

Lithium battery Chargers

700W / 1500W

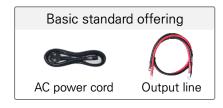
(Industrial / Indoor / Stationary Equipment)

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

(for several models)



700W charger





Exporting HS Code: 8504.40.30 / Made in Korea



Table of Contents

0. Important Notices	3
How to Select Charging Voltage	3
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 – 700W Series	7
2. Specifications – 1500W Series	9
3. Common Specifications for all models	11
Charge current Adjustment Function	11
Bidirectional Communicating Function (COM) - Option	11
Charger and Lithium Battery Charging Characteristics	15
Characteristics of electric circuit	15
Procedures of Charge	15
Other Specification for Safety and Convenience	16
4. Model Number / Order Code / Option Marking	18
5. Selecting Connector Options	18
6. Product Drawings	19



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.
(70, 7001100)	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 *In case of AGV, this voltage range is selected generally.
	58V	90%	To maximize battery utilization. This could be applied if no problem occurs.

Cautions when using Chargers

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.



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.



Mhen 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.

Compared to electric current, the use of thin wires causes fire accidents due to deterioration of wires and connectors in the long term.

In addition, in the case of a charging line, it is necessary to use an appropriate wire thickness to reduce the voltage drop so that charging can be performed in accordance with the target value.

The wire thickness is determined by the size of the current used.

♦ AC input power line:

Calculation formula for allowable current per wire thickness of AC input wire: minimum 5A / mm2 (SQMM).

In a room temperature environment, the permissible current per 1mm2 (square millimeter) of wire can be calculated as about 5A.

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

However, this regulation is related to safety, such as heating of wires.

If the maximum AC input current is 8A --> Minimum 8/5 = Minimum 1.6 mm2 or more

♦DC Battery Charging Line:

Calculation formula for allowable current per wire thickness of charging line: minimum 3A / mm2 (SQMM). (Condition: When the length of the charging cable is less than 2m)

This regulation is recommended by Tabos. If the charging line is thin, a voltage drop will occur. Even if the voltage drop is only 0.5V

The battery charge is low. This is a regulation to reduce the amount of voltage drop in the wire when charging so that the charging works well in the target range.

If the length of the charging line is longer than 2~3m, a lot of voltage drop occurs during charging, so you should use a wire thicker than the wire thickness calculated above. If the ambient temperature is above 40 degrees, you may also need to use thicker wire than the above calculation.



If the charging current is 50A --> Minimum 45 / 3 = Minimum 15 mm2 or more --> Select standard wire 16 or 25 mm2 wire.

If the charging current is 25A --> Minimum 25 / 3 = Minimum 8 mm2 or more --> Select standard wire 10 mm2 wire.

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-700W-25V□□A → The recharge start voltage = Around 27V
- Model : TC-1500W-25V□□A → The recharge start voltage = Around 27V
- Model : TC-700W-50V□□A → The recharge start voltage = Around 55V
- Model : TC-1500W-50V□□A → The recharge start voltage = Around 55V

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

- ♦ Green(●) : Charging completed
- ♦ Red(●): Normal charging state
- ♦ Orange(●): battery warning
- ♦ Orange flickering (●●●・・・): battery changes polarity
- ♦ Red, Green flickering alternately (●●●●···): Flashes 3 to 4 times per second.

Normal operation for fine charging after under voltage state.

After several minutes, it turns red and charges normally.

- ♦ Green flickering(●●●●···): Standby state when battery is not connected / or Fine charging state.
- ♦ If there is a lot of heat in the connected lithium battery, stop charging, check again and recharge.



Cautions on the Type and Capacity of Lithium Ion battery



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.



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 – 700W Series

	Model	Standard model	TC-700W-25V25A /Max29V	TC-700W-25V25A /Max28V	TC-700W-50V13A /Max58V	TC-700W-50V13A /Max56V
	name	Communication port (RS232C)	TC-700W-25V25A /Max29V/COM	TC-700W-25V25A /Max28V/COM	TC-700W-50V13A /Max58V/COM	TC-700W-50V13A /Max56V/COM
0	Certification					
1	Batteries	At room temperature	At lea	st 8 mm2	At lea	est 5 mm2
2	Batteries	Li-Ion/Polymer	7 Series(7S), 25.2V or r	more, 29.4V charging max.	14 Series(14S), 50.4V o	r 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.Voltage by the load	Standard	Recommended for Factory Automation, AGV Battery Systems	Standard	Recommended for Factory Automation, AGV Battery Systems
5	Charging Capacity	Full Charged Capacity	About 90%	About 80%	About 90%	About 80%
6	Charge current			rrent ripples : under 3%) stment(13, 17 , 21, 27A)		urrent ripples : under 3%) justment (6, 8, 10, 13A)
7	Finishing Current		Approximately	y 10 – 20% of the normal cha	arge current max. (Current	that stops charging)
8	How to Charge		CC/CV (Constant Cur	rent/ Constant Voltage), 4-s	teps current increase after	charging starts (Slow Start)
9	Type of Charger	Insulated	Primary/Secondary Ir	nsulated chargers (Safety ma	nagement and noise reduc	tion in case of ground fault)
10	Input Voltage	RMS		180VAC ~ 24	0VAC / 50~60 Hz	
11	Input Power	RMS	About 887 VA	About 918 VA	About 816 VA	About 743 VA



	Model	Standard model	TC-700W-25V25A /Max29V	TC-700W-25V25A /Max28V	TC-700W-50V13A /Max58V	TC-700W-50V13A /Max56V
	name	Communication port (RS232C)	TC-700W-25V25A /Max29V/COM	TC-700W-25V25A /Max28V/COM	TC-700W-50V13A /Max58V/COM	TC-700W-50V13A /Max56V/COM
12	Recommended	d Circuit Breaker(CB)	,	5A Circui considering surge current pe	t Breaker(CB) eak max. at initial start of ch	nargers
13	Standby Power	RMS	17W	←	←	←
14	Charging Power	RMS	756W max.	783W max.	728W max.	754W max.
15	Efficiency/PF		Efficiency 87%,	Power Factor 98%	Efficiency 91%	, Power Factor 98%
16	Protection Features			S/PCM unblocking feature * E		erse connection prevention / ement System / Protection
17	Temperature			Operation: -20°C ~ +40°C	C / Storage : -20°C ~ +6!	5°C
18	Size / Weight			W 140mm x H 77mm	x L 340mm , 3.5Kg	

^{*} Please refer to the separate manual on the website for the communication protocol related to the communication port mounting type.



2. Specifications – 1500W Series

	Model	Standard model	TC-1500W-25V45A /Max29V	TC-1500W-25V45A /Max28V	TC-1500W-50V25A /Max58V	TC-1500W-50V25A /Max56V
	name	Communication port (RS232C)	TC-1500W-25V45A /Max29V/COM	TC-150W-25V45A /Max28V/COM	TC-1500W-50V25A /Max58V/COM	TC-1500W-50V25A /Max56V/COM
0	Certification			CE (EMC: IEC 6° CE (LVD: IEC60°	1000-6, Class A) 335-1,2)	
1	Output Wire Size	At room temperature	At leas	t 16 mm2	At lea	st 8 mm2
2	Batteries	Li-lon/Polymer	7series(7S), 25.2V or n	nore, 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	29.0 VDC	28.0 VDC
4	Application	Considering acceptable Max.Voltage by the load	Standard	Recommended for automation power supply	Standard	Recommended for automation power supply
5	Charging Capacity	Full Charged Capacity	About 90%	About 80%	About 90%	About 80%
6	Charge current			rrent ripples : under 3%) stment (18, 25 , 33, 45A)	Max. 25A±0.5A, (cu 4–steps current adju	rrent ripples : under 3%) stment (13, 17 , 21, 25A)
7	Finishing Current		Approximately	y 10 – 20% of the normal cha	arge current max. (Current	that stops charging)
8	How to Charge		CC/CV (Constant Cur	rent/ Constant Voltage), 4-s	teps current increase after	charging starts (Slow Start)
9	Type of Charger	Insulated	Primary/Secondary In	sulated chargers (Safety ma	nagement and noise reduc	tion in case of ground fault)
10	Input Voltage	RMS		180VAC ~ 24	0VAC / 50~60 Hz	



	Model	Standard model	TC-1500W-25V45A /Max29V	TC-1500W-25V45A /Max28V	TC-1500W-50V25A /Max58V	TC-1500W-50V25A /Max56V
	name	Communication port (RS232C)	TC-1500W-25V45A /Max29V/COM	TC-150W-25V45A /Max28V/COM	TC-1500W-50V25A /Max58V/COM	TC-1500W-50V25A /Max56V/COM
11	Input Power	RMS	About 1,332 VA	About 1,286 VA	About 1,332 VA	About 1,286 VA
12	Recommende	d Circuit Breaker(CB)	,	10A Circu considering surge current p	iit Breaker(CB) eak max. at initial start of ch	nargers
13	Standby Power	RMS	30W	←	30W	←
14	Charging Power	RMS	1,500W Max.	1,448W Max.	1,500W Max.	1,448W Max.
15	Efficiency/PF		Efficiency 87%,	Power Factor 98%	Efficiency 91%,	, Power Factor 98%
16	Protection Features		Short circuit protection pre-charging / *BMS	/PCM unblocking feature *	ver voltage protection / rev BMS/PCM : Battery Manage iit Module	erse connection prevention / ement System / Protection
17	Temperature			Operation: -20°C ~ +40°	C / Storage: -20°C ~ +65	S°C
18	Size / Weight			W 180mm x H 86m	m x L 410mm , 5.5Kg	

^{*} Please refer to the separate manual on the website for the communication protocol related to the communication port mounting type.



3. 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 Function (COM) - Option

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)



How to use the 1500W charger

Basic Model



[Rear: Charging Output (DC)]

* Use of green connector:

When this connector (2 poles) is short-circuited, the pre-charging function is activated. If OPEN is selected, the <u>pre-charging function</u> is disabled and the main charge is directly entered.



Line Input (AC)

Description of pre-charging function: When the battery is over-discharged, pulse charging is performed at 1~2A, and when the battery is revived, it detects the battery voltage and

Optional model " / COM" Communication D-sub 9pin Port



[Rear : Charging Output (DC)]
(D-Sub 9 pins Communication Ports / RS232C



[Line Input (AC)]



How to adjust the charging current (충전전류 조정 방법)

Turning the rotary switch to the right as far as possible sets the maximum charging current. At this time, the charging current for each model is as follows.

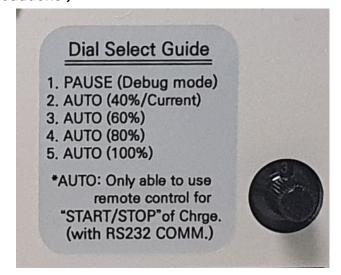
(<u>로터리 스위치</u>를 오른쪽으로 최대한 돌리면 최대충전전류로 세팅된다. 이 때 각 모델 별 충전전류는 아래와 같다.)

TC-1500W - 50V 25A Model --> Charging Current 25A setting TC-1500W - 25V 45A Model --> Charging Current 45A setting





(Cautions)



(Detailed photo of the rotary switch)

Ex.: 700W Charger

For model "TC-700W-25V25A"

The maximum charging current is 30A.

Turn the rotary switch to '2':

Charging current 30A x 40% =

approximately 12A

Turn the rotary switch to '3':

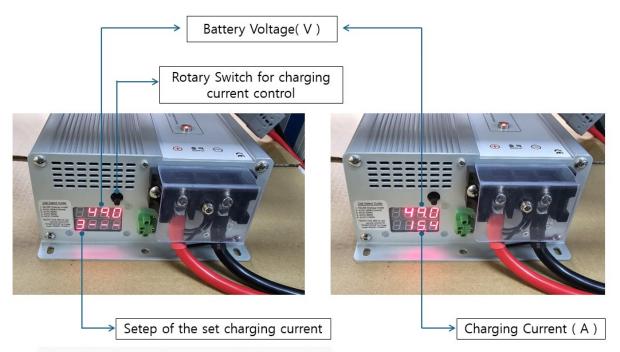
Charging current 30A x 60% =

approximately 18A

Turn the rotary switch as far to the right as possible and then turn it to the left one click at a time to lower the charging current by that much.



However, the position where it no longer turns to the left is for using the communication port. Therefore, when setting the charging current, the lowest current setting position is the position where you turn as far left as possible and then turn right by 1 click.



This number changes when you turn the 'rotary switch'

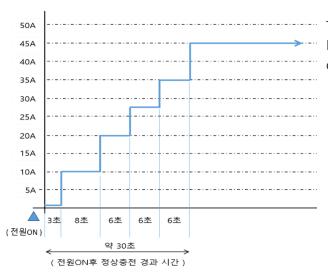
Note: <Set charging current level> and <Current charging current> display alternately at 2-second intervals.



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

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

- 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 $10 \sim 20\%$ 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

♦ 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.
- ♦ 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.

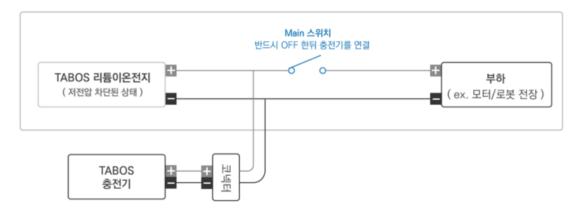
The battery BMS (Battery Safety Management Circuit) automatically cuts off battery output when the remaining battery power is close to 0%.

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.



4. Model Number / Order Code / Option Marking

1 2 3 4 5

TC- 700W - 25V 25A / Max29V / COM TC-1500W - 25V 45A / Max29V / COM TC-1500W - 25V 45A / Max28V

1	S eries name	TC-700W , TC-1500W
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

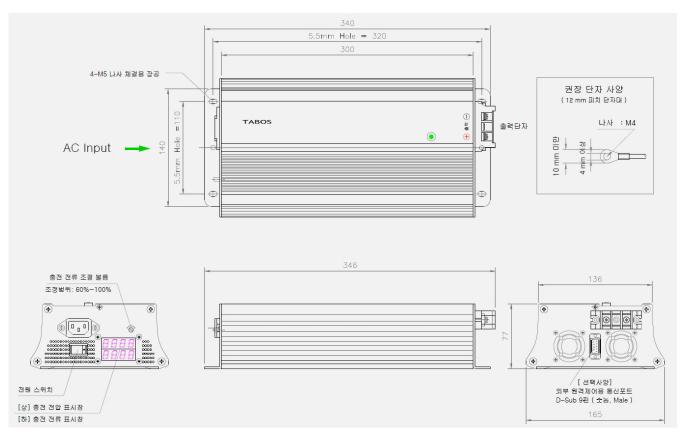
5. Selecting Connector Options

Tabos batteries are typically M6.



6. Product Drawings

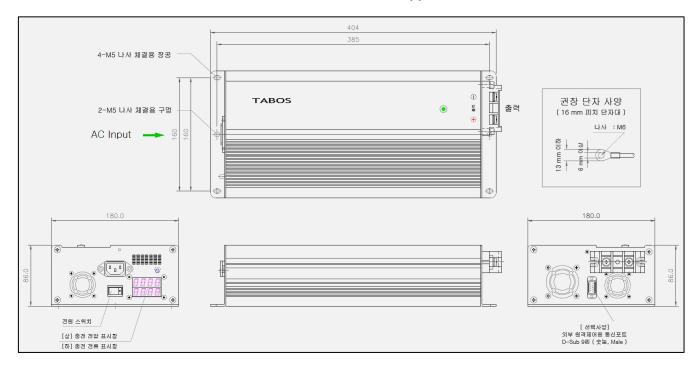
700W (All models are common)



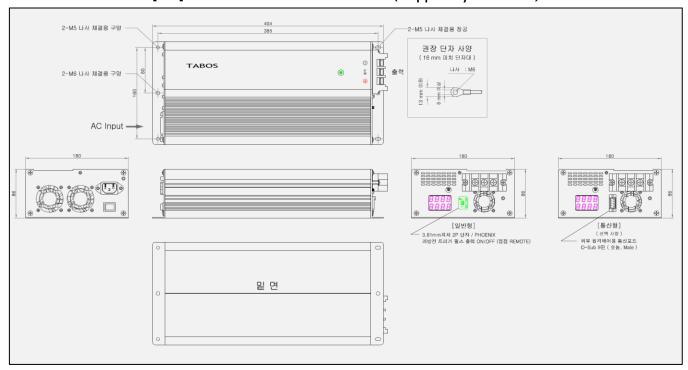


1500W (All models are common)

[New] 1500W common to all models (shipped after 2022.08.01)



[Old] Common to all 1500W models (shipped by ~2022.07)



*You can download CAD drawings from our website.