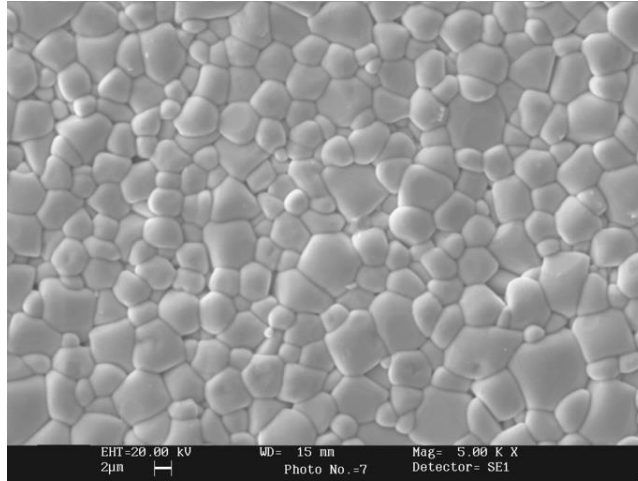




Ferroperm™ Piezoelectric

## Pz21 Very soft relaxor type PNN-PZT



Microstructure of Pz21 at a magnification of 5000 times

### A very soft relaxor based PNN-PZT solid solution

Pz21 is a very soft piezoceramic material with very high coupling factors and charge coefficients. The material is optimised for applications where high sensitivity, low porosity and small grain size are required.

### Repeatable performance

The main focus through our entire production process is to provide materials and components with the highest possible reproducibility of properties and parameters and to obtain the lowest aging rates in the industry.

Our materials have a variation of  $\pm 5\%$  for all parameters. This reduces the requirements for impedance matching, frequency tuning and dimensioning of the housing meaning fewer rejects and lower costs.

### Customised solutions

We have more than 60 years of experience in the production of advanced piezoelectric ceramics. Our team has extensive expertise in customising designs to match the customer's needs.

Please contact us to discuss your requirements in further detail.

### Key benefits

- Lowest batch to batch variation in the industry
- Stable material with consistent performance
- Customised or standard designs

### Key features

- High sensitivity
- Low porosity
- Small grain size

### Applications

- 1D and 2D medical arrays for imaging systems
- Shear Inkjet print heads
- Underwater acoustic sensors
- High precision flow meters

### Contact

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CTS Ferroperm

Our product competencies and services:  
Piezoelectric ceramics | Multilayer | Thick-film | InSensor® | PiezoPaint™

**CTS** | Ferroperm  
Piezoceramics

Your Partner in Smart Solutions



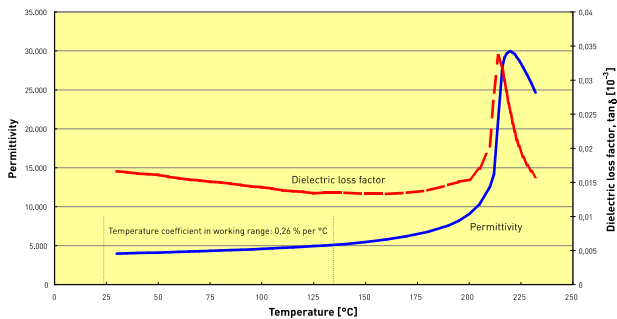
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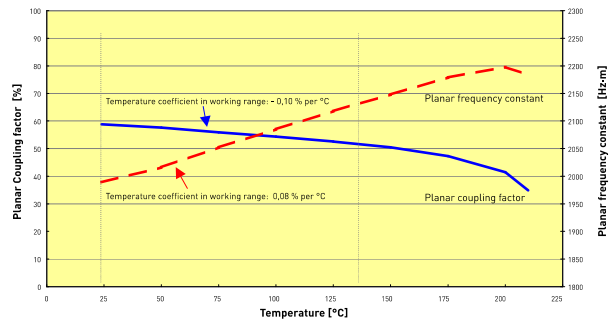
### Material properties

Electrical	Symbol	Pz21
Relative dielectric permittivity at 1 kHz	$K_{33}^T$	3650
Dielectric dissipation factor at 1 kHz	$\tan \delta$	$18 \times 10^{-3}$
Curie temperature	$T_C >$	$\sim 220^\circ\text{C}$
Recommended working range	$<$	$\sim 130^\circ\text{C}$
Electromechanical		
Coupling factors	$k_p$	0.58
	$k_t$	0.47
	$k_{33}$	0.69
Piezoelectric charge coefficient	$d_{33}$	670 pC/N
Mechanical		
Mechanical Quality Factor	$Q_{m,P}$	65
Density	$\rho$	$7.80 \text{ g/cm}^3$

Note: Due to continuous process improvement, specifications are subject to change without notice. Please be aware that extreme dimensions and geometries can lead to exaggeration in tolerances in all materials.



Permittivity (blue) and dielectric loss factor (red) for Ferroperm Pz21. The Curie point is above  $220^\circ\text{C}$  and the increase in permittivity in the recommended working range from  $20^\circ$  to  $130^\circ\text{C}$  is only  $0.26\%$  per  $^\circ\text{C}$ .



Planar coupling factor (blue) and planar frequency constant (red) for Ferroperm Pz21 as a function of temperature. Very linear and stable behaviour is observed within the recommended working temperature range between  $20^\circ\text{C}$  and  $130^\circ\text{C}$ .