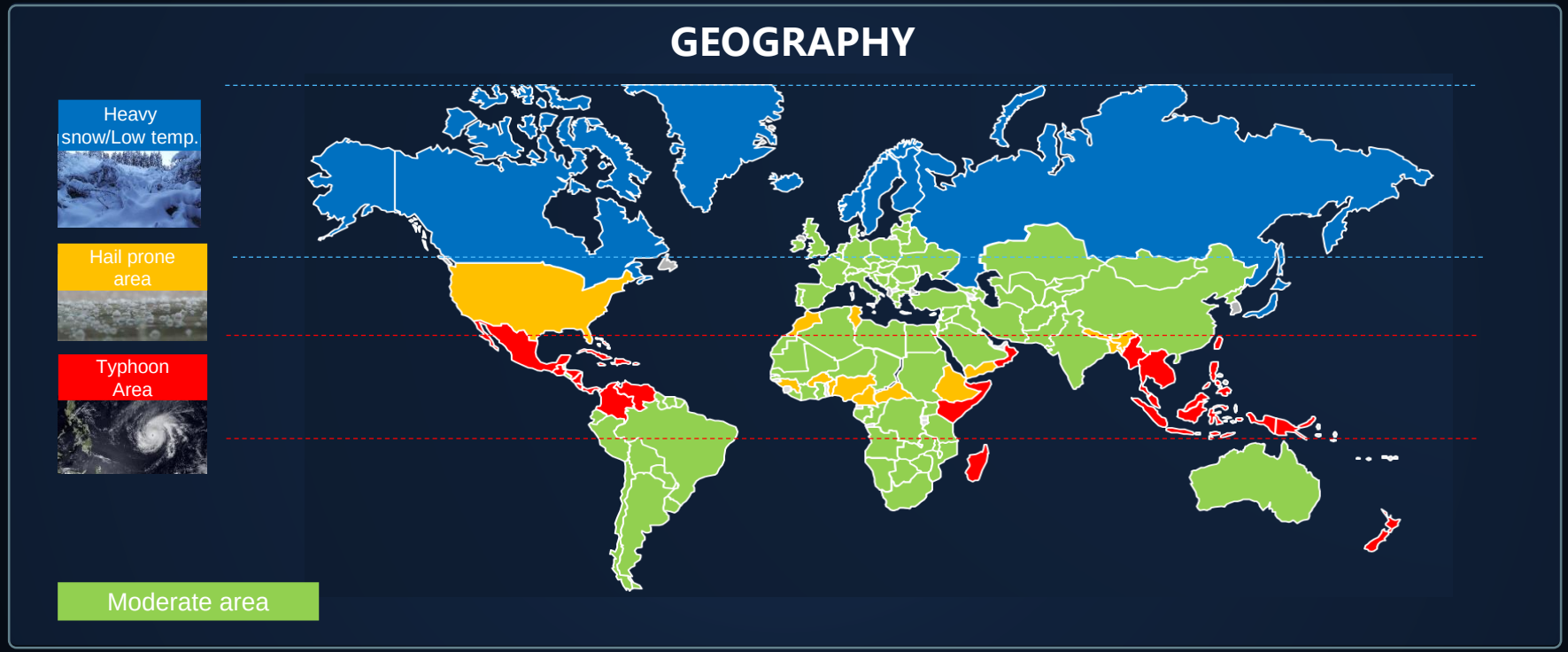
PVTECH TECHTalk Trinasolar

Vertex

Enhanced Reliability – 670W Vertex Module

Harsh Environment VS Module Durability

The Diverse Scenarios of Photovoltaic Applications



- Extreme weather conditions such as strong winds, heavy snow, and hail present serious challenges for all PV module manufacturers, in mechanical performance terms.

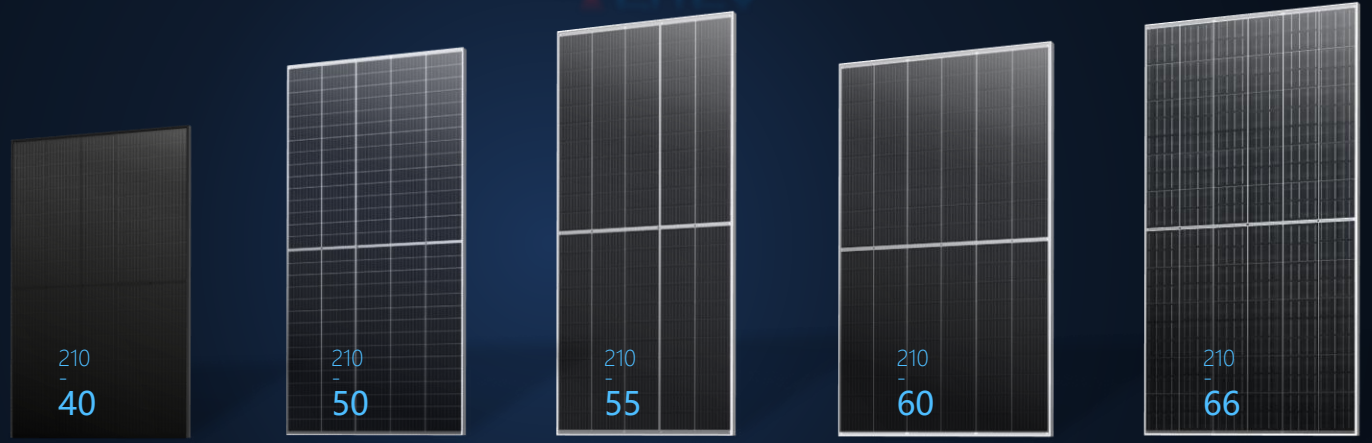
Trina Solar Vertex Family

Trina Solar – Pioneering Ultra-high Power Modules

RESIDENTIAL, COMMERCIAL & INDUSTRIAL

Vertex

GROUND-MOUNTED PLANT



Vertex

UP to 410W | UP to 510W | UP to 550W | UP to 600W | UP to 670W

Industrial average

370W | 450W | 540W | 580W

- Vertex modules are available from 410 to 670W+ in power, covering all applications
- In various applications, Vertex output is 35W to 90W higher than the industry average, BOS savings in range of 0.5~1.6 c USD/W

5 Enhanced Tests

670W - Proven Mechanical Performance

Static Load

Non-uniform Snow Load

Static Loading under -40℃

Hail Impact

Enhanced Dynamic Load

Wind Tunnel Test

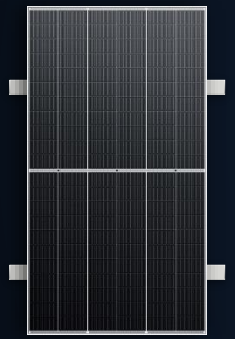
- High reliability ensures extended power generation
- All tests conducted by independent 3rd parties
- All test samples are randomly picked from mass production (DEG21C.20)
- Mechanical load and warranty should comply with latest official Trina Solar User Manual and Trina Solar Warranty

Static Load

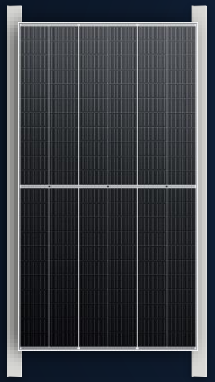
Equivalent Level to Traditional Modules

IEC 61215
IEC 61730
Granted in 2021.1

670W Module reliability simulations evaluating wind and snow resistance.

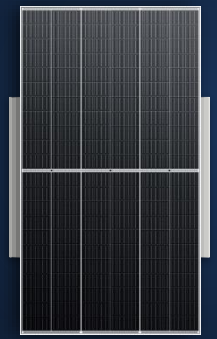


Static load
+5400Pa/-2400Pa



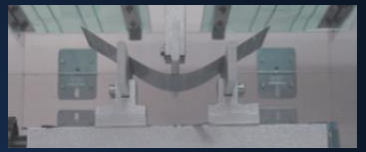
Static load
+3600Pa/-2400Pa

Fixed tilt



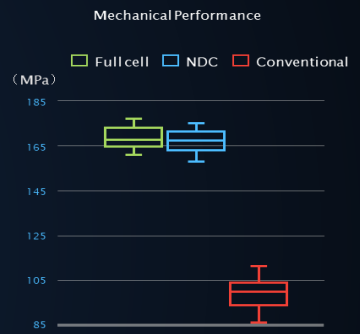
Static load
+2400Pa/-2400Pa

Tracker

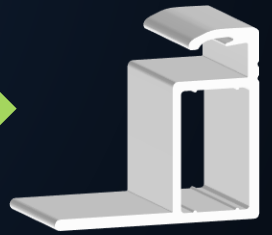


Vertex non-destructive cutting cell

Conventional cutting cell



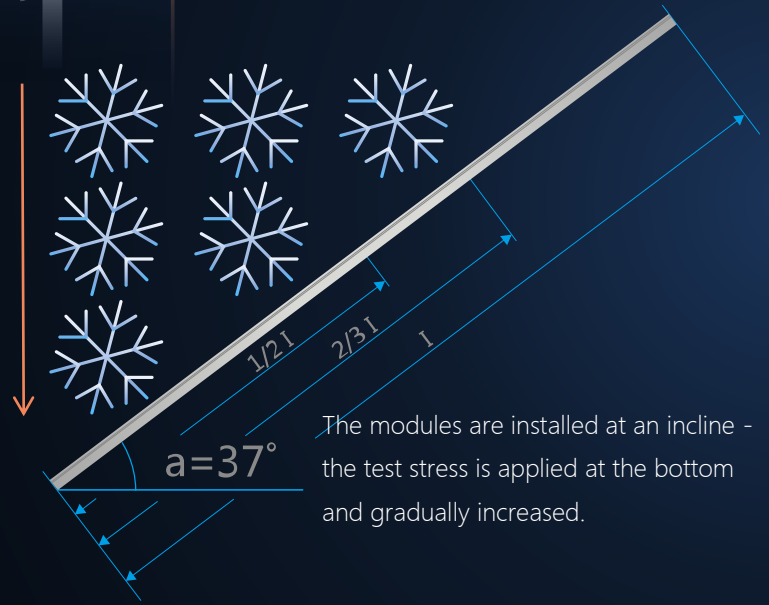
Conventional module structure



670W Vertex module structure

Non-uniform Snow Load Tests

2.8M Snow Load Endurance



The modules are installed at an incline - the test stress is applied at the bottom and gradually increased.

7000Pa, 2.8 m of snow

Post testing, power degradation is only 0.56%.

*Test modules: 210-670 bifacial and dual-glass modules, clamping installation

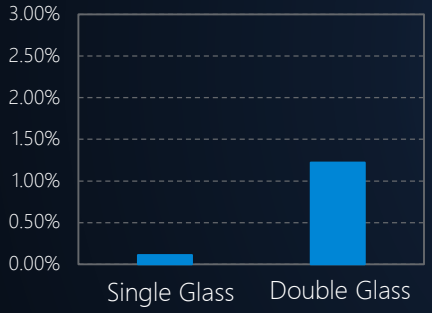
Static Load Test Under -40℃

Enhanced Mechanical Load Characteristics

2

Mechanical load test under (-40℃): Working in extreme low-temperature environments is one of the critical situations, which can result in reduced mechanical performance/damage.

Power degradation after test



EL Image

Dependable in extreme low-temperatures

*Vertex 670 single and dual glass modules with cross-beam screw installation: static load criteria +5400Pa/-2400Pa

Hail Impact

35mm Hail Impact Resistance

Simulated impact of different sized hail on module output.

Single glass—— hail test

IEC standard		Trina test results		Tests passed
Hail size	Power degradation	Hail size	Power degradation	
25mm	< 3%	35mm	0.17%	

Dual glass —— hail test

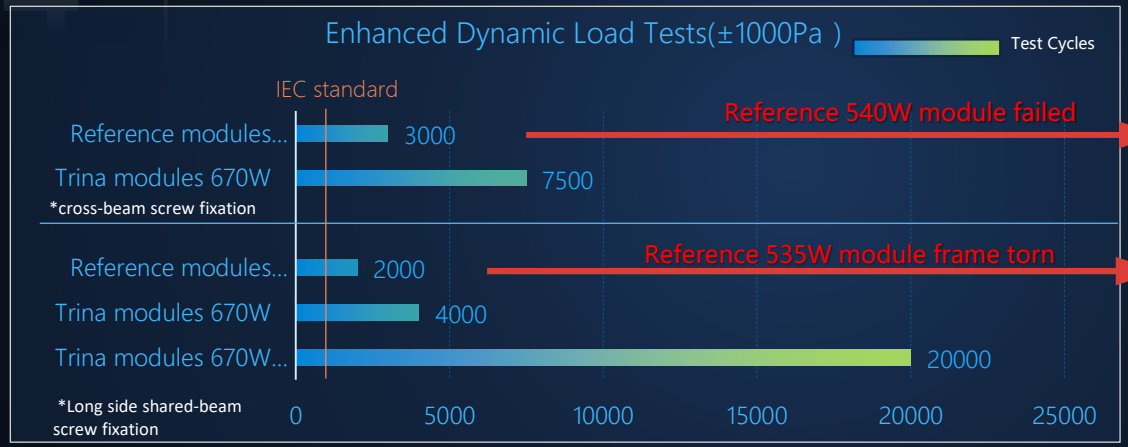
IEC standard		Trina test results		Tests passed
Hail size	Power degradation	Hail size	Power degradation	
25mm	< 3%	35mm	0.53%	

Enhanced Dynamic Load Test

±1000PA @20000 Cycles Passed

During their lifecycle, modules endure long-term dynamic stresses on their upper and back sides. The frame, cells and BoS are subjected to fatigue stress which can be simulated by dynamic load testing.

"IEC62782: DML±1000Pa: positive and negative cycles 3~7 time/min，5.6h/1000times"



Screw hole partially deformed

Vertex module is pass

Test results: after 1000Pa dynamic load in 20,000 cycles, - power degradation was only 0.1%.

7.5 times IEC standard

Single glass module

4 times standard

Dual glass module

20 times (clamping) strength than standard

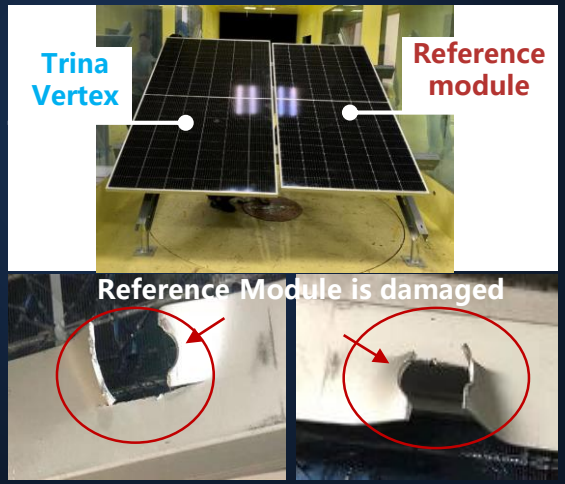
Note: National Key Laboratory for PV Science and Technology

Wind Tunnel Test

62m/s Extreme Wind Performance

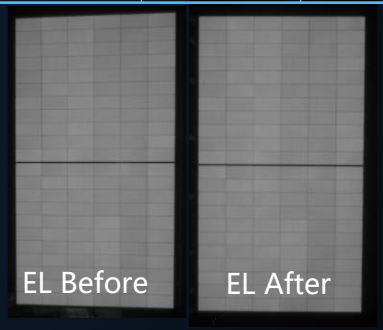
Wind tunnel test: One of the best methods to verify mechanical stability. Wind loads applied from 30m/s to 62m/s, each lasting 30 second. Once target wind speed is achieved and stabilized, test is maintained for 900 seconds.

Wind speed (m/s)	Reference modules(530W)	Trina Vertex modules(670W)
30.53	Slight vibration.	Slight vibration.
45.80	Mounting failed with module under test blown away	The surface of the module distorts in the middle; severe vibration
59.54		
62.60	/	Under highest wind speed the module experiences damage



Vertex 53m/s wind test:

	30° tilt	45° tilt
Screw	Pass	Pass
Hybrid	Pass	Pass



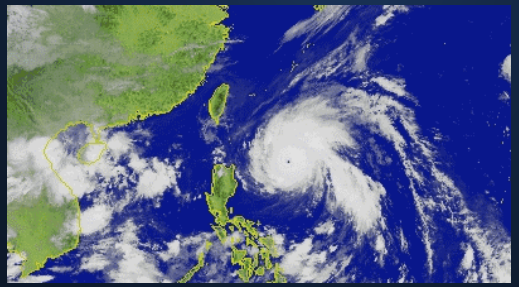
Robustness of Vertex module outperforms reference module

Installation Tips

The Installation Method Strongly Impacts System Stability.

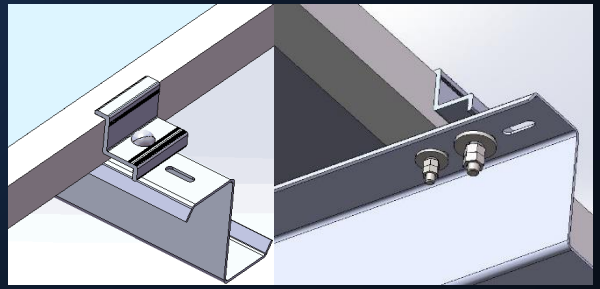
Enhanced Installations >

To optimize for extreme weather such as heavy snow or strong winds Trina Solar recommends hybrid installation methods to ensure better system stability



Hybrid Fixation

Clamp + Bolt



210 Vertex modules: over 18GW of signed orders

Trinasolar

Building Done

China
Hebei LingShou
50MW

China
Hebei NanGong
400MW

China
Hubei LuoTian
100MW

Spain
176MW & 202MW

China
QingHai DaChaiDan
112MW

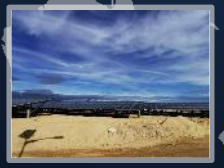
JPN 2.85MW
Bison Energy

NA 4,000MW
** **ENERGY.**

Brazil
715MW & 850MW

Yulin China
100MW

Singapore 60MW



Vietnam
Vinh Long
49.3MW

Vietnam
50.6MW

Vietnam
HoChiMinh & Hanoi
40MW

SUMMARY

1. The Vertex 670W module achieves outstanding mechanical load performance.
2. Verified in enhanced tests for extreme weather conditions such as strong wind, heavy snow, extreme cold and hail.
3. The installation method strongly impacts system stability. Hybrid fixation is recommended for extreme weather conditions.

THANKS!