

Frequently asked questions (FAQs)

Question:

What is the Young's modulus of the Ferroperm™ Piezoceramic materials?

Answer:

In any piezoelectric material there is not only 1 but 4 different Young's moduli.

This is first of all because piezoelectric materials are anisotropic, and therefore behaves differently in the thickness and planar directions.

Secondly Young's module in piezoceramics is also dependent on the external conditions. The material will thus react differently depending if it is short-circuited (superscript E) or in an electrical open condition (superscript D).

Generally the Young's modulus can be calculated as the inverse value of the elastic compliance parameter, "s".

The four different types of Young's moduli are therefore:

$$Y_{11}^E = 1/s_{11}^E \text{ Planar direction, short-circuit condition}$$

$$Y_{33}^E = 1/s_{33}^E \text{ Thickness direction, short-circuit condition}$$

$$Y_{11}^D = 1/s_{11}^D \text{ Planar direction, electrically open condition}$$

$$Y_{33}^D = 1/s_{33}^D \text{ Thickness direction, electrically open condition}$$

The Young's moduli can be calculated as follows:

Type	Unit	Pz21	Pz23	Pz24	Pz26	Pz27	Pz28	Pz29	Pz34	Pz46
Y_{11}^E	GPa	55	68	96	77	59	79	59	136	94
Y_{33}^E	GPa	56	52	73	51	43	55	44	137	23
Y_{11}^D	GPa	61	74	105	86	66	90	68	137	94
Y_{33}^D	GPa	107	88	130	96	84	104	101	162	23