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OBC+DC Technical Manual

Model：

AT1K5D6K6B-D14B144-LF

AT1K5D6K6B-D14B312-LF

AT1K5D6K6B-D14B144-LW

AT1K5D6K6B-D14B144-LW

Name： Combo 6.6KW OBC+1.5KW DC/DC Converter

Version： V1.0

Issue Date： 2019-2-27

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V1.0	Draft	Tianxiang Pan	Lizhen Tang	Hongbin Zhang	2019.2.27

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Content

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1 Overview

1.1 Subject

AT1K5D6K6B-LF/-LW series full-sealed on-board charger and DC/DC integrated is a product specially designed for new energy vehicle by ANNREN Technologies Co.,Ltd according to China standard QC/T895-2011《Conductive On-board Charger for Electric Vehicle》 and GB/T24347-2009《Electrical Vehicle DC/DC Converter》,which function is as the battery charger plus providing the 12V low voltage DC power supply for low voltage devices in the vehicle, the output can connect to 12V back-up battery, DC-DC converter will make the charge management to the back-up battery. This product not only has the advantages of high efficiency, small size, high stability, long-lifetime but also with the performance of high protection level, high reliability, more protection functions, it is an ideal solution for electrical vehicle. Thermal sensor is built-in the charger, has the function of over-temperature and can auto-recovery when temperature decreased. With the process of full-sealing, achieve the protection level of IP67, which make sure the excellent working under the complicated operation condition.

1.2 Main Features

1.2.1 Support UDS diagnosis, with CAN wake-up function

1.2.2 Full-sealed process, can reliably work in the temperature of -40℃~55

1.2.3 Built-in thermal sensor, shut off when temperature up to 90℃

1.2.4 Protection Reachs IP67

2 Size and Appearance

2.1 Size and Weight

	Length（mm）	Width（mm）	Height（mm）	GW（KG）
Fan-cooled	380±5	290.3±3	87±5	＜8.7
Liquid-cooled	380±1	290.3±1	87±1	＜8.7

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2.2 Appearance

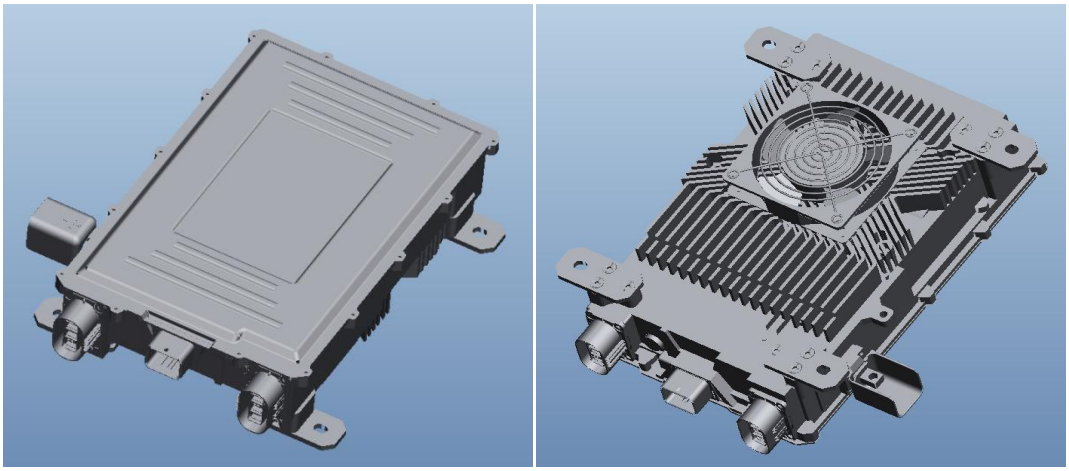


Chart 1 Fan-cooled Appearance

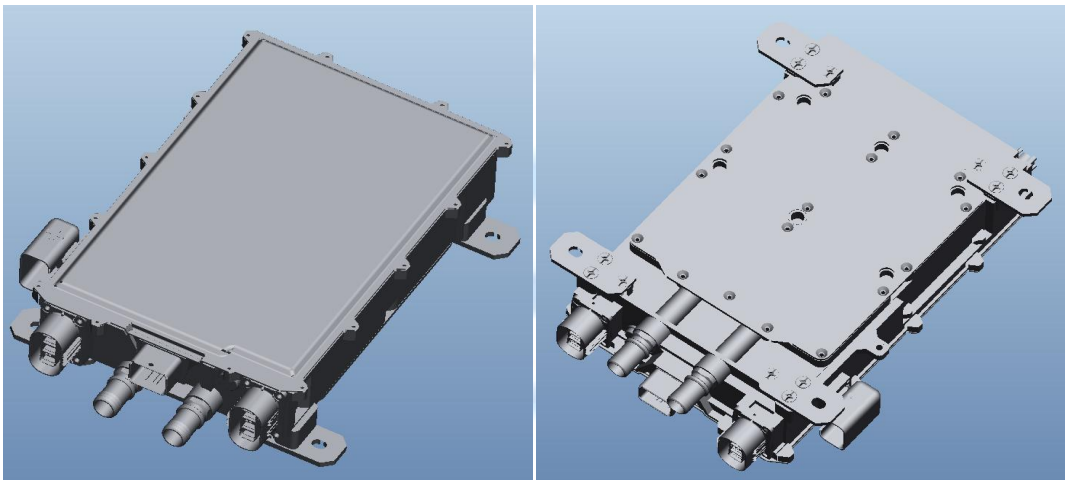


Chart 2 Liquid-cooled Appearance

2.3 Label

3 Environmental Specification

▲ Working environmental temperature

Area	Lowest Temperature	Highest Temperature
Global	-40℃	55℃

▲Storage environmental temperature

Area	Lowest Temperature	Highest Temperature
Global	-55℃	95℃

▲Humidity：relative humidity 5%~95%，no condensation

▲Altitude：≤3000m

▲Working noisy：max when working ≤65dB，meet China standard QTC 895-2011

4 Charger Technical Specification

4.1 Charger regulatory requirements and reference standards

The design and production of the charger must meet the relevant requirements of China's mandatory laws and environmental regulations on vehicle requirements，reference standards as following:：

No.	Standard Code	Standard Name	Remark
1	QC/T 895-2011	Conductive on-board charger of electrical vehicle	/
3	QSQR E1-5-2012	Prohibited substances requirement	/
4	GB/T 18387-2008	Electromagnetic field emission intensity limits and measurement methods for electric vehicles, broadband，9kHz~30MHz	/
5	GB/T 18384-2015	Safety requirements of electrical vehicle	/
6	GB/T 18487-2015	Electric vehicle conductive charging system	/
7	GB/T 28382-2012	Pure electric passenger vehicle technical conditions	/
8	GB/T 14023-2011	Limits and methods of measurement for radio disturbance characteristics of vehicles, ships and installations driven by internal combustion engines	/
9	EN 55022	Electromagnetic compatibility test Testing Technology Electromagnetic anti-interference test of information technology products	/
10	EN 50178	General electronic appliance safety standards	/
11	EN 61000-3-2	Electromagnetic compatibility test Testing Technology Harmonic current emission test	/
12	EN 61000-3-3	Electromagnetic compatibility test Testing Technology	/

		Voltage fluctuation and scintillation test	
13	EN 61000-4-2	Electromagnetic compatibility test Testing Technology Electrostatic release immunity test	/
14	EN 61000-4-3	Electromagnetic compatibility test Testing Technology Anti-jamming test of radio frequency electromagnetic wave	/
15	EN 61000-4-4	Electromagnetic compatibility test Testing Technology Electrical fast transient/impact immunity test	/
16	EN 61000-4-5	Electromagnetic compatibility test Testing Technology Surge (impact) immunity test	/
17	EN 61000-4-6	Electromagnetic compatibility test Testing Technology Test of immunity to conductive interference induced by radio frequency magnetic field	/
18	EN 61000-4-8	Electromagnetic compatibility test Testing Technology Frequency magnetic field anti-interference test of power supply	/
19	EN61000-4-11	Electromagnetic compatibility test Testing Technology Voltage transient drop anti-jamming test	/
20	EN 61000-6-1	General standard for electromagnetic compatibility testing， Immunity for domestic, commercial and light industrial environments	/
21	EN 61000-6-2	General standard for electromagnetic compatibility testing，Immunity in industrial environments	/
22	EN 61000-6-3	General standard for electromagnetic compatibility testing，Radiation standards for residential, commercial and light industrial environments	/
23	EN 61000-6-4	General standard for electromagnetic compatibility testing,Emission standard for industrial environments	/
24	QSQR E8-4-2015	EMC technical requirements for electronic components and subsystems of passenger vehicles	/
25	GB/T 18655-2010	Limits and measurement methods for the radio disturbance characteristics of vehicles, ships and internal combustion engines used to protect vehicle-mounted receivers	/

4.2 Charger Safety Regulations Specification

	Condition	Requirement
Grounding resistance test	@25A/AC	≤100mΩ
Input insulation test	@1000V/DC	≥20MΩ
Output insulation test	@1000V/DC	≥20MΩ
Input withstand test	@2000V/AC 1min	Leak current≤15ma
Output withstand test	@2000V/AC 1min	Leak current≤10ma
Input to Output withstand test	@2000V/AC 1min	Leak current≤10ma

4.3 Charger Electrical Performance

4.3.1 Input

Input	Input voltage range	AC 90~265V
	Frequency	47~63Hz
	Input Current	≤32A
	Power Factor	≥0.98； @ ≥3300W
	Starting inrush current	≤48A

4.3.2 Output

Voltage Plateform		144V	312V	/	/	/
Output	Output voltage range	95~202V	200~450V	/	/	/
	Max output current	46A	20A	/	/	/
	Output power	6600W@220VAC；3300W@110VAC				
	Output way	CV/CC				
	Efficiency	≥94%				
	CV accuracy	±1%				
	CC accuracy	±2%				
	Ripple voltage coefficient	±5%				
	Output voltage rising time	＜5S，overshoot＜10%				
	Shut off response time	Current decreased below 10% in 300ms，and decreased to 0A in 500ms				
	Stand-by power consumption	≤5W				

4.3.3 Low Voltage Output

Low voltage Output	Output way	CV
	Output voltage	12V
	Nominal current	5.5A
	CV accuracy	±2%
	Output Power	≥66W
	Ripple voltage coefficient	≤1%

4.3.4 Low Voltage Interface

Low Voltage Interface	CAN Communication	yes
	Baud rate	Optional for 125Kbps、250Kbps、500Kbps
	Terminal resistance	Not available

4.3.5 Environment Test

Humidity Test	Meet QCT 895-2011 7.2.1
Low temperature working test	Meet QCT 895-2011 7.2.2.1
Low temperature storage test	Meet QCT 895-2011 7.2.2.2
High temperature working test	Meet QCT 895-2011 7.2.2.3
High temperature storage test	Meet QCT 895-2011 7.2.2.4
Salt spray test	Meet QCT 895-2011 7.8.5
EMI	Meet GB/T 18487.3-2001 11.3.1
EMD	Meet GB/T 18487.3-2001 11.3.2
Harmonic current	Meet GB 17625.1-2003 6.7.1.1
Protection level	IP67
Vibration resistance	10~25Hz swing 1.2mm，25－500Hz 30m/S^2，8 hours each direction
M T B F	150000H

4.3.6 Charger Protection Functions

Protection Functions	Input over-voltage protection	AC270 ± 5V
	Input low-voltage protection	AC85 ± 5V
	Output over-voltage protection	Stop output when exceed the highest voltage ±5V
	Output low-voltage protection	Stop output when below the lowest voltage ±5V
	Over-temperature protection	Power start to decrease when internal temperature rise to 85℃, shut off when rise to 90℃
	Output short circuit protection	Stop output
	Output polarity reverse protection	yes
	Grounding protection	⩽100mΩ
	CAN Communication protection	Automatically stop output when CAN communication fails
	Power-off protection	Yes

5 DC/DC Converter Technical Specification

5.1 DC/DC Converter Regulations requirements and reference standards

No.	Standard Code	Standard Name	Remark
1	GB/T 24347-2009	Electric vehicle DC/DC converter	/
2	GB/T 18488.1-2015	Electric motors and their controllers for electric vehicles -	/

		part 1: technical conditions	
3	GB/T 18384.2-2015	Safety requirements for electric vehicles - part 2: functional safety and fault protection	/
4	GB/T 18384.3-2015	Safety requirements for electric vehicles - part 3: protection against shock to personnel	/
5	GB/T 18387-2008	Limits and measurement methods for electromagnetic field emission intensity of electric vehicles	/
6	GB/T 31498-2015	Post-crash safety requirements for electric vehicles	/
7	GB 9254-2008	Limits and methods for measurement of radio harassment for information technology equipment	/
8	GB/T 18655-2010	Limits and measurement methods for radio disturbance characteristics of vehicles, ships and internal combustion engines used to protect vehicle-mounted receivers	/
9	GB 29743-2013	Motor vehicle engine coolant	/
10	GB 4208	Enclosure protection level (IP code)	/
11	GB/T 28046-2	Environmental conditions and tests for electrical and electronic equipment for road vehicles - part 2: electrical loads	/
12	GB/T 28046-3	Road vehicles - environmental conditions and tests for electrical and electronic equipment - part 3: mechanical loads	/
13	GB/T 28046-4	Environmental conditions and tests for electrical and electronic equipment for road vehicles - part 4: climatic loads	/
14	GB/T 2423.34-2012	Environmental test - part 2: test method test Z/AD: combined temperature/humidity cycle test	/
15	GB/T 2423.1-2008	Environmental testing of electrical and electronic products - part 1: test methods - test B: low temperature	/
16	GB/T 2423.2-2008	Environmental tests for electrical and electronic products - part 2: test methods - test B: high temperature	/
17	GB/T 2423.3-2008	Electrical and electronic products - environmental tests - part 2: test methods - Cab: constant heat and humidity test	/
18	GB/T 2423.17-2008	Environmental tests for electrical and electronic products - part 2: test methods : salt spray	/
19	GB/T 30512-2014	Prohibited substances requirements for automobiles	/
20	QC/T 413	Basic technical conditions of automotive electrical equipment	/

5.2 DC/DC Converter Safety Regulations Specification

	Condition	Requirement

Grounding resistance test	@25A/AC	≤100mΩ
Input insulation test	@1000V/DC	≥20MΩ
Input withstand test	@2000V/DC 1min	Leak current≤10ma

5.3 DC/DC Converter Electrical Performance

5.3.1 Input

Nominal Voltage	144V	312V	/	/	/
Input voltage range	88-195V	206-454V	/	/	/

5.3.2 Output

Output	Nominal output voltage	14V
	Output voltage range	9~15V
	Nominal output current	110A
	Peak current	135A-140A
	Nominal power	1500W
	Peak power	1800W last 6 minutes
	Efficiency	≥94%
	Dynamic response time	<50ms
	Voltage regulation	≤1%
	Load regulation	≤1%
	Voltage control accuracy	≤1%
	Current control accuracy	≤2%
	Quiescent current	≤1mA @14V
	Ripple voltage coefficient	≤2% @nominal working state

5.3.3 Environment Test

Humidity test	Meet GB/T 24347-2009 6.1.2
Low temperature test	Meet GB/T 24347-2009 6.1.1.1
High temperature test	Meet GB/T 24347-2009 6.1.1.2
Salt-spray Test	Meet GB/T 24347-2009 6.1.3
EMI	Meet GB/T 17619-1998 article 4
EMD	Meet GB 18655-2002 article 12 and 14
Salt-spray Test	IP67
EMI	10~25Hz swing 1.2mm，25－500Hz 30m/S^2，8 hours each direction
M T B F	150000H

5.3.4 DC/DC Converter Protection Functions

Protection Functions	Input over-voltage protection	144V	312V	/	/	/
		＞195V	＞454V	/	/	/
	Input low-voltage protection	144V	312V	/	/	/
		＜88V	＜206V	/	/	/
	Output over-voltage protection	Output voltage over-voltage protection threshold is 16±0.5V，working recovery after voltage back to≤14±0.2V				
	Output low-voltage protection	Output voltage low-voltage protection threshold is 7±1V，working recovery when voltage rise to≥9±0.2V				
	Output over-current protection	Reduces the output voltage when the output current exceeds the maximum output current				
	Over-temperature protection	Power start to decrease when internal temperature rise to 100℃, shut off when rise to 110℃, auto-recovery when power decreased				
	Short circuit protection	Yes, auto-recovery				

6 Interface

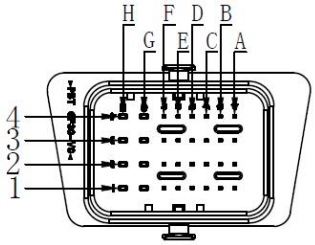
The interfaces in the charger can be grouped into two categories, one category is low voltage interface, the other is high voltage interface.

Low voltage interface includes signal connector and DC/DC output

High voltage interface includes AC220V input, OBC output and DC/DC input.

6.1 Low Voltage Connector and Pins Definition

6.1.1 32 pin Low Voltage Connector

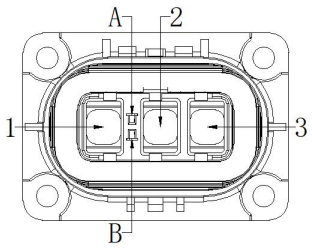


0643340100 Charger Low Voltage Connector
0643193211 Charger Low Voltage Connector

Pin No.	Name	Definition	Description
1H	KL30 constant power supply input	constant power supply input +	constant power supply input 9-16V，peak current 3A（electronic lock locking），time 1.5S,sleep current≤1ma
2F	CAN/GND		
2H	12V5A+	OBC low voltage power supply +	By controlled to output 13.8V，max output current capacity5.5A（long time）
4A	CAH-H	CAN H	
4B	CAN-L	CAN L	
4C	HVIL+	High voltage connector interlock signal 1	Can be detected by vehicle or by charger,max voltage 12V，current is lot more than 0.1A
4D	HVIL-	High voltage connector interlock signal 2	
4G	KL31 Constant power supply input-	Constant power supply input-	Can be connected with OBC grounding, voltage is 0V, peak current is 5A
Others	NA	/	/

6.2 High Voltage Connectors and Pins Definition

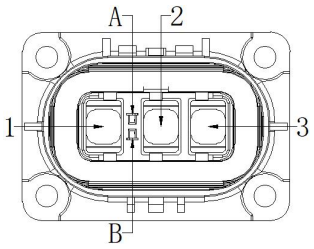
6.2.1 AC Input



REM Ⅱ-Z3PCH-6-A AC Input

REM Ⅱ-T3PCH-6-A AC Input			
Brand	Pin	Definition	Wire diameter（mm² ）
Ruikeda	1	火线（L）	Brwon/6
	2	地线（PE）	Yellow Green/6
	3	零线（N）	Blue/6
	A	HVIL 1	Black/0.5
	B	HVIL 2	Black/0.5

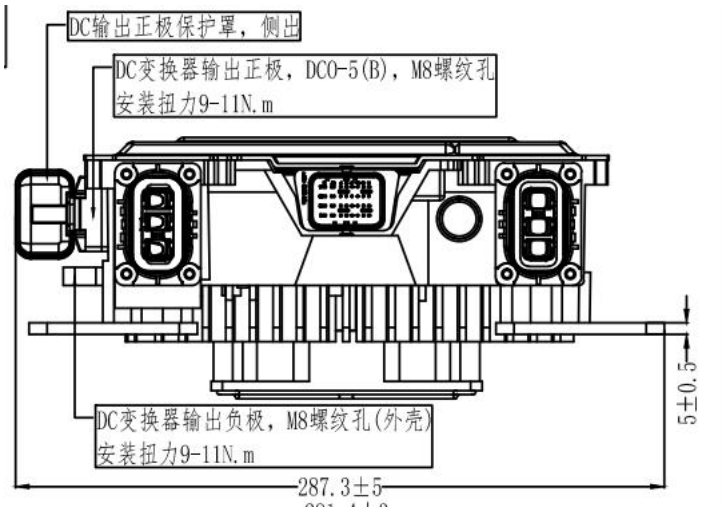
6.2.2 OBC Output and DC-DC Input



REM Ⅱ-Z3PAH-4-A OBC Output and DC-DC Input REM Ⅱ-T3PAH-4-A OBC Output and DC-DC Input			
Brand	Pin	Definition	Wire diameter(mm²)
Ruikeda	1	OBC output +	Red/4
	2	Sharing -	Black/4
	3	DC input +	Yellow/4
	A	HVIL 1	Black/0.5
	B	HVIL 2	Black/0.5

7. Mechanical Requirement

7.1 Air-cooled Drawing



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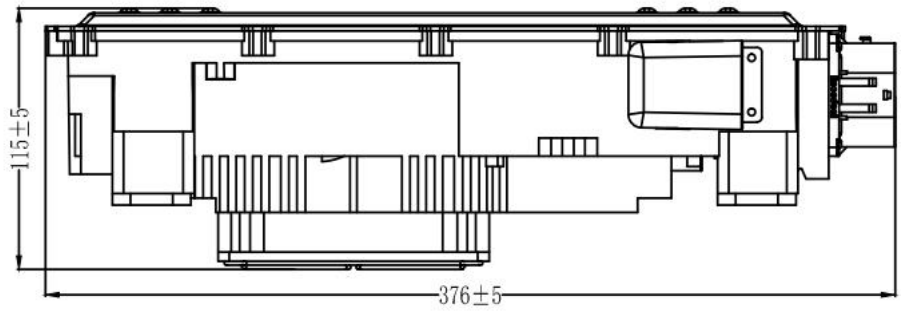
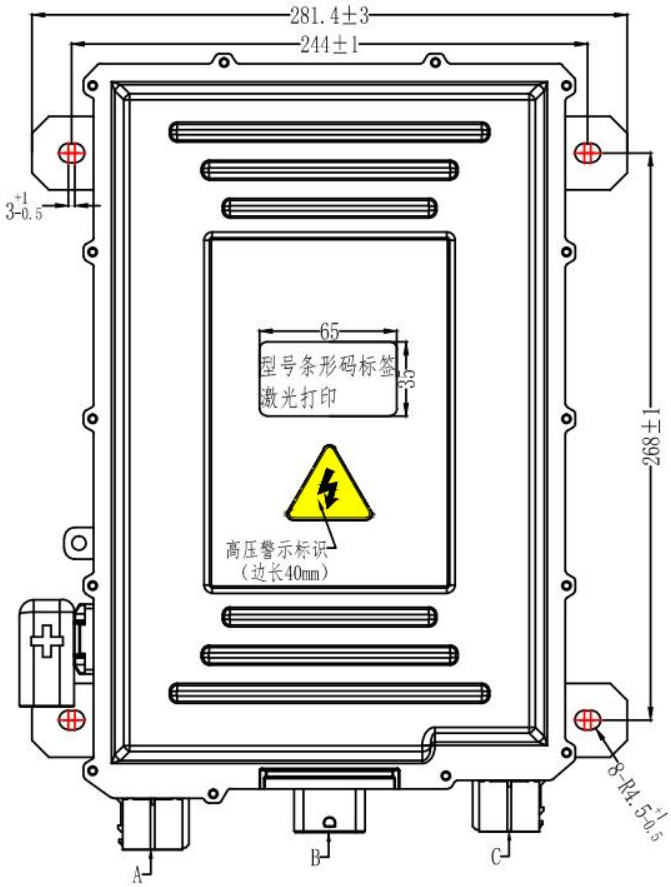
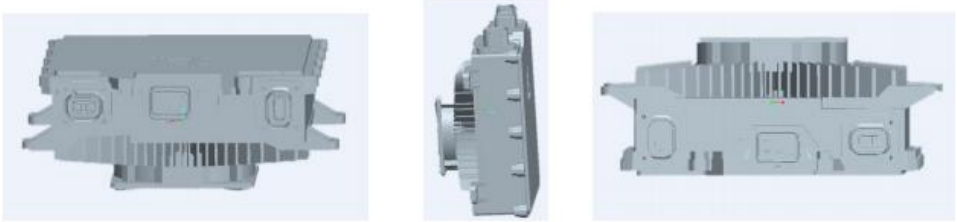


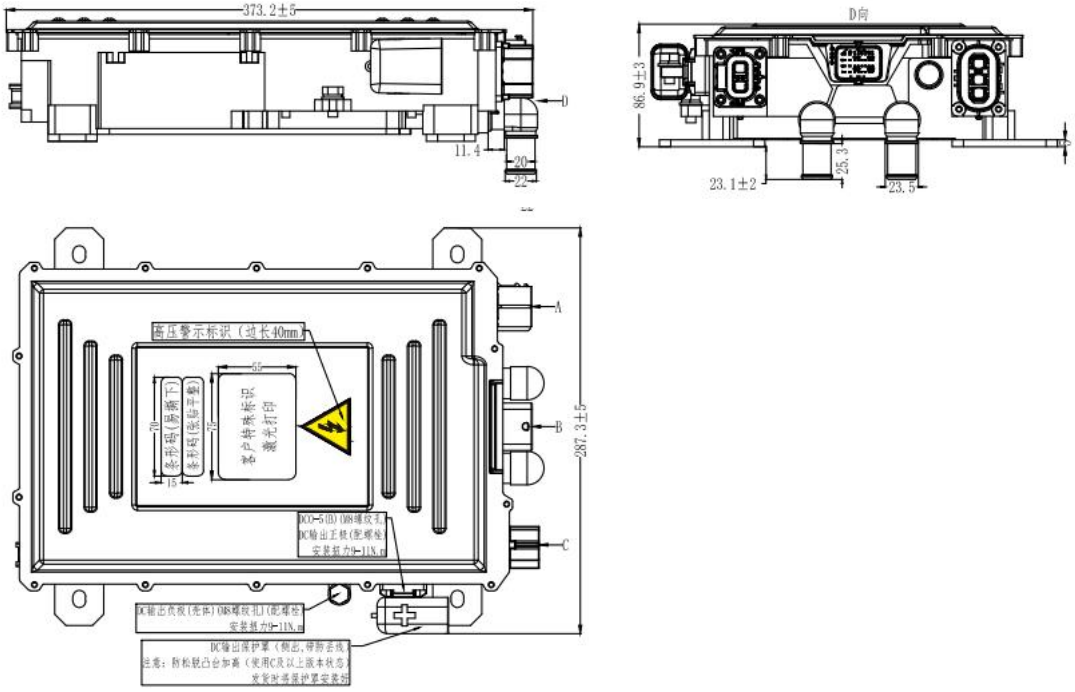


Installation Direction – Enforced Air Cooling-Liquid Cooling



Well Accepted | Accepted | Not Accepted

7.2 Liquid-cooled Drawing



8. Package, Transport and Storage

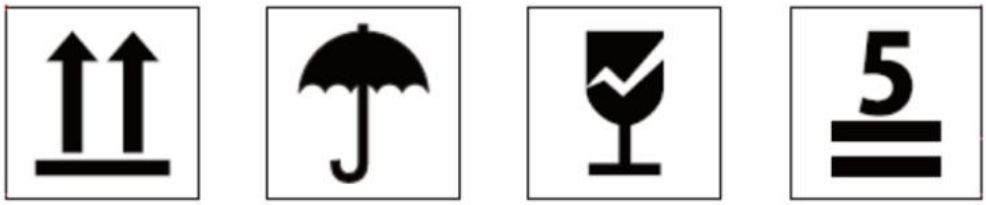
8.1 Package

The packing box shall be provided with product name, model, manufacturer identification, inspection certificate of the manufacturer's quality department, manufacturing date, etc; There is a list of accessories in the packing box:

No.	Item	Qty	Unit	Remark
1	On-board Charger	1	pc	
2	Outboard bill	1	pc	

8.2 Transportation

The product shall be transported in a firm packing box, which shall comply with the provisions of relevant national standards and shall be marked with "handle with care" and "moisture-proof". The packaging box containing the product can be transported by various means of transportation. Direct rain and snow and mechanical impact shall be avoided during transportation.



The products shall be stored in the packing box when not in use. The ambient temperature of the warehouse shall be -10-40 ℃ and the relative humidity shall not be greater than 80%. There shall be no harmful gas, flammable, explosive products and corrosive chemicals in the warehouse, and there shall be no strong mechanical vibration, impact and strong magnetic field. The packing box shall be at least 20cm above the ground and at least 50cm away from the wall, heat source, window or air inlet, The storage period under the specified conditions is generally 2 years, and the inspection shall be carried out again after more than 2 years.
The product shall be stored in a ventilated and dry place. At the same time, high temperature sources, fire sources and chemicals must be avoided. Store neatly to avoid throwing.

8.3 Safe Guide

Warning: remind the user that the operation is dangerous
* It is strictly prohibited to disassemble and refit the on-board charger for repair or commissioning
* Do not place the parts in the rain
* Please confirm that the housing is intact before installation. If it is damaged, please replace it immediately or contact the after-sales service department
* All plugs and sockets shall be connected firmly. If they are damaged or loose, please replace them immediately
*It is strictly prohibited to plug and unplug the connector when the product is powered on, otherwise personal injury may be caused
*It is strictly prohibited to open the product shell during the power on operation of the product, otherwise personal injury may be caused
* It is strictly forbidden to touch the high-voltage live parts of the product with bare hands. Please wear insulating gloves, insulating shoes Insulating clothing, live maintenance and detection are strictly prohibited
*During the replacement of fuses and contactors, barbaric operation is strictly prohibited to avoid damaging the product and causing potential safety hazards
* Three core cable with grounding wire shall be selected for AC power supply, and the grounding wire
* Please unplug the power plug if there is abnormal sound or smell during the operation of the charger
* Please keep away from fire sources and inflammables and explosives when the battery is normally charged
* Do not charge damaged or non rechargeable batteries
Note: remind the user that the following operations are important operations of the product

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* Do not block the air inlet and outlet of the charger to prevent overheating
* Please make sure that the output cable is not too long to avoid the impact of line voltage drop on charging
* Please disconnect the power cord and charging plug when moving the charger
* The battery voltage must be consistent with the nominal voltage of the charger
* Avoid collision, compression, pulling, twisting or shaking the charging cable
* The product should be placed in a safe, ventilated, dust-free and rain free environment
* Please pack and store if not used for a long time