

| Temperatur<br>[°C] | Druck<br>[bar] |           | Dichte<br>[kg/m <sup>3</sup> ] |           | Enthalpie<br>[kJ/kg] |           | Entropie<br>[J/kg*K] |           |
|--------------------|----------------|-----------|--------------------------------|-----------|----------------------|-----------|----------------------|-----------|
|                    | flüssig        | gasförmig | flüssig                        | gasförmig | flüssig              | gasförmig | flüssig              | gasförmig |
| -60,0              | 0,430          | 0,277     | 1430,0                         | 1,370     | 119,34               | 375,81    | 0,6688               | 1,8940    |
| -59,0              | 0,455          | 0,295     | 1427,1                         | 1,453     | 120,63               | 376,41    | 0,6749               | 1,8909    |
| -58,0              | 0,481          | 0,314     | 1424,1                         | 1,540     | 121,93               | 377,02    | 0,6809               | 1,8878    |
| -57,0              | 0,509          | 0,333     | 1421,1                         | 1,630     | 123,22               | 377,63    | 0,6869               | 1,8849    |
| -56,0              | 0,537          | 0,354     | 1418,1                         | 1,726     | 124,52               | 378,23    | 0,6929               | 1,8819    |
| -55,0              | 0,567          | 0,376     | 1415,1                         | 1,825     | 125,82               | 378,84    | 0,6988               | 1,8791    |
| -54,0              | 0,599          | 0,399     | 1412,2                         | 1,929     | 127,12               | 379,44    | 0,7047               | 1,8762    |
| -53,0              | 0,631          | 0,423     | 1409,2                         | 2,038     | 128,42               | 380,04    | 0,7106               | 1,8735    |
| -52,0              | 0,666          | 0,448     | 1406,1                         | 2,152     | 129,72               | 380,64    | 0,7165               | 1,8707    |
| -51,0              | 0,701          | 0,475     | 1403,1                         | 2,270     | 131,02               | 381,24    | 0,7224               | 1,8681    |
| -50,0              | 0,738          | 0,502     | 1400,1                         | 2,394     | 132,33               | 381,84    | 0,7283               | 1,8654    |
| -49,0              | 0,777          | 0,531     | 1397,1                         | 2,523     | 133,63               | 382,44    | 0,7341               | 1,8628    |
| -48,0              | 0,817          | 0,561     | 1394,1                         | 2,658     | 134,94               | 383,04    | 0,7399               | 1,8603    |
| -47,0              | 0,859          | 0,593     | 1391,0                         | 2,798     | 136,25               | 383,64    | 0,7457               | 1,8578    |
| -46,0              | 0,903          | 0,626     | 1388,0                         | 2,944     | 137,56               | 384,23    | 0,7514               | 1,8554    |
| -45,0              | 0,948          | 0,661     | 1384,9                         | 3,097     | 138,87               | 384,83    | 0,7572               | 1,8529    |
| -44,0              | 0,995          | 0,697     | 1381,9                         | 3,255     | 140,18               | 385,42    | 0,7629               | 1,8506    |
| -43,0              | 1,044          | 0,734     | 1378,8                         | 3,420     | 141,50               | 386,01    | 0,7686               | 1,8483    |
| -42,0              | 1,095          | 0,773     | 1375,7                         | 3,591     | 142,81               | 386,60    | 0,7743               | 1,8460    |
| -41,0              | 1,148          | 0,814     | 1372,6                         | 3,769     | 144,13               | 387,19    | 0,7800               | 1,8437    |
| -40,0              | 1,203          | 0,857     | 1369,5                         | 3,954     | 145,45               | 387,78    | 0,7856               | 1,8415    |
| -39,0              | 1,259          | 0,901     | 1366,4                         | 4,146     | 146,77               | 388,37    | 0,7913               | 1,8393    |
| -38,0              | 1,318          | 0,947     | 1363,3                         | 4,345     | 148,09               | 388,95    | 0,7969               | 1,8372    |
| -37,0              | 1,379          | 0,995     | 1360,2                         | 4,552     | 149,42               | 389,53    | 0,8025               | 1,8351    |
| -36,0              | 1,443          | 1,045     | 1357,0                         | 4,766     | 150,74               | 390,11    | 0,8081               | 1,8330    |
| -35,0              | 1,508          | 1,097     | 1353,9                         | 4,989     | 152,07               | 390,69    | 0,8136               | 1,8310    |
| -34,0              | 1,576          | 1,150     | 1350,8                         | 5,220     | 153,40               | 391,27    | 0,8192               | 1,8290    |
| -33,0              | 1,646          | 1,206     | 1347,6                         | 5,458     | 154,73               | 391,85    | 0,8247               | 1,8270    |
| -32,0              | 1,719          | 1,264     | 1344,4                         | 5,706     | 156,07               | 392,42    | 0,8302               | 1,8251    |
| -31,0              | 1,794          | 1,325     | 1341,2                         | 5,962     | 157,40               | 392,99    | 0,8357               | 1,8232    |
| -30,0              | 1,871          | 1,387     | 1338,1                         | 6,228     | 158,74               | 393,57    | 0,8412               | 1,8213    |
| -29,0              | 1,952          | 1,452     | 1334,9                         | 6,502     | 160,08               | 394,13    | 0,8467               | 1,8195    |
| -28,0              | 2,034          | 1,519     | 1331,6                         | 6,786     | 161,42               | 394,70    | 0,8522               | 1,8177    |
| -27,0              | 2,120          | 1,588     | 1328,4                         | 7,080     | 162,77               | 395,26    | 0,8576               | 1,8159    |
| -26,0              | 2,208          | 1,660     | 1325,2                         | 7,384     | 164,11               | 395,83    | 0,8630               | 1,8142    |
| -25,0              | 2,299          | 1,735     | 1321,9                         | 7,697     | 165,46               | 396,39    | 0,8685               | 1,8124    |
| -24,0              | 2,393          | 1,812     | 1318,7                         | 8,022     | 166,81               | 396,94    | 0,8739               | 1,8107    |
| -23,0              | 2,490          | 1,891     | 1315,4                         | 8,357     | 168,16               | 397,50    | 0,8792               | 1,8091    |
| -22,0              | 2,590          | 1,974     | 1312,1                         | 8,703     | 169,52               | 398,05    | 0,8846               | 1,8074    |
| -21,0              | 2,693          | 2,059     | 1308,8                         | 9,060     | 170,88               | 398,60    | 0,8900               | 1,8058    |
| -20,0              | 2,799          | 2,147     | 1305,5                         | 9,429     | 172,24               | 399,15    | 0,8953               | 1,8042    |

| Temperatur<br>[°C] | Druck<br>[bar] |           | Dichte<br>[kg/m³] |           | Enthalpie<br>[kJ/kg] |           | Entropie<br>[J/kg*K] |           |
|--------------------|----------------|-----------|-------------------|-----------|----------------------|-----------|----------------------|-----------|
|                    | flüssig        | gasförmig | flüssig           | gasförmig | flüssig              | gasförmig | flüssig              | gasförmig |
| -19,0              | 2,909          | 2,238     | 1302,2            | 9,809     | 173,60               | 399,70    | 0,9007               | 1,8026    |
| -18,0              | 3,021          | 2,332     | 1298,9            | 10,20     | 174,96               | 400,24    | 0,9060               | 1,8010    |
| -17,0              | 3,137          | 2,429     | 1295,5            | 10,61     | 176,33               | 400,78    | 0,9113               | 1,7995    |
| -16,0              | 3,256          | 2,529     | 1292,2            | 11,02     | 177,70               | 401,32    | 0,9166               | 1,7980    |
| -15,0              | 3,379          | 2,632     | 1288,8            | 11,46     | 179,07               | 401,85    | 0,9219               | 1,7965    |
| -14,0              | 3,505          | 2,738     | 1285,4            | 11,90     | 180,45               | 402,39    | 0,9272               | 1,7951    |
| -13,0              | 3,635          | 2,848     | 1282,0            | 12,36     | 181,82               | 402,91    | 0,9324               | 1,7936    |
| -12,0              | 3,769          | 2,961     | 1278,6            | 12,83     | 183,20               | 403,44    | 0,9377               | 1,7922    |
| -11,0              | 3,906          | 3,078     | 1275,1            | 13,31     | 184,59               | 403,96    | 0,9429               | 1,7908    |
| -10,0              | 4,047          | 3,198     | 1271,7            | 13,81     | 185,97               | 404,49    | 0,9482               | 1,7894    |
| -9,0               | 4,192          | 3,321     | 1268,2            | 14,33     | 187,36               | 405,00    | 0,9534               | 1,7880    |
| -8,0               | 4,340          | 3,449     | 1264,7            | 14,86     | 188,75               | 405,52    | 0,9586               | 1,7867    |
| -7,0               | 4,493          | 3,580     | 1261,2            | 15,40     | 190,15               | 406,03    | 0,9638               | 1,7853    |
| -6,0               | 4,650          | 3,715     | 1257,7            | 15,96     | 191,55               | 406,53    | 0,9690               | 1,7840    |
| -5,0               | 4,811          | 3,853     | 1254,2            | 16,54     | 192,95               | 407,04    | 0,9742               | 1,7827    |
| -4,0               | 4,976          | 3,996     | 1250,6            | 17,14     | 194,35               | 407,54    | 0,9794               | 1,7814    |
| -3,0               | 5,145          | 4,142     | 1247,1            | 17,75     | 195,76               | 408,04    | 0,9845               | 1,7801    |
| -2,0               | 5,318          | 4,293     | 1243,5            | 18,38     | 197,17               | 408,53    | 0,9897               | 1,7789    |
| -1,0               | 5,496          | 4,448     | 1239,8            | 19,02     | 198,58               | 409,02    | 0,9949               | 1,7776    |
| 0,0                | 5,679          | 4,607     | 1236,2            | 19,69     | 200,00               | 409,51    | 1,0000               | 1,7764    |
| 1,0                | 5,866          | 4,771     | 1232,6            | 20,37     | 201,42               | 409,99    | 1,0051               | 1,7752    |
| 2,0                | 6,057          | 4,938     | 1228,9            | 21,08     | 202,84               | 410,47    | 1,0103               | 1,7740    |
| 3,0                | 6,253          | 5,111     | 1225,2            | 21,80     | 204,27               | 410,94    | 1,0154               | 1,7728    |
| 4,0                | 6,454          | 5,288     | 1221,5            | 22,54     | 205,70               | 411,41    | 1,0205               | 1,7716    |
| 5,0                | 6,660          | 5,469     | 1217,8            | 23,30     | 207,14               | 411,88    | 1,0256               | 1,7704    |
| 6,0                | 6,871          | 5,655     | 1214,0            | 24,09     | 208,58               | 412,34    | 1,0307               | 1,7692    |
| 7,0                | 7,087          | 5,846     | 1210,2            | 24,90     | 210,02               | 412,79    | 1,0358               | 1,7681    |
| 8,0                | 7,307          | 6,042     | 1206,4            | 25,72     | 211,47               | 413,25    | 1,0409               | 1,7669    |
| 9,0                | 7,533          | 6,243     | 1202,6            | 26,57     | 212,92               | 413,69    | 1,0460               | 1,7658    |
| 10,0               | 7,764          | 6,449     | 1198,7            | 27,45     | 214,37               | 414,14    | 1,0511               | 1,7647    |
| 11,0               | 8,000          | 6,660     | 1194,9            | 28,35     | 215,83               | 414,58    | 1,0561               | 1,7636    |
| 12,0               | 8,242          | 6,876     | 1191,0            | 29,27     | 217,29               | 415,01    | 1,0612               | 1,7624    |
| 13,0               | 8,489          | 7,098     | 1187,0            | 30,21     | 218,76               | 415,44    | 1,0663               | 1,7613    |
| 14,0               | 8,741          | 7,324     | 1183,1            | 31,19     | 220,23               | 415,86    | 1,0713               | 1,7602    |
| 15,0               | 9,000          | 7,557     | 1179,1            | 32,18     | 221,71               | 416,28    | 1,0764               | 1,7591    |
| 16,0               | 9,263          | 7,795     | 1175,1            | 33,21     | 223,19               | 416,69    | 1,0814               | 1,7580    |
| 17,0               | 9,533          | 8,038     | 1171,0            | 34,26     | 224,68               | 417,10    | 1,0865               | 1,7570    |
| 18,0               | 9,808          | 8,287     | 1166,9            | 35,34     | 226,17               | 417,50    | 1,0915               | 1,7559    |
| 19,0               | 10,09          | 8,542     | 1162,8            | 36,45     | 227,66               | 417,89    | 1,0966               | 1,7548    |
| 20,0               | 10,38          | 8,803     | 1158,7            | 37,59     | 229,16               | 418,28    | 1,1016               | 1,7537    |

| Temperatur<br>[°C] | Druck<br>[bar] |           | Dichte<br>[kg/m³] |           | Enthalpie<br>[kJ/kg] |           | Entropie<br>[J/kg*K] |           |
|--------------------|----------------|-----------|-------------------|-----------|----------------------|-----------|----------------------|-----------|
|                    | flüssig        | gasförmig | flüssig           | gasförmig | flüssig              | gasförmig | flüssig              | gasförmig |
| 21,0               | 10,67          | 9,070     | 1154,5            | 38,77     | 230,67               | 418,66    | 1,1067               | 1,7526    |
| 22,0               | 10,97          | 9,343     | 1150,3            | 39,97     | 232,18               | 419,04    | 1,1117               | 1,7516    |
| 23,0               | 11,27          | 9,623     | 1146,1            | 41,20     | 233,69               | 419,41    | 1,1167               | 1,7505    |
| 24,0               | 11,59          | 9,908     | 1141,8            | 42,47     | 235,21               | 419,77    | 1,1218               | 1,7494    |
| 25,0               | 11,90          | 10,20     | 1137,5            | 43,77     | 236,74               | 420,13    | 1,1268               | 1,7483    |
| 26,0               | 12,23          | 10,50     | 1133,1            | 45,11     | 238,27               | 420,48    | 1,1318               | 1,7472    |
| 27,0               | 12,56          | 10,80     | 1128,8            | 46,48     | 239,81               | 420,82    | 1,1369               | 1,7462    |
| 28,0               | 12,90          | 11,12     | 1124,3            | 47,89     | 241,35               | 421,16    | 1,1419               | 1,7451    |
| 29,0               | 13,24          | 11,43     | 1119,9            | 49,34     | 242,90               | 421,48    | 1,1469               | 1,7440    |
| 30,0               | 13,59          | 11,76     | 1115,4            | 50,82     | 244,46               | 421,80    | 1,1520               | 1,7429    |
| 31,0               | 13,95          | 12,09     | 1110,8            | 52,35     | 246,02               | 422,11    | 1,1570               | 1,7418    |
| 32,0               | 14,31          | 12,43     | 1106,2            | 53,92     | 247,59               | 422,41    | 1,1621               | 1,7407    |
| 33,0               | 14,69          | 12,78     | 1101,6            | 55,53     | 249,17               | 422,71    | 1,1671               | 1,7396    |
| 34,0               | 15,06          | 13,13     | 1096,9            | 57,19     | 250,75               | 422,99    | 1,1722               | 1,7385    |
| 35,0               | 15,45          | 13,49     | 1092,1            | 58,89     | 252,34               | 423,27    | 1,1772               | 1,7373    |
| 36,0               | 15,84          | 13,86     | 1087,4            | 60,64     | 253,94               | 423,53    | 1,1823               | 1,7362    |
| 37,0               | 16,24          | 14,24     | 1082,5            | 62,44     | 255,54               | 423,79    | 1,1873               | 1,7350    |
| 38,0               | 16,65          | 14,62     | 1077,6            | 64,29     | 257,15               | 424,04    | 1,1924               | 1,7339    |
| 39,0               | 17,07          | 15,01     | 1072,7            | 66,19     | 258,77               | 424,27    | 1,1975               | 1,7327    |
| 40,0               | 17,49          | 15,41     | 1067,7            | 68,15     | 260,40               | 424,50    | 1,2025               | 1,7315    |
| 41,0               | 17,92          | 15,82     | 1062,6            | 70,16     | 262,04               | 424,71    | 1,2076               | 1,7303    |
| 42,0               | 18,36          | 16,24     | 1057,5            | 72,23     | 263,68               | 424,92    | 1,2127               | 1,7291    |
| 43,0               | 18,81          | 16,66     | 1052,3            | 74,36     | 265,34               | 425,11    | 1,2178               | 1,7279    |
| 44,0               | 19,26          | 17,10     | 1047,0            | 76,55     | 267,00               | 425,29    | 1,2230               | 1,7266    |
| 45,0               | 19,72          | 17,54     | 1041,7            | 78,81     | 268,67               | 425,45    | 1,2281               | 1,7254    |
| 46,0               | 20,19          | 17,99     | 1036,3            | 81,13     | 270,35               | 425,60    | 1,2332               | 1,7241    |
| 47,0               | 20,67          | 18,45     | 1030,8            | 83,53     | 272,04               | 425,74    | 1,2384               | 1,7228    |
| 48,0               | 21,16          | 18,91     | 1025,3            | 86,00     | 273,75               | 425,87    | 1,2435               | 1,7215    |
| 49,0               | 21,66          | 19,39     | 1019,6            | 88,54     | 275,46               | 425,98    | 1,2487               | 1,7201    |
| 50,0               | 22,16          | 19,88     | 1013,9            | 91,17     | 277,18               | 426,07    | 1,2539               | 1,7187    |
| 51,0               | 22,67          | 20,37     | 1008,1            | 93,87     | 278,92               | 426,15    | 1,2591               | 1,7173    |
| 52,0               | 23,19          | 20,88     | 1002,2            | 96,67     | 280,67               | 426,21    | 1,2643               | 1,7159    |
| 53,0               | 23,73          | 21,39     | 996,23            | 99,55     | 282,43               | 426,26    | 1,2696               | 1,7144    |
| 54,0               | 24,26          | 21,92     | 990,14            | 102,5     | 284,20               | 426,29    | 1,2748               | 1,7129    |
| 55,0               | 24,81          | 22,45     | 983,93            | 105,6     | 285,99               | 426,29    | 1,2801               | 1,7113    |
| 56,0               | 25,37          | 23,00     | 977,62            | 108,8     | 287,79               | 426,28    | 1,2854               | 1,7097    |
| 57,0               | 25,94          | 23,56     | 971,18            | 112,1     | 289,61               | 426,25    | 1,2908               | 1,7081    |
| 58,0               | 26,51          | 24,12     | 964,62            | 115,5     | 291,44               | 426,19    | 1,2961               | 1,7064    |
| 59,0               | 27,10          | 24,70     | 957,92            | 119,1     | 293,29               | 426,11    | 1,3015               | 1,7047    |
| 60,0               | 27,69          | 25,29     | 951,08            | 122,7     | 295,16               | 426,01    | 1,3069               | 1,7029    |

| Temperatur<br>[°C] | Druck<br>[bar] |           | Dichte<br>[kg/m³] |           | Enthalpie<br>[kJ/kg] |           | Entropie<br>[J/kg*K] |           |
|--------------------|----------------|-----------|-------------------|-----------|----------------------|-----------|----------------------|-----------|
|                    | flüssig        | gasförmig | flüssig           | gasförmig | flüssig              | gasförmig | flüssig              | gasförmig |
| 61,0               | 28,30          | 25,89     | 944,09            | 126,5     | 297,05               | 425,87    | 1,3124               | 1,7011    |
| 62,0               | 28,91          | 26,50     | 936,94            | 130,5     | 298,96               | 425,72    | 1,3179               | 1,6992    |
| 63,0               | 29,54          | 27,12     | 929,61            | 134,6     | 300,88               | 425,53    | 1,3235               | 1,6972    |
| 64,0               | 30,17          | 27,75     | 922,10            | 138,9     | 302,83               | 425,31    | 1,3290               | 1,6952    |
| 65,0               | 30,81          | 28,40     | 914,38            | 143,4     | 304,81               | 425,05    | 1,3347               | 1,6931    |
| 66,0               | 31,47          | 29,06     | 906,45            | 148,1     | 306,81               | 424,76    | 1,3404               | 1,6909    |
| 67,0               | 32,13          | 29,73     | 898,27            | 152,9     | 308,84               | 424,43    | 1,3461               | 1,6886    |
| 68,0               | 32,81          | 30,41     | 889,84            | 158,0     | 310,90               | 424,06    | 1,3520               | 1,6862    |
| 69,0               | 33,49          | 31,11     | 881,12            | 163,4     | 312,99               | 423,65    | 1,3579               | 1,6838    |
| 70,0               | 34,19          | 31,82     | 872,09            | 169,0     | 315,12               | 423,18    | 1,3639               | 1,6811    |
| 71,0               | 34,90          | 32,55     | 862,71            | 175,0     | 317,29               | 422,66    | 1,3699               | 1,6784    |
| 72,0               | 35,61          | 33,29     | 852,94            | 181,2     | 319,51               | 422,07    | 1,3761               | 1,6755    |
| 73,0               | 36,34          | 34,04     | 842,73            | 187,9     | 321,77               | 421,42    | 1,3824               | 1,6724    |
| 74,0               | 37,08          | 34,81     | 832,02            | 194,9     | 324,09               | 420,70    | 1,3889               | 1,6692    |
| 75,0               | 37,83          | 35,60     | 820,75            | 202,4     | 326,48               | 419,89    | 1,3955               | 1,6657    |
| 76,0               | 38,59          | 36,41     | 808,82            | 210,5     | 328,94               | 418,98    | 1,4022               | 1,6620    |
| 77,0               | 39,36          | 37,23     | 796,11            | 219,2     | 331,48               | 417,97    | 1,4092               | 1,6580    |
| 78,0               | 40,14          | 38,07     | 782,49            | 228,7     | 334,13               | 416,82    | 1,4165               | 1,6536    |
| 79,0               | 40,94          | 38,93     | 767,74            | 239,0     | 336,90               | 415,51    | 1,4241               | 1,6489    |
| 80,0               | 41,74          | 39,81     | 751,59            | 250,4     | 339,84               | 414,01    | 1,4321               | 1,6436    |
| 81,0               | 42,55          | 40,71     | 733,61            | 263,2     | 342,97               | 412,27    | 1,4407               | 1,6377    |
| 82,0               | 43,37          | 41,65     | 713,14            | 277,9     | 346,39               | 410,21    | 1,4500               | 1,6309    |
| 83,0               | 44,19          | 42,61     | 688,99            | 295,2     | 350,22               | 407,71    | 1,4604               | 1,6229    |
| 84,0               | 45,00          | 43,61     | 658,64            | 316,7     | 354,76               | 404,50    | 1,4728               | 1,6130    |
| 85,0               | 45,79          | 44,68     | 614,85            | 346,1     | 360,89               | 399,98    | 1,4896               | 1,5995    |
| 86,0               | 46,39          | 45,90     | 516,33            | 403,2     | 374,09               | 390,98    | 1,5261               | 1,5735    |

Berechnet mit Refprop Version 10.0

Eine Garantie, Gewährleistung oder Haftung für die Richtigkeit, Vollständigkeit und Aktualität der zur Verfügung gestellten Inhalte und Informationen kann nicht übernommen werden.

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