SUMMARY OF TEST REPORT No. 4789949365-BIS-S3, DATED(mm/dd/yyyy): 10/28/2021
ULR No. TC616821100000894F
(Number of pages in test report: Page no.1 to 43)
TEST FORMAT AS PER IS/IEC 61730-2:2004 +A1:2017

1. Name of manufacturer:	Visaka Industries Limited (Atum Division)
2. Product:	Crystalline Silicon Photovoltaic (PV) Modules
3. Model:	72 Full Cell Mono crystalline models **Representative Model: VIL-375M** Series Model: VIL-370M
4. Model differences provided (if applicable): Yes/No	YES
5. Model differences verified as per MNRE Guidelines for series formulation: Yes/No	YES

6. Test Results:

SL. NO.	TEST REQUIREMENTS	CLAUSE	VERDICT
1	MST 01 – Visual inspection	10.1	P
2	MST 11 – Accessibility test	10.2	P
3	MST 12 – Cut susceptibility test	10.3	P
4	MST 13 – Ground continuity test	10.4	P
5	MST 14 – Impulse voltage test	10.5	P
6	MST 16 – Dielectric withstand test	10.6	P
7	MST 21 – Temperature test	10.7	P
8	MST 23 – Fire test	10.8	P
9	MST 26 – Reverse current overload Test	10.9	P
10	MST 32 – Module breakage test	10.10	P
11	MST 17 – Wet leakage current test :	MST 17	P
12	MST 22 – Hot-spot test	MST 22	P
13	MST 34 – Mechanical load test	MST 34	P
14	MST 51a – Thermal cycling test (TC200)	MST 51a	P
15	MST 51b – Thermal cycling test (TC50) :	MST 51b	P
16	MST 52 – Humidity freeze test :	MST 52	P
17	MST 53 – Damp heat test :	MST 53	P
18	MST 54 – UV preconditioning test :	MST 54	P
19	MST 42-Robustness of Termination Test	10.14	P
20	MST 25- Bypass diode thermal test	10.18	P
21	Maximum Power Determination	10.2	P
22	MST 16 - Dielectric withstand test Prior to Bypass diode thermal test	10.6	P
	Component tests	-	-
23	Partial discharge test	MST 15 Manufacturer submitted the Partial Discharge letter from Lab has been verified	P
24	Conduit bending test	MST 33	N/A
25	Terminal box knockout test	MST 44	N/A

SUMMARY OF TEST REPORT No. 4789949365-BIS-S3, DATED(mm/dd/yyyy): 10/28/2021
ULR No. TC616821100000894F

General Information:

1. The conformity certificates of critical components are verified to ensure complete testing of product under test and details regarding harmonized IEC/UL Standards (where IS standards are not available) are also provided in the list of critical component.

CONCLUSION:

1. Sample meets all relevant requirements of IS/IEC 61730-2:2004 +A1:2017: Yes

2. ~~Sample fails to meet the following test requirements:~~

I, hereby, undertake that the verdict stated in the test reports for all the tests matches with the test results. The sample meets all relevant requirements of IS/IEC 61730-2:2004 + A1:2017~~./does not meet the requirements stated above at 2) of conclusion~~. If any deviation is found, suitable punitive action may be taken by BIS

Srimathy N Digitally signed by Srimathy N Date: 2021.10.28 19:00:26 +05'30'

Date(mm/dd/yyyy): 10/28/2021 **(Signature of Authorized person)**

TC- 6168

Test Report issued under the responsibility of:

TEST REPORT **IS/IEC 61730-2:2004 +A1:2017** **PV Module Safety Qualification** **Part 2: Requirements for testing**	
Report Number. .....:	4789949365-BIS-S3
ULR. Number.....:	TC616821100000894F
Test Request.....:	SC21SPI00509
Date of issue(mm/dd/yyyy).....:	10/28/2021
Total number of pages.....	43
Name of Testing Laboratory preparing the Report.....:	UL INDIA PVT LTD
Applicant's name.....:	VISAKA INDUSTRIES LIMITED (ATUM DIVISION)
Address .....:	Survey No 95 & 96, Adjacent to Kukkadam Railway Station, Kukkadam Post, Gajalapur, Madugulapally, Nalgonda-508207, Telangana, India.
Test specification:	
Standard .....:	IS/IEC 61730-2:2004 +A1:2017
Test procedure .....:	IS/IEC 61730-2:2004 +A1:2017
Non-standard test method.....:	N/A
Test Report Form No.....:	IS/IEC61730-2_V1.0
Test Report Form(s) Originator.....:	BIS
Master TRF .....:	Dated 19.02.2018
General disclaimer: The test results presented in this report relate only to the object tested.	

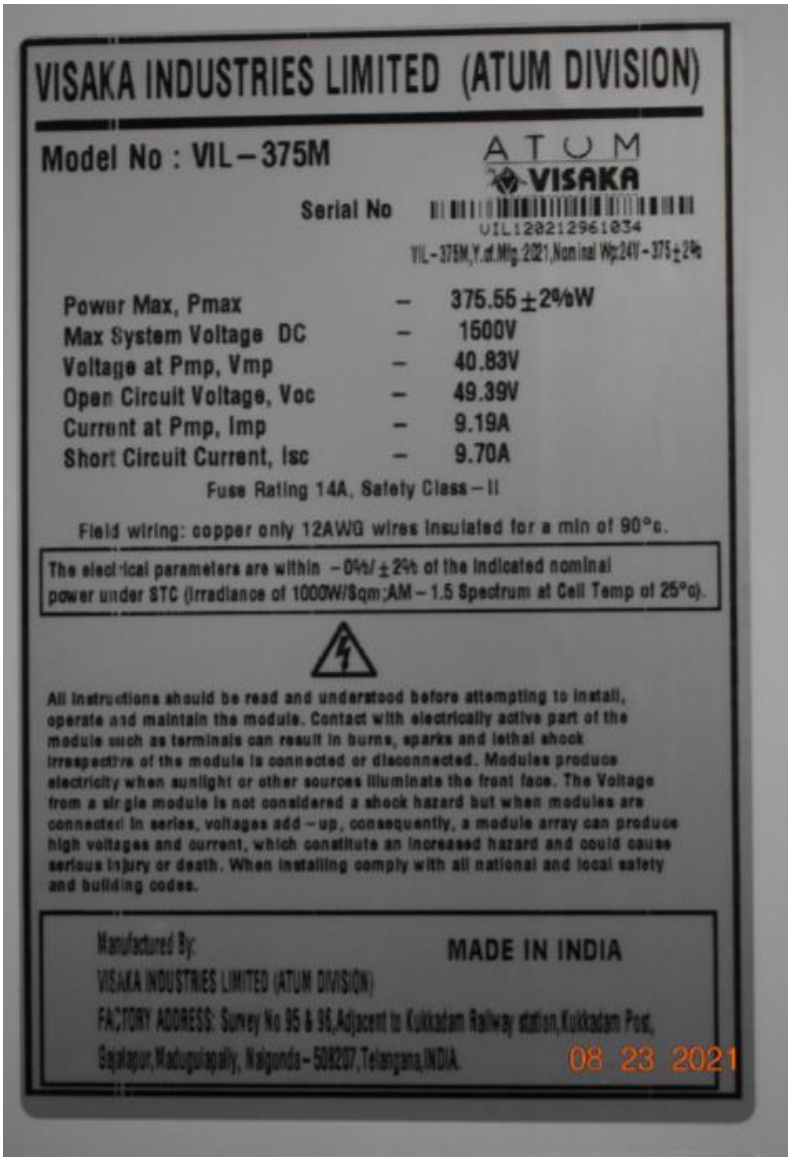
Test item description ..... :	Photovoltaic (PV) Module(s)
Trade Mark ..... :	ATUM by VISAKA
Manufacturer ..... :	VISAKA INDUSTRIES LIMITED (ATUM DIVISION)
Address ..... :	Survey No 95 & 96, Adjacent to Kukkadam Railway Station, Kukkadam Post, Gajalapur, Madugulapally, Nalgonda-508207, Telangana, India.
Model/Type reference ..... :	Representative Model: **VIL-375M** Series Model: VIL-370M
Ratings ..... :	Maximum System Voltage: 1500V Maximum over current protection rating: 14A See specific model rating in General Product information

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ **Testing Laboratory:**		
Testing location/address.....:	UL India Pvt. Ltd Laboratory Building, Kalyani Platina Campus, Survey. No. 129/4, EPIP Zone, Phase II, Whitefield, IN-560066, Bangalore, India	
Tested by (name, function, signature).....:	Viswanathan K	K. Viswanathan Digitally signed by K. Viswanathan Date: 2021.10.28 18:25:21 +05'30'
Approved by (name + signature)	N Srimathy	Srimathy N Digitally signed by Srimathy N Date: 2021.10.28 19:00:46 +05'30'
Issued by (name, function, signature).....:	Kantha Raju H S	Kantha Raju Digitally signed by Kantha Raju Date: 2021.10.28 19:09:10 +05'30'

List of Attachments (including a total number of pages in each attachment): N/A	
Summary of testing:	
Tests performed (name of test and test clause): Model VIL-375M from Mono cell families were considered as representative of all series with same component All models are same in construction except output power and electrical ratings.	**Testing location:** UL India Pvt. Ltd. Laboratory Building, Kalyani Platina Campus, Survey. No. 129/4, EPIP Zone, Phase II, Whitefield, IN-560066, Bangalore, India
10.1 Visual Inspection (MST 01)	
10.2 Maximum Power Determination	
10.10 Module Breakage Test (MST 32)	
10.6 Dielectric Withstand Test (MST 16)	
Accessibility Test (MST 11)	
10.15 Wet Leakage Test (MST 17)	
10.10 UV Preconditioning Test (MST 54)	
10.11 Thermal Cycling Test - 50 Cycles (MST 51b)	
10.12 Humidity-Freeze Test (MST 52)	
10.14 Robustness of Terminations Test (MST 42)	
10.13 Damp-Heat Test (MST 53)	
10.16 Mechanical Load Test (MST 34)	
10.11 Thermal Cycling Test - 200 Cycles (MST 51a)	
10.9 Hot-Spot Endurance Test (MST 22)	
10.5 Impulse Voltage Test (MST 14)	
10.18 Bypass Diode Thermal Test (MST 25)	
Temperature Test (MST 21)	
Reverse Current Overload Test (MST 26)	
Fire test (MST 23)	
10.1 Visual Inspection Test - Follow Up (MST 01)	
☒ **The product fulfils the requirements of ____IS/IEC 61730-2:2004 (First Edition) +A1:2011_____ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)**	

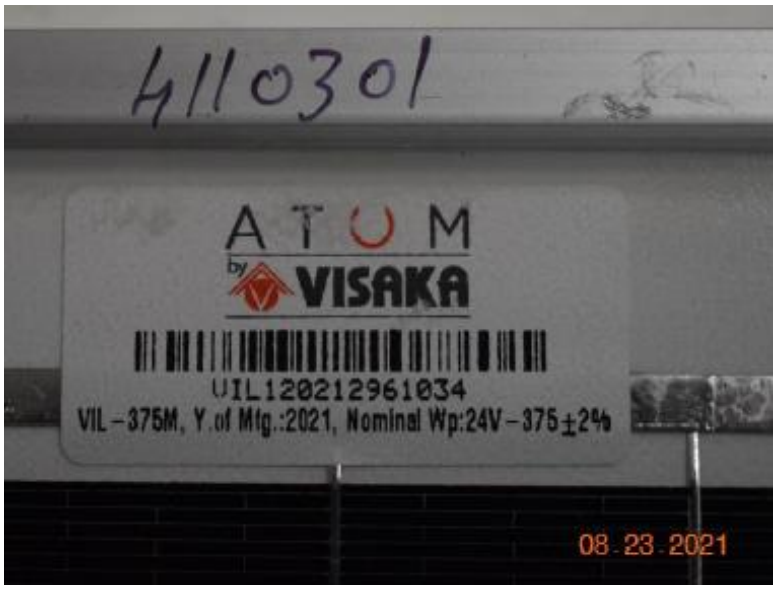
Copy of marking plate:

Representative Model: VIL-375M:



Note: Photo Date format (mm/dd/yyyy)

Inside Laminate Marking label



Inside laminate marking label with serial No. “VIL120212961034”.
as declared by the manufacturer, 5th to 8th digits from left “2021” representing manufactured Year, 9th and 10th digit from left “29” representing manufactured week of the year, 11th digit “6” represents the day of the week (That is Saturday).

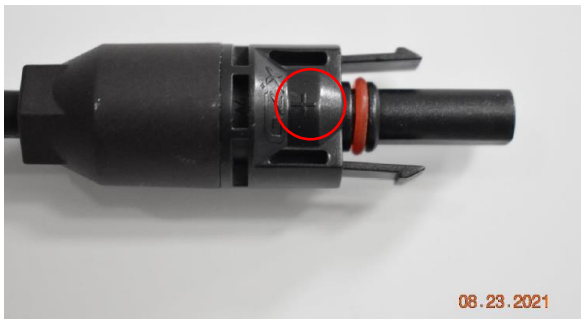
Note: Photo Date format (mm/dd/yyyy)

Note: Photos date Format: mm/dd/yyyy

Polarity marked on the junction box

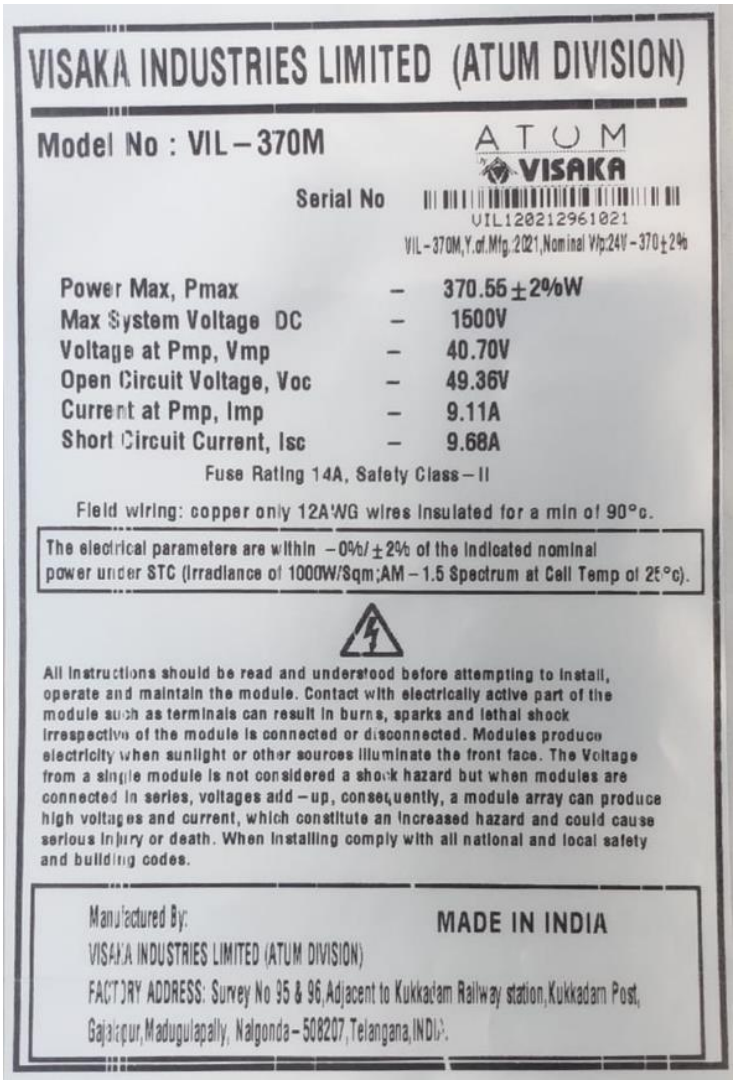
Note: Photos date Format: mm/dd/yyyy

Polarity marked on the connectors



Note: Photos date Format: mm/dd/yyyy

Series Model Back Label:



VISAKA INDUSTRIES LIMITED (ATUM DIVISION)

Model No : VIL – 370M

ATUM VISAKA

Serial No

VIL120212961021

VIL-370M,Y.of.Mfg.2021,Nominal Vp:24V-370±2%

Power Max, Pmax	–	370.55±2%W
Max System Voltage DC	–	1500V
Voltage at Pmp, Vmp	–	40.70V
Open Circuit Voltage, Voc	–	49.36V
Current at Pmp, Imp	–	9.11A
Short Circuit Current, Isc	–	9.68A

Fuse Rating 14A, Safety Class – II

Field wiring: copper only 12AWG wires insulated for a min of 90°c.

The electrical parameters are within –0%/+2% of the indicated nominal power under STC (Irradiance of 1000W/Sqm;AM – 1.5 Spectrum at Cell Temp of 25°c).

All instructions should be read and understood before attempting to install, operate and maintain the module. Contact with electrically active part of the module such as terminals can result in burns, sparks and lethal shock irrespective of the module is connected or disconnected. Modules produce electricity when sunlight or other sources illuminate the front face. The Voltage from a single module is not considered a shock hazard but when modules are connected in series, voltages add – up, consequently, a module array can produce high voltages and current, which constitute an increased hazard and could cause serious injury or death. When installing comply with all national and local safety and building codes.

Manufactured By:
VISAKA INDUSTRIES LIMITED (ATUM DIVISION)
FACTORY ADDRESS: Survey No 95 & 96,Adjacent to Kukkadam Railway station,Kukkadam Post, Gajaraipur,Madugulapally, Nalgonda – 508207,Telangana,INDIA.

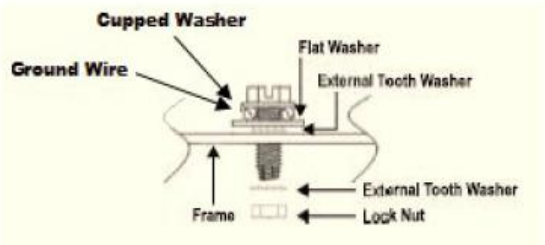
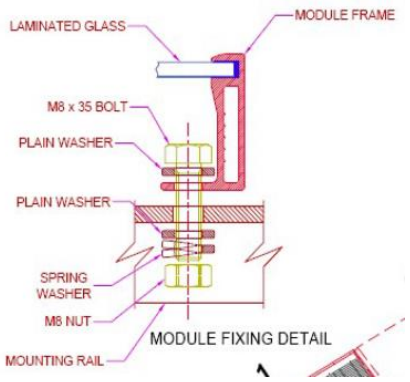
MADE IN INDIA

Inside Laminate of model series:

Logo of Make in India:

Logo is common for all the models

The marking plate above represents all models covered by this report except for difference in electrical ratings and model designation. See “General product information” for electrical ratings for all models

Test item particulars:	
Accessories and detachable parts included in the evaluation:	**Grounding the Array:** Attach a separate conductor to one of the 4mm diameter grounding holes marked on the Module frame with a screw and nut that incorporates an external tooth washer. This is to ensure positive electrical contact with the frame. It is recommended to ground each module frame at the provided grounding holes (4 mm or 5/32-inch diameter, marked with the grounding symbol). The modules can be connected at the grounding holes using stainless steel nut, bolt, start washer and flat washer of size M4  The grounding screw, bolt or other parts are separately used from the mounting parts of the module. The grounding is achieved through securement to the array frame. The torque rating provided for grounding means is 2.8 Nm [25 in.–lbs].
Mounting system used:	**Mounting Method:** The frame of each Module has 8mm x 12mm mounting holes used to secure the modules to supporting structure. The Module frame must be attached to a supporting structure using M8 stainless steel bolt hardware together with hex nut, spring washers and 2nos of plain washers in four places (i.e. minimum number holes to be used are 4 mounting holes) symmetrical on the SPV Module. The applied torque is about 8 Newton-meters. 
Other options included:	N/A

Possible test case verdicts:	
- test case does not apply to the test object..:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement..:	F (Fail)

Abbreviations used in the report:

Pmax	– Maximum power	PD	– Partial Discharge
Vpm	– Maximum power voltage	RTI	– Relative Thermal Index
Ipm	– Maximum power current	STC	– Standard Test Conditions
Isc	– Short circuit current	TC	– Thermal Cycling
Voc	– Open circuit voltage	CTI	– Comparative Tracking Index
FF	– Fill factor	MST	– Module Safety Test

Testing .....:	Refer individual Test Date(mm/dd/yyyy)
Date of receipt of test item(mm/dd/yyy) .....:	07-30-2021
Date (s) of performance of tests(mm/dd/yyy) :	08-13-2021 to 10-20-2021

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

This Test Report Form is intended for the investigation of PV modules in accordance with IS/IS/IEC 61730-2. It can only be used together with IS/IEC 61730-1 Test Report.

Name and address of factory (ies) .....:	VISAKA INDUSTRIES LIMITED (ATUM DIVISION) Survey No 95 & 96, Adjacent to Kukkadam Railway Station, Kukkadam Post, Gajalapur, Madugulapally, Nalgonda-508207, Telangana, India.

General product information:	All models are same in construction output power and electrical ratings System Voltage: 1500V
PV module type reference .....:	**VIL-375M (Representative Model)**
Product Electrical Ratings at STC	
Nominal maximum power (Pmax) ..... :	375.55 W
Nominal open circuit voltage at (Voc) ..... :	49.39 V
Nominal short circuit current at (Isc) ..... :	9.70 A
Nominal maximum power voltage (Vpm) ..... :	40.83 V
Nominal maximum power current (Ipm) ..... :	9.19 A
Product Safety Ratings	
Maximum systems operating voltage ..... :	1500 V
Maximum over-current protection rating..... :	14 A
Safety application class ..... :	Class A
Safety class in accordance with IEC 61140 ..... :	Class II
Fire safety class ..... :	Class C
Recommended maximum series/parallel module configurations ..... :	24 modules in series for 72 cell Model series Note: Refer Annexure 3 for all electrical ratings of all series model

Scope of Module Safety Qualification Testing:

☒ Initial module safety qualification

☐ Extension of module safety qualification

Original test report ref. no. .....:

Model differences and modification:

☐ Change in cell technology	☐ Change in cell interconnect materials/technique
☐ Modification to encapsulation system	☐ Modification to junction box/el. termination
☐ Modification to superstrate	☐ Change in el. circuit of an identical package
☐ Modification to backsheet/substrate	☐ Higher or lower output by 10 %
☐ Modification to frame/mounting structure	☐ Increase in module size
☐ Removal of frame	

Note (1) Use the “General product information” field to give any information on model differences within a product type family covered by the test report.

Note (2) Use the “General product information” field to describe the range of electrical and safety ratings, if the TRF covers a type family of modules.

Note (3) Use Annexure 1 to list the used materials and components of the module (manufacturer/supplier and type reference)

IS/IEC 61730-2:2004 (First Edition) +A1:2017			
Clause	Requirement + Test	Result - Remark	Verdict
3	**Application Classes**		**P**
	The module has been evaluated for the following Application Class (Class A, B, C).....:	A	P
6	**Sampling**		P
	☒ The modules tested (modules and laminate) were taken at random from a production batch and subjected to manufacturer's normal quality control and inspection for safety testing.		P
	☐ The modules tested (modules and laminate) were prototypes of a new design and not taken from a production batch.		N/A
	☐ Preconditioning of test samples was performed within IS 14286 (2010) or IS 16077:2013/IEC 61646:2008 performance testing.		N/A
	☒ Preconditioning of test samples was performed separately from IS 14286 (2010) or IS 16077:2013/IEC 61646:2008 performance testing.		P

List of test samples

Sample No.	Type / model	Remark
4110301	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961034
4110302	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961026
4110303	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961027
4110304	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961028
4110305	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961029
4110306	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961030
4110307	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961031
4110308	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961025
4110309	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961024
4110310	VIL-375M	VISAKA INDUSTRIES LIMITED (ATUM DIVISION), Solar PV Module 375W, Model No: VIL-375M, Sl No: VIL120212961016
Supplementary information: N/A		

IS/IEC 61730-2:2004 (First Edition) +A1:2017			
Clause	Requirement + Test	Result - Remark	Verdict
9	**Pass Criteria**		P
	The module under evaluation was judged to have passed all safety qualification test. The test samples met all of the criteria of each individual safety test.	See appended tables	P
Supplementary information: N/A			
10	**Test Procedures**		
	Safety qualification testing includes the following Module Safety Tests (MST) of IS/IEC 61730-2:		
10.1	MST 01 – Visual inspection .....:	see table 10.1	P
10.2	MST 11 – Accessibility test .....:	see table 10.2	P
10.3	MST 12 – Cut susceptibility test.....:	see table 10.3	P
10.4	MST 13 – Ground continuity test .....:	see table 10.4	P
10.5	MST 14 – Impulse voltage test .....:	see table 10.5	P
10.6	MST 16 – Dielectric withstand test .....:	see table 10.6	P
10.7	MST 21 – Temperature test .....:	see table 10.7	P
10.8	MST 23 – Fire test .....:	see table 10.8	P
10.9	MST 26 – Reverse current overload Test.....:	see table 10.9	P
10.10	MST 32 – Module breakage test.....:	see table 10.10	P
MST 17	MST 17 – Wet leakage current test .....:	see table MST 17	P
MST 22	MST 22 – Hot-spot test .....:	see table MST 22 under Annexure 4	P
MST 34	MST 34 – Mechanical load test.....:	see table MST 34 under Annexure 4	P
MST 51a	MST 51a – Thermal cycling test (TC200) .....:	see table MST 51a under Annexure 4	P
MST 51b	MST 51b – Thermal cycling test (TC50) .....:	see table MST 51b under Annexure 4	P
MST 52	MST 52 – Humidity freeze test.....:	See table MST 52 under Annexure 4	P
MST 53	MST 53 – Damp heat test .....:	see table MST 53 under Annexure 4	P
MST 54	MST 54 – UV preconditioning test .....:	see table MST 54 under Annexure 4	P
MST 42	MST 42-Robustness of Termination Test	see table MST 42 under Annexure 4	P
MST 25	MST 25-Bypass diode thermal test	see table MST 25 under Annexure 4	P
MST-16	MST 16 - Dielectric withstand test Prior to Bypass diode thermal test	See table MST 16 under Annexure 4	P
10.2	Maximum Power Determination	See table 10.2 under Annexure 4	P

IS/IEC 61730-2:2004 (First Edition) +A1:2017			
Clause	Requirement + Test	Result - Remark	Verdict

	Component tests:		
11.1	MST 15 – Partial discharge test.....:	As per Manufacturer submitted the Partial Discharge letter from Lab has been verified for the back sheet.	P
11.2	MST 33 – Conduit bending test .....:	There is no conduit in Junction box, conduit bending test not applicable	N/A
11.3	MST 44 – Terminal box knockout test .....:	There is no terminal box in Junction box, terminal knockout test not applicable	N/A
Supplementary information: N/A			

10.1	**TABLE: Visual Inspection - MST 01 (Initial)**	**P**
Sample No.	Nature and position of findings	—
4110301	No Visual defects found	P
4110302	No Visual defects found	P
4110303	No Visual defects found	P
4110304	No Visual defects found	P
4110305	No Visual defects found	P
4110306	No Visual defects found	P
4110307	No Visual defects found	P
Supplementary information: Test Date (mm/dd/yyyy): 08/13/2021		

10.2	**TABLE: Accessibility Test - MST 11 (Initial)**		**P**
	Maximum system voltage [V_{DC}] .....:	1500	—
Sample No.	Result [MΩ]		—
4110303	5000*		P
4110304	5000*		P
4110305	5000*		P
4110306	5000*		P
Supplementary information: Test Date (mm/dd/yyyy): 08/23/2021 * Equipment maximum range was 5000 M Ohm.			

10.4	**TABLE: Ground Continuity Test - MST 13 (Initial)**		**P**
	Maximum system voltage [V_{DC}] .....:	1500V	—
	Current applied [A] .....:	35	—
	Location of designated grounding point.....:	Grounding hole on frame left side (long side)	—
	Location of second contacting point.....:	Grounding hole on frame right side (long side)	—
Sample No.	Voltage [V_{DC}]	Resistance [Ω]	—
4110303	0.0371	0.0011	P
4110304	0.0351	0.0010	P
4110305	0.0299	0.0009	P
4110306	0.0289	0.0008	P
Supplementary information: Test Date: 08/23/2021			

IS/IEC 61730-2:2004 (First Edition) +A1:2017			
Clause	Requirement + Test	Result - Remark	Verdict

10.6	**TABLE: Dielectric Withstand Test - MST 16 (Initial)**			**P**
	Maximum system voltage [V_{DC}] .....:		1500	—
	Test voltage applied V_{TEST} [V_{DC}].....:		IR =1500 Dielectric = 8000	—
	Module area A [m²] .....:		1.96	—
Sample No.	Dielectric breakdown	Insulation resistance at V_{TEST} [GΩ]	Insulation resistance x A [MΩ·m²]	—
4110303	☐	8.63	40	P
4110304	☐	9.01	40	P
4110305	☐	8.72	40	P
4110306	☐	9.38	40	P
Supplementary information: Test Date(mm/dd/yyyy): 08/23/2021				

MST 17	**TABLE: Wet Leakage Current Test - MST 17 (Initial)**			**P**
	Maximum system voltage [V_{DC}] .....:		1500	—
	Test voltage applied V_{TEST} [V_{DC}].....:		1500	—
	Module area A [m²] .....:		1.96	—
	Resistivity of wetting agent [Ω·cm].....:		2190	—
	Average wetting agent temperature [°C].....:		23.8	—
Sample No.	Insulation resistance at V_{TEST} [GΩ]		Insulation resistance x A [MΩ·m²]	—
4110303	5.36		40	P
4110304	4.98		40	P
4110305	5.07		40	P
4110306	4.86		40	P
Supplementary information: Test Date(mm/dd/yyyy): 08/23/2021				

10.3	**TABLE: Cut Susceptibility Test - MST 11**		**P**
	Applied force [N].....:	8.9 N ± 0.5 N	—
Sample No.			—
4110303	☒ No exposure of active circuitry of the module		P
4110304	☒ No exposure of active circuitry of the module		P
Supplementary information: Test Date (mm/dd/yyyy): 10/18/2021			

IS/IEC 61730-2:2004 (First Edition) +A1:2017			
Clause	Requirement + Test	Result - Remark	Verdict

10.1	TABLE: Visual Inspection - MST 01 (after Cut Susceptibility Test)		P
Sample No.	Nature and position of findings		—
4110303	No Visual defects found		P
4110304	No Visual defects found		P
Supplementary information: Test Date (mm/dd/yyyy): 10/18/2021			

10.2	TABLE: Accessibility test - MST 11 (after cut susceptibility Test)		P
	Maximum system voltage [V_{DC}] .....:	1500	
Sample No.	Nature and position of findings/ Result [MΩ]		—
4110303	5000*		P
4110304	5000*		P
Supplementary information: Test Date (mm/dd/yyyy): 10/18/2021 *Equipment maximum range was 5000 M ohms.			

10.4	TABLE: Ground Continuity Test - MST 13 (after Cut Susceptibility Test)		P
	Maximum system voltage [V_{DC}] .....:	1500	—
	Current applied [A] .....:	35	—
	Location of designated grounding point.....:	Grounding holes of the frame	—
	Location of second contacting point.....:	Grounding holes of the frame	—
Sample No.	Voltage [V_{DC}]	Resistance [Ω]	—
4110303	0.0225	0.0006	P
4110304	0.0336	0.0009	P
Supplementary information: Test Date (mm/dd/yyyy): 10/18/2021			

10.6	TABLE: Dielectric Withstand Test - MST 16 (after Cut Susceptibility Test)			P
	Maximum system voltage [V_{DC}] .....:		1500V	—
	Test voltage applied V_{TEST} [V_{DC}].....:		IR= 1500V Dielectric = 8000	—
	Module area A [m²] .....:		20.40	—
Sample No.	Dielectric breakdown	Insulation resistance at V_{TEST} [GΩ]	Insulation resistance x A [MΩ·m²]	—
4110303	--	2.15	40	P
4110304	--	1.96	40	P
Supplementary information: Test Date (mm/dd/yyyy): 10/18/2021				

IS/IEC 61730-2:2004 (First Edition) +A1:2017			
Clause	Requirement + Test	Result - Remark	Verdict

MST 17	TABLE: Wet Leakage Current Test - MST 17 (after Cut Susceptibility Test)		P
	Maximum system voltage [V_{DC}] .....:	1500	—
	Test voltage applied V_{TEST} [V_{DC}].....:	1500	—
	Module area A [m²] .....:	1.96	—
	Resistivity of wetting agent [Ω·cm].....:	2250	—
	Average wetting agent temperature [°C].....:	24.1	—

Sample No.	Insulation resistance at V_{TEST} [GΩ]	Insulation resistance x A [MΩ·m²]	—
4110303	1.36	40	P
4110304	1.29	40	P
Supplementary information: Test Date (mm/dd/yyyy): 10/18/2021			

10.5	TABLE: Impulse Voltage Test - MST 14		P
	Maximum system voltage [V_{DC}] .....:	1500	—
	Impulse voltage [V].....:	12000	—
	Thickness of conductive foil [mm].....:	0.05	—

Sample No.		—
4110306	☒ No evidence of dielectric breakdown or surface tracking observed	P
Supplementary information: Test Date(mm/dd/yyyy): 10/18/2021		

10.1	TABLE: Visual Inspection - MST 01 (after Impulse Voltage Test)	P
Sample No.	Nature and position of findings	—
4110306	No Visual defects found	P
Supplementary information: Test Date(mm/dd/yyyy): 10/18/2021		

10.6	TABLE: Dielectric Withstand Test - MST 16 (after Impulse Voltage Test)			P
	Maximum system voltage [V_{DC}] .....:		1500	—
	Test voltage applied V_{TEST} [V_{DC}].....:		IR = 1500 Dielectric =8000	—
	Module area A [m²] .....:		1.96	—

Sample No.	Dielectric breakdown	Insulation resistance at V_{TEST} [GΩ]	Insulation resistance x A [MΩ·m²]	—
4110306	-	2.81	40	P
Supplementary information: Test Date(mm/dd/yyyy): 10/18/2021				

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Clause	Requirement + Test	Result - Remark	Verdict

10.7	**TABLE: Temperature Test - MST 21**				**P**
	Sample No. .....:	4110307			—
	Reference solar irradiance [W/m²] .....:	1000 W/m²			—
	Reference ambient temperature [°C] .....:	40°C			—
Measuring location		Component temperature T_{OBS} [°C]	Normalised temperature T_{CON} [°C]	Component temperature limit [°C]	—
Module open-circuited					
Module superstrate above the centre cell		63.60	72.40	Reference	P
Module substrate below the centre cell		62.00	70.80	120ºC	P
Terminal enclosure interior surface		54.90	63.70	85ºC	P
Terminal enclosure interior air space		58.20	67.00	Reference	P
Wiring terminals		56.50	65.30	85ºC	P
Insulation of the wiring leads		56.80	65.60	90ºC	P
External connector bodies		58.20	67.00	85ºC	P
Diode D1		57.10	65.90	188.54˚C	P
Diode D2		57.80	66.60	188.54˚C	P
Diode D3		58.00	66.80	188.54˚C	P
Sealant		49.10	57.90	85ºC	P
Module short-circuit					
Module superstrate above the centre cell		63.60	70.40	Reference	P
Module substrate below the centre cell		62.30	69.10	120ºC	P
Terminal enclosure interior surface		56.30	63.10	85ºC	P
Terminal enclosure interior air space		59.00	65.80	Reference	P
Wiring terminals		59.00	65.80	85ºC	P
Insulation of the wiring leads		57.30	64.10	90ºC	P
External connector bodies		56.70	63.50	85ºC	P
Diode D1		58.60	65.40	188.54˚C	P
Diode D2		59.00	65.80	188.54˚C	P
Diode D3		59.00	65.80	188.54˚C	P
Sealant		50.90	57.70	85ºC	P
Supplementary information: Test Date(mm/dd/yyyy): 10/08/2021					

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Clause	Requirement + Test	Result - Remark	Verdict

10.8	**TABLE: Fire Test - MST 23**		**P**
	Module fire resistance class (A, B, C).....:	C	—
	No. of modules provided to create the test assembly.....:	3	—
Sample No.			—
4110308	☒ Modules comply with the requirements for the fire resistance class		P
4110309			P
*4110310			P
Supplementary information: Spread-Of-Flame Test Date(mm/dd/yyyy): 09/16/2021 *Burning-Brand Test Date(mm/dd/yyyy): 09/16/2021			

10.9	**TABLE: Reverse Current Overload Test - MST 26**		**P**
	Module over-current protection rating [A].....:	14	—
	Test current [A].....:	18.9	—
	Range of applied voltage [V].....:	53.6	—
	Test duration .....:	2 hours	—
Sample No.			—
4110307	☒ No flaming of the module ☒ No flaming or charring of the cheesecloth ☒ No flaming of the tissue paper ☒ MST 17 requirements fulfilled (see appended Table MST17)		P
Supplementary information: Test Date(mm/dd/yyyy): 10/11/2021			

MST 17	**TABLE: Wet Leakage Current Test - MST 17 (after Reverse Current Overload Test)**			**P**
	Maximum system voltage [V_{DC}] .....:		1500V	—
	Test voltage applied V_{TEST} [V_{DC}].....:		1500V	—
	Module area A [m²] .....:		1.96	—
	Resistivity of wetting agent [Ω•cm] .....:		2015	
	Average wetting agent temperature [°C].....:		24.1	
Sample No.	Insulation resistance at V_{TEST} [GΩ]		Insulation resistance x A [MΩ·m²]	—
4110307	1.52		40	P
Supplementary information: Test Date(mm/dd/yyyy): 10/11/2021				

IS/IEC 61730-2:2004 (First Edition) +A1:2017			
Clause	Requirement + Test	Result - Remark	Verdict
10.10	**TABLE: Module Breakage Test - MST 32**		**P**
	Weight of impactor [kg] .....:	45.5	—
	Thickness of sample [mm].....:	4.5mm (approx.)	—
	Mounting technique used.....:	As mentioned in installation manual	—
	Module breakage .....:	☐ No breakage ☐ Breakage at 300 mm ☐ Breakage at 450 mm ☒ Breakage at 1220 mm	—
	Weight of particles in case of breakage [g] .....:	No Particles were observed	—
Sample No.			—
4110302	☒ Breakage occurred, but no shear or opening large enough for a 76 mm diameter sphere to pass freely has developed.		P
	☒ Disintegration occurred, but the ten largest crack-free particles selected 5 min subsequent to the test did not weigh more in grams than 16 times the thickness of the sample in millimetres.		P
	☒ Breakage occurred, but no particles larger than 6.5 cm² have been ejected from the sample.		P
Supplementary information: Test Date(mm/dd/yyyy): 10/13/2021			

IS/IEC 61730-2:2004 (First Edition) +A1:2017			
Clause	Requirement + Test	Result - Remark	Verdict
11	**Component Tests**		
	MST 15 - Partial discharge test ..... :	As per Manufacturer submitted the Partial Discharge letter from Lab has been verified for the back sheet.	P
	MST 33 - Conduit bending test ..... :	There is no conduit in Junction box, conduit bending test not applicable	N/A
	MST 44 - Terminal box knockout test ..... :	There is no terminal box in Junction box , terminal knockout test not applicable	N/A

11.1	**TABLE: Partial Discharge Test - MST 15**		**P**
	Manufacturer ..... :		—
	Type reference ..... :		—
	Materials and thicknesses ..... :		—
	Ambient temperature [°C] ..... :		—
	Relative humidity [%] ..... :		—
	Test medium (air/oil) ..... :		

Sample No.	PD inception voltage, U_i [V]	PD extinction voltage, U_e [V]
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Mean value of PD extinction voltage, $\bar{U}_{e,\,avg}$ [V] ..... :	
Standard deviation of PD extinction voltage, σ [V] ..... :	
Mean value minus standard deviation of PD extinction voltage [V]	
Resulting maximum system voltage, U_{SYS} [V] ..... :	
Supplementary information: Manufacturer submitted the Partial Discharge letter from Lab has been verified.	

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Clause	Requirement + Test	Result - Remark	Verdict

11.2	**TABLE: Conduit Bending Test - MST 33**		**N/A**
	Manufacturer and type reference of conduit .....:		—
	Trade size of conduit [mm] .....:		—
	Distance between the ends of the conduit in the box .....:		—
	Distance between supports .....:		—
	Force load in accordance with Table 10 of IS/IEC 61730-2 [N] .....:		—
Sample No.			—
	☐ No rupture of the attachment walls of the junction box		
	☐ No separation of junction box from the conduit		
Supplementary information: Distance between supports = 760 mm + Distance between the ends of the conduit in the box			

11.3	**TABLE: Terminal Box Knockout Test - MST 44**		**N/A**
	Manufacturer of terminal box.....:		—
	Type reference .....:		—
	Number of knockouts in the junction box .....:		—
	Force applied to knockout [N] .....:	44.5	—
Knockout No.			—
	☐ The knockout remains in place		
	☐ The clearance between knockout and opening is < 0.75 mm		
	☐ The knockout remains in place		
	☐ The clearance between knockout and opening is < 0.75 mm		
	☐ The knockout remains in place		
	☐ The clearance between knockout and opening is < 0.75 mm		
	☐ The knockout remains in place		
	☐ The clearance between knockout and opening is < 0.75 mm		
Supplementary information: N/A			

ANNEXURE 1: CONSTRUCTIONAL DETAILS

A1.1	**MODULE TYPE/S**	
	Representative Model: VIL-375M Series Model: VIL-370M	
A1.2	**MODULE DESIGN –DIMENSIONS**	
	Module dimensions (L x W x H) [mm]:	1981x991x35

A1.3	**SOLAR CELL**	
	Cell type reference.....:	Mono-crystalline PERC Manufactured by: ADANI SOLAR CELLS (Mundra Solar Pvt Ltd) Type: MSPVLM2M5
	Cell dimensions L x W xT (± %) [mm]:	156.75 mm x 156.75 mm ± 0.25 mm
	Cell thickness [µm]:	190 µm ± 30 µm
	Cell area [cm²]:	245.70

A1.4	**IDENTIFICATION OF MATERIALS**	
	Front cover.....:	Manufactured by: Borosil Renewables Limited, Type: AR Coated (Low-iron) Textured Tempered Solar Glass. Thickness: 3.2mm
	Rear cover .....:	Manufactured by: Renewsys India Private Limited, Type: Preserv 1 300 WD, Thickness: 0.395mm, Color: WT, RTI: 140 degC, Flame Spread Index: 30, Partial Discharge: 4.17kV
	Encapsulation material .....:	Manufactured by: Renewsys India Private Limited, Type: CONSERV P 360-14FC, Thickness: 0.45- 0.5mm, HWI=4, HAI=0, RTI:50, Color : NC
	Frame parts .....:	Manufactured by: Satya Surya Aluminium Industries Ltd. Type 6063–T6
	Mounting parts.....:	Modules must be mounted using the mounting holes located on the rear side of the long frame parts using M8 stainless steel bolts, nuts, and washers
	Adhesive for frame .....:	Manufactured by: Sika India Pvt Ltd, Type: Sikasil AS 60 IN, Thickness: 1.5 mm min, Flame Class: HB, HWI: 3, HAI:0, RTI:105, color: WT
	Cell connector.....:	Manufactured by: NEOCAB-PV, AB Industries Type: Cross section: 0.9X0.20 mm, Material: Base Cu ≥ 99.95%, Coating Sn60%Pb40%,
	String connector .....:	Manufactured by: NEOCAB-PV, AB Industries Type: Cross section: 0.3X5.0 mm, Material: Base Cu ≥ 99.95%,Coating Sn60%Pb40%,
	Soldering material.....:	Manufactured by: Kester Type, 245 Flux cored wire Kester
	Fluxing agent .....:	Manufactured by: KESTER, Type: 952S
	Junction box.....:	Manufactured by: Ningbo GZX Photovoltaic Technology Co., Ltd, Type: PV-GZX156V, 1500Vdc, 14A, Reverse Current 30A, -40°C to 85°C, IP65/68.

	Cable .....:	Manufactured by: Ningbo GZX Photovoltaic Technology Co., Ltd, Type: 62930 IEC 131, 1500Vdc, -40°C to 90°C, 120°C
	Connector .....:	Manufactured by: Ningbo GZX Photovoltaic Technology Co., Ltd Type: PV- GZX 1500, 1500VDC, 30A, IP68.
	Bypass diode .....:	Manufactured by: Ningbo GZX Photvoltaic Technology Co. Ltd Type: 30SQ 045T, 45V, 30A
	Potting material.....:	Manufactured by: Shanghai Huitian new material Co., Ltd Type: 5299W-S, Thickness: 3.0 mm min, Flame Class: V-0, HWI: 1, HAI:0, RTI:105, color: WT
	Adhesive for junction box .....:	Manufactured by: Sika India Pvt Ltd, Type: Sikasil AS 60 IN, Thickness: 1.5 mm min, Flame Class: HB, HWI: 3, HAI:0, RTI:105,IPT:2.5kV, color: WT
	Additional material (e. g. fixing tape, insulation tape) .....:	Aluminium corner Key: Manufactured by: Satya Surya Aluminium Industries Ltd. Type: D-6606 Back Label: Speckgrap India Pvt. Ltd, Type: 2M MAT CH PET TC/S-730 Internal Label: Speckgrap India Pvt. Ltd. Type: PET WHITE TC 50 -RC18.

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells (mm) .....:	2.14
	Between cell and edge of laminate (mm) .....:	13.2
	Between any current carrying part and edge of laminate (mm).....:	18.95

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells .:	72
	Serial-parallel connection of cells .....:	All cells are in series connection
	Cells per bypass diode:	24
	No. of bypass diodes .:	03

Annexure:2 List of the Measurement

Description	Identification	Test Name
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	201396	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Meter, pH, Digital or Analog	177914	Wet Insulation Resistance test
Fixture, For Testing, Water Tank	167776	Wet Insulation Resistance test
Stopwatch, Digital or Analog	159551	Wet Insulation Resistance test
Apparatus, Dielectric Strength Test	169917	Wet Insulation Resistance test
Probe, Mechanical, Finger, IEC	187916	Accessibility Test
Multimeter, Digital, Handheld	68599	Accessibility Test
Apparatus, Insulation Resistance Test	68600	Accessibility Test
Power Supply, DC	70971	Ground Continuity test
Power Supply, DC	72850	Ground Continuity test
Power Supply, DC	147770	Ground Continuity test
Multimeter, Digital, Handheld	68599	Ground Continuity test
Datalogger, RH & Temperature	68610	Ground Continuity test
Stopwatch, Digital or Analog	159551	Ground Continuity test
Radiometer	199438	UV Preconditioning Test
Datalogger	72942	UV Preconditioning Test
Chamber, Conditioning, UV	74011	UV Preconditioning Test
Chamber, Climatic, Temp and RH	169223	Damp heat
Datalogger	168532	Damp heat
Chamber, Climatic, Temp and RH	169218	Thermal Cycling Test-200
Datalogger	69922	Thermal Cycling Test-200
Shunt, Current	76386	Thermal Cycling Test-200
Shunt, Current	76382	Thermal Cycling Test-200
Shunt, Current	76384	Thermal Cycling Test-200
Power Supply, DC	69871	Thermal Cycling Test-200
Power Supply, DC	69872	Thermal Cycling Test-200
Power Supply, DC	69873	Thermal Cycling Test-200
Radiometer	199438	UV Preconditioning Test
Datalogger	72942	UV Preconditioning Test

Chamber, Conditioning, UV	74011	UV Preconditioning Test
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	201396	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Chamber, Climatic, Temp and RH	70576	Burning Brand Test
Timer, Digital or Analog, Wound or Battery Powered	69762	Burning Brand Test
Measuring Tool, Dynascope	179803	Spread Flame test
Measuring Tool, Dynascope	174010	Spread Flame test
Measuring Tool, Dynascope	179802	Spread Flame test
Measuring Tool, Dynascope	174010	Spread Flame test
Measuring Tool, Rigid Ruler	176846	Spread Flame test
Probe, Temperature, Thermocouple	176857	Spread Flame test
Indicator, Temperature	67909	Spread Flame test
Gauge, Inclinometer, Digital or Analog	154637	Spread Flame test
Datalogger, RH & Temperature	68610	Spread Flame test
Stopwatch, Digital or Analog	159551	Spread Flame test
Chamber, Climatic, Temp and RH	70576	Burning Brand Test
Timer, Digital or Analog, Wound or Battery Powered	69762	Burning Brand Test
Measuring Tool, Dynascope	174010	Burning Brand
Measuring Tool, Rigid Ruler	176846	Burning Brand
Indicator, Temperature	67909	Burning Brand
Datalogger, RH & Temperature	65675	Burning Brand
Weighing Device, Scale or Balance, Analog or Digital	159968	Burning Brand
Stopwatch, Digital or Analog	159551	Burning Brand
Fixture, For Testing, Threshold Obstruction	178823	Burning Brand
Fixture, For Testing, Threshold Obstruction	178824	Burning Brand
Measuring Tool, Caliper, Digital or Analog	69881	Burning Brand
Probe, Temperature, Thermocouple	176857	Burning Brand
Datalogger	70818	Thermal Cycling 50
Chamber, Climatic, Temp and RH	169217	Thermal Cycling 50
Chamber, Climatic, Temp	70192	Bypass Diode Test
Power Supply, DC	88419	Bypass Diode Test

Power Supply, DC	88424	Bypass Diode Test
Datalogger	70334	Bypass Diode Test
Multimeter, Digital, Handheld	68599	Bypass Diode Test
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Datalogger	70818	Thermal Cycling 50
Chamber, Climatic, Temp and RH	169217	Thermal Cycling 50
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Datalogger	70818	HF-10 Cycling
Chamber, Climatic, Temp and RH	169217	HF-10 Cycling
INSTRUMENT RACK (PV LAB)	70492	HF-10 Cycling
Camera, Infrared	168290	Hotspot Test
Power Supply, DC	70580	Hotspot Test
Datalogger	70334	Hotspot Test
CONTINOUS SIMULATOR	71790	Hotspot Test
PYRANOMETER	167578	Hotspot Test
BLACK VINYL TAPE	75646	Hotspot Test
Timer, Digital or Analog, Wound or Battery Powered	69762	Hotspot Test
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Chamber, Climatic, Temp and RH	169218	Thermal Cycling Test-200
Datalogger	69922	Thermal Cycling Test-200
Shunt, Current	76386	Thermal Cycling Test-200
Shunt, Current	76382	Thermal Cycling Test-200

Shunt, Current	76384	Thermal Cycling Test-200
Power Supply, DC	69871	Thermal Cycling Test-200
Power Supply, DC	69872	Thermal Cycling Test-200
Power Supply, DC	69873	Thermal Cycling Test-200
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
CONTINOUS SIMULATOR	71790	Temperature Test
PYRANOMETER	167578	Temperature Test
Datalogger	70334	Temperature Test
Measuring Tool, Dynascope	174010	Temperature Test
Gauge, Inclinometer, Digital or Analog	69891	Temperature Test
Chamber, Climatic, Temp and RH	169223	Damp heat
Datalogger	168532	Damp heat
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Meter, pH, Digital or Analog	177914	Wet Insulation Resistance test
Fixture, For Testing, Water Tank	167776	Wet Insulation Resistance test
Stopwatch, Digital or Analog	159551	Wet Insulation Resistance test
Apparatus, Dielectric Strength Test	169917	Wet Insulation Resistance test
Stopwatch, Digital or Analog	159551	Reverse Current Over Load Test
Measuring Tool, Caliper, Digital or Analog	69881	Reverse Current Over Load Test
Fixture, For Testing, Wooden	177922	Reverse Current Over Load Test
Tissue Paper Weighing between 15 g/m2 to 20 g/m2	471080	Reverse Current Over Load Test

Deroyal Textiles / Deroyal Industries BRR32283100; USP Type II Cotton Gauze (Cheesecloth), 36" Bleached Reroll, 32 (Warp) by 28 (Fill) Threads/in, 37.4 ± 4.5 g/m² (14.5 yd/lb); CC55	474399	Reverse Current Over Load Test
Power Supply, DC	72924	Reverse Current Over Load Test
Power Supply, DC	70584	Reverse Current Over Load Test
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Datalogger	70818	HF-10 Cycling
Chamber, Climatic, Temp and RH	169217	HF-10 Cycling
INSTRUMENT RACK (PV LAB)	70492	HF-10 Cycling
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Camera, Infrared	168290	Hotspot Test
Power Supply, DC	70580	Hotspot Test
Datalogger	70334	Hotspot Test
CONTINOUS SIMULATOR	71790	Hotspot Test
PYRANOMETER	167578	Hotspot Test
BLACK VINYL TAPE	75646	Hotspot Test
Timer, Digital or Analog, Wound or Battery Powered	69762	Hotspot Test
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test

Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Meter, pH, Digital or Analog	177914	Wet Insulation Resistance test
Fixture, For Testing, Water Tank	167776	Wet Insulation Resistance test
Stopwatch, Digital or Analog	159551	Wet Insulation Resistance test
Apparatus, Dielectric Strength Test	169917	Wet Insulation Resistance test
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Meter, pH, Digital or Analog	177914	Wet Insulation Resistance test
Fixture, For Testing, Water Tank	167776	Wet Insulation Resistance test
Stopwatch, Digital or Analog	159551	Wet Insulation Resistance test
Apparatus, Dielectric Strength Test	169917	Wet Insulation Resistance test
MECHANICAL LOADING FIXTURE	171618	Mechanical load test
Power Supply, DC	147761	Mechanical load test
Weighing Device, Scale or Balance, Analog or Digital	31818	Mechanical load test
Timer, Digital or Analog, Wound or Battery Powered	159549	Mechanical load test
Measuring Tool, Rigid Ruler	177816	Mechanical load test
Tool, Torque, Wrench	199818	Mechanical load test
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Force Gauge, Digital	88737	Robustness of Termination test
Weight	156992	Robustness of Termination test
Weight	156993	Robustness of Termination test
Measuring Tool, Rigid Ruler	177816	Robustness of Termination test
Timer, Digital or Analog, Wound or Battery Powered	159549	Robustness of Termination test
Apparatus, Strain Relief Test	70751	Robustness of Termination test
Measuring Tool, Caliper, Digital or Analog	69881	Robustness of Termination test
Apparatus, Impact, Drop	70574	Hail Impact Test
Power Supply, DC	147761	Hail Impact Test
Apparatus, Hailstone Creator	160913	Hail Impact Test
Measuring Tool, Caliper, Digital or Analog	69881	Hail Impact Test
Fixture, For Testing, Refrigerator	70749	Hail Impact Test
Weighing Device, Scale or Balance, Analog or Digital	159968	Hail Impact Test
Oscilloscope, Scope Meter	127264	Hail Impact Test
Measuring Tool, Rigid Ruler	177816	Hail Impact Test
Gauge, Dimensional, Radius	155553	Hail Impact Test
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Apparatus, Solar Simulator	199796	Maximum Power determination

Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
MODULE BREAKAGE TESTER (PV LAB)	70748	Module Breakage Test
Weighing Device, Scale or Balance, Analog or Digital	49060	Module Breakage Test
Measuring Tool, Rigid Ruler	177816	Module Breakage Test
Measuring Tool, Caliper, Digital or Analog	69881	Module Breakage Test
Weighing Device, Scale or Balance, Analog or Digital	159968	Module Breakage Test
Apparatus, Solar Simulator	199796	Maximum Power determination
Thermometer, Infrared	148434	Maximum Power determination
Measuring Tool, Rigid Ruler	176846	Maximum Power determination
Datalogger, RH & Temperature	68610	Maximum Power determination
Reference Standard, Voltage or Current	210178	Maximum Power determination
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Meter, pH, Digital or Analog	177914	Wet Insulation Resistance test
Fixture, For Testing, Water Tank	167776	Wet Insulation Resistance test
Stopwatch, Digital or Analog	159551	Wet Insulation Resistance test
Apparatus, Dielectric Strength Test	169917	Wet Insulation Resistance test
Probe, Mechanical, Finger, IEC	187916	Accessibility Test
Multimeter, Digital, Handheld	68599	Accessibility Test
Apparatus, Insulation Resistance Test	68600	Accessibility Test
Power Supply, DC	70971	Ground Continuity test
Power Supply, DC	72850	Ground Continuity test
Power Supply, DC	147770	Ground Continuity test
Multimeter, Digital, Handheld	68599	Ground Continuity test
Datalogger, RH & Temperature	68610	Ground Continuity test
Stopwatch, Digital or Analog	159551	Ground Continuity test
Voltmeter, Digital or Analog, Benchtop	200563	Impulse Voltage Test
Probe, Electrical, Voltage	203668	Impulse Voltage Test

Oscilloscope, Scope Meter	160917	Impulse Voltage Test
Copper Foil, 3M™ Copper Foil Shielding Tape 1181. CC1597	2107057	Impulse Voltage Test
Measuring Tool, Caliper, Digital or Analog	69881	Impulse Voltage Test
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection
Tester, Crosscut, Dual Guide	69895	Cut Susceptibility Test
Stopwatch, Digital or Analog	159551	Cut Susceptibility Test
Measuring Tool, Rigid Ruler	177816	Cut Susceptibility Test
Timer, Digital or Analog, Wound or Battery Powered	157295	Cut Susceptibility Test
Measuring Tool, Caliper, Digital or Analog	69881	Cut Susceptibility Test
Apparatus, Dielectric Strength Test	169917	IR and Dielectric test
Stopwatch, Digital or Analog	159551	IR and Dielectric test
Datalogger, RH & Temperature	68610	IR and Dielectric test
Meter, pH, Digital or Analog	177914	Wet Insulation Resistance test
Fixture, For Testing, Water Tank	167776	Wet Insulation Resistance test
Stopwatch, Digital or Analog	159551	Wet Insulation Resistance test
Apparatus, Dielectric Strength Test	169917	Wet Insulation Resistance test
Meter, pH, Digital or Analog	177914	Wet Insulation Resistance test
Fixture, For Testing, Water Tank	167776	Wet Insulation Resistance test
Stopwatch, Digital or Analog	159551	Wet Insulation Resistance test
Apparatus, Dielectric Strength Test	169917	Wet Insulation Resistance test
Measuring Tool, Caliper, Digital or Analog	69881	Creepage Measuring
Magnifying Lens, Without Ruler	76645	Creepage Measuring
Datalogger, RH & Temperature	68611	Creepage Measuring
Meter and/or Sensor, Light	180089	Visual Inspection
Fixture, For Testing, Table	160912	Visual Inspection
Magnifying Lens, Without Ruler	76645	Visual Inspection

Annexure: 3 Electrical data table.

PV Module Type Name	Open Circuit Voltage @ STC, (Voc)	Rated Voltage @ STC/Vmp (V dc)	Maximum System Voltage, (V dc)	Rated Current @ STC/Imp (A)	Short Circuit Current @ STC/Isc (A)	Rated Maximum Power at STC, (Watts)	Maximum Series Fuse, (A)
72 cell series (Monocrystalline)							
VIL-370M	49.36	40.70	1500	9.11	9.68	370	14

Annexure:4

Test Clause	Test description	Results-Remark	Verdict
10.2	Maximum Power Determination (initial)	See table 10.2	P
MST 22	MST 22 – Hot-spot test.....:	see table 10.9	P
MST 34	MST 34 – Mechanical load test .....:	see table 10.16	P
MST 51a	MST 51a – Thermal cycling test (TC200).....:	see table 10.11	P
MST 51b	MST 51b – Thermal cycling test (TC50).....:	see table 10.11	P
MST 52	MST 52 – Humidity freeze test .....:	See table 10.12	P
MST 53	MST 53 – Damp heat test.....:	see table 10.13	P
MST 54	MST 54 – UV preconditioning test.....:	see table 10.10	P
MST 42	MST 42-Robustness of Termination Test	see table 10.14	P
MST 25	MST 25-Bypass diode thermal test	see table 10.18	P
MST-16	MST 16 - Dielectric withstand test Prior to Bypass diode thermal test	See table 10.6	P

10.2	**TABLE: Maximum power determination (initial)**						**P**
Test Date(mm/dd/yyyy)			08/23/2021				—
Module temperature [°C].....:			25				—
Irradiance [W/m^2).....:			1000				—
Sample #	**Voc [V]**	**Vmp [V]**	**Isc [A]**	**Imp [A]**	**Pmp [W]**	**FF [%]**	
4110301	48.72	40.06	9.83	9.31	372.88	78	
4110302	48.51	39.95	9.88	9.33	372.74	78	
4110303	48.64	40.28	9.88	9.30	374.43	78	
4110304	48.74	40.30	9.86	9.29	374.57	78	
4110305	48.69	40.27	9.85	9.28	373.91	78	
4110306	48.71	40.23	9.84	9.29	373.79	78	
4110307	48.63	40.25	9.86	9.29	374.01	78	
Supplementary information: N/A							

10.9 TABLE: Hot-spot Endurance test (MST 22)		**P**
Sample No.	4110307	
Test Date(mm/dd/yyyy) :	10/07/2021	**P**
Cell interconnection circuit ..... :	[X] S [ ] SP [ ] SPS	P
Module temperature at thermal equilibrium **[**°C**]** :	47.7	—
Determination of worst case cell	-	
Maximum measured cell temperature in 5 h (+) **[**°C**]**:	68.2	—
Shading rate [%] ..... :	100	—
Supplementary information: N/A		

10.1 TABLE: Visual inspection - Following Hot-Spot Endurance Test		
Test Date(mm/dd/yyyy)..... :	10/07/2021	P
Sample #	Nature and position of initial findings – comments or attach photos	
4110307	No Visual defects found	P
Supplementary information: N/A		

10.6 Table: Dielectric withstand test – Following Hot-spot endurance test				P
Test Date(mm/dd/yyyy)		10/07/2021		—
Module maximum system voltage rating (V, DC) :		1500		—
Potential applied (V, DC) ..... :		IR =1500 Dielectric =8000		—
Minimum allowable insulation resistance (MΩ) :		20.40		—
Sample #	Measured (uA)	Dielectric breakdown [Yes]/[No]	Insulation resistance (GΩ)	Result
4110307	-	NO	4.22	P
Supplementary information: N/A				

10.15 Wet leakage current test-– Following Hot-spot endurance test				P
Test Date(mm/dd/yyyy) .... :	10/07/2021			-
Test Voltage applied [V] ..... :	1500V			
Solution resistivity **[**Ω cm) ..... :	< 3500 Ω cm at 22 +/- 3°C -		2290	P
Solution temperature [°C] ..... :	23.8			
Sample #	Measured [GΩ]	Limit [MΩ]		Result
4110307	2.63	20.40		P
Supplementary information: N/A				

10.16 TABLE: Mechanical load test (MST 34)			P
Sample # ..... :	4110304		—
Test Date(mm/dd/yyyy)……:	10/13/2021		—
Mounting method ..... :	As per Installation Manual (Nut-Bolt Method)		—
Load applied to ..... :	Front side	Back side	—
Mechanical load [Pa] ..... :	2400	2400	—
First cycle time (start/end) .... :	09:10/10:10	10:30/11:30	—
Intermittent open-circuit (yes/no) ..... :	No	No	P
Mechanical load [Pa] ..... :	Front side	Back side	—
Load applied to ..... :	2400	2400	—
Second cycle time (start/end) ... :	11:50/12:50	13:10/14:10	—
Intermittent open-circuit yes/no) ..... :	No	No	P
Mechanical load [Pa] ..... :	Front side	Back side	—
Load applied to ..... :	5400	2400	—
Third cycle time (start/end) .... :	14:30/15:30	16:00/17:00	—
Intermittent open-circuit (yes/no) ..... :	No	No	P
Supplementary information: N/A			

10.1 TABLE: Visual inspection - Following Mechanical load test		
Test Date(mm/dd/yyyy)….:	10/13/2021	P
Sample #	Nature and position of initial findings – comments or attach photos	—
4110304	No Visual defects found	P
Supplementary information: N/A		

10.15 Wet leakage current test after mechanical load test			P
Test Date(mm/dd/yyyy)…:	10/14/2021		—
Test Voltage applied [V] ..... :	1500V		
Solution resistivity **[**Ω cm) ..... :	< 3500 Ω cm at 22 +/- 3°C		1990
Solution temperature [°C] ..... :	23.6		
Sample #	Measured [GΩ]	Limit [MΩ]	Result
4110304	2.71	20.40	P
Supplementary information: N/A			

10.11	**TABLE: Thermal cycling 200 test (MST 51a)**	**P**
Test Date(mm/dd/yyyy) start/end ....:	09/04/2021 to 10/07/2021	—
Total cycles (200) ..... .:	200	—
Applied current **[**A**]** ..... .:	9.19	—

Sample #	Open circuits (yes/no)	—
4110305	No Open circuits found	P
4110306	No Open circuits found	P

Supplementary information: Limiting voltage [V]: 52.7 Vdc

10.1	**TABLE: Visual inspection - Following TC200 test (MST 51a)**	**P**
Test Date(mm/dd/yyyy) .....:	10/07/2021	—

Sample #	Nature and position of initial findings – comments or attach photos	—
4110305	No Visual defects found	P
4110306	No Visual defects found	P

Supplementary information: N/A

10.6	**Table: Dielectric withstand test- Following TC200 test (MST 51a)**	**P**
Test Date(mm/dd/yyyy) ..... :	10/07/2021	—
Module maximum system voltage rating (V, DC) . :	1500V	—
Potential applied (V, DC) ..... :	IR=1500V Dielectric =8000	—
Minimum allowable insulation resistance (MΩ) ... :	20.40	—

Sample #	Measured (uA)	Dielectric breakdown [Yes]/[No]	Insulation resistance (GΩ)	Result
4110305	-	No	3.52	P
4110306	-	No	3.89	P

Supplementary information: N/A

10.11 TABLE: Thermal cycling 50 test (MST 51b)		**P**
Test Date(mm/dd/yyyy) start/end ..:	09/17/2021 to 09/27/2021	—
Total cycles (50) ..... :	50	—

Sample #	Open Circuits (yes/no)	
4110303	No Open circuits found	P

Supplementary information: N/A

10.1 TABLE: Visual inspection - Following TC-50 test		**P**
Test Date(mm/dd/yyyy) :	09/27/2021	—

Sample #	Nature and position of initial findings – comments or attach photos	
4110303	No Visual defects found	P

Supplementary information: N/A

10.3 Table: Dielectric withstand test (MST 16) - Following TC-50 test		**P**
Test Date(mm/dd/yyyy) ...:	09/27/2021	—
Module maximum system voltage rating (V, DC) :	1500V	—
Potential applied (V, DC) ..... :	IR =1500V DIELECTRIC = 8000	—
Minimum allowable insulation resistance (MΩ) :	20.40	

Sample #	Measured (uA)	Dielectric breakdown [Yes]/[No]	Insulation Resistance (GΩ)	Result
4110303	-	No	4.62	P

Supplementary information: N/A

10.12 TABLE: Humidity freeze 10 test (MST 52)				**P**
Test Date(mm/dd/yyyy) start/end ..:		10/01/2021 to 10/12/2021		—
Total cycles (10) ..... :		10		—
Sample #		Open circuits (yes/no)		—
4110303		No Open circuits found		P
Supplementary information: N/A				
10.1 TABLE: Visual inspection - Following HF-10 test				**P**
Test Date(mm/dd/yyyy) :	10/12/2021			—
Sample #	Nature and position of initial findings – comments or attach photos			—
4110303	No Visual defects found			P
Supplementary information: N/A				
10.6 Table: Dielectric withstand test – Following HF-10 test				
Test Date(mm/dd/yyyy)…::		10/12/2021		P
Module maximum system voltage rating (V, DC) :		1500		—
Potential applied (V, DC) ..... :		IR =1500V DIELECTRIC = 8000		—
Minimum allowable insulation resistance (MΩ) :		20.40		—
Sample #	Measured (uA)	Dielectric breakdown [Yes]/[No]	Insulation resistance (GΩ)	Result
4110303	-	No	3.62	P
Supplementary information: N/A				
10.13 TABLE: Damp heat 1000 test (MST 53)				P
Test Date(mm/dd/yyyy) start/end :		08/30/2021 to 10/11/2021		
Total hours (1000) ..... :		1000		
Sample #		Open circuits (yes/no)		—
4110304		NO Open circuits found		P
Supplementary information: N/A				
10.1 TABLE: Visual inspection - Following Damp heat test				
Test Date(mm/dd/yyyy) ..... :		10/11/2021		P
Sample #		Nature and position of initial findings – comments or attach photos		—
4110304		No visual defects found		P
Supplementary information: N/A				

10.6 Table: Dielectric withstand test - Following Damp heat test				
Test Date(mm/dd/yyyy) ..:			10/11/2021	P
Module maximum system voltage rating (V, DC) :			1500	—
Potential applied (V, DC) ..... :			IR=1500 DIELECTRIC=8000	—
Minimum allowable insulation resistance (MΩ) :			20.40	—
Sample #	Measured (uA/MΩ)	Dielectric breakdown [Yes]/[No]	Insulation resistance (GΩ)	Result
4110304	-	No	3.61	P
Supplementary information: N/A				

10.15 Wet leakage current test - Following Damp heat test			
Test Date(mm/dd/yyyy) ..... :	10/11/2021		P
Test Voltage applied [V] ..... :	1500V		
Solution resistivity [Ω cm) ..... :	< 3500 Ω cm at 22 +/- 3°C		2180
Solution temperature [°C] ..... :		23.6	
Sample #	Measured [GΩ]	Limit [MΩ]	Result
4110304	2.41	20.40	P
Supplementary information: N/A			

10.10 TABLE: UV preconditioning test (MST 54)		P
Test Date(mm/dd/yyyy) start/end.....:	08/26/2021 to 09/06/2021	—
Module temperature (°C) ..... :	Min - 55.2 Max – 65.0	—
Irradiation 280 - 400 nm [kWh/ m²] UV-A:	15.53	—
Irradiation 280 - 320 nm [kWh/ m²] UV-B:	0.79	—
Sample #	Open circuits (yes/no)	Result
4110303	No Open circuits found	P
Supplementary information: N/A		

10.1 TABLE: Visual inspection - Following UV Pre-conditioning test		P
Test Date(mm/dd/yyyy)..... :	09/06/2021	—
Sample #	Nature and position of initial findings – comments or attach photos	Result
4110303	No Visual defects found	P
Supplementary information: N/A		

10.6 Table: Dielectric withstand test (MST 16) – Following UV Pre-conditioning test				P
Test Date(mm/dd/yyyy) ..... :		09/07/2021		—
Module maximum system voltage rating (V, DC) :		1500V		—
Potential applied (V, DC) ..... :		IR = 1500V Dielectric = 8000		—
Minimum allowable insulation resistance (MΩ) :		20.40		—
Sample #	Measured (uA)	Dielectric Breakdown [Yes]/[No	Insulation Resistance (GΩ)	RESULT
4110303	-	No	6.37	P
Supplementary information: N/A				

10.14	**TABLE: Robustness of terminations test(MST 42)**		P
Test Date(mm/dd/yyyy):	10/13/2021		
Types of terminations	☒Type A: wire of flying lead ☐Type B: tags, threaded stubs, screws, etc. ☐Type C: connector		
Applied force in all directions [N]..:	40 N TENSILE 20 N BENDING		P
Sample #	Open circuits (yes/no)		—
4110303	No Open Circuits Found		P
Supplementary information: N/A			

10.1	**TABLE: Visual inspection - Following Robustness of terminations test**			**P**
Test Date(mm/dd/yyyy)	10/13/2021			—
Sample #	Nature and position of initial findings – comments or attach photos			—
4110303	No visual defects found			P
Supplementary information: N/A				

10.6	**Table: Dielectric withstand test - Following Robustness of terminations test**			**P**
Test Date(mm/dd/yyyy) :		10/13/2021		—
Module maximum system voltage rating (V, DC):		1500		—
Potential applied (V, DC) .....:		IR = 1500 Dielectric = 8000		—
Minimum allowable insulation resistance (MΩ) :		20.40		—
Initial Tests				
Sample #	Measured (*u*A)	Dielectric breakdown [Yes]/[No]	Insulation resistance (GΩ)	Result
4110303	-	NO	3.03	P
Supplementary information: N/A				

10.6	Table: Dielectric withstand test (MST 16) - Prior to Bypass diode thermal test	P
Test Date(mm/dd/yyyy)	08/23/2021	—
Module maximum system voltage rating (V, DC):	1500V	
Potential applied (V, DC)..... :	IR = 1500 Dielectric = 8000	—
Minimum allowable insulation resistance (MΩ) :	20.40	-

Initial Tests

Sample #	Measured (*u*A)	Dielectric breakdown [Yes]/[No]	Insulation resistance (GΩ)	Result
4110307	-	No	8.81	P

Supplementary information: N/A

10.18	TABLE: Bypass diode thermal test (MST 25)			P
Sample #	4110307			—
Test Date(mm/dd/yyyy) ….. :	09/22/2021			—
Module temperature [°C] :	75 °C ± 5 °C.			—
Number of diodes in junction box :	3			—
Diode manufacturer :	Ningbo Guangzhixing Photovoltaic Tech. Co.Ltd			—
Diode type designation :	30SQ045T			—
Max. permissible junction temperature Tjmax [°C] (according to diode datasheet):	200			—
	Diode 1	Diode 2	Diode 3	Result
Current flow applied [A] ..... :	9.70	9.70	9.70	
Max. diode surface temperature [°C] a or b ..... :	139.9	132.0	135.5	-
Voltage drop [V] ..... :	0.3800	0.3860	0.3980	-
Power dissipation [W] ..... :	3.69	3.74	3.86	-
Thermal resistance junction to leads (RTHJL)/to case (RTHJC/RTHJA) [K/W] (according to datasheet) : RTHJC/RTHJA	1.5	1.5	1.5	-
Calculated max. junction temp. Tjcalc [°C] a or b:a	145.4	137.6	141.3	P
Tjcalc < Tjmax (test passed)? Yes/no ... :	YES	YES	YES	P
Current flow (1.25 * Isc) [A] ..... :	12.13	12.13	12.13	-
Max. diode surface temperature [°C] a or b :a	153.7	146.5	149.4	P
Supplementary Information: (a measured at diode case or ambient near diode case, b measured at diode leads)				

10.1	TABLE: Visual inspection - Following Bypass Diode Thermal test	P
Test Date(mm/dd/yyyy)	09/22/2021	—
Sample #	Nature and position of initial findings – comments or attach photos	—
4110307	No Visual defects found	P
Supplementary information:- N/A		

10.6	**Table: Dielectric withstand test - Following Bypass diode thermal test**	P

Test Date(mm/dd/yyyy) .....:	09/23/2021	
Module maximum system voltage rating (V, DC) :	1500	—
Potential applied (V, DC).....:	IR =1500V DIELECTRIC =8000	—
Minimum allowable insulation resistance (MΩ) :	20.40	—

Initial Tests

Sample #	Measured (uA)	Dielectric breakdown [Yes]/[No]	Insulation resistance (GΩ)	Result
4110307	-	NO	5.26	P

Supplementary information: N/A

10.15 Wet leakage current test				P
Test Date(mm/dd/yyyy) ..... :	09/23/2021			—
Test Voltage applied [V] ..... :	1500V			—
Solution resistivity [Ω cm)..... :	< 3500 Ω cm at 22 □ 3°C	1990		—
Solution temperature [°C] ..... :	23.6			
Sample #	Measured [GΩ]	Limit [MΩ]		Result
4110307	3.72	20.40		P

Supplementary information: N/A

10.1	**TABLE: Visual inspection - Follow up**	P
Test Date(mm/dd/yyyy) ..... :	10/20/2021	—
Sample #	Nature and position of initial findings – comments or attach photos	—
4110301 (Control)	No Visual defects found	P

Supplementary information: N/A

---------- End of TRF IS/IEC 61730-2---------