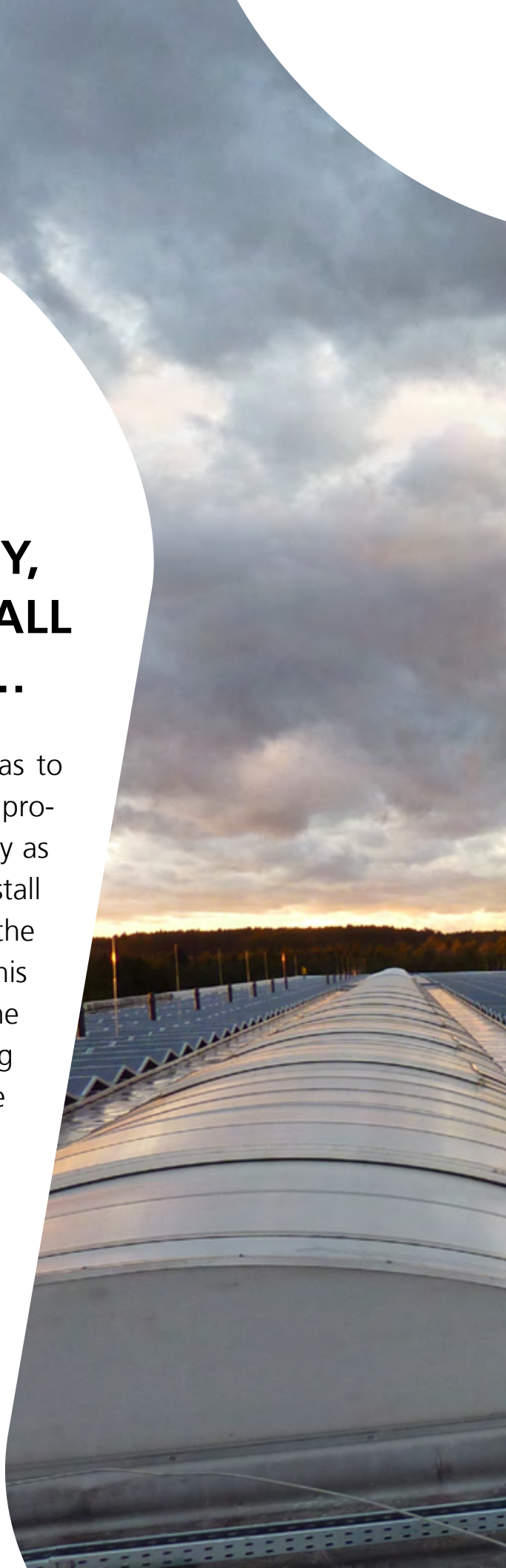
WINAICO®

Power to Perform

WHAT WILL THE FUTURE BRING? LOTS OF SOLAR ENERGY!

PERFORMANCE, DURABILITY, COST-EFFECTIVENESS: IT'S ALL A QUESTION OF QUALITY …

Anyone who opts for a photovoltaic system has to look far ahead – ultimately this system has to produce as much clean and cost-effective electricity as possible for 25 years and more. Only if you install a high-quality system will you really achieve the promised high performance you want over this prolonged period. In order for you to make the right decision, we'll show you on the following pages why WINAICO photovoltaic modules are better – and the benefits they produce for you in reality on your roof, day by day and year after year. For every situation and scope of project WINAICO has an economically sen-sible solution – ask a WINAICO technician you trust for advice.



What do you have to think about with a PV system? Everything …

WINAICO has one goal: every single photovoltaic system is intended to provide maximum performance on your roof for decades and be a worthwhile investment for you. We are dedicated to achieving this goal in every single detail and every single module – with plenty of passion and uncompromising consistency. At every stage of the entire process chain we ensure quality and test it thoroughly. This is how we guarantee that only flawless modules are installed that adhere to or exceed their promised performance.

Perfection due to monitored flow of goods

We at WINAICO want you to have nothing but perfect quality. Which is why we have installed a strict, seamless quality management system from incoming goods inspection throughout the entire production chain to 100 % visual, micro-optic, mechanical and electrical pre-delivery inspection of each individual module.

Reliability on the roof with hot spot testing

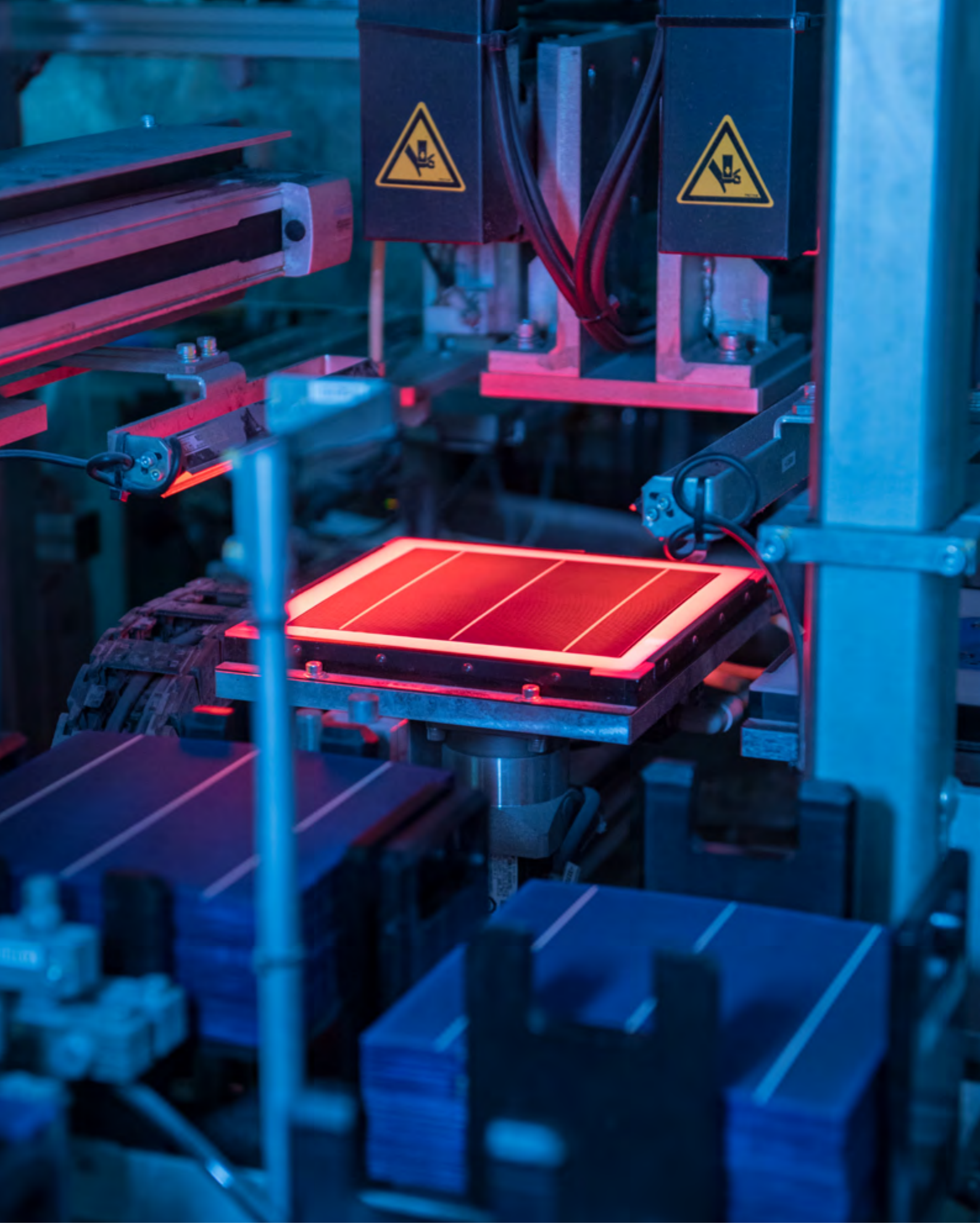
There is something that all owners of photovoltaic systems fear – the hot spot effect or overheating of one section of the module, which in extreme cases may cause a fire. WINAICO inspects its cells 100 % by applying a reverse current. With this specially developed and defined procedure we enable damaged hot spot cells to be isolated and thus reduce the risk of fire.

100 % error-free thanks to EL testing

All the cells and finished laminates are examined with a special electroluminescence testing device for internal damage. This means micro-cracks, hot spots, soldering errors and other defective structures that cannot be seen with the naked eye can be virtually ruled out. A kind of X-ray provides evidence of 100 % cell quality – and it does so with every single module.

Peak performance in practice thanks to direct sales

For peace of mind all WINAICO photovoltaic modules are shipped directly from our own warehouse to local specialist partners. This ensures that only tested, traceable modules at the cutting edge of technology get delivered straight to you.



WINAICO attaches great importance to non-contact production processes. The busbars are soldered in a high-precision process to what are known as strings. Highly reflective strips are then attached to the front and back of the cells.

What differentiates quality modules from the rest? Component selection ...

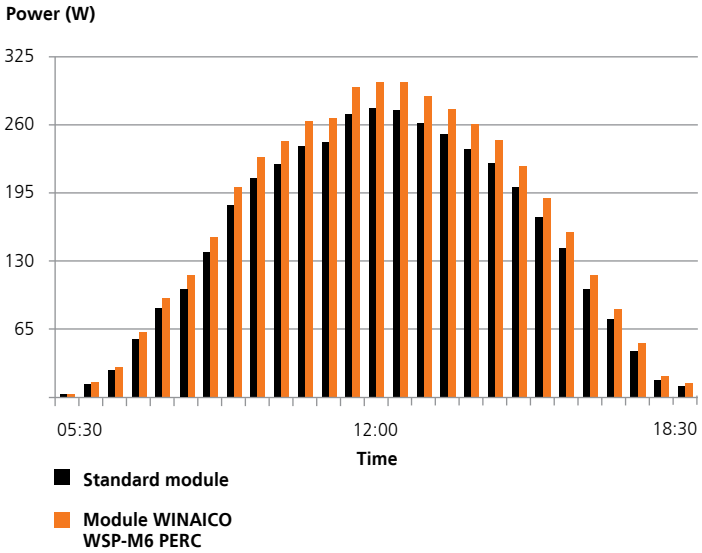
With WINAICO modules, you purchase products from a manufacturer who specialises in premium quality solar modules. Comprehensive experience and expertise from the semiconductor sector, coupled with ultramodern production technology, enables high process mastery and outstanding quality. As such, with HeatCap® WINAICO has once again further developed its technology and set a new standard.

The cells: the module's generator.

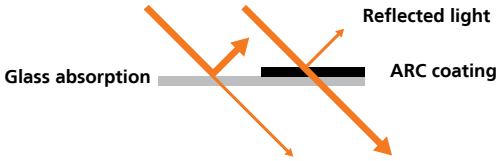
The solar cells are crucial for the module's output. For the industry's most efficient modules, WINAICO selects only PERC-based solar cells from Taiwan with the highest efficiency level. An anti-reflective coating and degradation-free technologies increase the cells' efficiency and ensure long-term reliability. In order to spread the load on the cells in the module evenly, WINAICO selects cells with minimal variance before production and thus avoids localised thermal loads (hotspots) and achieves a high energy yield even in poor light conditions.

PERC technology.

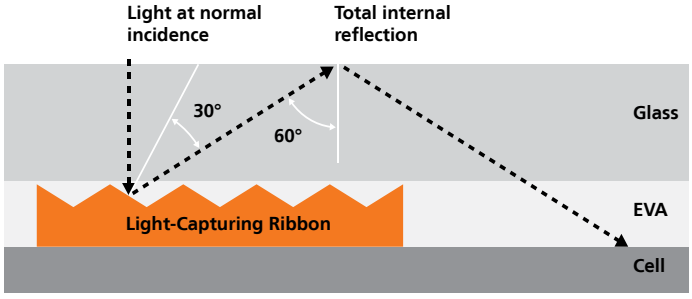
PERC stands for Passivated Emitter and Rear Cell and the resulting improvements in temperature and low light behaviour increases module efficiency by up to 1 %.



Glass: the transmitter of light.
WINAICO uses highly transmissive front glass – this has a direct positive effect on the module's performance and yield. The additional anti-reflective coating on the glass reduces the amount of reflected light and increases the amount of light absorbed by the solar cells by 2.5 %. It contributes to the module's superior efficiency and mechanical stability. The glass also protects the components inside from the weather and other external hazards.



Contact strips: the clever transport network.
WINAICO chooses highly reflective contact strips, so the rays of light falling on the strips are absorbed by the solar cells with total internal reflection. The result is a light absorption increase of 2.5 % – and therefore enhanced module efficiency. The more contact strips that are placed in the cell (e.g. 3 or 4-bus bar), the more electricity can be fed into the electrical system without loss.



The back sheet: the protective coat.
Back sheets protect the components from steam and other external influences. The back sheet used by WINAICO is particularly weather-resistant and is considered the only proven film that reliably protects photovoltaic modules throughout their entire life of more than 25 years.

The back sheet material is also of low flammability and thus increases the module's fire safety. The highly reflective surface on the back is capable of directing sunlight back on to the solar cells, which increases the energy balance of the individual modules even more.

The EVA film: the reliable contact area.
EVA films connect the solar cells to the glass surface and encapsulate the module. If they are of poor quality, they may come loose and turn yellow. The quality film used by WINAICO guarantees the insulation and protective effect for the entire lifetime of the module. It increases the module's output by 3 % and ensures consistent energy production.

The frame: the stylish stabiliser.
The frame protects the internal laminate from thermal and mechanical stresses. The unique frame of WINAICO modules made from solid aluminium ensures maximum stability and protection from material fatigue. The special L-shaped aluminium corner pieces guarantee the highest level of torsional stiffness and water tightness. WINAICO works with leading research institutes to test the mechanical resilience of frame designs and continuously improve them. Each latest generation module is capable of bearing more than 1,300 kg of snow without doing any damage.

The junction box: safe contact.
The junction box enables the solar module to be connected to the external electrical system. The junction boxes used by WINAICO prevent power losses by means of low electrical resistance and efficient energy transfer. The IP65 protection system provides ideal protection from moisture, dirt and UV rays; IP67 rated connectors withstand the penetration of water for 30 minutes at a depth of one metre and remains safe even when cable trays are flooded during long rainy seasons. Genuine MC4 connectors are available for regions where MC4-compatible connectors are prohibited.

The adhesive tape: the flexible seal.
The adhesive tape connects the aluminium frame and the glass. Unlike a silicone seal the adhesive tape has very high resistance to heat, UV light and chemical attacks, such as ammonia. The adhesive tape used by WINAICO provides an excellent seal against dirt and moisture, is particularly resilient and compensates for the different expansions of glass and aluminium without causing stress. The result is a reliable and long-lasting adhesive.

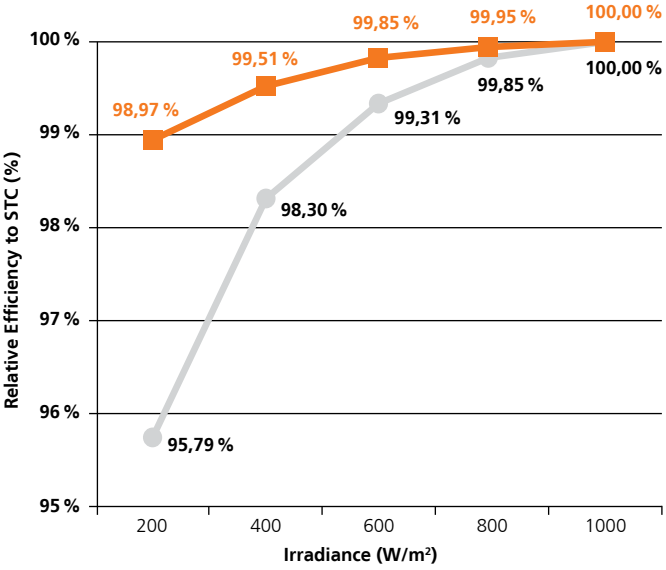
Stability is only one of many quality features for WINAICO. The fully automatic frame assembly is the last step before every single module goes through WINAICO's quality testing.

What's better than keeping a promise? Going beyond expectations!

Lasting high performance is created when highly efficient solar cells and the best module technology come together. What is true here too is that the overall quality of each product is only as good as its weakest element. This is why WINAICO insists solely on first class, weather-resistant components from certified suppliers. This makes it especially possible to produce durable modules with long-lasting performance.

Strong low light capability

With blue skies and brilliant sunshine a photovoltaic system produces the most electricity – but our weather is often different in reality. Around two thirds of the average annual radiation is in the low light range – this is what is referred to as radiation intensity that is significantly below 1,000 W/m². WINAICO modules are also effective in the low light range – tests have shown that their relative efficiency is at 99 %. In practice this also means the system starts producing electricity earlier in the morning and stops later in the evening. This results in a high level of efficiency overall and an increase in yield of 3 %.



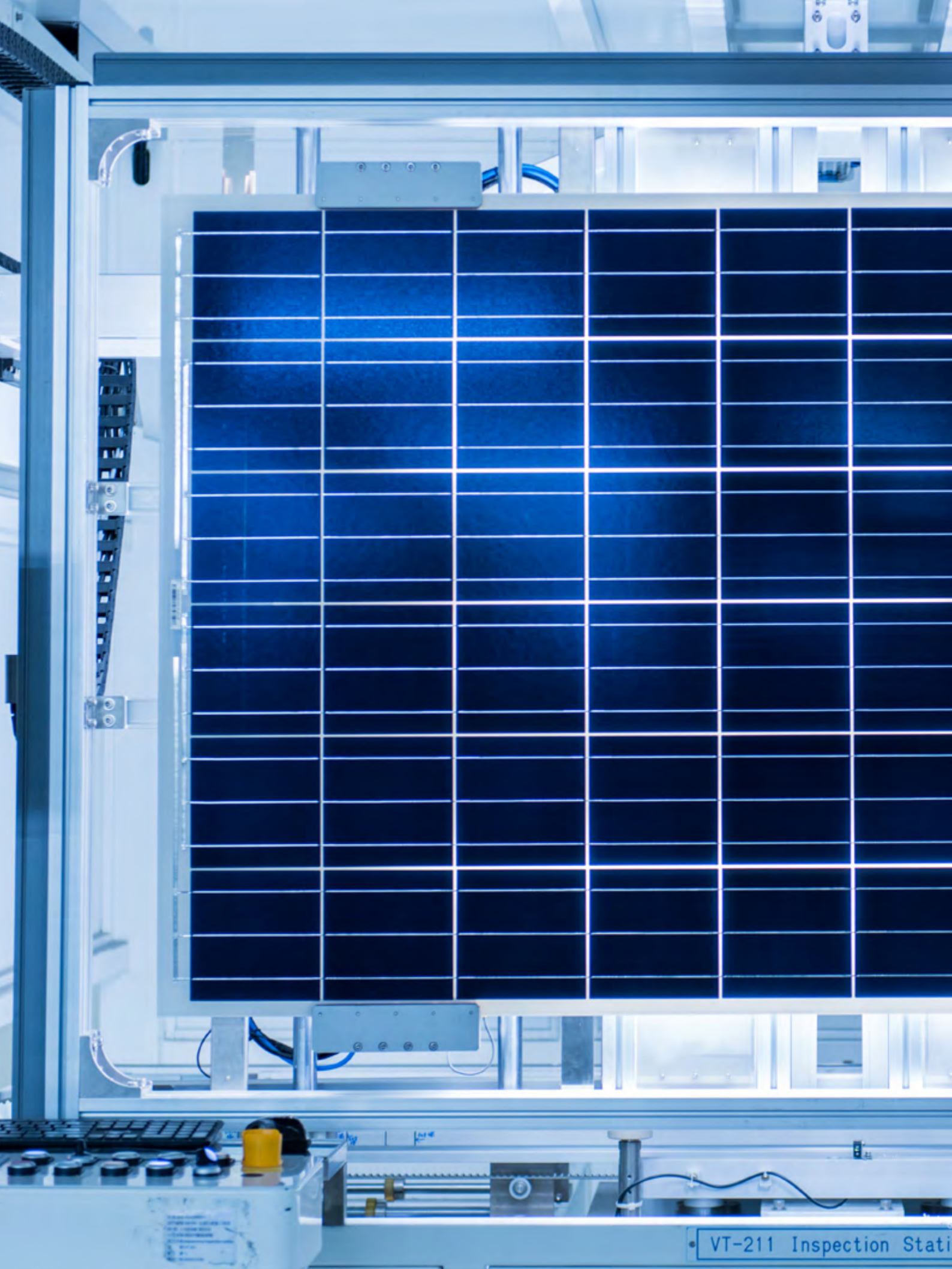
Low serial resistance

WINAICO panels have a Serial resistance (RS) < 0.48 Ω. Usually you will not find indications of serial resistance on the flash list provided by the manufacturers. Check the values on the flash list; quality-oriented producers show the serial resistance of each panel. Serial resistance provides information on the number of electrical resistances in a module. The lower the resistance the higher the yield of a solar panel. High-performance solar modules have a serial resistance below 0.48 Ω.

High fill factor

WINAICO panels have a fill factor (FF) > 76% Fill factor describes the performance of the panel. The closer the fill factor is to 100 %, the higher the performance of the panel. High-performance panels have a fill factor of at least 76 %. Normally you will not find an indication of the fill factor on the flash list from other producers.

Check the values on the flash list; Quality-oriented producers will show the fill factor of each solar panel.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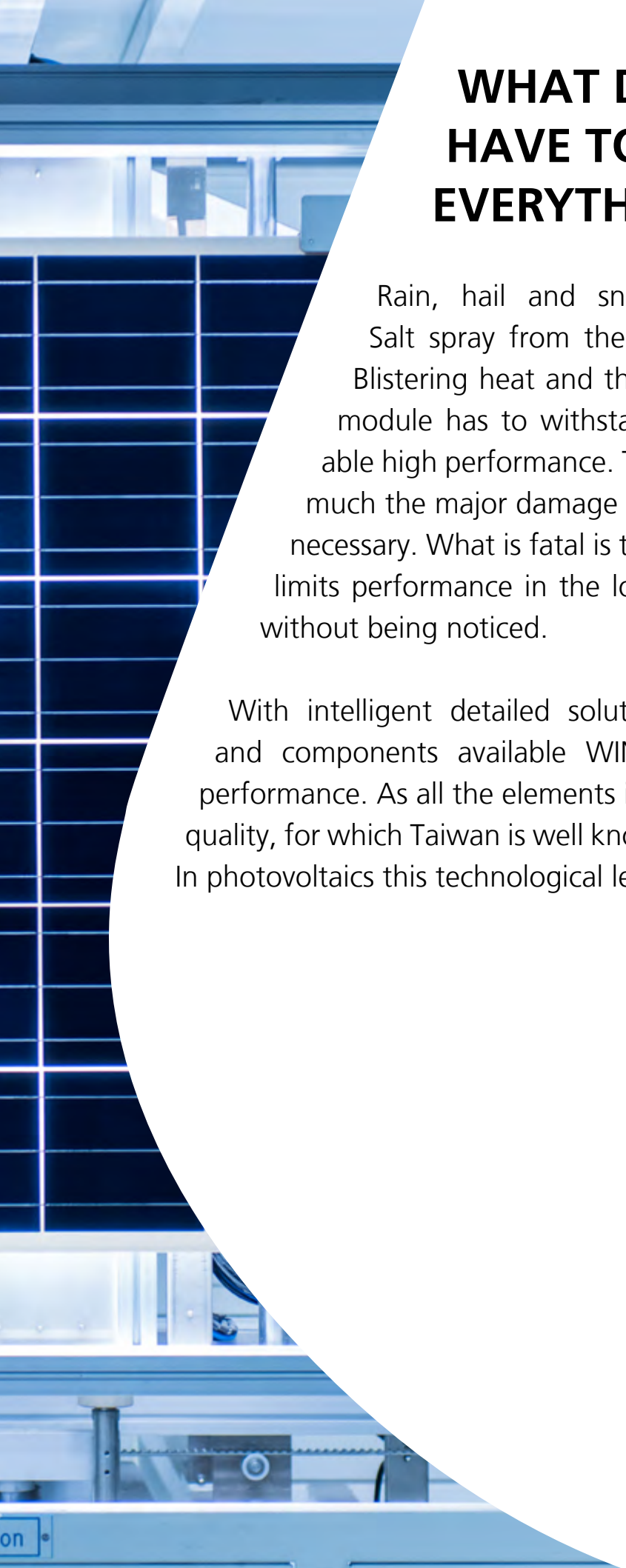

WHAT DOES A PV MODULE HAVE TO WITHSTAND? EVERYTHING!

Rain, hail and snow. Wind, storms and hurricanes. Salt spray from the sea and ammonia from agriculture. Blistering heat and the bitter cold. In reality a photovoltaic module has to withstand a great deal and still deliver reliable high performance. The problem in terms of yield, is not so much the major damage you can see straightaway and repair if necessary. What is fatal is the small, almost invisible damage that limits performance in the long term and often reduces the yield without being noticed.

With intelligent detailed solutions and the best quality materials and components available WINAICO modules reliably ensure top performance. As all the elements interact perfectly, the result is superior quality, for which Taiwan is well known for in the semiconductor industry. In photovoltaics this technological leadership is sustained.

From goods receipt inspection of each cell to final inspection of each module, every detail counts. Only 100 % verified and error-free modules are released for shipping at WINAICO.

What are regulations and standards for? To be exceeded!

Regulations and standards certainly make sense. They give you as a user or investor an assurance that certain minimum standards are met. But for us at WINAICO this isn't enough – because in reality the minimum standard simply doesn't make the grade. WINAICO modules easily pass all the relevant tests and exceed the default values significantly in all parameters. What this means is obvious on your roof later on; our modules can withstand wind, weather and other adverse conditions far better and for far longer. Our superior quality means WINAICO can issue a product guarantee for 15 years and a high power output guarantee for 25 years.

+ The thermal shock test measures how the modules withstand thermal stresses due to changes in temperature. As such, they are cooled down from +85 °C to –40 °C and then reheated to +85 °C.

+ The damp heat test checks how the modules are capable of withstanding humidity and heat (85 °C at 85 % relative humidity) over a prolonged period.

+ The mechanical load refers to the pressure a module can endure due to snow, for example. While the IEC standard requires only 5,400 Pa, WINAICO modules can always bear a load of up to 10,000 Pa, which is equivalent to about 1,020 kg per square metre.

+ In the hail test WINAICO modules have to deal with four times the kinetic energy prescribed by the IEC standard – and withstand it easily. Even if it is hailing golf balls, this is no problem for WINAICO modules.

+ Dynamic mechanical load refers to a change in pressure, due to strong winds and squalls, for example, in which WINAICO modules have to withstand 4,000 Pa for 1,000 cycles, a test that is not required by the IEC.

+ Due to potential-induced degradation (PID) yield losses of 20 % and more may occur in conventional photovoltaic systems. Long-term tests show that this effect could be reduced to a minimum in WINAICO's modules.

+ High concentrations of salt in the air are aggressive environmental factors that may have an influence on the output of PV modules. Certification to IEC 61701 guarantees consistently high-energy yields even for sites with high concentrations of salt and ammonia gas.

+ Ammonia emissions from livestock may also accelerate the ageing of PV modules, which results in falling energy yields and therefore a lower return for the system operator. WINAICO modules are tested for resistance to ammonia to alleviate this risk.

WHERE CAN I SEE TRUE QUALITY? ON YOUR ROOF!

Photovoltaic professionals know the quality and performance of photovoltaic modules are not simply written on datasheets, but installed on actual roofs. Quality modules are designed to provide a rich and reliable harvest of energy, day after day and year after year. The reference projects are the unbiased evidences that WINAICO modules are vastly superior to other well-known brands.

A good reason why experienced installers recommend WINAICO is because great performance lasts!

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CHECKLIST: HOW TO CHOOSE THE BEST PHOTOVOLTAIC SYSTEM!

The price of a solar electricity system is certainly an important consideration but it should not be the only one. With a service life of at least 25 years the quality of the components and the installation work are very important factors.

In general, when making a decision on your purchase, you should pay attention to the following points.

- Ask to see **guarantees** and **certificates**.
- Pay attention to the quality of workmanship and ask to see **samples**.
- Ask about **reference systems** that exist in your vicinity.
- Ask to see the **yield data of existing systems**.
- Do not buy a system based on a description or a photo.
- Ask for an **evaluation of economic efficiency** to be drawn up and explained to you.
- Find out more about the **components' origins**.
- Does the manufacturer have a local warehouse for **quick product dispatch**?
- Can you get hold of the manufacturer in **case of a complaint**?
- Find out more about people's **experiences** with solar systems put in by the installation company.

WINAICO supports you in your search for a photovoltaic system from the start. Get in touch with us today.

Your local partner

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