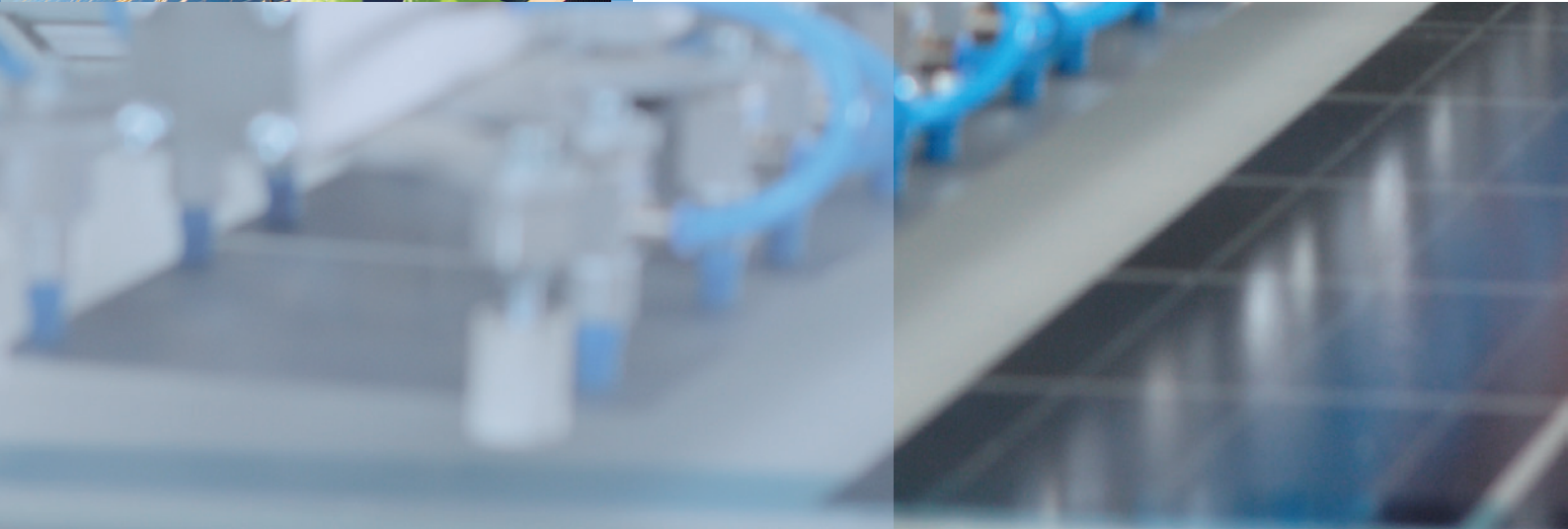




Anlagenbau & Fördertechnik GmbH

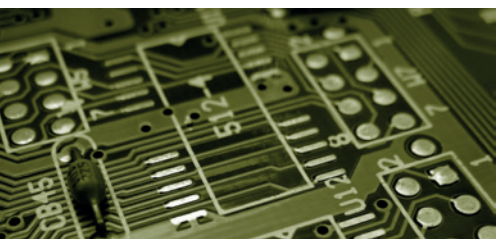


## **PV Module Production**



**Your partner for innovative plant construction, conveyor technology and automation**





# About us

## ➤ Ulrich Rotte GmbH

Founded in 1994, our extensive product portfolio now offers our customers a range of attractive benefits.

Fully automated production facilities and special developments in the field of robotics are the fundamental strengths of our company. Come and meet our team of dedicated developers and design engineers, who have a passion for design and creativity. We focus on the following areas:

- Automotive industry
- Solar industry
- Wood technology
- Rubber processing industry
- Sewage technology
- Technical laminates

Thanks to our team of highly motivated and qualified technical professionals, we are able to offer our customers worldwide support and service – dedicated, unbiased, fast and flexible. We also provide on-site training courses, enabling your staff to learn new skills and make the most of your new plant.

We are also your specialist partner for special plant construction, particularly in the solar industry.

Learn more about our skills and expertise on the following pages.

Yours sincerely,

Ulrich Rotte

# Your business

## ➤ The solar industry

To facilitate PV module production, Ulrich Rotte GmbH offers complete conveyor technology, including glass pane, laminate and module handling - from glass loading right through to the packaging stage.

Our highly motivated and qualified team realizes your ideas and designs, effectively and individually. Our extensive experience and knowledge allow us to go beyond a 'one-size-fits-all approach' and to come up with innovative solutions.

Each production line is therefore unique.

Our specialist skills and experience enable us to develop special plants that are affordable, individual and technically feasible.

We will support you during every phase of your project. Satisfied customers in India, Canada, Asia and Europe can vouch for our expertise and international capability.

**Challenge us with your brief!**



The perfect attributes for developing your PV module production lines.

Seamless expertise - from glass loading right through to the packaging stage.







# The human factor

## ➔ We focus on people

A well designed workplace is vital for effective and efficient workflow. An ergonomic layout as well as robust and easy-to-use drawers, grippers and storage racks allow operators to concentrate on the tasks at hand.

Production lines for PV modules demand a full range of process, inspection and repair facilities. Material loading and unloading can be performed fully automatically, semi-automatically or manually. Manual workstation design is one of the key areas of focus during the planning and development phase.

Height adjustable and portable material and tool trays, easy-to-use and well-balanced manipulators/suction bars for handling delicate cell or string materials are just some of the points which arise. Process workstations, e.g. for edge trimming, junction box assembly, framing with crimping, inspecting and cleaning, are also incorporated into the production process in an ergonomically and technically perfect way.

Respective workstations are specially developed for testing and repair tasks, e.g. repairing the string and matrix.

Sockets for the required power supply and appropriately installed lighting ensure all work areas are well lit.

Our extensive range of workstation accessories, such as trolleys and small tables, are tailored to the needs of industrial and efficient PV module production.



# The idea

## ➔ It all starts with an idea

You have a business idea for the production of module lines and now require the complete conveyor technology? Or you have a particularly innovative idea for the realization of a production stage? We specialize in special plant construction and are, therefore, your specialist partner to solve this complex issue. **We bring your idea to life.**

We will support your project from start to finish by planning, programming, realizing and commissioning your automation tasks.



Once an idea has been formed, it can become a reality.

Does your idea have this potential?

Together we can turn your idea into a success.







## From glass loading ... ➔ **Module line**

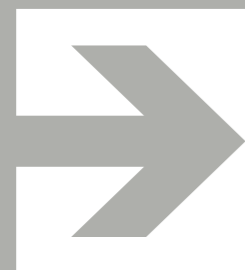
We offer our customers individual and innovative conveyor and handling technology for module lines - from glass loading right through to the packaging stage.

Our portfolio provides you with complete conveyor technology:

- Glass pane, laminate and module handling
- Storing and buffering
- Conveyors and ramifications
- Gathering sections with turning and aligning
- Lifts and buffers
- Flasher and hipot automation
- Module sorter for horizontal stacking or vertical packetizing
- Stack turners
- Straight Cut 750
- Glass loader

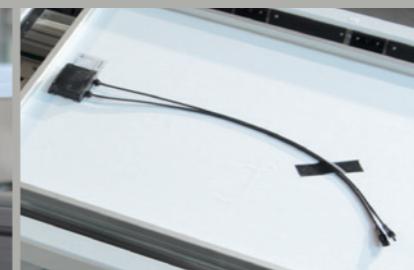
The fully automatic FIFO 20 buffer temporarily stores glass panes or laminates and decouples your continuously running machinery, such as stringers and laminators, from your module line. The now continuous material supply ensures the high efficiency of your 'bottleneck' workstations. FIFO 20 makes your production less sensitive to downtime due, e.g., to material changeover at the stringer or faults and increases production output.

FIFO 20 can be retrofitted into conveyor lines and integrated into their control units, or installed into existing lines with its own control unit.

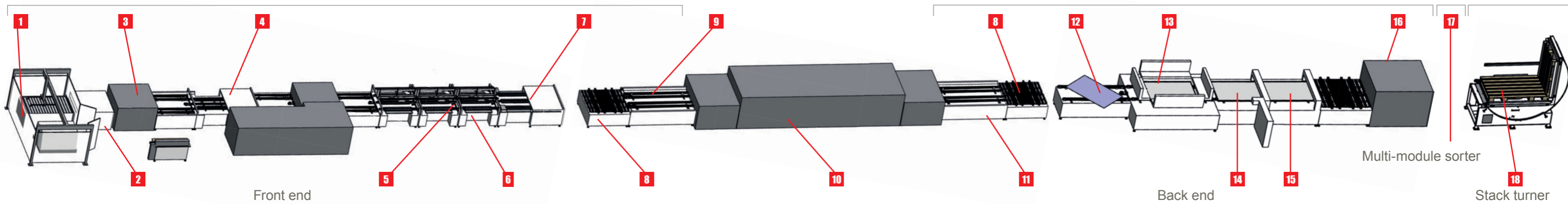


Storing according to various storage strategies – no problem with our sophisticated systems.

Conveying, turning, discharging all the elements – perfectly harmonized to ensure best practices.







## to the packaging stage Module line

In the module line, toothed belts and roller conveyors transport the glass panes, laminates and modules from the glass loader, through the workstations right up to the packaging stage.

Ramifications and gathering sections load and unload the laminators. Corner conveyors discharge or ramify to various sub-lines, e.g. laminators.

Turning stations alter orientation between lengthwise and crosswise transport. Additional functions, such as aligning and positioning, can be integrated into conveyors and workstations on demand.

Customized to your module line, we offer performance inspection and hipot testing with automated module handling as an integral part of your module line or as a stand-alone solution. To achieve this, we integrate the flasher and hipot manufacturers of your choice with tunnels or towers. In accordance with your specifications, we also implement interfaces to transfer data to your QM system for documenting production quality.

We offer conveyor and testing technology from a single source, from partial solutions to fully automated complete solutions, and integrate it into your desired testing technology.

- |                              |                                 |                                 |
|------------------------------|---------------------------------|---------------------------------|
| <b>1</b> Glass loader        | <b>7</b> Film loading           | <b>13</b> Framing and crimping  |
| <b>2</b> FILO or FIFO buffer | <b>8</b> Turning, alignment     | <b>14</b> Junction box assembly |
| <b>3</b> Glass washer        | <b>9</b> Laminator loading      | <b>15</b> Cleaning              |
| <b>4</b> EVA loading         | <b>10</b> Laminator             | <b>16</b> Flasher, hipot        |
| <b>5</b> String repairs      | <b>11</b> Laminator unloading   | <b>17</b> Sorting, stacking     |
| <b>6</b> Cross soldering     | <b>12</b> Edge trimming, taping | <b>18</b> Stack turner          |

Uninterrupted operation with short cycle times means the highest possible cost-efficiency when sorting. Furthermore, the compact and simple setup saves precious production space and ensures high availability. We also supply the ideal stack turner for erecting to the short or long side, lengthwise or crosswise, on a standardized or customized shipping pallet according to your module size and logistics concept for truck or container transport.

Straight Cut 750 processes common solder ribbon wires up to 750 mm in length fully automatically in a single step. The particular material characteristics of your ribbon are configured and processed in the control unit.

The various automation levels of the glass loader enable the integration of semi-automatic or fully automatic module lines.





Cleaning, reworking, inspecting and turning the framed PV modules



Customer satisfaction is our top priority.

Our plants are tested down to the very last detail – to ensure optimum workflow.



## Flasher and hipot ➔ Performance testing

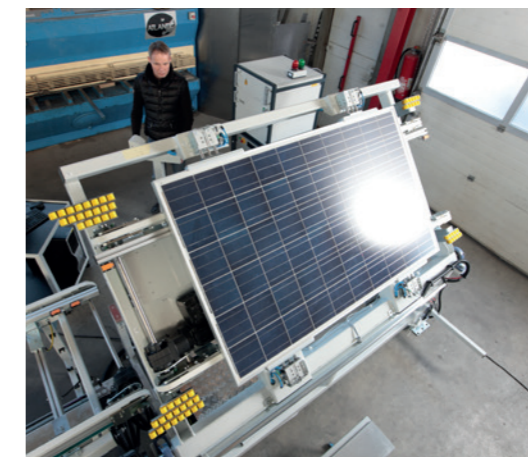
Adapted to your module line, we offer semi-automatic module handling for performance and hipot testing. To achieve this, we integrate the flasher and hipot manufacturers of your choice. Depending on your individual layout and the available space, we also offer tunnel or tower solutions.

For flashers with tunnels, we align the module ready for testing, fix it into position and then swivel it vertically to the test position in front of the tunnel. Underneath the standing tower, the inaccessible module is automatically aligned and connected using adapters for flashing and hipot testing.

Testing occurs according to the flasher and hipot manufacturer. The results are transferred to the control unit and, if desired, to the downstream sorter stacker as an optical signal or digitally via an interface.

## Cleaning ➔ Cleanliness is the key

The cleaning station is an inherent component at the end of module production which prepares the modules for flasher testing and subsequent packaging. Whether cleaning the glass, reworking the frame or visually inspecting the module, the operator can simply rotate the module to the optimum working position with just one hand. Locking positions every 45° ensure the PV module is always held in the correct position. The operator is thus free to use both hands. Module changeover occurs automatically. Optionally, quality features can be entered at the control panel.







PV modules sorted and stacked automatically according to classes for one or several module sizes

## Stack turning

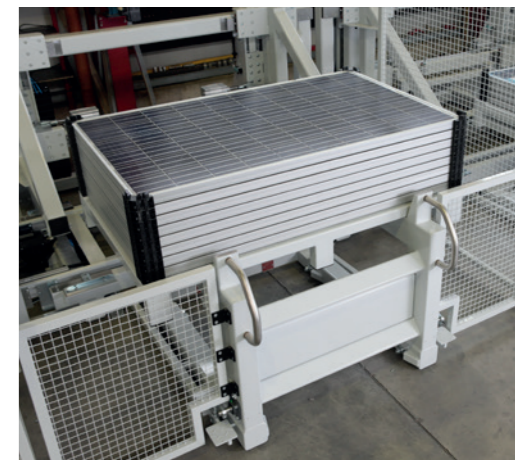
### ➤ Turning and packaging

At the end of the module line, the PV modules are cleaned, tested, sorted and stacked horizontally. However, vertical module transportation is the safest method to ensure the modules reach your customers undamaged. The stack turner effectively places the modules on the shipping pallets. Depending on the desired level of automation, turning can be carried out manually or automatically.

The stack turner developed by Ulrich Rotte GmbH is ideal for this process. An inserted shipping pallet is turned 90°, the module stack is picked up, rotated and made ready for transportation. An integrated anti-tilt mechanism keeps the stack in position while it turns.

Thanks to the automatic corner fitter, we offer our customers an economic solution for the fully automatic fitting of *Eckpack* Trio corners on frameless and framed modules.

The symbiosis that exists between *Eckpack* corners and Rotte automation helps to double the benefits for our customers: cost-effective sorting and packaging combined with optimum module protection from shipping right up to roof-top installation.



## Assignment and removal

### ➤ Sorting and stacking

**The module sorter is the essential component for every automated PV module production line.**

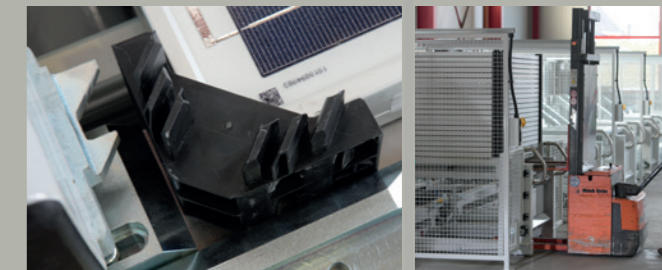
Depending on its performance class, the PV MMS control unit assigns the module to a stacking box, transports it to the respective box and adds it to the stack.

Fully automated stack removal ensures uninterrupted operation even with short cycle times and means production performance does not depend on the operator.

The modular addition of further stacking boxes guarantees the utilization of additional performance classes. Each stacking box in PV MMS can be set easily to the produced frame size.



*Eckpack* corners protect your modules against damage in transit.







Our plants can be found in Europe, Asia, America and the Indian subcontinent.

We install turnkey solutions.



## Service range

### ➔ Rotte international

Individual plant concepts, clever transport logistics and sophisticated testing technology demand structured control procedures with transparent program structures.

Our control planners and programmers plan and create the necessary control units according to the requirements profile and country-specific guidelines. Based on the required functional sequences, we program and visualize your plant concept, including all the necessary interfaces to adjacent or integrated sections, such as your computer systems.

Remote access to our control units ensures quick and effective international support even after installation and commissioning.

## Sea or air freight

### ➔ Efficient forwarding solutions

All our planned and constructed plants are tested and accepted together with our customers before being prepared for shipping. This involves carefully disassembling all the components. The disassembled individual elements are packed in bespoke wooden crates. If necessary, these crates can also be designed for sea transport. Built to standards, they fit precisely on the loading ramps of trucks and container ships.

We also offer a worldwide installation and commissioning service. Our engineers and technicians ensure that your plant functions efficiently and effectively anywhere in the world.







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