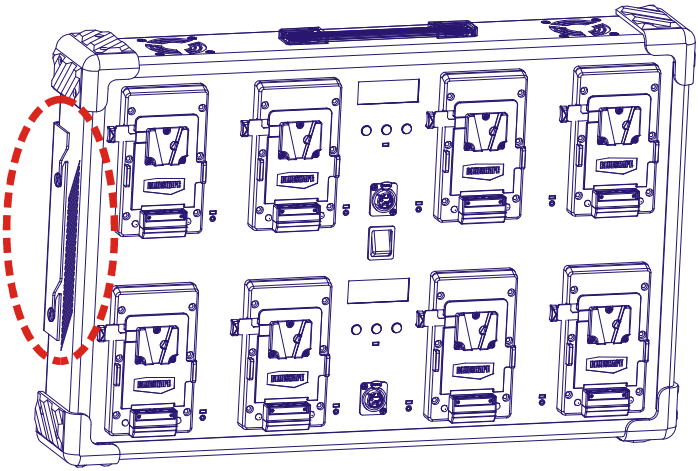
- proceed with the mounting bracket first:



- put the bracket against the wall, and mark the 4 holes
- screws and/or fittings are not included: choose proper screws or fittings to fix the bracket to the wall that are specially suited to the material in your wall and have sufficient holding power
- fix the bracket firmly tightening all the 4 screws
- lift the charger and align the 4 lateral golden studs with the corresponding slots on the mounting bracket



- slide the studs in the slots carefully, then lower the charger to seat it in its definitive position



- IMPORTANT- verify that that all the 4 studs are correctly and firmly inserted in the related slots
- connect the AC power cord
- if needed, connect the USB data cable to the PC **before switching-on the charger**, to allow a correct detection and initialization of the communication hardware.

The charger is now ready to operate.

Introduction

The BLUESHAPE series of intelligent lithium ion battery chargers has been specifically designed for fast and reliable charging of the BLUESHAPE V-lock battery range. All charger models are capable of delivering up to 4.8 Amps in constant current mode making them particularly suitable to users who require a fast turnaround from their batteries.
This charger has been designed for users having large fleets of batteries, and with a higher daily rotation; the wall mounting feature and the flat form factor makes it discrete and minimally intrusive in any installation.

Properties of the CVS8XW

- Elegant and robust design. Ideal for indoor use
- Sophisticated electronics for accurately detecting the charging state
- Simultaneous battery charging, truly 8 channels without the need of external adapters.
- Charging power optimisation for maximum charging performance
- Double colour LCD display and three-colour LED indicators for effective and comprehensive individual charge-station monitoring
- Pre-charge function for protecting heavily discharged cells against high currents until their voltages rise to a safe level.
- Maximum compactness and space utilisation
- IPCS and CTP Features *(see next pages)*
- Dual powerful auxiliary outputs at 13.8V / 110W through 4-pole XLRs
- USB connection to interface the CVS8XW with a PC: up to 4 chargers can be monitored by a single PC using **BSCVMon -** a custom Blueshape software for tracking and monitoring chargers and logging battery fleet history.
- Redundant electronic design with 4 power supplies for increased reliability.

Battery charging and performance features

The electronic circuitry provides a very accurate lithium ion charge algorithm. Initially, the charger will only apply a pre-charge current of a few milli-amperes to batteries that are heavily discharged. This same current enables the charger to detect the present battery state. Once the cells inside the batteries reach a safe level, the full (maximum) charging current is delivered until the battery reaches almost 80% state of charge. After this, a constant voltage phase begins with the charging current decaying slowly until full cut-off.

The following table describe the charging time (in minutes) with regards to battery model and number of batteries installed. The approximate charging time refers to charging batteries from empty.

Battery model	up to 4 batteries installed (all charging simultaneously)	more than 4 batteries installed (all charging simultaneously)
BV065	55	91
BV090	76	126
BV100HD	76	126
BV150	125	207
BV180	150	248
BV190HD	165	273
BV225	188	310
BV270HD	225	372

The 8 channels are paired in this way:
chan 1-2, chan 3-4, chan 5-6, chan 7-8.

To achieve the fastest charge performance, install only one battery on each pair of channels: in this way the charge current will reach approx. 4.9A per battery (but no more than 0.8C) achieving a shorter charge time.

Instead, if two batteries are installed on a pair of channels, the charge current will be reduced to 3A per battery (but no more than 0.8C).

IPCS and fast charging

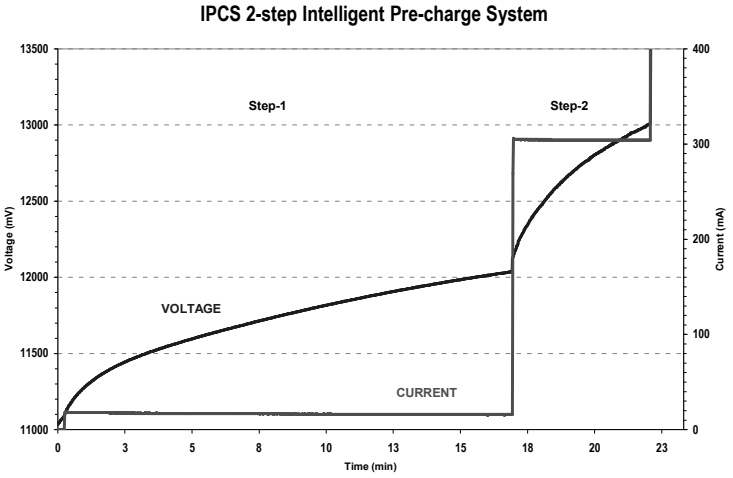
The CVS8XW charger, similarly to the other product of BLUESHAPE range, features the highest charging current for a Li-Ion charger in the broadcasting sector.
This results in currently the shortest possible battery charging time.

BLUESHAPE Li-Ion BV battery series allow fast charging due to several intrinsic features such as pre-charge protection and cell balancing; avoiding cell damage and life-cycle shortening, as demonstrated by the life-cycle performances.

Additionally, the CVS8XW charger supports and enhances these features with **IPCS**, a 2-step Intelligent Pre-Charge System.

Since fast charging can damage cells if not properly applied, especially with low voltage (discharged) cells, appropriate care must be taken. The 2-step procedure implemented by IPCS, initially boosts very low voltage cells to a state where charge can be applied with a medium-low current without damage, then starts to charge with a 300mA current for a while. Finally, when the pack reaches a reasonable voltage state, it speed-up the charge process by going to full throttle.

The operation implemented by IPCS is only applied if the prevailing cells-state need it, and normally takes a few minutes, depending on the state of discharge of the cells.
The operation implemented by IPCS is outlined in the chart below.



CTP: flexibility of operation and charger reliability

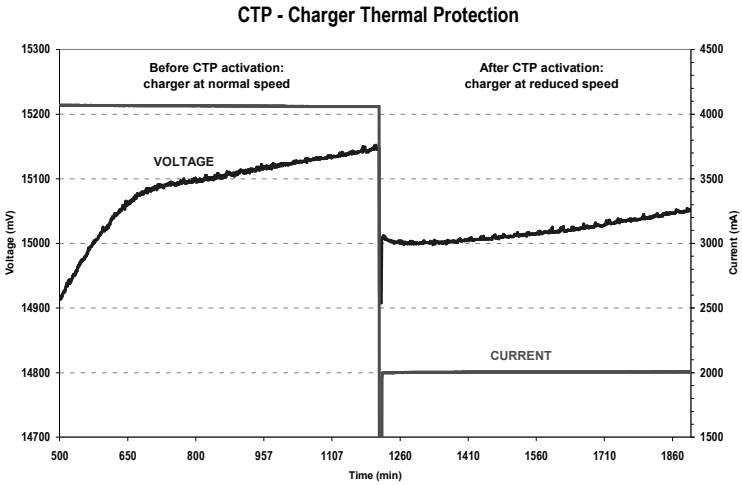
Due to the high charging currents developed by the CVS8XW charger, heat control is an issue for reliability and operational consistency, even in presence of an abundant air flow convection.

To improve the reliability of the device without compromising its usage flexibility, BLUESHAPE has developed an innovative feature; **CTP** (Charger Thermal Protection) that allows the electronics to work out the best possible charge profiles without causing damage, even in adverse temperature conditions.

In case of the charger internal temperature reaching a high level, the charging current is automatically reduced to avoid possible damage caused by internal overheating. When the charging speed is reduced, the internal temperature starts to descend. As soon as the temperature reaches a safe level, normal charging speed is resumed.

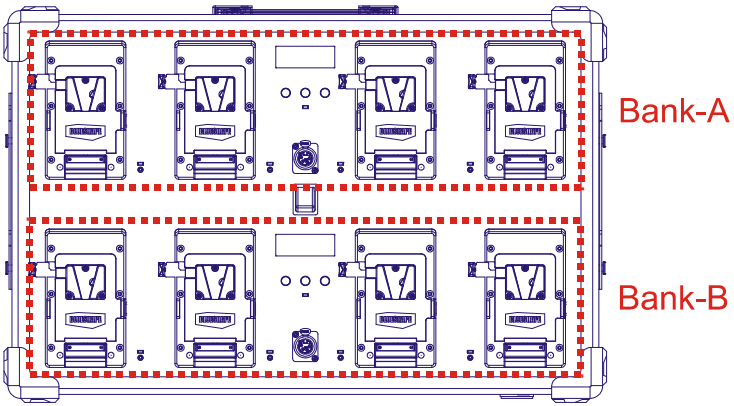
Through indoor usage, CTP features do not normally intervene (unless the air convection flow path is obstructed or the internal cooling fan is damaged).

The operation implemented by CTP is outlined in the chart below.



Operating Instructions

This charger can charge up to 8 batteries independently.
It is aptly divided into 2 sub-sections named: Bank-A (upper side) and Bank-B (lower side) - each bank having its own LCD display.



Bank-A is for channels 1-2-3-4 (from left through right)
Bank-B is for channels 5-6-7-8 (from left through right)

The two sections are totally independent, and each section features an auxiliary DC Output.

All channels are totally independent, implying that charging is managed simultaneously: each battery can be inserted and/or removed at any time without affecting the operation of the others.

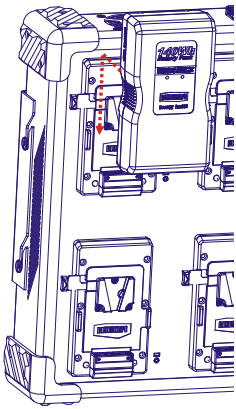
Procedure:

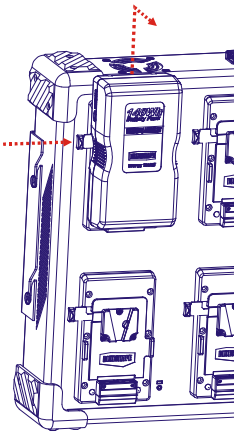
- Plug the AC power cord provided into the charger AC input
- If the user wants to connect the charger to the PC to analyse and log the battery data through BSCVMon, it is best done now before switching on the charger
- Plug and switch on the AC mains supply
- Insert batteries onto any one of the eight V-plate adapters as shown (see picture on the next page)
- Observe the LED. In addition, the charge status may be read in 20% steps through the BLUESHAPE battery LED array.
- Leave the battery to charge for the appropriate time (see table on page 9)
- Remove the battery when the LED becomes steady green as shown (see picture on next page)

Battery installation

Battery removal

CVS8XW





CVS8XW

Insert the battery in the direction of the arrow

1) Push and hold the button in the direction of the arrow
2) Pull out the battery in the direction of arrow

In the case when you want to charge more batteries, insert the additional batteries into the available V-plate adapters.

In the case when an external equipment is plugged into any of the two accessory XLRs, the charging process will be suspended only on the related channels: #3 and #4, if connected to XLR of Bank-A; #7 and #8, if connected to that of Bank-B.
The AUX LED will light up and the paused battery LEDs will show 'WAITING'. Once the accessory has been unplugged, the charger will resume the previous charging sequence and from the same point of interruption.

PLEASE NOTE THAT THE MAXIMUM LOAD THAT CAN BE CONNECTED TO ANY XLR OUTPUT MUST NOT EXCEED 110W.

ADDITIONAL SAFETY NOTES

Chargers and/or batteries may become hot during charging. This is normal. 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.
Never insert any metallic or any other objects inside the equipment through the ventilation openings or otherwise.

LCD indications and usage

Each LCD displays up to 2 pages of information divided as follows:

Bank-A	Bank-B
page 1: details for Batteries 1~4 page 2: AUX port information	page 1: details for Batteries 5~8 page 2: AUX port information

To browse between the pages, press the 'CHAN' button.
Pressing at anytime, the 'BACK' button returns the user to the initial page.

Page 1:
In these pages the information display show a summary of the batteries in charge with these info always visible:

- the battery state of charge in percentage
- the remaining charge time in minutes
- a verbose indication of the battery status

Please note that when batteries other than BLUESHAPE are installed, the information displayed may not be accurate.

Bank-A

```
B1: 55% 123m Charge
B2: no battery
B3: no battery
B4:100%   -  Full
```

Bank-B

```
B5: no battery
B6: no battery
B7: no battery
B8: no battery
```

Pressing the 'INFO' button permits a detailed view of each battery, scrolling cyclically from 1 to 4 (for Bank-A) and from 5 to 8 (for Bank-B). Pressing at anytime, the 'BACK' button returns the user to the previous screen. The picture below shows a display example:

```
B1: 55% 123m Charge
V:15234mV   I:4820mA
T: 24C V12:3808-3815
N:134c V34:3799-3803
```

Explanation:

row #1	▪ the battery state of charge in percentage ▪ the remaining charge time in minutes ▪ a verbose indication of the battery status
row #2	▪ V: Battery voltage ▪ I: Charging current
row #3	▪ T: Battery temperature ▪ V12: Voltage of cell #1 and cell #2
row #4	▪ N: Number of charge/discharge cycles already elapsed ▪ V34: Voltage of cell #3 and cell #4

If errors occur during charge, the explanation is given in the battery detail page as described in the following table.

Err #	Explanation
01	Battery with wrong ID. Charge not allowed. The battery has a wrong ID resistor (not in the range 10Kohm ~ 60Kohm) and is not enabled to charge.
02	Battery failure: the battery does not accept any charge. A generic battery failure: It means that the charger was expecting the battery to charge, but it didn't Possible reasons are: 1) a real battery failure in the battery: - electrical failure: something is disconnected internally, maybe after a crash - software failure: the battery has the safety settings locked down and need to be reset (by BSMON) 2) a temporary safety protection activated 3) the battery is almost full and the charger attempt to charge it without success: in this case discharge the battery a bit more in order to start a new charging session. The reason of the failure is usually described on the charger display
03	Battery Voltage too low. Charge is not allowed. The pack voltage is below 8V and is dangerous to attempt a charge.
04	Timeout error in the charge session. The battery does not terminated the charge in the expected time. This error may occur charging pack with large capacity. In this case simply remove the battery and install again to reset the timer and start a new session until the battery is full.
05	Premature charge termination. The charge process has terminated unexpectedly. This error means that the battery started charging but suddenly stopped. It may be a temporary inability of the charger to charge, or the battery went in to a temporary protection state. Perhaps it could be that some cell has a voltage too high, and during the charge process this would cause the pack protection safety to trip in order to avoid dangerous overvoltage conditions. When this error occurs, the charge session is reset every minute, and the charge is re-attempted. This error occur also when a battery too hot (> 45°C) or too cold (usually < 0°C) is inserted on the charger: in this case the session does not stop but the charger retry automatically every 30 seconds until the battery allow charging.

Page 2

This page shows detailed information on the status of the AUX port - the actual output voltage, the actual current and the power supplied to the connected device if any.
The pictures below show some display examples:

Pressing the 'INFO' button further details are shown:

Explanation:

row #2	Charger model
row #3	Serial number
row #4	Firmware version for LCD control unit (1°) and charger boards (2° and 3°)

Battery LED indications

#	OPERATING MODE	TIMEOUT	LED INDICATION
1	BATTERY DETECTION Battery detected while the other on the same pair is already charging		**BATTERY WAITING:** GREEN: 1sec ON/1sec OFF
2	BATTERY NOT ALLOWED 10Kohm < ID resistor < 60Kohm		**BATTERY NOT ALLOWED:** GREEN: 500ms/RED: 500ms
3	BATTERY EVALUATION i) Total pack voltage < 8000mV ii) I < 10mA If the charging does not rise within 30sec, the battery does not accept charge iii) Single cell voltages < 2800mV 10mA < I < 50mA iv) Single cell voltages > 2800mV Total pack voltage < 13000mV 50mA < I < 300mA	 3600sec 1200sec	 **VOLTAGE TOO LOW:** RED flashing 500ms ON/500ms OFF **BATTERY FAILURE:** Steady RED **PRECHARGE-1:** ORANGE flashing 500ms ON/500ms OFF **PRECHARGE-2:** ORANGE flashing 250ms ON/250ms OFF
4	CONSTANT CURRENT MODE 13000mV < V < 16750, I = max 4.9A	18000sec	**CC-MODE:** Steady ORANGE
5	CONSTANT VOLTAGE MODE V >16750mV 150mA < I < 4900mA	10800sec	**CV-MODE:** ORANGE 500ms/ GREEN 500ms
6	FULL CHARGE V ≅ 16800mV I ≅ 150mA		**FULL CHARGE:** Steady GREEN
7	OTHER INDICATIONS In the case of premature charge termination, the charger retries to charge the battery every 30 seconds. If after 10 minutes, there is still no response, the indication is changed into 'BATTERY FAILURE'		**PREMATURE CHARGE TERMINATION:** RED: 250ms ON/100ms OFF / 250ms ON /1sec OFF (2 blinks + 1 pause) **BATTERY FAILURE:** Steady RED

AUX output LED indications

#	OPERATING MODE	LED INDICATION
1	The AUX output is correctly powered up: 10mA < I < 8.2A	**AUX OK:** AUX LED Steady GREEN
2	The AUX is self-protected if a load is connected and an excessive current is absorbed: I > 8.2A	**SHORT-CIRCUIT:** AUX LED Steady ORANGE
3	An Overload condition may occur when the AUX is powered up and an excessive current is drained as follow: i) 8.2A < I < 9.5A, for 30sec ii) 9.5A < I < 13A, for 1sec iii) I > 13A	 **OVERLOAD1:** AUX LED+BAT2+BAT4 Steady RED **OVERLOAD2:** AUX LED Steady RED **OVERLOAD3:** AUX LED Steady ORANGE

Technical specifications

Type	Constant current and voltage control system with timer interventions
CC-MODE: Output current	4900mA ± 1%
CC-MODE: Vmax	16800 ± 50mV (0.3%)
CV-MODE: Vmax	16800 ± 50mV (0.3%)
CV-MODE: Cutoff current	150mA ± 10mA
Short circuit protection	Available
Overcharge protection	Available
Overtemperature protection	Available
LEDS	3 colour type for BAT1~BAT8 and AUX
LCD	2x 20x4 Blue/White backlight
Special features	IPCS and CTP
Auxiliary power	2x 13.8V 110W (max)
Power supply	AC mains 100V - 240V ~, 47 - 63 Hz autoselect
Fuse	1 x 220V 2.5A (5x20mm quick blow) + 1 spare
Power consumption	200W max / 180W typical
Operating temperature range	0°C - 45°C
Storage temperature range	-20°C - 65°C (-4°F - 149°F)
Dimensions	620 x 410 x 110 mm
Weight	9.7 Kg

The CE certification process is underway.

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.

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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