



Solar Controller / Battery Charger

ZS-30A / ZS-40A

Input: DC12 / 24V Solar panel (Max. 50V)

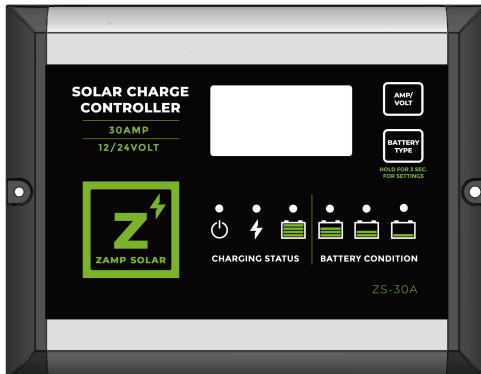
Output: DC 12 / 24V 30A (ZS-30A)

DC 12 / 24V 40A (ZS-40A)

User's Manual

FEATURE

- Advanced MCU control pulse width modulated (PWM) technology, high efficiency operation.
- Target for LiFePO4, LTO (Lithium Titanium Oxide), LI-95, Gel, AGM, Conventional lead-acid (WET) Batteries.
- Integrated regulator to prevent your battery from being overcharged. Overcharging occurs when the charge voltage is unregulated. This can result in premature battery failure.
- Integrated regulator to prevent your battery from being under charged, The unit provides an automatic Equalization feature for deeply drained Conventional lead acid battery, as well as provides a cycling automatic Equalizing feature every 28 days.
- Can be connected to the battery permanently to keep the battery fully charged by using a process called "floating". This means the controller will stop charging when the battery is full and will automatically start charging the battery as required. This process will also reduce water loss and help prevent the battery from 'drying out'.
- Protects your battery from discharge at night. Under low light or no light conditions the solar panel voltage could be less than the battery voltage. The unit contains a special circuit which prevents current flowing back from the battery and into the solar panel.
- Colored LED's to easily indicate the operational status and battery conditions.
- Digital LCD to directly display battery voltage, charging current, charging capacity (Amp hour), battery types and faulty codes.
- Provides plug-in remote digital display meter (Optional).
- Provides external battery temperature sensor (Optional).
- Multi charging protections against reverse polarity, short circuit, over temperature, over voltage, etc.
- Surface Mount or Flush Panel Mount options.
- Conformal-coating circuit boards and plated terminals apply to hostile environments.



For use with 12 / 24 Volt Solar Panel; Suitable for Solar panels up to 1020 Watts / ZS-30A; 1360 Watt / ZS-40A

WARNING – IMPORTANT PLEASE READ

- This charger is designed for indoor use only and should never be exposed to rain or moisture.
- Do not disassemble the controller. Contact Zamp Solar Technical Services if you suspect an issue with the controller.
- Lead acid, LiFePO4, LTO, LI-95 batteries can be dangerous. Ensure no sparks or flames are present when working near batteries.
- Eye protection should always be used. Never short circuit the battery
- Given sufficient light solar panels always generate energy even when they are disconnected.
- Accidental 'shorting' of the terminals or wiring can result in sparks causing personal injury or a fire hazard. We recommend that you cover up the panel(s) with some sort of soft cloth so you can block all incoming light during the installation. This will ensure that no damage is caused to the Solar Panel or Battery if the wires are accidentally short circuited.
- Always install a battery fuse on each circuit including the solar controller
- Do not reverse connect the wires to the solar panel or battery

MOUNTING THE DEVICE

The Solar Controller has two mounting options.

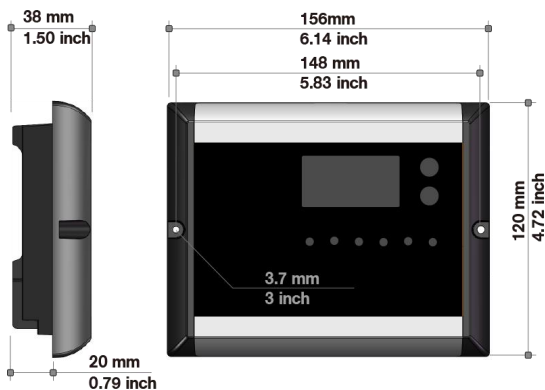
1. Surface mount:

The quickest and easiest way to mount the unit is to use the two plastic spacers and self tapping screws supplied and mount the unit to a flat surface,

2. Flush (panel) mount:

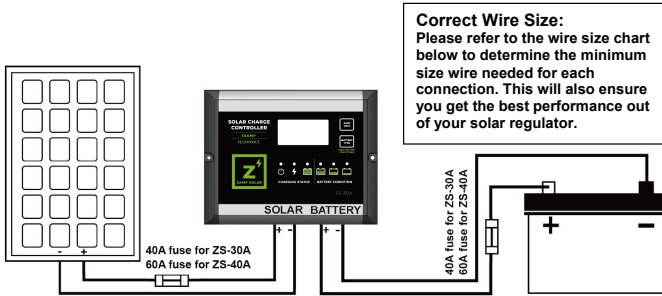
Before deciding to use this mounting method, please ensure there is sufficient depth behind the controller or in the cavity. (Refer to Diagram below)

Using the dimensions shown in the following diagram, mark a 105mm x 130mm rectangle where you wish to mount the controller and cut-out the panel opening then use the two self-tapping screws supplied to secure the unit.



WIRING CONNECTIONS

To protect the Battery and the Solar Panel, we strongly recommend that you place a 40A inline fuse for ZS-30A (60A fuse for ZS-40A) on the positive wire on both the "Solar" and "Battery" Circuits. (As close to the Battery /Panel as possible)
The Solar Controller has 4 terminals which are clearly marked 'Solar' and 'Battery'. There is a (12V) and earth (GND) terminal for each circuit.
Refer to the wiring diagram below.



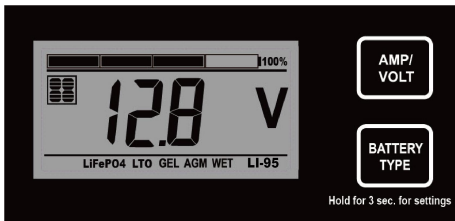
Length of Wire	Battery Connection		Solar Array Connection		
	5ft	10ft	10ft	15ft	20ft
Size (AWG)	10	8	10	8	8

1. Using the Terminals supplied, crimp the terminals on your Solar Array wires and connect to the Solar Panel like shown.
2. Using the Terminals supplied, crimp the terminals on your Battery wires and connect to the Battery like shown.

When the connections are completed, Solar Controller will start working automatically.

OPERATION - LCD DISPLAY


Please check your battery manufacturer's specifications to select correct battery type. The unit provides 6 battery types for selections: LiFePO4, LTO, LI-95, Gel, AGM, WET (conventional lead acid).



Press **BATTERY TYPE button** and **hold** for 3 seconds access battery type selection mode, the battery type you select will be shown on the LCD meter, the default setting is AGM Battery; the controller will automatically retain your battery type setting.

Caution: Incorrect battery type setting may damage your battery.


When the controller powers on, the unit will run self-quality mode and automatically show below items on LCD before going into charging process

 Self-test starts, digital meter segments test

 Software version test

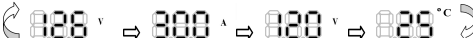
 Rated voltage and current test

 External battery temperature sensor test (if connected)

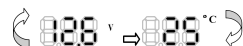
 Indicates the solar panel connected.

After going into charging process, the LCD displays the charging statuses as below: Press **VOLT / AMP button** in sequence, the LCD will display in turn with Battery Voltage, Charging Current, Charged capacity (Amp-hour) and Battery Temperature (if external temperature sensor connected)

Display in the daytime



Display during the night-



The **VOLT / AMP button** can be changed at any time during the charging process.

You also can visually monitor your battery charging condition for each battery; there is a LCD bar to show the percentage of charge, indicating the battery is charged to 25%, 50%, 75% or 100%.

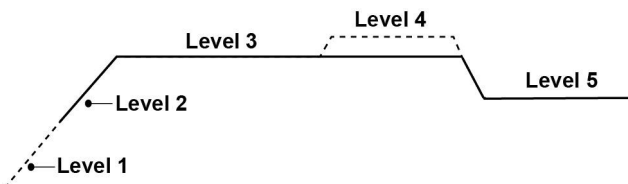


The LCD also can be treated as an independent voltage meter or thermometer. A voltage less than 11.5V Volts indicates that the battery is discharged and requires re-charging.

CHARGING STAGES

The unit has a 5-stage charging algorithm.

Soft Charge (Level 1) – Bulk Charge (Level 2)–Absorption charge (Level 3) – Equalizing Charge* (Level 4) - Float Mode (Level 5)



Soft Charge- When batteries suffer an over-discharge, the controller will softly ramp the battery voltage up to 10V.

Bulk Charge-Maximum current charging until batteries rise to Absorption level

Absorption Charge-Constant voltage charging and battery is over 80%

Equalization Charge*-Only for WET battery type, when the WET battery is deeply drained below 10V, it will automatically run this stage to bring the internal cells as an equal state and fully complement the loss of capacity. (other battery types do not run Equalization charge)

Float Charge-Battery is fully charged and maintained at a safe level.






A fully charged Lead acid battery (GEL, AGM, WET battery) has a voltage of more than 13.6 Volts; A fully charged LiFePO4, LTO or LI-95 battery has a voltage level of 13.4V.













Remarks: Voltage setting for 12V mode, x 2 for 24V mode.


OPERATION - L.E.D. INDICATION

The 6 LED's indicate the charging status and the battery condition						
	Red	Blue	Green	Green	Yellow	Red
Solar Power Present-No battery connected	ON	OFF	OFF	OFF	OFF	Flash
Soft charging	ON	Flash	OFF	OFF	OFF	ON
Bulk charging	ON	ON	OFF	Subject to battery voltage		
Absorption charging	ON	ON	OFF	ON	OFF	OFF
Equalization charging	ON	ON	OFF	ON	OFF	OFF
Float charging	ON	OFF	ON	ON	OFF	OFF
Solar panel weak	Flash	OFF	OFF	Subject to battery voltage		
At night, no charge	OFF	OFF	OFF	Subject to battery voltage		
Battery Voltage below 11.5V (+/-0.2V)	ON	ON	OFF	OFF	OFF	ON
Battery Voltage between 11.5V - 12.5V(+/-0.2V)	ON	ON	OFF	OFF	ON	OFF
Battery Voltage above 12.5V (+/-0.2V)	ON	ON	OFF	ON	OFF	OFF

ABNORMAL OPERATION MODE

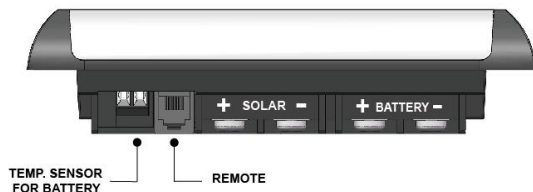
Solar panel abnormal mode	LCD display	LED indication	LCD backlight
Solar panel weak		 Flash	ON
Solar panel reverse connection		 Flash	Flash
Solar panel over voltage (> 26.5V)		 Flash	Flash

Battery abnormal mode	LCD display	LED indication	LCD backlight
Battery disconnected or less than 3.0V		 Flash  Flash  Flash	Flash
Battery reverse connection		 Flash	Flash
Battery over voltage than > 17.5V		 Flash	Flash
Battery temperature over 65°C		 Flash  Flash  Flash	Flash

The solar controller abnormal mode	LCD display	LED indication	LCD backlight
The controller over temperature protection			Flash

OPTIONAL EXTERNAL DEVICE

The controller provides two optional devices (excludes in the packaging box).



Optional external Battery temperature sensor:

As an option, the unit provides a port to connect the external battery temperature sensor; if the external battery temperature sensor is connected, the unit will optimize the charging performance subjected to the battery temperature detected and also provide the battery over temperature protection, in some cases, if battery over temperature occurs, the controller will automatically stop charging.

Optional external Remote display meter:

As an option, the unit also provides a port to connect the external Remote display meter for some special location needed. The display content on the Remote meter is same as the display on the controller.

SPECIFICATIONS

1	Electrical Parameters			
1-1	Rated solar panel amps ZS-30A /ZS-40A	30 / 40	Max.	AMP
1-2	Normal input Solar cell array voltage	15-22		VDC
1-3	Max. solar cell array voltage (output has no load)	25	Max.	VDC
1-4	The controller lowest operating voltage (solar or battery side)	8V	Min	VDC
1-5	Maximum voltage drop-Solar panel to battery	0.25	Max.	VDC
2	Charging characteristics			
2-1	Minimum battery start charging voltage	3	Min	VDC
2-2	Soft start charging voltage	3-10	+/-0.2	VDC
2-3	Soft start charging current ZS-30A / ZS-40A	Up to 15 / 20		AMP
2-4	Bulk charge voltage	10-14.0	+/-0.2	VDC
2-5	Absorption charging voltage at 25°C			
	--LI-95 type battery (i)	13.7	+/-0.2	VDC
	--LTO type battery	14.0	+/-0.2	VDC
	--LiFePO4 type battery	14.4	+/-0.2	VDC
	--GEL battery	14.1	+/-0.2	VDC
	--AGM type battery (default setting)	14.4	+/-0.2	VDC
	--WET type battery	14.7	+/-0.2	VDC
2-6	Absorption transits to Equalizing or Float condition:			
	--Charging current drops to	1.0	+0.1	AMP
	-- or Absorption charging timer timed out	4		Hour
2-7	Equalization charging active			
	--Only for WET battery			
	--Battery voltage discharged to less than	10	+/-0.2	VDC
	--Automatic equalizing charging periodical	28		Day
2-8	Equalization charging voltage at 25°C	15.5	+/-0.2	VDC
2-9	Equalization charging timer timed out	2		Hour
2-10	Float charging voltage at 25°C			
	-- For LI-95, LTO and LiFePO4 battery	13.4	+/-0.2	VDC
	-- For Gel, AGM, WET battery	13.6	+/-0.2	VDC
2-11	Voltage control accuracy	+/- 1%		
2-12	Battery temperature compensation coefficient	-24		mV/°C
2-13	Temperature compensation (exclude Lithium battery)	-20~+50		°C
3	Protection			
3-1	Against reverse polarity or short circuit			
3-2	No reverse current from battery to solar at night			
3-3	Over temperature protection during charging	65		°C
3-4	Transient over voltage protection with TVS or varistor			
4	Electrical parts			
4-1	Input output terminal	M5 terminals		
4-2	Remote port	RJ-11 (6 pins)		
5	Physical Parameters			
5-1	Controller material	Plastic, Standard ABS		
5-2	Power terminal maximum stranded wire size	#6 AWG stranded -16 mm ²		
5-3	Power terminal torque	Up to 17 in-lb (0.2n-m)		
5-4	Mounting	Vertical wall mounting		
5-5	IP grade	IP22,		
5-6	Net weight	Approx. 0.3kg / 0.66lb		
6	Environmental characteristics			
6-1	Operating temperature	-25 ~ 50°C / -13 ~ 122 °F		
6-2	Storage temperature	-40 ~ 85°C / -40 ~ 185 °F		
6-3	Operating Humidity range	100% no condensation		

Remarks: Voltage setting for 12V mode, x 2 for 24V mode.

(i) The LI-95 battery profile keeps your LiFePO4 battery charged at 95%. Evidence suggests that charging your Lithium battery to less than 100% can increase longevity of your battery.

