Product Manual of Electric Motor Inverter

Version 1.0

Please read this manual carefully before use.



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Part I: Safety Summary and Precautions

In order to use our products correctly, please read the "Safety Summary and Precautions" carefully to reduce the dangerous situation caused by human misoperation and ensure the correct use of products. If you have finished reading this manual, please keep it properly for future reference.

1.1 Safety signs

Please do not install, operate, maintain or check the motor control system products before carefully reading the manual and auxiliary materials.

Common signs on products:





Danger caused by incorrect operation will lead to general or slight injury, or equipment failure and shutdown.

1.2 Key points for attention

① When the inverter is connected to the high-voltage power supply, please do not open the cover of the inverter to avoid electric shock;

⁽²⁾ Before wiring or inspection, please disconnect the power supply. After 10 minutes, use a multimeter to check if the residual voltage drops below 36V;

③ The product shell needs reliable grounding;

④ It is forbidden to damage the high-voltage power cable, which is easily damaged by stress, resulting in electric shock or short circuit accident;

(5) Before the product is input into the high-voltage power supply for operation, please make sure that the product is trouble-free in the low-voltage state, otherwise it is strictly forbidden to input the high-voltage power supply by force;

⁽⁶⁾ The positive and negative terminals of the input high-voltage power supply cannot be connected reversely;

 \bigcirc The phase order of U/V/W three-phase line cannot be reversed or wrong;

(8) For liquid cooling system, the type, flow rate and pressure of cooling fluid must meet the requirements of product specifications;

⁽⁹⁾ Please plug and unplug the connectors of the low-voltage power supply and signal harness of the inverter correctly. Abnormal operation may easily lead to poor contact;

1.3 General inspection

(1) Check whether the packaging is damaged due to transportation;

⁽²⁾ According to the supply list, check whether the accessories are complete. If any missing or damaged, please contact our sales department.

③ Check whether the phase order of three-phase line of the inverter and motor matches;

④ Whether the CAN communication interface can communicate normally;

⁽⁵⁾ Input the low-voltage auxiliary power supply to the inverter, checking whether it can work normally;

⁽⁶⁾ Whether the cooling circulation circuit is connected; Whether the pressure and flow rate of coolant can meet the working condition of the product;

 \bigcirc The electrical characteristics of the input and output terminals of the inverter must meet the requirements of product technical parameters;

⑧ Cover plates of inverter and motor need to be assembled completely before putting into use;

Part II: Product introduction

2.1 Product functional characteristics

This motor system is mainly suitable for the powertrain of pure electric and hybrid commercial vehicles.

2.2 Product function definition

1) Motor inverter

• Control function: According to the control requirements of the whole vehicle, the motor inverter receives the signal output by the whole vehicle inverter, and controls the running state of the driving motor. The control mode is torque or speed control, and the specific control mode is switched according to the running state of the whole vehicle.

• Regenerative braking function: The motor inverter has regenerative braking management ability, and controls the motor to brake and recover the energy fed back by the motor to the power battery pack according to the regenerative braking request sent by the vehicle inverter. The specific technical requirements (regenerative voltage and regenerative efficiency) are determined by both parties through discussion.

• Protection function: The motor control system has protection functions of short circuit, overcurrent, overvoltage, undervoltage and overheating. At the same time, the motor inverter monitors the working state of the motor by collecting the rotating speed, bus voltage, temperature and output current of the motor, so as to protect the normal operation of the motor. When the motor fails and loses power at high voltage, the motor inverter should be able to take corresponding measures to control the back electromotive force generated by the motor to protect the safety of the motor inverter and the power battery pack.

• Positive and reverse rotation function: the motor inverter has positive and reverse rotation function, positive and reverse rotation safety conversion control function, and reverse rotation speed limit function.

• Self-diagnosis: when the motor inverter and motor fail, it should be able to diagnose the fault level, and take different treatments according to the fault level to prevent the fault from expanding.

• Pre-charging and discharge management function: the pre-charging function of the motor

inverter is completed by pre-charging the external main circuit to ensure the safe use of the motor circuit contactor. Coordinate the charge control strategy of vehicle inverter, and complete the charge process of motor inverter and motor. When the whole vehicle is powered off, it has the function of releasing the residual electricity of the motor inverter, coordinates the discharge control strategy of the whole vehicle inverter, completes the discharge process of the motor inverter and the motor, and controls the actual discharge time of the inverter within 1 min.

- Communication function: The motor inverter uses CAN communication mode, and the specific communication protocol is negotiated by two parties.
- The product meets the requirements of ENISO 13849-1:2015, and has obtained TUV CE certification; The product has obtained UL583 certification.

1. Parameters of Motor Inverter

Category	Project	Parameters
	Matching motor	Permanent magnet synchronous motor
	Rated input voltage	540VDC
	Input voltage range	400~720VDC
	Rated output voltage	380VAC
	Rated capacity of motor inverter	120KVA
	Peak capacity of motor inverter	200KVA
	Rated working current	160A
	Short-time working current	370A
	Peak working current	400A
	Maximum back electromotive force of withstand motor	1190VDC
	Maximum efficiency of inverter	98%
	Nominal value of dc bus voltage	540V
	Input voltage	Range: 400 V ~ 720 V;
Electrical Specification	Insulation resistance	The steady state of inverter+, -, U, V, W to the insulation resistance of shell is over 1 M Ω .
	Grounding continuity	Resistance between the conductive part that can be touched by the inverter and the grounding point of the shell is less than 0.1Ω .
	Weight	11±1kg
	Overall dimension	390×280×100 (±2)
	Installation requirements	See drawings.
	Tightening torque of power terminal bolts	17±1Nm
Mechanical Parameters	Fastening torque of cover plate bolts	2.6±0.2Nm
	Tightening torque of power cable waterproof joint	5-6Nm
	Fastening torque of fuselage bolts	20±1Nm
	Fastening torque of grounding bolt	5±0.2Nm
	Cooling mode	water-cooling
	Rated flow	16L/min
Water Cooling	Operating water pressure	≤6600Pa
Parameter	Outside diameter of water inlet and outlet (Make positive tolerance of outer diameter 0-0.5mm)	Φ25

Low Voltage Power Supply Parameters	Low voltage power supply input voltage	24
	Low voltage overvoltage protection point	32V
	Low-voltage power supply under- voltage protection point	18V

	Storage temperature	-40°C~85°C	
Environment Parameters	Operating environmental temperature	-40°C~55°C	
	Relative humidity	95%	
	Coolant temperature	60°C	
	Enclosure protection level	IP67	
	Maximum altitude	2000m	
	Insulation requirements	≥1MΩ	
	Withstand pressure grade	Н	
	Sweep frequency vibration	Implement according to QC/T 413-2002 standard.	
Anti-vibration characteristics	Random vibration	Implement according to GB/T 28046.3-2011 standard.	
	Motor temperature sensor	PT100	
	Accuracy of internal temperature sensor of inverter	3%	

2. High-voltage interfaces:

Interface code	Wiring bolt specification	Type of external terminal	Applicable cable outside diameter	Torque requirement	
DC input+	M8	SC50-8/SC70-8	14-21mm	17±1Nm	
DC input-				- /	
AC output U					
AC output V	M8	SC50-8	13-18mm	17±1Nm	
AC output W					
Connection interface	The connecting cable ends of high-voltage positive and negative lines and three- phase lines are waterproof lock nuts; Specific installation distance can be seen at CAD drawings.				

3. Low-voltage interfaces:

AMP Number	Signal Description	AMP Number	Signal Description
1	Constant power supply	19	Motor resolver R1
2	ON power supply	20	Motor resolver S2
3	Negative electrode	21	Motor resolver S1
7	Motor resolver R2	22	Motor PT1002-

8	Motor resolver S4	23	Motor PT1001+
9	Motor resolver S3	24	Motor PT1001-
10	Motor PT1002+	25	
14	Intranet CAN-H	26	CAN shield
15	Intranet CAN-L	27	

4. Overall dimensions



5. Other requirements

- 5.1 The locking torque of the anchor mounting bolts shall be controlled within the range of 20±1Nm. The inverter doesn't need an insulating pad.
- 5.2 The locking torque of cable waterproof connector shall be controlled within the range of 17± 1Nm, and the locking torque of M8 hexagon socket triple combination screw for fixing the nose of UVW+- line shall be within the range of 17±1Nm. Exceeding the torque will cause damage to plastic parts.
- 5.3 The plug number docked with the socket is AMP: p/n-1-776164-1-plus+M7.
- 5.4 When using, please try to avoid flooding, so as not to affect the normal use.
- 5.5 The bolt of the grounding part of the grounding copper braid is M8, and the torque is determined by i the installation materials to ensure good grounding.
- 5.6 The flow rate of water inlet and outlet is 16L/min, the temperature of that water inlet is less than 60°C, and the temperature of water outlet is less than 63°C.