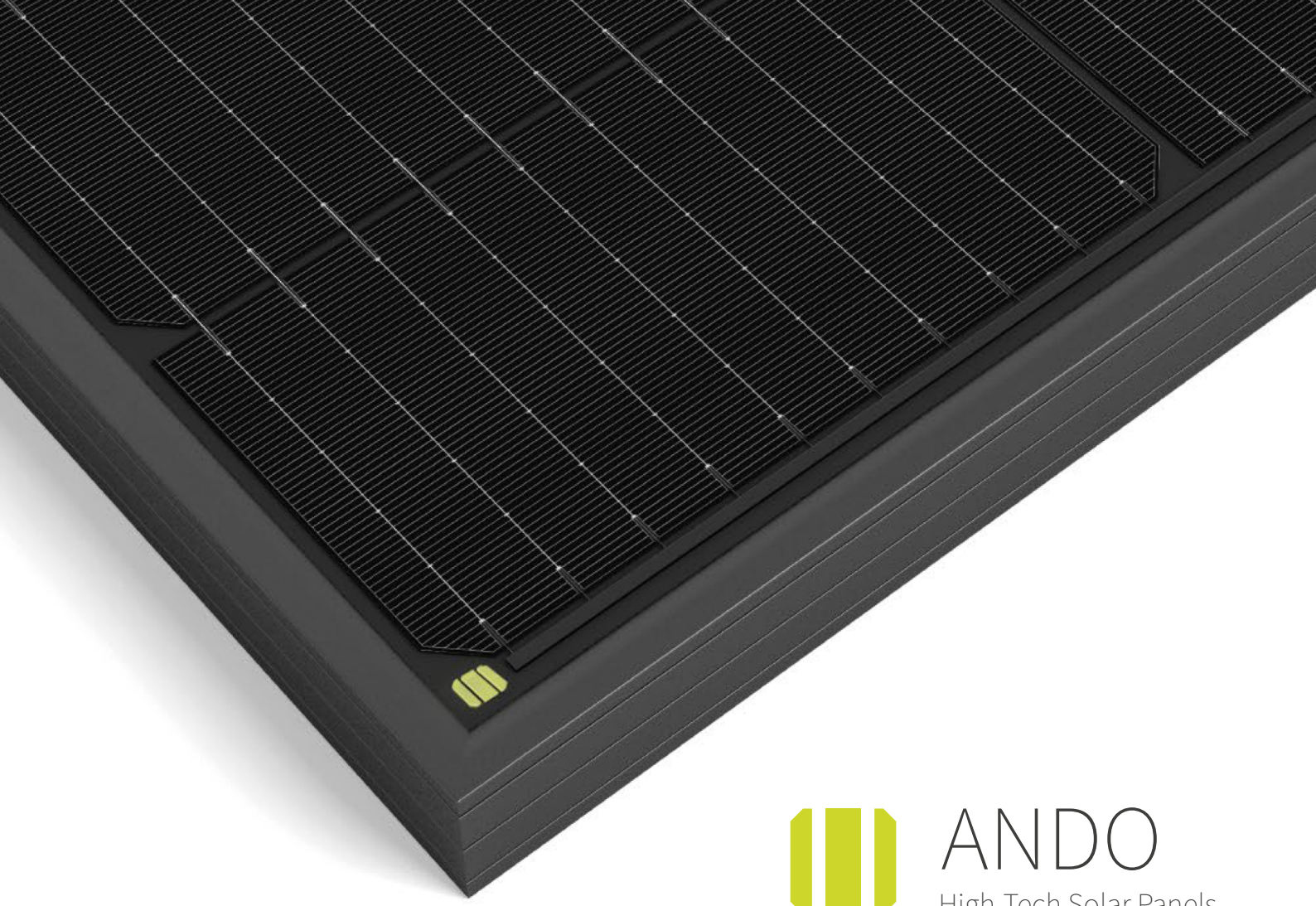


ANDO
High-Tech Solar Panels

DATASHEET

N-TYPE BIFACIAL DOUBLE-GLASS SOLAR MODULE – 500 WP

ANDO-N-AB-BI-BG-GG-500

ALL-BLACK 500 WP RESIDENTIAL SOLAR MODULE FEATURING N-TYPE BIFACIAL CELLS, A REFINED BLACK GRID DESIGN FOR FULL BIFACIAL LIGHT TRANSMISSION, AND A DURABLE DOUBLE-GLASS CONSTRUCTION

- TIER 1 Bloomberg NEW ENERGY FINANCE — MOST ANDO PRODUCTS ARE PRODUCED IN BLOOMBERG TIER 1–LISTED FACILITIES, ENSURING BANKABLE QUALITY
- 20% — BIFACIAL GAIN UP TO 20 %
- 35 YEARS — ANDO 35-YEAR LONG-TERM WARRANTY
- 23,10 % — MODULE EFFICIENCY
- 500 Wp — Wp OUTPUT

Designed and manufactured by

TMRWS. ENERGY

ANDO

High-Tech Solar Panels

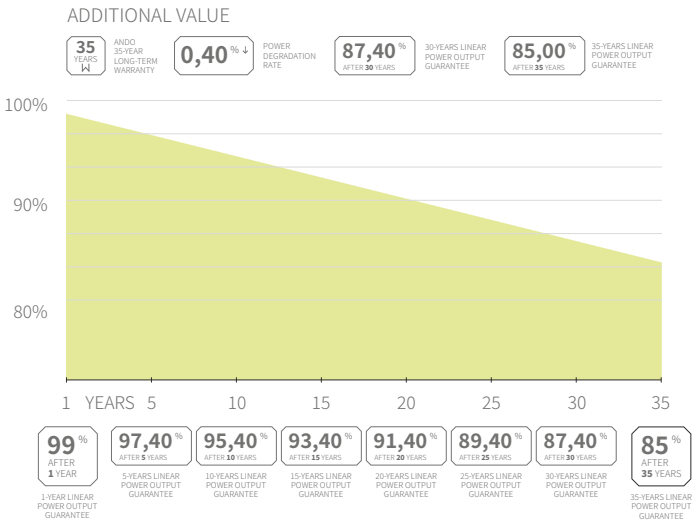
Exclusive Highlights: ANDO Reliable Features

STAUBLI	Genuine Components (e.g., MC & Staubli)
ANDO FRAME SYSTEM	High rigidity and torsion-free design
ANDO JUNCTION BOX	Durable design for long lifespan
ANDO ANTI-REFLECTION COATING	Enhances light capture for better energy output
ANDO MODULE WAVE DESIGN	Ergonomic frame profile with enhanced grip and anti-slip surface
ANDO EUROPEAN QUALITY ASSURANCE	All quality assurance procedures and performance validations are conducted in certified European laboratories anti-slip surface to ensure full compliance with EU standards.
ANDO 35-YEAR LONG-TERM WARRANTY	Warranty extended from 15 to 35 years when installed by certified ANDO installers. Includes both product and performance coverage – for complete peace of mind.

Efficiency

0 ~ +5 W POSITIVE POWER TOLERANCE	Individually measured for guaranteed performance above rated output.
LOW LCOE (LEVELIZED COST OF ENERGY)	Optimized for maximum energy yield and reduced lifetime energy costs
23,10% MODULE EFFICIENCY	High-performance conversion rate for maximum energy generation
BIFACIAL TECHNOLOGY	Generates up to 20% more energy by capturing light from both sides of the module

Linear Power Output Warranty & Degradation Rate Specification



Durability & Quality Assurance

SALT & AMMONIA RESISTANT	Built to endure coastal and agricultural environments
100% EL INSPECTION	Every module tested for microcracks and defects
SHADING TOLERANT	Optimized design reduces resistive loss
EXTREME WEATHER DURABLE	Reliable performance under harsh conditions
MULTI-BUSBAR EFFICIENCY	Improves light capture and current flow
LOW TEMPERATURE COEFFICIENT	Delivers more power in high-temperature climates
HIGH MECHANICAL STRENGTH	Withstands wind up to 2400 Pa and snow up to 5400 Pa
HOT SPOT PROTECTION	Low-current design minimizes hot spot risk
PID RESISTANT	Enhanced reliability through optimized materials

ANDO

High-Tech Solar Panels

European Origin & Sustainability Commitment

EUROPEAN BRAND AND OFFICES

ANDO is a European brand with 100% European roots
ANDO operates across Europe with offices, warehousing, and local technical support
All products are engineered in Europe and comply with EN, IEC, and EU standards.

EUROPEAN PARTNER NETWORK

More than 100 ANDO brand ambassadors across Europe

imec EUROPEAN R&D

The ANDO R&D team collaborates with IMEC on advanced product development

Munich RE EUROPEAN INSURANCE

Manufacturing is insured and supported by Munich RE

EnergyVille EUROPEAN TESTLABS

SOLAR TESTER EUROPEAN TESTLABS

Fraunhofer EUROPEAN TESTLABS

Member of Group kiwa EUROPEAN TESTLABS

Upon request, quality inspections can be conducted in collaboration with **EnergyVille Belgium** and **Solar Tester Netherlands**, with additional testing options available in Germany through **Fraunhofer ISE –TestLab PV Modules (Freiburg)**, PV Lab Germany, Kiwa PI Berlin, and I**SFH – Institut fürSolarenergieforschung Hameln**, including **flash testing, durability evaluation, and EL analysis.**

Quality Management & Environmental Standards

ISO 9001:2015

ISO 14001:2015 ISO CERTIFICATIONS & STANDARDS COMMITMENT TO QUALITY AND SUSTAINABILITY

ISO 45001:2018

ANDO production facilities comply with leading ISO standards to ensure quality, safety, and sustainability:
ISO 9001:2015 – Consistent quality and continuous process improvement.
ISO 14001:2015 – Environmentally responsible and resource-efficient production.
ISO 45001:2018 – Safe, compliant, and reliable working conditions. These certifications guarantee high-performance products, reliable supply, and sustainable operations.

TIER 1 Bloomberg BLOOMBERG TIER 1 MANUFACTURING

Most ANDO products are produced in Bloomberg Tier 1–listed facilities, ensuring bankable quality, reliable performance, and long-term investment security.

3x TRIPLE TESTED

Hail, snow, wind, ammonia, salt mist, corrosion – you name it, ANDO modules has passed it

Environmental & Circular Manufacturing Commitment

cradle to cradle CRADLE TO CRADLE COMMITMENT

ANDO aims to maximize the use of recyclable and reusable materials, supporting a closed-loop production

ISO 14067 LOW CARBON FOOTPRINT MANUFACTURING

Production processes are optimized to minimize Co_2 per W emissions per watt, verified by independent certifications such as ISO 14067 and Certisolis-verified

RECYCLABLE MATERIALS & END-OF-LIFE PROGRAM

Panels are designed for recyclability — aluminum, glass, and silicon are recoverable

ecovadis GREEN SUPPLY CHAIN & MATERIAL SOURCING ISO 45001:2018

Raw materials are sourced preferably from certified partners who adhere to strict environmental and ethical standards. reducing upstream emissions and ensuring traceability.

ISO 14001 WATER & RESOURCE EFFICIENCY

Closed-loop water systems and optimized resource usage minimize water consumption and reduce waste in manufacturing

CLIMATE GROUP RE100 CDP RENEWABLE ENERGY–POWERED PRODUCTION

Production facilities are partially or fully powered by solar and renewable energy sources, reducing dependence on fossil fuels

RoHS ROHS & REACH COMPLIANCE

All products meet EU RoHS and REACH regulations, ensuring they are free from hazardous substances and safe for the environment and users

PFAS FREE PFAS-FREE – SUSTAINABLE AND SAFE

This product is manufactured entirely without the use of PFAS (per- and polyfluoroalkyl substances).Plastic-free, 100% recycled packaging, and produced using solar energy.

EPD LIFE CYCLE ASSESSMENT (LCA)

Comprehensive LCA studies quantify environmental impact from raw material sourcing to recycling, guiding ongoing improvements

SUSTAINABLE PACKAGING

Packaging materials are made from recycled or renewable sources and are fully recyclable, reducing waste during transportation

ANDO

High-Tech Solar Panels

Electrical Parameters (STC)

Parameter	Value
Peak Power – Pmax (W)	500 Wp
Open-Circuit Voltage – Voc (V)	44.71 V
Short-Circuit Current – Isc (A)	14.06 A
Maximum Power Voltage – Vmp (V)	37.65 V
Maximum Power Current – Imp (A)	13.28 A
Module Efficiency – η (%)	23.10%
Power Tolerance (W)	(0, +5W)

STC (Standard Test Conditions):
1000 W/m² irradiance, 25 °C cell temperature, Air Mass 1,5 spectrum

Temperature Coefficients

Parameter	Value
Pmax Temperature Coefficient Voc	-0,29 % / °C
Temperature Coefficient Isc	-0,25 % / °C
Temperature Coefficient	+ 0,045 % / °C

Electrical Parameters (NMOT)

Parameter	Value
Maximum Power – Pmax (W)	377 W
Open-Circuit Voltage – Voc (V)	42.50 V
Short-Circuit Current – Isc (A)	11.40 A
Maximum Power Voltage – Vmp (V)	35.80 V
Maximum Power Current – Imp (A)	10.70 A

NMOT (Nominal Module Operating Temperature):
Irradiance 800 W/m², Ambient Temperature 20 °C,
Air Mass 1,5, wind speed 1 m/s.

Bifacial Rear-Side Output – Additional Power Gain (Example based on this model)

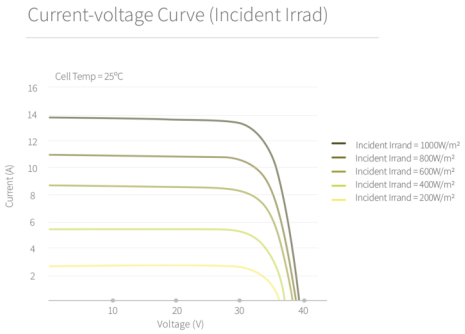
Rear-Side Power Gain	5%	10%	20%
Maximum Power – Pmax (W)	525 W	550 W	600 W
Open-Circuit Voltage – Voc (V)	44,71 V	44,71 V	44,71 V
Short-Circuit Current – Isc (A)	14,76 A	15,47 A	16,87 A
Maximum Power Voltage – Vmp (V)	37,65 V	37,65 V	37,65 V
Maximum Power Current – Imp (A)	13,94 A	14,61 A	15,94 A

Bifacial cell design increases total power generation by up to 20% through rear-side light capture.

Electrical Performance Characteristics

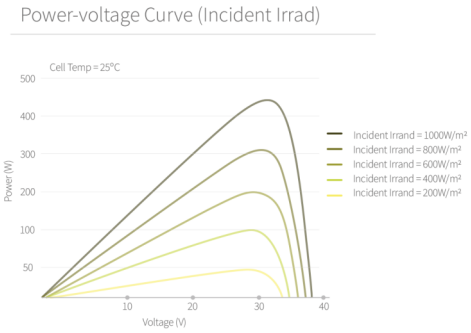
Current–Voltage Characteristics (Cell Temperature Dependence)

Shows thermal stability with stable current and slight voltage drop



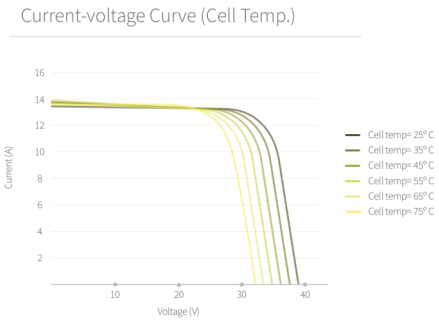
Power–Voltage Characteristics (Irradiance Dependence)

Indicates high efficiency under varying light conditions



Current–Voltage Characteristics (Irradiance Dependence)

Demonstrates strong energy yield as irradiance increases



Mechanical Load Capacity

Parameter	Specification
Design Load (Pressure / Suction)	3600 Pa (snow) / 1600 Pa (wind)
Test Load (Pressure / Suction)	5400 Pa (snow) / 2400 Pa (wind)
Wind Load Resistance	Up to 2400 Pa
Snow Load Resistance	Up to 5400 Pa
Hail Impact Resistance	25 mm diameter hail at 80 km/h
Mounting Orientation Tested	Portrait & Landscape
Compliance Standards	IEC 61215 / IEC 61730
Frame Strength (no deformation)	≥ 5400 Pa

Mechanical Structure

Component	Specification
Frontside Glass	1,6mm + 1,6mm toughened, Low-reflection low-iron tempered glass for maximum transmission
Backside Glass	1.6 mm low-iron tempered transparent glass (bifacial transparent rear)
Coating on Glass	Dual-side anti-reflection nano-coating (ANDO type)
Optical Appearance	Black frame with black cell-matrix grid pattern; transparent inter-cell spacing for light transmission
Encapsulant Material	Transparent EVA / POE encapsulant
Frame	30 mm black anodized aluminum alloy (6063-T6, ANDO type)
Concept	Cradle-to-Cradle design
Junction Box	IP68, 1500 V DC, ANDO type with integrated bypass diodes
Cable Length	(+) 1200 mm / (–) 1200 mm (± 10 mm)
Cable Thickness	4 mm^2 (IEC standard)
Connector	Original Stäubli MC4-EVO2 plug socket, IP68, 1500 V DC
Fire Class	Class A
Internal Diodes	3 bypass diodes

Operating Parameters

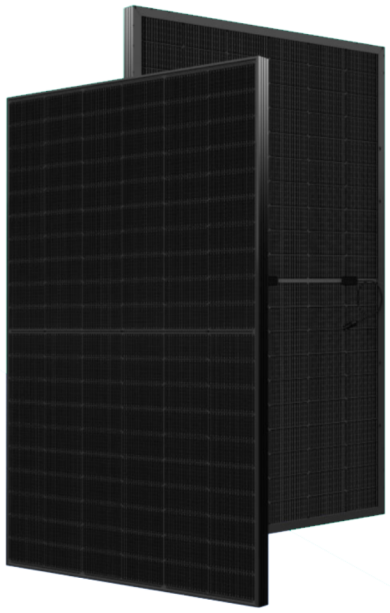
Parameter	Value
Maximum System Voltage	1500 Vdc
Maximum Series Fuse Rating	30
Operating Temperature Range	−40 °C ~ +85 °C
Nominal Module Operating	45 ±2 °C
Temperature Safety Class	Fire Class A

Module Specifications

Parameter	Specification
Module Type	Mono Crystalline
Cell Type	N-Type 16BB
Cell Size	182 x 94mm (half-cut)
Number of Cells	120 pcs (6 x 20)
Front Surface	Glass
Back Surface	Black-Grid EVA Bifacial Backsheet
Module Dimensions (L x W x H)	≈1910 x 1134 x 30mm
Weight	26,5 kg

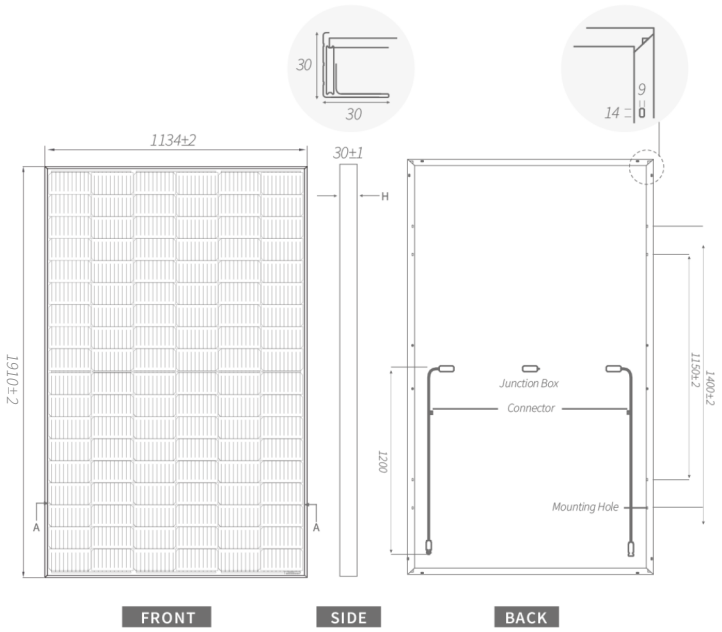
Mechanical Design & Construction Details

Front View – Black Grid Design
Rear View – Transparent Layer Behind Cells (Bifacial Design)



Module Dimensions & Drawings

Front View	Displays the modules total dimensions (1910 x 1134 mm) and cell layout.
Side View	Shows frame depth (30 mm) and structural profile.
Rear View	Indicates junction box and connector positions, as well as mounting hole locations for secure installation.
Detailed Frame Section Drawings	Precise cross-sectional dimensions (30 x 30 mm frame profileand 14 mm mounting groove depth) for system design and mechanical integration.



Packaging & Logistics Information

Parameter	Specification
Pallet Configuration	37 modules per pallet
Pallet Dimensions (L x W x H)	1980 x 1140 x 1254 mm
Pallets per 40 ft HQ Container	24 pallets
Total Modules per 40 ft HQ Container	888 modules
Pallet Weight (approx.)	~ 1050 kg (including packaging)
Container Weight (approx.)	~ 25,000 kg (net)
Stacking in Warehouse	Up to 2 pallets can be safely stacked on top of each other
Pallet Material	ISPM-15 compliant multilayer engineered wood
Stacking Method	Vertical orientation with protective corner guards and shrink-wrap film
Packaging Material	Recyclable cardboard, plastic film, and wooden pallet base

RECYCLABLE MATERIALS & END-OF-LIFE PROGRAM