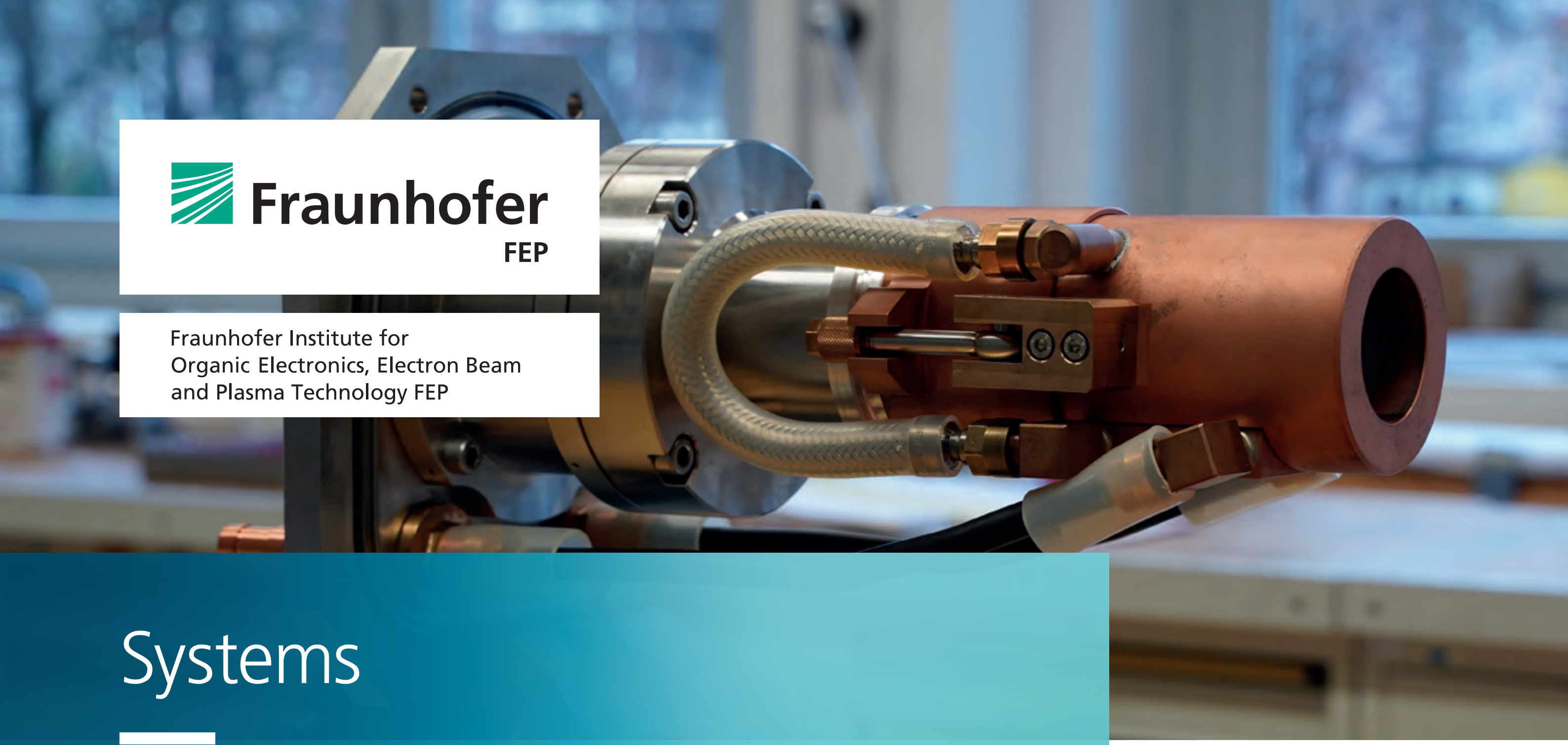
Fraunhofer FEP

Fraunhofer Institute for
Organic Electronics, Electron Beam
and Plasma Technology FEP



Systems

Process oriented hardware development for the technologies of the future

Unipolar / bipolar switching unit UBS-C2

Technology and hardware development go hand in hand at Fraunhofer FEP. Electron beam and plasma components required within the institute are often not available in the market and are specifically modified and further developed to meet application requirements. The development and implementation of this hardware takes place within the »Systems« department. Equipped with mechanical and electronic development as well as the associated workshop facilities, we are able we are able to convert ideas into reality.

The internal development of our hardware allows for close coordination with process engineers throughout the entire development process. This enables fast iterative processes and allows us to quickly achieve our goal: technology and hardware transfer to our industrial partners. Close interaction between the mechanical, electrical and process engineers enabled continuous improvement of the key components of Fraunhofer FEP.

Plasma and electron beam sources for a wide range of applications are part of our technological key component development portfolio. Our key components are already widely used in industry together with the technologies developed at Fraunhofer FEP.

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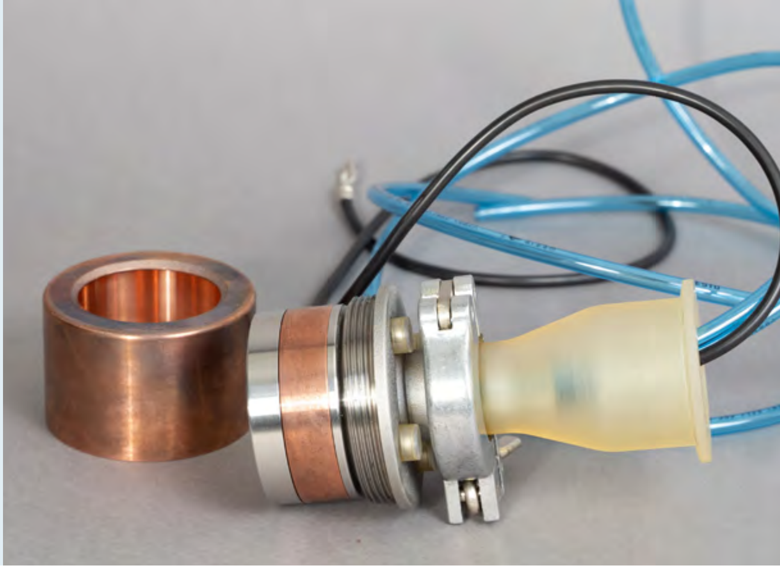

Coating tools directly from the 3D printer

As part of an in-house research project, we were able to develop and manufacture a fully functional sputter magnetron using additive manufacturing and successfully test it on one of our coating systems.

There are many requirements for the materials used in a magnetron. They must withstand and dissipate the heat generated at the target, withstand the pressure gradients within the system, and be able to isolate high voltages. These requirements are well-known for parts when produced by classical machining. For additive manufacturing, these properties are often still unknown and depend highly on the printing parameters. In the course of the project, various methods such as stereolithography, selective laser sintering, as well as laser and electron beam powder bed processes, were compared and evaluated.

After comparing the individual methods and evaluating different test specimens, a small magnetron was designed and produced using additive manufacturing. The production was carried out in collaboration with local companies and other Fraunhofer Institutes as well as with our own printers.

In the final demonstrator, not only the metal parts were printed, but also the insulators and a large part of the magnets. Not only were we able to make the magnetron even more compact, but we also reduced the number of parts, for example by integrating the cooling channels directly into the main body.

By using additive manufacturing, we were also able to shorten the production time. The finishing of the individual parts was done in-house.

The project ended with a real-life test where we successfully deposited copper. We also want to use the new possibilities of additive manufacturing in the future to integrate further functionalities such as highly efficient cooling structures, complex magnet geometries and much more into our key components.

1-2 *Magnetron sputtering source produced with additive manufacturing processes*