SOLVAY FLUOR

SOLKANE® - INFORMATION SERVICE

# Solkane® 404A Thermodynamics

SOLVAY FLUOR

## Technical Service - Refrigerants -

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P.O. Box 220
30002 Hannover
Hans-Boeckler-Allee 20
30173 Hannover / Germany

Phone +49/511/857-2653
Fax +49/511/857-2166
E-Mail refrigerants@solvay.com
Internet: www.solvay-fluor.com

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# 1 Units and Symbols

| Symbol | Unit | Meaning/Definition |
|---|---|---|
| *A, B* | [-] | Parameters of the Wagner equation |
| *C* | [-] | Parameter of the equation for density of boiling liquid |
| *D* | [kJ/(kgK)] | Parameter of the equation for specific heat capacity in an ideal gas state |
| *E, F, G* | [-] | Parameter of the Martin-Hou equation |
| *I* | [-] | Parameter of the equation for dynamic viscosity of vapour |
| *J* | [-] | Parameter for the boiling liquid enthalpy equation |
| *K* | [kJ/(kgK)] | Parameter for the boiling liquid entropy equation |
| *L* | [Pa s /K] | Parameter of the equation for dynamic viscosity of liquid |
| *M* | [W/(m K)] | parameter of the equation for thermal conductivity of the saturated liquid |
| *N* | [W/(m K)] | Parameter of the equation for thermal conductivity of the saturated vapour |
| *O* | [N/(m K)] | Parameter of the equation for surface tension |
| *P* | [kJ/(kg K)] | parameter of the equation for specific heat capacity of the saturated liquid |
| *R* | [bar $m^3$/(kg K)] | Gas constant |
| *b* | [$m^3$/kg)] | Parameter of the Martin-Hou equation |
| *c* | [kJ/(kg K)] | Specific heat capacity |
| *e* | [kJ/kg] | Specific exergy |
| *h* | [kJ/kg] | Specific enthalpy |
| *k* | [-] | Parameter of the Martin-Hou equation |
| *p* | [bar] | Pressure |
| *r* | [kJ/kg] | Enthalpy of vaporisation |
| *s* | [kJ/(kg K)] | Specific entropy |
| *t* | [°C] | Temperature |
| *t* | [K] | Temperature |
| *v* | [$m^3$/kg] | Specific volume |
| $\eta$ | [Pa s] | Dynamic viscosity |
| $\lambda$ | [W/(m K)] | Thermal conductivity |
| $\rho$ | [kg/$m^3$] | Density |
| $\sigma$ | [N/m] | Surface tension |

## Indices

| | |
|---|---|
| ´ | Liquid |
| ´´ | Vapour |
| *c* | critical value |
| *r* | reduced value |
| *i* | run index |
| *u* | ambient conditions |
| *p* | Isobar |
| *v* | Isochor |
| *0* | ideal gas |

# 2 Introduction

The refrigerant Solkane®404A is a long-term replacement for R502 and R22 in low temperature refrigeration. As R502 consists of 48.8% R22 and 51.2% R115 by weight, its production has been stopped since several years in developed countries[1] because of its content of R115, a chlorofluorocarbon (CFC) with an ozone depletion potential (ODP) of 0.6. The ozone depletion potential of the hydrochlorofluorocarbon (HCFC) R22 is reduced to a fraction of the ODPs of chlorofluorocarbons. R22 is therefore regarded as an intermediate solution. The use of HCFCs will be gradually reduced and these products will finally be banned. By 2030 the production of HCFCs will be phased out in developed countries[1]. Accelerated phase out scenarios may apply in selected countries especially in Europe.

Solkane®404A is a near-azeotrope blend with a temperature glide of approx. 0.8 K. It consists of 44 % R125 ($CF_3CHF_2$), 52 % R143a ($CF_3CH_3$) and 4 % R134a ($CF_3CH_2F$) by weight. The hydrofluorocarbons (HFC) R125, R143a and R134a contain only carbon, fluorine and hydrogen. They do not contribute to the depletion of the stratospheric ozone layer. The global warming potential is significantly reduced compared to the CFCs.

Solkane®404A can be used in new equipment and also in retrofitted R502 equipment.

Solkane®404A is non-flammable. Its toxicity is low and comparable to that of R502. The environmental behaviour and the handling of Solkane®404A are described in the material safety data sheet[2] and in the environmental compatibility brochure[3].

[1] In the sence of Montreal Protocol (1995 Vienna meeting)

[2] Order by Fax : +49 (0) 511 857 2146

[3] see Thermodynamics Solkane 507

# 3 Thermophysical Values

## 3.1 Physical Data

| | | |
|---|---|---|
| Chemical name | [-] | Pentafluoroethane/<br>1,1,1-Trifluoroethane<br>1,1,1,2-Tetrafluoroethane |
| Chemical formula | [-] | $CF_3CHF_2$ /$CF_3CH_3$ /$CF_3CH_2F$ |
| CAS No. | [-] | 150743-07-0 |
| Molecular weight | [kg/kmol] | 97.6 |
| Boiling point[1] | [°C] | -46.6 |
| Temperature glide | [K] | 0.8 |
| Freezing point[1] | [°C] | -101 |
| Critical temperature | [°C] | 72.1 |
| Critical pressure | [bar] | 37.4 |
| Saturated liquid density[2] | [kg/m³] | 1045 |
| Saturated vapour density[2] | [kg/m³] | 65.35 |
| Vapour pressure[2] | [bar] | 12.45 |
| Enthalpy of vaporization[2] | [kJ/kg] | 140.1 |
| Liquid thermal conductivity[2] | [W/m K] | 0.066 |
| Surface tension of liquid[2] | [N/m] | $4.437 \times 10^{-3}$ |
| Specific heat capacity of liquid[2] | [kJ/(kgK)] | 1.541 |
| Specific heat capacity of vapour[2] | [kJ/(kgK)] | 1.200 |
| Liquid viscosity[2] | [Pa s] | $0.1245 \times 10^{-3}$ |
| Saturated vapour viscocity[2] | [Pa s] | $12.097 \times 10^{-6}$ |
| Flammability limit in air[1] | [Vol.-%] | None[3] |

[1] at 1.013 bar

[2] at 25°C and saturated conditions

[3] according to DIN 51649 and UL 2128

## 3.2 Basis of Thermodynamic Calculation

The thermodynamic calculation equations have been adapted to ISO/DIS 17584, as at 12/2003. They fulfil this standard with the exception of the thermal capacities in a saturated state of 0.65 < $T_R$ < 0.95 and in an overheated state of 0.05MPa < p < 2.5MPa and $T_{max}$ = 475K.

The Wagner equation

$$\ln p_R = \left(A_1(1-T_R) + A_2(1-T_R)^{B_1} + A_3(1-T_R)^{B_2} + A_4(1-T_R)^{B_3} + A_5(1-T_R)^{B_4} + A_6\right)/T_R \qquad (1)$$

where $T_R = \frac{T}{T_c}$ and $p_R = \frac{p}{p_c}$

was chosen to describe the bubble and dew pressures. The constants and values for the critical pressure $p_C$ and the critical pressure $T_C$ are as follows:

| | | Boiling line | Dew line |
|---|---|---|---|
| $A_1$ | [-] | -7.60299407 | -7.81307914 |
| $A_2$ | [-] | 3.731263605 | 4.859254488 |
| $A_3$ | [-] | -7.79162519 | -11.0987729 |
| $A_4$ | [-] | 11.51536845 | 16.29371703 |
| $A_5$ | [-] | -9.44588683 | -12.3673965 |
| $A_6$ | [-] | 0.001223648 | -0.00055455 |
| $B_1$ | [-] | 1.5 | 1.5 |
| $B_2$ | [-] | 2.0 | 2.0 |
| $B_3$ | [-] | 2.5 | 2.5 |
| $B_4$ | [-] | 3 | 3 |
| $T_c$ | [K] | 345.29 | |
| $p_c$ | [bar] | 37.35 | |

The density of the boiling liquid is described by the equation

$$\rho'_R = 1 + C_1(1-T_R)^{1/3} + C_2(1-T_R)^{2/3} + C_3(1-T_R) + C_4(1-T_R)^{4/3} \qquad (2)$$

where $\rho'_R = \frac{\rho'}{\rho_c}$.

The constants and the value for the critical density are:

| | | | | | |
|---|---|---|---|---|---|
| $C_1$ | [-] | 1.680265 | $C_4$ | [-] | 0.953230 |
| $C_2$ | [-] | 1.410642 | $\rho_c$ | [kg/m³] | 488.46 |
| $C_3$ | [-] | -1.222830 | | | |

The specific heat capacity under ideal gas conditions is represented by the equation

$$c_p{}^0 = D_1 + D_2T + D_3T^2 + D_4T^3 + D_5/T \quad (3)$$

The coefficients are:

| | | | | | |
|---|---|---|---|---|---|
| $D_1$ | [kJ/(kg K)] | 2.58689E-01 | $D_4$ | [kJ/(kg K³)] | -1.18590E-09 |
| $D_2$ | [kJ/(kg K²)] | 2.24187E-03 | $D_5$ | [kJ/kg] | -4.18094E+00 |
| $D_3$ | [kJ/kg] | -2.13810E-07 | | | |

The equation of state according to Martin-Hou is

$$p = \frac{RT}{z} + \frac{E_1 + F_1T + G_1e^{-kT_R}}{z^2} + \frac{E_2 + F_2T + G_2e^{-kT_R}}{z^3} + \frac{E_3}{z^4} + \frac{E_4 + F_4T + G_4e^{-kT_R}}{z^5} \quad (4)$$

and is a good representation of the pvT relationship for Solkane® 404A. The coefficients of the equation are:

| | | | | | |
|---|---|---|---|---|---|
| $E_1$ | [-] | -1.29414E-03 | $F_2$ | [-] | 3.10589E-11 |
| $E_2$ | [-] | 6.22058E-07 | $F_4$ | [-] | 1.75766E-14 |
| $E_3$ | [-] | -5.30396E-11 | $G_1$ | [-] | -2.59156E-02 |
| $E_4$ | [-] | -8.56937E-12 | $G_2$ | [-] | -1.67442E-05 |
| $F_1$ | [-] | 1.89444E-06 | $G_4$ | [-] | 7.17681E-10 |
| B | [m³/kg] | -3.26856E-04 | k | [-] | 5.475 |
| R | [bar m³/(kgK)] | 8.51861E-04 | | | |

with $z = v - b$. The equation for specific heat capacity under ideal gas conditions (3) and the thermal equation of state (4) form the basis of the specific enthalpy and entropy calculation.

$$h = H_0 + (pv - RT) + D_1T + D_2\frac{T^2}{2} + D_3\frac{T^3}{3} + D_4\ln T + \frac{E_1}{z} + \frac{E_2}{2z^2} + \frac{E_3}{3z^3} + \frac{E_4}{4z^4} + e^{-k\cdot T_R}\cdot(1 + k\cdot T_R)\cdot\left(\frac{G_1}{z} + \frac{G_2}{2z^2} + \frac{G_4}{4z^4}\right) \quad (5)$$

and

$$s = S_0 + R\ln\left(\frac{zp_1}{RT}\right) + D_1\cdot\ln T + D_2T + D_3\frac{T^2}{2} - \frac{D_4}{T} - \left(\frac{F_1}{z} + \frac{F_2}{2z^2} + \frac{F_4}{4z^4}\right) + \frac{k}{T_c}e^{-k\cdot T_R}\left(\frac{G_1}{z} + \frac{G_2}{2z^2} + \frac{G_4}{4z^4}\right) \quad (6)$$

with $z = v - b$ and $p_1$=1,013bar.
For the boiling liquid, enthalpy and entropy are calculated with the following equations :

$$h' = J_1 + J_2(1 - T_R) + J_3(1 - T_R)^2 + J_4(1 - T_R)^3 + J_5(1 - T_R)^4 + J_6(1 - T_R)^5 \quad (7)$$

$$s' = 1 + K_1 t + K_2 t^2 + K_3 t^3 + K_4 t^4 \quad (8)$$

The temperature t for the calculation of the entropy is in °C and the parameters for both integrated formulas are :

| | | | | | |
|---|---|---|---|---|---|
| $J_1$ | [-] | 325.5684358 | $J_6$ | [-] | -13610.9110 |
| $J_2$ | [-] | -892.994422 | $K_1$ | [kJ/(kgK$^2$)] | 0.004956173 |
| $J_3$ | [-] | 2768.458005 | $K_2$ | [kJ/(kgK$^3$)] | 2.40679e-6 |
| $J_4$ | [-] | -9807.73400 | $K_3$ | [kJ/(kgK$^4$)] | 7.86992e-8 |
| $J_5$ | [-] | 18427.02151 | $K_4$ | [kJ/(kgK$^5$)] | -5.2699e-10 |

If neither the kinetic nor the potential energies are taken into account, the specific exergy may be found by the following equation:

$$e = h - h_u - T_u(s - s_u) \quad (9)$$

where the subscript u indicates ambient conditions.
The saturation pressure of the substance at $T_u$ = 290 K serves as the reference pressure.
The integration constants $h_u$ and $s_u$ are found by letting

$h'_{(t = 0°C)}$= 200.0 kJ/kg
$s'_{(t = 0°C)}$= 1.000 kJ/(kgK)

$H_0$ = 250.492
$S_0$ = -0.269

to be

$h_u$ = 224.02 kJ/kg
$s_u$ = 1.0832 kJ/(kg K)

so the specific exergy is $e$ = 0 according to existing agreements.

# 3.3 Transport Properties

## 3.3.1 Dynamic Viscosity of Saturated Liquid

The viscosity of the saturated liquid of Solkane®404A was measured within the temperature range of -50 to 60 °C. The following regression equation is valid for the liquid phase:

$$\ln\left(\frac{\eta'}{10^{-3}}\right) = L_0 + L_1 t + L_2 t^2 + L_3 t^3 \qquad (10)$$

with $t$ in °C and $\eta'$ in $10^{-3}$ Pa s. The coefficients are:

| | | | | | |
|---|---|---|---|---|---|
| $L_0$ | = | -1.73999 | [Pa s] | $L_2$ = | -4.7589e-6 [Pa s/K$^2$] |
| $L_1$ | = | -0.013554 | [Pa s/K] | $L_3$ = | -1.0953e-7 [Pa s/K$^3$] |

Saturated liquid viscosity $\eta'$ in $10^{-3}$ Pa s

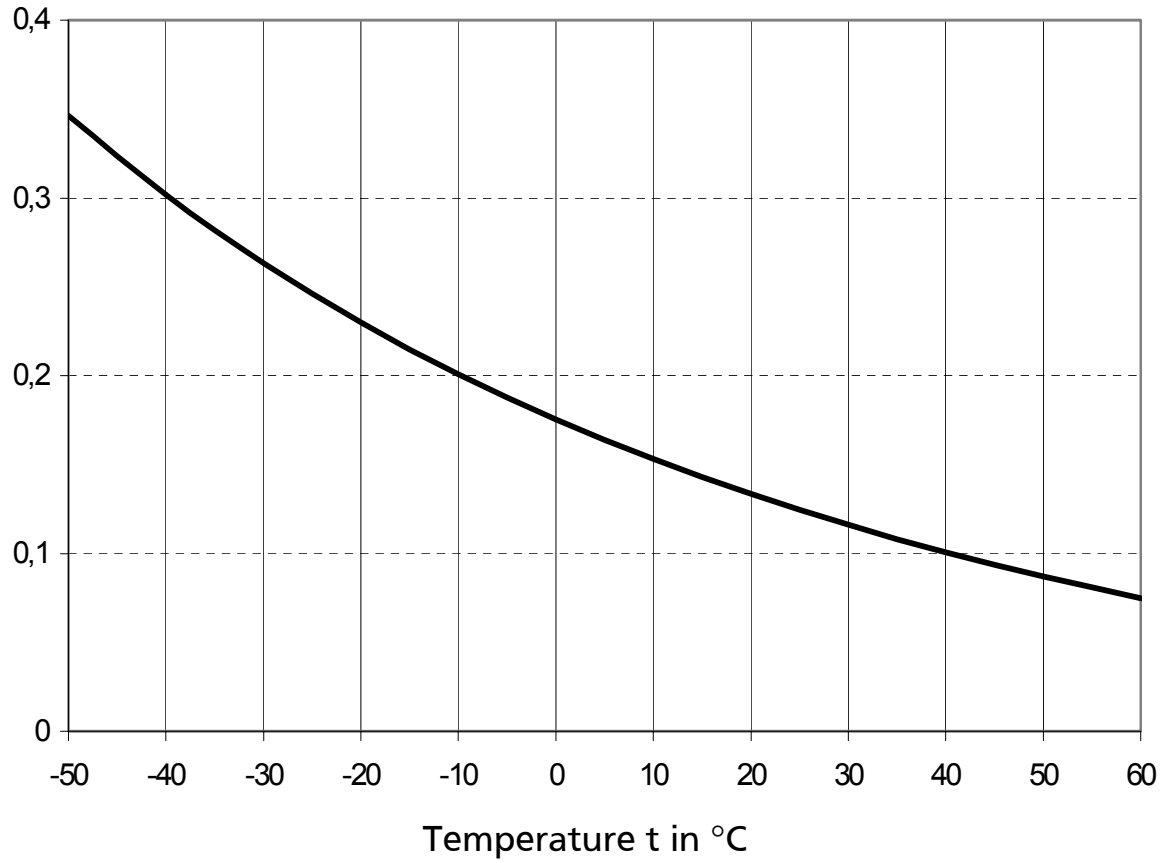


**Figure 1: Dynamic viscosity of the saturated liquid**

## 3.3.2 Dynamic Viscosity of Saturated and Superheated Vapour

The viscosity of the saturated and superheated vapour of Solkane®404A was measured in a temperature range of -50 to 50°C. The data can be represented by the following equations

$$\eta = \eta_0 + \Delta\eta \tag{11}$$

with

$$\eta_0 = 2.6696\times10^{-2}\times\frac{(MT)^{\frac{1}{2}}}{\sigma^2\Omega_\eta T^*}, \qquad T^* = \frac{kT}{\varepsilon} \text{ and}$$

$$\Omega(T^*) = \exp[0.45667 - 0.53955(\ln(T^*) + 0.187265(\ln T^*)^2 - 0.03629(\ln T^*)^3 + 0.00241(\ln T^*)^4] \tag{12 a-c}$$

$$\Delta\eta = T_R^{2.2}\left[\ln(1.65+\rho_{R0}^{0.8})\right]^{1.6}\left[e^{\left(1-\frac{0.78}{T_c}\right)\cdot\rho_{r0}} - 1\right](F\cdot z_c\cdot\zeta)^{-1}$$

$z_c = \frac{p_c V_c}{RT_c}$ and $\rho_{R0} = \frac{\rho-\rho_0}{\rho_c}$ and $F$ = 1 for R404A as a light polar agent. (12 d-f)

In equation (12) the constants are as follows .

| | | |
|---|---|---|
| $R$ the universal gas constant | = 8314 | [J kmol$^{-1}$ K$^{-1}$] |
| $\rho_c$ the critical density | = 484.50 | [kg/m$^3$] |
| $\rho_0$ the density at 1.013bar and temperature as defined by T | | [kg/m$^3$] |
| $T_c$ the critical temperature | = 345.25 | [K] |

The constants of equation (11) where determined to be

| | | |
|---|---|---|
| $\zeta$ = | 42429.18 | [1/(Pa s)] |
| $\sigma$ = | 0.4968 | [nm] |
| $\varepsilon/k$ = | 279.31 | [K] |

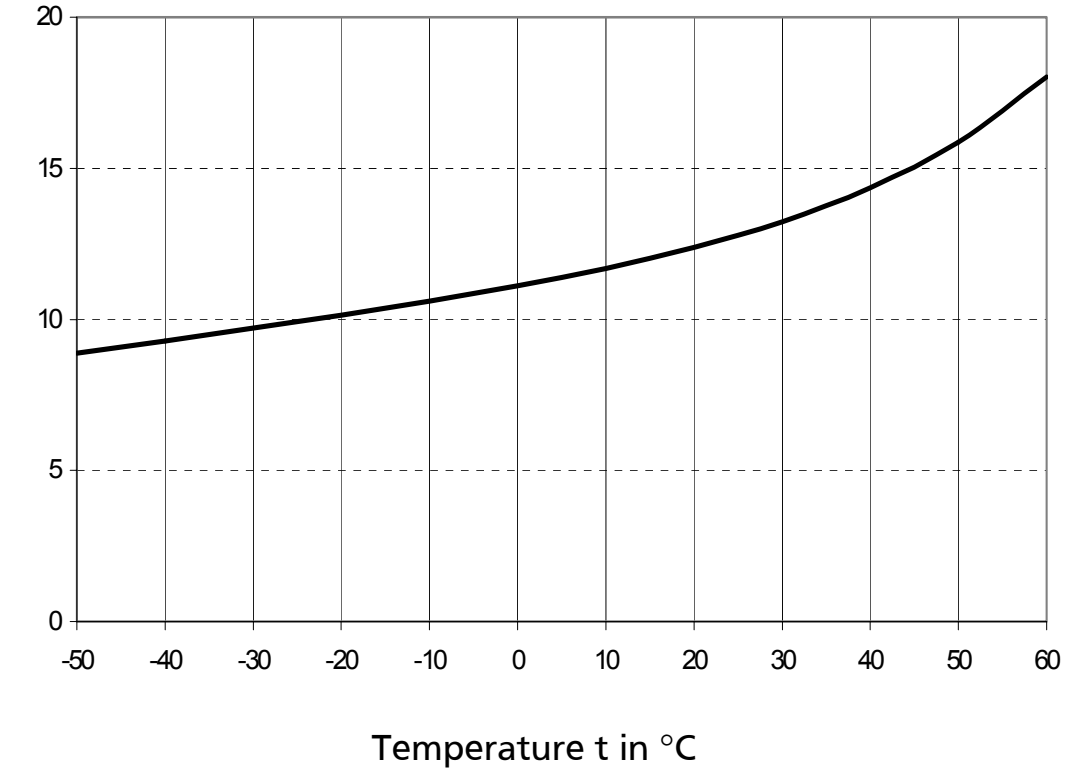


**Figure 2:** **Dynamic viscosity of saturated vapour**

### 3.3.3 Thermal Conductivity of Saturated Liquid

The thermal conductivity of saturated liquid can be expressed with the regression equation

$$\lambda' = M_0 + M_1 t \qquad (13)$$

where t is in °C and $\lambda'$ in $10^{-3}$W/(mK). The coefficients of the equation are:

$M_0$ = 76.009 $[10^{-3}W/(mK)]$ $M_1$ = -0.4024 $[10^{-3}W/(mK^2)]$

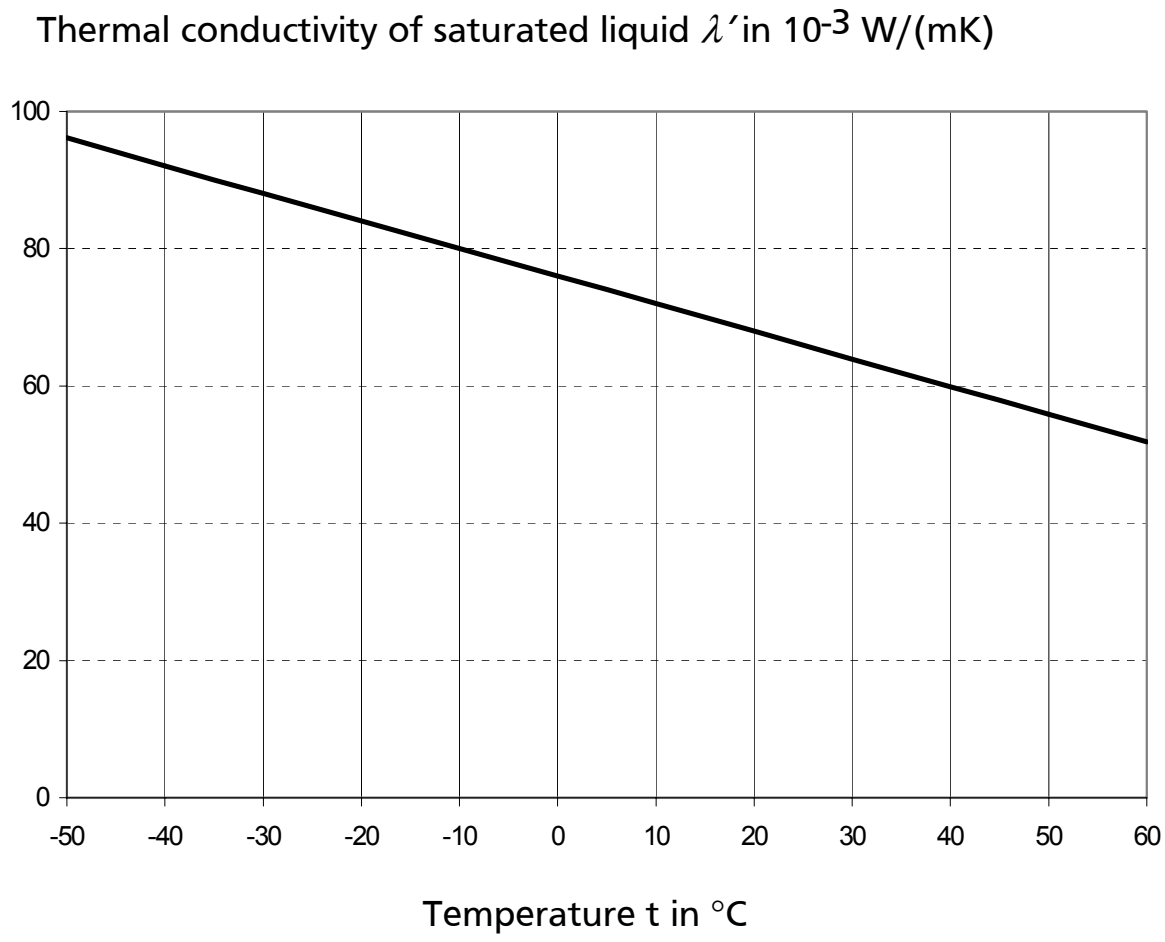


**Figure 3: Thermal conductivity of saturated liquid**

### 3.3.4 Thermal Conductivity of Saturated Vapour

The thermal conductivity of saturated vapour can be expressed using the regression equation

$$\lambda'' = N_0 + N_1 t + N_2 t^2 + N_3 t^3 + N_4 t^4 \qquad (14)$$

where t is in °C and λ'' in $10^{-3}$ W/(m K). The coefficients of the equation are as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $N_0$ | = | 12.709 | [$10^{-3}$W/(mK)] | $N_3$ | = | 1.0683e-5 | [$10^{-3}$W/(m $K^4$)] |
| $N_1$ | = | 0.09932 | [$10^{-3}$W/($mK^2$] | $N_4$ | = | 5.7339e-8 | [$10^{-3}$W/(m $K^5$)] |
| $N_2$ | = | 6.2261e-4 | [$10^{-3}$W/($mK^3$)] | | | | |

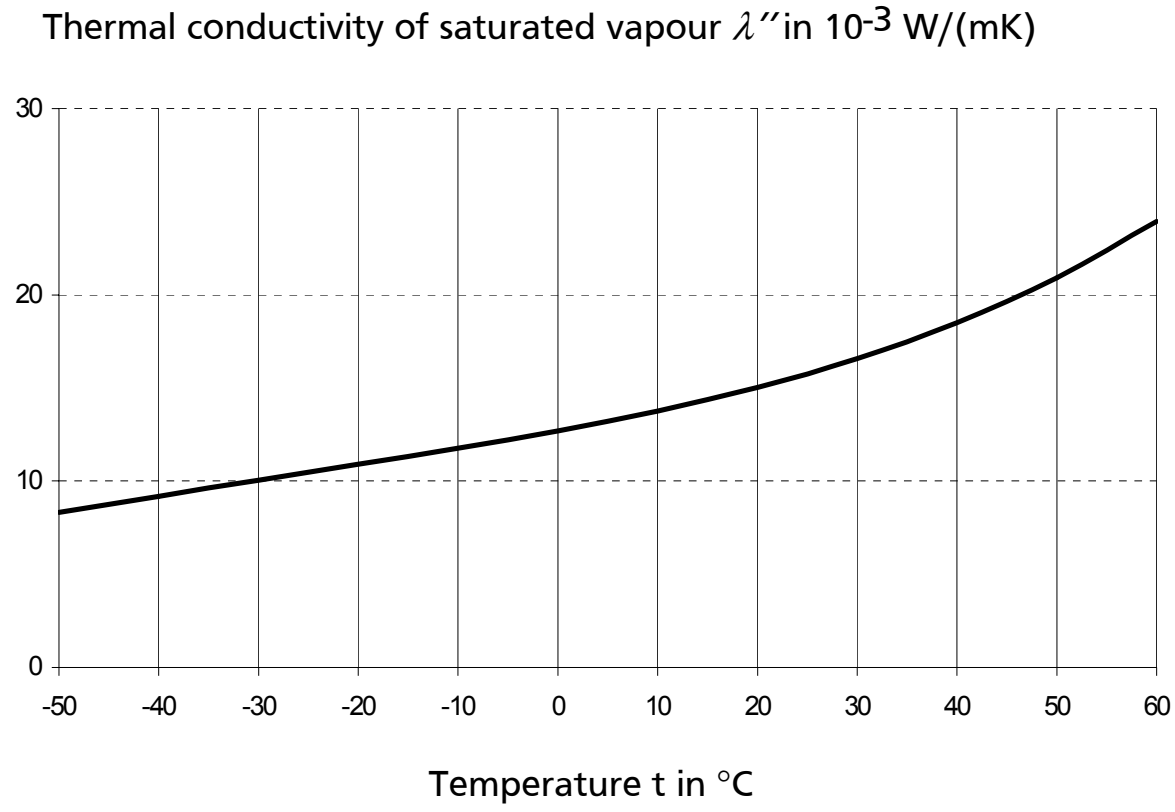


**Figure 4: Thermal conductivity of saturated vapour**

### 3.3.5 Surface Tension

The surface tension of the liquid can be expressed using the regression equation

$$\sigma = O_0 + O_1 t + O_2 t^2 + O_3 t^3 \qquad (15)$$

where t is in °C and σ in $10^{-3}$N/m. The coefficients of the equation are:

| | | | | | |
|---|---|---|---|---|---|
| $O_0$ | = 7.5370 | [$10^{-3}$N/m] | $O_2$ | = 1.6168e-4 | [$10^{-3}$N/(mK$^2$)] |
| $O_1$ | = -0.1290 | [$10^{-3}$N/(mK)] | $O_3$ | = 1.5624e-6 | [$10^{-3}$N/(mK$^3$)] |

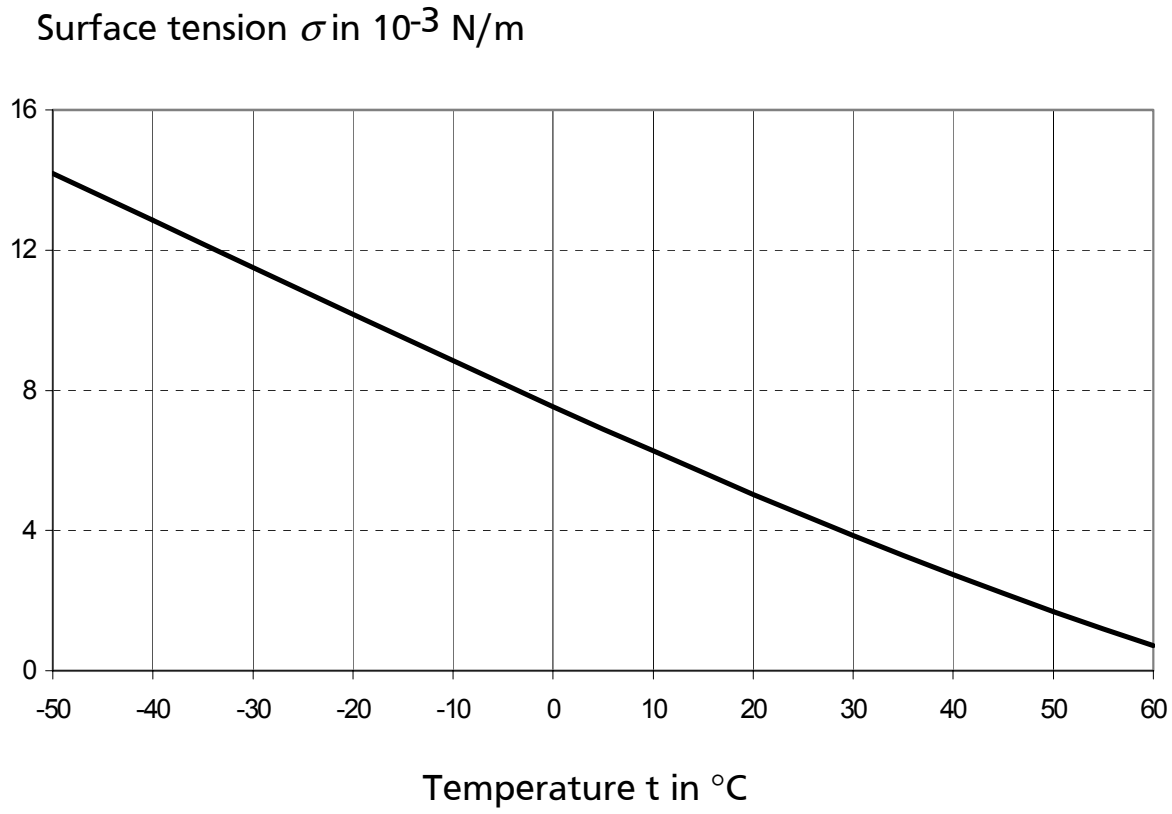


**Figure 5: Surface tension**

## 3.3.6 Specific Heat Capacity of Saturated Liquid

The specific heat capacity of saturated liquid can be expressed using the equation

$$c'_p = P_0 + P_1(1-T_R)^{1/9} + P_2(1-T_R)^{2/9} + P_3(1-T_R)^{3/9} + P_4(1-T_R)^{6/9} \quad (16)$$

where $T_R = \frac{T}{T_c}$, $c'_p$ is in kJ/(kg K) and *T* is in K. The coefficients of the equation are as follows:

| | | | |
|---|---|---|---|
| $P_0$ = | 272.7746241 [kJ/(kgK)] | $P_3$ = | -872.727122 [kJ/(kgK)] |
| $P_1$ = | -1137.19404 [kJ/(kgK)] | $P_4$ = | 72.38836018 [kJ/(kgK)] |
| $P_2$ = | 1666.232657 [kJ/(kgK)] | | |

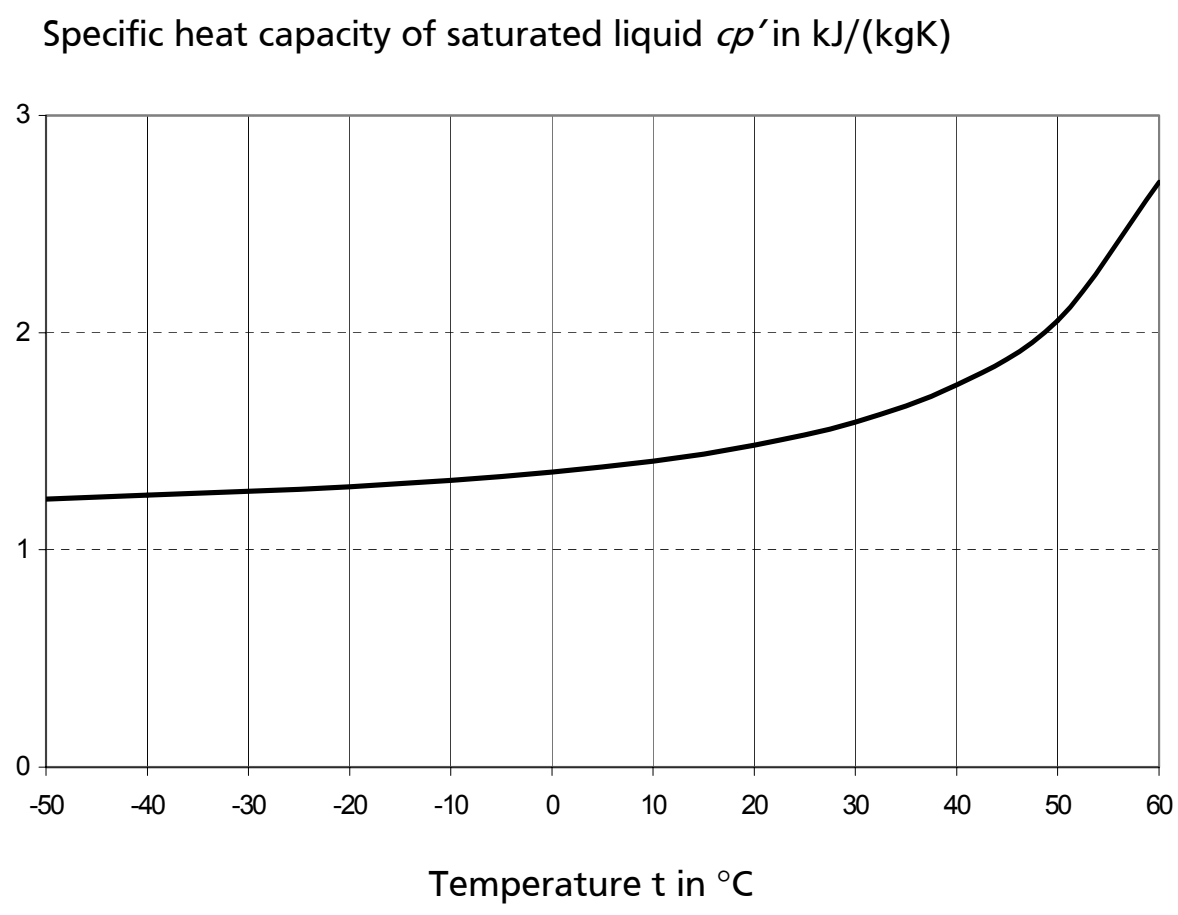


**Figure 6: Specific heat capacity of saturated liquid**

# 4 Compatibility of Materials

## 4.1 Elastomeres

The compatibility of the elastomeres that are normally used in refrigeration systems with Solkane®404A is generally good. Cold extraction tests that where carried out on CR (chlorbutadiene rubber or Neoprene®), NBR (acrylonitrilebutadienerubber) and HNBR (hydrated acrylnitrilbutadiene rubber) showed only slight swelling and yielded negligible amounts of extract. Fluorinated rubbers (FKM and FPM) are not recommended because of their considerable swelling and blistering when used with Solkane®404A or with other HFC refrigerants. Ethylenepropylenediene rubber is only to be recommended where the presence of mineral oil in the refrigeration cycle can be excluded.
The effect of the lubricant that is used must not be ignored. Recommendations made by the lubricant and compressor manufacturers must be followed.

## 4.2 Thermoplastics

Experience with CFC and HCFC has shown that only a limited number of plastics are resistant to fluorinated refrigerants. Polytetrafluoroethylene, polyacetale and polyamide might be taken into account for the use with Solkane®404A. It is again vital to take the effect of the lubricant into account.

## 4.3 Metals

Solkane®404A is generally used in conjunction with lubricants (Ester oils, PAG-oils) in refrigeration technology. In combination both materials are compatible with the metals and alloys usually found in machines and apparatus. Only zinc, magnesium, lead and aluminium alloys with more than 2% magnesium by mass should be avoided. The water content of refrigeration oil depending on oil type should especially be taken into account. Values of not more than 50 ppm are to be aimed at.

# 5 Refrigerant Oils

Like all fluorinated hydrocarbons, Solkane®404A is immiscible with mineral oils. Ester oils (POE) are normally used as lubricants. The solubility of these oils in Solkane®404A is a function of temperature and composition. The following diagrams show the solubility properties of various lubricants with Solkane®404A. Highly viscous lubricants tend to give large miscibility gaps.

The precise miscibility gaps of the individual oils can be obtained from the lubricant manufacturers.

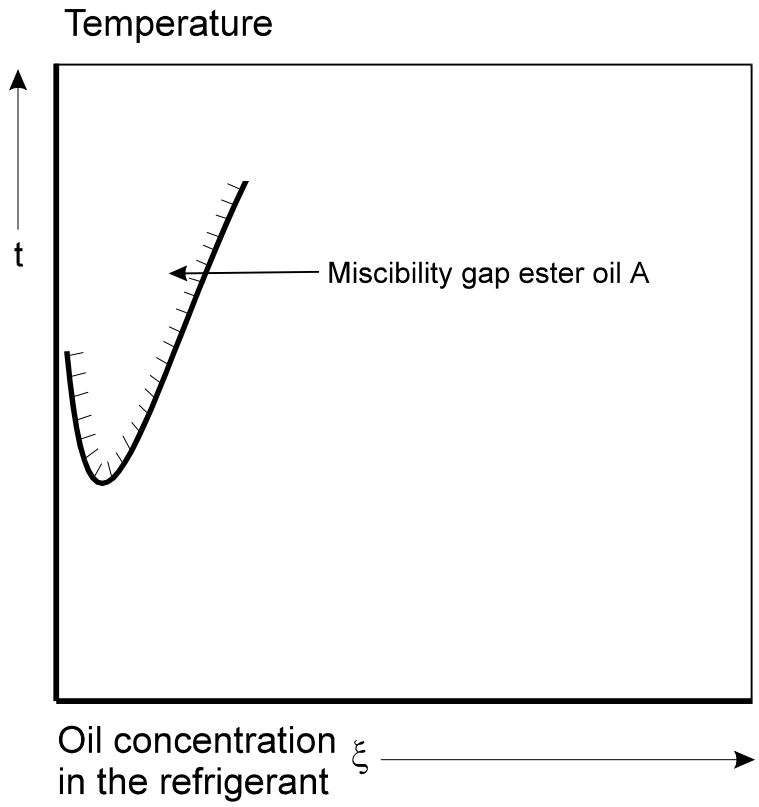


**Figure 7: Miscibility behaviour of Solkane®404A and ester oil A**

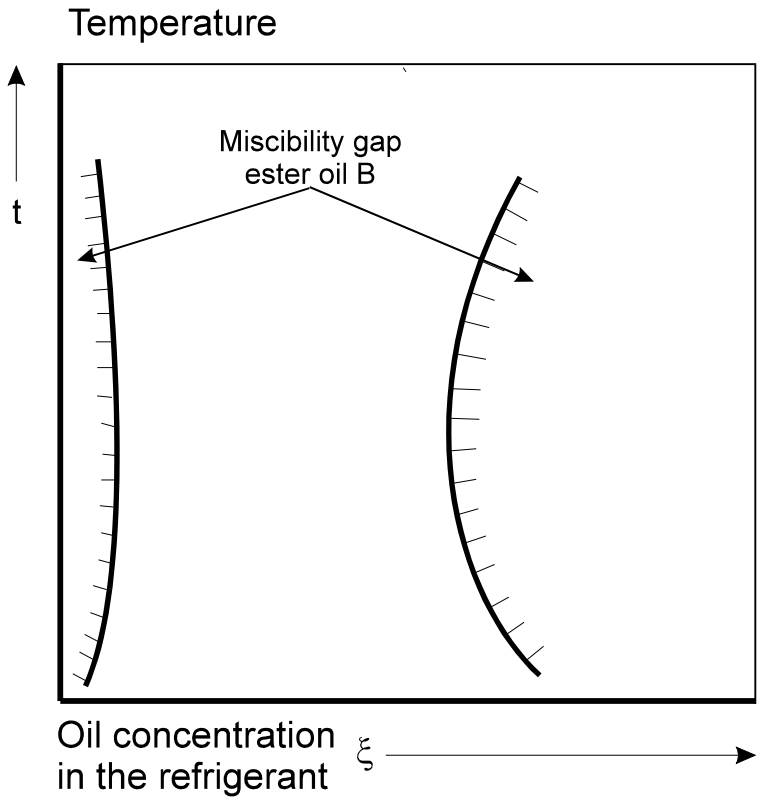


**Figure 8:** **Miscibility behaviour of Solkane®404A and ester oil B**

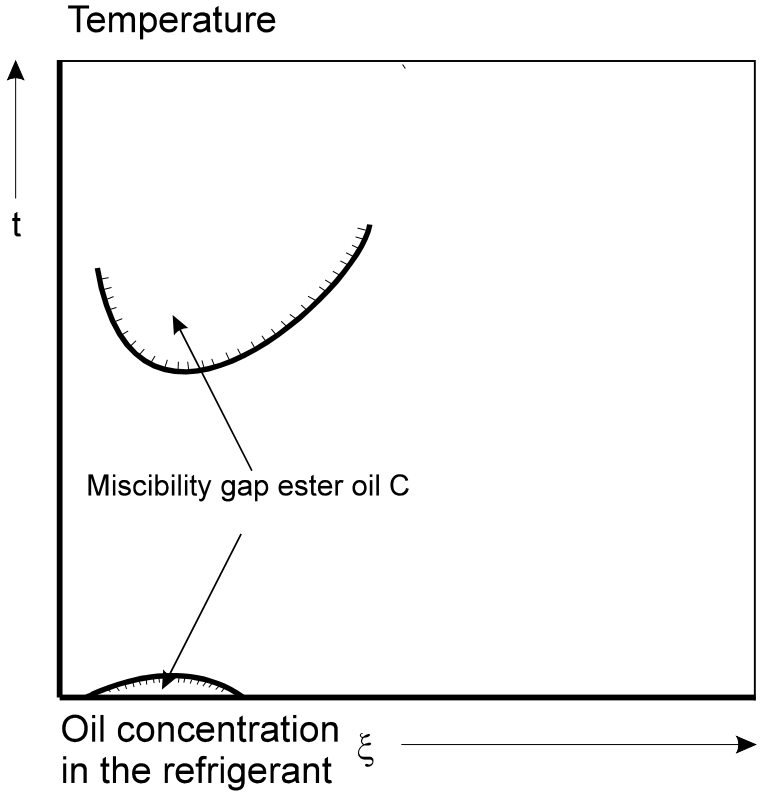


**Figure 9:** **Miscibility behaviour of Solkane®404A and ester oil C**

# 6 Flammability

The explosion limits of R143a are 7.1 - 20.9 % by volume in air. R125 and R134a have no explosion limits. When blended 46/52/4 percent by weight the outcoming mixture has no explosion limits. According to UL 2182 Solkane®404A is non-flammable.

# 7 Toxicity

The toxicity of R125 and R134a was extensively tested within the scope of the PAFT programme (Programme for Alternative Fluorocarbon Toxicity Testing). PAFT recommended an occupational exposure limit of 1000 ppm for both products. For R143a various manufacturers recommend a maximum exposure limit of 500 ppm related to an eight-hour working day. The toxicity of Solkane®404A can therefore be regarded as low and comparable to the toxicity of R502.

# 8 Vapour Table, Wet Vapour Range Solkane®404A

| t [°C] | p´ [bar] | p´´ [bar] | v´ [dm³/kg] | v´´ [dm³/kg] | ρ' [kg/dm³] | ρ´´ [kg/m³] | h´ [kJ/kg] | h´´ [kJ/kg] | r [kJ/kg] | s´ [kJ/kg K] | s´´ [kJ/kg K] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| -60 | 0.508 | 0.484 | 0.742 | 364.71 | 1.348 | 2.74 | 123.10 | 330.92 | 207.83 | 0.6838 | 1.6644 |
| -59 | 0.537 | 0.512 | 0.743 | 346.19 | 1.345 | 2.89 | 124.29 | 331.54 | 207.25 | 0.6894 | 1.6626 |
| -58 | 0.567 | 0.541 | 0.745 | 328.78 | 1.342 | 3.04 | 125.48 | 332.15 | 206.66 | 0.6951 | 1.6608 |
| -57 | 0.598 | 0.571 | 0.747 | 312.43 | 1.340 | 3.20 | 126.68 | 332.76 | 206.08 | 0.7007 | 1.6590 |
| -56 | 0.631 | 0.603 | 0.748 | 297.05 | 1.337 | 3.37 | 127.88 | 333.37 | 205.49 | 0.7063 | 1.6573 |
| -55 | 0.665 | 0.636 | 0.750 | 282.57 | 1.334 | 3.54 | 129.08 | 333.98 | 204.90 | 0.7119 | 1.6557 |
| -54 | 0.700 | 0.670 | 0.751 | 268.94 | 1.331 | 3.72 | 130.28 | 334.59 | 204.31 | 0.7174 | 1.6540 |
| -53 | 0.737 | 0.706 | 0.753 | 256.09 | 1.328 | 3.90 | 131.48 | 335.20 | 203.71 | 0.7230 | 1.6525 |
| -52 | 0.775 | 0.743 | 0.755 | 243.99 | 1.325 | 4.10 | 132.69 | 335.81 | 203.11 | 0.7286 | 1.6509 |
| -51 | 0.815 | 0.782 | 0.757 | 232.57 | 1.322 | 4.30 | 133.90 | 336.41 | 202.51 | 0.7341 | 1.6494 |
| -50 | 0.857 | 0.823 | 0.758 | 221.79 | 1.319 | 4.51 | 135.11 | 337.02 | 201.91 | 0.7396 | 1.6480 |
| -49 | 0.900 | 0.865 | 0.760 | 211.61 | 1.316 | 4.73 | 136.33 | 337.62 | 201.30 | 0.7451 | 1.6465 |
| -48 | 0.945 | 0.909 | 0.762 | 201.99 | 1.313 | 4.95 | 137.55 | 338.23 | 200.68 | 0.7507 | 1.6452 |
| -47 | 0.992 | 0.955 | 0.764 | 192.89 | 1.310 | 5.18 | 138.77 | 338.83 | 200.06 | 0.7561 | 1.6438 |
| -46 | 1.041 | 1.002 | 0.765 | 184.29 | 1.307 | 5.43 | 139.99 | 339.43 | 199.44 | 0.7616 | 1.6425 |
| -45 | 1.091 | 1.051 | 0.767 | 176.15 | 1.304 | 5.68 | 141.22 | 340.03 | 198.81 | 0.7671 | 1.6412 |
| -44 | 1.143 | 1.102 | 0.769 | 168.44 | 1.301 | 5.94 | 142.45 | 340.63 | 198.18 | 0.7725 | 1.6399 |
| -43 | 1.198 | 1.155 | 0.771 | 161.14 | 1.297 | 6.21 | 143.69 | 341.23 | 197.55 | 0.7780 | 1.6387 |
| -42 | 1.254 | 1.211 | 0.773 | 154.22 | 1.294 | 6.48 | 144.92 | 341.83 | 196.91 | 0.7834 | 1.6375 |
| -41 | 1.312 | 1.268 | 0.774 | 147.66 | 1.291 | 6.77 | 146.16 | 342.43 | 196.26 | 0.7888 | 1.6364 |
| -40 | 1.373 | 1.327 | 0.776 | 141.43 | 1.288 | 7.07 | 147.41 | 343.02 | 195.61 | 0.7942 | 1.6352 |
| -39 | 1.435 | 1.388 | 0.778 | 135.52 | 1.285 | 7.38 | 148.66 | 343.62 | 194.96 | 0.7996 | 1.6341 |
| -38 | 1.500 | 1.451 | 0.780 | 129.90 | 1.282 | 7.70 | 149.91 | 344.21 | 194.30 | 0.8050 | 1.6330 |
| -37 | 1.567 | 1.517 | 0.782 | 124.57 | 1.279 | 8.03 | 151.16 | 344.80 | 193.64 | 0.8103 | 1.6320 |
| -36 | 1.636 | 1.585 | 0.784 | 119.50 | 1.276 | 8.37 | 152.42 | 345.39 | 192.97 | 0.8157 | 1.6310 |
| -35 | 1.708 | 1.656 | 0.786 | 114.68 | 1.272 | 8.72 | 153.69 | 345.98 | 192.29 | 0.8210 | 1.6300 |
| -34 | 1.782 | 1.728 | 0.788 | 110.09 | 1.269 | 9.08 | 154.95 | 346.56 | 191.61 | 0.8263 | 1.6290 |
| -33 | 1.858 | 1.803 | 0.790 | 105.73 | 1.266 | 9.46 | 156.22 | 347.15 | 190.93 | 0.8316 | 1.6280 |
| -32 | 1.937 | 1.881 | 0.792 | 101.57 | 1.263 | 9.85 | 157.50 | 347.73 | 190.24 | 0.8369 | 1.6271 |
| -31 | 2.019 | 1.961 | 0.794 | 97.61 | 1.260 | 10.24 | 158.77 | 348.31 | 189.54 | 0.8422 | 1.6262 |
| -30 | 2.103 | 2.044 | 0.796 | 93.83 | 1.256 | 10.66 | 160.06 | 348.89 | 188.84 | 0.8475 | 1.6253 |
| -29 | 2.190 | 2.130 | 0.798 | 90.23 | 1.253 | 11.08 | 161.34 | 349.47 | 188.13 | 0.8527 | 1.6244 |
| -28 | 2.280 | 2.218 | 0.800 | 86.80 | 1.250 | 11.52 | 162.63 | 350.05 | 187.42 | 0.8579 | 1.6236 |
| -27 | 2.372 | 2.309 | 0.802 | 83.53 | 1.247 | 11.97 | 163.92 | 350.62 | 186.70 | 0.8632 | 1.6228 |
| -26 | 2.468 | 2.403 | 0.804 | 80.40 | 1.243 | 12.44 | 165.22 | 351.20 | 185.98 | 0.8684 | 1.6219 |
| -25 | 2.566 | 2.500 | 0.807 | 77.41 | 1.240 | 12.92 | 166.51 | 351.77 | 185.25 | 0.8736 | 1.6212 |
| -24 | 2.667 | 2.599 | 0.809 | 74.56 | 1.237 | 13.41 | 167.82 | 352.33 | 184.52 | 0.8788 | 1.6204 |
| -23 | 2.771 | 2.702 | 0.811 | 71.83 | 1.233 | 13.92 | 169.12 | 352.90 | 183.78 | 0.8839 | 1.6196 |
| -22 | 2.879 | 2.808 | 0.813 | 69.22 | 1.230 | 14.45 | 170.43 | 353.47 | 183.03 | 0.8891 | 1.6189 |
| -21 | 2.989 | 2.917 | 0.815 | 66.73 | 1.226 | 14.99 | 171.74 | 354.03 | 182.28 | 0.8942 | 1.6182 |

# Vapour Table, Wet Vapour Range Solkane®404A

| t | p´ | p´´ | v´ | v´´ | ρ' | ρ´´ | h´ | h´´ | r | s´ | s´´ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [°C] | [bar] | [bar] | [dm³/kg] | [dm³/kg] | [kg/dm³] | [kg/m³] | [kJ/kg] | [kJ/kg] | [kJ/kg] | [kJ/kg K] | [kJ/kg K] |
| -20 | 3.103 | 3.029 | 0.818 | 64.34 | 1.223 | 15.54 | 173.06 | 354.59 | 181.53 | 0.8994 | 1.6175 |
| -19 | 3.220 | 3.145 | 0.820 | 62.06 | 1.220 | 16.11 | 174.38 | 355.15 | 180.76 | 0.9045 | 1.6168 |
| -18 | 3.340 | 3.263 | 0.822 | 59.87 | 1.216 | 16.70 | 175.70 | 355.70 | 180.00 | 0.9096 | 1.6162 |
| -17 | 3.464 | 3.386 | 0.825 | 57.77 | 1.213 | 17.31 | 177.03 | 356.25 | 179.22 | 0.9147 | 1.6155 |
| -16 | 3.591 | 3.511 | 0.827 | 55.77 | 1.209 | 17.93 | 178.36 | 356.80 | 178.44 | 0.9198 | 1.6149 |
| -15 | 3.721 | 3.640 | 0.829 | 53.84 | 1.206 | 18.57 | 179.69 | 357.35 | 177.66 | 0.9249 | 1.6142 |
| -14 | 3.856 | 3.773 | 0.832 | 51.99 | 1.202 | 19.23 | 181.03 | 357.90 | 176.87 | 0.9299 | 1.6136 |
| -13 | 3.994 | 3.909 | 0.834 | 50.22 | 1.199 | 19.91 | 182.37 | 358.44 | 176.07 | 0.9350 | 1.6130 |
| -12 | 4.135 | 4.049 | 0.837 | 48.53 | 1.195 | 20.61 | 183.71 | 358.98 | 175.27 | 0.9401 | 1.6125 |
| -11 | 4.280 | 4.193 | 0.839 | 46.90 | 1.192 | 21.32 | 185.06 | 359.52 | 174.46 | 0.9451 | 1.6119 |
| -10 | 4.430 | 4.341 | 0.842 | 45.33 | 1.188 | 22.06 | 186.41 | 360.05 | 173.64 | 0.9501 | 1.6113 |
| -9 | 4.583 | 4.492 | 0.844 | 43.83 | 1.185 | 22.82 | 187.76 | 360.58 | 172.82 | 0.9551 | 1.6108 |
| -8 | 4.740 | 4.647 | 0.847 | 42.38 | 1.181 | 23.60 | 189.12 | 361.11 | 171.99 | 0.9602 | 1.6102 |
| -7 | 4.901 | 4.807 | 0.849 | 40.99 | 1.177 | 24.40 | 190.48 | 361.64 | 171.16 | 0.9652 | 1.6097 |
| -6 | 5.066 | 4.970 | 0.852 | 39.66 | 1.174 | 25.22 | 191.84 | 362.16 | 170.32 | 0.9702 | 1.6092 |
| -5 | 5.235 | 5.138 | 0.855 | 38.37 | 1.170 | 26.06 | 193.21 | 362.68 | 169.47 | 0.9751 | 1.6087 |
| -4 | 5.409 | 5.310 | 0.858 | 37.14 | 1.166 | 26.93 | 194.58 | 363.19 | 168.62 | 0.9801 | 1.6082 |
| -3 | 5.586 | 5.486 | 0.860 | 35.95 | 1.162 | 27.82 | 195.95 | 363.70 | 167.76 | 0.9851 | 1.6077 |
| -2 | 5.768 | 5.667 | 0.863 | 34.80 | 1.159 | 28.73 | 197.32 | 364.21 | 166.89 | 0.9901 | 1.6072 |
| -1 | 5.955 | 5.852 | 0.866 | 33.70 | 1.155 | 29.67 | 198.70 | 364.72 | 166.01 | 0.9950 | 1.6067 |
| 0 | 6.146 | 6.041 | 0.869 | 32.64 | 1.151 | 30.64 | 200.00 | 365.22 | 165.22 | 1.0000 | 1.6062 |
| 1 | 6.342 | 6.235 | 0.872 | 31.62 | 1.147 | 31.63 | 201.47 | 365.71 | 164.24 | 1.0050 | 1.6058 |
| 2 | 6.542 | 6.434 | 0.875 | 30.63 | 1.143 | 32.64 | 202.86 | 366.21 | 163.35 | 1.0099 | 1.6053 |
| 3 | 6.747 | 6.637 | 0.878 | 29.68 | 1.139 | 33.69 | 204.25 | 366.70 | 162.44 | 1.0148 | 1.6049 |
| 4 | 6.957 | 6.846 | 0.881 | 28.77 | 1.135 | 34.76 | 205.65 | 367.18 | 161.53 | 1.0198 | 1.6044 |
| 5 | 7.171 | 7.059 | 0.884 | 27.88 | 1.132 | 35.86 | 207.05 | 367.66 | 160.61 | 1.0247 | 1.6040 |
| 6 | 7.391 | 7.277 | 0.887 | 27.03 | 1.128 | 36.99 | 208.46 | 368.14 | 159.68 | 1.0297 | 1.6035 |
| 7 | 7.615 | 7.500 | 0.890 | 26.21 | 1.124 | 38.15 | 209.86 | 368.61 | 158.75 | 1.0346 | 1.6031 |
| 8 | 7.845 | 7.728 | 0.893 | 25.41 | 1.119 | 39.35 | 211.28 | 369.08 | 157.80 | 1.0395 | 1.6027 |
| 9 | 8.080 | 7.961 | 0.897 | 24.65 | 1.115 | 40.57 | 212.69 | 369.54 | 156.85 | 1.0445 | 1.6022 |
| 10 | 8.320 | 8.199 | 0.900 | 23.91 | 1.111 | 41.83 | 214.11 | 370.00 | 155.89 | 1.0494 | 1.6018 |
| 11 | 8.565 | 8.443 | 0.903 | 23.19 | 1.107 | 43.12 | 215.54 | 370.45 | 154.91 | 1.0543 | 1.6014 |
| 12 | 8.815 | 8.692 | 0.907 | 22.50 | 1.103 | 44.45 | 216.97 | 370.90 | 153.93 | 1.0593 | 1.6009 |
| 13 | 9.071 | 8.946 | 0.910 | 21.83 | 1.099 | 45.81 | 218.40 | 371.34 | 152.94 | 1.0642 | 1.6005 |
| 14 | 9.333 | 9.206 | 0.914 | 21.18 | 1.095 | 47.20 | 219.84 | 371.78 | 151.94 | 1.0692 | 1.6000 |
| 15 | 9.600 | 9.472 | 0.917 | 20.56 | 1.090 | 48.64 | 221.28 | 372.21 | 150.92 | 1.0741 | 1.5996 |
| 16 | 9.873 | 9.743 | 0.921 | 19.95 | 1.086 | 50.11 | 222.73 | 372.63 | 149.90 | 1.0790 | 1.5992 |
| 17 | 10.15 | 10.02 | 0.925 | 19.37 | 1.082 | 51.63 | 224.19 | 373.05 | 148.86 | 1.0840 | 1.5987 |
| 18 | 10.44 | 10.30 | 0.928 | 18.80 | 1.077 | 53.18 | 225.65 | 373.46 | 147.82 | 1.0889 | 1.5983 |
| 19 | 10.73 | 10.59 | 0.932 | 18.25 | 1.073 | 54.78 | 227.11 | 373.87 | 146.76 | 1.0939 | 1.5978 |

# Vapour Table, Wet Vapour Range Solkane®404A

| T | p´ | p´´ | v´ | v´´ | ρ' | ρ´´ | h´ | h´´ | r | s´ | s´´ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [°C] | [bar] | [bar] | [dm³/kg] | [dm³/kg] | [kg/dm³] | [kg/m³] | [kJ/kg] | [kJ/kg] | [kJ/kg] | [kJ/kg K] | [kJ/kg K] |
| 20 | 11.02 | 10.89 | 0.936 | 17.72 | 1.068 | 56.43 | 228.59 | 374.27 | 145.68 | 1.0989 | 1.5973 |
| 21 | 11.32 | 11.19 | 0.940 | 17.21 | 1.064 | 58.11 | 230.06 | 374.66 | 144.60 | 1.1038 | 1.5969 |
| 22 | 11.63 | 11.50 | 0.944 | 16.71 | 1.059 | 59.85 | 231.55 | 375.05 | 143.50 | 1.1088 | 1.5964 |
| 23 | 11.95 | 11.81 | 0.948 | 16.23 | 1.054 | 61.63 | 233.04 | 375.42 | 142.38 | 1.1138 | 1.5959 |
| 24 | 12.27 | 12.13 | 0.953 | 15.76 | 1.050 | 63.46 | 234.54 | 375.79 | 141.25 | 1.1188 | 1.5954 |
| 25 | 12.60 | 12.45 | 0.957 | 15.30 | 1.045 | 65.35 | 236.05 | 376.15 | 140.11 | 1.1238 | 1.5949 |
| 26 | 12.93 | 12.79 | 0.961 | 14.86 | 1.040 | 67.28 | 237.56 | 376.51 | 138.95 | 1.1289 | 1.5944 |
| 27 | 13.27 | 13.13 | 0.966 | 14.43 | 1.035 | 69.28 | 239.08 | 376.85 | 137.77 | 1.1339 | 1.5939 |
| 28 | 13.62 | 13.47 | 0.970 | 14.02 | 1.030 | 71.33 | 240.62 | 377.19 | 136.57 | 1.1389 | 1.5933 |
| 29 | 13.97 | 13.83 | 0.975 | 13.62 | 1.025 | 73.44 | 242.16 | 377.51 | 135.36 | 1.1440 | 1.5928 |
| 30 | 14.33 | 14.19 | 0.980 | 13.23 | 1.020 | 75.61 | 243.70 | 377.83 | 134.13 | 1.1491 | 1.5922 |
| 31 | 14.70 | 14.55 | 0.985 | 12.85 | 1.015 | 77.84 | 245.26 | 378.14 | 132.87 | 1.1542 | 1.5916 |
| 32 | 15.07 | 14.93 | 0.990 | 12.48 | 1.010 | 80.14 | 246.83 | 378.43 | 131.60 | 1.1593 | 1.5910 |
| 33 | 15.46 | 15.31 | 0.995 | 12.12 | 1.005 | 82.52 | 248.41 | 378.72 | 130.31 | 1.1644 | 1.5904 |
| 34 | 15.84 | 15.69 | 1.000 | 11.77 | 1.000 | 84.96 | 250.00 | 378.99 | 128.99 | 1.1695 | 1.5897 |
| 35 | 16.24 | 16.09 | 1.006 | 11.43 | 0.994 | 87.48 | 251.60 | 379.25 | 127.65 | 1.1747 | 1.5890 |
| 36 | 16.64 | 16.49 | 1.011 | 11.10 | 0.989 | 90.08 | 253.22 | 379.50 | 126.29 | 1.1799 | 1.5883 |
| 37 | 17.06 | 16.90 | 1.017 | 10.78 | 0.983 | 92.75 | 254.85 | 379.74 | 124.90 | 1.1851 | 1.5876 |
| 38 | 17.47 | 17.32 | 1.023 | 10.47 | 0.978 | 95.52 | 256.48 | 379.96 | 123.48 | 1.1903 | 1.5869 |
| 39 | 17.90 | 17.75 | 1.029 | 10.17 | 0.972 | 98.37 | 258.14 | 380.17 | 122.03 | 1.1955 | 1.5861 |
| 40 | 18.34 | 18.18 | 1.035 | 9.87 | 0.966 | 101.32 | 259.81 | 380.37 | 120.56 | 1.2008 | 1.5852 |
| 41 | 18.78 | 18.62 | 1.042 | 9.58 | 0.960 | 104.37 | 261.49 | 380.54 | 119.06 | 1.2061 | 1.5844 |
| 42 | 19.23 | 19.07 | 1.048 | 9.30 | 0.954 | 107.52 | 263.18 | 380.71 | 117.52 | 1.2114 | 1.5835 |
| 43 | 19.69 | 19.53 | 1.055 | 9.03 | 0.948 | 110.78 | 264.90 | 380.85 | 115.95 | 1.2167 | 1.5826 |
| 44 | 20.15 | 20.00 | 1.062 | 8.76 | 0.942 | 114.16 | 266.63 | 380.98 | 114.35 | 1.2221 | 1.5816 |
| 45 | 20.63 | 20.47 | 1.069 | 8.50 | 0.935 | 117.66 | 268.37 | 381.08 | 112.71 | 1.2275 | 1.5806 |
| 46 | 21.11 | 20.96 | 1.077 | 8.24 | 0.929 | 121.29 | 270.14 | 381.17 | 111.03 | 1.2329 | 1.5795 |
| 47 | 21.60 | 21.45 | 1.085 | 8.00 | 0.922 | 125.06 | 271.92 | 381.23 | 109.31 | 1.2384 | 1.5784 |
| 48 | 22.11 | 21.95 | 1.093 | 7.75 | 0.915 | 128.97 | 273.73 | 381.27 | 107.55 | 1.2439 | 1.5772 |
| 49 | 22.62 | 22.46 | 1.101 | 7.52 | 0.908 | 133.04 | 275.55 | 381.29 | 105.74 | 1.2494 | 1.5759 |
| 50 | 23.13 | 22.98 | 1.110 | 7.28 | 0.901 | 137.27 | 277.39 | 381.28 | 103.89 | 1.2549 | 1.5746 |
| 51 | 23.66 | 23.51 | 1.119 | 7.06 | 0.894 | 141.69 | 279.26 | 381.24 | 101.98 | 1.2605 | 1.5732 |
| 52 | 24.20 | 24.04 | 1.129 | 6.84 | 0.886 | 146.29 | 281.15 | 381.17 | 100.02 | 1.2661 | 1.5717 |
| 53 | 24.75 | 24.59 | 1.139 | 6.62 | 0.878 | 151.11 | 283.06 | 381.07 | 98.01 | 1.2718 | 1.5702 |
| 54 | 25.30 | 25.15 | 1.149 | 6.40 | 0.870 | 156.15 | 285.00 | 380.93 | 95.93 | 1.2775 | 1.5685 |
| 55 | 25.87 | 25.72 | 1.160 | 6.19 | 0.862 | 161.44 | 286.96 | 380.76 | 93.79 | 1.2832 | 1.5668 |
| 56 | 26.45 | 26.30 | 1.172 | 5.99 | 0.853 | 166.99 | 288.95 | 380.54 | 91.59 | 1.2890 | 1.5649 |
| 57 | 27.03 | 26.88 | 1.184 | 5.79 | 0.845 | 172.85 | 290.97 | 380.27 | 89.31 | 1.2948 | 1.5629 |
| 58 | 27.63 | 27.48 | 1.197 | 5.59 | 0.835 | 179.03 | 293.01 | 379.95 | 86.94 | 1.3007 | 1.5607 |
| 59 | 28.24 | 28.09 | 1.211 | 5.39 | 0.826 | 185.58 | 295.08 | 379.58 | 84.50 | 1.3066 | 1.5584 |

# Vapour Table, Wet Vapour Range Solkane®404A

| T | p´ | p´´ | v´ | v´´ | ρ' | ρ´´ | h´ | h´´ | r | s´ | s´´ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [°C] | [bar] | [bar] | [$dm^3$/kg] | [$dm^3$/kg] | [kg/$dm^3$] | [kg/$m^3$] | [kJ/kg] | [kJ/kg] | [kJ/kg] | [kJ/kg K] | [kJ/kg K] |
| 60 | 28.86 | 28.71 | 1.226 | 5.19 | 0.816 | 192.55 | 297.19 | 379.14 | 81.95 | 1.3125 | 1.5559 |
| 61 | 29.49 | 29.34 | 1.242 | 5.00 | 0.805 | 199.99 | 299.32 | 378.62 | 79.30 | 1.3185 | 1.5532 |
| 62 | 30.13 | 29.99 | 1.259 | 4.81 | 0.794 | 207.99 | 301.49 | 378.02 | 76.53 | 1.3246 | 1.5503 |
| 63 | 30.78 | 30.64 | 1.278 | 4.62 | 0.782 | 216.63 | 303.69 | 377.32 | 73.63 | 1.3307 | 1.5471 |
| 64 | 31.44 | 31.31 | 1.299 | 4.42 | 0.770 | 226.04 | 305.92 | 376.50 | 70.58 | 1.3368 | 1.5435 |
| 65 | 32.12 | 31.99 | 1.323 | 4.23 | 0.756 | 236.39 | 308.19 | 375.53 | 67.34 | 1.3430 | 1.5395 |
| 66 | 32.81 | 32.69 | 1.349 | 4.03 | 0.741 | 247.95 | 310.50 | 374.38 | 63.88 | 1.3492 | 1.5350 |
| 67 | 33.52 | 33.40 | 1.379 | 3.83 | 0.725 | 261.10 | 312.85 | 372.99 | 60.14 | 1.3555 | 1.5298 |
| 68 | 34.23 | 34.12 | 1.415 | 3.62 | 0.707 | 276.49 | 315.23 | 371.26 | 56.03 | 1.3619 | 1.5236 |

# 9 Vapour Table, Superheated Range Solkane®404A

### 0.82bar -50.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -50 | 221.79 | 337.02 | 1.6480 |
| -45 | 227.54 | 340.82 | 1.6648 |
| -40 | 233.25 | 344.65 | 1.6814 |
| -35 | 238.90 | 348.52 | 1.6978 |
| -30 | 244.52 | 352.43 | 1.7141 |
| -25 | 250.10 | 356.37 | 1.7301 |
| -20 | 255.64 | 360.35 | 1.7460 |
| -15 | 261.16 | 364.37 | 1.7618 |
| -10 | 266.64 | 368.44 | 1.7773 |
| -5 | 272.11 | 372.54 | 1.7928 |
| 0 | 277.55 | 376.68 | 1.8081 |
| 5 | 282.97 | 380.86 | 1.8233 |
| 10 | 288.37 | 385.09 | 1.8383 |
| 15 | 293.76 | 389.36 | 1.8533 |
| 20 | 299.13 | 393.66 | 1.8681 |
| 25 | 304.49 | 398.01 | 1.8828 |
| 30 | 309.84 | 402.41 | 1.8974 |
| 35 | 315.17 | 406.84 | 1.9119 |

### 1.10bar -44.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -44 | 168.44 | 340.63 | 1.6399 |
| -40 | 171.97 | 343.76 | 1.6535 |
| -35 | 176.32 | 347.69 | 1.6701 |
| -30 | 180.64 | 351.65 | 1.6866 |
| -25 | 184.91 | 355.64 | 1.7028 |
| -20 | 189.15 | 359.67 | 1.7189 |
| -15 | 193.36 | 363.73 | 1.7348 |
| -10 | 197.54 | 367.83 | 1.7505 |
| -5 | 201.70 | 371.97 | 1.7661 |
| 0 | 205.83 | 376.14 | 1.7815 |
| 5 | 209.94 | 380.35 | 1.7968 |
| 10 | 214.04 | 384.61 | 1.8120 |
| 15 | 218.12 | 388.90 | 1.8270 |
| 20 | 222.18 | 393.23 | 1.8419 |
| 25 | 226.23 | 397.60 | 1.8567 |
| 30 | 230.26 | 402.01 | 1.8714 |
| 35 | 234.29 | 406.47 | 1.8859 |
| 40 | 238.31 | 410.96 | 1.9004 |

### 1.45bar -38.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -38 | 129.90 | 344.21 | 1.6330 |
| -35 | 131.97 | 346.62 | 1.6432 |
| -30 | 135.37 | 350.65 | 1.6600 |
| -25 | 138.73 | 354.71 | 1.6765 |
| -20 | 142.05 | 358.80 | 1.6928 |
| -15 | 145.34 | 362.91 | 1.7089 |
| -10 | 148.60 | 367.06 | 1.7248 |
| -5 | 151.83 | 371.24 | 1.7406 |
| 0 | 155.04 | 375.46 | 1.7561 |
| 5 | 158.23 | 379.71 | 1.7716 |
| 10 | 161.39 | 384.00 | 1.7868 |
| 15 | 164.55 | 388.32 | 1.8020 |
| 20 | 167.68 | 392.68 | 1.8170 |
| 25 | 170.81 | 397.08 | 1.8319 |
| 30 | 173.91 | 401.52 | 1.8466 |
| 35 | 177.01 | 405.99 | 1.8613 |
| 40 | 180.10 | 410.51 | 1.8758 |
| 45 | 183.18 | 415.06 | 1.8902 |

### 1.88bar -32.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -32 | 101.57 | 347.73 | 1.6271 |
| -30 | 102.66 | 349.39 | 1.6339 |
| -25 | 105.37 | 353.53 | 1.6508 |
| -20 | 108.04 | 357.70 | 1.6674 |
| -15 | 110.66 | 361.88 | 1.6838 |
| -10 | 113.26 | 366.10 | 1.7000 |
| -5 | 115.83 | 370.34 | 1.7159 |
| 0 | 118.38 | 374.61 | 1.7317 |
| 5 | 120.90 | 378.91 | 1.7473 |
| 10 | 123.41 | 383.24 | 1.7627 |
| 15 | 125.89 | 387.60 | 1.7780 |
| 20 | 128.36 | 392.00 | 1.7931 |
| 25 | 130.82 | 396.43 | 1.8081 |
| 30 | 133.26 | 400.90 | 1.8230 |
| 35 | 135.69 | 405.41 | 1.8377 |
| 40 | 138.11 | 409.95 | 1.8523 |
| 45 | 140.52 | 414.53 | 1.8668 |
| 50 | 142.92 | 419.14 | 1.8812 |

### 0.91 bar -48.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -48 | 201.99 | 338.23 | 1.6452 |
| -45 | 205.14 | 340.52 | 1.6553 |
| -40 | 210.36 | 344.38 | 1.6720 |
| -35 | 215.53 | 348.27 | 1.6885 |
| -30 | 220.66 | 352.19 | 1.7048 |
| -25 | 225.75 | 356.15 | 1.7209 |
| -20 | 230.81 | 360.14 | 1.7369 |
| -15 | 235.83 | 364.18 | 1.7526 |
| -10 | 240.83 | 368.25 | 1.7683 |
| -5 | 245.81 | 372.36 | 1.7837 |
| 0 | 250.76 | 376.52 | 1.7991 |
| 5 | 255.69 | 380.71 | 1.8143 |
| 10 | 260.61 | 384.94 | 1.8294 |
| 15 | 265.51 | 389.22 | 1.8443 |
| 20 | 270.39 | 393.53 | 1.8592 |
| 25 | 275.26 | 397.89 | 1.8739 |
| 30 | 280.12 | 402.29 | 1.8886 |
| 35 | 284.96 | 406.73 | 1.9031 |

### 1.21 bar -42.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -42 | 154.22 | 341.83 | 1.6375 |
| -40 | 155.84 | 343.41 | 1.6443 |
| -35 | 159.86 | 347.36 | 1.6611 |
| -30 | 163.83 | 351.34 | 1.6776 |
| -25 | 167.77 | 355.35 | 1.6940 |
| -20 | 171.67 | 359.40 | 1.7101 |
| -15 | 175.53 | 363.48 | 1.7261 |
| -10 | 179.37 | 367.59 | 1.7419 |
| -5 | 183.18 | 371.74 | 1.7575 |
| 0 | 186.97 | 375.93 | 1.7730 |
| 5 | 190.74 | 380.16 | 1.7883 |
| 10 | 194.49 | 384.42 | 1.8035 |
| 15 | 198.23 | 388.72 | 1.8185 |
| 20 | 201.94 | 393.06 | 1.8335 |
| 25 | 205.65 | 397.44 | 1.8483 |
| 30 | 209.34 | 401.86 | 1.8630 |
| 35 | 213.02 | 406.32 | 1.8776 |
| 40 | 216.69 | 410.82 | 1.8920 |

### 1.59 bar -36.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -36 | 119.50 | 345.39 | 1.6310 |
| -35 | 120.14 | 346.20 | 1.6344 |
| -30 | 123.30 | 350.26 | 1.6512 |
| -25 | 126.41 | 354.35 | 1.6679 |
| -20 | 129.49 | 358.46 | 1.6843 |
| -15 | 132.54 | 362.60 | 1.7005 |
| -10 | 135.55 | 366.76 | 1.7165 |
| -5 | 138.54 | 370.96 | 1.7323 |
| 0 | 141.50 | 375.20 | 1.7479 |
| 5 | 144.45 | 379.46 | 1.7634 |
| 10 | 147.37 | 383.76 | 1.7787 |
| 15 | 150.27 | 388.10 | 1.7939 |
| 20 | 153.16 | 392.47 | 1.8089 |
| 25 | 156.04 | 396.88 | 1.8238 |
| 30 | 158.90 | 401.33 | 1.8386 |
| 35 | 161.76 | 405.81 | 1.8533 |
| 40 | 164.60 | 410.33 | 1.8679 |
| 45 | 167.43 | 414.89 | 1.8823 |

### 2.04 bar -30.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -30 | 93.83 | 348.89 | 1.6253 |
| -25 | 96.37 | 353.07 | 1.6423 |
| -20 | 98.86 | 357.27 | 1.6590 |
| -15 | 101.31 | 361.49 | 1.6755 |
| -10 | 103.73 | 365.72 | 1.6918 |
| -5 | 106.13 | 369.99 | 1.7078 |
| 0 | 108.49 | 374.28 | 1.7237 |
| 5 | 110.84 | 378.60 | 1.7394 |
| 10 | 113.16 | 382.94 | 1.7549 |
| 15 | 115.47 | 387.32 | 1.7702 |
| 20 | 117.76 | 391.74 | 1.7854 |
| 25 | 120.04 | 396.18 | 1.8004 |
| 30 | 122.30 | 400.66 | 1.8153 |
| 35 | 124.55 | 405.18 | 1.8301 |
| 40 | 126.79 | 409.73 | 1.8447 |
| 45 | 129.02 | 414.32 | 1.8593 |
| 50 | 131.24 | 418.95 | 1.8737 |
| 55 | 133.45 | 423.61 | 1.8880 |

### 1.00 bar -46.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -46 | 184.29 | 339.43 | 1.6425 |
| -45 | 185.26 | 340.20 | 1.6459 |
| -40 | 190.05 | 344.08 | 1.6627 |
| -35 | 194.79 | 347.99 | 1.6793 |
| -30 | 199.48 | 351.93 | 1.6956 |
| -25 | 204.14 | 355.90 | 1.7118 |
| -20 | 208.76 | 359.92 | 1.7278 |
| -15 | 213.36 | 363.96 | 1.7437 |
| -10 | 217.92 | 368.05 | 1.7593 |
| -5 | 222.46 | 372.17 | 1.7749 |
| 0 | 226.98 | 376.34 | 1.7902 |
| 5 | 231.48 | 380.54 | 1.8055 |
| 10 | 235.96 | 384.78 | 1.8206 |
| 15 | 240.43 | 389.06 | 1.8356 |
| 20 | 244.88 | 393.39 | 1.8505 |
| 25 | 249.31 | 397.75 | 1.8652 |
| 30 | 253.73 | 402.15 | 1.8799 |
| 35 | 258.15 | 406.60 | 1.8944 |

### 1.33 bar -40.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -40 | 141.43 | 343.02 | 1.6352 |
| -35 | 145.15 | 347.00 | 1.6521 |
| -30 | 148.82 | 351.01 | 1.6688 |
| -25 | 152.45 | 355.05 | 1.6852 |
| -20 | 156.04 | 359.11 | 1.7014 |
| -15 | 159.60 | 363.21 | 1.7174 |
| -10 | 163.13 | 367.34 | 1.7333 |
| -5 | 166.64 | 371.50 | 1.7490 |
| 0 | 170.12 | 375.70 | 1.7645 |
| 5 | 173.59 | 379.94 | 1.7799 |
| 10 | 177.03 | 384.22 | 1.7951 |
| 15 | 180.46 | 388.53 | 1.8102 |
| 20 | 183.87 | 392.88 | 1.8252 |
| 25 | 187.26 | 397.27 | 1.8400 |
| 30 | 190.65 | 401.70 | 1.8547 |
| 35 | 194.02 | 406.16 | 1.8693 |
| 40 | 197.39 | 410.67 | 1.8839 |
| 45 | 200.74 | 415.21 | 1.8983 |

### 1.73 bar -34.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -34 | 110.09 | 346.56 | 1.6290 |
| -30 | 112.44 | 349.84 | 1.6426 |
| -25 | 115.34 | 353.96 | 1.6593 |
| -20 | 118.20 | 358.09 | 1.6758 |
| -15 | 121.03 | 362.25 | 1.6921 |
| -10 | 123.83 | 366.44 | 1.7082 |
| -5 | 126.59 | 370.66 | 1.7241 |
| 0 | 129.34 | 374.91 | 1.7398 |
| 5 | 132.06 | 379.19 | 1.7553 |
| 10 | 134.76 | 383.51 | 1.7707 |
| 15 | 137.45 | 387.86 | 1.7859 |
| 20 | 140.12 | 392.24 | 1.8010 |
| 25 | 142.77 | 396.66 | 1.8159 |
| 30 | 145.41 | 401.12 | 1.8308 |
| 35 | 148.04 | 405.62 | 1.8455 |
| 40 | 150.66 | 410.15 | 1.8600 |
| 45 | 153.27 | 414.72 | 1.8745 |
| 50 | 155.87 | 419.32 | 1.8889 |

### 2.22 bar -28.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -28 | 86.80 | 350.05 | 1.6236 |
| -25 | 88.22 | 352.58 | 1.6338 |
| -20 | 90.56 | 356.81 | 1.6507 |
| -15 | 92.85 | 361.06 | 1.6673 |
| -10 | 95.11 | 365.32 | 1.6837 |
| -5 | 97.35 | 369.61 | 1.6998 |
| 0 | 99.56 | 373.92 | 1.7158 |
| 5 | 101.74 | 378.26 | 1.7315 |
| 10 | 103.91 | 382.63 | 1.7471 |
| 15 | 106.05 | 387.03 | 1.7625 |
| 20 | 108.18 | 391.46 | 1.7777 |
| 25 | 110.29 | 395.92 | 1.7928 |
| 30 | 112.39 | 400.41 | 1.8078 |
| 35 | 114.48 | 404.94 | 1.8226 |
| 40 | 116.56 | 409.50 | 1.8373 |
| 45 | 118.63 | 414.10 | 1.8518 |
| 50 | 120.69 | 418.74 | 1.8663 |
| 55 | 122.74 | 423.41 | 1.8806 |

# Vapour Table, Superheated Range Solkane®404A

**2.40 bar -26.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -26 | 80.40 | 351.20 | 1.6219 |
| -25 | 80.84 | 352.05 | 1.6254 |
| -20 | 83.03 | 356.32 | 1.6424 |
| -15 | 85.19 | 360.60 | 1.6592 |
| -10 | 87.31 | 364.89 | 1.6756 |
| -5 | 89.40 | 369.21 | 1.6919 |
| 0 | 91.46 | 373.54 | 1.7079 |
| 5 | 93.50 | 377.91 | 1.7237 |
| 10 | 95.52 | 382.29 | 1.7394 |
| 15 | 97.52 | 386.71 | 1.7548 |
| 20 | 99.50 | 391.16 | 1.7701 |
| 25 | 101.47 | 395.63 | 1.7853 |
| 30 | 103.43 | 400.14 | 1.8003 |
| 35 | 105.37 | 404.68 | 1.8151 |
| 40 | 107.30 | 409.26 | 1.8299 |
| 45 | 109.22 | 413.87 | 1.8445 |
| 50 | 111.13 | 418.51 | 1.8589 |
| 55 | 113.03 | 423.19 | 1.8733 |

**3.03 bar -20.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -20 | 64.34 | 354.59 | 1.6175 |
| -15 | 66.15 | 358.99 | 1.6347 |
| -10 | 67.92 | 363.40 | 1.6516 |
| -5 | 69.66 | 367.81 | 1.6682 |
| 0 | 71.37 | 372.23 | 1.6846 |
| 5 | 73.05 | 376.68 | 1.7007 |
| 10 | 74.71 | 381.14 | 1.7166 |
| 15 | 76.35 | 385.62 | 1.7323 |
| 20 | 77.98 | 390.12 | 1.7478 |
| 25 | 79.58 | 394.65 | 1.7631 |
| 30 | 81.17 | 399.21 | 1.7783 |
| 35 | 82.75 | 403.80 | 1.7933 |
| 40 | 84.32 | 408.42 | 1.8082 |
| 45 | 85.88 | 413.07 | 1.8229 |
| 50 | 87.42 | 417.75 | 1.8375 |
| 55 | 88.96 | 422.46 | 1.8520 |
| 60 | 90.49 | 427.21 | 1.8663 |
| 65 | 92.02 | 431.99 | 1.8806 |

**3.77 bar -14.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -14 | 51.99 | 357.90 | 1.6136 |
| -10 | 53.21 | 361.54 | 1.6276 |
| -5 | 54.69 | 366.08 | 1.6447 |
| 0 | 56.13 | 370.62 | 1.6614 |
| 5 | 57.55 | 375.16 | 1.6779 |
| 10 | 58.95 | 379.72 | 1.6942 |
| 15 | 60.32 | 384.28 | 1.7101 |
| 20 | 61.67 | 388.87 | 1.7259 |
| 25 | 63.01 | 393.47 | 1.7415 |
| 30 | 64.33 | 398.09 | 1.7568 |
| 35 | 65.64 | 402.73 | 1.7720 |
| 40 | 66.93 | 407.41 | 1.7871 |
| 45 | 68.22 | 412.10 | 1.8020 |
| 50 | 69.49 | 416.83 | 1.8167 |
| 55 | 70.75 | 421.58 | 1.8313 |
| 60 | 72.01 | 426.37 | 1.8458 |
| 65 | 73.26 | 431.19 | 1.8601 |
| 70 | 74.50 | 436.03 | 1.8744 |

**4.65 bar -8.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -8 | 42.38 | 361.11 | 1.6102 |
| -5 | 43.15 | 363.94 | 1.6208 |
| 0 | 44.41 | 368.63 | 1.6382 |
| 5 | 45.64 | 373.31 | 1.6552 |
| 10 | 46.83 | 377.99 | 1.6718 |
| 15 | 48.01 | 382.66 | 1.6882 |
| 20 | 49.16 | 387.34 | 1.7043 |
| 25 | 50.29 | 392.03 | 1.7201 |
| 30 | 51.40 | 396.73 | 1.7358 |
| 35 | 52.51 | 401.45 | 1.7512 |
| 40 | 53.59 | 406.19 | 1.7665 |
| 45 | 54.67 | 410.94 | 1.7815 |
| 50 | 55.73 | 415.73 | 1.7965 |
| 55 | 56.79 | 420.53 | 1.8112 |
| 60 | 57.83 | 425.36 | 1.8258 |
| 65 | 58.87 | 430.22 | 1.8403 |
| 70 | 59.90 | 435.11 | 1.8547 |
| 75 | 60.93 | 440.03 | 1.8689 |

**2.60 bar - 24.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -24 | 74.56 | 352.33 | 1.6204 |
| -20 | 76.21 | 355.78 | 1.6341 |
| -15 | 78.23 | 360.10 | 1.6510 |
| -10 | 80.22 | 364.43 | 1.6676 |
| -5 | 82.18 | 368.77 | 1.6840 |
| 0 | 84.12 | 373.14 | 1.7001 |
| 5 | 86.03 | 377.52 | 1.7160 |
| 10 | 87.91 | 381.93 | 1.7317 |
| 15 | 89.78 | 386.37 | 1.7473 |
| 20 | 91.63 | 390.83 | 1.7626 |
| 25 | 93.47 | 395.33 | 1.7778 |
| 30 | 95.29 | 399.85 | 1.7929 |
| 35 | 97.10 | 404.41 | 1.8078 |
| 40 | 98.90 | 409.00 | 1.8225 |
| 45 | 100.68 | 413.62 | 1.8372 |
| 50 | 102.46 | 418.27 | 1.8517 |
| 55 | 104.23 | 422.97 | 1.8661 |
| 60 | 105.99 | 427.69 | 1.8804 |

**3.26 bar - 18.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -18 | 59.87 | 355.70 | 1.6162 |
| -15 | 60.89 | 358.37 | 1.6266 |
| -10 | 62.57 | 362.82 | 1.6436 |
| -5 | 64.21 | 367.27 | 1.6604 |
| 0 | 65.83 | 371.73 | 1.6769 |
| 5 | 67.41 | 376.21 | 1.6931 |
| 10 | 68.98 | 380.69 | 1.7091 |
| 15 | 70.52 | 385.20 | 1.7249 |
| 20 | 72.04 | 389.73 | 1.7405 |
| 25 | 73.55 | 394.28 | 1.7559 |
| 30 | 75.04 | 398.86 | 1.7711 |
| 35 | 76.52 | 403.47 | 1.7862 |
| 40 | 77.99 | 408.10 | 1.8011 |
| 45 | 79.45 | 412.77 | 1.8158 |
| 50 | 80.90 | 417.46 | 1.8305 |
| 55 | 82.33 | 422.19 | 1.8450 |
| 60 | 83.76 | 426.95 | 1.8594 |
| 65 | 85.19 | 431.74 | 1.8737 |

**4.05 bar - 12.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -12 | 48.53 | 358.98 | 1.6125 |
| -10 | 49.10 | 360.82 | 1.6195 |
| -5 | 50.51 | 365.42 | 1.6368 |
| 0 | 51.89 | 370.00 | 1.6537 |
| 5 | 53.24 | 374.59 | 1.6704 |
| 10 | 54.56 | 379.18 | 1.6867 |
| 15 | 55.86 | 383.78 | 1.7028 |
| 20 | 57.14 | 388.39 | 1.7187 |
| 25 | 58.40 | 393.02 | 1.7343 |
| 30 | 59.65 | 397.66 | 1.7498 |
| 35 | 60.88 | 402.33 | 1.7651 |
| 40 | 62.10 | 407.02 | 1.7802 |
| 45 | 63.31 | 411.74 | 1.7951 |
| 50 | 64.50 | 416.48 | 1.8099 |
| 55 | 65.69 | 421.25 | 1.8246 |
| 60 | 66.87 | 426.05 | 1.8391 |
| 65 | 68.04 | 430.88 | 1.8535 |
| 70 | 69.21 | 435.74 | 1.8677 |

**4.97 bar -6.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | KJ/kgK |
| -6 | 39.66 | 362.16 | 1.6092 |
| -5 | 39.90 | 363.11 | 1.6128 |
| 0 | 41.11 | 367.87 | 1.6303 |
| 5 | 42.28 | 372.60 | 1.6475 |
| 10 | 43.43 | 377.33 | 1.6643 |
| 15 | 44.54 | 382.04 | 1.6808 |
| 20 | 45.64 | 386.76 | 1.6971 |
| 25 | 46.72 | 391.48 | 1.7131 |
| 30 | 47.78 | 396.22 | 1.7288 |
| 35 | 48.82 | 400.96 | 1.7443 |
| 40 | 49.85 | 405.73 | 1.7597 |
| 45 | 50.87 | 410.51 | 1.7748 |
| 50 | 51.87 | 415.31 | 1.7898 |
| 55 | 52.87 | 420.14 | 1.8046 |
| 60 | 53.86 | 424.99 | 1.8193 |
| 65 | 54.84 | 429.87 | 1.8338 |
| 70 | 55.81 | 434.77 | 1.8482 |
| 75 | 56.77 | 439.70 | 1.8625 |

**2.81 bar - 22.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -22 | 69.22 | 353.47 | 1.6189 |
| -20 | 70.00 | 355.21 | 1.6258 |
| -15 | 71.91 | 359.57 | 1.6429 |
| -10 | 73.78 | 363.93 | 1.6596 |
| -5 | 75.63 | 368.31 | 1.6761 |
| 0 | 77.44 | 372.70 | 1.6923 |
| 5 | 79.23 | 377.11 | 1.7083 |
| 10 | 81.00 | 381.55 | 1.7241 |
| 15 | 82.75 | 386.01 | 1.7397 |
| 20 | 84.48 | 390.49 | 1.7552 |
| 25 | 86.20 | 395.00 | 1.7704 |
| 30 | 87.90 | 399.54 | 1.7855 |
| 35 | 89.59 | 404.11 | 1.8005 |
| 40 | 91.26 | 408.72 | 1.8153 |
| 45 | 92.93 | 413.35 | 1.8300 |
| 50 | 94.59 | 418.02 | 1.8446 |
| 55 | 96.24 | 422.72 | 1.8590 |
| 60 | 97.88 | 427.46 | 1.8733 |

**3.51 bar - 16.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -16 | 55.77 | 356.80 | 1.6149 |
| -15 | 56.09 | 357.70 | 1.6184 |
| -10 | 57.68 | 362.20 | 1.6356 |
| -5 | 59.24 | 366.70 | 1.6525 |
| 0 | 60.76 | 371.20 | 1.6692 |
| 5 | 62.26 | 375.70 | 1.6855 |
| 10 | 63.74 | 380.22 | 1.7016 |
| 15 | 65.19 | 384.76 | 1.7175 |
| 20 | 66.63 | 389.31 | 1.7332 |
| 25 | 68.05 | 393.89 | 1.7486 |
| 30 | 69.45 | 398.49 | 1.7639 |
| 35 | 70.84 | 403.11 | 1.7791 |
| 40 | 72.21 | 407.76 | 1.7940 |
| 45 | 73.58 | 412.45 | 1.8089 |
| 50 | 74.94 | 417.16 | 1.8236 |
| 55 | 76.28 | 421.90 | 1.8381 |
| 60 | 77.62 | 426.67 | 1.8526 |
| 65 | 78.95 | 431.47 | 1.8669 |

**4.34 bar - 10.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -10 | 45.33 | 360.05 | 1.6113 |
| -5 | 46.68 | 364.70 | 1.6288 |
| 0 | 47.99 | 369.34 | 1.6460 |
| 5 | 49.28 | 373.97 | 1.6628 |
| 10 | 50.53 | 378.60 | 1.6793 |
| 15 | 51.77 | 383.24 | 1.6955 |
| 20 | 52.98 | 387.88 | 1.7115 |
| 25 | 54.17 | 392.54 | 1.7272 |
| 30 | 55.35 | 397.21 | 1.7428 |
| 35 | 56.51 | 401.90 | 1.7581 |
| 40 | 57.66 | 406.62 | 1.7733 |
| 45 | 58.80 | 411.35 | 1.7883 |
| 50 | 59.93 | 416.12 | 1.8032 |
| 55 | 61.05 | 420.90 | 1.8179 |
| 60 | 62.16 | 425.72 | 1.8324 |
| 65 | 63.26 | 430.56 | 1.8469 |
| 70 | 64.36 | 435.44 | 1.8612 |
| 75 | 65.44 | 440.34 | 1.8754 |

**5.31 bar - 4.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -4 | 37.14 | 363.19 | 1.6082 |
| 0 | 38.06 | 367.05 | 1.6224 |
| 5 | 39.19 | 371.85 | 1.6398 |
| 10 | 40.29 | 376.62 | 1.6568 |
| 15 | 41.35 | 381.39 | 1.6735 |
| 20 | 42.40 | 386.15 | 1.6899 |
| 25 | 43.43 | 390.91 | 1.7060 |
| 30 | 44.43 | 395.67 | 1.7218 |
| 35 | 45.42 | 400.45 | 1.7375 |
| 40 | 46.40 | 405.24 | 1.7529 |
| 45 | 47.37 | 410.05 | 1.7681 |
| 50 | 48.32 | 414.87 | 1.7832 |
| 55 | 49.26 | 419.72 | 1.7981 |
| 60 | 50.20 | 424.59 | 1.8128 |
| 65 | 51.12 | 429.49 | 1.8274 |
| 70 | 52.04 | 434.41 | 1.8418 |
| 75 | 52.95 | 439.35 | 1.8561 |
| 80 | 53.86 | 444.33 | 1.8703 |

# Vapour Table, Superheated Range Solkane®404A

**5.67 bar -2.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| -2 | 34.80 | 364.21 | 1.6072 |
| 0 | 35.25 | 366.17 | 1.6144 |
| 5 | 36.33 | 371.03 | 1.6320 |
| 10 | 37.39 | 375.87 | 1.6493 |
| 15 | 38.41 | 380.68 | 1.6661 |
| 20 | 39.41 | 385.49 | 1.6827 |
| 25 | 40.39 | 390.29 | 1.6989 |
| 30 | 41.35 | 395.09 | 1.7149 |
| 35 | 42.29 | 399.90 | 1.7306 |
| 40 | 43.22 | 404.72 | 1.7461 |
| 45 | 44.14 | 409.56 | 1.7614 |
| 50 | 45.04 | 414.41 | 1.7766 |
| 55 | 45.94 | 419.28 | 1.7915 |
| 60 | 46.82 | 424.17 | 1.8063 |
| 65 | 47.70 | 429.08 | 1.8210 |
| 70 | 48.57 | 434.02 | 1.8355 |
| 75 | 49.43 | 438.99 | 1.8498 |
| 80 | 50.29 | 443.98 | 1.8640 |

**6.04 bar 0.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 0 | 32.64 | 365.22 | 1.6062 |
| 5 | 33.69 | 370.16 | 1.6242 |
| 10 | 34.70 | 375.06 | 1.6416 |
| 15 | 35.69 | 379.93 | 1.6587 |
| 20 | 36.65 | 384.79 | 1.6754 |
| 25 | 37.58 | 389.63 | 1.6918 |
| 30 | 38.50 | 394.48 | 1.7079 |
| 35 | 39.40 | 399.32 | 1.7238 |
| 40 | 40.29 | 404.18 | 1.7394 |
| 45 | 41.16 | 409.04 | 1.7548 |
| 50 | 42.02 | 413.92 | 1.7700 |
| 55 | 42.87 | 418.81 | 1.7850 |
| 60 | 43.71 | 423.72 | 1.7999 |
| 65 | 44.54 | 428.66 | 1.8146 |
| 70 | 45.36 | 433.62 | 1.8291 |
| 75 | 46.18 | 438.60 | 1.8436 |
| 80 | 46.99 | 443.60 | 1.8578 |
| 85 | 47.79 | 448.64 | 1.8720 |

**6.43 bar 2.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 2 | 30.63 | 366.21 | 1.6053 |
| 5 | 31.24 | 369.22 | 1.6162 |
| 10 | 32.22 | 374.19 | 1.6339 |
| 15 | 33.17 | 379.13 | 1.6512 |
| 20 | 34.09 | 384.04 | 1.6681 |
| 25 | 34.99 | 388.93 | 1.6847 |
| 30 | 35.87 | 393.82 | 1.7009 |
| 35 | 36.73 | 398.71 | 1.7169 |
| 40 | 37.57 | 403.59 | 1.7326 |
| 45 | 38.41 | 408.49 | 1.7481 |
| 50 | 39.23 | 413.40 | 1.7634 |
| 55 | 40.03 | 418.32 | 1.7786 |
| 60 | 40.83 | 423.25 | 1.7935 |
| 65 | 41.62 | 428.21 | 1.8083 |
| 70 | 42.40 | 433.19 | 1.8229 |
| 75 | 43.18 | 438.19 | 1.8373 |
| 80 | 43.94 | 443.21 | 1.8517 |
| 85 | 44.71 | 448.26 | 1.8659 |

**6.85 bar 4.0°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 4 | 28.77 | 367.18 | 1.6044 |
| 5 | 28.96 | 368.20 | 1.6081 |
| 10 | 29.91 | 373.26 | 1.6261 |
| 15 | 30.83 | 378.26 | 1.6436 |
| 20 | 31.72 | 383.24 | 1.6607 |
| 25 | 32.59 | 388.19 | 1.6775 |
| 30 | 33.43 | 393.12 | 1.6939 |
| 35 | 34.25 | 398.05 | 1.7100 |
| 40 | 35.06 | 402.98 | 1.7259 |
| 45 | 35.86 | 407.91 | 1.7415 |
| 50 | 36.64 | 412.84 | 1.7569 |
| 55 | 37.41 | 417.79 | 1.7721 |
| 60 | 38.17 | 422.75 | 1.7871 |
| 65 | 38.92 | 427.73 | 1.8019 |
| 70 | 39.66 | 432.73 | 1.8166 |
| 75 | 40.40 | 437.75 | 1.8311 |
| 80 | 41.13 | 442.79 | 1.8455 |
| 85 | 41.85 | 447.86 | 1.8598 |

**7.28 bar 6.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 6 | 27.03 | 368.14 | 1.6035 |
| 10 | 27.77 | 372.25 | 1.6182 |
| 15 | 28.66 | 377.34 | 1.6360 |
| 20 | 29.52 | 382.38 | 1.6533 |
| 25 | 30.35 | 387.39 | 1.6703 |
| 30 | 31.17 | 392.38 | 1.6868 |
| 35 | 31.96 | 397.35 | 1.7031 |
| 40 | 32.73 | 402.32 | 1.7191 |
| 45 | 33.49 | 407.29 | 1.7349 |
| 50 | 34.24 | 412.26 | 1.7504 |
| 55 | 34.98 | 417.24 | 1.7656 |
| 60 | 35.70 | 422.23 | 1.7807 |
| 65 | 36.42 | 427.23 | 1.7956 |
| 70 | 37.12 | 432.25 | 1.8104 |
| 75 | 37.82 | 437.29 | 1.8250 |
| 80 | 38.52 | 442.36 | 1.8394 |
| 85 | 39.20 | 447.44 | 1.8537 |
| 90 | 39.88 | 452.55 | 1.8679 |

**7.73 bar 8.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 8 | 25.41 | 369.08 | 1.6027 |
| 10 | 25.77 | 371.17 | 1.6101 |
| 15 | 26.64 | 376.35 | 1.6282 |
| 20 | 27.47 | 381.46 | 1.6458 |
| 25 | 28.28 | 386.54 | 1.6630 |
| 30 | 29.06 | 391.58 | 1.6797 |
| 35 | 29.83 | 396.61 | 1.6962 |
| 40 | 30.57 | 401.62 | 1.7123 |
| 45 | 31.30 | 406.63 | 1.7282 |
| 50 | 32.02 | 411.64 | 1.7438 |
| 55 | 32.72 | 416.65 | 1.7592 |
| 60 | 33.41 | 421.67 | 1.7744 |
| 65 | 34.10 | 426.70 | 1.7894 |
| 70 | 34.77 | 431.75 | 1.8042 |
| 75 | 35.44 | 436.81 | 1.8188 |
| 80 | 36.10 | 441.89 | 1.8333 |
| 85 | 36.75 | 447.00 | 1.8477 |
| 90 | 37.40 | 452.12 | 1.8619 |

**8.20 bar 10.0°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 10 | 23.91 | 370.00 | 1.6018 |
| 15 | 24.76 | 375.28 | 1.6203 |
| 20 | 25.57 | 380.48 | 1.6382 |
| 25 | 26.35 | 385.63 | 1.6556 |
| 30 | 27.11 | 390.74 | 1.6726 |
| 35 | 27.84 | 395.82 | 1.6892 |
| 40 | 28.56 | 400.88 | 1.7055 |
| 45 | 29.26 | 405.93 | 1.7215 |
| 50 | 29.95 | 410.98 | 1.7372 |
| 55 | 30.62 | 416.03 | 1.7527 |
| 60 | 31.29 | 421.08 | 1.7680 |
| 65 | 31.94 | 426.14 | 1.7831 |
| 70 | 32.59 | 431.22 | 1.7980 |
| 75 | 33.22 | 436.30 | 1.8127 |
| 80 | 33.85 | 441.41 | 1.8273 |
| 85 | 34.47 | 446.53 | 1.8417 |
| 90 | 35.09 | 451.68 | 1.8559 |
| 95 | 35.70 | 456.84 | 1.8701 |

**8.69 bar 12.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 12 | 22.50 | 370.90 | 1.6009 |
| 15 | 22.99 | 374.12 | 1.6122 |
| 20 | 23.79 | 379.42 | 1.6304 |
| 25 | 24.55 | 384.65 | 1.6481 |
| 30 | 25.29 | 389.83 | 1.6653 |
| 35 | 26.00 | 394.98 | 1.6821 |
| 40 | 26.69 | 400.09 | 1.6986 |
| 45 | 27.37 | 405.19 | 1.7148 |
| 50 | 28.03 | 410.28 | 1.7307 |
| 55 | 28.67 | 415.37 | 1.7463 |
| 60 | 29.31 | 420.46 | 1.7617 |
| 65 | 29.94 | 425.55 | 1.7768 |
| 70 | 30.55 | 430.65 | 1.7918 |
| 75 | 31.16 | 435.77 | 1.8066 |
| 80 | 31.76 | 440.90 | 1.8212 |
| 85 | 32.36 | 446.04 | 1.8357 |
| 90 | 32.95 | 451.21 | 1.8500 |
| 95 | 33.53 | 456.39 | 1.8642 |

**9.21 bar 14.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 14 | 21.18 | 371.78 | 1.6000 |
| 15 | 21.35 | 372.87 | 1.6039 |
| 20 | 22.13 | 378.28 | 1.6225 |
| 25 | 22.87 | 383.61 | 1.6405 |
| 30 | 23.59 | 388.87 | 1.6580 |
| 35 | 24.28 | 394.08 | 1.6750 |
| 40 | 24.95 | 399.26 | 1.6917 |
| 45 | 25.60 | 404.41 | 1.7080 |
| 50 | 26.24 | 409.55 | 1.7240 |
| 55 | 26.86 | 414.67 | 1.7398 |
| 60 | 27.47 | 419.80 | 1.7553 |
| 65 | 28.07 | 424.93 | 1.7706 |
| 70 | 28.66 | 430.06 | 1.7856 |
| 75 | 29.25 | 435.20 | 1.8005 |
| 80 | 29.82 | 440.36 | 1.8152 |
| 85 | 30.39 | 445.53 | 1.8297 |
| 90 | 30.95 | 450.71 | 1.8441 |
| 95 | 31.51 | 455.92 | 1.8584 |

**9.74 bar 16.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 16 | 19.95 | 372.63 | 1.5992 |
| 20 | 20.57 | 377.05 | 1.6143 |
| 25 | 21.30 | 382.48 | 1.6327 |
| 30 | 22.00 | 387.83 | 1.6505 |
| 35 | 22.67 | 393.12 | 1.6678 |
| 40 | 23.32 | 398.36 | 1.6847 |
| 45 | 23.95 | 403.57 | 1.7012 |
| 50 | 24.57 | 408.76 | 1.7174 |
| 55 | 25.17 | 413.94 | 1.7333 |
| 60 | 25.76 | 419.10 | 1.7489 |
| 65 | 26.33 | 424.27 | 1.7643 |
| 70 | 26.90 | 429.43 | 1.7794 |
| 75 | 27.46 | 434.61 | 1.7944 |
| 80 | 28.01 | 439.79 | 1.8092 |
| 85 | 28.55 | 444.98 | 1.8238 |
| 90 | 29.09 | 450.19 | 1.8382 |
| 95 | 29.62 | 455.42 | 1.8525 |
| 100 | 30.15 | 460.67 | 1.8667 |

**10.30 bar 18.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 18 | 18.80 | 373.46 | 1.5983 |
| 20 | 19.10 | 375.72 | 1.6060 |
| 25 | 19.82 | 381.27 | 1.6248 |
| 30 | 20.51 | 386.72 | 1.6429 |
| 35 | 21.17 | 392.09 | 1.6605 |
| 40 | 21.80 | 397.41 | 1.6776 |
| 45 | 22.41 | 402.69 | 1.6943 |
| 50 | 23.01 | 407.93 | 1.7107 |
| 55 | 23.59 | 413.15 | 1.7267 |
| 60 | 24.16 | 418.37 | 1.7425 |
| 65 | 24.71 | 423.57 | 1.7580 |
| 70 | 25.26 | 428.77 | 1.7732 |
| 75 | 25.79 | 433.98 | 1.7883 |
| 80 | 26.32 | 439.19 | 1.8032 |
| 85 | 26.84 | 444.41 | 1.8178 |
| 90 | 27.36 | 449.65 | 1.8324 |
| 95 | 27.87 | 454.90 | 1.8467 |
| 100 | 28.37 | 460.16 | 1.8609 |

**10.89 bar 20.00°C**

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 20 | 17.72 | 374.27 | 1.5973 |
| 25 | 18.44 | 379.96 | 1.6166 |
| 30 | 19.11 | 385.53 | 1.6351 |
| 35 | 19.76 | 391.00 | 1.6530 |
| 40 | 20.37 | 396.40 | 1.6704 |
| 45 | 20.97 | 401.74 | 1.6873 |
| 50 | 21.55 | 407.05 | 1.7039 |
| 55 | 22.11 | 412.33 | 1.7201 |
| 60 | 22.66 | 417.58 | 1.7360 |
| 65 | 23.20 | 422.83 | 1.7516 |
| 70 | 23.72 | 428.07 | 1.7670 |
| 75 | 24.24 | 433.31 | 1.7822 |
| 80 | 24.75 | 438.56 | 1.7971 |
| 85 | 25.25 | 443.81 | 1.8119 |
| 90 | 25.74 | 449.07 | 1.8265 |
| 95 | 26.23 | 454.35 | 1.8409 |
| 100 | 26.71 | 459.63 | 1.8552 |
| 105 | 27.19 | 464.94 | 1.8693 |

# Vapour Table, Superheated Range Solkane®404A

### 11.5 bar 22.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 22 | 16.71 | 375.05 | 1.5964 |
| 25 | 17.13 | 378.54 | 1.6082 |
| 30 | 17.80 | 384.24 | 1.6271 |
| 35 | 18.43 | 389.82 | 1.6454 |
| 40 | 19.04 | 395.31 | 1.6631 |
| 45 | 19.62 | 400.73 | 1.6803 |
| 50 | 20.18 | 406.11 | 1.6970 |
| 55 | 20.73 | 411.45 | 1.7134 |
| 60 | 21.26 | 416.76 | 1.7295 |
| 65 | 21.78 | 422.05 | 1.7453 |
| 70 | 22.29 | 427.34 | 1.7608 |
| 75 | 22.79 | 432.61 | 1.7760 |
| 80 | 23.27 | 437.89 | 1.7911 |
| 85 | 23.76 | 443.18 | 1.8059 |
| 90 | 24.23 | 448.47 | 1.8206 |
| 95 | 24.70 | 453.77 | 1.8351 |
| 100 | 25.16 | 459.08 | 1.8494 |
| 105 | 25.62 | 464.41 | 1.8636 |

### 12.13 bar 24.00°C

| t | v | h | s |
|---|---|---|---|
| C | dm³/kg | kJ/kg | kJ/kgK |
| 24 | 15.76 | 375.79 | 1.5954 |
| 25 | 15.90 | 376.99 | 1.5994 |
| 30 | 16.56 | 382.84 | 1.6189 |
| 35 | 17.19 | 388.55 | 1.6376 |
| 40 | 17.78 | 394.14 | 1.6556 |
| 45 | 18.35 | 399.66 | 1.6731 |
| 50 | 18.90 | 405.11 | 1.6901 |
| 55 | 19.44 | 410.51 | 1.7067 |
| 60 | 19.95 | 415.88 | 1.7229 |
| 65 | 20.45 | 421.23 | 1.7388 |
| 70 | 20.94 | 426.56 | 1.7545 |
| 75 | 21.43 | 431.88 | 1.7699 |
| 80 | 21.90 | 437.19 | 1.7850 |
| 85 | 22.36 | 442.51 | 1.8000 |
| 90 | 22.82 | 447.83 | 1.8147 |
| 95 | 23.27 | 453.16 | 1.8293 |
| 100 | 23.71 | 458.50 | 1.8437 |
| 105 | 24.15 | 463.85 | 1.8580 |

### 12.79 bar 26.00°C

| t | v | h | s |
|---|---|---|---|
| C | dm³/kg | kJ/kg | kJ/kgK |
| 26 | 14.86 | 376.51 | 1.5944 |
| 30 | 15.39 | 381.32 | 1.6104 |
| 35 | 16.02 | 387.18 | 1.6295 |
| 40 | 16.60 | 392.89 | 1.6479 |
| 45 | 17.16 | 398.51 | 1.6657 |
| 50 | 17.70 | 404.04 | 1.6830 |
| 55 | 18.22 | 409.52 | 1.6998 |
| 60 | 18.72 | 414.95 | 1.7163 |
| 65 | 19.21 | 420.36 | 1.7323 |
| 70 | 19.69 | 425.73 | 1.7481 |
| 75 | 20.15 | 431.10 | 1.7637 |
| 80 | 20.61 | 436.45 | 1.7789 |
| 85 | 21.06 | 441.81 | 1.7940 |
| 90 | 21.50 | 447.16 | 1.8088 |
| 95 | 21.93 | 452.52 | 1.8235 |
| 100 | 22.36 | 457.89 | 1.8380 |
| 105 | 22.78 | 463.26 | 1.8523 |
| 110 | 23.19 | 468.66 | 1.8664 |

### 13.47 bar 28.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 28 | 14.02 | 377.19 | 1.5933 |
| 30 | 14.28 | 379.66 | 1.6015 |
| 35 | 14.91 | 385.69 | 1.6212 |
| 40 | 15.49 | 391.54 | 1.6401 |
| 45 | 16.04 | 397.27 | 1.6582 |
| 50 | 16.57 | 402.90 | 1.6758 |
| 55 | 17.08 | 408.46 | 1.6929 |
| 60 | 17.57 | 413.97 | 1.7095 |
| 65 | 18.04 | 419.43 | 1.7258 |
| 70 | 18.51 | 424.86 | 1.7418 |
| 75 | 18.96 | 430.28 | 1.7574 |
| 80 | 19.40 | 435.68 | 1.7728 |
| 85 | 19.83 | 441.07 | 1.7880 |
| 90 | 20.26 | 446.46 | 1.8029 |
| 95 | 20.67 | 451.85 | 1.8177 |
| 100 | 21.08 | 457.24 | 1.8322 |
| 105 | 21.49 | 462.65 | 1.8466 |
| 110 | 21.89 | 468.07 | 1.8608 |

### 14.19 bar 30.00°C

| t | v | h | s |
|---|---|---|---|
| C | dm³/kg | kJ/kg | kJ/kgK |
| 30 | 13.23 | 377.83 | 1.5922 |
| 35 | 13.85 | 384.07 | 1.6126 |
| 40 | 14.44 | 390.08 | 1.6320 |
| 45 | 14.99 | 395.94 | 1.6505 |
| 50 | 15.51 | 401.68 | 1.6684 |
| 55 | 16.01 | 407.33 | 1.6858 |
| 60 | 16.48 | 412.92 | 1.7027 |
| 65 | 16.95 | 418.45 | 1.7192 |
| 70 | 17.40 | 423.94 | 1.7353 |
| 75 | 17.84 | 429.41 | 1.7511 |
| 80 | 18.26 | 434.86 | 1.7666 |
| 85 | 18.68 | 440.29 | 1.7819 |
| 90 | 19.09 | 445.72 | 1.7970 |
| 95 | 19.50 | 451.14 | 1.8118 |
| 100 | 19.89 | 456.57 | 1.8265 |
| 105 | 20.28 | 462.00 | 1.8409 |
| 110 | 20.67 | 467.45 | 1.8552 |
| 115 | 21.05 | 472.90 | 1.8694 |

### 14.93 bar 32.00°C

| t | v | h | s |
|---|---|---|---|
| C | dm³/kg | kJ/kg | kJ/kgK |
| 32 | 12.48 | 378.43 | 1.5910 |
| 35 | 12.85 | 382.29 | 1.6036 |
| 40 | 13.44 | 388.50 | 1.6236 |
| 45 | 13.99 | 394.51 | 1.6426 |
| 50 | 14.50 | 400.38 | 1.6609 |
| 55 | 14.99 | 406.13 | 1.6786 |
| 60 | 15.46 | 411.80 | 1.6957 |
| 65 | 15.92 | 417.41 | 1.7124 |
| 70 | 16.36 | 422.97 | 1.7288 |
| 75 | 16.78 | 428.49 | 1.7447 |
| 80 | 17.20 | 433.99 | 1.7604 |
| 85 | 17.60 | 439.47 | 1.7758 |
| 90 | 18.00 | 444.94 | 1.7910 |
| 95 | 18.39 | 450.40 | 1.8059 |
| 100 | 18.77 | 455.86 | 1.8207 |
| 105 | 19.15 | 461.33 | 1.8352 |
| 110 | 19.52 | 466.80 | 1.8496 |
| 115 | 19.89 | 472.28 | 1.8638 |

### 15.69 bar 34.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 34 | 11.77 | 378.99 | 1.5897 |
| 35 | 11.90 | 380.32 | 1.5940 |
| 40 | 12.49 | 386.77 | 1.6148 |
| 45 | 13.04 | 392.96 | 1.6344 |
| 50 | 13.55 | 398.97 | 1.6531 |
| 55 | 14.04 | 404.84 | 1.6712 |
| 60 | 14.50 | 410.61 | 1.6886 |
| 65 | 14.94 | 416.30 | 1.7056 |
| 70 | 15.37 | 421.93 | 1.7221 |
| 75 | 15.79 | 427.52 | 1.7383 |
| 80 | 16.19 | 433.08 | 1.7541 |
| 85 | 16.59 | 438.61 | 1.7697 |
| 90 | 16.97 | 444.12 | 1.7850 |
| 95 | 17.35 | 449.62 | 1.8000 |
| 100 | 17.72 | 455.12 | 1.8148 |
| 105 | 18.09 | 460.62 | 1.8295 |
| 110 | 18.45 | 466.12 | 1.8439 |
| 115 | 18.80 | 471.63 | 1.8582 |

### 16.49 bar 36.00°C

| t | v | h | s |
|---|---|---|---|
| C | dm³/kg | kJ/kg | kJ/kgK |
| 36 | 11.10 | 379.50 | 1.5883 |
| 40 | 11.58 | 384.86 | 1.6056 |
| 45 | 12.14 | 391.27 | 1.6259 |
| 50 | 12.65 | 397.45 | 1.6451 |
| 55 | 13.13 | 403.46 | 1.6636 |
| 60 | 13.59 | 409.34 | 1.6814 |
| 65 | 14.03 | 415.12 | 1.6986 |
| 70 | 14.45 | 420.84 | 1.7154 |
| 75 | 14.86 | 426.49 | 1.7317 |
| 80 | 15.25 | 432.11 | 1.7478 |
| 85 | 15.63 | 437.69 | 1.7635 |
| 90 | 16.01 | 443.26 | 1.7789 |
| 95 | 16.37 | 448.80 | 1.7941 |
| 100 | 16.73 | 454.34 | 1.8090 |
| 105 | 17.09 | 459.87 | 1.8237 |
| 110 | 17.43 | 465.41 | 1.8383 |
| 115 | 17.78 | 470.94 | 1.8526 |
| 120 | 18.11 | 476.49 | 1.8668 |

### 17.32 bar 38.00°C

| t | v | h | s |
|---|---|---|---|
| C | dm³/kg | kJ/kg | kJ/kgK |
| 38 | 10.47 | 379.96 | 1.5869 |
| 40 | 10.71 | 382.75 | 1.5958 |
| 45 | 11.28 | 389.42 | 1.6169 |
| 50 | 11.79 | 395.80 | 1.6368 |
| 55 | 12.28 | 401.96 | 1.6557 |
| 60 | 12.73 | 407.97 | 1.6739 |
| 65 | 13.16 | 413.87 | 1.6915 |
| 70 | 13.58 | 419.67 | 1.7085 |
| 75 | 13.97 | 425.40 | 1.7251 |
| 80 | 14.36 | 431.09 | 1.7413 |
| 85 | 14.73 | 436.73 | 1.7572 |
| 90 | 15.10 | 442.35 | 1.7728 |
| 95 | 15.45 | 447.94 | 1.7881 |
| 100 | 15.80 | 453.52 | 1.8031 |
| 105 | 16.15 | 459.09 | 1.8179 |
| 110 | 16.48 | 464.66 | 1.8326 |
| 115 | 16.81 | 470.23 | 1.8470 |
| 120 | 17.14 | 475.80 | 1.8613 |

### 18.18 bar 40.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 40 | 9.87 | 380.37 | 1.5852 |
| 45 | 10.45 | 387.38 | 1.6075 |
| 50 | 10.98 | 394.00 | 1.6281 |
| 55 | 11.46 | 400.35 | 1.6476 |
| 60 | 11.91 | 406.51 | 1.6662 |
| 65 | 12.34 | 412.52 | 1.6842 |
| 70 | 12.75 | 418.43 | 1.7015 |
| 75 | 13.14 | 424.25 | 1.7183 |
| 80 | 13.52 | 430.01 | 1.7348 |
| 85 | 13.89 | 435.72 | 1.7508 |
| 90 | 14.24 | 441.39 | 1.7665 |
| 95 | 14.59 | 447.03 | 1.7820 |
| 100 | 14.93 | 452.66 | 1.7972 |
| 105 | 15.26 | 458.27 | 1.8121 |
| 110 | 15.58 | 463.88 | 1.8268 |
| 115 | 15.90 | 469.48 | 1.8414 |
| 120 | 16.22 | 475.09 | 1.8557 |
| 125 | 16.53 | 480.70 | 1.8699 |

### 19.07 bar 42.00°C

| t | v | h | s |
|---|---|---|---|
| C | dm³/kg | kJ/kg | kJ/kgK |
| 42 | 9.30 | 380.71 | 1.5835 |
| 45 | 9.66 | 385.10 | 1.5974 |
| 50 | 10.20 | 392.03 | 1.6190 |
| 55 | 10.69 | 398.60 | 1.6392 |
| 60 | 11.14 | 404.93 | 1.6583 |
| 65 | 11.56 | 411.08 | 1.6766 |
| 70 | 11.97 | 417.10 | 1.6943 |
| 75 | 12.35 | 423.02 | 1.7114 |
| 80 | 12.73 | 428.86 | 1.7281 |
| 85 | 13.08 | 434.64 | 1.7443 |
| 90 | 13.43 | 440.38 | 1.7602 |
| 95 | 13.77 | 446.08 | 1.7758 |
| 100 | 14.10 | 451.75 | 1.7912 |
| 105 | 14.42 | 457.41 | 1.8062 |
| 110 | 14.74 | 463.06 | 1.8210 |
| 115 | 15.05 | 468.70 | 1.8357 |
| 120 | 15.35 | 474.33 | 1.8501 |
| 125 | 15.65 | 479.97 | 1.8644 |

### 20.00 bar 44.00°C

| t | v | h | s |
|---|---|---|---|
| C | dm³/kg | kJ/kg | kJ/kgK |
| 44 | 8.76 | 380.98 | 1.5816 |
| 45 | 8.88 | 382.52 | 1.5864 |
| 50 | 9.44 | 389.84 | 1.6093 |
| 55 | 9.94 | 396.68 | 1.6303 |
| 60 | 10.40 | 403.22 | 1.6501 |
| 65 | 10.83 | 409.53 | 1.6689 |
| 70 | 11.23 | 415.68 | 1.6869 |
| 75 | 11.61 | 421.71 | 1.7044 |
| 80 | 11.97 | 427.64 | 1.7213 |
| 85 | 12.33 | 433.50 | 1.7378 |
| 90 | 12.67 | 439.31 | 1.7539 |
| 95 | 13.00 | 445.07 | 1.7696 |
| 100 | 13.32 | 450.80 | 1.7851 |
| 105 | 13.63 | 456.51 | 1.8003 |
| 110 | 13.94 | 462.19 | 1.8152 |
| 115 | 14.24 | 467.87 | 1.8299 |
| 120 | 14.54 | 473.55 | 1.8445 |
| 125 | 14.83 | 479.22 | 1.8588 |

# Vapour Table, Superheated Range Solkane®404A

### 20.96 bar 46.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 46 | 8.24 | 381.17 | 1.5795 |
| 50 | 8.71 | 387.38 | 1.5988 |
| 55 | 9.23 | 394.57 | 1.6209 |
| 60 | 9.69 | 401.36 | 1.6414 |
| 65 | 10.12 | 407.86 | 1.6608 |
| 70 | 10.52 | 414.16 | 1.6793 |
| 75 | 10.90 | 420.31 | 1.6971 |
| 80 | 11.26 | 426.35 | 1.7143 |
| 85 | 11.61 | 432.30 | 1.7311 |
| 90 | 11.94 | 438.18 | 1.7474 |
| 95 | 12.27 | 444.01 | 1.7633 |
| 100 | 12.58 | 449.79 | 1.7789 |
| 105 | 12.89 | 455.55 | 1.7942 |
| 110 | 13.19 | 461.29 | 1.8093 |
| 115 | 13.48 | 467.01 | 1.8242 |
| 120 | 13.77 | 472.72 | 1.8388 |
| 125 | 14.05 | 478.43 | 1.8532 |
| 130 | 14.33 | 484.14 | 1.8674 |

### 21.95 bar 48.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 48 | 7.75 | 381.27 | 1.5772 |
| 50 | 8.00 | 384.57 | 1.5874 |
| 55 | 8.54 | 392.22 | 1.6109 |
| 60 | 9.02 | 399.32 | 1.6324 |
| 65 | 9.45 | 406.05 | 1.6524 |
| 70 | 9.85 | 412.52 | 1.6714 |
| 75 | 10.23 | 418.82 | 1.6896 |
| 80 | 10.59 | 424.97 | 1.7072 |
| 85 | 10.93 | 431.02 | 1.7242 |
| 90 | 11.26 | 436.98 | 1.7407 |
| 95 | 11.57 | 442.88 | 1.7569 |
| 100 | 11.88 | 448.74 | 1.7727 |
| 105 | 12.18 | 454.55 | 1.7881 |
| 110 | 12.47 | 460.34 | 1.8033 |
| 115 | 12.76 | 466.11 | 1.8183 |
| 120 | 13.04 | 471.86 | 1.8330 |
| 125 | 13.31 | 477.61 | 1.8476 |
| 130 | 13.58 | 483.35 | 1.8619 |

### 22.98 bar 50.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 50 | 7.28 | 381.28 | 1.5746 |
| 55 | 7.87 | 389.57 | 1.6001 |
| 60 | 8.36 | 397.06 | 1.6227 |
| 65 | 8.81 | 404.07 | 1.6436 |
| 70 | 9.21 | 410.75 | 1.6632 |
| 75 | 9.59 | 417.21 | 1.6819 |
| 80 | 9.95 | 423.50 | 1.6998 |
| 85 | 10.28 | 429.66 | 1.7172 |
| 90 | 10.61 | 435.71 | 1.7340 |
| 95 | 10.92 | 441.70 | 1.7503 |
| 100 | 11.22 | 447.62 | 1.7663 |
| 105 | 11.51 | 453.50 | 1.7819 |
| 110 | 11.80 | 459.34 | 1.7973 |
| 115 | 12.08 | 465.16 | 1.8124 |
| 120 | 12.35 | 470.96 | 1.8272 |
| 125 | 12.62 | 476.74 | 1.8418 |
| 130 | 12.88 | 482.52 | 1.8563 |
| 135 | 13.14 | 488.30 | 1.8705 |

### 24.04 bar 52.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 52 | 6.84 | 381.17 | 1.5717 |
| 55 | 7.20 | 386.52 | 1.5881 |
| 60 | 7.73 | 394.54 | 1.6124 |
| 65 | 8.19 | 401.90 | 1.6343 |
| 70 | 8.60 | 408.83 | 1.6546 |
| 75 | 8.98 | 415.48 | 1.6739 |
| 80 | 9.33 | 421.92 | 1.6922 |
| 85 | 9.67 | 428.20 | 1.7099 |
| 90 | 9.99 | 434.37 | 1.7270 |
| 95 | 10.30 | 440.44 | 1.7436 |
| 100 | 10.59 | 446.44 | 1.7598 |
| 105 | 10.88 | 452.39 | 1.7756 |
| 110 | 11.16 | 458.29 | 1.7912 |
| 115 | 11.43 | 464.16 | 1.8064 |
| 120 | 11.70 | 470.01 | 1.8213 |
| 125 | 11.96 | 475.84 | 1.8361 |
| 130 | 12.21 | 481.66 | 1.8506 |
| 135 | 12.46 | 487.47 | 1.8649 |

### 25.15 bar 54.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 54 | 6.40 | 380.93 | 1.5685 |
| 55 | 6.54 | 382.89 | 1.5745 |
| 60 | 7.11 | 391.68 | 1.6011 |
| 65 | 7.59 | 399.49 | 1.6243 |
| 70 | 8.01 | 406.73 | 1.6456 |
| 75 | 8.39 | 413.61 | 1.6655 |
| 80 | 8.75 | 420.23 | 1.6844 |
| 85 | 9.09 | 426.65 | 1.7025 |
| 90 | 9.40 | 432.94 | 1.7199 |
| 95 | 9.71 | 439.11 | 1.7368 |
| 100 | 10.00 | 445.20 | 1.7532 |
| 105 | 10.28 | 451.22 | 1.7692 |
| 110 | 10.55 | 457.19 | 1.7849 |
| 115 | 10.82 | 463.12 | 1.8003 |
| 120 | 11.08 | 469.02 | 1.8154 |
| 125 | 11.33 | 474.89 | 1.8302 |
| 130 | 11.58 | 480.75 | 1.8448 |
| 135 | 11.82 | 486.60 | 1.8593 |

### 26.30 bar 56.00°C

| t | v | h | s |
|---|---|---|---|
| °C | dm³/kg | kJ/kg | kJ/kgK |
| 56 | 5.99 | 380.54 | 1.5649 |
| 60 | 6.49 | 388.35 | 1.5885 |
| 65 | 7.00 | 396.78 | 1.6136 |
| 70 | 7.44 | 404.42 | 1.6360 |
| 75 | 7.83 | 411.57 | 1.6567 |
| 80 | 8.19 | 418.40 | 1.6762 |
| 85 | 8.53 | 424.99 | 1.6947 |
| 90 | 8.85 | 431.41 | 1.7125 |
| 95 | 9.15 | 437.70 | 1.7297 |
| 100 | 9.43 | 443.88 | 1.7464 |
| 105 | 9.71 | 449.98 | 1.7627 |
| 110 | 9.98 | 456.02 | 1.7785 |
| 115 | 10.24 | 462.02 | 1.7941 |
| 120 | 10.49 | 467.97 | 1.8093 |
| 125 | 10.74 | 473.90 | 1.8243 |
| 130 | 10.98 | 479.80 | 1.8390 |
| 135 | 11.22 | 485.69 | 1.8535 |
| 140 | 11.45 | 491.57 | 1.8679 |

### 27.48 bar 58.00°C

| t | v | h | s |
|---|---|---|---|
| 58 | 5.59 | 379.95 | 1.5607 |
| 60 | 5.86 | 384.33 | 1.5739 |
| 65 | 6.43 | 393.69 | 1.6018 |
| 70 | 6.89 | 401.85 | 1.6257 |
| 75 | 7.29 | 409.35 | 1.6474 |
| 80 | 7.66 | 416.42 | 1.6676 |
| 85 | 8.00 | 423.21 | 1.6867 |
| 90 | 8.31 | 429.78 | 1.7049 |
| 95 | 8.61 | 436.19 | 1.7225 |
| 100 | 8.90 | 442.48 | 1.7394 |
| 105 | 9.17 | 448.68 | 1.7559 |
| 110 | 9.43 | 454.80 | 1.7720 |
| 115 | 9.69 | 460.86 | 1.7877 |
| 120 | 9.94 | 466.87 | 1.8031 |
| 125 | 10.18 | 472.85 | 1.8182 |
| 130 | 10.42 | 478.81 | 1.8331 |
| 135 | 10.65 | 484.74 | 1.8477 |
| 140 | 10.87 | 490.66 | 1.8621 |

### 28.71 bar 60.00°C

| t | v | h | s |
|---|---|---|---|
| 60 | 5.19 | 379.14 | 1.5559 |
| 65 | 5.85 | 390.06 | 1.5885 |
| 70 | 6.35 | 398.95 | 1.6146 |
| 75 | 6.77 | 406.89 | 1.6375 |
| 80 | 7.15 | 414.27 | 1.6586 |
| 85 | 7.49 | 421.28 | 1.6783 |
| 90 | 7.80 | 428.03 | 1.6970 |
| 95 | 8.10 | 434.59 | 1.7150 |
| 100 | 8.38 | 441.00 | 1.7323 |
| 105 | 8.65 | 447.29 | 1.7490 |
| 110 | 8.91 | 453.50 | 1.7653 |
| 115 | 9.17 | 459.64 | 1.7812 |
| 120 | 9.41 | 465.72 | 1.7968 |
| 125 | 9.65 | 471.76 | 1.8121 |
| 130 | 9.88 | 477.77 | 1.8271 |
| 135 | 10.10 | 483.75 | 1.8418 |
| 140 | 10.32 | 489.71 | 1.8563 |
| 145 | 10.54 | 495.66 | 1.8707 |

For further information please contact our technical specialists:

Solvay Fluor
Postfach 220
D-30002 Hannover

Telephone: +49-(0)511-857-2653
Telefax: +49-(0)511-857-2166

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