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Property Libraries

for Water and Steam, and other Working Fluids

for Calculating Heat Cycles, Turbines, Heat Pumps, and Refrigeration Processes

Steam, Water, and Ice

Library LibIF97

- Industrial Formulation IAPWS-IF97 (Revision 2007)
- Supplementary Standards IAPWS-IF97-S01 IAPWS-IF97-S03ref IAPWS-IF97-S04 IAPWS-IF97-S05
- IAPWS Revised Advisory Note No. 3 on Thermodynamic Derivatives (2008)

Library LibICE

- Ice from IAPWS-06
- Melting line and sublimation line from IAPWS-08
- Water from IAPWS-IF97
- Steam from IAPWS-95 and IAPWS-IF97

Humid Combustion Gas Mixtures

Library LibHuGas

- Model: Ideal mixture of the real fluids:
- CO₂ - Span and Wagner (1994)
 - O₂ - Schmidt and Wagner (1995)
 - H₂O - IAPWS-95
 - Ar - Tegeler et al. (1999)
 - N₂ - Span (2000)
- and of the ideal Gases:
- SO₂, CO, Ne (Bücker et al., 2003)
- Consideration of:
- Condensation of steam
 - Dissociation and 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 and IAPWS-06
- Consideration of:
- Condensation and freezing of steam
 - Dissociation from VDI-Guideline 4670 (2003)
 - Poynting effect from ASHRAE RP-1485 (2009)

Ideal Gas Mixtures

Library LibIdGasMix

Model: Ideal mixture of the ideal gases:

Ar	SO ₂	Methane
Ne	H ₂	Ethane
N ₂	H ₂ S	Ethylene
O ₂	OH	Propylene
CO	He	Propane
CO ₂	F ₂	n-Butane
Air	NH ₃	Isobutane
NO		Benzene
H ₂ O		Methanol

Consideration of:
Dissociation from VDI-Guideline 4670 (2003)

Carbon Dioxide including Dry Ice

Library LibCO2

Formulation of Span and Wagner (1994)

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)

Dry Air including Liquid Air

Library LibRealAir

Formulation of Lemmon et al. (2000)

Seawater

Library LibSeaWa

IAPWS-Formulation of Feistel (2008) and IAPWS-IF97

Ammonia

Library LibNH3

Formulation of Tillner-Roth (1995)

Hydrogen

Library LibH2

Formulation of Leachman et al. (2007)

Nitrogen

Library LibN2

Formulation of Span et al. (2000)

Siloxanes as ORC Working Fluids

C₈H₂₄O₄Si₄
Octamethylcyclotetrasiloxane

Library LibD4

C₁₀H₃₀O₅Si₅
Decamethylcyclopentasiloxane

Library LibD5

C₁₄H₄₂O₅Si₆
Tetradecamethylhexasiloxane

Library LibMD4M

C₆H₁₈OSi₂
Hexamethyldisiloxane

Library LibMM

Formulation of Colonna et al. (2006)

C₁₂H₃₆O₆Si₆
Dodecamethylcyclohexasiloxane

Library LibD6

C₁₀H₃₀O₃Si₄
Decamethyltetrasiloxane

Library LibMD2M

C₁₂H₃₆O₄Si₅
Dodecamethylpentasiloxane

Library LibMD3M

C₈H₂₄O₂Si₃
Octamethyltrisiloxane

Library LibMDM

Formulation of Colonna et al. (2008)

R134a

Library LibR134a

Formulation of Tillner-Roth and Baehr (1994)

Propane

Library LibPropane

Formulation of Lemmon et al. (2007)

Iso-Butane

Library LibButane_Iso

Formulation of Bücker et al. (2003)

n-Butane

Library LibButane_n

Formulation of Bücker et al. (2003)

Hydrocarbons

C₁₀H₂₂ Dekane

Library LibC10H22

C₅H₁₂ Isopentane

Library LibC5H12_ISO

C₅H₁₂ Neopentane

Library LibC5H12_NEO

C₆H₁₄ Isohexane

Library LibC5H14

C₇H₈ Toluene

Library LibC7H8

Formulation: Lemmon and Span (2006)

Liquid Coolants

Library LibSecRef

Liquid solutions of water with:

C ₂ H ₆ O ₂	Ethylene glycol
C ₃ H ₈ O ₂	Propylene glycol
C ₂ H ₅ OH	Ethyl alcohol
CH ₃ OH	Methyl alcohol
C ₃ H ₈ O ₃	Glycerol
K ₂ CO ₃	Potassium carbonate
CaCl ₂	Calcium chloride
MgCl ₂	Magnesium chloride
NaCl	Sodium chloride
C ₂ H ₃ KO ₂	Potassium acetate

Formulation of the International Institute of Refrigeration (1997)

Ethanol

Library LibC2H5OH

Formulation of Schroeder et al. (2012)

Methanol

Library LibCH3OH

Formulation of de Reuck and Craven (1993)

Helium

Library LibHe

Formulation of Arp et al. (1998)

Other Fluids

CO Carbon monoxide

Library LibCO

COS Carbonyl sulfide

Library LibCOS

H₂S Hydrogen sulfide

Library LibH2S

N₂O Dinitrogen monoxide

Library LibN2O

SO₂ Sulfur dioxide

Library LibSO2

C₃H₆O Acetone

Library LibC3H6O

Formulation: Lemmon and Span (2006)