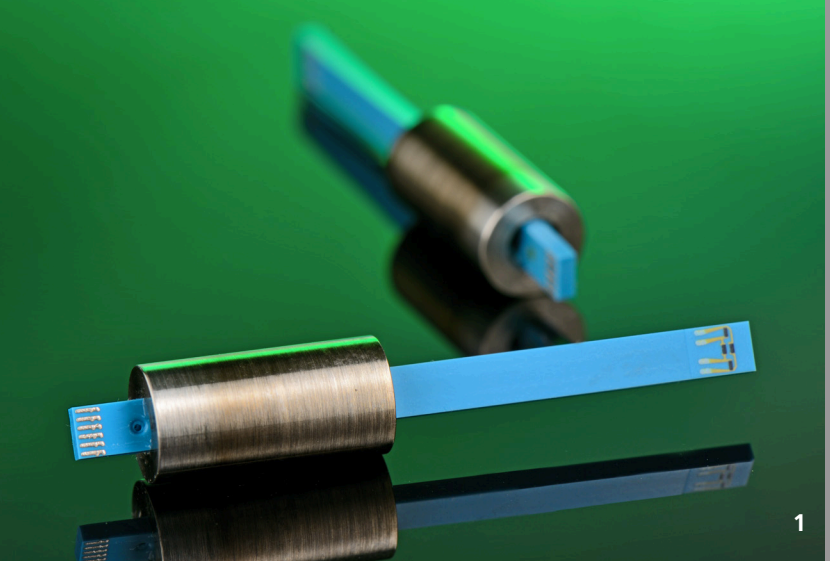

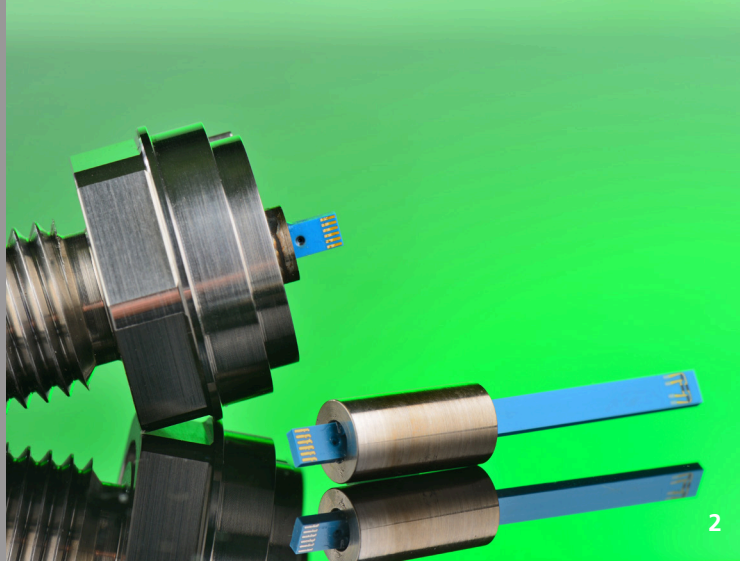

LASER-BASED MANUFACTURE OF COMPRESSION SEALS FOR MULTILAYER CERAMIC FEEDTHROUGHS

Task

Compressed glass feedthroughs are reliable elements for contacting electronic components and electrical assemblies in hermetically sealed housings. The current standardized manufacturing process for the metal-to-glass connection is a time-consuming oven-based process that lasts for several hours. All necessary components of the feedthrough, such as the metallic mount and the electrical contacts, are heated to the melting temperature of the sealing glass. Usually, the melting temperature of sealing glass is above 400 °C. As developments in multilayer ceramic substrates advance – which enable the construction of three-dimensional interconnected multilayer boards – high temperatures can damage the circuits on the boards and cause the integrated electronics to fail. Oven-based fabrication of compressed glass feedthroughs for multilayer ceramic elements is thus problematic, indicating that a manufacturing process with localized energy input is necessary.

Method

The laser-based process developed by Fraunhofer ILT, which focuses the laser radiation on the metallic mount, exploits the advantages of locally defined energy input and local temperature rise typical of laser processes. The radiation energy absorbed there is converted into thermal energy, which increases the temperature of the irradiated area rapidly. Via thermal conduction, the heat flows into the glass body. As soon as the glass body melts, the molten glass wets the mount wall and the multilayer ceramic in equal measure.

Results

Within 70 seconds, laser radiation produces a helium-tight pressurized glass joint between the mount made of Inconel 718 and the LTCC multilayer ceramic element. The measured leakage rate of the joint is in the range of 2.2×10^{-9} mbar l/s.

Applications

Vacuum-tight feedthroughs for multilayer ceramic elements with integrated electronics are used in the field of sensor and measurement technology.

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1 Laser-based manufactured compressed glass feedthrough for an LTCC board.

2 Compressed glass feedthrough welded into a housing component.