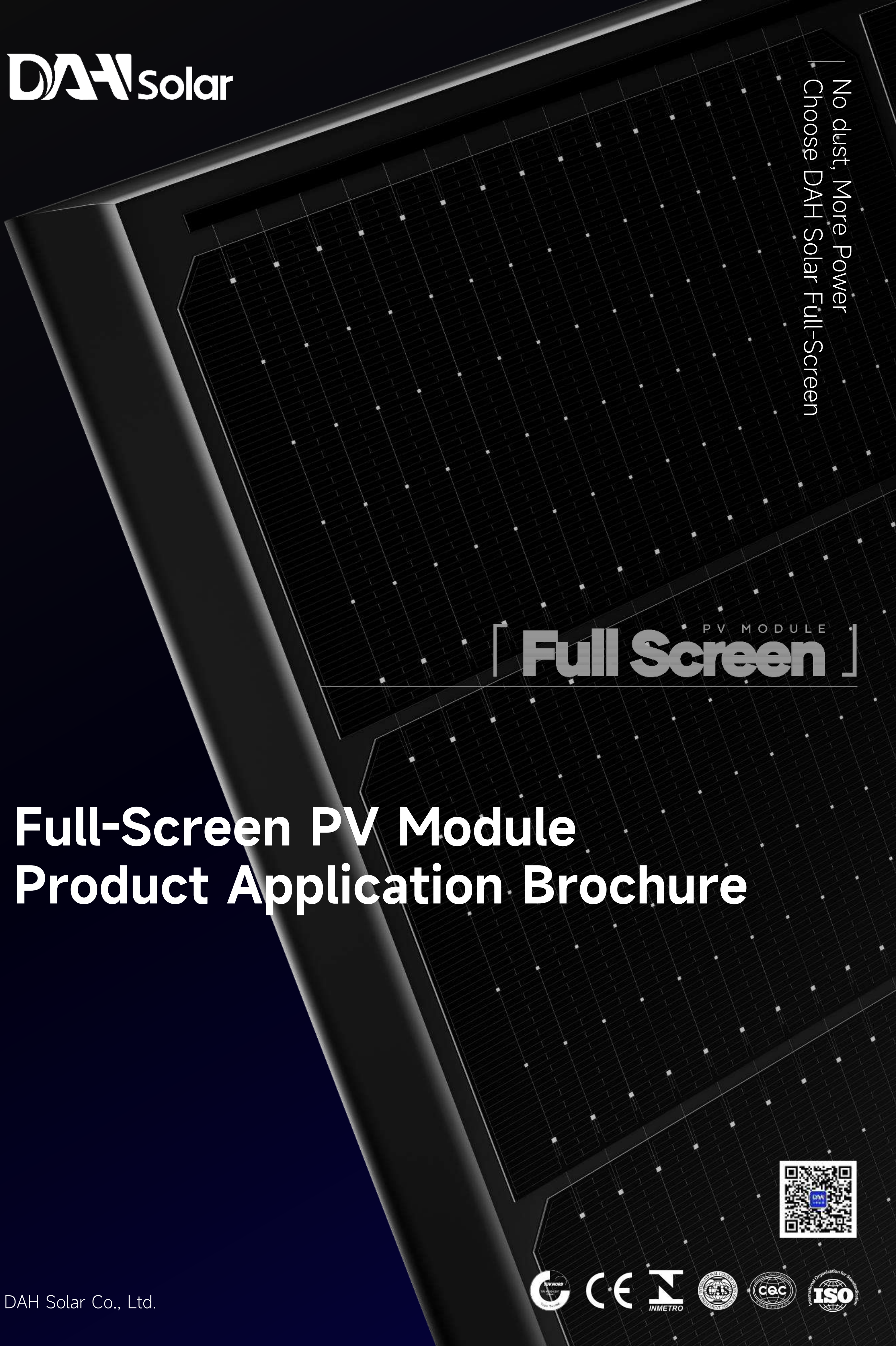
DAH Solar



No dust, More Power
Choose DAH Solar Full-Screen

Full-Screen PV Module Product Application Brochure

DAH Solar Co., Ltd.

CONTENTS

1. About DAH Solar

Established in 2009, DAH Solar is an innovation-driven and technology-leading company in PV product manufacturing. DAH Solar focuses on the research, production of PV modules, integrated PV systems, inverter & energy storage systems.

DAH Solar has over 2,000 employees worldwide and owns more than 200 product patents. The products have passed through TUV, IEC, CE, INMETRO, and other international authoritative certifications, as well as CQC, ISO9001, IS014001, and ISO45001.

The strong company strength and reliable products have brought countless honors to DAH Solar such as National High-tech Enterprise of China, the "Little Giant" Enterprise, and Top 100 New Energy Enterprises of China. DAH Solar received recognition such as being listed as Tier 1 PV module Manufacturer and Top Brand PV of EUPD, as well as being ranked as the top 3 influential brand of PV in Brazil continuously.

DAH Solar

Capacity
20GW

Employees
2000+

Markets
120+

Note: 20GW is the production capacity in planning 2024

1. About DAH Solar
Manufacture Bases

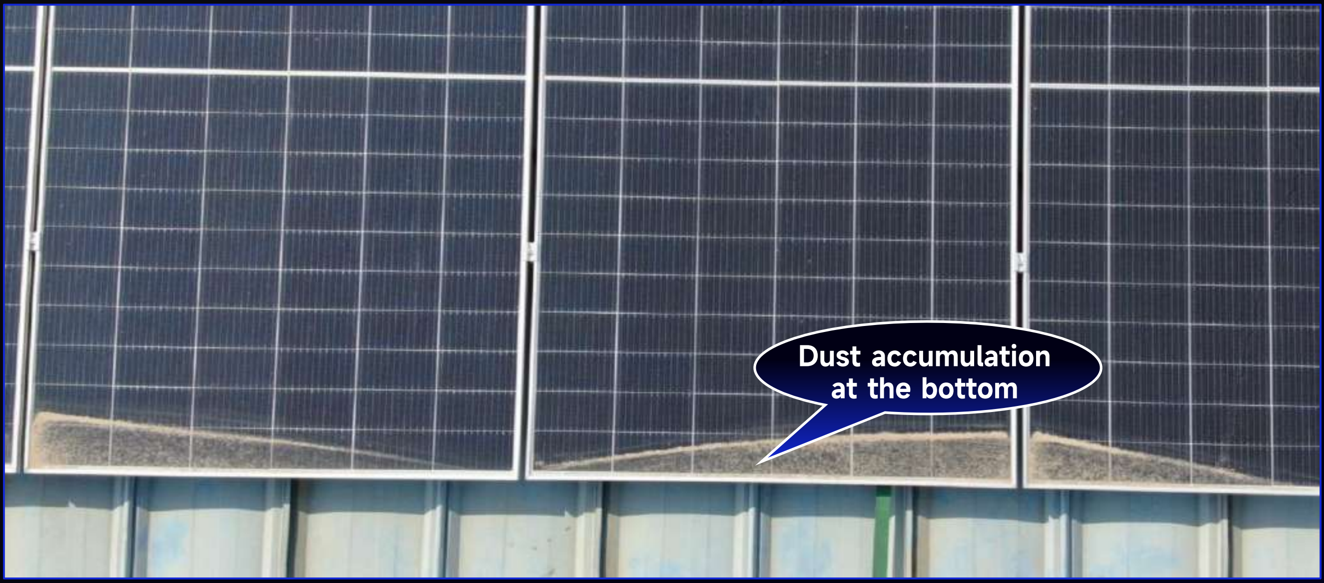
6

Smart Factory

- **A** Headquarters base and global operations center
- **B** An-chao Solar cells & PV Module Manufacture Base
- **C** MaAnshan silicon wafer Manufacture Base
- **D** Wuhu Manufacture Base
- **E** Shan Xi Manufacture Base
- **F** Guang Xi Manufacture Base

2. Pain Point of PV Industry
The Effect of Dust Accumulation

The dust accumulation in PV modules has always been a pain point in the PV industry

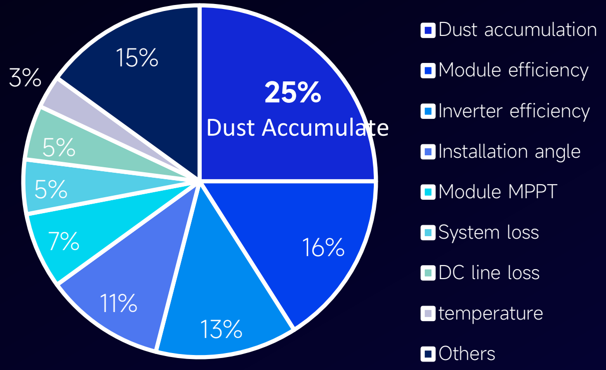


Dust accumulates at the bottom of the modules, forming mud bands

The increasing accumulation of dust has an impact on power generation

Dust (power loss) + Increased heat loss + Glass corrosion + Hot spot + Rainbow pattern/water ripple =module failure/reduced lifespan

Power loss caused by dust accumulation **25%**



Dust reduces the lifespan of module **15~50%**

(Sources: PV research reports)

A 1MW C&I PV power station annual power losses due to dust accumulation

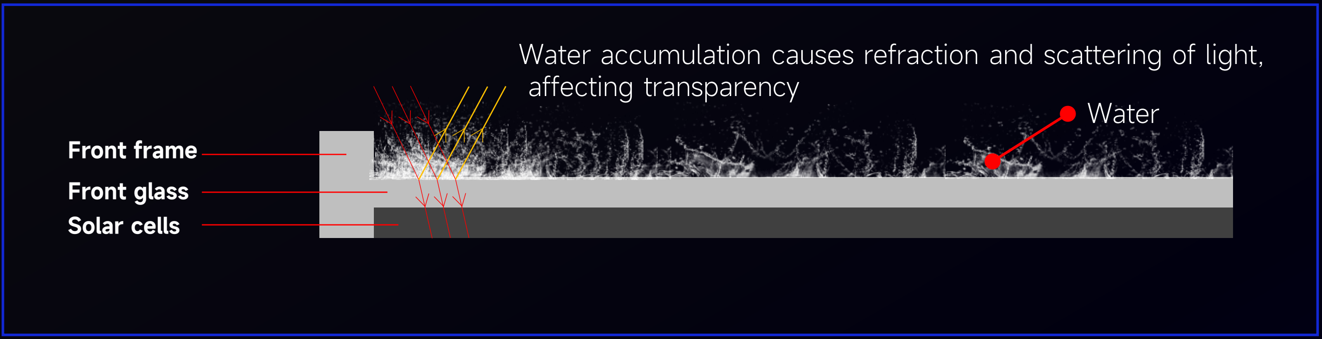
60000+ kWh

(Note: Taking Hefei, China as example)

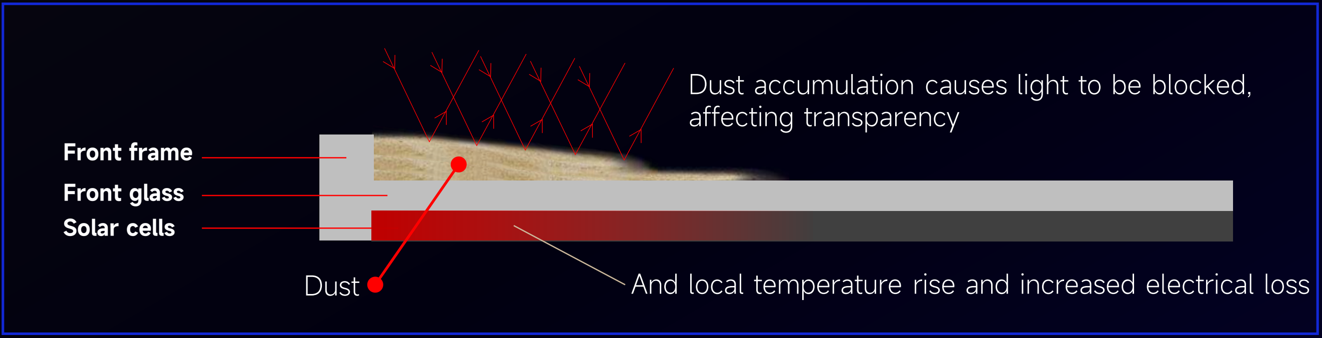
2. Pain Point of PV Industry

How dust&water accumulation causing power losses?

The effect of water accumulation

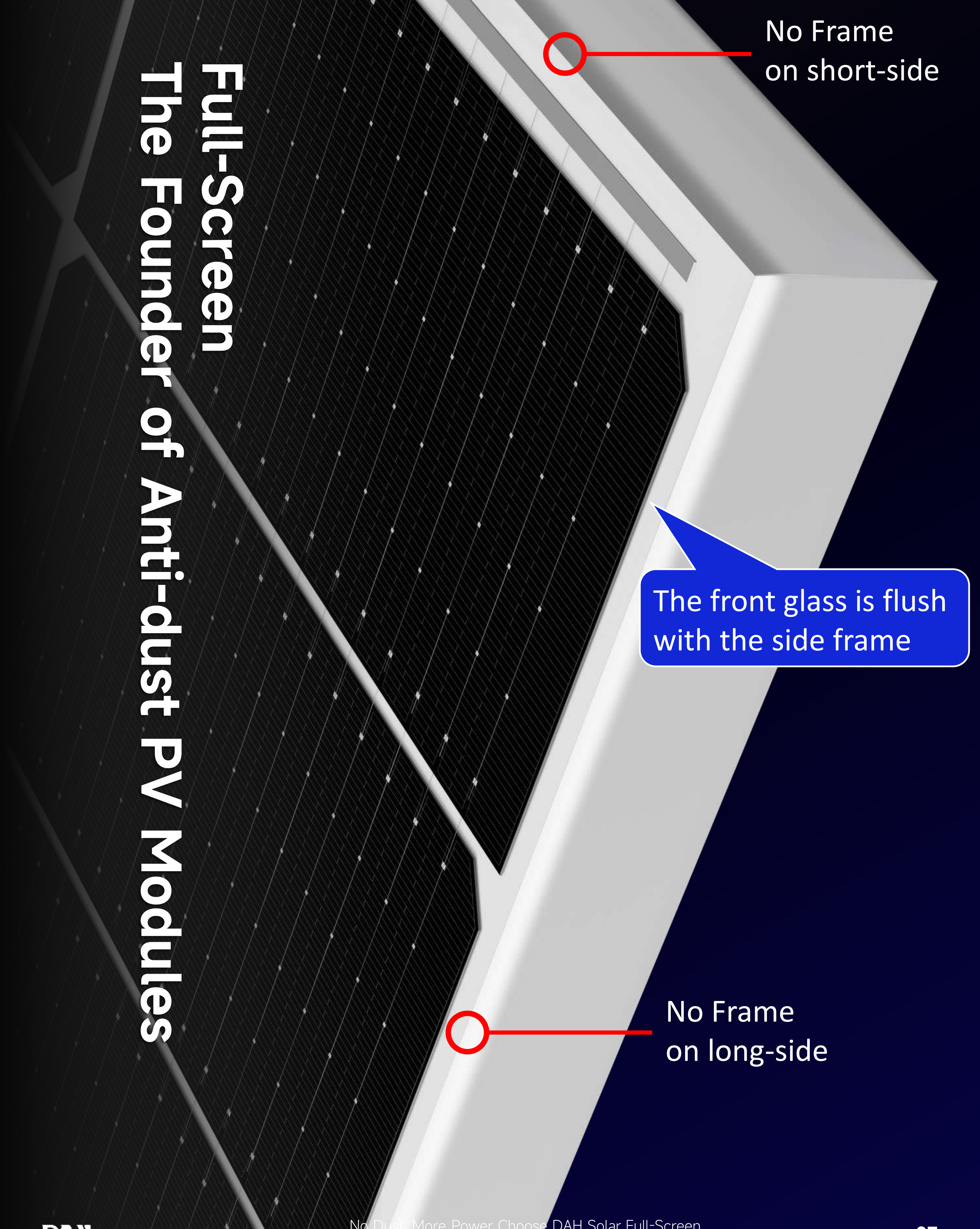


The effect of dust accumulation



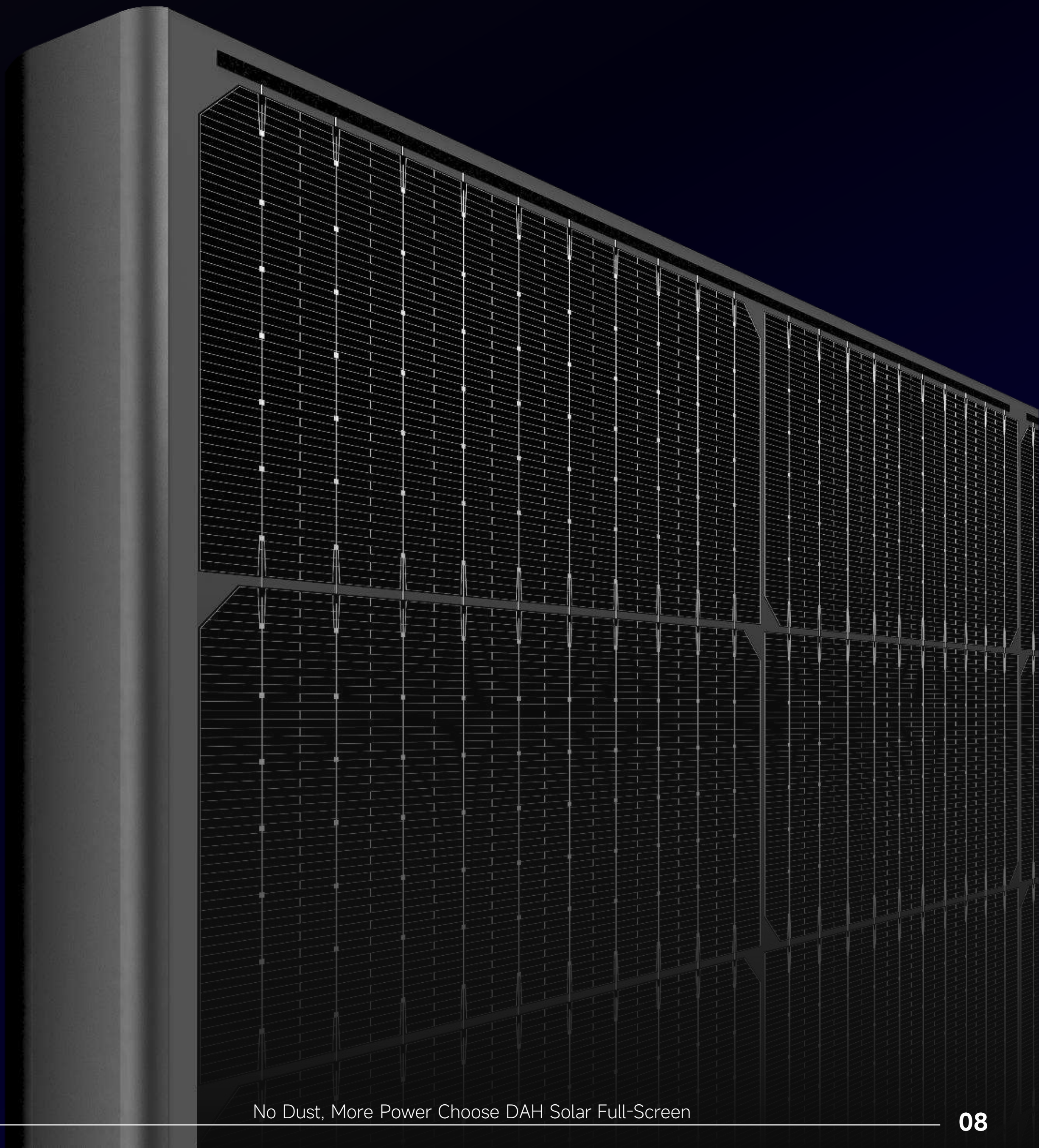
3. Innovative Product

Global Patented Full-Screen PV Module



3. Innovative Product
Advantages of Full-Screen PV Module

- H High Power Generation
- L Low Maintenance Costs
- F Full-scenario Applications
- S Stable and Reliable
- B More Beautiful



3. Innovative Product
The milestones of Full-Screen PV Modules

2019 — Start Product R&D

2020

R&D Process
Structural optimization & Reliability testing

- More than 50 product structure optimizations
- More than 20 product reliability tests
- More than 100 equipment precision adjustments

2021

Trial Production
Cost/process optimization & Yield ramp up

- Official released in SNEC
- Patent certification in 18 countries & EU
- First year shipment, 200MW

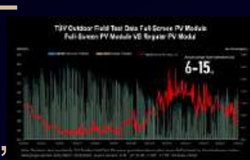
2022

Mass Production
Large scale shipment & Positive feedbacks

- The mass production yield exceeded 98.5%
- Product shipments exceed 600MW
- TUV empirical power generation gain of 11.5%

2023

Large scale shipment
Exported to Latin America, Europe, and Asia Pacific



- Full-Screen Power Station over 8000
- Annual power generation increase by 6-15%
- The most innovative product in PV industry

2024

Technology extension
Establish series product for multiple scenarios

- Full-Screen Double-glass Module released
- Full-Screen Rectangle Module released
- Full-Screen DBB Module released
- Full-Screen Colored Module released
- The shipments have exceeded 4.2GW

Keeping Development

3. Innovation Products

Full-Screen PV Module No.1 Global shipments

(No.1 in Anti-dust PV Module until July, 2024)

Full-Screen PV Module
Global shipments

4.2GW+

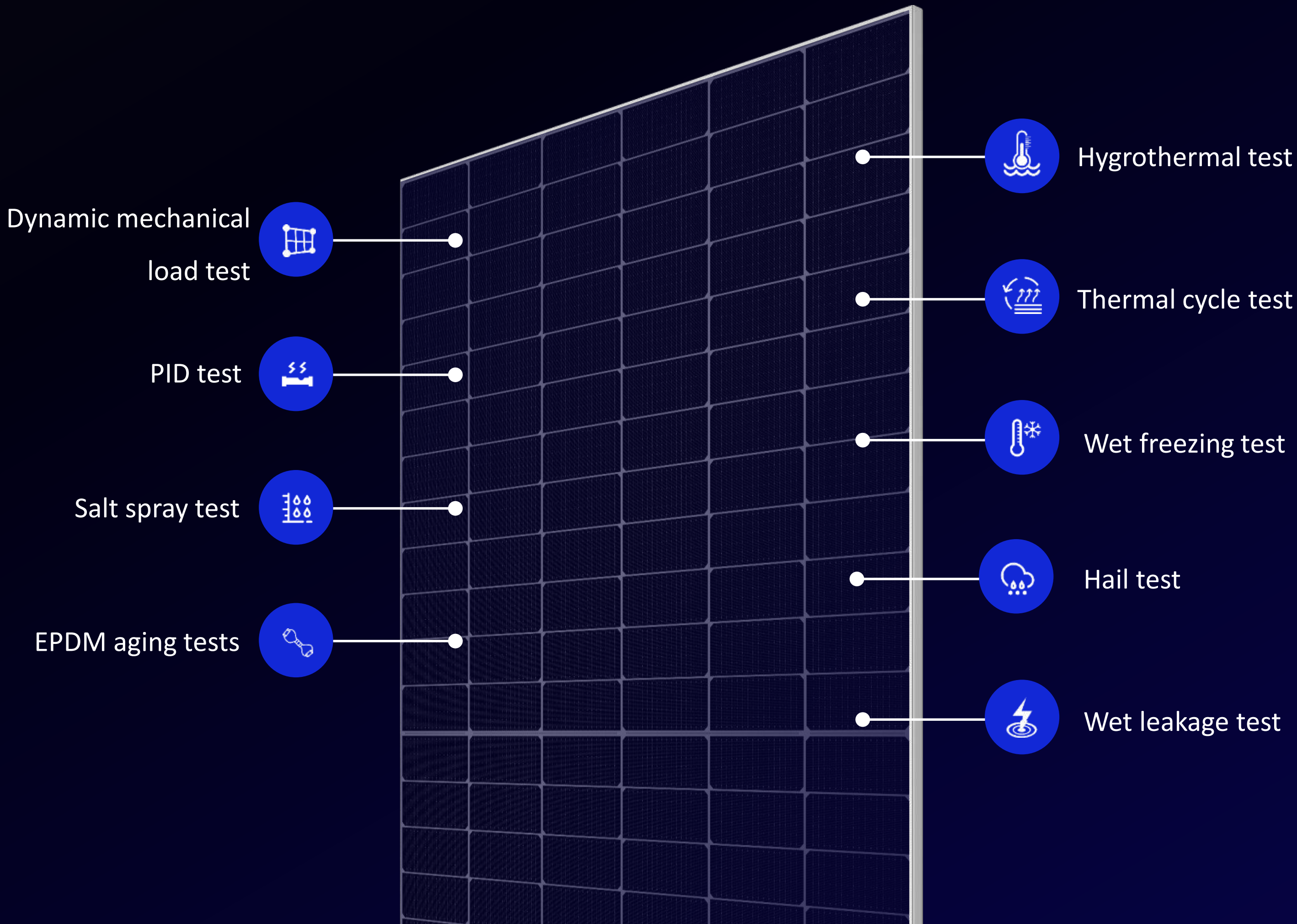
Full-Screen PV Module
Distribution network

80+

Full-Screen PV Module

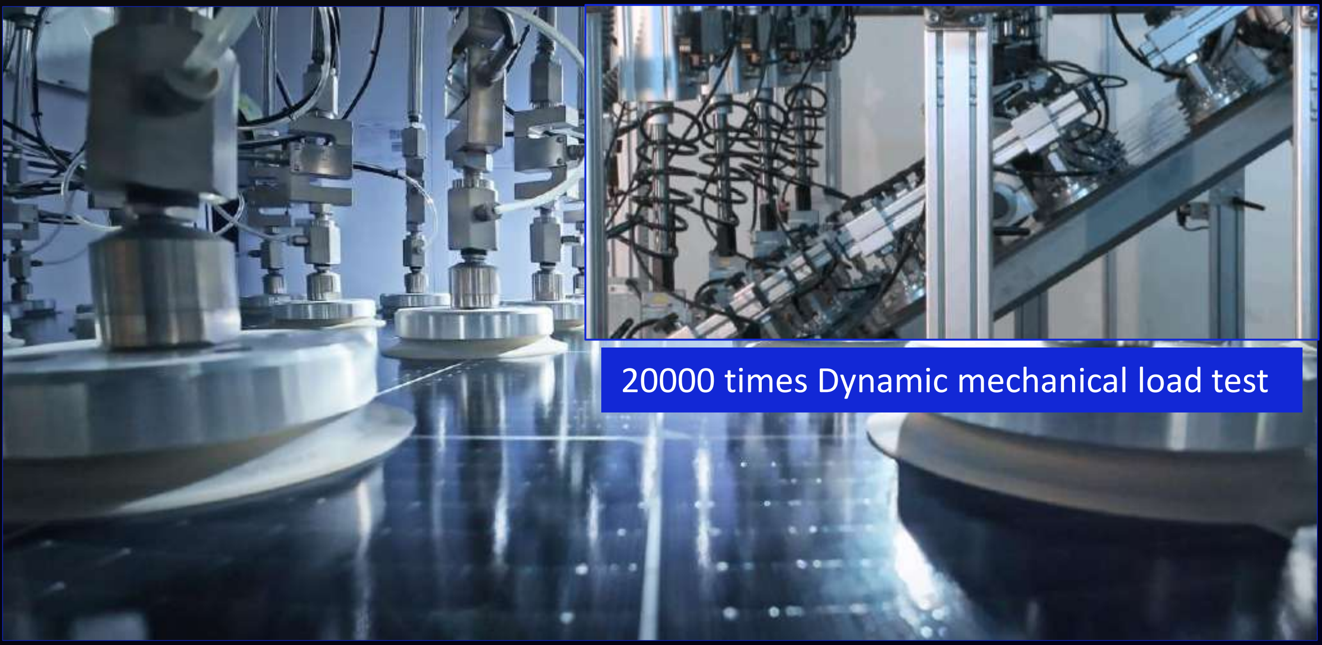
Owns 20+ patents and certifications, sold to 18+ countries and European Union area

4. Full-Screen PV Module Reliability test



4. Full-Screen PV Module Reliability Test 1

Frontal load test：



The front snow load is 5400Pa, and under uniform force, it can carry 551kg of weight or more than 2 meters of snow. (PV Module are not damaged)

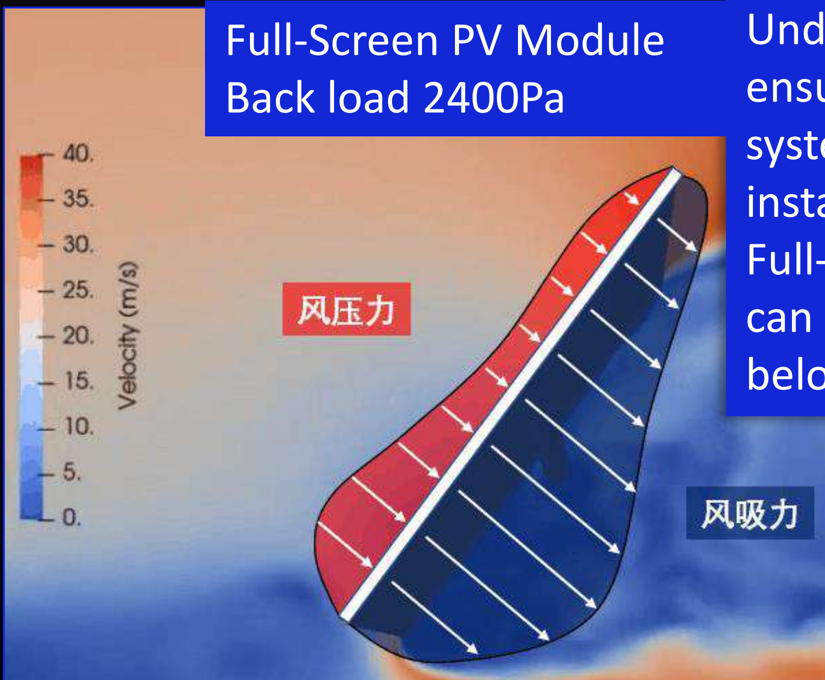
5400Pa
That's equivalent to about bearing
Per square
≈551kg

5400Pa
That's equivalent to about bearing
≈2.76m
Height Snow load

4. Full-Screen PV Module Reliability Test 1

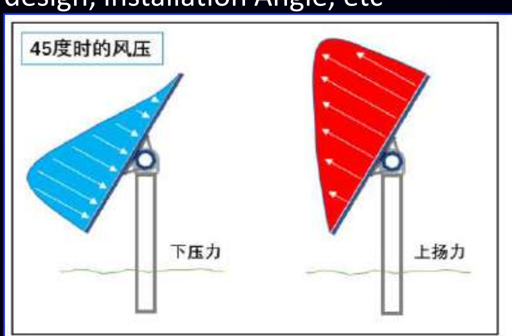
Back wind load test:

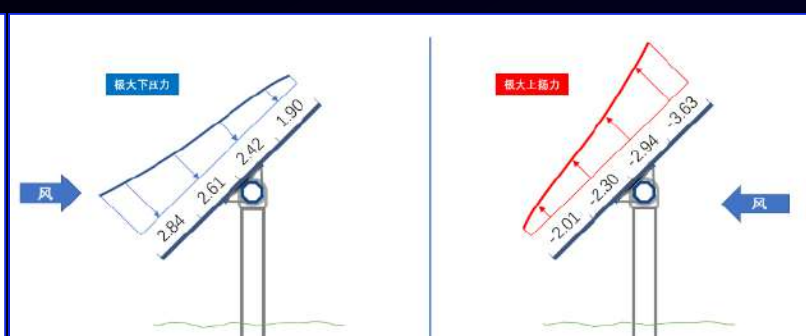
Full-Screen PV Module
Back load 2400Pa



Under the condition of ensuring the stability of system design and bracket installation
Full-Screen PV Module can resist strong winds below level 13

The wind load capacity of PV Module is affected by wind speed, wind direction incidence Angle, system design, installation Angle, etc



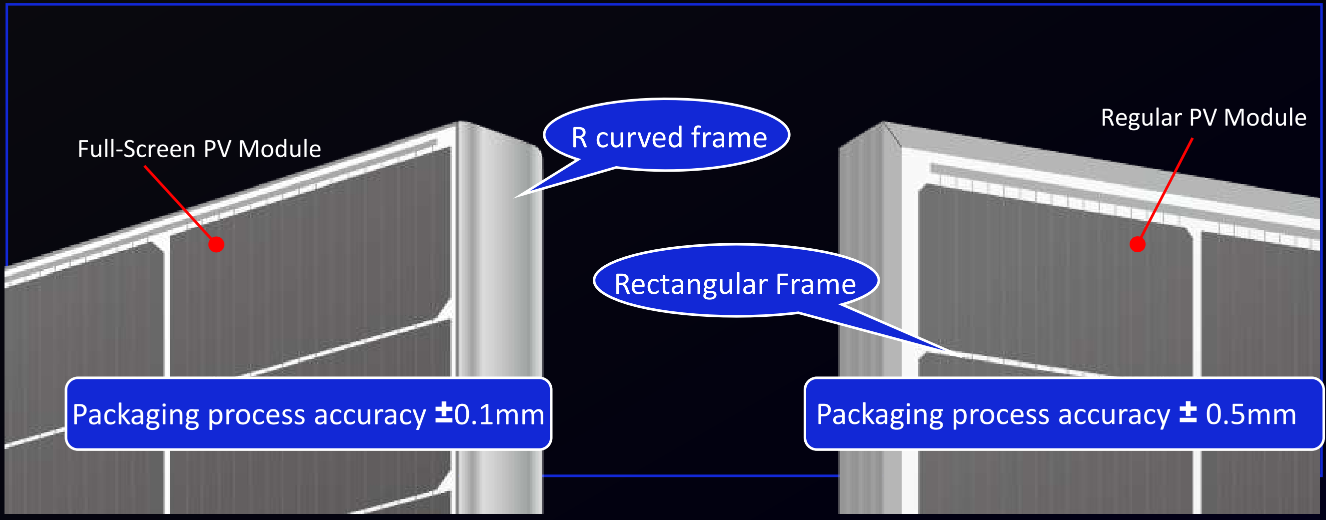


Wind Scale	Wind Speed Range	Installation Angle	Positive Pressure Range(Pa)	Negtive Pressure Range(Pa)
10	24.5-28.4 Storm, damage to buildings	25°	353.04-474.38	447.86-601.79
		30°	371.20-498.78	480.13-645.16
		35°	389.35-523.17	512.41-688.53
		40°	407.51-547.57	544.69-731.90
11	28.5-32.6 High winds, widespread damage	25°	477.73-625.07	606.03-792.94
		30°	502.30-657.21	649.71-850.09
		35°	526.87-689.36	693.39-907.24
		40°	551.43-721.50	737.07-964.39
12	32.7-36.9 Typhoon, super destructive force	25	628.91-800.84	797.81-1015.92
		30°	661.25-842.02	855.31-1089.14
		35°	693.59-883.21	912.81-1162.36
		40°	725.94-924.39	970.31-1235.57
13	37.0-41.4 Hurricanes, rarely seen on land	25°	805.18-1008.07	1021.43-1278.81
		30	846.59-1059.91	1095.05-1370.98
		35°	888.00-1111.76	1168.66-1463.14
		40°	929.41-1163.60	1242.28-1555.31

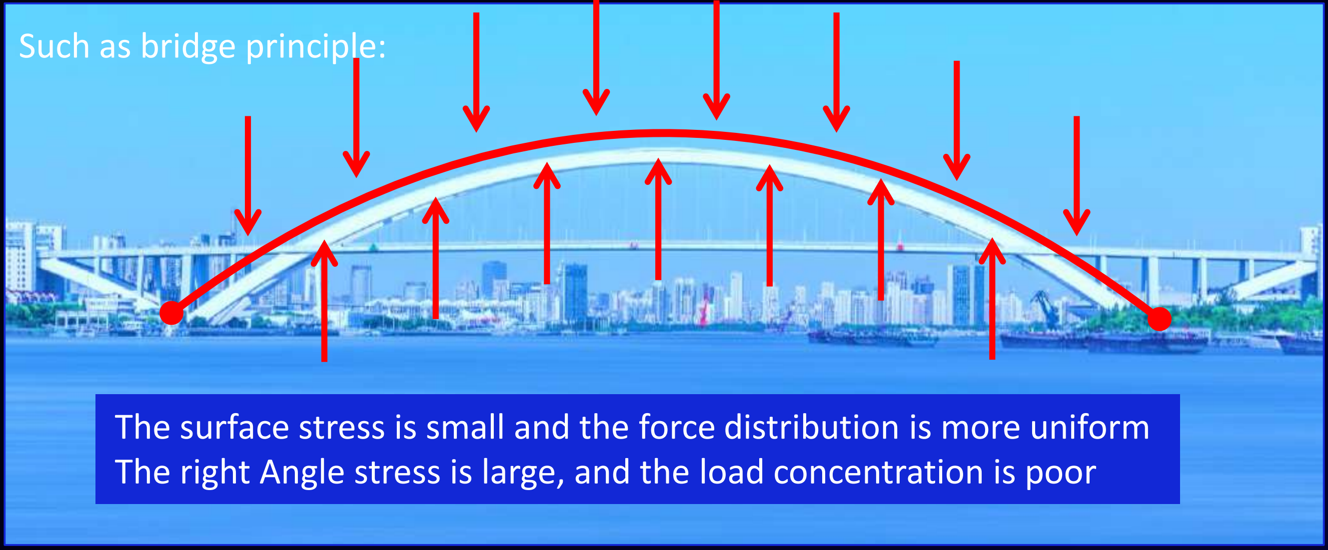
4. Full-Screen PV Module Reliability Test 1

The frame design is used to optimize the PV Module structure to reduce stress and improve load and stability

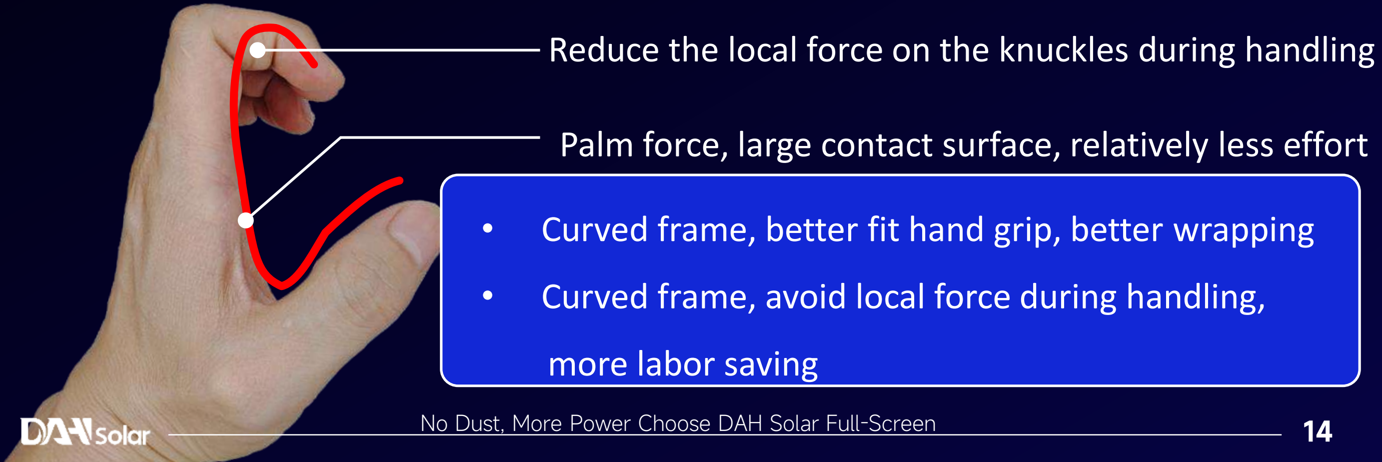
Full-Screen PV Module with 128° R curved Frame design



Full-Screen PV Module through the curved border design, optimize the stress force more uniform, improve the component load strength



128° Ergonomic Optimum grip design
(combination of industrial aesthetics and humanization)

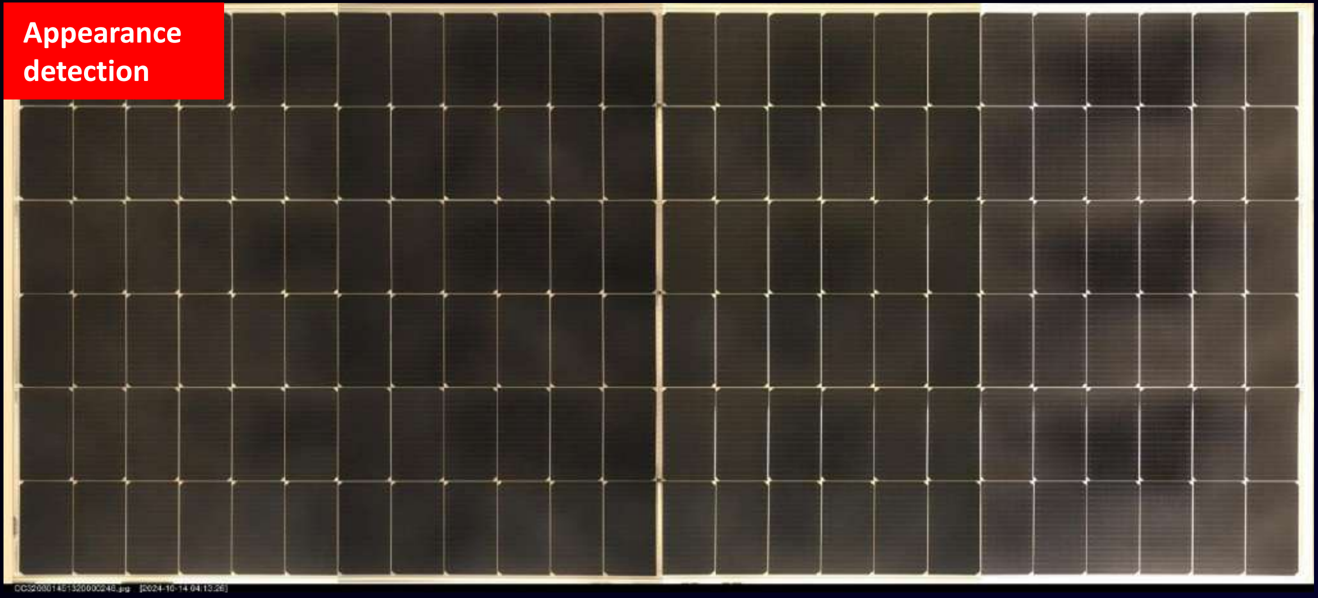


- Curved frame, better fit hand grip, better wrapping
- Curved frame, avoid local force during handling, more labor saving

4. Full-Screen PV Module Reliability Test 2

Hail impact test:

EL detection results: Hail with a diameter of 25mm (about 20g) hit the surface of the PV Module at a speed of 23m/s, and no hidden cracks and other problems were found in the PV Module through EL detection.



4. Full-Screen PV Module Reliability Test 3

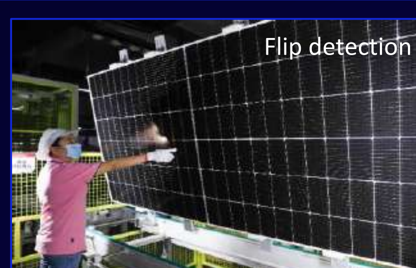
Product quality assurance selected industry TOP5 raw material suppliers

No	Material name	Material brand name
1	Solar cells	
2	Frame	
3	Glass	
4	EVA	
5	POE	
6	EPE	
7	Back sheet	
8	Junction box	
9	Connector	
10	Structural adhesive	
11	Ribbon	

Product 100% 5 times EL test production line products into the laboratory sampling test

Front-channel EL detection

Post-channel EL detection

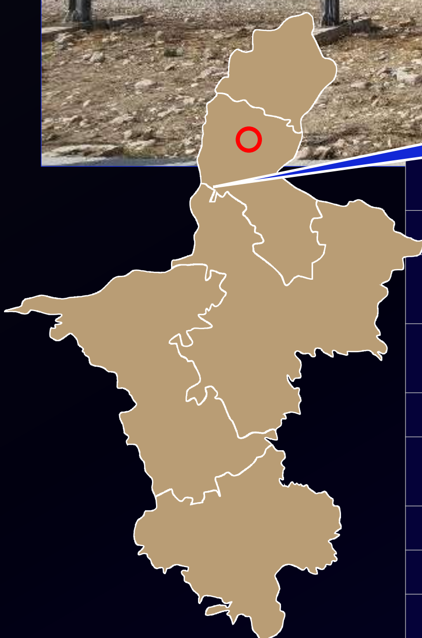


Flip detection

5. Power station case & application performance

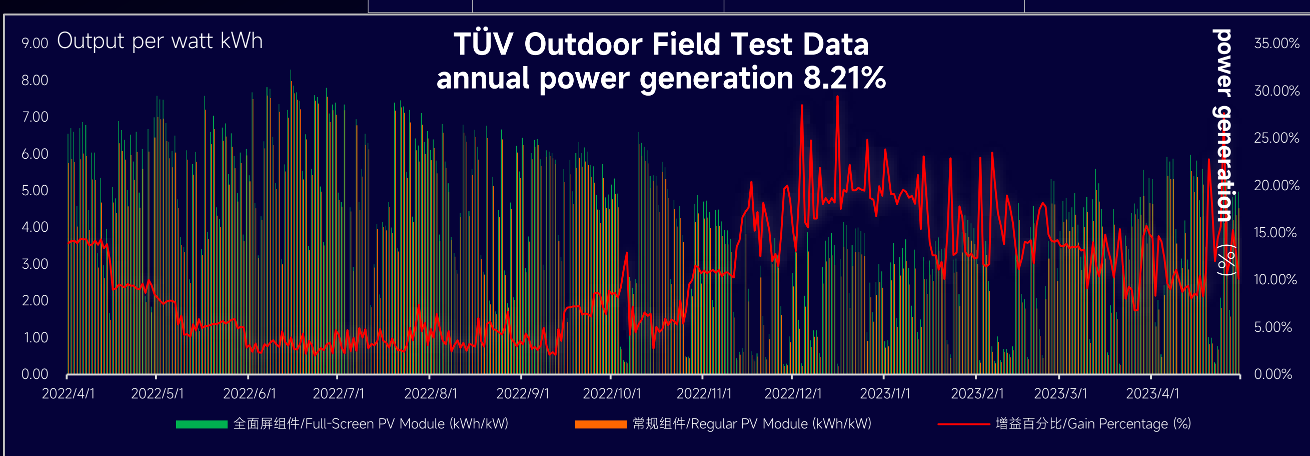
TUV Household demonstration power station

Full-Screen PV Module The annual comprehensive power generation gain is 8.21%



PV Module outdoor demonstration equipment configuration list

No.	Equipment name	Size	Amount
1	Full-Screen PV Module	DHT-M60X10/FS-460W	2 test pieces /1 spare part /1 control piece
2	Regular frame PV Module	DHT-M60X10-460W	2 test pieces /1 spare part /1 control piece
3	Micro-Inverter	HM-1500	2
4	Six elements weather stations	MULTI-6P	1
5	Frontal Irradiatometer	Kipp&Zone SMP10，Class A	1
6	Temperature Sensor	STM-4	4
7	PV Module Sensor	PVMS，0.5 level	4
8	Data collector	MAP MINI	1



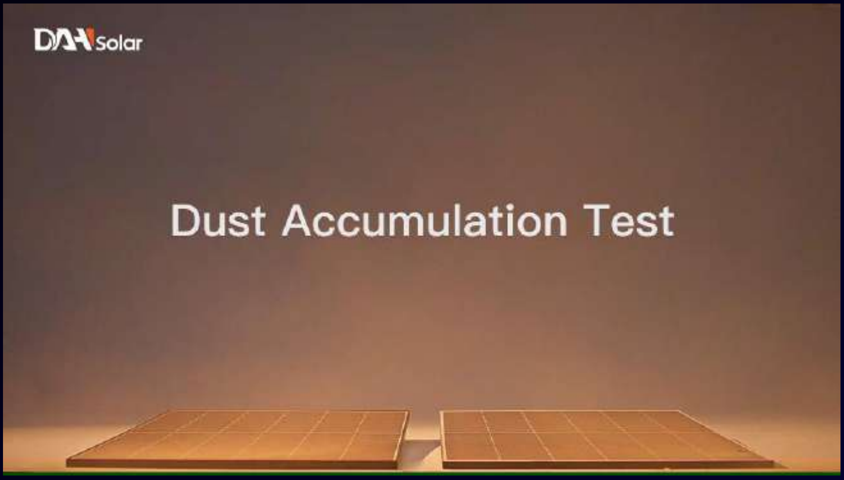
5. Power station case & application performance

Application Advantages

1. The accumulation of water on the modules can cause light refraction and scattering, leading to a reduction in energy conversion efficiency
2. The accumulation of dust on the modules can obstruct light absorption, leading to a reduction in energy conversion efficiency.
3. The accumulation of snow on the modules can be mitigated by full-screen modules designed to prevent ice formation and accelerate the snow shedding process.

The impact of water accumulation on energy generation

The impact of dust accumulation on energy generation



The impact of snow accumulation on energy generation.

5. Power station case & application performance

The effectiveness of natural cleaning by rainwater on photovoltaic modules varies across different environments.

The natural cleaning effect of rainwater is primarily influenced by four key factors.

(Uncontrollable factors)

(Controllable factors)

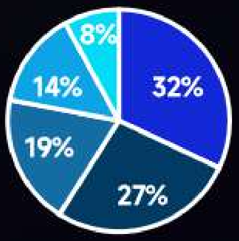
1. Real-time rainfall

2.Surface contaminants on the modules

3.Installation tilt angle

4.Module drainage performance

Factors affecting the effectiveness of rainwater cleaning and their respective contributions



The degree of natural cleaning of surface contaminants by rainwater on the modules

Surface contaminants on the modules	Rainwater cleaning effectiveness
Dust	95%
Plant debris (leaves, branches, etc.)	90%
Pollen	80%
Industrial dust and oil stains	76%
Bird droppings	75%

Commonly encountered three types of application scenarios and the proportion of surface contaminants on modules

Urban areas

Surface contaminants on the modules	Percentage of attachment
Dust	90%
Plant debris (leaves, branches, etc.)	5%
Pollen	2%
Industrial dust and oil stains	1%
Bird droppings	2%

It is expected that the rainwater natural cleaning effect in the surrounding urban areas will reach

93.86%

Mountainous / Agricultural areas

Surface contaminants on the modules	Percentage of attachment
Dust	67%
Plant debris (leaves, branches, etc.)	10%
Pollen	4%
Industrial dust and oil stains	3%
Bird droppings	16%

It is expected that the rainwater natural cleaning effect in mountainous/agricultural areas will reach

90.13%

Dusty industrial areas Key pollutant discharge zones

Surface contaminants on the modules	Percentage of attachment
Dust	13%
Plant debris (leaves, branches, etc.)	2%
Pollen	1%
Industrial dust and oil stains	82%
Bird droppings	2%

It is expected that the rainwater natural cleaning effect in dusty industrial parks will reach

78.77%

6. Installation Plan 1 for Full-Screen PV Modules

Conventional Clamp Installation

Regular Clamp

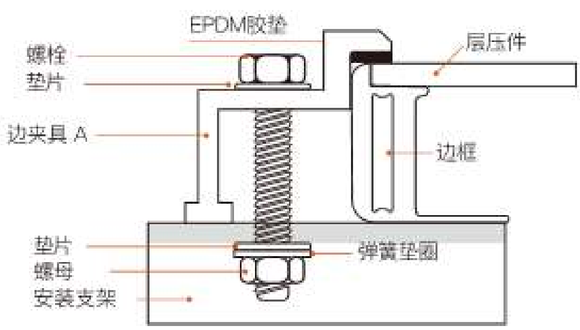
+

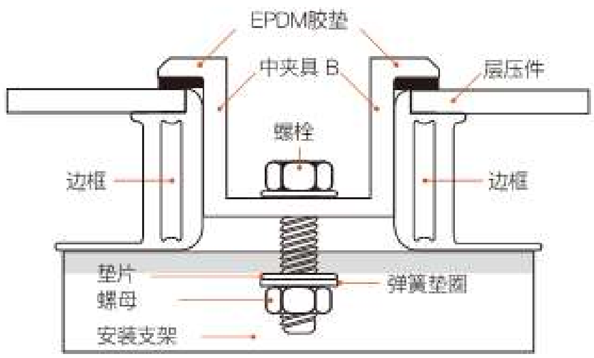
EPDM Anti-Scratch Washer
(included with the modules upon purchase)

=

Full-Screen PV Module
Protective Clamp

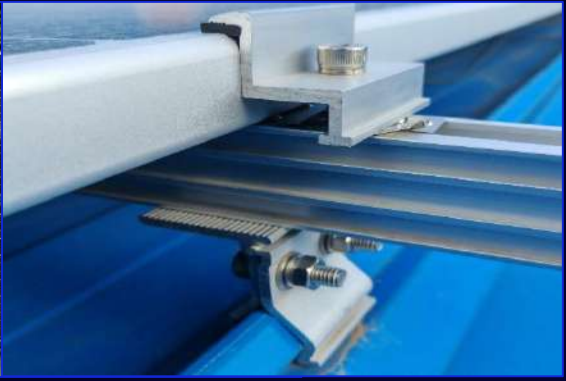
Medium Pressure and Edge Pressure Installation Diagram





Recommended application scenarios are as follows

Installation tilt angle of 2°-5°



Installation tilt angle of 15°-30°

6. Installation Plan 1 for Full-Screen PV Modules

EPDM Durability Test

EPDM has excellent elasticity, chemical stability, weather resistance, aging resistance, and compression set resistance, as well as outstanding electrical insulating properties.

Cushioning Installation Torque

Prevent Scratching from Hard Objects

Operating Temperature Range

-50°C

+150°C

6. Installation Plan 1 for Full-Screen PV Modules

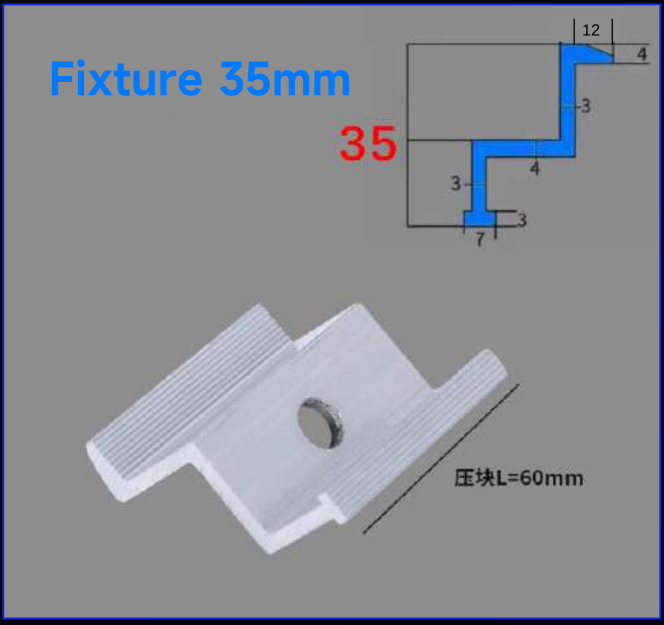
Recommended Clamp Size and Installation Torque Standards for PV Full-Screen Modules

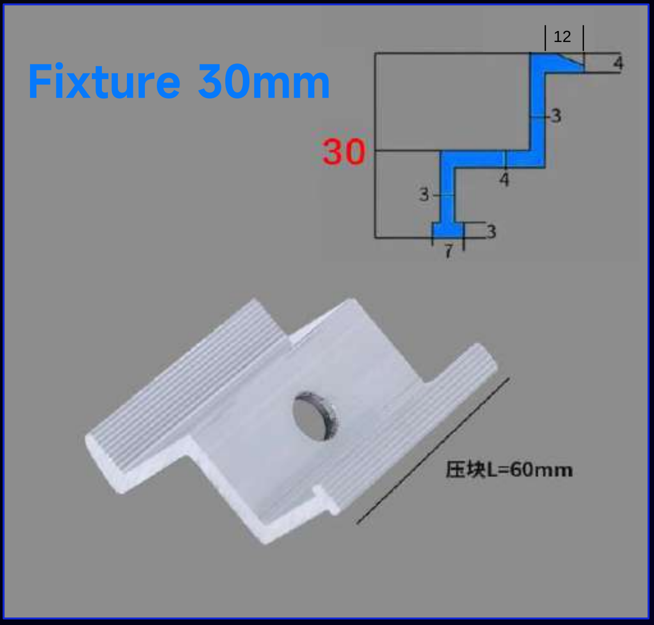
Clamp Specifications:

Center Clamp / Edge Clamp Length ≥ 60mm; Thickness ≥ 3mm; Bolt: M8

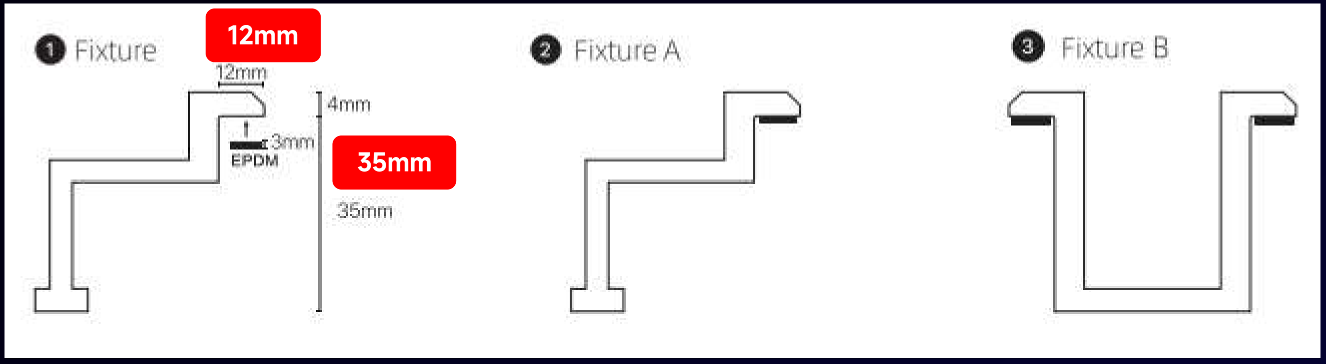
Clamp Surface Width ≥ 12mm ;

Recommended Standard Installation Torque Range： **20-30N.M**

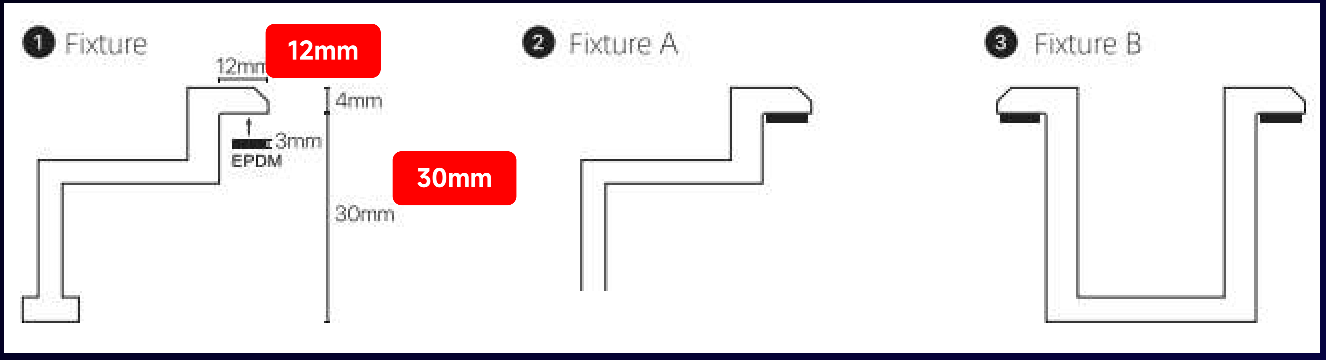




Compatible with 32mm Frame

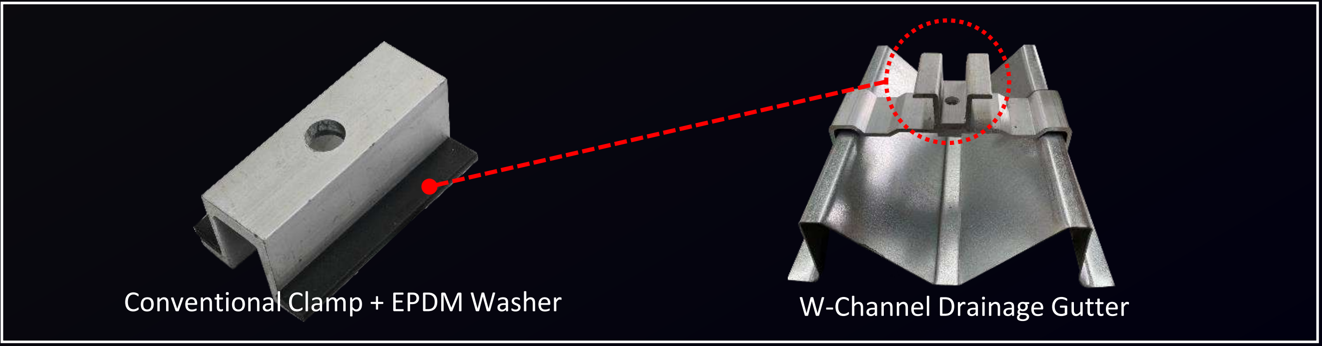


Compatible with 28mm Frame



6. Installation Plan 2 for Full-Screen PV Modules

Clamp + W-Channel Installation



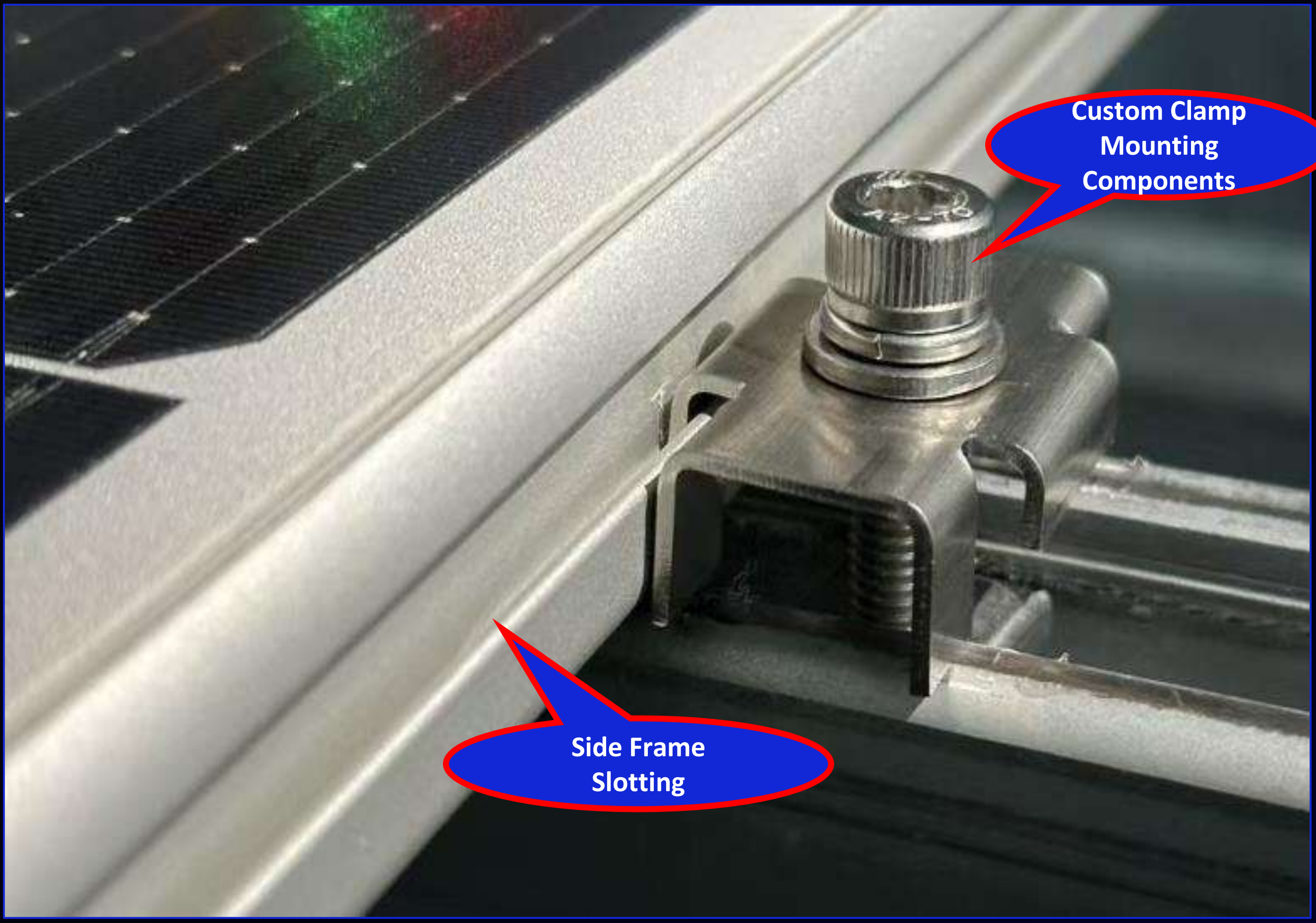
Applicable to BIPV Scenarios

Applicable to Sunroom Scenarios

Applicable to Photovoltaic Carport Scenarios

6. Installation Plan 2 for Full-Screen PV Modules

A. Side Frame Installation Plan (Module + Clamp Mounting Parts Customization Required)

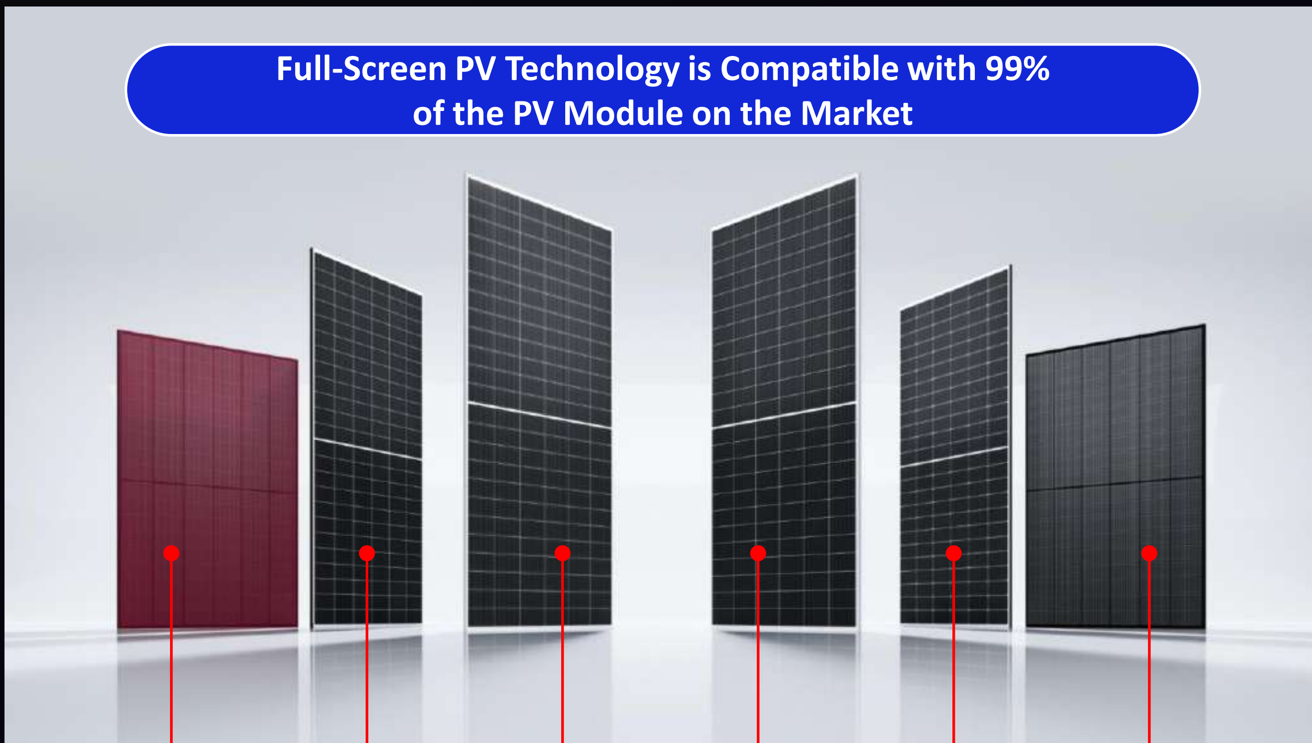


B. Frame Mounting Hole Installation (Bolt Fixing)

C. Rear-Mounted, Suitable for Building Curtain Wall Scenarios

Note: The above A, B, and C installation solutions for special scenarios to provide reference advice, the regular scenarios recommended the use of Program 1 and Program 2.

7. Full-Screen PV Module Product Matrix



54P
1722×1134×32mm
Full-Screen Color PV module
380-430W

54P 60P 72P
Full-Screen DBB PV module
450-630W

54P 60P 72P
2278×1134×32mm
1903×1134×32mm
1722×1134×32mm
Full-Screen Single Glass PV module
450-595W

54P 60P 72P
Full-Screen Rectangular PV module (silver frame)
450-630W

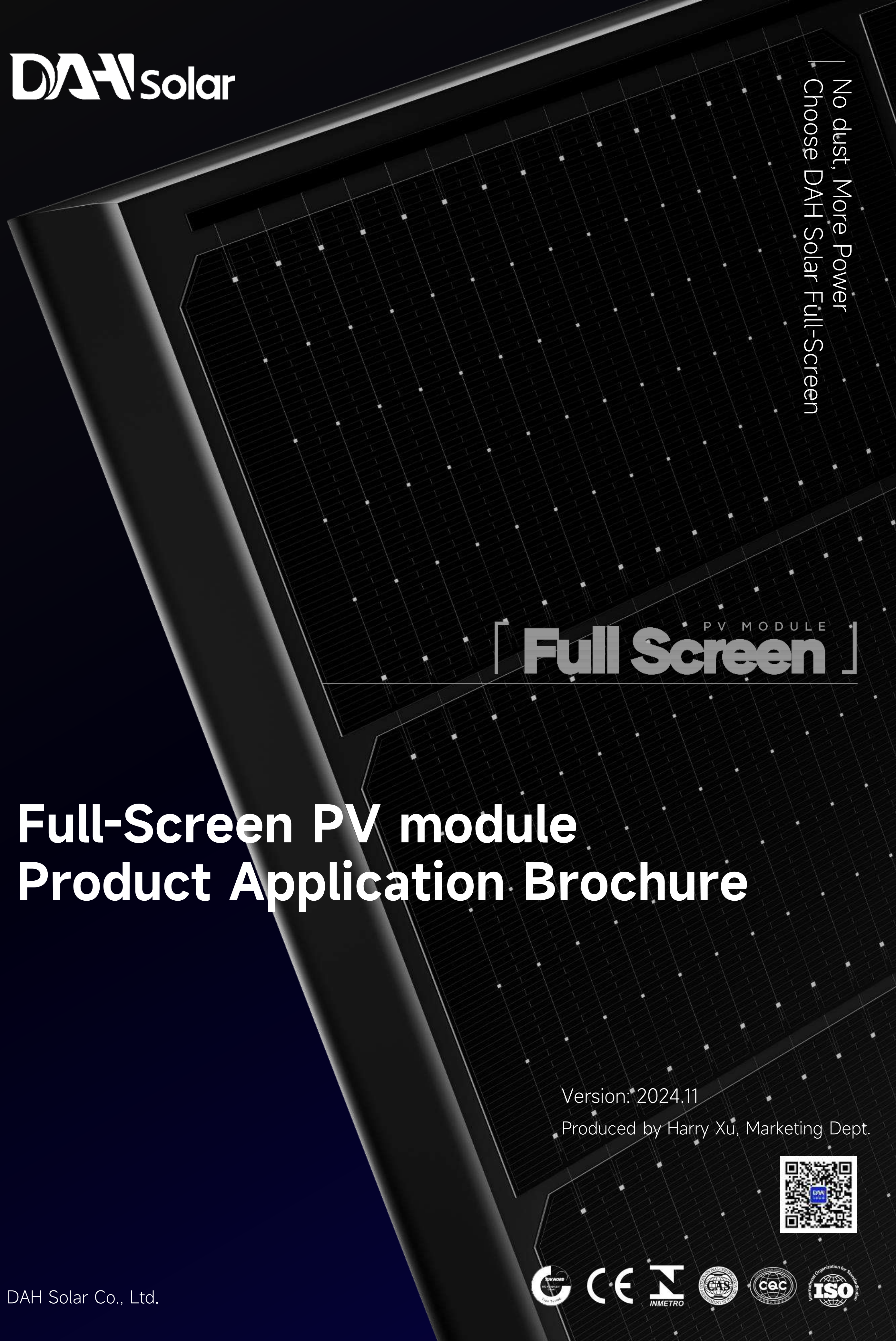
54P 60P 72P
2278×1134×32mm
1722×1134×32mm
1903×1134×32mm
Full-Screen Dual glass PV module (black frame)
450-590W

54P 60P
Full-Screen Rectangular PV module (all black)
450-520W

Note: The above is only the main version of the Full-screen PV modules, the power band is updated in October 2024

DAH Solar

No dust, More Power
Choose DAH Solar Full-Screen



Full-Screen PV module Product Application Brochure

Version: 2024.11

Produced by Harry Xu, Marketing Dept.

DAH Solar Co., Ltd.