

Tracer3210A

—— Maximum Power Point Tracking Solar Charge Controller



Tracer-A series is based on common positive design and advanced MPPT control algorithm, with LCD displaying running status, this product is artistic, economical and practical.

With MPPT control algorithm, in any situation, products of this series can fast and accurately track out the best maximum power point (MPPT) of photovoltaic array, in order to obtain the maximum solar energy in time, which remarkably improves energy efficiency. There is dual display function: local LCD panel or remote meter (needs extra MT50). With Modbus communication protocol interface, it is convenient for customers to expand applications and monitor in various fields like telecommunication base station, household system, street lighting system, wilderness monitoring system, etc.

All-round electronic fault self-test function and enhanced electronic protection function could furthest avoid damages on system components resulting from installation errors or system failures.

Features:

- Advanced Maximum Power Point Tracking (MPPT) technology, with efficiency no less than 99.5%.
- High quality components, perfecting system performance, with maximum conversion efficiency of 98%.
- Ultra-fast tracking speed and guaranteed tracking efficiency.
- Accurately recognizing and tracking of multiple power points.
- Reliable automatic limit function of maximum PV input power, ensuring no overload under any circumstance.
- Wide MPP operating voltage range.
- 12/24VDC automatically identifying system voltage.
- LCD panel display design, dynamically displaying tool's operating data and working condition.
- Multiple load control modes: manual control, light ON/OFF, light On+Timer and test mode.
- Support 3 charging preprogram options: Sealed, Gel, Flooded.
- Battery temperature compensation function.
- Real-time energy statistics function.
- With RS-485 communication bus interface and Modbus communication protocol, it is available to meet various communication requirements in different situations.
- Available for network module (eBox--01) with protocol TCP/UDP/SNMP, to realize connection to internet.
- Available for PC monitoring and external display unit connecting like MT50 and so on, realizing real-time data checking and parameters setting.
- Support software upgrade.

Electronic protections:

- PV reverse polarity protection
- PV short circuit protection
- PV over current alarm protection
- Battery overcharge protection
- Battery over discharge protection
- Battery reverse polarity protection
- Load short circuit protection

- Load overload protection

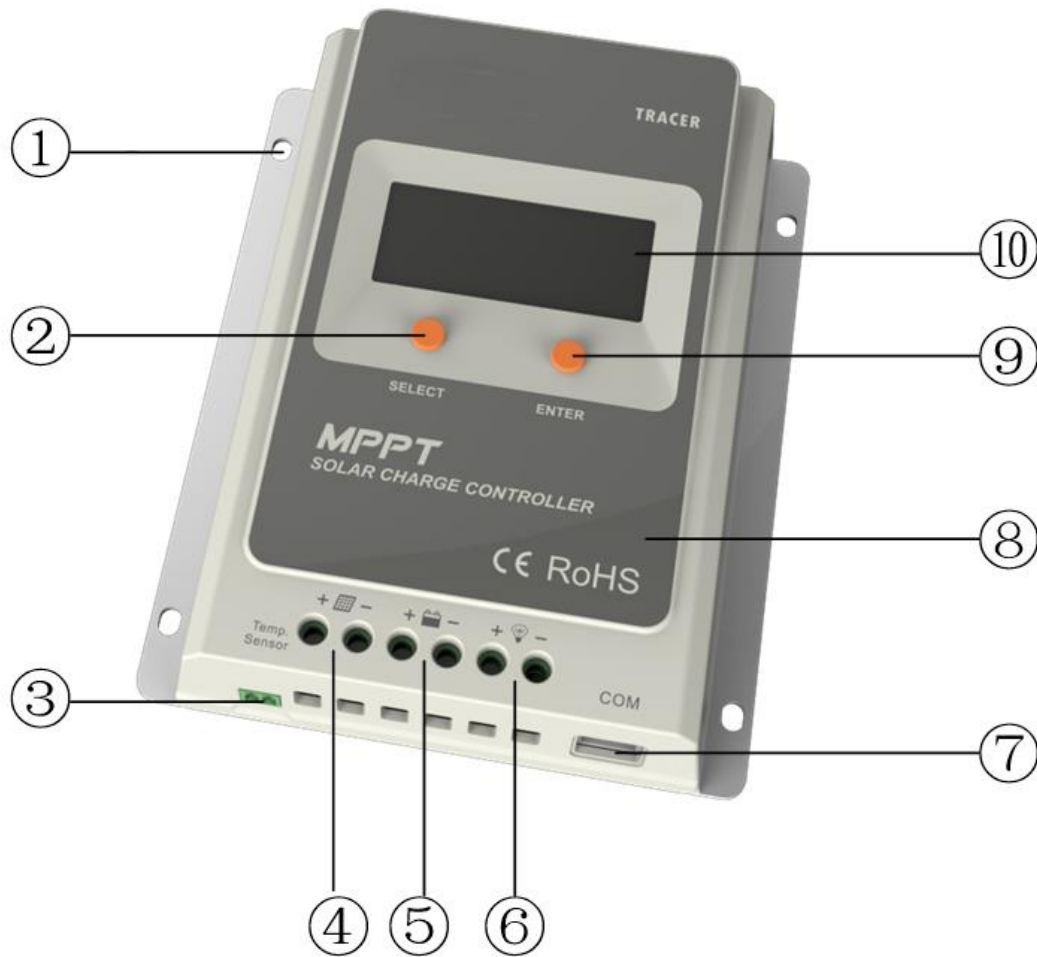


Figure 1-1 Tracer-A Series Characteristics

- 1 –Mounting hole size Φ 5
- 2 –Select Button
- 3 –Connection for a RTS (Remote Temperature Sensor) to remotely detect battery temperature.
- 4 –Solar Module Terminals: Connect solar modules.
- 5 –Battery Terminals: Connect batteries.
- 6 –Load Terminals: Connect loads.
- 7 –RS-485 Port (RJ45 interface): Connect with PC or MT50 to monitor or update firmware.
- 8 –Product shell
- 9 –Enter Button
- 10 – LCD

Technical Specifications

• Electrical Parameters

Description	Parameter
Nominal system voltage	12VDC / 24VDC Auto work
Rated charge current	Tracer3210A 30A
Rated discharge current	Tracer3210A 30A
Battery voltage range	9V~32V
Max. solar input voltage	100VDC
MPPT voltage range	VBAT +2V~90V (Voc. less than 100V)
Max. PV input power	Tracer3210A 390W (12V) 780W (24V)
Self-consumption*	≤20mA(12V) ≤16mA(24V)
Temperature compensate coefficient	-3mV/℃/2V(default)
Communication	RS485(RJ45 interface)

• Environmental Parameters

Environmental	Parameter
LCD temperature range	-20℃to +70℃
Ambient temperature range	-25℃to +45℃
Storage temperature range	-35℃ to +80℃
Humidity range	≤95%(NC)
Enclosure	IP30

• Mechanical Parameters (Tracer1210A)

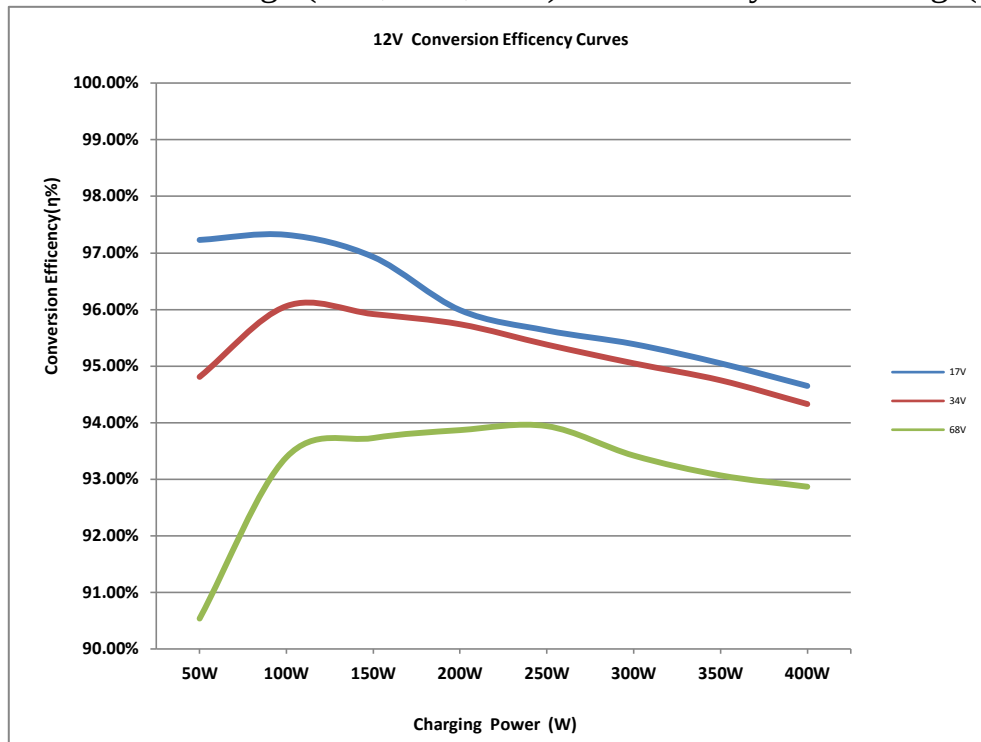
Mechanical	Parameter
Dimension	228mm x 164mm x 55mm
Mounting dimension	170mm*164mm
Mounting hole size	Φ5
Power cable	10mm ²
Weight	2. 1kg

Annex I Conversion Efficiency Curves

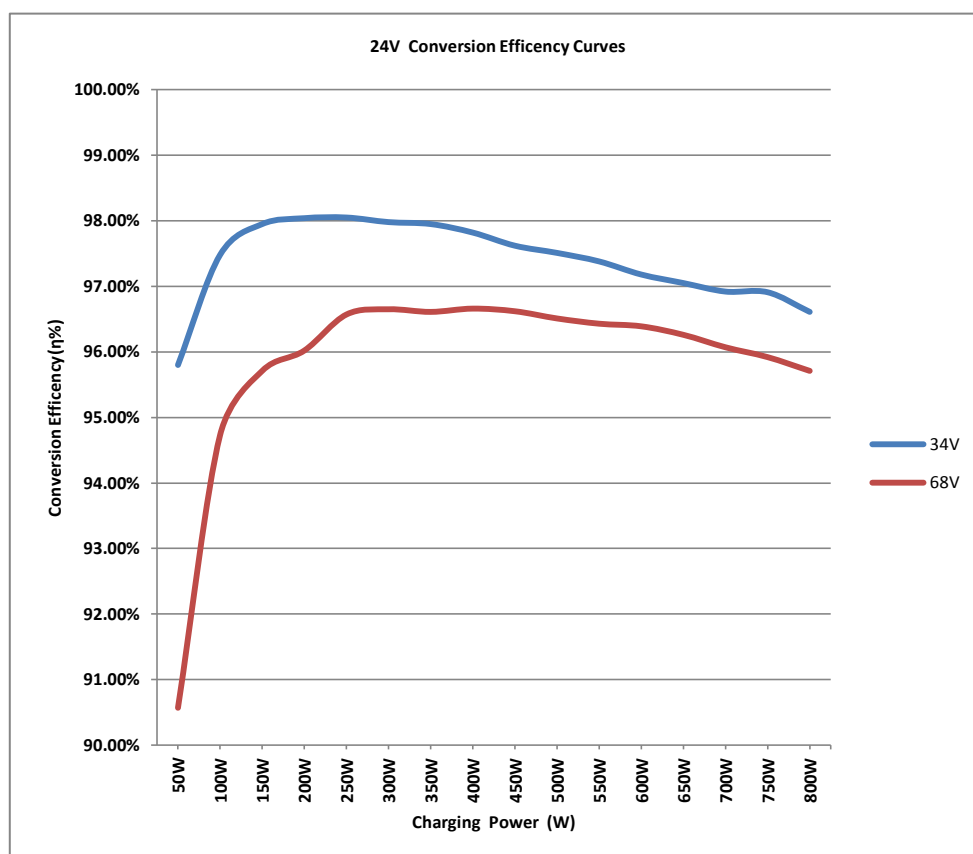
Illumination Intensity: 1000W/m^2 Temp: 25°C

Model: Tracer3210A

Solar Module MPP Voltage (17V, 34V, 68V) / Nominal System Voltage(12V)



Solar Module MPP Voltage (34V, 68V) / Nominal System Voltage(24V)



Maximum Power Point Tracking Technology

Due to the nonlinear characteristics of solar array, there is a maximum energy output point (Max Power Point) on its curve. Traditional controllers, with switch charging technology and PWM charging technology, can't charge the battery at the maximum power point, so can't harvest the maximum energy available from PV array, but the solar charge controller with Maximum Power Point Tracking (MPPT) Technology can lock on the point to harvest the maximum energy and deliver it to the battery.

The MPPT algorithm of our company continuously compares and adjusts the operating points to attempt to locate the maximum power point of the array. The tracking process is fully automatic and does not need user adjustment.

As the Figure 1-2, the curve is also the characteristic curve of the array; the MPPT technology will 'boost' the battery charge current through tracking the MPPT. Assuming 100% conversion efficiency of the solar system, in that way, the following formula is established:

$$\text{Input power (P}_{PV}\text{)} = \text{Output power (P}_{Bat}\text{)}$$



$$\text{Input voltage (V}_{Mp}\text{)} * \text{input current (I}_{PV}\text{)} = \text{Battery voltage (V}_{Bat}\text{)} * \text{battery current (I}_{Bat}\text{)}$$

Normally, the V_{Mp} is always higher than V_{Bat} , Due to the principle of conservation of energy, the I_{Bat} is always higher than I_{PV} . The greater the discrepancy between V_{Mp} & V_{Bat} , the greater the discrepancy between I_{PV} & I_{Bat} . The greater the discrepancy between array and battery, the bigger reduction of the conversion efficiency of the system, thus the controller's conversion efficiency is particularly important in the PV system.

Figure 1-2 is the maximum power point curve, the shaded area is charging range of traditional solar charge controller (PWM Charging Mode), it can obviously diagnose that the MPPT mode can improve the usage of the solar energy resource. According to our test, the MPPT controller can raise 20%-30% efficiency compared to the PWM controller. (Value may be fluctuant due to the influence of the ambient circumstance and energy loss.)

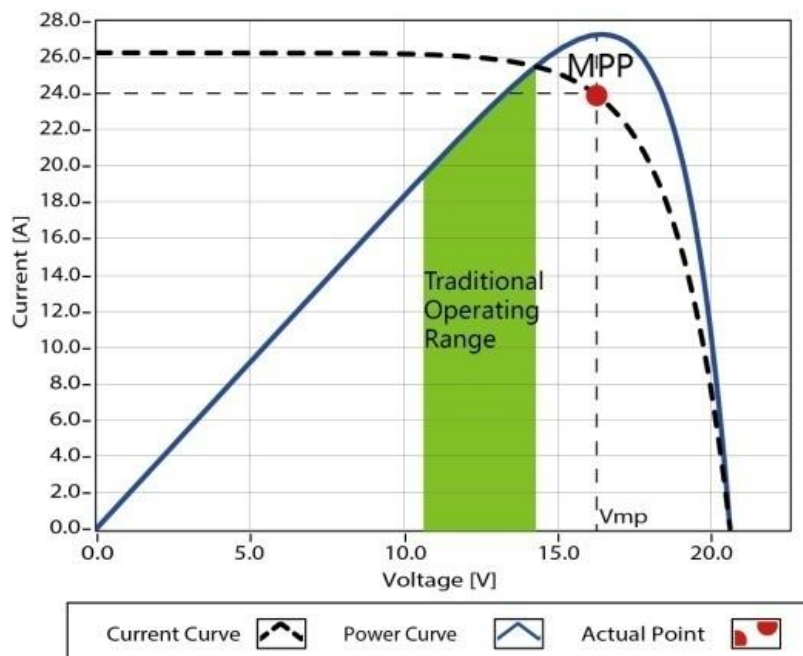


Figure 1-2 Maximum Power Point Curve

In actual application, as shading from cloud, tree and snow, the panel maybe appear Multi-MPP, but in actually there is only one real Maximum Power Point. As the below Figure 1-3 shows:

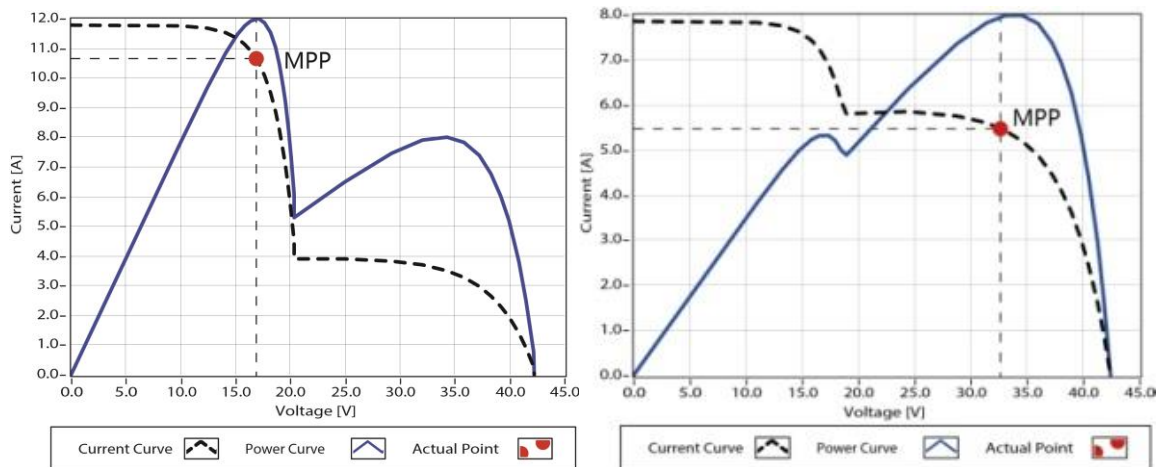
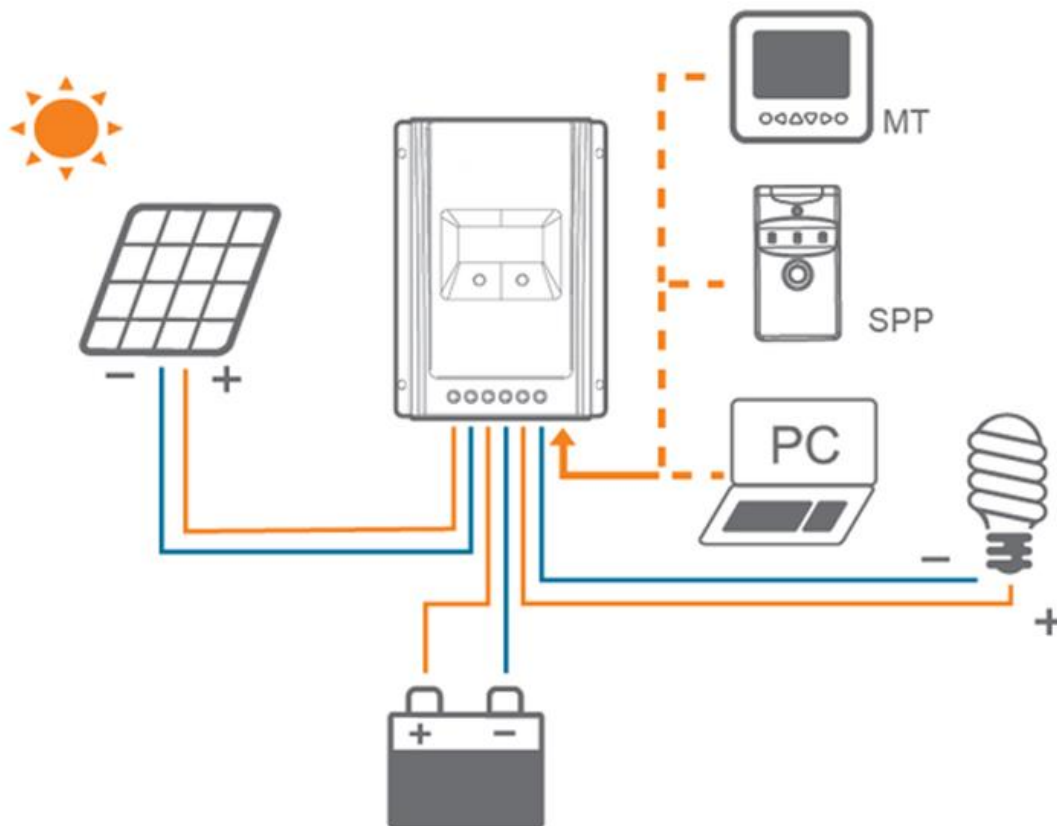


Figure 1-3 Multi-MPPT Curves

If the program works improperly after appearing Multi-MPPT, the system will not work on the real max power point, which may waste most solar energy resources and seriously affect the normal operation of the system. The typical MPPT algorithm, designed by our company, can track the real MPP quickly and accurately, improve the utilization rate of the array and avoid the waste of resources.

Connection:



Battery Charging Stage

The controller has a 3 stages battery charging algorithm (Bulk Charging, Constant Charging and Float Charging) for rapid, efficient, and safe battery charging.

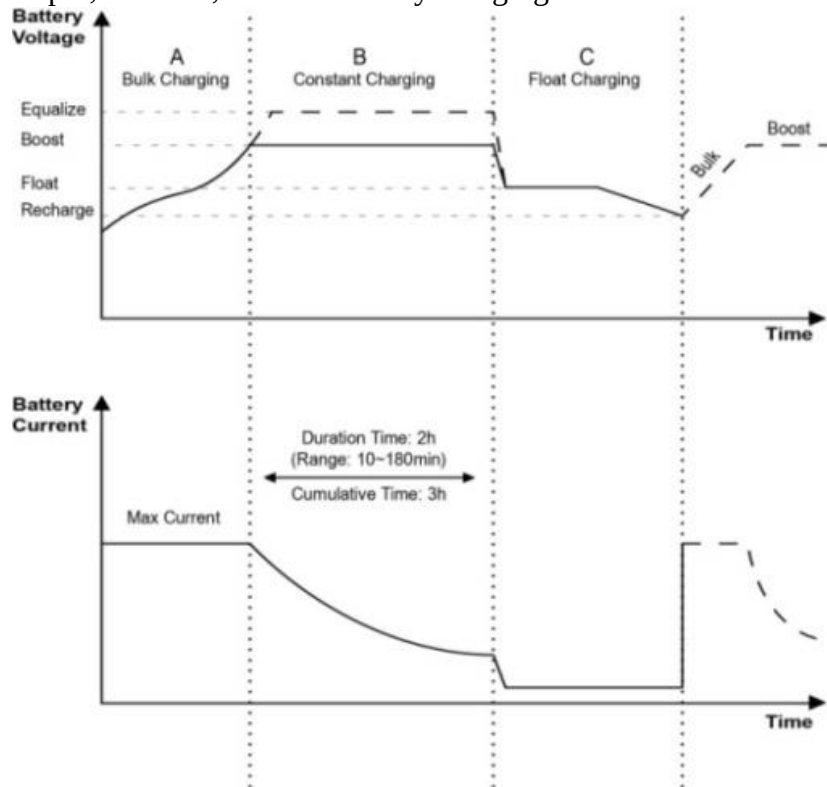


Figure 1-4 Battery charging stage Curve

A) Bulk Charging

In this stage, the battery voltage has not yet reached constant voltage (Equalize or Boost Voltage), the controller operates in constant current mode, delivering its maximum current to the batteries (MPPT Charging).

B) Constant Charging

When the battery voltage reaches the constant voltage setpoint, the controller will start to operate in constant charging mode, this process is no longer MPPT charging, and in the meantime the charging current will drop gradually, the process is not the MPPT charging. The Constant Charging has 2 stages, equalize and boost. These two stages are not carried out constantly in a full charge process to avoid too much gas precipitation or overheating of battery.

Boost Charging

The Boost stage maintain 2 hours in default, user can adjust the constant time and preset value of boost voltage according to demand.

The stage is used to prevent heating and excessive battery gassing.

Tracer3210A Dimensions in Millimeters

