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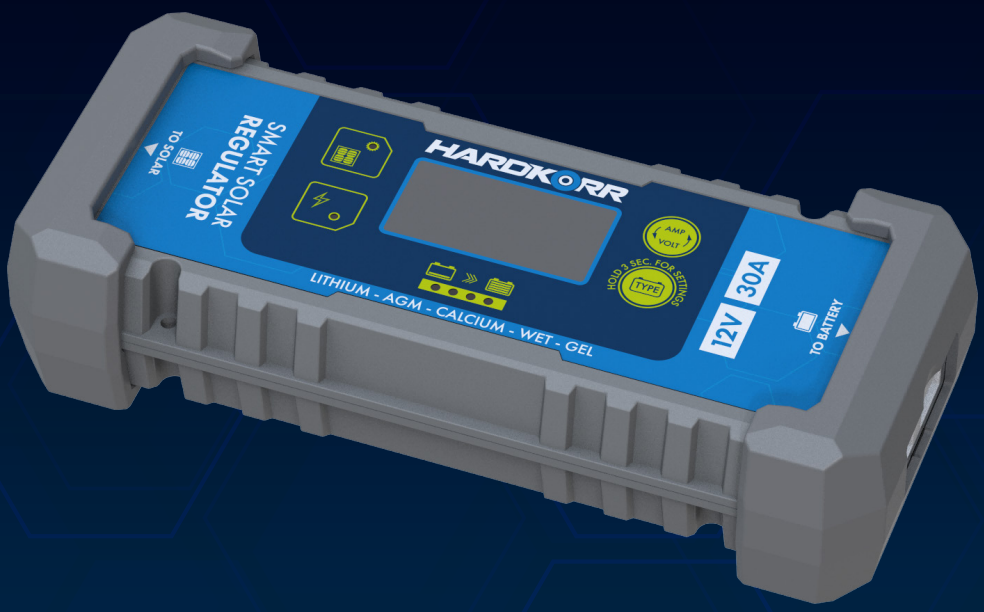


# 30A 12V **INLINE SMART SOLAR REGULATOR**

v1.0.0 - November 2021

## INSTRUCTION MANUAL

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# INTRODUCTION

**Congratulations on purchasing this high quality Hardkorr product.**

In doing so, you now have the assurance and peace of mind that comes from purchasing a product that has been manufactured to the highest quality standards.

Our aim is for you to be completely satisfied with your purchase, and therefore your new Hardkorr product is backed by a comprehensive 2-year warranty and an outstanding after-sales customer service team.

If you require technical support, or in the unlikely event your purchase appears to be faulty, please contact our support team for immediate assistance.



**PLEASE KEEP THIS MANUAL FOR FUTURE REFERENCE**

This manual contains important safety instructions for your 30A PWM inline smart solar regulator. Do not operate the solar regulator until you have thoroughly read and understood this user manual.

# GENERAL INFO & SAFETY INSTRUCTIONS

This Hardkorr 30A PWM inline smart solar regulator offers unrivalled quality, durability and value for money. It is simple to operate without sacrificing features or functionality.

Its large, backlit LCD screen provides useful information relating to power input and battery charge level, and inbuilt LEDs provide a quick-reference indicator of battery charge status.

This regulator ensures that the power generated from your solar panels is at the right voltage to charge your auxilliary batteries. It has an advanced 6-stage charging algorithm, and contains specific charge programs for a range of batteries including Lithium ($LiFePO_4$ / LTO), AGM, Wet, Gel and Calcium. Battery type can be set with the push of a button and will be memorised by the regulator..

Its rugged, high-quality construction means it is also IP65 rated, so will not be damaged by exposure to dust and rain. It contains a host of electronic protection circuits including:

- Reverse polarity protection
- Short circuit protection
- Reverse current protection
- Overcharge protection
- Transient overvoltage protection
- Over-temperature protection

These circuits will ensure your batteries are charged optimally and protected from damage.

Inbuilt smart reactivation technology means that this regulator is able to wake up 'dead' lithium batteries where the BMS over-discharge protection circuit has been triggered.

## WARNINGS

RISK OF FIRE, EXPLOSION AND BURNS: Working in the vicinity of lead acid batteries is dangerous. Explosive gases can develop during normal battery operation. Be certain there is enough ventilation to release the gasses. DO NOT smoke when in the vicinity of the battery under charge.

ENSURE the red is connected to the positive terminal and the black is connected to the negative terminal if using clamps to connect to your battery. Connecting to the wrong terminals may burn out the regulator.

DO NOT use the regulator to charge non-rechargeable batteries; this may result in harm to the user and/or damage to the equipment.

CHECK the manufacturer's data for your battery and ensure the maximum voltage of the the profile you select does not exceed the recommended maximum charge voltage.

CONFIRM that the power wires are tightly connected to avoid excessive heating from a loose connection.

BE VERY CAREFUL not to short-circuit the battery connections.

Accidental shorting of the terminals or wiring can result in sparks, causing personal inury or a fire hazard. We recommend that you cover up the panel with a soft cloth during installation of the regulator to block all incoming light. This will ensure that no damage is caused to the solar panel or battery if the wires are accidentally short-circuited.

## CAUTION

The regulator should not be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they are supervised or have been instructed on how to use the appliance by a person responsible for their safety.

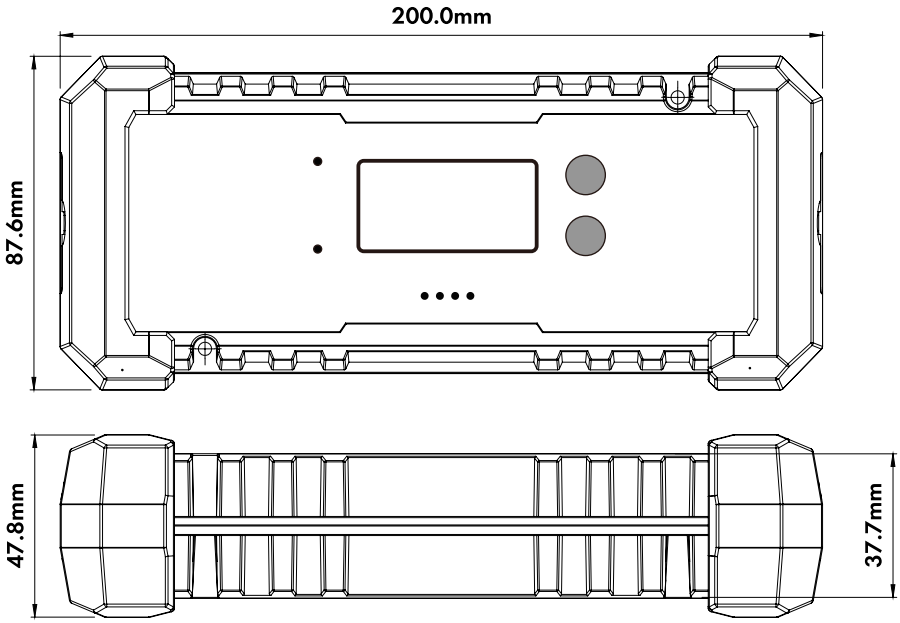
DO NOT alter or disassemble the solar regulator under any circumstances. Incorrect handling or reassembly may result in a risk of electric shock or fire and may void the unit warranty.

Minimum cable gauge is dependent on the total cable length between the solar panel and battery. Selecting the wrong cable or fuse size could result in harm to the installer or user and/or damage to the battery or other equipment installed in the system. The installer is responsible for ensuring that the correct cable and fuse sizes are used when installing this solar regulator.

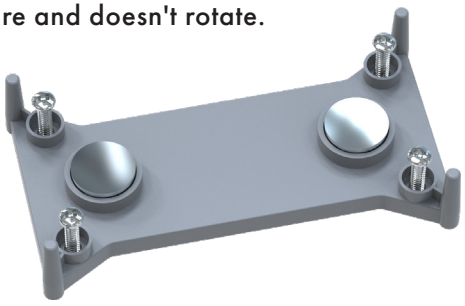
We recommend the following cable sizes for each total distance:

< 3 metres: 10AWG
3-6 metres: 8AWG
6-9 metres: 6AWG
9-12 metres: 4AWG

ONLY use this solar charge regulator for charging 12 volt lithium, AGM, wet, gel and calcium batteries.




If you wish to permanently mount the solar regulator, we also offer a magnetic mounting plate (sold separately - part no. HKPSOLRMOUNT). This plate can be attached to any flat surface using the four included mounting screws, and the regulator then fastens securely to the plate with the inbuilt magnets. Locating pins in all four corners of the plate ensure the regulator sits square and doesn't rotate.

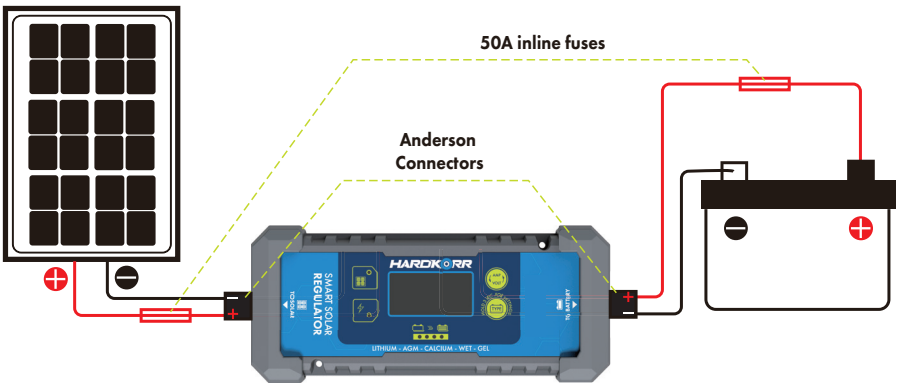


*Magnetic mounting plate*
*SKU: HKPSOLRMOUNT*

## CONNECTING YOUR SOLAR PANEL & BATTERY

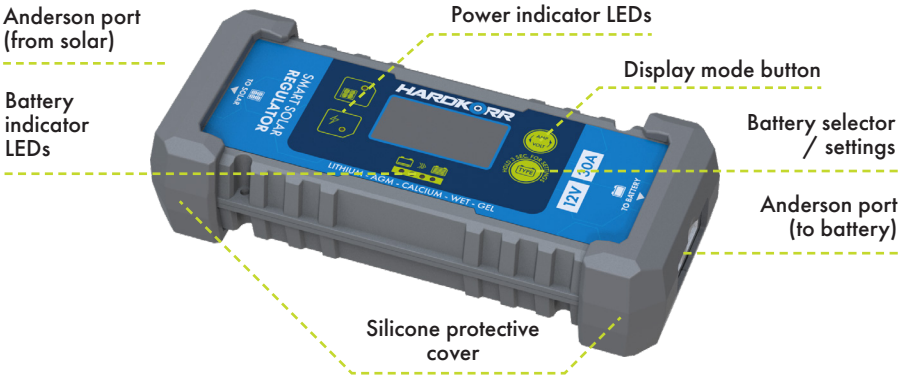
Your solar regulator has two Anderson ports marked "TO SOLAR" and "TO BATTERY". Refer to wiring diagram below.

*NOTE: if constructing your own cables, you must ensure the polarity is correct as shown in the wiring diagram.*

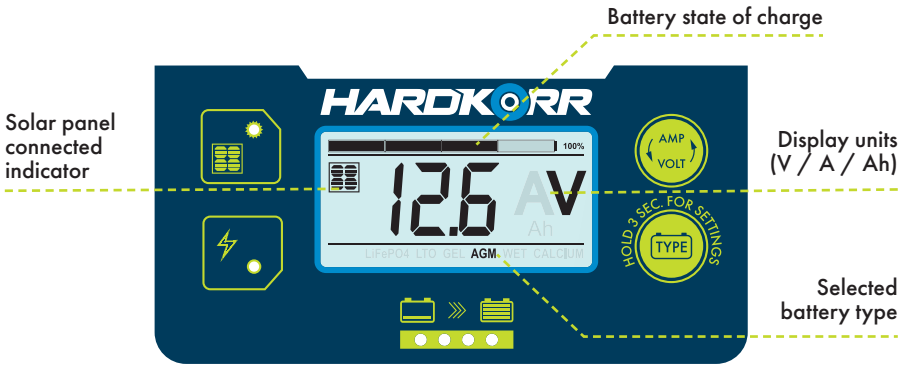



Once the connections are completed, the solar regulator will start working automatically.

# OPERATION




## LCD DISPLAY




When the unit powers on it will run a self-test sequence as follows:

| | | |
|---|---|---|
| 8.8.8 | r0.1 | 12.0V 15.0A |
| Self-test starts, digital meter segments test | Software version test | Rated voltage and current test |

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After completing the self-test the regulator will commence charging.

Press and hold the TYPE button for 3 seconds to enter battery selection mode. The regulator will memorise the selected battery for future use.

**CAUTION: selecting the wrong battery type may cause damage.**

Press the AMP / VOLT button to cycle through battery voltage (V), charging current (A) and charged capacity (Ah). Note: at night only voltage will be displayed.

When the battery is fully charged it will alternate between displaying 8.08 and the charge status every 2 seconds.

The six LEDs indicate the regulator status and alert to any faults present.

## LCD DISPLAY - CHARGE MODES

| |  |  |  | | | |
|---|---|---|---|---|---|---|
| Soft start charging | ON | Flash | ON | OFF | OFF | OFF |
| Bulk charging (batt. voltage < 11.5V ± 0.2V) | ON | ON | ON | OFF | OFF | OFF |
| Bulk charging (batt. voltage 11.5V-12.5V ± 0.2V) | ON | ON | OFF | ON | OFF | OFF |
| Bulk charging (batt. voltage > 12.5V ± 0.2V) | ON | ON | OFF | OFF | ON | OFF |
| Absorption charging | ON | ON | OFF | OFF | ON | OFF |
| Equalisation charging | ON | ON | OFF | OFF | ON | OFF |
| Float charging | ON | OFF | OFF | OFF | ON | ON |
| At night, no charge | OFF | OFF | Subject to battery voltage | | | OFF |

## LCD DISPLAY - FAULT MODES

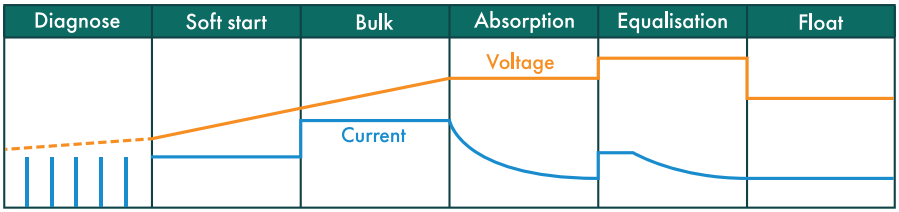
| Solar panel fault mode | LCD Display | LED Indication | LCD Backlight |
|---|---|---|---|
| Solar panel weak | Normal | Flash | ON |
| Solar panel reverse connection | P01 | Flash | Flash |
| Solar panel over voltage (> 26.5V) | P02 | Flash | Flash |

| Battery fault mode | LCD Display | LED Indication | LCD Backlight |
|---|---|---|---|
| Battery disconnected (or < 3.0V) | b01 | ON Flash | Flash |
| Battery reverse connection | b02 | Flash | Flash |
| Battery over-voltage (> 16.5V) | b03 | Flash | Flash |
| Battery over-temperature (> 65°C) | b04 | Flash | Flash |

| Solar regulator fault mode | LCD Display | LED Indication | LCD Backlight |
|---|---|---|---|
| Regulator over-temperature | OtP | | Flash |

## CHARGE PROGRAMS

This smart solar regulator has a 6-stage charging algorithm.




| | |
|---|---|
| **Diagnose (lithium only)** | The regulator checks the lithium battery initial voltage to determine whether it should go to Soft start or Bulk charge; if the battery is protected by BMS, the regulator will automatically send a signal periodically to the battery terminals to activate the BMS against protection. |
| **Soft start** | When batteries suffer an over-discharge, the regulator will softly ramp the battery voltage up to 10V. |
| **Bulk charge** | The regulator will charge the batteries at maximum current until they reach Absorption level (85% of total capacity) |
| **Absorption** | Once the battery reaches 85% of total capacity, the regulator will apply a constant voltage charge. Current will taper off as internal resistance rises. $LiFePO_4$, LTO, Gel and AGM batteries will go straight to float charge after absorption stage i.e. an equalisation charge will not be applied. |
| **Equalisation (Wet/Calcium only)** | When the battery is deeply drained below 10V or once every 28 days, the regulator will run this stage to bring the internal cells to a state of equal voltage. $LiFePO_4$, LTO, Gel and AGM batteries do not run this stage. |
| **Float charge** | The regulator will apply a float charge to maintain a fully charged battery at full capacity. |

Note: Batteries will return to bulk charge stage if the regulator detects that their voltage has dropped below the "Restart voltage" stipulated in the specifications table.

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# SPECIFICATIONS

| | |
|---|---|
| Rated maximum solar panel current | 30A |
| Normal solar cell array input voltage | 15-22V |
| Lowest operating voltage (solar or battery) | 8V |
| Standby consumption | 5mA |
| Max. voltage drop (solar panel to battery) | 0.25V |
| Minimum battery start charging voltage | 3V |
| Soft start charging voltage / current | 3-10V ± 0.2V / max 15.0A |
| Bulk charge voltage | 10-14V ± 0.2V |
| Absorption charging voltage @ 25°C: | |
| - LTO battery | 14.0V ± 0.2V |
| - $LiFePO_4$ battery | 14.4V ± 0.2V |
| - AGM battery | 14.4V ± 0.2V |
| - Wet cell battery | 14.7V ± 0.2V |
| - Gel battery | 14.1V ± 0.2V |
| - Calcium battery | 14.9V ± 0.2V |
| Absorption transitions to equalisation or float when: | |
| - Charging current drops to | 0.5A ± 0.1A |
| - Or total absorption charging time reaches | 4 hours |
| Equalisation charge (Wet & calcium cell only) activated when: | |
| - Battery voltage discharged to less than | 10V ± 0.2V |
| - Time elasped since last equalisation charge is | 28 days |
| Equalisation charge @ 25°C | 15.5V ± 0.2V |
| Equalisation charge timeout | 2 hours |

## SPECIFICATIONS (CONT.)

| | |
|---|---|
| Float charge voltage @ 25°C:<br>- LTO and $LiFePO_4$<br>- AGM, Wet, Gel, Calcium | <br>13.4V ± 0.2V<br>13.6V ± 0.2V |
| Restart voltage:<br>- LTO and $LiFePO_4$<br>- AGM, Wet, Gel, Calcium | <br>13.3V ± 0.2V<br>12.8V ± 0.2V |
| Voltage control accuracy | ± 1% |
| Battery temperature compensation co-efficient | -24mV/°C |
| Temperature compensation range | -20°C ~ 50°C |
| Input / output terminals | 50A Anderson connector |
| Materials | ABS plastic |
| Waterproof rating | IP65 |
| Operating temperature | -25°C to 50°C |
| Storage temperature | -40°C to 85°C |
| Operating humidity range | 0% to 100% |
| Net weight | 0.3kg |
| Protection circuits | Reverse polarity protection, short circuit protection, reverse current protection, overcharge protection, transient overvoltage protection, over-temperature protection |

**Q. Can I connect this solar regulator to an existing battery management system / DC-DC charger with solar input?**

A. If you wish to connect your solar panel via an existing battery management system / DC-DC charger, you must bypass this regulator. Connect your solar panel directly to the solar input port on your battery management system. Always check that the device you wish to use in place of this solar regulator is rated to handle the maximum current capable of being produced by your solar panel.

**Q. Why am I getting no power through my solar panel?**

A. Check the following:

1. Make sure all Anderson connectors are plugged in at both ends.
2. Make sure a wire has not been pulled out of an Anderson plug.
3. Please ensure the solar regulator is connected directly to a battery (not through any secondary regulator / charger)

*(Note: if you need to reset the regulator, you can do so by disconnecting the battery)*

**Q. Why is my solar panel not producing its rated output?**

A. Your solar panel will produce maximum output on a clear (cloudless) day when the temperature is between 24-28 degrees Celsius. It must also be connected to a battery that is at less than 80% capacity. Once a battery reaches 80% capacity, the regulator will gradually reduce the charge current until it reaches 100%.

# WARRANTY

**Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.**


Hardkorr warrants that this product will be free from defects in material and workmanship for two years. The warranty commences on the date of purchase by the original purchaser, and is not transferable. To access the benefits of this warranty, you must retain your proof of purchase and follow any other direction we reasonably give you (e.g. completing and returning your warranty card if applicable).

If you believe your Hardkorr product is defective, it must be returned to Hardkorr for inspection by our warranty claims department. Hardkorr will not be liable for any charges you incur relating to installation, repair or removal of Hardkorr products, nor for any costs incurred in returning the product to us.

**To begin your warranty claim:**

1. You must have a Return Authorization (RA) number. To get your RA number, please complete the form found on our website and wait for the warranty team to contact you.
2. Once you have an RA number, you must arrange for the product must be shipped back to Hardkorr. The address for shipment will be provided to you by our warranty team.
3. Please include a copy of your original proof of purchase.
4. Please be sure that your RA number is clearly marked on your documentation as well as on the outside of the packaging used for shipping.

Completing the steps above will ensure faster processing of your claim, so that Hardkorr can get your product back to you as soon as possible.

If Hardkorr determines, at our sole discretion, that your product is defective in material or workmanship, we will honor your warranty claim. We will determine whether the item is repaired or replaced.

Your warranty is voided if we (at our sole discretion) determine that there is evidence of one or more of the following:

- Negligence: Improper installation, improper or extreme use, etc.
- Abuse: Road hazards, Damage beyond the limits of "normal wear and tear."
- Unauthorized Repair: Repair service performed by an unauthorized service centre.
- Disassembly: Any attempt to open, tamper with or otherwise compromise the integrity of the product.

**Discontinued Items:**

Discontinued items that are still under warranty will be reviewed by Hardkorr. If a discontinued item is covered under warranty it may be replaced by an equivalent item. If an equivalent item is not available Hardkorr will determine terms of resolution on a case-by-case basis.

**Exceptions to this Warranty:**

Painted Finish: Hardkorr uses the highest quality materials available, but depending on location, environment and exposure, painted surfaces can fade. We will not approve any warranty claims that relate to faded paint.

Damage to Lenses: Please be aware that certain chemicals cause damage to polycarbonate plastics. Do not use cleaning products that contain any chemicals in the following list: Acetic Acid Aq., Acetone, Ammonium Carbonate Aq., Ammonium Chloride Aq., Benzene, Calcium Hypochlorite, Chloroform, Chromic Acid Aq., Ethyl Acetate, Ethylene, Glycol Aq., Formaldehyde Aq., Citric Acid, Heptane, Hydrofluoric Acid Aq., Lubricating Oils (Petroleum), Methyl Ethyl Ketone, Methyl Chloride, Mineral Oils, Oleic Acid, Ozone, Phosphoric Acid Aq., Toluene, Turpentine, Zinc Chloride Aq.

Hardkorr will not approve any warranty claims for lighting products where we reasonably believe that products have been exposed to any of these chemicals.

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