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Property Calculation Libraries and Software for Working Fluids in Energy Conversion Processes

H.-J. Kretzschmar[1*], Matthias Kunick[2], Sebastian Herrmann[2], Martin Suender[2]

[1] KCE-ThermoFluidProperties, Amberg, (Germany)

[2] Faculty of Mechanical Engineering, Zittau/Goerlitz University of Applied Sciences, Zittau (Germany)

[3] *Corresponding Author: kretzschmar@thermofluidprop.com

The program libraries for calculating thermophysical properties of water and steam, mixtures with water and steam, and other working fluids are designed for practical use by engineers calculating heat cycles, steam or gas turbines, boilers, heat pumps, refrigerators and other energy conversion processes. Thermodynamic properties, transport properties, thermodynamic derivatives and inverse functions can be calculated.
The following property libraries are presented:

LibIF97 for water and steam, *LibIF97-META* for metastable steam, *LibICE* for ice, *LibSeaWa* for seawater,
LibHuGas for humid combustion-gas mixtures also at high pressures,
LibHuAir for humid air also at high pressures and with high water content,
LibAmWa for ammonia/water mixtures in absorption processes,
LibWaLi for water/lithium bromide mixtures in absorption processes,
LibIdGasMix for 25 ideal gases and their mixtures,
LibRealAir for real dry air,
LibCO2 for carbon dioxide including dry ice, *LibNH3* for ammonia,
LibPropane for propane, *LibButane_Iso* and *LibButane_n* for iso-butane and n-butane,
LibD4, *LibD5*, *LibD6*, *LibMDM*, *LibMD2M*, *LibMD3M*, *LibMD4M*, and *LibMM* for siloxanes used in ORC processes,
LibCH3OH for methanol, *LibC2H5OH* for ethanol,
LibH2 for hydrogen, *LibN2* for nitrogen, *LibHe* for helium, and
LibSecRef for liquid coolants.

In addition, property libraries for a number of refrigerants and hydrocarbons are available.
These libraries contain accurate and fast algorithms currently available for calculating thermodynamic and transport properties.
For extremely fast property computations in CFD or simulations of transient processes, property libraries that use the Spline-Based Table Look-up method (SBTL) are available.
The property libraries can be used in user-specific programs written in Fortran, C/C++, C#, Java, Python, Visual Basic or other programming languages on Windows, Linux or Mac OS.
In addition, add-ons for the use of these property libraries in Excel, MATLAB and Simulink, Mathcad, Engineering Equation Solver (EES), Dymola and SimulationX (Modelica), and LabVIEW are available.