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

Steam, Water, and Ice
Libraries LibIF97, LibICE

- Industrial Formulation IAPWS-IF97 (Revision 2007)
- Supplemantary Standards IAPWS-IF97-S01, IAPWS-IF97-S03rev IAPWS-IF97-S04, IAPWS-IF97-S05
- Ice from IAPWS Formulation 2006

Seawater
Library LibSeaWa

IAPWS-Formulation (2008) and IAPWS-IF97

Humid Combustion Gas Mixtures
Library LibHuGas

Model: Ideal mixture of the real fluids:
nitrogen, carbon cioxide, steam, oxygen, argon

and of the ideal gases:
sulfur dioxide, carbon monoxide, neon

Consideration of:
Condensation of steam, Dissociation from VDI Guideline 4670, Poynting effect

Library LibIDGAS

Model: Ideal gas mixture from VDI Guideline 4670

Humid Air
Library LibHuAir

Model: Ideal mixture of the real fluids:

- Dry Air from Lemmon et al. (2000)
- Steam, water and ice from IAPWS-IF97

Consideration of:

- Condensation of steam
- Dissociation from VDI Guideline 4670
- Poynting effect from ASHRAE RP-1485

Library LibIDAir

Model: Ideal gas mixture from VDI Guideline 4670

Ammonia/Water - Mixtures
Library LibAmWa

IAPWS-Guideline 2001 of Tillner-Roth and Friend (1998)

Ideal Gas Mixtures
Library LibIdGasMix

Model: Ideal mixtures of 25 ideal gases
Consideration of : Dissociation from VDI Guideline 4670

Carbon Dioxide and Dry Ice
Library LibCO2

Formulation of Span and Wagner (1994)

Water/Lithium Bromide - Mixtures
Library LibWaLi

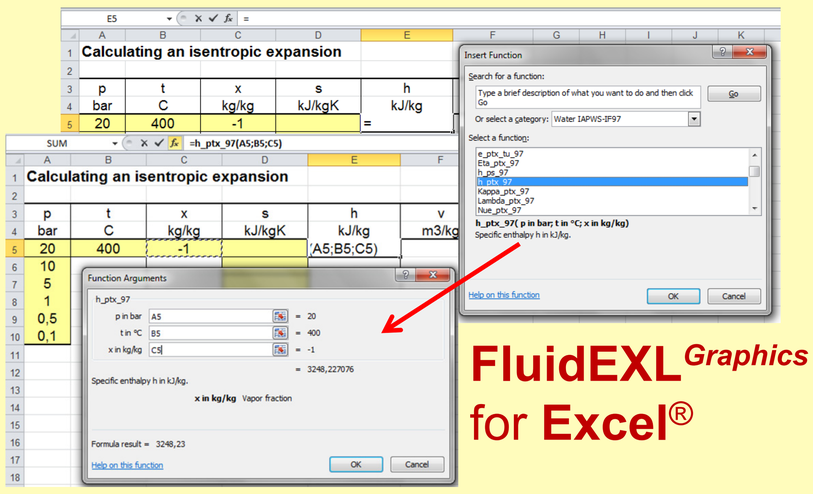
Formulation of Kim and Infante Ferreira (2004)

Siloxanes for ORC Processes
Libraries LibD4...MD4M...MM

Formulations of Colonna et al. (2006, 2008)

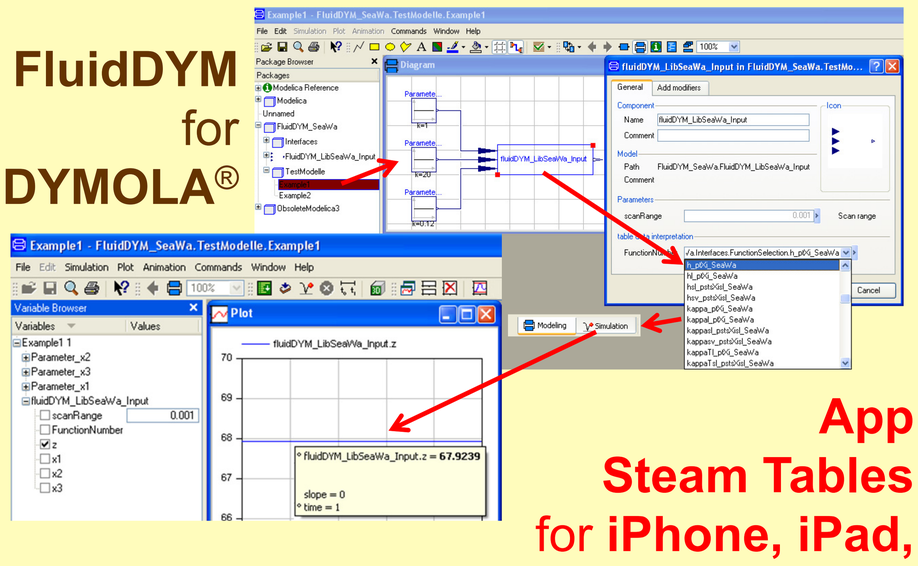
Dry Air
Library LibRealAir

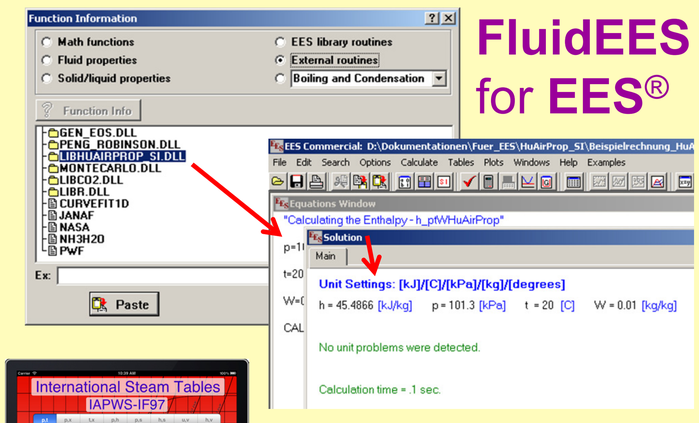
Formulation of Lemmon et al. (2000)



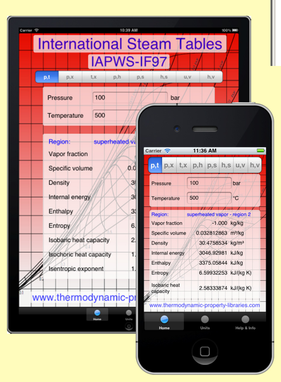
FluidEXL *Graphics* for **Excel®**

FluidDYM for **DYMOLA®**

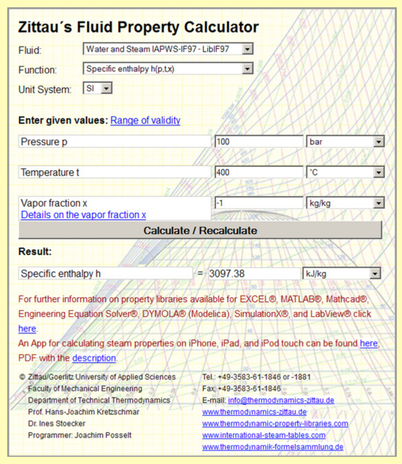




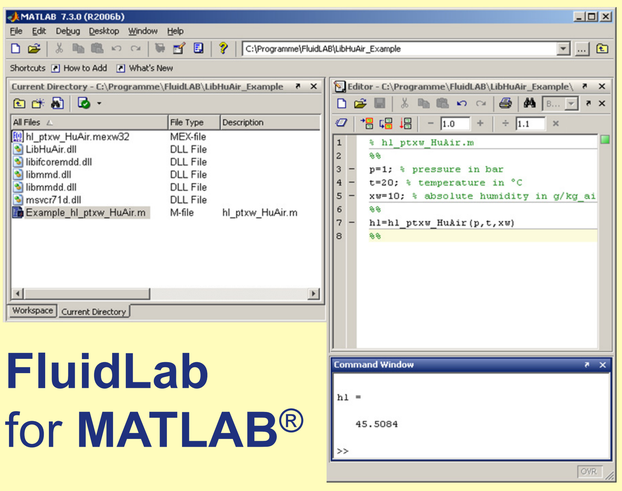
FluidEES for **EES®**



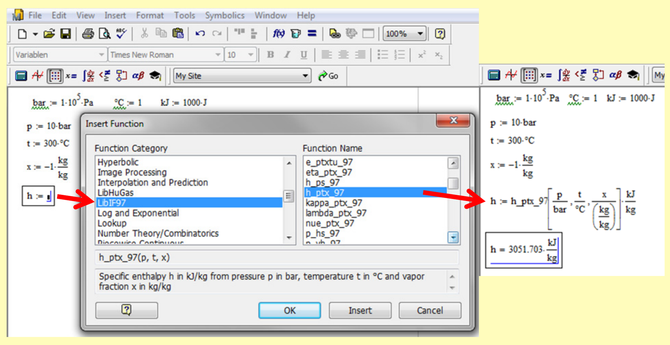
App Steam Tables for **iPhone, iPad, iPod touch**



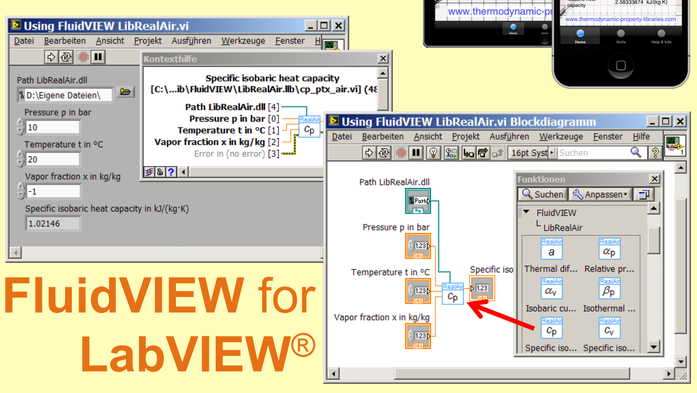
Online Property Calculator



FluidLab for **MATLAB®**



FluidMAT for **Mathcad®**



FluidVIEW for **LabVIEW®**

Nitrogen
Library LibN2

Formulation of Span et al. (2000)

Ammonia
Library LibNH3

Formulation of Tillner-Roth (1995)

R134a
Library LibR134a

Formulation of Tillner-Roth and Baehr (1994)

Hydrogen
Library LibH2

Formulation of Leachman et al. (2007)

Helium
Library LibHe

Formulation of Arp et al. (1998)

Propane
Library **LibPropan**

Formulation of Lemmon et al. (2008)

Iso-Butane
Library **LibButan_Iso**

Formulation of Bücker et al. (2003)

n-Butane
Library **LibButan_n**

Formulation of Bücker et al. (2003)

Ethanol
Library **LibC2H5OH**

Formulation of Dillon and Penoncello (2004)

Methanol
Library **LibCH3OH**

Formulation of De Reuck and Craven

The following thermodynamic and transport properties can be calculated[a]

Thermodynamic Properties

- Vapor pressure p_s
- Saturation temperature T_s
- Density ρ
- Specific volume v
- Enthalpy h
- Internal energy u
- Entropy s
- Exergy e
- Isobaric heat capacity c_p
- Isochoric heat capacity c_v
- Isentropic exponent k
- Speed of sound w
- Surface tension s

Transport Properties

- Dynamic viscosity η
- Kinematic viscosity ν
- Thermal conductivity λ
- Prandtl-number Pr

Backward Functions

- $T, v, s\ (p,h)$
- $T, v, h\ (p,s)$
- $p, T, v\ (h,s)$
- $p, T\ (v,h)$
- $p, T\ (v,u)$

Thermodynamic Derivatives

- Partial derivatives can be calculated.

www.thermodynamic-property-libraries.com

[a] Not all of these property functions are available in all property libraries listed before.