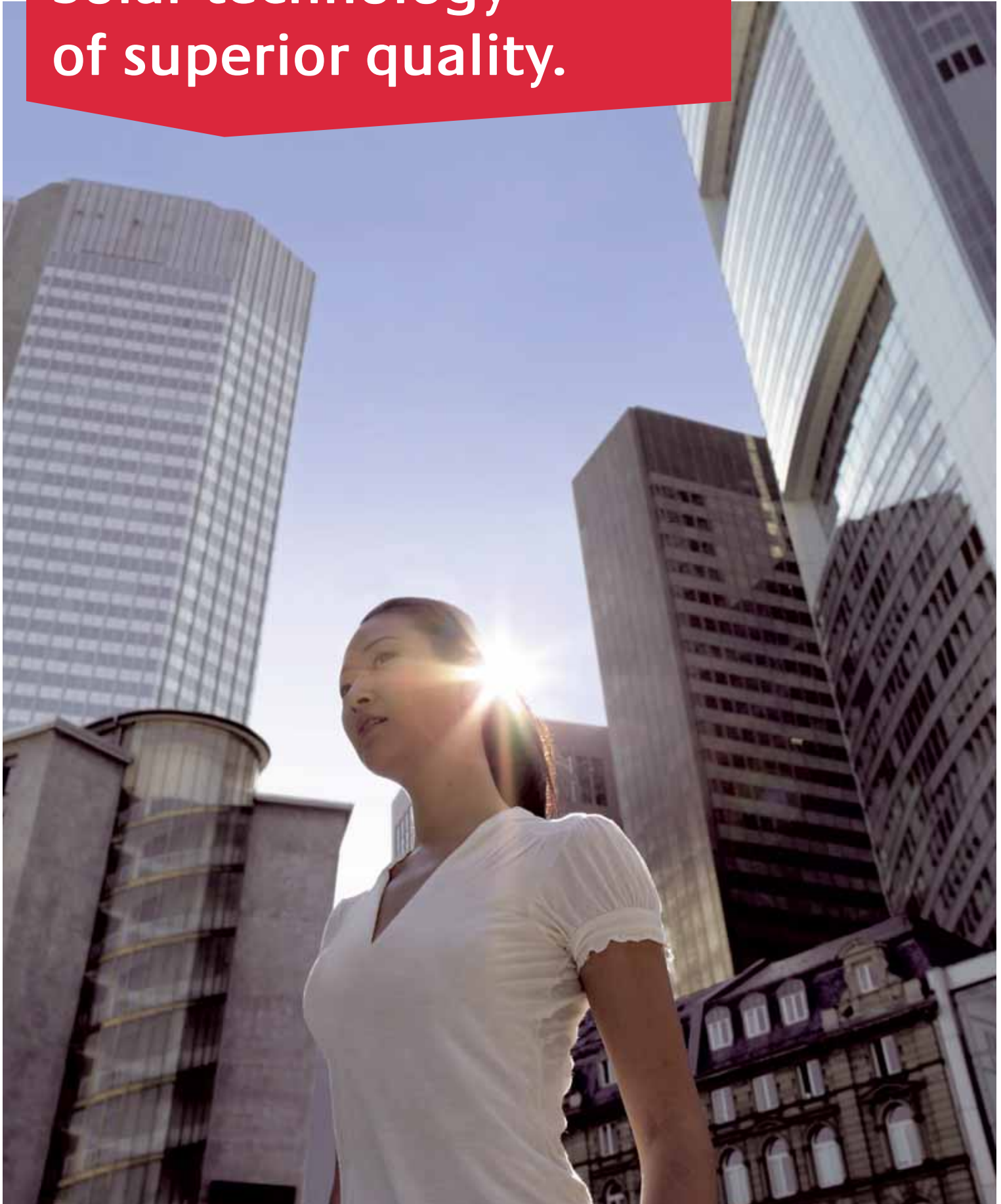




SOLAR

We care! Since 1975.

Solar technology  
of superior quality.



**The future poses many questions.  
Together, we can answer them:**



*Solar energy will be a key factor in a future shaped by alternative energy. At Kyocera Solar we are among the pioneers of photovoltaic technology. For over 35 years we have been pursuing our vision, unswervingly and successfully – solar energy for everyone.*

**Climate change and shortage of energy sources – the biggest challenges we face today.**

Global warming and the shortage of fossil fuels are among the major challenges we are facing today. If we want to safeguard the future of our planet and our quality of life we must stop climate change and provide a widely available and sustainable energy supply. To achieve this Kyocera Solar focuses on electricity from solar energy: photovoltaics.

**Acting now to safeguard tomorrow's world: We care!**

We started exploiting solar energy at a very early stage. For over 35 years we have been working hard to advance this technology and make solar energy accessible to everyone – worldwide. In preventing supply shortages and protecting the environment we are facing up to our responsibility for this planet.

This brochure will provide you with important information regarding our company and solar modules. For the sake of future generations!



*Kyocera Solar is a strong and experienced partner. We have in-depth knowledge in the field of photovoltaics and always rise to new challenges. Our company's development is evidence of our success: a steady rise to the top of the photovoltaic industry.*

**Kyocera Solar – a driving force for solar energy.**

As pioneers in the field of photovoltaics we have played a part in realising numerous solar energy solutions around the world. Today we are among the world's leading manufacturers in the solar industry.

When the going gets tough we get going and this is why we have come as far as we have. We implement sophisticated large-scale projects and aim to supply people with electricity, no matter how remote their location. The experience we have gained over the years benefits our customers worldwide.

 **KYOCERA** = **KYO**to **CERA**mics

**Founded:** 1959 in Kyoto, Japan



**Commencement of solar technology activities:** 1975 with Japan Solar Energy Corp. (JSEC)

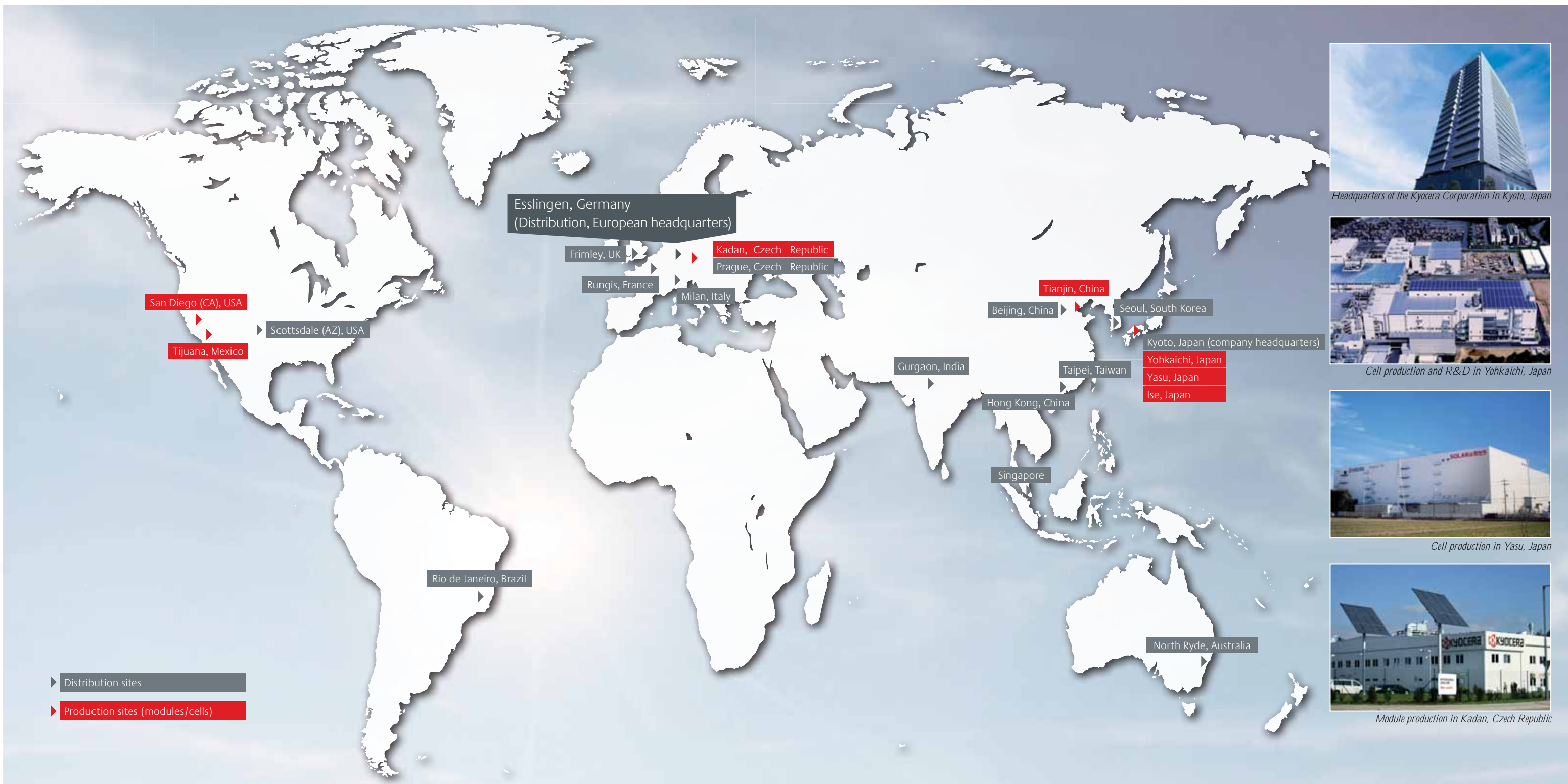
**Number of employees:** Around 66,600 at 208 locations worldwide

**Areas of activity:** Information and communication technology, environmental protection and quality of life

**Services:** Comprehensive network of development, installation and maintenance services

**We care!**  
So that the photovoltaics success story will continue!





Headquarters of the Kyocera Corporation in Kyoto, Japan



Cell production and R&D in Yohkaichi, Japan



Cell production in Yasu, Japan



Module production in Kadan, Czech Republic

**The global Kyocera group – a strong partner.**

Kyocera Solar is part of the Japanese Kyocera Corporation, a future-oriented and globally active concern. Since its foundation in 1959, the corporation’s global presence and product portfolio have been expanding on a continuous basis. Our motto is consistent and healthy growth. Our positive balance sheets in the last decades are evidence that this is the right approach: even in difficult economic times, we have always been profitable. This is due, among other

factors, to our broad positioning in various sectors. This solid basis allows us to look to the future with optimism. The company’s stability ensures that our partners can rely on lasting, dependable co-operation.

**We aim for healthy growth.**

By 2013 Kyocera Solar plans to have increased its annual solar module production to one gigawatt. The centre of our solar cell production is located in Yohkaichi, Japan, with Yasu acting as a second centre since 2010. We are also present in Europe. Our module assembly site is situated

in Kadan, in the Czech Republic. Furthermore, we have branches in all major European countries. Customer proximity is of great importance to us. We consider ourselves as an excellent partner that provides support for all your questions or problems.

*Top quality depends on sophisticated technologies and strict regular controls. We rely not only on external test agencies but also carry out relevant tests internally. The two most important issues in this context are efficiency and service life.*



**Innovative top technology by Kyocera:  
Always a step ahead.**

Kyocera Solar was the **first company** worldwide to introduce serial production of polycrystalline silicon solar cells. We have maintained this leadership until today. Our production technology is always state-of-the-art and is subject to continuous development as part of our extensive research and innovation programme. This allows us to set new records regarding the durability and efficiency of our solar cells. Our **internally developed and patented** “reactive ion etching” process, which increases the light yield through reduced reflection, is a case in point. Over the years we have also optimised our silicon casting process for solar cell production.

**Our time and effort ensures top quality.**

Kyocera Solar stands for a quality that is far above the average. We are one of the few companies on the market that can carry out all production steps at its own manufacturing sites. This **vertical integration** gives us total control over our product quality. Furthermore, it helps us guarantee the performance of each cell and thereby reduces the number of module types to one per performance class. With less storage space required for individual module types and equipment that can be configured faster with only one system, we can offer wholesalers and installers greater planning security.

**Breaking new ground on the road:  
Kyocera solar technology for the Toyota Prius.**

With Kyocera comfortably fulfilling the strict requirements under the Toyota quality management rules, our solar modules have now been integrated into the third generation of the Toyota Prius. The innovative technological concept: a solar-powered system ventilates the passenger compartment while the vehicle is parked.



Our sorting process – the so-called ‘**pairing**’ process – represents another great advantage for our customers. On a pallet containing 20 modules the modules are always paired in such a way that, together, they always achieve the rated power.

All modules leaving our factory have a high efficiency and optimum area utilisation. They are accompanied by the performance data (flash data) as measured at the factory to provide our customers with a control medium.

Our internal tests, which are even more stringent than the controls typically applied in the sector, play an important role in the manufacturing process. Each individual solar module component is tested for its properties and suitability, and is subsequently subjected to real module tests.

**We care!**  
Especially where in-depth research  
and quality assurance are concerned.





**Consistent implementation of quality assurance.**

Each module is produced in a clearly defined development process:

**1. Analysis of product requirements:**

- visualisation of the individual system requirements and tailor-made design

**2. CAD model development:**

- sophisticated computer simulation of the installation, identifies specific loads and environmental impacts
- e.g. computer-aided temperature analysis tests sensitivity to temperature deviations

**3. Sample testing:**

- verification of simulation results by means of practical tests
- e.g. loading analysis: simulation of a complete installation with modules subjected to maximum load, subsequent comparison to recorded CAD model development data
- e.g. cyclical short-term and long-term loading analysis
- e.g. vibration analysis testing resistance to vibrations

**4. Product design:**

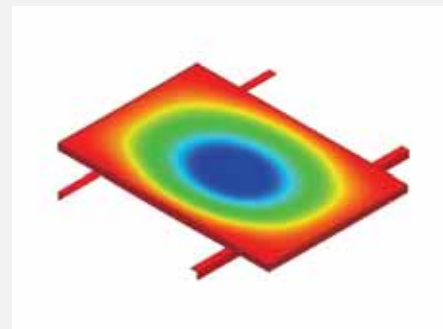
- development of modules based on the test results

**5. Long-term tests:**

- implementation of extensive and stringent tests
- electroluminescent recording: random samples taken to test the function and condition of the solar cells

New test results are always compared to our extensive database of completed simulations, thereby ensuring the validity of the tests.

The results are included in the database and thus add to our extensive know-how.



Loading analysis and comparison with CAD model development

Electroluminescent recording

**100% KYOCERA development } vertical integration } 100% quality product**

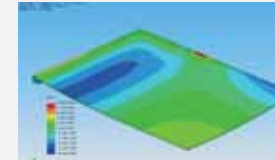
**Development process**

Analysis of product requirements



- Analysis of environmental conditions
- Failure modes and effect analysis

CAD model development



- Data acquisition
- Structural analysis
- Thermoanalysis

Sample testing



- Loading test
- Vibration analysis
- Bending test

Product design



Long-term tests



- Damp Heat test
- Thermal Cycling test

**Production process**



Polysilicon



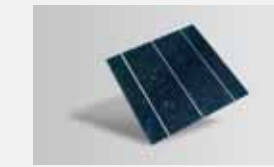
Cast silicon block



Sawn silicon ingots

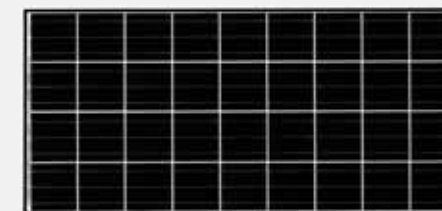


Wafer



Polycrystalline solar cell

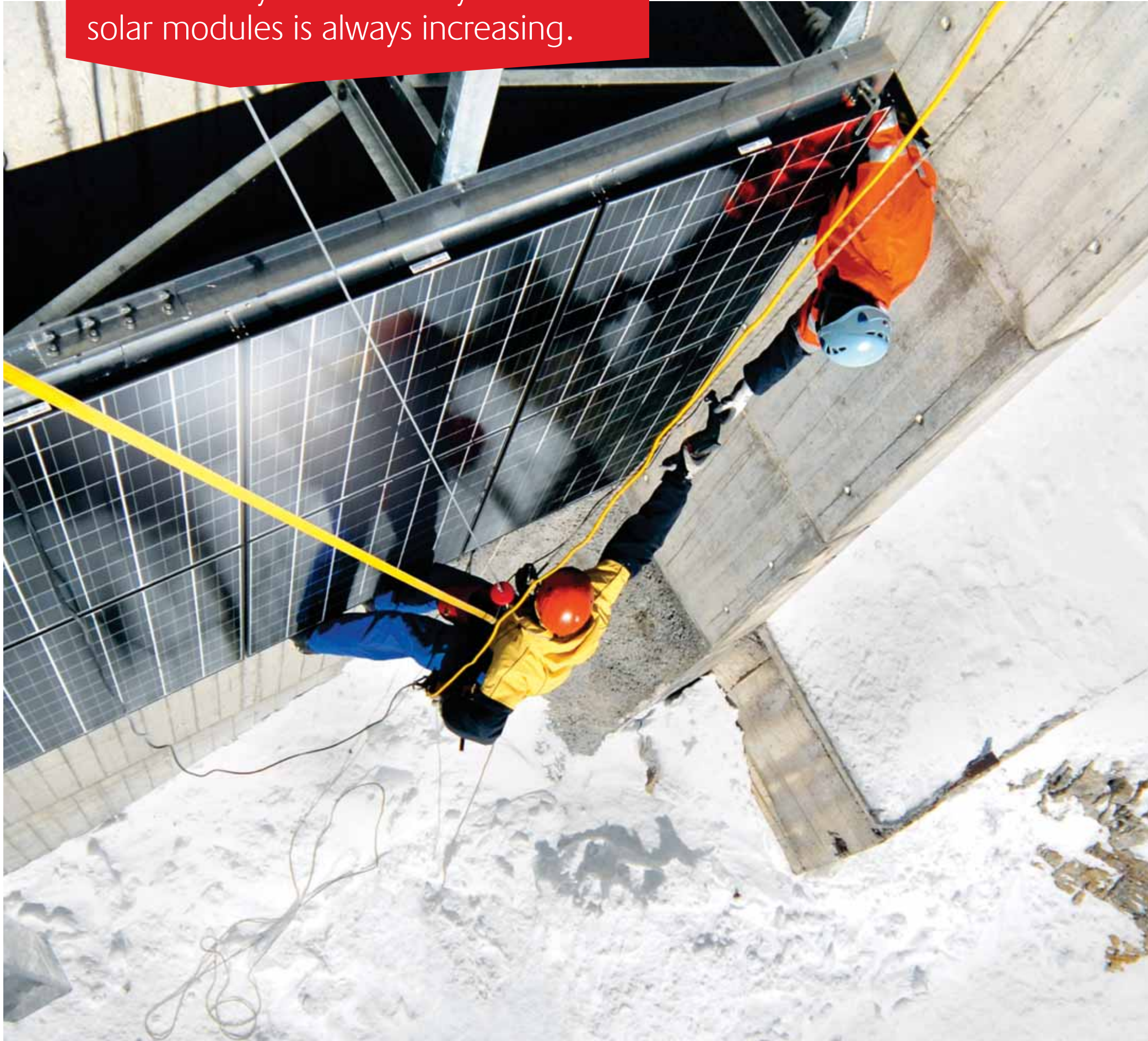
Module



Vertical integration is a special feature of our production process at Kyocera.

## We care!

Which is why the efficiency of our solar modules is always increasing.

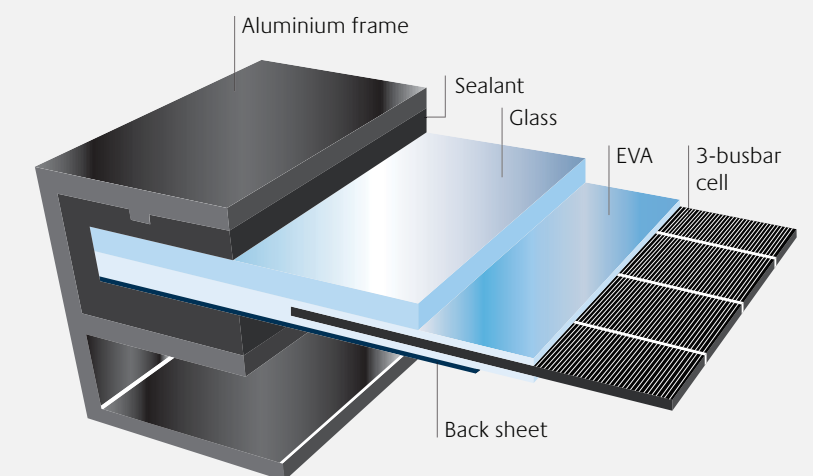


*Efficiency is a key quality feature of all solar modules.*

*It describes the ratio between incoming solar energy and the electrical output produced. Hence, the higher the module's efficiency, the more powerful and profitable it is.*

### Structure of our solar module

The solar module's structure is a decisive factor for high efficiency and a long service life. The module must be protected from external impacts at all times. Both sides of our solar cells are embedded in EVA foil. The top is additionally protected by glass covering on the front side (tempered safety glass) and the bottom by a back sheet. The foils and the glass are resistant to both weather and dirt. Enclosed by a sealant, the protected solar module is mounted in a black anodised aluminium frame.



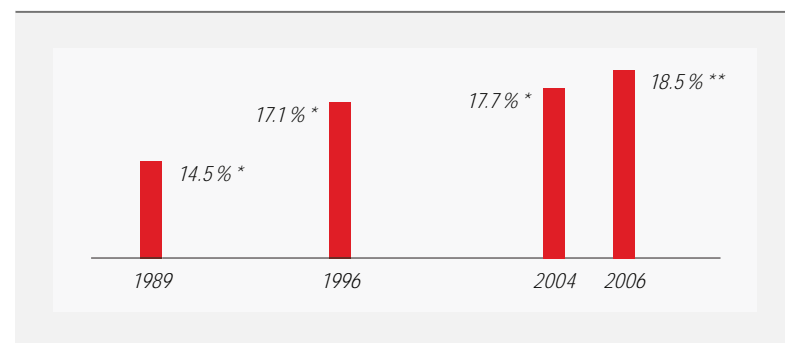


**Kyocera Solar's patented "reactive ion etching".**

The efficiency of a solar cell mainly depends on the degree of reflection on the cell surface. This determines how much light reaches the cell's transforming layer. The patented "reactive ion etching" process allows Kyocera Solar to increase cell efficiency to over 16%; in the laboratory, values of up to 18.5% have been recorded. Pyramid-like roughening of the surface on a micron-scale results in multiple reflection of light, leading to increased yield. This process is also referred to as "d.Blue" as it makes the cells appear dark blue and homogenous. As a beautiful side-effect, the new surface character gives the modules an attractive appearance.

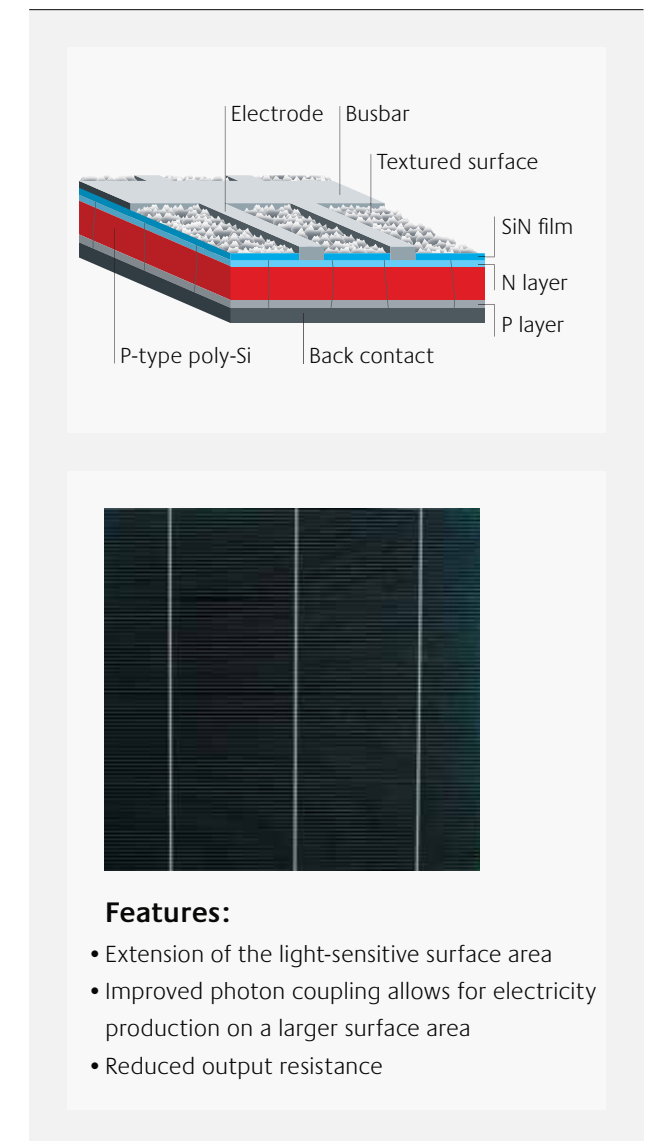
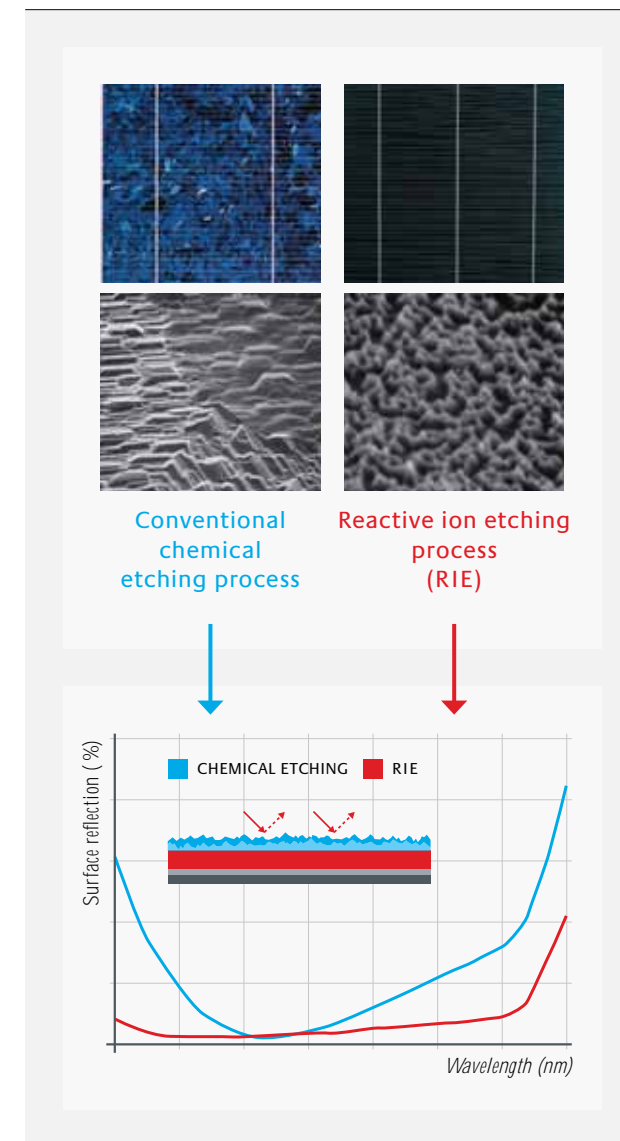
**3-busbar cell technology guarantees even higher efficiency.**

The development of Kyocera Solar's 3-busbar cell technology is another success story. We are the **first company** to use 3-busbar cells in mass production. The cells have a larger active area to absorb solar radiation. However, their main advantage is optimised cell contacting. Compared to traditional 2-busbar versions, this new version boasts reduced electrical losses and increased efficiency.



In 1989, 1996, 2004 and 2006, Kyocera Solar achieved the highest efficiency worldwide for polycrystalline cells.

Efficiency for quadratic polycrystalline solar cells  
\* 15 x 15 cm, \*\* 15 x 15.5 cm



**Features:**

- Extension of the light-sensitive surface area
- Improved photon coupling allows for electricity production on a larger surface area
- Reduced output resistance



**We care!**  
To ensure that our solar modules stand out for their extreme durability.



*We are confident of our products' long service life and guarantee them without hesitation. We, Kyocera Fineceramics GmbH, headquartered in Esslingen, Germany, guarantee all Kyocera solar products. This therefore ensures simple communication and a rapid response through our local service teams. Furthermore, we work closely together with Kyocera Japan.*

**A solid frame as a prerequisite for a long service life.**

Our solar modules are mounted in a weather-resistant aluminium frame – a further component contributing to the system's durability. The module frames are black anodised to protect them against external impacts and are also coated to ensure extremely high corrosion resistance and

durability. Meeting the extended requirements under IEC 61215 ed. 2, their mechanical load capacity is 5,400 N/m<sup>2</sup>.

Our module frames have further important advantages: they are easy to install and, thanks to the compact module

sizes in relation to their high efficiency, the available surface space can be put to optimum use.

The drainage holes on the module frames' interior allow for safe drainage and prevent frost damage. This prevents blockage of drilled holes by the mounting system.

Laser-engraved, weather-resistant serial numbers on the frame ensure easy identification of the individual modules without having to disassemble them on the roof.

**A good junction box serves as efficient fire protection.**

Photovoltaic systems must be perfect in order to guarantee both durability and, in particular, safety. When systems are connected to the grid faulty electrical connections may set the junction box on fire. Hence, Kyocera Solar has replaced traditional clamping joints with high-quality soldered joints. This technology protects against corrosion and overheating. The junction box, which is manufactured exclusively using fire-retardant components, has been classified in the highest non-flammability class (5VA pursuant to UL94).



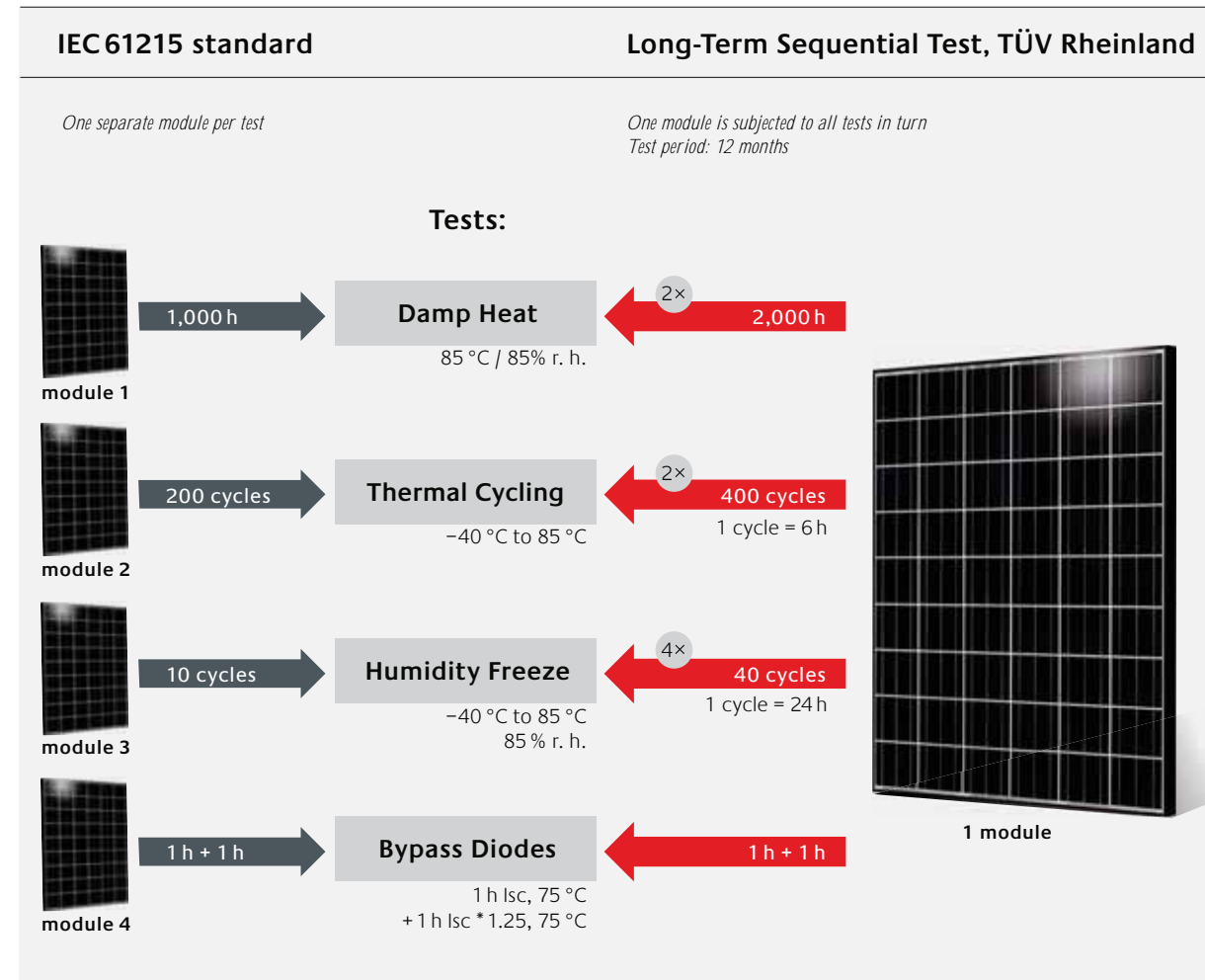
**Kyocera photovoltaic modules meet the highest standards**

- IEC 61215 ed. 2, IEC 61730: Prerequisite for the CE labelling required in Europe
- IEC 61701: Salt mist corrosion test
- Safety class II
- Production sites certified as per ISO 9001, OHSAS 18001
- Environmentally compatible production, certified as per ISO 14001: Use of closed and resource-saving cycles of potential recyclables
- Member of the PV CYCLE: An independent association that has set itself the goal of creating a take-back and recycling programme for old modules



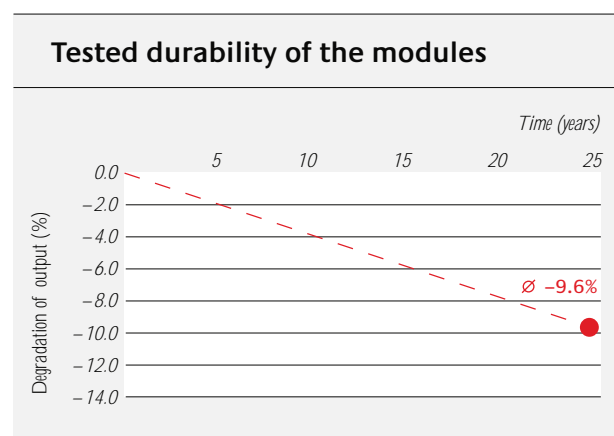


Kyocera test system in Sakura, Japan



**Consistent output over decades.**

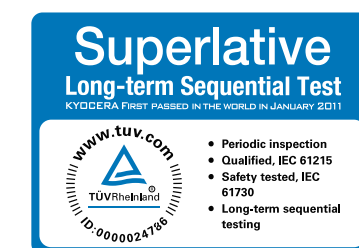
In 1984 Kyocera Solar installed a 43 kWp test system in Sakura, Japan. The modules are still achieving excellent results. With an average degradation of just 9.6% after 25 years, the test system provides a very impressive example of real-life operation. It is notable that these excellent results are achieved by modules produced using the materials and technology available at the time of manufacture. The results are evidence of the above average service life of our solar cells.



**Kyocera modules were the first modules worldwide to pass the new Long-Term Sequential Test devised by TÜV Rheinland.**

The quality and reliability of our modules have been tested in a long-term test series newly developed by TÜV Rheinland. Kyocera modules were the first modules worldwide to pass all four individual tests. The test criteria consisted of the following: damp heat, thermal cycling, humidity-freeze and bypass diodes. The requirements were considerably more stringent than the commonly applied IEC 61215 standard. For example, the duration of the individual tests was more than doubled. Other unusual features of the long-term test series include the long test period of 12 months and the fact that the same module is used in all four tests. The test series therefore corresponds to the operational conditions that the module will encounter in real life. The results provide further confirmation of the data collected by

us: the tests show that the module's power output remains constant. This testifies to the products' extraordinary sturdiness and reliability. Kyocera solar modules represent a secure investment for both private customers and major clients.





**We care!**  
For solutions created in close co-operation with our customers.

**Optimum answers to all questions.**

We offer all our customers – whether they are end-users or professionals – an extensive range of support measures and comprehensive assistance. A qualified team of engineers and service technicians are on call to provide customers with on-the-spot expert advice in response to all technical questions. We offer product-specific and operation-specific services, in particular for installers, architects, solar engineers and construction planners, in order to guarantee optimum use of our photovoltaic systems.

**Excellent all-round service.**

Our all-round service includes the following:

- Advice on design issues
- Advice on location and installation
- Information on new products and processes
- Special support for starting operations
- Joint analysis of faults
- Fast and unbureaucratic help in the event of guarantee claims
- Customer-specific training and basic training in photovoltaic technology
- Comprehensive, expert advice in the project business

**Service hotlines**

Professional, Europe-wide customer service in Esslingen, Germany

For technical questions:	For general questions:
Tel: +49 (0) 711-93 93 49 98	Tel: +49 (0) 711-93 93 49 99
Fax: +49 (0) 711-93 93 48 61	Fax: +49 (0) 711-93 93 49 50
Email: pv-support@kyocera.de	E-mail: solar@kyocera.de

*The field of photovoltaics is a broad one that grows and develops continuously. We therefore consider it important to assist our customers with the help of our regularly trained expert staff. They can give you straightforward and qualified answers to all your questions.*





## We care!

Because solar energy is a good decision in all respects.

*A strong partner, years of experience, innovative technology and outstanding quality – these are just some of the many reasons for choosing Kyocera Solar.*

*The Stade de Suisse football stadium, Bern*

### All advantages at a glance

- **Over 50 years of healthy development:** Thanks to its extensive portfolio, Kyocera will continue to be a reliable partner in the future.
- **More than 35 years of experience:** Kyocera Solar offers vast expertise in the field of photovoltaics.
- **Leading innovative technology:** Kyocera Solar continuously sets new records with processes developed in-house.
- **Vertical integration:** Complete in-house production gives Kyocera Solar total control.
- **High efficiency, reliability and durability:** Kyocera Solar delivers outstanding quality.
- **Proven long-term solutions:** Kyocera Solar achieves extremely low output losses over decades as demonstrated by existing solar systems, which represents an advantage over the company's competitors.
- **Highly qualified, all-round service:** Our comprehensive network of expert advisers provides customers with professional and straightforward support.

# A good decision.

## Superlative

Long-term Sequential Test

KYOCERA FIRST PASSED IN THE WORLD IN JANUARY 2011



- Periodic inspection
- Qualified, IEC 61215
- Safety tested, IEC 61730
- Long-term sequential testing

Stiftung  
Warentest



Top Grade  
GOOD

Tested:  
15 solar modules  
Tested product:  
KC170GT-2

Issue 5/2006

 **KYOCERA**  
SOLAR

**KYOCERA Fineceramics GmbH**  
Solar Division  
Fritz-Mueller-Strasse 27  
737 30 Esslingen / Germany  
Tel: +49 (0)711-93 93 49 99  
Fax: +49 (0)711-93 93 49 50  
E-Mail: solar@kyocera.de  
www.kyocerasolar.eu