Attachment 1

LEADING EDGE CONSTRUCTION MATERIALS TESTING COMPANY LIMITED
Asia Aluminum Industrial City. The New & High Tech Industrial Development Zone,
Dawang, Zhaoqing,Guang Dong Province,China
Tel.: (852) 3705 3591 / (86) 758-3632768 Fax.: (852) 3705 2074 Email: info@le-testlab.com

IAS ACCREDITED Testing Laboratory TL-496

Fire Resistance Test Report	
Report No.	Q23A173
Revision:	00
Date of issue:	May 22, 2023

TEST REPORT

Test Report

for

IEC 61730-2/MST-23 (according to UL790)

Sponsor:	DEKRA Testing and Certification (Shanghai) Ltd.
Address of Sponsor:	No.16, Lane 1288, Luoning Road, Baoshan District, Shanghai, 200949, P.R.China
Date of Test:	May 12 & 19, 2023
Location of Testing Yard:	Asia Aluminum Industrial City, The New High-Tech Industrial Development Zone, Dawang, Zhaoqing, Guang Dong Province, China

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IAS ACCREDITED TL-495

Test Report for IEC 61730-2/MST-23 (UL790)

Description of Specimen

Identification of Test Item:	**Q23A173-A (Serial No.: M754W160323000002)** **Q23A173-B (Serial No.: M754W160323000001)**
Manufacturer:	Sunova Solar Technology Co., Ltd.
Module Type:	SS-BG410-54MDH
Dimensions:	1722*1134*30mm
Test Method:	Perform Fire Test, according to IEC 61730-2/MST-23(UL790), Fire Class A.

Purpose of Test

This test is used to determine if the classification of the photovoltaic panel in accordance with the requirement of IEC 61730-2/MST-23(UL790), Fire Class A.

Measuring Equipment Used

1. Type K Thermocouple (I.D. No.: LE39099, Next Calibration Date: 7-Sept-2023)
2. Type K Thermocouple (I.D. No.: LE39100, Next Calibration Date: 7-Sept-2023)
3. Anemometer (I.D. No.: LE4031, Next Calibration Date: 6-Feb-2024)

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Testing Procedures

The photovoltaic panel was stored in the controlled indoor environment for 24 hours before test.

The specimen was tested against the Class A conditions as specified in the standard IEC 61730-2/MST-23(UL790). Before the test, the deck was subjected to an air current that flows uniformly over the top surface of the roof covering material, as determined by a pre-calibration of the equipment using a bare (1 m by 1.3 m) gypsum deck at points midway up (650 mm from edge) the incline of the bare deck, with the deck positioned at an incline of 127 mm to the horizontal 0.3 m, the velocity of the air current was 5.3 m/s ±0.2 m/s, as measured at the center and at each of two locations measured 76 mm from each edge of the deck, with each measurement being 94 mm above the surface of the deck.

Procedure 1: Spread-of-Flame Test

The gas supply is to be regulated so that the flame develops a temperature of 760°C ±28°C. The temperature was determined by a thermocouple located 25 mm above the surface and 13 mm toward the source of flame from the lower edge the deck.

The corresponding serial number photovoltaic panel was placed over the deck (See **Figure 1**). The gas flame is to be applied for 10 minutes and then removed. During and after the application of the test flame, the test sample is to be observed for the distance to which flaming of the material has spread, production of flaming or glowing brands, and displacement of portions of the test sample. The observation is to continue until the flame has permanently receded from a point of maximum spread. The operator recorded his observations in his worksheet. This test was identified as **Q23A173-A.**

Procedure 2: Burning-Brand Test

The corresponding serial number photovoltaic panel was placed over deck for testing (See **Figure 3**).
The Class A brands are to be exposed to the flame for 5 minutes at 888℃ ±28℃, during which time they are to be rotated to present each surface to the flame as follows:
a) Each 12 by 12-inch (305 by 305 mm) face for 30 seconds,
b) Each 2-1/4 by 12-inch (57.2 by 305 mm) face for 45 seconds,
c) Each 12 by 12-inch face again for 30 seconds.
The test is to be continued until the brand is consumed and until all evidence of flame, glow and smoke has disappeared from both the exposed surface being tested and the underside of the photovoltaic panel. The operator recorded his observations in his worksheet.
This test was identified as **Q23A173-B.**

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Results

During the Spread-of-Flame test **Q23A173-A**, no fall off of glowing particles or significant spread was observed, the flame distance was less than 1.80m. The photographs before and after the test are shown in **Figure 2**.

During the Burning-brand test **Q23A173-B**, no fall off of glowing particles, no burning through or sustained flaming on the underside of the panel was observed. The photographs before and after the test are shown in **Figure 4**.

The test worksheets are shown in **Appendix 1**.

Conclusion

All photovoltaic panels were tested and satisfied by standard: IEC 61730-2/MST-23(UL790), **Fire Class A**.

Approved Signatory: _____ Date: May 22, 2023

Mr. Zeng Xiang Jian

End of Report

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Figure 1: Spread-of-Flame test set-up for Q23A173-A

Figure 2: Photovoltaic Panel after Spread-of-Flame test Q23A173-A

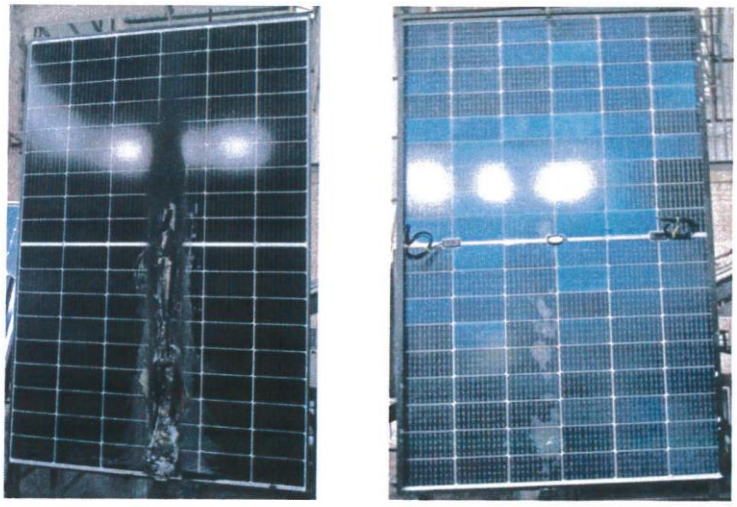

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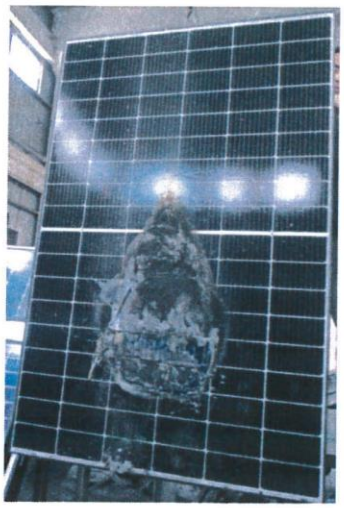
Figure 3: Photovoltaic panel before Burning-Brand Test Q23A173-B

Figure 4: Photovoltaic Panel after Burning-Brand Test Q23A173-B



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Appendix 1: Worksheets for fire test to building coverings, as shown below.

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FORM TM-UL790
WORKSHEET FOR FIRE TEST TO BUILDING COVERINGS

Client: DEKRA

FTL No. (Specimen ID): Q23A173-A

Laboratory: ☑ Zhaoqing ☐ Other _____

Test Method: ☑ Clause 6* / Clause 7* / Clause 8* of UL790 ☐ Other _____

*Delete as appropriate

Ambient Temperature (°C): 26.6 (requirement: 16-32°C) Humidity (%r.h.): 76 Time: 16:06

Specimen Description: M754W 180323 00 0002 Drawing: _____

PRE-TEST CHECK

TC's Verified

TC's s/n LE35095 Due 2023.8.7

Burner Output Verification

Flow _____ KW _____

Flow _____ Temp. 765°C

Requirements: 760 ± 28 °C

Duct Flow Verified Indication _____

Anemometer Verified: s/n LE4031 Due 2024.2.6

#1 Left (1) 5.3 (2) 5.3 (3) 5.4 (4) 5.3 (5) 5.3

average: 5.32 (m/s)

#2 Middle (1) 5.4 (2) 5.3 (3) 5.3 (4) 5.3 (5) 5.3

average: 5.32 (m/s)

#3 Right (1) 5.3 (2) 5.4 (3) 5.4 (4) 5.3 (5) 5.3

average: 5.34 (m/s)

NB: The wind speed is obtained from 5 readings in 30 seconds.

Requirements: 5.3 ± 0.2 m/s

Time: (min)	OBSERVATION
	For spread-of-frame: Fall off of glowing particles, flame distance, no significant lateral spread. For Burning-brand: Fall off of glowing particles, burn through, sustained flaming.
0'00"	Test started.
10'00"	Test ended. No fall off of glowing particles, no significant lateral spread was observed, the flame distance was less than 1.80 m in the test.

Tested by: Tong Date of Testing: 2023.5.12

Verified by: _____ (Work Sheet)

FORM TM-UL790 Worksheet for Fire Tests for Roof Coverings (Rev 2.0) Mar, 09

Attachment 1

LEADING EDGE CONSTRUCTION MATERIALS TESTING COMPANY LIMITED.

Page 2 of 2

FORM TM-UL790
WORKSHEET FOR FIRE TEST TO BUILDING COVERINGS

Client: DEKRA

FTL No. (Specimen ID): Q23A173-B

Laboratory: ☑ Zhaoqing ☐ Other _____

Test Method: ☑ Clause 6* / Clause 7* / Clause 8* of UL790 ☐ Other _____

*Delete as appropriate

Ambient Temperature (°C): 26.8 (requirement: 16-32°C) Humidity (%r.h.): 78 Time: 15:18

Specimen Description: M754W160 323000001 Drawing: _____

PRE-TEST CHECK

TC's Verified

TC's s/n LE39100 Due 2023.9.7

Burner Output Verification

Flow _____ KW _____

Flow _____ Temp. 891°C

Requirements: 888 ± 28 °C

Duct Flow Verified Indication _____

Anemometer Verified: s/n LE4031 Due 2024.2.6

#1 Left (1) 5.4 (2) 5.4 (3) 5.3 (4) 5.3 (5) 5.3

average: 5.34 (m/s)

#2 Middle (1) 5.4 (2) 5.3 (3) 5.3 (4) 5.4 (5) 5.4

average: 5.36 (m/s)

#3 Right (1) 5.3 (2) 5.3 (3) 5.4 (4) 5.4 (5) 5.4

average: 5.36 (m/s)

NB: The wind speed is obtained from 5 readings in 30 seconds.

Requirements: 5.3 ± 0.2 m/s

Time: (min)	OBSERVATION
	For spread-of-frame: Fall off of glowing particles, flame distance, no significant lateral spread. For Burning-brand: Fall off of glowing particles, burn through, sustained flaming.
0'00"	Test started.
21'40"	Test ended. The burning brand disappeared and burn mark was observed.
	No fall off of glowing particles, no burning through of the specimen or sustained flaming on the underside of the specimen was observed.

Tested by: Tong Date of Testing: 2023.5.19

Verified by: _____ (Work Sheet)

FORM TM-UL790 Worksheet for Fire Tests for Roof Coverings (Rev 2.0) Mar, 09