CONDUCTIVITY	GE 10

As opposed to resistivity, conductivity is the property of a water to conduct electrical current. It is related to the existence of water ion electrical charges. Its measurement makes it possible to rapidly know the concentration of dissolved mineral salts, although it does not give their nature.

Conductivity is dependent on ion nature, concentration, charge and mobility (itself depending on temperature).

Refer to: Conductivity of water solutions at 25°C *in page 2*

Conductivity of water as a function of temperature *in page 3*

Engineering units

Resistivity	Conductivity
Ohm.cm (Ω.cm)	Siemens/cm (S/cm)
KΩ.cm	mS/cm
MΩ.cm	µS/cm

Refer to : Conductivity/resistivity conversion curve *in page 4*

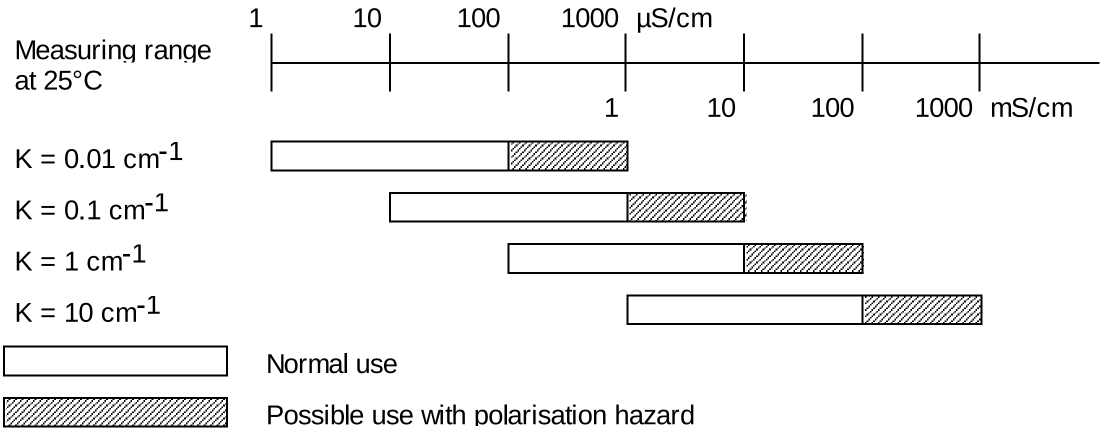
Measuring a water solution conductivity

The principle consists in measuring the electrical current flowing between two electrodes dipped in the solution to be tested.

The measured value shall be influenced by the electrode area and the distance between them. These sizes are dependent on the design of the measuring system. Their ratio defines the cell constant K.

The cell constant must be matched with the measuring range to be performed in order to reduce the polarisation resistance error.

The 4-electrode measurement makes it possible to check highly conductive liquids while accepting a significant deposit scaling level on electrodes. Here as well, this method makes it possible to reduce the polarisation effect errors.



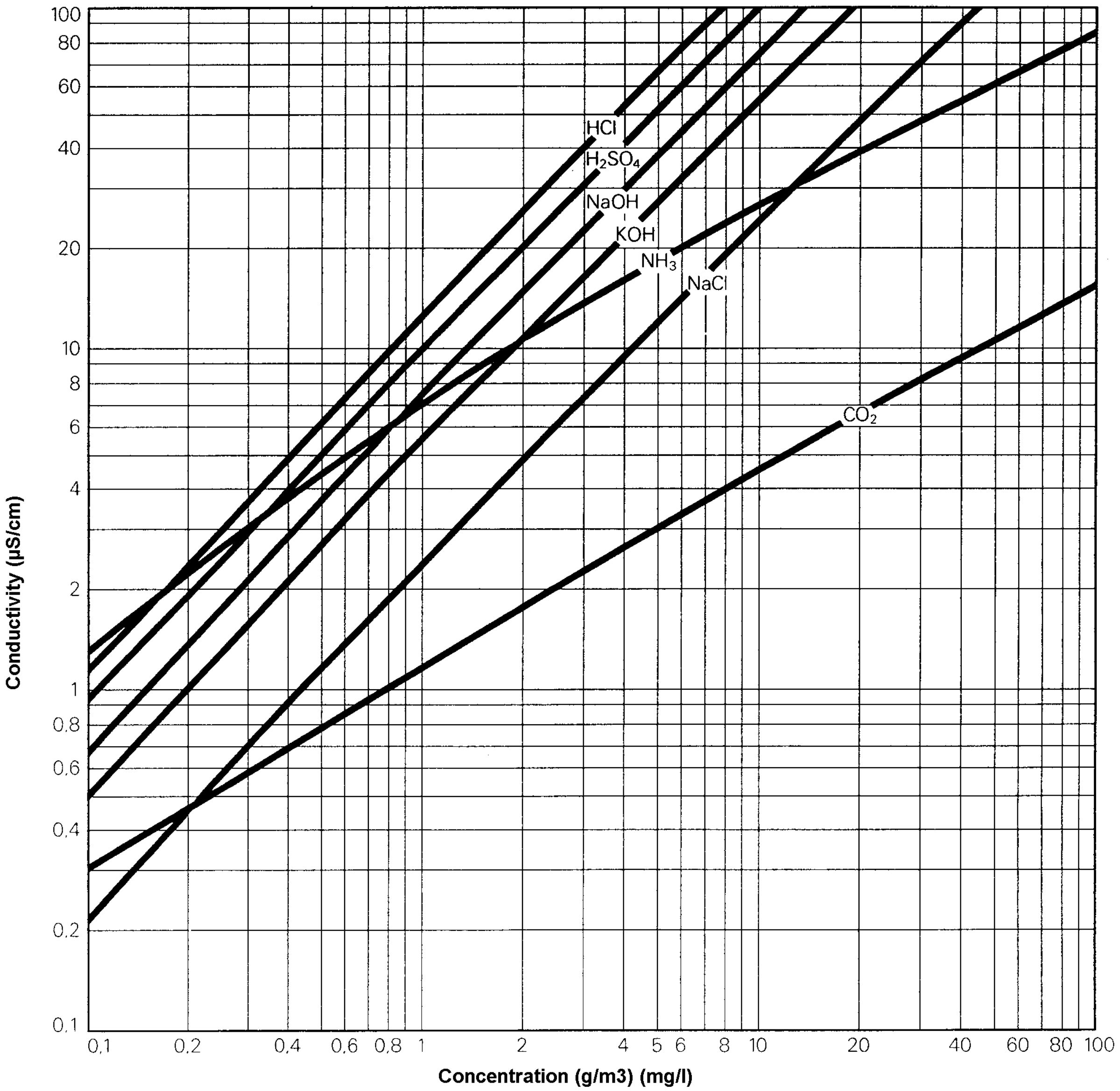
Operating ranges for various cell constants

Pure water conductivity

In perfectly pure water, conductivity corresponds to the sum of the specific conductivities of ions H+ and OH-
i.e. 0.0547 µS/cm or 18.3 MΩ.cm at 25°C.

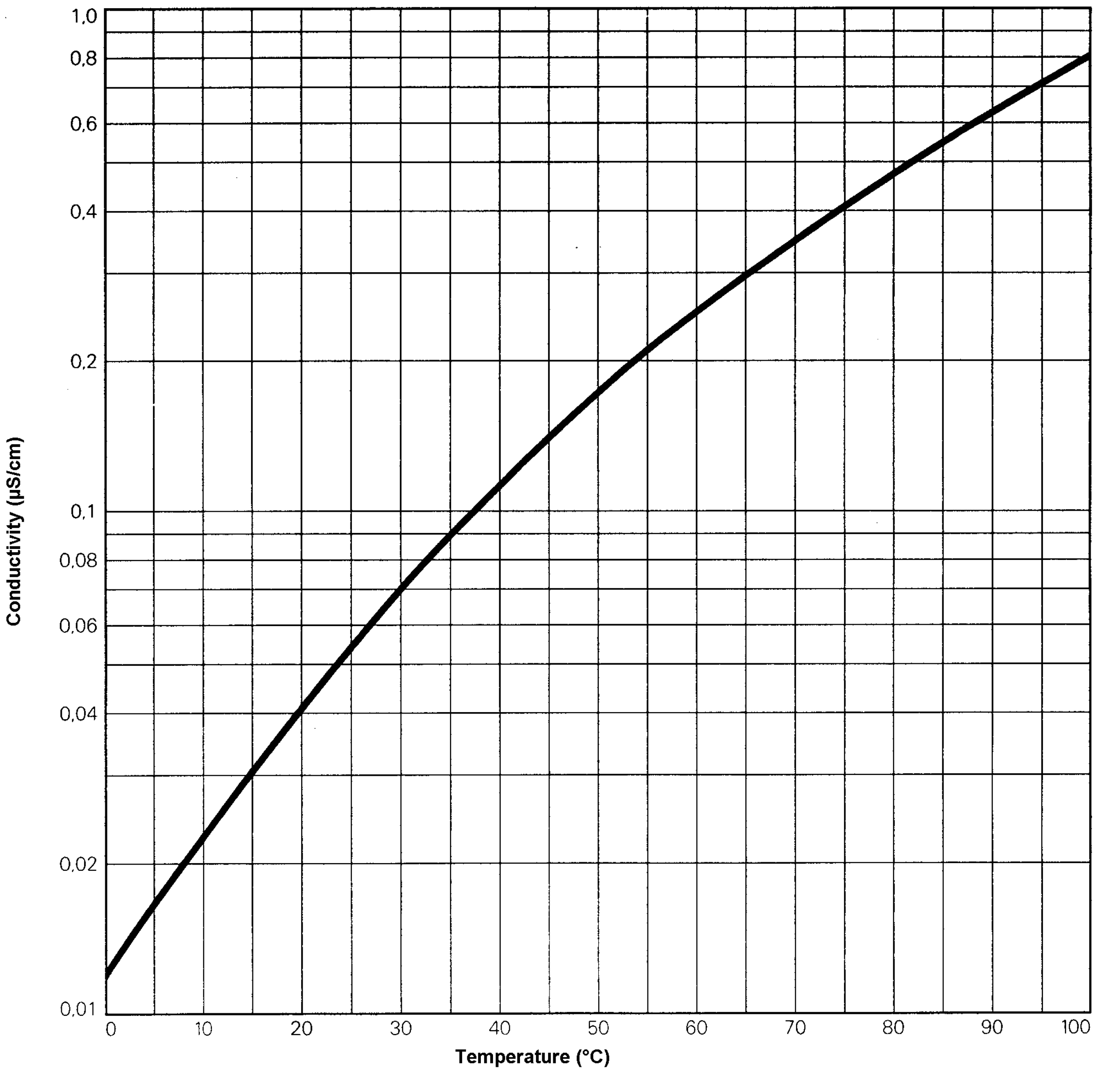
In this case, it can be clearly seen that conductivity changes as a function of the pH.

Conductivity of water solutions at 25°C

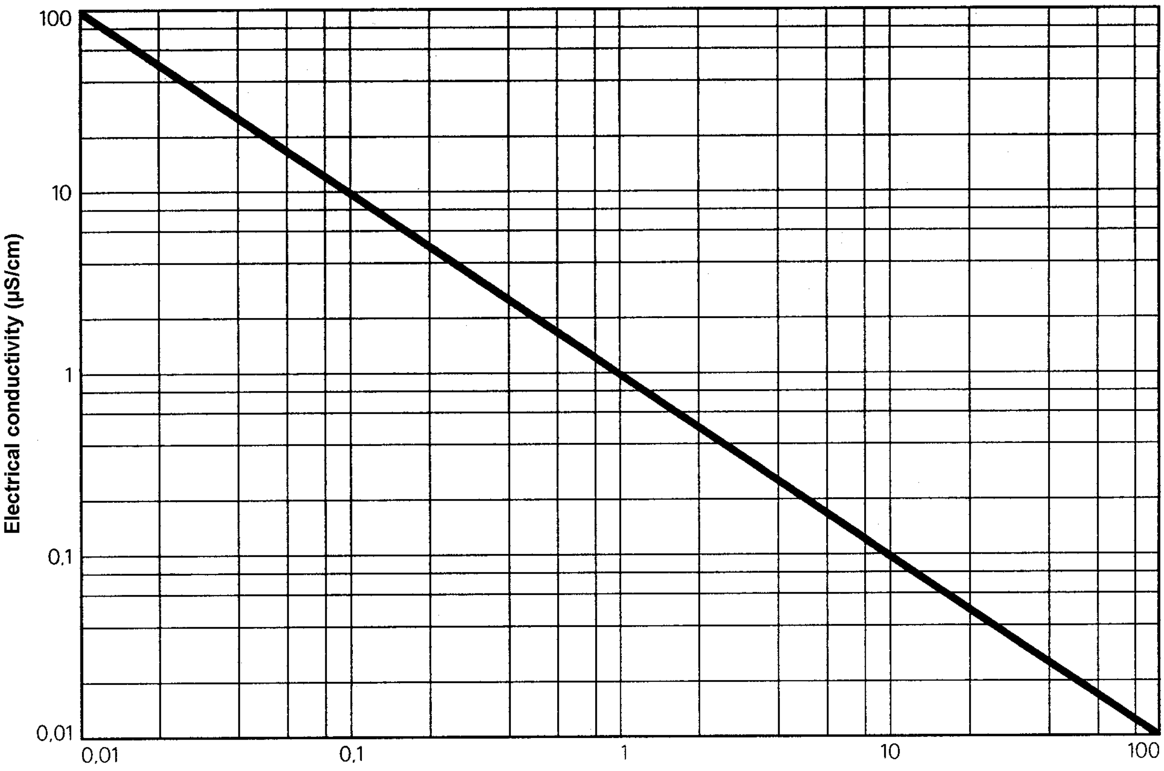


Water electrical conductivity

Water electrical conductivity as a function of temperature



Electrical conductivity and resistivity



Electrical resistance (10^6 Ω.cm = MΩ.cm)

A water purity is often expressed in terms of conductivity the basic unit of which is the Siemens per centimetre (S/cm) or in terms of resistivity which is the reverse unit, based on the Ohm x cm (Ω.cm).

$$S.cm^{-1} = \frac{S}{cm} = \frac{1}{\Omega.cm} = \Omega^{-1}.cm^{-1}$$

The following two examples show the various methods used to express the same situation:

10^{-6} S/cm = 1 µS/cm ~ 1 MΩ.cm = 10^6 Ω.cm

10^{-3} S/cm = 1 mS/cm ~ 1 kΩ.cm = 10^3 Ω.cm