TBB POWER

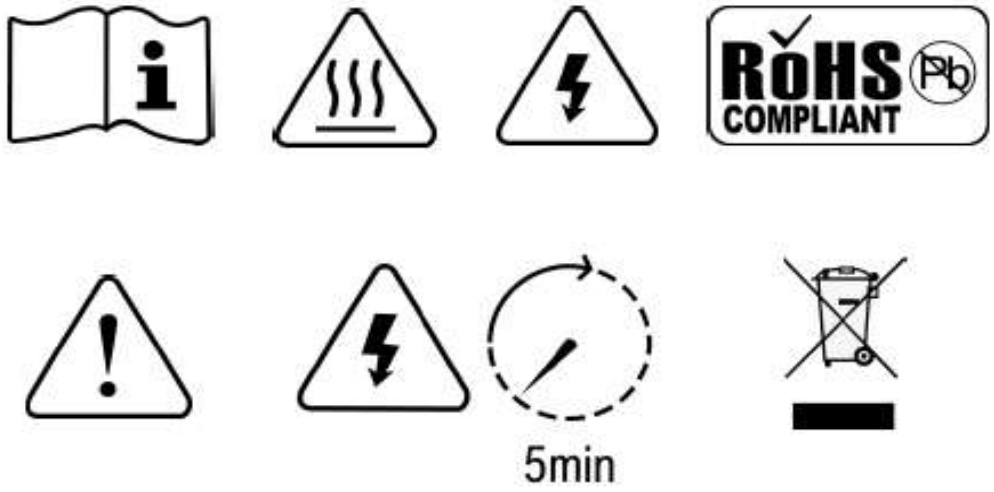
Version: A1.1

DUAL/SINGLE OUTPUTS BOOSTER CHARGER

USER MANUAL

DM Series

www. tbbpower. com



WARNING: HIGH VOLTAGE INSIDE

CAUTION: THE DC FUSE MUST HAVE BEENTURNED OFF BEFORE SERVICING

MADE IN CHINA

Disclaimer

Unless specially agreed in writing, TBB Power Co., Ltd.

- Takes no warranty as to the accuracy, sufficiency of suitability of any technical or other information provided in this manual or other documentation.
- Assumes no responsibility or liability for loss or damage, whether direct, indirect, consequential or incidental, which might arise out of the use of such information.
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About this Manual

This manual describes the features of the dual/single outputs booster charger , and provides the procedure of installations. This manual is for anyone intending to install our product.

General Instruction

Thanks for choosing our products and this manual is suitable for dual/single outputs booster charger.

This chapter contains important safety and operation instructions. Read and keep this User Guide well for later reference.

This system needs to be installed by professionals with enough knowledge of electrical system. Please pay attention to the following points prior to installation:

1) Please check the input voltage is same to the nominal input voltage of this unit.
2) Upon connection with Alternator, battery and fridge/load, please double confirm the polarity.
3) Please use the shortest possible cable to connect and ensure the secure connection.
4) While connecting, please secure the connection and avoid short circuit between positive terminal and negative terminal.
5) The unit will have high voltage inside. Only authorized electrician can open the case.
6) The unit WAS NOT designed to use in any life retaining equipment.

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1. General Safety Instruction

Safety Instruction

As dangerous voltage and high temperature exist within the charge controller, only qualified and authorized maintenance personnel are permitted to open and repair it.

This manual contains information concerning the installation and operation of the charge controller. All relevant parts of the manual should be read prior to commencing the installation. Please follow the local stipulation meantime.

Any operation against safety requirement or against design, manufacture, safety standard, and are out of the manufacturer warranty.

General Precaution

- Do not expose to rain, snow or liquids of any type，it is designed for indoor use.
- To avoid fire and electric shock, make sure all cables selected with right gauge and being connected well. Smaller diameter and broken cable are not allowed to use.
- Please do not put any inflammable goods near to charge controller.
- Never place unit directly above batteries, gases from a battery will corrode and damage the charge controller.
- Do not place battery over charge controller.

Precaution regarding battery operation

- Use plenty of fresh water to clean in case battery acid contacts skin, clothing, or eyes and consult with doctor as soon as possible.
- The battery may generate flammable gas during charging. Never smoke or allow a spark or flame in vicinity of a battery.
- Do not put the metal tool on the battery, spark and short circuit might lead to explosion.
- Remove all personal metal items such as rings, bracelets, necklaces, and watches while working with batteries. Batteries can cause short-circuit current high enough to make metal melt, and could cause severe burns.

2. Introduction

2.1 General introduction

TBB's DM series charger is an in-vehicle charging solution which specified designed for on-board application such as RV, Marine, Utility Vehicle, Truck etc.

Dual outputs DMT1250 comes with a brilliant feature of dual outputs: one is for auxiliary battery charging with charge current up to 30A, and the other one is dedicated to power a DC load (Typically a DC fridge) with current up to 20A. When vehicle engine is running, DMT1250 will draw power from engine to charge battery as well as to power DC load; when vehicle engine is turned off, DMT1250 will draw power from auxiliary battery to power DC load. So that connected DC load could be powered always either by engine or auxiliary battery.

Single output DM1230 and DM1245 are the booster charger only with charge current up to 30A or 45A respectively for 12V system.

Single output DM2430 is a booster charger only with charge current up to 30A for 24V system.

All DM and DMT chargers are Euro-6 engine compatible, which is able to charge auxiliary battery properly and fully with much wider variable voltage output from engine.

Features

- Dual outputs, separate circuits for charging battery and powering DC load (DMT1250);
- Non-isolation design with max efficiency 96%;
- Euro-6 engine (Smart alternator) compatible;
- TBB Premium II multiple stages charging algorithm;
- Multiple battery chemical for optional including lithium battery;
- Built-in automatic temperature compensated charging;
- Plug and Play for easy installation;
- Natural cooling without fan;
- Supports RS485 communication;
- Protection against input/output over voltage, output over current, output short circuit, internal over temperature, battery over temperature, battery low temperature protect for LFP etc.
- Back-charging function.

2.2 Topology

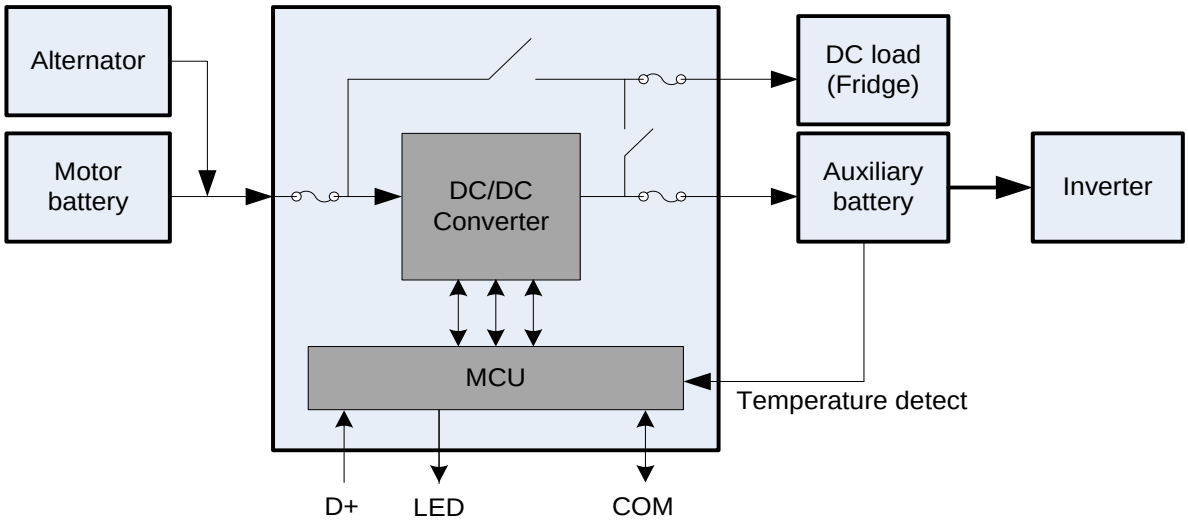


Figure 2-1 Topology of DMT models

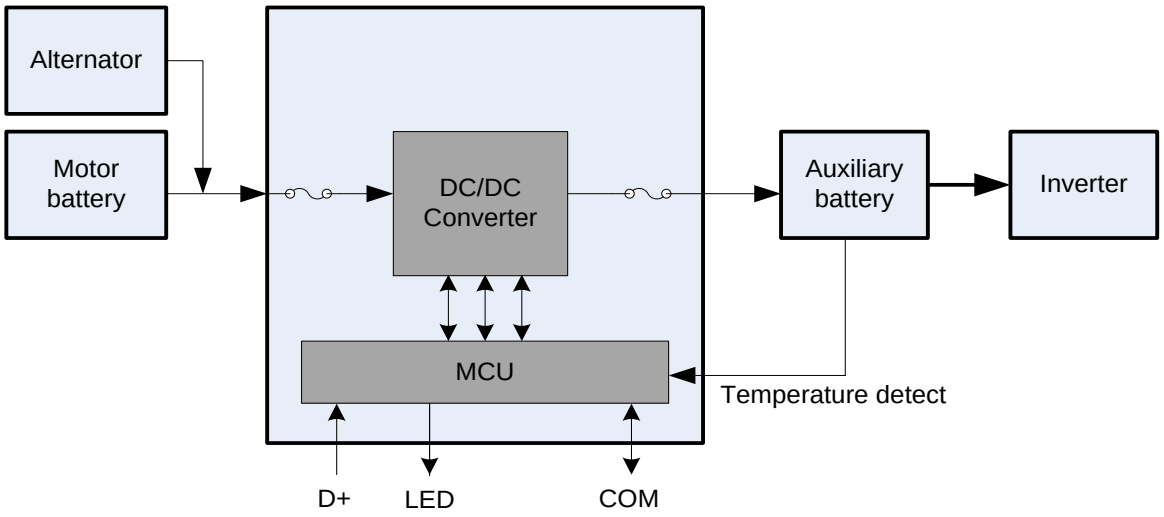


Figure 2-2 Topology of DM models

Thanks to its non-isolation design, the charging efficiency of DM/DMT is up to 96%.

When both alternator and auxiliary battery are well connected, DMT1250 will automatically judge if engine is turning on by detecting D+ signal or sensing alternator output voltage, to decide charge battery and power DC load by alternator, or power DC load by auxiliary battery.

All models support communication of RS485.

2.3 Booster mode logic

Table2-1 Charging logic for 12V system

ACC+/D+	Term	Configuration			
		Starter battery voltage		Time delay	
		Default	Range	Default	Range
With ACC+/D+ connected	D+/ACC+ **AND** voltage meets the threshold	≥13.2V	12~14.5V	20s	5~60s
Without ACC+/D+ connected	voltage meets the threshold	≥13.2V	12~14.5V	20s	5~60s

Table2-2 Stop charging logic for 12V system

ACC+/D+	Term	Configuration			
		Starter battery voltage		Time delay	
		Default	Range	Default	Range
With ACC+/D+ connected	no D+/ACC+ OR voltage meets the threshold	＜12.8V	11.6~13.5V	20s	5~60s
Without ACC+/D+ connected	voltage meets the threshold	＜12.8V	11.6~13.5V	20s	5~60s

Table2-3 Charging logic for 24V system

ACC+/D+	Term	Configuration			
		Starter battery voltage		Time delay	
		Default	Range	Default	Range
With ACC+/D+ connected	D+/ACC+ **AND** voltage meets the threshold	≥26.4V	24~29V	20s	5~60s
Without ACC+/D+ connected	voltage meets the threshold	≥26.4V	24~29V	20s	5~60s

Table2-4 Stop charging logic for 24V system

ACC+/D+	Term	Configuration			
		Starter battery voltage		Time delay	
		Default	Range	Default	Range
With ACC+/D+ connected,	no D+/ACC+ OR voltage meets the threshold	＜25.6V	23.2~27V	20s	5~60s
Without ACC+/D+ connected	voltage meets the threshold	＜25.6V	23.2~27V	20s	5~60s

Remark: All above threshold voltage and time delay can be configured by Program Tool RapNEMO.

2.4 TBB Premium II five stages charging algorithm

Fitted with five stages charging algorithm (soft start-bulk-absorption-float-recycle), DMT1250/DM1230 is able to charge auxiliary battery quickly and fully. Microprocessor controlled charging algorithm with variable absorption charging timer to guarantee the optimal charging for batteries of different discharged states.

Float charging and Recycle charging program guarantee your battery get proper maintenance in case of long time connected.

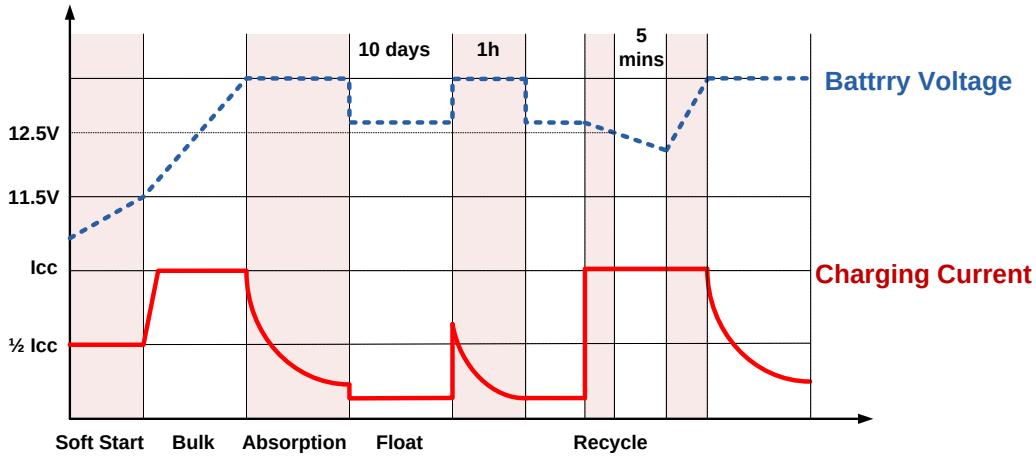


Figure 2-3 TBB Premium II Charging Algorithm

2.5 Battery temperature compensation

Battery temperature is a key factor in correct charging, the charging formula must be adjusted (automatically and in real time) according to the actual battery temperature to ensure that battery are fully charged but not overcharged or undercharged. All charging voltages recommended by battery manufacture are in fact only applied at 20℃-25℃.

The BTS (Battery Temperature Sensor) supplied with DM/DMT measures the temperature of battery and automatically makes adjustments at real time to properly charge your batteries at the default compensation rate of – 3mv/℃/cell.

In case of BTS was not present, the charger will use 25℃ as default setting.

Figure 2-4 Battery Temperature Sensor(BTS)

2.6 Back-charging function

It's required to connect D+ cable or ACC signal to enable back-charging function.

All standard models comes with back-charging function, which allows DMT/DM draws power from auxiliary battery to charge starter battery (charge current is from 0-3A). With back-charging function, it will prevent starter battery to get flat which fails to start engine.

Table2-5 Charging logic for 12V system

ACC/D+	Term	Starter battery voltage	Value Configuration			
			Auxiliary battery voltage		Time delay	
			Default	Range	Default	Range
With ACC+/D+ connected	No ACC+/D+ is detected AND voltage meet the threshold	⩽12.4V	⩾12.2V	12.2~14.5V	5s	5~60s
Without ACC+/D+ connected	without this function					

Table2-6 Stop charging logic for 12V system

ACC/D+	Term	Starter battery voltage	Value Configuration			
			Auxiliary battery voltage		Time delay	
			Default	Range	Default	Range
With ACC/D+ connected,	ACC+/D+ is detected OR voltage meet the threshold	⩾12.8V	⩽12V	12~14.3V	5s	5~60s
Without ACC+/D+ connected	without this function					

Table2-7 Charging logic for 24V system

ACC/D+	Term	Starter battery voltage	Value Configuration			
			Auxiliary battery voltage		Time delay	
			Default	Range	Default	Range
With ACC+/D+ connected	No ACC+/D+ is detected AND voltage meet the threshold	⩽24.8V	⩾24.4V	24.4~29V	5s	5~60s
Without ACC+/D+ connected	without this function					

Table2-8 Stop charging logic for 24V system

ACC/D+	Term	Starter battery voltage	Value Configuration			
			Auxiliary battery voltage		Time delay	
			Default	Range	Default	Range
With ACC/D+ connected,	ACC+/D+ is detected OR voltage meet the threshold	⩾25.6V	⩽24V	24~28.6V	5s	5~60s
Without ACC+/D+ connected	without this function					

Remarks:

1. All above threshold voltage and time delay can be configured by Program Tool RapNEMO.
2. Back charging function is only available upon D+/ACC+ connected.

2.7 De-rate curve against temperature increase

DM/DMT monitors the internal temperature to decide output power. It will de-rate its output power against temperature increasing. Below is a curve to reflect the change of output power with temperature increase.

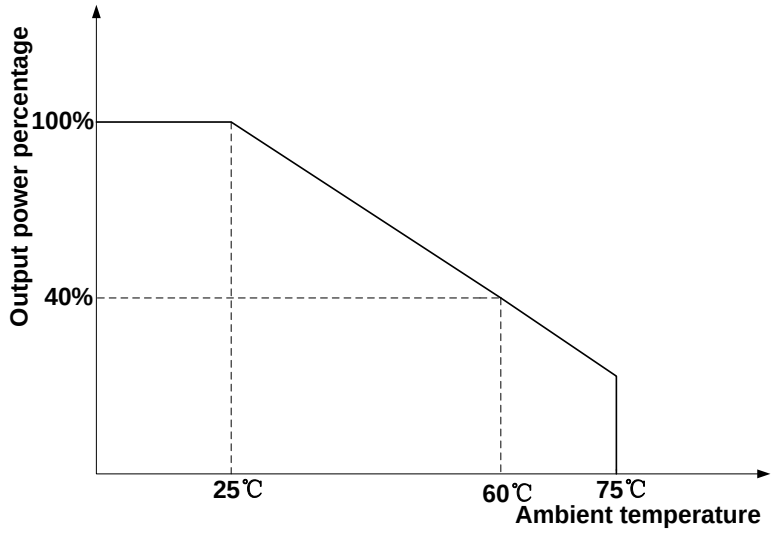


Figure 2-5 De-rate curve against temperature increase

3. Structure and dimension

3.1 Exterior and dimension

Figure 3-1 Product front view

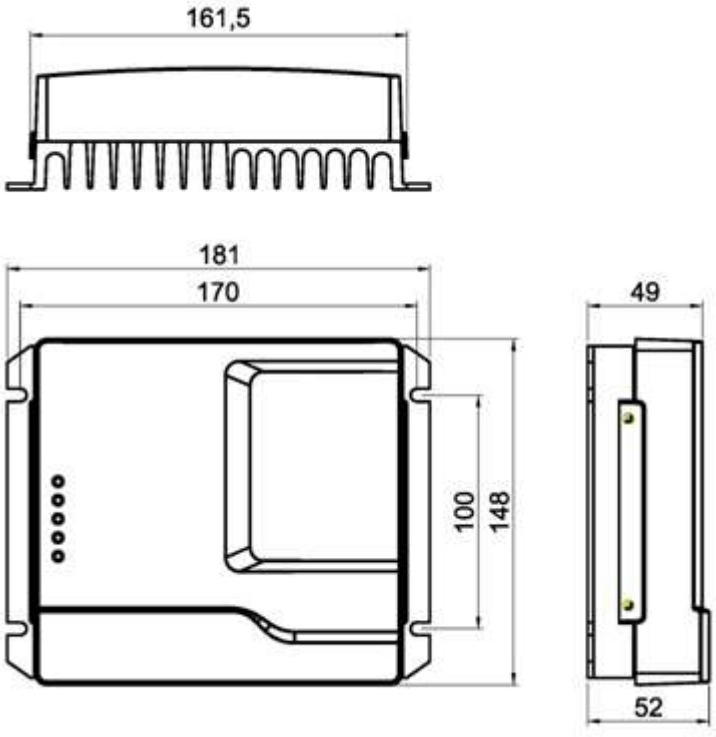


Figure 3-2 Product dimension

3.2 Connectors and terminals

Figure 3-3 Connectors and terminals

Table 3-1 Connectors and terminals definition

No	Print	Definition	Remarks
①	Alternator	Connects to positive of Alternator	Or connects to positive of starter battery
	BAT-	Connects to negative of Alternator	Or connects to positive of starter battery
②	Fridge/Load	Connects to positive of DC load (Fridge)	No available for DM1230
	AUX BAT	Connects to positive of auxiliary battery	
	BAT-	Connects to negative of DC load (Fridge) and negative of auxiliary battery	
③	COM	For communication of RS485	Pin definition can be found as below Table 3
④	D+	Connects to D+ or ACC signal at smart alternator	
	BAT-	Connects to BTS' black cable	For battery temperature sensing
	Temp	Connects to BTS' white cable	
	V-Sen	Auxiliary battery voltage sensing	No used

3.3 LED indication

Table 3-3 LED indication

No.	Print	Color	Status	Description
1	Power	Green	ON	Working normal
			OFF	No working or Low Power Mode
2	Fridge/Load (No available for DM1230)	Green	ON	Fridge/Load working
			Flashing	Fridge/Load is over-temperature; or output to Fridge/Load is over-current
			OFF	Fridge/Load no working
3	Alternator	Green	ON	Starter battery voltage in the range
			Fast flashing	Starter battery voltage high
			Slow flashing	Auxiliary battery charges to starter battery
			OFF	Starter battery voltage low
4	Charge	Green	ON	Charging battery at bulk or absorption stage
			Flashing	Charging battery at float stage
			OFF	No charging to auxiliary battery
5	Fault	Red	ON	1. Charger over temperature 2. Starter battery voltage high 3. Output to auxiliary battery short circuit
			Flashing	1. Auxiliary battery over temperature or under temperature 2. Fridge/Load over temperature (For DMT1250 only) 3. Output to Fridge/Load over current (ForDMT1250 only)
			OFF	No fault

4. Installation

4.1 Material checking

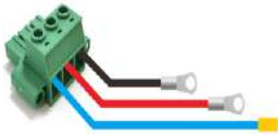
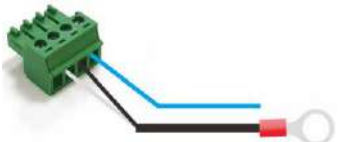
Before installation, please open the box to check if the product is broken or it's the right item you purchased. If you have any question, please don't remove the package and contact us in first time.

Please check the item with the list attached in the box.

4.2 Prepare harness

The output and input cable has to be fabricated at customer end. The suggested cable specification and counter connector could be found as below Table 4-1.

Table 4-1 Cable fabrication and counter connector

Connector at DMT	Print	Counter connector	Cable specification			
			Gauge	Length	Color	Terminal
Input connector port	Alternator		10~16mm^2	＜3m	Red	M8 terminal
	BAT-		10~16mm^2	＜3m	Black	M8 terminal
Output connector port	Fridge Load		4~6mm^2	＜3m	Blue	(No available for DM models)
	AUX BAT		6~16mm^2	＜3m	Red	M8 terminal
	BAT-		10~16mm^2	＜3m	Black	M8 terminal
Signal connector port	D+		0.3mm^2	--	Blue	--
	BAT-		0.3mm^2	2m	Black	M8 terminal
	Temp		0.3mm^2	2m	White	
	V-Sen		No available			

4.3 Proper installation location

- DM/DMT are designed with IP20, the installation location should be indoor.
- The temperature at the house and heat sink of the charger will be as high as 60℃ during its working. So please have it installed at a location hard to touch.
- Please have the installation stay away from inflammable and explosive goods.
- Please have the installation stay away from kids.
- Don't install the charger based on inflammable material.
- Please insure the mounting surface is solid enough for installation.

Please never install the charger into a seal enclosure with battery.

4.4 Installation space

It's required to leave space at installation for ventilation. The dimension for ventilation is defined as below.

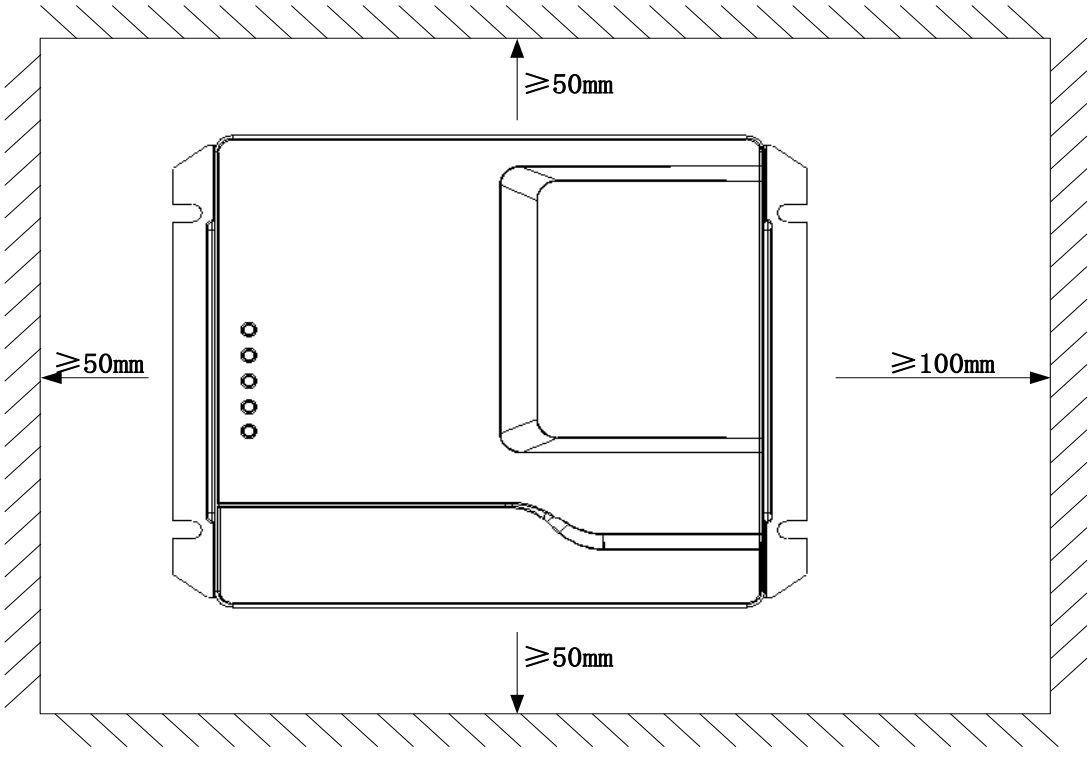


Figure 4-1 The required dimension for ventilation

4.5 Mounting holes

Find a appropriate mounting surface, drill mounting holes as dimension shown in below picture.

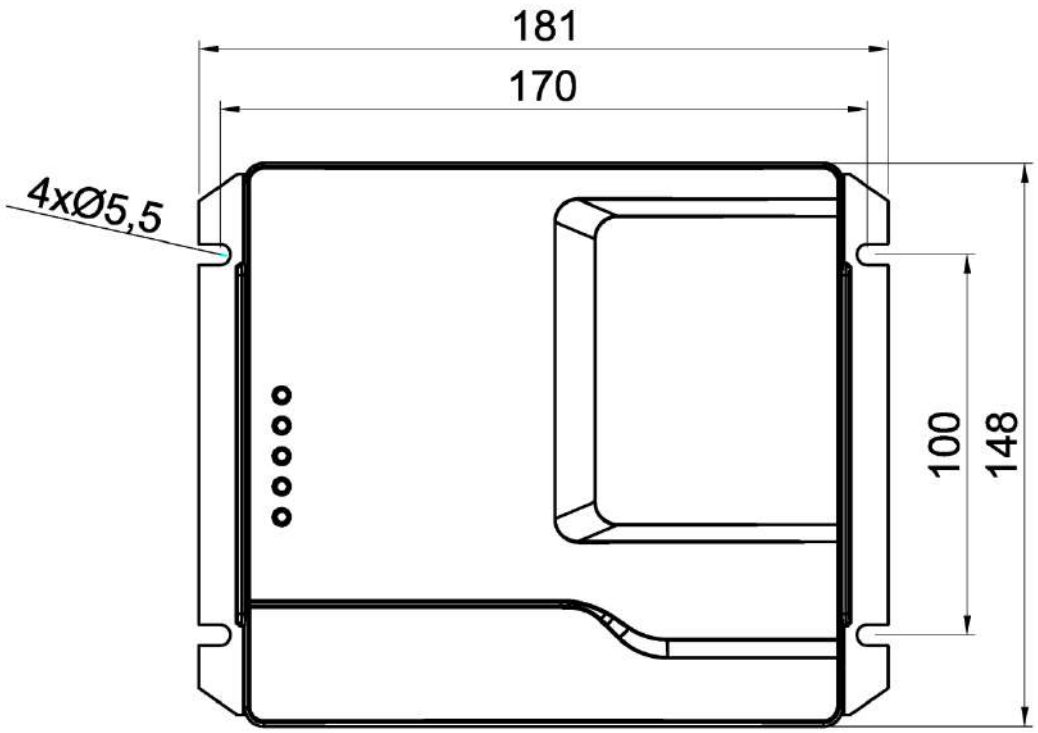


Figure 4-2 Drill holes for mounting

Please have the charger installed with auxiliary battery as close as possible to reduce voltage drop on cable.

4.6 Auxiliary battery type and fridge load work mode setting

Table 4-2 Battery type and charge voltage

Battery type	12V battery		24V battery	
	Absorption charging voltage	Float charging voltage	Absorption charging voltage	Float charging voltage
AGM (Default setting)	14.6V	13.5V	29.2V	27V
GEL	14.2V	13.8V	28.4V	27.6V
LFP	14.4V	13.5V	28.8V	27V
WET	14.8V	13.8V	29.6V	27.6V

The voltage of auxiliary battery must be above 2V if the battery type isn't lithium type, or the charger will not charge to auxiliary battery. If the auxiliary battery is lithium type and the voltage is below 2V , the charger works on 'wake up' mode with a constant voltage output until the output current over 3A and then the charger turns into the battery charging mode.

Table 4-3 Fridge load working mode (For DMT1250 only)

Working mode	**Description**
No power to DC load (Fridge)	DMT1250 will not power DC load (Fridge) under this mode.
Power DC load (Fridge) only upon driving	Under this mode: -DMT1250 will draw power from alternator to power DC load (Fridge) when engine is ON. -DMT1250 will stop powering DC load (Fridge) when engine is OFF.
Power DC load (Fridge) always (Default setting)	Under this mode: -DMT1250 will draw power from alternator to power DC load (Fridge) when engine is ON. -DMT1250 will draw power from auxiliary battery to power DC load (Fridge) when engine is OFF.

Note:

Auxiliary battery type and DC load work mode can be configured by program tool RapNEMO.

4.7 Cable connection

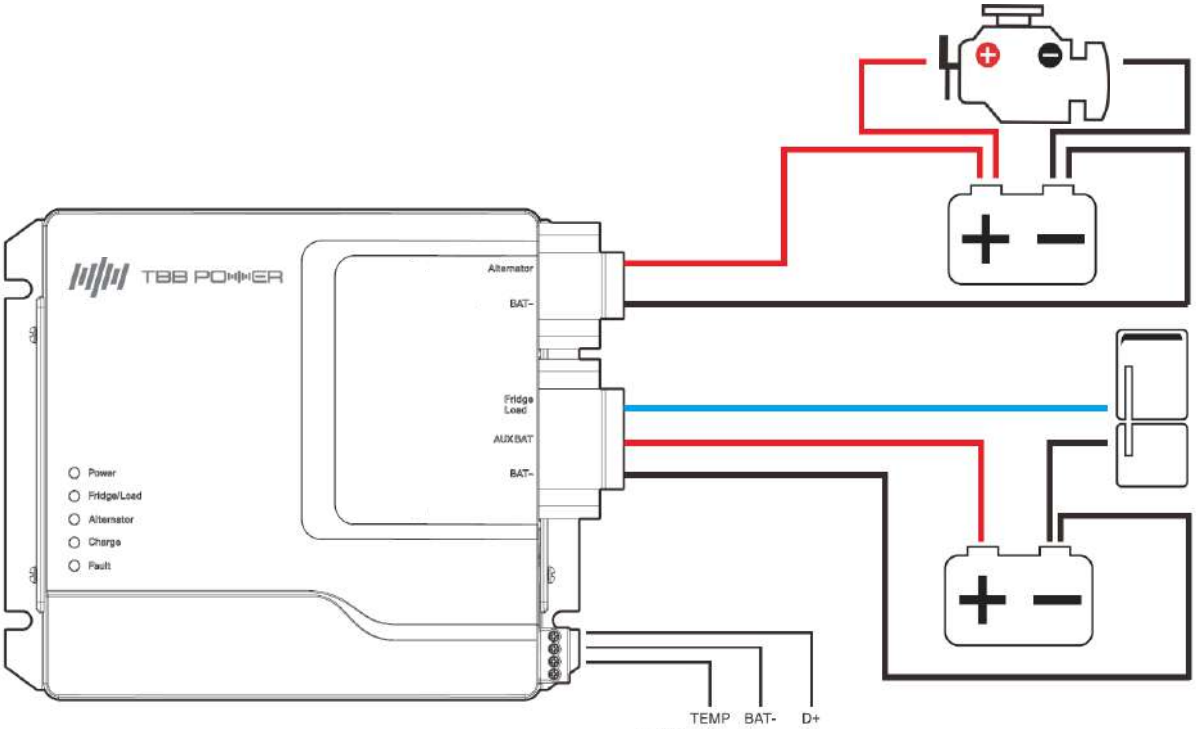


Figure 4-3 Connection diagram

Step 1: Prepare proper cables to connect with positive and negative terminals of starter battery; and fix them into counter part of input connector which also provided by TBB.

Step 2: Prepare proper cables to connect with positive and negative terminals of auxiliary battery, as well as positive and negative connector of DC load (Fridge); and fix them into counter part of output connector which also provided by TBB.

Remarks: For DM models, not necessary to prepare connectors for DC load.

Step 3: Prepare proper signal cable to connect with D+ at smart alternator; and fix battery temperature sensor cables into counter part of signal connector which also provided by TBB.

Step 4: Connects above signal cable in Step 3 to alternator D+ and positive terminal of auxiliary battery; then plug counterpart into signal connector on the charger respectively.

Step 5: Connects above cable in Step 1 to positive and negative terminals of starter battery; then plug counterpart into input connector on the charger respectively.

Step 6: Connects to above cables in Step 2 to positive & negative terminals of auxiliary battery and positive of DC load(Fridge); then plug counterpart into output connector on the charger.

Remarks: The negative cable of DC load (Fridge) will be connected to negative terminal of auxiliary battery directly or chassis.

It is strictly forbidden to use the device with other voltages or AC power, otherwise it will cause short circuit, fire and other accidents, putting people and the charger at risk.

Please make sure there is not reverse polarity connection anywhere. Please also check if connection is stable enough. Any damage caused by improper connection will be out of TBB’s warranty.

5. FAQ

No.	Issue	Analysis and countermeasure
1	Indicator of Alternator flashing, and indicator of Fault ON	1. Please check if voltage of alternator or voltage of starter battery is higher than 16.0V; if yes, please wait for the voltage dropped to 15.0V. If voltage of them is in the normal range while indicator is still flashing, please contact TBB for further advice.
2	Indicator of Fridge/Load flashing, and indicator of Fault ON (For DMT1250 only)	1. Please check if ambient temperature is over-temperature; If yes, please wait to the temperature is dropped to working range. 2. Please check if required current of fridge is greater than 21A; if yes, please make sure the required current is equal or less than 20A. 3. Please contact TBB for further advice if temperature and current are good while still have indicator flashing.
3	Indicator of Fault flashing, and indicator of Fridge/Load either ON or OFF	1.Please check if auxiliary battery is greater than 55℃; if yes, please have battery temperature dropped to 45℃. 2.For LFP battery type, the battery temperature must be over the setting value (default value is 0℃). 3.Please contact TBB for further advice if temperature is good while still have the issue.
4	Indicator of Fault ON, and indicator of Alternator either ON or OFF	1.DMT1250 is over temperature, please have it dropped to working temperature range. 2.Please check if output to auxiliary battery short circuit. Please contact TBB for further advice if no above phenomenon but still have indicator issue.

6. Specification

Model NO.	DMT	DM			
	1250	1230	1245	1260	2430
Electrical					
Alternator input voltage range (Default setting)	13.2~16VDC				26.4~32 VDC
Automatic activation D+	Yes				
Absorption charge voltage(Default Setting)	14.6VDC				29.2VDC
Float charge voltage(Default Setting)	13.5VDC				27VDC
Charge current	30A		45A	60A	30A
Load bypass current	20A	N/A			
Total current of load and charging	50A	30A	45A	60A	30A
Maximum charging efficiency	96%				
Maximum load bypass efficiency	99%	N/A			
Temperature compensation	Default Setting: -3mV/℃/cell				
Charge algorithm	TBB premium II multi stage				
Protection	Battery charger over temperature；Battery over temperature；Over load；Short circuit				
Back-charging function	Standard				
Communication	RS485, RJ45 connector				
Storage temperature	-40℃~70℃				
Operating temperature	-40℃~70℃				
Enclosure					
Battery Connection	Cable with connector				
Protection category	IP20				
Weight	1.0kg				
Dimensions（h*w*d）	181*148*52mm				
Standards					
Emission	ECE 10R-06，EN61000-6-1，EN61000-6-3				