Property Libraries and Software for Working Heat Cycles, Boilers, Turbines, Heat Pumps,

H.-J. Kretzschmar, I. Stöcker,

www.thermodynamic-

Steam, Water, and Ice

Libraries LibIF97, LibICE

- Industrial Formulation IAPWS-IF97 (Revision 2007)
- Supplementary Standards
  - IAPWS-IF97-S01
  - IAPWS-IF97-S03rev
  - IAPWS-IF97-S04
  - IAPWS-IF97-S05
- IAPWS Revised Advisory Note No. 3 on Thermodynamic Derivatives (2008)
- Ice from IAPWS Formulation 2006

Seawater

Library LibSeaWa

IAPWS-Formulation (2008) and IAPWS-IF97

Carbon Dioxide and Dry Ice

Library LibCO2

Formulation of Span and Wagner (1994)

Ammonia

Library LibNH3

Formulation of Tillner-Roth (1995)

Methanol

Library LibCH3OH

Formulation of de Reuck and Craven

Ethanol

Library LibC2H5OH

Formulation of Dillon and Penoncello (2004)

Hydrogen

Library LibH2

Formulation of Leachman et. al. (2007)

Helium

Library LibHe

Formulation of Arp et al. (1998)

Humid Combustion Gas Mixtures

Library LibHuGas

Model: Ideal mixture of the real fluids:

CO_2	- Span and Wagner	O_2	- Schmidt and Wagner
H_2O	- IAPWS-95	Ar	- Tegeler et al.
N_2	- Span et al.		

and of the ideal gases:

SO_2, CO, Ne (Scientific Formulation of Bücker et al.)

Consideration of:

Dissociation from VDI Guideline 4670 und poynting effect

Library LibIDGAS

Model: Ideal gas mixture from VDI Guideline 4670

Ideal Gas Mixtures

Library LibIdGasMix

Model: Ideal mixture of the ideal gases:

Ar	H_2O	H_2S	Methane	Butane
Ne	SO_2	OH	Ethane	Isobutane
N_2	Dry air	H_2	Ethylene	Benzene
O_2	Air nitrogen	He	Propylene	Methanol
CO	NO	F_2	Propane	Ammonia
CO_2				

Consideration of

- Dissociation from VDI Guideline 4670

Ammonia / Water - Mixtures

Library LibAmWa

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

Water / Lithium Bromide - Mixtures

Library LibWaLi

Formulation of Kim and Infante Ferreira (2004)

Propane

Library LibPropane

Formulation of Lemmon et al. (2008)

R134a

Library LibR134a

Formulation of Tillner-Roth and Baehr (1994)

Iso-Butane

Library LibButane_Iso

n-Butane

Library LibButane_n

Formulationen of Bücker et al. (2003)

Humid Air

Library LibHuAir

Model: Ideal mixture of the real fluids:

- Dry Air from Lemmon et al.
- Steam, water, and ice from IAPWS-IF97 and IAPWS-06

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

Dry Air

Library LibRealAir

Formulation of Lemmon et al. (2000)

Nitrogen

Library LibN2

Formulation of Span et al. (2000)

Working Fluids for ORC Processes

Siloxane $C_6H_{18}OSi_2$

Library LibMM

Siloxane $C_8H_{24}O_4Si_4$

Library LibD4

Siloxane $C_{10}H_{30}O_5Si_5$

Library LibD5

Siloxane $C_{12}H_{36}O_6Si_6$

Library LibD6

Siloxane $C_8H_{24}O_2Si_3$

Library LibMDM

Siloxane $C_{10}H_{30}O_3Si_4$

Library LibMD2M

Siloxane $C_{12}H_{36}O_4Si_5$

Library LibMD3M

Siloxane $C_{14}H_{42}O_5Si_6$

Library LibMD4M

Formulationen of Colonna et al. (2006, 2008)

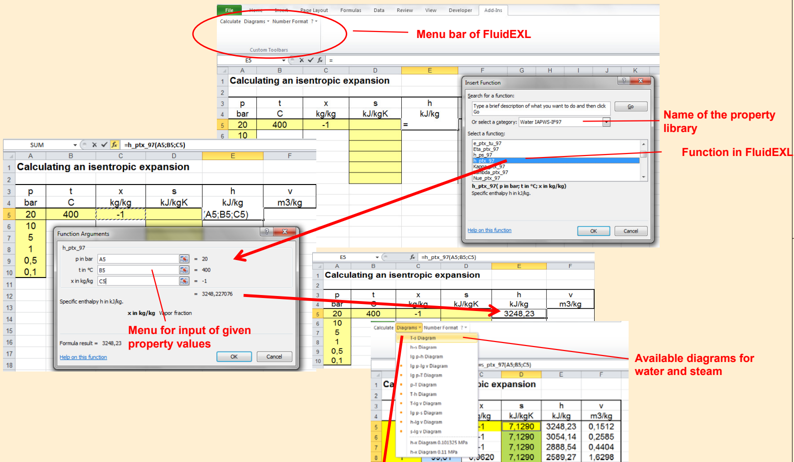
Fluids for Calculating and Refrigeration Processes

ZITTAU/GOERLITZ
University of Applied Sciences
Department of Technical Thermodynamics
www.thermodynamics-zittau.de

M. Kunick, S. Herrmann, M. Nicke

property-libraries.com

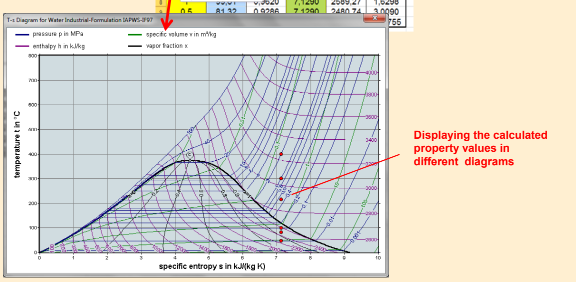
FluidEXL^{Graphics} for Excel®



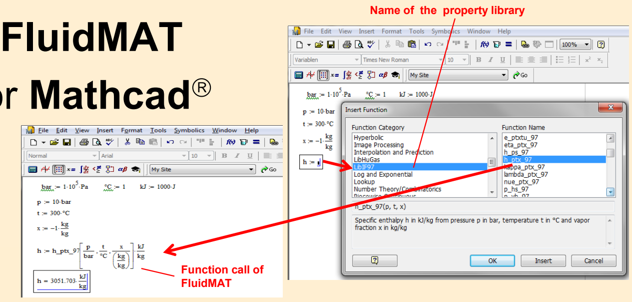
The following diagrams are available

Water and Steam :
T-s diagram
h-s diagram
log *p-h* diagram
log *p-s* diagram
p-T diagram
log *p-T* diagram
h-log *v* diagram
log *p*-log *v* diagram
T-h diagram
T-log *v* diagram
s-log *v* diagram

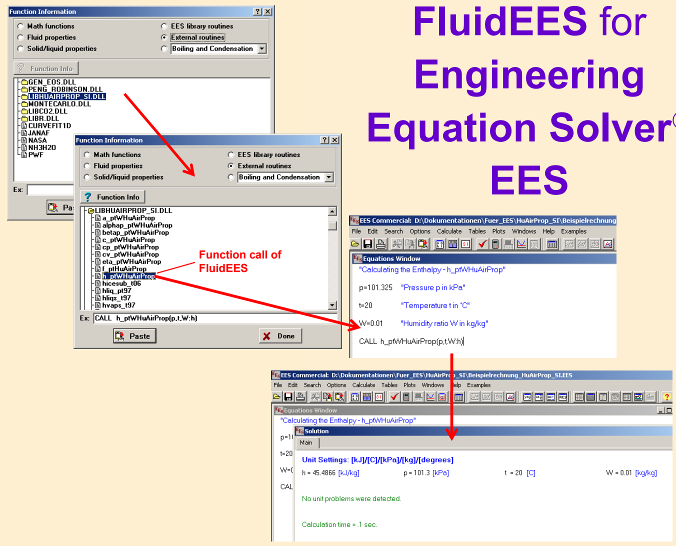
Humid Air :
h-x diagram for *p* = 0.101325 MPa
h-x diagram for *p* = 0.1 MPa



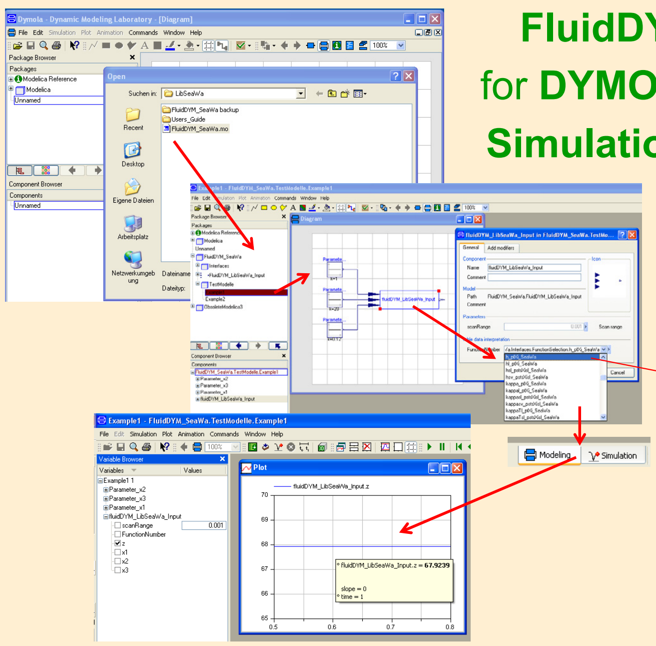
FluidMAT for Mathcad®



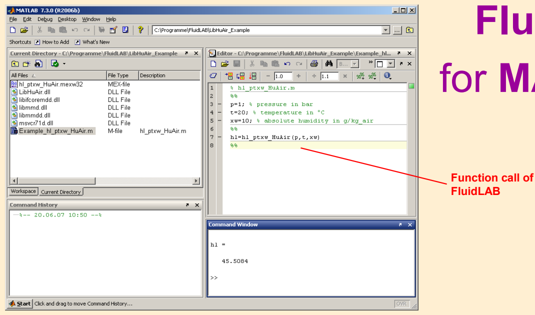
FluidEES for Engineering Equation Solver® EES



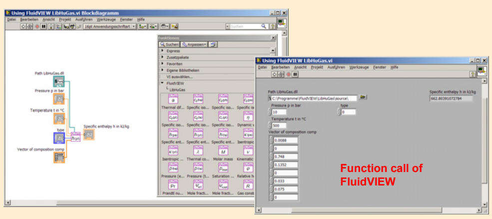
FluidDYM for DYMOLA®, SimulationX®



FluidLAB for MATLAB®



FluidVIEW for LabVIEW®



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 κ
- Speed of sound w
- Surface tension σ

Transport Properties

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

Thermodynamic Derivatives

- Partial derivatives can be calculated.

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)

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