

## Temperature Sensors

KVG's temperature sensors are crystals with a very high dependence of the frequency from the temperature. The gradient of the frequency-temperature ( $f/t$ ) characteristic as well as its linearity depend on the orientation of the crystal blank with respect to the crystal axes and therefore they can be varied within certain limits. The fundamental frequencies range between 2 and 30 MHz depending on the enclosure. For higher frequencies the crystals operate in the 3rd or 5th overtone.

There are two basic types with many possible variations:

1) XA 979:

This type has the highest linearity of the  $f/t$ -characteristic. Its production is however more complicated and the fabrication spread is larger than that of the second type.

2) XA 1024:

In comparison with the sensors of type XA 979 the  $f/t$ -characteristic is less linear but the fabrication spread of the thermal data is smaller.

Special types according to customer specifications upon demand.

### Technical data:

1) Electrical data:

The values of  $C_1$ ,  $L_1$ ,  $R_1$  and  $C_0$  depend on the crystal frequency, the overtone and the enclosure. Generally the quality factor is higher than 50000.

2) Thermal data:

a) Gradient of the  $f/t$ -characteristic:

XA 979: 37 ppm/K  $\pm$  1.5%

XA1024: depending on the orientation. 30ppm/K to 94ppm/K  $\pm$  0.5%

b) Deviation from linearity:

XA 979: < 0.1K from 0°C to 100°C

XA 1024: depending on the orientation

c) Calibration at 25°C:  $\pm$  500ppm

d) Time constant: depending on the crystal enclosure e.g. for HC-52/U approx. 3sec.

e) Aging (1st year):  $\leq$  5ppm (or better if required)

3) Crystal enclosures: HC-52/U, HC-49/U, HC-35/U, HC-51/U



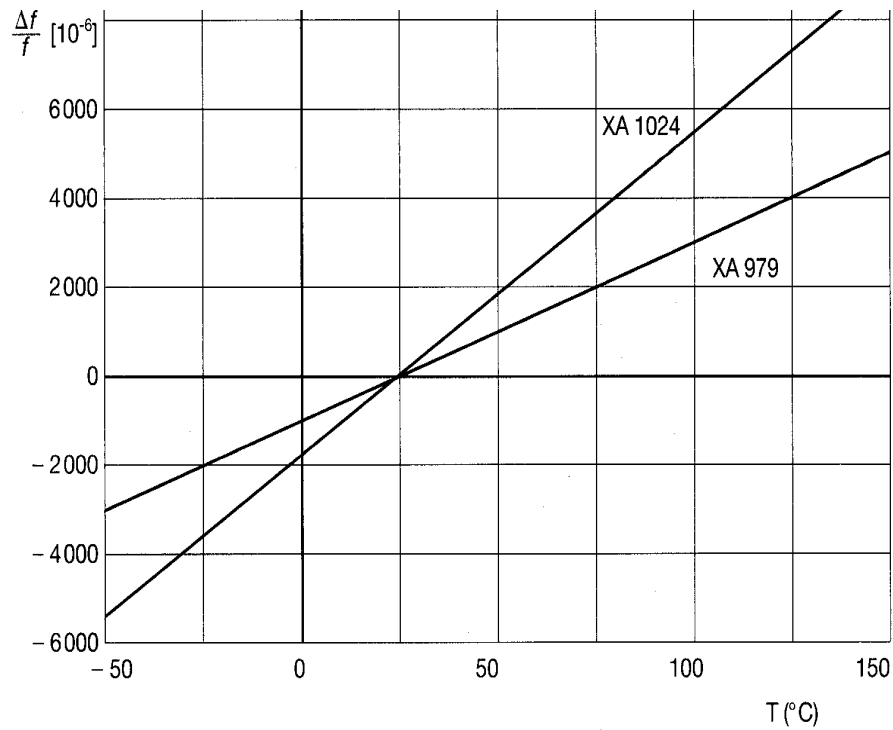
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# Special Crystals



Temperature Characteristic of the Frequency 13.56 MHz HC-52/U



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