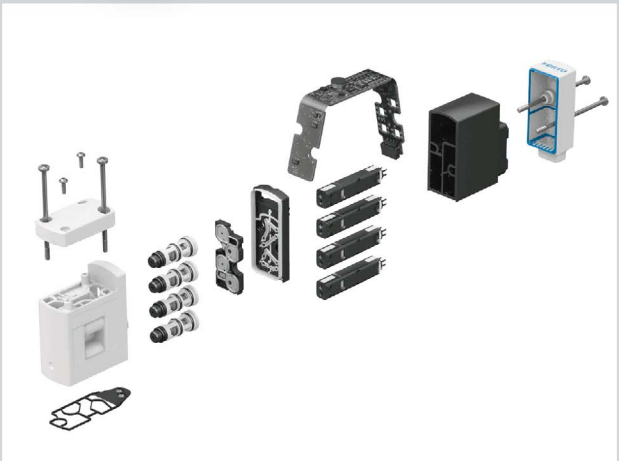
CUSTOMER SUCCESS STORY

DIGITIZED PNEUMATIC SYSTEM FESTO

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

THE WORLD'S FIRST APP CONTROLLED VALVE

The Festo VTEM Motion Terminal for Industry 4.0 enables a digitized pneumatic system for a wide range of functions with a single valve system and application-specific motion apps. This achieves a high level of hardware standardization and offers all the benefits of electrics and pneumatics with high energy efficiency.
A key element of the valve electronics is the printed circuit board in BEND.**flex** technology. It enables the integration of the piezo pilot valves and the valve electronics with sensors (stroke, pressure and temperature) in the smallest possible space. The BEND.**flex** circuit board can withstand even the most demanding operating conditions.



REQUIREMENTS

This revolutionary innovation must operate absolutely process-safe and reliably in continuous industrial use, even under harsh conditions. Various options for the electronics and their wiring technology were evaluated with regard to

- Signal density, signal quality and EMC
- Mechanical stability, mounting capability
- Space requirement of the wiring solution
- Vibration resistance
- Test effort
- Procurement costs
- Logistics costs

After the decision was made in favor of a homogeneous Flex solution that fits spatially around the module and connects all components securely and reliably, the central challenges of the project crystallized as **3D wiring** on the one hand and the assembly of the populated PCB on the other. The FESTO assembly team demanded: "... must be bendable by hand in the device and survive bending!"
It had to be taken into account that a sliding movement takes place during **assembly** into the valve housing. The assembled printed circuit board without a panel edge had to be sufficiently stable for this.
The **design strategy** in terms of stackup and component wiring requires additional special microvias over three copper layers without connection on the intermediate layer.

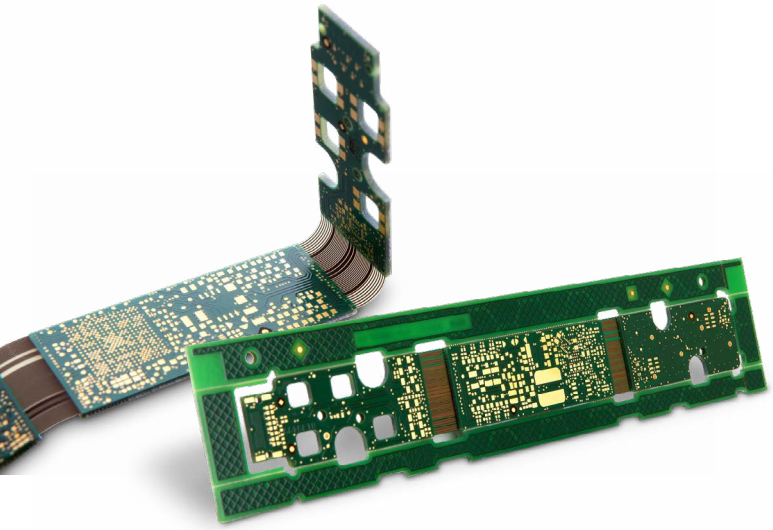
IMPLEMENTATION

From the possible variants of flex solutions, Festo's developers together with the project team from Würth Elektronik chose the BEND**.flex** technology after extensive testing with different variants. This flex variant has thin bending areas formed by thin cores similar to those of the RIGID**.flex** technology, but without using flexible films made of polyimide. As a result, BEND**.flex** occupies an intermediate position between SEMI**.flex** and RIGID**.flex**, both in terms of price and bending performance. The latter made the use of SEMI**.flex** in this application impossible. In comparison, BEND**.flex** allows

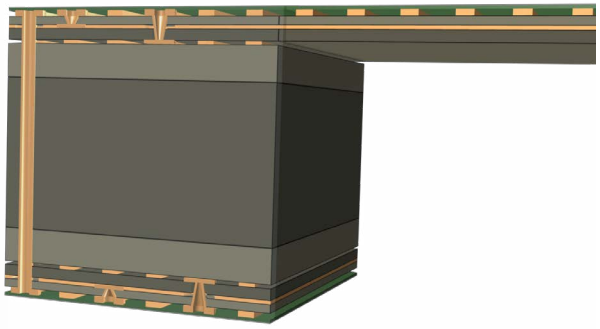
- smaller bending radii with more bending cycles
- the use of mid and high Tg materials
- bending areas with two copper layers and good bendability
- bending in both directions.

Despite the good bendability, BEND**.flex** is sufficiently stable so that the bending areas are not damaged when the assembled PCB is pushed into the housing, as happened during testing with RIGID**.flex**. And of course, cost also played an important role in the project, because: BEND**.flex** is less expensive than RIGID**.flex**, but it is also

- more cost-effective than a solution with three printed circuit boards and two pairs of connectors and cable harnesses
- more robust than a solution with connectors
- more space-saving due to the elimination of connectors
- functionally better and also testable before installation in the valve housing
- more favorable in terms of storage costs, since only one part is stored and not three individual printed circuit boards plus connectors and cable harnesses
- more favorable concerning test costs, since only one part is tested and not three individual printed circuit boards
- easier in processing and handling



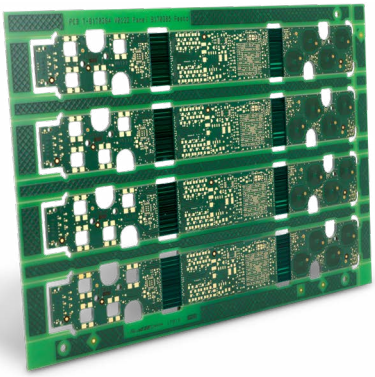
For more information on BEND**.flex**, please visit our website: **www.we-online.com/bendflex_en**



Stackup BEND**.flex** 2Ri-4Ri + HDI 2-2-2

PROCESS

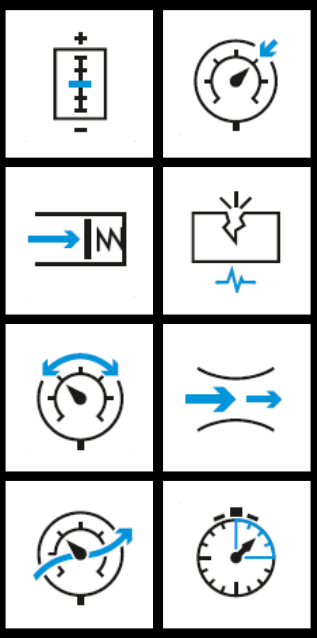
First-Time-Right! Early, interdisciplinary collaboration involving the PCB manufacturer was the key to success. For example, it was possible to find a stable, favorable delivery panel that combines V-scoring outside the bending areas with milling in areas with increased requirements for accuracy and contour quality.



Quote request with **variants** → **Outline & delivery array** optimization → Prototypes → Testing **optimizations** → Sample approval → **Series release**

DIGITIZATION FOR INDUSTRY 4.0

- One hardware. The valve replaces more than 50 positions, eliminating shock absorbers and restrictors.
- Motion apps allow a wide range of functions and simple parameterization.
- Diagnostic functions included, for example leakage detection.
- Built-in traceability.
- Reduction of energy consumption during pilot control by up to 90%, reduction of compressed air consumption by up to 70%.
- First-Time-Right: Interdisciplinary collaboration and close cooperation with the PCB manufacturer.
- Evaluation of the best flex solution for the given product requirements. The decision for BEND.**flex** allows a miniaturized mechatronic solution and ensures high reliability at a good price-performance ratio.



QUOTES FROM THE PROJECT TEAM

"With this product, there is no before - after, because we decided on the Flex PCB at an early stage of the project. The cooperation with Würth Elektronik is uncomplicated, fast and of good quality.
We are very satisfied with the current solution."
Michael Link, Development Controlled Pneumatics Electronics / Festo SE & Co. KG

"We were able to contribute our technical solution expertise to this customer project from the very beginning. The early inquiry enabled us to understand the customer's needs. Close and very trusting cooperation in the area of technical solution finding and variant testing led to this beautiful and reliable solution."
Werner Öchslen, Technical Project Management Würth Elektronik

FESTO

Festo is an independent family-owned company with a long tradition. Festo, the world's leading supplier of automation technology and technical education, is deploying its products and services to meet the challenge of smart production for the future in the course of digitalisation. The company also relies on artificial intelligence and machine learning. Established in1925, the independent family-owned company based in Esslingen a.N., Germany, has been a driving force in automation for over 60 years and with its unique range of offers has become the world market leader intechnical education. 300,000 customers worldwide in factory and process automation put their trust in the company's pneumatic and electric drive solutions.

INTERESTED?

For more information about our Flex technologies, please visit **www.we-online.com/flex** or contact our flex solutions experts directly at **+49 7940 946-3539** or **flex@we-online.com**

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