

Prüfbericht-Nr.: Test Report No.:	ULR:TC568819400000074F 001	Auftrags-Nr.: Order No.:	166101036	Seite 1 von 11 Page 1 of 11
Kunden-Referenz-Nr.: Client Reference No.:	379165	Auftragsdatum: Order date:	15/01/2019	
Auftraggeber: Client:	PV Power Technologies Private Limited, Tarapur Textile Park Ltd, Plot No. 60, Village Gundale, Post: Mahagoan, Tal: Palghar, Dist: Thane -401501, India.			
Prüfgegenstand: Test item:	Photovoltaic (PV) modules			
Bezeichnung / Typ-Nr.: Identification / Type No.:	ECO 320			
Auftrags-Inhalt: Order content:	Testing against PID resistivity			
Prüfgrundlage: Test specification:	Solar Photovoltaic Modules IEC TS 62804 – 1 : Test methods for the detection of potential-induced degradation – Part 1: Crystalline silicon with following severities - Climatic conditions: 85°C and 85% RH - Duration: 288 hours- 3 cycles of 96 hours each			
Wareneingangsdatum: Date of receipt:	31/12/2018	Detaillierte Fotodokumentation siehe Anlage zu diesem Bericht Detailed photo documentation see appendix to this report		
Prüfmuster-Nr.: Test sample No.:	Refer list of test samples			
Prüfzeitraum: Testing period:	19/01/2019 – 21/02/2019			
Ort der Prüfung: Place of testing:	Bangalore			
Prüflaboratorium: Testing laboratory:	TUV Rheinland(India) Pvt. Ltd., Bangalore, India			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
05/02/2019	K. Ganesh Kamath/Manager-PV Products	05/02/2019	Kamalaksha CS/AGM -PV Products	
Datum Date	Name / Stellung Name / Position	Unterschrift Signature	Datum Date	Name / Stellung Name / Position
Sonstiges / Other: none				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 2 von 11
Page 2 of 11

Liste der verwendeten Prüfmittel
List of used test equipment

[illegible]

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 3 von 11
Page 3 of 11

Produktbeschreibung
Product description

1 Produktdetails
Product details

ECO xxx (xxx= 300-325 in steps of 1 with 72 poly cells)

xxx represents output power in Wp

2 Verwendete Materialien
Used materials

Refer constructional characteristics in the "List of test samples"

3 Adresse(n) der Fertigungsstätte(n)
Address(es) of the manufacturing site(s)

PV Power Technologies Private Limited, Tarapur Textile Park Ltd, Plot No. 60, Village Gundale, Post: Mahagoan, Tal: Palghar, Dist: Thane -401501, India

4 Zusammenfassung der Prüfergebnisse
Summary of test results

"According to the enquiry of the manufacturer for a testing against PID resistivity shall be performed according to IEC TS 62804 with following severities –

- Negative potential of the specified maximum system voltage between the shorted output terminals and the frame(ground), - 1000V DC
- Climatic conditions: 85°C and 85% RH
- Duration: 288 hours (3 cycles of 96 hours each)

Before and after the PID test, Visual inspection, maximum power determination, Ground continuity and documentation by electroluminescence imaging shall be performed.

In line with the international standard for PV module type approval testing EN IEC 61215, two modules will be tested. One additional module will be used as a reference sample.

Pass Criteria:

A module design shall be judged to have passed the PID test , if each test sample meets all the following criteria:

- The degradation of maximum output power does not exceed 5%.
- No evidence of a major visual defect (as defined in IEC 61215:2005)

All presented results are only valid for the exact tested module type and design (cell type, encapsulation material, glass type)

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 4 von 11
Page 4 of 11

Absatz <i>Clause</i>	Solar Photovoltaic Modules <i>Anforderungen - Prüfungen / Requirements - Tests</i>	Messergebnisse - Bemerkungen <i>Measuring results - Remarks</i>	Bewertung <i>Evaluation</i>
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—	Test specification		
Photovoltaic (PV) modules – Test methods for the detection of potential-induced degradation - Part 1: Crystalline silicon		IEC TS 62804-1:2015-08, Edition 1.0	—

—	Marking		
Name, monogram or symbol of manufacturer		On Type label and on module front	P
Type or model number		On Type label	P
Serial number		On laminate from front side	P
Polarity of terminals or leads		On JB and cable	P
Maximum system voltage		On Type label	P
Date and place of manufacture		Date traceable from serial number and Manufacturing address mentioned on type label	P

-	List of test samples		
Sample No.	Sample S/N	Type/Model	Remarks/constructional characteristics (e.g. cell, back sheet, frame type)
A000861147-025	ECO 121814944	ECO 320	Cell: Motech-IM156B5 -5bb Poly crystalline Back Sheet: Coveme- DyMat PYE SPV EVA: : STR 15585/HLT (Front), STR 15580 (Back) Glass: Gujarat Borosil, AR Coated, 3.2 mm JB: Zhejiang Zhonghuan Sunter PV ZH011-3
A000861147-026	ECO 121814946	ECO 320	
A000861147-027	ECO 121814945	ECO 320	

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 5 von 11
Page 5 of 11

Absatz	Solar Photovoltaic Modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

10.1	Visual inspection (Initial)		
Test date [DD/MM/YYYY]	Sample No.	Nature and position of initial findings	-
19/01/2019	A000861147-025	No Major visual defects found	P
19/01/2019	A000861147-026	No Major visual defects found	P
19/01/2019	A000861147-027	No Major visual defects found	P
Supplementary information: - None			

10.2	Maximum power determination (Initial)							
Module temperature [°C]		corrected to 25						-
Irradiance [W/m²]		1000						
Test date [DD/MM/YYYY]	Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
19/01/2019	A000861147-025	325.78	37.52	8.68	45.86	9.15	77.7	-
19/01/2019	A000861147-026	325.40	37.52	8.67	45.82	9.19	77.3	-
19/01/2019	A000861147-027	325.19	37.73	8.62	45.83	9.14	77.7	-
Supplementary information: - None								

10.3	Insulation test (Initial)						
Maximum system voltage [V _{DC}]			1000				
High voltage applied [V _{DC}]			3000/6000				
Insulation resistance measured at [V _{DC}]			1000				
Test date [DD/MM/YYYY]	Sample No.	Measured	Area	Result*	Dielectric breakdown		-
		[GΩ]	[m²]	[GΩ × m²]	Yes (description)	No	
19/01/2019	A000861147-025	49.70	1.94	96.42	--	No	P
19/01/2019	A000861147-026	49.80	1.94	96.61	--	No	P
19/01/2019	A000861147-027	51.30	1.94	99.52	--	No	P
*Minimum requirement acc. to the standard is 0.04 GΩ × m².							
Supplementary information: - None							

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 6 von 11
Page 6 of 11

Absatz	Solar Photovoltaic Modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

10.15 Wet leakage current test (Initial)

Insulation resistance measured at [V _{DC}]		1000			-
Solution resistivity [Ω cm]		< 3,500			P
Solution temperature [°C]		22 ± 3			P
Test date [DD/MM/YYYY]	Sample No.	Measured	Area	Result*	-
		[MΩ]	[m²]	[MΩ × m²]	
19/01/2019	A000861147-025	2300.0	1.94	4462.0	P
19/01/2019	A000861147-026	2500.0	1.94	4850.0	P
19/01/2019	A000861147-027	2400.0	1.94	4656.0	P
* Minimum requirement acc. to the standard is 40 MΩ × m².					
Supplementary information: - None					

10.4 Ground continuity (Initial) - MST 13

Maximum over-current protection rating [A]		15		-
Current applied [A]		37.5		
Location of designated grounding point		Right side Longer frame		
Location of second contacting point		Opposite frame		
Test date [DD/MM/YYYY]	Sample No.	Voltage [mV]	Resistance [mΩ]	
19/01/2019	A000861147-025	199.60	5.32	P
19/01/2019	A000861147-026	210.50	5.61	P
19/01/2019	A000861147-027	215.30	5.74	P
Supplementary information: - None				

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 7 von 11
Page 7 of 11

Absatz	Solar Photovoltaic Modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

	Performance of PID Test -1 st Cycle				
Test Method		Chamber		—	
Module Temperature [°C]		85			
Relative Humidity [%]		85			
Grounding polarity		+ve			
Test date [DD/MM/YYYY]	Sample No.		Applied Voltage [V]	Duration[Hrs]	
05/02/2019 to 10/02/2019	A000861147-026		-1000	96	P
	A000861147-027		-1000	96	P
Supplementary information: - None					

10.1	Visual inspection after 1 st PID Cycle			
Test date [DD/MM/YYYY]		Sample No.	Nature and position of initial findings	-
10/02/2019		A000861147-026	No Major visual defects found	P
10/02/2019		A000861147-027	No Major visual defects found	P
Supplementary information: - None				

10.2	Maximum power determination - after 1 st PID Cycle								
Module temperature [°C]		corrected to 25							-
Irradiance [W/m²]		1000							
Test date [DD/MM/YYYY]	Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	Degradation [%]	
10/02/2019	A000861147-026	319.35	37.37	8.55	45.45	9.11	77.2	-1.9	P
10/02/2019	A000861147-027	321.74	37.51	8.58	45.89	9.06	77.4	-1.1	P
Supplementary information: - Initial measurements were considered for calculating degradation									

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 8 von 11
Page 8 of 11

Absatz	Solar Photovoltaic Modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

10.3	Insulation test after 1 st PID Cycle						
Maximum system voltage [V _{DC}]			1000				
High voltage applied [V _{DC}]			3000/6000				
Insulation resistance measured at [V _{DC}]			1000				
Test date [DD/MM/YYYY]	Sample No.	Measured	Area	Result*	Dielectric breakdown		-
		[GΩ]	[m²]	[GΩ × m²]	Yes (description)	No	
10/02/2019	A000861147-026	42.80	1.94	83.03	--	No	P
10/02/2019	A000861147-027	43.20	1.94	83.80	--	No	P
*Minimum requirement acc. to the standard is 0.04 GΩ × m².							
Supplementary information: - None							

10.15	Wet leakage current test after 1 st PID Cycle				
Insulation resistance measured at [V _{DC}]		1000			-
Solution resistivity [Ω cm]		< 3,500			P
Solution temperature [°C]		22 ± 3			P
Test date [DD/MM/YYYY]	Sample No.	Measured	Area	Result*	-
		[MΩ]	[m²]	[MΩ × m²]	
10/02/2019	A000861147-026	2100.0	1.94	4074.0	P
10/02/2019	A000861147-027	1900.0	1.94	3686.0	P
* Minimum requirement acc. to the standard is 40 MΩ × m².					
Supplementary information: - None					

	Performance of PID Test – II nd Cycle				
Test Method		Chamber			—
Module Temperature [°C]		85			
Relative Humidity [%]		85			
Grounding polarity		+ve			
Test date [DD/MM/YYYY]	Sample No.		Applied Voltage [V]	Duration[Hrs.]	
11/02/2019 to 16/02/2019	A000861147-026		-1000	96	P
	A000861147-027		-1000	96	P
Supplementary information: - None					

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 9 von 11
Page 9 of 11

Absatz	Solar Photovoltaic Modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

10.1	Visual inspection after IInd PID Cycle		
Test date [DD/MM/YYYY]	Sample No.	Nature and position of initial findings	-
16/02/2019	A000861147-026	No Major visual defects found	P
16/02/2019	A000861147-027	No Major visual defects found	P
Supplementary information: - None			

10.2	Maximum power determination - after II nd PID Cycle								
Module temperature [°C]		corrected to 25							-
Irradiance [W/m²]		1000							
Test date [DD/MM/YYYY]	Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	Degradation [%]	
16/02/2019	A000861147-026	320.14	36.95	8.67	45.85	9.06	77.1	-1.6	P
16/02/2019	A000861147-027	320.36	37.42	8.56	45.87	9.03	77.3	-1.5	P
Supplementary information: - Initial measurements were considered for calculating degradation									

10.3	Insulation test after II nd PID cycle						
Maximum system voltage [V _{DC}]			1000				
High voltage applied [V _{DC}]			3000/6000				
Insulation resistance measured at [V _{DC}]			1000				
Test date [DD/MM/YYYY]	Sample No.	Measured	Area	Result*	Dielectric breakdown		-
		[GΩ]	[m²]	[GΩ × m²]	Yes (description)	No	
16/02/2019	A000861147-026	16.90	1.94	32.78	--	No	P
16/02/2019	A000861147-027	30.40	1.94	58.97	--	No	P
*Minimum requirement acc. to the standard is 0.04 GΩ × m².							
Supplementary information: - None							

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Absatz	Solar Photovoltaic Modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

10.15	Wet leakage current after IInd PID Cycle				
Insulation resistance measured at [V _{DC}]		1000			-
Solution resistivity [Ω cm]		< 3,500			P
Solution temperature [°C]		22 ± 3			P
Test date [DD/MM/YYYY]	Sample No.	Measured	Area	Result*	-
		[MΩ]	[m²]	[MΩ × m²]	
16/02/2019	A000861147-026	11100.0	1.94	21340.0	P
16/02/2019	A000861147-027	9400.0	1.94	18236.0	P
* Minimum requirement acc. to the standard is 40 MΩ × m².					
Supplementary information: - None					

	Performance of PID Test – III rd Cycle				
Test Method		Chamber			—
Module Temperature [°C]		85			
Relative Humidity [%]		85			
Grounding polarity		+ve			
Test date [DD/MM/YYYY]	Sample No.		Applied Voltage [V]	Duration[Hrs.]	
16/02/2019 to 21/02/2019	A000861147-026		-1000	96	P
	A000861147-027		-1000	96	P
Supplementary information: - None					

10.1	Visual inspection after III rd PID Cycle			
Test date [DD/MM/YYYY]		Sample No.	Nature and position of initial findings	-
21/02/2019		A000861147-026	No Major visual defects found	P
21/02/2019		A000861147-027	No Major visual defects found	P
Supplementary information: - None				

Prüfbericht-Nr.: ULR:TC568819400000074F 001
Test Report No.:

Seite 11 von 11
Page 11 of 11

Absatz	Solar Photovoltaic Modules	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

10.2	Maximum power determination - after III rd Cycle								
Module temperature [°C]		corrected to 25							-
Irradiance [W/m²]		1000							
Test date [DD/MM/YYYY]	Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	Degradation [%]	
21/02/2019	A000861147-026	320.71	37.58	8.53	45.76	9.03	77.6	-1.4	P
21/02/2019	A000861147-027	321.33	37.58	8.55	45.84	9.01	77.8	-1.2	P
Supplementary information: - Initial measurements were considered for calculating degradation									

10.3	Insulation test after III rd Cycle						
Maximum system voltage [V _{DC}]			1000				
High voltage applied [V _{DC}]			3000/6000				
Insulation resistance measured at [V _{DC}]			1000				
Test date [DD/MM/YYYY]	Sample No.	Measured	Area	Result*	Dielectric breakdown		-
		[GΩ]	[m²]	[GΩ × m²]	Yes (description)	No	
21/02/2019	A000861147-026	18.90	1.94	36.66	--	No	P
21/02/2019	A000861147-027	28.60	1.94	55.48	--	No	P
*Minimum requirement acc. to the standard is 0.04 GΩ × m².							
Supplementary information: - None							

10.15	Wet leakage current after IIIrd PID Cycle				
Insulation resistance measured at [V _{DC}]			1000		-
Solution resistivity [Ω cm]			< 3,500		P
Solution temperature [°C]			22 ± 3		P
Test date [DD/MM/YYYY]	Sample No.	Measured	Area	Result*	-
		[MΩ]	[m²]	[MΩ × m²]	
21/02/2019	A000861147-026	9400.0	1.94	18236.0	P
21/02/2019	A000861147-027	6600.10	1.94	12804.0	P
* Minimum requirement acc. to the standard is 40 MΩ × m².					
Supplementary information: - None					

Result:

1. The degradation of maximum output power does not exceed 5%
2. There is no evidence of a major local degradation in electroluminescence inspection.

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 2 von 16
Page 2 of 16

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Statement of the estimated uncertainty of the test verdicts

- Electrical performance rating is outside the scope of IEC 61215:2005 qualification testing. The verdicts of performance rating are only related to the test samples that were subjected to the tests. They cannot be generalised to the modules from the series production.
- The calibration to STC was performed with a class AAA solar simulator. The extended measurement uncertainty is:
- Pmax measurement: 2.12% with a coverage factor $k=2$
- Current measurement: 1.76% with a coverage factor $k=2$
- Voltage measurement: 1.57% with a coverage factor $k=2$
- Relative measurements were performed with a flash type solar simulator.
- The accuracy of measurement reproduction with the solar simulator is less than ± 1 %.

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 3 von 16
Page 3 of 16

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

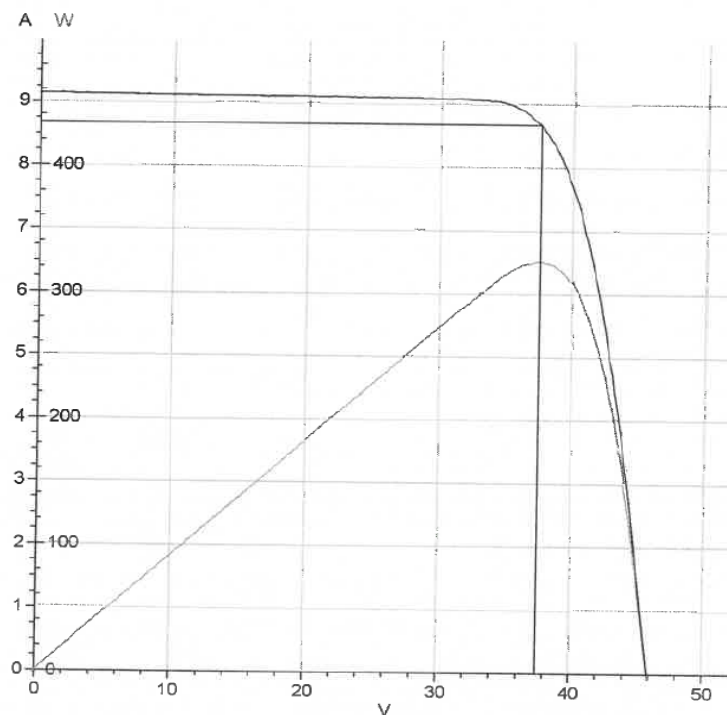
Measurement reports: Initial



Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

19-01-19 10:54



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-025 initi
Module ID Code	ECO 121814944	Serial number	
Standard temperature	25.0 °C	Monitor Cell	071-2014
Mean Irradiance	1.006 kW/m²	Calibration Value	37.47 mV/(kW/m²)
Module Temp.	24.6 °C	Mon. Cell Temp.	24.6 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm²
Module Area	19404.00 cm²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m²
Isc	9.15 A	Voc	45.86 V
Imp	8.68 A	Vmp	37.52 V
Pmax	325.78 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power ar ref 1	-1.00 W
Power ar ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.7 %
Cell Efficiency	18.4 %	Module Efficiency	16.8 %
Shunt res.	614.519 Ohm	Serie res.	0.542 Ohm

Handwritten signature: N. L. J. C.
19.01.19

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 4 von 16
Page 4 of 16

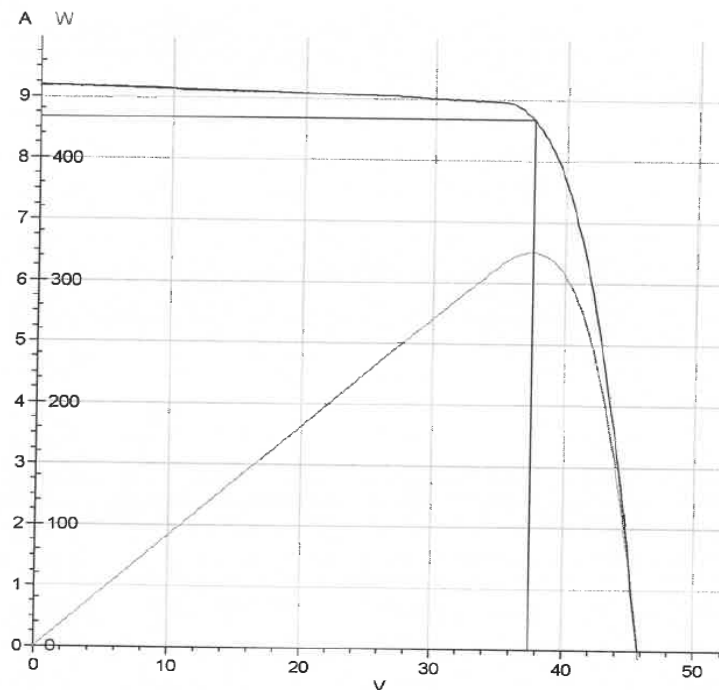
ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION



Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

19-01-19 11:05



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-026 initi
Module ID Code	ECO 121814946	Serial number	
Standard temperature	25.0 °C	Monitor Cell	071-2014
Mean Irradiance	1.006 kW/m²	Calibration Value	37.47 mV/(kW/m²)
Module Temp.	24.6 °C	Mon. Cell Temp.	24.6 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm²
Module Area	19404.00 cm²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m²
Isc	9.19 A	Voc	45.82 V
Imp	8.67 A	Vmp	37.52 V
Pmax	325.40 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power at ref 1	-1.00 W
Power at ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.3 %
Cell Efficiency	18.4 %	Module Efficiency	16.8 %
Shunt res.	201.347 Ohm	Series res.	0.538 Ohm

*Accepted
19.01.19*

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 5 von 16
Page 5 of 16

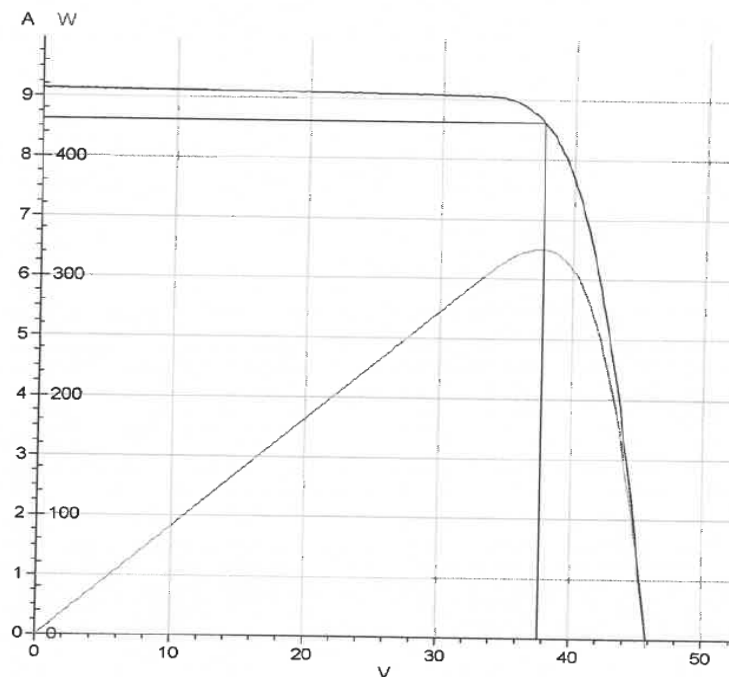
ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION



Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

19-01-19 11:02



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-027 initi
Module ID Code	ECO 121814945	Serial number	
Standard temperature	25.0 °C	Monitor Cell	071-2014
Mean Irradiance	1.006 kW/m²	Calibration Value	37.47 mV/(kW/m²)
Module Temp.	24.7 °C	Mon. Cell Temp.	24.7 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm²
Module Area	19404.00 cm²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m²
Isc	9.14 A	Voc	45.83 V
Imp	8.62 A	Vmp	37.73 V
Pmax	325.19 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power ar ref 1	-1.00 W
Power ar ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.7 %
Cell Efficiency	18.4 %	Module Efficiency	16.8 %
Shunt res.	493.893 Ohm	Serie res.	0.533 Ohm

*Meas. by M. J. C.
19.01.19*

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 6 von 16
Page 6 of 16

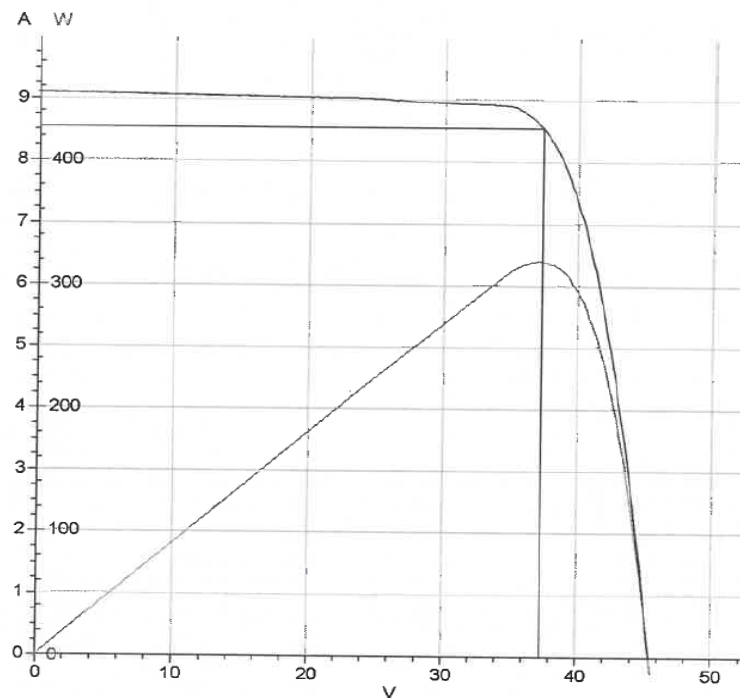
ZUSATZ-DOKUMENTATION ADDITIONAL DOCUMENTATION

Measurement Reports after 1st PID Cycle:

Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

10-02-19 18:30



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-026 AFPID
Module ID Code	ECO 121814946	Serial number	
Standard temperature	25.0 °C	Monitor Cell	TVI001/002-2012
Mean Irradiance	1.006 kW/m ²	Calibration Value	35.00 mV/(kW/m ²)
Module Temp.	24.0 °C	Mon. Cell Temp.	24.0 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm ²
Module Area	19404.00 cm ²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m ²
Isc	9.11 A	Voc	45.45 V
Imp	8.55 A	Vmp	37.37 V
Pmax	319.35 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power ar ref 1	-1.00 W
Power ar ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.2 %
Cell Efficiency	18.1 %	Module Efficiency	16.5 %
Shunt res.	273.016 Ohm	Serie res.	0.541 Ohm

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10-02-19

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

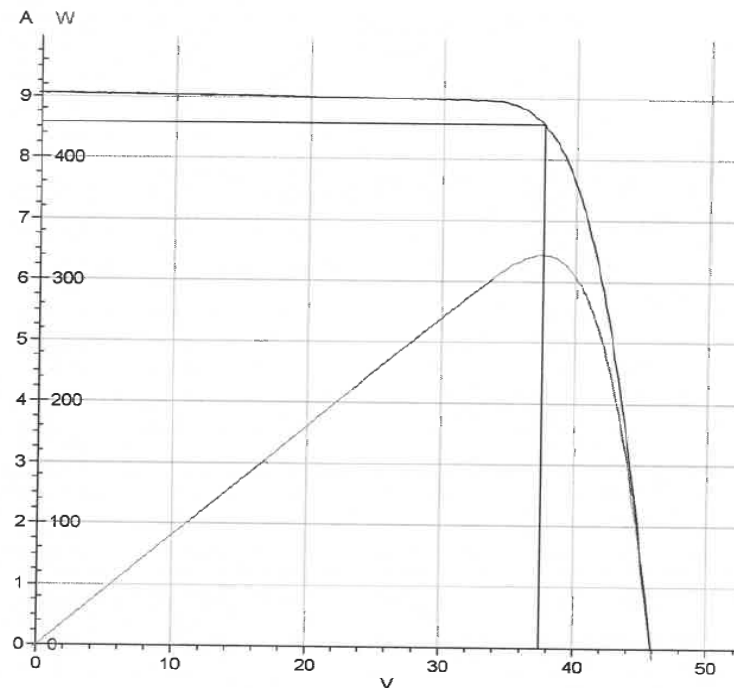
Seite 7 von 16
Page 7 of 16

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

10-02-19 18:23



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-027 AFPID
Module ID Code	ECO 121814945	Serial number	
Standard temperature	25.0 °C	Monitor Cell	TVI001/002-2012
Mean Irradiance	1.006 kW/m ²	Calibration Value	35.00 mV/(kW/m ²)
Module Temp.	26.4 °C	Mon. Cell Temp.	26.4 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm ²
Module Area	19404.00 cm ²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m ²
Isc	9.06 A	Voc	45.89 V
Imp	8.58 A	Vmp	37.51 V
Pmax	321.74 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power ar ref 1	-1.00 W
Power ar ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.4 %
Cell Efficiency	18.2 %	Module Efficiency	16.6 %
Shunt res.	506.681 Ohm	Serie res.	0.552 Ohm

Handwritten signature and date:
16.02.19

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 8 von 16
Page 8 of 16

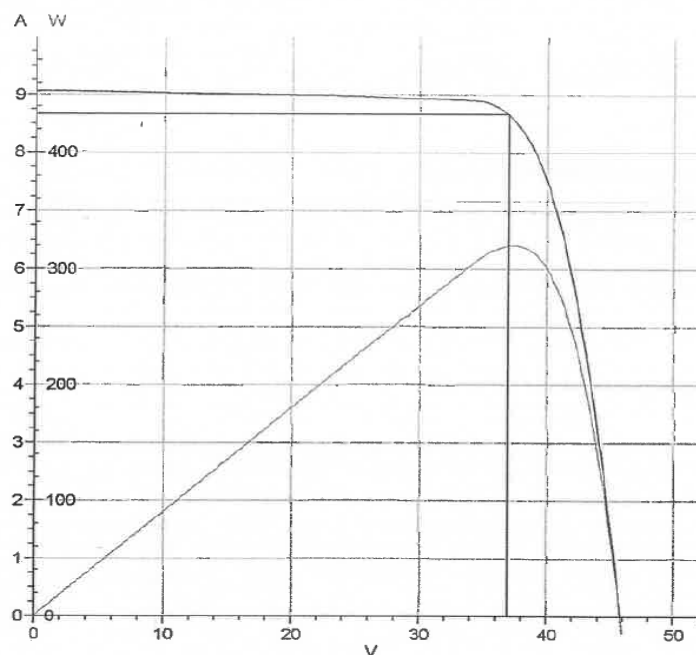
ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION



Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

16-02-19 11:53



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-026Af2npi
Module ID Code	ECO 121814946	Serial number	
Standard temperature	25.0 °C	Monitor Cell	TVI001/002-2012
Mean Irradiance	1.006 kW/m ²	Calibration Value	35.00 mV/(kW/m ²)
Module Temp.	26.6 °C	Mon. Cell Temp.	26.6 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm ²
Module Area	19404.00 cm ²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m ²
Isc	9.06 A	Voc	45.85 V
Imp	8.67 A	Vmp	36.95 V
Pmax	320.14 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power ar ref 1	-1.00 W
Power ar ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.1 %
Cell Efficiency	18.1 %	Module Efficiency	18.5 %
Shunt res.	287.061 Ohm	Serie res.	0.566 Ohm

Handwritten signature: P. A. B. C.
Date: 16.02.19

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 9 von 16
Page 9 of 16

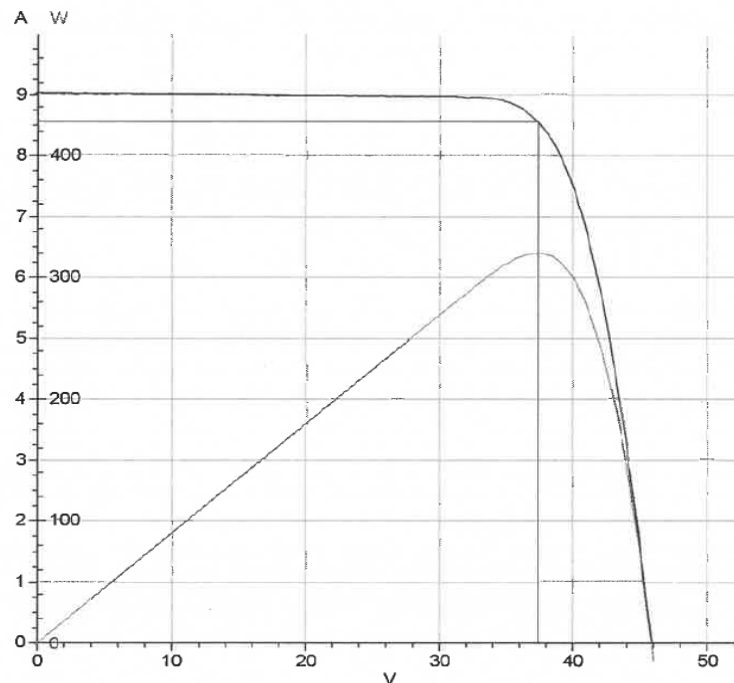
ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION



Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

16-02-19 11:50



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-027Af2npi
Module ID Code	ECO 121814945	Serial number	
Standard temperature	25.0 °C	Monitor Cell	TVI001/002-2012
Mean Irradiance	1.006 kW/m ²	Calibration Value	35.00 mV/(kW/m ²)
Module Temp.	26.9 °C	Mon. Cell Temp.	26.9 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm ²
Module Area	19404.00 cm ²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m ²
Isc	9.03 A	Voc	45.87 V
Imp	8.56 A	Vmp	37.42 V
Pmax	320.36 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power ar ref 1	-1.00 W
Power ar ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.3 %
Cell Efficiency	18.1 %	Module Efficiency	16.5 %
Shunt res.	592.836 Ohm	Serie res.	0.564 Ohm

Handwritten signature: K. A. P. C.
Handwritten date: 16.02.19

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 10 von 16
Page 10 of 16

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

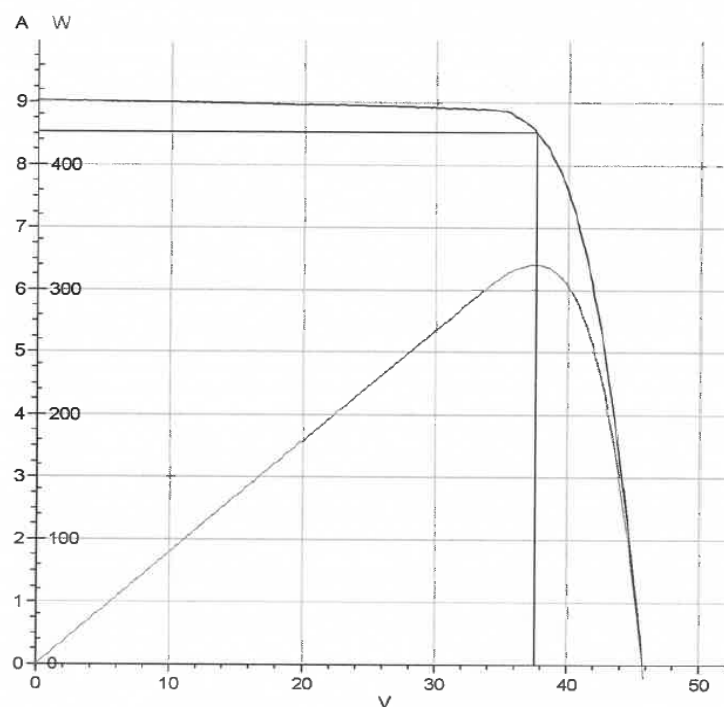
Measurement Reports after Illrd PID Cycle:



Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

21-02-19 15:17



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-026 AF PI
Module ID Code	ECO 121814946	Serial number	
Standard temperature	25.0 °C	Monitor Cell	TVI001/002-2012
Mean Irradiance	1.006 kW/m ²	Calibration Value	35.00 mV/(kW/m ²)
Module Temp.	24.5 °C	Mon. Cell Temp.	24.5 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm ²
Module Area	19404.00 cm ²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m ²
Isc	9.03 A	Voc	45.76 V
Imp	8.53 A	Vmp	37.58 V
Pmax	320.71 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power ar ref 1	-1.00 W
Power ar ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.6 %
Cell Efficiency	18.1 %	Module Efficiency	16.5 %
Shunt res.	328.818 Ohm	Serie res.	0.530 Ohm

Handwritten signature: K. J. C.
Handwritten date: 21.02.19

ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 11 von 16
Page 11 of 16

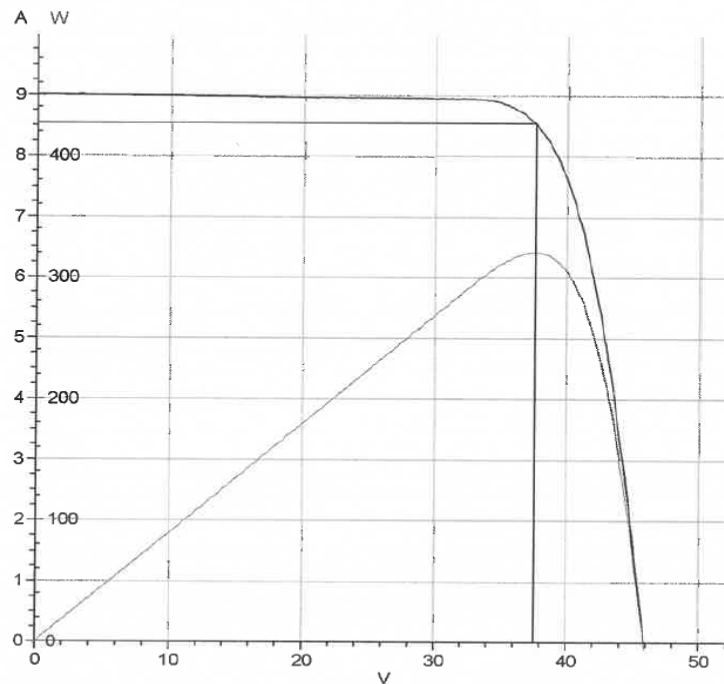
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ADDITIONAL DOCUMENTATION



Performance measurement

PASAN SLAB Tester - STC + SM V2.4.4

21-02-19 15:24



Measurement Data (Temp. compensated results)

PASAN Tester version	2.4.4	Operator	A000861147-027 AF PI
Module ID Code	ECO 121814945	Serial number	
Standard temperature	25.0 °C	Monitor Cell	TVI001/002-2012
Mean Irradiance	1.006 kW/m ²	Calibration Value	35.00 mV/(kW/m ²)
Module Temp.	24.5 °C	Mon. Cell Temp.	24.5 °C
Mask	NO-MASK 1.000 -	Cell Area	245.71 cm ²
Module Area	19404.00 cm ²	Cells in Parallel	1
Cells in Series	72	Measurement irradiance	1.000 kW/m ²
Isc	9.01 A	Voc	45.84 V
Imp	8.55 A	Vmp	37.58 V
Pmax	321.33 W	Reference vlt 1	0.00 V
Reference vlt 2	0.00 V	Power ar ref 1	-1.00 W
Power ar ref 2	-1.00 W	Current at ref 1	0.00 A
Current at ref 2	0.00 A	Fill Factor	77.8 %
Cell Efficiency	18.2 %	Module Efficiency	16.6 %
Shunt res.	592.173 Ohm	Serie res.	0.546 Ohm

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21.02.19

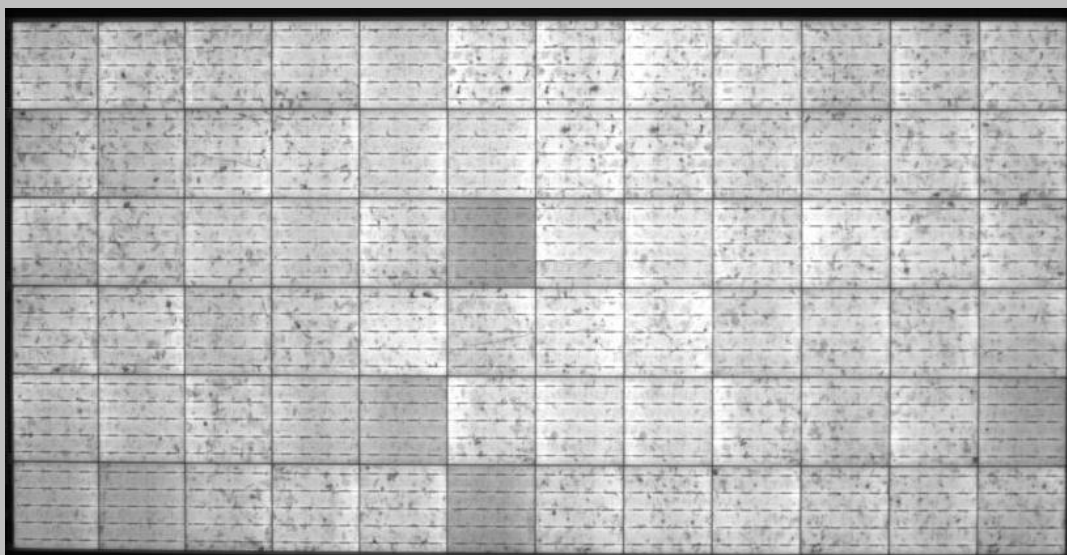
ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 12 von 16
Page 12 of 16

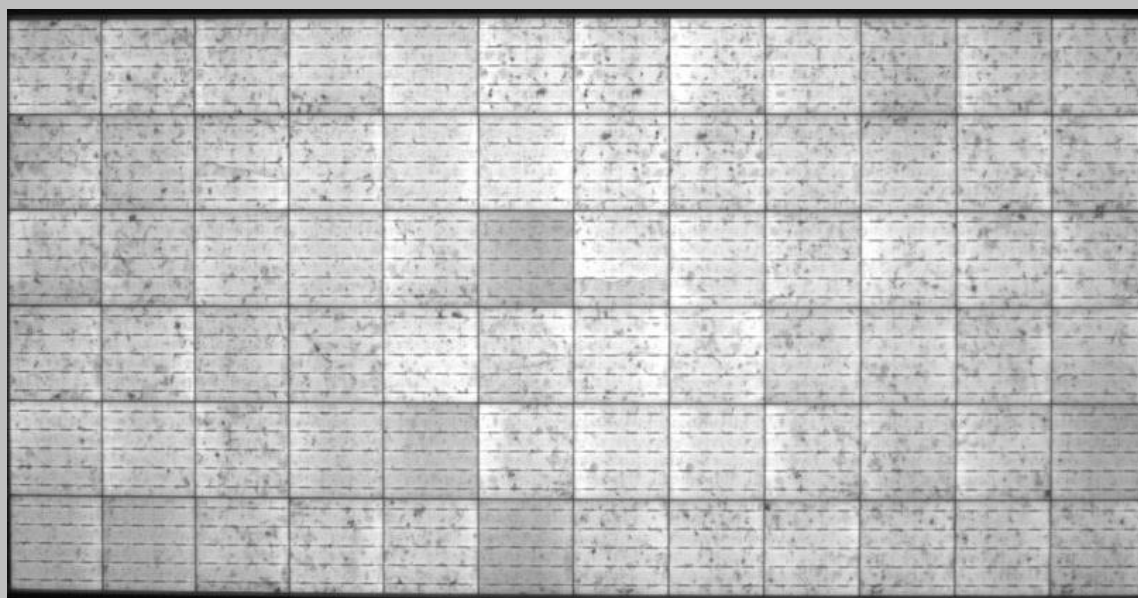
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ADDITIONAL DOCUMENTATION

EL Images of Test samples :

A000861147-026(Initial)



A000861147-026 (After- 1st PID Cycle)

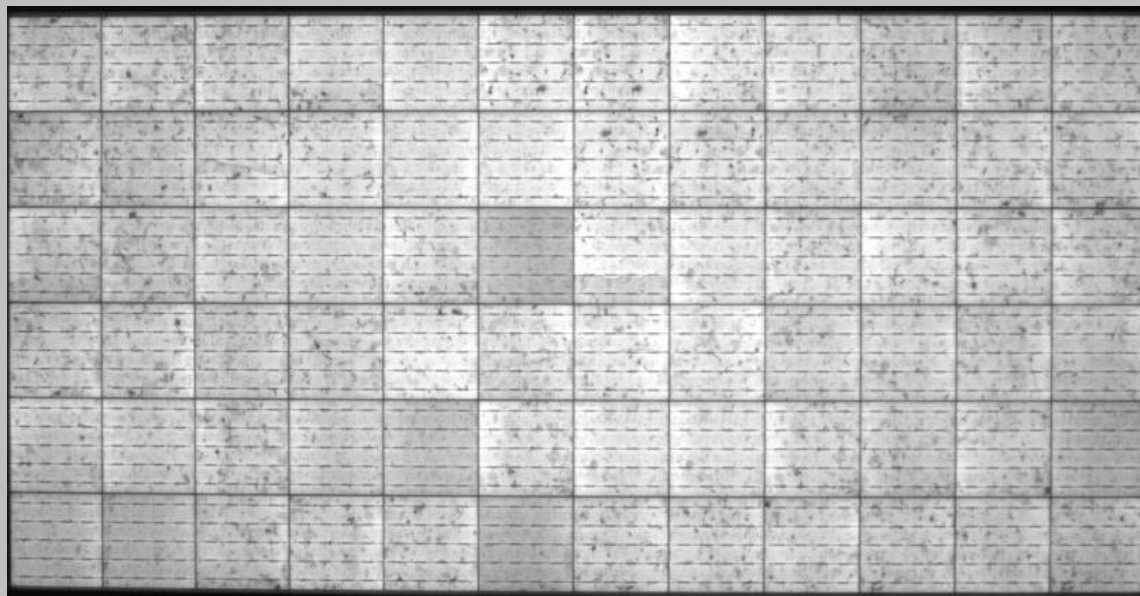


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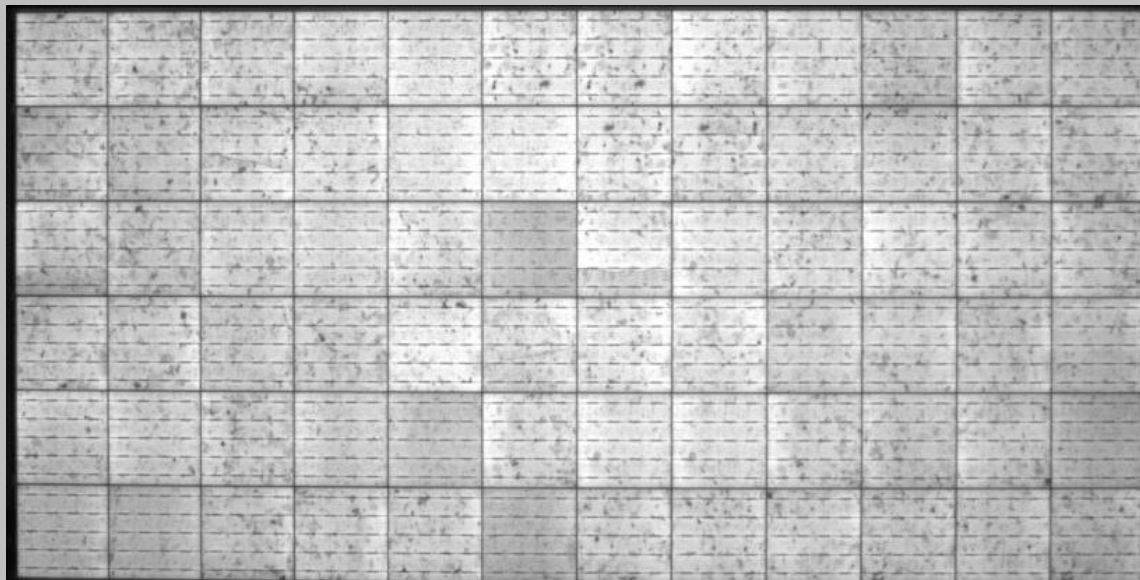
Seite 13 von 16
Page 13 of 16

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

A000861147-026(After- IIInd PID Cycle)



A000861147-026(After- IIIrd PID Cycle)

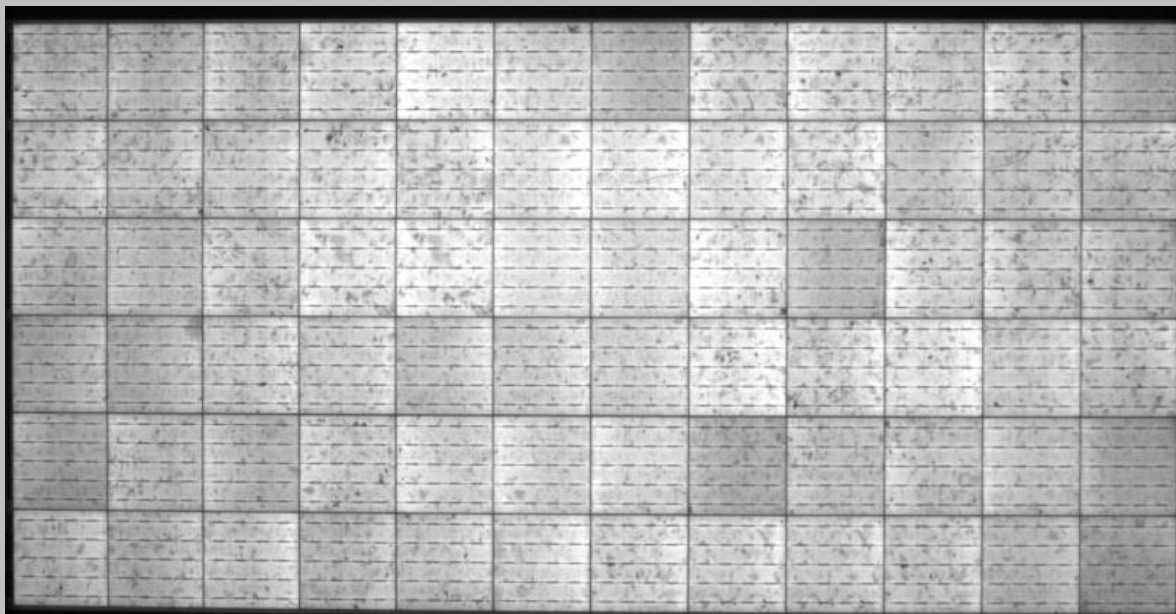


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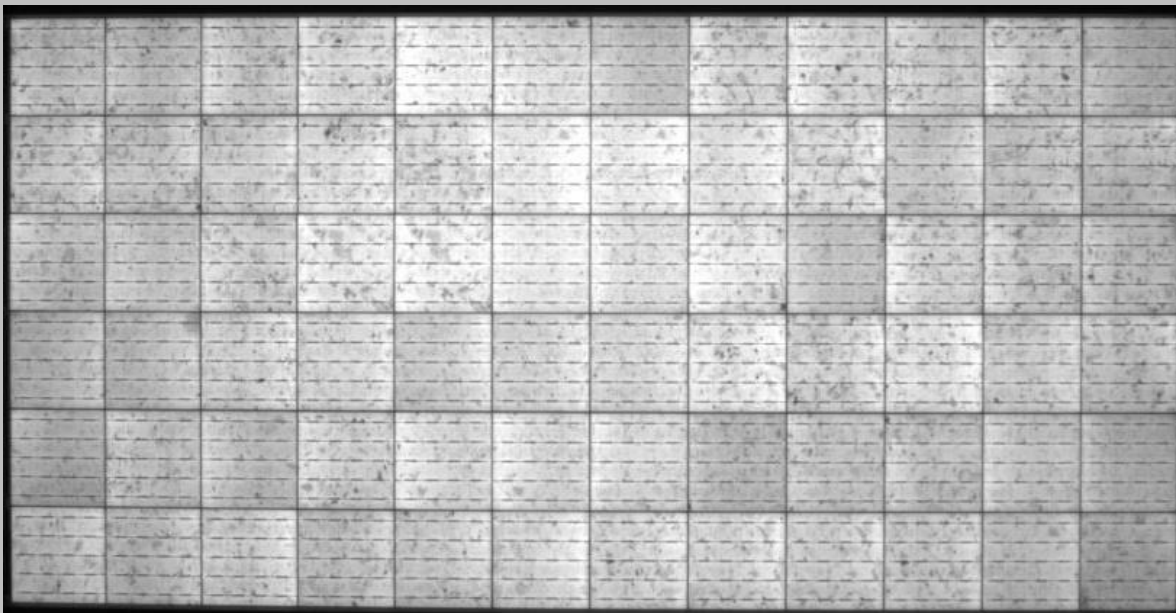
Seite 14 von 16
Page 14 of 16

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

A000861147-027(Initial)



A000861147-027(After- 1st PID Cycle)

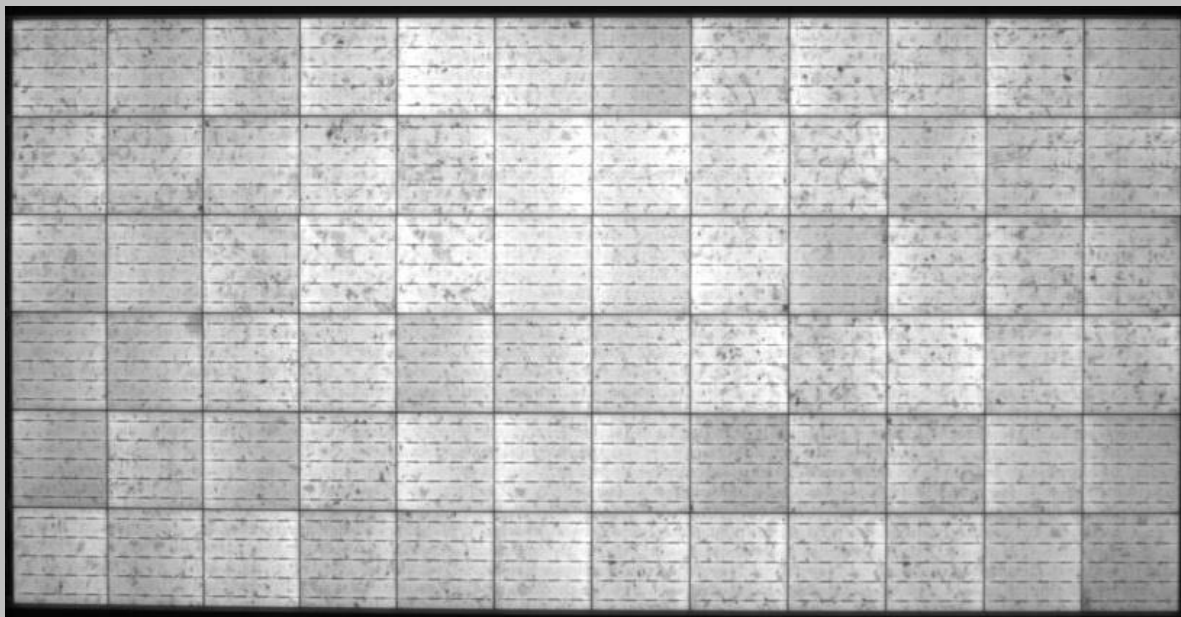


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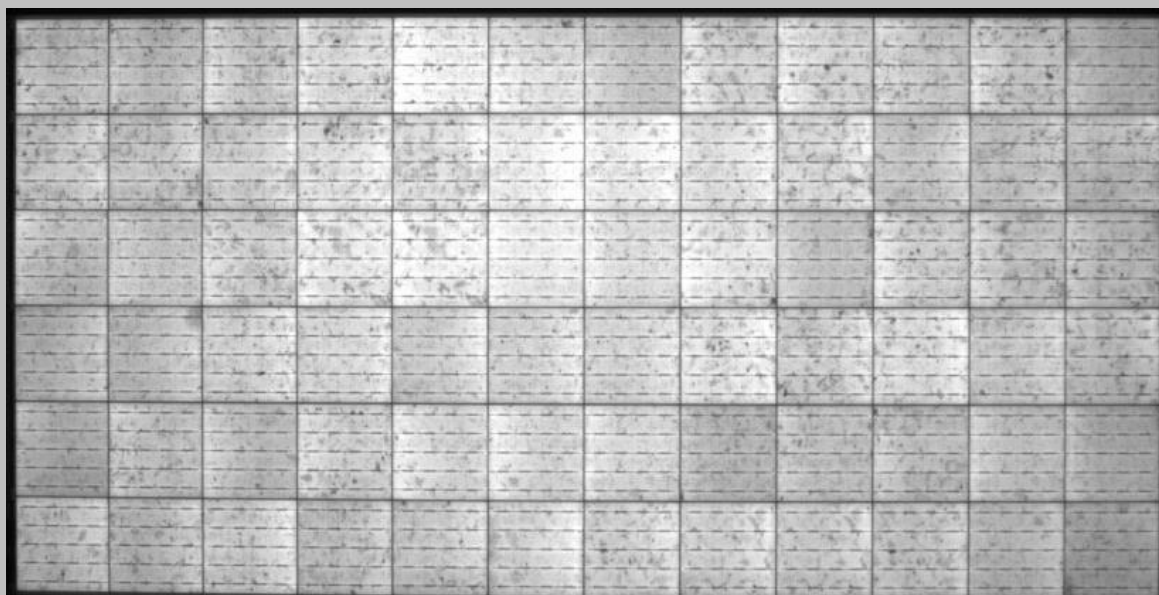
Seite 15 von 16
Page 15 of 16

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

A000861147-027(After- IIInd PID Cycle)



A000861147-027(After- IIIrd PID Cycle)

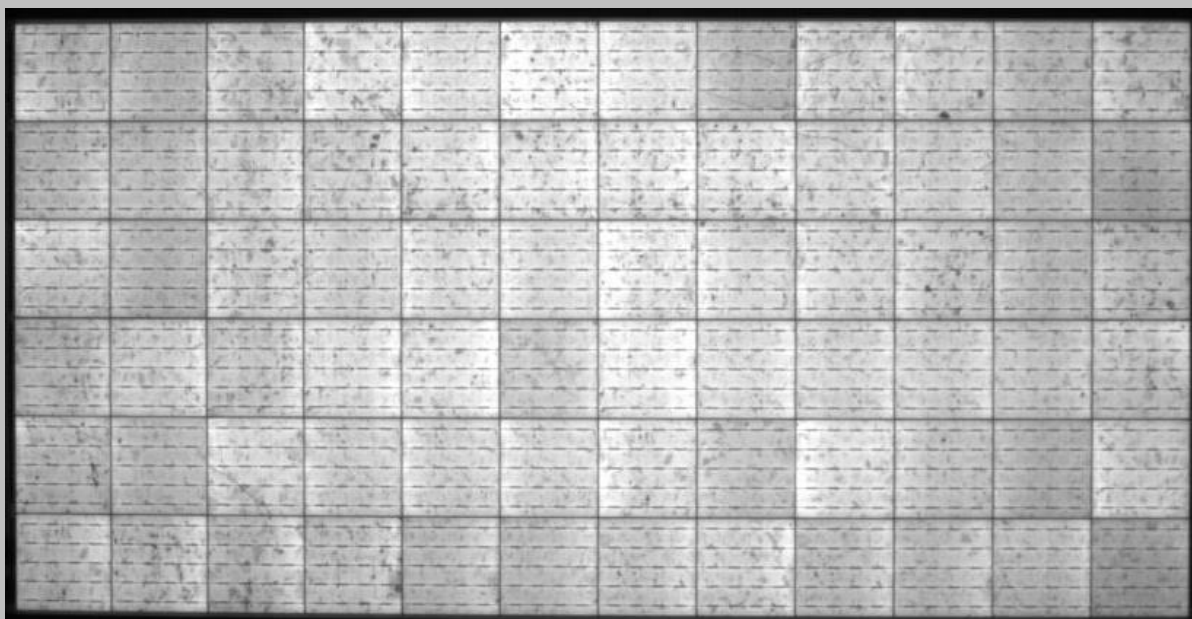


ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 16 von 16
Page 16 of 16

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

A000861147-025(Control module)



ANLAGE zum Prüfbericht-Nr.:
APPENDIX to Test Report No.: ULR-TC568819400000074F 001

Seite 1 von 1
Page 1 of 1

FOTO-DOKUMENTATION PHOTO-DOCUMENTATION

Pictures of Modules



Fig.1:Front view of the module

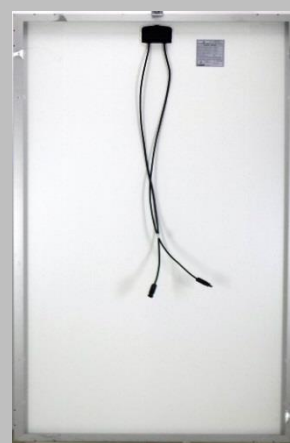


Fig.2:Rear view of the module



Fig.3:Detail view of the Solar cell



Fig.4: Detail view of Junction Box

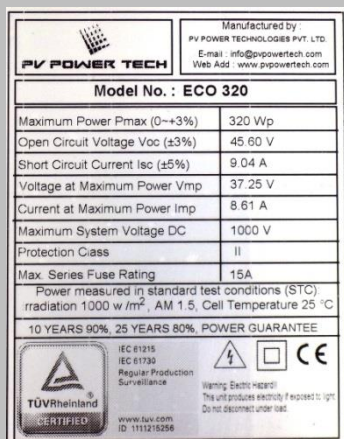


Fig.5: detail view of the Type label



Fig.6: detail view of the Serial number