

# USER GUIDE

## Battery Charger

### **Smart 110**

*with built-in flashlight*

for 6 – 240Ah lead-acid batteries

**Please read this user guide carefully before using the charger**

Use protective eyewear when handling batteries

### INTRODUCTION

**Thank you** for choosing a professional quality product from MODERNUM! This advanced and user-friendly battery charger will optimize performance and lifetime of your battery.

This intelligent and fully automatic charger can be used to charge any type of lead-acid batteries, including AGM and GEL types from 6 to 240Ah. It has a flashlight that automatically turns on while not connected to the battery.

Visit [www.modernum.se](http://www.modernum.se) for more info about us.

### SAFETY

- This charger is made for charging 12V lead-acid batteries (including AGM and GEL). Do not use it for other purposes or with other battery types.
- **IF THE CHARGER IS WRONGLY INDICATING REPEATED STARTUPS, WITHOUT A BATTERY CONNECTED, THEN THE CHARGER'S SPARK PROTECTION MAY BE FAULTY, WHICH CAN CAUSE SPARKS THAT CAN IGNITE EXPLOSIVE GASES AND THE CHARGER SHOULD BE DISCARDED.**
- Do not try to recharge non-rechargeable batteries.
- Do not use the charger if its casing, terminals, clamps or cables are damaged.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- Use protective eyewear when handling batteries, and connecting or disconnecting it.
- Battery acid is corrosive. If it comes in contact with skin or eyes – rinse with plenty of water and contact a doctor immediately.
- **DURING CHARGE, A BATTERY CAN EMIT EXPLOSIVE GASES. MAKE SURE THERE ARE**

## NOT SPARKS OR FLAMES CLOSE TO IT, AND ENSURE GOOD VENTILATION.

- Never charge a battery that is frozen.
- Do not place the charger on top of the battery.
- Do not cover the charger.
- The charger is protected against overheating. If the ambient temperature is too high, the charging current is reduced.
- During the charge, the charger may intermittently provide a 15.0V charge voltage. Ensure that no equipment that may be damaged by this voltage level is connected to the battery during charging.
- **THIS APPLIANCE CAN BE USED BY CHILDREN AGED FROM 8 YEARS AND ABOVE AND PERSONS WITH REDUCED PHYSICAL, SENSORY OR MENTAL CAPABILITIES OR LACK OF EXPERIENCE AND KNOWLEDGE IF THEY HAVE BEEN GIVEN SUPERVISION OR INSTRUCTION CONCERNING USE OF THE APPLIANCE IN A SAFE WAY AND UNDERSTAND THE HAZARD INVOLVED. CHILDREN SHALL NOT PLAY WITH THE APPLIANCE. CLEANING AND USER MAINTENANCE SHALL NOT BE MADE BY CHILDREN WITHOUT SUPERVISION.**
- Make sure that the charger switched to maintenance mode after normal charging is completed, if you want to leave it unattended and connected for a long time. If it does not leave charge mode after maximum time, disconnect charger from the battery. See technical specifications below for info about time limit.
- All batteries will eventually fail. If that happens during charging, the charger will detect it, but there may be some rare faults in the battery, so do not leave it charging unattended for longer periods of time.
- You need to have read and understood the full context of this user guide before you start using the battery charger.

### **GETTING STARTED**

1. Connecting the charger: Connect the charger to the supply mains. A flashlight on the top will automatically turn on to assist you in dark situations. The battery terminal not connected to the chassis has to be connected first. The other connection is to be made to the chassis, remote from the battery and fuel line. The red clamp should connect to the positive (+) pole of the battery and the black clamp to the negative (-) pole.

Please note that the vehicle manufacturer may have

their own recommendations for connection points for battery chargers, in which case you should follow those. For stand-alone batteries: Connect the charger to the supply mains. Connect the red clamp to the battery's positive (+) pole, and then the black clamp to the battery's negative (-) pole.

2. When all 4 charge level indicators are constantly lit, the battery is fully charged and has entered maintenance mode. The battery will be kept fully charged as long as charger is plugged in to the mains.

## INSTRUCTIONS

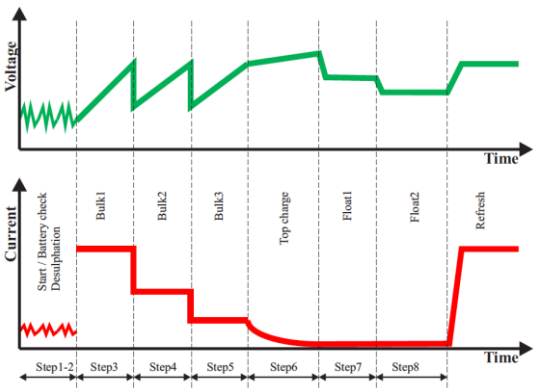
1. Connect the charger as explained in GETTING STARTED, point 1, above. The 4 LEDs in the battery symbol will flash for a few seconds. Then it will start to analyze the battery, and the charge level indicators will start rolling from "battery empty" to "battery full". After a little while, the LEDs will have a steady light indicating the current battery charge level, and when charging is finished all 4 LEDs will be lit.
2. If the red light below the level indicators is lit constantly, it means "FAULT" and indicates wrong connection to battery (reversed polarity). Disconnect clamps from battery, and reconnect them correctly as said mentioned above.
3. When charging, the yellow and green indicators will show the current charge level of the battery, when constantly lit.



Lamp lit – Battery not connected  
Lamp+Red – wrong polarity to battery  
Yellow+Green rolling – Charging  
Yellow+Green constant– fully charged  
Yellow+Green+red constantly lit - charging timeout (charge cycle finished without reaching full charge)

4. After charging, disconnect the battery charger from the supply mains. Then remove the chassis connection and then the battery connection. For stand-alone batteries: After charging, disconnect the charger from the supply mains. Then remove the black clamp and then the red clamp.
5. By leaving the clamps on the battery after charging, and mains plugged in, the charger will automatically switch to maintenance mode as long as it is connected to the mains.
6. To stop or interrupt charging, unplug the supply mains, at any time, and then remove clamps.

## CHARGING CURVE



Reference charging time (hours) to 85 % capacity.

Time varies with different batteries and conditions.

25Ah: 2.7h 75Ah: 5h 100Ah: 10h 150Ah: 14h

Note: If left connected, it is programmed to restart from Step3 after 7 days, to refresh the battery.

## SPECIAL FEATURES

**Flashlight:** There is a built-in flashlight in the front of the charger, on the top of casing just in front of the battery symbol. It will automatically turn on when the charger is plugged in. It will switch off if connected to a battery.

**Temperature sensor:** The temperature affects the batteries ability to receive charge. This product has a sensor in the black clamp, which compensates for temperature variations to give optimal charge in cold as well as warm conditions, avoiding the common problem of insufficient charging in cold weather and over-charging at high temperatures.

## FAULTS INDICATIONS & TROUBLE-SHOOTING

- Fault:** Lamp+Red light (constant) is lit, Clamps connected to the battery.

**Probable cause:** Reversed polarity protection activated due to clamps connected to wrong battery poles.

**Action:** disconnect the charger from the mains, re-connect the clamps correctly and connect mains again.

**Probable cause 2:** The battery voltage is too high (over 17V).

**Action:** Replace battery with a 12V lead-acid type.
- Fault:** Charging does not start and flashlight does not turn off. None of the battery level lights are lit.

**Probable cause 1:** Clamps do not have good connection to battery.

**Action:** Check that clamps are connected well to metal on both battery poles. Check that connector on the clamp cable is pushed all the way into connector on charger's connector.

**Probable cause 2:** The battery voltage is too low (<5V) for the charger to detect it, and it will not start. This may be because the battery is worn or faulty or has been overly discharged.

**Action:** Replace the battery, or you can try to connect a 12VDC power supply to the battery for a while to see if the battery voltage can be increased >5V and then reconnect the charger.

3. **Fault:** Charging started normally, but did not complete, and stopped. Yellow+Green+Red lights are lit.

**Probable cause 1:** The battery has a fault that does not permit it to be charged, e.g. a short circuit.

**Action:** Replace the battery (with lead-acid type).

**Probable cause 2:** Parallel load. If there is an equipment using current from the battery while charging, the charger may not be able to charge the battery within the safety time limit set for safety reasons.

**Action:** Disconnect the parallel load and repeat charging, or purchase a more powerful charger that can handle the extra load.

**Probable cause 3:** Battery is too large and could not be charged within the set safety time limit.

**Action:** Repeat charging.

4. **Fault:** The flashlight does not come on when the charger's power cable is plugged into the mains socket.

**Probable cause:** No power in mains socket. Or the flashlight LED is broken. (You can still use the charger but it will be without flashlight function).

5. **Fault:** The charger is wrongly indicating repeated startups; the 4 battery level indicator LEDs are blinking for a few seconds, then turns off, and this repeats itself.

**Probable cause:** The charger cannot identify a chargeable battery. It can happen when the current to the battery is <10mA and has a high internal resistance. Battery could be defect, too small, or very cold.

**Action:** Replace the battery.

6. **Fault:** The charger is wrongly indicating repeated startups; the 4 battery level indicator LEDs are blinking for a few seconds, then turns off, and this repeats itself, even when a battery is not connected.

**Probable cause:** The charger's spark protection may be faulty, which can cause sparks that can ignite explosive gases.

**Action:** The charger shall be discarded.

## **MAINTENANCE**

The charger is entirely maintenance-free. It has no user-serviceable parts. Opening the charger will void the warranty. The case may be cleaned using a soft, damp cloth. The charger must be disconnected from the mains when being cleaned.

## **ACCESSORIES**

The charger comes with clamp cables. (Ring terminal cables, which can be used for fixed installations, can be ordered separately). To change cables, press the unlock flange on the connector and pull it out. Connect the desired new cable. Push it all the way. The flange should lock it.

## **TECHNICAL SPECIFICATIONS**

Model:	Smart 110
Type:	Switch mode charger, microprocessor controlled
For battery types (12V)	lead-acid (incl. AGM, GEL)
For battery capacity	6 – 240Ah
Input voltage	220-240 VAC
Input current	1.2A
Back current	≤1mA
Charging Voltage	13.5 – 15.0VDC
Charging current	Max 10A
Ripple voltage	Max 100mV
Ambient temperature	- 40 – +50°C
Cooling	Convection
Spark protection	Yes
Temperature sensor	Yes (≈0.3V/10°C)
Desulphation error	Yes after 15min if I <sub>min</sub> <0,1A
Max charging time	80 hours (approximately)
Charging type	8 step;
Battery DC cable (length)	1500 mm
Power cable (length, type)	1400 mm, 2x0.75 mm <sup>2</sup>
Dimensions (LxWxH)	290x55x55 mm
International Protection class	IP54
Weight	0.8 kg (net)

## **CE MANUFACTURER DECLARATION**

Made by: HF SM Power Innovations AB

Product: Battery charger Smart 110

The manufacturer guarantees that the unit complies with the relevant standards. Tested and approved by Intertek.

## **LIMITED WARRANTY**

We guarantee the quality of this product. It is made to meet high industrial production standards for electronics. This limited warranty is made to the original purchaser of this product, and is valid from the date of purchase, meeting the mandatory warranty rights for the country of purchase. If the product has workmanship defects or damages relating to manufacturing or distribution, contact the store where you purchased the charger for warranty claims. The warranty is void if the unit has been damaged due to careless handling, abuse or unauthorized repair, or has been opened, or screws and/or labels have been removed. We are not responsible for any consequential costs, or shipping- or handling costs for the return to the place of purchase. Nor are we liable under any other warranty than this one. This warranty is not transferrable.

Note: Measurements such as time, %, lengths etc are approximates.