HANDBOOK of THERMODYNAMIC TABLES

Second Edited and Revised Edition

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3 Vapors

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Instructions for Use of Tables

Each physical quantity is represented as the product of the numerical value and a unit of measurement. Thus, we can write some the unknown quantity X as:

$$\mathbf{X = \{X\}[X],} \tag{1}$$

where {X} is the numerical value and [X] is the unit of measurement. Equation (1) could be written in the form of a fraction:

$$\mathbf{\{X\}=X/[X],} \tag{2}$$

from which it follows that the numerical value {X} is equal to the quotient of the physical quantity X and the unit of measurement, [X]. This is true for every physical quantity. For example, for the unknown physical quantity of length L, we can write:

$$\mathbf{L = \{L\}[L],} \tag{3}$$

then the numerical value {L} is equal to:

$$\mathbf{\{L\} = L/[L].} \tag{4}$$

For a known quantity, for example, when the distance between two cities is 580 km, then according to equation (3), we will write:

$$\mathbf{L = 580\ km,}$$

where 580 = {L}, the numerical value, and km = [L] is the unit of length. According to equations (2) and (4) the numerical value 580 is equal to the quotient of quantity L and units of length, km, namely:

$$\mathbf{580 = L/km}$$

Numerical values in the tables in this book are actually the numerical values of physical quantities, that is that the numerical values in the table column are quotients of the physical quantity and the unit of measurement in the column head of the table. For example, on page 10, table 1.8, in the column for the specific heat capacity, 0.314 is in the first row, that is the numerical value which is equal to the quotient of the quantity c and the unit of measurement kJ/(kg K) in the table head in the same row, namely:

$$\mathbf{0.314 = \frac{c}{kJ(kg\ K).}}$$

Hence it follows that the value of the specific heat capacity is:

$$\mathbf{c = 0.314\ kJ/(kg\ K).}$$

In the same way we can read any numerical values from the tables and determine the quantitative values of corresponding quantities.

This tabular way of representing physical quantities is the most suitable because there is no need to state separately the units to which the numerical values in the tables refer.

CHAPTER

ONE

SOLIDS

Table 1-1 Thermal Properties of Solid Elements

Element		At a temperature of 20 °C		At a pressure p = 1.013 25 bar (= 760 mm Hg)			
Name	Symbol	Density ρ kg/m³	Linear expansion coefficient α 1/kK[1)]	Melting point t_m °C	Heat of fusion q_f kJ/kg	Boiling point t_b °C	Heat of vaporization r kJ/kg
Aluminium	Al	2700	0.0237	658	355.878	2270	11723.040
Antimony	Sb	6690	0.0110	630.5	167.472	1640	1256.040
Arsenic	As	5720	0.0050	830	—	625	1674.720
Barium	Ba	3760	—	704	—	1700	1339.776
Beryllium	Be	1850	0.0130	1278	1427.699	3000	24827.724
Bismuth	Bi	9800	0.0135	271	54.428	1500	837.360
Boron	B	2340	0.008	2500	—	—	—
Cadmium	Cd	8640	0.030	320.9	54.428	767	1004.832
Calcium	Ca	1540	0.025	851	328.664	1400	4186.800
Carbon	C	—	—	3540	—	4000	5024.160
Cerium	Ce	6800	0.010	815	—	1400	—
Cesium	Cs	1870	0.097	28	15.910	670	502.416
Chromium	Cr	7100	0.008	1800	293.076	2400	6154.596
Cobalt	Co	8800	0.0123	1490	280.516	3200	6489.540
Copper	Cu	8930	0.0166	1083	209.340	2330	4647.348
Gallium	Ga	5900	0.018	29.78	79.968	2300	—
Gold	Au	19290	0.0142	1063	66.989	2700	1758.456
Iodine	J	4930	0.093	113.5	—	185	334.944
Iridium	Ir	22500	0.0065	2454	—	>4800	3893.724
Iron	Fe	7860	0.0123	1530	272.142	2500	6363.936
Lead	Pb	11340	0.029	327.3	23.865	1730	921.096
Lithium	Li	534	0.056	180	138.164	1400	21352.680
Magnesium	Mg	1740	0.026	650	209.340	1110	5652.180
Manganese	Mn	7300	0.023	1250	251.208	2100	4186.800
Mercury	Hg	—	—	–38.83	—	356.95	—
Molybdenum	Mo	10200	0.005	2600	—	3560	7117.560
Nickel	Ni	8900	0.013	1455	293.076	3000	6196.464
Osmium	Os	22480	0.0061	2500	—	—	—
Palladium	Pd	12000	0.0118	1555	150.725	—	3977.460
Phosphorus, white	P	1820	0.125	44.1	21.771	280	1674.720
Platinum	Pt	21450	0.009	1773	113.044	3800	2512.080
Potassium	K	862	0.083	63	54.428	760	2051.532
Rhenium	Re	20500	—	3150	—	—	—
Rhodium	Rh	12400	0.009	1966	—	—	—
Rubidium	Rb	1520	0.090	38.5	25.539	713	837.360
Selenium	Se	4400	0.037	220	68.664	688	1088.568
Silicon	Si	2330	0.0024	1410	—	2350	14067.648
Silver	Ag	10500	0.0189	960.5	104.670	1950	2177.136
Sodium	Na	971	0.072	97.7	113.044	880	4186.800
Strontium	Sr	—	—	757	—	1370	—
Sulfur (monoclinic)	S	1960	0.080	119	46.055	—	—
Sulfur (rhombic)	S	2060	0.074	112.8	39.356	444.60	293.076
Tantalum	Ta	16600	0.0065	3000	—	—	—
Tin	Sn	7280	0.027	231.9	58.615	2300	2595.816
Titanium	Ti	4530	0.0108	1800	—	—	—
Tungsten	W	19300	0.0043	3380	251.208	5000	4814.820
Vanadium	V	6000	0.0085	1720	—	—	—
Zinc	Zn	7130	0.029	419.4	112.206	907	1800.324
Zirconium	Zr	6530	—	1900	—	—	—

[1)] kK = kilokelvin = 10^3 K
1 Btu = 1.055 06 kJ

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