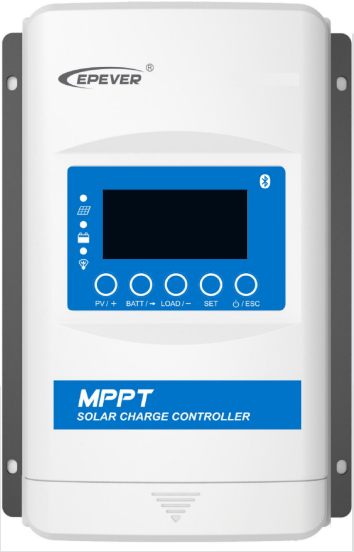
USER MANUAL



MPPT Solar Charge Controller

XTRA1206/1210/2206/2210/3210/3215/3415/4210/4215/4415N G3

XTRA1206/1210/2206/2210/3210/3215/3415/4210/4215/4415N G3 BLE

EN

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Important Safety Instructions

Please keep this manual for future reference.

This manual contains the safety, installation, and operation instructions for the XTRA-N G3 or XTRA-N G3 BLE series Maximum Power Point Tracking (MPPT) solar charge controller (hereinafter referred to as "the controller").

The Bluetooth trademark " " mentioned in this product and the user manual is owned by Bluetooth Special Interest Group (SIG).

1. Safety instructions for installation

- Read all the instructions and warnings carefully in the manual before installation.
- No user-serviceable components exist inside the controller. Do not disassemble or attempt to repair the controller.
- Mount the controller indoors. Avoid exposure to the components and do not allow water to enter the controller.
- Install the controller in a well-ventilated place. The controller's heat sink may become very hot during operation.
- It is suggested to install appropriate external fast-acting fuses/breakers.
- Disconnect all PV array connections and the fast-acting fuses/breakers before controller installation and adjustment.
- Power connections must remain tight to avoid excessive heating from a loose connection.

NOTICE

Do not install the controller in humid, high salt spray, corrosion, greasy, flammable, explosive, dust accumulative, or other severe environments.

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2. Other safety instructions

NOTICE

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

- This equipment has been tested and found to comply with the limits for a Class B digital equipment, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.
- If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

  (1) Reorient or relocate the receiving antenna.

  (2) Increase the distance between the equipment and receiver.

  (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

  (4) Consult the dealer or an experienced radio/TV technician for help.
- This equipment comply with Part 15 of the FCC Rules and have license-exempt transmitter/receiver in line with License-Exempt RSS of Innovation, Science and Economic Development Canada. The operation should meet the following two conditions at the same time:

  (1) The controller may not cause interference.

  (2) The controller has to accept any interference, including the interference that may make the controller fail to operate normally.

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Disclaimers

The warranty does not apply to the following conditions:

- Damage caused by improper use or inappropriate environment (such as the humid, high salt spray, corrosion, greasy, flammable, explosive, dust accumulative, or other severe environments).
- The actual current/voltage/power exceeds the limit value of the controller.
- Damage caused by working temperature exceeding the rated range.
- Arc, fire, explosion, and other accidents caused by failure to follow the controller stickers or manual instructions.
- Unauthorized dismantling or attempted repair.
- Damage caused by force majeure.
- Damage occurred during transportation or handling.

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1 General Information

1.1 Overview

XTRA-N G3/XTRA-N G3 BLE series controller, based on a new design concept, adopts the solar charge controller as the main component. A built-in Bluetooth module is a must for the XTRA-N G3 BLE series, which helps the end-users read and write parameters by phone APP conveniently.

The controller adopts the advanced MPPT control algorithm, improving the maximum power point (MPP) tracking and acting speed. By minimizing the MPP loss rate and time, the controller can track the MPP quickly to obtain the maximum energy under any conditions.

Independent voltage regulation, namely, the battery terminal of the controller can be connected to loads directly when there is no battery, is a new add function. It is friendly to various lithium batteries, avoiding the instability output voltage caused by the internal protection of the lithium batteries. The low self-consumption design significantly reduces the static power consumption and extends system standby time.

Characters of the charging power/current limit, charging power auto-reduction under the high temperature ensure the system stability after connecting with excess PV modules or working in a high-temperature environment.

IP33 Ingress protection and isolated RS485 communication port design improve the controller's reliability and meet the different application requirements.

XTRA-N G3/XTRA-N G3 BLE series owns a three-stage charging mode, which effectively prolongs the battery's lifespan and improves performance. Comprehensive electronic protections, such as overcharge, over-discharge, PV & battery reverse polarity, etc., ensure the solar system is safe, reliable and durable. This controller can be widely used for RVs, household systems, monitoring fields, etc.

Features

- High quality and low failure rate components of ST, TI and Infineon to ensure the service life
- Advanced MPPT technology & ultra-fast tracking speed, tracking efficiency is up to 99.5%
- Maximum DC/DC transfer efficiency is as high as 98.5%; full load efficiency is up to 97.2%
- Advanced MPPT control algorithm to minimize the lost rate and lost time
- Accurate recognizing and tracking of multi-peaks maximum power point
- Wide range of MPP (maximum power point) running voltage to optimize PV utilization
- Support multi battery types including lithium batteries
- Equipped with a stable self-activation function for the lithium battery

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- Set the battery voltage parameters on the LCD(1)
- Battery temperature compensation
- Limit the charging power & charging current to no higher than the rated value
- Real-time energy statistics function
- Charging power reduction automatically for over-temperature
- Built-in Bluetooth to adjust settings through EPEVER APP(2)
- RS485 communication interface with optional 4G or Wi-Fi modules for remote monitoring
- Setting parameters via the PC software, APP, or remote meter
- Constant voltage output function(3)
- Comprehensive electronic protections
- Multiple load work modes
- Dust-proof and waterproof design with IP33 enclosure(4)
- Low self-consumption, lower than 10mA(5)
- Operation at full load without charging power reduced in the working temperature range

(1) For the BCV, FCV, LVD, and LVR, users can modify them on the local controller when the battery type is "USE."

(2) Only the XTRA-N G3 BLE series support the built-in Bluetooth module.

(3) To enable the constant voltage output function, ensure the input power is higher than the output power. Suppose the input power is lower than the output power. In that case, the controller enters the ON-OFF state intermittently caused by the under-voltage protection.

(4) 3-protection against solid objects: protected against solid objects over 2.5mm. 3-protected against sprays to 60° from the vertical.

(5) After disabling the communication port, the self-consumption is lower than 10mA.

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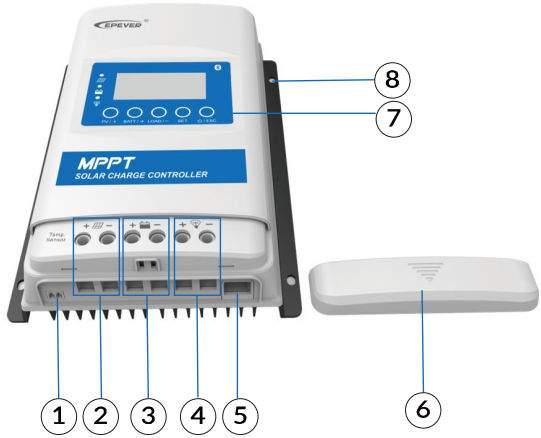
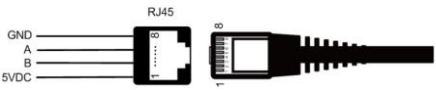
1.2 Appearance



No.	Instruction	No.	Instruction
1	RTS port(1)	5	RS485 communication port(2)
2	PV terminals	6	Terminal protection cover
3	Battery terminals	7	Display units
4	Load terminals	8	Mounting hole Φ 5mm

(1) If the temperature sensor is short-circuited or damaged, the controller will charge or discharge according to the setting voltage at 25℃ (no temperature compensation).

(2) RS485 communication port (RJ45)



Pin	Definition	Instruction	Pin	Definition	Instruction
1	+5VDC	5V/200mA	5	RS485-A	RS485-A
2	+5VDC		6	RS485-A	
3	RS485-B	RS485-B	7	GND	Power GND
4	RS485-B		8	GND	

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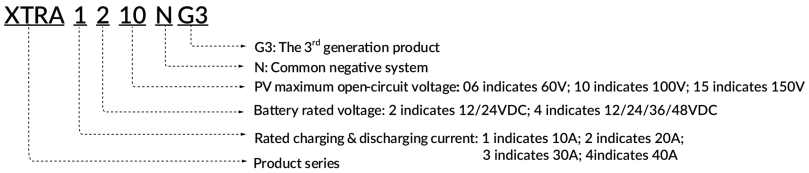
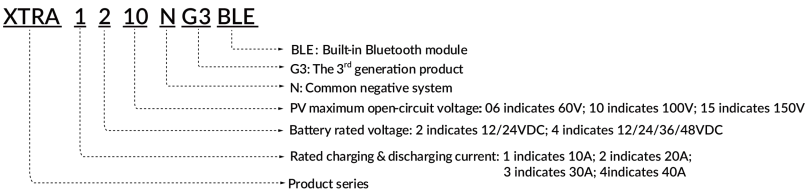
1.3 Naming rules

- **Naming rules for products without Bluetooth module**



- **Naming rules for products with built-in Bluetooth module**



1.4 Connection diagram

- **No-battery Mode**

When there is no battery, IT-NC G3/IT-NC G3 BLE series controller can be connected to the inverter directly. The inverter must be connected to the battery terminals of the controller and meet the following conditions at the same time:

1) When connecting a high-frequency inverter: PV input power > (load output power divided by the inverter conversion efficiency divided by the controller conversion efficiency).

2) When connecting an industrial frequency inverter: PV input power > (load output power divided by the inverter conversion efficiency divided by the controller conversion efficiency) × 2.

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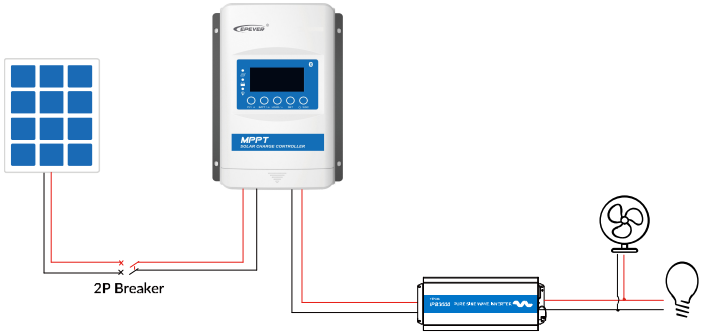
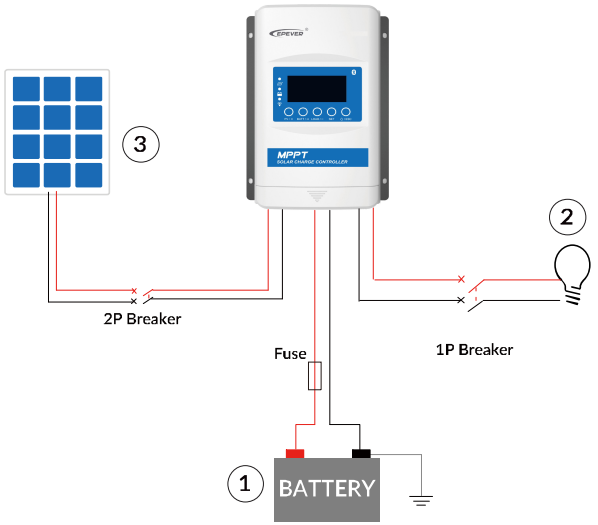


- **Battery Mode (not connect BMS-Link)**



NOTICE

- The cable length of the battery should not exceed 3 meters.
- The recommended cable length of the PV array should not exceed 3 meters (**Note:** If the cable length of the PV array is less than 3 meters, the system meets EN/IEC61000-6-3 requirements. If more than 3 meters, the system may not meet EN/IEC61000-6-3 requirements).

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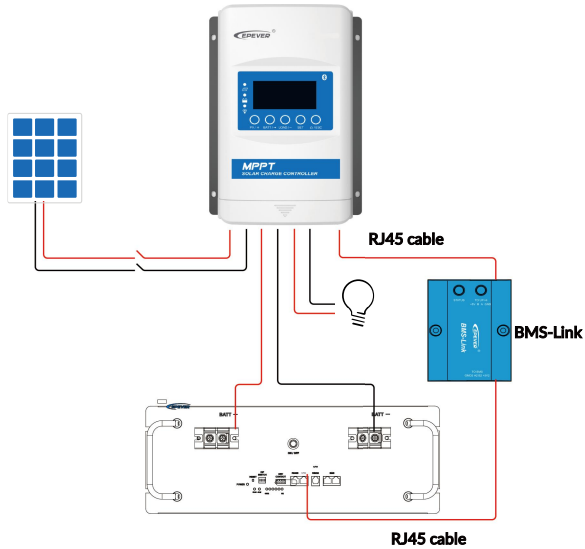
- **Battery Mode (connect BMS-Link)**



NOTICE

- The cable length of the battery should not exceed 3 meters.
- The recommended cable length of the PV array should not exceed 3 meters (**Note:** If the cable length of the PV array is less than 3 meters, the system meets EN/IEC61000-6-3 requirements. If more than 3 meters, the system may not meet EN/IEC61000-6-3 requirements).

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2 Installation

2.1 Precautions

- Be careful when installing the batteries. Please wear eye protection when installing the flooded lead-acid battery and rinse with clean water in time for battery acid contact.
- Keep the battery away from any metal objects, which may cause a short circuit of the battery.
- Explosive battery gases may come out from the battery during charging, so make sure the ventilation condition is good.
- Avoid direct sunlight and rain infiltration when installing it outdoor.
- Loose power connections and corroded wires may produce high heat that can melt wire insulation, burn surrounding materials, or even cause a fire. Ensure tight connections and secure cables with cable clamps to prevent them from swaying in moving applications.
- Only charge the lead-acid and lithium-ion batteries within the control range of the controller.
- The battery connector may be wired to another battery or a bank of batteries. The following instructions refer to a singular battery. Still, it is implied that the battery connection can be made to either one battery or a bank of batteries in a battery bank.
- Select the system cables according to 5A/mm^2 or less current density.
- The wire size of the grounding wire should not be less than 4mm^2.
- The torque of tightening the wiring screw should not be less than 1.2 N·m.

2.2 Requirements for the PV array

Serial connection (string) of PV modules

As the core component of the solar system, the controller could be suitable for various types of PV modules and maximize converting solar energy into electrical energy. According to the open-circuit voltage (V_{OC}) and the maximum power point voltage (V_{MPP}) of the MPPT controller, the series number of different types of PV modules can be calculated. The below table is for reference only.

XTRA1206/2206N G3; XTRA1206/2206N G3 BLE:

System Voltage	36-cell Voc < 23V		48-cell Voc < 31V		54-cell Voc < 34V		60-cell Voc < 38V	
	Max.	Best	Max.	Best	Max.	Best	Max.	Best
12V	2	2	1	1	1	1	1	1
24V	2	2	-	-	-	-	-	-

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System Voltage	72-cell Voc < 46V		96-cell Voc < 62V		Thin-film Module Voc > 80V
	Max.	Best	Max.	Best	
12V	1	1	-	-	-
24V	1	1	-	-	-

Note: The above parameters are calculated under the STC (Standard Test Condition)—temperature at 25℃, air mass 1.5, irradiance 1,000W/m^2.

XTRA1210/2210/3210/4210N G3; XTRA1210/2210/3210/4210N G3 BLE:

System Voltage	36-cell Voc < 23V		48-cell Voc < 31V		54-cell Voc < 34V		60-cell Voc < 38V	
	Max.	Best	Max.	Best	Max.	Best	Max.	Best
12V	4	2	2	1	2	1	2	1
24V	4	3	2	2	2	2	2	2

System Voltage	72-cell Voc < 46V		96-cell Voc < 62V		Thin-film Module Voc > 80V
	Max.	Best	Max.	Best	
12V	2	1	1	1	1
24V	2	1	1	1	1

Note: The above parameters are calculated under the STC (Standard Test Condition)—temperature at 25℃, air mass 1.5, irradiance 1,000W/m^2.

XTRA3215/4215N G3; XTRA3215/4215N G3 BLE:

System Voltage	36-cell Voc < 23V		48-cell Voc < 31V		54-cell Voc < 34V		60-cell Voc < 38V	
	Max.	Best	Max.	Best	Max.	Best	Max.	Best
12V	4	2	2	1	2	1	2	1
24V	6	3	4	2	4	2	3	2

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System Voltage	72-cell Voc < 46V		96-cell Voc < 62V		Thin-film Module Voc > 80V
	Max.	Best	Max.	Best	
12V	2	1	1	1	1
24V	3	2	2	1	1

Note: The above parameters are calculated under the STC (Standard Test Condition)—temperature at 25℃, air mass 1.5, irradiance 1,000W/m^2.

XTRA3415/4415N G3; XTRA3415/4415N G3 BLE:

System Voltage	36-cell Voc < 23V		48-cell Voc < 31V		54-cell Voc < 34V		60-cell Voc < 38V	
	Max.	Best	Max.	Best	Max.	Best	Max.	Best
12V	4	2	2	1	2	1	2	1
24V	6	3	4	2	4	2	3	2
48V	6	5	4	3	4	3	3	3

System Voltage	72-cell Voc < 46V		96-cell Voc < 62V		Thin-film Module Voc > 80V
	Max.	Best	Max.	Best	
12V	2	1	1	1	1
24V	3	2	2	1	1
48V	3	2	2	2	1

Note: The above parameters are calculated under the STC (Standard Test Condition)—temperature at 25℃, air mass 1.5, irradiance 1,000W/m^2.

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2.3 Wire size and circuit breaker

The wiring and installation methods must conform to national and local electrical code requirements.

- **Recommended PV wire size**

The PV array output varies with the PV module size, connection method, and sunlight angle. The PV array's short circuit current (ISC) can calculate the minimum PV wire size. Please refer to the value of Isc in the PV module specification. When PV modules are connected in series, the Isc equals a PV module Isc. When PV modules are connected in parallel, the Isc equals the sum of the PV modules' Isc. The Isc of the PV array must not exceed the controller's maximum PV input current. Please refer to the table below for the Max. PV input current and the Max. PV wire size:

Model	Max. PV Input Current	Max. PV Wire Size*	Circuit Breaker
XTRA1206/1210N G3 XTRA1206/1210N G3 BLE	10A	4mm^2/12AWG	16A/125V/2 P
XTRA2206/2210N G3 XTRA2206/2210N G3 BLE	20A	6mm^2/10AWG	32A/125V/2 P
XTRA3210/3215/3415N G3 XTRA3210/3215/3415N G3 BLE	30A	10mm^2/8AWG	40A/125V/2 P
XTRA4210/4215/4415N G3 XTRA4210/4215/4415N G3 BLE	40A	16mm^2/6AWG	63A/125V/2 P

NOTICE

When the PV modules are connected in series, the open-circuit voltage of the PV array must not exceed 46V (XTRA ** 06N G3/XTRA**06N G3 BLE), 92V (XTRA**10N G3/XTRA ** 10N G3 BLE), 138V (XTRA ** 15N G3/XTRA ** 15N G3 BLE) at 25℃.

- **Recommended Battery and Load wire size**

The battery and load wire size must conform to the rated current. The reference size is as below:

Model	Rated Charge Current	Rated Discharge Current	Battery Wire Size	Circuit Breaker
XTRA1206/1210N G3 XTRA1206/1210N G3 BLE	10A	10A	4mm^2/12AWG	16A/125V/2 P

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XTRA2206/2210N G3 XTRA2206/2210N G3 BLE	20A	20A	6mm²/10AWG	32A/125V/2 P
XTRA3210/3215/3415N G3 XTRA3210/3215/3415N G3 BLE	30A	30A	10mm²/8AWG	40A/125V/2 P
XTRA4210/4215/4415N G3 XTRA4210/4215/4415N G3 BLE	40A	40A	16mm²/6AWG	63A/125V/2 P

Model	Rated Charge Current	Rated Discharge Current	Load Wire Size	Circuit Breaker
XTRA1206/1210N G3 XTRA1206/1210N G3 BLE	10A	10A	4mm²/12AWG	16A/125V/2 P
XTRA2206/2210N G3 XTRA2206/2210N G3 BLE	20A	20A	6mm²/10AWG	32A/125V/2 P
XTRA3210/3215/3415N G3 XTRA3210/3215/3415N G3 BLE	30A	30A	10mm²/8AWG	40A/125V/2 P
XTRA4210/4215/4415N G3 XTRA4210/4215/4415N G3 BLE	40A	40A	16mm²/6AWG	63A/125V/2 P

NOTICE

- The wire size is only for reference. Suppose there is a long distance between the PV array, the controller, and the battery. In that case, larger wires can be used to reduce the voltage drop and improve performance.
- The recommended battery wire is selected when the battery terminals are not connected to any additional inverter.

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2.4 Mounting and wiring the controller

DANGER

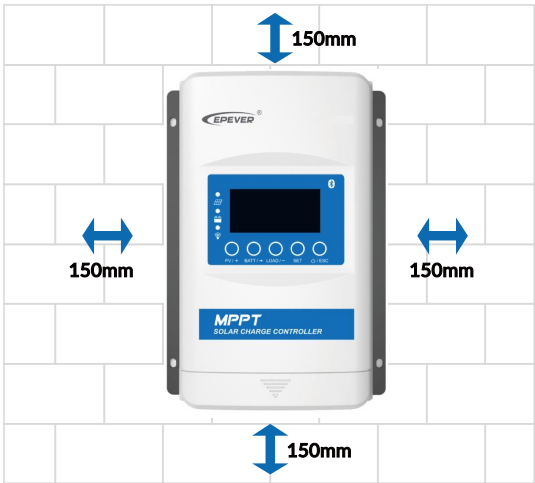
- Risk of explosion! Never install the controller in the enclosed space with flooded batteries! Do not install it in a confined area where battery gas can accumulate either.
- Electric shock hazard! The PV array may generate a very high open circuit voltage. Disconnect the circuit breaker or fast-acting fuse first and be careful when wiring.

NOTICE

When installing the controller, ensure that there is enough air flow through the controller's heat sink, and leave at least 150mm of clearance above and below the controller to guarantee natural convection for heat dissipation. If the controller is mounted in a closed cabinet, ensure that heat can be dissipated through the cabinet.

Step 1: Determination of the installation location and heat-dissipation space

The controller shall be installed in a place with sufficient airflow through the controller radiators and a minimum clearance of 150mm from the upper and lower edges of the controller to ensure natural thermal convection.



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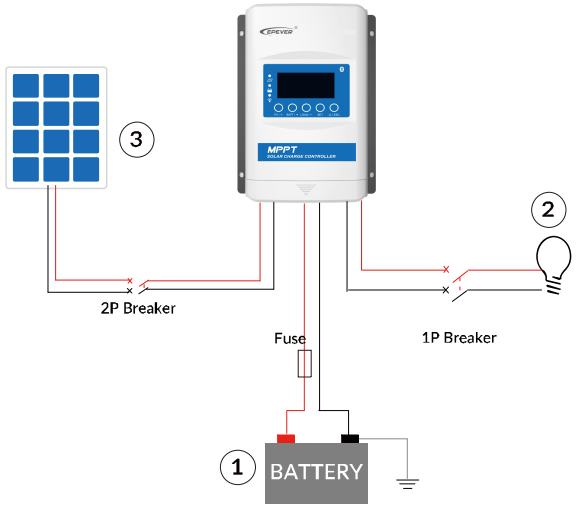
Step 2: Connect the system in the order of ①battery > ②load > ③PV array by the following figure and disconnect the system in the reverse order ③②①.



NOTICE

- While wiring the controller, do not connect the circuit breaker or fast-acting fuse. Ensure that the electrode polarity is correctly connected.
- A fast-acting fuse whose current is 1.25 to 2 times the rated current of the controller must be installed on the battery side with a distance from the battery not greater than 150mm.
- The cable length of the battery should not exceed 3 meters.
- The recommended cable length of the PV array should not exceed 3 meters (Note: If the cable length of the PV array is less than 3 meters, the system meets EN/IEC61000-6-3 requirements. If more than 3 meters, the system may not meet EN/IEC61000-6-3 requirements).
- Suppose the controller is to be used in an area with frequent lightning strikes or an unattended area. In that case, it must install an external surge arrester.
- Suppose an inverter is to be connected to the system. In that case, you must connect the inverter directly to the battery, not to the load side of the controller.

Step 3: Grounding

XTRA-N G3/XTRA-N G3 BLE series are common-negative controllers; all the negative terminals can be grounded simultaneously, or anyone is grounded. However, according to the practical

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application, the negative terminals of the PV array, battery, and load can also be ungrounded. Still, the grounding terminal on the shell must be grounded. It effectively shields the electromagnetic interference from the outside and prevents some electric shock to the human body.

NOTICE

- A common-negative controller for a common-negative system, such as the motorhome, is recommended.
- The controller may be damaged if a common-positive controller is used and the positive electrode is grounded in the common-negative system.

Step 4: Connect accessories

- Connect the remote temperature sensor cable

Included Accessory	Connect the temperature sensor	Model: RT-MF58R47K3.81A	
Optional Accessory	Remote temperature sensor	Model: RTS300R47K3.81A	

Connect the remote temperature sensor cable to the port 1 of the controller, and place the other end close to the battery.

NOTICE

Suppose the remote temperature sensor is not connected to the controller. In that case, the default battery charging or discharging temperature setting is 25℃ without temperature compensation.

- Connect the accessories for RS485 communication

Refer to Subsection 4.1.3 Remote setting.

Note: For product models with PV open-circuit voltage ≤ 60V, the RS485 interface is non-isolated and requires an external isolator to ensure safe communication. Models with PV open-circuit voltage ≥ 100V feature an isolated RS485 interface and permit direct connection.

Step 5: Powered on the controller

Connect the battery's fast-acting fuse to power the controller. Then check the battery indicator's status (the controller operates normally when the indicator is lit in green). Connect the fast-acting

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fuse and circuit breaker of the load and PV array. Then the system will be operating in preprogrammed mode.

NOTICE

If the controller is not operating properly or the battery indicator on the controller shows an abnormality, please refer to Section 5.2 Troubleshooting.

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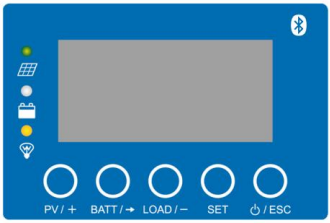
3 Interface



3.1 Indicator

Indicator	Color	Status	Instruction
PV	Green	Solid ON	PV charges the battery with a low current
	Green	Solid OFF	1. No sunlight; 2. Connection error; 3. PV low voltage
	Green	Slowly flashing (1Hz)	Charging normally
	Green	Fast flashing (4Hz)	PV overvoltage
BATT	Green	Solid ON	Normal
	Green	Slowly flashing (1Hz)	Battery fully charged
	Green	Fast flashing (4Hz)	Battery overvoltage
	Orange	Solid ON	Battery undervoltage
	Red	Solid ON	Battery over-discharged
	Red	Slowly flashing (1Hz)	Battery overheating Lithium battery low temperature(1)
LOAD	Yellow	Solid ON	Load on
	Yellow	Solid OFF	Load off
PV&BATTLED fast flashing			Controller overheating System voltage error(2)

(1) When a lead-acid battery is used, the controller does not have low-temperature protection.

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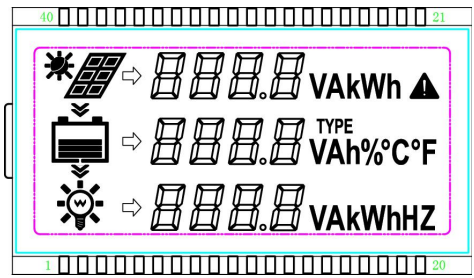
(2) When a lithium battery is used, the system voltage cannot be identified automatically.

3.2 Button

PV / +	Press the button	PV browsing interface
		Setting data +
	Press the button and hold 5s	Setting the LCD cycle time, enabling or disabling the communication port
BATT / →	Press the button	BATT browsing interface
		Cursor displacement during setting
	Press the button and hold 5s	Setting the battery type, battery capacity level, and temperature unit.
LOAD / –	Press the button	Controller load browsing interface
		Setting data
	Press the button and hold 5s	Setting the load working mode
SET	Press the button	Enter into setting interface
		Switch the setting interface to the browsing interface
		Confirm the setting parameter
⏻ / ESC	Press the button	Exit the setting interface

3.3 Display



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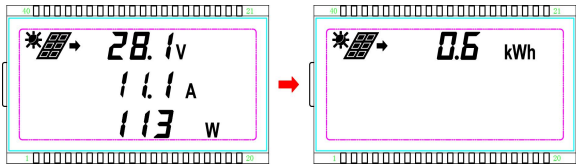
Note: The LCD can be viewed clearly when the angle between the end-user's horizontal sight and the LCD is within 90°. If the angle exceeds 90°, the information on the LCD cannot be viewed clearly.

Icon	Information	Icon	Information	Icon	Information
	Day		Not charging		Not discharging
	Night		Charging		Discharging

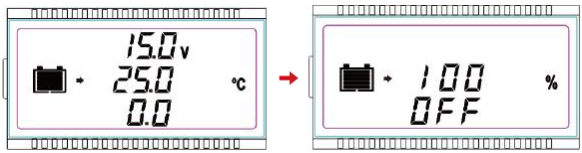
1. PV



Display: Voltage/Current/Power/Generated Energy

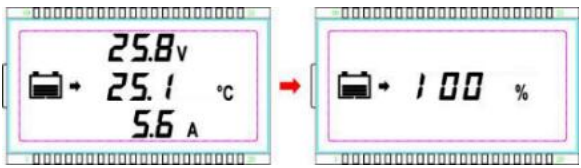
2. Battery

- **Parameters in master mode**



Display: Voltage/Current/Temperature/SOC/BMS connection status

- **Parameters in slave mode**



Display: Voltage/Current/Temperature/Battery capacity level

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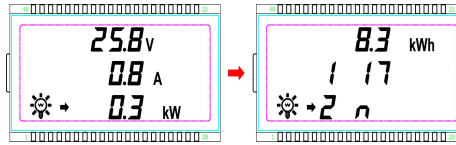
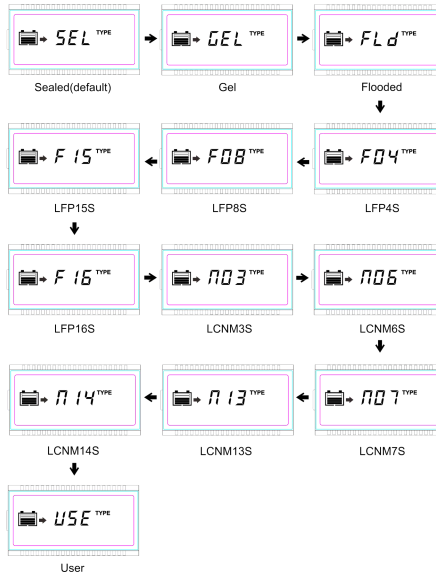
3. Load



Display: Voltage/Current/Power/Consumed energy/Load working mode-Timer1/Load working mode-Timer2

3.4 Setting parameters

4. Battery type



Operation:

Step 1: Press the BATT / → button to browse the battery parameters on the initial interface. Then, press the SET button to enter the battery parameters setting interface.

Step 2: Press the BATT / → button and hold for 5s to enter the battery-type interface.

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Step 3: Press the PV/ + or LOAD / – button to select the battery type.

Step 4: Press the SET button to confirm.

Step 5: Continue to press the SET button twice or wait for 10s of no-operation to automatically go back to the battery parameters setting interface.

NOTICE

- If the controller supports 48V system voltage, the battery type will display LiFePO4 F15/F16 and Li(NiCoMn)O2 N13/N14.
- Please refer to Subsection 4.1.2 Local setting for the battery control voltage setting when the battery type is Use.

5. Battery capacity

Operation:

Step 1: Press the BATT / → button to browse the battery parameters on the initial interface. Then, press the SET button to enter the battery parameters setting interface.

Step 2: Press the BATT / → button and hold for 5s to enter the battery-type interface.

Step 3: Press the SET button to jump to the battery capacity interface.

Step 4: Press the PV/ + or LOAD / – button to set the battery capacity.

Step 5: Press the SET button to confirm.

6. Temperature units

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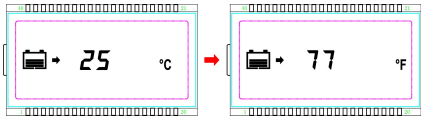


Operation:

Step 1: Press the BATT / ⇥ button to browse the battery parameters on the initial interface. Then, press the SET button to enter the battery parameters setting interface.

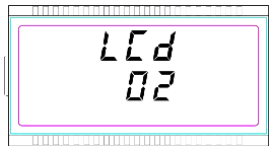
Step 2: Press the BATT / ⇥ button and hold for 5s to enter the battery-type interface.

Step 3: Press the SET button twice to jump to the temperature unit's interface.

Step 4: Press the PV / + or LOAD / − button to set the temperature units.

Step 5: Press the SET button to confirm.

7. LCD cycle time



Tip	The LCD cycle default time is 2s, and the setting time range is 0-20s.

Step 1: Press the PV / + button to browse the PV parameters on the initial interface. Then, press the SET button to enter the PV parameters setting interface.

Step 2: Press the PV / + button and hold for 5s to enter the LCD cycle time interface, and the cycle time flashes.

Step 3: Press the PV / + or LOAD / − button to set the LCD cycle time.

Step 4: Press the SET button to confirm.

8. Clear the accumulated electricity

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Operation:

Step 1: Press the PV/+ button to browse the PV parameters on the initial interface. Then, press the SET button to enter the PV parameters setting interface.

Step 2: Press the PV/+ button and hold for 5s to enter the LCD cycle time interface, and the cycle time flashes.

Step 3: Hold the PV/+ button and the LOAD/− button for 5seconds to clear the accumulated electricity.

Tip	Return to the PV parameters interface to confirm whether the accumulated electricity (kWH) is zero.

9. Enable the RS485 communication port

The RS485 communication port supports 5V output and communication function when enabled. And it has no output and communication function when disabled. At the same time, the system's self-consumption is reduced further.

Operation:

Step 1: Press the PV/+ button to browse the PV parameters on the initial interface. Then, press the SET button to enter the PV parameters setting interface.

Step 2: Press the PV/+ button and hold for 5s to enter the LCD cycle time interface. Then, press the SET button to switch to the CON interface.

Step 3: Press the PV/+ or LOAD/− button to enable (EN) or disable (DIS) the RS485 communication port.

Step 4: Press the SET button to confirm.

10. Master and slave modes

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The master mode is used for BMS communication; the slave mode is used for RS485 communication and in such mode, battery parameters can be set remotely via PC host computer software or APP software. See Subsection 4.1.1 Supported battery type -- 4.1.3 Remote setting for details. The master and slave modes are switched as follows:

Operation:

Press the PV / + button to browse the PV parameters on the initial interface. Then, press the SET button to enter the PV parameters setting interface; press the PV / + button and hold for 5s to enter the LCD cycle time interface, and the cycle time flashes. Press the SET button to enter the CON interface and the number flashes; press the SET button to enter the nnS interface that displays S. Press the PV / + button or the LOAD / − button to set and the nnS interface displays nn ("nn" indicates master communication mode, and "S" indicates slave communication mode).

11. BMS protocol number

When using the lithium batteries with BMS function, after the controller is connected to BMS-Link module and lithium batteries, by setting the BMS protocol number, BMS protocols of different lithium battery manufactures can be converted into our standard protocols by BMS-Link module so as to realize the communication between the controller and lithium battery BMS of different manufacturers. The BMS protocol number of different lithium batteries can be found on the websites of corresponding companies. Normal communication can only be achieved after the protocol number is properly set. The protocol number is set as follows:

Operation:

Press the PV / + button to browse the PV parameters on the initial interface. Then, press the SET button to enter the PV parameters setting interface; press the PV / + button and hold for 5s to enter the LCD cycle time interface, and the cycle time flashes. Press the SET button to enter the CON

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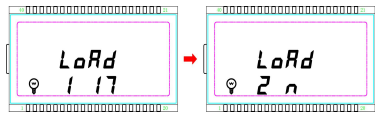
interface and the number flashes; press the SET button to enter the nnS interface that displays S. Press the PV / + button or the LOAD / – button to set and the nnS interface displays nn ("nn" indicates master communication mode, and "S" indicates slave communication mode). In the master mode (the first TYPE interface displays "nn"), press the SET button to enter the PRO interface (default 01, scope: 0-231) and the number flashes. Press the SET button to confirm.

BMS control logic description:

After the controller reads the BMS enabled status:

- Replace local parameters: Replace capacity level with SOC.
- Make charge and discharge switch logic control based on BMS status.
- After reading the valid BMS protection voltage, the actual working voltage can be calculated according to logical relationship. At that time, it can be set but will not be actually implemented. After BMS is disconnected or disabled, the equipment can work according to set voltage point.
- After reading the valid BMS current limit, the current limit charge can be completed according to the BMS current limit and originally set current limit (whichever is smaller).

12. Load type



Operation:

Step 1: Press the LOAD / – button to browse the load parameters on the initial interface. Then, press the SET button to enter the load parameters setting interface.

Step 2: Press the LOAD / – button and hold for 5s to enter the load type interface.

Step 3: Press the PV / + or LOAD / – button to change the load type.

Step 4: Press the SET button to confirm.

Tip	Please refer to Section 4.2 Load operation mode.

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4 Controller Parameter Setting

4.1 Battery parameters settings

4.1.1 Supported battery types

1	Battery	Sealed (default)
		Gel
		Flooded
2	Lithium battery	LiFePO4 (4S/8S/15S/16S)
		Li(NiCoMn)O2 (3S/6S/7S/13S/14S)
3	User	

NOTICE

If the controller supports 48V system voltage, the battery type will display LiFePO4 F15/F16 and Li(NiCoMn)O2 N13/N14.

4.1.2 Local setting

NOTICE

When the default battery type is selected, the battery voltage parameters cannot be modified. To change these parameters, select the "USE" type.

Step 1: Enter the “USE” battery type. Detailed operations of entering the “USE” battery type are shown in the following table.

Content	Instructions
Enter the “USE” battery type	1) Press the BATT / → button to browse the battery parameters on the initial interface. Press the SET button to enter the battery parameters setting interface, and press the BATT / → button and hold for 5s to enter the battery-type interface. 2) Press the PV / + or LOAD / − button to select the battery type, such as select

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	the battery type as F04. And then press the SET button to confirm. Continue to press the SET button twice or wait for 10s of no-operation to automatically go back to the battery parameters setting interface. 3) Press the BATT / → button and hold for 5s to enter the battery-type interface again on the battery parameters setting interface. 4) Press the PV / + or LOAD / − button to select the battery type "USE."

Step 2: Set the battery parameters on the local equipment. Under the "USE" interface, the battery parameters that can be local set are shown in the table below:

Parameters	Default	Range	Instructions
System Voltage Level (SYS)★	12VDC	12/24/36/48VDC or "0" (auto identity)	1) Under the "USE" battery type, press the SET button to enter the "SYS" interface. 2) Press the SET button again to display the current "SYS" value. 3) Press the PV / + or LOAD / − button to modify the parameter. 4) Press the SET button to confirm and enter the next parameter.
Bulk Charging Voltage (BCV)	14.4V	9-17V	5) Press the SET button again to display the current voltage value. 6) Press the PV / + or LOAD / − button to modify the parameter (press the PV / + button to increase 0.1V, press the LOAD / − button to decrease 0.1V).
Float Charging Voltage (FCV)	13.8V	9-17V	
Low Voltage Recovery Voltage (LVR)	12.6V	9-17V	

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Low Voltage Disconnect Voltage (LVD)	11.1V	9-17V	7) Press the SET button to confirm and enter the next parameter.
Lithium battery protection enable (LEN)	NO	YES/NO	Press the PV / + or LOAD / − button to modify the switch status. **Note:** It exists automatically from the current interface after no operation of more than 10s.

★ The SYS value can only be modified under the non-lithium "USE" type. The SYS value can be modified if the battery type is Sealed, Gel, Flooded before entering the "USE" type. The SYS value cannot be modified if it is a lithium battery type before entering the "USE" type.

For the no-battery application, if the actual system voltage is 12V, the SYS value can be set as “12VDC” or “0 (auto identify the system voltage)”. If the actual system voltage is higher than 12V, such as 24V/36V/48V, the SYS value must be the same as the actual system voltage. Or the load cannot work normally.

Only the above battery parameters can be set on the local controller. The remaining battery parameters follow the following logic (the voltage level of the 12V system is 1, the voltage level of the 24V system is 2, and the voltage level of the 48V system is 4).

Battery Type / Battery Parameters	Sealed/Gel/Flooded User	LiFePO4 User	Li(NiCoMn)O2 User
Overvoltage Disconnect Voltage	BCV + 1.4V * voltage level	BCV + 0.3V * voltage level	BCV + 0.3V * voltage level
Charging Voltage Limit Voltage	BCV + 0.6V * voltage level	BCV + 0.1V * voltage level	BCV + 0.1V * voltage level
Overvoltage Recovery Voltage	BCV + 0.6V * voltage level	BCV + 0.1V * voltage level	Boost charging voltage
Equalization Charging Voltage	BCV + 0.2V * voltage level	Boost charging voltage	Boost charging voltage
Bulk Recovery Voltage	FCV - 0.6V * voltage level	FCV - 0.6V * voltage level	FC V - 0.1V * voltage level
Undervoltage Alarm	UVW + 0.2V *	UVW + 0.2V *	UVW + 1.7V *

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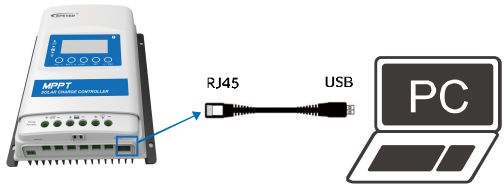
Recovery Voltage	voltage level	voltage level	voltage level
Undervoltage Alarm Voltage	LVD + 0.9V * voltage level	LVD + 0.9V * voltage level	LVD + 1.2V * voltage level
Discharging Voltage Limit Voltage	LVD - 0.5V * voltage level	LVD - 0.1V * voltage level	LVD - 0.1V * voltage level

4.1.3 Remote setting

To set the parameters of the battery, the communication mode needs to be set to slave mode.

1. Setting the battery parameters by PC software

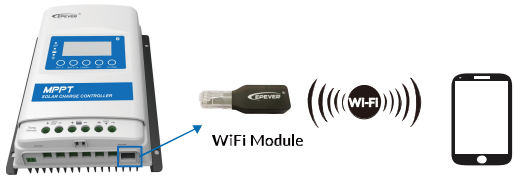
Connect the controller's RJ45 interface to the PC's USB interface via a USB to RS485 cable. When selecting the battery type as "USE," set the voltage parameters by the PC software.



2. Setting the battery parameters by APP

- Via an external WiFi module

Connect the controller to an external WiFi module by the RS485 communication port. End-users can set the voltage parameters by the APP after selecting the battery type as "USE." Refer to the cloud APP manual for details.



- Via an external Bluetooth module

Connect the controller to an external Bluetooth module by the RS485 communication port. End-users can set the voltage parameters by the APP after selecting the battery type as "USE." Refer to the cloud APP manual for details.

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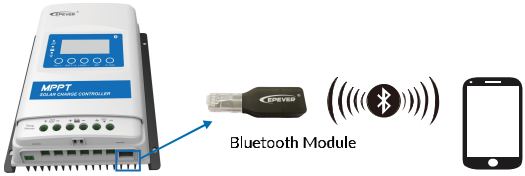

- Via a built-in Bluetooth module (only XTRA-N G3 BLE series support）

Connect the mobile phone with the built-in Bluetooth module by the Bluetooth signal. End-users can set the voltage parameters by the APP after selecting the battery type as "USE." Refer to the cloud APP manual for details.

3. Setting the battery parameters by MT52

Connect the controller to the remote meter (MT52) through a standard network cable. After selecting the battery type as "USE," set the voltage parameters by the MT52. Refer to the MT52 manual or after-sales engineer for details.

4. Controller parameters

- **Battery voltage parameters**

Parameters in below table are measured in the condition of 12V/25℃. Please double the values in the 24V system and multiplies the values by 4 in the 48V system.

Battery Type / Voltage Control Parameters	Sealed	GEL	FLD	User define
Overvoltage Disconnect Voltage	16.0V	16.0V	16.0V	9–17V
Charging Voltage Limit Voltage	15.0V	15.0V	15.0V	9–15.5V

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Overvoltage Recovery Voltage	15.0V	15.0V	15.0V	9–15.5V
Equalization Charging Voltage	14.6V	--	14.8V	9–15.5V
Bulk Charging Voltage	14.4V	14.2V	14.6V	9–15.5V
Float Charging Voltage	13.8V	13.8V	13.8V	9–15.5V
Bulk Recovery Voltage	13.2V	13.2V	13.2V	9–15.5V
Low Voltage Recovery Voltage	12.6V	12.6V	12.6V	9–15.5V
Undervoltage Alarm Recovery Voltage	12.2V	12.2V	12.2V	9–15.5V
Undervoltage Alarm Voltage	12.0V	12.0V	12.0V	9–15.5V
Low Voltage Disconnect Voltage	11.1V	11.1V	11.1V	9–15.5V
Discharging Voltage Limit Voltage	10.6V	10.6V	10.6V	9–15.5V
Equalization Charging Time★	120 minutes	--	120 minutes	0–180 minutes
Bulk Charging Time★	120 minutes	120 minutes	120 minutes	10–180 minutes

★ When the battery type is set as lithium battery, the lithium battery protection is enabled automatically, and the default value of “Equalize Duration” and “Boost Duration” is changed to 10 minutes.

★ When the battery type is set as Sealed, GEL, or FLD, the lithium battery protection is disabled, and the default value of “Equalize Duration” and “Boost Duration” is changed to 120 minutes.

★ When the battery type is set as User, the lithium battery protection, “Equalize Duration” and “Boost Duration” maintain the parameter values of the previous battery type.

When the battery type is "USER," the battery voltage parameters follow the following logic:

A. Overvoltage Disconnect Voltage > Charging Voltage Limit Voltage ≥ Equalization Charging Voltage ≥ Bulk Charging Voltage ≥ Float Charging Voltage > Bulk Recovery Voltage;

B. Overvoltage Disconnect Voltage > Overvoltage Recovery Voltage;

C. Low Voltage Recovery Voltage > Low Voltage Disconnect Voltage ≥ Discharging Voltage Limit Voltage;

D. Undervoltage Alarm Recovery Voltage > Undervoltage Alarm Voltage ≥ Discharging Voltage Limit Voltage;

E. Bulk Recovery Voltage > Low Voltage Recovery Voltage.

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- **Lithium battery voltage parameters**

Battery Type / Voltage Control Parameters	LFP			
	LFP4S	User Define	LFP8S	User Define
Overvoltage Disconnect Voltage	14.5V	9–17V	29.0V	18–34V
Charging Voltage Limit Voltage	14.3V	9–15.5V	28.6V	18–31V
Overvoltage Recovery Voltage	14.3V	9–15.5V	28.6V	18–31V
Equalization Charging Voltage	14.2V	9–15.5V	28.4V	18–31V
Bulk Charging Voltage	14.2V	9–15.5V	28.4V	18–31V
Float Charging Voltage	13.3V	9–15.5V	26.6V	18–31V
Bulk Recovery Voltage	13.0V	9–15.5V	26.0V	18–31V
Low Voltage Recovery Voltage	12.8V	9–15.5V	25.6V	18–31V
Undervoltage Alarm Recovery Voltage	12.2V	9–15.5V	24.4V	18–31V
Undervoltage Alarm Voltage	12.0V	9–15.5V	24.0V	18–31V
Low Voltage Disconnect Voltage	11.3V	9–15.5V	22.6V	18–31V
Discharging Voltage Limit Voltage	11.0V	9–15.5V	22.0V	18–31V

Note: The LFP4S voltage is 12V, the LFP8S voltage is 24V.

Battery Type / Voltage Control Parameters	LFP		
	LFP15S	LFP16S	User Define
Overvoltage Disconnect Voltage	54.7V	58.4V	36–68V
Charging Voltage Limit Voltage	53.6V	57.2V	36–62V
Overvoltage Recovery Voltage	53.6V	57.2V	36–62V
Equalization Charging Voltage	53.3V	56.8V	36–62V
Bulk Charging Voltage	53.3V	56.8V	36–62V
Float Charging Voltage	50.0V	54.0V	36–62V
Bulk Recovery Voltage	49.7V	52.0V	36–62V

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Low Voltage Recovery Voltage	48.0V	51.2V	36–62V
Undervoltage Alarm Recovery Voltage	45.7V	48.8V	36–62V
Undervoltage Alarm Voltage	45.0V	48.0V	36–62V
Low Voltage Disconnect Voltage	42.5V	45.2V	36–62V
Discharging Voltage Limit Voltage	41.5V	44.0V	36–62V

Note: The voltage of LFP15S and LFP16S is 48V.

Battery Type / Voltage Control Parameters	LNCM				
	LNCM3S	User Define	LNCM6S	LNCM7S	User Define
Overvoltage Disconnect Voltage	12.8V	9–17V	25.6V	29.8V	18–34V
Charging Voltage Limit Voltage	12.6V	9–15.5V	25.2V	29.4V	18–31V
Overvoltage Recovery Voltage	12.5V	9–15.5V	25.0V	29.1V	18–31V
Equalization Charging Voltage	12.5V	9–15.5V	25.0V	29.1V	18–31V
Bulk Charging Voltage	12.5V	9–15.5V	25.0V	29.1V	18–31V
Float Charging Voltage	12.2V	9–15.5V	24.4V	28.4V	18–31V
Bulk Recovery Voltage	12.1V	9–15.5V	24.2V	28.2V	18–31V
Low Voltage Recovery Voltage	10.5V	9–15.5V	21.0V	24.5V	18–31V
Undervoltage Alarm Recovery Voltage	12.2V	9–15.5V	24.4V	28.4V	18–31V
Undervoltage Alarm Voltage	10.5V	9–15.5V	21.0V	24.5V	18–31V
Low Voltage Disconnect Voltage	9.3V	9–15.5V	18.6V	21.7V	18–31V
Discharging Voltage Limit Voltage	9.3V	9–15.5V	18.6V	21.7V	18–31V

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Note: The LNCM3S voltage is 12V, the voltage of LNCM6S and LNCM7S is 24V.

Battery Type / Voltage Control Parameters	LNCM		
	LNCM13S	LNCM14S	User Define
Overvoltage Disconnect Voltage	55.4V	59.7V	36–68V
Charging Voltage Limit Voltage	54.6V	58.8V	36–62V
Overvoltage Recovery Voltage	54.1V	58.3V	36–62V
Equalization Charging Voltage	54.1V	58.3V	36–62V
Bulk Charging Voltage	54.1V	58.3V	36–62V
Float Charging Voltage	52.8V	56.9V	36–62V
Bulk Recovery Voltage	52.4V	56.4V	36–62V
Low Voltage Recovery Voltage	45.5V	49.0V	36–62V
Undervoltage Alarm Recovery Voltage	52.8V	56.9V	36–62V
Undervoltage Alarm Voltage	45.5V	49.0V	36–62V
Low Voltage Disconnect Voltage	40.3V	43.4V	36–62V
Discharging Voltage Limit Voltage	40.3V	43.4V	36–62V

Note: The voltage of LFP15S and LFP16S is 48V.

When the battery type is "USER", the lithium battery voltage parameters follow the following logic:

A. Overvoltage Disconnect Voltage > Over Charging Protection Voltage (Protection Circuit Modules(BMS)) plus 0.2V;

B. Overvoltage Disconnect Voltage > Overvoltage Recovery Voltage = Charging Voltage Limit Voltage ≥ Equalization Charging Voltage = Bulk Charging Voltage ≥ Float Charging Voltage > Bulk Recovery Voltage;

C. Low Voltage Recovery Voltage > Low Voltage Disconnect Voltage ≥ Discharging Voltage Limit Voltage;

D. Undervoltage Alarm Recovery Voltage > Undervoltage Alarm Voltage ≥ Discharging Voltage Limit Voltage;

E. Bulk Recovery Voltage > Low Voltage Recovery Voltage;

F. Low Voltage Disconnect Voltage ≥ Over Discharging Protection Voltage (BMS) plus 0.2V.

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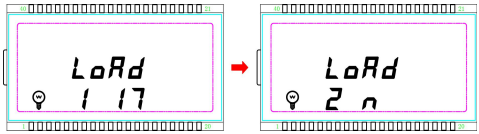
NOTICE

The required accuracy of BMS is no higher than 0.2V. We will not assume responsibility for the abnormal when the accuracy of BMS is higher than 0.2V.

4.2 Load operation mode

4.2.1 LCD setting



When the LCD shows the above interface, it operates as follows:

Step 1: Press the LOAD / − button to browse the load parameters on the initial interface, and then press the SET button to enter the load parameters setting interface.

Step 2: Press the LOAD / − button and hold for 5s to enter the load type interface.

Step 3: Press the PV / + or LOAD / − button to change the load type.

Step 4: Press the SET button to confirm.

1**	Timer 1	2**	Timer 2
100	Light ON/OFF	2 n	Disabled
101	The load will be on for 1 hour after sunset	201	The load will be on for 1 hour before sunrise
102	The load will be on for 2 hours after sunset	202	The load will be on for 2 hours before sunrise
103-113	The load will be on for 3-13 hours after sunset	203-213	The load will be on for 3-13 hours before sunrise
114	The load will be on for 14 hours after sunset	214	The load will be on for 14 hours before sunrise
115	The load will be on for 15 hours after sunset	215	The load will be on for 15 hours before sunrise

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116	Test mode	2 n	Disabled
117	Manual mode(Default load ON)	2 n	Disabled
118	Always ON mode (The load always maintains the output state, and this mode is suitable for loads that require 24-hour power supply)		

Note: When selecting the load mode as the Light ON/OFF mode, Test mode, and Manual mode, only Timer 1 can be set, and Timer 2 is disabled and display "2n".

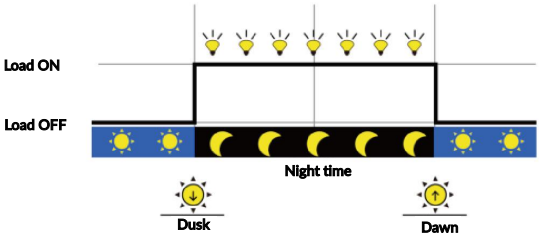
4.2.2 RS485 communication setting

1. Load mode

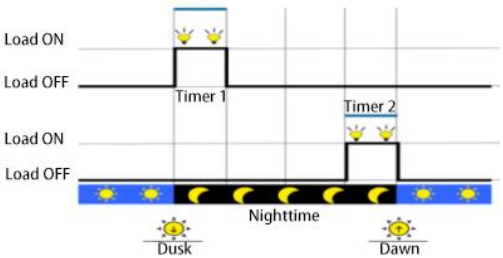
- Manual Control (default)

Control the load ON/OFF via the button or remote commands (e.g., PC software, APP, or remote meter).

- Light ON/OFF



- Light ON+ Timer



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- Time Control

Control the load ON/OFF time by setting the real-time clock.

2. Load mode settings

Set the load modes by PC software, APP, or remote meter (MT52). For detailed connection diagrams and settings, refer to Subsection 4.1.2 Remote setting.

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5 Others

5.1 Protection

Protections	Instructions
PV overcurrent/over power	When the charging current or power of the PV array exceeds the controller's rated current or power, it will be charged at the rated current or power. **Note:** When the PV's charging current is higher than the rated current, the PV's open-circuit voltage cannot be higher than the "maximum PV open-circuit voltage." Otherwise, the controller may be damaged.
PV short circuit	When not in a PV charging state, the controller will not be damaged in case of a short-circuiting in the PV array. **Note:** It is forbidden to short-circuit the PV array during charging. Otherwise, the controller may be damaged.
PV reverse polarity	When the polarity of the PV array is reversed, the controller may not be damaged and can continue to operate normally after the polarity is corrected. **Note:** The controller is damaged when the PV array is connected reversely to the controller, and the PV array's actual operating power exceeds 1.5 times the rated charging power.
Night reverse charging	Prevents the battery from discharging to the PV module at night.
Battery reverse polarity	The battery can be reversely connected when the PV is disconnected or reversely connected. Correct the wire connection to resume work. **Note:** The controller will be damaged when the PV connection is correct and the battery connection is reversed!
Battery overvoltage	When the battery voltage exceeds the Overvoltage Disconnect Voltage, the controller will stop charging the battery to protect the battery from being overcharged.

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Battery over-discharge	When the battery voltage is lower than the Low Voltage Disconnect Voltage, the controller will stop battery discharging to protect the battery from being over-discharged.
Battery over-heating	The controller can detect the battery temperature through an external temperature sensor. The controller stops working when its temperature exceeds 65 ℃ and restarts to work when its temperature is below 55 ℃.
Lithium battery low temperature	When the temperature detected by the optional temperature sensor is lower than the Low Temperature Protection Threshold (LTPT), the controller will stop charging and discharging automatically. When the detected temperature is higher than the LTPT, the controller will work automatically (The LTPT is 0 ℃ by default and can be set within -40 ℃ to 10 ℃).
Load short circuit	When the load is short-circuited (The short circuit current is ≥ 4 times the rated controller load current), the controller will automatically cut off the output. Suppose the load reconnects the output five times (delay of 5s, 10s, 15s, 20s, 25s). In that case, it needs to be canceled by pressing the Load button, restarting the controller, or waiting for one night-day cycle (night time > 3 hours).
Overload	When the load is overloading (The overload current is ≥ 1.02 times the rated load current), the controller will automatically cut off the output. Suppose the load reconnects five times (delay of 5s, 10s, 15s, 20s, 25s). In that case, it needs to be canceled by pressing the Load button, restarting the controller, or waiting for one night-day cycle (night time > 3 hours).
Controller over-heating*	The controller can detect its internal temperature by the temperature sensor. The controller stops working when its internal temperature exceeds 85 ℃ and resumes work when its temperature is below 75 ℃.
TVS high voltage transients	The internal circuitry of the controller is designed with Transient Voltage Suppressors (TVS), which can only protect against high-voltage surge pulses with less energy. Suppose the controller is to be used in an area with frequent lightning strikes. In that case, it is recommended to install an external surge arrester.

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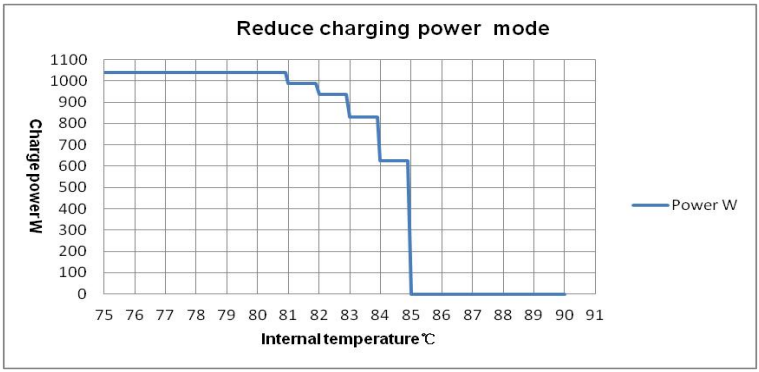
★When the internal temperature is 81℃, the reduced charging power mode is turned on. It reduces the charging power by 5%,10%, 20%, and 40% with every increase of 1℃. If the internal temperature exceeds 85℃, the controller will stop charging. When the temperature declines to below 75℃, the controller will resume. For example XTRA4215N G3/XTRA4215N G3 BLE 24V system:



5.2 Troubleshooting

Possible Reasons	Faults	Troubleshooting
PV array disconnection	Charging LED indicator off during daytime when sunshine falls on PV modules properly.	Confirm that PV wire connections are correct and tight.
Battery voltage is lower than 8V	The wire connection is correct, and the controller is not working.	Please check the battery voltage. At least 8V to activate the controller.
Battery overvoltage	Green charging indicator fast flashes. Battery level shows full, battery frame and fault icon blink.	Check if the battery voltage is higher than OVD (overvoltage disconnect voltage), and disconnect the PV.
Battery over-discharged	Red charging indicator is ON solid. Battery level shows empty, battery frame and fault icon blink.	When the battery voltage is restored to or above LVR(low voltage reconnect voltage), the load will recover

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Battery Overheating	Red battery indicator slow flashes. Battery frame and fault icon blink.	The controller will automatically turn the system off. When the temperature declines to below 55℃, the controller will resume.
Controller Overheating	PV and BATT indicators fast flash.	When the heat sink of the controller exceeds 85℃, the controller will automatically cut off the input and output circuit. When the temperature is below 75℃, the controller will resume work.
System voltage error		① Check whether the battery voltage matches the system voltage level set on the controller. ② Change a matched battery or modify the system voltage level. **Note: T**he fault can be ignored for the no-battery application if the system voltage level matches the actual system voltage. The alarm will disappear after 3 minutes or press the Load button to cancel it.
Load Short Circuit	1. The load has no output. 2. LCD blinks "E001." 3. Load and fault icons blink. 	① Check carefully load connection, and cancel the fault. ② Restart the controller. ③ Wait for one night-day cycle (night time > 3 hours).
Load Overload(1)	1. The load has no output. 2. LCD blinks "E002." 3. Load and fault icons blink. 	① Please reduce the number of electric equipment. ② Restart the controller. ③ Wait for one night-day cycle (night time > 3 hours).

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(1) When the actual load current exceeds the rated value, the load will be cut off after a delay.

Times of the actual load current Vs. the rated value	1.02-1.15	1.15-1.25	1.25-1.35	1.35-1.5
Delay time of the load cut off	50s	30s	10s	2s

5.3 Maintenance

The following inspections and maintenance tasks are recommended at least twice yearly for best performance.

- Make sure the controller is firmly installed in a clean and dry ambient.
- Make sure no block on airflow around the controller. Clear up any dirt and fragments on the heat sink.
- Check all the naked wires to ensure insulation is not damaged by sun exposure, frictional wear, dryness, insects or rats, etc. Repair or replace some wires if necessary.
- Tighten all the terminals. Inspect for loose, broken, or burnt wire connections.
- Check and confirm that LED is consistent with required. Pay attention to any troubleshooting or error indication. Take corrective action if necessary.
- Confirm that all the system components are ground connected tightly and correctly.
- Confirm that all the terminals have no corrosion, insulation damage, high temperature, or burnt/discolored sign. Tighten terminal screws to the suggested torque.
- Clear up dirt, nesting insects, and corrosion in time.
- Check and confirm that the lightning arrester is in good condition. Replace a new one in time to avoid damaging the controller and other equipment.

⚠ DANGER

Electric shock hazard! Ensure all the power is turned off before the above operations, and then follow the corresponding inspections and operations.

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6 Technical Specifications

Model	XTRA1206N G3/G3 BLE	XTRA2206N G3/G3 BLE	XTRA1210N G3/G3 BLE
Electrical Parameters			
Battery Rated Voltage	12/24VDC★ Auto-recognition		
Rated Charging Current	10A	20A	10A
Rated Discharging Current	10A	20A	10A
Controller Work Voltage Range	8V – 31V		
Maximum PV Open-circuit Voltage	60V(At minimum operating environment temperature) 46V (At 25℃)		100V (At minimum operating environment temperature) 92V (At 25℃)
MPPT Voltage Range	(Battery voltage + 2V) to 36V		(Battery voltage + 2V) to 72V
Rated Charging Power	130W/12V 260W/24V	260W/12V 520W/24V	130W/12V 260W/24V
Maximum Conversion Efficiency	97.9%	98.3%	98.2%
Full-load Efficiency	97%	96.7%	96.2%
Static Losses (Enable the com. port)	≤ 10mA (12V) ≤ 7mA (24V)		≤ 15mA (12V) ≤ 9mA (24V)
Static Losses (Disable the com. port)	≤ 8mA (12V) ≤ 5mA (24V)		≤ 8mA (12V) ≤ 6mA (24V)
Discharge-circuit Voltage Drop	≤ 0.23V		
Temperature Compensation◆	-3mV/℃/2V (Default)		

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Grounding Type	Common negative		
RS485 Port	5VDC/200mA (RJ45)		
LCD Backlight Time	Default: 60s, Range: 0 to 999s (0s: the backlight is ON all the time)		
Mechanical Parameters			
Dimension (L × W × H)	175mm × 143mm × 48mm	217mm × 158mm × 56.5mm	175mm × 143mm × 48mm
Mounting Size (L× W)	120mm × 134mm	160mm × 149mm	120mm × 134mm
Mounting Hole Size	Φ 5mm		
Terminal	12AWG ($4mm^2$)	6AWG ($16mm^2$)	12AWG ($4mm^2$)
Recommended Wire Size	12AWG ($4mm^2$)	10AWG ($6mm^2$)	12AWG ($4mm^2$)
Net Weight	0.58kg	0.97kg	0.59kg

★ When a lithium battery is used, the system voltage cannot be identified automatically.

◆ When a lithium battery is used, the temperature compensation coefficient must be "0" and cannot be changed.

Model	XTRA2210N G3/G3 BLE	XTRA3210N G3/G3 BLE	XTRA4210N G3/G3 BLE
Electrical Parameters			
Battery Rated Voltage	12/24VDC★ Auto-recognition		
Rated Charging Current	20A	30A	40A
Rated Discharging Current	20A	30A	40A
Controller Work Voltage Range	8V–31V		
Maximum PV Open-circuit Voltage	100V (At minimum operating environment temperature) 92V (At 25℃)		
MPPT Voltage Range	(Battery voltage + 2V) to 72V		
Rated Charging Power	260W/12V	390W/12V	520W/12V

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	520W/24V	780W/24V	1,040W/24V
Maximum Conversion Efficiency	98.3%	98.6%	98.6%
Full-load Efficiency	96.4%	96.6%	96.5%
Static Losses (Enable the com. port)	≤ 15mA (12V) ≤ 9mA (24V)		
Static Losses (Disable the com. port)	≤ 8mA (12V) ≤ 6mA (24V)	≤ 8mA (12V) ≤ 5mA (24V)	≤ 8mA (12V) ≤ 5mA (24V)
Discharge-circuit Voltage Drop	≤ 0.23V		
Temperature Compensation◆	-3mV/℃/2V (Default)		
Grounding Type	Common negative		
RS485 Port	5VDC/200mA (RJ45)		
LCD Backlight Time	Default: 60s, Range: 0 to 999s (0s: the backlight is ON all the time)		
Mechanical Parameters			
Dimension (L × W × H)	217mm × 158mm × 56.5mm	230mm × 165mm × 63mm	255mm × 185mm × 67.8mm
Mounting Size (L × W)	160mm × 149mm	173mm × 156mm	200mm × 176mm
Mounting Hole Size	Φ 5mm		
Terminal	6AWG (16mm^2)		
Recommended Wire Size	10AWG (6mm^2)	8AWG (10mm^2)	6AWG (16mm^2)
Net Weight	0.97kg	1.30kg	1.72kg

★ When a lithium battery is used, the system voltage cannot be identified automatically.

◆ When a lithium battery is used, the temperature compensation coefficient must be “0” and cannot be changed.

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Model	XTRA3215N G3/G3 BLE	XTRA4215N G3/G3 BLE	XTRA3415N G3/G3 BLE	XTRA4415N G3/G3 BLE
Electrical Parameters				
Battery Rated Voltage	12/24VDC* Auto-recognition		12/24/36/48VDC* Auto-recognition	
Rated Charging Current	30A	40A	30A	40A
Rated Discharging Current	30A	40A	30A	40A
Controller Work Voltage Range	8-31V		8-62V	
Maximum PV Open-circuit Voltage	150V (At minimum operating environment temperature) 138V (At 25℃)			
MPPT Voltage Range	(Battery voltage + 2V) to 108V			
Rated Charging Power	390W/12V 780W/24V	520W/12V 1,040W/24V	390W/12V 780W/24V 1,170W/36V 1,560W/48V	520W/12V 1,040W/24V 1,560W/36V 2,080W/48V
Maximum Conversion Efficiency	97.6%	97.9%	98.1%	98.5%
Full-load Efficiency	95.1%	95.4%	96.9%	97.2%
Static Losses (Enable the com. port)	≤ 15mA (12V) ≤ 9mA (24V)	≤ 15mA (12V) ≤ 9mA (24V)	≤ 14mA (12V) ≤ 9mA (24V) ≤ 8mA (36V) ≤ 7mA (48V)	≤ 14mA (12V) ≤ 9mA (24V) ≤ 8mA (36V) ≤ 7mA (48V)
Static Losses (Disable the com. port)	≤ 8mA (12V) ≤ 5mA (24V)	≤ 8mA (12V) ≤ 5mA (24V)	≤ 8mA (12V) ≤ 5mA (24V) ≤ 5mA (36V) ≤ 5mA (48V)	≤ 8mA (12V) ≤ 5mA (24V) ≤ 5mA (36V) ≤ 5mA (48V)

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Discharge-circuit Voltage Drop	≤ 0.23V			
Temperature Compensation◆	-3mV/℃/2V (Default)			
Grounding Type	Common negative			
RS485 Port	5VDC/200mA (RJ45)			
LCD Backlight Time	Default: 60s, Range: 0s to 999s (0s: the backlight is ON all the time)			
Mechanical Parameters				
Dimension (L × W × H)	255mm × 185mm × 67.8mm	255mm × 187mm × 75.7mm	255mm × 187mm × 75.7mm	255mm × 189mm × 83.2mm
Mounting Size (L × W)	200mm × 176mm	200mm × 178mm		200mm × 180mm
Mounting Hole Size	Φ 5mm			
Terminal	6AWG (16mm^2)			
Recommended Wire Size	8AWG (10mm^2)	6AWG (16mm^2)	8AWG (10mm^2)	6AWG (16mm^2)
Net Weight	1.66kg	2.08kg	2.16kg	2.60kg

★ When a lithium battery is used, the system voltage cannot be identified automatically.

◆ When a lithium battery is used, the temperature compensation coefficient must be “0” and cannot be changed.

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Environmental Parameters

Parameter	XTRA1206/2206/1210/2210/3210/4210N G3 XTRA1206/2206/1210/2210/3210/4210N G3 BLE	XTRA3215/4215/3415/4415N G3 XTRA3215/4215/3415/4415N G3 BLE
Work Temperature Range※	-25℃ to + 50℃	-25℃ to + 45℃
Storage Temperature Range	-20℃ to + 70℃	
Relative Humidity	≤ 95%, N.C.	
Enclosure	IP33 (3-protection against solid objects: protected against solids objects over 2.5mm. 3-protected against sprays to 60° from the vertical.	
Pollution Degree	PD2	

※ The controller can fully load working in the work temperature range. When the internal temperature reaches 81℃, the reducing charging power mode is turned on. Refer to Section 5.1 Protection.

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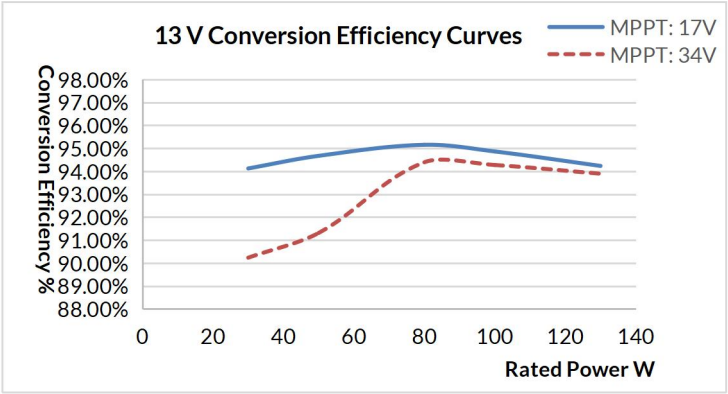
Appendix I Conversion Efficiency Curves

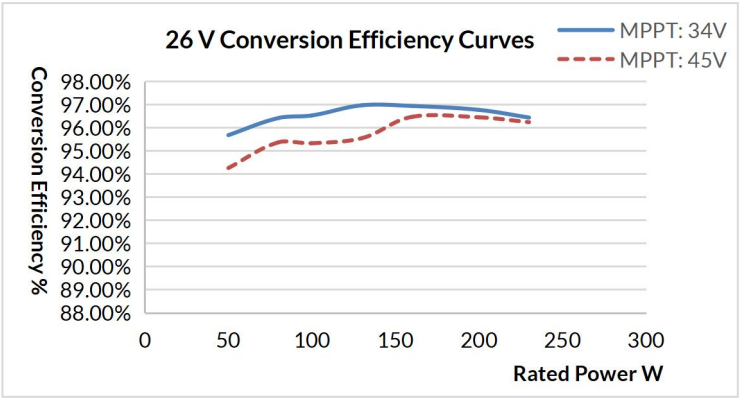
Illumination Intensity: 1,000W/m² Temperature: 25℃

Model: XTRA1206N G3/XTRA1206N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 45V)/Nominal System Voltage (26V)**



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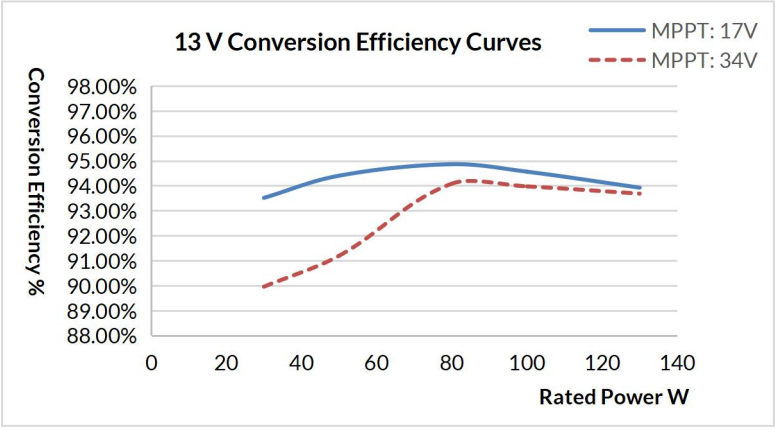
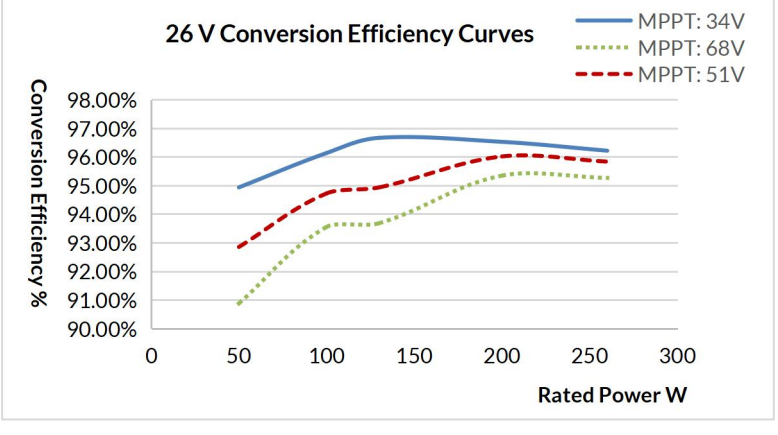
Model: XTRA1210N G3/XTRA1210N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 51V, 68V)/Nominal System Voltage (26V)**



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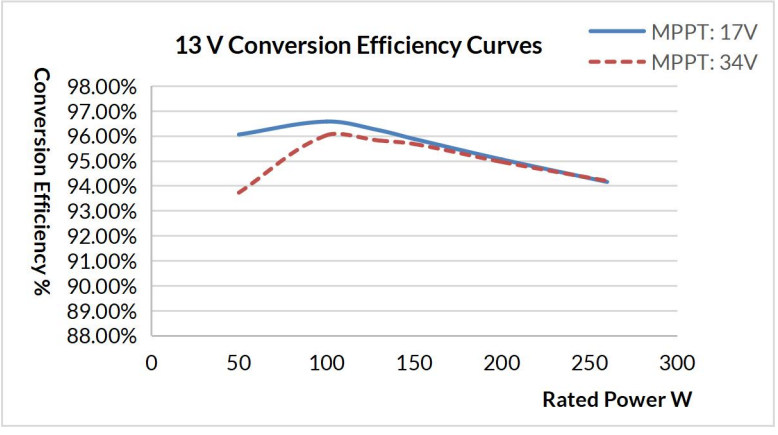
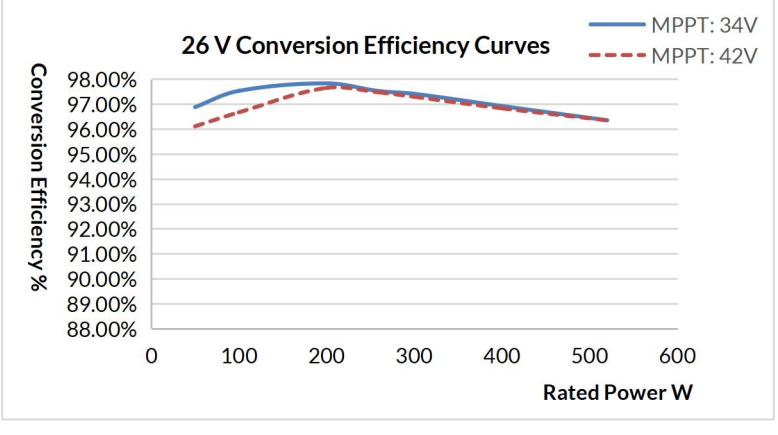
Model: XTRA2206N G3/XTRA2206N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 42V)/Nominal System Voltage (26V)**



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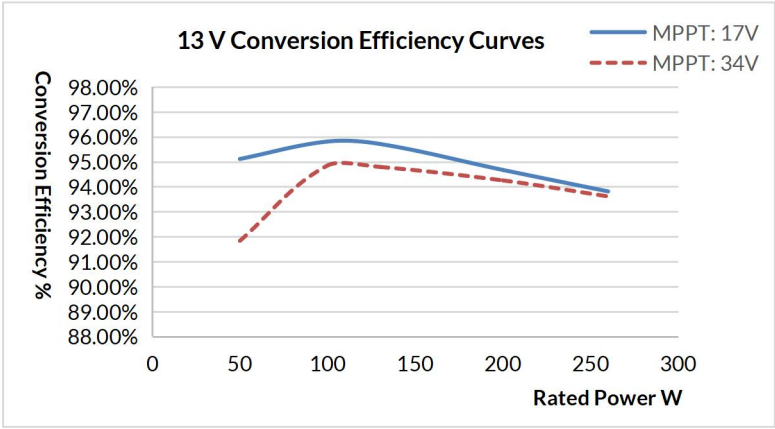
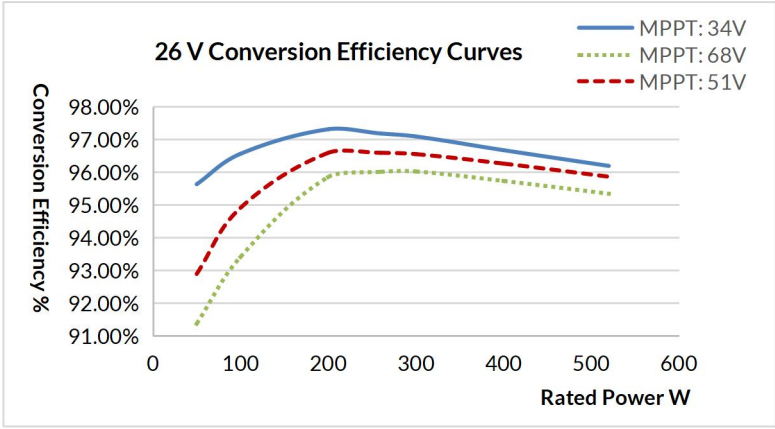
Model: XTRA2210N G3/XTRA2210N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 51V, 68V)/Nominal System Voltage (26V)**



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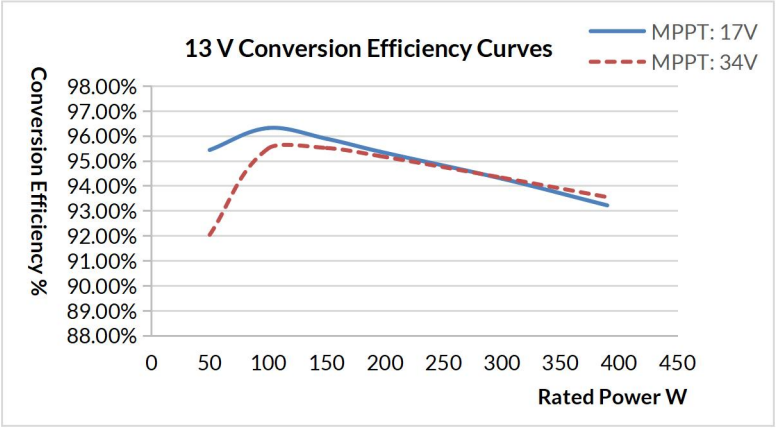
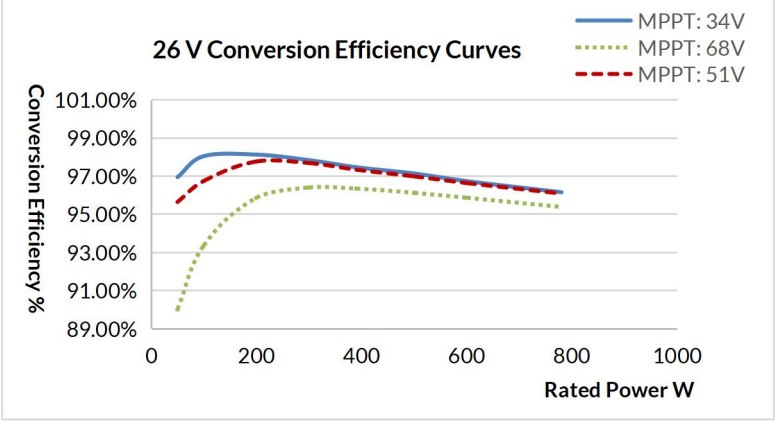
Model: XTRA3210N G3/XTRA3210N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 51V, 68V)/Nominal System Voltage (26V)**



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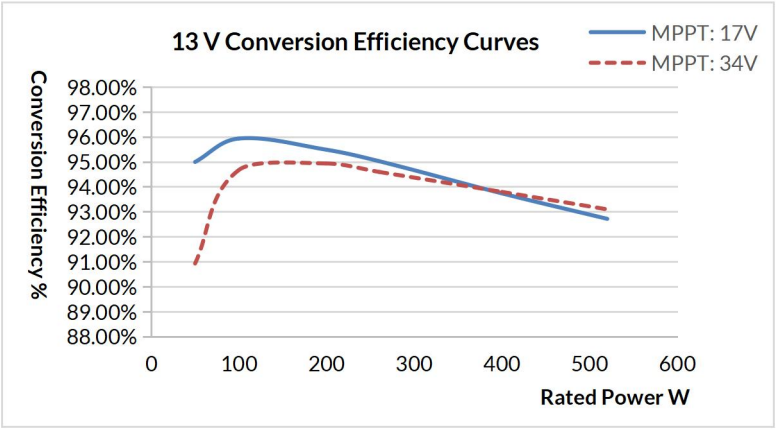
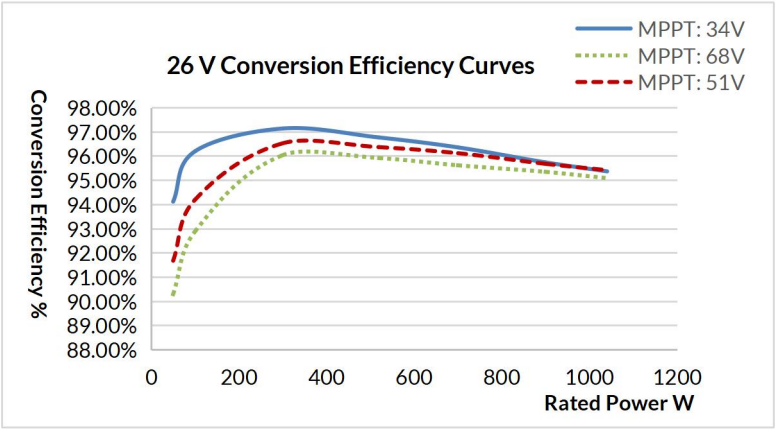
Model: XTRA4210N G3/XTRA4210N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 51V, 68V)/Nominal System Voltage (26V)**



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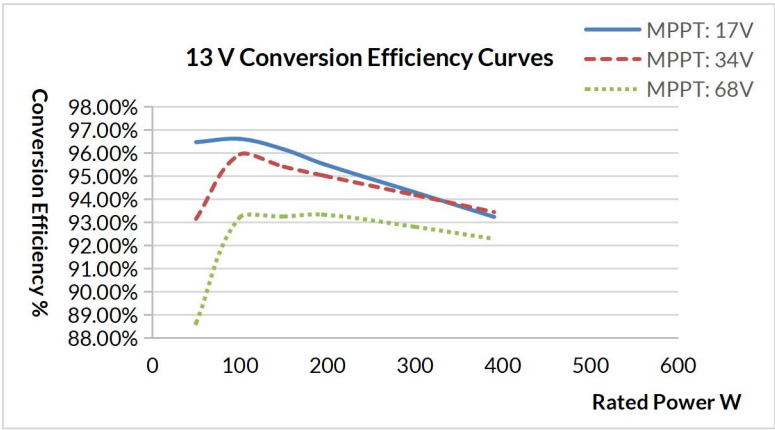
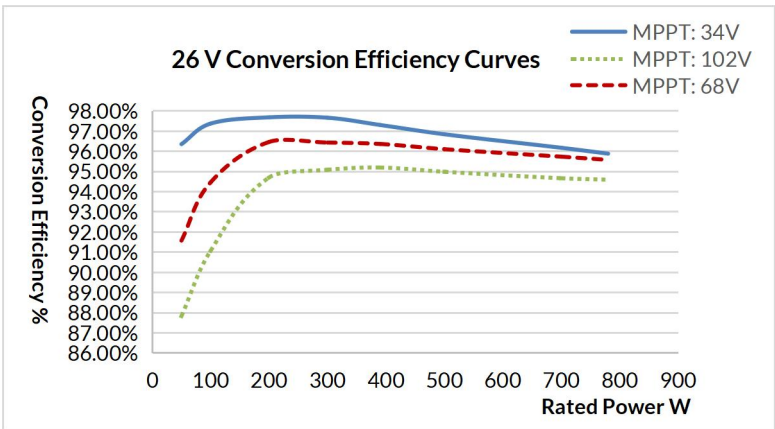
Model: XTRA3215N G3/XTRA3215N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V, 68V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 68V, 102V)/Nominal System Voltage (26V)**



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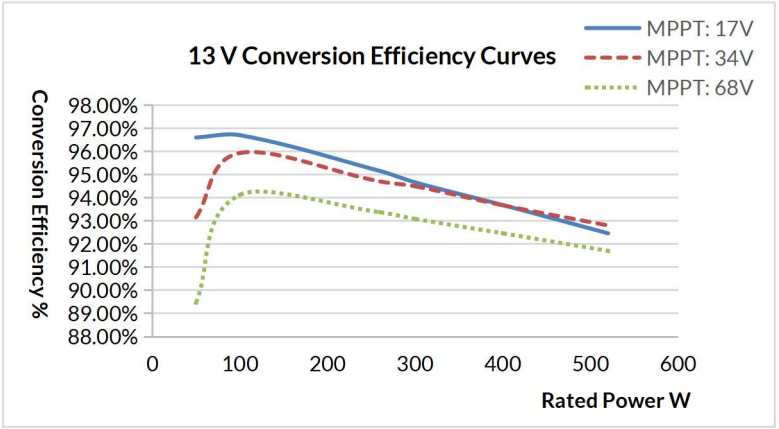
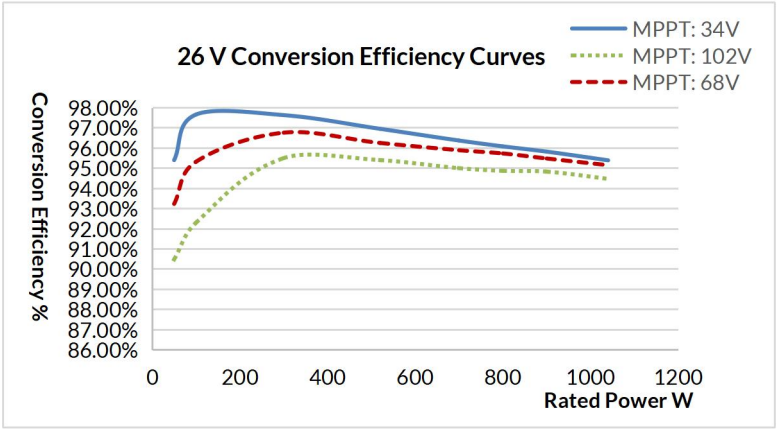
Model: XTRA4215N G3/XTRA4215N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V, 68V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 68V, 102V)/Nominal System Voltage (26V)**



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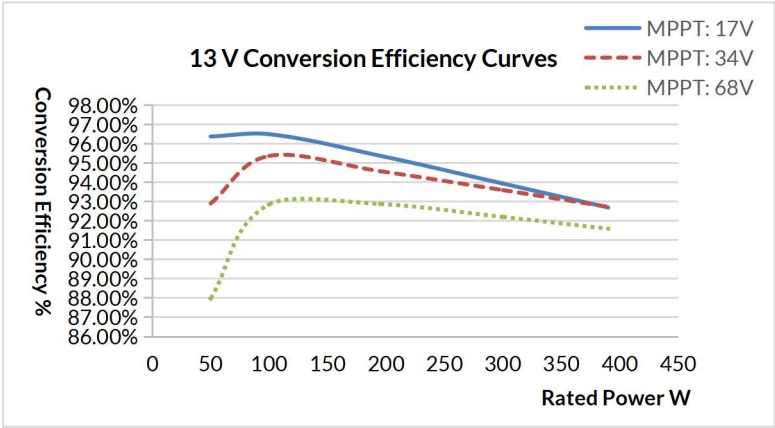
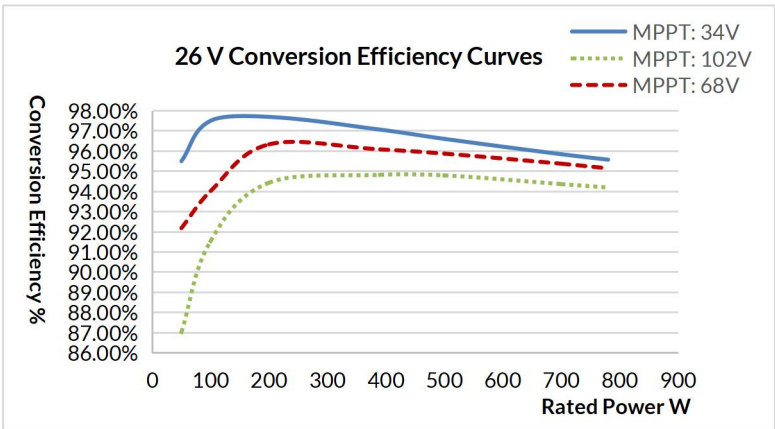
Model: XTRA3415N G3/XTRA3415N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V, 68V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 68V, 102V)/Nominal System Voltage (26V)**



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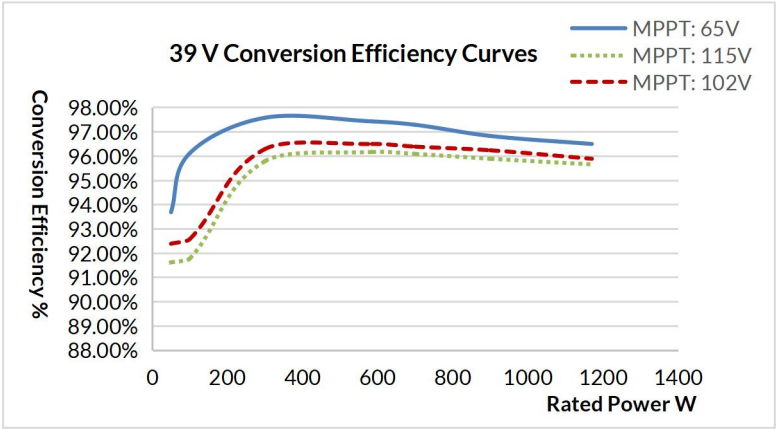
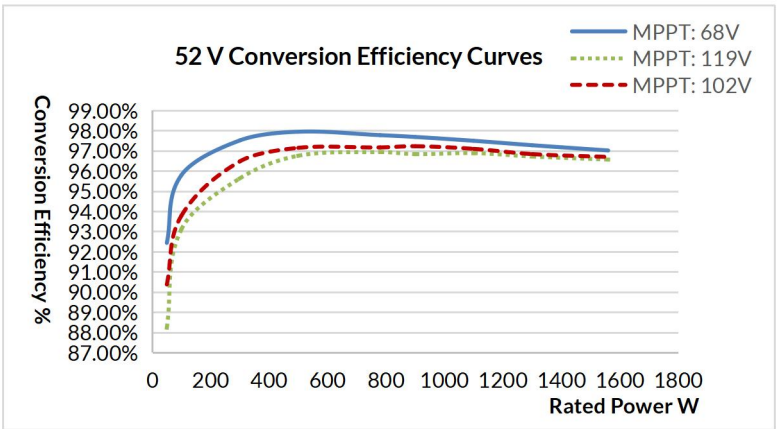
3. **Solar Module MPP Voltage (65V, 102V, 115V)/Nominal System Voltage (39V)**



4. **Solar Module MPP Voltage (68V, 102V, 119V)/Nominal System Voltage (52V)**



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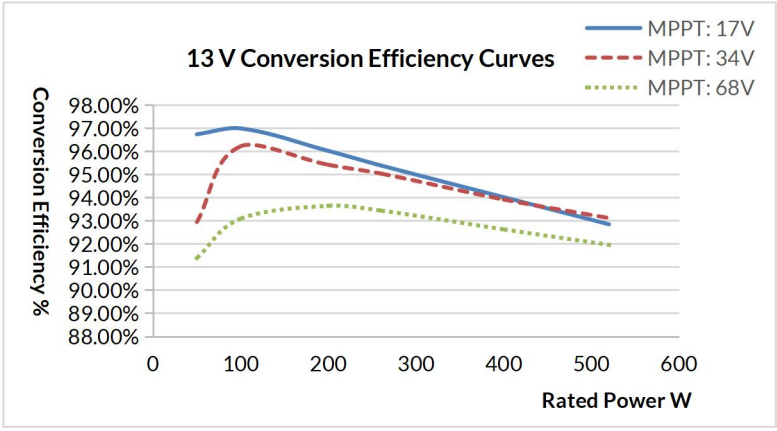
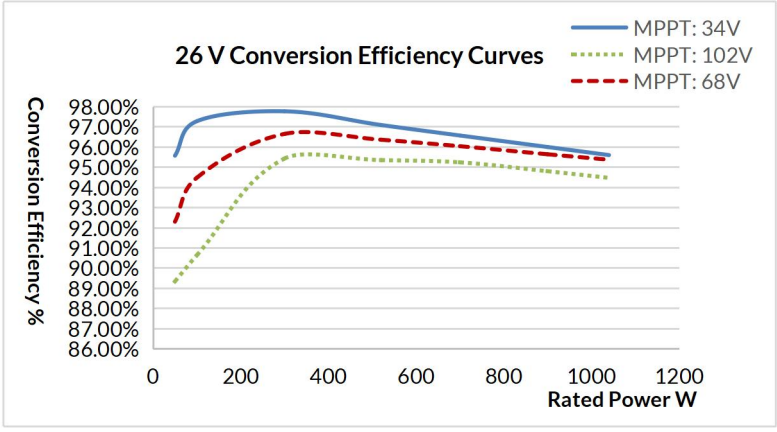
Model: XTRA4415N G3/XTRA4415N G3 BLE

1. **Solar Module MPP Voltage (17V, 34V, 68V)/Nominal System Voltage (13V)**



2. **Solar Module MPP Voltage (34V, 68V, 102V)/Nominal System Voltage (26V)**



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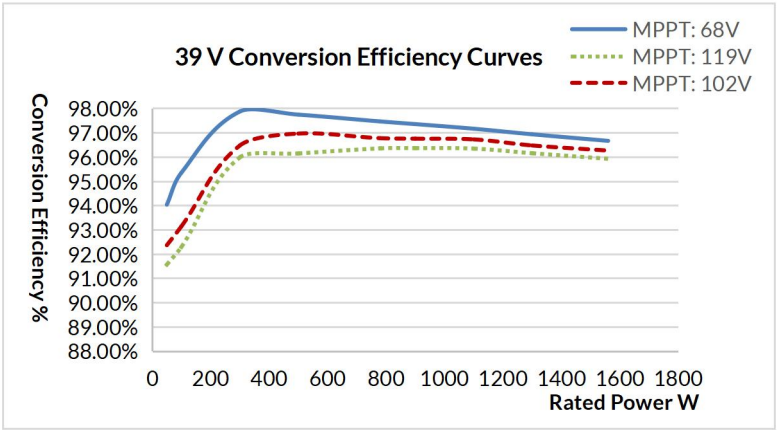
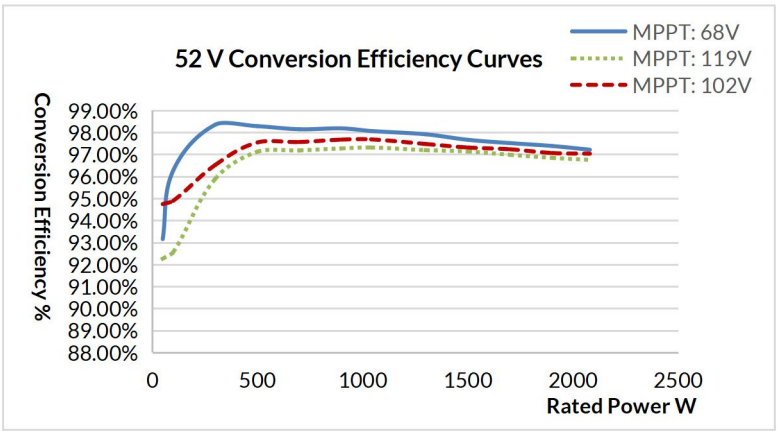
3. **Solar Module MPP Voltage (68V, 102V, 119V)/Nominal System Voltage (39V)**



4. **Solar Module MPP Voltage (68V, 102V, 119V)/Nominal System Voltage (52V)**



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HUIZHOU EPEVER TECHNOLOGY CO., LTD.

+86 - 752-3889706

info@epever.com

www.epever.com