



# Process-oriented development of control and power electronics for electron beam and plasma sources

Best results for the treatment and coating of surfaces can be achieved when hardware, control electronics and process are optimally matched.

Established control units and power supplies available on the market are often insufficient for demanding, innovative processes. For this reason Fraunhofer FEP has been developing technological core components and processes for many years, which are already in use in many industrial areas.

## Our offer

- Development and prototyping of control hardware and pulsed power supplies, in particular for plasma and electron beam sources including process-specific measurement technology
- Design and manufacturing of customized coils, especially for guiding and shaping the

Fraunhofer FEP has a process-oriented hardware and electronics development department and offers research and development services for customized power supplies and control technology that are optimally adapted to the technological core components. The team of physicists, electrical and process engineers always keeps focus on the overall system and can respond to customer requirements in the best possible way. Depending on the requirements existing technology platforms (see back page) can also be used.

- electron beam (static as well as highly dynamic focusing, stigmatization, deflection)
- Technical consulting services
- Simulation services (electronic circuit, thermal, electromagnetic field and structural mechanics simulation)

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## Highlights

### 1. Unipolar/Bipolar Switching Unit for Pulse Magnetron Sputtering – UBS-C2

The UBS-C2 pulse unit, with its extraordinary flexibility to control important plasma parameters, is an excellent tool for producing optimal coatings in research and production. It features DC, unipolar, bipolar, pulse package and unipolar/bipolar hybrid modes of operation with a maximum output voltage of 1600 V and output currents of up to 80 A.

### 2. Spectrometric Process Control Unit – S-PCU<sup>plus</sup>

The S-PCU<sup>plus</sup> is used for plasma analysis by optical emission spectroscopy (OES) and can measure and evaluate the intensity of optical lines of one or more wavelengths in the range from 300 nm to 1200 nm. By means of mathematics and control modules, process parameters can be analyzed, visualized and controlled. The integration of a Python platform allows the connection to many libraries for data processing

### 3. Deflection Amplifier DAV

The deflection amplifiers of the DAV series are based on the principle of class-D amplifiers and are designed to drive inductive loads in the range of 50  $\mu$ H up to several mH, which corresponds to the usual range of deflection coils in electron beam guns. Due to the high efficiency, two channels can be accommodated in an extremely small footprint of only 19" / 4 U, each capable of driving a current of up to 24 A at 20 kHz.

### 4. Coil Manufacturing

Fraunhofer FEP has many years of experience in the design, development and sample production of deflection coils, centering and focusing coils for electron beam technologies as well as self-supporting coils for vacuum technology and offers the design and production of coils and coil bodies according to customer requirements. In addition, internal cooling, special insulation and adapted core shapes can be realized.

- 1 *Unipolar/Bipolar Switching Unit for Pulse Magnetron Sputtering UBS-C2*
- 2 *Spectrometric Process Control Unit S-PCU<sup>plus</sup>*
- 3 *Deflection Amplifier DAV 20-2*
- 4 *Coil Manufacturing*