

# PRIMUS<sup>®</sup>

## Portable Solar Panel Kit

### User Manual and Product Specifications



Suitable for camping,  
4WD driving, caravanning  
and other outdoor  
activities

Part No. PRI0180W / PRI02120W

## Introduction

**This product is designed to be used for;**

Charging 12V battery's while; Camping, 4WDDriving, Caravanning or as a power backup around the home to run suitable appliances;

- Portable 12V fridges
- Portable 12V lighting
- TV's and DVD players
- Inverter; to run 240V appliances, including charging phones or smaller hand held devices using their own 240V charger

Primus has designed this portable solar panel range not only to suit the tough Australian conditions using quality components, but also taking consideration compactness and ease of use.

After taking the solar panel kit out of the box, choosing a suitably cleared area to unfold and setup the panels facing the sun, select the appropriate battery type on the digital controller, connect the clamps to your battery, and then join the extension leads, you're ready to go. Simple!

Utilizing the abundance of free sunlight available, the Monocrystalline cells convert this sunlight into usable DC (direct current) electricity. Due to the cells efficiency, the electricity produced or voltage output (measured directly at the cell) is too high to be used effectively. To better control the voltage output we have included a digital, 5 stage 10A PWM (pulse width modulated) water proof controller to automatically adjust the voltage output no matter what type of battery is being charged.

Simply, select the correct battery type, being either; GEL, AGM, WET (Lead-Acid) or Calcium, connect the supplied battery clamps to the correct battery terminals and the digital controller will automatically decide what the battery needs in regard to the amount and rate of charge.

**Note: The controller supplied with this product is NOT suitable for charging lithium batteries.**

**Part No. PRI0180W Product Features;**

- Two 40W High Quality Monocrystalline solar cell panels
- Anodised aluminium frame
- Hinged frame for easy storage
- Hinged controller bracket
- Low profile frame locking latches
- Simple to use folding support legs
- Carry handle with spring return
- 12V digital, 5 stage 10A PWM (pulse width modulated) water proof controller
- 50A heavy duty Anderson style plug
- 10m Extension lead – Twin core, 4.17mm<sup>2</sup> with UV stable outer sheath
- 0.8m Extension lead with battery clamps
- Heavy duty 1200D padded storage bag
- Easy to setup and use
- Everything needed to charge your battery is included in the kit, except the sun!

**Part No. PRI02120W Product Features;**

- Two 60W High Quality Monocrystalline solar cell panels
- Anodised aluminium frame
- Hinged frame for easy storage
- Hinged controller bracket
- Low profile frame locking latches
- Simple to use folding support legs
- Carry handle with spring return
- 12V digital, 5 stage 10A PWM (pulse width modulated) water proof controller
- 50A heavy duty Anderson style plug
- 10m Extension lead – Twin core, 4.17mm<sup>2</sup> with UV stable outer sheath
- 0.8m Extension lead with battery clamps
- Heavy duty 1200D padded storage bag
- Easy to setup and use
- Everything needed to charge your battery is included in the kit, except the sun!

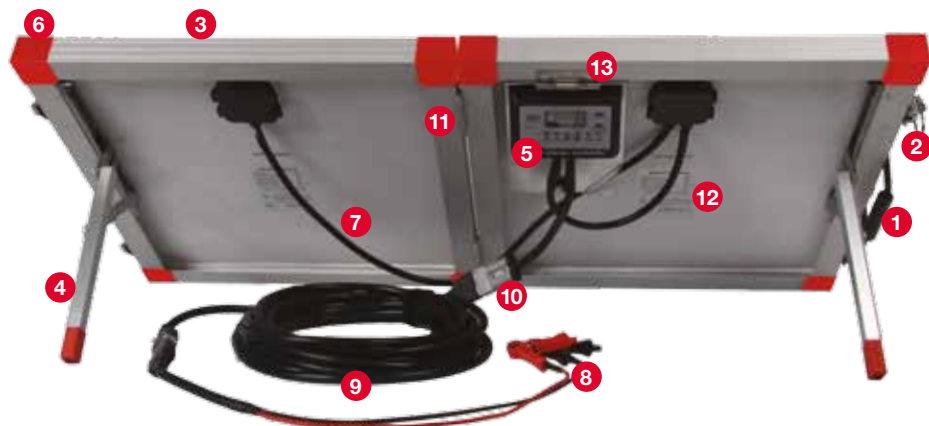
**IMPORTANT:** This user manual contains important safety information and operating instructions. Please read this manual carefully to familiarise yourself with the product and accessories before connecting to the battery being charged. Keep this manual in a safe place for future reference.

## General Warnings

- Do not connect the solar panel output wire directly to the battery being charged. A controller/regulator must be used inline. Failure to do so, could cause permanent damage to the battery and or personal injury if the battery ruptures
- Follow the assembly instructions within this manual carefully as to not cause harm to yourself or others, particularly when 'connecting' and 'disconnecting' the DC clamps (Direct Current clamps) to or from the battery being charged
- Do not charge 'dry' cell rechargeable batteries with this product. To charge 'dry' cell rechargeable batteries, connect an appropriate sized 240V inverter to the 'wet' cell battery being charged by the solar panel. Then connect the 240V 'dry' cell charger which came with the batteries to the 240V inverter ensuring that the manufactures guidelines are followed
- Do not charge 'dry' cell non-rechargeable batteries
- Do not charge a damaged battery
- Do not charge a frozen battery
- Do not use this solar panel kit if it is damaged in anyway. Please contact customer service for advice if necessary, details are at the back of this booklet
- Do not disassemble the solar panels or controller
- Ensure that the battery being charged is in a well ventilated area as poisonous gasses are emitted during the charging process
- Ensure that appropriate personal protective equipment (PPE) is worn while in close proximity to the battery being charged; Safety glasses, Gloves, Protective clothing as a minimum
- Ensure that no metal objects or jewellery contacts the battery terminals. It is recommended to remove rings, bracelets etc when working with lead-acid batteries. A lead-acid battery can produce a short-circuit current high enough to melt metallic materials possibly causing severe burns
- Do not smoke or have the battery in the vicinity of sparks, open flame, fuel or solvents while the battery is being charged. Gasses emitted could be 'EXPLOSIVE'
- Battery acid is highly corrosive. Avoid 'CHEMICAL BURNS' wash effected area immediately with clean running water if contact is made with your skin or eyes. Seek medical advice
- Disconnect power from the solar panel by separating at least one join between either extension lead before 'connecting' or 'disconnecting' the DC clamps to or from the battery
- Ensure correct DC clamp connection '**sequence**' when 'connecting' and 'disconnecting' the DC clamps to or from the battery being charged. A simple way to remember is; The negative '-' DC clamp is '**Last**' on and '**First**' off (the negative '-' battery terminal). This will reduce the dangers of a potential short-circuit and excessive sparking of the battery terminals
- Ensure correct DC clamp connection '**polarity**' when 'connecting' to the battery being charged. Connect the Red coloured DC clamp to the positive '+' battery terminal. Then connect the Black coloured DC clamp to the negative '-' battery terminal
- Immediately cease charging if the battery being charged is found to be excessively hot, leaks or appears to be taking a long time to charge
- This product must not be used by children or by an adult who has reduced physical or mental capabilities. Also, this product is not to be used by an adult who has a lack of knowledge or experience with this type of product, unless they are being supervised by a person who is competent in the safe use of this type of product.

## Understanding your Solar Panel

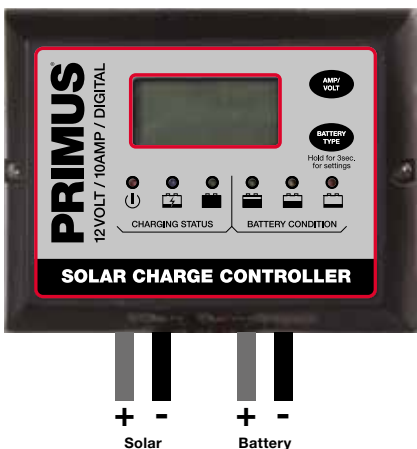
- |   |                                 |  |
|---|---------------------------------|--|
| 1. Carry handle with Spring Return        | 6. Protective Corners           | 11. Heavy Duty Hinges                            |
| 2. Low Profile Locking Latches            | 7. Panel Leads                  | 12. Panel Specification                          |
| 3. Anodised Aluminium Frame               | 8. Battery Clamp Extension Lead | 13. Hinged Controller Bracket with Spring Return |
| 4. Folding Support Legs                   | 9. Extension Lead               | 14. Storage Carry Bag                            |
| 5. PWM Digital Water Proof 10A Controller | 10. 50A Anderson Style Plug     |  |



## Controller/Regulator Specification and Operation

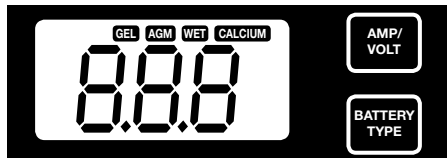
### FEATURES

- Advanced MCU control Pulse Width Modulated (PWM) technology, high efficiency operation
- To be used on GEL, AGM, Conventional lead-acid (WET) and Calcium Batteries ONLY
- Built in regulator prevents your battery from being over or undercharged. Overcharging occurs when the charge voltage is unregulated and can result in premature battery failure. Undercharging is common with some conventional lead-acid and calcium batteries and your battery will not perform to its capacity
- Automatic equalization feature to revive deeply drained lead-acid and calcium batteries
- 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
- Coloured LEDs to easily indicate the operational status and battery condition
- Digital LCD to directly display battery voltage, charging current, charging capacity (Amp hour), battery types, full charge and fault codes
- Provides external battery temperature sensor (Optional)
- Multi charging protections against reverse polarity, short circuit, over temperature, over voltage, etc
- Waterproof design.



## Operation - LCD (Liquid Crystal Display)

Please check your battery manufacturer's specifications to select correct battery type. There are 4 battery types to select from: GEL, AGM, WET (conventional lead-acid), and Calcium.



Press **BATTERY TYPE** button and hold for 3 seconds to go into the battery type selection mode, the battery type you select will be shown on the LCD, the default battery setting is AGM. The controller will automatically memorize your battery type.

**Caution: Incorrect battery type setting may damage your battery.**

When the controller powers on, the unit will run a self-test and will automatically show the details on the LCD before going into charging process, for example:

8.8.8 Self-test starts,  
digital meter segments test

8.0.3 Software version test

82.0V 8.0.0A  
Rated voltage and current test

82.5°C  
External battery temperature sensor test  
(if connected)

After going into charging process, the LCD displays the charging status as below: Press **AMP/VOLT** 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 during the day**

(82.6V ⇌ 8.6.0A ⇌ 45.0AH ⇌ 82.5°C)

**Display during the night**

(82.6V ⇌ 82.5°C)

**Display when battery is fully charged**

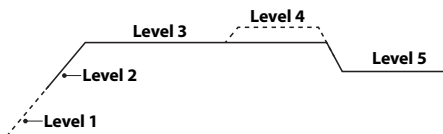
Press **AMP/VOLT** button in sequence, the LCD will display in turn with Battery Voltage, Charging Current, if you do not press the button, the LCD will alternatively display FULL and VOLT or FULL and AMP every 2 seconds.

(82.6V ⇌ 8.0.0°C) or (8.0.0A ⇌ 8.0.0°C)

**CHARGING STAGES**







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

The LCD also can be treated as an independent voltage meter or thermometer. A voltage less than 11.5V indicates that the battery is discharged and needs recharging.














- 1. Soft Charge:** When a battery has been over-discharged, the controller will softly ramp the battery voltage up to 10V.
- 2. Bulk Charge:** Maximum current charging until the battery rises to absorption level.
- 3. Absorption Charge:** Constant voltage charging until the battery is over 85%.
- 4. Equalization Charge:** Only for WET or Calcium battery types, when the battery is deeply drained below 10V, it will automatically run this stage to bring the internal cells to an equal state in an attempt to restore lost capacity. (GEL and AGM battery do not run equalization charge)
- 5. Float Charge:** Battery is fully charged and maintained at a safe level. A fully charged battery has a voltage of more than 12.6Volts.

## Operation - LED Indication

The 6 LEDs 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	OFF	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	8.0.1	 FLASH	FLASH
Solar panel over voltage (>26.5V)	8.0.2	 FLASH	FLASH

Battery abnormal mode	LCD display	LED indication	LCD backlight
Battery disconnected or less than 3.0V	8.0.1	 FLASH  FLASH  FLASH	FLASH
Battery reverse connection	8.0.2	 FLASH	FLASH
Battery over voltage (>17.5V)	8.0.3	 FLASH	FLASH
Battery temperature over 65°C	8.0.4	 FLASH  FLASH  FLASH	FLASH

Solar controller abnormal mode	LCD display	LED indication	LCD backlight
Controller over temperature protection	8.8.8		FLASH



## Set Up

### STEP 1

Remove the solar panel and accessory leads from the original packaging or storage bag. Check the panel, leads and connectors for any damage before use.

**Note: If damage is found on any part, it is highly recommended that they are replaced with genuine parts available from Primus Australia Pty Ltd. Please contact Primus customer service, details are at the back of this booklet if spare parts are required.**

Select a suitably cleared area to unfold the panel, unfold the support legs and position the solar panel with a clear view of the sun and facing in the direction of 'North' as close as possible.

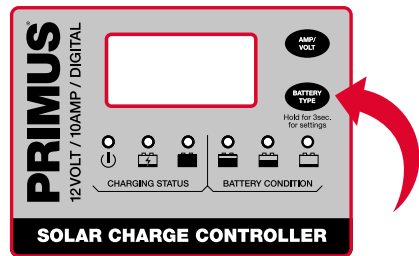
#### Warning;

**Cells (panels) will start producing electricity as soon as they are exposed to the sun. Care must be taken when connecting the DC clamps to the battery and joining the extension leads. To reduce the possibility of an electric shock or short-circuit, it is recommended to place a blanket or tarp over the panels to block out any sunlight temporarily while all connections are made.**

### STEP 2

Refer to the specification label on your battery or consult the battery manufacture to establish the type of battery being charged. On the controller front panel, push the 'Battery Type' button to cycle through the menu to match the battery type being charged. The different battery types are displayed at the top of the LCD.

**Once selected, the battery type will remain in memory for next time**



## STEP 3

FIRST, connect the DC clamp on the 0.8m extension lead to the correct polarity **A** terminals on the battery being charged. Example; 'RED' DC clamp to the Positive '+' terminal and the **B** 'BLACK' DC clamp to the negative '-' terminal.

**Note: Please refer to "General Warnings" on page 3 of this manual regarding the correct sequence when "connecting" & "disconnecting" the DC clamps from the battery being charged.**

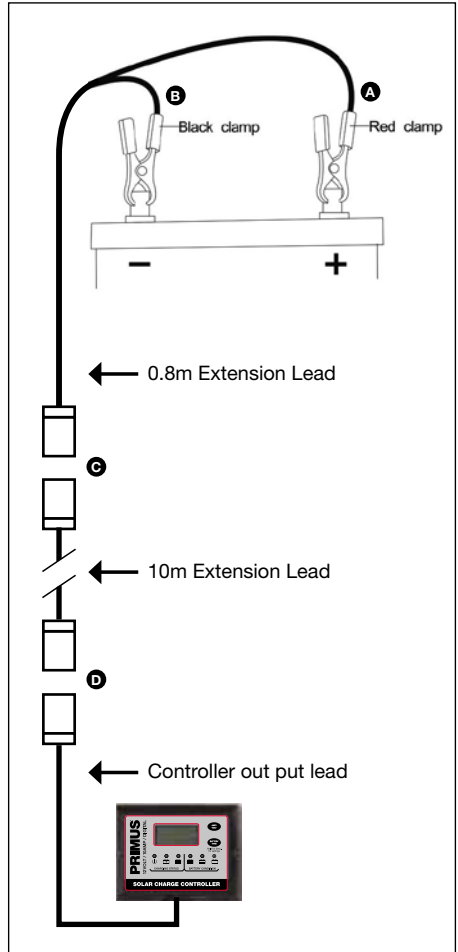
**C** Connect other end of the 0.8m extension lead (50A plug) to either end of the 10m extension lead (50A plug) then finally, join the remaining end of the 10m extension lead to the controller output lead. **D**

Ensure the all connections are firm and that the extension lead is positioned not to cause a tripping danger to people walking by. And that's it, your battery will now be charging.

Monitor the output of the solar panels via the controller display. Also ensure that the panels are kept in direct sunlight for optimum efficiency. The solar panels may have to be moved periodically throughout the day to track the sun's path.

For disconnection, simply reverse the sequence above.

**Note: It is recommended to establish connections (DC clamps) at the battery being charged first. Then, join the connectors in sequence working back towards the solar panels (controller). This will eliminate the danger of having 'live' battery clamps inadvertently being short-circuited causing equipment damage and possibly fire.**



## Frequently Asked Questions

### **Q: How does the solar panel work?**

A: The solar panel converts sunlight energy into DC (direct current) electric power to charge rechargeable batteries. The batteries are then used to run your lights, fridge or power an inverter

### **Q: What type of batteries can be charged with this solar panel kit?**

A: The controller is factory set for AGM batteries, however the controller can also be set to charge GEL, WET or Calcium batteries by scrolling through the menu. Do not charge 'dry' cell rechargeable batteries or 'dry' cell non-rechargeable batteries.

### **Q: Can I bypass the controller to charge my battery?**

A: No, the voltage output directly from the solar panel exceeds the optimum voltage recommended to charge the battery. The controller automatically regulates the voltage output to suit the particular battery size and type being charged.

### **Q: Will the solar panel overcharge my battery?**

A: The controller (regulator) ensures that a steady charge is supplied and will not over charge the battery. The controller has up to five levels of charging and will automatically evaluate the battery's condition to establish whether to; Soft Charge, Bulk Charge, Absorption Charge, Equalization Charge (only for WET or Calcium batteries) or Float Charge.

### **Q: How many Amps do I get out of my 80w Solar Panel Kit and what can I run?**

A: An 80W kit can supply between 4 and 5 Amps in optimal conditions on a sunny day or for most of the sunlight hours of the day. There are many variables, but let's assume that we can achieve 6 to 7 sunlight hours in a day, anymore sunlight hours would be considered a bonus.

Provided it is not too cloudy, the panels are moved every now and again to best track the sun's path and the panels are kept out of the shade, it is safe to assume that the panels can supply between 4 and 5 Amps per charging hour.

So, to put it into perspective, let's assume that the 80w solar panels are charging a 100Ah battery. You wish to run a 40L Fridge which draws on average 1.5A over a 24hr period, and 2 x LED camp lights which draw 1.0A each when running. You want to have the fridge running (cycling) 24 hours a day, and the camp light for 3 hours each night.

Fridge:  $1.5A \times 24h = 36Ah$

Lights:  $1.0A \times 3h = 3Ah \times 2 \text{ lights} = 6Ah$

Total: 42Ah per day.

Your panels can supply:

$4.5A \times 6h = 27Ah$  each day.

Therefore the battery is being discharged by:

$42Ah - 27Ah = 15Ah$  each day.

Although you have a 100Ah battery, it is recommended when calculating run times is to allow yourself a buffer and calculate using only 50% of the battery specification. So, in this case using 50Ah you could run your fridge and lights for:  $50Ah / 15Ah = 3.33$  days without any other form of charge.

### **Q: How many Amps do I get out of my 120w Solar Panel Kit and what can I run?**

A: A 120W kit can supply between 6 and 7 Amps in optimal conditions on a sunny day or for most of the sunlight hours of the day. There are many variables, but let's assume that we can achieve 6 to 7 sunlight hours in a day, anymore sunlight hours would be considered a bonus.

Provided it is not too cloudy, the panels are moved every now and again to best track the sun's path and the panels are kept out of the shade, it is safe to assume that the panels can supply between 6 and 7 Amps per charging hour.

As a comparison, we'll use the same scenario as with the 80w panel previously. So, putting this into perspective, let's assume that the 120w solar panels are charging a 100Ah battery. You wish to run a 40L Fridge which draws on average 1.5A over a 24hr period, and 2 x LED camp lights which draw 1.0A each when running. You want to have the fridge running (cycling) 24 hours a day, and the camp light for 3 hours each night.

Fridge:  $1.5A \times 24h = 36Ah$

Lights:  $1.0A \times 3h = 3Ah \times 2 \text{ lights} = 6Ah$

Total: 42Ah per day.

Your panels can supply:

$6.5A \times 6h = 39Ah$  each day.

Therefore the battery is being discharged by:

$42Ah - 39Ah = 3Ah$  each day.

Although you have a 100Ah battery, it is recommended when calculating run times is to allow yourself a buffer and calculate using only 50% of the battery specification. So, in this case using 50Ah you could run your fridge and lights for:

$50Ah / 3Ah = 16.6$  days or over 2 weeks without any other form of charge.

## Maintenance

Periodically, clean the panels with warm water and a soft sponge or cloth to remove any built up dust or foreign deposits. Keeping your solar panels clean will ensure optimum performance.

### Troubleshooting

The Solar Panels and Controller are both sealed units and cannot be repaired. If a problem does occur, double checking all connections, including correct polarity of the DC battery clamps and or disconnect the DC battery clamps from the battery and wait 30 seconds (this will reset the controller). If after reconnecting the DC battery clamps and the problem persists, please contact Primus customer service (details are at the back of this booklet)

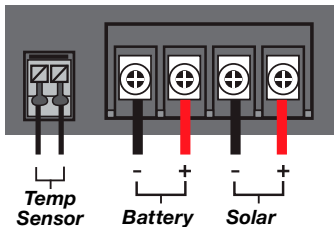
## Technical Details - Controller

<b>Charging</b>	
Minimum battery start charging voltage	3VDC
Soft start charging voltage	3-10VDC +/-0.2
Soft start charging current (50% PWM duty)	Up to 10Amp
Bulk charge voltage	10-14VDC +/-0.2
Absorption charging voltage at 25°C	
• GEL type battery	14.1VDC +/-0.2
• AGM type battery (default setting)	14.4VDC +/-0.2
• WET type battery	14.7VDC +/-0.2
• Calcium type battery	14.9VDC +/-0.2
Absorption transits to Equalizing or Float condition	
• Charging current drops to	0.5Amp +/-0.1
• or Absorption charging timer timed out	4 Hours
Equalization charging active (Only for WET or Calcium battery)	
• Battery voltage discharged to less than	10VDC +/-0.2
• Automatic equalizing charging periodical	28 Days
Equalization charging voltage at 25°C	15.5VDC +/-0.2
Equalization charging timer timed out	2 Hours
Float charging voltage at 25°C	13.6VDC +/-0.2
Voltage control accuracy	+/- 1%
Battery temperature compensation coefficient	-24 mV/°C
Temperature compensation range	-20 to +50°C
<b>Protection</b>	
Against reverse polarity or short circuit at panel side	Yes
Against reverse polarity or short circuit at battery side	Yes
No reverse current from battery to solar at night	Yes
Over temperature protection during charging	65°C
Transient over voltage protection with TVS or varistor	Yes
<b>Electrical Parts</b>	
Input output terminal	M4 terminals
Temperature sensor port (Press and Release type)	DA 250-350 2P

## Technical Details - Controller

Physical	
Controller material	Plastic, Standard ABS
Water & Weatherproof design	Yes
Net weight	Approx. 250g
Environmental	
Operating temperature	-25 to 50°C
Storage temperature	-40 to 85°C
Operating Humidity range	100% no condensation

## Optional External Device



### 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 case, if battery over temperature occurs, the controller will automatically stop charging.

## Technical Details - Panels

	80W Kit	120W Kit
<b>Cell type</b>	Monocrystalline	Monocrystalline
<b>Model</b>	PM80-36F	PM120-36F
<b>Pmax</b>	80W	120W
<b>Imp</b>	4.37A	6.82A
<b>Vmp</b>	18.3V	17.6V
<b>Voc</b>	22.5V	21.4V
<b>Isc</b>	4.75A	7.18A
<b>Normal operating cell Temp (NOCT)</b>	45°C ± 2°	45°C ± 2°
<b>Maximum system voltage</b>	700V	700V
<b>Standard test conditions</b>	AM1.5, 25°C, 1000W/M2	AM1.5, 25°C, 1000W/M2
<b>Max series fuse rating</b>	10A	10A
<b>Dimension folded</b>	51cm L x 8cm W x 54cm H	51cm L x 8cm W x 78cm H
<b>Dimension unfolded</b>	102cm L x 4cm W x 54cm H	102cm L x 4cm W x 78cm H
<b>Weight (total)</b>	13kg	16kg

## Customer Service

For more information call 1300 555 197

Email: [service@companionbrands.com.au](mailto:service@companionbrands.com.au)











Distributed by  
**Companion Brands**  
Bundoora Victoria 3083  
[www.companionbrands.com.au](http://www.companionbrands.com.au)



PR16774