

The Eberhard system ensures the efficient production of M8 and M12 circular connectors with various codings, with or without a protective ground connection

Connectors Made Easy

High product variety with minimum setup times: Eberhard AG builds high-performance assembly system for M8 and M12 connectors

When it comes to cabling industrial plants, machines and devices under demanding operating conditions, circular connectors are one of the most common physical interfaces worldwide. M12 and M8 have become established as the standard sizes for more compact devices. Turck had been looking for an assembly solution that offered fast throughput times, scalable quantities and maximum process reliability for the automated assembly of M8 and M12 circular connectors with different codings. These were to be used in TBEN block I/O modules, with or without a protective earth (PE) connection. The assembly of millions of circular connectors places high demands on automated systems. This is particularly the case when regular retooling for different variants is required. The machine is moreover not only required to handle the actual assembly, but also the visual inspection of the contact insertion and lastly the packaging of the circular connectors in trays.

The production planners at Turck had already experienced good results with the special machines of Eberhard AG used at various production sites. The order was therefore placed with the company based in Schlierbach, Baden-Württemberg. For more than 50 years, the company has supported electronics manufacturers and automotive suppliers worldwide with modular and high-performance solutions for the production of connectors and other electromechanical components. Its core competences include all the standard processes involved in assembly technology, insertion and bending of contacts, testing and packaging, as well as the handling of products according to customer requirements.

The requirements for maximum productivity and efficiency were already clear during the design phase of the application: maximum output, short setup time, as well as high system flexibility and reliability. "Eberhard AG proved to be the most trustworthy and suitable partner for our application," says Jörg Montowski, from Production Engineering – Process Development at Turck. "We were particularly impressed by the company's exceptional expertise in the production of plug connectors and insertion of contacts in plastic parts, such as hundred-pin male connectors for the automotive industry."

Automated insertion

The pin insertion machine inserts the metal contacts into the plastic cores of the subsequent female connector, slips the later metal connector body over the plastic core like a sleeve and also adds a ground connection beforehand. The process control is handled



by a Siemens PLC. The remaining automation tasks were implemented with Turck components wherever possible, including sensors, safety light curtains, block I/O modules, HMI operator panels with direct cloud connection and connection technology.

Like the metal bodies, the plastic cores are fed via a spiral conveyor. A QS18 photoelectric sensor detects the tray on which the finished female connectors are placed. The optical sensor from Banner Engineering

Eberhard was able to utilize the full Turck range, from sensors and I/O modules to HMI and cloud, for the design and implementation of the plant

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Eberhard AG is a powerful partner in the field of automation, and develops, produces and distributes customized automation and assembly systems worldwide. Depending on customer requirements, individual stations are individually combined into complex systems and then integrated into the production lines. Eberhard AG developed an assembly machine for the production of M8 and M12 female connectors for use in Turck's block I/O modules and benefited from these very same block I/O modules during its construction. Turck's pressure sensors and Banner Engineering's optical sensor components also impressed Eberhard AG. The standout features of the insertion system are its minimal setup times and high precision.

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Andreas Wißt | Eberhard AG



A Turck HMI from the TX700 series is used for visualization and cloud connection

thus ensures the orderly feed and outflow of the plastic carriers. Banner Engineering safety light curtains are used in tunnel operation in the palletizer to protect the operators of the system from unintentional access into the danger area of the machine. After feeding the plastic parts, a camera system measures their position based on the guide and hole geometry. The system reports a degree to the controller so that the robot can pick up the plastic parts in the correct

position or correct their position. After the actual and target insertion positions have been matched, the robot moves the plastic part to the rotary table, where it is rotated to the appropriate position and inserted. During the insertion operation, a QM30 sensor mounted on the insertion head records vibration data that is visualized via a dashboard and can be used for condition monitoring and predictive maintenance.

Plug and play device replacement with IO-Link
One requirement was the ability for plug and play replacement of the sensors, so that they can be exchanged in the event of a fault and used directly without the need for renewed parameterization. A requirement that was met with smart IO-Link sensors. Parameter sets of IO-Link devices can be stored in the IO-Link master and applied to any replacement device. Other IO-Link components in the plant are valve terminals, including the large main terminal at the insertion head and the Turck pressure sensors. "The PS+ pressure sensors deliver on their promise to offer intuitive commissioning and operation," Andres Wißt, head of software engineering at Eberhard AG, confirms. The PS+ sensors monitor the pressure changes in the pneumatic system of the plant. The user is alerted if the plant delivers values that deviate from the standard.

Flexible I/O and safety modules
Eberhard relied on Turck's TBEN I/O module portfolio to connect the IO-Link signals as well as the conventional digital input and output signals. "We were particularly impressed by the variety and flexibility of the decentralized block I/O modules," Andreas Wißt describes. "Turck's hybrid TBPN-Profinet/Profisafe module in IP67 combines standard and safety inputs/outputs in a single device, which can be parameterized flexibly. I was very surprised at what this device can do."

A TX700 series HMI serves as a fixed panel for visualization and is also used as a cloud gateway. "A major benefit," says Wißt. "One of the requirements was to provide data for the cloud. This was only

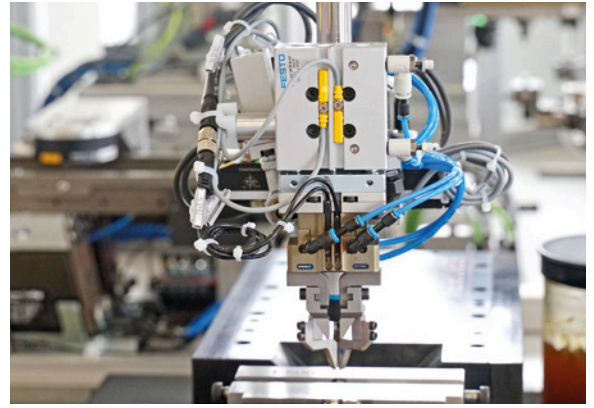
possible with the Turck HMI – and without any problems.” The HMI accesses the controller data via OPC UA. Relevant data can thus be uploaded to the cloud, where key figures are derived such as the number of parts produced, fault messages or machine downtimes. These are visualized on a central monitor in the plant.

Further possible applications examined

The project members at Eberhard AG are also examining additional scenarios for the use of Turck components in other projects due to their good experience with them. “This applies to the sensors and especially the TBEN modules as a whole,” says Wißt. “We will thus benefit from the diversity and their flexibility, especially with the hybrid safety module.”

The insertion system is now running successfully at the Lublin production site in Poland. In anticipation of the continuing high demand for M8 and M12 connectors, another machine has already been ordered as a result of the good experience had with the first one. “The cooperation with project management and those responsible was excellent – also on a personal level. Very communicative and relaxed,” says Wißt. “This is especially true in light of the fact that this was the first machine of its kind, and everyone involved was able to learn something. I am looking forward to more projects in the future.”

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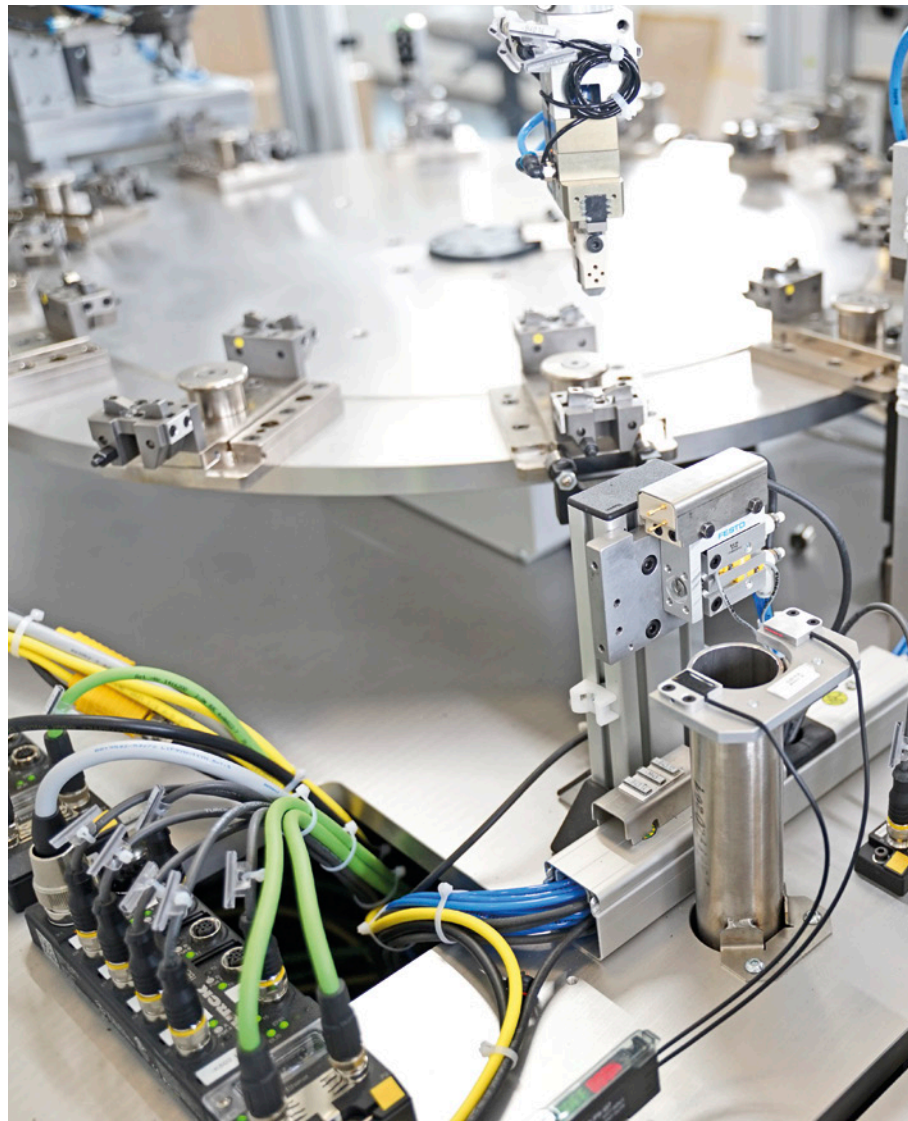


The BIM-UNTK magnetic field sensors detect the piston position and thus the height of the gripper



Illuminated emergency-stop pushbuttons: the space-saving concept of the light integrated in the pushbutton is rarely found

After checking the insertion position, the robot moves the plastic part to the rotary table, rotates it into the correct position and inserts it for insertion with the contacts



A QS18 photoelectric sensor detects the tray on which the finished connectors are placed