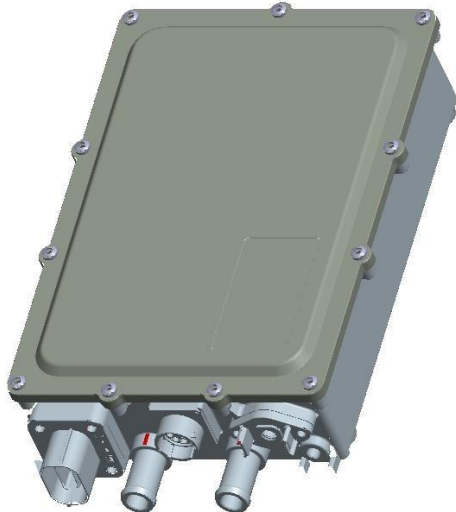


Version	Change Description	Date (dd/mm/yyyy)
0	First edition	28/12/2021

3KW DCDC Converter Module



Model Number: GVD510-3BM3R0MB

Rated Power: 3000W

Input Voltage Range: 400V-750V

Output Voltage: 27.5Vdc

Dimensions: 180 mm × 120 mm × 46 mm

Weight:

Specification

1 Product Overview

GVD510-2BM3R0MB is a high-power density bidirectional DC/DC converter with two working modes: buck and boost. When switching from buck to boost mode, it only needs the VCU to issue a boot command to switch to boost mode and wake up. When the time is less than 800MS, a low-voltage battery can supply power to the high-voltage side, ensuring uninterrupted power supply to the high-voltage steering motor controller and ensuring safe parking of the vehicle. It can directly replace the existing DC/DC converter, and directly meet the "Technical Conditions for Safety of Electric Passenger Cars" without changing the structural design of the controller, and improve the driving safety to a level. In the forward working mode, the energy of the high-voltage power battery can be converted into 24V low-voltage to provide the power demand of the low-voltage power system of the whole vehicle. When the 24V low-voltage battery has insufficient power, it is necessary to charge the 24V low-voltage battery to ensure sufficient battery power to meet the needs of automotive electrical appliances. The electrical system interface of the DC/DC part should include high-voltage input, low-voltage output and control communication signals.

2 Product model name description

GVD510 – 3 B M 3R0 M B

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

Mark	Description	Details
①	Product series	GVD510
②	Delimiter	--
③	Product generation	3rd generation
④	Input voltage range	B: Working voltage range 400-750VDC
⑤	Output voltage	M: 27.5V (24V battery or air conditioner power supply)

⑥	Output Power	3KW --- 3R0
⑦	System	M: integrated module
⑧	Power conversion method	B: Bidirectional DC (both charging and inverter)

3 Product model and its main rated electrical parameters

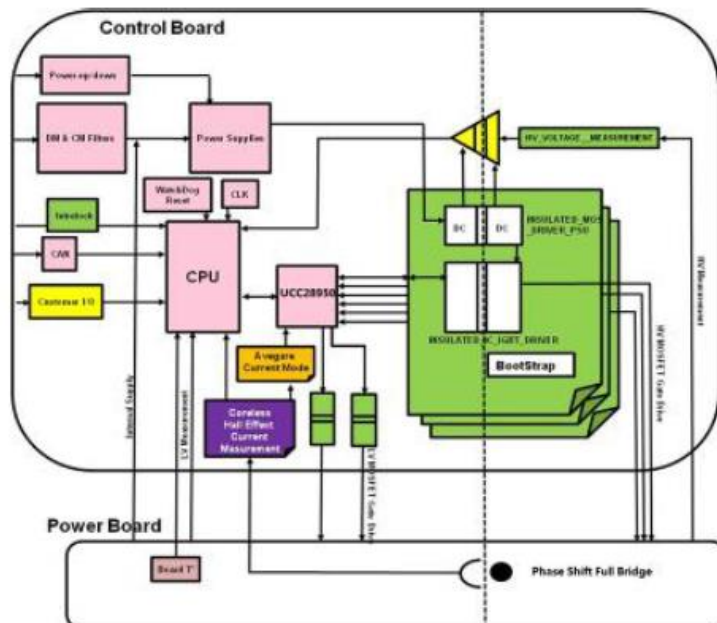
3-1 Model

Product name	Model Number
3KW DCDC	GVD510-3BM3R0MB

3-2 Electrical parameters

Model Number	Specifications	Parameters
GVD510-3BM3R0LD	Rated power	3KW
	Peak power	3.6KW
	Input voltage range	400- 750VDC
	Output voltage	27.5Vdc
	Input current range	0-10A
	Output peak current	133A
	Output rated current	110A
	Positive Peak efficiency	≥0.94
	Reverse rated power	3KW
	Reverse peak power	4.5KW (MAX)
	Reverse output voltage	450V
	Reverse peak efficiency	≥0.96

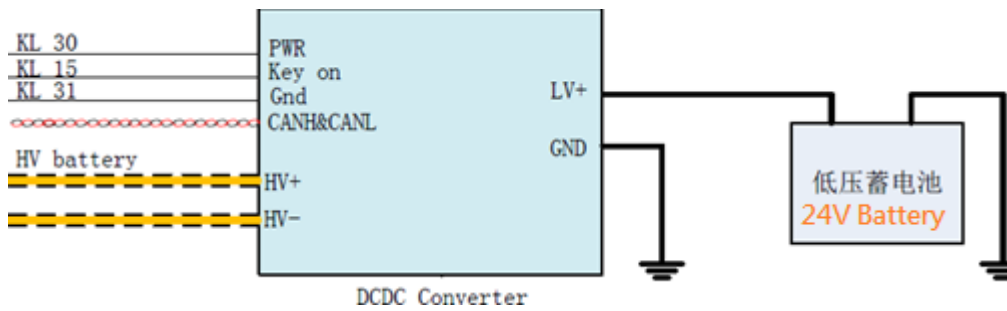
4 System block diagram



5 Main circuit terminal composition

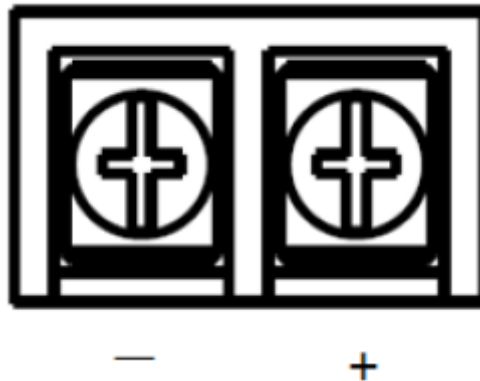
5.1 Logic block diagram of the main loop

PV2003 is a one-way 3KW reverse peak 4.5KW DCDC single-product module. In actual applications, the external interfaces: DC input terminals, low-voltage DC output terminals, and low-voltage signal terminals.



5.2 Main circuit terminal function description

1. DC input terminal_M3 screw hole

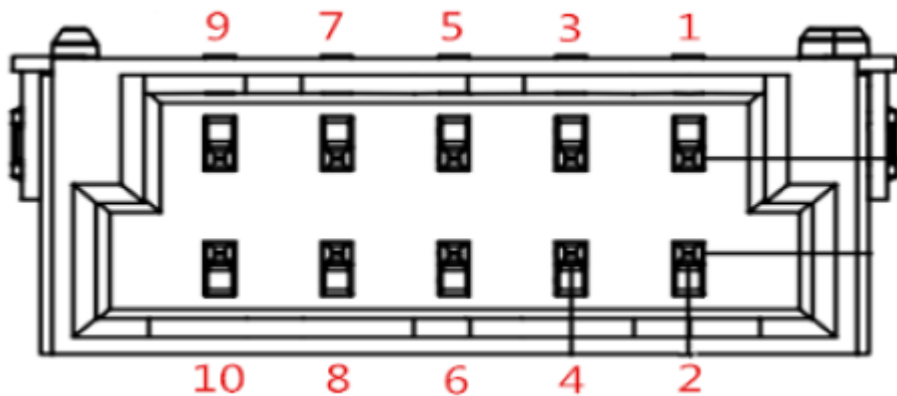


2. Low voltage DC output terminal

Use bronze as output +, output-as chassis

3. Low voltage signal terminal

1) Model: 8254B1044104 Brand: LianSuo



Top view
 Brand Terminal: LianSuo

Signal definition

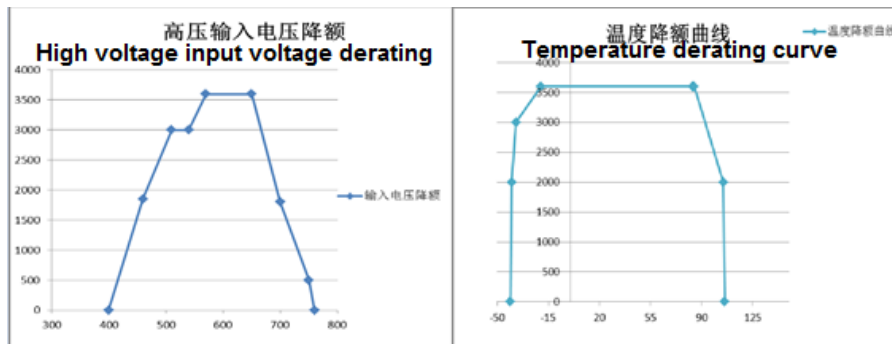
PIN	Function	Description	Remarks
PIN1	KL31 (24V power supply+)	DCDC control board power supply, positive	DC-DC
PIN2	High voltage interlock	High voltage interlock detection signal	
PIN3	KL30 (24V power supply -)	DCDC control board power supply, negative	
PIN4			
PIN5	KL15 (enable signal)	Engine ignition signal input, high level enables work, low level DCDC enters the standby state	
PIN6	Empty	Empty	CAN
PIN7	CAN_H	Main CAN bus, used for normal communication between DCDC and body CAN network	
PIN8	CAN_L		
PIN9	Empty	Empty	
PIN10	Empty		

6 Key technical indicators

1、Input characteristics					
Item	Description	Parameters	Unit	Remarks	
1.1	Rated input voltage	560VDC	V	Derated output below 510V	
	Input voltage range	400-750VDC			
1.2	Start transient surge current	≤15	A	Rated input, rated load	
1.3	Maximum input current	10	A	Rms (effective value)	
1.4	Static current consumption	≤0.5	mA	Sleep mode	
1.5	Input control voltage	10-32	Vdc		
2、Output characteristics					
2.1	Output voltage adjustment range	20-28	Vdc		
2.2	Rated output voltage	27.5	Vdc	Voltage sampling accuracy ≤1%	
	Maximum output current	133	A	Current measurement accuracy ≤±2%.	
2.3	Rated output power	3000	W	Rated power	
2.4	Overall efficiency	≥94	%	When output power ≥800W	
2.5	Output ripple voltage	$V_{p-p} \leq 700\text{mV}$	V_{p-p}	Rated voltage and current, the bandwidth of the oscilloscope should be 20MHz, the probe is connected in parallel with 10u+104 capacitance	
2.6	Turn on and turn off overshoot range	≤±10	%	Full and empty conditions	
2.7	Dynamic load dump test	Overshoot amplitude	$\Delta V: \leq \pm 20$	%	0%-100% or 100%-0% load Change, the jump rate jump cycle is 20ms.
		Recovery Time	$\Delta t: \leq 10$	mS	
2.8	Stabilization accuracy	main road	≤±1	%	
2.9	Load adjustment rate	main road	≤±1	%	
3、Protection characteristics					
3.1	Input undervoltage protection point	390±5	Vdc	Automatic recovery	

3.2	Input undervoltage recovery point	400±5	Vdc	Automatic recovery
3.3	Input overvoltage protection point	760±5	Vac	Automatic recovery
3.4	Input overvoltage recovery point	750±5	Vac	Automatic recovery
3.5	Enter the maximum current limit	26	A	Automatic recovery
3.6	Output overvoltage protection point	31±0.5	Vdc	Automatic recovery
3.7	Output undervoltage protection point	19±0.5	Vdc	Automatic recovery
3.8	Maximum output current limit	133	A	Automatic recovery
3.9	Short circuit protection	yes	-	Automatic recovery
3.10	Over temperature protection point	106	°C	Can be automatically restored, 85°C enters derating, 106°C protection, over temperature recovery point is 100°C
4. Reverse characteristics				
4.1	Input voltage range	18-28	V	
4.2	Rated power	3	KW	
4.3	Peak power	4.5	KW	Peak power output duration 30S
4.4	Output voltage	450	V	Working voltage range: 450~550Vdc
4.5	Output current	<11	A	Output voltage is 450V
4.6	Input undervoltage protection	17	V	
4.7	Input overvoltage protection	29	V	
4.8	Output overvoltage protection	750	V	
4.9	Maximum output current limit	10	A	
4.10	Output rise time	≤200ms	mS	
4.11	Overall efficiency	≥94	%	Tested above 50% load
4.12	Output anti-reverse	Yes		High voltage maximum anti-reverse connection 850V
4.13	Short circuit protection	Yes		Lock up

Derating Curve

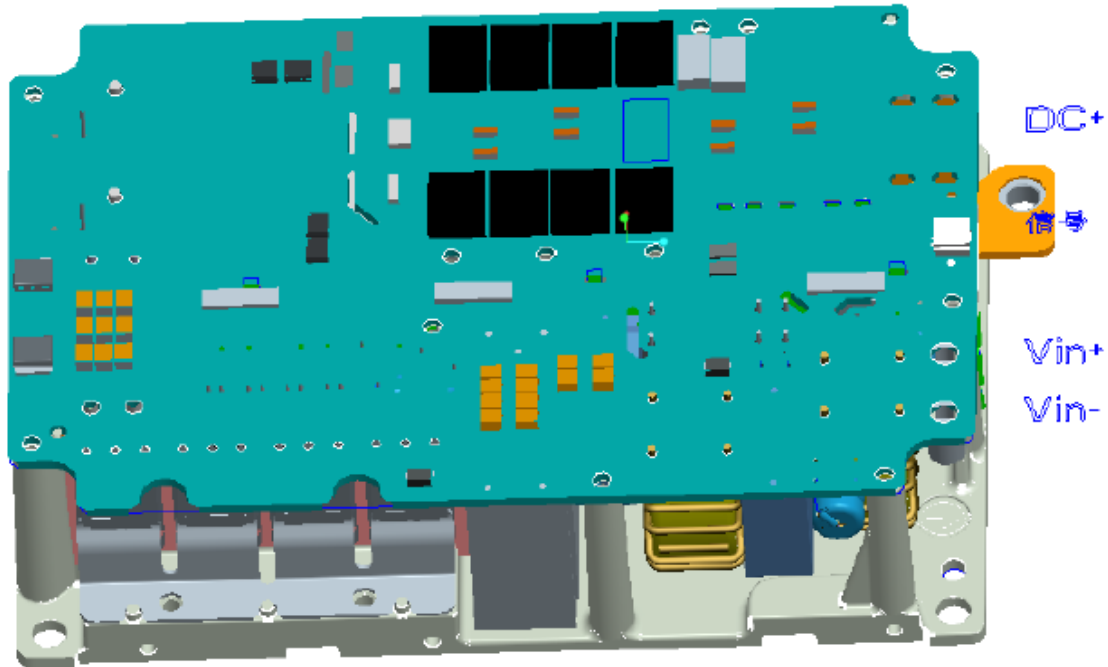


Input voltage derating curve

Temperature derating curve

Overall structure plan and process requirements

The overall picture is as follows:



model: GVD510-3BM3R0MB

- Overall dimensions: $\leq 180\text{mm} \times 120\text{mm} \times 46\text{mm}$
- Shell, aluminum die casting
- Cover plate: aluminum plate to meet the mechanical strength requirements
- The packaging design meets the needs of single-machine shipments, and special attention is paid to the protection of external connectors to prevent damage during transportation.
- For the cable inlet interface, refer to the description of 5.2 main circuit function terminals.
- Meet the requirements of electrical clearance, creepage distance, and grounding safety regulations
- Meet the needs of OEM production
- Electric shock protection and scald protection warning signs are set on the outside of the machine
- The structure meets the horizontal installation method

7 Safety requirements

Item	Description		Standard test	Remarks
1	Dielectric strength	Input-Output	2800Vdc/1mA/1min	No breakdown or flashover
		Input-Chassis	2800Vdc/1mA/1min	No breakdown or flashover
2	Insulation resistance	Input-Output	$\geq 20\text{M}\Omega$	Input to output, input to the chassis plus 500Vdc Test conditions: normal air pressure, humidity 90%
		Input-shell		
3	Electric clearance, creepage distance		GB/T24347-2009; IEC/EN61800-5-1 (electrical Clearance and creepage distance section)	Except for electrical clearance and creepage distance, other parts are GB/T24347 requirements

8 Environmental requirements

In order to give full play to the performance of DCDC and maintain its function for a long time, the environmental requirements of DCDC are as follows:

Environmental conditions		fulfill the standard
working environment	Installation site	1. The materials used in the product shall not cause personal injury in extreme situations such as fire; 2. Insulation resistance $\geq 10M\Omega$ (high voltage input to output); 3. Withstand voltage meets the requirements of GB/T 18488.1-2015; 4. Contact current $\leq 5mA$, meeting the requirements of GB/T 18488.1-2015;
	Ambient temperature	-40°C~+85°C
	Relative humidity	5%~90%
	Other climatic conditions	In a place where there is no condensation, no icing, no dripping or stagnant water
	Salt spray and corrosive Gas content	Electric vehicle DC DC converter (GBT24347-2020 draft), 144 hours Time salt spray test: to ensure normal operation, no salt spray enters the shell
	Vibration and shock	Meet ISO 16750-3
Storage environment	Storage place	Store in a clean, dry indoor place
	Ambient temperature	-40 °C~ +85°C, the air temperature change is less than 1 °C/min
	Relative humidity	5%~95%
	Storage time	The total delivery and storage time should not exceed 6 months. If the storage time is longer, then Storage conditions should be improved (e.g. lower temperature range)
Transport environment	Transportation	In the standard packing box, car, train, airplane, ship and other relative Near tool transportation
	Ambient temperature	-40 °C~ +85°C
	Relative humidity	At +40 °C, less than 85%
	vibration	Meet ISO 16750-3
life	Life requirement	Product life is 8 years/15W kilometers, whichever comes first

9 Environment and reliability test

Table 13-1 Description of environment and reliability test

Item	Test items	Test method	development stage	Pilot stage	Remark
1	Structure inspection	N/A	V	V	
2	High and low temperature storage	ISO16750-4:5.1.1.1 & 5.1.2.1	V	V	
3	Thermal shock	ISO16750-4:5.3.2	V	V	
4	Random vibration and temperature cycle test	ISO 16750-3:4.1.2.4.2/ ISO 16750-3 Figure1	V	V	
5	Damp heat, constant state, 21 days	ISO16750-4:5.7	V	V	
6	Temperature step test	ISO 16750-4:5.2	V	V	

7	High and low temperature operation	GS 95024-3-1:july 3013 & 14.3	V	V	
8	Life cycle test	EN60068-2-14	V	V	
9	Temperature cycle test	ISO16750-4:5.3.1.2	V	V	
10	Damp heat cycle test	ISO16750-4:2 & 5.6.2.3	V	V	

10 ROHS requirements

ROHS grade	Is it satisfied	Description
ROHS	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	All materials must be met, with certification instructions
Other request	No	No

11 Optional accessories specifications

All components must meet the design specifications, and key components need to be made of automotive-specific materials.

12 Product installation, operation and maintenance requirements

12.1 Install

Installed in the customer's vehicle, fixed on the fixed frame

12.2 Operate

Within the allowable range of input, temperature, output and auxiliary power supply, DCDC works according to the instructions of the vehicle.

12.3 Maintain

(1) The maintenance, inspection or component replacement of DCDC must be carried out by trained and qualified professionals.

(2) Before connecting the DCDC terminal, the connection between the connecting wire and the high-voltage battery must be cut off.

(3) During maintenance, maintenance and component replacement, measures must be taken to prevent conductive objects such as screws and cables from entering the DCDC.

(4) During maintenance, maintenance and component replacement, it is necessary to avoid DCDC and components contacting or attaching flammable materials.

(5) After maintenance and maintenance, insulation test and Hipot test must be done.

(6) In the process of maintenance, maintenance and component replacement, the DCDC and internal components must be taken anti-static measures.

13 Product production, testing, marking, packaging, and transportation requirements

13.1 Manufacturability requirements

- (1) Working tools are commonly used sockets, wrenches, screw cutters, forklifts, etc.
- (2) Multiple people are required to coordinate production and assembly. Install as a component first, then as a unit
- (3) Install in accordance with the process operation instructions

13.2 Testability requirements

- (1) Single board test meets the requirements of automatic test on tooling
- (2) The system test requires a complete test of the electrical performance and control performance of the entire system, including the system's power-on sequence, terminal function, host computer function, full load test, etc., refer to the production debugging instructions

13.3 Mark

- a) The name, address and zip code of the manufacturer and the receiving unit;
- b) Product name, model and quantity;
- c) Product standard number;
- d) The total mass of the packing box;
- e) Overall dimensions of the packing box (length×width×height);
- f) Date of manufacture or batch number;
- g) The transportation safety signs should meet the requirements of GB/T 191 2008 "Picture Signs for Packaging, Storage and Transportation";
- h) The packaging plan and drawing requirements are jointly determined by INVT and the XX customer;
- i) The packaging box requirements are jointly determined by INVT and the XX customer.

13.4 Packaging requirements

- a) The packaging box should be firm, and the product should not move in the box. The packaging box should be made of wooden materials.
- b) There should be a plastic bag outside the DCDC assembly.
- c) The quantity of all materials in the packaging box meets the requirements of the 2D drawing.
- d) There should be a product certificate and packing list in the packing box, and an instruction manual should be provided according to customer requirements (the content of the instruction manual should meet the requirements of GB/T9969 2008 "General Instructions for Industrial Products") and the factory test report transcript.
- e) The total mass of each box shall not exceed 15 kg.
- f) Anti-rust treatment shall be carried out before leaving the factory. Under normal storage conditions, it shall be ensured that the rust corrosion shall meet the requirements of 3.2 within 24 months from the date of leaving the

factory.

13.5 Transport requirements

The product should be rainproof and moisture-proof during transportation, loading and unloading in a civilized manner, beating and violent collisions are forbidden, and should comply with relevant transportation regulations.

14 Referenced standards and specifications

GB/T2423.1 2008 Environmental Testing of Electrical and Electronic Products Part 2: Test Method Test A: Low Temperature

GB/T2423.2 2008 Environmental Testing of Electrical and Electronic Products Part 2: Test Method Test B: High Temperature

GB/T2423.18 2000 Environmental Test of Electrical and Electronic Products Part 2: Test Test Kb: Salt Spray Alternating Sodium Chloride Solution

GB/T2423.22 2002 Environmental Testing of Electrical and Electronic Products Part 2: Test Method Test N: Temperature Change

GB/T2423.26 2008 Basic Environmental Test Regulations for Electrical and Electronic Products Test Z/BM: Comprehensive test of high temperature and low pressure

GB4208 2008 Enclosure protection grade (IP code)

GB/T12678 1990 Automobile Reliability Driving Test Method

GB17625.1 2003 electromagnetic compatibility limit harmonic current emission limit equipment input current per phase $\leq 32A$)

GB/T17626.2 2006 Electromagnetic compatibility test and measurement technology Electrostatic discharge immunity test

GB/T17626.3 2006 Electromagnetic compatibility test and measurement technology Radio frequency electromagnetic field immunity test

GB/T17626.4 2008 Electromagnetic compatibility test and measurement technology Electrical fast transient pulse group deflection test

GB/T17626.5 2008 Electromagnetic compatibility test and measurement technology Surge shock Immunity test

GB/Z17625.6 2003 Electromagnetic compatibility limits the harmonic current generated in the low-voltage power supply system for equipment with a rated current greater than 32A

limits

GB/T17626.11 2008 Electromagnetic compatibility test and measurement technology Voltage sag, short-term interruption and voltage change immunity test

GB/T17626.13 2006 Electromagnetic compatibility test and measurement technology AC power port harmonics, interharmonic waves and low frequency immunity test of power grid signals

GB/T18384 Electric Vehicle Safety Requirements

GB/T18387 2008 Limits and measurement methods of electromagnetic field emission intensity of electric vehicles, broadband, 9kHz 30MHz

GB/T18487.2 2001 Electric Vehicle Conductive Charging System Requirements for the Connection of Electric Vehicles to AC and DC Power Sources

B/T191 2000 Packaging, Storage and Transportation Pictorial Sign

QC/T238 storage and custody of auto parts

QC/T413 2002 Basic technical requirements for automotive electrical equipment

GB/T 24347-2009 DC/DC converters for electric vehicles

SJ3212 1989 General Technical Requirements for Electronic Product Transport Packaging

IEC61000 2 2 Electromagnetic Compatibility Part 2 2 Environment Low-frequency conducted disturbances and signal transmission in public low-voltage power supply systems

Compatibility level

IEC60068 2 13 Environmental Test Part 2 Test Test M: Low air pressure

IEC60068 2 30 2005 Basic Environmental Test Procedure Part 2: Test Test Db and Guidelines Alternating Humidity and Heat

EN60068 2 27 1993 Basic Environmental Test Procedure Part 2 Test Test Ea and Guideline Impact

CAN Specification V2.0 BOSCH