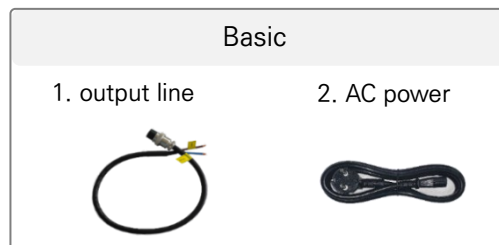


300W Lithium Battery Charger_New

〈 Industrial / Indoor / Stationary Equipment 〉

CE / KC (for some models)




New products come with basic accessories (AC power cord and output wires).
The output line terminals are delivered in different forms depending on the battery connection method and may incur additional costs.

Export HS Code: 8504.40.30 / Direct Production of Tabos (Made in Korea)

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0. Important cautions

 **Do not use the AC input power as a way to turn the charge on/off.**


When in use, always leave the AC power ON and charge the battery by attaching or detaching the charging connector connected to the battery to the battery charging terminal (output). This will not affect the durability of the charger.

Even with AC power on, the output is safe because it will not go out if the battery is not connected.

(When used while turning on/off the mechinswitch for AC input power ON/OFF
The charger's Firm Ware (S/W) may malfunction in some cases, resulting in poor operation).

The charger detects the battery connection status (battery present or absent) and automatically controls the charge.

When applied to an automatic charging station for AMR / AGV (autonomous robot, unmanned guided vehicle), the AC input power is always turned on, and when the charging electrode is attached to the battery of the driving robot that arrives at the charging station (connected), the charger determines whether the battery is connected and automatically emits output to charge it.

 **How to select a charging voltage**

Lithium battery types	Chargers Maximum	Approximate Charge	Charge level	Considerations when choosing a charging voltage
25V battery (7S , 7Series)	29V	90% charge	Normal charge	How to maximize battery utilization. (The charging voltage is set to 29V at the

Notes : The estimated remaining capacity varies depending on the charging and discharging current of the battery and the length and thickness of the charging wire path. The above estimated remaining capacity may vary depending on the field situation and is an estimate for your understanding.

⚠ Charging a lithium battery with an undervoltage cutoff would not charge properly.

If the lithium battery is under-voltage cut off, and the standby power of the load connected to the charger (with the battery also connected) absorbs the charger's startup current, the battery may not be able to charge and remain in standby.

This situation can occur in AMR / AGV (autonomous robots, automated guided vehicles).

The charger has a failsafe that prevents the output from going out when no battery is connected.

Lithium batteries have a built-in BMS/PCM device that will shut down the output if it goes into a low voltage state. The charger will detect if the battery is connected by the micro output, but if the battery is in a low voltage cutoff state, the charger will not detect the battery voltage, so it will not do a full charge and will only send out micro power.

If the various electrical devices connected to the load are left on, the trace power from the charger will be consumed by the load's standby power, preventing it from charging over time.

If this happens, you should turn off the switch (breaker, etc.) that connects to the load so that the charger's small output current does not drain the load's standby power.

Especially for Tabos batteries, if the model has '/COM' at the end of the model name (this product has an LED lamp on the battery terminal), the communication device power switch of the battery must be turned off.

After doing so, you can start the charger and then turn on the switch that the load is connected to when the charger starts the main charge.

Using wires that are too thin for the current will cause the wires and connectors to deteriorate in the long run, resulting in a fire.

Also, for charging wires, the proper wire thickness should be used to reduce the amount of voltage drop to ensure that charging is on target.

The wire size is determined by the current draw.

AC input power wire:

Formula for calculating the allowable current per wire diameter for AC input wires: $5A/\text{mm}^2$ minimum² (SQMM).

In a room temperature environment, the allowable current per 1 mm^2 (square millimeter) of wire can be calculated as 5 amps.

If the ambient temperature is above 40 degrees, you may also need to use thicker wire than the above calculations.

However, this regulation is about safety, such as wires heating up.

If the AC input max current is 2A --> Minimum $2/5 = 1.6 \text{ mm}^2 = 0.4 \text{ mm}^2$ Standard wire 0.75 mm^2 Select the wire.

DC battery charging wire:

Formula for calculating the allowable current per wire thickness of the charging line: minimum $3A/mm^2$ (SQMM). (Condition: when the length of the charging line is 2 meters or less.)

This is the specification recommended by Tapos. Thin charging wires cause a voltage drop. A voltage drop of just 0.5 V is enough to cause the

The battery will charge less. This is intended to reduce the amount of voltage drop across the wires when charging to ensure that charging is on target.

If the length of the charging wire is longer than 2-3 meters, you should use a thicker wire than the above calculation because there is a large voltage drop during charging. If the ambient temperature is above 40 degrees, you may also need to use a thicker wire than the above calculation.

If the charging current is 15A --> Select at least $15 / 3 =$ at least $5 mm^2$ --> Select at least $6 mm^2$ standard wire.

1. Model Name and Order Code Explanations

Number	λ	B	③ â	④ â	⑤ â
Example model name1	tc - 7s 10a - s				
Example model name2	tc - 7s 10a - s				
Model name example3	tc - 7s 10a - s / 28v				

No	Item	内容
①	Series name	Tabos Charger
②	Applied Battery Voltage Rating	3S: For 3 series of Li-ion (NCM) battery cells (10.8V nominal / 12.6V charge) 7S: For 7 series of lithium-ion (NCM) battery cells (25.2V nominal / 29V rechargeable and 28V optional) 14S: For 14 series lithium-ion (NCM) battery cells (50.4V nominal / 58V and 56V)
③	Charge current rating	5A: Class 5A / 10A: Class 10A / 15A: Class 15A
④	Identifier	S
⑤	(Optional) Charging voltage	(1) None (no sign): Standard charging voltage Type 3S = 12.6V (default), Type 7S = 29V (default), Type 14S = 58V (default) (2) Optional charge voltage: Free charge voltage Type 3S = N/A, Type 7S = 28V, Type 14S = 56V
⑥	(Optional)	Other options

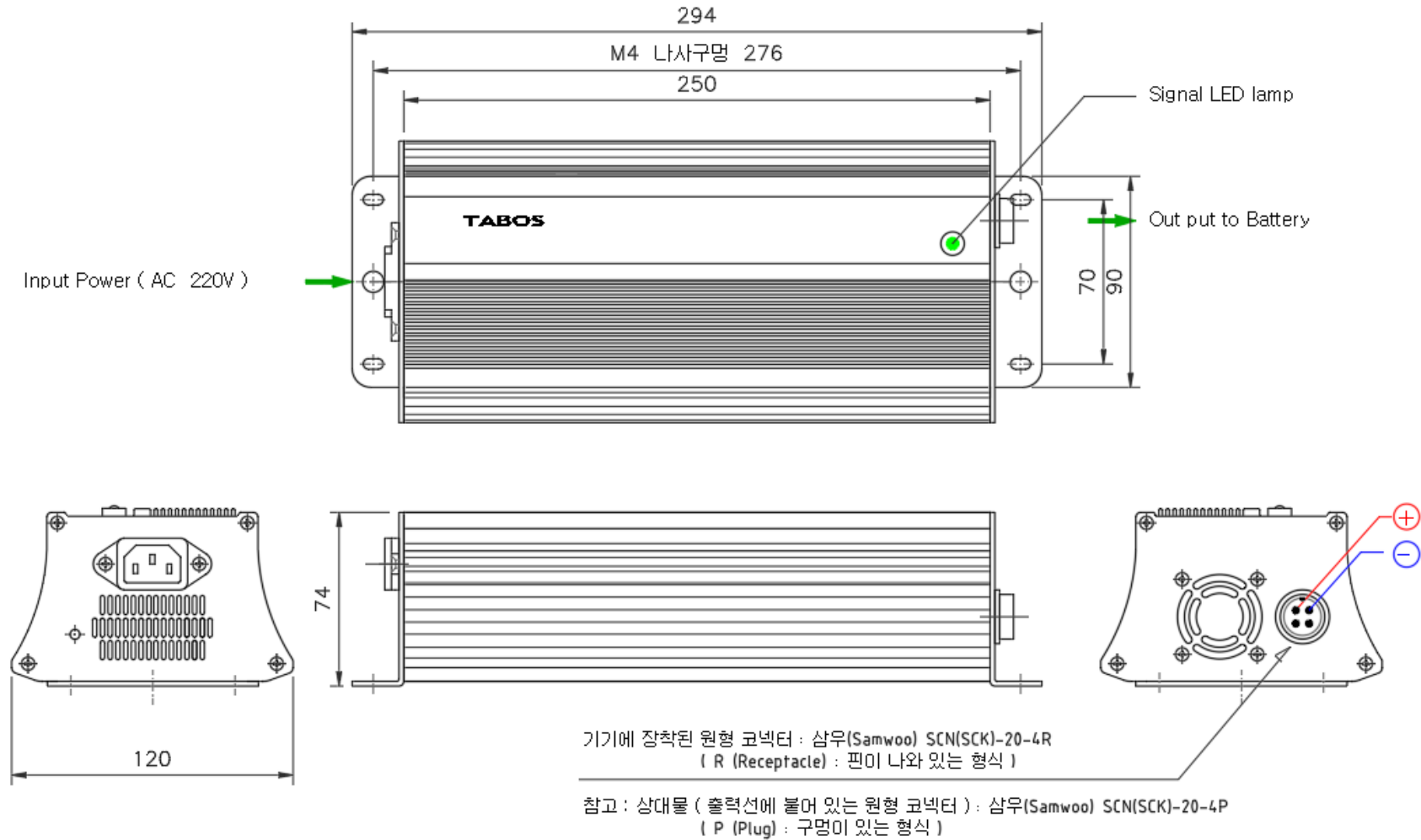
2. Model-specific specifications

Developed by TABOS / Made in Korea

No	Model Name →		TC-3S15A-S	TC-7S10A-S	TC-14S5A-S
1	Authentication			CE, KC	
2	Applied Battery	Li-ion or polymer (NCM Series)	3-Series (3S) type, 10.8-11.2V nominal, 12.6V full charge	7Series (7S) type, 25.2V nominal, Max Charge 29.4V	14Series (14S) type, 50.4V nominal, Max Charge 58.8V
3	DC charging voltage	Maximum battery voltage at full charge	12.6 VDC	29.0 VDC → Approximately 90% or more of the estimated charge	58.0 VDC → Approximately 94% of estimated charge
4	When specifying a charging voltage change (optional)		(not applicable)	Option code: '/28V' → Approximately 80% of estimated charge	Option code: '/56V' → Approximately 85% of estimated charge
5	Charging current	Charge Current Ripple Reduction	Max. 15A±0.5A, (3% or less charge current ripple)	Max. 10A±0.5A, (3% or less charge current ripple)	Max. 5A±0.5A, (3% or less charge current ripple)
6	End-of-charge current		Approximately 20% of the normal (maximum) charge current (the current at which charging stops as full).		
7	Charging methods	CC/CV	Constant current/constant voltage type, CC/CV (Constant Current/ Constant Voltage), 4-stage current increase after charging starts (Slow Start)		
8	Charger format	Isolated	Primary and secondary isolated charger (safety management and noise reduction in case of battery power line ground fault)		
9	Input Voltage	RMS value	180 VAC to 280 VAC / 50 to 60 Hz		
10	Input Power	RMS value	Approx. 234 VA	Approx. 340 VA	Approx. 330 VA
11	Input breaker recommended capacity		Standard breaker 5 A (breaking capacity of at least 3 A), taking into account the maximum peak current value caused by the inrush current during the initial startup of the charger.		

No	Model Name →		TC-3S15A-S	TC-7S10A-S	TC-14S5A-S
12	Standby power	RMS value	10 W	10 W	10 W
13	Charging power	RMS value	Up to 190 W	Up to 290 W	Up to 290 W
14	Efficiency/Power Factor		Efficiency 83% , Power Factor 98	Efficiency 87% , Power Factor 98	90% efficiency, 98% power factor
15	Lithium batteries Protection	Output side short circuit protection / Charge over current protection / Charge over voltage protection / Charge reverse connection protection / Pre-charging function / *BMS/PCM unblocking function * BMS/PCM : Li-ion Battery Management System / Li-ion Battery Protection Circuit Module			
16	Operating Temperature Conditions	Operating : -20°C ~ +40°C / Storage : -20°C ~ +65			
17	Size/Weight	W 120mm x H 75mm x L 294mm , Weight1.7Kg			

1. Product drawings



Output line length = 600 mm / 1.5sqmm



(+) /Highlight
(Reddish Brown)
(-) / light blue
(Sky Blue)

2. Product Features / How It Works / Safety Features

[Electrical Circuit Features]

- ◇ LLC resonant converter method enables soft switching [Zero Voltage Switching (ZVS) and Zero Current Switching (ZCS)] for low noise generation, low heat generation, and increased durability.
- ◇ Built-in Mi-com enables optimal charging performance based on battery condition → Increased safety, increased convenience

[Charger Charging Procedure]

- ◇ No electricity is output from the output terminals when the battery is not connected. → Safety features.
- ◇ After the battery is connected, the charger detects the battery voltage and starts charging with a microcurrent if the battery voltage is lower than normal. This is implemented through the automatic Pre Charging function (the signal LED lamp flashes red and green alternately) and continues until the battery voltage reaches a normal value. This can take from a few seconds to tens of minutes, depending on the battery capacity and the degree of over-discharge. This feature is only implemented when the battery is over-discharged. This is to protect the battery and ensure its safety.
- ◇ If the battery voltage connected to the charger is within normal values, the charger will start charging the battery a few seconds after it is connected, increasing the current in multi-steps. This is implemented as a soft start feature.
This is especially useful when charging batteries on board a driverless vehicle, as it allows the vehicle to arrive at the charging station (home position) without any control and stably charge without electrical sparks when it is plugged into the charger.
- ◇ Battery charging continues constant current (CC) charging until full charge voltage.
For example, the TC-7S10A-S/28V model will hold a charge of about 10A.
- ◇ When the battery reaches full state of charge, it will be charged in constant voltage (CV) mode, which means that the maximum current will be charged without exceeding the full state of charge, and the charging current will gradually decrease.

◇ When the charging current is gradually reduced to 10–20% of the rated charging current (depending on the model), the charger recognizes that it is full and stops charging. At this time, all operations of the charger are stopped and the cooling fan stops running.

[The ability of the charger to recharge the battery when the battery voltage drops after a full charge].

Keep the charger and battery connected at all times

The battery can be connected to a load device. In this case, the charger will resume charging when the battery drops below a certain voltage. This voltage is called the recharge initiation voltage.

* TC-3S15A-□□ Model → Recharge initiation voltage = voltage near 11.1 V

* TC-7S10A-□□ model → Recharge start voltage = approx. 25.9V near voltage

[Other safety notes].

◇ Short circuit protection and auto-recovery: The output line will automatically detect a short circuit and cut off the output, and will automatically return when the short circuit is broken.

◇ The battery is protected from overcharging and overcurrent charging.

◇ The primary AC power supply and the secondary output DC power supply are electrically isolated.

◇ The battery has a reverse polarity connection detector, which prevents the battery and charger from failing when connected in reverse + / -. The orange lamp on the signal LED flashes when this happens. Once the user corrects the connection, normal charging is possible.

◇ No charging current is output to the charger output terminal even when the charger is powered on if it is not connected to the battery by a wire. (Only a small current is output for battery sensing.) → Secure the safety function.

3. Cautions for different lithium battery types and capacities

1) Cautions for Lithium Battery Maximum Voltage

For example, the "TC-7S10A-S" charger is for 7 direct thermal cells, 7 Direct thermal lithium batteries have a maximum voltage of 29.4V or 30.1V or even higher, depending on the manufacturer.

The "TC-7S10A-S" charger only charges up to 29V, so if your lithium battery has a maximum voltage of 30.1V and higher, you can charge it with this charger. However, you will get about 5% less charge, but it is not a problem to use.

[CAUTION]: Never connect a lithium battery with a maximum voltage of less than 29.4V to this charger.

2) Notes on the size (capacity) of the applied lithium cells

[Maximum charging current considering only lithium battery cells].

It is recommended to charge the maximum current to 0.5C or less.

If a lithium battery has a capacity of 20Ah, a 0.5C charge means charging it with a current of 10A (= 20Ah x 50%) or less, which is 50% or less of the battery's capacity.

While a typical Li-ion cell may be capable of up to a 1C charge (1C refers to a 50A charge for a 50Ah battery), this is a maximum, and for safety and longevity, 0.5C or less is generally recommended for finished Li-ion battery packs.

However, even this varies by Li-ion battery pack product, and the maximum charge current specification is

listed on each battery pack. Exceeding this can cause the battery to fail, reduce its lifespan, or sometimes even overheat and break, depending on the manufacturer. Refer to the lithium battery manufacturer's charging current specifications for this charge current. Some lithium batteries may be able to be charged to a maximum of 1C.

[Maximum charging current considering the current capacity of the lithium battery BMS].

In addition to considering the maximum charging current of the lithium battery cell as reviewed earlier, it is important to charge at or below the maximum charging current value set by the lithium battery BMS. Some companies' lithium batteries may accumulate heat in the BMS when charged to the maximum charging current specified in the specification, which may cause the lithium battery to overheat or cause an accident. If you're not in a hurry, we recommend charging slowly by reducing the charging current.

4. Charger usage and precautions

1) Ensure that the applied battery is the correct one for the charger.

- ◇ Do not connect and use lead-acid batteries. The charging voltage specifications may not be met.
- ◇ Check the maximum charging voltage of the applied lithium battery and use it only if the charging voltage of the charger is lower than the maximum voltage of the battery.
- ◇ Connect the + and - on the terminal block of the charge output to the battery terminals.

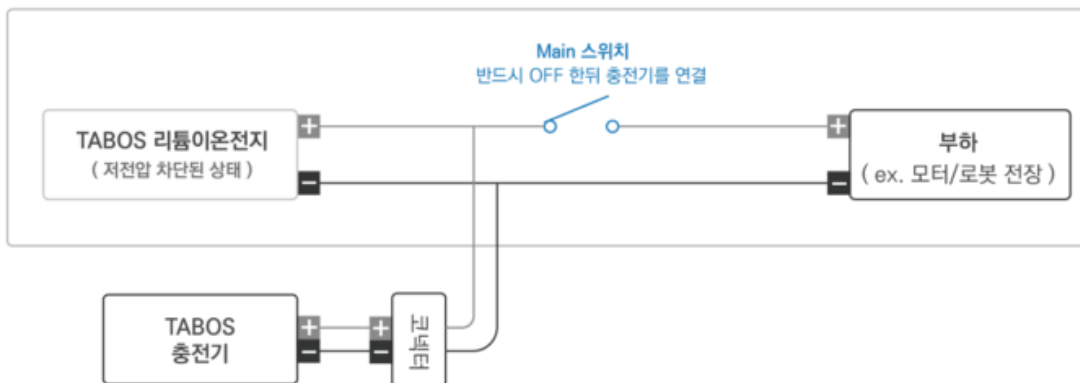
2) When cutting off battery low voltage, remove all loads connected to the battery and connect the battery and charger 1:1 and charge as shown in the picture below.

The battery BMS (Battery Safety Management Circuit) automatically cuts off battery output when the remaining battery power is close to 0%.

In this situation, if you try to charge by connecting the charger, the charger cannot charge normally because it does not detect the battery voltage, and starts charging with a pulse wave of about 1A.

Because it attempts to charge with a small current of about 1A, if a load is connected to the battery, the current will not go into the battery but will be supplied to the load. So, if you want to save the battery, remove the load from the battery.

저전압 차단된 배터리 충전시 주의사항



배터리가 보호 회로에 의하여 저전압 차단 상태가 되었을때 Main 스위치가 ON된 상태에서 바로 충전기를 연결할 시, 충전기측 배터리 감지 회로의 전류를 부하측에서 대신 소모하는 현상이 발생하여 감지 회로 소손으로 이어집니다.

2) Depending on the operating status of the charger, the signal LED lamp lights up as shown below, and take appropriate action.

No	Status type	LED indication	Description.
1	Standby mode	Blinking green (●●~) (1 second cycle)	Normal standby status. Outputting a pulse (1 A) to detect an over-discharged battery.
2	Battery resuscitation mode	Red, orange (●●~) Cross-lighting (every 0.5 seconds)	Behavior for releasing an over-discharge protected circuit. (0V release function)
3	Low-current charging	Illuminated orange (●)	in the low-voltage region immediately after 0V release. Low-current charging behavior to protect cells.
4	Charging normally	Illuminated red (●)	Charging CC (constant current)
5	Waiting for full	Lights green (●)	Stop charging when full voltage is reached and standby
Errors Show	Reverse connection detection	Flashing orange (●●~) (1 second cycle)	Error signals when wired with reverse polarity

No	Status type	LED indication	Description.
Errors Show	Stop charging	Flashing red (●●~) (1 second cycle)	<p>case1. When the red and green (●●~) lights up at intervals of 1 second or more, and at the same time, <u>the relay repeating sound (click-clack) occurs more than 10 times in a row</u> (charging abnormality judgment)</p> <p>case2. When the red and orange (●●~) lights up in a 0.5 second cycle (battery resuscitation mode) for more than 40 minutes</p> <p>case3. orange (●) light (low current charging) lasts for more than 40 minutes</p> <p>-> Emergency stop when case1-3 above occur. When stopped, it flashes red (●●~) with a 1-second cycle.</p> <p>⟨Causes and solutions for cases 1 through 3 Overcurrent disconnect or poor contact, check the charging line or replace the battery, or check if the charging current is excessive for the battery capacity.</p> <p>⟨How to return the charger to standby (green flashing) After removing the battery, turn off the AC power and wait at least 5 seconds after confirming the LED is off before turning it on.</p>