



# Skylla-IP65

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# 1. Safety Instructions

## 1.1. General

- Please read the documentation supplied with this product first, so that you are familiar with the safety signs and directions before using the product.
- This product is designed and tested in accordance with international standards. The equipment should be used for the designated application only.



danger of electric shock

- The product is used in combination with a permanent energy source (battery). Even if the equipment is switched off, a dangerous electrical voltage may still be present at the input and/or output terminals. Always disconnect the AC power and the battery before performing maintenance.
- The product contains no internal user-serviceable parts. Do not remove the front panel unless the mains and the battery are disconnected. Do not put the product into operation unless all panels are fitted. All maintenance should be performed by qualified personnel.
- Never use the product at sites where gas or dust explosions could occur. Refer to the specifications provided by the manufacturer of the battery to ensure that the battery is suitable for use with this product. The battery manufacturer's safety instructions should always be observed.



do not lift heavy objects unassisted

## 1.2. Installation

- Read the installation instructions before commencing installation activities.
- This product is a safety class I device (supplied with a ground terminal for safety purposes). **Its AC input and/or output terminals must be provided with uninterruptible grounding for safety purposes. An additional grounding point is located on the outside of the product.** If it can be assumed that the grounding protection is damaged, the product should be taken out of operation and prevented from accidentally being put into operation again; contact qualified maintenance personnel.
- Ensure that the connection cables are provided with fuses and circuit breakers. Never replace a protective device by a component of a different type. Refer to the manual for the correct part.
- Check before switching the device on whether the available voltage source conforms to the configuration settings of the product as described in the manual.
- Ensure that the equipment is used under the correct operating conditions. Never operate it in a wet or dusty environment.
- Ensure that there is always sufficient free space around the product for ventilation, and that ventilation openings are not blocked.
- Install the product in a heatproof environment. Ensure therefore that there are no chemicals, plastic parts, curtains or other textiles, etc. in the immediate vicinity of the equipment.

## 1.3. Transport and storage

- During storage or transport of the product, ensure that the mains supply and battery cables are disconnected.
- No liability can be accepted for damage in transit if the equipment is not transported in its original packaging.
- Store the product in a dry environment; the storage temperature should range from  $-20^{\circ}\text{C}$  to  $60^{\circ}\text{C}$ .
- Refer to the battery manufacturer's manual for information on transport, storage, charging, recharging and disposal of the battery.

## 2. Installation and wiring

### 2.1. Installation

Find a dry and well-ventilated area to mount the Skylia-IP65 charger and battery. Keep the cable length between the charger and the battery less than 6 meters.

The charger may be wall or floor mounted. Always make sure that air may flow freely at the back side of the cabinet. This will improve cooling of the charger and prolong lifetime.

#### Wall mounting

The unit can best be mounted vertical to a wall. See appendix for exact positions of the mounting holes.

#### Wiring

The inlets for the mains cable, the battery cables, the remote functions and the connection to attach the earth cable are located at the bottom of the housing; see markings on the front panel.

6 mm bolt on left hand side mounting	Earth point
Grey terminal block	External Voltage sense
	External Temperature sense
	Remote shut down
	User relay
	Starter battery
	VE.Can cables
Black cable glands: 2 or 4 pcs	Main battery cables
Black cable gland single	Mains cable



For best protection against water and dust from entering the case, all openings in the grey terminal block should be closed, either with a suitable cable or, when no connection is used, a dummy piece of cable.

#### Connecting earth

Connect the earth point to the installation earth. Connections to earth have to be according to applicable safety standards.

- On a ship: connect to the earth plate or to the hull of the ship.
- On land: connect to the earth of the mains. The connection to the earth of the mains has to be according to applicable safety standards.
- Mobile applications (a vehicle, a car or a caravan): Connect to the frame of the vehicle.

The battery connections of the charger are fully floating with respect to this grounding point

### 2.2. Connecting the main battery

Before the main battery is connected to the charger, make sure the charger is set to the correct battery type.

Minimum cable cross section between main battery and charger:

Skylia-IP65 type	cable length up to 1.5 m	cable length 1.5 m – 6 m
12/70	10 mm <sup>2</sup>	16 mm <sup>2</sup>
24/35	6 mm <sup>2</sup>	10 mm <sup>2</sup>

The largest possible cable lug that will fit through the battery cable glands is size S6-16. That cable lug will suit a maximum cable diameter of 16 mm<sup>2</sup> and fit on an M6 bolt.

#### 2.2.1. Main battery connection sequence



The Skylla-IP65 is NOT protected against reverse polarity of the main battery. ("+" connected to "-" and "-" connected to "+").

Follow the installation procedure. The warranty expires when the Skylla-IP65 becomes defective due to reverse polarity.



Disconnect the mains supply before making or breaking connections to the main battery.

1. Disconnect the mains supply
2. Disconnect battery cables from the battery.
3. Remove the grey cover in the front panel of the charger, enabling access to the terminals.
4. Connect battery cables to the charger:
  - plus (red) to "+BAT1";
  - minus (black) to "-BAT"
5. Connect battery cables to the battery:
  - plus (red) to positive pole,
  - minus (black) to negative pole.
6. Connect the mains supply.

### 2.2.2. Main battery disconnection sequence



When disconnecting the battery cables, be very careful not to accidentally short circuit the battery.

1. Disconnect the mains supply.
2. Disconnect battery cables from the battery.
3. Remove the grey cover in the front panel of the charger, enabling access to the terminals.
4. Disconnect the battery-cables from the charger.
5. Disconnect all other cables like temperature sensor and/or voltage sensor used with this particular battery.

## 2.3. Connecting the starter battery



The Skylla-IP65 is NOT protected against reverse polarity of the starter battery. ("+" connected to "-" and "-" connected to "+").

Follow the installation procedure. The warranty expires when the Skylla-IP65 becomes defective due to reverse polarity.



Disconnect the mains supply before making or breaking connections to the main battery.

The starter battery has to be connected using wire of at least 1.5 mm<sup>2</sup> (max. 6 mm<sup>2</sup>).

Connect the positive (+) battery-pole to the "Starter battery plus" connector, see Figure 1.

The negative pole of the starter battery has to be connected to the "-BAT" connection of the charger.



The starter battery can draw current from the battery connected to the main battery terminals in case the voltage of the starter battery is lower than the voltage main battery. However, the main battery cannot draw current from the starter battery even when the starter battery is fully charged and the main battery is at minimum charge level.

## 2.4. VE.Can bus connection

The two VE.Can bus connectors provide access for control with the Skylla-i control panel or NMEA 2000.

## 2.5. User relay, external sense and remote shut down

The wiring of these signals must be done with the mains disconnected from the charger.

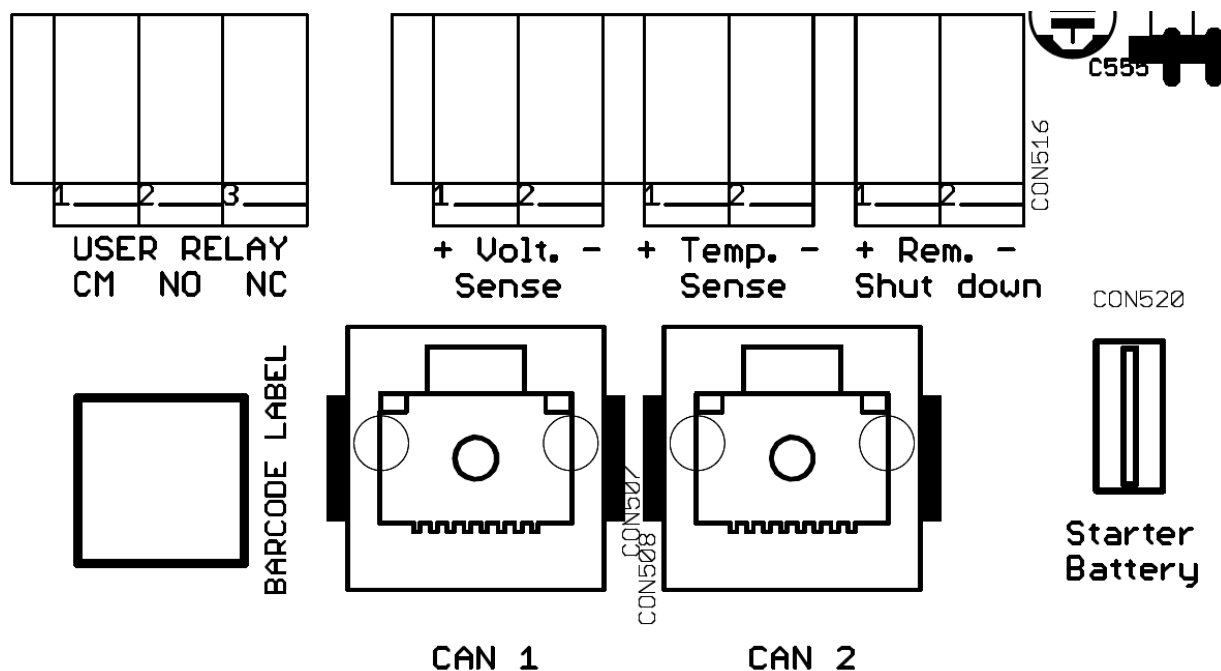


Figure 1 Connectors for external voltage/temperature sensing, Rem. Shut down, VE.Can bus and Starter battery.

### 2.5.1. External voltage sense

External voltage sensing may be used when accurate battery voltage sensing is important, such as high charging currents in combination with long cables.

To connect the external voltage sensing option, proceed as follows:

- connect a red wire (0.75 mm<sup>2</sup>) between the positive battery pole and connector "+ Volt. sense"
- connect a black wire (0.75 mm<sup>2</sup>) between the negative battery pole and connector "- Volt. sense"

### 2.5.2. External temperature sense

The external temperature sensor, supplied with the charger, can be connected to these terminals in order to perform temperature compensated charging of the battery. The sensor is electrically isolated and must be connected to the positive or negative pole of the battery.

To connect the temperature sensor, proceed as follows:

- connect the red wire to connector "+ Temp. sense"
- connect the black wire to connector "
- Temp. sense" - mount the temperature sensor on the positive or negative pole of the battery
- check in the menu for the actual temperature

### 2.5.3. Remote shut down

The wiring of the remote shut down requires extra attention. Since this input is quite sensitive it is advised to use twisted wires for this connection.

The remote shut down can also be connected to an open collector opto coupler: the open circuit voltage is 5 V and the closed circuit current is < 100 µA.

When no remote shut down is connected, the remote shut down terminals must be short circuited by a short wire (as provided on delivery of the charger).

### 2.5.4. User relay connections

The user relay is triggered by a battery under-voltage situation (<11.8 V). The function may be used for any desirable action: starting a generator, sounding an alarm etc.

The ratings of the relay can be found in the specification.

**Table 1. Relay modes**

#	Description	Setup Menu #
0	Skylia-i behaviour: on when charging (no error condition) and battery voltage between low and high voltage settings	12,13,14 and 15
1	Always off	
2	Temperature high > 85 °C)	12 and 13
3	Battery voltage too low	
4	Equalization active	
5	Error condition present	
6	Temperature low (< -20 °C)	
7	Battery voltage too high	14 and 15
8	Charger in float or storage	

ON : CM connected to NO

OFF : CM connected to NC

## 2.6. Connecting the mains

1. Check if the battery is connected to the charger.
2. Remove the grey cover in the front panel of the charger, to access the AC input connector, see Figure 2.
3. Connect the mains earth cable (green/yellow) to the AC input connector, terminal .  $\perp$
4. Connect the mains neutral cable (blue) to the AC input connector terminal N.
5. Connect the mains line cable (brown) to the AC input connector terminal L.

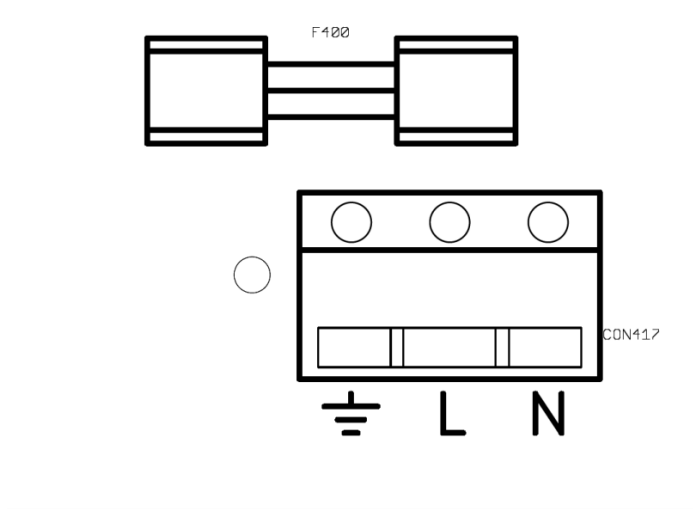


Figure 2 Mains input terminal

### 3. Control and Adjustment

When the charger is installed correctly, the charger should be set up to suit the battery connected.

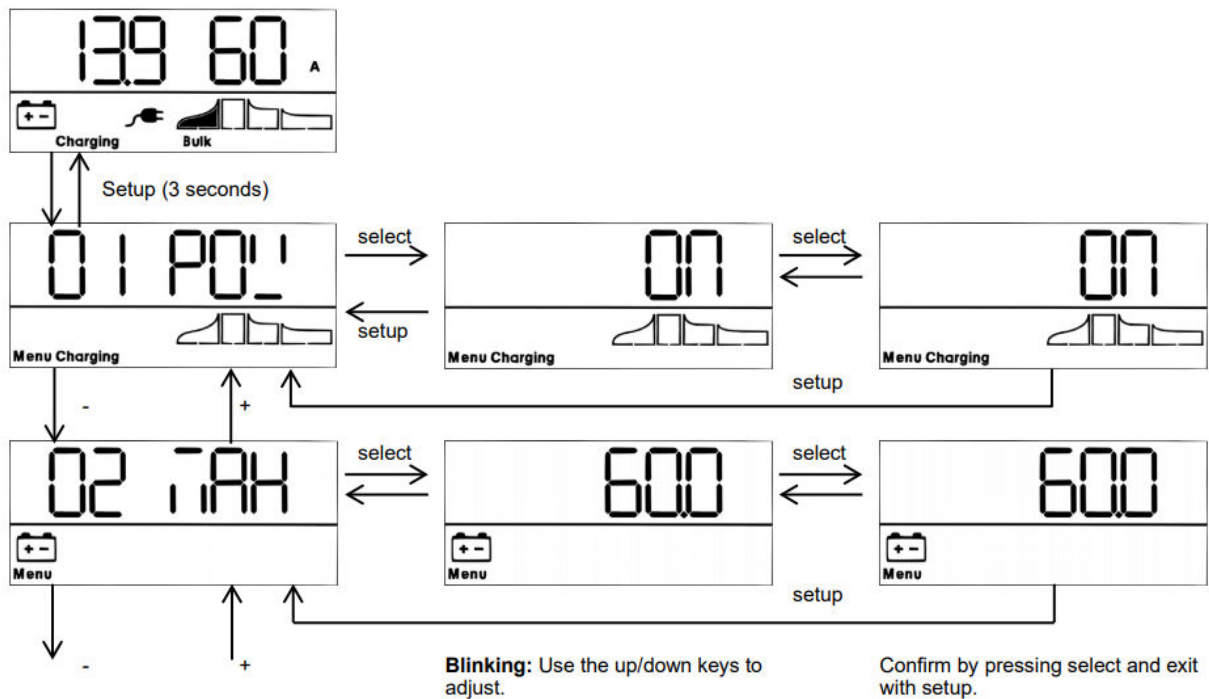
To set up the charger, apply mains power and enter the setup menu by pressing “SETUP” for three seconds.

The charger will enter a standby mode (no power applied to the battery terminals) and the user can set up the unit accordingly.











See the next table for all possible adjustments.

### 3.1. Monitor menu

The monitor menu is visible when power is applied to the charger.



The following table shows the consecutive lines when scrolling through the menu with the up/down keys:

Displayed info	Icons	Segments	Units
Battery voltage / current		140	A
Battery voltage		14.40	V
Battery charge current		60.00	A
Battery temperature *1		25.0_---_Err	°C/°F
Mains current		103.6	A
Battery voltage out 1*2		114.4	V
Battery charge current out 1*2		60.0	A
Battery voltage out 2*2		214.4	V
Battery charge current out 2*2		260.0	A
Battery voltage out 3*2		314.4	V



Displayed info	Icons	Segments	Units
Battery charge current out <sup>*2</sup>		3 60.0	A
Warning message <sup>*3 *4</sup>		1 nF 65	
Error message <sup>*3 *4</sup>		Err 2	
BMS operation <sup>*3</sup>		b75	

<sup>\*1</sup> A valid temperature is shown. “ --- ” means no sensor information or “Err” means invalid sensor data.

<sup>\*2</sup> The output channel number is shown in the first segment; only visible in a three output model.

<sup>\*3</sup> These items are only visible when relevant.

<sup>\*4</sup> After a short delay a scrolling text is shown with the error description.

With the up/down keys the user can scroll through the monitor menu.



















Holding either up or down for three seconds will start the auto scrolling mode: all Monitor menu items will be shown for 5 seconds.

The auto scroll mode can be exit by pressing up or down once.

## 3.2. Setup menu

The setup menu can be entered by pressing “SETUP” during three seconds.

Scrolling text	Icons	Segments	Units	Function or parameter
01 Power On OFF	Menu Charging	On_OFF		On/off switch
02 MAXIMUM CHARGE CURRENT	Menu	1.0-60.0	A	Maximum charge current
03 SYSTEM VOLTAGE	Menu	12	V	System voltage (read-only)
04 CHARGE ALGORITHM	Menu	1-2-9	Type	Charge algorithm
05 ABSORPTION VOLTAGE	Menu	8.0- 14.4- 15.9	V	Absorption voltage
06 FLOAT VOLTAGE	Menu	8.0- 14.4- 15.9	V	Float voltage
08 EQUALIZE RATE VOLTAGE	Menu	8.0- 15.9 15.9	V	Equalization voltage
09 AUTOMATIC C EQUALIZE RATE VOLTAGE	Menu	OFF_ AUTO		Automatic equalization
10 MANUAL EQUALIZE RATE VOLTAGE	Menu	START		Manual equalization
11 RELAY MODE	Menu	REL_ 08		Relay Function
12 RELAY LOW VOLTAGE	Menu	16.0- 11.6- 17.4	V	Low battery voltage alarm set
13 RELAY CLEAR LOW VOLTAGE	Menu	16.0- 12.0- 17.4	V	Low battery voltage alarm clear
14 RELAY HIGH VOLTAGE	Menu	16.0- 17.1- 17.4	V	High battery voltage alarm set
15 RELAY CLEAR HIGH VOLTAGE	Menu	16.0- 16.7- 17.4	V	High battery voltage alarm clear
16 RELAY HIGH PANEL VOLTAGE	Menu	U 1.0- 150.0	V	High panel voltage alarm set
18 RELAY MINIMUM CLOSED TIME	Menu	PP 0-500		Relay minimum closed time (minutes)

Scrolling text	Icons	Segments	Units	Function or parameter
20 tEñPEnrAtUrE COñPEnSAti On	Menu 	-3_0-2_7-0_0	°C mV	Battery temperature compensation per cell
22 bULH tIñE PrOtECtI On	Menu  	OFF 10	A	Bulk time protection
23 ÑAHÍ ÑUñ AbSOrPEtI On tIñE	Menu 	1_0-8_024_0	h	Absorption time
24 StOrAGe mOdE	Menu 	On_ OFF		Storage mode
25 ÑAHÍ ÑUñ FLOAtE tIñE	Menu  	4_0-8_0-24_0	h	Maximum float time
26 rEPEnrEd AbSOrPEtI On tIñE	Menu 	0_5- 1_0-24_0	h	Repeated absorption time
27 rEPEnrEd AbSOrPEtI On tIñE IntErVAL	Menu 	0_5-7_0-45	Day	Repeated absorption interval
28 tEñPEnrAtUrE CHArGE CUrrEnt	Menu  	0_0-60_0	A	Low temperature charge current
29 tEñPEnrAtUrE CHArGE CUrrEnt	Menu  	0_0- 100_0-0_0	A	Max. charge current below the low temperature level (item 30)
30 CHArGE	Menu 	OFF_On		Watch function (start-up in storage if battery voltage >13 V)
30 tEñPEnrAtUrE LEvEL	Menu  	- 10_0-5- 10_0	°C	Low temperature level (for item 29)
31 bñS PrESEnt	Menu	bñS y_n		BMS Present
33 POwEr SUPPLy vOLtAGE		8_0- 12_0- 15_9	V	Power supply voltage
34 InPUt CUrrEnt LIñIt		Ic 0_0- 12_0	A	Input current limit
49 bACHLI GHt IntEnSI tY	Menu	0-5-9		The intensity of the backlight
50 bACHLI GHt rELAYs On	Menu	OFF_On_ AUTO		Backlight automatic turn off after 60s
51 SCrOLL SPEEd	Menu	1-3-5		Text scroll speed
52 BUZZEr	Menu	y_n		Buzzer
60 CAn dEvi CE InStAnCE	Menu 	dL 0-255		VE.Can device instance
61 SOFTwARE vErSI On	Menu	1.00		Software version
62 rEStOrE dEFALtS	Menu	rESEt		System reset to default settings
63 CLAR HI StOrY	Menu	CLAR		History data reset
64 LOCH SEtUP	Menu	LOCH y_n		Lock setting
67 tEñPEnrAtUrE Uni t	Menu 	CELC_FAhrr		Temperature unit °C/°F

After entering the setup menu, the user can scroll through the menu with the up/down keys.

With select a menu item is entered and the present value is shown. With the up/down keys the user can scroll through the available modes or increase/decrease the value.

By pressing select again the value/item is set.

Pressing setup shortly will return to the setup menu.

When setup is completed, exit the menu by pressing "SETUP" again three seconds.

### 3.3. Battery selection

The charge algorithm of the charger must fit the battery type connected to the charger. The following table shows all the predefined battery types available in the charge algorithm selection menu.

#	Description	Unit type	Absorption V	Float V	Storage V	Equalization Max V @% of Inom	dV/dT mV/°C
1	Gel Victron long life (OPzV)	12 V	14.1	13.8	13.2	15.9 @ 6 % max 1hr	-16
	Gel exide A600 (OPzV)	24 V	28.2	27.6	26.4	31.8 @ 6 % max 1hr	32
	Gel MK						
2	<b>Default setting</b>	12 V	14.4	13.8	13.2	15.9 @ 6 % max 1hr	-16
	Gel Victron deep discharge, Gel Exide A200	24 V	18.8	27.6	26.4	31.8 @ 6 % max 1hr	-32
	AGM Victron deep discharge Stationary tubular plate (OPzS) Rolls Marine (flooded), Rolls Solar (flooded)						
3	AGM spiral cell	12 V	14.7	13.8	13.2	15.9 @ 6 % max 1hr	-16
	Rolls AGM	24 V	29.4	27.6	26.4	31.8 @ 6 % max 1hr	-32
4	PzS tubular plate traction batteries or	12 V	14.1	13.8	13.2	15.9 @ 6 % max 4hrs	-16
	OPzS batteries in cyclic mode 1	24 V	28.2	27.6	26.4	31.8 @ 6 % max 4hrs	-32
5	PzS tubular plate traction batteries or	12 V	14.4	13.8	26.4	15.9 @ 6 % max 4hrs	-16
	OPzS batteries in cyclic mode 2	24 V	18.8	27.6	13.2	31.8 @ 6 % max 4hrs	-32
6	PzS tubular plate traction batteries or	12 V	15	13.8	13.2	15.9 @ 6 % max 4hrs	-16
	OPzS batteries in cyclic mode 3	24 V	30	27.6	26.4	31.8 @ 6 % max 4hrs	-32
7	Lithium Iron Phosphate (LiFePo4) batteries	12 V	14.2	n.a.	13.50	n.a.	0
		24 V	28.4	n.a.	26.7	n.a.	0
8	Adjustable: maximum charge current and absorption, float, storage and equalization voltages can be changed in the setup menu	12 V	Adj.	Adj.	Adj.	Adj. @ 6 % max 4hrs	Adj.
		24 V	Adj.	Adj.	Adj.	Adj. @ 6 % max 4hrs	Adj.
9	Power supply mode	12 V	12.0	n.a.	n.a.	n.a.	0
		24 V	24.0	n.a.	n.a.	n.a.	0

### 3.4. Power supply mode

The charger can be set to operate as a DC power supply.

In this mode, the charger functions as a constant voltage source:

1. an adjustable output voltage of 8.0 to 15.9 V (12 V type) resp. 16.0 to 31.8 Volt (24 V type)
2. a maximum output current of 60A (12 V type) resp. 30A (24 V type).

### 3.5. Temperature compensation (dV/dT)

The temperature sensor should be connected to the plus or negative pole of the battery.

The temperature compensation is a fixed setting, see table and fig. 4, and applies to all charge states.

The temperature sensor must be installed when:

- ambient temperature of the battery is expected to regularly be lower than 15 °C or to regularly exceed 30 °C
- charge current exceeds 15 A per 100 Ah battery capacity

Temperature compensation is not required for Li-Ion batteries.

### **3.6. Power Control – maximum use of limited shore current**

A maximum mains current can be set in order to avoid interruption of an external fuse in the mains supply.




## 4. Operation

### 4.1. Battery charging

After applying mains power and remote shut down is not active, the display will show the following:

All icons of the screen will be visible to check the correct functioning of the display.

- The back lighting of the display is ON.
- Next the firmware version number will be displayed.
- Finally, the actual state is displayed on the screen:
- By using Voltage sensing, the actual battery voltage is shown.

Output Voltage	13.9 6.0 A	Charge current
Battery charger mode	   <b>Charging</b> <b>Bulk</b>	State of charge
	When the mains plug is blinking, the mains voltage is below normal and the charger is reducing the maximum charge current.	

- By using Voltage sensing, the actual battery voltage is shown.

### 4.2. Seven stage charge curve for lead-acid batteries

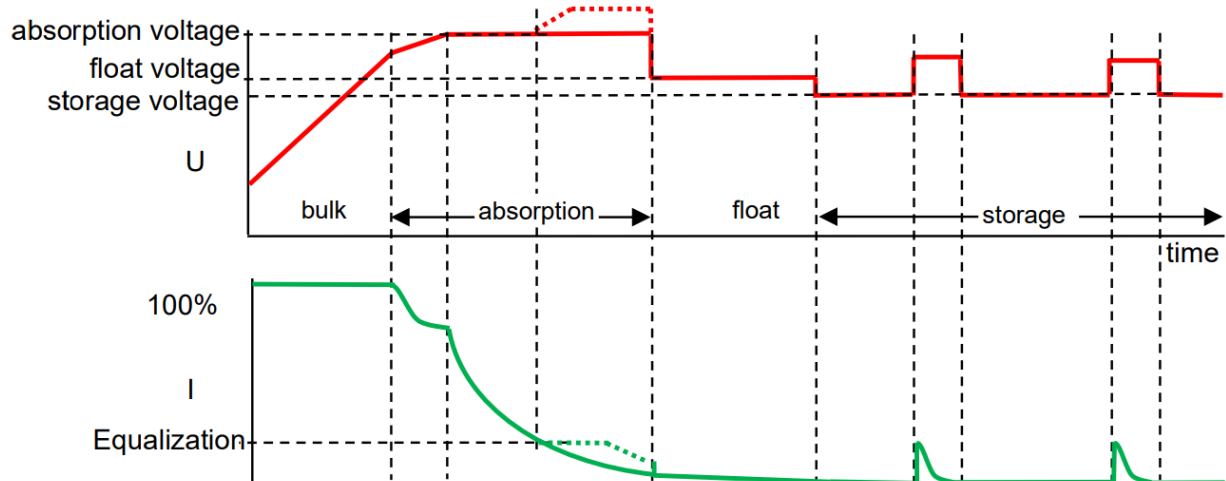


Figure 3 Voltage and current during different states in battery charging.

#### 4.2.1. Bulk

Entered when the charger is started or when the battery voltage falls below 13.2 V / 26.4 V (due to a heavy load) during at least 1 minute. Constant current is applied until gassing voltage is reached (14.4 V / 18.8 V).

#### 4.2.2. Battery Safe

If absorption voltage is set higher than 14.4 V / 18.8 V, the rate of voltage increase beyond 14.4 V / 18.8 V is limited to 7mV/14mV per minute, in order to prevent excessive gassing.

#### 4.2.3. Absorption

After the absorption voltage has been reached, the charger operates in constant voltage mode.

In case of adaptive charging, the absorption time is dependent on the bulk time, see section 3.2.

#### 4.2.4. Automatic equalization

If automatic equalization has been set to 'on', the absorption period is followed by a second voltage limited constant current period: see section 3.3. This feature will charge VRLA batteries to the full 100 %, and prevent stratification of the electrolyte in flooded batteries.

Alternatively, manual equalization can be applied.

#### 4.2.5. Float

After float charge the output voltage is reduced to storage level. This level is not sufficient to compensate for slow self-discharge of the battery, but will limit water loss and corrosion of the positive plates to a minimum when the battery is not used.

#### 4.2.6. Storage

After float charge the output voltage is reduced to storage level. This level is not sufficient to compensate for slow self-discharge of the battery, but will limit water loss and corrosion of the positive plates to a minimum when the battery is not used.

#### 4.2.7. Weekly battery 'refresh'

Once a week the charger will enter Repeated Absorption-mode during one hour to 'refresh' (i. e. to fully charge) the battery

### 4.3. Four stage charge curve for Lithium Iron Phosphate (LiFePo4) batteries

#### 4.3.1. Bulk

Entered when the charger is started, or when the battery voltage falls below 13,5 V / 27,0 V (due to a heavy load) during at least 1 minute. Constant current is applied until absorption voltage is reached (14.2 V / 28.4 V).

#### 4.3.2. Absorption

After the absorption voltage has been reached, the charger operates in constant voltage mode. The recommended absorption time is 2 hours.

#### 4.3.3. Storage

After absorption charge the output voltage is reduced to storage level. This level is not sufficient to compensate for slow selfdischarge of the battery, but will maximize service life.

#### 4.3.4. Weekly battery 'refresh'

Once a week the charger will enter Repeated Absorption-mode during one hour to 'refresh' (i. e. to fully charge) the battery.

## 5. Maintenance

This charger does not require any specific maintenance. However an annual check of the battery and mains connections is recommended.

Keep the charger dry, clean and free of dust.

## 6. Troubleshooting

Problem	Possible cause	Solution
Charger does not function	The mains is not ok	Measure mains: 120 - 240 VAC
	Input or output fuses are defective	Return product to your dealer
The battery is not fully charged	A bad battery connection	Check battery connection
	The wrong battery type has been selected in the menu.	Select correct battery type in the menu.
	Cable losses too high	Use cables with larger cross section. Use external voltage sensing.
The battery is being overcharged	The wrong battery type has been selected in the menu.	Select correct battery type in the menu.
	A battery cell is defective.	Replace battery
Battery temperature too high	Overcharging or too fast charging	Connect external temperature sensor
Error in display	See section 9	Check all charging equipment. Check cables and connections.



## 7. Temperature Compensation

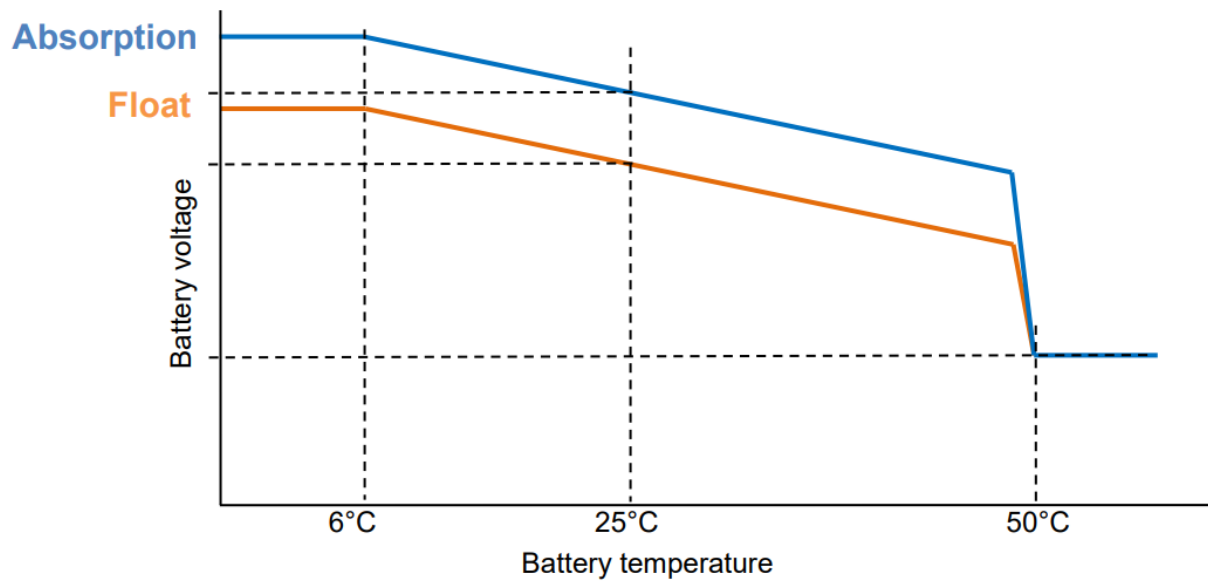


Figure 4 Temperature compensation graph for float and absorption voltages.

## 8. Specifications

Skylla-IP65	12/70	24/35
Input voltage (VAC)	120 – 240	
Input voltage range (VAC) <sup>(1)</sup>	90 – 265	
Maximum AC input current	12	
Frequency (Hz)	45-65	
Power factor	0,98	
Charge voltage 'absorption' (VDC) <sup>(2)</sup>	See table	See table
Charge voltage 'float' (VDC) <sup>(2)</sup>	See table	See table
Charge voltage 'storage' (VDC) <sup>(2)</sup>	See table	See table
Charge current main batt. (A) <sup>(3)</sup>	70	35
Charge current starter batt. (A) <sup>(4)</sup>	3	4
Charge curve, lead-acid	7 stage adaptive	
Recommended battery capacity (Ah)	350-700	150-350
Charge curve, Li-Ion	2 stage, with on-off control or VE.Can bus control	
Temperature sensor	Yes	
Power supply function	Yes	
Remote on-off port	Yes (can be connected to a Li-Ion BMS)	
CAN bus communication port	Two RJ45 connectors, NMEA2000 protocol	
Remote alarm relay	DPST AC rating: 240 VAC/4A	DC rating: 4A up to 35 VDC, 1 A up to 60 VDC
Forced cooling	Yes	
Protection	Battery reverse polarity (fuse)	Output short circuit      Over temperature
Operating temp. range	-20 to 60 °C (full output current up to 40 °C)	
Humidity (non-condensing)	max 95 %	
ENCLOSURE		
Material & Colour	steel; blue, RAL 5012	
Battery-connection	M6 bolts	
Mains connection	screw-clamp 6 mm² (AWG 10)	
Protection category	IP65	
Weight kg (lbs)	6 (14)	
Dimensions hxxxd incl. glands in mm in inches	401 x 375 x 265 (16 x 15 x 10.5)	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29	
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2	
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3	
1) Output current will gradually reduce below 110 V to 50 % @ 100 V		
2) Depending upon battery type as selected in the setup menu.		
3) Maximum current up to 40 °C (100 °F) ambient. Output current will reduce to 60 % at 50 °C, and to 40 % at 60 °C.		
4) Depending upon state of charge of starter battery		

## 9. Error indication

Error nr	Description	Possible cause	Solution
1	battery temperature too high	Overcharging or fast charging	Check air flow near the battery Improve cooling of environment. The charger stops automatically and will resume once the battery has cooled down
2	battery voltage too high	Wiring mistake, or another charger is over charging	Check all charging equipment. Check cables and connections
3, 4, 5	temp. sense error	Wiring mistake or temperature sensor broken	Check the temperature sensor wiring and if that doesn't help replace the temperature sensor
6, 7, 8, 9	voltage sense error	Wiring mistake	Check the voltage sensor wiring.
17	charger temperature too high	The heat generated by the charger cannot be removed	Check air flow of the cabinet. Improve cooling of environment. The charger stops automatically and will resume once the charger has cooled down.
18	Internal error		Contact Victron service.
20	charger bulk time expired	After 10 hours of bulk charging, the battery voltage has still not reached the absorption voltage.	Possible cell failure or higher charge current needed.
34	Internal error		Contact Victron service
37	No input voltage (only for the three output version)	Mains removed or ac-input fuse blown	Check mains availability and fuse.
65	charger disappeared during operation	One of the other chargers with which this charger was synchronizing has disappeared during operation	To clear the error, switch the charger off and back on.
66	Incompatible device	The charger is being paralleled to another charger that has different settings and/or a different charge algorithm	Make sure all settings are the same and update firmware on all chargers to the latest version.
67	BMS connection lost	Connection to the BMS lost	Check the VE.Can bus cabling. When the charger needs to operate in standalone mode again, go to the setup menu #31 (BMS Present) and set to N.
113, 114	Internal error		Contact Victron service.
115		Communication error	Check wiring and terminators
116, 117, 118	Internal error		Contact Victron service.
119	Settings invalid		Restore defaults in the setup menu #62.

## 10. Dimensions

