

**DuPont™ Suva®**  
refrigerants

**Thermodynamic  
Properties  
of  
HFC-134a**

**(1,1,1,2-tetrafluoroethane)**

**DuPont Product Names:**

**DuPont™ Suva® 134a Refrigerant**

**DuPont™ Formacel® Z-4 Blowing Agent**

**DuPont™ Dymel® 134a Aerosol Propellant**

**DuPont™ Dymel® 134a/P Aerosol Propellant (Pharmaceutical Grade)**

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# Thermodynamic Properties of HFC-134a Refrigerant (1,1,1,2-tetrafluoroethane) SI Units

New tables of the thermodynamic properties of HFC-134a have been developed and are presented here. These tables are based on experimental data from the database at the National Institute of Standards and Technology (NIST). Equations have been developed, based on the Modified Benedict-Webb-Rubin (MBWR) equation of state, which represent the data with accuracy and consistency throughout the entire range of temperature, pressure, and density.

## Physical Properties

|                                    |                                  |                             |
|------------------------------------|----------------------------------|-----------------------------|
| Chemical Formula                   | CH <sub>2</sub> FCF <sub>3</sub> |                             |
| Molecular Weight                   | 102.03                           |                             |
| Boiling Point at<br>One Atmosphere | -26.06°C                         | (-14.9°F)                   |
| Critical Temperature               | 101.08°C                         | (213.9°F)                   |
|                                    | 374.23 K                         | (673.6°R)                   |
| Critical Pressure                  | 4060.3 kPa (abs)                 | (588.9 psia)                |
| Critical Density                   | 515.3 kg/m <sup>3</sup>          | (32.17 lb/ft <sup>3</sup> ) |
| Critical Volume                    | 0.00194 m <sup>3</sup> /kg       | (0.031 ft <sup>3</sup> /lb) |

## Units and Factors

$t$  = temperature in °C  
 $T$  = temperature in K = °C + 273.15  
 $P$  = pressure in kiloPascals absolute [kPa (abs)]  
 $v_f$  = volume of saturated liquid in m<sup>3</sup>/kg  
 $v_g$  = volume of saturated vapor in m<sup>3</sup>/kg  
 $\bar{V}$  = volume of superheated vapor in m<sup>3</sup>/kg  
 $d_f$  =  $1/v_f$  = density of saturated liquid in kg/m<sup>3</sup>  
 $d_g$  =  $1/v_g$  = density of saturated vapor in kg/m<sup>3</sup>  
 $h_f$  = enthalpy of saturated liquid in kJ/kg  
 $h_{fg}$  = enthalpy of vaporization in kJ/kg  
 $h_g$  = enthalpy of saturated vapor in kJ/kg  
 $H$  = enthalpy of superheated vapor in kJ/kg  
 $s_f$  = entropy of saturated liquid in kJ/(kg) (K)  
 $s_g$  = entropy of saturated vapor in kJ/(kg) (K)  
 $\bar{S}$  = entropy of superheated vapor in kJ/(kg) (K)  
 $C_p$  = heat capacity at constant pressure in kJ/(kg) (°C)  
 $C_v$  = heat capacity at constant volume in kJ/(kg) (°C)  
 $v_s$  = velocity of sound in m/sec

The gas constant,  $R$  = 8.314 J/(mole) (K)

for HFC-134a,  $R$  = 0.0815 kJ/kg • K

One atmosphere = 101.325 kPa

Reference point for enthalpy and entropy:

$h_f$  = 200 kJ/kg at 0°C

$s_f$  = 1 kJ/kg • K at 0°C

## Equations

The Modified Benedict-Webb-Rubin (MBWR) equation of state was used to calculate the tables of thermodynamic properties. It was chosen as the preferred equation of state because it provided the most accurate fit of the thermodynamic data over the entire range of temperatures and pressures presented in these tables. The data fit and calculation of constants for HFC-134a were performed for Du Pont at the National Institute of Standards and Technology (NIST) under the supervision of Dr. Mark O. McLinden.

The constants were calculated in SI units. For conversion of thermodynamic properties to Engineering (I/P) units, properties must be calculated in SI units and converted to I/P units. Conversion factors are provided for each property derived from the MBWR equation of state.

### 1. Equation of State (MBWR)

$$\frac{P}{100} = \sum_{n=1}^9 a_n/V^n + \exp(-V_c^2/V^2) \sum_{n=10}^{15} a_n/V^{2n-17}$$

where the temperature dependence of the coefficients is given by:

$$a_1 = RT$$

$$a_2 = b_1T + b_2T^{0.5} + b_3 + b_4/T + b_5/T^2$$

$$a_3 = b_6T + b_7 + b_8/T + b_9/T^2$$

$$a_4 = b_{10}T + b_{11} + b_{12}/T$$

$$a_5 = b_{13}$$

$$a_6 = b_{14}/T + b_{15}/T^2$$

$$a_7 = b_{16}/T$$

$$a_8 = b_{17}/T + b_{18}/T^2$$

$$a_9 = b_{19}/T^2$$

$$a_{10} = b_{20}/T^2 + b_{21}/T^3$$

$$a_{11} = b_{22}/T^2 + b_{23}/T^4$$

$$a_{12} = b_{24}/T^2 + b_{25}/T^3$$

$$a_{13} = b_{26}/T^2 + b_{27}/T^4$$

$$a_{14} = b_{28}/T^2 + b_{29}/T^3$$

$$a_{15} = b_{30}/T^2 + b_{31}/T^3 + b_{32}/T^4$$

where  $T$  is in K = °C + 273.15,  $V$  is in liters/mole (= m<sup>3</sup>/kg × MW),  $V_c$  = 0.199334 liters/mole,  $P$  is in kPa, and  $R$  = 0.08314471 bar (absolute) × liters/mole × K.

**MBWR coefficients for HFC-134a:**

$b_1 = -6.545 \ 523 \ 5227 \text{ E-02}$   
 $b_2 = 5.889 \ 375 \ 1817 \text{ E+00}$   
 $b_3 = -1.376 \ 178 \ 8409 \text{ E+02}$   
 $b_4 = 2.269 \ 316 \ 8845 \text{ E+04}$   
 $b_5 = -2.926 \ 261 \ 3296 \text{ E+06}$   
 $b_6 = -1.192 \ 377 \ 6190 \text{ E-04}$   
 $b_7 = -2.721 \ 419 \ 4543 \text{ E+00}$   
 $b_8 = 1.629 \ 525 \ 3680 \text{ E+03}$   
 $b_9 = 7.294 \ 220 \ 3182 \text{ E+05}$   
 $b_{10} = -1.172 \ 451 \ 9115 \text{ E-04}$   
 $b_{11} = 8.686 \ 451 \ 0013 \text{ E-01}$   
 $b_{12} = -3.066 \ 016 \ 8246 \text{ E+02}$   
 $b_{13} = -2.566 \ 404 \ 7742 \text{ E-02}$   
 $b_{14} = -2.438 \ 183 \ 5971 \text{ E+00}$   
 $b_{15} = -3.160 \ 316 \ 3961 \text{ E+02}$   
 $b_{16} = 3.432 \ 165 \ 1521 \text{ E-01}$   
 $b_{17} = -1.015 \ 436 \ 8796 \text{ E-02}$   
 $b_{18} = 1.173 \ 423 \ 3787 \text{ E+00}$   
 $b_{19} = -2.730 \ 176 \ 6113 \text{ E-02}$   
 $b_{20} = -6.633 \ 850 \ 2898 \text{ E+05}$   
 $b_{21} = -6.475 \ 479 \ 9101 \text{ E+07}$   
 $b_{22} = -3.729 \ 521 \ 9382 \text{ E+04}$   
 $b_{23} = 1.261 \ 473 \ 5899 \text{ E+09}$   
 $b_{24} = -6.474 \ 220 \ 0070 \text{ E+02}$   
 $b_{25} = 1.236 \ 245 \ 0399 \text{ E+05}$   
 $b_{26} = -1.569 \ 919 \ 6293 \text{ E+00}$   
 $b_{27} = -5.184 \ 893 \ 2204 \text{ E+05}$   
 $b_{28} = -8.139 \ 632 \ 1392 \text{ E-02}$   
 $b_{29} = 3.032 \ 516 \ 8842 \text{ E+01}$   
 $b_{30} = 1.339 \ 904 \ 2297 \text{ E-04}$   
 $b_{31} = -1.585 \ 619 \ 2849 \text{ E-01}$   
 $b_{32} = 9.067 \ 958 \ 3743 \text{ E+00}$

**Ideal Gas Heat Capacity Equation (at constant pressure):**

$$C_p^o (\text{J/mole} \cdot \text{K}) = \text{cp1} + \text{cp2} T + \text{cp3} T^2$$

$$\text{cp1} = 1.94006 \text{ E+01} \quad \text{cp3} = -1.29665 \text{ E-04}$$

$$\text{cp2} = 2.58531 \text{ E-01} \quad R = 8.314471 \text{ J/mole} \cdot \text{K}$$

$$\text{MW} = 102.03$$

Properties calculated in SI units from the equation and constants listed above can be converted to I/P units using the conversion factors shown below. Please note that in converting enthalpy and entropy from SI to I/P units, a change in reference states must be included (from  $H = 200$  and  $S = 1$  at  $0^\circ\text{C}$  for SI units to  $H = 0$  and  $S = 0$  at  $-40^\circ\text{C}$  for I/P units). In the conversion equation below,  $H(\text{ref})$  and  $S(\text{ref})$  are the saturated liquid enthalpy and entropy at  $-40^\circ\text{C}$ . For HFC-134a,  $H(\text{ref}) = 148.4 \text{ kJ/kg}$  and  $S(\text{ref}) = 0.7967 \text{ kJ/kg} \cdot \text{K}$ .

$$P (\text{psia}) = P (\text{kPa}) \cdot 0.14504$$

$$T (^\circ\text{F}) = (T [^\circ\text{C}] \cdot 1.8) + 32$$

$$D (\text{lb/ft}^3) = D (\text{kg/m}^3) \cdot 0.062428$$

$$V (\text{ft}^3/\text{lb}) = V (\text{m}^3/\text{kg}) \cdot 16.018$$

$$H (\text{Btu/lb}) = [H (\text{kJ/kg}) - H(\text{ref})] \cdot 0.43021$$

$$S (\text{Btu/lb} \cdot ^\circ\text{R}) = [S (\text{kJ/kg} \cdot \text{K}) - S(\text{ref})] \cdot 0.23901$$

$$C_p (\text{Btu/lb} \cdot ^\circ\text{F}) = C_p (\text{kJ/kg} \cdot \text{K}) \cdot 0.23901$$

$$C_v (\text{Btu/lb} \cdot ^\circ\text{F}) = C_v (\text{kJ/kg} \cdot \text{K}) \cdot 0.23901$$

$$v_s (\text{ft/sec}) = v_s (\text{m/sec}) \cdot 3.2808$$

**2. Martin-Hou Equation of State (fit from MBWR data)**

As previously stated, the thermodynamic properties presented in these tables are based on the MBWR equation of state. Coefficients for the Martin-Hou equation of state are presented below for the convenience of those who may have existing computer programs based on this equation of state. While not as accurate as the data from the MBWR equation of state, particularly in the superheated region, data calculated using these Martin-Hou coefficients should be sufficient for most engineering calculations.

$$P = RT/(V-b) + \sum_{i=2}^5 (A_i + B_i T + C_i \exp(-kT/T_c))/(V-b)^i$$

**For SI units**

$T$  and  $T_c$  are in  $\text{K} = ^\circ\text{C} + 273.15$ ,  $V$  is in  $\text{m}^3/\text{kg}$ , and  $P$  is in  $\text{kPa}$

$$R = 0.0815 \text{ kJ/kg} \cdot \text{K}$$

$b, A_i, B_i, C_i, k$  are constants:

$$A_2 = -8.909485 \text{ E-02} \quad A_4 = 1.778071 \text{ E-05}$$

$$B_2 = 4.408654 \text{ E-05} \quad B_4 = -4.016976 \text{ E-08}$$

$$C_2 = -2.074834 \text{ E+00} \quad C_4 = -2.977911 \text{ E-04}$$

$$A_3 = -1.016882 \text{ E-03} \quad A_5 = -7.481440 \text{ E-08}$$

$$B_3 = 2.574527 \text{ E-06} \quad B_5 = 1.670285 \text{ E-10}$$

$$C_3 = 2.142829 \text{ E-02} \quad C_5 = 1.255922 \text{ E-06}$$

$$b = 3.755677 \text{ E-04} \quad k = 4.599967$$

**For I/P units**

T and  $T_c$  are in  $^{\circ}\text{R} = ^{\circ}\text{F} + 459.67$ , V is in  $\text{ft}^3/\text{lb}$ ,  
and P is in psia

$$R = 0.1052 (\text{psia})(\text{ft}^3)/\text{lb} \cdot ^{\circ}\text{R}$$

b,  $A_i$ ,  $B_i$ ,  $C_i$ , k are constants:

$$A_2 = -3.315708 \text{ E}+00 \quad A_4 = 1.697907 \text{ E}-01$$

$$B_2 = 9.115011 \text{ E}-04 \quad B_4 = -2.131040 \text{ E}-04$$

$$C_2 = -7.721597 \text{ E}+01 \quad C_4 = -2.843653 \text{ E}+00$$

$$A_3 = -6.061984 \text{ E}-01 \quad A_5 = -1.144381 \text{ E}-02$$

$$B_3 = 8.526469 \text{ E}-04 \quad B_5 = 1.419396 \text{ E}-05$$

$$C_3 = 1.277414 \text{ E}+01 \quad C_5 = 1.921091 \text{ E}-01$$

$$b = 6.016014 \text{ E}-03 \quad k = 4.599967 \text{ E}+00$$

**Ideal Gas Heat Capacity (at constant volume):**

$$C_v^{\circ} = a + bT + cT^2 + dT^3 + f/T^2$$

**For SI units**

$$C_v^{\circ} = \text{kJ/kg} \cdot \text{K}$$

T is in  $\text{K} = ^{\circ}\text{C} + 273.15$

a, b, c, d, f are constants:

$$a = 3.154856 \text{ E}+00 \quad d = -3.754497 \text{ E}-08$$

$$b = -1.656054 \text{ E}-02 \quad f = -3.023189 \text{ E}+04$$

$$c = 4.353378 \text{ E}-05$$

**For I/P units**

$$C_v^{\circ} = \text{Btu/lb} \cdot ^{\circ}\text{R}$$

T is in  $^{\circ}\text{R} = ^{\circ}\text{F} + 459.67$

a, b, c, d, f are constants:

$$a = 7.540287 \text{ E}-01 \quad d = -1.538660 \text{ E}-09$$

$$b = -2.198925 \text{ E}-03 \quad f = -2.341093 \text{ E}+04$$

$$c = 3.211365 \text{ E}-06$$

**3. Vapor Pressure**

$$\log_{10} P_{\text{sat}} = A + B/T + C \log_{10} T + D T + E ([F-T]/T) \log_{10} (F-T)$$

**For SI units**

T is in  $\text{K} = ^{\circ}\text{C} + 273.15$  and P is in kPa

A, B, C, D, E, F are constants:

$$A = 4.069889 \text{ E}+01 \quad D = 7.616005 \text{ E}-03$$

$$B = -2.362540 \text{ E}+03 \quad E = 2.342564 \text{ E}-01$$

$$C = -1.306883 \text{ E}+01 \quad F = 3.761111 \text{ E}+02$$

**For I/P units**

T is in  $^{\circ}\text{R} = ^{\circ}\text{F} + 459.67$  and P is in psia

A, B, C, D, E, F are constants:

$$A = 4.325629 \text{ E}+01 \quad D = 4.231114 \text{ E}-03$$

$$B = -4.293056 \text{ E}+03 \quad E = 2.342564 \text{ E}-01$$

$$C = -1.306883 \text{ E}+01 \quad F = 6.770000 \text{ E}+02$$

**4. Density of the Saturated Liquid**

$$d_f = A_f + B_f (1-T_r)^{(1/3)} + C_f (1-T_r)^{(2/3)} + D_f (1-T_r) + E_f (1-T_r)^{(4/3)}$$

**For SI units**

$T_r = T/T_c$ , both in  $\text{K} = ^{\circ}\text{C} + 273.15$  and  $d_f$  is in  $\text{kg/m}^3$

$A_f$ ,  $B_f$ ,  $C_f$ ,  $D_f$ ,  $E_f$  are constants:

$$A_f = 5.281464 \text{ E}+02 \quad D_f = -9.491172 \text{ E}+02$$

$$B_f = 7.551834 \text{ E}+02 \quad E_f = 5.935660 \text{ E}+02$$

$$C_f = 1.028676 \text{ E}+03$$

**For I/P units**

$T_r = T/T_c$ , both in  $^{\circ}\text{R} = ^{\circ}\text{F} + 459.67$  and  $d_f$  is in  $\text{lb/ft}^3$

$A_f$ ,  $B_f$ ,  $C_f$ ,  $D_f$ ,  $E_f$  are constants:

$$A_f = 3.297110 \text{ E}+01 \quad D_f = -5.925145 \text{ E}+01$$

$$B_f = 4.714456 \text{ E}+01 \quad E_f = 3.705512 \text{ E}+01$$

$$C_f = 6.421816 \text{ E}+01$$

**TABLE 1**  
**HFC-134a Saturation Properties—Temperature Table**

| TEMP.<br>°C | PRESSURE<br>kPa (abs) | VOLUME<br>m <sup>3</sup> /kg |                         | DENSITY<br>kg/m <sup>3</sup> |                           | ENTHALPY<br>kJ/kg        |                           |                         | ENTROPY<br>kJ/(kg)(K)    |                         | TEMP.<br>°C |
|-------------|-----------------------|------------------------------|-------------------------|------------------------------|---------------------------|--------------------------|---------------------------|-------------------------|--------------------------|-------------------------|-------------|
|             |                       | LIQUID<br>v <sub>f</sub>     | VAPOR<br>v <sub>g</sub> | LIQUID<br>1/v <sub>f</sub>   | VAPOR<br>1/v <sub>g</sub> | LIQUID<br>h <sub>f</sub> | LATENT<br>h <sub>fg</sub> | VAPOR<br>h <sub>g</sub> | LIQUID<br>s <sub>f</sub> | VAPOR<br>s <sub>g</sub> |             |
| -100        | 0.57                  | 0.0006                       | 25.0000                 | 1580.5                       | 0.040                     | 77.3                     | 259.9                     | 337.2                   | 0.4448                   | 1.9460                  | -100        |
| -99         | 0.63                  | 0.0006                       | 22.7273                 | 1577.8                       | 0.044                     | 78.4                     | 259.4                     | 337.8                   | 0.4514                   | 1.9407                  | -99         |
| -98         | 0.70                  | 0.0006                       | 20.4082                 | 1575.0                       | 0.049                     | 79.6                     | 258.8                     | 338.4                   | 0.4581                   | 1.9356                  | -98         |
| -97         | 0.77                  | 0.0006                       | 18.5185                 | 1572.3                       | 0.054                     | 80.7                     | 258.2                     | 339.0                   | 0.4646                   | 1.9306                  | -97         |
| -96         | 0.86                  | 0.0006                       | 16.9492                 | 1569.5                       | 0.059                     | 81.9                     | 257.7                     | 339.6                   | 0.4711                   | 1.9257                  | -96         |
| -95         | 0.95                  | 0.0006                       | 15.3846                 | 1566.8                       | 0.065                     | 83.0                     | 257.1                     | 340.1                   | 0.4776                   | 1.9209                  | -95         |
| -94         | 1.04                  | 0.0006                       | 13.8889                 | 1564.1                       | 0.072                     | 84.2                     | 256.6                     | 340.7                   | 0.4841                   | 1.9161                  | -94         |
| -93         | 1.15                  | 0.0006                       | 12.6582                 | 1561.3                       | 0.079                     | 85.3                     | 256.0                     | 341.3                   | 0.4905                   | 1.9115                  | -93         |
| -92         | 1.27                  | 0.0006                       | 11.6279                 | 1558.6                       | 0.086                     | 86.5                     | 255.4                     | 341.9                   | 0.4968                   | 1.9070                  | -92         |
| -91         | 1.40                  | 0.0006                       | 10.6383                 | 1555.8                       | 0.094                     | 87.6                     | 254.9                     | 342.5                   | 0.5032                   | 1.9025                  | -91         |
| -90         | 1.53                  | 0.0006                       | 9.7087                  | 1553.1                       | 0.103                     | 88.8                     | 254.3                     | 343.1                   | 0.5095                   | 1.8982                  | -90         |
| -89         | 1.68                  | 0.0006                       | 8.9286                  | 1550.4                       | 0.112                     | 89.9                     | 253.8                     | 343.7                   | 0.5158                   | 1.8939                  | -89         |
| -88         | 1.84                  | 0.0006                       | 8.1967                  | 1547.6                       | 0.122                     | 91.1                     | 253.2                     | 344.3                   | 0.5220                   | 1.8898                  | -88         |
| -87         | 2.02                  | 0.0006                       | 7.5188                  | 1544.9                       | 0.133                     | 92.3                     | 252.7                     | 344.9                   | 0.5282                   | 1.8857                  | -87         |
| -86         | 2.20                  | 0.0006                       | 6.8966                  | 1542.1                       | 0.145                     | 93.4                     | 252.1                     | 345.5                   | 0.5344                   | 1.8817                  | -86         |
| -85         | 2.41                  | 0.0006                       | 6.3291                  | 1539.4                       | 0.158                     | 94.6                     | 251.6                     | 346.2                   | 0.5406                   | 1.8778                  | -85         |
| -84         | 2.63                  | 0.0007                       | 5.8480                  | 1536.7                       | 0.171                     | 95.7                     | 251.0                     | 346.8                   | 0.5467                   | 1.8739                  | -84         |
| -83         | 2.86                  | 0.0007                       | 5.4054                  | 1533.9                       | 0.185                     | 96.9                     | 250.5                     | 347.4                   | 0.5528                   | 1.8702                  | -83         |
| -82         | 3.11                  | 0.0007                       | 4.9751                  | 1531.2                       | 0.201                     | 98.0                     | 249.9                     | 348.0                   | 0.5589                   | 1.8665                  | -82         |
| -81         | 3.39                  | 0.0007                       | 4.6083                  | 1528.5                       | 0.217                     | 99.2                     | 249.4                     | 348.6                   | 0.5650                   | 1.8629                  | -81         |
| -80         | 3.68                  | 0.0007                       | 4.2553                  | 1525.7                       | 0.235                     | 100.4                    | 248.8                     | 349.2                   | 0.5710                   | 1.8594                  | -80         |
| -79         | 3.99                  | 0.0007                       | 3.9526                  | 1523.0                       | 0.253                     | 101.5                    | 248.3                     | 349.8                   | 0.5770                   | 1.8559                  | -79         |
| -78         | 4.33                  | 0.0007                       | 3.6630                  | 1520.2                       | 0.273                     | 102.7                    | 247.7                     | 350.4                   | 0.5830                   | 1.8525                  | -78         |
| -77         | 4.69                  | 0.0007                       | 3.3898                  | 1517.5                       | 0.295                     | 103.9                    | 247.2                     | 351.1                   | 0.5890                   | 1.8492                  | -77         |
| -76         | 5.07                  | 0.0007                       | 3.1546                  | 1514.8                       | 0.317                     | 105.0                    | 246.6                     | 351.7                   | 0.5949                   | 1.846                   | -76         |
| -75         | 5.48                  | 0.0007                       | 2.9326                  | 1512.0                       | 0.341                     | 106.2                    | 246.1                     | 352.3                   | 0.6009                   | 1.8428                  | -75         |
| -74         | 5.92                  | 0.0007                       | 2.7248                  | 1509.3                       | 0.367                     | 107.4                    | 245.5                     | 352.9                   | 0.6068                   | 1.8397                  | -74         |
| -73         | 6.39                  | 0.0007                       | 2.5381                  | 1506.5                       | 0.394                     | 108.6                    | 245.0                     | 353.5                   | 0.6126                   | 1.8366                  | -73         |
| -72         | 6.89                  | 0.0007                       | 2.3641                  | 1503.8                       | 0.423                     | 109.7                    | 244.4                     | 354.2                   | 0.6185                   | 1.8336                  | -72         |
| -71         | 7.42                  | 0.0007                       | 2.2075                  | 1501.0                       | 0.453                     | 110.9                    | 243.9                     | 354.8                   | 0.6243                   | 1.8307                  | -71         |
| -70         | 7.98                  | 0.0007                       | 2.0576                  | 1498.3                       | 0.486                     | 112.1                    | 243.3                     | 355.4                   | 0.6302                   | 1.8279                  | -70         |
| -69         | 8.58                  | 0.0007                       | 1.9231                  | 1495.5                       | 0.520                     | 113.3                    | 242.8                     | 356.0                   | 0.6360                   | 1.8251                  | -69         |
| -68         | 9.22                  | 0.0007                       | 1.7986                  | 1492.8                       | 0.556                     | 114.5                    | 242.2                     | 356.6                   | 0.6417                   | 1.8223                  | -68         |
| -67         | 9.89                  | 0.0007                       | 1.6835                  | 1490.0                       | 0.594                     | 115.6                    | 241.6                     | 357.3                   | 0.6475                   | 1.8196                  | -67         |
| -66         | 10.61                 | 0.0007                       | 1.5773                  | 1487.3                       | 0.634                     | 116.8                    | 241.1                     | 357.9                   | 0.6532                   | 1.817                   | -66         |
| -65         | 11.37                 | 0.0007                       | 1.4771                  | 1484.5                       | 0.677                     | 118.0                    | 240.5                     | 358.5                   | 0.6590                   | 1.8144                  | -65         |
| -64         | 12.18                 | 0.0007                       | 1.3850                  | 1481.8                       | 0.722                     | 119.2                    | 239.9                     | 359.2                   | 0.6647                   | 1.8119                  | -64         |
| -63         | 13.03                 | 0.0007                       | 1.3004                  | 1479.0                       | 0.769                     | 120.4                    | 239.4                     | 359.8                   | 0.6704                   | 1.8095                  | -63         |
| -62         | 13.93                 | 0.0007                       | 1.2210                  | 1476.3                       | 0.819                     | 121.6                    | 238.8                     | 360.4                   | 0.6760                   | 1.8071                  | -62         |
| -61         | 14.88                 | 0.0007                       | 1.1481                  | 1473.5                       | 0.871                     | 122.8                    | 238.2                     | 361.0                   | 0.6817                   | 1.8047                  | -61         |
| -60         | 15.89                 | 0.0007                       | 1.0799                  | 1470.7                       | 0.926                     | 124.0                    | 237.7                     | 361.7                   | 0.6873                   | 1.8024                  | -60         |
| -59         | 16.95                 | 0.0007                       | 1.0163                  | 1468.0                       | 0.984                     | 125.2                    | 237.1                     | 362.3                   | 0.6929                   | 1.8001                  | -59         |
| -58         | 18.07                 | 0.0007                       | 0.9579                  | 1465.2                       | 1.044                     | 126.4                    | 236.5                     | 362.9                   | 0.6985                   | 1.7979                  | -58         |
| -57         | 19.25                 | 0.0007                       | 0.9025                  | 1462.4                       | 1.108                     | 127.6                    | 236.0                     | 363.6                   | 0.7041                   | 1.7958                  | -57         |
| -56         | 20.49                 | 0.0007                       | 0.8511                  | 1459.6                       | 1.175                     | 128.8                    | 235.4                     | 364.2                   | 0.7097                   | 1.7937                  | -56         |
| -55         | 21.80                 | 0.0007                       | 0.8032                  | 1456.9                       | 1.245                     | 130.0                    | 234.8                     | 364.8                   | 0.7152                   | 1.7916                  | -55         |
| -54         | 23.17                 | 0.0007                       | 0.7587                  | 1454.1                       | 1.318                     | 131.2                    | 234.2                     | 365.4                   | 0.7208                   | 1.7896                  | -54         |
| -53         | 24.62                 | 0.0007                       | 0.7168                  | 1451.3                       | 1.395                     | 132.4                    | 233.6                     | 366.1                   | 0.7263                   | 1.7876                  | -53         |
| -52         | 26.14                 | 0.0007                       | 0.6775                  | 1448.5                       | 1.476                     | 133.7                    | 233.1                     | 366.7                   | 0.7318                   | 1.7857                  | -52         |
| -51         | 27.73                 | 0.0007                       | 0.6410                  | 1445.7                       | 1.560                     | 134.9                    | 232.5                     | 367.3                   | 0.7373                   | 1.7838                  | -51         |
| -50         | 29.41                 | 0.0007                       | 0.6068                  | 1442.9                       | 1.648                     | 136.1                    | 231.9                     | 368.0                   | 0.7428                   | 1.7819                  | -50         |
| -49         | 31.16                 | 0.0007                       | 0.5747                  | 1440.1                       | 1.740                     | 137.3                    | 231.3                     | 368.6                   | 0.7482                   | 1.7801                  | -49         |
| -48         | 33.00                 | 0.0007                       | 0.5447                  | 1437.3                       | 1.836                     | 138.5                    | 230.7                     | 369.2                   | 0.7537                   | 1.7783                  | -48         |
| -47         | 34.93                 | 0.0007                       | 0.5165                  | 1434.5                       | 1.936                     | 139.8                    | 230.1                     | 369.9                   | 0.7591                   | 1.7766                  | -47         |
| -46         | 36.95                 | 0.0007                       | 0.4902                  | 1431.6                       | 2.040                     | 141.0                    | 229.5                     | 370.5                   | 0.7645                   | 1.7749                  | -46         |
| -45         | 39.06                 | 0.0007                       | 0.4653                  | 1428.8                       | 2.149                     | 142.2                    | 228.9                     | 371.1                   | 0.7699                   | 1.7732                  | -45         |
| -44         | 41.27                 | 0.0007                       | 0.4419                  | 1426.0                       | 2.263                     | 143.5                    | 228.3                     | 371.8                   | 0.7753                   | 1.7716                  | -44         |
| -43         | 43.58                 | 0.0007                       | 0.4198                  | 1423.2                       | 2.382                     | 144.7                    | 227.7                     | 372.4                   | 0.7806                   | 1.77                    | -43         |
| -42         | 45.99                 | 0.0007                       | 0.3992                  | 1420.3                       | 2.505                     | 145.9                    | 227.1                     | 373.0                   | 0.7860                   | 1.7685                  | -42         |
| -41         | 48.51                 | 0.0007                       | 0.3798                  | 1417.5                       | 2.633                     | 147.2                    | 226.5                     | 373.7                   | 0.7913                   | 1.767                   | -41         |

**TABLE 1** (continued)  
**HFC-134a Saturation Properties—Temperature Table**

| TEMP.<br>°C | PRESSURE<br>kPa (abs) | VOLUME<br>m <sup>3</sup> /kg |                         | DENSITY<br>kg/m <sup>3</sup> |                           | ENTHALPY<br>kJ/kg        |                           |                         | ENTROPY<br>kJ/(kg)(K)    |                         | TEMP.<br>°C |
|-------------|-----------------------|------------------------------|-------------------------|------------------------------|---------------------------|--------------------------|---------------------------|-------------------------|--------------------------|-------------------------|-------------|
|             |                       | LIQUID<br>v <sub>f</sub>     | VAPOR<br>v <sub>g</sub> | LIQUID<br>1/v <sub>f</sub>   | VAPOR<br>1/v <sub>g</sub> | LIQUID<br>h <sub>f</sub> | LATENT<br>h <sub>fg</sub> | VAPOR<br>h <sub>g</sub> | LIQUID<br>s <sub>f</sub> | VAPOR<br>s <sub>g</sub> |             |
| -40         | 51.14                 | 0.0007                       | 0.3614                  | 1414.6                       | 2.767                     | 148.4                    | 225.9                     | 374.3                   | 0.7967                   | 1.7655                  | -40         |
| -39         | 53.88                 | 0.0007                       | 0.3441                  | 1411.8                       | 2.906                     | 149.6                    | 225.3                     | 374.9                   | 0.8020                   | 1.7641                  | -39         |
| -38         | 56.74                 | 0.0007                       | 0.3279                  | 1408.9                       | 3.050                     | 150.9                    | 224.7                     | 375.5                   | 0.8073                   | 1.7627                  | -38         |
| -37         | 59.72                 | 0.0007                       | 0.3125                  | 1406.0                       | 3.200                     | 152.1                    | 224.0                     | 376.2                   | 0.8126                   | 1.7613                  | -37         |
| -36         | 62.83                 | 0.0007                       | 0.2980                  | 1403.1                       | 3.356                     | 153.4                    | 223.4                     | 376.8                   | 0.8178                   | 1.7599                  | -36         |
| -35         | 66.07                 | 0.0007                       | 0.2843                  | 1400.2                       | 3.518                     | 154.6                    | 222.8                     | 377.4                   | 0.8231                   | 1.7586                  | -35         |
| -34         | 69.43                 | 0.0007                       | 0.2713                  | 1397.4                       | 3.686                     | 155.9                    | 222.2                     | 378.1                   | 0.8283                   | 1.7573                  | -34         |
| -33         | 72.93                 | 0.0007                       | 0.2590                  | 1394.5                       | 3.861                     | 157.1                    | 221.5                     | 378.7                   | 0.8336                   | 1.7561                  | -33         |
| -32         | 76.58                 | 0.0007                       | 0.2474                  | 1391.5                       | 4.042                     | 158.4                    | 220.9                     | 379.3                   | 0.8388                   | 1.7548                  | -32         |
| -31         | 80.36                 | 0.0007                       | 0.2365                  | 1388.6                       | 4.229                     | 159.7                    | 220.3                     | 379.9                   | 0.8440                   | 1.7536                  | -31         |
| -30         | 84.29                 | 0.0007                       | 0.2260                  | 1385.7                       | 4.424                     | 160.9                    | 219.6                     | 380.6                   | 0.8492                   | 1.7525                  | -30         |
| -29         | 88.37                 | 0.0007                       | 0.2162                  | 1382.8                       | 4.625                     | 162.2                    | 219.0                     | 381.2                   | 0.8544                   | 1.7513                  | -29         |
| -28         | 92.61                 | 0.0007                       | 0.2069                  | 1379.8                       | 4.833                     | 163.5                    | 218.3                     | 381.8                   | 0.8595                   | 1.7502                  | -28         |
| -27         | 97.02                 | 0.0007                       | 0.1981                  | 1376.9                       | 5.049                     | 164.7                    | 217.7                     | 382.4                   | 0.8647                   | 1.7491                  | -27         |
| -26         | 101.58                | 0.0007                       | 0.1896                  | 1373.9                       | 5.273                     | 166.0                    | 217.1                     | 383.1                   | 0.8698                   | 1.7481                  | -26         |
| -25         | 106.32                | 0.0007                       | 0.1817                  | 1371.0                       | 5.504                     | 167.3                    | 216.4                     | 383.7                   | 0.8750                   | 1.747                   | -25         |
| -24         | 111.22                | 0.0007                       | 0.1741                  | 1368.0                       | 5.743                     | 168.6                    | 215.7                     | 384.3                   | 0.8801                   | 1.746                   | -24         |
| -23         | 116.31                | 0.0007                       | 0.1669                  | 1365.0                       | 5.991                     | 169.8                    | 215.1                     | 384.9                   | 0.8852                   | 1.745                   | -23         |
| -22         | 121.57                | 0.0007                       | 0.1601                  | 1362.0                       | 6.247                     | 171.1                    | 214.4                     | 385.5                   | 0.8903                   | 1.744                   | -22         |
| -21         | 127.02                | 0.0007                       | 0.1536                  | 1359.0                       | 6.511                     | 172.4                    | 213.7                     | 386.2                   | 0.8954                   | 1.7431                  | -21         |
| -20         | 132.67                | 0.0007                       | 0.1474                  | 1356.0                       | 6.784                     | 173.7                    | 213.1                     | 386.8                   | 0.9005                   | 1.7422                  | -20         |
| -19         | 138.50                | 0.0007                       | 0.1415                  | 1353.0                       | 7.066                     | 175.0                    | 212.4                     | 387.4                   | 0.9055                   | 1.7413                  | -19         |
| -18         | 144.54                | 0.0007                       | 0.1359                  | 1349.9                       | 7.357                     | 176.3                    | 211.7                     | 388.0                   | 0.9106                   | 1.7404                  | -18         |
| -17         | 150.78                | 0.0007                       | 0.1306                  | 1346.9                       | 7.658                     | 177.6                    | 211.0                     | 388.6                   | 0.9157                   | 1.7395                  | -17         |
| -16         | 157.23                | 0.0007                       | 0.1255                  | 1343.8                       | 7.968                     | 178.9                    | 210.4                     | 389.2                   | 0.9207                   | 1.7387                  | -16         |
| -15         | 163.90                | 0.0007                       | 0.1207                  | 1340.8                       | 8.288                     | 180.2                    | 209.7                     | 389.8                   | 0.9257                   | 1.7379                  | -15         |
| -14         | 170.78                | 0.0007                       | 0.1160                  | 1337.7                       | 8.618                     | 181.5                    | 209.0                     | 390.4                   | 0.9307                   | 1.7371                  | -14         |
| -13         | 177.89                | 0.0007                       | 0.1116                  | 1334.6                       | 8.958                     | 182.8                    | 208.3                     | 391.1                   | 0.9357                   | 1.7363                  | -13         |
| -12         | 185.22                | 0.0008                       | 0.1074                  | 1331.5                       | 9.309                     | 184.1                    | 207.6                     | 391.7                   | 0.9407                   | 1.7356                  | -12         |
| -11         | 192.79                | 0.0008                       | 0.1034                  | 1328.4                       | 9.671                     | 185.4                    | 206.9                     | 392.3                   | 0.9457                   | 1.7348                  | -11         |
| -10         | 200.60                | 0.0008                       | 0.0996                  | 1325.3                       | 10.044                    | 186.7                    | 206.2                     | 392.9                   | 0.9507                   | 1.7341                  | -10         |
| -9          | 208.65                | 0.0008                       | 0.0959                  | 1322.1                       | 10.428                    | 188.0                    | 205.4                     | 393.5                   | 0.9557                   | 1.7334                  | -9          |
| -8          | 216.95                | 0.0008                       | 0.0924                  | 1319.0                       | 10.823                    | 189.3                    | 204.7                     | 394.1                   | 0.9606                   | 1.7327                  | -8          |
| -7          | 225.50                | 0.0008                       | 0.0890                  | 1315.8                       | 11.231                    | 190.7                    | 204.0                     | 394.7                   | 0.9656                   | 1.7321                  | -7          |
| -6          | 234.32                | 0.0008                       | 0.0858                  | 1312.6                       | 11.650                    | 192.0                    | 203.3                     | 395.3                   | 0.9705                   | 1.7314                  | -6          |
| -5          | 243.39                | 0.0008                       | 0.0828                  | 1309.4                       | 12.082                    | 193.3                    | 202.5                     | 395.9                   | 0.9755                   | 1.7308                  | -5          |
| -4          | 252.74                | 0.0008                       | 0.0798                  | 1306.2                       | 12.526                    | 194.6                    | 201.8                     | 396.4                   | 0.9804                   | 1.7302                  | -4          |
| -3          | 262.36                | 0.0008                       | 0.0770                  | 1303.0                       | 12.983                    | 196.0                    | 201.1                     | 397.0                   | 0.9853                   | 1.7295                  | -3          |
| -2          | 272.26                | 0.0008                       | 0.0743                  | 1299.8                       | 13.454                    | 197.3                    | 200.3                     | 397.6                   | 0.9902                   | 1.729                   | -2          |
| -1          | 282.45                | 0.0008                       | 0.0718                  | 1296.5                       | 13.937                    | 198.7                    | 199.6                     | 398.2                   | 0.9951                   | 1.7284                  | -1          |
| 0           | 292.93                | 0.0008                       | 0.0693                  | 1293.3                       | 14.435                    | 200.0                    | 198.8                     | 398.8                   | 1.0000                   | 1.7278                  | 0           |
| 1           | 303.70                | 0.0008                       | 0.0669                  | 1290.0                       | 14.946                    | 201.3                    | 198.0                     | 399.4                   | 1.0049                   | 1.7273                  | 1           |
| 2           | 314.77                | 0.0008                       | 0.0646                  | 1286.7                       | 15.472                    | 202.7                    | 197.3                     | 400.0                   | 1.0098                   | 1.7267                  | 2           |
| 3           | 326.16                | 0.0008                       | 0.0624                  | 1283.4                       | 16.013                    | 204.0                    | 196.5                     | 400.5                   | 1.0146                   | 1.7262                  | 3           |
| 4           | 337.85                | 0.0008                       | 0.0604                  | 1280.1                       | 16.569                    | 205.4                    | 195.7                     | 401.1                   | 1.0195                   | 1.7257                  | 4           |
| 5           | 349.87                | 0.0008                       | 0.0583                  | 1276.7                       | 17.140                    | 206.8                    | 194.9                     | 401.7                   | 1.0244                   | 1.7252                  | 5           |
| 6           | 362.21                | 0.0008                       | 0.0564                  | 1273.4                       | 17.726                    | 208.1                    | 194.2                     | 402.3                   | 1.0292                   | 1.7247                  | 6           |
| 7           | 374.88                | 0.0008                       | 0.0546                  | 1270.0                       | 18.329                    | 209.5                    | 193.4                     | 402.8                   | 1.0340                   | 1.7242                  | 7           |
| 8           | 387.88                | 0.0008                       | 0.0528                  | 1266.6                       | 18.948                    | 210.8                    | 192.6                     | 403.4                   | 1.0389                   | 1.7238                  | 8           |
| 9           | 401.23                | 0.0008                       | 0.0511                  | 1263.2                       | 19.583                    | 212.2                    | 191.8                     | 404.0                   | 1.0437                   | 1.7233                  | 9           |
| 10          | 414.92                | 0.0008                       | 0.0494                  | 1259.8                       | 20.236                    | 213.6                    | 190.9                     | 404.5                   | 1.0485                   | 1.7229                  | 10          |
| 11          | 428.97                | 0.0008                       | 0.0478                  | 1256.3                       | 20.906                    | 215.0                    | 190.1                     | 405.1                   | 1.0533                   | 1.7224                  | 11          |
| 12          | 443.37                | 0.0008                       | 0.0463                  | 1252.9                       | 21.594                    | 216.4                    | 189.3                     | 405.6                   | 1.0582                   | 1.722                   | 12          |
| 13          | 458.11                | 0.0008                       | 0.0448                  | 1249.4                       | 22.301                    | 217.7                    | 188.5                     | 406.2                   | 1.0630                   | 1.7216                  | 13          |
| 14          | 473.25                | 0.0008                       | 0.0434                  | 1245.9                       | 23.026                    | 219.1                    | 187.6                     | 406.8                   | 1.0678                   | 1.7212                  | 14          |
| 15          | 488.78                | 0.0008                       | 0.0421                  | 1242.3                       | 23.770                    | 220.5                    | 186.8                     | 407.3                   | 1.0726                   | 1.7208                  | 15          |
| 16          | 504.68                | 0.0008                       | 0.0408                  | 1238.8                       | 24.533                    | 221.9                    | 185.9                     | 407.8                   | 1.0773                   | 1.7204                  | 16          |
| 17          | 520.98                | 0.0008                       | 0.0395                  | 1235.2                       | 25.317                    | 223.3                    | 185.1                     | 408.4                   | 1.0821                   | 1.72                    | 17          |
| 18          | 537.67                | 0.0008                       | 0.0383                  | 1231.6                       | 26.121                    | 224.7                    | 184.2                     | 408.9                   | 1.0869                   | 1.7196                  | 18          |
| 19          | 554.76                | 0.0008                       | 0.0371                  | 1228.0                       | 26.945                    | 226.1                    | 183.3                     | 409.5                   | 1.0917                   | 1.7192                  | 19          |

**TABLE 1 (continued)**  
**HFC-134a Saturation Properties—Temperature Table**

| TEMP.<br>°C | PRESSURE<br>kPa (abs) | VOLUME<br>m <sup>3</sup> /kg |                         | DENSITY<br>kg/m <sup>3</sup> |                           | ENTHALPY<br>kJ/kg        |                           |                         | ENTROPY<br>kJ/(kg)(K)    |                         | TEMP.<br>°C |
|-------------|-----------------------|------------------------------|-------------------------|------------------------------|---------------------------|--------------------------|---------------------------|-------------------------|--------------------------|-------------------------|-------------|
|             |                       | LIQUID<br>v <sub>f</sub>     | VAPOR<br>v <sub>g</sub> | LIQUID<br>1/v <sub>f</sub>   | VAPOR<br>1/v <sub>g</sub> | LIQUID<br>h <sub>f</sub> | LATENT<br>h <sub>fg</sub> | VAPOR<br>h <sub>g</sub> | LIQUID<br>s <sub>f</sub> | VAPOR<br>s <sub>g</sub> |             |
| 20          | 572.25                | 0.0008                       | 0.0360                  | 1224.4                       | 27.791                    | 227.5                    | 182.5                     | 410.0                   | 1.0964                   | 1.7189                  | 20          |
| 21          | 590.16                | 0.0008                       | 0.0349                  | 1220.7                       | 28.659                    | 228.9                    | 181.6                     | 410.5                   | 1.1012                   | 1.7185                  | 21          |
| 22          | 608.49                | 0.0008                       | 0.0338                  | 1217.0                       | 29.549                    | 230.4                    | 180.7                     | 411.0                   | 1.1060                   | 1.7182                  | 22          |
| 23          | 627.25                | 0.0008                       | 0.0328                  | 1213.3                       | 30.462                    | 231.8                    | 179.8                     | 411.6                   | 1.1107                   | 1.7178                  | 23          |
| 24          | 646.44                | 0.0008                       | 0.0318                  | 1209.6                       | 31.399                    | 233.2                    | 178.9                     | 412.1                   | 1.1155                   | 1.7175                  | 24          |
| 25          | 666.06                | 0.0008                       | 0.0309                  | 1205.9                       | 32.359                    | 234.6                    | 178.0                     | 412.6                   | 1.1202                   | 1.7171                  | 25          |
| 26          | 686.13                | 0.0008                       | 0.0300                  | 1202.1                       | 33.344                    | 236.1                    | 177.0                     | 413.1                   | 1.1250                   | 1.7168                  | 26          |
| 27          | 706.66                | 0.0008                       | 0.0291                  | 1198.3                       | 34.354                    | 237.5                    | 176.1                     | 413.6                   | 1.1297                   | 1.7165                  | 27          |
| 28          | 727.64                | 0.0008                       | 0.0283                  | 1194.4                       | 35.389                    | 238.9                    | 175.2                     | 414.1                   | 1.1345                   | 1.7161                  | 28          |
| 29          | 749.04                | 0.0008                       | 0.0274                  | 1190.6                       | 36.451                    | 240.4                    | 174.2                     | 414.6                   | 1.1392                   | 1.7158                  | 29          |
| 30          | 771.02                | 0.0008                       | 0.0266                  | 1186.7                       | 37.540                    | 241.8                    | 173.3                     | 415.1                   | 1.1439                   | 1.7155                  | 30          |
| 31          | 793.43                | 0.0008                       | 0.0259                  | 1182.8                       | 38.657                    | 243.3                    | 172.3                     | 415.6                   | 1.1487                   | 1.7151                  | 31          |
| 32          | 816.28                | 0.0008                       | 0.0251                  | 1178.8                       | 39.802                    | 244.8                    | 171.3                     | 416.1                   | 1.1534                   | 1.7148                  | 32          |
| 33          | 839.66                | 0.0009                       | 0.0244                  | 1174.9                       | 40.975                    | 246.2                    | 170.3                     | 416.6                   | 1.1581                   | 1.7145                  | 33          |
| 34          | 863.53                | 0.0009                       | 0.0237                  | 1170.8                       | 42.179                    | 247.7                    | 169.3                     | 417.0                   | 1.1628                   | 1.7142                  | 34          |
| 35          | 887.91                | 0.0009                       | 0.0230                  | 1166.8                       | 43.413                    | 249.2                    | 168.3                     | 417.5                   | 1.1676                   | 1.7138                  | 35          |
| 36          | 912.80                | 0.0009                       | 0.0224                  | 1162.7                       | 44.679                    | 250.6                    | 167.3                     | 418.0                   | 1.1723                   | 1.7135                  | 36          |
| 37          | 938.20                | 0.0009                       | 0.0218                  | 1158.6                       | 45.977                    | 252.1                    | 166.3                     | 418.4                   | 1.1770                   | 1.7132                  | 37          |
| 38          | 964.14                | 0.0009                       | 0.0211                  | 1154.5                       | 47.308                    | 253.6                    | 165.3                     | 418.9                   | 1.1817                   | 1.7129                  | 38          |
| 39          | 990.60                | 0.0009                       | 0.0205                  | 1150.3                       | 48.672                    | 255.1                    | 164.2                     | 419.3                   | 1.1864                   | 1.7125                  | 39          |
| 40          | 1017.61               | 0.0009                       | 0.0200                  | 1146.1                       | 50.072                    | 256.6                    | 163.2                     | 419.8                   | 1.1912                   | 1.7122                  | 40          |
| 41          | 1045.16               | 0.0009                       | 0.0194                  | 1141.9                       | 51.508                    | 258.1                    | 162.1                     | 420.2                   | 1.1959                   | 1.7119                  | 41          |
| 42          | 1073.26               | 0.0009                       | 0.0189                  | 1137.6                       | 52.980                    | 259.6                    | 161.0                     | 420.6                   | 1.2006                   | 1.7115                  | 42          |
| 43          | 1101.93               | 0.0009                       | 0.0184                  | 1133.3                       | 54.490                    | 261.1                    | 159.9                     | 421.1                   | 1.2053                   | 1.7112                  | 43          |
| 44          | 1131.16               | 0.0009                       | 0.0178                  | 1128.9                       | 56.040                    | 262.7                    | 158.8                     | 421.5                   | 1.2101                   | 1.7108                  | 44          |
| 45          | 1161.01               | 0.0009                       | 0.0174                  | 1124.5                       | 57.630                    | 264.2                    | 157.7                     | 421.9                   | 1.2148                   | 1.7105                  | 45          |
| 46          | 1191.41               | 0.0009                       | 0.0169                  | 1120.0                       | 59.261                    | 265.7                    | 156.6                     | 422.3                   | 1.2195                   | 1.7101                  | 46          |
| 47          | 1222.41               | 0.0009                       | 0.0164                  | 1115.6                       | 60.934                    | 267.3                    | 155.4                     | 422.7                   | 1.2242                   | 1.7097                  | 47          |
| 48          | 1253.95               | 0.0009                       | 0.0160                  | 1111.0                       | 62.652                    | 268.8                    | 154.3                     | 423.1                   | 1.2290                   | 1.7093                  | 48          |
| 49          | 1286.17               | 0.0009                       | 0.0155                  | 1106.4                       | 64.415                    | 270.4                    | 153.1                     | 423.5                   | 1.2337                   | 1.709                   | 49          |
| 50          | 1319.00               | 0.0009                       | 0.0151                  | 1101.8                       | 66.225                    | 271.9                    | 151.9                     | 423.8                   | 1.2384                   | 1.7086                  | 50          |
| 51          | 1352.44               | 0.0009                       | 0.0147                  | 1097.1                       | 68.084                    | 273.5                    | 150.7                     | 424.2                   | 1.2432                   | 1.7082                  | 51          |
| 52          | 1386.52               | 0.0009                       | 0.0143                  | 1092.4                       | 69.992                    | 275.1                    | 149.5                     | 424.6                   | 1.2479                   | 1.7077                  | 52          |
| 53          | 1421.23               | 0.0009                       | 0.0139                  | 1087.6                       | 71.952                    | 276.6                    | 148.3                     | 424.9                   | 1.2527                   | 1.7073                  | 53          |
| 54          | 1456.58               | 0.0009                       | 0.0135                  | 1082.8                       | 73.966                    | 278.2                    | 147.0                     | 425.3                   | 1.2574                   | 1.7069                  | 54          |
| 55          | 1492.59               | 0.0009                       | 0.0132                  | 1077.9                       | 76.035                    | 279.8                    | 145.8                     | 425.6                   | 1.2622                   | 1.7064                  | 55          |
| 56          | 1529.26               | 0.0009                       | 0.0128                  | 1072.9                       | 78.162                    | 281.4                    | 144.5                     | 425.9                   | 1.2670                   | 1.7059                  | 56          |
| 57          | 1566.61               | 0.0009                       | 0.0124                  | 1067.9                       | 80.348                    | 283.0                    | 143.2                     | 426.2                   | 1.2717                   | 1.7055                  | 57          |
| 58          | 1604.63               | 0.0009                       | 0.0121                  | 1062.8                       | 82.596                    | 284.6                    | 141.9                     | 426.5                   | 1.2765                   | 1.705                   | 58          |
| 59          | 1643.35               | 0.0009                       | 0.0118                  | 1057.7                       | 84.908                    | 286.3                    | 140.5                     | 426.8                   | 1.2813                   | 1.7044                  | 59          |
| 60          | 1682.76               | 0.0010                       | 0.0115                  | 1052.5                       | 87.287                    | 287.9                    | 139.2                     | 427.1                   | 1.2861                   | 1.7039                  | 60          |
| 61          | 1722.88               | 0.0010                       | 0.0111                  | 1047.2                       | 89.735                    | 289.5                    | 137.8                     | 427.4                   | 1.2909                   | 1.7033                  | 61          |
| 62          | 1763.72               | 0.0010                       | 0.0108                  | 1041.8                       | 92.255                    | 291.2                    | 136.4                     | 427.6                   | 1.2957                   | 1.7028                  | 62          |
| 63          | 1805.28               | 0.0010                       | 0.0105                  | 1036.4                       | 94.851                    | 292.9                    | 135.0                     | 427.9                   | 1.3006                   | 1.7021                  | 63          |
| 64          | 1847.47               | 0.0010                       | 0.0103                  | 1030.9                       | 97.526                    | 294.5                    | 133.6                     | 428.1                   | 1.3054                   | 1.7015                  | 64          |
| 65          | 1890.54               | 0.0010                       | 0.0100                  | 1025.3                       | 100.283                   | 296.2                    | 132.1                     | 428.3                   | 1.3102                   | 1.7009                  | 65          |
| 66          | 1934.36               | 0.0010                       | 0.0097                  | 1019.6                       | 103.125                   | 297.9                    | 130.6                     | 428.5                   | 1.3151                   | 1.7002                  | 66          |
| 67          | 1978.94               | 0.0010                       | 0.0094                  | 1013.8                       | 106.058                   | 299.6                    | 129.1                     | 428.7                   | 1.3200                   | 1.6995                  | 67          |
| 68          | 2024.28               | 0.0010                       | 0.0092                  | 1008.0                       | 109.085                   | 301.3                    | 127.5                     | 428.8                   | 1.3249                   | 1.6987                  | 68          |
| 69          | 2070.42               | 0.0010                       | 0.0089                  | 1002.0                       | 112.212                   | 303.0                    | 126.0                     | 429.0                   | 1.3298                   | 1.6979                  | 69          |
| 70          | 2117.34               | 0.0010                       | 0.0087                  | 995.9                        | 115.442                   | 304.8                    | 124.4                     | 429.1                   | 1.3347                   | 1.6971                  | 70          |
| 71          | 2165.08               | 0.0010                       | 0.0084                  | 989.7                        | 118.783                   | 306.5                    | 122.7                     | 429.2                   | 1.3397                   | 1.6963                  | 71          |
| 72          | 2213.63               | 0.0010                       | 0.0082                  | 983.4                        | 122.239                   | 308.3                    | 121.1                     | 429.3                   | 1.3446                   | 1.6954                  | 72          |
| 73          | 2263.01               | 0.0010                       | 0.0079                  | 977.0                        | 125.818                   | 310.1                    | 119.4                     | 429.4                   | 1.3496                   | 1.6945                  | 73          |
| 74          | 2313.23               | 0.0010                       | 0.0077                  | 970.4                        | 129.527                   | 311.8                    | 117.6                     | 429.5                   | 1.3547                   | 1.6935                  | 74          |
| 75          | 2364.31               | 0.0010                       | 0.0075                  | 963.7                        | 133.373                   | 313.7                    | 115.8                     | 429.5                   | 1.3597                   | 1.6924                  | 75          |
| 76          | 2416.25               | 0.0010                       | 0.0073                  | 956.9                        | 137.366                   | 315.5                    | 114.0                     | 429.5                   | 1.3648                   | 1.6913                  | 76          |
| 77          | 2469.08               | 0.0011                       | 0.0071                  | 949.9                        | 141.514                   | 317.3                    | 112.2                     | 429.5                   | 1.3699                   | 1.6902                  | 77          |
| 78          | 2522.79               | 0.0011                       | 0.0069                  | 942.7                        | 145.830                   | 319.2                    | 110.3                     | 429.4                   | 1.3750                   | 1.689                   | 78          |
| 79          | 2577.42               | 0.0011                       | 0.0067                  | 935.4                        | 150.324                   | 321.0                    | 108.3                     | 429.3                   | 1.3801                   | 1.6877                  | 79          |

**TABLE 1** (continued)  
**HFC-134a Saturation Properties—Temperature Table**

| TEMP.<br>°C | PRESSURE<br>kPa (abs) | VOLUME<br>m <sup>3</sup> /kg |                         | DENSITY<br>kg/m <sup>3</sup> |                           | ENTHALPY<br>kJ/kg        |                           |                         | ENTROPY<br>kJ/(kg)(K)    |                         | TEMP.<br>°C |
|-------------|-----------------------|------------------------------|-------------------------|------------------------------|---------------------------|--------------------------|---------------------------|-------------------------|--------------------------|-------------------------|-------------|
|             |                       | LIQUID<br>v <sub>f</sub>     | VAPOR<br>v <sub>g</sub> | LIQUID<br>1/v <sub>f</sub>   | VAPOR<br>1/v <sub>g</sub> | LIQUID<br>h <sub>f</sub> | LATENT<br>h <sub>fg</sub> | VAPOR<br>h <sub>g</sub> | LIQUID<br>s <sub>f</sub> | VAPOR<br>s <sub>g</sub> |             |
| 80          | 2632.97               | 0.0011                       | 0.0065                  | 927.8                        | 155.010                   | 322.9                    | 106.3                     | 429.2                   | 1.3854                   | 1.6863                  | 80          |
| 81          | 2689.46               | 0.0011                       | 0.0063                  | 920.1                        | 159.904                   | 324.9                    | 104.2                     | 429.1                   | 1.3906                   | 1.6849                  | 81          |
| 82          | 2746.90               | 0.0011                       | 0.0061                  | 912.1                        | 165.022                   | 326.8                    | 102.1                     | 428.9                   | 1.3959                   | 1.6834                  | 82          |
| 83          | 2805.31               | 0.0011                       | 0.0059                  | 903.9                        | 170.383                   | 328.8                    | 99.9                      | 428.7                   | 1.4012                   | 1.6818                  | 83          |
| 84          | 2864.70               | 0.0011                       | 0.0057                  | 895.5                        | 176.010                   | 330.7                    | 97.7                      | 428.4                   | 1.4066                   | 1.68                    | 84          |
| 85          | 2925.11               | 0.0011                       | 0.0055                  | 886.7                        | 181.929                   | 332.8                    | 95.3                      | 428.1                   | 1.4121                   | 1.6782                  | 85          |
| 86          | 2986.54               | 0.0011                       | 0.0053                  | 877.6                        | 188.169                   | 334.8                    | 92.9                      | 427.7                   | 1.4176                   | 1.6762                  | 86          |
| 87          | 3049.01               | 0.0012                       | 0.0051                  | 868.2                        | 194.766                   | 336.9                    | 90.4                      | 427.3                   | 1.4232                   | 1.6741                  | 87          |
| 88          | 3112.55               | 0.0012                       | 0.0050                  | 858.4                        | 201.761                   | 339.0                    | 87.7                      | 426.8                   | 1.4289                   | 1.6719                  | 88          |
| 89          | 3177.10               | 0.0012                       | 0.0048                  | 848.1                        | 209.206                   | 341.2                    | 85.0                      | 426.2                   | 1.4347                   | 1.6694                  | 89          |
| 90          | 3242.87               | 0.0012                       | 0.0046                  | 837.3                        | 217.162                   | 343.4                    | 82.1                      | 425.5                   | 1.4406                   | 1.6668                  | 90          |
| 91          | 3309.78               | 0.0012                       | 0.0044                  | 826.0                        | 225.706                   | 345.7                    | 79.1                      | 424.8                   | 1.4466                   | 1.6639                  | 91          |
| 92          | 3377.85               | 0.0012                       | 0.0043                  | 814.0                        | 234.936                   | 348.0                    | 75.9                      | 423.9                   | 1.4528                   | 1.6607                  | 92          |
| 93          | 3447.13               | 0.0012                       | 0.0041                  | 801.1                        | 244.978                   | 350.4                    | 72.5                      | 422.9                   | 1.4592                   | 1.6572                  | 93          |
| 94          | 3517.65               | 0.0013                       | 0.0039                  | 787.4                        | 256.005                   | 353.0                    | 68.9                      | 421.8                   | 1.4658                   | 1.6533                  | 94          |
| 95          | 3589.44               | 0.0013                       | 0.0037                  | 772.3                        | 268.255                   | 355.6                    | 64.9                      | 420.5                   | 1.4727                   | 1.6489                  | 95          |
| 96          | 3662.57               | 0.0013                       | 0.0035                  | 755.8                        | 282.079                   | 358.4                    | 60.5                      | 418.9                   | 1.4799                   | 1.6439                  | 96          |
| 97          | 3737.09               | 0.0014                       | 0.0034                  | 737.1                        | 298.029                   | 361.3                    | 55.7                      | 417.0                   | 1.4877                   | 1.6381                  | 97          |
| 98          | 3813.08               | 0.0014                       | 0.0032                  | 715.4                        | 317.065                   | 364.6                    | 50.0                      | 414.6                   | 1.4963                   | 1.6311                  | 98          |
| 99          | 3890.64               | 0.0015                       | 0.0029                  | 688.6                        | 341.133                   | 368.4                    | 43.2                      | 411.5                   | 1.5061                   | 1.6221                  | 99          |
| 100         | 3969.94               | 0.0015                       | 0.0027                  | 651.4                        | 375.503                   | 373.2                    | 33.8                      | 407.0                   | 1.5187                   | 1.6092                  | 100         |
| 101         | 4051.35               | 0.0018                       | 0.0022                  | 566.4                        | 457.594                   | 383.0                    | 13.0                      | 396.0                   | 1.5447                   | 1.5794                  | 101         |



# **TABLE 2** **HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 10.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 20.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|----------------------------|-------|--------|--------|--------|----------------|---------|----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -66.85     | 0.00067                    | 115.8 | 0.6484 | 1.1863 | 1.5234 | 938.7          | SAT LIQ | 0.00068                    | 128.3 | 0.7075 | 1.2068 | 1.5130 | 887.7          | -56.39     |
| -66.85     | 1.66667                    | 357.4 | 1.8192 | 0.6695 | 1.1477 | 137.7          | SAT VAP | 0.87032                    | 363.9 | 1.7945 | 0.6968 | 1.1466 | 140.3          | -56.39     |
| -65        | 1.68067                    | 358.6 | 1.8252 | 0.6727 | 1.1465 | 138.3          |         | —                          | —     | —      | —      | —      | —              | -65        |
| -60        | 1.72414                    | 362.0 | 1.8413 | 0.6816 | 1.1434 | 139.9          |         | —                          | —     | —      | —      | —      | —              | -60        |
| -55        | 1.76678                    | 365.4 | 1.8572 | 0.6906 | 1.1405 | 141.4          |         | 0.87642                    | 364.9 | 1.7989 | 0.6990 | 1.1456 | 140.7          | -55        |
| -50        | 1.80832                    | 368.9 | 1.8730 | 0.6996 | 1.1378 | 142.9          |         | 0.89767                    | 368.4 | 1.8149 | 0.7071 | 1.1423 | 142.3          | -50        |
| -45        | 1.84843                    | 372.4 | 1.8886 | 0.7087 | 1.1352 | 144.4          |         | 0.91912                    | 372.0 | 1.8306 | 0.7154 | 1.1392 | 143.9          | -45        |
| -40        | 1.89036                    | 376.0 | 1.9040 | 0.7178 | 1.1328 | 145.9          |         | 0.93985                    | 375.6 | 1.8462 | 0.7238 | 1.1364 | 145.4          | -40        |
| -35        | 1.93050                    | 379.6 | 1.9193 | 0.7269 | 1.1304 | 147.4          |         | 0.96061                    | 379.2 | 1.8617 | 0.7323 | 1.1337 | 146.9          | -35        |
| -30        | 1.97239                    | 383.3 | 1.9345 | 0.7360 | 1.1283 | 148.9          |         | 0.98232                    | 382.9 | 1.8770 | 0.7409 | 1.1311 | 148.4          | -30        |
| -25        | 2.01207                    | 387.0 | 1.9496 | 0.7451 | 1.1262 | 150.3          |         | 1.00301                    | 386.6 | 1.8921 | 0.7495 | 1.1288 | 149.8          | -25        |
| -20        | 2.05339                    | 390.7 | 1.9646 | 0.7541 | 1.1242 | 151.7          |         | 1.02354                    | 390.4 | 1.9072 | 0.7582 | 1.1265 | 151.3          | -20        |
| -15        | 2.09644                    | 394.5 | 1.9794 | 0.7632 | 1.1223 | 153.1          |         | 1.04493                    | 394.2 | 1.9221 | 0.7669 | 1.1244 | 152.7          | -15        |
| -10        | 2.13675                    | 398.3 | 1.9941 | 0.7722 | 1.1204 | 154.5          |         | 1.06496                    | 398.1 | 1.9369 | 0.7756 | 1.1224 | 154.1          | -10        |
| -5         | 2.17865                    | 402.2 | 2.0087 | 0.7813 | 1.1187 | 155.9          |         | 1.08578                    | 402.0 | 1.9516 | 0.7843 | 1.1205 | 155.5          | -5         |
| 0          | 2.21729                    | 406.2 | 2.0233 | 0.7902 | 1.1170 | 157.2          |         | 1.10619                    | 405.9 | 1.9661 | 0.7930 | 1.1186 | 156.9          | 0          |
| 5          | 2.26244                    | 410.1 | 2.0377 | 0.7992 | 1.1154 | 158.6          |         | 1.12740                    | 409.9 | 1.9806 | 0.8017 | 1.1169 | 158.3          | 5          |
| 10         | 2.30415                    | 414.1 | 2.0520 | 0.8081 | 1.1139 | 159.9          |         | 1.14811                    | 413.9 | 1.9950 | 0.8104 | 1.1152 | 159.6          | 10         |
| 15         | 2.34192                    | 418.2 | 2.0662 | 0.8169 | 1.1124 | 161.2          |         | 1.16822                    | 418.0 | 2.0092 | 0.8191 | 1.1136 | 161.0          | 15         |
| 20         | 2.38095                    | 422.3 | 2.0803 | 0.8257 | 1.1109 | 162.6          |         | 1.18906                    | 422.1 | 2.0234 | 0.8277 | 1.1121 | 162.3          | 20         |
| 25         | 2.42718                    | 426.5 | 2.0944 | 0.8345 | 1.1095 | 163.9          |         | 1.20919                    | 426.3 | 2.0375 | 0.8363 | 1.1106 | 163.6          | 25         |
| 30         | 2.46305                    | 430.7 | 2.1083 | 0.8432 | 1.1082 | 165.1          |         | 1.23001                    | 430.5 | 2.0514 | 0.8449 | 1.1092 | 164.9          | 30         |
| 35         | 2.50627                    | 434.9 | 2.1222 | 0.8518 | 1.1069 | 166.4          |         | 1.25156                    | 434.7 | 2.0653 | 0.8534 | 1.1078 | 166.2          | 35         |
| 40         | 2.54453                    | 439.2 | 2.1360 | 0.8605 | 1.1056 | 167.7          |         | 1.27226                    | 439.0 | 2.0791 | 0.8619 | 1.1065 | 167.5          | 40         |
| 45         | 2.59067                    | 443.5 | 2.1497 | 0.8690 | 1.1044 | 168.9          |         | 1.29199                    | 443.3 | 2.0929 | 0.8704 | 1.1052 | 168.7          | 45         |
| 50         | 2.63158                    | 447.9 | 2.1633 | 0.8775 | 1.1033 | 170.2          |         | 1.31234                    | 447.7 | 2.1065 | 0.8788 | 1.1040 | 170.0          | 50         |
| 55         | 2.67380                    | 452.3 | 2.1768 | 0.8860 | 1.1021 | 171.4          |         | 1.33333                    | 452.1 | 2.1200 | 0.8871 | 1.1028 | 171.2          | 55         |
| 60         | 2.71003                    | 456.7 | 2.1903 | 0.8943 | 1.1010 | 172.7          |         | 1.35318                    | 456.6 | 2.1335 | 0.8954 | 1.1017 | 172.5          | 60         |
| 65         | 2.75482                    | 461.2 | 2.2037 | 0.9027 | 1.1000 | 173.9          |         | 1.37363                    | 461.1 | 2.1469 | 0.9037 | 1.1006 | 173.7          | 65         |
| 70         | 2.79330                    | 465.8 | 2.2170 | 0.9110 | 1.0989 | 175.1          |         | 1.39470                    | 465.6 | 2.1603 | 0.9119 | 1.0995 | 174.9          | 70         |
| 75         | 2.83286                    | 470.3 | 2.2302 | 0.9192 | 1.0979 | 176.3          |         | 1.41443                    | 470.2 | 2.1735 | 0.9201 | 1.0984 | 176.1          | 75         |
| 80         | 2.87356                    | 474.9 | 2.2434 | 0.9273 | 1.0969 | 177.5          |         | 1.43678                    | 474.8 | 2.1867 | 0.9282 | 1.0974 | 177.3          | 80         |
| 85         | 2.91545                    | 479.6 | 2.2565 | 0.9354 | 1.0960 | 178.7          |         | 1.45560                    | 479.5 | 2.1998 | 0.9362 | 1.0965 | 178.5          | 85         |

  

| TEMP<br>°C | PRESSURE = 30.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 40.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|----------------------------|-------|--------|--------|--------|----------------|---------|----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -49.66     | 0.00069                    | 136.5 | 0.7446 | 1.2205 | 1.5084 | 855.4          | SAT LIQ | 0.00070                    | 142.8 | 0.7722 | 1.2311 | 1.5059 | 831.3          | -44.57     |
| -49.66     | 0.59559                    | 368.2 | 1.7813 | 0.7154 | 1.1468 | 141.8          | SAT VAP | 0.45496                    | 371.4 | 1.7725 | 0.7301 | 1.1475 | 142.8          | -44.57     |
| -45        | 0.60901                    | 371.5 | 1.7961 | 0.7224 | 1.1434 | 143.3          |         | —                          | —     | —      | —      | —      | —              | -45        |
| -40        | 0.62344                    | 375.2 | 1.8118 | 0.7300 | 1.1401 | 144.8          |         | 0.46490                    | 374.8 | 1.7871 | 0.7364 | 1.1440 | 144.3          | -40        |
| -35        | 0.63735                    | 378.8 | 1.8274 | 0.7379 | 1.1370 | 146.4          |         | 0.47574                    | 378.5 | 1.8028 | 0.7437 | 1.1404 | 145.9          | -35        |
| -30        | 0.65189                    | 382.6 | 1.8428 | 0.7459 | 1.1341 | 147.9          |         | 0.48662                    | 382.2 | 1.8183 | 0.7511 | 1.1372 | 147.4          | -30        |
| -25        | 0.66578                    | 386.3 | 1.8581 | 0.7541 | 1.1315 | 149.4          |         | 0.49727                    | 386.0 | 1.8336 | 0.7587 | 1.1342 | 148.9          | -25        |
| -20        | 0.67981                    | 390.1 | 1.8732 | 0.7623 | 1.1289 | 150.9          |         | 0.50787                    | 389.8 | 1.8489 | 0.7665 | 1.1314 | 150.4          | -20        |
| -15        | 0.69396                    | 393.9 | 1.8882 | 0.7707 | 1.1266 | 152.3          |         | 0.51867                    | 393.6 | 1.8639 | 0.7745 | 1.1288 | 151.9          | -15        |
| -10        | 0.70771                    | 397.8 | 1.9031 | 0.7790 | 1.1244 | 153.8          |         | 0.52910                    | 397.5 | 1.8789 | 0.7825 | 1.1264 | 153.4          | -10        |
| -5         | 0.72202                    | 401.7 | 1.9178 | 0.7874 | 1.1223 | 155.2          |         | 0.53967                    | 401.5 | 1.8937 | 0.7906 | 1.1241 | 154.8          | -5         |
| 0          | 0.73584                    | 405.7 | 1.9324 | 0.7959 | 1.1203 | 156.6          |         | 0.55036                    | 405.4 | 1.9083 | 0.7988 | 1.1219 | 156.2          | 0          |
| 5          | 0.74963                    | 409.7 | 1.9470 | 0.8043 | 1.1184 | 158.0          |         | 0.56085                    | 409.4 | 1.9229 | 0.8070 | 1.1199 | 157.7          | 5          |
| 10         | 0.76336                    | 413.7 | 1.9614 | 0.8128 | 1.1166 | 159.3          |         | 0.57110                    | 413.5 | 1.9374 | 0.8152 | 1.1180 | 159.0          | 10         |
| 15         | 0.77760                    | 417.8 | 1.9757 | 0.8213 | 1.1149 | 160.7          |         | 0.58173                    | 417.6 | 1.9517 | 0.8235 | 1.1161 | 160.4          | 15         |
| 20         | 0.79114                    | 421.9 | 1.9899 | 0.8297 | 1.1132 | 162.0          |         | 0.59207                    | 421.7 | 1.9659 | 0.8318 | 1.1144 | 161.8          | 20         |
| 25         | 0.80515                    | 426.1 | 2.0040 | 0.8382 | 1.1117 | 163.4          |         | 0.60241                    | 425.9 | 1.9801 | 0.8401 | 1.1128 | 163.1          | 25         |
| 30         | 0.81900                    | 430.3 | 2.0180 | 0.8466 | 1.1102 | 164.7          |         | 0.61312                    | 430.1 | 1.9941 | 0.8484 | 1.1112 | 164.4          | 30         |
| 35         | 0.83264                    | 434.6 | 2.0319 | 0.8550 | 1.1087 | 166.0          |         | 0.62344                    | 434.4 | 2.0081 | 0.8566 | 1.1097 | 165.7          | 35         |
| 40         | 0.84602                    | 438.9 | 2.0457 | 0.8634 | 1.1073 | 167.3          |         | 0.63371                    | 438.7 | 2.0219 | 0.8649 | 1.1082 | 167.0          | 40         |
| 45         | 0.85985                    | 443.2 | 2.0595 | 0.8717 | 1.1060 | 168.5          |         | 0.64392                    | 443.0 | 2.0357 | 0.8731 | 1.1068 | 168.3          | 45         |
| 50         | 0.87413                    | 447.6 | 2.0731 | 0.8800 | 1.1047 | 169.8          |         | 0.65445                    | 447.4 | 2.0494 | 0.8813 | 1.1055 | 169.6          | 50         |
| 55         | 0.88731                    | 452.0 | 2.0867 | 0.8883 | 1.1035 | 171.1          |         | 0.66489                    | 451.9 | 2.0630 | 0.8895 | 1.1042 | 170.9          | 55         |
| 60         | 0.90171                    | 456.5 | 2.1002 | 0.8965 | 1.1023 | 172.3          |         | 0.67522                    | 456.3 | 2.0765 | 0.8977 | 1.1030 | 172.1          | 60         |
| 65         | 0.91491                    | 461.0 | 2.1136 | 0.9047 | 1.1012 | 173.5          |         | 0.68540                    | 460.8 | 2.0899 | 0.9058 | 1.1018 | 173.4          | 65         |
| 70         | 0.92851                    | 465.5 | 2.1270 | 0.9129 | 1.1001 | 174.8          |         | 0.69589                    | 465.4 | 2.1033 | 0.9138 | 1.1006 | 174.6          | 70         |
| 75         | 0.94251                    | 470.1 | 2.1402 | 0.9210 | 1.0990 | 176.0          |         | 0.70621                    | 470.0 | 2.1165 | 0.9219 | 1.0995 | 175.8          | 75         |
| 80         | 0.95602                    | 474.7 | 2.1534 | 0.9290 | 1.0979 | 177.2          |         | 0.71633                    | 474.6 | 2.1297 | 0.9299 | 1.0985 | 177.0          | 80         |
| 85         | 0.96993                    | 479.4 | 2.1665 | 0.9370 | 1.0969 | 178.4          |         | 0.72674                    | 479.3 | 2.1429 | 0.9378 | 1.0974 | 178.2          | 85         |
| 90         | 0.98328                    | 484.1 | 2.1796 | 0.9449 | 1.0960 | 179.6          |         | 0.73692                    | 484.0 | 2.1559 | 0.9457 | 1.0964 | 179.4          | 90         |
| 95         | 0.99701                    | 488.8 | 2.1925 | 0.9528 | 1.0950 | 180.7          |         | 0.74738                    | 488.7 | 2.1689 | 0.9535 | 1.0954 | 180.6          | 95         |
| 100        | 1.01112                    | 493.6 | 2.2054 | 0.9607 | 1.0941 | 181.9          |         | 0.75758                    | 493.5 | 2.1818 | 0.9613 | 1.0945 | 181.8          | 100        |
| 105        | 1.02459                    | 498.4 | 2.2183 | 0.9685 | 1.0932 | 183.1          |         | 0.76805                    | 498.3 | 2.1947 | 0.9691 | 1.0936 | 183.0          | 105        |
| 110        | —                          | —     | —      | —      | —      | —              |         | 0.77821                    | 503.2 | 2.2074 | 0.9768 | 1.0927 | 184.1          | 110        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 50.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 60.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|----------------------------|-------|--------|--------|--------|----------------|---------|----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -40.43     | 0.00071                    | 147.9 | 0.7944 | 1.2399 | 1.5046 | 811.8          | SAT LIQ | 0.00071                    | 152.2 | 0.8130 | 1.2476 | 1.5040 | 795.3          | -36.91     |
| -40.43     | 0.36914                    | 374.0 | 1.7661 | 0.7424 | 1.1483 | 143.6          | SAT VAP | 0.31114                    | 376.2 | 1.7611 | 0.7533 | 1.1493 | 144.2          | -36.91     |
| -40        | 0.36982                    | 374.3 | 1.7675 | 0.7430 | 1.1480 | 143.7          |         | —                          | —     | —      | —      | —      | —              | -40        |
| -35        | 0.37864                    | 378.1 | 1.7833 | 0.7495 | 1.1440 | 145.3          |         | 0.31397                    | 377.7 | 1.7672 | 0.7555 | 1.1477 | 144.8          | -35        |
| -30        | 0.38745                    | 381.8 | 1.7990 | 0.7564 | 1.1404 | 146.9          |         | 0.32134                    | 381.5 | 1.7830 | 0.7618 | 1.1436 | 146.4          | -30        |
| -25        | 0.39604                    | 385.6 | 1.8144 | 0.7635 | 1.1370 | 148.5          |         | 0.32873                    | 385.3 | 1.7986 | 0.7683 | 1.1400 | 148.0          | -25        |
| -20        | 0.40469                    | 389.5 | 1.8297 | 0.7708 | 1.1340 | 150.0          |         | 0.33591                    | 389.2 | 1.8140 | 0.7752 | 1.1366 | 149.6          | -20        |
| -15        | 0.41339                    | 393.3 | 1.8449 | 0.7784 | 1.1311 | 151.5          |         | 0.34317                    | 393.0 | 1.8292 | 0.7823 | 1.1334 | 151.1          | -15        |
| -10        | 0.42194                    | 397.3 | 1.8599 | 0.7860 | 1.1284 | 153.0          |         | 0.35039                    | 397.0 | 1.8443 | 0.7896 | 1.1306 | 152.6          | -10        |
| -5         | 0.43048                    | 401.2 | 1.8748 | 0.7938 | 1.1260 | 154.5          |         | 0.35753                    | 400.9 | 1.8592 | 0.7971 | 1.1279 | 154.1          | -5         |
| 0          | 0.43898                    | 405.2 | 1.8895 | 0.8017 | 1.1236 | 155.9          |         | 0.36470                    | 404.9 | 1.8740 | 0.8047 | 1.1254 | 155.6          | 0          |
| 5          | 0.44743                    | 409.2 | 1.9041 | 0.8097 | 1.1215 | 157.3          |         | 0.37189                    | 409.0 | 1.8887 | 0.8124 | 1.1230 | 157.0          | 5          |
| 10         | 0.45579                    | 413.3 | 1.9186 | 0.8177 | 1.1194 | 158.7          |         | 0.37893                    | 413.1 | 1.9032 | 0.8202 | 1.1208 | 158.4          | 10         |
| 15         | 0.46425                    | 417.4 | 1.9330 | 0.8257 | 1.1175 | 160.1          |         | 0.38595                    | 417.2 | 1.9176 | 0.8280 | 1.1188 | 159.8          | 15         |
| 20         | 0.47259                    | 421.5 | 1.9473 | 0.8338 | 1.1156 | 161.5          |         | 0.39308                    | 421.3 | 1.9319 | 0.8359 | 1.1168 | 161.2          | 20         |
| 25         | 0.48100                    | 425.7 | 1.9614 | 0.8420 | 1.1139 | 162.8          |         | 0.40000                    | 425.5 | 1.9461 | 0.8439 | 1.1150 | 162.6          | 25         |
| 30         | 0.48948                    | 430.0 | 1.9755 | 0.8501 | 1.1122 | 164.2          |         | 0.40700                    | 429.8 | 1.9602 | 0.8519 | 1.1132 | 163.9          | 30         |
| 35         | 0.49776                    | 434.2 | 1.9895 | 0.8582 | 1.1106 | 165.5          |         | 0.41408                    | 434.1 | 1.9742 | 0.8599 | 1.1116 | 165.3          | 35         |
| 40         | 0.50607                    | 438.5 | 2.0034 | 0.8664 | 1.1091 | 166.8          |         | 0.42105                    | 438.4 | 1.9881 | 0.8679 | 1.1100 | 166.6          | 40         |
| 45         | 0.51440                    | 442.9 | 2.0172 | 0.8745 | 1.1076 | 168.1          |         | 0.42808                    | 442.7 | 2.0020 | 0.8759 | 1.1085 | 167.9          | 45         |
| 50         | 0.52274                    | 447.3 | 2.0309 | 0.8826 | 1.1062 | 169.4          |         | 0.43497                    | 447.1 | 2.0157 | 0.8839 | 1.1070 | 169.2          | 50         |
| 55         | 0.53107                    | 451.7 | 2.0445 | 0.8907 | 1.1049 | 170.7          |         | 0.44189                    | 451.6 | 2.0293 | 0.8919 | 1.1056 | 170.5          | 55         |
| 60         | 0.53937                    | 456.2 | 2.0580 | 0.8988 | 1.1036 | 171.9          |         | 0.44883                    | 456.1 | 2.0429 | 0.8999 | 1.1043 | 171.8          | 60         |
| 65         | 0.54765                    | 460.7 | 2.0715 | 0.9068 | 1.1024 | 173.2          |         | 0.45579                    | 460.6 | 2.0563 | 0.9079 | 1.1030 | 173.0          | 65         |
| 70         | 0.55586                    | 465.3 | 2.0848 | 0.9148 | 1.1012 | 174.4          |         | 0.46275                    | 465.1 | 2.0697 | 0.9158 | 1.1018 | 174.3          | 70         |
| 75         | 0.56402                    | 469.9 | 2.0981 | 0.9228 | 1.1001 | 175.7          |         | 0.46970                    | 469.7 | 2.0830 | 0.9237 | 1.1006 | 175.5          | 75         |
| 80         | 0.57241                    | 474.5 | 2.1113 | 0.9307 | 1.0990 | 176.9          |         | 0.47642                    | 474.4 | 2.0962 | 0.9316 | 1.0995 | 176.7          | 80         |
| 85         | 0.58072                    | 479.2 | 2.1245 | 0.9386 | 1.0979 | 178.1          |         | 0.48356                    | 479.1 | 2.1094 | 0.9394 | 1.0984 | 177.9          | 85         |
| 90         | 0.58893                    | 483.9 | 2.1375 | 0.9464 | 1.0969 | 179.3          |         | 0.49020                    | 483.8 | 2.1225 | 0.9472 | 1.0973 | 179.1          | 90         |
| 95         | 0.59737                    | 488.6 | 2.1505 | 0.9543 | 1.0959 | 180.5          |         | 0.49727                    | 488.5 | 2.1355 | 0.9550 | 1.0963 | 180.3          | 95         |
| 100        | 0.60533                    | 493.4 | 2.1635 | 0.9620 | 1.0949 | 181.7          |         | 0.50403                    | 493.3 | 2.1484 | 0.9627 | 1.0953 | 181.5          | 100        |
| 105        | 0.61387                    | 498.3 | 2.1763 | 0.9697 | 1.0940 | 182.8          |         | 0.51099                    | 498.2 | 2.1613 | 0.9703 | 1.0944 | 182.7          | 105        |
| 110        | 0.62189                    | 503.1 | 2.1891 | 0.9774 | 1.0931 | 184.0          |         | 0.51787                    | 503.0 | 2.1741 | 0.9780 | 1.0934 | 183.9          | 110        |
| 115        | —                          | —     | —      | —      | —      | —              |         | 0.52466                    | 507.9 | 2.1868 | 0.9855 | 1.0925 | 185.0          | 115        |

  

| TEMP<br>°C | PRESSURE = 70.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 80.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|----------------------------|-------|--------|--------|--------|----------------|---------|----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -33.83     | 0.00072                    | 156.1 | 0.8292 | 1.2544 | 1.5038 | 781.0          | SAT LIQ | 0.00072                    | 159.5 | 0.8435 | 1.2606 | 1.5038 | 768.3          | -31.09     |
| -33.83     | 0.26918                    | 378.2 | 1.7571 | 0.7630 | 1.1504 | 144.6          | SAT VAP | 0.23747                    | 379.9 | 1.7538 | 0.7718 | 1.1515 | 145.0          | -31.09     |
| -30        | 0.27412                    | 381.1 | 1.7693 | 0.7673 | 1.1470 | 145.9          |         | 0.23872                    | 380.7 | 1.7572 | 0.7729 | 1.1505 | 145.4          | -30        |
| -25        | 0.28050                    | 385.0 | 1.7850 | 0.7733 | 1.1430 | 147.6          |         | 0.24438                    | 384.6 | 1.7730 | 0.7783 | 1.1460 | 147.1          | -25        |
| -20        | 0.28678                    | 388.8 | 1.8004 | 0.7797 | 1.1392 | 149.1          |         | 0.24994                    | 388.5 | 1.7886 | 0.7842 | 1.1420 | 148.7          | -20        |
| -15        | 0.29308                    | 392.7 | 1.8158 | 0.7863 | 1.1359 | 150.7          |         | 0.25549                    | 392.4 | 1.8040 | 0.7904 | 1.1383 | 150.3          | -15        |
| -10        | 0.29931                    | 396.7 | 1.8309 | 0.7932 | 1.1327 | 152.2          |         | 0.26103                    | 396.4 | 1.8192 | 0.7969 | 1.1349 | 151.9          | -10        |
| -5         | 0.30553                    | 400.7 | 1.8459 | 0.8004 | 1.1298 | 153.8          |         | 0.26645                    | 400.4 | 1.8343 | 0.8037 | 1.1318 | 153.4          | -5         |
| 0          | 0.31172                    | 404.7 | 1.8608 | 0.8077 | 1.1271 | 155.2          |         | 0.27196                    | 404.5 | 1.8492 | 0.8107 | 1.1290 | 154.9          | 0          |
| 5          | 0.31786                    | 408.8 | 1.8755 | 0.8151 | 1.1246 | 156.7          |         | 0.27732                    | 408.5 | 1.8640 | 0.8179 | 1.1263 | 156.4          | 5          |
| 10         | 0.32394                    | 412.9 | 1.8901 | 0.8227 | 1.1223 | 158.1          |         | 0.28273                    | 412.6 | 1.8786 | 0.8252 | 1.1238 | 157.8          | 10         |
| 15         | 0.33003                    | 417.0 | 1.9045 | 0.8303 | 1.1201 | 159.6          |         | 0.28810                    | 416.8 | 1.8931 | 0.8326 | 1.1215 | 159.3          | 15         |
| 20         | 0.33613                    | 421.2 | 1.9189 | 0.8380 | 1.1180 | 161.0          |         | 0.29343                    | 421.0 | 1.9075 | 0.8402 | 1.1193 | 160.7          | 20         |
| 25         | 0.34211                    | 425.4 | 1.9331 | 0.8458 | 1.1161 | 162.3          |         | 0.29878                    | 425.2 | 1.9218 | 0.8478 | 1.1172 | 162.1          | 25         |
| 30         | 0.34819                    | 429.6 | 1.9473 | 0.8537 | 1.1143 | 163.7          |         | 0.30404                    | 429.4 | 1.9359 | 0.8555 | 1.1153 | 163.5          | 30         |
| 35         | 0.35423                    | 433.9 | 1.9613 | 0.8615 | 1.1125 | 165.0          |         | 0.30941                    | 433.7 | 1.9500 | 0.8632 | 1.1135 | 164.8          | 35         |
| 40         | 0.36023                    | 438.2 | 1.9752 | 0.8694 | 1.1109 | 166.4          |         | 0.31466                    | 438.1 | 1.9640 | 0.8709 | 1.1118 | 166.2          | 40         |
| 45         | 0.36630                    | 442.6 | 1.9890 | 0.8773 | 1.1093 | 167.7          |         | 0.32000                    | 442.4 | 1.9778 | 0.8787 | 1.1101 | 167.5          | 45         |
| 50         | 0.37230                    | 447.0 | 2.0028 | 0.8852 | 1.1078 | 169.0          |         | 0.32520                    | 446.9 | 1.9916 | 0.8865 | 1.1085 | 168.8          | 50         |
| 55         | 0.37821                    | 451.4 | 2.0164 | 0.8931 | 1.1063 | 170.3          |         | 0.33047                    | 451.3 | 2.0053 | 0.8944 | 1.1071 | 170.1          | 55         |
| 60         | 0.38417                    | 455.9 | 2.0300 | 0.9010 | 1.1050 | 171.6          |         | 0.33568                    | 455.8 | 2.0188 | 0.9022 | 1.1056 | 171.4          | 60         |
| 65         | 0.39017                    | 460.5 | 2.0435 | 0.9089 | 1.1036 | 172.8          |         | 0.34095                    | 460.3 | 2.0323 | 0.9100 | 1.1043 | 172.7          | 65         |
| 70         | 0.39620                    | 465.0 | 2.0569 | 0.9168 | 1.1024 | 174.1          |         | 0.34614                    | 464.9 | 2.0457 | 0.9178 | 1.1030 | 173.9          | 70         |
| 75         | 0.40209                    | 469.6 | 2.0702 | 0.9246 | 1.1012 | 175.3          |         | 0.35137                    | 469.5 | 2.0591 | 0.9255 | 1.1017 | 175.2          | 75         |
| 80         | 0.40800                    | 474.3 | 2.0834 | 0.9324 | 1.1000 | 176.6          |         | 0.35663                    | 474.2 | 2.0723 | 0.9333 | 1.1005 | 176.4          | 80         |
| 85         | 0.41391                    | 478.9 | 2.0966 | 0.9402 | 1.0989 | 177.8          |         | 0.36179                    | 478.8 | 2.0855 | 0.9410 | 1.0994 | 177.6          | 85         |
| 90         | 0.41982                    | 483.7 | 2.1097 | 0.9480 | 1.0978 | 179.0          |         | 0.36697                    | 483.6 | 2.0986 | 0.9487 | 1.0982 | 178.9          | 90         |
| 95         | 0.42589                    | 488.4 | 2.1227 | 0.9557 | 1.0967 | 180.2          |         | 0.37216                    | 488.3 | 2.1116 | 0.9564 | 1.0972 | 180.1          | 95         |
| 100        | 0.43178                    | 493.2 | 2.1357 | 0.9633 | 1.0957 | 181.4          |         | 0.37736                    | 493.1 | 2.1246 | 0.9640 | 1.0961 | 181.3          | 100        |
| 105        | 0.43764                    | 498.1 | 2.1485 | 0.9710 | 1.0948 | 182.6          |         | 0.38256                    | 498.0 | 2.1375 | 0.9716 | 1.0951 | 182.5          | 105        |
| 110        | 0.44346                    | 502.9 | 2.1613 | 0.9786 | 1.0938 | 183.8          |         | 0.38775                    | 502.8 | 2.1503 | 0.9792 | 1.0942 | 183.6          | 110        |
| 115        | 0.44944                    | 507.8 | 2.1741 | 0.9861 | 1.0929 | 184.9          |         | 0.39293                    | 507.8 | 2.1630 | 0.9867 | 1.0932 | 184.8          | 115        |
| 120        | 0.45537                    | 512.8 | 2.1867 | 0.9936 | 1.0920 | 186.1          |         | 0.39809                    | 512.7 | 2.1757 | 0.9941 | 1.0923 | 186.0          | 120        |

**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 90.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 100.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -28.61     | 0.00072                    | 162.7 | 0.8564 | 1.2662 | 1.5041 | 756.7          | SAT LIQ | 0.00073                     | 165.6 | 0.8681 | 1.2715 | 1.5046 | 746.2          | -26.34     |
| -28.61     | 0.21254                    | 381.4 | 1.7509 | 0.7800 | 1.1527 | 145.4          | SAT VAP | 0.19246                     | 382.8 | 1.7484 | 0.7876 | 1.1539 | 145.7          | -26.34     |
| -25        | 0.21622                    | 384.3 | 1.7624 | 0.7835 | 1.1492 | 146.6          |         | 0.19372                     | 383.9 | 1.7527 | 0.7888 | 1.1525 | 146.1          | -25        |
| -20        | 0.22129                    | 388.2 | 1.7780 | 0.7888 | 1.1448 | 148.3          |         | 0.19829                     | 387.9 | 1.7685 | 0.7935 | 1.1477 | 147.8          | -20        |
| -15        | 0.22624                    | 392.1 | 1.7935 | 0.7946 | 1.1408 | 149.9          |         | 0.20284                     | 391.8 | 1.7840 | 0.7988 | 1.1434 | 149.5          | -15        |
| -10        | 0.23121                    | 396.1 | 1.8088 | 0.8007 | 1.1372 | 151.5          |         | 0.20734                     | 395.8 | 1.7994 | 0.8045 | 1.1395 | 151.1          | -10        |
| -5         | 0.23613                    | 400.2 | 1.8240 | 0.8071 | 1.1339 | 153.0          |         | 0.21182                     | 399.9 | 1.8146 | 0.8106 | 1.1359 | 152.7          | -5         |
| 0          | 0.24102                    | 404.2 | 1.8389 | 0.8138 | 1.1308 | 154.5          |         | 0.21626                     | 404.0 | 1.8297 | 0.8169 | 1.1327 | 154.2          | 0          |
| 5          | 0.24588                    | 408.3 | 1.8538 | 0.8207 | 1.1279 | 156.0          |         | 0.22065                     | 408.1 | 1.8445 | 0.8235 | 1.1296 | 155.7          | 5          |
| 10         | 0.25069                    | 412.4 | 1.8684 | 0.8278 | 1.1253 | 157.5          |         | 0.22502                     | 412.2 | 1.8593 | 0.8304 | 1.1269 | 157.2          | 10         |
| 15         | 0.25549                    | 416.6 | 1.8830 | 0.8350 | 1.1229 | 159.0          |         | 0.22941                     | 416.4 | 1.8739 | 0.8373 | 1.1243 | 158.7          | 15         |
| 20         | 0.26028                    | 420.8 | 1.8974 | 0.8423 | 1.1206 | 160.4          |         | 0.23370                     | 420.6 | 1.8883 | 0.8445 | 1.1218 | 160.1          | 20         |
| 25         | 0.26504                    | 425.0 | 1.9117 | 0.8498 | 1.1184 | 161.8          |         | 0.23804                     | 424.8 | 1.9027 | 0.8517 | 1.1196 | 161.6          | 25         |
| 30         | 0.26976                    | 429.3 | 1.9259 | 0.8573 | 1.1164 | 163.2          |         | 0.24231                     | 429.1 | 1.9169 | 0.8591 | 1.1175 | 163.0          | 30         |
| 35         | 0.27450                    | 433.6 | 1.9400 | 0.8649 | 1.1145 | 164.6          |         | 0.24661                     | 433.4 | 1.9310 | 0.8665 | 1.1155 | 164.3          | 35         |
| 40         | 0.27925                    | 437.9 | 1.9540 | 0.8725 | 1.1127 | 165.9          |         | 0.25088                     | 437.7 | 1.9450 | 0.8741 | 1.1136 | 165.7          | 40         |
| 45         | 0.28393                    | 442.3 | 1.9679 | 0.8802 | 1.1110 | 167.3          |         | 0.25517                     | 442.1 | 1.9589 | 0.8816 | 1.1118 | 167.1          | 45         |
| 50         | 0.28860                    | 446.7 | 1.9816 | 0.8879 | 1.1093 | 168.6          |         | 0.25940                     | 446.6 | 1.9727 | 0.8892 | 1.1101 | 168.4          | 50         |
| 55         | 0.29334                    | 451.2 | 1.9953 | 0.8956 | 1.1078 | 169.9          |         | 0.26364                     | 451.0 | 1.9864 | 0.8968 | 1.1085 | 169.7          | 55         |
| 60         | 0.29797                    | 455.7 | 2.0089 | 0.9033 | 1.1063 | 171.2          |         | 0.26788                     | 455.5 | 2.0001 | 0.9045 | 1.1070 | 171.0          | 60         |
| 65         | 0.30266                    | 460.2 | 2.0225 | 0.9110 | 1.1049 | 172.5          |         | 0.27203                     | 460.1 | 2.0136 | 0.9121 | 1.1055 | 172.3          | 65         |
| 70         | 0.30731                    | 464.8 | 2.0359 | 0.9188 | 1.1036 | 173.8          |         | 0.27624                     | 464.7 | 2.0270 | 0.9198 | 1.1042 | 173.6          | 70         |
| 75         | 0.31201                    | 469.4 | 2.0492 | 0.9265 | 1.1023 | 175.0          |         | 0.28043                     | 469.3 | 2.0404 | 0.9274 | 1.1028 | 174.9          | 75         |
| 80         | 0.31666                    | 474.0 | 2.0625 | 0.9342 | 1.1010 | 176.3          |         | 0.28466                     | 473.9 | 2.0537 | 0.9350 | 1.1016 | 176.1          | 80         |
| 85         | 0.32123                    | 478.7 | 2.0757 | 0.9418 | 1.0999 | 177.5          |         | 0.28885                     | 478.6 | 2.0669 | 0.9427 | 1.1004 | 177.4          | 85         |
| 90         | 0.32595                    | 483.5 | 2.0888 | 0.9495 | 1.0987 | 178.7          |         | 0.29300                     | 483.4 | 2.0800 | 0.9503 | 1.0992 | 178.6          | 90         |
| 95         | 0.33058                    | 488.2 | 2.1018 | 0.9571 | 1.0976 | 179.9          |         | 0.29718                     | 488.1 | 2.0930 | 0.9578 | 1.0981 | 179.8          | 95         |
| 100        | 0.33523                    | 493.0 | 2.1148 | 0.9647 | 1.0966 | 181.1          |         | 0.30139                     | 492.9 | 2.1060 | 0.9654 | 1.0970 | 181.0          | 100        |
| 105        | 0.33979                    | 497.9 | 2.1277 | 0.9722 | 1.0955 | 182.3          |         | 0.30553                     | 497.8 | 2.1189 | 0.9729 | 1.0959 | 182.2          | 105        |
| 110        | 0.34447                    | 502.8 | 2.1405 | 0.9798 | 1.0946 | 183.5          |         | 0.30969                     | 502.7 | 2.1318 | 0.9804 | 1.0949 | 183.4          | 110        |
| 115        | 0.34904                    | 507.7 | 2.1533 | 0.9872 | 1.0936 | 184.7          |         | 0.31387                     | 507.6 | 2.1445 | 0.9878 | 1.0940 | 184.6          | 115        |
| 120        | 0.35361                    | 512.6 | 2.1659 | 0.9947 | 1.0927 | 185.9          |         | 0.31797                     | 512.5 | 2.1572 | 0.9952 | 1.0930 | 185.8          | 120        |
| 125        | 0.35817                    | 517.6 | 2.1786 | 1.0021 | 1.0918 | 187.0          |         | 0.32216                     | 517.5 | 2.1698 | 1.0026 | 1.0921 | 186.9          | 125        |

  

| TEMP<br>°C | PRESSURE = 101.325 kPa (abs) |       |        |        |        |                |         | PRESSURE = 110.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -26.06     | 0.00073                      | 165.9 | 0.8696 | 1.2722 | 1.5046 | 744.9          | SAT LIQ | 0.00073                     | 168.2 | 0.8788 | 1.2765 | 1.5051 | 736.6          | -24.25     |
| -26.06     | 0.19011                      | 383.0 | 1.7481 | 0.7886 | 1.1540 | 145.7          | SAT VAP | 0.17593                     | 384.1 | 1.7462 | 0.7948 | 1.1551 | 145.9          | -24.25     |
| -25        | 0.19106                      | 383.9 | 1.7515 | 0.7895 | 1.1530 | 146.1          |         | —                           | —     | —      | —      | —      | —              | -25        |
| -20        | 0.19562                      | 387.8 | 1.7673 | 0.7942 | 1.1481 | 147.7          |         | 0.17953                     | 387.5 | 1.7597 | 0.7984 | 1.1507 | 147.4          | -20        |
| -15        | 0.20012                      | 391.8 | 1.7829 | 0.7994 | 1.1438 | 149.4          |         | 0.18369                     | 391.5 | 1.7754 | 0.8031 | 1.1461 | 149.0          | -15        |
| -10        | 0.20454                      | 395.8 | 1.7982 | 0.8050 | 1.1398 | 151.0          |         | 0.18783                     | 395.6 | 1.7908 | 0.8084 | 1.1419 | 150.7          | -10        |
| -5         | 0.20894                      | 399.9 | 1.8135 | 0.8110 | 1.1362 | 152.6          |         | 0.19194                     | 399.6 | 1.8061 | 0.8141 | 1.1381 | 152.3          | -5         |
| 0          | 0.21336                      | 403.9 | 1.8285 | 0.8173 | 1.1329 | 154.2          |         | 0.19600                     | 403.7 | 1.8212 | 0.8201 | 1.1346 | 153.9          | 0          |
| 5          | 0.21768                      | 408.0 | 1.8434 | 0.8239 | 1.1299 | 155.7          |         | 0.20004                     | 407.8 | 1.8361 | 0.8264 | 1.1314 | 155.4          | 5          |
| 10         | 0.22202                      | 412.2 | 1.8581 | 0.8307 | 1.1271 | 157.2          |         | 0.20404                     | 412.0 | 1.8509 | 0.8330 | 1.1284 | 156.9          | 10         |
| 15         | 0.22630                      | 416.3 | 1.8727 | 0.8377 | 1.1244 | 158.6          |         | 0.20803                     | 416.2 | 1.8656 | 0.8397 | 1.1257 | 158.4          | 15         |
| 20         | 0.23057                      | 420.5 | 1.8872 | 0.8448 | 1.1220 | 160.1          |         | 0.21200                     | 420.4 | 1.8801 | 0.8467 | 1.1231 | 159.9          | 20         |
| 25         | 0.23485                      | 424.8 | 1.9015 | 0.8520 | 1.1197 | 161.5          |         | 0.21598                     | 424.6 | 1.8945 | 0.8538 | 1.1208 | 161.3          | 25         |
| 30         | 0.23906                      | 429.1 | 1.9158 | 0.8594 | 1.1176 | 162.9          |         | 0.21988                     | 428.9 | 1.9087 | 0.8610 | 1.1186 | 162.7          | 30         |
| 35         | 0.24331                      | 433.4 | 1.9299 | 0.8668 | 1.1156 | 164.3          |         | 0.22376                     | 433.2 | 1.9228 | 0.8683 | 1.1165 | 164.1          | 35         |
| 40         | 0.24759                      | 437.7 | 1.9439 | 0.8743 | 1.1137 | 165.7          |         | 0.22769                     | 437.6 | 1.9369 | 0.8756 | 1.1145 | 165.5          | 40         |
| 45         | 0.25176                      | 442.1 | 1.9578 | 0.8818 | 1.1119 | 167.0          |         | 0.23154                     | 442.0 | 1.9508 | 0.8831 | 1.1127 | 166.9          | 45         |
| 50         | 0.25595                      | 446.5 | 1.9716 | 0.8894 | 1.1102 | 168.4          |         | 0.23546                     | 446.4 | 1.9646 | 0.8905 | 1.1109 | 168.2          | 50         |
| 55         | 0.26015                      | 451.0 | 1.9853 | 0.8970 | 1.1086 | 169.7          |         | 0.23929                     | 450.9 | 1.9784 | 0.8981 | 1.1093 | 169.5          | 55         |
| 60         | 0.26427                      | 455.5 | 1.9989 | 0.9046 | 1.1071 | 171.0          |         | 0.24313                     | 455.4 | 1.9920 | 0.9056 | 1.1077 | 170.8          | 60         |
| 65         | 0.26846                      | 460.1 | 2.0125 | 0.9123 | 1.1056 | 172.3          |         | 0.24697                     | 459.9 | 2.0055 | 0.9132 | 1.1062 | 172.1          | 65         |
| 70         | 0.27263                      | 464.6 | 2.0259 | 0.9199 | 1.1042 | 173.6          |         | 0.25088                     | 464.5 | 2.0190 | 0.9208 | 1.1048 | 173.4          | 70         |
| 75         | 0.27678                      | 469.3 | 2.0393 | 0.9275 | 1.1029 | 174.8          |         | 0.25465                     | 469.2 | 2.0324 | 0.9283 | 1.1034 | 174.7          | 75         |
| 80         | 0.28090                      | 473.9 | 2.0526 | 0.9352 | 1.1016 | 176.1          |         | 0.25853                     | 473.8 | 2.0457 | 0.9359 | 1.1021 | 176.0          | 80         |
| 85         | 0.28506                      | 478.6 | 2.0658 | 0.9428 | 1.1004 | 177.3          |         | 0.26233                     | 478.5 | 2.0589 | 0.9435 | 1.1009 | 177.2          | 85         |
| 90         | 0.28918                      | 483.3 | 2.0789 | 0.9504 | 1.0992 | 178.6          |         | 0.26610                     | 483.2 | 2.0720 | 0.9510 | 1.0997 | 178.4          | 90         |
| 95         | 0.29326                      | 488.1 | 2.0919 | 0.9579 | 1.0981 | 179.8          |         | 0.26998                     | 488.0 | 2.0851 | 0.9586 | 1.0985 | 179.7          | 95         |
| 100        | 0.29735                      | 492.9 | 2.1049 | 0.9655 | 1.0970 | 181.0          |         | 0.27375                     | 492.8 | 2.0981 | 0.9661 | 1.0974 | 180.9          | 100        |
| 105        | 0.30157                      | 497.8 | 2.1178 | 0.9730 | 1.0960 | 182.2          |         | 0.27755                     | 497.7 | 2.1110 | 0.9735 | 1.0963 | 182.1          | 105        |
| 110        | 0.30562                      | 502.6 | 2.1306 | 0.9804 | 1.0950 | 183.4          |         | 0.28129                     | 502.6 | 2.1238 | 0.9810 | 1.0953 | 183.3          | 110        |
| 115        | 0.30969                      | 507.6 | 2.1434 | 0.9879 | 1.0940 | 184.6          |         | 0.28514                     | 507.5 | 2.1366 | 0.9884 | 1.0943 | 184.5          | 115        |
| 120        | 0.31377                      | 512.5 | 2.1561 | 0.9953 | 1.0931 | 185.7          |         | 0.28893                     | 512.5 | 2.1493 | 0.9958 | 1.0934 | 185.6          | 120        |
| 125        | 0.31797                      | 517.5 | 2.1687 | 1.0026 | 1.0922 | 186.9          |         | 0.29265                     | 517.5 | 2.1619 | 1.0031 | 1.0924 | 186.8          | 125        |
| 130        | —                            | —     | —      | —      | —      | —              |         | 0.29647                     | 522.5 | 2.1745 | 1.0104 | 1.0915 | 188.0          | 130        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 120.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 130.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -22.29     | 0.00073                     | 170.7 | 0.8888 | 1.2812 | 1.5058 | 727.6          | SAT LIQ | 0.00074                     | 173.1 | 0.8981 | 1.2856 | 1.5065 | 719.1          | -20.47     |
| -22.29     | 0.16207                     | 385.4 | 1.7443 | 0.8016 | 1.1563 | 146.1          | SAT VAP | 0.15026                     | 386.5 | 1.7426 | 0.8080 | 1.1575 | 146.3          | -20.47     |
| -20        | 0.16385                     | 387.2 | 1.7516 | 0.8033 | 1.1538 | 146.9          |         | 0.15060                     | 386.9 | 1.7441 | 0.8083 | 1.1570 | 146.4          | -20        |
| -15        | 0.16773                     | 391.2 | 1.7674 | 0.8075 | 1.1488 | 148.6          |         | 0.15423                     | 390.9 | 1.7600 | 0.8120 | 1.1516 | 148.2          | -15        |
| -10        | 0.17156                     | 395.3 | 1.7829 | 0.8124 | 1.1443 | 150.3          |         | 0.15780                     | 395.0 | 1.7756 | 0.8164 | 1.1468 | 149.9          | -10        |
| -5         | 0.17535                     | 399.3 | 1.7983 | 0.8177 | 1.1402 | 151.9          |         | 0.16134                     | 399.1 | 1.7910 | 0.8213 | 1.1425 | 151.5          | -5         |
| 0          | 0.17912                     | 403.5 | 1.8134 | 0.8233 | 1.1365 | 153.5          |         | 0.16483                     | 403.2 | 1.8062 | 0.8266 | 1.1385 | 153.1          | 0          |
| 5          | 0.18285                     | 407.6 | 1.8284 | 0.8294 | 1.1331 | 155.1          |         | 0.16829                     | 407.3 | 1.8212 | 0.8323 | 1.1349 | 154.7          | 5          |
| 10         | 0.18657                     | 411.7 | 1.8432 | 0.8356 | 1.1300 | 156.6          |         | 0.17173                     | 411.5 | 1.8361 | 0.8383 | 1.1316 | 156.3          | 10         |
| 15         | 0.19022                     | 415.9 | 1.8579 | 0.8422 | 1.1271 | 158.1          |         | 0.17516                     | 415.7 | 1.8509 | 0.8446 | 1.1286 | 157.8          | 15         |
| 20         | 0.19387                     | 420.2 | 1.8725 | 0.8489 | 1.1245 | 159.6          |         | 0.17857                     | 420.0 | 1.8654 | 0.8511 | 1.1258 | 159.3          | 20         |
| 25         | 0.19751                     | 424.4 | 1.8869 | 0.8558 | 1.1220 | 161.0          |         | 0.18195                     | 424.2 | 1.8799 | 0.8578 | 1.1232 | 160.8          | 25         |
| 30         | 0.20113                     | 428.7 | 1.9012 | 0.8628 | 1.1197 | 162.5          |         | 0.18529                     | 428.5 | 1.8942 | 0.8647 | 1.1208 | 162.2          | 30         |
| 35         | 0.20475                     | 433.1 | 1.9153 | 0.8700 | 1.1175 | 163.9          |         | 0.18864                     | 432.9 | 1.9084 | 0.8717 | 1.1185 | 163.6          | 35         |
| 40         | 0.20833                     | 437.4 | 1.9294 | 0.8772 | 1.1155 | 165.3          |         | 0.19198                     | 437.3 | 1.9225 | 0.8788 | 1.1164 | 165.0          | 40         |
| 45         | 0.21191                     | 441.8 | 1.9434 | 0.8845 | 1.1135 | 166.6          |         | 0.19531                     | 441.7 | 1.9365 | 0.8860 | 1.1144 | 166.4          | 45         |
| 50         | 0.21552                     | 446.3 | 1.9572 | 0.8919 | 1.1117 | 168.0          |         | 0.19861                     | 446.1 | 1.9504 | 0.8933 | 1.1125 | 167.8          | 50         |
| 55         | 0.21906                     | 450.7 | 1.9710 | 0.8993 | 1.1100 | 169.3          |         | 0.20190                     | 450.6 | 1.9641 | 0.9006 | 1.1108 | 169.1          | 55         |
| 60         | 0.22262                     | 455.3 | 1.9846 | 0.9068 | 1.1084 | 170.7          |         | 0.20521                     | 455.1 | 1.9778 | 0.9080 | 1.1091 | 170.5          | 60         |
| 65         | 0.22614                     | 459.8 | 1.9982 | 0.9143 | 1.1068 | 172.0          |         | 0.20846                     | 459.7 | 1.9914 | 0.9154 | 1.1075 | 171.8          | 65         |
| 70         | 0.22967                     | 464.4 | 2.0117 | 0.9218 | 1.1054 | 173.3          |         | 0.21173                     | 464.3 | 2.0049 | 0.9228 | 1.1060 | 173.1          | 70         |
| 75         | 0.23321                     | 469.0 | 2.0251 | 0.9293 | 1.1040 | 174.5          |         | 0.21501                     | 468.9 | 2.0183 | 0.9302 | 1.1045 | 174.4          | 75         |
| 80         | 0.23669                     | 473.7 | 2.0384 | 0.9368 | 1.1026 | 175.8          |         | 0.21825                     | 473.6 | 2.0316 | 0.9377 | 1.1032 | 175.7          | 80         |
| 85         | 0.24021                     | 478.4 | 2.0516 | 0.9443 | 1.1014 | 177.1          |         | 0.22148                     | 478.3 | 2.0448 | 0.9451 | 1.1019 | 176.9          | 85         |
| 90         | 0.24372                     | 483.1 | 2.0647 | 0.9518 | 1.1001 | 178.3          |         | 0.22477                     | 483.0 | 2.0580 | 0.9526 | 1.1006 | 178.2          | 90         |
| 95         | 0.24722                     | 487.9 | 2.0778 | 0.9593 | 1.0989 | 179.5          |         | 0.22800                     | 487.8 | 2.0711 | 0.9600 | 1.0994 | 179.4          | 95         |
| 100        | 0.25069                     | 492.7 | 2.0908 | 0.9667 | 1.0978 | 180.8          |         | 0.23116                     | 492.6 | 2.0841 | 0.9674 | 1.0982 | 180.6          | 100        |
| 105        | 0.25419                     | 497.6 | 2.1037 | 0.9742 | 1.0967 | 182.0          |         | 0.23447                     | 497.5 | 2.0970 | 0.9748 | 1.0971 | 181.8          | 105        |
| 110        | 0.25767                     | 502.5 | 2.1165 | 0.9816 | 1.0957 | 183.2          |         | 0.23764                     | 502.4 | 2.1098 | 0.9822 | 1.0961 | 183.0          | 110        |
| 115        | 0.26116                     | 507.4 | 2.1293 | 0.9890 | 1.0947 | 184.4          |         | 0.24091                     | 507.3 | 2.1226 | 0.9895 | 1.0950 | 184.2          | 115        |
| 120        | 0.26462                     | 512.4 | 2.1420 | 0.9963 | 1.0937 | 185.5          |         | 0.24414                     | 512.3 | 2.1353 | 0.9968 | 1.0940 | 185.4          | 120        |
| 125        | 0.26810                     | 517.4 | 2.1547 | 1.0036 | 1.0928 | 186.7          |         | 0.24728                     | 517.3 | 2.1480 | 1.0041 | 1.0931 | 186.6          | 125        |
| 130        | 0.27152                     | 522.4 | 2.1672 | 1.0109 | 1.0919 | 187.9          |         | 0.25050                     | 522.3 | 2.1606 | 1.0114 | 1.0922 | 187.8          | 130        |

  

| TEMP<br>°C | PRESSURE = 140.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 150.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -18.75     | 0.00074                     | 175.3 | 0.9068 | 1.2899 | 1.5072 | 711.2          | SAT LIQ | 0.00074                     | 177.4 | 0.9150 | 1.2939 | 1.5081 | 703.7          | -17.12     |
| -18.75     | 0.14010                     | 387.5 | 1.7411 | 0.8142 | 1.1587 | 146.4          | SAT VAP | 0.13123                     | 388.5 | 1.7397 | 0.8201 | 1.1599 | 146.5          | -17.12     |
| -15        | 0.14263                     | 390.6 | 1.7530 | 0.8166 | 1.1545 | 147.7          |         | 0.13259                     | 390.3 | 1.7464 | 0.8213 | 1.1574 | 147.3          | -15        |
| -10        | 0.14599                     | 394.7 | 1.7687 | 0.8205 | 1.1493 | 149.5          |         | 0.13576                     | 394.4 | 1.7622 | 0.8247 | 1.1519 | 149.1          | -10        |
| -5         | 0.14930                     | 398.8 | 1.7842 | 0.8250 | 1.1447 | 151.2          |         | 0.13889                     | 398.5 | 1.7778 | 0.8287 | 1.1470 | 150.8          | -5         |
| 0          | 0.15258                     | 402.9 | 1.7995 | 0.8299 | 1.1405 | 152.8          |         | 0.14196                     | 402.7 | 1.7931 | 0.8333 | 1.1426 | 152.4          | 0          |
| 5          | 0.15584                     | 407.1 | 1.8146 | 0.8353 | 1.1368 | 154.4          |         | 0.14503                     | 406.9 | 1.8083 | 0.8384 | 1.1386 | 154.1          | 5          |
| 10         | 0.15906                     | 411.3 | 1.8295 | 0.8411 | 1.1333 | 156.0          |         | 0.14806                     | 411.1 | 1.8233 | 0.8438 | 1.1350 | 155.7          | 10         |
| 15         | 0.16226                     | 415.5 | 1.8443 | 0.8471 | 1.1301 | 157.5          |         | 0.15106                     | 415.3 | 1.8381 | 0.8496 | 1.1316 | 157.2          | 15         |
| 20         | 0.16543                     | 419.8 | 1.8589 | 0.8534 | 1.1272 | 159.0          |         | 0.15404                     | 419.6 | 1.8528 | 0.8557 | 1.1285 | 158.7          | 20         |
| 25         | 0.16858                     | 424.1 | 1.8734 | 0.8599 | 1.1245 | 160.5          |         | 0.15701                     | 423.9 | 1.8673 | 0.8620 | 1.1257 | 160.2          | 25         |
| 30         | 0.17173                     | 428.4 | 1.8877 | 0.8666 | 1.1219 | 162.0          |         | 0.15995                     | 428.2 | 1.8817 | 0.8685 | 1.1231 | 161.7          | 30         |
| 35         | 0.17486                     | 432.7 | 1.9020 | 0.8735 | 1.1196 | 163.4          |         | 0.16289                     | 432.5 | 1.8959 | 0.8752 | 1.1206 | 163.2          | 35         |
| 40         | 0.17794                     | 437.1 | 1.9161 | 0.8804 | 1.1174 | 164.8          |         | 0.16581                     | 436.9 | 1.9101 | 0.8820 | 1.1183 | 164.6          | 40         |
| 45         | 0.18106                     | 441.5 | 1.9301 | 0.8875 | 1.1153 | 166.2          |         | 0.16869                     | 441.4 | 1.9241 | 0.8890 | 1.1162 | 166.0          | 45         |
| 50         | 0.18413                     | 446.0 | 1.9440 | 0.8946 | 1.1134 | 167.6          |         | 0.17156                     | 445.8 | 1.9380 | 0.8960 | 1.1142 | 167.4          | 50         |
| 55         | 0.18720                     | 450.5 | 1.9578 | 0.9019 | 1.1115 | 168.9          |         | 0.17449                     | 450.3 | 1.9518 | 0.9032 | 1.1123 | 168.7          | 55         |
| 60         | 0.19026                     | 455.0 | 1.9715 | 0.9091 | 1.1098 | 170.3          |         | 0.17734                     | 454.9 | 1.9656 | 0.9103 | 1.1105 | 170.1          | 60         |
| 65         | 0.19331                     | 459.6 | 1.9851 | 0.9165 | 1.1082 | 171.6          |         | 0.18018                     | 459.4 | 1.9792 | 0.9176 | 1.1088 | 171.4          | 65         |
| 70         | 0.19635                     | 464.2 | 1.9986 | 0.9238 | 1.1066 | 172.9          |         | 0.18305                     | 464.0 | 1.9927 | 0.9249 | 1.1072 | 172.8          | 70         |
| 75         | 0.19936                     | 468.8 | 2.0120 | 0.9312 | 1.1051 | 174.2          |         | 0.18587                     | 468.7 | 2.0061 | 0.9322 | 1.1057 | 174.1          | 75         |
| 80         | 0.20243                     | 473.5 | 2.0253 | 0.9386 | 1.1037 | 175.5          |         | 0.18875                     | 473.4 | 2.0195 | 0.9395 | 1.1043 | 175.3          | 80         |
| 85         | 0.20547                     | 478.2 | 2.0386 | 0.9460 | 1.1024 | 176.8          |         | 0.19157                     | 478.1 | 2.0327 | 0.9468 | 1.1029 | 176.6          | 85         |
| 90         | 0.20851                     | 482.9 | 2.0517 | 0.9534 | 1.1011 | 178.0          |         | 0.19440                     | 482.8 | 2.0459 | 0.9541 | 1.1016 | 177.9          | 90         |
| 95         | 0.21146                     | 487.7 | 2.0648 | 0.9607 | 1.0998 | 179.3          |         | 0.19720                     | 487.6 | 2.0590 | 0.9615 | 1.1003 | 179.1          | 95         |
| 100        | 0.21450                     | 492.5 | 2.0778 | 0.9681 | 1.0987 | 180.5          |         | 0.20000                     | 492.4 | 2.0720 | 0.9688 | 1.0991 | 180.4          | 100        |
| 105        | 0.21753                     | 497.4 | 2.0908 | 0.9755 | 1.0975 | 181.7          |         | 0.20284                     | 497.3 | 2.0850 | 0.9761 | 1.0979 | 181.6          | 105        |
| 110        | 0.22051                     | 502.3 | 2.1036 | 0.9828 | 1.0964 | 182.9          |         | 0.20563                     | 502.2 | 2.0978 | 0.9834 | 1.0968 | 182.8          | 110        |
| 115        | 0.22351                     | 507.2 | 2.1164 | 0.9901 | 1.0954 | 184.1          |         | 0.20846                     | 507.1 | 2.1106 | 0.9907 | 1.0958 | 184.0          | 115        |
| 120        | 0.22650                     | 512.2 | 2.1291 | 0.9974 | 1.0944 | 185.3          |         | 0.21124                     | 512.1 | 2.1234 | 0.9979 | 1.0947 | 185.2          | 120        |
| 125        | 0.22946                     | 517.2 | 2.1418 | 1.0046 | 1.0934 | 186.5          |         | 0.21404                     | 517.1 | 2.1360 | 1.0052 | 1.0937 | 186.4          | 125        |
| 130        | 0.23245                     | 522.2 | 2.1544 | 1.0118 | 1.0925 | 187.7          |         | 0.21683                     | 522.2 | 2.1486 | 1.0123 | 1.0928 | 187.6          | 130        |
| 135        | 0.23546                     | 527.3 | 2.1669 | 1.0190 | 1.0916 | 188.8          |         | 0.21964                     | 527.2 | 2.1611 | 1.0195 | 1.0919 | 188.7          | 135        |

**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 160.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 170.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| –15.58     | 0.00074                     | 179.4 | 0.9228 | 1.2979 | 1.5089 | 696.6          | SAT LIQ | 0.00075                     | 181.3 | 0.9302 | 1.3017 | 1.5098 | 689.9          | –14.11     |
| –15.58     | 0.12344                     | 389.5 | 1.7384 | 0.8258 | 1.1612 | 146.6          | SAT VAP | 0.11655                     | 390.4 | 1.7372 | 0.8313 | 1.1624 | 146.7          | –14.11     |
| –15        | 0.12379                     | 390.0 | 1.7402 | 0.8261 | 1.1605 | 146.9          |         | —                           | —     | —      | —      | —      | —              | –15        |
| –10        | 0.12679                     | 394.1 | 1.7561 | 0.8289 | 1.1546 | 148.6          |         | 0.11889                     | 393.8 | 1.7503 | 0.8333 | 1.1574 | 148.2          | –10        |
| –5         | 0.12975                     | 398.3 | 1.7717 | 0.8325 | 1.1494 | 150.4          |         | 0.12170                     | 398.0 | 1.7660 | 0.8364 | 1.1518 | 150.0          | –5         |
| 0          | 0.13268                     | 402.4 | 1.7872 | 0.8367 | 1.1447 | 152.1          |         | 0.12447                     | 402.2 | 1.7815 | 0.8402 | 1.1469 | 151.7          | 0          |
| 5          | 0.13556                     | 406.6 | 1.8024 | 0.8415 | 1.1405 | 153.7          |         | 0.12721                     | 406.4 | 1.7968 | 0.8446 | 1.1424 | 153.4          | 5          |
| 10         | 0.13843                     | 410.8 | 1.8174 | 0.8466 | 1.1367 | 155.3          |         | 0.12994                     | 410.6 | 1.8119 | 0.8495 | 1.1384 | 155.0          | 10         |
| 15         | 0.14126                     | 415.1 | 1.8323 | 0.8522 | 1.1332 | 156.9          |         | 0.13263                     | 414.9 | 1.8268 | 0.8548 | 1.1347 | 156.6          | 15         |
| 20         | 0.14407                     | 419.4 | 1.8470 | 0.8580 | 1.1299 | 158.5          |         | 0.13528                     | 419.2 | 1.8415 | 0.8604 | 1.1314 | 158.2          | 20         |
| 25         | 0.14686                     | 423.7 | 1.8616 | 0.8641 | 1.1270 | 160.0          |         | 0.13793                     | 423.5 | 1.8561 | 0.8663 | 1.1283 | 159.7          | 25         |
| 30         | 0.14966                     | 428.0 | 1.8760 | 0.8705 | 1.1242 | 161.5          |         | 0.14055                     | 427.8 | 1.8706 | 0.8724 | 1.1254 | 161.2          | 30         |
| 35         | 0.15242                     | 432.4 | 1.8903 | 0.8770 | 1.1217 | 162.9          |         | 0.14316                     | 432.2 | 1.8849 | 0.8788 | 1.1228 | 162.7          | 35         |
| 40         | 0.15516                     | 436.8 | 1.9044 | 0.8837 | 1.1193 | 164.4          |         | 0.14577                     | 436.6 | 1.8991 | 0.8853 | 1.1203 | 164.1          | 40         |
| 45         | 0.15790                     | 441.2 | 1.9185 | 0.8905 | 1.1171 | 165.8          |         | 0.14835                     | 441.1 | 1.9132 | 0.8920 | 1.1180 | 165.6          | 45         |
| 50         | 0.16059                     | 445.7 | 1.9324 | 0.8974 | 1.1150 | 167.2          |         | 0.15092                     | 445.5 | 1.9272 | 0.8988 | 1.1159 | 167.0          | 50         |
| 55         | 0.16329                     | 450.2 | 1.9463 | 0.9044 | 1.1131 | 168.6          |         | 0.15347                     | 450.0 | 1.9410 | 0.9057 | 1.1139 | 168.4          | 55         |
| 60         | 0.16600                     | 454.7 | 1.9600 | 0.9115 | 1.1112 | 169.9          |         | 0.15603                     | 454.6 | 1.9548 | 0.9127 | 1.1120 | 169.7          | 60         |
| 65         | 0.16869                     | 459.3 | 1.9736 | 0.9187 | 1.1095 | 171.3          |         | 0.15858                     | 459.2 | 1.9684 | 0.9198 | 1.1102 | 171.1          | 65         |
| 70         | 0.17141                     | 463.9 | 1.9872 | 0.9259 | 1.1079 | 172.6          |         | 0.16108                     | 463.8 | 1.9820 | 0.9269 | 1.1085 | 172.4          | 70         |
| 75         | 0.17406                     | 468.6 | 2.0006 | 0.9331 | 1.1063 | 173.9          |         | 0.16364                     | 468.4 | 1.9954 | 0.9341 | 1.1069 | 173.7          | 75         |
| 80         | 0.17674                     | 473.2 | 2.0140 | 0.9404 | 1.1048 | 175.2          |         | 0.16617                     | 473.1 | 2.0088 | 0.9413 | 1.1054 | 175.0          | 80         |
| 85         | 0.17940                     | 478.0 | 2.0272 | 0.9477 | 1.1034 | 176.5          |         | 0.16863                     | 477.9 | 2.0221 | 0.9485 | 1.1039 | 176.3          | 85         |
| 90         | 0.18205                     | 482.7 | 2.0404 | 0.9549 | 1.1020 | 177.7          |         | 0.17117                     | 482.6 | 2.0353 | 0.9557 | 1.1025 | 177.6          | 90         |
| 95         | 0.18471                     | 487.5 | 2.0535 | 0.9622 | 1.1008 | 179.0          |         | 0.17367                     | 487.4 | 2.0484 | 0.9630 | 1.1012 | 178.9          | 95         |
| 100        | 0.18734                     | 492.3 | 2.0666 | 0.9695 | 1.0995 | 180.2          |         | 0.17618                     | 492.2 | 2.0614 | 0.9702 | 1.1000 | 180.1          | 100        |
| 105        | 0.19001                     | 497.2 | 2.0795 | 0.9768 | 1.0983 | 181.5          |         | 0.17867                     | 497.1 | 2.0744 | 0.9774 | 1.0988 | 181.3          | 105        |
| 110        | 0.19260                     | 502.1 | 2.0924 | 0.9840 | 1.0972 | 182.7          |         | 0.18113                     | 502.0 | 2.0873 | 0.9847 | 1.0976 | 182.6          | 110        |
| 115        | 0.19524                     | 507.0 | 2.1052 | 0.9913 | 1.0961 | 183.9          |         | 0.18362                     | 507.0 | 2.1001 | 0.9919 | 1.0965 | 183.8          | 115        |
| 120        | 0.19790                     | 512.0 | 2.1179 | 0.9985 | 1.0951 | 185.1          |         | 0.18612                     | 511.9 | 2.1128 | 0.9990 | 1.0954 | 185.0          | 120        |
| 125        | 0.20052                     | 517.0 | 2.1306 | 1.0057 | 1.0941 | 186.3          |         | 0.18857                     | 516.9 | 2.1255 | 1.0062 | 1.0944 | 186.2          | 125        |
| 130        | 0.20313                     | 522.1 | 2.1432 | 1.0128 | 1.0931 | 187.5          |         | 0.19106                     | 522.0 | 2.1381 | 1.0133 | 1.0934 | 187.4          | 130        |
| 135        | 0.20576                     | 527.2 | 2.1557 | 1.0200 | 1.0922 | 188.6          |         | 0.19354                     | 527.1 | 2.1506 | 1.0204 | 1.0925 | 188.5          | 135        |
| 140        | —                           | —     | —      | —      | —      | —              |         | 0.19600                     | 532.2 | 2.1631 | 1.0275 | 1.0915 | 189.7          | 140        |

  

| TEMP<br>°C | PRESSURE = 180.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 190.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| –12.71     | 0.00075                     | 183.2 | 0.9372 | 1.3053 | 1.5107 | 683.4          | SAT LIQ | 0.00075                     | 184.9 | 0.9439 | 1.3089 | 1.5116 | 677.3          | –11.37     |
| –12.71     | 0.11039                     | 391.2 | 1.7361 | 0.8366 | 1.1637 | 146.8          | SAT VAP | 0.10484                     | 392.0 | 1.7351 | 0.8418 | 1.1649 | 146.9          | –11.37     |
| –10        | 0.11186                     | 393.5 | 1.7448 | 0.8377 | 1.1602 | 147.8          |         | 0.10556                     | 393.2 | 1.7395 | 0.8422 | 1.1631 | 147.4          | –10        |
| –5         | 0.11453                     | 397.7 | 1.7606 | 0.8404 | 1.1543 | 149.6          |         | 0.10812                     | 397.4 | 1.7554 | 0.8444 | 1.1569 | 149.2          | –5         |
| 0          | 0.11718                     | 401.9 | 1.7761 | 0.8438 | 1.1491 | 151.3          |         | 0.11066                     | 401.6 | 1.7710 | 0.8474 | 1.1514 | 151.0          | 0          |
| 5          | 0.11979                     | 406.1 | 1.7915 | 0.8478 | 1.1444 | 153.0          |         | 0.11315                     | 405.9 | 1.7864 | 0.8510 | 1.1464 | 152.7          | 5          |
| 10         | 0.12237                     | 410.4 | 1.8066 | 0.8524 | 1.1402 | 154.7          |         | 0.11562                     | 410.1 | 1.8016 | 0.8553 | 1.1420 | 154.4          | 10         |
| 15         | 0.12494                     | 414.7 | 1.8216 | 0.8574 | 1.1363 | 156.3          |         | 0.11805                     | 414.4 | 1.8166 | 0.8600 | 1.1380 | 156.0          | 15         |
| 20         | 0.12747                     | 419.0 | 1.8364 | 0.8628 | 1.1328 | 157.9          |         | 0.12047                     | 418.7 | 1.8314 | 0.8652 | 1.1343 | 157.6          | 20         |
| 25         | 0.12999                     | 423.3 | 1.8510 | 0.8685 | 1.1296 | 159.4          |         | 0.12287                     | 423.1 | 1.8461 | 0.8706 | 1.1309 | 159.2          | 25         |
| 30         | 0.13247                     | 427.6 | 1.8655 | 0.8744 | 1.1266 | 160.9          |         | 0.12525                     | 427.5 | 1.8606 | 0.8764 | 1.1278 | 160.7          | 30         |
| 35         | 0.13495                     | 432.0 | 1.8798 | 0.8806 | 1.1239 | 162.4          |         | 0.12760                     | 431.9 | 1.8750 | 0.8824 | 1.1250 | 162.2          | 35         |
| 40         | 0.13742                     | 436.4 | 1.8941 | 0.8870 | 1.1213 | 163.9          |         | 0.12995                     | 436.3 | 1.8893 | 0.8887 | 1.1223 | 163.7          | 40         |
| 45         | 0.13988                     | 440.9 | 1.9082 | 0.8936 | 1.1190 | 165.3          |         | 0.13229                     | 440.7 | 1.9034 | 0.8951 | 1.1199 | 165.1          | 45         |
| 50         | 0.14231                     | 445.4 | 1.9222 | 0.9003 | 1.1167 | 166.8          |         | 0.13461                     | 445.2 | 1.9174 | 0.9017 | 1.1176 | 166.6          | 50         |
| 55         | 0.14474                     | 449.9 | 1.9360 | 0.9071 | 1.1147 | 168.2          |         | 0.13693                     | 449.8 | 1.9313 | 0.9084 | 1.1155 | 168.0          | 55         |
| 60         | 0.14717                     | 454.5 | 1.9498 | 0.9140 | 1.1127 | 169.5          |         | 0.13922                     | 454.3 | 1.9451 | 0.9152 | 1.1134 | 169.4          | 60         |
| 65         | 0.14957                     | 459.0 | 1.9635 | 0.9209 | 1.1109 | 170.9          |         | 0.14152                     | 458.9 | 1.9588 | 0.9221 | 1.1115 | 170.7          | 65         |
| 70         | 0.15195                     | 463.7 | 1.9770 | 0.9280 | 1.1091 | 172.2          |         | 0.14380                     | 463.5 | 1.9724 | 0.9290 | 1.1098 | 172.1          | 70         |
| 75         | 0.15434                     | 468.3 | 1.9905 | 0.9351 | 1.1075 | 173.6          |         | 0.14607                     | 468.2 | 1.9859 | 0.9360 | 1.1081 | 173.4          | 75         |
| 80         | 0.15674                     | 473.0 | 2.0039 | 0.9422 | 1.1059 | 174.9          |         | 0.14832                     | 472.9 | 1.9993 | 0.9431 | 1.1065 | 174.7          | 80         |
| 85         | 0.15911                     | 477.7 | 2.0172 | 0.9494 | 1.1044 | 176.2          |         | 0.15060                     | 477.6 | 2.0126 | 0.9502 | 1.1050 | 176.0          | 85         |
| 90         | 0.16150                     | 482.5 | 2.0304 | 0.9565 | 1.1030 | 177.5          |         | 0.15284                     | 482.4 | 2.0258 | 0.9573 | 1.1035 | 177.3          | 90         |
| 95         | 0.16385                     | 487.3 | 2.0435 | 0.9637 | 1.1017 | 178.7          |         | 0.15509                     | 487.2 | 2.0389 | 0.9645 | 1.1021 | 178.6          | 95         |
| 100        | 0.16622                     | 492.1 | 2.0566 | 0.9709 | 1.1004 | 180.0          |         | 0.15733                     | 492.0 | 2.0520 | 0.9716 | 1.1008 | 179.8          | 100        |
| 105        | 0.16858                     | 497.0 | 2.0696 | 0.9781 | 1.0992 | 181.2          |         | 0.15957                     | 496.9 | 2.0650 | 0.9788 | 1.0996 | 181.1          | 105        |
| 110        | 0.17094                     | 501.9 | 2.0825 | 0.9853 | 1.0980 | 182.4          |         | 0.16181                     | 501.8 | 2.0779 | 0.9859 | 1.0984 | 182.3          | 110        |
| 115        | 0.17328                     | 506.9 | 2.0953 | 0.9924 | 1.0969 | 183.7          |         | 0.16404                     | 506.8 | 2.0907 | 0.9930 | 1.0972 | 183.6          | 115        |
| 120        | 0.17562                     | 511.8 | 2.1080 | 0.9996 | 1.0958 | 184.9          |         | 0.16625                     | 511.8 | 2.1034 | 1.0001 | 1.0961 | 184.8          | 120        |
| 125        | 0.17797                     | 516.9 | 2.1207 | 1.0067 | 1.0947 | 186.1          |         | 0.16849                     | 516.8 | 2.1161 | 1.0072 | 1.0951 | 186.0          | 125        |
| 130        | 0.18031                     | 521.9 | 2.1333 | 1.0138 | 1.0937 | 187.3          |         | 0.17071                     | 521.8 | 2.1288 | 1.0143 | 1.0940 | 187.2          | 130        |
| 135        | 0.18265                     | 527.0 | 2.1458 | 1.0209 | 1.0928 | 188.4          |         | 0.17292                     | 526.9 | 2.1413 | 1.0214 | 1.0931 | 188.3          | 135        |
| 140        | 0.18498                     | 532.1 | 2.1583 | 1.0279 | 1.0918 | 189.6          |         | 0.17516                     | 532.0 | 2.1538 | 1.0284 | 1.0921 | 189.5          | 140        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 200.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 210.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -10.08     | 0.00075                     | 186.6 | 0.9503 | 1.3124 | 1.5125 | 671.3          | SAT LIQ | 0.00076                     | 188.2 | 0.9565 | 1.3157 | 1.5135 | 665.6          | -8.84      |
| -10.08     | 0.09985                     | 392.8 | 1.7342 | 0.8468 | 1.1661 | 146.9          | SAT VAP | 0.09531                     | 393.6 | 1.7333 | 0.8517 | 1.1674 | 147.0          | -8.84      |
| -10        | 0.09989                     | 392.9 | 1.7344 | 0.8468 | 1.1660 | 146.9          |         | —                           | —     | —      | —      | —      | —              | -10        |
| -5         | 0.10235                     | 397.1 | 1.7504 | 0.8485 | 1.1595 | 148.8          |         | 0.09713                     | 396.8 | 1.7456 | 0.8527 | 1.1621 | 148.4          | -5         |
| 0          | 0.10478                     | 401.4 | 1.7661 | 0.8510 | 1.1537 | 150.6          |         | 0.09945                     | 401.1 | 1.7613 | 0.8548 | 1.1560 | 150.2          | 0          |
| 5          | 0.10717                     | 405.6 | 1.7815 | 0.8543 | 1.1485 | 152.3          |         | 0.10175                     | 405.4 | 1.7769 | 0.8577 | 1.1506 | 152.0          | 5          |
| 10         | 0.10953                     | 409.9 | 1.7968 | 0.8583 | 1.1438 | 154.0          |         | 0.10401                     | 409.7 | 1.7922 | 0.8613 | 1.1457 | 153.7          | 10         |
| 15         | 0.11186                     | 414.2 | 1.8118 | 0.8627 | 1.1396 | 155.7          |         | 0.10626                     | 414.0 | 1.8073 | 0.8654 | 1.1413 | 155.4          | 15         |
| 20         | 0.11417                     | 418.5 | 1.8267 | 0.8676 | 1.1358 | 157.3          |         | 0.10847                     | 418.3 | 1.8222 | 0.8700 | 1.1373 | 157.0          | 20         |
| 25         | 0.11647                     | 422.9 | 1.8414 | 0.8729 | 1.1323 | 158.9          |         | 0.11067                     | 422.7 | 1.8370 | 0.8751 | 1.1336 | 158.6          | 25         |
| 30         | 0.11874                     | 427.3 | 1.8560 | 0.8784 | 1.1291 | 160.4          |         | 0.11284                     | 427.1 | 1.8516 | 0.8805 | 1.1303 | 160.2          | 30         |
| 35         | 0.12099                     | 431.7 | 1.8704 | 0.8843 | 1.1261 | 162.0          |         | 0.11501                     | 431.5 | 1.8660 | 0.8862 | 1.1272 | 161.7          | 35         |
| 40         | 0.12324                     | 436.1 | 1.8847 | 0.8904 | 1.1234 | 163.4          |         | 0.11715                     | 435.9 | 1.8803 | 0.8921 | 1.1244 | 163.2          | 40         |
| 45         | 0.12547                     | 440.6 | 1.8989 | 0.8967 | 1.1208 | 164.9          |         | 0.11927                     | 440.4 | 1.8945 | 0.8982 | 1.1218 | 164.7          | 45         |
| 50         | 0.12767                     | 445.1 | 1.9129 | 0.9031 | 1.1185 | 166.3          |         | 0.12139                     | 444.9 | 1.9086 | 0.9046 | 1.1193 | 166.1          | 50         |
| 55         | 0.12989                     | 449.6 | 1.9268 | 0.9097 | 1.1163 | 167.8          |         | 0.12350                     | 449.5 | 1.9225 | 0.9110 | 1.1171 | 167.6          | 55         |
| 60         | 0.13207                     | 454.2 | 1.9406 | 0.9164 | 1.1142 | 169.2          |         | 0.12560                     | 454.0 | 1.9363 | 0.9176 | 1.1149 | 169.0          | 60         |
| 65         | 0.13425                     | 458.8 | 1.9543 | 0.9232 | 1.1122 | 170.5          |         | 0.12768                     | 458.6 | 1.9501 | 0.9244 | 1.1129 | 170.4          | 65         |
| 70         | 0.13643                     | 463.4 | 1.9679 | 0.9301 | 1.1104 | 171.9          |         | 0.12975                     | 463.3 | 1.9637 | 0.9312 | 1.1111 | 171.7          | 70         |
| 75         | 0.13860                     | 468.1 | 1.9814 | 0.9370 | 1.1087 | 173.2          |         | 0.13184                     | 468.0 | 1.9772 | 0.9380 | 1.1093 | 173.1          | 75         |
| 80         | 0.14075                     | 472.8 | 1.9948 | 0.9440 | 1.1070 | 174.6          |         | 0.13390                     | 472.7 | 1.9906 | 0.9450 | 1.1076 | 174.4          | 80         |
| 85         | 0.14290                     | 477.5 | 2.0082 | 0.9511 | 1.1055 | 175.9          |         | 0.13596                     | 477.4 | 2.0040 | 0.9519 | 1.1060 | 175.7          | 85         |
| 90         | 0.14505                     | 482.3 | 2.0214 | 0.9581 | 1.1040 | 177.2          |         | 0.13799                     | 482.2 | 2.0172 | 0.9589 | 1.1045 | 177.0          | 90         |
| 95         | 0.14719                     | 487.1 | 2.0345 | 0.9652 | 1.1026 | 178.4          |         | 0.14004                     | 487.0 | 2.0304 | 0.9660 | 1.1031 | 178.3          | 95         |
| 100        | 0.14932                     | 491.9 | 2.0476 | 0.9723 | 1.1013 | 179.7          |         | 0.14209                     | 491.8 | 2.0434 | 0.9730 | 1.1017 | 179.6          | 100        |
| 105        | 0.15145                     | 496.8 | 2.0606 | 0.9794 | 1.1000 | 181.0          |         | 0.14413                     | 496.7 | 2.0564 | 0.9801 | 1.1004 | 180.8          | 105        |
| 110        | 0.15359                     | 501.7 | 2.0735 | 0.9865 | 1.0988 | 182.2          |         | 0.14616                     | 501.6 | 2.0694 | 0.9872 | 1.0992 | 182.1          | 110        |
| 115        | 0.15571                     | 506.7 | 2.0864 | 0.9936 | 1.0976 | 183.4          |         | 0.14819                     | 506.6 | 2.0822 | 0.9942 | 1.0980 | 183.3          | 115        |
| 120        | 0.15783                     | 511.7 | 2.0991 | 1.0007 | 1.0965 | 184.7          |         | 0.15020                     | 511.6 | 2.0950 | 1.0013 | 1.0968 | 184.5          | 120        |
| 125        | 0.15995                     | 516.7 | 2.1118 | 1.0078 | 1.0954 | 185.9          |         | 0.15223                     | 516.6 | 2.1077 | 1.0083 | 1.0957 | 185.8          | 125        |
| 130        | 0.16207                     | 521.8 | 2.1244 | 1.0148 | 1.0944 | 187.1          |         | 0.15423                     | 521.7 | 2.1203 | 1.0153 | 1.0947 | 187.0          | 130        |
| 135        | 0.16418                     | 526.8 | 2.1370 | 1.0218 | 1.0934 | 188.2          |         | 0.15623                     | 526.8 | 2.1329 | 1.0223 | 1.0937 | 188.1          | 135        |
| 140        | 0.16628                     | 532.0 | 2.1495 | 1.0288 | 1.0924 | 189.4          |         | 0.15825                     | 531.9 | 2.1454 | 1.0293 | 1.0927 | 189.3          | 140        |
| 145        | —                           | —     | —      | —      | —      | —              |         | 0.16028                     | 537.1 | 2.1578 | 1.0362 | 1.0917 | 190.5          | 145        |

  

| TEMP<br>°C | PRESSURE = 220.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 230.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -7.64      | 0.00076                     | 189.8 | 0.9624 | 1.3190 | 1.5144 | 660.2          | SAT LIQ | 0.00076                     | 191.3 | 0.9681 | 1.3222 | 1.5154 | 654.9          | -6.49      |
| -7.64      | 0.09117                     | 394.3 | 1.7325 | 0.8564 | 1.1686 | 147.0          | SAT VAP | 0.08737                     | 395.0 | 1.7317 | 0.8611 | 1.1699 | 147.0          | -6.49      |
| -5         | 0.09237                     | 396.5 | 1.7410 | 0.8569 | 1.1649 | 148.0          |         | 0.08803                     | 396.3 | 1.7365 | 0.8612 | 1.1677 | 147.6          | -5         |
| 0          | 0.09462                     | 400.8 | 1.7568 | 0.8585 | 1.1584 | 149.8          |         | 0.09020                     | 400.6 | 1.7524 | 0.8624 | 1.1609 | 149.5          | 0          |
| 5          | 0.09683                     | 405.1 | 1.7724 | 0.8611 | 1.1527 | 151.6          |         | 0.09234                     | 404.9 | 1.7681 | 0.8645 | 1.1549 | 151.3          | 5          |
| 10         | 0.09901                     | 409.4 | 1.7878 | 0.8643 | 1.1476 | 153.4          |         | 0.09444                     | 409.2 | 1.7835 | 0.8674 | 1.1495 | 153.0          | 10         |
| 15         | 0.10116                     | 413.8 | 1.8029 | 0.8682 | 1.1430 | 155.1          |         | 0.09651                     | 413.6 | 1.7987 | 0.8709 | 1.1447 | 154.8          | 15         |
| 20         | 0.10330                     | 418.1 | 1.8179 | 0.8725 | 1.1388 | 156.7          |         | 0.09856                     | 417.9 | 1.8137 | 0.8751 | 1.1404 | 156.4          | 20         |
| 25         | 0.10540                     | 422.5 | 1.8327 | 0.8774 | 1.1350 | 158.3          |         | 0.10059                     | 422.3 | 1.8286 | 0.8796 | 1.1364 | 158.1          | 25         |
| 30         | 0.10749                     | 426.9 | 1.8473 | 0.8825 | 1.1316 | 159.9          |         | 0.10260                     | 426.7 | 1.8433 | 0.8846 | 1.1329 | 159.7          | 30         |
| 35         | 0.10957                     | 431.3 | 1.8618 | 0.8880 | 1.1284 | 161.5          |         | 0.10459                     | 431.2 | 1.8578 | 0.8900 | 1.1296 | 161.2          | 35         |
| 40         | 0.11162                     | 435.8 | 1.8762 | 0.8938 | 1.1255 | 163.0          |         | 0.10656                     | 435.6 | 1.8721 | 0.8956 | 1.1265 | 162.7          | 40         |
| 45         | 0.11365                     | 440.3 | 1.8904 | 0.8998 | 1.1228 | 164.5          |         | 0.10853                     | 440.1 | 1.8864 | 0.9014 | 1.1237 | 164.2          | 45         |
| 50         | 0.11569                     | 444.8 | 1.9044 | 0.9060 | 1.1202 | 165.9          |         | 0.11047                     | 444.6 | 1.9005 | 0.9075 | 1.1211 | 165.7          | 50         |
| 55         | 0.11772                     | 449.3 | 1.9184 | 0.9124 | 1.1179 | 167.4          |         | 0.11242                     | 449.2 | 1.9145 | 0.9138 | 1.1187 | 167.2          | 55         |
| 60         | 0.11970                     | 453.9 | 1.9322 | 0.9189 | 1.1157 | 168.8          |         | 0.11435                     | 453.8 | 1.9283 | 0.9202 | 1.1165 | 168.6          | 60         |
| 65         | 0.12171                     | 458.5 | 1.9460 | 0.9255 | 1.1136 | 170.2          |         | 0.11627                     | 458.4 | 1.9421 | 0.9267 | 1.1144 | 170.0          | 65         |
| 70         | 0.12370                     | 463.2 | 1.9596 | 0.9322 | 1.1117 | 171.6          |         | 0.11818                     | 463.0 | 1.9557 | 0.9333 | 1.1124 | 171.4          | 70         |
| 75         | 0.12569                     | 467.8 | 1.9732 | 0.9390 | 1.1099 | 172.9          |         | 0.12008                     | 467.7 | 1.9693 | 0.9400 | 1.1105 | 172.7          | 75         |
| 80         | 0.12765                     | 472.6 | 1.9866 | 0.9459 | 1.1082 | 174.3          |         | 0.12198                     | 472.4 | 1.9827 | 0.9468 | 1.1088 | 174.1          | 80         |
| 85         | 0.12962                     | 477.3 | 1.9999 | 0.9528 | 1.1066 | 175.6          |         | 0.12387                     | 477.2 | 1.9961 | 0.9537 | 1.1071 | 175.4          | 85         |
| 90         | 0.13158                     | 482.1 | 2.0132 | 0.9598 | 1.1050 | 176.9          |         | 0.12574                     | 482.0 | 2.0094 | 0.9606 | 1.1055 | 176.7          | 90         |
| 95         | 0.13355                     | 486.9 | 2.0264 | 0.9667 | 1.1035 | 178.2          |         | 0.12763                     | 486.8 | 2.0225 | 0.9675 | 1.1040 | 178.0          | 95         |
| 100        | 0.13550                     | 491.7 | 2.0395 | 0.9737 | 1.1022 | 179.5          |         | 0.12950                     | 491.6 | 2.0356 | 0.9745 | 1.1026 | 179.3          | 100        |
| 105        | 0.13746                     | 496.6 | 2.0525 | 0.9808 | 1.1008 | 180.7          |         | 0.13135                     | 496.5 | 2.0487 | 0.9814 | 1.1012 | 180.6          | 105        |
| 110        | 0.13939                     | 501.6 | 2.0654 | 0.9878 | 1.0996 | 182.0          |         | 0.13323                     | 501.5 | 2.0616 | 0.9884 | 1.1000 | 181.8          | 110        |
| 115        | 0.14132                     | 506.5 | 2.0782 | 0.9948 | 1.0983 | 183.2          |         | 0.13508                     | 506.4 | 2.0745 | 0.9954 | 1.0987 | 183.1          | 115        |
| 120        | 0.14327                     | 511.5 | 2.0910 | 1.0018 | 1.0972 | 184.4          |         | 0.13693                     | 511.4 | 2.0872 | 1.0024 | 1.0975 | 184.3          | 120        |
| 125        | 0.14520                     | 516.5 | 2.1037 | 1.0088 | 1.0961 | 185.7          |         | 0.13879                     | 516.4 | 2.1000 | 1.0094 | 1.0964 | 185.5          | 125        |
| 130        | 0.14712                     | 521.6 | 2.1164 | 1.0158 | 1.0950 | 186.9          |         | 0.14063                     | 521.5 | 2.1126 | 1.0163 | 1.0953 | 186.8          | 130        |
| 135        | 0.14905                     | 526.7 | 2.1289 | 1.0228 | 1.0940 | 188.0          |         | 0.14247                     | 526.6 | 2.1252 | 1.0233 | 1.0943 | 188.0          | 135        |
| 140        | 0.15099                     | 531.8 | 2.1414 | 1.0297 | 1.0930 | 189.2          |         | 0.14430                     | 531.7 | 2.1377 | 1.0302 | 1.0933 | 189.1          | 140        |
| 145        | 0.15288                     | 537.0 | 2.1538 | 1.0366 | 1.0920 | 190.4          |         | 0.14616                     | 536.9 | 2.1501 | 1.0371 | 1.0923 | 190.3          | 145        |

**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 240.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 250.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -5.37      | 0.00076                     | 192.8 | 0.9736 | 1.3254 | 1.5164 | 649.7          | SAT LIQ | 0.00077                     | 194.3 | 0.9790 | 1.3285 | 1.5174 | 644.8          | -4.29      |
| -5.37      | 0.08389                     | 395.6 | 1.7310 | 0.8656 | 1.1711 | 147.0          | SAT VAP | 0.08067                     | 396.3 | 1.7303 | 0.8701 | 1.1724 | 147.0          | -4.29      |
| -5         | 0.08405                     | 396.0 | 1.7322 | 0.8657 | 1.1706 | 147.2          |         | —                           | —     | —      | —      | —      | —              | -5         |
| 0          | 0.08615                     | 400.3 | 1.7482 | 0.8663 | 1.1634 | 149.1          |         | 0.08241                     | 400.0 | 1.7441 | 0.8703 | 1.1660 | 148.7          | 0          |
| 5          | 0.08821                     | 404.6 | 1.7639 | 0.8680 | 1.1571 | 150.9          |         | 0.08442                     | 404.4 | 1.7599 | 0.8715 | 1.1594 | 150.6          | 5          |
| 10         | 0.09024                     | 409.0 | 1.7794 | 0.8705 | 1.1515 | 152.7          |         | 0.08638                     | 408.7 | 1.7754 | 0.8737 | 1.1535 | 152.4          | 10         |
| 15         | 0.09224                     | 413.3 | 1.7947 | 0.8738 | 1.1465 | 154.4          |         | 0.08832                     | 413.1 | 1.7908 | 0.8766 | 1.1483 | 154.1          | 15         |
| 20         | 0.09422                     | 417.7 | 1.8097 | 0.8776 | 1.1420 | 156.1          |         | 0.09023                     | 417.5 | 1.8059 | 0.8802 | 1.1436 | 155.8          | 20         |
| 25         | 0.09618                     | 422.1 | 1.8246 | 0.8820 | 1.1379 | 157.8          |         | 0.09212                     | 421.9 | 1.8208 | 0.8843 | 1.1393 | 157.5          | 25         |
| 30         | 0.09812                     | 426.5 | 1.8393 | 0.8867 | 1.1341 | 159.4          |         | 0.09399                     | 426.3 | 1.8355 | 0.8889 | 1.1355 | 159.1          | 30         |
| 35         | 0.10004                     | 431.0 | 1.8539 | 0.8919 | 1.1307 | 161.0          |         | 0.09584                     | 430.8 | 1.8501 | 0.8938 | 1.1319 | 160.7          | 35         |
| 40         | 0.10194                     | 435.4 | 1.8683 | 0.8973 | 1.1276 | 162.5          |         | 0.09768                     | 435.3 | 1.8645 | 0.8991 | 1.1287 | 162.3          | 40         |
| 45         | 0.10383                     | 439.9 | 1.8825 | 0.9030 | 1.1247 | 164.0          |         | 0.09951                     | 439.8 | 1.8788 | 0.9047 | 1.1257 | 163.8          | 45         |
| 50         | 0.10571                     | 444.5 | 1.8967 | 0.9090 | 1.1220 | 165.5          |         | 0.10131                     | 444.3 | 1.8930 | 0.9105 | 1.1230 | 165.3          | 50         |
| 55         | 0.10757                     | 449.0 | 1.9107 | 0.9151 | 1.1196 | 167.0          |         | 0.10310                     | 448.9 | 1.9070 | 0.9165 | 1.1204 | 166.8          | 55         |
| 60         | 0.10942                     | 453.6 | 1.9245 | 0.9214 | 1.1172 | 168.4          |         | 0.10489                     | 453.5 | 1.9209 | 0.9227 | 1.1180 | 168.2          | 60         |
| 65         | 0.11127                     | 458.3 | 1.9383 | 0.9278 | 1.1151 | 169.8          |         | 0.10668                     | 458.1 | 1.9347 | 0.9290 | 1.1158 | 169.6          | 65         |
| 70         | 0.11311                     | 462.9 | 1.9520 | 0.9344 | 1.1130 | 171.2          |         | 0.10845                     | 462.8 | 1.9484 | 0.9355 | 1.1137 | 171.0          | 70         |
| 75         | 0.11494                     | 467.6 | 1.9656 | 0.9410 | 1.1111 | 172.6          |         | 0.11019                     | 467.5 | 1.9620 | 0.9421 | 1.1118 | 172.4          | 75         |
| 80         | 0.11675                     | 472.3 | 1.9790 | 0.9478 | 1.1093 | 173.9          |         | 0.11197                     | 472.2 | 1.9755 | 0.9487 | 1.1099 | 173.8          | 80         |
| 85         | 0.11857                     | 477.1 | 1.9924 | 0.9546 | 1.1076 | 175.3          |         | 0.11371                     | 477.0 | 1.9888 | 0.9554 | 1.1082 | 175.1          | 85         |
| 90         | 0.12038                     | 481.9 | 2.0057 | 0.9614 | 1.1060 | 176.6          |         | 0.11545                     | 481.8 | 2.0021 | 0.9622 | 1.1065 | 176.5          | 90         |
| 95         | 0.12219                     | 486.7 | 2.0189 | 0.9683 | 1.1045 | 177.9          |         | 0.11718                     | 486.6 | 2.0153 | 0.9690 | 1.1050 | 177.8          | 95         |
| 100        | 0.12398                     | 491.5 | 2.0320 | 0.9752 | 1.1030 | 179.2          |         | 0.11891                     | 491.4 | 2.0285 | 0.9759 | 1.1035 | 179.1          | 100        |
| 105        | 0.12577                     | 496.4 | 2.0450 | 0.9821 | 1.1017 | 180.5          |         | 0.12064                     | 496.3 | 2.0415 | 0.9828 | 1.1021 | 180.3          | 105        |
| 110        | 0.12755                     | 501.4 | 2.0579 | 0.9891 | 1.1004 | 181.7          |         | 0.12235                     | 501.3 | 2.0544 | 0.9897 | 1.1008 | 181.6          | 110        |
| 115        | 0.12935                     | 506.3 | 2.0708 | 0.9960 | 1.0991 | 183.0          |         | 0.12407                     | 506.2 | 2.0673 | 0.9966 | 1.0995 | 182.9          | 115        |
| 120        | 0.13111                     | 511.3 | 2.0836 | 1.0030 | 1.0979 | 184.2          |         | 0.12579                     | 511.2 | 2.0801 | 1.0035 | 1.0983 | 184.1          | 120        |
| 125        | 0.13291                     | 516.4 | 2.0963 | 1.0099 | 1.0967 | 185.4          |         | 0.12750                     | 516.3 | 2.0928 | 1.0104 | 1.0971 | 185.3          | 125        |
| 130        | 0.13466                     | 521.4 | 2.1090 | 1.0168 | 1.0956 | 186.7          |         | 0.12920                     | 521.3 | 2.1055 | 1.0173 | 1.0960 | 186.5          | 130        |
| 135        | 0.13646                     | 526.5 | 2.1216 | 1.0237 | 1.0946 | 187.9          |         | 0.13092                     | 526.4 | 2.1181 | 1.0242 | 1.0949 | 187.8          | 135        |
| 140        | 0.13824                     | 531.7 | 2.1341 | 1.0306 | 1.0936 | 189.0          |         | 0.13261                     | 531.6 | 2.1306 | 1.0311 | 1.0938 | 189.0          | 140        |
| 145        | 0.13998                     | 536.8 | 2.1465 | 1.0375 | 1.0926 | 190.2          |         | 0.13432                     | 536.8 | 2.1430 | 1.0379 | 1.0929 | 190.1          | 145        |
| 150        | —                           | —     | —      | —      | —      | —              |         | 0.13600                     | 542.0 | 2.1554 | 1.0448 | 1.0919 | 191.3          | 150        |

  

| TEMP<br>°C | PRESSURE = 260.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 270.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -3.24      | 0.00077                     | 195.7 | 0.9841 | 1.3315 | 1.5184 | 640.0          | SAT LIQ | 0.00077                     | 197.0 | 0.9891 | 1.3345 | 1.5194 | 635.3          | -2.23      |
| -3.24      | 0.07769                     | 396.9 | 1.7297 | 0.8745 | 1.1737 | 147.0          | SAT VAP | 0.07493                     | 397.5 | 1.7291 | 0.8787 | 1.1749 | 147.0          | -2.23      |
| 0          | 0.07897                     | 399.7 | 1.7401 | 0.8744 | 1.1687 | 148.3          |         | 0.07578                     | 399.5 | 1.7363 | 0.8785 | 1.1714 | 147.1          | 0          |
| 5          | 0.08091                     | 404.1 | 1.7560 | 0.8752 | 1.1617 | 150.2          |         | 0.07766                     | 403.8 | 1.7522 | 0.8788 | 1.1641 | 149.8          | 5          |
| 10         | 0.08282                     | 408.5 | 1.7716 | 0.8769 | 1.1556 | 152.0          |         | 0.07951                     | 408.2 | 1.7679 | 0.8802 | 1.1577 | 151.7          | 10         |
| 15         | 0.08469                     | 412.9 | 1.7870 | 0.8795 | 1.1501 | 153.8          |         | 0.08133                     | 412.6 | 1.7833 | 0.8825 | 1.1520 | 153.5          | 15         |
| 20         | 0.08654                     | 417.3 | 1.8021 | 0.8828 | 1.1452 | 155.5          |         | 0.08313                     | 417.1 | 1.7985 | 0.8855 | 1.1469 | 155.2          | 20         |
| 25         | 0.08837                     | 421.7 | 1.8171 | 0.8867 | 1.1408 | 157.2          |         | 0.08490                     | 421.5 | 1.8135 | 0.8891 | 1.1423 | 156.9          | 25         |
| 30         | 0.09018                     | 426.1 | 1.8319 | 0.8910 | 1.1368 | 158.9          |         | 0.08666                     | 426.0 | 1.8283 | 0.8932 | 1.1381 | 158.6          | 30         |
| 35         | 0.09197                     | 430.6 | 1.8465 | 0.8958 | 1.1331 | 160.5          |         | 0.08839                     | 430.4 | 1.8430 | 0.8978 | 1.1344 | 160.2          | 35         |
| 40         | 0.09375                     | 435.1 | 1.8610 | 0.9009 | 1.1298 | 162.0          |         | 0.09011                     | 434.9 | 1.8575 | 0.9027 | 1.1309 | 161.8          | 40         |
| 45         | 0.09550                     | 439.6 | 1.8753 | 0.9063 | 1.1267 | 163.6          |         | 0.09181                     | 439.5 | 1.8718 | 0.9080 | 1.1277 | 163.4          | 45         |
| 50         | 0.09725                     | 444.2 | 1.8894 | 0.9120 | 1.1239 | 165.1          |         | 0.09350                     | 444.0 | 1.8860 | 0.9135 | 1.1248 | 164.9          | 50         |
| 55         | 0.09899                     | 448.7 | 1.9035 | 0.9179 | 1.1213 | 166.6          |         | 0.09517                     | 448.6 | 1.9001 | 0.9193 | 1.1221 | 166.4          | 55         |
| 60         | 0.10073                     | 453.4 | 1.9174 | 0.9240 | 1.1188 | 168.0          |         | 0.09685                     | 453.2 | 1.9140 | 0.9253 | 1.1196 | 167.8          | 60         |
| 65         | 0.10243                     | 458.0 | 1.9312 | 0.9302 | 1.1165 | 169.5          |         | 0.09851                     | 457.9 | 1.9279 | 0.9314 | 1.1173 | 169.3          | 65         |
| 70         | 0.10414                     | 462.7 | 1.9449 | 0.9366 | 1.1144 | 170.9          |         | 0.10016                     | 462.5 | 1.9416 | 0.9377 | 1.1151 | 170.7          | 70         |
| 75         | 0.10583                     | 467.4 | 1.9585 | 0.9431 | 1.1124 | 172.3          |         | 0.10180                     | 467.2 | 1.9552 | 0.9441 | 1.1130 | 172.1          | 75         |
| 80         | 0.10753                     | 472.1 | 1.9720 | 0.9497 | 1.1105 | 173.6          |         | 0.10342                     | 472.0 | 1.9687 | 0.9506 | 1.1111 | 173.5          | 80         |
| 85         | 0.10921                     | 476.8 | 1.9854 | 0.9563 | 1.1087 | 175.0          |         | 0.10505                     | 476.7 | 1.9821 | 0.9572 | 1.1093 | 174.8          | 85         |
| 90         | 0.11089                     | 481.6 | 1.9987 | 0.9630 | 1.1071 | 176.3          |         | 0.10668                     | 481.5 | 1.9954 | 0.9639 | 1.1076 | 176.2          | 90         |
| 95         | 0.11256                     | 486.5 | 2.0119 | 0.9698 | 1.1055 | 177.6          |         | 0.10830                     | 486.4 | 2.0087 | 0.9706 | 1.1059 | 177.5          | 95         |
| 100        | 0.11425                     | 491.3 | 2.0251 | 0.9766 | 1.1040 | 178.9          |         | 0.10990                     | 491.2 | 2.0218 | 0.9774 | 1.1044 | 178.8          | 100        |
| 105        | 0.11590                     | 496.2 | 2.0381 | 0.9835 | 1.1025 | 180.2          |         | 0.11151                     | 496.1 | 2.0348 | 0.9842 | 1.1029 | 180.1          | 105        |
| 110        | 0.11755                     | 501.2 | 2.0511 | 0.9903 | 1.1012 | 181.5          |         | 0.11311                     | 501.1 | 2.0478 | 0.9910 | 1.1016 | 181.4          | 110        |
| 115        | 0.11922                     | 506.1 | 2.0640 | 0.9972 | 1.0999 | 182.7          |         | 0.11471                     | 506.1 | 2.0607 | 0.9978 | 1.1002 | 182.6          | 115        |
| 120        | 0.12086                     | 511.2 | 2.0768 | 1.0041 | 1.0986 | 184.0          |         | 0.11629                     | 511.1 | 2.0735 | 1.0047 | 1.0990 | 183.9          | 120        |
| 125        | 0.12249                     | 516.2 | 2.0895 | 1.0110 | 1.0974 | 185.2          |         | 0.11788                     | 516.1 | 2.0863 | 1.0115 | 1.0978 | 185.1          | 125        |
| 130        | 0.12416                     | 521.3 | 2.1022 | 1.0178 | 1.0963 | 186.4          |         | 0.11946                     | 521.2 | 2.0989 | 1.0183 | 1.0966 | 186.3          | 130        |
| 135        | 0.12579                     | 526.4 | 2.1147 | 1.0247 | 1.0952 | 187.7          |         | 0.12105                     | 526.3 | 2.1115 | 1.0252 | 1.0955 | 187.6          | 135        |
| 140        | 0.12744                     | 531.5 | 2.1273 | 1.0315 | 1.0941 | 188.9          |         | 0.12264                     | 531.4 | 2.1241 | 1.0320 | 1.0944 | 188.8          | 140        |
| 145        | 0.12907                     | 536.7 | 2.1397 | 1.0384 | 1.0931 | 190.0          |         | 0.12422                     | 536.6 | 2.1365 | 1.0388 | 1.0934 | 190.0          | 145        |
| 150        | 0.13068                     | 541.9 | 2.1521 | 1.0452 | 1.0922 | 191.2          |         | 0.12577                     | 541.8 | 2.1489 | 1.0456 | 1.0924 | 191.1          | 150        |

**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 280.0 kPa (abs) |       |        |        |        |                |         | PRESSURE = 290.0 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|----------------------------|-------|--------|--------|--------|----------------|---------|----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| -1.24      | 0.00077                    | 198.3 | 0.9939 | 1.3374 | 1.5204 | 630.8          | SAT LIQ | 0.00077                    | 199.6 | 0.9986 | 1.3403 | 1.5214 | 626.4          | -0.28      |
| -1.24      | 0.07235                    | 398.1 | 1.7285 | 0.8830 | 1.1762 | 147.0          | SAT VAP | 0.06995                    | 398.6 | 1.7280 | 0.8871 | 1.1774 | 147.0          | -0.28      |
| 0          | 0.07281                    | 399.2 | 1.7325 | 0.8827 | 1.1741 | 147.5          |         | 0.07005                    | 398.9 | 1.7289 | 0.8870 | 1.1770 | 147.1          | 0          |
| 5          | 0.07464                    | 403.6 | 1.7485 | 0.8826 | 1.1665 | 149.5          |         | 0.07183                    | 403.3 | 1.7449 | 0.8864 | 1.1690 | 149.1          | 5          |
| 10         | 0.07645                    | 408.0 | 1.7643 | 0.8835 | 1.1598 | 151.3          |         | 0.07359                    | 407.8 | 1.7607 | 0.8869 | 1.1620 | 151.0          | 10         |
| 15         | 0.07822                    | 412.4 | 1.7797 | 0.8854 | 1.1539 | 153.2          |         | 0.07531                    | 412.2 | 1.7763 | 0.8885 | 1.1558 | 152.8          | 15         |
| 20         | 0.07996                    | 416.9 | 1.7950 | 0.8881 | 1.1486 | 154.9          |         | 0.07701                    | 416.6 | 1.7916 | 0.8909 | 1.1503 | 154.6          | 20         |
| 25         | 0.08168                    | 421.3 | 1.8100 | 0.8915 | 1.1438 | 156.7          |         | 0.07867                    | 421.1 | 1.8067 | 0.8939 | 1.1454 | 156.4          | 25         |
| 30         | 0.08338                    | 425.8 | 1.8249 | 0.8954 | 1.1395 | 158.3          |         | 0.08033                    | 425.6 | 1.8216 | 0.8976 | 1.1409 | 158.1          | 30         |
| 35         | 0.08506                    | 430.3 | 1.8396 | 0.8998 | 1.1356 | 160.0          |         | 0.08196                    | 430.1 | 1.8363 | 0.9018 | 1.1369 | 159.7          | 35         |
| 40         | 0.08672                    | 434.8 | 1.8541 | 0.9045 | 1.1320 | 161.6          |         | 0.08358                    | 434.6 | 1.8508 | 0.9064 | 1.1332 | 161.3          | 40         |
| 45         | 0.08837                    | 439.3 | 1.8685 | 0.9096 | 1.1288 | 163.1          |         | 0.08517                    | 439.1 | 1.8652 | 0.9113 | 1.1298 | 162.9          | 45         |
| 50         | 0.09001                    | 443.9 | 1.8827 | 0.9150 | 1.1258 | 164.7          |         | 0.08676                    | 443.7 | 1.8795 | 0.9166 | 1.1267 | 164.4          | 50         |
| 55         | 0.09163                    | 448.5 | 1.8968 | 0.9207 | 1.1230 | 166.2          |         | 0.08835                    | 448.3 | 1.8936 | 0.9221 | 1.1239 | 166.0          | 55         |
| 60         | 0.09325                    | 453.1 | 1.9108 | 0.9266 | 1.1204 | 167.6          |         | 0.08990                    | 452.9 | 1.9076 | 0.9279 | 1.1212 | 167.4          | 60         |
| 65         | 0.09485                    | 457.7 | 1.9246 | 0.9326 | 1.1180 | 169.1          |         | 0.09145                    | 457.6 | 1.9215 | 0.9338 | 1.1187 | 168.9          | 65         |
| 70         | 0.09645                    | 462.4 | 1.9383 | 0.9388 | 1.1158 | 170.5          |         | 0.09301                    | 462.3 | 1.9352 | 0.9399 | 1.1164 | 170.3          | 70         |
| 75         | 0.09804                    | 467.1 | 1.9520 | 0.9451 | 1.1137 | 171.9          |         | 0.09455                    | 467.0 | 1.9489 | 0.9462 | 1.1143 | 171.8          | 75         |
| 80         | 0.09962                    | 471.8 | 1.9655 | 0.9516 | 1.1117 | 173.3          |         | 0.09606                    | 471.7 | 1.9624 | 0.9525 | 1.1123 | 173.1          | 80         |
| 85         | 0.10118                    | 476.6 | 1.9789 | 0.9581 | 1.1098 | 174.7          |         | 0.09760                    | 476.5 | 1.9758 | 0.9590 | 1.1104 | 174.5          | 85         |
| 90         | 0.10275                    | 481.4 | 1.9922 | 0.9647 | 1.1081 | 176.0          |         | 0.09911                    | 481.3 | 1.9892 | 0.9656 | 1.1086 | 175.9          | 90         |
| 95         | 0.10432                    | 486.3 | 2.0055 | 0.9714 | 1.1064 | 177.3          |         | 0.10062                    | 486.2 | 2.0024 | 0.9722 | 1.1069 | 177.2          | 95         |
| 100        | 0.10588                    | 491.1 | 2.0186 | 0.9781 | 1.1049 | 178.7          |         | 0.10213                    | 491.0 | 2.0156 | 0.9788 | 1.1053 | 178.5          | 100        |
| 105        | 0.10743                    | 496.1 | 2.0317 | 0.9848 | 1.1034 | 180.0          |         | 0.10363                    | 496.0 | 2.0286 | 0.9855 | 1.1038 | 179.8          | 105        |
| 110        | 0.10897                    | 501.0 | 2.0447 | 0.9916 | 1.1020 | 181.2          |         | 0.10512                    | 500.9 | 2.0416 | 0.9923 | 1.1024 | 181.1          | 110        |
| 115        | 0.11052                    | 506.0 | 2.0576 | 0.9984 | 1.1006 | 182.5          |         | 0.10663                    | 505.9 | 2.0546 | 0.9990 | 1.1010 | 182.4          | 115        |
| 120        | 0.11206                    | 511.0 | 2.0704 | 1.0052 | 1.0993 | 183.8          |         | 0.10812                    | 510.9 | 2.0674 | 1.0058 | 1.0997 | 183.7          | 120        |
| 125        | 0.11358                    | 516.0 | 2.0831 | 1.0120 | 1.0981 | 185.0          |         | 0.10960                    | 515.9 | 2.0801 | 1.0126 | 1.0985 | 184.9          | 125        |
| 130        | 0.11511                    | 521.1 | 2.0958 | 1.0189 | 1.0969 | 186.2          |         | 0.11107                    | 521.0 | 2.0928 | 1.0194 | 1.0973 | 186.1          | 130        |
| 135        | 0.11665                    | 526.2 | 2.1084 | 1.0257 | 1.0958 | 187.5          |         | 0.11256                    | 526.1 | 2.1054 | 1.0262 | 1.0961 | 187.4          | 135        |
| 140        | 0.11818                    | 531.4 | 2.1209 | 1.0325 | 1.0947 | 188.7          |         | 0.11404                    | 531.3 | 2.1180 | 1.0329 | 1.0950 | 188.6          | 140        |
| 145        | 0.11969                    | 536.5 | 2.1334 | 1.0392 | 1.0937 | 189.9          |         | 0.11550                    | 536.5 | 2.1304 | 1.0397 | 1.0940 | 189.8          | 145        |
| 150        | 0.12121                    | 541.7 | 2.1458 | 1.0460 | 1.0927 | 191.0          |         | 0.11697                    | 541.7 | 2.1428 | 1.0464 | 1.0930 | 191.0          | 150        |

  

| TEMP<br>°C | PRESSURE = 300.0 kPa (abs) |       |        |        |        |                |         | PRESSURE = 310.0 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|----------------------------|-------|--------|--------|--------|----------------|---------|----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                          | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 0.66       | 0.00077                    | 200.9 | 1.0032 | 1.3431 | 1.5225 | 622.1          | SAT LIQ | 0.00078                    | 202.1 | 1.0077 | 1.3459 | 1.5235 | 617.9          | 1.57       |
| 0.66       | 0.06770                    | 399.2 | 1.7275 | 0.8912 | 1.1787 | 147.0          | SAT VAP | 0.06559                    | 399.7 | 1.7270 | 0.8952 | 1.1800 | 146.9          | 1.57       |
| 5          | 0.06921                    | 403.1 | 1.7415 | 0.8902 | 1.1715 | 148.7          |         | 0.06676                    | 402.8 | 1.7381 | 0.8942 | 1.1741 | 148.3          | 5          |
| 10         | 0.07092                    | 407.5 | 1.7573 | 0.8904 | 1.1642 | 150.7          |         | 0.06842                    | 407.3 | 1.7540 | 0.8938 | 1.1665 | 150.3          | 10         |
| 15         | 0.07260                    | 412.0 | 1.7729 | 0.8915 | 1.1578 | 152.5          |         | 0.07006                    | 411.7 | 1.7696 | 0.8947 | 1.1598 | 152.2          | 15         |
| 20         | 0.07424                    | 416.4 | 1.7883 | 0.8936 | 1.1521 | 154.3          |         | 0.07166                    | 416.2 | 1.7850 | 0.8964 | 1.1538 | 154.0          | 20         |
| 25         | 0.07587                    | 420.9 | 1.8034 | 0.8964 | 1.1469 | 156.1          |         | 0.07325                    | 420.7 | 1.8002 | 0.8989 | 1.1485 | 155.8          | 25         |
| 30         | 0.07748                    | 425.4 | 1.8183 | 0.8998 | 1.1423 | 157.8          |         | 0.07481                    | 425.2 | 1.8152 | 0.9021 | 1.1438 | 157.5          | 30         |
| 35         | 0.07906                    | 429.9 | 1.8331 | 0.9038 | 1.1381 | 159.5          |         | 0.07635                    | 429.7 | 1.8300 | 0.9059 | 1.1394 | 159.2          | 35         |
| 40         | 0.08063                    | 434.4 | 1.8477 | 0.9082 | 1.1343 | 161.1          |         | 0.07788                    | 434.3 | 1.8446 | 0.9101 | 1.1355 | 160.8          | 40         |
| 45         | 0.08219                    | 439.0 | 1.8621 | 0.9130 | 1.1309 | 162.7          |         | 0.07939                    | 438.8 | 1.8590 | 0.9147 | 1.1319 | 162.4          | 45         |
| 50         | 0.08372                    | 443.6 | 1.8764 | 0.9181 | 1.1277 | 164.2          |         | 0.08090                    | 443.4 | 1.8734 | 0.9197 | 1.1287 | 164.0          | 50         |
| 55         | 0.08525                    | 448.2 | 1.8905 | 0.9236 | 1.1247 | 165.8          |         | 0.08239                    | 448.0 | 1.8875 | 0.9250 | 1.1256 | 165.6          | 55         |
| 60         | 0.08678                    | 452.8 | 1.9045 | 0.9292 | 1.1220 | 167.3          |         | 0.08385                    | 452.7 | 1.9015 | 0.9305 | 1.1228 | 167.1          | 60         |
| 65         | 0.08829                    | 457.5 | 1.9184 | 0.9350 | 1.1195 | 168.7          |         | 0.08532                    | 457.3 | 1.9154 | 0.9363 | 1.1203 | 168.5          | 65         |
| 70         | 0.08978                    | 462.1 | 1.9322 | 0.9411 | 1.1171 | 170.2          |         | 0.08678                    | 462.0 | 1.9292 | 0.9422 | 1.1178 | 170.0          | 70         |
| 75         | 0.09128                    | 466.9 | 1.9458 | 0.9472 | 1.1149 | 171.6          |         | 0.08821                    | 466.7 | 1.9429 | 0.9483 | 1.1156 | 171.4          | 75         |
| 80         | 0.09276                    | 471.6 | 1.9594 | 0.9535 | 1.1129 | 173.0          |         | 0.08967                    | 471.5 | 1.9565 | 0.9545 | 1.1135 | 172.8          | 80         |
| 85         | 0.09424                    | 476.4 | 1.9728 | 0.9599 | 1.1110 | 174.4          |         | 0.09111                    | 476.3 | 1.9699 | 0.9608 | 1.1115 | 174.2          | 85         |
| 90         | 0.09571                    | 481.2 | 1.9862 | 0.9664 | 1.1091 | 175.7          |         | 0.09253                    | 481.1 | 1.9833 | 0.9672 | 1.1097 | 175.6          | 90         |
| 95         | 0.09718                    | 486.1 | 1.9994 | 0.9730 | 1.1074 | 177.1          |         | 0.09395                    | 486.0 | 1.9966 | 0.9737 | 1.1079 | 176.9          | 95         |
| 100        | 0.09863                    | 490.9 | 2.0126 | 0.9796 | 1.1058 | 178.4          |         | 0.09536                    | 490.8 | 2.0097 | 0.9803 | 1.1063 | 178.3          | 100        |
| 105        | 0.10009                    | 495.9 | 2.0257 | 0.9862 | 1.1042 | 179.7          |         | 0.09678                    | 495.8 | 2.0228 | 0.9869 | 1.1047 | 179.6          | 105        |
| 110        | 0.10153                    | 500.8 | 2.0387 | 0.9929 | 1.1028 | 181.0          |         | 0.09818                    | 500.7 | 2.0359 | 0.9936 | 1.1032 | 180.9          | 110        |
| 115        | 0.10299                    | 505.8 | 2.0516 | 0.9996 | 1.1014 | 182.3          |         | 0.09958                    | 505.7 | 2.0488 | 1.0003 | 1.1018 | 182.2          | 115        |
| 120        | 0.10444                    | 510.8 | 2.0645 | 1.0064 | 1.1001 | 183.5          |         | 0.10098                    | 510.7 | 2.0616 | 1.0070 | 1.1004 | 183.4          | 120        |
| 125        | 0.10585                    | 515.9 | 2.0772 | 1.0131 | 1.0988 | 184.8          |         | 0.10236                    | 515.8 | 2.0744 | 1.0137 | 1.0991 | 184.7          | 125        |
| 130        | 0.10730                    | 520.9 | 2.0899 | 1.0199 | 1.0976 | 186.0          |         | 0.10376                    | 520.9 | 2.0871 | 1.0204 | 1.0979 | 185.9          | 130        |
| 135        | 0.10873                    | 526.1 | 2.1025 | 1.0266 | 1.0964 | 187.3          |         | 0.10514                    | 526.0 | 2.0997 | 1.0271 | 1.0967 | 187.2          | 135        |
| 140        | 0.11017                    | 531.2 | 2.1151 | 1.0334 | 1.0953 | 188.5          |         | 0.10654                    | 531.1 | 2.1122 | 1.0338 | 1.0956 | 188.4          | 140        |
| 145        | 0.11158                    | 536.4 | 2.1275 | 1.0401 | 1.0943 | 189.7          |         | 0.10791                    | 536.3 | 2.1247 | 1.0406 | 1.0945 | 189.6          | 145        |
| 150        | 0.11301                    | 541.6 | 2.1399 | 1.0468 | 1.0932 | 190.9          |         | 0.10929                    | 541.5 | 2.1371 | 1.0472 | 1.0935 | 190.8          | 150        |
| 155        | 0.11442                    | 546.9 | 2.1523 | 1.0535 | 1.0922 | 192.1          |         | 0.11067                    | 546.8 | 2.1495 | 1.0539 | 1.0925 | 192.0          | 155        |



**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 320.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 330.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|--------------------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 2.46       | 0.00078                     | 203.3 | 1.0120 | 1.3486 | 1.5245 | 613.8          | SAT LIQ<br>SAT VAP | 0.00078                     | 204.5 | 1.0162 | 1.3514 | 1.5256 | 609.8          | 3.33       |
| 2.46       | 0.06361                     | 400.2 | 1.7265 | 0.8991 | 1.1813 | 146.9          |                    | 0.06174                     | 400.7 | 1.7260 | 0.9030 | 1.1825 | 146.9          | 3.33       |
| 5          | 0.06445                     | 402.5 | 1.7347 | 0.8982 | 1.1768 | 148.0          |                    | 0.06229                     | 402.2 | 1.7315 | 0.9023 | 1.1795 | 147.6          | 5          |
| 10         | 0.06608                     | 407.0 | 1.7507 | 0.8974 | 1.1688 | 149.9          |                    | 0.06388                     | 406.8 | 1.7475 | 0.9010 | 1.1712 | 149.6          | 10         |
| 15         | 0.06768                     | 411.5 | 1.7664 | 0.8978 | 1.1618 | 151.9          |                    | 0.06544                     | 411.3 | 1.7633 | 0.9010 | 1.1639 | 151.5          | 15         |
| 20         | 0.06924                     | 416.0 | 1.7819 | 0.8992 | 1.1557 | 153.7          |                    | 0.06697                     | 415.8 | 1.7788 | 0.9021 | 1.1575 | 153.4          | 20         |
| 25         | 0.07079                     | 420.5 | 1.7971 | 0.9015 | 1.1501 | 155.5          |                    | 0.06848                     | 420.3 | 1.7941 | 0.9040 | 1.1518 | 155.2          | 25         |
| 30         | 0.07231                     | 425.0 | 1.8121 | 0.9044 | 1.1452 | 157.3          |                    | 0.06996                     | 424.8 | 1.8091 | 0.9067 | 1.1467 | 157.0          | 30         |
| 35         | 0.07382                     | 429.5 | 1.8269 | 0.9080 | 1.1407 | 159.0          |                    | 0.07143                     | 429.3 | 1.8240 | 0.9101 | 1.1421 | 158.7          | 35         |
| 40         | 0.07530                     | 434.1 | 1.8416 | 0.9120 | 1.1367 | 160.6          |                    | 0.07288                     | 433.9 | 1.8387 | 0.9139 | 1.1379 | 160.4          | 40         |
| 45         | 0.07678                     | 438.7 | 1.8561 | 0.9165 | 1.1330 | 162.2          |                    | 0.07432                     | 438.5 | 1.8532 | 0.9182 | 1.1341 | 162.0          | 45         |
| 50         | 0.07824                     | 443.2 | 1.8704 | 0.9213 | 1.1296 | 163.8          |                    | 0.07574                     | 443.1 | 1.8675 | 0.9229 | 1.1306 | 163.6          | 50         |
| 55         | 0.07967                     | 447.9 | 1.8846 | 0.9264 | 1.1265 | 165.3          |                    | 0.07715                     | 447.7 | 1.8818 | 0.9279 | 1.1274 | 165.1          | 55         |
| 60         | 0.08112                     | 452.5 | 1.8986 | 0.9319 | 1.1237 | 166.9          |                    | 0.07854                     | 452.4 | 1.8958 | 0.9332 | 1.1245 | 166.7          | 60         |
| 65         | 0.08254                     | 457.2 | 1.9126 | 0.9375 | 1.1210 | 168.4          |                    | 0.07993                     | 457.0 | 1.9098 | 0.9387 | 1.1218 | 168.2          | 65         |
| 70         | 0.08396                     | 461.9 | 1.9264 | 0.9433 | 1.1186 | 169.8          |                    | 0.08131                     | 461.8 | 1.9236 | 0.9445 | 1.1193 | 169.6          | 70         |
| 75         | 0.08537                     | 466.6 | 1.9401 | 0.9493 | 1.1163 | 171.3          |                    | 0.08267                     | 466.5 | 1.9373 | 0.9504 | 1.1169 | 171.1          | 75         |
| 80         | 0.08676                     | 471.4 | 1.9536 | 0.9555 | 1.1141 | 172.7          |                    | 0.08403                     | 471.3 | 1.9509 | 0.9565 | 1.1147 | 172.5          | 80         |
| 85         | 0.08816                     | 476.2 | 1.9671 | 0.9617 | 1.1121 | 174.1          |                    | 0.08538                     | 476.1 | 1.9644 | 0.9627 | 1.1127 | 173.9          | 85         |
| 90         | 0.08953                     | 481.0 | 1.9805 | 0.9681 | 1.1102 | 175.4          |                    | 0.08675                     | 480.9 | 1.9778 | 0.9690 | 1.1107 | 175.3          | 90         |
| 95         | 0.09092                     | 485.9 | 1.9938 | 0.9745 | 1.1084 | 176.8          |                    | 0.08807                     | 485.7 | 1.9910 | 0.9753 | 1.1089 | 176.7          | 95         |
| 100        | 0.09229                     | 490.7 | 2.0070 | 0.9811 | 1.1067 | 178.1          |                    | 0.08941                     | 490.6 | 2.0042 | 0.9818 | 1.1072 | 178.0          | 100        |
| 105        | 0.09366                     | 495.7 | 2.0201 | 0.9876 | 1.1051 | 179.5          |                    | 0.09074                     | 495.6 | 2.0174 | 0.9883 | 1.1056 | 179.3          | 105        |
| 110        | 0.09504                     | 500.6 | 2.0331 | 0.9942 | 1.1036 | 180.8          |                    | 0.09208                     | 500.5 | 2.0304 | 0.9949 | 1.1040 | 180.6          | 110        |
| 115        | 0.09639                     | 505.6 | 2.0460 | 1.0009 | 1.1022 | 182.0          |                    | 0.09339                     | 505.5 | 2.0433 | 1.0015 | 1.1026 | 181.9          | 115        |
| 120        | 0.09775                     | 510.6 | 2.0589 | 1.0075 | 1.1008 | 183.3          |                    | 0.09471                     | 510.5 | 2.0562 | 1.0081 | 1.1012 | 183.2          | 120        |
| 125        | 0.09910                     | 515.7 | 2.0716 | 1.0142 | 1.0995 | 184.6          |                    | 0.09603                     | 515.6 | 2.0690 | 1.0148 | 1.0998 | 184.5          | 125        |
| 130        | 0.10046                     | 520.8 | 2.0843 | 1.0209 | 1.0983 | 185.8          |                    | 0.09735                     | 520.7 | 2.0817 | 1.0214 | 1.0986 | 185.7          | 130        |
| 135        | 0.10180                     | 525.9 | 2.0970 | 1.0276 | 1.0971 | 187.1          |                    | 0.09864                     | 525.8 | 2.0943 | 1.0281 | 1.0974 | 187.0          | 135        |
| 140        | 0.10316                     | 531.0 | 2.1095 | 1.0343 | 1.0959 | 188.3          |                    | 0.09995                     | 531.0 | 2.1069 | 1.0348 | 1.0962 | 188.2          | 140        |
| 145        | 0.10448                     | 536.2 | 2.1220 | 1.0410 | 1.0948 | 189.5          |                    | 0.10126                     | 536.2 | 2.1194 | 1.0414 | 1.0951 | 189.4          | 145        |
| 150        | 0.10582                     | 541.5 | 2.1344 | 1.0477 | 1.0938 | 190.7          |                    | 0.10255                     | 541.4 | 2.1318 | 1.0481 | 1.0940 | 190.6          | 150        |
| 155        | 0.10717                     | 546.7 | 2.1468 | 1.0543 | 1.0928 | 191.9          |                    | 0.10384                     | 546.6 | 2.1441 | 1.0547 | 1.0930 | 191.8          | 155        |

  

| TEMP<br>°C | PRESSURE = 340.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 350.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|--------------------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 4.18       | 0.00078                     | 205.6 | 1.0204 | 1.3541 | 1.5266 | 605.9          | SAT LIQ<br>SAT VAP | 0.00078                     | 206.8 | 1.0244 | 1.3567 | 1.5276 | 602.1          | 5.01       |
| 4.18       | 0.05998                     | 401.2 | 1.7256 | 0.9069 | 1.1838 | 146.8          |                    | 0.05832                     | 401.7 | 1.7252 | 0.9106 | 1.1851 | 146.8          | 5.01       |
| 5          | 0.06024                     | 402.0 | 1.7283 | 0.9064 | 1.1823 | 147.2          |                    | —                           | —     | —      | —      | —      | —              | 5          |
| 10         | 0.06180                     | 406.5 | 1.7444 | 0.9047 | 1.1736 | 149.2          |                    | 0.05985                     | 406.2 | 1.7414 | 0.9084 | 1.1761 | 148.9          | 10         |
| 15         | 0.06333                     | 411.0 | 1.7602 | 0.9043 | 1.1660 | 151.2          |                    | 0.06134                     | 410.8 | 1.7572 | 0.9076 | 1.1682 | 150.9          | 15         |
| 20         | 0.06483                     | 415.5 | 1.7758 | 0.9050 | 1.1594 | 153.1          |                    | 0.06281                     | 415.3 | 1.7729 | 0.9079 | 1.1613 | 152.8          | 20         |
| 25         | 0.06630                     | 420.1 | 1.7911 | 0.9066 | 1.1535 | 154.9          |                    | 0.06425                     | 419.9 | 1.7882 | 0.9093 | 1.1552 | 154.6          | 25         |
| 30         | 0.06776                     | 424.6 | 1.8062 | 0.9091 | 1.1482 | 156.7          |                    | 0.06567                     | 424.4 | 1.8034 | 0.9115 | 1.1497 | 156.4          | 30         |
| 35         | 0.06919                     | 429.2 | 1.8211 | 0.9122 | 1.1434 | 158.4          |                    | 0.06706                     | 429.0 | 1.8183 | 0.9143 | 1.1448 | 158.2          | 35         |
| 40         | 0.07060                     | 433.7 | 1.8358 | 0.9158 | 1.1391 | 160.1          |                    | 0.06845                     | 433.6 | 1.8330 | 0.9178 | 1.1403 | 159.9          | 40         |
| 45         | 0.07200                     | 438.3 | 1.8504 | 0.9200 | 1.1352 | 161.8          |                    | 0.06981                     | 438.2 | 1.8476 | 0.9217 | 1.1363 | 161.5          | 45         |
| 50         | 0.07339                     | 442.9 | 1.8648 | 0.9245 | 1.1316 | 163.4          |                    | 0.07116                     | 442.8 | 1.8620 | 0.9261 | 1.1327 | 163.1          | 50         |
| 55         | 0.07476                     | 447.6 | 1.8790 | 0.9294 | 1.1284 | 164.9          |                    | 0.07250                     | 447.4 | 1.8763 | 0.9309 | 1.1293 | 164.7          | 55         |
| 60         | 0.07612                     | 452.2 | 1.8931 | 0.9346 | 1.1254 | 166.5          |                    | 0.07383                     | 452.1 | 1.8904 | 0.9359 | 1.1262 | 166.3          | 60         |
| 65         | 0.07747                     | 456.9 | 1.9070 | 0.9400 | 1.1226 | 168.0          |                    | 0.07515                     | 456.8 | 1.9044 | 0.9412 | 1.1234 | 167.8          | 65         |
| 70         | 0.07880                     | 461.6 | 1.9209 | 0.9456 | 1.1200 | 169.5          |                    | 0.07645                     | 461.5 | 1.9182 | 0.9468 | 1.1207 | 169.3          | 70         |
| 75         | 0.08013                     | 466.4 | 1.9346 | 0.9515 | 1.1176 | 170.9          |                    | 0.07775                     | 466.2 | 1.9320 | 0.9525 | 1.1183 | 170.7          | 75         |
| 80         | 0.08146                     | 471.1 | 1.9482 | 0.9575 | 1.1153 | 172.3          |                    | 0.07904                     | 471.0 | 1.9456 | 0.9585 | 1.1160 | 172.2          | 80         |
| 85         | 0.08280                     | 475.9 | 1.9617 | 0.9636 | 1.1132 | 173.8          |                    | 0.08033                     | 475.8 | 1.9591 | 0.9645 | 1.1138 | 173.6          | 85         |
| 90         | 0.08410                     | 480.8 | 1.9751 | 0.9698 | 1.1113 | 175.1          |                    | 0.08161                     | 480.7 | 1.9725 | 0.9707 | 1.1118 | 175.0          | 90         |
| 95         | 0.08540                     | 485.6 | 1.9884 | 0.9761 | 1.1094 | 176.5          |                    | 0.08287                     | 485.5 | 1.9858 | 0.9770 | 1.1099 | 176.4          | 95         |
| 100        | 0.08669                     | 490.5 | 2.0016 | 0.9826 | 1.1077 | 177.9          |                    | 0.08414                     | 490.4 | 1.9991 | 0.9833 | 1.1081 | 177.7          | 100        |
| 105        | 0.08800                     | 495.5 | 2.0147 | 0.9890 | 1.1060 | 179.2          |                    | 0.08541                     | 495.4 | 2.0122 | 0.9897 | 1.1065 | 179.1          | 105        |
| 110        | 0.08929                     | 500.4 | 2.0278 | 0.9955 | 1.1044 | 180.5          |                    | 0.08666                     | 500.3 | 2.0252 | 0.9962 | 1.1049 | 180.4          | 110        |
| 115        | 0.09058                     | 505.4 | 2.0407 | 1.0021 | 1.1030 | 181.8          |                    | 0.08790                     | 505.3 | 2.0382 | 1.0027 | 1.1034 | 181.7          | 115        |
| 120        | 0.09184                     | 510.4 | 2.0536 | 1.0087 | 1.1015 | 183.1          |                    | 0.08916                     | 510.4 | 2.0511 | 1.0093 | 1.1019 | 183.0          | 120        |
| 125        | 0.09314                     | 515.5 | 2.0664 | 1.0153 | 1.1002 | 184.4          |                    | 0.09041                     | 515.4 | 2.0639 | 1.0159 | 1.1006 | 184.3          | 125        |
| 130        | 0.09440                     | 520.6 | 2.0791 | 1.0220 | 1.0989 | 185.6          |                    | 0.09165                     | 520.5 | 2.0766 | 1.0225 | 1.0993 | 185.5          | 130        |
| 135        | 0.09568                     | 525.7 | 2.0917 | 1.0286 | 1.0977 | 186.9          |                    | 0.09289                     | 525.6 | 2.0892 | 1.0291 | 1.0980 | 186.8          | 135        |
| 140        | 0.09696                     | 530.9 | 2.1043 | 1.0352 | 1.0965 | 188.1          |                    | 0.09413                     | 530.8 | 2.1018 | 1.0357 | 1.0968 | 188.0          | 140        |
| 145        | 0.09822                     | 536.1 | 2.1168 | 1.0419 | 1.0954 | 189.3          |                    | 0.09536                     | 536.0 | 2.1143 | 1.0423 | 1.0957 | 189.2          | 145        |
| 150        | 0.09948                     | 541.3 | 2.1292 | 1.0485 | 1.0943 | 190.5          |                    | 0.09658                     | 541.2 | 2.1267 | 1.0489 | 1.0946 | 190.4          | 150        |
| 155        | 0.10074                     | 546.6 | 2.1416 | 1.0551 | 1.0933 | 191.7          |                    | 0.09781                     | 546.5 | 2.1391 | 1.0555 | 1.0935 | 191.6          | 155        |
| 160        | —                           | —     | —      | —      | —      | —              |                    | 0.09904                     | 551.8 | 2.1514 | 1.0621 | 1.0925 | 192.8          | 160        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 360.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 370.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 5.82       | 0.00078                     | 207.9 | 1.0283 | 1.3593 | 1.5287 | 598.3          | SAT LIQ | 0.00079                     | 209.0 | 1.0322 | 1.3619 | 1.5297 | 594.7          | 6.62       |
| 5.82       | 0.05675                     | 402.2 | 1.7248 | 0.9144 | 1.1864 | 146.7          | SAT VAP | 0.05526                     | 402.6 | 1.7244 | 0.9181 | 1.1877 | 146.7          | 6.62       |
| 10         | 0.05800                     | 406.0 | 1.7384 | 0.9122 | 1.1786 | 148.5          |         | 0.05625                     | 405.7 | 1.7354 | 0.9160 | 1.1812 | 148.1          | 10         |
| 15         | 0.05946                     | 410.5 | 1.7543 | 0.9109 | 1.1704 | 150.5          |         | 0.05769                     | 410.3 | 1.7514 | 0.9143 | 1.1727 | 150.2          | 15         |
| 20         | 0.06090                     | 415.1 | 1.7700 | 0.9109 | 1.1632 | 152.5          |         | 0.05909                     | 414.9 | 1.7672 | 0.9140 | 1.1652 | 152.1          | 20         |
| 25         | 0.06231                     | 419.7 | 1.7854 | 0.9120 | 1.1569 | 154.3          |         | 0.06047                     | 419.4 | 1.7826 | 0.9147 | 1.1586 | 154.0          | 25         |
| 30         | 0.06370                     | 424.2 | 1.8006 | 0.9139 | 1.1512 | 156.2          |         | 0.06184                     | 424.0 | 1.7979 | 0.9163 | 1.1528 | 155.9          | 30         |
| 35         | 0.06507                     | 428.8 | 1.8156 | 0.9165 | 1.1462 | 157.9          |         | 0.06317                     | 428.6 | 1.8129 | 0.9187 | 1.1476 | 157.7          | 35         |
| 40         | 0.06641                     | 433.4 | 1.8303 | 0.9198 | 1.1416 | 159.6          |         | 0.06449                     | 433.2 | 1.8277 | 0.9217 | 1.1429 | 159.4          | 40         |
| 45         | 0.06775                     | 438.0 | 1.8449 | 0.9235 | 1.1375 | 161.3          |         | 0.06580                     | 437.8 | 1.8423 | 0.9253 | 1.1386 | 161.1          | 45         |
| 50         | 0.06907                     | 442.6 | 1.8594 | 0.9278 | 1.1337 | 162.9          |         | 0.06708                     | 442.5 | 1.8568 | 0.9294 | 1.1347 | 162.7          | 50         |
| 55         | 0.07037                     | 447.3 | 1.8736 | 0.9324 | 1.1302 | 164.5          |         | 0.06836                     | 447.1 | 1.8711 | 0.9339 | 1.1312 | 164.3          | 55         |
| 60         | 0.07167                     | 451.9 | 1.8878 | 0.9373 | 1.1271 | 166.1          |         | 0.06962                     | 451.8 | 1.8852 | 0.9387 | 1.1279 | 165.9          | 60         |
| 65         | 0.07296                     | 456.6 | 1.9018 | 0.9425 | 1.1242 | 167.6          |         | 0.07088                     | 456.5 | 1.8992 | 0.9438 | 1.1250 | 167.4          | 65         |
| 70         | 0.07423                     | 461.4 | 1.9156 | 0.9480 | 1.1215 | 169.1          |         | 0.07213                     | 461.2 | 1.9131 | 0.9491 | 1.1222 | 168.9          | 70         |
| 75         | 0.07551                     | 466.1 | 1.9294 | 0.9536 | 1.1189 | 170.6          |         | 0.07336                     | 466.0 | 1.9269 | 0.9547 | 1.1196 | 170.4          | 75         |
| 80         | 0.07676                     | 470.9 | 1.9430 | 0.9595 | 1.1166 | 172.0          |         | 0.07459                     | 470.8 | 1.9406 | 0.9605 | 1.1172 | 171.9          | 80         |
| 85         | 0.07800                     | 475.7 | 1.9566 | 0.9654 | 1.1144 | 173.4          |         | 0.07582                     | 475.6 | 1.9541 | 0.9664 | 1.1150 | 173.3          | 85         |
| 90         | 0.07925                     | 480.6 | 1.9700 | 0.9716 | 1.1124 | 174.9          |         | 0.07702                     | 480.4 | 1.9675 | 0.9724 | 1.1129 | 174.7          | 90         |
| 95         | 0.08050                     | 485.4 | 1.9833 | 0.9778 | 1.1104 | 176.2          |         | 0.07824                     | 485.3 | 1.9809 | 0.9786 | 1.1109 | 176.1          | 95         |
| 100        | 0.08173                     | 490.3 | 1.9966 | 0.9841 | 1.1086 | 177.6          |         | 0.07945                     | 490.2 | 1.9941 | 0.9848 | 1.1091 | 177.5          | 100        |
| 105        | 0.08295                     | 495.3 | 2.0097 | 0.9904 | 1.1069 | 178.9          |         | 0.08065                     | 495.2 | 2.0073 | 0.9912 | 1.1074 | 178.8          | 105        |
| 110        | 0.08418                     | 500.2 | 2.0228 | 0.9969 | 1.1053 | 180.3          |         | 0.08184                     | 500.1 | 2.0203 | 0.9975 | 1.1057 | 180.1          | 110        |
| 115        | 0.08540                     | 505.2 | 2.0357 | 1.0034 | 1.1038 | 181.6          |         | 0.08304                     | 505.1 | 2.0333 | 1.0040 | 1.1042 | 181.5          | 115        |
| 120        | 0.08663                     | 510.3 | 2.0486 | 1.0099 | 1.1023 | 182.9          |         | 0.08420                     | 510.2 | 2.0462 | 1.0105 | 1.1027 | 182.8          | 120        |
| 125        | 0.08783                     | 515.3 | 2.0614 | 1.0164 | 1.1009 | 184.2          |         | 0.08540                     | 515.3 | 2.0590 | 1.0170 | 1.1013 | 184.0          | 125        |
| 130        | 0.08904                     | 520.4 | 2.0741 | 1.0230 | 1.0996 | 185.4          |         | 0.08657                     | 520.4 | 2.0718 | 1.0235 | 1.0999 | 185.3          | 130        |
| 135        | 0.09024                     | 525.6 | 2.0868 | 1.0296 | 1.0983 | 186.7          |         | 0.08776                     | 525.5 | 2.0844 | 1.0301 | 1.0986 | 186.6          | 135        |
| 140        | 0.09146                     | 530.7 | 2.0994 | 1.0362 | 1.0971 | 187.9          |         | 0.08891                     | 530.7 | 2.0970 | 1.0366 | 1.0974 | 187.8          | 140        |
| 145        | 0.09264                     | 535.9 | 2.1119 | 1.0428 | 1.0960 | 189.1          |         | 0.09009                     | 535.9 | 2.1095 | 1.0432 | 1.0963 | 189.0          | 145        |
| 150        | 0.09385                     | 541.2 | 2.1243 | 1.0493 | 1.0949 | 190.3          |         | 0.09126                     | 541.1 | 2.1219 | 1.0498 | 1.0951 | 190.3          | 150        |
| 155        | 0.09504                     | 546.4 | 2.1367 | 1.0559 | 1.0938 | 191.6          |         | 0.09241                     | 546.4 | 2.1343 | 1.0563 | 1.0941 | 191.5          | 155        |
| 160        | 0.09623                     | 551.7 | 2.1490 | 1.0625 | 1.0928 | 192.7          |         | 0.09358                     | 551.7 | 2.1466 | 1.0628 | 1.0930 | 192.7          | 160        |

| TEMP<br>°C | PRESSURE = 380.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 390.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 7.4        | 0.00079                     | 210.0 | 1.0360 | 1.3645 | 1.5308 | 591.1          | SAT LIQ | 0.00079                     | 211.1 | 1.0397 | 1.3670 | 1.5318 | 587.6          | 8.16       |
| 7.4        | 0.05384                     | 403.1 | 1.7240 | 0.9218 | 1.1890 | 146.6          | SAT VAP | 0.05250                     | 403.5 | 1.7237 | 0.9254 | 1.1903 | 146.6          | 8.16       |
| 10         | 0.05459                     | 405.5 | 1.7325 | 0.9200 | 1.1838 | 147.8          |         | 0.05302                     | 405.2 | 1.7297 | 0.9240 | 1.1865 | 147.4          | 10         |
| 15         | 0.05600                     | 410.1 | 1.7486 | 0.9178 | 1.1750 | 149.8          |         | 0.05440                     | 409.8 | 1.7459 | 0.9213 | 1.1773 | 149.5          | 15         |
| 20         | 0.05738                     | 414.6 | 1.7644 | 0.9170 | 1.1672 | 151.8          |         | 0.05576                     | 414.4 | 1.7617 | 0.9201 | 1.1693 | 151.5          | 20         |
| 25         | 0.05874                     | 419.2 | 1.7799 | 0.9174 | 1.1604 | 153.7          |         | 0.05708                     | 419.0 | 1.7773 | 0.9202 | 1.1622 | 153.4          | 25         |
| 30         | 0.06007                     | 423.8 | 1.7952 | 0.9188 | 1.1544 | 155.6          |         | 0.05839                     | 423.6 | 1.7926 | 0.9213 | 1.1560 | 155.3          | 30         |
| 35         | 0.06138                     | 428.4 | 1.8102 | 0.9209 | 1.1490 | 157.4          |         | 0.05968                     | 428.2 | 1.8077 | 0.9232 | 1.1504 | 157.1          | 35         |
| 40         | 0.06267                     | 433.0 | 1.8251 | 0.9238 | 1.1441 | 159.1          |         | 0.06094                     | 432.8 | 1.8225 | 0.9258 | 1.1454 | 158.9          | 40         |
| 45         | 0.06395                     | 437.7 | 1.8397 | 0.9272 | 1.1398 | 160.8          |         | 0.06219                     | 437.5 | 1.8372 | 0.9290 | 1.1409 | 160.6          | 45         |
| 50         | 0.06521                     | 442.3 | 1.8542 | 0.9311 | 1.1358 | 162.5          |         | 0.06342                     | 442.1 | 1.8517 | 0.9328 | 1.1368 | 162.3          | 50         |
| 55         | 0.06645                     | 447.0 | 1.8686 | 0.9354 | 1.1321 | 164.1          |         | 0.06465                     | 446.8 | 1.8661 | 0.9369 | 1.1331 | 163.9          | 55         |
| 60         | 0.06769                     | 451.7 | 1.8827 | 0.9401 | 1.1288 | 165.7          |         | 0.06586                     | 451.5 | 1.8803 | 0.9415 | 1.1297 | 165.5          | 60         |
| 65         | 0.06892                     | 456.4 | 1.8968 | 0.9451 | 1.1258 | 167.2          |         | 0.06706                     | 456.2 | 1.8944 | 0.9464 | 1.1266 | 167.0          | 65         |
| 70         | 0.07014                     | 461.1 | 1.9107 | 0.9503 | 1.1229 | 168.8          |         | 0.06825                     | 461.0 | 1.9083 | 0.9515 | 1.1237 | 168.6          | 70         |
| 75         | 0.07135                     | 465.9 | 1.9245 | 0.9558 | 1.1203 | 170.2          |         | 0.06942                     | 465.7 | 1.9221 | 0.9569 | 1.1210 | 170.1          | 75         |
| 80         | 0.07254                     | 470.7 | 1.9381 | 0.9615 | 1.1179 | 171.7          |         | 0.07061                     | 470.5 | 1.9358 | 0.9625 | 1.1185 | 171.5          | 80         |
| 85         | 0.07374                     | 475.5 | 1.9517 | 0.9673 | 1.1156 | 173.1          |         | 0.07177                     | 475.4 | 1.9494 | 0.9683 | 1.1162 | 173.0          | 85         |
| 90         | 0.07492                     | 480.3 | 1.9652 | 0.9733 | 1.1135 | 174.6          |         | 0.07293                     | 480.2 | 1.9628 | 0.9742 | 1.1140 | 174.4          | 90         |
| 95         | 0.07611                     | 485.2 | 1.9785 | 0.9794 | 1.1115 | 176.0          |         | 0.07407                     | 485.1 | 1.9762 | 0.9802 | 1.1120 | 175.8          | 95         |
| 100        | 0.07729                     | 490.1 | 1.9918 | 0.9856 | 1.1096 | 177.3          |         | 0.07523                     | 490.0 | 1.9894 | 0.9864 | 1.1101 | 177.2          | 100        |
| 105        | 0.07846                     | 495.1 | 2.0049 | 0.9919 | 1.1078 | 178.7          |         | 0.07637                     | 495.0 | 2.0026 | 0.9926 | 1.1083 | 178.6          | 105        |
| 110        | 0.07962                     | 500.1 | 2.0180 | 0.9982 | 1.1061 | 180.0          |         | 0.07750                     | 500.0 | 2.0157 | 0.9989 | 1.1066 | 179.9          | 110        |
| 115        | 0.08078                     | 505.1 | 2.0310 | 1.0046 | 1.1046 | 181.3          |         | 0.07865                     | 505.0 | 2.0287 | 1.0053 | 1.1050 | 181.2          | 115        |
| 120        | 0.08193                     | 510.1 | 2.0439 | 1.0111 | 1.1031 | 182.6          |         | 0.07978                     | 510.0 | 2.0416 | 1.0117 | 1.1034 | 182.5          | 120        |
| 125        | 0.08308                     | 515.2 | 2.0567 | 1.0175 | 1.1016 | 183.9          |         | 0.08089                     | 515.1 | 2.0544 | 1.0181 | 1.1020 | 183.8          | 125        |
| 130        | 0.08423                     | 520.3 | 2.0694 | 1.0241 | 1.1003 | 185.2          |         | 0.08202                     | 520.2 | 2.0672 | 1.0246 | 1.1006 | 185.1          | 130        |
| 135        | 0.08538                     | 525.4 | 2.0821 | 1.0306 | 1.0990 | 186.5          |         | 0.08314                     | 525.3 | 2.0798 | 1.0311 | 1.0993 | 186.4          | 135        |
| 140        | 0.08653                     | 530.6 | 2.0947 | 1.0371 | 1.0977 | 187.7          |         | 0.08425                     | 530.5 | 2.0924 | 1.0376 | 1.0980 | 187.6          | 140        |
| 145        | 0.08767                     | 535.8 | 2.1072 | 1.0437 | 1.0966 | 189.0          |         | 0.08536                     | 535.7 | 2.1049 | 1.0441 | 1.0968 | 188.9          | 145        |
| 150        | 0.08881                     | 541.0 | 2.1196 | 1.0502 | 1.0954 | 190.2          |         | 0.08648                     | 540.9 | 2.1174 | 1.0506 | 1.0957 | 190.1          | 150        |
| 155        | 0.08994                     | 546.3 | 2.1320 | 1.0567 | 1.0943 | 191.4          |         | 0.08757                     | 546.2 | 2.1298 | 1.0571 | 1.0946 | 191.3          | 155        |
| 160        | 0.09107                     | 551.6 | 2.1443 | 1.0632 | 1.0933 | 192.6          |         | 0.08868                     | 551.5 | 2.1421 | 1.0636 | 1.0935 | 192.5          | 160        |

**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 400.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 425.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 8.91       | 0.00079                     | 212.1 | 1.0433 | 1.3695 | 1.5329 | 584.1          | SAT LIQ | 0.00080                     | 214.6 | 1.0520 | 1.3757 | 1.5355 | 575.8          | 10.72      |
| 8.91       | 0.05122                     | 403.9 | 1.7234 | 0.9290 | 1.1916 | 146.5          | SAT VAP | 0.04827                     | 404.9 | 1.7226 | 0.9378 | 1.1949 | 146.4          | 10.72      |
| 10         | 0.05152                     | 404.9 | 1.7269 | 0.9281 | 1.1893 | 147.0          |         | —                           | —     | —      | —      | —      | —              | 10         |
| 15         | 0.05288                     | 409.6 | 1.7432 | 0.9249 | 1.1797 | 149.1          |         | 0.04939                     | 408.9 | 1.7366 | 0.9341 | 1.1859 | 148.3          | 15         |
| 20         | 0.05421                     | 414.2 | 1.7590 | 0.9233 | 1.1714 | 151.2          |         | 0.05067                     | 413.6 | 1.7526 | 0.9314 | 1.1768 | 150.4          | 20         |
| 25         | 0.05552                     | 418.8 | 1.7747 | 0.9230 | 1.1641 | 153.1          |         | 0.05192                     | 418.3 | 1.7683 | 0.9302 | 1.1688 | 152.4          | 25         |
| 30         | 0.05680                     | 423.4 | 1.7900 | 0.9238 | 1.1576 | 155.0          |         | 0.05314                     | 422.9 | 1.7838 | 0.9302 | 1.1618 | 154.3          | 30         |
| 35         | 0.05806                     | 428.0 | 1.8051 | 0.9254 | 1.1519 | 156.9          |         | 0.05434                     | 427.6 | 1.7990 | 0.9312 | 1.1556 | 156.2          | 35         |
| 40         | 0.05930                     | 432.7 | 1.8201 | 0.9278 | 1.1467 | 158.6          |         | 0.05553                     | 432.2 | 1.8140 | 0.9331 | 1.1501 | 158.0          | 40         |
| 45         | 0.06052                     | 437.3 | 1.8348 | 0.9309 | 1.1421 | 160.4          |         | 0.05669                     | 436.9 | 1.8288 | 0.9356 | 1.1451 | 159.8          | 45         |
| 50         | 0.06172                     | 442.0 | 1.8493 | 0.9345 | 1.1379 | 162.0          |         | 0.05785                     | 441.6 | 1.8434 | 0.9388 | 1.1407 | 161.5          | 50         |
| 55         | 0.06293                     | 446.7 | 1.8637 | 0.9385 | 1.1341 | 163.7          |         | 0.05899                     | 446.3 | 1.8579 | 0.9424 | 1.1366 | 163.2          | 55         |
| 60         | 0.06411                     | 451.4 | 1.8779 | 0.9429 | 1.1306 | 165.3          |         | 0.06010                     | 451.0 | 1.8722 | 0.9465 | 1.1329 | 164.8          | 60         |
| 65         | 0.06529                     | 456.1 | 1.8920 | 0.9477 | 1.1274 | 166.9          |         | 0.06123                     | 455.7 | 1.8863 | 0.9510 | 1.1295 | 166.4          | 65         |
| 70         | 0.06645                     | 460.8 | 1.9059 | 0.9527 | 1.1244 | 168.4          |         | 0.06233                     | 460.5 | 1.9003 | 0.9558 | 1.1264 | 167.9          | 70         |
| 75         | 0.06761                     | 465.6 | 1.9198 | 0.9580 | 1.1217 | 169.9          |         | 0.06343                     | 465.3 | 1.9142 | 0.9608 | 1.1235 | 169.5          | 75         |
| 80         | 0.06876                     | 470.4 | 1.9335 | 0.9635 | 1.1192 | 171.4          |         | 0.06452                     | 470.1 | 1.9279 | 0.9661 | 1.1208 | 171.0          | 80         |
| 85         | 0.06989                     | 475.3 | 1.9471 | 0.9692 | 1.1168 | 172.8          |         | 0.06559                     | 475.0 | 1.9415 | 0.9716 | 1.1183 | 172.4          | 85         |
| 90         | 0.07102                     | 480.1 | 1.9605 | 0.9751 | 1.1146 | 174.3          |         | 0.06668                     | 479.8 | 1.9550 | 0.9773 | 1.1160 | 173.9          | 90         |
| 95         | 0.07215                     | 485.0 | 1.9739 | 0.9810 | 1.1125 | 175.7          |         | 0.06774                     | 484.7 | 1.9684 | 0.9831 | 1.1138 | 175.3          | 95         |
| 100        | 0.07328                     | 489.9 | 1.9872 | 0.9871 | 1.1106 | 177.1          |         | 0.06880                     | 489.7 | 1.9817 | 0.9891 | 1.1118 | 176.7          | 100        |
| 105        | 0.07440                     | 494.9 | 2.0004 | 0.9933 | 1.1087 | 178.4          |         | 0.06986                     | 494.6 | 1.9949 | 0.9951 | 1.1099 | 178.1          | 105        |
| 110        | 0.07551                     | 499.9 | 2.0134 | 0.9996 | 1.1070 | 179.8          |         | 0.07092                     | 499.6 | 2.0081 | 1.0013 | 1.1081 | 179.5          | 110        |
| 115        | 0.07661                     | 504.9 | 2.0264 | 1.0059 | 1.1054 | 181.1          |         | 0.07196                     | 504.6 | 2.0211 | 1.0075 | 1.1064 | 180.8          | 115        |
| 120        | 0.07772                     | 509.9 | 2.0394 | 1.0123 | 1.1038 | 182.4          |         | 0.07300                     | 509.7 | 2.0340 | 1.0138 | 1.1048 | 182.1          | 120        |
| 125        | 0.07881                     | 515.0 | 2.0522 | 1.0187 | 1.1023 | 183.7          |         | 0.07404                     | 514.8 | 2.0469 | 1.0201 | 1.1033 | 183.4          | 125        |
| 130        | 0.07991                     | 520.1 | 2.0649 | 1.0251 | 1.1009 | 185.0          |         | 0.07508                     | 519.9 | 2.0596 | 1.0264 | 1.1018 | 184.7          | 130        |
| 135        | 0.08101                     | 525.2 | 2.0776 | 1.0316 | 1.0996 | 186.3          |         | 0.07611                     | 525.0 | 2.0723 | 1.0328 | 1.1004 | 186.0          | 135        |
| 140        | 0.08210                     | 530.4 | 2.0902 | 1.0381 | 1.0983 | 187.5          |         | 0.07714                     | 530.2 | 2.0849 | 1.0393 | 1.0991 | 187.3          | 140        |
| 145        | 0.08318                     | 535.6 | 2.1028 | 1.0445 | 1.0971 | 188.8          |         | 0.07817                     | 535.4 | 2.0975 | 1.0457 | 1.0979 | 188.5          | 145        |
| 150        | 0.08426                     | 540.9 | 2.1152 | 1.0510 | 1.0960 | 190.0          |         | 0.07920                     | 540.7 | 2.1099 | 1.0521 | 1.0967 | 189.8          | 150        |
| 155        | 0.08535                     | 546.1 | 2.1276 | 1.0575 | 1.0949 | 191.2          |         | 0.08021                     | 546.0 | 2.1223 | 1.0585 | 1.0955 | 191.0          | 155        |
| 160        | 0.08642                     | 551.4 | 2.1399 | 1.0640 | 1.0938 | 192.4          |         | 0.08123                     | 551.3 | 2.1347 | 1.0650 | 1.0944 | 192.2          | 160        |
| 165        | —                           | —     | —      | —      | —      | —              |         | 0.08224                     | 556.6 | 2.1469 | 1.0714 | 1.0934 | 193.4          | 165        |

  

| TEMP<br>°C | PRESSURE = 450.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 475.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 12.45      | 0.00080                     | 217.0 | 1.0603 | 1.3818 | 1.5382 | 567.8          | SAT LIQ | 0.00080                     | 219.3 | 1.0683 | 1.3878 | 1.5409 | 560.1          | 14.11      |
| 12.45      | 0.04564                     | 405.9 | 1.7218 | 0.9465 | 1.1982 | 146.2          | SAT VAP | 0.04327                     | 406.8 | 1.7211 | 0.9549 | 1.2015 | 146.0          | 14.11      |
| 15         | 0.04628                     | 408.3 | 1.7302 | 0.9437 | 1.1925 | 147.4          |         | 0.04349                     | 407.7 | 1.7241 | 0.9538 | 1.1994 | 146.4          | 15         |
| 20         | 0.04751                     | 413.0 | 1.7464 | 0.9399 | 1.1825 | 149.5          |         | 0.04468                     | 412.4 | 1.7404 | 0.9487 | 1.1884 | 148.7          | 20         |
| 25         | 0.04871                     | 417.7 | 1.7623 | 0.9377 | 1.1738 | 151.6          |         | 0.04584                     | 417.2 | 1.7565 | 0.9454 | 1.1790 | 150.8          | 25         |
| 30         | 0.04989                     | 422.4 | 1.7779 | 0.9369 | 1.1662 | 153.6          |         | 0.04697                     | 421.9 | 1.7722 | 0.9438 | 1.1708 | 152.9          | 30         |
| 35         | 0.05104                     | 427.1 | 1.7932 | 0.9372 | 1.1595 | 155.5          |         | 0.04808                     | 426.6 | 1.7876 | 0.9433 | 1.1635 | 154.8          | 35         |
| 40         | 0.05217                     | 431.8 | 1.8083 | 0.9384 | 1.1536 | 157.4          |         | 0.04917                     | 431.3 | 1.8028 | 0.9439 | 1.1572 | 156.7          | 40         |
| 45         | 0.05329                     | 436.5 | 1.8232 | 0.9405 | 1.1482 | 159.2          |         | 0.05024                     | 436.0 | 1.8177 | 0.9454 | 1.1515 | 158.6          | 45         |
| 50         | 0.05439                     | 441.2 | 1.8379 | 0.9432 | 1.1435 | 160.9          |         | 0.05130                     | 440.8 | 1.8325 | 0.9477 | 1.1464 | 160.4          | 50         |
| 55         | 0.05548                     | 445.9 | 1.8524 | 0.9464 | 1.1391 | 162.6          |         | 0.05234                     | 445.5 | 1.8471 | 0.9505 | 1.1418 | 162.1          | 55         |
| 60         | 0.05655                     | 450.6 | 1.8667 | 0.9502 | 1.1352 | 164.3          |         | 0.05336                     | 450.3 | 1.8615 | 0.9539 | 1.1376 | 163.8          | 60         |
| 65         | 0.05761                     | 455.4 | 1.8809 | 0.9543 | 1.1316 | 165.9          |         | 0.05438                     | 455.0 | 1.8757 | 0.9578 | 1.1338 | 165.4          | 65         |
| 70         | 0.05867                     | 460.2 | 1.8949 | 0.9589 | 1.1283 | 167.5          |         | 0.05539                     | 459.8 | 1.8898 | 0.9620 | 1.1303 | 167.0          | 70         |
| 75         | 0.05971                     | 465.0 | 1.9088 | 0.9637 | 1.1253 | 169.0          |         | 0.05639                     | 464.7 | 1.9038 | 0.9666 | 1.1271 | 168.6          | 75         |
| 80         | 0.06075                     | 469.8 | 1.9226 | 0.9688 | 1.1225 | 170.6          |         | 0.05737                     | 469.5 | 1.9176 | 0.9714 | 1.1242 | 170.1          | 80         |
| 85         | 0.06178                     | 474.7 | 1.9363 | 0.9741 | 1.1199 | 172.1          |         | 0.05836                     | 474.4 | 1.9313 | 0.9765 | 1.1214 | 171.7          | 85         |
| 90         | 0.06279                     | 479.6 | 1.9498 | 0.9796 | 1.1174 | 173.5          |         | 0.05934                     | 479.3 | 1.9448 | 0.9819 | 1.1189 | 173.1          | 90         |
| 95         | 0.06381                     | 484.5 | 1.9632 | 0.9852 | 1.1152 | 175.0          |         | 0.06030                     | 484.2 | 1.9583 | 0.9874 | 1.1165 | 174.6          | 95         |
| 100        | 0.06482                     | 489.4 | 1.9766 | 0.9910 | 1.1130 | 176.4          |         | 0.06126                     | 489.2 | 1.9717 | 0.9930 | 1.1143 | 176.0          | 100        |
| 105        | 0.06583                     | 494.4 | 1.9898 | 0.9970 | 1.1111 | 177.8          |         | 0.06221                     | 494.1 | 1.9849 | 0.9988 | 1.1122 | 177.5          | 105        |
| 110        | 0.06683                     | 499.4 | 2.0029 | 1.0030 | 1.1092 | 179.2          |         | 0.06317                     | 499.1 | 1.9981 | 1.0047 | 1.1103 | 178.8          | 110        |
| 115        | 0.06782                     | 504.4 | 2.0160 | 1.0091 | 1.1074 | 180.5          |         | 0.06411                     | 504.2 | 2.0111 | 1.0107 | 1.1085 | 180.2          | 115        |
| 120        | 0.06882                     | 509.5 | 2.0289 | 1.0153 | 1.1057 | 181.9          |         | 0.06506                     | 509.3 | 2.0241 | 1.0168 | 1.1067 | 181.6          | 120        |
| 125        | 0.06979                     | 514.6 | 2.0418 | 1.0215 | 1.1042 | 183.2          |         | 0.06600                     | 514.3 | 2.0370 | 1.0230 | 1.1051 | 182.9          | 125        |
| 130        | 0.07078                     | 519.7 | 2.0546 | 1.0278 | 1.1027 | 184.5          |         | 0.06694                     | 519.5 | 2.0498 | 1.0291 | 1.1036 | 184.2          | 130        |
| 135        | 0.07176                     | 524.8 | 2.0673 | 1.0341 | 1.1013 | 185.8          |         | 0.06787                     | 524.6 | 2.0625 | 1.0354 | 1.1021 | 185.5          | 135        |
| 140        | 0.07274                     | 530.0 | 2.0799 | 1.0405 | 1.0999 | 187.0          |         | 0.06880                     | 529.8 | 2.0752 | 1.0417 | 1.1007 | 186.8          | 140        |
| 145        | 0.07371                     | 535.2 | 2.0925 | 1.0468 | 1.0986 | 188.3          |         | 0.06972                     | 535.1 | 2.0877 | 1.0480 | 1.0994 | 188.1          | 145        |
| 150        | 0.07468                     | 540.5 | 2.1050 | 1.0532 | 1.0974 | 189.6          |         | 0.07065                     | 540.3 | 2.1002 | 1.0543 | 1.0981 | 189.3          | 150        |
| 155        | 0.07565                     | 545.8 | 2.1174 | 1.0596 | 1.0962 | 190.8          |         | 0.07157                     | 545.6 | 2.1127 | 1.0606 | 1.0969 | 190.6          | 155        |
| 160        | 0.07662                     | 551.1 | 2.1297 | 1.0659 | 1.0951 | 192.0          |         | 0.07249                     | 550.9 | 2.1250 | 1.0669 | 1.0957 | 191.8          | 160        |
| 165        | 0.07757                     | 556.4 | 2.1420 | 1.0723 | 1.0940 | 193.2          |         | 0.07341                     | 556.3 | 2.1373 | 1.0732 | 1.0946 | 193.0          | 165        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 500.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 525.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|--------------------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 15.71      | 0.00081                     | 221.5 | 1.0759 | 1.3937 | 1.5436 | 552.8          | SAT LIQ<br>SAT VAP | 0.00081                     | 223.6 | 1.0833 | 1.3995 | 1.5463 | 545.7          | 17.24      |
| 15.71      | 0.04114                     | 407.7 | 1.7205 | 0.9633 | 1.2049 | 145.8          |                    | 0.03920                     | 408.5 | 1.7199 | 0.9715 | 1.2083 | 145.6          | 17.24      |
| 20         | 0.04213                     | 411.8 | 1.7347 | 0.9578 | 1.1947 | 147.8          |                    | 0.03982                     | 411.2 | 1.7291 | 0.9674 | 1.2013 | 146.9          | 20         |
| 25         | 0.04325                     | 416.6 | 1.7508 | 0.9535 | 1.1844 | 150.0          |                    | 0.04090                     | 416.0 | 1.7454 | 0.9618 | 1.1901 | 149.2          | 25         |
| 30         | 0.04434                     | 421.3 | 1.7667 | 0.9509 | 1.1755 | 152.1          |                    | 0.04196                     | 420.8 | 1.7613 | 0.9582 | 1.1804 | 151.4          | 30         |
| 35         | 0.04541                     | 426.1 | 1.7822 | 0.9496 | 1.1677 | 154.1          |                    | 0.04300                     | 425.6 | 1.7770 | 0.9562 | 1.1721 | 153.4          | 35         |
| 40         | 0.04646                     | 430.8 | 1.7975 | 0.9496 | 1.1609 | 156.1          |                    | 0.04401                     | 430.4 | 1.7924 | 0.9554 | 1.1647 | 155.4          | 40         |
| 45         | 0.04749                     | 435.6 | 1.8125 | 0.9505 | 1.1548 | 158.0          |                    | 0.04501                     | 435.2 | 1.8075 | 0.9558 | 1.1582 | 157.3          | 45         |
| 50         | 0.04851                     | 440.4 | 1.8274 | 0.9523 | 1.1493 | 159.8          |                    | 0.04599                     | 439.9 | 1.8224 | 0.9570 | 1.1524 | 159.2          | 50         |
| 55         | 0.04951                     | 445.1 | 1.8420 | 0.9547 | 1.1444 | 161.5          |                    | 0.04695                     | 444.7 | 1.8371 | 0.9590 | 1.1472 | 161.0          | 55         |
| 60         | 0.05050                     | 449.9 | 1.8565 | 0.9577 | 1.1400 | 163.3          |                    | 0.04790                     | 449.5 | 1.8517 | 0.9616 | 1.1425 | 162.7          | 60         |
| 65         | 0.05147                     | 454.7 | 1.8708 | 0.9612 | 1.1360 | 164.9          |                    | 0.04884                     | 454.3 | 1.8660 | 0.9648 | 1.1383 | 164.5          | 65         |
| 70         | 0.05244                     | 459.5 | 1.8849 | 0.9652 | 1.1323 | 166.6          |                    | 0.04976                     | 459.2 | 1.8802 | 0.9685 | 1.1344 | 166.1          | 70         |
| 75         | 0.05339                     | 464.3 | 1.8989 | 0.9695 | 1.1290 | 168.2          |                    | 0.05068                     | 464.0 | 1.8942 | 0.9725 | 1.1309 | 167.7          | 75         |
| 80         | 0.05434                     | 469.2 | 1.9128 | 0.9741 | 1.1259 | 169.7          |                    | 0.05159                     | 468.9 | 1.9081 | 0.9769 | 1.1276 | 169.3          | 80         |
| 85         | 0.05528                     | 474.1 | 1.9265 | 0.9791 | 1.1230 | 171.3          |                    | 0.05250                     | 473.8 | 1.9219 | 0.9816 | 1.1246 | 170.9          | 85         |
| 90         | 0.05621                     | 479.0 | 1.9401 | 0.9842 | 1.1204 | 172.8          |                    | 0.05338                     | 478.7 | 1.9355 | 0.9866 | 1.1219 | 172.4          | 90         |
| 95         | 0.05713                     | 483.9 | 1.9536 | 0.9895 | 1.1179 | 174.2          |                    | 0.05428                     | 483.7 | 1.9491 | 0.9917 | 1.1193 | 173.9          | 95         |
| 100        | 0.05806                     | 488.9 | 1.9670 | 0.9950 | 1.1156 | 175.7          |                    | 0.05516                     | 488.6 | 1.9625 | 0.9971 | 1.1169 | 175.4          | 100        |
| 105        | 0.05898                     | 493.9 | 1.9803 | 1.0007 | 1.1134 | 177.1          |                    | 0.05603                     | 493.6 | 1.9758 | 1.0026 | 1.1147 | 176.8          | 105        |
| 110        | 0.05989                     | 498.9 | 1.9934 | 1.0065 | 1.1114 | 178.5          |                    | 0.05691                     | 498.7 | 1.9890 | 1.0083 | 1.1126 | 178.2          | 110        |
| 115        | 0.06078                     | 503.9 | 2.0065 | 1.0124 | 1.1095 | 179.9          |                    | 0.05777                     | 503.7 | 2.0021 | 1.0140 | 1.1106 | 179.6          | 115        |
| 120        | 0.06169                     | 509.0 | 2.0195 | 1.0183 | 1.1077 | 181.3          |                    | 0.05864                     | 508.8 | 2.0151 | 1.0199 | 1.1087 | 181.0          | 120        |
| 125        | 0.06258                     | 514.1 | 2.0324 | 1.0244 | 1.1060 | 182.6          |                    | 0.05950                     | 513.9 | 2.0281 | 1.0259 | 1.1070 | 182.4          | 125        |
| 130        | 0.06348                     | 519.3 | 2.0452 | 1.0305 | 1.1044 | 184.0          |                    | 0.06035                     | 519.1 | 2.0409 | 1.0319 | 1.1053 | 183.7          | 130        |
| 135        | 0.06437                     | 524.4 | 2.0580 | 1.0367 | 1.1029 | 185.3          |                    | 0.06120                     | 524.2 | 2.0536 | 1.0380 | 1.1038 | 185.0          | 135        |
| 140        | 0.06526                     | 529.6 | 2.0707 | 1.0429 | 1.1015 | 186.6          |                    | 0.06205                     | 529.4 | 2.0663 | 1.0441 | 1.1023 | 186.3          | 140        |
| 145        | 0.06613                     | 534.9 | 2.0832 | 1.0491 | 1.1001 | 187.8          |                    | 0.06289                     | 534.7 | 2.0789 | 1.0503 | 1.1009 | 187.6          | 145        |
| 150        | 0.06702                     | 540.1 | 2.0957 | 1.0554 | 1.0988 | 189.1          |                    | 0.06373                     | 539.9 | 2.0914 | 1.0565 | 1.0995 | 188.9          | 150        |
| 155        | 0.06790                     | 545.4 | 2.1082 | 1.0616 | 1.0975 | 190.4          |                    | 0.06457                     | 545.2 | 2.1039 | 1.0627 | 1.0982 | 190.2          | 155        |
| 160        | 0.06877                     | 550.7 | 2.1205 | 1.0679 | 1.0964 | 191.6          |                    | 0.06541                     | 550.6 | 2.1163 | 1.0689 | 1.0970 | 191.4          | 160        |
| 165        | 0.06964                     | 556.1 | 2.1328 | 1.0742 | 1.0952 | 192.8          |                    | 0.06624                     | 555.9 | 2.1286 | 1.0751 | 1.0958 | 192.6          | 165        |
| 170        | 0.07052                     | 561.5 | 2.1450 | 1.0804 | 1.0941 | 194.0          |                    | 0.06707                     | 561.3 | 2.1408 | 1.0813 | 1.0947 | 193.9          | 170        |

| TEMP<br>°C | PRESSURE = 550.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 575.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|--------------------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 18.72      | 0.00081                     | 225.7 | 1.0904 | 1.4052 | 1.5490 | 538.8          | SAT LIQ<br>SAT VAP | 0.00082                     | 227.7 | 1.0972 | 1.4109 | 1.5518 | 532.2          | 20.15      |
| 18.72      | 0.03743                     | 409.3 | 1.7193 | 0.9795 | 1.2117 | 145.4          |                    | 0.03581                     | 410.1 | 1.7188 | 0.9875 | 1.2152 | 145.2          | 20.15      |
| 20         | 0.03771                     | 410.6 | 1.7236 | 0.9774 | 1.2083 | 146.0          |                    | —                           | —     | —      | —      | —      | —              | 20         |
| 25         | 0.03877                     | 415.4 | 1.7401 | 0.9705 | 1.1961 | 148.4          |                    | 0.03681                     | 414.8 | 1.7349 | 0.9796 | 1.2023 | 147.5          | 25         |
| 30         | 0.03980                     | 420.3 | 1.7562 | 0.9658 | 1.1856 | 150.6          |                    | 0.03781                     | 419.7 | 1.7512 | 0.9737 | 1.1910 | 149.8          | 30         |
| 35         | 0.04080                     | 425.1 | 1.7720 | 0.9629 | 1.1766 | 152.7          |                    | 0.03879                     | 424.6 | 1.7671 | 0.9699 | 1.1813 | 152.0          | 35         |
| 40         | 0.04178                     | 429.9 | 1.7874 | 0.9614 | 1.1687 | 154.8          |                    | 0.03974                     | 429.4 | 1.7827 | 0.9676 | 1.1728 | 154.1          | 40         |
| 45         | 0.04274                     | 434.7 | 1.8027 | 0.9611 | 1.1617 | 156.7          |                    | 0.04068                     | 434.3 | 1.7980 | 0.9666 | 1.1654 | 156.1          | 45         |
| 50         | 0.04369                     | 439.5 | 1.8177 | 0.9618 | 1.1556 | 158.6          |                    | 0.04159                     | 439.1 | 1.8131 | 0.9668 | 1.1588 | 158.0          | 50         |
| 55         | 0.04462                     | 444.3 | 1.8324 | 0.9633 | 1.1501 | 160.5          |                    | 0.04249                     | 443.9 | 1.8279 | 0.9678 | 1.1530 | 159.9          | 55         |
| 60         | 0.04554                     | 449.2 | 1.8470 | 0.9656 | 1.1451 | 162.2          |                    | 0.04338                     | 448.8 | 1.8426 | 0.9696 | 1.1477 | 161.7          | 60         |
| 65         | 0.04644                     | 454.0 | 1.8614 | 0.9684 | 1.1406 | 164.0          |                    | 0.04425                     | 453.6 | 1.8570 | 0.9721 | 1.1430 | 163.5          | 65         |
| 70         | 0.04733                     | 458.8 | 1.8757 | 0.9718 | 1.1366 | 165.6          |                    | 0.04511                     | 458.5 | 1.8713 | 0.9751 | 1.1387 | 165.2          | 70         |
| 75         | 0.04822                     | 463.7 | 1.8898 | 0.9755 | 1.1328 | 167.3          |                    | 0.04597                     | 463.4 | 1.8854 | 0.9786 | 1.1348 | 166.9          | 75         |
| 80         | 0.04909                     | 468.6 | 1.9037 | 0.9797 | 1.1294 | 168.9          |                    | 0.04681                     | 468.3 | 1.8994 | 0.9825 | 1.1313 | 168.5          | 80         |
| 85         | 0.04996                     | 473.5 | 1.9175 | 0.9842 | 1.1263 | 170.5          |                    | 0.04765                     | 473.2 | 1.9133 | 0.9868 | 1.1280 | 170.1          | 85         |
| 90         | 0.05082                     | 478.4 | 1.9312 | 0.9889 | 1.1234 | 172.0          |                    | 0.04847                     | 478.1 | 1.9270 | 0.9914 | 1.1250 | 171.6          | 90         |
| 95         | 0.05167                     | 483.4 | 1.9447 | 0.9939 | 1.1207 | 173.5          |                    | 0.04930                     | 483.1 | 1.9406 | 0.9962 | 1.1222 | 173.2          | 95         |
| 100        | 0.05252                     | 488.4 | 1.9582 | 0.9991 | 1.1182 | 175.0          |                    | 0.05011                     | 488.1 | 1.9540 | 1.0012 | 1.1196 | 174.7          | 100        |
| 105        | 0.05336                     | 493.4 | 1.9715 | 1.0045 | 1.1159 | 176.5          |                    | 0.05092                     | 493.1 | 1.9674 | 1.0065 | 1.1171 | 176.1          | 105        |
| 110        | 0.05419                     | 498.4 | 1.9847 | 1.0100 | 1.1137 | 177.9          |                    | 0.05172                     | 498.2 | 1.9806 | 1.0119 | 1.1149 | 177.6          | 110        |
| 115        | 0.05503                     | 503.5 | 1.9979 | 1.0157 | 1.1117 | 179.3          |                    | 0.05253                     | 503.2 | 1.9938 | 1.0174 | 1.1128 | 179.0          | 115        |
| 120        | 0.05585                     | 508.6 | 2.0109 | 1.0215 | 1.1097 | 180.7          |                    | 0.05332                     | 508.3 | 2.0069 | 1.0231 | 1.1108 | 180.4          | 120        |
| 125        | 0.05668                     | 513.7 | 2.0239 | 1.0273 | 1.1079 | 182.1          |                    | 0.05412                     | 513.5 | 2.0198 | 1.0288 | 1.1089 | 181.8          | 125        |
| 130        | 0.05749                     | 518.8 | 2.0367 | 1.0333 | 1.1062 | 183.4          |                    | 0.05490                     | 518.6 | 2.0327 | 1.0347 | 1.1071 | 183.2          | 130        |
| 135        | 0.05832                     | 524.0 | 2.0495 | 1.0393 | 1.1046 | 184.8          |                    | 0.05568                     | 523.8 | 2.0455 | 1.0406 | 1.1055 | 184.5          | 135        |
| 140        | 0.05913                     | 529.2 | 2.0622 | 1.0453 | 1.1031 | 186.1          |                    | 0.05647                     | 529.0 | 2.0582 | 1.0466 | 1.1039 | 185.8          | 140        |
| 145        | 0.05994                     | 534.5 | 2.0748 | 1.0514 | 1.1016 | 187.4          |                    | 0.05724                     | 534.3 | 2.0708 | 1.0526 | 1.1024 | 187.2          | 145        |
| 150        | 0.06074                     | 539.8 | 2.0873 | 1.0576 | 1.1002 | 188.7          |                    | 0.05801                     | 539.6 | 2.0834 | 1.0587 | 1.1010 | 188.4          | 150        |
| 155        | 0.06155                     | 545.1 | 2.0998 | 1.0637 | 1.0989 | 189.9          |                    | 0.05879                     | 544.9 | 2.0958 | 1.0648 | 1.0996 | 189.7          | 155        |
| 160        | 0.06235                     | 550.4 | 2.1122 | 1.0699 | 1.0977 | 191.2          |                    | 0.05956                     | 550.2 | 2.1082 | 1.0709 | 1.0983 | 191.0          | 160        |
| 165        | 0.06315                     | 555.8 | 2.1245 | 1.0761 | 1.0965 | 192.4          |                    | 0.06032                     | 555.6 | 2.1206 | 1.0770 | 1.0971 | 192.2          | 165        |
| 170        | 0.06395                     | 561.2 | 2.1367 | 1.0822 | 1.0953 | 193.7          |                    | 0.06109                     | 561.0 | 2.1328 | 1.0831 | 1.0959 | 193.5          | 170        |
| 175        | —                           | —     | —      | —      | —      | —              |                    | 0.06185                     | 566.4 | 2.1450 | 1.0893 | 1.0948 | 194.7          | 175        |

**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 600.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 625.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|--------------------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 21.54      | 0.00082                     | 229.7 | 1.1038 | 1.4165 | 1.5545 | 525.8          | SAT LIQ<br>SAT VAP | 0.00082                     | 231.6 | 1.1102 | 1.4221 | 1.5573 | 519.5          | 22.88      |
| 21.54      | 0.03432                     | 410.8 | 1.7183 | 0.9954 | 1.2187 | 145.0          |                    | 0.03295                     | 411.5 | 1.7179 | 1.0033 | 1.2223 | 144.7          | 22.88      |
| 25         | 0.03502                     | 414.2 | 1.7299 | 0.9890 | 1.2090 | 146.7          |                    | 0.03336                     | 413.6 | 1.7250 | 0.9988 | 1.2159 | 145.8          | 25         |
| 30         | 0.03600                     | 419.2 | 1.7463 | 0.9819 | 1.1967 | 149.0          |                    | 0.03432                     | 418.6 | 1.7415 | 0.9904 | 1.2026 | 148.2          | 30         |
| 35         | 0.03695                     | 424.1 | 1.7623 | 0.9771 | 1.1862 | 151.3          |                    | 0.03525                     | 423.5 | 1.7577 | 0.9845 | 1.1913 | 150.5          | 35         |
| 40         | 0.03787                     | 428.9 | 1.7780 | 0.9740 | 1.1771 | 153.4          |                    | 0.03615                     | 428.4 | 1.7735 | 0.9805 | 1.1816 | 152.7          | 40         |
| 45         | 0.03878                     | 433.8 | 1.7934 | 0.9723 | 1.1692 | 155.5          |                    | 0.03703                     | 433.3 | 1.7890 | 0.9781 | 1.1731 | 154.8          | 45         |
| 50         | 0.03967                     | 438.7 | 1.8086 | 0.9718 | 1.1622 | 157.4          |                    | 0.03790                     | 438.2 | 1.8042 | 0.9771 | 1.1657 | 156.8          | 50         |
| 55         | 0.04054                     | 443.5 | 1.8235 | 0.9724 | 1.1560 | 159.3          |                    | 0.03874                     | 443.1 | 1.8192 | 0.9771 | 1.1591 | 158.8          | 55         |
| 60         | 0.04140                     | 448.4 | 1.8382 | 0.9738 | 1.1505 | 161.2          |                    | 0.03957                     | 448.0 | 1.8340 | 0.9780 | 1.1532 | 160.6          | 60         |
| 65         | 0.04224                     | 453.3 | 1.8527 | 0.9759 | 1.1455 | 163.0          |                    | 0.04040                     | 452.9 | 1.8486 | 0.9797 | 1.1480 | 162.5          | 65         |
| 70         | 0.04308                     | 458.1 | 1.8671 | 0.9786 | 1.1410 | 164.7          |                    | 0.04121                     | 457.8 | 1.8630 | 0.9820 | 1.1432 | 164.2          | 70         |
| 75         | 0.04390                     | 463.0 | 1.8813 | 0.9818 | 1.1369 | 166.4          |                    | 0.04200                     | 462.7 | 1.8772 | 0.9850 | 1.1389 | 166.0          | 75         |
| 80         | 0.04472                     | 468.0 | 1.8953 | 0.9854 | 1.1331 | 168.1          |                    | 0.04279                     | 467.7 | 1.8913 | 0.9884 | 1.1350 | 167.6          | 80         |
| 85         | 0.04552                     | 472.9 | 1.9092 | 0.9895 | 1.1297 | 169.7          |                    | 0.04357                     | 472.6 | 1.9052 | 0.9922 | 1.1314 | 169.3          | 85         |
| 90         | 0.04633                     | 477.9 | 1.9229 | 0.9938 | 1.1265 | 171.3          |                    | 0.04434                     | 477.6 | 1.9190 | 0.9963 | 1.1282 | 170.9          | 90         |
| 95         | 0.04712                     | 482.8 | 1.9365 | 0.9985 | 1.1236 | 172.8          |                    | 0.04511                     | 482.6 | 1.9327 | 1.0008 | 1.1251 | 172.4          | 95         |
| 100        | 0.04790                     | 487.8 | 1.9500 | 1.0033 | 1.1209 | 174.3          |                    | 0.04587                     | 487.6 | 1.9462 | 1.0055 | 1.1223 | 174.0          | 100        |
| 105        | 0.04868                     | 492.9 | 1.9634 | 1.0084 | 1.1184 | 175.8          |                    | 0.04663                     | 492.6 | 1.9596 | 1.0104 | 1.1197 | 175.5          | 105        |
| 110        | 0.04945                     | 497.9 | 1.9767 | 1.0137 | 1.1161 | 177.3          |                    | 0.04738                     | 497.7 | 1.9729 | 1.0155 | 1.1173 | 177.0          | 110        |
| 115        | 0.05023                     | 503.0 | 1.9899 | 1.0191 | 1.1139 | 178.7          |                    | 0.04812                     | 502.8 | 1.9861 | 1.0208 | 1.1150 | 178.4          | 115        |
| 120        | 0.05100                     | 508.1 | 2.0030 | 1.0247 | 1.1118 | 180.1          |                    | 0.04886                     | 507.9 | 1.9992 | 1.0263 | 1.1129 | 179.8          | 120        |
| 125        | 0.05175                     | 513.3 | 2.0159 | 1.0303 | 1.1099 | 181.5          |                    | 0.04959                     | 513.0 | 2.0122 | 1.0318 | 1.1109 | 181.3          | 125        |
| 130        | 0.05252                     | 518.4 | 2.0288 | 1.0361 | 1.1081 | 182.9          |                    | 0.05033                     | 518.2 | 2.0251 | 1.0375 | 1.1090 | 182.6          | 130        |
| 135        | 0.05327                     | 523.6 | 2.0417 | 1.0419 | 1.1063 | 184.3          |                    | 0.05105                     | 523.4 | 2.0380 | 1.0433 | 1.1072 | 184.0          | 135        |
| 140        | 0.05402                     | 528.8 | 2.0544 | 1.0478 | 1.1047 | 185.6          |                    | 0.05177                     | 528.6 | 2.0507 | 1.0491 | 1.1055 | 185.4          | 140        |
| 145        | 0.05477                     | 534.1 | 2.0670 | 1.0538 | 1.1032 | 186.9          |                    | 0.05250                     | 533.9 | 2.0633 | 1.0550 | 1.1040 | 186.7          | 145        |
| 150        | 0.05552                     | 539.4 | 2.0796 | 1.0598 | 1.1017 | 188.2          |                    | 0.05321                     | 539.2 | 2.0759 | 1.0609 | 1.1024 | 188.0          | 150        |
| 155        | 0.05626                     | 544.7 | 2.0921 | 1.0658 | 1.1003 | 189.5          |                    | 0.05393                     | 544.5 | 2.0884 | 1.0669 | 1.1010 | 189.3          | 155        |
| 160        | 0.05700                     | 550.0 | 2.1045 | 1.0719 | 1.0990 | 190.8          |                    | 0.05465                     | 549.9 | 2.1008 | 1.0729 | 1.0997 | 190.6          | 160        |
| 165        | 0.05774                     | 555.4 | 2.1168 | 1.0780 | 1.0977 | 192.0          |                    | 0.05536                     | 555.2 | 2.1132 | 1.0789 | 1.0984 | 191.8          | 165        |
| 170        | 0.05848                     | 560.8 | 2.1291 | 1.0840 | 1.0965 | 193.3          |                    | 0.05607                     | 560.7 | 2.1255 | 1.0850 | 1.0971 | 193.1          | 170        |
| 175        | 0.05921                     | 566.3 | 2.1413 | 1.0901 | 1.0954 | 194.5          |                    | 0.05678                     | 566.1 | 2.1377 | 1.0910 | 1.0959 | 194.3          | 175        |

  

| TEMP<br>°C | PRESSURE = 650.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 675.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|--------------------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 24.18      | 0.00083                     | 233.5 | 1.1163 | 1.4276 | 1.5601 | 513.5          | SAT LIQ<br>SAT VAP | 0.00083                     | 235.3 | 1.1224 | 1.4331 | 1.5630 | 507.6          | 25.45      |
| 24.18      | 0.03167                     | 412.2 | 1.7174 | 1.0111 | 1.2259 | 144.5          |                    | 0.03049                     | 412.8 | 1.7170 | 1.0188 | 1.2295 | 144.2          | 25.45      |
| 25         | 0.03183                     | 413.0 | 1.7202 | 1.0091 | 1.2233 | 144.9          |                    | —                           | —     | —      | —      | —      | —              | 25         |
| 30         | 0.03277                     | 418.0 | 1.7369 | 0.9993 | 1.2089 | 147.4          |                    | 0.03133                     | 417.4 | 1.7323 | 1.0086 | 1.2154 | 146.6          | 30         |
| 35         | 0.03367                     | 423.0 | 1.7532 | 0.9922 | 1.1967 | 149.8          |                    | 0.03222                     | 422.5 | 1.7487 | 1.0002 | 1.2022 | 149.0          | 35         |
| 40         | 0.03456                     | 428.0 | 1.7691 | 0.9873 | 1.1862 | 152.0          |                    | 0.03308                     | 427.4 | 1.7648 | 0.9943 | 1.1910 | 151.3          | 40         |
| 45         | 0.03542                     | 432.9 | 1.7847 | 0.9841 | 1.1772 | 154.2          |                    | 0.03392                     | 432.4 | 1.7805 | 0.9903 | 1.1814 | 153.5          | 45         |
| 50         | 0.03626                     | 437.8 | 1.8000 | 0.9824 | 1.1693 | 156.2          |                    | 0.03474                     | 437.4 | 1.7959 | 0.9879 | 1.1730 | 155.6          | 50         |
| 55         | 0.03708                     | 442.7 | 1.8151 | 0.9819 | 1.1623 | 158.2          |                    | 0.03555                     | 442.3 | 1.8111 | 0.9868 | 1.1656 | 157.6          | 55         |
| 60         | 0.03789                     | 447.6 | 1.8300 | 0.9823 | 1.1561 | 160.1          |                    | 0.03633                     | 447.2 | 1.8260 | 0.9867 | 1.1590 | 159.6          | 60         |
| 65         | 0.03869                     | 452.5 | 1.8446 | 0.9836 | 1.1505 | 162.0          |                    | 0.03711                     | 452.2 | 1.8407 | 0.9876 | 1.1532 | 161.5          | 65         |
| 70         | 0.03948                     | 457.5 | 1.8591 | 0.9856 | 1.1456 | 163.8          |                    | 0.03787                     | 457.1 | 1.8552 | 0.9892 | 1.1479 | 163.3          | 70         |
| 75         | 0.04025                     | 462.4 | 1.8733 | 0.9882 | 1.1411 | 165.5          |                    | 0.03862                     | 462.1 | 1.8695 | 0.9915 | 1.1432 | 165.1          | 75         |
| 80         | 0.04102                     | 467.3 | 1.8874 | 0.9913 | 1.1370 | 167.2          |                    | 0.03937                     | 467.0 | 1.8837 | 0.9944 | 1.1389 | 166.8          | 80         |
| 85         | 0.04177                     | 472.3 | 1.9014 | 0.9949 | 1.1332 | 168.9          |                    | 0.04010                     | 472.0 | 1.8977 | 0.9977 | 1.1350 | 168.5          | 85         |
| 90         | 0.04252                     | 477.3 | 1.9152 | 0.9988 | 1.1298 | 170.5          |                    | 0.04083                     | 477.0 | 1.9116 | 1.0014 | 1.1314 | 170.1          | 90         |
| 95         | 0.04326                     | 482.3 | 1.9289 | 1.0031 | 1.1266 | 172.1          |                    | 0.04155                     | 482.0 | 1.9253 | 1.0054 | 1.1282 | 171.7          | 95         |
| 100        | 0.04399                     | 487.3 | 1.9425 | 1.0076 | 1.1237 | 173.6          |                    | 0.04226                     | 487.0 | 1.9389 | 1.0098 | 1.1251 | 173.3          | 100        |
| 105        | 0.04472                     | 492.4 | 1.9559 | 1.0124 | 1.1210 | 175.1          |                    | 0.04296                     | 492.1 | 1.9523 | 1.0144 | 1.1223 | 174.8          | 105        |
| 110        | 0.04545                     | 497.4 | 1.9693 | 1.0174 | 1.1185 | 176.6          |                    | 0.04367                     | 497.2 | 1.9657 | 1.0193 | 1.1197 | 176.3          | 110        |
| 115        | 0.04617                     | 502.5 | 1.9825 | 1.0226 | 1.1161 | 178.1          |                    | 0.04437                     | 502.3 | 1.9789 | 1.0243 | 1.1173 | 177.8          | 115        |
| 120        | 0.04688                     | 507.7 | 1.9956 | 1.0279 | 1.1139 | 179.6          |                    | 0.04505                     | 507.4 | 1.9921 | 1.0296 | 1.1150 | 179.3          | 120        |
| 125        | 0.04760                     | 512.8 | 2.0086 | 1.0334 | 1.1119 | 181.0          |                    | 0.04574                     | 512.6 | 2.0051 | 1.0349 | 1.1129 | 180.7          | 125        |
| 130        | 0.04830                     | 518.0 | 2.0215 | 1.0389 | 1.1099 | 182.4          |                    | 0.04642                     | 517.8 | 2.0181 | 1.0404 | 1.1109 | 182.1          | 130        |
| 135        | 0.04900                     | 523.2 | 2.0344 | 1.0446 | 1.1081 | 183.8          |                    | 0.04711                     | 523.0 | 2.0309 | 1.0460 | 1.1090 | 183.5          | 135        |
| 140        | 0.04970                     | 528.4 | 2.0471 | 1.0504 | 1.1064 | 185.1          |                    | 0.04778                     | 528.2 | 2.0437 | 1.0516 | 1.1072 | 184.9          | 140        |
| 145        | 0.05040                     | 533.7 | 2.0598 | 1.0562 | 1.1047 | 186.5          |                    | 0.04845                     | 533.5 | 2.0564 | 1.0574 | 1.1055 | 186.2          | 145        |
| 150        | 0.05109                     | 539.0 | 2.0724 | 1.0620 | 1.1032 | 187.8          |                    | 0.04913                     | 538.8 | 2.0690 | 1.0632 | 1.1039 | 187.6          | 150        |
| 155        | 0.05178                     | 544.3 | 2.0849 | 1.0680 | 1.1017 | 189.1          |                    | 0.04979                     | 544.2 | 2.0815 | 1.0690 | 1.1024 | 188.9          | 155        |
| 160        | 0.05247                     | 549.7 | 2.0973 | 1.0739 | 1.1003 | 190.4          |                    | 0.05046                     | 549.5 | 2.0940 | 1.0749 | 1.1010 | 190.2          | 160        |
| 165        | 0.05316                     | 555.1 | 2.1097 | 1.0799 | 1.0990 | 191.6          |                    | 0.05112                     | 554.9 | 2.1063 | 1.0809 | 1.0996 | 191.5          | 165        |
| 170        | 0.05384                     | 560.5 | 2.1220 | 1.0859 | 1.0977 | 192.9          |                    | 0.05178                     | 560.3 | 2.1186 | 1.0868 | 1.0983 | 192.7          | 170        |
| 175        | 0.05453                     | 565.9 | 2.1342 | 1.0919 | 1.0965 | 194.2          |                    | 0.05244                     | 565.8 | 2.1309 | 1.0928 | 1.0971 | 194.0          | 175        |
| 180        | 0.05520                     | 571.4 | 2.1464 | 1.0979 | 1.0954 | 195.4          |                    | 0.05310                     | 571.2 | 2.1430 | 1.0987 | 1.0959 | 195.2          | 180        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 700.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 725.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 26.68      | 0.00083                     | 237.0 | 1.1282 | 1.4385 | 1.5658 | 501.8          | SAT LIQ | 0.00084                     | 238.8 | 1.1339 | 1.4440 | 1.5687 | 496.2          | 27.88      |
| 26.68      | 0.02939                     | 413.5 | 1.7166 | 1.0265 | 1.2332 | 144.0          | SAT VAP | 0.02836                     | 414.1 | 1.7162 | 1.0341 | 1.2370 | 143.7          | 27.88      |
| 30         | 0.02999                     | 416.8 | 1.7278 | 1.0182 | 1.2223 | 145.7          |         | 0.02874                     | 416.2 | 1.7234 | 1.0283 | 1.2295 | 144.9          | 30         |
| 35         | 0.03086                     | 421.9 | 1.7444 | 1.0085 | 1.2081 | 148.2          |         | 0.02960                     | 421.4 | 1.7401 | 1.0172 | 1.2142 | 147.4          | 35         |
| 40         | 0.03171                     | 426.9 | 1.7606 | 1.0015 | 1.1960 | 150.6          |         | 0.03043                     | 426.4 | 1.7564 | 1.0090 | 1.2013 | 149.9          | 40         |
| 45         | 0.03253                     | 431.9 | 1.7764 | 0.9967 | 1.1857 | 152.8          |         | 0.03123                     | 431.5 | 1.7724 | 1.0033 | 1.1903 | 152.2          | 45         |
| 50         | 0.03333                     | 436.9 | 1.7919 | 0.9935 | 1.1768 | 155.0          |         | 0.03202                     | 436.5 | 1.7880 | 0.9994 | 1.1807 | 154.4          | 50         |
| 55         | 0.03412                     | 441.9 | 1.8071 | 0.9918 | 1.1689 | 157.0          |         | 0.03278                     | 441.4 | 1.8033 | 0.9970 | 1.1724 | 156.5          | 55         |
| 60         | 0.03488                     | 446.8 | 1.8221 | 0.9913 | 1.1620 | 159.0          |         | 0.03353                     | 446.4 | 1.8184 | 0.9959 | 1.1651 | 158.5          | 60         |
| 65         | 0.03564                     | 451.8 | 1.8369 | 0.9917 | 1.1559 | 160.9          |         | 0.03427                     | 451.4 | 1.8332 | 0.9959 | 1.1587 | 160.4          | 65         |
| 70         | 0.03638                     | 456.7 | 1.8515 | 0.9929 | 1.1504 | 162.8          |         | 0.03500                     | 456.4 | 1.8478 | 0.9967 | 1.1529 | 162.3          | 70         |
| 75         | 0.03711                     | 461.7 | 1.8658 | 0.9949 | 1.1454 | 164.6          |         | 0.03571                     | 461.4 | 1.8623 | 0.9983 | 1.1477 | 164.1          | 75         |
| 80         | 0.03784                     | 466.7 | 1.8801 | 0.9974 | 1.1409 | 166.3          |         | 0.03641                     | 466.4 | 1.8765 | 1.0006 | 1.1430 | 165.9          | 80         |
| 85         | 0.03855                     | 471.7 | 1.8941 | 1.0005 | 1.1369 | 168.0          |         | 0.03711                     | 471.4 | 1.8906 | 1.0033 | 1.1387 | 167.6          | 85         |
| 90         | 0.03925                     | 476.7 | 1.9080 | 1.0040 | 1.1331 | 169.7          |         | 0.03779                     | 476.4 | 1.9045 | 1.0066 | 1.1349 | 169.3          | 90         |
| 95         | 0.03995                     | 481.7 | 1.9217 | 1.0078 | 1.1297 | 171.3          |         | 0.03847                     | 481.5 | 1.9183 | 1.0103 | 1.1313 | 171.0          | 95         |
| 100        | 0.04064                     | 486.8 | 1.9354 | 1.0120 | 1.1266 | 172.9          |         | 0.03914                     | 486.5 | 1.9320 | 1.0143 | 1.1280 | 172.6          | 100        |
| 105        | 0.04133                     | 491.9 | 1.9489 | 1.0165 | 1.1236 | 174.5          |         | 0.03981                     | 491.6 | 1.9455 | 1.0186 | 1.1250 | 174.1          | 105        |
| 110        | 0.04201                     | 496.9 | 1.9622 | 1.0212 | 1.1209 | 176.0          |         | 0.04047                     | 496.7 | 1.9589 | 1.0231 | 1.1222 | 175.7          | 110        |
| 115        | 0.04269                     | 502.1 | 1.9755 | 1.0261 | 1.1184 | 177.5          |         | 0.04112                     | 501.8 | 1.9722 | 1.0279 | 1.1196 | 177.2          | 115        |
| 120        | 0.04336                     | 507.2 | 1.9887 | 1.0312 | 1.1161 | 179.0          |         | 0.04177                     | 507.0 | 1.9854 | 1.0329 | 1.1172 | 178.7          | 120        |
| 125        | 0.04402                     | 512.4 | 2.0018 | 1.0365 | 1.1139 | 180.4          |         | 0.04243                     | 512.2 | 1.9985 | 1.0380 | 1.1149 | 180.1          | 125        |
| 130        | 0.04468                     | 517.6 | 2.0147 | 1.0419 | 1.1118 | 181.8          |         | 0.04307                     | 517.4 | 2.0115 | 1.0433 | 1.1128 | 181.6          | 130        |
| 135        | 0.04535                     | 522.8 | 2.0276 | 1.0473 | 1.1099 | 183.2          |         | 0.04371                     | 522.6 | 2.0244 | 1.0487 | 1.1108 | 183.0          | 135        |
| 140        | 0.04600                     | 528.0 | 2.0404 | 1.0529 | 1.1081 | 184.6          |         | 0.04434                     | 527.8 | 2.0372 | 1.0542 | 1.1089 | 184.4          | 140        |
| 145        | 0.04665                     | 533.3 | 2.0531 | 1.0586 | 1.1063 | 186.0          |         | 0.04497                     | 533.1 | 2.0499 | 1.0598 | 1.1071 | 185.8          | 145        |
| 150        | 0.04730                     | 538.6 | 2.0657 | 1.0643 | 1.1047 | 187.3          |         | 0.04560                     | 538.4 | 2.0625 | 1.0655 | 1.1055 | 187.1          | 150        |
| 155        | 0.04795                     | 544.0 | 2.0782 | 1.0701 | 1.1032 | 188.7          |         | 0.04622                     | 543.8 | 2.0751 | 1.0712 | 1.1039 | 188.4          | 155        |
| 160        | 0.04859                     | 549.3 | 2.0907 | 1.0760 | 1.1017 | 190.0          |         | 0.04685                     | 549.2 | 2.0875 | 1.0770 | 1.1024 | 189.8          | 160        |
| 165        | 0.04923                     | 554.7 | 2.1031 | 1.0818 | 1.1003 | 191.3          |         | 0.04747                     | 554.6 | 2.0999 | 1.0828 | 1.1009 | 191.1          | 165        |
| 170        | 0.04987                     | 560.2 | 2.1154 | 1.0877 | 1.0990 | 192.5          |         | 0.04809                     | 560.0 | 2.1122 | 1.0887 | 1.0996 | 192.3          | 170        |
| 175        | 0.05051                     | 565.6 | 2.1276 | 1.0936 | 1.0977 | 193.8          |         | 0.04871                     | 565.4 | 2.1245 | 1.0945 | 1.0983 | 193.6          | 175        |
| 180        | 0.05114                     | 571.1 | 2.1398 | 1.0996 | 1.0965 | 195.0          |         | 0.04932                     | 570.9 | 2.1367 | 1.1004 | 1.0970 | 194.9          | 180        |

  

| TEMP<br>°C | PRESSURE = 750.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 800.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 29.04      | 0.00084                     | 240.5 | 1.1394 | 1.4494 | 1.5716 | 490.8          | SAT LIQ | 0.00085                     | 243.7 | 1.1500 | 1.4602 | 1.5775 | 480.2          | 31.29      |
| 29.04      | 0.02740                     | 414.6 | 1.7158 | 1.0417 | 1.2408 | 143.5          | SAT VAP | 0.02565                     | 415.7 | 1.7150 | 1.0569 | 1.2485 | 142.9          | 31.29      |
| 30         | 0.02757                     | 415.6 | 1.7191 | 1.0388 | 1.2372 | 144.0          |         | —                           | —     | —      | —      | —      | —              | 30         |
| 35         | 0.02841                     | 420.8 | 1.7360 | 1.0262 | 1.2206 | 146.6          |         | 0.02626                     | 419.6 | 1.7278 | 1.0453 | 1.2344 | 145.0          | 35         |
| 40         | 0.02923                     | 425.9 | 1.7524 | 1.0168 | 1.2067 | 149.1          |         | 0.02705                     | 424.8 | 1.7445 | 1.0332 | 1.2184 | 147.6          | 40         |
| 45         | 0.03002                     | 431.0 | 1.7684 | 1.0100 | 1.1950 | 151.5          |         | 0.02782                     | 430.0 | 1.7608 | 1.0243 | 1.2049 | 150.1          | 45         |
| 50         | 0.03079                     | 436.0 | 1.7842 | 1.0053 | 1.1848 | 153.7          |         | 0.02856                     | 435.1 | 1.7767 | 1.0178 | 1.1935 | 152.4          | 50         |
| 55         | 0.03154                     | 441.0 | 1.7996 | 1.0023 | 1.1760 | 155.9          |         | 0.02928                     | 440.2 | 1.7923 | 1.0133 | 1.1836 | 154.7          | 55         |
| 60         | 0.03227                     | 446.0 | 1.8147 | 1.0006 | 1.1683 | 157.9          |         | 0.02998                     | 445.2 | 1.8076 | 1.0105 | 1.1750 | 156.8          | 60         |
| 65         | 0.03299                     | 451.0 | 1.8296 | 1.0001 | 1.1615 | 159.9          |         | 0.03067                     | 450.3 | 1.8226 | 1.0089 | 1.1674 | 158.8          | 65         |
| 70         | 0.03370                     | 456.0 | 1.8443 | 1.0005 | 1.1554 | 161.8          |         | 0.03135                     | 455.3 | 1.8374 | 1.0085 | 1.1607 | 160.8          | 70         |
| 75         | 0.03439                     | 461.0 | 1.8588 | 1.0018 | 1.1500 | 163.7          |         | 0.03202                     | 460.4 | 1.8520 | 1.0090 | 1.1548 | 162.7          | 75         |
| 80         | 0.03508                     | 466.1 | 1.8731 | 1.0037 | 1.1451 | 165.5          |         | 0.03267                     | 465.4 | 1.8664 | 1.0103 | 1.1494 | 164.6          | 80         |
| 85         | 0.03576                     | 471.1 | 1.8872 | 1.0063 | 1.1406 | 167.2          |         | 0.03331                     | 470.5 | 1.8806 | 1.0122 | 1.1446 | 166.4          | 85         |
| 90         | 0.03643                     | 476.1 | 1.9012 | 1.0093 | 1.1366 | 168.9          |         | 0.03395                     | 475.5 | 1.8947 | 1.0147 | 1.1402 | 168.1          | 90         |
| 95         | 0.03708                     | 481.2 | 1.9150 | 1.0127 | 1.1329 | 170.6          |         | 0.03457                     | 480.6 | 1.9086 | 1.0177 | 1.1362 | 169.8          | 95         |
| 100        | 0.03774                     | 486.2 | 1.9287 | 1.0165 | 1.1295 | 172.2          |         | 0.03520                     | 485.7 | 1.9223 | 1.0212 | 1.1325 | 171.5          | 100        |
| 105        | 0.03839                     | 491.3 | 1.9422 | 1.0207 | 1.1264 | 173.8          |         | 0.03581                     | 490.8 | 1.9360 | 1.0250 | 1.1292 | 173.1          | 105        |
| 110        | 0.03903                     | 496.4 | 1.9557 | 1.0251 | 1.1235 | 175.4          |         | 0.03642                     | 495.9 | 1.9494 | 1.0291 | 1.1261 | 174.7          | 110        |
| 115        | 0.03966                     | 501.6 | 1.9690 | 1.0297 | 1.1208 | 176.9          |         | 0.03703                     | 501.1 | 1.9628 | 1.0334 | 1.1232 | 176.3          | 115        |
| 120        | 0.04030                     | 506.7 | 1.9822 | 1.0346 | 1.1183 | 178.4          |         | 0.03763                     | 506.3 | 1.9761 | 1.0380 | 1.1205 | 177.8          | 120        |
| 125        | 0.04093                     | 511.9 | 1.9953 | 1.0396 | 1.1160 | 179.9          |         | 0.03822                     | 511.5 | 1.9892 | 1.0428 | 1.1181 | 179.3          | 125        |
| 130        | 0.04155                     | 517.1 | 2.0083 | 1.0448 | 1.1138 | 181.3          |         | 0.03881                     | 516.7 | 2.0023 | 1.0478 | 1.1157 | 180.8          | 130        |
| 135        | 0.04217                     | 522.4 | 2.0212 | 1.0501 | 1.1117 | 182.7          |         | 0.03940                     | 522.0 | 2.0152 | 1.0529 | 1.1136 | 182.2          | 135        |
| 140        | 0.04279                     | 527.6 | 2.0341 | 1.0555 | 1.1098 | 184.1          |         | 0.03998                     | 527.2 | 2.0281 | 1.0582 | 1.1115 | 183.6          | 140        |
| 145        | 0.04340                     | 532.9 | 2.0468 | 1.0611 | 1.1080 | 185.5          |         | 0.04056                     | 532.5 | 2.0408 | 1.0636 | 1.1096 | 185.0          | 145        |
| 150        | 0.04401                     | 538.3 | 2.0594 | 1.0667 | 1.1062 | 186.9          |         | 0.04114                     | 537.9 | 2.0535 | 1.0690 | 1.1078 | 186.4          | 150        |
| 155        | 0.04462                     | 543.6 | 2.0720 | 1.0723 | 1.1046 | 188.2          |         | 0.04171                     | 543.2 | 2.0661 | 1.0745 | 1.1061 | 187.8          | 155        |
| 160        | 0.04523                     | 549.0 | 2.0845 | 1.0780 | 1.1031 | 189.5          |         | 0.04229                     | 548.6 | 2.0786 | 1.0801 | 1.1045 | 189.1          | 160        |
| 165        | 0.04583                     | 554.4 | 2.0969 | 1.0838 | 1.1016 | 190.9          |         | 0.04285                     | 554.0 | 2.0910 | 1.0858 | 1.1029 | 190.5          | 165        |
| 170        | 0.04643                     | 559.8 | 2.1092 | 1.0896 | 1.1002 | 192.1          |         | 0.04342                     | 559.5 | 2.1034 | 1.0915 | 1.1015 | 191.8          | 170        |
| 175        | 0.04703                     | 565.3 | 2.1215 | 1.0954 | 1.0989 | 193.4          |         | 0.04398                     | 565.0 | 2.1157 | 1.0972 | 1.1001 | 193.1          | 175        |
| 180        | 0.04762                     | 570.8 | 2.1336 | 1.1013 | 1.0976 | 194.7          |         | 0.04455                     | 570.5 | 2.1279 | 1.1030 | 1.0988 | 194.3          | 180        |
| 185        | —                           | —     | —      | —      | —      | —              |         | 0.04511                     | 576.0 | 2.1400 | 1.1087 | 1.0975 | 195.6          | 185        |

**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 850.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 900.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|-----------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 33.44      | 0.00085                     | 246.9 | 1.1602 | 1.4710 | 1.5836 | 470.1          | SAT LIQ | 0.00086                     | 249.9 | 1.1699 | 1.4818 | 1.5897 | 460.4          | 35.49      |
| 33.44      | 0.02410                     | 416.8 | 1.7143 | 1.0720 | 1.2564 | 142.4          | SAT VAP | 0.02271                     | 417.7 | 1.7137 | 1.0872 | 1.2646 | 141.8          | 35.49      |
| 35         | 0.02435                     | 418.4 | 1.7198 | 1.0663 | 1.2498 | 143.3          |         | —                           | —     | —      | —      | —      | —              | 35         |
| 40         | 0.02512                     | 423.7 | 1.7368 | 1.0510 | 1.2312 | 146.0          |         | 0.02340                     | 422.6 | 1.7293 | 1.0702 | 1.2453 | 144.4          | 40         |
| 45         | 0.02586                     | 429.0 | 1.7534 | 1.0395 | 1.2157 | 148.6          |         | 0.02412                     | 427.9 | 1.7462 | 1.0559 | 1.2275 | 147.2          | 45         |
| 50         | 0.02658                     | 434.1 | 1.7695 | 1.0311 | 1.2027 | 151.1          |         | 0.02482                     | 433.2 | 1.7625 | 1.0452 | 1.2128 | 149.7          | 50         |
| 55         | 0.02728                     | 439.3 | 1.7853 | 1.0250 | 1.1916 | 153.4          |         | 0.02550                     | 438.4 | 1.7785 | 1.0373 | 1.2003 | 152.2          | 55         |
| 60         | 0.02796                     | 444.4 | 1.8008 | 1.0208 | 1.1820 | 155.6          |         | 0.02616                     | 443.5 | 1.7942 | 1.0316 | 1.1896 | 154.5          | 60         |
| 65         | 0.02862                     | 449.5 | 1.8159 | 1.0181 | 1.1737 | 157.8          |         | 0.02680                     | 448.7 | 1.8095 | 1.0278 | 1.1803 | 156.7          | 65         |
| 70         | 0.02927                     | 454.6 | 1.8309 | 1.0167 | 1.1663 | 159.8          |         | 0.02743                     | 453.8 | 1.8246 | 1.0253 | 1.1722 | 158.8          | 70         |
| 75         | 0.02991                     | 459.7 | 1.8456 | 1.0164 | 1.1598 | 161.8          |         | 0.02803                     | 458.9 | 1.8394 | 1.0242 | 1.1650 | 160.8          | 75         |
| 80         | 0.03053                     | 464.7 | 1.8601 | 1.0170 | 1.1539 | 163.7          |         | 0.02864                     | 464.1 | 1.8540 | 1.0240 | 1.1586 | 162.8          | 80         |
| 85         | 0.03115                     | 469.8 | 1.8744 | 1.0184 | 1.1487 | 165.5          |         | 0.02923                     | 469.2 | 1.8684 | 1.0247 | 1.1529 | 164.7          | 85         |
| 90         | 0.03176                     | 474.9 | 1.8885 | 1.0204 | 1.1439 | 167.3          |         | 0.02981                     | 474.3 | 1.8826 | 1.0261 | 1.1478 | 166.5          | 90         |
| 95         | 0.03236                     | 480.0 | 1.9025 | 1.0229 | 1.1396 | 169.1          |         | 0.03039                     | 479.4 | 1.8967 | 1.0282 | 1.1431 | 168.3          | 95         |
| 100        | 0.03295                     | 485.1 | 1.9163 | 1.0259 | 1.1357 | 170.8          |         | 0.03096                     | 484.6 | 1.9106 | 1.0308 | 1.1389 | 170.1          | 100        |
| 105        | 0.03353                     | 490.3 | 1.9300 | 1.0293 | 1.1321 | 172.4          |         | 0.03151                     | 489.8 | 1.9243 | 1.0338 | 1.1351 | 171.7          | 105        |
| 110        | 0.03412                     | 495.4 | 1.9435 | 1.0331 | 1.1288 | 174.1          |         | 0.03207                     | 494.9 | 1.9379 | 1.0373 | 1.1315 | 173.4          | 110        |
| 115        | 0.03469                     | 500.6 | 1.9569 | 1.0372 | 1.1257 | 175.6          |         | 0.03262                     | 500.1 | 1.9514 | 1.0410 | 1.1282 | 175.0          | 115        |
| 120        | 0.03526                     | 505.8 | 1.9703 | 1.0415 | 1.1229 | 177.2          |         | 0.03316                     | 505.3 | 1.9647 | 1.0451 | 1.1252 | 176.6          | 120        |
| 125        | 0.03582                     | 511.0 | 1.9834 | 1.0461 | 1.1202 | 178.7          |         | 0.03370                     | 510.6 | 1.9779 | 1.0494 | 1.1224 | 178.2          | 125        |
| 130        | 0.03639                     | 516.3 | 1.9965 | 1.0509 | 1.1178 | 180.2          |         | 0.03423                     | 515.8 | 1.9911 | 1.0540 | 1.1198 | 179.7          | 130        |
| 135        | 0.03695                     | 521.5 | 2.0095 | 1.0558 | 1.1155 | 181.7          |         | 0.03477                     | 521.1 | 2.0041 | 1.0587 | 1.1174 | 181.2          | 135        |
| 140        | 0.03750                     | 526.8 | 2.0224 | 1.0609 | 1.1133 | 183.1          |         | 0.03530                     | 526.4 | 2.0170 | 1.0636 | 1.1151 | 182.7          | 140        |
| 145        | 0.03805                     | 532.2 | 2.0352 | 1.0661 | 1.1113 | 184.6          |         | 0.03582                     | 531.8 | 2.0298 | 1.0687 | 1.1130 | 184.1          | 145        |
| 150        | 0.03860                     | 537.5 | 2.0479 | 1.0714 | 1.1094 | 186.0          |         | 0.03634                     | 537.1 | 2.0426 | 1.0738 | 1.1110 | 185.5          | 150        |
| 155        | 0.03914                     | 542.9 | 2.0605 | 1.0768 | 1.1076 | 187.4          |         | 0.03686                     | 542.5 | 2.0552 | 1.0791 | 1.1091 | 186.9          | 155        |
| 160        | 0.03969                     | 548.3 | 2.0731 | 1.0823 | 1.1059 | 188.7          |         | 0.03737                     | 547.9 | 2.0678 | 1.0844 | 1.1073 | 188.3          | 160        |
| 165        | 0.04023                     | 553.7 | 2.0855 | 1.0878 | 1.1043 | 190.1          |         | 0.03789                     | 553.3 | 2.0803 | 1.0898 | 1.1056 | 189.7          | 165        |
| 170        | 0.04076                     | 559.1 | 2.0979 | 1.0934 | 1.1028 | 191.4          |         | 0.03840                     | 558.8 | 2.0927 | 1.0953 | 1.1040 | 191.0          | 170        |
| 175        | 0.04130                     | 564.6 | 2.1102 | 1.0990 | 1.1013 | 192.7          |         | 0.03890                     | 564.3 | 2.1050 | 1.1009 | 1.1025 | 192.3          | 175        |
| 180        | 0.04183                     | 570.1 | 2.1224 | 1.1047 | 1.0999 | 194.0          |         | 0.03941                     | 569.8 | 2.1172 | 1.1064 | 1.1011 | 193.6          | 180        |
| 185        | 0.04236                     | 575.7 | 2.1346 | 1.1104 | 1.0986 | 195.3          |         | 0.03992                     | 575.4 | 2.1294 | 1.1120 | 1.0997 | 194.9          | 185        |
| 190        | —                           | —     | —      | —      | —      | —              |         | 0.04042                     | 580.9 | 2.1415 | 1.1177 | 1.0984 | 196.2          | 190        |

  

| TEMP<br>°C | PRESSURE = 950.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 1000.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|-----------------------------|-------|--------|--------|--------|----------------|---------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                           | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 37.46      | 0.00086                     | 252.8 | 1.1792 | 1.4926 | 1.5960 | 451.1          | SAT LIQ | 0.00087                      | 255.6 | 1.1881 | 1.5035 | 1.6025 | 442.1          | 39.35      |
| 37.46      | 0.02147                     | 418.6 | 1.7130 | 1.1024 | 1.2730 | 141.2          | SAT VAP | 0.02034                      | 419.5 | 1.7124 | 1.1177 | 1.2817 | 140.6          | 39.35      |
| 40         | 0.02184                     | 421.4 | 1.7220 | 1.0913 | 1.2609 | 142.8          |         | 0.02044                      | 420.2 | 1.7147 | 1.1144 | 1.2782 | 141.0          | 40         |
| 45         | 0.02256                     | 426.8 | 1.7391 | 1.0736 | 1.2404 | 145.7          |         | 0.02114                      | 425.7 | 1.7322 | 1.0928 | 1.2546 | 144.1          | 45         |
| 50         | 0.02324                     | 432.2 | 1.7558 | 1.0604 | 1.2236 | 148.3          |         | 0.02181                      | 431.2 | 1.7491 | 1.0766 | 1.2354 | 146.9          | 50         |
| 55         | 0.02390                     | 437.4 | 1.7720 | 1.0504 | 1.2095 | 150.9          |         | 0.02246                      | 436.5 | 1.7655 | 1.0644 | 1.2195 | 149.6          | 55         |
| 60         | 0.02454                     | 442.7 | 1.7878 | 1.0431 | 1.1976 | 153.3          |         | 0.02308                      | 441.8 | 1.7816 | 1.0552 | 1.2061 | 152.1          | 60         |
| 65         | 0.02516                     | 447.9 | 1.8033 | 1.0379 | 1.1873 | 155.6          |         | 0.02368                      | 447.1 | 1.7972 | 1.0485 | 1.1947 | 154.4          | 65         |
| 70         | 0.02577                     | 453.1 | 1.8185 | 1.0344 | 1.1783 | 157.8          |         | 0.02427                      | 452.3 | 1.8126 | 1.0438 | 1.1848 | 156.7          | 70         |
| 75         | 0.02636                     | 458.2 | 1.8334 | 1.0323 | 1.1705 | 159.9          |         | 0.02485                      | 457.5 | 1.8277 | 1.0406 | 1.1762 | 158.9          | 75         |
| 80         | 0.02694                     | 463.4 | 1.8481 | 1.0313 | 1.1635 | 161.9          |         | 0.02541                      | 462.7 | 1.8425 | 1.0388 | 1.1687 | 160.9          | 80         |
| 85         | 0.02751                     | 468.5 | 1.8626 | 1.0313 | 1.1573 | 163.8          |         | 0.02596                      | 467.9 | 1.8571 | 1.0381 | 1.1619 | 162.9          | 85         |
| 90         | 0.02807                     | 473.7 | 1.8769 | 1.0321 | 1.1518 | 165.7          |         | 0.02650                      | 473.1 | 1.8715 | 1.0383 | 1.1559 | 164.9          | 90         |
| 95         | 0.02862                     | 478.9 | 1.8911 | 1.0337 | 1.1468 | 167.5          |         | 0.02703                      | 478.3 | 1.8857 | 1.0393 | 1.1506 | 166.8          | 95         |
| 100        | 0.02917                     | 484.0 | 1.9050 | 1.0358 | 1.1422 | 169.3          |         | 0.02756                      | 483.5 | 1.8997 | 1.0409 | 1.1457 | 168.6          | 100        |
| 105        | 0.02971                     | 489.2 | 1.9188 | 1.0384 | 1.1381 | 171.1          |         | 0.02807                      | 488.7 | 1.9136 | 1.0432 | 1.1413 | 170.4          | 105        |
| 110        | 0.03023                     | 494.4 | 1.9325 | 1.0415 | 1.1343 | 172.7          |         | 0.02859                      | 493.9 | 1.9273 | 1.0459 | 1.1372 | 172.1          | 110        |
| 115        | 0.03076                     | 499.6 | 1.9460 | 1.0450 | 1.1309 | 174.4          |         | 0.02909                      | 499.1 | 1.9409 | 1.0490 | 1.1335 | 173.8          | 115        |
| 120        | 0.03128                     | 504.9 | 1.9594 | 1.0488 | 1.1277 | 176.0          |         | 0.02959                      | 504.4 | 1.9543 | 1.0525 | 1.1301 | 175.4          | 120        |
| 125        | 0.03180                     | 510.1 | 1.9727 | 1.0528 | 1.1247 | 177.6          |         | 0.03008                      | 509.7 | 1.9676 | 1.0563 | 1.1270 | 177.0          | 125        |
| 130        | 0.03231                     | 515.4 | 1.9858 | 1.0572 | 1.1219 | 179.1          |         | 0.03058                      | 515.0 | 1.9809 | 1.0604 | 1.1241 | 178.6          | 130        |
| 135        | 0.03282                     | 520.7 | 1.9989 | 1.0617 | 1.1194 | 180.7          |         | 0.03106                      | 520.3 | 1.9940 | 1.0647 | 1.1214 | 180.1          | 135        |
| 140        | 0.03333                     | 526.0 | 2.0119 | 1.0664 | 1.1170 | 182.2          |         | 0.03155                      | 525.6 | 2.0070 | 1.0692 | 1.1189 | 181.7          | 140        |
| 145        | 0.03383                     | 531.4 | 2.0247 | 1.0713 | 1.1147 | 183.6          |         | 0.03203                      | 531.0 | 2.0198 | 1.0739 | 1.1165 | 183.1          | 145        |
| 150        | 0.03432                     | 536.7 | 2.0375 | 1.0763 | 1.1126 | 185.1          |         | 0.03250                      | 536.3 | 2.0326 | 1.0787 | 1.1143 | 184.6          | 150        |
| 155        | 0.03482                     | 542.1 | 2.0502 | 1.0814 | 1.1107 | 186.5          |         | 0.03298                      | 541.8 | 2.0453 | 1.0837 | 1.1122 | 186.0          | 155        |
| 160        | 0.03531                     | 547.5 | 2.0628 | 1.0866 | 1.1088 | 187.9          |         | 0.03345                      | 547.2 | 2.0579 | 1.0888 | 1.1103 | 187.5          | 160        |
| 165        | 0.03580                     | 553.0 | 2.0753 | 1.0919 | 1.1070 | 189.3          |         | 0.03392                      | 552.6 | 2.0705 | 1.0940 | 1.1084 | 188.9          | 165        |
| 170        | 0.03629                     | 558.5 | 2.0877 | 1.0973 | 1.1054 | 190.6          |         | 0.03438                      | 558.1 | 2.0829 | 1.0993 | 1.1067 | 190.2          | 170        |
| 175        | 0.03677                     | 564.0 | 2.1000 | 1.1027 | 1.1038 | 192.0          |         | 0.03485                      | 563.6 | 2.0953 | 1.1046 | 1.1050 | 191.6          | 175        |
| 180        | 0.03725                     | 569.5 | 2.1123 | 1.1082 | 1.1023 | 193.3          |         | 0.03531                      | 569.2 | 2.1076 | 1.1100 | 1.1035 | 192.9          | 180        |
| 185        | 0.03774                     | 575.0 | 2.1245 | 1.1137 | 1.1009 | 194.6          |         | 0.03577                      | 574.7 | 2.1198 | 1.1154 | 1.1020 | 194.2          | 185        |
| 190        | 0.03821                     | 580.6 | 2.1366 | 1.1193 | 1.0995 | 195.9          |         | 0.03623                      | 580.3 | 2.1319 | 1.1209 | 1.1006 | 195.6          | 190        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 1100.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 1200.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|--------------------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 42.93      | 0.00088                      | 261.0 | 1.2050 | 1.5256 | 1.6158 | 424.9          | SAT LIQ<br>SAT VAP | 0.00089                      | 266.2 | 1.2208 | 1.5481 | 1.6300 | 408.8          | 46.28      |
| 42.93      | 0.01839                      | 421.0 | 1.7112 | 1.1488 | 1.3000 | 139.4          |                    | 0.01674                      | 422.4 | 1.7100 | 1.1807 | 1.3195 | 138.1          | 46.28      |
| 45         | 0.01867                      | 423.4 | 1.7186 | 1.1368 | 1.2876 | 140.8          |                    |                              |       |        |        |        |                |            |
| 50         | 0.01932                      | 429.0 | 1.7362 | 1.1131 | 1.2623 | 143.9          |                    | 0.01722                      | 426.8 | 1.7235 | 1.1563 | 1.2951 | 140.7          | 50         |
| 55         | 0.01995                      | 434.5 | 1.7531 | 1.0952 | 1.2419 | 146.8          |                    | 0.01783                      | 432.5 | 1.7411 | 1.1310 | 1.2685 | 143.9          | 55         |
| 60         | 0.02054                      | 440.0 | 1.7696 | 1.0817 | 1.2251 | 149.5          |                    | 0.01842                      | 438.1 | 1.7580 | 1.1119 | 1.2471 | 146.9          | 60         |
| 65         | 0.02112                      | 445.4 | 1.7856 | 1.0716 | 1.2110 | 152.1          |                    | 0.01897                      | 443.6 | 1.7745 | 1.0974 | 1.2296 | 149.7          | 65         |
| 70         | 0.02168                      | 450.7 | 1.8013 | 1.0640 | 1.1990 | 154.5          |                    | 0.01951                      | 449.1 | 1.7905 | 1.0864 | 1.2149 | 152.3          | 70         |
| 75         | 0.02223                      | 456.0 | 1.8166 | 1.0586 | 1.1887 | 156.8          |                    | 0.02003                      | 454.5 | 1.8062 | 1.0782 | 1.2025 | 154.8          | 75         |
| 80         | 0.02275                      | 461.3 | 1.8317 | 1.0548 | 1.1797 | 159.1          |                    | 0.02054                      | 459.8 | 1.8215 | 1.0722 | 1.1918 | 157.1          | 80         |
| 85         | 0.02327                      | 466.6 | 1.8465 | 1.0525 | 1.1718 | 161.2          |                    | 0.02103                      | 465.2 | 1.8365 | 1.0679 | 1.1825 | 159.3          | 85         |
| 90         | 0.02378                      | 471.8 | 1.8611 | 1.0513 | 1.1648 | 163.2          |                    | 0.02151                      | 470.5 | 1.8513 | 1.0652 | 1.1743 | 161.5          | 90         |
| 95         | 0.02428                      | 477.1 | 1.8755 | 1.0511 | 1.1585 | 165.2          |                    | 0.02199                      | 475.8 | 1.8659 | 1.0636 | 1.1671 | 163.6          | 95         |
| 100        | 0.02477                      | 482.3 | 1.8897 | 1.0517 | 1.1529 | 167.1          |                    | 0.02245                      | 481.2 | 1.8802 | 1.0630 | 1.1607 | 165.6          | 100        |
| 105        | 0.02525                      | 487.6 | 1.9037 | 1.0530 | 1.1479 | 168.9          |                    | 0.02290                      | 486.5 | 1.8944 | 1.0633 | 1.1549 | 167.5          | 105        |
| 110        | 0.02573                      | 492.9 | 1.9175 | 1.0549 | 1.1433 | 170.7          |                    | 0.02335                      | 491.8 | 1.9083 | 1.0644 | 1.1497 | 169.4          | 110        |
| 115        | 0.02620                      | 498.1 | 1.9312 | 1.0573 | 1.1391 | 172.5          |                    | 0.02379                      | 497.1 | 1.9221 | 1.0660 | 1.1450 | 171.2          | 115        |
| 120        | 0.02666                      | 503.4 | 1.9447 | 1.0602 | 1.1353 | 174.2          |                    | 0.02423                      | 502.5 | 1.9358 | 1.0682 | 1.1407 | 173.0          | 120        |
| 125        | 0.02713                      | 508.7 | 1.9582 | 1.0634 | 1.1318 | 175.9          |                    | 0.02466                      | 507.8 | 1.9493 | 1.0708 | 1.1368 | 174.7          | 125        |
| 130        | 0.02758                      | 514.1 | 1.9715 | 1.0670 | 1.1285 | 177.5          |                    | 0.02508                      | 513.2 | 1.9627 | 1.0739 | 1.1331 | 176.4          | 130        |
| 135        | 0.02803                      | 519.4 | 1.9846 | 1.0709 | 1.1255 | 179.1          |                    | 0.02550                      | 518.5 | 1.9760 | 1.0773 | 1.1298 | 178.0          | 135        |
| 140        | 0.02848                      | 524.8 | 1.9977 | 1.0750 | 1.1227 | 180.6          |                    | 0.02592                      | 523.9 | 1.9891 | 1.0810 | 1.1267 | 179.6          | 140        |
| 145        | 0.02892                      | 530.2 | 2.0106 | 1.0793 | 1.1201 | 182.2          |                    | 0.02633                      | 529.4 | 2.0021 | 1.0849 | 1.1239 | 181.2          | 145        |
| 150        | 0.02936                      | 535.6 | 2.0235 | 1.0838 | 1.1177 | 183.7          |                    | 0.02675                      | 534.8 | 2.0150 | 1.0890 | 1.1212 | 182.8          | 150        |
| 155        | 0.02980                      | 541.0 | 2.0363 | 1.0885 | 1.1154 | 185.2          |                    | 0.02715                      | 540.2 | 2.0279 | 1.0934 | 1.1187 | 184.3          | 155        |
| 160        | 0.03023                      | 546.5 | 2.0489 | 1.0933 | 1.1133 | 186.6          |                    | 0.02756                      | 545.7 | 2.0406 | 1.0979 | 1.1164 | 185.8          | 160        |
| 165        | 0.03067                      | 551.9 | 2.0615 | 1.0982 | 1.1113 | 188.0          |                    | 0.02796                      | 551.2 | 2.0532 | 1.1026 | 1.1142 | 187.2          | 165        |
| 170        | 0.03110                      | 557.4 | 2.0740 | 1.1033 | 1.1094 | 189.5          |                    | 0.02836                      | 556.8 | 2.0657 | 1.1074 | 1.1122 | 188.7          | 170        |
| 175        | 0.03152                      | 563.0 | 2.0864 | 1.1084 | 1.1076 | 190.8          |                    | 0.02875                      | 562.3 | 2.0782 | 1.1123 | 1.1102 | 190.1          | 175        |
| 180        | 0.03194                      | 568.5 | 2.0987 | 1.1136 | 1.1059 | 192.2          |                    | 0.02915                      | 567.9 | 2.0906 | 1.1173 | 1.1084 | 191.5          | 180        |
| 185        | 0.03237                      | 574.1 | 2.1110 | 1.1188 | 1.1043 | 193.6          |                    | 0.02954                      | 573.5 | 2.1029 | 1.1223 | 1.1067 | 192.9          | 185        |
| 190        | 0.03279                      | 579.7 | 2.1231 | 1.1241 | 1.1028 | 194.9          |                    | 0.02993                      | 579.1 | 2.1151 | 1.1275 | 1.1050 | 194.2          | 190        |
| 195        | 0.03321                      | 585.3 | 2.1353 | 1.1295 | 1.1013 | 196.2          |                    | 0.03032                      | 584.7 | 2.1272 | 1.1326 | 1.1035 | 195.6          | 195        |
| 200        | —                            | —     | —      | —      | —      | —              |                    | 0.03070                      | 590.4 | 2.1393 | 1.1379 | 1.1020 | 196.9          | 200        |

  

| TEMP<br>°C | PRESSURE = 1300.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 1400.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|--------------------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 49.42      | 0.00091                      | 271.0 | 1.2357 | 1.5714 | 1.6449 | 393.5          | SAT LIQ<br>SAT VAP | 0.00092                      | 275.7 | 1.2498 | 1.5954 | 1.6608 | 378.9          | 52.39      |
| 49.42      | 0.01534                      | 423.6 | 1.7088 | 1.2137 | 1.3405 | 136.9          |                    | 0.01413                      | 424.7 | 1.7076 | 1.2482 | 1.3631 | 135.5          | 52.39      |
| 50         | 0.01542                      | 424.3 | 1.7110 | 1.2088 | 1.3358 | 137.3          |                    | —                            | —     | —      | —      | —      | —              | 45         |
| 55         | 0.01602                      | 430.3 | 1.7292 | 1.1731 | 1.3005 | 140.9          |                    | 0.01445                      | 427.9 | 1.7174 | 1.2239 | 1.3399 | 137.6          | 55         |
| 60         | 0.01660                      | 436.1 | 1.7468 | 1.1466 | 1.2730 | 144.1          |                    | 0.01502                      | 434.0 | 1.7357 | 1.1872 | 1.3039 | 141.2          | 60         |
| 65         | 0.01714                      | 441.8 | 1.7637 | 1.1266 | 1.2510 | 147.1          |                    | 0.01556                      | 439.8 | 1.7531 | 1.1600 | 1.2760 | 144.5          | 65         |
| 70         | 0.01767                      | 447.3 | 1.7801 | 1.1114 | 1.2330 | 150.0          |                    | 0.01607                      | 445.6 | 1.7700 | 1.1395 | 1.2537 | 147.5          | 70         |
| 75         | 0.01817                      | 452.9 | 1.7961 | 1.0998 | 1.2179 | 152.6          |                    | 0.01656                      | 451.2 | 1.7864 | 1.1239 | 1.2354 | 150.4          | 75         |
| 80         | 0.01865                      | 458.4 | 1.8117 | 1.0911 | 1.2052 | 155.1          |                    | 0.01703                      | 456.8 | 1.8023 | 1.1119 | 1.2201 | 153.0          | 80         |
| 85         | 0.01912                      | 463.8 | 1.8270 | 1.0847 | 1.1942 | 157.5          |                    | 0.01749                      | 462.3 | 1.8179 | 1.1029 | 1.2071 | 155.6          | 85         |
| 90         | 0.01959                      | 469.2 | 1.8420 | 1.0801 | 1.1847 | 159.8          |                    | 0.01793                      | 467.8 | 1.8331 | 1.0962 | 1.1960 | 158.0          | 90         |
| 95         | 0.02003                      | 474.6 | 1.8568 | 1.0770 | 1.1763 | 161.9          |                    | 0.01836                      | 473.3 | 1.8481 | 1.0913 | 1.1863 | 160.2          | 95         |
| 100        | 0.02047                      | 480.0 | 1.8713 | 1.0751 | 1.1690 | 164.0          |                    | 0.01878                      | 478.8 | 1.8628 | 1.0880 | 1.1779 | 162.4          | 100        |
| 105        | 0.02091                      | 485.3 | 1.8856 | 1.0743 | 1.1624 | 166.0          |                    | 0.01919                      | 484.2 | 1.8772 | 1.0859 | 1.1704 | 164.6          | 105        |
| 110        | 0.02133                      | 490.7 | 1.8997 | 1.0743 | 1.1565 | 168.0          |                    | 0.01960                      | 489.6 | 1.8915 | 1.0849 | 1.1637 | 166.6          | 110        |
| 115        | 0.02175                      | 496.1 | 1.9136 | 1.0752 | 1.1512 | 169.9          |                    | 0.01999                      | 495.0 | 1.9055 | 1.0847 | 1.1577 | 168.6          | 115        |
| 120        | 0.02216                      | 501.5 | 1.9274 | 1.0766 | 1.1464 | 171.7          |                    | 0.02038                      | 500.5 | 1.9194 | 1.0854 | 1.1524 | 170.5          | 120        |
| 125        | 0.02257                      | 506.9 | 1.9410 | 1.0786 | 1.1420 | 173.5          |                    | 0.02077                      | 505.9 | 1.9332 | 1.0866 | 1.1475 | 172.3          | 125        |
| 130        | 0.02297                      | 512.3 | 1.9545 | 1.0810 | 1.1380 | 175.3          |                    | 0.02115                      | 511.3 | 1.9467 | 1.0885 | 1.1430 | 174.1          | 130        |
| 135        | 0.02336                      | 517.7 | 1.9678 | 1.0839 | 1.1343 | 177.0          |                    | 0.02153                      | 516.8 | 1.9602 | 1.0908 | 1.1390 | 175.9          | 135        |
| 140        | 0.02375                      | 523.1 | 1.9810 | 1.0871 | 1.1309 | 178.6          |                    | 0.02189                      | 522.2 | 1.9734 | 1.0935 | 1.1352 | 177.6          | 140        |
| 145        | 0.02414                      | 528.5 | 1.9941 | 1.0906 | 1.1278 | 180.2          |                    | 0.02226                      | 527.7 | 1.9866 | 1.0966 | 1.1318 | 179.3          | 145        |
| 150        | 0.02453                      | 534.0 | 2.0071 | 1.0944 | 1.1249 | 181.8          |                    | 0.02263                      | 533.2 | 1.9997 | 1.1000 | 1.1286 | 180.9          | 150        |
| 155        | 0.02491                      | 539.5 | 2.0200 | 1.0984 | 1.1221 | 183.4          |                    | 0.02299                      | 538.7 | 2.0126 | 1.1036 | 1.1257 | 182.5          | 155        |
| 160        | 0.02529                      | 545.0 | 2.0328 | 1.1027 | 1.1196 | 184.9          |                    | 0.02334                      | 544.2 | 2.0255 | 1.1075 | 1.1229 | 184.1          | 160        |
| 165        | 0.02566                      | 550.5 | 2.0455 | 1.1070 | 1.1172 | 186.4          |                    | 0.02370                      | 549.8 | 2.0382 | 1.1116 | 1.1203 | 185.6          | 165        |
| 170        | 0.02604                      | 556.1 | 2.0581 | 1.1116 | 1.1150 | 187.9          |                    | 0.02405                      | 555.4 | 2.0508 | 1.1159 | 1.1179 | 187.1          | 170        |
| 175        | 0.02641                      | 561.6 | 2.0706 | 1.1162 | 1.1129 | 189.4          |                    | 0.02440                      | 561.0 | 2.0634 | 1.1203 | 1.1157 | 188.6          | 175        |
| 180        | 0.02677                      | 567.2 | 2.0830 | 1.1210 | 1.1110 | 190.8          |                    | 0.02475                      | 566.6 | 2.0758 | 1.1249 | 1.1136 | 190.1          | 180        |
| 185        | 0.02714                      | 572.8 | 2.0953 | 1.1259 | 1.1091 | 192.2          |                    | 0.02509                      | 572.2 | 2.0882 | 1.1295 | 1.1116 | 191.5          | 185        |
| 190        | 0.02751                      | 578.5 | 2.1075 | 1.1308 | 1.1073 | 193.6          |                    | 0.02543                      | 577.9 | 2.1005 | 1.1343 | 1.1097 | 192.9          | 190        |
| 195        | 0.02787                      | 584.1 | 2.1197 | 1.1359 | 1.1057 | 194.9          |                    | 0.02577                      | 583.5 | 2.1127 | 1.1391 | 1.1079 | 194.3          | 195        |
| 200        | 0.02823                      | 589.8 | 2.1318 | 1.1409 | 1.1041 | 196.3          |                    | 0.02611                      | 589.3 | 2.1248 | 1.1440 | 1.1062 | 195.7          | 200        |
| 205        | —                            | —     | —      | —      | —      | —              |                    | 0.02645                      | 595.0 | 2.1369 | 1.1490 | 1.1046 | 197.0          | 205        |



**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 1500.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 1600.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|--------------------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 55.2       | 0.00093                      | 280.1 | 1.2632 | 1.6205 | 1.6778 | 365.0          | SAT LIQ<br>SAT VAP | 0.00094                      | 284.5 | 1.2759 | 1.6468 | 1.6959 | 351.6          | 57.88      |
| 55.2       | 0.01308                      | 425.7 | 1.7063 | 1.2844 | 1.3876 | 134.2          |                    | 0.01215                      | 426.5 | 1.7050 | 1.3227 | 1.4142 | 132.8          | 57.88      |
| 60         | 0.01363                      | 431.7 | 1.7246 | 1.2358 | 1.3416 | 138.0          |                    | 0.01239                      | 429.3 | 1.7134 | 1.2953 | 1.3888 | 134.7          | 60         |
| 65         | 0.01417                      | 437.8 | 1.7427 | 1.1989 | 1.3056 | 141.7          |                    | 0.01294                      | 435.6 | 1.7323 | 1.2448 | 1.3412 | 138.7          | 65         |
| 70         | 0.01468                      | 443.7 | 1.7601 | 1.1715 | 1.2776 | 145.0          |                    | 0.01344                      | 441.7 | 1.7503 | 1.2083 | 1.3056 | 142.3          | 70         |
| 75         | 0.01516                      | 449.5 | 1.7769 | 1.1507 | 1.2552 | 148.0          |                    | 0.01392                      | 447.7 | 1.7675 | 1.1811 | 1.2779 | 145.6          | 75         |
| 80         | 0.01562                      | 455.2 | 1.7932 | 1.1349 | 1.2368 | 150.9          |                    | 0.01437                      | 453.6 | 1.7842 | 1.1604 | 1.2556 | 148.7          | 80         |
| 85         | 0.01606                      | 460.9 | 1.8090 | 1.1228 | 1.2214 | 153.6          |                    | 0.01480                      | 459.3 | 1.8004 | 1.1447 | 1.2373 | 151.5          | 85         |
| 90         | 0.01649                      | 466.4 | 1.8245 | 1.1136 | 1.2084 | 156.1          |                    | 0.01522                      | 465.0 | 1.8162 | 1.1325 | 1.2220 | 154.2          | 90         |
| 95         | 0.01690                      | 472.0 | 1.8397 | 1.1067 | 1.1972 | 158.5          |                    | 0.01562                      | 470.6 | 1.8316 | 1.1233 | 1.2090 | 156.8          | 95         |
| 100        | 0.01731                      | 477.5 | 1.8546 | 1.1016 | 1.1875 | 160.8          |                    | 0.01602                      | 476.2 | 1.8467 | 1.1163 | 1.1978 | 159.2          | 100        |
| 105        | 0.01770                      | 483.0 | 1.8692 | 1.0982 | 1.1790 | 163.0          |                    | 0.01640                      | 481.8 | 1.8616 | 1.1112 | 1.1881 | 161.5          | 105        |
| 110        | 0.01809                      | 488.5 | 1.8837 | 1.0959 | 1.1714 | 165.2          |                    | 0.01677                      | 487.4 | 1.8761 | 1.1077 | 1.1796 | 163.7          | 110        |
| 115        | 0.01847                      | 494.0 | 1.8978 | 1.0948 | 1.1647 | 167.2          |                    | 0.01714                      | 492.9 | 1.8905 | 1.1054 | 1.1721 | 165.9          | 115        |
| 120        | 0.01885                      | 499.4 | 1.9119 | 1.0945 | 1.1587 | 169.2          |                    | 0.01750                      | 498.4 | 1.9046 | 1.1042 | 1.1653 | 167.9          | 120        |
| 125        | 0.01921                      | 504.9 | 1.9257 | 1.0950 | 1.1532 | 171.1          |                    | 0.01785                      | 503.9 | 1.9186 | 1.1038 | 1.1593 | 169.9          | 125        |
| 130        | 0.01958                      | 510.4 | 1.9394 | 1.0962 | 1.1483 | 173.0          |                    | 0.01820                      | 509.5 | 1.9323 | 1.1042 | 1.1539 | 171.8          | 130        |
| 135        | 0.01993                      | 515.9 | 1.9529 | 1.0979 | 1.1438 | 174.8          |                    | 0.01854                      | 515.0 | 1.9460 | 1.1053 | 1.1489 | 173.7          | 135        |
| 140        | 0.02028                      | 521.4 | 1.9663 | 1.1001 | 1.1397 | 176.6          |                    | 0.01887                      | 520.5 | 1.9594 | 1.1069 | 1.1444 | 175.5          | 140        |
| 145        | 0.02063                      | 526.9 | 1.9795 | 1.1027 | 1.1360 | 178.3          |                    | 0.01921                      | 526.0 | 1.9728 | 1.1090 | 1.1403 | 177.3          | 145        |
| 150        | 0.02098                      | 532.4 | 1.9926 | 1.1057 | 1.1325 | 180.0          |                    | 0.01954                      | 531.6 | 1.9860 | 1.1115 | 1.1365 | 179.0          | 150        |
| 155        | 0.02132                      | 537.9 | 2.0056 | 1.1090 | 1.1293 | 181.6          |                    | 0.01986                      | 537.2 | 1.9990 | 1.1144 | 1.1330 | 180.7          | 155        |
| 160        | 0.02166                      | 543.5 | 2.0185 | 1.1125 | 1.1263 | 183.2          |                    | 0.02018                      | 542.7 | 2.0120 | 1.1176 | 1.1298 | 182.4          | 160        |
| 165        | 0.02199                      | 549.1 | 2.0313 | 1.1163 | 1.1235 | 184.8          |                    | 0.02050                      | 548.3 | 2.0248 | 1.1211 | 1.1268 | 184.0          | 165        |
| 170        | 0.02233                      | 554.7 | 2.0440 | 1.1203 | 1.1209 | 186.3          |                    | 0.02082                      | 554.0 | 2.0376 | 1.1248 | 1.1240 | 185.5          | 170        |
| 175        | 0.02265                      | 560.3 | 2.0566 | 1.1244 | 1.1185 | 187.9          |                    | 0.02113                      | 559.6 | 2.0502 | 1.1287 | 1.1214 | 187.1          | 175        |
| 180        | 0.02298                      | 565.9 | 2.0691 | 1.1288 | 1.1162 | 189.3          |                    | 0.02144                      | 565.2 | 2.0627 | 1.1328 | 1.1190 | 188.6          | 180        |
| 185        | 0.02331                      | 571.6 | 2.0815 | 1.1332 | 1.1141 | 190.8          |                    | 0.02175                      | 570.9 | 2.0752 | 1.1370 | 1.1167 | 190.1          | 185        |
| 190        | 0.02363                      | 577.2 | 2.0939 | 1.1378 | 1.1121 | 192.3          |                    | 0.02206                      | 576.6 | 2.0876 | 1.1414 | 1.1145 | 191.6          | 190        |
| 195        | 0.02395                      | 582.9 | 2.1061 | 1.1425 | 1.1102 | 193.7          |                    | 0.02236                      | 582.3 | 2.0998 | 1.1458 | 1.1125 | 193.1          | 195        |
| 200        | 0.02427                      | 588.7 | 2.1183 | 1.1472 | 1.1084 | 195.1          |                    | 0.02267                      | 588.1 | 2.1121 | 1.1504 | 1.1106 | 194.5          | 200        |
| 205        | 0.02459                      | 594.4 | 2.1303 | 1.1520 | 1.1067 | 196.5          |                    | 0.02297                      | 593.8 | 2.1242 | 1.1551 | 1.1088 | 195.9          | 205        |
| 210        | 0.02491                      | 600.2 | 2.1424 | 1.1569 | 1.1050 | 197.8          |                    | 0.02327                      | 599.6 | 2.1362 | 1.1598 | 1.1070 | 197.3          | 210        |

  

| TEMP<br>°C | PRESSURE = 1700.00 kPa (abs) |       |        |        |        |                |                    | PRESSURE = 1800.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|--------------------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |                    | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 60.43      | 0.00095                      | 288.6 | 1.2882 | 1.6746 | 1.7155 | 338.6          | SAT LIQ<br>SAT VAP | 0.00096                      | 292.6 | 1.2999 | 1.7040 | 1.7366 | 326.1          | 62.87      |
| 60.43      | 0.01132                      | 427.2 | 1.7037 | 1.3635 | 1.4432 | 131.4          |                    | 0.01058                      | 427.8 | 1.7022 | 1.4072 | 1.4749 | 130.0          | 62.87      |
| 65         | 0.01183                      | 433.3 | 1.7217 | 1.3004 | 1.3851 | 135.5          |                    | 0.01082                      | 430.8 | 1.7110 | 1.3696 | 1.4408 | 132.1          | 65         |
| 70         | 0.01234                      | 439.7 | 1.7405 | 1.2514 | 1.3390 | 139.5          |                    | 0.01134                      | 437.4 | 1.7306 | 1.3029 | 1.3794 | 136.5          | 70         |
| 75         | 0.01281                      | 445.8 | 1.7583 | 1.2158 | 1.3042 | 143.1          |                    | 0.01182                      | 443.8 | 1.7491 | 1.2559 | 1.3352 | 140.5          | 75         |
| 80         | 0.01326                      | 451.8 | 1.7754 | 1.1891 | 1.2770 | 146.4          |                    | 0.01227                      | 450.0 | 1.7667 | 1.2215 | 1.3016 | 144.0          | 80         |
| 85         | 0.01369                      | 457.7 | 1.7920 | 1.1687 | 1.2551 | 149.5          |                    | 0.01269                      | 456.1 | 1.7837 | 1.1957 | 1.2752 | 147.3          | 85         |
| 90         | 0.01410                      | 463.5 | 1.8081 | 1.1532 | 1.2371 | 152.3          |                    | 0.01309                      | 462.0 | 1.8001 | 1.1760 | 1.2538 | 150.3          | 90         |
| 95         | 0.01449                      | 469.3 | 1.8238 | 1.1412 | 1.2219 | 155.0          |                    | 0.01348                      | 467.8 | 1.8161 | 1.1607 | 1.2361 | 153.2          | 95         |
| 100        | 0.01487                      | 474.9 | 1.8391 | 1.1321 | 1.2091 | 157.5          |                    | 0.01386                      | 473.6 | 1.8317 | 1.1491 | 1.2213 | 155.8          | 100        |
| 105        | 0.01525                      | 480.6 | 1.8541 | 1.1252 | 1.1980 | 159.9          |                    | 0.01422                      | 479.3 | 1.8469 | 1.1401 | 1.2087 | 158.4          | 105        |
| 110        | 0.01561                      | 486.2 | 1.8689 | 1.1202 | 1.1884 | 162.3          |                    | 0.01457                      | 485.0 | 1.8618 | 1.1334 | 1.1978 | 160.8          | 110        |
| 115        | 0.01596                      | 491.8 | 1.8834 | 1.1166 | 1.1799 | 164.5          |                    | 0.01491                      | 490.7 | 1.8765 | 1.1284 | 1.1882 | 163.1          | 115        |
| 120        | 0.01631                      | 497.4 | 1.8976 | 1.1143 | 1.1724 | 166.6          |                    | 0.01524                      | 496.3 | 1.8909 | 1.1249 | 1.1798 | 165.3          | 120        |
| 125        | 0.01665                      | 502.9 | 1.9117 | 1.1130 | 1.1657 | 168.7          |                    | 0.01557                      | 501.9 | 1.9051 | 1.1226 | 1.1724 | 167.4          | 125        |
| 130        | 0.01698                      | 508.5 | 1.9256 | 1.1126 | 1.1597 | 170.7          |                    | 0.01589                      | 507.5 | 1.9191 | 1.1214 | 1.1657 | 169.5          | 130        |
| 135        | 0.01730                      | 514.1 | 1.9393 | 1.1130 | 1.1542 | 172.6          |                    | 0.01621                      | 513.1 | 1.9329 | 1.1210 | 1.1598 | 171.5          | 135        |
| 140        | 0.01763                      | 519.6 | 1.9529 | 1.1140 | 1.1493 | 174.5          |                    | 0.01652                      | 518.7 | 1.9466 | 1.1213 | 1.1544 | 173.4          | 140        |
| 145        | 0.01795                      | 525.2 | 1.9663 | 1.1156 | 1.1448 | 176.3          |                    | 0.01682                      | 524.3 | 1.9601 | 1.1223 | 1.1495 | 175.3          | 145        |
| 150        | 0.01826                      | 530.8 | 1.9796 | 1.1176 | 1.1407 | 178.1          |                    | 0.01713                      | 530.0 | 1.9734 | 1.1239 | 1.1450 | 177.1          | 150        |
| 155        | 0.01857                      | 536.4 | 1.9927 | 1.1201 | 1.1369 | 179.8          |                    | 0.01742                      | 535.6 | 1.9866 | 1.1259 | 1.1409 | 178.9          | 155        |
| 160        | 0.01888                      | 542.0 | 2.0057 | 1.1229 | 1.1334 | 181.5          |                    | 0.01772                      | 541.2 | 1.9997 | 1.1283 | 1.1371 | 180.6          | 160        |
| 165        | 0.01918                      | 547.6 | 2.0186 | 1.1260 | 1.1302 | 183.1          |                    | 0.01801                      | 546.9 | 2.0127 | 1.1310 | 1.1336 | 182.3          | 165        |
| 170        | 0.01949                      | 553.2 | 2.0314 | 1.1294 | 1.1272 | 184.8          |                    | 0.01830                      | 552.5 | 2.0256 | 1.1341 | 1.1304 | 184.0          | 170        |
| 175        | 0.01978                      | 558.9 | 2.0441 | 1.1330 | 1.1244 | 186.4          |                    | 0.01859                      | 558.2 | 2.0383 | 1.1374 | 1.1274 | 185.6          | 175        |
| 180        | 0.02008                      | 564.6 | 2.0567 | 1.1368 | 1.1218 | 187.9          |                    | 0.01887                      | 563.9 | 2.0509 | 1.1410 | 1.1246 | 187.2          | 180        |
| 185        | 0.02037                      | 570.3 | 2.0692 | 1.1408 | 1.1193 | 189.4          |                    | 0.01915                      | 569.6 | 2.0635 | 1.1447 | 1.1220 | 188.7          | 185        |
| 190        | 0.02066                      | 576.0 | 2.0816 | 1.1450 | 1.1170 | 190.9          |                    | 0.01943                      | 575.4 | 2.0759 | 1.1487 | 1.1196 | 190.3          | 190        |
| 195        | 0.02096                      | 581.7 | 2.0939 | 1.1493 | 1.1149 | 192.4          |                    | 0.01971                      | 581.1 | 2.0883 | 1.1528 | 1.1173 | 191.8          | 195        |
| 200        | 0.02124                      | 587.5 | 2.1062 | 1.1537 | 1.1128 | 193.9          |                    | 0.01998                      | 586.9 | 2.1005 | 1.1570 | 1.1151 | 193.3          | 200        |
| 205        | 0.02153                      | 593.3 | 2.1183 | 1.1582 | 1.1109 | 195.3          |                    | 0.02026                      | 592.7 | 2.1127 | 1.1613 | 1.1130 | 194.7          | 205        |
| 210        | 0.02182                      | 599.1 | 2.1304 | 1.1628 | 1.1091 | 196.7          |                    | 0.02053                      | 598.5 | 2.1248 | 1.1658 | 1.1111 | 196.2          | 210        |
| 215        | 0.02210                      | 604.9 | 2.1424 | 1.1674 | 1.1073 | 198.1          |                    | 0.02080                      | 604.3 | 2.1369 | 1.1703 | 1.1093 | 197.6          | 215        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 1900.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 2000.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|---------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 65.22      | 0.00098                      | 296.6 | 1.3113 | 1.7353 | 1.7594 | 314.0          | SAT LIQ | 0.00099                      | 300.4 | 1.3223 | 1.7690 | 1.7844 | 302.2          | 67.47      |
| 65.22      | 0.00991                      | 428.3 | 1.7007 | 1.4544 | 1.5098 | 128.6          | SAT VAP | 0.00931                      | 428.8 | 1.6991 | 1.5055 | 1.5484 | 127.2          | 67.47      |
| 70         | 0.01043                      | 435.1 | 1.7205 | 1.3658 | 1.4297 | 133.3          |         | 0.00959                      | 432.5 | 1.7101 | 1.4452 | 1.4943 | 129.9          | 70         |
| 75         | 0.01092                      | 441.7 | 1.7398 | 1.3032 | 1.3722 | 137.7          |         | 0.01009                      | 439.5 | 1.7303 | 1.3600 | 1.4173 | 134.7          | 75         |
| 80         | 0.01137                      | 448.1 | 1.7580 | 1.2587 | 1.3301 | 141.5          |         | 0.01055                      | 446.1 | 1.7493 | 1.3019 | 1.3638 | 138.9          | 80         |
| 85         | 0.01179                      | 454.3 | 1.7755 | 1.2259 | 1.2980 | 145.0          |         | 0.01097                      | 452.5 | 1.7673 | 1.2601 | 1.3242 | 142.7          | 85         |
| 90         | 0.01219                      | 460.4 | 1.7923 | 1.2011 | 1.2725 | 148.3          |         | 0.01137                      | 458.8 | 1.7845 | 1.2291 | 1.2936 | 146.2          | 90         |
| 95         | 0.01257                      | 466.4 | 1.8086 | 1.1821 | 1.2518 | 151.3          |         | 0.01175                      | 464.8 | 1.8011 | 1.2055 | 1.2692 | 149.3          | 95         |
| 100        | 0.01294                      | 472.2 | 1.8244 | 1.1674 | 1.2346 | 154.1          |         | 0.01211                      | 470.8 | 1.8173 | 1.1874 | 1.2493 | 152.3          | 100        |
| 105        | 0.01329                      | 478.0 | 1.8399 | 1.1561 | 1.2202 | 156.7          |         | 0.01246                      | 476.7 | 1.8320 | 1.1733 | 1.2327 | 155.1          | 105        |
| 110        | 0.01364                      | 483.8 | 1.8550 | 1.1475 | 1.2078 | 159.3          |         | 0.01279                      | 482.6 | 1.8483 | 1.1625 | 1.2186 | 157.7          | 110        |
| 115        | 0.01397                      | 489.5 | 1.8698 | 1.1409 | 1.1971 | 161.7          |         | 0.01312                      | 488.4 | 1.8633 | 1.1542 | 1.2066 | 160.2          | 115        |
| 120        | 0.01429                      | 495.2 | 1.8844 | 1.1361 | 1.1877 | 164.0          |         | 0.01344                      | 494.1 | 1.8781 | 1.1479 | 1.1961 | 162.6          | 120        |
| 125        | 0.01461                      | 500.9 | 1.8987 | 1.1327 | 1.1795 | 166.2          |         | 0.01374                      | 499.8 | 1.8925 | 1.1433 | 1.1869 | 164.9          | 125        |
| 130        | 0.01492                      | 506.5 | 1.9129 | 1.1305 | 1.1721 | 168.3          |         | 0.01405                      | 505.5 | 1.9068 | 1.1401 | 1.1789 | 167.1          | 130        |
| 135        | 0.01523                      | 512.2 | 1.9268 | 1.1293 | 1.1656 | 170.4          |         | 0.01434                      | 511.2 | 1.9208 | 1.1380 | 1.1717 | 169.2          | 135        |
| 140        | 0.01553                      | 517.8 | 1.9405 | 1.1290 | 1.1597 | 172.4          |         | 0.01463                      | 516.9 | 1.9347 | 1.1369 | 1.1652 | 171.3          | 140        |
| 145        | 0.01582                      | 523.5 | 1.9541 | 1.1293 | 1.1543 | 174.3          |         | 0.01492                      | 522.6 | 1.9483 | 1.1366 | 1.1594 | 173.3          | 145        |
| 150        | 0.01611                      | 529.1 | 1.9676 | 1.1303 | 1.1495 | 176.2          |         | 0.01520                      | 528.3 | 1.9619 | 1.1370 | 1.1541 | 175.2          | 150        |
| 155        | 0.01640                      | 534.8 | 1.9808 | 1.1319 | 1.1450 | 178.0          |         | 0.01547                      | 534.0 | 1.9752 | 1.1380 | 1.1493 | 177.1          | 155        |
| 160        | 0.01668                      | 540.5 | 1.9940 | 1.1338 | 1.1410 | 179.8          |         | 0.01575                      | 539.7 | 1.9884 | 1.1395 | 1.1449 | 178.9          | 160        |
| 165        | 0.01696                      | 546.1 | 2.0070 | 1.1362 | 1.1372 | 181.5          |         | 0.01602                      | 545.4 | 2.0015 | 1.1415 | 1.1409 | 180.7          | 165        |
| 170        | 0.01724                      | 551.8 | 2.0199 | 1.1389 | 1.1337 | 183.2          |         | 0.01629                      | 551.1 | 2.0145 | 1.1439 | 1.1372 | 182.4          | 170        |
| 175        | 0.01752                      | 557.5 | 2.0327 | 1.1419 | 1.1305 | 184.8          |         | 0.01655                      | 556.8 | 2.0274 | 1.1466 | 1.1337 | 184.1          | 175        |
| 180        | 0.01779                      | 563.2 | 2.0454 | 1.1452 | 1.1275 | 186.5          |         | 0.01681                      | 562.6 | 2.0401 | 1.1496 | 1.1305 | 185.7          | 180        |
| 185        | 0.01806                      | 569.0 | 2.0580 | 1.1487 | 1.1248 | 188.1          |         | 0.01707                      | 568.3 | 2.0527 | 1.1528 | 1.1276 | 187.4          | 185        |
| 190        | 0.01832                      | 574.7 | 2.0705 | 1.1524 | 1.1221 | 189.6          |         | 0.01733                      | 574.1 | 2.0653 | 1.1563 | 1.1248 | 189.0          | 190        |
| 195        | 0.01859                      | 580.5 | 2.0829 | 1.1563 | 1.1197 | 191.2          |         | 0.01758                      | 579.9 | 2.0777 | 1.1599 | 1.1222 | 190.5          | 195        |
| 200        | 0.01885                      | 586.3 | 2.0952 | 1.1604 | 1.1174 | 192.7          |         | 0.01784                      | 585.7 | 2.0900 | 1.1638 | 1.1198 | 192.1          | 200        |
| 205        | 0.01911                      | 592.1 | 2.1074 | 1.1645 | 1.1152 | 194.1          |         | 0.01809                      | 591.5 | 2.1023 | 1.1678 | 1.1175 | 193.6          | 205        |
| 210        | 0.01937                      | 597.9 | 2.1195 | 1.1688 | 1.1132 | 195.6          |         | 0.01834                      | 597.4 | 2.1145 | 1.1719 | 1.1153 | 195.0          | 210        |
| 215        | 0.01963                      | 603.8 | 2.1316 | 1.1732 | 1.1113 | 197.0          |         | 0.01858                      | 603.2 | 2.1265 | 1.1761 | 1.1133 | 196.5          | 215        |
| 220        | 0.01989                      | 609.7 | 2.1436 | 1.1776 | 1.1095 | 198.4          |         | 0.01883                      | 609.1 | 2.1386 | 1.1804 | 1.1114 | 197.9          | 220        |

  

| TEMP<br>°C | PRESSURE = 2200.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 2400.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|---------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 71.72      | 0.00102                      | 307.8 | 1.3433 | 1.8446 | 1.8417 | 279.5          | SAT LIQ | 0.00104                      | 314.9 | 1.3632 | 1.9351 | 1.9120 | 257.6          | 75.69      |
| 71.72      | 0.00825                      | 429.3 | 1.6956 | 1.6230 | 1.6389 | 124.2          | SAT VAP | 0.00735                      | 429.5 | 1.6917 | 1.7675 | 1.7530 | 121.2          | 75.69      |
| 75         | 0.00860                      | 434.5 | 1.7105 | 1.5190 | 1.5466 | 128.1          |         | —                            | —     | —      | —      | —      | —              | 75         |
| 80         | 0.00909                      | 441.8 | 1.7313 | 1.4143 | 1.4531 | 133.3          |         | 0.00782                      | 436.7 | 1.7122 | 1.5873 | 1.5944 | 126.8          | 80         |
| 85         | 0.00953                      | 448.7 | 1.7507 | 1.3450 | 1.3903 | 137.7          |         | 0.00829                      | 444.3 | 1.7336 | 1.4637 | 1.4851 | 132.3          | 85         |
| 90         | 0.00993                      | 455.3 | 1.7690 | 1.2961 | 1.3449 | 141.7          |         | 0.00870                      | 451.4 | 1.7533 | 1.3841 | 1.4137 | 136.9          | 90         |
| 95         | 0.01031                      | 461.6 | 1.7865 | 1.2601 | 1.3103 | 145.3          |         | 0.00909                      | 458.2 | 1.7718 | 1.3286 | 1.3630 | 141.0          | 95         |
| 100        | 0.01067                      | 467.9 | 1.8033 | 1.2329 | 1.2831 | 148.6          |         | 0.00945                      | 464.7 | 1.7894 | 1.2882 | 1.3250 | 144.8          | 100        |
| 105        | 0.01100                      | 474.0 | 1.8195 | 1.2121 | 1.2612 | 151.7          |         | 0.00978                      | 471.1 | 1.8064 | 1.2579 | 1.2954 | 148.2          | 105        |
| 110        | 0.01133                      | 480.0 | 1.8354 | 1.1959 | 1.2429 | 154.6          |         | 0.01010                      | 477.3 | 1.8227 | 1.2346 | 1.2715 | 151.3          | 110        |
| 115        | 0.01164                      | 485.9 | 1.8508 | 1.1834 | 1.2276 | 157.3          |         | 0.01041                      | 483.4 | 1.8386 | 1.2166 | 1.2519 | 154.3          | 115        |
| 120        | 0.01195                      | 491.8 | 1.8658 | 1.1737 | 1.2145 | 159.9          |         | 0.01070                      | 489.5 | 1.8541 | 1.2026 | 1.2355 | 157.1          | 120        |
| 125        | 0.01224                      | 497.7 | 1.8806 | 1.1662 | 1.2032 | 162.4          |         | 0.01098                      | 495.5 | 1.8692 | 1.1917 | 1.2215 | 159.7          | 125        |
| 130        | 0.01253                      | 503.5 | 1.8951 | 1.1606 | 1.1934 | 164.7          |         | 0.01126                      | 501.4 | 1.8841 | 1.1832 | 1.2095 | 162.3          | 130        |
| 135        | 0.01281                      | 509.3 | 1.9094 | 1.1565 | 1.1847 | 167.0          |         | 0.01153                      | 507.3 | 1.8986 | 1.1767 | 1.1990 | 164.7          | 135        |
| 140        | 0.01308                      | 515.1 | 1.9235 | 1.1537 | 1.1770 | 169.1          |         | 0.01179                      | 513.2 | 1.9129 | 1.1719 | 1.1898 | 167.0          | 140        |
| 145        | 0.01335                      | 520.8 | 1.9374 | 1.1519 | 1.1701 | 171.2          |         | 0.01205                      | 519.0 | 1.9270 | 1.1684 | 1.1817 | 169.2          | 145        |
| 150        | 0.01362                      | 526.6 | 1.9510 | 1.1510 | 1.1639 | 173.3          |         | 0.01230                      | 524.9 | 1.9408 | 1.1660 | 1.1744 | 171.3          | 150        |
| 155        | 0.01388                      | 532.3 | 1.9646 | 1.1509 | 1.1583 | 175.2          |         | 0.01255                      | 530.7 | 1.9545 | 1.1646 | 1.1679 | 173.4          | 155        |
| 160        | 0.01413                      | 538.1 | 1.9779 | 1.1515 | 1.1532 | 177.1          |         | 0.01279                      | 536.5 | 1.9680 | 1.1641 | 1.1620 | 175.4          | 160        |
| 165        | 0.01439                      | 543.9 | 1.9912 | 1.1526 | 1.1485 | 179.0          |         | 0.01303                      | 542.3 | 1.9814 | 1.1642 | 1.1567 | 177.3          | 165        |
| 170        | 0.01464                      | 549.6 | 2.0042 | 1.1541 | 1.1443 | 180.8          |         | 0.01326                      | 548.1 | 1.9946 | 1.1649 | 1.1518 | 179.2          | 170        |
| 175        | 0.01488                      | 555.4 | 2.0172 | 1.1561 | 1.1404 | 182.6          |         | 0.01349                      | 554.0 | 2.0077 | 1.1662 | 1.1473 | 181.1          | 175        |
| 180        | 0.01513                      | 561.2 | 2.0300 | 1.1585 | 1.1367 | 184.3          |         | 0.01372                      | 559.8 | 2.0206 | 1.1679 | 1.1432 | 182.9          | 180        |
| 185        | 0.01537                      | 567.0 | 2.0428 | 1.1612 | 1.1334 | 186.0          |         | 0.01395                      | 565.7 | 2.0335 | 1.1699 | 1.1394 | 184.6          | 185        |
| 190        | 0.01561                      | 572.8 | 2.0554 | 1.1642 | 1.1302 | 187.6          |         | 0.01417                      | 571.5 | 2.0462 | 1.1723 | 1.1359 | 186.3          | 190        |
| 195        | 0.01585                      | 578.6 | 2.0679 | 1.1674 | 1.1273 | 189.3          |         | 0.01440                      | 577.4 | 2.0588 | 1.1751 | 1.1327 | 188.0          | 195        |
| 200        | 0.01608                      | 584.5 | 2.0803 | 1.1708 | 1.1246 | 190.8          |         | 0.01462                      | 583.3 | 2.0713 | 1.1780 | 1.1296 | 189.6          | 200        |
| 205        | 0.01631                      | 590.3 | 2.0927 | 1.1744 | 1.1221 | 192.4          |         | 0.01483                      | 589.2 | 2.0837 | 1.1812 | 1.1268 | 191.2          | 205        |
| 210        | 0.01654                      | 596.2 | 2.1049 | 1.1781 | 1.1197 | 193.9          |         | 0.01505                      | 595.1 | 2.0960 | 1.1846 | 1.1241 | 192.8          | 210        |
| 215        | 0.01677                      | 602.1 | 2.1170 | 1.1820 | 1.1174 | 195.4          |         | 0.01526                      | 601.0 | 2.1082 | 1.1882 | 1.1216 | 194.4          | 215        |
| 220        | 0.01700                      | 608.0 | 2.1291 | 1.1861 | 1.1153 | 196.9          |         | 0.01548                      | 607.0 | 2.1203 | 1.1919 | 1.1193 | 195.9          | 220        |
| 225        | 0.01723                      | 614.0 | 2.1411 | 1.1902 | 1.1133 | 198.4          |         | 0.01569                      | 612.9 | 2.1324 | 1.1957 | 1.1171 | 197.4          | 225        |
| 230        | —                            | —     | —      | —      | —      | —              |         | 0.01590                      | 618.9 | 2.1443 | 1.1996 | 1.1150 | 198.9          | 230        |

**TABLE 2 (continued)**  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V = Volume in m<sup>3</sup>/kg    H = Enthalpy in kJ/kg    S = Entropy in kJ/(kg)(K)    v<sub>s</sub> = Velocity of Sound in m/sec**  
**Cp = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    Cp/Cv = Heat Capacity Ratio (Dimensionless)**

| TEMP<br>°C | PRESSURE = 2600.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 2800.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|---------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 79.41      | 0.00107                      | 321.8 | 1.3823 | 2.0468 | 2.0008 | 236.5          | SAT LIQ | 0.00111                      | 328.6 | 1.4007 | 2.1903 | 2.1171 | 216.0          | 82.91      |
| 79.41      | 0.00657                      | 429.3 | 1.6872 | 1.9511 | 1.9009 | 118.2          | SAT VAP | 0.00589                      | 428.7 | 1.6819 | 2.1936 | 2.0991 | 115.2          | 82.91      |
| 80         | 0.00664                      | 430.4 | 1.6904 | 1.9044 | 1.8601 | 119.2          |         | —                            | —     | —      | —      | —      | —              | 80         |
| 85         | 0.00718                      | 439.2 | 1.7151 | 1.6459 | 1.6339 | 126.1          |         | 0.00614                      | 433.0 | 1.6941 | 1.9759 | 1.9096 | 118.8          | 85         |
| 90         | 0.00763                      | 447.1 | 1.7369 | 1.5063 | 1.5114 | 131.7          |         | 0.00666                      | 442.1 | 1.7193 | 1.6913 | 1.6622 | 125.8          | 90         |
| 95         | 0.00803                      | 454.4 | 1.7569 | 1.4179 | 1.4330 | 136.5          |         | 0.00709                      | 450.2 | 1.7413 | 1.5403 | 1.5307 | 131.5          | 95         |
| 100        | 0.00839                      | 461.3 | 1.7756 | 1.3571 | 1.3781 | 140.7          |         | 0.00747                      | 457.6 | 1.7614 | 1.4459 | 1.4477 | 136.4          | 100        |
| 105        | 0.00873                      | 468.0 | 1.7933 | 1.3131 | 1.3373 | 144.5          |         | 0.00782                      | 464.7 | 1.7802 | 1.3812 | 1.3897 | 140.7          | 105        |
| 110        | 0.00905                      | 474.5 | 1.8103 | 1.2801 | 1.3056 | 148.0          |         | 0.00814                      | 471.4 | 1.7980 | 1.3345 | 1.3469 | 144.5          | 110        |
| 115        | 0.00935                      | 480.8 | 1.8268 | 1.2549 | 1.2803 | 151.2          |         | 0.00844                      | 478.0 | 1.8150 | 1.2996 | 1.3137 | 148.1          | 115        |
| 120        | 0.00964                      | 487.0 | 1.8427 | 1.2354 | 1.2595 | 154.2          |         | 0.00872                      | 484.5 | 1.8315 | 1.2729 | 1.2873 | 151.3          | 120        |
| 125        | 0.00992                      | 493.2 | 1.8582 | 1.2201 | 1.2422 | 157.1          |         | 0.00899                      | 490.8 | 1.8474 | 1.2521 | 1.2657 | 154.4          | 125        |
| 130        | 0.01018                      | 499.2 | 1.8734 | 1.2081 | 1.2275 | 159.8          |         | 0.00925                      | 497.0 | 1.8630 | 1.2359 | 1.2477 | 157.3          | 130        |
| 135        | 0.01044                      | 505.2 | 1.8882 | 1.1988 | 1.2149 | 162.3          |         | 0.00951                      | 503.1 | 1.8781 | 1.2231 | 1.2324 | 160.0          | 135        |
| 140        | 0.01069                      | 511.2 | 1.9027 | 1.1916 | 1.2039 | 164.8          |         | 0.00975                      | 509.2 | 1.8929 | 1.2131 | 1.2193 | 162.6          | 140        |
| 145        | 0.01094                      | 517.2 | 1.9170 | 1.1861 | 1.1943 | 167.1          |         | 0.00999                      | 515.3 | 1.9075 | 1.2053 | 1.2080 | 165.1          | 145        |
| 150        | 0.01118                      | 523.1 | 1.9311 | 1.1821 | 1.1858 | 169.4          |         | 0.01022                      | 521.3 | 1.9218 | 1.1994 | 1.1981 | 167.4          | 150        |
| 155        | 0.01142                      | 529.0 | 1.9450 | 1.1793 | 1.1782 | 171.5          |         | 0.01045                      | 527.3 | 1.9358 | 1.1949 | 1.1893 | 169.7          | 155        |
| 160        | 0.01165                      | 534.9 | 1.9587 | 1.1775 | 1.1714 | 173.6          |         | 0.01067                      | 533.2 | 1.9497 | 1.1917 | 1.1814 | 171.9          | 160        |
| 165        | 0.01187                      | 540.8 | 1.9722 | 1.1765 | 1.1653 | 175.7          |         | 0.01088                      | 539.2 | 1.9634 | 1.1895 | 1.1744 | 174.0          | 165        |
| 170        | 0.01210                      | 546.6 | 1.9855 | 1.1763 | 1.1597 | 177.6          |         | 0.01110                      | 545.1 | 1.9769 | 1.1882 | 1.1681 | 176.1          | 170        |
| 175        | 0.01232                      | 552.5 | 1.9987 | 1.1767 | 1.1547 | 179.6          |         | 0.01131                      | 551.1 | 1.9902 | 1.1877 | 1.1624 | 178.1          | 175        |
| 180        | 0.01253                      | 558.4 | 2.0118 | 1.1776 | 1.1500 | 181.4          |         | 0.01151                      | 557.0 | 2.0034 | 1.1878 | 1.1572 | 180.0          | 180        |
| 185        | 0.01275                      | 564.3 | 2.0247 | 1.1790 | 1.1458 | 183.2          |         | 0.01172                      | 562.9 | 2.0164 | 1.1885 | 1.1524 | 181.9          | 185        |
| 190        | 0.01296                      | 570.2 | 2.0375 | 1.1808 | 1.1418 | 185.0          |         | 0.01192                      | 568.9 | 2.0293 | 1.1897 | 1.1480 | 183.7          | 190        |
| 195        | 0.01317                      | 576.1 | 2.0502 | 1.1830 | 1.1382 | 186.7          |         | 0.01212                      | 574.8 | 2.0421 | 1.1913 | 1.1440 | 185.5          | 195        |
| 200        | 0.01338                      | 582.0 | 2.0628 | 1.1855 | 1.1348 | 188.4          |         | 0.01232                      | 580.8 | 2.0547 | 1.1932 | 1.1402 | 187.3          | 200        |
| 205        | 0.01358                      | 588.0 | 2.0753 | 1.1883 | 1.1317 | 190.1          |         | 0.01251                      | 586.8 | 2.0673 | 1.1955 | 1.1367 | 189.0          | 205        |
| 210        | 0.01379                      | 593.9 | 2.0876 | 1.1912 | 1.1288 | 191.7          |         | 0.01270                      | 592.8 | 2.0798 | 1.1981 | 1.1335 | 190.6          | 210        |
| 215        | 0.01399                      | 599.9 | 2.0999 | 1.1944 | 1.1260 | 193.3          |         | 0.01289                      | 598.8 | 2.0921 | 1.2009 | 1.1305 | 192.3          | 215        |
| 220        | 0.01419                      | 605.9 | 2.1121 | 1.1978 | 1.1234 | 194.9          |         | 0.01308                      | 604.8 | 2.1044 | 1.2039 | 1.1277 | 193.9          | 220        |
| 225        | 0.01439                      | 611.9 | 2.1242 | 1.2014 | 1.1210 | 196.4          |         | 0.01327                      | 610.8 | 2.1165 | 1.2071 | 1.1250 | 195.5          | 225        |
| 230        | 0.01458                      | 617.9 | 2.1362 | 1.2050 | 1.1187 | 197.9          |         | 0.01346                      | 616.8 | 2.1286 | 1.2105 | 1.1225 | 197.0          | 230        |
| 235        | —                            | —     | —      | —      | —      | —              |         | 0.01364                      | 622.9 | 2.1406 | 1.2140 | 1.1202 | 198.6          | 235        |

  

| TEMP<br>°C | PRESSURE = 3000.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 3200.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|---------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 86.22      | 0.00114                      | 335.3 | 1.4188 | 2.3843 | 2.2770 | 195.8          | SAT LIQ | 0.00118                      | 342.0 | 1.4367 | 2.6657 | 2.5126 | 175.9          | 89.35      |
| 86.22      | 0.00528                      | 427.6 | 1.6758 | 2.5300 | 2.3769 | 112.1          | SAT VAP | 0.00472                      | 426.0 | 1.6685 | 3.0280 | 2.7912 | 109.1          | 89.35      |
| 90         | 0.00575                      | 436.1 | 1.6992 | 2.0156 | 1.9317 | 119.1          |         | 0.00482                      | 427.9 | 1.6737 | 2.8017 | 2.5961 | 110.6          | 90         |
| 95         | 0.00624                      | 445.3 | 1.7245 | 1.7214 | 1.6778 | 126.1          |         | 0.00544                      | 439.5 | 1.7056 | 2.0237 | 1.9273 | 119.9          | 95         |
| 100        | 0.00665                      | 453.5 | 1.7466 | 1.5654 | 1.5427 | 131.7          |         | 0.00589                      | 448.8 | 1.7307 | 1.7365 | 1.6809 | 126.7          | 100        |
| 105        | 0.00701                      | 461.1 | 1.7667 | 1.4676 | 1.4573 | 136.6          |         | 0.00628                      | 457.1 | 1.7527 | 1.5813 | 1.5473 | 132.3          | 105        |
| 110        | 0.00733                      | 468.2 | 1.7855 | 1.4007 | 1.3977 | 140.9          |         | 0.00662                      | 464.7 | 1.7728 | 1.4831 | 1.4619 | 137.2          | 110        |
| 115        | 0.00764                      | 475.1 | 1.8034 | 1.3523 | 1.3537 | 144.8          |         | 0.00692                      | 472.0 | 1.7916 | 1.4156 | 1.4022 | 141.4          | 115        |
| 120        | 0.00792                      | 481.8 | 1.8204 | 1.3161 | 1.3197 | 148.4          |         | 0.00721                      | 478.9 | 1.8094 | 1.3667 | 1.3579 | 145.3          | 120        |
| 125        | 0.00819                      | 488.3 | 1.8369 | 1.2884 | 1.2926 | 151.7          |         | 0.00748                      | 485.7 | 1.8264 | 1.3299 | 1.3236 | 148.9          | 125        |
| 130        | 0.00845                      | 494.7 | 1.8528 | 1.2669 | 1.2704 | 154.7          |         | 0.00773                      | 492.2 | 1.8428 | 1.3017 | 1.2962 | 152.2          | 130        |
| 135        | 0.00869                      | 501.0 | 1.8683 | 1.2500 | 1.2520 | 157.6          |         | 0.00798                      | 498.7 | 1.8587 | 1.2797 | 1.2738 | 155.3          | 135        |
| 140        | 0.00893                      | 507.2 | 1.8835 | 1.2366 | 1.2363 | 160.4          |         | 0.00821                      | 505.1 | 1.8742 | 1.2624 | 1.2551 | 158.2          | 140        |
| 145        | 0.00916                      | 513.3 | 1.8983 | 1.2262 | 1.2229 | 163.0          |         | 0.00844                      | 511.3 | 1.8893 | 1.2487 | 1.2393 | 160.9          | 145        |
| 150        | 0.00939                      | 519.4 | 1.9128 | 1.2179 | 1.2113 | 165.5          |         | 0.00865                      | 517.5 | 1.9041 | 1.2379 | 1.2257 | 163.5          | 150        |
| 155        | 0.00960                      | 525.5 | 1.9271 | 1.2116 | 1.2011 | 167.9          |         | 0.00887                      | 523.7 | 1.9186 | 1.2294 | 1.2139 | 166.0          | 155        |
| 160        | 0.00982                      | 531.6 | 1.9411 | 1.2068 | 1.1921 | 170.2          |         | 0.00907                      | 529.8 | 1.9328 | 1.2228 | 1.2036 | 168.4          | 160        |
| 165        | 0.01003                      | 537.6 | 1.9549 | 1.2032 | 1.1841 | 172.4          |         | 0.00927                      | 535.9 | 1.9468 | 1.2177 | 1.1944 | 170.7          | 165        |
| 170        | 0.01023                      | 543.6 | 1.9686 | 1.2007 | 1.1770 | 174.5          |         | 0.00947                      | 542.0 | 1.9606 | 1.2140 | 1.1863 | 173.0          | 170        |
| 175        | 0.01043                      | 549.6 | 1.9820 | 1.1992 | 1.1705 | 176.6          |         | 0.00967                      | 548.1 | 1.9742 | 1.2113 | 1.1790 | 175.1          | 175        |
| 180        | 0.01063                      | 555.6 | 1.9953 | 1.1984 | 1.1646 | 178.6          |         | 0.00986                      | 554.1 | 1.9876 | 1.2095 | 1.1724 | 177.2          | 180        |
| 185        | 0.01083                      | 561.6 | 2.0085 | 1.1983 | 1.1593 | 180.5          |         | 0.01004                      | 560.2 | 2.0009 | 1.2086 | 1.1665 | 179.2          | 185        |
| 190        | 0.01102                      | 567.6 | 2.0215 | 1.1988 | 1.1544 | 182.4          |         | 0.01023                      | 566.2 | 2.0140 | 1.2083 | 1.1611 | 181.2          | 190        |
| 195        | 0.01121                      | 573.6 | 2.0344 | 1.1998 | 1.1499 | 184.3          |         | 0.01041                      | 572.3 | 2.0270 | 1.2086 | 1.1561 | 183.1          | 195        |
| 200        | 0.01139                      | 579.6 | 2.0471 | 1.2012 | 1.1458 | 186.1          |         | 0.01059                      | 578.3 | 2.0398 | 1.2094 | 1.1515 | 184.9          | 200        |
| 205        | 0.01158                      | 585.6 | 2.0598 | 1.2030 | 1.1420 | 187.8          |         | 0.01077                      | 584.4 | 2.0526 | 1.2107 | 1.1473 | 186.7          | 205        |
| 210        | 0.01176                      | 591.6 | 2.0723 | 1.2051 | 1.1384 | 189.6          |         | 0.01094                      | 590.4 | 2.0652 | 1.2123 | 1.1434 | 188.5          | 210        |
| 215        | 0.01194                      | 597.6 | 2.0847 | 1.2075 | 1.1351 | 191.3          |         | 0.01111                      | 596.5 | 2.0776 | 1.2143 | 1.1398 | 190.2          | 215        |
| 220        | 0.01212                      | 603.7 | 2.0970 | 1.2102 | 1.1320 | 192.9          |         | 0.01129                      | 602.6 | 2.0900 | 1.2166 | 1.1365 | 191.9          | 220        |
| 225        | 0.01230                      | 609.7 | 2.1092 | 1.2130 | 1.1291 | 194.5          |         | 0.01146                      | 608.6 | 2.1023 | 1.2191 | 1.1333 | 193.6          | 225        |
| 230        | 0.01248                      | 615.8 | 2.1214 | 1.2161 | 1.1264 | 196.1          |         | 0.01162                      | 614.8 | 2.1145 | 1.2218 | 1.1304 | 195.2          | 230        |
| 235        | 0.01265                      | 621.9 | 2.1334 | 1.2194 | 1.1239 | 197.7          |         | 0.01179                      | 620.9 | 2.1266 | 1.2248 | 1.1276 | 196.8          | 235        |
| 240        | 0.01283                      | 628.0 | 2.1454 | 1.2227 | 1.1215 | 199.2          |         | 0.01196                      | 627.0 | 2.1386 | 1.2279 | 1.1251 | 198.4          | 240        |

**TABLE 2** (continued)  
**HFC-134a Superheated Vapor—Constant Pressure Tables**

**V** = Volume in m<sup>3</sup>/kg    **H** = Enthalpy in kJ/kg    **S** = Entropy in kJ/(kg)(K)    **v<sub>s</sub>** = Velocity of Sound in m/sec  
**Cp** = Heat Capacity at Constant Pressure in kJ/(kg)(°C)    **Cp/Cv** = Heat Capacity Ratio (Dimensionless)

| TEMP<br>°C | PRESSURE = 3400.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 3600.00 kPa (abs) |       |        |        |        |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|---------|------------------------------|-------|--------|--------|--------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |            |
| 92.32      | 0.00123                      | 348.8 | 1.4548 | 3.1183 | 2.8961 | 156.1          | SAT LIQ | 0.00130                      | 356.0 | 1.4737 | 3.9821 | 3.6345 | 136.2          | 95.15      |
| 92.32      | 0.00420                      | 423.6 | 1.6596 | 3.8377 | 3.4671 | 106.0          | SAT VAP | 0.00370                      | 420.3 | 1.6483 | 5.3756 | 4.7521 | 102.8          | 95.15      |
| 95         | 0.00463                      | 432.0 | 1.6825 | 2.6656 | 2.4643 | 112.6          |         | —                            | —     | —      | —      | —      | —              | 95         |
| 100        | 0.00518                      | 443.4 | 1.7132 | 2.0061 | 1.9016 | 121.2          |         | 0.00449                      | 436.6 | 1.6924 | 2.5079 | 2.3168 | 115.0          | 100        |
| 105        | 0.00561                      | 452.7 | 1.7379 | 1.7383 | 1.6732 | 127.8          |         | 0.00498                      | 447.6 | 1.7216 | 1.9711 | 1.8620 | 122.9          | 105        |
| 110        | 0.00597                      | 461.0 | 1.7597 | 1.5889 | 1.5452 | 133.3          |         | 0.00537                      | 456.8 | 1.7458 | 1.7296 | 1.6572 | 129.2          | 110        |
| 115        | 0.00629                      | 468.7 | 1.7796 | 1.4930 | 1.4622 | 138.0          |         | 0.00571                      | 465.1 | 1.7672 | 1.5896 | 1.5377 | 134.5          | 115        |
| 120        | 0.00658                      | 475.9 | 1.7983 | 1.4263 | 1.4035 | 142.2          |         | 0.00601                      | 472.8 | 1.7870 | 1.4978 | 1.4586 | 139.1          | 120        |
| 125        | 0.00685                      | 482.9 | 1.8160 | 1.3777 | 1.3596 | 146.1          |         | 0.00628                      | 480.1 | 1.8055 | 1.4333 | 1.4019 | 143.2          | 125        |
| 130        | 0.00710                      | 489.7 | 1.8329 | 1.3411 | 1.3255 | 149.6          |         | 0.00654                      | 487.1 | 1.8230 | 1.3859 | 1.3592 | 147.0          | 130        |
| 135        | 0.00734                      | 496.4 | 1.8493 | 1.3128 | 1.2982 | 152.9          |         | 0.00678                      | 494.0 | 1.8399 | 1.3499 | 1.3258 | 150.5          | 135        |
| 140        | 0.00757                      | 502.9 | 1.8651 | 1.2908 | 1.2758 | 156.0          |         | 0.00700                      | 500.6 | 1.8561 | 1.3220 | 1.2989 | 153.8          | 140        |
| 145        | 0.00779                      | 509.3 | 1.8805 | 1.2733 | 1.2571 | 158.9          |         | 0.00722                      | 507.2 | 1.8719 | 1.3001 | 1.2767 | 156.8          | 145        |
| 150        | 0.00801                      | 515.6 | 1.8956 | 1.2595 | 1.2413 | 161.6          |         | 0.00743                      | 513.6 | 1.8873 | 1.2828 | 1.2582 | 159.7          | 150        |
| 155        | 0.00821                      | 521.9 | 1.9103 | 1.2485 | 1.2276 | 164.2          |         | 0.00763                      | 520.0 | 1.9022 | 1.2690 | 1.2424 | 162.4          | 155        |
| 160        | 0.00842                      | 528.1 | 1.9247 | 1.2399 | 1.2158 | 166.7          |         | 0.00783                      | 526.3 | 1.9169 | 1.2581 | 1.2288 | 165.0          | 160        |
| 165        | 0.00861                      | 534.3 | 1.9389 | 1.2331 | 1.2054 | 169.1          |         | 0.00802                      | 532.6 | 1.9313 | 1.2494 | 1.2170 | 167.5          | 165        |
| 170        | 0.00880                      | 540.4 | 1.9529 | 1.2279 | 1.1962 | 171.4          |         | 0.00821                      | 538.8 | 1.9454 | 1.2425 | 1.2066 | 169.9          | 170        |
| 175        | 0.00899                      | 546.6 | 1.9667 | 1.2240 | 1.1880 | 173.6          |         | 0.00839                      | 545.0 | 1.9594 | 1.2373 | 1.1974 | 172.2          | 175        |
| 180        | 0.00917                      | 552.7 | 1.9802 | 1.2211 | 1.1806 | 175.8          |         | 0.00857                      | 551.2 | 1.9731 | 1.2333 | 1.1892 | 174.4          | 180        |
| 185        | 0.00935                      | 558.8 | 1.9936 | 1.2192 | 1.1740 | 177.9          |         | 0.00874                      | 557.4 | 1.9866 | 1.2303 | 1.1818 | 176.6          | 185        |
| 190        | 0.00953                      | 564.9 | 2.0068 | 1.2181 | 1.1680 | 179.9          |         | 0.00891                      | 563.5 | 1.9999 | 1.2284 | 1.1752 | 178.7          | 190        |
| 195        | 0.00971                      | 571.0 | 2.0199 | 1.2177 | 1.1625 | 181.9          |         | 0.00908                      | 569.7 | 2.0131 | 1.2272 | 1.1691 | 180.7          | 195        |
| 200        | 0.00988                      | 577.1 | 2.0328 | 1.2179 | 1.1575 | 183.8          |         | 0.00925                      | 575.8 | 2.0261 | 1.2267 | 1.1636 | 182.7          | 200        |
| 205        | 0.01005                      | 583.1 | 2.0457 | 1.2186 | 1.1529 | 185.7          |         | 0.00941                      | 581.9 | 2.0390 | 1.2267 | 1.1586 | 184.6          | 205        |
| 210        | 0.01022                      | 589.2 | 2.0583 | 1.2197 | 1.1486 | 187.5          |         | 0.00957                      | 588.1 | 2.0518 | 1.2273 | 1.1540 | 186.5          | 210        |
| 215        | 0.01038                      | 595.3 | 2.0709 | 1.2212 | 1.1447 | 189.3          |         | 0.00973                      | 594.2 | 2.0644 | 1.2284 | 1.1497 | 188.3          | 215        |
| 220        | 0.01055                      | 601.5 | 2.0834 | 1.2231 | 1.1410 | 191.0          |         | 0.00989                      | 600.3 | 2.0770 | 1.2298 | 1.1457 | 190.1          | 220        |
| 225        | 0.01071                      | 607.6 | 2.0957 | 1.2253 | 1.1376 | 192.7          |         | 0.01005                      | 606.5 | 2.0894 | 1.2316 | 1.1420 | 191.8          | 225        |
| 230        | 0.01087                      | 613.7 | 2.1080 | 1.2277 | 1.1345 | 194.4          |         | 0.01020                      | 612.7 | 2.1017 | 1.2336 | 1.1386 | 193.5          | 230        |
| 235        | 0.01103                      | 619.8 | 2.1201 | 1.2303 | 1.1315 | 196.0          |         | 0.01035                      | 618.8 | 2.1139 | 1.2359 | 1.1354 | 195.2          | 235        |
| 240        | 0.01119                      | 626.0 | 2.1322 | 1.2331 | 1.1287 | 197.6          |         | 0.01050                      | 625.0 | 2.1260 | 1.2385 | 1.1324 | 196.8          | 240        |
| 245        | 0.01134                      | 632.2 | 2.1441 | 1.2361 | 1.1261 | 199.2          |         | 0.01065                      | 631.4 | 2.1380 | 1.2412 | 1.1296 | 198.4          | 245        |
| 250        | —                            | —     | —      | —      | —      | —              |         | 0.01080                      | 637.4 | 2.1500 | 1.2441 | 1.1269 | 200.0          | 250        |

  

| TEMP<br>°C | PRESSURE = 3800.00 kPa (abs) |       |        |        |        |                |         | PRESSURE = 4000.00 kPa (abs) |       |        |         |         |                | TEMP<br>°C |
|------------|------------------------------|-------|--------|--------|--------|----------------|---------|------------------------------|-------|--------|---------|---------|----------------|------------|
|            | V                            | H     | S      | Cp     | Cp/Cv  | v <sub>s</sub> |         | V                            | H     | S      | Cp      | Cp/Cv   | v <sub>s</sub> |            |
| 97.83      | 0.00139                      | 364.0 | 1.4947 | 6.3049 | 5.6279 | 116.1          | SAT LIQ | 0.00158                      | 375.6 | 1.5250 | 28.1470 | 24.2211 | 95.7           | 100.37     |
| 97.83      | 0.00319                      | 415.1 | 1.6324 | 9.3686 | 8.0817 | 99.5           | SAT VAP | 0.00254                      | 404.4 | 1.6022 | 42.1018 | 35.2394 | 95.0           | 100.37     |
| 100        | 0.00374                      | 427.0 | 1.6645 | 3.8743 | 3.4563 | 107.3          |         | —                            | —     | —      | —       | —       | —              | 100        |
| 105        | 0.00438                      | 441.5 | 1.7031 | 2.3563 | 2.1772 | 117.6          |         | 0.00376                      | 433.7 | 1.6804 | 3.1309  | 2.8151  | 111.6          | 105        |
| 110        | 0.00482                      | 452.1 | 1.7309 | 1.9265 | 1.8153 | 124.9          |         | 0.00429                      | 446.7 | 1.7143 | 2.2216  | 2.0540  | 120.4          | 110        |
| 115        | 0.00517                      | 461.1 | 1.7543 | 1.7135 | 1.6356 | 130.8          |         | 0.00468                      | 456.8 | 1.7406 | 1.8780  | 1.7663  | 127.1          | 115        |
| 120        | 0.00549                      | 469.4 | 1.7754 | 1.5848 | 1.5261 | 135.9          |         | 0.00501                      | 465.7 | 1.7634 | 1.6927  | 1.6106  | 132.7          | 120        |
| 125        | 0.00577                      | 477.1 | 1.7948 | 1.4986 | 1.4519 | 140.4          |         | 0.00530                      | 473.8 | 1.7840 | 1.5762  | 1.5117  | 137.5          | 125        |
| 130        | 0.00602                      | 484.4 | 1.8131 | 1.4371 | 1.3979 | 144.4          |         | 0.00556                      | 481.5 | 1.8031 | 1.4963  | 1.4429  | 141.8          | 130        |
| 135        | 0.00626                      | 491.4 | 1.8306 | 1.3915 | 1.3569 | 148.1          |         | 0.00580                      | 488.8 | 1.8212 | 1.4384  | 1.3921  | 145.8          | 135        |
| 140        | 0.00649                      | 498.3 | 1.8473 | 1.3566 | 1.3245 | 151.6          |         | 0.00603                      | 495.9 | 1.8385 | 1.3950  | 1.3530  | 149.4          | 140        |
| 145        | 0.00671                      | 505.0 | 1.8634 | 1.3295 | 1.2982 | 154.8          |         | 0.00624                      | 502.8 | 1.8550 | 1.3615  | 1.3219  | 152.8          | 145        |
| 150        | 0.00691                      | 511.6 | 1.8791 | 1.3080 | 1.2766 | 157.8          |         | 0.00645                      | 509.5 | 1.8710 | 1.3354  | 1.2965  | 155.9          | 150        |
| 155        | 0.00711                      | 518.1 | 1.8944 | 1.2910 | 1.2583 | 160.7          |         | 0.00664                      | 516.2 | 1.8866 | 1.3146  | 1.2755  | 158.9          | 155        |
| 160        | 0.00731                      | 524.5 | 1.9093 | 1.2775 | 1.2428 | 163.4          |         | 0.00683                      | 522.7 | 1.9018 | 1.2981  | 1.2577  | 161.7          | 160        |
| 165        | 0.00749                      | 530.9 | 1.9239 | 1.2666 | 1.2293 | 166.0          |         | 0.00702                      | 529.2 | 1.9166 | 1.2849  | 1.2424  | 164.4          | 165        |
| 170        | 0.00767                      | 537.2 | 1.9382 | 1.2580 | 1.2176 | 168.4          |         | 0.00719                      | 535.6 | 1.9311 | 1.2743  | 1.2293  | 167.0          | 170        |
| 175        | 0.00785                      | 543.5 | 1.9523 | 1.2512 | 1.2073 | 170.8          |         | 0.00737                      | 541.9 | 1.9454 | 1.2658  | 1.2177  | 169.4          | 175        |
| 180        | 0.00802                      | 549.7 | 1.9661 | 1.2459 | 1.1982 | 173.1          |         | 0.00753                      | 548.2 | 1.9594 | 1.2591  | 1.2076  | 171.8          | 180        |
| 185        | 0.00819                      | 555.9 | 1.9798 | 1.2419 | 1.1900 | 175.3          |         | 0.00770                      | 554.5 | 1.9732 | 1.2539  | 1.1985  | 174.1          | 185        |
| 190        | 0.00836                      | 562.1 | 1.9932 | 1.2390 | 1.1827 | 177.5          |         | 0.00786                      | 560.8 | 1.9867 | 1.2499  | 1.1904  | 176.3          | 190        |
| 195        | 0.00852                      | 568.3 | 2.0065 | 1.2369 | 1.1760 | 179.6          |         | 0.00802                      | 567.0 | 2.0001 | 1.2470  | 1.1831  | 178.4          | 195        |
| 200        | 0.00868                      | 574.5 | 2.0197 | 1.2357 | 1.1700 | 181.6          |         | 0.00817                      | 573.2 | 2.0134 | 1.2450  | 1.1765  | 180.5          | 200        |
| 205        | 0.00884                      | 580.7 | 2.0326 | 1.2351 | 1.1645 | 183.5          |         | 0.00833                      | 579.4 | 2.0265 | 1.2438  | 1.1705  | 182.5          | 205        |
| 210        | 0.00900                      | 586.9 | 2.0455 | 1.2351 | 1.1594 | 185.5          |         | 0.00848                      | 585.7 | 2.0394 | 1.2432  | 1.1650  | 184.5          | 210        |
| 215        | 0.00915                      | 593.0 | 2.0582 | 1.2357 | 1.1548 | 187.3          |         | 0.00863                      | 591.9 | 2.0522 | 1.2431  | 1.1600  | 186.4          | 215        |
| 220        | 0.00930                      | 599.2 | 2.0708 | 1.2366 | 1.1505 | 189.1          |         | 0.00877                      | 598.1 | 2.0649 | 1.2436  | 1.1554  | 188.3          | 220        |
| 225        | 0.00945                      | 605.4 | 2.0833 | 1.2380 | 1.1465 | 190.9          |         | 0.00892                      | 604.3 | 2.0774 | 1.2445  | 1.1511  | 190.1          | 225        |
| 230        | 0.00960                      | 611.6 | 2.0957 | 1.2397 | 1.1428 | 192.7          |         | 0.00906                      | 610.5 | 2.0898 | 1.2458  | 1.1471  | 191.9          | 230        |
| 235        | 0.00975                      | 617.8 | 2.1079 | 1.2416 | 1.1394 | 194.4          |         | 0.00920                      | 616.8 | 2.1022 | 1.2475  | 1.1434  | 193.6          | 235        |
| 240        | 0.00989                      | 624.0 | 2.1201 | 1.2439 | 1.1362 | 196.1          |         | 0.00934                      | 623.0 | 2.1144 | 1.2494  | 1.1400  | 195.3          | 240        |
| 245        | 0.01004                      | 630.2 | 2.1322 | 1.2463 | 1.1331 | 197.7          |         | 0.00948                      | 629.3 | 2.1265 | 1.2515  | 1.1368  | 197.0          | 245        |
| 250        | 0.01018                      | 636.5 | 2.1441 | 1.2490 | 1.1303 | 199.3          |         | 0.00962                      | 635.5 | 2.1386 | 1.2539  | 1.1337  | 198.6          | 250        |



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