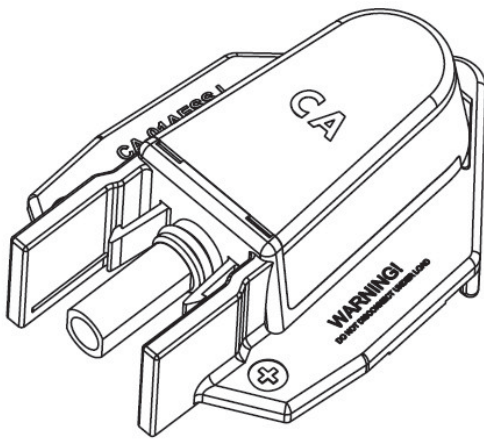


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TITLE: ALTERNATIVE ENERGY SOLAR JUNCTION BOX	PAGE: 1 OF 16	
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		REV: D
		DATE: 04/10/12'

LIST OF REVISION

REV	PAGE	DESCRIPTION	DO. NO.	DATE
A	All	NEW RELEASE	H4838	John 10/12/11'
B	All	REMOVE SOME ITEM	H4898	Jason 11/07/11'
C	ALL	REMOVE MARK	H4938	Jason 12/09/11'
D	ALL	REMOVE UL RECOGNIZED	H5134	Jason 04/10/12'



**CA-01AESSJ-X
JUNCTION BOX SOCKET**



**CA-01AESPJ-X
JUNCTION BOX PLUG**

CONTENTS

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ALTERNATIVE ENERGY SOLAR
JUNCTION BOX

PAGE: 2 OF 16

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DATE: 04/10/12'

1.SCOPE:

This specification covers the performance, tests, and quality requirements for Sheng Qiao Circuit Assembly (Shen Zhen) Co., Ltd Alternative Energy Solar (PV) Junction Box.

The applicable product descriptions and part numbers are as shown in table

Product No.	Description
CA-01AESPJ-X	JUNCTION BOX PLUG
CA-01AESSL-X	JUNCTION BOX SOCKET

2 Requirements:

2.1 Design and Construction


Product shall be of the design, construction and physical dimensions specified on applicable product drawing

2.2 Regulatory Requirements

- 2.2.1 Be an TUV Recognized Component
- 2.2.2 Housing plastics must be rate UL 94V-0
- 2.2.3 The connector should be ROHS compliant

2.3.APPLICABLE DOCUMENTS

Document Number	Title	Origin
H619003, H629004	Applicable Drawing	CA
ASTM B545-97	Standard Specification for Electrodeposited	ASTM
ASTM B733-04	Standard Specification for Autocatalytic(Electroless) Nickel-Phosphorus Coatings on Metal	ASTM
IEC61646	Thin Film Terrestrial Photovoltaic Modules	IEC

	PRODUCT SPECIFICATION	DOCUMENT NO H100074
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ALTERNATIVE ENERGY SOLAR JUNCTION BOX	Pre: Jason	APPD: Ray DATE: 04/10/12'

3 Product Details

3.1 Materials

- 3.1.1 Contact: Brass HPb59-1, Beryllium copper C7035H
- 3.1.2 Base&Cover: Xyron 644Z , UL 94V-0 , Color: Black
- 3.1.3 “O” Ring: Silicone.

3.2 Finish

- 3.2.1 Contact
 - a. Contact area: 200 bright Tin plated all over.
 - b. Under plating: 75u” (minimum) Nickel plating.

3.3 Ratings

- 3.3.1 Voltage
 - Rated Voltage: 1000V
- 3.3.2 Current
 - Rated Current: 30A
- 3.3.3 Operating temperature: -40°C to +80°C
 - Storage temperature: -40°C to +105°C
- 3.3.4 IP65(MATED)/IP2X(UNMATED)
- 3.3.5 Meets NEC Requirements for tool to release. Will not unmate without a tool.



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3.4 Reference Drawing 3.4.1 CA-01AESSJ-X

1. MATERIAL:
BASE & COVER: XTRON 644Z, UJ94V-0, COLOR: BLACK.
CONTACT: BRASS HP659-1.
2. A TOOL IS REQUIRED TO UNLOCK.

ITEM	P/N	DWG NO.
1	AESL-11	H010431

3. TÜV IS PENDING.
4. ALL DIMENSION MEASURE BY FAI
5. MARK ▼ DIMENSION MUST CONTROL
6. MEETS THE REQUIREMENTS OF DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 27 JANUARY 2003 ON THE RESTRICTION OF THE USE OF CERTAIN HAZARDOUS SUBSTANCES IN ELECTRICAL AND ELECTRONIC EQUIPMENT. (RoHS)
7. COVER IS NOT ASSEMBLED BEFORE THE JUNCTION BOX INSTALLED ON THE PANEL, AND SHIPPED UNASSEMBLED.
8. COMPANY CONFIDENTIAL : DOCUMENT AND CONTENTS DESCRIBED ARE SUBJECT TO THE TERMS OF A CUSTOMER NON-DISCLOSURE AGREEMENT. NOT FOR GENERAL COMPANY-WIDE USE OR SALES.

1 POLARITY

1 MARK (POLARITY) _____
1= PLUS WITH MARK'+-' (STANDARD),
2= MINUS WITH MARK'--' (OPTIION).

ORDERING NOMENCLATURE :
CA-01AESSJ-X

REV.	DESCRIPTION	DATE	APPD.
A	NEW RELEASE SEE DO H4827	7/16/11'	Ray
B	CHANGE MATERIAL SEE DO H488	11/01/11'	Ray
C	FORME 'N-404' SEE DO H403	12/09/11'	Ray
D	ADD PART No. TO PARTS SEE DO H488	12/16/11'	Ray
E	SEE DO H503	3/15/12'	Ray
F	SEE DO H514	04/10/12'	Ray

MILLIMETERS	INCH	UNITS	MM	NAME/(INTENDED USE)
X ± 0.2	X ± 0.01	MATL.		
X ± 0.25	X ± 0.01	SEE NOTES		
XXX ± 0.15	XXX ± .006	FINISH		
XXX ± ---	XXX ± ---	SEE NOTES		

THESE DIMENSIONS AND SPECIFICATIONS ARE THE PROPERTY OF CIRCUIT ASSEMBLY & SHENZHEN MOBILE ELECTRONIC TECHNOLOGY CO., LTD. NO REUSE OR DISSEMINATION OF THIS INFORMATION WITHOUT WRITTEN PERMISSION FROM CIRCUIT ASSEMBLY & SHENZHEN MOBILE ELECTRONIC TECHNOLOGY CO., LTD.

SCALE SHEET REV. 1/1 1/1 F

DATE: 07/15/11'

CHKD: Ray 07/15/11'

DR: JOHN 07/15/11'

DMG NO.: H619003

TITLE: CIRCUIT ASSEMBLY & SHENZHEN MOBILE ELECTRONIC TECHNOLOGY CO., LTD. ALTERNATIVE ENERGY SOLAR SOCKET JUNCTION-BOXES

PART NO.(INTENDED USE): CA-01AESSJ-X

NAME/(INTENDED USE): CA-01AESSJ-X

DATE: 07/15/11'

APPD: Ray 07/15/11'

CHKD: Ray 07/15/11'

DR: JOHN 07/15/11'



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DATE: 04/10/12'

3.4.2 CA-01AESPJ-X

1. MATERIAL:
BASE & COVER: XYRON 644Z, U94V-0, COLOR: BLACK.
CONTACT: BRASS HP639-1.
2. A TOOL IS REQUIRED TO UNLOCK.

ITEM	P/N	DWG. NO.
1	AESL-T1	H010431

3. TUV IS PENDING.
4. ALL DIMENSION MEASURE BY FAI
5. MARK ▼ DIMENSION MUST CONTROL
6. MEETS THE REQUIREMENTS OF DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 27 JANUARY 2003 ON THE RESTRICTION OF THE USE OF CERTAIN HAZARDOUS SUBSTANCES IN ELECTRICAL AND ELECTRONIC EQUIPMENT. (RoHS)
7. COVER IS NOT ASSEMBLED BEFORE THE JUNCTION BOX INSTALLED ON THE PANEL, AND SHIPPED UNASSEMBLED.
8. COMPANY CONFIDENTIAL : DOCUMENT AND CONTENTS DESCRIBED ARE SUBJECT TO THE TERMS OF A CUSTOMER NON-DISCLOSURE AGREEMENT. NOT FOR GENERAL COMPANY-WIDE USE OR SALES.

ORDERING NOMENCLATURE:
ALTERNATIVE ENERGY
SOLAR PLUG JUNCTION-BOX
CA-01AESPJ-X

1= PLUS WITH MARK+* (OPTIION),
2= MINUS WITH MARK-* (STANDARD)

REV. DESCRIPTION DATE APPD.

REV.	DESCRIPTION	DATE	APPD.
A	NEW RELEASE SEE DO H4427	7/15/11'	Ray
B	CHANGE MATERIAL SEE DO H488	11/07/11'	Ray
C	REMOVE PIN-4884- SEE DO H488	12/09/11'	Ray
D	ADD PART No. TO PARTS SEE DO H488	12/19/11'	Ray
E	SEE DO H488	3/15/12'	Ray
F	SEE DO H434	04/10/12'	Ray

MILLIMETERS INCH

M [±]	2"	M [±]	2"
X±	0.05	X±	.01
XX±	0.15	XX±	.002
XXX±	---	XXX±	---

NAME/(INTENDED USE)
CA-01AESPJ-X


TITLE:
CIRCUIT ASSEMBLY SHENZHEN
CA-01AESPJ-X
ASSEMBLY DRAWING FOR ALTERNATIVE ENERGY
SOLAR PLUG JUNCTION-BOX(R&SD)

DATE: 07/15/11'

DWG NO.: H629004

SCALE SHEET REV. 1/1 1/1 F

DR: John 07/15/11'

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4. DESIGN REQUIREMENTS

- 4.1 The junction box shall be certifiable to 600V(USA) and 1000V(IEC) and 30Amps.
- 4.2 Connector interface shall be rated 30A, 600V(USA), 1000V(IEC), 105°C minimum and shall mate to a locking connector requiring a tool to disengage and certified to IP67 requirements for ingress protection.
- 4.3 The minimum material thickness shall be consistent with constituent material, minimum thickness to attain V-0 rating for UL qualification(0.75mm for Xyron 644Z).
- 4.4 The junction box shall have a standoff 0.020"(0.5mm) at the glue line.
- 4.5 The junction box shall have a lid that is interchangeable between both the negative and positive types of boxes.
- 4.6 The junction box shall be compatible with connected cable, bearing 2.5-4mm[^] conductors and having mating connectors with a rating of 600V(USA)/1000V(IEC) ratings.
- 4.7 The junction box lid shall require no more than 25lbf(110N) to snap closed. This shall be measured by a force gauge at a single contact point as indicated below, the contact point shall be no smaller than 6mm in diameter(see below).





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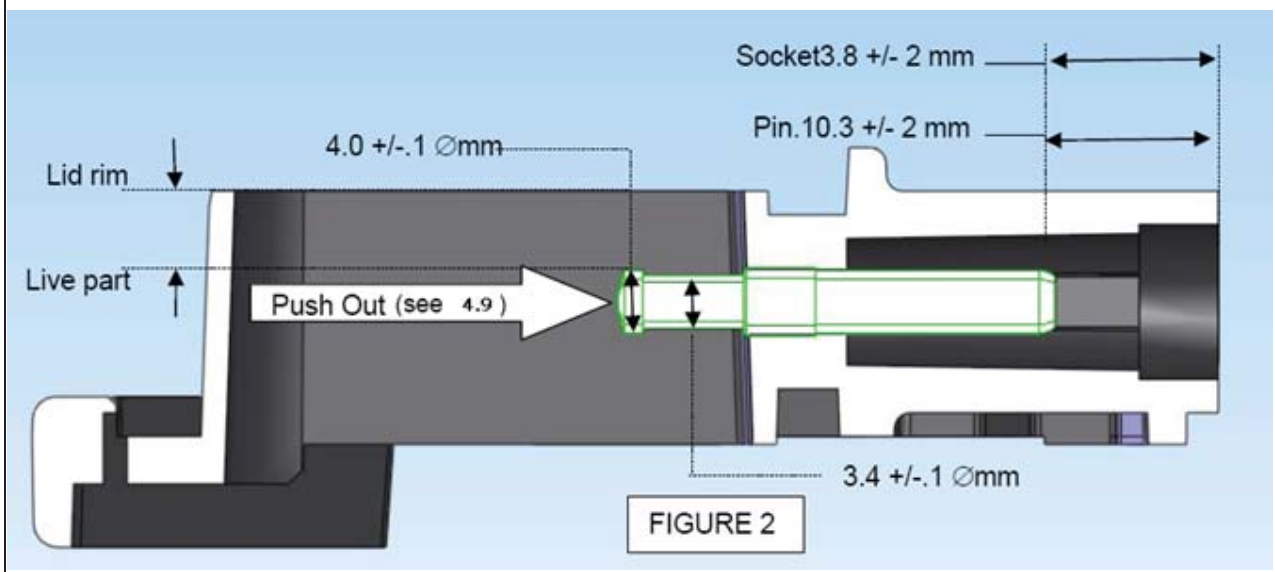
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4.8 The pin shall have the dimensions shown in figure2.



4.9 The pin shall have a minimum push out force, defined as pressing the weld tip of the pin from inside the J-box to the cable insertion side of 300N.



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8. Performance and Testing


8.1 Test Requirement and Procedures Summary are shown in table1.
Table 1


Electrical performance


Test description	Test condition	Requirement
Overall resistance (DC) (Low Level Contact Resistance)	Subject mated contacts assembled in housing to 20mV maximum open circuit at 100 mA current maximum (IEC60512-2)	5 milliohm maximum, initial per mated pair.
Initial measurement of electrical performance	Test current: 1 A Measuring points: at the end of the termination. Maximum three contacts per specimen	Reference value for subsequent. Measurement
Final measurement of electrical performance	Test current: 1 A Measuring points: at the end of the termination. Maximum three contacts per specimen Voltage proof	The contact resistance change shall be more than 50% of the reference value or $\leq 5m\Omega$ There shall be no breakdown or flashover
Dielectric strength	The voltage proof test shall be performed by applying a r.m.s withstand voltage(50/60Hz) with a r.m.s value of 2000V+4times rated voltage, the test duration shall be 1 min.	No breakdown or flashover
Wet Leakage Current Test	Test is carried out under the following test condition: a) A shallow trough or tank of sufficient size to enable the module with frame to be placed in the solution in a flat, horizontal position, it shall contain a water/wetting agent solution meeting the following requirement: Resistivity: 3500ohm .cm or less Surface tension: 0.03Nm-1 or less Temperature: 22±3°C The depth of the solution shall be sufficient to cover all surface between mounting surface and box, b) Spray equipment containing the same solution. c) DC voltage source with current limitation, capable of applying 500V. d) Instrument to measure insulation resistance.	1 Milliamp maximum The insulation resistance shall be not less than 400MΩ


Mechanical performance


Test description	Test condition	Requirement
Mechanical operation(Durability)	Mate connectors for 50 cycles at a maximum rate of 10 cycles per minute	No damage likely to impair function

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Durability of marking	With the naked eye		Marking are easily legible and indelible
Polarization	Test force: While trying to mate connectors in an unintended manner, apply either 20N(4.5lb) or 1.5 times insertion force, whichever is higher, but not higher than 80N		No damage likely to impair function
Connection and terminations methods	Screwless-type connection		The pin shall have a minimum push out force 300N
Visual inspections	Visual and functional per applicable quality inspection plan, any existing cover shall be removed if required.		Meets below requirements: a) Trademark b) Type identification c) Rated current d) Rated voltage e) Rated impulse f) Max working voltage g) Pollution degree h) Protection degree i) Range of temperature j) Type of terminals k) Connectable conductors l) Reference to this standard if applicable m) Hint" do not connector or disconnect under load n) Polarity of connector
Visual inspection of documents	The minimum marking on the junction box shall be a), b), n) Junction box is fitted with an attached connector the hint under "m" is near the connector or junction box is fitted with fixed cable and a connector at the other end of the cable the hint under "m" is on the connector or on an attached sticker near at the connector. Marking a) and b) are found on the smallest unit of packaging. All other marking should be given in the technical documentation or catalogue of the manufacturer Information about mounting and the mounting material.		Marking indelible and easily legible
Pin push out force test	Defined as pressing the weld tip of the pin from inside the junction box to the cable insertion side.		The pin shall have a minimum push out force 300N.
Lid snap closed force test	Measured by a force gauge at a single contact point as indicated at the cover, the contact point shall be no smaller than 6mm in diameter.		The junction box lid shall require no more than 25lbf(110N) to snap closed.

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Protection against electric shock	Touch live parts with test probe 11 acc. To EN61032 at test force 20N.	Not possible to touch live parts No loosening or displacement	
Wall thickness	Acc. To the product drawing	3mm Min or test acc. To clause B10.	
Cover of opening	Knock-out retention: A force $45\pm 1N$ shall be applied to a knock-out for $15\pm 1s$ by means of a 6mm diameter mandrel with a flat end, duration 1hour. Knock-out removal: Temperature: $-20\pm 2^{\circ}C$, duration: $5h\pm 10min$	No sharp edges after the test The box and enclosure shall not be damaged.	
Fixing of cover	The test will be performed at specimens which passed though test sequences of test group E and F Screwless fixing of lid: The test probe 11 according to IEC 61032, force: 75N, duration 1min, position: all points in enclosure	The lid shall not come off during test and without any damage.	
General construction	Barriers have adequate thickness acc. To IEC 61140 and fixing	No sharp edges Connections must be suitable for type and cross-section of cable and specified rated voltage and current Non-insulated connections must be kept securely in their position so that reduction of clearance and creepage distances cannot occur.	

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Visual inspection for the verification of suitability of the components	Components suit for the junction box		<ol style="list-style-type: none"> 1. Connections are suitable for type and cross-section of cables and their specified rated voltage and current. 2. Connectors assembled at the junction box and connectors that are connected with the junction box by a cable comply with EN 50521:2008. 3. Rated current and voltage of connectors comply at least with rated values of the junction box. 4. Assembled cable(cable standard version:2PfG 1169: 2008.07) are suitable for photovoltaic systems, rated current and voltage comply at least with rated values of the junction box. 	
Fixing of junction box at backsheet material	The tests will be performed at specimens which passed though test sequences of test group E and F, A force of 40N is gradually applied for 30 min in each direction parallel to the mounting surface. A force of 40N is gradually applied for 30 min without jerks, in a direction perpendicular to the mounting surface.		No deposition of the box at the mounting surface which impairs isolating characteristics.	
Connector Mate and Unmate Force	Mate and unmate connector(male to female) at a rate of 25±6mm(1±1/4 inch) per minute. When unmating, the latches are to be fully compressed.		50N(11.2 lbf) MAXIMUM insertion force & 5N(1.1 lbf) MINIMUM withdrawal force	
Effectiveness of connector coupling device	The force shall be increased steadily at the rate of 10N/s until specified force or at least 80N is reached and maintained 15s		No damage and function	
Degree of protection	Unmate connector: Using the IEC jointed test finger apply a test force of 20N(4.4lbf) in the worst direction (largest access point to hazardous parts) Specified IP-Protection acc. To EN 60529		No risk of electric shock or injury to person No ingress of dust after test, no ingress of water.	

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Environmental performance				
Impact Test	Mate connectors: Temperature: 25°C 1 impact of 6.78 joule [535 g(1.18 lb), 1.295m(51in)]		No exposure of live parts	
Mechanical test at low temperatures	Specimens shall be stored for 5 hours at a temperature of -40°C on a steel plate of 20mm thickness 4 Impacts on the specimen with 1J		Parts used for protection against electric shock shall not be damaged A reduction of clearance and creepage distances in not allowed No damages on the function of the connector	
Thermal Cycle test	Mate connectors: expose for 200h between temperatures -40±2°C and 85±2°C ; dwell 0.5 hours at each temperature. Transfer time 3 minutes maximum. {Note: Remove surface moisture and air dry for 1 hour prior to measurements }		50% change from initial or 5 milliohms Maximum (change from initial) & Must pass dielectric and impulse withstanding voltage test and No visible damages on the samples	
Requirements for clearance and creepage distance of junction box for PV module	See table 3		See table 3	
Damp Heat	Mate connectors: expose to a temperature of 85±2°C with a relative humidity of 85% for 1000 hours. {Note: Remove surface moisture and air dry for 1 hour prior to measurements.}		There is no obvious change of the lid which will affect sealing There is no obvious crack or distortion of the material No affection to electrical connection(could be approved by measuring the change of contact resistance or by pull test) Cable clamp resistance to cable pull and cable torsion still reliable. No obvious change for the connection between junction box and PV module.	
Humidity-freeze test	See Figure 2		After the test, no visible damages on the samples	

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Impulse voltage test	The impulse withstand test shall be carried out with a voltage having a 1,2/50 μ s waveform according to IEC 60060-1 with three impulses of each polarity and an interval of at least 1 s between pulses, the output impedance of the impulse generator should not be higher than 500 ohm, the test voltage shall comply with the rated impulse voltage under consideration of IEC 60664-1. (see table 2)	There shall be no breakdown or flashover.	
Weather resistance	After test acc. ISO 4892-2: 500 hours at 60W/m ² , 300-400nm, 65 $^{\circ}$ C,65%RH, cycles: 18min spraying, 102min drying with relevant	No cracks visible	
Glow wire test	The glow wire test is performed according to IEC 60695-2-11, the test temperature is 650 $^{\circ}$ C for outer materials providing protection against electric shock, 750 $^{\circ}$ C for materials necessary to retain current carrying parts in position and for potting material	No ignition of material, or support, or self extinguishing within 30s.	
Temperature resistance(Enclosure)	Ball pressure test with 90 $^{\circ}$ C The loading device shall consist of a 5mm diameter pressure ball(steel), weights should be designed to apply a downward force equivalent to a 20N plus/minus 0.2N, load including the mass of the pressure ball.	No damages	
Temperature resistance(Live parts)	Ball pressure test with 125 $^{\circ}$ C The loading device shall consist of a 5mm diameter pressure ball(steel), weights should be designed to apply a downward force equivalent to a 20N plus/minus 0.2N, load including the mass of the pressure ball.	No damages	
Protection against corrosion	All grease is removed from the parts to be tested by immersion in a degreasing agent for (10 \pm 1)min, the parts are then immersed for (10 \pm 1)min in a 10% solution of ammonium chloride in water at a temperature of 20 \pm 5 $^{\circ}$ C, without drying but after shaking off any drops, the parts are placed for (10 \pm 1)min in a box containing air saturated with moisture to a level of 91% to 95% at a temperature of 20 \pm 5 $^{\circ}$ C, after the parts have been dried for (10 \pm 1)min in a heating cabinet at a temperature of 100 \pm 5 $^{\circ}$ C	There is no sign of rust on the junction box surface.	
Degree of protection IP code (Ingress Protection) (IP65)	No risk of electric shock, or injury to person during application of test finger with a test force of 20N. Specified IP-Protection acc. To EN60529.	No ingress of dust or water	


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Flammability classification	Flammability Class HB, V-2, V-1, or V-0 according to EN 60695-11-10 Glow wire test with (650°C) 750°C according to EN 60695-2-10 If the wall thickness of the junction box is less than 3mm, then the tests are performed according the flammability class 5V of IEC 60695-11-20 at an end-product, the result is assessed for flammability class 5VB. (see table 1)		No flame or flame disappeared in 30 seconds

Table 1 1– 5V burning categories

Criteria	Category(see note)	
	5VA	5VB
Individual bar test specimen after flame plus after glow time after the fifth flame application(t1+t2) for each individual bar test specimen	≤ 60s	≤ 60s
Was the cotton indicator(see 6.10) ignited by flaming particles or drops from any bar test specimen?	No	No
Did the bar test specimen burn up completely?	No	No
Did the flame penetrate through(burn-through) any of the individual plates?	No	Yes
Note if the test results are not in accordance with the specified criteria, the material cannot be categorized by this test method.		

Table 2 – Test voltages

Maximum system voltage(V)	Impulse test voltage* (1.2/50 μs)	
	Application class A	Application class B
100	1500	800
150	2500	1500
300	4000	2500
600	6000	4000
1000	8000	6000
* If the test laboratory is located between sea level and an altitude of 2000m above sea level, interpolation of the impulse withstand voltage is allowed.		

Table 3 Requirements for clearance and creepage distance

Rated voltage	Over voltage category	Rated impulse voltage	Pollution degree	Clearance distance	Creepage distance
1000V	III	8000V	2 or 1	14mm	20mm

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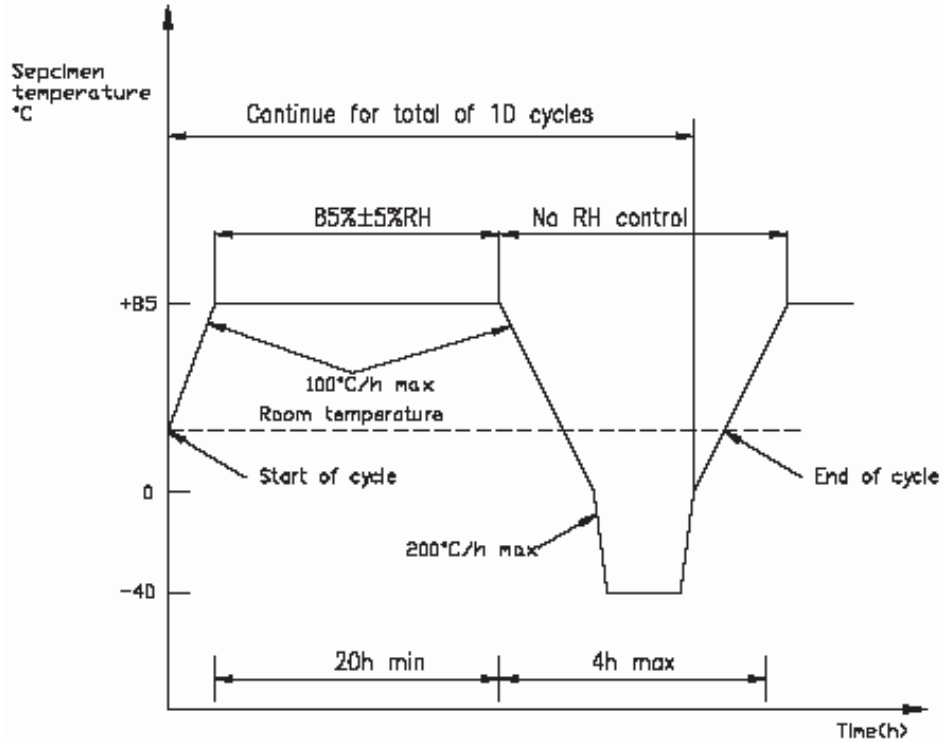


Figure 2- Humidity-freeze cycle

8.2 Product Qualification and Test Sequence

8.2.1 TEST GROUP

ITEM	TEST	
A1	Visual inspections	Group A(no required sequence)
A2	Visual inspection of documents	
A3	Visual inspection for the verification of suitability of the components	

ITEM	TEST	
B1	Durability of marking	Group B(no required sequence)
B2	Protection against corrosion	
B3	Flammability classification	
B4	Weather resistance	
B5	Glow wire test	
B6		
B7	Temperature resistance(Enclosure)	
B8	Temperature resistance(Live parts)	
B9	Flammability classification	



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ITEM	TEST	GROUP C(no required sequence)
C1	Protection against electric shock	
C2		
C3	General construction	
C4		
C5		
C6	Requirements for clearance and creepage distance of junction box for PV module	
C7	Wall thickness	

ITEM	TEST	GROUP D(no required sequence)
D1	Connections and terminations methods	
D2	Covers of openings	
D3	Mechanical test at low temperatures	
D4	Fixing of cover	
D5	Fixing of junction box at backsheet material	

ITEM	TEST	GROUP E(required test sequence)
E1	Degree of protection	
E2	Dielectric strength	
E3	Wet leakage current test	
E4	Thermal cycle test	
E5	Dielectric strength	
E6	Impulse voltage test	

EM	TEST	GROUP F(required test sequence)
F1	Wet leakage current test	
F2	Damp heat	
F3	Dielectric strength	
F4	Wet leakage current test	

G1	TEST	GROUP G(required test sequence)
G1	Thermal cycle test(50cycles)	
G2	Humidity-freeze test	
G3	Wet leakage current test	

H1	TEST	GROUP H(no required sequence)
H1	Pin push out force test	
H2	Lid snap closed force test	

Note: numbers denote the order in which the tests are performed.