

TW Solar Shingled Module

Keeping the Sunlight:
Innovative Structure&Excellent Aesthetics

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www.tongwei.com.cn

01

About us

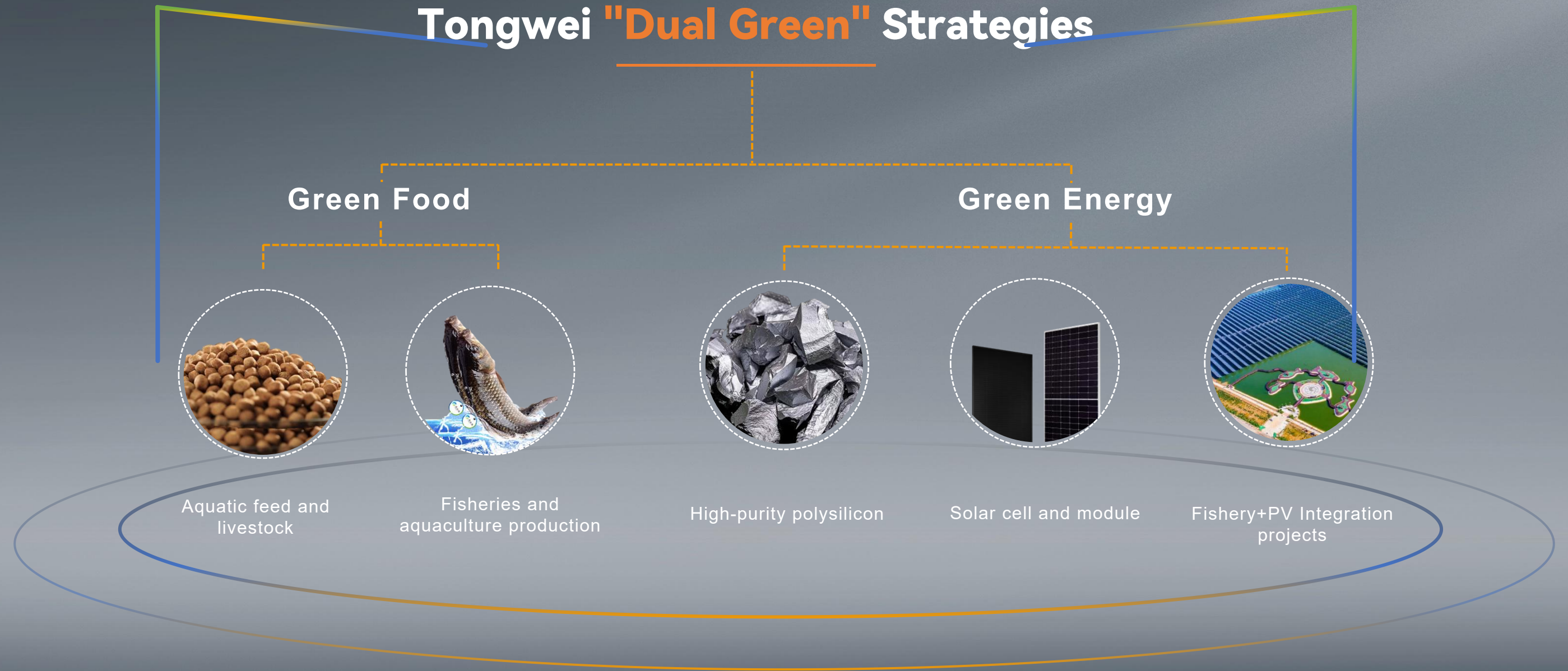
TONGWEI GROUP

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 Silicon

Capacity **380,000** tons

**No.1
WORLDWIDE** Delivered over 100GW



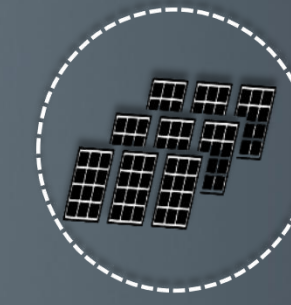
High-efficiency Solar Cell

Capacity **80-100** GW



High-efficiency PV Module

Capacity **80** GW



Fishery & PV integration

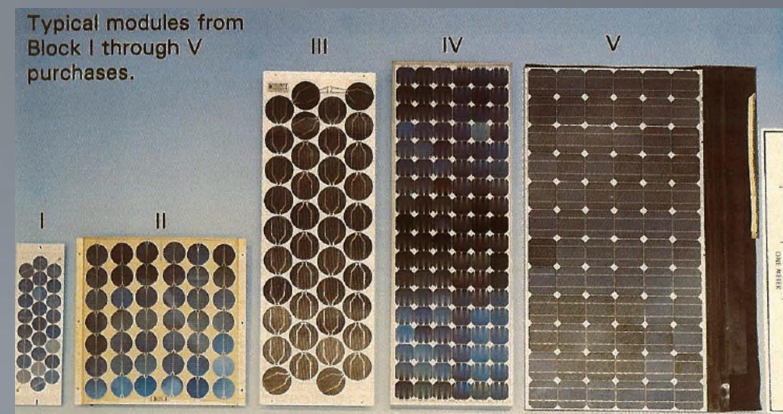
Capacity **3.4** GW

 02

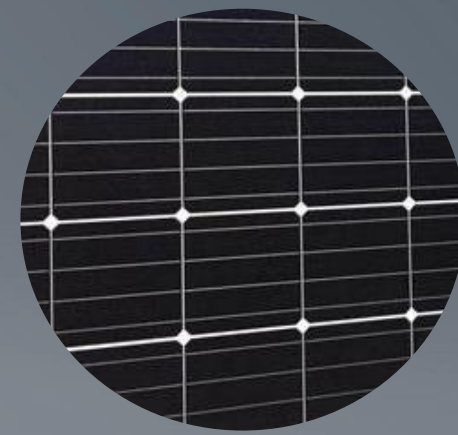
The Evolution of Shingled Module

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.

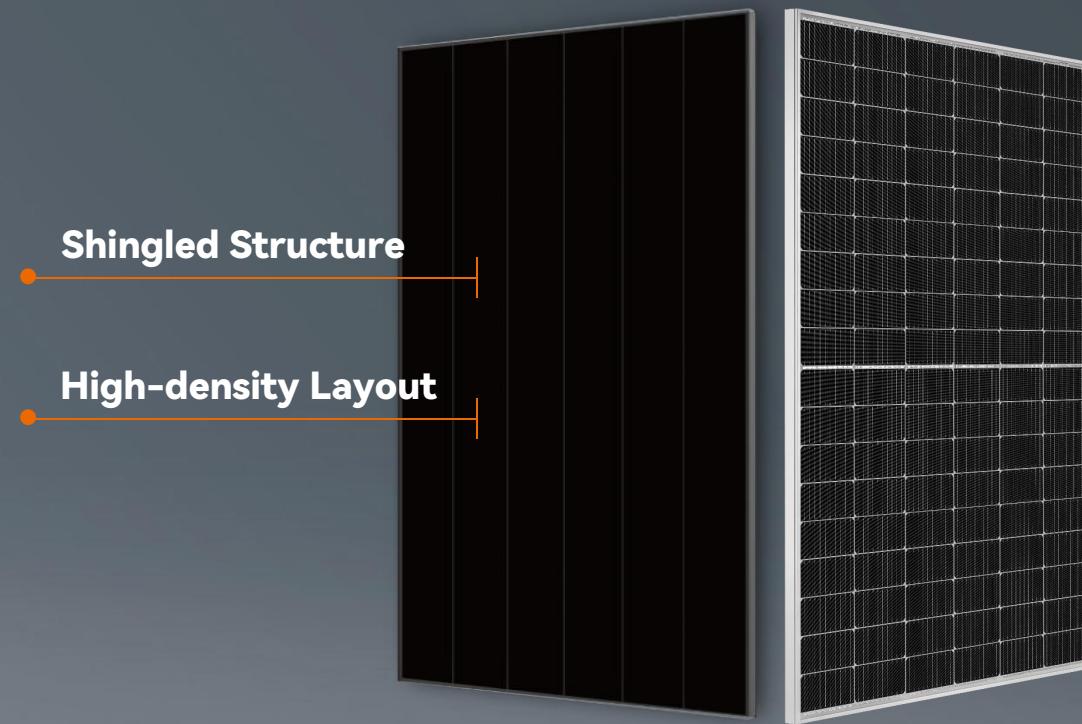


Earlier Modules



Full-cell Module

Tongwei Twins

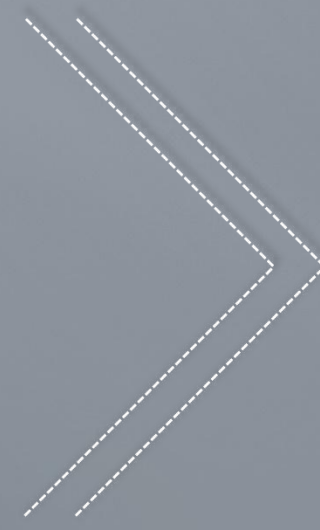
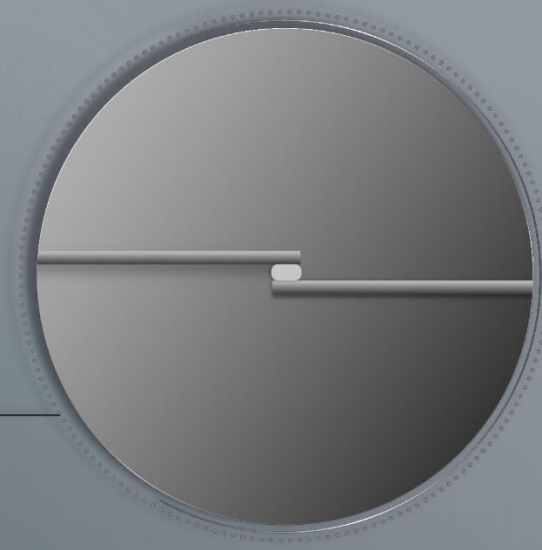
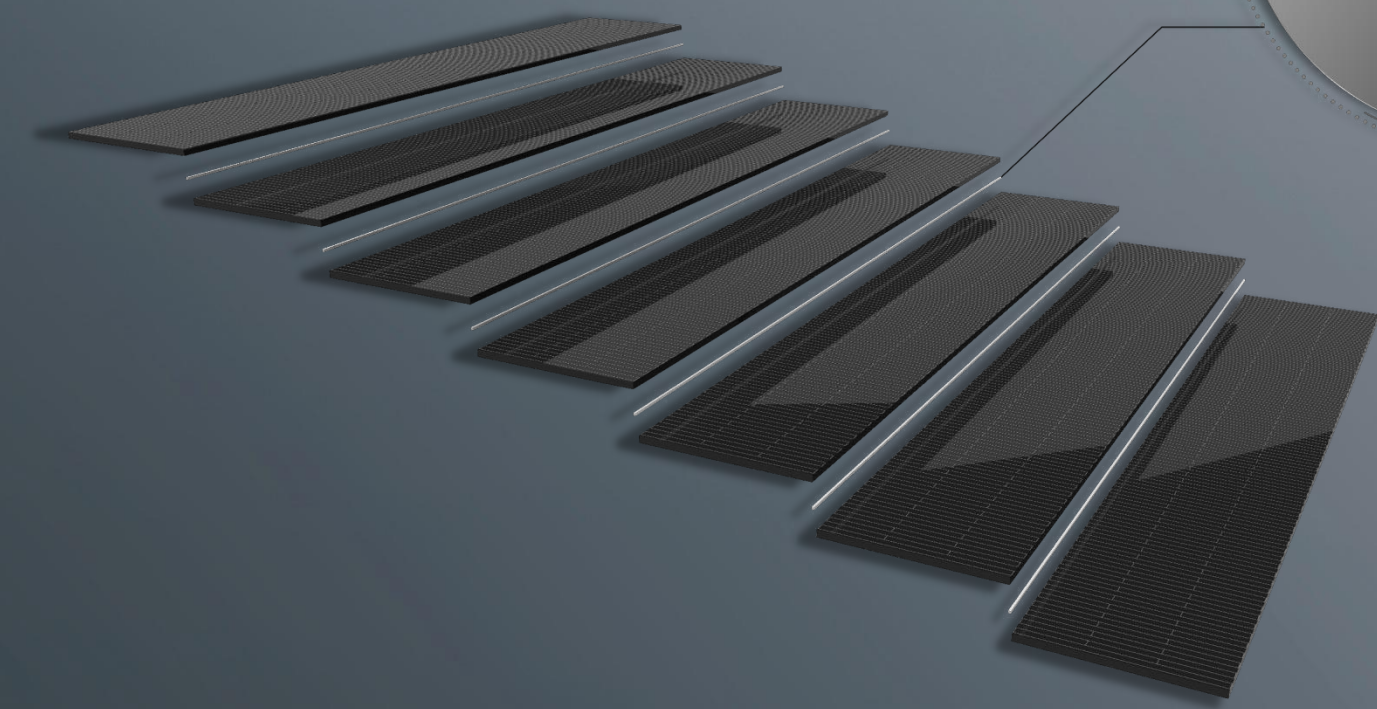


Shingled Module

Half-cut Module

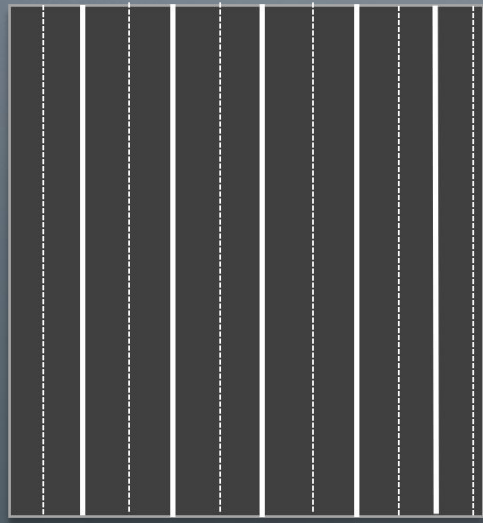
DESIGN > FLEXIBLE CONNECTION

Flexible Connection



Adhesive is widely used in daily life

DESIGN > MULTI-CUTTING



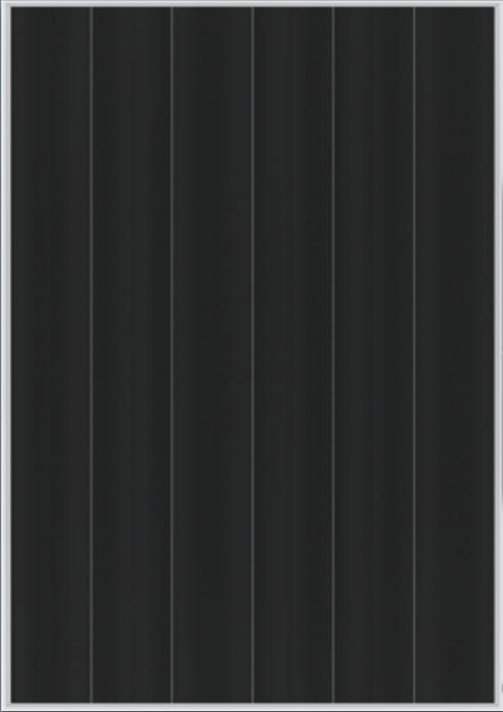
Shingled Cells

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

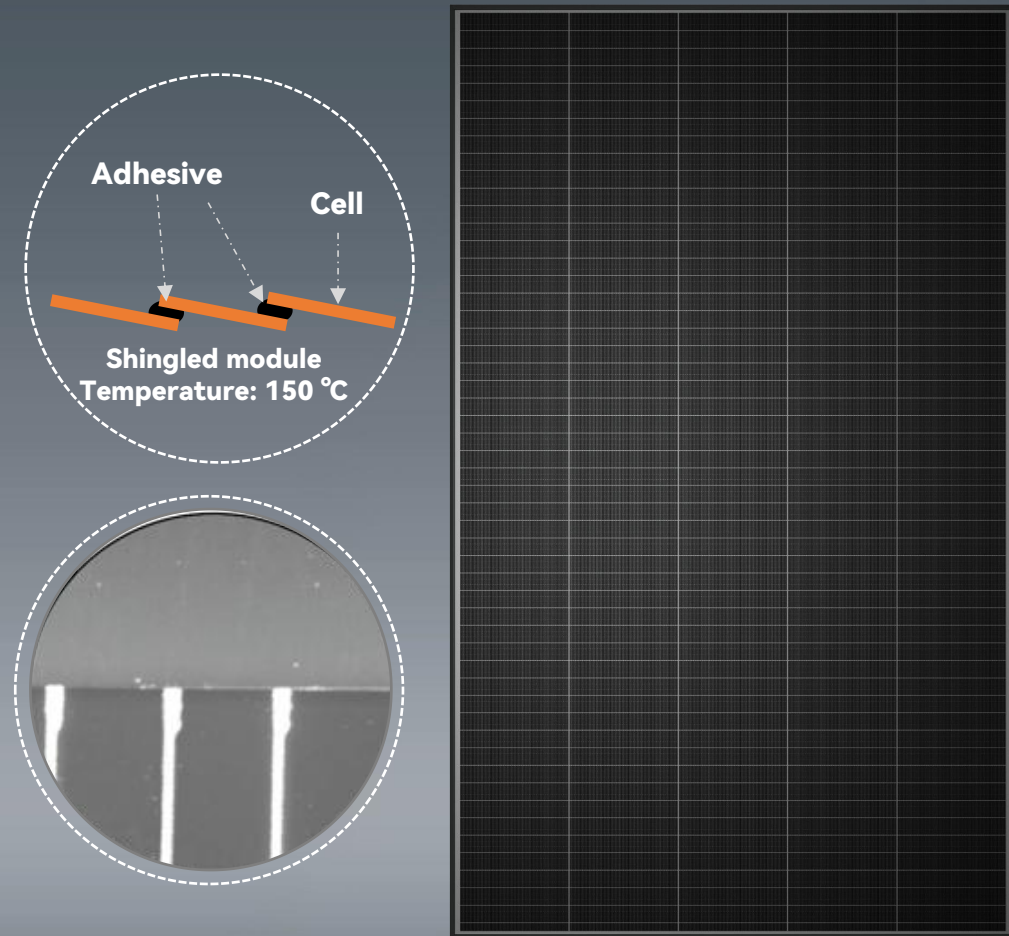
Aesthetic shingled module with higher power & higher efficiency.



03

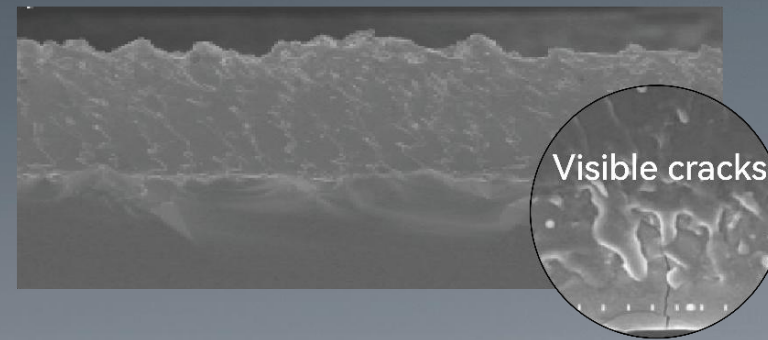
Design Advantages

LESS MICRO-CRACKS



Lower Soldering Temperature

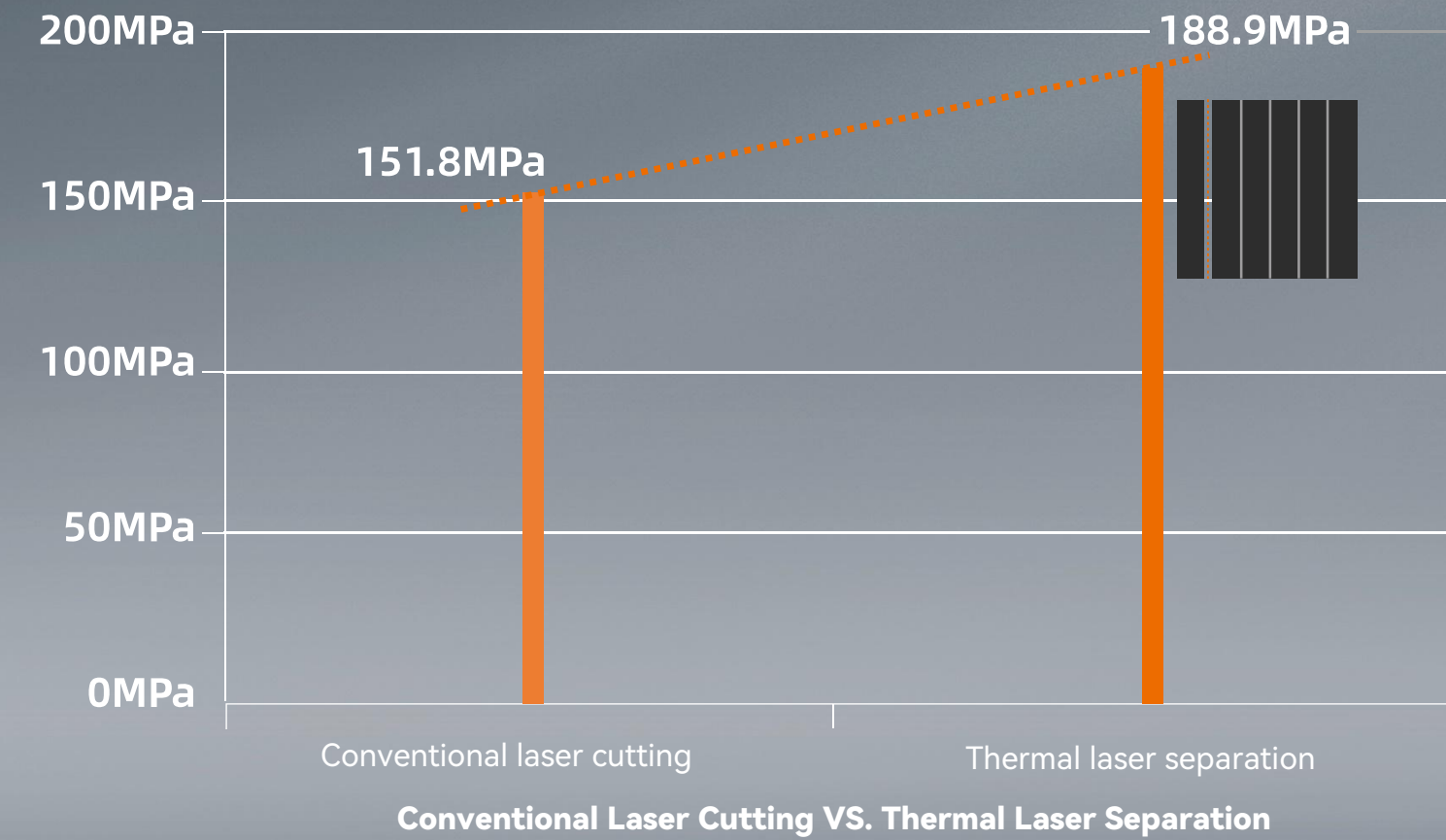
Cross-section and microstructure of conventional cutting



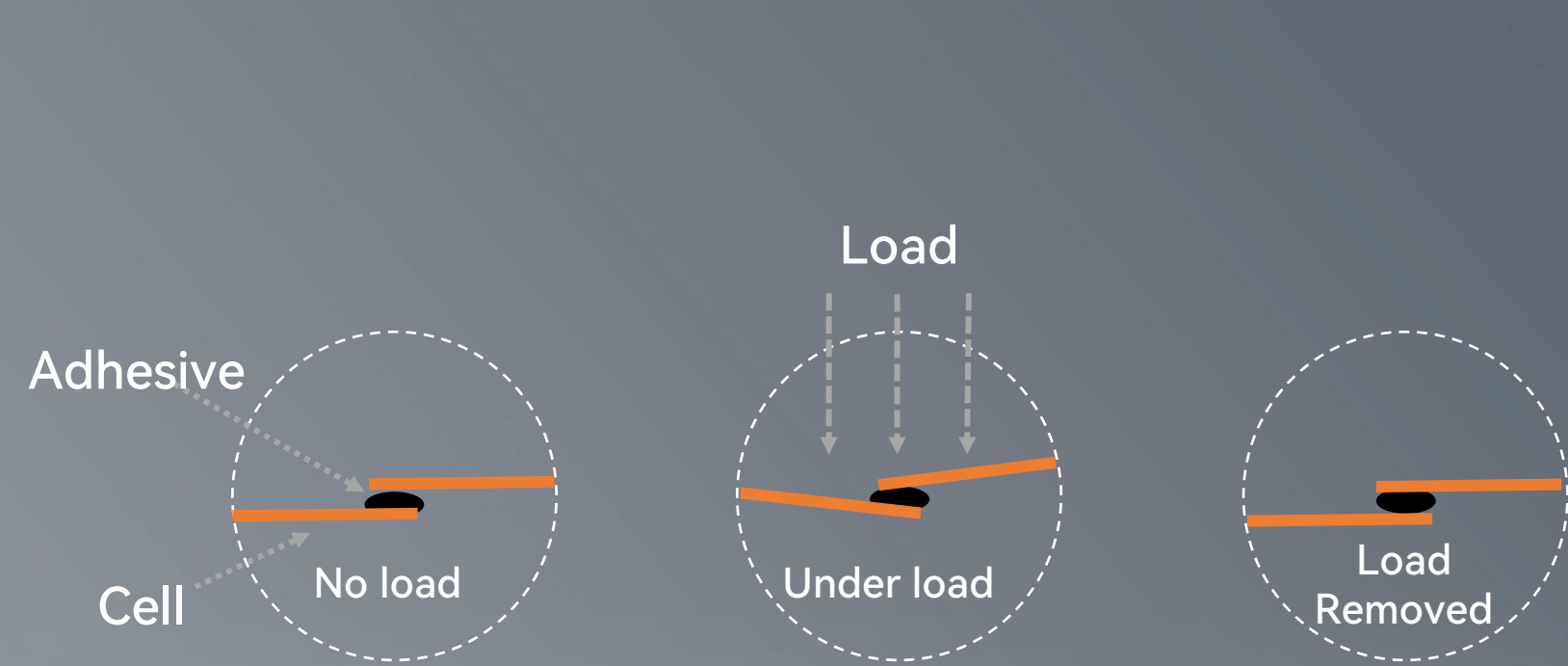
Cross-section and microstructure of optimized thermal laser separation technology (TLS)



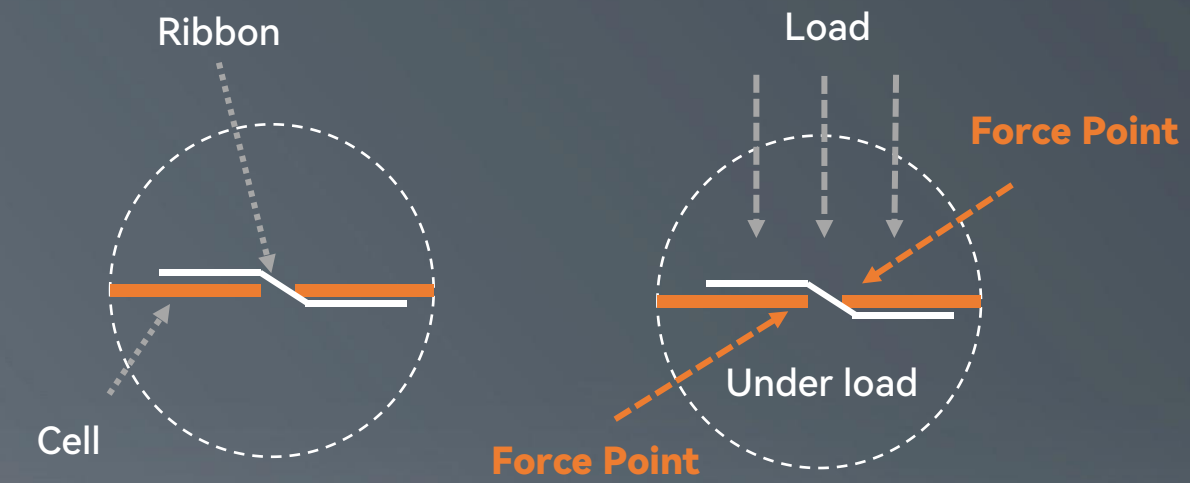
Shingled Modules with Optimized Thermal Laser Separation Technology



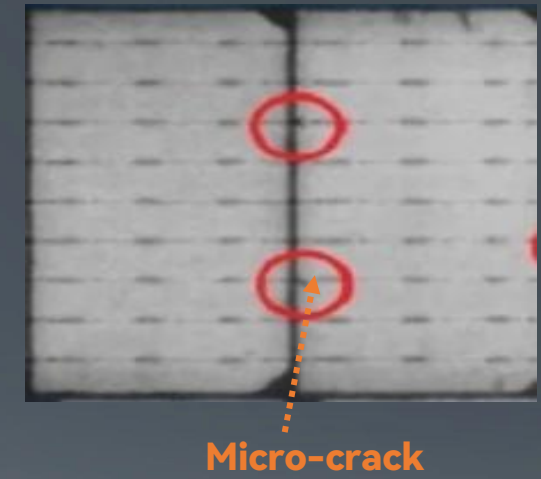
HIGHER LOADING CAPACITY



Flexible Connection of Shingled Module



Force Point of Full-cell Module

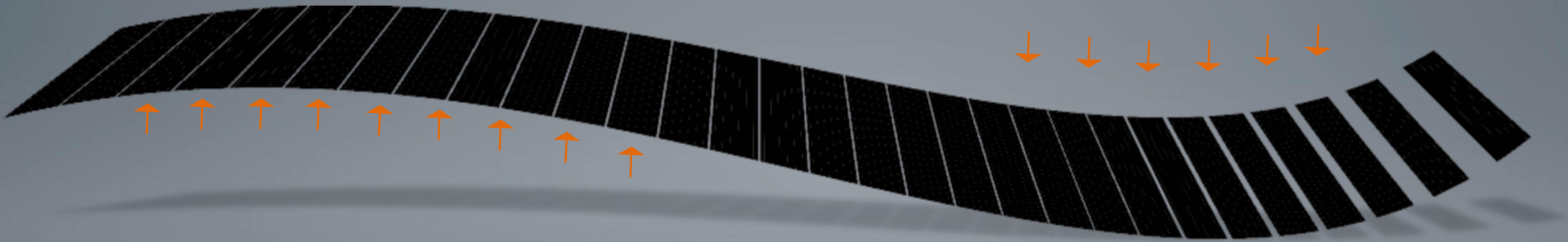


HIGHER LOADING CAPACITY

8100Pa static mechanical load test

No additional micro-crack

The power degradation is **<0.5%**



RIGOROUS LOAD TEST

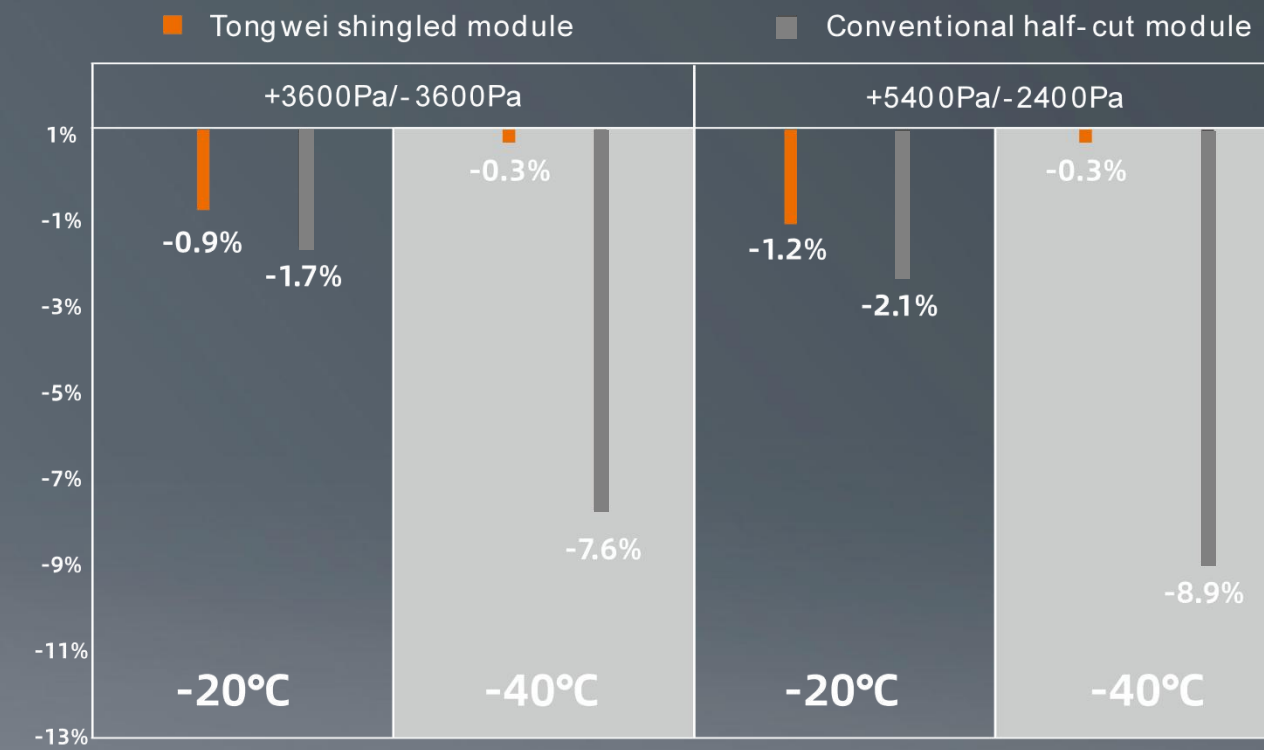
Dynamic Mechanical Load Test



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

The power degradation ≤ 0.3%

Tongwei's Shingled Modules under Load at Low Temperature

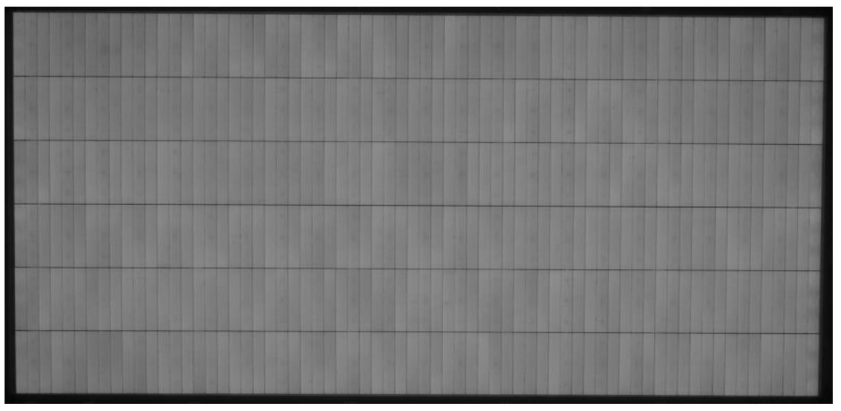


Lower power degradation

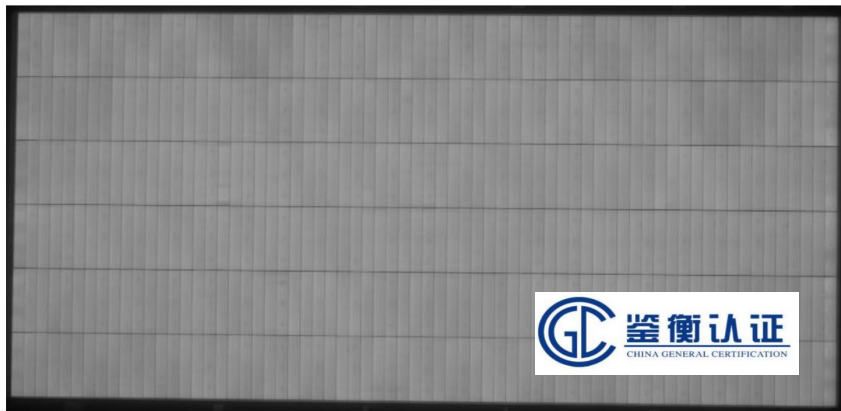
RIGOROUS HAIL TEST

45mm+30.7m/s

The power degradation < 0.4%



Appearance and EL (before hail)



Appearance and EL (after hail)

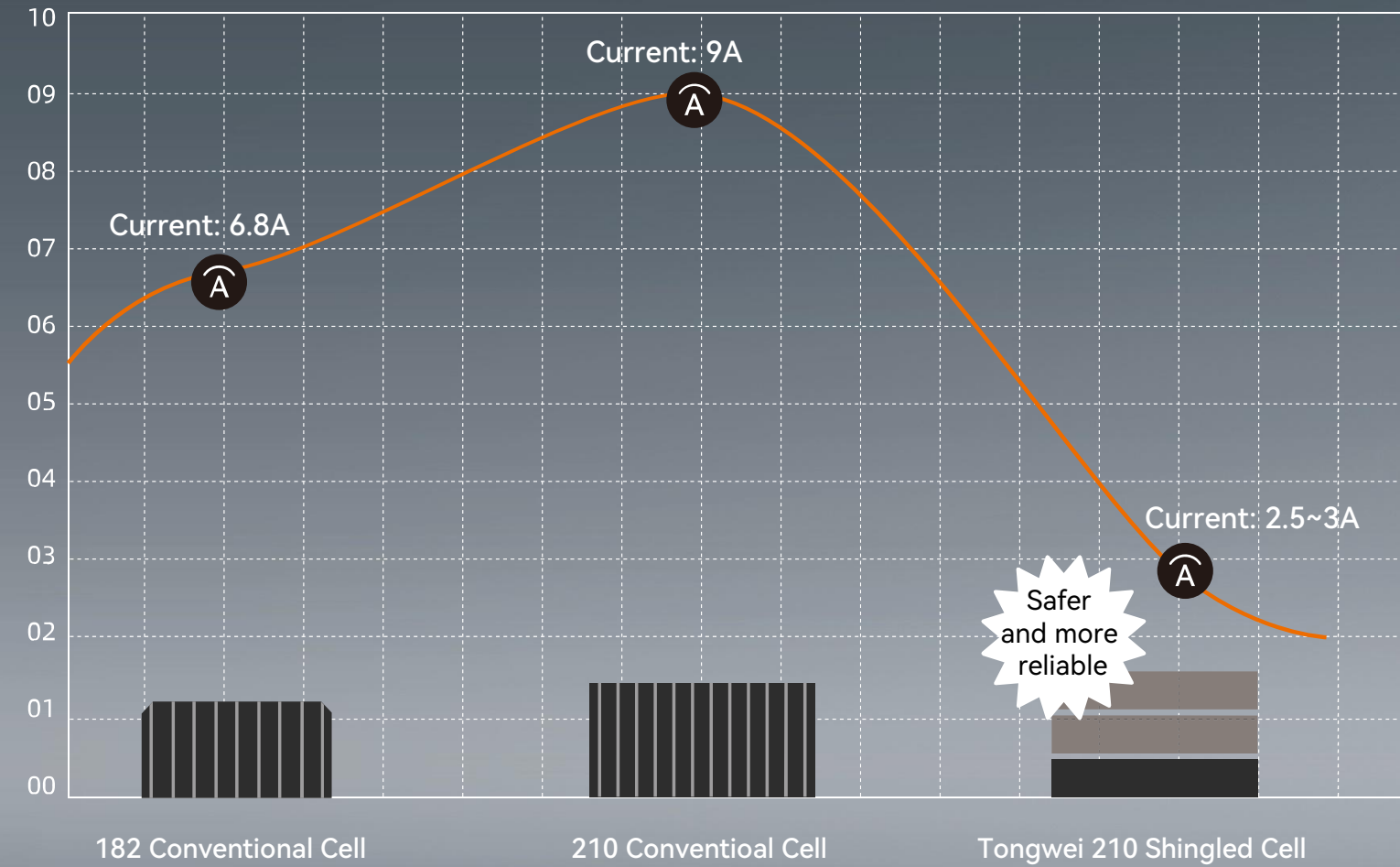


LOWER HOTSPOT RISK

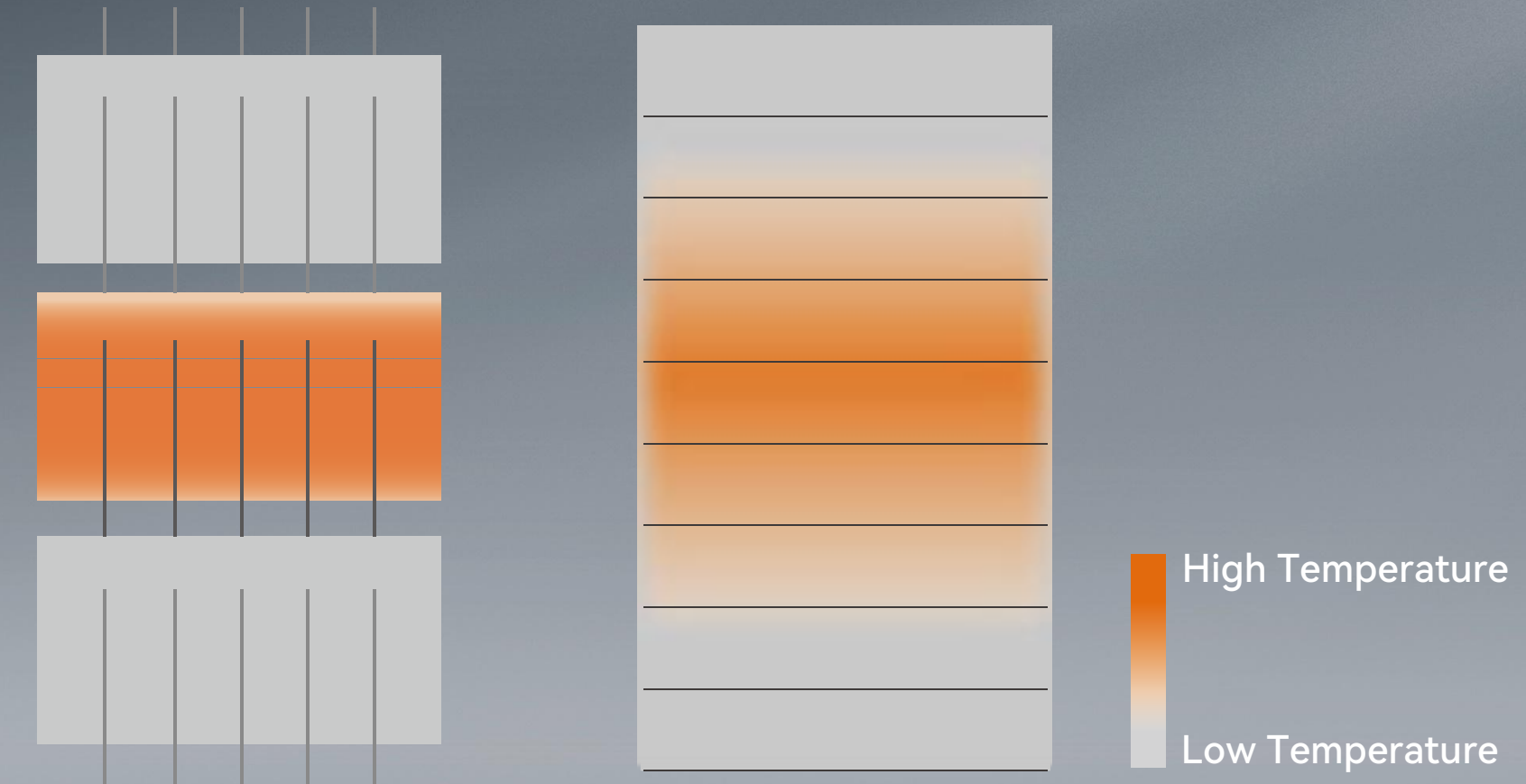
Caused by shading from trees or buildings, partial module damage, or manufacturing defects.



LOWER HOTSPOT RISK



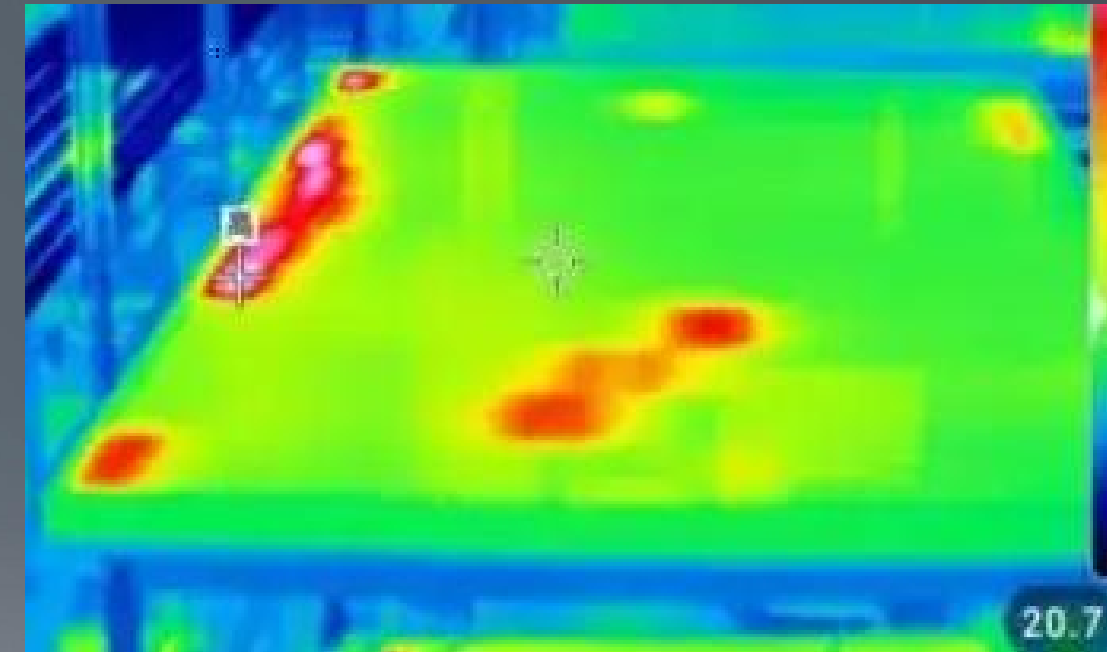
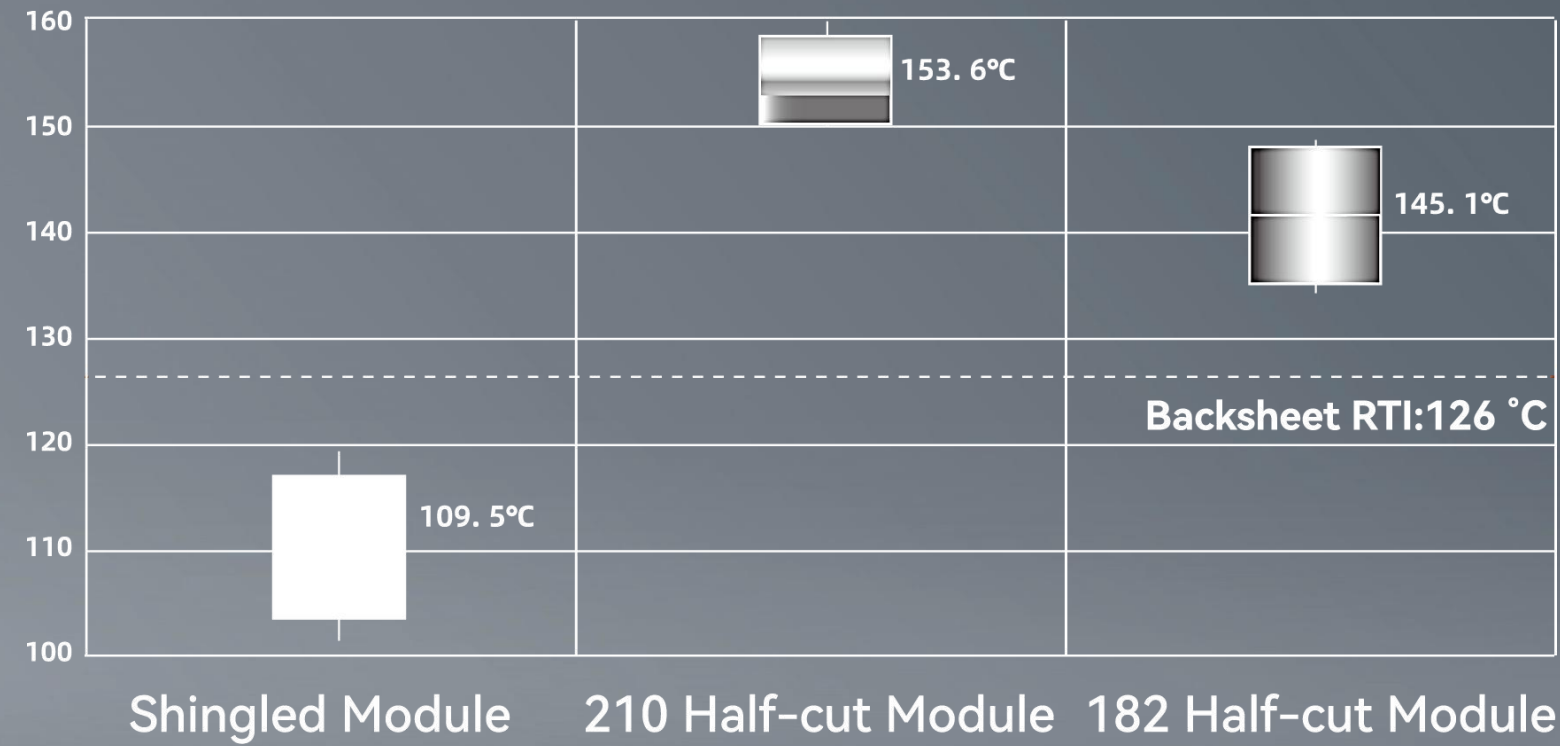
Multi-cutting — Less Current



Flexible Connection — Lower Temperature

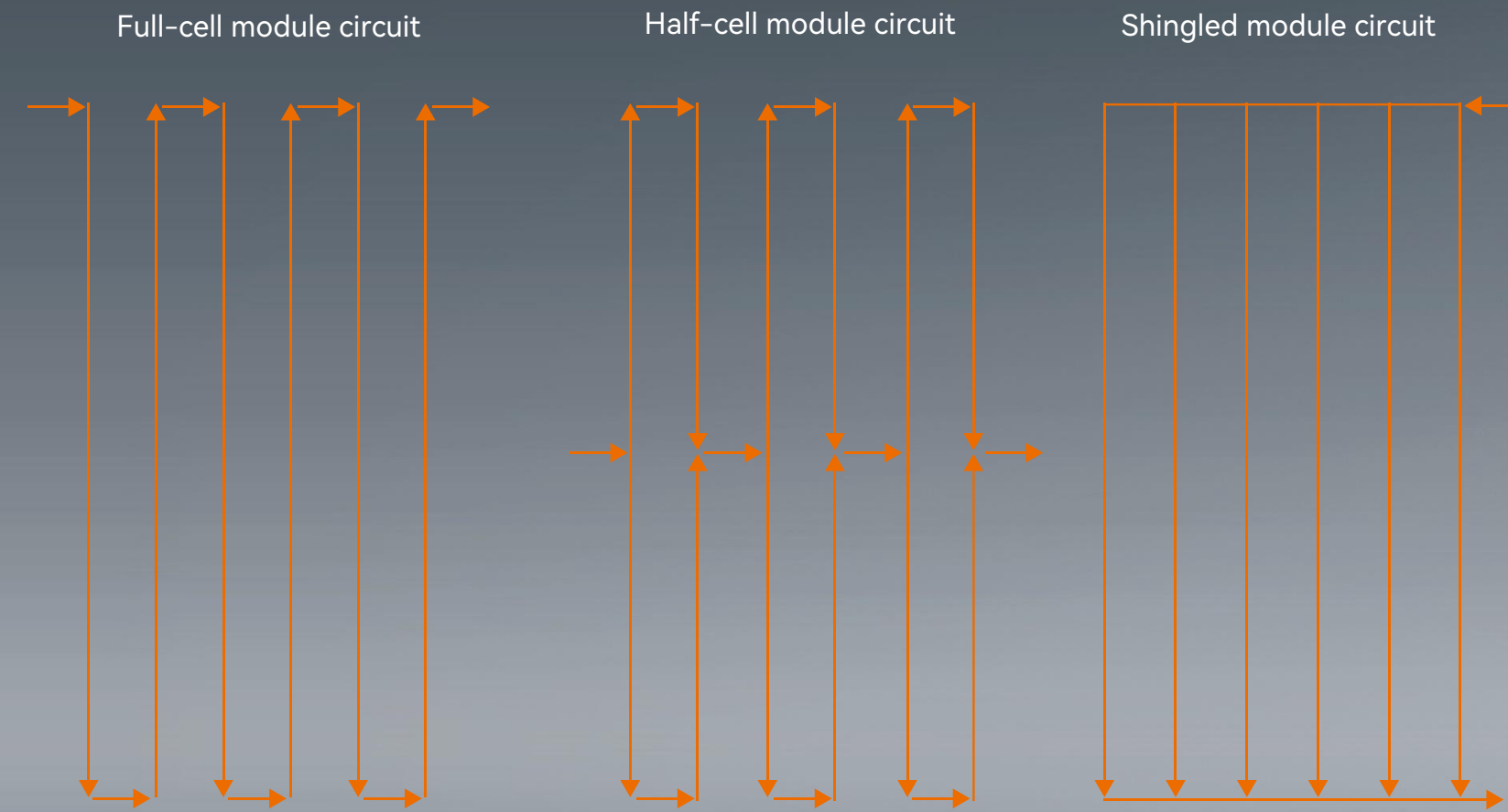
LOWER HOTSPOT RISK

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

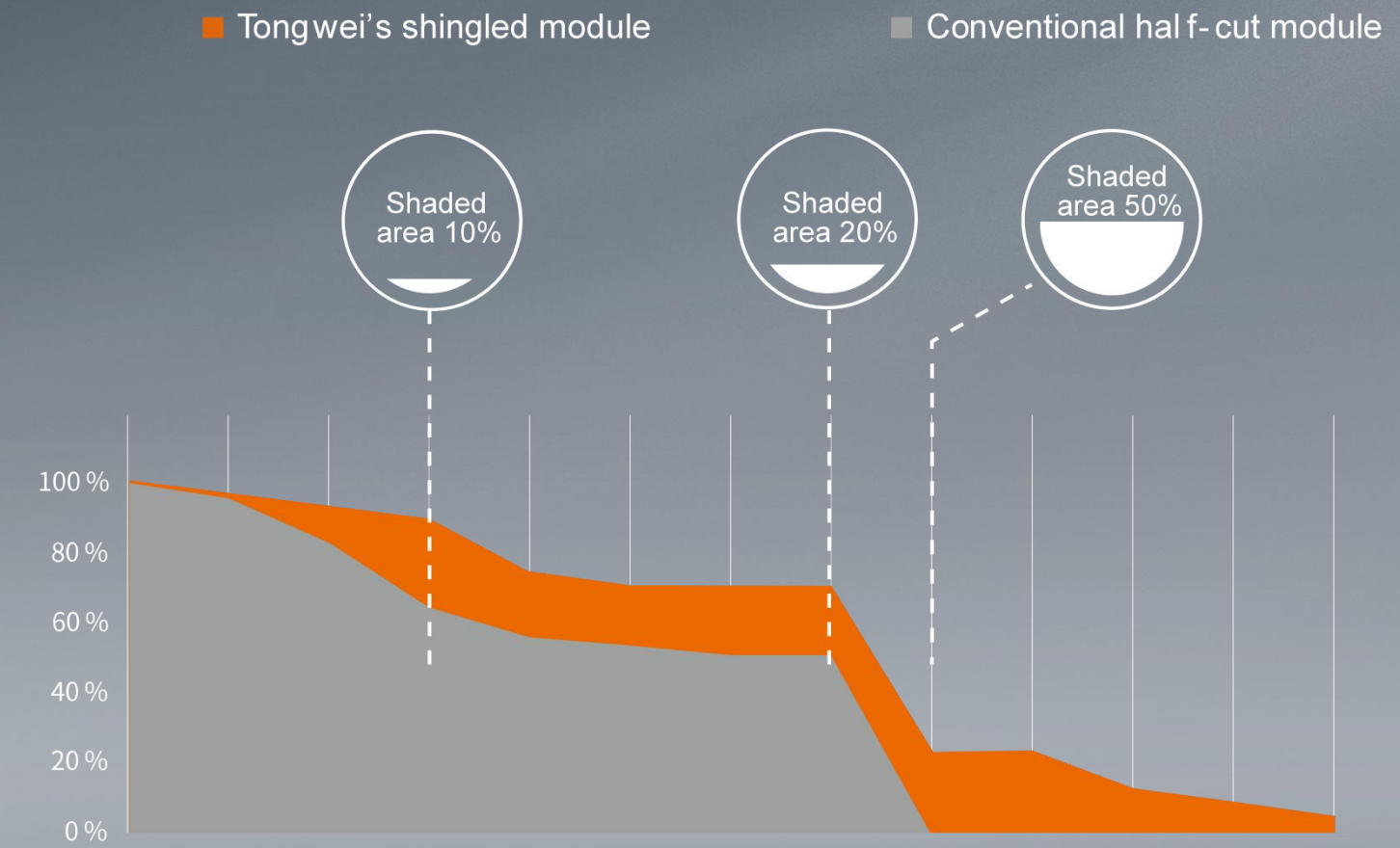


Data source: Fraunhofer ISE

BETTER ANTI-SHADING PERFORMANCE



Note: The arrows represent the directions of the current.

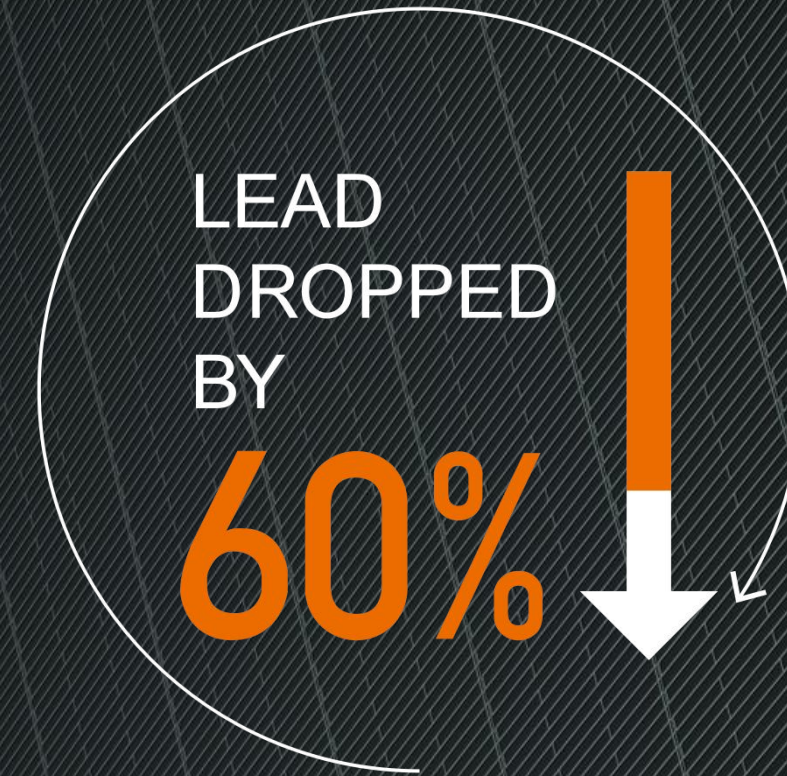


Module power retention rates under different shading ratios

ECO-FRIENDLY

Green Shingled Modules, reducing lead content

by more than **60%**

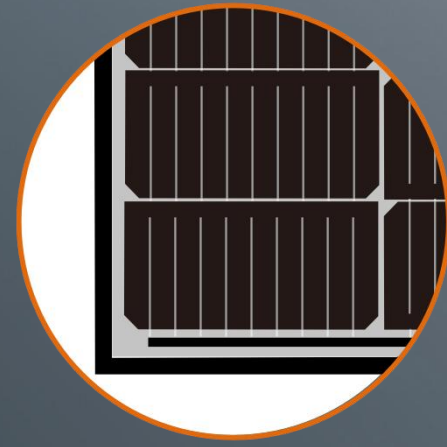


AESTHETIC APPEARANCE

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



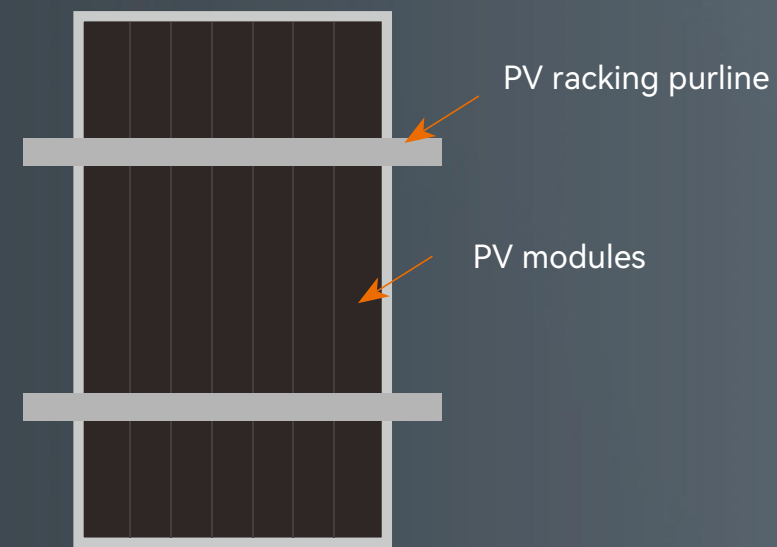
04

System Compatibility

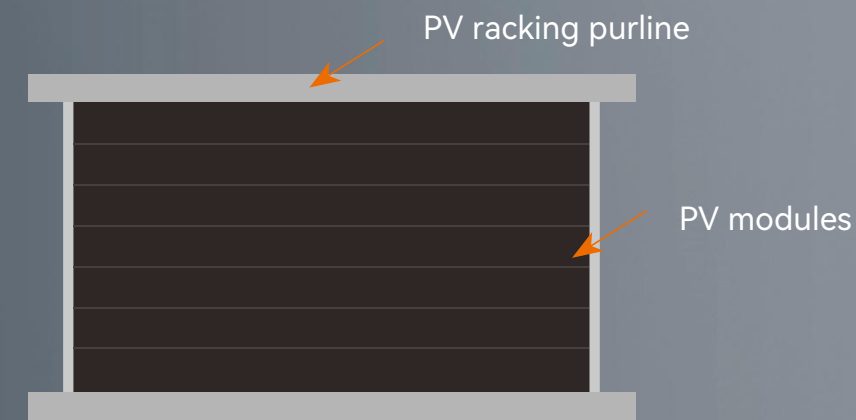
MOUNTING SYSTEM COMPATIBILITY

FIXED RACKS

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



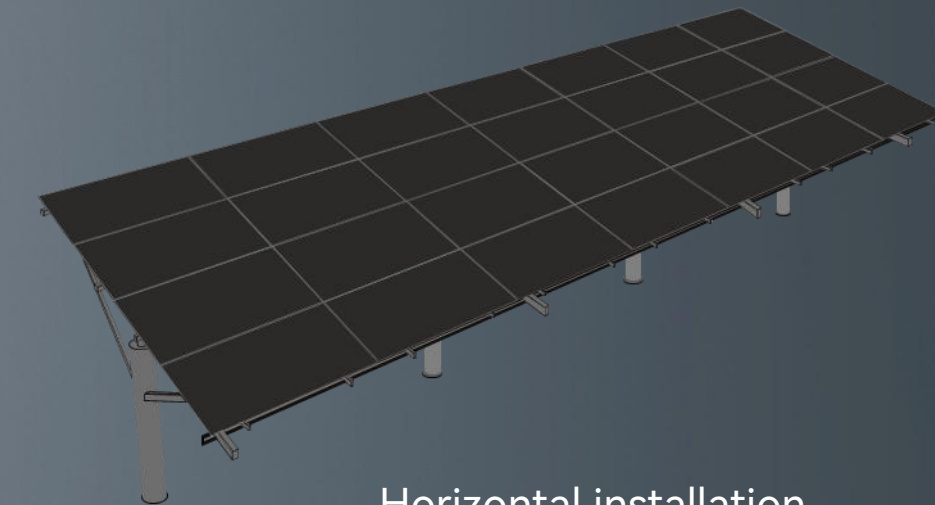
Long side of purline vertical module
(+5400Pa, -2400Pa)



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



Vertical installation



Horizontal installation

MOUNTING SYSTEM COMPATIBILITY

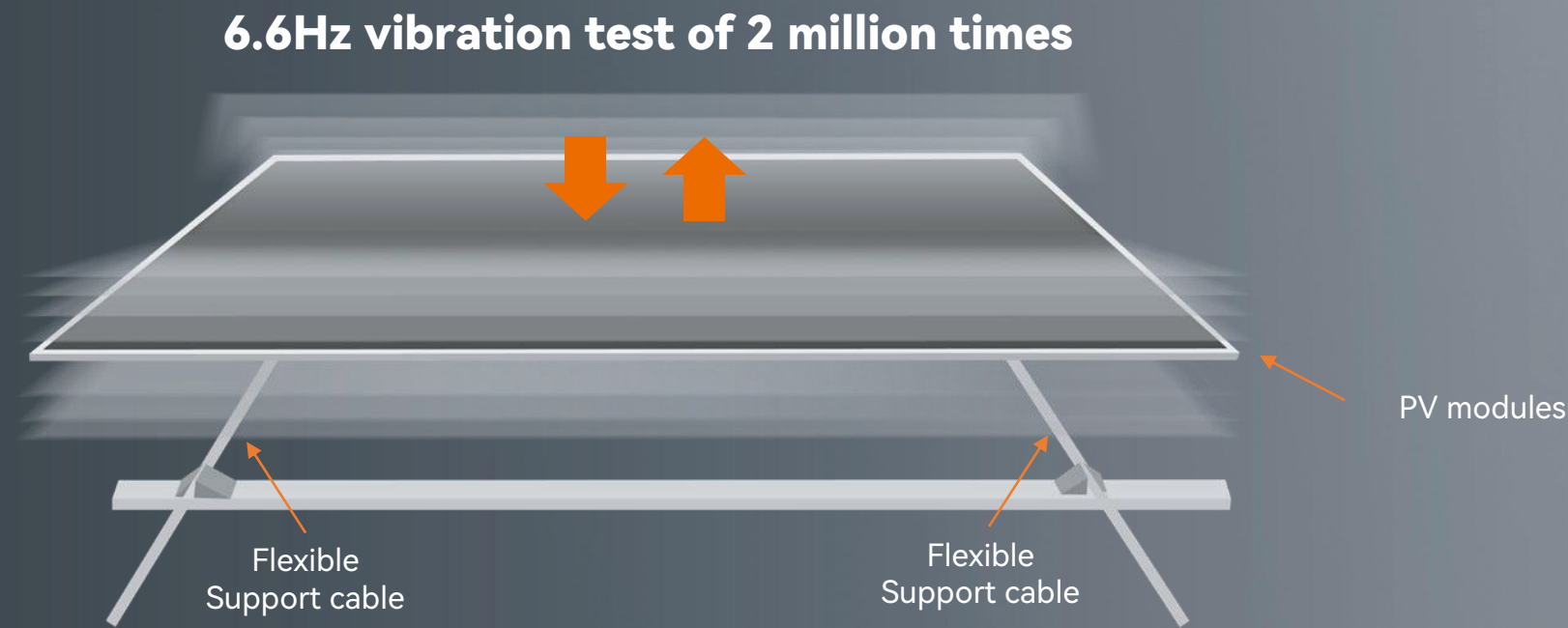
TRACKING SYSTEM

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

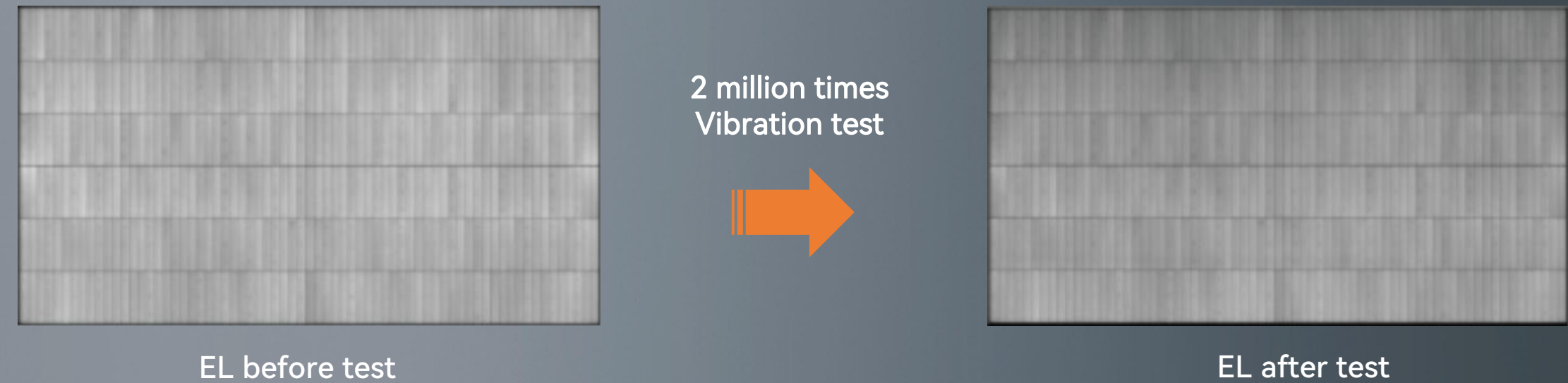


MOUNTING SYSTEM COMPATIBILITY

FLEXIBLE MOUNTING



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



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.

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.

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

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	固德威 SUNGROW 锦浪科技
			GROWATT SMA 上能电气 SOFAR Afore 艾伏 Fronius

 05

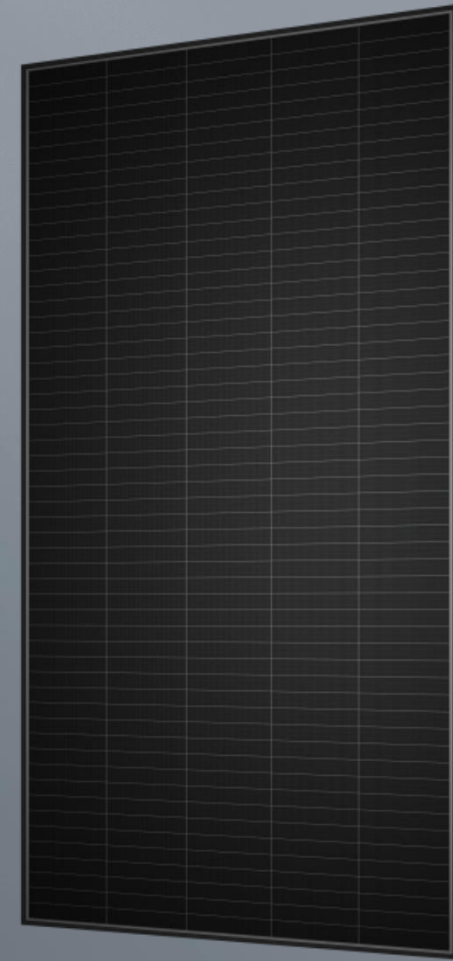
Products and Applications

TONGWEI TERRA PRODUCTS



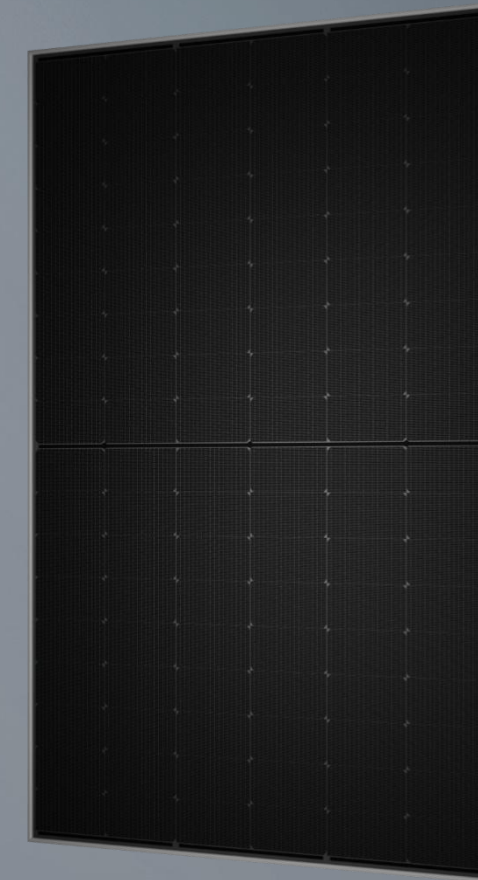
400-425W

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



420-445W

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



405-430W

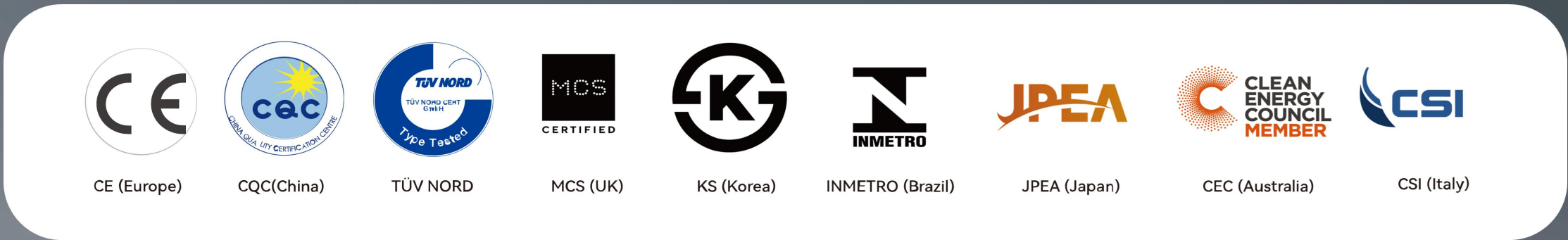
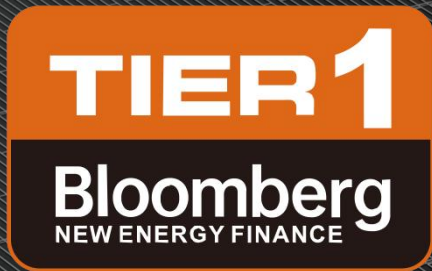
Terra-N
24.5kg/21.8%
1696*1134mm
N-TOPCon Bifacial

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

The image features two solar panels, one on the left and one on the right, angled towards the center. They are set against a dark, gradient background that transitions from a deep blue at the top to a lighter grey at the bottom. The solar panels have a visible grid pattern. In the center, the text 'Thank You' is written in a large, bold, white sans-serif font. Below it is a short orange horizontal line, followed by the text 'PV CHANGES THE WORLD' in a smaller, white, all-caps sans-serif font.

Thank You

PV CHANGES THE WORLD