

Isobaric Properties for Water

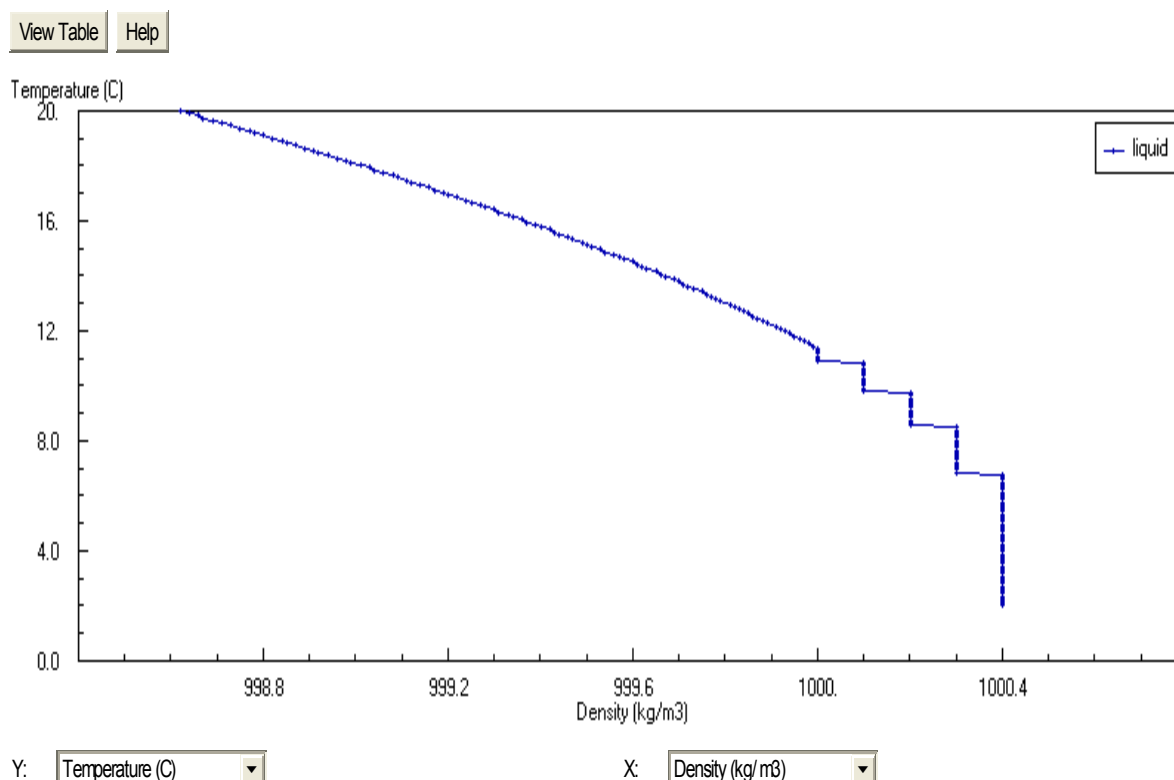
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The following adjustments were made to the specified data range:

- The specified increment was adjusted to limit the number of points calculated.

Fluid Data

Isobaric Data for P = 1.0000 MPa



Auxiliary Data

Reference States

Internal energy	U = 0 at 273.16 K for saturated liquid.
Entropy	S = 0 at 273.16 K for saturated liquid.

Additional fluid data

Critical temperature (T_c)	373.946 C
Critical pressure (P_c)	22.0640 MPa
Critical density (D_c)	322.000000 kg/m ³
Acentric factor	0.3443
Normal boiling point	99.974301 C
Dipole moment	1.855 Debye

References**Equation of state and auxiliary model**

Wagner, W.; Pruss, A., *The IAPWS formulation 1995 for the thermodynamic properties of ordinary water substance for general and scientific use*, **J. Phys. Chem. Ref. Data**, 2002, 31, 2, 387-535. [\[all data\]](#)

Auxiliary model

Saul, A.; Wagner, W., *A Fundamental Equation for Water Covering the Range From the Melting Line to 1273 K at Pressures up to 25000 MPa*, **J. Phys. Chem. Ref. Data**, 1989, 18, 4, 1537-1564. [\[all data\]](#)

Thermal conductivity

IAPWS, Revised Release on the IAPS Formulation 1985 for the Thermal Conductivity of Ordinary Water Substance, International Association for the Properties of Water and Steam, London, 1998, 23. [\[all data\]](#)

Thermal conductivity and viscosity

Kestin, J.; Sengers, J.V.; Kamgar-Parsi, B.; Levelt Sengers, J.M.H., *Thermophysical Properties of Fluid H₂O*, **J. Phys. Chem. Ref. Data**, 1984, 13, 1, 175-183. [\[all data\]](#)

Viscosity

IAPWS, Revised Release on the IAPS Formulation 1985 for the Viscosity of Ordinary Water Substance, International Association for the Properties of Water and Steam, Erlangen, Germany, 1997, 15. [\[all data\]](#)

Surface tension

Reference entry not in database.

Dielectric constant

Fernandez, D.P.; Goodwin, A.R.H.; Lemmon, E.W.; Levelt Sengers, J.M.; Williams, R.C., *A Formulation for the Static Permittivity of Water and Steam at Temperatures from 238 K to 873 K at Pressures up to 1200 MPa, Including Derivatives and Debye-Huckel Coefficients*, **J. Phys. B: At. Mol. Opt. Phys.**, 1997, 26, 4, 1125-1165. [\[all data\]](#)

Melting curve

Wagner, W.; Saul, A.; Pruss, A., *International Equations for the Pressure Along the Melting and Along the Sublimation Curve of Ordinary Water Substance*, **J. Pharm. Sci**, 1994, 23, 3, 515-527. [\[all data\]](#)

Additional Information

Equation of state

The uncertainty in density of the equation of state is 0.0001% at 1 atm in the liquid phase, and 0.001% at other liquid states at pressures up to 10 MPa and temperatures to 423 K. In the vapor phase, the uncertainty is 0.05% or less. The uncertainties rise at higher temperatures and/or pressures, but are generally less than 0.1% in density except at extreme conditions. The uncertainty in pressure in the critical region is 0.1%. The uncertainty of the speed of sound is 0.15% in the vapor and 0.1% or less in the liquid, and increases near the critical region and at high temperatures and pressures. The uncertainty in isobaric heat capacity is 0.2% in the vapor and 0.1% in the liquid, with increasing values in the critical region and at high pressures. The uncertainties of saturation conditions are 0.025% in vapor pressure, 0.0025% in saturated liquid density, and 0.1% in saturated vapor density. The uncertainties in the saturated densities increase substantially as the critical region is approached.

Thermal conductivity

For the uncertainties in the thermal conductivity, see the IAPWS Release.

Viscosity

For the uncertainties in the viscosity, see the IAPWS Release.

Surface tension

For the uncertainties in surface tension, see the IAPWS Release.

The fluid data above is also available from stand-alone NIST data products. These products include the [NIST Thermodynamic and Transport Properties of Pure Fluids Database](#) and the [NIST Thermodynamic and Transport Properties of Refrigerants and Refrigerant Mixtures Database](#). These data products include many additional features not available from this web site.

Notes

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