



Standard Specification for Propane Thermophysical Property Tables¹

This standard is issued under the fixed designation D4362; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 The thermophysical property tables for propane are for use in the calculation of the pressure-volume-temperature (PVT), thermodynamic, and transport properties of propane for process design and operations. Tables are provided for gaseous and liquid propane at temperatures between 90 and 600 K at pressures to 20 MPa. One table provides properties at the conditions of liquid-vapor equilibrium (saturation properties). The other table provides properties at selected T , p points for the equilibrium phase at those conditions. The tables were developed by the National Institute of Standards and Technology from a Standard Reference Database product REFPROP, version 8.0.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

2. Applicability

2.1 These tables apply directly only to pure gaseous propane. However, it is expected that they may find substantial use in mathematical models and tables for the thermophysical properties of mixtures containing propane.

3. Tables

3.1 These thermophysical property tables are:

3.1.1 *Thermophysical Properties of Coexisting Gaseous and Liquid Propane*, in SI units. See [Table 1](#).

¹ This specification is under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D03.08 on Thermophysical Properties.

Current edition approved Dec. 1, 2008. Published January 2009. Originally approved in 1984. Last previous edition approved in 2003 as D4362 – 93 (2003). DOI: 10.1520/D4362-08.

3.1.2 *Thermophysical Properties of Propane Along Isobars*, in SI units. See [Table 2](#).

3.2 The tabulated thermophysical properties are:

ρ , molar density ($\text{mol}\cdot\text{l}^{-1}$)

H , molar enthalpy ($\text{J}\cdot\text{mol}^{-1}$)

S , molar entropy ($\text{J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$)

C_v , constant volume molar heat capacity ($\text{J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$)

C_p , constant pressure molar heat capacity ($\text{J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$)

c , speed of sound ($\text{m}\cdot\text{s}^{-1}$)

η , viscosity ($\mu\text{Pa}\cdot\text{s}$)

λ , thermal conductivity ($\text{mW}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$)

3.3 These tables were produced by equations from a computer package, “NIST Standard Reference Database 23; Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version =8.0” A wide selection of units (SI units, engineering units, chemical units) is available with this program.²

4. Additional Information

4.1 Reference state properties are required to calculate certain of the thermodynamic properties (enthalpy, entropy, etc.) from an equation of state formulation. The reference state properties used to generate the tables in this specification are: enthalpy, H , and entropy, S , at 298.15 K and 0.101325 MPa ($H = 14740.2 \text{ J/mol}$ and $S = 270.203 \text{ J/(mol K)}$). The molar mass of propane is 44.096 g/mol.

5. Keywords

5.1 natural gas; propane gas tables; thermodynamic properties of propane; transport properties of propane

² Available from Standard Reference Data, National Institute of Standards and Technology (NIST), 100 Bureau Drive, Stop 3460, Gaithersburg, MD 20899.

TABLE 1 Thermophysical Properties of Coexisting Gaseous and Liquid Propane

T K	p MPa	ρ mol·l ⁻¹	H J·mol ⁻¹	S J·mol ⁻¹ ·K ⁻¹	C_p J·mol ⁻¹ ·K ⁻¹	C_p J·mol ⁻¹ ·K ⁻¹	c m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
90	9.69E-10	16.520	-21348	87.53	59.51	84.64	2106.1	7395	206.6
90	9.69E-10	1.3E-09	3270.8	361.07	31.24	39.55	146.59	2.744	1.919
92	1.98E-09	16.473	-21178	89.40	59.42	84.73	2092.4	6359	206.0
92	1.98E-09	2.59E-09	3350.2	356.01	31.58	39.90	148.03	2.790	2.017
94	3.91E-09	16.426	-21009	91.22	59.34	84.82	2078.8	5518	205.4
94	3.91E-09	5E-09	3430.4	351.21	31.93	40.25	149.46	2.837	2.115
96	7.49E-09	16.379	-20839	93.00	59.27	84.92	2065.1	4827	204.7
96	7.49E-09	9.39E-09	3511.2	346.65	32.28	40.59	150.88	2.884	2.214
98	1.39E-08	16.333	-20669	94.76	59.21	85.02	2051.5	4254	203.9
98	1.39E-08	1.71E-08	3592.7	342.32	32.62	40.94	152.28	2.932	2.315
100	2.53E-08	16.286	-20499	96.48	59.15	85.12	2037.8	3774	203.2
100	2.53E-08	3.04E-08	3674.9	338.21	32.96	41.28	153.66	2.979	2.417
102	4.46E-08	16.240	-20328	98.16	59.10	85.23	2024.1	3369	202.4
102	4.46E-08	5.26E-08	3757.8	334.30	33.30	41.62	155.03	3.027	2.520
104	7.7E-08	16.193	-20158	99.82	59.06	85.34	2010.4	3024	201.6
104	7.7E-08	8.91E-08	3841.4	330.58	33.634	41.95	156.39	3.075	2.624
106	1.3E-07	16.147	-19987	101.44	59.02	85.45	1996.7	2729	200.8
106	1.3E-07	1.47E-07	3925.6	327.04	33.97	42.28	157.73	3.123	2.730
108	2.14E-07	16.101	-19816	103.04	58.98	85.56	1983.0	2475	200.0
108	2.14E-07	2.39E-07	4010.5	323.66	34.30	42.61	159.06	3.172	2.836
110	3.47E-07	16.055	-19645	104.61	58.96	85.68	1969.4	2255	199.1
110	3.47E-07	3.8E-07	4096.1	320.44	34.62	42.94	160.38	3.220	2.944
112	5.51E-07	16.008	-19473	106.16	58.93	85.80	1955.7	20623	198.2
112	5.51E-07	5.92E-07	4182.3	317.37	34.95	43.26	161.69	3.269	3.053
114	8.6E-07	15.962	-19302	107.68	58.91	85.92	1942.1	1895	197.3
114	8.6E-07	9.08E-07	4269.1	314.44	35.27	43.58	162.98	3.318	3.163
116	1.32E-06	15.916	-19130	109.17	58.89	86.04	1928.5	1747	196.4
116	1.32E-06	1.37E-06	4356.6	311.64	35.58	43.90	164.27	3.368	3.274
118	1.99E-06	15.870	-18957	110.65	58.87	86.17	1914.9	1616	195.4
118	1.99E-06	2.03E-06	4444.7	308.97	35.89	44.21	165.54	3.417	3.386
120	2.96E-06	15.825	-18785	112.09	58.86	86.29	1901.3	1500	194.4
120	2.96E-06	2.97E-06	4533.4	306.42	36.20	44.52	166.80	3.467	3.500
122	4.34E-06	15.779	-18612	113.52	58.85	86.42	1887.8	1397	193.5
122	4.34E-06	4.28E-06	4622.7	303.97	36.51	44.82	168.05	3.516	3.614
124	6.28E-06	15.733	-18439	114.93	58.84	86.55	1874.2	1305	192.5
124	6.28E-06	6.09E-06	4712.7	301.64	36.81	45.13	169.30	3.566	3.730
126	8.97E-06	15.687	-18266	116.31	58.84	86.68	1860.7	1222	191.4
126	8.97E-06	8.56E-06	4803.2	299.40	37.11	45.43	170.53	3.616	3.847
128	1.26E-05	15.641	-18093	117.68	58.84	86.82	1847.2	1147	190.4
128	1.26E-05	1.19E-05	4894.3	297.27	37.41	45.72	171.75	3.666	3.966
130	1.76E-05	15.595	-17919	119.03	58.84	86.96	1833.7	1079	189.4
130	1.76E-05	1.63E-05	4986.0	295.22	37.70	46.02	172.96	3.717	4.085
132	2.43E-05	15.550	-17745	120.36	58.84	87.10	1820.3	1018	188.3
132	2.43E-05	2.21E-05	5078.3	293.26	38.00	46.31	174.17	3.767	4.205
134	3.31E-05	15.504	-17570	121.67	58.84	87.24	1806.8	962.4	187.2
134	3.31E-05	2.97E-05	5171.2	291.38	38.29	46.60	175.36	3.818	4.327
136	4.46E-05	15.458	-17396	122.96	58.85	87.38	1793.4	911.5	186.1
136	4.46E-05	3.95E-05	5264.6	289.58	38.58	46.89	176.54	3.868	4.450

TABLE 1 *Continued*

<i>T</i> K	<i>p</i> MPa	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	<i>C_v</i> J·mol ⁻¹ ·K ⁻¹	<i>C_p</i> J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
138	5.97E-05	15.412	-17221	124.24	58.86	87.53	1780	865.0	185.0
138	5.97E-05	5.2E-05	5358.6	287.86	38.86	47.18	177.72	3.919	4.574
140	7.9E-05	15.366	-17046	125.50	58.88	87.68	1766.6	822.2	183.9
140	7.9E-05	6.79E-05	5453.1	286.20	39.15	47.46	178.88	3.970	4.699
142	0.000104	15.320	-16870	126.74	58.89	87.83	1753.2	782.9	182.8
142	0.000104	8.78E-05	5548.1	284.62	39.43	47.75	180.04	4.021	4.825
144	0.000135	15.275	-16694	127.97	58.91	87.98	1739.8	746.6	181.7
144	0.000135	0.000113	5643.7	283.10	39.71	48.03	181.18	4.072	4.953
146	0.000174	15.229	-16518	129.19	58.93	88.14	1726.4	713.1	180.5
146	0.000174	0.000143	5739.9	281.64	39.99	48.32	182.32	4.123	5.081
148	0.000223	15.183	-16342	130.39	58.95	88.30	1713.0	682.0	179.4
148	0.000223	0.000181	5836.5	280.24	40.27	48.60	183.45	4.174	5.211
150	0.000283	15.137	-16165	131.57	58.98	88.46	1699.7	653.1	178.2
150	0.000283	0.000227	5933.6	278.90	40.55	48.88	184.57	4.226	5.342
152	0.000358	15.091	-15988	132.75	59.01	88.62	1686.3	626.2	177.1
152	0.000358	0.000283	6031.3	277.61	40.83	49.16	185.67	4.277	5.474
154	0.000448	15.044	-15811	133.91	59.04	88.79	1672.9	601.1	175.9
154	0.000448	0.00035	6129.4	276.37	41.11	49.45	186.77	4.329	5.607
156	0.000559	14.998	-15633	135.05	59.08	88.96	1659.6	577.7	174.7
156	0.000559	0.000431	6228.0	275.19	41.39	49.73	187.86	4.380	5.741
158	0.000691	14.952	-15455	136.19	59.12	89.13	1646.2	555.7	173.5
158	0.000691	0.000527	6327.1	274.05	41.67	50.02	188.94	4.432	5.877
160	0.00085	14.906	-15276	137.31	59.16	89.31	1632.9	535.0	172.3
160	0.00085	0.00064	6426.6	272.95	41.95	50.30	190.01	4.483	6.013
162	0.00104	14.859	-15097	138.42	59.20	89.49	1619.5	515.6	171.1
162	0.00104	0.000773	6526.6	271.90	42.23	50.59	191.06	4.535	6.151
164	0.001265	14.813	-14918	139.52	59.26	89.67	1606.1	497.3	169.9
164	0.001265	0.000929	6627.0	270.89	42.51	50.88	192.11	4.586	6.290
166	0.00153	14.766	-14739	140.61	59.31	89.86	1592.7	480.1	168.7
166	0.00153	0.00111	6727.8	269.92	42.80	51.17	193.14	4.638	6.429
168	0.001841	14.719	-14559	141.68	59.37	90.05	1579.4	463.8	167.5
168	0.001841	0.00132	6829.1	268.99	43.08	51.46	194.17	4.690	6.570
170	0.002204	14.673	-14379	142.75	59.43	90.25	1566.0	448.4	166.3
170	0.002204	0.001563	6930.7	268.10	43.37	51.76	195.18	4.742	6.712
172	0.002627	14.626	-14198	143.81	59.50	90.45	1552.6	433.8	165.1
172	0.002627	0.001841	7032.7	267.24	43.65	52.06	196.18	4.793	6.855
174	0.003116	14.579	-14017	144.85	59.57	90.65	1539.2	419.9	163.8
174	0.003116	0.00216	7135.1	266.42	43.94	52.36	197.17	4.845	7.000
176	0.00368	14.532	-13835	145.89	59.65	90.86	1525.9	406.7	162.6
176	0.00368	0.002523	7237.8	265.62	44.23	52.66	198.15	4.897	7.145
178	0.004327	14.485	-13653	146.92	59.73	91.07	1512.5	394.2	161.4
178	0.004327	0.002935	7340.8	264.86	44.53	52.98	199.11	4.948	7.291
180	0.005068	14.437	-13471	147.94	59.81	91.29	1499.1	382.2	160.2
180	0.005068	0.0034	7444.2	264.13	44.82	53.29	200.06	5.000	7.439
182	0.005912	14.390	-13288	148.95	59.90	91.52	1485.7	370.8	158.9
182	0.005912	0.003924	7547.9	263.43	45.12	53.61	200.99	5.052	7.587
184	0.006869	14.342	-13105	149.95	60.00	91.74	1472.3	359.9	157.7
184	0.006869	0.004513	7651.8	262.76	45.43	53.93	201.92	5.103	7.737
186	0.007953	14.295	-12921	150.94	60.10	91.98	1459.0	349.6	156.5

TABLE 1 *Continued*

<i>T</i> K	<i>p</i> MPa	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	<i>C_v</i> J·mol ⁻¹ ·K ⁻¹	<i>C_p</i> J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
186	0.007953	0.005172	7756.0	262.11	45.73	54.26	202.82	5.155	7.887
188	0.009174	14.247	-12737	151.93	60.21	92.22	1445.6	339.6	155.2
188	0.009174	0.005907	7860.5	261.49	46.04	54.60	203.71	5.206	8.039
190	0.010547	14.199	-12552	152.90	60.32	92.46	1432.2	330.1	154.0
190	0.010547	0.006724	7965.2	260.89	46.35	54.94	204.59	5.258	8.192
192	0.012085	14.151	-12367	153.87	60.44	92.71	1418.9	321.0	152.8
192	0.012085	0.00763	8070.1	260.31	46.67	55.28	205.45	5.309	8.345
194	0.013802	14.102	-12181	154.84	60.56	92.97	1405.5	312.2	151.5
194	0.013802	0.008632	8175.2	259.76	46.99	55.64	206.30	5.361	8.500
196	0.015715	14.054	-11995	155.79	60.69	93.23	1392.2	303.8	150.3
196	0.015715	0.009737	8280.5	259.23	47.31	56.00	207.12	5.412	8.656
198	0.017839	14.005	-11808	156.74	60.83	93.50	1378.8	295.8	149.1
198	0.017839	0.010952	8386.0	258.73	47.64	56.36	207.93	5.464	8.813
200	0.020192	13.957	-11620	157.68	60.97	93.78	1365.5	288.0	147.8
200	0.020192	0.012285	8491.6	258.24	47.98	56.74	208.73	5.515	8.971
202	0.022791	13.908	-11432	158.61	61.11	94.06	1352.2	280.5	146.6
202	0.022791	0.013744	8597.4	257.77	48.31	57.12	209.50	5.566	9.130
204	0.025655	13.858	-11244	159.54	61.26	94.35	1338.9	273.3	145.4
204	0.025655	0.015337	8703.3	257.32	48.65	57.50	210.26	5.617	9.290
206	0.028803	13.809	-11055	160.46	61.42	94.65	1325.7	266.4	144.2
206	0.028803	0.017073	8809.2	256.89	49.00	57.90	210.99	5.668	9.451
208	0.032255	13.760	-10865	161.38	61.58	94.96	1312.4	259.7	142.9
208	0.032255	0.018961	8915.3	256.47	49.35	58.30	211.71	5.720	9.614
210	0.036032	13.710	-10674	162.29	61.74	95.27	1299.2	253.3	141.7
210	0.036032	0.021009	9021.4	256.08	49.70	58.71	212.41	5.771	9.777
212	0.040156	13.660	-10483	163.19	61.91	95.59	1285.9	247.1	140.5
212	0.040156	0.023227	9127.6	255.70	50.06	59.13	213.08	5.822	9.942
214	0.044649	13.610	-10292	164.09	62.09	95.92	1272.7	241.1	139.3
214	0.044649	0.025625	9233.8	255.33	50.42	59.56	213.74	5.873	10.11
216	0.049534	13.56	-10099	164.98	62.27	96.25	1259.5	235.3	138.1
216	0.049534	0.028212	9340	254.98	50.79	59.99	214.37	5.924	10.27
218	0.054834	13.509	-9906.3	165.87	62.45	96.60	1246.4	229.7	136.9
218	0.054834	0.030998	9446.2	254.64	51.16	60.43	214.98	5.975	10.440
220	0.060574	13.458	-9712.5	166.75	62.64	96.95	1233.2	224.2	135.7
220	0.060574	0.033994	9552.4	254.32	51.54	60.88	215.57	6.026	10.61
222	0.06678	13.407	-9518.0	167.63	62.84	97.31	1220.1	219.0	134.5
222	0.06678	0.03721	9658.6	254.01	51.91	61.34	216.14	6.077	10.78
224	0.073476	13.356	-9322.7	168.51	63.04	97.68	1206.9	213.9	133.3
224	0.073476	0.040658	9764.7	253.72	52.30	61.80	216.68	6.128	10.95
226	0.080689	13.304	-9126.7	169.37	63.24	98.05	1193.8	209.0	132.1
226	0.080689	0.044349	9870.7	253.43	52.68	62.28	217.20	6.180	11.13
228	0.088447	13.252	-8929.8	170.24	63.45	98.44	1180.7	204.2	131.0
228	0.088447	0.048293	9976.6	253.16	53.08	62.76	217.69	6.231	11.30
230	0.096776	13.200	-8732.2	171.10	63.66	98.83	1167.6	199.6	129.8
230	0.096776	0.052503	10082	252.90	53.47	63.26	218.16	6.282	11.48
232	0.1057	13.148	-8533.8	171.95	63.88	99.24	1154.5	195.1	128.6
232	0.1057	0.056991	10188	252.65	53.87	63.76	218.61	6.333	11.65
234	0.11526	13.095	-8334.5	172.81	64.10	99.65	1141.5	190.7	127.5
234	0.11526	0.06177	10294	252.41	54.27	64.27	219.03	6.385	11.83

TABLE 1 *Continued*

<i>T</i> K	<i>p</i> MPa	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	<i>C_v</i> J·mol ⁻¹ ·K ⁻¹	<i>C_p</i> J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
236	0.12548	13.042	-8134.4	173.66	64.33	100.07	1128.4	186.5	126.3
236	0.12548	0.066851	10399	252.19	54.68	64.79	219.42	6.436	12.01
238	0.13638	12.989	-7933.4	174.50	64.56	100.50	1115.3	182.4	125.2
238	0.13638	0.072248	10504	251.97	55.09	65.32	219.79	6.488	12.19
240	0.148	12.935	-7731.5	175.34	64.79	100.94	1102.3	178.4	124.0
240	0.148	0.077974	10609	251.76	55.50	65.86	220.12	6.540	12.38
242	0.16037	12.881	-7528.7	176.18	65.03	101.39	1089.2	174.5	122.9
242	0.16037	0.084043	10714	251.56	55.92	66.411	220.43	6.592	12.56
244	0.17352	12.827	-7325	177.01	65.27	101.86	1076.2	170.7	121.7
244	0.17352	0.090469	10818	251.37	56.34	66.972	220.72	6.644	12.75
246	0.18748	12.772	-7120.3	177.84	65.52	102.33	1063.1	167.1	120.6
246	0.18748	0.097266	10922	251.19	56.77	67.54	220.97	6.697	12.94
248	0.20228	12.717	-6914.6	178.67	65.77	102.81	1050.1	163.5	119.5
248	0.20228	0.10445	11026	251.01	57.20	68.13	221.20	6.750	13.13
250	0.21796	12.662	-6707.9	179.50	66.03	103.30	1037.1	160.0	118.4
250	0.21796	0.11203	11130	250.85	57.63	68.72	221.39	6.803	13.32
252	0.23455	12.606	-6500.2	180.32	66.29	103.81	1024.0	156.6	117.3
252	0.23455	0.12004	11233	250.69	58.06	69.33	221.56	6.856	13.52
254	0.25209	12.550	-6291.5	181.14	66.56	104.32	1010.9	153.3	116.2
254	0.25209	0.12847	11335	250.54	58.51	69.95	221.69	6.910	13.72
256	0.2706	12.493	-6081.7	181.96	66.82	104.85	997.87	150.1	115.1
256	0.2706	0.13736	11438	250.39	58.95	70.583	221.79	6.964	13.92
258	0.29012	12.436	-5870.9	182.77	67.10	105.39	984.80	147.0	114.0
258	0.29012	0.14671	11540	250.25	59.40	71.23	221.86	7.018	14.12
260	0.31068	12.379	-5658.9	183.58	67.38	105.94	971.73	143.9	112.9
260	0.31068	0.15655	11641	250.12	59.85	71.89	221.90	7.073	14.32
262	0.33233	12.32	-5445.8	184.39	67.66	106.51	958.64	141.0	111.8
262	0.33233	0.1669	11742	249.99	60.31	72.57	221.90	7.128	14.53
264	0.35509	12.262	-5231.5	185.20	67.94	107.09	945.54	138.0	110.8
264	0.35509	0.17776	11842	249.87	60.77	73.26	221.88	7.184	14.74
266	0.37901	12.203	-5016	186.00	68.24	107.69	932.43	135.2	109.7
266	0.37901	0.18917	11942	249.76	61.24	73.98	221.81	7.240	14.95
268	0.40411	12.143	-4799.4	186.81	68.53	108.30	919.32	132.4	108.6
268	0.40411	0.20115	12042	249.65	61.71	74.70	221.71	7.298	15.17
270	0.43043	12.083	-4581.5	187.61	68.83	108.92	906.18	129.7	107.6
270	0.43043	0.21371	12140	249.54	62.18	75.45	221.58	7.355	15.39
272	0.45801	12.023	-4362.3	188.41	69.13	109.56	893.04	127.1	106.6
272	0.45801	0.22687	12238	249.44	62.66	76.22	221.41	7.414	15.61
274	0.48689	11.961	-4141.8	189.21	69.44	110.22	879.88	124.5	105.5
274	0.48689	0.24067	12336	249.35	63.15	77.01	221.20	7.473	15.84
276	0.51711	11.899	-3920	190.01	69.76	110.89	866.70	122.0	104.5
276	0.51711	0.25513	12432	249.25	63.64	77.82	220.96	7.533	16.07
278	0.54869	11.837	-3696.9	190.80	70.07	111.59	853.50	119.5	103.5
278	0.54869	0.27026	12528	249.17	64.14	78.66	220.68	7.593	16.30
280	0.58169	11.774	-3472.3	191.60	70.39	112.30	840.29	117.1	102.5
280	0.58169	0.28611	12623	249.08	64.64	79.52	220.36	7.655	16.54
282	0.61613	11.710	-3246.4	192.39	70.72	113.04	827.06	114.7	101.5
282	0.61613	0.30269	12717	249.00	65.15	80.40	220.00	7.718	16.79

TABLE 1 *Continued*

<i>T</i> K	<i>p</i> MPa	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	<i>C_v</i> J·mol ⁻¹ ·K ⁻¹	<i>C_p</i> J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
284	0.65205	11.645	-3018.9	193.18	71.05	113.79	813.81	112.4	100.5
284	0.65205	0.32003	12810	248.92	65.66	81.32	219.59	7.782	17.04
286	0.68951	11.580	-2790.0	193.98	71.38	114.57	800.53	110.1	99.5
286	0.68951	0.33817	12903	248.85	66.18	82.27	219.15	7.846	17.29
288	0.72852	11.514	-2559.6	194.77	71.72	115.38	787.23	107.8	98.5
288	0.72852	0.35715	12994	248.77	66.71	83.25	218.67	7.913	17.55
290	0.76914	11.447	-2327.5	195.56	72.07	116.21	773.90	105.7	97.6
290	0.76914	0.37698	13084	248.70	67.24	84.27	218.14	7.980	17.81
292	0.8114	11.380	-2093.9	196.35	72.41	117.06	760.55	103.5	96.6
292	0.8114	0.39772	13173	248.63	67.78	85.32	217.57	8.049	18.08
294	0.85535	11.311	-1858.6	197.14	72.77	117.95	747.16	101.4	95.7
294	0.85535	0.41940	13261	248.57	68.33	86.42	216.95	8.119	18.36
296	0.90101	11.242	-1621.6	197.93	73.12	118.87	733.75	99.32	94.7
296	0.90101	0.44206	13348	248.50	68.88	87.56	216.29	8.191	18.65
298	0.94844	11.171	-1382.8	198.72	73.48	119.82	720.30	97.28	93.8
298	0.94844	0.46575	13433	248.44	69.45	88.75	215.58	8.265	18.94
300	0.99768	11.100	-1142.2	199.51	73.85	120.80	706.81	95.28	92.9
300	0.99768	0.49051	13517	248.37	70.02	89.99	214.82	8.340	19.24
302	1.0488	11.027	-899.8	200.30	74.22	121.83	693.28	93.31	91.9
302	1.0488	0.5164	13600	248.31	70.60	91.28	214.02	8.417	19.54
304	1.1017	10.954	-655.4	201.09	74.60	122.90	679.71	91.37	91.0
304	1.1017	0.54347	13681	248.25	71.18	92.64	213.16	8.497	19.86
306	1.1567	10.879	-409.0	201.88	74.98	124.01	666.09	89.46	90.1
306	1.1567	0.57177	13760	248.18	71.78	94.06	212.26	8.578	20.18
308	1.2135	10.803	-160.6	202.67	75.36	125.18	652.42	87.57	89.2
308	1.2135	0.60137	13838	248.12	72.38	95.56	211.30	8.663	20.52
310	1.2724	10.726	90.0	203.46	75.75	126.40	638.70	85.72	88.3
310	1.2724	0.63234	13914	248.06	73.00	97.14	210.28	8.749	20.86
312	1.3334	10.647	342.7	204.26	76.15	127.68	624.91	83.89	87.4
312	1.3334	0.66475	13988	247.99	73.62	98.80	209.21	8.839	21.22
314	1.3965	10.567	597.8	205.05	76.55	129.02	611.07	82.08	86.6
314	1.3965	0.69869	14060	247.93	74.26	100.56	208.09	8.932	21.59
316	1.4617	10.485	855.2	205.85	76.96	130.44	597.16	80.29	85.68
316	1.4617	0.73423	14129	247.86	74.91	102.43	206.91	9.027	21.97
318	1.5292	10.402	1115.1	206.65	77.38	131.93	583.18	78.53	84.8
318	1.5292	0.77149	14197	247.79	75.57	104.41	205.66	9.127	22.37
320	1.5989	10.317	1377.6	207.45	77.80	133.52	569.12	76.78	83.9
320	1.5989	0.81055	14261	247.72	76.24	106.53	204.35	9.230	22.78
322	1.6708	10.230	1642.9	208.26	78.23	135.20	554.97	75.05	83.1
322	1.6708	0.85155	14323	247.64	76.92	108.80	202.98	9.337	23.21
324	1.7452	10.141	1911.0	209.07	78.67	137.00	540.74	73.34	82.2
324	1.7452	0.89461	14382	247.56	77.62	111.24	201.55	9.449	23.66
326	1.8219	10.051	2182.0	209.88	79.12	138.93	526.40	71.64	81.4
326	1.8219	0.93987	14438	247.47	78.32	113.87	200.04	9.566	24.13
328	1.9011	9.9574	2456.3	210.69	79.57	141.00	511.96	69.95	80.5
328	1.9011	0.9875	14491	247.38	79.04	116.71	198.47	9.688	24.616
330	1.9828	9.8617	2733.9	211.51	80.04	143.24	497.40	68.28	79.7
330	1.9828	1.0377	14540	247.29	79.78	119.81	196.82	9.816	25.13
332	2.0671	9.7634	3015.0	212.33	80.52	145.67	482.72	66.61	78.9

TABLE 1 *Continued*

<i>T</i> K	<i>p</i> MPa	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	<i>C_v</i> J·mol ⁻¹ ·K ⁻¹	<i>C_p</i> J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
332	2.0671	1.0906	14585	247.18	80.52	123.20	195.10	9.951	25.67
334	2.154	9.6622	3300.0	213.16	81.00	148.33	467.90	64.95	78.0
334	2.154	1.1466	14626	247.07	81.28	126.93	193.30	10.09	26.25
336	2.2436	9.5578	3589.0	214.00	81.51	151.24	452.93	63.29	77.2
336	2.2436	1.2058	14662	246.95	82.06	131.07	191.43	10.24	26.86
338	2.3359	9.4499	3882.3	214.84	82.02	154.47	437.79	61.64	76.4
338	2.3359	1.2685	14692	246.82	82.86	135.72	189.47	10.40	27.51
340	2.4311	9.3382	4180.5	215.69	82.56	158.07	422.46	59.98	75.6
340	2.4311	1.3353	14717	246.68	83.69	140.98	187.44	10.57	28.20
342	2.5291	9.2222	4483.8	216.55	83.11	162.12	406.93	58.32	74.8
342	2.5291	1.4064	14735	246.52	84.56	147.00	185.31	10.75	28.95
344	2.63	9.1014	4792.8	217.41	83.69	166.73	391.16	56.65	73.9
344	2.63	1.4824	14745	246.35	85.49	153.96	183.1	10.95	29.77
346	2.734	8.9751	5108.0	218.30	84.29	172.03	375.11	54.98	73.1
346	2.734	1.5640	14748	246.16	86.48	162.11	180.78	11.16	30.66
348	2.8411	8.8427	5430.3	219.19	84.93	178.21	358.76	53.28	72.3
348	2.8411	1.6518	14741	245.94	87.54	171.79	178.36	11.38	31.64
350	2.9514	8.703	5760.6	220.10	85.62	185.54	342.06	51.56	71.5
350	2.9514	1.7468	14723	245.71	88.69	183.45	175.83	11.63	32.73
352	3.065	8.555	6100.1	221.03	86.36	194.39	324.94	49.81	70.7
352	3.065	1.8503	14693	245.44	89.94	197.76	173.18	11.90	33.96
354	3.182	8.397	6450.2	221.98	87.17	205.36	307.36	48.02	69.9
354	3.182	1.9637	14648	245.14	91.30	215.70	170.39	12.21	35.37
356	3.3025	8.2269	6813.0	222.96	88.08	219.35	289.24	46.18	69.1
356	3.3025	2.0892	14586	244.80	92.79	238.85	167.47	12.55	37.01
358	3.4266	8.0418	7191.5	223.98	89.13	237.92	270.49	44.27	68.4
358	3.4266	2.2297	14501	244.40	94.42	269.86	164.38	12.93	38.96
360	3.5545	7.8371	7589.7	225.05	90.36	263.88	250.99	42.27	67.7
360	3.5545	2.3896	14389	243.93	96.24	313.56	161.12	13.38	41.36
362	3.6864	7.6062	8014.4	226.17	91.86	303.00	230.58	40.13	67.2
362	3.6864	2.5756	14238	243.37	98.32	379.78	157.65	13.92	44.43
364	3.8224	7.3371	8476.9	227.40	93.80	369.18	209.01	37.80	67.2
364	3.8224	2.7995	14034	242.66	100.77	491.96	153.89	14.59	48.62
366	3.9629	7.0055	9000.9	228.78	96.52	506.34	185.86	35.13	68.2
366	3.9629	3.0857	13741	241.73	103.9	722.87	149.7	15.47	55.0
368	4.1084	6.5428	9653.7	230.50	101.03	960.63	160.18	31.76	72.8
368	4.1084	3.5029	13268	240.32	108.36	1463.7	144.54	16.85	67.8

TABLE 2 Thermophysical Properties of Propane Along Isobars

T K	ρ mol·l ⁻¹	H J·mol ⁻¹	S J·mol ⁻¹ ·K ⁻¹	C_v J·mol ⁻¹ ·K ⁻¹	C_p J·mol ⁻¹ ·K ⁻¹	c m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
Pressure = 0.1 MPa								
90	16.521	-21342	87.5	59.52	84.64	2106.4	7404	206.7
100	16.287	-20494	96.5	59.15	85.12	2038.1	3778	203.2
110	16.055	-19640	104.6	58.96	85.68	1969.7	2257	199.1
120	15.825	-18780	112.1	58.86	86.29	1901.7	1502	194.5
130	15.596	-17914	119.0	58.84	86.95	1834.1	1080	189.4
140	15.367	-17041	125.5	58.88	87.67	1767.0	822.9	184.0
150	15.138	-16160	131.6	58.98	88.45	1700.1	653.7	178.3
160	14.907	-15271	137.3	59.16	89.30	1633.4	535.5	172.4
170	14.674	-14374	142.7	59.44	90.24	1566.5	448.7	166.3
180	14.439	-13466	147.9	59.82	91.28	1499.7	382.5	160.2
190	14.200	-12548	152.9	60.33	92.45	1432.8	330.3	154.0
200	13.958	-11617	157.7	60.97	93.77	1366.1	288.2	147.9
210	13.711	-10672	162.3	61.74	95.26	1299.7	253.4	141.8
220	13.459	-9710.8	166.8	62.65	96.94	1233.5	224.3	135.7
230	13.200	-8732.1	171.1	63.66	98.83	1167.7	199.6	129.8
230.74	13.181	-8659.1	171.4	63.74	98.98	1162.8	197.9	129.4
230.74	0.054127	10121	252.8	53.62	63.44	218.33	6.301	11.54
240	0.051792	10715	255.3	55.06	64.67	222.95	6.559	12.40
250	0.049510	11369	258.0	56.69	66.12	227.74	6.835	13.35
260	0.047439	12037	260.6	58.39	67.67	232.35	7.110	14.32
270	0.045547	12722	263.2	60.15	69.30	236.81	7.384	15.33
280	0.043811	13424	265.8	61.96	71.02	241.13	7.656	16.36
290	0.042210	14143	268.3	63.82	72.79	245.33	7.927	17.42
300	0.040729	14880	270.8	65.72	74.62	249.43	8.196	18.51
320	0.038070	16409	275.7	69.60	78.38	257.34	8.732	20.78
340	0.035750	18015	280.6	73.54	82.24	264.93	9.262	23.16
360	0.033704	19699	285.4	77.51	86.15	272.26	9.787	25.66
380	0.031886	21461	290.2	81.47	90.06	279.35	10.31	28.27
400	0.030257	23301	294.9	85.40	93.94	286.25	10.82	31.00
420	0.028789	25219	299.6	89.26	97.78	292.97	11.33	33.84
440	0.027460	27212	304.2	93.05	101.55	299.52	11.83	36.79
460	0.026249	29280	308.8	96.76	105.23	305.93	12.32	39.87
480	0.025142	31421	313.3	100.37	108.83	312.20	12.81	43.06
500	0.024125	33633	317.9	103.89	112.33	318.35	13.29	46.36
520	0.023188	35914	322.3	107.31	115.74	324.37	13.76	49.78
540	0.022322	38262	326.8	110.63	119.05	330.29	14.23	53.32
560	0.021518	40675	331.1	113.85	122.27	336.10	14.69	56.98
580	0.020771	43152	335.5	116.98	125.39	341.81	15.14	60.75
600	0.020074	45690	339.8	120.02	128.42	347.43	15.58	64.63
Pressure = 1 MPa								
90	16.527	-21295	87.4	59.55	84.63	2109.1	7487	206.9
100	16.294	-20446	96.4	59.19	85.10	2041.1	3816	203.4
110	16.063	-19592	104.5	59.00	85.66	1972.9	2278	199.4
120	15.834	-18733	112.0	58.90	86.27	1905.1	1515	194.8
130	15.605	-17867	118.9	58.88	86.92	1837.8	1089	189.7
140	15.377	-16994	125.4	58.92	87.63	1771.0	829.3	184.3
150	15.148	-16114	131.5	59.02	88.40	1704.4	658.5	178.6
160	14.918	-15226	137.2	59.20	89.25	1637.9	539.4	172.8
170	14.687	-14329	142.6	59.48	90.17	1571.5	452.0	166.8
180	14.452	-13422	147.8	59.86	91.20	1505.0	385.3	160.7
190	14.215	-12505	152.8	60.37	92.35	1438.6	332.8	154.5
200	13.975	-11575	157.6	61.01	93.65	1372.4	290.4	148.4
210	13.730	-10631	162.2	61.79	95.12	1306.5	255.5	142.3
220	13.480	-9671.7	166.6	62.69	96.77	1241.0	226.2	136.3
230	13.223	-8694.9	171.0	63.70	98.62	1175.8	201.4	130.4
240	12.960	-7698.5	175.2	64.83	100.70	1110.8	180.0	124.6
250	12.687	-6680.2	179.4	66.06	103.02	1045.6	161.5	119.0
260	12.404	-5637.2	183.5	67.40	105.63	980.08	145.2	113.5
270	12.108	-4566.5	187.5	68.84	108.58	913.91	130.8	108.1
280	11.795	-3464.2	191.5	70.40	111.97	846.70	117.9	102.9
290	11.461	-2325.1	195.5	72.06	115.96	777.96	106.1	97.82
300	11.100	-1142.2	199.5	73.85	120.80	706.85	95.28	92.86
300.09	11.096	-1131.0	199.5	73.87	120.85	706.18	95.19	92.82
300.09	0.49168	13521	248.4	70.04	90.05	214.79	8.343	19.25
320	0.43868	15293	254.1	72.58	88.57	229.86	8.879	21.49
340	0.39942	17072	259.5	75.72	89.61	242.44	9.414	23.91
360	0.36843	18884	264.7	79.14	91.75	253.46	9.948	26.46
380	0.34296	20746	269.7	82.71	94.46	263.42	10.48	29.13
400	0.32144	22665	274.6	86.35	97.49	272.61	11.00	31.92
420	0.30288	24646	279.4	90.00	100.69	281.21	11.51	34.82

TABLE 2 *Continued*

<i>T</i> K	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	<i>C_v</i> J·mol ⁻¹ ·K ⁻¹	<i>C_p</i> J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
440	0.28664	26693	284.2	93.64	103.98	289.33	12.01	37.83
460	0.27225	28806	288.9	97.23	107.31	297.07	12.51	40.96
480	0.25939	30985	293.5	100.75	110.62	304.48	13.00	44.20
500	0.24780	33231	298.1	104.20	113.90	311.61	13.48	47.56
520	0.23728	35541	302.7	107.57	117.12	318.50	13.95	51.02
540	0.22769	37915	307.1	110.85	120.28	325.17	14.42	54.61
560	0.21889	40352	311.6	114.05	123.37	331.65	14.87	58.30
580	0.21078	42849	315.9	117.15	126.39	337.95	15.32	62.11
600	0.20329	45407	320.3	120.17	129.33	344.10	15.76	66.04
Pressure = 2 MPa								
90	16.535	-21242	87.4	59.59	84.62	2112.1	7580	207.1
100	16.302	-20394	96.3	59.23	85.09	2044.3	3858	203.7
110	16.071	-19540	104.4	59.04	85.64	1976.4	2301	199.7
120	15.843	-18681	111.9	58.94	86.24	1908.9	1529	195.1
130	15.615	-17815	118.8	58.92	86.89	1841.9	1099	190.1
140	15.388	-16943	125.3	58.96	87.59	1775.3	836.4	184.7
150	15.160	-16063	131.4	59.07	88.35	1709.1	664.0	179.1
160	14.931	-15175	137.1	59.25	89.18	1643.0	543.7	173.2
170	14.700	-14279	142.5	59.52	90.10	1576.9	455.6	167.3
180	14.468	-13373	147.7	59.91	91.11	1510.9	388.4	161.2
190	14.232	-12457	152.7	60.42	92.25	1445.0	335.6	155.1
200	13.993	-11528	157.4	61.06	93.52	1379.3	292.9	149.0
210	13.750	-10586	162.0	61.83	94.96	1314.1	257.8	142.9
220	13.502	-9628.0	166.5	62.73	96.58	1249.2	228.4	137.0
230	13.249	-8653.3	170.8	63.74	98.40	1184.7	203.4	131.1
240	12.988	-7659.4	175.1	64.86	100.42	1120.5	182.0	125.4
250	12.719	-6644.1	179.2	66.09	102.67	1056.3	163.4	119.8
260	12.441	-5605.1	183.3	67.43	105.19	991.91	147.1	114.3
270	12.150	-4539.3	187.3	68.86	108.02	927.10	132.6	109.0
280	11.844	-3443.4	191.3	70.41	111.24	861.57	119.7	103.8
290	11.520	-2312.9	195.2	72.05	114.95	794.95	108.0	98.85
300	11.172	-1142.0	199.2	73.80	119.36	726.65	97.33	93.99
320	10.364	1360.7	207.3	77.72	132.12	580.58	77.78	84.52
330.41	9.8417	2791.5	211.7	80.14	143.73	494.39	67.93	79.54
330.41	1.0484	14550	247.3	79.93	120.48	196.47	9.844	25.24
340	0.96090	15649	250.6	79.82	110.30	208.77	9.996	25.91
360	0.83982	17769	256.6	81.67	103.39	228.15	10.41	28.01
380	0.75745	19820	262.2	84.47	102.25	243.31	10.88	30.50
400	0.69513	21872	267.4	87.63	103.15	256.14	11.36	33.20
420	0.64523	23953	272.5	90.96	105.02	267.46	11.85	36.06
440	0.6038	26077	277.4	94.36	107.42	277.72	12.34	39.07
460	0.56852	28251	282.3	97.79	110.11	287.17	12.82	42.20
480	0.53793	30482	287.0	101.20	112.95	295.99	13.30	45.45
500	0.51101	32770	291.7	104.56	115.88	304.31	13.77	48.82
520	0.48707	35117	296.3	107.87	118.83	312.21	14.23	52.31
540	0.46557	37523	300.8	111.10	121.78	319.76	14.69	55.92
560	0.44613	39988	305.3	114.26	124.70	327.00	15.14	59.64
580	0.42842	42511	309.7	117.34	127.57	333.97	15.58	63.48
600	0.41221	45091	314.1	120.34	130.40	340.71	16.01	67.43
Pressure = 3 MPa								
90	16.542	-21189	87.3	59.63	84.61	2115.2	7674.3	207.3
100	16.310	-20341	96.2	59.27	85.07	2047.6	3901.3	204.0
110	16.080	-19487	104.4	59.08	85.62	1980.0	2324.8	199.9
120	15.852	-18628	111.8	58.98	86.21	1912.7	1543.9	195.4
130	15.625	-17763	118.8	58.96	86.85	1845.9	1108.9	190.4
140	15.398	-16891	125.2	59.00	87.55	1779.6	843.6	185.1
150	15.172	-16012	131.3	59.11	88.30	1713.7	669.4	179.5
160	14.944	-15125	137.0	59.30	89.12	1648.0	548.1	173.7
170	14.714	-14229	142.4	59.57	90.02	1582.3	459.2	167.7
180	14.483	-13324	147.6	59.96	91.02	1516.7	391.6	161.7
190	14.249	-12408	152.6	60.47	92.14	1451.3	338.3	155.6
200	14.011	-11481	157.3	61.11	93.40	1386.2	295.4	149.6
210	13.770	-10540	161.9	61.88	94.82	1321.5	260.0	143.6
220	13.524	-9584.0	166.4	62.77	96.40	1257.3	230.5	137.6
230	13.273	-8611.3	170.7	63.78	98.18	1193.5	205.4	131.8
240	13.016	-7619.8	174.9	64.90	100.15	1130.1	183.9	126.1
250	12.751	-6607.5	179.0	66.13	102.35	1066.8	165.2	120.5
260	12.476	-5572.0	183.1	67.46	104.78	1003.4	148.9	115.1
270	12.191	-4510.8	187.1	68.89	107.50	939.86	134.5	109.9
280	11.892	-3420.8	191.1	70.42	110.56	875.86	121.6	104.8
290	11.576	-2298.1	195.0	72.05	114.05	811.12	109.9	99.85

TABLE 2 *Continued*

<i>T</i> K	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	C_v J·mol ⁻¹ ·K ⁻¹	C_p J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
300	11.239	-1137.8	198.9	73.77	118.12	745.23	99.30	95.08
320	10.472	1326.7	206.9	77.56	129.21	607.00	80.13	85.88
340	9.4660	4098.8	215.3	82.18	151.57	448.29	61.96	76.70
350.86	8.6403	5905.7	220.5	85.93	189.14	334.73	50.81	71.13
350.86	1.7903	14712	245.6	89.22	189.24	174.70	11.75	33.24
360	1.5539	16157	249.7	86.48	139.74	193.46	11.54	31.75
380	1.2965	18668	256.5	86.88	117.38	219.46	11.66	32.77
400	1.1464	20952	262.3	89.20	112.14	237.99	11.98	34.96
420	1.0404	23181	267.8	92.07	111.15	253.00	12.38	37.57
440	0.95893	25410	272.9	95.18	111.92	265.88	12.81	40.44
460	0.89307	27664	278.0	98.41	113.58	277.33	13.25	43.49
480	0.83806	29956	282.8	101.68	115.73	287.72	13.70	46.70
500	0.79103	32295	287.6	104.94	118.17	297.32	14.15	50.04
520	0.75010	34684	292.3	108.18	120.76	306.28	14.59	53.52
540	0.71400	37125	296.9	111.36	123.43	314.72	15.03	57.12
560	0.68182	39621	301.4	114.48	126.13	322.72	15.47	60.84
580	0.65286	42171	305.9	117.53	128.84	330.36	15.90	64.69
600	0.62662	44774	310.3	120.50	131.52	337.67	16.32	68.66
Pressure = 5 MPa								
90	16.556	-21084	87.1	59.70	84.59	2121.2	7866	207.8
100	16.325	-20236	96.0	59.34	85.04	2054.1	3988	204.5
110	16.097	-19383	104.2	59.15	85.58	1986.9	2372	200.5
120	15.870	-18524	111.6	59.06	86.16	1920.2	1573	196.0
130	15.645	-17659	118.6	59.05	86.79	1853.9	1129	191.1
140	15.420	-16788	125.0	59.09	87.47	1788.2	858.0	185.8
150	15.194	-15910	131.1	59.20	88.20	1722.9	680.5	180.3
160	14.969	-15024	136.8	59.38	89.00	1657.9	556.9	174.6
170	14.741	-14129	142.2	59.66	89.88	1593.0	466.6	168.7
180	14.512	-13226	147.4	60.05	90.85	1528.3	397.8	162.7
190	14.281	-12312	152.3	60.56	91.94	1463.8	343.8	156.7
200	14.047	-11387	157.1	61.20	93.16	1399.6	300.4	150.7
210	13.809	-10448	161.7	61.97	94.53	1336.0	264.6	144.8
220	13.568	-9495.4	166.1	62.86	96.07	1273.0	234.7	138.9
230	13.322	-8526.3	170.4	63.87	97.78	1210.6	209.4	133.1
240	13.070	-7539.3	174.6	64.98	99.66	1148.6	187.7	127.5
250	12.811	-6532.4	178.7	66.20	101.75	1087.0	169.0	122.0
260	12.544	-5503.6	182.7	67.52	104.04	1025.5	152.5	116.7
270	12.268	-4450.7	186.7	68.94	106.58	964.24	138.0	111.5
280	11.981	-3371.2	190.6	70.45	109.38	902.90	125.2	106.6
290	11.680	-2262.0	194.5	72.05	112.51	841.37	113.6	101.8
300	11.363	-1119.6	198.4	73.74	116.05	779.44	103.1	97.13
320	10.659	1285.5	206.2	77.36	124.96	652.95	84.42	88.36
340	9.8081	3910.4	214.1	81.44	138.83	518.75	67.68	80.04
360	8.6191	6948.1	222.8	86.57	171.15	364.42	50.87	71.56
380	4.7260	12993	239.0	100.84	674.49	157.16	21.94	63.25
400	2.5448	18388	252.9	93.82	163.28	197.41	14.95	42.44
420	2.0849	21297	260.0	94.82	134.39	223.42	14.40	42.22
440	1.8257	23887	266.1	97.07	126.03	242.93	14.40	43.96
460	1.6477	26375	271.6	99.78	123.31	258.94	14.59	46.42
480	1.5134	28834	276.8	102.70	122.94	272.71	14.89	49.28
500	1.4064	31300	281.9	105.73	123.78	284.92	15.21	52.41
520	1.3180	33790	286.7	108.80	125.29	295.99	15.56	55.74
540	1.2430	36314	291.5	111.87	127.19	306.16	15.94	59.24
560	1.1782	38879	296.2	114.90	129.32	315.62	16.32	62.88
580	1.1213	41488	300.7	117.89	131.59	324.50	16.70	66.72
600	1.0708	44143	305.2	120.81	133.93	332.89	17.08	70.69
Pressure = 7.5 MPa								
90	16.574	-20952	86.9	59.79	84.56	2128.7	8111	208.3
100	16.344	-20104	95.8	59.44	85.01	2062.2	4098	205.1
110	16.117	-19251	104.0	59.25	85.53	1995.6	2433	201.2
120	15.892	-18393	111.4	59.16	86.10	1929.4	1611	196.8
130	15.669	-17529	118.3	59.15	86.71	1863.9	1154	192.0
140	15.446	-16659	124.8	59.19	87.37	1798.9	876.2	186.8
150	15.223	-15782	130.8	59.31	88.08	1734.3	694.4	181.3
160	14.999	-14897	136.5	59.50	88.86	1670.1	568.0	175.6
170	14.775	-14004	142.0	59.78	89.71	1606.1	475.8	169.8
180	14.549	-13103	147.1	60.17	90.65	1542.4	405.7	164.0
190	14.321	-12191	152.0	60.68	91.71	1479.0	350.8	158.0
200	14.090	-11268	156.8	61.32	92.89	1416.0	306.6	152.1
210	13.857	-10333	161.3	62.08	94.21	1353.7	270.3	146.2
220	13.620	-9383.2	165.8	62.97	95.68	1292.1	240.0	140.4

TABLE 2 *Continued*

<i>T</i> K	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	<i>C_v</i> J·mol ⁻¹ ·K ⁻¹	<i>C_p</i> J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
230	13.380	-8418.4	170.0	63.97	97.31	1231.1	214.4	134.8
240	13.134	-7436.4	174.2	65.08	99.11	1170.8	192.4	129.2
250	12.883	-6435.6	178.3	66.29	101.08	1111.0	173.5	123.8
260	12.625	-5414.2	182.3	67.61	103.23	1051.7	157.0	118.6
270	12.359	-4370.3	186.3	69.01	105.58	992.83	142.4	113.6
280	12.085	-3301.9	190.1	70.51	108.14	934.27	129.5	108.7
290	11.800	-2206.7	194.0	72.08	110.94	875.98	117.9	104.0
300	11.501	-1082.1	197.8	73.73	114.03	817.88	107.5	99.54
320	10.856	1268.5	205.4	77.24	121.32	701.70	89.24	91.15
340	10.117	3786.1	213.0	81.03	130.97	584.30	73.40	83.45
360	9.2192	6539.5	220.9	85.19	145.61	463.71	58.91	76.25
380	8.0106	9696.4	229.4	90.01	173.73	339.27	44.66	69.14
400	6.1366	13702	239.7	95.53	228.72	232.27	30.02	61.57
420	4.2428	18128	250.5	97.93	196.04	210.53	21.08	53.84
440	3.3283	21599	258.5	99.38	156.99	226.64	18.40	50.96
460	2.8351	24563	265.1	101.48	141.67	244.55	17.50	51.29
480	2.5149	27323	271.0	103.98	135.25	260.68	17.19	53.02
500	2.2834	29998	276.5	106.71	132.70	275.03	17.16	55.46
520	2.1048	32643	281.7	109.57	132.11	287.92	17.27	58.35
540	1.9607	35289	286.7	112.48	132.62	299.65	17.46	61.53
560	1.8408	37953	291.5	115.40	133.78	310.44	17.70	64.91
580	1.7387	40643	296.2	118.31	135.34	320.47	17.98	68.66
600	1.6502	43368	300.8	121.18	137.14	329.87	18.27	72.56
Pressure = 10 MPa								
90	16.592	-20820	86.7	59.89	84.54	2136.1	8364	208.8
100	16.363	-19972	95.6	59.53	84.98	2070.2	4212	205.7
110	16.138	-19120	103.7	59.35	85.49	2004.2	2495	201.9
120	15.914	-18263	111.2	59.26	86.04	1938.6	1649	197.5
130	15.692	-17399	118.1	59.25	86.64	1873.7	1180	192.8
140	15.471	-16530	124.6	59.30	87.28	1809.3	894.7	187.7
150	15.250	-15653	130.6	59.41	87.97	1745.5	708.5	182.3
160	15.029	-14770	136.3	59.60	88.73	1682.1	579.3	176.7
170	14.807	-13879	141.7	59.89	89.55	1619.0	485.1	171.0
180	14.584	-12979	146.9	60.28	90.47	1556.2	413.7	165.2
190	14.359	-12069	151.8	60.79	91.49	1493.8	357.7	159.3
200	14.133	-11148	156.5	61.43	92.63	1432.0	312.8	153.5
210	13.903	-10216	161.0	62.19	93.91	1370.8	276.0	147.7
220	13.671	-9269.8	165.4	63.08	95.33	1310.5	245.3	142.0
230	13.435	-8308.8	169.7	64.08	96.90	1250.9	219.3	136.4
240	13.196	-7331.3	173.9	65.18	98.62	1192.1	197.1	130.9
250	12.951	-6335.9	177.9	66.39	100.49	1134.0	178.0	125.6
260	12.701	-5321.0	181.9	67.69	102.52	1076.5	161.3	120.5
270	12.445	-4284.9	185.8	69.09	104.72	1019.7	146.6	115.5
280	12.181	-3226.0	189.7	70.57	107.10	963.42	133.7	110.7
290	11.909	-2142.3	193.5	72.13	109.66	907.76	122.1	106.2
300	11.626	-1032.0	197.2	73.76	112.43	852.66	111.7	101.8
320	11.025	1277.6	204.7	77.20	118.71	743.99	93.65	93.68
340	10.358	3725.2	212.1	80.85	126.32	637.11	78.30	86.37
360	9.5970	6344.1	219.6	84.71	136.02	532.08	64.77	79.79
380	8.6947	9189.3	227.3	88.80	149.24	430.46	52.44	73.80
400	7.5855	12346	235.4	93.08	167.11	338.98	41.08	68.25
420	6.2772	15856	243.9	97.07	181.40	274.95	31.45	63.17
440	5.0672	19445	252.3	100.06	174.03	251.46	25.21	59.22
460	4.2149	22765	259.7	102.48	158.41	253.39	22.07	57.38
480	3.6476	25818	266.2	104.92	147.82	263.68	20.57	57.48
500	3.2498	28710	272.1	107.51	142.04	275.88	19.83	58.85
520	2.9536	31519	277.6	110.22	139.26	288.07	19.49	61.01
540	2.7222	34292	282.8	113.02	138.25	299.73	19.38	63.68
560	2.5347	37057	287.8	115.85	138.35	310.72	19.40	66.64
580	2.3786	39831	292.7	118.68	139.14	321.06	19.50	70.19
600	2.2457	42625	297.4	121.50	140.37	330.81	19.67	73.95
Pressure = 20 MPa								
90	16.661	-20293	85.9	60.24	84.46	2165.4	9446	211.0
100	16.437	-19446	94.8	59.90	84.86	2101.6	4689	208.2
110	16.217	-18595	102.9	59.72	85.33	2037.7	2753	204.7
120	16.000	-17739	110.3	59.65	85.84	1974.3	1808	200.6
130	15.784	-16878	117.2	59.64	86.38	1911.7	1286	196.1
140	15.570	-16012	123.7	59.70	86.96	1849.8	971.3	191.3
150	15.357	-15139	129.7	59.82	87.58	1788.6	766.6	186.2
160	15.145	-14260	135.3	60.03	88.26	1728.0	625.4	180.9
170	14.932	-13373	140.7	60.32	89.01	1668.0	523.1	175.4

TABLE 2 *Continued*

<i>T</i> K	ρ mol·l ⁻¹	<i>H</i> J·mol ⁻¹	<i>S</i> J·mol ⁻¹ ·K ⁻¹	<i>C_v</i> J·mol ⁻¹ ·K ⁻¹	<i>C_p</i> J·mol ⁻¹ ·K ⁻¹	<i>c</i> m·s ⁻¹	η μPa·s	λ mW·m ⁻¹ ·K ⁻¹
180	14.719	-12479	145.8	60.72	89.83	1608.6	446.0	169.9
190	14.506	-11576	150.7	61.23	90.75	1549.8	385.9	164.3
200	14.291	-10664	155.4	61.87	91.78	1491.8	337.9	158.8
210	14.076	-9740.5	159.9	62.62	92.92	1434.7	298.8	153.3
220	13.859	-8805.1	164.3	63.50	94.18	1378.6	266.2	147.8
230	13.640	-7856.5	168.5	64.49	95.56	1323.5	238.8	142.5
240	13.420	-6893.5	172.6	65.58	97.06	1269.5	215.5	137.3
250	13.197	-5915.0	176.6	66.78	98.67	1216.5	195.5	132.2
260	12.971	-4919.7	180.5	68.06	100.40	1164.6	178.1	127.4
270	12.742	-3906.6	184.3	69.44	102.24	1113.8	162.9	122.7
280	12.510	-2874.6	188.0	70.89	104.17	1064.1	149.5	118.2
290	12.274	-1822.8	191.7	72.42	106.21	1015.5	137.6	113.9
300	12.034	-750.24	195.4	74.00	108.33	968.12	127.1	109.8
320	11.540	1460.7	202.5	77.32	112.82	877.01	109.0	102.4
340	11.025	3764.3	209.5	80.79	117.59	791.11	94.16	95.78
360	10.485	6165.8	216.3	84.36	122.59	710.97	81.64	90.12
380	9.9205	8669.0	223.1	87.98	127.75	637.36	70.94	85.33
400	9.3302	11276	229.8	91.61	132.91	571.29	61.71	81.37
420	8.7187	13984	236.4	95.19	137.82	513.98	53.74	78.17
440	8.0962	16784	242.9	98.67	142.06	466.64	46.97	75.69
460	7.4803	19659	249.3	102.01	145.18	430.00	41.38	73.89
480	6.8923	22583	255.5	105.18	147.00	403.80	36.94	72.75
500	6.3510	25531	261.5	108.22	147.72	386.76	33.53	72.26
520	5.8671	28487	267.3	111.15	147.81	376.98	30.99	72.41
540	5.4426	31443	272.9	114.01	147.73	372.55	29.14	73.12
560	5.0736	34397	278.3	116.82	147.75	371.88	27.82	74.16
580	4.7533	37354	283.5	119.60	148.03	373.75	26.87	76.34
600	4.4745	40320	288.5	122.35	148.59	377.30	26.21	78.98

The symbols are:

T , temperature (K)

ρ , molar density ($\text{mol}\cdot\text{l}^{-1}$)

H , molar enthalpy ($\text{J}\cdot\text{mol}^{-1}$)

S , molar entropy ($\text{J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$)

$C_{v,m}$, constant volume molar heat capacity ($\text{J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$)

$C_{p,m}$, constant pressure molar heat capacity ($\text{J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$)

c , speed of sound ($\text{m}\cdot\text{s}^{-1}$)

η , viscosity ($\mu\text{Pa}\cdot\text{s}$)

λ , thermal conductivity ($\text{mW}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$)

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