Automation of Organs-on-a-Chip for Drug Development

Next-Gen Life Science Automation

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The development of drugs is lengthy, complex and expensive. Approaches from organ-on-a-chip research promise to shorten the time to approval of new active ingredients. Together with experts from TU Darmstadt, Festo has developed an exhibit that demonstrates the automated production of such mini-organs: A bioprinter applies human cell material to a microfluidic chip, on which organ-like tissue then grows. Festo is combining two future technologies for the first time: SupraMotion and Diffusion Bonded Manifolds.

The development of drugs takes a long time and is very costly: a drug candidate first undergoes several preclinical studies on cell cultures or animals. Clinical trials on humans follow in the final phase before approval. In this phase, an average of five drug candidates are tested, four of which fail in the end - so-called late fails. The reason is that the results of preclinical studies often do not translate well to the human organism.

Much better results can be achieved with so-called organs-on-a-chip from the bioprinter, on which efficacy and side effects can already be tested more precisely in the preclinical studies. Unsuitable candidates are thus eliminated at a much earlier stage, saving time and money. Organ-on-a-chip (OoC) refers to microfabrication processes that are used to create miniature models of organs such as the heart, lungs or intestines. Cells are arranged and cultivated on prefabricated polymer or plastic carriers in such a way that they form organ-like tissue.

Precise fluid control for tissue engineering

Together with experts from TU Darmstadt, Festo is demonstrating how the bioprinting process can be automated - including a solution for the contactless transport of microfluidic chips equipped with bonded manifold technology. Bonded manifolds are multi-layer plastic manifold plates with finely structured microchannels that enable the precise dosing and handling of liquids.

SupraMotion: contactless working in the laboratory of the future

Transport through the various steps in the production process is carried out using the unique superconductor technology of Festo. This allows objects to be transported contactlessly on a magnetic levitator. The kinematic system remains outside the clean room and does not carry any particles away. The surfaces are very easy to clean. The innovative technology can be combined with automation solutions for the life science sector to create a reliable overall concept that meets the highest cleanliness requirements.

Diffusion Bonded Manifolds from Festo: Nominated for the Hermes Award 2026

Festo's Diffusion Bonded Manifolds are among the three nominees for the Hermes Award 2026. The Hermes Award is one of the world's most prestigious industry prizes and is presented at the Hannover Messe for an outstanding innovation - products and solutions with a particularly high degree of technological innovation.

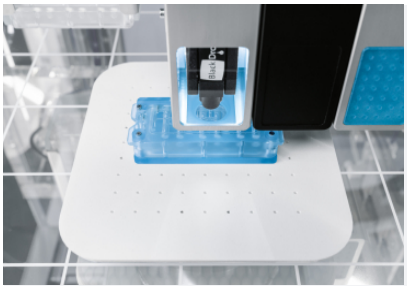
Festo as an automation partner for life sciences

With flexible automation solutions, Festo supports the transfer of innovative therapies into clinical practice and makes state-of-the-art biotechnology available where it is needed. With the help of its product portfolio of pneumatics, electrics, software and AI, Festo works with customers to implement the perfect seamless automation solution. www.festo.com/lifetech

Press Images

Automated production of organs-on-a-chip

Together with experts from TU Darmstadt, Festo has developed a solution that demonstrates the automated production of organs-on-a-chip.



Bioprinter for organs-on-a-chip

The bioprinter prints living cells embedded in hydrogel in tiny droplets directly onto the microfluidic chip.

Microfluidic chip

The microfluidic chip: a diffusion bonded manifold with precise channel structures.

SupraMotion transport system

Contactless transport with SupraMotion: electric axes under the floor surface move the cryostat and the magnetic carrier floating above it from station to station.

About Festo

Festo is a global player and an independent family-owned company with headquarters in Esslingen am Neckar, Germany. Festo has set standards in industrial automation technology and technical education ever since its establishment, thereby making a contribution to sustainable development of the environment, the economy and society. The company supplies pneumatic and electrical automation technology to 300,000 customers of factory and process automation in over 35 industries. Digitalization, AI and the LifeTech sector with medical technology and laboratory automation are becoming increasingly important. The products and services are available in 176 countries. With about 20,600 employees in over 250 branch offices in around 60 countries worldwide, Festo achieved a turnover of around €3.33 billion in 2025. More than 8% of this turnover is invested in research and development. In this learning company, 1.5 % of turnover is invested in basic and further training. Festo Didactic SE is a leading provider of technical education and training and offers its customers worldwide comprehensive digital and physical learning solutions in the industrial environment.