EPSOLAR

Tracer1215BP

— Maximum Power Point Tracking Solar Charge Controller

INSTRUCTION MANUAL

Thank you very much for selecting our product!

This manual offers important information and suggestions with respect to installation, use and troubleshooting, etc. Please read this manual carefully before using the product and pay attention to the safety recommendations in it.

Tracer1215BP

— Maximum Power Point Tracking Solar Charge Controller

System Voltage	12 / 24VDC
Rated Charge Current	10A
Rated Discharge Current	10A
Max. PV Input Voltage	150VDC
Max. PV Input Power	
12V System	130W
24V System	260W

***Array voltage should never exceed maximum PV input voltage. Refer to the solar module documentation to determine the highest expected array Voc (open circuit voltage) as defined by the lowest expected ambient temperature for the system location.*

Contents

1 Important Safety Information

Save These Instructions

This manual contains important safety, installation and operating instructions for TracerBP.

The following symbols are used throughout this manual to indicate potentially dangerous conditions or mark important safety instructions, please take care when meeting these symbols.

WARNING: Indicates a potentially dangerous condition.

Use extreme caution when performing this task.

CAUTION: Indicates a critical procedure for safe and proper operation of the controller

NOTE: Indicates a procedure or function that is important for the safe and proper operation of the controller.

General Safety Information

·Read all of the instructions and cautions in the manual before beginning installation.

There are no user serviceable parts inside the TracerBP. Do not disassemble or attempt to repair the controller.

Disconnect the solar module and fuse/breakers near to battery before installing or adjusting the TracerBP.

Install external fuses/breakers as required.

Confirm that power connections are tightened to avoid excessive heating from loose connection.

2 General Information

2.1 Overview

Thank you for selecting the TracerBP controller which represents advanced technology of our company. The features are listed below:

12V/24V automatic identify or user-defined working voltage.
Advanced maximum power point tracking technology to optimize using the solar system.
Peak conversion efficiency of 97 %, high Tracking efficiency of 99%.
Widely used, automatic recognize day/night.
Several load methods are supported to convenient for different demand.
Support 4 charging options: Sealed, Gel, Flooded and User-defined.
Adopting temperature compensation and correcting the charging and discharging parameters automatically, improving the battery lifetime.
Protection: Over temperature, over charging, PV and load short, PV (battery) revered, over current protection.
Actual power convenient and record function make convenience to check the datum every day, every month and every year.
RS-232 TTL ports via the open standard Modbus protocol are supported to meet different occasion of demand.
With supporting PC monitoring software and remote meter MT50, it is convenient to check the real-time data of controllers and set the parameters.
Firmware update.
Fully encapsulated PCB, IP67 protection.
Aluminumhousing.

The TracerBP series controller is for off-grid solar system and control the charging and discharging of the battery, especially suitable for the street light system. The controller features a smart tracking algorithm inside that maximizes the energy from the solar PV module(s) and charge the battery. At the same time, the low voltage disconnect function (LVD) will prevent the battery from over discharging.

The TracerBP controller charging process has been optimized for long battery life and improved system performance. The comprehensive self-diagnostics and electronic protection functions can prevent damage from installation mistakes or system faults. In addition, the TracerBP controller has a RJ45 interface to allow communication with a meter for remote monitoring.

Although the TracerBP controller is very simple to configure and use, please take your time to read the operator's manual and become familiar with the controller. This will help you make full use of all the functions and improve your solar PV system.

The features of TracerBP controller:

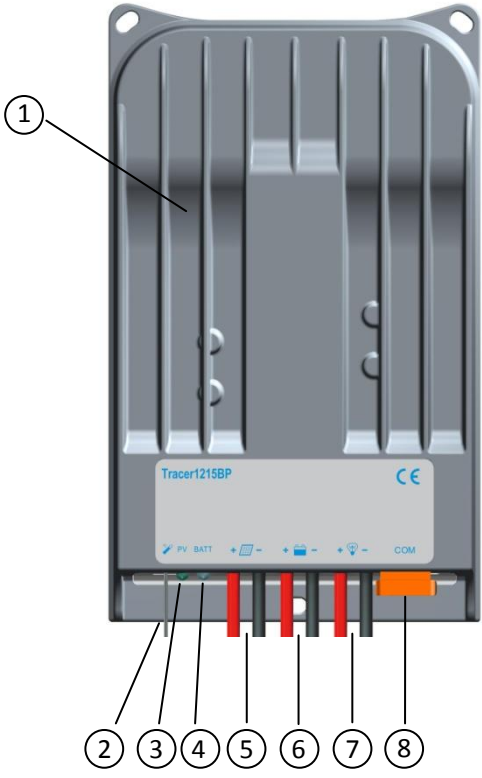


Figure 2-1 Tracer1215BP Characteristics

1 – Heat Sink

Aluminum heat sink to dissipate controller heat.

2 –Temperature Sensor

Measure ambient temperature and make temperature compensation for charging and discharging.

3 – Charging LED Indicator

Indicate that the battery is charging or not.

4 – Battery LED Indicator

Three states of battery LED indicator show charging status.

5 – Solar Module Terminals

Connect solar modules.

6 – Battery Terminals

Connect batteries.

7 – Load Terminals

Connect loads.

8 – RS-232 TTL Port

Monitor controller by PC, MT50 and update controller software.

2.2 Optional Accessories

Remote Meter(Model：MT50)

The digital remote meter displays system operating information, error indications, and self-diagnostics read-out. Information is displayed on a backlit LCD display. The large numerical display and icons are easy to read and large buttons make navigating the meter menus easy. The meter can be flush mounted in a wall or surface mounted using the mounting frame (included). The MT50(standard edition) is supplied with 2m of cable and a mounting frame. The MT50 connects to the RS232 TTL port on the TracerBP.

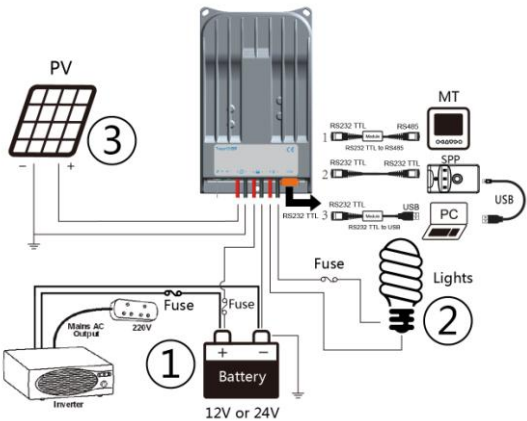
3 Installation Instructions

3.1 General Installation Notes

- Be very careful when working with batteries. Wear eye protection. Have fresh water available to wash and clean any contact with battery acid.
- Uses insulated tools and avoid placing metal objects near the batteries.
- Explosive battery gasses may be present during charging. Be certain there is sufficient ventilation to release the gasses.

- Loose power connections and/or corroded wires may result in resistive connections that melt wire insulation, burn surrounding materials, or even cause fire. Ensure tight connections and use cable clamps to secure cables and prevent them from swaying in mobile applications.
- Use with Gel, Sealed or Flooded batteries only.
- Battery connection may be wired to one battery or a bank of batteries. The following instructions refer to a singular battery, but it is implied that the battery connection can be made to either one battery or a group of batteries in a battery bank.
- Select the system cables according to 3A/mm^2 current density.

3.2 Mounting



1. Connect components to the charge controller in the sequence as shown above picture and pay much attention to the “+”（Red）and “-“（Black）.Always power the battery First.

2. After power the battery, check the battery indicator on the controller, it will be green. If it’s not green, please refer to chapter 5.

3. The battery fuse should be installed as close to battery as possible. The suggested distance is within 150mm.

4 Operation

4.1 MPPT Technology

The TracerBP utilizes Maximum Power Point Tracking technology to extract maximum power from the solar module (s). The tracking algorithm is fully automatic and does not require user adjustment, TracerBP technology will track the array *maximum power point voltage* (Vmp) as it varies with weather conditions, ensuring that maximum power is harvested from the array through the course of the day.

·Current Boost

In many cases, TracerBP MPPT technology will "boost" the solar charge current. For example, a system may have 8 Amps of solar current flowing into the TracerBP and 10 Amps of charge current flowing out to the battery. The TracerBP does not create current! Rest assured that the power into the TracerBP is the same as the power out of the TracerBP. Since power is the product of voltage and current (Volts×Amps), the following is true*****:

(1) Power Into the TracerBP =Power Out of the TracerBP

(2) Volts In×Amps In=Volts Out×Amps Out

***** Assuming 100% efficiency. Actually, the losses in wiring and conversion exist.
If the solar module's Vmp is greater than the battery voltage, it follows that the battery current must be proportionally greater than the solar input current so that input and output power are balanced. The greater the difference between the maximum power voltage and battery voltage, the greater the current boost. Current boost can be substantial in systems where the solar array is of a higher nominal voltage than the battery.

·**An Advantage Over Traditional Controllers**

Traditional controllers connect the solar module directly to the battery when recharging. This requires that the solar module operate in a voltage range that is below the module's Vmp. In a 12V system for example, the battery voltage may range from 11-15Vdc but the module's Vmp is typically around 16 or 17V.

Figure 4-1 shows a typical current VS. voltage output curve for a nominal 12V off-grid module.

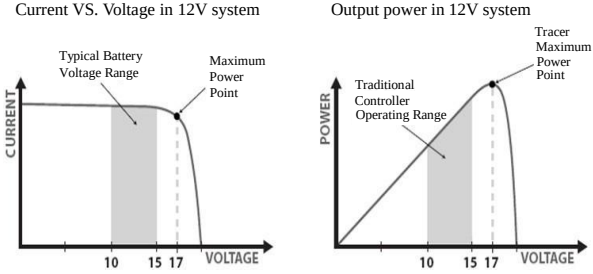


Figure 4-1 Nominal 12V Solar Module I-V curve and output power graph

The array Vmp is the voltage where the product of current and voltage (Amps×Volts) is greatest, which falls on the "knee" of the solar module I-V curve as shown in Figure4-1. Because Traditional controllers do not operate at the Vmp of the solar modules(s), energy is wasted that could otherwise be used to charge the battery and power system loads. The greater the difference between battery voltage and the Vmp of the module, the more energy is wasted.

TracerBP MPPT technology will always operate at the Vmp resulting in less wasted energy compared to traditional controllers.

·Conditions That Limits the Effectiveness of MPPT

The Vmp of a solar module decreases as the temperature of the module increases. In very hot weather, the Vmp may be close or even less than battery voltage. In this situation, there will be very little or no MPPT gain compared to traditional controllers. However, systems with modules of higher nominal voltage than the battery bank will always have an array Vmp greater than battery voltage. Additionally, the savings in wiring due to reduced solar current make MPPT worthwhile even in hot climates.

4.2 Battery Charging Information

Four Charging Stage

The TracerBP has a 4-stage battery charging algorithm for rapid, efficient, and safe battery charging.

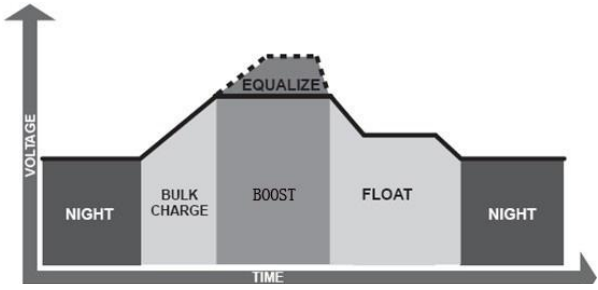


Figure 4-2 TracerBP MPPT charging algorithm

Bulk Charge

In this stage, the battery voltage has not yet reached boost voltage and 100% of available solar power is used to recharge the battery.

Boost Charge

When the battery has recharged to the Boost voltage setpoint, constant-voltage regulation is used to prevent heating and excessive battery gassing. The Boost stage remains 120 minutes and then goes to Float Charge. Every time when the controller is powered on, if it detects neither over discharged nor overvoltage, the charging will enter into boost charging stage.

Float Charge

After the Boost voltage stage, TracerBP will reduce the battery voltage to Float voltage setpoint. When the battery is fully recharged, there will be no more chemical reactions and all the charge current transmits into heat and gas at this time. Then the TracerBP reduces the voltage to the floating stage, charging with a smaller voltage and current. It will reduce the temperature of battery and prevent the gassing, also charging the battery slightly at the same time. The purpose of Float stage is to offset the power consumption caused by self consumption and small loads in the whole system, while maintaining full battery storage capacity.

In Float stage, loads can continue to draw power from the battery. In the event that the system load(s) exceed the solar charge current, the controller will no longer be able to maintain the battery at the Float setpoint. Should the battery voltage remains below the boost reconnect charging voltage, the controller will exit Float stage and return to Bulk charging.

Equalize

WARNING: Risk of explosion!
Equalizing flooded battery can produce explosive gases, so well ventilation of battery box is necessary.

CAUTION: Equipment damage!
Equalization may increase battery voltage to the level damaging to sensitive DC loads. Ensure that all load allowable input voltages are greater than the equalizing charging set point voltage.

CAUTION: Equipment damage!
Over-charging and excessive gas precipitation may damage the battery plates and activate material shedding on them. Too high an equalizing charge or for too long may cause damage.
Please carefully review the specific requirements of the battery used in the system.

Certain types of batteries benefit from periodic equalizing charge, which can stir the electrolyte, balance battery voltage and complete chemical reaction. Equalizing charge increases the battery voltage, higher than the standard complement voltage, which gasifies the battery electrolyte.

If it detects that the battery is being over discharged, the solar controller will automatically turn the battery to equalization charging stage, and the equalization charging will be 120mins. Equalizing charge and boost charge are not carried out constantly in a full charge process to avoid too much gas precipitation or overheating of battery.

4.3 LED Indications

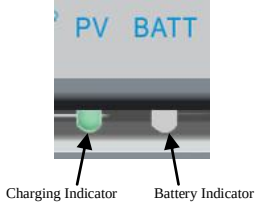


Figure 4-3 LED Indicators

- **Charging Indicator**

Charging LED indicator Table4-1

Indicator	Status
Green Blink	Charging
Green OFF	No charging

- **Battery Indicator**

Battery LED indicator Table 4-2

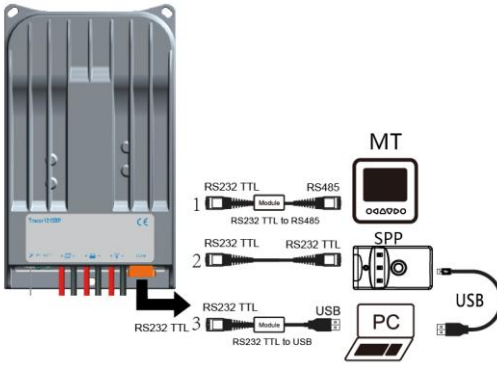
Indicator	Status
Green ON	Normal
Green slow blink	Full
Orange ON	Under voltage warning
Red ON	Low voltage disconnect
Red Blink	Battery over temperature
Green fast blink	High volt disconnect

- **All LED Indicator**

All LED indicator Table 4-3

Indicator	Status
Blink(Battery LED in Red)	Work voltage error
Blink(Battery LED in Orange)	Controller over temperature

4.4 Setting Operation



Three methods to program the controller:
1–Remote Meter,MT50/MT100(Use dedicated RS232 TTL to RS485 communication cable with CC-TTL-RS485-150U).

2–Super Parameter Programmer, SPP-01(Use dedicated RS232 TTL to RS232 TTL communication cable with CC-TTL-TTL-150U).
This method can realize one-key setting operation which is suitable for bulk quantity products setting or applied in the projects.

3–PC monitoring setting software "Solar Station Monitor"（Use dedicated RS232 TTL to USB communication cable with CC-USB-TTL-150U）.
Through the remote meter and PC software, it can realize real-time monitoring, modification of control parameter, charge mode, load work mode, inquiry of failure information etc.

Note: Please refer to the user manual of MT, SPP-01 and PC software for more details.

•Load Set

1．Manual Control

2．Light ON/Off(default)

3．Light ON+ Timer

4．Time Control

•Battery Type

1．Gel　2．Sealed(default)　3．Flooded　4．User

5 Protections, Troubleshooting and Maintenance

5.1 Protection

PV Array Short Circuit

If PV array short circuit occurs, clear it to resume normal operation.

PV Over Voltage

If PV voltage is larger than maximum input open voltage 150V, PV will remain disconnected and warning until the voltage falls safely below 145V. PV voltage cannot be too high, otherwise it may damage the controller, please verify the PV parameter.

PV Over Current

The TracerBP controller will limit battery current to the Maximum Battery Current rating. An over-sized solar array will not operate at peak power.

Load Overload

If the load current exceeds the maximum load current rating 1.05 times, the controller will disconnect the load. Overloading must be cleared up through reducing the load and restarting controller or send a "remote load switch" command.

Load Short Circuit

Fully protected against load wiring short-circuit. Once the load short, the load short protection will start automatically. After five automatic load reconnect attempt, the fault must be cleared by restarting controller or send a "remote load switch" command.

PV Reverse Polarity

Fully protection against PV reverse polarity, no damage to the controller will result. Correct the miswire to resume normal operation.

Battery Reverse Polarity

Fully protection against battery reverse polarity, no damage to the controller will result. Correct the miswire to resume normal operation.

Damaged Local Temperature Sensor

If the temperature sensor short-circuited or damaged, the controller will be charging or discharging at the default temperature 25℃ to prevent the battery damaged from overcharging or over discharged.

Over Temperature Protection

If the temperature of the controller heat sinks exceeds 85℃, the controller will automatically start the overheating protection and recover below 75℃.

5.2 Troubleshooting

Trouble Shooting Table 5-1

Faults	Possible reasons	Troubleshooting
Charging LED indicator off during daytime when sunshine falls on PV modules properly	PV array disconnection	Confirm that PV and battery wire connections are correct and tight
Battery LED indicator green fast blink	Battery voltage higher than over voltage disconnect voltage(OVD)	Check if battery voltage too high, and disconnect the solar module
Battery LED indicator are orange	Battery under voltage	Load output is normal,, charging LED indicator will return to green automatically when fully charged
Battery LED indicator red color	Battery over discharged	The controller cut off the output automatically, LED indicator will return to green automatically when fully charged
All the LED indicator blink. (battery orange indicator blink)	Too high temperature of controller	When heat sink of the controller exceeds 85 ℃, the controller will automatically cut input and output circuit. When the temperature below 75℃, the controller will resume to work. Please reduce the environment temperature, the power of solar module or the power of the load
All the LED indicator blink. (battery red indicator blink)	System voltage error	Check whether the battery voltage match with the controller working voltage. Please change to a suitable battery or reset the working voltage
No output load terminals	Over load or Short circuit	Remove or reducing the load and sending a “remote load switch” command ,the controller will resume to work after 3s or restart the controller

5.3 Maintenance

The following inspections and maintenance tasks are recommended at least two times per year for best controller performance.

- Check that the air flow and ventilation around the controller is not blocked. Clear all dirt or fragments on the heat sink.
- Check all the naked wires to make sure insulation is not damaged for serious solarization, frictional wear, dryness, insects or rats etc. Maintain or replace the wires if necessary.
- Check and confirm that LED digital tube is consistent with required. Pay attention to any troubleshooting or error indication .Take necessary corrective action.
- Confirm that all the system components are ground connected tightly and correctly.
- Inspect for dirt, insects and corrosion, and clear up.
- Check and confirm that lightning arrester is in good condition. Replace a new one in time to avoid damaging of the controller and even other equipments.

Warning：Risk of electric shock!

Make sure all the power is turned off before above operations, and then follow the corresponding inspections and operations.

6 Warranty

The TracerBP charge controller is warranted to be free from defects for a period of TWO (2) years from the date of shipment to the original end user. We will, at its option, repair or replace any such defective products.

• Claim procedure:

Before requesting warranty service, check the Operation Manual to be certain that there is a problem with the controller. Return the defective product to us with shipping charges prepaid if problem cannot be solved. Provide proof of date and place of purchase. To obtain rapid service under this warranty, the returned products must include the model, serial number and detailed reason for the failure, the module type and size, type of batteries and system loads. This information is critical to a rapid disposition of your warranty claim.

•This warranty does not apply under the following conditions:

1. Damage by accident, negligence, abuse or improper use.
2. PV or load current exceeding the ratings of product.
3. Unauthorized product modification or attempted repair.
4. Damaged occurring during shipment.
5. Damage results from acts of nature such as lightning, weather extremes.
6. Irreclaimable mechanical damage.

7 Technical Specifications

• Electrical Parameters

Description	Parameter
Nominal system voltage	12VDC / 24VDC Auto work
Rated charge current	10A
Rated discharge current	10A
Maximum battery voltage	32V
Max. solar input voltage	150VDC
Max. PV input power	12V / 130W 24V / 260W
Self-consumption	<50mA(12V) <30mA(24V)
Discharge circuit voltage drop	≤0.3V
Communication	RS232(TTL)

• Battery Parameters (Tem：25℃)

Battery Voltage Parameters (parameters is in 12V system at 25℃, please use X 2 in 24V system）

Control Parameters				
Battery charging setting	Gel	Sealed	Flooded	User
Over Voltage Disconnect Voltage	16.0V	16.0V	16.0V	9~17V
Charging Limit Voltage	15.0V	15.0V	15.0V	9~17V
Over Voltage Reconnect Voltage	15.0V	15.0V	15.0V	9~17V
Equalize Charging Voltage	——	14.6V	14.8V	9~17V
Boost Charging Voltage	14.2V	14.4V	14.6V	9~17V
Float Charging Voltage	13.8V	13.8V	13.8V	9~17V

Boost Reconnect Charging Voltage	13.2V	13.2V	13.2V	9~17V
Low Voltage Reconnect Voltage	12.6V	12.6V	12.6V	9~17V
Under Voltage Warning Reconnect Voltage	12.2V	12.2V	12.2V	9~17V
Under Voltage Warning Voltage	12.0V	12.0V	12.0V	9~17V
Low Voltage Disconnect Voltage	11.1V	11.1V	11.1V	9~17V
Discharging Limit Voltage	10.6V	10.6V	10.6V	9~17V
Equalize Duration	——	2 hrs.	2 hrs.	0~3 hrs.
Boost Duration	2 hrs.	2 hrs.	2 hrs.	0~3 hrs.

Notes:

1．The default battery type is Sealed. For Gel, Sealed, Flooded battery type, the voltage point is fixed, unable to modify it.

2．User type is the user defined battery type. The default value is the same as sealed type. When modify it, please follow the below logistic relation:

a) Over Voltage Disconnect Voltage > Charging Limit Voltage ≥ Equalize Charging Voltage ≥ Boost Charging Voltage ≥ Float Charging Voltage > Boost Reconnect Charging Voltage.

b) Over Voltage Disconnect Voltage > Over Voltage Reconnect Voltage c) Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage.

d) Under Voltage Warning Reconnect Voltage > Under Voltage Warning Voltage ≥ Discharging Limit Voltage.

e) Boost Reconnect Charging voltage > Low Voltage Disconnect Voltage.

***Please carefully to select battery type. It will damage battery if the setting is incorrect.**

• **Environmental Parameters**

Environmental	Parameter
Ambient temperature range	-35 ℃to +55℃
Storage temperature range	-35℃ to +80℃
Humidity range	10%-90%(NC)
Enclosure	IP67
Altitude	≤3000 m

• **Mechanical Parameters**

Mechanical	Parameter
Dimension	196mm x 117.8mm x 36mm
Mounting dimension	Detail in dimensions drawing
Mounting hole size	Φ4.7
Power cable	$4mm^2$
Weight	1kg

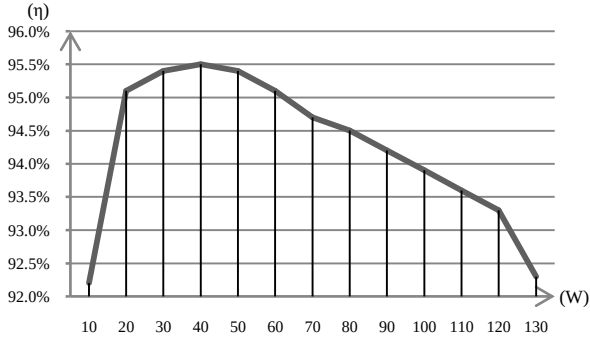
Final interpretation right of the manual belongs to our company.

Any changes without prior notice

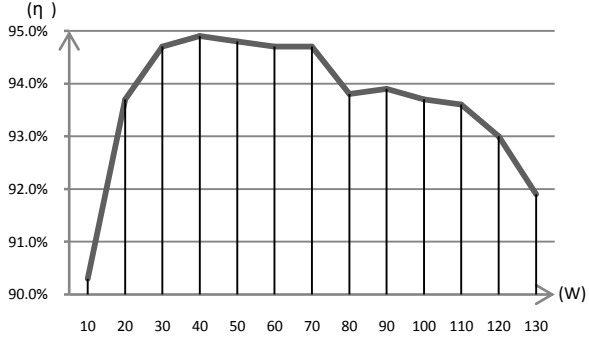
PV Power — Conversion Efficiency Curve

Illumination Intensity: 1000W/m^2 Temperature: 25℃

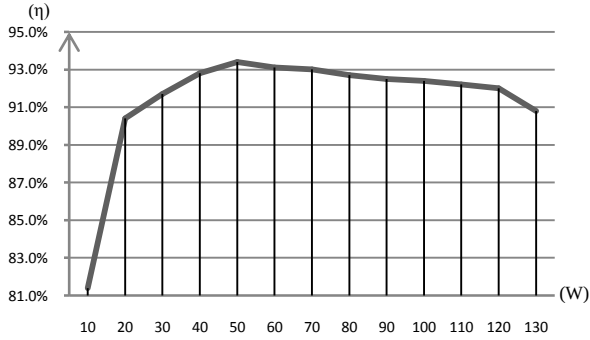
1. Solar Module MPP Voltage(17V) / Nominal System Voltage(12V)



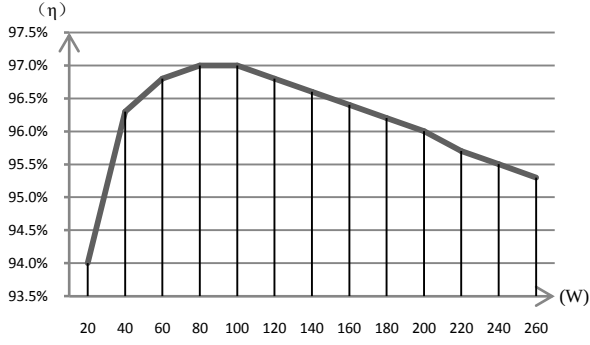
2. Solar Module MPP Voltage(34V) / Nominal System Voltage(12V)



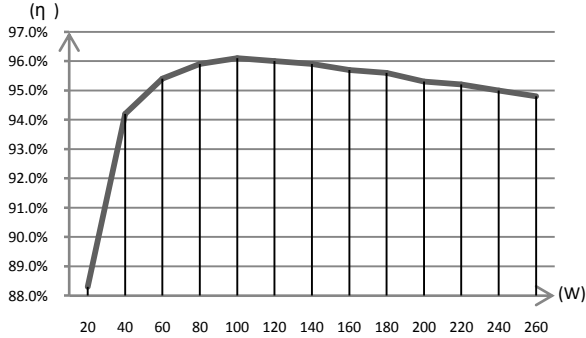
3. Solar Module MPP Voltage(68V) / Nominal System Voltage(12V)



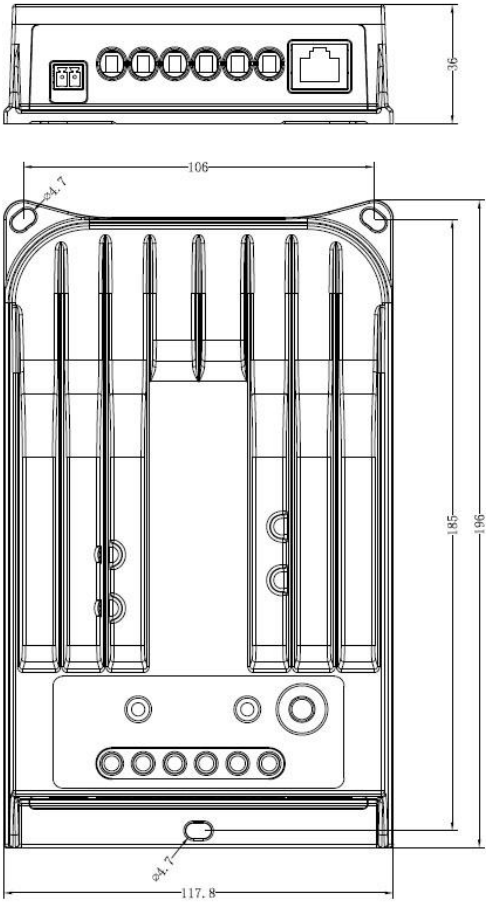
4. Solar Module MPP Voltage(34V) / Nominal System Voltage(24V)



5. Solar Module MPP Voltage(68V) / Nominal System Voltage(24V)



Tracer1215BP Dimensions (mm)



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