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# XTAR® SPI CHARGER MANUAL

The name XTAR, derived from "X-STAR", representing the innumerable unknown stars in the universe, brings to mind a vision of infinite imagination. The XTAR logo, a trademark of Hong Kong XTAR Co., Ltd., contains a spheroidal figure and character that together represent the modest spirit of our company, XTAR being tolerant to diversity and our aspirations towards continuing development and innovation.

HONG KONG XTAR CO., LTD

## SPI CHARGER MANUAL

### ■ Introduction:

- The SP1 is a professional Li-ion battery charger with three charge current options and three voltage options plus a USB power output feature. It can charge one 10440, 14500, 14650, 16340, 17500, 17670, 18350, 18500, 18650, 18700, 22650, 25500, 26650 (3.0V/3.2V, 3.6/3.7V, 3.8V) rechargeable Li-ion battery. With a three-stage charge algorithm, 0V activation of batteries, and real-time detection of battery state, the SP1 charges batteries intelligently and safely.
- The SP1 uses pulse width modulation technology to control a high efficiency DC-DC circuit, which can greatly reduce energy losses while resulting in a more reliable, safe, and efficient charger. In addition, the SP1 provides reverse-polarity and short-circuit protection.
- Three charge current options (0.5A, 1.0A, and 2.0A) allow you to choose a suitable charge current to balance charge time with battery lifespan. The SP1 uses a soft-start function, to avoid damage from large charging currents.
- The three voltage options (3.2V, 3.6V, and 3.8V) allow you to have a choice to choose the different charge algorithms based on your battery types. During charging, you can also check out the voltage you selected.

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- In addition, with the USB power output feature, the SP1 can use your Li-ion batteries to charge and supply power for your mobile devices, up to a maximum current of 1.0A. In this mode, the SP1 has low-voltage, over-current, and short-circuit protection, automatically stop supplying and power indication function.

### ■ Charge Parameter:

#### ● Charging Parameter :

Input		12.0V DC/1.0A
Three charging current options	0.5 A CC Current	500±50mA
	1.0 A CC Current	1000±80mA
	2.0 A CC Current	2000±100mA
The corresponding termination voltage for three voltage options	3.2V	3.60±0.05V
	3.6V	4.20±0.05V
	3.8V	4.35±0.05V
TC of 0.5A		≤60mA
TC of 1.0A		≤100mA
TC of 2.0A		≤120mA
Operation Temperature		0-40 °C

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### ● USB output parameter :

USB Output Voltage	5.0±0.3V
Max USB Output Current	1000mA
Battery Over-discharged Protection Voltage	3.0±0.3V

### ■ Performance:

#### ● Charging rate:

- "0.5A/3.2V": 0.5A Constant charging current 500mA, 3.2V suit for termination-voltage 3.60 V LiFePO battery.
- "1.0A/3.6V": 1.0A Constant charging current 1000mA, 3.6V suit for termination-voltage 4.20 V Lithium-ion battery.
- "2.0 A/3.8V": 0.5A Constant charging current 2000mA, 3.8V suit for termination-voltage 4.35V Lithium-ion battery.

#### ● LED indicator:

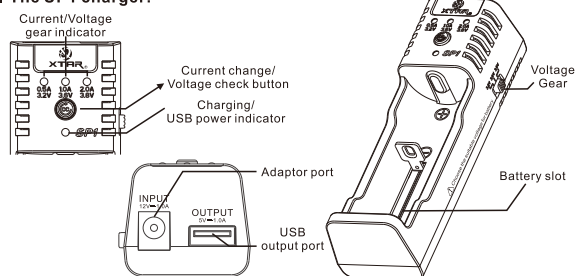
- Blue on:** Within about one second after the SP1 turning on ; Battery is being charged at the indicated constant-current rate.
- Blue flashing:** Charger is being standby.
- Blue flashing triple:** Change or check out the selected termination voltage when charging.
- Charging LED indicator:**
  - Red on:**
    - Within about one second after the SP1 turning on ;
    - Battery is being charged;
    - In the USB output mode, battery capacity is approximately 50%-25%.
  - Red flashing:**
    - Protected battery (Voltage is approximately 1.0-2.0V) is being activated;
    - In the USB output mode;
    - Battery capacity is approximately 25%-50%.

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### Green on: Any of the following conditions:

- Charge is complete
- No battery is inserted
- Battery voltage is below 1.0 V
- Battery polarity is reversed
- Poor connection
- When USB output, battery power is ≥50%.

### ■ The SP1 charger:



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<p>■ <b>Usage:</b> Before charging batteries, check that the battery types are compatible with the SP1, and then determine the suitable charge current/voltage settings for them. <b>Note:</b> Damage can occur to the batteries and charger if incompatible batteries are inserted or if improper charge current and voltage settings are selected.</p> <p>■ <b>Charging Battery</b> ■ Connect the supplied power adaptor to the SP1. The SP1 performs a self-check, turning on all LEDs (Three blue charge-level indicators, and one red status indicator). After about one second, one of the charge-level indicators flashes and the status indicator turns green. Then the charger switches to standby mode, with a default charge current setting of 0.5 A, and the selected voltage setting indicator flashes. ■ Insert one over-discharge battery (voltage <math>\leq 2.0V</math>) into the charging slot, being careful to insert it with the correct polarity. SP1 starts the battery activation function: If the battery voltage is below 1.0V, the status indicator turns green. If the battery voltage is approximately 1.0-2.0V, and the status indicator flashes red. After the battery activation completes, the SP1 begins its intelligent charging cycle. ■ Choose the charge current that best suits your 3.0V/3.2V, 3.6/3.7V, 3.8V rechargeable Li-ion batteries: 0.5 A: suitable for Li-ion batteries with capacity <math>\geq 500</math> mAh); 1.0 A: suitable for Li-ion batteries with capacity <math>\geq 2000</math> mAh). 2.0 A: suitable for Li-ion batteries with capacity <math>\geq 4000</math> mAh). It is not recommended to charge batteries with capacity <math>&lt; 500</math>mAh. ■ Press the current-change button one or more times to change to a different charge</p> <p>5</p>	<p>current, the current arrangement is: 0.5A-1.0A-2.0A-0.5A.</p> <p>■ During charging, double-press the current-change button to check the selected voltage setting,. The corresponding charge-level indicator flashes three times. Choose the voltage setting suitable for your battery. After about 3 seconds, the indicator reverts to showing the charge current.</p> <p>■ When the battery is fully charged, the SP1 stops charging, and the status indicator turns green. It is recommended that you remove batteries from the charger once charging has completed. If batteries are left in the charger after charging completes, the charger will automatically restart the charge cycle when the voltage drops below 3.9 V or 3.4V, based on the chosen voltage setting.</p> <p>■ <b>USB power output:</b> ■ Ensure that the SP1 is not connected to any power source. Insert a battery with Capacity<math>&gt; 2200</math>mAh into the slot, being careful to insert it with the correct polarity, then press and hold the button for 1.5 seconds to start the USB power output. After the status indicator turns on, you can connect an external device to the USB port. ■ When finished using the USB power output, disconnect the external device, press and hold the button for 1.5 seconds to switch off the USB power output, and then after the USB indicator extinguishes, remove the battery. ■ When battery capacity is <math>&gt; 50\%</math>, the status indicator is green; when capacity is 50% - 25%, the status indicator is red; when capacity is 25% - 5%, the status indicator flashes red. When the battery capacity is very low, the USB power output automatically switches off.</p> <p>6</p>
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<p>■ <b>Notice:</b></p> <ul style="list-style-type: none"> <li>● The SP1 is for use only with 3.0V/3.2V, 3.6/3.7V, 3.8V rechargeable lithium-ion batteries or LiFePO battery. Attempting to charge other battery types may be hazardous, and can damage the batteries and charger.</li> <li>● Choose the suitable voltage for your battery type, attempting to charge with an unsuitable voltage may be hazardous, and can damage the batteries and charger.</li> <li>● The SP1 provides three charge current options; selecting a suitable charging current for your battery according to the user manual is strongly recommended. Attempting to charge with unsuitable current may be hazardous, and can damage the batteries and charger.</li> <li>● Keep the SP1 be away from water and excessive dust.</li> <li>● Do not disassemble the SP1.</li> <li>● Do not use the SP1 once it is broken.</li> </ul> <p>7</p>	<p>■ <b>Tips:</b></p> <ul style="list-style-type: none"> <li>● Because of different battery types, capacities, and over-discharge depths, the battery-revive time may vary; heavily over-discharged batteries may not be able to be revived.</li> <li>● The SP1 has three charge current options to choose from. You can choose different charge currents to achieve different charge speeds, but remember that if a low-capacity battery is charged by a higher charge current, may cause overheat or unfulfilled capacity. For low-capacity batteries, over-discharged batteries and batteries that have been idle for long periods, the 0.5A current setting is recommended to prolong the battery lifespan; and high charge current is recommended to charge high capacity batteries.</li> <li>● The USB power output is available only when no external power source is connected. Low capacity batteries (<math>&lt; 2200</math>mAh) are not suitable for the USB output supply power mode.</li> <li>● When using the USB output, the SP1 has low-voltage, over-current, and short-circuit protection and an automatic shutdown feature when the battery capacity is very low.</li> <li>● The SP1 has integrated short-circuit protection to protect the charger if a short circuit occurs in a battery. Note that this short-circuit protection protects the charger; it does not prevent batteries from short-circuiting internally.</li> <li>● If this manual description has differences with the official website, please prevail official website.</li> </ul> <p>8</p>
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<p>■ <b>Warranty:</b></p> <ul style="list-style-type: none"> <li>● 15 days free replacement: We will repair or replace a charger within 15 days of purchase if it is afflicted with a manufacturing defect. If the problem calls for a replacement, we will replace the charger with the same model as the one you bought. If the model has been discontinued, customers will receive a product with similar or improved performance.</li> <li>● 24 months free repair. We offer free repair within 24 months of purchase if problems develop with normal use.</li> <li>● Limited lifetime warranty. If problems develop after 24 months of the purchase date, we will charge for parts. The total repair fee will assess according to the cost of the replaced materials. If damage to the charger is grave, XTAR will contact distributors with a quote who should contact the customers to decide whether to exchange the parts or not. Freight should be paid by distributors or customers.</li> <li>● (This warranty is not applicable for damages cause by artificial damage or intentional force.)</li> </ul> <p>9</p>	<p>■ <b>Website and Anti-fake inquiry:</b></p> <ul style="list-style-type: none"> <li>● Welcome to visit out company website to get more information. <a href="http://www.xtarlight.com">www.xtarlight.com</a></li> <li>● Anti-fake inquiry: A group of eighteen-digit number could be gained by scraping the anti-counterfeiting label on our product or package. Then, input it to the corresponding query window in our service column of our official website to distinguish the product's authenticity. The serial number does the same work.</li> <li>● <b>Thank you for choosing our excellent products, your satisfaction and feed backs are essential to our progress.</b></li> </ul> <p>10</p>
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