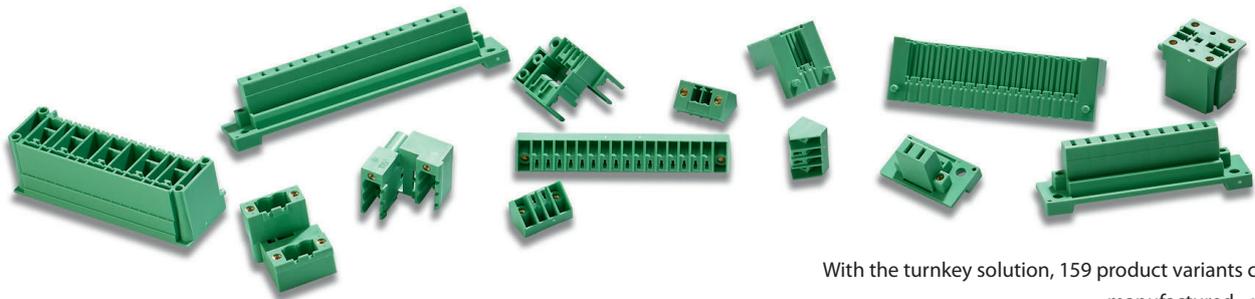


Flexible Production Concept Combines High Article Variance with Automation

One System, 159 Variants

At the beginning of 2021, the following question arose at Phoenix Contact: How can we implement high article variance on an automated system with optimized set-up times – with the requirement of solely producing flawless parts that come directly from the system with no finishing work – even without 100 % testing? The answer: with a fully automated system and interchangeable mold cassettes.



With the turnkey solution, 159 product variants can be manufactured. © Arburg

Phoenix Contact, a German family-owned company with over 20,000 employees and headquarters in Blomberg, describes itself as the global market leader and innovator for electrification, networking, and automation on the path to a smart world. The plans to use a new turnkey solution to manufacture 159 base strip variants (**Title figure**) were correspondingly ambitious. Base strips with different pitches and numbers of positions are used in device connection technology. The flanged parts, made by overmolding a metal bushing with internal threads, form a total of five different product families. The new system was intended to “reconcile high article variance with automation”, explains Bernd Laumann, Team Manager Injection Moulding Projects PCC in the DC (Device Connectors) business area. The specifications were also challenging: the fully automated system had to offer a 20 % reduction in cycle time across all part variants compared with the existing system – in addition to the high levels of reproducibility, accuracy and efficiency expected by the customer.

Laumann is familiar with the extremely high expectations of customers, especially in the Japan and Asian market. Thus, the outcome of the selection process was a decision to collaborate with Arburg and to design a turnkey solution

around an electric Allrounder 470 A injection molding machine with Multi-lift V robotic system.

Cycle Time Reduced by 30 Percent

With the new machine mold concept, the cycle time requirements are not only met, but far exceeded. The bushings are separated and fed via an automation module (supplier: Hörmlle GmbH). An articulated-arm robot (type: Kuka Agilus) with direct data record connection takes the bushings from the conveyor bowl or web position and places them at the specified positions on the corresponding transfer plate (**Fig. 1**). Transfer plates and

grippers fit the respective mold cassettes, which have one, two or four cavities. Those not currently in use are stored on two gripper trolleys that can be moved to the system for a better change (**Fig. 2**).

The bushings are picked up from the transfer plate by a handling robot (Multi-lift V), which engages vertically, and inserted into the mold on the nozzle side. At the same time, the gripper on the opposite side removes sprue and molded parts (**Fig. 3**). The sprue is then discharged via a chute into a sprue mill, where it is regranulated and returned to the production process. This is followed by the inductive bushing inspection

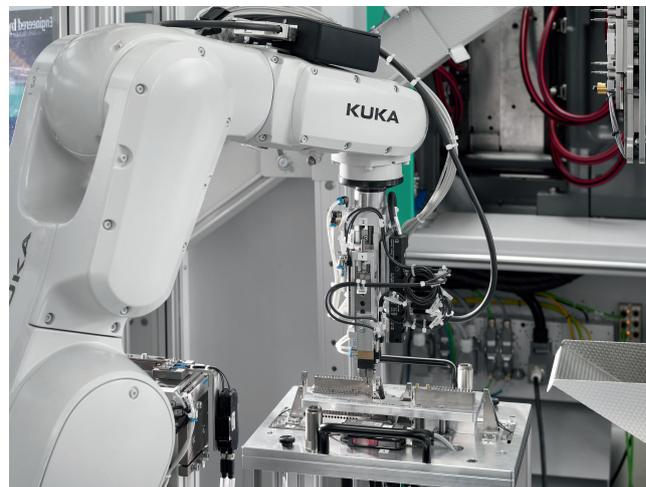


Fig. 1. An articulated-arm robot takes the bushings and places them at the specified positions on the corresponding transfer plate.

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Fig. 2. To enable a quick changeover, the transfer plates and the matching grippers are available on two trolleys. © Arburg

together with a quality inspection of the parts and ejection into the corresponding transport containers, separated by cavities or mold cavity.

Two flame retardant materials are processed, a PA66 and a PBT-GF. Quality is ensured by an internal pressure sensor system that ensures optimum part filling. As part of the start-up process, additional non-standard programs enable the production of plastic parts without bushings in order to optimize the injection molding process.

Set-Up 50 Percent Faster

The mold cassettes are changed at least once a day, because there are often smaller series to be produced. The cassettes, which have identical external dimensions, contain mold inserts that differ in the number and type of cavities and are inserted into one and the same master mold. Cassette changes involve

just a few steps and may be done in the closed mold. Optimized for fast mold and gripper changes on the machine and robotic system, the exchange takes place in less than half the previous set-up time. The quick set-up mold concept was developed in Phoenix Contact's own mold construction facility. Nor is any time lost when restarting after a changeover, because the process data record for each product variant is stored inside the machine controller.

The system's final acceptance test took place after a development period of only 15 months, during which those involved were able to exchange information exclusively via videoconferencing. "We have a long partnership with Arburg. We have always been very satisfied and know what we can ask for," says Bernd Laumann, describing the cooperation. "We found a good technical level with them". And Carsten Vogt, Turnkey Project Planning and responsible project engineer at Arburg, can only return this compliment: "Phoenix Contact provided

us with very good data right from the start, so that we were able to design the system precisely and implement it relatively quickly despite its high complexity." Another turnkey system has already been ordered from Arburg and is under construction. ■

Info

Company Profile

Phoenix Contact GmbH & Co. KG is a family-owned company headquartered in Blomberg, Germany. The group of companies numbers over 20,000 employees and more than 100 international companies and holdings. Phoenix Contact's products are used wherever processes must run automatically, e.g. in industrial production plants, in the renewable energy sector, in infrastructure, for complex device connections, and wherever power or data flows are connected, distributed and controlled. Founded in 1923, the company most recently generated sales of EUR 2.97 billion (in 2021).

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Text

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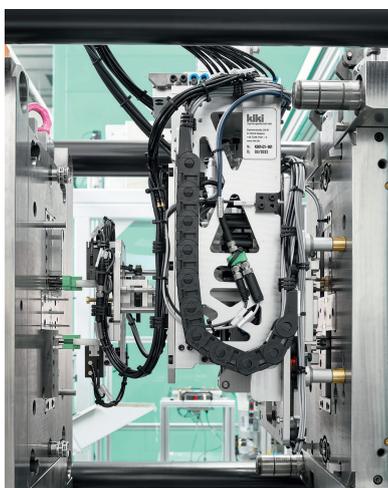


Fig. 3. Stations in automated production: removing the molded parts and inserting bushings into the mold (left); next to that: a bird's-eye view of the Kuka placement robot and the Multilift Robot system in action.

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