



8-STAGE AUTOMATIC

# **BATTERY CHARGER**

MCU CONTROLLED & HIGH FREQUENCY SWITCHMODE



P/No. MFC1205L, MFC1207L, MFC1210L, MFC1212L,  
MFC1215L, MFC1220L, MFC2405L, MFC2410L

**Instruction Manual**

Please read user manual carefully before use.



## 1. WARNING

- ◆ Explosive gases may escape from the battery during charging. Prevent flames and sparks. Provide adequate ventilation.
- ◆ Before charging, read the instructions.
- ◆ For indoor use. Do not expose to rain.
- ◆ For charging 12V/24V Lithium-ion with LiFePO<sub>4</sub> batteries and Lead Acid batteries ONLY.
- ◆ Disconnect the 110V/220-240V AC mains supply before making or breaking the connections to the battery.
- ◆ The battery charger must be plugged into an earthed socket-outlet.
- ◆ Connection to supply mains is to be in accordance with National wiring rules.
- ◆ Do not attempt to charge non-rechargeable batteries.
- ◆ Never charge a frozen battery.
- ◆ If the AC cord is damaged do not attempt to use. It must be replaced or repaired by a qualified person.
- ◆ Corrosive substances may escape from the battery during charging and damage delicate surfaces. Store and charge in a suitable area.
- ◆ Ensure all vehicle accessories including lights, heaters, appliances etc are turned off prior to charging
- ◆ This appliance is not intended for use by young children or infirm persons unless they have been adequately supervised by a responsible person to ensure that they can use the appliance safely.
- ◆ Young children should be supervised to ensure that they do not play with the appliance.

## 2. FEATURES

### 8-STAGE AUTOMATIC CHARGING

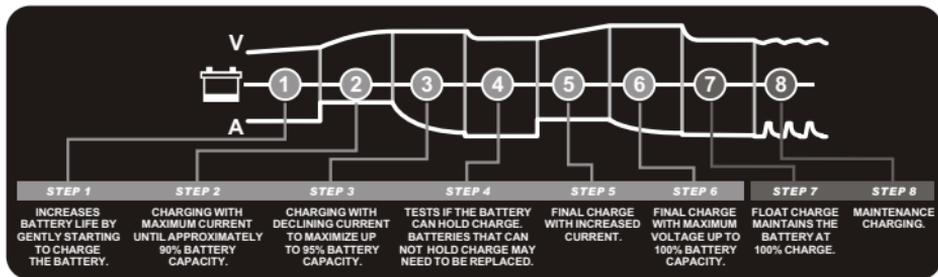
This is a fully automatic battery charger with 8 charge stages.

Automatic charging protects your battery from being overcharged. So you can leave the charger connected to the battery indefinitely.

8-stage charging is a very comprehensive and accurate charging process that gives your battery longer life and better performance compared to using traditional chargers.

8-stage chargers are suitable for most battery types including LITHIUM, GEL, AGM, WET, MF and CALCIUM batteries. They may also help restore drained and sulphated batteries.

The Lithium battery mode 8 stages are: Soft Start, Bulk, Absorption, Analyse, Completion, Maximization, Float and Maintain.



|                                |   | LIMIT   |
|--------------------------------|---|---|
| <b>STEP 1<br/>SOFT START</b>   | 25% Current until 11V/22V                                       | Max 30s   |
| <b>STEP 2<br/>BULK</b>         | 100% Current until 13.8V/27.6V                                  | Max 10h   |
| <b>STEP 3<br/>ABSORPTION</b>   | Constant 13.8V/27.6V until current drops to 15%                 | 30 minutes                                      |
| <b>STEP 4<br/>ANALYSE</b>      | Checks if voltage drops to 12V/24V                              | 3 minutes                                       |
| <b>STEP 5<br/>COMPLETION</b>   | 30% Current until 14.5V/29V                                     |   |
| <b>STEP 6<br/>MAXIMIZATION</b> | Constant 14.5V/29V until current drops to 15%                   | 30 minutes                                      |
| <b>STEP 7<br/>FLOAT</b>        | 13.6V/27.2V, 100% Current                                       | 10 days Charge cycle restarts if voltage drops* |
| <b>STEP 8<br/>MAINTAIN</b>     | During 13.0V-13.8V/26.0V-27.6V, the current control at 100%~20% | Charge cycle restarts if voltage drops          |

## STEP 1 SOFT START

A preliminary charge processes that gently introduces power to the battery. This protects the battery and increases battery life.

## STEP 2 BULK

Charging with maximum current until approximately 90% battery capacity.

Bulk mode for the charging cycle. The start phase continues until the battery's terminal voltage has risen above the set limit, at which point the charger switches to bulk charging. If the terminal voltage has not passed the voltage limit within the time limit, the charger switches to fault mode (Step 2 lamp solid) and discontinues the charging. If so, the battery is faulty or its capacity is too large.

### STEP 3 ABSORPTION

Charging with declining current to maximize up to 95% battery capacity.

### STEP 4 ANALYSE

Tests if the battery can hold charge. Batteries that can not hold charge may need to be replaced.

### STEP 5 COMPLETION

Final charge with increased current.

### STEP 6 MAXIMIZATION

Final charge with maximum voltage up to 100% battery capacity.

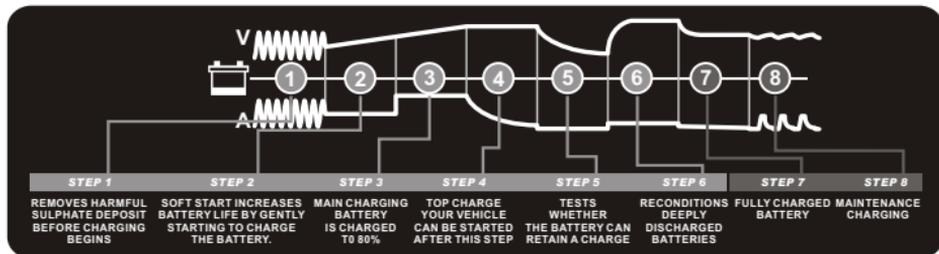
### STEP 7 FLOAT

The Float stage maintains the battery at 100% charge without overcharging or damaging the battery. This means the charger can be left connected to the battery indefinitely.

### STEP 8 MAINTAIN

Maintaining the battery at 95 -100% capacity. The charger monitors the battery voltage and gives a maintain when necessary to keep the battery fully charged.

The Lead Acid battery mode (Including GEL, AGM, WET, MF and CALCIUM) 8 stages are: Desulphation, Soft Start, Bulk, Absorption, Analyse, Recondition, Float and Pulse



|                          | <b>SMALL</b>  | <b>NORMAL</b>   | <b>COLD</b> ❄️  | <b>RECOND</b>   | <b>LIMIT</b>                                    |
|--------------------------|---|---|---|---|---|
| <b>1</b><br>DESULPHATION | 11V   | 11V/22V   | 11V/22V   | 11V/22V   | Max 8h  |
| <b>2</b><br>SOFT START   | Half the rated until 12.5V  | Half the rated until 12.5V/25V                                    | Half the rated until 12.5V/25V                                    | Half the rated until 12.5V/25V                                    | Max 8h  |
| <b>3</b><br>BULK         | 100% Current until 14.4V  | 100% Current until 14.4V/28.8V                                    | 100% Current until 14.7V/29.4V                                    | 100% Current until 14.4V/28.8V                                    | Max 24h   |
| <b>4</b><br>ABSORPTION   | Constant 14.4V until current drops to 15%   | Constant 14.4V/28.8V until current drops to 15%                   | Constant 14.7V/29.4V until current drops to 15%                   | Constant 14.4V/28.8V until current drops to 15%                   | 30 minutes                                      |
| <b>5</b><br>ANALYSE      | Checks if voltage drops to 12V  | Checks if voltage drops to 12V/24V                                | Checks if voltage drops to 12V/24V                                | Checks if voltage drops to 12V/24V                                | 3 minutes                                       |
| <b>6</b><br>RECONDITION  |   |   |   | Constant current (15%) limited to 16V/32V                         | 30 mins or 4h depending on battery voltage      |
| <b>7</b><br>FLOAT        | 13.7V 100% Current  | 13.7 V/27.4V 100% Current   | 13.7V/27.4V 100% Current  | 13.7V/27.4V 100% Current  | 10 days Charge cycle restarts if voltage drops* |
| <b>8</b><br>PULSE        | During 12.6V -14.4V, the current control at 0.8-0.4A  | During 12.6V -14.4V/25.2V -28.8V, the current control at 100%~20% | During 12.6V -14.7V/25.2V -29.4V, the current control at 100%~20% | During 12.6V -14.4V/25.2V -28.8V, the current control at 100%~20% | Charge cycle restarts if voltage drops          |

\***SMALL** - This mode only for MFC1205L

\***NIGHT** - This mode is equal to **NORMAL**, but with reduced current

## Desulphation

The Desulphation stage may break down sulphation that occurs in batteries that have been left flat for extended periods of time, returning them back to full charge. Sulphation occurs when lead-sulphate hardens and clogs up the battery cells.

## Soft Start

A preliminary charge process that gently introduces power to the battery. This protects the battery and increases battery life.

## **Bulk (Constant Current)**

Charging with maximum current until approximately 80% battery capacity. Bulk mode for the charging cycle. The start phase continues until the battery's terminal voltage has risen above the set limit, at which point the charger switches to bulk charging. If the terminal voltage has not passed the voltage limit within the time limit, the charger switches to fault mode (Step 3 lamp solid) and discontinues the charging. If so, the battery is faulty or its capacity is too large.

## **Absorption (Constant Voltage)**

Charging with declining current to maximize up to 100% battery capacity.

## **Analyse**

Tests the battery whether can save power, if unable battery may need replacing.

## **Recondition**

Choose the Recond program to add the Recond step to the charging process. During the Recond step voltage increases to create controlled gassing in the battery. Gassing mixes the battery acid and gives back energy to the battery.

This recondition stage can recover batteries from a deeply discharged state increasing performance and battery life.

RECOND - This mode is used to recover deep discharged flooded batteries where you could expect a stratified acid (high acid weight in the bottom, low on top). Check with battery manufacturer when in doubt.

Use this mode with care, because the high voltage will cause some water loss. 16V/32V is normally no problem for electronics in 12V/24V system. Consult your supplier when in doubt. Life of light bulbs will be reduced at higher voltage. Try to disconnect light from the battery during this phase. Maximum effect and minimum risk for electronics is achieved by charging a disconnected battery.

## **Float**

The Float stage maintains the battery at 100% charge without overcharging or damaging the battery. This means the charger can be left connected to the battery indefinitely.

## **Pulse**

Maintaining the battery at 95 - 100% capacity. The charger monitors the battery voltage and gives a pulse when necessary to keep the battery fully charged.

The AUTOMATIC BATTERY CHARGER has an 8-step fully automatic charging cycle, the cycle is repeated infinitely. If the terminal voltage drops below a lower limit, the charger automatically goes back to the beginning of the charging curve.

### 3. SWITCHMODE TECHNOLOGY

Using the latest technology in battery chargers, switch mode chargers convert 110V/220-240V AC power to 12V/24V DC power using electronic components unlike traditional battery chargers that rely on heavy transformers. This allows the charger to be light weight and compact without sacrificing on performance.

### 4. PROTECTIVE FEATURES

#### **POLARITY PROTECTION**

Prevents the output leads from sparking due to accidental reverse connection or short circuit, making the charger safer to use around batteries.

#### **OUTPUT SHORT PROTECTION**

Short circuit connection of the clips: Check clips are not touching each other  
OR Check the clips are correctly connected to the battery.

#### **NON BATTERY LINK PROTECTION**

If battery charger connects with non battery load, it will go into protection state.

#### **DISCONNECT PROTECTION**

The charger has entered the energy save mode. This happens if the charger isn't connected to the battery in 2 minutes.

#### **OVER VOLTAGE PROTECTION**

##### **Lithium battery mode**

The 12V lithium battery charger will automatically protection if the voltage is higher than 15.5V.

The 24V lithium battery charger will automatically protection if the voltage is higher than 31V.

##### **Lead Acid battery mode (Including GEL, AGM, WET, MF and CALCIUM)**

The 12V lead acid charger will automatically protection if the voltage is higher than 17.5V.

The 24V lead acid charger will automatically protection if the voltage is higher than 35V.

#### **OVER TEMPERATURE PROTECTION**

Internal temperature is above 65°C +/- 5°C

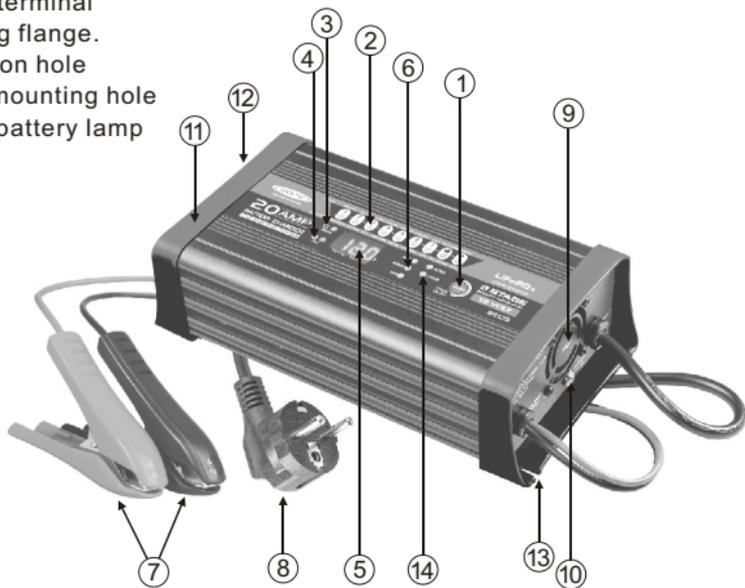
#### **COOLING FAN**

The charger is fitted with a thermostatically controlled fan to cool onboard electronics and maintain charging performance. The cooling fan will engage automatically when there is a high load on the battery or there is sufficient heat build up.

## 5. PRODUCT OVERVIEW

The 8-stage automatic charging consists of the following components:

- 1.Mode button
- 2.Stage lamp status display indicates power, charging and fully charged.
- 3.Power lamp
- 4.Fault Led
- 5.Output voltage meter
- 6.Charging mode
- 7.DC leads.
- 8.Power Cord
- 9.Thermostatically controlled cooling fan
- 10.Ground terminal
- 11.Mounting flange.
- 12.Ventilation hole
- 13.3.5mm mounting hole
- 14.Lithium battery lamp



### REMARK:

1. NIGHT - The "NIGHT" mode will fail in the event of a power failure and also the charger is disconnected with the battery. Next time use this function to be reset.
2. Night - Charging with reduced power and almost silent fan for 8 hours.
3. If you want to cancel the "NIGHT" function, press the mode button to cancel until "NIGHT" indicator quenches.

## 6. CHARGE STATUS INDICATOR

The LITHIUM BATTERY CHARGING and STAGE LAMP will illuminate and flash in various patterns to indicate the different stages of charging. See below for flash / steady patterns.

|                                    | Power on lamp   | Stage lamp      | Fault lamp | LED display  |          |
|------------------------------------|-----------------|-----------------|------------|--------------|----------|
| Power Off                          | —               | —               | —          | —            |          |
| Power On                           | ●               | —               | —          | 0.0          |          |
| Stage                              | 1. Soft Start   | ●               | ☀ / ●      | —            | Out volt |
|                                    | 2. Bulk         | ●               | ☀ / ●      | —            |          |
|                                    | 3. Absorption   | ●               | ☀ / ●      | —            |          |
|                                    | 4. Analyse      | ●               | ☀ / ●      | —            |          |
|                                    | 5. Completion   | ●               | ☀ / ●      | —            |          |
|                                    | 6. Maximization | ●               | ☀ / ●      | —            |          |
|                                    | 7. Float        | ●               | ☀ / ●      | —            |          |
|                                    | 👍 Fully Charged | ●               | ☀ / ●      | —            |          |
|                                    | 8. Maintain     | ●               | ☀ / ●      | —            |          |
| Non Battery Link Protection        | ●               | —               | —          | 0.0          |          |
| Output Short Protection            | ●               | —               | ☀          | - U -        |          |
| Output Polarity Reverse Protection | ●               | —               | ☀          |              |          |
| Disconnect Protection              | ☀               | —               | —          | 0.0          |          |
| Over Voltage Protection            | ●               | —               | ☀          | - U -        |          |
| Not accept charge                  | ●               | ☀ (Step 1 Lamp) | ●          | Battery volt |          |
| Faulty Battery                     | ●               | ☀ (Step 2 Lamp) | ●          |              |          |
| Can not keep charge                | ●               | ☀ (Step 4 Lamp) | ●          |              |          |
| Battery Charge Fully               | ●               | ● (Fully lamp)  | —          |              |          |
| Thermal Protection                 | ●               | —               | ☀          | - t -        |          |

**Note:** ● : (Solid) ☀ : (Flashing) — : (EXTINGUISH)

**STAGE LAMP:** illuminates and flashes when 8-stage charging process.

**STAGE LAMP:** illuminates solid when fully charged.

## **POWER ON LAMP**

If the power lamp is lit with a:

### **1. STEADY LIGHT**

The mains cable is connected to the wall socket.

### **2. FLASHING LIGHT**

The charger has entered the energy save mode. This happens if the charger isn't connected to the battery in 2 minutes.

## **FAULT LAMP STEADY LIGHT**

If the fault lamp is lit solid, check the following:

Has charging been interrupted in STEP 1, 2, or 4?

Restart the charger by pressing the MODE-button. If charging is still being interrupted, the battery.

STEP 1: ...cannot accept charge and may need to be replaced.

STEP 2: ...battery is faulty and may need to be replaced. (Bulk charging has timed out and stopped after 10 hours.)

STEP 4: ...cannot keep charge and may need to be replaced.

## **FAULT LAMP FLASHING LIGHT**

★ Charger's internal temperature is higher than  $65^{\circ}\text{C} \pm 5^{\circ}\text{C}$

The Lead Acid battery CHARGING and STAGELAMP will illuminate and flash in various patterns to indicate the different stages of charging. See below for flash / steady patterns.

|                                    |                 | Power on lamp | Stage lamp      | Fault lamp | LED display  |
|------------------------------------|-----------------|---------------|-----------------|------------|--------------|
| Power Off                          |                 | —             | —               | —          | —            |
| Power On                           |                 | ☀             | ☀               | ☀          | —            |
| Power On                           |                 | ●             | —               | —          | 0.0          |
| Stage                              | 1. Desulphation | ●             | ☀ / ●           | —          | Out volt     |
|                                    | 2. Soft Start   | ●             | ☀ / ●           | —          |              |
|                                    | 3. Bulk         | ●             | ☀ / ●           | —          |              |
|                                    | 4. Absorption   | ●             | ☀ / ●           | —          |              |
|                                    | 5. Analyse      | ●             | ☀ / ●           | —          |              |
|                                    | 6. Recondition  | ●             | ☀ / ●           | —          |              |
|                                    | 7. Float        | ●             | ☀ / ●           | —          |              |
|                                    | 8. Pulse        | ●             | ●               | —          |              |
| Non Battery Link Protection        |                 | ●             | —               | —          | 0.0          |
| Output Short Protection            |                 | ●             | —               | —          |              |
| Output Polarity Reverse Protection |                 | ●             | —               | —          |              |
| Disconnect Protection              |                 | ☀             | —               | —          |              |
| Over Voltage Protection            |                 | ●             | —               | ☀          | - U -        |
| Is seriously sulphated             |                 | ●             | ☀ (Step 1 Lamp) | ●          | Battery volt |
| Not accept charge                  |                 | ●             | ☀ (Step 2 Lamp) | ●          |              |
| Faulty Battery                     |                 | ●             | ☀ (Step 3 Lamp) | ●          |              |
| Not keep charge                    |                 | ●             | ☀ (Step 5 Lamp) | ●          |              |
| Battery Charge Fully               |                 | ●             | ● (Fully lamp)  | —          |              |
| Thermal Protection                 |                 | ●             | —               | ☀          | - t -        |

**Note:** ● : (Solid) ☀ : (Flashing) — : (EXTINGUISH)

**STAGE LAMP:** illuminates and flashes when 8-stage charging process.

**STAGE LAMP:** illuminates solid when fully charged.

## **POWER ON LAMP**

If the power lamp is lit with a:

### 1. STEADY LIGHT

The mains cable is connected to the wall socket.

### 2. FLASHING LIGHT

The charger has entered the energy save mode. This happens if the charger isn't connected to the battery in 2 minutes.

## **FAULT LAMP STEADY LIGHT**

If the fault lamp is lit solid, check the following:

Has charging been interrupted in STEP 1, 2, 3 or 5?

Restart the charger by pressing the MODE-button. If charging is still being interrupted, the battery.

STEP 1: ...is seriously sulphated and may need to be replaced.

STEP 2: ...cannot accept charge and may need to be replaced.

STEP 3: ...battery is faulty and may need to be replaced. (Bulk charging has timed out and stopped after 24 hours.)

STEP 5: ...cannot keep charge and may need to be replaced.

## **FAULT LAMP FLASHING LIGHT**

★ Charger's internal temperature is higher than 65°C +/- 5°C

## 7. SPECIFICATIONS

| P/No.                         | MFC 1205L  | MFC 1207L  | MFC 1210L  |
|-------------------------------|--|--|--|
| Charger Type                  | 8-Stage automatic  |  |  |
| Input Voltage                 | <input type="checkbox"/> 220-240V~, 50/60Hz  | <input type="checkbox"/> 110V~, 60Hz   |  |
| Input Power                   | 154W   | 215W   | 307W   |
| Output Voltage                | 12V DC   | 12V DC   | 12V DC   |
| Output Current                | 5A   | 7A   | 10A  |
| Minimum Start Voltage         | Lead Acid: 2.0V Lithium: 1.0V  |  |  |
| Back Drain                    | 4mA  |  |  |
| Current Fuse Rating           | T3.15A, 250V AC  |  |  |
| <b>CHARGE CONTROL</b>         |  |  |  |
| Desulphation                  | Pulse charge up to 11V   |  |  |
| Soft Start                    | Half the rated set current upto 12.5V  |  |  |
| Bulk                          | 5A up to 14.4V/0.8A(SMALL)<br>14.4V(NORMAL)<br>14.7V(COLD)<br>14.4V(RECONDITION)                                       | 7A up to 14.4V(NIGHT)<br>14.4V(NORMAL)<br>14.7V(COLD)<br>14.4V(RECONDITION)  | 10A up to 14.4V(NIGHT)<br>14.4V(NORMAL)<br>14.7V(COLD)<br>14.4V(RECONDITION)   |
| Absorption                    | Constant voltage until current drops to 0.75A  | Constant voltage until current drops to 1.05A  | Constant voltage until current drops to 1.5A   |
| Analyse                       | Monitors voltage for 3 minutes   |  |  |
| Recondition                   | Max 16V / 0.75A for 30 mins or 4h depending on battery voltage   | Max 16V / 1.05A for 30 mins or 4h depending on battery voltage   | Max 16V / 1.5A for 30 mins or 4h depending on battery voltage  |
| Float                         | 13.7V also with pulse feature  |  |  |
| Pulse                         | 12.6V-14.4V,0.8-0.4A(SMALL)<br>12.6V- 14.4V, 5-1A(NORMAL)<br>12.6V- 14.7V, 5-1A(COLD)<br>12.6V-14.4V,5-1A(RECONDITION) | 12.6V- 14.4V, 7-1.4A(NIGHT)<br>12.6V- 14.4V, 7-1.4A(NORMAL)<br>12.6V- 14.7V, 7-1.4A(COLD)<br>12.6V- 14.4V, 7-1.4A(RECONDITION) | 12.6V- 14.4V, 10-2A(NIGHT)<br>12.6V- 14.4V, 10-2A(NORMAL)<br>12.6V- 14.7V, 10-2A(COLD)<br>12.6V- 14.4V, 10-2A(RECONDITION) |
| Over Voltage Protection       | The 12V lead acid charger will automatically protection if the voltage is higher than 17.5V                            |  |  |
| <b>CHARGE CONTROL LITHIUM</b> |  |  |  |
| Soft Start                    | 25% Current until 11V  |  |  |
| Bulk                          | 5A up to 13.8V   | 7A up to 13.8V   | 10A up to 13.8V  |
| Absorption                    | Constant voltage until current drops to 0.75A  | Constant voltage until current drops to 1.05A  | Constant voltage until current drops to 1.5A   |
| Analyse                       | Monitors voltage for 3 minutes   |  |  |
| Completion                    | 1.5A Current until 14.5V   | 2.1A Current until 14.5V   | 3A Current until 14.5V   |
| Maximization                  | Constant 14.5V until current drops to 0.75A  | Constant 14.5V until current drops to 1.05A  | Constant 14.5V until current drops to 1.5A   |
| Float                         | 13.6V, 100% Current  |  |  |
| Maintain                      | 13.0V-13.8V, 5-1A  | 13.0V-13.8V, 7-1.4A  | 13.0V-13.8V, 10-2A   |
| Over Voltage Protection       | The 12V lithium charger will automatically protection if the voltage is higher than 15.5V.                             |  |  |
| <b>BATTERY RANGE</b>          |  |  |  |
| Deep Cycle                    | 35-100Ah   | 50-140Ah   | 70-200Ah   |
| Lithium                       | 10-50Ah  | 14-70Ah  | 20-100Ah   |
| Types of Batteries            | Most types of 12V Lithium-ion LiFePO4 batteries and Lead Acid batteries including WET, MF, Calcium, AGM and GEL        |  |  |
| Efficiency                    | App.85%  |  |  |
| Thermal Protect               | 65°C+/-5°C   |  |  |
| Cooling Fan                   | Automatic temperature controlled   |  |  |
| Ambient temperature           | -20°C to +50°C, output power is reduced automatically at high temperatures   |  |  |
| Dimension (L×W×H)             | 197×116×62mm   | 197×116×62mm   | 197×116×62mm   |
| Weight                        | 1.05Kg   | 1.05Kg   | 1.1Kg  |

\*Specifications are subjected to change without prior notice.

## 8. SPECIFICATIONS

| P/No.                         | MFC 1212L   | MFC 1215L  | MFC 1220L  |
|-------------------------------|---|--|--|
| Charger Type                  | 8-Stage automatic   |  |  |
| Input Voltage                 | <input type="checkbox"/> 220-240V~, 50/60Hz   | <input type="checkbox"/> 110V~, 60Hz   |  |
| Input Power                   | 332W  | 415W   | 554W   |
| Output Voltage                | 12V DC  | 12V DC   | 12V DC   |
| Output Current                | 12A   | 15A  | 20A  |
| Minimum Start Voltage         | Lead Acid: 2.0V Lithium: 1.0V   |  |  |
| Back Drain                    | 4mA   |  |  |
| Current Fuse Rating           | T3.15A, 250V AC   | <input type="checkbox"/> T3.15A, 250V AC<br><input type="checkbox"/> T5A, 250V AC  | <input type="checkbox"/> T5A, 250V AC<br><input type="checkbox"/> T6.3A, 250V AC   |
| <b>CHARGE CONTROL</b>         |   |  |  |
| Desulphation                  | Pulse charge up to 11V  |  |  |
| Soft Start                    | Half the rated set current upto 12.5V   |  |  |
| Bulk                          | 12A up to 14.4V(NIGHT)<br>14.4V(NORMAL) 14.7V(COLD)<br>14.4V(RECONDITION)   | 15A up to 14.4V(NIGHT)<br>14.4V(NORMAL) 14.7V(COLD)<br>14.4V(RECONDITION)  | 20A up to 14.4V(NIGHT)<br>14.4V(NORMAL) 14.7V(COLD)<br>14.4V(RECONDITION)  |
| Absorption                    | Constant voltage until current drops to 1.8A  | Constant voltage until current drops to 2.25A  | Constant voltage until current drops to 3A   |
| Analyse                       | Monitors voltage for 3 minutes  |  |  |
| Recondition                   | Max 16V / 1.8A for 30 mins or 4h depending on battery voltage   | Max 16V / 2.25A for 30 mins or 4h depending on battery voltage   | Max 16V / 3A for 30 mins or 4h depending on battery voltage  |
| Float                         | 13.7V also with pulse feature   |  |  |
| Pulse                         | 2.6V- 14.4V, 12-2.4A(NIGHT)<br>12.6V- 14.4V, 12-2.4A(NORMAL)<br>12.6V- 14.7V, 12-2.4A(COLD)<br>12.6V- 14.4V, 12-2.4A(RECONDITION) | 12.6V- 14.4V, 15-3A(NIGHT)<br>12.6V- 14.4V, 15-3A(NORMAL)<br>12.6V- 14.7V, 15-3A(COLD)<br>12.6V- 14.4V, 15-3A(RECONDITION) | 12.6V- 14.4V, 20-4A(NIGHT)<br>12.6V- 14.4V, 20-4A(NORMAL)<br>12.6V- 14.7V, 20-4A(COLD)<br>12.6V- 14.4V, 20-4A(RECONDITION) |
| Over Voltage Protection       | The 12V lead acid charger will automatically protection if the voltage is higher than 17.5V                                       |  |  |
| <b>CHARGE CONTROL LITHIUM</b> |   |  |  |
| Soft Start                    | 25% Current until 11V   |  |  |
| Bulk                          | 12A up to 13.8V   | 15A up to 13.8V  | 20A up to 13.8V  |
| Absorption                    | Constant voltage until current drops to 1.8A  | Constant voltage until current drops to 2.25A  | Constant voltage until current drops to 3A   |
| Analyse                       | Monitors voltage for 3 minutes  |  |  |
| Completion                    | 3.6A Current until 14.5V  | 4.5A Current until 14.5V   | 6A Current until 14.5V   |
| Maximization                  | Constant 14.5V until current drops to 1.8A  | Constant 14.5V until current drops to 2.25A  | Constant 14.5V until current drops to 3A   |
| Float                         | 13.6V, 100% Current   |  |  |
| Maintain                      | 13.0V-13.8V, 12-2.4A  | 13.0V-13.8V, 15-3A   | 13.0V-13.8V, 20-4A   |
| Over Voltage Protection       | The 12V lithium charger will automatically protection if the voltage is higher than 15.5V.  |  |  |
| <b>BATTERY RANGE</b>          |   |  |  |
| Deep Cycle                    | 80-240Ah  | 100-300Ah  | 134-400Ah  |
| Lithium                       | 24-120Ah  | 30-150Ah   | 40-200Ah   |
| Types of Batteries            | Most types of 12V Lithium-ion LiFePO <sub>4</sub> batteries and Lead Acid batteries including WET, MF, Calcium, AGM and GEL       |  |  |
| Efficiency                    | App.85%   |  |  |
| Thermal Protect               | 65°C+/-5°C  |  |  |
| Cooling Fan                   | Automatic temperature controlled  |  |  |
| Ambient temperature           | -20°C to +50°C, output power is reduced automatically at high temperatures  |  |  |
| Dimension (L×W×H)             | 197×116×62mm  | 217×116×62mm   | 217×116×62mm   |
| Weight                        | 1.1Kg   | 1.28Kg   | 1.28Kg   |

\*Specifications are subjected to change without prior notice.

## 9. SPECIFICATIONS

| P/No.                         | MFC 2405L   | MFC 2410L  |
|-------------------------------|---|--|
| Charger Type                  | 8-Stage automatic   |  |
| Input Voltage                 | <input type="checkbox"/> 220-240V~, 50/60Hz   | <input type="checkbox"/> 110V~, 60Hz   |
| Input Power                   | 296W  | 547W   |
| Output Voltage                | 24V DC  | 24V DC   |
| Output Current                | 5A  | 10A  |
| Minimum Start Voltage         | Lead Acid: 4.0V Lithium: 2.0V   |  |
| Back Drain                    | 8mA   |  |
| Current Fuse Rating           | T3.15A, 250V AC   | <input type="checkbox"/> T5A, 250V AC <input type="checkbox"/> T6.3A, 250V AC  |
| <b>CHARGE CONTROL</b>         |   |  |
| Desulphation                  | Pulse charge up to 22V  |  |
| Soft Start                    | Half the rated set current up to 25V  |  |
| Bulk                          | 5A up to<br>28.8V(NIGHT) 28.8V(NORMAL)<br>29.4V(COLD) 28.8V(RECONDITION)  | 10A up to<br>28.8V(NIGHT) 28.8V(NORMAL)<br>29.4V(COLD) 28.8V(RECONDITION)  |
| Absorption                    | Constant voltage until<br>current drops to 0.75A  | Constant voltage until<br>current drops to 1.5A  |
| Analyse                       | Monitors voltage for 3 minutes  |  |
| Recondition                   | Max 16V / 0.75A for 30 mins or 4h<br>depending on battery voltage   | Max 16V / 1.5A for 30 mins or 4h<br>depending on battery voltage   |
| Float                         | 27.4V also with pulse feature   |  |
| Pulse                         | 25.2V- 28.8V, 5-1A(NIGHT)<br>25.2V- 28.8V, 5-1A(NORMAL)<br>25.2V- 29.4V, 5-1A (COLD)<br>25.2V- 28.8V, 5-1A (RECONDITION)    | 25.2V- 28.8V, 10-2A(NIGHT)<br>25.2V- 28.8V, 10-2A(NORMAL)<br>25.2V- 29.4V, 10-2A (COLD)<br>25.2V- 28.8V, 10-2A (RECONDITION) |
| Over Voltage Protection       | The 24V lead acid charger will automatically protection if the voltage is higher than 35V.                                  |  |
| <b>CHARGE CONTROL LITHIUM</b> |   |  |
| Soft Start                    | 25% Current until 22V   |  |
| Bulk                          | 5A up to 27.6V  | 10A up to 27.6V  |
| Absorption                    | Constant voltage until<br>current drops to 0.75A  | Constant voltage until<br>current drops to 1.5A  |
| Analyse                       | Monitors voltage for 3 minutes  |  |
| Completion                    | 1.5A Current until 29V  | 3A Current until 29V   |
| Maximization                  | Constant 29V until current drops to 0.75A   | Constant 29V until current drops to 1.5A   |
| Float                         | 27.2V, 100% Current   |  |
| Maintain                      | 26.0V-27.6V, 5-1A   | 26.0V-27.6V, 10-2A   |
| Over Voltage Protection       | The 24V lithium battery charger will automatically protection if the voltage is higher than 31V.                            |  |
| <b>BATTERY RANGE</b>          |   |  |
| Deep Cycle                    | 35-100Ah  | 70-200Ah   |
| Lithium                       | 10-50 Ah  | 20-100 Ah  |
| Types of Batteries            | Most types of 24V Lithium-ion LiFePO <sub>4</sub> batteries and Lead Acid batteries including WET, MF, Calcium, AGM and GEL |  |
| Efficiency                    | App.85%   |  |
| Thermal Protect               | 65°C+/-5°C  |  |
| Cooling Fan                   | Automatic temperature controlled  |  |
| Ambient temperature           | -20°C to +50°C, output power is reduced automatically at high temperatures  |  |
| Dimension (L×W×H)             | 197×110×62mm  | 217×116×62mm   |
| Weight                        | 1.1Kg   | 1.28Kg   |

\*Specifications are subjected to change without prior notice.

## 10. CHARGING INSTRUCTIONS

1. Settings are made by pressing the MODE-button. After about two seconds the charger activates the selected program. The selected program will be restarted next time the charger is connected.
2. To turn off the charger by pressing and holding the Mode button for 3 seconds.
3. To restart the charger by pressing and holding the Mode button for 3 seconds.

The table explains the different Charging Programs:

| Mode    | Explanation   | Temp range                      |
|---------|---|---------------------------------|
| NORMAL  | Normal battery program 14.4V/28.8V. Use for WET, Calcium, MF and for most GEL batteries   | -20°C~+50°C<br>(-4°F~122°F)     |
| COLD ❄️ | AGM battery program 14.7V/29.4V Use for AGM batteries. Cold weather program   | -20°C~+5°C<br>(-4°F~41°F)       |
| RECOND  | Recond program 16V/32V Use to return energy to the empty WET and Calcium batteries. Recond your battery once per year and after deep discharge to maximise lifetime and capacity. The Recond program adds STEP 6 to the normal battery program. Frequent use of the Recond program may cause water loss in the batteries and reduce service life of electronics. Contact your vehicle and battery supplier for advice.  | -20°C~+50°C<br>(-4°F~122°F)     |
| SMALL 🚲 | Small battery program 14.4V/0.8A Use for smaller batteries.   | -20°C - +50°C<br>(-4°F - 122°F) |
| NIGHT   | NIGHT - This mode is equal to NORMAL, but with reduced current. The noise of the built-in fan has reduced to its lowest level and the unit is almost silent. The Unit returns automatically to NORMAL after 8 hours. To ensure that the charger restarts in "NIGHT" mode in the event of a power failure the setting is stored in a memory. The indication shows "NIGHT" even if the charger has returned to NORMAL mode to remind that the charger will start in NIGHT mode next time. |                                 |

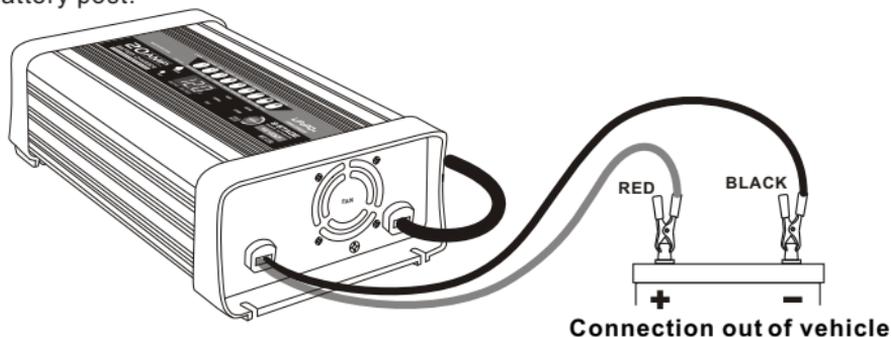
### STEP 1 - CHECK THE ELECTROLYTE LEVEL

Prior to charging the battery, remove the vent caps and check the electrolyte level (not required on sealed & maintenance free batteries). The electrolyte should be 6mm (1/4") above the battery's plates. If low, top up with distilled water to the correct level and refit the vent caps.

## STEP 2A - CONNECTION OUT OF THE VEHICLE

Connect the RED lead (battery clip) from the charger to the Positive (+) battery post.

Connect the BLACK lead (battery clip) from the charger to the Negative (-) battery post.



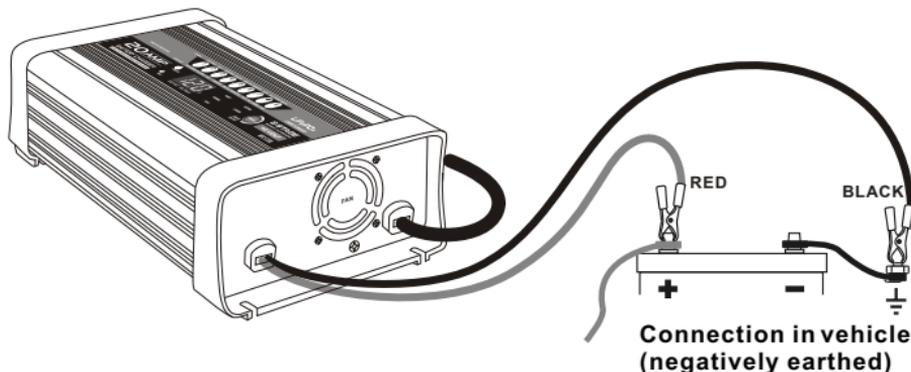
## STEP 2B - CONNECTION IN VEHICLE

Determine if the vehicle is Positively (+) or Negatively (-) earthed. Negatively earthed vehicles have a cable (usually black) from the Negative battery terminal to the vehicle's chassis.

### a) Negatively earthed (most vehicles)

Connect the RED lead (battery clip) from the charger to the Positive (+) battery terminal.

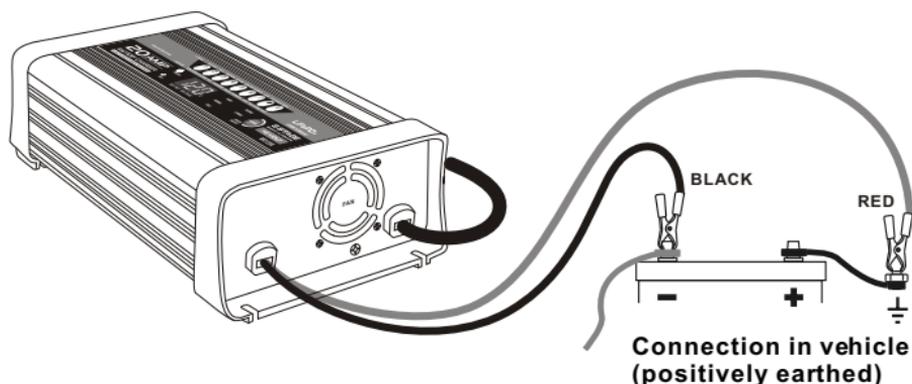
Connect the BLACK lead (battery clip) from the charger to the vehicle's chassis away from the fuel line or moving parts.



## b) Positively earthed

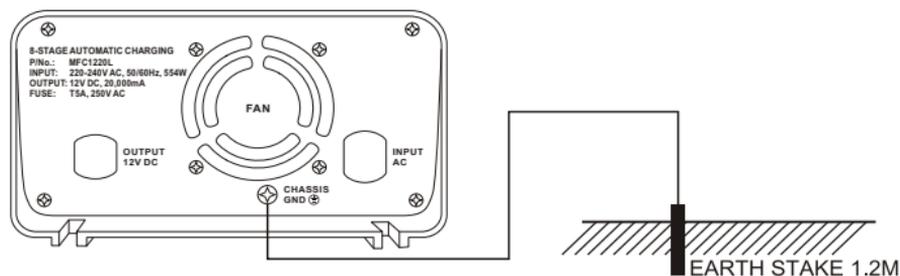
Connect the BLACK lead (battery clip) from the charger to the Negative (-) battery terminal.

Connect the RED lead (battery clip) from the charger to the vehicle's chassis away from the fuel line or moving parts.



## c) Chassis earthing

The chassis earthing lug should be connected to an earthing point which will be depending on where the battery charger is installed. In a vehicle, connect the chassis ground lug to the chassis of the vehicle. In a boat, connect to the boat's grounding systems. In a fixed location, connect to earth.



## STEP 3 - CONNECT TO 110V/220-240V AC MAINS POWER

Connect the battery charger to the 110V/220-240V AC mains powered socket and turn on the mains power.

## STEP 4 - CHARGING

During the charge process, the CHARGING and STAGE LAMP will flash various patterns. This is normal and indicates the various charge stages. Refer to "How can I know what stage the battery charger is in" in the FAQ section, page 22. When the STAGE LAMP remains on, this is known as the float stage and the charger can be left connected to the battery without over charging. If the POWER ON LAMP is flashing, there is fault; refer to "Fault Codes" explanation on page 21 of this manual.

## STEP 5 - DISCONNECTION

Ensure the 110V/220-240V AC mains switch is turned off and the charger is disconnected from the 110V/220-240V AC mains power.

### Battery out of vehicle

Remove the BLACK lead (battery clip) from the battery.

Remove the RED lead (battery clip) from battery.

### Battery in vehicle

Remove the chassis connection.

Remove the battery terminal connection.

## 11. MOUNTING INSTRUCTIONS

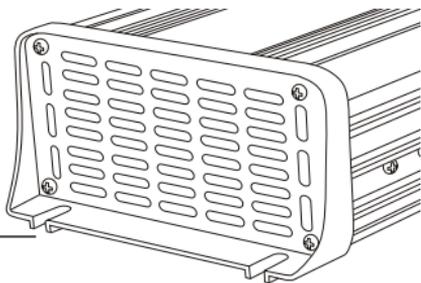
8-stage chargers are designed for indoor, out of weather use only. Ensure that both charger and battery are in a well-ventilated space during charging.

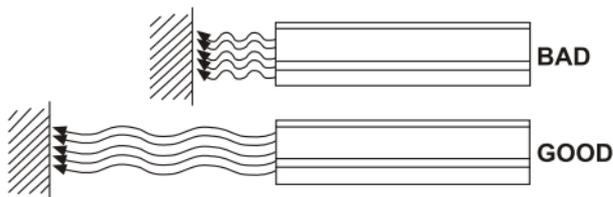
The battery charger end plates include a mounting flange for easy mounting.

If permanently fixed the charger should be mounted to a suitable horizontal or vertical panel, with at least 10cm clearance from the end plates to provide adequate ventilation for the cooling fan.

3.5mm  
mounting hole

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## 12. PERMANENT WIRING TO BATTERY

It is possible to hard wire the DC charging leads to the battery for permanent installations.

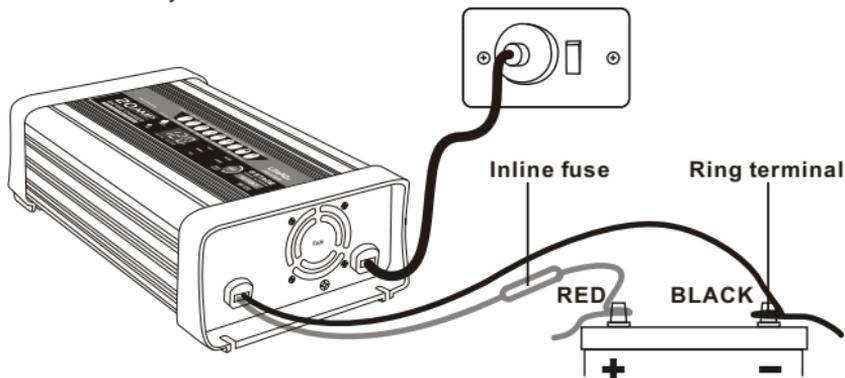
You will need 2x ring terminals, an inline fuse holder and a fuse with a rating equal to or more than twice of the charger's output. (See below)

5A = 10 Amp fuse    7A = 14 Amp fuse    10A = 20 Amp fuse

12A = 24 Amp fuse    15A = 30 Amp fuse    20A = 40 Amp fuse

### Connection:

1. Cut off the supplied battery clips; ensure you leave sufficient cable to reach the battery terminals. (DO NOT extend the battery charger DC cables, as the added voltage drop will cause incorrect charging).
2. Fit a ring terminal to the BLACK Negative (-) wire.
3. Connect the inline fuse to the RED Positive (+) wire.
4. Connect a ring terminal to the other end of the inline fuse.
5. Connect the RED lead (with inline fuse and ring terminal) to the Positive (+) battery post.
6. Connect the BLACK lead (with ring terminal) to the Negative (-) battery post.
7. Fit the correctly rated fuse.



If the charger is used in a Permanent / Hard Wired application and the vehicle will not be used for some time, it is best to leave the charger connected to mains power (turned "On") so that it can maintain the battery fully charged.

Ensure any modification to the 110V/220-240V AC mains lead is carried out by a qualified person and that connection to supply mains is in accordance with National wiring rules.

### 13.ADJUSTABLE CHARGER RATES

#### CHARGE RATE BATTERY SIZE (12V)

|       | Lithium Battery size (Ah) | Charger time (hours) | Lead Acid Battery size (Ah) | Charger time (hours) |
|-------|---------------------------|----------------------|-----------------------------|----------------------|
| 5Amp  | 10-50Ah                   | 2-14                 | 35-100Ah                    | 7-24                 |
| 7Amp  | 14-70Ah                   | 2-14                 | 50-140Ah                    | 7-24                 |
| 10Amp | 20-100Ah                  | 2-14                 | 70-200Ah                    | 7-24                 |
| 12Amp | 24-120Ah                  | 2-14                 | 80-240Ah                    | 7-24                 |
| 15Amp | 30-150Ah                  | 2-14                 | 100-300Ah                   | 7-24                 |
| 20Amp | 40-200Ah                  | 2-14                 | 134-400Ah                   | 7-24                 |

#### CHARGE RATE BATTERY SIZE (24V)

|       | Lithium Battery size (Ah) | Charger time (hours) | Lead Acid Battery size (Ah) | Charger time (hours) |
|-------|---------------------------|----------------------|-----------------------------|----------------------|
| 5Amp  | 10-50 Ah                  | 2-14                 | 35-100Ah                    | 7-24                 |
| 10Amp | 20-100 Ah                 | 2-14                 | 70-200Ah                    | 7-24                 |

## 14. FAULT CODES

There are error codes that may be displayed. These will be displayed in the following way:

| Error Code                      | Power on lamp | Stage lamp   | Fault lamp   | Cause  | Remedy  |
|---------------------------------|---------------|--|--|--|---|
| Polarity Reverse / Output Short | ●             | —  | Lithium: <br>Lead Acid: — | Short circuit or reverse connection of the clips   | Check clips are not touching each other. OR Check the clips are correctly connected to the battery.                               |
| Non Battery Link                | ●             | —  | —  | Non battery link   | Please choose the right battery type for connection.  |
| Faulty Battery                  | ●             | Lithium:  (Step 2 lamp)<br>OR<br>Lead Acid:  (Step 3 lamp) | ●  | Bulk charging has timed out and stopped after 10 hours (Lithium Mode) / 24 hours (Lead Acid Mode).   | Battery is faulty and may need to be replaced.  |
| Over Voltage                    | ●             | —  |                           | <b>Lithium:</b> The 12V lithium battery voltage is above 15.5V. The 24V lithium battery voltage is above 31V. <b>OR Lead Acid:</b> The 12V battery voltage is above 17.5V. The 24V battery voltage is above 35V. | Disconnect the charger and check the battery voltage. This charger is suitable for 12V/ 24V Lithium and Lead Acid batteries ONLY. |
| Over Temperature                | ●             | —  |                         | Internal temperature is above 65°C +/- 5°C   | Turn off charger and allow to cool.   |

## 15. FREQUENTLY ASKED QUESTIONS

### Q. How do I know if the battery is charged?

A. The charger's FULLY STAGE LAMP will illuminate (solid). Alternatively use a Battery Hydrometer A reading of 1.250 or more in each cell indicates a fully charged battery.

### Q. I have connected the charger properly but the 'STAGE LAMP' does not come on?

A. In some cases batteries can be flattened to the point where they have very little or no voltage. This can occur if a small amount of power is used for a long time, for example a map reading light is left on for a week or more. 8-Stage chargers are designed to charge Lithium battery from as little as 1.0 Volts (12V) and 2.0 Volts (24V). Lead Acid battery from as little as 12V charger 2.0 Volts and 24V charger 4.0 Volts.

#### LITHIUM battery mode

If the voltage is less than 1.0 Volts (12V) / 2.0 Volts (24V) this is very low and the battery may not be rechargeable. You could try a very an electronic power supply to gradually bring the battery voltage above 1.0 Volts (12V) / 2.0 Volts (24V) so the charger can then take over or take the battery back to the place of purchase so they can try and repair it.

#### Lead Acid battery mode (Including GEL, AGM, WET, MF and CALCIUM)

If the voltage is lower than 2.0 Volts and 4.0 Volts use a pair of booster cables to connect between two batteries to provide more than 2.0 Volts and 4.0 Volts to the battery being charged. The charger can then start to charge the battery and the booster cables can be removed.

### Q. Can I use the charger as a power supply?

A. 8-Stage chargers are designed to only supply power to the battery clips when they are connected correctly to a battery. This is to prevent sparks during connection to the battery or if connected incorrectly by mistake. This safety feature prevents the charger from being used as a 'Power Supply'. No Voltage will be present at the clips until connected to the battery.

### Q. How can I know what stage the battery charger is in?

A. Below are the conditions that are displayed by the LAMP for each of the charge stages.

|             | ①<br>Stage | ②<br>Stage | ③<br>Stage | ④<br>Stage | ⑤<br>Stage | ⑥<br>Stage | ⑦<br>Stage | ⑧<br>Stage |
|-------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Step Finish | ●          | ●          | ●          | ●          | ●          | ●          | ●          | —          |

**Note:** ● : (Solid) ☀ : (Flashing) — : (EXTINGUISH)

## CAUTION

ALWAYS PLACE THE BATTERY CHARGER IN AN ENVIRONMENT WHICH IS:

- A. WELL VENTILATED.
- B. NOT EXPOSED TO DIRECT SUNLIGHT OR HEAT SOURCE.
- C. OUT OF REACH FROM CHILDREN.
- D. AWAY FROM WATER / MOISTURE, OIL OR GREASE.
- E. AWAY FROM ANY FLAMMABLE SUBSTANCE.
- F. SECURE NO RISK OF FALLING.



## SAFETY

- ◆ The charger is designed for charging 12V/24V Lithium batteries and lead-acid batteries. Do not use the charger for any other purpose.
- ◆ Check the charger cables prior to use. Ensure that no cracks have occurred in the cables or in the bend protection. A charger with damaged cables must not be used. A damaged cable must be replaced by a professional representative.
- ◆ Never charge a damaged battery.
- ◆ Never charge a frozen battery.
- ◆ Never place the charger on top of the battery when charging.
- ◆ Always provide for proper ventilation during charging.
- ◆ Avoid covering the charger.
- ◆ A battery being charged could emit explosive gasses. Prevent sparks close to the battery. When batteries are reaching the end of their lifecycle internal sparks may occur.
- ◆ All batteries fail sooner or later. A battery that fails during charging is normally taken care of by the charger's advanced control, but some rare errors in the battery could still exist. Don't leave any battery during charging unattended for a longer period of time.
- ◆ Ensure that the cabling does not jam or come into contact with hot surfaces or sharp edges.
- ◆ Battery acid is corrosive. Rinse immediately with water if acid comes into contact with skin or eyes, seek immediate medical advice.
- ◆ Batteries consume water during use and charging. For batteries where water can be added, the water level should be checked regularly. If the water level is low add distilled water.
- ◆ 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.