



Forane[®] 134a

Thermodynamic Properties (Saturation) - SI

This data was generated using the NIST REFPROP Database

(Lemmon, E.W., Huber, M.L., McLinden, M.O. NIST Standard Reference Database 23: Reference Fluid Thermodynamic and Transport Properties-REFPROP, Version 9.0, National Institute of Standards and Technology, Standard Reference Data Program, Gaithersburg, 2010)



Thermodynamic Properties of R-134a - Saturation

Temperature (°C)	Pressure (kPA)	Volume (m ³ /kg)		Density (kg/m ³)		Enthalpy (kJ/kg)		Entropy (kJ/(kg K))		Temperature (°C)
		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
-100	0.6	0.0006	25.1930	1582.4	0.040	75.36	336.85	0.4354	1.9456	-100
-99	0.6	0.0006	22.7780	1579.7	0.044	76.55	337.44	0.4422	1.9403	-99
-98	0.7	0.0006	20.6240	1577.1	0.048	77.73	338.02	0.4490	1.9351	-98
-97	0.8	0.0006	18.6990	1574.5	0.053	78.92	338.61	0.4558	1.9300	-97
-96	0.8	0.0006	16.9770	1571.8	0.059	80.10	339.19	0.4625	1.9250	-96
-95	0.9	0.0006	15.4350	1569.1	0.065	81.29	339.78	0.4691	1.9201	-95
-94	1.0	0.0006	14.0500	1566.5	0.071	82.47	340.38	0.4758	1.9154	-94
-93	1.1	0.0006	12.8060	1563.8	0.078	83.66	340.97	0.4824	1.9107	-93
-92	1.3	0.0006	11.6870	1561.2	0.086	84.85	341.56	0.4890	1.9061	-92
-91	1.4	0.0006	10.6790	1558.5	0.094	86.04	342.16	0.4955	1.9016	-91
-90	1.5	0.0006	9.7698	1555.8	0.102	87.23	342.76	0.5020	1.8972	-90
-89	1.7	0.0006	8.9485	1553.2	0.112	88.42	343.36	0.5085	1.8929	-89
-88	1.8	0.0006	8.2059	1550.5	0.122	89.61	343.96	0.5149	1.8887	-88
-87	2.0	0.0006	7.5334	1547.8	0.133	90.80	344.56	0.5213	1.8846	-87
-86	2.2	0.0006	6.9239	1545.1	0.144	91.99	345.17	0.5277	1.8805	-86
-85	2.4	0.0006	6.3707	1542.5	0.157	93.18	345.77	0.5341	1.8766	-85
-84	2.6	0.0006	5.8680	1539.8	0.170	94.38	346.38	0.5404	1.8727	-84
-83	2.9	0.0007	5.4107	1537.1	0.185	95.57	346.99	0.5467	1.8689	-83
-82	3.1	0.0007	4.9943	1534.4	0.200	96.77	347.60	0.5530	1.8652	-82
-81	3.4	0.0007	4.6147	1531.7	0.217	97.96	348.21	0.5592	1.8616	-81
-80	3.7	0.0007	4.2682	1529.0	0.234	99.16	348.83	0.5654	1.8580	-80
-79	4.0	0.0007	3.9516	1526.3	0.253	100.36	349.44	0.5716	1.8546	-79
-78	4.3	0.0007	3.6621	1523.6	0.273	101.56	350.06	0.5778	1.8512	-78
-77	4.7	0.0007	3.3970	1520.9	0.294	102.76	350.67	0.5839	1.8478	-77
-76	5.1	0.0007	3.1540	1518.2	0.317	103.96	351.29	0.5900	1.8446	-76
-75	5.5	0.0007	2.9312	1515.5	0.341	105.17	351.91	0.5961	1.8414	-75
-74	5.9	0.0007	2.7265	1512.8	0.367	106.37	352.53	0.6022	1.8382	-74
-73	6.4	0.0007	2.5384	1510.1	0.394	107.58	353.15	0.6082	1.8352	-73
-72	6.9	0.0007	2.3653	1507.3	0.423	108.78	353.77	0.6142	1.8322	-72
-71	7.4	0.0007	2.2059	1504.6	0.453	109.99	354.40	0.6202	1.8293	-71
-70	8.0	0.0007	2.0590	1501.9	0.486	111.20	355.02	0.6262	1.8264	-70
-69	8.6	0.0007	1.9234	1499.1	0.520	112.41	355.65	0.6321	1.8236	-69
-68	9.2	0.0007	1.7982	1496.4	0.556	113.62	356.27	0.6381	1.8209	-68
-67	9.9	0.0007	1.6826	1493.7	0.594	114.83	356.90	0.6440	1.8182	-67
-66	10.6	0.0007	1.5756	1490.9	0.635	116.05	357.53	0.6498	1.8155	-66
-65	11.4	0.0007	1.4765	1488.2	0.677	117.26	358.16	0.6557	1.8130	-65
-64	12.2	0.0007	1.3847	1485.4	0.722	118.48	358.79	0.6615	1.8105	-64
-63	13.0	0.0007	1.2996	1482.6	0.769	119.70	359.42	0.6673	1.8080	-63
-62	13.9	0.0007	1.2206	1479.9	0.819	120.92	360.05	0.6731	1.8056	-62
-61	14.9	0.0007	1.1472	1477.1	0.872	122.14	360.68	0.6789	1.8033	-61
-60	15.9	0.0007	1.0790	1474.3	0.927	123.36	361.31	0.6846	1.8010	-60
-59	17.0	0.0007	1.0156	1471.6	0.985	124.59	361.94	0.6904	1.7987	-59
-58	18.1	0.0007	0.9565	1468.8	1.045	125.81	362.58	0.6961	1.7965	-58
-57	19.3	0.0007	0.9015	1466.0	1.109	127.04	363.21	0.7017	1.7944	-57
-56	20.5	0.0007	0.8502	1463.2	1.176	128.27	363.84	0.7074	1.7922	-56
-55	21.8	0.0007	0.8024	1460.4	1.246	129.50	364.48	0.7131	1.7902	-55
-54	23.2	0.0007	0.7577	1457.6	1.320	130.73	365.11	0.7187	1.7882	-54
-53	24.7	0.0007	0.7159	1454.8	1.397	131.96	365.75	0.7243	1.7862	-53
-52	26.2	0.0007	0.6769	1452.0	1.477	133.20	366.38	0.7299	1.7843	-52
-51	27.8	0.0007	0.6404	1449.1	1.562	134.44	367.02	0.7355	1.7824	-51
-50	29.5	0.0007	0.6062	1446.3	1.650	135.67	367.65	0.7410	1.7806	-50
-49	31.2	0.0007	0.5742	1443.5	1.742	136.91	368.29	0.7466	1.7788	-49
-48	33.1	0.0007	0.5442	1440.6	1.838	138.15	368.92	0.7521	1.7770	-48

Thermodynamic Properties of R-134a - Saturation

Temperature (°C)	Pressure (kPA)	Volume (m ³ /kg)		Density (kg/m ³)		Enthalpy (kJ/kg)		Entropy (kJ/(kg K))		Temperature (°C)
		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
-47	35.0	0.0007	0.5160	1437.8	1.938	139.40	369.56	0.7576	1.7753	-47
-46	37.0	0.0007	0.4896	1434.9	2.043	140.64	370.19	0.7631	1.7736	-46
-45	39.1	0.0007	0.4647	1432.1	2.152	141.89	370.83	0.7685	1.7720	-45
-44	41.3	0.0007	0.4414	1429.2	2.266	143.14	371.46	0.7740	1.7704	-44
-43	43.6	0.0007	0.4195	1426.4	2.384	144.39	372.10	0.7794	1.7688	-43
-42	46.1	0.0007	0.3988	1423.5	2.507	145.64	372.73	0.7848	1.7673	-42
-41	48.6	0.0007	0.3794	1420.6	2.636	146.89	373.37	0.7902	1.7658	-41
-40	51.2	0.0007	0.3611	1417.7	2.770	148.14	374.00	0.7956	1.7643	-40
-39	54.0	0.0007	0.3438	1414.8	2.909	149.40	374.64	0.8010	1.7629	-39
-38	56.8	0.0007	0.3276	1411.9	3.053	150.66	375.27	0.8063	1.7615	-38
-37	59.8	0.0007	0.3122	1409.0	3.203	151.92	375.90	0.8117	1.7602	-37
-36	62.9	0.0007	0.2977	1406.1	3.359	153.18	376.54	0.8170	1.7588	-36
-35	66.1	0.0007	0.2840	1403.1	3.521	154.44	377.17	0.8223	1.7575	-35
-34	69.5	0.0007	0.2711	1400.2	3.689	155.71	377.80	0.8276	1.7563	-34
-33	73.0	0.0007	0.2589	1397.3	3.863	156.98	378.43	0.8329	1.7550	-33
-32	76.7	0.0007	0.2473	1394.3	4.044	158.25	379.06	0.8381	1.7538	-32
-31	80.4	0.0007	0.2363	1391.4	4.232	159.52	379.69	0.8434	1.7526	-31
-30	84.4	0.0007	0.2259	1388.4	4.426	160.79	380.32	0.8486	1.7515	-30
-29	88.5	0.0007	0.2161	1385.4	4.627	162.07	380.95	0.8539	1.7503	-29
-28	92.7	0.0007	0.2068	1382.4	4.836	163.34	381.57	0.8591	1.7492	-28
-27	97.1	0.0007	0.1980	1379.5	5.051	164.62	382.20	0.8643	1.7482	-27
-26	101.7	0.0007	0.1896	1376.5	5.275	165.90	382.82	0.8694	1.7471	-26
-25	106.4	0.0007	0.1816	1373.4	5.506	167.19	383.45	0.8746	1.7461	-25
-24	111.3	0.0007	0.1741	1370.4	5.745	168.47	384.07	0.8798	1.7451	-24
-23	116.4	0.0007	0.1669	1367.4	5.992	169.76	384.69	0.8849	1.7441	-23
-22	121.7	0.0007	0.1601	1364.4	6.248	171.05	385.32	0.8900	1.7432	-22
-21	127.1	0.0007	0.1536	1361.3	6.512	172.34	385.94	0.8951	1.7422	-21
-20	132.7	0.0007	0.1474	1358.3	6.785	173.64	386.55	0.9003	1.7413	-20
-19	138.6	0.0007	0.1415	1355.2	7.066	174.93	387.17	0.9053	1.7404	-19
-18	144.6	0.0007	0.1359	1352.1	7.357	176.23	387.79	0.9104	1.7396	-18
-17	150.8	0.0007	0.1306	1349.0	7.657	177.53	388.40	0.9155	1.7387	-17
-16	157.3	0.0007	0.1255	1345.9	7.967	178.83	389.02	0.9205	1.7379	-16
-15	163.9	0.0007	0.1207	1342.8	8.287	180.14	389.63	0.9256	1.7371	-15
-14	170.8	0.0007	0.1161	1339.7	8.617	181.44	390.24	0.9306	1.7363	-14
-13	177.9	0.0007	0.1117	1336.6	8.957	182.75	390.85	0.9356	1.7355	-13
-12	185.2	0.0007	0.1074	1333.4	9.307	184.07	391.46	0.9407	1.7348	-12
-11	192.8	0.0008	0.1034	1330.3	9.669	185.38	392.06	0.9457	1.7341	-11
-10	200.6	0.0008	0.0996	1327.1	10.041	186.70	392.66	0.9507	1.7334	-10
-9	208.6	0.0008	0.0959	1323.9	10.425	188.02	393.27	0.9556	1.7327	-9
-8	216.9	0.0008	0.0924	1320.8	10.820	189.34	393.87	0.9606	1.7320	-8
-7	225.5	0.0008	0.0891	1317.6	11.227	190.66	394.47	0.9656	1.7313	-7
-6	234.3	0.0008	0.0859	1314.3	11.646	191.99	395.06	0.9705	1.7307	-6
-5	243.3	0.0008	0.0828	1311.1	12.077	193.32	395.66	0.9754	1.7300	-5
-4	252.7	0.0008	0.0799	1307.9	12.521	194.65	396.25	0.9804	1.7294	-4
-3	262.3	0.0008	0.0771	1304.6	12.978	195.98	396.84	0.9853	1.7288	-3
-2	272.2	0.0008	0.0744	1301.4	13.448	197.32	397.43	0.9902	1.7282	-2
-1	282.3	0.0008	0.0718	1298.1	13.931	198.66	398.02	0.9951	1.7276	-1
0	292.8	0.0008	0.0693	1294.8	14.428	200.00	398.60	1.0000	1.7271	0
1	303.6	0.0008	0.0669	1291.5	14.939	201.34	399.19	1.0049	1.7265	1
2	314.6	0.0008	0.0647	1288.1	15.465	202.69	399.77	1.0098	1.7260	2
3	326.0	0.0008	0.0625	1284.8	16.005	204.04	400.34	1.0146	1.7255	3
4	337.7	0.0008	0.0604	1281.4	16.560	205.40	400.92	1.0195	1.7250	4
5	349.7	0.0008	0.0584	1278.1	17.131	206.75	401.49	1.0243	1.7245	5

Thermodynamic Properties of R-134a - Saturation

Temperature (°C)	Pressure (kPA)	Volume (m ³ /kg)		Density (kg/m ³)		Enthalpy (kJ/kg)		Entropy (kJ/(kg K))		Temperature (°C)
		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
6	362.0	0.0008	0.0564	1274.7	17.717	208.11	402.06	1.0292	1.7240	6
7	374.6	0.0008	0.0546	1271.3	18.319	209.47	402.63	1.0340	1.7235	7
8	387.6	0.0008	0.0528	1267.9	18.938	210.84	403.20	1.0388	1.7230	8
9	400.9	0.0008	0.0511	1264.4	19.573	212.21	403.76	1.0437	1.7226	9
10	414.6	0.0008	0.0494	1261.0	20.226	213.58	404.32	1.0485	1.7221	10
11	428.6	0.0008	0.0479	1257.5	20.896	214.95	404.88	1.0533	1.7217	11
12	443.0	0.0008	0.0463	1254.0	21.584	216.33	405.43	1.0581	1.7212	12
13	457.8	0.0008	0.0449	1250.5	22.290	217.71	405.98	1.0629	1.7208	13
14	472.9	0.0008	0.0435	1246.9	23.015	219.09	406.53	1.0677	1.7204	14
15	488.4	0.0008	0.0421	1243.4	23.758	220.48	407.07	1.0724	1.7200	15
16	504.3	0.0008	0.0408	1239.8	24.522	221.87	407.61	1.0772	1.7196	16
17	520.5	0.0008	0.0395	1236.2	25.305	223.26	408.15	1.0820	1.7192	17
18	537.2	0.0008	0.0383	1232.6	26.109	224.66	408.69	1.0867	1.7188	18
19	554.2	0.0008	0.0371	1229.0	26.934	226.06	409.22	1.0915	1.7184	19
20	571.7	0.0008	0.0360	1225.3	27.780	227.47	409.75	1.0962	1.7180	20
21	589.6	0.0008	0.0349	1221.7	28.648	228.88	410.27	1.1010	1.7177	21
22	607.9	0.0008	0.0339	1218.0	29.539	230.29	410.79	1.1057	1.7173	22
23	626.6	0.0008	0.0328	1214.2	30.452	231.70	411.31	1.1105	1.7169	23
24	645.8	0.0008	0.0319	1210.5	31.389	233.12	411.82	1.1152	1.7166	24
25	665.4	0.0008	0.0309	1206.7	32.350	234.55	412.33	1.1199	1.7162	25
26	685.4	0.0008	0.0300	1202.9	33.335	235.97	412.84	1.1246	1.7159	26
27	705.9	0.0008	0.0291	1199.1	34.346	237.40	413.34	1.1294	1.7155	27
28	726.9	0.0008	0.0283	1195.2	35.382	238.84	413.84	1.1341	1.7152	28
29	748.3	0.0008	0.0274	1191.4	36.445	240.28	414.33	1.1388	1.7148	29
30	770.2	0.0008	0.0266	1187.5	37.535	241.72	414.82	1.1435	1.7145	30
31	792.6	0.0008	0.0259	1183.5	38.653	243.17	415.30	1.1482	1.7142	31
32	815.4	0.0008	0.0251	1179.6	39.799	244.62	415.78	1.1529	1.7138	32
33	838.8	0.0009	0.0244	1175.6	40.974	246.08	416.26	1.1576	1.7135	33
34	862.6	0.0009	0.0237	1171.6	42.180	247.54	416.72	1.1623	1.7131	34
35	887.0	0.0009	0.0230	1167.5	43.416	249.01	417.19	1.1670	1.7128	35
36	911.9	0.0009	0.0224	1163.4	44.683	250.48	417.65	1.1717	1.7124	36
37	937.2	0.0009	0.0217	1159.3	45.983	251.95	418.10	1.1764	1.7121	37
38	963.2	0.0009	0.0211	1155.1	47.316	253.43	418.55	1.1811	1.7118	38
39	989.6	0.0009	0.0205	1151.0	48.683	254.92	418.99	1.1858	1.7114	39
40	1016.6	0.0009	0.0200	1146.7	50.085	256.41	419.43	1.1905	1.7111	40
41	1044.1	0.0009	0.0194	1142.5	51.523	257.91	419.86	1.1952	1.7107	41
42	1072.2	0.0009	0.0189	1138.2	52.998	259.41	420.28	1.1999	1.7103	42
43	1100.9	0.0009	0.0183	1133.8	54.512	260.91	420.70	1.2046	1.7100	43
44	1130.1	0.0009	0.0178	1129.5	56.064	262.43	421.11	1.2092	1.7096	44
45	1159.9	0.0009	0.0173	1125.1	57.657	263.94	421.52	1.2139	1.7092	45
46	1190.3	0.0009	0.0169	1120.6	59.292	265.47	421.92	1.2186	1.7089	46
47	1221.3	0.0009	0.0164	1116.1	60.969	267.00	422.31	1.2233	1.7085	47
48	1252.9	0.0009	0.0160	1111.5	62.690	268.53	422.69	1.2280	1.7081	48
49	1285.1	0.0009	0.0155	1106.9	64.458	270.07	423.07	1.2327	1.7077	49
50	1317.9	0.0009	0.0151	1102.3	66.272	271.62	423.44	1.2375	1.7072	50
51	1351.3	0.0009	0.0147	1097.6	68.134	273.18	423.80	1.2422	1.7068	51
52	1385.4	0.0009	0.0143	1092.9	70.047	274.74	424.15	1.2469	1.7064	52
53	1420.1	0.0009	0.0139	1088.1	72.012	276.31	424.49	1.2516	1.7059	53
54	1455.5	0.0009	0.0135	1083.2	74.030	277.89	424.83	1.2563	1.7055	54
55	1491.5	0.0009	0.0131	1078.3	76.104	279.47	425.15	1.2611	1.7050	55
56	1528.2	0.0009	0.0128	1073.4	78.235	281.06	425.47	1.2658	1.7045	56
57	1565.6	0.0009	0.0124	1068.3	80.426	282.66	425.77	1.2705	1.7040	57
58	1603.6	0.0009	0.0121	1063.2	82.679	284.27	426.07	1.2753	1.7035	58

Thermodynamic Properties of R-134a - Saturation

Temperature (°C)	Pressure (kPA)	Volume (m ³ /kg)		Density (kg/m ³)		Enthalpy (kJ/kg)		Entropy (kJ/(kg K))		Temperature (°C)
		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
59	1642.3	0.0009	0.0118	1058.1	84.996	285.88	426.36	1.2801	1.7030	59
60	1681.8	0.0009	0.0114	1052.9	87.379	287.50	426.63	1.2848	1.7024	60
61	1721.9	0.0010	0.0111	1047.6	89.832	289.14	426.89	1.2896	1.7019	61
62	1762.8	0.0010	0.0108	1042.2	92.358	290.78	427.14	1.2944	1.7013	62
63	1804.4	0.0010	0.0105	1036.8	94.958	292.43	427.38	1.2992	1.7006	63
64	1846.7	0.0010	0.0102	1031.2	97.637	294.09	427.61	1.3040	1.7000	64
65	1889.8	0.0010	0.0100	1025.6	100.400	295.76	427.82	1.3088	1.6993	65
66	1933.7	0.0010	0.0097	1020.0	103.240	297.44	428.02	1.3137	1.6987	66
67	1978.3	0.0010	0.0094	1014.2	106.180	299.14	428.20	1.3185	1.6979	67
68	2023.7	0.0010	0.0092	1008.3	109.210	300.84	428.36	1.3234	1.6972	68
69	2069.8	0.0010	0.0089	1002.3	112.340	302.55	428.52	1.3283	1.6964	69
70	2116.8	0.0010	0.0087	996.3	115.570	304.28	428.65	1.3332	1.6956	70
71	2164.6	0.0010	0.0084	990.1	118.910	306.02	428.77	1.3381	1.6948	71
72	2213.2	0.0010	0.0082	983.8	122.370	307.78	428.86	1.3430	1.6939	72
73	2262.7	0.0010	0.0079	977.3	125.950	309.55	428.94	1.3480	1.6929	73
74	2313.0	0.0010	0.0077	970.8	129.650	311.33	429.00	1.3530	1.6920	74
75	2364.1	0.0010	0.0075	964.1	133.490	313.13	429.03	1.3580	1.6909	75
76	2416.1	0.0010	0.0073	957.3	137.480	314.94	429.04	1.3631	1.6899	76
77	2469.0	0.0011	0.0071	950.3	141.620	316.78	429.03	1.3682	1.6887	77
78	2522.8	0.0011	0.0069	943.1	145.930	318.63	428.98	1.3733	1.6876	78
79	2577.6	0.0011	0.0066	935.8	150.410	320.50	428.91	1.3784	1.6863	79
80	2633.2	0.0011	0.0064	928.2	155.080	322.39	428.81	1.3836	1.6850	80
81	2689.8	0.0011	0.0063	920.5	159.950	324.30	428.68	1.3889	1.6836	81
82	2747.3	0.0011	0.0061	912.6	165.050	326.24	428.51	1.3942	1.6821	82
83	2805.8	0.0011	0.0059	904.4	170.380	328.21	428.30	1.3995	1.6806	83
84	2865.3	0.0011	0.0057	895.9	175.970	330.20	428.05	1.4049	1.6789	84
85	2925.8	0.0011	0.0055	887.2	181.850	332.22	427.76	1.4104	1.6771	85
86	2987.4	0.0011	0.0053	878.1	188.050	334.28	427.42	1.4159	1.6752	86
87	3049.9	0.0012	0.0051	868.7	194.590	336.38	427.02	1.4215	1.6732	87
88	3113.6	0.0012	0.0050	858.9	201.520	338.51	426.55	1.4273	1.6710	88
89	3178.3	0.0012	0.0048	848.6	208.890	340.69	426.02	1.4331	1.6687	89
90	3244.2	0.0012	0.0046	837.8	216.760	342.93	425.42	1.4390	1.6662	90
91	3311.2	0.0012	0.0044	826.5	225.200	345.22	424.72	1.4451	1.6634	91
92	3379.3	0.0012	0.0043	814.4	234.310	347.59	423.92	1.4514	1.6604	92
93	3448.7	0.0012	0.0041	801.6	244.220	350.03	422.99	1.4578	1.6571	93
94	3519.3	0.0013	0.0039	787.8	255.080	352.58	421.92	1.4645	1.6534	94
95	3591.2	0.0013	0.0037	772.7	267.140	355.25	420.67	1.4715	1.6492	95
96	3664.5	0.0013	0.0036	756.1	280.730	358.07	419.18	1.4789	1.6445	96
97	3739.1	0.0014	0.0034	737.3	296.410	361.12	417.39	1.4869	1.6389	97
98	3815.2	0.0014	0.0032	715.5	315.130	364.47	415.14	1.4957	1.6322	98
99	3892.9	0.0015	0.0030	688.6	338.850	368.34	412.16	1.5058	1.6235	99
100	3972.4	0.0015	0.0027	651.2	373.010	373.30	407.68	1.5188	1.6109	100
101	4054.1	0.0018	0.0021	557.3	465.260	384.35	395.43	1.5480	1.5776	101