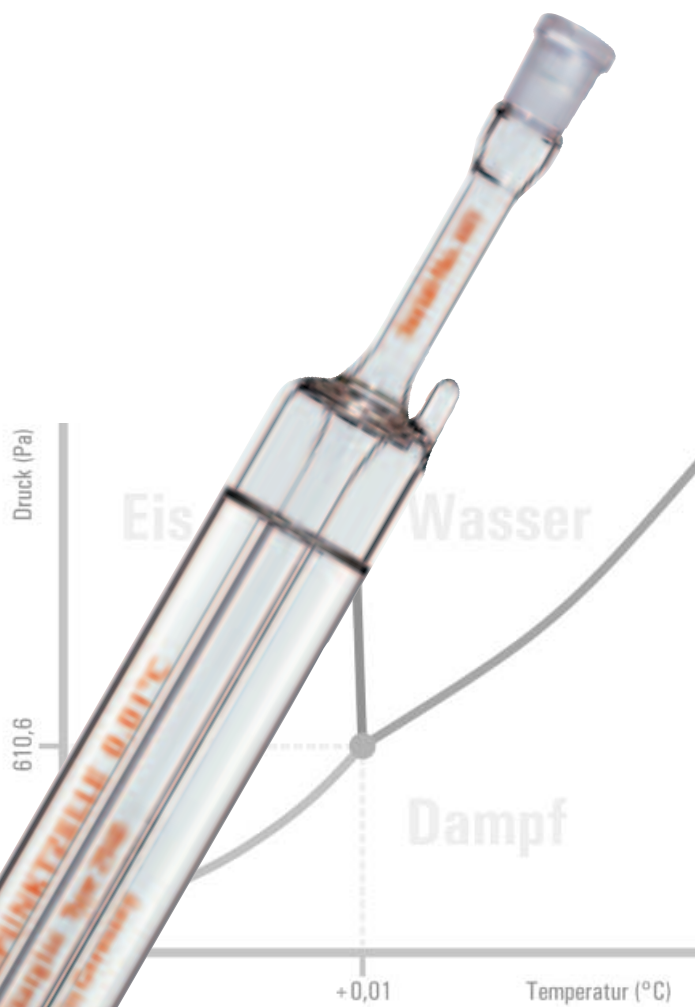


Water Triple Point Cells

High-precision fixed-point devices for the calibration of platinum resistance thermometers



Ludwig Schneider 

High-precision measuring instruments for temperature and density

The Water Triple Point Cell



The triple point of water

The triple point of water is the thermodynamic state in which the three phases of water vapor, water and ice coexist in equilibrium. As long as all three phases are present, temperature and pressure remain constant independently of the quantities of the respective phases.

The most precise temperature fixed point

The water triple point is the most important and most precise fixed point of the International Temperature Scale of 1990 (ITS-90). It is defined at 0.01° C. The precision of this fixed point is better than 0.0001° C.

Because of the pronounced thermal equilibrium of the water triple point, the water triple point cell is ideal for the high-precision calibration of platinum resistance thermometers.

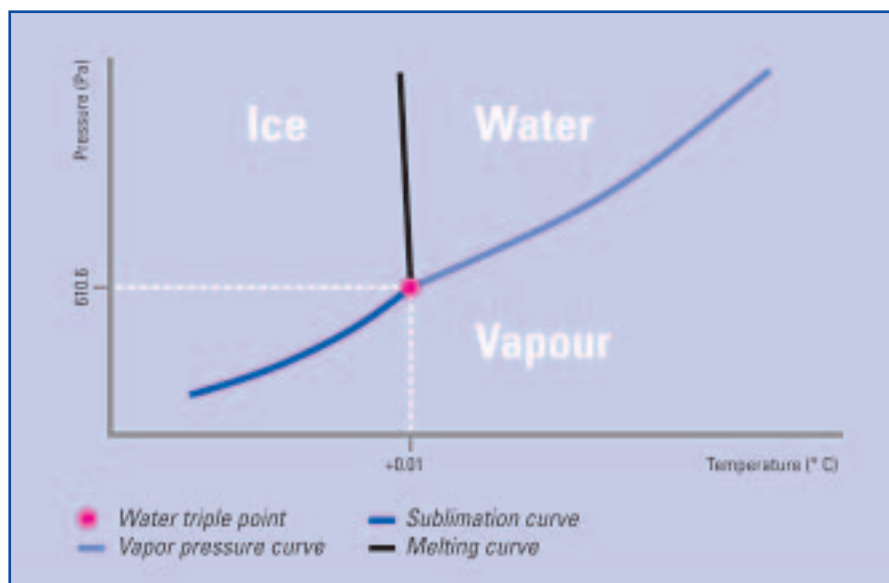
Specializing in high-precision temperature measurement

For almost a century now, Ludwig Schneider has been one of the leader producers of thermometers and areometers-precision instruments that have become bywords for quality among international industrial companies and research laboratories.

In addition, Ludwig Schneider Messtechnik GmbH is accredited with the DKD calibration laboratory (K-06701/LSM) for temperature and is thus permitted to carry out DKD calibrations in comparison measurements and fixed-point processes with a measurement uncertainty of just a few millikelvins.

On the basis of this experience, Ludwig Schneider is capable of producing high-precision water triple point cells on its own site.

Graph of the solid, liquid and gas phases of water with the water triple point



Quality materials and meticulous production methods for long-term precision

Water triple point cells from Ludwig Schneider are filled with high-purity water. This water is gas-free and has the same isotope composition as ocean water.

Before filling, the cells are chemically cleaned with a special cleaning procedure. This is the reason for the low drift of this type of cell, which is less than 0.01 mK/a.

Water triple point cells are maintenance-free and are mainly used for the calibration of platinum resistance thermometers.

The Calibration Principle

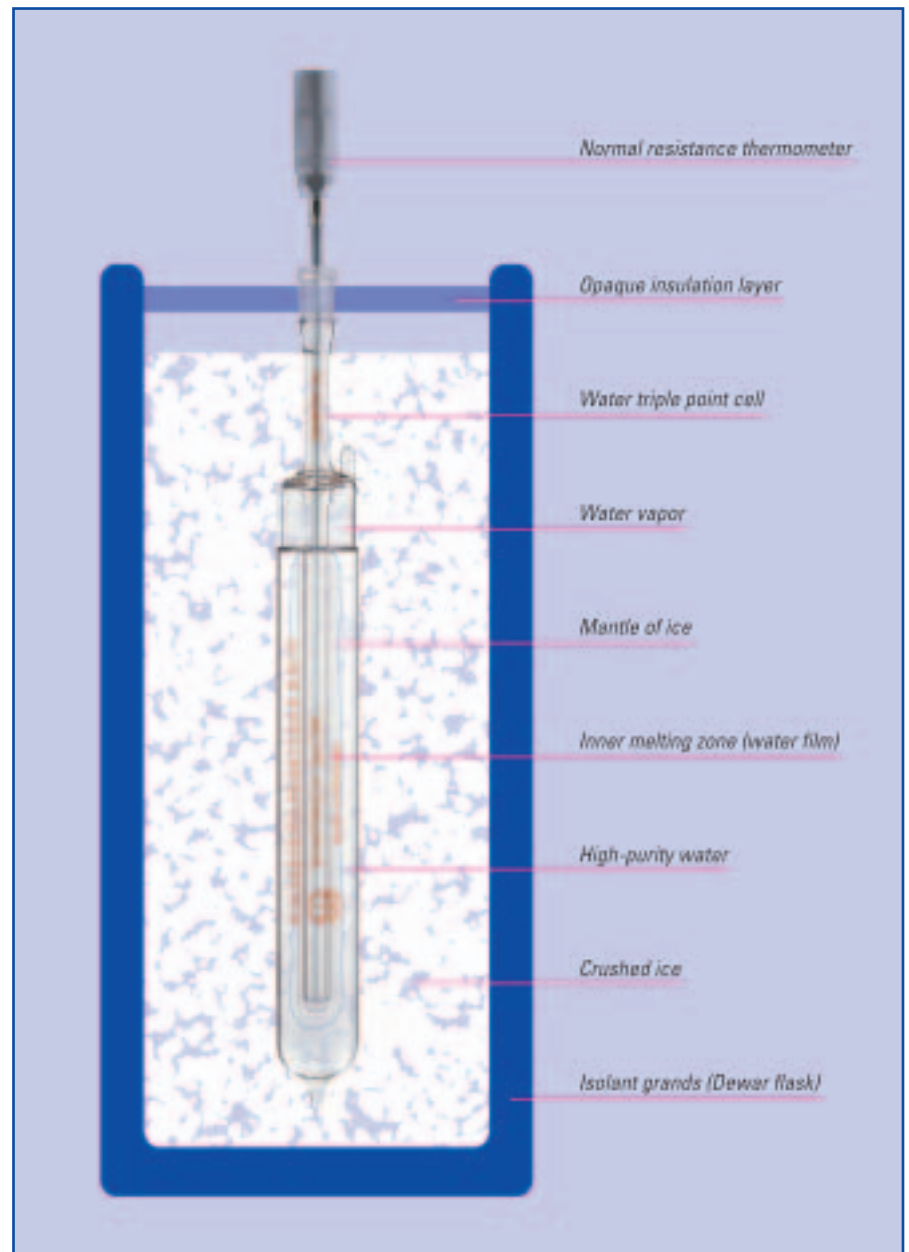


A temperature kept constant to within a tenth of a millikelvin can be indicated for a relatively long time. The constancy of a calibrated platinum resistance thermometer is checked at the water triple point after each important measurement so that measurement tolerances of just a few millikelvins can be achieved.

The space between the inner well and the thermometer should be filled with water to improve thermal conductivity.

In favorable conditions, a prepared cell can be operated for as long as several weeks without re-freezing.

Diagram of the calibration set-up



Preparation and calibration

The water triple point cell is frozen with the aid of dry ice (carbon dioxide). A thick layer of ice forms around the inner well.

The temperature inside the cell rises by a few tenths of a millikelvin in the first few hours and becomes constant after one to three days.

During the calibration process for sensors, the cell is kept in a Dewar flask with crushed ice.

The dissolved mantle of ice of the water triple point cell ensures that the cell is set precisely to the temperature of the water triple point (0.0100°C).

Technical Data

Technical data of the water triple point cells

Type: **WTP-LSW2940**
Indicated temperature: 0.01° C (273.16 K)
Uncertainty (u): $u < 0.1 \text{ mK}$
Drift: Drift $< 0.01 \text{ mK/a}$
Material: DURAN (borosilicate glas)

Cell case

Outer diameter: 40 mm
Length: 290 mm

Inner well

Inner diameter: 10 mm

Traceability: Available on request with a DKD or PTB calibration certificate



Since we are accredited by the accreditation body of the DKD at the Physikalisch-Technische Bundesanstalt (PTB) for temperatures ranging from -196°C to $+1300^{\circ}\text{C}$, we can also provide our customers with other services in the measurement, inspection and calibration sectors:

- DKD calibration certificates and works test certificates
- In-situ calibration
- Conformity tests
- Stabilization of temperature probes
- Consultation and training (by phone or on site)



Ludwig Schneider

Ludwig Schneider GmbH & Co. KG

Postfach 15 61 · D-97865 Wertheim
Am Eichamt 4 · D-97877 Wertheim
Tel.: +49-9342-8286 · Fax: +49-9342-84671
e-Mail: info@ludwig-schneider.de
www.ludwig-schneider.de

