

Reference liquids for density

Densimeters of the oscillating type must be adjusted using mostly air and water as adjusting fluids due to their functional principle. They are traced back to the national density standard by calibrating the densimeters additionally with density reference liquids.

This is normally done by the operator on location and user-oriented. Suited reference liquids can be supplied by PTB or a DKD calibration laboratory.

In the meantime, the measurement uncertainty stated for the density reference liquids on the calibration certificates of the DKD differs only slightly from the measurement uncertainty stated by PTB. DKD's offer of reference liquids can be compared with that of PTB as far as density and temperature ranges are concerned. The DKD calibration certificates document the traceability to national standards (realised by PTB) for the description of the units in agreement with the international unit system (SI). PTB thus restricts the disposal of density reference liquids for industrial application to special cases. PTB, however, remains responsible for calibration on the highest level.

The density reference liquids are provided as samples in clear-glass phials of 10 ml each. On the calibration certificate, which belongs to each reference liquid, the density is indicated for the temperature of 20°C. Additionally, a formula of calculation is given for the change of density in the temperature range from 5°C to 70°C; these indications are valid for a pressure of 1013.25 mbar. The expanded measurement uncertainty (coverage factor $k = 2$) of the density indications is 0.02 kg/m³ to 0.05 kg/m³. The uncertainty, amongst other things, depends on the characterisations of the reference liquids, it as well comprises uncertainty contributions caused by transport and storage of the liquids.

At present, PTB can provide the following density reference liquids:

Liquid	Guide value for the density in kg/m ³ (pressure 1013,25 mbar)			
	5°C	20°C	40°C	70°C
n-nonane	729	718	702	678
High-purity water	999	998	992	978

Reference liquids with higher viscosity

Liquid	Viscosity in mm ² /s	Guide value for the density in kg/m ³ (pressure 1013,25 mbar)			
		5°C	20°C	40°C	50°C
EF162	10	805	795	782	775
EF164	38	825	816	803	797

Inquiries can be made to:

**Physikalisch-Technische Bundesanstalt
Working Group 3.32 "Properties of Liquids"
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The samples are generally delivered within four weeks after receipt of order.

The costs are charged according to the Regulations governing charges for services rendered by PTB and calculated according to the average work done, which is necessary for the determination of the density, dissemination and supply of the reference liquids depending on the quantity delivered.

Each sample or each first sample of a density reference liquid approximately costs €430.50, each additional sample of the same liquid approximately €246. A transport flat rate is charged, which is €10 for the first liquid when dispatched within Germany; €25 within the EU; otherwise €40; for each additional liquid the flat rate increases by €5.

If requested by the customer, the delivery can be effected carriage forward with the parcel service suggested by the customer. n-Nonan will only be shipped carriage forward with the parcel service suggested by the customer.