

KUKA

KUKA Systems Energy

**SUNNY PROSPECTS
FOR YOUR PRODUCTION**

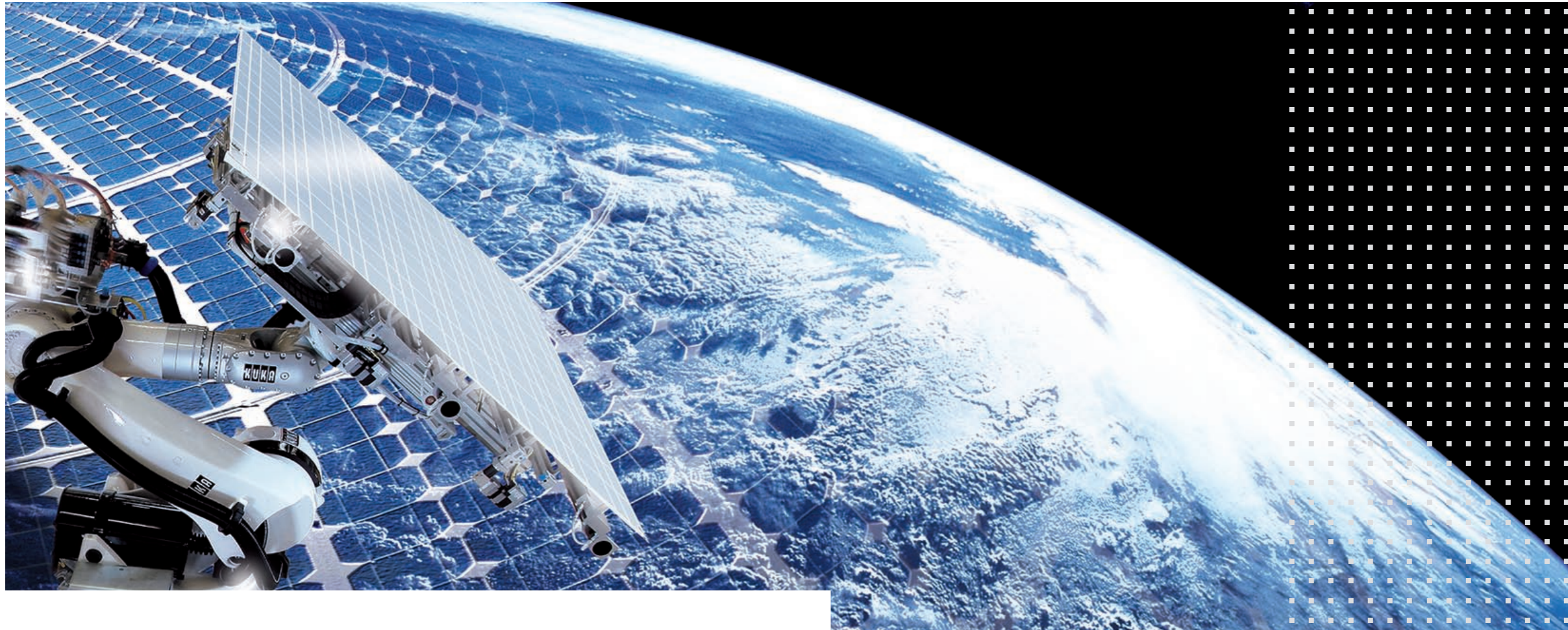


SUNRISE *or* BLACKOUT

TRANSFORM MARKET PRESSURE INTO ENERGY FOR YOUR COMPANY.

Current developments in the energy and ecology sector necessitate increased use of renewable energy resources worldwide. The importance of the solar industry within this sector is becoming ever greater, leading to growing pressure on producers. Technical innovations are constantly being introduced and production standards are being geared towards ever higher quality and productivity. For the manufacturers of these products, this means mastering

all these challenges in the face of global competition. KUKA Systems Energy is the worldwide network of KUKA Systems competence centers. The group specializes in the automation of processes in the solar industry and offers manufacturers a range of products and services for the implementation of production processes with utmost precision and efficiency. Here we show you how. We would be delighted to provide further explanation in person.



SUNSHINE OR SHADOW?
KUKA SYSTEMS ENERGY OFFERS YOU EFFICIENT AUTOMATION SOLUTIONS FOR THE SOLAR INDUSTRY.

KUKA Systems Energy is specialized in the supply of turnkey systems. Our core competencies are the analysis, modeling and optimization of complex production processes that are integrated and supported on site. All the automation solutions can be flexibly scaled – from the robotic cell as an automated production island right up to complete production lines.

The first focus of our activity is the analysis, digital modeling and engineering of manufacturing sequences. Our expertise is founded on a unique range of experience and relevant data for every automation task. This makes our automated production solutions world leaders in terms of safety and reliability.

The second focus of KUKA Systems Energy is the development of optimal tools for every automation task – or the use of established KUKA standards. From the production of individual components to the packaged end-product – KUKA Systems offers flexible solutions that are tailored to the specific processes in the solar industry and optimally adapted to your needs.

The third focus of KUKA Systems Energy is the assembly and commissioning of turnkey systems or system components at any desired point on the globe. We have qualified personnel and competence centers located in the most important industrial regions of the world. This global network is also available after commissioning, with fast support and professional service, to maintain and improve every automated production system.

ENGINEERING

1

Make use of our engineering references in the development of highly efficient, automated production solutions.

PROCESSES

2

Optimize workflow layouts, material flows and automation components using the digital factory and our wealth of experience from numerous major projects.

TECHCENTER

3

Come and work with us at the KUKA Systems TechCenter covering an area of 2,500 m². There is plenty of space here for realistic mock-ups to provide reliable project data for applications without the need to take risks.

STANDARDIZED SOLUTIONS

4

Benefit from our long-standing experience with standardized automation solutions – which we will also be happy to adapt to your requirements.

EXPERTS

5

Consult our local experts when production systems are put into operation and additional requirements arise.



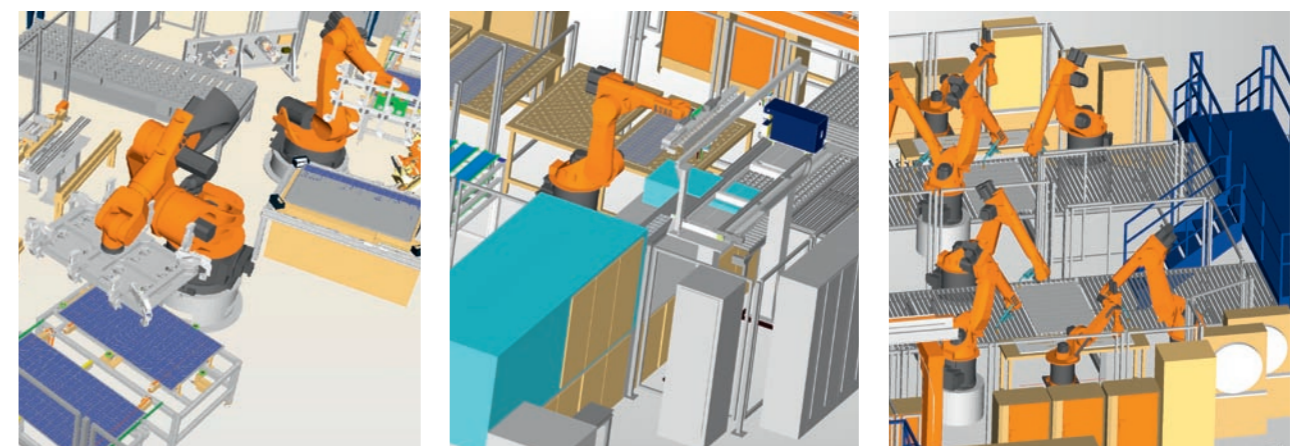
Example of a fully automated turnkey photovoltaic production line for 1 million solar modules per year

AUTOMATION INTELLIGENCE OR FURROWED BROW?

WITH PRODUCTION CONDITIONS BECOMING EVER MORE DEMANDING, ENGINEERING COMPETENCE TAKES ON EVER GREATER IMPORTANCE.

The solar sector is developing at an astonishing pace: series production is in greater demand than ever before, there is growing pressure on costs, and the market demands ever greater flexibility. This is where KUKA Systems comes into play. Thanks to our knowledge of the industry, we integrate production processes of increasing complexity to create a profitable automation solution. Right from the very first contact, you will experience how our experts understand your problems and develop intelligent solutions together with you. All relevant sources must be defined in advance and the data transformed into a workable model. This database must also be compatible within the supply chain and versatile enough to allow subsequent new developments and adaptations.

Good engineering can accomplish even more: an intelligent automation solution can flexibly underpin your production strategies. It also enables you to roll out new manufacturing qualities within a very short time and to compensate for shortages in skilled labor. This is precisely what our team stands for – with automation expertise that is unmatched anywhere in the world.



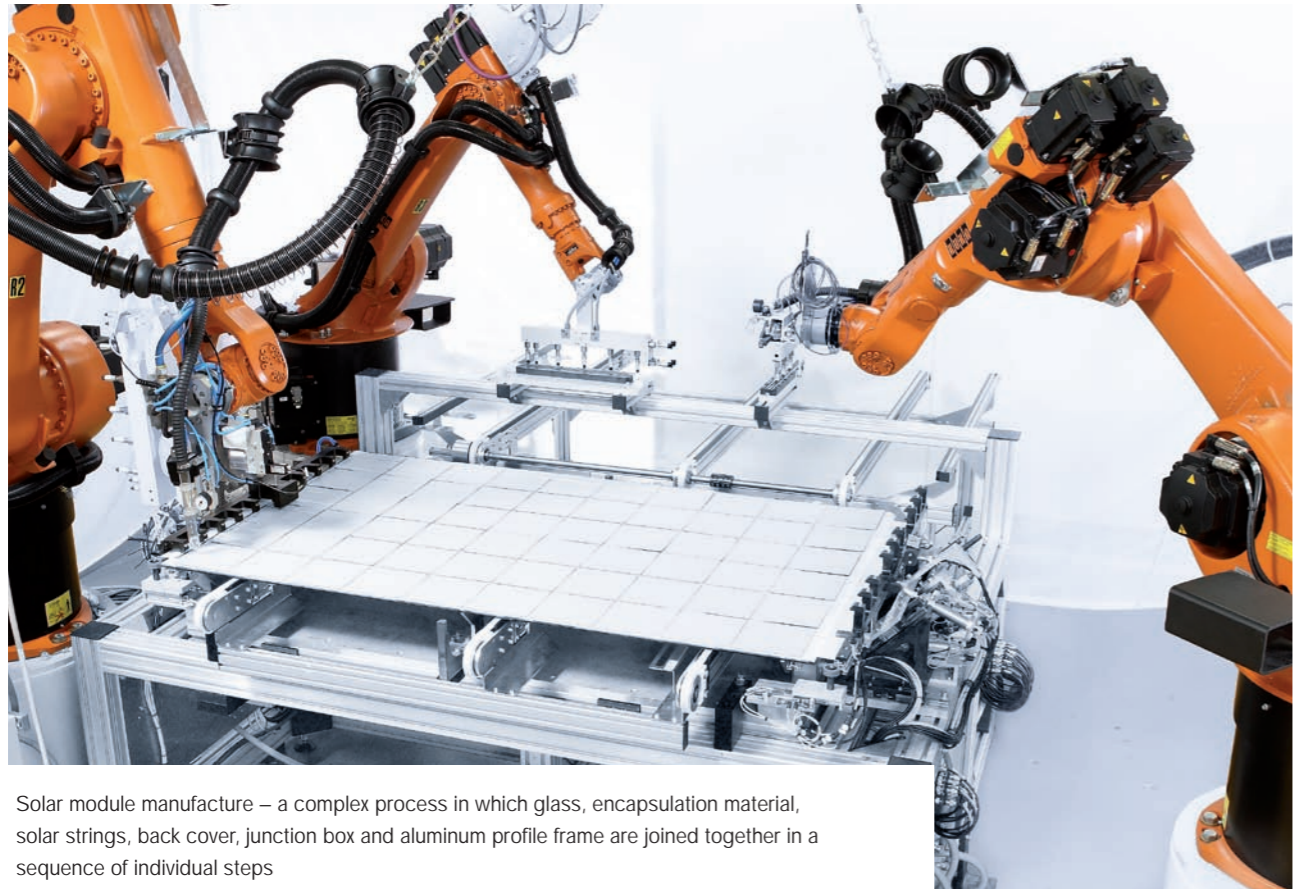
Final check at KUKA Systems: virtual verification of production solutions assures the success of your investment

■ SNAIL'S PACE OR SPEED OF LIGHT?

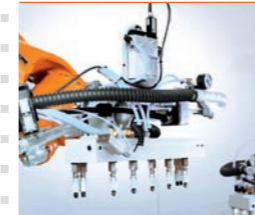
BOOST THE QUALITY, SPEED AND PRECISION OF OPERATIONS IN YOUR PRODUCTION SHOP – WITH FLEXIBILITY AND NO RISK OF FATIGUE.

SOLAR			
CRYSTALLINE PV	THIN FILM PV	NEW CONCEPTS PV (CIGS, CPV)	HEAT COLLECTORS
<ul style="list-style-type: none"> ■ Wafer lines ■ Cell lines ■ Module lines 	<ul style="list-style-type: none"> ■ Cleanroom handling ■ Module lines 	<ul style="list-style-type: none"> ■ Cell sorting ■ Module lines 	<ul style="list-style-type: none"> ■ Absorber manufacture ■ Collector assembly

Whether standardized or tailored to your needs, for individual cells or turnkey production lines – we implement complex manufacturing systems and ensure that our concepts meet your requirements. KUKA Systems has the right solution for every step of module production – from brick sawing, cell handling and cross-soldering to framing and packaging of the modules.



Solar module manufacture – a complex process in which glass, encapsulation material, solar strings, back cover, junction box and aluminum profile frame are joined together in a sequence of individual steps



AUTOMATIC CROSS-SOLDERING WITH ROBO X.

Until now, the string matrix has generally been manually connected. KUKA Systems has developed a process that allows cross-soldering to be fully automated. Thanks to the balanced interplay between the loading and clamping tools and the robot-guided brazing heads, the entire process can be carried out in a single station: cutting, positioning, fixing and soldering. The cross-connectors can also be automatically pre-assembled.



AUTOMATIC GLUING WITH ROBO GLUE.

Consistent dispensing quality coupled with maximum speed and precision – these are strong arguments for the automated application of adhesives. Arguments that were the motivation for KUKA Systems to develop fully automated robotic gluing cells. Alongside “conventional” variants with robot-guided dispensing heads, other solutions are also implemented with component handling at a stationary adhesive nozzle. For example, if the robot should perform additional operations. The robotic gluing process can be used for gluing wafers and glass.



AUTOMATIC FRAMING OF SOLAR MODULES WITH ROBO FRAME.

This is where the laminate becomes a solar module: using a special gripper, the individual photovoltaic modules are positioned and fastened within the frame components. A unique KUKA patent demonstrates the flexibility of a robotic application.



AUTOMATIC TAPE APPLICATION WITH ROBO TAPE.

In this station, tape and sealant are automatically applied, precisely cut and the excess material is removed. A wide range from the Tapetec generation offers solutions from copper tape to butyl tape. Many manufacturers already rely on ROBO Tape as their quality guarantee for edge sealing.

GLOBAL, LOCAL – OR BOTH?

WE ARE THERE WHERE YOU NEED US: WORLDWIDE.



KUKA Systems will launch your desired automation solution on a set date and in perfect quality – anywhere in the world. This applies equally to individual robotic cells in existing lines and to entire new production sites where the required infrastructure must first be created.

This performance is based in part on our long-standing global presence in every economically relevant region of the world: in all of these regions, KUKA Systems has competence centers in which our automation experts work. These experts not only have a thorough understanding of their work and the objectives of the customer, but are also familiar with the mentalities of different countries.

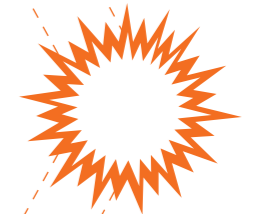
Another factor for this capability is the fact that KUKA Systems has been successfully supporting the automation of key industries for over 50 years. Over the decades, KUKA Systems has developed a first-class service and solution competency, offering extremely short response times anywhere in the world for the start, performance and completion of projects.

Our highly-qualified and lightning-fast service department is also set up on a global scale, with specialist personnel based locally to maximize efficiency. This service need not necessarily end with the commissioning of an automated production line. Particularly when it comes to keeping production flexible, KUKA Systems can also support ongoing operation. The scope of the support provided can be freely selected by the customer.

RESPONSIBILITY RIGHT FROM THE GROUND-BREAKING CEREMONY – KUKA SYSTEMS AS GENERAL CONTRACTOR.

KUKA Systems offers far more than the mere optimization of production processes: you can also order complete production centers from us – for installation anywhere in the world. We then act as general contractor and sole contact partner.

Because we build complete production facilities for you, this leaves you free to concentrate on your core competencies. Our global expertise in systems engineering and project management are your guarantee of success.



OUR SERVICES FOR YOU.

<p>PLANNING AND ENGINEERING</p> <ul style="list-style-type: none"> Material flow and logistics analysis Plant & facilities layout 3D simulation (Digital Factory) Cycle time and MTM analyses PLC network integration and HMI design Design and manufacture of tooling and special machines Processing of quality related data, MES Operator ergonomics 	<p>HIGHLY AUTOMATED BRICK AND WAFER LINE</p> <ul style="list-style-type: none"> Cutting and cropping Grinding and chamfering Inspecting and marking Automated brick gluing Wafer sawing Handling, sorting and logistics 	<p>AUTOMATED MODULE MANUFACTURING</p> <ul style="list-style-type: none"> Glass handling String lay-up Automated bussing Precision foil lay-up Material handling with conveyor and gantry Module encapsulation <ul style="list-style-type: none"> KUKA ROBO TRIM® KUKA ROBO TAPE® KUKA ROBO FRAME® KUKA ROBO FINISH® Boxing Complete range of testing <ul style="list-style-type: none"> Vision system, electroluminescence and bubble check Product classification with Class A equipment UL and DIN EN testing procedures Semi or fully automated sorting/packaging
<p>THIN FILM HANDLING</p> <ul style="list-style-type: none"> Handling and logistic solutions for processing thin film 	<p>THERMAL COLLECTOR SOLUTIONS</p> <ul style="list-style-type: none"> Brazing, fastening and laser welding Glass handling, priming, cleaning and gluing Automated assembly, testing and packaging 	



WOULD YOU LIKE TO FIND OUT MORE ABOUT HOW TO MAKE YOUR PRODUCTION PROCESSES SHINE? THEN CONTACT US: **PHONE +49 821 797-1076** OR MAIL US AT: **SOLAR@KUKA.DE**