

## LATEST EQUIPMENT



## BÜRKLE Ypsator Laminator

With the multi-opening laminator, Ypsator Bürkle aims to set trends in the solar module production.

### Problem

Manufacturers are facing more and more the decline of module prices. Improving the productivity of the module production lines and the reduction of the operating costs resulting in lower costs per module is what is important.

### Solution

The multi-opening lamination systems can be adjusted to the capacity requirements of the customers very flexibly by adjusting the number of openings. A production capacity per line per year of 100 MWp, for example, is very easy to achieve with such a system. This capability is realised on extremely small production surfaces.

The three-step process from Bürkle has revolutionized the lamination process and permits not only a higher production capacity with considerably reduced cycle times, but also the production of new materials due to the high flexibility of the concept and the selection of parameters, which could not be produced by means of the conventional machine concepts at all or only with considerably increased efforts.

In case of glass-glass modules, Bürkle was the first manufacturer to offer a special three-step lamination concept that avoids an overpressure at the edges and supplies the heating of the modules from both sides. This three-step process enables stress-free lamination and minimizes glass breakage at high plant output rates.

Moreover, all Bürkle lamination systems are equipped with thermal oil heating systems that ensure a homogeneous temperature distribution on the entire useful lamination area.

### Application

The single- and multi-opening lamination lines from Bürkle are used to manufacture crystalline and thin-film solar modules.

[www.buerkle-gmbh.de](http://www.buerkle-gmbh.de)



## 3S/SOMONT/PASAN Human Machine Interface

All the individual machines from 3S Swiss Solar Systems, Pasan and Somont (former 3S Industries Group, now module section within the Meyer Burger Technology Group) have a uniform Human Machine Interface (HMI). Users can therefore become familiar with the line more quickly and optimally. The induction time for new employees can be significantly reduced.

### Problem

PV module production lines often consist of machines from several very different manufacturers. Every manufacturer makes use of its own steering and HMI system, which leads to a large variety of user interfaces and concepts within a factory. For the module producer, this means a great deal of time and cost for training of staff and the threat of operating errors due to a lack of familiarity with the user interfaces for machinery control.

### Solution

3S Swiss Solar Systems, as a turnkey supplier of equipment across the entire value-creation chain, has standardised its HMI for all machine controls of the production line. The interface, which is intuitively operable, enables maximum operating safety with an extremely short induction time. Through the use of standardised hardware components, the stocking of replacement parts is made much easier for the customer.

### Application

Turnkey production lines for crystalline PV modules

[www.3-s.ch](http://www.3-s.ch)



## SCHILLER AUTOMATION TS 3600 Cell Tester

The TS 3600 from Schiller Automation is a fully automated solar cell tester and sorter. It includes up to four different inspections like front / back side inspection, EL / PL measurements and sun simulation.

### Problem

At the end of the cell production the product has to be classified and sorted. This classification has to happen in a precise and reliable way. The results have to be guaranteed for while keeping the costs low.

### Solution

The equipment is a very fast and reliable handling system that guarantees the highest position accuracy. The cells are precisely placed on the internal transport system in a controlled and flat position. The transport system utilizing a revolving chain equipped with wafer grippers. This system ensures a continuous and reproducible transport of the cells to the inspection locations. The robust system in conjunction with the leading-edge probe card contacting lead to extremely stable and persistent operation. Soft handling reduces the possibility of breakage to a minimum and together with the robustness yields the highest total throughput. In this way, the most cost-effective tester and sorter system was constructed.

### Application

The TS 3600 can be used at the end of the cell fabrication line or the beginning of the module manufacturing. It has a throughput of 3,600 cells per hour and 48 classes.

[www.schiller-automation.com](http://www.schiller-automation.com)

## LATEST EQUIPMENT



## RENA PVGlassCoat/PVFlexxCoat

RENA's PVGlassCoat and PVFlexxCoat are low COO solutions, offering high inline throughput. Its optimized Chemical Bath Deposition (CBD) processes for CdS layers for the CdS deposition with excellent layer quality on glass and flexible substrates.

### Problem

Compared to state-of-the-art batch processes, the RENA solutions offer:

- higher throughput
- significant smaller footprint
- significant lower total cost of ownership

### Solution

#### PVGlassCoat

RENA, with its patented CBD technology is able to coat up to 1200 mm width substrates with a cycle time of 60 seconds.

Glass substrates are coated upside down by external heating of the substrates and transporting them above the surface of the chemical bath, generating smooth, homogeneous and pinhole free layers.

Applications are running with homogeneity of 5%. The footprint of a PVGlassCoat for a 10 MW/year application is 12,000 x 3,000 mm<sup>2</sup> for a 60 MW/year 17,000 x 3,500 mm<sup>2</sup>.

#### PVFlexxCoat

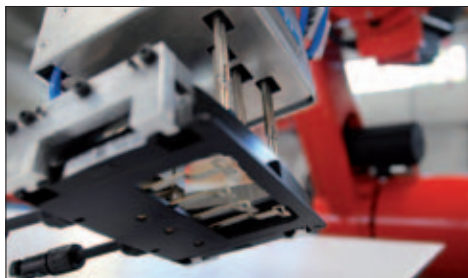
For flexible substrates RENA's Coating tool has successfully passed the phase of pilot production and was enhanced to series production with line speeds of up to 1.25 m/min. Flexible substrates are transported over a heated profile with the chemical solution on top.

### Application

Due to its modular design, PVFlexxCoat can be adapted to different production capacities (e.g., the footprint of a PVFlexxCoat for a 20 MW / year application is 11,300 x 3,000 mm<sup>2</sup>).

RENA is able to deliver the complete layer coating line, starting with DI water supply, using the CBD coating process and ending with waste water treatment and exhaust cleaning.

[www.rena.de](http://www.rena.de)



## REIS ROBOTICS Junction Box

In recent years, Reis Robotics designed the most verified assembly systems for the module production and furnished many renowned solar module manufacturers with them. The more than 60 systems put into practice so far achieve an annual production capacity of approx. 2,5 GW. This corresponds to an annual production capacity of more than 12.500.000 modules.

### Problem

Efficient production of solar modules

### Solution

Reis Robotics offers a performance range from technology development, development of new production methods, planning and putting into practice individual production cells, as well as delivery and commissioning of complete production lines. The degrees of automation range from manual, semi-automatic up to fully automatic production lines in the ranges thin film, silicon and solar heat.

Fully automated assembly of the junction box:

The new system for fully automatic setting of the junction box is mounted on a platform completely ready for operation and thus, can be integrated in any existing production line with minimum expenditure. This new concept has many advantages compared to the conventional method. Due to this new concept, critical work steps before lamination are omitted:

- foil stamping
- unthreading of terminal lugs
- no emerging EVA during lamination
- no soiling of the membrane

### Application

This new method also avoids the risk of damaging the membrane during lamination due to protruding lugs. Here, also an optimum of cost savings can be seen, since various manual and automatic work steps can be omitted and in addition also material savings are possible. Also the possible break rate is reduced, since no manual actions are required any more.

[www.reisrobotics.de](http://www.reisrobotics.de)



## KOMAX SOLAR Xcell X2

### Problem

Solar cell handling often requires handoffs that can result in breakage.

Great consideration needs to be given to throughput, cycle time, temperature control, and increasing the user-friendly aspects of the machine.

### Solution

The Xcell X2 drastically reduces cell handling by using just one commercial SCARA robot. Solar cell separations, optical alignment, spray fluxing, optical inspection and placement on the preheated chuck is all done in one robot motion.

The Xcell X2'S updated, high-speed induction soldering method is the most gentle and precise soldering technology available. This technology more precisely focuses the induction field, combined with non-contact pyrometry, allows for closed-loop temperature control (PID) ensuring outstanding solder quality, uniformity and low breakage rates.

### Application

The Xcell X2 industry-leading spray fluxing technology allows not only accurate dispensing; it is also capable of targeting up to six spots per busbar. It has three cool down zones to smooth the temperature gradient, reducing thermal stress and improving solar cell yield. The machine features highly accurate preheated and heated chucks achieving a temperature variation within +/- 3°C relative to the set point, thereby reducing thermal stress across the solar cell. The Xcell X2 does not need numerous options; it has several new capabilities built in, such as adding Z-Bends in the ribbons between solar cells, by simply turning it on or off via the HMI control panel. Furthermore, the machine is equipped with an integrated SCADA system, which collects material data, solder recipe, machine performance and process variables for optimized use.

[www.komaxsolar.com](http://www.komaxsolar.com)

## LATEST EQUIPMENT



## KUKA SYSTEMS

### Silicon Slicing Technology

KUKA provides fully integrated wafer lines and single machines for silicon slicing

#### Problem

With the increasing cost pressure on wafer and cell producers, production yield, product quality and machine uptime is getting more and more relevant. Next generation cells demand for higher wafer quality.

#### Solution

KUKA's products for slicing of silicon from brick to wafer integrated into a highly automated production facility are optimized to help manufacturers achieve this goal. With 40 years of history in silicon slicing, KUKA's experts are helping customers worldwide.

The design of the machines utilizes advanced methods for improving stability parameters and long service life of the parts subjected to higher stress (bearings, shafts, wire guide etc.).

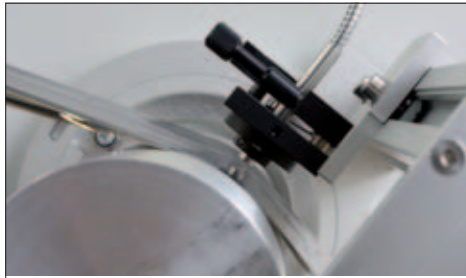
#### Application

KUKA Advanced Wire Saw Machine AWSM 3800.6 is a fully automatic three wire guide saw machine for slicing hard and expensive materials such as ingots of Silicon, Germanium, GaAs, InP and other AIII-BV or AII-BVI materials, glass, ceramics, ferrites etc. into wafers.

Further services:

- Ingot preparation: cropping and squaring
- Slicing service as contract manufacturer
- Fully integrated wafer lines

[www.kuka-systems.com](http://www.kuka-systems.com)



## LAYTEC

### SolR

SolR is a contactless optical monitor for in-line and roll-to-roll applications and it is capable of measuring all key parameters of all layers throughout the solar cell manufacturing process.

#### Problem

To reduce production costs, it is essential to control the manufacturing process and keep the processes tightly within the specification limits.

#### Solution

SolR provides direct feedback to the growth control system and statistical process control. It helps to identify and correct anomalies, accelerate development cycles, transfer established processes to new lines and re-establish conditions after maintenance.

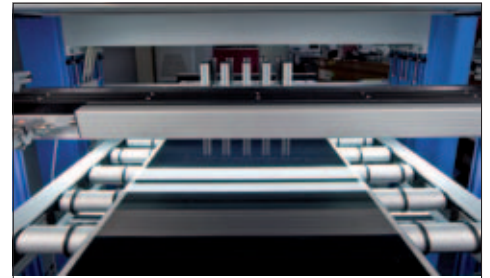
SolR is based on specular spectroscopic reflectance measurements (500-1000 or 500-1600 nm) and measures in-line film thickness of each layer, provides TCO conductivity fingerprints, separation of refractive index and film thickness for SiNx, on-line process homogeneity checks, roughness and texture characterization for c-Si, poly-Si and TCO as well as in-line haze measurements.

#### Application

SolR is applicable basically to all major PV thin-film structures: CIGS- and CdTe-based thin-film solar cells, a-Si/ $\mu$ c-Si tandem cells and anti-reflective coatings on mc-Si and c-Si solar wafers. A special communicating system of metrology stations takes reflectance spectra after every single deposition step with the optical heads positioned in the transfer lines between the deposition chambers.

SolR is adaptable to virtually any process system. The small optical heads can be installed even inside vacuum chambers. The control computer communicates with the production line control to assure that measurements after each deposition step relate to the same position.

[www.laytec.de](http://www.laytec.de)



## ISRA SURFACE VISION

### Powerscan

POWERSCAN is an advanced optical multi-panel inspection system for automated inspection of glass, surface and laminate for the photovoltaic industry. Based on its standardised modules and software, ISRA has developed a special system setup to inspect thin-film solar modules right after lamination.

#### Problem

In order to be able to run PV manufacturing facilities 24/7, one of the keys to success is to be able to feed the manufacturing process with materials of only the highest quality. In addition, it is necessary to protect and control these complex processes and to generate production data in order to be able to determine each available optimisation possibility so as to assure and increase the yield the customers are aiming for. The original task of the POWERSCAN for Lamination Inspection is to detect laminated bubbles, shrinkage and excessive PVB.

#### Solution

POWERSCAN for Lamination Inspection is dedicated to the inspection of the lamination of thin-film solar modules, looking for bubbles, as well as edge defects and scratches on the glass itself. The modular product structure allows for an easy update of the existing POWERSCAN, should inspection requirements require it. Based on its modular product structure in regard to the cameras, illumination and frames, ISRA is able to solve nearly each inspection task of its photovoltaic customers. Additional features, such as state-of-the-art interfaces, inspection of flexible batches and high-performance inspection tasks within the thin-film solar industry are our daily business, today.

#### Application

In the photovoltaic industry, the inspection of laminates is a requirement. Additional applications include: incoming glass inspection, edge inspection, coating inspections (such as TCO) and scribing inspection.

[www.isravision.com](http://www.isravision.com)