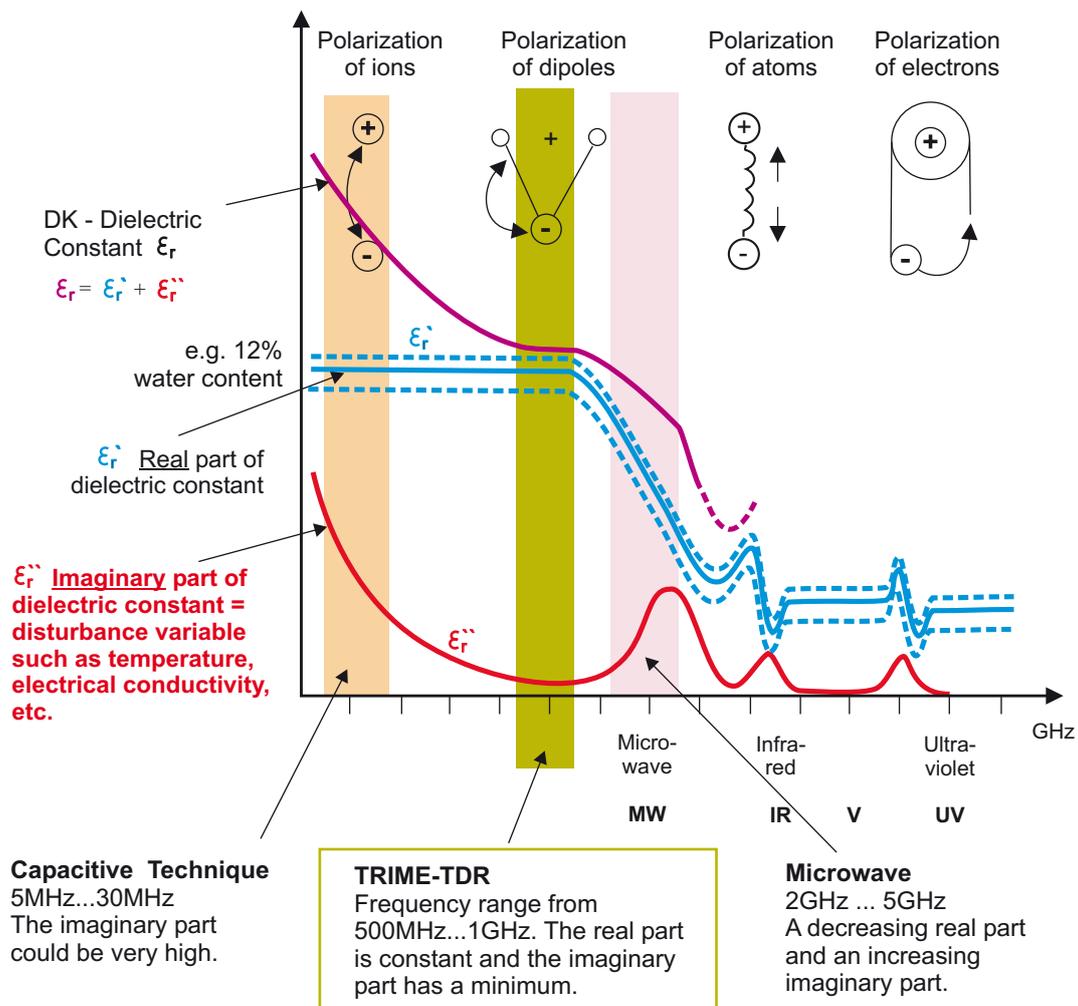


The TRIME®-Technology...

... and its physical advantages compared to other measurement methods

TRIME measures the 'dielectric constant' of a material to determine the moisture. The dielectric constant is a complex quantity with a real number (black curve), that characterises the moisture and with an imaginary component (red curve) as a measure for energy loss and electrical conductivity (see graph below). Both parts depend mainly on frequency, so that the measuring frequency of an electromagnetic technique is a decisive criterion.

Basic physical conditions in water at different measurement methods:



The TRIME-TDR-technique has an ideal measuring frequency between 600MHz and 1.2 GHz

The electromagnetic pulses generated in the TRIME device correspond with frequencies of 600 MHz .. 1.2 GHz. According to the graph, the real part of the dielectric constant (black curve) in this frequency range is high enough and constant for a good resolution and accuracy of the measurement. The imaginary part (red curve) reaches a minimum so that disturbing influences such as electrical conductivity have nearly no effect. Perfect conditions for precise moisture measurements up to 130°C.

The TRIME-measuring field penetrates deep into the material and therefore, shows less influence of heterogeneous moisture distribution in bulk materials or the nature of the sensor-to-sample-contact. Up to 2 litres of volume are penetrated.

Other moisture measuring techniques in comparison

Capacitance method

Capacitance methods work with single measuring frequencies between 5...80 MHz. The dielectric constant is influenced both by moisture and salinity. It is very difficult to distinguish between the two influences and precise moisture measurements are difficult to achieve.

Microwave method

The frequencies of microwave techniques are generally higher than 2GHz. With this technique it is possible to distinguish between real and imaginary part of the dielectric constant. But, as can be deduced from the graph above, the real part of the dielectric constant decreases significantly with increasing frequency. This leads to a loss in the resolution and accuracy of the measurement. Furthermore, the imaginary part (dielectric loss) increases with frequency, which again has a negative influence on the measurement.

Conductance or Resistance method

Resistance methods have very low measuring frequencies of about 4 kHz. Therefore, the main problem of this technique is the strong influence of different salinity (bulk electrical conductivity) of the bulk material on the measurement. The difference in salinity is caused by different mineral contents temperature. Another problem of resistance methods is the low penetration depth of the measuring field and therefore a strong influence of the sensor-to-sample-contact on the result.

Near-Infrared method (NIR)

The NIR-reflectance or transmittance method shows a very lower penetration depth and, therefore, considerable influences of material surface and thickness.

Precise TRIME measurements supports your industrial or scientific applications, and provide security!

TRIME sensors are the accurate solution for:

- The building industry (e.g. for the precise determination of the quality of concrete directly in the mixer)
- The handling of bulk goods (e.g. for the consistent inline-measuring of the moisture content of wood chips, pellets, animal food etc.)
- The glass and ceramics industry (e.g. silica sand, moulding sand, ceramics mass etc)
- The chemical and pharmaceutical industry (e.g. powders, granulates etc.)
- Geology, hydrology, and meteorology (e.g. soil)