Test Report issued under the responsibility of:

DEKRA

TEST REPORT Photovoltaic (PV) Modules Test	
Report Number. .....:	**6202700A.50**
Date of issue .....:	**2024-10-22**
Total number of pages.....:	**15**
DEKRA Branch .....:	**DEKRA Testing and Certification (Shanghai) Ltd.**
Applicant's name.....:	**Senergy Technical Services (Shanghai) Co., Ltd.**
Address .....:	**19J Huamin Empire Plaza, 726, Yan'An West Road, Changning District, 200050 Shanghai, China**
Test specification:	
Standard .....:	Refer to IEC 61215-2:2021
Test procedure .....:	Client specified
Non-standard test method .....:	N/A
Test Report Form No. .....:	DEKRA Specified Test_1.0
Test Report Form(s) Originator ....:	DEKRA Testing and Certification (Shanghai) Ltd.
Master TRF.....:	2019-05-20

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This report does not entitle to carry any test mark.

Test item description.....:	Photovoltaic (PV) Module(s)
Trade Mark.....:	DUAL SUN
Manufacturer.....:	DUAL SUN
Address.....:	2 Rue Marc Donadille, 13013 Marseille, Cedex 13, France
Model/Type reference.....:	DS500-120M10TB-03
Ratings.....:	Refer to page 6 for more details

Testing procedure and testing location:			
☒	**DEKRA Branch**	DEKRA Testing and Certification (Shanghai) Ltd.	
Testing location/ address .....:		3F #250, Jiangchangsan Road, Building 16, Headquarter Economy Park Shibei Hi-Tech Park, Jing'an District, Shanghai, 200436, P.R. China	
☒	**Associated Testing Laboratory**	DEKRA Testing and Certification (Shanghai) Ltd. No.16, Lane 1288, Luoning Road, Baoshan District, Shanghai, 200949, P.R. China	
Tested by (name, function, signature).....:		Christy Zhu	
Approved by (name, function, signature) ..:		Kevin Lu	

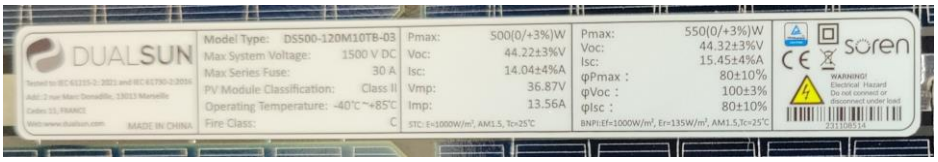
List of Attachments (including a total number of pages in each attachment):	
	attachment number / number of pages
Installation manual	
Drawings mechanical	
Circuit diagram	
Photographs	Annex 1 / 2 pages
IV Curve	
Component datasheets / certificates	
Others:	
List of test equipment used	Annex 2 / 1 pages
Electroluminescence	
Statement of measurement uncertainty	Annex 3 / 1 page

Summary of testing:	
Tests performed (name of test and test clause): Visual inspection (MQT 01) Maximum power determination (MQT 02) Wet leakage current test (MQT 15) Static mechanical load test (MQT 16) UV preconditioning test (MQT 10) Hail test (HMQT 17)	**Testing location:** DEKRA Testing and Certification (Shanghai) Ltd. No.16, Lane 1288, Luoning Road, Baoshan District, Shanghai, 200949, P.R. China

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.)



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	FF – Fill factor
Vmp – Maximum power voltage	NP – Nameplate
Imp – Maximum power current	SML –Static mechanical load test
Isc – Short circuit current	IT – Insulation test
Voc – Open circuit voltage	r – Pmax measurement reproducibility
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	HI – Hail Resistance Test
UV – UV preconditioning test	
Testing Dates (YYYY-MM-DD)	
Date of first test item received..... :	2024-09-02
Dates of tests (beginning/end)..... :	2024-09-14 / 2024-10-10

GENERAL REMARKS:	
Test procedure is according to client's requirements. Test results are documented within this test report. "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☐ comma / ☒ point is used as the decimal separator.	
Name and address of factory (factories)..... :	DUAL SUN 2 Rue Marc Donadille, 13013 Marseille, Cedex 13, France

Product Electrical Ratings:				
Module type	DS500-120M10TB-03			
Voc [V]	44.22±3%			
Vmp [V]	36.87			
Imp [Adc]	13.56			
Isc [Adc]	14.04±4%			
Pmax [W]	500(0/+3%)			
Maximum system voltage [V]	1500			
Maximum Over-Current Protection Rating [A]	30			
Supplementary information: N/A				

MODULE GROUP ASSIGNMENT:			
Sample #	Type/model	Sample S/N	Remark
1	DS500-120M10TB-03	DSAABTWD44248VA11341112	SML
2	DS500-120M10TB-03	DSAABTWD44248VA12399112	UV
3	DS500-120M10TB-03	DSAABTWD44248VA12543112	HI
Supplementary information: N/A			

4. TESTING OVERVIEW			
4.1	Visual inspection (MQT 01)	See Table 01	P
4.2	Maximum power determination (MQT 02)	See Table 02	—
4.15	Wet leakage current test (MQT 15)	See Table 03	P
4.16	Static mechanical load test (MQT 16)	See Table 04-04.3	P
4.10	UV preconditioning test (MQT 10)	See Table 05-05.3	P
4.17	Hail test (HMQT 17)	See Table 06-06.3	P

TABLE 01: MQT 01 – Initial Visual inspection		
Test Date [YYYY-MM-DD]..... :	2024-09-14 (Sample#1-2) 2024-10-09 (Sample#3)	—
Sample #	Nature and position of initial findings – comments or attach photos	—
1	No visual defects found.	P
2	No visual defects found.	P
3	No visual defects found.	P
Supplementary information: N/A		

TABLE 02: MQT 02 – Maximum power determination						
Test Date [YYYY-MM-DD] ..... :			2024-09-14 (Sample#1-2) 2024-10-09 (Sample#3)			—
Irradiance [W/m²] ..... :			1000			—
Module temperature [°C] ..... :			Corrected to 25			—
Test method ..... :			☒ Simulator ☐ Natural sunlight			—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]
1	13.893	44.188	13.247	37.393	495.326	80.68
2	13.879	44.311	13.228	37.458	495.493	80.57
3	13.886	44.315	13.230	37.405	494.872	80.42
Supplementary information: N/A						

Table 03: MQT 15 – Initial Wet leakage current test			
Test Date [YYYY-MM-DD] ..... :	2024-09-14 (Sample#1-2) 2024-10-09 (Sample#3)		—
Test Voltage applied [V] ..... :	1500		—
Solution temperature [°C] ..... :	23.8; 23.6		—
Solution resistivity [Ω cm] ..... :	2607; 2675		—
Size of module [m²]..... :	2.21		—
Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
1	18.10	>5000	P
2	18.10	>5000	P
3	18.10	>5000	P
Supplementary information: The insulation tester can measure up to 5000MΩ.			

TABLE 04: MQT 16 Static mechanical load test			
Sample #:	1		—
Design load (front side/ back side):	4400 / 2400		—
Safety factors :	1.5		—
Test Date [YYYY-MM-DD]	2024-09-23		—
Mounting method :	4xclamps on 1/4 of long side		—
Load applied to :	Front side	Back side	—
Mechanical load [Pa] :	6600	3600	—
First cycle time (start/end) :	9:00-10:00	10:00-11:00	—
Intermittent open-circuit (yes/no) :	no	no	P
Second cycle time (start/end):	11:00-12:00	12:00-13:00	—
Intermittent open-circuit (yes/no) :	no	no	P
Third cycle time (start/end) :	13:00-14:00	14:00-15:00	—
Intermittent open-circuit (yes/no) :	no	no	P
Supplementary information: N/A			

TABLE 04.1: MQT 01 - Visual inspection after static mechanical load test		
Test Date [YYYY-MM-DD].....:	2024-09-23	—
Sample #	Nature and position of initial findings – comments or attach photos	—
1	No visual defects found.	P
Supplementary information: N/A		

TABLE 04.2: MQT 02 – Maximum power determination after static mechanical load test								
Test Date [YYYY-MM-DD] ..... :	2024-09-23							—
Irradiance [W/m²] ..... :	1000							—
Module temperature [°C] ..... :	Corrected to 25							—
Test method ..... :	☒ Simulator ☐ Natural sunlight							—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Degradation [%]	Result
1	13.895	44.198	13.244	37.378	495.028	80.61	-0.06	P
Supplementary information: N/A								

TABLE 04.3: MQT 15 Wet leakage current test after static mechanical load test			
Test Date [YYYY-MM-DD] .....:	2024-09-23		—
Test Voltage applied [V] .....:	1500		—
Solution temperature [°C].....:	23.4		—
Solution resistivity [Ω cm] .....:	2669		—
Size of module [m²] .....:	2.21		—
Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
1	18.10	>5000	P
Supplementary information: The insulation tester can measure up to 5000MΩ.			

TABLE 05: MQT 10 - UV preconditioning test		
Test Date (YYYY-MM-DD) start/end .....:	2024-09-27 / 2024-10-10	—
Sample # .....:	2	
Module temperature [°C] ..... :	58.5	—
UV irradiance (280-400nm) [W/m²] ..... :	194	—
UV dose (280-320nm) [kWh/ m²] ..... :	60	—
Module operation condition ..... .:	☒ Short circuited ☐ Open circuited	—
Supplementary information: N/A		

TABLE 05.1: MQT 01 - Visual inspection after UV preconditioning test		
Test Date [YYYY-MM-DD].....:	2024-10-10	—
Sample #	Nature and position of initial findings – comments or attach photos	—
2	No visual defects found.	P
Supplementary information: N/A		

TABLE 05.2: MQT 02 – Max. power determination after UV preconditioning test								
Test Date [YYYY-MM-DD] ..... :	2024-10-10							—
Irradiance [W/m²] ..... :	Corrected to 25							—
Module temperature [°C] ..... :	1000							—
Test method ..... :	☒ Simulator ☐ Natural sunlight							—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Degradation [%]	Result
2	13.803	44.289	13.153	37.479	492.962	80.64	-0.51	P
Supplementary information: N/A								

TABLE 05.3: MQT 15 - Wet leakage current test after UV preconditioning test			
Test Date [YYYY-MM-DD]..... :	2024-10-10		—
Test Voltage applied [V] ..... :	1500		—
Solution temperature [°C]..... :	23.2		—
Size of module [m²] ..... :	2.21		—
Solution resistivity [Ω cm] ..... :	2652		—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result
2	>5000	18.10	P
Supplementary information: The insulation tester can measure up to 5000MΩ.			

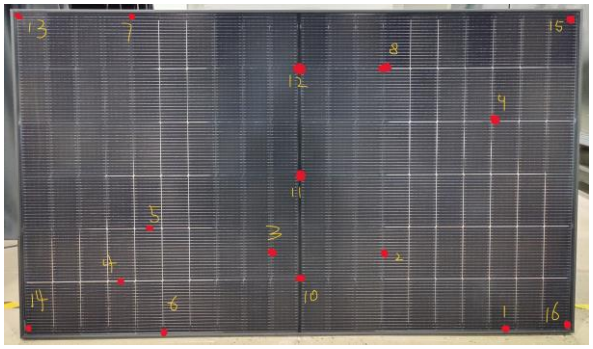
TABLE 06: HMQT 17 - Hail impact test							
Test Date [YYYY-MM-DD] ..... :	2024-10-10						—
Sample #	3						—
Ice ball size [mm] ..... :	1	2	3	4	5	6	—
	35.2	35.1	35.0	34.9	35.2	35.3	
	7	8	9	10	11	12	
	35.4	35.0	35.2	35.1	35.0	35.5	
	13	14	15	16	—	—	
	34.9	35.1	35.0	35.1	—	—	
Ice ball weight [g] ..... :	1	2	3	4	5	6	—
	20.20	20.84	20.71	20.50	20.71	20.57	
	7	8	9	10	11	12	
	20.67	21.30	20.34	20.21	20.87	21.00	
	13	14	15	16	—	—	
	21.29	21.18	20.14	20.83	—	—	
Ice ball velocity [m/s] ..... :	1	2	3	4	5	6	—
	27.7	26.9	28.0	28.0	27.1	27.3	
	7	8	9	10	11	12	
	27.4	27.0	27.7	27.4	27.0	28.0	
	13	14	15	16	—	—	
	27.7	27.3	27.7	27.8	—	—	
Number of impact locations ..... :	16						—
Supplementary information:							

TABLE 06.1: MQT 01 - Visual inspection after hail impact test		
Test Date [YYYY-MM-DD]..... :	2024-10-10	—
Sample #	Nature and position of initial findings – comments or attach photos	—
3	No visual defects found.	P
Supplementary information:		

TABLE 06.2: MQT 02 – Maximum power determination after hail impact test								
Test Date [YYYY-MM-DD] ..... :	2024-10-10							—
Irradiance [W/m²] ..... :	1000							—
Module temperature [°C] ..... :	Corrected to 25							—
Test method ..... :	☒ Simulator ☐ Natural sunlight							—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Degradation [%]	Result
3	13.884	44.318	13.232	37.411	495.021	80.45	0.03	P
Supplementary information: N/A								

TABLE 06.3: MQT 15 - Wet leakage current test after hail impact test			
Test Date [YYYY-MM-DD]..... :	2024-10-10		—
Test Voltage applied [V]..... :	1500		—
Solution temperature [°C]..... :	23.2		—
Size of module [m²] ..... :	2652		—
Solution resistivity [Ω cm] ..... :	2.21		—
Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
3	18.10	>5000	P
Supplementary information:			

Annex 1: Photographs

Module Type: DS500-120M10TB-03

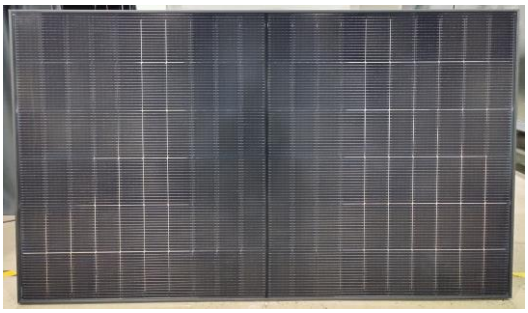


Fig. 01: front view of test sample

Fig. 02: rear view of test sample

Fig. 03: type label of test sample

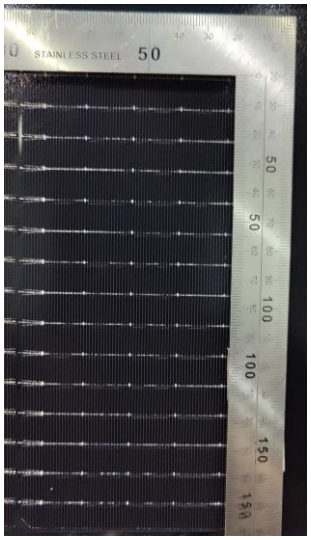


Fig. 04: cell of test sample

Fig. 05: view of junction box

Fig. 06: view of mechanical installation

Annex 2: List of measurement equipment

List of Measurement Equipment:				
Measurement / testing	**Testing / measuring equipment / material used, (Equipment ID)**	**Range used**	**Last Calibration date**	**Calibration due date**
Visual inspection	Visual inspection bench BS-PV 010	-	-	-
	Illumination photometer BS-PV 036	2000lx	2024-02-27	2025-02-26
Maximum power determination	Pulse solar simulator BS-PV 057	A+AA+	2024-07-29	2025-07-28
	Electrical Load BS-PV 057-02	-15V~420V -50A~50A	2024-07-29	2025-07-28
	Reference Module BS-PV 057-03	-	2024-07-08	2025-07-07
Wet leakage current	Water tank BS-PV 047-01	22 ± 2°C	2024-05-22	2025-05-21
	Insulation resistance tester BS-PV 090	Test voltage: 0~10kV Result range: 0~50000MΩ	2024-05-22	2025-05-21
	Conductivity meter BS-PV 047-02	0~1999μs/cm, 10.0~40.0°C	2024-05-22	2025-05-21
Static mechanical load test	Static mechanical load tester BS-PV 049	≤12500Pa	2024-03-27	2025-03-26
Hail test	Hail tester BS-PV 050-01	-	2024-06-03	2025-06-02
	Electrical balance BS-PV 050-02	220g/0.01g	2024-05-22	2025-05-21
	Digital Caliper BS-PV 050-03	0-150mm	2024-06-16	2025-06-15
UV precondition test	UV test chamber BS-PV 058	UVB/(UVA+UVB) =3%~10% Nonuniformity:15 %	2024-06-25	2025-06-24

Annex 3: Statement of test uncertainty

The total measuring uncertainty of Pmpp is ≤ 2.47%
The total measuring uncertainty of Isc is ≤ 2.35%
The total measuring uncertainty of Voc is ≤ 0.84%