

Property Libraries

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

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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

Library **LibSBTL_IF97** Library **LibSBTL_95**

Extremely fast property calculations according to the IAPWS Guideline 2015 Spline-based Table Look-up Method (SBTL) applied to the Industrial Formulation IAPWS-IF97 and to the Scientific Formulation IAPWS-95 for Computational Fluid Dynamics (CFD) and the simulation of non-stationary processes

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 et. al. (2000)
and of the ideal gases:
SO₂, CO, Ne (Bücker et al., 2003)
Consideration of:
• Condensation of steam
• Dissociation and Poynting effect

Library **LibIdGasMix**

Model: Ideal gas mixture of 25 ideal gases from VDI-Guideline 4670 (2003)

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 the VDI-Guideline 4670 (2003)
• Poynting effect from ASHRAE RP-1485

Library **ASHRAE LibHuAirProp**

Model: Virial equation from ASHRAE Report RP-1485 for real mixture of the real fluids dry air and steam.

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 Industrial Formulation (2013)

Ammonia

Library **LibNH3**

Formulation of Tillner-Roth (1993)

Hydrogen

Library **LibH2**

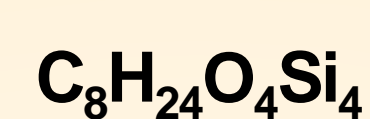
Formulation of Leachman et al. (2009)

Nitrogen

Library **LibN2**

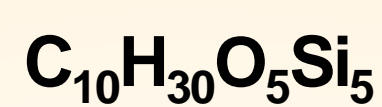
Formulation of Span et al. (2000)

Siloxanes as ORC Working Fluids



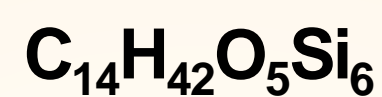
Octamethylcyclotetrasiloxane

Library **LibD4**



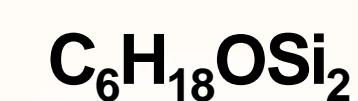
Decamethylcyclopentasiloxane

Library **LibD5**



Tetradecamethylhexasiloxane

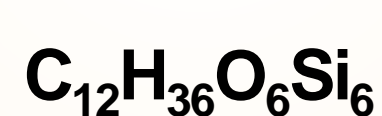
Library **LibMD4M**



Hexamethyldisiloxane

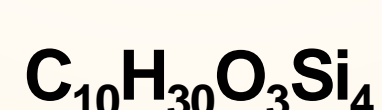
Library **LibMM**

Formulation of Colonna et al. (2006)



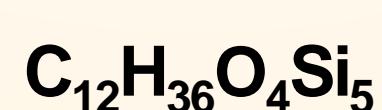
Dodecamethylcyclohexasiloxane

Library **LibD6**



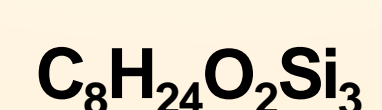
Decamethyltetrasiloxane

Library **LibMD2M**



Dodecamethylpentasiloxane

Library **LibMD3M**



Octamethyltrisiloxane

Library **LibMDM**

Formulation of Colonna et al. (2008)

R134a

Library **LibR134a**

Formulation of Tillner-Roth and Baehr (1994)

Iso-Butane

Library **LibButane_Iso**

Formulation of Bücker and Wagner (2006)

Propane

Library **LibPropane**

Formulation of Lemmon et al. (2009)

n-Butane

Library **LibButane_n**

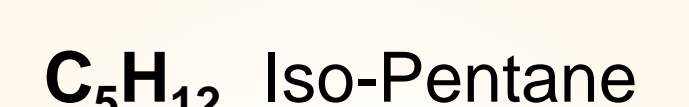
Formulation of Bücker and Wagner (2006)

Hydrocarbons



Decane

Library **LibC10H22**



Iso-Pentane

Library **LibC5H12_ISO**



Neo-Pentane

Library **LibC5H12_NEO**



Iso-Hexane

Library **LibC5H14**



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	Ethanol
CH ₃ OH	Methanol
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

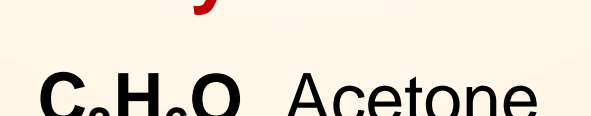
Library **LibH2S**

N₂O Dinitrogen monoxide

Library **LibN2O**

SO₂ Sulfur dioxide

Library **LibSO2**



Acetone

Library **LibC3H6O**

Formulation: Lemmon and Span (2006)