

# Chargers

## 3000W

### for Lithium Battery

for AC 220V only  
for Li-Ion / Li-Polymer battery only  
Bidirectional control of external communication for automation system (option)



#### IMPORTANT CAUTIONS

When applying to an automatic charging station of an AGV (Automatic Guide Vehicle), Do not turn ON / OFF the AC input power to turn ON / OFF chargers. Because the Firmware (S / W) of the charger may malfunction in some cases. It will operate automatically if the AC input power is always set to ON.

This charger detects the battery and charges it automatically only when the battery is connected. In other words, when the battery is not connected, there would be no outputs.

## Table of Contents

0. Important Notices .....	2
How to Select Charging Voltage .....	2
Cautions when using Chargers.....	3
Cautions on the Type and Capacity of Lithium Ion battery .....	6
Cautions on the Capacity of the Lithium Battery to be applied. ....	6
1. Specifications by each models – 3000W .....	7
2. Common Specifications for all models .....	8
Charge current Adjustment Function.....	8
Bidirectional Communicating Function (COM) – Option (700W / 1500W) .....	8
Charger and Lithium Battery Charging Characteristics .....	8
Characteristics of electric circuit .....	9
Procedures of Charge .....	9
Other Specification for Safety and Convenience .....	9
3. Model Number / Order Code / Option Marking .....	10
4. Selecting Connector Options .....	10
5. Product Drawings.....	11

## 0. Important Notices

### How to Select Charging Voltage

Type	Charger Max. charging voltage	Approximate amount of charging	Considerations when selecting charging voltage
25V Battery (7S, 7 series )	28V	80%	Applied when the electric equipment installed in the load generates an error due to overvoltage at 29V *In case of AGV, this voltage range is selected generally.

	29V	90%	To maximize battery utilization. This could be applied if no problem occurs.
50V Battery (14S,14series)	56V	80%	Applied when the electric equipment installed in the load generates an error due to overvoltage at 29V <i>*In case of AGV, this voltage range is selected generally.</i>
	58V	90%	To maximize battery utilization. This could be applied if no problem occurs.

### Cautions when using Chargers

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 **Do not turn ON / OFF the AC input power to turn ON / OFF chargers.**

When applying to an automatic charging station of an AGV (Automatic Guide Vehicle), Do not turn ON / OFF the AC input power to turn ON / OFF chargers. Because the Firmware (S / W) of the charger may malfunction in some cases. It will operate automatically if the AC input power is always set to ON.

**⚠ When the battery is not connected, there would be no outputs.**

This charger detects the battery and charges it automatically only when the battery is connected.

**⚠ When cannot boot powered on AC ( No durability issues )**

When power is applied, it is recommended to observe the following procedure.

1) When 220V AC power is applied, the switch must be OFF.

2) Turn on the switch after turning on the power.

\* If there is no response from the above,

3) After the power switch is off and 220V AC is shorted, wait until the internal capacitor is fully discharged. (maximum 1 minute)

4) After waiting, try again in the above order,

If there is no response afterwards, please fill out the application form and send it to us.

**⚠ Make sure the applied battery is suitable for the charger.**

Do not connect lead acid storage batteries. The charging voltage specification may not be suitable for the charger. The charger can be used only when the charging voltage of it is lower than the maximum voltage of the battery. Connect +, - on the output terminal block to the battery terminal.

**⚠ The use of thin wires compared to the current causes a fire accident due to deterioration of the wires and connectors in the long term..**

The wire thickness is not determined by the capacity and size of the battery, but is determined by the size of the used current (charge current and discharge current).

◇ In a room temperature environment, the allowable current per 1 mm<sup>2</sup> (square millimeter) of wire is about 5A.

**The allowable current = 5A / mm<sup>2</sup> (SQMM).**

**In a high temperature environment, use wires that are thicker than the formula above.**

**[ Selection example ]**

**( Example 1 )**

If the maximum charge current is designed as 90A, the charge wire thickness is:  $90A / (5A / \text{mm}^2) = 18 \text{ mm}^2$   
or more → Standard wire 20 mm<sup>2</sup>

**( Example 2 )**

If the maximum charge current is designed as 50A, the charge wire thickness is:  $50A / (5A / \text{mm}^2) = 10 \text{ mm}^2$   
or more.

**⚠ The ability of the charger to recharge when the battery voltage drops after the battery is fully charged .**

With the charger and battery connected at all times

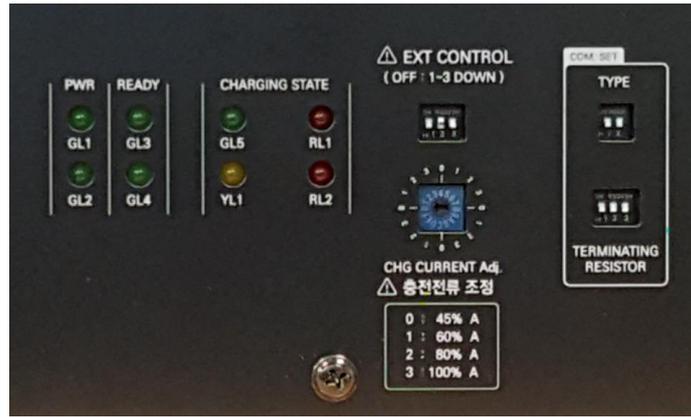
The battery can be used in conjunction with a load device.

At this time, the charger resumes charging operation when the battery falls below a certain voltage. This voltage is called the recharge start voltage.

\* Model : TC-3000W-25V90A → The recharge start voltage = Around 25.9V

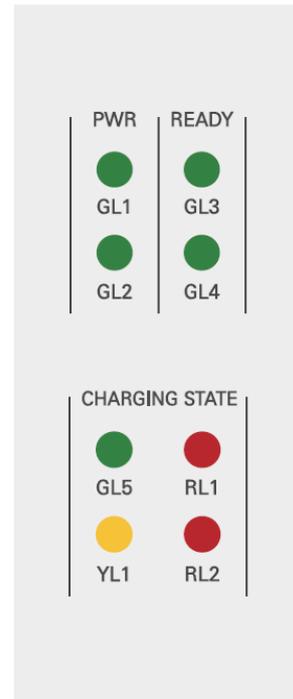
\* Model : TC-3000W-50V50A → The recharge start voltage = Around 51.8V

**⚠ Depending on the operating state of the charger, the LED signal will light up as shown below.**



	1500W Power Module 1	1500W Power Module 2
Power ON	GL1	GL2
Ready	GL3	GL4

	● GL5	● YL1	● RL1	● RL2
배터리 연결 탐색중 Battery Connection Searching	FLICKER		ON	
배터리 소생 동작중 Battery Voltage Recovering	FLICKER	FLICKER		
프리차징 동작 On Precharging	ON	FLICKER		
충전중 On Charging	ON			
만충 상태 Full Charged	ON	ON		
역결선 감지 Reverse Wire Detection			ON	FLICKER
대기 모드 Standby Mode			ON	
파워 모듈 이상 Power Module Abnormal			FLICKER (Module1)	FLICKER (Module2)



## Cautions on the Type and Capacity of Lithium Ion battery

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### Cautions on the Maximum Voltage of Lithium Battery.

The maximum voltage for lithium batteries in 7 series, varies depending on the manufacturer and may be 29.4 V or 30.1 V or more. 'TC-1500W-25V45A / Max29V' charger charges up to 29V. So if the maximum voltage of the battery is 30.1V or higher, it will charge about 5% less. But there is no problem to use.

#### Caution

Do not connect this charger with the maximum voltage of the lithium battery itself less than 29.4V.

## Cautions on the Capacity of the Lithium Battery to be applied.

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### Maximum charge current when considering only lithium battery cell

It is recommended to charge with maximum current to 0.5C or less. If the capacity of the lithium battery is 20Ah, 0.5C charging means charging with current less than 10A (= 20Ah x 50%) which is less than 50% of the battery capacity. Typical lithium ion battery cells can be charged up to 1 C, but this is the maximum value. We recommend 0.5 C or less for safety and long life.

However, this also depends on the lithium ion battery pack product, and the maximum charge current specifications are listed on each battery pack. Exceeding this value may cause the battery to malfunction, deteriorate its life, or sometimes overheat and damage it. Please refer to lithium battery manufacturer's charge current specification. Some lithium batteries may be available for charging up to 1C.

### Maximum charge current considering capacity of BMS

You must charge below the maximum charge current value set by BMS.

Some companies' lithium batteries can accumulate heat in the BMS when charged with the maximum charge current specified in the specification, which can cause the battery to overheat or accidents.

If it is not urgent, it is recommended to charge the battery slowly by reducing the charge current. Our chargers are designed to reduce the charge current by considering the above problems.

# 1. Specifications by each models – 3000W

		Standard model	TC-3000W-25V90A /Max29V	TC-3000W-25V90A /Max28V	TC-3000W-50V50A /Max58V	TC-3000W-50V50A /Max56V
1	Output Wire Size	At room temperature	At least 20 mm <sup>2</sup>		At least 10 mm <sup>2</sup>	
2	Battery	Li-Ion/Polymer	7series(7S), 25.2V or more, 29.4V charging max.		14series(14S), 50.4V or more, 58.8V charging max.	
3	Charging Voltage	Battery Max.Voltage when fully charged	29.0 VDC	28.0 VDC	58.0 VDC	56.0 VDC
4	Application	Considering acceptable Max.V of load	Standard	Recommended for Factory Automation Systems	Standard	Recommended for Factory Automation Systems
5	Amount of Charging	charging amount when fully charged	About 90%	About 80%	About 90%	About 80%
6	Charge current	Volumetric current regulation,	Max. 90A±0.5A, (current ripples : under 3%) 4-steps current adjustment (50, 63, 72, 90A)		Max. 50A±0.3A, (current ripples : under 3%) 4-steps current adjustment (28, 35, 40, 50A)	
7	Finishing Current		Approximately 10 – 20% of the normal charge current max. (Current that stops charging)			
8	How to Charge		CC/CV (Constant Current/ Constant Voltage), 4-steps current increase after charging starts (Slow Start)			
9	Type of Charger	Insulated	Primary/Secondary Insulated chargers (Safety management and noise reduction in case of ground fault)			
10	Input Voltage	RMS	180VAC ~ 240VAC / 50~60 Hz			
11	Output Voltage	RMS	About 2,700 VA	About 2,580 VA	About 2,960 VA	About 2,860 VA
12	Recommended capacity for Input CB		general CB 30A ( blocking capacity : 15A or more ) , considering surge current peak max. at initial start of chargers			
13	Standby Power	RMS	60W	←	←	←
14	Charging Power	RMS	2,610W max.	2,520W max.	2,900W max.	2,800W max.
15	Efficiency/PF		Efficiency 87% , Power Factor 98%		Efficiency 91% , Power Factor 98%	
16	Protection Features		Short circuit protection / over current protection / over voltage protection / reverse connection prevention / pre-charging / *BMS/PCM unblocking feature * BMS/PCM : Battery Management System / Protection Circuit Module			
17	Temperature		Operation : -20℃ ~ +40℃ / Storage : -20℃ ~ +65℃			
18	Size / Weight		W 487mm x H 160mm x L 602mm , 21Kg ( it can be modified arbitrarily.)			

## 2. Common Specifications for all models

### Charge current Adjustment Function

Refer to Product Drawings section.

Turning the current adjustment volume to the left decreases the charge current, and turning it to the right increases it. (Multilevel adjustment type).

During charging, you can adjust the current by turning the volume and it will be reflected a few seconds later. The volume is initially set to the maximum right of the volume and can be reduced. The charge current adjustment volume can be reduced to 60% of the rated charge current.

### Bidirectional Communicating Optional (COM) – to 700W / 1500W

COM (option) – RS232C communication support (Recommended for automation power supply)

< charger → upper stage controller > contents of transmission : Charger operating status, etc.

< upper stage controller → charger > contents of transmission : Charge start, Charge end, etc.

\* Please refer to the attached document for detailed communication protocol specifications.  
(Download from Tabos website)

### Charger and Lithium Battery Charging Characteristics

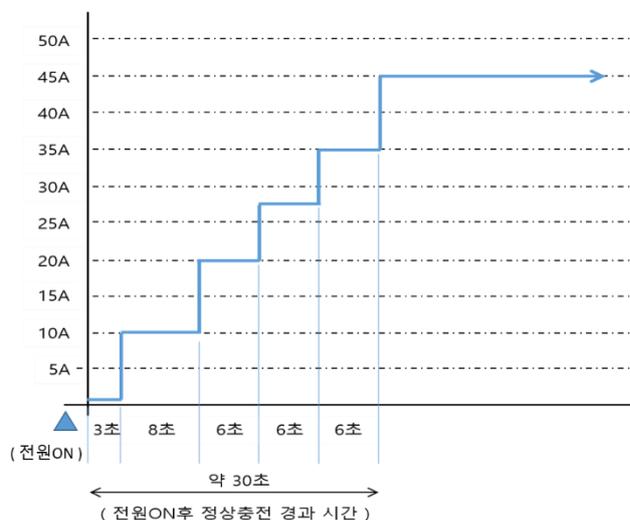
Data of products manufactured by Tabos.

#### ◇ Charging time calculation

= Amphere hour of Li-Ion Battery (Ah) / Charge current (A) x Correction factor(1.1)

= 104Ah / 45A \* 1.1 = 2.5 hour

#### ◇ Elapsed time from initial charge to normal charge / 1500W Charger



This chart can be implied to 700W charger as well. Elapsed time could be slightly changed according to circumstances.

## Characteristics of electric circuit

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- ◇ LLC Resonant converter type  
Soft Switching [ZVS(Zero Voltage Switching) and ZCS(Zero Current Switching)] is possible.  
Minimized current noise, controlled heat, increased durability.
- ◇ Mi-com mounted  
Optimum charging performance.  
Increased safety and stability.

## Procedures of Charge

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- ◇ When the battery is not connected, no electricity is output from the output terminal.
- ◇ Pre-Charging Function  
After the battery is connected, the charger detects the battery voltage and starts charge with the low current when the voltage is lower than normal. (The signal LED lamp flickers alternately between red and green until voltage back to be normal.) This function is implemented only when voltage of the battery is abnormally low. This is to protect the battery and ensure safety.
- ◇ Soft Start function  
If voltage of the battery connected to the charger is within the normal range, it starts to charge by gradually increasing the current in several steps. This is particularly useful when charging batteries mounted on Automatic Guided Vehicle (AGV). When an AGV arrives at home position and is connected to the charger, it can be charged reliably without electrical sparks.
- ◇ Constant Current Charge  
The battery is charged with constant current (CC) until full charge.  
For example, the TC-1500W-25V45A / Max29V will continue charging at about 45A.
- ◇ Constant Voltage Charge  
When the battery reaches the full charge voltage, it is charged in the constant voltage (CV) mode. After the battery charged with maximum current that does not exceed full charge voltage, the charge current is gradually decreased.  
When the charge current is gradually reduced to 10 ~ 20% of the rated charge current (varies by model), it is recognized as a full charge and the charging is stopped. At this time, all operations of charger and fan stops.

## Other Specification for Safety and Convenience

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- ◇ Short-Circuit Protection and Automatic Return  
The output line automatically detects the short-circuit and cuts off the output. When the problem is solved, it returns.
- ◇ Under/Over Voltage Protection.  
The primary AC power stage and the secondary output DC power stage are electrically isolated.
- ◇ Reversed Polarity Detecting Device,

The battery and charger will not fail even if the + / - is changed and connected. In this situation, The orange lamp of the signal LED flickers until the user corrects the wiring.

◇ Monitoring display:  
 Indication of charge voltage and charge current  
 Inform of the abnormality.

◇ Charge current adjustment  
 Current adjustment function through volume knob.

### 3. Model Number / Order Code / Option Marking

①            ②    ③            ④            ⑤  
 TC- 700W - 25V 25A / Max29V / COM  
 TC-1500W - 25V 45A / Max29V / COM  
 TC-3000W - 25V 90A / Max28V

①	Series name	TC-700W , TC-1500W , TC-3000W
②	Battery nominal voltage	25V : for 7 series battery ( nominal 25.2V / 29.4V charge max.) 50V : for 14 series battery ( nominal 50.4V / 58.8V charge max.)
③	Charge Current Rating	Classification of Charge Current amount
④	Maximum charge voltage	Customers' selection
⑤	Communication port ( option )	COM : Bidirectional Communication (RS232C) Charge start command, charge end command, charge current control command, and monitoring information. * D-Sub 9-pin (Male / Male) connector next to output terminal block

### 4. Selecting Connector Options

<p>SB50A-Gray- M4-800L ( for 700W )</p>	<p>1) 50Ah, Terminal for M4 and M6, wire length 800mm,  2) Connector : Compatible with Anderson SB50A grey These connectors are connected to each other with the same connector pair without male and female, and they must be inserted only in the direction in which the +/- are matched.</p>	
<p>SB50A-Gray- M6-800L ( for 1500W )</p>	<p>3) Output wire combination example * 2 Purchases example: 1 battery, 1 charger * 3 Purchases example: 1 battery, 1 charger, 1 load side * Note: 700W charger terminal is M4, 1500W charger is M6, Tabos batteries are typically M6.</p>	

## 5. Product Drawings

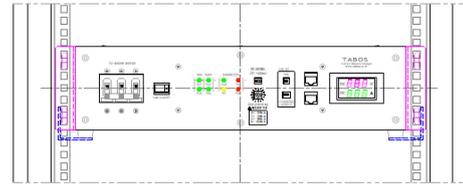
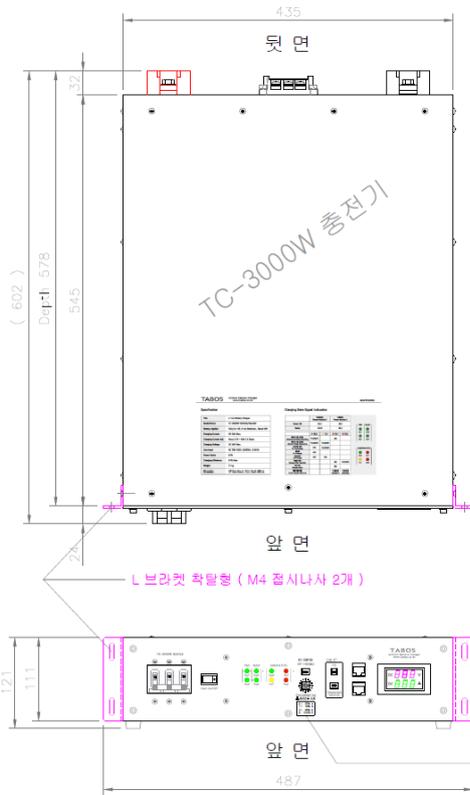
3000W (All models are common)



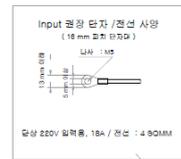
# 신형 3,000W 리튬전지 충전기 / 2019.01모델

표준 19인치 랙마운트형 / 2.5U

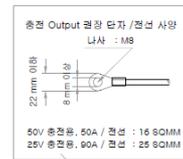
2019.01.17 / 수정



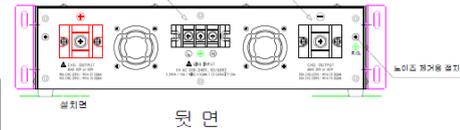
### 전원 Input 단자



### 충전 Output 단자



### 충전전류 조정



TABOS Inc.

3000W 배터리 충전기

\*You can download CAD drawings from our website.