

高等学校试用教材

水和水蒸汽热力性质图和简表

南京工学院 庞麓鸣 陈军健编

人民教育出版社

内 容 简 介

本书是根据一九八〇年召开的教育部热工教材编审委员会扩大会议决定编写的。它是与根据高等工业学校《工程热力学教学大纲》(草案,70~90学时)编写的各类“工程热力学”教材相配套的,是高等工业学校学生学习水和水蒸汽性质必备的辅助教材,同时也可供有关工程技术人员参考。

书中水和水蒸汽热力性质图表,主要采用一九八〇年出版的С.Л.Ривкин,А.А.Александров 所编《Тепло физические свойства воды и водяного пара》一书的数据,而该书数据系根据“国际公式化委员会(IFC)”的公式计算而得,采用国际制单位。为了满足教学的需要,本书在附录中还列出了单位换算表,并附有氨、氟里昂-12物性图表及湿空气焓-湿图。

本书由上海交通大学沈维道同志审阅,并经热工教材编委会复审通过。

高等学校试用教材
**水和水蒸汽
热力性质图和简表**

南京工学院
庞鹤鸣 陈军健编

人民教育出版社出版
新华书店北京发行所发行
北京市国祥印刷厂印装

开本850×1168 1/32 印张2.625 插页3 字数:100,000

1982年7月第1版 1983年4月第1次印刷

印数 00,001—9,000

书号15012·0398 定价,0.95元

前 言

本书系根据一九八〇年五月在苏州召开的教育部热工教材编审委员会扩大会议决定编写的。它是与根据高等工业学校《工程热力学教学大纲》(草案, 70~90学时)编写的各类“工程热力学”教材相配套的, 作为高等工业学校学生学习水蒸汽性质必备的辅助教材, 同时也可供有关工程技术人员参考。

书中水和水蒸汽热力性质图表主要采用一九八〇年出版的С.Л. Ривкин, А.А. Александров所编《Тепло-физические свойства воды и водяного пара》一书的数据, 而该书数据系根据“国际公式化委员会(IFC)”的公式计算而得, 内能和焓值以水在三相点时的液相水的内能和焓值作为基准点, 取为零。单位采用国际单位制(SI)。

考虑到教学需要, 在附录中还列出单位换算表, 并附有制冷剂氨(NH_3)、氟利昂-12(CCl_2F_2)的图表以及湿空气焓-湿图。

本书由上海交通大学沈维道同志担任主审, 并经一九八一年十二月召开的热工教材编委会会议复审通过。主审人及参加审稿会的同志对初稿提出了许多宝贵的意见和建议, 在此一并表示感谢。

本书由南京工学院热工教研组庞麓鸣、陈军健编写。书中不妥之处, 敬请读者批评指正。

编 者

一九八一年十一月于南京

符 号 说 明

| | |
|-----------|-----------|
| a_r | 焓 |
| h | 焓 |
| h' | 饱和液体焓 |
| h'' | 饱和蒸汽焓 |
| h_c | 临界焓 |
| p | 压力 |
| p_c | 临界压力 |
| r | 汽化潜热 |
| s | 熵 |
| s' | 饱和液体熵 |
| s'' | 饱和蒸汽熵 |
| s_c | 临界熵 |
| t | 摄氏温标 |
| t_c | 临界温度 |
| t_s | 饱和温度 |
| T | 热力学温标 |
| v | 比容 |
| v' | 饱和液体比容 |
| v'' | 干饱和蒸汽比容 |
| v_c | 临界比容 |
| ω | 比湿度 (含湿量) |
| φ | 空气相对湿度 |

目 录

| | |
|---|----|
| 前言 | 1 |
| 符号说明 | 2 |
| 表 1 饱和水与饱和水蒸汽表(按温度排列) | 1 |
| 表 2 饱和水与饱和水蒸汽表(按压力排列) | 5 |
| 表 3 未饱和水与过热蒸汽表 | 11 |
| 表 4 水和水蒸汽临界参数 | 61 |
| 图 1 水蒸汽焓-熵图 | |
| 图 2 未饱和水焓-熵图 | |
| 图 3 水蒸汽焓-熵图 | |
| 附录 | |
| 附表 1 压力单位换算表 | 62 |
| 附表 2 常用能量单位换算表 | 63 |
| 附表 3 饱和氨(NH ₃)蒸汽表 | 64 |
| 附表 4 过热氨(NH ₃)蒸汽表 | 65 |
| 附表 5 饱和氟利昂-12(CCl ₂ F ₂)蒸汽表 | 71 |
| 附表 6 过热氟利昂-12(CCl ₂ F ₂)蒸汽表 | 72 |
| 附图 1 氨(NH ₃)的温-熵图(公制) | |
| 附图 2 氨(NH ₃)lg <i>p</i> - <i>h</i> 图(公制) | |
| 附图 3 氟利昂-12(CCl ₂ F ₂)lg <i>p</i> - <i>h</i> 图(公制) | |
| 附图 4 湿空气焓-湿图 | |

表1 饱和水与饱和水蒸汽表(按温度排列)

| t °C | T K | p bar | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|--------|--------|----------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 0 | 273.15 | 0.006108 | 0.0010002 | 206.321 | -0.04 | 2501.0 | 2501.0 | -0.0002 | 9.1565 |
| 0.01 | 273.16 | 0.006112 | 0.00100022 | 206.175 | 0.000614 | 2501.0 | 2501.0 | 0.0000 | 9.1562 |
| 1 | 274.15 | 0.006566 | 0.0010001 | 192.611 | 4.17 | 2502.8 | 2498.6 | 0.0152 | 9.1298 |
| 2 | 275.15 | 0.007054 | 0.0010001 | 179.935 | 8.39 | 2504.7 | 2496.3 | 0.0306 | 9.1035 |
| 4 | 277.15 | 0.008129 | 0.0010000 | 157.267 | 16.80 | 2508.3 | 2491.5 | 0.0611 | 9.0514 |
| 6 | 279.15 | 0.009346 | 0.0010000 | 137.768 | 25.21 | 2512.0 | 2486.8 | 0.0913 | 9.0003 |
| 8 | 281.15 | 0.010721 | 0.0010001 | 120.952 | 33.60 | 2515.7 | 2482.1 | 0.1213 | 8.9501 |
| 10 | 283.15 | 0.012271 | 0.0010003 | 106.419 | 41.99 | 2519.4 | 2477.4 | 0.1510 | 8.9009 |
| 12 | 285.15 | 0.014015 | 0.0010004 | 93.828 | 50.38 | 2523.0 | 2472.6 | 0.1805 | 8.8525 |
| 14 | 287.15 | 0.015974 | 0.0010007 | 82.893 | 58.75 | 2526.7 | 2467.9 | 0.2098 | 8.8050 |
| 16 | 289.15 | 0.018170 | 0.0010010 | 73.376 | 67.13 | 2530.4 | 2463.3 | 0.2388 | 8.7583 |
| 18 | 291.15 | 0.020626 | 0.0010013 | 65.089 | 75.50 | 2534.0 | 2458.5 | 0.2677 | 8.7125 |
| 20 | 293.15 | 0.023368 | 0.0010017 | 57.833 | 83.86 | 2537.7 | 2453.8 | 0.2963 | 8.6674 |
| 22 | 295.15 | 0.026424 | 0.0010022 | 51.488 | 92.22 | 2541.4 | 2449.2 | 0.3247 | 8.6232 |
| 24 | 297.15 | 0.029824 | 0.0010026 | 45.923 | 100.59 | 2545.0 | 2444.4 | 0.3530 | 8.5797 |
| 26 | 299.15 | 0.033600 | 0.0010032 | 41.031 | 108.95 | 2548.6 | 2439.6 | 0.3810 | 8.5370 |
| 28 | 301.15 | 0.037785 | 0.0010037 | 36.726 | 117.31 | 2552.3 | 2435.0 | 0.4088 | 8.4950 |
| 30 | 303.15 | 0.042417 | 0.0010043 | 32.929 | 125.66 | 2555.9 | 2430.2 | 0.4365 | 8.4537 |
| 35 | 308.15 | 0.056217 | 0.0010060 | 25.246 | 146.56 | 2565.0 | 2418.4 | 0.5049 | 8.3536 |
| 40 | 313.15 | 0.073749 | 0.0010078 | 19.548 | 167.45 | 2574.0 | 2406.5 | 0.5721 | 8.2576 |

表1(续)

| t °C | T K | p bar | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|--------|--------|----------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 45 | 318.15 | 0.095817 | 0.0010099 | 15.278 | 188.35 | 2582.9 | 2394.5 | 0.6383 | 8.1655 |
| 50 | 323.15 | 0.12335 | 0.0010121 | 12.048 | 209.26 | 2591.8 | 2382.5 | 0.7035 | 8.0771 |
| 55 | 328.15 | 0.15740 | 0.0010145 | 9.5812 | 230.17 | 2600.7 | 2370.5 | 0.7677 | 7.9922 |
| 60 | 333.15 | 0.19919 | 0.0010171 | 7.6807 | 251.09 | 2609.5 | 2358.4 | 0.8310 | 7.9106 |
| 65 | 338.15 | 0.25008 | 0.0010199 | 6.2042 | 272.02 | 2618.2 | 2346.2 | 0.8933 | 7.8320 |
| 70 | 343.15 | 0.31161 | 0.0010228 | 5.0479 | 292.97 | 2626.8 | 2333.8 | 0.9548 | 7.7565 |
| 75 | 348.15 | 0.38548 | 0.0010259 | 4.1356 | 313.94 | 2635.3 | 2321.4 | 1.0154 | 7.6837 |
| 80 | 353.15 | 0.47359 | 0.0010292 | 3.4104 | 334.92 | 2643.8 | 2308.9 | 1.0752 | 7.6135 |
| 85 | 358.15 | 0.57803 | 0.0010326 | 2.8300 | 355.92 | 2652.1 | 2296.2 | 1.1343 | 7.5459 |
| 90 | 363.15 | 0.70108 | 0.0010361 | 2.3624 | 376.94 | 2660.3 | 2283.4 | 1.1925 | 7.4805 |
| 95 | 368.15 | 0.84525 | 0.0010398 | 1.9832 | 397.99 | 2668.4 | 2270.4 | 1.2500 | 7.4174 |
| 100 | 373.15 | 1.01325 | 0.0010437 | 1.6738 | 419.06 | 2676.3 | 2257.2 | 1.3069 | 7.3564 |
| 105 | 378.15 | 1.20800 | 0.0010477 | 1.4200 | 440.17 | 2684.1 | 2243.9 | 1.3630 | 7.2974 |
| 110 | 383.15 | 1.4326 | 0.0010519 | 1.2106 | 461.32 | 2691.8 | 2230.5 | 1.4185 | 7.2402 |
| 115 | 388.15 | 1.6905 | 0.0010562 | 1.0369 | 482.50 | 2699.3 | 2216.8 | 1.4733 | 7.1848 |
| 120 | 393.15 | 1.9854 | 0.0010606 | 0.89202 | 503.7 | 2706.6 | 2202.9 | 1.5276 | 7.1310 |
| 125 | 398.15 | 2.3209 | 0.0010652 | 0.77067 | 525.0 | 2713.8 | 2188.8 | 1.5813 | 7.0788 |
| 130 | 403.15 | 2.7012 | 0.0010700 | 0.66851 | 546.3 | 2720.7 | 2174.4 | 1.6344 | 7.0281 |
| 135 | 408.15 | 3.1306 | 0.0010750 | 0.58212 | 567.7 | 2727.4 | 2159.7 | 1.6869 | 6.9787 |
| 140 | 413.15 | 3.6136 | 0.0010801 | 0.50875 | 589.1 | 2734.0 | 2144.9 | 1.7390 | 6.9307 |

表1(续)

| t °C | T K | p bar | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|--------|--------|---------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 145 | 418.15 | 4.1550 | 0.0010853 | 0.44618 | 610.6 | 2740.3 | 2129.7 | 1.7906 | 6.8838 |
| 150 | 423.15 | 4.7597 | 0.0010908 | 0.39261 | 632.2 | 2746.3 | 2114.1 | 1.8416 | 6.8381 |
| 155 | 428.15 | 5.4331 | 0.0010964 | 0.34656 | 653.8 | 2752.1 | 2098.3 | 1.8923 | 6.7934 |
| 160 | 433.15 | 6.1804 | 0.0011022 | 0.30685 | 675.5 | 2757.7 | 2082.2 | 1.9425 | 6.7498 |
| 165 | 438.15 | 7.0075 | 0.0011082 | 0.27246 | 697.3 | 2763.0 | 2065.7 | 1.9922 | 6.7070 |
| 170 | 443.15 | 7.9202 | 0.0011145 | 0.24259 | 719.1 | 2768.0 | 2048.9 | 2.0416 | 6.6652 |
| 175 | 448.15 | 8.9246 | 0.0011209 | 0.21656 | 741.1 | 2772.7 | 2031.6 | 2.0906 | 6.6241 |
| 180 | 453.15 | 10.027 | 0.0011275 | 0.19381 | 763.1 | 2777.1 | 2014.0 | 2.1393 | 6.5833 |
| 185 | 458.15 | 11.234 | 0.0011344 | 0.17385 | 785.3 | 2781.2 | 1995.9 | 2.1876 | 6.5441 |
| 190 | 463.15 | 12.552 | 0.0011415 | 0.15631 | 807.5 | 2784.9 | 1977.4 | 2.2356 | 6.5052 |
| 195 | 468.15 | 13.989 | 0.0011489 | 0.14082 | 829.9 | 2788.3 | 1958.4 | 2.2833 | 6.4667 |
| 200 | 473.15 | 15.551 | 0.0011565 | 0.12714 | 852.4 | 2791.4 | 1939.0 | 2.3307 | 6.4289 |
| 210 | 483.15 | 19.079 | 0.0011726 | 0.10422 | 897.8 | 2796.4 | 1898.6 | 2.4247 | 6.3546 |
| 220 | 493.15 | 23.201 | 0.0011900 | 0.08602 | 943.7 | 2799.9 | 1856.2 | 2.5178 | 6.2819 |
| 230 | 503.15 | 27.979 | 0.0012087 | 0.07143 | 990.3 | 2801.7 | 1811.4 | 2.6102 | 6.2104 |
| 240 | 513.15 | 33.480 | 0.0012291 | 0.05964 | 1037.6 | 2801.6 | 1764.0 | 2.7021 | 6.1397 |
| 250 | 523.15 | 39.776 | 0.0012513 | 0.05002 | 1085.8 | 2799.5 | 1713.7 | 2.7936 | 6.0693 |
| 260 | 533.15 | 46.940 | 0.0012756 | 0.04212 | 1135.0 | 2795.2 | 1660.2 | 2.8850 | 5.9989 |
| 270 | 543.15 | 55.051 | 0.0013025 | 0.03557 | 1185.4 | 2788.3 | 1602.9 | 2.9766 | 5.9278 |
| 280 | 553.15 | 64.191 | 0.0013324 | 0.03010 | 1237.0 | 2778.6 | 1541.6 | 3.0687 | 5.8555 |

表1(续)

| t °C | T K | p bar | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|--------|--------|---------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 290 | 563.15 | 74.448 | 0.0013659 | 0.02551 | 1290.3 | 2765.4 | 1475.1 | 3.1616 | 5.7811 |
| 300 | 573.15 | 85.917 | 0.0014041 | 0.02162 | 1345.4 | 2748.4 | 1403.0 | 3.2559 | 5.7038 |
| 310 | 583.15 | 98.697 | 0.0014480 | 0.01829 | 1402.9 | 2726.8 | 1323.9 | 3.3522 | 5.6224 |
| 320 | 593.15 | 112.90 | 0.0014995 | 0.01544 | 1463.4 | 2699.6 | 1236.2 | 3.4513 | 5.5356 |
| 330 | 603.15 | 128.65 | 0.0015614 | 0.01296 | 1527.5 | 2665.5 | 1138.0 | 3.5546 | 5.4414 |
| 340 | 613.15 | 146.08 | 0.0016390 | 0.01078 | 1596.8 | 2622.3 | 1025.5 | 3.6638 | 5.3363 |
| 350 | 623.15 | 165.37 | 0.0017407 | 0.008822 | 1672.9 | 2566.1 | 893.2 | 3.7816 | 5.2149 |
| 360 | 633.15 | 186.74 | 0.0018930 | 0.006970 | 1763.1 | 2485.7 | 722.6 | 3.9189 | 5.0603 |
| 370 | 643.15 | 210.53 | 0.002231 | 0.004958 | 1896.2 | 2335.7 | 439.5 | 4.1198 | 4.8031 |
| 371 | 644.15 | 213.06 | 0.002298 | 0.004710 | 1916.5 | 2310.7 | 394.2 | 4.1503 | 4.7624 |
| 372 | 645.15 | 215.62 | 0.002392 | 0.004432 | 1942.0 | 2280.1 | 338.1 | 4.1891 | 4.7130 |
| 373 | 646.15 | 218.21 | 0.002525 | 0.004090 | 1974.5 | 2238.3 | 263.8 | 4.2385 | 4.6467 |
| 374 | 647.15 | 220.84 | 0.002834 | 0.003482 | 2039.2 | 2150.7 | 111.5 | 4.3374 | 4.5096 |

1 bar = 0.1 MPa

表2 饱和水与饱和水蒸汽表(按压力排列)

| p bar | t °C | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|---------|--------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 0.010 | 6.982 | 0.0010001 | 129.208 | 29.33 | 2513.8 | 2484.5 | 0.1060 | 8.9756 |
| 0.015 | 13.034 | 0.0010006 | 87.982 | 54.71 | 2525.0 | 2470.3 | 0.1956 | 8.8278 |
| 0.020 | 17.511 | 0.0010012 | 67.066 | 73.45 | 2533.2 | 2459.8 | 0.2606 | 8.7236 |
| 0.025 | 21.094 | 0.0010020 | 54.256 | 88.44 | 2539.7 | 2451.3 | 0.3119 | 8.6431 |
| 0.030 | 24.098 | 0.0010027 | 45.668 | 101.00 | 2545.2 | 2444.2 | 0.3543 | 8.5776 |
| 0.035 | 26.692 | 0.0010033 | 39.480 | 111.84 | 2549.9 | 2438.1 | 0.3907 | 8.5224 |
| 0.040 | 28.981 | 0.0010040 | 34.803 | 121.41 | 2554.1 | 2432.7 | 0.4224 | 8.4747 |
| 0.045 | 31.034 | 0.0010046 | 31.142 | 129.98 | 2557.8 | 2427.8 | 0.4507 | 8.4327 |
| 0.050 | 32.90 | 0.0010052 | 28.196 | 137.77 | 2561.2 | 2423.4 | 0.4762 | 8.3952 |
| 0.055 | 34.60 | 0.0010058 | 25.772 | 144.91 | 2564.2 | 2419.3 | 0.4995 | 8.3613 |
| 0.060 | 36.18 | 0.0010064 | 23.742 | 151.50 | 2567.1 | 2415.6 | 0.5209 | 8.3305 |
| 0.065 | 37.65 | 0.0010069 | 22.017 | 157.64 | 2569.7 | 2412.1 | 0.5401 | 8.3022 |
| 0.070 | 39.02 | 0.0010074 | 20.532 | 163.38 | 2572.2 | 2408.8 | 0.5591 | 8.2760 |
| 0.075 | 40.32 | 0.0010079 | 19.241 | 168.77 | 2574.5 | 2405.7 | 0.5763 | 8.2517 |
| 0.080 | 41.53 | 0.0010084 | 18.106 | 173.87 | 2576.7 | 2402.8 | 0.5926 | 8.2289 |
| 0.085 | 42.69 | 0.0010089 | 17.102 | 178.69 | 2578.8 | 2400.1 | 0.6079 | 8.2076 |
| 0.090 | 43.79 | 0.0010094 | 16.206 | 183.28 | 2580.8 | 2397.5 | 0.6224 | 8.1875 |
| 0.095 | 44.83 | 0.0010098 | 15.402 | 187.66 | 2582.6 | 2394.9 | 0.6361 | 8.1685 |

表2(续)

| p bar | t °C | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|---------|--------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 0.100 | 45.83 | 0.0010102 | 14.676 | 191.84 | 2584.4 | 2392.6 | 0.6493 | 8.1505 |
| 0.11 | 47.71 | 0.0010111 | 13.418 | 199.68 | 2587.8 | 2388.1 | 0.6738 | 8.1171 |
| 0.12 | 49.45 | 0.0010119 | 12.364 | 206.94 | 2590.9 | 2384.0 | 0.6963 | 8.0867 |
| 0.13 | 51.06 | 0.0010126 | 11.467 | 213.70 | 2593.7 | 2380.0 | 0.7172 | 8.0538 |
| 0.14 | 52.58 | 0.0010133 | 10.696 | 220.03 | 2596.4 | 2376.4 | 0.7367 | 8.0330 |
| 0.15 | 54.00 | 0.0010140 | 10.025 | 225.98 | 2598.9 | 2372.9 | 0.7549 | 8.0089 |
| 0.16 | 55.34 | 0.0010147 | 9.4348 | 231.60 | 2601.3 | 2369.7 | 0.7721 | 7.9855 |
| 0.17 | 56.62 | 0.0010154 | 8.9128 | 236.93 | 2603.5 | 2366.6 | 0.7883 | 7.9655 |
| 0.18 | 57.83 | 0.0010160 | 8.4470 | 242.00 | 2605.7 | 2363.7 | 0.8036 | 7.9456 |
| 0.19 | 58.98 | 0.0010166 | 8.0288 | 246.83 | 2607.7 | 2360.9 | 0.8182 | 7.9269 |
| 0.20 | 60.99 | 0.0010172 | 7.6515 | 251.46 | 2609.6 | 2358.1 | 0.8321 | 7.9092 |
| 0.21 | 61.15 | 0.0010178 | 7.3091 | 255.89 | 2611.5 | 2355.6 | 0.8454 | 7.8923 |
| 0.22 | 62.16 | 0.0010183 | 6.9967 | 260.14 | 2613.2 | 2353.1 | 0.8581 | 7.8762 |
| 0.23 | 63.14 | 0.0010189 | 6.7110 | 264.24 | 2614.9 | 2350.7 | 0.8703 | 7.8609 |
| 0.24 | 64.08 | 0.0010194 | 6.4483 | 268.18 | 2616.6 | 2348.4 | 0.8820 | 7.8462 |
| 0.25 | 64.99 | 0.0010199 | 6.2060 | 271.99 | 2618.1 | 2346.1 | 0.8932 | 7.8321 |
| 0.26 | 65.87 | 0.0010204 | 5.9819 | 275.68 | 2619.7 | 2344.0 | 0.9041 | 7.8186 |
| 0.27 | 66.72 | 0.0010209 | 5.7739 | 279.24 | 2621.1 | 2341.9 | 0.9146 | 7.8057 |
| 0.28 | 67.55 | 0.0010214 | 5.5804 | 282.70 | 2622.6 | 2339.9 | 0.9248 | 7.7932 |
| 0.29 | 68.35 | 0.0010219 | 5.3998 | 286.05 | 2624.0 | 2337.9 | 0.9346 | 7.7811 |

表2(续)

| p bar | t °C | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|---------|--------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 0.30 | 69.12 | 0.0010223 | 5.2308 | 289.31 | 2625.2 | 2336.0 | 0.9441 | 7.7695 |
| 0.40 | 75.89 | 0.0010265 | 3.9949 | 317.65 | 2636.8 | 2319.2 | 1.0261 | 7.6711 |
| 0.50 | 81.35 | 0.0010301 | 3.2415 | 340.57 | 2646.0 | 2305.4 | 1.0912 | 7.5951 |
| 0.60 | 85.95 | 0.0010333 | 2.7329 | 359.93 | 2653.6 | 2293.7 | 1.1454 | 7.5332 |
| 0.70 | 89.96 | 0.0010361 | 2.3653 | 376.77 | 2660.2 | 2283.4 | 1.1921 | 7.4811 |
| 0.80 | 93.51 | 0.0010387 | 2.0879 | 391.72 | 2666.0 | 2274.3 | 1.2339 | 7.4360 |
| 0.90 | 96.71 | 0.0010412 | 1.8701 | 405.21 | 2671.1 | 2265.9 | 1.2696 | 7.3963 |
| 1.00 | 99.63 | 0.0010434 | 1.6946 | 417.51 | 2675.7 | 2258.2 | 1.3027 | 7.3608 |
| 1.2 | 104.81 | 0.0010476 | 1.4239 | 439.36 | 2683.8 | 2244.4 | 1.3609 | 7.2996 |
| 1.4 | 109.32 | 0.0010513 | 1.2379 | 458.42 | 2690.8 | 2232.4 | 1.4109 | 7.2480 |
| 1.6 | 113.32 | 0.0010547 | 1.0917 | 475.33 | 2696.8 | 2221.4 | 1.4550 | 7.2032 |
| 1.8 | 116.33 | 0.0010579 | 0.9775 | 490.70 | 2702.1 | 2211.4 | 1.4944 | 7.1638 |
| 2.0 | 120.23 | 0.0010608 | 0.8852 | 504.7 | 2706.9 | 2202.2 | 1.5301 | 7.1286 |
| 2.5 | 127.43 | 0.0010675 | 0.71831 | 535.4 | 2717.2 | 2181.8 | 1.6072 | 7.0540 |
| 3.0 | 133.54 | 0.0010735 | 0.60536 | 561.4 | 2725.5 | 2164.1 | 1.6717 | 6.9930 |
| 3.5 | 138.88 | 0.0010789 | 0.52425 | 584.3 | 2732.5 | 2148.2 | 1.7273 | 6.9414 |
| 4.0 | 143.62 | 0.0010839 | 0.46242 | 604.7 | 2738.5 | 2133.8 | 1.7764 | 6.8966 |
| 4.5 | 147.92 | 0.0010885 | 0.41392 | 623.2 | 2743.8 | 2120.6 | 1.8204 | 6.8570 |
| 5.0 | 151.85 | 0.0010923 | 0.37481 | 640.1 | 2748.5 | 2108.4 | 1.8604 | 6.8215 |
| 6.0 | 158.84 | 0.0011009 | 0.31556 | 670.4 | 2756.4 | 2086.0 | 1.9308 | 6.7598 |

表2(续)

| p bar | t °C | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|---------|--------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 7.0 | 164.96 | 0.0014082 | 0.27274 | 697.1 | 2762.9 | 2065.8 | 1.9918 | 6.7074 |
| 8.0 | 170.42 | 0.0011150 | 0.24030 | 720.9 | 2768.4 | 2047.5 | 2.0457 | 6.6618 |
| 9.0 | 175.36 | 0.0011213 | 0.21484 | 742.6 | 2773.0 | 2030.4 | 2.0941 | 6.6212 |
| 10.0 | 179.88 | 0.0011274 | 0.19430 | 762.6 | 2777.0 | 2014.4 | 2.1382 | 6.5847 |
| 11.0 | 184.06 | 0.0011331 | 0.17739 | 781.1 | 2780.4 | 1999.3 | 2.1786 | 6.5515 |
| 12.0 | 187.96 | 0.0011386 | 0.16320 | 798.4 | 2783.4 | 1935.0 | 2.2160 | 6.5210 |
| 13.0 | 191.60 | 0.0011438 | 0.15112 | 814.7 | 2786.0 | 1971.3 | 2.2509 | 6.4927 |
| 14.0 | 195.04 | 0.0011489 | 0.14072 | 830.1 | 2788.4 | 1958.3 | 2.2836 | 6.4665 |
| 15.0 | 198.28 | 0.0011538 | 0.13165 | 844.7 | 2790.4 | 1945.7 | 2.3144 | 6.4418 |
| 16.0 | 201.37 | 0.0011586 | 0.12368 | 858.6 | 2792.2 | 1933.6 | 2.3436 | 6.4187 |
| 17.0 | 204.30 | 0.0011633 | 0.11661 | 871.8 | 2793.8 | 1922.0 | 2.3712 | 6.3967 |
| 18.0 | 207.10 | 0.0011678 | 0.11031 | 884.6 | 2795.1 | 1910.5 | 2.3976 | 6.3759 |
| 19.0 | 209.79 | 0.0011722 | 0.10464 | 896.8 | 2796.4 | 1899.6 | 2.4227 | 6.3561 |
| 20.0 | 212.37 | 0.0011766 | 0.09953 | 908.6 | 2797.4 | 1888.8 | 2.4468 | 6.3373 |
| 21.0 | 214.85 | 0.0011808 | 0.09488 | 919.9 | 2798.3 | 1878.4 | 2.4699 | 6.3192 |
| 22.0 | 217.24 | 0.0011850 | 0.09064 | 930.9 | 2799.1 | 1868.2 | 2.4922 | 6.3018 |
| 23.0 | 219.54 | 0.0011891 | 0.08676 | 941.6 | 2799.8 | 1858.2 | 2.5136 | 6.2851 |
| 24.0 | 221.78 | 0.0011932 | 0.08319 | 951.9 | 2800.4 | 1848.5 | 2.5343 | 6.2691 |
| 25.0 | 223.94 | 0.0011972 | 0.07990 | 962.0 | 2800.8 | 1838.8 | 2.5543 | 6.2536 |
| 26.0 | 226.03 | 0.0012011 | 0.07685 | 971.7 | 2801.2 | 1829.5 | 2.5736 | 6.2386 |

表2(续)

| p bar | t °C | v' m ³ /kg | v'' m ³ /kg | h' kJ/kg | h'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|---------|--------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 27.0 | 228.06 | 0.0012050 | 0.07402 | 981.2 | 2801.5 | 1820.3 | 2.5924 | 6.6271 |
| 28.0 | 230.04 | 0.0012088 | 0.07138 | 990.5 | 2801.7 | 1811.2 | 2.6106 | 6.2161 |
| 29.0 | 231.96 | 0.0012126 | 0.06892 | 999.5 | 2801.8 | 1802.3 | 2.6283 | 6.1834 |
| 30.0 | 233.84 | 0.0012163 | 0.06662 | 1008.4 | 2801.9 | 1793.5 | 2.6455 | 6.1832 |
| 31.0 | 235.66 | 0.0012200 | 0.06446 | 1017.0 | 2801.9 | 1784.9 | 2.6623 | 6.1703 |
| 32.0 | 237.44 | 0.0012237 | 0.06243 | 1025.5 | 2801.8 | 1776.3 | 2.6786 | 6.1577 |
| 33.0 | 239.18 | 0.0012273 | 0.06052 | 1033.7 | 2801.7 | 1768.0 | 2.6946 | 6.1454 |
| 34.0 | 240.88 | 0.0012310 | 0.05872 | 1041.8 | 2801.5 | 1759.7 | 2.7101 | 6.1335 |
| 35.0 | 242.54 | 0.0012345 | 0.05702 | 1049.8 | 2801.3 | 1751.5 | 2.7253 | 6.1218 |
| 36.0 | 244.16 | 0.0012381 | 0.05540 | 1057.6 | 2801.0 | 1743.4 | 2.7402 | 6.1103 |
| 37.0 | 245.75 | 0.0012416 | 0.05388 | 1065.3 | 2800.7 | 1735.4 | 2.7548 | 6.0992 |
| 38.0 | 247.31 | 0.0012451 | 0.05243 | 1072.8 | 2800.3 | 1727.5 | 2.7690 | 6.0883 |
| 39.0 | 248.84 | 0.0012486 | 0.05105 | 1080.2 | 2799.9 | 1719.7 | 2.7880 | 6.0775 |
| 40.0 | 250.33 | 0.0012521 | 0.04974 | 1087.5 | 2799.4 | 1711.9 | 2.7967 | 6.0670 |
| 45.0 | 257.41 | 0.0012691 | 0.04402 | 1122.2 | 2796.5 | 1674.3 | 2.8614 | 6.0171 |
| 50.0 | 263.92 | 0.0012858 | 0.03941 | 1154.6 | 2792.8 | 1638.2 | 2.9209 | 5.9712 |
| 55.0 | 269.94 | 0.0013023 | 0.03561 | 1185.1 | 2788.4 | 1603.3 | 2.9761 | 5.9282 |
| 60.0 | 275.56 | 0.0013187 | 0.03241 | 1213.9 | 2783.3 | 1569.4 | 3.0277 | 5.8878 |
| 65.0 | 280.83 | 0.0013350 | 0.02969 | 1241.4 | 2777.6 | 1536.2 | 3.0764 | 5.8494 |
| 70.0 | 285.80 | 0.0013514 | 0.02734 | 1267.7 | 2771.4 | 1503.7 | 3.1225 | 5.8126 |

表2(续)

| p bar | t °C | v' m ³ /kg | v'' m ³ /kg | k' kJ/kg | k'' kJ/kg | r kJ/kg | s' kJ/(kg·K) | s'' kJ/(kg·K) |
|---------|--------|-------------------------|--------------------------|------------|-------------|-----------|----------------|-----------------|
| 75.0 | 290.51 | 0.0013678 | 0.02530 | 1293.0 | 2764.7 | 1471.7 | 3.1663 | 5.7773 |
| 80.0 | 294.98 | 0.0013843 | 0.02349 | 1317.5 | 2757.5 | 1440.0 | 3.2083 | 5.7430 |
| 85.0 | 299.24 | 0.0014010 | 0.02189 | 1341.2 | 2749.9 | 1408.7 | 3.2487 | 5.7098 |
| 90.0 | 303.31 | 0.0014179 | 0.02046 | 1364.2 | 2741.8 | 1377.6 | 3.2875 | 5.6773 |
| 95.0 | 307.22 | 0.0014351 | 0.01917 | 1386.7 | 2733.4 | 1346.7 | 3.3251 | 5.6456 |
| 100 | 310.96 | 0.0014526 | 0.01800 | 1408.6 | 2724.4 | 1315.8 | 3.3616 | 5.6143 |
| 110 | 318.04 | 0.0014887 | 0.01597 | 1451.2 | 2705.4 | 1254.2 | 3.4316 | 5.5531 |
| 120 | 324.64 | 0.0015267 | 0.01425 | 1492.6 | 2684.8 | 1192.2 | 3.4986 | 5.4930 |
| 130 | 330.81 | 0.0015670 | 0.01277 | 1533.0 | 2662.4 | 1129.4 | 3.5633 | 5.4333 |
| 140 | 336.63 | 0.0016104 | 0.01149 | 1572.8 | 2638.3 | 1065.5 | 3.6262 | 5.3737 |
| 150 | 342.12 | 0.0016580 | 0.01035 | 1612.2 | 2611.6 | 999.4 | 3.6877 | 5.3122 |
| 160 | 347.32 | 0.0017101 | 0.00930 | 1651.5 | 2582.7 | 931.2 | 3.7486 | 5.2496 |
| 170 | 352.26 | 0.0017690 | 0.008401 | 1691.6 | 2550.8 | 859.2 | 3.8103 | 5.1841 |
| 180 | 356.96 | 0.0018380 | 0.007534 | 1733.4 | 2514.4 | 781.0 | 3.8739 | 5.1135 |
| 190 | 361.44 | 0.0019231 | 0.006700 | 1778.2 | 2470.1 | 691.9 | 3.9417 | 5.0321 |
| 200 | 365.71 | 0.002038 | 0.005873 | 1828.8 | 2413.8 | 585.0 | 4.0181 | 4.9338 |
| 210 | 369.79 | 0.002218 | 0.005006 | 1892.2 | 2349.2 | 448.0 | 4.1137 | 4.8106 |
| 220 | 373.68 | 0.002675 | 0.003757 | 2007.7 | 2192.5 | 184.8 | 4.2891 | 4.5748 |

表3 未饱和水与过热蒸汽表

 v m³/kg, h kJ/kg, s kJ/(kg·K), t °C

| p | 0.01 bar (0.001 MPa) | | | 0.05 bar (0.005 MPa) | | |
|----------|----------------------|-----------------|-----------------|----------------------|----------------|---------------|
| | $t_s = 6.982$ | | | $t_s = 32.90$ | | |
| 饱和 参数 | $v' = 0.0010001$ | $v'' = 129.208$ | | $v' = 0.0010052$ | $v'' = 28.196$ | |
| | $h' = 29.33$ | $h'' = 2513.8$ | | $h' = 137.77$ | $h'' = 2561.2$ | |
| | $s' = 0.1060$ | $s'' = 8.9756$ | | $s' = 0.4762$ | $s'' = 8.3952$ | |
| t | v | h | s | v | h | s |
| 0 | <u>0.0010002</u> | -0.0412 | <u>0.000154</u> | 0.0010002 | 0.0 | -0.0001 |
| 10 | 130.60 | 2519.5 | 8.9956 | 0.0010002 | 42.0 | 0.1510 |
| 20 | 135.23 | 2538.1 | 9.0604 | 0.0010017 | 83.9 | 0.2963 |
| 30 | 139.85 | 2556.8 | 9.1230 | <u>0.0010043</u> | <u>125.7</u> | <u>0.4365</u> |
| 40 | 144.47 | 2575.5 | 9.1837 | 28.86 | 2574.6 | 8.4385 |
| 50 | 149.09 | 2594.2 | 9.2426 | 29.78 | 2593.4 | 8.4977 |
| 60 | 158.71 | 2613.0 | 9.2997 | 30.71 | 2612.3 | 8.5552 |
| 70 | 158.33 | 2631.8 | 9.3552 | 31.64 | 2631.1 | 8.6110 |
| 80 | 162.95 | 2650.6 | 9.4093 | 32.57 | 2650.0 | 8.6652 |
| 90 | 167.57 | 2669.4 | 9.4619 | 33.49 | 2668.9 | 8.7180 |
| 100 | <u>172.19</u> | 2688.3 | 9.5132 | 34.42 | 2687.9 | 8.7695 |
| 110 | 176.80 | 2707.3 | 9.5633 | 35.34 | 2706.8 | 8.8197 |
| 120 | 181.42 | 2726.2 | 9.6122 | 36.27 | 2725.9 | 8.8687 |
| 130 | 186.04 | 2745.2 | 9.6599 | 37.19 | 2744.9 | 8.9165 |
| 140 | 190.66 | 2764.3 | 9.7066 | 38.12 | 2764.0 | 8.9633 |
| 150 | 195.27 | 2783.4 | 9.7523 | 39.04 | 2783.1 | 9.0091 |
| 160 | 199.89 | 2802.6 | 9.7971 | 39.97 | 2802.3 | 9.0539 |
| 170 | 204.50 | 2821.8 | 9.8409 | 40.89 | 2821.6 | 9.0978 |
| 180 | 209.12 | 2841.0 | 9.8839 | 41.81 | 2840.8 | 9.1408 |
| 190 | 213.74 | 2860.4 | 9.9261 | 42.74 | 2860.2 | 9.1830 |
| 200 | 218.35 | 2879.6 | 9.9672 | 43.66 | 2879.5 | 9.2244 |
| 210 | 222.97 | 2899.1 | 10.0080 | 44.58 | 2899.0 | 9.2650 |
| 220 | 227.58 | 2918.6 | 10.0480 | 45.51 | 2918.5 | 9.3049 |
| 230 | 232.20 | 2938.2 | 10.0872 | 46.43 | 2938.0 | 9.3442 |
| 240 | 236.82 | 2957.7 | 10.1257 | 47.36 | 2957.6 | 9.3828 |
| 250 | 241.43 | 2977.4 | 10.1636 | 48.28 | 2977.3 | 9.4207 |

表3(续)

| p | 0.01 bar (0.001 MPa) | | | 0.05 bar (0.005 MPa) | | |
|----------|----------------------|--------|-----------------|----------------------|--------|----------------|
| | $t_s = 6.982$ | | | $t_s = 32.90$ | | |
| 饱和 参数 | $v' = 0.0010001$ | | $v'' = 129.208$ | $v' = 0.0010052$ | | $v'' = 28.196$ |
| | $h' = 29.33$ | | $h'' = 2513.8$ | $h' = 137.77$ | | $h'' = 2561.2$ |
| | $s' = 0.1060$ | | $s'' = 8.9756$ | $s' = 0.4762$ | | $s'' = 8.3952$ |
| t | v | h | s | v | h | s |
| 260 | 246.05 | 2997.1 | 10.2010 | 49.20 | 2997.0 | 9.4580 |
| 270 | 250.66 | 3016.9 | 10.2377 | 50.13 | 3016.8 | 9.4948 |
| 280 | 255.28 | 3036.7 | 10.2739 | 51.05 | 3036.6 | 9.5310 |
| 290 | 259.89 | 3056.6 | 10.3095 | 51.97 | 3056.5 | 9.5666 |
| 300 | 264.51 | 3076.5 | 10.3446 | 52.90 | 3076.4 | 9.6017 |
| 310 | 269.12 | 3096.6 | 10.3792 | 53.82 | 3096.4 | 9.6363 |
| 320 | 273.74 | 3116.6 | 10.4134 | 54.74 | 3116.5 | 9.6705 |
| 330 | 278.35 | 3137.0 | 10.4470 | 55.67 | 3136.7 | 9.7042 |
| 340 | 282.97 | 3157.0 | 10.4802 | 56.59 | 3156.9 | 9.7374 |
| 350 | 287.58 | 3177.2 | 10.5130 | 57.51 | 3177.1 | 9.7702 |
| 360 | 292.20 | 3197.5 | 10.5454 | 58.44 | 3197.5 | 9.8025 |
| 370 | 296.82 | 3217.9 | 10.5773 | 59.36 | 3217.9 | 9.8345 |
| 380 | 301.43 | 3238.4 | 10.6089 | 60.28 | 3238.3 | 9.8660 |
| 390 | 306.05 | 3258.9 | 10.6401 | 61.21 | 3258.8 | 9.8972 |
| 400 | 310.66 | 3279.5 | 10.6709 | 62.13 | 3279.4 | 9.9280 |
| 410 | 315.28 | 3300.1 | 10.701 | 63.05 | 3300.1 | 9.9585 |
| 420 | 319.89 | 3320.8 | 10.731 | 63.98 | 3320.8 | 9.9886 |
| 430 | 324.51 | 3341.6 | 10.761 | 64.90 | 3341.6 | 10.018 |
| 440 | 329.12 | 3362.5 | 10.790 | 65.82 | 3362.4 | 10.048 |
| 450 | 333.74 | 3383.4 | 10.819 | 66.74 | 3383.3 | 10.077 |
| 460 | 338.35 | 3404.3 | 10.848 | 67.67 | 3404.3 | 10.106 |
| 470 | 342.97 | 3425.4 | 10.877 | 68.59 | 3425.4 | 10.134 |
| 480 | 347.58 | 3446.5 | 10.905 | 69.51 | 3446.5 | 10.162 |
| 490 | 352.20 | 3467.7 | 10.933 | 70.44 | 3467.7 | 10.190 |
| 500 | 356.81 | 3489.0 | 10.960 | 71.36 | 3489.0 | 10.218 |