



**TEST REPORT**  
**IEC 60255-27**  
**Measuring relays and protection equipment –**  
**Part 27: Product safety requirements**

**Report Number.....:** 6046094.50

**Date of issue .....** 2019-03-07

**Total number of pages.....** 73 pages

**Name of Testing Laboratory preparing the Report.....:** DEKRA Testing and Certification (Shanghai) Ltd.

**Applicant's name .....** Hitachi Hi-Rel Power Electronics Pvt. Ltd.

**Address .....** SM 3 & 4, Sanand – II GIDC, Industrial Estate, Boll Village, Sanand – 382 110, Gujarat, India.

**Test specification:**

**Standard.....:** IEC 60255-27:2013 (Second Edition)

**Test procedure.....:** Type test

**Non-standard test method.....:** N/A

**Test Report Form No. ....:** IEC60255\_27A

**Test Report Form(s) Originator ....:** IMQ S.p.A.

**Master TRF .....** 2014-09

**Copyright © 2014 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved.**

This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.




If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

**This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.**

**General disclaimer:**

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.








<b>Test item description..... :</b>	Grid-connected PV Inverter	
<b>Trade Mark..... :</b>		
<b>Manufacturer..... :</b>	Hitachi Hi-Rel Power Electronics Pvt. Ltd. SM 3 & 4, Sanand - II GIDC, Industrial Estate, Boll Village, Sanand - 382 110, Gujarat, India.	
<b>Model/Type reference..... :</b>	Hiverter Si-50K, Hiverter Si-60K, Hiverter Si-70K	
<b>Ratings..... :</b>	<p>Hiverter Si-50K: PV input: Max.1000 Vdc, MPPT voltage range: 250-950 Vdc, max 40/30/30 A, Isc PV: 48/36/36 A Output: 400 Vac, 3/N/PE, 50/60 Hz, nominal 50000 W, max 50000 VA, max 3x80 A</p> <p>Hiverter Si-60K: PV input: Max.1000 Vdc, MPPT voltage range: 250-950 Vdc, max 40/40/40 A, Isc PV: 48/48/48 A Output: 400 Vac, 3/N/PE, 50/60 Hz, nominal 60000 W, max 60000 VA, max 3x90 A</p> <p>Hiverter Si-70K: PV input: Max.1000 Vdc, MPPT voltage range: 250-950 Vdc, max 40/40/40 A, Isc PV: 48/48/48 A Output: 480 Vac, 3/PE, 50/60 Hz, nominal 70000 W, max 75000 VA, max 3x90 A</p>	
<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>		
<input checked="" type="checkbox"/>	<b>Testing Laboratory:</b>	DEKRA Testing and Certification (Shanghai) Ltd.
	<b>Testing location/ address..... :</b>	3F, #250 Jiangchangsan Road, Building 16, Headquarter Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai 200436, China
<input checked="" type="checkbox"/>	<b>Associated Testing Laboratory:</b>	Suzhou Longce Testing Technology Service Co., Ltd.
	<b>Testing location/ address..... :</b>	Building 5, No.369, Lushan Road, New District, Suzhou, China
	<b>Tested by (name, function, signature) :</b>	Jason Guo 
	<b>Approved by (name, function, signature) :</b>	Allan Chen 
<b>Testing procedure: TMP/CTF Stage 1:</b>		
	<b>Testing location/ address..... :</b>	
	<b>Tested by (name, function, signature) :</b>	
	<b>Approved by (name, function, signature) :</b>	
<b>Testing procedure: WMT/CTF Stage 2:</b>		
	<b>Testing location/ address..... :</b>	








<b>Tested by (name + signature) ..... :</b>			
<b>Witnessed by (name, function, signature) ..... :</b>			
<b>Approved by (name, function, signature) :</b>			
<input type="checkbox"/>	<b>Testing procedure: SMT/CTF Stage 3 or 4:</b>		
<b>Testing location/ address..... :</b>			
<b>Tested by (name, function, signature) —:</b>			
<b>Witnessed by (name, function, signature) ..... :</b>			
<b>Approved by (name, function, signature) :</b>			
<b>Supervised by (name, function, signature) ..... :</b>			








<b>List of Attachments (including a total number of pages in each attachment):</b>  Attachment 1: Vibration, Shock, Bump, Seismic test report (19 pages) Attachment 2: Pictures (12 pages)	
<b>Summary of testing:</b>	
<b>Tests performed (name of test and test clause):</b> All applicable clauses test according standards IEC 60255-27:2013 were performed DEKRA Testing and Certification (Shanghai) Ltd. except below tests was performed in Suzhou Longce Testing Technology Service Co., Ltd.: 10.6.2.1 Vibration 10.6.2.2 Shock 10.6.2.3 Bump 10.6.2.4 Seismic	<b>Testing location:</b> DEKRA Testing and Certification (Shanghai) Ltd. 3F, #250 Jiangchangsan Road, Building 16, Headquarter Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai 200436, China  Suzhou Longce Testing Technology Service Co., Ltd. Building 5, No.369, Lushan Road, New District, Suzhou, China
<b>Summary of compliance with National Differences:</b> <b>List of countries addressed</b>  N/A  <input checked="" type="checkbox"/> The product fulfils the requirements of IEC 60255-27:2013 (Second Edition)	

**Copy of marking plate:**

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

<b>HITACHI</b>	
<b>Solar Grid Tied Inverter</b>	
Model No.	Hiverter Si-50K
Max. DC Input Voltage	1000V
Operating MPPT Voltage Range	250-950V
Max. Input Current	40A/30A/30A
Max. PV Isc	48A/36A/36A
Nominal Grid Voltage	3/N/PE,400VAC
Max. Output Current	80A
Nominal Grid Frequency	50Hz/60Hz
Nominal Output Power	50000W
Max. Output Power	50000VA
Power Factor	>0.99(adjustable+/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25 ~+60°C
Protective Class	Class I
©Hitachi Hi-Rel Power Electronics Pvt. Ltd. SM 3 & 4, Sanand - II GIDC, Industrial Estate, Bol Village, Sanand - 382 110, Gujarat, India., www.hitachi-hirel.com	
      	

<b>HITACHI</b>	
<b>Solar Grid Tied Inverter</b>	
Model No.	Hiverter Si-60k
Max. DC Input Voltage	1000V
Operating MPPT Voltage Range	250-950V
Max. Input Current	40A/40A/40A
Max. PV Isc	48A/48A/48A
Nominal Grid Voltage	3/N/PE,400VAC
Max. Output Current	90A
Nominal Grid Frequency	50Hz/60Hz
Nominal Output Power	60000W
Max. Output Power	60000VA
Power Factor	>0.99(adjustable+/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25 ~+60°C
Protective Class	Class I
©Hitachi Hi-Rel Power Electronics Pvt. Ltd. SM 3 & 4, Sanand - II GIDC, Industrial Estate, Bol Village, Sanand - 382 110, Gujarat, India., www.hitachi-hirel.com	
      	

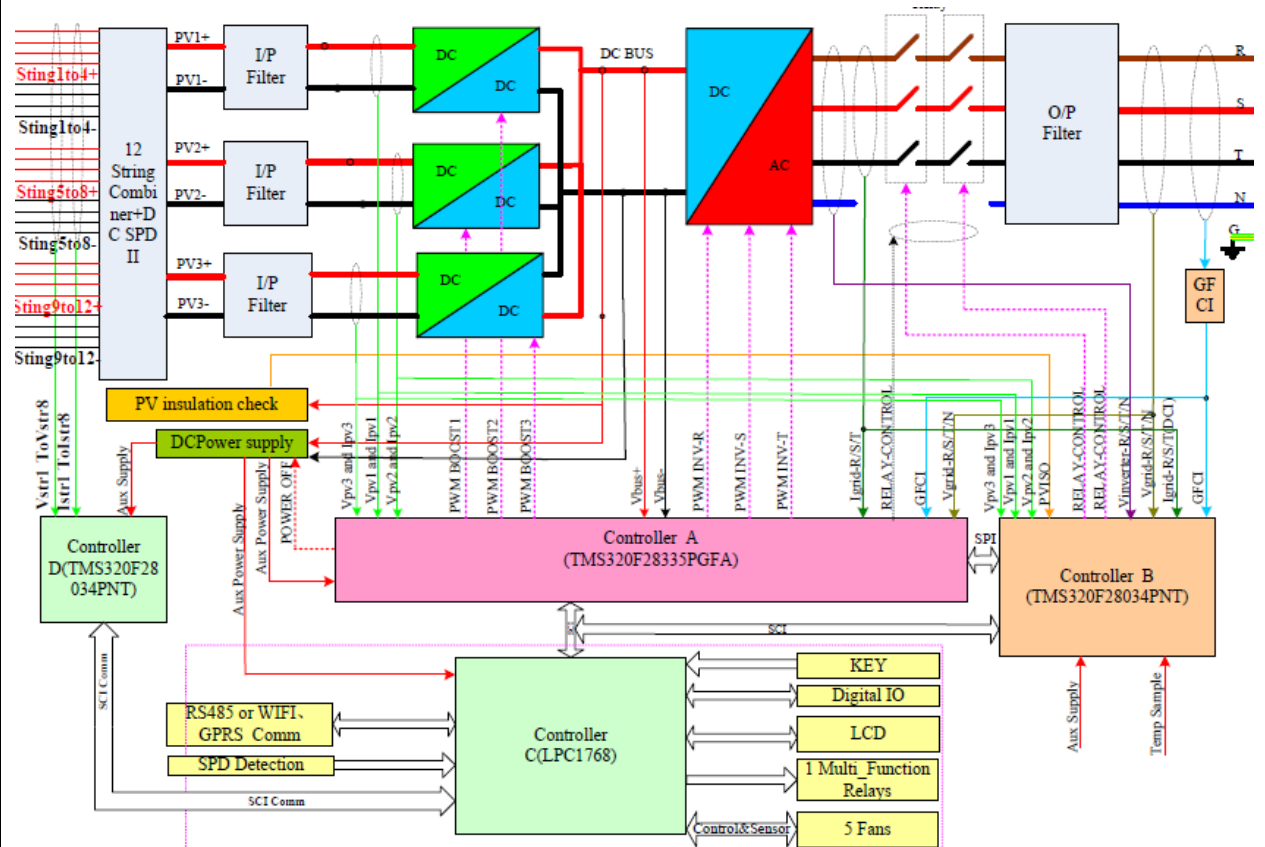
<b>HITACHI</b>	
<b>Solar Grid Tied Inverter</b>	
Model No.	Hiverter Si-70k
Max. DC Input Voltage	1000V
Operating MPPT Voltage Range	250-950V
Max. Input Current	40A/40A/40A
Max. PV Isc	48A/48A/48A
Nominal Grid Voltage	3/PE,480VAC
Max. Output Current	90A
Nominal Grid Frequency	50Hz/60Hz
Nominal Output Power	70000W
Max. Output Power	75000VA
Power Factor	>0.99(adjustable+/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25 ~+60°C
Protective Class	Class I
©Hitachi Hi-Rel Power Electronics Pvt. Ltd. SM 3 & 4, Sanand - II GIDC, Industrial Estate, Bol Village, Sanand - 382 110, Gujarat, India., www.hitachi-hirel.com	
      	

<b>Test item particulars.....:</b> Grid-connected PV Inverter	
<b>Classification of installation and use .....</b> : Fixed	
<b>Supply Connection.....:</b> Permanent connection	
<b>External operating temperature range.....:</b> -25 to 60 °C	
<b>Altitude during operation (m) .....</b> : 2000 m	
<b>Supply fluctuations.....:</b> According to the specified supply range	
<b>Over voltage category (OVC) Mains .....</b> : <input type="checkbox"/> OVC I <input type="checkbox"/> OVC II <input checked="" type="checkbox"/> OVC III <input type="checkbox"/> OVC IV <input type="checkbox"/> other:	
<b>Over voltage category (OVC) PV.....:</b> <input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV <input type="checkbox"/> other:	
<b>External pollution degree (PD) .....</b> : <input type="checkbox"/> PD 1 <input type="checkbox"/> PD 2 <input checked="" type="checkbox"/> PD 3	
<b>Class of equipment .....</b> : <input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified	
<b>Possible test case verdicts:</b>	
- test case does not apply to the test object ..... : <b>N/A</b>	
- test object does meet the requirement..... : <b>P (Pass)</b>	
- test object does not meet the requirement ..... : <b>F (Fail)</b>	
<b>Testing .....</b> :	
<b>Date of receipt of test item.....:</b> 2018-10-15 (samples provided by applicant)	
<b>Date (s) of performance of tests .....</b> : 2018-10-15 to 2019-02-25	
<b>General remarks:</b>	
<p>"(See Enclosure #)" refers to additional information appended to the report.          "(See appended table)" refers to a table appended to the report.          The test results presented in this report relate only to the object tested.          This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.          This report is only for reference and is not used for legal proof function in China market.          The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.          Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
<b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60255-27A:</b>	
<b>The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :</b>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
<b>When differences exist; they shall be identified in the General product information section.</b>	
<b>Name and address of factory (ies)..... :</b> Dongguan SOFAR SOLAR Co., Ltd. 1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City, China.	

**General product information:**

The PCEs are three-phase Grid-connected PV Inverter converts DC voltage into AC voltage.

The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output (transformerless). The output is switched off redundant by the high power switching bridge and two relays. This assures that the opening of the output circuit will also operate in case of one error.

**Block Diagram**

The internal control is redundant built. It consists of Main DSP and slave DSP.

The Main DSP can control the relays, measures voltage, and frequency, AC current with injected DC, insulation resistance and residual current; In addition it tests the array insulation resistance and the RCMU circuit before each start up.

The slave DSP is using for detects residual current, also can open the relays independently and communicate with Main DSP.

The unit provides two relays in series on Line conductors. When single-fault applied to one relay, alarm an error code in display panel, another redundant relay provides basic insulation maintained between the PV array and the mains. All the relays are tested before start up. Both controllers Main DSP, Slave DSP can open the relays.

**Model Difference:**

The models Hiverter Si-50K, Hiverter Si-60K are identical in hardware and software with Hiverter Si-70K, except for electrical ratings and model name.

Unless otherwise specified, all tests were conducted on basic model of SOFAR 70000TL-HV to represent the other models.

The product was tested on:

Hardware version: V1.00

Software version: V1.10

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

<b>4</b>	<b>General safety requirements</b>		-
4.1	General		P
4.2	Earthing requirements		P

<b>5</b>	<b>Protection against electric shock</b>		-
5.1	General		P
5.1.1	Introductory remark		P
5.1.2	Protection from contact with hazardous live parts		P
5.1.2.1	General		P
5.1.2.2	Insulation		P
5.1.2.3	Equipment case and barriers	IP65 enclosure and no opening in the case.	P
	Hazardous live parts	Hazardous live parts were separated from the accessible part.	P
	Top surfaces of barriers accessible in normal use...	No opening of EUT and the cover only can be removed with tool by trained personnel.	P
	Protection in service access areas		P
	- with rigid test finger and a force of 10 N		N/A
	- with jointed test finger		N/A
5.1.2.4	Hazardous live terminations using stranded wire		P
5.1.3	Discharge of capacitors		-
	Compliance checked by calculation		P
	Measured voltage (V); time-constant (s)		P
	Residual charge (μC)		P
5.1.4	Protective impedance	No protective impedance used.	-
	Requirements of 5.1.5.3.2 in normal and to level of 5.2.4.1.2 in single fault condition		N/A
	The protective impedance consists of one or more of the following:		N/A
	appropriate high-integrity single component		N/A
	combination of components		N/A
	combination of basic insulation and a current- or voltage-limiting device		N/A
	Voltage test for double/reinforced insulation		N/A

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
	Components and associated basic insulation checked after a single-fault condition assessment or test according to 10.6.5.5.		N/A
	Clearance, creepage distance between terminations of the impedance meet requirements of double or reinforced insulation of Annex C of this standard and 6.7 of IEC 61010-1:2010:		N/A
5.1.5	Accessible parts		-
5.1.5.1	General	All accessible metal parts were earthed and separated from live parts by basic insulation. All external accessible circuit were separated from live parts by reinforce insulation.	P
5.1.5.2	Determination of accessible parts		-
5.1.5.2.1	General		P
	Normal operational use, with or without the aid of a tool which will increase the accessibility	See 5.1.5.2.2 to 5.1.5.2.4 or test by inspection.	P
5.1.5.2.2	General examination	No opening of EUT and the cover only can be removed with tool by trained personnel.	-
	Test with jointed test finger		N/A
	Test with rigid test finger (force of 10 N)		N/A
5.1.5.2.3	Openings above parts, enclosed by the case, which are hazardous live	No opening of EUT and the cover only can be removed with tool by trained personnel.	-
	Test with test pin (100mm, Ø4mm)		N/A
5.1.5.2.4	Openings for pre-set controls	No opening of EUT and the cover only can be removed with tool by trained personnel.	-
	Test with test pin (100mm, Ø3mm)		N/A
5.1.5.2.5	ELV rated or live parts accessible when cover removed		-
	Removing the cover without tools	No opening of EUT and the cover only can be removed with tool by trained personnel.	N/A
	- Symbol 14		N/A
	- Symbol 12		N/A
5.1.5.2.6	Wiring terminals		-
	IP1X according to 5.1 of IEC 60529		P
	- Symbol 12		P
5.1.5.3	Permissible limits for accessible parts		-

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.5.3.1	General		P
	Values of 5.1.5.3.2 in normal operational condition and nor those of 5.2.4.1.2 in single-fault condition.		P
5.1.5.3.2	Values under normal conditions		-
	a) Voltage limits less than 33 V r.m.s. or 70 V d.c.:		P
	for wet locations voltage limits less than 25 V r.m.s. or 37.5V d.c.	Communication port was accessible conductive part that voltage less than 25 V r.m.s. or 37.5 V d.c.	P
	Voltages are not hazardous live the levels of	Communication port.	P
	b) Current less than 0,5 mA r.m.s. for sinusoidal, 0,7 mA peak non-sinusoidal or mixed frequencies or 2 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz		N/A
	for wet locations measuring circuit A.4 used		N/A
	70 mA r.m.s. when measured with circuit A.3 for higher frequencies :		N/A
	c) Levels of capacitive charge or energy less:		N/A
	1) 45 $\mu$ C for voltages up to 15 kV peak or d.c. or line A of Figure 3 of IEC 61010-1:2010		N/A
	2) 350 mJ stored energy for voltages above 15 kV peak or d.c.		N/A
5.1.6	Bonding to the protective conductor		-
5.1.6.1	Insulation between live parts and accessible conductive parts		P
	Accessible conductive parts		P
	Unearthed accessible conductive parts		P
	separated from by double insulation or reinforced insulation, or		P
	Equipment of class I protection		P
5.1.6.2	Protective bonding		P
	Accessible conductive parts bonded, or		P
	EVL circuit protected in case of direct contact of 5.1.5		P
	magnetic cores are used		P
	parts of small dimensions separated from hazardous live parts by at least basic insulation		P
5.1.6.3	Bonding of parts connected to the protective conductor		P
5.1.6.4	Protection against corrosion		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.6.5	Interruption of protective bonding	No such protective bonding.	N/A
5.1.7	Protective conductor connection		P
	means of connection		P
	suitable for use		P
	not be used as a part of the mechanical assembly.:		P
5.1.8	High leakage current	Measured continuous leakage current was 2.54 mA, and the EUT was permanently connected equipment.	N/A
5.1.9	Solid insulation		-
5.1.9.1	General		P
5.1.9.2	Requirements	(see appended table 10.6.4.2/ 10.6.4.3)	P
5.1.10	Clearances and creepage distances		-
5.1.10.1	General		P
5.1.10.2	Clearances		P
5.1.10.2.1	General		P
5.1.10.2.2	Clearances for primary circuits	(see appended table 10.6.3)	P
5.1.10.2.3	Clearances for non-primary circuits	(see appended table 10.6.3)	P
5.1.10.2.4	Creepage distances:	(see appended table 10.6.3)	P
5.1.11	Functional earthing:		P
	Requirements:		P
	Connection to protective conductor terminal permitted:		P
	separated by a functional insulation:		P
	separated from parts at hazardous voltage by:		P
	1) double insulation or reinforced insulation : or		P
	2) a protectively earthed screen or another protectively earthed conductive part, separated from parts at hazardous voltages by at least basic insulation :		P
5.2	Single-fault conditions		-
5.2.1	Testing in single-fault condition	(see appended table 5.2)	P
	not risk of electric shock or fire after a single-fault test:		P
5.2.2	Application of single-fault condition		P
5.2.2.1	General:		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
5.2.2.2	Protective impedance:		N/A
5.2.2.3	Transformers:		P
5.2.2.4	Outputs:		P
5.2.2.5	Insulation between circuits and parts:		P
5.2.2.6	Primary circuits and hazardous voltage non-primary circuits:		P
5.2.2.7	Overloads:		P
5.2.2.8	Intermittently rated resistors:	No such resistors used.	N/A
5.2.2.9	DC inputs:		P
5.2.3	Duration of tests:	(see appended table 5.2)	P
5.2.4	Compliance		-
5.2.4.1	Compliance with requirements for electric shock protection		-
5.2.4.1.1	General:		P
5.2.4.1.2	Values in single-fault condition	(see appended table 5.2.4.1.2)	P
	a) Voltage limits less than 55 V r.m.s. or 140 V d.c. :		P
	For temporary voltages, limits less than 55 V r.m.s. and 78 V peak or 140 V d.c.		P
	for wet locations voltage limits less than 33V r.m.s. or 70d.c.	Communication port was accessible conductive part that voltage less than 33 V r.m.s. or 70 V d.c.	P
	b) Current less than 3,5 mA r.m.s. for sinusoidal, 5 mA peak non-sinusoidal or mixed frequencies or 15 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz or 500mA r.m.s (Figure with $R_B = 75 \Omega$ Relates to possible burns in the frequency range 30 kHz to 500 kHz)		N/A
	for wet locations measuring circuit A.4 used (with $R_S = 375 \Omega$ (instead of 1 500 $\Omega$ ) :		N/A
	Current less than 3,5 mA r.m.s. for sinusoidal, 5mA peak non-sinusoidal or mixed frequencies or 15 mA d.c		N/A
	c) capacitance level is that defined in Figure 3. curve B in IEC 61010-1:2010:		N/A
5.2.4.2	Compliance with requirements for temperature protection:		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
5.2.4.3	Compliance with requirements for protection against the spread of fire:		P
5.2.4.4	Compliance with requirements for hazardous gases and chemicals:		P
5.2.4.5	Compliance with requirements for mechanical protection		P

<b>6</b>	<b>Mechanical aspects</b>		-
6.1	Protection against mechanical hazards		-
6.1.1	Stability:		P
6.1.2	Moving parts:		P
6.1.3	Edges and corners:		P
6.2	Mechanical requirements		P
	Mechanical tests requirements of 10.6.2.1 to 10.6.2.4		P
	Higher severity levels:		N/A
6.3	Mechanical security of terminations	(see Annex E)	P

<b>7</b>	<b>Flammability and resistance to fire</b>		-
7.1	General		P
	reducing the risk of fire by one of the following means:		-
	Eliminating or reducing the sources of ignition within the equipment:		P
	Reducing the amount of combustible (or flammable) materials within the equipment:		P
	Containment of a fire within the equipment:	Metal enclosure used.	P
7.2	Rationale		P
	Risk of fire in normal and single fault condition:		P
	In order for a risk of fire within the equipment to exist, all three of the following basic elements shall exist:		P
	The equipment circuits shall have sufficient power or energy to be an ignition source		P
	There shall be oxygen present (air is about 21 % oxygen) :		P
	There shall be combustible materials present to support the combustion process:		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
	Conformity is checked by minimum one or a combination of the following (see Figure 1):		P
	Equipment temperature limits of 7.3.1:		P
	Single Fault test of 7.11 and 10.6.5.5:		P
	Minimization of fire risk and reducing sources of ignition of 7.4 and 7.4.2:		P
	Containment of a fire within equipment of 7.10:		P
7.3	General hazards from overheating and fire		-
7.3.1	Equipment temperature limits:		P
	In normal conditions:	(See appended table 7.3)	P
	In single-fault condition (limits of clause 7.11) :	(See appended table 5.2)	P
	Symbol 13 of Table 10:		P
	Symbol 14 of Table 10:		P
7.3.2	Hazardous gases and chemicals	No gases and chemicals used.	-
	Manufacturer's documentation:		N/A
7.4	Minimization of fire risk		-
7.4.1	General		P
	Critical components of primary circuits and circuits exceeding ELV voltage limits. Compliance with Annex D:		P
7.4.2	Eliminating or reducing the sources of ignition within the equipment		P
	a) Either 1) or 2)		P
	1) Limited-energy circuit as specified in 7.12		P
	2) Insulation between parts at different potentials, compliance with clause 7.11		P
	b) circuits designed to produce heat in compliance with clause 5.2:		N/A
	Circuits not classified as limited-energy circuits. Method i) or ii) below shall be used.		P
	i) Testing in the single-fault conditions in compliance with clause 5.2:		P
	ii) Verifying as in 7.11 that if a fire occurs it will be contained within the equipment:		P
7.5	Cabling and fusing		P
	Manufacturer's recommendations:		P
	Connection cables: minimum cross-section and voltage rating:		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
	Protection devices:		P
7.6	Flammability of materials and components		-
7.6.1	General:		P
	Conformity is checked by inspection:		P
	Tests in compliance with IEC 60695-11-10:		P
7.6.2	Materials for components and other parts inside fire enclosures:		P
7.6.3	Materials for fire enclosures:		P
7.6.4	Materials for components and other parts outside fire enclosures:		P
7.7	Fire ignition sources:		P
7.8	Conditions for a fire enclosure	Metal enclosure used.	-
7.8.1	General:		P
7.8.2	Parts requiring a fire enclosure:		P
7.8.3	Parts not requiring a fire enclosure:		P
7.9	Requirements for primary circuits and circuits exceeding ELV limits:		P
7.10	Fire enclosures and flame barriers		-
	Enclosure meets following requirements:	No opening in the metal enclosure.	P
	Bottom:		P
	no openings, or:		P
	to the extent in Figure 3, shall be constructed with baffles as specified in Figure 2, or:		N/A
	be made of metal, perforated as specified in Table 6, or:		N/A
	be a metal screen with a mesh not exceeding 2 mm x 2 mm centre to centre and a wire diameter of at least 0,45 mm :		N/A
	The sides shall have no openings within the area that is included within the inclined line C in Figure 3 or:		N/A
	Case and baffle or flame barrier:		N/A
7.11	Assessment of the fire risk due to a single-fault condition		-
7.11.1	Guidelines for maximum acceptable temperatures when subjecting a circuit or component to a single-fault condition		P
7.11.2	Temperature of windings under a normal condition or a single-fault condition	(See appended table 7.3 and 5.2)	P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
7.11.3	Compliance of equipment with requirements for protection against the spread of fire		P
7.12	Limited-energy circuit	Not applied.	N/A
	a) Potential not more than 33 r.m.s. or 70 V dc		N/A
	b) Current limited by one of following means:		N/A
	3) Inherently or by impedance (see Table 8); or		N/A
	4) Overcurrent protective device (see Table 9); or		N/A
	5) A regulating network limits also in single fault condition (see Table 8)		N/A
	c) Is separated by at least basic insulation		N/A
	Fuse or a nonadjustable electromechanical device is used		N/A

<b>8</b>	<b>General and fundamental design requirements for safety</b>		<b>-</b>
8.1	Climatic conditions for safety		P
	Environmental ranges declared by the manufacturer:		P
	temperature, operation and storage:		P
	humidity, non-condensing:		P
	atmospheric pressure:		P
8.2	Electrical connections		P
	electrical terminations and connection points:		P
	protective bonding:	(See appended table 10.6.4.5)	P
	wires and cables:		P
	Conductors:		P
	electrical connections:		P
8.3	Components		-
8.3.1	General	(See appended table 8.3)	P
8.3.2	High-integrity part or component		P
8.4	Connection to telecommunication networks Requirements according to IEC 62151:	Not connect to telecommunication networks	N/A
8.5	Connection to other equipment Requirements in accordance with Table A.1:		P
8.6	Laser sources Requirements in accordance with IEC 60825-1:	No such device.	N/A

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
8.7	Explosion		-
8.7.1	General:		P
8.7.2	Components at risk of explosion		-
8.7.2.1	General:	(see clause 5.2.4.5)	P
8.7.2.2	Batteries	No battery used.	N/A
	Compliance with Annex F:		N/A
	Marking and warning:		N/A
	Rechargeable batteries:		N/A
	Battery compartment:		N/A
	Batteries intended to be replaced by the user:		N/A

<b>9</b>	<b>Marking, documentation and packaging</b>		-
9.1	Marking		-
9.1.1	General		P
	Removable parts:		P
	Symbols according to table 9:		P
	Rack or panel equipment:		P
	Voltages, currents, frequency and their tolerances according to IEC 60255-6:		P
9.1.2	Identification		-
	Equipment is identified on the equipment by:		P
	a) Manufacturer's or supplier's name or trademark		P
	b) Model or type reference:		P
	Manufacturing location identified:		P
9.1.3	Auxiliary supplies, VT, CT, I/O (Input/Output)	No such device.	-
9.1.3.1	General requirements for marking		-
	For marking the following should be taken into account:		N/A
	a) a.c. – with symbol 2 of Table 9 and rated frequency or frequency range:		N/A
	b) d.c. – with symbol 1 of Table 9 :		N/A
	c) symbol 3 of Table 9 on equipment for a.c. and d.c. supply:		N/A
	d) symbol 4 of Table 9 on equipment for 3 phase a.c. supply:		N/A

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
	e) a hyphen (-) shall be used to separate the lower and upper nominal voltages, for example, 125 V-230 V:		N/A
	f) for measurands either a hyphen (-) or an ellipse (...) shall be used to separate the lower and upper voltages:		N/A
	g) for selectable voltage or current markings:		-
	the lower and upper selectable values shall be separated by means of a solidus, i.e. forward slash (/) :		N/A
	voltages or frequencies where switching is automatic then the markings shall be according to symbol 15 of Table 9 or the word "AUTO" :		N/A
	operating voltage achieved using an external, separate device, use +EXT.R.:		N/A
	h) the burden in watts (active power) or volt-amperes (apparent power) or the rated input current, with all accessories or plug-in modules connected:		N/A
	The documentation shall specify the burden:		N/A
	The measured value shall not exceed the marked value by more than 10 %:		N/A
	i) the rated supply voltage(s) or the rated supply voltage range:		N/A
	voltage range more than 20 % of the mean value:		N/A
	different rated supply voltages:		N/A
9.1.3.2	Auxiliary supply		-
	The following information shall be provided:		-
	a) on the equipment and in the documentation:		N/A
	a.c. and/or d.c. supply:		N/A
	the rated values:		N/A
	b) in the documentation:		N/A
	the burden:		N/A
9.1.3.3	Measurands		-
	The following information shall be provided:		N/A
	a) on the equipment and in the documentation:		N/A
	the nominal values, for example, voltage, current, frequency:		N/A
	b) in the documentation:		N/A
	the burden:		N/A

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
	the overload withstand:		N/A
9.1.3.4	Inputs		-
	The following information shall be provided in the documentation:		N/A
	a) a.c. and/or d.c. supply:		N/A
	b) the rated values:		N/A
	c) burden on the supply input:		N/A
9.1.3.5	Outputs		-
	The following information shall be provided in the documentation:		N/A
	a) the kind of output, for example, relay, optocoupler etc:		N/A
	b) burden on the supply input:		N/A
	c) the switching capability on/off:		N/A
	d) the switching voltage:		N/A
	e) the permissible current, continuous value and short time value for 1s:		N/A
	f) withstand voltage across open contacts:		N/A
9.1.4	Fuses	No such device used.	-
	Operator replaceable fuse marking:		N/A
	Not replaceable by the user:		N/A
9.1.5	Measuring circuit terminals		-
	Marking shall be adjacent to the measuring terminals:		N/A
	If insufficient space, symbol 14 used:		N/A
	Symbol 14 and/or 12 of Table 9:		N/A
	Voltage 33 V a.c. or 70 V d.c		N/A
	Exceptions:		N/A
9.1.6	Terminals and operating devices		-
	Safety markings:		P
	AC or d.c. supply:		P
	Operating device markings:		P
	Functional earth terminals:		N/A
	Protective conductor terminals:		P
	Marking place:		P
	Plug/socket device:		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
	Marking for accessible terminals:		P
	Marking for lasers or high-intensity infra-red diodes of class 2 rating or higher:		N/A
9.1.7	Equipment protected by double or reinforced insulation:		N/A
9.1.8	Batteries		-
9.1.8.1	Replaceable batteries:	No battery used.	N/A
	Battery accessible to the user:		N/A
	Battery not accessible to the user:		N/A
	Polarity of the battery:		N/A
9.1.8.2	Charging:		N/A
9.1.9	Test voltage marking:		N/A
9.1.10	Warning markings		-
	Rack- or panel-mounted equipment:	Wall mounted equipment.	P
	Access in normal use:		P
	Equipment documentation:		P
	Batteries:		N/A
	Warning markings size:		N/A
9.1.11	Marking durability:		P
9.2	Documentation		-
9.2.1	General:		P
	Explanation of warning symbols:		P
	Protective conductor connections:		P
	Equipment ratings, operating instructions and installation instructions:		P
	Information specified in 9.2.2 to 9.2.5:		P
	Intended use:		P
9.2.2	Equipment ratings	See rating label	-
9.2.2.1	General		P
	Overvoltage category:	OVC III for MAINS; OVC II for PV	P
	Rated voltage(s) or voltage range(s) (V) :		P
	Rated frequency or rated frequency range (Hz) :		P
	Rated power (W) rated current (mA or A) :		P
	Nominal functional value:		P
	Input and output connections:		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
9.2.2.2	Fuses and external protective devices		-
	Fuse ratings:		N/A
	External device:	According to user manual the circuit breaker should use in final Installation.	P
9.2.2.3	Environmental requirement		-
	IP rating:	IP65	P
	Pollution degree:	PD2 (Inside); PD3 (Outside)	P
	Insulation class:	Class I	P
9.2.3	Equipment installation		-
	Safe mounting:		P
	Protective earthing		P
	Ventilation requirements:		P
	Digital input circuits and output relays:		N/A
	Wire:		P
	External devices:		P
9.2.4	Equipment commissioning and maintenance		-
	Fault-finding and repair:		P
	Equipment part:		P
	Safe methods for changing and disposal of:		-
	Accessible fuses:		N/A
	Replaceable batteries:		N/A
	Re-charging and/or replacement for re-chargeable batteries:		N/A
	Fibre-optic output devices:		N/A
9.2.5	Equipment operation		-
	Operating instructions:		-
	CT circuits:		N/A
	Responsibility of the user:		P
	pictures and symbols used:		P
9.3	Packaging		P

<b>10</b>	<b>Type tests and routine tests</b>		<b>-</b>
10.1	General:		P
10.2	Safety type tests:		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
10.3	Routine testing or sample testing:		N/A
10.4	Conditions for testing:	Considered.	P
10.5	Verification procedure:	Considered.	P
10.6	Tests		-
10.6.1	Climatic environmental tests		-
10.6.1.1	Dry-heat test – operational. Tests according to IEC 60255-1		P
10.6.1.2	Cold test – operational. Tests according to IEC 60255-1		P
10.6.1.3	Dry heat test at maximum storage temperature. Tests according to IEC 60255-1		P
10.6.1.4	Cold test at minimum storage temperature. Tests according to IEC 60255-1		P
10.6.1.5	Damp-heat test. Tests according to IEC 60255-1		P
10.6.1.6	Cyclic temperature with humidity test. Tests according to IEC 60255-1		P
10.6.2	Mechanical tests	See attachment 1: Vibration, Shock, Bump, Seismic test report	-
10.6.2.1	Vibration Tests according to IEC 60255-21-1		P
10.6.2.2	Shock Tests according to IEC 60255-21-2:		P
10.6.2.3	Bump Tests according to IEC 60255-21-2:		P
10.6.2.4	Seismic Tests according to IEC 60255-21-3:		P
10.6.2.5	Accessible parts test	(See clause 5.1.5)	P
10.6.2.6	Dust/water ingress protection Tests according to IEC 60529:	IP65	P
10.6.3	Clearances and creepage distances		-
	Compliance with Annex C:	(see appended table 10.6.3)	P
	Compliance with clause 5.1.10.2.2:	(see appended table 10.6.3)	P
	Transient suppressor used to reduce the overvoltage. Tests according to IEC 60255-26:		N/A
10.6.4	Safety-related electrical tests		-

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
10.6.4.1	General:		P
10.6.4.2	Impulse voltage test		-
10.6.4.2.1	General:		P
10.6.4.2.2	Test procedures:		P
10.6.4.2.3	Waveform and generator characteristics:		P
10.6.4.2.4	Selection of impulse test voltage:		P
10.6.4.2.4.1	General:		P
	Altitudes(m) :		P
10.6.4.2.4.2	Equipment to tested at 5 kV peak nominal		P
10.6.4.2.4.3	Equipment to tested at 1 kV peak nominal		N/A
	auxiliary (power supply) circuits:		P
	equipment power supply:		P
	I/O circuits:		P
10.6.4.2.5	Performing of tests		P
	test performed between the followings part:	(see appended table 10.6.4.2)	P
	between each circuit specified for the same impulse voltage:		P
	between independent circuits:		P
	across the terminals of a given circuit:		P
	Equipment with an insulated case:		P
10.6.4.2.6	Test acceptance criteria		-
	During the tests:		P
	After the tests:		P
10.6.4.2.7	Repetition of the impulse voltage test:		P
10.6.4.3	AC or d.c. dielectric voltage test		-
10.6.4.3.1	General:		P
10.6.4.3.2	Performing the dielectric voltage test:	(see appended table 10.6.4.3)	-
10.6.4.3.2.1	Type tests		-
	test performed between the followings part:		P
	between each circuit and the accessible conductive parts:		P
	between independent circuits:		P
	dielectric voltage withstand, for open metallic contacts:		P

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
10.6.4.3.2.2	Routine tests:		N/A
10.6.4.3.2.3	Routine tests by sampling:		N/A
10.6.4.3.3	Value of the dielectric test voltage:		P
10.6.4.3.4	Test voltage source:		P
10.6.4.3.5	Test method:		P
10.6.4.3.6	Test acceptance criteria:		P
10.6.4.3.7	Repetition of the dielectric voltage test:		P
10.6.4.4	Insulation resistance:	(See appended table 10.6.4.4)	P
10.6.4.5	Protective bonding tests	(See appended table 10.6.4.5)	P
10.6.5	Electrical environment and flammability		-
10.6.5.1	Maximum temperature of parts and materials:		P
10.6.5.2	Flammability of insulating materials, components and fire enclosures:		N/A
10.6.5.3	Thermal short-time test		-
	Overvoltage:		N/A
	Overcurrent:		N/A
10.6.5.4	Output relay parameters Parameters in according to IEC 60255-26:		N/A
10.6.5.5	Single-fault condition:		N/A
10.6.6	Reverse polarity and slow ramp test:	(See appended table 5.2)	P

<b>A</b>	<b>ANNEX A, ISOLATION CLASS REQUIREMENTS AND EXAMPLE DIAGRAMS (NORMATIVE) (see 5.1.2; 5.1.6.2; 5.1.10)</b>	<b>P</b>
----------	--	----------

<b>B</b>	<b>ANNEX B, RATED IMPULSE VOLTAGES (NORMATIVE) (see 5.1.2.2)</b>	<b>P</b>
----------	--	----------

<b>C</b>	<b>ANNEX C, GUIDANCE FOR THE DETERMINATION OF CLEARANCE, CREEPAGE DISTANCE AND WITHSTAND VOLTAGES (NORMATIVE) (see 5.1.2.2; 5.1.4; 5.1.10; 10.6.3)</b>	<b>P</b>
----------	--	----------

<b>D</b>	<b>ANNEX D, COMPONENTS (INFORMATIVE) (see 7.4.1; 8.3; 8.7.1)</b>	<b>P</b>
----------	--	----------

<b>E</b>	<b>ANNEX E, EXTERNAL WIRING TERMINATIONS (NORMATIVE) (see 6.3)</b>	<b>-</b>
E.1	General	P
E.2	Permanently connected equipment	P
	a) a set of terminals; or	P
	b) a non-detachable power supply cable.	N/A

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
	terminals:		P
	screws and nuts:		P
	power supply cables:		N/A
	a) two independent fixings:		N/A
	b) mechanical fixing of the cables:		N/A
E.3	Conductors		N/A
	Connection of conductors in compliance with Table E1. :		N/A
E.4	Terminals		P
	Contact pressure size in compliance with Table E2. :		P
	Terminals contact pressure:		P
	Slipping of the conductor:		P
	Terminals shall be so fixed that when the means of clamping the conductor is tightened or loosened:		P
	a) the terminal itself does not work loose:		P
	b) internal wiring is not subjected to stress:		P
	Ordinary non-detachable power supply cables:		N/A
	c) creepage distances and clearances are not reduced below the values specified in Annex C. :		P
<b>F</b>	<b>ANNEX F, EXAMPLES OF BATTERY PROTECTION (INFORMATIVE) (see 8.7.2.2)</b>		<b>N/A</b>

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

5.2	TABLE: Fault condition tests					P
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Comments/ Observation
PCE input	Reversed	DC 640/800	30min	--	--	DC Input: 0V /0A /0W AC Output: 230V /0A /0W FID: Inverter can't start.
PCE input	s-c	DC 640/800	30min	--	--	DC Input: 0V /0A /0W AC Output: 230V /0A/0W /0W FID: Inverter can't start.
PCE input	Over-voltage	DC 980	30min	--	--	DC Input: 980V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately and LCD display "BusOVP" and "Pvovp" fault.
PCE input (only for multi-string)	Different input MPP1: low input MPP2: high input	DC 480/800	30min	--	--	DC Input: MPPT1.800V/23.7A/18960W MPPT2.480V/42.1A/20208W MPPT3.480V/47.4A/22752W AC Output: 230V/266A/60.3Kw FID: Inverter work normally.
PCE input (only for multi-string)	Same input (MPP1 & MPP2 from same power source)	DC 640/800	30min	--	--	DC Input: 640V/93.9A/60100W AC Output: 230V/254A/58399W FID: Inverter work normally.
PCE output	Power over-feed (OCP & OTP function controlled by DSP/ software is disable)	DC 640/800	30min	--	--	DC Input: 800V /0A/0W AC Output: 230V /0A /0W FID: Inverter shutdown, LCD display "HwAcOCP" fault.
PCE output	Over-voltage (OVP function controlled by DSP/ software is disable)	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down, LCD display "Grid OVP" fault.

IEC 60255-27						
Clause	Requirement + Test					Result - Remark
PCE output	s-c	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately, LCD displays "HwAcOCP" fault.
PCE output	Phase sequence or polarity incorrect	DC 640/800	30min	--	--	DC Input: 640V/93.9A/60100W AC Output: 230V/254A/58399W FID: Inverter work normally.
PCE output	A-Phase mis- wiring grid connection	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down, LCD display "Grid UVP" fault.
PCE output	B-Phase mis- wiring grid connection	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down, LCD display "Grid UVP" fault.
PCE output	C-Phase mis- wiring grid connection	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down, LCD display "Grid UVP" fault.
PCE Cooling system failure	Fan locked	DC 640/800	3h	--	--	DC Input: 640V/93.9A/60100W AC Output: 230V/254A/58399W FID: Inverter work normally. LCD display "Fan alarm" fault.
PCE Cooling system failure	Opening blocked	DC 640/800	3h	--	--	DC Input: 640V/93.9A/60100W AC Output: 230V/254A/58399W FID: Inverter work normally.
PCE Cooling system failure	Blanketing test	DC 640/800	3h	--	--	DC Input: 640V/93.9A/60100W AC Output: 230V/254A/58399W FID: Inverter work normally.
DSP failure	+1.9V power supply disable (ECC12 s-c)	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down immediately. No display.
DSP failure	+3.3V power supply disable (UC13 Pin 2 s-c)	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down immediately. LCD display "SCI Comm lose".

IEC 60255-27							
Clause	Requirement + Test					Result - Remark	Verdict
DSP failure	+5V power supply disable (LC20 Pin 1 to GND s-c)	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down immediately. LCD display "SCI Comm lose".	
DSP failure	reset	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down immediately. LCD display "SCI Comm lose".	
DSP failure	Redundancy protect	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down immediately. LCD display "Mchip-Fault".	
IGBT PMW	Loss / failure (no power)	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD shows "DCI OCP" fault.	
IGBT PMW	Loss / failure (one bridge on always)	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. IGBT1, IGBT2, IGBT3, RY1, RY2 damaged.	
IGBT PMW	Loss / failure (No driver)	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD shows "Vbus Unbalance" fault.	
PV/DC Voltage detector (RA9 s-c)	Loss / failure	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD shows "PV OVP" fault.	
PV/DC current detector (UC624 7 PIN o-c)	Loss / failure	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD shows "Hw Boost OCP" fault.	
BUS Voltage detector RC126 s-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately. LCD shows "BusVoltZeroFault" fault.	

IEC 60255-27						
Clause	Requirement + Test					Result - Remark
Inverter current detector (RC37 s-c)	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately. LCD shows "BusVoltZeroFault" fault.
Grid/AC voltage detector (UC627 s-c)	Loss / failure s-c	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD shows "Grid UVP" fault.
DC isolation device function check	Loss / failure	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. No display.
Relay function check K1 o-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD display "Vbus Unbalance".
Relay function check K2 o-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD display "Vbus Unbalance".
Relay function check K3 o-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD display "Vbus Unbalance".
Ambient temperature detector RC456 s-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 580V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD display "Over Temp Derating" fault.
Ambient temperature detector RC190 o-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /19.75A /12641W AC Output: 230V /53.48A /12300W FID: Work normally.
IGBT temperature detector UC621 s-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD display "Over Temp Derating" fault.
IGBT temperature detector RC487 o-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /2.4A /1390W AC Output: 230V /5.8A /1320W FID: Work normally.

IEC 60255-27						
Clause	Requirement + Test					Result - Remark
Heatsink temperature detector RC454 s-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. LCD display "Over Temp Derating" fault.
Heatsink temperature detector RC447 o-c	Loss / failure	DC 640/800	30min	--	--	DC Input: 640V /19.75A /12641W AC Output: 230V /53.48A /12300W FID: Work normally.
IGBT (IGBT D-S)	s-c	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. IGBT D1, IGBT D2, IGBT D3, RY1, RY2 damaged.
DC input Bus capacitor	s-c	DC 640/800	30min	--	--	DC Input: 800V /0A /0W AC Output: 230V /0A /0W FID: Inverter shut down. IGBT D1, IGBT D2, IGBT D3, RY1, RY2 damaged.
DC input filter capacitor	s-c	DC 640/800	30min	--	--	DC Input: 580V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately. No display.
LC filter capacitor	s-c	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately. RY1, RY2 damaged.
Power supply transformer TC1	Output 12.5 V s-c	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately. LCD display abnormal.
Power supply transformer TC1	Output 9 V s-c	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately. Inverter keep reset status.
Power supply transformer TC1	Output 12 V s-c	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately. Inverter keep reset status.
Power supply transformer TC1	Output -12 V s-c	DC 640/800	30min	--	--	DC Input: 640V /0A /0W AC Output: 230V /0A /0W FID: Inverter shutdown immediately. Inverter keep reset status.

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
Supplementary information:			

7.3	TABLE: Heating Test				P	
	Test voltage (V) ..... :		See below		—	
	Ambient (°C)..... :		See below		—	
Thermocouple Locations		Max. temperature measured, (°C)				Max. temperature limit, (°C)
Voltage		660VDC	800VDC	660VDC	800VDC	--
Ambient		44.4	44.9	63.0	61.4	--
Boost Inductor 1		65.6	46.0	75.8	62.5	110
INV inductor R		77.0	78.4	85.0	87.0	110
E-capacitor ECD16		69.9	65.6	78.7	76.3	105
Drive optocoupler UV2		96.7	92.9	103.3	101.3	105
Drive transformer TXD1		87.0	81.7	93.3	90.3	110
Film capacitor CD18		79.6	75.9	87.5	85.9	105
IGBT Module T		110.9	110.1	114.1	114.4	150
DD30		90.3	65.0	95.3	76.8	150
MOSFET DD14		99.8	68.3	104.4	80.4	150
DC switch		47.9	44.5	63.0	61.4	85
PV connector		59.4	55.5	72.0	69.5	85
Input wire		80.2	74.1	87.0	83.4	105
PCB of Power board		105.1	97.4	107.0	102.5	130
Capacitor CD47		85.1	72.9	92.2	83.7	105
Y capacitor CF18		73.1	67.3	82.1	78.8	105
Film capacitor CAS21		77.1	71.7	85.0	82.0	105
MOV6		77.5	69.5	82.5	80.6	85
Input Inductor LA2		79.9	73.0	87.2	83.1	110
Film capacitor CA23		66.8	67.3	82.1	78.2	105
Current sensor HCTA2		78.2	73.0	78.7	83.3	85
ISO Relay RYA2		76.7	73.5	75.3	82.7	85
Internal Fan		75.5	70.6	82.5	82.3	85
MOSFET QC5		85.7	81.1	95.1	92.2	150
SPS transformer TC1		79.0	75.4	89.8	86.6	110

IEC 60255-27					
Clause	Requirement + Test			Result - Remark	Verdict
coil					
Inductor LB6	76.6	74.3	85.0	84.3	110
Film capacitor CB50	76.1	73.9	84.1	83.3	105
Output CT HCTB1	83.3	81.0	83.0	82.9	85
Output Relay RY3B	82.3	79.8	81.8	83.0	85
Inductor LB1	83.9	82.9	89.6	89.6	110
MOVB2	75.6	73.0	83.9	83.1	85
X capacitor CB3	74.1	71.2	82.7	81.8	110
CYB5A Y capacitor	73.4	69.7	82.4	80.5	110
Output wire	81.5	79.0	89.3	87.3	105
Inductor LB2	80.3	77.9	87.6	86.7	110
AC Connector	72.8	69.9	81.5	80.4	85
Outside fan	54.4	51.5	71.1	69.2	85
Display	70.6	66.9	80.3	78.4	85
Heatsink / mounting surface	57.9	50.5	71.9	66.8	100
Supplementary information:					
Temperature rise of winding	R <sub>1</sub> (Ω)	R <sub>2</sub> (Ω)	ΔT (K)	Max. dT (K)	Insulation class
--	--	--	--	--	--
Supplementary information:					

7.6	TABLE: Flammability of materials and components					N/A
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict	
--	--	--	--	--	--	--
Supplementary information:						
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence	
--	--	--	--	--	--	--

IEC 60255-27					
Clause	Requirement + Test			Result - Remark	Verdict
Supplementary information:					

8.3	TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>	
DC Input Connector	Stäubli (Hangzhou) Mechatronic Co., Ltd.	MC4 Series	1000Vdc,39A, Max. 90°C, IP68	EN 50521 UL 6703	TUV R60028286 R60087448 UL E343181	
	Amphenol Industrial Operations	Helios H4 Series	1000Vdc,40A, Max.90°C,IP68	EN 50521 UL 6703	TUV R 50157783 UL E339277	
AC Wiring Connector (020.00200018-0)	SCED Electronics Co., Ltd.	TR100-01 (600V 100A)	600V 100A	UL1059	E313040	
DC Switch (011.00200010-0)	Santon International B.V	XBHP3610-2-D	1000VDC/20A,50 0Vdc/45A/6POLE, 85°C	IEC60947-3 GB14048.3-2008	DEKRA 2184962.01A CCC 2015010302 775872	
	Bremas Bremas Ersce SpA	DK10016220B MMVU 6	1000VDC16A/600 V40A/6 POLE, 85°C	GB14048.3-2008	CCC 2016010302 924261	
	ProJoy Electric Co., Ltd.	PEDS150R-HM40-6	1000VDC20A/600 V40A/6 POLE, 85°C	EN 60947-3 IEC 60947-3	TUV R50321787 SAA152354	
PV Terminal (Internal metal pin)	Stäubli (Hangzhou) Mechatronic Co., Ltd.	PV-ADBP4-S2/6-UR	1000V dc, 39 A 90°C , IP65	DIN V VDE V 0126-3/12.2006	TUV R60028286 R60087448 UL E343181	
		PV-ADSP4-S2/6-UR	1000V dc, 39 A 90°C , IP65	DIN V VDE V 0126-3/12.2006	TUV R60028286 R60087448 UL E343181	
PCB Material	SHANTOU LUCKY STAR PCB CO LTD	WS888	130°C, V-0, CTI: min.175	UL796	UL E301869	
	Shenzhen Glorysky electronics CO LTD	GS-M	130°C, V-0, CTI: min.175	UL796	UL E257384	
Gas Discharge Tube (GASB1)	SHENZHEN BENCENT ELECTRONIC CO LTD	B8G1500M	1200-1800Vdc, -40-90°C	UL 1449	UL E337906	

IEC 60255-27					
Clause	Requirement + Test		Result - Remark		Verdict
Output on-grid Relay (RY1, RY2, RY3, RY4, RY5, RY6)	Xiamen Hongfa Electroacoustic Co., Ltd.	HF167F	90A, 320VAC, Resistive, 1k cycles, 85°C	EN 61810-1 2005	TUV R50360703
	Panasonic Industrial Devices Sales (China) Co., Ltd.	HE1aN-W-DC12V-Y6	90A/ 277 VAC/ -50° C~+85°C	UL 60947-4-1	UL E43028
	Churod Electronics Co., Ltd	CHAR-112A100	100A, 277V ac, -40°C~+85°C	UL 60947-4-1 EN 61810-1	UL E341422 TUV R50316974
	Zettler Relay (Xiamen) Co., Ltd	AZSR190-1A-12D	90A 480Vac -40°C~+85°C	UL 60947-4-1 EN61810-1	UL E365652 TUV B17098879 3008
Current Sensor (HCTB1, HCTB2, HCTB3)	VACUUMSCHM ELZE GmbH & Co. KG	T60404-N4646- X461	100A/5V/-40°C~+85°C	UL 508	UL E317483
	tamurash shanghai electronics ltd	F23P100S05	100A/5V/-40°C~+85 °C	UL508	UL E243511
Y Capacitor (CF1, CF2, CF3, CF4, CF5, CF6, CF7, CF8, CF17, CF18, CF27, CF28, CF37, CF38, CF47, CF48, CF49, CF50, CF51, CF52, CF58, CF65, CF70, CF72, CA10, CA11, CA16, CA17, CA18, CA19, CA25, CA26, CA34, CA35, CA40, CA41)	SONGTIAN ENTERPRISE Co., LTD	CD	Y1, 4700PF, 400Vac, 125°C	IEC/EN 60384-14 UL60384-14	VDE 40025754 UL E208107
	Vishay Electronic GmbH	VY1	Y1, 4700PF, 500Vac, 125°C	IEC/EN 60384-14 UL60384-14	VDE 40012673 UL E183844
Voltage Dependent Resistor (MOVB1, MOVB2, MOVB3, MOVB4)	Littelfuse, Inc	V1000LA160 BP	1000Vac, 1200 Vdc, 85°C	UL 1414 IEC/EN 61051-1 IEC/EN 61051-2	UL E320116 VDE 116895
	THINKING ELECTRONIC INDUSTRIAL CO., LTD.	TVR20561K SY	1000Vac, 85°C	UL 1414	UL E314979
	TDK	B72220S051 1K101	510Vac, 85°C	IEC 61051-1 IEC 61051-2	VDE 40027582
Input Common-mode Inductor (LA1, LA2, LA3)	Huizhou baohui electronics technology co., ltd	115-17-019A	580uH/M12K	IEC 60255-27	Test with appliance

IEC 60255-27					
Clause	Requirement + Test		Result - Remark		Verdict
	Yindate electronics Huizhou ltd	115-17-019A	580uH/M12K	IEC 60255-27	Test with appliance
IGBT Module	Infineon Electronic GmbH	DS_F3L200 R12W2H3_B11_ENG_1_1_d e-en	200A/1200V/Easy 2B	IEC 60255-27	Test with appliance
	Vincotech Electronic GmbH	10-xY12NMA16 0SH01-M820F18x-D2-14-1	160A/1200V/Flow1	IEC 60255-27	Test with appliance
	Vincotech Electronic GmbH	30-FT12NMA16 0SH02-M669F28-PM	160A/1200V/Flow2	IEC 60255-27	Test with appliance
	Onsemi	NXH160T120 L2Q1SG	160A/1200V/Flow1	IEC 60255-27	Test with appliance
IGBT (QD1, QD2, QD3, QD12, QD13, QD14, QD8, QD9, QD10)	Onsemi	FGY40T120S MD	1200V, 40A, TP-247	IEC 60255-27	Test with appliance
Diode (DD14, DD15, DD20, DD21, DD29, DD30)	Cree, Inc.	C4D15120D	24A/1200V/TO-247	IEC 60255-27	Test with appliance
	Cree, Inc.	C4D20120D	32A/1200V/TO-247	IEC 60255-27	Test with appliance
	ROHM Co., Ltd.	SCS230KE2C	30A/1200V/TO-247	IEC 60255-27	Test with appliance
Bus Capacitor (CD13, CD14, CD15, CD17, CD18, CD19, CD21, CD22, CD24, CD25, CD26, CD72)	KEMET Electronics Italia S.r.l.	C4AELBW61 10A3NK	500V110uF at 85°C, 2.5 mOhm	IEC 60255-27	Test with appliance
	Panasonic Industrial Devices Sales (China) Co., Ltd.	EZPE55117 MTA	500V110uF at 85°C, 4.4 mOhm	IEC 60255-27	Test with appliance
	Xiamen faratronic co,ltd	C3D1U117J M0AC00	600V 110uF at 85°C, 3.8m Ohm	IEC 60255-27	Test with appliance
	HUAJUNG COMPONENTS CO.,LTD.	EPB-117K0600DB 152B-FF	600V 110uF at 85°C, 4m Ohm	IEC 60255-27	Test with appliance
	Cree, Inc.	DMJ-PS110UF50 0V	500V110uF at 85°C, 4.4 mOhm	IEC 60255-27	Test with appliance
Bus Electrolytic Capacitor ECD1, ECD2, ECD3, ECD4,	Nichicon corporation	LGX2H471M ELC58	470uF/500V/Φ 35*58/5000H	IEC 60255-27	Test with appliance
	UNICON corporation	LLN2H471M 3560	470uF/500V/Φ35 *60/5000H	IEC 60255-27	Test with appliance

IEC 60255-27					
Clause	Requirement + Test		Result - Remark		Verdict
ECD5, ECD6, ECD7, ECD8, ECD9, ECD10, ECD11, ECD12, ECD13, ECD14, ECD15, ECD16	Man Yue Electronics Company Limited	EEP477V2H Q50SW**P	470uF/500V/Φ35 *50/5000H	IEC 60255-27	Test with appliance
small chip inductor (LB5, LC6, LC11, LC13, LC20, LC21, LT1, LF2)	Huizhou baohui Electronics technology co., ltd	SH-L006	39uH, DR10*5.4RB K38/RI10*3.4 *8.2 K38,130°C	IEC 60255-27	Test with appliance
optical-coupler (UC11, UC12, UC63, UC64, UC67, UC68, UC70, UC71, UF4, UF6, UF7)	Toshiba Corporation	TLP785F	Isolation voltage: 5000Vrms 85 °C	UL1577	UL E67349
	LITE-ON TECHNOLOGY CORPORATION	LTV816S2T PB-V	Isolation voltage: 5000Vrms 110 °C	DIN EN 60747-5-5	VDE 40015248
Driver Transformer (TV1)	Huizhou baohui Electronics technology co., ltd.	SH-T002	Class B, 130°C	IEC 60255-27	Test with appliance
	boluodaxin electronics	SH-T002	Class B, 130°C	IEC 60255-27	Test with appliance
X Capacitor (CB1, CB2, CB3)	Xiamen faratronic co, ltd.	C42Q2475MB FC000	X2/4.7uF/305VAC/ ±20%/32*14*28, P=27.5mm MKP62	UL 60384-14: 2014	UL E186600
	TDK China Co Ltd	B32924H3475 K000	X2/4.7uF/305VAC/ ±10%/21*36.5*31. 5/2pin	IEC 60384-14	ENEC-00812
	SONGTIAN ENTERPRISE	MPX	X2, 2.2uF, 305Vac	UL 60384-14 IEC 60384-14	UL E208107 VDE 40034679
Y Capacitor (CYB1, CYB2, CYB3, CYB4, CYB5, CYB6, CYB7)	SONGTIAN ENTERPRISE Co., LTD	CE	Y2, 250Vac, 10000pF, 125°C	UL 60384-14, IEC 60384-14	UL E208107 VDE 40025748 CQC0700101 9906
	Xiamen faratronic co, ltd.	C43Q1103M4 0C000	Y2/10nF/300VAC/ 13*12*6.0	UL 60384-14	UL E186600
ISO Relay (RYA1, RYA2)	Fujitsu Component Limited	NA5W-K	2A/220VDC/5VDC /2C	UL 508	UL E45026
	Xiamen Hongfa Electroacoustic Co., Ltd.	HFD3/5	5Vdc/2A/30Vdc	IEC 60255-27	Test with appliance
Input Current Sensor (HCTA1, HCTA2, HCTA3)	LEM Electronics (China) Co. Ltd	HXN 50-P	50A/±12V/1%/19x 15x20mm	UL 508	UL E189713
	tamurash shanghai electronics ltd	L18P050 D15-OP	50A/±12V/1%/17x 15x17.5mm	UL 508	UL E243511

IEC 60255-27					
Clause	Requirement + Test		Result - Remark		Verdict
Output Common- mode Inductor (LB2)	tamurash shanghai electronics ltd	CF501900-H00TS	50-70KW Common-mode Inductor /0.50mH/90A	IEC 60255-27	Test with appliance
	Huizhou baohui electronics technology co., ltd	115-17-031A	50-70KW, Output three-winding common-mode inductance/90A/490UH	IEC 60255-27	Test with appliance
Boost Inductor (60K, 70K)	Huizhou baohui electronics technology co., ltd	DCL40A244uH	DCL40A244uH at 40A	IEC 60255-27	Test with appliance
	HeFei ECU-TAMURA Electric Co., Ltd		DCL40A244uH at 40A	IEC 60255-27	Test with appliance
	yunlu Qingdao green energy ltd		DCL40A244uH at 40A	IEC 60255-27	Test with appliance
	tamurash shanghai electronics ltd		DCL40A244uH at 40A	IEC 60255-27	Test with appliance
Boost Inductor (50K)	Huizhou baohui electronics technology co., ltd	DCL30A287uH	DCL30A287uH	IEC 60255-27	Test with appliance
	HeFei ECU-TAMURA Electric Co.,Ltd		DCL30A287uH	IEC 60255-27	Test with appliance
	yunlu Qingdao green energy ltd		DCL30A287uH	IEC 60255-27	Test with appliance
	tamurash shanghai electronics ltd		DCL30A287uH	IEC 60255-27	Test with appliance
Inverter Inductor (60K, 70K)	HeFei ECU-TAMURA Electric Co., Ltd	ACL90A120uH	120.3 uH min@128.6A Class B	IEC 60255-27	Test with appliance
	Huizhou baohui electronics technology co., ltd		120.3 uH min@128.6A Class B	IEC 60255-27	Test with appliance
	yunlu Qingdao green energy ltd		120.3 uH min@128.6A Class B	IEC 60255-27	Test with appliance
	tamurash shanghai electronics ltd		120.3 uH min@128.6A Class B	IEC 60255-27	Test with appliance
Inverter Inductor (50K)	HeFei ECU-TAMURA Electric Co.,Ltd	ACL76A160uH	L=160uH at 107A, Class B	IEC 60255-27	Test with appliance
	Huizhou baohui electronics technology co., ltd		L=160uH at 107A, Class B	IEC 60255-27	Test with appliance
	yunlu Qingdao green energy ltd		L=160uH at 107A, Class B	IEC 60255-27	Test with appliance

IEC 60255-27					
Clause	Requirement + Test		Result - Remark		Verdict
	tamurash shanghai electronics ltd		L=160uH at 107A, Class B	IEC 60255-27	Test with appliance
Auxiliary Power Transformer	Huizhou baohui electronics technology co., ltd	SH-T002	3.3mH/ETD39H/P C40/ Horizontal	IEC 60255-27	Test with appliance
	yingdate Huizhou electronics		3.3mH/ETD39H/P C40/ Horizontal	IEC 60255-27	Test with appliance
GFCI Transformer	Huizhou baohui electronics technology co., ltd	115-17-020A	MP2303-4AS/HITACHI	IEC 60255-27	Test with appliance
	yingdate Huizhou electronics		MP2303-4AS/HITACHI	IEC 60255-27	Test with appliance
	NAMIN TECHNOLOGY		MP2303-4AS/HITACHI	IEC 60255-27	Test with appliance
Internal Fan	MinebeaMitsumi Inc.	4710KL-04W-B29- E51	12VDC/2.28W/120*120*25	UL507 EN60950-1	UL E89936 VDE 1507300
External Fan	MinebeaMitsumi Inc.	08025VE12P GLD1	08025VE12PGLD 1/12V/0.57A/6.84 W/80*80*25	cULus File No.UL507 VDE File No EN60950-1	UL E89936 VDE 1507300
	MinebeaMitsumi Inc.	08025VE-12M- CTD-1	08025VE-12M-CTD-1/12V/0.23A, 2.76W/8, 0*80*25	cULus File No.UL507 VDE File No EN60950-1	UL E89936 VDE 1507300
Supplementary information:					
1) Provided evidence ensures the agreed level of compliance.					

10.6.3	TABLE: Clearance And Creepage Distance Measurements					P
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
PCE unit (Vmax PV: OVCI I 1000Vdc, OVC III 277Vac, 50Hz)						
PV supply circuits line to line: FI	4464	1000	3.6	>20	10	>20
PV supply circuits / AC mains circuit to metal chassis: BI	4464	1000	3.6	See below	10	See below
-at IGBT	--	--	--	12	--	>12
-at PCB	--	--	--	12	--	>12
AC mains circuit L1 to L2 to L3- FI	4464	1000	3.6	15	10	15
AC mains circuit L to N- FI	4464	1000	3.6	15	10	15
PV Input Board (150-303001-2 V03)						
PV supply terminal “+” to “-” FI	4464	1000	3.6	5.3	5.0	5.3

IEC 60255-27						
Clause	Requirement + Test			Result - Remark		Verdict
PV supply circuits to earth: BI	4464	1000	3.6	See below	5.0	See below
-at RA25-RA30	--	--	--	12	--	12
-at Trace	--	--	--	5.3	--	5.3
PV supply circuits to Control circuits: BI	4464	1000	3.6	See below	5.0	See below
-at Trace	--	--	--	5.6	--	5.6
-at RA8-RA12, RA39,RA38,RA62	--	--	--	12	--	12
-at HCTA1, HCTA2	--	--	--	5.6	--	5.6
<b>AC Output Board (019.00040004-1 V10)</b>						
AC mains circuit L1 to L2 to L3) FI	4464	1000	3.6	5.2	5.0	5.2
AC mains circuit L to N. FI	4464	1000	3.6	5.2	5.0	5.2
AC mains circuit to earth: BI	4464	1000	3.6	5.2	5.0	5.2
AC mains circuit to Control circuits: BI	4464	1000	3.6	See below	5.0	See below
-at Trace	--	--	--	5.7	--	5.7
-at HCTB1-HCTB3	--	--	--	5.2	--	5.2
-at RB33,RB32,RB137-RB140	--	--	--	12	--	12
-at RB35,RB34,RB128-RB131	--	--	--	12	--	12
-at RB36,RB37,RB119-RB122	--	--	--	12	--	12
-at RB38,RB39,RB109-RB112	--	--	--	12	--	12
-at LB7	--	--	--	5.1	--	5.1
-at RY3	--	--	--	5.5	--	5.5
<b>AC Filter Board (150-303004-6)</b>						
AC mains circuit L1 to L2 to L3. FI	4464	1000	3.6	3.9	5.0	3.9 s-c
AC mains circuit L to N. FI	4464	1000	3.6	3.9	5.0	3.9 s-c
AC mains circuit to earth: BI	4464	1000	3.6	5.2	5.0	5.2
<b>Power Board (150-303002-2 v03)</b>						
PV supply terminal “+” to “-” : FI	4464	1000	3.6	5.2	5.0	5.2
PV supply circuits to earth: BI	4464	1000	3.6	5.2	5.0	5.2
PV supply circuits to Control circuits: BI	4464	1000	3.6	See below	5.0	See below
-at Trace	--	--	--	6.4	--	6.4

IEC 60255-27						
Clause	Requirement + Test			Result - Remark		Verdict
-at Transformer TXD1	--	--	--	15	--	15
-at Transformer TV1 (on 150- 203010-3 V1.3 board)	--	--	--	6.2	--	6.2
-at UD1, UD2	--	--	--	7.4	--	7.4
-at RD1-RD20	--	--	--	10	--	10
<b>Control Board (150-303000-2 V03)</b>						
PV supply terminal “+” to “-” : FI	4464	1000	3.6	6.0	5.0	6.0
Control circuit to COM/Display circuits: SI	4464	1000	3.6	See below	5.0	See below
-at TC1	--	--	--	10.1	--	10.1
-at UC63, UC64, UC67, UC68, UC70, UC71	--	--	--	7.7	--	8.0
PV supply circuits to Control circuits: BI	4464	1000	3.6	See below	5.0	See below
-at Trace	--	--	--	5.7	--	5.7
-at TC1	--	--	--	8.4	--	8.4
-at UC11, UC12	--	--	--	7.6	--	7.6
-at CC85	--	--	--	5.7	--	5.7
<b>PV Combine Board (150-303005-3 V04)</b>						
PV supply terminal “+” to “-” : FI	4464	1000	3.6	5.9	5.0	5.9
PV supply circuits to earth: BI	4464	1000	3.6	5.2	5.0	5.2
Control circuits to COM/Display circuits: SI	4464	1000	3.6	See below	5.0	See below
-at UF4, UF6, UF7	--	--	--	7.7	--	8.0
-at Trace	--	--	--	6.2	--	6.2
PV supply circuits to Control circuits: BI	4464	1000	3.6	See below	5.0	See below
-at Trace	--	--	--	5.3	--	5.3
-at UF15-UF22	--	--	--	8.0	--	8.0
-at RF171-RF175, RF190- RF194	--	--	--	10	--	10
-at RF159-RF163, RF154- RF158, RF164-RF168, RF6, RF111, RF119, RF131, RF142, RF176- RF180, RF185-RF189	--	--	--	10	--	10
<b>Communication Board (150-000000-1 V02)</b>						
Control circuit to COM/Display circuits: SI	4464	1000	3.6	See below	5.0	See below
-at UT4	--	--	--	7.7	--	8.0

IEC 60255-27						
Clause	Requirement + Test			Result - Remark		Verdict
-at Trace	--	--	--	9.5	--	9.5
Independence components						
IGBT	4464	1000	3.6	11.3	10.0	11.3
DC Switch	4464	1000	3.6	>30	10.0	>30
Circuits Definition:						
Communication Circuits/ Display Circuits: DVC-A			PV / DC Circuits: DVC-C			
AC mains / Grid Circuits: DVC-C			Control Circuits: DVC-C			
Protection Separation						
Communication Circuits/ Display Circuits to AC mains/Grid Circuits: DI			Communication Circuits/ Display Circuits to PV Circuits / AC mains / Grid Circuits: DI			
Communication Circuits/ Display Circuits to						
Accessible Parts Earthed to PV Circuits: BI			Accessible Parts Earthed to PV Circuits: BI			
Accessible Parts Earthed to AC mains/Grid Circuits: BI						
Legend						
BI	Basic insulation		SI	Supplementary insulation		
DI	Double insulation		RI	Reinforced insulation		
FI	Functional insulation		O.V.C	Overvoltage category		
PD	Pollution degree		MG	Insulating material group		
PPI	Protection by Protective Impedance		DVC	Decision Voltage Classification		
s-c	Shorted Circuits		o-c	Opened Circuits		
Supplementary information:						
VMAX PV (V) = 1000 Vd.c, AC output voltage = 480 Va.c;						
PV supply circuits = O.V.C II, AC mains circuits = O.V.C. III.						
PD = PD2 (IP65), MG = IIIa/b, Altitude = 2000m (1.0 factor)						
Communication Circuits/ Display Circuits in PCE is considered as DVC-A with reinforced insulation from DVC-C circuits.						
Communication and display circuits in PCE are considered as DVC-A which could be accessible.						
PV side: SPD were provided between PV circuits and earth.						
Grid side: SPD were provided between AC mains circuits and mains to earth as well.						
1. Annex I of SPD or varistor for reducing impulse voltage was considered in this test report.						
2. Functional insulation was shorted circuit tests and consideration.						
Circuit breakers are required both to PV input and Grid output side in final installation.						

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

10.6.4.2/ 10.6.4.3	TABLE: Impulse voltage test/Dielectric Strength			P
Test voltage applied between:		impulse withstand voltage (kV) 1.2/50 μs	Test voltage (V)	Breakdown / flashover (Yes/No)
DC input terminal to earthed enclosure		6.0	2120Vdc	No
AC output terminal to earthed enclosure		6.0	2120Vdc	No
DC input terminal to communication port		8.0	4240Vdc	No
AC output terminal to communication port		8.0	4240Vdc	No
DC input terminal to LCD screen cover		8.0	4240Vdc	No
AC output terminal to LCD screen cover		8.0	4240Vdc	No
Legend				
BI	Basic insulation	SI	Supplementary insulation	
DI	Double insulation	RI	Reinforced insulation	
FI	Functional insulation	O.V.C	Overvoltage category	
Supplementary information:				

10.6.4.4	TABLE: insulation resistance measurements		P
Insulation resistance R between:		R (M $\Omega$ )	Required R (M $\Omega$ )
Between mains poles (primary fuse disconnected)		>100	10
Between parts separated by basic or supplementary insulation		>100	10
Between parts separated by double or reinforced insulation		>100	10
Supplementary information:			

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

**Attachment 1: Vibration, Shock, Bump, Seismic test report**

LCJC-JL-708-02 A/0

Report No.: LCJC201902023YW001-1

Date Issued: Feb. 25, 2019

**苏州茳测检测技术服务有限公司**

Suzhou Longce Testing Technology Service Co., Ltd.

**检 测 报 告**

Test Report

Test Items: Vibration ,Shock, Bump, Seismic test  
Sample Name: PV Inverter  
Consigner: DEKRA Testing and Certification (Shanghai) Ltd.  
Test Type: Entrust Test

Prepared By: Yao Jun Checked By: Zhang Baokai Approve By: Lu Jitian

Authorized signatory

Suzhou Longce Testing Technology Service Co., Ltd.  
<http://www.szlcjc.com>

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict



LCJC-JL-708-02 A/0

### 1. GENERAL INFORMATION

Equipment Under Test (EUT)	PV Inverter
Model	Hiverter Si-50K, Hiverter Si-60K, Hiverter Si-70K
Quantity of Tested Samples	1 PCS
Samples Code	LCJC2019022100401
Entrust unit name	DEKRA Testing and Certification (Shanghai) Ltd.
Entrust unit address	3F, #250 Jiangchangsan Road, Building 16, Headquarter Economy Park Shibe Hi-Tech Park, Zhabei District, Shanghai 200436, China
Manufacture unit name	Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Manufacture unit address	SM 3 & 4, Sanand – II GIDC, Industrial Estate, Boll Village, Sanand – 382 110, Gujarat, India.
Sample delivery personnel information	Stone.Wang@dekra.com
Sample status	Conform to the requirements of the test
Received the sample date	Feb. 21, 2019
Test date	Feb. 21, 2019~Feb. 23, 2019
Test standard	IEC 60255-27:2013 Measuring relays and protection equipment - Part 27: Product safety requirements IEC60255-21-1:1988 Vibration, shock, bump and seismic tests on measuring relays and protection equipment. Section 1 : Vibration tests (sinusoidal) ; IEC60255-21-2:1988 Vibration, shock, bump and seismic tests on measuring relays and protection equipment. Section 2: Shock and bump tests; IEC60255-21-3:1993 Vibration, shock, bump and seismic tests on measuring relays and protection equipment. Section 3: Seismic tests;
Test engineer	Yao Jun
Temperature	25±5℃
Humidity	<70%RH

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict



LCJC-JL-708-02 A/0

## 2. TEST ITEMS AND RESULT

No.	Test Item	Test Information	Test Result	Verdict
1	Vibration response test	1.Frequency: 10~150Hz; 2.Cross-over Frequency: 58~60Hz; 3.Peak Displacement: 0.035mm; 4.Acceleration: 0.5g; 5.Cycle Time: 8min /axis; 6.Direction: X, Y, Z axis.	The appearance of the sample was normal.	Pass
	Vibration endurance test	1.Frequency: 10~150Hz; 2.Acceleration: 1g; 3.Cycle Time: 8min /axis, total 20 cycles/axis; 4.Direction: X, Y, Z axis.	The appearance of the sample was normal.	Pass
2	Shock response test	1.Acceleration: 5g; 2.Duration: 11ms; 3.Times: 3times/direction, total 18times. 4.Direction: ±X, ±Y, ±Z axis.	The appearance of the sample was normal.	Pass
	Shock withstand test	1.Acceleration: 15g; 2.Duration: 11ms; 3.Times: 3times/direction, total 18times. 4.Direction: ±X, ±Y, ±Z axis.	The appearance of the sample was normal.	Pass
3	Bump test	1.Acceleration: 10g; 2.Duration: 16ms; 3.Number: 1000 times/direction; 4.Direction: ±X, ±Y, ±Z axis.	The appearance of the sample was normal.	Pass
4	Seismic test	1.Frequency: 1~35Hz; 2.Cross-over Frequency: 8~9Hz; 3.Horizontal (X, Y) : Peak Displacement: 3.5mm; Acceleration: 1.0g; 4.Vertical (Z) : Peak Displacement: 1.5mm; Acceleration:0.5g; 5.Cycle Time: 10min /axis; 6.Direction: X, Y, Z axis.	The appearance of the sample was normal.	Pass

### Remark:

The tests were performed on model Hiverter Si-70K and the test result are also applicable for all other models stated in this report due to they have same hardware and construction enclosure.

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict



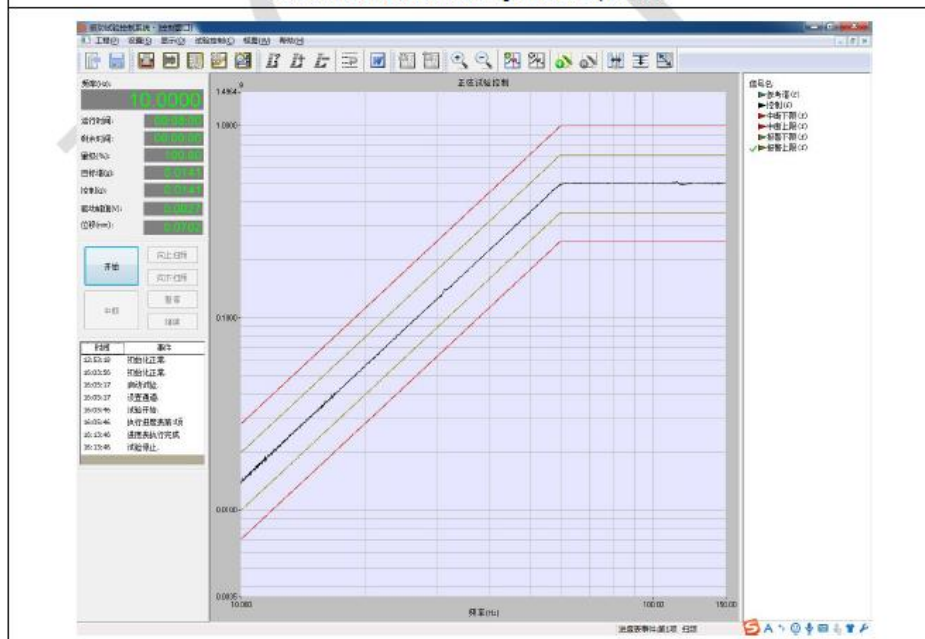
LCJC-JL-708-02 A/0

### 3. TEST SAMPLE PICTURES

Sample Picture before test



The curves of vibration response test (Z-axis)

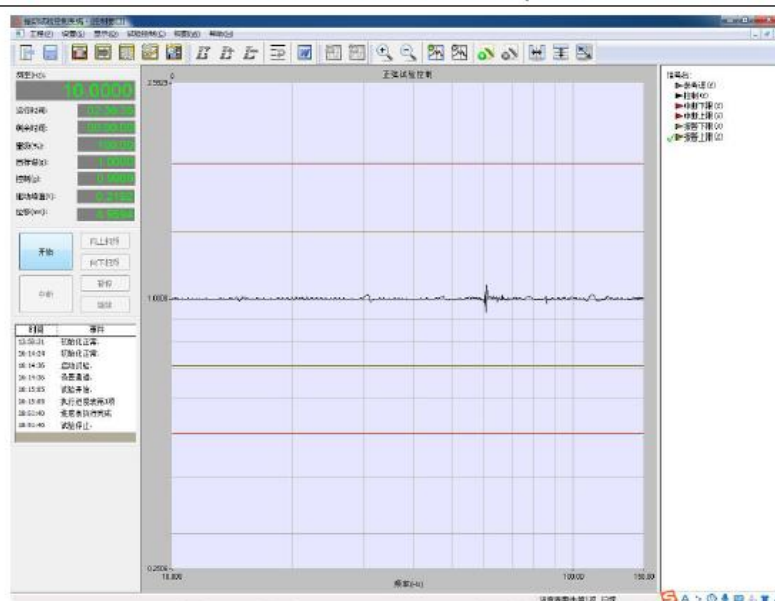


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

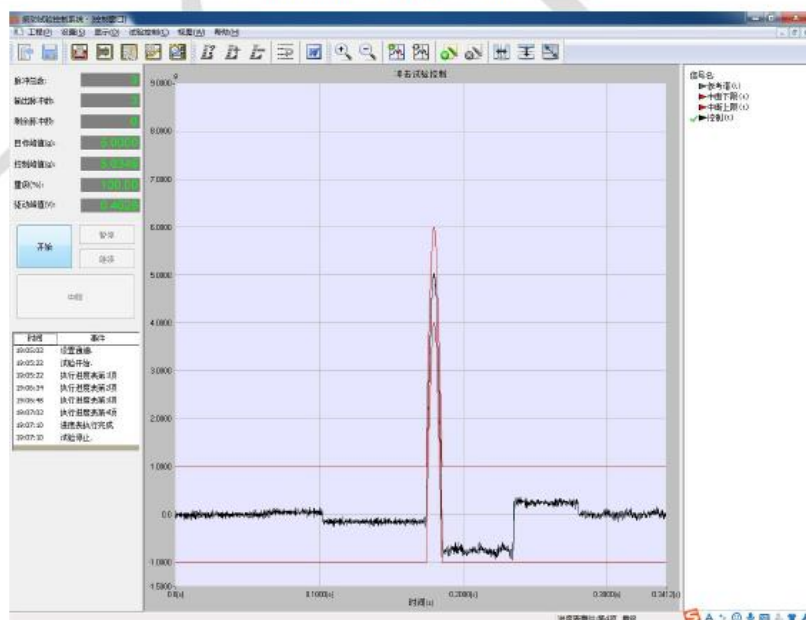


LCJC-JL-708-02 A/0

The curves of vibration endurance test(Z-axis)



The curve of shock response test (+Z-axis)

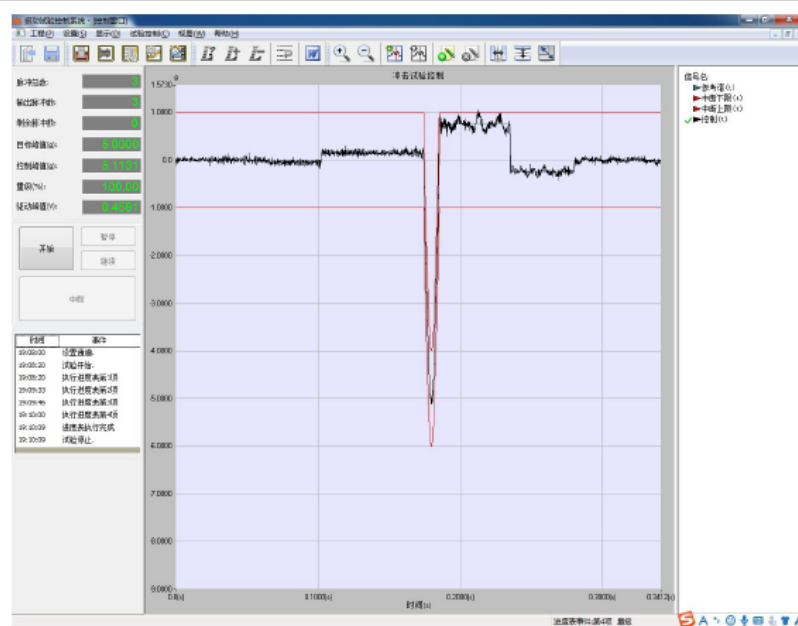


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

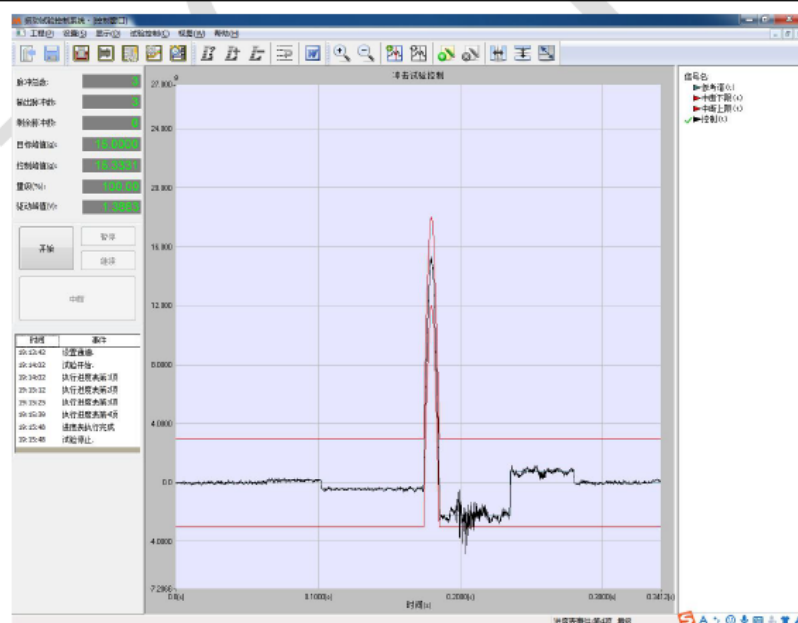


LCJC-JL-708-02 A/0

The curve of shock response test (-Z-axis)



The curve of shock withstand test (+Z-axis)

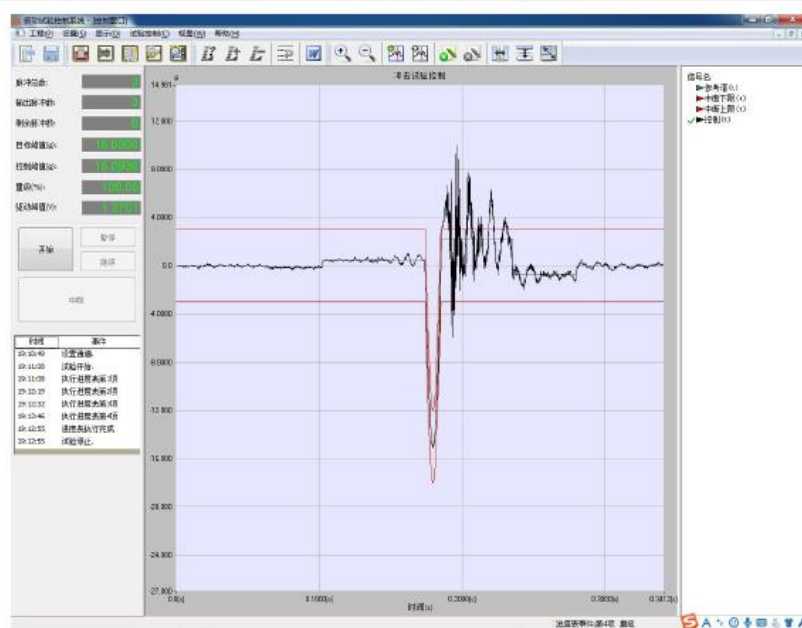


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

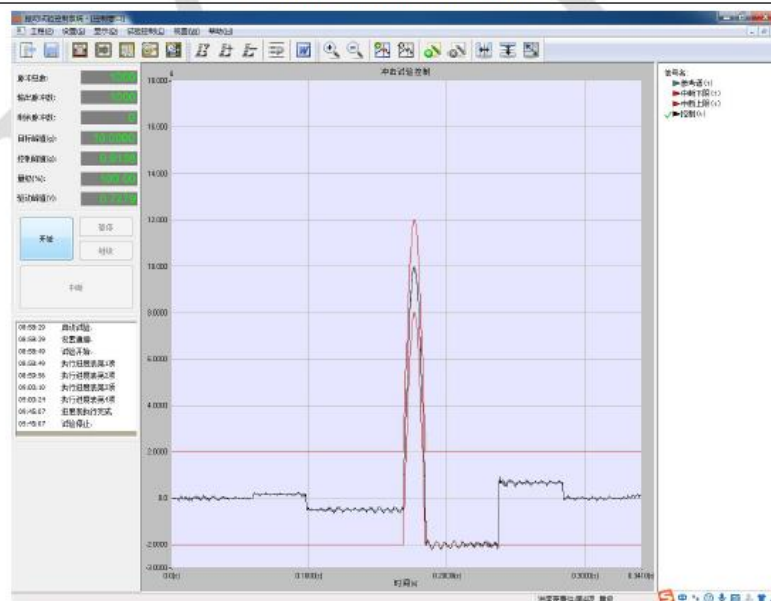


LCJC-JL-708-02 A/0

The curve of shock withstand test (-Z-axis)



The curves of bump test (+Z-axis)

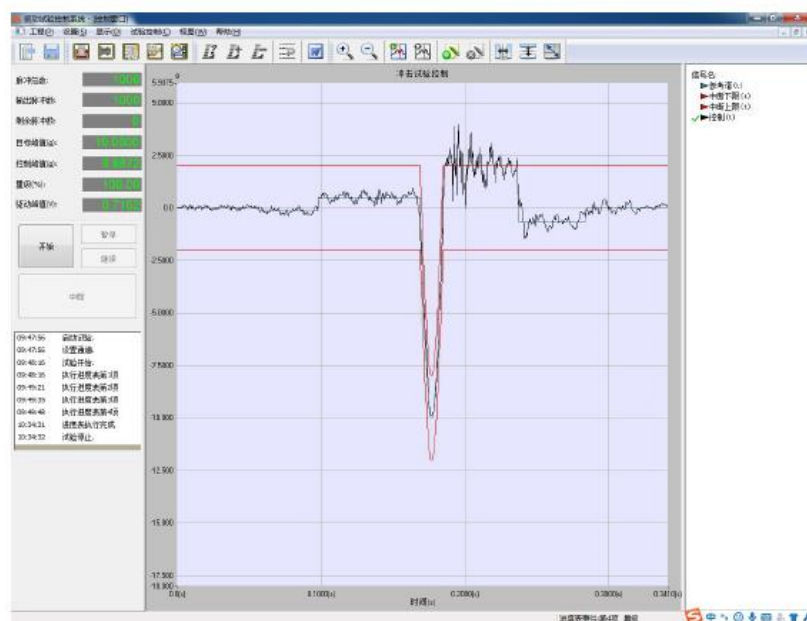


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

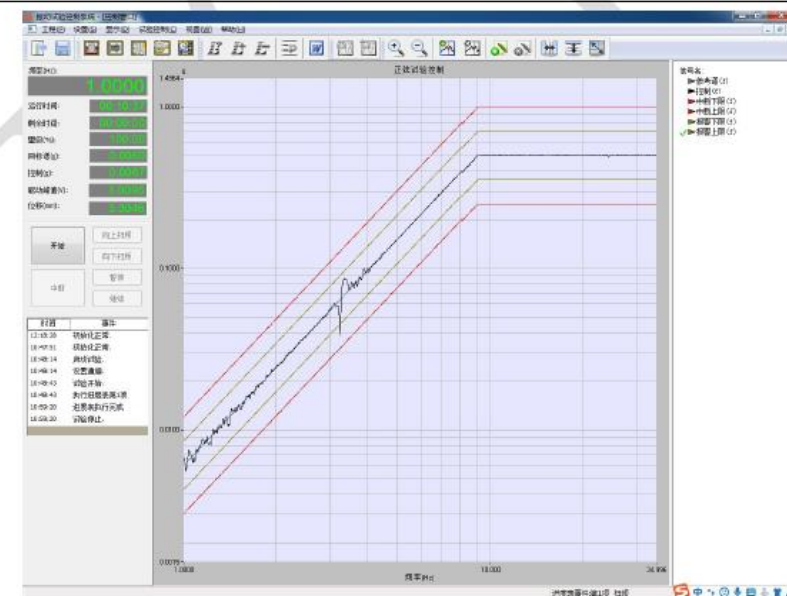


LCJC-JL-708-02 A/0

The curves of bump test (-Z-axis)



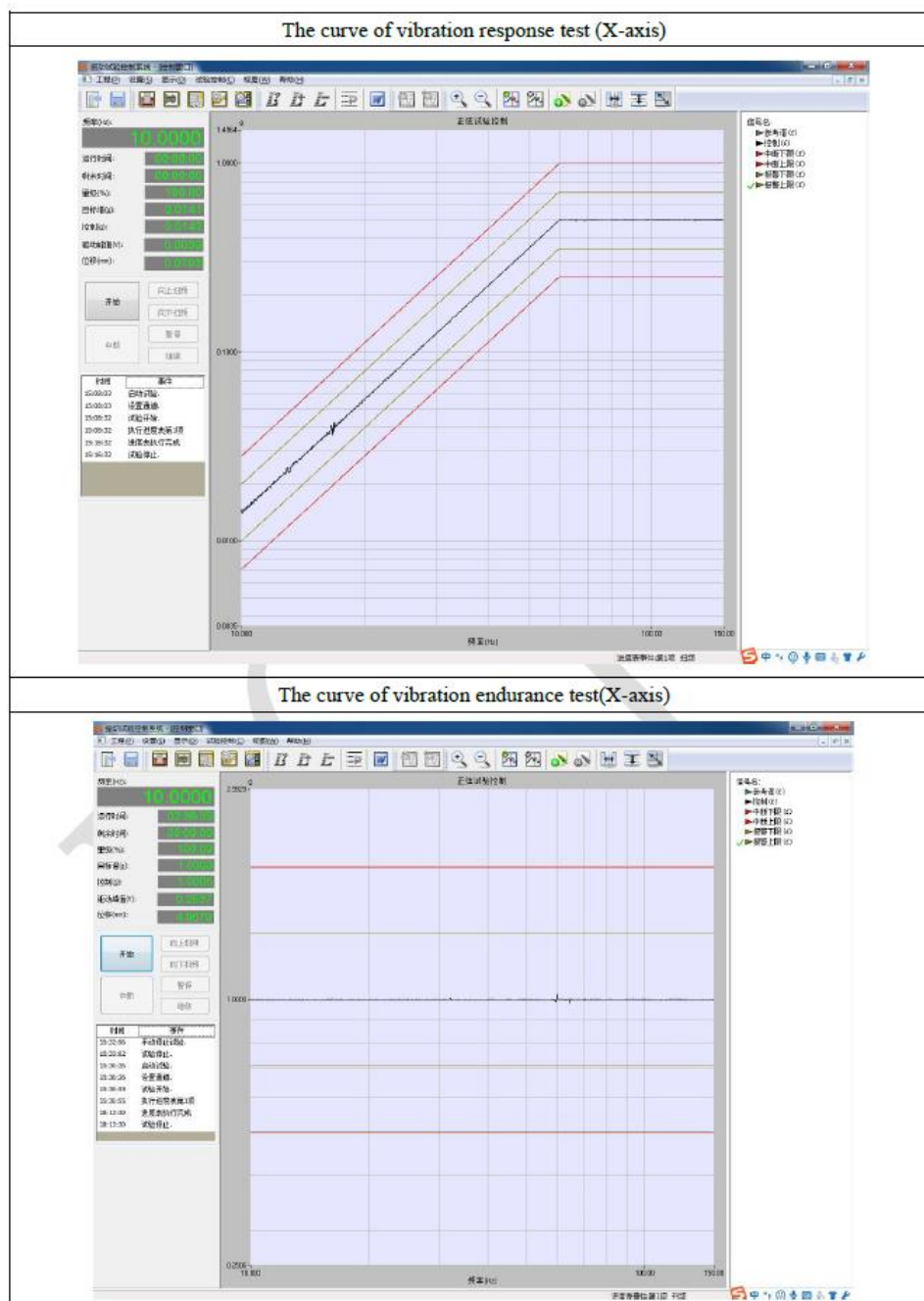
The curves of seismic test(Z-axis)



IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict



LCJC-JL-708-02 A/0

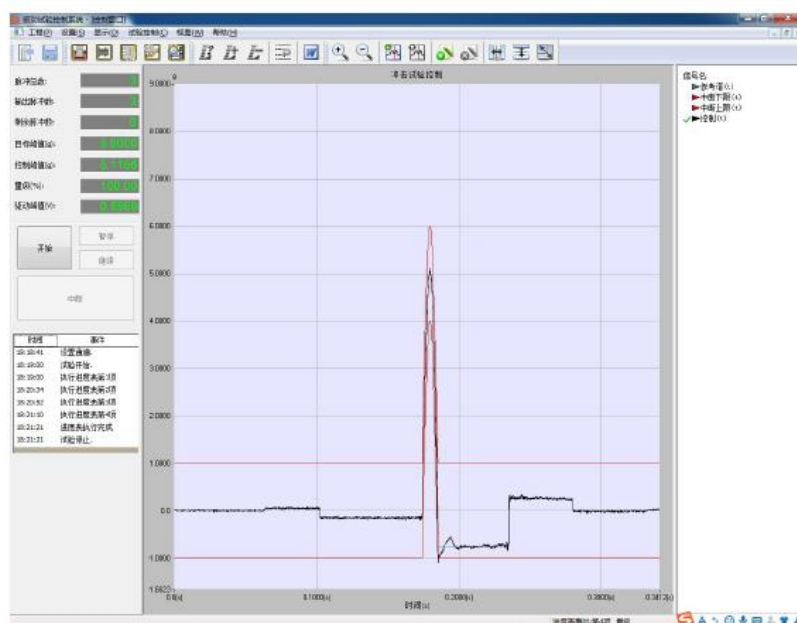


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

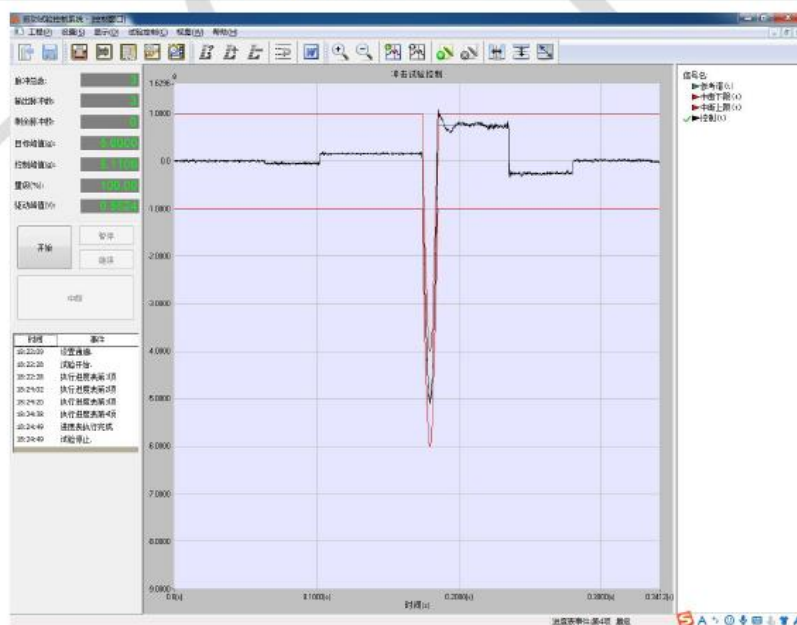


LCJC-JL-708-02 A/0

The curve of shock response test (+X-axis)



The curve of shock response test (-X-axis)

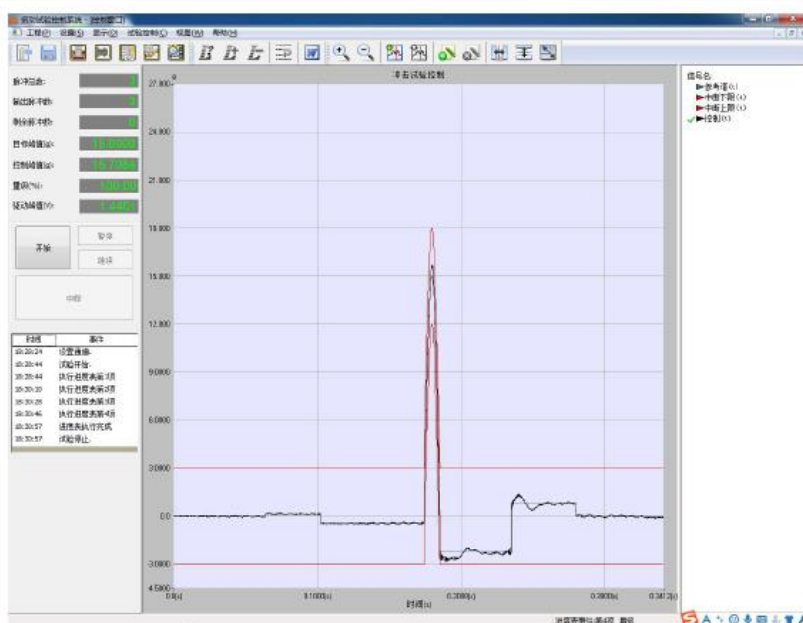


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

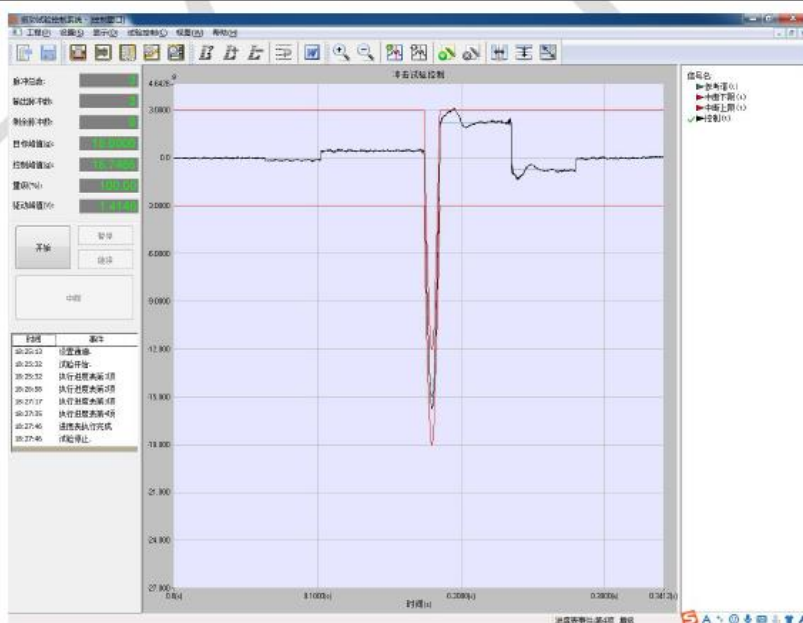


LCJC-JL-708-02 A/0

The curve of shock withstand test (+X-axis)



The curve of shock withstand test (-X-axis)

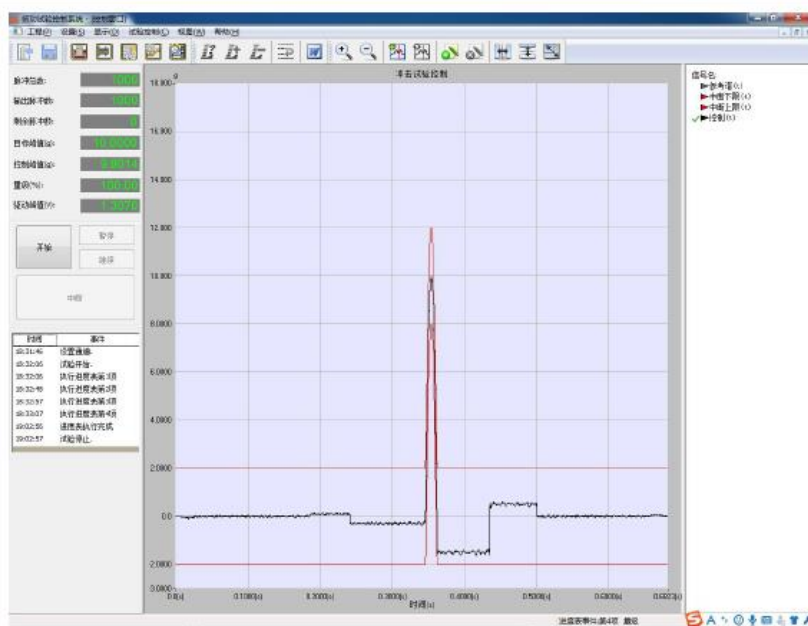


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

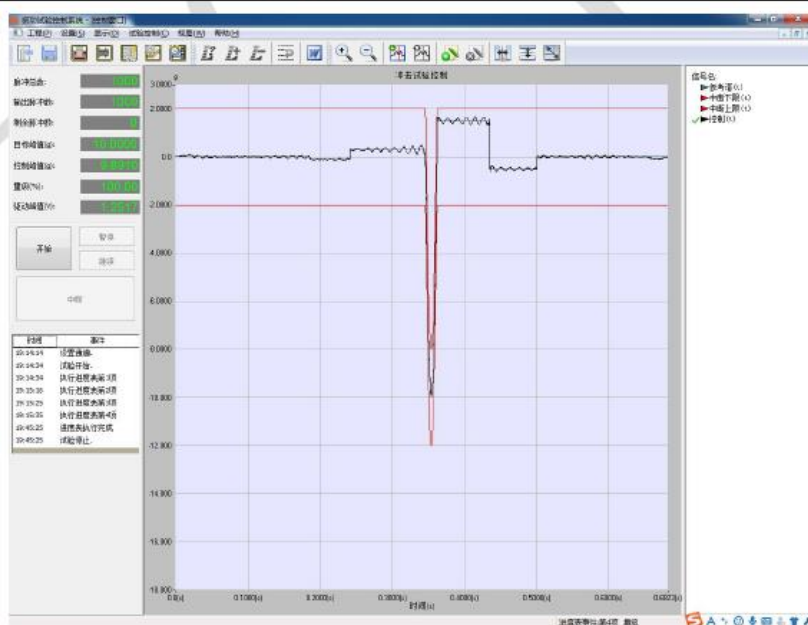


LCJC-JL-708-02 A/0

The curves of bump test (+X-axis)



The curves of bump test (-X-axis)

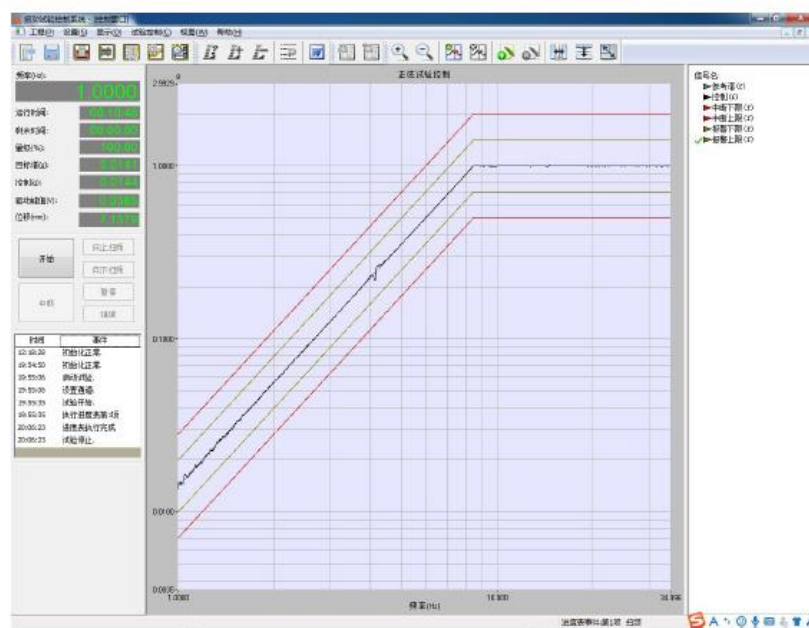


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

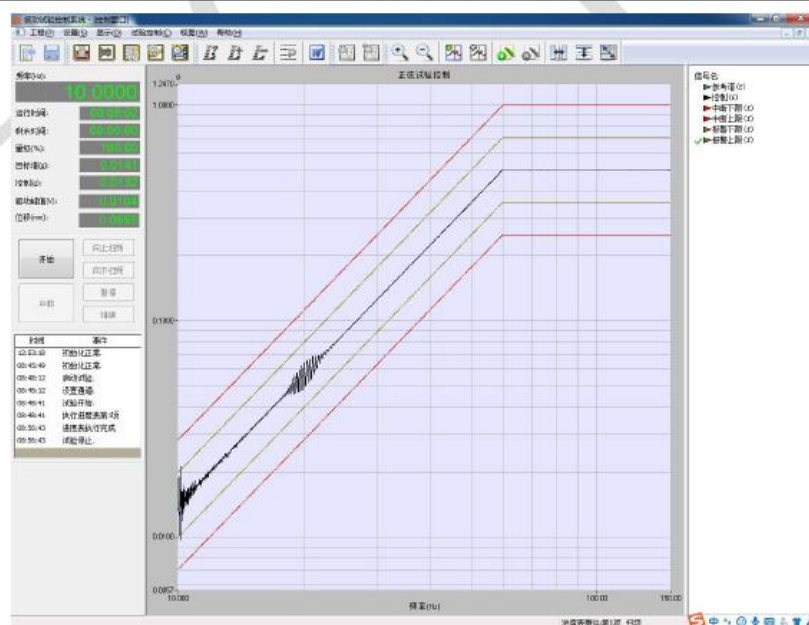


LCJC-JL-708-02 A/0

The curves of seismic test(X-axis)



The curve of vibration response test (Y-axis)

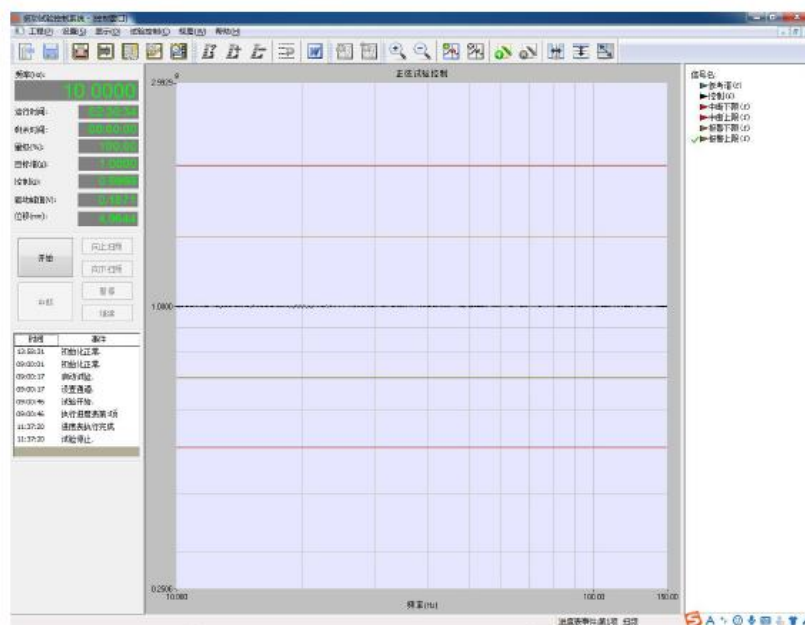


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

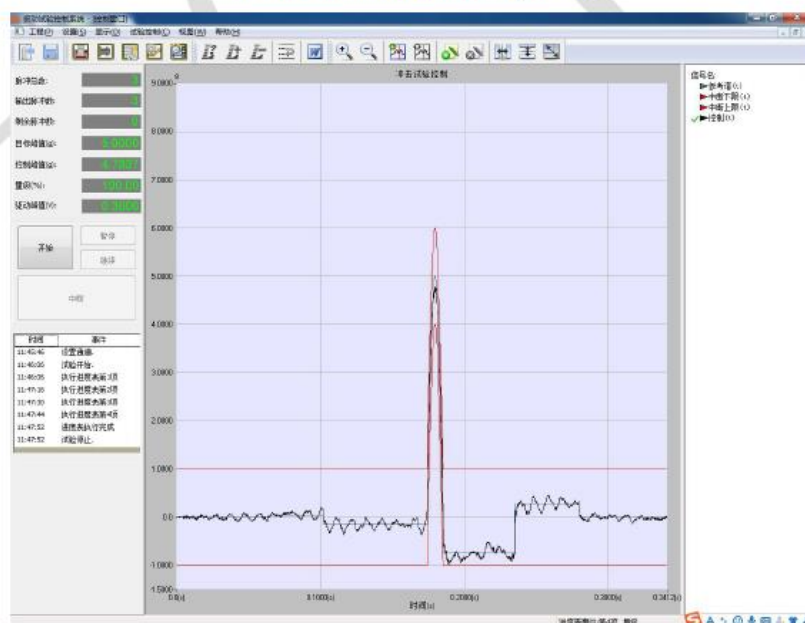


LCJC-JL-708-02 A/0

The curve of vibration endurance test(Y-axis)



The curve of shock response test (+Y-axis)

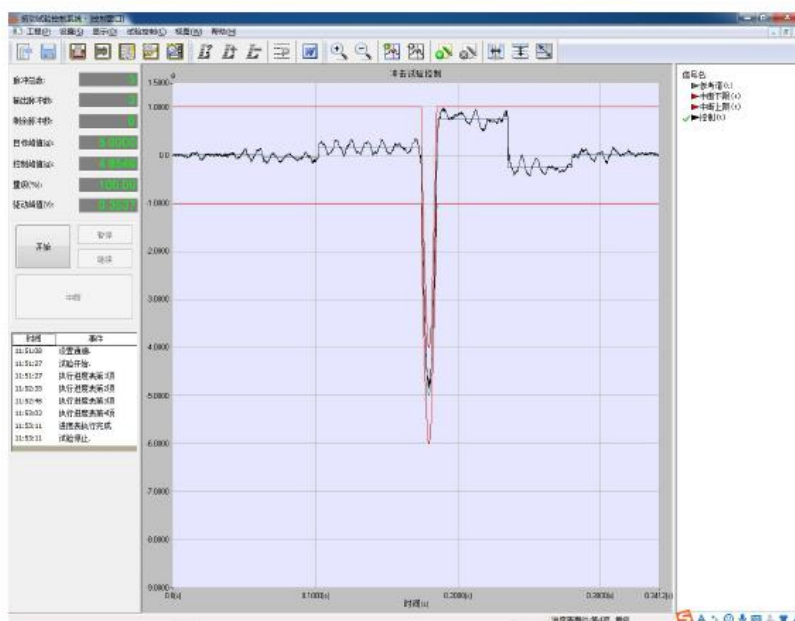


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

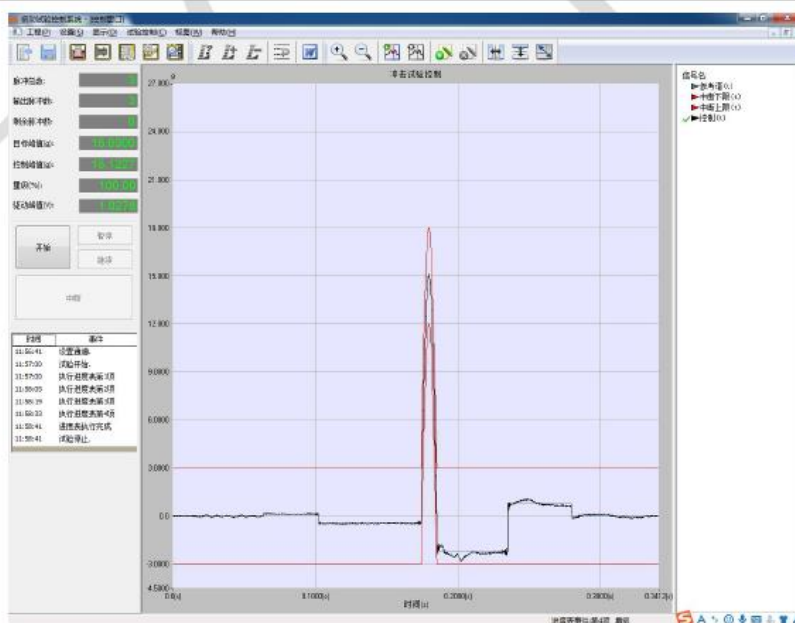


LCJC-JL-708-02 A/0

The curve of shock response test (-Y-axis)



The curve of shock withstand test (+Y-axis)

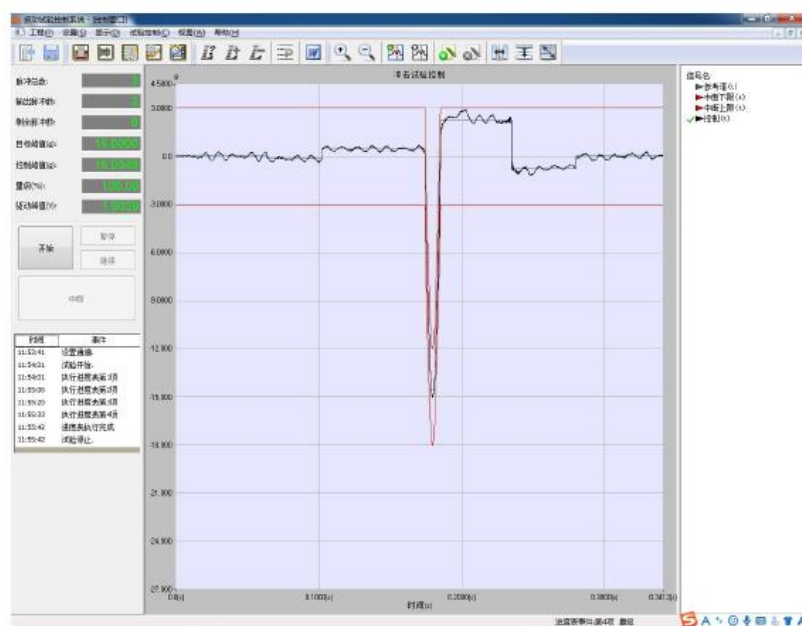


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

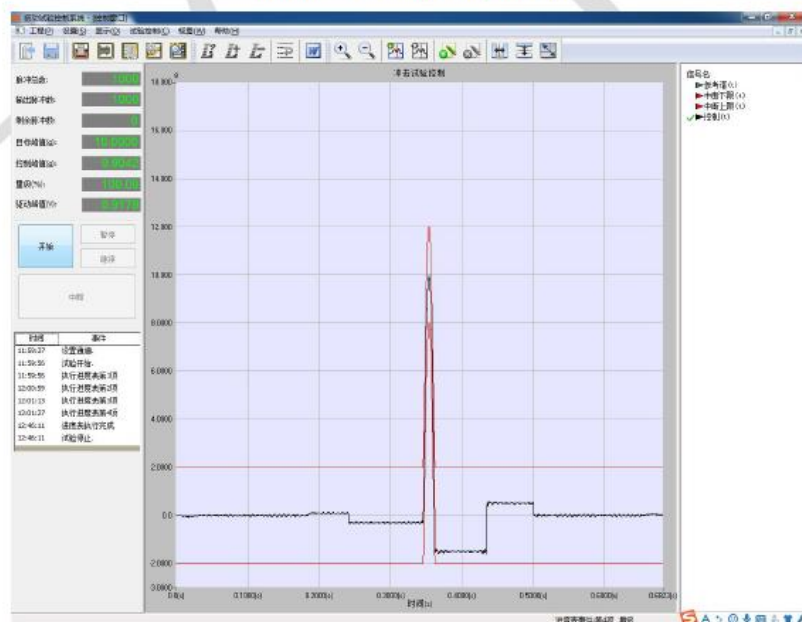


LCJC-JL-708-02 A/0

The curve of shock withstand test (-Y-axis)



The curves of bump test (+Y-axis)

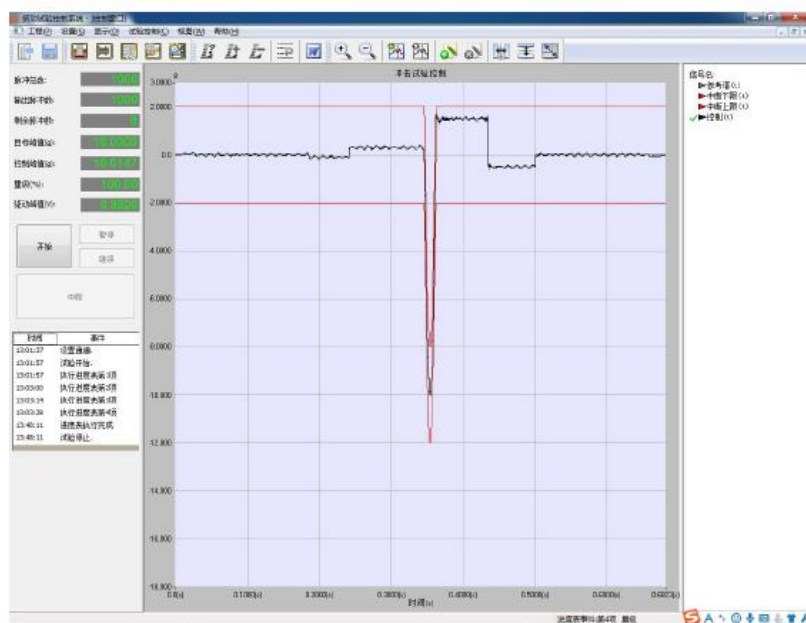


IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

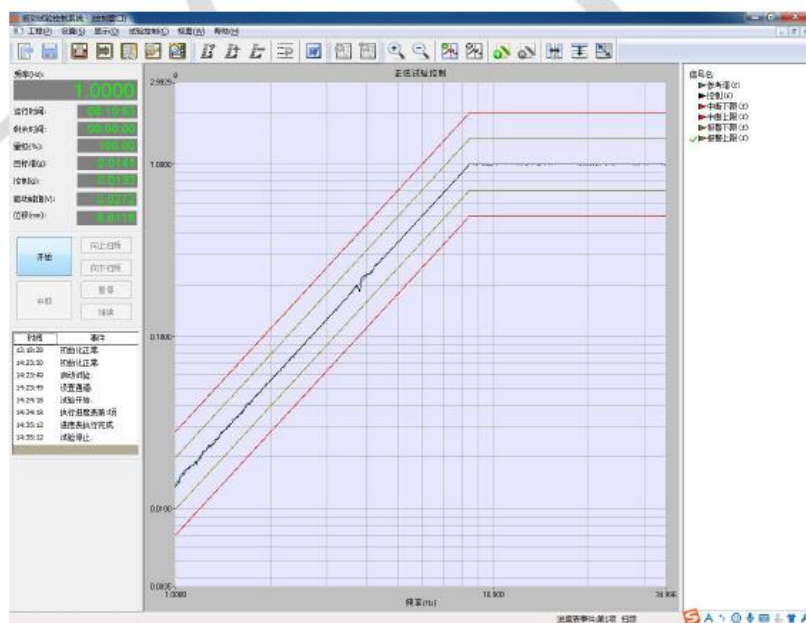


LCJC-JL-708-02 A/0

The curves of bump test (-Y-axis)



The curves of seismic test(Y-axis)



IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict



LCJC-JL-708-02 A/0

Sample Picture after test



#### 4、TEST EQUIPMENT

No.	Equipment Name	Model	Calibration Due Date
1	Vibration test equipment	DC-4000-40	Mar. 19, 2019

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict



LCJC-JL-708-02 A/0

### Declaration

- 1、The LAB have meet the required of CNAS-CL01:2018(Same as ISO/IEC 17025:2017), and have get the authorize from CNAS, CNAS Number: CNAS L8212, Also get the authorize from ISTA, ISTA ID: 10764;
- 2、The LAB is responsible for the impartiality of all test data and the confidentiality of client information except the customer disclosure;
- 3、The LAB is only responsible for the test items entrusted by the client;
- 4、This report is valid in the condition of having sign of approver, special seal of laboratory testing and Connective seal, The report shall not be partial duplicated without written approval from the LAB except fully copy.
- 5、The Samples were provided by the client, and the authenticity also is borne by the client, the LAB is only responsible for the test data of the sample;
- 6、If have any objection to the report, please submit it to the LAB in writing within 15 days after receiving the report;
- 7、The samples must be take back within 3 months,and the LAB will dipose it after the deadline.
- 8、Subcontractor and Details: NA;
- 9、The visual inspection used in this test is visual observation, except for non-visual observation.
- 10、Conclusion language description:
  - (1) Pass : the samples conform to the requirements of the standard;
  - (2) Fail: the samples do not conform to the requirements of the standard ;
  - (3) / : don't judge or no test standard.
- 11、Disclaimer: The Verdict of the report is only responsible for the appearance, and LAB shall not bear any risk responsibility for the performance data or function data which were provide by client, such as test data, test result and judgment requirements and so on.

**LAB:** Suzhou Longce Testing Technology Service Co., Ltd.

**ADD:** (Building 5, National Environmental New & Hi-tech Industrial Park) No.369, Lushan Road, New District, Suzhou, China

**TEL:** 0512-68326317, 89990816

**FAX:** 0512-69200365

**E-mail:** lcjc@szlcjc.com

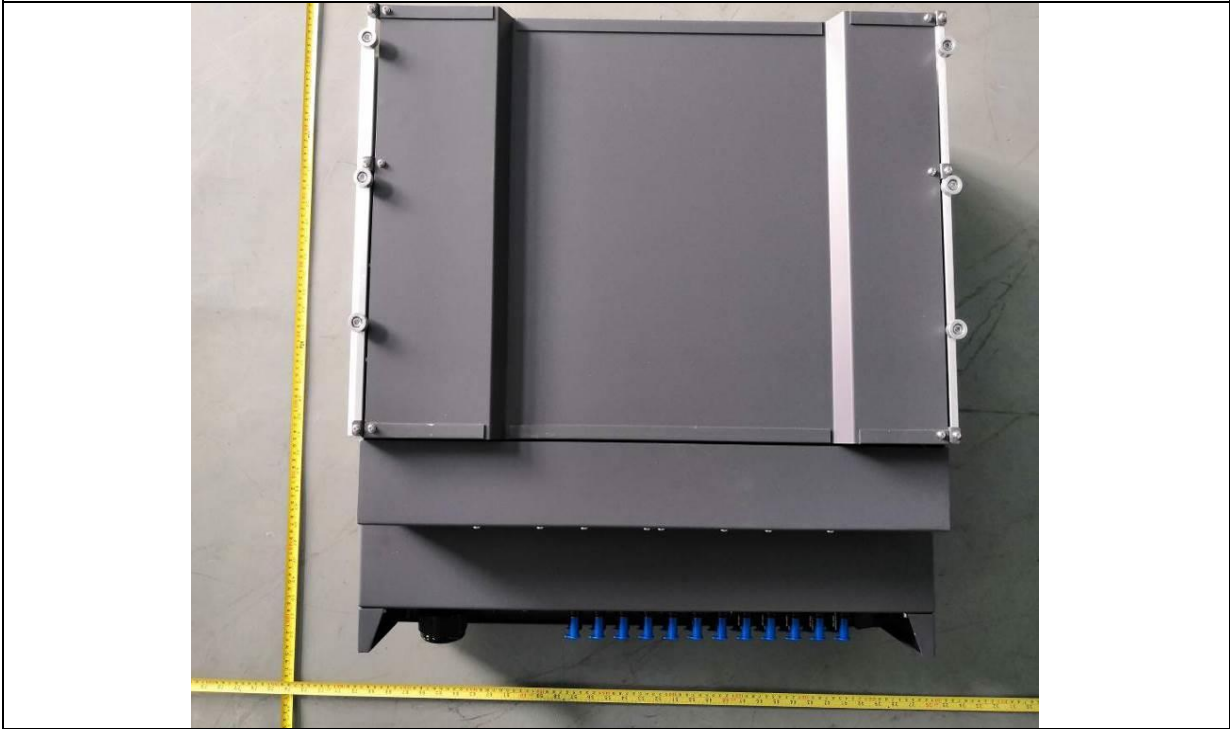
**\*\*\*End of the report\*\*\***

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

Attachment 2: Pictures



Enclosure – Front View

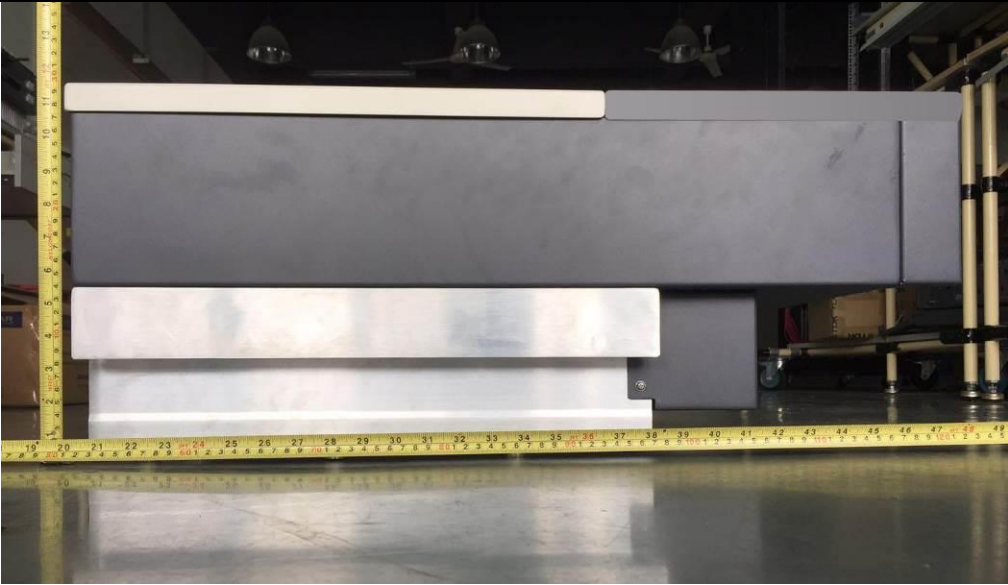


Enclosure – Rear View

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

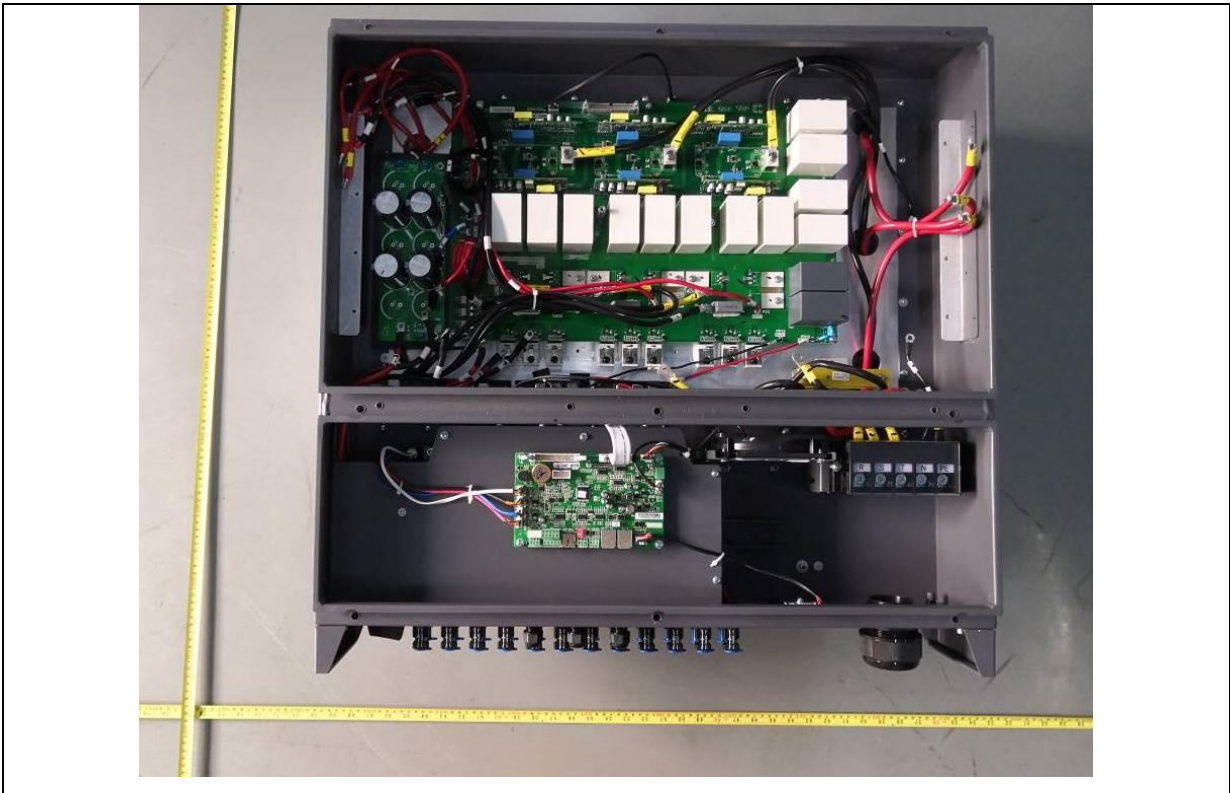


Enclosure – Bottom View

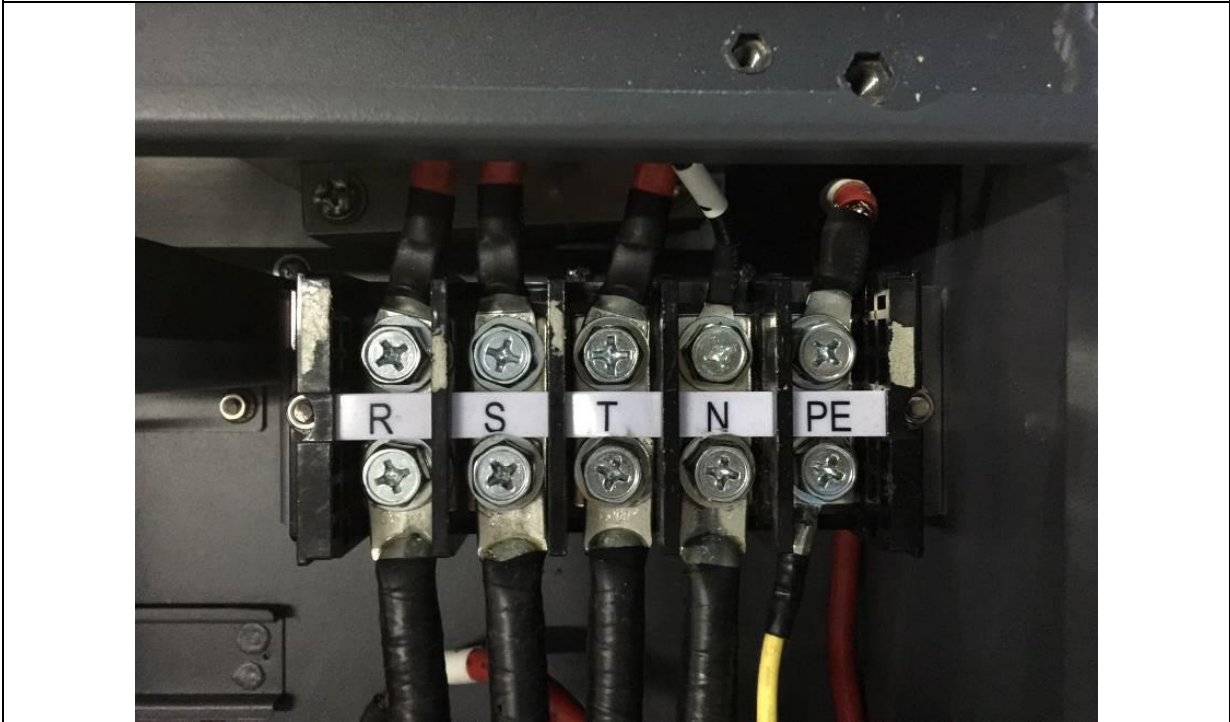


Enclosure – Side View

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

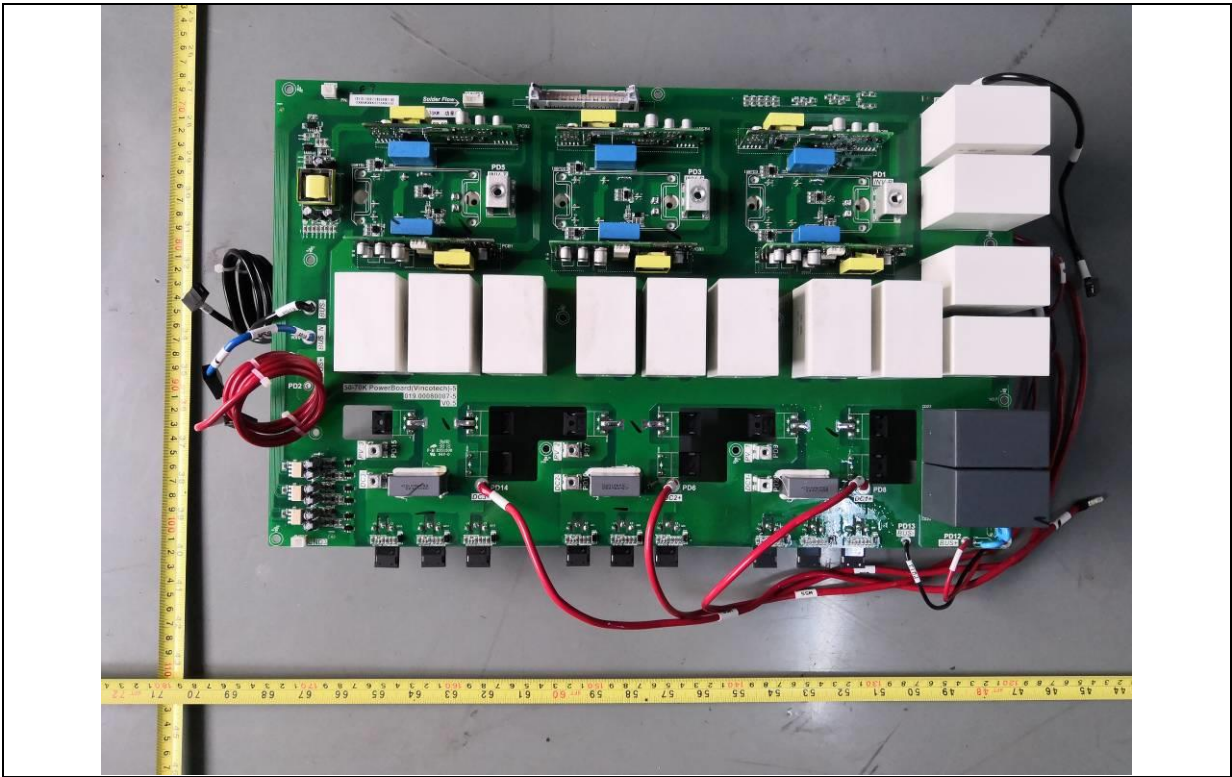


Internal View

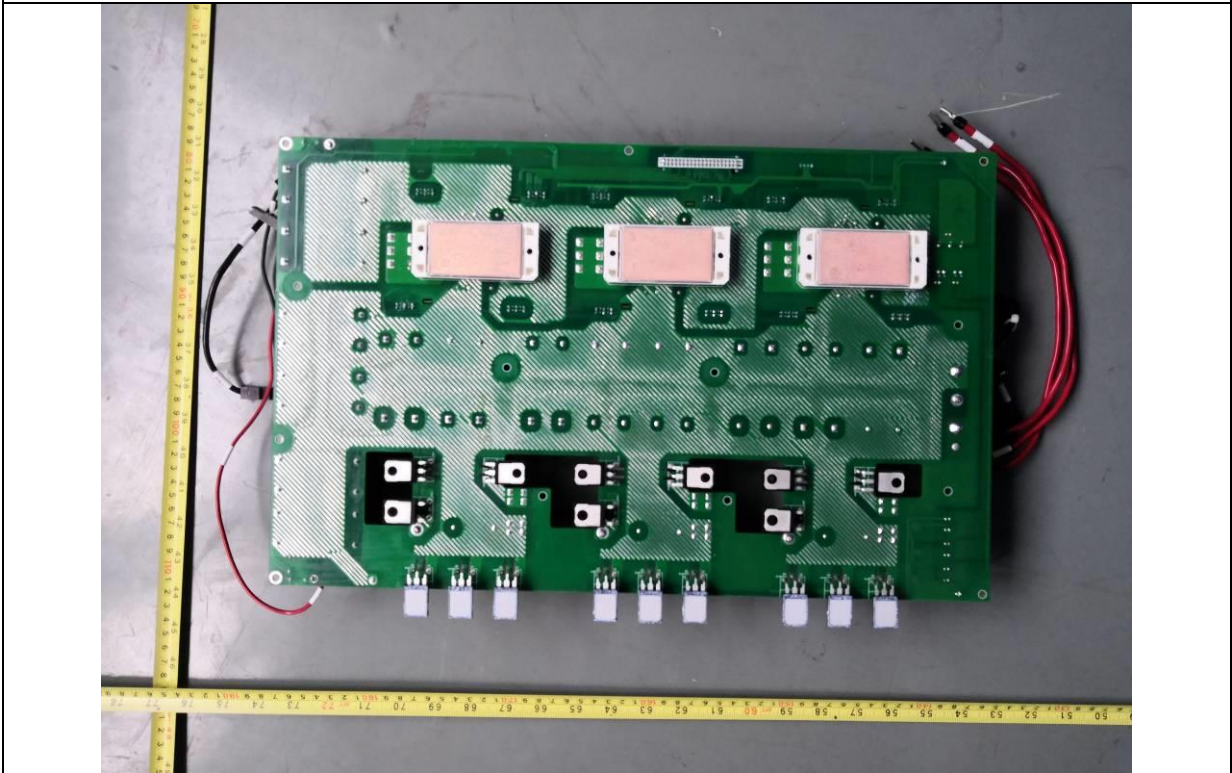


AC Output Terminal Blocks

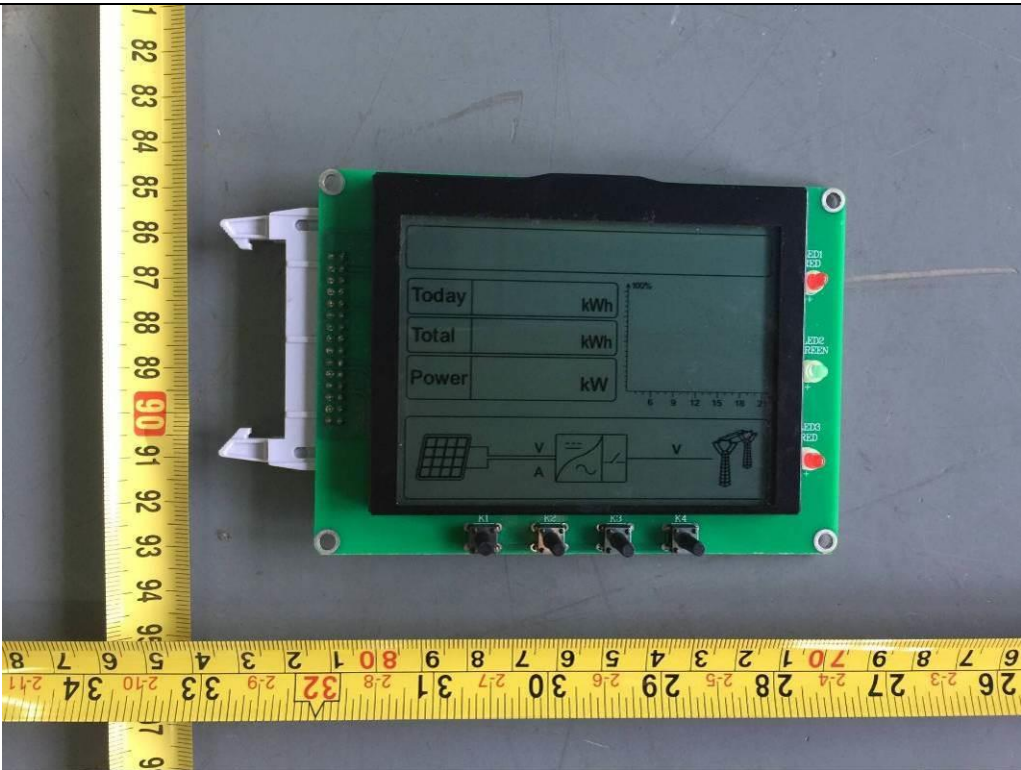
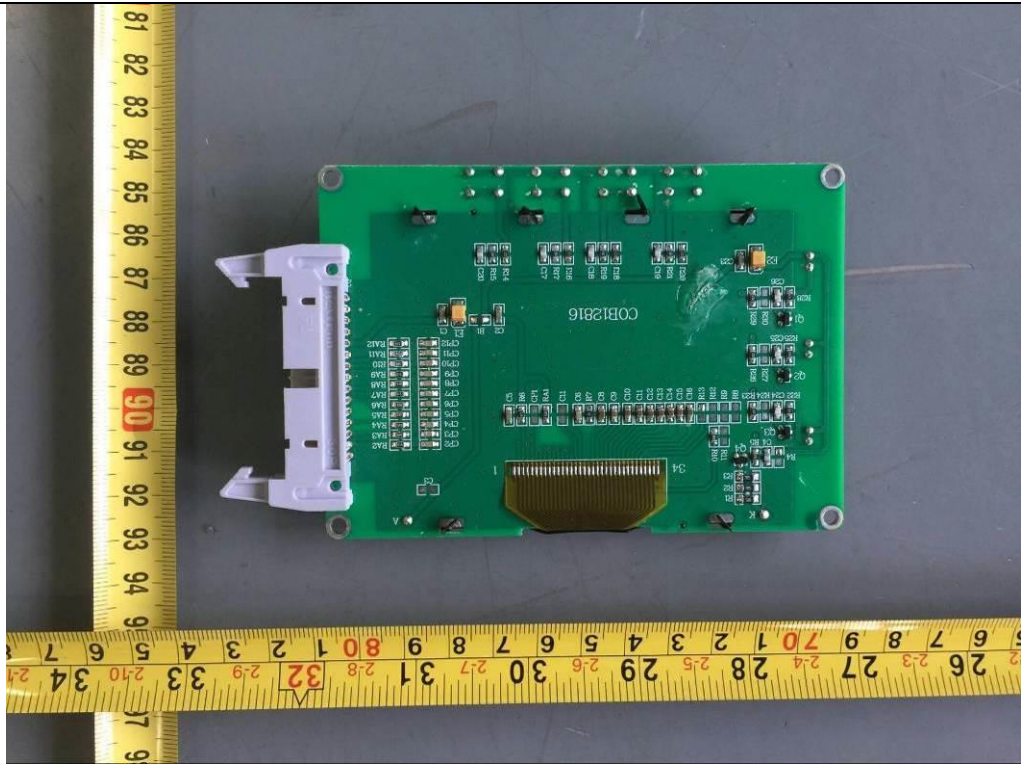
IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict

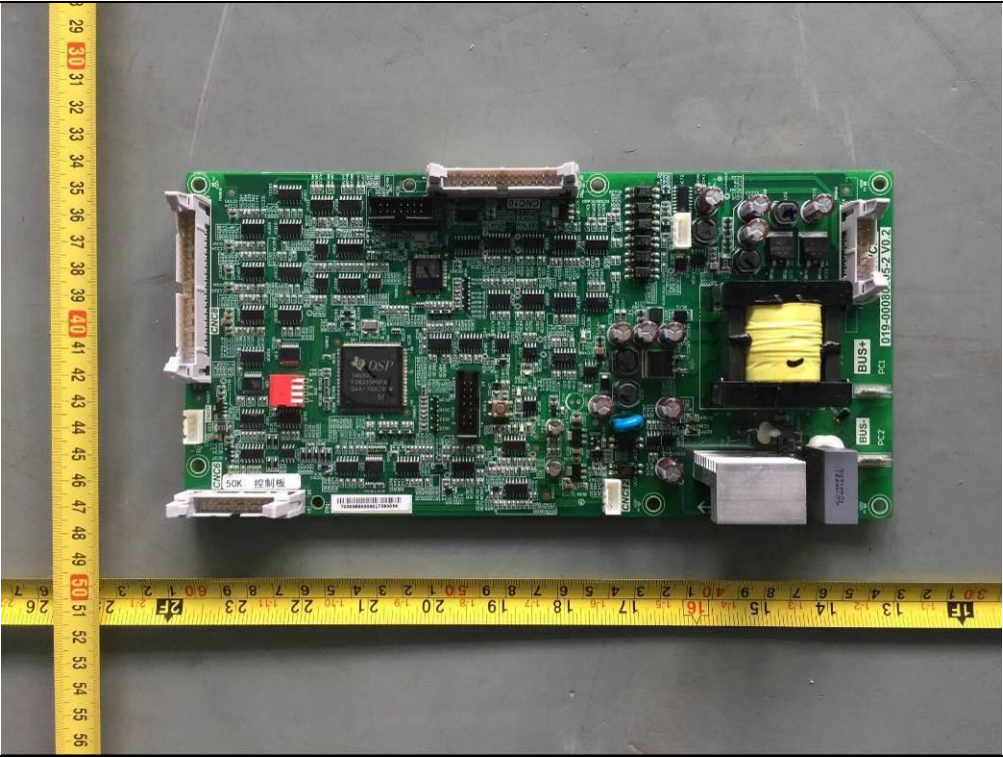
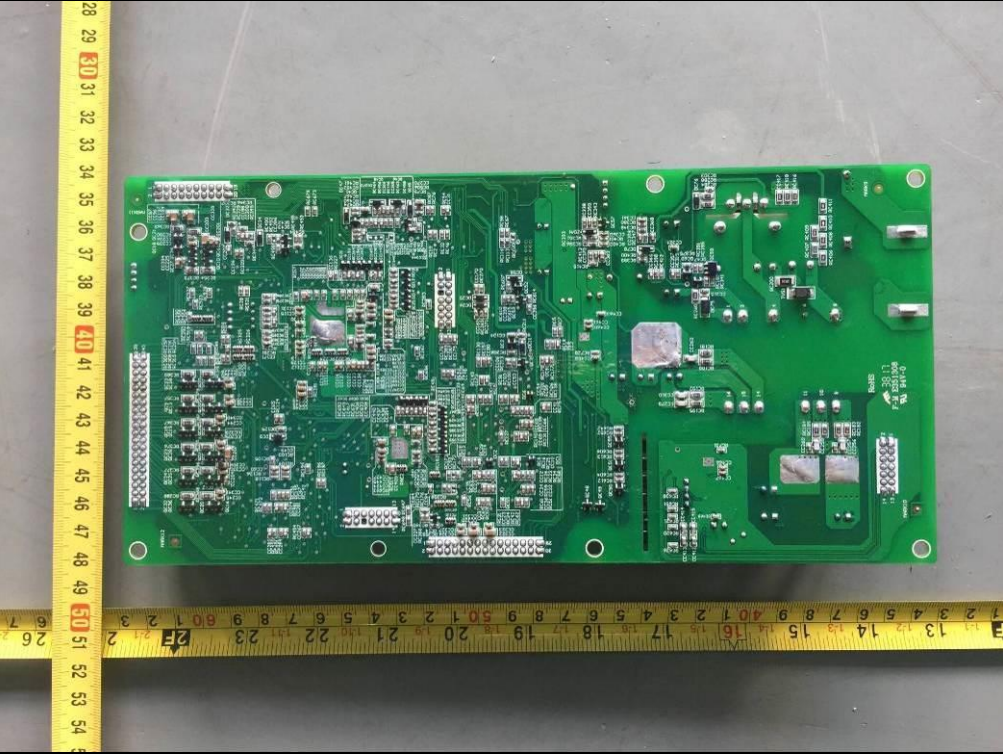



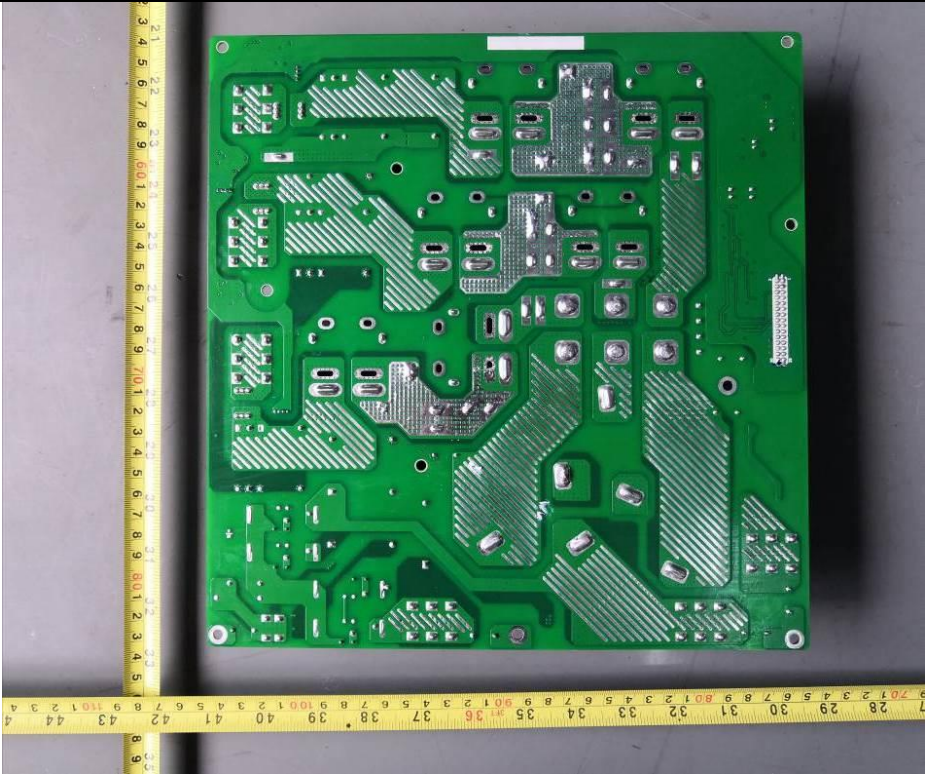
Main Board – Component Side

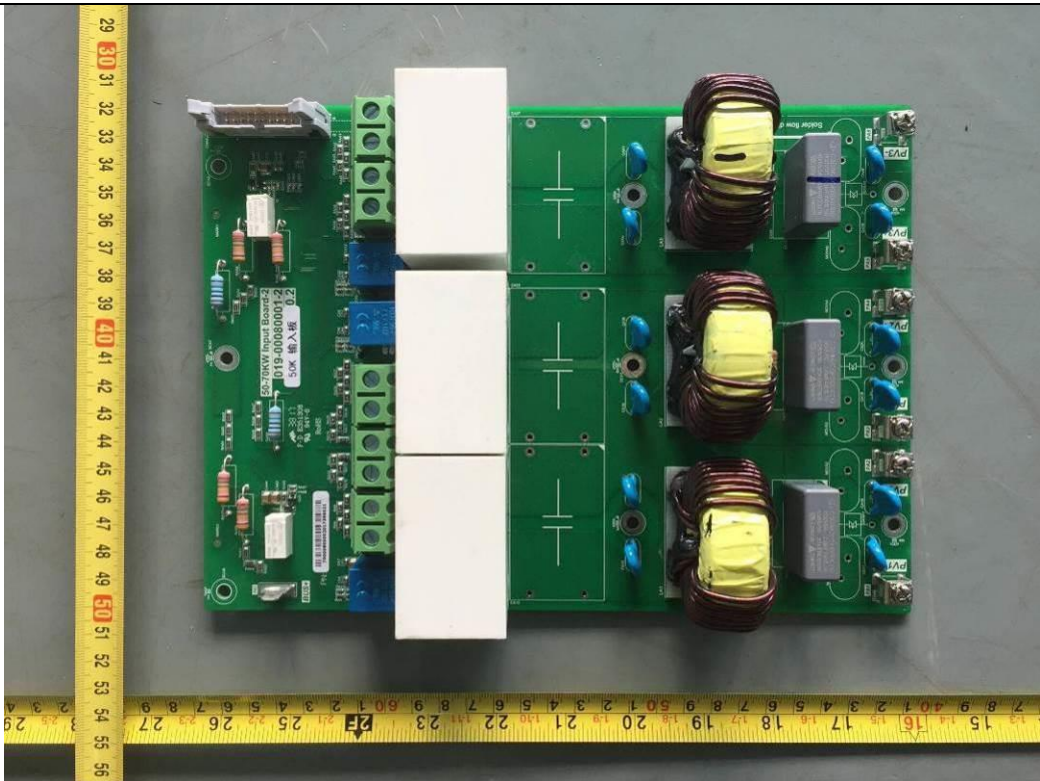
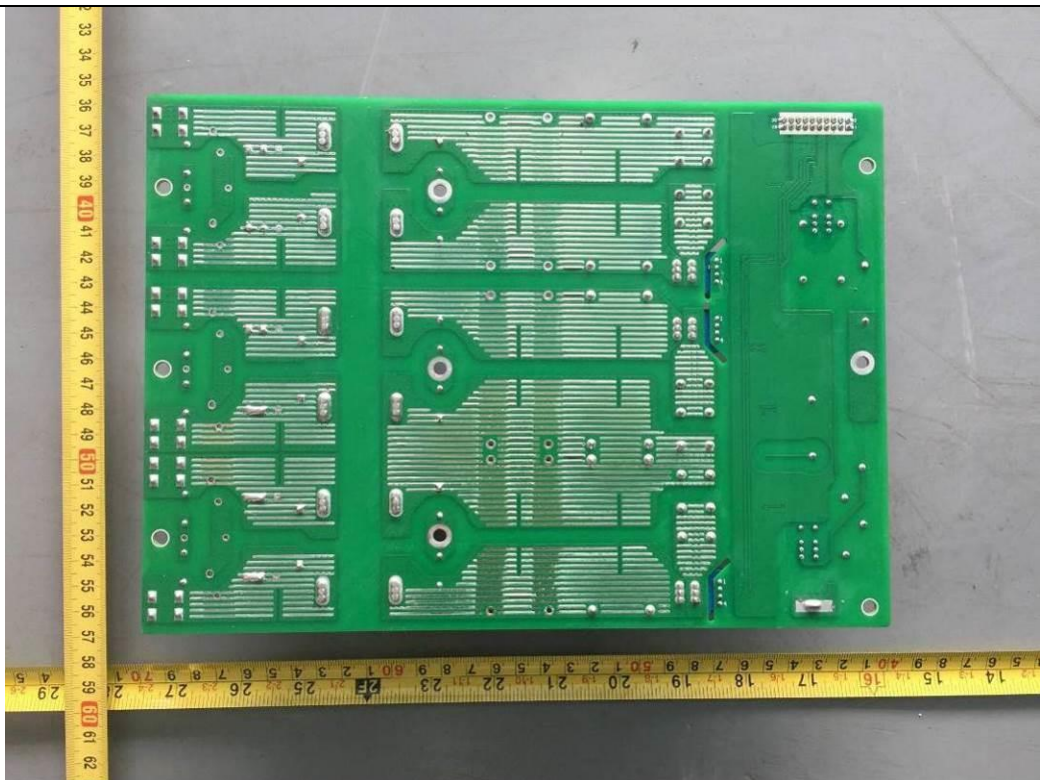


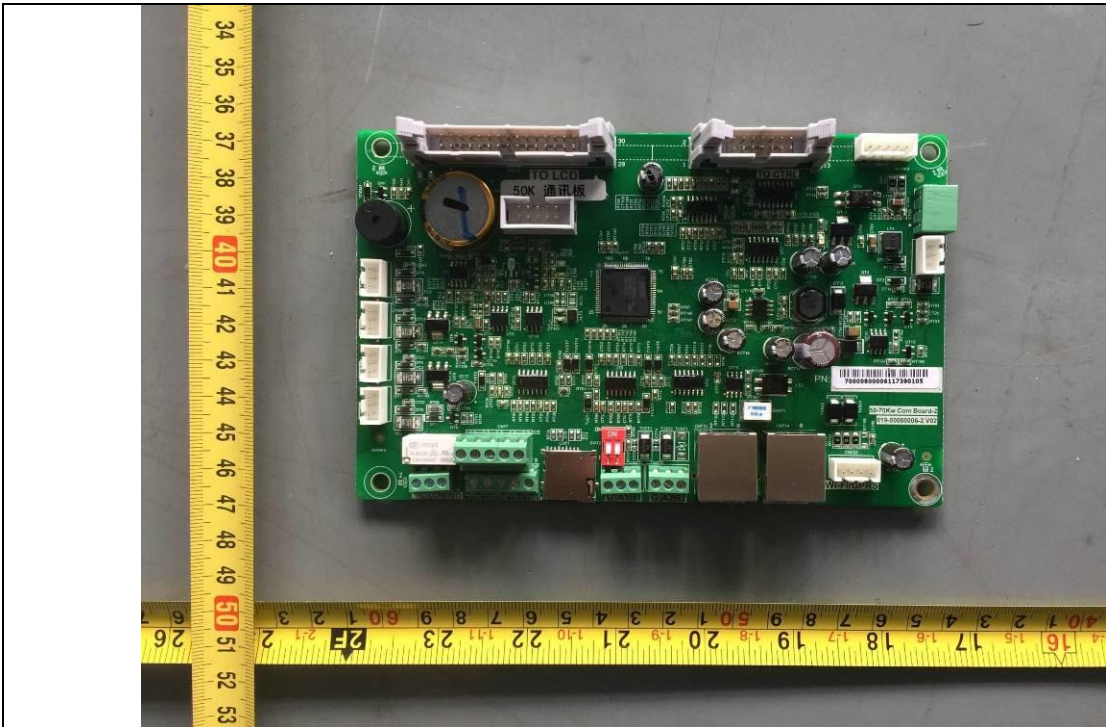
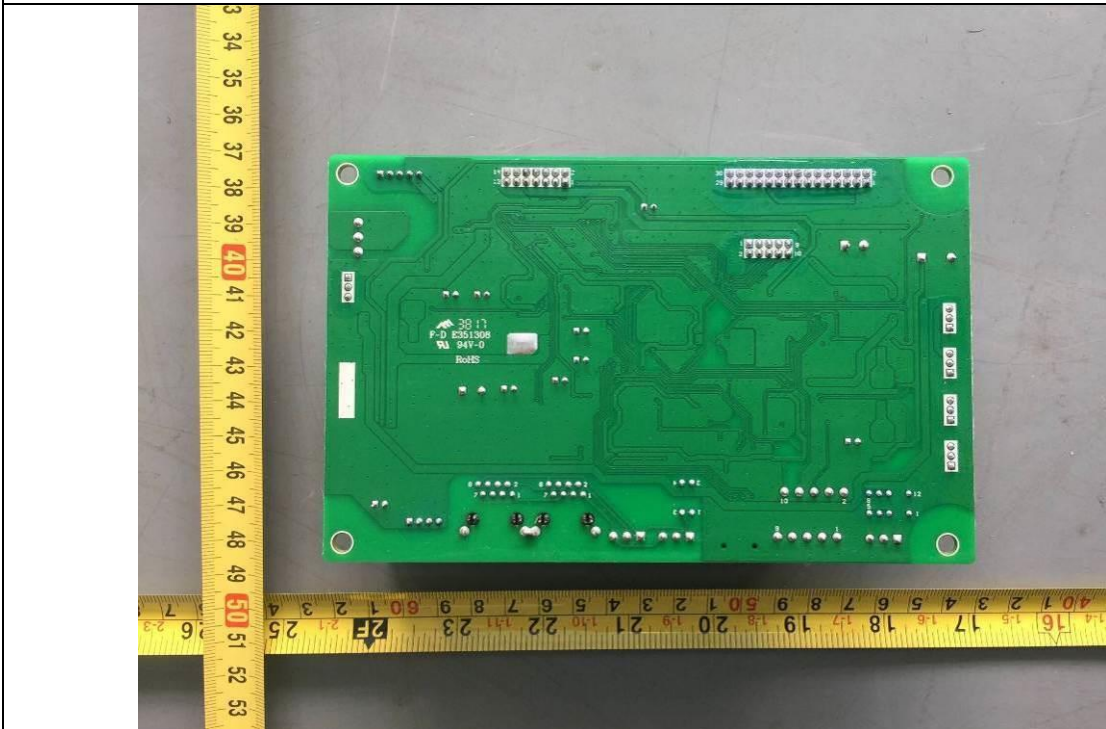
Main Board – Solder Side

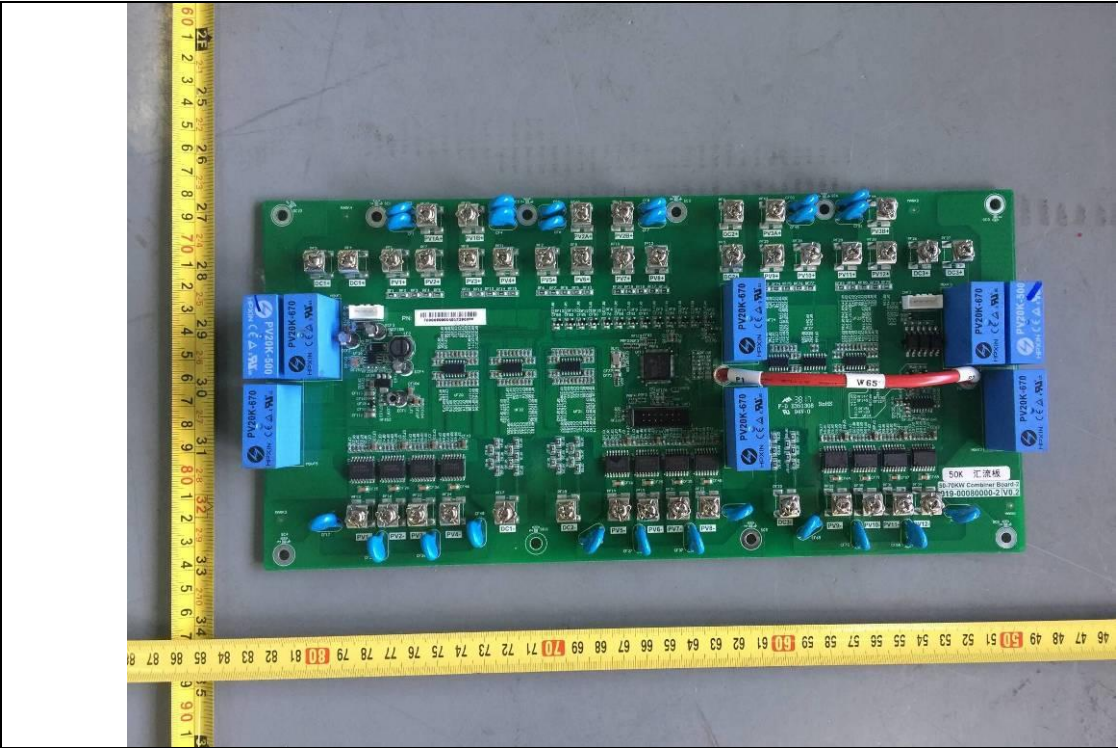
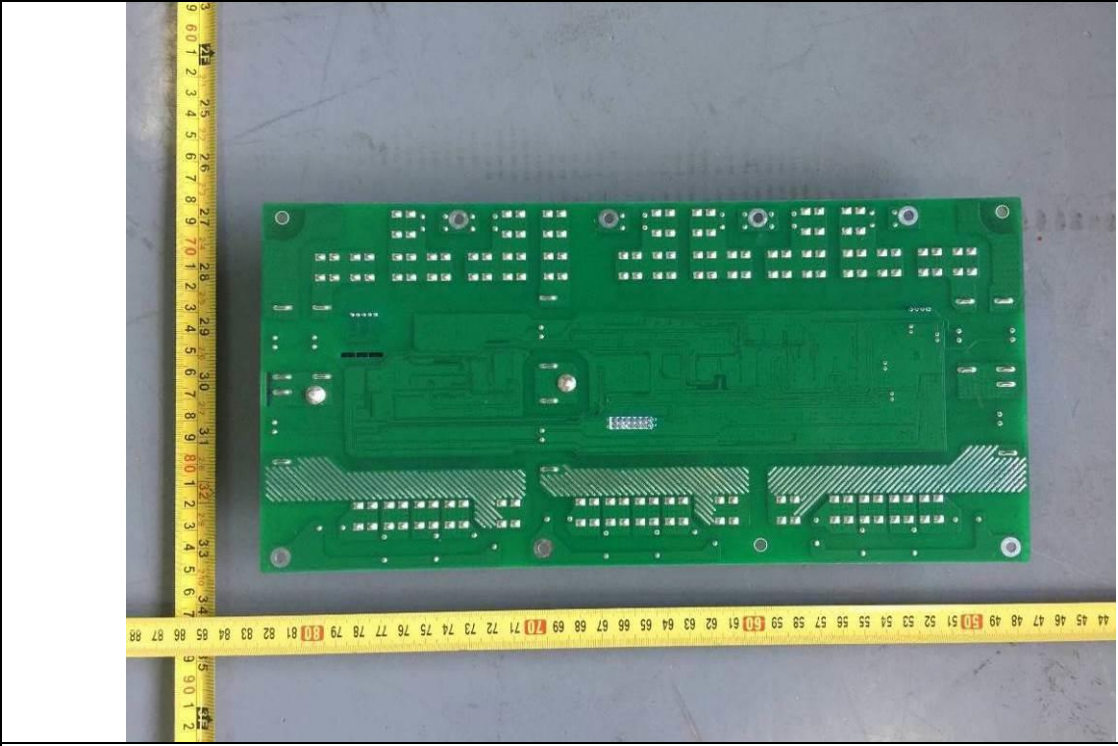
IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
			
	LCD Board – Component Side		
			
	LCD Board – Solder Side		

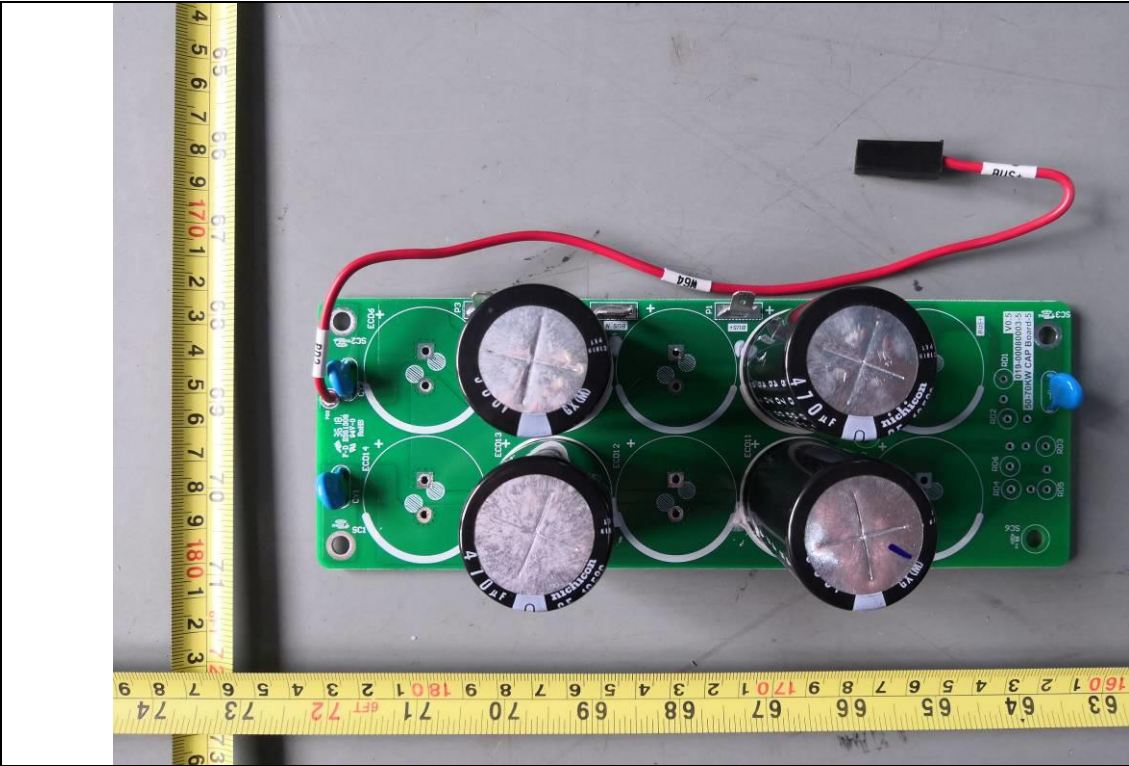
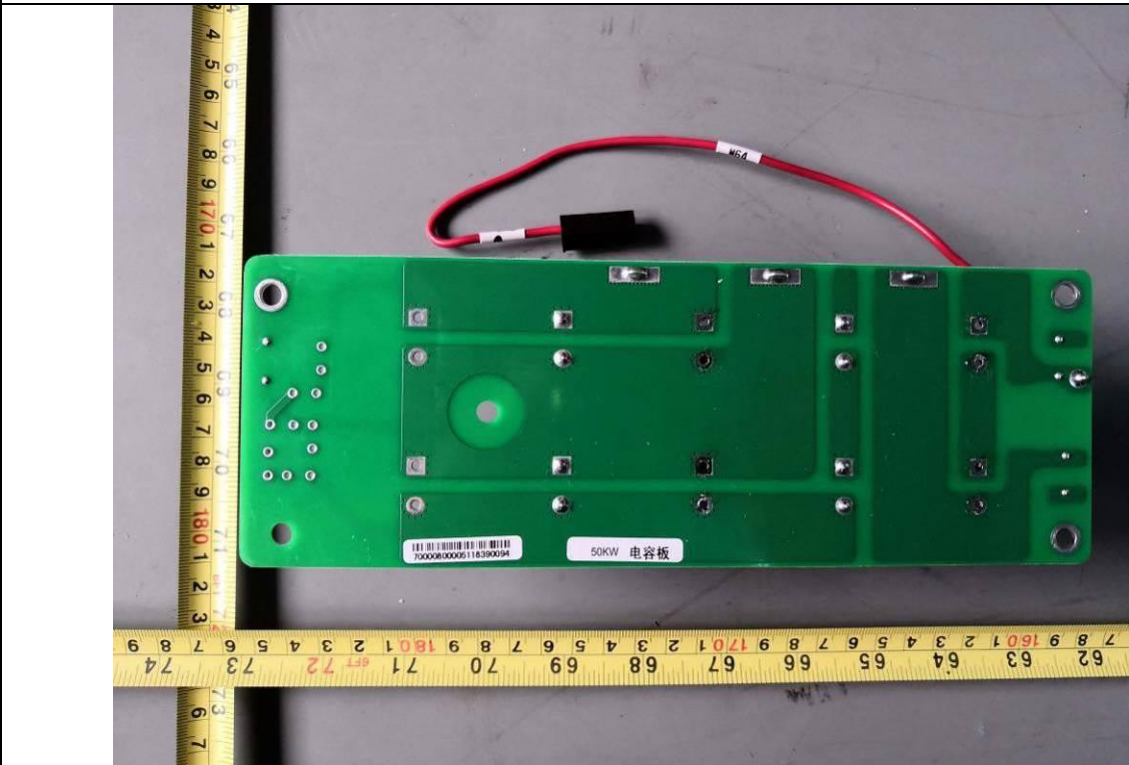
IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
			
	Control Board – Component Side		
			
	Control Board – Solder Side		

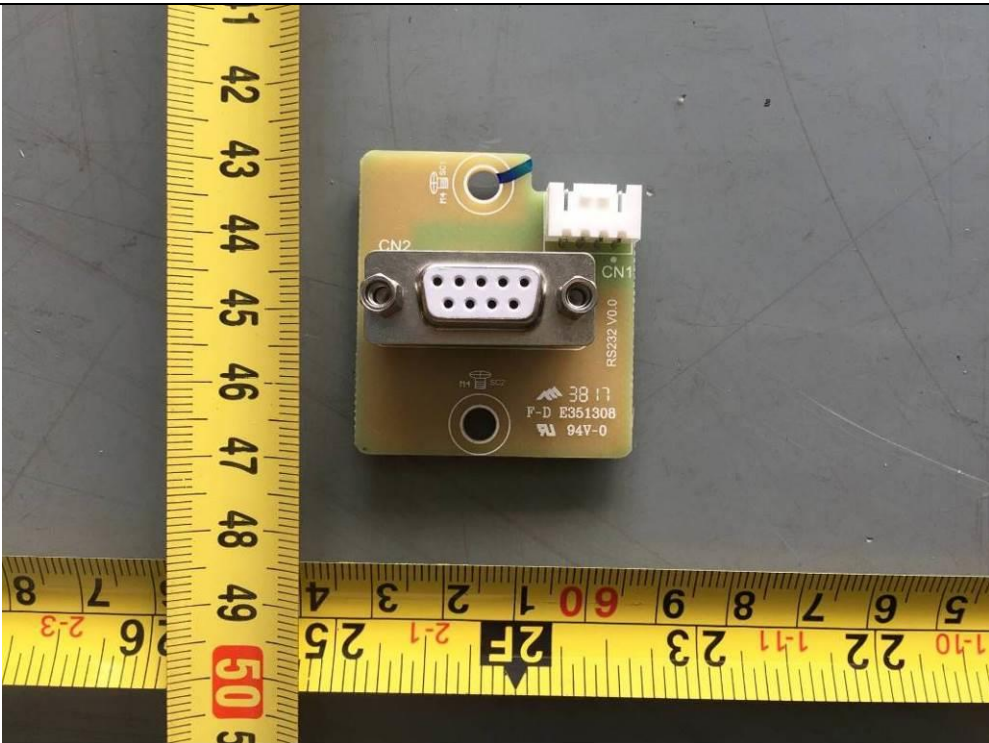
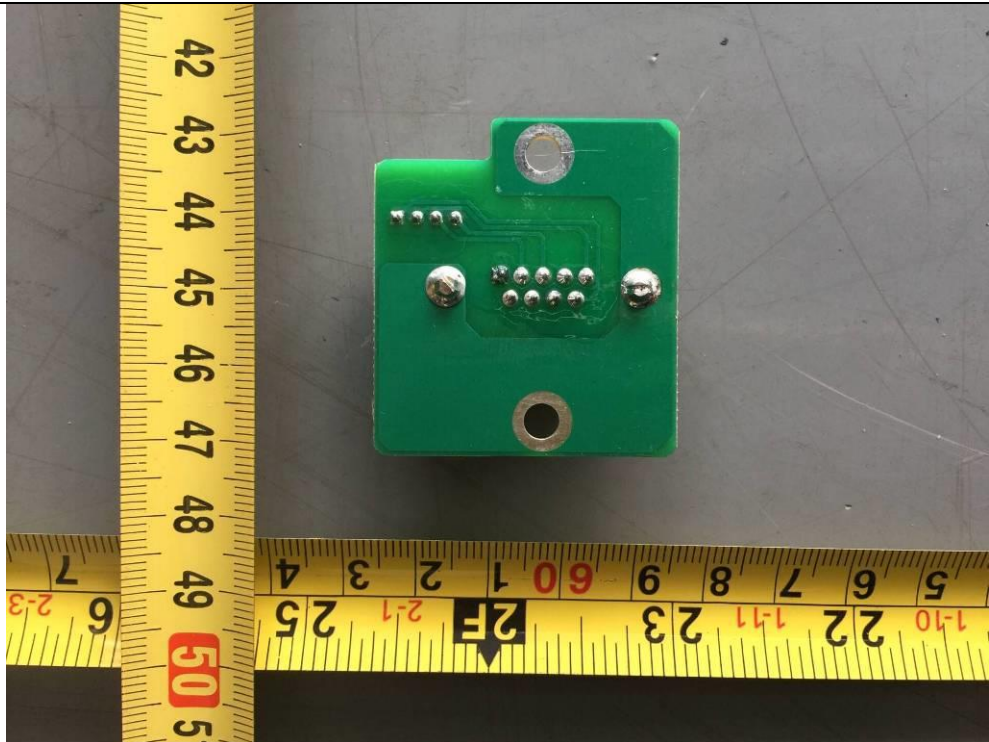
IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
			
	AC Output Board – Component Side		
			
	AC Output Board – Solder Side		

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
			
	PV Input Board – Component Side		
			
	PV Input Board – Solder Side		

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
			
	Communication Board – Component Side		
			
	Communication Board – Solder Side		

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
			
	Junction Board – Component Side		
			
	Junction Board – Solder Side		

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
			
Hiverter Si-50K Capacitor Board – Component Side			
			
Hiverter Si-50K Capacitor Board – Solder Side			

IEC 60255-27			
Clause	Requirement + Test	Result - Remark	Verdict
			
	RS 232 Board – Component Side		
			
	RS 232 Board – Solder Side		

-----END-----