Jinko N-type Solar Module Training 2024

Contents

Company Portfolio

- Achievements
- Global Marketing
- Tiger Neo Green
- Utility Projects in Australia
- Basic fundamentals of Panel

Tiger Neo

- Product Roadmap
- Cell technology
- N-type specification
- Technical aspects
- Warnings
- Maintenance and care
- Technical tips (Rooftop design, Wind load checking and Mechanical load)
- Warranty and Panel testing

The world's No.1 module shipments delivered

260GW
Delivered

18%
Market Share

26
World Records

*Data as of June 30,2024

Global Marketing

39% Israel
35% Thailand
20% Japan
18% China
18% Australia

42% Poland
30% Netherlands
25% Italy
24% Germany

JinkoSolar's market share on major markets

30% Colombia
25% Argentina
20% Chile
18% Brazil
6% United States

60% Saudi Arabia
40% UAE
30% Oman
30% Egypt
20% Morocco

35 Global Service Centers | **3000+** Strategic Customers | **160+** Distribution countries | **120+** Global Marketing Branches


NeoGreen
Zero Carbon Manufacturing

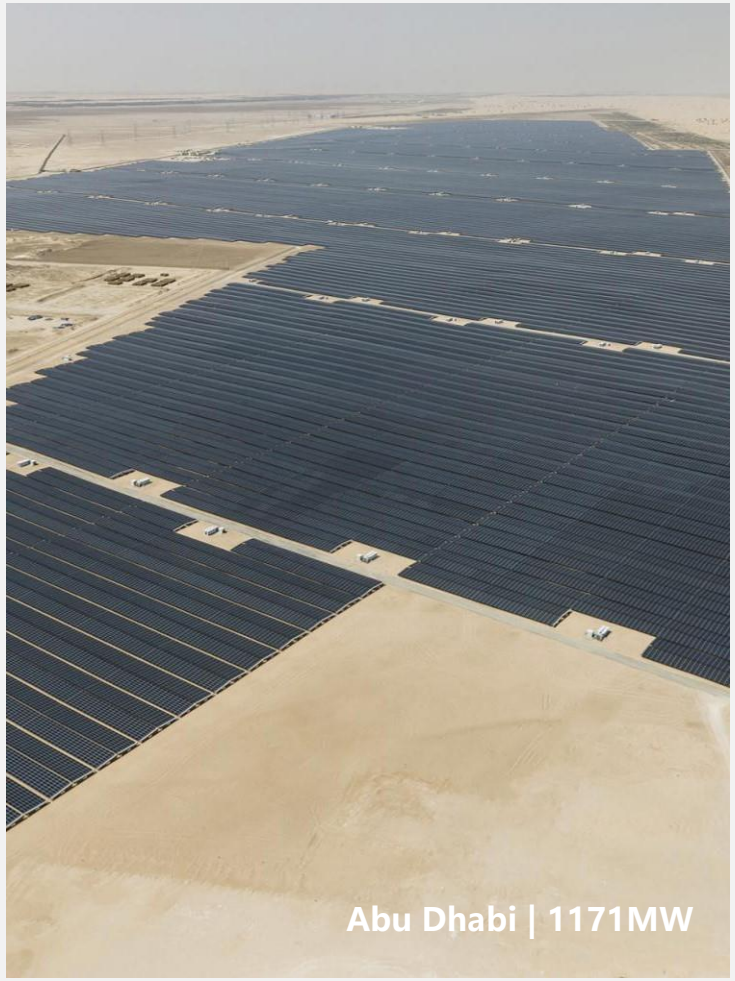
JKS Track record in Australia

Major projects 2018-2024 Q1

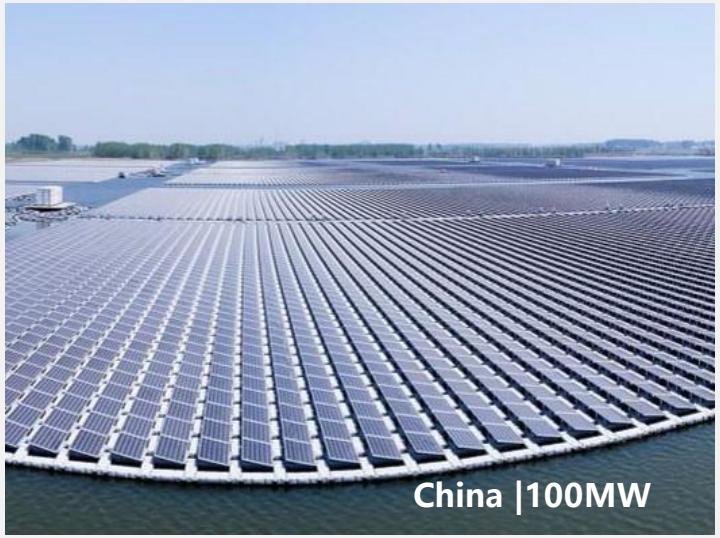
1. Bungala Solar Farm Stage 1: 138 MW
2. Bungala Solar Farm Stage 2: 138 MW
3. Kennedy Energy Park: 20 MW
4. Wemen Solar Farm: 110 MW
5. Haughton Solar Farm: 130 MW
6. Summerhill Solar Farm: 10 MW
7. Tailem Bend Solar Farm: 127 MW,
8. Sunraysia Solar Farm: 255 MW
9. Bomen Solar Farm : 120 MW **First big Bifacial** project
10. Glenrowan Solar Farm: 140 MW
11. Jamelong Solar Farm: 65 MW
12. Bachelor 2 SF: 13 MW (1st Tiger 465Wp)
13. New England SF : 523 MW DC (Delivery ongoing) 1st 540 watt project
14. Tailem Bend Phase 2 SF: 118 MW (Delivery in 2022).
16. Wagga Wagga phase 2 – 29 MW DC (Delivery ongoing).
17. Northern Gold Solar project ~ 38 MW DC (Delivery in 2022).
18. Mica Creek SF-stg1 : 50 MW DC (Delivery in 2022)
19. Mica Creek SF-stg2 : 50 MW DC (Delivery in 2022, N-type 182)
20. LSBP 700MW DC Project (Delivery start 2023, N-type 182)

- No LD, serial defect or any other penalty in Australian projects.
- Strong references. Over 2GW utility scale projects

Projects


Abu Dhabi | 1171MW


Vietnam | 610MW


China |100MW


Australia| 255MW


Japan | 98MW

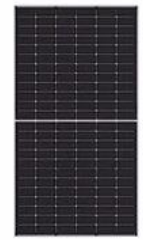

USA | 180MW

Basic Composition of PV Industrial Chain










Silica sand

Silicon material

High-purity silicon

Silicones

Silicone oil

Silastic

Aluminum alloy

Silicon rod

Wafer

Cell

Module

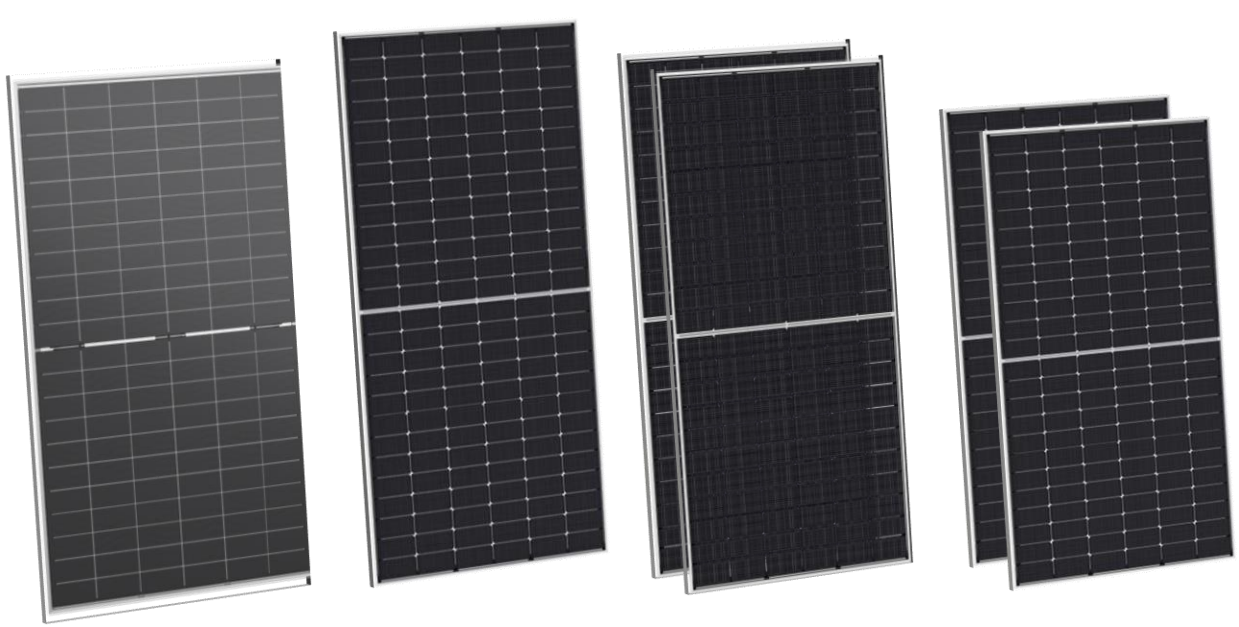
PV plant

Chemical processes

Semiconductor

N type Product

Product Portfolio Tiger Neo Series

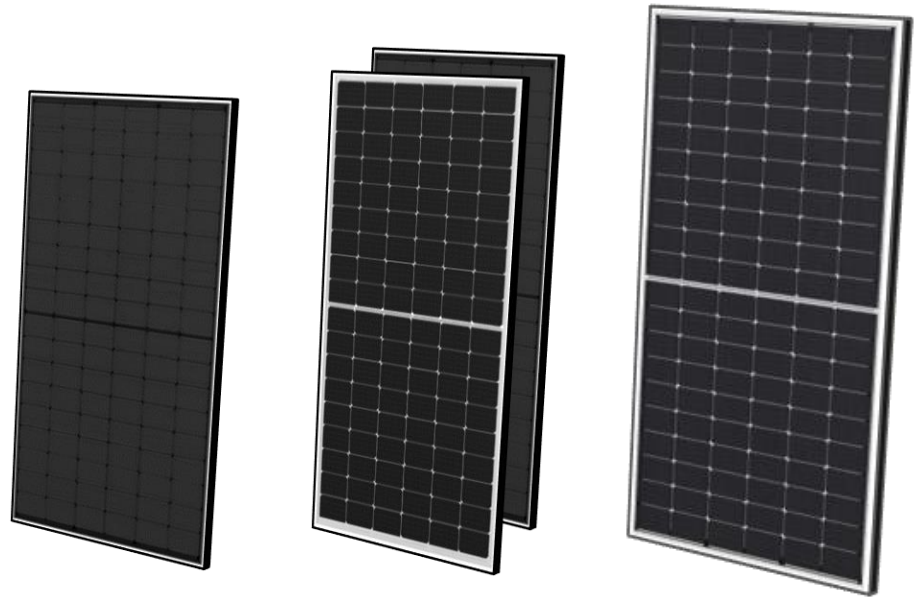


720W
N66HL5-BDV

645W
N78HL4-BDV

630W
N66HL4M-BDV/V

605W
N72HL4-BDV/V



450W
N54HL4R-BDB

460W
N54HL4R-V/B

495W
N60HL4-V

Utility Projects

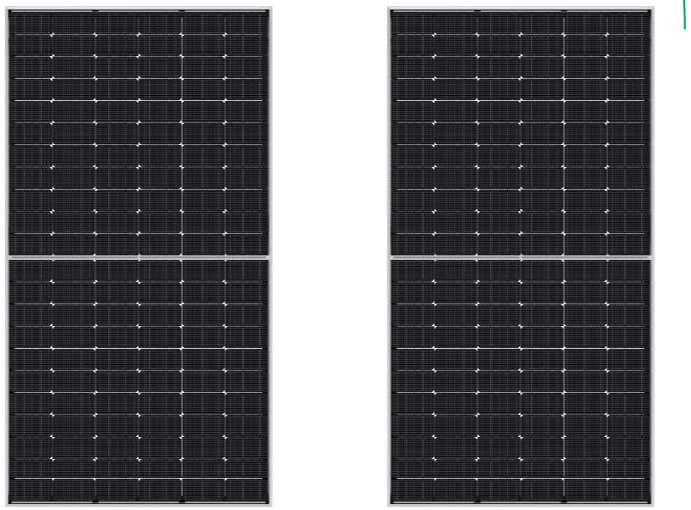
High Power **Low LCOE**

Distributed Grid

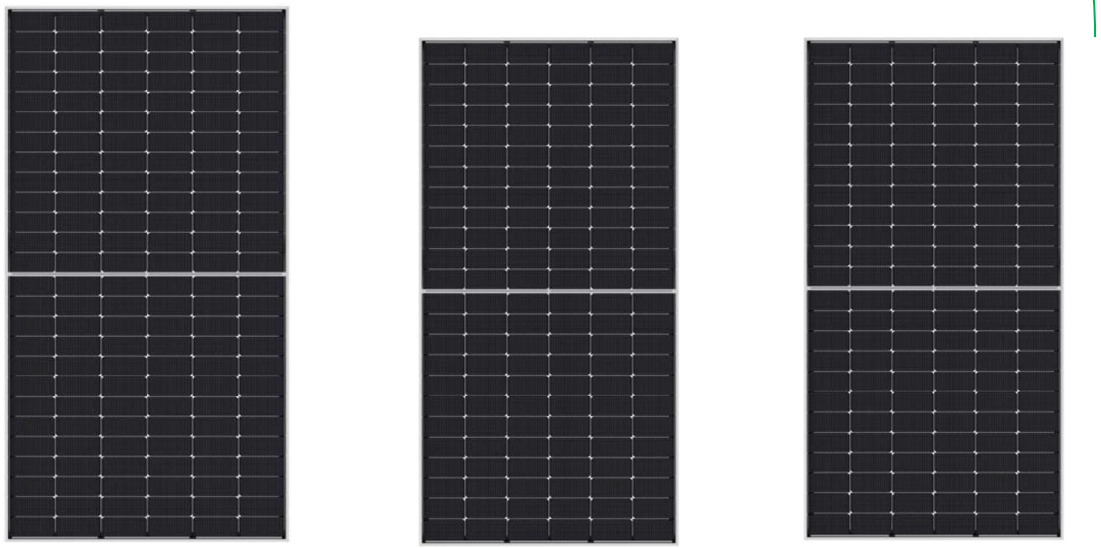
High Power **Small Size**

Tiger Neo Series Utility Projects

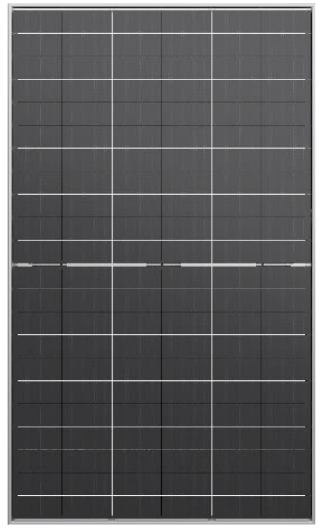
182.3*210mm



182.3*183.5mm



210*210mm

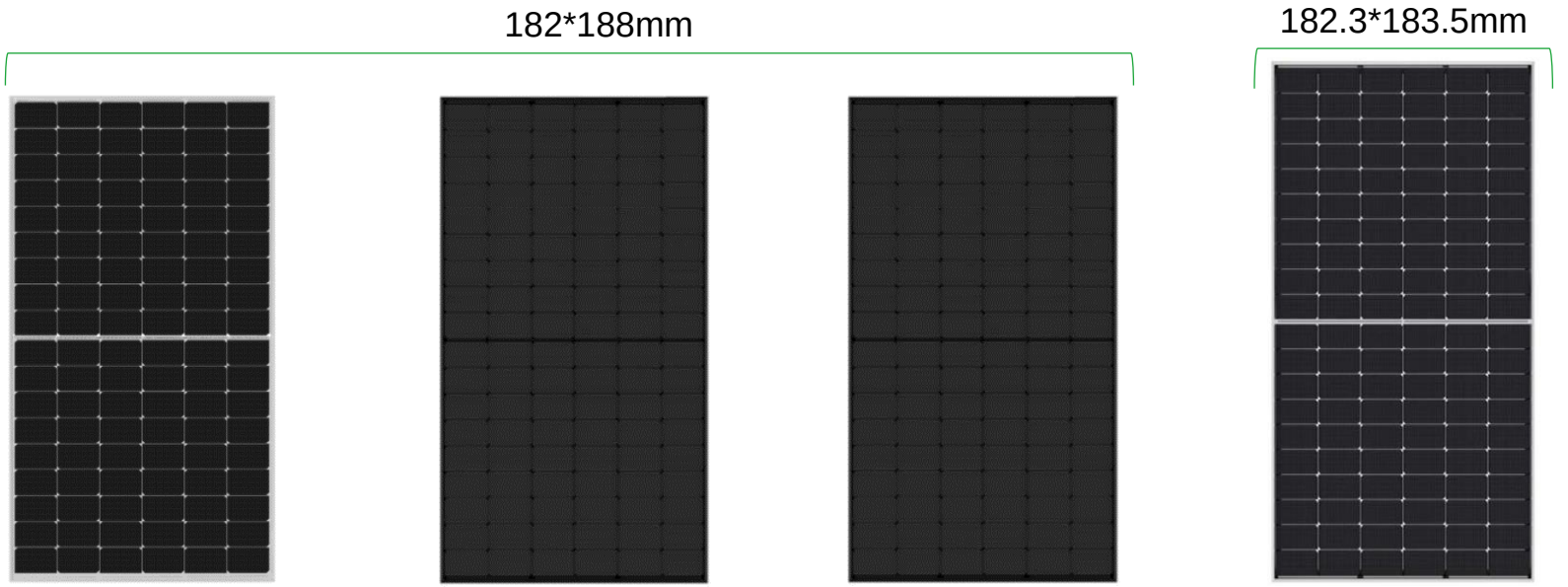


JKMxxxN-66HL4M-BDV	JKMxxxN-66HL4M-(V)	JKMxxxN-78HL4-BDV	JKMxxxN-72HL4-(V)	JKMxxxN-72HL4-BDV	JKMxxxN-66HL5-BDV
610-625W	615-630 W	625-645 W	585-605 W	580-600 W	700-720W
2382*1134mm	2382*1134mm	2465*1134 mm	2278*1134 mm	2278*1134 mm	2384*1303mm
22.58-23.14%	22.77-23.32%	22.36~23.07%	22.65%~23.42%	22.45%~23.23%	22.53-23.18%
66P	66P	78P	72P	72P	66P
12 years	12 years	12 years	12 years	12 years	12 years
Bifacial	Monofacial	Bifacial	Monofacial	Bifacial	Bifacial

*Maximum power is based on the highest efficiency BOM.

*The data is released for regional orders' preliminary guidance. The specific contract review output is subject to the PMC information.

Tiger Neo Series Distributed Grid



JKMxxxN-54HL4R-(V)	JKMxxxN-54HL4R-B	JKMxxxN-54HL4R-BDB	JKMxxxN-60HL4-(V)
445-460W	440-455W	435-450W	480-510W
1762*1134 mm	1762*1134mm	1762*1134mm	1906*1134mm
22.27-23.02%	22.02-22.77%	21.77-22.52%	22.21%~22.90%
54P	54P	54P	60P
25 yreas	25 years	25 years	25 years
Monofacial	Mono All Black	Bifacial All Black	Monofacial

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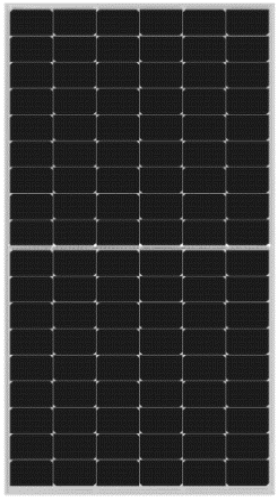
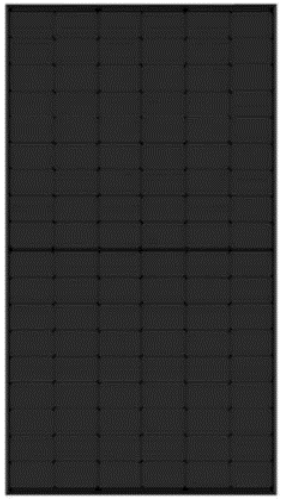
Special Scenario Products





JKMxxxN-72HL4-BDX	JKMxxxN-54HL4R-V	JKMxxxN-54HL4R-BDB
575-595 W	445-640 W	435-450W
2278*1134 mm	1762*1134 mm	1762*1134mm
22.26%~23.03%	22.27-23.02%	21.77-22.52%
72P	54P	54P
12 years	25 yreas	25 years
Bifacial	Monofacial	Bifacial All Black

*Maximum power is based on the highest efficiency BOM.

*The data is released for regional orders' preliminary guidance. The specific contract review output is subject to the PMC information.

Leading Edge Technology

26 times break the world record.

The 182 **n-type TOPCon cell** reaches **26.89%** maximum conversion efficiency, setting two new world records in **n-type TOPCon tandem with 32.33% and 33.24%**

3500+
Granted Patents

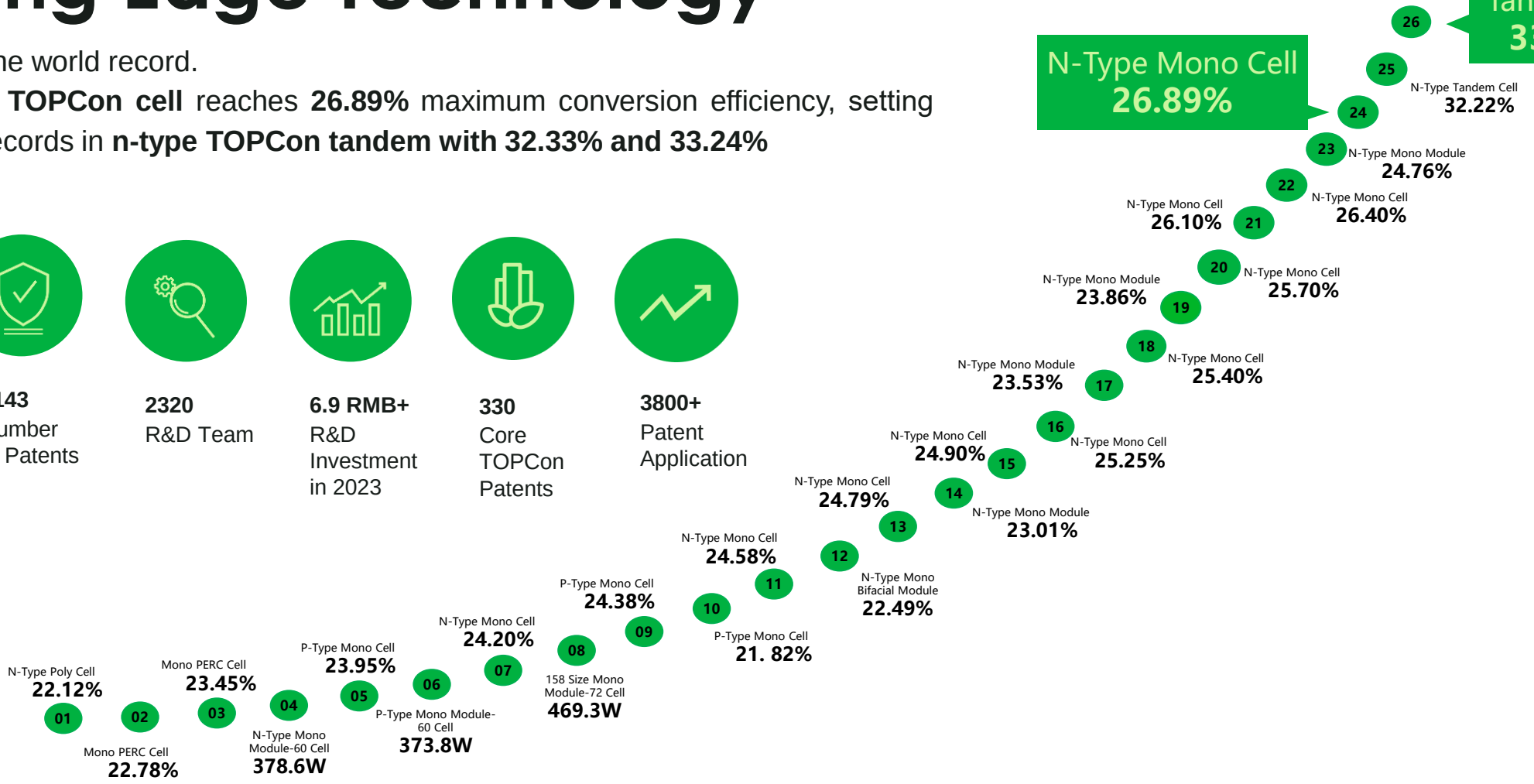
2143
Number of Patents

2320
R&D Team

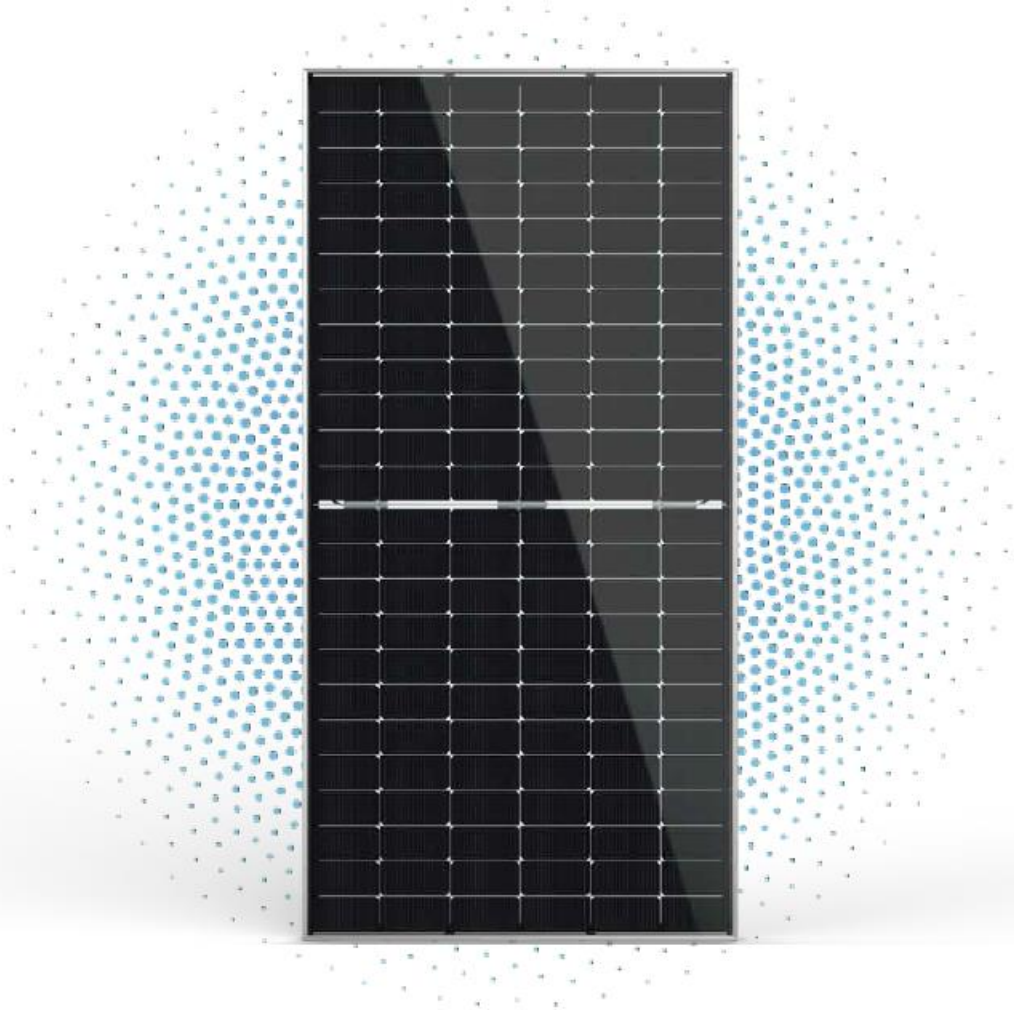
6.9 RMB+
R&D Investment in 2023

330
Core TOPCon Patents

3800+
Patent Application



BEST ADVANTAGE OF N-TYPE MODULES



30 Years
Long warranty for power production

23%
Maximum efficiency up to

0.4%
Low yearly degradation

80±5%
Best bifaciality

-0.29 %/°C
Lowest temperature coefficient

HIGHER POWER GENERATION EFFICIENCY

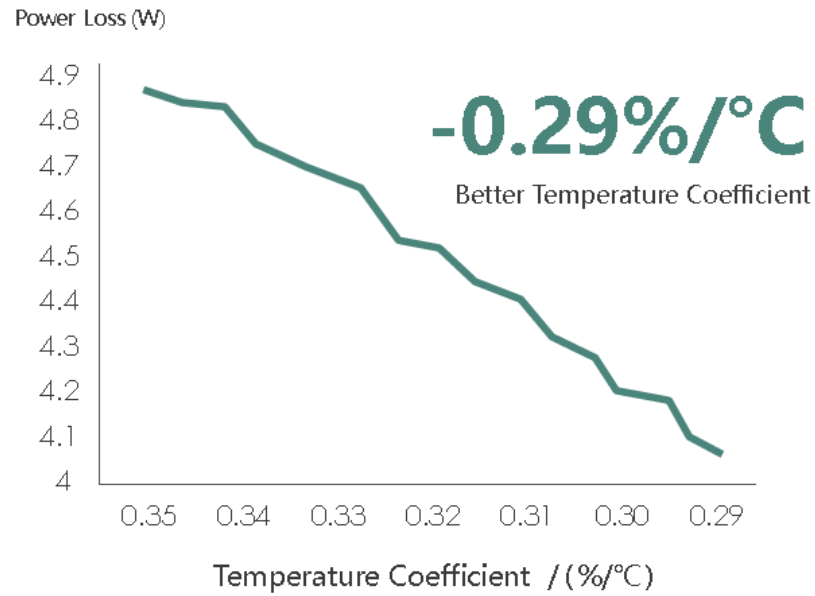
23%

Maximum efficiency up to

- Increase in power generation by **5-6%** per unit module area
- **4-5%** more electricity generation within the same installation area

  As the cost of land increases, along with the costs of raw materials and Balance of System (BOS), the advantages of Internal Rate of Return (IRR) become greater.

LOWER TEMPERATURE COEFFICIENT



-0.29%/℃ VS -0.35%/℃

- When the module's operating temperature exceeds **25℃**, the power generation decreases by **0.05%** for every degree increase.

HIGHER BIFACIAL FACTOR

85% VS 70%

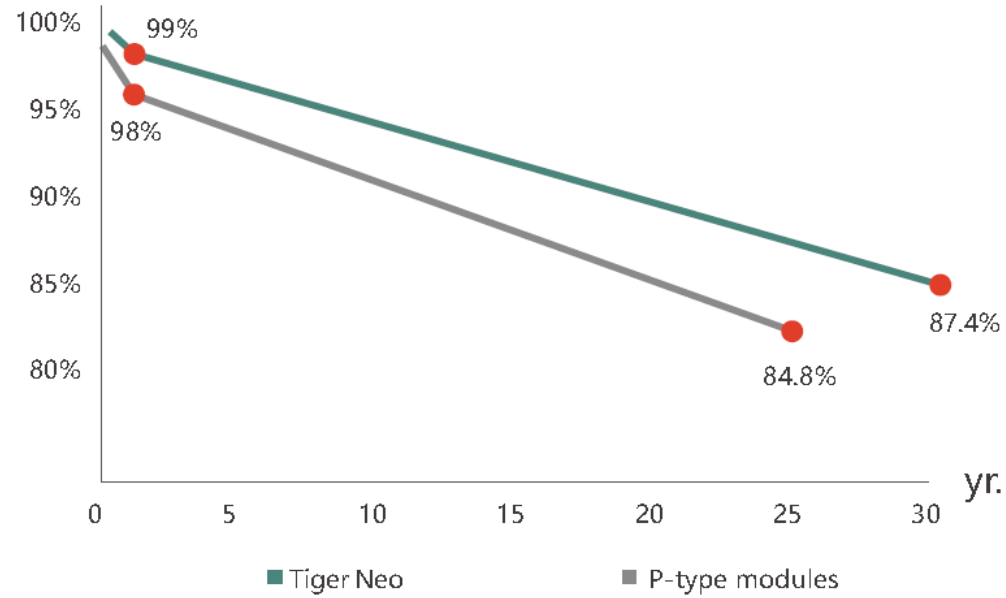
- For a 100 MW utility project, the average annual electricity generation difference between bifacial modules with trackers is:

3.4 million kWh

80±5%

Higher Bifacial Factor

LOWER DEGRADATION



⩽1%
First year degradation

⩽0.4%
Linear degradation

- 100 MW utility, average power generation **168,000,000 kWh/year**

Difference in first-year power generation:
16.8 million kWh

Difference power generation per year for the next 24 years
44.69 million kWh

Accumulated difference power generation in 25 years
61.49 million kWh

N type Product- TYP Tracker design

NT, ATI, PVH MONOLINE (130M)	Panel watts	Cell design	size	Typ.string length (-2 DEG)	String/ tracker	Tracker length (W*1.02	W/tracker	# /tracker	# Tracker/ 100MW	
	585	182x 72	2278x1134	28	4	129548.16	65520	112	1526	0.000%
	610	182x192 72	2382x1134	27	4	124921.44	65880	108	1518	0.546%
	610	182x210 66	2382x1134	27	4	124921.44	65880	108	1518	0.546%
	625	182 78	2465x1134	28	4	129548.16	70000	112	1429	6.400%
	690	210x210 66	2380x1303	31	3	123507.72	64170	93	1558	-2.104%

NT, ATI, PVH MONOLINE (100M)	Panel watts	Cell design	size	Typ.string length (-2 DEG)	String/ tracker	Tracker length	W/tracker	# /tracker	# Tracker/ 100MW	
	585	182x 72	2278x1134	28	3	97161.12	49140	84	2035	0.000%
	610	182Rx 72	2382x1134	27	3	93691.08	49410	81	2024	0.546%
	610	182x210 66	2382x1134	30	3	104101.2	54900	90	1821	10.492%
	625	182 78	2465x1134	27	3	93691.08	50625	81	1975	2.933%
	690	210x210 66	2380x1303	31	2	82338.48	42780	62	2338	-14.867%

Notes:

NT, ATI, PVH MONOLINE (100M)	Panel watts	Cell design	size	Typ.string length (-10 DEG)	String/ tracker	Tracker length	W/tracker	# /tracker	# Tracker/ 100MW	
	580	182x 72	2278x1134	27	3	93691.08	46980	81	2129	0.000%
	610	182x192 72	2382x1134	26	3	90221.04	47580	78	2102	1.261%
	610	182x210 66	2382x1134	29	3	100631.16	53070	87	1884	11.475%
	625	182 78	2465x1134	26	3	90221.04	48750	78	2051	3.631%
	690	210x120	2380x1303	30	2	79682.4	41400	60	2415	-13.478%

BOS SAVINGS – TRACKER OPTIMIZATION

- 182x182 72cell is most common product in the market, widely accepted for 2ppl installation
- 182x210 66cell provides best BOS in ideal scenario, specially in cooler environment for max Watt/tracker
- longer size may lead to higher installation cost but the width is usually the bigger problem
- Voltage increase as power of 182x182 or 210x210 product increases which will be difficult to main the same design
- Same 720 pcs per container for 210x182-66 vs 182x182 thus higher power density
- Assuming installation cost/piece is the same but larger module will be higher or equal in real life

Choose the right panel as per site

Target- 150KWDC+

DESIGN 1
300x P type 550W 72 =165kw OR
300x N type 575W 72 =172.5kw
(BOTH SIZE 2278x 1134)

Note
-Not perfect as overlap skylight
-72 size is difficult to handle
-Challenge in high wind area

DESIGN 2
Jinko 600W 72 N-type
260x600=156kw
(size 2330X1134)

Note
-No overlap skylight
-72 size is difficult to handle
-Challenge in high wind area

DESIGN 3
Jinko 475W 60 cell N-type
376x475=178kw
(1950X1134)

Note
-No overlap skylight
-easier to handle
-Stronger for high wind area

Fixed Installation-Mounting with Bolts

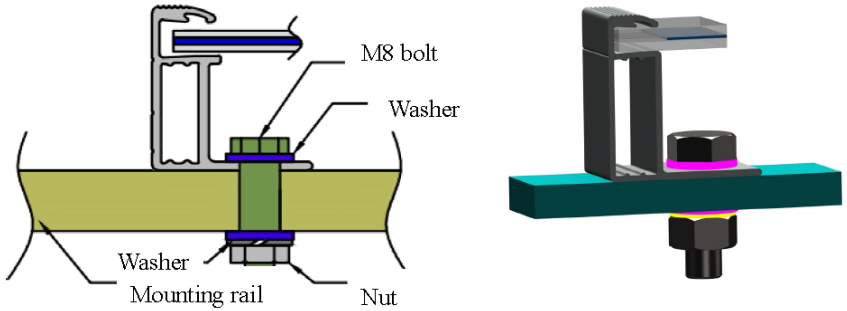


Fig. 2 Mounting with bolts

Mounting hole (mm)	Recommended bolt size
14 x 9	M8
10 x 7	M6

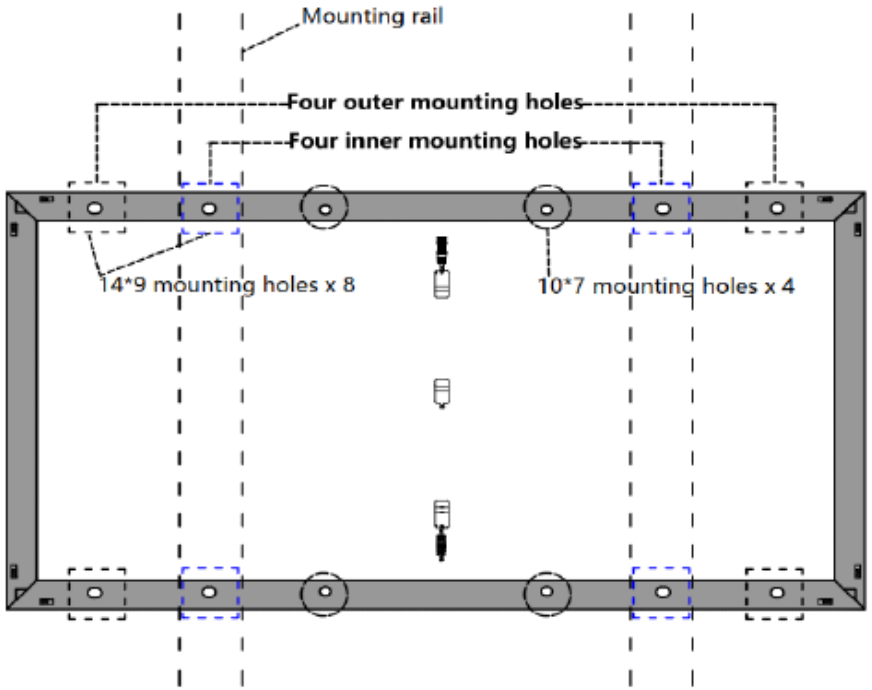


Fig. 3 Installation with bolt (Four inner mounting holes)

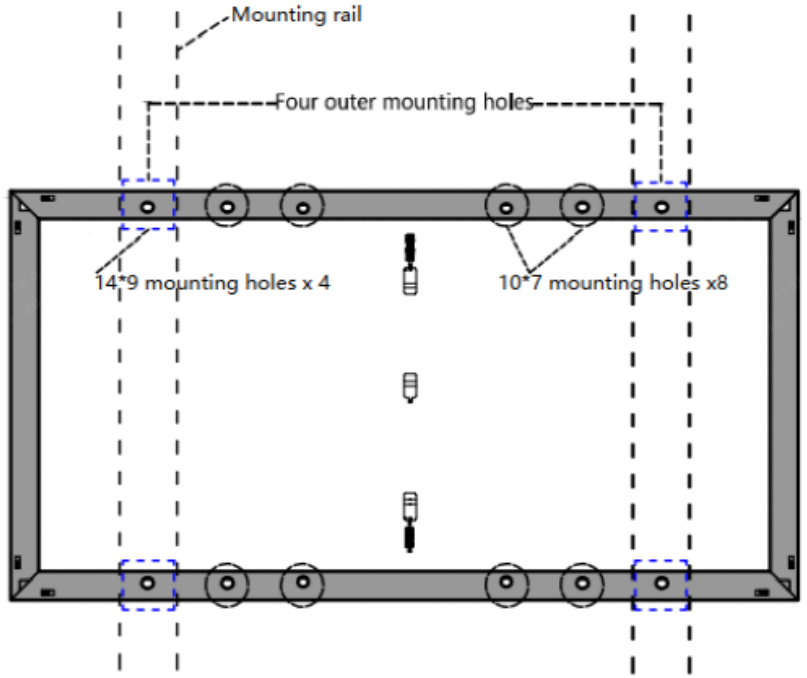
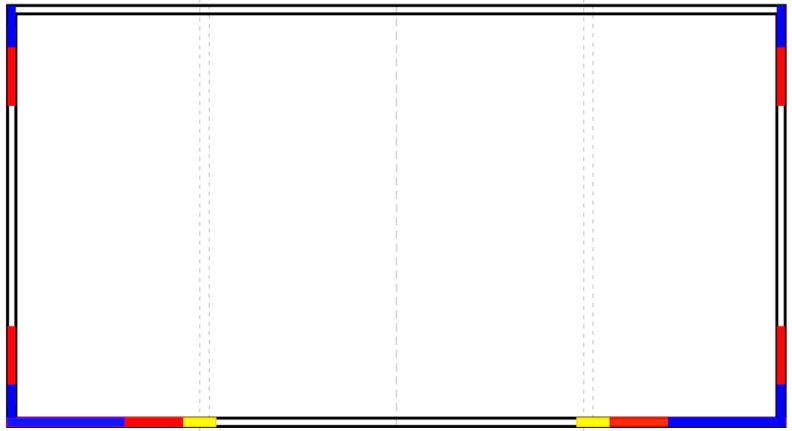


Fig. 4 Installation with bolt (Four outer mounting holes)

Fixed Installation-Clamps

Q: Can my panel mounted in Wind region D?



TYPICAL 60/66 CELL JINKO SOLAR MODULE

- Jinko provide data for clamping zone (Just ask)
- Check latest manual for different design method
- Wind load is subject to design (edge zone, center zone)
- Consult structural engineer
- Cyclone region requires design certificate (not product)
- Improved 30mm frame designed for large size modules
- Third party “test to fail” report available

2.3.2.1 Different methods of clamp installation

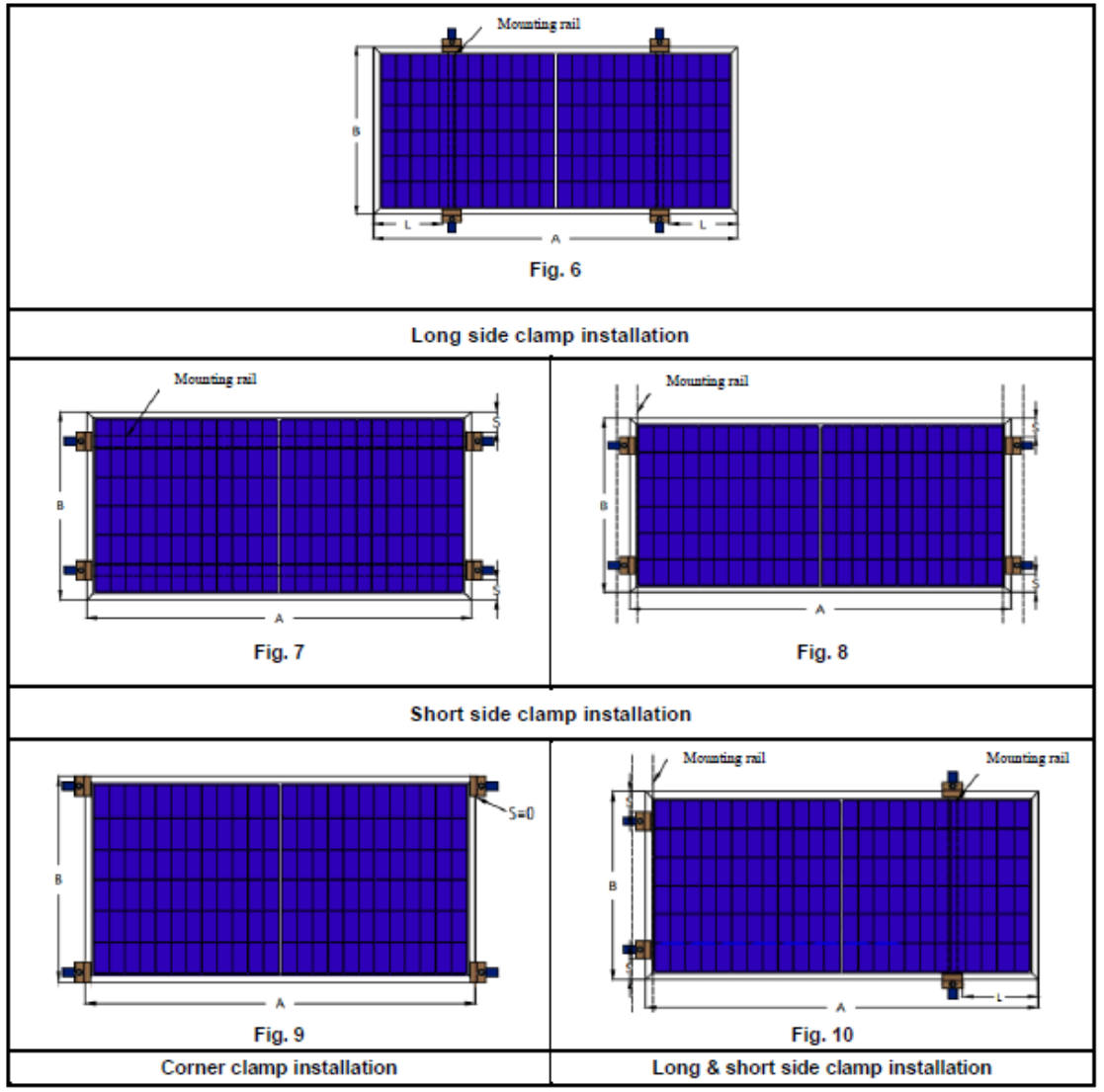


Table 3 Clamp Installation

Fixed Installation-Clamps

LONG SIDE CLAMPS

Installation of clamps on long side of frames						
	Length	Width	Blue Zone	Red Zone		Yellow Zone
JKMxxxM/N-60HL4(-V)/(-B)	1903	1134	100	330.6	430.6	600
JKMxxxM-54HL4(-V)/(-B)	1722	1134	100	294.4	394.4	600

Test Load	Front Side Maximum wind load	Rear Side Maximum wind load		
Blue Zone	1600 Pa	1600 Pa		
Ref Zone	5400 Pa	2400 Pa	For 54-cell 6000 Pa	4000 Pa
Yellow Zone	3600 Pa	2000 Pa		

- There are three types of wind load we count in Solar Panels Installation (Design Load, Serviceability Load and Ultimate Wind Load)
- The standard is not very aligned in between module IEC and local structural certificates
- **Module design:** modules tested load / 1.5, such test per IEC61215 will include before/after EL and Flash so, EL degradation shall be less than 5% .
- **Serviceability**: which for us we can refer to the tested load. Module installed in such environment will be fully covered by warranty. In our DS, manual or promotion we used the serviceability load.
- **Ultimate load** is a test to fail, which is mechanical only, and for reference only, so called cyclone test as what has been done at local structural engineer. This test do not consider any electrical loss and module are expected to be fail at such wind load, but not structurally failed and fly away

Panel Installation at seaside

Solar system installation near shoreline

- Always check the distance between installation location to sea level
- Check the salt and mist compatibility certificate from Manufacturer
- Minimum of 50m is required to get the regular warranty for Panel
- Minimum of 8-10 degree angle is required for self cleaning
- Follow the recommendations of racking providers (for example, they will ask to swap bolts to SS316 and screws to C4 or C5)
- Try to install the inverter inside the garage
- Try to complete the panel installation and connection on the same day to avoid any contact with sea particle to open connectors
- Use the connectors jackets or cover if connection is not on the same day

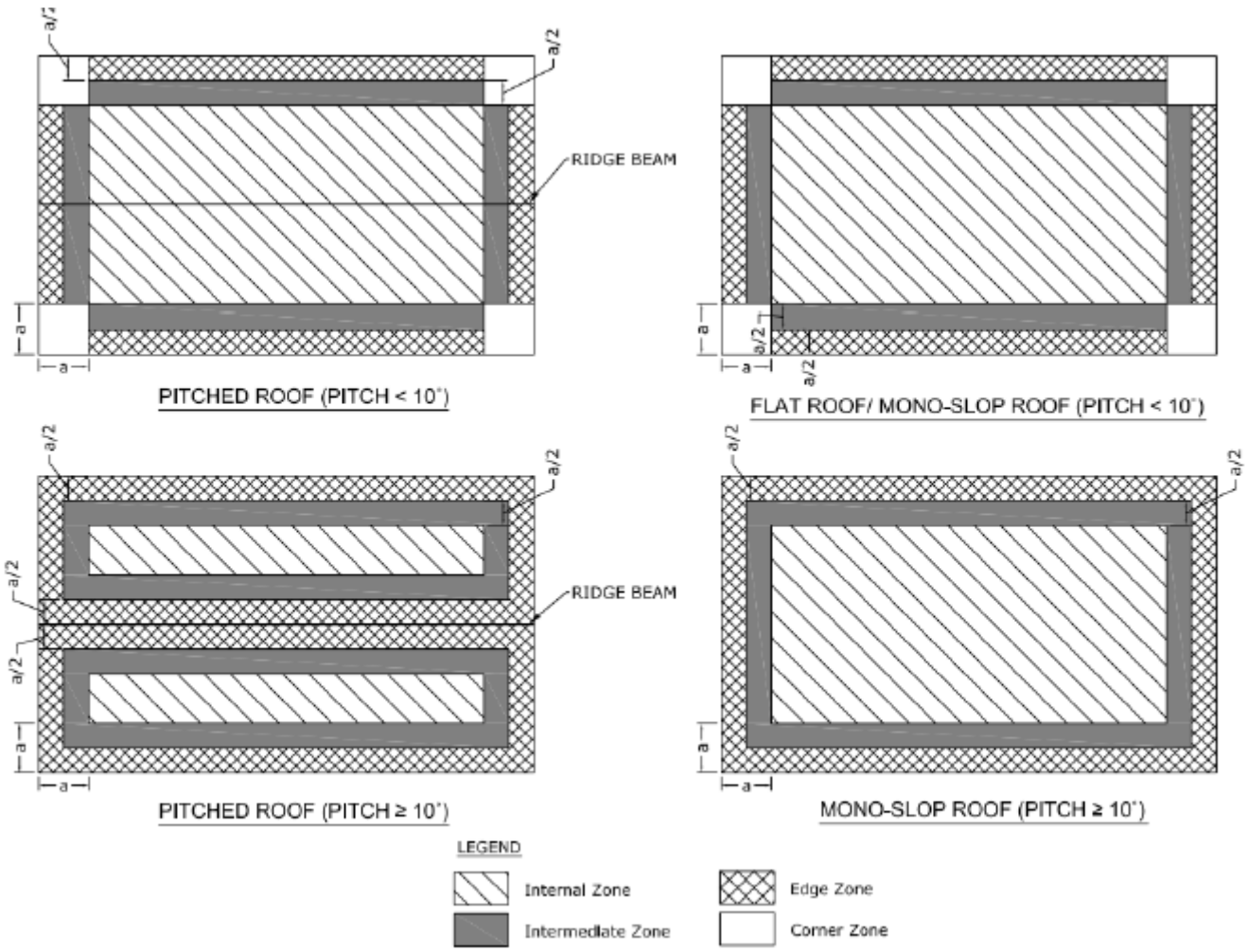
Panel Installation at seaside

Solar system installation near shoreline

- In order to avoid external matter such as sand or water vapor from entering and causing connection safety problems, once the modules are taken out of the box and installed, the connectors between the modules need to be connected in time, and the connectors need to be kept dry and clean during the installation process. It is recommended to add connector dust plugs as a temporary protective measure in areas with heavy dust, high salinity and pollution, but long-term use (within 1 month) is not recommended.

Definition of Roof Zones

- Depend on he height and style of the roof wind load is different for each site
- Internal zone is always consider for low wind load and suitable for any situation
- Check with structural engineer for the intermediate and edge zone
- Edge zone requires more wind load than other zones, always suggest to consult with Panel manufacturer
- Corner zone is not applicable for installation



Connectors

Q: Difference in between Jinko PV Cable Connectors and Stäubli MC4 Connectors

Staubli – MC4 ©

Staubli – MC4-EVO2 ©

As per AS/NZS 5033:2021, rooftop solar installation requires MC4 connectors.

As standard connector offered to distribution market (54 Cells and 60 Cells)
MC4 can only mate with MC4 or MC4-EVO2

PV Cable Connector: PV-JK03M2/xy series

PV Cable Connector: PV-JK03M/xy series

As standard connector offered to C&I or utility market (72 cells)
JK03M can only mate with JK03M OR M2

- Use the right tools for connectors
  1. Wire stripper plier
  2. Crimp tool
  3. Assembly tool
- IP68 protection is used

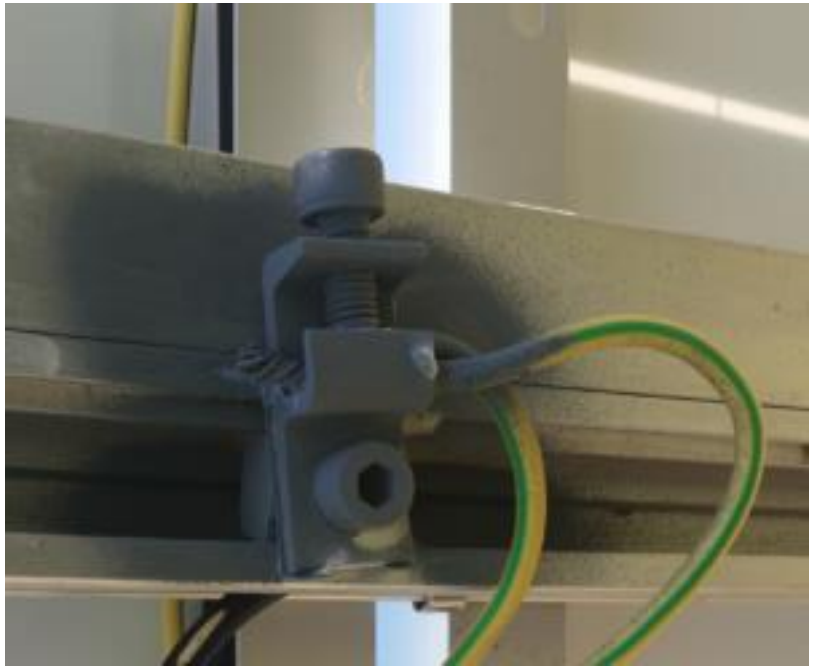
Maintenance and Care

- If the modules are observed having slight module color differences at different angles, this is a normal phenomenon for modules with anti-reflection coating technology.
- Check the glass is broken.
- No sharp objects are in contact with the PV module surfaces.
- The PV modules are not shaded by unwanted obstacles or foreign material.
- Corrosion along the cells' busbar. The corrosion is caused by moisture intrusion thought the module back sheet. Check the back sheet for damage.
- Check whether the back sheet is burnt.
- Check if screws and mounting accessories are tight, adjust and tighten as necessary.

- Clean the module preferably once per annum, more frequently in dusty conditions, using soft cloth dry or damp.
- Never use abrasive material under any circumstances.
- In order to reduce the potential for electrical and thermal shock, Jinko recommends to clean PV modules during early morning or late afternoon hours when solar irradiation is low and the modules are cooler, especially in regions with hot temperatures.
- Never attempt to clean PV module with broken glass or other signs of exposed wiring, as this presents a shock hazard.
- Never use chemicals when cleaning modules as this may affect the module warranty and energy yield.
- For single-side module, backsheet cleaning is not necessary; for dual-glass module, cleaning the module backside regularly when necessary.

Technical Tips

- Common Issue of earthing



Shading or Diode Bypass

- If the site is known to regularly shady, it is not recommended to rely on the bypass diodes to protect against shade
- The purpose of the diodes is to manage intermittent soiling (as example)
  - Leaves or birds dropping which usually washed after rain
  - Clouds passing or trees occasionally dropping down
- If the site is temporary or partially shady, the bypass diode will engage regularly and pass the full array current approx. 10-15 Amp
- For a log time shading it will generate no power, as a result long time overcurrent may cause to diode failure and burn
- Better to inspect the site before installation and check the shading
- If there is any chance to regular shading better use optimiser

Electrical Performance Safety

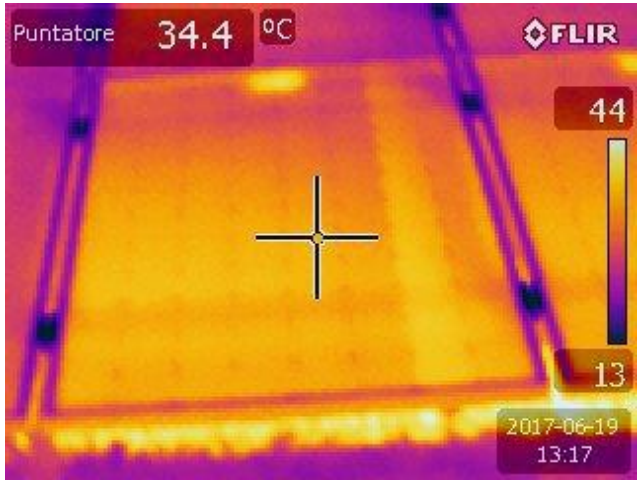
- Modules generate DC electrical energy when exposed to sunlight or other light sources. Improper contact with live parts, such as terminals, may result in burns, sparks, and lethal shock.
- Breakage, opening the module to the exterior, of the front or rear glass can cause an electrical safety hazard, electric shock, or fire.
- These modules cannot be repaired and must be removed and replaced immediately.
- Snow, water, or other reflective medium in surrounding environments that intensify light reflection will increase output current and power. And module voltage and power will increase under low temperature condition.
- Artificially concentrated sunlight shall not be directed on the module. Do not expose the back of the monofacial module directly to sunlight.
- To prevent arcs and electrical shocks, do not disconnect modules under load without authorization; if disconnecting the connector is needed, turn off DC and AC inverters or cut off the main switch of the converter first.
- PV module operation can only be stopped when they are kept from sunlight or covered by hard board (opaque material) or UV-proof materials.
- Due to the risk of electrical shock, do not perform any work if the terminals of the module are wet.
- Do not operate on wet modules, if this is needed, only by wearing PPE.

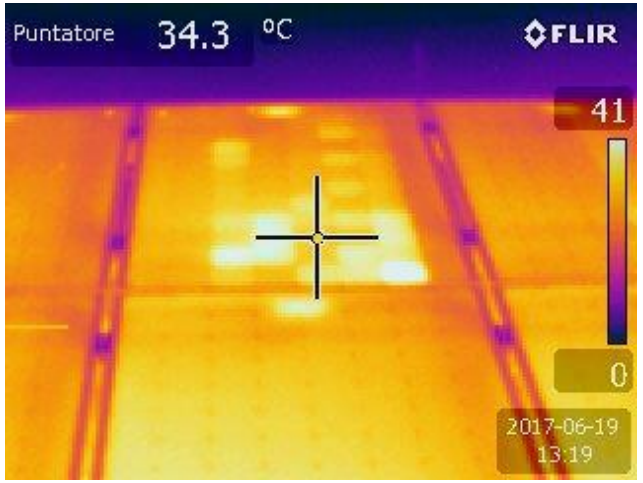
Panel Warranty

- Always check the warranty terms and conditions from the manufacturer
- Collect the serial number
- Check for external damage first before going for any test or analysis
- Check the Open Circuit Voltage
- If required go for insulation and thermal scanning
- Please collect the data from the site and capture all the test result
- Share the serial number with house owner
- Fill the warranty claim form

Panel Warranty Hotspot Detection and checking

- Hot-spot heating occurs in a PV module when its operating current exceeds the reduced short-circuit current of a shadowed or faulty cell or group of cells within it.
- We, Jinko Solar, highly recommend using thermograph analysis to detect the presence of possible hot spot defects.
- Inspect the surface of the solar modules carefully and remove any possible shading.
- Ensure the PV array is well connected and operating.
- Check inverter display or String electrical output.
- Position the camera as perpendicularly as possible to the object being measured.
- Avoid any shading effect or dirty conditions during the measurement phase.
- Record module serial number, time, date, picture number, and module location in the array.





Resources

- From the below QR scanner code and Jinko.au website anyone can access the course materials for Jinko Product,
  - Panel material
  - ESS material
  - Installation manual
  - Clamping zones
  - Certificates

  Contact details:
  - Dan Su (Head of BESS, ANZ)_dan1.su@jinkosolar.com
  - Alif Shahriar (Technical Service Manager, ANZ)_alif.Shahriar@jinkosolar.com

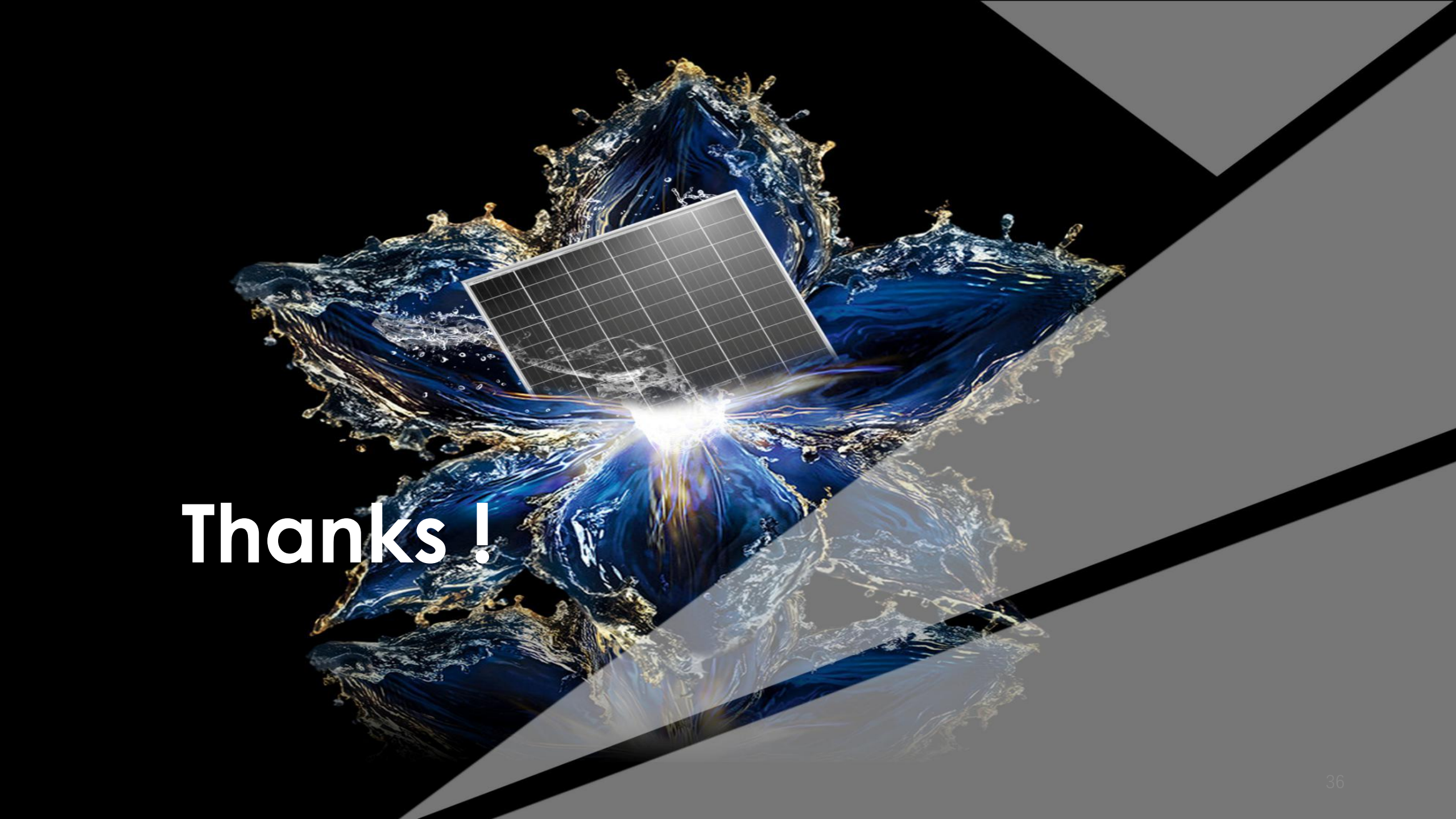
  These are the contact details of Jinko tech team, anyone can access following these email address.

Materials for Installation use

- Installation Manual

- Clamping Zone Manual

Q&A



Thanks !