1.5KW DC-DC Converter

Specification

TDC-J Series

V 3.2

Date_____2016-10-14_____

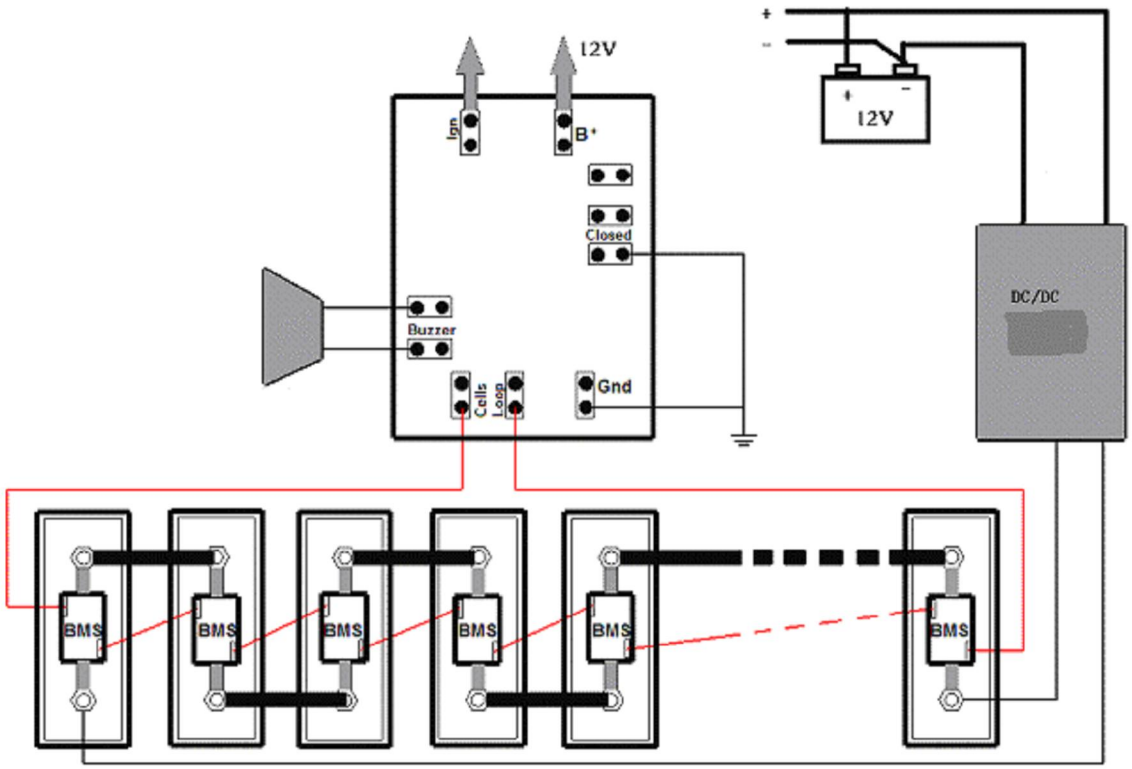
Table of Contents

DC-DC Converter Specifications

1 Overview

The TDC-J series 1.5KW DC-DC converters can be mounted on the electric vehicle to provide 12V / 24V low voltage DC power. Output can be attached to a 12V / 24V backup battery. The DC-DC converter automatically handles battery charge management. Case is fully sealed waterproof and dustproof structure, automotive temperature and anti-vibration protected.

The DC-DC converter and battery, 12V / 24V battery back-up, low-voltage equipment, and BMS are connected as shown below. The DC-DC converter high voltage DC power input is directly connected to the battery positive and negative, DC output is connected to a 12V battery backup, and then output to the respective 12V / 24V appliances.



2 Basic Functions

2.1 High-voltage DC battery power can be converted to 12V / 24V low-voltage DC

2.2 DC-DC converter capable of 12V / 24V backup battery charge management

2.3 With HVIL high voltage interlock function

2.4 CAN 2.0 communication displays the working status, fault code, etc.

2.5 The CAN bus can be used to run OBD diagnostics, display working status, modify operating parameters, and perform other programming functions

2.6 Protection features include input reverse polarity protection, input low-voltage protection, input overvoltage protection, output overvoltage, overcurrent, short circuit protection, over-temperature protection

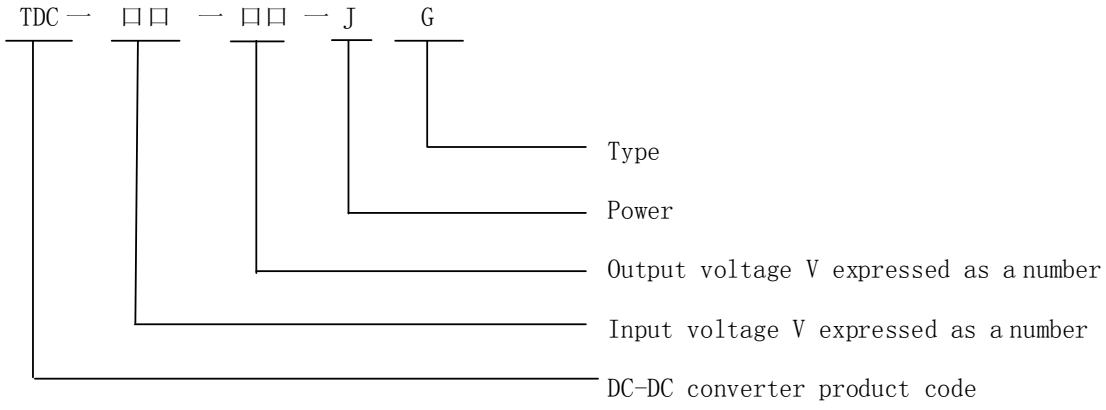
2.7 Input precharge function

2.8 Sealed waterproof structure, water-cooled, forced air cooling or natural convection cooling

3 Technical Specifications

3.1 Product Naming

3.1.1 Type designation

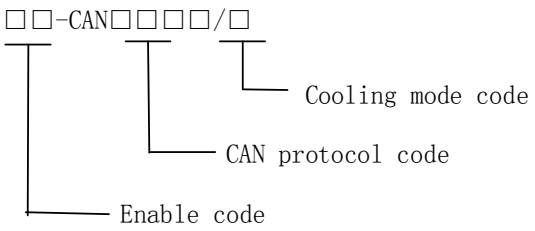


1.1.1 Model name representation

Name Representation

Name	Representation
Type	No letter = No isolation, G = Isolation, GC = Isolated band charging curve
Power	A=50W, B=100W, C=200W, D=300W, E=400W, F=500W, G=600W, H=800W, I=1000W, J=1500W, K=2000W, L=2500W, M=3000W

1.1.2 Configuration



1.1.3 Configuration description

Name Representation

Name	Representation
Enable code	AF = No enable line, AL = 12V / 24V enable line
CAN protocol code	5000-6000
Cooling mode code	F = fan forced air cooling, N＝natural cooling, W＝water-cooled

1.2 Model list

Input	Output	Model	Configuration	Remarks
144V	13.8V	TDC-144-12JG	AF-CANxxxx/x	No enable line
		TDC-144-12JG	AL-CANxxxx/x	With enable line
	27.6V	TDC-144-24JG	AF-CANxxxx/x	No enable line
		TDC-144-24JG	AL-CANxxxx/x	With enable line
320V	13.8V	TDC-320-12JG	AF-CANxxxx/x	No enable line
		TDC-320-12JG	AL-CANxxxx/x	With enable line
	27.6V	TDC-320-24JG	AF-CANxxxx/x	No enable line
		TDC-320-24JG	AL-CANxxxx/x	With enable line
360V	13.8V	TDC-360-12JG	AF-CANxxxx/x	No enable line
		TDC-360-12JG	AL-CANxxxx/x	With enable line
	27.6V	TDC-360-24JG	AF-CANxxxx/x	No enable line
		TDC-360-24JG	AL-CANxxxx/x	With enable line
540V	13.8V	TDC-540-12JG	AF-CANxxxx/x	No enable line
		TDC-540-12JG	AL-CANxxxx/x	With enable line
	27.6V	TDC-540-24JG	AF-CANxxxx/x	No enable line
		TDC-540-24JG	AL-CANxxxx/x	With enable line

1.3 Lithium Battery Model Select (lithium iron phosphate as an example)

Product	Cell nominal/maximum	Number of cells	Input voltage
TDC-144	3.2/3.6V	44-55	110-200V DC
TDC-320		88-120	220-450V DC
TDC-360		121-137	260-560V DC
TDC-540		160-178	420-650V DC

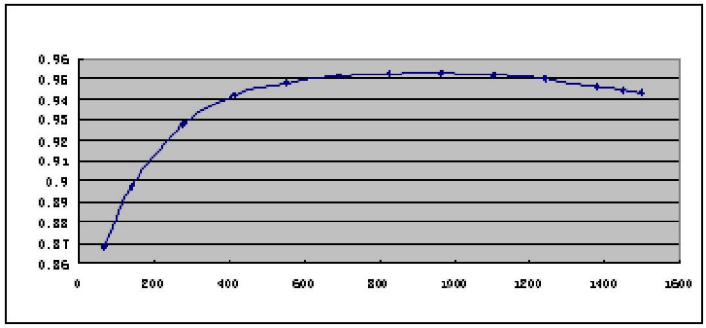
1.4 Technical Specification

Model		TDC-144 -12JG	TDC-144 -24JG	TDC-320 -12JG	TDC-320 -24JG	TDC-360 -12JG	TDC-360 -24JG	TDC-540 -12JG	TDC-540 -24JG
Input	Voltage	DC144V		DC320V		DC360V		DC540V	
	Current	11.5A		5A		4.5A		2A	
	Maximum	≤18A		≤9A		≤8A		≤3A	
	Input V	110-200V		220-450V		260-560V		420-650V	
	Minimum V	105V±5V		215V±5V		255V±5V		400V±5V	
	Maximum V	215V±5V		455V±5V		570V±10V		660V±10V	
	Start time	≈1.5S @ VIN=144V		≈0.9S @ VIN=320V		≈0.8S @ VIN=360V		≈0.6S @ VIN=540V	
Output	Output V	13.8V±1%	27.6V±1%	13.8V±1%	27.6V±1%	13.8V±1%	27.6V±1%	13.8V±1%	27.6V±1%
	Current	110A	55A	110A	55A	110A	55A	70A	35A
	Peak	135A-140A	65A-70A	135A-140A	65A-70A	135A-140A	65A-70A	70A-75A	35A-37A
	Power	1500W						1000W	
	Peak W	1800W 6 minutes						1000W	
	Efficiency	≥95%							
	Transient	≤50ms							
	Voltage reg	1%							
	Load reg	1%							
	Accuracy	≤1%							
	Steady flow	≤2%							
	O Leakage	≤5mA							
	O ripple	≤276mV @ 12V ≤552mV @ 24V							
	Over V Prot	15-16V @ 12V 29-30V @ 24V							

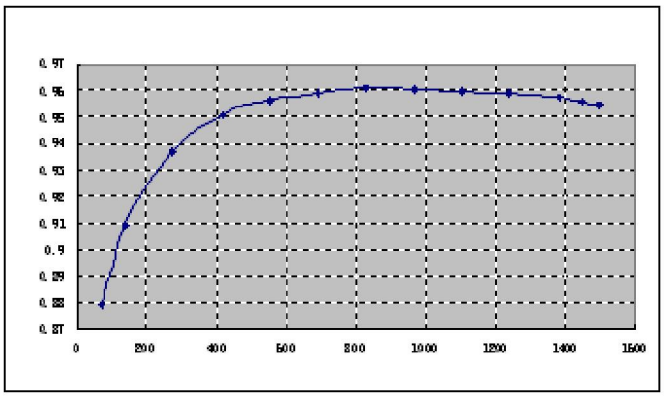
Other	12V/24V enable voltage	6-30V
	12V/24V enable current	≤1mA
	Output harness	25－30mm2 @ 12V　16mm2 @ 24V
	Ground Resist	Resistance between ground and heatsink less than 100 milliohms, test current 25A AC
	Working Temp	－30～60 ℃
	Storage Temp	－40～90℃
	Humidity	5%～95%non-condensing
	IP rating	GB4208-2008 IP67
	Test voltage	Withstands the test voltage shown in Table 1 with no corona, ionization, arcing or breakdown between test terminals
	Insulation resistance	At ambient temperature (23 ± 2) ℃ and relative humidity of 80% to 90%, not less than 2M Ω, test voltage in Table 2
	Noise	Distance 1.5m, A-weighted ≤55dB
	Electromagnetic Compatibility	Meets the GB / T 18655-2002 12 and 14 of the relevant requirements
	Reliability	MTBF 300,000 Hours

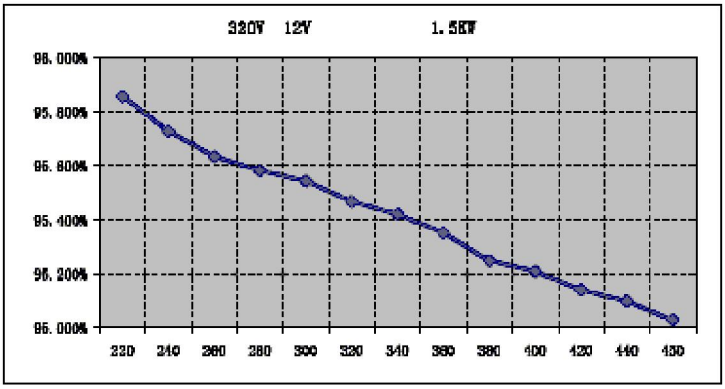
1.5 Efficiency

1.5.1 144V to 12V efficiency curve

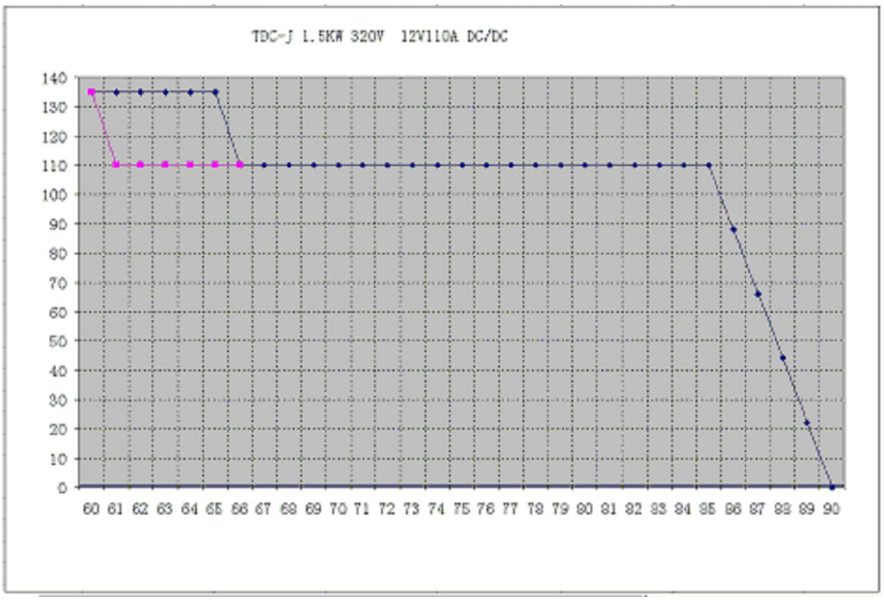


1.5.2 320V to 12V efficiency curve





1.6 320V to 12V temperature derating curve



Blue line for the temperature rise of the derating curve, red line for the temperature drop of the recovery curve

1.7 Withstand voltage characteristic

Terminal-to-ground (case) and each other, the dielectric strength of the electrical connection between the circuit should be able to withstand the test voltage in the table below, there should be no corona, ionization, arcing or breakdown phenomenon.

Table 1 test voltage

Between + and case	2500V DC	1min	Leakage ≤0.1mA
Input to CAN signal	2500V DC	1min	Leakage ≤0.1mA
CAN signal housing	500V DC	1min	Leakage ≤0.1mA

1.8 Insulation

Terminal-to-ground (case) and each other, the dielectric strength of the electrical connection between the circuit should be able to withstand the test voltage in the table below, there should be no corona, ionization, arcing or breakdown phenomenon.

Table 2 insulation test

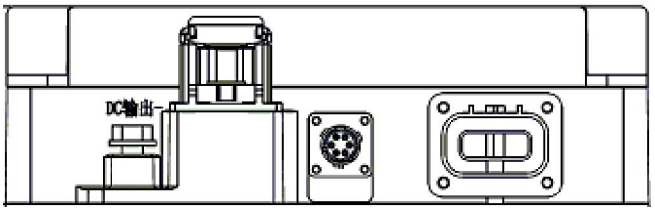
Negative input of the shell	1000V DC	1min	≥2M
Negative input signals to CAN	1000V DC	1min	≥2M
CAN signal housing	500V DC	1min	≥2M

2 Protective function

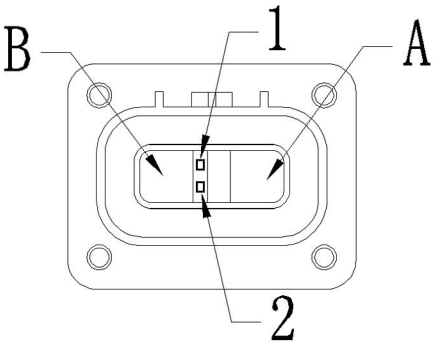
Overcurrent protection	The output is stopped when the output current exceeds the peak current
Output overvoltage protection	See Technical Specifications
Output under-voltage protection	The output voltage is below 6V Delay 2 seconds after the fault message Output Low
Over-temperature protection	Internal power began to drop 85 degrees, 90 degrees off
Input undervoltage protection	See Technical Specifications
Input overvoltage protection	See Technical Specifications
Short circuit protection	The output voltage is below 6V To resume normal operation to eliminate the short-circuit voltage to rise above 6V; delay of 10 seconds after the current dropped to a quarter of rated current
Input anti-reverse protection	Does not work, does not damage, restore the normal wiring
HVIL high voltage interlock	Loose input plug when not plugged into place, DC-DC stops working
Communication protection	Auto-stop when CAN communication is disabled (optional)

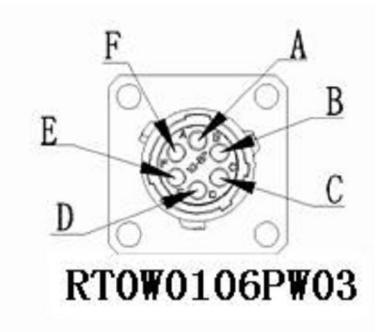
3 Interface diagram

With input, output, signal three interfaces, the output negative for the aluminum shell.



4 Interface definition diagram





Input connector signal plug-in:

Model: HV1-Z2J (40A) -00

Plug-in model: HV1-T2K (40A) -00

Plug-in model: RTOW6106SWHEC03 (short)

Brand: Xin Xi

Model: RTOW0106P W 03

Plug-in model: RTOW6106S W H03 (long)

Brand: Amphenol

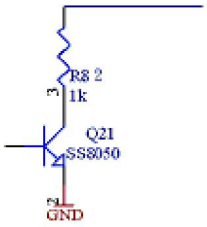
1	HVIL(interlock)
2	HVIL(interlock)
A	DC input +
B	DC input -

Definition:

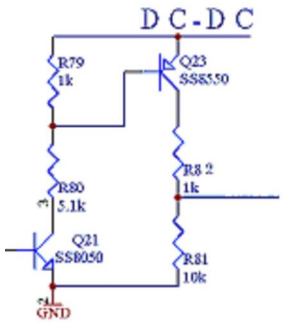
A	CANL
B	CANH
C	CANGND
D	12/24V control
E	Instructions
F	Fault

5 Interface Schematic

Work instructions: Output: As shown in the figure, when the DC-DC output voltage exceeds 13V or greater than the operating current of 1 A, work instructions valid pin is pulled low (1K impedance); when the DC-DC does not work, the pin is in open high-impedance state. Maximum withstand voltage of 30V. Working with indication output DC-DC main output negative common ground (ground shell).



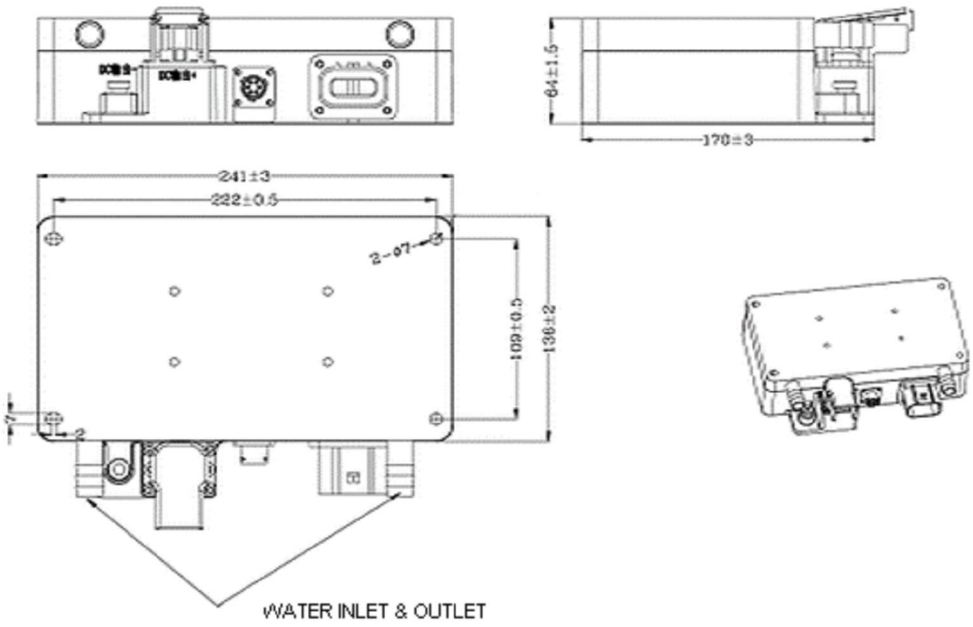
When the fault when the DC-DC, is the output voltage is less than 12.5V, while current is less than 1 A, the high level fault signal output (with DC-DC output voltage equivalent, 1K impedance): Fault indication output: As shown in the figure, when the DC-DC works, it outputs a low level state, 10K impedance. Fault indication output with DC-DC main output negative common ground (ground shell)



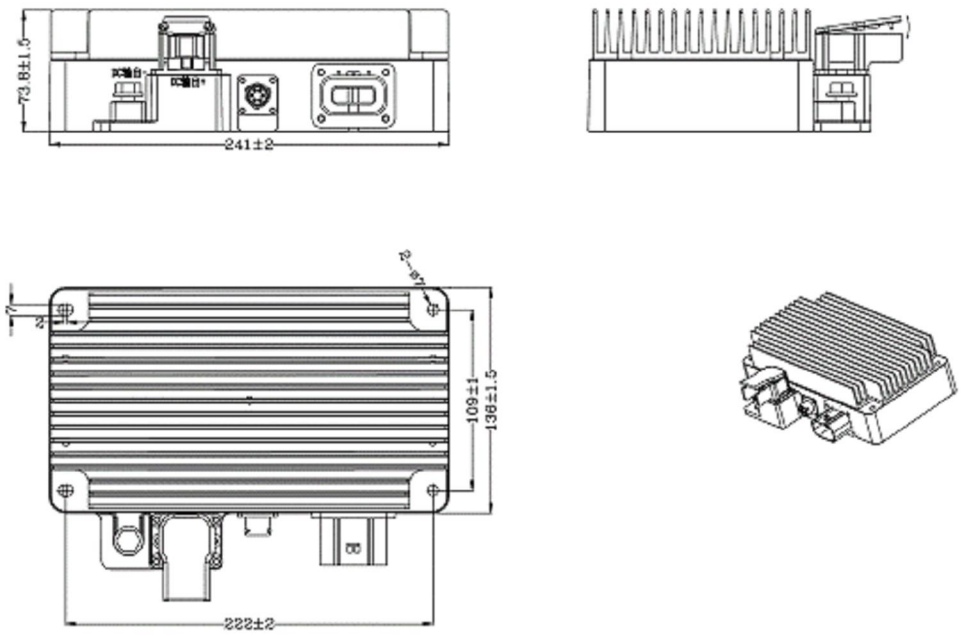
6 Power Density

	weight	volume	Mass unit density	Bulk density
Unit	kg	L	kw/kg	kw/L
Natural cooling	4.2	3.2	0.36	0.47
Water-cooled	4.8	2.6	0.31	0.58

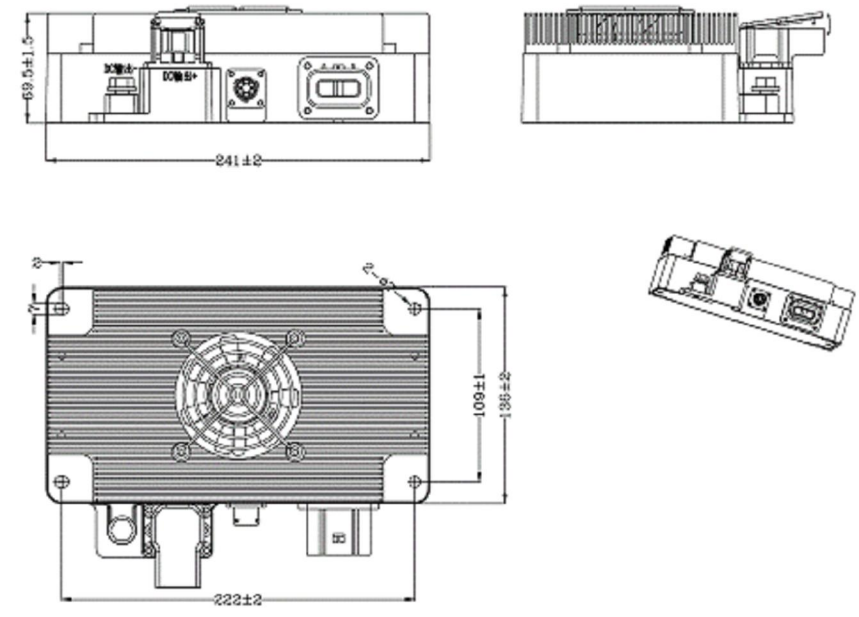
7 Water cooling dimensions (in mm)



8 Natural cooling dimensions (in mm)



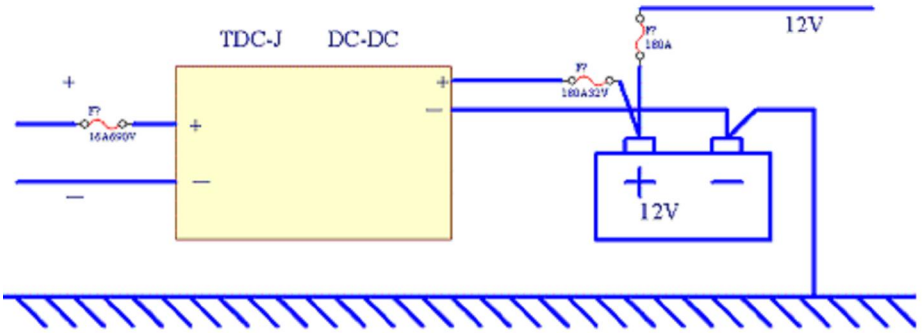
9 Forced air cooling dimensions (in mm)



10 Application

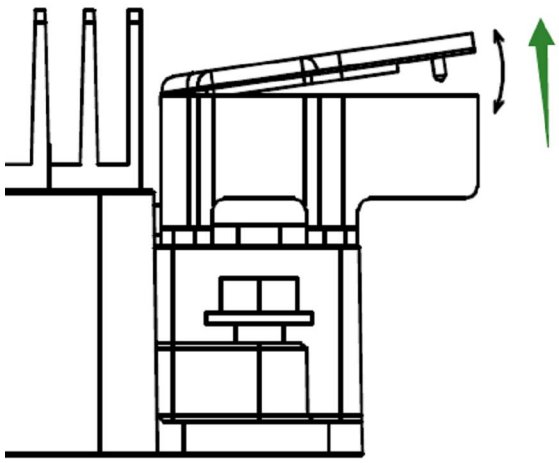
14.1、DC-DC input terminal HV DC requires an external fast fuse and installed in a easily replaceable position. Fuse value of 1.5-2 times the current value, 320V models need 16 -20A 690V, 144V models need 24 -32A 250V, 360V-540V models need 10 -16A 750V.

10.2、DC-DC output terminal needs a fuse at both ends, and the battery negative must be connected to the frame, as shown below. Fuse is determined by the maximum current, generally more than 180A.



14.3、The battery terminals must be tight to prevent damage to the DC-DC.

14.4、The output positive terminal block protective cover can be opened up as shown below:



14.5 Standard water-cooled model parameters (model 24013520)

Dimensions: 240mm * 135mm * 20mm
Material: 6063 (T6)
Access to water diameter: 1 2 mm
Weight: 17 49 g
Surface treatment: degreasing, drawing
Flow rate: 5 -20L / min
Pressure: 200 kPa
Water capacity: 1 6 0mL
Maximum feed water temperature: not more than 70 degrees (DC-DC output 1500W, flow rate 5 L / min)
Cooling parameters: flow rate 5 L / min, heating power 300W, Thermal resistance 0.042 degrees / W, the flow resistance of 0.0 17 bar
Cooling parameters: flow rate 7 L / min, heating power 300W, Thermal resistance 0.029 degrees / W, flow resistance 0.035bar

14.6 Standard water-cooled model parameters (model 24013525)

Dimensions: 240mm * 135mm * 25mm
Material: 6063 (T6)
Access to water Diameter: 18mm
Weight: 2187g
Surface treatment: degreasing, drawing
Flow rate: 5 -20L / min
Pressure: 200kpa
Water capacity: 200 mL
The maximum water temperature: not more than 70 degrees (DC-DC output 1500W, flow rate 5 L / min)
Cooling parameters: flow rate 5 L / min, heating power 300W, Thermal resistance 0.054 degrees / W, flow resistance 0.009bar
Cooling parameters: flow rate 7 L / min, heating power 300W, Thermal resistance 0.031 degrees / W, flow resistance 0.015bar

15. Installation Requirements

1 Air-cooled DC-DC heatsink must have at least 3cm clearance in order to facilitate ventilation.
2 Natural cooling type DC-DC must be mounted with radiator up, not down. There must be a clearance of at least 10cm for the heat sink.

3 Water-cooled DC-DC controller needs to start primary coolant fan when the water temperature is 60 degrees, and stop at 50 degrees.

4 Air cooling and natural cooling type DC-DC must not be installed in a confined space. Fresh cool air ventilation must be provided to prevent overheating.

5 Output positive terminal M8 studs,use 14mm hex nuts, tightening force 14-16 Nm.

6 Output negative terminal M8 hex flange bolt tightening force 14-16Nm.