On Board Charger

Prodution Specification

Model： GW-LF-XXX-XX

Product Name： 6.6KW OBC

Version ： V1.0

Date： 2024.07.20

Qingdao Greatway Technology Co.,Ltd

Contents:

Version	Note	Prepare	Review	Approve	Date
V1.0					2024.07.10
V1.1	Add water cooling version				2024.07.20

1.Overview

1.1 Abstract

GW-LF series 6.6KW on-board charger is designed according to national standards and is a product that provides energy replenishment for vehicle power batteries. It meets the new national standards CC/CP, electronic lock, and temperature detection interface. The charger adopts CAN bus control to achieve information interaction with the vehicle BMS/VCU and feedback of working status. This product not only has the advantages of high efficiency, small size, high stability, and long life, but also has the characteristics of high protection level, high reliability, and complete protection functions. It is an ideal power supply for charging electric vehicles. The product has a built-in thermal sensing device with overheating protection function and can automatically recover. The fully sealed process and the protection level of up to IP67 can ensure that it can work in any complex environment without causing failures.

1.2 Main features of the charger

1.2.1 Fan/liquid cooling

1.2.2 Built-in temperature sensor, can shut down output under dangerous working conditions (internal 95℃)

1.2.3 Protection level reaches IP67, can work safely under short-term immersion conditions

1.2.4 Complies with CAN2.0 communication specifications, bus displays working status, fault codes, etc.

1.2.5 Supports UDS function diagnosis, reports to the vehicle system, and can also be flashed remotely to achieve offline flashing, reducing after-sales maintenance costs

1.2.6 Compatible with the new national standard CC/CP, electronic lock, temperature detection

1.2.7 With self-diagnosis, input and output overvoltage, undervoltage protection, short circuit protection, hardware fault protection, overtemperature protection and recovery functions

1.3 Industry Terminology

Item	Terms or abbreviations	Details
1	BMS	电池管理系统（Battery Management System）
2	ADS	高压电安全系统（Auto-Disconnect System）
3	SOC	电池荷电状态（State of Charge）
4	CAN	CAN 通讯网络（Controller Area Network ）
5	ECU	电子电控单元（Electronic Control Unit ）
6	EV	纯电动车（Electric Vehicle ）
7	OBC	车载充电机（On Board Charger）
8	DCDC	直流变换器（DC-DC Converter）
9	PDU	高压配电（Power Distribution Unit）
10	HV	高压（High Voltage）
11	LV	低压（Low Voltage）
12	CC	恒流（Constant Current）
13	CV	恒压（Constant Voltage）
13	MCU	电机控制器（Motor Control Unit）
14	VCU	整车控制器（Vehicle Control Unit）
15	UDS	诊断系统（Unified Diagnostic Services）

16	ASIL	汽车功能安全等级（Automotive Safety Integrity Level）
17	HVIL	高压互锁（High Voltage Interlock Loop）

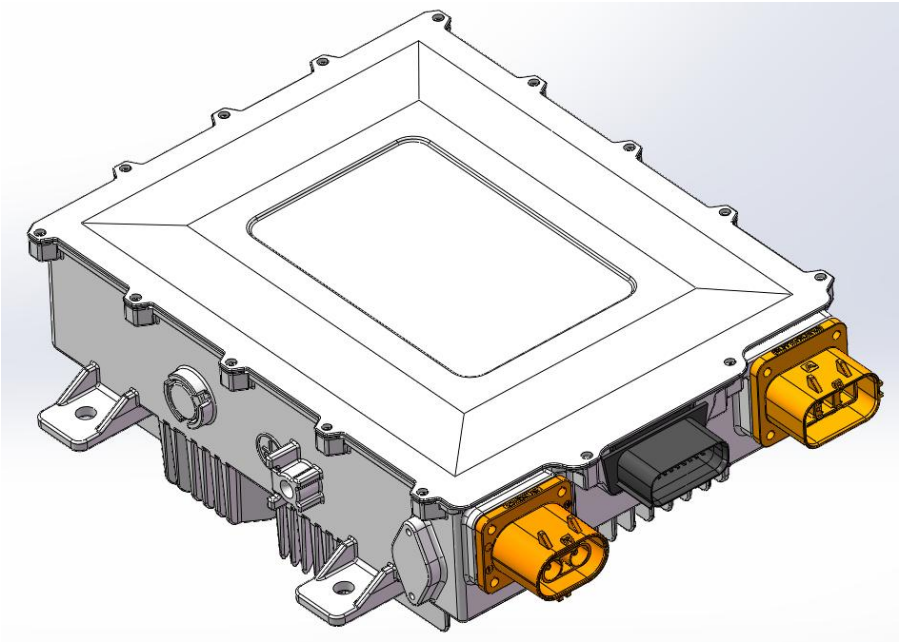
2. Demension and Appreance

2.1 Demension and Weight

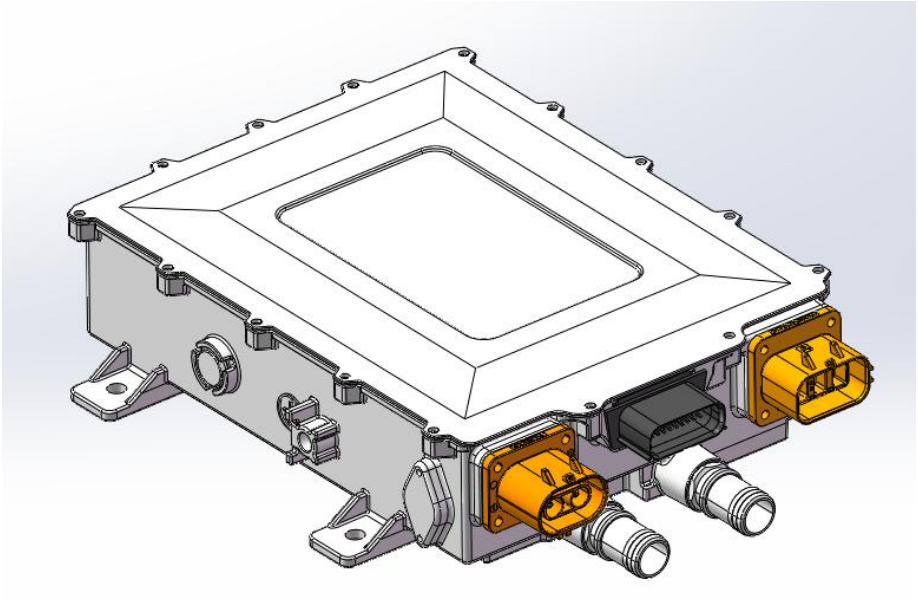
Cooling way	Length（mm）	Width（mm）	Height（mm）	Weight（KG）
Air /Water cooling	170±1	244±1	117±3（air cooling ） 77±3（water cooling ）	

2.2 Appreance

The surface of the parts is smooth, without any defects such as peeling, rust, cracks, spots, burrs, deformation, or bumps that can be touched by hand. The connectors are complete, and the parts are securely fastened, without any defects or damage such as rust, burrs, and cracks. The connector sheaths and pins are intact and undamaged, and all parts are securely connected.



Air cooling



Water cooling

3. Charger technical indicators

3.1 Environmental requirements

▲ Operating temperature

Areas	Minimum temperature	Maximum temperature
World	-40℃	55℃（inner side 85℃）

▲ Storage environment temperature

Areas	Minimum temperature	Maximum temperature
World	-40℃	100℃

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

▲ Altitude: Altitude ≤2000m, meeting GB/T 40432-2021 standard

▲ Working noise: Maximum noise during operation ≤65dB, meeting GB/T 40432-2021 standard

3.2 Regulatory requirements and reference standards for chargers

Items	Standard No.	Standard Name	Note
1	GB/T 40432-2021	Conductive on-board charger for electric vehicles	/
2	GB/T 18488.1-2015	Electric motors and controllers for electric vehicles Part 1: Technical requirements	/
3	GB/T 18384.2-2015	Electric vehicles - Safety requirements - Part 2: Functional safety and fault protection	/
4	GB/T 18384.3-2015	Electric vehicles - Safety requirements - Part 3: Personnel protection against electric shock	/
5	GB/T 18387-2008	Limits and measurement methods for electromagnetic field emission intensity of electric vehicles	/
6	GB/T 31498-2015	Post-collision safety requirements for electric vehicles	/
7	GB 9254-2008	Limits and measurement methods for radio disturbance of information technology equipment	/
8	GB/T 18655-2010	Vehicles, ships and internal combustion engines - Radio disturbance characteristics - Limits and measurement methods for protecting on-board receivers	/
9	GB 29743-2013	Motor vehicle engine coolant	/
10	GB 4208	Enclosure protection degree (IP code)	/
11	GB/T 28046-2	Road vehicles - Environmental conditions and tests for electrical and electronic equipment - 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	Road vehicles - Environmental conditions and tests for electrical and electronic equipment - Part 4: Climatic loads	/
14	GB/T 2423.34-2012	Environmental testing - Part 2: Test methods - Test Z/AD: Temperature/humidity combined cycle test	/
15	GB/T 2423.1-2008	Environmental testing for electric and electronic products - Part 1: Test methods - Test B: Low temperature	/
16	GB/T 2423.2-2008	Environmental testing for electric and electronic products - Part 2: Test methods - Test B: High temperature	/
17	GB/T 2423.3-2008	Environmental testing for electric and electronic products - Part 2: Test methods - Cab: Steady damp heat test	/
18	GB/T 2423.17-2008	Environmental testing for electric and electronic products - Part 2: Test method Test Ka: Salt spray	/
19	GB/T 30512-2014	Requirements for banned substances in automobiles	/

20	QC/T 413	Basic technical requirements for automotive electrical equipment	/
21	GB/T 2423.17-2008	Environmental testing for electrical and electronic products Part 2: Test method Test Ka: Salt spray	/
22	GB/T 19596-2017	Terms for electric vehicles	/
23	GB/T 191—2008	Packaging, storage and transportation pictorial signs	/
24	GB/Z 17625.6-2003	Electromagnetic compatibility Limits Limits on harmonic currents generated by equipment with a rated current greater than 16A in low-voltage power supply systems	/
25	GB 17625.1—2012	Electromagnetic compatibility Limits Harmonic current emission limits (equipment input current per phase ≤ 16A)	/
26	GB/T 18384.3-2015	Electric vehicles Safety requirements Part 3 Personnel protection against electric shock	/
27	GB/T 19515-2015	Calculation method for reusability and recoverability of road vehicles	/
28	GB/T 28382-2012	Pure electric passenger vehicles Technical requirements	
29	GB/T 28046.3-2011	Road vehicles Environmental conditions and tests for electrical and electronic equipment Part 3: Mechanical loads	

4.Charger safety regulations

Items		Conditions	Standard
Ground resistance	AC ground wire-ground resistance	The resistance between the ground point and the heat sink is less than 100 milliohms, the test current is 25A AC	≤100mΩ
Input insulation test	Input-housing	Test voltage is 1000VDC	≥20MΩ
Output insulation test	Output-housing	Test voltage is 1000VDC	≥20MΩ
Electrical strength	Input-output	@2000V/AC 1min	Leakage current ≤10mA
	Input-housing	@2000V/AC 1min	Leakage current ≤10mA
	Output-housing	@2000V/AC 1min	Leakage current ≤10mA

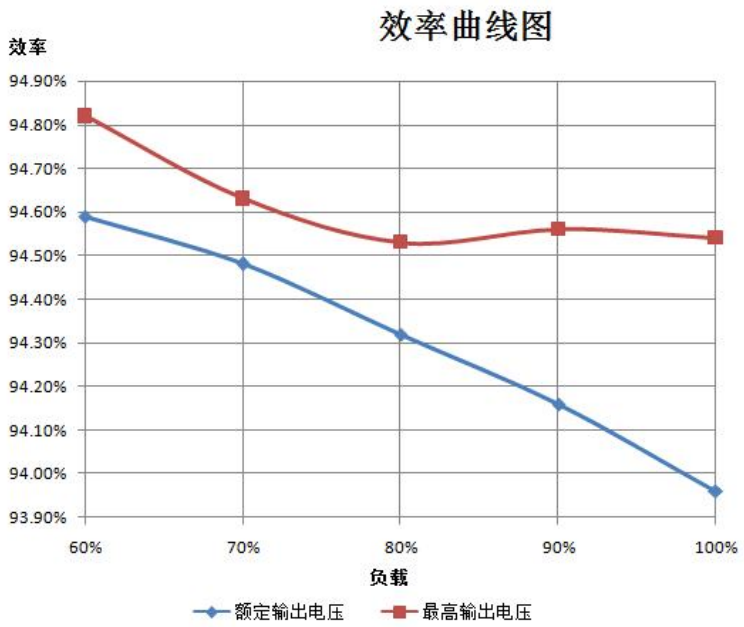
5.Charger electrical performance

5.1 Electrical characteristics

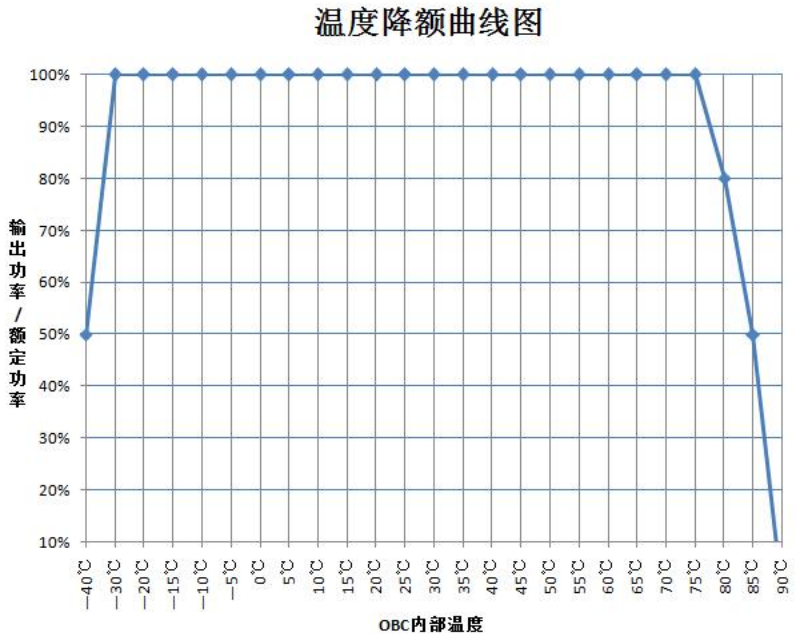
Input electrical characteristics							
Rated input voltage	220V AC						
Input voltage range	90-265V AC						
Frequency	45-65Hz						
Maximum input current	32A						
Power factor	≥0.99 above half load						
Standby power consumption	≤5W						
Output electrical characteristics							
Model No.	GW-LF-48-80	GW-LF-80-80	GW-LF-108-60	GW-LF-144-44	GW-LF-360-18	GW-LF-540-12	GW-LF-720-9
Rated output voltage	48v	80v	96V/108V	144V	360v	540v	720v
Output voltage range	30V-80V	50V-105V	65V-140V	90V-195V	220V-450V	350V-650V	550V-850V
Output current range	0-80A	0-80A	0-60A	0-44A	0-18A	0-12A	0-9A
Rated output power	6.6KW（220VAC） 3.3KW(110VAC)						
Output mode	CC /CV						
Output constant voltage accuracy	1%						
Output constant current accuracy	±0.5A（Io≤10A）&≤±5%（Io>10A）						
Output response time	≤200mS						
Voltage ripple coefficient	1%						
Overall efficiency	≥92%				≥94%		
Protection function							
Input overvoltage protection value	AC 270±5V						
Input undervoltage protection value	AC 85±5V						
Output overvoltage	When the maximum output voltage exceeds +2%, the output stops.						

protection value	
Output undervoltage protection value	When the minimum output voltage is lower than -5%, the output stops.
Output overcurrent protection value	When the output current is greater than the maximum current, the output stops.
Output reverse connection and short circuit protection	When the output is short-circuited or reversely connected, the protection shuts down, and the fault can be automatically restored after troubleshooting.
CAN communication protection	when the CAN communication fails, the output stops automatically.
Over temperature protection	When the heat sink temperature is higher than 75℃, the output power is reduced. When the temperature is higher than 90℃, the circuit is disconnected, and the output is restored when the temperature returns to below 85℃.

5.2 Charger output efficiency and temperature derating curve



Charger efficiency curve



Charger temperature derating curve

5.3 Environmental testing

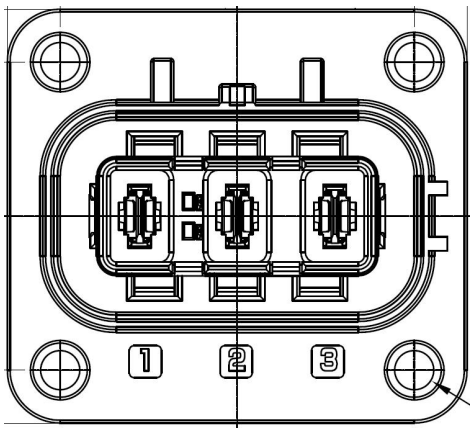
Wet heat test	Meets the requirements of 5.6 in GB/T 28046.4-2011
Low temperature test	Meets the requirements of 5.7.1.1 in GB/T 40432-2021
High temperature test	Meets the requirements of 5.7.1.4 in GB/T 40432-2021
Salt spray test	Meets the requirements of 5.5 in GB/T 28046.4-2011
Electromagnetic immunity	Meets the requirements of 4.5.2 in GB/T 40432-2021
Electromagnetic disturbance	Meets the requirements of 4.5.3 in GB/T 40432-2021
Protection level	IP67
Vibration resistance	Meets the requirements of 4.1 in GB/T 28046.3-2011
MTBF	150000H

6. Interface and Definition

The charger interface mainly includes low-voltage interface and high-voltage interface. The low-voltage signal interface is mainly connected to the vehicle and BMS, and the high-voltage interface is connected to the charging station and battery pack;

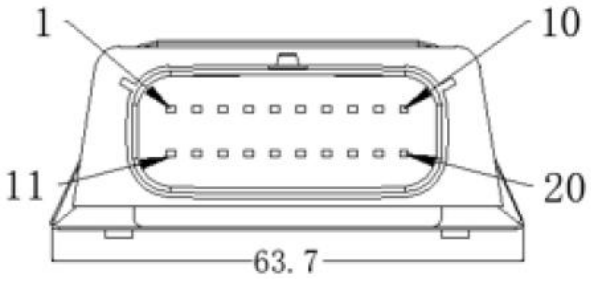
***The low-voltage signal interface connector model is fixed and cannot be replaced. The high-voltage interface connector model and brand can be selected by the car manufacturer

7.1 AC input interface and Definition



Product side connector model ： FHV200301TX-06U01F		Plug Side ： FHV600301TX-06U01F	
Brand	Pin	Definition	Wire Color & Diameter
FUTRONICE	1	L	Brown/6
	2	PE	Yellow-green/6
	3	N	Blue/6
	A/B	/	/

7.2 Signal interface and definition

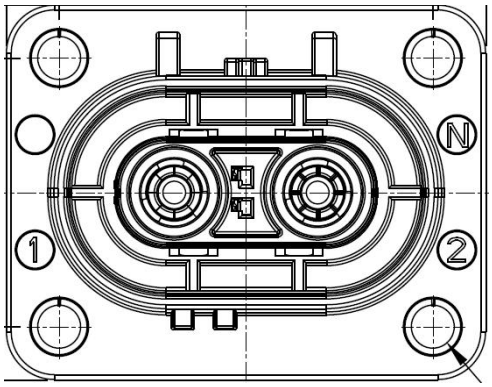


Product side connector model ： 348302001		Plug Side： 334722006	
Brand	Pin	Definition	F
Moshi	1	AC L line temperature detection	Temperature detection
	2	AC L line temperature detection	Temperature detection
	3	AC N line temperature detection	Temperature detection
	4	AC N line temperature detection	Temperature detection
	5	CC signal	Detect the connection status of the charging gun
	6	CP signal	Detect the maximum current allowed for charging and the grounding reliability between the charging pile
	7	KL30	Normal power input positive pole
	8	Electronic lock power positive	
	9	DC/DC hard line enable	Two-in-one reserved position
	10	12V output	12V2A
	11	CAN_H	
	12	CAN_L	
	13	High voltage interlock	Output to vehicle inspection
	14	High voltage interlock	
	15	Electronic lock feedback 2	

	16	Electronic lock feedback 1	
	17	KL31	Negative pole for normal power input
	18	Electronic lock power negative	
	19	GND	
	20	CCout Signal output	

The above pins, except for PIN 11 and PIN12 need to be used, and other pins should be selected to be used according to needs

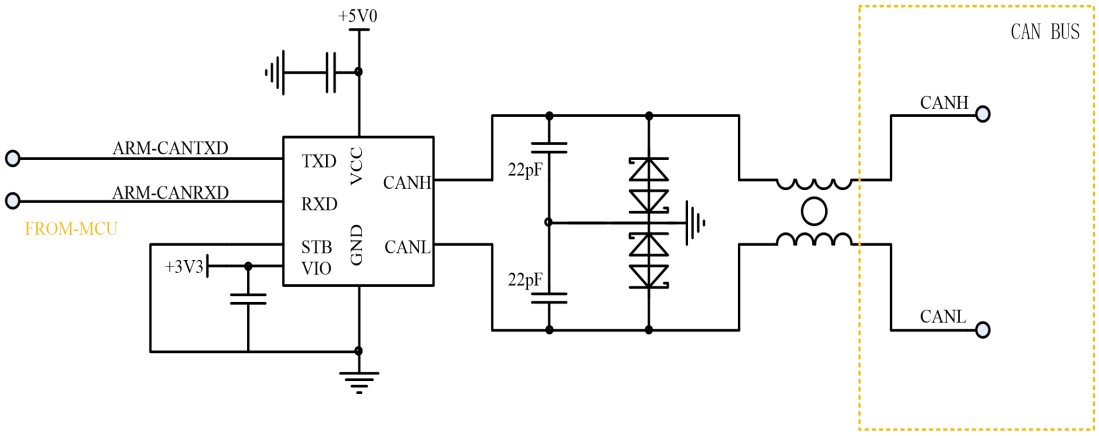
7.3 DC output interface and definition



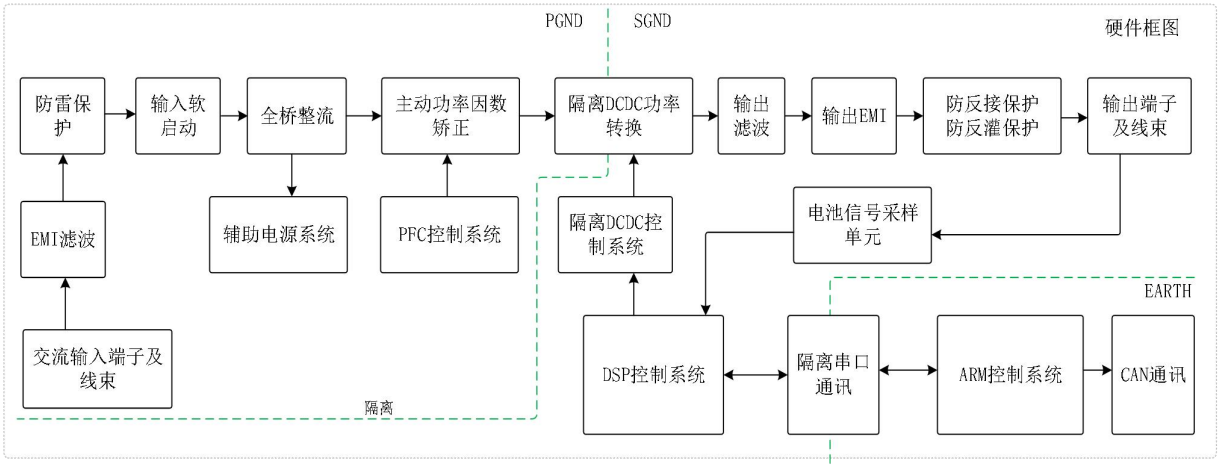
Product side connector model ： FHV200236TN-**U01F		Plug Side： FHV600236TN-**U01F	
Brand	Pin	Definition	Wire Color & Diameter
FUTRONICS	1	Postive	Red/2.5-16mm² (selected according to current size)
	2	Negetive	Black/2.5-16mm² (selected according to current size)
	3/4	/	/

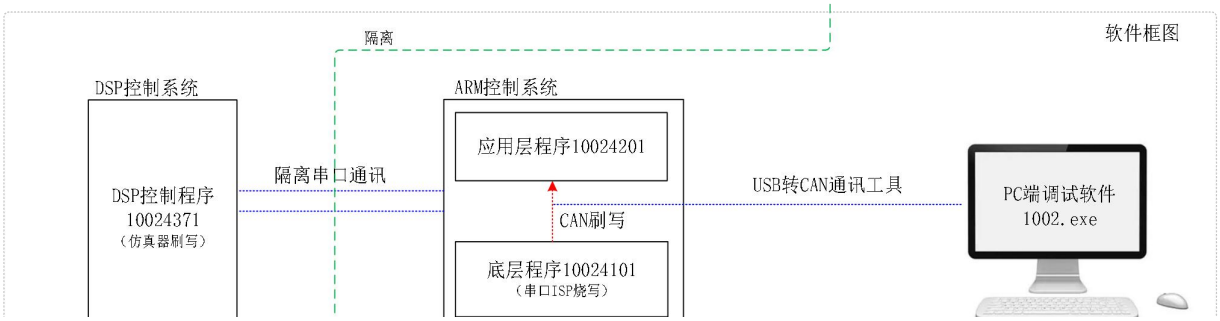
7. Block Diagram

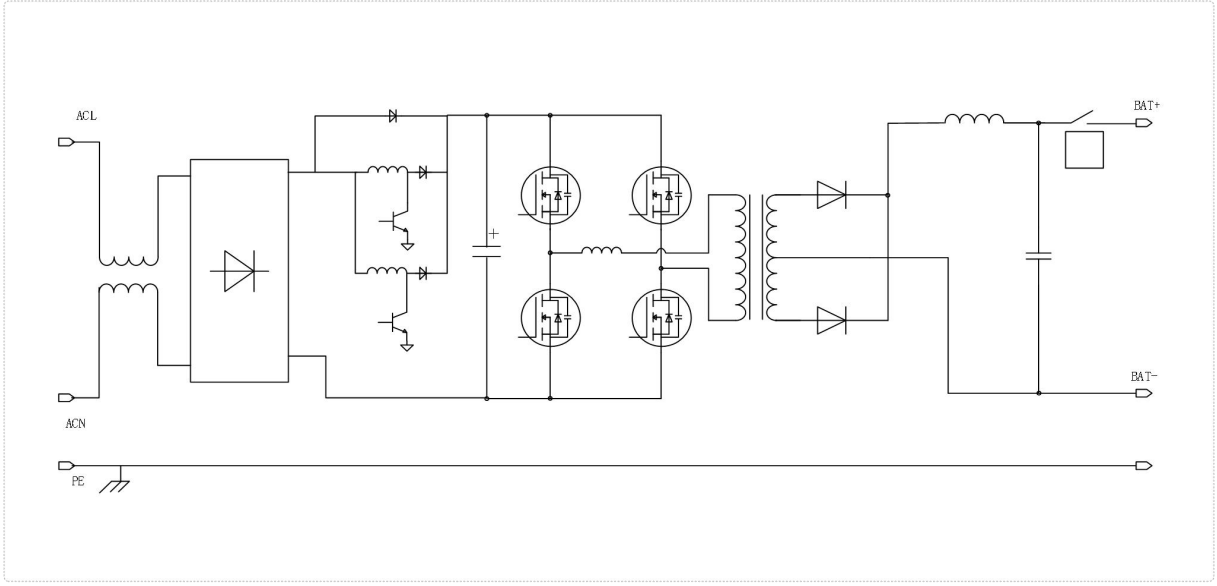
7.1 CAN communication block diagram (without terminal resistor)



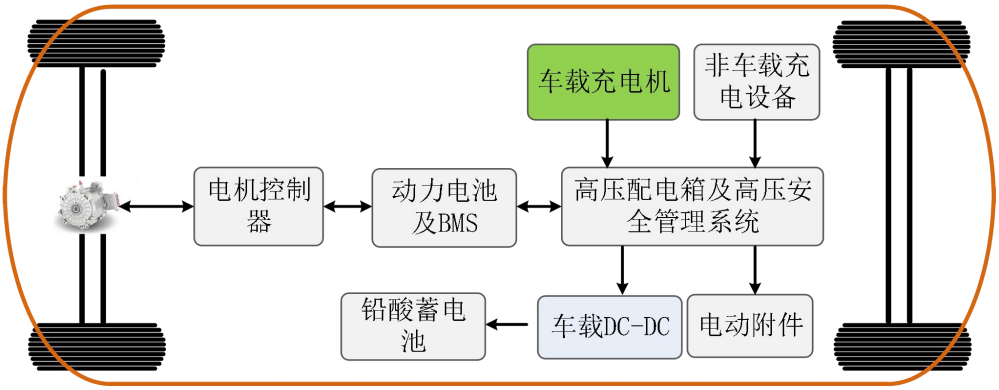
7.2 Hardware Block Diagram







7.3 Vehicle connection diagram



8.Nameplate, warning label, packaging, transportation, storage

8.1 Nameplate and barcode (nameplate label for traceability)

The basic parameters of the nameplate include: model, rated voltage, rated power, production date, serial number, etc.

The following format is for reference:

8.2 Warning signs

高压警告标识

8.3 Package

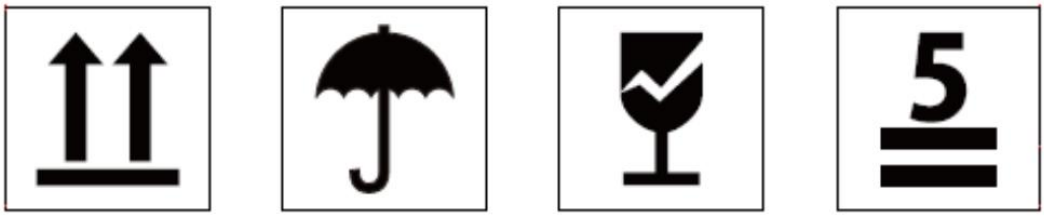
The packaging box contains the product name, model, manufacturer's logo, the manufacturer's quality department's inspection certificate, manufacturing date, etc.

The packaging box contains a list of accessories:

Item	Na me	Qty	Unit	Note
1	Charger assembly	1	台	
2	Test Report	1	张	

8.4 Transport

The products are transported in firm packaging boxes. The outside of the boxes should comply with the relevant national standards and should have signs such as "Handle with care" and "Moisture-proof". The packaging boxes containing the products can be transported by various means of transportation. During transportation, they should be protected from direct rain, snow and mechanical impact.



Shipping Mark

8.5 Storage

When the product is not in use, it should be stored in the packaging box. The warehouse environment temperature is -10-40℃ and the relative humidity is not more than 80%. No harmful gases, flammable and explosive products and corrosive chemicals are allowed in the warehouse. There is no strong mechanical vibration, impact and strong magnetic field. The packaging box should 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. After more than 2 years, it should be re-inspected.
The product should be stored in a ventilated and dry place. At the same time, it must be kept away from high temperature sources, fire sources and chemicals. Store neatly and avoid throwing and smashing.

9. Safety Guide

Warning: remind users that it is dangerous to operate with electricity

* It is strictly forbidden to disassemble and modify the device for repair or debugging without authorization

* Do not place parts in a location exposed to rain

* Please make sure the shell is intact before installation. If there is any damage, please replace it immediately or contact after-sales

* Each plug and socket should be connected tightly. If there is any damage or looseness, please replace it immediately

* It is strictly forbidden to plug and unplug the connector when the product is powered on, otherwise it may cause personal injury

* It is strictly forbidden to open the product shell when the product is powered on,

otherwise it may cause personal injury

* It is strictly forbidden to touch the high-voltage live parts of the product with bare hands. Please wear insulating gloves, insulating shoes, and insulating clothes during inspection and maintenance. It is strictly forbidden to repair and inspect with power

* When replacing fuses and contactors, it is strictly forbidden to operate rudely to avoid damaging the product and causing safety hazards

* When the battery is charging normally, please stay away from fire and flammable and explosive items

* Do not charge damaged or non-rechargeable batteries

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

* Do not block the air inlet and outlet of the product 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 this product

* The battery pack voltage must match the nominal voltage of the charger

* Avoid collision, pressure, pulling, twisting or shaking the charging cable

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

* Please package and store if not in use for a long time