

## FAQ's TO FERROPERM PIEZOCERAMICS

### QUESTION

What is the maximum pre-stress I can apply on my high-power transducer using Pz26 or Pz28?

### ANSWER:

Ferroperm is generally concentrated completely on the manufacturing of piezoceramic materials and have no expertise in the assembly of ultrasonic devices. By maintaining this strategy we keep a status as a completely independent supplier and avoid any indirect competition with our own customers.

We therefore only have very limited information on this subject, but will of course be willing to help with the general guidelines we have:

When assembling a high-power transducer it is important to apply the right amount of pre-stress. However, if the pre-stress is too high, a de-polarisation will begin to take place resulting in lower output of the transducer.

We generally recommend not to use a pre-stress higher than **25 MPa**, since this is the level that Pz26 under normal circumstances will withstand during high-field operation, where the stress rises further in the "expansion-phase" of a cycle.

The amount of pre-stress can be monitored either by a simple torque wrench, or by measuring the DC voltage over a large capacitor.

It is important to point out that the stress level can increase above the critical level if an unfavourable combination of materials is chosen in a transducer that needs to work at elevated temperatures, or at some point is heat-treated (e.g. autoclaving of ultrasonic dental equipment).

It is therefore important to carefully select materials, whose TEC match the TEC for PZT in such a way that stresses are released, or at least kept constant, at elevated temperatures.

As a general guideline, the TEC for the thickness direction in Pz26 is  $1 \text{ to } 2 \times 10^{-6} \text{ K}^{-1}$  in a temperature range from  $0 - 100^\circ\text{C}$ .