

Prüfbericht-Nr.: <i>Test Report No.:</i>	21208413.017	Auftrags-Nr.: <i>Order No.:</i>	21238781	Seite 1 von 9 <i>Page 1 of 9</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	223874	Auftragsdatum: <i>Order date:</i>	22 December 2016		
Auftraggeber: <i>Client:</i>	LG Electronics Inc. 168, Suchul-daero, Gumi-si, Gyeongsangbuk-do, 39368, Korea				
Prüfgegenstand: <i>Test item:</i>	Photovoltaic (PV) modules				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	LG395N2W-A5				
Auftrags-Inhalt: <i>Order content:</i>	Ammonia corrosion testing of photovoltaic (PV) modules				
Prüfgrundlage: <i>Test specification:</i>	IEC 62716:2013 / EN 62716:2013 Photovoltaic (PV) modules - Ammonia corrosion testing				
Wareneingangsdatum: <i>Date of receipt:</i>	22 December 2016	Detaillierte Fotodokumentation siehe Anlage zu diesem Bericht Detailed photo documentation see appendix to this report			
Prüfmuster-Nr.: <i>Test sample No.:</i>	HV2017000868 - HV2017000870				
Prüfzeitraum: <i>Testing period:</i>	16 January 2017 – 22 February 2017				
Ort der Prüfung: <i>Place of testing:</i>	Cologne				
Prüflaboratorium: <i>Testing laboratory:</i>	Solar Energy Assessment Center				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
03.03.2017	T. Herbrecht, project engineer	03.03.2017	D. Dopmeier, technical certifier		
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:		N/A			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* 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. <i>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.</i>					

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Liste der verwendeten Prüfmittel
List of used test equipment

Prüfmittel <i>Test equipment</i>	Prüfmittel-Nr. / ID-Nr. <i>Equipment No. / ID-No.</i>	Nächste Kalibrierung <i>Next calibration</i>
<p>All equipment used for tests, including equipment for subsidiary measurements having a significant effect on the accuracy or validity of the result of the test is calibrated before being put into service. The laboratory has an established programme and procedure for the calibration of its equipment according to EN ISO/IEC 17025 (Reg. no.: D-PL-11120-01-00).</p>		

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Produktbeschreibung
Product description

1 Produktdetails
Product details

LG395N2W-A5

2 Verwendete Materialien
Used materials

see Constructional Data Form (CDF) in the annex of this test report

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

1. LG Electronics Inc.
77, Sanho-daero, Gumi-si, Gyeongsangbuk-do,
39381, Korea
2. LG Electronics Inc.
168, Suchul-daero
Gumi-si, Gyeongsangbuk-do
39368, Korea

4 Zusammenfassung der Prüfergebnisse
Summary of test results

According to the inquiry the resistance to ammonia of photovoltaic (PV) modules should be assessed in accordance with **IEC 62716:2013 / EN 62716:2013**. For the qualification of the modules to this test initial and final control measurements were performed before and after the ammonia corrosion testing. The measurements included relative power measurements, insulation testing and visual inspections. The maximum permissible power degradation of 5 % must not be exceeded. Furthermore the minimum requirements for the insulation test and wet leakage test as defined in IEC 61215:2005-10.3 and -10.15 have to be met. No major visual defects as defined in IEC 61215:2005 shall occur.

The tests of the requirements of **IEC 62716:2013 / EN 62716:2013** were all fulfilled according to its regulations of the pass criteria.

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Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

- List of test samples			
Sample No.	Sample S/N	Remarks / constructional characteristics (e.g. cell, backsheet, frame type)	
HV2017000868	612K5XL1902F	A-Reference	—
HV2017000869	612K5AJ1902B	Ammonia Corrosion Test	
HV2017000870	612K5CY19027	Ammonia Corrosion Test	

6.2 c) Visual inspection (Initial)			
Sample No.	Nature and position of initial findings		
HV2017000868	No visual defects		P
HV2017000869	No visual defects		P
HV2017000870	No visual defects		P
Supplementary information: -			

6.2 a) Maximum power determination (Initial)							
Module temperature [°C]			corrected to 25				—
Irradiance [W/m²]			1000				
Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	
HV2017000868	393.8	39.21	10.04	49.36	10.35	77.1	—
HV2017000869	393.9	39.23	10.04	49.36	10.42	76.6	—
HV2017000870	393.2	39.19	10.03	49.31	10.41	76.6	—
Supplementary information: -							

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6.2 e)	Insulation test (Initial)					
Maximum system voltage [V _{DC}]		1000			—	
High voltage applied [V _{DC}]		3000				
Insulation resistance measured at [V _{DC}]		1000				
Sample No.	Measured	Area	Result*	Dielectric breakdown		
	[GΩ]	[m ²]	[GΩ × m ²]	Yes (description)	No	
HV2017000868	4.70	2.11	9.9		X	P
HV2017000869	4.67	2.11	9.9		X	P
HV2017000870	6.22	2.11	13.1		X	P
* Minimum requirement acc. to the standard is 0.04 GΩ × m ² .						
Supplementary information: -						

6.2 b)	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
Sample No.	Measured	Area	Result*		—
	[GΩ]	[m ²]	[GΩ × m ²]		
HV2017000868	1508.5	2.11	3183.0		P
HV2017000869	1508.5	2.11	3183.0		P
HV2017000870	1508.5	2.11	3183.0		P
* Minimum requirement acc. to the standard is 40 MΩ × m ² .					
Supplementary information: -					

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6.2 d)	Ground continuity test (Initial)		
Maximum over-current protection rating [A]	20		—
Current applied [A]	50.0		
Location of designated grounding point	E		
Location of second contacting point	A		
Sample No.	Voltage [mV]	Resistance [mΩ]	
HV2017000868	105.0	2.1	P
HV2017000869	85.0	1.7	P
HV2017000870	70.0	1.4	P
Supplementary information: -			

7	Ammonia corrosion test		
Sample No. 1	HV2017000869		—
Sample No. 2	HV2017000870		
NH ₃ - concentration [ppm]	6667		
Temperature [°C]	60		
Relative humidity [%]	approx. 100 (condensation on the samples)		
One cycle (24 h)	- exposure of NH ₃ for 8 h and 60°C with nearly 100 % condensation on the samples - drying for 16 h at normal atmosphere (23 °C and max. 75 % rel. humidity)		
Duration	20 cycles = 480 h (20 days)		
Comment	according to DIN EN ISO 3231/ DIN EN ISO 6988 DIN 50018		
Supplementary information: -			

9.2 c)	Visual inspection after ammonia corrosion test		
Sample No.	Nature and position of findings	—	
HV2017000869	No significant visual defects	P	
HV2017000870	No significant visual defects	P	
Supplementary information: -			

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Clause	Anforderungen - Prüfungen / <i>Requirements - Tests</i>	<i>Measuring results - Remarks</i>	<i>Evaluation</i>

9.2 a)	Maximum power determination after ammonia corrosion test							
Module temperature [°C]				corrected to 25				—
Irradiance [W/m²]				1000				
Sample No.	P _{max} [W]	V _{mpp} [V]	I _{mpp} [A]	V _{oc} [V]	I _{sc} [A]	FF [%]	Degradation [%]	
HV2017000869	388.5	38.79	10.02	49.32	10.38	75.9	-1.4	P
HV2017000870	388.6	39.32	9.88	49.27	10.39	75.9	-1.2	P
Supplementary information: Positive/Negative degradation values indicate the increase/decrease of P _{max} . Maximum allowable P _{max} degradation after this test is -5.0%.								

9.2 e)	Insulation test after ammonia corrosion test							
Maximum system voltage [V _{DC}]				1000				—
High voltage applied [V _{DC}]				3000				
Insulation resistance measured at [V _{DC}]				1000				
Sample No.	Measured	Area	Result*	Dielectric breakdown				
	[GΩ]	[m²]	[GΩ × m²]	Yes (description)		No		
HV2017000869	5.79	2.11	12.2			X		P
HV2017000870	5.13	2.11	10.8			X		P
* Minimum requirement acc. to the standard is 0.04 GΩ × m².								
Supplementary information: -								

9.2 e)	Insulation test after ammonia corrosion test							
Maximum system voltage [V _{DC}]				1500				—
High voltage applied [V _{DC}]				4000				
Insulation resistance measured at [V _{DC}]				1500				
Sample No.	Measured	Area	Result*	Dielectric breakdown				
	[GΩ]	[m²]	[GΩ × m²]	Yes (description)		No		
HV2017000869	5.34	2.11	11.3			X		P
HV2017000870	5.82	2.11	12.3			X		P
* Minimum requirement acc. to the standard is 0.04 GΩ × m².								
Supplementary information: -								

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9.2 b)	Wet leakage current test after ammonia corrosion test		
Insulation resistance measured at [V _{DC}]	1000		—
Solution resistivity [Ω cm]	< 3,500		P
Solution temperature [°C]	22 ± 3		P
Sample No.	Measured	Area	Result*
	[GΩ]	[m ²]	[GΩ × m ²]
HV2017000869	717.0	2.11	1512.8
HV2017000870	844.6	2.11	1782.1
* Minimum requirement acc. to the standard is 40 MΩ × m ² .			
Supplementary information: -			

9.2 b)	Wet leakage current test after ammonia corrosion test		
Insulation resistance measured at [V _{DC}]	1500		—
Solution resistivity [Ω cm]	< 3,500		P
Solution temperature [°C]	22 ± 3		P
Sample No.	Measured	Area	Result*
	[GΩ]	[m ²]	[GΩ × m ²]
HV2017000869	698.2	2.11	1473.1
HV2017000870	735.7	2.11	1552.2
* Minimum requirement acc. to the standard is 40 MΩ × m ² .			
Supplementary information: -			

9.2 d)	Ground continuity test after ammonia corrosion test		
Maximum over-current protection rating [A]	20		—
Current applied [A]	50.0		
Location of designated grounding point	E		
Location of second contacting point	A		
Sample No.	Voltage [mV]	Resistance [mΩ]	
HV2017000869	500.0	10.0	
HV2017000870	340.0	6.8	
Supplementary information: -			

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4.2	Bypass diode functional test after ammonia corrosion test						
Number of diodes in junction box				3			—
Diode manufacturer				JMTHY			
Diode type designation				THY2550			
Max. permissible junction temperature T_{jmax} [°C] (according to diode datasheet)				200			
Sample No.	Diode 1	Diode 2	Diode 3	Diode 4	Diode 5	Diode 6	
HV2017000869	P	P	P	-	-	-	P
HV2017000870	P	P	P	-	-	-	P
Supplementary information: -							

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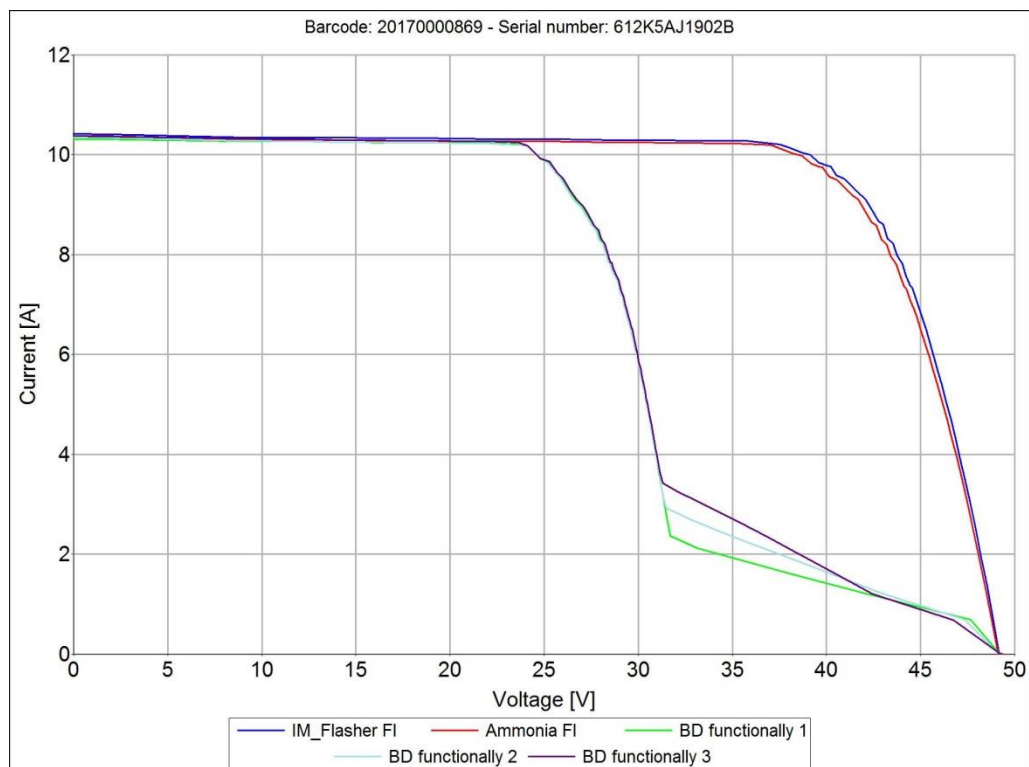
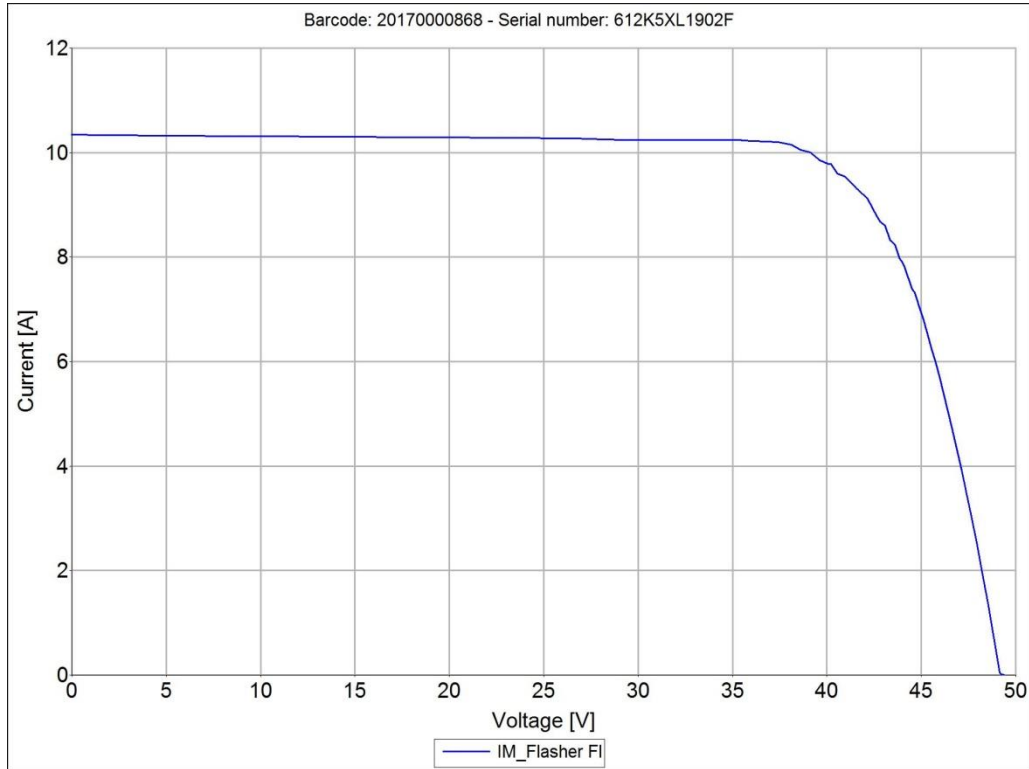
ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Statement of the estimated uncertainty of the test verdicts

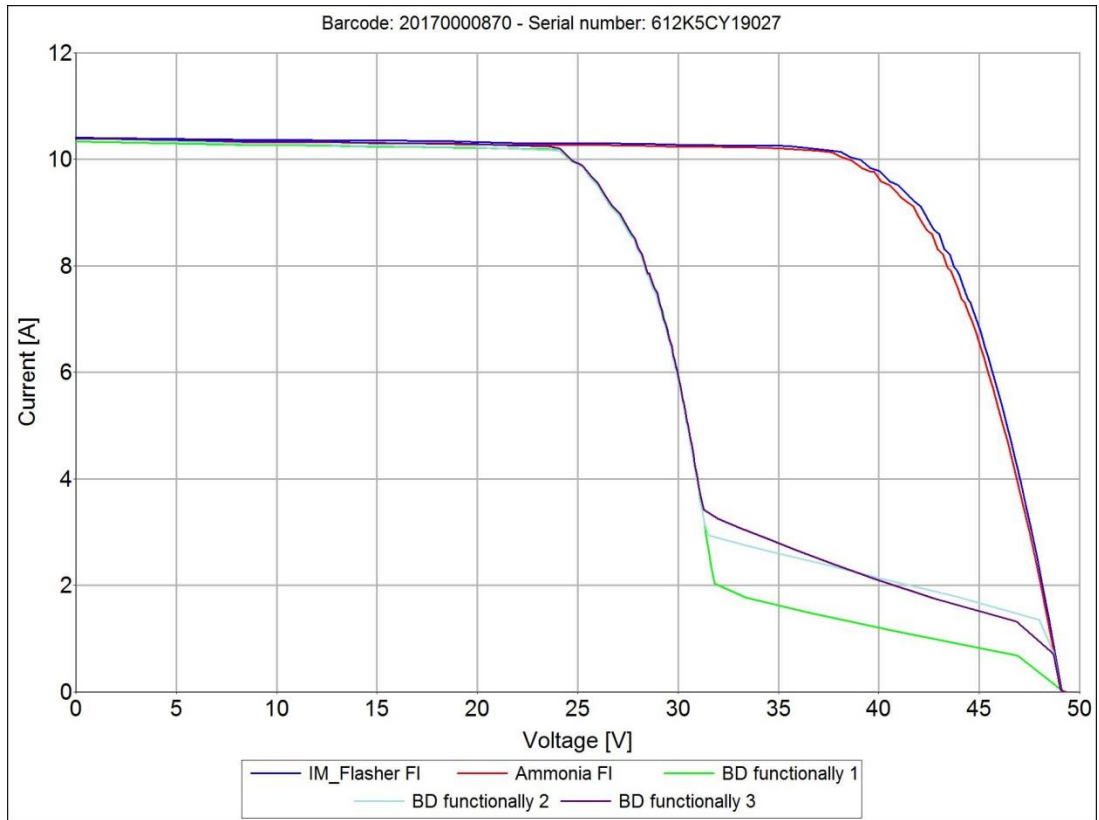
- Electrical performance rating is outside the scope of IEC 61215:2005 qualification testing. The verdicts of performance rating are only related to the test samples that were subjected to the tests. They cannot be generalised to the modules from the series production.
- The calibration to STC was performed with a class AAA solar simulator. The extended measurement uncertainty is:
 - o $2\sigma (P_{\text{mpp}}) \leq \pm 2.5 \%$
 - o $2\sigma (I_{\text{SC}}) \leq \pm 2.3 \%$
 - o $2\sigma (V_{\text{OC}}) \leq \pm 1.0 \%$
- Relative measurements were performed with a flash type solar simulator.
- The accuracy of measurement reproduction with the solar simulator is less than $\pm 1\%$.

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Measurement reports



ZUSATZ-DOKUMENTATION
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ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

Constructional Data Form

Object	Manufacturer / trademark	Type / model
Front cover	ACHT	AR-Coated Solar Glass
Rear cover	SKC	BQ3RE 30
Encapsulation material	SKC	EF2T
		EF2N
Frame parts	HAIHONG	Corner-key
Adhesive (frame)	Dow-Corning	PV-8007
Junction box	JMTHY	JL29x
Bypass diode	JMTHY	THY2550
Cable	JMTHY	PV1500DC-F 1x4.0
Connector	JMTHY	PV-JM601A
Adhesive (junction box)	Dow-Corning	PV-804

FOTO-DOKUMENTATION
PHOTO-DOCUMENTATION

Fig. 1: front view of module type LG395N2W-A5



Fig. 2: rear view of module type LG395N2W-A5



Fig. 3: detail view of junction box LG395N2W-A5



Fig. 4: detail view of type label LG395N2W-A5



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FOTO-DOKUMENTATION
PHOTO-DOCUMENTATION

Photos of modules after ammonia corrosion test

*Fig. 5: side view of frame of
module type LG395N2W-A5*



*Fig. 6: inner side of frame of
module type LG395N2W-A5*



Fig. 7: front view of frame of type label LG395N2W-A5

