

Property Libraries and Software for Working Fluids for Calculating Heat Cycles, Turbines, Boilers, Heat Pumps, and Refrigeration Processes

Hans-Joachim Kretzschmar^{C, S}

*Department of Technical Thermodynamics, Zittau/Goerlitz University of Applied Sciences, Zittau, Saxony,
Germany
hj.kretzschmar@hszg.de*

Matthias Kunick and Sebastian Herrmann

Department of Technical Thermodynamics, Zittau/Goerlitz University of Applied Sciences, Zittau, Saxony

The program libraries for calculating the thermophysical properties for water and steam, for mixtures with water and steam, and for other working fluids are designed for practical use by engineers who calculate heat cycles, steam or gas turbine, boiler, heat pump, or other thermal or refrigeration processes. Thermodynamic properties, transport properties, thermodynamic derivatives, and inverse functions can be calculated. The following property libraries are presented here: - 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 and the Kalina process, - 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 the most accurate algorithms currently available for calculating thermodynamic and transport properties. For extremely fast property computations in CFD or non-stationary process simulations, Spline-based Table Look-up Method (SBTL) property libraries are available. The property libraries can be used in user-specific programs written in Fortran, C++, C#, Java, Pascal (Delphi), Python, Visual Basic or other programming languages under the operating systems Windows, Unix/Linux, or Mac OS. In addition, add-ons for the use of these property libraries in Excel®, MATLAB®, Mathcad®, Engineering Equation Solver® (EES), Dymola® and SimulationX® (Modelica), and LabVIEW™ are available.