

KICKASS®

SOLAR REGULATOR PWM 12V 30A MANUAL



KAPWM30A

INTRODUCTION

KickAss is focused on bringing the luxury of home to the outdoors. Your one stop shop for 12V products. All of our products are designed to be plug and play, for the ultimate camping experience. Designed by the KickAss team in Australia.

The KickAss 12V PWM 30A Solar Regulator has been design to provide a compact plug and play solar power solution, highly efficient power conversion to keep your battery safely charged. Our team of dedicated engineers test every product to make sure they stand up to the tough Australian outback. The KAPWM30A solar regulator uses a solid state design with Pulse Width Modulation (PWM). Without the need of cooling fans, the unit is fully sealed, rated at IP65 making it dust and water resistance for outdoor use.

IMPORTANT WARNING AND SAFETY INSTRUCTIONS!

DO NOT operate Solar Panel UNLESS YOU HAVE READ AND UNDERSTOOD THIS MANUAL and the Solar Regulator is installed as instructed.

Working in the vicinity of Lead-Acid batteries is dangerous. During normal operation batteries generate explosive gases. It is important that the battery is operated in a well ventilated area and the Solar Regulator is installed as directed.

Check the battery manufactures guide for the recommended voltage profile for charging.

Failure to ensure the selected voltage does not exceed the recommend profile could damage your battery. Change the selection if necessary before charging the battery.

Risk of injury and damage due to incorrect installation product:

- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they are supervised or have been properly instructed on how to use the appliance by a person responsible of their safety.
- Children should be supervised to ensure they do not play with the appliance.
- Ensure to use the Solar Panel with a regulator of the correct input rating and suitable charge profile for the battery chemistry type being charged. Suitable battery types include; Lead Acid, Gel, Calcium, AGM or Lithium.

- The battery should be mounted in a well ventilated area, and a safe distance from any ignition source. NEVER smoke or allow a spark or flame in the vicinity of the battery. This may cause the battery to explode.
- If battery acid comes in contact with skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flush eye with running cold water for at least 10 minutes and get medical attention immediately.
- To reduce risk; take when using any metal tool near the battery to avoid risk of shorting the terminals.
- To reduce the risk of sparks, connect or disconnect the Solar Blanket to the charge regulator BEFORE exposure to sunlight. The Solar Blanket may generate voltage up to the rated open circuit value, at the connection leads while unconnected.
- Ensure a fuse or circuit breaker is installed on connection from battery to regulator.
- Do not disassemble charger, contact KickAss customer support for trouble shooting advice.
- Do not reverse polarity connect the wires to the solar panel or battery.

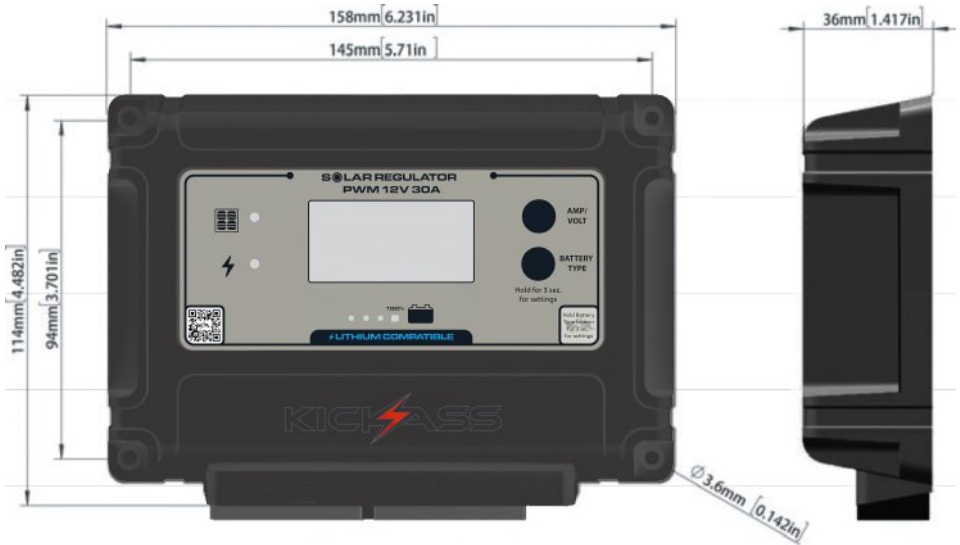
FEATURES

- Designed with PWM technology.
- Common negative grounding design and 100% solid state.
- Suitable for solar panels with max open circuit voltage of 25V
- 7 Different Battery type charge profiles included:
 - Lead crystal
 - Calcium
 - Gel
 - AGM
 - WET (Lead acid Flooded)
 - Lithium Iron Phosphate battery (LiFePO4)
 - LI-LION series
- Lithium BMS "Wake up" feature to automatically reactive BMS.
- Highly efficient charger that ensures your battery is charged to 100% every time.
- Coloured LED's that indicate the charging status and battery conditions.
- Big Digital LCD to clearly display battery voltage, charge current, overall charged capacity (Amp hour of charge into battery), battery type, charge percentage, battery temperature and fault codes.
- Plug & Play connection that accepts Anderson plug connection.
- M5 Screw terminals for hardwired option.
- Protection features including: Overvoltage, Short Circuit, Reverse Polarity and Thermal Protection
- Over voltage protection, Short circuit protection, Reverse polarity protection
- Includes external battery temperature sensor.
- IP65 rated, suitable for indoor or outdoor use, surface panel mount
- Rubber dust cover for terminal protection

INSTALLATION

The Solar Controller is mounted as shown below

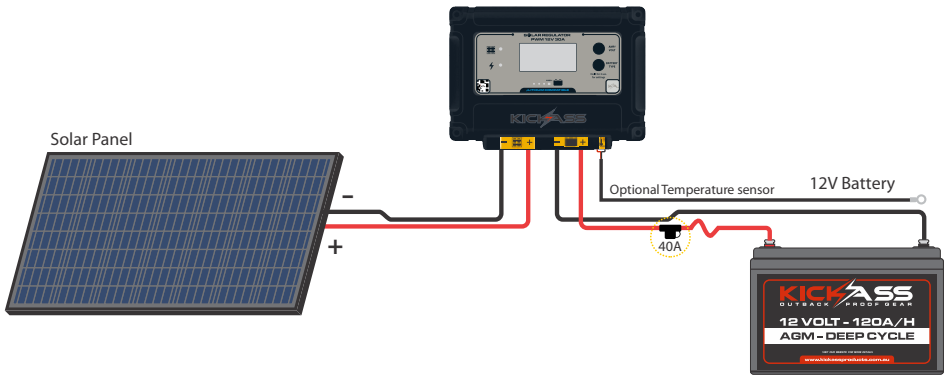
The unit can be mounted on a flat surface using the 4 corner screw down points. Do this by firstly removing the exiting 4x machine screws and backing plate. With the corner screw down points free, mark the surface for the mounting points and pre drill your screw holes or simply use a self tapping screw and directly mount the unit.



↑ Rubber Dust Covers ↓



CONNECTION INSTRUCTIONS

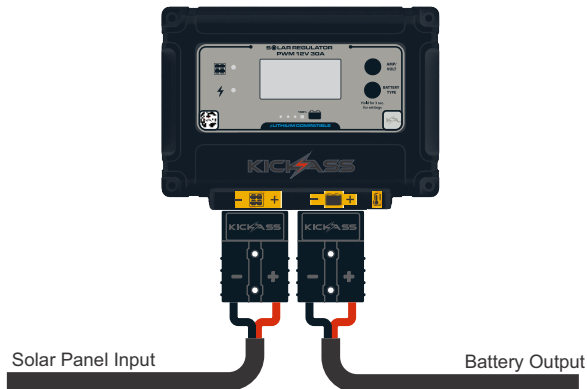


There are two options for connecting your solar panels and battery to charger. These include Plug and Plug using Anderson style quick connector or hardwired cable to screw terminal connection. For either option, we recommend installing the regulator as close to the battery as possible.

Option 1: KAPWM30 Regulator with anderson plug connection

Step 1. Remove rubber seals from regulator connection points and insert the appropriate Anderson connection lead from battery into the regulator connection marked as battery output. Ensure a fuse is installed on the positive cable as close to the battery positive terminal as possible. Once Battery is connected to the regulator, the correct battery type charge profile can be selected. See section "Operating Instructions" for Battery type selection and LCD operation

Step 2. With Solar Panel in shade, connect Anderson extension lead from Solar Panel into the regulator connection plug marked as Solar Panel input.



Option 2. Hardwiring using screw terminal option.

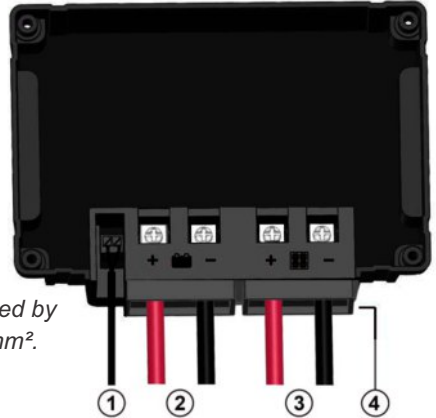
Step 1. Mount regulator and battery in a suitable position. Ensure to carefully measure the cable from the regulator to battery. Refer to Cable Size Chart below.

Note: Do not remove the rubber covers "4", these are designed to create a seal and protect the terminations from moisture and dust.

Step 2. Ensure cable sizing is appropriate for length of wire as per chart below. Wires to connect the battery and solar panel to the regulator will be required to be crimped with M5 ring terminals.

Step 3. Battery Connection: Terminate the battery positive and negative cables to the regulator (2), ensuring bolts are securely tightened. Connect the negative cable to the negative terminal on the battery. Using an inline 40A fuse of circuit breaker, connect the positive wire to the positive terminal on the battery

Step 4. Solar Panel Connection. With the solar panel unplugged from the solar connection lead, terminate positive and negative solar cables to regulator (3), ensuring bolts are securely tightened. With the solar panel out of the sun, connect all cables to solar panels, ensuring a well sealed termination.



Note: Always use the correct solar cable as directed by solar panel manufacture and is a minimum of 4mm².

External Battery Temperature Sensor (1):

We recommend installing the external temperature sensor when battery and regulator are installed in separate locations from each other or the temperature range where the battery is installed may range outside of the normal operating range. The sensor is designed to optimize the charging performance subject to the battery temperature detected while also providing over temperature protection. If over temperature occurs, the regulator will automatically stop charging.

Please refer to the cable size chart to determine the minimum size cable needed for ensuring the best performance of regulator

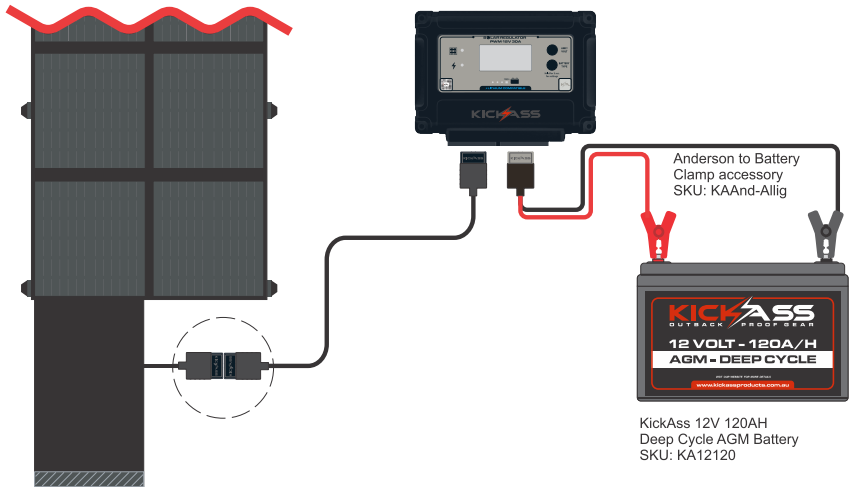
Unit: Meter

Rated current	Cable Size Chart - Distance of Regulator from Battery			
	Cable length (One way)	<2M	2 - 4M	4 - 6.5M
30A	The cable size (AWG)	10AWG	8AWG	6AWG

Recommend Connect diagram

Note: Please connect solar panels to regulator before exposing to direct sun

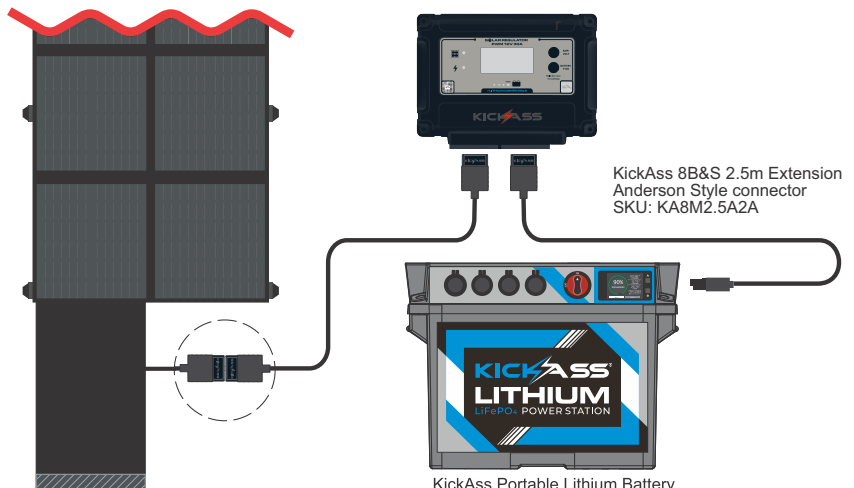
KAPWM30A Regulator connected with KA Folding Solar Blanket and KickAss 120AH AGM Battery



KickAss 160W Folding Solar Blanket
SKU: KASB160

KickAss 12V 120AH
Deep Cycle AGM Battery
SKU: KA12120

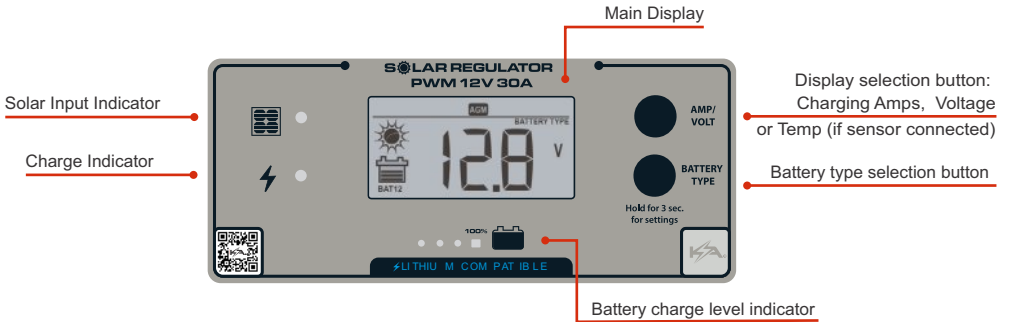
KAPWM30A Regulator connected with KA Folding Solar Blanket and Power Station



KickAss 160W Folding Solar Blanket
SKU: KASB160

KickAss Portable Lithium Battery
Box Power Station No DCDC
SKU: KAJBLITNODCCD

OPERATION



When unit first connected to the battery, the display will power on and enter a self test mode. The screen will display the follow information:

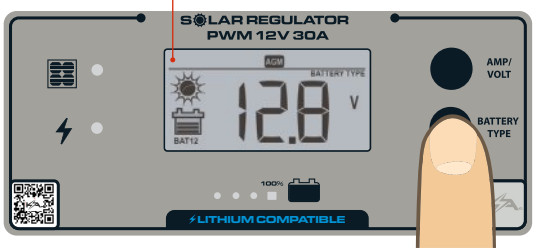
- 888 Self test for digital segment display
- 888 Software version test
- 820 Rated Voltage
- 808 Rated Current

BATTERY TYPE SELECTION

IMPORTANT! Please select the correct battery type as damage can occur if incorrect settings are used. The default battery type is set for AGM. Press the “BATTERY TYPE” button and hold for 3 seconds to enter the battery type selection mode. The available selections will be shown on the LCD as indicated below. Once the correct battery type is selected the regulator will automatically memorize your battery type setting. These include:

Setting	Battery Type	Max Voltage	Setting	Battery Type	Max Voltage
CRYSTAL	Lead Crystal crystalline silicon dioxide	14.7V	LTO	Lithium titanite oxidized (Li4Ti5O12)	14.5V
CALCIUM	Calcium Lead-acid	14.9V	LI-LION	Lithium Cobalt Oxide (LiCoO2)	12.6V
GEL	Gel Lead-acid	14.1V		Lithium Manganese Oxide (LiMn2O4)	
AGM	AGM Lead-acid	14.4V		Lithium Nickel Manganese Cobalt Oxide (LiNiMnCoO2)	
WET	Flooded Lead-acid	14.7V		Lithium Nickel Cobalt Aluminum Oxide (LiNiCoAlO2)	
LFP	Lithium Iron Phosphate (LiFePO4)	14.5V			

CRYSTAL > CALCIUM > GEL > AGM > WET > LFP > LTO > LI-LION



Press and hold for 3 seconds to enter “Battery Type” selection mode.

LCD Display - Normal function

When the solar input is active and the charging process begins, the LCD will show the charging status. This can be displayed as battery voltage, charging amps, charged capacity (Amp hours) and battery temperature (if external temperature sensor connected)

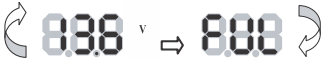


Press once to scroll through selection mode.

Display in sequence



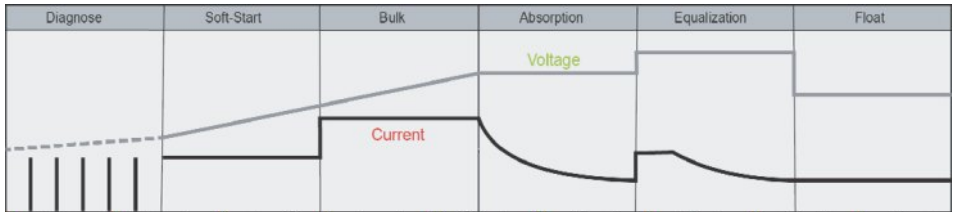
Alternatively Display voltage and FUL when battery is fully charged



CHARGING STAGE

The KAPWM30A 12V Regulator has a 6 stage charge algorithm

Diagnose* - Soft Charge – Bulk Charge - Absorption charge – Equalizing Charge* - Float Mode



Diagnose * – Only for Lithium battery type, subjected to the Lithium battery initial voltage which will determine if Soft start or Bulk stage is appropriate; if the Lithium battery is protected by the BMS, the regulator will automatically send a voltage signal periodically to the battery terminal to activate the BMS, and bring it out of low voltage protection.

Soft start - When batteries suffer an over-discharge, the regulator will softly ramp the battery voltage up to 10V, before entering the Bulk Stage.

Bulk Stage - Maximum charging current will be delivered to batteries until the Absorption stage reached. For Lead crystal battery type, the regulator will deliver a two step level of Bulk charge. The first level rises the battery voltage up to 14.4V, then will switch into the second level of the 50% of the first bulk charge rate, until the Lead crystal battery voltage reaches

Absorption Stage - Constant voltage charging until battery capacity reaches 85% for Lead Acid type; Li-ion battery, LiFePO4 battery and L TO battery will be fully charged after absorption stage. See specification table for Max voltage reached for different battery types.

Equalization * - Only for WET or Calcium battery types, when the battery is deeply drained below 10V or every 28 day charge cycle, the regulator will automatically run this stage to bring the internal cells to an equal state and aim to remove any build up of sulfation from inside the battery. (Equalization charge will not run when battery type is selected as: Lead crystal, Li-ion, LiFePO4, LTO, Gel and AGM)

Float Stage or Re-Bulk Stage - Battery will enter this stage when fully charged and will be maintained at a safe level. A fully charged Lead Acid battery (Crystal, GEL, AGM, WET battery) has a voltage of more than 13.8 Volts; if the battery voltage drops to 12.8V during the Float Stage, the regulator will return to Bulk charge; Li-ion, LiFePO4 and LTO battery have no float mode; If a Li-ion battery voltage drops to 12.0V after absorption stage, it will return to Bulk charge; if a LiFePO4 battery voltage drops to 13.4V, or LTO battery voltage drops to 13.2V after Absorption stage, they will return to Bulk charge. (Voltage x 2 for 24V use).

LED INDICATION

LED indications							LCD Display	LCD Backlight
	RED	BLUE	BLUE	BLUE	BLUE	GREEN		WHITE
Soft-start charging	ON	FLASH	FLASH	OFF	OFF	OFF	Normal Display	ON
Bulk charge (charged capacity < 25%)	ON	ON	ON	OFF	OFF	OFF		
Bulk charge (charged capacity < 50%)	ON	ON	OFF	FLASH	OFF	OFF		
Bulk charge (charged capacity < 75%)	ON	ON	OFF	OFF	FLASH	OFF		
Absorption charging	ON	ON	ON	ON	ON	FLASH		
Float charging	ON	OFF	OFF	OFF	OFF	ON		
Solar voltage low (Low light)	FLASH	OFF	Subject to battery voltage			OFF		
Solar not detected	OFF	OFF	Subject to battery voltage			OFF	OFF	
Solar voltage OK - Battery < 5V	ON	OFF	FLASH	OFF	OFF	OFF	b03 / bLv	FLASH
Solar voltage OK, Battery reversed polarity	ON	OFF	FLASH	OFF	OFF	OFF	b0 2/ brc	FLASH
Solar voltage OK, Battery over-voltage	ON	OFF	FLASH	FLASH	FLASH	OFF	b01 / bov	FLASH
Solar not detected, Battery over-voltage	OFF	OFF	FLASH	FLASH	FLASH	OFF	b01 / bov	FLASH
Solar voltage OK, Battery over 65 °C	ON	OFF	Subject to battery voltage			OFF	b04	FLASH
Battery voltage OK, Solar reversed polarity	FLASH	OFF	Subject to battery voltage			OFF	P01	FLASH
Battery voltage OK, Solar over-voltage	FLASH	OFF	Subject to battery voltage			OFF	P02	FLASH
Over Temperature Protection							otP	FLASH

SAFETY PROTECTION

- Reverse polarity solar and battery connection.
- Over temperature protection with charging current de-rated.
- Transient over voltage protection
- Safety and EMC compliance
- IEC/EN 60335, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5 FCC Class-B EN61000-4-6, EN61000-4-11, EN61000-3-3, CISPR14-1

MAINTENANCE

Occasionally, clean the case using a damp cloth and mild cleaning agent. Check with terminals without loose, rusty; If connecting cable is damaged, replace the cable by qualified person.

SPECIFICATION

Voltages in below table are for 12V use, x 2 for 24V use.




1	Electrical Parameters			
1-1	Rated solar panel amps	30	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 at solar or battery side	8V	Min	VDC
1-5	Standby current consumption at night	5	Max	mA
1-6	Maximum voltage drop-Solar panel to battery	0.25	Max.	VDC

Absorption - Constant voltage charging and battery is over 85% for lead acid battery; a Li-ion battery, LiFePO4 battery and LTO battery will close fully charging after absorption stage, the absorption voltage level will reach 12.6V for Li-ion battery, 14.4V for LiFePO4 battery; 14.0V for LTO battery. 14.7V for Lead crystal battery.

Equalization * - Only for WET battery or Calcium battery type, when the battery is deeply drained below 10V or every 28 days cycle, it will automatically run this stage to bring the internal cells as an equal state and fully complement the loss of capacity. (Lead crystal, Li-ion, LiFePO4, LTO, Gel and AGM battery do not run Equalization charge)

Float Charge or Re-Bulk charge - Battery is fully charged and maintained at a safe level. A fully charged Lead acid battery (Crystal, GEL, AGM, WET battery) has a voltage of more than 13.8 Volts; if the lead acid battery voltage drops to 12.8V at float mode, it will return to Bulk charge; Li-ion, LiFePO4 and LTO battery have no float mode; If a Li-ion battery voltage drops to 12.0V after absorption stage, it will return to Bulk charge; if a LiFePO4 battery voltage drops to 13.4V, or LTO battery voltage drops to 13.2V after Absorption stage, they will return to Bulk charge. (Voltage x 2 for 24V use)

LED INDICATION

LED indications							LCD Display	LCD Backlight
LED Color	RED	BLUE	BLUE	BLUE	BLUE	GREEN		WHITE
Soft-start charging	ON	FLASH	FLASH	OFF	OFF	OFF	Normal Display	ON
Bulk charge (charged capacity < 25%)	ON	ON	ON	OFF	OFF	OFF		
Bulk charge (charged capacity < 50%)	ON	ON	OFF	FLASH	OFF	OFF		
Bulk charge (charged capacity < 75%)	ON	ON	OFF	OFF	FLASH	OFF		
Absorption charging	ON	ON	ON	ON	ON	FLASH		
Float charging	ON	OFF	OFF	OFF	OFF	ON		
Solar weak (At dawn or dusk)	FLASH	OFF	Subject to battery voltage			OFF		
In the night	OFF	OFF	Subject to battery voltage			OFF	OFF	
Solar good, VB < 5V	ON	OFF	FLASH	OFF	OFF	OFF	b03 / bLv	FLASH
Solar good, battery reversed	ON	OFF	FLASH	OFF	OFF	OFF	b0 2/ brc	FLASH
Solar good, battery over-voltage	ON	OFF	FLASH	FLASH	FLASH	OFF	b01 / bov	FLASH
Solar off, battery over-voltage	OFF	OFF	FLASH	FLASH	FLASH	OFF	b01 / bov	FLASH
Solar good, battery over 65°C	ON	OFF	Subject to battery voltage			OFF	b04	FLASH
Battery good, solar reverse	FLASH	OFF	Subject to battery voltage			OFF	P01	FLASH
Battery good, solar over-voltage	FLASH	OFF	Subject to battery voltage			OFF	P02	FLASH
Over Temperature Protection							otP	FLASH

Voltages are for 12V use, x 2 for 24V use

SAFETY PROTECTION

- Spark-free protection.
- Reverse polarity solar and battery connection.
- Against reverse current from battery to solar panel at night.
- Over temperature protection with charging current de-rate.
- Transient overvoltage protection, a varistor or transient voltage suppressor (TVS) at the solar input and battery output against surge voltage.
- Safety and EMC compliance
IEC/EN 60335, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5 FCC Class-B
EN61000-4-6, EN61000-4-11, EN61000-3-3, CISPR14-1

MAINTENANCE

Occasionally, clean the case using a damp cloth and mild cleaning agent. Check with terminals without loose, rusty; If connecting cable is damaged, replace the cable by qualified person.

SPECIFICATION

Voltages in below table are for 12V use, x 2 for 24V use.

1	Electrical Parameters			
1-1	Rated solar panel amps	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 at solar or battery side	8V	Min	VDC
1-5	Standby current consumption at night	5	Max	mA
1-6	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 (50% PWM duty)	Up to 15/20		AMP
2-4	Bulk charge	By the maximum rated current		
	Bulk charge level1 for Lead Crystal battery	By 100% maximum rated current charge up to 14.4V.		
	Bulk charge level2 for Lead Crystal battery	By 50% rated current charge up to 14.7V from 14.4V.		
2-5	Absorption charging voltage at 25°C			
	--Lead Crystal battery	14.7	+/-0.2	VDC
	--Gel type battery	14.1	+/-0.2	VDC
	--AGM type battery (default setting)	14.4	+/-0.2	VDC
	--WET type battery	14.7	+/-0.2	VDC
	--Calcium type battery	14.9	+/-0.2	VDC
	--LTO battery	14.0	+/-0.2	VDC
	--LFP battery	14.5	+/-0.2	VDC
	--Li-ion battery	12.6	+/-0.2	VDC
2-6	Absorption transits to Equalizing or Float condition:			
	--Charging current drops to	1.5	+0.1	AMP
	-- or Absorption charging timer timed out	4		Hour
2-7	Equalization charging active			
	--Only for WET or Calcium 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 voltage (for Crystal, GEL, WET, Calcium, AGM battery) at 25°C	13.8	+/-0.2	VDC
	Restart voltage for LTO battery	13.2	+/-0.2	VDC
	Restart voltage for LFP battery	13.4	+/-0.2	VDC
	Restart voltage for Li-ion battery	12.0	+/-0.2	VDC
2-11	Voltage control accuracy	+/- 1%		
2-12	Battery temperature compensation coefficient	-24		mV/°C
2-13	Temperature compensation range			°C
3	Protection			
3-1	Against reverse polarity or short circuit at panel or battery			
3-2	Over temperature protection during charging	65		°C
4	Electrical Connections			
4-1	Input output terminal	M5 Terminal Screw/ Anderson style		
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	IP65,		
5-6	Net weight	Approx. 300g		
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		

THANK YOU FOR CHOOSING

KICKASS[®]



For more information please visit us at:
kickassproducts.com.au