TABLAS Y FIGURAS DE

PROPIEDADES TERMODINÁMICAS DE SUSTANCIAS PURAS.

SISTEMA INTERNACIONAL DE UNIDADES (SI).

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Las presentes tablas de propiedades termodinámicas están disponibles en formato digital en la siguiente dirección:

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Aquel que no sabe y sabe que no sabe es un idiota; evítalo. Aquel que no sabe y no sabe que no sabe es un niño; edúcalo. Aquel que sabe y no sabe que sabe está dormido; despiértalo. Aquel que sabe y sabe que sabe es un sabio; síguelo.

Proverbio persa.

CONTENIDO.

PRESENTACIÓN.

Modificaciones introducidas en las tablas de propiedades termodinámicas presentadas en este documento con respecto a las tablas de propiedades termodinámicas del texto original.

1.- Se ha incluido un índice de tablas, con el objeto de facilitar la búsqueda de propiedades termodinámicas para una sustancia en particular.

2.- Uniformidad en la presentación de los datos.

a.- En la tabla de saturación del agua, se presentan las propiedades termodinámicas para la diferencia del volumen específico durante la evaporación (v_{fg}), de la misma forma como es presentada esta propiedad en las tablas de Amoniaco, Refrigerante-12, Refrigerante-22, Refrigerante-134a, Nitrógeno y Metano.

b.- Las tablas de vapor sobrecalentado para el Amoniaco, Nitrógeno y Metano se presentan en el mismo formato que las de Agua, Refrigerante-12, Refrigerante-22 y Refrigerante-134a.

3.- Se incluyó la tabla de presiones de saturación para el amoniaco, refrigerante 12, refrigerante 22, refrigerante 134a y propano.

4.- Se incluyó la tabla del refrigerante 134a con la misma referencia para la entalpía que para el amoniaco, refrigerante 12, refrigerante 22 y propano ($h_f = 0$ a –40ºC).

5.- Se ha incluido la energía interna para el Amoniaco, Refrigerante-12, Refrigerante-22, Refrigerante-134a, Nitrógeno y Metano tanto en las tablas de saturación (para el líquido saturado, el vapor saturado y la evaporación) como en las tablas de sobrecalentamiento. Anteriormente este dato debía ser estimado mediante la ecuación

$$u = h - Pv$$

Como ejemplo, para el amoniaco saturado, a 40ºC, la energía interna del líquido saturado y del vapor saturado se obtenían mediante:

Líquido saturado: $u_f = h_f - Pv_f$

$$u_f = 371.43\,\text{kJ/kg} - 1554.92\,\text{kPa} \times 0.001725\,\text{m}^3/\text{kg}$$

$u_f = 371.43\,\text{kJ/kg} - 2.68\,\text{kJ/kg}$

$u_f = 368.75\,\text{kJ/kg}$

Vapor saturado: $u_g = h_g - P v_g$

$u_g = 1470.22\,\text{kJ/kg} - 1554.92\,\text{kPa} \times 0.08313\,\text{m}^3\text{/kg}$

$u_g = 1470.22\,\text{kJ/kg} - 129.26\,\text{kJ/kg}$

$u_g = 1340.96\,\text{kJ/kg}$

La diferencia entre estos dos valores:

Evaporación: $u_{fg} = u_g - u_f$

$u_{fg} = 1340.96\,\text{kJ/kg} - 368.75\,\text{kJ/kg}$

$u_{fg} = 972.21\,\text{kJ/kg}$

Mientras que para el refrigerante-12 sobrecalentado a 1.00 MPa (1000 kPa) y 100ºC, era necesario aplicar:

$u = h - P v$

$u = 247.612\,\text{kJ/kg} - 1000\,\text{kPa} \times 0.023133\,\text{m}^3\text{/kg}$

$u = 247.612\,\text{kJ/kg} - 23.133\,\text{kJ/kg}$

$u = 224.479\,\text{kJ/kg}$

Con los datos proporcionados, no es necesario el cálculo de la energía interna, pues estos datos están disponibles en las tablas actuales.

6.- Se ha incluido la entalpía específica, energía interna específica y entropía específica de diversas sustancias como gas ideal en función de la temperatura, en contraste con la entalpía molar, energía interna molar y entropía molar disponibles en las tablas anexas en los textos de Termodinámica.

7.- Se han resaltado en colores los datos de presión (azul), temperatura (rojo), nombre y fórmula química de las sustancias (verde), los títulos de cada tabla (violeta) y las referencias o fuentes (anaranjado).

8.- Se han sombreado lineas alternadas para la lectura más fácil de los datos.

Tabla A.1 SI Propiedades termodinámicas del Agua.
Tabla A.1.1 SI Agua saturada: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión kPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
0.01	**0.6113**	**0.001000**	**206.131**	**206.132**	**0.00**	**2375.3**	**2375.3**	**0.00**	**2501.3**	**2501.3**	**0.0000**	**9.1562**	**9.1562**
5	0.8721	0.001000	147.117	147.118	20.97	2361.2	2382.2	20.98	2489.5	2510.5	0.0761	8.9496	9.0257
10	1.2276	0.001000	106.376	106.377	41.99	2347.2	2389.2	41.99	2477.7	2519.7	0.1510	8.7497	8.9007
15	1.7051	0.001001	77.923999	77.925	62.98	2333.0	2396.0	62.98	2465.9	2528.9	0.2245	8.5568	8.7813
20	2.3385	0.001002	57.788998	57.790	83.94	2319.0	2402.9	83.94	2454.2	2538.1	0.2926	8.3745	8.6671
25	3.1691	0.001003	43.357997	43.359	104.86	2304.9	2409.8	104.87	2442.3	2547.2	0.3673	8.1906	8.5579
30	4.2461	0.001004	32.891996	32.893	125.77	2290.8	2416.6	125.77	2430.4	2556.2	0.4369	8.0164	8.4533
35	5.6280	0.001006	25.214994	25.216	146.65	2276.8	2423.4	146.66	2418.6	2565.3	0.5052	7.8478	8.3530
40	7.3837	0.001008	19.521992	19.523	167.53	2262.6	2430.1	167.54	2406.8	2574.3	0.5724	7.6845	8.2569
45	9.3954	0.001010	15.256990	15.258	188.41	2248.4	2436.8	188.42	2394.8	2583.2	0.6386	7.5261	8.1647
50	12.350	0.001012	12.030988	12.032	209.30	2234.2	2443.5	209.31	2382.8	2592.1	0.7037	7.3725	8.0762
55	15.758	0.001015	9.566985	9.568	230.19	2219.9	2450.1	230.20	2370.7	2600.9	0.7679	7.2233	7.9912
60	19.941	0.001017	7.669983	7.671	251.09	2205.5	2456.6	251.11	2358.5	2609.6	0.8311	7.0784	7.9095
65	25.033	0.001020	6.195980	6.197	272.00	2191.1	2463.1	272.03	2346.2	2618.2	0.8934	6.9375	7.8309
70	31.188	0.001023	5.040977	5.042	292.93	2176.6	2469.5	292.96	2333.7	2626.7	0.9548	6.8004	7.7552
75	38.578	0.001026	4.129974	4.131	313.87	2162.0	2475.9	313.91	2321.4	2635.3	1.0154	6.6670	7.6824
80	47.390	0.001029	3.405971	3.407	334.84	2147.4	2482.2	334.88	2308.8	2643.7	1.0752	6.5369	7.6121
85	57.834	0.001032	2.826968	2.828	355.82	2132.6	2488.4	355.88	2296.0	2651.9	1.1342	6.4102	7.5444
90	70.139	0.001036	2.359964	2.361	376.82	2117.7	2494.5	376.90	2283.2	2660.1	1.1924	6.2866	7.4790
95	84.554	0.001040	1.980960	1.982	387.86	2112.7	2500.6	397.94	2270.2	2668.1	1.2500	6.1658	7.4158
100	101.325	0.001044	1.671856	1.6729	418.91	2087.6	2506.5	419.02	2257.0	2676.0	1.3068	6.0480	7.3548
	MPa												
105	0.12082	0.001047	1.418353	1.4194	440.00	2072.3	2512.3	440.13	2243.7	2683.8	1.3629	5.9329	7.2958
110	0.14328	0.001052	1.209148	1.2102	461.12	2057.0	2518.1	461.27	2230.2	2691.5	1.4184	5.8202	7.2386
115	0.16906	0.001056	1.035544	1.0366	482.28	2041.4	2523.7	482.46	2216.5	2699.0	1.4733	5.7099	7.1832
120	0.19853	0.001060	0.890840	0.8919	503.48	2025.7	2529.2	503.69	2202.6	2706.3	1.5275	5.6020	7.1295
125	0.2321	0.001065	0.769525	0.77059	524.72	2009.9	2534.6	524.96	2188.5	2713.5	1.5812	5.4962	7.0774
130	0.2701	0.001070	0.667430	0.66850	546.00	1993.9	2539.9	549.29	2171.2	2720.5	1.6343	5.3926	7.0269
135	0.3130	0.001075	0.581095	0.58217	567.34	1977.7	2545.0	567.67	2159.6	2727.3	1.6869	5.2908	6.9777
140	0.3613	0.001080	0.507770	0.50885	588.72	1961.3	2550.0	589.11	2144.8	2733.9	1.7390	5.1908	6.9298
145	0.4154	0.001085	0.445235	0.44632	610.16	1944.7	2554.9	610.61	2129.7	2740.3	1.7906	5.0926	6.8832
150	0.4759	0.001090	0.391690	0.39278	631.66	1927.8	2559.5	632.18	2114.2	2746.4	1.8417	4.9961	6.8378
155	0.5431	0.001096	0.345664	0.34676	653.23	1910.8	2564.0	653.82	2098.6	2752.4	1.8924	4.9010	6.7934
160	0.6178	0.001102	0.305958	0.30706	674.85	1893.6	2568.4	675.53	2082.6	2758.1	1.9426	4.8075	6.7501
165	0.7005	0.001108	0.271582	0.27269	695.55	1877.0	2572.5	697.32	2066.2	2763.5	1.9924	4.7154	6.7078
170	0.7917	0.001114	0.241716	0.24283	718.31	1858.1	2576.5	719.20	2049.5	2768.7	2.0418	4.6245	6.6663

Tabla A.1.1 SI Agua saturada: Tabla de Temperatura.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
175	0.8982	0.001121	0.215679	0.21680	740.16	1840.0	2580.2	741.16	2032.4	2773.6	2.0909	4.5347	6.6256
180	1.0022	0.001127	0.192923	0.19405	762.08	1821.6	2583.7	763.21	2015.0	2778.2	2.1395	4.4462	6.5857
185	1.1227	0.001134	0.172956	0.17409	784.08	1802.9	2587.0	785.36	1997.0	2782.4	2.1878	4.3586	6.5464
190	1.2544	0.001141	0.155399	0.15654	806.17	1783.8	2590.0	807.61	1978.8	2786.4	2.2358	4.2720	6.5078
195	1.3978	0.001149	0.139901	0.14105	828.36	1764.4	2592.8	829.96	1960.0	2790.0	2.2835	4.1862	6.4697
200	1.5538	0.001156	0.126204	0.12736	850.64	1744.7	2595.3	852.43	1940.8	2793.2	2.3308	4.1014	6.4322
205	1.7230	0.001164	0.114046	0.11521	873.02	1724.5	2597.5	875.03	1921.0	2796.0	2.3779	4.0172	6.3951
210	1.9063	0.001173	0.103237	0.10441	895.51	1703.9	2599.4	897.75	1900.8	2798.5	2.4247	3.9337	6.3584
215	2.1042	0.001181	0.093609	0.09479	918.12	1683.0	2601.1	920.61	1879.9	2800.5	2.4713	3.8508	6.3221
220	2.3178	0.001190	0.085000	0.08619	940.85	1661.5	2602.3	943.61	1858.5	2802.1	2.5177	3.7683	6.2860
225	2.5477	0.001199	0.077291	0.07849	963.72	1639.6	2603.3	966.70	1836.6	2803.3	2.5639	3.6863	6.2502
230	2.7949	0.001209	0.070371	0.07158	986.72	1617.2	2603.9	990.10	1813.8	2803.9	2.6069	3.6077	6.2146
235	3.0601	0.001219	0.064141	0.06536	1009.88	1594.2	2604.1	1013.61	1790.5	2804.1	2.6557	3.5234	6.1791
240	3.3442	0.001229	0.058531	0.05976	1033.19	1570.7	2603.9	1037.31	1766.5	2803.8	2.7015	3.4421	6.1436
245	3.6482	0.001240	0.053460	0.05470	1056.69	1546.7	2603.4	1061.21	1741.7	2802.9	2.7471	3.3612	6.1083
250	3.9730	0.001251	0.048879	0.05013	1080.37	1522.0	2602.4	1085.34	1716.2	2801.5	2.7927	3.2802	6.0729
255	4.3195	0.001263	0.044717	0.04598	1104.26	1496.6	2600.9	1109.72	1689.8	2799.5	2.8382	3.1992	6.0374
260	4.6886	0.001276	0.040924	0.04220	1128.37	1470.6	2599.0	1134.35	1662.6	2796.9	2.8837	3.1181	6.0018
265	5.0813	0.001289	0.037481	0.03877	1152.72	1443.9	2596.6	1159.27	1634.3	2793.6	2.9293	3.0368	5.9661
270	5.4987	0.001302	0.034338	0.03564	1177.33	1416.4	2593.7	1184.49	1605.2	2789.7	2.9750	2.9551	5.9301
275	5.9418	0.001317	0.031473	0.03279	1202.23	1388.0	2590.2	1210.05	1575.0	2785.0	3.0208	2.8729	5.8937
280	6.4117	0.001332	0.028838	0.03017	1227.43	1358.7	2586.1	1235.97	1543.5	2779.5	3.0667	2.7903	5.8570
285	6.9094	0.001348	0.026422	0.02777	1252.98	1328.4	2581.4	1262.29	1511.0	2773.3	3.1129	2.7069	5.8198
290	7.4360	0.001366	0.024204	0.02557	1278.89	1297.1	2576.0	1289.04	1477.1	2766.1	3.1593	2.6228	5.7821
295	7.9928	0.001384	0.022156	0.02354	1305.21	1264.7	2569.9	1316.27	1441.7	2758.0	3.2061	2.5375	5.7436
300	8.5810	0.001404	0.020266	0.02167	1331.97	1231.0	2563.0	1344.01	1404.9	2748.9	3.2533	2.4511	5.7044
305	9.2018	0.001425	0.018525	0.01995	1359.22	1196.0	2555.2	1372.33	1366.4	2738.7	3.3009	2.3633	5.6642
310	9.8566	0.001447	0.016903	0.01835	1387.03	1159.4	2546.4	1401.29	1326.0	2727.3	3.3492	2.2737	5.6229
315	10.547	0.001472	0.015398	0.01687	1415.44	1121.2	2536.6	1430.97	1283.4	2714.4	3.3981	2.1822	5.5803
320	11.274	0.001499	0.013991	0.01549	1444.55	1081.0	2525.5	1461.45	1238.7	2700.1	3.4479	2.0882	5.5361
330	12.845	0.001561	0.011435	0.012996	1505.24	993.7	2498.9	1525.29	1140.5	2665.8	3.5506	1.8910	5.4416
340	14.586	0.001638	0.009159	0.010797	1570.26	894.2	2464.5	1594.15	1027.9	2622.0	3.6593	1.6763	5.3356
350	16.514	0.001740	0.007073	0.008813	1641.81	776.6	2418.4	1670.54	893.4	2563.9	3.7776	1.4335	5.2111
360	18.651	0.001892	0.005053	0.006945	1725.19	626.3	2351.5	1760.48	720.5	2481.0	3.9146	1.1379	5.0525
370	21.028	0.002213	0.002713	0.004926	1843.84	384.7	2228.5	1890.37	441.7	2332.1	4.1104	0.6868	4.7972
374.14	22.089	0.003155	0	0.003155	2029.58	0	2029.6	2099.26	0	2099.3	4.4297	0	4.4297

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 755 – 756, tabla A.1.1SI.

Tabla A.1.2 SI Agua saturada: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión kPa, P	Temp.ºC T	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
0.6113	**0.01**	0.001000	206.13100	206.132	0	2375.3	2375.3	0.00	2501.3	2501.3	0	9.1592	9.1592
1.0	6.98	0.001000	129.20700	129.208	29.29	2355.7	2385.0	29.29	2484.9	2514.2	0.1059	8.8697	8.9756
1.5	13.03	0.001001	87.978999	87.980	54.70	2338.6	2393.3	54.70	2470.6	2525.3	0.1956	8.6322	8.8278
2.0	17.50	0.001001	67.002999	67.004	73.47	2326.0	2399.5	73.47	2460.0	2533.5	0.2607	8.4629	8.7236
2.5	21.08	0.001002	54.252998	54.254	88.47	2315.9	2404.4	88.84	2451.2	2540.0	0.3120	8.3311	8.6431
3.0	24.08	0.001003	45.663997	45.665	101.03	2307.5	2408.5	101.03	2444.5	2545.5	0.3545	8.2230	8.5775
4.0	28.96	0.001004	34.798996	34.800	121.44	2293.8	2415.2	121.44	2433.0	2554.4	0.4226	8.0520	8.4746
5.0	32.88	0.001005	28.191995	28.193	137.79	2282.7	2420.5	137.79	2423.6	2561.4	0.4763	7.9187	8.3950
7.5	40.29	0.001008	19.236992	19.238	168.76	2261.7	2430.5	168.77	2406.0	2574.8	0.5763	7.6751	8.2514
10.0	45.81	0.001010	14.672990	14.674	191.79	2246.1	2437.9	191.81	2392.8	2584.6	0.6492	7.5009	8.1501
15.0	53.97	0.001014	10.051186	10.052	225.90	2222.8	2448.7	225.91	2373.2	2599.1	0.7548	7.2536	8.0084
20.0	60.06	0.001017	7.647983	7.649	251.35	2205.4	2456.7	251.38	2358.3	2609.7	0.8319	7.0766	7.9085
25.0	64.97	0.001020	6.202980	6.204	271.88	2191.2	2463.1	271.89	2346.3	2618.2	0.8930	6.9383	7.8313
30.0	69.10	0.001022	5.227978	5.229	289.18	2179.2	2468.4	289.21	2336.1	2625.3	0.9439	6.8247	7.7686
40.0	75.87	0.001026	3.991974	3.993	317.51	2159.5	2477.0	317.55	2319.2	2636.7	1.0258	6.6442	7.6700
50.0	81.33	0.001030	3.238970	3.240	340.42	2143.4	2483.8	340.47	2305.4	2645.9	1.0910	6.5029	7.5939
75.0	91.77	0.001037	2.215963	2.217	384.29	2112.4	2496.7	384.36	2278.6	2663.0	1.2129	6.2434	7.4563
MPa													
0.100	99.62	0.001043	1.692957	1.6940	417.33	2088.8	2506.1	417.44	2258.1	2675.5	1.3025	6.0568	7.3593
0.125	105.99	0.001048	1.373852	1.3749	444.16	2069.3	2513.5	444.30	2241.0	2685.3	1.3739	5.9104	7.2843
0.150	111.37	0.001053	1.158247	1.1593	466.92	2052.7	2519.6	467.08	2226.4	2693.5	1.4335	5.7897	7.2232
0.175	116.06	0.001057	1.002543	1.0036	486.78	2038.1	2524.9	486.97	2213.5	2700.5	1.4848	5.6869	7.1717
0.200	120.23	0.001061	0.884639	0.8857	504.47	2025.0	2529.5	504.68	2201.9	2706.6	1.5300	5.5971	7.1271
0.225	124.00	0.001064	0.792236	0.7933	520.45	2013.2	2533.6	520.69	2191.3	2712.0	1.5705	5.5173	7.0878
0.250	127.43	0.001067	0.717633	0.7187	535.08	2002.1	2537.2	535.34	2181.6	2716.9	1.6072	5.4454	7.0526
0.275	130.60	0.001070	0.656230	0.6573	548.57	1991.9	2540.5	548.87	2172.4	2721.3	1.6407	5.3801	7.0208
0.300	133.55	0.001073	0.604727	0.6058	561.13	1982.5	2543.6	561.45	2164.9	2726.3	1.6717	5.3201	6.9918
0.325	136.30	0.001076	0.560924	0.5620	572.88	1973.4	2546.3	573.23	2155.8	2729.0	1.7005	5.2646	6.9651
0.350	138.88	0.001079	0.523221	0.5243	583.93	1965.0	2548.9	584.31	2148.1	2732.4	1.7274	5.2130	6.9404
0.375	141.32	0.001081	0.490319	0.4914	594.38	1956.9	2551.3	594.79	2140.8	2735.6	1.7527	5.1647	6.9174
0.40	143.63	0.001084	0.461416	0.4625	604.29	1949.3	2553.6	604.73	2133.8	2738.5	1.7766	5.1192	6.8958
0.45	147.93	0.001088	0.412912	0.4140	622.75	1934.9	2557.6	623.24	2120.7	2743.9	1.8206	5.0359	6.8565
0.50	151.86	0.001093	0.373807	0.3749	639.66	1921.5	2561.2	640.21	2108.5	2748.7	1.8606	4.9606	6.8212
0.55	155.48	0.001097	0.341603	0.3427	655.30	1909.2	2564.5	655.91	2097.0	2752.9	1.8972	4.8920	6.7892
0.60	158.85	0.001101	0.314599	0.3157	669.88	1897.5	2567.4	670.54	2086.3	2756.8	1.9311	4.8289	6.7600
0.65	162.01	0.001104	0.291596	0.2927	683.55	1886.6	2570.1	684.26	2076.0	2760.3	1.9627	4.7703	6.7330
0.70	164.97	0.001108	0.271792	0.2729	696.43	1877.1	2573.5	697.20	2066.3	2763.5	1.9922	4.7158	6.7080
0.75	167.77	0.001111	0.254489	0.2556	708.62	1866.1	2574.7	709.45	2057.0	2766.4	2.0199	4.6647	6.6846

Tabla A.1.2 SI Agua saturada: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión MPa, P	Temp.ºC T	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
0.80	170.43	0.001115	0.239285	0.2404	720.20	1856.6	2576.8	721.10	2048.0	2769.1	2.0461	4.6166	6.6627
0.85	172.96	0.001118	0.225882	0.2270	731.25	1847.5	2578.7	732.20	2039.8	2772.0	2.0709	4.5712	6.6421
0.90	175.38	0.001121	0.213879	0.2150	741.81	1838.7	2580.5	741.82	2032.1	2773.9	2.0946	4.5279	6.6225
0.95	177.69	0.001124	0.203076	0.2042	751.94	1830.2	2582.1	753.00	2023.1	2776.1	2.1171	4.4869	6.6040
1.00	179.91	0.001127	0.193313	0.19444	761.67	1821.9	2583.6	762.79	2015.3	2778.1	2.1386	4.4478	6.5864
1.10	184.09	0.001133	0.176397	0.17753	780.08	1806.3	2586.4	781.32	2000.4	2781.7	2.1791	4.3744	6.5535
1.20	187.99	0.001139	0.162191	0.16333	797.27	1791.5	2588.8	798.64	1986.2	2784.8	2.2165	4.3068	6.5233
1.30	191.64	0.001144	0.150106	0.15125	813.42	1777.5	2590.9	814.91	1972.7	2787.6	2.2514	4.2439	6.4953
1.40	195.07	0.001149	0.139691	0.14084	828.68	1764.1	2592.8	830.29	1959.7	2790.0	2.2842	4.1850	6.4692
1.50	198.32	0.001154	0.130616	0.13177	843.14	1751.4	2594.5	844.47	1947.6	2792.1	2.3150	4.1298	6.4448
1.75	205.76	0.001166	0.112324	0.11349	876.44	1721.4	2597.8	878.48	1917.9	2796.4	2.3851	4.0044	6.3895
2.00	212.42	0.001177	0.098453	0.09963	906.42	1693.9	2600.3	908.77	1857.7	2799.5	2.4473	3.8935	6.3408
2.25	218.45	0.001187	0.087563	0.08875	933.81	1668.2	2602.0	936.48	1865.2	2801.7	2.5034	3.7937	6.2971
2.50	223.09	0.001197	0.078783	0.07998	959.09	1644.0	2603.1	962.09	1841.0	2803.1	2.5546	3.7028	6.2574
2.75	229.12	0.001207	0.071543	0.07275	982.65	1621.2	2603.8	985.97	1817.9	2803.9	2.6018	3.6190	6.2208
3.00	233.90	0.001216	0.065464	0.06668	1004.76	1599.3	2604.1	1008.41	1795.7	2804.1	2.6456	3.5413	6.1869
3.25	238.38	0.001226	0.060294	0.06152	1025.62	1578.4	2604.0	1029.60	1774.4	2804.0	2.6866	3.4685	6.1551
3.50	242.60	0.001235	0.055835	0.05707	1045.41	1558.3	2603.7	1049.73	1753.7	2803.4	2.7285	3.3967	6.1252
4.0	250.40	0.001252	0.048526	0.049778	1052.28	1550.0	2602.3	1087.29	1714.1	2801.4	2.7963	3.2737	6.0700
5.0	263.99	0.001286	0.038155	0.039441	1147.78	1449.3	2597.1	1154.21	1640.1	2794.3	2.9201	3.0532	5.9733
6.0	275.64	0.001319	0.031121	0.032440	1205.41	1384.3	2589.7	1213.32	1571.0	2784.3	3.0266	2.8625	5.8891
7.0	285.88	0.001345	0.026025	0.027370	1257.51	1323.0	2580.5	1266.97	1505.1	2772.1	3.1210	2.6922	5.8132
8.0	295.06	0.001384	0.022134	0.023518	1305.54	1264.2	2569.8	1316.61	1441.3	2757.9	3.2067	2.5364	5.7431
9.0	303.40	0.001418	0.019066	0.020484	1350.47	1207.3	2557.8	1363.23	1378.9	2742.1	3.2857	2.3914	5.6771
10.0	311.06	0.001452	0.016574	0.018026	1393.00	1151.4	2544.4	1407.53	1317.2	2724.7	3.3595	2.2545	5.6140
11.0	318.15	0.001489	0.014498	0.015987	1433.68	1096.0	2529.7	1450.05	1255.6	2705.6	3.4294	2.1233	5.5527
12.0	324.75	0.001527	0.012736	0.014263	1472.92	1040.8	2513.7	1491.24	1193.6	2684.8	3.4961	1.9962	5.4923
13.0	330.93	0.001567	0.011213	0.012780	1511.09	985.0	2496.1	1531.46	1130.7	2662.2	3.5604	1.8719	5.4323
14.0	336.75	0.001611	0.009874	0.011485	1547.53	929.3	2476.8	1571.08	1066.4	2637.5	3.6231	1.7485	5.3716
15.0	342.24	0.001658	0.008680	0.010338	1585.58	869.8	2455.4	1610.45	1000.1	2610.5	3.6847	1.6250	5.3097
16.0	347.43	0.001711	0.007595	0.009306	1622.63	809.1	2431.7	1650.00	930.6	2580.6	3.7460	1.4994	5.2454
17.0	352.37	0.001770	0.006595	0.008365	1660.16	744.8	2405.0	1690.25	857.0	2547.2	3.8078	1.3698	5.1776
18.0	357.06	0.001840	0.005650	0.007490	1698.86	675.4	2374.3	1731.97	777.1	2509.1	3.8713	1.2331	5.1044
19.0	361.54	0.001924	0.004733	0.006657	1739.87	598.2	2338.1	1776.43	688.1	2464.5	3.9387	1.0840	5.0227
20.0	365.81	0.002035	0.003799	0.005834	1785.47	507.6	2293.1	1826.18	583.5	2409.7	4.0137	0.9132	4.9269
21.0	369.89	0.002206	0.002747	0.004953	1841.97	388.7	2230.7	1888.36	446.3	2334.7	4.1073	0.6942	4.8015
22.0	373.80	0.002808	0.000718	0.003526	1973.16	108.2	2081.4	2034.92	124.1	2159.0	4.3307	0.1917	4.5224
22.09	374.14	0.003155	0	0.003155	2029.58	0	2029.6	2099.26	0	2099.3	4.4297	0	4.4297

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 758 - 760, tabla A.1.2SI.

Tabla A.1.3 SI Vapor de Agua sobrecalentado.

	P = 10 kPa (45.81ºC)				P = 50 kPa (81.33ºC)				P = 100 kPa (99.62ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	14.674	2437.9	2584.6	8.1501	3.240	2483.8	2645.9	7.5939	1.6940	2506.1	2675.5	7.3593
50	14.869	2443.9	2592.6	8.1749	-	-	-	-	-	-	-	-
100	17.196	2515.5	2687.5	8.4479	3.418	2511.6	2682.5	7.6947	1.6958	2506.6	2676.2	7.3614
150	19.513	2587.9	2783.0	8.6881	3.889	2585.6	2780.1	7.9400	1.9364	2582.7	2776.4	7.6133
200	21.825	2661.3	2879.5	8.9037	4.356	2659.8	2877.6	8.1579	2.1723	2658.0	2875.3	7.8342
250	24.136	2736.0	2977.3	9.1002	4.821	2735.0	2976.0	8.3555	2.4060	2733.7	2974.3	8.0332
300	26.445	2812.1	3076.5	9.2812	5.284	2811.3	3075.5	8.5372	2.6388	2810.4	3074.3	8.2157
400	31.063	2968.9	3279.5	9.6076	6.209	2968.4	3278.9	8.8641	3.1026	2967.8	3278.1	8.5434
500	35.679	3132.3	3489.0	9.8977	7.134	3131.9	3488.6	9.1545	3.5655	3131.5	3488.1	8.8341
600	40.295	3302.5	3705.4	10.1608	8.058	3302.2	3705.1	9.4177	4.0278	3301.9	3704.7	9.0098
700	44.911	3479.6	3928.7	10.4028	8.981	3479.5	3928.5	9.6599	4.4899	3479.2	3928.2	9.3398
800	49.526	3663.8	4159.1	10.6281	9.904	3363.7	4158.9	9.8852	4.9517	3663.5	4158.7	9.5652
900	54.141	3855.0	4396.4	10.7840	10.828	3854.9	4396.3	10.0967	5.4135	3854.8	4395.1	9.7767
1000	58.757	4053.0	4640.6	11.0392	11.751	4052.9	4640.5	10.2964	5.8753	4052.8	4640.3	9.9764
1100	63.372	4257.5	4891.2	11.2287	12.674	4257.4	4891.1	10.4858	6.3370	4257.3	4890.9	10.1658
1200	67.987	4467.9	5147.8	11.4090	13.594	4467.8	5147.7	10.6662	6.7986	4467.7	5147.6	10.3462
1300	72.603	4683.7	5409.7	11.5810	14.521	4683.6	5409.6	10.8382	7.2603	4683.5	5409.5	10.5182

	P = 200 kPa (120.23ºC)				P = 300 kPa (133.55ºC)				P = 400 kPa (143.63ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.88573	2529.5	2706.6	7.1271	0.60582	2543.6	2725.3	6.9918	0.46426	2553.6	2738.5	6.8958
150	0.95964	2576.9	2768.8	7.2795	0.63388	2570.9	2761.0	7.0778	0.47078	2564.5	2752.8	6.9299
200	1.08034	2654.4	2870.5	7.5066	0.71629	2650.7	2865.5	7.3115	0.53422	2646.8	2860.5	7.1706
250	1.19880	2731.2	2971.0	7.7085	0.78964	2728.7	2967.6	7.5165	0.59512	2726.1	2964.2	7.3788
300	1.31616	2808.6	3071.8	7.8926	0.87529	2806.7	3069.3	7.7022	0.65484	2804.8	3066.7	7.5661
400	1.54930	2966.7	3276.5	8.2217	1.03151	2965.5	3275.0	8.0329	0.77262	2964.4	3273.4	7.8984
500	1.78139	3130.7	3487.0	8.5132	1.18669	3130.0	3486.0	8.3250	0.88934	3219.2	3484.9	8.1912
600	2.01297	3301.4	3704.0	8.7769	1.34140	3300.8	3703.2	8.5892	1.00555	3300.2	3702.4	8.4557
700	2.24426	3478.8	3927.7	9.0194	1.49573	3478.4	3927.1	8.8319	1.12147	3477.9	3926.5	8.6987
800	2.47539	3663.2	4158.3	9.2450	1.64994	3662.9	4157.8	9.0575	1.23722	3662.5	4157.4	8.9244
900	2.70643	3854.5	4395.8	9.4565	1.80460	3854.2	4395.4	9.2610	1.35288	3853.9	4395.1	9.1361
1000	2.93740	4052.5	4640.0	9.6563	1.95812	4052.3	4639.7	9.4689	1.46847	4052.0	4639.4	9.3360
1100	3.16834	4257.0	4890.7	9.8458	2.11214	4256.8	4890.4	9.6585	1.58404	4256.5	4890.1	9.5255
1200	3.39297	4467.5	5147.3	10.0262	2.26614	4467.2	5147.1	9.8389	1.69958	4467.0	5146.8	9.7059
1300	3.63018	4683.2	5409.3	10.1982	2.42013	4683.0	5409.0	10.0109	1.81511	4682.8	5408.8	9.8780

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 761, tabla A.1.3SI.

Tabla A.1.3 SI Vapor de Agua sobrecalentado.

	P = 500 kPa (151.86ºC)				P = 600 kPa (158.85ºC)				P = 800 kPa (170.43ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.37489	2561.2	2748.7	6.8212	0.31567	2567.4	2756.8	6.7600	0.24043	2576.8	2769.1	6.6627
200	0.42492	2642.9	2855.4	7.0592	0.35202	2638.9	2850.1	6.9665	0.26508	2630.6	2839.2	6.8158
250	0.47436	2723.5	2960.7	7.2708	0.39383	2720.9	2957.2	7.1816	0.29314	2715.5	2950.0	7.0384
300	0.52256	2802.9	3064.2	7.4598	0.43437	2801.0	3061.6	7.3723	0.32411	2797.1	3056.4	7.2327
350	0.57012	2882.6	3167.6	7.6328	0.47424	2881.1	3165.7	7.5463	0.35439	2878.2	3161.7	7.4088
400	0.61728	2963.2	3271.8	7.7937	0.51372	2962.0	3270.2	7.7078	0.38426	2959.7	3267.1	7.5715
500	0.71093	3128.4	3483.8	8.0872	0.59199	3127.6	3482.7	8.0020	0.44331	3125.9	3480.6	7.8672
600	0.80406	3299.6	3701.7	8.3521	0.66974	3299.1	3700.9	8.2673	0.50184	3297.9	3699.4	8.1332
700	0.89691	3477.5	3926.0	8.5952	0.74720	3477.1	3925.4	8.5107	0.56007	3476.2	3924.3	8.3730
800	0.98959	3662.2	4157.0	8.8211	0.82450	3661.8	4156.5	8.7367	0.61813	3661.1	4155.7	8.6033
900	1.08217	3853.6	4394.7	9.0329	0.90169	3853.3	4394.4	8.9485	0.67610	3852.8	4393.6	8.8153
1000	1.17469	4051.8	4639.1	9.2328	0.97883	4051.5	4638.8	9.1484	0.73401	4051.0	4638.2	9.0153
1100	1.26718	4256.3	4889.9	9.4224	1.05594	4256.1	4889.6	9.3381	0.79188	4255.6	4889.1	9.2049
1200	1.35964	4466.8	5146.6	9.6028	1.13302	4466.5	5146.3	9.5185	0.84974	4466.1	5145.8	9.3854
1300	1.45210	4682.5	5408.6	9.7749	1.21009	4682.3	5408.3	9.6906	0.90758	4681.8	5407.9	9.5575

	P = 1.00 MPa (179.91ºC)				P = 1.20 MPa (187.99ºC)				P = 1.40 MPa (195.07ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.19444	2583.6	2778.1	6.5864	0.16333	2588.8	2784.8	6.5233	0.14084	2592.8	2790.0	6.4692
200	0.20596	2621.9	2827.9	6.6939	0.16930	2612.7	2815.9	6.5898	0.14302	2603.1	2803.3	6.4975
250	0.23268	2709.9	2942.6	6.9246	0.19235	2704.2	2935.0	6.8293	0.16350	2698.3	2927.2	6.7467
300	0.25794	2793.2	3051.2	7.1228	0.21382	2789.2	3045.8	7.0316	0.18228	2785.2	3040.4	6.9533
350	0.28247	2875.2	3157.7	7.3010	0.23452	2872.2	3153.6	7.2120	0.20026	2869.1	3149.5	7.1359
400	0.30659	2957.3	3263.9	7.4650	0.25480	2954.9	3260.7	7.3773	0.21780	2952.5	3257.4	7.3025
500	0.35411	3124.3	3478.4	7.7621	0.29463	3122.7	3476.3	7.6758	0.25215	3121.1	3474.1	7.6026
600	0.40109	3296.8	3697.9	8.0289	0.33393	3295.6	3696.3	7.9434	0.28596	3294.4	3694.8	7.8710
700	0.44779	3475.4	3923.1	8.2731	0.37294	3474.5	3922.0	8.1881	0.31947	3473.6	3920.9	8.1160
800	0.49432	3660.5	4154.8	8.4996	0.41177	3659.8	4153.9	8.4149	0.35281	3659.1	4153.0	8.3431
900	0.54075	3852.2	4392.9	8.7118	0.45051	3851.6	4392.2	8.6272	0.38606	3851.0	4391.5	8.5555
1000	0.58712	4050.5	4637.6	8.9119	0.48919	4050.0	4637.0	8.8274	0.41924	4049.5	4636.4	8.7558
1100	0.63345	4255.1	4888.5	9.1016	0.52783	4254.6	4888.0	9.0171	0.45239	4254.1	4887.5	8.9456
1200	0.67977	4465.6	5145.4	9.2821	0.56646	4465.1	5144.9	9.1977	0.48552	4464.6	5144.4	9.1262
1300	0.72608	4681.3	5407.4	9.4542	0.60507	4680.9	5406.9	9.3698	0.51864	4680.4	5406.5	9.2983

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 762 - 763, tabla A.1.3SI.

Tabla A.1.3 SI Vapor de Agua sobrecalentado.

	P = 1.60 MPa (201.40ºC)				P = 1.80 MPa (207.15ºC)				P = 2.00 MPa (212.42ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.12380	2595.9	2794.0	6.4217	0.11042	2598.4	2797.1	6.3793	0.09963	2600.3	2799.5	6.3408
225	0.13287	2644.6	2857.2	6.5518	0.11673	2636.6	2846.7	6.4807	0.10377	2628.3	2835.8	6.4146
250	0.14184	2692.3	2919.2	6.6732	0.12497	2686.0	2911.0	6.6066	0.11144	2679.6	2902.5	6.5452
300	0.15862	2781.0	3034.8	6.8844	0.14021	2776.8	3029.2	6.8226	0.12547	2772.6	3023.5	6.7663
350	0.17456	2866.0	3145.4	7.0693	0.15457	2862.9	3141.2	7.0099	0.13857	2859.8	3137.0	6.9562
400	0.19005	2950.1	3254.2	7.2373	0.16847	2947.7	3250.9	7.1793	0.15120	2945.2	3247.6	7.1270
500	0.22029	3119.5	3471.9	7.5389	0.19550	3117.8	3469.7	7.4824	0.17568	3116.2	3467.6	7.4316
600	0.24998	3293.3	3693.2	7.8080	0.22199	3292.1	3691.7	7.7523	0.18996	3290.9	3690.1	7.7023
700	0.27937	3472.7	3919.7	8.0535	0.24818	3471.9	3918.6	7.9983	0.22323	3471.0	3917.5	7.9487
800	0.30859	3658.4	4152.1	8.2808	0.27420	3657.7	4151.3	8.2258	0.24668	3657.0	4150.4	8.1766
900	0.33772	3850.5	4390.8	8.4934	0.30012	3849.9	4390.1	8.4386	0.27004	3849.3	4389.4	8.3895
1000	0.36678	4049.0	4635.8	8.6938	0.32598	4048.4	4635.2	8.6390	0.29333	4047.9	4634.6	8.5900
1100	0.39581	4253.7	4887.0	8.8837	0.35180	4253.2	4886.4	8.8290	0.31659	4252.7	4885.9	8.7800
1200	0.42482	4464.2	5143.9	9.0642	0.37761	4463.7	5143.4	9.0096	0.33984	4463.2	5142.9	8.9606
1300	0.45382	4679.9	5406.0	9.2364	0.40340	4679.4	5405.6	9.1817	0.36306	4679.0	5405.1	9.1328

	P = 2.50 MPa (223.99ºC)				P = 3.00 MPa (233.90ºC)				P = 3.50 MPa (242.60ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.07998	2603.1	2803.1	6.2574	0.06668	2604.1	2804.1	6.1869	0.05707	2603.7	2803.4	6.1252
225	0.08027	2605.6	2806.3	6.2638	-	-	-	-	-	-	-	-
250	0.08700	2662.5	2880.1	6.4084	0.07058	2644.0	2855.8	6.2871	0.05873	2623.7	2829.2	6.1748
300	0.09890	2761.6	3008.8	6.6437	0.08114	2750.0	2993.5	6.5389	0.06842	2738.0	2977.5	6.4460
350	0.10976	2851.8	3126.2	6.8402	0.09053	2843.7	3115.3	6.7427	0.07378	2835.3	3104.0	6.6578
400	0.12010	2939.0	3239.3	7.0147	0.09936	2932.7	3230.8	6.9211	0.08453	2926.4	3222.2	6.8404
450	0.13014	3025.4	3350.8	7.1745	0.10787	3020.4	3344.0	7.0833	0.09196	3015.3	3337.2	7.0051
500	0.13998	3112.1	3462.0	7.3233	0.11619	3107.9	3456.5	7.2337	0.09918	3103.7	3450.9	7.1571
600	0.15930	3288.0	3686.2	7.5960	0.13243	3285.0	3682.3	7.5084	0.11324	3282.1	3678.4	7.4338
700	0.17832	3468.8	3914.6	7.4835	0.14838	3466.6	3911.7	7.7571	0.12699	3464.4	3908.8	7.6837
800	0.19716	3655.3	4148.2	8.0720	0.16414	3653.6	4146.0	7.9682	0.14056	3651.8	4143.8	7.9135
900	0.21590	3847.9	4387.6	8.2853	0.17980	3846.5	4385.9	8.1999	0.15402	3845.0	4384.1	8.1275
1000	0.23458	4046.7	4633.1	8.4860	0.19541	4045.4	4631.6	8.4009	0.16743	4044.1	4630.1	8.3288
1100	0.25322	4251.5	4884.6	8.6761	0.21098	4250.3	4883.3	8.5911	0.18080	4249.1	4881.9	8.5191
1200	0.27185	4462.1	5141.7	8.8569	0.22652	4460.9	5140.5	8.7719	0.19415	4459.8	5139.3	8.7000
1300	0.29046	4677.8	5404.0	9.0291	0.24206	4676.6	5402.8	8.9442	0.20749	4675.5	5401.7	8.8723

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 763 - 764, tabla A.1.3SI.

Tabla A.1.3 SI Vapor de Agua sobrecalentado.

	P = 4.00 MPa (250.40ºC)				P = 4.50 MPa (257.48ºC)				P = 5.00 MPa (263.99ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.04978	2602.3	2801.4	6.0700	0.04406	2600.0	2798.3	6.0198	0.03944	2597.1	2794.3	5.9733
275	0.05457	2667.9	2886.2	6.2284	0.04730	2650.3	2863.1	6.1401	0.04141	2631.2	2838.3	6.0543
300	0.05884	2725.3	2960.7	6.3614	0.05135	2712.0	2943.1	6.2827	0.04532	2697.9	2924.5	6.2083
350	0.06645	2826.6	3092.4	6.5820	0.05840	2817.8	3080.6	6.5130	0.05194	2808.7	3068.4	6.4492
400	0.07341	2919.9	3213.5	6.7689	0.06475	2913.3	3204.7	6.7046	0.05781	2906.6	3195.6	6.6458
450	0.08003	3010.1	3330.2	6.9632	0.07074	3004.9	3323.2	6.8745	0.06330	2999.6	3316.1	6.8185
500	0.08643	3099.5	3445.2	7.0900	0.07651	3095.2	3439.5	7.0300	0.06857	3090.0	3433.8	6.9758
600	0.09885	3279.1	3674.4	7.3688	0.08765	3276.0	3670.5	7.3109	0.07869	3273.0	3666.5	7.2588
700	0.11095	3462.1	3905.9	7.6298	0.09847	3459.9	3903.0	7.5631	0.08849	3457.7	3900.1	7.5122
800	0.12287	3650.1	4141.6	7.8502	0.10911	3648.4	4139.4	7.7942	0.09811	3646.6	4137.2	7.7440
900	0.13469	3843.6	4382.3	8.0647	0.11965	3842.1	4380.6	8.0091	0.10762	3840.7	4378.8	4.9593
1000	0.14645	4042.9	4628.7	8.2661	0.13013	4041.6	4627.2	8.2108	0.11707	4040.3	4625.7	8.1612
1100	0.15817	4248.0	4880.6	8.4566	0.14056	4246.8	4879.3	8.4014	0.12648	4245.6	4878.0	8.3519
1200	0.16987	4458.6	5138.1	8.6376	0.15098	4457.4	5136.9	8.5824	0.13587	4456.3	5135.7	8.5330
1300	0.18156	4674.3	5400.5	8.8099	0.16139	4673.1	4399.4	8.7548	0.14526	4672.0	5398.2	8.7055

	P = 6.00 MPa (275.64ºC)				P = 7.00 MPa (285.88ºC)				P = 8.00 MPa (295.06ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.03244	2589.7	2784.3	5.8891	0.02737	2580.5	2772.1	5.8132	0.02352	2569.8	2757.9	5.7431
300	0.03616	2667.2	2884.2	6.0673	0.02947	2632.1	2838.4	5.9304	0.02426	2590.9	2785.0	5.7905
350	0.04223	2789.6	3043.0	6.3334	0.03524	2769.3	3016.0	6.2282	0.02995	2747.7	2987.3	6.1300
400	0.04739	2892.8	3177.2	6.5407	0.03993	2878.6	3158.1	6.4477	0.03432	2863.8	3138.3	6.3633
450	0.05214	2988.9	3301.8	6.7192	0.04416	2977.9	3287.0	6.6326	0.03817	2966.7	3272.0	6.5550
500	0.05665	3082.2	3422.1	6.8802	0.04814	3073.3	3410.3	6.7974	0.04175	3064.3	3398.3	6.7239
550	0.06101	3174.6	3540.6	7.0287	0.05195	3167.2	3530.9	6.9486	0.04516	3159.8	3521.0	6.8778
600	0.06525	3266.9	3658.4	7.1676	0.05565	3260.7	3650.3	7.0894	0.04845	3254.4	3642.0	7.0205
700	0.07352	3453.2	3894.3	7.4234	0.06283	3448.6	3888.4	7.3476	0.05481	3444.0	3882.5	7.2812
800	0.08160	3643.1	4132.7	7.6566	0.06981	3639.6	4128.3	7.5822	0.06098	3636.1	4123.8	7.5173
900	0.08958	3837.8	4375.3	7.8727	0.07669	3835.0	4371.8	7.7991	0.06702	3832.1	4368.3	7.7350
1000	0.09749	4037.8	4622.7	8.0751	0.08350	4035.3	4619.8	8.0020	0.07301	4032.8	4616.9	7.9384
1100	0.10536	4243.3	4875.4	8.2661	0.09027	4240.9	4872.8	8.1933	0.07896	4238.6	4870.3	8.1299
1200	0.11321	4454.0	5133.3	8.4473	0.09703	4451.7	5130.9	8.3747	0.08489	4449.4	5128.5	8.3115
1300	0.12106	4669.6	5396.0	8.6199	0.10377	4667.3	5393.7	8.5472	0.09080	4665.0	5391.5	8.4842

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 764 - 765, tabla A.1.3SI.

Tabla A.1.3 SI Vapor de Agua sobrecalentado.

	P = 9.00 MPa (303.40ºC)				P = 10.00 MPa (311.06ºC)				P = 12.50 MPa (327.89ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.02048	2557.8	2742.1	5.6771	0.01803	2544.4	2724.7	5.6140	0.0135	2505.1	2673.8	5.4623
325	0.02327	2646.5	2855.9	5.8711	0.01986	2610.4	2809.0	5.7568	-	-	-	-
350	0.02580	2724.4	2956.5	6.0361	0.02242	2699.2	2923.4	5.9442	0.01613	2624.6	2826.2	5.7117
400	0.02993	2848.4	3117.8	6.2853	0.02641	2832.4	3096.5	6.2119	0.02000	2789.3	3039.3	6.0416
450	0.03350	2955.1	3256.6	6.4843	0.02975	2943.3	3240.8	6.4189	0.02299	2912.4	3199.8	6.2718
500	0.03677	3055.1	3386.1	6.6575	0.03279	3045.8	3373.6	6.5965	0.02560	3021.7	3341.7	6.4617
550	0.03987	3152.2	3511.0	6.8141	0.03564	3144.5	3500.9	6.7561	0.02801	3124.9	3475.1	6.6289
600	0.04285	3248.1	3633.7	6.9588	0.03837	3241.7	3625.3	6.9028	0.03029	3225.4	3604.0	6.7810
650	0.04574	3343.7	3755.3	7.0943	0.04101	3338.2	3748.3	7.0397	0.03248	3324.4	3730.4	6.9218
700	0.04857	3439.4	3876.5	7.2221	0.04358	3434.7	3870.5	7.1687	0.03460	3422.9	3855.4	7.0536
800	0.05409	3632.5	4119.4	7.4597	0.04859	3629.0	4114.9	7.4077	0.03869	3620.0	4103.7	7.2965
900	0.05950	3829.2	4364.7	7.6782	0.05349	3826.3	4361.2	7.6272	0.04267	3819.1	4352.5	7.5181
1000	0.06485	4030.3	4613.9	7.8821	0.05832	4027.8	4611.0	7.8315	0.04658	4021.6	4603.8	7.7237
1100	0.07016	4236.3	4867.7	8.0739	0.06312	4234.0	4865.1	8.0236	0.05045	4228.2	4858.8	7.9165
1200	0.07544	4447.2	5126.2	8.2556	0.06789	4444.9	5123.8	8.2054	0.05430	4439.3	5118.0	8.0987
1300	0.08072	4662.7	5389.2	8.4283	0.07265	4660.4	5387.0	8.3783	0.05813	4654.8	5381.4	8.2717

	P = 15 MPa (342.24ºC)				P = 17.5 MPa (354.75ºC)				P = 20 MPa (365.81ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.010338	2455.4	2610.5	5.3097	0.0079204	2390.2	2528.8	5.1418	0.0058342	2293.1	2409.7	4.9269
350	0.011470	2520.4	2692.4	5.4420	-	-	-	-	-	-	-	-
400	0.015649	2740.7	2975.4	5.8810	0.0124477	2685.0	2902.8	5.7212	0.0099423	2619.2	2818.1	5.5539
450	0.018446	2879.5	3156.2	6.1403	0.0151740	2844.2	3109.7	6.0183	0.0126953	2806.2	3060.1	5.9016
500	0.020800	2996.5	3308.5	6.3442	0.0173585	2970.3	3274.0	6.2382	0.0147683	2942.8	3238.2	6.1400
550	0.022927	3104.7	3448.6	6.5198	0.0192877	3083.8	3421.4	6.4229	0.0165553	3062.3	3393.5	6.3347
600	0.024911	3208.6	3582.3	6.6775	0.0210640	3191.5	3560.1	6.5866	0.0181781	3174.0	3537.6	6.5048
650	0.026797	3310.4	3712.3	6.8223	0.0227372	3296.0	3693.9	6.7356	0.0196929	3281.5	3675.3	6.6582
700	0.028612	3410.9	3840.1	6.9572	0.0243365	3398.8	3824.7	6.8736	0.0211311	3386.5	3809.1	6.7993
800	0.032096	3611.0	4082.4	7.2040	0.0273849	3601.9	4081.1	7.1245	0.0238532	3592.7	4069.8	7.0544
900	0.035457	3811.9	4343.8	7.4279	0.0303071	3804.7	4335.1	7.3507	0.0264463	3797.4	4326.4	7.2830
1000	0.038748	4015.4	4596.6	7.6347	0.0331580	4009.3	4589.5	7.5588	0.0289666	4003.1	4582.5	7.4925
1100	0.042001	4222.6	4852.6	7.8282	0.0359695	4216.9	4846.4	7.7530	0.0314471	4211.3	4840.2	7.6874
1200	0.045233	4433.8	5112.3	8.0108	0.0387605	4428.3	5106.6	7.9359	0.0339071	4422.8	5101.0	7.8706
1300	0.048455	4649.1	5375.9	8.1839	0.0415417	4643.5	5370.5	8.1093	0.0363574	4638.0	5365.1	8.0401

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 765 - 766, tabla A.1.3SI.

Tabla A.1.3 SI Vapor de Agua sobrecalentado.

	P = 25 MPa				P = 30 MPa				P = 35 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
375	0.001973	1798.6	1847.9	4.0319	0.001789	1737.8	1791.4	3.9303	0.001700	1702.9	1762.4	3.8721
400	0.006004	2430.1	2580.2	5.1418	0.002790	2067.3	2151.0	4.4728	0.002100	1914.0	1987.5	4.2124
425	0.007882	2609.2	2806.3	5.4722	0.005304	2455.1	2614.2	5.1503	0.003428	2253.4	2373.4	4.7747
450	0.009162	2720.7	2949.7	5.6743	0.006735	2619.3	2821.4	5.4423	0.004962	2498.7	2672.4	5.1962
500	0.011124	2884.3	3162.4	5.9592	0.008679	2820.7	3081.0	5.7904	0.006927	2751.9	2994.3	5.6281
550	0.012724	3017.5	3335.6	6.1764	0.010168	2970.3	3275.4	6.0342	0.008345	2920.9	3213.0	5.9025
600	0.014138	3137.9	3491.4	6.3602	0.011446	3100.5	3443.9	6.2330	0.009527	3062.0	3395.5	6.1178
650	0.015433	3251.6	3637.5	6.5229	0.012596	3221.0	3598.9	6.4057	0.010575	3189.8	3559.9	6.3010
700	0.016647	3361.4	3777.6	6.6707	0.013661	3335.8	3745.7	6.5606	0.011533	3309.9	3713.5	6.4631
800	0.018913	3574.3	4047.1	6.9345	0.015623	3555.6	4024.3	6.8332	0.013278	3536.8	4001.5	6.7450
900	0.021045	3873.0	4309.1	7.1679	0.017448	3768.5	4291.9	7.0717	0.014883	3754.0	4274.9	6.9886
1000	0.023102	3990.9	4568.5	7.3801	0.019196	3978.8	4554.7	7.2687	0.016410	3966.7	4541.1	7.2063
1100	0.025119	4200.2	4828.2	7.5765	0.020903	4189.2	4816.3	7.4845	0.017895	4178.3	4804.6	7.4056
1200	0.027115	4412.0	5089.9	7.7604	0.022589	4401.3	5079.0	7.6691	0.019360	4390.7	5068.4	7.5910
1300	0.029101	4626.9	5354.4	7.9342	0.024266	4616.0	5344.0	7.8432	0.020815	4605.1	5333.6	7.7652

	P = 40 MPa				P = 50 MPa				P = 60 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
375	0.0016406	1677.1	1742.7	3.8289	0.0015593	1638.6	1716.5	3.7638	0.0015027	1609.3	1699.5	3.7140
400	0.0019077	1854.5	1930.8	4.1134	0.0017309	1788.0	1874.6	4.0030	0.0016335	1745.3	1843.4	3.9317
425	0.0025319	2096.8	2198.1	4.5028	0.0020071	1959.6	2060.0	4.2733	0.0018165	1892.7	2001.7	4.1625
450	0.0036931	2365.1	2512.8	4.9459	0.0024862	2159.6	2283.9	4.5883	0.0020850	2053.9	2179.0	4.4119
500	0.0056225	2678.4	2903.3	5.4966	0.0038924	2525.5	2720.1	5.1725	0.0029557	2390.5	2567.9	4.9320
550	0.0069840	2689.7	3149.1	5.7785	0.0051180	2763.6	3019.5	5.5485	0.0039560	2658.8	2896.2	5.3441
600	0.0080943	3022.6	3346.4	6.0113	0.0061123	2942.0	3247.6	5.8177	0.0048345	2861.1	3151.2	5.6451
650	0.0090636	3158.0	3520.6	6.2054	0.0069657	3093.6	3441.8	6.0342	0.0055953	3028.8	3364.6	5.8829
700	0.0099415	3283.6	3681.3	6.3750	0.0077274	3230.5	3616.9	6.2189	0.0062719	3177.3	3553.6	6.0824
800	0.0115228	3517.9	3978.8	6.6662	0.0090761	3479.8	3933.6	6.5290	0.0074588	3441.6	3889.1	6.4110
900	0.0129626	3739.4	4257.9	6.9150	0.0102831	3710.3	4224.4	6.7882	0.0085083	3681.0	4191.5	6.6805
1000	0.0143238	3954.6	4527.6	7.1356	0.0114113	3930.5	4501.1	7.0146	0.0094800	3906.4	4475.2	6.9126
1100	0.0156426	4167.4	4793.1	7.3364	0.0124966	4145.7	4770.6	7.2183	0.0104091	4124.1	4748.6	7.1194
1200	0.0169403	4380.1	5057.7	7.5224	0.0135606	4359.1	5037.2	7.4058	0.0113167	4338.2	5017.2	7.3082
1300	0.0182292	4594.3	5323.5	7.6969	0.0146159	4572.8	5303.6	7.5807	0.0122155	4551.4	5284.3	7.4837

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 766 - 767, tabla A.1.3SI.

Tabla A.1.4 SI Agua líquida comprimida.

	P = 5.00 MPa (263.99ºC)				P = 10.00 MPa (311.06ºC)				P = 15.00 MPa (342.24ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.0012859	1147.78	1154.21	2.9201	0.0014524	1393.00	1407.53	3.3595	0.0016581	1585.6	1610.45	3.6847
0	0.0009977	0.03	5.02	0.0001	0.0009952	0.10	10.05	0.0003	0.0009928	0.15	15.04	0.0004
20	0.0009995	83.64	88.64	0.2955	0.0009972	83.35	93.32	0.2945	0.0009950	83.05	97.97	0.2934
40	0.0010056	166.93	171.95	0.5705	0.0010034	166.33	176.36	0.5685	0.0010013	165.73	180.75	0.5665
60	0.0010149	250.21	255.28	0.8284	0.0010127	249.34	259.47	0.8258	0.0010105	248.49	263.65	0.8231
80	0.0010268	333.69	338.83	1.0719	0.0010245	332.56	342.81	1.0687	0.0010222	331.46	346.79	1.0655
100	0.0010410	417.50	422.71	1.3603	0.0010385	416.09	426.48	1.2992	0.0010361	414.72	430.26	1.2954
120	0.0010576	501.79	507.07	1.5232	0.0010549	500.07	510.61	1.5188	0.0010522	498.39	514.17	1.5144
140	0.0010768	586.74	592.13	1.7342	0.0010737	584.67	595.40	1.7291	0.0010707	582.64	598.70	1.7241
160	0.0010988	672.61	678.10	1.9374	0.0010953	670.11	681.07	1.9316	0.0010918	667.69	684.07	1.9259
180	0.0011240	759.62	765.24	2.1341	0.0011199	756.63	767.83	2.1274	0.0011159	753.74	770.48	2.1209
200	0.0011530	848.08	853.85	2.3254	0.0011480	844.49	855.97	2.3178	0.0011433	841.04	858.18	2.3103
220	0.0011866	938.43	944.36	2.5128	0.0011805	934.07	945.88	2.5038	0.0011748	929.89	947.52	2.4952
240	0.0012264	1031.34	1037.47	2.6978	0.0012187	1025.94	1038.13	2.6872	0.0012114	1020.82	1038.99	2.6770
260	0.0012748	1127.92	1134.30	2.8829	0.0012645	1121.03	1333.68	2.8698	0.0012550	1114.59	1133.41	2.8575
280	-	-	-	-	0.0013216	1220.90	1234.11	3.0547	0.0013084	1212.47	1232.09	3.0392
300	-	-	-	-	0.0013972	1328.34	1342.31	3.2468	0.0013770	1316.58	1337.23	3.2259
320	-	-	-	-	-	-	-	-	0.0014724	1431.05	1453.13	3.4246
340	-	-	-	-	-	-	-	-	0.0016311	1567.42	1591.88	3.6545

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 767 - 768, tabla A.1.4SI.

Tabla A.1.4 SI Agua líquida comprimida.

	P = 20 MPa (365.81ºC)				P = 30 MPa				P = 40 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat.	0.0020353	1785.47	1826.18	4.0137	-	-	-	-	-	-	-	-
0	0.0009904	0.20	20.00	0.0004	0.0009856	0.25	29.82	0.0001	0.0009766	0.20	49.03	-0.0014
20	0.0009928	82.75	102.61	0.2922	0.0009886	82.16	111.82	0.2898	0.0009804	80.98	130.00	0.2847
40	0.0009992	165.15	185.14	0.5646	0.0009951	164.01	193.87	0.5606	0.0009872	161.84	211.20	0.5526
60	0.0010084	347.66	267.82	0.8205	0.0010042	246.03	276.16	0.8153	0.0009962	242.96	292.77	0.8051
80	0.0010199	330.38	350.78	1.0623	0.0010156	328.28	358.75	1.0561	0.0010073	324.32	374.68	1.0439
100	0.0010337	413.37	434.04	1.2917	0.0010290	410.76	441.63	1.2844	0.0010201	405.86	456.87	1.2703
120	0.0010496	496.75	517.74	1.5101	0.0010445	493.58	524.91	1.5017	0.0010348	487.63	539.37	1.4857
140	0.0010678	580.67	602.03	1.7192	0.0010621	576.86	608.73	1.7097	0.0010515	569.76	622.33	1.6915
160	0.0010885	665.34	687.11	1.9203	0.0010821	660.81	693.27	1.9095	0.0010703	652.39	705.91	1.8890
180	0.0011120	750.94	773.18	2.1146	0.0011047	745.57	778.71	2.1024	0.0010912	735.68	790.24	2.0793
200	0.0011387	837.70	860.47	2.3031	0.0011302	831.34	865.24	2.2892	0.0011146	819.73	875.46	2.2634
220	0.0011693	925.89	949.27	2.4869	0.0011590	918.32	953.09	2.4710	0.0011408	904.67	961.71	2.4419
240	0.0012046	1015.94	1040.04	2.6673	0.0011920	1006.84	1042.60	2.6489	0.0011702	990.69	1049.20	2.6158
260	0.0012462	1108.53	1133.45	2.8459	0.0012303	1097.38	1134.29	2.8242	0.0012034	1078.06	1138.23	2.7860
280	0.0012965	1204.69	1230.62	3.0248	0.0012755	1190.69	1228.96	2.9985	0.0012415	1167.19	1229.26	2.9536
300	0.0013596	1306.10	1333.29	3.2071	0.0013304	1287.89	1327.80	3.1740	0.0012860	1258.66	1322.95	3.1200
320	0.0014437	1415.66	1444.53	3.3978	0.0013997	1390.64	1432.63	3.3538	0.0013388	1353.23	1420.17	3.2867
340	0.0015683	1539.64	1571.01	3.6074	0.0014919	1501.71	1546.47	3.5425	0.0014032	1451.91	1522.07	3.4556
360	0.0018226	1702.78	1739.23	3.8770	0.0016265	1626.57	1675.36	3.7492	0.0014838	1555.97	1630.16	3.6290
380	-	-	-	-	0.0018691	1781.35	1837.43	4.0010	0.0015883	1667.13	1746.54	3.8100

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 768, tabla A.1.4SI.

Tabla A.1.5 SI Agua sólido saturado - vapor saturado.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión kPa, P	Sólido saturado v_i	Evap v_{fg}	Vapor saturado v_g	Sólido saturado u_i	Evap u_{fg}	Vapor saturado u_g	Sólido saturado h_i	Evap h_{fg}	Vapor saturado h_g	Sólido saturado s_i	Evap s_{fg}	Vapor saturado s_g
0.01	0.6113	0.0010908	206.152	206.153	-333.40	2708.70	2375.3	-333.40	2834.70	2501.3	-1.2210	10.3772	9.1562
0	0.6108	0.0010908	206.314	206.315	-333.42	2708.72	2375.3	-333.42	2834.72	2501.3	-1.2211	10.3776	9.1565
-2	0.5177	0.0010905	241.662	241.663	-337.61	2710.11	2372.5	-337.61	2835.21	2497.6	-1.2369	10.4562	9.2193
-4	0.4376	0.0010901	283.798	283.799	-341.78	2711.58	2369.8	-341.78	2835.78	2494.0	-1.3526	10.6358	9.2832
-6	0.3689	0.0010898	334.138	334.139	-345.91	2712.91	2367.0	-345.91	2836.21	2490.3	-1.2683	10.6165	9.3482
-8	0.3102	0.0010894	394.413	394.414	-350.02	2714.22	2364.2	-350.02	2836.62	2486.6	-1.2839	10.6982	9.4143
-10	0.2601	0.0010891	466.756	466.757	-354.09	2715.49	2361.4	-354.09	2836.99	2482.9	-1.2995	10.7810	9.4815
-12	0.2176	0.0010888	553.802	553.803	-358.14	2716.84	2358.7	-358.14	2837.34	2479.2	-1.3150	10.8648	9.5498
-14	0.1815	0.0010884	658.823	658.824	-362.16	2718.06	2355.9	-362.16	2837.66	2475.5	-1.3306	10.9498	9.6192
-16	0.1540	0.0010881	785.906	785.907	-366.14	2719.24	2353.1	-366.14	2837.94	2471.8	-1.3461	11.0359	9.6898
-18	0.1252	0.0010878	940.182	940.183	-370.10	2720.40	2350.3	-370.10	2838.20	2468.1	-1.3617	11.1233	9.7616
-20	0.10355	0.0010874	1128.112	1128.113	-374.03	2721.53	2347.5	-374.03	2838.33	2464.3	-1.3772	11.2120	9.8348
-22	0.08535	0.0010871	1357.863	1357.864	-377.93	2722.63	2344.7	-377.93	2838.53	2460.6	-1.3829	11.2922	9.9093
-24	0.07012	0.0010868	1639.752	1639.753	-381.80	2723.80	2342.0	-381.80	2838.70	2456.9	-1.4083	11.3935	9.9852
-26	0.05741	0.0010864	1986.775	1986.776	-385.64	2724.84	2339.2	-385.64	2838.84	2453.2	-1.4239	11.4864	10.0625
-28	0.04684	0.0010861	2415.200	2415.201	-389.45	2725.85	2336.4	-389.45	2838.95	2449.5	-1.4394	11.5807	10.1413
-30	0.03810	0.0010858	2945.227	2945.228	-393.23	2726.83	2333.6	-393.23	2839.03	2445.8	-1.4550	11.6765	10.2215
-32	0.03090	0.0010854	3601.822	3601.823	-396.98	2727.78	2330.8	-396.98	2839.08	2442.1	-1.4705	11.7733	10.3028
-34	0.02499	0.0010851	4416.252	4416.253	-400.71	2728.71	2328.0	-400.71	2839.11	2438.4	-1.4860	11.8713	10.3853
-36	0.02016	0.0010848	5430.115	5430.116	-404.40	2729.60	2325.2	-404.40	2839.10	2434.7	-1.5014	11.9704	10.4690
-38	0.01618	0.0010844	6707.021	6707.022	-408.06	2730.46	2322.4	-408.06	2839.06	2431.0	-1.5168	12.0714	10.5546
-40	0.01286	0.0010841	8366.395	8366.396	-411.70	2731.30	2319.6	-411.70	2838.90	2427.2	-1.5321	12.1768	10.6447

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 769, tabla A.1.5SI.

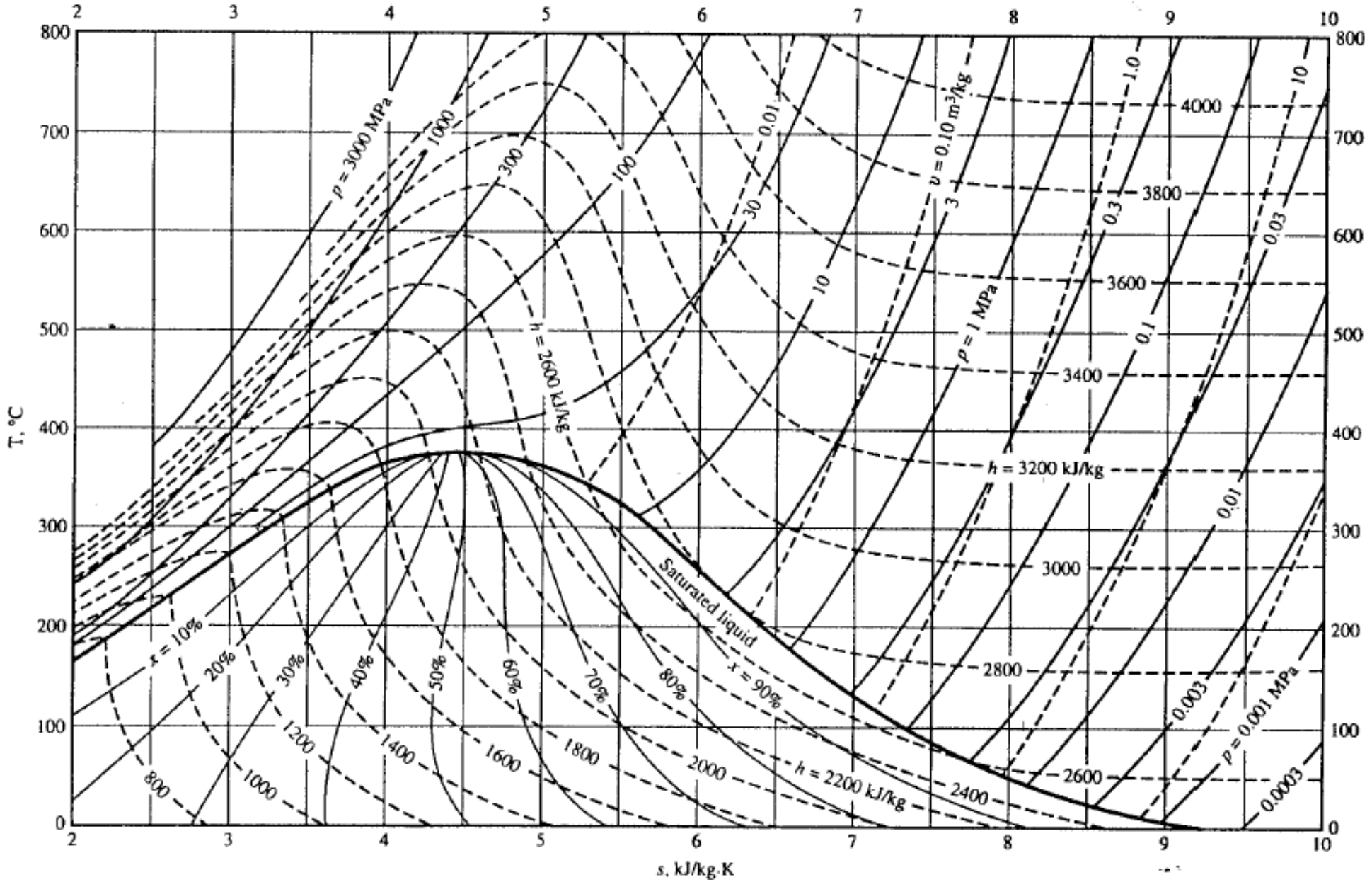

Figura 1. Diagrama Temperatura – Entropia para el **Agua**. (Fuente: Jones, J.B. and Dugan, R.E. 1996. Engineering Thermodynamics, Prentice-Hall, Englewood Cliffs, NJ, basado en datos y formulas de Haar, L., Gallagher, J.S., and Kell, G.S. 1984. NBS/NRC Steam Tables. Hemisphere, Washington, D.C.)

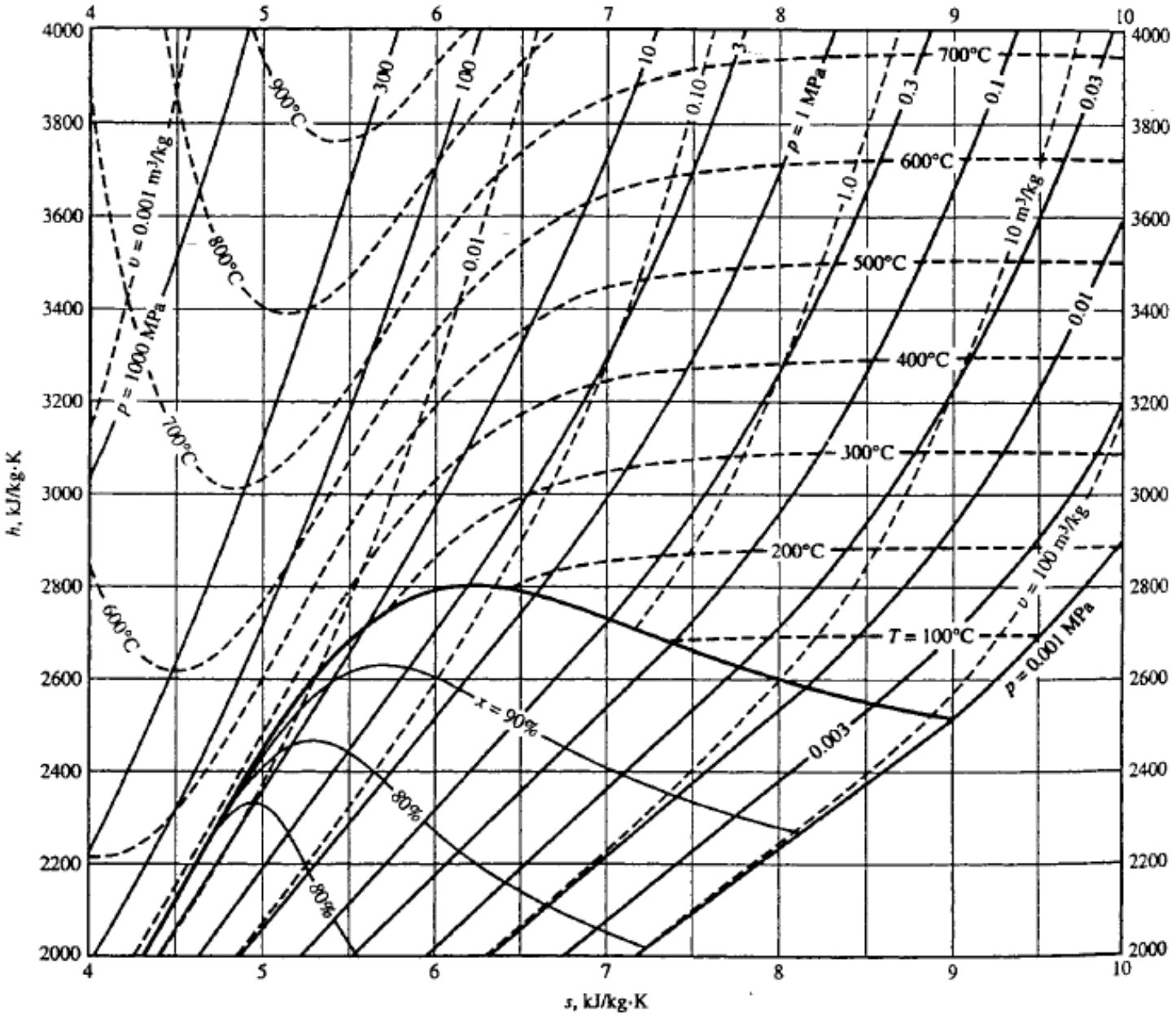

Figura 2. Diagrama Entalpía – Entropia (Mollier) para el Agua. (*Fuente:* Jones, J.B. and Dugan, R.E. 1996. *Engineering Thermodynamics*, Prentice-Hall, Englewood Cliffs, NJ, basado en datos y formulas de Haar, L., Gallagher, J.S., and Kell, G.S. 1984. *NBS/NRC Steam Tables.* Hemisphere, Washington, D.C.)

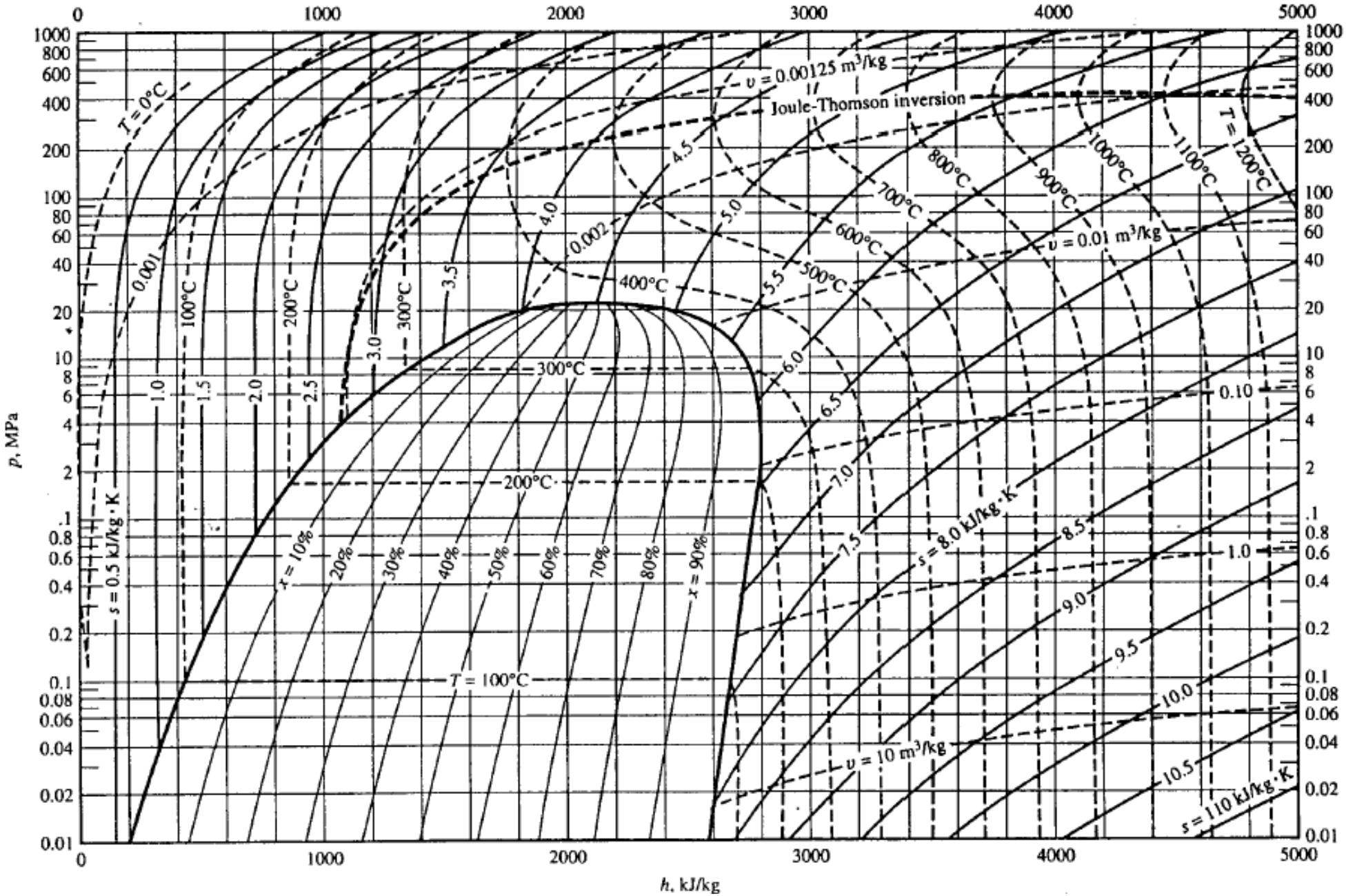

Figura 3. Diagrama Presión – Entalpía para el Agua. (*Fuente:* Jones, J.B. and Dugan, R.E. 1996. *Engineering Thermodynamics*, Prentice-Hall, Englewood Cliffs, NJ, basado en datos y formulas de Haar, L., Gallagher, J.S., and Kell, G.S. 1984. *NBS/NRC Steam Tables.* Hemisphere, Washington, D.C.)

Tabla A.2 SI Propiedades termodinámicas del Amoniaco.
Tabla A.2.1 SI Amoniaco saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión kPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
-50	40.86	0.001424	2.62525	2.62667	-43.82	1309.06	1265.24	-43.76	1416.33	1372.57	-0.1916	6.3469	6.1553
-48	45.94	0.001429	2.35297	2.35440	-35.11	1302.84	1267.74	-35.04	1410.94	1375.90	-0.1528	6.2667	6.1139
-46	51.52	0.001434	2.11360	2.11503	-26.38	1296.61	1270.22	-26.31	1405.50	1379.19	-0.1142	6.1875	6.0733
-44	57.66	0.001439	1.90262	1.90406	-17.64	1290.29	1272.65	-17.56	1400.00	1382.44	-0.0759	6.1095	6.0336
-42	64.38	0.001444	1.71625	1.71769	-8.85	1283.92	1275.07	-8.76	1394.41	1385.65	-0.0378	6.0326	5.9948
-40	**71.72**	**0.001450**	**1.55124**	**1.55269**	**-0.10**	**1277.57**	**1277.46**	**0**	**1388.82**	**1388.82**	**0**	**5.9568**	**5.9568**
-38	79.74	0.001455	1.40482	1.40627	8.69	1271.11	1279.80	8.81	1383.13	1391.94	0.0376	5.8820	5.9196
-36	88.48	0.001460	1.27461	1.27607	17.51	1264.61	1282.12	17.64	1377.39	1395.03	0.0749	5.8082	5.8831
-34	97.98	0.001465	1.15858	1.16004	26.35	1258.06	1284.41	26.49	1371.58	1398.07	0.1120	5.7353	5.8473
-32	108.29	0.001471	1.05496	1.05643	35.20	1251.46	1286.66	35.36	1365.70	1401.06	0.1489	5.6634	5.8123
-30	119.46	0.001476	0.96226	0.96374	44.08	1244.80	1288.88	44.26	1359.75	1404.01	0.1856	5.5924	5.7780
-28	131.54	0.001482	0.87916	0.88064	52.98	1238.11	1291.08	53.17	1353.75	1406.92	0.2220	5.5223	5.7443
-26	144.59	0.001487	0.80453	0.80602	61.89	1231.33	1293.23	62.11	1347.66	1409.77	0.2583	5.4530	5.7113
-24	158.65	0.001493	0.73738	0.73887	70.83	1224.53	1295.36	71.07	1341.51	1412.58	0.2942	5.3846	5.6788
-22	173.80	0.001498	0.67685	0.67835	79.79	1217.65	1297.44	80.05	1335.29	1415.34	0.3301	5.3169	5.6470
-20	190.08	0.001504	0.62221	0.62371	88.76	1210.73	1299.50	89.05	1329.00	1418.05	0.3657	5.2501	5.6158
-18	207.56	0.001510	0.57277	0.57428	97.77	1203.75	1301.51	98.08	1322.63	1420.71	0.4011	5.1840	5.5851
-16	226.29	0.001516	0.52799	0.52951	106.78	1196.72	1303.50	107.12	1316.20	1423.32	0.4363	5.1187	5.5550
-14	246.35	0.001522	0.48737	0.48889	115.82	1189.63	1305.44	116.19	1309.69	1425.88	0.4713	5.0541	5.5254
-12	267.79	0.001528	0.45044	0.45197	124.88	1182.47	1307.35	125.29	1303.09	1428.38	0.5061	4.9902	5.4963
-10	290.67	0.001534	0.41684	0.41837	133.96	1175.26	1309.22	134.41	1296.42	1430.83	0.5408	4.9268	5.4676
-8	315.08	0.001540	0.38621	0.38775	143.06	1167.98	1311.05	143.55	1289.67	1433.22	0.5753	4.8642	5.4395
-6	341.07	0.001546	0.35824	0.35979	152.19	1160.65	1312.85	152.72	1282.84	1435.56	0.6095	4.8023	5.4118
-4	368.72	0.001553	0.33268	0.33423	161.34	1153.27	1314.60	161.91	1275.93	1437.84	0.6437	4.7409	5.3846
-2	398.10	0.001559	0.30928	0.31084	170.50	1145.82	1316.31	171.12	1268.94	1440.06	0.6776	4.6801	5.3577
0	429.29	0.001566	0.28783	0.28940	179.69	1138.30	1317.98	180.36	1261.86	1442.22	0.7114	4.6199	5.3313
2	462.34	0.001573	0.26815	0.26972	188.90	1130.71	1319.62	189.63	1254.69	1444.32	0.7450	4.5603	5.3053
4	497.35	0.001579	0.25005	0.25163	198.14	1123.06	1321.20	198.93	1247.42	1446.35	0.7785	4.5011	5.2796

Tabla A.2.1 SI Amoniaco saturado: Tabla de temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión kPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
6	534.39	0.001586	0.23340	0.23499	207.40	1115.34	1322.74	208.25	1240.07	1448.32	0.8118	4.4425	5.2543
8	573.54	0.001593	0.21807	0.21966	216.69	1107.56	1324.25	217.60	1232.63	1450.23	0.8449	4.3845	5.2294
10	614.87	0.001600	0.20393	0.20553	225.99	1099.71	1325.70	226.97	1225.10	1452.07	0.8779	4.3269	5.2048
12	658.48	0.001608	0.19086	0.19247	235.32	1091.78	1327.10	236.38	1217.46	1453.84	0.9108	4.2697	5.1805
14	704.43	0.001615	0.17879	0.18040	244.67	1083.78	1328.45	245.81	1209.72	1455.53	0.9435	4.2130	5.1565
16	752.81	0.001623	0.16761	0.16923	254.06	1075.70	1329.76	255.28	1201.88	1457.16	0.9760	4.1568	5.1328
18	803.71	0.001630	0.15725	0.15888	263.46	1067.56	1331.02	264.77	1193.94	1458.71	1.0085	4.1009	5.1094
20	857.22	0.001638	0.14764	0.14928	272.90	1059.32	1332.21	274.30	1185.88	1460.18	1.0408	4.0455	5.0863
22	913.41	0.001646	0.13872	0.14037	282.35	1051.02	1333.36	283.85	1177.73	1461.58	1.0730	3.9904	5.0634
24	972.38	0.001654	0.13043	0.13208	291.83	1042.63	1334.46	293.44	1169.45	1462.89	1.1050	3.9357	5.0407
26	1034.21	0.001663	0.12272	0.12438	301.35	1034.14	1335.49	303.07	1161.06	1464.13	1.1370	3.8812	5.0182
28	1099.00	0.001671	0.11553	0.11720	310.88	1025.58	1336.47	312.72	1152.55	1465.27	1.1688	3.8272	4.9960
30	1166.83	0.001680	0.10883	0.11051	320.46	1016.92	1337.38	322.42	1143.91	1466.33	1.2005	3.7735	4.9740
32	1237.80	0.001688	0.10258	0.10427	330.05	1008.18	1338.23	332.14	1135.16	1467.30	1.2321	3.7200	4.9521
34	1312.00	0.001697	0.09675	0.09845	339.68	999.32	1339.00	341.91	1126.26	1468.17	1.2635	3.6669	4.9304
36	1389.52	0.001707	0.09129	0.09300	349.34	990.42	1339.75	351.71	1117.27	1468.98	1.2949	3.6140	4.9089
38	1470.46	0.001716	0.08618	0.08790	359.03	981.36	1340.39	361.55	1108.09	1469.64	1.3262	3.5613	4.8875
40	1554.92	0.001725	0.08141	0.08313	368.75	972.21	1340.96	371.43	1098.79	1470.22	1.3574	3.5088	4.8662
42	1642.98	0.001735	0.07693	0.07866	378.50	962.95	1341.45	381.35	1089.34	1470.69	1.3885	3.4566	4.8451
44	1734.75	0.001745	0.07273	0.07447	388.28	953.59	1341.87	391.31	1079.75	1471.06	1.4195	3.4045	4.8240
46	1830.33	0.001755	0.06878	0.07053	398.11	944.12	1342.23	401.32	1070.00	1471.32	1.4504	3.3526	4.8030
48	1929.82	0.001766	0.06507	0.06684	407.97	934.50	1342.47	411.38	1060.08	1471.46	1.4813	3.3009	4.7822
50	2033.32	0.001777	0.06158	0.06336	417.87	924.79	1342.66	421.48	1050.01	1471.49	1.5121	3.2492	4.7613

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 770 - 771, tabla A.1.2.1SI.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía del líquido saturado.

Tabla A.2.2 SI Amoniaco saturado: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión MPa, P	Temp.ºC T	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
0.04	-50.36	0.0014236	2.67808	2.6795	-45.52	1310.06	1264.54	-45.46	1417.18	1371.72	-0.1992	6.3610	6.1618
0.05	-46.53	0.0014330	2.17377	2.1752	-28.73	1298.04	1269.31	-28.66	1406.73	1378.07	-0.1245	6.2074	6.0829
0.06	-43.28	0.0014410	1.83306	1.8345	-14.51	1287.78	1273.27	-14.42	1397.76	1383.34	-0.0622	6.0808	6.0186
0.07	-40.46	0.0014482	1.58695	1.5884	-2.11	1278.77	1276.66	-2.01	1389.85	1387.84	-0.0086	5.9729	5.9643
0.08	-37.94	0.0014546	1.40055	1.4020	8.93	1270.68	1279.61	9.04	1382.74	1391.78	0.0386	5.9088	5.9474
0.09	-35.67	0.0014605	1.25444	1.2559	18.91	1263.33	1282.24	19.04	1376.23	1395.27	0.0808	5.7952	5.8760
0.10	-33.60	0.0014660	1.13663	1.1381	28.03	1256.58	1284.61	28.18	1370.23	1398.41	0.1191	5.7200	5.8391
0.125	-29.07	0.0014782	0.92222	0.9237	48.03	1241.62	1289.65	48.22	1356.89	1405.11	0.2018	5.5592	5.7610
0.150	-25.22	0.0014889	0.77721	0.7787	65.10	1228.70	1293.80	65.32	1345.29	1410.61	0.2712	5.4081	5.6793
0.175	-21.86	0.0014984	0.67250	0.6740	80.08	1217.25	1297.33	80.35	1334.92	1415.27	0.3312	5.3123	5.6435
0.200	-18.86	0.0015071	0.59309	0.5946	93.50	1206.89	1300.39	93.80	1325.51	1419.31	0.3843	5.2126	5.5969
0.225	-16.15	0.0015151	0.53078	0.5323	105.68	1197.40	1303.08	106.03	1316.83	1422.86	0.4319	5.1239	5.5558
0.250	-13.67	0.0015225	0.48058	0.4821	116.88	1188.61	1305.49	117.26	1308.77	1426.03	0.4753	5.0437	5.5190
0.275	-11.37	0.0015295	0.43927	0.4408	127.26	1180.41	1307.67	127.68	1301.20	1428.88	0.5152	4.9706	5.4858
0.300	-9.24	0.0015361	0.40456	0.4061	136.96	1172.69	1309.65	137.42	1294.05	1431.47	0.5520	4.9034	5.4554
0.325	-7.24	0.0015424	0.37496	0.3765	146.06	1165.40	1311.46	146.57	1287.27	1433.84	0.5864	4.8411	5.4275
0.350	-5.36	0.0015484	0.34955	0.3511	154.66	1158.48	1313.14	155.20	1280.81	1436.01	0.6186	4.7830	5.4016
0.375	-3.58	0.0015542	0.32735	0.3289	162.80	1151.88	1314.68	163.38	1274.65	1438.03	0.6489	4.7285	5.3774
0.400	-1.90	0.0015597	0.30784	0.3094	170.55	1145.57	1316.12	171.18	1268.71	1439.89	0.6776	4.6772	5.3548
0.425	-0.29	0.0015650	0.29054	0.2921	177.96	1139.51	1317.47	178.62	1263.01	1441.63	0.7048	4.6288	5.3336
0.450	1.25	0.0015702	0.27513	0.2767	185.04	1133.69	1318.73	185.75	1257.50	1443.25	0.7308	4.5827	5.3135
0.475	2.72	0.0015752	0.26132	0.2629	191.84	1128.07	1319.91	192.59	1252.18	1444.77	0.7555	4.5391	5.2946
0.500	4.13	0.0015800	0.24872	0.2503	198.37	1122.65	1321.02	199.18	1247.01	1446.19	0.7791	4.4974	5.2765
0.525	5.48	0.0015847	0.23742	0.2390	204.69	1117.38	1322.07	205.52	1242.01	1447.53	0.8018	4.4576	5.2594
0.550	6.79	0.0015893	0.22701	0.2286	210.78	1112.28	1323.06	211.65	1237.15	1448.80	0.8236	4.4194	5.2430
0.575	8.05	0.0015938	0.21751	0.2191	216.66	1107.34	1324.00	217.58	1232.41	1449.99	0.8446	4.3827	5.2273
0.60	9.27	0.0015982	0.20880	0.2104	222.37	1102.52	1324.89	223.32	1227.80	1451.12	0.8649	4.3473	5.2122
0.70	13.79	0.0016148	0.17989	0.1815	243.56	1084.48	1328.04	244.69	1210.38	1455.07	0.9394	4.2182	5.1576
0.80	17.84	0.0016302	0.15797	0.1596	262.64	1068.00	1330.64	263.95	1194.35	1458.30	1.0054	4.1045	5.1099

Tabla A.2.2 SI Amoniaco saturado: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión MPa, P	Temp.ºC T	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
0.90	21.52	0.0016446	0.14076	0.1424	280.05	1052.77	1332.82	281.53	1179.44	1460.97	1.0649	4.0026	5.0675
1.00	24.89	0.0016584	0.12684	0.1285	296.10	1038.56	1334.66	297.76	1165.42	1463.18	1.1191	3.9103	5.0294
1.20	30.94	0.0016841	0.10582	0.1075	324.99	1012.53	1337.52	327.01	1139.52	1466.53	1.2152	3.7472	4.9624
1.40	36.26	0.0017080	0.09059	0.0923	350.58	988.98	1339.56	352.97	1115.82	1468.79	1.2987	3.6063	4.9050
1.60	41.03	0.0017306	0.07907	0.0808	373.69	967.28	1340.97	376.46	1093.77	1470.23	1.3729	3.4813	4.8542
1.80	45.38	0.0017522	0.06995	0.0717	394.85	947.03	1341.88	398.00	1073.01	1471.01	1.4399	3.3687	4.8086
2.00	49.37	0.0017731	0.06263	0.0644	414.44	927.93	1342.37	417.99	1053.27	1471.26	1.5012	3.2658	4.7670

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 832, tabla A.14.

Tabla A.2.3 SI Amoniaco sobrecalentado.

	P = 50 kPa (-46.53ºC)				P = 75 kPa (-39.16ºC)				P = 100 kPa (-33.59ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
-20	2.4463	1312.3	1434.6	6.3187	1.6222	1310.0	1431.7	6.1120	1.2101	1307.8	1428.8	5.9626
-10	2.5471	1328.3	1455.7	6.4006	1.6905	1326.5	1453.3	6.1954	1.2621	1324.6	1450.8	6.0477
0	2.6474	1344.5	1476.9	6.4795	1.7582	1342.9	1474.8	6.2756	1.3136	1341.2	1472.6	6.1291
10	2.7472	1360.7	1498.1	6.5556	1.8255	1359.3	1496.2	6.3527	1.3647	1357.9	1494.4	6.2073
20	2.8466	1377.0	1519.3	6.6293	1.8924	1375.8	1517.7	6.4272	1.4153	1374.6	1516.1	6.2826
30	2.9458	1393.3	1540.6	6.7008	1.9591	1392.3	1539.2	6.4993	1.4657	1391.1	1537.7	6.3553
40	3.0477	1409.6	1562.0	6.7703	2.0255	1408.8	1560.7	6.5693	1.5158	1407.9	1559.5	6.4258
50	3.1435	1426.3	1583.5	6.8379	2.0917	1425.5	1582.4	6.6373	1.5658	1424.6	1581.2	6.4943
60	3.2421	1443.0	1605.1	6.9038	2.1577	1442.3	1604.1	6.7036	1.6156	1441.5	1603.1	6.5609
70	3.3406	1459.9	1626.9	6.9682	2.2237	1459.2	1626.0	6.7683	1.6652	1458.6	1625.1	6.6258
80	3.4390	1476.9	1648.8	7.0312	2.2895	1476.3	1648.0	6.8315	1.7148	1475.6	1647.1	6.6892
100	-	-	-	-	-	-	-	-	1.8137	1510.3	1691.7	6.8120

	P = 125 kPa (-29.06ºC)				P = 150 kPa (-25.21ºC)				P = 200 kPa (-18.55ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
-20	0.9627	1305.6	1425.9	5.8446	0.7977	1306.2	1425.9	5.7465	-	-	-	-
-10	1.0051	1322.7	1448.3	5.9314	0.8336	1320.7	1445.7	5.8349	0.6193	1316.7	1440.6	5.6791
0	1.0468	1339.7	1470.5	6.0141	0.8689	1338.0	1468.3	5.9189	0.6465	1334.5	1463.8	5.7659
10	1.0881	1356.5	1492.5	6.0933	0.9037	1355.0	1490.6	5.9992	0.6732	1352.2	1486.8	5.8484
20	1.1290	1373.3	1514.4	6.1694	0.9381	1372.1	1512.8	6.0761	0.6995	1369.5	1509.4	5.9270
30	1.1696	1390.1	1536.3	6.2428	0.9723	1389.0	1534.8	6.1502	0.7255	1386.8	1531.9	6.0025
40	1.2100	1407.0	1558.2	6.3138	1.0062	1406.0	1556.9	6.2217	0.7513	1404.0	1554.3	6.0751
50	1.2502	1423.8	1580.1	6.3827	1.0398	1422.9	1578.9	6.2910	0.7769	1421.2	1576.6	6.1453
60	1.2903	1440.8	1602.1	6.4496	1.0734	1440.0	1601.0	6.3583	0.8023	1438.4	1598.9	6.2133
70	1.3020	1461.4	1624.1	6.5149	1.1068	1457.2	1623.2	6.4238	0.8275	1455.8	1621.3	6.2794
80	1.3700	1475.1	1646.3	6.5785	1.1401	1474.4	1645.4	6.4877	0.8527	1473.2	1643.7	6.3437
100	1.4494	1509.8	1691.0	6.7017	1.2065	1509.2	1690.2	6.6112	0.9028	1508.2	1688.8	6.4679

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 772, tabla A.1.2.2SI.

Tabla A.2.2 SI Amoniaco sobrecalentado.

	P = 250 kPa (-13.65ºC)				P = 300 kPa (-9.22ºC)				P = 350 kPa (-5.34ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
-10	0.4905	1312.7	1435.3	5.5544	-	-	-	-	-	-	-	-
0	0.5129	1331.1	1459.3	5.6441	0.4238	1327.6	1454.7	5.5420	0.3601	1323.9	1449.9	5.4532
10	0.5348	1349.2	1482.9	5.7288	0.4425	1346.2	1478.9	5.6290	0.3765	1343.1	1474.9	5.5427
20	0.5563	1366.9	1506.0	5.8093	0.4608	1364.4	1502.6	5.7113	0.3925	1361.7	1499.1	5.6270
30	0.5774	1384.7	1529.0	5.8861	0.4787	1382.3	1525.9	5.7890	0.4081	1380.1	1522.9	5.7068
40	0.5983	1402.1	1551.7	5.9599	0.4964	1400.1	1549.0	5.8645	0.4235	1398.1	1546.3	5.7828
50	0.6190	1419.6	1574.3	6.0309	0.5138	1417.8	1571.9	5.9365	0.4386	1416.0	1569.5	5.8557
60	0.6396	1436.9	1596.8	6.0997	0.5311	1435.4	1594.7	6.0060	0.4536	1433.8	1592.6	5.9259
70	0.6600	1454.4	1619.4	6.1663	0.5483	1453.0	1617.5	6.0732	0.4685	1451.5	1615.5	5.9938
80	0.6803	1471.8	1641.9	6.2312	0.5653	1470.6	1640.2	6.1385	0.4832	1469.3	1638.4	6.0596
100	0.7206	1507.2	1687.3	6.3561	0.5992	1506.0	1685.8	6.2642	0.5124	1505.0	1684.3	6.1860

	P = 400 kPa (-1.87ºC)				P = 450 kPa (1.27ºC)				P = 500 kPa (4.15ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
0	0.3123	1320.2	1445.1	5.3741	-	-	-	-	-	-	-	-
10	0.3270	1339.9	1470.7	5.4663	0.2885	1336.7	1466.5	5.3972	-	-	-	-
20	0.3413	1359.1	1495.6	5.5525	0.3014	1356.4	1492.0	5.4855	0.2695	1353.6	1488.3	5.4244
30	0.3552	1377.7	1519.8	5.6338	0.3140	1375.4	1516.7	5.5685	0.2810	1373.0	1513.5	5.9090
40	0.3688	1396.1	1543.6	5.7111	0.3263	1394.1	1540.9	5.6470	0.2923	1392.0	1538.1	5.5889
50	0.3823	1414.2	1567.1	5.7850	0.3384	1412.4	1564.7	5.7219	0.3033	1410.7	1562.3	5.6647
60	0.3955	1432.2	1590.4	5.8560	0.3503	1430.6	1588.2	5.7936	0.3141	1429.1	1586.1	5.7372
70	0.4086	1450.2	1613.6	5.9244	0.3620	1448.7	1611.6	5.8627	0.3248	1447.2	1609.6	5.8070
80	0.4216	1468.1	1636.7	5.9907	0.3737	1466.7	1634.9	5.9295	0.3353	1465.5	1633.1	5.8744
100	0.4473	1503.9	1682.8	6.1179	0.3967	1502.8	1681.3	6.0575	0.3562	1501.7	1679.8	6.0031
120	-	-	-	-	-	-	-	-	0.3768	1538.2	1726.6	6.1253
140	-	-	-	-	-	-	-	-	0.3972	1575.2	1773.8	6.2422

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 772 - 773, tabla A.2.2SI.

Tabla A.2.2 SI Amoniaco sobrecalentado.

	P = 600 kPa (9.29ºC)				P = 700 kPa (13.81ºC)				P = 800 kPa (17.86ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
20	0.2215	1347.9	1480.8	5.3156	0.1872	1342.0	1473.0	5.2196	0.1614	1335.8	1464.9	5.1328
30	0.2315	1368.2	1507.1	5.4037	0.1961	1363.1	1500.4	5.3115	0.1695	1357.9	1493.5	5.2287
40	0.2412	1387.8	1532.5	5.4862	0.2046	1383.5	1526.7	5.3968	0.1772	1379.0	1520.8	5.3171
50	0.2506	1406.9	1557.3	5.5641	0.2129	1403.2	1552.2	5.4770	0.1846	1399.3	1547.0	5.3996
60	0.2598	1425.7	1581.6	5.6383	0.2210	1422.4	1577.1	5.5529	0.1919	1419.0	1572.5	5.4774
70	0.2689	1444.4	1605.7	5.7094	0.2289	1441.4	1601.6	5.6254	0.1990	1438.3	1597.5	5.5513
80	0.2778	1462.8	1629.5	5.7778	0.2367	1460.1	1625.8	5.6949	0.2059	1457.4	1622.1	5.6219
100	0.2955	1499.5	1676.8	5.9081	0.2521	1497.2	1673.7	5.8268	0.2195	1495.0	1670.6	5.7555
120	0.3128	1536.3	1724.0	6.0314	0.2671	1534.4	1721.4	5.9512	0.2328	1532.5	1718.7	5.8811
140	0.3300	1573.5	1771.5	6.1491	0.2819	1571.9	1769.2	6.0698	0.2459	1570.2	1766.9	6.0006
160	-	-	-	-	-	-	-	-	0.2589	1608.2	1815.3	6.1150

	P = 900 kPa (21.53ºC)				P = 1000 kPa (24.91ºC)				P = 1200 kPa (30.95ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
30	0.1487	1352.7	1486.5	5.1530	0.1321	1347.0	1479.1	5.0826	-	-	-	-
40	0.1558	1374.5	1514.7	5.2447	0.1387	1369.8	1508.5	5.1778	0.1129	1359.9	1495.4	5.0564
50	0.1626	1395.4	1541.7	5.3296	0.1450	1391.3	1536.3	5.2654	0.1185	1382.9	1525.1	5.1497
60	0.1692	1415.6	1567.9	5.4093	0.1511	1412.0	1563.1	5.3471	0.1238	1404.7	1553.3	5.2357
70	0.1756	1435.3	1593.3	5.4847	0.1570	1432.1	1589.1	5.4240	0.1289	1425.8	1580.5	5.3159
80	0.1819	1454.7	1618.4	5.5565	0.1627	1451.9	1614.6	5.4971	0.1339	1446.1	1606.8	5.3916
90	0.1942	1492.7	1667.5	5.6919	0.1739	1490.4	1664.3	5.6342	0.1435	1485.8	1658.0	5.5325
100	0.2061	1530.6	1716.1	5.8187	0.1848	1528.6	1713.4	5.7622	0.1527	1524.8	1708.0	5.6631
120	0.2179	1568.4	1764.5	5.9389	0.1955	1566.7	1762.2	5.8834	0.1618	1563.3	1757.5	5.786
140	0.2295	1606.7	1813.2	6.0541	0.2060	1605.2	1811.2	5.9992	0.1707	1602.3	1807.1	5.9031
160	-	-	-	-	0.2164	1644.1	1860.5	6.1105	0.1795	1641.5	1856.9	6.0156

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 773 - 774, tabla A.2.2SI.

Tabla A.2.2 SI Amoniaco sobrecalentado.

	P = 1400 kPa (36.26ºC)				P = 1600 kPa (41.03ºC)				P =1800 kPa (45.37ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
40	0.0943	1349.6	1481.6	4.9463	-	-	-	-	-	-	-	-
50	0.0994	1374.2	1513.4	5.0462	0.0851	1364.8	1501.0	4.9510	0.0738	1355.1	1487.9	4.8614
60	0.1042	1397.2	1543.1	5.1370	0.0895	1389.3	1532.5	5.0472	0.0780	1381.0	1521.4	4.9637
70	0.1088	1419.2	1571.5	5.2209	0.0937	1412.4	1562.3	5.1351	0.0819	1405.3	1552.7	5.0564
80	0.1132	1440.3	1598.8	5.2994	0.0977	1434.4	1590.7	5.2167	0.0857	1427.9	1582.2	5.1410
100	0.1217	1481.0	1651.4	5.4443	0.1054	1476.2	1644.8	5.3659	0.0927	1471.1	1638.0	5.2948
120	0.1299	1520.6	1702.5	5.5775	0.1127	1516.6	1696.9	5.5018	0.0993	1512.5	1691.2	5.4337
140	0.1378	1559.9	1752.8	5.7023	0.1197	1556.5	1748.0	5.6286	0.1057	1552.8	1743.1	5.5624
160	0.1455	1599.2	1802.9	5.8208	0.1266	1596.1	1798.7	5.7485	0.1119	1593.1	1794.5	5.6838
180	0.1532	1638.7	1853.2	5.9343	0.1334	1636.1	1849.5	5.8631	0.1180	1633.3	1845.7	5.7995

	P = 2000 kPa (49.36ºC)			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
50	0.0647	1344.5	1473.9	4.7754
60	0.0687	1372.4	1509.8	4.8848
70	0.0725	1397.7	1542.7	4.9821
80	0.0760	1421.5	1573.5	5.0707
100	0.0825	1466.1	1631.1	5.2294
120	0.0886	1508.3	1685.5	5.3714
140	0.0945	1549.2	1738.2	5.5022
160	0.1002	1589.8	1790.2	5.6251
180	0.1057	1630.6	1842.0	5.7420

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 774, tabla A.2.2SI.

Tabla A.3 SI Propiedades termodinámicas del Refrigerante - 12.
Tabla A.3.1 SI Refrigerante - 12 saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
-90	0.00284	0.000608	4.414937	4.415545	-43.286	177.210	133.924	-43.284	189.748	146.464	-0.20863	1.03593	0.82730
-85	0.00424	0.000612	3.036704	3.037316	-39.008	174.863	135.855	-39.005	187.736	148.731	-0.18558	0.99771	0.81213
-80	0.00617	0.000617	2.137728	2.138345	-34.725	172.553	137.828	-34.721	185.739	151.018	-0.16312	0.96155	0.79843
-75	0.00879	0.000622	1.537029	1.537651	-30.435	170.246	139.811	-30.430	183.751	153.321	-0.14119	0.92725	0.78606
-70	0.01227	0.000627	1.126653	1.127280	-26.136	167.948	141.812	-26.128	181.764	155.636	-0.11977	0.89466	0.77489
-65	0.01680	0.000632	0.840474	0.841106	-21.825	165.664	143.839	-21.814	179.774	157.960	-0.09880	0.86360	0.76480
-60	0.02262	0.000638	0.637273	0.637911	-17.499	163.373	145.874	-17.485	177.774	160.289	-0.07827	0.83397	0.75570
-55	0.02998	0.000642	0.490358	0.491000	-13.160	161.080	147.920	-13.141	175.762	162.621	-0.05815	0.80563	0.74748
-50	0.03915	0.000648	0.382457	0.383105	-8.804	158.782	149.978	-8.779	173.730	164.951	-0.03841	0.77848	0.74007
-45	0.05044	0.000654	0.302028	0.302682	-4.433	156.475	152.042	-4.400	171.676	167.276	-0.01903	0.75241	0.73338
-40	**0.06417**	**0.000659**	**0.241251**	**0.241910**	**-0.042**	**154.156**	**154.114**	**0**	**169.595**	**169.595**	**0**	**0.72735**	**0.72735**
-35	0.08071	0.000666	0.194732	0.195398	4.366	151.819	156.185	4.420	167.482	171.902	0.01871	0.70322	0.72193
-30	0.10041	0.000672	0.158703	0.159375	8.795	149.467	158.262	8.862	165.335	174.197	0.03711	0.67993	0.71704
-25	0.12368	0.000679	0.130487	0.131166	13.243	147.094	160.337	13.327	163.149	176.476	0.05522	0.65742	0.71264
-20	0.15093	0.000685	0.108162	0.108847	17.713	144.698	162.411	17.816	160.920	178.736	0.07306	0.63563	0.70869
-15	0.18260	0.000693	0.090325	0.091018	22.204	142.276	164.480	22.331	158.643	180.974	0.09063	0.61450	0.70513
-10	0.21912	0.000700	0.075946	0.076646	26.721	139.826	166.547	26.874	156.314	183.188	0.10796	0.59398	0.70194
-5	0.26096	0.000708	0.064255	0.064963	31.261	137.346	168.607	31.446	153.929	185.375	0.12056	0.57851	0.69907
0	0.30861	0.000716	0.054673	0.055389	35.831	134.827	170.658	36.052	151.479	187.531	0.14196	0.55453	0.69649
5	0.36255	0.000724	0.046761	0.047485	40.432	132.269	172.701	40.694	148.960	189.654	0.15865	0.53551	0.69416
10	0.42330	0.000733	0.040181	0.040914	45.065	129.667	174.732	45.375	146.365	191.740	0.17517	0.51689	0.69206
15	0.49137	0.000743	0.034670	0.035413	49.735	127.013	176.748	50.100	143.684	193.784	0.19154	0.49861	0.69015
20	0.56729	0.000752	0.030028	0.030780	54.447	124.301	178.748	54.874	140.909	195.783	0.20777	0.48064	0.68841
25	0.65162	0.000763	0.026091	0.026854	59.205	121.524	180.729	59.702	138.028	197.730	0.22388	0.46292	0.68680
30	0.74490	0.000774	0.022734	0.023508	64.015	118.670	182.685	64.592	135.028	199.620	0.23991	0.44539	0.68530
35	0.84772	0.000786	0.019855	0.020641	68.885	115.730	184.615	69.551	131.895	201.446	0.25587	0.42800	0.68387
40	0.96065	0.000798	0.017373	0.018171	73.820	112.690	186.511	74.587	128.613	203.200	0.27179	0.41069	0.68248
45	1.08432	0.000811	0.015221	0.016032	78.833	109.536	188.369	79.712	125.160	204.872	0.28771	0.39338	0.68109
50	1.21932	0.000826	0.013344	0.014170	83.929	106.251	190.179	84.936	121.514	206.450	0.30366	0.37601	0.67967

Tabla A.3.1 SI Refrigerante - 12 saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
55	1.36630	0.000841	0.011701	0.012542	89.125	102.808	191.933	90.274	117.646	207.920	0.31967	0.35850	0.67817
60	1.52592	0.000858	0.010253	0.011111	94.434	99.185	193.619	95.743	113.521	209.264	0.33580	0.34073	0.67653
65	1.69884	0.000877	0.008970	0.009847	99.872	95.348	195.220	101.362	109.098	210.460	0.35209	0.32262	0.67471
70	1.88578	0.000897	0.007828	0.008725	105.463	89.564	195.028	107.155	104.326	211.481	0.36861	0.30401	0.67262
75	2.08745	0.000920	0.006803	0.007723	111.233	84.934	196.167	113.153	99.135	212.288	0.38543	0.28474	0.67017
80	2.30460	0.000946	0.005875	0.006821	117.214	79.898	197.112	119.394	93.438	212.832	0.40265	0.26457	0.66722
85	2.53802	0.000976	0.005029	0.006005	123.455	74.343	197.798	125.932	87.107	213.039	0.42040	0.24321	0.66361
90	2.78850	0.001012	0.004246	0.005258	130.019	68.124	198.143	132.841	79.961	212.802	0.43887	0.22018	0.65905
95	3.05689	0.001056	0.003507	0.004563	137.007	60.986	197.993	140.235	71.707	211.942	0.45833	0.19477	0.65310
100	3.34406	0.001113	0.002790	0.003903	144.592	52.480	197.072	148.314	61.810	210.124	0.47928	0.16564	0.64492
105	3.65093	0.001197	0.002045	0.003242	153.151	41.581	194.732	157.521	49.047	206.568	0.50285	0.12969	0.63254
110	3.97846	0.001364	0.001098	0.002462	164.123	24.077	188.200	169.550	28.445	197.995	0.53334	0.07424	0.60758
112	4.11548	0.001792	0	0.001792	176.043	0	176.043	183.418	0	183.418	0.56888	0	0.56888

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 775 - 776, tabla A.3.1SI.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía del líquido saturado.

Tabla A.3.2 SI Refrigerante - 12 saturado: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión MPa, P	Temp.ºC T	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
0.06	-41.42	0.0006578	0.256842	0.2575	-1.29	154.78	153.49	-1.25	170.19	168.94	-0.0054	0.7344	0.7290
0.10	-30.10	0.0006719	0.159328	0.1600	8.71	149.44	158.15	8.78	165.37	174.15	0.0368	0.6803	0.7171
0.12	-25.74	0.0006776	0.134222	0.1349	12.58	147.37	159.95	12.66	163.48	176.14	0.0526	0.6607	0.7133
0.14	-21.91	0.0006828	0.116117	0.1168	15.99	145.53	161.52	16.09	161.78	177.87	0.0663	0.6439	0.7102
0.16	-18.49	0.0006876	0.102412	0.1031	19.07	143.84	162.91	19.18	160.23	179.41	0.0784	0.6292	0.7076
0.18	-16.38	0.0006921	0.091558	0.09225	21.86	142.33	164.19	21.98	158.82	180.80	0.0893	0.6161	0.7054
0.20	-12.53	0.0006862	0.082854	0.08354	24.43	140.93	165.36	24.57	157.50	182.07	0.0992	0.6043	0.7035
0.24	-7.42	0.0007040	0.069626	0.07033	29.06	138.38	167.44	29.23	155.09	184.32	0.1168	0.5836	0.7004
0.28	-2.93	0.0007111	0.060049	0.06076	33.15	136.11	169.26	33.35	152.92	186.27	0.1321	0.5659	0.6980
0.32	1.11	0.0007177	0.052792	0.05351	36.85	134.03	170.88	37.08	150.92	188.00	0.1457	0.5503	0.6960
0.40	8.15	0.0007299	0.042480	0.04321	43.35	130.34	173.69	43.64	147.33	190.97	0.1691	0.5237	0.6928
0.50	15.60	0.0007438	0.034076	0.03482	50.30	126.31	176.61	50.67	143.35	194.02	0.1935	0.4964	0.6899
0.60	22.00	0.0007566	0.028373	0.02913	56.35	122.74	179.09	56.80	139.77	196.57	0.2142	0.4736	0.6878
0.70	27.65	0.0007686	0.024241	0.02501	61.75	119.48	181.23	62.29	136.45	198.74	0.2324	0.4536	0.6860
0.80	32.74	0.0007802	0.021100	0.02188	66.68	116.45	183.13	67.30	133.33	200.63	0.2487	0.4358	0.6845
0.90	37.37	0.0007914	0.018629	0.01942	71.22	113.59	184.81	71.93	130.36	202.29	0.2634	0.4198	0.6832
1.0	41.64	0.0008023	0.016638	0.01744	75.46	110.86	186.32	76.26	127.50	203.76	0.2770	0.4050	0.6820
1.2	49.31	0.0008237	0.013586	0.01441	83.22	105.73	188.95	84.21	122.03	206.24	0.3015	0.3784	0.6799
1.4	56.09	0.0008448	0.011375	0.01222	90.28	100.83	191.11	91.46	116.76	208.22	0.3232	0.3546	0.6778
1.6	62.19	0.0008660	0.009674	0.01054	96.80	96.15	192.95	98.19	111.62	209.81	0.3329	0.3429	0.6758

Fuente: Yunus Çengel y Michael Boles. *Termodinámica*, 2a. ed. (Mc Graw Hill, México, 1996), p. A-23, tabla A.12.

Tabla A.3.3 SI Refrigerante - 12 sobrecalentado.

	P = 0.05 MPa				P = 0.10 MPa				P = 0.15 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
-20	0.341859	164.077	181.170	0.79172	0.167702	163.217	179.987	0.74064	-	-	-	-
-10	0.356228	169.078	186.889	0.81388	0.175223	168.314	185.836	0.76331	0.114826	167.529	184.753	0.73240
0	0.370509	174.180	192.705	0.83557	0.182648	173.500	191.765	0.78541	0.119980	172.803	190.800	0.75495
10	0.384717	179.378	198.614	0.85681	0.189995	178.771	197.770	0.80700	0.125051	178.148	196.906	0.77690
20	0.398864	184.674	204.617	0.87764	0.197277	184.127	203.855	0.82812	0.130053	183.569	203.077	0.79832
30	0.412960	190.062	210.710	0.89808	0.250451	184.973	210.018	0.84879	0.135000	189.064	209.314	0.81924
40	0.427014	195.540	216.891	0.91814	0.211692	195.093	216.262	0.86905	0.139900	194.636	215.621	0.83971
50	0.441031	201.108	223.160	0.93784	0.218839	200.699	222.583	0.88892	0.144761	200.284	221.998	0.85975
60	0.455018	206.761	229.512	0.95720	0.225956	206.386	228.982	0.90842	0.149589	206.008	228.446	0.87940
70	0.468980	212.497	235.946	0.97623	0.233045	212.153	235.457	0.92757	0.154391	211.804	234.963	0.89867
80	0.482919	218.314	242.460	0.99494	0.240112	217.996	242.007	0.94638	0.159168	217.674	241.549	0.91759
90	0.486839	224.708	249.050	1.01334	0.247160	223.913	248.629	0.96487	0.163926	223.615	248.204	0.93617

	P = 0.20 MPa				P = 0.25 MPa				P = 0.30 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
0	0.088609	172.083	189.805	0.73249	0.069752	171.341	188.779	0.71437	0.057150	170.573	187.718	0.69894
10	0.092550	177.510	196.020	0.75484	0.073024	176.853	195.109	0.73713	0.059984	176.178	194.173	0.72215
20	0.096419	182.997	202.281	0.77657	0.076219	182.413	201.468	0.75920	0.062735	181.816	200.636	0.74458
30	0.100229	188.551	208.597	0.79775	0.079351	188.028	207.866	0.78066	0.065419	187.493	207.119	0.76633
40	0.103990	193.993	214.791	0.81843	0.082432	193.701	214.309	0.80157	0.068049	193.220	213.635	0.78747
50	0.107710	199.863	221.405	0.83866	0.085470	199.436	220.803	0.82198	0.070636	199.000	220.191	0.80808
60	0.111397	205.623	227.902	0.85846	0.088474	205.233	227.351	0.84193	0.073186	204.837	226.793	0.82820
70	0.115056	211.451	234.462	0.87786	0.091449	211.094	233.956	0.86147	0.075706	210.732	233.444	0.84787
80	0.118691	217.349	241.087	0.89689	0.094399	217.020	240.620	0.88061	0.078200	216.687	240.147	0.86712
90	0.122305	223.314	247.775	0.91556	0.097328	223.009	247.341	0.89937	0.080673	222.702	246.904	0.88599
100	0.125902	229.345	254.525	0.93390	0.100239	229.062	254.122	0.91779	0.083127	228.778	253.716	0.90449
110	0.129484	235.441	261.338	0.95191	0.103135	235.178	260.962	0.93588	0.085566	234.912	260.582	0.92265

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 776 - 777, tabla A.3.2SI.

Tabla A.3.2 SI Refrigerante - 12 sobrecalentado.

	P = 0.40 MPa				P = 0.50 MPa				P = 0.60 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
20	0.045837	180.571	198.906	0.72043	0.035646	179.254	197.077	0.70043	-	-	-	-
30	0.047971	186.389	205.577	0.74281	0.037464	185.231	203.963	0.72352	0.030422	184.010	202.263	0.70679
40	0.050046	192.232	212.250	0.76447	0.039215	191.203	210.810	0.74574	0.031966	190.127	209.307	0.72965
50	0.052072	198.110	218.939	0.78549	0.040912	197.187	217.643	0.76722	0.033450	196.230	216.300	0.75163
60	0.054059	204.029	225.653	0.80595	0.042566	203.196	224.479	0.78806	0.034887	202.336	223.268	0.77287
70	0.056014	209.995	232.401	0.82591	0.044185	209.238	231.330	0.80832	0.036286	208.459	230.231	0.79346
80	0.057941	216.012	239.188	0.84540	0.045775	215.319	238.206	0.82807	0.037653	214.609	237.201	0.81348
90	0.059846	222.079	246.017	0.86447	0.047341	221.442	245.112	0.84735	0.038996	220.790	244.188	0.83299
100	0.061731	228.200	252.892	0.88315	0.048886	227.611	252.054	0.86621	0.040316	227.010	251.200	0.85204
110	0.063601	234.375	259.815	0.90145	0.050415	233.828	259.035	0.88467	0.041619	233.271	258.242	0.87066
120	0.065456	240.604	266.786	0.91941	0.051929	240.093	266.057	0.90276	0.042907	239.574	265.318	0.88889
130	0.067299	246.886	273.806	0.93704	0.053430	246.408	273.123	0.92050	0.044181	245.922	272.431	0.90675

	P = 0.70 MPa				P = 0.80 MPa				P = 0.90 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
40	0.026761	188.999	207.732	0.71529	0.022830	187.810	206.074	0.70210	0.019744	186.550	204.320	0.68972
50	0.028100	195.233	214.903	0.73783	0.024068	194.192	213.446	0.72527	0.020912	193.100	211.921	0.71361
60	0.029387	201.446	222.017	0.75951	0.025247	200.522	220.720	0.74744	0.022012	199.562	219.373	0.73633
70	0.030632	207.657	229.099	0.78045	0.026380	206.830	227.934	0.76878	0.023062	205.974	226.730	0.75808
80	0.031843	213.881	236.171	0.80076	0.027477	213.132	235.114	0.78940	0.024073	212.362	234.028	0.77905
90	0.033028	220.124	243.244	0.82051	0.028545	219.443	242.279	0.80941	0.025051	218.744	241.290	0.79932
100	0.034189	226.398	250.330	0.83976	0.029588	225.773	249.443	0.82887	0.026005	225.133	248.537	0.81901
110	0.035332	232.704	257.436	0.85855	0.030612	232.126	256.616	0.84784	0.026937	231.538	255.781	0.83817
120	0.036459	239.047	264.568	0.87693	0.031619	238.511	263.806	0.86360	0.022785	242.525	263.032	0.85685
130	0.037572	245.430	271.730	0.89492	0.032612	244.929	271.019	0.88448	0.028751	244.422	270.298	0.87510
140	0.038673	251.854	278.925	0.91254	0.033592	251.385	278.259	0.90221	0.029639	250.910	277.585	0.89295
150	0.039765	258.320	286.155	0.92984	0.034563	257.879	285.529	0.91960	0.030515	257.433	284.896	0.91043

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 777 - 778, tabla A.3.2SI.

Tabla A.3.2 SI Refrigerante - 12 sobrecalentado.

	P = 1.00 MPa				P = 1.20 MPa				P = 1.40 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
50	0.018366	191.951	210.317	0.70259	0.014483	189.433	206.813	0.06817	-	-	-	-
60	0.019410	198.560	217.970	0.72951	0.015463	196.408	214.964	0.70649	0.012579	194.002	211.613	0.68806
70	0.020397	205.088	225.485	0.74814	0.016368	203.209	222.851	0.72982	0.013448	201.157	219.984	0.71281
80	0.021341	211.569	232.910	0.76946	0.017221	209.903	230.568	0.75198	0.014247	208.113	228.059	0.73601
90	0.022251	218.027	240.278	0.79004	0.018032	216.533	238.171	0.77321	0.014997	214.944	235.940	0.75802
100	0.023133	224.479	247.612	0.80996	0.018812	223.125	245.699	0.79366	0.015710	221.698	243.692	0.77907
110	0.023993	230.938	254.931	0.82931	0.019567	229.700	253.180	0.81344	0.016393	228.405	251.355	0.79934
120	0.024835	237.411	262.246	0.84816	0.020301	236.271	260.632	0.83265	0.017053	235.087	258.961	0.81893
130	0.025661	243.906	269.567	0.86655	0.021018	242.850	268.072	0.85133	0.017695	241.757	266.530	0.83795
140	0.026474	250.428	276.902	0.88452	0.021721	249.444	275.509	0.86955	0.018321	248.429	274.078	0.85644
150	0.027275	256.980	284.255	0.90211	0.022412	256.058	282.952	0.88735	0.018934	255.110	281.618	0.87447
160	0.028068	263.564	291.632	0.91933	0.023093	262.696	290.408	0.90477	0.019535	261.809	289.158	0.89208

	P = 1.60 MPa				P = 1.80 MPa				P = 2.00 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
70	0.011208	198.877	216.810	0.69641	0.009406	196.277	213.208	0.67992	-	-	-	-
80	0.011984	206.170	225.344	0.72092	0.010187	204.026	222.363	0.70622	0.008704	201.616	219.024	0.69143
90	0.012698	213.246	233.563	0.74387	0.010884	211.416	231.007	0.73036	0.009406	199.414	218.226	0.71713
100	0.013366	220.189	241.575	0.76564	0.011525	218.587	239.332	0.75297	0.010035	216.866	236.936	0.74079
110	0.014000	227.047	249.447	0.78646	0.012126	225.619	247.446	0.77443	0.010615	224.106	245.336	0.76300
120	0.014608	233.852	257.225	0.80649	0.012697	232.562	255.417	0.79497	0.011159	231.210	253.528	0.78411
130	0.015195	240.625	264.937	0.82586	0.013244	239.449	263.288	0.81474	0.011676	238.225	261.577	0.80433
140	0.015765	247.382	272.606	0.84465	0.013772	246.300	271.090	0.83385	0.012172	245.182	269.526	0.82380
150	0.016320	254.138	280.250	0.86293	0.014284	253.136	278.847	0.85240	0.012651	252.103	277.405	0.84265
160	0.016864	230.898	257.880	0.88076	0.014784	259.963	286.574	0.87045	0.013116	259.005	285.237	0.86094
170	0.017398	267.669	295.506	0.89816	0.015272	266.794	294.284	0.88805	0.013570	265.897	293.037	0.87874
180	0.017923	274.459	303.136	0.91519	0.015752	273.634	301.988	0.90524	0.014013	272.793	300.819	0.89611

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 778 - 779, tabla A.3.2SI.

Tabla A.3.2 SI Refrigerante - 12 sobrecalentado.

	P = 2.50 MPa				P = 3.00 MPa				P = 3.50 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
90	0.006595	203.249	219.736	0.68284	-	-	-	-	-	-	-	-
100	0.007264	211.869	230.029	0.71081	0.005231	205.030	220.723	0.67755	-	-	-	-
110	0.007837	219.861	239.453	0.73573	0.005886	214.598	232.256	0.70806	0.004324	207.226	222.360	0.67559
120	0.008351	227.502	248.379	0.75873	0.006420	223.138	242.398	0.73420	0.004959	217.730	235.086	0.70840
130	0.008827	234.919	256.986	0.78035	0.006887	231.164	251.825	0.75788	0.005456	226.769	245.865	0.73548
140	0.009273	242.195	265.377	0.80091	0.007313	238.879	260.818	0.77991	0.005884	235.134	255.728	0.75965
150	0.009697	249.374	273.616	0.82062	0.007709	246.394	269.521	0.80072	0.006270	243.108	265.053	0.78195
160	0.010104	256.488	281.748	0.83961	0.008083	253.775	278.024	0.82059	0.006626	250.836	274.027	0.80291
170	0.010497	263.560	289.802	0.85799	0.008439	261.067	286.384	0.83967	0.006961	258.396	282.759	0.82284
180	0.010879	270.605	297.802	0.87584	0.008782	268.294	294.640	0.85809	0.007279	265.843	291.319	0.84194
190	0.011250	277.639	305.764	0.89322	0.009114	275.478	302.820	0.87594	0.007584	273.208	299.752	0.86035
200	0.011614	284.666	313.701	0.91018	0.009436	282.638	310.946	0.89330	0.007878	280.519	308.092	0.87816

	P = 4.00 MPa				P = 5.00 MPa			
Temp.ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
120	0.003736	210.236	225.180	0.67769	0.001369	169.458	176.303	0.54710
130	0.004325	221.391	238.691	0.71164	0.002501	203.953	216.458	0.64811
140	0.004781	230.806	249.930	0.73918	0.003139	219.309	235.004	0.69359
150	0.005172	239.436	260.124	0.76357	0.003585	230.491	248.416	0.72568
160	0.005522	247.622	269.710	0.78596	0.003950	240.160	259.910	0.75253
170	0.005845	255.523	278.903	0.80694	0.004268	249.060	270.400	0.77648
180	0.006147	263.237	287.825	0.82685	0.004555	257.501	280.276	0.79851
190	0.006434	270.816	296.552	0.84590	0.004821	265.635	289.740	0.81917
200	0.006708	278.304	305.136	0.86424	0.005071	273.561	298.916	0.83877
210	0.006972	285.726	313.614	0.88197	0.005308	281.342	307.882	0.85753
220	0.007228	293.101	322.013	0.89917	0.005535	289.015	316.690	0.87557
230	0.007477	300.444	330.352	0.91592	0.005733	296.715	325.380	0.89301

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 779, tabla A.3.2SI.

Tabla A.4 SI Propiedades termodinámicas del Refrigerante - 22.
Tabla A.4.1 SI Refrigerante - 22 saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
-70	0.0205	0.000670	0.940268	0.940938	-30.621	230.150	199.529	-30.607	249.425	218.818	-0.1401	1.2277	1.0876
-65	0.0280	0.000676	0.704796	0.705472	-25.677	227.191	201.514	-25.658	246.925	221.267	-0.1161	1.1862	1.0701
-60	0.0375	0.000682	0.536470	0.537152	-20.678	224.236	203.559	-20.652	244.354	223.702	-0.0924	1.1464	1.0540
-55	0.0495	0.000689	0.414138	0.414827	-15.619	221.202	205.583	-15.585	241.702	226.117	-0.0689	1.1079	1.0390
-50	0.0644	0.000695	0.323862	0.324557	-10.501	218.108	207.608	-10.456	238.965	228.509	-0.0457	1.0708	1.0251
-45	0.0827	0.000702	0.256288	0.256990	-5.320	214.937	209.617	-5.262	236.132	230.870	-0.0227	1.0349	1.0122
-40	**0.1049**	**0.000709**	**0.205036**	**0.205745**	**-0.074**	**211.689**	**211.614**	**0**	**233.197**	**233.197**	**0**	**1.0002**	**1.0002**
-35	0.1317	0.000717	0.165683	0.166400	5.234	208.336	213.569	5.328	230.156	235.484	0.0225	0.9664	0.9889
-30	0.1635	0.000725	0.135124	0.135844	10.607	204.908	215.516	10.725	227.001	237.726	0.0449	0.9335	0.9784
-25	0.2010	0.000733	0.111126	0.111859	16.044	201.391	217.434	16.191	223.727	239.918	0.0670	0.9015	0.9685
-20	0.2448	0.000741	0.092102	0.092843	21.547	197.780	219.327	21.728	220.327	242.055	0.0890	0.8703	0.9593
-15	0.2957	0.000750	0.076875	0.077625	27.112	194.066	221.178	27.334	216.798	244.132	0.1107	0.8398	0.9505
-10	0.3543	0.000759	0.064581	0.065340	32.743	190.251	222.994	33.012	213.132	246.144	0.1324	0.8098	0.9422
-5	0.4213	0.000768	0.054571	0.055339	38.438	186.332	224.771	38.762	209.323	248.085	0.1538	0.7806	0.9344
0	0.4976	0.000778	0.046357	0.047135	44.199	182.296	226.495	44.586	205.363	249.949	0.1751	0.7518	0.9269
5	0.5838	0.000789	0.039567	0.040356	50.024	178.147	228.171	50.485	201.246	251.731	0.1963	0.7234	0.9197
10	0.6807	0.000800	0.033914	0.034714	55.918	173.875	229.793	56.463	196.960	253.423	0.2173	0.6956	0.9129
15	0.7891	0.000812	0.029175	0.029987	61.882	169.473	231.355	62.523	192.495	255.018	0.2382	0.6680	0.9062
20	0.9099	0.000824	0.025179	0.026003	67.920	164.926	232.846	68.670	187.836	256.506	0.2590	0.6407	0.8997
25	1.0439	0.000838	0.021786	0.022624	74.035	160.225	234.260	74.910	182.967	257.877	0.2797	0.6137	0.8934
30	1.1919	0.000852	0.018890	0.019742	80.234	155.354	235.589	81.250	177.869	259.119	0.3004	0.5867	0.8871
35	1.3548	0.000867	0.016402	0.017269	86.525	150.295	236.820	87.700	172.516	260.216	0.3210	0.5599	0.8809
40	1.5335	0.000884	0.014251	0.015135	92.916	145.023	237.939	94.272	166.877	261.149	0.3417	0.5329	0.8746
45	1.7290	0.000902	0.012382	0.013284	99.422	139.506	238.928	100.982	160.914	261.896	0.3624	0.5058	0.8682
50	1.9423	0.000922	0.010747	0.011669	106.060	133.703	239.763	107.851	154.577	262.428	0.3832	0.4783	0.8615
55	2.1744	0.000944	0.009308	0.010252	112.852	127.561	240.413	114.905	147.800	262.705	0.4042	0.4504	0.8546
60	2.4266	0.000969	0.008032	0.009001	119.829	121.008	240.836	122.180	140.498	262.678	0.4255	0.4217	0.8472
65	2.6999	0.000997	0.006890	0.007887	126.739	111.884	238.623	129.729	132.547	262.276	0.4472	0.3919	0.8391
70	2.9959	0.001030	0.005859	0.006889	134.539	106.219	240.758	137.625	123.772	261.397	0.4695	0.3607	0.8302

Tabla A.4.1 SI Refrigerante - 22 saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
75	3.3161	0.001069	0.004914	0.005983	142.441	97.607	240.048	145.986	113.902	259.888	0.4927	0.3271	0.8198
80	3.6623	0.001183	0.003966	0.005149	150.678	88.324	239.003	155.011	102.849	257.860	0.5173	0.2902	0.8075
85	4.0368	0.001282	0.003076	0.004358	159.917	76.181	236.098	165.092	88.598	253.690	0.5445	0.2473	0.7918
90	4.4425	0.001282	0.002282	0.003564	171.509	59.899	231.408	177.204	70.037	247.241	0.5767	0.1928	0.7695
95	4.8835	0.001521	0.001030	0.002551	188.931	29.895	218.826	196.359	34.925	231.284	0.6273	0.0949	0.7222
96.006	4.9773	0.001906	0	0.001906	203.059	0	203.059	212.546	0	212.546	0.6708	0	0.6708

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 780 - 781, tabla A.4.1SI.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía del líquido saturado.

Tabla A.4.2 SI Refrigerante - 22 saturado: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión MPa, P	Temp.ºC T	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
0.04	-58.86	0.0006847	0.50492	0.5056	-20.36	224.49	204.13	-20.34	244.70	224.36	-0.0907	1.1419	1.0512
0.05	-54.83	0.0006901	0.41001	0.4107	-16.07	221.83	205.76	-16.03	242.33	226.30	-0.0709	1.1100	1.0391
0.06	-51.40	0.0006947	0.34591	0.3466	-12.39	219.53	207.14	-12.35	240.28	227.93	-0.0542	1.0836	1.0294
0.07	-48.40	0.0006989	0.29950	0.3002	-9.17	217.51	208.34	-9.12	238.47	229.35	-0.0397	1.0610	1.0213
0.08	-45.73	0.0007026	0.26430	0.2650	-6.28	215.69	209.41	-6.23	236.84	230.61	-0.0270	1.0414	1.0144
0.09	-43.30	0.0007061	0.23669	0.2374	-3.66	214.03	210.37	-3.60	235.34	231.74	-0.0155	1.0239	1.0084
0.10	-41.09	0.0007093	0.21449	0.2152	-1.26	212.51	211.25	-1.19	233.96	232.77	-0.0051	1.0082	1.0031
0.125	-36.23	0.0007166	0.17388	0.1746	4.04	209.12	213.16	4.13	230.86	234.99	0.0175	0.9744	0.9919
0.150	-32.08	0.0007230	0.14648	0.1472	8.60	206.17	214.77	8.70	228.16	236.86	0.0366	0.9464	0.9830
0.175	-28.44	0.0007287	0.12667	0.1274	12.61	203.57	216.18	12.74	225.73	238.47	0.0531	0.9224	0.9755
0.200	-25.18	0.0007340	0.11157	0.1123	16.22	201.20	217.42	16.37	223.51	239.88	0.0678	0.9013	0.9691
0.225	-22.22	0.0007389	0.09976	0.1005	19.51	199.02	218.53	19.67	221.48	241.15	0.0809	0.8827	0.9636
0.250	-19.51	0.0007436	0.09026	0.0910	22.54	197.01	219.55	22.72	219.57	242.29	0.0930	0.8656	0.9586
0.275	-17.00	0.0007479	0.08235	0.0831	25.36	195.12	220.48	25.56	217.77	243.33	0.1040	0.8502	0.9542
0.300	-14.66	0.0007521	0.07575	0.0765	27.99	193.35	221.34	28.22	216.07	244.29	0.1143	0.8359	0.9502
0.325	-12.46	0.0007561	0.07014	0.0709	30.47	191.66	222.13	30.72	214.46	245.18	0.1238	0.8227	0.9465
0.350	-10.39	0.0007599	0.06534	0.0661	32.82	190.06	222.88	33.09	212.91	246.00	0.1328	0.8103	0.9431
0.375	-8.43	0.0007636	0.06104	0.0618	35.06	188.52	223.58	35.34	211.43	246.77	0.1413	0.7986	0.9399
0.400	-6.56	0.0007672	0.05733	0.0581	37.18	187.06	224.24	37.49	209.99	247.48	0.1493	0.7877	0.9370
0.425	-4.78	0.0007706	0.05403	0.0548	39.22	185.64	224.86	39.55	208.61	248.16	0.1569	0.7773	0.9342
0.450	-3.08	0.0007740	0.05113	0.0519	41.17	184.28	225.45	41.52	207.28	248.80	0.1642	0.7674	0.9316
0.475	-1.45	0.0007773	0.04842	0.0492	43.05	182.95	226.00	43.42	205.98	249.40	0.1711	0.7581	0.9292
0.500	0.12	0.0007805	0.04612	0.0469	44.86	181.68	226.54	45.25	204.72	249.97	0.1777	0.7492	0.9269
0.525	1.63	0.0007836	0.04392	0.0447	46.61	180.43	227.04	47.02	203.49	250.51	0.1841	0.7406	0.9247
0.550	3.08	0.0007867	0.04191	0.0427	48.30	179.23	227.53	48.74	202.28	251.02	0.1903	0.7323	0.9226
0.575	4.49	0.0007897	0.04011	0.0409	49.94	178.05	227.99	50.40	201.11	251.51	0.1962	0.7244	0.9206
0.60	5.85	0.0007927	0.03841	0.0392	51.53	176.91	228.44	52.01	199.97	251.98	0.2019	0.7167	0.9186
0.70	10.91	0.0008041	0.03290	0.0337	57.48	172.56	230.04	58.04	195.60	253.64	0.2231	0.6886	0.9117
0.80	15.45	0.0008149	0.02869	0.0295	62.88	168.55	231.43	63.53	191.52	255.05	0.2419	0.6637	0.9056
0.90	19.59	0.0008252	0.02537	0.0262	67.84	164.80	232.64	68.59	187.66	256.25	0.2591	0.6410	0.9001

Tabla A.4.2 SI Refrigerante - 22 saturado: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión MPa, P	Temp.ºC T	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
1.00	23.40	0.0008352	0.02276	0.0236	72.46	161.25	233.71	73.30	183.98	257.28	0.2748	0.6204	0.8952
1.20	30.25	0.0008546	0.01865	0.0195	80.87	154.61	235.48	81.90	177.04	258.94	0.3029	0.5835	0.8864
1.40	36.29	0.0008734	0.01573	0.0166	88.45	148.44	236.89	89.68	170.48	260.16	0.3277	0.5509	0.8786
1.60	41.73	0.0008919	0.01351	0.0144	95.41	142.59	238.00	96.83	164.21	261.04	0.3500	0.5215	0.8715
1.80	46.69	0.0009104	0.01179	0.0127	101.87	136.99	238.86	103.51	158.13	261.64	0.3705	0.4944	0.8649
2.00	51.26	0.0009291	0.01027	0.0112	107.95	131.56	239.51	109.81	152.17	261.98	0.3895	0.4691	0.8586
2.40	59.46	0.0009677	0.00813	0.0091	119.24	120.98	240.22	121.56	140.43	261.99	0.4241	0.4222	0.8463

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 821, tabla A.8.

Tabla A.4.3 SI Refrigerante - 22 sobrecalentado.

	P = 0.05 MPa				P = 0.10 MPa				P = 0.15 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
-40	0.440633	212.692	234.724	1.07616	0.216331	211.737	233.370	1.00523	-	-	-	-
-30	0.460641	217.570	240.602	1.10084	0.226754	216.684	239.359	1.03052	0.148723	215.770	238.078	0.98773
-20	0.480543	222.559	246.586	1.12495	0.237064	221.760	245.466	1.05513	0.155851	220.941	244.319	1.01288
-10	0.500357	227.658	252.676	1.14855	0.247279	226.937	251.665	1.07914	0.162879	226.199	250.631	1.03733
0	0.520095	232.869	258.874	1.17166	0.257415	232.215	257.956	1.10261	0.169823	231.549	257.022	1.06116
10	0.539771	238.191	265.180	1.19433	0.267485	237.597	264.345	1.12588	0.176699	236.991	263.496	1.08444
20	0.559393	243.624	271.594	1.21659	0.277500	243.081	270.831	1.14809	0.183516	242.530	270.057	1.10721
30	0.578970	249.167	278.115	1.23846	0.287467	248.669	277.416	1.17017	0.190284	248.166	276.709	1.12952
40	0.598507	254.818	284.743	1.25998	0.297394	254.362	284.101	1.19187	0.197011	253.900	283.452	1.15144
50	0.618011	260.577	291.478	1.28114	0.307287	260.158	290.887	1.21320	0.203702	259.734	290.289	1.17289
60	0.637485	266.445	298.319	1.30119	0.317149	266.057	297.772	1.23418	0.210362	265.666	297.220	1.19402
70	0.656935	272.418	305.265	1.32253	0.326986	272.058	304.757	1.25484	0.216997	271.696	304.246	1.21479
80	0.676362	278.496	312.314	1.34278	0.336801	278.162	311.842	1.27519	0.223608	277.827	311.368	1.23525
90	0.695771	284.676	319.465	1.36275	0.346596	284.366	319.026	1.29524	0.230200	284.054	318.584	1.25540

	P = 0.20 MPa				P = 0.25 MPa				P = 0.30 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
-20	0.115203	220.099	243.140	0.98184	-	-	-	-	-	-	-	-
-10	0.120647	225.445	249.574	1.00676	0.095280	224.672	248.492	0.98231	0.078344	223.879	247.382	0.96170
0	0.126003	230.868	256.069	1.03098	0.099689	230.175	255.097	1.00695	0.082128	229.466	254.104	0.98677
10	0.131286	236.376	262.633	1.05458	0.104022	235.750	261.755	1.03089	0.085832	235.111	260.861	1.01106
20	0.136509	241.971	269.273	1.07763	0.108292	241.403	268.476	1.05421	0.089469	240.826	267.667	1.03468
30	0.141681	247.656	275.992	1.10016	0.112508	247.140	275.267	1.07699	0.093051	246.616	274.531	1.05771
40	0.146809	253.434	282.796	1.12224	0.116681	252.962	282.132	1.09927	0.096588	252.484	281.460	1.08019
50	0.151902	259.306	289.686	1.14390	0.120815	258.872	289.076	1.12109	0.100085	258.435	288.460	1.10220
60	0.156963	265.271	296.664	1.16516	0.124918	264.873	296.102	1.14250	0.103550	264.470	295.535	1.12376
70	0.161997	271.332	303.731	1.18607	0.128993	270.964	303.212	1.16353	0.106986	270.593	302.689	1.14491
80	0.167008	277.488	310.890	1.20633	0.133044	277.148	310.409	1.18420	0.110399	276.804	309.924	1.16569
90	0.171999	283.739	318.139	1.22687	0.137075	283.423	317.692	1.20454	0.113790	283.104	317.241	1.18612
100	0.176972	290.086	325.480	1.24681	0.141089	289.791	325.063	1.22456	0.117164	289.494	324.643	1.20623
110	0.181931	296.526	332.912	1.26646	0.145086	296.251	332.522	1.24428	0.120522	295.972	332.129	1.22603

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 781 - 782, tabla A.4.2SI.

Tabla A.4.3 SI Refrigerante - 22 sobrecalentado.

	P = 0.40 MPa				P = 0.50 MPa				P = 0.60 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
0	0.060131	227.999	252.051	0.95359	-	-	-	-	-	-	-	-
10	0.063060	233.799	259.023	0.97866	0.049355	232.431	257.108	0.95223	0.040180	231.001	255.109	0.92945
20	0.065915	239.644	266.010	1.00291	0.051751	238.420	264.295	0.97717	0.042280	237.149	262.517	0.95517
30	0.068710	245.545	273.029	1.02646	0.054081	244.443	271.483	1.00128	0.044307	243.304	269.888	0.97989
40	0.071455	251.510	280.092	1.04938	0.056358	250.511	278.690	1.02467	0.046276	249.484	277.250	1.00378
50	0.074160	257.545	287.209	1.07175	0.058590	256.635	285.930	1.04743	0.048198	255.703	284.622	1.02695
60	0.076830	263.654	294.386	1.09362	0.060786	262.822	293.215	1.06963	0.050081	261.971	292.020	1.04950
70	0.079470	269.842	301.630	1.11504	0.062951	269.077	300.552	1.09133	0.051931	268.297	299.456	1.07149
80	0.082085	276.110	308.944	1.13605	0.065090	275.404	307.949	1.11257	0.053754	274.686	306.938	1.09298
90	0.084679	282.460	316.332	1.15668	0.067206	281.807	315.410	1.13340	0.055553	281.143	314.475	1.11403
100	0.087254	288.894	323.796	1.17695	0.069303	288.288	322.939	1.15386	0.057332	287.672	322.071	1.13466
110	0.089813	295.414	331.339	1.19690	0.071384	294.847	330.539	1.17395	0.059094	294.275	329.731	1.15492
120	0.092358	302.018	338.961	1.21654	0.073450	301.488	338.213	1.19373	0.060842	300.953	337.458	1.17482
130	0.094890	308.708	346.664	1.23588	0.075503	308.212	345.963	1.21319	0.062576	307.709	345.255	1.19441

	P = 0.70 MPa				P = 0.80 MPa				P = 0.90 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
20	0.035487	235.826	260.667	0.93565	0.030366	234.444	258.737	0.91787	0.026355	232.994	256.713	0.90132
30	0.037305	242.127	268.240	0.96105	0.032034	240.906	266.533	0.94402	0.027915	239.637	264.760	0.92831
40	0.039059	248.428	275.769	0.98549	0.033632	247.337	274.243	0.96905	0.029397	246.213	272.670	0.95398
50	0.040763	254.748	283.282	1.00910	0.035175	253.767	281.907	0.99314	0.030819	252.760	280.497	0.97859
60	0.042424	261.103	290.800	1.03201	0.036674	260.213	289.552	1.01644	0.032193	259.304	288.278	1.00230
70	0.044052	267.503	298.339	1.05431	0.038136	266.693	297.202	1.03906	0.033528	265.867	296.042	1.02526
80	0.045650	273.437	305.392	1.07606	0.039568	273.214	304.868	1.06108	0.034832	272.458	303.807	1.04757
90	0.047224	280.513	313.570	1.09732	0.040974	279.786	312.565	1.08257	0.036108	279.093	311.590	1.06930
100	0.048778	287.047	321.192	1.11815	0.042359	286.416	320.303	1.10359	0.037363	285.774	319.401	1.09052
110	0.050313	293.695	328.914	1.13856	0.043725	293.107	328.087	1.12417	0.038598	292.513	327.251	1.11128
120	0.051834	300.412	336.696	1.15861	0.045076	299.864	335.925	1.14437	0.039817	299.312	335.147	1.13162
130	0.053341	307.202	344.541	1.17832	0.046413	306.691	343.821	1.16420	0.041022	306.174	343.094	1.15158
140	0.054836	314.069	352.454	1.19770	0.047738	313.588	351.778	1.18369	0.042215	313.104	351.097	1.17119
150	0.056321	321.010	360.435	1.21679	0.049052	320.557	359.799	1.20288	0.043398	320.101	359.159	1.19047

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 782 - 783, tabla A.4.2SI.

Tabla A.4.3 SI Refrigerante - 22 sobrecalentado.

	P = 1.00 MPa				P = 1.20 MPa				P = 1.40 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
30	0.024600	238.312	262.912	0.91358	-	-	-	-	-	-	-	-
40	0.025995	245.047	271.042	0.93996	0.020851	242.581	267.602	0.91411	0.017120	239.893	263.861	0.89010
50	0.027323	252.083	279.406	0.96512	0.022051	249.550	276.011	0.94055	0.018247	247.220	272.766	0.91809
60	0.028601	258.372	286.973	0.98928	0.023191	256.434	284.263	0.96570	0.019299	254.382	281.401	0.94441
70	0.029836	265.023	294.859	1.01260	0.024282	263.277	292.415	0.98981	0.020295	261.445	289.858	0.96942
80	0.031038	271.689	302.727	1.03520	0.025336	270.105	300.508	1.01305	0.021248	268.455	298.202	0.99339
90	0.032213	278.346	310.559	1.05718	0.026359	276.939	308.570	1.03556	0.022167	275.439	306.473	1.01649
100	0.033364	285.124	318.488	1.07861	0.027357	283.795	316.623	1.05744	0.023057	282.423	314.703	1.03884
110	0.034495	291.910	326.405	1.09955	0.028334	290.681	324.682	1.07875	0.023925	289.421	322.916	1.06056
120	0.035609	298.751	334.360	1.12004	0.029292	297.612	332.762	1.09957	0.024775	296.443	331.128	1.08172
130	0.036709	305.651	342.360	1.14014	0.030236	304.588	340.871	1.11994	0.025608	303.503	339.354	1.10238
140	0.037797	312.613	350.410	1.15986	0.031166	291.620	329.019	1.13990	0.026426	310.607	347.603	1.12259
150	0.038873	319.641	358.514	1.17924	0.032084	318.709	357.210	1.15949	0.027233	317.759	355.885	1.14240
160	0.039940	326.737	366.677	1.19831	0.032993	325.858	365.450	1.17873	0.028029	324.965	364.206	1.16183

	P = 1.60 MPa				P = 1.80 MPa				P = 2.00 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
50	0.015351	244.700	269.262	0.89689	0.013052	241.929	265.423	0.87625	-	-	-	-
60	0.016351	252.196	278.358	0.92461	0.014028	249.847	275.097	0.90573	0.012135	247.293	271.563	0.88729
70	0.017284	259.517	287.171	0.95068	0.014921	257.473	284.331	0.93304	0.013008	255.294	281.310	0.91612
80	0.018167	266.730	295.797	0.97546	0.015755	264.923	293.282	0.95876	0.013811	263.018	290.640	0.94292
90	0.019011	273.883	304.301	0.99920	0.016546	272.263	302.046	0.98323	0.014563	270.571	299.697	0.96821
100	0.019825	281.005	312.725	1.02209	0.017303	279.538	310.683	1.00669	0.015277	278.017	308.571	0.99232
110	0.020614	288.121	321.103	1.04424	0.018032	286.781	319.239	1.02932	0.015960	285.402	317.322	1.01546
120	0.021382	295.246	329.457	1.06576	0.018738	294.017	327.745	1.05123	0.016619	292.753	325.991	1.03780
130	0.022133	302.392	337.805	1.08673	0.019427	301.255	336.224	1.07253	0.017258	300.094	334.610	1.05944
140	0.022869	309.572	346.162	1.10721	0.020099	308.517	344.695	1.09329	0.017881	307.439	343.201	1.08049
150	0.023592	316.793	354.540	1.12724	0.020759	315.806	353.172	1.11356	0.018490	314.803	351.783	1.10102
160	0.024305	324.057	362.945	1.14688	0.021407	323.133	361.666	1.13340	0.019087	322.195	360.369	1.12107
170	0.025008	331.373	371.386	1.16614	0.022045	330.505	370.186	1.15284	0.019673	329.624	368.970	1.14070
180	0.025703	338.744	379.869	1.18507	0.022675	337.923	378.738	1.17193	0.020251	337.093	377.595	1.15995

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 783 - 784, tabla A.4.2SI.

Tabla A.4.3 SI Refrigerante - 22 sobrecalentado.

	P = 2.50 MPa				P = 3.00 MPa				P = 3.50 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
70	0.009459	249.030	272.677	0.87476	-	-	-	-	-	-	-	-
80	0.010243	257.725	283.332	0.90537	0.007747	251.289	274.530	0.86780	0.005765	242.562	262.739	0.82489
90	0.010948	265.968	293.338	0.93332	0.008465	260.647	286.042	0.89995	0.006597	254.179	277.268	0.86548
100	0.011598	273.940	302.935	0.95939	0.009098	269.369	296.663	0.92881	0.007257	264.105	289.504	0.89872
110	0.012208	281.741	312.261	0.98405	0.009674	277.722	306.744	0.95547	0.007829	273.239	300.640	0.92818
120	0.012788	289.430	321.400	1.00760	0.010211	285.837	316.470	0.98053	0.008346	281.918	311.129	0.95520
130	0.013343	297.055	330.412	1.03023	0.010717	293.804	325.955	1.00435	0.008825	290.309	321.196	0.98049
140	0.013880	304.636	339.336	1.05210	0.011200	301.670	335.270	1.02718	0.009276	298.510	330.976	1.00445
150	0.014400	312.205	348.205	1.07331	0.011665	309.472	344.467	1.04918	0.009704	306.590	340.554	1.02736
160	0.014907	319.773	357.040	1.09395	0.012114	317.252	353.594	1.07047	0.010114	314.590	349.989	1.04940
170	0.015402	327.355	365.860	1.11408	0.012550	324.997	362.647	1.09116	0.010510	322.539	359.324	1.07071
180	0.015887	334.962	374.679	1.13376	0.012976	332.751	371.679	1.11131	0.010894	330.461	368.590	1.09138
190	0.016364	342.598	383.508	1.15303	0.013392	340.519	380.695	1.13099	0.011268	338.372	377.810	1.11151
200	0.016834	350.269	392.354	1.17192	0.013801	348.305	389.708	1.15024	0.011634	346.285	387.004	1.13115

	P = 4.00 MPa				P = 5.00 MPa				P = 6.00 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
90	0.005037	245.481	265.629	0.82544	-	-	-	-	-	-	-	-
100	0.005804	257.781	280.997	0.86721	0.003334	236.372	253.042	0.78005	-	-	-	-
110	0.006405	268.128	293.748	0.90094	0.004255	254.644	275.919	0.84064	0.002432	228.686	243.278	0.74674
120	0.006924	277.577	305.273	0.93064	0.004851	367.107	391.362	0.88045	0.003333	252.387	272.385	0.82185
130	0.007391	286.516	316.080	0.95778	0.005335	277.794	304.469	0.91337	0.003899	266.859	290.253	0.86675
140	0.007822	295.134	326.422	0.98312	0.005757	287.594	316.379	0.94256	0.004345	278.687	304.757	0.90230
150	0.008226	303.542	336.446	1.00710	0.006139	296.868	327.563	0.96931	0.004728	289.265	317.633	0.93310
160	0.008610	311.806	346.246	1.02999	0.006493	305.801	338.266	0.99431	0.005071	299.127	329.553	0.96094
170	0.008978	319.973	355.885	1.05199	0.006826	314.503	348.633	1.01797	0.005386	308.533	340.849	0.98673
180	0.009332	328.081	365.409	1.07324	0.007142	323.050	358.760	1.04057	0.005680	317.635	351.715	1.01098
190	0.009675	336.153	374.853	1.09386	0.007444	331.493	368.713	1.06230	0.005958	326.523	362.271	1.03402
200	0.010000	344.240	384.240	1.11391	0.007735	339.862	378.537	1.08328	0.006222	335.270	372.602	1.05609
210	0.010335	352.253	393.593	1.13347	0.008018	348.178	388.268	1.10363	0.006477	343.902	382.764	1.07734
220	0.010654	360.309	402.925	1.15259	0.008292	356.472	397.932	1.12343	0.006722	352.469	392.801	1.09790

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 784 - 785, tabla A.4.2SI.

Tabla A.5 SI Propiedades termodinámicas del Refrigerante – 134a (Van Wylen).
Tabla A.5.1 SI Refrigerante - 134a saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
-33	0.0737	0.000718	0.255742	0.25646	157.364	201.643	359.007	157.417	220.491	377.908	0.8346	0.9182	1.7528
-30	0.0851	0.000722	0.223298	0.22402	161.057	199.681	360.738	161.118	218.684	379.802	0.8499	0.8994	1.7493
-26.25	0.1013	0.000728	0.189472	0.19020	165.728	197.166	362.895	165.802	216.360	382.162	0.8690	0.8763	1.7453
-25	0.1073	0.000730	0.179560	0.18029	167.303	196.302	363.605	167.381	215.569	382.950	0.8754	0.8687	1.7441
-20	0.1337	0.000738	0.145752	0.14649	173.645	192.852	366.497	173.744	212.339	386.083	0.9007	0.8388	1.7395
-15	0.1650	0.000746	0.119324	0.12007	180.070	189.316	369.385	180.193	209.004	389.197	0.9258	0.8096	1.7354
-10	0.2017	0.000755	0.098454	0.099209	186.569	185.706	372.275	186.721	205.564	392.285	0.9507	0.7812	1.7319
-5	0.2445	0.000764	0.081812	0.082576	193.137	182.013	375.150	193.324	202.016	395.340	0.9755	0.7533	1.7288
0	0.2940	0.000773	0.068420	0.069193	199.773	178.241	378.013	200.000	198.356	398.356	1.0000	0.7262	1.7262
5	0.3509	0.000783	0.057551	0.058334	206.476	174.377	380.854	206.751	194.572	401.323	1.0243	0.6996	1.7239
10	0.4158	0.000794	0.048657	0.049451	213.250	170.421	383.671	213.580	190.653	404.233	1.0485	0.6733	1.7218
15	0.4895	0.000805	0.041326	0.042131	220.098	166.354	386.452	220.492	186.583	407.075	1.0725	0.6475	1.7200
20	0.5728	0.000817	0.035238	0.036055	227.025	162.161	389.186	227.493	182.345	409.838	1.0963	0.6220	1.7183
25	0.6663	0.000829	0.030148	0.030977	234.038	157.831	391.869	234.590	177.919	412.509	1.1201	0.5967	1.7168
30	0.7710	0.000843	0.025864	0.026707	241.140	153.344	394.484	241.790	173.285	415.075	1.1437	0.5716	1.7153
35	0.8876	0.000857	0.022237	0.023094	248.342	148.677	397.020	249.103	168.415	417.518	1.1673	0.5466	1.7139
40	1.0171	0.000873	0.019147	0.020020	255.651	143.808	399.459	256.539	163.282	419.821	1.1909	0.5214	1.7123
45	1.1602	0.000890	0.016499	0.017389	263.077	138.710	401.787	264.110	157.852	421.962	1.2145	0.4961	1.7106
50	1.3180	0.000908	0.014216	0.015124	270.633	133.348	403.982	271.830	152.085	423.915	1.2381	0.4707	1.7088
55	1.4915	0.000928	0.012238	0.013166	278.334	127.679	406.013	279.718	145.932	425.650	1.2619	0.4447	1.7066
60	1.6818	0.000951	0.010511	0.011462	286.195	121.659	407.853	287.794	139.336	427.130	1.2857	0.4183	1.7040
65	1.8898	0.000976	0.008994	0.009970	294.244	115.220	409.464	296.088	132.217	428.305	1.3099	0.3910	1.7009
70	2.1169	0.001005	0.007652	0.008657	302.515	108.269	410.784	304.642	124.468	429.110	1.3343	0.3627	1.6970
75	2.3644	0.001038	0.006453	0.007491	311.059	100.681	411.739	313.513	115.938	429.451	1.3592	0.3331	1.6923
80	2.6337	0.001078	0.005368	0.006446	319.955	92.257	412.212	322.794	106.395	429.189	1.3849	0.3013	1.6862
85	2.9265	0.001128	0.004367	0.005495	329.343	82.660	412.003	332.644	95.440	428.084	1.4117	0.2665	1.6782
90	3.2448	0.001195	0.003411	0.004606	339.502	71.228	410.730	343.380	82.296	425.676	1.4404	0.2266	1.6670
95	3.5914	0.001297	0.002432	0.003729	351.176	56.250	407.426	355.834	64.984	420.818	1.4733	0.1765	1.6498
101.15	4.0640	0.001969	0	0.001969	382.975	0	382.975	390.977	0	390.977	1.5658	0	1.5658

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 785 - 786, tabla A.5.1SI.

Tabla A.5.2 SI Refrigerante - 134a sobrecalentado.

	P = 0.10 MPa				P = 0.15 MPa				P = 0.20 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
-25	0.19400	363.812	383.212	1.75058	-	-	-	-	-	-	-	-
-20	0.19860	367.355	387.215	1.76655	-	-	-	-	-	-	-	-
-10	0.20765	374.505	395.270	1.79775	0.13603	373.435	393.839	1.76058	0.10013	372.312	392.338	1.73276
0	0.21652	381.761	403.413	1.82813	0.14222	380.854	402.187	1.79171	0.10501	379.909	400.911	1.76474
10	0.22527	389.141	411.668	1.85780	0.14828	388.360	410.602	1.82197	0.10974	387.552	409.500	1.79562
20	0.23393	396.655	420.048	1.88689	0.15424	395.975	419.111	1.85150	0.11436	395.273	418.145	1.82563
30	0.24250	404.314	428.564	1.91545	0.16011	403.714	427.730	1.88041	0.11889	403.097	426.875	1.85491
40	0.25102	412.121	437.223	1.94355	0.16592	411.585	436.473	1.90879	0.12335	411.038	435.708	1.88357
50	0.25948	420.081	446.029	1.97123	0.17168	419.598	445.350	1.93669	0.12776	419.106	444.658	1.91171
60	0.26971	428.015	454.986	1.99853	0.17740	427.756	454.366	1.96416	0.13213	427.309	453.735	1.93937
70	0.27631	436.465	464.096	2.02547	0.18308	436.063	463.525	1.99125	0.13646	435.654	462.946	1.96661
80	0.28468	444.891	473.359	2.05208	0.18874	444.520	472.831	2.01798	0.14076	444.144	472.296	1.99346
90	0.29303	453.474	482.777	2.07837	0.19437	453.130	482.285	2.04438	0.14504	452.780	481.788	2.01997
100	0.30136	462.213	492.349	2.10437	0.19999	461.890	491.888	2.07046	0.14930	461.564	491.424	2.04614

	P = 0.25 MPa				P = 0.30 MPa				P = 0.40 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
0	0.082637	378.920	399.579	1.74284	-	-	-	-	-	-	-	-
10	0.086584	386.711	408.357	1.77440	0.071110	385.838	407.171	1.75637	0.051681	383.979	404.651	1.72611
20	0.090408	394.549	417.151	1.80492	0.074415	393.800	416.124	1.78744	0.054362	392.220	413.965	1.75844
30	0.094139	402.462	425.997	1.83460	0.077620	401.810	425.096	1.81754	0.056926	400.445	423.215	1.78947
40	0.097798	410.476	434.925	1.86357	0.080748	409.900	434.124	1.84684	0.059402	408.704	432.465	1.81949
50	0.101401	418.603	443.953	1.89195	0.083816	418.089	443.234	1.87547	0.061812	417.026	441.751	1.84868
60	0.104958	426.855	453.094	1.91980	0.086838	426.391	452.442	1.90354	0.064169	425.436	451.104	1.87718
70	0.108480	435.239	462.359	1.94720	0.089821	434.817	461.763	1.93110	0.066484	433.860	460.454	1.90510
80	0.111972	443.761	471.754	1.97419	0.092774	443.374	471.206	1.95823	0.068767	442.581	470.088	1.93252
90	0.115440	452.425	481.285	2.00080	0.095702	452.066	480.777	1.98495	0.071022	451.336	479.745	1.95948
100	0.118888	461.233	490.955	2.02707	0.098609	460.899	490.482	2.01131	0.073254	460.221	489.523	1.98604
110	0.122318	470.187	500.766	2.05301	0.101498	469.875	500.324	2.03734	0.075468	469.241	499.428	2.01223
120	0.125734	479.287	510.720	2.07866	0.104371	478.993	510.304	2.06305	0.077665	478.398	509.464	2.03809

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 786 - 787, tabla A.5.2SI.

Tabla A.5.2 SI Refrigerante - 134a sobrecalentado.

	P = 0.50 MPa				P = 0.60 MPa				P = 0.70 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
20	0.042256	390.517	411.645	1.73420	-	-	-	-	-	-	-	-
30	0.044457	398.993	421.221	1.76632	0.036094	397.442	419.098	1.74610	0.030069	395.761	416.809	1.72770
40	0.046557	407.442	430.720	1.79715	0.037958	406.106	428.881	1.77786	0.031781	404.686	426.933	1.76056
50	0.048581	415.915	440.205	1.82696	0.039735	414.748	438.589	1.80838	0.033392	413.521	436.895	1.79187
60	0.050547	424.445	449.718	1.85596	0.041447	423.411	448.279	1.83791	0.034929	422.332	446.782	1.82201
70	0.052467	433.057	459.290	1.88426	0.043108	432.129	457.994	1.86664	0.036410	431.168	456.655	1.85121
80	0.054351	441.767	468.942	1.91199	0.044730	440.926	467.764	1.89471	0.037848	440.060	466.554	1.87964
90	0.056205	450.588	478.690	1.93931	0.046319	449.820	477.611	1.92220	0.039251	449.031	476.507	1.90743
100	0.058035	459.529	488.546	1.96598	0.047883	458.820	487.550	1.94920	0.040627	458.096	486.535	1.93467
110	0.059845	468.596	498.518	1.99235	0.049426	468.938	498.594	1.97576	0.041980	467.268	496.654	1.96143
120	0.061639	477.794	508.613	2.01836	0.050951	477.179	507.750	2.00193	0.043314	476.555	506.875	1.98777
130	0.063418	487.126	518.835	2.04403	0.052461	486.549	518.026	2.02774	0.044633	485.964	517.207	2.01372
140	0.065184	496.595	529.187	2.06940	0.053958	496.050	528.425	2.05322	0.045938	495.499	527.656	2.03932

	P = 0.80 MPa				P = 0.90 MPa				P = 1.00 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
40	0.027113	403.170	424.860	1.74450	0.023446	401.541	422.642	1.72943	0.020473	399.776	420.249	1.71479
50	0.028611	412.225	435.114	1.77680	0.024868	410.854	433.235	1.76273	0.021849	409.394	431.243	1.74936
60	0.030024	421.204	445.223	1.80761	0.026192	420.022	443.595	1.79431	0.023110	418.780	441.890	1.78181
70	0.031375	430.170	455.270	1.83732	0.027447	429.133	453.835	1.82459	0.024293	428.052	452.345	1.81273
80	0.032678	439.166	465.308	1.86616	0.028649	438.241	464.025	1.85387	0.025417	437.286	462.703	1.84248
90	0.033944	448.220	475.375	1.89427	0.029810	447.387	474.216	1.88232	0.026497	446.530	473.027	1.87131
100	0.035180	457.355	485.499	1.92177	0.030940	456.595	484.441	1.91010	0.027543	455.818	483.361	1.89938
110	0.036392	466.584	495.698	1.94874	0.032043	465.887	494.726	1.93730	0.028561	465.175	493.736	1.92682
120	0.037584	475.921	505.988	1.97525	0.033126	475.275	505.088	1.96399	0.029556	474.619	504.175	1.95371
130	0.038760	485.371	516.379	2.00135	0.034190	484.771	515.542	1.99025	0.030533	484.161	514.694	1.98013
140	0.039921	494.943	526.880	2.02708	0.035241	494.379	526.096	2.01611	0.031495	493.810	525.305	2.00613
150	0.041071	504.640	537.497	2.05247	0.036278	504.110	536.760	2.04161	0.032444	503.573	536.017	2.03175

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 787 - 788, tabla A.5.2SI.

Tabla A.5.2 SI Refrigerante - 134a sobrecalentado.

	P = 1.20 MPa				P = 1.40 MPa				P = 1.60 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
50	0.017243	406.153	426.845	1.72373	-	-	-	-	-	-	-	-
60	0.018439	416.083	438.210	1.75837	0.015032	413.034	434.079	1.73597	0.012392	409.495	429.322	1.71349
70	0.019530	425.743	449.179	1.79081	0.016083	423.204	445.720	1.77040	0.013449	420.370	441.888	1.75066
80	0.020548	435.267	459.925	1.82168	0.017040	433.088	456.944	1.80265	0.014378	430.717	453.722	1.78466
90	0.021512	444.737	470.551	1.85135	0.017931	442.828	467.931	1.83333	0.015225	440.785	465.145	1.81656
100	0.022436	454.205	481.128	1.88009	0.018775	452.505	478.790	1.86282	0.016015	450.709	476.333	1.84695
110	0.023329	463.707	491.702	1.90805	0.019583	462.173	489.589	1.89139	0.016763	460.569	487.390	1.87619
120	0.024197	473.271	502.307	1.93537	0.020362	471.872	500.379	1.91918	0.017479	470.421	498.387	1.90452
130	0.025044	482.912	512.965	1.96214	0.021180	467.540	511.192	1.94634	0.018169	480.301	509.371	1.93211
140	0.025874	492.648	523.697	1.98844	0.021856	491.459	522.057	1.97296	0.018840	490.232	520.376	1.95905
150	0.026691	502.485	534.514	2.01431	0.022579	501.373	532.984	1.99910	0.019493	500.238	531.427	1.98551
160	0.027495	512.432	545.426	2.03980	0.023289	511.389	543.994	2.02481	0.020133	510.329	542.542	2.01147
170	0.028289	522.496	556.443	2.06494	0.023988	521.514	555.097	2.05015	0.020761	520.517	553.735	2.03702

	P = 1.80 MPa				P = 2.00 MPa				P = 2.50 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
70	0.011341	417.148	437.562	1.73085	0.009581	413.369	432.531	1.71011	-	-	-	-
80	0.012273	428.111	450.202	1.76717	0.010550	425.204	446.304	1.74968	0.007221	415.745	433.797	1.70180
90	0.013099	438.586	462.164	1.80057	0.011374	436.203	458.951	1.78500	0.008157	429.107	449.499	1.74567
100	0.013854	448.804	473.741	1.83202	0.012111	446.774	470.996	1.81772	0.008907	441.012	463.279	1.78311
110	0.014560	458.887	485.095	1.86205	0.012789	457.115	482.693	1.84866	0.009558	452.234	476.129	1.81709
120	0.015230	468.911	496.325	1.89098	0.013424	467.339	494.187	1.87827	0.010148	463.087	488.457	1.84886
130	0.015871	478.930	507.498	1.91905	0.014028	477.513	505.569	1.90686	0.010694	473.739	500.474	1.87904
140	0.016490	488.977	518.659	1.94639	0.014608	487.684	516.900	1.93463	0.011208	484.287	512.307	1.90804
150	0.017091	499.077	529.841	1.97314	0.015168	497.888	528.224	1.96171	0.011698	494.792	524.037	1.93609
160	0.017677	509.249	541.068	1.99936	0.015712	508.147	539.571	1.98821	0.012169	505.300	535.722	1.96338
170	0.018251	519.505	552.357	2.02513	0.016242	518.479	550.963	2.01421	0.012624	515.839	547.399	1.99004
180	0.018814	529.859	563.724	2.05049	0.016762	528.994	562.518	2.03977	0.013066	526.433	559.098	2.01614
190	0.019369	540.313	575.177	2.07549	0.017272	539.406	573.950	2.06494	0.013498	537.096	570.841	2.04177

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 788 - 789, tabla A.5.2SI.

Tabla A.5.2 SI Refrigerante - 134a sobrecalentado.

	P = 3.00 MPa				P = 3.50 MPa				P = 4.00 MPa			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
90	0.005755	418.928	436.193	1.69950	-	-	-	-	-	-	-	-
100	0.006653	433.772	453.731	1.74717	0.004839	423.497	440.433	1.70386	-	-	-	-
110	0.007339	446.483	468.500	1.78623	0.005667	439.377	459.211	1.75355	0.004277	429.736	446.844	1.71480
120	0.007924	458.271	482.043	1.82113	0.006289	452.686	474.697	1.79346	0.005005	445.967	465.987	1.76415
130	0.008446	469.177	494.515	1.85347	0.006813	464.926	488.771	1.82881	0.005559	459.629	481.865	1.80404
140	0.008926	480.610	507.388	1.88406	0.007279	476.603	502.079	1.86142	0.006027	472.187	496.295	1.83940
150	0.009375	491.493	519.618	1.91328	0.007706	487.957	514.928	1.89216	0.006444	484.149	509.925	1.87200
160	0.009801	502.301	531.704	1.94151	0.008103	499.136	527.496	1.92151	0.006825	495.772	523.072	1.90271
170	0.010208	513.089	543.713	1.96892	0.008480	510.210	539.890	1.94980	0.007181	507.193	535.917	1.93203
180	0.010601	523.887	555.690	1.99565	0.008839	521.212	552.149	1.97724	0.007517	518.505	548.573	1.96028
190	0.010982	534.724	567.670	2.02180	0.009185	532.283	564.430	2.00397	0.007837	529.769	561.117	1.98766
200	0.011353	545.619	579.678	2.04745	0.009519	543.349	576.665	2.03010	0.008145	541.021	573.601	2.01432

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 789, tabla A.5.2SI.

Tabla A.5 SI Propiedades termodinámicas del Refrigerante – 134a (Çengel).
Tabla A.5.1 SI Refrigerante - 134a saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
-40	**0.05164**	**0.0007055**	**0.3561945**	**0.3569**	**-0.04**	**204.49**	**204.45**	**0.00**	**222.88**	**222.88**	**0.0000**	**0.9560**	**0.9560**
-36	0.06332	0.0007113	0.2939887	0.2947	4.68	202.05	206.73	4.73	220.67	225.40	0.0201	0.9305	0.9506
-32	0.07704	0.0007172	0.2443828	0.2451	9.47	199.54	209.01	9.52	218.38	227.90	0.0401	0.9055	0.9456
-28	0.09305	0.0007233	0.2044767	0.2052	14.31	196.98	211.29	14.37	216.01	230.38	0.0600	0.8811	0.9411
-26	0.10199	0.0007265	0.1874735	0.1882	16.75	195.68	212.43	16.82	214.80	231.62	0.0699	0.8691	0.9390
-24	0.11160	0.0007296	0.1720704	0.1728	19.21	194.36	213.57	19.29	213.56	232.85	0.0798	0.8572	0.9370
-22	0.12192	0.0007328	0.1582672	0.1590	21.68	193.02	214.70	21.77	212.31	234.08	0.0897	0.8454	0.9351
-20	0.13299	0.0007361	0.1456639	0.1464	24.17	191.67	215.84	24.26	211.05	235.31	0.0996	0.8336	0.9332
-18	0.14483	0.0007395	0.1342605	0.1350	26.67	190.30	216.97	26.77	209.76	236.53	0.1094	0.8221	0.9315
-16	0.15748	0.0007428	0.1239572	0.1247	29.18	188.92	218.10	29.30	208.44	237.74	0.1192	0.8106	0.9298
-12	0.18540	0.0007498	0.1060502	0.1068	34.25	186.11	220.36	34.39	205.76	240.15	0.1388	0.7879	0.9267
-8	0.21704	0.0007569	0.0911431	0.0919	39.38	183.22	222.60	39.54	203.00	242.54	0.1583	0.7656	0.9239
-4	0.25274	0.0007644	0.0786356	0.0794	44.56	180.28	224.84	44.75	200.15	244.90	0.1777	0.7436	0.9213
0	0.29282	0.0007721	0.0681279	0.0689	49.79	177.27	227.06	50.02	197.21	247.23	0.1970	0.7220	0.9190
4	0.33765	0.0007801	0.0592199	0.0600	55.08	174.19	229.27	55.35	194.18	249.53	0.2162	0.7007	0.9169
8	0.38756	0.0007884	0.0517116	0.0525	60.43	171.03	231.46	60.73	191.07	251.80	0.2354	0.6796	0.9150
12	0.44294	0.0007971	0.0452029	0.0460	65.83	167.80	233.63	66.18	187.85	254.03	0.2545	0.6587	0.9132
16	0.50416	0.0008062	0.0396938	0.0405	71.29	164.49	235.78	71.69	184.53	256.22	0.2735	0.6381	0.9116
20	0.57160	0.0008157	0.0349843	0.0358	76.80	161.11	237.91	77.26	181.09	258.35	0.2924	0.6178	0.9102
24	0.64566	0.0008257	0.0308743	0.0317	82.37	157.64	240.01	82.90	177.55	260.45	0.3113	0.5976	0.9089
26	0.68530	0.0008309	0.0289691	0.0298	85.18	155.87	241.05	85.75	175.73	261.48	0.3208	0.5874	0.9082
28	0.72675	0.0008362	0.0272638	0.0281	88.00	154.08	242.08	88.61	173.89	262.50	0.3302	0.5774	0.9076
30	0.77006	0.0008417	0.0256583	0.0265	90.84	152.26	243.10	91.49	172.01	263.50	0.3396	0.5674	0.9070
32	0.81528	0.0008473	0.0241527	0.0250	93.70	150.42	244.12	94.39	170.09	264.48	0.3490	0.5574	0.9064
34	0.86247	0.0008530	0.0227470	0.0236	96.58	118.54	215.12	97.31	168.14	265.45	0.3584	0.5474	0.9058
36	0.91168	0.0008590	0.0214410	0.0223	99.47	146.64	246.11	100.25	166.15	266.40	0.3678	0.5375	0.9053
38	0.96298	0.0008651	0.0201349	0.0210	102.38	144.71	247.09	103.21	164.12	267.33	0.3772	0.5275	0.9047
40	1.0164	0.0008714	0.0190286	0.0199	105.30	142.76	248.06	106.19	162.05	268.24	0.3866	0.5175	0.9041
42	1.0720	0.0008780	0.0179220	0.0188	108.25	140.77	249.02	109.19	159.95	269.14	0.3960	0.5075	0.9035
44	1.1299	0.0008847	0.0168153	0.0177	111.22	138.74	249.96	112.22	157.79	270.01	0.4054	0.4976	0.9030
48	1.2526	0.0008989	0.0150011	0.0159	117.22	134.57	251.79	118.35	153.33	271.68	0.4243	0.4774	0.9017
52	1.3851	0.0009142	0.0132858	0.0142	123.31	130.24	253.55	124.58	148.66	273.24	0.4432	0.4572	0.9004

Tabla A.5.1 SI Refrigerante - 134a saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.ºC T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
56	1.5278	0.0009308	0.0117692	0.0127	129.51	125.72	255.23	130.93	143.75	274.68	0.4622	0.4368	0.8990
60	1.6813	0.0009488	0.0104512	0.0114	135.82	120.99	256.81	137.42	138.57	275.99	0.4814	0.4159	0.8973
70	2.1162	0.0010027	0.0075973	0.0086	152.22	107.93	260.15	154.34	124.09	278.43	0.5302	0.3616	0.8918
80	2.6324	0.0010766	0.0053234	0.0064	169.88	92.26	262.14	172.71	106.41	279.12	0.5814	0.3013	0.8827
90	3.2435	0.0011949	0.0034051	0.0046	189.82	71.52	261.34	193.69	82.63	276.32	0.6380	0.2275	0.8655
100	3.9742	0.0015443	0.0011557	0.0027	218.60	29.89	248.49	224.74	34.39	259.13	0.7196	0.0921	0.8117

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 826, tabla A.10.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía del líquido saturado.

Tabla A.5.2 SI Refrigerante - 134a saturado: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión MPa, P	Temp.ºC T	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
0.06	-37.07	0.0007097	0.3092903	0.3100	3.41	202.71	206.12	3.46	221.26	224.72	0.0147	0.9373	0.9520
0.08	-31.21	0.0007184	0.2358816	0.2366	10.41	199.05	209.46	10.47	217.92	228.39	0.0440	0.9007	0.9447
0.10	-26.43	0.0007258	0.1909742	0.1917	16.22	195.96	212.18	16.29	215.06	231.35	0.0678	0.8717	0.9395
0.12	-22.36	0.0007323	0.1606677	0.1614	21.23	193.27	214.50	21.32	212.54	233.86	0.0879	0.8475	0.9354
0.14	-18.80	0.0007381	0.1387619	0.1395	25.66	190.86	216.52	25.77	210.27	236.04	0.1055	0.8267	0.9322
0.16	-15.62	0.0007435	0.1221565	0.1229	29.66	188.66	218.32	29.78	208.19	237.97	0.1211	0.8084	0.9295
0.18	-12.73	0.0007485	0.1090515	0.1098	33.31	186.63	219.94	33.45	206.26	239.71	0.1352	0.7921	0.9273
0.20	-10.09	0.0007532	0.0985468	0.0993	36.69	184.74	221.43	36.84	204.46	241.30	0.1481	0.7772	0.9253
0.24	-5.37	0.0007618	0.0826382	0.0834	42.77	181.30	224.07	42.95	201.14	244.09	0.1710	0.7512	0.9222
0.28	-1.23	0.0007697	0.0711303	0.0719	48.18	178.20	226.38	48.39	198.13	246.52	0.1911	0.7286	0.9197
0.32	2.48	0.0007770	0.0624230	0.0632	53.06	175.37	228.43	53.31	195.35	248.66	0.2089	0.7088	0.9177
0.36	5.84	0.0007839	0.0556161	0.0564	57.54	172.74	230.28	57.82	192.76	250.58	0.2251	0.6909	0.9160
0.4	8.93	0.0007904	0.0501096	0.0509	61.69	170.28	231.97	62.00	190.32	252.32	0.2399	0.6746	0.9145
0.5	15.74	0.0008056	0.0400944	0.0409	70.73	164.91	235.64	71.33	184.74	256.07	0.2723	0.6394	0.9117
0.6	21.58	0.0008196	0.0332804	0.0341	78.99	159.75	238.74	79.48	179.71	259.19	0.2999	0.6098	0.9097
0.7	26.72	0.0008328	0.0283672	0.0292	86.19	155.23	241.42	86.78	175.07	261.85	0.3242	0.5838	0.9080
0.8	31.33	0.0008454	0.0246546	0.0255	92.75	151.03	243.78	93.42	170.73	264.15	0.3459	0.5607	0.9066
0.9	35.53	0.0008576	0.0217424	0.0226	98.79	147.09	245.88	99.56	166.62	266.18	0.3656	0.5398	0.9054
1.0	39.39	0.0008695	0.0193305	0.0202	104.42	143.35	247.77	105.29	162.68	267.97	0.3838	0.5205	0.9043
1.2	46.32	0.0008928	0.0157072	0.0166	114.69	136.34	251.03	115.76	155.23	270.99	0.4164	0.4859	0.9023
1.4	52.43	0.0009159	0.0130841	0.0140	123.98	129.76	253.74	125.26	148.14	273.40	0.4453	0.4550	0.9003
1.6	57.92	0.0009392	0.0111608	0.0121	132.52	123.48	256.00	134.02	141.31	275.33	0.4714	0.4268	0.8982
1.8	62.91	0.0009631	0.0095369	0.0105	140.49	117.39	257.88	142.22	134.61	276.83	0.4954	0.4005	0.8959
2.0	67.49	0.0009878	0.0083122	0.0093	148.02	111.39	259.41	149.99	127.95	277.94	0.5178	0.3756	0.8934
2.5	77.59	0.0010562	0.0058438	0.0069	165.48	96.36	261.84	168.12	111.05	279.17	0.5687	0.3167	0.8854
3.0	86.22	0.0011416	0.0041584	0.0053	181.88	80.28	262.16	185.30	92.71	278.01	0.6156	0.2579	0.8735

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 827, tabla A.11.

Tabla A.5.3 SI Refrigerante - 134a sobrecalentado.

	P = 0.06 MPa (-37.07ºC)				P = 0.10 MPa (-26.43ºC)				P = 0.14 MPa (-18.80ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.31003	206.12	224.72	0.9520	0.19170	212.18	231.35	0.9395	0.13945	216.52	236.04	0.9322
-20	0.33536	217.86	237.98	1.0062	0.19770	216.77	236.54	0.9602	-	-	-	-
-10	0.34992	224.96	245.96	1.0371	0.20686	224.01	244.70	0.9918	0.14549	223.03	243.40	0.9606
0	0.36433	232.24	254.10	1.0675	0.21587	231.40	252.99	1.0227	0.15219	230.55	251.86	0.9922
10	0.37861	239.69	262.41	1.0973	0.22473	238.96	261.43	1.0531	0.15875	238.21	260.43	1.0230
20	0.39279	247.32	270.89	1.1267	0.23349	246.67	270.02	1.0829	0.16520	246.00	269.13	1.0532
30	0.40688	255.12	279.53	1.1557	0.24216	254.54	278.76	1.1122	0.17155	253.95	277.97	1.0828
40	0.42091	263.10	288.35	1.1844	0.25076	262.58	287.66	1.1411	0.17783	262.06	286.96	1.1120
50	0.43487	271.25	297.34	1.2126	0.25930	270.79	296.72	1.1696	0.18404	270.32	296.09	1.1407
60	0.44879	279.58	306.51	1.2405	0.26779	279.16	305.94	1.1977	0.19020	278.74	305.37	1.1690
70	0.46266	288.08	315.84	1.2681	0.27623	287.70	315.32	1.2254	0.19633	287.31	314.80	1.1969
80	0.47650	296.75	325.34	1.2954	0.28464	296.41	324.87	1.2528	0.20241	296.05	324.39	1.2244
90	0.49031	305.58	335.00	1.3224	0.29302	305.27	334.57	1.2799	0.20846	304.96	334.14	1.2516
100	-	-	-	-	-	-	-	-	0.21449	314.01	344.04	1.2785

	P = 0.18 MPa (-12.73ºC)				P = 0.20 MPa (-10.09ºC)				P = 0.24 MPa (-5.37ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.10983	219.94	239.71	0.9273	0.09933	221.43	241.30	0.9523	0.08343	224.07	244.09	0.9222
-10	0.11135	222.02	242.06	0.9362	0.09938	221.50	241.38	0.9256	-	-	-	-
0	0.11678	229.67	250.69	0.9684	0.10438	229.22	250.10	0.9582	0.08574	228.31	248.89	0.9399
10	0.12207	237.44	259.41	0.9998	0.10922	237.05	258.89	0.9898	0.08993	236.26	257.84	0.9721
20	0.12723	245.33	268.23	1.0304	0.11394	244.99	267.78	1.0206	0.09339	244.44	266.85	1.0034
30	0.13230	253.36	277.17	1.0604	0.11856	253.06	276.77	1.0508	0.09794	252.44	275.95	1.0339
40	0.13730	261.53	286.24	1.0898	0.12311	261.26	285.88	1.0804	0.10181	260.73	285.16	1.0637
50	0.14222	269.85	295.45	1.1187	0.12758	269.60	295.12	1.1094	0.10562	269.12	294.47	1.0930
60	0.14710	278.31	304.79	1.1472	0.13201	278.10	304.50	1.1380	0.10937	277.66	303.91	1.1218
70	0.15193	286.93	314.28	1.1753	0.13639	286.74	314.02	1.1661	0.11307	286.35	313.49	1.1501
80	0.15672	295.71	323.92	1.2030	0.14073	295.53	323.68	1.1939	0.11674	295.17	323.19	1.1780
90	0.16148	304.63	333.70	1.2303	0.14504	304.46	333.47	1.2212	0.12037	304.15	333.04	1.2055
100	0.16622	313.71	343.63	1.2573	0.14932	313.57	343.43	1.2483	0.12398	313.27	343.03	1.2326

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 828, tabla A.12.

Tabla A.5.3 SI Refrigerante - 134a sobrecalentado.

	P = 0.28 MPa (-1.23ºC)				P = 0.32 MPa (2.48ºC)				P = 0.40 MPa (8.93ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.07193	226.38	246.52	0.9197	0.06322	228.43	248.66	0.9177	0.0509	231.96	252.32	0.9145
0	0.07240	227.37	247.64	0.9238	-	-	-	-	-	-	-	-
10	0.07613	235.44	256.76	0.9566	0.06576	234.61	255.65	0.9427	0.0512	232.87	253.35	0.9182
20	0.07972	243.59	265.91	0.9883	0.06901	242.87	264.95	0.9749	0.0540	241.37	262.96	0.9515
30	0.08320	251.82	275.12	1.0192	0.07214	251.20	274.28	1.0062	0.0566	249.89	272.54	0.9837
40	0.08660	260.17	284.42	1.0494	0.07518	259.61	283.67	1.0367	0.0592	258.47	282.14	1.0148
50	0.08992	268.63	293.81	1.0789	0.07815	268.14	293.15	1.0665	0.0616	267.13	291.79	1.0452
60	0.09319	277.23	303.32	1.1079	0.08106	276.78	302.72	1.0957	0.0641	275.89	301.51	1.0748
70	0.09641	285.96	312.95	1.1364	0.08392	285.56	312.41	1.1243	0.0664	284.76	311.32	1.1038
80	0.09960	294.82	322.71	1.1644	0.08674	294.46	322.22	1.1525	0.0687	293.74	321.23	1.1322
90	0.10275	303.83	332.60	1.1920	0.08953	303.50	332.15	1.1802	0.0710	302.84	331.25	1.1602
100	0.10587	312.98	342.62	1.2193	0.09229	312.68	342.21	1.1076	0.0733	312.07	341.38	1.1878
110	0.10897	322.27	352.78	1.2461	0.09503	321.99	352.40	1.2345	0.0755	321.44	351.64	1.2149
120	0.11205	331.71	363.08	1.2727	0.09774	331.45	362.73	1.2611	0.0777	330.95	362.03	1.2417
130	-	-	-	-	-	-	-	-	0.0799	340.58	372.54	1.2681
140	-	-	-	-	-	-	-	-	0.0821	350.35	383.18	1.2941

	P = 0.50 MPa (15.74ºC)				P = 0.60 MPa (21.58ºC)				P = 0.70 MPa (26.72ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.04086	235.64	256.07	0.9117	0.03408	238.74	259.19	0.9097	0.02918	241.42	261.85	0.9080
20	0.04188	239.40	260.34	0.9264	-	-	-	-	-	-	-	-
30	0.04416	248.20	270.28	0.9597	0.03581	246.40	267.89	0.9388	0.02979	244.52	265.37	0.9197
40	0.04633	257.00	280.16	0.9918	0.03774	255.45	278.09	0.9719	0.03157	253.83	275.93	0.9539
50	0.04842	265.83	290.04	1.0229	0.03958	264.48	288.23	1.0037	0.03324	263.08	286.35	0.9867
60	0.05043	274.74	299.95	1.0531	0.04134	273.55	298.35	1.0346	0.03482	272.32	296.69	1.0182
70	0.05240	283.72	309.92	1.0825	0.04304	282.66	308.48	1.0645	0.03634	281.57	307.01	1.0487
80	0.05432	292.80	319.96	1.1114	0.04469	291.86	318.67	1.0938	0.03781	290.88	317.35	1.0784
90	0.05620	302.00	330.10	1.1397	0.04631	301.14	328.93	1.1225	0.03924	300.27	327.74	1.1074
100	0.05805	311.31	340.33	1.1675	0.04790	310.53	339.27	1.1505	0.04064	309.74	338.19	1.1358
110	0.05988	320.74	350.68	1.1949	0.04946	320.02	349.70	1.1781	0.04201	319.30	348.71	1.1637
120	0.06168	330.30	361.14	1.2218	0.05099	329.65	360.24	1.2053	0.04335	328.99	359.33	1.1910
130	0.06347	339.99	371.72	1.2484	0.05251	339.37	370.88	1.2320	0.04468	338.76	370.04	1.2179
140	0.06524	349.80	382.42	1.2746	0.05402	349.23	381.64	1.2584	0.04599	348.67	380.86	1.2444
150	-	-	-	-	0.05550	359.22	392.52	1.2844	0.04729	358.69	391.79	1.2706
160	-	-	-	-	0.05698	369.32	403.51	1.3100	0.04857	368.82	402.82	1.2963

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 829, tabla A.12.

Tabla A.5.3 SI Refrigerante - 134a sobrecalentado.

	P = 0.80 MPa (31.33ºC)				P = 0.90 MPa (35.53ºC)				P = 1.00 MPa (39.39ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.02547	243.77	264.15	0.9066	0.02255	245.89	266.18	0.9054	0.02020	247.77	267.97	0.9043
40	0.02691	252.13	273.66	0.9374	0.02325	250.33	271.25	0.9217	0.02029	248.39	268.68	0.9066
50	0.02846	261.62	284.39	0.9711	0.02472	260.09	282.34	0.9566	0.02171	258.48	280.19	0.9428
60	0.02992	271.04	294.98	1.0034	0.02609	269.73	293.21	0.9897	0.02301	268.35	291.36	0.9768
70	0.03131	280.45	305.50	1.0345	0.02738	279.30	303.94	1.0214	0.02423	278.11	302.34	1.0093
80	0.03264	289.89	316.00	1.0647	0.02861	288.87	314.62	1.0521	0.02538	287.82	313.20	1.0405
90	0.03393	299.38	326.52	1.0940	0.02980	298.46	325.28	1.0819	0.02649	297.52	324.01	1.0707
100	0.03519	308.93	337.08	1.1227	0.03095	308.11	335.96	1.1109	0.02755	307.27	334.82	1.1000
110	0.03642	318.57	347.71	1.1508	0.03207	317.82	346.68	1.1392	0.02858	317.07	345.65	1.1286
120	0.03762	328.30	358.40	1.1784	0.03316	327.63	357.47	1.1670	0.02959	326.93	356.52	1.1567
130	0.03881	338.14	369.19	1.2055	0.03423	337.52	368.33	1.1943	0.03058	336.88	367.46	1.1841
140	0.03997	348.09	380.07	1.2321	0.03529	347.51	379.27	1.2211	0.03154	346.92	378.46	1.2111
150	0.04113	358.15	391.05	1.2584	0.03633	357.61	390.31	1.2475	0.03250	357.06	389.56	1.2376
160	0.04227	368.32	402.14	1.2843	0.03736	367.82	401.44	1.2735	0.03344	367.30	400.74	1.2638
170	0.04340	378.61	413.33	1.3098	0.03838	378.14	412.68	1.2992	0.03436	377.66	412.02	1.2895
180	0.04452	389.01	424.63	1.3351	0.03939	388.57	424.02	1.3245	0.03528	388.12	423.40	1.3149

	P = 1.20 MPa (46.32ºC)				P = 1.40 MPa (52.43ºC)				P = 1.60 MPa (57.92ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.01663	251.03	270.99	0.9023	0.01405	253.73	273.40	0.9003	0.01208	256.00	275.33	0.8982
50	0.01712	254.98	275.52	0.9164	-	-	-	-	-	-	-	-
60	0.01835	265.42	287.44	0.9527	0.01495	262.17	283.10	0.9297	0.01233	258.47	278.20	0.9069
70	0.01947	275.60	298.96	0.9868	0.01603	272.87	295.31	0.9658	0.01340	269.89	291.33	0.9457
80	0.02051	285.63	310.24	1.0192	0.01701	283.29	307.10	0.9997	0.01435	280.78	303.74	0.9713
90	0.02150	295.59	321.39	1.0503	0.01792	293.54	318.63	1.0319	0.01521	291.38	315.72	1.0148
100	0.02244	305.54	332.47	1.0804	0.01878	303.73	330.02	1.0628	0.01601	301.84	327.46	1.0467
110	0.02335	315.50	343.52	1.1096	0.01960	313.88	341.32	1.0927	0.01677	312.21	339.04	1.0773
120	0.02423	325.50	354.58	1.1381	0.02039	324.04	352.59	1.1218	0.01750	322.53	350.53	1.1069
130	0.02508	335.58	365.68	1.1660	0.02115	334.25	363.86	1.1501	0.01820	332.87	361.99	1.1357
140	0.02592	345.73	376.83	1.1933	0.02189	344.50	375.15	1.1777	0.01887	343.25	373.44	1.1638
150	0.02674	355.95	388.04	1.2201	0.02262	354.82	386.49	1.2048	0.01953	353.66	384.91	1.1912
160	0.02754	366.28	399.33	1.2465	0.02333	365.23	397.89	1.2315	0.02017	364.16	396.43	1.2181
170	0.02834	376.69	410.70	1.2724	0.02403	375.72	409.36	1.2576	0.02080	374.71	407.99	1.2445
180	0.02912	387.22	422.16	1.2980	0.02472	386.29	420.90	1.2834	0.02142	385.35	419.62	1.2704
190	-	-	-	-	0.02541	396.96	432.53	1.3088	0.02203	396.08	431.33	1.2960
200	-	-	-	-	0.02608	407.73	444.24	1.3338	0.02263	406.90	443.11	1.3212

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 830, tabla A.12.

Tabla A.6 SI Propiedades termodinámicas del Nitrógeno.
Tabla A.6.1 SI Nitrógeno saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp.K T	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
63.148	0.01252	0.001150	1.480099	1.481249	-150.925	196.862	45.937	-150.911	215.393	64.482	2.4234	3.4108	5.8342
65	0.01741	0.001160	1.092665	1.093825	-147.192	194.361	47.169	-147.172	213.384	66.212	2.4816	3.2830	5.7646
70	0.03858	0.001191	0.525015	0.526206	-137.134	187.533	50.399	-137.088	207.788	70.700	2.6307	2.9684	5.5991
75	0.07610	0.001223	0.280499	0.281722	-127.042	180.470	53.428	-126.949	201.816	74.867	2.7700	2.6909	5.4609
77.348	0.101325	0.001240	0.215145	0.216385	-122.276	177.039	54.764	-122.150	198.839	76.689	2.8326	2.5707	5.4033
80	0.13699	0.001259	0.162485	0.163744	-116.861	173.060	56.199	-116.689	195.319	78.630	2.9014	2.4415	5.3429
85	0.22903	0.001299	0.100204	0.101503	-106.550	165.200	58.651	-106.252	188.150	81.898	3.0266	2.2135	5.2401
90	0.36066	0.001343	0.064803	0.066146	-96.061	156.765	60.704	-95.577	180.137	84.560	3.1466	2.0016	5.1482
95	0.54082	0.001393	0.043399	0.044792	-88.346	150.604	62.258	-87.593	174.075	86.482	3.2627	1.8009	5.0636
100	0.77881	0.001452	0.029764	0.031216	-74.330	137.511	63.182	-73.199	160.692	87.493	3.3761	1.6070	4.9831
105	1.08423	0.001522	0.020673	0.022195	-62.888	126.183	63.295	-61.238	148.597	87.359	3.4883	1.4153	4.9036
110	1.46717	0.001610	0.014342	0.015952	-50.808	113.123	62.315	-48.446	134.165	85.719	3.6017	1.2198	4.8215
115	1.93875	0.001729	0.009716	0.011445	-37.660	97.375	59.715	-34.308	116.212	81.904	3.7204	1.0106	4.7310
120	2.51248	0.001915	0.006083	0.007998	-22.416	76.646	54.229	-17.605	91.929	74.324	3.8536	0.7661	4.6197
125	3.20886	0.002353	0.002530	0.004883	-0.873	40.643	39.769	6.677	48.761	55.438	4.0395	0.3898	4.4293
126.193	3.39780	0.003194	0	0.003194	18.938	0	18.938	29.791	0	29.791	4.2193	0	4.2193

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 790, tabla A.6.1SI.

Tabla A.6.2 SI Nitrógeno sobrecalentado.

	P = 0.1 MPa				P = 0.2 MPa				P = 0.5 MPa			
Temp, K	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
100	0.291030	72.295	101.398	5.69440	0.142521	71.734	100.238	5.4775	0.053062	67.929	94.460	5.1660
125	0.367236	91.699	128.423	5.93080	0.181711	90.952	127.294	5.7191	0.070328	88.612	123.776	5.4282
150	0.442612	110.434	154.695	6.12250	0.220007	109.875	153.876	5.9130	0.086429	108.162	151.376	5.6296
175	0.517577	129.102	180.860	6.28380	0.257878	128.660	180.236	6.0755	0.102059	127.320	178.349	5.7959
200	0.592311	147.736	206.967	6.42320	0.295515	147.373	206.476	6.2157	0.117442	146.277	204.998	5.9383
225	0.666904	166.349	233.039	6.54610	0.333008	166.042	232.644	6.3390	0.132677	165.120	231.458	6.0629
250	0.741404	184.950	259.090	6.65590	0.370408	184.684	258.766	6.4491	0.147817	183.891	257.799	6.1740
275	0.815839	203.544	285.128	6.75510	0.407743	203.312	284.861	6.5486	0.162892	202.617	284.063	6.2741
300	0.890229	222.137	311.160	6.84570	0.445033	221.931	310.938	6.6393	0.177921	221.316	310.276	6.3653

	P = 1.0 MPa				P = 2.0 MPa				P = 4.0 MPa			
Temp, K	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
125	0.033064	84.333	117.397	5.1872	0.014030	73.481	101.541	4.8887	-	-	-	-
150	0.041876	105.186	147.062	5.4039	0.019541	98.697	137.779	5.1541	0.008231	82.671	115.595	4.8379
175	0.050120	125.036	175.156	5.5772	0.024153	120.278	168.584	5.3443	0.011185	109.932	154.672	5.0797
200	0.058093	144.429	202.522	5.7234	0.028436	140.656	197.528	5.4989	0.013650	132.817	187.417	5.2548
225	0.065911	163.571	229.482	5.8504	0.032548	160.447	225.543	5.6310	0.015912	154.092	217.740	5.3978
250	0.073631	182.563	256.194	5.9630	0.036558	179.898	253.014	5.7467	0.018063	174.548	246.800	5.5203
275	0.081285	201.458	282.743	6.0642	0.040500	199.140	280.140	5.8502	0.020145	194.518	275.098	5.6282
300	0.088893	220.289	309.182	6.1562	0.044395	218.244	307.034	5.9438	0.022179	214.182	302.898	5.7250

	P = 6.0 MPa				P = 8.0 MPa				P = 10.0 MPa			
Temp, K	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
150	0.004421	60.772	87.298	4.5685	0.002914	38.612	61.924	4.3522	0.002388	24.779	48.659	4.2290
175	0.006909	98.491	139.945	4.8956	0.004861	86.438	125.326	4.7460	0.003752	74.843	112.363	4.6233
200	0.008771	124.667	177.293	5.0955	0.006387	116.373	167.469	4.9717	0.005014	108.213	158.353	4.8697
225	0.010412	147.653	210.125	5.2503	0.007701	141.225	202.833	5.1385	0.006112	134.902	196.022	5.0474
250	0.011937	169.200	240.822	5.3797	0.008905	163.905	235.145	5.2748	0.007113	158.711	229.841	5.1901
275	0.013393	189.936	270.294	5.4921	0.010042	185.425	265.761	5.3916	0.008053	181.002	261.532	5.3109
300	0.014803	210.170	298.988	5.5920	0.011135	206.238	295.318	5.4945	0.008952	202.382	291.902	5.4167
350	0.017532	249.759	354.951	5.7646	0.013236	246.623	352.511	5.6709	0.01067	243.560	350.260	5.5967
400	0.020187	288.708	409.83	5.9112	0.015264	286.125	408.237	5.8197	0.01232	283.590	406.790	5.7477

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 791 - 792, tabla A.6.2SI.

Tabla A.6.2 SI Nitrógeno sobrecalentado.

	P = 15 MPa				P = 20 MPa			
Temp, K	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
150	0.001955	7.480	36.805	4.0790	0.001782	-1.996	33.644	3.9960
175	0.002598	52.958	91.928	4.4191	0.002187	39.577	83.317	4.3024
200	0.003365	90.124	140.599	4.6796	0.002687	76.428	130.168	4.5529
225	0.004109	120.273	181.908	4.8745	0.003213	108.064	172.324	4.7517
250	0.004804	146.536	218.596	5.0292	0.003729	135.854	210.434	4.9124
275	0.005461	170.555	252.470	5.1585	0.004226	161.179	245.699	5.0469
300	0.006088	193.245	284.565	5.2702	0.004704	184.927	279.007	5.1629
350	0.007280	236.266	345.466	5.4581	0.005616	229.536	341.856	5.3568
400	0.008416	277.551	403.791	5.6139	0.006487	271.909	401.649	5.5166

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 792, tabla A.6.2SI.

Tabla A.7 SI Propiedades termodinámicas del Metano.
Tabla A.7.1 SI Metano saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp, K	Presión MPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
90.685	0.01169	0.00221	3.97955	3.98176	-358.1	496.7	138.6	-358.1	543.2	185.1	4.226	5.990	10.216
95	0.01983	0.00224	2.44824	2.45048	-343.7	488.6	144.8	-343.7	537.1	193.4	4.381	5.654	10.035
100	0.03441	0.00228	1.47657	1.47885	-326.9	478.9	152.0	-326.8	529.7	202.9	4.554	5.297	9.851
105	0.05643	0.00231	0.93791	0.94022	-309.8	469.0	159.1	-309.7	521.9	212.2	4.721	4.970	9.691
110	0.08820	0.00235	0.62219	0.62454	-292.5	458.4	165.9	-292.3	513.3	221.0	4.882	4.666	9.548
115	0.13232	0.00239	0.42809	0.43048	-275.0	447.5	172.4	-274.7	504.1	229.4	5.037	4.384	9.421
120	0.19158	0.00244	0.30371	0.30615	-257.5	436.0	178.5	-257.0	494.2	237.2	5.187	4.118	9.305
125	0.26896	0.00249	0.22110	0.22359	-239.7	424.0	184.4	-239.0	483.5	244.5	5.332	3.868	9.200
130	0.36760	0.00254	0.16448	0.16702	-221.6	411.2	189.6	-220.7	471.7	251.0	5.473	3.629	9.102
135	0.49072	0.00259	0.12458	0.12717	-203.4	397.8	194.4	-202.1	458.9	256.8	5.611	3.400	9.011
140	0.64165	0.00265	0.09574	0.09839	-184.9	383.5	198.6	-183.2	444.9	261.7	5.746	3.178	8.924
145	0.82379	0.00272	0.07444	0.07716	-165.9	368.1	202.1	-163.7	429.4	265.7	5.879	2.962	8.841
150	1.04065	0.00279	0.05838	0.06117	-146.6	351.4	204.8	-143.7	412.2	268.5	6.011	2.747	8.758
155	1.29580	0.00288	0.04604	0.04892	-126.8	333.6	206.8	-123.1	393.3	270.2	6.141	2.538	8.679
160	1.59296	0.00297	0.03638	0.03935	-106.3	313.9	207.6	-101.6	371.9	270.3	6.272	2.325	8.597
165	1.93607	0.00309	0.02867	0.03176	-85.1	292.3	207.2	-79.1	347.8	268.7	6.405	2.107	8.512
170	2.32396	0.00322	0.02241	0.02563	-62.7	267.9	205.2	-55.2	320.0	264.8	6.540	1.882	8.422
175	2.77762	0.00339	0.01719	0.02058	-38.7	239.5	200.7	-29.3	287.2	257.9	6.681	1.641	8.322
180	3.28655	0.00362	0.01266	0.01628	-12.4	205.1	192.7	-0.5	246.7	246.2	6.833	1.371	8.204
185	3.86361	0.00398	0.00845	0.01243	18.4	202.7	221.1	33.8	192.1	225.9	7.009	1.039	8.048
190	4.52082	0.00499	0.00297	0.00796	69.6	66.4	136.0	92.2	79.8	172.0	7.305	0.420	7.725
190.551	4.59920	0.00615	0	0.00615	101.4	0	101.4	129.7	0	129.7	7.500	0	7.500

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 793, tabla A.7.1SI.

Tabla A.7.2 SI Metano sobrecalentado.

	P = 0.05 MPa				P = 0.10 MPa				P = 0.50 MPa			
Temp, K	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
150	1.5433	231.3	308.5	10.5170	0.7659	230.2	306.8	10.1504	0.1433	220.7	292.3	9.2515
175	1.8054	270.5	360.8	10.8399	0.8984	269.8	359.6	10.4759	0.1726	262.8	349.1	9.6021
200	2.0665	309.9	413.2	11.1196	1.0299	309.2	412.2	10.7570	0.2006	303.8	404.1	9.8959
225	2.3270	349.5	465.8	11.3674	1.1609	348.9	465.0	11.0058	0.2280	344.5	458.5	10.1520
250	2.5872	389.5	518.9	11.5914	1.2915	389.2	518.3	11.2303	0.2550	385.4	512.9	10.3812
275	2.8472	430.5	572.9	11.7972	1.4219	430.2	572.4	11.4365	0.2817	427.0	567.8	10.5906
300	3.1069	472.8	628.1	11.9891	1.5521	472.4	627.6	11.6286	0.3083	469.6	623.7	10.7850
350	3.6262	561.6	742.9	12.3429	1.8123	561.4	742.6	11.9829	0.3611	559.1	739.6	11.1422
400	4.1451	658.1	865.4	12.6697	2.0721	657.9	865.1	12.3099	0.4137	655.9	862.7	11.4710

	P = 1.00 MPa				P = 1.50 MPa				P = 2.00 MPa			
Temp, K	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
150	0.0643	206.3	270.6	8.9702	-	-	-	-	-	-	-	-
175	0.0815	253.4	334.9	9.1871	0.0508	242.6	318.8	8.9121	0.0350	230.0	300.0	8.6839
200	0.0968	296.7	393.5	9.5006	0.0621	289.2	382.3	9.2514	0.0446	281.0	370.2	9.0596
225	0.1113	338.8	450.1	9.7672	0.0724	332.8	441.4	9.5303	0.0529	326.6	432.4	9.3532
250	0.1254	380.6	506.0	10.0028	0.0822	375.7	499.0	9.7730	0.0606	370.6	491.8	9.6036
275	0.1392	422.8	562.0	10.2164	0.0917	418.7	556.2	9.9911	0.0680	414.3	550.3	9.8266
300	0.1528	466.0	618.8	10.4138	0.1010	462.3	613.8	10.1916	0.0751	458.7	608.9	10.0303
350	0.1798	556.1	735.9	10.7748	0.1193	553.4	732.3	10.5565	0.0891	550.4	728.6	10.3992
400	0.2064	653.6	860.0	11.1059	0.1373	651.3	857.2	10.8899	0.1027	648.9	854.3	10.7349

	P = 3.00 MPa				P = 4.00 MPa				P = 5.00 MPa			
Temp, K	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
200	0.0269	262.0	342.7	8.7492	0.0176	237.8	308.2	8.4675	0.0114	201.3	258.3	8.1459
225	0.0333	313.4	413.3	9.0823	0.0235	298.4	392.4	8.8653	0.0175	281.8	369.3	8.6728
250	0.0390	360.1	477.1	9.3512	0.0281	349.2	461.6	9.1574	0.0216	337.6	445.6	8.9945
275	0.0442	405.7	538.3	9.5848	0.0324	396.5	526.1	9.4031	0.0252	387.6	513.6	9.2540
300	0.0492	451.2	598.8	9.7954	0.0363	443.5	588.7	9.6212	0.0286	435.6	578.6	9.4802
350	0.0589	544.5	721.2	10.1726	0.0438	538.7	713.9	10.0071	0.0348	532.7	706.7	9.8751
400	0.0682	644.2	848.8	10.5130	0.0510	639.2	843.2	10.3523	0.0406	634.8	837.8	10.2251
450	0.0774	751.2	983.5	10.8303	0.0580	747.2	979.2	10.6725	0.0463	743.5	975.0	10.5483

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 794 - 795, tabla A.7.1SI.

Tabla A.7.2 SI Metano sobrecalentado.

	P = 6.00 MPa				P = 8.00 MPa				P = 10.00 MPa			
Temp, K	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
200	0.0061	123.7	160.3	7.6125	0.0041	55.7	88.5	7.2069	0.0038	34.2	72.2	7.0862
225	0.0135	262.7	343.7	8.4907	0.0085	217.0	285.0	8.1344	0.0059	170.3	229.3	7.8245
250	0.0173	325.0	428.8	8.8502	0.0120	297.9	393.9	8.5954	0.0089	269.6	358.6	8.3716
275	0.0205	377.9	500.9	9.1253	0.0147	357.8	475.4	8.9064	0.0113	337.1	450.1	8.7210
300	0.0234	428.0	568.4	9.3601	0.0171	411.3	548.1	9.1598	0.0133	395.4	528.4	8.9936
350	0.0288	526.7	699.5	9.7643	0.0213	515.0	685.4	9.5831	0.0169	502.8	671.8	9.4362
400	0.0338	629.6	832.4	10.1192	0.0252	620.4	822.0	9.9477	0.0201	610.9	811.9	9.8104
450	0.0386	739.3	970.9	10.4453	0.0289	731.7	962.9	10.2796	0.0231	724.3	955.3	10.1480

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 795, tabla A.7.1SI.

Tabla A.8 SI Propiedades termodinámicas del Propano.
Tabla A.8.1 SI Propano saturado: Tabla de Temperaturas.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Temp, ºC	Presión kPa, P	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
-100	2.888	0.001553	11.268447	11.27	-128.4	447.9	319.5	-128.4	480.4	352.0	-0.634	2.774	2.140
-90	6.426	0.001578	5.343422	5.345	-107.8	437.1	329.3	-107.8	471.4	363.6	-0.519	2.574	2.055
-80	13.01	0.001605	2.772395	2.774	-87.0	426.3	339.3	-87.0	462.4	375.4	-0.408	2.397	1.989
-70	24.34	0.001633	1.549367	1.551	-65.8	415.3	349.5	-65.8	453.1	387.3	-0.301	2.230	1.929
-60	42.61	0.001663	0.921737	0.9234	-44.4	404.3	359.9	-44.3	443.5	399.2	-0.198	2.081	1.883
-50	70.46	0.001694	0.577606	0.5793	-22.5	392.9	370.4	-22.4	433.6	411.2	-0.098	1.943	1.845
-40	**111.0**	**0.001728**	**0.378072**	**0.3798**	**-0.2**	**381.2**	**381.0**	**0.0**	**423.2**	**423.2**	**0.000**	**1.815**	**1.815**
-30	167.7	0.001763	0.256737	0.2585	22.6	369.0	391.6	22.9	412.1	435.0	0.096	1.695	1.791
-20	244.4	0.001802	0.179698	0.1815	45.9	356.5	402.4	46.3	400.5	446.8	0.190	1.582	1.772
-10	345.1	0.001844	0.129056	0.1309	69.8	343.4	413.2	70.4	388.0	458.4	0.282	1.475	1.757
0	474.3	0.001890	0.094640	0.09653	94.2	329.6	423.8	95.1	374.5	469.6	0.374	1.371	1.745
4	534.9	0.001910	0.084000	0.08591	104.2	323.9	428.1	105.3	368.8	474.1	0.410	1.331	1.741
8	601.1	0.001931	0.074729	0.07666	114.3	318.0	432.3	115.5	362.9	478.4	0.446	1.291	1.737
12	673.2	0.001952	0.066628	0.06858	124.6	311.9	436.5	125.9	356.8	482.7	0.482	1.252	1.734
16	751.5	0.001975	0.059515	0.06149	135.0	305.7	440.7	136.4	350.5	486.9	0.519	1.212	1.731
20	836.2	0.001999	0.053251	0.05525	145.4	299.4	444.8	147.1	343.9	491.0	0.555	1.173	1.728
24	927.8	0.002024	0.047706	0.04973	156.1	292.8	448.9	158.0	337.0	495.0	0.591	1.134	1.725
28	1027	0.002050	0.042786	0.04484	166.9	286.0	452.9	169.0	329.9	498.9	0.627	1.095	1.722
32	1133	0.002078	0.038402	0.04048	177.8	278.9	456.7	180.2	322.4	502.6	0.663	1.057	1.720
36	1247	0.002108	0.034482	0.03659	188.9	271.7	460.6	191.6	314.6	506.2	0.699	1.018	1.717
40	1369	0.002140	0.030960	0.03310	200.2	264.1	464.3	203.1	306.5	509.6	0.736	0.979	1.715
44	1500	0.002174	0.027796	0.02997	211.7	256.2	467.9	214.9	298.0	512.9	0.772	0.940	1.712
48	1640	0.002211	0.024929	0.02714	223.4	248.0	471.4	227.0	288.9	515.9	0.809	0.900	1.709
52	1789	0.002250	0.022340	0.02459	235.3	239.3	474.6	239.3	279.3	518.6	0.846	0.859	1.705
56	1947	0.002293	0.019977	0.02227	247.4	230.3	477.7	251.9	269.2	521.1	0.884	0.817	1.701
60	2116	0.002340	0.017810	0.02015	259.8	220.8	480.6	264.8	258.4	523.2	0.921	0.776	1.697
65	2342	0.002406	0.015354	0.01776	275.7	207.9	483.6	281.4	243.8	525.2	0.969	0.721	1.690
70	2586	0.002483	0.013117	0.01560	292.3	193.8	486.1	298.7	227.7	526.4	1.018	0.664	1.682
75	2849	0.002573	0.011057	0.01363	309.5	178.3	487.8	316.8	209.8	526.6	1.069	0.602	1.671
80	3131	0.002683	0.009137	0.01182	327.6	160.6	488.2	336.0	189.2	525.2	1.122	0.535	1.657
85	3436	0.002827	0.007283	0.01011	347.2	139.7	486.9	356.9	164.7	521.6	1.178	0.460	1.638
90	3764	0.003038	0.005377	0.008415	369.4	112.8	482.2	380.8	133.1	513.9	1.242	0.366	1.608
95	4119	0.003488	0.002907	0.006395	399.8	67.6	467.4	414.2	79.5	493.7	1.330	0.216	1.546
96.7	4248	0.004535	0.000000	0.004535	434.9	0.0	434.9	454.2	0.0	454.2	1.437	0.000	1.437

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 837, tabla A.16.

Tabla A.8.2 SI Propano saturado: Tabla de Presiones.

		Volumen específico, m^3/kg			Energía interna, kJ/kg			Entalpía, kJ/kg			Entropía, kJ/kg.K		
Presión kPa, P	Temp, ºC	Líquido saturado v_f	Evap v_{fg}	Vapor saturado v_g	Líquido saturado u_f	Evap u_{fg}	Vapor saturado u_g	Líquido saturado h_f	Evap h_{fg}	Vapor saturado h_g	Líquido saturado s_f	Evap s_{fg}	Vapor saturado s_g
5	-93.28	0.001570	6.750430	6.752	-114.6	440.6	326.0	-114.6	474.4	359.8	-0.556	2.637	2.081
10	-83.87	0.001594	3.540406	3.542	-95.1	430.5	335.4	-95.1	465.9	370.8	-0.450	2.461	2.011
25	-69.55	0.001634	1.511366	1.513	-64.9	414.9	350.0	-64.9	452.7	387.8	-0.297	2.224	1.927
50	-56.93	0.001672	0.794528	0.7962	-37.7	400.8	363.1	-37.6	440.5	402.9	-0.167	2.038	1.871
75	-48.68	0.001698	0.545002	0.5467	-19.6	391.4	371.8	-19.5	432.3	412.8	-0.085	1.926	1.841
100	-42.38	0.001719	0.416781	0.4185	-5.6	384.1	378.5	-5.4	425.7	420.3	-0.023	1.845	1.822
200	-25.43	0.001781	0.217419	0.2192	33.1	363.5	396.6	33.5	406.9	440.4	0.139	1.643	1.782
300	-14.16	0.001826	0.147774	0.1496	59.8	348.9	408.7	60.3	393.3	453.6	0.244	1.518	1.762
400	-5.46	0.001865	0.111835	0.1137	80.8	337.2	418.0	81.5	382.0	463.5	0.324	1.427	1.751
500	1.74	0.001899	0.089821	0.09172	98.6	327.1	425.7	99.5	372.1	471.6	0.389	1.354	1.743
600	7.93	0.001931	0.074869	0.07680	114.2	318.0	432.2	115.3	363.0	478.3	0.446	1.291	1.737
700	13.41	0.001960	0.064020	0.06598	128.2	309.8	438.0	129.6	354.6	484.2	0.495	1.238	1.733
800	18.33	0.001989	0.055771	0.05776	141.0	302.1	443.1	142.6	346.7	489.3	0.540	1.189	1.729
900	22.82	0.002016	0.049274	0.05129	152.9	294.7	447.6	154.7	339.1	493.8	0.580	1.146	1.726
1000	26.95	0.002043	0.044017	0.04606	164.0	287.8	451.8	166.1	331.8	497.9	0.618	1.105	1.723
1100	30.80	0.002070	0.039670	0.04174	174.5	281.1	455.6	176.8	324.7	501.5	0.652	1.069	1.721
1200	34.39	0.002096	0.036004	0.03810	184.4	274.7	459.1	187.0	317.8	504.8	0.685	1.033	1.718
1300	37.77	0.002122	0.032868	0.03499	193.9	268.3	462.2	196.7	311.0	507.7	0.716	1.000	1.716
1400	40.97	0.002148	0.030162	0.03231	203.0	262.2	465.2	206.0	304.4	510.4	0.745	0.969	1.714
1500	44.01	0.002174	0.027796	0.02997	211.7	256.2	467.9	215.0	297.9	512.9	0.772	0.940	1.712
1600	46.89	0.002200	0.025700	0.02790	220.1	250.3	470.4	223.6	291.4	515.0	0.799	0.911	1.710
1700	49.65	0.002227	0.023833	0.02606	228.3	244.4	472.7	232.0	285.0	517.0	0.824	0.883	1.707
1800	52.30	0.002253	0.022157	0.02441	236.2	238.7	474.9	240.2	278.6	518.8	0.849	0.856	1.705
1900	54.83	0.002280	0.020640	0.02292	243.8	233.1	476.9	248.2	272.2	520.4	0.873	0.830	1.703
2000	57.27	0.002308	0.019262	0.02157	251.3	227.4	478.7	255.9	265.9	521.8	0.896	0.804	1.700
2200	61.90	0.002364	0.016846	0.01921	265.8	215.9	481.7	271.0	253.0	524.0	0.939	0.756	1.695
2400	66.21	0.002424	0.014786	0.01721	279.7	204.6	484.3	285.5	240.1	525.6	0.981	0.698	1.679
2600	70.27	0.002487	0.013003	0.01549	293.1	193.1	486.2	299.6	226.9	526.5	1.021	0.660	1.681
2800	74.10	0.002555	0.011425	0.01398	306.2	181.3	487.5	313.4	213.2	526.6	1.060	0.613	1.673
3000	77.72	0.002630	0.010000	0.01263	329.2	158.9	488.1	327.1	198.9	526.0	1.097	0.567	1.664
3500	86.01	0.002862	0.006909	0.00977	351.4	134.9	486.3	361.4	159.1	520.5	1.190	0.773	1.963
4000	93.38	0.003279	0.003872	0.00715	387.9	86.8	474.7	404.0	99.3	503.3	1.295	0.279	1.574
4248	96.70	0.004535	0.000000	0.00454	434.9	0.0	434.9	454.2	0.0	454.2	1.437	0.000	1.437

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 838, tabla A.17.

Tabla A.8.3 SI Propano sobrecalentado.

	P = 5 kPa (-93.28ºC)				P = 10 kPa (-83.87ºC)				P = 50 kPa (-56.93ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	6.752	326.0	359.8	2.081	3.542	367.3	370.8	2.011	0.796	363.1	402.9	1.871
-90	6.877	329.4	363.8	2.103	-	-	-	-	-	-	-	-
-80	7.258	339.8	376.1	2.169	3.617	339.5	375.7	2.037	-	-	-	-
-70	7.639	350.6	388.8	2.233	3.808	350.3	388.4	2.101	-	-	-	-
-60	8.018	361.8	401.9	2.296	3.999	361.5	401.5	2.164	-	-	-	-
-50	8.397	373.3	415.3	2.357	4.190	373.1	415.0	2.226	0.824	371.3	412.5	1.914
-40	8.776	385.1	429.0	2.418	4.380	385.0	428.8	2.286	0.863	383.4	426.6	1.976
-30	9.155	397.4	443.2	2.477	4.570	397.3	443.0	2.346	0.903	396.0	441.1	2.037
-20	9.533	410.1	457.8	2.540	4.760	410.0	457.6	2.405	0.942	408.8	455.9	2.096
-10	9.911	423.2	472.8	2.594	4.950	423.1	472.6	2.463	0.981	422.1	471.1	2.155
0	10.29	436.8	488.2	2.652	5.139	436.7	488.1	2.520	1.019	435.8	486.7	2.213
10	10.67	450.8	504.1	2.709	5.329	450.6	503.9	2.578	1.058	449.8	502.7	2.271
20	11.05	470.6	520.4	2.765	5.518	465.1	520.3	2.634	1.096	464.3	519.1	2.328
30	-	-	-	-	-	-	-	-	1.135	479.2	535.9	2.384
40	-	-	-	-	-	-	-	-	1.173	494.6	553.2	2.440
50	-	-	-	-	-	-	-	-	1.211	510.4	570.9	2.496
60	-	-	-	-	-	-	-	-	1.249	526.7	589.1	2.551

	P = 100 kPa (-42.38ºC)				P = 200 kPa (-25.43ºC)				P = 300 kPa (-14.15ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.4185	378.5	420.3	1.822	0.2192	396.6	440.4	1.782	0.1496	408.7	453.6	1.762
-50	-	-	-	-	-	-	-	-	-	-	-	-
-40	0.4234	381.5	423.8	1.837	-	-	-	-	-	-	-	-
-30	0.4439	394.2	438.6	1.899	-	-	-	-	-	-	-	-
-20	0.4641	407.3	453.7	1.960	0.2251	404.0	449.0	1.816	-	-	-	-
-10	0.4842	420.7	469.1	2.019	0.2358	417.7	464.9	1.877	0.1527	414.7	460.5	1.789
0	0.5040	434.4	484.8	2.078	0.2463	431.8	481.1	1.938	0.1602	429.0	477.1	1.851
10	0.5238	448.6	501.0	2.136	0.2566	446.3	497.6	1.997	0.1674	443.8	494.0	1.912
20	0.5434	463.3	517.6	2.194	0.2669	461.1	514.5	2.056	0.1746	458.8	511.2	1.971
30	0.5629	478.2	534.5	2.251	0.2770	476.3	531.7	2.113	0.1816	474.2	528.7	2.030
40	0.5824	493.7	551.9	2.307	0.2871	491.9	549.3	2.170	0.1885	490.1	546.6	2.088
50	0.6018	509.5	569.7	2.363	0.2970	507.9	567.3	2.227	0.1954	506.2	564.8	2.145
60	0.6211	525.8	587.9	2.419	0.3070	524.3	585.7	2.283	0.2022	,522,7	583.4	2.202
70	-	-	-	-	0.3169	541.1	604.5	2.339	0.2090	539.6	602.3	2.258
80	-	-	-	-	0.3267	558.4	623.7	2.394	0.2157	557.0	621.7	2.314
90	-	-	-	-	0.3365	576.1	643.4	2.449	0.2223	574.8	641.5	2.369

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 839, tabla A.18.

Tabla A.8.3 SI Propano sobrecalentado.

	P = 400 kPa (-5.46ºC)				P = 500 kPa (1.74ºC)				P = 600 kPa (7.93ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.1137	418.0	463.5	1.751	0.09172	425.7	471.6	1.743	0.07680	432.2	478.3	1.737
0	0.1169	426.1	472.9	1.786	-	-	-	-	-	-	-	-
10	0.1227	441.2	490.3	1.848	0.09577	438.4	486.3	1.796	0.07769	435.6	482.2	1.751
20	0.1283	456.6	507.9	1.909	0.1005	454.1	504.3	1.858	0.08187	451.5	500.6	1.815
30	0.1338	472.2	525.7	1.969	0.1051	470.0	522.5	1.919	0.08588	467.7	519.2	1.877
40	0.1392	488.1	543.8	2.027	0.1096	486.1	540.9	1.979	0.08978	484.0	537.9	1.938
50	0.1445	504.4	562.2	2.085	0.1140	502.5	559.5	2.038	0.09357	500.7	556.8	1.997
60	0.1498	521.1	581.0	2.143	0.1183	519.4	578.5	2.095	0.09729	517.6	576.0	2.056
70	0.1550	538.1	600.1	2.199	0.1226	536.6	597.9	2.153	0.1009	535.0	595.5	2.113
80	0.1601	555.7	619.7	2.286	0.1268	554.1	617.5	2.209	0.1045	552.7	615.4	2.170
90	0.1652	573.5	639.6	2.311	0.1310	572.1	637.6	2.265	0.1081	570.7	635.6	2.227
100	0.1703	591.8	659.9	2.366	0.1351	590.5	658.0	2.321	0.1116	589.2	656.2	2.283
110	0.1754	610.4	680.6	2.421	0.1392	609.3	678.9	2.376	0.1151	608.0	677.1	2.338
120	-	-	-	-	-	-	-	-	0.1185	627.3	698.4	2.393

	P = 700 kPa (13.41ºC)				P = 800 kPa (18.33ºC)				P = 900 kPa (22.82ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.06598	438.0	484.2	1.733	0.05776	443.1	489.3	1.729	0.05129	447.2	493.8	1.726
10	-	-	-	-	-	-	-	-	-	-	-	-
20	0.06847	448.8	496.7	1.776	0.05834	445.9	492.6	1.740	-	-	-	-
30	0.07210	465.2	515.7	1.840	0.06170	462.7	512.1	1.806	0.05355	460.0	508.2	1.774
40	0.07558	481.9	534.8	1.902	0.06489	479.6	531.5	1.869	0.05653	477.2	528.1	1.839
50	0.07896	498.7	554.0	1.962	0.06796	496.7	551.1	1.930	0.05938	494.7	548.1	1.901
60	0.08225	515.9	573.5	2.021	0.07094	514.0	570.8	1.990	0.06213	512.2	568.1	1.962
70	0.07855	533.4	593.2	2.079	0.07385	531.6	590.7	2.049	0.06479	530.0	588.3	2.022
80	0.08863	551.2	613.2	2.137	0.07669	549.6	611.0	2.107	0.06738	548.1	608.7	2.081
90	0.09175	569.4	633.6	2.194	0.07948	567.9	631.5	2.165	0.06992	566.5	629.4	2.138
100	0.09482	587.9	645.3	2.250	0.08222	586.5	652.3	2.221	0.07241	585.2	650.4	2.195
110	0.09786	606.8	675.3	2.306	0.08493	605.6	673.5	2.277	0.07487	604.3	671.7	2.252
120	0.10090	626.2	696.8	2.361	0.08761	625.0	695.1	2.333	0.07729	623.7	693.3	2.307
130	-	-	-	-	0.09026	644.8	717.0	2.388	0.07969	643.6	715.3	2.363
140	-	-	-	-	0.09289	665.0	739.3	2.442	0.08206	663.8	737.7	2.418

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 840, tabla A.18.

Tabla A.8.3 SI Propano sobrecalentado.

	P = 1000 kPa (26.95ºC)				P = 1200 kPa (34.39ºC)				P = 1400 kPa (40.97ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.04606	451.8	497.9	1.723	0.03810	459.1	504.8	1.718	0.03231	465.2	510.4	1.714
30	0.04696	457.1	504.1	1.744	-	-	-	-	-	-	-	-
40	0.04980	474.8	524.6	1.810	0.03957	469.4	516.9	1.757	-	-	-	-
50	0.05248	492.4	544.9	1.874	0.04204	487.8	538.2	1.824	0.03446	482.6	530.8	1.778
60	0.05505	510.2	565.2	1.936	0.04436	506.1	559.3	1.889	0.03664	501.6	552.9	1.845
70	0.05752	528.2	585.7	1.997	0.04657	524.4	580.3	1.951	0.03869	520.4	574.6	1.909
80	0.05992	546.4	606.3	2.056	0.04869	543.1	601.5	2.012	0.04063	539.4	596.3	1.972
90	0.06226	564.9	627.2	2.114	0.05075	561.8	622.7	2.071	0.04249	558.6	618.1	2.033
100	0.06456	583.7	648.3	2.172	0.05275	580.9	644.2	2.129	0.04429	577.9	639.9	2.092
110	0.06681	603.0	669.8	2.228	0.05470	600.4	666.0	2.187	0.04604	597.5	662.0	2.150
120	0.06903	622.6	691.6	2.284	0.05662	520.1	688.0	2.244	0.04774	617.5	684.3	2.208
130	0.07122	642.5	713.7	2.340	0.05851	540.1	710.3	2.300	0.04942	637.7	706.9	2.265
140	0.07338	662.8	736.2	2.395	0.06037	660.6	733.0	2.355	0.05106	658.3	729.8	2.321
150	-	-	-	-	-	-	-	-	0.05268	679.2	753.0	2.376
160	-	-	-	-	-	-	-	-	0.05428	700.5	776.5	2.431

	P = 1600 kPa (46.89ºC)				P = 1800 kPa (52.30ºC)				P = 2000 kPa (57.27ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.02790	470.4	515.0	1.710	0.02441	474.9	518.8	1.705	0.02157	478.7	521.8	1.700
50	0.02861	476.7	522.5	1.733	-	-	-	-	-	-	-	-
60	0.03075	496.6	545.8	1.804	0.02606	491.1	538.0	1.763	0.02216	484.8	529.1	1.722
70	0.03270	516.2	568.5	1.871	0.02798	511.4	561.8	1.834	0.02412	506.3	554.5	1.797
80	0.03453	535.7	590.9	1.935	0.02974	531.6	585.1	1.901	0.02585	527.1	578.8	1.867
90	0.03626	555.2	613.2	1.997	0.03138	551.5	608.0	1.965	0.02744	547.6	602.5	1.933
100	0.03792	574.8	635.5	2.058	0.03293	571.5	630.8	2.027	0.02892	568.1	625.9	1.997
110	0.03952	594.7	657.9	2.117	0.03443	591.7	653.7	2.087	0.03033	588.5	649.2	2.059
120	0.04107	614.8	680.5	2.176	0.03586	612.1	676.6	2.146	0.03169	609.2	672.6	2.119
130	0.04259	635.3	703.4	2.233	0.03726	632.7	699.8	2.204	0.03299	630.0	696.0	2.178
140	0.04407	656.0	726.5	2.290	0.03863	653.6	723.1	2.262	0.03426	651.2	719.7	2.236
150	0.04553	677.1	749.9	2.346	0.03996	674.8	746.7	2.318	0.03550	672.5	743.5	2.293
160	0.04696	698.5	773.6	2.401	0.04127	696.3	770.6	2.374	0.03671	694.2	767.6	2.349
170	-	-	-	-	0.04256	718.2	794.8	2.429	0.03790	716.2	792.0	2.404
180	-	-	-	-	0.04383	740.4	819.3	2.484	0.03907	738.5	816.6	2.459

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 841, tabla A.18.

Tabla A.8.3 SI Propano sobrecalentado.

	P = 2200 kPa (61.90ºC)				P = 2400 kPa (66.21ºC)				P = 2600 kPa (70.27ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.01921	481.8	524.0	1.695	0.01721	484.3	525.6	1.688	0.01549	486.2	526.5	1.681
70	0.02086	500.5	546.4	1.761	0.01802	493.7	536.9	1.722	-	-	-	-
80	0.02261	522.4	572.1	1.834	0.01984	517.0	564.6	1.801	0.01742	511.0	556.3	1.767
90	0.02417	543.5	596.7	1.902	0.02141	539.0	590.4	1.873	0.01903	534.2	583.7	1.844
100	0.02561	564.5	620.8	1.969	0.02283	560.6	615.4	1.941	0.02045	556.4	609.0	1.914
110	0.02697	585.3	644.6	2.032	0.02414	581.9	639.8	2.006	0.02174	578.3	634.8	1.981
120	0.02826	606.2	668.4	2.093	0.02538	603.2	664.1	2.068	0.02294	600.0	659.6	2.045
130	0.02949	627.3	692.2	2.153	0.02656	624.6	688.3	2.129	0.02408	621.6	684.2	2.106
140	0.03069	648.6	716.1	2.211	0.02770	646.0	712.5	2.188	0.02516	643.4	708.8	2.167
150	0.03185	670.1	740.2	2.269	0.02880	667.8	736.9	2.247	0.02621	665.3	733.4	2.226
160	0.03298	691.9	764.5	2.326	0.29860	689.7	761.4	2.304	0.02723	687.4	758.2	2.283
170	0.03409	714.1	789.1	2.382	0.03091	711.9	786.1	2.360	0.02821	709.9	783.2	2.340
180	0.03517	736.5	813.9	2.437	0.03193	734.5	811.1	2.416	0.02918	732.5	808.4	2.397
190	-	-	-	-	-	-	-	-	0.03012	755.5	833.8	2.452

	P = 3000 kPa (77.72ºC)				P = 3500 kPa (86.01ºC)				P = 4000 kPa (93.38ºC)			
Temp, ºC	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)	v (m^3/kg)	u (kJ/kg)	h (kJ/kg)	s (kJ/kg.K)
Sat	0.01263	488.2	526.0	1.664	0.00977	486.3	520.5	1.633	0.00715	474.7	503.3	1.574
80	0.01318	495.4	534.9	1.689	-	-	-	-	-	-	-	-
90	0.01506	522.8	568.0	1.782	0.01086	502.4	540.5	1.688	-	-	-	-
100	0.01654	547.2	596.8	1.860	0.01270	532.9	577.3	1.788	0.00940	512.1	549.7	1.700
110	0.01783	570.4	623.9	1.932	0.01408	558.9	608.2	1.877	0.01110	544.7	589.1	1.804
120	0.01899	593.0	650.0	1.999	0.01526	583.4	636.8	1.944	0.01237	572.1	621.6	1.887
130	0.02007	615.4	675.6	2.063	0.01631	607.0	664.1	2.012	0.01344	597.4	651.2	1.962
140	0.02109	637.7	701.0	2.126	0.01728	630.2	690.7	2.077	0.01439	621.9	679.5	2.031
150	0.02206	660.1	726.3	2.186	0.01819	653.3	717.0	2.140	0.01527	645.9	707.0	2.097
160	0.02300	682.6	751.6	2.245	0.01906	676.4	743.1	2.201	0.01609	669.7	734.1	2.160
170	0.02390	705.4	777.1	2.303	0.01989	699.6	769.2	2.261	0.00169	693.4	760.9	2.222
180	0.02478	728.3	802.6	2.360	0.02068	722.9	795.3	2.319	0.01761	717.3	787.7	2.281
190	0.02563	751.5	828.4	2.417	0.02146	746.5	821.6	2.376	0.01833	741.2	814.5	2.340
200	-	-	-	-	0.02221	770.3	848.0	2.433	0.01902	765.3	841.4	2.397

Fuente: Michael Moran y Howard Shapiro. *Fundamentos de Termodinámica Técnica*, 2a ed. (Editorial Reverté, Barcelona, 2004), p. 842, tabla A.18.

Tabla A.9 SI Constantes Críticas.

Sustancia	Fórmula	Masa molar	Temperatura K	Presión, MPa	Volumen m^3/kmol	Factor acéntrico	Sustancia	Fórmula	Masa molar	Temperatura K	Presión, MPa	Volumen m^3/kmol	Factor acéntrico
Acetileno	C_2H_6	26.038	308.3	6.14	0.1127	0.190	Etileno	C_2H_4	28.054	282.4	5.04	0.1304	0.089
Agua	H_2O	18.015	647.3	22.12	0.0571	0.344	Flúor	F_2	37.997	144.3	5.22	0.0663	0.054
Alcohol metílico	CH_3OH	32.042	512.6	8.09	0.1180	0.556	Helio	He	4.003	5.19	0.227	0.0574	-0.365
Alcohol etílico	C_2H_5OH	46.069	513.9	6.14	0.1671	0.644	Helio3	He	3.017	3.31	0.114	0.0729	-0.473
Amoniaco	NH_3	17.031	405.5	11.35	0.0725	0.250	n-Heptano	C_7H_{16}	100.205	540.3	2.74	0.4320	0.349
Argón	Ar	39.948	150.8	4.87	0.0749	0.001	n-Hexano	C_6H_{14}	86.178	507.5	3.01	0.3700	0.299
Benceno	C_6H_6	78.114	562.2	4.89	0.2590	0.212	Hidrógeno (normal)	H_2	2.016	33.2	1.30	0.0651	-0.218
Bromo	Br_2	159.808	588	10.30	0.1272	0.108	Kriptón	Kr	83.80	209.4	5.50	0.0912	0.005
n-Butano	C_4H_{10}	58.124	425.2	3.80	0.2550	0.199	Metano	CH_4	16.043	190.4	4.60	0.0992	0.011
Cloro	Cl_2	70.906	416.9	7.98	0.1238	0.090	Monóxido de carbono	CO	28.01	132.9	3.50	0.0932	0.066
Clorodifluoroetano	CH_3CClF_2	100.495	410.3	4.25	0.2310	0.250	Neón	Ne	20.183	44.4	2.76	0.0416	-0.029
Clorodifluorometano	$CHClF_2$	86.469	369.3	4.97	0.1656	0.221	Nitrógeno	N_2	28.013	126.2	3.39	0.0898	0.039
Cloroformo	$CHCl_3$	119.378	536.4	5.37	0.2389	0.218	n-Octano	C_8H_{18}	114.232	568.8	2.49	0.4920	0.398
Cloruro de metilo	CH_3Cl	50.488	416.3	6.70	0.1389	0.153	Óxido nítrico	NO	30.006	180	6.48	0.0577	0.588
Deuterio (normal)	D_2	4.032	38.4	1.66	-	-0.160	Óxido nitroso	N_2O	44.013	309.6	7.24	0.0974	0.165
Diclorodifluorometano (12)	CCl_2F_2	120.914	385.0	4.14	0.2167	0.204	Oxígeno	O_2	31.999	154.6	5.04	0.0734	0.025
Diclorofluoroetano (141)	CH_3CCl_2F	116.95	481.5	4.54	0.2520	0.215	n-Pentano	C_5H_{16}	72.151	469.7	3.37	0.3040	0.251
Diclorofluorometano (21)	$CHCl_2F$	102.923	451.6	5.18	0.1964	0.210	Propano	C_3H_8	44.094	369.8	4.25	0.2030	0.153
Difluoroetano (152a)	CHF_2CH_3	66.05	386.4	4.52	0.1795	0.275	Propeno	C_3H_6	42.081	364.9	4.60	0.1810	0.144
Diclorotrifluorometano (123)	$CHCl_2F$	152.93	456.9	3.67	0.2781	0.282	Propino	C_3H_4	40.065	402.4	5.63	0.1640	0.215
Dióxido de azufre	SO_2	64.063	430.8	7.88	0.1222	0.256	Tetracloruro de carbono	CCl_4	153.823	556.4	4.56	0.2759	0.193
Dióxido de carbono	CO_2	44.01	304.1	7.38	0.0939	0.239	Tetrafluoroetano (134a)	CF_3CH_2F	102.03	374.2	4.06	0.1980	0.327
Dióxido de nitrógeno	NO_2	46.006	431	10.1	0.1678	0.834	Xenón	Xe	131.30	289.7	5.84	0.1184	0.008
Etano	C_2H_6	30.070	305.4	4.88	0.1483	0.099							

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 796 - 797, tabla A.8SI.

Tabla A.10 SI Propiedades de líquidos y sólidos comunes.
Tabla A.10.1 SI Propiedades de diversos sólidos y líquidos a 25ºC.

Sólido	C_p, KJ/kg.K	ρ, kg/m^3	Líquido	C_p, kJ/kg.K	ρ, kg/m^3
Acero (AISI302)	0.48	8050	Agua	4.184	997
Aluminio	0.9	2700	Amoniaco	4.8	602
Arena (seca)	0.8	1450-1750	Benceno	1.72	879
Cobre	0.386	8900	Butano	2.4690	556
Concreto	0.65	2300	Etanol	2.456	783
Estaño	0.217	5730	Glicerina	2.40	1200
Grafito	0.711	2500	Iso-octano	2.1	692
Granito	1.017	2700	Mercurio	0.139	13560
Hierro	0.450	7840	Metanol	2.55	787
Hule (blando)	1.84	1100	Petróleo (ligero)	1.8	910
Madera (la mayoría)	1.76	350-700	Propano	2.54	510
Plata	0.235	10470	R-12	0.971	1310
Plomo	0.128	11310	R-134a	1.43	1206
Vidrio	0.8	2300			

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 797, tabla A.9SI.

Tabla A.10.2 SI Propiedades de diversos líquidos.

	Datos de ebullición		Datos de congelación		Propiedades de líquido		
Sustancia	Punto normal de ebullición, °C	Calor latente de vaporización, h_{fg}, kJ/kg	Punto de congelación, °C	Calor latente de fusión, h_{lf}, kJ/kg	Temp., °C	Densidad kg/m^3	Calor específico, Cp kJ/kg.K
Aceite (ligero)					25	910	1.80
Agua	100	2257	0.0	333.7	0	1000	4.23
					25	997	4.18
					50	988	4.18
					75	975	4.19
					100	958	4.22
Alcohol etílico	79	855	-156	108	20	789	2.84
Amoniaco	-33.3	1357	-77.7	322.4	-33.3	682	4.43
					-20	665	4.52
					0	639	4.60
					25	602	4.80
Argón	-185.9	161.6	-189.3	28	-185.6	1394	1.14
Benceno	80.2	394	5.5	136	20	879	1.72
Dióxido de carbono	-78.4	230,5 (a 0ºC)	-56.6		0	298	0.59
Etanol	78.2	838.3	-114.2	109	25	783	2.46
Etilén glicol	198.1	800.1	-10.8	181.1	20	1109	2.84
Glicerina	179.9	974	18.9	200.6	20	1261	2.32
Helio	-268.9	22.8	-	-	-268.9	146.2	22.8
Hidrógeno	-252.8	445.7	-259.2	59.5	-252.8	70.7	10.0
Isobutano	-11.7	367.1	-160.0	105.7	-11.7	593.8	2.28
Mercurio	356.7	294.7	-38.9	11.4	25	13560	0.139
Metano	-161.5	510.4	-182.2	58.4	-161.5	423	3.49
					-100	301	5.79
Metanol	64.5	1100	-97.7	99.2	25	787	2.55
n-Butano	-0.5	385.2	-138.5	80.3	-0.5	601	2.31
Nitrógeno	-195.8	198.6	-210.0	25.3	-195.8	809	2.06
					-160	596	2.97
Octano	124.8	306.3	-57.5	180.7	20	703	2.10
Oxígeno	-183.0	212.7	-218.8	13.7	-183	1141	1.71
Petróleo	-	230 - 384			20	640	2.0
Propano		427.8	-187.7	80.0	-42.1	581	2.25
					0	529	2.53
					50	449	3.13
Queroseno	204 - 293	251	-24.9	-	20	820	2.00
Refrigerante 134a.	-26.1	216.8	-96.6	-	-50	1443	1.23
					-26.1	1374	1.27
					0	1294	1.34
					25	1206	1.42
Salmuera (20% cloruro de sodio por masa)	103.9	-	-17.4	-	20	1150	3.11

Fuente: Yunus Çengel y Michael Boles. *Termodinámica*, 4a. ed. (Mc Graw Hill, México, 2004), p. 726, tabla A.3.

Tabla A.10.3 SI Propiedades de diversos sólidos.

Metales			No metales		
Sustancia	ρ, kg/m^3	C_p, kJ/kg.K	Sustancia	ρ, kg/m^3	C_p, kJ/kg.K
Acero dulce	7830	0.500	Arena	1520	0.800
Aluminio			Arcilla	1000	0.920
200 K		0.797	Asfalto	2110	0.920
250 K		0.859	Caucho (blando)	1100.00	1.840
300 K		0.902	Caucho (Duro)	1150	2.009
350 K	2700	0.929	Concreto	2300	0.653
400 K		0.949	Diamante	2420	0.616
450 K		0.973	Grafito	2500	0.711
500 K		0.997	Granito	2700	1.017
Bronce (76% Cu, 2% Zn, 2% Al)	8280	0.400	Hielo		5.000
Cobre			200 K		1.56
-173ºC		0.254	220 K		1.71
-100ºC		0.342	240 K	921	1.86
-50ºC		0.367	260 K		2.01
0ºC	8900	0.381	273 K		2.11
27ºC		0.386	Ladrillo común	1922	0.79
100ºC		0.393	Ladrillo refractario (500ºC)	2300	0.960
200ºC		0.403	Madera contrachapada (Abeto Douglas)	545	1.21
Hierro	7840	0.45	Maderas duras (maple, encino, etc)	721	1.26
Latón amarillo (65% Cu, 35% Sn)	8310	0.400	Maderas suaves (abeto, pino, etc)	513	1.38
Magnesio	1730	1.000	Mármol	2600	1.880
Níquel	8890	0.440	Piedra	1500	0.800
Plomo	11310	0.128	Piedra caliza	1650	0.909
Plata	10470	0.235	Vidrio para ventanas	2700	0.800
Tunsgteno	19400	0.130	Vidrio Pyrex	2230	0.840
			Yeso o tabla de yeso.	800	1.09

Fuente: Yunus Çengel y Michael Boles. *Termodinámica*, 4a. ed. (Mc Graw Hill, México, 2004), p. 727, tabla A.3.

Tabla A.10.4 SI Calores específicos de sólidos y líquidos comunes.

Sólidos					
Sustancia	Temp	Cp (kJ/kg.K)	Sustancia	Temp	Cp (kJ/kg.K)
Hielo	200 K	1.46	Plata	20 ºC	0.233
	220 K	1.71		200 ºC	0.243
	240 K	1.86	Plomo	-173 ºC	0.118
	260 K	2.01		-50 ºC	0.126
	270 K	2.08		27 ºC	0.129
	273 K	2.11		100 ºC	0.131
Aluminio	200 K	0.797		200 ºC	0.136
	250 K	0.859	Cobre	-173 ºC	0.254
	300 K	0.902		-100 ºC	0.342
	350 K	0.929		-50 ºC	0.367
	400 K	0.949		0 ºC	0.381
	450 K	0.973		27 ºC	0.386
	500 K	0.997		100 ºC	0.393
Hierro	20 ºC	0.448		200 ºC	0.403
Líquidos					
Sustancia	Estado	Cp (kJ/kg.K)	Sustancia	Estado	Cp (kJ/kg.K)
Agua	1 atm, 273 K	4.217	Benceno	1 atm, 15 ºC	1.80
	1 atm, 280 K	4.198		1 atm, 65 ºC	1.92
	1 atm, 300 K	4.179	Glicerina	1 atm, 10 ºC	2.32
	1 atm, 320 K	4.180		1 atm, 50 ºC	2.58
	1 atm, 340 K	4.188	Mercurio	1 atm, 10 ºC	0.138
	1 atm, 360 K	4.203		1 atm, 315 ºC	0.134
	1 atm, 373 K	4.218	Sodio	1 atm, 95 ºC	1.38
Amoniaco	Sat, -20 ºC	4.52		1 atm, 540 ºC	1.26
	Sat, 50 ºC	5.10	Propano	1 atm, 0 ºC	2.41
Refrigerante 12	Sat, -40 ºC	0.884	Bismuto	1 atm, 425 ºC	0.144
	Sat, -20 ºC	0.908		1 atm, 760 ºC	0.164
	Sat, 50 ºC	1.02	Alcohol etílico	1 atm, 25 ºC	2.43

Fuente: Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 930. tabla A.4.

Tabla A.11 SI Propiedades de combustibles, hidrocarburos y alimentos comunes.
Tabla A.11.1 SI Propiedades de algunos combustibles e hidrocarburos comunes.

Combustible (Fase)	Fórmula	Masa molar, kg/kmol	Densidad [1](kg/L)	Entalpía de vaporización[2] (kJ/kg)	Calor específico (kJ/kg.K)	Valor calorifico superior[3] (kJ/kg)	Valor calorífico inferior (kJ(kg)
1 - Penteno (l)	C_5H_{10}	70.134	0.641	363	2.20	47760	44630
Acetileno (g)	C_2H_2	26.038	-	-	1.69	49970	48280
Benceno (l)	C_6H_6	78.114	0.877	433	1.72	41800	40100
Butano (l)	C_4H_{10}	58.123	0.579	362	2.42	49150	45370
Carbono (s)	C	12.011	2	-	0.708	32800	32800
Decano (l)	$C_{10}H_{22}$	142.285	0.730	361	2.21	47640	44240
Diesel ligero (l)	$C_nH_{1.8n}$	170	0.78 - 0.84	270	2.2	46100	43200
Diesel pesado (l)	$C_nH_{1.7n}$	200	0.82 - 0.88	230	1.9	45500	42800
Etano (g)	C_2H_6	30.07	-	172	1.75	51900	47520
Etanol (l)	C_2H_6O	46.069	0.790	919	2.44	29670	26810
Gas natural (g)	$C_nH_{3.8n}N_{0.1n}$	18	-	-	2	50000	45000
Gasolina (l)	$C_nH_{1.87n}$	100 - 110	0.72 - 0.78	350	2.4	47300	44000
Heptano (l)	C_7H_{16}	100.204	0.684	365	2.24	48100	44600
Hexano (l)	C_6H_{14}	86.177	0.660	366	2.27	48310	44740
Hexeno (l)	C_6H_{12}	84.161	0.673	392	1.84	47500	44400
Hidrógeno (g)	H_2	2.016	-	-	14.4	141800	120000
Isopentano (l)	C_5H_{12}	72.150	0.626	-	2.32	48570	44910
Metano (g)	CH_4	16.043	-	509	2.20	55530	50050
Metanol (l)	CH_4O	32.042	0.790	1168	2.53	22660	19920
Monóxido de carbono (g)	CO	28.013	-	-	1.05	10100	10100
Octano (l)	C_8H_{18}	114.231	0.703	363	2.23	47890	44430
Propano (l)	C_3H_8	44.097	0.500	420	2.77	50330	46340
Tolueno (l)	C_7H_8	92.141	0.867	412	1.71	42400	40500

Fuente: Yunus Çengel y Michael Boles. *Termodinámica*, 4a. ed. (Mc Graw Hill, México, 2004), p. 762, tabla A.27.

[1] A 1 atm y 20ºC.
[2] A 25ºC para combustibles líquidos, y 1 atm y temperatura normal de ebullición para combustibles gaseosos.
[3] A 25ºC.

Tabla A.11.2 SI Propiedades de alimentos comunes.

Alimentos	Contenido de agua, % (masa)	Punto de congelación, ºC	Calor específico, kJ/kg.ºC		Calor latente de fusión, kJ/kg
			Por encima del punto de congelación	Por debajo del punto de congelación	
Brócoli	90	-0.6	3.86	1.97	301
Camarón	83	-2.2	3.62	1.89	277
Carne de pollo	74	-2.8	3.32	1.77	247
Carne de res	67	-	3.08	1.68	224
Cerezas	80	-1.8	3.52	1.85	267
Espinaca	93	-0.3	3.96	2.01	311
Fresas	90	-0.8	3.86	1.97	301
Huevo entero	74	-0.6	3.32	1.77	247
Leche entera	88	-0.6	3.79	1.95	294
Lechuga	95	-0.2	4.02	2.04	317
Maíz dulce	74	-0.6	3.32	1.77	247
Mantecado (Helado)	63	25.6	2.95	1.63	210
Mantequilla	16	-	-	1.04	53
Manzanas	84	-1.1	3.65	1.90	281
Naranjas	87	-0.8	3.75	1.94	291
Papas (Patatas)	78	-0.6	3.45	1.82	261
Pavo	64	-	2.98	1.65	214
Plátanos	75	-0.8	3.35	1.78	251
Queso suizo	39	-10.0	2.15	1.33	130
Salmón	64	-2.2	2.98	1.65	214
Sandía	93	-0.4	3.96	2.01	311
Tomates (jitomates) maduros	94	-0.5	3.99	2.02	314

Fuente: Yunus Çengel y Michael Boles. *Termodinámica*, 4a. ed. (Mc Graw Hill, México, 2004), p. 727, tabla A.3.

Tabla A.12 SI Propiedades de diversos gases ideales.
Tabla A.12.1 SI Propiedades de diversos gases ideales a 300 K.

Gas	Fórmula química	Masa molar	R, kJ/kg.K	Cpo, kJ/kg.K	Cvo, kJ/kg.K	k
Acetileno	C_2H_2	26.038	0.3193	1.6986	1.3793	1.231
Aire		28.97	0.2870	1.0035	0.7165	1.401
Amoniaco	NH_3	17.031	0.48819	2.1300	1.6418	1.297
Argón	Ar	39.948	0.20813	0.5203	0.3122	1.667
Butano	C_4H_{10}	58.124	0.14304	1.7164	1.5734	1.091
Dióxido de azufre	SO_2	64.059	0.12979	0.6236	0.4938	1.263
Dióxido de carbono	CO_2	44.01	0.18892	0.8418	0.6529	1.289
Monóxido de carbono	CO	28.01	0.29683	1.0413	0.7445	1.399
Etano	C_2H_6	30.07	0.27650	1.7662	1.4897	1.186
Etanol	C_2H_5OH	46.069	0.18048	1.427	1.246	1.145
Etileno	C_2H_4	28.054	0.29637	1.5482	1.2518	1.237
Helio	He	4.003	2.07703	5.1926	3.1156	1.667
Hidrógeno	H_2	2.016	4.12418	14.2091	10.0849	1.409
Metano	CH_4	16.04	0.51835	2.2537	1.7354	1.299
Metanol	CH_3OH	32.042	0.25948	1.4050	1.1455	1.227
Neón	Ne	20.183	0.41195	1.0299	0.6179	1.667
Nitrógeno	N_2	28.013	0.29680	1.0416	0.7448	1.398
Oxido nitroso	N_2O	44.013	0.18891	0.8793	0.6904	1.274
n-Octano	C_8H_{18}	114.23	0.07279	1.7113	1.6385	1.044
Oxígeno	O_2	31.999	0.25983	0.9216	0.6618	1.393
Propano	C_3H_8	44.097	0.18855	1.6794	1.4909	1.126
Trióxido de azufre	SO_3	80.058	0.10386	0.6346	0.5307	1.196
Vapor de agua	H_2O	18.015	0.46152	1.8723	1.4108	1.327

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 797 - 798, tabla A.10SI.

Tabla A.12.2 SI Calores específicos de gas ideal de varios gases comunes.

Temperatura (K)	Cpo (kJ/kg.K)	Cvo (kJ/kg.K)	k	Cpo (kJ/kg.K)	Cvo (kJ/kg.K)	k	Cpo (kJ/kg.K)	Cvo (kJ/kg.K)	k
	Aire			Dióxido de carbono, CO_2			Monóxido de carbono, CO		
250	1.003	0.716	1.401	0.791	0.602	1.314	1.039	0.743	1.400
300	1.005	0.718	1.400	0.846	0.657	1.288	1.040	0.744	1.399
350	1.008	0.721	1.398	0.895	0.706	1.268	1.043	0.746	1.398
400	1.013	0.726	1.395	0.939	0.750	1.252	1.047	0.751	1.395
450	1.020	0.733	1.391	0.978	0.790	1.239	1.054	0.757	1.392
500	1.029	0.742	1.387	1.014	0.825	1.229	1.063	0.767	1.387
550	1.040	0.753	1.381	1.046	0.857	1.220	1.075	0.778	1.382
600	1.051	0.764	1.376	1.075	0.886	1.213	1.087	0.790	1.376
650	1.063	0.776	1.370	1.102	0.913	1.207	1.100	0.803	1.370
700	1.075	0.788	1.364	1.126	0.937	1.202	1.113	0.816	1.364
750	1.087	0.800	1.359	1.148	0.959	1.197	1.126	0.829	1.358
800	1.099	0.812	1.354	1.169	0.980	1.193	1.139	0.842	1.353
900	1.121	0.834	1.344	1.204	1.015	1.186	1.163	0.866	1.343
1000	1.142	0.855	1.336	1.234	1.045	1.181	1.185	0.888	1.335
	Hidrógeno, H_2			Nitrógeno, N_2			Oxígeno, O_2		
250	14.051	9.927	1.416	1.039	0.742	1.400	0.913	0.653	1.398
300	14.307	10.183	1.405	1.039	0.743	1.400	0.918	0.658	1.395
350	14.427	10.302	1.400	1.041	0.744	1.399	0.928	0.668	1.389
400	14.476	10.352	1.398	1.044	0.747	1.397	0.941	0.681	1.382
450	14.501	10.377	1.398	1.049	0.752	1.395	0.956	0.696	1.373
500	14.513	10.389	1.397	1.056	0.759	1.391	0.972	0.712	1.365
550	14.530	10.405	1.396	1.065	0.768	1.387	0.988	0.728	1.358
600	14.546	10.422	1.396	1.075	0.778	1.382	1.003	0.743	1.350
650	14.571	10.447	1.395	1.086	0.789	1.376	1.017	0.758	1.343
700	14.604	10.480	1.394	1.098	0.801	1.371	1.031	0.771	1.337
750	14.645	10.521	1.392	1.110	0.813	1.365	1.043	0.783	1.332
800	14.695	10.570	1.390	1.121	0.825	1.360	1.054	0.794	1.327
900	14.822	10.698	1.385	1.145	0.849	1.349	1.074	0.814	1.319
1000	14.983	10.859	1.380	1.167	0.870	1.341	1.090	0.830	1.313

Fuente: Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 928, tabla A.3.

Tabla A.13 SI Calores específicos a presión constante de diversos gases ideales (Van Wylen).

Gas	Fórmula química	Cp_0. KJ/kmol.K, $\theta = T\,(\mathrm{K})/100$	Intervalo	Error máximo, %
Agua	H_2O	$Cp_0 = 143.05 - 183.54\theta^{0.25} + 82.751\theta^{0.5} - 3.6989\theta$	300 – 3500	0.43
n-Butano	C_4H_{10}	$Cp_0 = 3.954 + 37.12\theta - 1.833\theta^2 + 0.03498\theta^3$	300 - 1500	0.54
Dióxido de carbono	CO_2	$Cp_0 = -3.7357 + 30.529\theta^{0.5} - 4.1034\theta + 0.024198\theta^2$	300 – 3500	0.19
Dióxido de Nitrógeno	NO_2	$Cp_0 = 46.045 + 216.10\theta^{-0.5} - 363.66\theta^{-0.75} + 232.550\theta^{-2}$	300 – 3500	0.26
Etano	C_2H_6	$Cp_0 = 6.895 + 17.26\theta - 0.6402\theta^2 + 0.00728\theta^3$	300 - 1500	0.83
Etileno	C_2H_4	$Cp_0 = -95.395 + 123.15\theta^{0.5} - 35.641\theta^{0.75} + 182.77\theta^{-3}$	300 – 2000	0.07
Hidrógeno	H_2	$Cp_0 = 56.505 - 702.74\theta^{-0.75} + 1165.0\theta^{-1} - 560.70\theta^{-1.5}$	300 – 3500	0.60
Hidróxilo	OH	$Cp_0 = 81.546 - 59.350\theta^{0.25} + 17.329\theta^{-0.75} - 4.2660\theta$	300 – 3500	0.43
Metano	CH_4	$Cp_0 = -672.87 + 439.74\theta^{0.25} - 24.875\theta^{0.75} + 323.88\theta^{-0.5}$	300 – 2000	0.15
Monóxido de carbono	CO	$Cp_0 = 69.145 - 0.70463\theta^{0.75} - 200.77\theta^{-0.5} + 176.76\theta^{-0.75}$	300 – 3500	0.42
Nitrógeno	N_2	$Cp_0 = 39.060 - 512.79\theta^{-1.5} + 1072.7\theta^{-2} - 820.40\theta^{-3}$	300 - 3500	0.43
Óxido nítrico	NO	$Cp_0 = 59.283 - 1.7096\theta^{0.5} - 70.613\theta^{-0.5} + 74.889\theta^{-1.5}$	300 – 3500	0.34
Oxígeno	O_2	$Cp_0 = 37.432 + 0.020102\theta^{1.5} - 178.57\theta^{-1.5} + 236.88\theta^{-2}$	300 – 3500	0.30
Propano	C_3H_8	$Cp_0 = -4.042 + 30.46\theta - 1.571\theta^2 + 0.03171\theta^3$	300 – 1500	0.40

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 798, tabla A.11SI.

Calores específicos de gas ideal para varios gases comunes como una función de la temperatura (Cengel).

Sustancia	Fórmula	a	b	c	d	Nivel de temperatura, K	Máx.	Prom.
Acetileno	C_2H_2	21.8	9.2143	-6.527	18.21	273-1500	1.46	0.59
Aire	-	28.11	0.1967	0.4802	-1.966	273-1800	0.72	0.33
Amoniaco	NH_3	27.568	2.563	0.99072	-6.6909	273-1500	0.91	0.36
Azufre	S_2	27.21	2.218	-1.628	3.986	273-1800	0.99	0.38
Benceno	C_6H_6	-36.22	48.475	-31.57	77.62	273-1500	0.34	0.20
Cloruro de hidrógeno	HCl	30.33	-0.7620	1.327	-4.338	273-1500	0.22	0.08
Dióxido de azufre	SO_2	25.78	5.795	-3.812	8.612	273-1800	0.45	0.24
Dióxido de carbono	CO_2	22.26	5.981	-3.501	7.469	273-1800	0.67	0.22
Dióxido de nitrógeno	NO_2	22.9	5.715	-3.52	7.87	273-1500	0.46	0.18
Etano	C_2H_6	6.900	17.27	-6.406	7.285	273-1500	0.83	0.28
Etanol	C_2H_6O	19.9	20.96	-10.38	20.05	273-1500	0.40	0.22
Etileno	C_2H_4	3.95	15.64	-8.344	17.67	273-1500	0.54	0.13
Hidrógeno	H_2	29.11	-0.1916	0.4003	-0.8704	273-1800	1.01	0.26
i-butano	C_4H_{10}	-7.913	41.60	-23.01	49.91	273-1500	0.25	0.13
Metano	CH_4	19.89	5.024	1.269	-11.01	273-1500	1.33	0.57
Metanol	CH_4O	19.0	9.152	-1.22	-8.039	273-1000	0.18	0.08
Monóxido de carbono	CO	28.16	0.1675	0.5372	-2.222	273-1800	0.89	0.37
n-butano	C_4H_{10}	3.96	37.15	-18.34	35.00	273-1500	0.54	0.24
n-hexano	C_6H_{14}	6.938	55.22	-28.65	57.69	273-1500	0.72	0.20
Nitrógeno	N_2	28.9	-0.1571	0.8081	-2.873	273-1800	0.59	0.34
n-pentano	C_5H_{12}	6.774	45.43	-22.46	42.29	273-1500	0.56	0.21
Oxido nítrico	NO_2	29.34	-0.09395	0.9747	-4.187	273-1500	0.97	0.36
Oxido nitroso	N_2O	24.11	5.8632	-3.562	10.58	273-1500	0.59	0.26
Oxígeno	O_2	25.48	1.520	-0.7155	1.312	273-1800	1.19	0.28
Propano	C_3H_6	-4.04	30.48	-15.72	31.74	273-1500	0.40	0.12
Propileno	C_3H_6	3.15	23.83	-12.18	24.62	273-1500	0.73	0.17
Trióxido de azufre	SO_3	16.40	14.58	-11.2	32.42	273-1300	0.29	0.13
Vapor de agua	H_2O	32.24	0.1923	1.055	-3.595	273-1800	0.53	0.24

Fuente: Yunus Çengel y Michael Boles. *Termodinámica*, 4a. ed. (Mc Graw Hill, México, 2004), p. 724, tabla A.2.

Tabla A.14 SI Factor de compresibilidad de un fluido simple, Z.

T_r / P_r	0.10	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.70	2.00	2.50	3.00	5.00	7.00	10.00
0.30	0.0290	0.0579	0.1158	0.1737	0.2315	0.2892	0.3470	0.4047	0.4911	0.5775	0.7213	0.8648	1.4366	2.0048	2.8507
0.40	0.0239	0.0477	0.0953	0.1429	0.1904	0.2379	0.2853	0.3327	0.4036	0.4744	0.5921	0.7095	1.1758	1.6373	2.3211
0.50	0.0207	0.4130	0.0825	0.1236	0.1647	0.2056	0.2465	0.2730	0.3483	0.4092	0.5103	0.6110	1.0094	1.4017	1.9801
0.60	0.0186	0.0371	0.0741	0.1109	0.1476	0.1842	0.2207	0.2571	0.3115	0.3657	0.4554	0.5446	0.8959	1.2398	1.7440
0.70	0.0172	0.0344	0.0687	0.1027	0.1366	0.1703	0.2038	0.2372	0.2969	0.3364	0.4181	0.4991	0.8161	1.1241	1.5729
0.75	0.9165	0.0336	0.0670	0.1001	0.1330	0.1656	0.1981	0.2303	0.2784	0.3260	0.4046	0.4823	0.7854	1.0787	1.5047
0.80	0.9319	0.8539	0.0661	0.0985	0.1307	0.1626	0.1942	0.2255	0.2721	0.3182	0.3942	0.4690	0.7598	1.0400	1.4456
0.85	0.9436	0.8810	0.0661	0.0983	0.1301	0.1614	0.1924	0.2230	0.2684	0.3132	0.3868	0.4591	0.7380	1.0071	1.3943
0.90	0.9528	0.9015	0.7800	0.1006	0.1321	0.1630	0.1935	0.2235	0.2678	0.3114	0.3828	0.4527	0.7220	0.9793	1.3496
0.95	0.9600	0.9174	0.8206	0.6967	0.1410	0.1705	0.1998	0.2288	0.2717	0.3138	0.3827	0.4501	0.7092	0.9561	1.3108
1.00	0.9659	0.9300	0.8509	0.7574	0.6353	0.2901	0.2237	0.1246	0.2839	0.3229	0.3880	0.4522	0.7004	0.9372	1.2772
1.05	0.9707	0.9401	0.8743	0.8002	0.7130	0.6026	0.4437	0.3246	0.3182	0.3452	0.4014	0.4604	0.6956	0.9222	1.2481
1.10	0.9747	0.9485	0.8930	0.8323	0.7649	0.6880	0.5984	0.5003	0.4086	0.3953	0.4277	0.4770	0.6950	0.9110	1.2232
1.15	0.9780	0.9554	0.9081	0.8576	0.8032	0.7443	0.6803	0.6129	0.5227	0.4760	0.4718	0.5042	0.6987	0.9033	1.2021
1.20	0.9808	0.9611	0.9205	0.8779	0.8330	0.7858	0.7363	0.6856	0.6135	0.5605	0.4295	0.5425	0.7069	0.8990	1.1844
1.30	0.9852	0.9702	0.9396	0.9083	0.8764	0.8438	0.8111	0.7784	0.7316	0.6908	0.6467	0.6344	0.7358	0.8998	1.1580
1.40	0.9884	0.9768	0.9534	0.9298	0.9062	0.8827	0.8595	0.8367	0.8043	0.7753	0.7387	0.7202	0.7761	0.9112	1.1419
1.50	0.9909	0.9818	0.9636	0.9456	0.9278	0.9103	0.8933	0.8768	0.8536	0.8328	0.8052	0.7887	0.8200	0.9297	1.1339
1.60	0.9928	0.9856	0.9714	0.9575	0.9439	0.9308	0.9180	0.9059	0.8889	0.8738	0.8537	0.8410	0.8617	0.9518	1.1320
1.80	0.9955	0.9910	0.9823	0.9739	0.9659	0.9583	0.9511	0.9444	0.9353	0.9278	0.9176	0.9118	0.9297	0.9961	1.1391
2.00	0.9972	0.9944	0.9892	0.9842	0.9796	0.9754	0.9715	0.9680	0.9635	0.9599	0.9561	0.9550	0.9772	1.0328	1.1516
2.50	0.9994	0.9989	0.9981	0.9975	0.9971	0.9969	0.9970	0.9973	0.9982	0.9996	1.0031	1.0080	1.0395	1.0866	1.1763
3.00	1.0004	1.0008	1.0018	1.0030	1.0043	1.0057	1.0074	1.0091	1.0121	1.0153	1.0215	1.0284	1.0635	1.1075	1.1848
3.50	1.0008	1.0017	1.0035	1.0055	1.0075	1.0097	1.0120	1.0143	1.0181	1.0221	1.0292	1.0368	1.0723	1.1138	1.1834
4.00	1.0010	1.0021	1.0043	1.0066	1.0090	1.0115	1.0140	1.0166	1.0207	1.0249	1.0323	1.0401	1.0747	1.1136	1.1773
5.00	1.0012	1.0024	1.0048	1.0073	1.0098	1.0124	1.0150	1.0176	1.0217	1.0259	1.0331	1.0405	1.0722	1.1064	1.1611

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 809, tabla A.15.2.

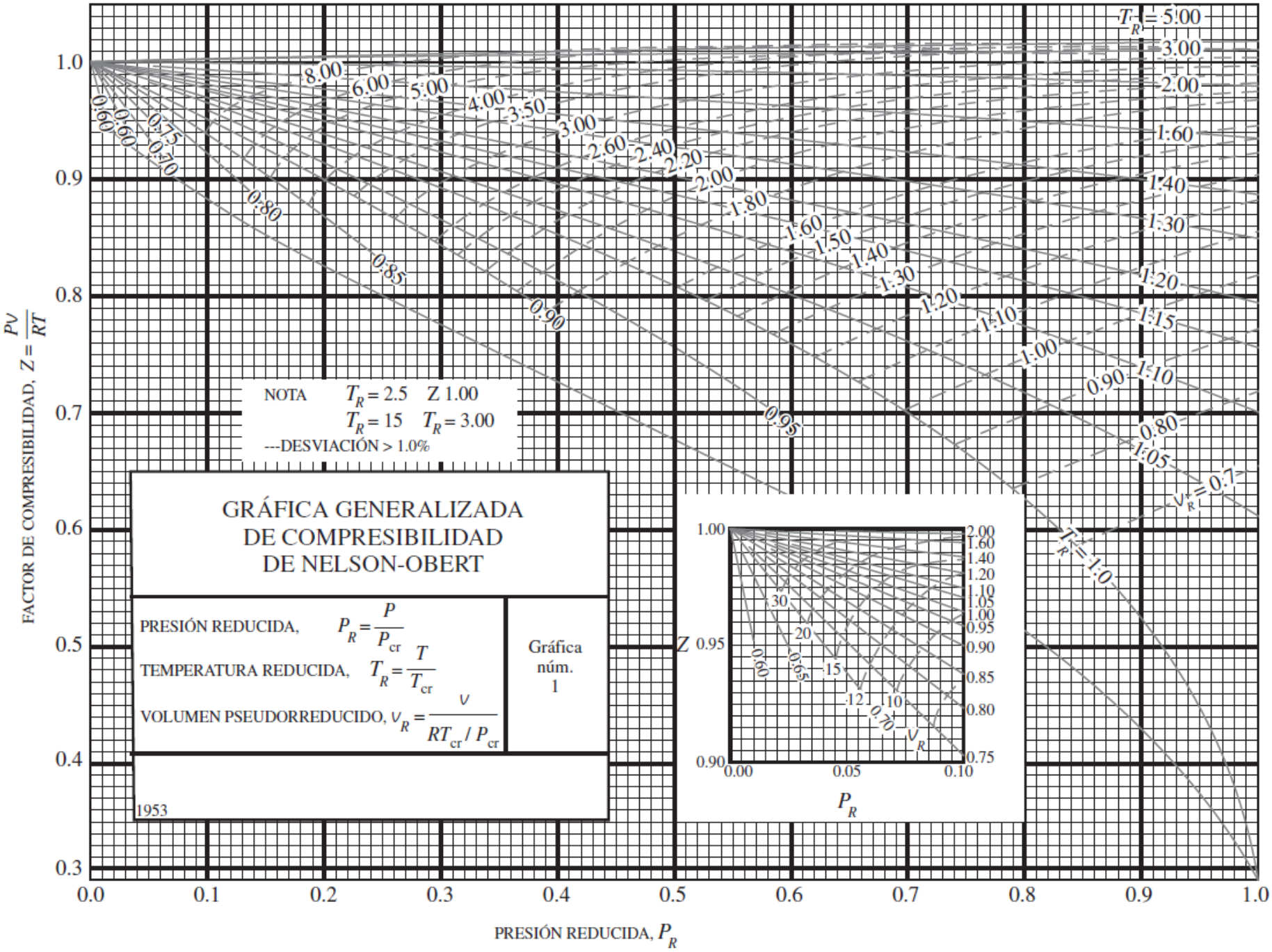

Figura 4. Carta de Compresibilidad generalizada ($T_R = T/T_C$, $p_R = p/p_C$,$v_R = vp_C/RT_C$) for $p_R \leq 10$. (*Fuente:* Yunus Çengel y Michael Boles. Termodinámica, 7a. ed. (Mc Graw Hill, México, 2012), p. 932, tabla A-15.

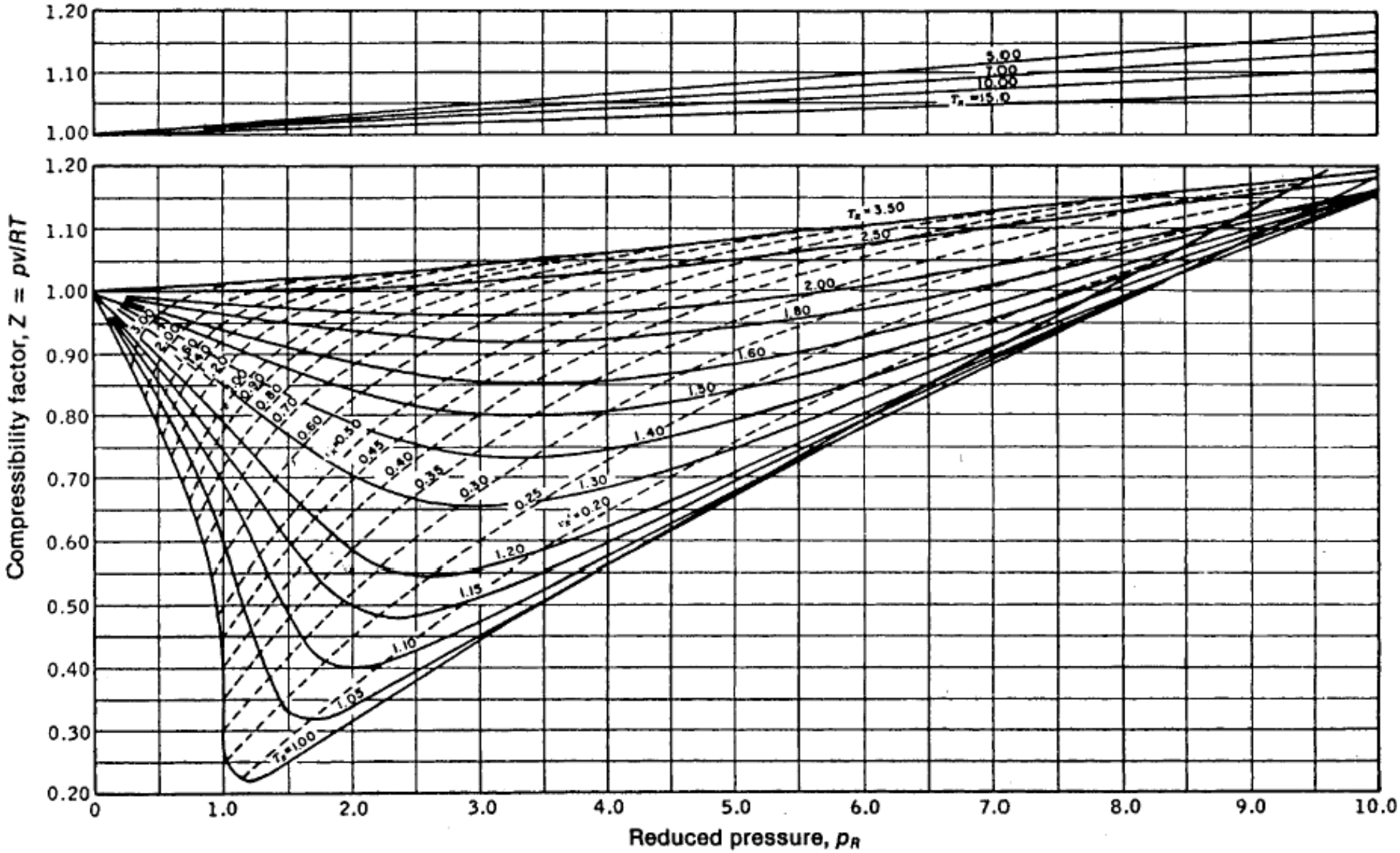

Figura 5. Carta de Compresibilidad generalizada ($T_R = T/T_C$, $p_R = p/p_C$,$v_R = vp_C /RT_C$) for $p_R \leq 10$. (*Fuente:* Obert, E.F. 1960 *Concepts of Thermodynamics*. McGraw-Hill, New York).

Tabla A.15 SI Constantes de las ecuaciones de estado.

Tabla A.15.1 SI Constantes de la ecuación de estado de Van der Waals.

$$P = \frac{RT}{v-b} - \frac{a}{v^2};\ v^3 - \left(b + \frac{RT}{P}\right)v^2 + \frac{a}{P}v - \frac{ab}{P} = 0$$

Sustancia	Fórmula	a (kPa.m^6/kmol^2)	b (m^3/kmol)	Sustancia	Fórmula	a (kPa.m^6/kmol^2)	b (m^3/kmol)
Acetileno	C_2H_6	451.4587	0.0522	Etileno	C_2H_4	461.4644	0.0582
Agua	H_2O	552.4150	0.0304	Flúor	F_2	116.3326	0.0287
Alcohol metílico	CH_3OH	947.2138	0.0659	Helio	He	3.4606	0.0238
Alcohol etílico	C_2H_5OH	1254.3774	0.0870	Helio3	He	2.8028	0.0302
Amoniaco	NH_3	422.4985	0.0371	n-Heptano	C_7H_{16}	3107.1250	0.2049
Argón	Ar	136.1799	0.0322	n-Hexano	C_6H_{14}	2495.4275	0.1752
Benceno	C_6H_6	1885.0036	0.1195	Hidrógeno (normal)	H_2	24.7270	0.0265
Bromo	Br_2	978.9416	0.0593	Kriptón	Kr	232.5038	0.0396
n-Butano	C_4H_{10}	1387.5296	0.1163	Metano	CH_4	229.8346	0.0430
Cloro	Cl_2	635.1850	0.0543	Monóxido de carbono	CO	147.1707	0.0395
Clorodifluoroetano	CH_3CClF_2	1155.1901	0.1003	Neón	Ne	20.8303	0.0167
Clorodifluorometano	$CHClF_2$	800.2793	0.0772	Nitrógeno	N_2	137.0119	0.0387
Cloroformo	$CHCl_3$	1562.5812	0.1038	n-Octano	C_8H_{18}	3789.3017	0.2374
Cloruro de metilo	CH_3Cl	754.3578	0.0646	Óxido nítrico	NO	145.8174	0.0289
Deuterio (normal)	D_2	25.9056	0.0240	Óxido nitroso	N_2O	386.1026	0.0444
Diclorodifluorometano (12)	CCl_2F_2	1044.1442	0.0966	Oxígeno	O_2	138.3018	0.0319
Diclorofluoroetano (141)	CH_3CCl_2F	1489.2791	0.1102	n-Pentano	C_5H_{16}	1909.1962	0.1449
Diclorofluorometano (21)	$CHCl_2F$	1148.1998	0.0906	Propano	C_3H_8	938.3919	0.0904
Difluoroetano (152a)	CHF_2CH_3	963.3301	0.0888	Propeno	C_3H_6	844.1687	0.0824
Diclorotrifluorometano (123)	$CHCl_2F$	1658.8824	0.1294	Propino	C_3H_4	838.7777	0.0743
Dióxido de azufre	SO_2	686.8541	0.0568	Tetracloruro de carbono	CCl_4	1979.9251	0.1268
Dióxido de carbono	CO_2	365.4398	0.0428	Tetrafluoroetano (134a)	CF_3CH_2F	1005.8214	0.0958
Dióxido de nitrógeno	NO_2	536.3799	0.0444	Xenón	Xe	419.1056	0.0516
Etano	C_2H_6	557.3880	0.0650				

Fuente: Calculados a partir de los valores críticos.

Tabla A.15.2 SI Constantes de la ecuación de estado de Redlich - Kwong.

$$P = \frac{RT}{v-b} - \frac{a}{v(v+b)T^{\frac{1}{2}}};\ v^3 - \frac{RT}{P}v^2 + \left(\frac{a}{PT^{\frac{1}{2}}} - \frac{RTb}{P} - b^2\right)v - \frac{ab}{PT^{\frac{1}{2}}} = 0$$

Sustancia	Fórmula	a (kPa.m^{6}·K$^{0.5}$/kmol^{2})	b (m^{3}/kmol)	Sustancia	Fórmula	a (kPa.m^{6}·K$^{0.5}$/kmol^{2})	b (m^{3}/kmol)
Acetileno	C_2H_6	8032.2423	0.0362	Etileno	C_2H_4	7857.8287	0.0404
Agua	H_2O	14241.3204	0.0211	Flúor	F_2	1416.0112	0.0199
Alcohol metílico	CH_3OH	21730.4812	0.0456	Helio	He	7.9885	0.0165
Alcohol etílico	C_2H_5OH	28813.7334	0.0603	Helio3	He	5.1670	0.0209
Amoniaco	NH_3	8620.9008	0.0257	n-Heptano	C_7H_{16}	73182.6644	0.1420
Argón	Ar	1694.5163	0.0223	n-Hexano	C_6H_{14}	56963.2792	0.1215
Benceno	C_6H_6	45288.6740	0.0828	Hidrógeno (normal)	H_2	144.3688	0.0184
Bromo	Br_2	24053.4542	0.0411	Kriptón	Kr	3409.1834	0.0274
n-Butano	C_4H_{10}	28991.5146	0.0806	Metano	CH_4	3213.5191	0.0298
Cloro	Cl_2	13141.5989	0.0376	Monóxido de carbono	CO	1719.1579	0.0274
Clorodifluoroetano	CH_3CClF_2	23710.2549	0.0695	Neón	Ne	140.6435	0.0116
Clorodifluorometano	$CHClF_2$	15583.4367	0.0535	Nitrógeno	N_2	1559.6245	0.0268
Cloroformo	$CHCl_3$	36670.6830	0.0720	n-Octano	C_8H_{18}	91573.7467	0.1646
Cloruro de metilo	CH_3Cl	15595.9770	0.0448	Óxido nítrico	NO	1982.3376	0.0200
Deuterio (normal)	D_2	162.6640	0.0167	Oxido nitroso	N_2O	6883.9099	0.0308
Diclorodifluorometano (12)	CCl_2F_2	20759.7846	0.0670	Oxígeno	O_2	1742.4669	0.0221
Diclorofluoroetano (141)	CH_3CCl_2F	33113.5877	0.0764	n-Pentano	C_5H_{16}	41926.9104	0.1004
Diclorofluorometano (21)	$CHCl_2F$	24724.4383	0.0628	Propano	C_3H_8	18285.1993	0.0627
Difluoroetano (152a)	CHF_2CH_3	19187.8238	0.0616	Propeno	C_3H_6	16339.8546	0.0571
Diclorotrifluorometano (123)	$CHCl_2F$	35930.0807	0.0897	Propino	C_3H_4	17049.3528	0.0515
Dióxido de azufre	SO_2	14445.5599	0.0394	Tetracloruro de carbono	CCl_4	47323.2237	0.0879
Dióxido de carbono	CO_2	6457.3756	0.0297	Tetrafluoroetano (134a)	CF_3CH_2F	19715.3634	0.0664
Dióxido de nitrógeno	NO_2	11283.4826	0.0307	Xenón	Xe	7228.1932	0.0357
Etano	C_2H_6	9870.1584	0.0451				

Fuente: Calculados a partir de los valores críticos.

Tabla A.15.3 SI Constantes empíricas para la ecuación de Beattie - Bridgeman.

$$P = \frac{RT}{v^2}\left(1 - \frac{c}{vT^3}\right)(v + B) - \frac{A}{v^2}, \text{ donde } A = A_0\left(1 - \frac{a}{v}\right) \text{ y } B = B_0\left(1 - \frac{b}{v}\right)$$

Cuando P está en kPa, v está en m^3/kmol, T está en K y R = 8.314 kPa.m^3/kmol.K.

Gas	Ao	a	Bo	b	c
Aire	131.8441	0.01931	0.04611	-0.001101	4.34×10^4
Argón, Ar	130.7802	0.02328	0.03931	0.0	5.99×10^4
Dióxido de carbono, CO_2	507.2836	0.07132	0.10476	0.07235	6.60×10^4
Helio, He	2.1886	0.05984	0.01400	0.0	40
Hidrógeno, H_2	20.0117	-0.00506	0.02096	-0.04359	504
Nitrógeno, N_2	136.2315	0.02617	0.05046	-0.00691	4.20×10^4
Oxígeno, O_2	151.0857	0.02562	0.04624	0.004208	4.80×10^4

Fuente: Yunus Çengel y Michael Boles. *Termodinámica*, 7a. ed. (Mc Graw Hill, México, 2012), p. 146, tabla 3-4.

Tabla A.15.4 SI Constantes empíricas para la ecuación de Benedict - Webb - Rubin.

$$P = \frac{RT}{v} + \frac{RT\,B_0 - A_0 - C_0/T^2}{v^2} + \frac{RT\,b - a}{v^3} + \frac{a\,\alpha}{v^6} + \frac{c}{v^3 T^2}\left(1 + \frac{\gamma}{v^2}\right)e^{-\gamma/v^2}$$

Unidades: Atmósferas, Litros, Moles, K. Constante de los gases: R = 0.08206; T (K) = T (ºC) + 273.15

Gas	A_0	B_0	$C_0 \times 10^{-6}$	a	b	$c \times 10^{-6}$	$\alpha \times 10^{3}$	$\gamma \times 10^{2}$
Metano	1.85500	0.042600	0.022570	0.49400	0.00338004	0.0002545	0.124359	0.600
Etileno	3.33958	0.556833	0.131140	0.25900	0.008600	0.021120	0.17800	0.923
Etano	4.15556	0.0627724	0.179592	0.34516	0.011122	0.032767	0.243389	1.180
Propileno	6.11220	0.0850647	0.439182	0.774056	0.0187059	0.102611	0.455696	1.829
Propano	6.87225	0.097313	0.508256	0.94770	0.022500	0.12900	0.607175	2.200
n-Butano	10.0847	0.124361	0.992830	1.88231	0.0399983	0.316400	1.10132	3.400
n-Pentano	12.1794	0.156751	2.12121	4.07480	0.066812	0.82417	1.81000	4.750
n-Hexano	14.4373	0.177813	3.31935	7.11671	0.109131	1.51276	2.81086	6.66849
n-Heptano	17.5206	0.199005	4.74574	10.36475	0.151954	2.47000	4.35611	9.000
Nitrógeno	1.19250	0.04580	0.0058891	0.01490	0.00198154	0.000548064	0.291545	0.750
Oxígeno	1.49880	0.046524	0.0038617	-0.040507	-0.00027963	-0.000157536	0.008641	0.359
Amoniaco	3.78928	0.0516461	0.178567	0.10354	0.000719561	0.000157536	0.00465189	1.980
Dióxido de carbono	2.67340	0.045628	0.11333	0.051689	0.0030819	0.0070672	0.11271	0.494

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 71, tabla 3.3.

Tabla A.16 SI Propiedades del gas ideal del Aire (Çengel).

T (K)	h (kJ/kg)	P_r	u (kJ/kg)	v_r	s (kJ/kg.K)	T (K)	h (kJ/kg)	P_r	u (kJ/kg)	v_r	s (kJ/kg.K)	T (K)	h (kJ/kg)	P_r	u (kJ/kg)	v_r	s (kJ/kg.K)
200	199.97	0.3363	142.56	1707.0	1.29559	550	554.74	11.86	396.86	133.1	2.31809	1140	1207.57	193.1	880.35	16.946	3.11883
210	209.97	0.3987	149.69	1512.0	1.34444	560	565.17	12.66	404.42	127.0	2.33685	1160	1230.92	207.2	897.91	16.064	3.13916
220	219.97	0.4690	156.82	1346.0	1.39105	570	575.59	13.50	411.97	121.2	2.35531	1180	1254.34	222.2	915.57	15.241	3.15916
230	230.02	0.5477	164.00	1205.0	1.43557	580	586.04	14.38	419.55	115.7	2.37348	1200	1277.79	238.0	933.33	14.470	3.17888
240	240.02	0.6355	171.13	1084.0	1.47824	590	596.52	15.31	427.15	110.6	2.39140	1220	1301.31	254.7	951.09	13.747	3.19834
250	250.05	0.7329	178.28	979.0	1.51919	600	607.02	16.28	434.78	105.8	2.40902	1240	1324.93	272.3	968.95	13.069	3.21751
260	260.09	0.8405	185.45	887.8	1.55848	610	617.53	17.30	442.42	101.2	2.42644	1260	1348.55	290.8	986.90	12.435	3.23638
270	270.11	0.9590	192.60	808.0	1.59634	620	628.07	18.36	450.09	96.92	2.44356	1280	1372.24	310.4	1004.76	11.835	3.25510
280	280.13	1.0889	199.75	738.0	1.63279	630	638.63	19.84	457.78	92.84	2.46048	1300	1395.97	330.9	1022.82	11.275	3.27345
285	285.14	1.1584	203.33	706.1	1.65055	640	649.22	20.64	465.50	88.99	2.47716	1320	1419.76	352.5	1040.88	10.747	3.29160
290	290.16	1.2311	206.91	676.1	1.66802	650	659.84	21.86	473.25	85.34	2.49364	1340	1443.60	375.3	1058.94	10.247	3.30959
295	295.17	1.3068	210.49	647.9	1.68515	660	670.47	23.13	481.01	81.89	2.50985	1360	1467.49	399.1	1077.10	9.780	3.32724
300	300.19	1.3860	214.07	621.2	1.70203	670	681.14	24.46	488.81	78.61	2.52589	1380	1491.44	424.2	1095.26	9.337	3.34474
305	305.22	1.4686	217.67	596.0	1.71865	680	691.82	25.85	496.62	75.50	2.54175	1400	1515.42	450.5	1113.52	8.919	3.36200
310	310.24	1.5546	221.25	572.3	1.73498	690	702.52	27.29	504.45	72.56	2.55731	1420	1539.44	478.0	1131.77	8.526	3.37901
315	315.27	1.6442	224.85	549.8	1.75106	700	713.27	28.80	512.33	69.76	2.57277	1440	1563.51	506.9	1150.13	8.153	3.39586
320	320.29	1.7375	228.42	528.6	1.76690	710	724.04	30.38	520.23	67.07	2.58810	1460	1587.63	537.1	1168.49	7.801	3.41247
325	325.31	1.8345	232.02	508.4	1.78249	720	734.82	32.02	528.14	64.53	2.60319	1480	1611.79	568.8	1186.95	7.468	3.42892
330	330.34	1.9352	235.61	489.4	1.79783	730	745.62	33.72	536.07	62.13	2.61803	1500	1635.97	601.9	1025.41	7.152	3.44516
340	340.42	2.149	242.82	454.1	1.82790	740	756.44	35.50	544.02	59.82	2.63280	1520	1660.23	535.5	1223.87	6.854	3.46120
350	350.49	2.379	250.02	422.2	1.85708	750	767.29	37.35	551.99	57.63	2.64737	1540	1684.51	672.8	1242.43	6.569	3.47712
360	360.58	2.626	257.24	393.4	1.88543	760	778.18	39.27	560.01	55.54	2.66176	1560	1708.82	710.5	1260.99	6.301	3.49276
370	370.67	2.892	264.46	367.2	1.91313	780	800.03	43.35	576.12	51.64	2.69013	1580	1733.17	750.0	1279.65	6.046	3.50829
380	380.77	3.176	271.69	343.4	1.94001	800	821.95	47.75	592.30	48.08	2.71787	1600	1757.57	791.2	1298.30	5.804	3.52364
390	390.88	3.481	278.93	321.5	1.96633	820	843.98	52.59	608.59	44.84	2.74504	1620	1782.00	834.1	1316.96	5.574	3.53879
400	400.98	3.806	286.16	301.6	1.99194	840	866.08	57.60	624.95	41.85	2.77170	1640	1806.46	878.9	1335.72	5.355	3.55381
410	411.12	4.153	293.43	283.3	2.01699	860	888.27	63.09	641.40	39.12	2.79783	1660	1830.96	925.6	1354.48	5.147	3.56867
420	421.26	4.522	300.69	266.6	2.04142	880	910.56	68.98	657.95	36.61	2.82344	1680	1855.50	974.2	1373.24	4.949	3.58335
430	431.43	4.915	307.99	251.1	2.06533	900	932.93	75.29	674.58	34.31	2.84856	1700	1880.1	1025	1392.7	4.761	3.5979
440	441.61	5.332	315.30	236.8	2.08870	920	955.38	82.05	691.28	32.18	2.87324	1750	1941.6	1161	1439.8	4.328	3.6336
450	451.80	5.775	322.62	223.6	2.11161	940	977.92	89.28	708.08	30.22	2.89748	1800	2003.3	1310	1487.2	3.944	3.6684
460	462.02	6.245	329.97	211.4	2.13407	960	1000.55	97.00	725.02	28.40	2.92128	1850	2065.3	1475	1534.9	3.601	3.7023
470	472.24	6.742	337.32	200.1	2.15604	980	1023.25	105.2	741.98	26.73	2.94468	1900	2127.4	1655	1582.6	3.295	3.7354
480	482.49	7.268	344.70	189.5	2.17760	1000	1046.04	114.0	758.94	25.17	2.96770	1950	2189.7	1852	1630.6	3.022	3.7677
490	492.74	7.824	352.08	179.7	2.19876	1020	1068.89	123.4	776.10	23.72	2.99034	2000	2252.1	2068	1678.7	2.776	3.7994
500	503.02	8.411	359.49	170.6	2.21952	1040	1091.85	133.3	793.36	22.39	3.01260	2050	2314.6	2303	1726.8	2.555	3.8303
510	513.32	9.031	366.92	162.1	2.23993	1060	1114.86	143.9	810.62	21.14	3.03449	2100	2377.4	2559	1775.3	2.356	3.8605
520	523.63	9.684	374.36	154.1	2.25997	1080	1137.89	155.2	827.88	19.98	3.05608	2150	2440.3	2837	1823.8	2.175	3.8901
530	533.98	10.37	381.84	146.7	2.27967	1100	1161.07	167.1	845.33	18.896	3.07732	2200	2503.2	3138	1872.4	2.012	3.9191
540	544.35	11.10	389.34	139.7	2.29906	1120	1184.28	179.7	862.79	17.886	3.09825	2250	2566.4	3464	1921.3	1.864	3.9474

Nota: Las propiedades Pr (presión relativa) y Vr (volumen específico relativo) son cantidades adimensionales utilizadas en el análisis de procesos isentrópicos, y no deberán confundirse con las propiedades de presión y volumen específico.

Fuente: Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 931, tabla A.5.

Tabla A.17 SI Propiedades de diversas sustancias como gases ideales.

Tabla A.17.1 SI Propiedades del gas ideal del Nitrógeno, N_2.

T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)
0	**0**	**0**	**0**	590	616.21	441.08	7.55228	980	1052.23	761.36	8.11759	1740	1967.52	1465.36	8.81698
220	228.14	162.85	6.51979	600	626.96	448.86	7.57027	990	1063.90	770.04	8.12937	1760	2007.18	1484.81	8.83147
230	238.57	170.28	6.56617	610	637.70	456.65	7.58805	1000	1075.54	778.75	8.14111	1780	2032.56	1504.27	8.84582
240	248.99	177.74	6.61050	620	648.48	464.46	7.60558	1020	384.96	796.20	8.16428	4800	2058.01	1523.76	8.85999
250	259.38	185.20	6.65298	630	659.27	472.28	7.62293	1040	1122.41	813.73	8.18706	1820	2083.43	1543.25	8.87406
260	269.80	192.62	6.69382	640	670.12	480.13	7.63995	1060	1145.93	831.33	8.20951	1840	2108.84	1562.74	8.88798
270	280.19	200.05	6.73309	650	680.93	488.02	7.65677	1080	1169.53	848.96	8.23157	1860	2134.37	1582.27	8.90176
280	290.62	207.51	6.77089	660	691.82	496.02	7.67337	1100	1193.23	866.74	8.25328	1880	2159.85	1601.86	8.91543
290	301.00	214.94	6.80738	670	702.71	503.84	7.68975	1120	1217.01	884.59	8.27469	1900	2185.41	1621.50	8.92900
298	309.46	220.97	6.83618	680	713.63	511.80	7.70592	1140	1240.85	902.51	8.29583	1920	2210.97	1641.13	8.94235
300	311.39	222.36	6.84261	690	724.56	519.76	7.72191	1160	1264.77	920.50	8.31660	1940	2236.60	1660.80	8.95563
310	321.78	229.79	6.87674	700	735.52	527.75	7.73769	1180	1288.83	938.53	8.33716	1960	2262.56	1680.47	8.96876
320	332.20	237.21	6.90972	710	746.51	535.75	7.75326	1200	1312.85	956.66	8.35737	1980	2287.87	1700.17	8.98179
330	342.59	244.64	6.94174	720	757.51	543.82	7.76868	1220	1336.95	974.83	8.37729	2000	2313.57	1719.95	8.99472
340	352.98	252.06	6.97276	730	768.54	551.89	7.78421	1240	1361.12	993.07	8.39692	2050	2377.90	1769.43	9.02645
350	363.40	259.52	7.00293	740	779.60	559.95	7.79895	1260	1385.32	1011.35	8.41631	2100	2442.33	1819.05	9.05744
360	373.79	266.95	7.03227	750	790.67	568.06	7.81384	1280	1409.63	1029.70	8.43544	2150	2506.91	1868.81	9.08785
370	384.21	274.41	7.06079	760	801.77	576.20	7.82854	1300	1433.98	1048.12	8.45432	2200	2571.66	1918.72	9.11762
380	394.64	281.83	7.08857	770	812.91	584.37	7.84311	1320	1458.36	1048.73	8.47296	2250	2636.49	1968.69	9.14672
390	405.06	289.29	7.11566	780	824.08	592.55	7.85753	1340	1482.85	1085.14	8.49131	2300	2701.46	2018.81	9.17528
400	415.52	296.79	7.14208	790	835.26	600.79	7.87177	1360	1507.41	1103.74	8.50948	2350	2766.43	2068.97	9.20323
410	425.95	304.25	7.16789	800	846.54	609.04	7.88577	1380	1531.97	1122.37	8.52740	2400	2831.54	2119.23	9.23071
420	436.40	311.75	7.19305	810	857.71	617.28	7.89983	1400	1556.60	1141.04	8.54514	2450	2896.83	2169.67	9.25756
430	446.86	319.24	7.21768	820	868.95	625.57	7.91361	1420	1581.23	1159.78	8.56263	2500	2962.23	2220.22	9.28401
440	457.32	326.74	7.24174	830	880.23	633.88	7.92728	1440	1605.97	1178.52	8.57995	2550	3027.67	2270.84	9.30993
450	467.82	334.24	7.26531	840	891.51	642.20	7.94085	1460	1630.74	1197.41	8.59697	2600	3093.21	2321.53	9.33538
460	478.31	341.77	7.28840	850	902.87	650.56	7.95424	1480	1655.55	1216.26	8.61389	2650	3158.82	2372.29	9.36040
470	488.81	349.34	7.31100	860	914.22	658.94	7.96752	1500	1680.40	1235.18	8.63056	2700	3224.50	2423.16	9.38500
480	499.34	356.87	7.33317	870	925.57	667.37	7.98065	1520	1705.32	1254.17	8.64699	2750	3290.29	2474.07	9.40910
490	509.94	364.47	7.35491	880	936.99	675.79	7.99368	1540	1730.27	1273.16	8.66330	2800	3356.08	2525.04	9.43280
500	520.51	372.08	7.37622	890	948.42	684.25	8.00657	1560	1755.19	1292.15	8.67943	2850	3421.95	2576.05	9.45615
510	531.04	379.65	7.39714	900	959.91	692.79	8.01938	1580	1780.21	1311.25	8.69543	2900	3487.84	2627.10	9.47910
520	541.61	387.25	7.41770	910	971.33	701.25	8.03206	1600	1805.27	1330.38	8.71124	2950	3553.92	2678.33	9.50166
530	552.21	394.89	7.43790	920	982.83	709.78	8.04459	1620	1830.40	1349.59	8.72681	3000	3620.00	2729.59	9.52390
540	562.81	402.56	7.45775	930	994.32	718.31	8.05701	1640	1855.57	1368.79	8.74223	3050	3686.15	2780.92	9.54571
550	573.45	410.24	7.47728	940	1005.89	726.88	8.06936	1660	1880.77	1388.07	8.75754	3100	3752.36	2832.29	9.56724
560	584.12	417.91	7.49648	950	1017.42	735.48	8.08157	1680	1906.01	1407.35	8.77261	3150	3818.66	2886.95	9.58844
570	594.80	425.62	7.51537	960	1029.02	744.08	8.09367	1700	1931.21	1426.66	8.78756	3200	3884.98	2935.21	9.60932
580	605.50	433.33	7.53397	970	1040.62	752.72	8.10567	1720	1956.48	1446.01	8.80234	3250	3951.38	2986.76	9.62992

Fuente: La tabla A.17.1 SI se adaptó de Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 933 - 934, tabla A.6.

La masa molar del nitrógeno (N_2) es 28.013 kg/kmol.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía.

Tabla A.17.2 SI Propiedades del gas ideal del Oxígeno, O_2.

T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)
0	**0**	**0**	**0**	590	550.30	396.98	7.05672	980	959.15	704.52	7.58674	1740	1816.81	1365.64	8.23260
220	200.13	142.97	6.13054	600	560.30	404.39	7.07353	990	970.06	712.80	7.59774	1760	1840.06	1320.26	8.24591
230	209.19	149.44	6.17085	610	570.33	411.83	7.09013	1000	980.94	721.12	7.60871	1780	1863.31	1400.83	8.25910
240	218.26	155.91	6.20944	620	580.39	419.29	7.10647	1020	1002.78	737.74	7.63036	4800	1886.65	1418.95	8.27216
250	227.35	162.41	6.24660	630	590.49	426.79	7.12266	1040	1024.69	754.46	7.65161	1820	1910.00	1437.11	8.28504
260	236.44	168.91	6.28229	640	600.61	434.33	7.13863	1060	1046.60	771.18	7.67565	1840	1933.37	1455.30	8.29779
270	245.51	175.41	6.31670	650	610.77	441.89	7.15435	1080	1068.60	787.96	7.69308	1860	1956.81	1473.51	8.31042
280	254.70	181.94	6.34992	660	620.96	449.48	7.16991	1100	1090.63	804.81	7.71330	1880	1980.22	1491.73	8.32295
290	263.85	188.51	6.38201	670	631.18	457.08	7.18522	1120	1112.72	821.71	7.73318	1900	2003.69	1510.02	8.33532
298	271.32	193.85	6.40748	680	641.40	464.73	7.20038	1140	1134.85	838.65	7.75277	1920	2027.19	1528.30	8.34760
300	273.01	195.07	6.41311	690	651.71	441.14	7.21538	1160	1157.00	855.62	7.77206	1940	2050.69	1546.61	8.35979
310	282.20	201.66	6.44323	700	661.93	480.14	7.23016	1180	1179.22	872.62	7.79109	1960	2074.25	1564.99	8.37186
320	291.42	208.26	6.47245	710	672.33	487.86	7.24482	1200	1201.51	889.68	7.80981	1980	2097.78	1583.33	8.38386
330	300.63	214.91	6.50083	720	682.68	495.61	7.25932	1220	1223.85	906.84	7.82828	2000	2121.35	1601.71	8.36448
340	309.88	221.57	6.52845	730	693.05	503.36	7.27360	1240	1246.20	924.03	7.84646	2050	2180.44	1647.77	8.42489
350	319.17	228.23	6.55536	740	703.46	511.17	7.28776	1260	1268.60	941.22	7.86440	2100	2239.69	1694.05	8.45351
360	328.48	234.94	6.58158	750	713.90	518.98	7.30176	1280	1291.04	958.47	7.88209	2150	2299.23	1740.59	8.48148
370	337.79	241.66	6.60718	760	724.34	526.86	7.31557	1300	1313.57	975.81	7.89950	2200	2358.95	1787.31	8.50895
380	347.17	248.41	6.63214	770	734.80	534.74	7.32923	1320	1336.07	993.09	7.91665	2250	2418.73	1834.12	8.53577
390	356.54	255.20	6.65652	780	745.34	542.64	7.34273	1340	1358.64	1010.47	7.93362	2300	2478.70	1881.09	8.55936
400	365.98	262.01	6.68037	790	755.84	550.58	7.35607	1360	1381.23	1027.88	7.95037	2350	2538.92	1928.31	8.58805
410	375.39	268.85	6.70365	800	766.37	558.52	7.36929	1380	1403.89	1045.31	7.96687	2400	2599.27	1975.66	8.61355
420	384.82	275.70	6.72649	810	776.93	566.46	7.38242	1400	1426.54	1062.78	7.98319	2450	2659.83	2023.25	8.63852
430	394.32	282.60	6.74880	820	787.49	574.46	7.39536	1420	1449.23	1080.25	7.99925	2500	2720.62	2071.03	8.66299
440	403.86	289.51	6.77071	830	798.06	551.17	7.40820	1440	1471.98	1097.82	8.01509	2550	2781.46	2118.88	8.68712
450	413.39	296.48	6.79215	840	808.68	590.42	7.42092	1460	1494.77	1115.41	8.03081	2600	2842.46	2166.91	8.71083
460	422.67	303.45	6.81321	850	819.34	598.46	7.43348	1480	1517.58	1133.04	8.04631	2650	2903.72	2215.16	8.73418
470	432.58	310.48	6.83384	860	829.99	606.52	7.44598	1500	1540.42	1150.69	8.06166	2700	2965.12	2263.60	8.75712
480	442.23	317.51	6.85415	870	840.62	614.58	7.45836	1520	1563.30	1168.38	8.07681	2750	3026.72	2312.17	8.77971
490	451.89	324.57	6.87406	880	851.34	622.68	7.47058	1540	1586.17	1186.04	8.09175	2800	3088.41	2360.89	8.80196
500	461.58	331.70	6.89362	890	862.03	630.80	7.48270	1560	1609.11	1203.79	8.10657	2850	3150.35	2409.83	8.82393
510	471.33	338.82	6.91290	900	872.78	638.93	7.49470	1580	1632.05	1221.54	8.12119	2900	3212.38	2458.89	8.84553
520	481.11	345.98	6.93184	910	883.53	647.08	7.50342	1600	1655.08	1239.35	8.13566	2950	3274.63	2508.14	8.86678
530	490.89	353.17	6.95050	920	894.28	655.24	7.51836	1620	1678.05	1257.13	8.14997	3000	3336.98	2557.49	8.88775
540	500.70	360.42	6.96887	930	905.03	663.40	7.53002	1640	1701.12	1275.01	8.16408	3050	3399.42	2606.93	8.90840
550	510.58	367.67	6.98697	940	915.84	671.61	7.54158	1660	1724.18	1292.85	8.17807	3100	3462.11	2656.61	8.92881
560	520.45	374.95	7.00478	950	926.65	679.83	7.55302	1680	1747.30	1310.79	8.19188	3150	3524.95	2706.37	8.94887
570	530.36	382.26	7.02234	960	937.50	688.05	7.56436	1700	1770.43	1328.70	8.20560	3200	3587.89	2756.43	8.96869
580	540.33	389.61	7.03966	970	948.31	696.27	7.57558	1720	1793.62	1346.70	8.21916	3250	3650.96	2806.46	8.98822

Fuente: La tabla A.17.2 SI se adaptó de Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 935 - 936, tabla A.7.

La masa molar del oxígeno (O_2) es 31.999 kg/kmol.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía.

Tabla A.17.3 SI Propiedades del gas ideal del Dióxido de carbono, CO_2.

T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)
0	**0**	**0**	**0**	590	495.50	384.05	5.50795	980	947.17	762.03	6.09223	1740	1936.63	1607.91	6.83624
220	149.99	108.43	4.61182	600	506.25	392.89	5.52599	990	959.46	772.44	6.10475	1760	1963.64	1631.15	6.85169
230	157.65	114.20	4.64585	610	517.02	401.80	5.54381	1000	971.80	782.89	6.11713	1780	1990.73	1654.44	6.86701
240	165.42	120.09	4.67894	620	527.86	410.72	5.56142	1020	996.57	803.86	6.14170	1800	2017.86	1677.80	6.88216
250	173.30	126.06	4.71113	630	538.72	419.70	5.57882	1040	1021.43	824.95	6.16574	1820	2044.99	1701.16	6.89716
260	181.30	132.17	4.74249	640	549.65	428.74	5.59605	1060	1046.38	846.13	6.18950	1840	2072.17	1724.54	6.91202
270	189.39	138.40	4.77305	650	560.65	437.86	5.61309	1080	1071.42	867.39	6.21291	1860	2099.39	1747.99	6.92672
280	197.61	144.72	4.80291	660	571.69	446.99	5.64660	1100	1096.52	888.71	6.23597	1880	2126.63	1771.46	6.94131
290	205.93	151.12	4.83208	670	582.78	456.21	5.66310	1120	1121.77	910.18	6.25867	1900	2153.90	1794.96	6.95574
298	212.77	156.44	4.85537	680	593.91	465.44	5.67944	1140	1147.10	931.74	6.28107	1920	2181.21	1818.47	6.97003
300	214.29	157.67	4.86060	690	605.11	474.76	5.69559	1160	1172.51	953.35	6.30318	1940	2208.52	1842.01	6.98419
310	222.84	164.28	4.88857	700	616.34	484.09	5.71161	1180	1198.00	975.07	6.32495	1960	2235.88	1865.60	6.99823
320	231.45	171.01	4.91595	710	627.63	493.50	5.72745	1200	1223.54	996.84	6.34644	1980	2263.26	1889.21	7.01213
330	240.17	177.82	4.94283	720	638.97	502.93	5.74313	1220	1249.19	1018.72	6.36760	2000	2290.48	1912.86	7.02590
340	249.01	184.75	4.96919	730	650.35	512.43	5.75867	1240	1274.89	1040.65	6.38850	2050	2359.35	1972.07	7.05978
350	257.92	191.75	4.99502	740	661.76	521.97	5.77407	1260	1300.70	1062.67	6.40913	2100	2428.18	2031.45	7.09293
360	266.94	198.86	5.02040	750	673.23	531.54	5.78930	1280	1326.54	1084.73	6.42949	2150	2497.11	2090.96	7.12540
370	276.03	206.04	5.04531	760	684.73	541.17	5.80441	1300	1352.47	1106.86	6.44960	2200	2566.21	2146.51	7.38441
380	285.21	213.41	5.06980	770	696.30	550.83	5.81936	1320	1378.46	1129.08	6.46948	2250	2635.40	2210.34	7.18828
390	294.48	220.81	5.09389	780	707.88	560.53	5.83417	1340	1404.52	1151.37	6.48912	2300	2704.73	2270.21	7.21870
400	303.84	228.27	5.11759	790	719.50	570.26	5.84885	1360	1430.65	1173.73	6.50850	2350	2774.16	2330.20	7.24860
410	313.27	235.81	5.14088	800	731.17	580.03	5.86339	1380	1456.85	1196.16	6.52768	2400	2843.72	2390.30	7.27794
420	322.79	243.44	5.16378	810	742.88	589.84	5.86339	1400	1483.09	1218.61	6.54638	2450	2913.41	2450.56	7.30666
430	332.38	251.15	5.18637	820	754.65	599.73	5.87780	1420	1509.36	1241.10	6.56519	2500	2983.19	2510.88	7.33488
440	342.06	258.87	5.20859	830	766.42	609.61	5.89209	1440	1535.70	1263.67	6.58357	2550	3053.12	2571.37	7.36255
450	351.81	266.80	5.23049	840	778.25	619.56	5.90625	1460	1562.10	1286.28	6.60173	2600	3123.13	2631.95	7.38973
460	361.65	274.73	5.25208	850	790.12	629.54	5.92027	1480	1520.36	1308.93	6.61970	2650	3193.21	2692.57	7.41641
470	371.53	282.75	5.27335	860	802.00	639.06	5.93420	1500	1615.04	1331.65	6.63745	2700	3263.35	2753.28	7.44260
480	381.53	290.84	5.29434	870	813.93	649.58	5.94797	1520	1641.58	1354.44	6.65503	2750	3333.63	2814.11	7.46839
490	391.55	298.98	5.31506	880	825.88	659.65	5.96162	1540	1668.19	1377.26	6.64972	2800	3403.95	2874.98	7.49375
500	401.68	307.23	5.33547	890	837.90	669.76	5.97519	1560	1694.84	1400.14	6.68964	2850	3474.39	2936.65	7.51865
510	411.86	315.50	5.35560	900	849.92	679.89	5.98862	1580	1744.31	1423.09	6.70668	2900	3544.85	2997.00	7.54317
520	422.09	323.86	5.37548	910	861.96	690.05	6.00195	1600	1748.33	1448.33	6.72349	2950	3615.47	3058.15	7.56730
530	432.38	332.24	5.39511	920	874.05	700.25	6.00195	1620	1775.12	1469.05	6.74010	3000	3686.12	3142.08	7.59109
540	442.74	340.74	5.41450	930	886.16	710.47	6.01518	1640	1801.93	1492.12	6.75656	3050	3756.90	3180.69	7.61450
550	453.19	349.28	5.43365	940	898.32	720.72	6.02827	1660	1828.81	1513.11	6.77282	3100	3827.68	3242.01	7.63749
560	463.69	357.90	5.45244	950	910.47	730.99	6.05417	1680	1855.71	1538.33	6.78893	3150	3898.57	3303.45	7.66017
570	474.21	366.53	5.47123	960	922.68	741.31	6.06696	1700	1882.66	1561.46	6.80486	3200	3969.44	3364.89	7.68255
580	484.82	375.26	5.48971	970	934.90	751.67	6.07966	1720	1909.63	1584.69	6.82065	3250	4040.49	3426.52	7.70436

Fuente: La tabla A.17.3 SI se adaptó de Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 939 - 940, tabla A.9.

La masa molar del dióxido de carbono (CO_2) es 44.01 kg/kmol.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía.

Tabla A.17.4 SI Propiedades del gas ideal del Monóxido de carbono, CO.

T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)
0	**0**	**0**	**0**	590	617.89	442.73	7.77197	980	1060.09	769.19	8.34531	1740	2000.68	1484.18	9.05327
220	228.17	162.87	6.73638	600	628.74	450.62	7.79022	990	1071.90	778.04	8.35730	1760	2026.28	1503.86	9.06787
230	238.59	170.33	6.78258	610	639.59	458.51	7.80821	1000	1083.72	786.90	8.36919	1780	2051.87	1523.49	9.08240
240	249.02	177.76	6.82688	620	650.52	466.48	7.82596	1020	1107.46	804.71	8.39268	4800	2077.51	1543.20	9.09664
250	259.41	185.22	6.86937	630	661.44	474.44	7.84345	1040	1131.31	822.60	8.41585	1820	2103.18	1562.94	9.11082
260	269.83	192.65	6.91017	640	672.37	482.40	7.86073	1060	1155.19	840.56	8.43856	1840	2128.85	1582.68	9.12485
270	280.22	200.07	6.94945	650	683.36	490.40	7.87776	1080	1179.19	858.59	8.46098	1860	2154.62	1602.50	9.13874
280	290.61	207.50	6.98725	660	694.36	498.46	7.89457	1100	1203.21	876.72	8.48301	1880	2180.36	1622.31	9.15248
290	301.04	214.92	7.02374	670	705.39	506.50	7.91117	1120	1227.31	894.86	8.50471	1900	2206.14	1642.16	9.16612
298	309.50	220.99	7.05259	680	716.46	514.60	7.92760	1140	1251.48	913.07	8.52613	1920	2231.92	1661.98	9.17965
300	311.42	222.38	7.05901	690	727.53	522.71	7.94377	1160	1275.72	931.38	8.54720	1940	2257.69	1681.83	9.19304
310	321.81	229.81	7.09311	700	738.66	530.88	7.95976	1180	1299.75	949.73	8.56798	1960	2283.51	1701.71	9.20628
320	332.24	237.24	7.12613	710	749.80	539.06	7.97558	1200	1324.35	968.15	8.59204	1980	2309.32	1721.56	9.21942
330	342.63	244.70	7.15816	720	760.98	547.23	7.99118	1220	1348.80	986.68	8.60864	2000	2335.17	1741.52	9.23242
340	353.05	252.12	7.18925	730	772.15	555.44	8.00660	1240	1373.30	1050.55	8.62856	2050	2400.00	1792.11	9.26433
350	363.48	259.59	7.21946	740	783.40	563.69	8.02185	1260	1397.86	1023.85	8.64820	2100	1036.92	1841.63	9.29561
360	373.90	267.05	7.24884	750	794.64	572.01	8.03695	1280	1422.49	1042.52	8.66762	2150	2529.95	1891.75	9.32617
370	384.33	274.51	7.27747	760	805.89	580.33	8.05187	1300	1447.13	1061.23	8.68675	2200	2595.07	1942.02	9.35612
380	394.79	282.01	7.30532	770	817.21	588.65	8.06665	1320	1471.83	1080.01	8.70561	2250	2660.34	1992.47	9.38547
390	405.25	289.47	7.33249	780	828.56	597.04	8.08129	1340	1496.57	1098.82	8.72424	2300	2725.63	2042.91	9.41421
400	415.71	297.00	7.35898	790	839.91	605.39	8.09575	1360	1521.35	1117.67	8.74259	2350	2791.07	2093.54	9.44234
410	426.20	304.50	7.38486	800	851.27	613.82	8.11003	1380	1546.20	1136.59	8.76073	2400	2856.66	2144.23	9.46994
420	436.70	312.03	7.40982	810	862.69	622.24	8.12421	1400	1571.12	1155.55	8.77861	2450	2922.24	2195.00	9.49704
430	447.20	319.56	7.43492	820	874.08	630.67	8.13824	1420	1596.11	1174.58	8.79632	2500	2987.93	2245.84	9.52356
440	457.73	327.13	7.45909	830	885.51	639.13	8.15205	1440	1621.14	1193.65	8.81385	2550	3053.80	2296.86	9.54963
450	468.26	334.70	7.48279	840	896.97	647.63	8.16580	1460	1646.20	1212.82	8.83113	2600	3119.71	2347.95	9.57522
460	478.83	342.27	7.50600	850	908.46	656.16	8.17944	1480	1671.30	1231.99	8.84823	2650	3185.65	2399.04	9.60032
470	489.40	349.88	8.59979	860	919.96	664.66	8.19286	1500	1696.43	1251.20	8.86512	2700	3251.59	2450.12	9.62499
480	500.00	357.52	7.55102	870	931.49	673.26	8.20621	1520	1721.60	1270.40	8.88176	2750	3317.74	2501.46	9.64959
490	510.60	365.16	7.57290	880	943.06	681.86	8.21946	1540	1746.80	1289.68	8.89825	2800	3383.93	2552.80	9.67308
500	521.24	372.83	7.59439	890	954.66	619.10	8.23252	1560	1772.05	1309.00	8.91449	2850	3450.16	2604.25	9.69661
510	531.88	380.51	7.61549	900	966.30	699.14	8.24552	1580	1797.36	1328.35	8.93063	2900	3516.42	2655.59	9.71971
520	542.56	388.22	7.63620	910	977.94	707.82	8.25837	1600	1822.67	1347.73	8.94652	2950	3582.72	2707.07	9.74238
530	553.27	395.93	7.65655	920	989.61	716.53	8.27112	1620	1848.02	1367.12	8.96226	3000	3649.05	2758.55	9.76466
540	563.98	403.68	7.67654	930	1001.29	760.94	8.28376	1640	1873.33	1386.54	8.97787	3050	3715.57	2810.25	9.78661
550	574.69	411.42	7.69625	940	1013.03	733.99	8.29629	1660	1898.75	1406.00	8.99325	3100	3782.18	2861.98	9.80828
560	585.47	419.24	7.71564	950	1024.74	742.77	8.30871	1680	1924.13	1425.46	9.00853	3150	3848.70	2913.67	9.82956
570	596.25	427.03	7.73470	960	1036.52	751.55	8.32103	1700	1949.63	1444.98	9.02360	3200	3915.28	2965.41	9.85055
580	607.03	434.88	7.75348	970	1048.27	760.37	8.33320	1720	1975.12	1464.58	9.03852	3250	3981.94	3017.24	9.87126

Fuente: La tabla A.17.4 SI se adaptó de Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 937 - 938, tabla A.6.

La masa molar del monóxido de carbono (CO) es 28.01 kg/kmol.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía.

Tabla A.17.5 SI Propiedades del gas ideal del vapor de Agua, H_2O.

T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)
0	**0**	**0**	**0**	590	1112.35	840.08	11.78573	980	1946.21	1493.92	12.86522	1740	3860.67	3057.62	14.29858
220	404.94	303.41	9.91263	600	1132.50	855.56	11.81904	990	1969.03	1512.07	12.88837	1760	3915.35	3103.08	14.32978
230	423.42	317.24	9.99467	610	1152.65	871.11	11.85284	1000	1991.78	1530.28	12.91130	1780	3970.19	3148.65	14.36070
240	441.91	331.11	10.07333	620	1172.91	886.76	11.88576	1020	2037.69	1566.92	12.95670	4800	4025.15	3194.39	14.39145
250	460.39	344.99	10.14882	630	1193.17	902.41	11.91823	1040	2083.93	1603.94	13.00155	1820	4080.32	3240.36	14.42193
260	478.88	358.92	10.22143	640	1213.54	918.18	11.95032	1060	2130.45	1641.24	13.04580	1840	4135.89	3286.54	14.45223
270	497.42	372.80	10.29137	650	1233.97	934.00	11.98201	1080	2177.24	1678.77	13.08943	1860	4191.29	3332.89	14.48226
280	516.01	386.79	10.35892	660	1254.51	949.93	12.01327	1100	2224.31	1716.63	13.13261	1880	4247.07	3379.41	14.51213
290	534.61	400.72	10.42415	670	1275.05	965.81	12.04419	1120	2271.61	1754.70	13.17524	1900	4302.91	3426.03	14.54172
298	549.76	412.16	10.47571	680	1295.70	981.85	12.07477	1140	2319.18	1793.01	13.21732	1920	4358.98	3472.88	14.57102
300	553.21	414.77	10.48726	690	1316.35	997.95	12.10497	1160	2367.03	1831.64	13.25890	1940	4415.21	3519.90	14.60017
310	571.86	428.81	10.54843	700	1337.11	1014.04	12.13489	1180	2415.15	1870.55	13.30003	1960	4471.55	3566.97	14.62903
320	590.56	442.85	10.60772	710	1357.98	1030.31	12.16442	1200	2463.50	1909.69	13.34072	1980	4528.06	3614.27	14.65773
330	609.27	456.95	10.66533	720	1378.85	1046.57	12.19362	1220	2512.13	1949.04	13.38090	2000	2919.40	3661.67	14.68615
340	628.03	471.11	10.72129	730	1399.83	1062.89	12.22254	1240	2561.03	1988.73	13.42065	2050	4726.95	3780.79	14.75648
350	646.79	485.26	10.77574	740	1420.87	1079.32	12.25129	1260	2610.16	2028.64	13.46001	2100	4870.11	3900.92	14.82548
360	665.67	499.47	10.82881	750	1441.97	1095.81	12.27949	1280	2659.56	2068.83	13.49892	2150	5014.15	4021.87	14.89320
370	684.49	513.74	10.88049	760	1463.11	1112.35	12.30752	1300	2709.24	2109.35	13.53744	2200	5159.03	4161.48	14.95976
380	703.41	528.06	10.93089	770	1484.37	1129.00	12.33533	1320	2759.20	2149.99	13.57558	2250	5304.58	4266.17	15.02520
390	722.40	542.38	10.98013	780	1505.69	1145.66	12.36286	1340	2809.44	2191.51	13.61327	2300	5450.96	4389.45	15.08959
400	741.38	556.76	11.02820	790	1527.06	1162.42	12.39006	1360	2859.89	2232.20	13.65057	2350	5597.89	4513.35	15.15282
410	760.42	571.19	11.07527	800	1548.49	1179.30	12.41704	1380	2910.57	2273.66	13.68759	2400	5745.66	4637.97	15.21499
420	779.52	585.68	11.12129	810	1570.02	1196.17	12.44374	1400	2961.48	2315.35	13.72417	2450	5894.14	4763.31	15.27621
430	798.67	600.22	11.16625	820	1591.56	1213.16	12.47022	1420	3012.66	2357.26	13.76048	2500	6043.19	4889.37	15.33644
440	817.87	614.77	11.21038	830	1613.21	1230.20	12.49642	1440	3064.00	2399.44	13.79645	2550	6192.89	5016.04	15.39573
450	837.08	629.42	11.25362	840	1635.53	1247.29	12.52245	1460	3115.63	2441.80	13.83208	2600	6343.21	5143.27	15.45418
460	856.40	644.07	11.29598	850	1656.73	1264.45	12.54827	1480	3167.47	2484.37	13.86733	2650	6494.09	5271.05	15.51157
470	875.77	658.84	11.33761	860	1678.60	1281.71	12.57380	1500	3219.48	2527.23	13.90230	2700	6645.41	5399.33	15.56825
480	895.14	673.61	11.37841	870	1700.53	1299.03	12.59911	1520	3271.83	2570.52	13.93694	2750	6801.17	5528.06	15.62387
490	914.63	688.48	11.41854	880	1722.56	1316.40	12.62426	1540	3324.34	2613.60	13.97130	2800	6949.65	5657.34	15.67877
500	934.11	703.36	11.45784	890	1744.60	1333.83	12.64918	1560	3377.07	2657.12	14.00527	2850	7102.53	5787.18	15.73294
510	953.71	718.29	11.49664	900	1766.75	1351.37	12.67394	1580	3430.03	2700.80	14.03897	2900	7256.01	5917.57	15.78629
520	973.30	733.33	11.50147	910	1788.95	1368.97	12.69847	1600	3483.10	2744.66	14.07233	2950	7409.71	6048.24	15.83891
530	993.01	748.38	11.57230	920	1811.21	1386.62	12.72284	1620	3536.44	2788.79	14.10552	3000	7563.92	6179.35	15.89081
540	1012.77	763.53	11.60916	930	1835.25	1404.39	12.74699	1640	3590.06	2833.14	14.13838	3050	7718.62	6310.96	15.94194
550	1032.53	778.68	11.64557	940	1856.01	1422.20	12.77102	1660	3643.80	2877.66	14.17097	3100	7873.77	6443.08	15.99234
560	1052.40	793.95	11.68138	950	1878.49	1440.08	12.79484	1680	3697.70	2922.34	14.20333	3150	8029.31	6575.52	16.04213
570	1072.33	809.27	11.71663	960	1902.75	1457.95	12.81843	1700	3751.82	2967.25	14.23536	3200	8185.23	6708.35	16.09126
580	1092.31	824.65	11.75143	970	1923.56	1475.88	12.84191	1720	3806.11	3012.32	14.26711	3250	8341.49	6841.52	16.13966

Fuente: La tabla A.17.5 SI se adaptó de Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 941 - 942, tabla A.10.

La masa molar del agua (H_2O) es 18.015 kg/kmol.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía.

Tabla A.17.6 SI Propiedades del gas ideal del Hidrógeno, H_2.

T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)	T (K)	h (kJ/kg)	u (kJ/kg)	s (kJ/kg.K)
0	**0**	**0**	**0**	1440	21234.13	15295.14	88.00099
260	3655.75	2583.83	62.81548	1480	21870.54	15766.87	88.43800
270	3798.12	2684.52	63.35268	1520	22511.90	16243.06	88.86558
280	3940.97	2786.21	63.87153	1560	23156.25	16722.72	89.28323
290	4083.83	2887.90	64.37252	1600	23804.56	17205.85	89.69246
298	4200.40	2970.73	64.76885	1640	24455.85	17692.46	90.09524
300	4227.18	2989.58	64.85813	1680	25110.12	18181.55	90.49008
320	4513.89	3194.44	65.78423	1720	25767.36	18673.61	90.87698
340	4801.59	3399.31	66.65575	1760	26428.08	19169.15	91.25645
360	5090.28	3605.16	67.47966	1800	27092.26	19668.65	91.62897
380	5378.47	3811.51	68.25992	1840	27758.93	20170.14	91.99554
400	5667.66	4017.86	69.00099	1880	28428.08	20674.60	92.35615
420	5957.34	4225.20	69.70685	1920	29101.19	21183.04	92.71032
440	6247.02	4432.54	70.38095	1960	29777.28	21693.95	93.05903
460	6537.20	4640.38	71.02530	2000	30456.35	22207.84	93.40129
480	6827.38	4847.72	71.64286	2050	31309.03	22854.17	93.82341
500	7118.06	5056.05	72.23611	2100	32166.17	23504.96	94.23562
520	7408.23	5263.39	72.80506	2150	33027.78	24160.71	94.64087
560	7989.58	5680.06	73.88145	2200	33892.86	24819.94	95.03869
600	8571.43	6096.73	74.88492	2250	34761.90	25482.64	95.42907
640	9153.27	6514.38	75.82490	2300	35634.42	26148.81	95.81300
680	9737.10	6932.54	76.70883	2350	36511.90	26819.94	96.19097
720	10320.93	7351.69	77.54365	2400	37392.36	27494.54	96.56200
760	10906.75	7772.32	78.33482	2450	38277.78	28173.61	96.92609
800	11493.55	8194.44	79.08730	2500	39166.67	28856.65	97.28423
840	12082.84	8618.55	79.80704	2550	40057.04	29540.67	97.63740
880	12674.11	9045.14	80.49454	2600	40951.39	30228.67	97.98562
920	13267.36	9473.21	81.15427	2650	41849.21	30920.14	98.32788
960	13863.10	9903.77	81.78770	2700	42750.99	31615.58	98.31696
1000	14461.31	10336.81	82.39782	2750	43654.76	32313.49	98.99554
1040	15061.51	10772.32	82.98611	2800	44562.50	33014.88	99.32242
1080	15664.68	11210.81	83.55605	2850	45471.73	33718.25	99.64534
1120	16270.83	11651.79	84.10714	2900	46384.92	34425.10	99.96379
1160	16878.97	12095.24	84.64087	2950	47300.60	35134.42	100.27629
1200	17491.07	12541.67	85.15972	3000	48219.74	35847.22	100.58433
1240	18106.15	12992.06	85.66369	3050	49139.38	36561.01	100.88839
1280	18724.70	13445.44	86.15427	3100	50062.50	37277.78	101.18800
1320	19346.23	13902.28	86.63294	3150	50988.59	37998.02	101.48413
1360	19971.73	14362.60	87.09970	3200	51918.15	38720.73	101.77629
1400	20600.20	14825.89	87.55456	3250	52849.70	39445.93	102.06597

Fuente: La tabla A.17.6 SI se adaptó de Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 943, tabla A.11.

La masa molar del hidrógeno (H_2) es 2.016 kg/kmol.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía.

	Tabla A.17.7 SI Propiedades del gas ideal del Oxígeno monoatómico (O). M = 16.00 kg/kmol.			Tabla A.17.8 SI Propiedades del gas ideal del Hidroxilo (OH). M = 17.01 kg/kmol.		
T (K)	h (kJ/kmol)	u (kJ/kmol)	s (kJ/kmol.K)	h (kJ/kmol)	u (kJ/kmol)	s (kJ/kmol.K)
0	**0**	**0**	**0**	**0**	**0**	**0**
298	428.26	273.32	10.05931	540.15	394.42	10.79330
300	430.76	274.88	10.06775	543.45	396.77	10.80417
500	699.83	440.01	10.75584	892.48	648.09	11.69636
1000	1357.10	837.40	11.66774	1770.90	1282.13	12.91146
1500	2009.44	1229.98	12.19682	2707.00	1973.84	13.66878
1600	2139.69	1308.23	12.28088	2901.70	2119.64	13.79436
1700	2269.88	1386.48	12.35982	3098.53	2267.55	13.91370
1800	2400.08	1464.67	12.43420	3297.41	2417.58	14.02740
1900	2530.20	1542.86	12.50458	3498.24	2569.55	14.13598
2000	2660.33	1620.99	12.57133	3700.88	2723.28	14.23992
2050	2725.40	1660.05	12.60346	3802.88	2800.82	14.29024
2100	2790.46	1699.18	12.63483	3905.23	2878.78	14.33962
2150	2855.53	1738.24	12.66546	4008.05	2957.14	14.38801
2200	2920.59	1777.31	12.69533	4111.23	3035.92	14.43545
2250	2985.66	1816.43	12.72465	4214.81	3115.05	14.48195
2300	3050.78	1855.56	12.75321	4318.75	3194.53	14.52769
2350	3115.85	1894.68	12.78121	4423.05	3274.37	14.57255
2400	3180.97	1933.81	12.80859	4527.63	3354.56	14.61658
2450	3246.10	1972.94	12.83553	4632.63	3435.10	14.65985
2500	3311.29	2012.13	12.86184	4737.92	3515.93	14.70241
2550	3376.42	2051.31	12.88765	4843.50	3597.06	14.74421
2600	3441.61	2090.50	12.91297	4949.38	3678.54	14.78536
2650	3506.86	2129.75	12.93784	5055.56	3760.26	14.82581
2700	3572.11	2169.01	12.96222	5162.02	3842.33	14.86561
2750	3637.36	2208.32	12.98616	5268.78	3924.57	14.90476
2800	3702.68	2247.63	13.00966	5375.78	4007.17	14.94333
2850	3767.99	2286.95	13.03278	5483.01	4089.95	14.98131
2900	3833.37	2326.32	13.05553	5590.53	4173.02	15.01869
2950	3898.75	2365.76	13.07791	5698.24	4256.32	15.05550
3000	3964.19	2405.20	13.09991	5806.17	4339.80	15.09183
3100	4095.13	2484.20	13.14285	6022.75	4507.52	15.16279
3200	4226.32	2563.39	13.18447	6240.15	4676.01	15.23180
3300	4357.64	2642.77	13.22491	6458.26	4845.27	15.29894
3400	4489.14	2722.34	13.26416	6677.13	5015.23	15.36432
3500	4620.89	2802.09	13.30235	6896.65	5185.89	15.42792

Fuente: La tablas A.17.7 SI y A.17.8 SI se adaptaron de Kenneth Wark y Donalds Richards. *Termodinámica*, 6a. ed. (Nueva York: Mc Graw Hill, 2001), p. 944, tabla A.11.

La línea en negritas corresponde al estado de referencia para la entalpía y la entropía.

Tabla A.18 SI Propiedades del Aire como gas ideal (Van Wylen).
Entropía estándar en unidades SI a la presión de 0.1 MPa.

T, K	u, kJ/kg	h, kJ/kg	s^o, kJ/kg.K	Pr	Vr	T, K	u, kJ/kg	h, kJ/kg	s^o, kJ/kg.K	Pr	Vr
200	142.768	200.174	6.46260	0.27027	493.466	1150	881.211	1219.298	8.29616	160.7245	4.77141
220	157.071	220.218	6.55812	0.37700	389.150	1160	898.012	1230.969	8.30626	166.4834	4.64642
240	171.379	240.267	6.64353	0.51088	313.274	1180	915.660	2154.357	8.32625	178.4908	4.40857
260	185.695	260.323	6.72562	0.67573	256.584	1200	933.367	1277.805	8.34596	191.1736	4.18586
280	200.022	280.390	6.79998	0.87556	213.257	1250	977.888	1336.677	8.39402	226.0192	3.68804
290	207.191	290.430	6.83521	0.98990	195.361	1300	1022.751	1395.892	8.44046	265.7145	3.26257
298.15	213.036	298.615	6.86305	1.09071	182.288	1350	1067.936	1455.429	8.48539	310.7426	2.89711
300	214.364	300.473	6.86926	1.11458	179.491	1400	1113.426	1515.270	8.52891	361.6192	2.58171
320	228.726	320.576	6.93413	1.39722	152.728	1450	1159.202	1575.398	8.57111	418.8942	2.30831
340	243.113	340.704	6.99515	1.72814	131.200	1500	1205.253	1635.800	8.61208	183.1554	2.07031
360	257.532	360.863	7.05276	2.11226	113.654	1550	1251.547	1696.446	8.65185	554.9577	1.86253
380	271.988	381.060	7.10735	2.55479	99.1882	1600	1298.079	1757.329	8.69051	634.9670	1.68035
400	286.487	401.299	7.15926	3.06119	87.1367	1650	1344.834	1818.436	8.72811	723.8560	1.52007
420	301.035	421.589	7.20875	3.63727	77.0025	1700	1391.801	1879.755	8.76472	822.3300	1.37858
440	315.640	441.934	7.25607	4.28916	68.4088	1750	1438.970	1941.275	8.80039	931.1376	1.25330
460	330.306	462.340	7.30142	5.02333	61.0658	1800	1486.331	2002.987	8.83516	1051.051	1.14204
480	345.039	482.814	7.34499	5.84663	54.7479	1850	1533.873	2064.882	8.86908	1182.888	1.04294
500	359.844	503.360	7.38692	6.76629	49.2777	1900	1581.591	2126.951	8.90219	1327.498	0.95445
520	374.726	523.982	7.42736	7.78997	44.5143	1950	1629.474	2189.186	8.93452	1485.772	0.87521
540	389.689	544.686	7.46642	8.92569	40.3444	2000	1677.518	2251.581	8.96611	1658.635	0.80410
560	404.736	565.474	7.50422	10.18197	36.6765	2050	1725.714	2314.128	8.99699	1847.077	0.74012
580	419.871	586.350	7.54084	11.56771	33.4358	2100	1774.057	2376.823	9.02721	2052.109	0.68242
600	435.097	607.316	7.57638	13.09232	30.5609	2150	1822.541	2439.659	9.05678	2274.789	0.63027
620	450.415	628.375	7.61090	14.76564	28.0008	2200	1871.161	2502.630	9.08573	2516.217	0.58305
640	465.828	649.528	7.64448	16.59801	25.7132	2250	1919.912	2565.733	9.11409	2777.537	0.54020
660	481.335	670.776	7.67717	18.60025	23.6623	2300	1968.790	2628.962	9.14189	3059.939	0.50124
680	496.939	692.120	7.70903	20.78367	21.8182	2350	2017.789	2692.313	9.16913	3364.658	0.46576
700	512.639	713.561	7.74010	23.16010	20.1553	2400	2066.907	2755.782	9.19586	3692.974	0.43338
720	528.435	735.098	7.77044	25.74188	18.6519	2450	2116.138	2819.366	9.22208	4046.215	0.40378
740	544.328	756.731	7.80008	28.54188	17.2894	2500	2165.480	2883.059	9.24781	4425.759	0.37669
760	560.316	778.460	7.82905	31.57347	16.0518	2550	2214.929	2946.859	9.27308	4833.031	0.35185
780	576.400	800.284	7.85740	34.85061	14.9250	2600	2264.481	3010.763	9.29790	5269.505	0.32903
800	592.577	822.202	7.88514	38.38777	13.8972	2650	2314.133	3074.767	9.32228	5736.707	0.30805
850	633.422	877.397	7.95207	48.46828	11.6948	2700	2363.883	3138.868	9.34625	6236.215	0.28872
900	674.824	933.152	8.01581	60.51977	9.91692	2750	2413.727	3203.064	9.36980	6769.657	0.27089
950	716.756	989.436	8.07667	74.81519	8.46770	2800	2463.663	3267.351	9.39297	7338.715	0.25443
1000	759.189	1046.221	8.13493	91.65077	7.27604	2850	2513.687	3331.726	9.41576	7945.124	0.23921
1050	802.095	1103.478	8.19081	111.3467	6.28845	2900	2563.797	3396.188	9.43818	8590.676	0.22511
1100	845.445	1161.180	8.24449	134.2478	5.46408	2950	2613.990	3460.733	9.46025	9277.216	0.21205
1120	862.903	1184.379	8.26539	144.3878	5.17272	3000	2664.265	3525.359	9.48198	10006.645	0.19992
1140	880.426	1207.642	8.28598	155.1245	4.90068						

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 799 - 800, tabla A.12SI.

Tabla A.19 SI Propiedades de diversas sustancias como gases ideales.
Entropía estándar en unidades SI a la presión de 0.1 MPa (1 bar)

	Nitrógeno diatómico (N_2) $h^0_{f,298}$ = 0 kJ/kmol M = 28.013 kg/kmol.		Nitrógeno monoatómico (N) $h^0_{f,298}$ = 472680 kJ/kmol M = 14.007 kg/kmol.		Oxígeno diatómico (O_2) $h^0_{f,298}$ = 0 kJ/kmol M = 31.999 kg/kmol.		Oxígeno monoatómico (O) $h^0_{f,298}$ = 249170 kJ/kmol M = 16.00 kg/kmol.	
T, K	$h-h^0_{298}$, kJ/kg	s^0, kJ/kg.K	$h-h^0_{298}$, kJ/kg	s^0, kJ/kg.K	$h-h^0_{298}$, kJ/kg	s^0, kJ/kg.K	$h-h^0_{298}$, kJ/kg	s^0, kJ/kg.K
0	**-309.499**	**0**	**-442.431**	**0**	**-271.352**	**0**	**-420.326**	**0**
100	-205.904	5.70492	-294.074	9.32361	-180.537	5.41604	-282.384	8.49695
200	-101.988	6.42505	-145.645	10.35226	-89.628	6.04653	-136.629	9.50986
298	**0**	**6.84000**	**0**	**10.94476**	**0**	**6.41108**	**0**	**10.06650**
300	1.928	6.84643	2.713	10.95397	1.688	6.41673	2.563	10.07494
400	106.058	7.14600	151.142	11.38091	94.597	6.68374	137.942	10.46476
500	211.009	7.38014	299.571	11.71204	190.193	6.89687	271.446	10.76271
600	317.495	7.57423	447.928	11.98262	288.915	7.07678	403.888	11.00409
700	426.124	7.74158	596.357	12.21137	390.606	7.23351	535.642	11.20723
800	537.108	7.88977	744.715	12.40949	494.890	7.37273	666.958	11.38261
900	650.519	8.02331	893.144	12.58433	601.300	7.49808	797.962	11.53692
1000	766.180	8.14518	1041.573	12.74069	709.460	7.61208	928.779	11.67474
1100	883.875	8.25738	1189.931	12.88212	819.151	7.71658	1059.408	11.79931
1200	1003.427	8.36137	1338.359	13.01120	930.060	7.81309	1189.975	11.91287
1300	1124.585	8.45832	1486.788	13.13000	1042.064	7.90268	1320.416	12.01725
1400	1247.135	8.54914	1635.146	13.23995	1154.974	7.98637	1450.795	12.11388
1500	1370.971	8.63460	1783.575	13.34240	1268.790	8.06488	1581.049	12.20376
1600	1495.877	8.71520	1931.933	13.43814	1383.387	8.13882	1711.366	12.28782
1700	1621.747	8.79149	2080.362	13.52810	1498.766	8.20879	1841.558	12.36676
1800	1748.438	8.86388	2228.791	13.61291	1614.863	8.27516	1971.749	12.44120
1900	1875.879	8.93278	2377.148	13.69316	1731.742	8.33835	2101.941	12.51158
2000	2003.962	8.99850	2525.577	13.76934	1849.308	8.39864	2232.132	12.57833
2200	2261.878	9.12141	2822.506	13.91084	2086.628	8.51170	2486.765	12.70240
2400	2521.686	9.23443	3119.578	14.04007	2326.729	8.61614	2752.899	12.81571
2600	2783.101	9.33906	3416.936	14.15908	2569.612	8.71333	3013.594	12.92003
2800	3045.836	9.43640	3714.865	14.26946	2815.088	8.80431	3274.540	13.01678
3000	3309.713	9.52743	4013.651	14.37248	3063.002	8.88984	3535.985	13.10697
3200	3574.555	9.61289	4313.650	14.46929	3313.291	8.97059	3798.056	13.19154
3400	3840.253	9.69343	4615.363	14.56075	3565.768	9.04713	4060.814	13.27116
3600	4106.736	9.76957	4919.217	14.64756	3820.276	9.11994	4324.510	13.34654
3800	4364.259	9.84179	5225.642	14.73045	4076.596	9.18913	4589.143	13.41804
4000	4641.666	9.91047	5535.351	14.80984	4334.667	9.25532	4854.839	13.48623
4400	5178.953	10.03852	6166.120	14.96013	4855.589	9.37945	5389.793	13.61368
4800	5718.345	10.15582	6815.096	15.10127	5382.668	9.49408	5929.748	13.73112
5200	6259.665	10.26416	7485.204	15.23535	5916.185	9.60083	6474.702	13.84012
5600	6802.984	10.36479	8178.229	15.36372	6457.014	9.70102	7024.657	13.94206
6000	7348.303	10.45886	8895.029	15.48730	7006.781	9.79584	7579.237	14.03775

Fuente: La tabla A.19 SI se adaptó de Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 801 - 802, tabla A.13SI.
Las líneas en negritas corresponden al estado de referencia para la entalpía y la entropía.

Tabla A.19 SI Propiedades de diversas sustancias como gases ideales, entropía estándar en unidades SI a la presión de 0.1 MPa (1 bar)

	Dióxido de carbono (CO_2) $h^0_{f,298}$ = -393522 kJ/kmol M = 44.01 kg/kmol.		Monóxido de carbono (CO) $h^0_{f,298}$ = -110527 kJ/kmol M = 28.01 kg/kmol.		Agua (H_2O) $h^0_{f,298}$ = -241826 kJ/kmol M = 18.015 kg/kmol.		Hidroxilo (OH) $h^0_{f,298}$ = 38987 kJ/kmol M = 17.007 kg/kmol.	
T, K	$h-h^0_{298}$, kJ/kg	$s^{0.}$ kJ/kg.K	$h-h^0_{298}$, kJ/kg	$s^{0.}$ kJ/kg.K	$h-h^0_{298}$, kJ/kg	$s^{0.}$ kJ/kg.K	$h-h^0_{298}$, kJ/kg	$s^{0.}$ kJ/kg.K
0	**-212.770**	**0**	**-309.568**	**0**	**-549.764**	**0**	**-539.212**	**0**
100	-146.717	4.06748	-206.069	5.92117	-367.305	8.45884	-360.964	8.79430
200	-77.551	4.54388	-102.106	6.64134	-182.182	9.74122	-174.897	10.08771
298	**0**	**4.85785**	**0**	**7.05644**	**0**	**10.48210**	**0**	**10.80006**
300	1.568	4.86308	1.928	7.06287	3.442	10.49364	3.233	10.81093
400	90.957	5.11961	106.283	7.36308	191.507	11.03453	178.366	11.31487
500	188.707	5.33747	211.782	7.59846	384.235	11.46445	293.416	11.70288
600	293.252	5.52793	319.243	7.79439	582.792	11.82631	525.750	12.01928
700	403.408	5.69761	429.168	7.96383	787.677	12.14205	699.706	12.28741
800	518.200	5.85085	541.735	8.11414	999.278	12.42442	874.838	12.52111
900	636.901	5.99059	656.801	8.24970	1217.707	12.68165	1051.675	12.72934
1000	758.850	6.11904	774.223	8.37301	1443.242	12.91918	1230.747	12.91799
1100	883.549	6.23786	893.645	8.48718	1675.826	13.14083	1412.346	13.09112
1200	1010.520	6.34833	1014.888	8.59261	1915.404	13.34915	1596.649	13.25150
1300	1139.468	6.45151	1137.701	8.69086	2161.588	13.54621	1783.657	13.40123
1400	1270.052	6.54828	1265.048	8.78279	2414.155	13.73333	1973.369	13.54186
1500	1402.068	6.63938	1387.076	8.86919	2672.717	13.91174	2165.667	13.67454
1600	1535.310	6.72538	1513.317	8.95062	2936.830	14.08215	2360.435	13.80018
1700	1669.621	6.80679	1640.414	9.02770	3206.051	14.24541	2557.437	13.91958
1800	1804.863	6.88409	1768.261	9.10079	3480.044	14.40200	2756.614	14.03333
1900	1940.923	6.95767	1896.751	9.17030	3758.313	14.55243	2369.841	14.14203
2000	2077.687	7.02781	2025.812	9.23656	4040.411	14.69714	3160.670	14.24621
2200	2353.147	7.15905	2285.327	9.36030	4615.765	14.97114	3571.487	14.44203
2400	2630.743	7.27980	2546.448	9.47380	5203.497	15.22687	3988.242	14.62334
2600	2910.111	7.39166	2808.961	9.57879	5801.832	15.46628	4410.229	14.79212
2800	3190.979	7.49573	3072.831	9.67669	6409.270	15.69137	4836.449	15.53798
3000	3473.142	7.59305	3338.236	9.76819	7024.591	15.90364	5266.608	15.09847
3200	3756.442	7.68448	3604.498	9.85405	7646.739	16.10436	5700.176	15.23839
3400	4040.809	7.77069	3871.474	9.93499	8274.938	16.29475	6136.861	15.37072
3600	4326.153	7.85222	4139.165	10.01150	8908.354	16.47583	6576.367	15.49630
3800	4612.361	7.92958	4407.497	10.08404	9657.563	16.64829	7018.342	15.61581
4000	4899.432	8.00320	4676.508	10.15305	10188.843	16.81304	7462.669	15.72975
4400	5475.846	8.14056	5216.280	10.28165	11484.430	17.12173	8357.731	15.94303
4800	6055.169	8.26658	5758.122	10.39950	12792.451	17.40622	9260.553	16.13939
5200	6637.401	8.36035	6301.678	10.50946	14111.352	17.68682	10170.606	16.32152
5600	7222.677	8.49150	6846.912	10.60932	15440.522	17.91640	11087.478	16.49136
6000	7811.452	8.59305	7393.966	10.70364	16780.183	18.14743	12011.111	16.65062

Fuente: La tabla A.19 SI se adaptó de Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 803 - 804, tabla A.13SI.
Las líneas en negritas corresponden al estado de referencia para la entalpía y la entropía.

Tabla A.19 SI Propiedades de diversas sustancias como gases ideales, entropía estándar en unidades SI a la presión de 0.1 MPa (1 bar)

	Hidrógeno (H_2) $h^0_{f,298}$ = 0 kJ/kmol M = 2.016 kg/kmol		Hidrógeno monoatómico (H) $h^0_{f,298}$ = 217999 kJ/kmol M = 1.008 kg/kmol		Óxido nítrico (NO) $h^0_{f,298}$ = 90291 kJ/kmol M= 30.006 kg/kmol		Dióxido de nitrógeno (NO_2) $h^0_{f,298}$ = 33100 kJ/kmol M = 46.005	
T, K	$h-h^0_{298}$, kJ/kg	s^0, kJ/kg.K	$h-h^0_{298}$, kJ/kg	s^0, kJ/kg.K	$h-h^0_{298}$, kJ/kg	s^0, kJ/kg.K	$h-h^0_{298}$, kJ/kg	s^0, kJ/kg.K
0	**-4199.901**	**0**	**-6147.817**	**0**	**-306.339**	**0**	**-221.406**	**0**
100	-2711.806	49.96379	-4086.310	91.27877	-202.393	5.89985	-149.133	4.40297
200	-1375.992	59.23115	-2023.810	105.57242	-98.347	6.62358	-75.968	4.90919
298	**0**	**64.82044**	**0**	**113.80556**	**0**	**7.02390**	**0**	**5.21745**
300	26.290	64.90873	37.698	113.93353	1.833	7.03003	1.478	5.22243
400	1468.750	69.05704	3092.262	119.86607	101.313	7.31617	85.358	5.46324
500	2918.155	72.29067	4162.698	124.46726	201.926	7.54059	176.042	5.66509
600	4364.583	74.93948	6224.206	128.22718	304.739	7.72799	272.899	5.84174
700	5818.452	77.18700	8286.706	131.40575	410.185	7.89049	374.951	5.99896
800	7282.242	79.14385	10348.214	134.15972	518.163	8.03466	481.198	6.14079
900	8758.433	80.88294	12410.714	136.58829	628.474	8.16453	590.793	6.26983
1000	10249.504	82.45288	14473.214	138.76091	740.819	8.28288	703.039	6.38806
1100	11757.937	83.88938	16534.722	140.72619	854.929	8.39162	817.415	6.49707
1200	13286.210	85.21726	18597.222	142.52083	970.473	8.49217	933.487	6.59807
1300	14834.821	86.45536	20659.722	144.17063	1087.316	8.58565	1050.972	6.69208
1400	16405.258	87.61756	22721.230	145.69940	1205.226	8.67303	1169.587	6.77999
1500	17996.528	88.71478	24783.730	147.12202	1324.035	8.75502	1289.158	6.86247
1600	19609.623	89.75496	26845.238	148.45238	1443.678	8.83190	1409.512	6.94016
1700	21243.056	90.74454	28907.738	149.70238	1563.987	8.90515	1530.539	7.01352
1800	22896.825	91.68948	30970.238	150.88194	1684.896	8.97427	1652.132	7.08301
1900	24569.444	92.59425	33031.746	151.99603	1806.339	9.03993	1774.203	7.14902
2000	26260.913	93.46181	35094.246	153.05456	1928.248	9.10245	1896.687	7.21184
2200	29694.940	95.09871	39039.683	155.01984	2173.299	9.21922	2142.721	7.32909
2400	33191.964	96.62153	43342.262	156.81448	2419.716	9.32643	2389.862	7.43660
2600	36747.024	98.04514	47467.262	158.46429	2667.267	9.45884	2637.873	7.53586
2800	40354.663	99.38244	51591.270	159.99306	2915.784	9.51760	2886.580	7.62801
3000	44010.417	100.64385	55715.278	161.41567	3165.134	9.60358	3135.830	7.71399
3200	47711.806	101.83829	59839.286	162.74603	3415.217	9.68430	3385.558	7.79457
3400	51456.349	102.97272	63963.294	163.99603	3665.933	9.76028	3635.656	7.87039
3600	55241.567	104.05407	68088.294	165.17560	3917.250	9.83210	3886.080	7.94196
3800	59065.972	105.08730	72212.302	166.28968	4169.133	9.90019	4136.765	8.00972
4000	62928.571	106.06200	76336.310	167.34821	4421.482	9.96491	4387.689	8.07408
4400	70762.897	107.94246	84584.325	169.31349	4927.248	10.08552	4890.080	8.41114
4800	78735.119	109.67708	92833.333	171.10714	5435.380	10.19596	5393.079	8.30320
5200	86833.829	111.29911	101081.349	172.75794	5944.711	10.29787	5896.535	8.40395
5600	95043.155	112.82093	109330.357	174.28671	6455.476	10.39252	6400.361	8.49728
6000	103339.286	114.24702	117577.381	175.70833	6967.606	10.48084	6904.491	8.58423

Fuente: La tabla A.19 SI se adaptó de Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 805 - 806, tabla A.13SI.
Las líneas en negritas corresponden al estado de referencia para la entalpía y la entropía.

Propiedades de la atmósfera a gran altitud.

Altitud, m	Temperatura, ºC	Presión, kPa	Gravedad m/s^2	Velocidad del sonido, m/s	Densidad, kg/m^3	Viscosidad, kg/m.s	Conductividad térmica, W/m.ºC
0	15.00	101.33	9.807	340.3	1.225	1.789	0.0253
200	13.70	98.95	9.806	339.5	1.202	1.783	0.0252
400	12.40	96.61	9.805	338.8	1.179	1.777	0.0252
600	11.10	94.32	9.805	338.0	1.156	1.771	0.0251
800	9.80	92.08	9.804	337.2	1.134	1.764	0.0250
1000	8.50	89.88	9.804	336.4	1.112	1.758	0.0249
1200	7.20	87.72	9.803	335.7	1.090	1.752	0.0248
1400	5.90	85.60	9.802	334.9	1.069	1.745	0.0247
1600	4.60	83.53	9.802	334.1	1.048	1.739	0.0245
1800	3.30	81.49	9.801	333.3	1.027	1.732	0.0244
2000	2.00	79.50	9.800	332.5	1.007	1.726	0.0243
2200	0.70	77.55	9.800	331.7	0.987	1.720	0.0242
2400	-0.59	75.63	9.799	331.0	0.967	1.713	0.0241
2600	-1.89	73.76	9.799	330.2	0.947	1.707	0.0240
2800	-3.19	71.92	9.798	329.4	0.928	1.700	0.0239
3000	-4.49	70.12	9.797	328.6	0.909	1.694	0.0238
3200	-5.79	68.36	9.797	327.8	0.891	1.687	0.0237
3400	-7.09	66.63	9.796	327.0	0.872	1.681	0.0236
3600	-8.39	64.94	9.796	326.2	0.854	1.674	0.0235
3800	-9.69	63.28	9.795	325.4	0.837	1.668	0.0234
4000	-10.98	61.66	9.794	324.6	0.819	1.661	0.0233
4200	-12.3	60.07	9.794	323.8	0.802	1.655	0.0232
4400	-13.6	58.52	9.793	323.0	0.785	1.648	0.0231
4600	-14.9	57.00	9.793	322.2	0.769	1.642	0.0230
4800	-16.2	55.51	9.792	321.4	0.752	1.635	0.0229
5000	-17.5	54.05	9.791	320.5	0.736	1.628	0.0228
5200	-18.8	52.62	9.791	319.7	0.721	1.622	0.0227
5400	-20.1	51.23	9.790	318.9	0.705	1.615	0.0226
5600	-21.4	49.86	9.789	318.1	0.690	1.608	0.0224
5800	-22.7	48.52	9.789	317.3	0.675	1.602	0.0223
6000	-24.0	47.22	9.788	316.5	0.660	1.595	0.0222
6200	-25.3	45.94	9.788	315.6	0.646	1.588	0.0221
6400	-26.6	44.69	9.787	314.8	0.631	1.582	0.0220
6600	-27.9	43.47	9.786	314.0	0.617	1.575	0.0219
6800	-29.2	42.27	9.785	313.1	0.604	1.568	0.0218
7000	-30.5	41.11	9.785	312.3	0.590	1.561	0.0217
8000	-36.9	35.65	9.782	308.1	0.526	1.527	0.0212
9000	-43.4	30.80	9.779	303.8	0.467	1.493	0.0206
10000	-49.9	26.5	9.776	299.5	0.414	1.458	0.0201
12000	-56.5	19.40	9.770	295.1	0.312	1.422	0.0195
14000	-56.5	14.17	9.764	295.1	0.228	1.422	0.0195
16000	-56.5	10.53	9.758	295.1	0.166	1.422	0.0195
18000	-56.5	7.57	9.751	295.1	0.122	1.422	0.0195

Fuente: Yunus Çengel y Michael Boles. *Termodinámica*, 4a. ed. (Mc Graw Hill, México, 2004), p. 764, tabla A.29.

Entalpía de formación, función de formación de Gibbs y entropía absoluta de diversas sustancias a 25ºC, 100 kPa de presión.

Sustancia	Fórmula	M (kg/kmol)	Estado	hf (kJ/kmol)	gf (KJ/kmol)	sf (kJ/kmol.K)
Agua	H_2O	18.015	Gas	-241826	-228582	188.834
Agua	H_2O	18.015	Líquido	-285830	-237141	69.95
Peróxido de hidrógeno	H_2O_2	34.015	Gas	-136106	-105445	232.991
Ozono	O_3	47.998	Gas	142674	163184	238.932
Cabono (grafito)	C	12.011	Sólido	0	0	5.740
Monóxido de carbono	CO	28.011	Gas	-110527	-137163	197.653
Dióxido de carbono	CO_2	44.01	Gas	-393522	-394389	213.795
Metano	CH_4	16.043	Gas	-74873	-50768	186.251
Acetileno	C_2H_2	26.038	Gas	226731	209200	200.958
Eteno	C_2H_4	28.054	Gas	52467	68421	219.33
Etano	C_2H_6	30.07	Gas	-84740	-32885	229.597
Propeno	C_3H_6	42.081	Gas	20430	62825	267.066
Propano	C_3H_8	44.094	Gas	-103900	-23393	269.917
Butano	C_4H_{10}	58.124	Gas	-126200	-15970	306.647
Pentano	C_5H_{12}	72.151	Gas	-146500	-8208	348.945
Benceno	C_6H_6	78.114	Gas	82980	129765	269.562
Hexano	C_6H_{14}	86.178	Gas	-167300	28	387.979
Heptano	C_7H_{16}	100.205	Gas	-187900	8227	427.805
n-Octano	C_8H_{18}	114.232	Gas	-208600	16600	466.514
n-Octano	C_8H_{18}	114.232	Líquido	-250105	6741	360.575
Metanol	CH_3OH	32.042	Gas	-201300	-162551	239.709
Etanol	C_2H_5OH	46.069	Gas	-235000	-168319	282.444
Amoniaco	NH_3	17.031	Gas	-45720	-16128	192.572
Diesel T-T	$C_{14.4}H_{24.9}$	198.06	Líquido	-174000	178919	525.90
Azufre	S	32.06	Sólido	0	0	32.056
Dióxido de azufre	SO_2	64.059	Gas	-296842	-300125	248.212
Trióxido de azufre	SO_3	80.058	Gas	-395765	-371016	256.769
Óxido de nitrógeno	N_2O	44.013	Gas	82050	104179	219.957
Nitrometano	CH_3NO_2	61.04	Líquido	-113100	-14439	171.80

Fuente: Gordon J. Van Wylen, Richard E. Sontag y Claus Borgnakke. *Fundamentos de Termodinámica*, versión español / SI, 2a ed. (Limusa Wiley, México, 2003), p. 814, tabla A.16SI.

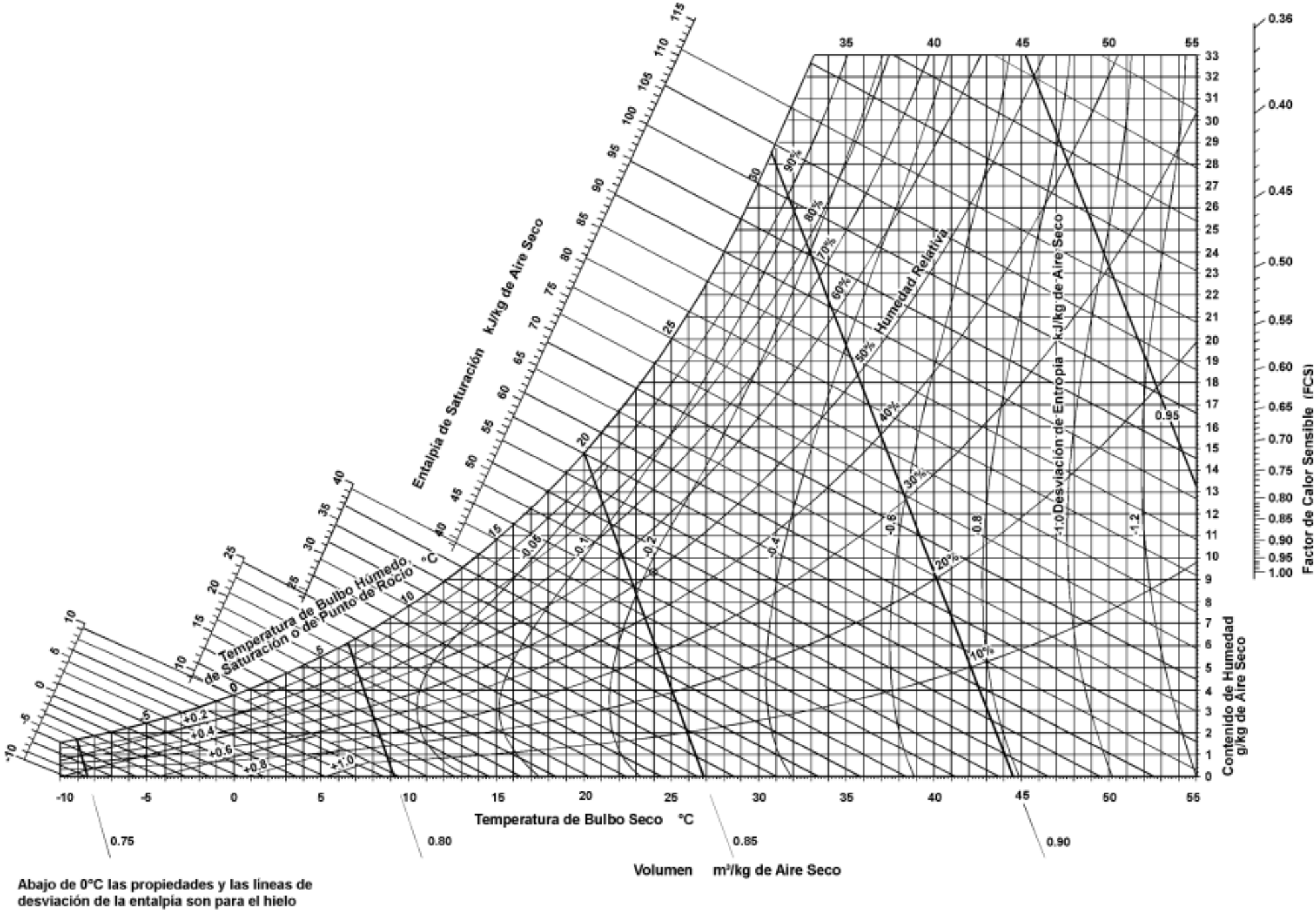

Figura 5. Carta psicrométrica a temperaturas normales y presión barométrica de 101.325 kPa (a nivel del mar).