

 **ZEBRA**
Technology Inside

Back Contact Solar Panels
with N-Type IBC cells

ABOUT US

FuturaSun was established in 2008 by a team of managers in Veneto, Italy's hub of the photovoltaic industry. The headquarters are located in Cittadella, Padua Province.

This is where our growth began, not only in Italy but on foreign markets too, right from the outset. Today we sell in over 70 countries, and have achieved double-digit sales growth year on year. Our team comes from 8 nations, for an international staff with multi-year experience in the photovoltaic industry. We continuously expand our sales network and directly invest in the development of new technologies.



Produktionswerk FuturaSun



Headquarters in Cittadella, Padua Province



ANTICIPATE TOMORROW

This is the slogan we have selected to describe FuturaSun: a company which strongly believes in a sustainable future, without the use of fossil fuels. Tomorrow is already here. Thanks to the falling cost of photovoltaic energy, it is absolutely the lowest compared to all other sources.

EXPERIENCE & TECHNOLOGY

Our team boasts over 15 years of experience in photovoltaic module production. The quality of our products is guaranteed by the decision to use only the best raw materials of traceable origin, rigorous quality tests (including electroluminescence on each module), certification according to the most rigorous international standards, as well as the continuous supervision of the production process by Quality Assurance Employees.

R & D

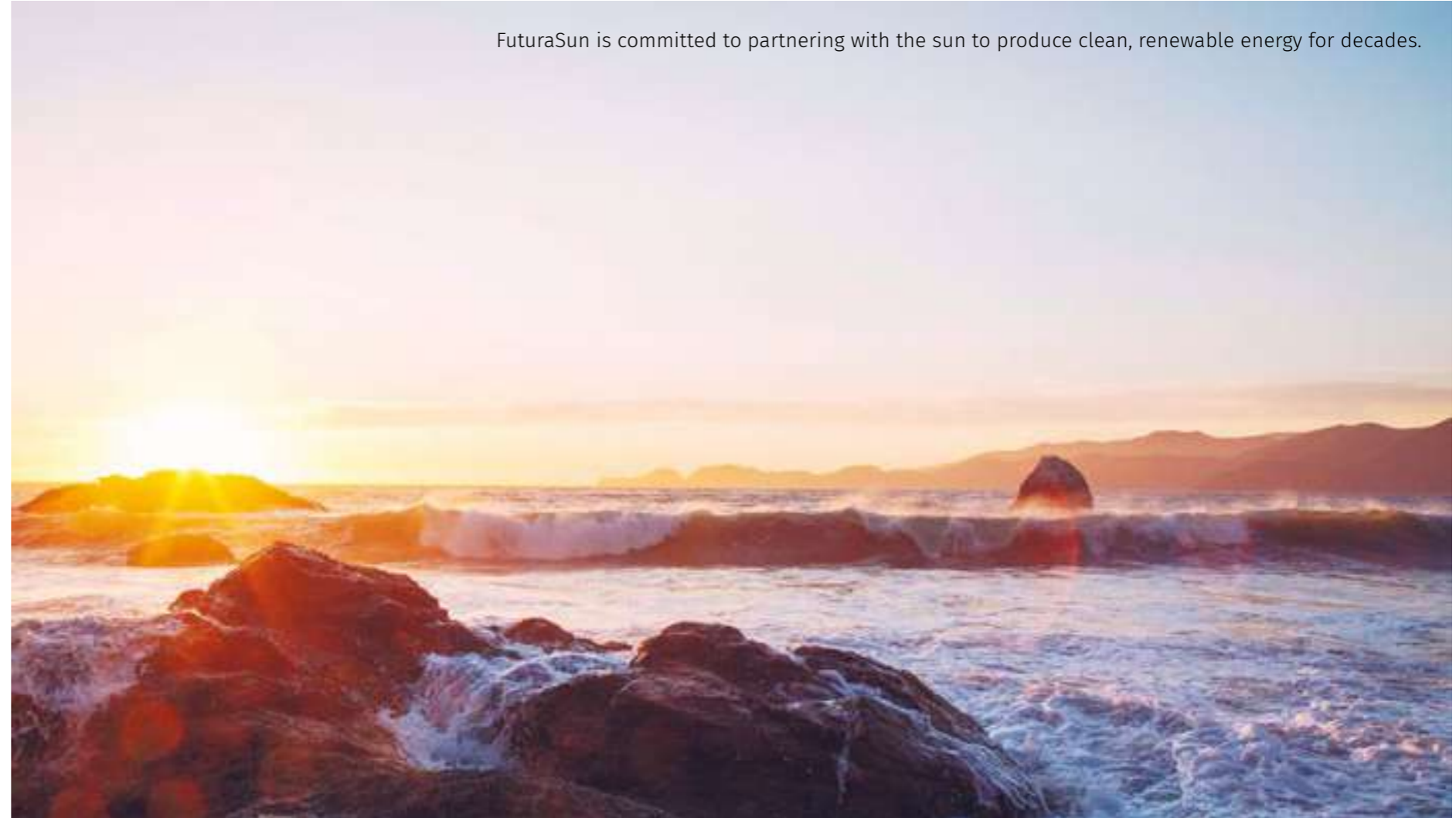
Quality technical choices in the pursuit of high efficiency performance have always characterised our production and continue to do so in an increasingly evolved way. Continuous research and development pursued by the Italian team is effectively applied at production plants, leveraging the most innovative technologies on the photovoltaic market: from IBC technology to cylindrical ribbon, glass-glass solutions and modules with independent sections.



VIDEO PRODUCTION



COMPANY PROFILE



FuturaSun is committed to partnering with the sun to produce clean, renewable energy for decades.



PRODUCTION OF PHOTOVOLTAIC PANELS

Our main production plants directed by Alessandro Barin, are located in China in Taizhou and have an annual production capacity of 2 GW/year. Our solar panels are produced on a 20,000 m² site, with a highly automated line, with rigid quality controls implemented throughout the entire process, to guarantee maximum quality and traceability for every single item.

We have been manufacturing solar panels for over 15 years, which is quite a number considering the relatively young market we operate in. FuturaSun uses only raw materials of finest quality from renowned suppliers, stored in compliance with stringent criteria for temperature and humidity control.

All production sites are periodically inspected by international accreditation bodies, as further confirmation of the high quality of our production process.





ZEBRA Pro

Technology Inside

FU 415 - 430 M
ZEBRA PRO
132 N-TYPE IBC
BACK CONTACT CELLS

The new high-efficiency module ZEBRA Pro stands out for its IBC (Interdigitated Back Contact) technology characterized by having the electrical contacts on the back. This way granting maximum light absorption.

415 - 430 Wp
POWER RANGE

> 24 %
CELL EFFICIENCY

21.84 %
MODULE EFFICIENCY
UP TO

-0.29 %/°C
TEMPERATURE COEFFICIENT

93% at the 25th year
POWER STABILITY

IBC N-TYPE ZEBRA CELL TECHNOLOGY DEVELOPED IN EUROPE



- Doped with phosphorus
- One extra electron more making it negatively charged
- The extra electron is boosting the efficiency
- ZEBRA N-Type cells are resistant to degradation problems like LID and LeTID
- Low temperature coefficient equals to excellent performance also at high temperatures
- More kWh per kWp
- A sustainable choice for your business plan



AVAILABLE ALSO
TOTAL BLACK

FU415 - 425M
ZEBRA PRO ALL BLACK
132 N-TYPE IBC
BACK CONTACT CELLS

415 - 425 Wp	21.60 %
POWER RANGE	MODULE EFFICIENCY
	<small>UP TO</small>

ZEBRA Pro All Black is particularly suitable for residential systems.

The elegant version in total black with a black back sheet and black frame is aesthetically unique since there're no metal wires on the cell's front. This characteristic makes it perfect for buildings of high architectural value.

✓ **TOTAL BLACK**

✓ **BIPV**

✓ **ARCHITECTURAL VALUE**

✓ **BLACK BACK SHEET**

✓ **RESIDENTIAL SYSTEMS**

✓ **AESTHETICALLY UNIQUE**

✓ **BLACK FRAME**

✓ **COMMERCIAL SYSTEMS**

✓ **ELEGANT**



ZEBRA Pro with black backsheet



DIMENSIONS: 1895X1039X30 mm

WEIGHT: 21.0 KG

SAY IBC
THINK
ZEBRA

GENERAL FEATURES & KEY BENEFITS

-  • 132 half-cut N-Type ZEBRA IBC cells – Interdigitated Back Contact
-  • Innovative ZEBRA cell technology developed in Europe
-  • Superior module efficiency up to 21,84 %
-  • Excellent temperature coefficient -0,29 %/°C
-  • Improved low light performance
-  • Better yield at various tilts
-  • No shading on the cell thanks to IBC technology
-  • Half-cut design reduces internal resistance and increases the power output
-  • Improved behaviour under partially shaded conditions
-  • Lower Hot-Spot risk thanks to the distributed junction of the ZEBRA cell
-  • Resistant to LID (Light Induced Degradation) and LeTID (Light and elevated Temperature Induced Degradation)
-  • Market leading power stability over time (93 % at the 25th year)
-  • 25-year performance guarantee with a maximum power decrease of 0.25 %/year starting from the 2nd year
-  • 25-year product and performance warranty



M6 half-cut ZEBRA cells with innovative layout

HIGH EFFICIENCY BACK CONTACT PV PANELS

ZEBRA Pro is the new series of back-contact PV modules reaching 430 Wp and 21.84 % module efficiency. 132 N-type ZEBRA IBC high-efficiency cells (166 mm – M6) are assembled with an innovative layout of cells with reduced gaps. The excellent technical features guarantee this product's superiority in performance and yield over the years, making ZEBRA Pro particularly suitable for residential and commercial systems and also for industrial rooftop PV systems.

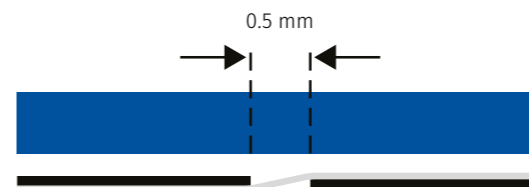
21.84 %

MODULE EFFICIENCY

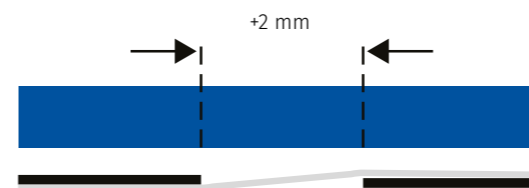
UP TO



M6 half-cut ZEBRA cells



High-Density module



Traditional module

INNOVATIVE LAYOUT OF CELL CONFIGURATION

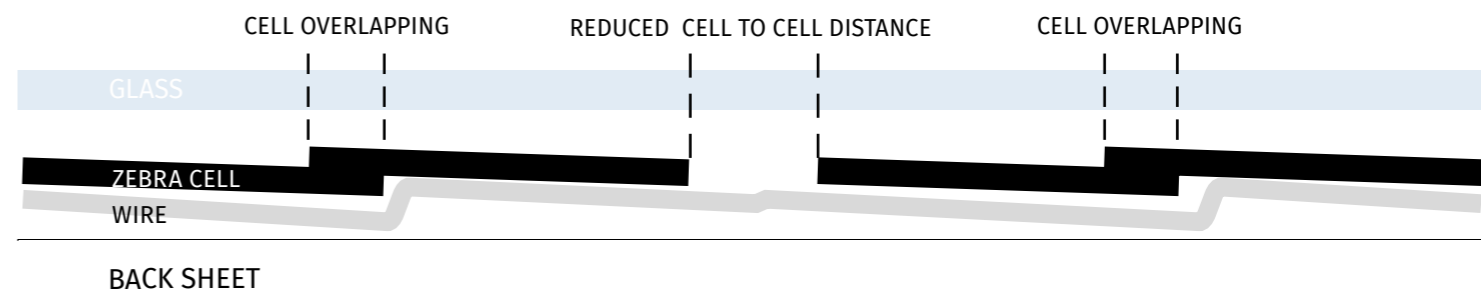
ZEBRA Pro is designed with an innovative cell layout that combines the latest gapless and reduced gap technologies. Two ZEBRA half-cut cells are arranged slightly overlapping, appearing as a full cell and reducing the internal resistance. The resulting cell pairs are connected to each other using reduced gap technology. Reducing and eliminating the gaps between the cells and the strings helps optimize the size of the module and the result is a module with an efficiency level of 21.84 % figuring among the highest in the industry.



M6 half-cut ZEBRA cells with white backsheet



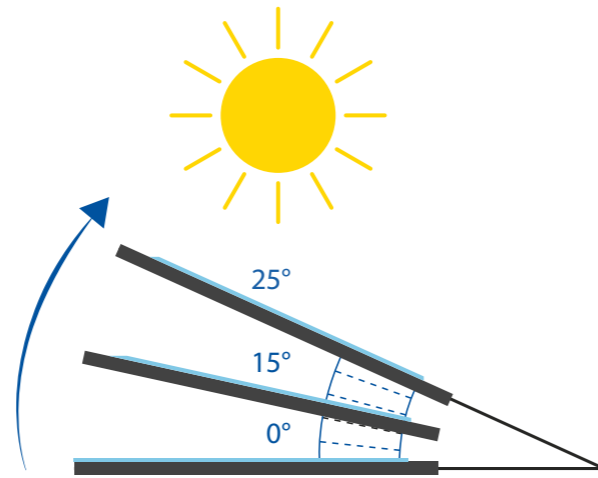
M6 half-cut ZEBRA cells with black backsheet



ZEBRA Pro module

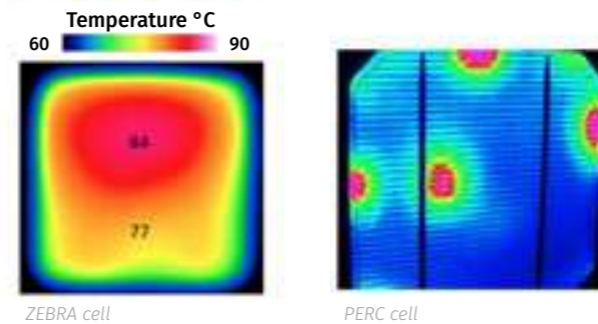
BETTER YIELD WITH VARIOUS TILTS

The installation angle of a PV module affects the yield of a PV system. Compared to traditional modules, **ZEBRA panels have a lower power loss even at higher tilt angles**, which is why they are also particularly well suited for facade installations. But even at low angles of inclination, ZEBRA modules **ensure higher yields than traditional technologies**.



LOWER HOT-SPOT RISK

Thanks to the distributed junction, ZEBRA dissipates in reverse bias conditions the power over a larger area and stays at a lower temperature, **minimizing the risk of damaging the panel**.



IMPROVED LOW LIGHT PERFORMANCE

The ZEBRA cell can **gather more light at every wavelength** thanks to the unshaded front side and even at low irradiation levels ZEBRA maintains high efficiency allowing a better energy yield. Compared to standard cells the biggest differences are found at short and long wavelengths due to better surface passivation. This benefit translates to a **higher output and a longer duration during cloudy days when light is shifted to blue and in the mornings and evenings when light is shifted to red**.



Blue light

Red light

RESISTANT TO LID (Light Induced Degradation) AND LETID (Light and elevated Temperature Induced Degradation)

LID is the degradation of the module arising in the first period of exposure to the sun. 95% of the cells worldwide suffer from this effect, in particular high efficiency cells. LID causes a reduction in efficiency from 1 to 5%. The LeTID degradation combines the effect of light with the effect of high temperatures and can also create power losses between 1 to 6%. **ZEBRA cells are resistant to these phenomena, because N-Type cells are doped with phosphorus and not with boron**. Also, ZEBRA cells do not degrade under UV rays.



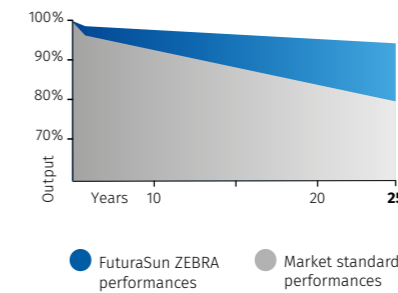
FUTURASUN IS BY YOUR SIDE

FuturaSun guarantees the ZEBRA product series with a **25 year product warranty and a 25 year performance warranty**, guaranteeing a linear degradation of max 0.25%/year as of the second year and a **market leading power stability over time of 93% at the 25th year**.



PERFORMANCE GUARANTEE

Max power decrease
from 2nd year 0,25%/year
1st year degradation < 1.0 %
99 % at the end of 1th year
93 % at the end of 25th year





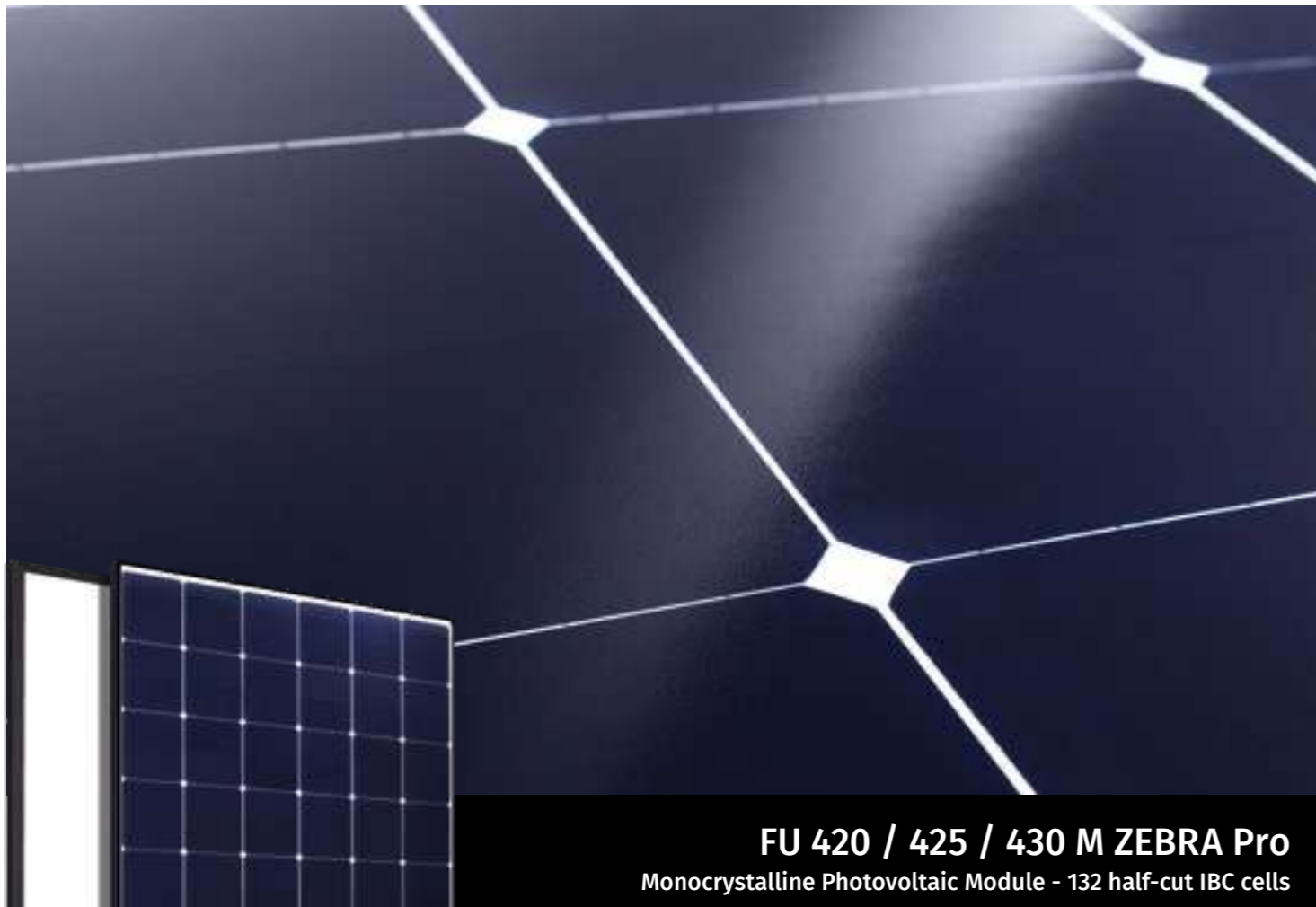
▲ SERBIA - BELGRADE
Commercial roof 10.5 kWp
ZEBRA All Black

POLAND ▶
Commercial roof 23 kWp
ZEBRA

◀ GERMANY - STUTTGART
Commercial facade 7 kWp
ZEBRA All Black

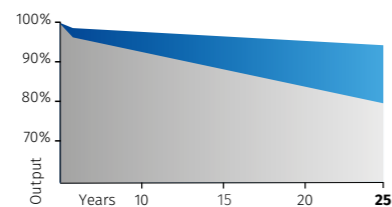
ITALY - MARSALA ▼
Residential roof 5 kWp
ZEBRA





GENERAL FEATURES

- 25-year product & performance warranty
- 132 Half-cut N-Type ZEBRA IBC Interdigitated Back Contact cells
- M6 166 mm cell format
- Superior module efficiency up to 21.84%
- Excellent temperature coefficient -0.29 %/°C
- Market leading power stability over time (93% at the 25th year)
- Lower Hot-Spot risk thanks to the distributed junction of the ZEBRA cell
- Resistant to LID and LeTID
- Improved low light performance
- Better yield with various tilts
- No shading on the cell created by front ribbons thanks to IBC technology
- Improved behaviour under partially shaded conditions



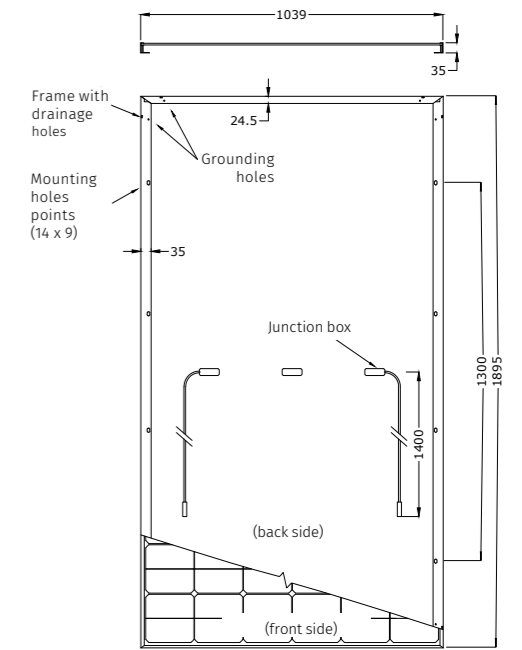
PERFORMANCE GUARANTEE

Max power decrease from 2nd year 0,25%/year
 1st year degradation < 1.0%
 99 % at the end of first year
 93 % at the end of 25th year
 Product guarantee 25 years



MECHANICAL SPECIFICATIONS

Dimensions	1895 x 1039 x 30 mm
Weight	21.0 kg
Glass	High transmission, Low iron, Tempered, ARC, Transparent, 3.2 mm
Cell encapsulation	POE (Polyolefin)
Cells	132 monocrystalline half-cut IBC cells 166 x 83 mm
Backsheet	Composite multilayer film
Frame	Black anodized aluminium frame with mounting and drainage holes
Junction box	Certified according to IEC 62790, IP 68 approved
Cables	Solar cable, length 1400 mm or customized assembled with MC4-compatible plugs
Maximum reverse current (I _r)	20 A
Maximum system voltage	1500 V (1000 V on request)
Mechanical load (snow)	Design load: 3600 Pa 5400 Pa (including safety factor 1,5)
Mechanical load (wind)	Design load: 1600 Pa 2400 Pa (including safety factor 1,5)
Protection Class	II - accordance to IEC 61730



Note: dimensions in mm, tolerance +/- 2 mm

ELECTRICAL DATA - STC*

		FU 420 M	FU 425 M	FU430 M
Module power (P _{max})	W	420	425	430
Open circuit voltage (V _{oc})	V	45.91	46.01	46.13
Short circuit current (I _{sc})	A	11.66	11.76	11.87
Maximum power voltage (V _{mpp})	V	38.74	38.97	39.16
Maximum power current (I _{mpp})	A	10.85	10.91	10.99
Module efficiency	%	21.33	21.58	21.84

ELECTRICAL DATA - NMOT**

		FU 420 M	FU 425 M	FU430 M
Module power (P _{max})	W	316	320	324
Open circuit voltage (V _{oc})	V	44.00	44.10	44.20
Short circuit current (I _{sc})	A	9.42	9.49	9.57
Maximum power voltage (V _{mpp})	V	36.20	36.40	36.60
Maximum power current (I _{mpp})	A	8.73	8.80	8.86

TEMPERATURE RATINGS

Temperature coefficient I _{sc}	%/°C	0.046
Temperature coefficient V _{oc}	%/°C	-0.246
Temperature coefficient P _{max}	%/°C	-0.290
NMOT**	°C	42 ± 2
Operating temperature	°C	from -40 to +85

CERTIFICATIONS

IEC 61215:2016 - IEC 61730:2016 & Factory Inspection
 Fire Resistance - Class C
 Salt Corrosion Resistance IEC 61701



PACKAGING INFORMATION

Quantity / Pallet	36 pcs
Container 40' HQ	900 pcs / 25 pallet

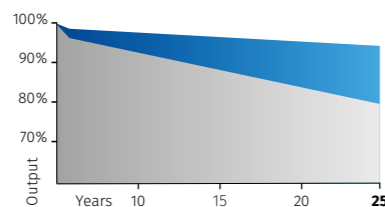
*Standard Test Conditions STC: 1000 W/m² - AM 1.5 - 25 °C - tolerance: P_{max} (±3%), V_{oc} (±4%), I_{sc} (±5%)
 **Nominal Module Operating Temperature NMOT: 800 W/m² - T=45 °C - AM 1.5
 Notice: All data and specifications are preliminary and subject to change without notice



FU 415 / 420 / 425 M ZEBRA Pro
Monocrystalline Photovoltaic Module - 132 half-cut IBC cells

GENERAL FEATURES

- 25-year product & performance warranty
- 132 Half-cut N-Type ZEBRA IBC Interdigitated Back Contact cells
- M6 166 mm cell format
- Total black look without ribbons on the cells
- Superior module efficiency up to 21.60%
- Excellent temperature coefficient -0.29 %/°C
- Market leading power stability over time (93% at the 25th year)
- Lower Hot-Spot risk thanks to the distributed junction of the ZEBRA cell
- Resistant to LID and LeTID
- Improved low light performance
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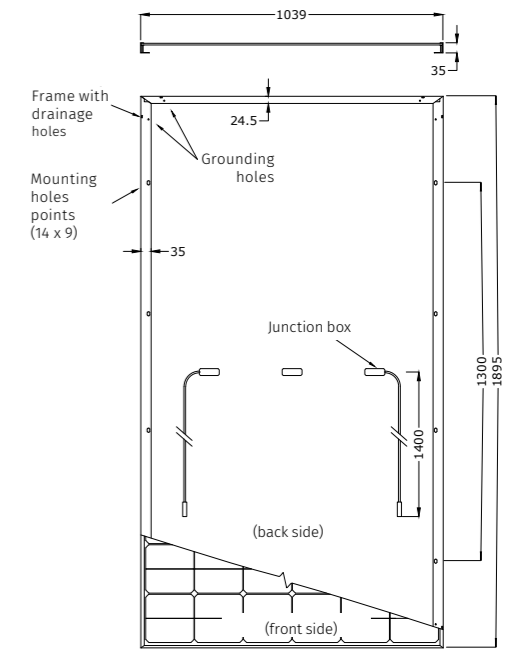
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Weight	21.0 kg
Glass	High transmission, Low iron, Tempered, ARC, Transparent, 3.2 mm
Cell encapsulation	POE (Polyolefin)
Cells	132 monocrystalline half-cut IBC cells 166 x 83 mm
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Protection Class	II - accordance to IEC 61730



ELECTRICAL DATA - STC*

		FU 415 M	FU 420 M	FU 425 M
Module power (P _{max})	W	415	420	425
Open circuit voltage (V _{oc})	V	45.85	45.91	46.01
Short circuit current (I _{sc})	A	11.57	11.66	11.76
Maximum power voltage (V _{mpp})	V	38.57	38.74	38.97
Maximum power current (I _{mpp})	A	10.78	10.85	10.91
Module efficiency	%	21.10	21.30	21.60

ELECTRICAL DATA - NMOT**

		FU 415 M	FU 420 M	FU 425 M
Module power (P _{max})	W	312	316	320
Open circuit voltage (V _{oc})	V	43.90	44.00	44.1
Short circuit current (I _{sc})	A	9.33	9.41	9.49
Maximum power voltage (V _{mpp})	V	36.00	36.2	36.40
Maximum power current (I _{mpp})	A	8.67	8.73	8.80

TEMPERATURE RATINGS

Temperature coefficient I _{sc}	%/°C	0.046
Temperature coefficient V _{oc}	%/°C	-0.246
Temperature coefficient P _{max}	%/°C	-0.290
NMOT**	°C	42 ± 2
Operating temperature	°C	from -40 to +85

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