

High-end solution for high-precision PCB placement

# Beckhoff automation platform controls EasyMounter

The Belgian company IPTE FA (Factory Automation) specializes in developing production and test systems in the electronics industry. With the EasyMounter, IPTE FA has created a machine for the placement of PCBs with odd-form printed circuits. A new Motion Control system and user-friendly HMI ensure a faster, more flexible and accurate production process.



The special features of the new EasyMounter for placing PCBs with odd-form printed circuits are high-speed production, short changeover times, considerable flexibility and user-friendliness.

Based in Genk, Belgium and founded in 1992 by five former Philips employees, IPTE FA began by producing specialized test systems. The EasyMounter developed by IPTE FA is suitable for the production of PCBs equipped with non-standard components. Its special features are its high-speed production, short changeover times, the considerable flexibility of the many grippers and placement heads and its unusual user-friendliness thanks to the newly developed Human Machine Interface (HMI).

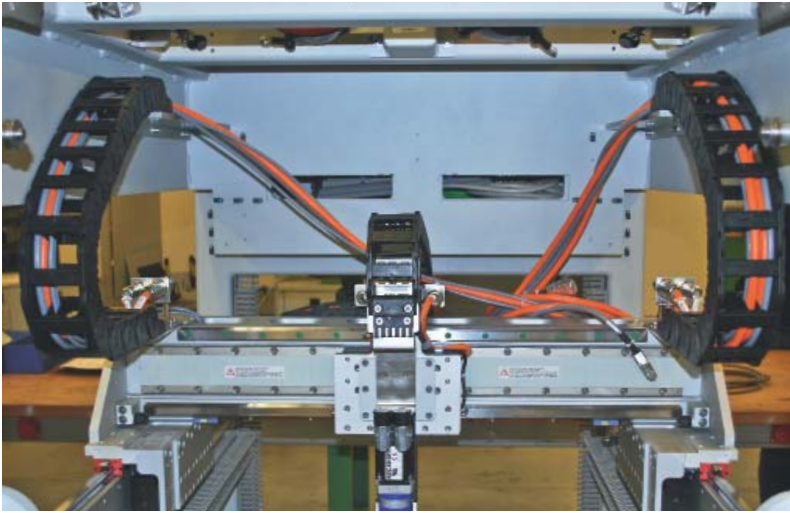
## Production process based on the utmost precision

The placement process must not only be fast and flexible, it must also be highly accurate. For this reason the EasyMounter uses a Double Vision system and application-dependent grippers equipped with a force control mechanism. First, a PCB which has been assigned a bar code in the system is inserted from the side; then the placement area on the PCB is marked out via two or three reference markers and the precise placement position (mount position) identified. This is a standard marking procedure, which determines the zero point of the group. The placement position is recorded by the top camera and transmitted to the Motion Control system. Then the correct component is picked up by the gripper from one of the six placement heads on the rear of the machine. The precise position

of the printed circuit in the gripper is recorded beforehand by the bottom camera. This requires a visual check on a reference pin. There is yet another quality control and visual inspection, in case pins have broken off, before the component is placed in position. Finally, the built-in force sensor and programmed force control ensure that nothing is damaged during placement. Although some force is required to press the pins into the openings on the PCB, a need for excessive force indicates that the positioning is not properly aligned with the pattern of the openings. Force measurement is therefore another control measure which guarantees a top-quality end product and a pristine machine. After placement, either the next component is placed or the PCB is fed towards the next process step, depending on the customer's order.

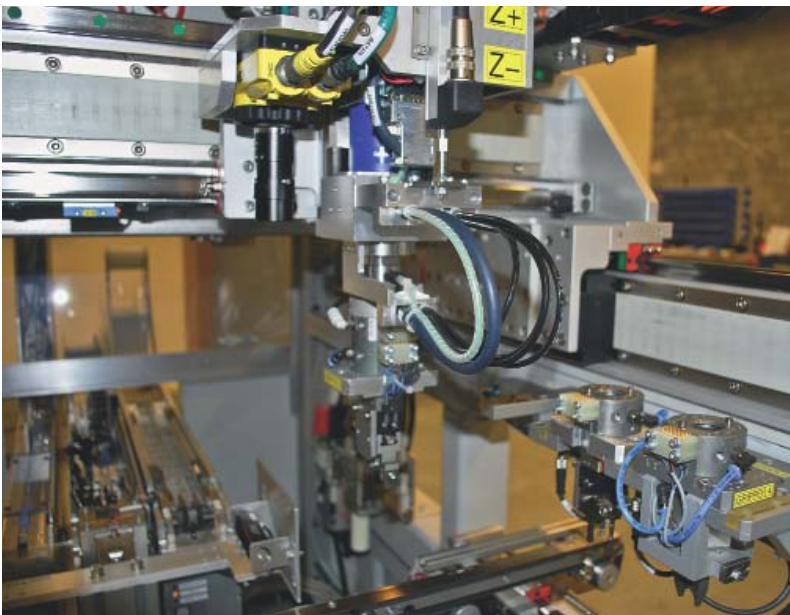
## One control platform for PLC and Motion Control

So that all the axes of the gantry robot and mounter, the individual grippers, vision systems and sensors work totally in sync, they need a control system that guarantees fast, and at the same time, precise positioning. An end-to-end Beckhoff control solution comprising an Industrial PC (IPC) with TwinCAT NC I automation software, various EtherCAT I/Os and Servo Drives was chosen. Evidently, its flexibility was not the only



Left: Several multi-function grippers enable the machine to be used in many applications.

Below: A camera checks the precise placement position of the PCB and transmits it to the Motion Control system. In the event of any deviation, the correction factor is transmitted to the CNC axis.



advantage of having the IPC control all the movements. The TwinCAT NC Interpolation system also eliminates the need to program the speed and torque in the drive itself. Using the SERCOS Drive profile, the positions are read via EtherCAT in each 125 microsecond cycle and the new speed curves of all the axes are automatically interpolated on the basis of three points.



(from left to right) Jonathan Janssen, IPTE FA programmer, Patrick Gielis, Managing Director of Beckhoff Belgium and Marc Hermans, Development Manager at IPTE FA



Phil Frederix,  
General Manager at IPTE FA

### Complete solution from a single source

The PC-based control platform offers IPTE FA several advantages at once as IPTE FA Managing Director, Phil Frederix, emphasizes: "The improved compatibility of the hardware components means their replacement, for example for maintenance reasons, requires only a brief intervention. Moreover a modular design is possible. This has advantages with regards to standardization, which no longer requires us to make compromises in the customer-specific versions of new generations of machines." The main reason for choosing Beckhoff to supply the control system was that the company offered a complete solution based on the 'building block' principle, which was able to guarantee an excellent price-to-performance ratio. "Another crucial factor was the commitment of the application engineers on-site to rise to the challenges posed by the specification in terms of speed and precision," explains Frederix.

### Universal machine operating concept

IPTE FA is no less proud of its user interface than of the high-end Motion Control solution which the company itself developed and has been seamlessly integrated into the new control system. Named Platform 3, the HMI includes an article manager, tool manager, calibration assistant and an order-processing module. "The modules programmed into C# include everything that the operator needs for precision PCB placement," Frederix stresses. New articles can be created or old ones adjusted in the article manager, whereby specifications such as gripper type, force settings and type of camera program can be applied and additional parameters coupled to the article concerned. The specific gripper settings are adjusted in the tool manager of a database in which all the devices (placers, grippers and cameras) are generated and managed. By setting the vision system, the calibration assistant helps identify a new product if necessary. Moreover, the system can be coupled to a customer's ERP system. In the words of the Managing Director, The uniformity of the user interface represents a huge gain for our customers who no longer have to familiarize themselves with another operating system for each individual production line in their plant."

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