



Test Report issued under the responsibility of:



TEST REPORT	
Report Number.....	6189255B.60
Date of issue.....	2024-07-09
Total number of pages	16
DEKRA Branch.....	DEKRA Testing and Certification (Shanghai) Ltd.
Applicant's name	Solar Fabrik GmbH
Address.....	Hermann-Niggemann-Straße 7, D-63846 Laufach, Germany
Test specification:	
Standard	<input checked="" type="checkbox"/> IEC 61215-1:2016, EN 61215-1:2016 <input checked="" type="checkbox"/> IEC 61215-2:2016, EN 61215-2:2017 <input checked="" type="checkbox"/> IEC 61215-1-1:2016, EN 61215-1-1:2016
Test procedure	N/A
Non-standard test method	N/A
Test Report Form No.	Hail_A
Test Report Form(s) Originator	DEKRA Testing and Certification (Shanghai) Ltd.
Master TRF	2019-05-20
General disclaimer:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Testing Laboratory. This report does not entitle to carry any test mark.	

Test item description :	Photovoltaic (PV) Module(s)	
Trade Mark :	Solar Fabrik	
Manufacturer	Solar Fabrik GmbH	
Model/Type reference	MS4 HC V XXX BF-DG (XXX=440-450W) / S4DGXXX-108T (XXX=440-450W)	
Ratings	Refer to section below for detail information	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/> DEKRA Branch:	DEKRA Testing and Certification (Shanghai) Ltd.	
Location/address	3F #250, Jiangchangsan Road, Building 16, Headquarter Economy Park Shibe Hi-Tech Park, Jing'an District, Shanghai, 200436, P.R. China	
<input checked="" type="checkbox"/> Associated Testing Laboratory:	Shanghai Institute of Quality Inspection and Technical Research	
Testing location/ address	900 Jianguyue Rd., Shanghai, China	
Tested by (name, function, signature)	Lee Huang	
Approved by (name, function, signature) ..	Kevin Lu	
Testing procedure: CTF Stage 1:		
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature) ..		
Testing procedure: CTF Stage 2:		
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature)		
Approved by (name, function, signature) ..		
Testing procedure: CTF Stage 3:		
Testing procedure: CTF Stage 4:		
Testing location/ address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature)		
Approved by (name, function, signature) ..		

Supervised by (name, function, signature).....		






List of Attachments (including a total number of pages in each attachment):	
	attachment number
Installation manual	
Drawings mechanical	
Circuit diagram	
Photographs	Annex 1
Lower and higher output power modules	
Others:	
Product Description Sheet (Manufacturers and type references)	
List of measurement equipment	Annex 2
Measurement uncertainty	Annex 3

Summary of testing:	
Tests performed (name of test and test clause): Refer to section below for detail information	Testing location: Shanghai Institute of Quality Inspection and Technical Research Institute of Electronics & Household Appliances Quality Inspection (SQI_DZ) No. 900 Jiang Yue Roa, Shanghai, 201114, China
Summary of compliance with National Differences (List of countries addressed): N/A	

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBS 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.)

 <p>Solar Fabrik GmbH Hermann-Niggemann-Str. 7-9 63846 Laufach/Germany Phone: +49(0)6093 20770-0 Fax: +49(0)6093 20770-99 Web: www.solar-fabrik.de</p>		Solarstrommodul/Photovoltaic module Mono S4 Trend Black Modell / type MS4 HC V 440 BF-DG	Operating Temperature -40 C to +85 C Safety Class Class I Safety Factor 15 Design Load +3800/-1600 Pa Module Dimensions 1762*1134*30 mm <small>(L*W*H)</small>	  																					
		<table border="1"> <thead> <tr> <th>STC</th> <th>BMV</th> <th>BSI</th> <th></th> </tr> </thead> <tbody> <tr> <td>440</td> <td>488</td> <td>-</td> <td>W±3%</td> </tr> <tr> <td>38.07</td> <td>38.07</td> <td>-</td> <td>V±3%</td> </tr> <tr> <td>14.33</td> <td>15.88</td> <td>17.77</td> <td>A±3%</td> </tr> <tr> <td>32.49</td> <td>32.49</td> <td>-</td> <td></td> </tr> <tr> <td>13.54</td> <td>15.00</td> <td>-</td> <td></td> </tr> </tbody> </table> Power Selection 0→+5W Maximum System Voltage 1500V Maximum Series Fuse Rating 30A Fire Performance Class A	STC		BMV	BSI		440	488	-	W±3%	38.07	38.07	-	V±3%	14.33	15.88	17.77	A±3%	32.49	32.49	-		13.54	15.00
STC	BMV	BSI																							
440	488	-	W±3%																						
38.07	38.07	-	V±3%																						
14.33	15.88	17.77	A±3%																						
32.49	32.49	-																							
13.54	15.00	-																							

ACHTUNG: Bei Installation, Inbetriebnahme oder Wartung die Installations- und Bedienungsanleitung befolgen. Steckkontakte niemals unter Laststrom trennen oder stecken.
WARNING: For installation, starting-up or servicing please refer to the installation and operation manual before proceeding. Do not connect or disconnect plug contacts while system is under current load.

Test item particulars..... :	
Accessories and detachable parts included in the evaluation	N/A
Mounting system used.....	with default mounting method
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	VFM _{rated} – 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	2024-06-26
Dates of tests (beginning/end).....	2024-07-02 / 2024-07-02

GENERAL REMARKS:	
<p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Additional disclaimer: This report shall not be reproduced, except in full, without the written approval of the Testing Laboratory. This report does not entitle to carry any test mark.</p>	
<p>Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60300-2-1:</p>	
<p>The application for obtaining a CB 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..... :</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable</p>
<p>When differences exist; they shall be identified in the General product information section.</p>	
<p>Name and address of factory (factories)</p>	<p>N/A</p>

Product Electrical Ratings:				
Module type	MS4 HC V 440 BF-DG			
Voc [V] /Tolerance	38.07/±3%			
Isc [A] /Tolerance	14.33 /±3%			
Pmp [W] /Tolerance	440 /±3%			
Maximum system voltage [V]	1500			
Maximum Over-Current Protection Rating [A]	30			
Note: MS4 HC V 440 BF-DG is specified by client to perform the test				

GENERAL PRODUCT INFORMATION AND OTHER REMARKS:Modifications:

- Initial module design qualification
- Extension of module design qualification
- Original test report ref. No.:

Model differences and modification:

- | | |
|--|---|
| <input type="checkbox"/> Test programs for crystalline silicon PV modules | <input type="checkbox"/> Test programs for thin-film PV modules |
| <input type="checkbox"/> 4.1.1 Modification to frontsheet | <input type="checkbox"/> 4.2.1 Modification to frontsheet |
| <input type="checkbox"/> 4.1.2 Modification to encapsulation system | <input type="checkbox"/> 4.2.2 Modification to encapsulation system |
| <input type="checkbox"/> 4.1.3 Modification to cell technology | <input type="checkbox"/> 4.2.3 Modification to front contact (e. g. TCO) |
| <input type="checkbox"/> 4.1.4 Modification to cell and string interconnect material or technique | <input type="checkbox"/> 4.2.4 Modification to cell technology |
| <input type="checkbox"/> 4.1.5 Modification to backsheet | <input type="checkbox"/> 4.2.5 Modification to cell layout |
| <input type="checkbox"/> 4.1.6 Modification to electrical termination | <input type="checkbox"/> 4.2.6 Modification to back contact |
| <input type="checkbox"/> 4.1.7 Modification to bypass diode | <input type="checkbox"/> 4.2.7 Modification to edge deletion |
| <input type="checkbox"/> 4.1.8 Modification to electrical circuitry | <input type="checkbox"/> 4.2.8 Modification to interconnect material or technique |
| <input type="checkbox"/> 4.1.9 Modification to edge sealing | <input type="checkbox"/> 4.2.9 Modification to backsheet |
| <input type="checkbox"/> 4.1.10 Modification to frame and/or mounting structure | <input type="checkbox"/> 4.2.10 Modification to electrical termination |
| <input type="checkbox"/> 4.1.11 Change in PV module size | <input type="checkbox"/> 4.2.11 Modification to bypass diode |
| <input type="checkbox"/> 4.1.12 Higher or lower output power (by 10 % or more) with the identical design and size and using the identical cell process | <input type="checkbox"/> 4.2.12 Modification to edge sealing |
| <input type="checkbox"/> 4.1.13 Increase of over-current protection rating | <input type="checkbox"/> 4.2.13 Modification to frame and/or mounting structure |
| <input type="checkbox"/> 4.1.14 Increase of system voltage | <input type="checkbox"/> 4.2.14 Change in PV module size |
| <input type="checkbox"/> 4.1.15 Change in cell fixing tape | <input type="checkbox"/> 4.2.15 Higher or lower output power (by 10 % or more) with the identical design and size |
| | <input type="checkbox"/> 4.2.16 Increase of over-current protection rating |
| | <input type="checkbox"/> 4.2.17 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
1	-	MS4 HC V 440 BF-DG	M754W06040300005	-
Supplementary information: N/A				
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			

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TABLE 01: MQT 01 ini: Initial Visual inspection		P
Test Date [YYYY-MM-DD]..... : 2024-07-02		—
Sample #	Nature and position of initial findings – comments or attach photos	—
1	No visual defects found	P
Supplementary information: N/A		

TABLE 02: MQT 02: Performance at STC							—
Test Date [YYYY-MM-DD] :		2024-07-02					—
Test method :		<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight					—
Irradiance [W/m ²] :		1000					—
Module temperature [°C] :		25					—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	—
1	14.353	38.263	13.575	32.623	442.857	80.64	—
Supplementary information: N/A							

TABLE 04: MQT 03 ini: Initial Insulation test				P
Test Date [YYYY-MM-DD].....:		2024-07-02		—
Test Voltage applied [V]		8000 / 1500		—
Size of module [m ²]		2.00		—
Required Resistance [MΩ].....:		20.0		—
Sample #	Measured	Dielectric breakdown		Result
	MΩ	Yes (description)	No	
1	>5000	-	No	P
Supplementary information: N/A				

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TABLE 05: MQT 15 ini: Initial Wet leakage current test				P
Test Date [YYYY-MM-DD]		2024-07-02		—
Test Voltage applied [V]		1500		—
Solution temperature [°C]		22.8		—
Size of module [m ²]		2.00		—
Sample #	Required Resistance [MΩ]	Measured [MΩ]		Result
1	20.0	>5000		P
Supplementary information: N/A				

TABLE 21.30: MQT 17 - Hail impact test								P
Test Date [YYYY-MM-DD]		2024-07-02						—
Sample #		1						—
Ice ball size [mm]	1	2	3	4	5	6	—	
	39.70	39.45	39.06	39.43	39.39	39.20		
	7	8	9	10	11	—		
	39.03	39.31	39.36	39.13	39.22	—		
Ice ball weight [g]	1	2	3	4	5	6	—	
	31.31	30.55	29.38	30.49	30.37	29.80		
	7	8	9	10	11	—		
	29.29	30.18	30.28	29.59	29.86	—		
Ice ball velocity [m/s]	1	2	3	4	5	6	—	
	27.9	28.3	28.9	27.6	27.7	29.0		
	7	8	9	10	11	—		
	27.7	28.8	29.2	28.5	29.2	—		
Supplementary information: N/A								

TABLE 19.9: MQT 01 – Visual inspection after hail impact test			P
Test Date [YYYY-MM-DD]		2024-07-02	—
Sample #	Nature and position of initial findings – comments or attach photos		—
1	No visual defects found		P
Supplementary information: N/A			

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TABLE 19.10: MQT 15 – Wet leakage current test after hail impact test				P
Test Date [YYYY-MM-DD]..... :		2024-07-02		—
Test Voltage applied [V]..... :		1500		—
Solution temperature [°C]..... :		22.9		—
Size of module [m ²]..... :		2.00		—
Sample #	Measured [MΩ]	Required Resistance [MΩ]		Result
1	>5000	20.0		P
Supplementary information: N/A				

TABLE 20.3: MQT 06.1: Final Performance at STC									P
Test Date [YYYY-MM-DD]..... :		2024-07-02							—
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
1	14.329	38.143	13.455	32.503	437.328	80.02	442.857	-1.25	P
Supplementary information: Pmax [W] (Lab_GateNo.1) is calculated by considering the reproducibility r of control module.									

TABLE 21: MQT 03 fin: Final Insulation test					P
Test Date [YYYY-MM-DD]..... :		2024-07-02			—
Test Voltage applied [V]..... :		8000 / 1500			—
Size of module [m ²]..... :		2.00			—
Sample #	Required	Measured	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
1	20.0	>5000	-	No	P
Supplementary information: N/A					

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TABLE 22: MQT 15 fin: Final Wet leakage current test			P
Test Date [YYYY-MM-DD]	:	2024-07-02	—
Test Voltage applied [V]	:	1500	—
Solution temperature [°C]	:	22.9	—
Size of module [m ²]	:	2.00	—
Required Resistance [MΩ]	:	20.0	—
Sample #	Measured [MΩ]	Limit [MΩ]	Result
1	>5000	20.0	P
Supplementary information: N/A			

Annex 1: Photographs

Module type: MS4 HC V 440 BF-DG

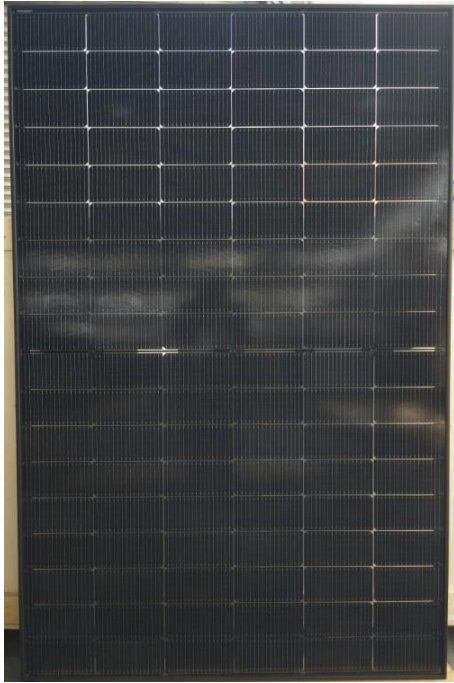


Fig. 1: front view of test sample



Fig. 2: rear view of test sample

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Annex 2: List of measurement equipment

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
MQT 01	Visual inspection	Band tape DZ-B-A1-0014	3.5m	2021-09-02	2024-09-01
MQT 03	Insulation test	Insulation tester DZ-A-A1-0258	Applied voltage:0~6kV Insulation resistance:1~50GΩ	2023-07-28	2024-07-27
		Withstand voltage tester DZ-A-A1-0256	0~10kV	2024-02-20	2025-02-19
MQT 06.1	performance at STC	Pulse solar simulator DZ-A-A2-0022	200~1200W/ m ²	2023-09-21	2024-09-20
MQT 17	Hail test	Hail tester DZ-A-A2-0165	25~75mm	2023-08-02	2024-08-01
		Electrical balance DZ-A-A2-0019-1	300g	2024-06-25	2025-06-24

Annex 3: Measurement uncertainty

The total measuring uncertainty of P_{mpp} is ≤ 2.1%

The total measuring uncertainty of I_{sc} is ≤ 2.0%

The total measuring uncertainty of V_{oc} is ≤ 0.8%