

Test Report issued under the responsibility of:


NCB TÜV SÜD Product Service GmbH
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Germany



TEST REPORT IEC 61215-series:2016 Terrestrial photovoltaic (PV) modules – Design qualification and type approval	
Report Number	: 704061905401-02 part 1 of 2
Date of issue.....	: 2019-08-09
Total number of pages	: 48
TÜV SÜD Branch	: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
Applicant's name.....	: Hengdian Group DMEGC Magnetics Co., LTD (76043).
Address.....	: Hengdian Industrial Zone, 322118 Dongyang City, Zhejiang Province P.R. China
Test specification:	
Standard	: <input checked="" type="checkbox"/> IEC 61215-1:2016 <input checked="" type="checkbox"/> IEC 61215-2:2016 <input checked="" type="checkbox"/> IEC 61215-1-1:2016 <input type="checkbox"/> IEC 61215-1-2:2016 <input type="checkbox"/> IEC 61215-1-3:2016 <input type="checkbox"/> IEC 61215-1-4:2016
Test procedure	: TÜV SÜD Mark
Non-standard test method	: N/A
Test Report Form No.....	: IEC61215D_SE
Test Report Form(s) Originator....	: TÜV SÜD Product Service GmbH
Master TRF.....	: 2017-11-30
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Test item description :	Photovoltaic (PV) Module(s)	
Trade Mark :	DMEGC	
Manufacturer :	DMEGC SOLAR Module Factory. (Production Facility Code: 76053). Hengdian Industrial Zone, 322118 Dongyang City, Zhejiang Province P.R.China.	
Model/Type reference :	See page 6~7 of this report	
Ratings :	See page 6~7 of this report	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	TÜV SÜD Branch:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
	Location/address:	No. 151 Heng Tong Road, Shanghai 200070, P. R. China
<input checked="" type="checkbox"/>	Associated Testing Laboratory:	Yangzhou Opto-Electrical Products Testing Institute.
	Testing location/address:	No. 10 West Kaifa Road, Yangzhou, 225009 Jiangsu, P. R. China.
	Tested by (name + signature)	Yang Xu
	Approved by (name + signature)	Tao Wang
<input type="checkbox"/>	Testing procedure: TMP/CTF Stage 1:	
	Testing location/address:	
	Tested by (name + signature)	
	Approved by (name + signature)	
<input type="checkbox"/>	Testing procedure: WMT/CTF Stage 2:	
	Testing location/address:	
	Tested by (name + signature)	
	Witnessed by (name + signature)	
	Approved by (name + signature)	
<input type="checkbox"/>	Testing procedure: SMT/CTF Stage 3 or 4:	
	Testing location/address:	
	Tested by (name + signature)	
	Witnessed by (name + signature)	
	Approved by (name + signature)	
	Supervised by (name + signature):	

List of Attachments (including a total number of pages in each attachment):	
	attachment number / number of pages
Installation manual	Attachment 1/23
Drawings mechanical	N/A
Circuit diagram	see report no.: 704061905401-02 Annex 2
Photographs	N/A
Component datasheets / certificates	Attachment 2/11
Others:	
Product Description Sheet (Manufacturers and type references)	Annex 1, _3_ pages
Test table for verifying other stabilization procedure	Annex 2, _N/A_ pages
Lower and higher output power modules	Annex 3, _2_ pages
List of test equipment used	Annex 4, _2_ pages

Summary of testing:	
<p>Tests performed (name of test and test clause): 1. Based on project 704061905401-01, add new cells: DMPD5B159-223, dimension:158.75 x158.755(mm), supplied by Hengdian Group DMEGC Magnetics Co.,Ltd.</p>  <p>According to retest guideline 4.2.3&4.2.5, the following test were conducted on model DM385-M159-72: Hot-spot endurance test (MQT 09) UV preconditioning test (MQT 10) Thermal cycling test, 50 cycles (MQT 11) Humidity freeze test (MQT 12) TC200 test (MQT 11) Damp heat test (MQT 13) Hail test (MQT 17) Static mechanical load test (MQT 16) The test module could cover other model types of this family and 60 cells family below: DMxxx-M159-72,(xxx=385-395,in step of 5) DMxxx-M159-72BK,(xxx=385-395,in step of 5) DMxxx-M159-60,(xxx=320-325,in step of 5) DMxxx-M159-60BK,(xxx=320-325,in step of 5) 2. Add new half cut cells: DMPD5B159-223, dimension:158.75 x79.375 (mm), supplied by Hengdian Group DMEGC Magnetics Co.,Ltd. the test has been verified in project 704061707705-01. New cells can be used on the following module</p>	<p>Testing location: Yangzhou Opto-Electrical Products Testing Institute. No. 10 West Kaifa Road, Yangzhou, 2225009 Jiangsu, P. R. China.</p>

models:
 DMHxxxM6A-144SW,(xxx=385-395,in step of 5)
 DMHxxxM6A-144BB,(xxx=385-395,in step of 5)
 DMHxxxM6A-144BW,(xxx=385-395,in step of 5)
 DMHxxxM6A-120SW,(xxx=320-325,in step of 5)
 DMHxxxM6A-120BB,(xxx=320-325,in step of 5)
 DMHxxxM6A-120BW,(xxx=320-325,in step of 5)
 xxx is standing for rated output power at STC

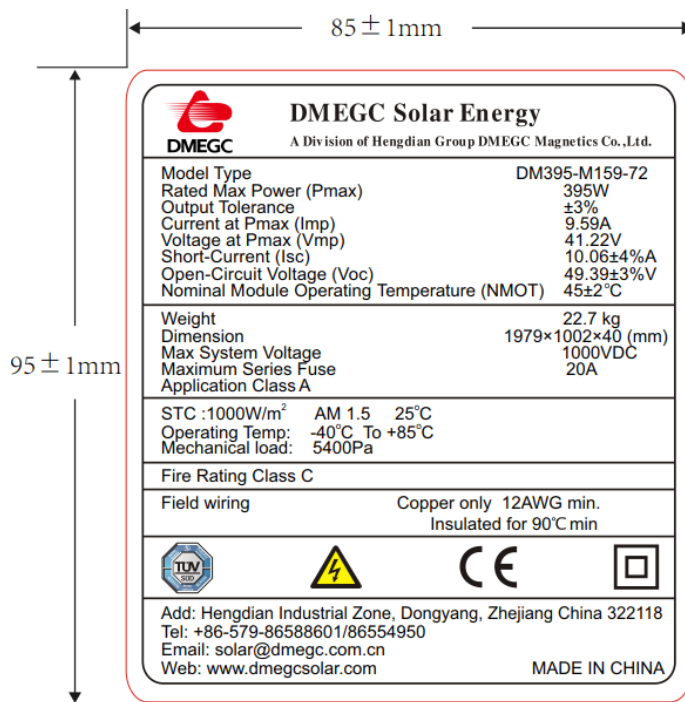
Summary of compliance with National Differences (List of countries addressed):

N/A

The product fulfils the requirements of _____ (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:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by TÜV SÜD Product Service GmbH that own these marks.



(Note: The marking plate 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. As there will be other lower wattages to be covered under same report which follows same back label format.)

Test item particulars	N/A
Accessories and detachable parts included in the evaluation	N/A
Mounting system used.....	Refer to user manual
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	HF – Humidity Freeze
Vmp – Maximum power voltage	DH – Damp Heat
Imp – Maximum power current	TC – Thermal Cycling
Isc – Short circuit current	α – Current temperature coefficient
Voc – Open circuit voltage	β – Voltage temperature coefficient
FF – Fill factor	δ – power temperature coefficient
STC – Standard Test Conditions (25°C, 1 000 W/m ²)	NMOT – Nominal Module Operating Temperature (20°C, 800 W/m ²)
MQT – Module Quality Tests	V _{FMrated} – Rated diode(s) forward voltage
VFM – Measured diode(s) forward voltage	NP – Nameplate
m_1 – the measurement uncertainty in % of laboratory for Pmax	m_2 – the measurement uncertainty in % of laboratory for Voc
m_3 – the measurement uncertainty in % of laboratory for Isc	t_1 – the manufacturer's rated lower production tolerance in % for Pmax
t_2 – the manufacturer's rated upper production tolerance in % for Voc	t_3 – the manufacturer's rated upper production tolerance in % for Isc
r – Pmax measurement reproducibility	
Testing Dates (YYYY-MM-DD)	
Date of first test item received.....	2019-04-20
Dates of tests (beginning/end)	2019-04-26 to 2019-07-31

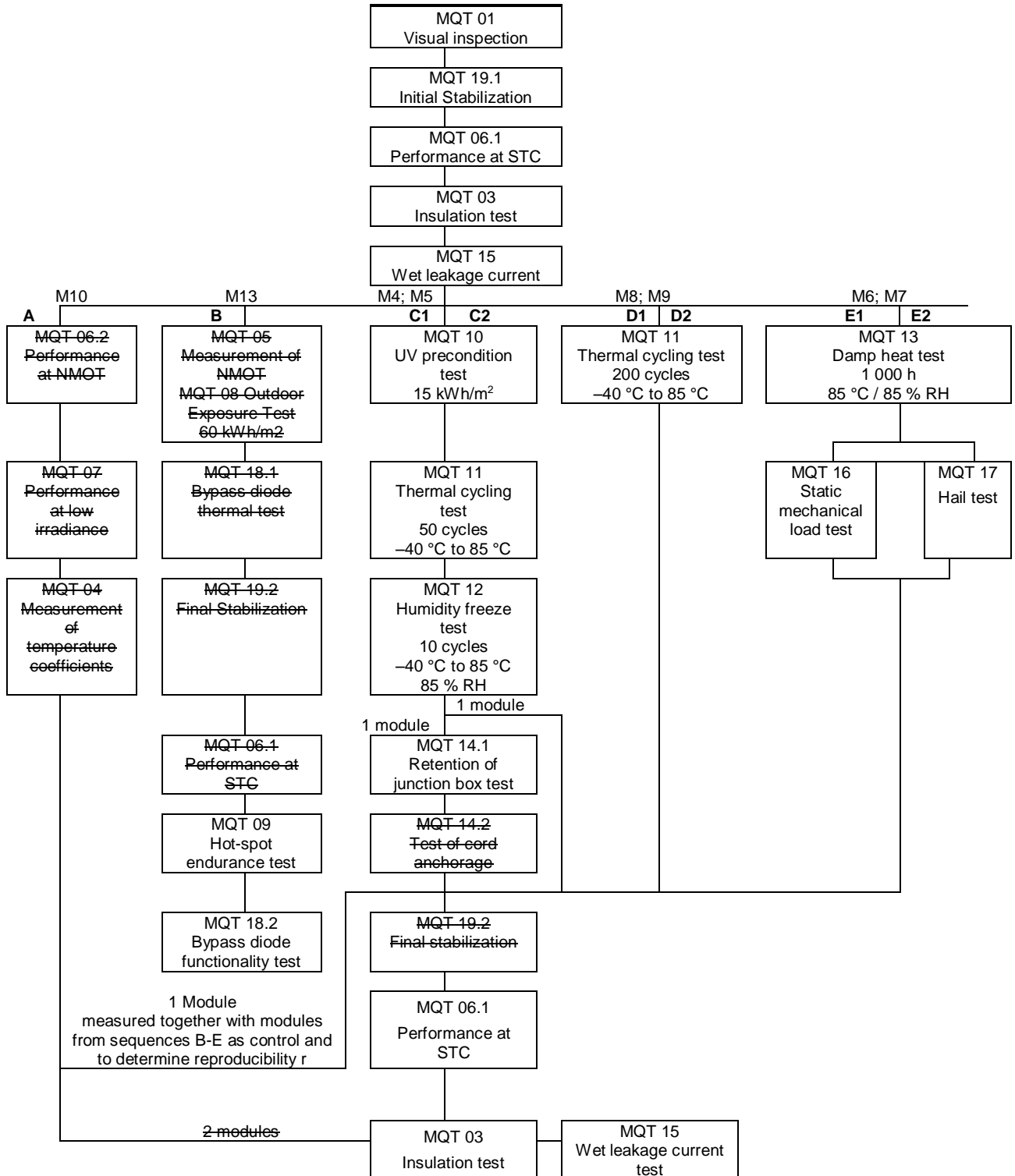
GENERAL REMARKS:				
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. This TRF has been created in cooperation with CTL ETF-9 and German National Committee (DKE). The originator's responsibility of this TRF in IECCEB CB Scheme has been assigned to TÜV SÜD Product Service GmbH.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p> <p>Manufacturer's Declaration per sub-clause 4.2.5 of IECCEB 02:</p>				
The application for obtaining a TÜV SÜD Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Not applicable	
When differences exist; they shall be identified in the General product information section.				
Name and address of factory (factories)..... :			DMEGC SOLAR Module Factory. (Production Facility Code: 76053) Hengdian Industrial Zone, 322118 Dongyang City, Zhejiang Province P.R. China	
PRODUCT ELECTRICAL RATINGS:				
Module type	DM385-M159-72/ DM385-M159-72BK	DM390-M159-72/ DM390-M159-72BK	DM395-M159-72/ DM395-M159-72BK	DM320-M159-60/ DM320-M159-60BK
Voc [V] /Tolerance(±3%)	49.11	49.25	49.39	40.90
Vmp [V]	40.84	41.03	41.22	33.81
Imp [A]	9.43	9.51	9.59	9.47
Isc [A] /Tolerance(±4%)	9.92	10.00	10.06	9.99
Pmp [W] /Tolerance(0/+3%)	385	390	395	320
Maximum system voltage [V]	1000	1000	1000	1000
Maximum Over-Current	20	20	20	20

Protection Rating [A]				
Module type	DM325-M159-60/ DM325-M159- 60BK	DMH380M6A- 144SW/ DMH380M6A- 144BB/ DMH380M6A- 144BW	DMH385M6A- 144SW/ DMH385M6A- 144BB/ DMH385M6A- 144BW	DMH390M6A- 144SW/ DMH390M6A- 144BB/ DMH390M6A- 144BW
Voc [V] /Tolerance($\pm 3\%$)	41.04	48.97	49.14	49.31
Vmp [V]	34.01	40.59	40.86	41.12
Imp [A _{dc}]	9.56	9.37	9.43	9.49
Isc [A _{dc}] /Tolerance($\pm 4\%$)	10.06	9.98	10.05	10.12
Pmp [W] /Tolerance($\pm 3\%$)	325	380	385	390
Maximum system voltage [V]	1000	1000	1000	1000
Maximum Over-Current Protection Rating [A]	20	20	20	20
Module type	DMH395M6A- 144SW/ DMH395M6A- 144BB/ DMH395M6A- 144BW	DMH320M6A- 120SW/ DMH320M6A- 120BB/ DMH320M6A- 120BW	DMH325M6A- 120SW/ DMH325M6A- 120BB/ DMH325M6A- 120BW	
Voc [V] /Tolerance($\pm 3\%$)	49.48	40.97	41.11	
Vmp [V]	41.38	33.4	33.60	
Imp [A _{dc}]	9.55	9.59	9.68	
Isc [A _{dc}] /Tolerance($\pm 4\%$)	10.19	10.04	10.11	
Pmp [W] /Tolerance($\pm 3\%$)	395	320	325	
Maximum system voltage [V]	1000	1000	1000	
Maximum Over-Current Protection Rating [A]	20	20	20	
Note: N/A				
GENERAL PRODUCT INFORMATION AND OTHER REMARKS:				
<u>Modifications:</u>				
<input type="checkbox"/> Initial module design qualification				

<input checked="" type="checkbox"/> Extension of module design qualification	
<input checked="" type="checkbox"/> Original test report ref. No. : 704061905401-01	
<u>Model differences and modification:</u>	
<input checked="" type="checkbox"/> Test programs for crystalline silicon PV modules	<input type="checkbox"/> Test programs for thin-film PV modules
<input type="checkbox"/> 4.2.1 Modification to frontsheet	<input type="checkbox"/> 4.3.1 Modification to frontsheet
<input type="checkbox"/> 4.2.2 Modification to encapsulation system	<input type="checkbox"/> 4.3.2 Modification to encapsulation system
<input checked="" type="checkbox"/> 4.2.3 Modification to cell technology	<input type="checkbox"/> 4.3.3 Modification to front contact (e. g. TCO)
<input type="checkbox"/> 4.2.4 Modification to cell and string interconnect material or technique	<input type="checkbox"/> 4.3.4 Modification to cell technology
<input checked="" type="checkbox"/> 4.2.5 Modification to backsheet	<input type="checkbox"/> 4.3.5 Modification to cell layout
<input type="checkbox"/> 4.2.6 Modification to electrical termination	<input type="checkbox"/> 4.3.6 Modification to back contact
<input type="checkbox"/> 4.2.7 Modification to bypass diode	<input type="checkbox"/> 4.3.7 Modification to edge deletion
<input type="checkbox"/> 4.2.8 Modification to electrical circuitry	<input type="checkbox"/> 4.3.8 Modification to interconnect material or technique
<input type="checkbox"/> 4.2.9 Modification to edge sealing	<input type="checkbox"/> 4.3.9 Modification to backsheet
<input type="checkbox"/> 4.2.10 Modification to frame and/or mounting structure	<input type="checkbox"/> 4.3.10 Modification to electrical termination
<input type="checkbox"/> 4.2.11 Change in PV module size	<input type="checkbox"/> 4.3.11 Modification to bypass diode
<input type="checkbox"/> 4.2.12 Higher or lower output power (by 10 % or more) with the identical design and size and using the identical cell process	<input type="checkbox"/> 4.3.12 Modification to edge sealing
<input type="checkbox"/> 4.2.13 Increase of over-current protection rating	<input type="checkbox"/> 4.3.13 Modification to frame and/or mounting structure
<input type="checkbox"/> 4.2.14 Increase of system voltage	<input type="checkbox"/> 4.3.14 Change in PV module size
<input type="checkbox"/> 4.2.15 Change in cell fixing tape	<input type="checkbox"/> 4.3.15 Higher or lower output power (by 10 % or more) with the identical design and size
<input checked="" type="checkbox"/> Others (See summary of testing)	<input type="checkbox"/> 4.3.16 Increase of over-current protection rating
	<input type="checkbox"/> 4.3.17 Increase of system voltage
Note: The clause references modifications extracted from IEC 62915	

MODULE GROUP ASSIGNMENT:				
Sample #	Sample Group ID	Type/model	Sample S/N	Remark
M10(1)	A1	DM390-M156-72	DMAAAI7211940500001	Control module
M13(2)	B	DM390-M156-72	DMAAAI7211940500002	HS
M4(7)	C1	DM390-M156-72	DMAAAI7211940500007	UV sequence
M5(8)	C2	DM390-M156-72	DMAAAI7211940500008	UV sequence
M8(3)	D1	DM390-M156-72	DMAAAI7211940500016	TC200
M9(4)	D2	DM390-M156-72	DMAAAI7211940500010	TC200
M6(9)	E1	DM390-M156-72	DMAAAI7211940500006	DH1000, SML
M7(10)	E2	DM390-M156-72	DMAAAI7211940500015	DH1000, Hail test
Higher end power class	—	DM395-M156-72	DMAAAI7211940500002	High 1
Higher end power class	—	DM395-M156-72	DMAAAI7211940500017	High 2
Lower end power class	—	DM385-M156-72	DMAAAI7211940500008	Low 1
Lower end power class	—	DM385-M156-72	DMAAAI7211940500006	Low 2
Higher end power class	—	DMH395M6A-144SW	DMHSWR7241981400003	High 3
Higher end power class	—	DMH395M6A-144SW	DMHSWR7241981400004	High 4
Lower end power class	—	DMH380M6A-144SW	DMHSWR7241981400001	Low 3
Lower end power class	—	DMH380M6A-144SW	DMHSWR7241981400002	Low 4
Supplementary information: Laboratory test item number is GDP190307.				
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 and to describe the range of electrical and safety ratings, if the TRF covers a type family of modules.			
Note (3)	Use Annex 1 to list the used materials and components of the module (manufacturer/supplier and type reference).			
Note (4)	The module numbers/identifiers are set in accordance to IEC 62915 Photovoltaic (PV) modules – Retesting for type approval, design and safety qualification, Annex A3			

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
11	TEST FLOW (if it is not a full test, strikethrough non-performed test) Note: Deviations from test sequence are possible but must be documented.		



IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
5. MARKING AND DOCUMENTATION			P
5.1	Name Plate		
	All electrical data is shown as relative to standard test conditions (1 000 W/m ² , 25 °C, AM 1,5 according to IEC TS 61836).	Marked on label	P
	International symbols are used where applicable.	Marked on label	P
	The module includes clear and indelible markings:		—
	a. Name, registered trade name or registered trade mark of manufacturer	DMEGC (logo)	P
	b. Type or model number designation	DM390-M156-72	P
	c. Serial number (unless marked on other part of product)	Provided under superstrate near the top rail of frame	P
	d. Date and place of manufacture, alternatively serial number allowing to trace the date and place of manufacture;	serial number allowing to trace the date and place of manufacture	P
	e. Maximum system voltage	1000V DC	P
	f. Class of protection against electrical shock	Class II	P
	g. Voltage at open-circuit or Voc including tolerances.	49.25V ± 3% for example	P
	h. Current at short-circuit or Isc including tolerances	10.00A ± 4% for example	P
	i. Module maximum power or Pmax including tolerances	390W ±3% for example	P
5.2	Documentation		
5.2.1	Minimum requirements		
	Modules are supplied with documentation describing the methods of electrical and mechanical installation as well as the electrical ratings of the module		P
	The documentation states the class of protection against electrical shock under which the module has been qualified and any specific limitations required for that class.		P
	The documentation assures that installers and operators receive appropriate and sufficient documentation for safe installation, use, and maintenance of the PV modules.		P
5.2.2	Information given in the documentation		P
	a. All information required under 5.1 e) to i)	Refer to manual document	P
	b. Overcurrent protection device type and rating are e.g. given in IEC 60269-6	Refer to manual document	P

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Maximum series/parallel module configuration is recommended		P
	c. Manufacturer's stated tolerance for Voc, Isc and maximum power output under standard test conditions		P
	d. Temperature coefficient for voltage at open-circuit		P
	e. Temperature coefficient for maximum power		P
	f. Temperature coefficient for short-circuit current		P
	All electrical data mentioned above shown as relative to standard test conditions (1 000 W/m ² , 25 °C, AM 1,5 according to IEC TS 61836)		P
	g. Nominal module operating temperature (NMOT) is specified		N/A
	h. Performance at NMOT (MQT 06.2) is specified		N/A
	i. Performance at low irradiance (MQT 07) is specified		P
	International symbols used where applicable		P
	Compliance checked by inspection and MQT 04 through MQT 07		P
	The electrical documentation includes a detailed description of the electrical installation wiring method to be used		—
	j. The minimum cable diameters for modules intended for field wiring		P
	k. Any limitations on wiring methods and wire management that apply to the wiring compartment or box;		P
	l. The size, type, material and temperature rating of the conductors to be used		P
	m. Type of terminals for field wiring		N/A
	n. Specific PV connector model/types and manufacturer to which the module connectors are mated		P
	o. The bonding method(s) to be used (if applicable); all provided or specified hardware is identified in the documentation	Refer to manual document	P
	p. The type and ratings of bypass diode to be used (if applicable)	Refer to manual document	P
	q. limitations to the mounting situation (e.g., slope, orientation, mounting means, cooling)	Refer to manual document	P

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	r. A statement indicating the fire rating(s) and the applied standard and the limitations to that rating (e.g., installation slope, sub-structure or other applicable installation information)		P
	s. A statement indicating the design load per each mechanical means for securing the module as evaluated during the static mechanical load test according to MQT 16. At discretion of the manufacturer the test load and/or the safety factor γ_m may be noted, too		P
	The installation instructions include relevant parameters specified by manufacturer or the following statement or the equivalent: <i>"Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of Isc and Voc marked on this module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, and size of controls connected to the PV output."</i>		P
5.2.3	Assembly instructions		N/A
	Provided with a product shipped in subassemblies, detailed and adequate to the degree required to facilitate complete and safe assembly of the product		N/A
Supplementary information: N/A			

7. PASS CRITERIA					P
7.2	Power output and electric circuitry				P
7.2.1	Verification of rated label values (Gate No. 1)				P
	Manufacturer's tolerances and Laboratory uncertainties				P
		t ₁	t ₂	t ₃	—
	manufacturer's rated lower/upper production tolerance in %	3	3	3	
		m ₁	m ₂	m ₃	
	measurement uncertainty in % of laboratory	2.28	1.08	1.90	
	Laboratory reproducibility r.....:	+0.30%			
	After stabilization, each individual module meets the requirements				P
	P _{max}	See Table 03			P
	V _{oc}	See Table 03			P
	I _{sc} :.....	See Table 03			P

IEC 61215-1			
Clause	Requirement + Test	Result - Remark	Verdict
	After stabilization the arithmetic average \bar{P}_{max} of all modules meet the requirements.	See Table 03	P
7.2.2	Maximum power degradation during type approval testing (Gate #2)		P
	At the end of each test sequence or for sequence B after bypass diode test, each test sample meets the requirements for P_{max}		P
7.2.3	Electrical circuitry		P
	Samples do not exhibit an open-circuit during the tests		P
7.3	Visual defects		P
	There is no visual evidence of a major defect.		P
7.4	Electrical safety		P
	The insulation test (MQT 03) requirements are met after the tests		P
	The wet leakage current test (MQT 15) requirements met at the beginning and at the end of each sequence		P
	Specific requirements of the individual tests are met		N/A
Supplementary information: N/A			

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

4. TESTING OVERVIEW			
	Initial examination	All modules	P
4.1	Visual inspection (MQT 01)) :	See Table 01	P
4.19.5	Initial stabilization (MQT 19.1)..... :	See Table 02	P
4.6	Performance at STC (MQT 06.1)	See Table 03	P
4.3	Insulation test (MQT 03) :	See Table 04	P
4.15	Wet leakage current test (MQT 15) :	See Table 05	P

Sequence A	3 Modules	Samples M10	P
4.6	Performance at NMOT (MQT 06.2)..... :	See Table 06	—
4.7	Performance at low irradiance (MQT 07)..... :	See Table 07	N/A
4.4	Measurement of temperature coefficients (MQT 04) :	See Table 08	N/A

Sequence B	1 Module	Sample M13	P
4.5	Measurement of nominal module operating temperature (NMOT, °C) (MQT 05)..... :	See Table 09	N/A
4.8	Outdoor exposure test (MQT 08) :	See Table 10	N/A
4.18.1	Bypass diode thermal test (MQT 18.1)		N/A
	Maximum allowed junction temperature :	See Table 11	—
	Calculated junction temperature :	See Table 11	—
	Final measurements :	See Table 11	N/A
4.18.2	Bypass diode functionality test (MQT 18.2) :	See Table 12	N/A
4.19.6	Final stabilization (MQT 19.2) :	See Table 12.1 – 12.3	N/A
4.9	Hot spot endurance test (MQT 09)..... :	See Table 13.1 - 13.5	P

Sequence C	2 Modules	Sample M4, M5	P
4.10	UV preconditioning test (MQT 10)..... :	See Table 14.1 - 14.4	P
4.11	Thermal cycling test 50 cycles (MQT 11) :	See Table 15.1 - 15.4	P
4.12	Humidity-freeze test (MQT 12)..... :	See Table 16.1 - 16.4	P

Sequence C1	1 Module	Sample M4	P
4.14	Robustness of terminations test (MQT 14)		P

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
4.14.2	Retention of junction box on mounting surface (MQT 14.1)	See Table 17.1 - 17.7	P
4.14.3	Test of cord anchorage (MQT 14.2)		N/A
4.14.3.1	This test omitted if junction box is qualified to IEC 62790.....	See list of attachments	N/A
4.14.3.2.1	Junction boxes intended to be used with cables specified by the manufacturer.....	See Table 17.4	N/A
4.14.3.2.2	Junction boxes intended to be used with generic cables.....	See Table 17.4	N/A
Sequence D	2 Modules	Sample M8; M9	P
4.11	Thermal cycling test 200 cycles (MQT 11)	See Table 18.1 - 18.2	P
Sequence E	2 Modules	Samples M6, M7	P
4.13	Damp heat test (MQT 13)	See Table 19.1 - 19.4	P
Sequence E1	1 Module	Sample M7	P
4.16	Static mechanical load test (MQT 16)	See Table 19.5 - 19.7	P
Sequence E2	1 Module	Sample M7	P
4.17	Hail test (MQT 17)	See Table 19.8 - 19.10	P
	Final measurement	All modules for Sequence C, D, E; Control module for Sequence A	P
4.19.6	Final stabilization (MQT 19.2)	See Table 20.1 - 20.2	N/A
4.6	Performance at STC (MQT 06.1)	See Table 20.3	P
4.3	Insulation test(MQT 03)	See Table 21	P
4.15	Wet leakage current test(MQT 15)	See Table 22	P

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE 01: MQT 01 ini: Initial Visual inspection			P
Test Date [YYYY-MM-DD]..... :		2019-04-26	—
Sample #	Nature and position of initial findings – comments or attach photos		—
M10	No major visual defects found		P
M13	No major visual defects found		P
M4	No major visual defects found		P
M5	No major visual defects found		P
M8	No major visual defects found		P
M9	No major visual defects found		P
M6	No major visual defects found		P
M7	No major visual defects found		P
Supplementary information: N/A			

TABLE 02: MQT 19.1 ini: Initial stabilization								—
TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization								—
Test Date [YYYY-MM-DD]..... :		2019-04-26						—
Test method..... :		<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result	
M10	10.172	48.819	9.749	39.738	387.404	78.01	—	
M13	10.193	48.805	9.729	39.988	389.027	78.20	—	
M4	10.195	48.802	9.707	40.015	388.439	78.07	—	
M5	10.098	48.874	9.711	39.766	386.156	78.24	—	
M8	10.134	48.816	9.704	39.883	387.047	78.24	—	
M9	10.151	48.829	9.725	39.929	388.314	78.35	—	
M6	10.093	48.853	9.713	39.752	386.108	78.30	—	
M7	10.099	48.843	9.686	39.968	387.134	78.49	—	

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: N/A

TABLE 02.2: MQT 19.1 ini: Initial Stabilization procedure

P

Light exposure method.....: Simulator Natural sunlight

Abbreviation: Regarding light source "S" for Solar simulator and "N" for Natural sunlight

Stabilization criterion x per IEC 61215-1-x: 1

Sample #	M10	Test Date (YYYY-MM-DD) start/end.....			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	387.404	—	—
1	5	Above 800	50±10	MPPT	387.705	—	—
2	5	Above 800	50±10	MPPT	387.880	0.123	Yes
Sample #	M13	Test Date (YYYY-MM-DD) start/end.....			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	389.027	—	—
1	5	Above 800	50±10	MPPT	389.029	—	—
2	5	Above 800	50±10	MPPT	389.120	0.024	Yes
Sample #	M4	Test Date (YYYY-MM-DD) start/end.....			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	388.439	—	—
1	5	Above 800	50±10	MPPT	388.749	—	—
2	5	Above 800	50±10	MPPT	388.793	0.091	Yes
Sample #	M5	Test Date (YYYY-MM-DD) start/end.....			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} - P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	386.156	—	—
1	5	Above 800	50±10	MPPT	386.340	—	—
2	5	Above 800	50±10	MPPT	386.596	0.114	Yes
Sample #	M8	Test Date (YYYY-MM-DD) start/end.....			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} - P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	387.047	—	—

IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
1	5	Above 800	50±10	MPPT	387.490	—	—
2	5	Above 800	50±10	MPPT	387.413	0.114	Yes
Sample #	M9	Test Date (YYYY-MM-DD) start/end.....			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} - P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	388.314	—	—
1	5	Above 800	50±10	MPPT	388.466	—	—
2	5	Above 800	50±10	MPPT	388.322	0.039	Yes
Sample #	M6	Test Date (YYYY-MM-DD) start/end.....			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} - P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	386.108	—	—
1	5	Above 800	50±10	MPPT	386.111	—	—
2	5	Above 800	50±10	MPPT	385.680	0.112	Yes
Sample #	M7	Test Date (YYYY-MM-DD) start/end.....			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	(P _{max} - P _{min}) / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	387.134	—	—
1	5	Above 800	50±10	MPPT	387.538	—	—
2	5	Above 800	50±10	MPPT	387.333	0.104	Yes
<input type="checkbox"/> Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end						
—	—						
Test method description: N/A							
Supplementary information: N/A							

TABLE 03: MQT 06.1 ini: Performance at STC after initial stabilization		P
Test Date [YYYY-MM-DD]	2019-04-29	—
P _{max} (lab) lower limit (W)	See table below: P _{max} [W] – Min calc.	—
\bar{P}_{max} (Lab) lower limit (W)	381.306	—
Voc(lab) upper limit (V)	See table below: Voc [V] Max. calc.	—
Isc (lab) upper limit (A)	See table below: Isc [A] Max. calc.	—
Test method	<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight	—

IEC 61215-2										
Clause	Requirement + Test						Result - Remark		Verdict	
Sample #	Isc [A]		Voc [V]		Imp [A]	Vmp [V]	Pmax [W]		FF [%]	Result
	Meas.	Max. calc.	Meas.	Max. calc.			Meas.	Min. calc.		
M10	10.17 4	10.20 6	48.830	50.185	9.764	39.726	387.880	369.867	78.08	P
M13	10.18 5	10.20 6	48.795	50.185	9.779	39.792	389.120	369.867	78.29	P
M4	10.20 2	10.20 6	48.814	50.185	9.771	39.789	388.793	369.867	78.07	P
M5	10.09 8	10.20 6	48.892	50.185	9.725	39.754	386.596	369.867	78.30	P
M8	10.13 9	10.20 6	48.817	50.185	9.720	39.856	387.413	369.867	78.27	P
M9	10.15 4	10.20 6	48.824	50.185	9.721	39.945	388.322	369.867	78.33	P
M6	10.07 9	10.20 6	48.839	50.185	9.675	39.865	385.680	369.867	78.35	P
M7	10.10 7	10.20 6	48.840	50.185	9.691	39.968	387.333	369.867	78.47	P
Average	—						387.642	381.306	—	P

Supplementary information: The limit values are calculated considering manufacturer's tolerances t of rated nameplate values and laboratory measurement uncertainties m .

TABLE 04: MQT 03 ini: Initial Insulation test					P
Test Date [YYYY-MM-DD]	2019-04-29			—	
Test Voltage applied [V]	6000/1000			—	
Size of module [m ²]	1.98			—	
Required Resistance [MΩ]	20.20			—	
Sample #	Measured	Dielectric breakdown			Result
	MΩ	Yes (description)	No		
M10	>5000	No dielectric breakdown	No	P	
M13	>5000	No dielectric breakdown	No	P	
M4	>5000	No dielectric breakdown	No	P	
M5	>5000	No dielectric breakdown	No	P	
M8	>5000	No dielectric breakdown	No	P	
M9	>5000	No dielectric breakdown	No	P	
M6	>5000	No dielectric breakdown	No	P	
M7	>5000	No dielectric breakdown	No	P	

Supplementary information: The maximum resistance measurement range is 5000MΩ.

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
TABLE 05: MQT 15 ini: Initial Wet leakage current test			P
Test Date [YYYY-MM-DD]..... :	2019-04-30		—
Test Voltage applied [V]..... :	1000		—
Solution temperature [°C]..... :	22.5		—
Size of module [m ²]..... :	1.98		—
Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
M10	20.20	372.6	P
M13	20.20	297.4	P
M4	20.20	362.2	P
M5	20.20	287.8	P
M8	20.20	322.5	P
M9	20.20	463.9	P
M6	20.20	373.4	P
M7	20.20	253.7	P
Supplementary information: Solution resistivity 2704[Ω·cm].			

TABLE 13: MQT 09 - Hot-spot endurance test		P
Test Date [YYYY-MM-DD] start/end..... :	2019-07-31	
Sample #	M13	
Procedure of technology..... :	<input checked="" type="checkbox"/> wafer-based technologies (WBT) MQT 09.1 <input type="checkbox"/> monolithically integrated (MLI) thin film technologies MQT 09.2	
Cell interconnection circuit..... :	<input checked="" type="checkbox"/> S <input type="checkbox"/> SP <input type="checkbox"/> PS	
Type of light source..... :	<input type="checkbox"/> Pulse Simulator <input checked="" type="checkbox"/> Steady state Simulator <input type="checkbox"/> Natural sunlight	
Module temperature at thermal equilibrium [°C]. :	50.4/50.4/50.6/50.9	

TABLE 13.1: MQT 09 - Hot-spot endurance test for WBT					
Selected hot-spot cells	LOW	LOW	LOW	HIGH	—
	/	/	/	/	
Shading rate [%]	10	10	10	10	—
Max. measured cell temperature in each cell [°C]:	147.3	141.9	138.2	126.5	—
Test duration of each shading [h]	1	1	1	1	—
Irradiance during shading [W/m ²]	1000	1000	1000	1000	—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
TABLE 13.2: MQT 09 - Hot-spot endurance test for MLI			N/A
Selected hot-spot cells		—	—
Number of cells shaded.....		—	—
Max. measured cell temperature [°C].....		—	—
Test duration during shading [h]		—	—
Irradiance during shading [W/m ²]		—	—
Supplementary information:N/A			

TABLE 13.3: MQT 01 - Visual inspection after hot-spot endurance test			P
Test Date [YYYY-MM-DD].....		2019-07-31	—
Sample #	Nature and position of initial findings – comments or attach photos		—
M13	No major visual defects found		—
Supplementary information: N/A			

TABLE 13.4: MQT 02 - Maximum power determination after hot-spot endurance test							P
Test Date [YYYY-MM-DD].....		2019-07-31					—
Module temperature [°C]		25					—
Irradiance [W/m ²]		1000					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	—
M13	10.037	48.747	9.604	39.785	382.097	78.10	P
Supplementary information: N/A							

TABLE 13.5: MQT 03 - Insulation test after hot-spot endurance test					P
Test Date [YYYY-MM-DD].....		2019-07-31			—
Test Voltage applied [V]		6000/1000			—
Size of module [m ²]		1.98			—
Required Resistance [MΩ].....		20.20			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M13	>5000	20.20	No dielectric breakdown	No	P
Supplementary information: The maximum resistance measurement range is 5000MΩ.					

TABLE 13.6: MQT 15 - Wet leakage current test after hot-spot endurance test			P
Test Date [YYYY-MM-DD].....		2019-07-31	—
Test Voltage applied [V]		1000	—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Solution temperature [°C].....:		22.5	—
Size of module [m²]		1.98	—
Required Resistance [MΩ].....		20.20	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M13	473.8	20.20	P
Supplementary information: Solution resistivity 2102 [Ω·cm].			

TABLE 13.7: MQT 18.2 - Bypass diode functionality test after Hot-spot endurance test				P
Test Date [YYYY-MM-DD].....:		2019-07-31		—
<input type="checkbox"/> Method A				—
Ambient temperature [°C]		—		—
Current flow applied [A]		—		—
Sample #	VFM	VFM _{rated}	VFM = (N × VFM _{rated}) ± 10 %	Result
—	—	—	<input type="checkbox"/> Yes <input type="checkbox"/> No	—
Supplementary information:N/A				
<input checked="" type="checkbox"/> Method B				—
	IV curve after shading			Result
Diode 1	Turn on			P
Diode 2	Turn on			P
Diode 3	Turn on			P
Supplementary information: N/A				

TABLE 14: MQT 10 - UV preconditioning test				P
Test Date (YYYY-MM-DD) start/end		2019-06-10/ 2019-06-14		—
Module temperature [°C]		60±5		—
UV irradiance (280-400nm) [W/m²]		166.67		—
Ratio of UV irradiance (280-320nm) (%)		7.67		—
UV dose (280-400nm) [kWh/ m²]		15		—
Module operation condition		<input checked="" type="checkbox"/> Short circuited <input type="checkbox"/> Pmax		—
Supplementary information: Light sources not emitting a significant portion of light in the visible spectrum where the module exhibits a power equal to or larger than 20 % of its STC measured power. UV preconditioning test was performed on front side of the module.				

TABLE 14.1: MQT 01 - Visual inspection after UV preconditioning test				P
Test Date [YYYY-MM-DD].....:		2019-06-14		—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Sample #	Nature and position of initial findings – comments or attach photos		—
M4	No major visual defects found		P
M5	No major visual defects found		P

TABLE 14.2: MQT 15 - Wet leakage current test after UV preconditioning test				P
Test Date [YYYY-MM-DD].....:		2019-06-14		—
Test Voltage applied [V]		1000		—
Solution temperature [°C].....:		22.5		—
Size of module [m ²]		1.98		—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result	
M4	466.5	20.20	P	
M5	395.1	20.20	P	
Supplementary information: Solution resistivity 1042 [Ω·cm].				

TABLE 14.3: MQT 02 – Max. power determination after UV preconditioning test - Optional								—
Test Date [YYYY-MM-DD].....:		—						—
Module temperature [°C]		—						—
Irradiance [W/m ²]		—						—
Sample #	Isc [A]	Voc [V]	I _{mp} [A]	V _{mp} [V]	P _{max} [W]	FF [%]	Result	
—	—	—	—	—	—	—	—	
Supplementary information: N/A								

TABLE 14.4: MQT 03 - Insulation test after UV preconditioning test - Optional							N/A
Test Date [YYYY-MM-DD].....:		—					—
Test Voltage applied [V]		—					—
Size of module [m ²]		—					—
Required Resistance [MΩ].....:		—					—
Sample #	Measured		Dielectric breakdown			Result	
	[MΩ]		Yes (description)	No			
—	—	—	—	—	—	—	
Supplementary information: N/A							

TABLE 15: MQT 11 - Thermal cycling 50 test			P
Test Date [YYYY-MM-DD] start/end.....:		2019-06-14/ 2019-06-24	
Total cycles (50).....:		50	

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Applied current (A)	During the heat up cycle from - 40 °C to 80 °C	9,97/9.73	—
	Other stages	0.05	—
Sample #	Open circuits (yes/no)		—
M4	No		P
M5	No		P
Supplementary information: N/A			

TABLE 15.1: MQT 01 - Visual inspection after thermal cycling 50 test			P
Test Date [YYYY-MM-DD]	2019-06-24		—
Sample #	Nature and position of initial findings – comments or attach photos		—
M4	No major visual defects found		P
M5	No major visual defects found		P
Supplementary information: N/A			

TABLE 15.2: MQT 15 - Wet leakage current test after thermal cycling 50 test			P
Test Date [YYYY-MM-DD]	2019-06-24		—
Test Voltage applied [V]	1000		—
Solution temperature [°C]	22.4		—
Size of module [m ²]	1.98		—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
M4	493.8	20.20	P
M5	352.7	20.20	P
Supplementary information: Solution resistivity 2628 [Ω-cm].			

TABLE 15.3: MQT 03 – Max. power determination after thermal cycling 50 test - Optional							—
Test Date [YYYY-MM-DD]	—						—
Module temperature [°C]	—						—
Irradiance [W/m ²]	—						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	
—	—	—	—	—	—	—	
Supplementary information: N/A							

TABLE 15.4: MQT 03 - Insulation test after thermal cycling 50 test - Optional			N/A
Test Date [YYYY-MM-DD]	—		—

IEC 61215-2				
Clause	Requirement + Test	Result - Remark	Verdict	
Test Voltage applied [V]		—	—	
Size of module [m ²]		—	—	
Required Resistance [MΩ]		—	—	
Sample #	Measured	Dielectric breakdown		Result
	[MΩ]	Yes (description)	No	
—	—	—	—	—
Supplementary information: N/A				

TABLE 16: MQT 12 - Humidity freeze 10 test			P
Test Date [YYYY-MM-DD] start/end	2019-06-25/2019-07-05		—
Total cycles (10)	10		—
Applied current (A)	0.05		—
Sample #	Open circuits (yes/no)		—
M4	No		P
M5	No		P
Supplementary information: N/A			

TABLE 16.1: MQT 01 - Visual inspection after humidity freeze 10 test			P
Test Date [YYYY-MM-DD]	2019-07-05		—
Sample #	Nature and position of initial findings – comments or attach photos		—
M4	No major visual defects found		P
M5	No major visual defects found		P
Supplementary information: N/A			

TABLE 16.2: MQT 15 - Wet leakage current test after humidity freeze 10 test				N/A
Test Date [YYYY-MM-DD]	2019-07-05			—
Test Voltage applied [V]	1000			—
Solution temperature [°C]	22.3			—
Size of module [m ²]	1.98			—
Required Resistance [MΩ]	20.20			—
Sample #	Measured [MΩ]	Limit [MΩ]	Result	
M4	364.6	20.20	P	
M5	427.3	20.20	P	
Supplementary information: Solution resistivity 2072 [Ω·cm].				

IEC 61215-2						
Clause	Requirement + Test			Result - Remark		Verdict
TABLE 16.3: MQT 02 - Maximum power determination after humidity freeze 10 test -Optional						N/A
Test Date [YYYY-MM-DD]..... :			—		—	
Module temperature [°C]			—		—	
Irradiance [W/m ²]			—		—	
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]
—	—	—	—	—	—	—
Supplementary information: N/A						

TABLE 16.4: MQT 03 Insulation test after humidity freeze 10 test) -Optional						N/A
Test Date [YYYY-MM-DD]..... :			—		—	
Test Voltage applied [V]			—		—	
Size of module [m ²]			—		—	
Required Resistance [MΩ]..... :			—		—	
Sample #	Measured	Required	Dielectric breakdown		Result	
	MΩ	MΩ	Yes (description)	No		
—	—	—	—	—	—	
Supplementary information: N/A						

TABLE 17: MQT 14 - Robustness of terminations test					P
Test Date [YYYY-MM-DD] start/end..... :			2019-07-05		—

TABLE 17.1: MQT 14.1 Retention of junction box on mounting surface					P
Sample #	M4				—
Supplementary information: N/A					

TABLE 17.2: MQT 01 - Visual inspection after retention of junction box on mounting surface					P
Test Date [YYYY-MM-DD]..... :			2019-07-05		—
Sample #	Nature and position of initial findings – comments or attach photos				—
M4	No major visual defects found				P
Supplementary information: N/A					

TABLE 17.3: MQT 15 - Wet leakage current test after retention of junction box on mounting surface					P
Test Date [YYYY-MM-DD]..... :			2019-07-05		—
Test Voltage applied [V]			1000		—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Solution temperature [°C].....:		22.5	—
Size of module [m ²].....:		1.98	—
Required Resistance [MΩ].....:		20.20	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M4	357.8	20.20	P
Supplementary information: Solution resistivity 2071 [Ω·cm].			

TABLE 17.4: MQT 14.2 - Test of cord anchorage						N/A
Sample #	—					—
<input type="checkbox"/> Junction boxes intended to be used with cables specified by the manufacturer						—
	Cable diameter, [mm]	Tension Force, [N]	Permissible displacement, [mm]	Measured displacement, [mm]	Result	
Pull test	—	—	—	—	—	—
	Cable diameter, [mm]	Torque Force, [Nm]	Permissible angle [°]	Measured angle [°]	Result	
Torque test	—	—	—	—	—	—
<input type="checkbox"/> Junction boxes intended to be used with generic cables						—
	Anchorage diameter range [mm]	Test mandrel [mm]	Tension Force, [N]	Permissible displacement [mm]	Measured displacement [mm]	Result
Pull test	Min	—	—	—	—	—
	Anchorage diameter range [mm]	Test mandrel [mm]	Torque Force [Nm]	Permissible angle [°]	Measured angle [°]	Result
Torque test	Max	—	—	—	—	—
Supplementary information: N/A						

TABLE 17.5: MQT 01 - Visual inspection after retention of test of cord anchorage			N/A
Test Date [YYYY-MM-DD].....:	—		—
Sample #	Nature and position of initial findings – comments or attach photos		Result
—	—		—
Supplementary information: N/A			

TABLE 17.6: MQT 15 - Wet leakage current test after retention of test of cord anchorage			N/A
Test Date [YYYY-MM-DD].....:	—		—
Test Voltage applied [V].....:	—		—
Solution temperature [°C].....:	—		—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Size of module [m ²]		—	—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
—	—	—	—
Supplementary information: N/A			

TABLE 17.7: MQT 03 - Insulation test after test of cord anchorage					N/A
Test Date [YYYY-MM-DD]		—		—	
Test Voltage applied [V]		—		—	
Size of module [m ²]		—		—	
Required Resistance [MΩ]		—		—	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
—	—	—	—	—	—
Supplementary information: N/A					

TABLE 18: MQT 11 - Thermal cycling 200 test				P
Test Date [YYYY-MM-DD] start/end		2019-05-13/2019-06-12		—
Total cycles (200)		200		—
Applied current (A)		During the heat up cycle from – 40 °C to 80 °C	9.72	—
		Other stages	0.05	—
Sample #	Open circuits (yes/no)			—
M8	No			P
M9	No			P
Supplementary information: N/A				

TABLE 18.1: MQT 01 - Visual inspection after thermal cycling 200 test				P
Test Date [YYYY-MM-DD]		2019-06-12		—
Sample #	Nature and position of initial findings – comments or attach photos			—
M8	No major visual defects found			P
M9	No major visual defects found			P
Supplementary information: N/A				

TABLE 18.2: MQT 15 - Wet leakage current test after thermal cycling 200 test				P
Test Date [YYYY-MM-DD]		2019-06-12		—
Test Voltage applied [V]		1000		—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Solution temperature [°C]..... :		22.5	—
Size of module [m ²] :		1.98	—
Required Resistance [MΩ]..... :		20.20	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M8	529.1	20.20	P
M9	433.6	20.20	P
Supplementary information: Solution resistivity 1036 [Ω·cm].			

TABLE 19: MQT 13 - Damp heat 1000 test			P
Test Date [YYYY-MM-DD] start/end..... :		2019-05-13/2019-06-24	—
Total hours (1000h)		1000	—
Sample #	Open circuits (yes/no)		—
M6	No		P
M7	No		P
Supplementary information: N/A			

TABLE 19.1: MQT 01 - Visual inspection after damp heat 1000 test			P
Test Date [YYYY-MM-DD]..... :		2019-06-24	—
Sample #	Nature and position of initial findings – comments or attach photos		—
M6	No major visual defects found		P
M7	No major visual defects found		P
Supplementary information: N/A			

TABLE 19.2: MQT 15 - Wet leakage current test after damp heat 1000 test			P
Test Date [YYYY-MM-DD]..... :		2019-06-24	—
Test Voltage applied [V]..... :		1000	—
Solution temperature [°C]..... :		22.3	—
Size of module [m ²] :		1.98	—
Required Resistance [MΩ]..... :		20.20	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M6	328.6	20.20	P
M7	361.9	20.20	P
Supplementary information: Solution resistivity 2625 [Ω·cm].			

TABLE 19.3: MQT 02 - Maximum power determination after damp heat 1000 test - Optional			N/A
Test Date [YYYY-MM-DD]..... :		—	—

IEC 61215-2							
Clause	Requirement + Test					Result - Remark	Verdict
Module temperature [°C]					—		—
Irradiance [W/m ²]					—		—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
Supplementary information: N/A							

TABLE 19.4: MQT 03 - Insulation test after damp heat 1000 test - Optional						N/A
Test Date [YYYY-MM-DD]					—	—
Test Voltage applied [V]					—	—
Size of module [m ²]					—	—
Sample #	Measured	Required Resistance	Dielectric breakdown		Result	
	[MΩ]	[MΩ]	Yes (description)	No		
—	—	—	—	—	—	
—	—	—	—	—	—	
Supplementary information: N/A						

TABLE 19.5: MQT 16 Static mechanical load test				P
Sample # :		M6		—
Design load(front side/ back side)		3600 / 1600		—
Safety factors		1.5		—
Test Date [YYYY-MM-DD]		2019-07-15		—
Mounting method		Installed by 8 mounting holes with screws		—
Load applied to		front side	back side	—
Mechanical load [Pa]		5400	2400	—
First cycle time (start/end)		10:05/11:05	11:10/12:10	—
Intermittent open-circuit (yes/no)		No	No	P
Second cycle time (start/end)		12:15/13:15	13:20/14:20	—
Intermittent open-circuit (yes/no)		No	No	P
Third cycle time (start/end)		14:25/15:25	15:30/16:30	—
Intermittent open-circuit (yes/no)		No	No	P
Supplementary information: Position of installation connecting points				

IEC 61215-2

Clause	Requirement + Test	Result - Remark	Verdict
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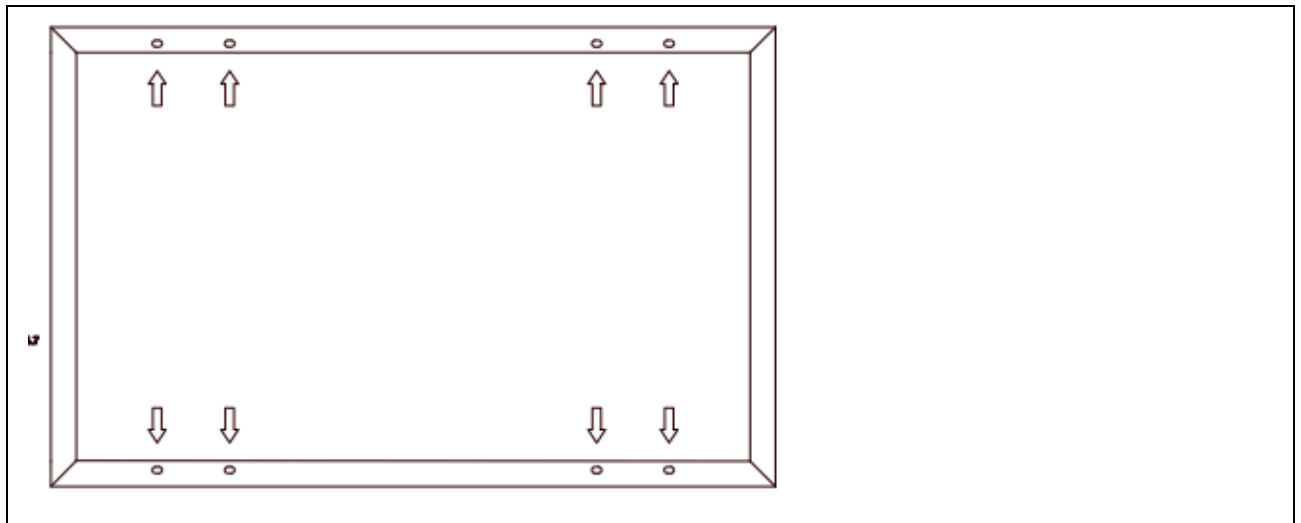


TABLE 19.6: MQT 01 - Visual inspection after static mechanical load test			P
Test Date [YYYY-MM-DD]..... :		2019-07-15	—
Sample #	Nature and position of initial findings – comments or attach photos		—
M6	No major visual defects found		P
Supplementary information: N/A			

TABLE 19.7: MQT 15 - Wet leakage current test after static mechanical load test			P
Test Date [YYYY-MM-DD]..... :		2019-07-15	—
Test Voltage applied [V]..... :		1000	—
Solution temperature [°C]..... :		22.4	—
Size of module [m ²]..... :		1.98	—
Required Resistance [MΩ]..... :		20.20	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
M6	574.9	20.20	P
Supplementary information: Solution resistivity 2826 [Ω·cm].			

TABLE 19.8: MQT 17 - Hail impact test							P
Test Date [YYYY-MM-DD]..... :		2019-06-25					—
Sample #	M7						—
Ice ball size [mm]..... :	1	2	3	4	5	6	—
	25.1	24.9	25.0	25.0	25.1	25.0	
	7	8	9	10	11	/	
	24.9	25.0	25.0	24.9	24.9	/	

IEC 61215-2							
Clause	Requirement + Test					Result - Remark	Verdict
Ice ball weight [g].....:	1	2	3	4	5	6	—
	7.59	7.47	7.53	7.53	7.59	7.53	
	7	8	9	10	11	/	
	7.47	7.53	7.53	7.47	7.47	/	
Ice ball velocity [m/s].....:	1	2	3	4	5	6	—
	23.1	22.9	23.0	23.0	22.9	23.1	
	7	8	9	10	11	/	
	22.8	22.8	23.0	23.1	23.0	/	
Number of impact locations	11						—

Supplementary information: (impact location descriptions)

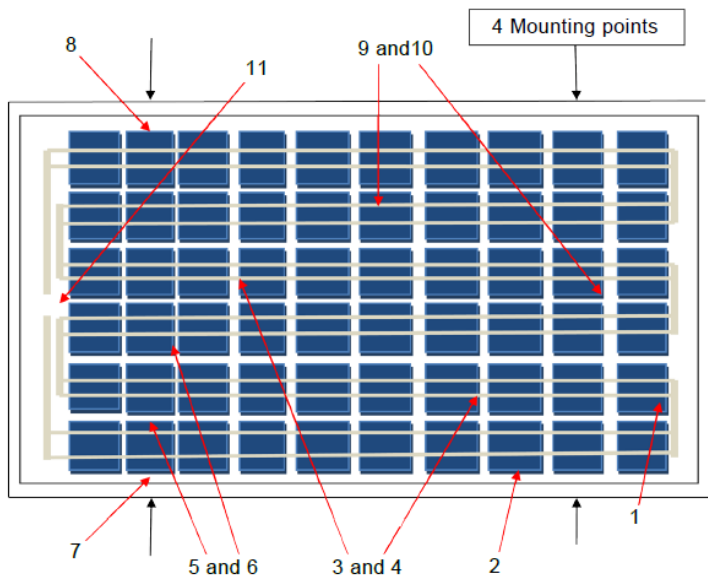


TABLE 19.9: MQT 01 - Visual inspection after hail impact test		P
Test Date [YYYY-MM-DD].....:	2019-06-25	—
Sample #	Nature and position of initial findings – comments or attach photos	—
M7	no major defects	P
Supplementary information: N/A		

TABLE 19.10: MQT 15 - Wet leakage current test after hail impact test		P
Test Date [YYYY-MM-DD].....:	2019-06-25	—
Test Voltage applied [V].....:	1000	—
Solution temperature [°C].....:	22.5	—
Size of module [m²]	1.98	—

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
M7	389.4	220.20	P
Supplementary information: Solution resistivity 2114 [Ω·cm].			

TABLE 20: MQT 19.1 Fin: Final stabilization							N/A
TABLE 20.1: MQT 06.1: Performance at STC before final stabilization							
Test Date [YYYY-MM-DD]..... :				—			—
Test method				<input type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight			—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
—	—	—	—	—	—	—	—
Supplementary information:N/A							

TABLE 20.2: MQT 19.1 Final Stabilization procedure							N/A
Light exposure method:				<input type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight			
Stabilization criterion x per IEC 61215-1-x :				—			
Abbreviation: Regarding light source “S” for Solar simulator and “N” for Natural sunlight							
Sample #		Test Date (YYYY-MM-DD) start/end..:			—		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} – P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #		Test Date (YYYY-MM-DD) start/end			—		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} – P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #		Test Date (YYYY-MM-DD) start/end			—		

IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	Test Date (YYYY-MM-DD) start/end..:				—		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	Test Date (YYYY-MM-DD) start/end				—		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	Test Date (YYYY-MM-DD) start/end.....:				—		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Sample #	Test Date (YYYY-MM-DD) start/end				—		

IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—	—	—
1	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—
Supplementary information: N/A							
<input type="checkbox"/> Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end						
—	—						
Test method description: N/A							
Supplementary information: see Annex 3 for verification of this alternative stabilization procedure							

TABLE 20.3: MQT 06.1: Final Performance at STC									P
Test Date [YYYY-MM-DD]					Different date				—
Test method					<input checked="" type="checkbox"/> Simulator	<input type="checkbox"/> Natural sunlight			—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Pmax [W] (Lab_GateNo.1)	Power Degradation [%]	Result
M10	10.169	48.786	9.732	39.735	386.705	77.95	384.001	-0.30%	P
M13	10.037	48.747	9.604	39.785	382.097	78.10	387.941	-1.51%	P
M4	9.938	48.633	9.523	39.534	376.483	77.89	387.615	-2.87%	P
M5	9.968	48.775	9.550	39.645	378.589	77.87	385.425	-1.77%	P
M8	10.084	48.793	9.711	39.497	383.574	77.96	386.239	-0.69%	P
M9	10.052	48.776	9.705	39.570	384.006	78.32	387.146	-0.81%	P
M6	9.958	48.458	9.503	39.387	374.288	77.56	384.512	-2.66%	P
M7	10.025	48.858	9.685	39.592	383.445	78.28	386.160	-0.70%	P
Supplementary information: Pmax [W] (Lab_GateNo.1) is calculated by considering the reproducibility <i>r</i> of control module.									

TABLE 21: MQT 03 fin: Final Insulation test		P
Test Date [YYYY-MM-DD]	Different date	—
Test Voltage applied [V]	6000/1000	—

IEC 61215-2					
Clause	Requirement + Test		Result - Remark		Verdict
Size of module [m ²]			1.98		—
Sample #	Required	Measured	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M10	20.20	>5000	No dielectric breakdown	No	P
M13	20.20	>5000	No dielectric breakdown	No	P
M4	20.20	>5000	No dielectric breakdown	No	P
M5	20.20	>5000	No dielectric breakdown	No	P
M8	20.20	>5000	No dielectric breakdown	No	P
M9	20.20	>5000	No dielectric breakdown	No	P
M6	20.20	>5000	No dielectric breakdown	No	P
M7	20.20	>5000	No dielectric breakdown	No	P
Supplementary information: The maximum resistance measurement range is 5000 MΩ.					

TABLE 22: MQT 15 fin: Final Wet leakage current test				P
Test Date [YYYY-MM-DD]		Different date		—
Test Voltage applied [V]		1000		—
Solution temperature [°C]		22 ± 2		—
Size of module [m ²]		1.98		—
Required Resistance [MΩ]		20.20		—
Sample #	Measured [MΩ]	Limit [MΩ]	Result	
M10	438.2	20.20	P	
M13	473.8	20.20	P	
M4	357.8	20.20	P	
M5	427.3	20.20	P	
M8	529.1	20.20	P	
M9	433.6	20.20	P	
M6	574.9	20.20	P	
M7	389.4	20.20	P	
Supplementary information: Solution resistivity <3500 [Ω·cm].				

IEC 61215-2

Annex 1: Product Description Sheet (Manufacturers and type references)

A1.1	MODULE TYPE/S
	DMxxx-M159-72 (xxx=385-395,in step of 5W)

A1.2	MODULE DESIGN
	Module dimensions (L x W x H) [mm] :
	Weights..... :
	Front/Rear cover bonding classification :

A1.3	SOLAR CELL
	Cell type reference : Hengdian Group DMEGC Magnetics Co.,Ltd Cell type: DMPD5B159-223, Mono-Si
	Cell dimensions L x W x T (\pm %) [mm] : 158.75 x 158.75 158.75 x 79.375 for half cut cells
	Cell thickness [μ m] : 180 \pm 18
	Cell area [cm ²] : 251.99 125.995 for half cut cells

A1.4	IDENTIFICATION OF MATERIALS
	Front cover :
	Rear cover :
	Encapsulation material front side..... :
	Encapsulation material back side :
	Frame parts :
	Mounting parts :

IEC 61215-2

	Adhesive for frame	:
	Edge sealing	:
	Internal wiring	:
	Cell connector	:
	String connector	:
	Soldering material	:
	Fluxing agent	:
	Junction box	:
	Cable	:
	Connector	:
	Bypass diode	:
	Potting material	:
	Adhesive for junction box	:
	Additional material (e. g. fixing tape, insulation tape)	:

A1.5	MODULE DESIGN - MINIMUM DISTANCES
	Between cells
	Between cell and accessible surfaces
	Between any current carrying part and accessible surfaces

IEC 61215-2

A1.6	MODULE DESIGN - ELECTRICAL CONFIGURATION	
	Total number of cells..... :	72
	Serial-parallel connection of cells :	All serial
	Cells per bypass diode :	24
	No. of bypass diodes..... :	3

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

Annex 2: Test table for verifying other alternative stabilization procedure

Step 1: Alternative stabilization								N/A
Test Date (YYYY-MM-DD) start/end:								—
Test method description:								—
								—
Power before alternative stabilization (W)								—
Power after alternative stabilization (W)								—
Supplementary information:								
Step 2: Light exposure								
<input type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight								
Abbreviation: Regarding light source "S" for Solar simulator and "N" for Natural sunlight								
Sample M10		Test Date (YYYY-MM-DD) start/end.....:						
Test cycle	Light source	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} – P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—		—	—
1							—	—
2								
Supplementary information:								
Sample M11		Test Date (YYYY-MM-DD) start/end.....:						
Test cycle	Light source	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} – P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—		—	—
1							—	—
2								
Supplementary information:								
Sample M12		Test Date (YYYY-MM-DD) start/end.....:						
Test cycle	Light source	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} – P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	—		—	—
1							—	—
2								
Supplementary information:								

IEC 61215-2					
Clause	Requirement + Test	Result - Remark			Verdict
Step 3: Stabilization determination					
				Result	
	Stable power P_{max1} after alternative stabilization (W)				
	Stable power P_{max2} after light exposure (W)				
	Power change P_{max2} to P_{max1} (%)				
	Allowed power change P_{max2} to P_{max1} (%)				
	Is alternative stabilization method valid? (Yes/No)				
Supplementary information:					

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

Annex 3: Lower and higher output power modules

TABLE A.4.1 Performance at STC before initial stabilization							—
Test Date [YYYY-MM-DD]			2019-04-26				—
Test method			<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight				—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 1	10.10	48.87	9.71	39.77	386.16	78.24	—
Low 2	10.09	48.85	9.71	39.75	386.11	78.30	—
High 1	10.19	48.81	9.73	39.99	389.03	78.20	—
High 2	10.18	48.88	9.76	39.98	390.27	78.43	—
Supplementary information: N/A							

TABLE A.4.1 Performance at STC before initial stabilization							—
Test Date [YYYY-MM-DD]			2019-08-07				—
Test method			<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight				—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 3	10.01	48.88	9.42	40.51	381.60	77.99	—
Low 4	10.00	48.90	9.41	40.49	381.01	77.92	—
High 3	10.20	49.50	9.56	41.38	395.59	78.35	—
High 4	10.20	49.44	9.53	41.52	395.69	78.46	—
Supplementary information: N/A							

TABLE A.4.2: MQT 19.1 ini: Initial Stabilization procedure							—
Light exposure method			<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight				—
Abbreviation: Regarding light source "S" for Solar simulator and "N" for Natural sunlight							
Stabilization criterion x per IEC 61215-1-x ..			1				—
Sample #	Low 1	Test Date (YYYY-MM-DD) start/end			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	386.156	—	—
1	5	Above 800	50±10	MPPT	386.340	—	—
2	5	Above 800	50±10	MPPT	386.596	0.11	Yes
Sample #	Low 2	Test Date (YYYY-MM-DD) start/end			2019-04-26 / 2019-04-29		

IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	386.108	—	—
1	5	Above 800	50±10	MPPT	386.111	—	—
2	5	Above 800	50±10	MPPT	385.680	0.11	Yes
Sample #	High 1	Test Date (YYYY-MM-DD) start/end			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	389.027	—	—
1	5	Above 800	50±10	MPPT	389.029	—	—
2	5	Above 800	50±10	MPPT	389.120	0.02	Yes
Sample #	High 2	Test Date (YYYY-MM-DD) start/end			2019-04-26 / 2019-04-29		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	390.274	—	—
1	5	Above 800	50±10	MPPT	390.133	—	—
2	5	Above 800	50±10	MPPT	390.501	0.09	Yes
Supplementary information: N/A							
<input type="checkbox"/> Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end			—			
Low 1				—			
Low 2				—			
High 1				—			
High 2				—			
Test method description: —							
Supplementary information: N/A							

TABLE A.4.2: MQT 19.1 ini: Initial Stabilization procedure			—
Light exposure method	<input checked="" type="checkbox"/> Simulator	<input type="checkbox"/> Natural sunlight	—
Abbreviation: Regarding light source "S" for Solar simulator and "N" for Natural sunlight			
Stabilization criterion x per IEC 61215-1-x ..	1		—
Sample #	Low 3	Test Date (YYYY-MM-DD) start/end	2019-08-07 / 2019-08-09

IEC 61215-2							
Clause	Requirement + Test				Result - Remark		Verdict
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	381.60	—	—
1	5	Above 800	50±10	MPPT	380.55	—	—
2	5	Above 800	50±10	MPPT	380.70	0.28	Yes
Sample #	Low 4	Test Date (YYYY-MM-DD) start/end			2019-08-07 / 2019-08-09		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	381.01	—	—
1	5	Above 800	50±10	MPPT	380.08	—	—
2	5	Above 800	50±10	MPPT	380.33	0.24	Yes
Sample #	High 3	Test Date (YYYY-MM-DD) start/end			2019-08-07 / 2019-08-09		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	395.59	—	—
1	5	Above 800	50±10	MPPT	395.27	—	—
2	5	Above 800	50±10	MPPT	395.18	0.10	Yes
Sample #	High 4	Test Date (YYYY-MM-DD) start/end			2019-08-07 / 2019-08-09		
Test cycle	Integrated irradiation (kWh/m ²)	Irradiance (W/m ²)	Module temperature (°C)	Resistive load	P _{max} (W) at the end of cycle	P _{max} - P _{min} / P _{average} (%)	Stable (Yes/No)
Initial	—	—	—	—	395.69	—	—
1	5	Above 800	50±10	MPPT	396.39	—	—
2	5	Above 800	50±10	MPPT	394.96	0.36	Yes
Supplementary information: N/A							
<input type="checkbox"/> Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end				—		
Low 1					—		
Low 2					—		
High 1					—		
High 2					—		
Test method description: —							
Supplementary information: N/A							

IEC 61215-2			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization							P
Test Date [YYYY-MM-DD]..... :		2019-04-29					—
		Lower end power class		Higher end power class			—
Pmax(lab) (W)		≥ 365.125		≥ 374.609			—
$\bar{P}_{max}(Lab)$ (W)		≥ 376.418		≥ 386.195			—
Voc(lab) (V)		≤ 50.043		≤ 50.328			—
Isc (lab) (A)		≤ 10.124		≤ 10.267			—
Test method		<input type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 1	10.098	48.892	9.725	39.754	386.596	78.30	P
Low 2	10.079	48.839	9.675	39.865	385.680	78.35	P
High 1	10.185	49.795	9.779	39.792	389.120	78.29	P
High 2	10.188	48.872	9.770	39.968	390.501	78.43	P
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

TABLE A.4.3: MQT 6.1 Performance at STC after initial stabilization							P
Test Date [YYYY-MM-DD]..... :		2019-08-09					—
		Lower end power class		Higher end power class			—
Pmax(lab) (W)		≥ 365.125		≥ 374.609			—
$\bar{P}_{max}(Lab)$ (W)		≥ 376.418		≥ 386.195			—
Voc(lab) (V)		≤ 50.043		≤ 50.420			—
Isc (lab) (A)		≤ 10.124		≤ 10.400			—
Test method		<input type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Result
Low 3	9.99	48.92	9.37	40.63	380.70	77.90	P
Low 4	9.98	48.97	9.37	40.59	380.33	77.82	P
High 3	10.19	49.48	9.55	41.38	395.18	78.38	P
High 4	10.19	49.52	9.54	41.40	394.96	78.27	P
Supplementary information: The limit value is calculated through considering the tolerance of rated label values and lab measurement uncertainty.							

IEC 61215-2

Annex 4: List of measurement equipment

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration Cycle
MQT01	—	SB08102	—	May -03-2019	1Year
MQT01	—	SB08108	—	April -29-2019	1Year
MQT01	—	SB08111	—	June-20-2019	1Year
MQT01	—	SB08125	—	April -26-2019	1Year
MQT02&M QT07&M0T 04&MQT09	—	SB08001	—	April -08-2019	1Year
MQT03&M QT15	—	SB10018	—	December -13-2018	1Year
MQT15	—	SB08079	—	April-10-2019	1Year
MQT04	—	SB10022	—	April -10-2019	1Year
MQT08	—	SB08038	—	April -10-2019	1Year
MQT18	—	SB10022	—	April -10-2019	1Year
MQT18&M QT09	—	SB08037	—	December -28-2018	1Year
MQT09	—	SB14002	—	April -07-2019	1Year
MQT10	—	SB16003	—	May -23-2018	1Year
MQT11(50)	—	SB08085	—	April -19-2019	1Year
MQT11(5	—	SB12002	—	December-13-2018	1Year
MQT11(50)	—	SB12011	—	December-13-2018	1Year
MQT11(50)	—	SB10013	—	December -13-2018	1Year
MQT12	—	SB16004	—	April -19-2019	1Year
MQT12	—	SB16006	—	June -29-2019	1Year

IEC 61215-2					
Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration Cycle
MQT12	—	SB16005	—	April -19-2019	1Year
MQT11(200)	—	SB08085	—	April -19-2019	1Year
MQT11(200)	—	SB08004	—	December -13-2018	1Year
MQT11(200)	—	SB08005	—	December -13-2018	1Year
MQT11(200)	—	SB08036	—	December -28-2018	1Year
MQT13	—	SB08087	—	December -28-2018	1Year
MQT16	—	SB10007	—	December -13-2018	1Year
MQT17	—	SB08076	—	May -20-2019	1Year
MQT17	—	SB08107	—	April -28-2019	1Year
MQT17	—	SB08142	—	April -20-2019	1Year
MQT17	—	SB08143	—	April -20-2019	1Year

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