
TW SOLAR
TW Solar Shingled Module
Keeping the Sunlight:
Innovative Structure&Excellent Aesthetics
Jack Xu
Oversea Technical Service Director
PV CHANGES THE WORLD

TW SOLAR

CONTENT

01

About us

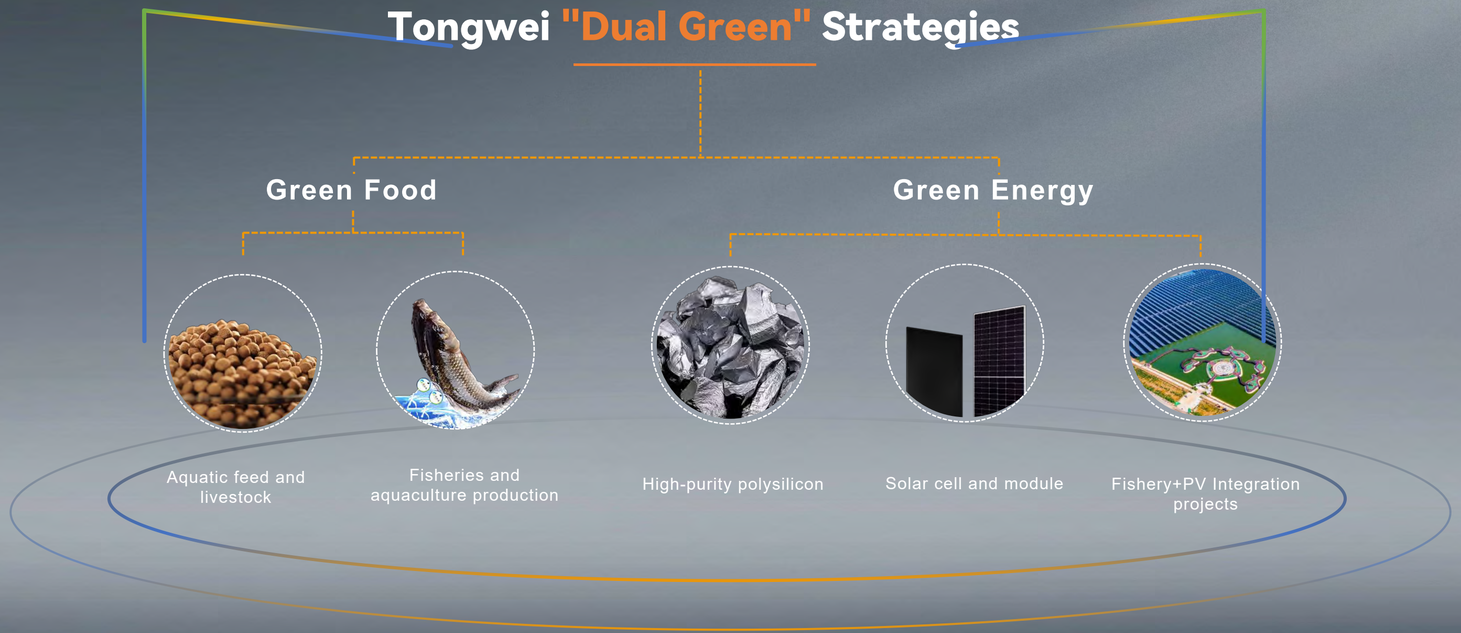
TONGWEI GROUP

FOR BETTER LIFE

A multinational organization with agriculture and renewable energy as its main businesses.

BUSINESS SCOPE

Green Food—Agriculture and Animal Husbandry
Green Energy—Photovoltaics



TONGWEI VALUE

Tongwei Co., Ltd. is fully owned by Tongwei Group, and listed in Shanghai Stock Exchange (SSE 600438).
Celebrated its 40th Anniversary on Sept. 20, 2022.
Engaged in 2 main industries: agriculture (1982) and renewable energy (2006).
Pursue leadership in quality, technology, cost, efficiency and production scale.

Over **€40** billion
The highest stock market value in 2022

About **€20** billion
Brand value

494
Ranking of Forbes 2023 global 2000

Nearly **50,000**
Employees worldwide

Over **200**
Branches or subsidiaries

TONGWEI PV INDUSTRY CHAIN

According to PV Infolink's global module shipment ranking in 2022, Tongwei is ranked among the top 10 worldwide.

No.1 WORLDWIDE

High-purity Crystalline Sillicon

Capacity 380,000tons

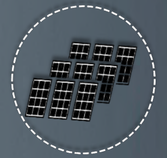
No.1 WORLDWIDE Delivered over 100GW

High-efficiency Solar Cell

Capacity 80-100GW

High-efficiency PV Module

Capacity 80GW



Fishery & PV integration

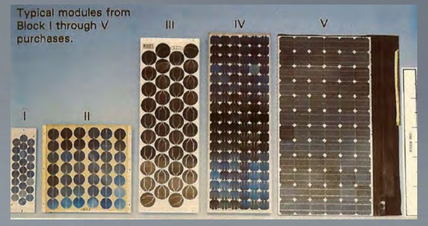
Capacity 3.4GW

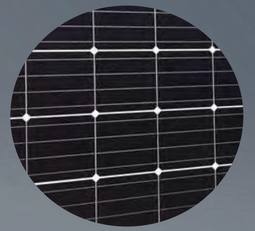
02

The Evolution of Shingled Module

EVOLUTION OF HIGH-EFFICIENCY MODULES

In earlier years, solar cells adopted the shape of silicon ingot, and were later optimized to have a square structure in order to improve the active area density therefore module efficiency.

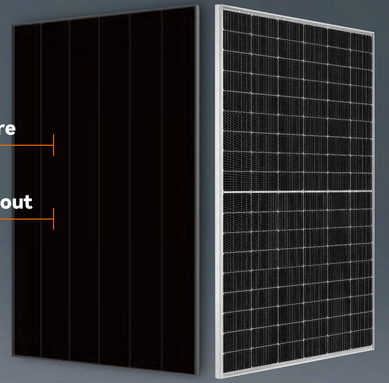




Tongwei Twins

Shingled Structure

High-density Layout



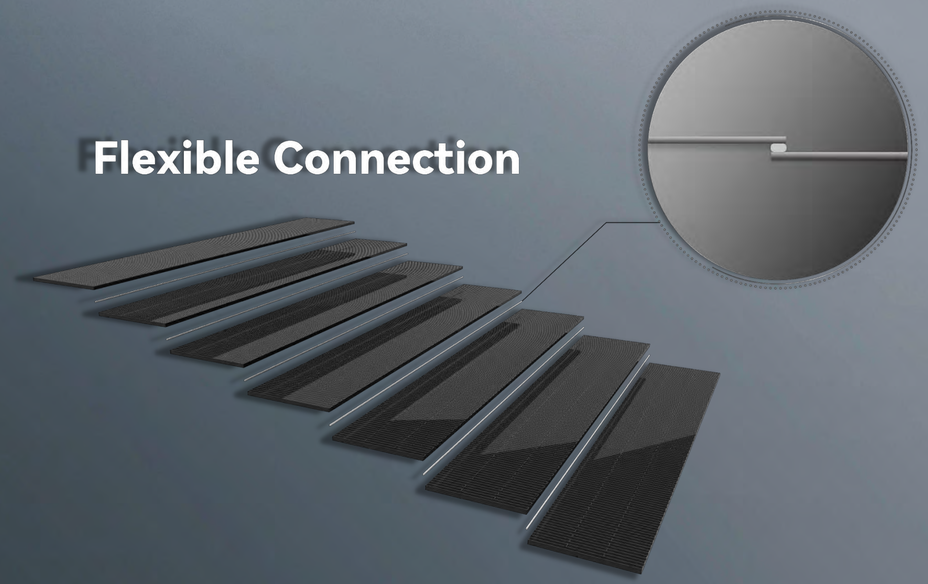
Earlier Modules

Full-cell Module

Shingled Module

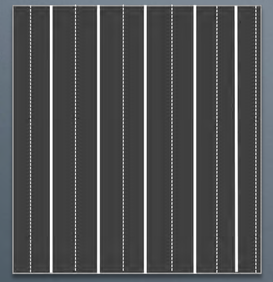
Half-cut Module

DESIGN > FLEXIBLE CONNECTION



Adhesive is widely used in daily life

DESIGN > MULTI-CUTTING

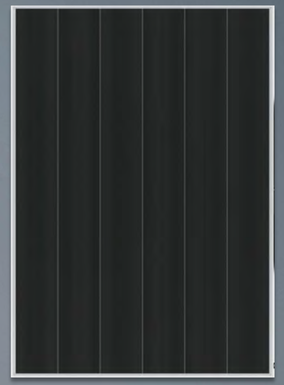


Shingled Cells

Cut one cell into more pieces.

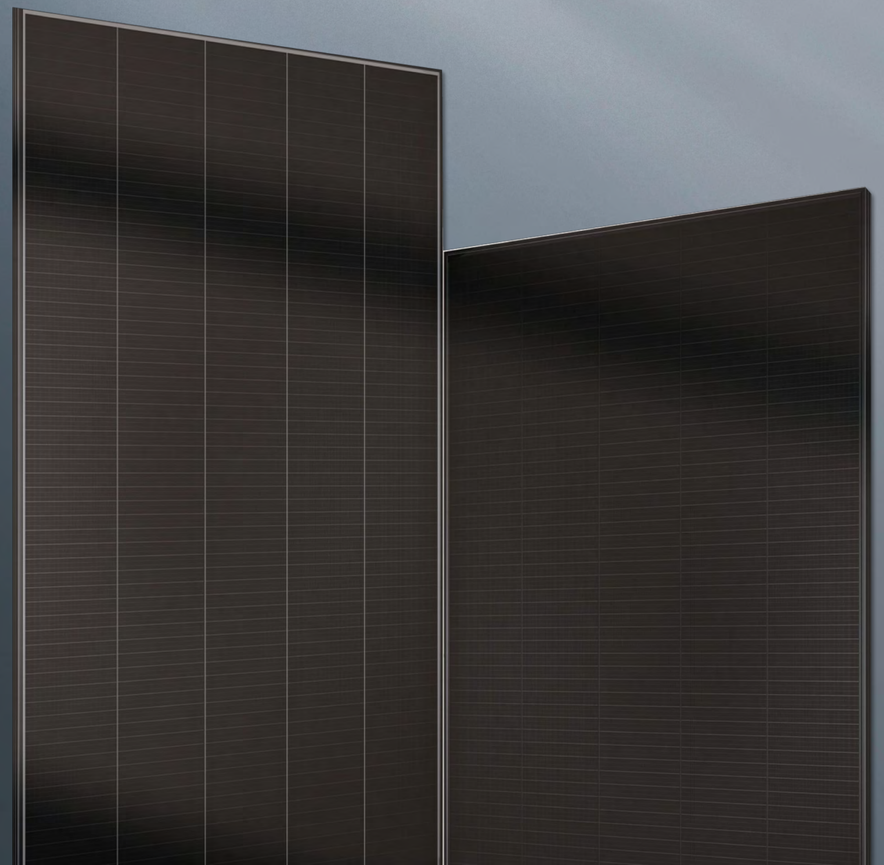
Shingled Structure

Maximize the power output from a given area of solar cells by overlapping the cells in a shingle-like pattern.



Shingled Module

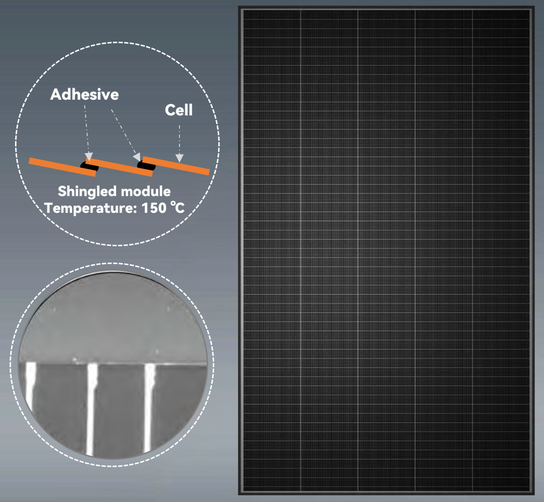
Aesthetic shingled module with higher power & higher efficiency.



03

Design Advantages

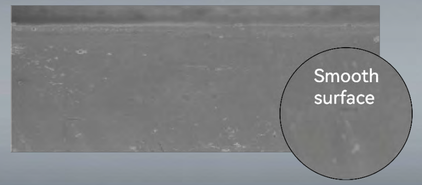
LESS MICRO-CRACKS

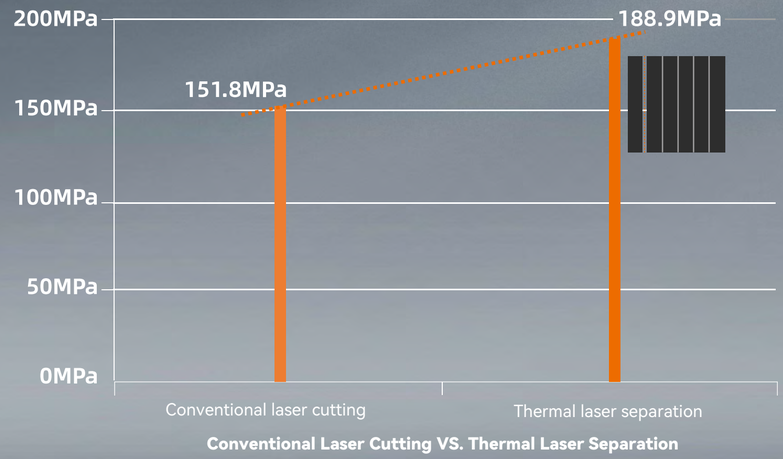


Lower Soldering Temperature

Cross-section section and microstructure of conventional cutting

Cross-section and microstructure of optimized thermal laser separation technology (TLS)

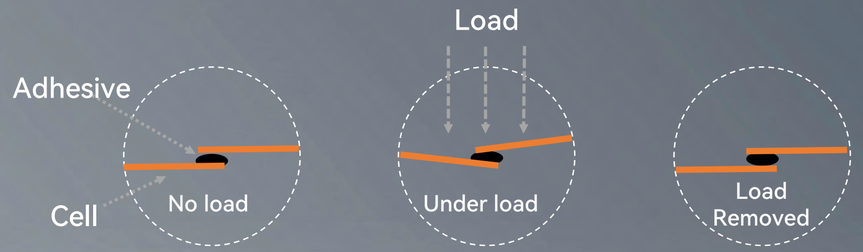




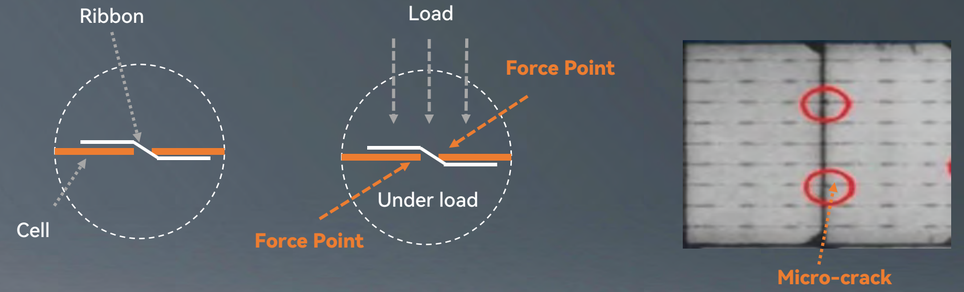
Conventional Laser Cutting VS. Thermal Laser Separation

Shingled Modules with Optimized Thermal Laser Separation Technology

HIGHER LOADING CAPACITY



Flexible Connection of Shingled Module



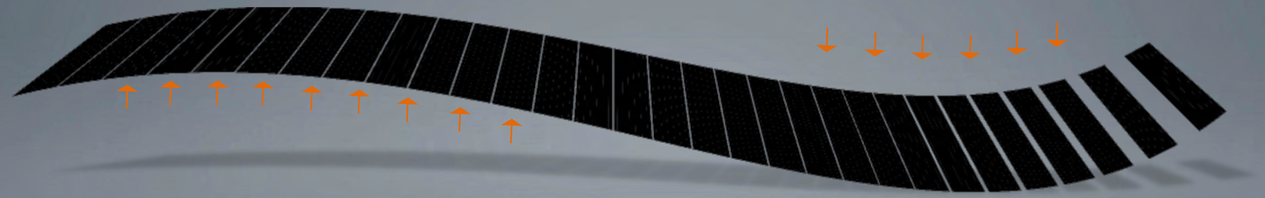
Force Point of Full-cell Module

HIGHER LOADING CAPACITY

8100Pa static mechanical load test

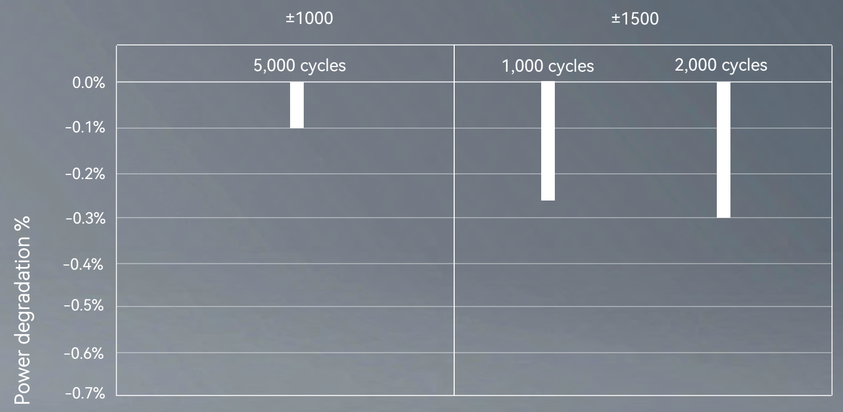
No additional micro-crack

The power degradation is <0.5%



RIGOROUS LOAD TEST

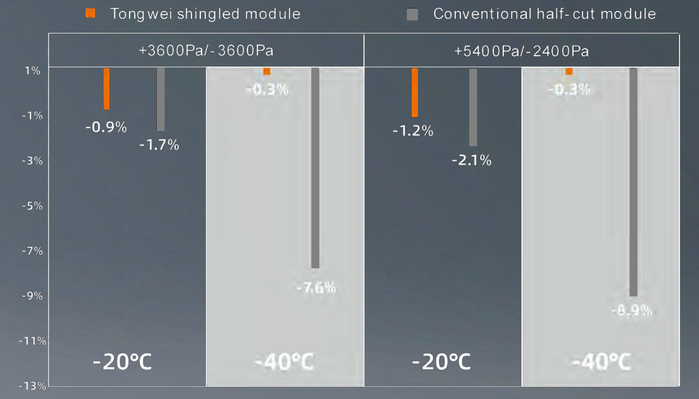
Dynamic Mechanical Load Test



Remarks: Industry-standard ±1000Pa, power degradation ≤ 5% after 1000 cycles

The power degradation ≤ 0.3%

Tongwei's Shingled Modules under Load at Low Temperature

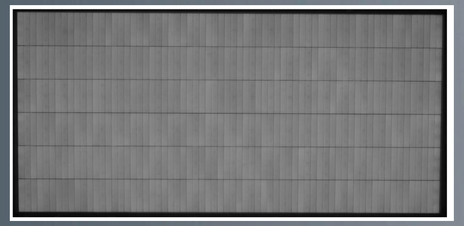


Lower power degradation

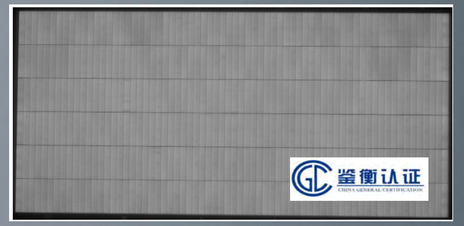
RIGOROUS HAIL TEST

45mm+30.7m/s

The power degradation < 0.4%



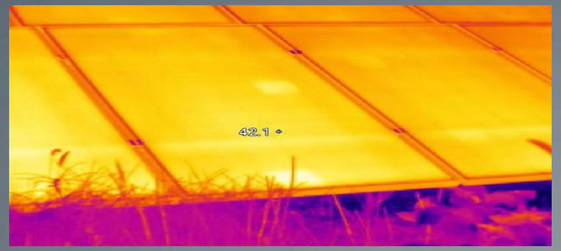
Appearance and EL (before hail)

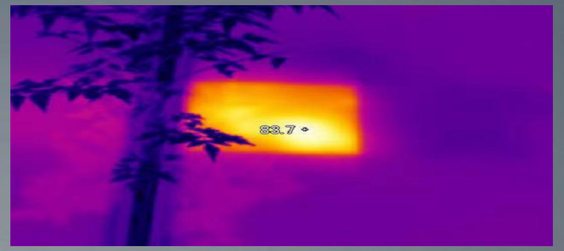


Appearance and EL (after hail)

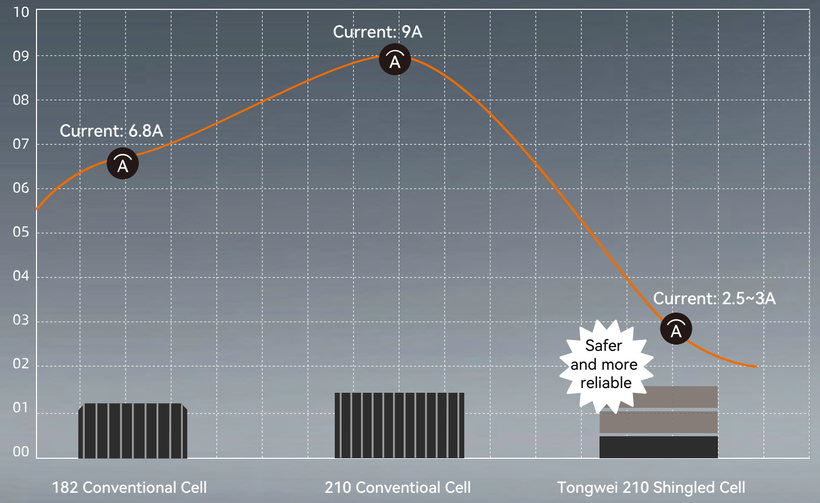
LOWER HOTSPOT RISK

Caused by shading from trees or buildings, partial module damage, or manufacturing defects.

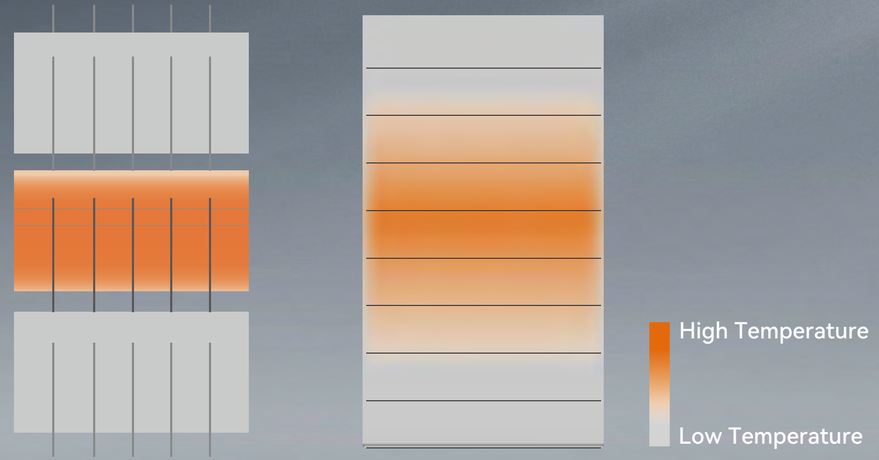




LOWER HOTSPOT RISK



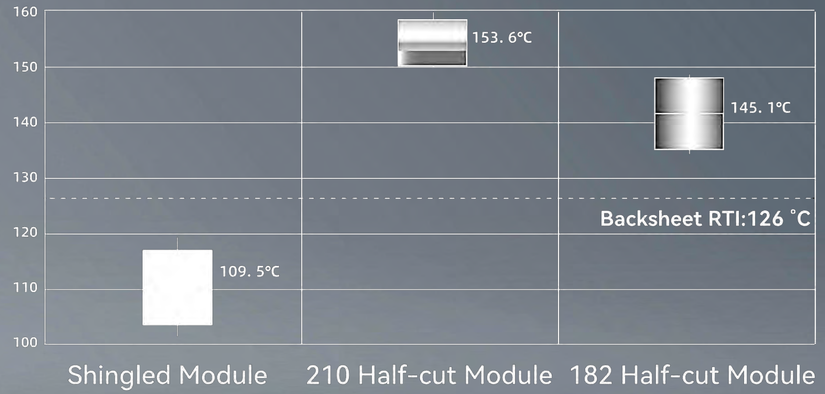
Multi-cutting —— Less Current

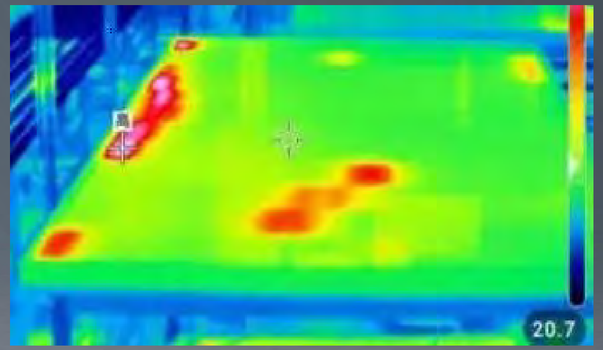


Flexible Connection —— Lower Temperature

LOWER HOTSPOT RISK

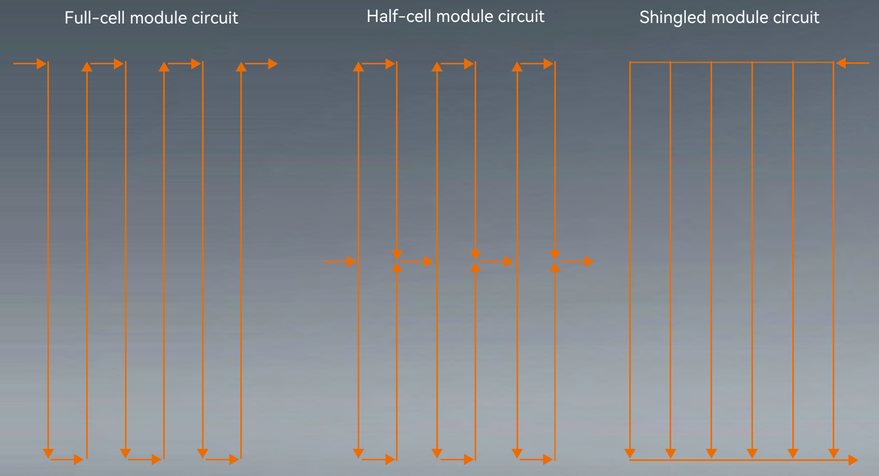
In Fraunhofer hotspot test, Tongwei shingled modules have an obvious lower temperature.



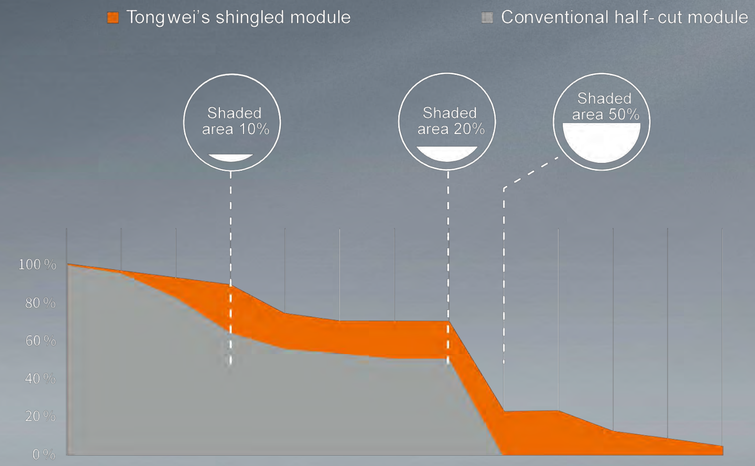


Data source: Fraunhofer ISE

BETTER ANTI-SHADING PERFORMANCE



Note: The arrows represent the directions of the current.

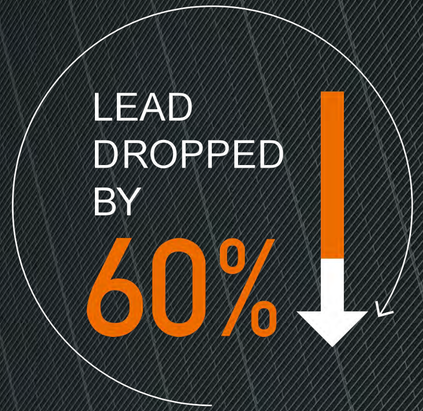


Module power retention rates under different shading ratios

ECO-FRIENDLY

Green Shingled Modules, reducing lead content

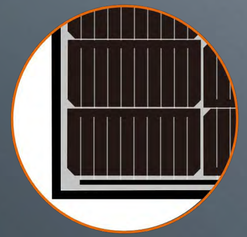
by more than 60%



AESTHETIC APPEARANCE

The cells of the shingled module are densely encapsulated, free of ribbons, and have a uniform appearance, which greatly improve the integration between the PV system and the building.

Shingled Modules



Conventional Modules

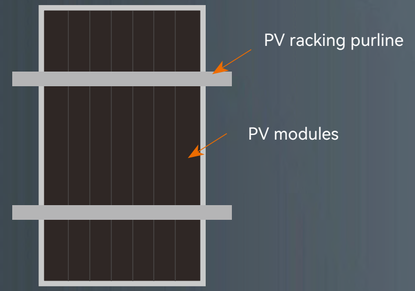
04

System Compatibility

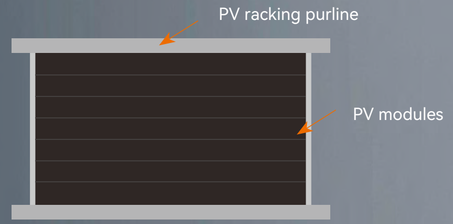
MOUNTING SYSTEM COMPATIBILITY

FIXED RACKS

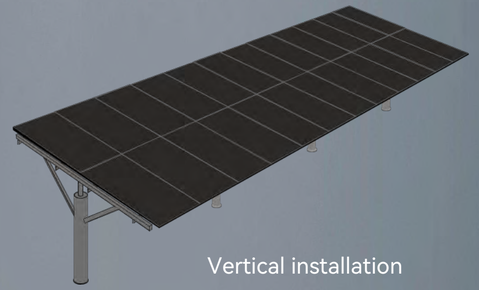
Compatible with various fixed racks to achieve horizontal and vertical installation.



Long side of purline vertical module
(+5400Pa, -2400Pa)



Long side of purline parallel module
(+3600Pa, -2400Pa)



Vertical installation

Horizontal installation

MOUNTING SYSTEM COMPATIBILITY

TRACKING SYSTEM

Match the length, width, string arrangement, and motor driving force of the tracking systems.

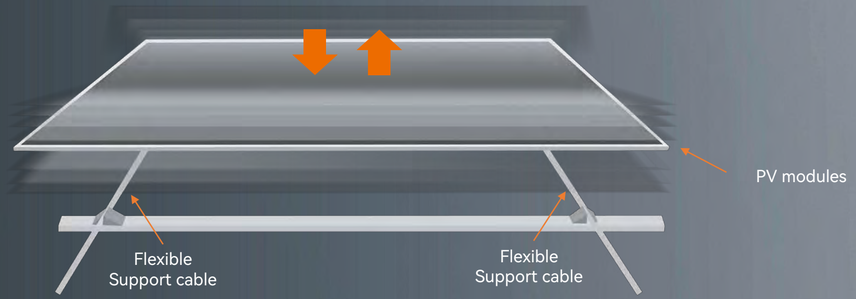
1P
Tracking Rack

2P
Tracking Rack

MOUNTING SYSTEM COMPATIBILITY

FLEXIBLE MOUNTING

6.6Hz vibration test of 2 million times



The flexible interconnection of Tongwei's shingled modules can better withstand the vibration and reduce cracking risks.

EL before test

EL after test

Simulating the installation method of flexible mounting, Tongwei's shingled modules have undergone 2 million times vibration tests, and there is no micro-crack or frame deformation.

INVERTER COMPATIBILITY
STRING INVERTER

The maximum power point current of Tongwei residential shingled modules is 12A and 14A for commercial/industrial modules. 80% of residential inverters and mainstream commercial/industrial inverters are compatible with the application.

Application scenarios	Maximum power point current of the module	Current of string inverter	Mainstream inverter brands
Ground-mount solar projects	17A	≥ 20A	HUAWEI, SUNGROW, 上能电气 SINENG, KELONG 科华技术, GOODWE 固德威, 锦浪科技, CHNT 正泰, CRRC 中国中车, KSTAR 科士达

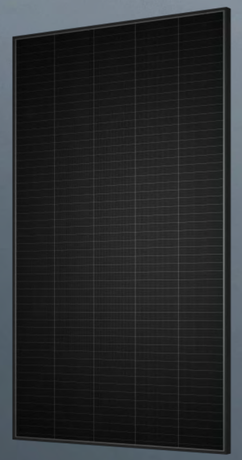
Application scenarios	Maximum power point current of the module	Current of string inverter	Mainstream inverter brands
Residential	12A	≥12.5A	Compatible
Commercial and industrial (C&I)	14A	≥ 15A	GOODWE 固德威, SUNGROW, 锦浪科技, GROWATT, 上能电气 SINENG, Afore 艾伏, SMA, SOFAR, Fronius

The MPPT current of common string inverters is compatible with Tongwei shingled modules, and upgraded versions of inverters from mainstream manufacturers are also available one after another, which will better match the application of Tongwei shingled modules.

05

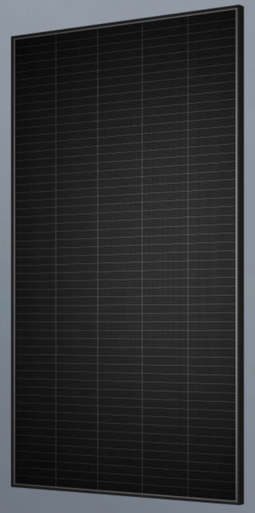
Products and Applications

TONGWEI TERRA PRODUCTS



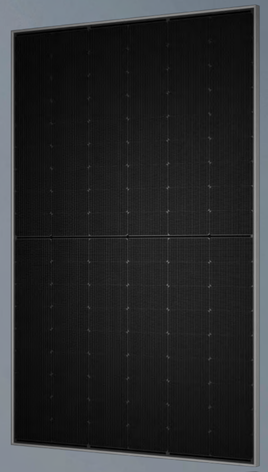
400-425W

Terra-5K
20.8kg/21.7%
1812*1096mm
Monofacial



420-445W

Terra-5E
21.8kg/21.4%
1899*1096mm
Monofacial



405-430W

Terra-N
24.5kg/21.8%
1696*1134mm
N-TOPCon Bifacial

CERTIFICATIONS

IEC TS 62941—2016 / PV industry quality management system

IEC 61215/61730, IEC 62804(PID), IEC 61701(Salt)

IEC 62716 (Ammonia), IEC 60068-2-68(Sand)

CE (Europe) | CQC(China) | TÜV NORD | MCS (UK) | KS (Korea) | INMETRO (Brazil) | JPEA (Japan) | CEC (Australia) | CSI (Italy)

GLOBAL MARKET

40+ countries and regions

PROJECT CASES

1.8KW

Location: Germany

Product: Full-black Shingled Modules

Capacity: 1.8KW

3.3KW

Location: Sweden

Product: Full-black Shingled Modules

Capacity: 3.3KW

PROJECT CASES

7.8KW

Location: Spain

Product: Full-black Shingled Modules

Capacity: 7.8KW

5.6KW

Location: Italy

Product: Full-black Shingled Modules

Capacity: 5.6KW

10.53KW

Location: Australia

Product: Black frame Shingled Modules

Capacity: 10.53KW

PROJECT CASES

8.8KW

Location: Netherlands

Product: Full-black Shingled Modules

Capacity: 8.8KW

5.07KW

Location: Belgium

Product: Full-black Shingled Modules

Capacity: 5.07KW

13KW

Location: Poland

Product: Full-black Shingled Modules

Capacity: 13KW

PROJECT CASES

40MW

40MW Dongxing, Guangxi, China

120MW

120MW Yangjiapo, Tianjin, China

60MW

60MW Gao'an, Jiangxi, China

PROJECT CASES

100MW

100MW Aohan, Inner Mongolia, China

90MW

90MW Binzhou, Shandong, China

20MW

20MW Chaoyang, Jilin, China


Thank You
PV CHANGES THE WORLD