

Personalized Cell Therapy for Cancer Treatment

Automation of CAR-T-Cell therapies by Fraunhofer IPA and Festo

At Next-Gen Life Science Automation, Festo is researching new solutions for medical technology and laboratory automation. At Hannover Messe 2026, Festo and Fraunhofer IPA will be demonstrating the construction of a cassette for the process step of modifying cells in CAR-T cell therapy. Automation significantly reduces manufacturing times and costs, making individualized cancer therapies faster, cheaper and available to more patients.

Cancer remains one of the biggest challenges in medicine. Tumors vary biologically, so standardized treatments are not always effective. A medicine that helps one patient might not have much of an effect for another. An alternative approach is CAR-T cell therapy. "CAR" stands for chimeric antigen receptors, and the therapies have a personalized approach: The patient's own immune cells – "T cells" – are taken, modified, expanded, and returned so that the immune system can fight the cancer cells itself. This individualized approach to treatment offers higher effectiveness and fewer side effects. What's more, the therapy is only needed once.

Faster, cheaper, and more available through automation

However, it only has limited availability due to its complexity and manual production. For this reason, the Fraunhofer Institute for Manufacturing Engineering and Automation IPA, with the help of Festo technology, has developed an automation concept for small, decentralized production systems for processing immune cells. These modular mini-factories could, for example, be deployed at university hospitals, operate largely autonomously, and require minimal specialist staff. Thanks to automation, the production times and costs are significantly reduced, making CAR-T cell therapies faster, cheaper, and available for more patients. The mini-factories consist of various modules through which the cassettes pass step by step. A cassette is required for each patient at every step of the therapy, with the T cells undergoing the necessary processing in each cassette. In the cassette used for the cell modification step, automation components from Festo ensure precise fluid transport in an extremely compact space. The cassette holds a self-contained and sterile fluid system with all the elements necessary for modifying the cells. The elements themselves are passive and are operated externally when the cassette is inserted into one of the mini-factory modules.

In the cell culture chamber, the T cells are brought into contact with viruses which introduce genetic material containing the blueprint for the CAR receptors. Through this, the T cells produce special CAR receptors and become CAR-T cells. For that to happen, the various media must be dosed into the cell culture chamber with precision, mixed in it, and brought to the required temperature.

Diffusion Bonded Manifolds: Compact distribution plates for precise fluid control

The fluid transport is performed by a Diffusion Bonded Manifold from Festo. The distribution block contains a channel system and connects all sections of the cassette through it. There are valves integrated into the manifold, and these valves are operated externally through control

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air to establish a connection between the individual elements.

Fluid is moved by pushing and pulling with compressed air or vacuum. Thanks to intelligently controlled compressed air, even the smallest volumes can be dosed with precision and transported inside the cassette – all in an extremely compact space. To use the cassette for other patients afterward, only the elements that were in contact with cells and viruses need to be exchanged. The system is designed so that this can be done in just a few steps without the need for a clean room.

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



Exhibit CAR-T cell therapy

The exhibit shows the construction of a cassette for the modification of cells in CAR $\mathbb{T}$ cell therapy components by Festo.

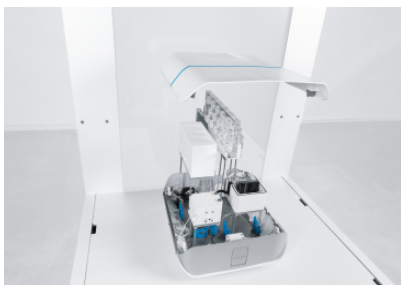


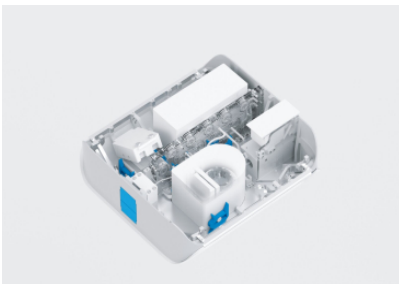
Exhibit CAR-T cell therapy (front)

The exhibit shows the construction of a cassette for the modification of cells in CAR $\mathbb{T}$ cell therapy components by Festo.



Cooperation Festo and Fraunhofer IPA

Fraunhofer IPA developed an automation concept for the cassette used to modify the cells, utilizing technology from Festo.



Cassette CAR-T cell therapy

The cassette contains a self-contained, sterile fluid system that includes all elements needed to modify the cells.

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.