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## 1 PRECAUTIONS – WARRANTY

The CRISTEC equipment includes the following :

- A box containing the battery charger's electronic function.
- AC input connector
- DC output connector
- This user manual
- Specific packing

This document applies to battery chargers from the YPOWER range as listed on the cover (available in colour on our website [www.cristec.fr](http://www.cristec.fr)).

The manual is intended for users, installers and equipment maintenance staff. Please read this manual carefully before working on the charger.

This manual should be kept safely and consulted before attempting any repairs because it contains all the information required to use the appliance.

This document is the property of CRISTEC; all the information it contains applies to the accompanying product. CRISTEC reserves the right to modify the specifications without notice.

### 1.1 PRECAUTIONS (WARNING) – PROVISIONS RELATING TO SAFETY

Material class I according to NF EN 60335-2-29 standards.

The requirements for installation are contained in the NFC 15-100 standards and in the specific standard “for pleasure boats – electrical systems – alternating current installations” ISO13297 reference.

The installation must be carried out by an electrician or a professional installer.

The AC network must be disconnected before starting any maintenance work on the equipment.

This equipment is not intended to be used by children.



#### **Main precaution**

Before handling the charger, please read carefully this manual.



#### **Precautions regarding electric shocks**

Risk of electric shock and danger of death: it's strictly forbidden to interfere with the charger when under voltage.



#### **Precautions regarding accidental earth leaks**

The charger's PE terminal must be earthed and connected before any other terminal.

The charger must be closed before it is turned on with the screw provided for this purpose.

Accidental leakage current between phase and earth : standard NFC15-100 should be followed when installing.

Use the services of an electrician or professional installer to make the necessary connections. The charger should be connected to a system having a 30mA differential bi-polar differential circuit-breaker.

Accidental leakage current between the charge circuit and the earth : accidental current leakage at the earth must be detected by means of an independent protective device outside the charger (a residual current device or an insulation detector).

The installer should decide on the rating and nature of the protection according to the risks. Special precautions should be taken on any installation prone to electrolyse phenomena. Regulations require the presence of a battery switch on the outputs of the + and the - poles.



#### **Precautions regarding lightning**

In areas highly exposed to lightning, it may be advisable to install a lightning arrester upstream of the charger to safeguard it against irreversible damage.



#### **Precautions regarding overheating of the appliance**

This appliance is designed to be mounted on a vertical wall or partition as indicated herein.

It is imperative that there be a gap of 150mm around the charger. The installer must ensure that the temperature of the air at the input is lower than 65°C in extreme operating conditions.

Measures should also be taken to allow for the evacuation of hot air on either side of the charger.

It's strictly forbidden to put any device on or against the charger.

The charger must not be installed near a heat source ; it should be installed in a well-ventilated area. The charger's air inlets and outlets must not be obstructed.



Attention hot surface : do not touch the charger during and after its operation (burn hazard).



#### **Precautions regarding dust, seepage and falling water**

The charger should be located so as to prevent penetration of damp, liquid, salt and dust, any of which could cause irreparable damage to the equipment and be potentially hazardous for the user.

The appliance should be installed in a dry and well-ventilated place.



#### **Precautions regarding inflammable materials**

The charger should not be used near inflammable materials, liquids or gases.

The batteries can emit explosive gases : please follow the manufacturer's instructions carefully when installing them.

Nearby the batteries : ventilate the area, do not smoke, do not use any open flame.

Use fuses as defined in this manual.



Ignition protection (Protection against ignition of surrounding flammable gases)

YPOWER 12V/40A without option is protected against ignition of flammable gases following the ISO 8846 standard.

The DC output fuses F500 and F501 should only be replaced by the following blade fuse :

Label : F500, F501, Quantity 2 Manufacturer : BUSSMAN

Reference : BK-ATC-25M Rating : 32V-25A



#### **Other precautions**

Never attempt to drill or to machine the charger's case : this may damage components or cause metal chips or filings to fall on the charger's board.

**Do not do anything that is not explicitly stated in this manual.**

## **1.2 WARRANTY**

CRISTEC waives all liability if the installation rules and instructions for use are not observed.

The warranty is valid for 36 months. It covers parts and labour for equipment returned to the Quimper plant (France). Only original parts recognized as being defective will be replaced under the warranty.

### **Our warranty does not cover :**

1. Failure to abide by this manual
2. Any mechanical, electrical or electronic alterations to the appliance
3. Improper use
4. Presence of moisture
5. Failure to comply with AC power-supply tolerances (i.e. overvoltage)
6. Incorrect connections
7. Falls or impacts during transportation, installation or use
8. Repairs carried out by anyone unauthorized by CRISTEC
9. The maintenance in the energy conversion area made by a non-authorized person by CRISTEC
10. Connection of any interface not supplied by CRISTEC
11. The cost of packaging and carriage
12. Apparent or latent damage sustained during shipment and/or handling (any such claims should be sent to the haulier)

Our warranty on no account provides for any form of compensation. CRISTEC shall not be held liable for damage incurred as a result of using the battery charger.

## **2 OPERATING-PRESENTATION-INTERFACES**

### **2.1 OPERATING PRINCIPLE**

The design of the battery chargers in the YPOWER range is based on a high-frequency split converter that transforms the AC signal into regulated and filtered DC current. They can operate as a DC power supply.

Once the type of battery and type of charge has been selected, operation of the battery charger is entirely automatic (unless otherwise specified by the supplier or the manufacturer of the batteries). It can remain connected to the batteries and does not need to be disconnected when starting up an engine (marine application), because it is equipped with an integrated separator.

The appliance's output voltage is sufficient to recharge 1, 2 or separate 3 batteries (integrated charge distributor, separation of batteries). The charger's maximum output is the rated current distributed to each output according to the connected batteries banks.

Each output can deliver the rated current.

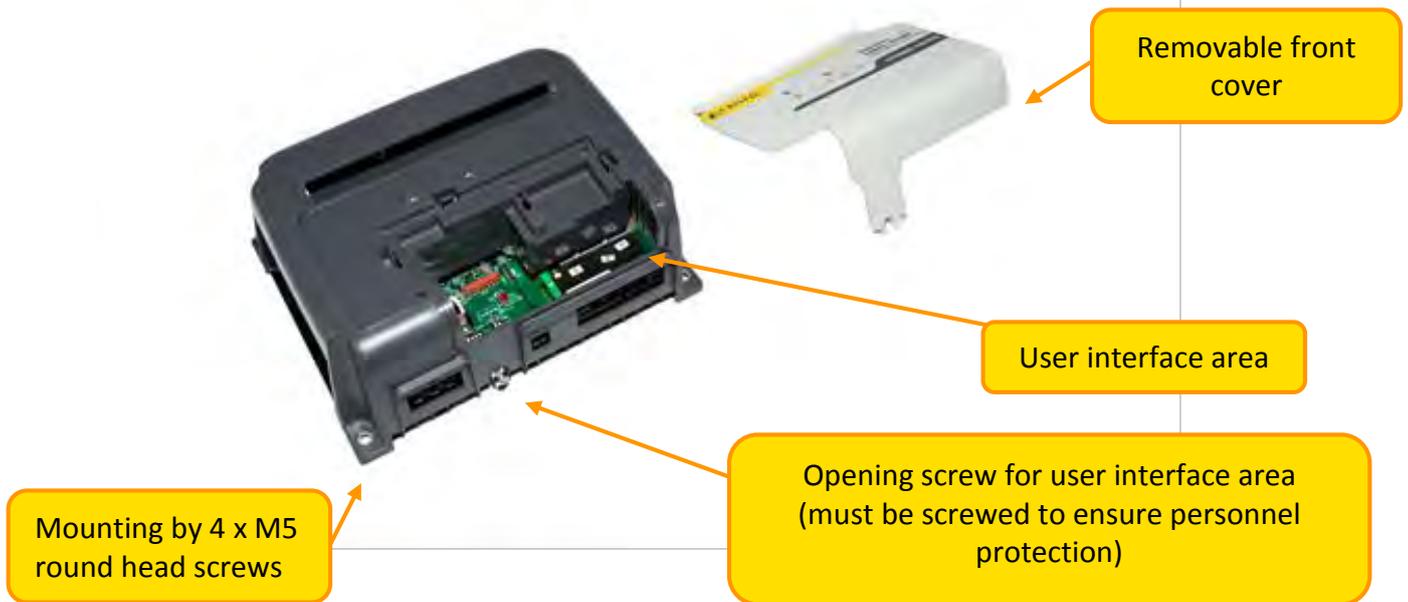
Not all the outputs have to be connected. However, if only one output is used, we recommend interconnecting outputs +BAT 1, +BAT 2 and +BAT E to one another (optional).

## 2.2 OVERVIEW PRESENTATION

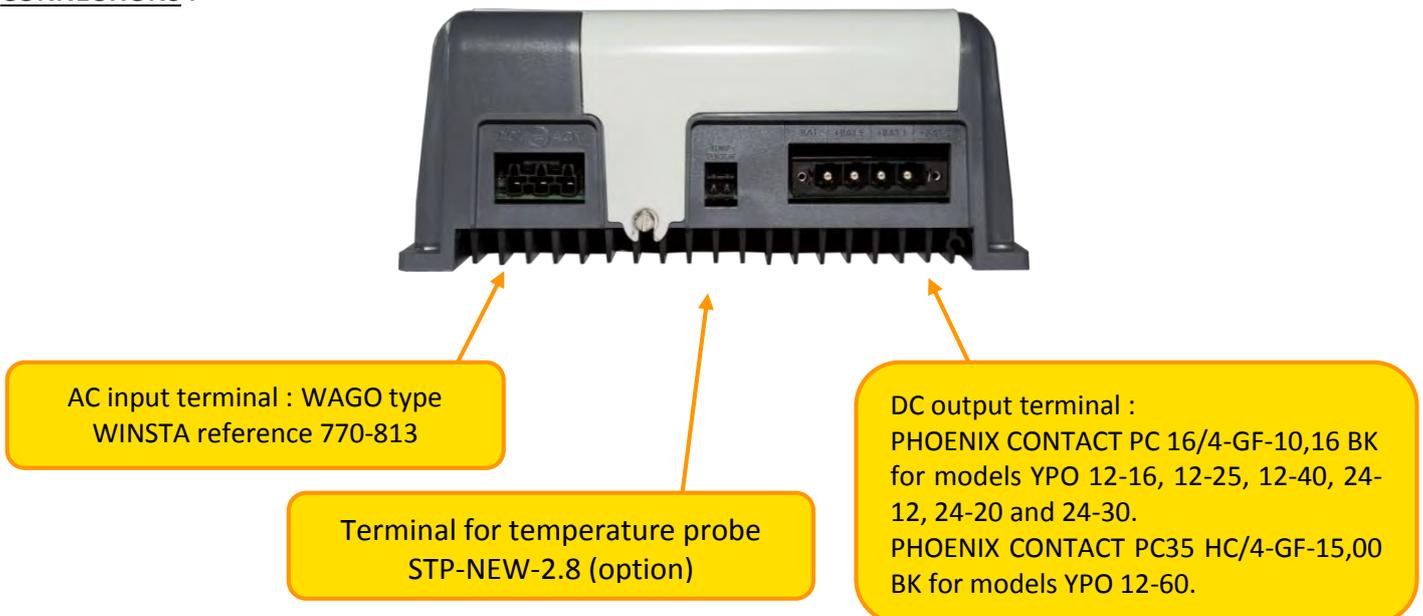
The chargers are divided into 2 zones :

- The user interface zone
- The energy conversion zone (all maintenance in this area is forbidden except with CRISTEC authorization, under penalty of warranty termination)

Fixing of the charger is made by 4 x M5 round head screws (screw head diameter less than 10 mm).  
Center distance : see corresponding drawing in the appendices 3 to 5 depending on model.



### CONNECTIONS :



## 2.3 USER INTERFACE AREA

Chargers YPO 12-16, 12-25 and 24-12 - See appendix 1

Chargers YPO 12-40, 12-60, 24-20 and 24-30 - See appendix 2

### 3 INSTALLATION

This paragraph deals with installation of the equipment.

Installation and initial commissioning should be carried out by an electrician or professional installer in accordance with the standards currently in force (for pleasure boats the applicable international standard is ISO13297).

The installer should familiarize himself with this operating manual and inform users of the instructions for use and the safety warnings set out in the manual.

#### 3.1 CHARGER OVERALL DIMENSIONS

Chargers YPO 12-16, 12-25 and 24-12 - See appendix 3

Chargers YPO 12-40 and 24-20 - See appendix 4

Chargers YPO 12-60 and 24-30 - See appendix 5

#### 3.2 WIRING

When connecting or disconnecting a cable, the charger's power supply must be turned off and the batteries electrically insulated from the charger.

The references for additional cables and connectors required for the appliance to operate efficiently are provided in the following paragraphs : failure to comply with these provisions renders the warranty null and void.

##### 3.2.1 Cable from the public AC power supply network or generator

Disconnect AC network before any wiring and connecting of the connector.

All YPOWER battery chargers can operate automatically and equally on single phase networks from 90 to 265VAC and from 47 to 65Hz.

##### Generators

The CRISTEC battery chargers are designed to operate from a generator.



**Be careful :** In some cases, the generators can produce high over voltages, in particular during start-up phase. Before connecting the charger, please check its compatibility with the characteristics of the generator : power, voltage, overvoltage, frequency, current, etc.

It's highly advised to disconnect the charger from the AC network during the generator starting phase.

Any damage to the charger due to a voltage surge will be excluded from the warranty.

Depending on cable lengths, the cross-section of AC power cables must be at least equal to or greater than the values provided in the table below :

Model	Minimum cross-section for 115VAC	Minimum cross-section for 230VAC
YPO 12-16, 12-25 and 24-12	3 x 1.5 mm <sup>2</sup>	
YPO 12-40 and 24-20	3 x 1.5 mm <sup>2</sup>	
YPO 12-60 and 24-30	3 x 2.5 mm <sup>2</sup>	3 x 1.5 mm <sup>2</sup>

The type of cable (H07-VK, MX, etc.) should be defined by the installer according to the application type and applicable standards.

For applications where the electricity network may be either 115VAC or 230VAC, always choose the cross section recommended for 115VAC.

Always use cable markers without insulating collars in accordance with installation standards governing AC network input connections.

The rating of the upstream circuit-breakers should match the equipment's requirements.

### Mounting of AC supply connector

The AC input must be made using a WAGO connector type WINSTA reference 770-103.

	<p>Strip the cable about 3cm.</p>
	<p>Strip 3 wires about 8mm. Tin the end of bare copper or crimp a wire tip without collar.</p>
	<p>Open the housing. Remove the cable seal from the housing.</p>
	<p>Pass a flat screwdriver into the square hole to open the contact and insert the wire.</p>
	<p>Carry out this operation on the 3 wires, respecting polarity. ⊕ : Earth N : Neutral L : Phase</p>
	<p>Position the connector in the housing, making sure that the cable enters by 1cm approx. Close the sides of the housing and screw.</p>

### Remarks :

The YPOWER chargers work as soon as they are powered on. (Input cable connected and powered)

The YPOWER chargers stop as soon as they are not under voltage (disconnected from AC network or installation circuit breaker in OFF position).

### 3.2.2 Battery cable

Disconnect batteries before any wiring and junction of the connector.

Please check the compatibility of voltage, current and setting according to the battery type before switching ON the charger.

#### **Checking of the charge voltage**

Before connecting the batteries to the charger, first check their polarity.

Equally check the battery voltage with a calibrated voltmeter. A too low voltage value on some types of batteries show irreversible damage and impossibility to recharge.

Any damage due to incorrect connections will be excluded from the warranty.

For battery cables up to **3 metres**, the cross-section of the battery cables should be at least equal to or greater than the values provided in the table below:

Model	Battery cable cross-section
YPO 12-16, 12-25 and 24-12	10mm <sup>2</sup>
YPO 12-40, 12-60, 24-20 and 24-30	16mm <sup>2</sup>

The installer should choose the type of cable (H07-VK, MX, etc.) according to the type of application and the applicable standards.

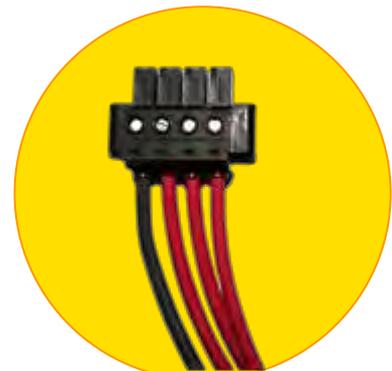
The DC outputs must use a PHOENIX CONTACT connector type. If you do not have 3 batteries, the terminals non-used bank will remain unconnected.

Model	PHOENIX CONTACT connector reference
YPO 12-16, 12-25, 12-40, 24-12, 24-20 and 24-30	PC 16/4-STF-10,16 BK
YPO 12-60	PC35 HC/4-STF-15,00 BK

#### **PHOENIX CONTACT connector junction**

Connect from left to right : -BAT, +BAT E, + BAT 1 and BAT 2.

- - BAT (minus set of batteries)
- +BAT E (plus engine battery for marine-type applications)
- +BAT 1 (plus battery set 1)
- +BAT 2 (plus battery set 2)



### 3.2.3 Precautions regarding electromagnetic disturbance generated by the appliance

We recommend a minimum distance of 2m between the charger and any potentially sensitive equipment.

Use shielded cables for all the connections (\*). The shielding should be earthed at both the transmitting and the receiving ends.

Keep cable length and shielding connections to a minimum.

Route cables as close as possible to conductive parts ("loose" cables or loops should be avoided – cables should be placed against the hull or walls).

Keep power cables separate from battery cables.

Keep power cables separate from control cables (at least 200mm).

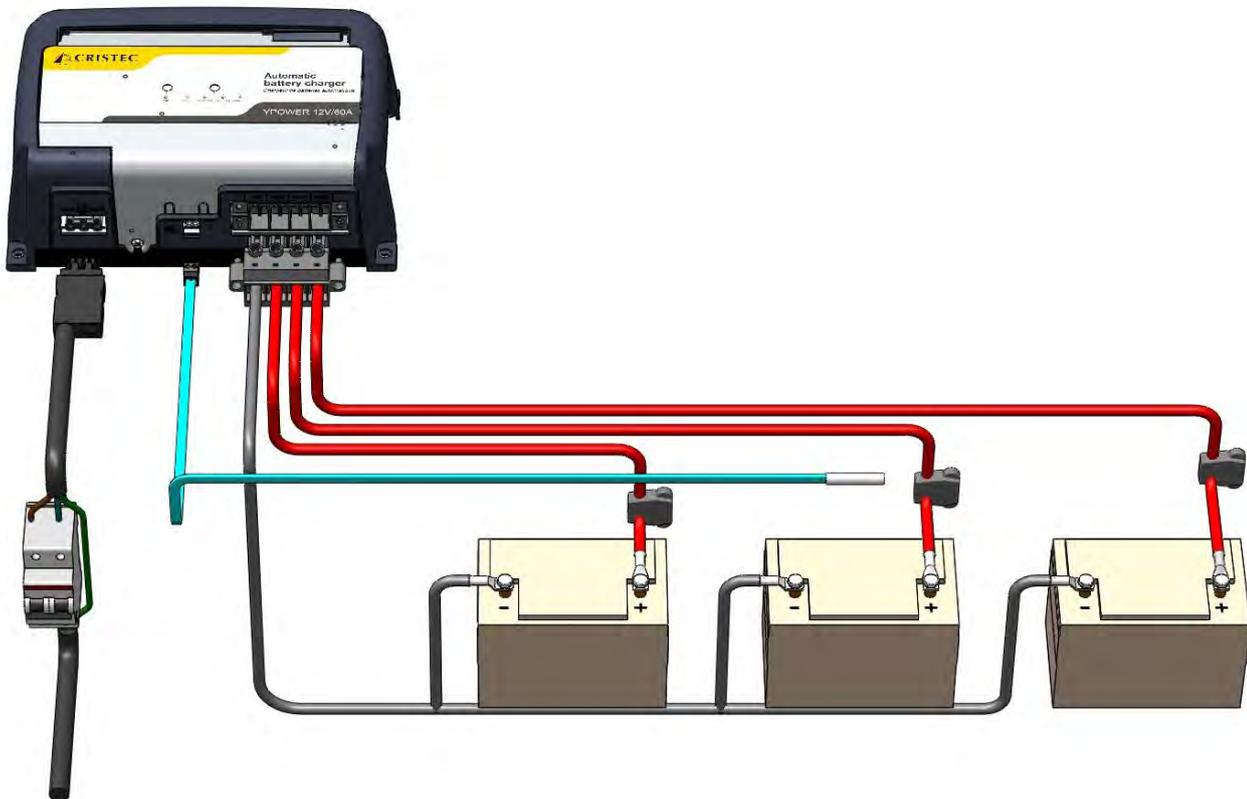
The cables should only supply power to this appliance; any deviation to power another appliance is prohibited.

(\*) This is a recommendation for installation rather than an obligation. The installing electrician should decide whether or not to use shielded cable depending on the EMC environment.

### 3.2.4 Cabling principle

#### Typical installation

This installation requires a GFCI (Ground Fault Circuit Interrupter), appropriate fuses on batteries and a battery compartment temperature probe.

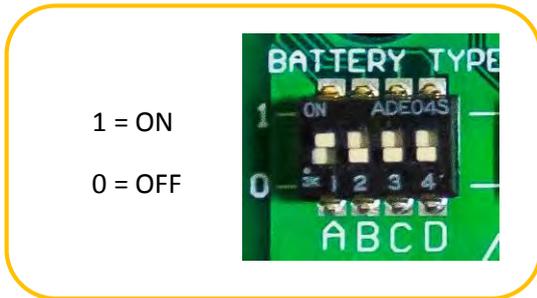


Other types of cabling - see appendix 6.

### 3.3 SWITCHES SETTING-ADJUSTMENT-INDICATORS

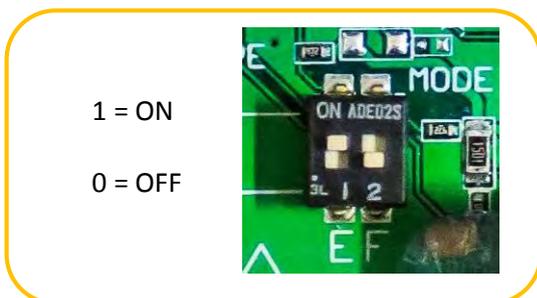
#### 3.3.1 Description

The YPOWER chargers are equipped with switches to configure the charger according the battery type and the application.



2 charging modes are available :

- The BOOST function enables a faster charge of the batteries. This function is timed controlled (see table here after) and is automatically switched off when the battery is fully charged : BOOST stops when batteries current < 20% of charger rated current. The BOOST function can also be disabled by means of a switch **(E)**.
- The REFRESH function enables to apply periodically a voltage step to maintain the battery, to promote its equalization and prevent from any sulphation. This function is activated by means of a switch **(F)**.



### 3.3.2 Setting according to the batteries type

Switches setting				Description of the battery type	Voltage* with BOOST OFF	Voltage* with BOOST ON	Maximum duration of BOOST at +/- 5% T <sub>BOOST</sub>	Maximum duration of ABSORPTION at +/- 5% T <sub>ABS</sub>
A	B	C	D					
0	0	0	0	<b>Opened type bat free electrolyte (wet)</b>	13.4V	14.1V	2H	4H
1	0	0	0	<b>Classic sealed type bat (Sealed Lead)</b>	13.8V	14.4V	2H	4H
<b>FACTORY SETTING</b>								
0	1	0	0	<b>GEL type bat</b>	13.8V	14.4V	2H	4H
1	1	0	0	<b>AGM type bat**</b>	13.6V	14.4V	2H	4H
0	0	1	0	<b>Spiral type bat</b>	13.6V	14.4V	2H	4H
1	0	1	0	<b>Tin calcium lead bat</b>	14.4V	15.1V	2H	4H
0	1	1	0	<b>Wintering or standby sealed bat</b>	13.4V	13.4V	0H	0H
1	1	1	0	<b>Stabilized DC power supply</b>	12.0V	12.0V	0H	0H
0	0	0	1	<b>SPE1 open type bat</b>	13.2V	14.8V	2H	4H
1	0	0	1	<b>Lithium Iron Phosphate (LiFePO4) with BMS (***)</b>	13,8V	14,4V	6H	10H
0	1	0	1	<b>STORMLINE Bat</b>	13,7V	14,5V	2H	6H
0	1	1	1	<b>Booked</b>				
1	1	1	1	<b>Booked</b>				

(\*) Voltage on + BAT 1, + BAT 2 and + BAT E with 10% of the rated current and a tolerance of +/- 1%.

The voltages values must be doubled for 24V batteries .

(\*\*) REFRESH is not advised for certain types of AGM batteries

(\*\*\*) Battery Management System

Some specific settings are possible – please consult us.

### 3.3.3 Temperature compensation

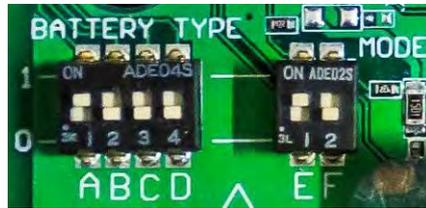
The STP-NEW-2.8 probe enables the compensation of Absorption voltage and Floating Voltage depending on the ambient temperature of the battery room. The coefficient used is -3mV/°C/element.



### 3.3.4 Factory setting

The charger's factory settings are:

Sealed type battery (lead sealed)  
 BOOST in ON position  
 REFRESH in OFF position



This setting is a compromise for satisfactory recharging of different technologies of batteries :

- Opened classic lead
- Sealed, Gel or AGM
- Spiral sealed
- Lithium Iron Phosphate ( LiFePO4 ) with BMS

To define the charge in function of your battery, please refer to the chart, paragraph : 3.3.2.

The installer should set the switches (excluding input and output voltage) and possibly adjust the output voltage with no load using potentiometer R432 (use the appropriate tool to turn the screw of the potentiometer), depending on :

- the type of battery (contact the battery manufacturer if necessary)
- the intended usage
- the cross-section and length of the output cables
- whether or not the boost function is required



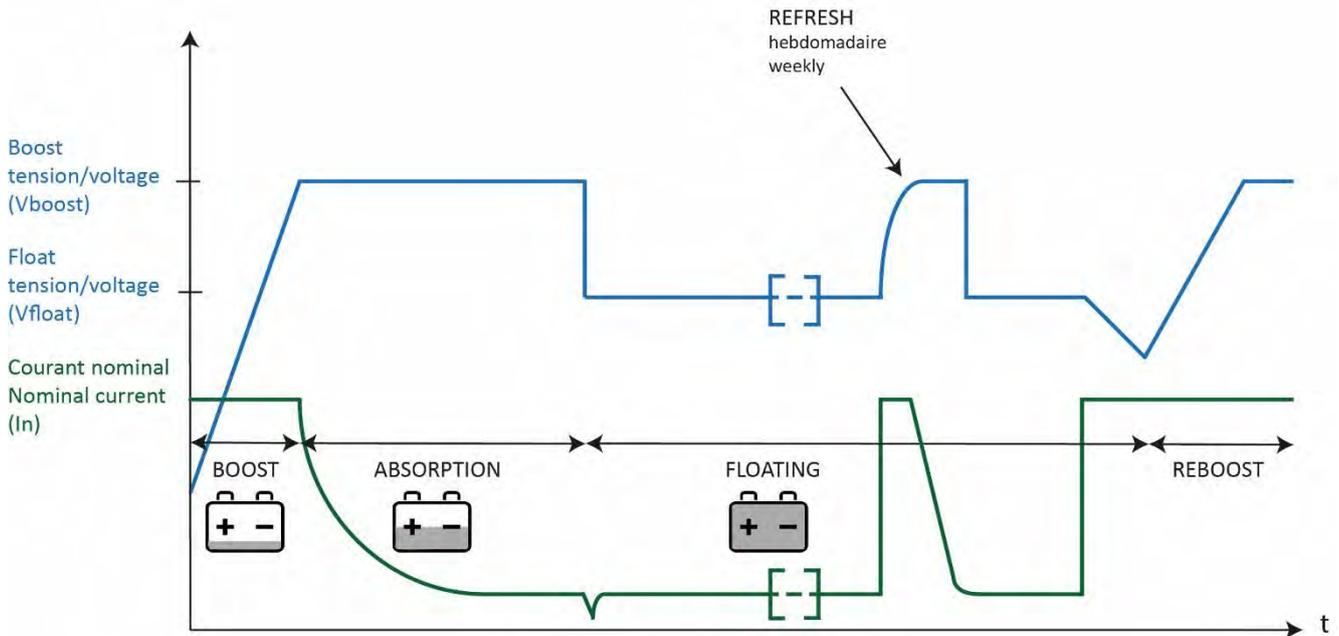
For special batteries, call in a professional installer, who will make the specific settings in accordance with the battery manufacturer's specifications and according to the specifics of the installation.

**CRISTEC is not liable for any damage caused to the batteries or for inefficient recharging.**

### 3.3.5 Charging curve

#### BOOST in ON position

With this setting the YPOWER charger delivers a 5-step charge curve IUoU + automatic weekly recycling (switch E) + return to automatic BOOST : BOOST, ABSORPTION, FLOATING + REFRESH, REBOOST.



- V BOOST : BOOST voltage (see table above)
- V FLOAT : FLOATING voltage (see table above : voltage with no BOOST)
- T BOOST : BOOST maximum duration (see table above – paragraph 3.3.2)
- T ABS : ABSORPTION maximum duration (see table above – paragraph 3.3.2 )

#### BOOST phase :

Starts up automatically when the charger is turned on if the battery is flat. The current is then at maximum output.

#### ABSORPTION phase :

Begins when the voltage has reached the maximum BOOST level. The current level starts falling.

These two phases combined last a maximum of TBOOST+TABS (depending on setting). If the current falls below 20% of rated current, the FLOATING phase automatically kicks in. Duration and current intensity depend on how charged the battery is.

#### FLOATING phase :

Starts after TBOOST or if output current has reached 20% of the charger's rated current. The voltage switches to the FLOATING value and the rated current continues to drop.

**REFRESH phase :**

It is an automatic weekly cycle (Inhibited or not by means of switch F) in order to optimize the battery life duration. It will occur only after a complete recharge cycle (BOOST, ABSORPTION and FLOATING).The charger will generate automatically a safe timed voltage step every 7 days whatever the position of BOOST switch.

**Phase REBOOST :**

Automatic phase consisting in coming back to a BOOST voltage if the DC utilizations require it (i.e. after a complete recharge cycle BOOST, ABSORPTION and FLOATING if a some DC constant consumptions are detected the charger will restart a new complete charge cycle including a BOOST phase).

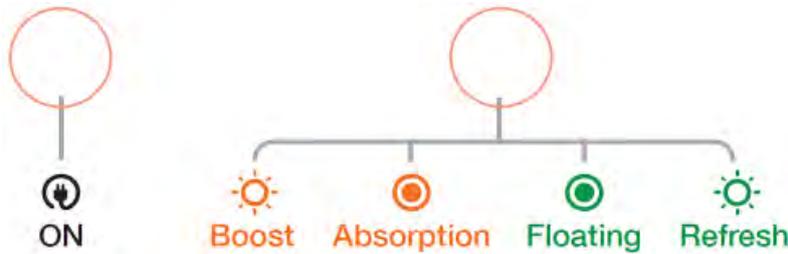
This REBOOST phase will be authorized after measuring certain battery voltage during a determined time.

**BOOST in OFF position**

With this setting, the YPOWER charger produces a single-stage UI type charge curve. It generates a constant voltage, supplying the current required by the battery(ies). Recharging time depends on the state of the battery, being longer than when the BOOST is in the ON position.

**3.3.6 Indicators**

The following led indicators are visible on the front of the appliance for monitoring.



INDICATORS	STATE	MEANING
Green LED 1 "ON"	On	Charger is ON
	Off	No or poor quality AC current Input fuse is blown Internal charger malfunction
Orange LED 2 "BOOST/ABSORPTION"	Flashing (1 sec. ON, 1 sec. OFF)	Charger in BOOST phase (switch E = '1')
	On fixed	Charger in ABSORPTION phase (switch E = '1')
Green LED 2 "FLOATING/REFRESH"	On fixed	Charger in FLOATING phase
	Flashing (1 sec. ON, 1 sec. OFF)	Charger in REFRESH phase (switch F = '1')
	Off	Internal charger malfunction or output fuse blown

## **4 EQUIPMENT MAINTENANCE AND REPAIRS**

### **4.1 OVERVIEW**

This paragraph deals with equipment maintenance and repairs. Proper operation of the product and its service life are dependent on strict compliance with the following recommendations.

### **4.2 EQUIPMENT MAINTENANCE**

Disconnect the battery charger from the AC network and the batteries before starting any maintenance work.

If appliances are in a dusty atmosphere, vacuum-clean them regularly, since dust deposits may adversely affect heat dissipation.

Check the state of battery charge every 3 months.

Nuts and screws should be tightened annually to ensure efficient operation of the appliance (particularly in rugged conditions: vibrations, shocks, high variations in temperature etc.).

### **4.3 EQUIPMENT REPAIRS**

Disconnect the battery charger from the AC power network and disconnect the batteries before undertaking any repairs.

When fuses have blown, only use fuses of the type and size recommended in this manual.

Please contact CRISTEC or their distributor for any other repairs.

Any repair without CRISTEC prior agreement entails an exclusion of warranty.

## 5 TECHNICAL SPECIFICATIONS

### YPO 12V-16A, 12V-25A, 24V12A

Part Number	YPO12-16	YPO12-25	YPO24-12
Model	12V/16A	12V/25A	24V/12A
recommended battery bank (Ah)	100-200Ah	200-300Ah	100-200Ah
<b>Input</b>			
Voltage	from 90 to 265VAC single-phase automatic		
Frequency	from 47 to 65Hz automatic		
Input current consumption 230/115VAC	1.1/2.2A	1.7/3.4A	1.7/3.4A
Recommended power for a generator	280W	435W	420W
Power factor	1		
Efficiency	90% typical		
Input fuses	T6,3A/250V - SCHURTER MST 250 Ref. 0034.6623 (F101)		
<b>Output</b>			
Number of battery bank	3 (including one for the engine battery) : +BAT E, +BAT 1 et +BAT 2 (integrated Mosfet splitter ) 1 -BAT Each bank can be used individually and deliver the rated current		
Total rated current (+/-7%) / Rated power	16A/228W	25A/356W	12A/342W
Charging curve	IU or IUoU through internal dip switches (Boost, Absorption, Floating and Refresh – factory setting)		
Battery type	Lead sealed as factory setting - Other choices through internal setting : gel, AGM, Calcium Lead, Stabilized power supply, etc.		
Boost voltage	14.4VDC for Lead sealed battery (factory setting)	28.8VDC for Lead sealed battery (factory setting)	
Floating voltage	13.8VDC for Lead sealed battery (factory setting)	27.6VDC for Lead sealed battery (factory setting)	
Regulation tolerance before output Mosfet splitter and fuse	< 2% (at rated conditions)		
Peak to peak ripple and noise	< 2% (at rated conditions)		
Automotive output fuse mounted in series in minus pole -BAT	1 x 20A/32V (F500)	1 x 30A/32V (F500)	1 x 15A/32V (F500)
<b>Environment</b>			
Cooling	Natural (fanless)		
Sound level	0		0
Operating temperature at 230VAC	From -20°C to +60°C, derating from 60°C. Above 65°C, automatic charger switch off, automatic restart when temperature decreases		
Storage temperature	From -20°C to +70°C		
Relative humidity	up to 70% (95% without condensation)		
<b>Casing</b>			
Material	Casing comprises 3 parts : · Aluminium sink frame · Thermoplastic body · Aluminium clasp		
Dimensions (length, height, depth) / Weight	236 x 180 x 96 mm / 2.1kg		236 x 180 x 96 mm / 2.1kg
Fixing center distance	219 x 155 mm		
Fixing screw (wall)	4 off M5 round head screws		
Protection factor	IP22		
PCB protection	Water-repellent varnish (marine environment)		
<b>Standards</b>			
CE declaration of conformity	Available on request		
CE / EMC	EN61204-3		
CE / Security - Others	EN60335-2-29. Pending UL and CSA.		
Ignition protected	NO	NO	NO
<b>Protections</b>			
	- Against leaking input surges by VDR rupture (voltage dependent resistor) - Not covered by warranty - Against output polarity reversal by fuse rupture (removable automotive type) - Against short-circuit and surge - Against abnormal overheating by cutting off the charger (internal temperature probe - automatic restart)		
<b>Options</b>			
Temperature probe	Output voltage compensation : -18mV/°C		Output voltage compensation : -36mV/°C
Communication	CAN BUS interface		