

## PV PRODUCTION LINES FROM MINITEC

EVERYTHING FROM A SINGLE SOURCE

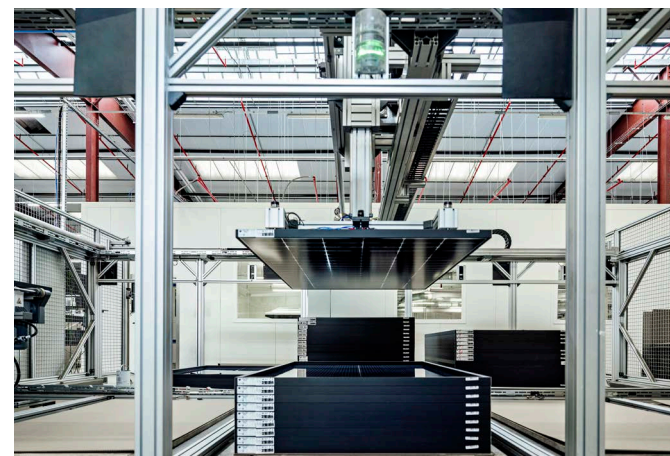
Photovoltaics is currently experiencing a major renaissance. Climate change, the energy transition and decarbonization are driving a sharp increase in demand for PV modules worldwide, leading to a significant expansion of production capacities in the solar industry.

Take advantage of this development by implementing your photovoltaic production line with MiniTec now. With many years of industry expertise, we offer a modular solution concept that includes everything from individual sub-components to complete production lines.

Our flexible MiniTec modular profile system ensures that the solution can be adapted to your specific requirements. From system layout and design to on-site assembly, commissioning and staff training, we provide everything from a single source.



Automatic conveyor line



3-axis palletizing port

## LOCATIONS WORLDWIDE

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Northmacedonia | Poland | Portugal | Romania | Russia | Serbia | Singapore | Slovakia | Slovenia  
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**MiniTec**  
THE ART OF SIMPLICITY

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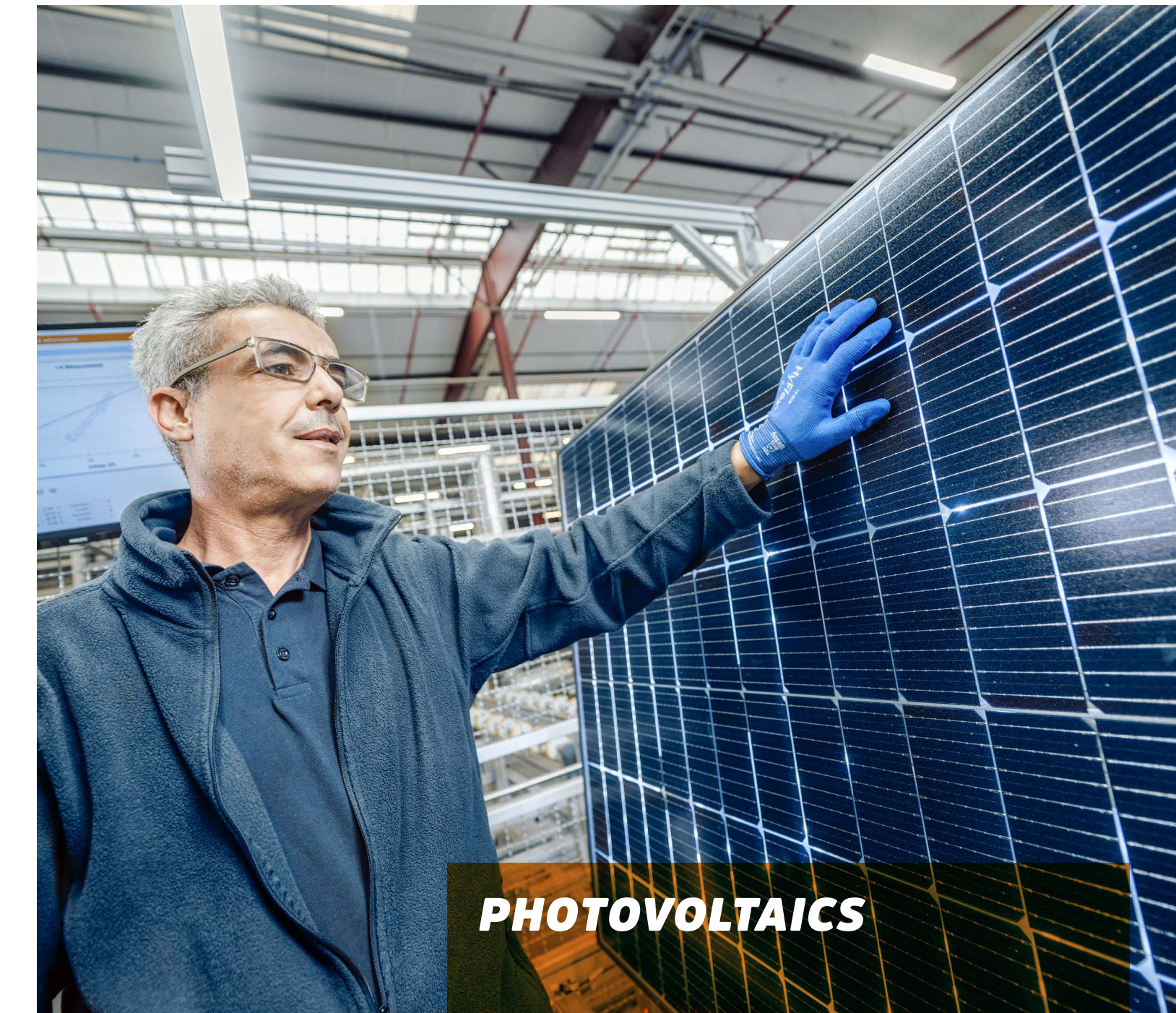
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## PHOTOVOLTAICS

Production lines for  
module manufacturing

**MiniTec**  
THE ART OF SIMPLICITY



## MiniTec Facts & figures

**1986**  
Founded

**420**  
Employees  
280 in Germany

**60**  
Sales and  
service partners  
around the world

**Business award**  
„Innovativer Mittelstand“  
**Award**  
„Attraktiver Arbeitgeber  
Rheinland-Pfalz“  
**Honorary award**  
of the region Westpfalz

**11**  
Locations  
Germany, France, Slovenia,  
United Kingdom, Spain,  
USA, China

**since 1996**  
PV equipment

## THE ART OF SIMPLICITY

MiniTec has continuously developed from a specialist for miniature guides into a leading technology company and special machine manufacturer.

Today, 420 experts at 11 locations in Germany, France, USA, Great Britain, Spain, Slovenia and China develop tailor-made solutions for our customers. At the same time more than 60 partners worldwide provide reliable service and expert advice.

As a full-service manufacturer, we leverage our design system to create intelligent solutions and special machines for a wide range of tasks across all major industrial sectors. We have been successfully operating in the field of PV production lines since 1996. Furthermore, we build systems for battery production and solar thermal energy within the renewable energy sector. In line with our high technical standards, our motto for complete solutions is: The Art of Simplicity.



Art.-Nr.: 950028/0





## ALL PROCESSES UNDER CONTROL

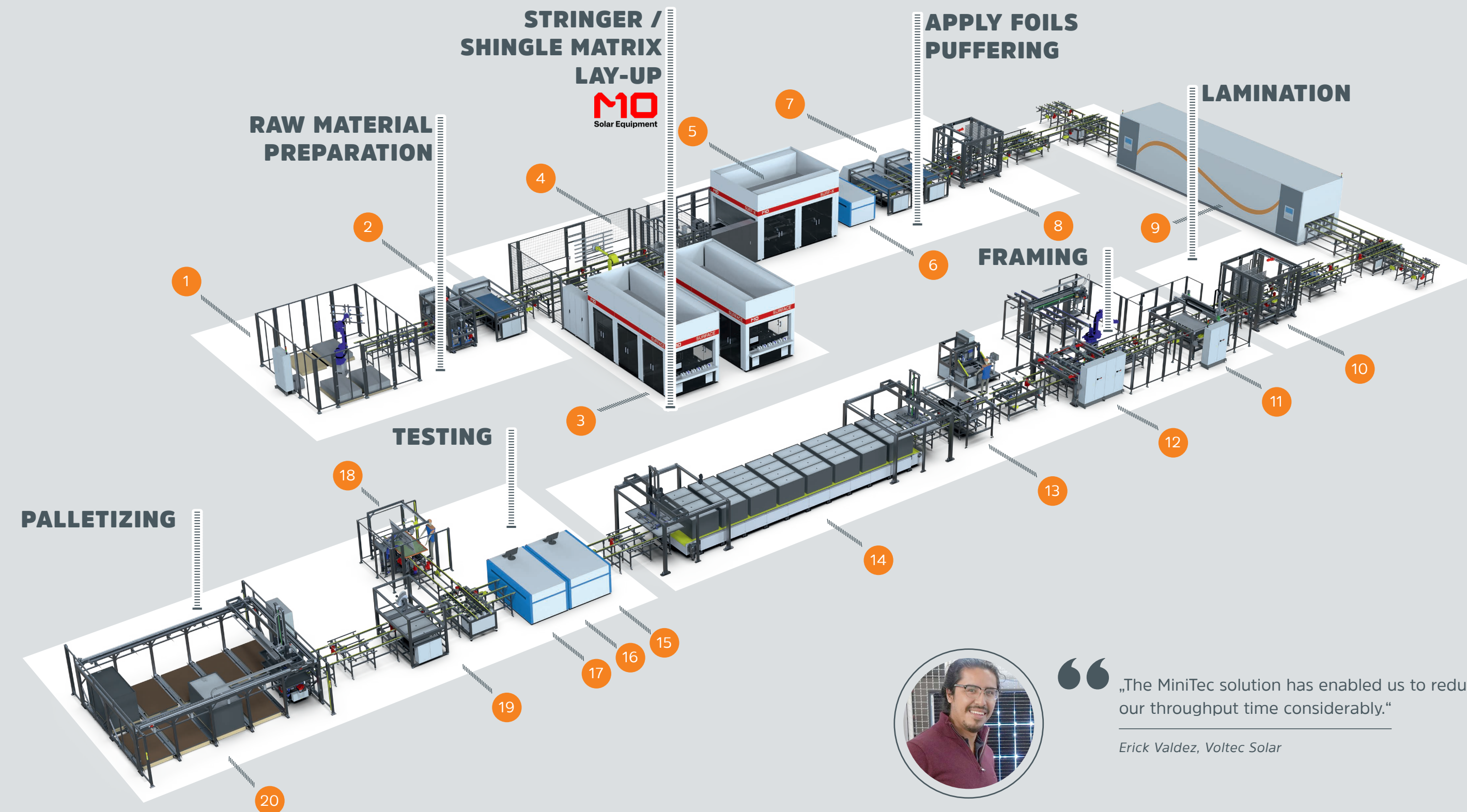
### A COMPLETE SOLUTION WITH MINITEC

Photovoltaic modules are manufactured in typical sub-steps. In principle, such a system consists of workstations, buffers and conveyor lines in between, along with specialized equipment. MiniTec turns all these elements into an efficient overall solution for you. If we do not have our own product for individual areas, such as stringers, lay-up stations or laminators, we integrate proven components from high-performance partners.



## PRODUCTION PROCESS

### FROM THE GLASS STORAGE TO THE FINISHED MODULE



„The MiniTec solution has enabled us to reduce our throughput time considerably.“

Erick Valdez, Voltec Solar

- 1 Automatic glass loading**  
The glass is loaded in the glass store and optionally cleaned in a glass washing system.
- 2 Cutting and automatic depositing of embedding material**
- 3 Shingling machine (M10) or stringer**  
In shingling, the cells are arranged overlapping in a matrix. This results in a larger active area on the same module surface. Alternative method: Stringer. The cells are connected to strings using busbars (conductor strips) by gluing or soldering.
- 4 Automatic lay-up**  
Placing the strings or matrix onto the front glass with pre-applied embedding material.
- 5 Cross-connection**  
The strings or matrices are electrically connected. The conductor strips, which are later contacted in the junction boxes, are attached.
- 6 EL tester**  
A voltage is applied. The cells light up in the infrared range. Special cameras detect cell breakages and other defects.
- 7 Cutting, automatic depositing of embedding material and backsheet**
- 8 FIFO storage**  
Intermediate storage according to the first-in-first-out principle.
- 9 Laminator**  
The modules are „baked“ in a vacuum. The embedding materials cross-link at appropriate temperatures. Air and gases are drawn out of the module in a vacuum.
- 10 FIFO or LIFO storage**  
Intermediate storage according to the first-in-first-out or last-in-first-out principle.
- 11 Automatic framing**  
Processing of the laminate edges. The module is picked up by a timing belt conveyor, aligned and fixed by vacuum suction cups. The edges are then trimmed with knives.
- 12 Automatic framing**  
Optional: automatic siliconizing.
- 13 Semi-automatic (connection) box assembly**  
Optional: including potting.
- 14 Curing line**
- 15 EL tester**
- 16 Flasher (sun simulator)**  
Generates a flash in a specific light spectrum. Records the power curve of the module. Determination of the power class. Detection of faults in the wiring or cell failures.
- 17 High voltage test**  
A high voltage is applied and maintained. The insulation resistance is measured. After the evaluation, the IO/NIO decision for the tested part can be made based on the test result.
- 18 Visual inspection**  
The panel is lifted with a pneumatic multi-joint arm and placed in a vertical position. An employee inspects the panel and assigns it to the appropriate quality level.
- 19 Labeling machine**
- 20 Sorting system finished modules**