SPECIFICATION FOR 275Wp/300Wp :

PURCHASE SPECIFICATION
GROUP: PHOTOVOLTAICS

300-WATT PV MODULE (MONO CELLS)

Technical Specification:

Sl. No	Item	Remarks	Vendor Confirmation
1	PV Module Configuration	Single glass laminated type with 72 numbers of 156-mm Mono Crystalline silicon solar cells in 12*6 series configuration as per Module overall assembly drawing no: 36790200371	Y/N
2	Power Output	300 Watts (minimum)	
3	Overall Module Size (Typ)	1976 (±3) * 996 (±2) * 50 (±1) mm	Y/N
4	Weight	25 kg. (Typ.)	Y/N
5	**Bill of Materials:**		
5 1	Solar cells	Three bus bar 156-mm Mono Crystalline silicon solar cells as per **PS-439-267** **Power Output: ≥ 4.3 watts (18 % efficiency)** **Visual Characteristics:** Cells should be free from the following defects a) Edge chips or cracks or deep scratches on the surface b) Misalignment and misprints in the front grid pattern c) Finger prints or stains or paste smudges on the surface d) Silicon Nitride coating color variations or inhomogeneity **Front Pattern** No of lines: 88 – 90 with borders closed No of bus bars : 3, Busbar Spacing 52 mm (centre to centre) Bus bar width: 1.4 to 1 5 mm **Back Pattern** No of bus bars : 3. Busbar Spacing· 52 mm (centre to centre) Bus bar width: 2.5 to 3 mm	Y/N
5 2	Glass	As per **PS- 439 – 143,** ≥ 91 % light transmission, tempered, one-side textured, Size· 1970*990*3 2 mm	Y/N
5 3	Fast cure EVA	Thickness.0 45 to 0.50 mm Width· 1000 mm	Y/N
5.4	Back Sheet	Thickness: 0.29 to 0.37 mm Width 1000 mm Colour. White TUV-certified for partial discharge test for system voltage ≥ 1000 V DC	Y/N
5,5	PV Module Frame	Anodized Aluminum (Corner block type) as per drawing no **36790200350, 46790200119,46790200120**& anodizing thickness.18±3 microns**(PS-438-562)**	Y/N
5 6	Frame Sealing, JB Potting	RTV / Silicone sealant, Neutral cure, White	Y/N
5 7	IP65 grade Junction Box with 3 bypass diodes (15 A, 40 V) ,100 cm solar cables with quick connectors (MC4 compatible)	TUV-certified Junction Box which is mounted on the back sheet and adequately sealed for protection against possible moisture ingression Certificate as below: Junction Box: DIN V VDE V 0126-5/05 08 Connectors EN 50521. 2008 Cables, 2PFG 1169/08.07 Protection: IP 65, Class II Rated Voltage: 1000 V DC	Y/N
5 8	Interconnect & Busbars	Tin-Lead-Silver (62.36.2) coated ETP copper material with coating thickness. 16 to 25 microns on each side. Bus bar. 5 mm * 0 3 – 0.4 mm, IC: 1.5 – 1 7 mm * 0 13 – 0.2 mm	Y/N
5 9	RFID Tag with 2D bar code Alien Technology ALN-9640 Squiggle Passive UHF - EPC Gen 2 compliant Copper/ Aluminum antennas (with PET laminate)	RFID Tags (100 mm * 30 mm) with white polyester label as per spec. **PS-439-249** containing following data shall be affixed on the backside of the PV module: • Name of the Manufacturer of PV Module & Solar cells • Month and year of manufacture for PV Module & Solar cells • Country of origin (for solar cells & PV Modules) • I-V curve, Peak Wattage. Imp, Vmp and FF for the module • Unique Serial No & Model No of the module • Date and Year of obtaining IEC certificate • Name of the test lab issuing IEC certificate The white polyester label shall have 2D barcode containing Module I-V details The RFID software used for writing the tag shall be compatible for reading by BHEL hand held RFID reader. **Note:** The specimen of all stickers are as enclosed.	Y/N

Revision: (00)

Approved By :

SR

Prepared	Issued	Date
SM	Engg.	10.02.2014

Sl. No	Item	Remarks	Vendor Confirmation
6	**Typical electrical characteristics:**		Y/N
6.1	Open Circuit Voltage (Voc)	44.0 V	
6.2	Short Circuit Current (Isc)	8.8 A	
6.3	Voltages at Peak Power Point (Vmp)	36 V	
6.4	Current at Peak Power Point (Imp)	8.34 A	
6.5	Peak Power Output (Pmax.)	300 Wp (minimum)	

Note: Electrical specifications mentioned above should be at standard test conditions of 100 mw/sq. cm solar insolation (AM 1.5) and at 25 deg. C cell temperatures.

Functional Specification:

Sl No.	Item	Remarks	Vendor Confirmation
1	Power Output	1) Test Report: 300 Wp (minimum). Shall be inspected/ verified at Vendor's works under STC by BHEL. 2) Sun simulator should be calibrated with PV Module measured at BHEL sun simulator.	Accept: Y/N Accept: Y/N
2	Visual Characteristics	Each PV module shall be free from the following visual rejects: Cell breakage/cracks, Air bubbles or de-lamination, Cells overlapping one another or cells touching the edge frame.	Accept: Y/N
3	Product warranty	5 Years from the date of supply against manufacturing defects Free replacement against defects.	Accept: Y/N
4	Product performance (power) warranty	From the date of supply of the PV Modules: 90% output for first 10 years. 80% output for next 15 years. Free replacement against non-performance.	Accept: Y/N
5	Grouping of PV Modules	PV Modules shall be grouped in the following power output bands and colour sticker (20mm * 10 mm approx.) to be affixed on the module frames accordingly. **Power Output** **Colour Sticker** 300 – 304.9 watts Blue >= 305 watts Orange	Accept: Y/N Enclose Certificates
6	Packing	Modules (18 in 1) to be packed in 7 ply carton box as per BHEL Drawing No: **36790200369**. Modules of the same group (colour band) to be packed in a box. Same colour code sticker (100*100 mm) shall be affixed on the carton box.	Accept: Y/N
7	BHEL Sl. No. Sticker and Rating Sticker	BHEL serial number sticker shall be laminated inside the module (as per Spec. no **PS-439-269**). Module Rating / Safety warning sticker (as per Spec. no **PS-439-295**) shall be affixed externally.	Accept: Y/N
8	Incoming material checks, in-process checks & routine production tests	To be carried out as per vendor's internal procedure. BHEL shall verify records of raw materials and in-process checks.	Accept: Y/N Enclose Sample Quality Reports
9	Insulation, Robustness of Terminations, Mechanical Load test	As per IEC 61215: 2005 As per **MI CD-4-4112-011A**	Accept: Y/N

Sampling Size for Inspection by BHEL at Vendor's works:

I. Visual Inspection:

Single Sampling Plan as per IS: 10673-1983, General Inspection Level II, AQL 2.5%

II. Electrical Inspection (I-V Testing of PV modules):

Single Sampling Plan as per IS: 10673-1983, Special Inspection Level S-4, AQL 2.5 %

Note: 1. Any deviation from the above specifications shall be clearly brought out by the supplier.

2. Documents required are to be attached along with the offer.

BHEL Approved Bill-of-Material/ Supplier List

Sl. No.	Item	Supplier List	Vendor Confirmation Please indicate vendor name.
1.	Solar Cells	Jiangsu Aiduo Photovoltaic, China Hangzhou Dahe Thermo Magnetics, China Magi Solar Power Technology, China NBS Energy, Taiwan BHEL, Bangalore	
2.	Fast cure EVA sheet	Changzhou SVECK, China Hangzhou First PV, China STR, USA Renewsys, Bangalore Etimex, Germany	
3.	Back sheet	Coveme, Italy Keiwa, Japan SFC, Korea Toyo Al., Japan Krempel, Germany Renewsys, Bangalore Isovolta, Austria	
4.	Junction Box (4 terminals, 3 diodes)	Bizlink, China (S419-2C2218-317A, SB1540 diodes) Renhe Photovoltaic (PV-RH701, PVS105 diodes) Shanghai Sunlont, China (SL15A3-1, 15SQ045 diodes) **Only the above part numbers are acceptable.**	
5.	RFID & Barcode Software	Great Eastern, Bangalore	

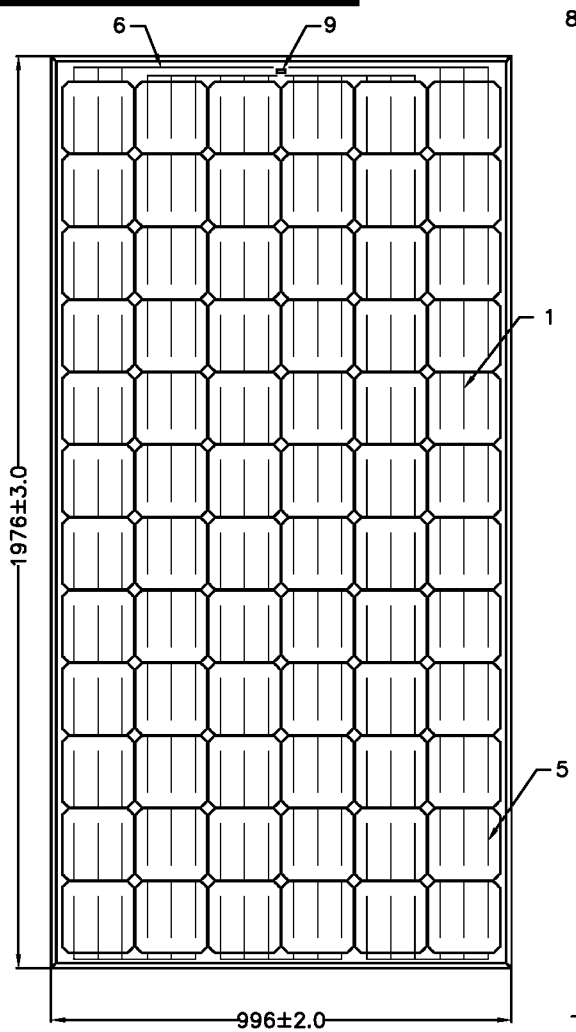
Note:

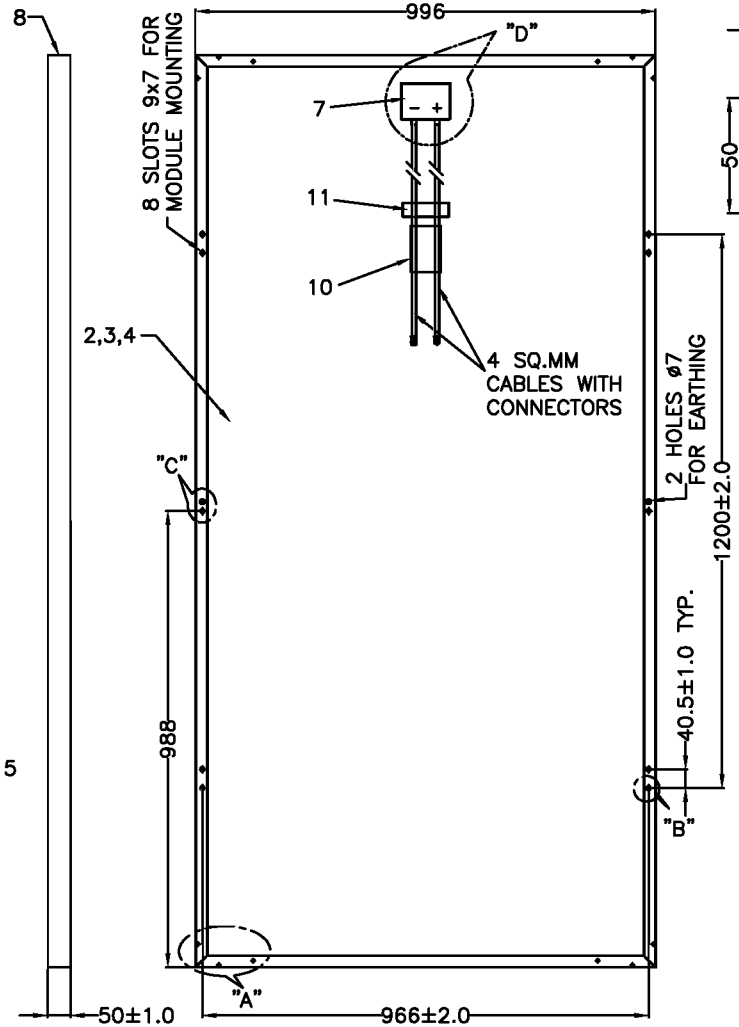
1. **Vendors shall source the above mentioned materials only from respective approved BHEL suppliers as indicated.**
2. **Sample Module approval required from BHEL before bulk manufacturing and supply.**

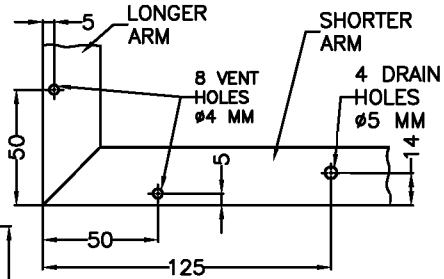
FIRST ANGLE PROJECTION

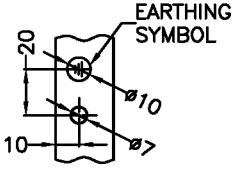
ALL DIMENSIONS ARE IN mm

DRAWING NO. 3 679 02 00371



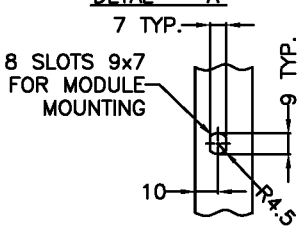






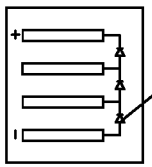
DETAIL – "C"

DETAL – "A"



DETAIL – "B"

11	RFID TAG
10	MODULE RATING STICKER
9	PV MODULE SL. NO. STICKER
8	ANODISED ALUMINUM EDGE FRAME
7	JUNCTION BOX WITH CABLES & CONNECTORS
6	BUS BAR
5	INTERCONNECTS
4	BACK SHEET
3	EVA SHEET
2	HIGH TRANSMISSION TEMPERED GLASS
1	72 Nos. OF 156 mm MONO CRYSTALLINE SILICON SOLAR CELLS CONNECTED IN SERIES
PART	DESCRIPTION



DETAIL "D"

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

	NAME	SIGN.	DATE	No. OF VAR
DRN	MANI	Sd/–	22.06.2013	
CKD	SM	Sd/–	22.06.2013	
APPD	SR	Sd/–	22.06.2013	

REV.	DATE		
02	031213	ALTERED	SAN
		CHECKED	NAR
		APPROVED	SR

DIM 1976±3.0 WAS 1998±3.0

REV.	DATE		
01	091113	ALTERED	SAN
		CHECKED	NAR
		APPROVED	SR

PART NOS. CHANGED IN DRAWING

REV.	DATE	
00		ALTERED
		CHECKED
		APPROVED

FIRST ISSUE

DEPT. SC&PV
CODE 439

FOR UNSPECIFIED–TOLERANCES REFER ED 0230499

SCALE 1 : 10

WEIGHT(Kg)

REF. TO ASSY. DRG.

ITEM NO.

No. OF ITEM

TITLE
PHOTOVOLTAIC MODULE–L24270
156mm Mono Solar Cell (Corner Block Type)

DRAWING NO. 3 679 02 00371

REV. 02

SHEET NO. 01

NO. OF SHEETS 01

REF. DRG.NO.

SIGN & DATE

INVENTORY NO.

FORM No. A3–02

A3 SIZE

A4-11	PURCHASE SPECIFICATION GROUP: PHOTOVOLTAICS	Spec. No	PS-439-267
		Rev. No	04
		Page	1 of 2

ITEM : 156-mm PSEUDO SQUARE MONO CRYSTALLINE SILICON SOLAR CELLS WITH 3-BUSBARS

1.0 PHYSICAL CHARACTERISTICS

1.1 MATERIAL	: Mono Crystalline Silicon.
1.2 DIMENSIONS	: 156± 1 mm (Side to Side) 200± 1 mm (Corner to Corner)
1.3 SHAPE	: Pseudo Square
1.4 THICKNESS	: 200 ± 20 microns
1.5 METALISATION	: **Number of Bus bars : Three (Front and Back)** Distance between bus bars: 52 mm (centre to centre) Front – Silver busbars shall be continuous Back – Silver busbars shall be continuous/discontinuous with Aluminum BSF
1.6 AR Coating	: PECVD Silicon Nitride (Deep blue color)

2.0 ELECTRICAL CHARACTERISTICS

2.1 POWER OUTPUT (Pmax)	: ≥ 4.30 Watts
2.2 CELL EFFICIENCY	: ≥ 18.0 %
2.3 VOLTAGE AT MAX.POWER POINT	: 510 mV (Typical)
2.4 OPEN-CIRCUIT VOLTAGE	: 620 mV (Typical)
2.5 SHORT-CIRCUIT CURRENT	: 8.80 A (Typical)
2.6 FILL FACTOR	: 0.75 (Typical)

REVISION (04)
Metalisation clause revised.

APPROVED BY
SR

PREPARED	ISSUED	DATE
SM	Engg	21-09-13

3.0 VISUAL CHARACTERISTICS :

3.1 Cells shall not have any edge chips or cracks or deep scratches on the surface.

3.2 Cells shall not have any misalignment and misprints in the front grid pattern.

3.3 Cells shall not have any finger prints or stains or paste smudges on the surface.

3.4 Cells shall not have Silicon Nitride coating colour variations or inhomogeneity.

4.0 PACKING CONDITIONS

4.1 Cells shall be packed tightly with heat shrinkable sleeves, then in foam or thermocole or carton boxes. Cell boxes shall be further packed in carton box / plywood box suitable for air-freight.

4.2 Manufacturer name, Cell type, lot number, wattage / efficiency quantity in each packet, date of manufacture to be indicated on each packet.

4.3 Test certificate shall be provided along with each consignment.

4.4 BHEL Purchase Order (PO) Number shall be mentioned on the plywood Boxes.

5.0 SAMPLING SIZE FOR INSPECTION AT BHEL

I. Visual Inspection:

Single Sampling Plan as per IS: 10673-1983, General Inspection Level I, AQL 2.5 %

II. Physical & Electrical Measurement:

Single Sampling Plan as per IS: 10673-1983, Special Inspection Level S-4, AQL 2.5 %

PURCHASE SPECIFICATION
GROUP : PHOTOVOLTAICS

1.0	ITEM	:	FRONT GLASS
2.0	APPLICATION	:	IT IS USED IN PHOTOVOLTAIC MODULES (270 W) FOR COVERING THE CELLS DURING LAMINATION.

3.0 TECHNICAL SPECIFICATIONS :

3.1	MATEIAL	:	TEMPERED
3.2	TYPE	:	TEXTURED ON ONE SURFACE.
3.3	VISIBLE LIGHT TRANSMISSION	:	> 91 %
3.4	DIMENSIONS	:	LENGTH : 1970 ± 1.5 MM WIDTH : 990 ± 1.5 MM THICKNESS : 3.2 ± 0.2 MM

3.5 ALL CORNERS TO BE ROUNDED TO R1. ALL EDGES TO BE GROUND.

3.6 GLASSES SHALL BE FREE FROM VISUAL DEFECTS SUCH AS EDGE CHIPS, DIGS, DIRT, STONES, GASEOUS INCLUSIONS, AIR BUBBLES, SCRATCHES, KNOTS AND DENTS.

4.0 PACKING CONDITIONS :

4.1 GLASSES SHALL BE INDIVIDUALLY INTERLEAVED WITH PAPER SHEETS.

4.2 THE GLASSES SHALL BE TIGHTLY PACKED INSIDE A WOODEN CASE (Foreign source-Seaworthy packing, Indian source- Roadworthy packing) TO AVOID TRANSIT DAMAGES.

4.3 EACH CRATE SHALL BE MARKED OUTSIDE WITH MANUFACTURER NAME, LOT NO., DATE OF MANUFACTURE, SIZE OF THE GLASS, BHEL PO NUMBER AND QUANTITY.

REVISION : (01)
Tolerance revised.

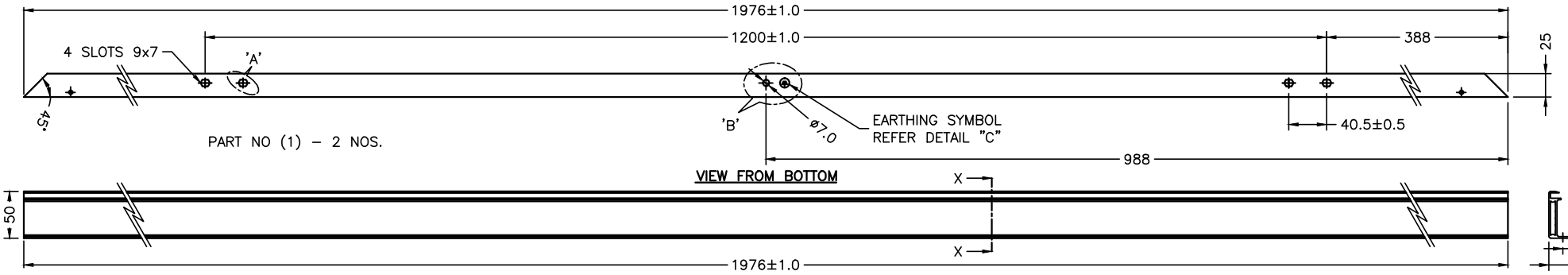
APPROVED BY :
SR

PREPARED	ISSUED	DATE
PJ Pratha	Engg.	13.05.13

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. No. 3 679 02 00350

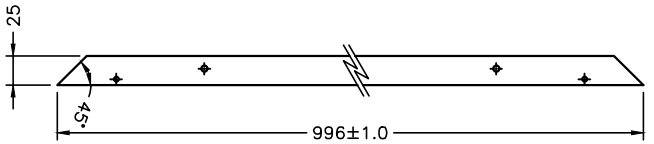


PART NO (1) – 2 NOS.

VIEW FROM BOTTOM

VIEW FROM FRONT

VIEW FROM LEFT



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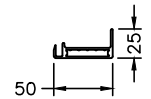
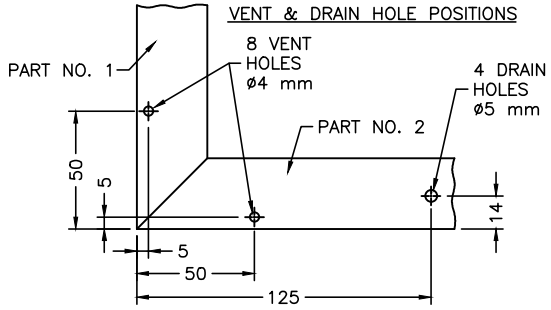
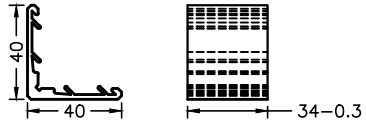
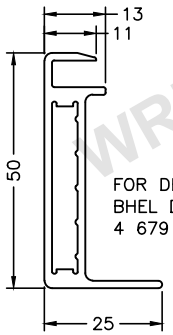




PART NO (3) – 4 NOS.
FINISH : NATURAL
SUPPLY : ITEM TO BE STACKED & PACKED IN CARTON BOXES

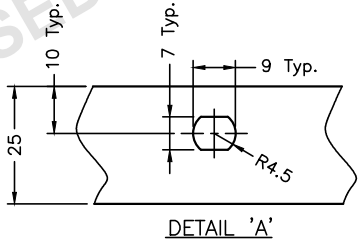


FOR DETAIL REFER
BHEL DRG. No. 4 679 02 00120

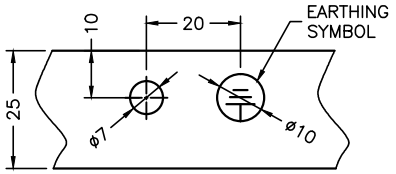


SECTION X–X

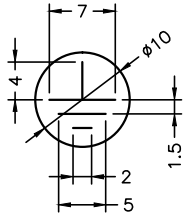
FOR DETAIL REFER
BHEL DRG. No.
4 679 02 00119



DETAIL 'A'



DETAIL 'B'



DETAIL 'C'

NOTE :
- REMOVE ALL BURRS & AVOID SCRATCHES, DEBURR ALL EDGES FOR PART 1, 2 AND 3.
- ROUND OFF ALL SHARP CORNERS WITH 0.2 mm
- OPEN TOLERANCES AS PER ED 0230499 (MEDIUM)
- FRAME MEMBERS TO BE ANODISED AS PER PS–438–562. ALL FABRICATIONS TO BE DONE AFTER ANODISATION.
- COATING THICKNESS OF ANODISATION = 18±3 MICRONS (FOR PART 1 & 2).
- FRAME MEMBER ARE TO BE WRAPPED WITH POLYTHENE COVER OR KRAFT PAPER TO AVOID SCRATCHES AND SUPPLIED IN CARTON BOXES.
- WALL THK. AFTER ANODISATION PROCESS = 1.5 mm (MINIMUM).
- EARTHING SYMBOL TO BE PUNCHED ON PART 1 AS PER DRAWING
- STICKER WITH BHEL PO. NO, MATERIAL CODE, ITEM DETAILS, QTY. AND SUPPLIER NAME TO BE AFFIXED ON EACH CARTON BOX.

SCALE NTS

REV.	DATE		REV.	DATE	
01	190112	ALTERED SAN CHECKED NAR APPROVED SR	02	031013	ALTERED SAN CHECKED NAR APPROVED SR
	NOTE REVISED.			PART (3) INCLUDED	

	NAME	SIGN	DATE
DRAWN	SAN	Sd/–	290811
CHECKED	NAR	Sd/–	290811
APPROVED	SR	Sd/–	290811

DEPT. CODE: SC&PV 439

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

CARD CODE

TITLE:
ALUMINIUM EDGE FRAME – 270 W
CORNER BLOCK TYPE

No. OF SHTS: 01
SHT No.: 01

M.O. No.

DRG. No. 3 679 02 00350

REV 02

REF. DRG. No.

SIGN. & DATE

INVENTORY No.

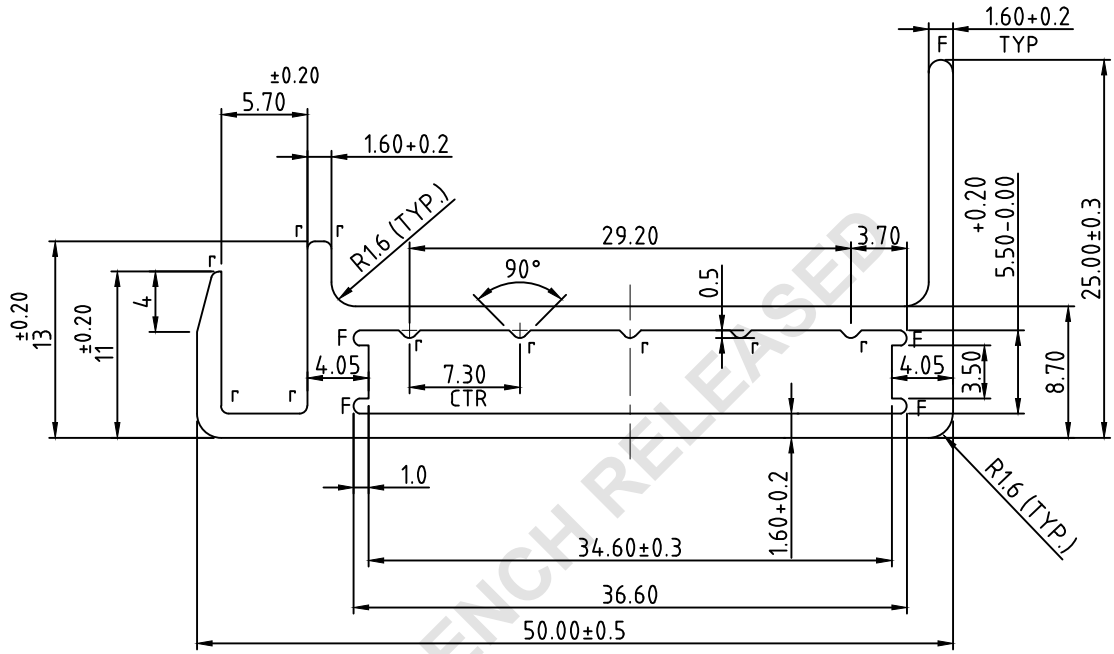
FORM No. A3–04

A3 SIZE

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV.	DATE		REV.	DATE		ADDITIONAL INFORMATION	
01	130112	ALTERED SAN CHECKED NAR APPROVED SR			ALTERED CHECKED APPROVED	STATUS OF DRAWING	
1. DRG REVIEWED AND REVISED FOR TOLERANCES. 2. IS:733 WAS IS:63400. 3. ALUMINIUM ALLOY WAS EXTRUDED ALUMIMIUM.			FIRST ISSUE			DISTRIBUTION OF PRINTS	

SCALE=1:1



MATERIAL : ALUMINIUM ALLOY - 63400 WP/HE9 AS PER IS:733.

NOTE :
1. ALL UNSPECIFIED WALL THICKNESS - 1.6+0.2.
2. r-0.50, F - FULL RADIUS.
3. DIMENSIONAL TOLERANCES FOR EXTRUDED ALUMINIUM AS PER IS:3965-1981.
4. HEAT TREATEMENT CONDITION : WP
5. ESTIMATED WEIGHT Kg/m = 0.644
6. ROUND OF ALL SHARP CORNERS WITH 0.25 mm.
7. VENDOR EXTRUSION DRAWING TO BE APPROVED BY BHEL.

REF. DRG.NO.

REMARKS	ITEM NO.	DESCRIPTION	STD.	MATERIAL CODE / MATERIAL SPECN.	A / C	UNIT	UNIT Wt.(Kg) / QUANTITY

SIGN & DATE

	NAME	SIGN.	DATE	No. OF VAR
DRN	SAN	Sd/-	250811	
CKD	NAR	Sd/-	250811	
APPD	SR	Sd/-	250811	

BHARAT HEAVY ELECTRICALS LIMITED,
ELECTRONICS DIVISION, BANGALORE

INVENTORY NO.

DEPT.		SCALE	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
SC&PV	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	2 : 1				
CODE 439						

TITLE
220W PV MODULE MAIN EXTRUSION

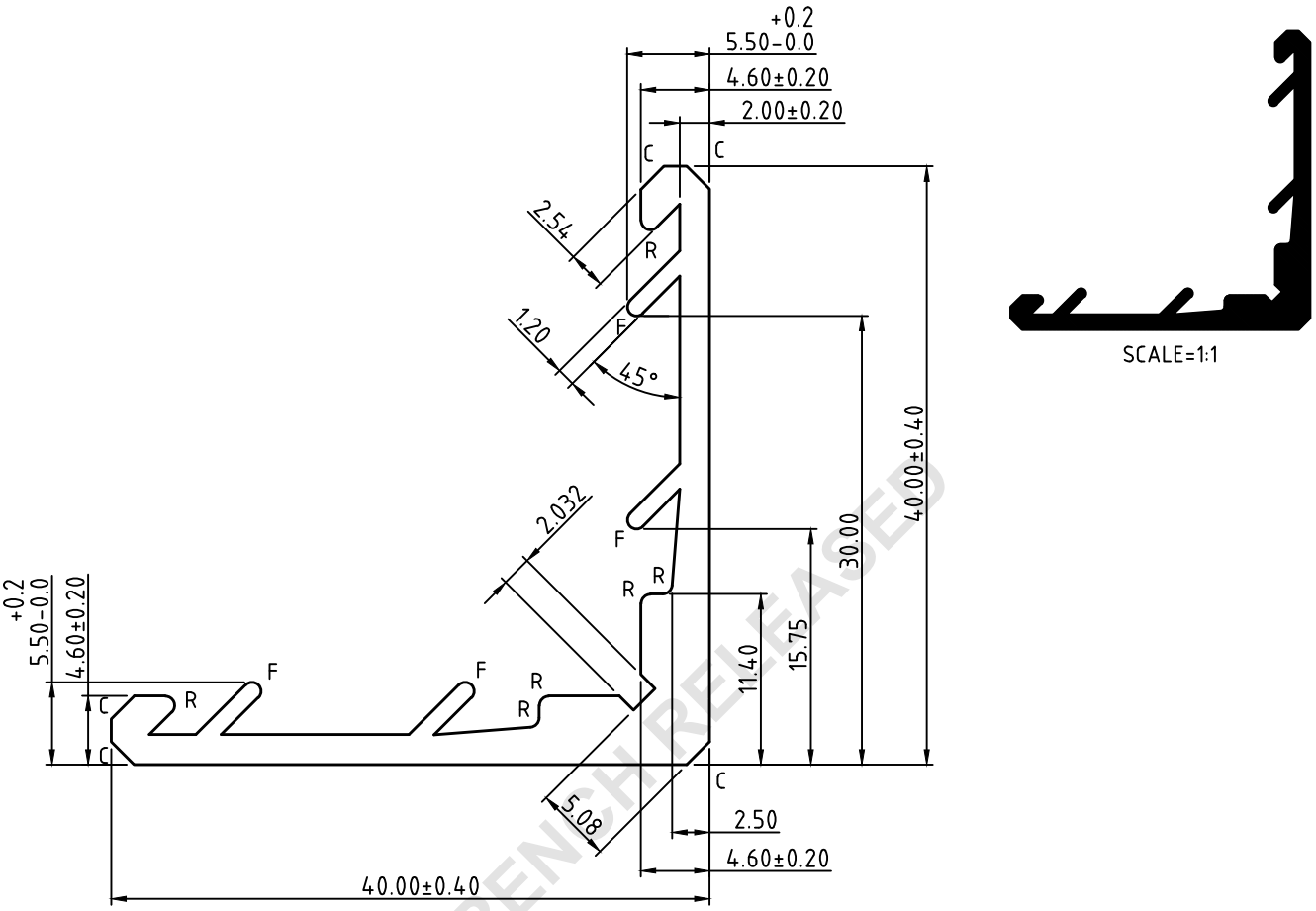
DRAWING NO. 4 679 02 00119 REV. 01

SHEET NO. 01 NO. OF SHEETS 01

A4 SIZE

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV.	DATE		REV.	DATE		ADDITIONAL INFORMATION	
01	130112	ALTERED SAN CHECKED NAR APPROVED SR			ALTERED CHECKED APPROVED	STATUS OF DRAWING	
1. DRG REVIEWED AND REVISED FOR TOLERANCES. 2. IS:733 WAS IS:63400. 3. ALUMINIUM ALLOY WAS EXTRUDED ALUMIMIUM.			FIRST ISSUE			DISTRIBUTION OF PRINTS	



MATERIAL : ALUMINIUM ALLOY – 63400 WP/HE9 AS PER IS:733.

NOTE :
1. R – 0.635, F – FULL RADIUS, C – 1.524x45°
2. DIMENSIONAL TOLERANCES FOR EXTRUDED ALUMINIUM AS PER IS:3965–1981.
3. HEAT TREATEMENT CONDITION : WP
4. ESTIMATED WEIGHT Kg/m = 0.639
5. ROUND OF ALL SHARP CORNERS WITH 0.25 mm.
6. VENDOR EXTRUSION DRAWING TO BE APPROVED BY BHEL.

REF. DRG.NO.

REMARKS	ITEM NO.	DESCRIPTION	STD.	MATERIAL CODE / MATERIAL SPECN.	A / C	UNIT	UNIT Wt.(Kg) / QUANTITY

SIGN & DATE

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

	NAME	SIGN.	DATE	No. OF VAR
DRN	SAN	Sd/–	290811	
CKD	NAR	Sd/–	290811	
APPD	SR	Sd/–	290811	

INVENTORY NO.

DEPT.		SCALE	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
SC&PV	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	2 : 1				
CODE 439						

TITLE
CORNER BLOCK EXTRUSION

DRAWING NO. 4 679 02 00120 REV. 01

SHEET NO. 01 NO. OF SHEETS 01

A4 SIZE

ANODIC COATING FOR ALUMINIUM

1.0 SCOPE :

This specification covers the requirements of electrolytically formed anodic coatings on Aluminum & Al alloy parts which are exposed to direct action of climatic elements (viz SUN, WIND, RAIN, DUST, SALT, and WATER)

2.0 GENERAL

2.1 Aluminum parts to be anodized are made of Al. alloy (63400-HE9) as per IS 733-1975 and supplied in Wp (temper) condition.
2.2 End use of component is for Photovoltaic module framing.
2.3 Anodizing process as per Type-I: IS 7088-1973.
2.4 Type of sealing as per IS 7088-1973 (CLAUSE 7).

3.0 REQUIREMENTS:

3.1 VISUAL :

The anodic coating shall be continuous, smooth, adherent, uniform in appearance and shall be free from powdery areas, loose films, and discontinuities such as breaks, scratches or other damages.

3.2 DIMENSIONAL :

After anodic coating, the parts shall comply with dimensional requirements of the applicable drawings.

3.3 Extent of surface to be anodized : All over

3.4 **Anodic Coating Thickness: 18±3 microns** as per IS 1868-1982 (AC 15 grade), Table 1.

3.5 **Surface Texture:** Natural matte finish.

3.6 Continuity:
As per IS 8375-1977.
3.7 Insulation:
As per IS 8554-1997, when anodic parts are checked, the break down potential of the coating is to be not less than 500 V DC.
3.8 Corrosion resistance :
Each anodised and sealed member when tested as per IS 9000 (part XI)-1983 as per procedure 1 (5% salt solution) shall not show more than 5 isolated spots or pits (0.8 mm dia max).

Note : Supplier shall produce test certificate from reputed labs for Sl. nos. 3.6, 3.7 and 3.8 which shall not be older than two years as on the date of material supply.

4.0 **TEST METHOD**
4.1 Visual &dimensional :
Parts selected in accordance with the sampling plan **(Table 1)** and tested for visual and dimensional checks shall comply with clause 3.1 & 3.2.
4.2 Coating thickness:
Parts selected as per sampling plan **(Table 2)** and tested for coating thickness in accordance with IS 6012-1970 shall comply with clause 3.4.
5.0 SAMPLING PLAN:

5.1 Samples for inspection shall be selected as given in **Table 1** & **Table 2.**
5.2 Accept the lot if the number of defectives is less than or equal to the acceptance number (Ac) given in the table for that particular batch size, reject the lot if the number of defectives is equal to or greater than rejection number [Re].

6.0 TABLE 1

VISUAL AND DIMENSIONAL

Batch Size	Sample Size	Ac	Re
Upto 5	100 %	-	-
6-50	5	0	1
51-150	20	1	2
151-280	32	2	3
281-500	50	3	4
501-1200	80	5	6

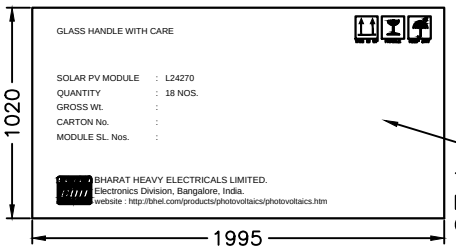
TABLE 2

ANODIC COATING THICKNESS

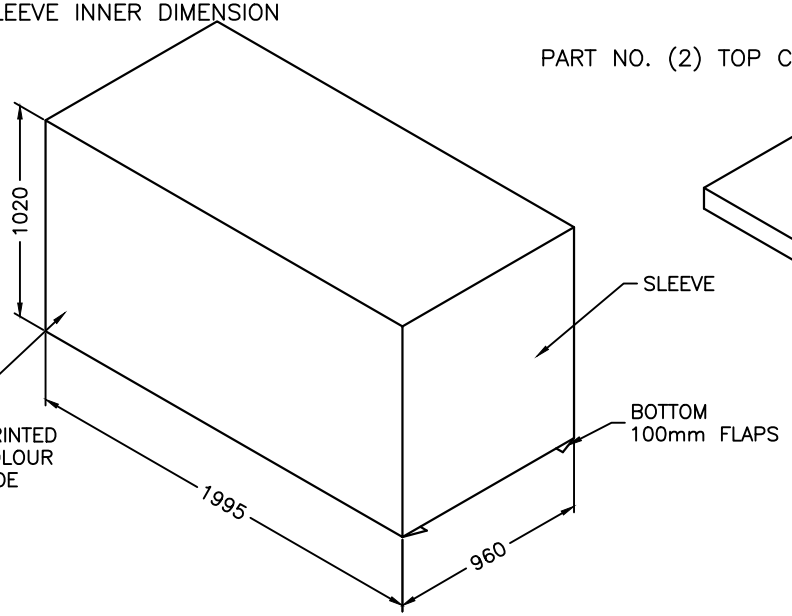
Batch Size	Sample Size	Ac	Re
Upto 8	100 %	-	-
9-1200	8	0	1

DRAWING NO. 3 679 02 00369

PART NO. (1) SLEEVE (CORRUGATED CARTON BOX) – 1 NO.

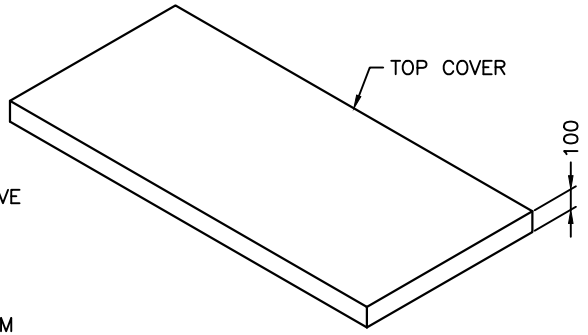


SLEEVE INNER DIMENSION

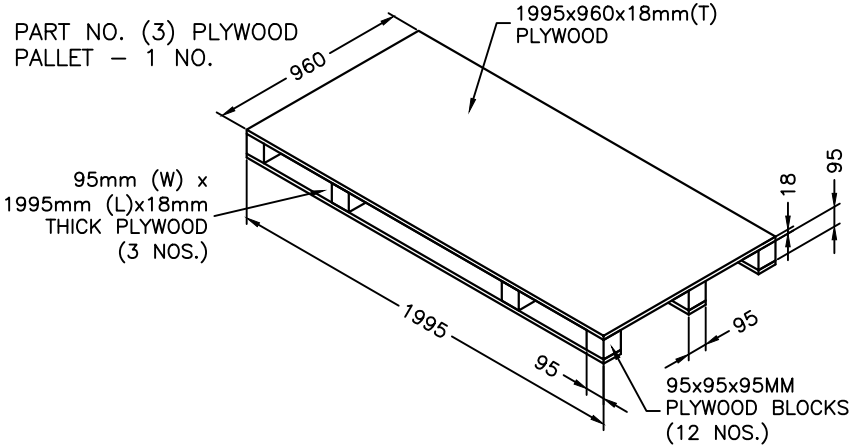


TEXT TO PRINTED IN BLUE COLOUR ON THIS SIDE

PART NO. (2) TOP COVER (CORRUGATED CARTON) – 1 NO.



PART NO. (3) PLYWOOD PALLET – 1 NO.



SPECIFICATIONS	SLEEVE	TOP COVER
PAPER COMBINATION	: 469/200/180/200/180/200/469 GSM	300/180/200/180/200 GSM
PAPER COLOUR	: BROWN	BROWN
FLUTE TYPE	: AAA	AC
NO OF PLY	: 7 PLY	5 PLY

NOTES :
1. ALL THE DIMENSIONS ARE IN MM.
2. FLUTE DIRECTION TO BE ALONG HEIGHT OF THE BOX.
3. SLEEVE & FLAP ARE TO BE FORMED FROM SAME CORRUGATED SHEET.
4. SELF ADHESIVE BHEL SPECIFIED COLOR STICKER OF SIZE 100x100 MM. TO BE AFFIXING ON THE PRINTING SIDE.

PART NO. (4) BOTTOM SHEET–1No OF 1985x950mm, 5 PLY 250/180/180/180/250 GSM SHEET

PART NO. (5) MODULE CORNER CAP – 72 NOS. 150x150mm, THICKNESS 0.6 TO 1.0mm

REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

	NAME	SIGN.	DATE
DRN	MANI	Sd/–	13.06.2013
CKD	SM	Sd/–	13.06.2013
APPD	SR	Sd/–	13.06.2013

No. OF VAR

DEPT.	FOR UNSPECIFIED–TOLERANCES REFER ED 0230499	SCALE	WEIGHT(Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
SC&PV		NTS				
CODE 439						

TITLE: PACKING BOX FOR L24270 – 18 IN 1

DRAWING NO. 3 679 02 00369 REV. 00

SHEET NO. 01 NO. OF SHEETS 01

REF. DRG.NO. | SIGN & DATE | INVENTORY NO.

TECHNICAL SPECIFICATION

Passive UHF RFID Tags for PV Modules

1. ITEM: Passive UHF RFID Tags for PV Modules with White Polyester Label.
2. PURPOSE: For storing PV Module data in it & fixing it on to the PV module as per Jawaharlal Nehru National Solar Mission (JNNSM) guidelines for traceability. The module Sl. No., Power output shall be printed on the Polyester label by BHEL and storing of module data into RFID tag shall be carried out by BHEL. The RFID tag, label and adhesive shall be suitable for sustaining outdoor environment.
3. SCOPE OF SUPPLY: Supply of blank RFID tags with polyester white label for writing the required PV module data into each tag as per JNNSM and printing the Module Sl. No. and Power output on the white polyester label.
4. RFID TAG TECHNOLOGY: Alien Technology ALN-9640 Squiggle
   Passive UHF - EPC Gen 2 compliant
   ISO/IEC 18000-6C compliant
   Operating Frequency 840–960 MHz
   Copper/Aluminum antennas (with PET laminate)
5. FORM FACTOR: Wet Inlay
6. RFID TAG DIE-CUT SIZE: (95 – 100) mm * (25 – 30) mm
7. RFID TAG USER MEMORY SIZE: 512 bits
8. The RFID tag shall be compatible for writing data as per JNNSM guidelines with fixed RFID printer-cum-writer station using the software interfaced with the PV Module tester. The written tag shall also be read by a portable RFID reader at the site.
9. RFID tags to be supplied with white polyester label with acrylic adhesion along with peel off paper **in roll form** for affixing the tag on the PV Module back sheet.

Note: Any deviation from the above spec. shall be clearly brought out by the supplier in their offer.

REVISION (02) Spec. completely revised	APPROVED BY SR		
	PREPARED	ISSUED	DATE
	SM	Engg.	30-10-2013

TECHNICAL SPECIFICATION

BLANK PV MODULE SERIAL NO. STICKER

1.0 ITEM : UL Certified Blank PV Module Serial No. Sticker (without any printing)

2.0 PURPOSE : For laminating inside the PV Module

3.0 SIZE : 60 * 20 mm or 60 * 22 mm

4.0 MATERIAL : White Polyester

5.0 ADHESIVE : Acrylic

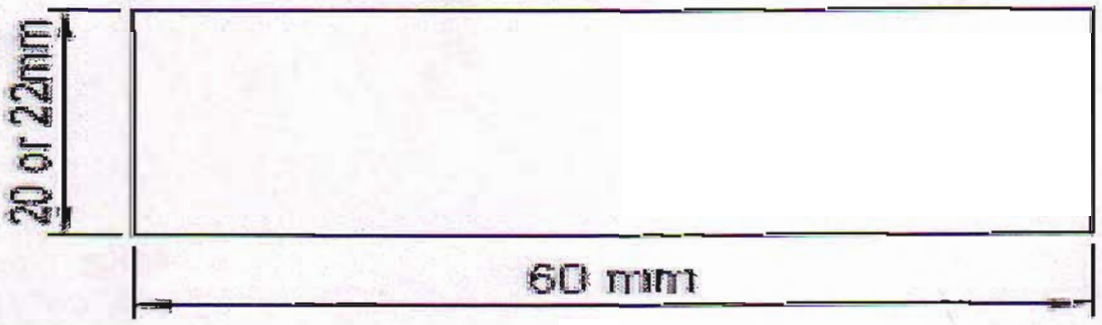
6.0 THICKNESS : Polyester – 50 to 58 micron, Adhesive – 20 to 25.4 micron

7.0 COLOUR : White

8.0 Sticker to withstand Lamination temperature upto 149 °C

Note:

1. Stickers should be supplied in roll form along with peel off paper suitable for printing using bar-code printer.
2. Test Certificate to be provided certifying the material.



REVISION (01)
Fully revised.

APPROVED BY		
SR		
PREPARED	**ISSUED**	**DATE**
PJ	Engg	11-12-2012

TECHNICAL SPECIFICATION

BLANK PV MODULE RATING STICKER

1.0 ITEM : Blank PV Module Rating Sticker (without any printing)

2.0 PURPOSE : For printing it with PV Module rating details and fixing on to the back sheet of the PV Module.

3.0 SIZE : 75 * 100 mm

4.0 MATERIAL : Polyester , 50 micron thick

5.0 ADHESIVE : Acrylic or rubber based

6.0 COLOUR : Silver-grey

Note:

1. Stickers should be supplied in roll form along with peel off paper suitable for printing using bar-code printer. Number of stickers per roll = 1000 max.

REVISION (00)	APPROVED BY SR		
	PREPARED	ISSUED	DATE
	PJ	Engg	04-03-2013

RELIABILITY TESTING PROCEDURES FOR PHOTOVOLTAIC MODULE

I. INSULATION TEST (before and after HV Test)

Testing Equipment	Test Procedure	Acceptance Criteria
Hand held insulation tester DOT 771	Check the insulation between the shorted terminals of junction box and aluminum frame at 1000 V DC	IR ≥ 24.25 MΩ (For 1656 mm * 996 mm Module Size)

II. HIGH VOLTAGE TEST

Testing Equipment	Test Procedure	Acceptance Criteria
HV Tester 5 kV DC DOT 458	Apply 3000 V DC for 1 minute between the shorted terminals of junction box and aluminum frame	There should not be any di-electric break down

III. MECHANICAL LOAD TEST (as per IEC 61215)

Testing Equipment	Test Procedure	Acceptance Criteria
Mechanical load test set-up	Module to be placed horizontally on the fixed structure. Three cycles of 2400 Pa uniform load to be applied for 1 hour to front and 1 hour to the back surface in turn. 245 kg/m^2 weights to be uniformly spread over the entire module. Check for continuity of electric circuit during the test. Carry out Insulation test before and after the tests.	There should be no evidence of mechanical or visual damage or discontinuity of electrical circuit. Also, insulation resistance should measure ≥ **24.25 MΩ** (For 1656 mm * 996 mm Module Size).

IV. ROBUSTNESS OF TERMINATION TEST (as per IEC 61215)

Testing Equipment	Test Procedure	Acceptance Criteria
Robustness of Termination test set-up	Module to be placed on the fixed structure. **Tensile test Ua**: 40 N (4 kgs weights) applied for 10 seconds to the junction box termination. **Bending test Ub**: 20 N (2 kgs weights) to be applied to the Junction box terminations and swing thru 45° angle with respect to initial position on both sides for a total of 10 cycles.	There should be no evidence of mechanical or visual damage. Also, insulation resistance should measure ≥ **24.25 MΩ** (For 1656 mm * 996 mm Module Size).