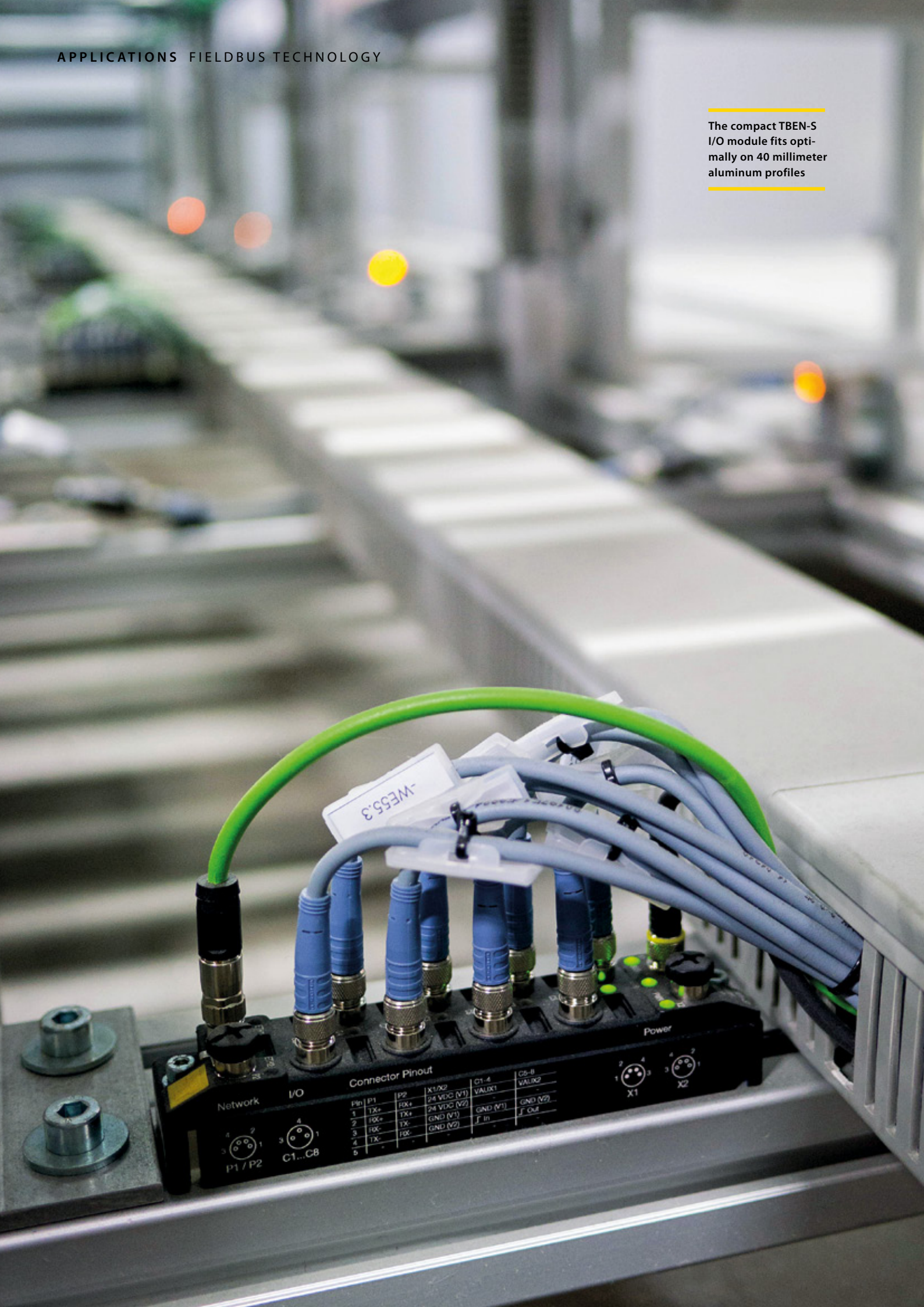
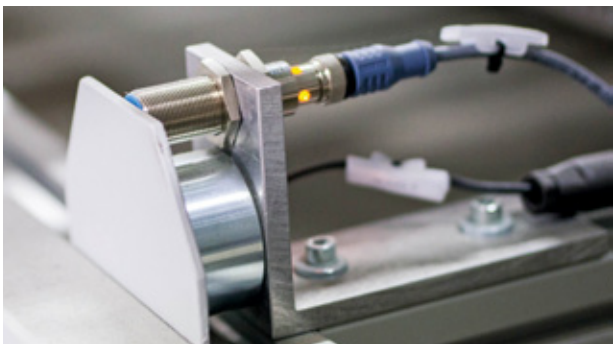


The compact TBEN-S I/O module fits optimally on 40 millimeter aluminum profiles



The signals of the sensor and the electromagnet are directly connected to the TBEN-S on the stacker carrier

Short Distances

Beil uses the TBEN-S compact Profinet I/O modules directly on 40 millimeter aluminum profiles in a punch bender for print shops

The journey from the first print with movable letters to offset printing was a long one. If you look at the art of book printing in Europe, you will more than likely come across the name of Christoph Plantin. In his print shop in Antwerp, the Belgian brought book printing into its heyday in the 16th century. Even today, the historic building of the print shop still houses a book printing museum, which impressively showcases Plantin's work.

The offset printing process widely used today has little in common with Plantin's print shop. Offset printing is neither a high speed process, such as linoleum printing, nor an intaglio printing process, as is the case with copperplate printing. In offset printing, the printing plates are set with a photosensitive layer in the so-called computer-to-plate (CTP) process. The exposed parts of the printing plate are oil absorbent and water repellent. The unexposed areas are oil repellent and water absorbent. After the oil-based ink is applied to the plates, the areas that are not to be printed are washed off with a water roller. What remains on the printing plate is a negative of the print image.

The CMYK process is normally used for four-color printing: Cyan, magenta, yellow and black (key). A printing plate is exposed for each of these colors. However, between exposure and entry into the printing machine, the plates often have to be trimmed in order to be fitted precisely to the print rollers. Depending on the requirements and the process, parts of the plates may also have to be cut off.

Registration marks are punched into the plates so that they can be aligned exactly and fixed on the rollers in the printing machine, with some plate setters directly punching these marks themselves. If necessary, the plates may have to be rotated in order to obtain the correct position for the printing process. A stacker finally stacks the printing plates on carts, which are then taken to the printing machine.

The punch benders, as well as the turning unit and stacker for this section of the printing process, frequently come from Beil Registersysteme GmbH, based in Abensberg, Bavaria. The company is one of the few full-range suppliers worldwide for punching and bending printing plates in all segments of the printing industry.

QUICK READ

Machines in the printing industry have many interfaces to the office world. Plate setters, punch benders and the actual printing machines must be networked together and connected to the system of the print shop. Barcode scanners and monitors also have to be connected. Ethernet solutions simplify this through the use of the common TCP/IP platform, leading companies like Beil Registersysteme GmbH to use Ethernet solutions in their machines for the printing industry. To connect sensors and actuators, Turck's ultra compact TBEN-S I/O modules are used in a Belgian print shop. The wiring in the machine as well as the integration in the controller environment couldn't be simpler.

Each of the five stacker modules are provided with a TBEN-S, which connects the input and output signals of the sensors and actuators

The illuminated pushbutton indicates that the cart is ready for fetching

Until now, Michael Denk, electrical designer at Beil, had to run up to 40 lines in the cabinet: "We wanted to save all this effort and replace it with a decentralized solution."

Ethernet simplifies data transfer

Beil produced a punch bender together with a rotating table and stacker for a Belgian print shop near Antwerp. The interfaces to the system of the print shop and the printing machine were integrated accordingly. The system assigns the individual printing plates to the print jobs at hand and ensures that all the plates are present at the printing machine in the correct order and at the right time.

The data transfer between the different machines involved in the printing process is now implemented with Industrial Ethernet and is considerably easier and more economical to set up than with conventional fieldbuses. "Machine communication with Ethernet has a major advantage over fieldbuses like Profibus, particularly when I want to connect a monitor to visualize data or connect a printer. That would have required more effort and would have been more expensive," explained Michael Denk, electrical designer at Beil. "Ethernet brings the office world and the industrial world together."

After bending, the printing plates are identified by their data matrix code and transported to the Beil stacker. In the Belgian plant, the plates are already punched in the CTP machine. The stacker is equipped with vacuum grippers in order to set up the plates carefully. After receiving 100 to 120 plates a cart is filled, and this is indicated to the operator by a light and acoustic signal. The cart can be released via a signal actuator. A control slip is printed at the same time in order to identify the plates stored on the cart.

To anchor the carts on the stacker, electromagnets are fitted which can be locked or released via the pushbutton actuator. An inductive sensor detects whether a cart is positioned correctly. If an emptied cart is positioned in front of the sensor, the light button flashes and the cart can be locked again for renewed filling.

Two carts are positioned opposite the stacker to form a module, and the print shop in Belgium has a total of five modules. Two electromagnets (actuators), two light buttons (sensor and actuator), and two inductive sensors are fitted on each module. Overall, there are roughly 40 input and 40 output signals, which run from the stacker to the controller on the turntable.

Reduced wiring effort

"Previously, we routed all the signals directly to control cabinets," said Denk. "With some systems this required cable lengths of between 10 to 15 meters for each of the 40 cables required. We then had to provide a terminal strip and required another module on the

»Today we are only using one Ethernet cable and a power supply to the control cabinet. This therefore reduces the mounting time at the customer's site as we just have to connect up the modules with two plugs and connect the entire run in the control cabinet.«

Michael Denk | Beil

ET200 to read in the information. We wanted to save all this effort and replace it with a decentralized solution."

Instead of the conventional point-to-point wiring, Beil used Turck's TBEN-S-I/O modules with IP67 protection. The Profinet modules collect the signals directly on the stacker and bring them to the box PC controller in the control cabinet. The TBEN-S modules are connected up in a linear topology. "We are only using one Ethernet cable and a power supply to the control cabinet. This reduces the mounting time at the customer's site, as we just have to connect up the modules with two plugs and connect the entire run in the control cabinet."

Ethernet address and web server on board

The TBEN-S modules have a very compact design and, thanks to their width of only 32 millimeters, could be mounted directly on the 40 mm profiles of the module carts. An even more noteworthy feature of the compact design is that themodules do not require a sub-bus with an additional Profinet coupler. Each module is an autonomous Profinet station with its own Ethernet address. A web server and two Ethernet ports for linear topology are also on board. Each TBEN-S also "speaks" Profinet, EtherNet/IP and Modbus TCP. As multiprotocol devices, the modules are set automatically to the Ethernet protocol used on the bus. In this case, this function was not important, but they may be of interest for machinery designed for export.

As each stacker module requires four inputs (one pushbutton actuator and one sensor per cart) and two outputs (one magnet each and the button light per cart), the signal distribution of the TBEN-S with four DI and four DO fit perfectly. The signals for the limit switches on the vacuum grippers are directly connected to the I/Os of the valve block.

Easy configuration in the TIA Portal

The TIA Portal combines some of the formerly separate engineering and visualization tools for electrical design in a single software platform. The GSDML file of the TBEN-S modules can be read directly in the TIA Portal. The configuration of the modules couldn't be simpler through the use of drop-down fields and drag and drop technology. Each module has a separate Ethernet address and can thus be easily maintained later.

Remote maintenance and diagnostics via Ethernet

Remote diagnostics are often sufficient in this case. "I don't have to travel to the customer. I can access the machine remotely via VPN and see directly where the fault is," Denk explained. "This also enables us to help our customers during the startup phase. Another useful feature is that it's possible to diagnose the module in its entirety as well as each individual channel of the TBEN-S.

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