



Max-Planck-Innovation

Technology Offer

Compact high-voltage vacuum feedthrough

File no.: MI 0302-4988-WT-WA

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Background

Applying high voltages in vacuum applications requires feedthroughs, which electrically insulate the conductor from the vacuum chamber whilst being vacuum-tight. In high- and ultrahigh vacuum environments, the materials used need to be low in outgassing rates. The current technology for feedthroughs withstanding tens to hundreds of kilovolts relies on vacuum-tight ceramic to metal connections, which are heavy, fragile and prone to contamination. Commercially available feedthroughs are stand-alone pieces, which need to be connected to a high-voltage cable on the air-side and the desired application on the vacuum side. As surface leakage currents occur for high voltages, each connection requires a connector with long leakage distances, adding to the feedthroughs dimensions.

Technology

The compact feedthrough is based on a vacuum-tight plastic to metal connection (see fig.) without any ceramic parts. The high dielectric strength of the plastic material allows very small dimensions (e.g. 16 mm diameter of the plastic for voltages of 100 kV). The feedthrough can be combined with a high-voltage cable, such that no electrical connections are required on the air side, saving additional space. The material cost is moderate.

Advantages

- Very compact dimensions – 100 kV feedthrough fits e.g. on a 16 CF flange. Total length of feedthrough approximately 300 mm.
- Leak-rate compatible with ultrahigh vacuum applications. Outgassing rates allow vacuum with pressures down to 10^{-9} mbar.
- Moderate material cost.
- Connector-free on air-side (if desired).

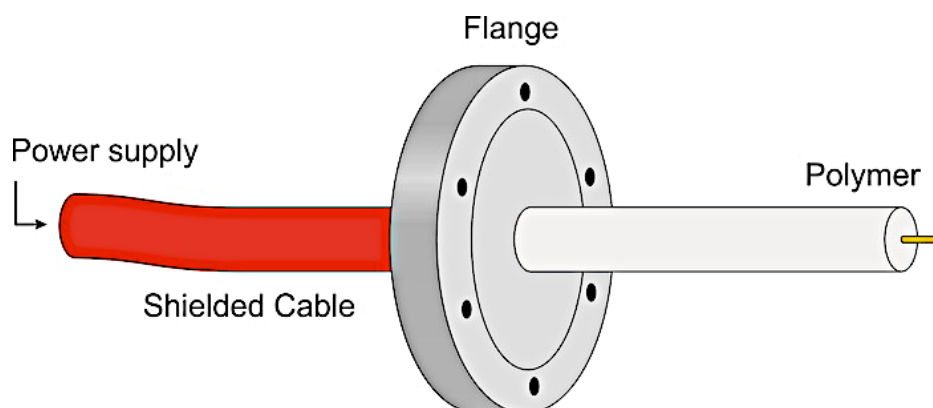


Fig. : Sketch of the compact high-voltage vacuum feedthrough.