

Sunman: Lightweight Solar Applications in the C&I Rooftop Market

2024 Corporate Presentation V1.0

Content

01 Company

02 Technology

03 Product

04 Application

01 Company



Sunman at a glance

- Founded in 2014, Sunman is an Australian Solar Technology Company
- Commercialized world's first ultra-light, glass-free crystalline silicon PV module "eArc"
- 600 MW+ shipments delivered to 40+ countries (Q4 2023)
- Operates 1 GW production capacity out of Jiangsu Province, China

Founder

- Sunman's founder is PV scientist and industry pioneer
Dr. Zhengrong Shi
- Founder of Suntech Power (No.1 PV Manufacturer
2010-2011)
- Founder of Asia Silicon (5th Largest Polysilicon producer)
- Central Figure to the development of global PV Industry
- Owner of 80 patents and author of 110 Academic
Papers
- Professor at the University of New South Wales
- Fellow at Australian Academy of Technological Sciences
& Engineering



Development History



Founded by a group of industry veterans

2014.10



Sunman launches its first 12 MW production line

2016.07



Products pass CSA certification

2017.05



Capacity expands to 100 MW

2019.05



Sunman closes Series B Financing

2020.11



Sunman launches the World's First GW-Scale Lightweight PV Module Manufacturing Base

2022.1



Sunman closes Series D Financing

2023.12

2016.02

Products pass IEC Certification



2016.12

Products pass JET certification



2018.01

Sunman closes Series A Financing



2019.09

Products pass new IEC Certification



2021

Continued R&D, growth and capacity expansion

2022.6

Sunman closes Series C Financing



2023

Cumulative shipments of eArc modules reach 600 MW

Backed By Blue-Chip, Global Investors



Sunman is backed by leading PE firms and VCs.
Largest Shareholder is the **Clean Energy Finance Corporation**
Australian Government Backed “World’s Largest Green Bank”

Sunman has successfully commercialized eArc modules to 1 GW capacity

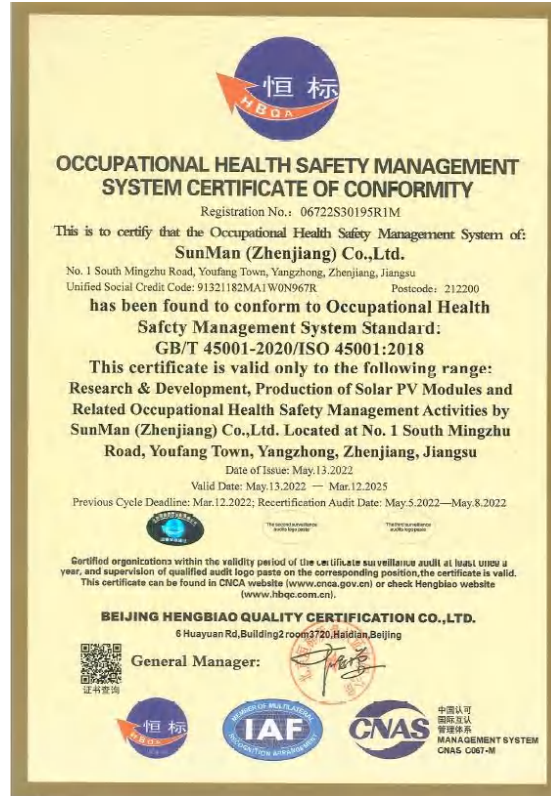


World class standards



ISO9001

Quality Management System



ISO45001

Occupational Health Safety Management System



ISO14001

Environment Management System

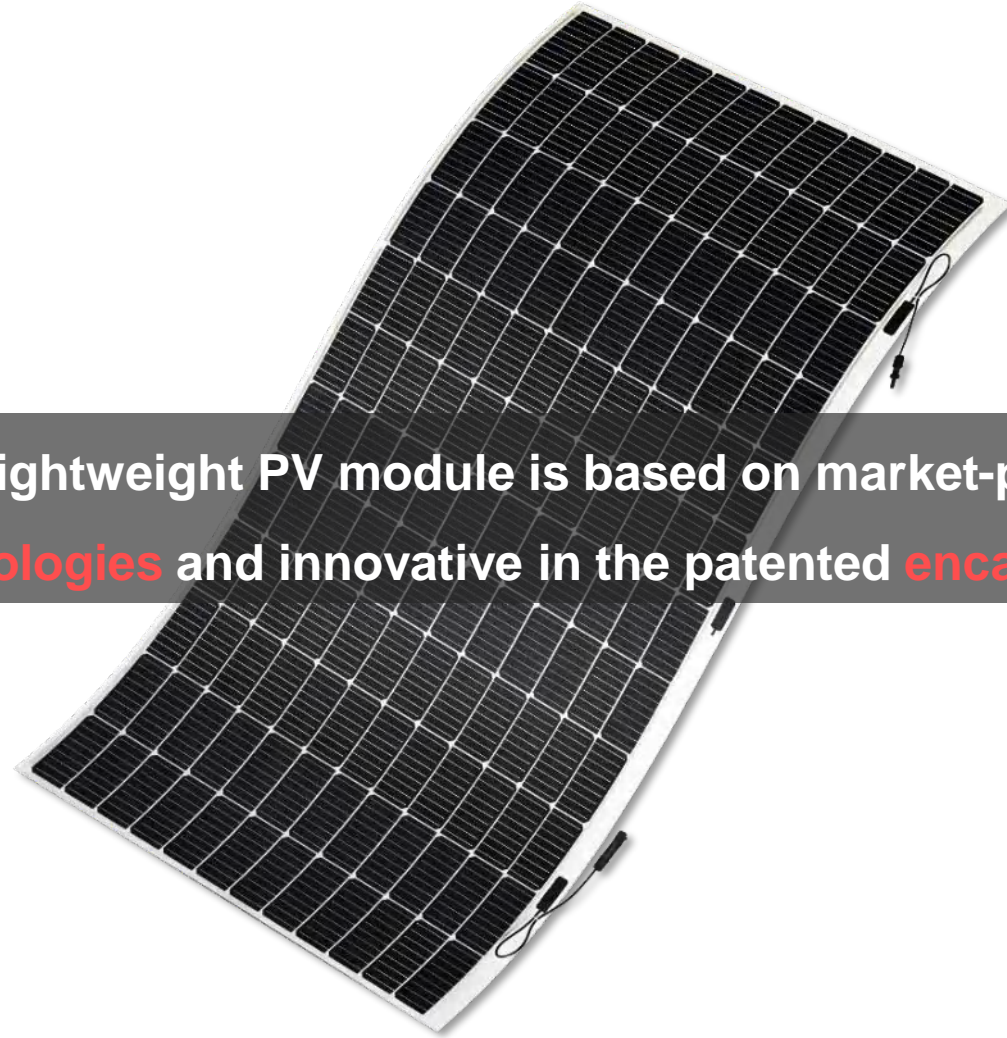


SA8000

Social Accountability 8000 International Standard

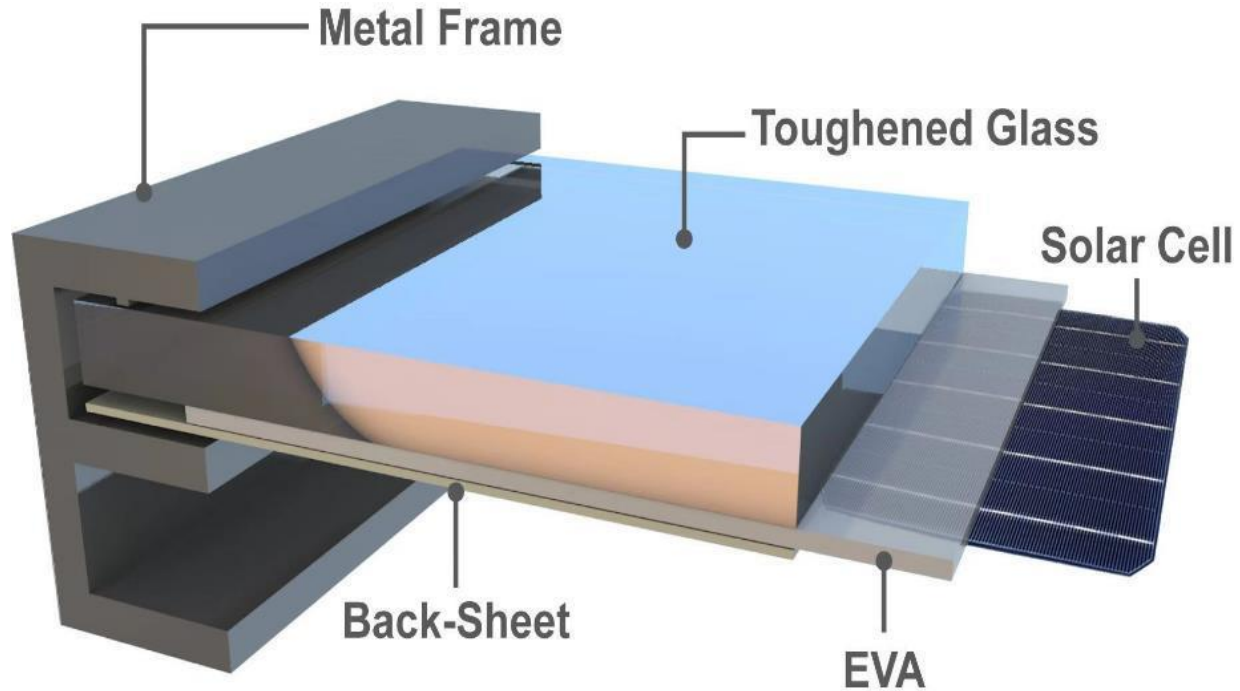
02 Technology

eArc Technology



Sunman's eArc lightweight PV module is based on market-proven **crystalline silicon cell technologies** and innovative in the patented **encapsulation system**.

Addressing The “Weight” Issue



Module weight= 20 kg

Cell weight= 0.72 kg

Only 3.6% generate electricity

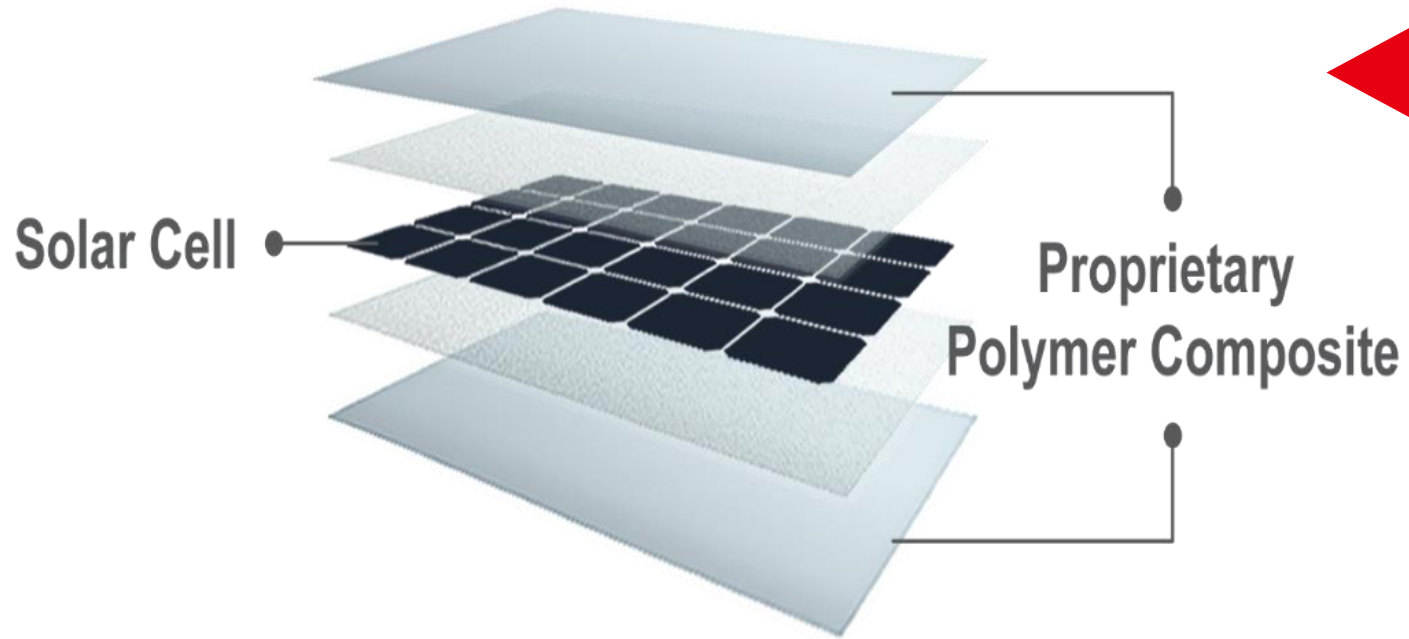
Module thickness= 40 mm

Cell thickness= 0.17 mm

Only 0.43% generate electricity

- The structure of conventional glass modules have remained unchanged in the last 50 years.
- An estimated 40% C&I rooftops cannot install solar due to static load issues.

Sunman's Innovation "eArc"



Module weight= 5.8 kg

Cell weight= 0.72 kg

12% generates electricity

Module thickness= 2 mm

Cell thickness= 0.17 mm

8.5% generates electricity

- eArc module uses patented polymer composites to replace glass and reduce weight.
- eArc is 70% lighter than traditional glass counterparts.

Complete Certifications for Global Deployment

認 証 書
Certificate

IEC PVm 認 証 業 務 規 程 第 7 項 的 規 定 之 認 証 登 錄 的 要 件 に 適 合 して いる も の と 認 め ら れ ま す の で 認 証 し ま す 。
I hereby certify that the product mentioned below complies with the Requirements for the Registration of Certification in the Rules for Operation of PVm Certification, Section 7.

認 証 書 番 号 : PV190-53201-1002
Certificate Number:
認 証 登 録 日 : 平 成 29 年 9 月 4 日
Date of Issue: September 4, 2017
有 効 期 限 : 平 成 34 年 9 月 3 日
Date of Validity: September 3, 2022

認 証 取 得 者 : SUNMAN (HONG KONG) LIMITED
Certificate Recipient:
ROOM 1401, 14/F, WORLD COMMERCE CENTRE, HARBOUR CITY,
7-11 CANTON ROAD, TSIMSHATSUI, KOWLOON, HONG KONG,
P. R. CHINA

認 証 製 品 製 造 工 場 : PV190-a
Factory of Certified Product:
ZHENJIANG FENGYUAN NEW ENERGY TECHNOLOGY CO., LTD.
NO.1 MINGZHU SOUTH ROAD, YOUFANG TOWN, ZHENJIANG,
JIANGSU, 212218, CHINA

試 験 基 準 : IEC61215 Second edition 2005-04,
Applied Standard for Test:
IEC61730-1 First edition 2004-10,
IEC61730-2 First edition 2004-10

製 品 の 型 名 等 :
Type Name of Product:
認 証 モ デ ル の 名 称 : 太 陽 電 池 モ ジ ュ ー ル (単 結 晶)
Name of Certified Model: PV Module (single crystal)
認 証 モ デ ル の 型 名 : SMA10M-6X12 etc.
Type of Certified Model: As shown in the attachment for details.
認 証 モ デ ル の 仕 様 : 付 属 書 Ⅱ の と お り
Manufacturer of Certified Model: As shown in the attachment for details.

一 般 財 団 法 人 電 気 安 全 環 境 研 究 所
Japan Electrical Safety & Environment Technology Laboratories
理 事 長 藤 田 隆 久
President Yasuhiko Koyanagi

東 京 都 港 区 代 々 木 5-14-12
5-14-12 Yayoi, Shinjuku-Ku, Tokyo

VDE Prüf- und Zertifizierungsinstitut

**ZEICHENGENEHMIGUNG
MARKS APPROVAL**

Sunman (Hong Kong) Limited
Room 1401, 14/F., World Commerce Centre
Harbour City, 7-11 Canton Road,
TSIMSHATSUI
Kowloon
HONG KONG
is hereby, for its product,
is authorized to use for their product:
Terrestrische Photovoltaik-Module mit Silizium-Solarzellen
Crystalline silicon terrestrial photovoltaic modules

die hier abgebildeten markenrechtlich geschützten Zeichen
für die ab B 02 2 aufgeführten Typen zu benutzen
the legally protected Marks to shown below for the types referred to on page 2 of



Geprüft und zertifiziert nach /
Tested and certified according to:

EN 61215 (VDE 0183-2) 2006-02 EN 61215 2006-02
EN 61730-1 (VDE 0183 Teil 1) 2004-10 EN 61730-1 2004-10
EN 61730-2 (VDE 0183 Teil 2) 2004-10 EN 61730-2 2004-10
EN 61730-1 (VDE 0183 Teil 1) 2004-10 EN 61730-1 2004-10
EN 61730-2 (VDE 0183 Teil 2) 2004-10 EN 61730-2 2004-10
IEC 61215 2005
IEC 61730-1 2004-10
IEC 61730-2 2004-10
IEC 61730-1 2004-10
IEC 61730-2 2004-10

Bericht zum / with ref: 2019-06-20
Attestation: 160236, 3672, 0001 / 262291
File ref:
VDE Prüf- und Zertifizierungsinstitut GmbH
VDE Testing and Certification Institute
Zertifizierungsstelle / Certification
Other ref: 2015-02-04
Inhalts-Änderung / update: 2015-12-22

VDE


Certificate of Compliance

Certificate: 2013225 Master Contract: 20971
Project: 2013225 Date Issued: 2017-05-04

Issued to: Sunman (Hong Kong) Limited,
Room 1401, 14/F., World Commerce Centre, Harbour City,
7-11 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Attention: Ted Kong

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US (indicating that products have been manufactured to the requirements of both Canadian and US Standards) or with adjacent indicator 'US' for US only or without either indicator for Canada only.

 Issued by: Qiang (Sean) Jiang
Qiang (Sean) Jiang

PRODUCTS
CLASS - C531110 - POWER SUPPLIES-Photovoltaic Modules and Panels - Certified to US Standards
CLASS - C531100 - POWER SUPPLIES-Photovoltaic Modules and Panels - Certified to US Standards

Photovoltaic Modules with maximum system voltage of 600 V dc and Class C fire class rating (Canada),
Model Series SMDXXXX-6X12 (XXX = 275 to 340 step 5), SMDXXXX-6X10 (XXX = 270 to 290 step 5),
SMDXXXX-8X06 (XXX = 140 to 170 step 5), SMDXXXX-4X12 (XXX = 185 to 225 step 5), SMDXXXX-
4X10 (XXX = 155 to 190 step 5), SMDXXXX-1X06 (XXX = 140 to 170 step 5), SMDXXXX-1X06 (XXX =
090 to 110 step 5), SMDXXXX-4X04 (XXX = 090 to 075 step 5), SMDXXXX-2X12 (XXX = 090 to 110 step
5), SMDXXXX-2X10 (XXX = 075 to 095 step 5), SMDXXXX-2X06 (XXX = 045 to 051 step 5), SMDXXXX-
2X04 (XXX = 030 to 035 step 5).

Model Series SMDXXXX-6X12 (XXX = 275 to 340 step 5), SMDXXXX-6X10 (XXX = 230 to 290 step 5),
SMDXXXX-4X12 (XXX = 185 to 225 step 5), SMDXXXX-4X10 (XXX = 155 to 190 step 5), SMDXXXX-4X06
(XXX = 090 to 110 step 5), SMDXXXX-2X12 (XXX = 090 to 110 step 5), SMDXXXX-2X10 (XXX = 075 to 095
step 5), SMDXXXX-2X06 (XXX = 045 to 051 step 5).


太阳能光伏产品金太阳认证证书

证书编号: GZ20200102010

申请人名称: 上海(集团)新晖光伏科技有限公司
地址: 上海市浦东新区川沙新镇川沙路1号
制造商名称: 上海(集团)新晖光伏科技有限公司
制造单位: 上海市浦东新区川沙新镇川沙路1号
产品: 光伏组件
产品规格: 光伏组件(单晶+多晶+薄膜)
型号: 详见证书附件(表4-5)
产品类型: 光伏组件(单晶+多晶+薄膜)
数量: 详见证书附件(表4-5)
日期: 2020-01-20
证书编号: GZ20200102010



认证机构: 鉴衡认证 + 光伏产品认证 + 光伏产品认证
上述产品符合GB/T19954-2005《光伏组件产品认证技术规范(单晶和多晶硅片)》要求,符合GB/T19954-2005《光伏组件产品认证技术规范(薄膜)》要求。


鉴衡认证中心有限公司
地址: 浙江省绍兴市越城区鉴湖街道鉴湖路1号
电话: 0575-85111111 传真: 0575-85111111 网址: www.jhcert.com

eArc is the first module of its kind to pass the IEC 61215:2016, IEC61730:2016, UL61730 (USA) and CGC (China).



Further Durability Testing

IEC 60068-2-68
Blowing Sand Test Lc 1
Confirmation of test results

VDE Renewables File Ref.: 10398/ ET-20210823-165

Applicant: Sunman (Zhenjiang) Company Limited
No.1 Mingzhu South Road, Youfang Town, Yangzhong City, 212218 Zhenjiang, Jiangsu, China

Product: Crystalline silicon Photovoltaic (PV)-Modules

Type:

A) SM6000M-6X120W	B) SM6000M-6X120W	C) SM6000M-6X120W
D) SM6000M-6X120W	E) SM6000M-6X120W	F) SM6000M-6X120W
G) SM6000M-6X120W	H) SM6000M-6X120W	I) SM6000M-6X120W
J) SM6000M-6X120W	K) SM6000M-6X120W	L) SM6000M-6X120W
M) SM6000M-6X120W	N) SM6000M-6X120W	O) SM6000M-6X120W
P) SM6000M-6X120W	Q) SM6000M-6X120W	R) SM6000M-6X120W
S) SM6000M-6X120W	T) SM6000M-6X120W	U) SM6000M-6X120W
V) SM6000M-6X120W	W) SM6000M-6X120W	X) SM6000M-6X120W
Y) SM6000M-6X120W	Z) SM6000M-6X120W	AA) SM6000M-6X120W
AB) SM6000M-6X120W	AC) SM6000M-6X120W	AD) SM6000M-6X120W
AE) SM6000M-6X120W	AF) SM6000M-6X120W	AG) SM6000M-6X120W
AH) SM6000M-6X120W	AI) SM6000M-6X120W	AJ) SM6000M-6X120W
AK) SM6000M-6X120W	AL) SM6000M-6X120W	AM) SM6000M-6X120W
AN) SM6000M-6X120W	AO) SM6000M-6X120W	AP) SM6000M-6X120W
AQ) SM6000M-6X120W	AR) SM6000M-6X120W	AS) SM6000M-6X120W
AT) SM6000M-6X120W	AU) SM6000M-6X120W	AV) SM6000M-6X120W
AW) SM6000M-6X120W	AX) SM6000M-6X120W	AY) SM6000M-6X120W
AZ) SM6000M-6X120W		

XXX in the type replaces the power in Watt and can be any number between: 415 - 440 for C(U), C(V) 155 - 160 for C(X); 415 - 440 for C(U), C(V)

Manufacturer: Sunman (Zhenjiang) Company Limited
IEC 60068-2-68, Dust and Sand test Lc1
Based on IEC 61701-2011

Test conditions

Dust concentration:	4.8 - 5.3 g/m³
Wind velocity:	18.3 - 20.7 m/s
Particle size:	Van der 3 - <500 µm
Dust composition:	Quartz, 95% SiO2
Testing time:	Front side: 4 hr, Rear side: 4 hr

File Ref.: 10398/ ET-20210823-165 Page 1 of 2

IEC 61701:2020
Salt mist corrosion testing of photovoltaic (PV) modules
Confirmation of test results

VDE Renewables File Ref.: 10398/ ET-20220711-121

Applicant: Sunman (Zhenjiang) Company Limited
No.1 Mingzhu South Road, Youfang Town, Yangzhong City, 212218 Zhenjiang, Jiangsu, China

Product: Crystalline silicon Photovoltaic (PV)-Modules

Type:

BE) SMF000L-12X110W	BF) SMF000L-12X110W	BG) SMF000L-12X110W
BH) SMF000L-12X110W	BI) SMF000L-12X110W	BJ) SMF000L-12X110W
BK) SMF000L-12X110W	BL) SMF000L-12X110W	BM) SMF000L-12X110W
BN) SMF000L-12X110W	BO) SMF000L-12X110W	BP) SMF000L-12X110W
BQ) SMF000L-12X110W	BR) SMF000L-12X110W	BS) SMF000L-12X110W
BT) SMF000L-12X110W	BU) SMF000L-12X110W	BV) SMF000L-12X110W
BW) SMF000L-12X110W	BX) SMF000L-12X110W	BY) SMF000L-12X110W
BZ) SMF000L-12X110W	CA) SMF000L-12X110W	CB) SMF000L-12X110W
CC) SMF000L-12X110W	CD) SMF000L-12X110W	CE) SMF000L-12X110W
CF) SMF000L-12X110W	CG) SMF000L-12X110W	CH) SMF000L-12X110W
CI) SMF000L-12X110W	CJ) SMF000L-12X110W	CK) SMF000L-12X110W
CL) SMF000L-12X110W	CM) SMF000L-12X110W	CN) SMF000L-12X110W
CO) SMF000L-12X110W	CP) SMF000L-12X110W	CQ) SMF000L-12X110W
CR) SMF000L-12X110W	CS) SMF000L-12X110W	CT) SMF000L-12X110W
CU) SMF000L-12X110W	CV) SMF000L-12X110W	CW) SMF000L-12X110W
CX) SMF000L-12X110W		

XXX in the type replaces the power in watt and can be any number between: 400 - 450 for BE), BF), BG), BH), BI), BJ), BK), BL), BM), BN), BO), BP), BQ), BR), BS), BT), BU), BV), BW), BX), BY), BZ), CA), CB), CC), CD), CE), CF), CG), CH), CI), CJ), CK), CL), CM), CN), CO), CP), CQ), CR), CS), CT), CU), CV), CW), CX); 415 - 440 for C(U), C(V); 155 - 160 for C(X), C(Y)

Manufacturer: Sunman (Zhenjiang) Company Limited

Standard: IEC 61701:2020, Salt mist corrosion test

Test conditions

Test method:	8
Testing time:	1440 hrs
Chamber temperature:	35°C
Relative Humidity:	95 %
Mist pH level:	3.5

VDE Renewables File Ref.: 10398/ ET-20220711-121 Page 1 of 2

IEC 62716:2013
Photovoltaic (PV) modules
- Ammonia corrosion testing -
Confirmation of test results

VDE Renewables File Ref.: 10398/ ET-20210823-165

Applicant: Sunman (Zhenjiang) Company Limited
No.1 Mingzhu South Road, Youfang Town, Yangzhong City, 212218 Zhenjiang, Jiangsu, China

Product: Crystalline silicon Photovoltaic (PV)-Modules

Type:

A) SM6000M-6X120W	B) SM6000M-6X120W	C) SM6000M-6X120W
D) SM6000M-6X120W	E) SM6000M-6X120W	F) SM6000M-6X120W
G) SM6000M-6X120W	H) SM6000M-6X120W	I) SM6000M-6X120W
J) SM6000M-6X120W	K) SM6000M-6X120W	L) SM6000M-6X120W
M) SM6000M-6X120W	N) SM6000M-6X120W	O) SM6000M-6X120W
P) SM6000M-6X120W	Q) SM6000M-6X120W	R) SM6000M-6X120W
S) SM6000M-6X120W	T) SM6000M-6X120W	U) SM6000M-6X120W
V) SM6000M-6X120W	W) SM6000M-6X120W	X) SM6000M-6X120W
Y) SM6000M-6X120W	Z) SM6000M-6X120W	AA) SM6000M-6X120W
AB) SM6000M-6X120W	AC) SM6000M-6X120W	AD) SM6000M-6X120W
AE) SM6000M-6X120W	AF) SM6000M-6X120W	AG) SM6000M-6X120W
AH) SM6000M-6X120W	AI) SM6000M-6X120W	AJ) SM6000M-6X120W
AK) SM6000M-6X120W	AL) SM6000M-6X120W	AM) SM6000M-6X120W
AN) SM6000M-6X120W	AO) SM6000M-6X120W	AP) SM6000M-6X120W
AQ) SM6000M-6X120W	AR) SM6000M-6X120W	AS) SM6000M-6X120W
AT) SM6000M-6X120W	AU) SM6000M-6X120W	AV) SM6000M-6X120W
AW) SM6000M-6X120W	AX) SM6000M-6X120W	AY) SM6000M-6X120W
AZ) SM6000M-6X120W		

XXX in the type replaces the power in watt and can be any number between: 415 - 440 for C(U), C(V) 155 - 160 for C(X); 415 - 440 for C(U), C(V)

Manufacturer: Sunman (Zhenjiang) Company Limited

Standard: IEC 62716:2013, Ammonia corrosion testing

Test conditions

Hours including heating up:	8 h
NH3 concentration (ppm):	6000
Chamber temperature:	60°C
Relative Humidity:	100 %
Hours including cooling:	15 h
NH3 concentration (ppm):	0
Chamber temperature:	23°C
Relative Humidity:	75 %

VDE Renewables File Ref.: 10398/ ET-20210823-165 Page 1 of 2

IEC TS 62804-1:2015
Photovoltaic (PV) Modules - Test Methods for the detection of potential-induced degradation
Part 1: Crystalline silicon
Confirmation of test results

VDE Renewables File Ref.: 10398/ ET-20230518-116

Applicant: Sunman (Zhenjiang) Company Limited
No. 1 Mingzhu South Road, Youfang Town, Yangzhong City, 212218 Zhenjiang, Jiangsu, China

Product: Crystalline silicon Photovoltaic (PV)-Modules

Type:

CU) SMF000F-6X120W	CV) SMF000F-6X120W	CW) SMF000F-6X120W
CX) SMF000F-12X120W	CY) SMF000F-12X120W	

XXX in the type replaces the power in Watt and can be any number between: 415 - 440 for C(U), C(V) 155 - 160 for C(X); 415 - 440 for C(U), C(V)

Manufacturer: Sunman (Zhenjiang) Company Limited

Standard: IEC TS 62804-1:2015

Test conditions

Testing time:	96 h
Chamber temperature:	85°C
Relative Humidity:	85 %
Potential to ground:	± 1500 V
Power degradation:	< 5%
Dry Insulation:	> 40 MΩm²
Wet Insulation:	> 40 MΩm²

Pass criteria

Date	Status	Revision
02-09-2020	Final	02

Straightforward
Maartvliet 49, 6129 EL
Utrecht, Netherlands
+31 (0) 88 1642700
info@straightforward.nl
www.straightforward.nl

VDE Renewables File Ref.: 10398/ ET-20230518-116 Page 1 of 2

Bankability Report Sunman eArche modules
Sunman(ZhenJiang) Co.,Ltd.

Manufacturer: Sunman (Zhenjiang) Company Limited

Standard: IEC TS 62804-1:2015

Test conditions

Testing time:	96 h
Chamber temperature:	85°C
Relative Humidity:	85 %
Potential to ground:	± 1500 V
Power degradation:	< 5%
Dry Insulation:	> 40 MΩm²
Wet Insulation:	> 40 MΩm²

Pass criteria

Date	Status	Revision
02-09-2020	Final	02

Straightforward
Maartvliet 49, 6129 EL
Utrecht, Netherlands
+31 (0) 88 1642700
info@straightforward.nl
www.straightforward.nl

VDE Renewables File Ref.: 10398/ ET-20230518-116 Page 1 of 2

Dust Testing

Salt Mist Corrosion Testing level 8

Ammonia Testing

PID Testing

Straightforward Module Bankability Testing

Extensive Fire Testing

Materialprüfungsanstalt Universität Stuttgart
Postfach 801140 | D-70501 Stuttgart
Telefon: (0711) 685-0

MPA Materialprüfungsanstalt
Universität Stuttgart
Vom DIBt anerkannte PÜZ-Stelle
Kennnummer BWU-03

Abteilung Brandschutz - Referat Brandverhalten von Baustoffen

Allgemeines bauaufsichtliches Prüfzeugnis
Prüfzeugnis-Nummer: **P-BWU03-I-16.3.455**

Gegenstand: Gegen Flugfeuer und strahlende Wärme widerstandsfähige Bedachung mit PV-Modul „Arc“ für unbeschränkte Dachneigungen, nach Verwaltungsvorschrift des Umweltministeriums und des Wirtschaftsministeriums über Technische Baubestimmungen (VwV TB) Baden-Württemberg vom 20. Dezember 2017, Lfd. Nr. C-4.8

Antragsteller: Sunman (Zhenjiang) Company Limited
No.1 Mingzhu South Road
Youfang Town, Yangzhong City
Zhenjiang, Jiangsu
CHINA

Ausstellungsdatum: 14. Oktober 2021
Geltungsdauer bis: 31. Oktober 2026

Aufgrund dieses allgemeinen bauaufsichtlichen Prüfzeugnisses ist der oben genannte Gegenstand im Sinne der Landesbauordnungen anwendbar.

Dieses allgemeine bauaufsichtliche Prüfzeugnis umfasst 6 Seiten und 1 Anlage. Gerichtsstand und Erfüllungsort ist Stuttgart.

Materialprüfungsanstalt Universität Stuttgart
Postfach 801140 | D-70501 Stuttgart
Telefon: (0711) 685-0
Telefax: (0711) 685-42033
Internet: www.mpa.uni-stuttgart.de

BR-Ber-Bauges/LBBW
Kontaktnr.: 1571 231 887 | 16226230188
IBAN: DE31 6005 0107 0871 5218 877
BIC: SWIFT-CODE: SOLADE33XXX
09/2021 - MVA/IB

TRASFERIMENTO TECNOLOGICO INNOVAZIONE SISTEMA CAMERALE VENETO

ACCREDIA

LAB N° 0170 L

egolf

General Membrane SPA
Via Venezia, 53B
36022 Ceggia (VE)

EN 13501-5:2016: Classificazione al fuoco dei prodotti e degli elementi da costruzione - Parte 5: Classificazione in base ai risultati delle prove di esposizione dei tetti a un fuoco esterno

EN 13501-5:2016: Fire classification of construction products and building elements
Part 5: Classification using data from external fire exposure to roof tests

- Rapporto di classificazione n°: 1727/21
- Classification report n°:
- Emesso in data: 2021-02-17
- Date of issue:
- Nome o modello del prodotto¹⁾: SOLAR PV MONO ARC PHOTOVOLTAIC MODULE
- Product name or model¹⁾:

Introduzione
Introduction

Questo rapporto di classificazione definisce la classe assegnata al tetto SOLAR PV MONO ARC PHOTOVOLTAIC MODULE in accordo con le procedure indicate nella norma EN 13501-5:2016.
This classification report defines the classification assigned to roof covering SOLAR PV MONO ARC PHOTOVOLTAIC MODULE in accordance with the procedures given in EN 13501-5:2016.

La riproduzione del presente documento è ammessa solo in copia conforme integrale. La riproduzione parziale o la ristampa è ammessa soltanto a seguito di autorizzazione scritta di ICI - Trasferimento Tecnologico e Innovazione S.p.A. e il numero di protocollo dell'autorizzazione va riportato in testa alla riproduzione o ristampa. Il presente documento è in formato bilingue (italiano e inglese). In caso di dubbio è valida la versione in lingua italiana. Tutti i dati descrittivi del campione riportati nel presente rapporto di prova e contrassegnati con "1)", sono stati forniti dal cliente. Il laboratorio ne declina ogni responsabilità.

Reproduction of this document is only permitted in an integral complete copy. Partial reproduction of the translation is allowed only after writing of ICI - Trasferimento Tecnologico e Innovazione S.p.A. and the authorization protocol number must be reported at the beginning of the reproduction or quotation. This document is in bilingual format (Italian and English). In case of doubt the only valid is the Italian one of the descriptive data of the sample reported in this report and marked with "1)", were provided by the customer. The laboratory declines of responsibility.

RIC. FLSO N028 - 03 del 2021-05-12

ICI - trasferimento tecnologico e innovazioni s.p.a. s.r.l.

Sede legale e operativa: Palazzo della Ricerca, via Enea, 170, 37139 Verona (VR)
Sede operativa: Corso Porta Nuova, 95, 37139 Verona (VR)
Sede operativa: Via Porta Po, 45, 37139 Verona (VR)
Laboratori ICIIT: Via Piazza Alfa, 14, 37139 Verona (VR)
Organismo notificato per il CPR n° 1000: Anagrafe Nazionale della Ricerca con il marchio UNI-Certificati
www.iciit.it | info@iciit.it | www.iciit.it

pag. 1 di 4
page 1 of 4

L.S.Fire
TESTING INSTITUTE

L.S. FIRE TESTING INSTITUTE S.R.L.
Via Ogliastra, 15 - 22070 Oltrepo di San Marone (CO) - Italy
Via della Sanonica, 4 - 44010 Contigugnano (FE) - Italy
Tel. +39 031 890388 - Fax +39 031 3532855
lsfire@lsfire.it - www.lsfire.it

Laboratorio autorizzato dal Ministero dell'Interno con codice 1501R101 del 14.06.10 (G.U. n. 140 del 12.07.10)

CERTIFICATO DI PROVA
L.S.FIRE/U16570/03180

Emesso ai sensi dell'Art. 10 del decreto del Ministero dell'Interno del 26 giugno 1984 concernente "Classificazione di reazione al fuoco ed omologazione dei materiali da fini della prevenzione incendi" modificato con decreto del Ministero dell'Interno del 03 settembre 2001 (G.U. n°542 del 17 ottobre 2001).

Visto l'esito degli accertamenti effettuati si certifica che alla **INSTALLAZIONE TECNICA** (Allegato A.2.1)

prodotto da: **SUNMAN ENERGY EU GmbH**
Thurn-und-Taxis-Platz, 6
60313 Frankfurt am Main (DE)

denominato: **EARC MONOCRYSTALLINE PV MODULE SMF430F-12X12UW**

impiegato come: Pannello Fotovoltaico

Descrizione	Metodo secondo la norma	Classe/Categoria Assegnabile
LATO A	UNI 8457 e 8457/A1	I
LATO B	UNI 8457 e 8457/A1	I
LATO A - LATO B	UNI 9174 e 9174/A1	II

è attribuita in conformità alla UNI 9177 Ia

CLASSE DI REAZIONE AL FUOCO
2 (DUE)

Il prodotto EARC MONOCRYSTALLINE PV MODULE SMF430F-12X12UW non ricade nel campo di applicazione di norme armonizzate CPR e per il prodotto medesimo della ditta SUNMAN ENERGY EU GmbH non risulta ottenuto il rilascio di ETA (European Technical Assessment), ai sensi dell'allegato IV del CPR. Il presente certificato è valido unicamente per la campionatura sottoposta a prova.

Costituiscono parte integrante del presente certificato n° 3 (TRE) allegati con i risultati di prova e la documentazione tecnica del produttore.

Oltrepo di San Marone, 01-08-2022

Il Direttore Tecnico
M. Scattolon

Il presente certificato di prova non può essere riprodotto in forma parziale senza l'autorizzazione di L.S. Fire Testing Institute srl

MOC-CH Pag. 1 di 1

MA **ICAC-MRA** **CNAS** **中国合格评定国家认可委员会**
220020349097

TEST REPORT
No:2022DMWA20843

SAMPLE PV Module

MODEL/TYPE -

APPLICANT VDE Global Services (Shanghai)

Wuxi Institute of Inspection, Testing and Certification
National Center of Inspection on Solar Photovoltaic Products Quality

B-Roof (t1) | B-Roof (t2) | UNI9177 | UL790

Further institutional recognition

School of Photovoltaic and Renewable Energy Engineering
Durability benchmarking of a light-weight polymer-based PV Module

PhD Candidate: Frank Wang | Supervisor: Prof. Dr. Zhongqiang Gong

INTRODUCTION

1. Introduction: Durability benchmarking of a light-weight polymer-based PV Module, with a focus on the product name 'SUNMAN'.

Step 1: Design

1.1. Design of experimental materials with well-established durability with a PV cell after several years.

Step 2: Test Regimes

1.2. Test regimes: A series of test regimes to simulate long-term operation of the PV module.

Step 3: Results

1.3. Results: The results of the durability benchmarking test, showing the performance of the PV module over time.

Conclusions and Further Work

1.4. Conclusions and Further Work: Summary of the findings and suggestions for future research.



Urkunde

pv magazine

HIGHLIGHT top innovation

Die unabhängige Jury von pv magazine Deutschland verlieht SunMan für die Entwicklung der „anforder“ „Anforder“ zur „Gestaltung“... (text partially obscured)

Michael Felber
 Michael Felber
 Geschäftsführer



中国科学院工程与材料学性能检测研究所

测试报告

产品名称: ...
 规格型号: ...
 测试日期: ...



Fraunhofer ISE

CaLab PV Modules

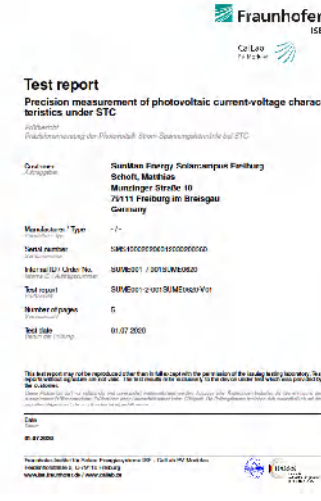
Test report

Precision measurement of photovoltaic current-voltage characteristics under STC

Produktionswerkstatt der Fraunhofer ISE, Stern-Straßenparkstraße 59, 79112 Freiburg im Breisgau, Germany

Order number: SUNMAN Energy, Fraunhofer Campus Freiburg, Schott, Mühlbacher, Mühlbacher Straße 10, 79111 Freiburg im Breisgau, Germany

Measurement Type: ...
 Serial number: ...
 Test report number: ...



gamcorp

CLEAN ENERGY SOLUTIONS

Roof Wind Tunnel Test Report

Product Name: ...
 Test Date: ...



6201623438

南京航空航天大学

cRoof 产品风洞测试报告

测试日期: ...
 测试地点: ...




eArc has been further tested and recognized by institutions such as University of New South Wales, Fraunhofer, PV Magazine, Chinese Academy of Sciences, Fraunhofer, Gamcorp, Nanjing University of Aeronautics and Astronautics.



03 Product

Products



SMF520J-12X12UW
SMF430F-12X12UW



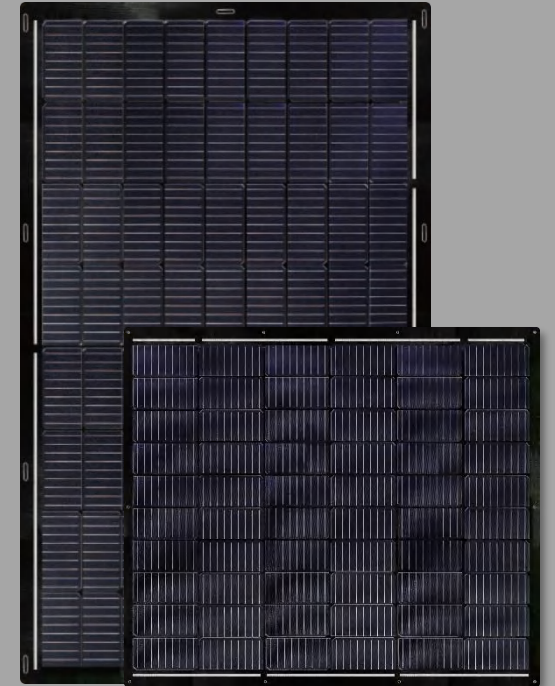
C&I

SMH520J-12X12UW



Off-grid

SMF100S-4X09UW
SMF175M-4X09UW



Balcony

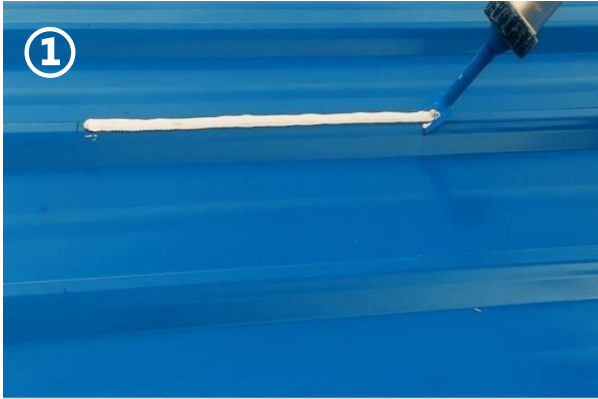
SMF200J-6X10DB-e
SMF200F-8X09DB-e

Technical Specification (C&I)

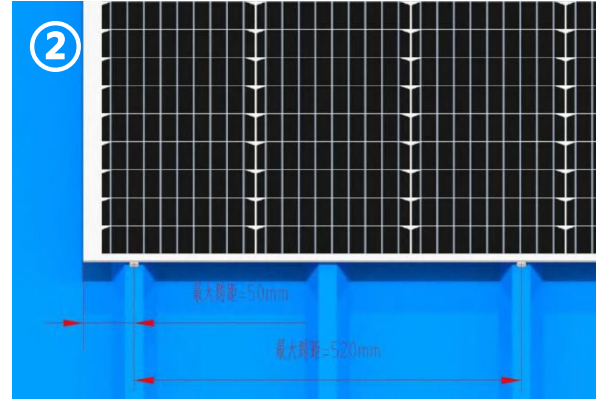
Class	Specification	SMF430F-12X12UW	SMF520J-12X12UW	SMH520J-12X12UW
Electrical characteristics	Pmax (W)	430	520	520
	Vmp (V)	42	42.3	42.3
	Imp (A)	10.24	12.31	12.31
	Voc (V)	49.8	49.5	49.5
	Isc (A)	10.74	13.56	13.56
	Max. system voltage(V)	1500	1500	1500
	Module efficiency (%)	19.3	19.3	19.3
Mechanical characteristics	Solar cells	Mono-silicon (166mm half cell)	Mono-silicon (182mm half cell)	Mono-silicon (182mm half cell)
	Dimensions (mm)	2054×1084×2	2246×1197×2	2246×1227.8×40.5
	Weight	6.3 (2.83kg/m ²)	7.7 (2.86kg/m ²)	11.1
Packaging configuration	20'GP	580	264	136
	40'HC	1320	528	272

SMF Installation Method

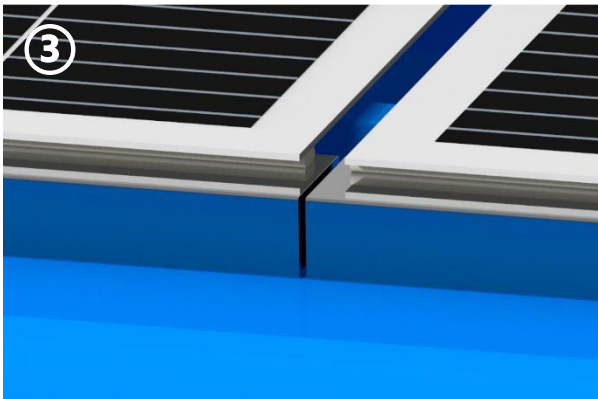
Metal Roofs



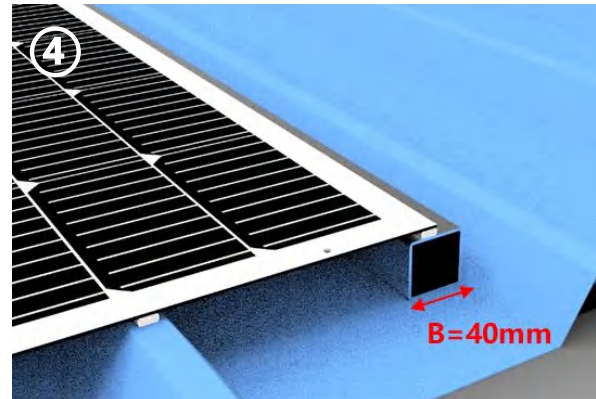
Evenly apply glue to the peaks of metal roof profile (>10mm width).



The spacing between lines of glue is $\leq 520\text{mm}$, and when the overhanging part of the module is $> 50\text{mm}$, use aluminum square tube.



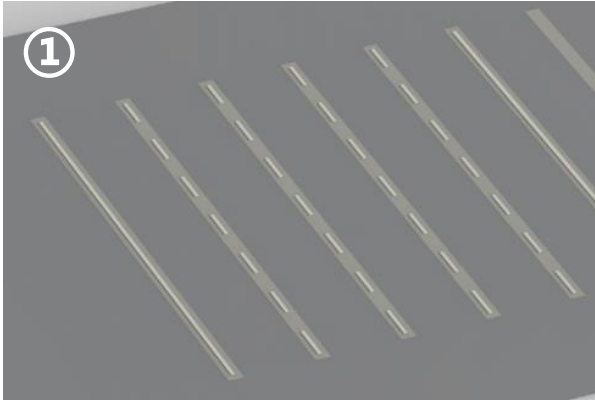
Ensure that the ends of aluminum tubes lay between panels.



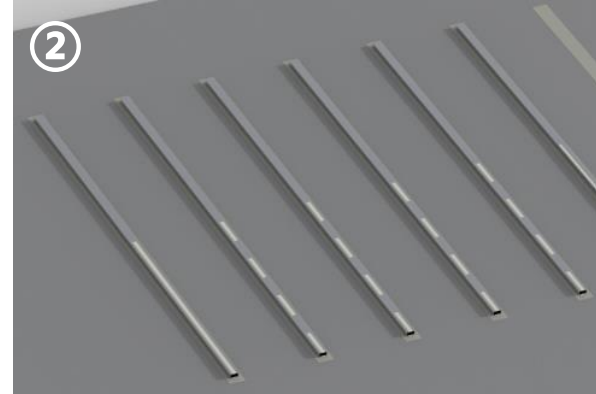
Aluminum square tube is required to be aluminum profile 6063-T5/T6, anodized AA10 or above.

SMF Installation Method

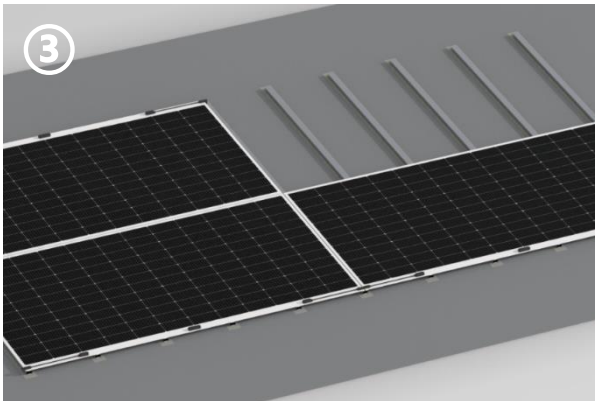
Membranes (with Tubes)



Clean the roof with the cleaning agent specified by Sunman. Apply the recommended glue that is appropriate for the roofing material.



Place tube onto the glue lines and put another layer of glue on the top side of the tube.



Place panels in the manner displayed in the diagram (430W correspond to 5 tubes, 520W correspond to 7 tubes)



Ensure a single panel is not mounted on two tubes – expansion and contraction of the tubes may cause issues, such as deformation of the panels.

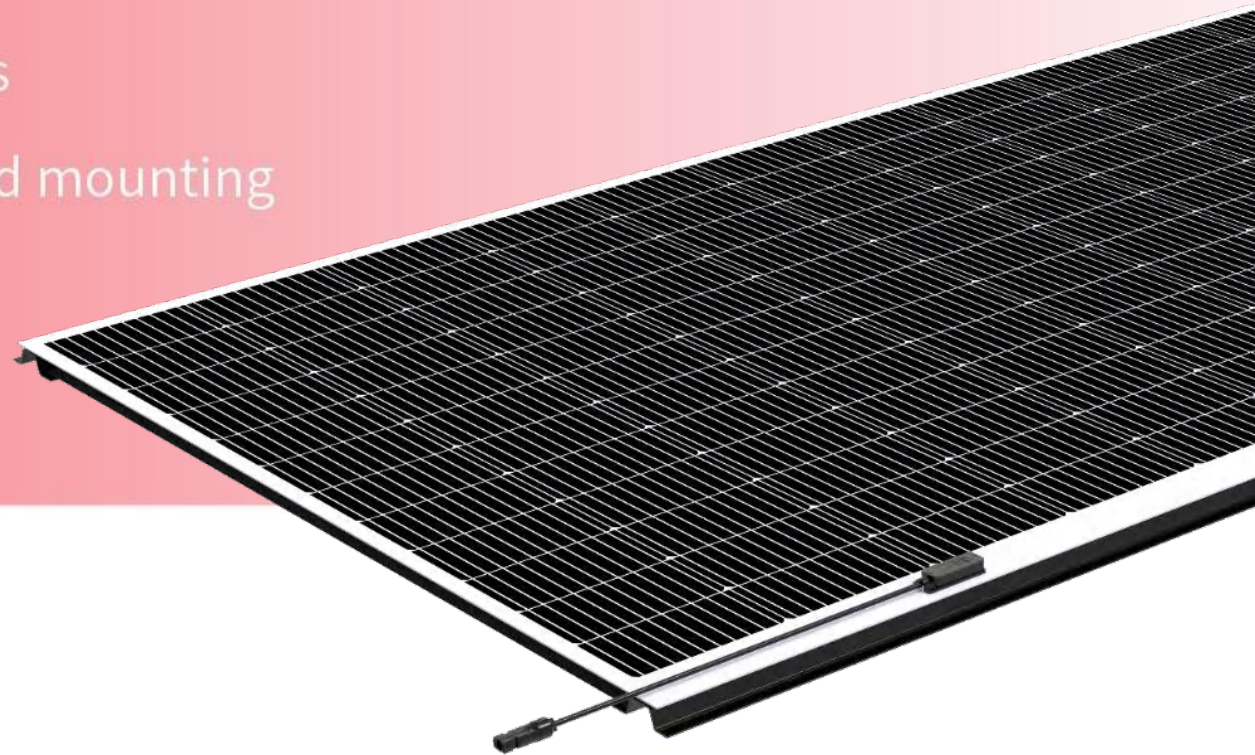
Introducing Dragonfly

A new innovation platform based on the SMF Series

520W high-efficiency PV module with pre-integrated mounting

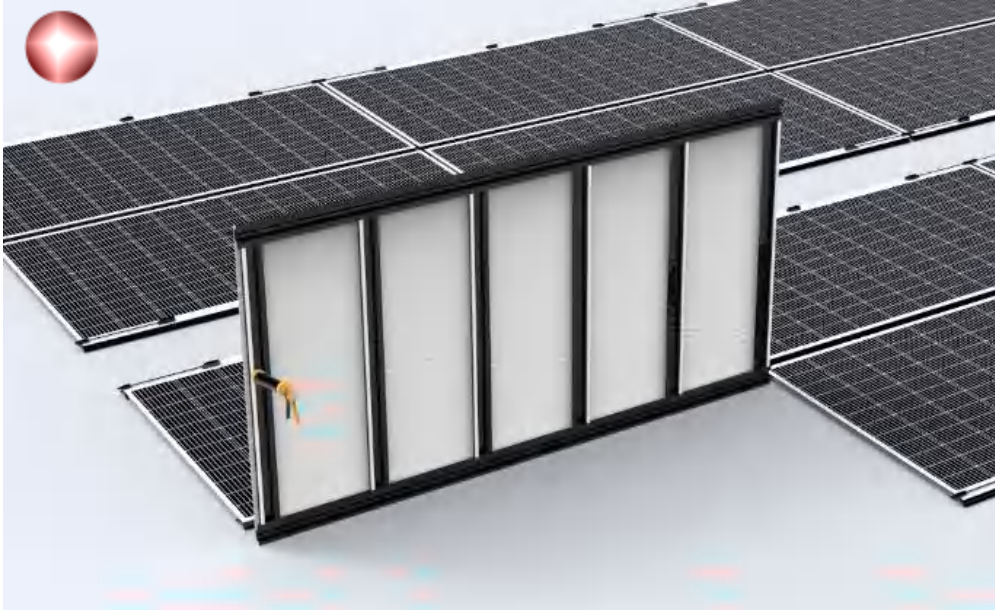
Bringing installation steps to the fab (“I2F”)

saving on-site time and costs.



DF Installation Method

Membranes (Quick-Bonding)



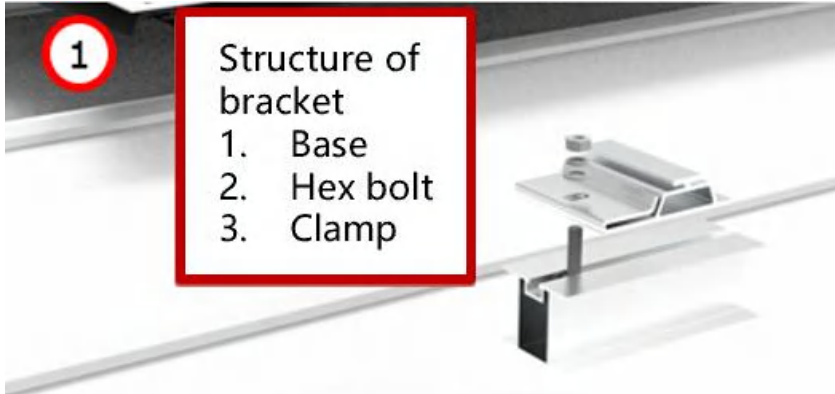
Put the DF module upright, and apply glue to backside of six short frames.



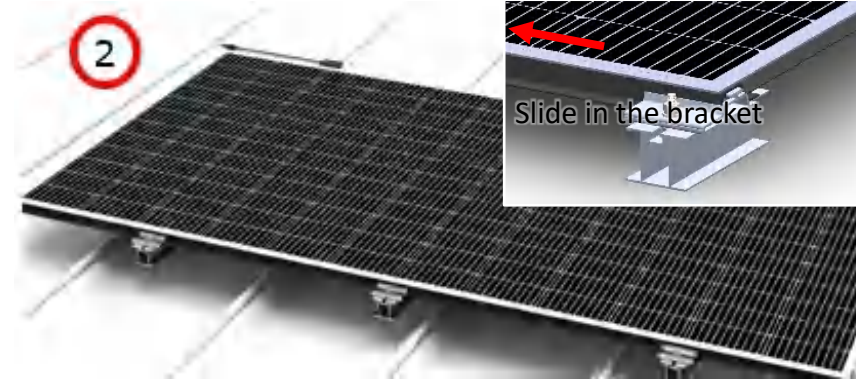
Paste the module and repeat preceding steps to finish all module installation.

DF Installation Method

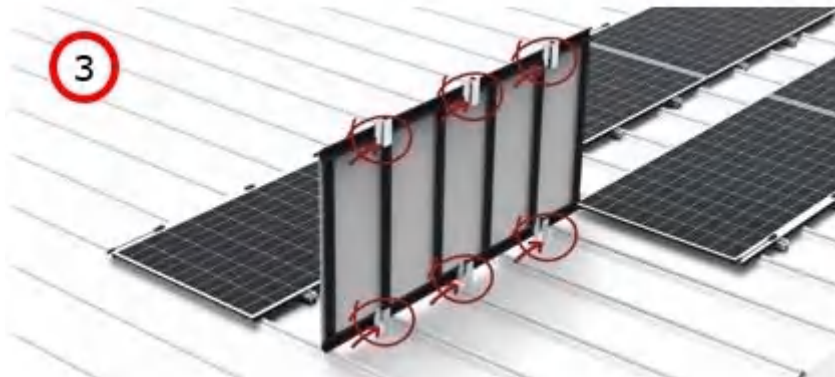
Membranes / Metal Roofs (Dismountable)



Assemble the bracket.



Install the bracket onto the prefabricated panel.



Apply glue to the base.



Paste the modules.

04 Application

C&I Applications

Roofs with Low Load Bearing Capacity



- An estimated 40% of commercial and industrial roofs lack the minimum load-bearing capacity (15 kg/m²) to support conventional glass modules.
- When buildings fall under this threshold, structural strengthening is required for solar to be installed, which is costly and disruptive to on-site business activities.
- The full installed weight of eArc modules is <4 kg per m².

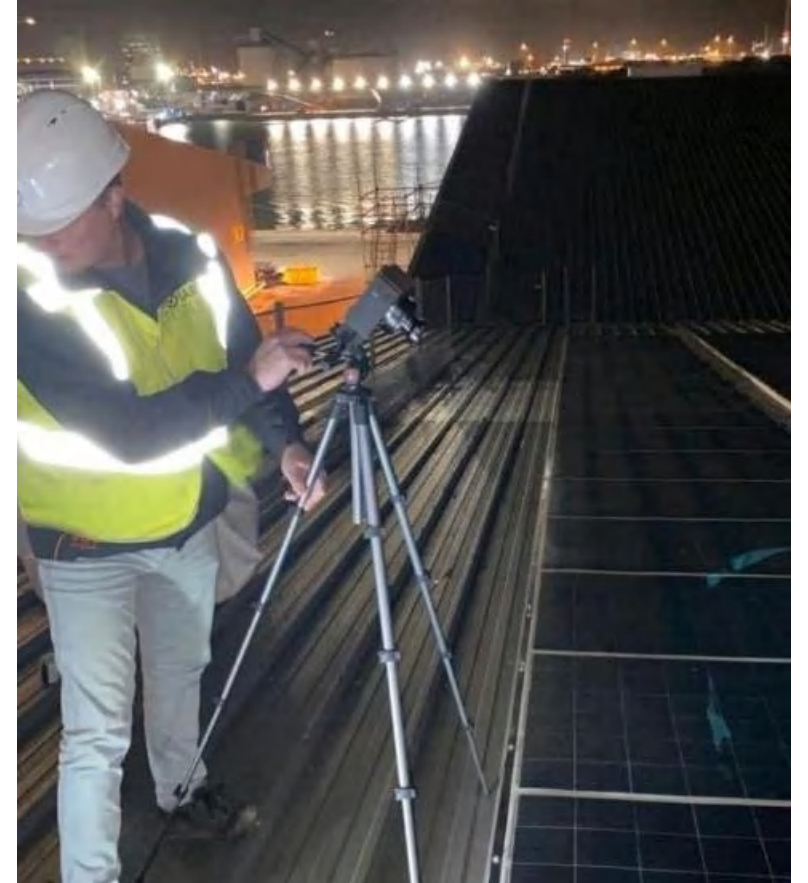
C&I Applications

Roofs with Low Load Bearing Capacity



C&I Applications

Roofs with Low Load Bearing Capacity



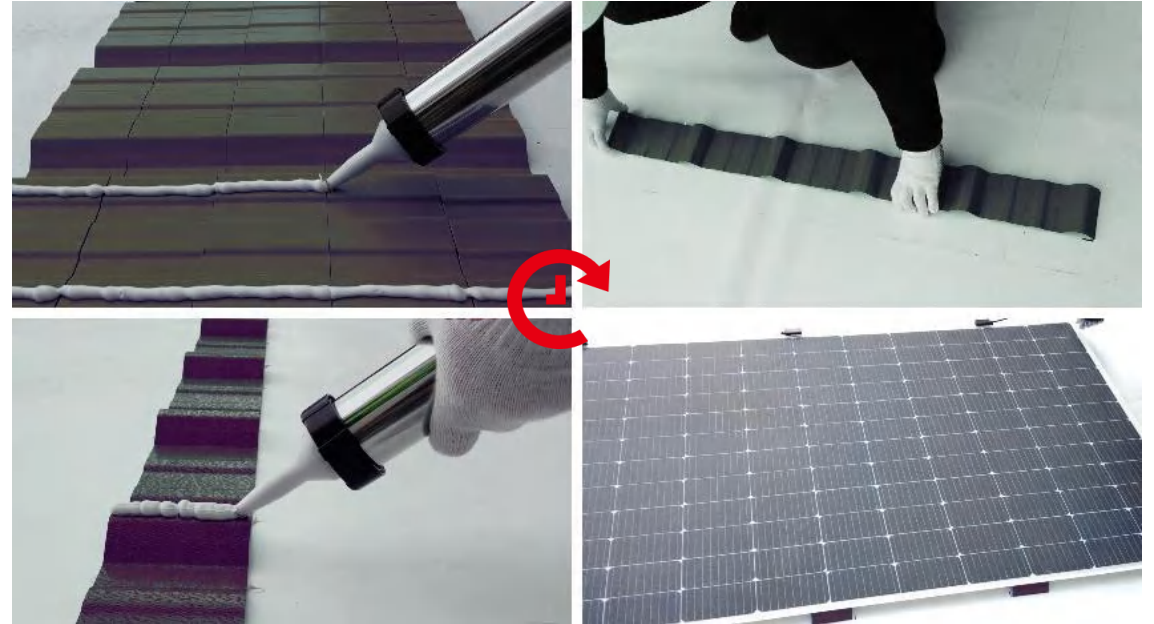
C&I Applications

Roofs with Low Load Bearing Capacity



C&I Applications

Membranes and Flat Roofs



- Roof membranes, such as TPO and PVC, are becoming increasingly popular for commercial roofs.
- Due to penetration issues, waterproofing membranes cannot accommodate conventional glass modules.
- eArc can be directly glued onto membranes with a substructure to elevate the module by 2 cm.

C&I Applications

Membranes and Flat Roofs



C&I Applications

Membranes and Flat Roofs



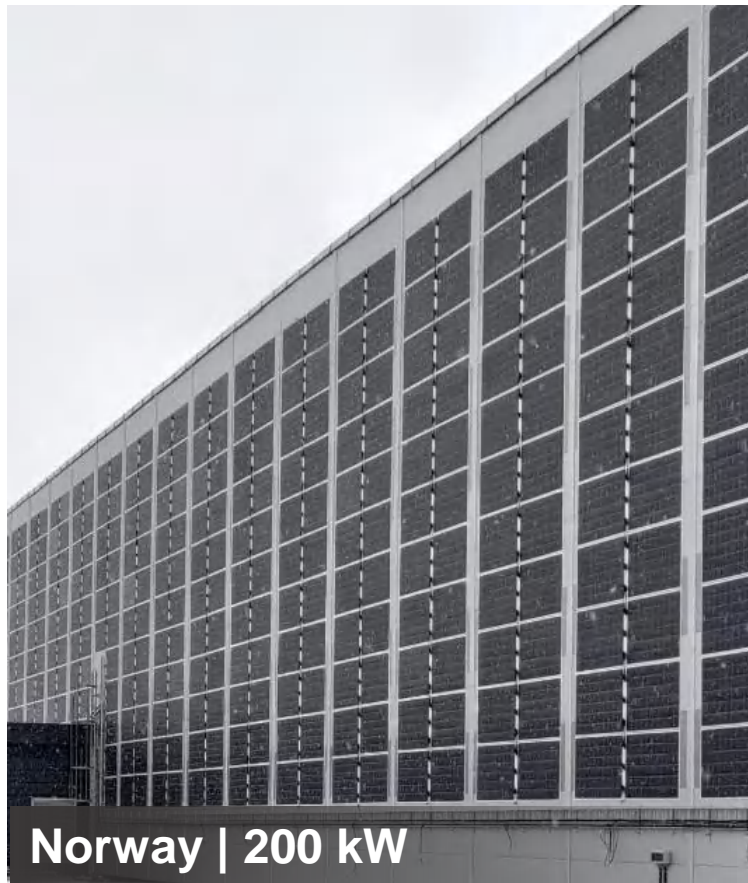
Other Applications

EV Charging Infrastructure and PV Carports



Other Applications

Facades

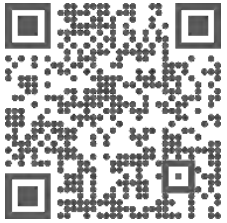


Other Applications

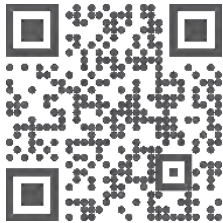
Vehicle Integrated Photovoltaics



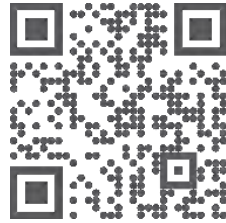
Thank You



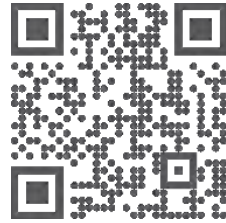
LinkedIn



Website



Twitter



Facebook

 www.sunman-energy.com

 21 3988 2800
