

Compact and waterproof:
the EtherCAT modules with IP 67
protection also enable the con-
nection of stepper motors.

Precise measurement of current and voltage

PV efficiency: fully automatic testing and sorting of photovoltaic cells

The checking and testing of photovoltaic cells is a significant element of quality assurance in solar cell manufacturing. Prior to assembly into solar modules, these cells must be checked for a number of criteria of which efficiency and power are of the most important. IPTE Factory Automation, headquartered in Genk, Belgium, has introduced a new SOL-TS: An integrated testing and sorting system for photovoltaic (PV) cells. Up to 3,600 PV cells can be processed per hour with this highly efficient, compact and cost-effective solution.

The SOL-TS developed by IPTE is a fully automatic system for testing and sorting photovoltaic cells. The testing unit can process 3,600 PV cells, up to 6 x 6 inches in size, per hour.

Before they are assembled in solar modules, the photovoltaic cells must be subjected to a series of intensive tests as described by the IEC standard. A very important parameter, among others, is the measurement of efficiency and power.

Precise measurements require precise positioning

The SOL-TS testing and sorting system developed by IPTE consists of three units: 1) the power supply section, 2) the test section and, finally, 3) the sorting and packaging unit. The testing unit can process 3,600 PV cells per hour that are each up to 6 x 6 inches in size. The cells are fed to the testing unit by means of intelligent conveyor belts which are driven by Beckhoff type AS1060 stepper motors. The photovoltaic cells must be precisely positioned for the tests. A 3 x 10 ms pulse emitted by a Class AAA multi-level solar simulator permits precise measurement of the voltage and current on each PV cell. Connected to a programmable load and multiple sampling allows verification of the performance of the PV cell. Since the PV cells are extremely thin (< 200 micrometers), they must be conveyed and connected under controlled conditions.

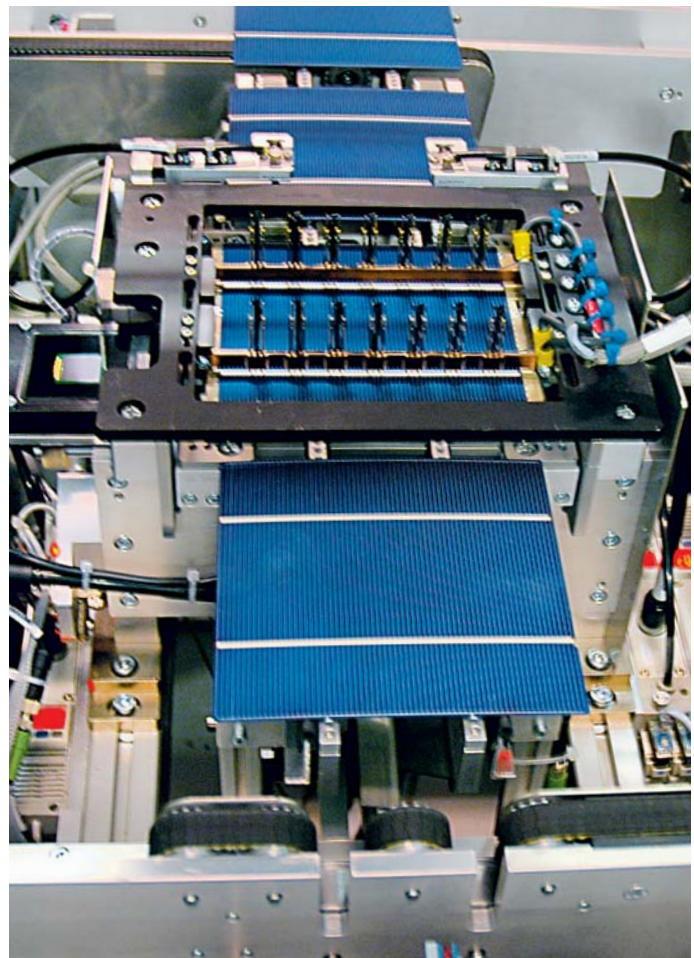
After the test, the results of the PV cell measurements are saved in a file and at the same time transmitted with the cells for further processing in the sorting system. The measurement results also represent an important source of information for manufacturers of solar modules. The data will be used in quality testing and traceability systems.

Control of robots with TwinCAT Kinematic Transformation

The sorting of the PV cells according to the test results is handled by a robot. The controller for the robotic system, including the drive technology with Beckhoff AM3033 servomotors and the AX5000 EtherCAT Servo Drive, was developed by IPTE in-house. "We opted for a cost-effective double drive system with one single and one double axis drive. For software we are using TwinCAT Kinematic Transformation, developed by Beckhoff for pick-and-place applications among other robot types," explains Dimitri Paque, a Software Developer at IPTE. "This Kinematic software is ideally suited to motion interpolation in G-code (DIN 66025), the standard for CNC machines," Koen Kerkhofs, Technical Support at Beckhoff Belgium emphasizes. Starting from Cartesian data, the setpoints for the robot can be set easily. The mass and the moments of inertia for dynamic control of the robot arms can also be entered.

All the internal I/O communication takes place via Beckhoff EtherCAT Box modules with IP 67 protection. This results in a compact and clearly laid out cabling. The photovoltaic cells are sorted according to their electrical characteristics and placed in small, ready-to-ship polystyrene containers.

The cells are fed to the testing unit by means of small conveyor belts which are driven by Beckhoff type AS1060 stepper motors.



Further Information:

www.ipte.com

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