Specification Manual

6.6KW + 2.5KW Bi-directional OBC + DC-DC

Model TCCDNB66662252

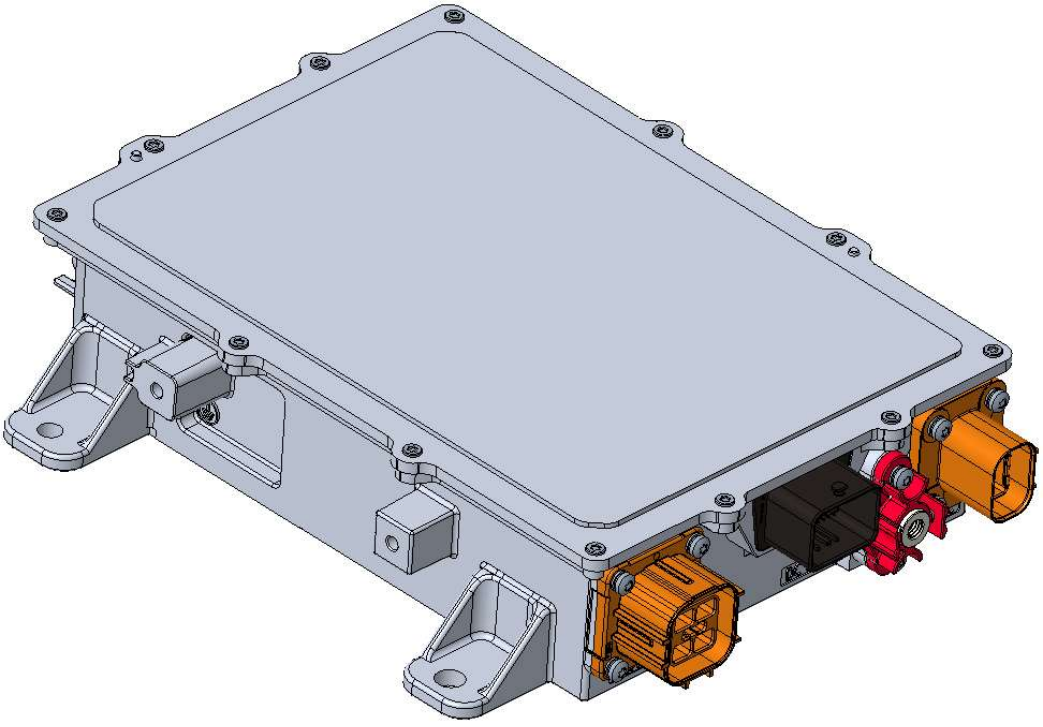
ElCon

Content

1. Overview

1.1 Abstract

This product is a two-way two in one vehicle charging and distribution assembly developed for new energy vehicles, featuring high integration and high power density. The on-board charger (OBC) obtains energy from a 220V AC power source to charge the high-voltage power battery inside the vehicle. During the charging process, the power battery management system monitors the charging status in real-time. OBC responds to the voltage and current commands given by BMS and provides status feedback to achieve self diagnosis. In addition, this product's OBC also has reverse discharge function, which can output 220V AC voltage to power devices with different characteristics. The main function of DC/DC is to convert the high-voltage direct current of the power battery pack into 13.8V low-voltage direct current, which supplies power to the automotive accessory system.



Picture 1 3D model

1.2 Industry term

No.	Terminology or abbreviations	Explanation
1	BMS	Battery Management System
2	ADS	Auto-Disconnect System
3	SOC	State of Charge
4	CAN	Controller Area Network
5	ECU	Electronic Control Unit
6	EV	Electric Vehicle
7	OBC	On Board Charger
8	DCDC	DC-DC Converter
9	HV	High Voltage
10	LV	Low Voltage
11	CC	Constant Current
12	CV	Constant Voltage
13	MCU	Motor Control Unit
14	VCU	Vehicle Control Unit
15	CAN	Controller Area Network
16	UDS	Unified Diagnostic Services
17	ASIL	Automotive Safety Integrity Level
18	HVIL	High Voltage Interlock Loop

1.3 Introduction to the main functions of the system

1.3.1 OBC module function

According to the BMS instructions, charge the battery with constant current and constant voltage in different states within an adjustable range;

Provide power to pure resistive loads with different power requirements within an adjustable range according to BMS instructions to achieve battery heating;

Perform AC inverter output within a certain voltage range according to BMS instructions to supply AC loads;

The diagnosis, self check, and protection functions of the OBC module can be achieved based on the

CAN information of the entire vehicle and self-monitoring information;

1.3.2 DC-DC converter function

The DCDC converter converts the high voltage of the power battery into a low voltage 14V output by receiving control signals from the vehicle controller, meeting the charging and load requirements of the rear stage on-board battery, while also providing feedback on its own and load status.

1.3.3 CAN communication function

OBC and DC/DC control the output voltage and output current through the CAN bus, and achieve information exchange with BMS and VCU through CAN communication, as well as feedback on the working status.

1.3.4 UDS diagnosis

It can achieve functional diagnosis of OBC and DCDC, report to the vehicle system, and also remotely flash programs to achieve offline burning, reducing after-sales maintenance costs;

1.3.5 Self diagnosis and multiple protection functions

Equipped with self diagnosis, input/output overvoltage/undervoltage protection, output short circuit protection, hardware fault protection, whole machine over temperature protection, and recovery functions;

1.3.6 Cooling method：

Liquid cooling

2. Reference standards

The reference standards for this technical requirement include but are not limited to the following standards. Regardless of whether they are dated or not, the latest version of the following standard documents (including all modification orders) is applicable to this technical requirement.

No.	Standard/Document Number	Standard/Document Name	Remark
1	QC/T 895-2011	《Conductive on-board charger for electric vehicles》	
2	GB/T 18384.1-2015	Safety requirements for electric vehicles - Part 1: On board energy storage devices	

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: Personnel electric shock protection	
5	GB/T 18487.1-2015	Electric vehicle conductive charging system - Part 1: General requirements	
6	GB/T 2423.1	Environmental testing for electrical and electronic products - Part 2: Test methods - Experiment A: Low temperature	
7	GB/T 2423.2	Environmental testing for electrical and electronic products - Part 2: Test methods - Experiment B: High temperature	
8	GB/T 2423.10	Environmental testing for electrical and electronic products - Part 2: Test methods - Experiment Fc: Vibration (sine)	
9	GB/T 2423.17	Environmental testing for electrical and electronic products - Part 2: Test methods - Experiment Ka: Salt spray	
10	GB/T 2423.22	Environmental testing for electrical and electronic products - Part 2: Test methods - Experiment N: Temperature changes	
11	GB/T 28046.2	Environmental conditions and experiments for electrical and electronic equipment of road vehicles - Part 2: Electrical loads	
12	GB/T 17619—1998	Electromagnetic radiation immunity limits and measurement methods for electronic and electrical components of motor vehicles	
13	GB/T 4094.2—2005	Signs for electric vehicle control components, indicators, and signaling devices	
14	QC/T 413-2002	Basic Technical Conditions for Automotive Electrical Equipment	
15	IEC 61851—1	Technical Committee for Electric Road Vehicles - General Requirements for Charging Systems	
16	GB 14023—2011	Radio disturbance characteristics of vehicles, ships, and internal combustion engines - Limits and measurement methods for protecting external receivers	
17	GBT 18387—2017	Limits and measurement methods for electromagnetic field emission intensity of electric vehicles, broadband, 9KHZ-30MHz related requirements	
18	EN 62477-1	Power electronic converter systems and equipment: general safety requirements	
19	GB/T 4208-2008	Shell protection rating (IP rating)	
20	GB/T 17619-1998	Electromagnetic radiation immunity limits and measuring methods for motor vehicle electrical and electronic components	
21	GB/T 24347-2021	Electric vehicle DCDC converter	

3. Environmental requirements

The environmental conditions for the use of this assembly are shown in the following table:

No.	Term	Technical Specification	Unit	Remark
1	Working temperature	-40～85	℃	Reduce power operation when the coolant temperature exceeds 65 ℃
2	Storage temperature	-40～95	℃	The power supply is not powered on
3	Relative humidity	5～95	%RH	No condensation, no frosting
4	Protection grade	IP67		
5	Cooling method	Liquid cooling		
6	Vibration level	Conform to QC/T895-2011		
7	Noise level	65	dB	Conform to QC/T895-2011
8	Salt spray level	Conform to QC/T2423.17-2011		
9	Altitude	4000	m	GB/T16935.1-2008
10	Temperature and humidity resistance	Conform to GB/T 2423.22		
11	Drop	Wiring according to QC/T417.1-2001 Housing according to GB/T 2423.8-1995		Normal appearance, structure, and performance

4. Technical specifications

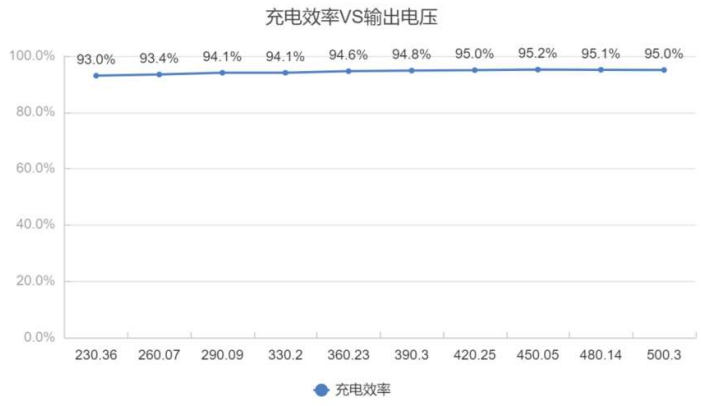
4.1.OBC Electrical performance requirements

Item		Min	Rated	Max	Unit	Condition
OBC Electrical parameters（AC/DC）						
1、Input parameters						
Rated input voltage		-	220	-	Vac	
Input voltage range		90	-	264	Vac	Normal operating voltage range
Maximum input current		-	-	32	A	Input voltage changes, input current does not exceed 32A
AC input voltage frequency		47	50	63	Hz	Rated 50 Hz
Power factor(PF)		0.98 0.94	-	-	-	@>0.98 at 50% to 100% load @When the load is between 15% and 50%, it is greater than 0.94
2、Output parameters						
High voltag	Rated output voltage	350			Vdc	Automatic power reduction operation when input at 110Vac.

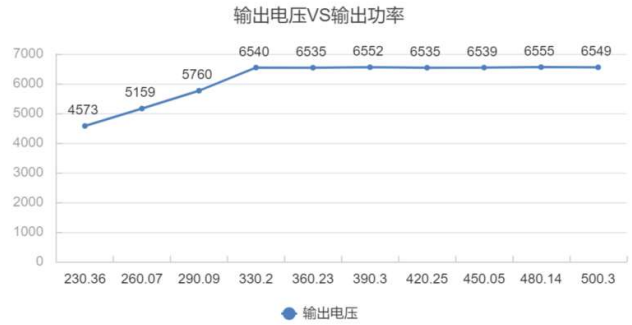
e Output	Output voltage range	200		500	Vdc	When the input is 220Vac, the output can run at full power
	Output current max		22		A	
	Output rated power		6.6		KW	
	Output ripple and noise		±5		%Vo	
	Startup rise time		4		S	After receiving the BMS charging request, the OBC increases the output voltage from 10% to 90%
	Output descent time		300		mS	The time it takes for OBC to decrease the output current to 0A after receiving the BMS shutdown command
	CV accuracy			1	%	Maximum ± 1%
	CC accuracy			5	%	Maximum ±0.5A
	Static loss current			1	mA	Not inserting the gun into sleep mode, consuming KL30 constant current
	Overall efficiency	93	-		%	Output voltage below 300V, efficiency ≥ 93% Output voltage above 300V, efficiency ≥ 94%
3、Protection features						
Input Overvoltage Protection		260	264	270	Vac	Turn off output
Input overvoltage recovery		250	259	260	Vac	Return difference ≥ 5Vac
Input undervoltage protection		80		90	Vac	Turn off output
Input undervoltage recovery		90		95	Vac	Return difference ≥ 5Vac
Input overcurrent protection				32	A	Maintain input current not exceeding 32A and automatically adjust output power.
High voltage Output	Output overvoltage protection		490		Vdc	Turn off the high voltage output, and it can be restored after troubleshooting
	Output undervoltage protection		195		Vdc	Turn off the high voltage output, and it can be restored after troubleshooting (Requires both battery voltage and output voltage to be met simultaneously)
	Output overcurrent protection			22	A	

	Output short circuit protection	yes			-	Before entering the charging process, do not start charging when an output short circuit is detected. Short circuit output during charging, immediately turn off high-voltage output
	Output reverse protection	yes			-	Output reverse connection, high voltage output does not start, after troubleshooting, normal operation is restored
Communication fault protection		yes			-	When the charger does not receive BMS instructions for 5 consecutive seconds, or when there is a communication failure during operation, the charger will shut down the output
Over temperature protection			85		℃	Detect the internal temperature of the OBC. When the internal temperature of the CPU exceeds 85 degrees, the power begins to decrease. However, when the temperature continues to rise to 90 degrees, the OBC shuts down.
			90			

4.1.1 OBC Output efficiency and temperature derating curve chart



Picture 2 OBC Efficiency curve chart



Picture 3 OBC Curve graph of output voltage and output power

Item		Min	Rated	Max	Unit	Condition
OBC Electrical parameters（DC/AC）						
1、Input parameters						
Rated input voltage		-	350	-	Vdc	DC
Input voltage range		200	-	500	Vdc	DC
2、Output parameters						
Inverter output	Output voltage range		220/110		Vac	220VAC±5%
	Output waveform	sine wave				
	AC output voltage frequency	-	50	-	Hz	50±1%
	Rated output power	-	6	-	kW	
	Efficiency	92	-	-	%	
	Output current range（In-car AC output）	0	-	10	A	
	Output current range（AC output outside V2V&V2L）	0	-	28	A	Determine by detecting the CC resistance

3、Protection features					
Output overvoltage protection	-	274V	-		Set the protection point voltage to peak voltage
Output overvoltage recovery	-	264V	-		
Output overcurrent protection	-	28A	-		
Overload capacity	-	10s			At 110% rated load, the continuous and reliable operation

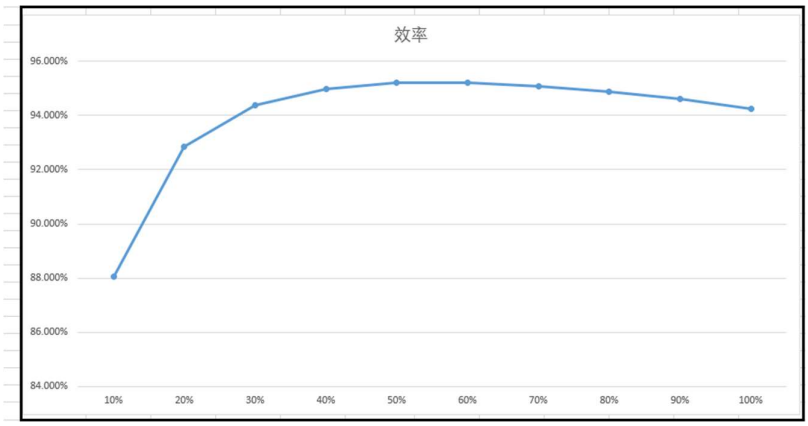
					of the current shall not be less than 1 minute; At 125% rated load, the continuous and reliable operation of the current shall not be less than 10 seconds.

4.2.DC/DC Electrical performance requirements

Item	Min	Rated	Max	Unit	Condition
DC/DC Electrical parameters					
1、Input parameters					
Input voltage range	200	-	500	Vdc	Full output voltage range 240-500V
2、Output parameters					
Output voltage range	9	14	16	Vdc	
Output current max	-	210	-	A	
Peak output current	-	250	-	A	
Output power	-	2500	-	W	
Peak power	-	-	3000	W	3kW@6min
DC Efficiency	-	92	-	%	Rated input weighted efficiency
3、Protection features					
Input overvoltage protection point	490		485	Vdc	Turn off output, fault elimination can self recover
Input overvoltage recovery point	485		490	Vdc	Return difference ≥ 5VDC
Input undervoltage protection point	195		200	Vdc	Turn off output, fault elimination can self recover
Input undervoltage recovery point	200		205	Vdc	Return difference ≥ 5VDC
Output overvoltage protection point		16		Vdc	
Output undervoltage protection point		9		Vdc	

Over temperature protection		90		℃	The internal CPU of the DC detects the temperature inside the DC, and under this condition, the power is reduced and the output is reduced.
		100		℃	The internal CPU of the DC detects the temperature inside the DC and reduces the power output when it reaches 90 degrees. However, when the temperature continues to reach 100 degrees, the DC shuts off the output.
Output overcurrent protection	>250			A	The software output is adjustable, and this value is the hardware current limit value
Communication fault protection	yes			-	When the charger does not receive BMS instructions for 5 consecutive seconds, or there is a communication failure during operation, the charger will shut down the output

4.2.1 DC-DC Output efficiency curve



Picture 4 DC/DC Efficiency curve

4.3. Low voltage electrical performance requirements

Signal interface						
KL30	**Thermistor**	**CC/CP**	**communication mode**	**Electronic lock**	**Baud rate**	**High voltage interlock**
12V	**10K**	**support**	**CAN**	**support**	**500Kbps**	**HVIL+/HVIL-**

4.4. Safety performance and others

Safety characteristics				
Item		**Technical indicators**	**Unit**	**Remark**
Dielectric	Input to housing	2000VAC, 3s, leakage current ≤ 20mA		No breakdown or arcing phenomenon

strength	Output to housing	2000VAC, 3s, leakage current ≤ 20mA		No breakdown or arcing phenomenon
	Input to output	2000VAC, 3s, leakage current ≤ 20mA		No breakdown or arcing phenomenon
Insulation resistance	DC high voltage - DC low voltage (housing ground)	Resistance ≥ 100M Ω, test voltage 500VDC		No breakdown or arcing phenomenon
Grounding resistance	Ground wire to housing - DC low voltage (housing ground)	≤0.1	Ω	The resistance between the grounding point and the radiator is less than 100 milliohms, and the test current is 25A AC
Creepage gap		≥4mm		Meet the requirements of Table 3 of GB/T18488.1-2001 standard
Electrical clearance		≥3mm		Meet the requirements of Table 3 of GB/T 18488.1-2001 standard
MTBF		150000H	h	Environmental temperature 25 ℃

Note: A 40A fuse needs to be added between the high-voltage DC port and the high-voltage battery

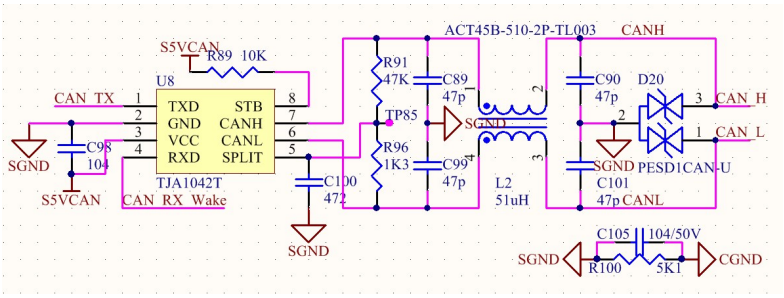
According to the requirements of the EMC testing outline, or refer to GB/T 18655

4.6 CAN network system

4.6.1 Equipped with CAN wake-up function to meet UDS diagnosis and offline program burning requirements

4.6.2 CAN Network compatibility

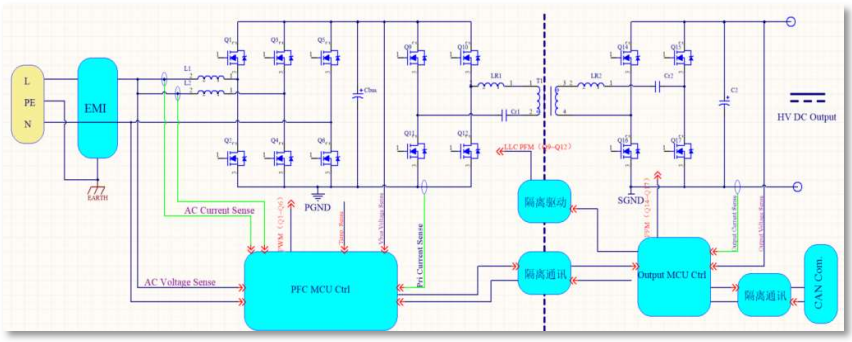
The CAN terminal does not require a terminal resistor. The recommended CAN circuit is as follows:



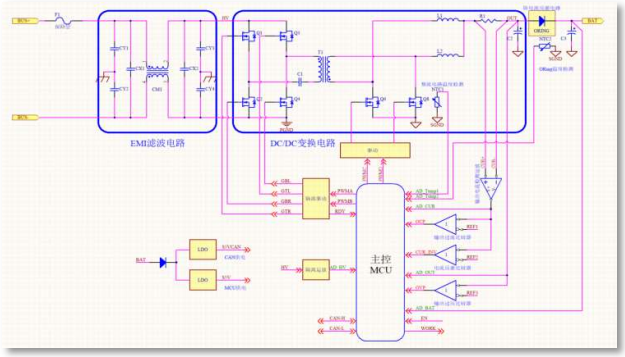
Picture 5 CAN Network schematic diagram

4.7 Function block diagram

OBC Main circuit Function block diagram



DCDC Main circuit Function block diagram



5. Interface requirements

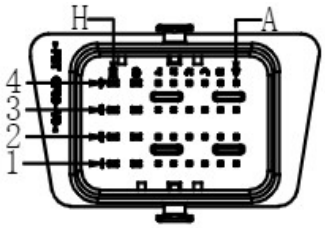
5.1 General interface requirements

The power distribution assembly, vehicle, and battery pack mainly include low-voltage interfaces and high-voltage interfaces. The model of the interface connector and the position on the parts are defined according to the overall layout of the vehicle

5.2 OBC Low voltage connector information

5.2.1 Low voltage signal connector's view（Component end）：

Name of connector	Socket (housing side)		Mating plug（connected to wiring）		Remark
	Part number	Brand	Part number	Brand	
Signal connector	0643340100	Molex	643191211	Molex	



Picture 6 Low voltage signal connector's view

5.2.2 Definitions of the pins of Low voltage signal connector as below

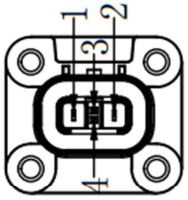
Brand	No.	Pins No.	Name	Function	Remark
Molex	1	1A	OBC_Wakeup_in		Inverter wake-up
	2	1B	Indicator Light _ Red Light		
	3	1E	Feedback signal of electronic lock		
	4	1G	L TEMP-		
	5	1H	KL30		
	6	2F	Indicator Light _ Blue Light		
	7	2G	N TEMP+		
	8	3A	CP		
	9	3B	CC		
	10	3E	Electronic lock driver-		
	11	3F	Indicator Light _ Green Light		
	12	3G	N TEMP-		
	13	4A	CANH		
	14	4B	CANL		
	15	4C	HVIL+		
	16	4D	HVIL-		
	17	4E	Electronic lock driver+		
	18	4F	L TEMP+		
	19	4G	KL31		

	20	4H	Indicator Light - Ground		
		Others	Reserved		

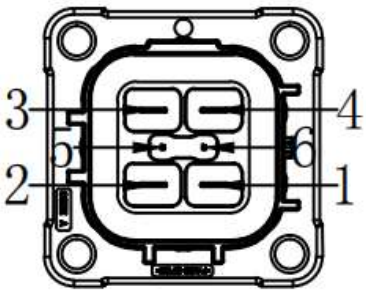
Name of connector	Socket (housing side)		Mating plug（connected to wiring）		Remark
	Part number	Brand	Part number	Brand	
DC output positive terminal	GH06-F210-1NNB-T01	国威通		/	Install bolt M8 * 16. Torque 14-18N. m
DC output negative terminal					Housing connection

5.3 Interface definition of high-voltage connectors

List 5.3.1 OBC output& DCDC input terminal

Name of connector	Battery		Connector model	Socket	2367138-1(Tyco)
				Plug	4-2103177-1(4-2310537-1)
No. of pin	Wire diameter	Definition	Remark		
1	/	Positive			
2	/	Negative			
3	/	HVIL+	Interlock		
4	/	HVIL-	Interlock		

List 5.3.2 HV AC terminal

Name of connector	OBC input		Connector model	Socket	HVC4PG63MV106-S02(Amphenol)
				Plug	Plug HVC4PG63FS106
No. of pin	Wire diameter	Definition	Remark		
1	/	L(In-car AC output)	10A		
2	/	N(In-car AC output)			
3	/	Shared N(AC input,AC output outside V2V&V2L)	32A		
4	/	Shared L(AC input,AC output			

		outside V2V&V2L)		
5	/	HVIL+	Interlock	
6	/	HVIL-	Interlock	

6. Software requirements

CAN communication

No.	Item	Technical indicators	Remark
1	Baud rate	500 Kbit/s	/
2	CAN bus communication protocol	Compliant with CANFD specifications	/
3	Terminal resistance	No terminal resistor	/

7. Mechanical parameters

7.1 Installation dimensions and specifications

See last page for details: Engineering drawings

7.2 Appearance

The surface of the parts should be smooth, without defects such as peeling, rust, cracks, spots, burrs, deformation, and tactile bumps. The connectors are complete, the components are securely fastened, and there are no defects or damages such as rust, burrs, cracks, etc. The connector sheath and pins should be intact and undamaged, and all components should be securely connected.

7.3 Weight

No.	Part name	Part number	Weight（kg）	Remark
1	Charging module assembly		≤6.5	

7.4 Water cooling chamber parameters

7.4.1 Coolant volume: 136ml

7.4.2 Inlet flow rate ≥ 8L/min

8. Nameplate, packaging, transportation, and storage

8.1. Nameplate barcode (Nameplate labels should have traceability)

The basic parameters of the nameplate include: model, rated power, etc.

8.2. Packaging and packaging schematic diagram

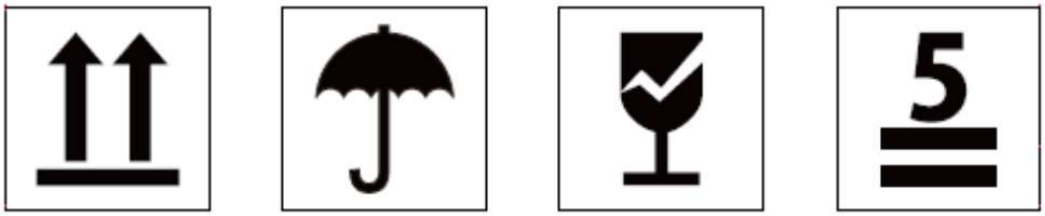
The packaging box has the product name, model, manufacturer identification, inspection certificate from the manufacturer's quality department, manufacturing date, etc; There is a list of accessories inside the packaging box:

No.	Name	Quantity	Unit	Remark
1	Charging and distribution	1		

	system assembly			
2	Test report	1		

8.3.Transportation

The product should be transported in a sturdy packaging box, and the outside of the box should comply with relevant national standards and have signs such as "Handle with Care" and "Moisture proof". The packaging box containing the product is allowed to be transported by various means of transportation. During transportation, direct rain, snow, and mechanical impact should be avoided.



Picture 7 Transportation signs

8.4.Storage

When the product is not in use, it should be stored in the packaging box. The warehouse environment temperature should be -10-40 ℃ and the relative humidity should not exceed 80%. Harmful gases, flammable, explosive products, and corrosive chemicals are not allowed in the warehouse, and there should be no strong mechanical vibration, impact, or strong magnetic field effects. The packaging box should be placed at least 20cm above the ground and at least 50cm away from walls, heat sources, windows, or air inlets. The storage period under these regulations is generally 2 years, and re inspection should be conducted after exceeding 2 years.

The product should be stored in a well ventilated and dry place. At the same time, it is necessary to avoid high temperature sources, fire sources, and chemicals. Store neatly and avoid throwing or smashing.

9. Safety Guide

Warning: Remind users that the operation carries risks

· □*□It is strictly prohibited to disassemble and modify the car charger for repair or debugging without authorization

□□*□Do not place the parts in a rainy location

□□*□Before installation, please confirm that the casing is intact and undamaged. If there is any damage, please replace it immediately or contact after-sales service□□*□Each plug and socket should be securely connected. If there is any damage or looseness, please replace it immediately

* It is strictly prohibited to plug and unplug connectors while the product is powered on, otherwise it may cause personal injury

* It is strictly prohibited to open the product casing while the product is powered on, otherwise it

may cause personal injury

*□It is strictly prohibited to touch the high-voltage live parts of the product with bare hands. Please wear insulated gloves, insulated shoes, and insulated clothing during inspection and maintenance. Live maintenance and testing are strictly prohibited

* During the process of replacing fuses and contactors, rough operation is strictly prohibited to avoid damaging the product and causing safety hazards

□□*□The AC power supply should choose a three core cable with a grounding wire and install the grounding wire correctly

□□*□If there is any abnormal sound or odor during the operation of the charger, please unplug the power plug

□□*□When charging the battery normally, please stay away from sources of fire and flammable and explosive materials□□

*□Do not charge damaged or non rechargeable batteries

Attention: Remind users that the following operations are important for this product

· ·*· Do not block the inlet and outlet of the charger to prevent overheating

· ·*· Please confirm 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 voltage of the battery must match the nominal voltage of the charger

· ·*· Avoid collision, compression, and do not pull, twist, or shake the charging cable · ·

*· The product should be placed in a safe, ventilated, dust-free, and rainless environment

· ·*· If not used for a long time, please pack and store