

APPENDIX A:
TABLES OF THERMOPHYSICAL PROPERTY DATA

Table 1. Summary of the Refrigerant Systems Studied, the Properties Measured for Each System, and the Molecular Weights of the Pure Components.

System	Vapor-Liquid Equilibrium Data ¹	Bubble-Point Pressures ²	Near-Saturation (p,p,T) Data	Compressed Liquid (p,p,T) Data	Compressed Gas (p,p,T) Data	Isochoric Heat Capacities	Sound Speed Data
R-32/134a	x		x				
R-32/125	x		x				
R-125/134a	x	x	x				
R-32/125/134a	x	x	x				
R-32/143a	x		x				
R-125/143a	x	x	x	x		x	
R-143a/134a	x	x	x				
R-32/290	x		x				
R-125/290	x		x				
R-134a/290	x		x				
R-41		x ³	x	x	x	x	x
R-41/744	x			x	x		

¹ Equilibrium two-phase measurements of the coexisting liquid and vapor compositions, the bubble-point pressures, and the equilibrium temperatures.

² Bubble-point pressures of a standard mixture.

³ Vapor pressure measurements.

Pure Component	Molecular Weight g/mole (lb/lbmole)
R-32	52.0237
R-125	120.0219
R-134a	102.0315
R-143a	84.0410
R-290	44.0965
R-41	34.0332
R-744	44.0098

Table 2. Summary of the Experimental Uncertainties for the Apparatus Used in This Project.

Measurement	Pure Component Uncertainty	Mixture Uncertainty
<u>Vapor-Liquid Equilibrium Apparatus</u>		
Temperature	± 0.02 K ($\pm 0.04^\circ\text{F}$)	± 0.02 K ($\pm 0.04^\circ\text{F}$)
Pressure	± 0.001 MPa (± 0.15 psia)	± 0.001 MPa (± 0.15 psia)
Composition		± 0.004 Mole Fraction (± 0.004 Mass Fraction)
<u>Bubble-Point and Near-Saturation (p.p.T) Apparatus</u>		
Temperature	± 0.05 K ($\pm 0.09^\circ\text{F}$)	± 0.05 K ($\pm 0.09^\circ\text{F}$)
Density	± 0.5 kg/m ³ (± 0.03 lb/ft ³)	± 0.5 kg/m ³ (± 0.03 lb/ft ³)
Pressure	± 0.0035 MPa (0.5 psia)	± 0.0035 MPa (0.5 psia)
Composition		± 0.004 Mole Fraction (± 0.004 Mass Fraction)
<u>Isochoric (p.p.T) Apparatus</u>		
Temperature	± 0.03 K ($\pm 0.05^\circ\text{F}$)	± 0.03 K ($\pm 0.05^\circ\text{F}$)
Density	$\pm 0.05\%$	$\pm 0.05\%$
Pressure	± 0.0007 MPa ($\pm 10^{-7}$ P)	± 0.1 psia ($\pm 1.5 \times 10^{-5}$ P)
Composition		$\pm 4 \times 10^{-5}$ Mole Fraction ($\pm 4 \times 10^{-5}$ Mass Fraction)
<u>Heat Capacity Apparatus</u>		
Temperature	± 0.03 K ($\pm 0.05^\circ\text{F}$)	± 0.03 K ($\pm 0.05^\circ\text{F}$)
Density	$\pm 0.15\%$	$\pm 0.15\%$
Pressure	± 0.0007 MPa ($\pm 10^{-7}$ P)	± 0.1 psia ($\pm 1.5 \times 10^{-5}$ P)
Heat Capacity	$\pm 0.5\%$	$\pm 0.5\%$
Composition		$\pm 4 \times 10^{-5}$ Mole Fraction ($\pm 4 \times 10^{-5}$ Mass Fraction)
<u>Sound Speed Apparatus</u>		
Temperature	± 0.03 K ($\pm 0.05^\circ\text{F}$)	
Pressure	$\pm 0.67\%$	
Sound Speed	$\pm 0.05\%$	

Table 3. Vapor-Liquid Equilibrium Data for R-32/134a Mixtures from 280 to 340 K (44 to 152°F).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-32) Vapor Mole Fraction	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-32) Vapor Mass Fraction
0.000	280.39	0.379	0.000	0.000	45.01	55.0	0.000
0.299	279.98	0.555	0.489	0.179	44.27	80.5	0.328
0.478	280.05	0.674	0.676	0.318	44.41	97.7	0.515
0.604	279.98	0.739	0.757	0.437	44.28	107.2	0.614
0.642	279.98	0.772	0.797	0.478	44.27	111.9	0.667
0.642	280.09	0.774	0.793	0.478	44.47	112.3	0.661
0.650	279.99	0.778	0.805	0.486	44.28	112.9	0.678
0.650	280.19	0.778	0.796	0.486	44.65	112.8	0.665
0.737	280.13	0.852	0.869	0.588	44.54	123.5	0.772
1.000	280.00	1.006	1.000	1.000	44.31	145.9	1.000
0.302	283.02	0.609	0.483	0.181	49.75	88.4	0.323
0.632	283.06	0.840	0.782	0.467	49.81	121.8	0.647
0.640	283.01	0.846	0.795	0.475	49.73	122.7	0.664
0.640	283.08	0.847	0.795	0.475	49.85	122.8	0.664
0.283	289.91	0.746	0.466	0.168	62.15	108.2	0.308
0.637	289.79	1.030	0.782	0.472	61.93	149.4	0.647
0.282	292.93	0.811	0.457	0.167	67.58	117.7	0.300
0.634	292.92	1.124	0.773	0.469	67.56	163.0	0.635
0.000	294.69	0.596	0.000	0.000	70.75	86.5	0.000
0.275	294.95	0.856	0.448	0.162	71.22	124.1	0.293
0.452	294.99	1.018	0.626	0.296	71.29	147.6	0.460
0.529	295.13	1.091	0.696	0.364	71.54	158.3	0.539
0.584	294.94	1.149	0.748	0.417	71.20	166.6	0.602
0.632	294.96	1.187	0.773	0.467	71.24	172.1	0.635
0.720	294.94	1.271	0.838	0.567	71.21	184.3	0.725
1.000	295.48	1.575	1.000	1.000	72.18	228.4	1.000
0.619	299.96	1.357	0.761	0.453	80.24	196.8	0.619
0.262	303.87	1.076	0.403	0.153	87.28	156.1	0.256
0.609	303.07	1.453	0.756	0.443	85.84	210.7	0.612
0.000	309.31	0.913	0.000	0.000	97.07	132.4	0.000
0.181	309.98	1.167	0.292	0.101	98.27	169.3	0.174
0.225	310.00	1.225	0.370	0.129	98.30	177.7	0.230
0.228	309.97	1.215	0.363	0.131	98.26	176.3	0.225
0.360	309.98	1.392	0.515	0.223	98.28	202.0	0.351
0.681	309.99	1.826	0.793	0.521	98.30	264.9	0.661
1.000	309.99	2.294	1.000	1.000	98.29	332.7	1.000

Table 3. Vapor-Liquid Equilibrium Data for R-32/134a Mixtures from 280 to 340 K (44 to 152°F) (continued).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-32) Vapor Mole Fraction	Temperature °F	Pressure psia	x(R-32) Liquid Mass Fraction	y(R-32) Vapor Mass Fraction
0.000	324.50	1.367	0.000	124.41	198.3	0.000	0.000
0.162	325.00	1.643	0.256	125.32	238.3	0.090	0.149
0.294	324.99	1.889	0.422	125.29	273.9	0.175	0.271
0.595	325.00	2.423	0.710	125.31	351.5	0.428	0.555
0.733	324.99	2.698	0.809	125.29	391.2	0.583	0.683
0.783	324.99	2.805	0.860	125.30	406.9	0.648	0.758
1.000	324.99	3.279	1.000	125.29	475.6	1.000	1.000
0.000	340.16	1.986	0.000	152.60	288.1	0.000	0.000
0.466	339.87	3.036	0.569	152.07	440.4	0.308	0.402
0.577	339.93	3.315	0.669	152.19	480.8	0.410	0.508
0.763	339.99	3.807	0.820	152.12	552.1	0.621	0.699
1.000	339.98	4.561	1.000	152.28	661.5	1.000	1.000

Table 4. Near-Saturation (p,p,T) Data for R-32/134a Mixtures from 279 to 340 K (43 to 152°F).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.216	279.63	0.523	1234.7	0.123	43.64	75.9	77.01
0.366	279.40	0.621	1197.5	0.227	43.23	90.1	74.69
0.519	279.45	0.698	1169.8	0.355	43.32	101.2	72.96
0.752	279.42	0.847	1108.9	0.607	43.27	122.9	69.16
0.214	293.49	0.791	1180.6	0.122	68.60	114.7	73.64
0.566	293.04	1.090	1106.8	0.399	67.78	158.1	69.03
0.639	292.88	1.184	1088.3	0.474	67.49	171.7	67.88
0.731	291.67	1.283	1060.3	0.581	65.32	186.0	66.13
0.807	292.93	1.381	1036.9	0.681	67.58	200.2	64.67
0.161	309.55	1.116	1130.6	0.089	97.50	161.9	70.52
0.214	308.46	1.192	1124.7	0.122	95.54	172.8	70.15
0.291	309.55	1.261	1111.0	0.173	97.50	182.9	69.30
0.498	309.62	1.536	1062.8	0.336	97.63	222.8	66.29
0.571	309.60	1.637	1045.8	0.404	97.59	237.4	65.23
0.789	309.70	1.942	987.3	0.656	97.77	281.6	61.58
0.873	309.34	2.085	958.7	0.778	97.13	302.3	59.80
0.130	324.64	1.587	1070.3	0.071	124.66	230.2	66.76
0.236	325.16	1.803	1040.6	0.136	125.59	261.4	64.90
0.387	325.27	2.044	1014.0	0.244	125.79	296.4	63.25
0.658	325.24	2.560	944.2	0.495	125.74	371.3	58.89
0.815	325.22	2.870	900.4	0.692	125.70	416.3	56.16
0.923	325.19	3.115	858.0	0.859	125.65	451.8	53.52
0.140	339.78	2.302	983.2	0.077	151.92	333.8	61.32
0.241	340.07	2.529	963.6	0.139	152.44	366.8	60.10
0.461	339.68	3.017	910.8	0.304	151.74	437.6	56.81
0.592	339.70	3.347	867.3	0.425	151.78	485.5	54.10
0.760	339.67	3.814	816.0	0.618	151.72	553.2	50.90
0.924	339.83	4.288	754.4	0.861	152.01	622.0	47.05

Table 4. Near-Saturation (p,p,T) Data for R-32/134a Mixtures from 279 to 340 K (43 to 152°F) (continued).

y(R-32)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-32)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.652	309.53	1.536	55.9	0.489	97.47	222.8	3.49
0.711	309.40	1.637	57.4	0.556	97.23	237.4	3.58
0.864	310.28	1.942	62.1	0.764	98.82	281.6	3.87
0.917	309.48	2.085	64.5	0.849	97.38	302.3	4.02
0.211	324.69	1.587	74.6	0.120	124.75	230.2	4.65
0.354	325.45	1.803	79.7	0.218	126.12	261.4	4.97
0.522	325.50	2.044	84.1	0.358	126.21	296.4	5.25
0.759	325.50	2.560	93.9	0.616	126.21	371.3	5.86
0.883	325.47	2.870	99.7	0.794	126.15	416.3	6.22
0.973	325.37	3.115	103.4	0.948	125.97	451.8	6.45
0.192	340.31	2.302	114.3	0.108	152.87	333.8	7.13
0.319	340.02	2.529	119.5	0.193	152.35	366.8	7.45
0.562	340.18	3.017	130.2	0.395	152.64	437.6	8.12
0.684	340.10	3.347	139.0	0.525	152.50	485.5	8.67
0.817	340.05	3.814	151.0	0.695	152.41	553.2	9.42
0.920	340.10	4.288	165.9	0.854	152.50	622.0	10.35

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 5. Vapor-Liquid Equilibrium Data for R-32/125 Mixtures from 280 to 340 K (44 to 152°F).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-32) Vapor Mole Fraction	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-32) Vapor Mass Fraction
0.000	280.29	0.830	0.000	0.000	44.83	120.4	0.000
0.346	279.83	0.919	0.398	0.187	44.01	133.3	0.223
0.350	280.02	0.924	0.387	0.189	44.34	134.0	0.215
0.482	280.06	0.955	0.520	0.287	44.41	138.5	0.320
0.650	279.95	0.985	0.676	0.446	44.23	142.9	0.475
0.948	280.07	1.017	0.947	0.888	44.44	147.4	0.886
1.000	280.00	1.008	1.000	1.000	44.31	146.1	1.000
0.000	295.23	1.272	0.000	0.000	71.72	184.5	0.000
0.347	295.01	1.415	0.387	0.187	71.32	205.2	0.215
0.470	295.03	1.461	0.508	0.278	71.37	211.9	0.309
0.653	295.06	1.516	0.676	0.449	71.42	219.9	0.475
0.914	295.03	1.559	0.915	0.822	71.35	226.0	0.824
0.948	294.94	1.556	0.947	0.888	71.20	225.6	0.886
1.000	293.99	1.515	1.000	1.000	69.49	219.8	1.000
0.000	310.61	1.890	0.000	0.000	99.41	274.2	0.000
0.339	310.01	2.080	0.373	0.182	98.32	301.7	0.205
0.465	310.00	2.150	0.498	0.274	98.30	311.8	0.301
0.646	309.96	2.227	0.672	0.442	98.24	323.0	0.470
0.915	310.08	2.303	0.914	0.824	98.45	334.1	0.822
1.000	310.51	2.329	1.000	1.000	99.23	337.8	1.000
0.000	324.89	2.639	0.000	0.000	125.11	382.8	0.000
0.462	325.07	3.058	0.489	0.271	125.43	443.5	0.293
0.644	324.97	3.174	0.661	0.439	125.26	460.3	0.458
0.919	325.17	3.297	0.919	0.831	125.61	478.1	0.831
1.000	325.49	3.318	1.000	1.000	126.19	481.2	1.000
0.000	339.38	3.629	0.000	0.000	151.19	526.4	0.000
0.740	340.18	4.482	0.749	0.552	152.63	650.0	0.564
0.885	340.17	4.572	0.890	0.769	152.62	663.1	0.778
0.919	340.17	4.582	0.919	0.831	152.62	664.5	0.831
1.000	340.08	4.572	1.000	1.000	152.45	663.1	1.000

Table 6. Near-Saturation (p,ρ,T) Data for R-32/125 Mixtures from 279 to 341 K (43 to 154°F).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.250	279.24	0.896	1245.9	0.126	42.94	129.9	77.71
0.494	279.19	0.946	1203.2	0.297	42.85	137.2	75.05
0.797	279.55	1.012	1114.2	0.630	43.50	146.7	69.49
0.875	279.60	1.018	1092.3	0.752	43.59	147.7	68.13
0.956	279.01	1.013	1060.9	0.904	42.53	146.9	66.17
0.237	293.75	1.348	1174.8	0.119	69.07	195.6	73.27
0.460	293.54	1.429	1135.7	0.270	68.69	207.3	70.84
0.801	293.35	1.500	1057.0	0.636	68.33	217.6	65.93
0.801	293.18	1.500	1055.3	0.636	68.04	217.6	65.82
0.890	293.27	1.517	1030.6	0.778	68.19	220.1	64.28
0.947	293.46	1.525	1003.7	0.886	68.55	221.2	62.60
0.270	309.83	2.009	1083.6	0.138	98.01	291.3	67.59
0.509	310.89	2.227	1032.2	0.310	99.92	322.9	64.38
0.745	310.50	2.299	980.8	0.559	99.21	333.5	61.17
0.803	310.66	2.322	969.5	0.639	99.50	336.8	60.47
0.873	309.57	2.296	954.6	0.749	97.54	332.9	59.54
0.916	309.73	2.302	941.1	0.825	97.83	333.9	58.70
0.952	309.52	2.308	927.7	0.896	97.45	334.7	57.86
0.323	324.98	2.969	950.3	0.171	125.27	430.6	59.27
0.456	325.48	3.128	925.7	0.267	126.17	453.7	57.74
0.755	325.40	3.270	883.0	0.572	126.03	474.3	55.07
0.804	325.55	3.303	870.6	0.640	126.30	479.0	54.30
0.867	325.37	3.324	859.8	0.739	125.97	482.1	53.63
0.916	325.35	3.315	851.6	0.825	125.94	480.8	53.12
0.744	340.33	4.581	723.6	0.557	152.91	664.4	45.13
0.873	340.28	4.606	722.0	0.749	152.82	668.0	45.03
0.898	339.99	4.595	724.5	0.792	152.30	666.4	45.19
0.916	339.99	4.598	723.9	0.825	152.30	666.8	45.15

Table 6. Near-Saturation (p,ρ,T) Data for R-32/125 Mixtures from 279 to 341 K (43 to 154°F) (continued).

y(R-32)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-32)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.275	295.03	1.348	72.9	0.141	71.37	195.6	4.55
0.810	294.49	1.500	53.6	0.649	70.40	217.6	3.34
0.303	310.36	2.009	116.2	0.159	98.96	291.4	7.25
0.541	311.32	2.227	108.6	0.338	100.69	322.9	6.77
0.761	311.11	2.299	89.4	0.580	100.31	333.5	5.58
0.814	311.34	2.322	84.6	0.656	100.72	336.8	5.28
0.879	310.54	2.296	80.7	0.759	99.29	332.9	5.03
0.919	310.82	2.302	76.6	0.831	99.79	333.9	4.78
0.953	310.69	2.308	71.7	0.897	99.56	334.7	4.47
0.349	325.58	2.969	183.6	0.189	126.35	430.6	11.45
0.766	326.12	3.270	143.0	0.586	127.32	474.3	8.92
0.812	326.23	3.303	138.9	0.652	127.52	479.0	8.66
0.872	326.12	3.324	130.1	0.746	127.32	482.1	8.11
0.918	326.10	3.315	121.9	0.829	127.28	480.8	7.60
0.877	341.15	4.606	221.1	0.755	154.39	668.0	13.79
0.901	340.81	4.595	213.3	0.798	153.77	666.4	13.30
0.918	340.81	4.598	197.8	0.830	153.77	666.8	12.34

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 7. Vapor-Liquid Equilibrium Data for R-125/134a Mixtures from 280 to 340 K (44 to 152°F).

x(R-125) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-125) Vapor Mole Fraction	x(R-125) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-125) Vapor Mass Fraction
0.000	280.39	0.379	0.000	0.000	45.01	55.0	0.000
0.264	279.98	0.486	0.408	0.297	44.27	70.5	0.448
0.425	279.97	0.574	0.595	0.465	44.27	83.2	0.633
0.521	279.98	0.614	0.690	0.561	44.27	89.0	0.724
0.600	279.98	0.642	0.720	0.638	44.28	93.2	0.752
1.000	280.29	0.830	1.000	1.000	44.83	120.4	1.000
0.000	294.69	0.596	0.000	0.000	70.75	86.5	0.000
0.270	294.93	0.780	0.400	0.303	71.19	113.2	0.440
0.347	294.92	0.835	0.475	0.385	71.17	121.1	0.516
0.383	294.92	0.853	0.523	0.422	71.17	123.8	0.563
0.600	294.84	0.979	0.703	0.638	71.02	142.0	0.736
1.000	295.23	1.272	1.000	1.000	71.73	184.5	1.000
0.000	309.31	0.913	0.000	0.000	97.07	132.4	0.000
0.259	309.97	1.171	0.376	0.291	98.27	169.9	0.415
0.362	309.99	1.263	0.475	0.400	98.29	183.2	0.516
0.454	309.99	1.349		0.494	98.29	195.6	
0.513	309.99	1.423	0.635	0.553	98.30	206.4	0.672
1.000	310.61	1.890	1.000	1.000	99.41	274.2	1.000
0.000	324.50	1.367	0.000	0.000	124.41	198.3	0.000
0.366	324.98	1.824	0.462	0.404	125.27	264.6	0.503
0.406	324.98	1.875	0.492	0.446	125.28	272.0	0.533
0.426	324.97	1.901		0.466	125.25	275.7	
0.511	324.96	2.026	0.610	0.551	125.24	293.9	0.648
1.000	324.89	2.639	1.000	1.000	125.11	382.7	1.000
0.000	340.16	1.986	0.000	0.000	152.60	288.1	0.000
0.361	339.96	2.520	0.438	0.399	152.24	365.5	0.478
0.370	339.91	2.522	0.443	0.409	152.16	365.8	0.483
0.448	339.99	2.664	0.512	0.488	152.29	386.4	0.552
0.493	339.89	2.749	0.543	0.534	152.11	398.7	0.583
1.000	339.38	3.629	1.000	1.000	151.20	526.3	1.000

Table 8. Bubble-Point Pressures for R-125/134a Mixtures from 280 to 340 K (45 to 153°F).

$x(\text{R-125})$ Liquid Mole Fraction	Temperature K	Pressure MPa	$x(\text{R-125})$ Liquid Mass Fraction	Temperature °F	Pressure psia
0.3498	280.35	0.537	0.3876	44.94	77.9
0.3498	295.09	0.837	0.3876	71.47	121.4
0.3498	310.05	1.260	0.3876	98.40	182.8
0.3498	324.99	1.815	0.3876	125.29	263.3
0.3498	340.26	2.543	0.3876	152.78	368.8
0.3498	340.41	2.546	0.3876	153.05	369.2
0.6491	280.78	0.675	0.6851	45.72	98.0
0.6491	294.99	1.031	0.6851	71.29	149.5
0.6491	310.19	1.541	0.6851	98.65	223.5
0.6491	324.98	2.180	0.6851	125.28	316.2

Table 9. Near-Saturation (p,p,T) Data for R-125/134a Mixtures from 280 to 342 K (44 to 157°F).

$x(R-125)$ Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	$x(R-125)$ Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.3498	280.09	0.537	1285.2	0.3876	44.47	77.9	80.16
0.3498	294.86	0.837	1226.9	0.3876	71.06	121.4	76.52
0.3498	310.07	1.260	1147.3	0.3876	98.44	182.8	71.56
0.3498	325.34	1.815	1072.4	0.3876	125.92	263.3	66.89
0.3498	340.17	2.543	973.5	0.3876	152.62	368.8	60.72
0.3498	340.24	2.546	972.1	0.3876	152.74	369.2	60.63
0.6491	280.29	0.675	1289.2	0.6851	44.83	98.0	80.41
0.6491	294.76	1.031	1225.4	0.6851	70.88	149.5	76.43
0.6491	310.20	1.541	1134.3	0.6851	98.67	223.5	70.75
0.6491	324.99	2.180	1043.3	0.6851	125.29	316.2	65.07

$y(R-125)^*$ Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	$y(R-125)^*$ Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.426	312.23	1.260	69.7	0.466	102.33	182.8	4.35
0.404	326.34	1.815	105.9	0.444	127.72	263.3	6.61
0.385	342.37	2.543	159.4	0.424	156.58	368.8	9.94
0.385	342.48	2.546	159.6	0.424	156.78	369.2	9.95
0.720	296.07	1.031	60.8	0.752	73.24	149.5	3.79
0.693	312.29	1.541	93.7	0.726	102.43	223.5	5.84
0.673	327.15	2.180	141.3	0.708	129.18	316.2	8.81

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 10. Vapor-Liquid Equilibrium Data for R-32/125/134a Mixtures from 280 to 340 K (44 to 152°F).

x(R-32) x(R-125) x(R-134a)			Temp. K		Temp. °F		Press. psia		x(R-32) x(R-125) x(R-134a)		Temp. °F		Press. psia		y(R-32) y(R-125) y(R-134a)	
Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction	Liquid Mole Fraction
0.190	0.358	0.452	279.93	0.661	0.294	0.444	0.263	0.100	0.434	0.466	44.19	95.9	0.160	0.558	0.335	0.335
0.224	0.261	0.515	279.93	0.641	0.495	0.307	0.198	0.122	0.328	0.550	44.18	92.9	0.311	0.445	0.354	0.354
0.391	0.327	0.282	279.97	0.780	0.396	0.258	0.346	0.230	0.444	0.326	44.25	113.1	0.237	0.356	0.533	0.533
0.251	0.214	0.535	294.96	0.987	0.366	0.306	0.328	0.140	0.275	0.585	71.25	143.2	0.213	0.412	0.477	0.477
0.263	0.256	0.481	294.96	1.004	0.464	0.272	0.264	0.146	0.329	0.525	71.25	145.6	0.288	0.390	0.452	0.452
0.264	0.205	0.531	294.96	0.973	0.430	0.270	0.300	0.148	0.266	0.586	71.24	141.2	0.262	0.380	0.486	0.486
0.301	0.230	0.469	294.96	1.036	0.575	0.265	0.160	0.172	0.303	0.525	71.24	150.3	0.383	0.408	0.339	0.339
0.495	0.290	0.215	294.94	1.294	0.212	0.584	0.204	0.312	0.422	0.266	71.21	187.6	0.108	0.688	0.229	0.229
0.163	0.549	0.288	309.99	1.673	0.287	0.528	0.185	0.082	0.635	0.283	98.29	242.7	0.154	0.652	0.230	0.230
0.218	0.506	0.276	309.99	1.722	0.546	0.278	0.178	0.113	0.606	0.281	98.29	249.8	0.355	0.417	0.352	0.352
0.303	0.462	0.235	310.00	1.798	0.262	0.476	0.262	0.166	0.583	0.252	98.31	260.8	0.140	0.586	0.319	0.319
0.463	0.308	0.229	309.99	1.903	0.315	0.365	0.320	0.285	0.438	0.277	98.29	276.0	0.176	0.472	0.427	0.427
0.203	0.418	0.379	324.99	2.321	0.428	0.224	0.348	0.106	0.505	0.389	125.30	336.6	0.263	0.318	0.569	0.569
0.240	0.335	0.425	324.99	2.265	0.534	0.245	0.221	0.130	0.419	0.451	125.29	328.5	0.348	0.369	0.434	0.434
0.319	0.193	0.488	324.99	2.174	0.523	0.251	0.226	0.185	0.259	0.556	125.30	315.4	0.338	0.375	0.434	0.434
0.428	0.241	0.331	324.98	2.442	0.062	0.508	0.430	0.262	0.340	0.397	125.28	354.1	0.356	0.384	0.403	0.403
0.443	0.241	0.316	324.99	2.488	0.111	0.482	0.407	0.274	0.343	0.383	125.30	360.9	0.030	0.564	0.418	0.418
0.473	0.253	0.274	324.99	2.562	0.398	0.331	0.271	0.297	0.366	0.337	125.29	371.5	0.055	0.550	0.418	0.418
0.045	0.470	0.485	339.96	2.864	0.505	0.273	0.222	0.022	0.521	0.457	152.25	415.3	0.235	0.451	0.410	0.410
0.086	0.488	0.466	339.96	2.936	0.533	0.256	0.211	0.040	0.530	0.430	152.24	425.9	0.322	0.401	0.409	0.409
0.347	0.326	0.327	339.93	3.331	0.539	0.254	0.207	0.199	0.432	0.368	152.18	483.1	0.347	0.384	0.412	0.412
0.452	0.276	0.273	339.93	3.516	0.533	0.256	0.211	0.278	0.392	0.330	152.18	509.9	0.352	0.383	0.409	0.409
0.480	0.237	0.283	339.95	3.564	0.533	0.256	0.211	0.303	0.346	0.351	152.23	516.9	0.347	0.384	0.412	0.412
0.487	0.255	0.258	339.94	3.564	0.539	0.254	0.207	0.308	0.372	0.320	152.20	516.9	0.352	0.383	0.409	0.409

Table 11. Bubble-Point Pressures for R-32/125/134a Mixtures from 221 to 345 K (-62 to 162°F).

$x(R-32)$ Liquid Mole Fraction	$x(R-125)$ Liquid Mole Fraction	$x(R-134a)$ Liquid Mole Fraction	Temp. K	Press. MPa	$x(R-32)$		$x(R-125)$		$x(R-134a)$		Temp. °F	Press. psia
					Liquid Mass Fraction	Liquid Mass Fraction	Liquid Mass Fraction	Liquid Mass Fraction	Liquid Mass Fraction	Liquid Mass Fraction		
0.3460	0.3005	0.3535	220.93	0.073	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	-62.02	10.6
0.3460	0.3005	0.3535	230.45	0.116	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	-44.88	16.9
0.3460	0.3005	0.3535	239.53	0.172	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	-28.53	25.0
0.3460	0.3005	0.3535	250.06	0.266	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	-9.58	38.5
0.3460	0.3005	0.3535	259.92	0.383	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	8.17	55.6
0.3460	0.3005	0.3535	269.95	0.541	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	26.23	78.5
0.3460	0.3005	0.3535	279.94	0.747	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	44.20	108.3
0.3460	0.3005	0.3535	289.88	1.000	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	62.10	145.0
0.3460	0.3005	0.3535	284.50	0.852	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	52.41	123.5
0.3460	0.3005	0.3535	293.40	1.099	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	68.43	159.4
0.3460	0.3005	0.3535	305.28	1.504	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	89.82	218.2
0.3460	0.3005	0.3535	317.09	2.013	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	111.07	292.0
0.3460	0.3005	0.3535	326.18	2.490	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	127.44	361.1
0.3460	0.3005	0.3535	335.01	3.020	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	143.33	438.0
0.3460	0.3005	0.3535	335.33	3.046	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	143.91	441.8
0.3460	0.3005	0.3535	345.21	3.734	0.1997	0.4001	0.4001	0.4001	0.4002	0.4002	161.69	541.5
0.2004	0.5992	0.2005	280.47	0.794	0.1014	0.6996	0.6996	0.6996	0.1990	0.1990	45.16	115.2
0.2004	0.5992	0.2005	295.07	1.202	0.1014	0.6996	0.6996	0.6996	0.1990	0.1990	71.44	174.4
0.2004	0.5992	0.2005	310.26	1.837	0.1014	0.6996	0.6996	0.6996	0.1990	0.1990	98.78	266.4
0.2004	0.5992	0.2005	325.34	2.584	0.1014	0.6996	0.6996	0.6996	0.1990	0.1990	125.92	374.7
0.5992	0.2006	0.2002	280.25	0.875	0.4119	0.3181	0.3181	0.3181	0.2700	0.2700	44.76	126.9
0.5992	0.2006	0.2002	295.04	1.339	0.4119	0.3181	0.3181	0.3181	0.2700	0.2700	71.38	194.2
0.5992	0.2006	0.2002	310.15	1.986	0.4119	0.3181	0.3181	0.3181	0.2700	0.2700	98.58	288.1
0.5992	0.2006	0.2002	324.96	2.831	0.4119	0.3181	0.3181	0.3181	0.2700	0.2700	125.24	410.5
0.5992	0.2006	0.2002	339.95	3.931	0.4119	0.3181	0.3181	0.3181	0.2700	0.2700	152.22	570.2
0.5992	0.2006	0.2002	325.00	2.830	0.4119	0.3181	0.3181	0.3181	0.2700	0.2700	125.31	410.4
0.5992	0.2006	0.2002	310.00	1.974	0.4119	0.3181	0.3181	0.3181	0.2700	0.2700	98.31	286.3
0.2005	0.1998	0.5997	280.22	0.601	0.1091	0.2509	0.2509	0.2509	0.6401	0.6401	44.71	87.2
0.2005	0.1998	0.5997	294.66	0.921	0.1091	0.2509	0.2509	0.2509	0.6401	0.6401	70.70	133.6
0.2005	0.1998	0.5997	310.07	1.396	0.1091	0.2509	0.2509	0.2509	0.6401	0.6401	98.44	202.5
0.2005	0.1998	0.5997	325.04	2.013	0.1091	0.2509	0.2509	0.2509	0.6401	0.6401	125.38	292.0
0.2005	0.1998	0.5997	340.05	2.791	0.1091	0.2509	0.2509	0.2509	0.6401	0.6401	152.40	404.8
0.2005	0.1998	0.5997	325.15	2.004	0.1091	0.2509	0.2509	0.2509	0.6401	0.6401	125.58	290.6
0.2005	0.1998	0.5997	310.13	1.390	0.1091	0.2509	0.2509	0.2509	0.6401	0.6401	98.55	201.6

Table 12. Near-Saturation (p,ρ,T) Data for R-32/125/134a Mixtures from 244 to 346 K (-21 to 163°F).

x(R-32) Liquid Mole Fraction	x(R-125) Liquid Mole Fraction	x(R-134a) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-32) Liquid Mass Fraction	x(R-125) Liquid Mass Fraction	x(R-134a) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.3460	0.3005	0.3535	243.62	0.229	1350.3	0.1997	0.4001	0.4002	-21.17	33.2	84.22
0.3460	0.3005	0.3535	243.62	0.232	1349.3	0.1997	0.4001	0.4002	-21.17	33.6	84.16
0.3460	0.3005	0.3535	254.15	0.329	1313.9	0.1997	0.4001	0.4002	-2.22	47.7	81.95
0.3460	0.3005	0.3535	264.62	0.485	1277.2	0.1997	0.4001	0.4002	16.63	70.4	79.66
0.3460	0.3005	0.3535	274.40	0.664	1240.5	0.1997	0.4001	0.4002	34.23	96.3	77.37
0.3460	0.3005	0.3535	283.04	0.849	1207.6	0.1997	0.4001	0.4002	49.78	123.1	75.32
0.3460	0.3005	0.3535	296.80	1.231	1149.6	0.1997	0.4001	0.4002	74.55	178.6	71.70
0.3460	0.3005	0.3535	306.50	1.595	1101.6	0.1997	0.4001	0.4002	92.01	231.4	68.71
0.3460	0.3005	0.3535	316.24	2.019	1051.2	0.1997	0.4001	0.4002	109.54	292.8	65.57
0.3460	0.3005	0.3535	326.11	2.531	991.3	0.1997	0.4001	0.4002	127.31	367.1	61.83
0.3460	0.3005	0.3535	335.91	3.121	919.5	0.1997	0.4001	0.4002	144.95	452.7	57.35
0.3460	0.3005	0.3535	345.66	3.800	823.6	0.1997	0.4001	0.4002	162.50	551.1	51.37
0.2004	0.5992	0.2005	280.40	0.794	1246.0	0.1014	0.6996	0.1990	45.03	115.2	77.72
0.2004	0.5992	0.2005	294.61	1.202	1184.3	0.1014	0.6996	0.1990	70.61	174.4	73.86
0.2004	0.5992	0.2005	310.46	1.837	1101.9	0.1014	0.6996	0.1990	99.14	266.4	68.73
0.2004	0.5992	0.2005	325.56	2.584	996.5	0.1014	0.6996	0.1990	126.32	374.7	62.15
0.5992	0.2006	0.2002	280.01	0.875	1158.2	0.4119	0.3181	0.2700	44.33	126.9	72.24
0.5992	0.2006	0.2002	295.10	1.339	1097.7	0.4119	0.3181	0.2700	71.49	194.2	68.46
0.5992	0.2006	0.2002	310.49	1.986	1026.2	0.4119	0.3181	0.2700	99.19	288.1	64.01
0.5992	0.2006	0.2002	325.49	2.831	939.5	0.4119	0.3181	0.2700	126.19	410.5	58.60
0.5992	0.2006	0.2002	340.56	3.931	815.8	0.4119	0.3181	0.2700	153.32	570.2	50.88
0.5992	0.2006	0.2002	325.54	2.830	948.2	0.4119	0.3181	0.2700	126.28	410.4	59.14
0.5992	0.2006	0.2002	310.44	1.974	1025.4	0.4119	0.3181	0.2700	99.10	286.3	63.96
0.2005	0.1998	0.5997	279.96	0.601	1240.6	0.1091	0.2509	0.6401	44.24	87.2	77.38
0.2005	0.1998	0.5997	294.50	0.921	1184.3	0.1091	0.2509	0.6401	70.41	133.6	73.87
0.2005	0.1998	0.5997	310.44	1.396	1116.7	0.1091	0.2509	0.6401	99.10	202.5	69.65
0.2005	0.1998	0.5997	325.54	2.013	1039.9	0.1091	0.2509	0.6401	126.28	292.0	64.86
0.2005	0.1998	0.5997	340.45	2.791	948.3	0.1091	0.2509	0.6401	153.12	404.8	59.15
0.2005	0.1998	0.5997	325.56	2.004	1042.4	0.1091	0.2509	0.6401	126.32	290.6	65.02
0.2005	0.1998	0.5997	310.49	1.390	1117.1	0.1091	0.2509	0.6401	99.19	201.6	69.68

Table 12. Near-Saturation (p,ρ,T) Data for R-32/125/134a Mixtures from 244 to 346 K (-21 to 163°F) (continued).

y(R-32)* Vapor Mole Fraction	y(R-125)* Vapor Mole Fraction	y(R-134a)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-32)* Vapor Mass Fraction	y(R-125)* Vapor Mass Fraction	y(R-134a)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.248	0.620	0.132	312.78	1.837	103.6	0.128	0.738	0.134	103.32	266.4	6.46
0.237	0.616	0.147	328.04	2.584	153.7	0.122	0.730	0.148	130.78	374.7	9.59
0.676	0.203	0.121	312.78	1.986	90.7	0.489	0.339	0.172	103.32	288.1	5.66
0.663	0.202	0.135	328.04	2.831	132.4	0.476	0.334	0.190	130.78	410.5	8.26
0.643	0.201	0.156	343.26	3.931	186.8	0.455	0.328	0.217	158.18	570.2	11.65
0.663	0.202	0.135	328.06	2.830	119.6	0.476	0.334	0.190	130.82	410.4	7.46
0.676	0.203	0.121	312.83	1.974	76.7	0.489	0.339	0.172	103.41	286.3	4.78
0.298	0.254	0.448	312.73	1.396	70.4	0.169	0.332	0.498	103.23	202.5	4.39
0.280	0.244	0.476	327.93	2.013	103.0	0.158	0.317	0.526	130.59	292.0	6.42
0.260	0.233	0.507	342.92	2.791	149.7	0.145	0.300	0.555	157.57	404.8	9.34
0.280	0.244	0.476	327.93	2.004	98.0	0.158	0.317	0.526	130.59	290.6	6.11
0.298	0.254	0.448	312.67	1.390	65.2	0.169	0.332	0.498	103.12	201.6	4.07

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data and REFPROP 6.0.

Table 13. Vapor-Liquid Equilibrium Data for R-32/143a Mixtures from 280 to 340 K (44 to 152°F).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-32)		Temperature °F	Pressure psia	y(R-32)	
			Vapor Mole Fraction	Fraction			Liquid Mass Fraction	Vapor Mass Fraction
0.000	280.23	0.767	0.000		44.73	111.3	0.000	0.000
0.357	279.88	0.906	0.439		44.09	131.3	0.256	0.326
0.377	279.88	0.912	0.434		44.10	132.3	0.273	0.322
0.605	279.90	0.971	0.652		44.13	140.8	0.487	0.537
0.674	279.86	0.980	0.692		44.07	142.2	0.561	0.582
0.735	279.85	0.992	0.759		44.04	143.9	0.632	0.661
1.000	280.00	1.007	1.000		44.31	146.1	1.000	1.000
0.000	294.11	1.135	0.000		69.71	164.6	0.000	0.000
0.719	294.92	1.517	0.756		71.16	220.0	0.613	0.657
0.414	294.96	1.407	0.479		71.25	204.0	0.304	0.363
0.638	295.03	1.493	0.665		71.37	216.6	0.522	0.551
1.000	293.99	1.515	1.000		69.49	219.8	1.000	1.000
0.000	309.37	1.677	0.000		97.18	243.2	0.000	0.000
0.635	310.10	2.191	0.676		98.49	317.7	0.519	0.564
0.811	310.05	2.266			98.41	328.7	0.726	
0.875	310.07	2.281			98.43	330.8	0.812	
0.912	310.06	2.288	0.936		98.41	331.9	0.865	0.901
1.000	310.51	2.329	1.000		99.23	337.8	1.000	1.000
0.000	326.02	2.467	0.000		127.15	357.8	0.000	0.000
0.818	325.06	3.209	0.841		125.41	465.5	0.736	0.766
0.746	325.05	3.156	0.762		125.41	457.7	0.645	0.665
0.604	325.07	3.067	0.638		125.44	444.9	0.486	0.522
0.547	324.94	3.013	0.575		125.20	437.0	0.428	0.456
1.000	325.49	3.318	1.000		126.19	481.2	1.000	1.000
0.000	340.07	3.318	0.000		152.44	481.2	0.000	0.000
0.543	340.03	4.169	0.570		152.36	604.7	0.424	0.451
0.499	340.01	4.136	0.546		152.32	599.8	0.381	0.427
0.698	340.02	4.345	0.718		152.35	630.2	0.589	0.612
1.000	340.08	4.571	1.000		152.46	663.0	1.000	1.000

Table 14. Near-Saturation (p,p,T) Data for R-32/143a Mixtures from 279 to 340 K (43 to 152°F).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.271	279.76	0.930	1003.2	0.187	43.87	134.9	62.57
0.271	279.73	0.929	1003.2	0.187	43.83	134.8	62.57
0.542	279.40	0.987	1009.8	0.423	43.23	143.1	62.99
0.952	279.22	1.017	1026.5	0.925	42.90	147.5	64.02
0.203	293.35	1.268	948.9	0.136	68.33	183.9	59.18
0.203	293.14	1.249	949.3	0.136	67.96	181.1	59.21
0.436	293.66	1.417	950.9	0.324	68.89	205.5	59.31
0.619	293.27	1.469	957.8	0.501	68.19	213.1	59.74
0.619	293.35	1.480	957.6	0.501	68.33	214.7	59.73
0.713	293.09	1.491	962.9	0.606	67.87	216.3	60.06
0.861	293.04	1.527	972.9	0.793	67.78	221.5	60.68
0.263	309.22	1.887	877.4	0.181	96.91	273.7	54.72
0.362	309.97	2.022	874.6	0.260	98.26	293.3	54.55
0.635	309.76	2.197	882.6	0.519	97.88	318.7	55.05
0.736	309.22	2.224	892.2	0.633	96.91	322.5	55.65
0.890	308.65	2.343	903.6	0.834	95.88	339.8	56.36
0.172	325.59	2.753	782.1	0.114	126.37	399.3	48.78
0.450	325.90	3.120	786.6	0.336	126.94	452.6	49.06
0.581	326.01	3.204	789.2	0.462	127.12	464.6	49.22
0.596	326.03	3.211	789.2	0.477	127.17	465.7	49.22
0.664	326.01	3.272	793.4	0.550	127.12	474.6	49.49
0.668	326.01	3.269	793.0	0.555	127.12	474.1	49.46
0.728	325.98	3.327	797.8	0.624	127.08	482.5	49.76
0.731	325.98	3.327	797.7	0.627	127.08	482.5	49.75
0.805	325.80	3.331	801.6	0.719	126.75	483.1	50.00
0.787	325.93	3.349	801.1	0.696	126.98	485.7	49.97
0.787	325.93	3.341	801.0	0.696	126.98	484.6	49.96
0.259	339.51	3.796	660.0	0.178	151.43	550.6	41.17
0.267	339.51	3.796	659.6	0.184	151.43	550.5	41.14
0.394	339.49	4.043	665.0	0.287	151.39	586.3	41.48
0.394	339.49	4.044	664.9	0.287	151.39	586.5	41.47
0.467	339.46	4.271	671.0	0.352	151.34	619.5	41.85
0.633	339.25	4.470	677.8	0.516	150.96	648.2	42.28
0.636	339.25	4.396	672.0	0.520	150.96	637.6	41.91
0.715	339.23	4.470	678.0	0.608	150.92	648.2	42.29
0.792	339.12	4.550	689.6	0.702	150.73	659.9	43.01

Table 14. Near-Saturation (p,ρ,T) Data for R-32/143a Mixtures from 279 to 340 K (43 to 152°F) (continued).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.811	339.15	4.555	689.9	0.726	150.78	660.6	43.03
0.887	339.25	4.589	704.8	0.829	150.96	665.6	43.96

y(R-32)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-32)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.258	294.34	1.249	52.5	0.177	70.13	181.1	3.28
0.408	310.26	2.022	82.6	0.299	98.79	293.3	5.15
0.669	309.95	2.197	78.2	0.550	98.23	318.7	4.88
0.760	309.46	2.224	75.4	0.662	97.34	322.5	4.70
0.190	326.66	2.741	134.9	0.127	128.29	397.5	8.41
0.611	326.89	3.204	133.9	0.492	128.71	464.6	8.35
0.695	326.89	3.269	132.5	0.585	128.71	474.1	8.26
0.658	339.96	4.470	209.8	0.544	152.25	648.2	13.09
0.800	339.78	4.550	198.9	0.712	151.92	659.9	12.40
0.817	339.83	4.555	199.0	0.734	152.01	660.6	12.41
0.888	340.04	4.589	185.8	0.831	152.39	665.6	11.59

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 15. Vapor-Liquid Equilibrium Data for R-125/143a Mixtures from 280 to 326 K (44 to 127°F).

$x(\text{R-125})$ Liquid Mole Fraction	Temperature K	Pressure MPa	$y(\text{R-125})$ Vapor Mole Fraction	$x(\text{R-125})$ Liquid Mass Fraction	Temperature °F	Pressure psia	$y(\text{R-125})$ Vapor Mass Fraction
0.000	280.23	0.767	0.000	0.000	44.73	111.2	0.000
0.287	279.95	0.769		0.365	44.22	111.5	
0.353	279.97	0.779	0.365	0.438	44.26	113.0	0.451
0.425	280.00	0.772	0.428	0.513	44.31	112.0	0.516
0.645	279.95	0.783		0.722	44.22	113.6	
1.000	280.29	0.830	1.000	1.000	44.83	120.4	1.000
0.000	294.11	1.135	0.000	0.000	69.71	164.6	0.000
0.302	294.96	1.176	0.318	0.382	71.24	170.6	0.400
0.353	294.95	1.183	0.365	0.438	71.22	171.6	0.451
0.422	294.95	1.176	0.432	0.510	71.21	170.6	0.521
0.642	294.96	1.199	0.670	0.719	71.24	173.9	0.744
1.000	295.23	1.272	1.000	1.000	71.73	184.5	1.000
0.000	309.37	1.677	0.000	0.000	97.18	243.2	0.000
0.312	309.97	1.727	0.330	0.393	98.26	250.5	0.413
0.354	309.97	1.734	0.365	0.439	98.25	251.5	0.451
0.422	310.08	1.742	0.432	0.510	98.46	252.7	0.521
0.640	309.91	1.792	0.668	0.717	98.15	259.9	0.742
1.000	310.61	1.888	1.000	1.000	99.41	273.8	1.000
0.000	326.02	2.467	0.000	0.000	127.15	357.8	0.000
0.309	324.98	2.450		0.390	125.27	355.3	
0.348	325.00	2.461	0.360	0.432	125.30	356.9	0.445
0.352	324.97	2.461	0.367	0.437	125.26	356.9	0.453
0.419	324.95	2.465	0.430	0.507	125.21	357.5	0.519
0.636	324.95	2.534	0.659	0.714	125.21	367.5	0.734
1.000	324.89	2.636	1.000	1.000	125.11	382.3	1.000

Table 16. Bubble-Point Pressures for R-125/143a Mixtures from 280 to 325 K (45 to 125°F).

x(R-125) Liquid Mole Fraction	Temperature K	Pressure MPa	x(R-125) Liquid Mass Fraction	Temperature °F	Pressure psia
0.3500	280.58	0.800	0.4347	45.36	116.0
0.3500	294.93	1.205	0.4347	71.19	174.8
0.3500	294.97	1.205	0.4347	71.26	174.8
0.3500	309.94	1.753	0.4347	98.20	254.3
0.3500	309.99	1.755	0.4347	98.29	254.5
0.3500	325.01	2.488	0.4347	125.33	360.9
0.3500	325.03	2.476	0.4347	125.37	359.1
0.6500	280.12	0.798	0.7262	44.53	115.7
0.6500	295.06	1.225	0.7262	71.42	177.7
0.6500	310.63	1.823	0.7262	99.45	264.4
0.6500	325.05	2.560	0.7262	125.40	371.3

Table 17. Near-Saturation (p,p,T) Data for R-125/143a Mixtures from 280 to 328 K (44 to 131°F).

x(R-125) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-125) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.3500	280.11	0.800	1107.6	0.4347	44.51	116.0	69.08
0.3500	294.92	1.205	1041.4	0.4347	71.17	174.8	64.96
0.3500	310.00	1.755	966.2	0.4347	98.31	254.5	60.27
0.3500	324.89	2.476	869.6	0.4347	125.11	359.1	54.24
0.6500	279.91	0.798	1199.4	0.7262	44.15	115.7	74.81
0.6500	294.40	1.225	1120.6	0.7262	70.23	177.7	69.89
0.6500	310.75	1.823	1032.5	0.7262	99.66	264.4	64.40
0.6500	325.02	2.560	929.4	0.7262	125.35	371.3	57.97

y(R-125)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-125)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.367	297.57	1.205	59.5	0.453	75.94	174.8	3.71
0.367	313.14	1.755	92.9	0.453	103.96	254.5	5.79
0.367	328.06	2.476	145.4	0.453	130.82	359.1	9.07
0.672	296.22	1.225	70.0	0.745	73.51	177.7	4.37
0.672	312.54	1.823	110.4	0.745	102.88	264.4	6.89
0.672	326.81	2.560	175.1	0.745	128.57	371.3	10.92

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 18. Isochoric (p,p,T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with x(R-125) = 0.49996 Mole Fraction (0.58812 Mass Fraction).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
200.002	3.7506	1436.26	-99.68	543.980	89.663
200.999	4.9935	1435.93	-97.89	724.248	89.642
202.001	6.2613	1435.68	-96.09	908.128	89.627
203.000	7.5391	1435.46	-94.29	1093.458	89.613
204.001	8.8261	1435.25	-92.49	1280.122	89.600
205.001	10.1129	1435.06	-90.69	1466.757	89.588
206.000	11.4026	1434.89	-88.89	1653.813	89.577
206.999	12.6913	1434.71	-87.09	1840.724	89.566
207.998	13.9760	1434.55	-85.29	2027.054	89.556
208.999	15.2691	1434.38	-83.49	2214.603	89.545
210.000	16.5530	1434.22	-81.69	2400.818	89.535
212.000	19.1238	1433.92	-78.09	2773.682	89.517
213.998	21.6852	1433.62	-74.49	3145.183	89.498
216.001	24.2425	1433.32	-70.89	3516.090	89.479
218.002	26.7839	1433.04	-67.28	3884.690	89.462
220.001	29.3202	1432.76	-63.69	4252.550	89.444
222.001	31.8491	1432.48	-60.09	4619.338	89.427
224.001	34.3699	1432.21	-56.49	4984.950	89.410
218.001	3.8638	1384.16	-67.29	560.399	86.410
218.999	4.9311	1383.88	-65.49	715.198	86.393
219.999	6.0153	1383.65	-63.69	872.449	86.378
220.999	7.1022	1383.44	-61.89	1030.091	86.365
222.000	8.1999	1383.26	-60.09	1189.299	86.354
224.000	10.3918	1382.91	-56.49	1507.208	86.332
226.001	12.5889	1382.59	-52.89	1825.872	86.312
228.001	14.7813	1382.29	-49.29	2143.854	86.294
230.000	16.9714	1382.00	-45.69	2461.502	86.275
232.000	19.1605	1381.72	-42.09	2779.005	86.258
234.000	21.3446	1381.45	-38.49	3095.783	86.241
235.999	23.5209	1381.18	-34.89	3411.430	86.224
238.001	25.6902	1380.92	-31.29	3726.061	86.208
239.999	27.8520	1380.65	-27.69	4039.605	86.191
241.998	30.0112	1380.40	-24.09	4352.772	86.176
244.002	32.1628	1380.14	-20.48	4664.836	86.159
246.000	34.3048	1379.89	-16.89	4975.508	86.144

Table 18. Isochoric (p,ρ,T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with x(R-125) = 0.49996 Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
232.002	3.7217	1341.20	-42.08	539.789	83.728
233.002	4.6604	1340.93	-40.28	675.936	83.712
233.998	5.6055	1340.70	-38.49	813.012	83.697
235.000	6.5633	1340.51	-36.69	951.930	83.685
236.000	7.5240	1340.33	-34.89	1091.268	83.674
237.000	8.4877	1340.16	-33.09	1231.041	83.663
238.000	9.4505	1340.00	-31.29	1370.684	83.653
238.999	10.4114	1339.84	-29.49	1510.051	83.643
240.000	11.3791	1339.69	-27.69	1650.405	83.634
242.001	13.3040	1339.41	-24.09	1929.589	83.617
244.001	15.2293	1339.13	-20.49	2208.831	83.599
246.000	17.1485	1338.86	-16.89	2487.188	83.582
248.001	19.0670	1338.60	-13.29	2765.444	83.566
250.001	20.9836	1338.34	-9.69	3043.424	83.550
252.000	22.8948	1338.09	-6.09	3320.622	83.534
253.999	24.8013	1337.84	-2.49	3597.137	83.519
256.002	26.7048	1337.59	1.12	3873.217	83.503
258.000	28.5988	1337.35	4.71	4147.920	83.488
260.000	30.4875	1337.11	8.31	4421.853	83.473
262.000	32.3738	1336.86	11.91	4695.439	83.457
263.999	34.2556	1336.62	15.51	4968.372	83.442
250.001	3.6410	1283.22	-9.69	528.084	80.109
250.999	4.4309	1282.97	-7.89	642.650	80.093
252.001	5.2340	1282.76	-6.09	759.130	80.080
253.000	6.0320	1282.58	-4.29	874.871	80.069
253.999	6.8381	1282.41	-2.49	991.786	80.058
256.000	8.4547	1282.10	1.11	1226.255	80.039
257.999	10.0704	1281.82	4.71	1460.593	80.021
259.998	11.6861	1281.55	8.31	1694.931	80.005
262.002	13.3063	1281.29	11.92	1929.922	79.988
263.998	14.9208	1281.03	15.51	2164.087	79.972
265.998	16.5348	1280.79	19.11	2398.178	79.957
268.002	18.1484	1280.54	22.72	2632.212	79.942
269.999	19.7557	1280.31	26.31	2865.332	79.927
271.998	21.3602	1280.07	29.91	3098.046	79.912

Table 18. Isochoric (p,ρ,T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with x(R-125) = 0.49996 Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
273.999	22.9642	1279.84	33.51	3330.687	79.898
276.002	24.5672	1279.61	37.12	3563.184	79.883
278.001	26.1621	1279.38	40.71	3794.505	79.869
280.001	27.7544	1279.15	44.31	4025.449	79.855
282.000	29.3470	1278.92	47.91	4256.437	79.840
284.002	30.9361	1278.70	51.52	4486.918	79.827
286.002	32.5217	1278.47	55.12	4716.890	79.812
288.001	34.1018	1278.25	58.71	4946.065	79.799
263.999	3.7705	1235.68	15.51	546.867	77.141
264.998	4.4605	1235.46	17.31	646.943	77.127
266.000	5.1538	1235.28	19.11	747.498	77.116
266.999	5.8503	1235.11	20.91	848.517	77.105
268.001	6.5504	1234.95	22.71	950.059	77.095
270.000	7.9488	1234.66	26.31	1152.880	77.077
272.000	9.3522	1234.39	29.91	1356.427	77.060
274.000	10.7530	1234.13	33.51	1559.596	77.044
276.001	12.1586	1233.89	37.11	1763.462	77.029
277.998	13.5561	1233.65	40.71	1966.153	77.014
279.998	14.9587	1233.41	44.31	2169.584	76.999
284.000	17.7592	1232.95	51.51	2575.763	76.971
287.999	20.5526	1232.51	58.71	2980.913	76.943
291.999	23.3373	1232.06	65.91	3384.801	76.915
295.999	26.1108	1231.64	73.11	3787.065	76.889
300.000	28.8753	1231.20	80.31	4188.023	76.861
304.000	31.6335	1230.78	87.51	4588.067	76.835
308.001	34.3803	1230.35	94.71	4986.458	76.808
280.001	3.6831	1175.50	44.31	534.190	73.384
281.001	4.2625	1175.30	46.11	618.226	73.372
282.000	4.8396	1175.13	47.91	701.927	73.361
283.000	5.4219	1174.97	49.71	786.383	73.351
284.000	6.0052	1174.82	51.51	870.984	73.342
286.001	7.1726	1174.55	55.11	1040.301	73.325
288.001	8.3444	1174.30	58.71	1210.257	73.309
290.001	9.5156	1174.06	62.31	1380.126	73.294

Table 18. Isochoric (p,ρ,T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with x(R-125) = 0.49996 Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
292.000	10.6859	1173.82	65.91	1549.864	73.279
294.000	11.8569	1173.59	69.51	1719.704	73.265
296.000	13.0286	1173.37	73.12	1889.645	73.251
297.999	14.1973	1173.16	76.71	2059.151	73.238
300.001	15.3698	1172.94	80.31	2229.209	73.224
302.002	16.5391	1172.73	83.92	2398.802	73.211
304.001	17.7094	1172.52	87.51	2568.540	73.198
306.000	18.8757	1172.31	91.11	2737.698	73.185
308.002	20.0449	1172.11	94.72	2907.277	73.172
310.001	21.2109	1171.90	98.31	3076.392	73.159
311.999	22.3755	1171.70	101.91	3245.303	73.147
316.000	24.7019	1171.29	109.11	3582.720	73.121
319.999	27.0204	1170.89	116.31	3918.991	73.096
324.001	29.3345	1170.49	123.51	4254.624	73.071
328.000	31.6369	1170.09	130.71	4588.560	73.046
332.000	33.9380	1169.69	137.91	4922.308	73.021
296.001	3.3401	1104.63	73.11	484.442	68.960
296.999	3.8033	1104.44	74.91	551.624	68.948
298.000	4.2701	1104.27	76.71	619.328	68.937
298.998	4.7359	1104.12	78.51	686.887	68.928
300.000	5.2037	1103.98	80.31	754.736	68.919
302.000	6.1457	1103.72	83.91	891.362	68.903
304.000	7.0887	1103.48	87.51	1028.133	68.888
306.001	8.0369	1103.25	91.11	1165.658	68.874
308.001	8.9843	1103.03	94.71	1303.067	68.860
310.000	9.9300	1102.82	98.31	1440.230	68.847
312.002	10.8795	1102.61	101.92	1577.944	68.834
316.001	12.7777	1102.21	109.11	1853.255	68.809
320.001	14.6770	1101.81	116.31	2128.726	68.784
324.002	16.5700	1101.44	123.52	2403.284	68.761
328.001	18.4665	1101.07	130.71	2678.349	68.738
332.002	20.3606	1100.71	137.92	2953.066	68.715
336.000	22.2523	1100.33	145.11	3227.435	68.691
340.000	24.1464	1099.96	152.31	3502.151	68.668
344.000	26.0347	1099.58	159.51	3776.027	68.645

Table 18. Isochoric (p,ρ,T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with x(R-125) = 0.49996 Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
347.999	27.9191	1099.21	166.71	4049.337	68.621
352.000	29.8009	1098.84	173.91	4322.270	68.598
355.999	31.6740	1098.47	181.11	4593.941	68.575
359.998	33.5435	1098.10	188.31	4865.090	68.552
364.000	35.4096	1097.72	195.51	5135.746	68.528
312.000	3.7918	1028.84	101.91	549.956	64.228
313.000	4.1628	1028.70	103.71	603.765	64.220
313.999	4.5353	1028.56	105.51	657.792	64.211
315.000	4.9070	1028.44	107.31	711.703	64.203
316.000	5.2799	1028.32	109.11	765.787	64.196
318.001	6.0293	1028.09	112.71	874.479	64.182
320.002	6.7805	1027.88	116.32	983.432	64.168
323.999	8.2885	1027.47	123.51	1202.149	64.143
327.999	9.8011	1027.09	130.71	1421.534	64.119
332.001	11.3174	1026.72	137.91	1641.456	64.096
335.998	12.8365	1026.35	145.11	1861.783	64.073
340.000	14.3596	1025.99	152.31	2082.691	64.050
344.000	15.8825	1025.64	159.51	2303.570	64.029
348.000	17.4077	1025.29	166.71	2524.782	64.007
352.001	18.9314	1024.94	173.91	2745.777	63.985
356.000	20.4540	1024.59	181.11	2966.612	63.963
360.000	21.9768	1024.25	188.31	3187.476	63.942
363.999	23.4986	1023.90	195.51	3408.196	63.920
367.999	25.0183	1023.56	202.71	3628.610	63.899
372.000	26.5365	1023.21	209.91	3848.807	63.877
376.000	28.0523	1022.87	217.11	4068.656	63.856
380.001	29.5659	1022.52	224.31	4288.186	63.834
383.999	31.0747	1022.18	231.51	4507.020	63.813
388.001	32.5831	1021.83	238.71	4725.796	63.791
392.001	34.0861	1021.48	245.91	4943.788	63.769
328.002	3.7130	919.21	130.72	538.527	57.384
329.001	3.9760	919.09	132.51	576.672	57.377
329.998	4.2397	918.98	134.31	614.919	57.370
331.001	4.5041	918.87	136.11	653.267	57.363

Table 18. Isochoric (p,ρ,T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with x(R-125) = 0.49896 Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
331.999	4.7706	918.77	137.91	691.919	57.357
334.002	5.3040	918.57	141.52	769.283	57.344
335.999	5.8395	918.38	145.11	846.951	57.333
340.001	6.9193	918.03	152.31	1003.563	57.311
344.001	8.0054	917.69	159.51	1161.089	57.290
348.001	9.0986	917.36	166.71	1319.645	57.269
352.001	10.1956	917.03	173.91	1478.752	57.248
355.999	11.2964	916.72	181.11	1638.410	57.229
360.002	12.4010	916.40	188.32	1798.619	57.209
363.999	13.5094	916.09	195.51	1959.380	57.190
368.001	14.6199	915.78	202.71	2120.445	57.170
372.000	15.7311	915.47	209.91	2281.611	57.151
376.002	16.8436	915.16	217.12	2442.966	57.132
380.002	17.9569	914.86	224.32	2604.437	57.113
383.999	19.0718	914.55	231.51	2766.140	57.094
388.000	20.1849	914.24	238.71	2927.582	57.074
391.999	21.2995	913.94	245.91	3089.242	57.055
396.001	22.4140	913.63	253.11	3250.887	57.036
399.998	23.5269	913.32	260.31	3412.300	57.017
344.000	4.5684	788.09	159.51	662.593	49.199
344.999	4.7457	788.01	161.31	688.308	49.194
346.000	4.9244	787.93	163.11	714.226	49.189
347.000	5.1033	787.85	164.91	740.174	49.184
348.001	5.2827	787.78	166.71	766.194	49.180
350.001	5.6438	787.63	170.31	818.567	49.170
351.999	6.0069	787.49	173.91	871.230	49.161
356.000	6.7392	787.20	181.11	977.442	49.143
359.999	7.4781	786.92	188.31	1084.610	49.126
364.002	8.2235	786.65	195.52	1192.722	49.109
368.001	8.9734	786.38	202.71	1301.486	49.092
372.000	9.7269	786.11	209.91	1410.772	49.075
376.001	10.4834	785.85	217.11	1520.494	49.059
380.000	11.2428	785.59	224.31	1630.636	49.043
384.002	12.0050	785.32	231.52	1741.184	49.026
388.000	12.7683	785.06	238.71	1851.892	49.010

Table 18. Isochoric (p,p,T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with x(R-125) = 0.49996 Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
392.000	13.5340	784.80	245.91	1962.948	48.993
396.001	14.3007	784.54	253.11	2074.148	48.977
399.999	15.0681	784.28	260.31	2185.451	48.961
359.999	6.3326	717.08	188.31	918.469	44.766
361.999	6.6333	716.96	191.91	962.082	44.758
364.001	6.9356	716.83	195.51	1005.927	44.750
365.999	7.2384	716.71	199.11	1049.845	44.743
368.000	7.5426	716.59	202.71	1093.965	44.735
370.000	7.8479	716.47	206.31	1138.246	44.728
372.000	8.1541	716.35	209.91	1182.656	44.720
375.999	8.7690	716.11	217.11	1271.840	44.705
380.000	9.3875	715.87	224.31	1361.547	44.690
384.000	10.0079	715.63	231.51	1451.528	44.675
388.002	10.6302	715.39	238.72	1541.786	44.660
391.999	11.2548	715.15	245.91	1632.376	44.645
396.000	11.8807	714.92	253.11	1723.156	44.631
399.999	12.5078	714.68	260.31	1814.109	44.616
360.001	5.4741	609.87	188.31	793.954	38.073
362.001	5.6949	609.77	191.91	825.978	38.067
364.002	5.9167	609.66	195.52	858.148	38.060
366.000	6.1395	609.56	199.11	890.462	38.054
368.001	6.3631	609.46	202.71	922.893	38.047
370.001	6.5877	609.35	206.31	955.468	38.040
371.998	6.8122	609.25	209.91	988.030	38.034
376.000	7.2640	609.05	217.11	1053.558	38.022
380.002	7.7179	608.84	224.32	1119.391	38.009
384.000	8.1732	608.65	231.51	1185.427	37.997
388.000	8.6302	608.44	238.71	1251.709	37.984
392.000	9.0882	608.24	245.91	1318.137	37.971
396.000	9.5472	608.04	253.11	1384.709	37.959
399.998	10.0079	607.84	260.31	1451.528	37.946

Table 18. Isochoric (p,ρ,T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with x(R-125) = 0.49996 Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
360.000	4.8317	426.20	188.31	700.781	26.607
362.001	4.9666	426.13	191.91	720.347	26.602
364.000	5.1014	426.06	195.51	739.898	26.598
365.999	5.2360	425.99	199.11	759.420	26.594
367.999	5.3703	425.92	202.71	778.899	26.589
369.999	5.5042	425.86	206.31	798.319	26.586
372.002	5.6386	425.79	209.92	817.813	26.581
376.001	5.9060	425.65	217.11	856.596	26.572
380.001	6.1729	425.51	224.31	895.307	26.564
383.999	6.4393	425.37	231.51	933.945	26.555
388.000	6.7051	425.24	238.71	972.496	26.547
392.002	6.9705	425.10	245.92	1010.989	26.538
396.000	7.2353	424.96	253.11	1049.395	26.529
400.000	7.4996	424.83	260.31	1087.729	26.521
360.002	3.8467	224.68	188.32	557.919	14.026
361.999	3.9073	224.67	191.91	566.708	14.026
364.000	3.9676	224.64	195.51	575.454	14.024
365.999	4.0278	224.61	199.11	584.185	14.022
368.001	4.0875	224.58	202.71	592.844	14.020
369.999	4.1467	224.55	206.31	601.430	14.018
372.000	4.2059	224.51	209.91	610.016	14.016
376.000	4.3232	224.43	217.11	627.029	14.011
379.999	4.4398	224.36	224.31	643.941	14.006
384.000	4.5556	224.29	231.51	660.736	14.002
388.000	4.6706	224.21	238.71	677.416	13.997
392.000	4.7848	224.14	245.91	693.979	13.993
396.001	4.8984	224.06	253.11	710.455	13.988
400.000	5.0114	223.99	260.31	726.845	13.983
359.999	2.1310	90.32	188.31	309.076	5.638
362.000	2.1501	90.30	191.91	311.847	5.637
364.002	2.1691	90.29	195.52	314.602	5.637
366.000	2.1881	90.27	199.11	317.358	5.635
367.999	2.2070	90.25	202.71	320.099	5.634
370.000	2.2258	90.23	206.31	322.826	5.633

Table 18. Isochoric (p, ρ, T) Data from 200 to 400 K (-100 to 260°F) for a Mixture of R-125/143a with $x(\text{R-125}) = 0.49996$ Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
372.002	2.2443	90.21	209.92	325.509	5.632
375.999	2.2815	90.17	217.11	330.905	5.629
379.999	2.3185	90.14	224.31	336.271	5.627
384.001	2.3553	90.10	231.51	341.609	5.625
388.000	2.3919	90.06	238.71	346.917	5.622
392.000	2.4282	90.02	245.91	352.182	5.620
395.999	2.4644	89.98	253.11	357.432	5.617
400.000	2.5004	89.93	260.31	362.654	5.614

Table 19. Isochoric Heat Capacities (C_v) from 205 to 344 K (-90 to 160°F) for a Mixture of R-125/143a with $x(\text{R-125}) = 0.49996$ Mole Fraction (0.58812 Mass Fraction).

Temperature K	Heat Capacity J/(mole·K)	Density kg/m ³	Pressure MPa	Temperature °F	Heat Capacity BTU/(lb·°F)	Density lb/ft ³	Pressure psia
205.344	79.81	1423.91	5.993	-90.07	0.1815	88.892	869.2
209.396	80.55	1422.62	10.830	-82.78	0.1832	88.811	1570.8
213.409	80.99	1421.37	15.576	-75.55	0.1842	88.733	2259.0
213.471	80.93	1421.35	15.649	-75.44	0.1841	88.732	2269.7
217.471	81.62	1420.11	20.343	-68.24	0.1856	88.655	2950.5
221.438	82.28	1418.89	24.962	-61.10	0.1871	88.578	3620.4
225.368	82.82	1417.69	29.491	-54.03	0.1884	88.504	4277.3
224.591	81.79	1368.69	5.976	-55.42	0.1861	85.445	866.8
228.625	82.40	1367.58	10.114	-48.16	0.1874	85.375	1467.0
232.628	83.25	1366.48	14.190	-40.96	0.1893	85.307	2058.1
236.602	83.77	1365.40	18.201	-33.80	0.1906	85.239	2639.9
240.542	84.51	1364.33	22.140	-26.71	0.1922	85.172	3211.2
244.456	84.77	1363.28	26.015	-19.67	0.1928	85.107	3773.1
248.328	85.63	1362.24	29.806	-12.70	0.1948	85.042	4323.0
242.601	84.18	1312.65	5.503	-23.01	0.1915	81.946	798.2
246.619	84.61	1311.67	9.011	-15.77	0.1925	81.885	1307.0
250.613	85.13	1310.72	12.477	-8.58	0.1936	81.826	1809.6
254.577	85.69	1309.78	15.893	-1.45	0.1949	81.767	2305.2
258.518	86.52	1308.85	19.266	5.64	0.1968	81.709	2794.3
262.438	87.08	1307.93	22.594	12.70	0.1981	81.651	3277.0
266.329	87.44	1307.02	25.871	19.70	0.1988	81.595	3752.3
270.200	88.31	1306.12	29.101	26.67	0.2008	81.538	4220.8
274.049	89.06	1305.22	32.282	33.60	0.2026	81.482	4682.1
263.312	86.95	1244.09	5.209	14.27	0.1978	77.666	755.4
267.338	87.34	1243.28	8.087	21.52	0.1987	77.615	1172.9
271.337	88.18	1242.47	10.935	28.72	0.2006	77.565	1586.0
275.322	88.73	1241.67	13.761	35.89	0.2018	77.515	1995.8
279.279	89.13	1240.89	16.553	43.01	0.2028	77.466	2400.9
283.221	89.51	1240.10	19.319	50.11	0.2036	77.417	2802.0
287.141	90.20	1239.33	22.052	57.17	0.2051	77.369	3198.4
291.048	90.72	1238.56	24.760	64.20	0.2064	77.321	3591.2
294.933	91.20	1237.80	27.436	71.19	0.2074	77.273	3979.3
298.806	92.21	1237.03	30.085	78.16	0.2097	77.225	4363.5

Table 19. Isochoric Heat Capacities (C_v) from 205 to 344 K (-90 to 160°F) for a Mixture of R-125/143a with $x(\text{R-125}) = 0.49996$ Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Heat Capacity J/(mole·K)	Density kg/m ³	Pressure MPa	Temperature °F	Heat Capacity BTU/(lb·°F)	Density lb/ft ³	Pressure psia
302.674	92.44	1236.27	32.714	85.13	0.2103	77.178	4744.8
283.541	89.92	1169.63	4.960	50.69	0.2046	73.018	719.3
287.598	90.26	1168.95	7.288	57.99	0.2053	72.975	1057.0
291.637	90.58	1168.27	9.602	65.26	0.2060	72.933	1392.7
295.661	91.21	1167.61	11.904	72.50	0.2075	72.892	1726.5
299.678	91.91	1166.95	14.195	79.73	0.2090	72.850	2058.8
303.680	91.96	1166.28	16.470	86.94	0.2091	72.808	2388.8
307.668	92.79	1165.63	18.728	94.11	0.2110	72.768	2716.2
311.647	93.39	1164.98	20.970	101.28	0.2125	72.727	3041.5
315.613	94.11	1164.33	23.195	108.42	0.2141	72.687	3364.2
319.573	94.59	1163.67	25.407	115.54	0.2151	72.646	3685.0
323.529	95.08	1163.03	27.606	122.66	0.2163	72.606	4003.9
327.471	95.67	1162.38	29.788	129.76	0.2176	72.565	4320.5
331.413	96.12	1161.73	31.962	136.86	0.2187	72.524	4635.7
283.602	89.70	1169.62	4.994	50.80	0.2040	73.017	724.4
287.663	90.62	1168.94	7.325	58.11	0.2061	72.975	1062.3
291.722	90.84	1168.26	9.651	65.41	0.2067	72.932	1399.7
295.752	91.29	1167.59	11.956	72.67	0.2076	72.890	1734.1
299.776	91.87	1166.93	14.251	79.91	0.2089	72.849	2066.9
303.783	92.42	1166.27	16.528	87.12	0.2102	72.808	2397.2
307.783	92.95	1165.61	18.793	94.32	0.2114	72.767	2725.6
311.771	93.41	1164.96	21.040	101.50	0.2125	72.726	3051.6
315.755	93.97	1164.31	23.275	108.67	0.2137	72.686	3375.7
319.717	94.50	1163.65	25.487	115.80	0.2149	72.644	3696.6
323.666	94.61	1163.01	27.682	122.91	0.2152	72.604	4014.9
327.618	95.42	1162.36	29.870	130.02	0.2170	72.564	4332.2
331.574	96.49	1161.70	32.051	137.15	0.2195	72.523	4648.6
295.577	91.61	1119.26	4.730	72.35	0.2084	69.873	686.1
299.643	92.44	1118.66	6.738	79.67	0.2103	69.836	977.2
303.695	92.87	1118.07	8.738	86.96	0.2112	69.799	1267.4
307.733	92.90	1117.47	10.732	94.23	0.2113	69.761	1556.5
311.754	93.44	1116.89	12.715	101.47	0.2126	69.725	1844.1
315.766	93.84	1116.31	14.690	108.69	0.2134	69.689	2130.6
319.763	94.34	1115.73	16.652	115.89	0.2146	69.653	2415.2

Table 19. Isochoric Heat Capacities (C_v) from 205 to 344 K (-90 to 160°F) for a Mixture of R-125/143a with $x(\text{R-125}) = 0.49996$ Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Heat Capacity J/(mole·K)	Density kg/m ³	Pressure MPa	Temperature °F	Heat Capacity BTU/(lb·°F)	Density lb/ft ³	Pressure psia
323.757	94.60	1115.15	18.609	123.07	0.2151	69.617	2699.0
327.714	95.46	1114.58	20.541	130.20	0.2171	69.581	2979.2
331.690	96.10	1113.99	22.476	137.35	0.2186	69.544	3259.9
335.682	96.60	1113.41	24.413	144.54	0.2197	69.508	3540.8
339.691	97.48	1112.83	26.350	151.76	0.2217	69.472	3821.8
343.704	97.55	1112.25	28.283	158.98	0.2219	69.436	4102.1
295.602	91.48	1119.26	4.743	72.40	0.2081	69.873	687.9
299.724	92.12	1118.65	6.777	79.82	0.2095	69.835	983.0
303.838	92.73	1118.04	8.809	87.22	0.2109	69.797	1277.7
307.944	92.88	1117.44	10.836	94.61	0.2112	69.760	1571.6
312.015	93.36	1116.85	12.843	101.94	0.2124	69.723	1862.8
316.079	94.16	1116.26	14.843	109.25	0.2142	69.686	2152.8
320.159	94.42	1115.67	16.847	116.60	0.2148	69.649	2443.4
324.227	94.66	1115.08	18.838	123.92	0.2153	69.612	2732.3
328.290	95.21	1114.49	20.822	131.23	0.2166	69.575	3019.9
332.328	95.58	1113.90	22.786	138.50	0.2174	69.539	3304.9
336.350	95.94	1113.32	24.736	145.74	0.2182	69.502	3587.7
340.383	96.34	1112.74	26.684	153.00	0.2191	69.466	3870.2
344.440	97.26	1112.15	28.636	160.30	0.2212	69.429	4153.3
306.100	93.35	1070.20	4.587	91.29	0.2124	66.810	665.3
310.268	93.49	1069.66	6.361	98.79	0.2127	66.777	922.6
314.448	93.99	1069.12	8.144	106.32	0.2138	66.743	1181.2
318.627	94.40	1068.58	9.929	113.84	0.2148	66.709	1440.0
322.797	94.77	1068.05	11.710	121.35	0.2156	66.676	1698.4
326.970	95.24	1067.51	13.493	128.86	0.2167	66.642	1957.0
331.132	95.79	1066.98	15.269	136.35	0.2179	66.609	2214.6
335.297	96.41	1066.44	17.045	143.85	0.2193	66.576	2472.1
339.464	96.88	1065.91	18.818	151.35	0.2204	66.543	2729.3
343.630	96.90	1065.37	20.587	158.85	0.2204	66.509	2985.8
306.153	94.03	1070.19	4.610	91.39	0.2139	66.810	668.6
310.354	93.95	1069.65	6.398	98.95	0.2137	66.776	927.9
314.537	93.94	1069.11	8.182	106.48	0.2137	66.742	1186.7
318.722	94.31	1068.57	9.969	114.01	0.2146	66.709	1445.9
322.899	94.97	1068.03	11.754	121.53	0.2160	66.675	1704.7
327.073	95.51	1067.50	13.536	129.04	0.2172	66.642	1963.3

Table 19. Isochoric Heat Capacities (C_v) from 205 to 344 K (-90 to 160°F) for a Mixture of R-125/143a with $x(\text{R-125}) = 0.49996$ Mole Fraction (0.58812 Mass Fraction) (continued).

Temperature K	Heat Capacity J/(mole·K)	Density kg/m ³	Pressure MPa	Temperature °F	Heat Capacity BTU/(lb·°F)	Density lb/ft ³	Pressure psia
331.244	95.82	1066.96	15.317	136.55	0.2180	66.608	2221.5
335.415	95.78	1066.43	17.095	144.06	0.2179	66.575	2479.4
339.571	96.52	1065.89	18.863	151.54	0.2195	66.541	2735.9
343.742	97.07	1065.36	20.634	159.05	0.2208	66.508	2992.7
317.080	95.46	1012.12	4.514	111.06	0.2171	63.185	654.7
321.317	95.94	1011.64	6.025	118.68	0.2182	63.155	873.9
325.544	96.00	1011.17	7.539	126.29	0.2184	63.125	1093.4
329.763	96.35	1010.70	9.053	133.89	0.2191	63.096	1313.1
333.968	96.72	1010.23	10.566	141.45	0.2200	63.067	1532.5
338.182	96.64	1009.77	12.084	149.04	0.2198	63.038	1752.6
342.377	97.38	1009.30	13.596	156.59	0.2215	63.009	1972.0
317.078	95.30	1012.12	4.514	111.05	0.2168	63.185	654.6
321.305	95.82	1011.65	6.021	118.66	0.2180	63.155	873.2
325.537	96.21	1011.17	7.536	126.28	0.2188	63.125	1093.0
329.755	96.46	1010.70	9.051	133.87	0.2194	63.096	1312.7
333.983	96.77	1010.23	10.572	141.48	0.2201	63.067	1533.3
338.205	97.13	1009.76	12.092	149.08	0.2209	63.037	1753.8
342.412	97.47	1009.29	13.609	156.65	0.2217	63.008	1973.8

Table 20. Vapor-Liquid Equilibrium Data for R-143a/134a Mixtures from 280 to 340 K (45 to 152°F).

x(R-143a) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-143a) Vapor Mole Fraction	x(R143a) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-143a) Vapor Mass Fraction
0.000	280.39	0.379	0.000	0.000	45.01	55.0	0.000
0.165	280.20	0.441		0.140	44.68	64.0	
0.304	280.17	0.491	0.446	0.265	44.63	71.2	0.399
0.515	280.13	0.569	0.643	0.467	44.54	82.6	0.597
0.578	280.11	0.595	0.703	0.530	44.52	86.3	0.661
1.000	280.23	0.767	1.000	1.000	44.73	111.3	1.000
0.000	294.69	0.596	0.000	0.000	70.75	86.5	0.000
0.194	295.09	0.715	0.294	0.165	71.47	103.8	0.255
0.381	295.10	0.808	0.519	0.336	71.49	117.2	0.471
0.601	295.08	0.935	0.707	0.554	71.46	135.6	0.665
1.000	294.11	1.135	1.000	1.000	69.71	164.6	1.000
0.000	309.31	0.913	0.000	0.000	97.07	132.4	0.000
0.198	309.87	1.072	0.285	0.169	98.07	155.5	0.247
0.237	309.94	1.102	0.330	0.204	98.21	159.9	0.289
0.348	310.02	1.183	0.459	0.305	98.35	171.5	0.411
0.372	310.02	1.202	0.474	0.328	98.36	174.3	0.426
0.595	309.90	1.374	0.679	0.548	98.14	199.2	0.635
1.000	309.37	1.677	1.000	1.000	97.18	243.2	1.000
0.000	324.50	1.367	0.000	0.000	124.41	198.3	0.000
0.290	324.93	1.628	0.382	0.308	125.18	236.2	0.337
0.351	324.88	1.694		0.599	125.10	245.7	
0.645	324.98	2.007	0.704	0.588	125.27	291.1	0.662
1.000	326.02	2.467	1.000	1.000	127.15	357.8	1.000
0.000	340.16	1.986	0.000	0.000	152.6	288.1	0.000
0.261	340.00	2.263	0.328	0.225	152.31	328.2	0.287
0.351	339.79	2.405	0.426	0.308	151.94	348.8	0.379
0.480	339.76	2.554	0.538	0.432	151.87	370.5	0.490
0.634	339.07	2.774	0.690	0.588	150.64	402.3	0.647
1.000	340.07	3.318	1.000	1.000	152.44	481.2	1.000

Table 21. Bubble-Point Pressures for R-143a/134a Mixtures from 281 to 340 K (46 to 153°F).

x(R-143a) Liquid Mole Fraction	Temperature K	Pressure MPa	x(R-143a) Liquid Mass Fraction	Temperature °F	Pressure psia
0.3500	280.85	0.522	0.3072	45.84	75.7
0.3500	294.48	0.786	0.3072	70.38	114.0
0.3500	295.10	0.798	0.3072	71.49	115.7
0.3500	310.43	1.203	0.3072	99.09	174.5
0.3500	324.96	1.709	0.3072	125.24	247.8
0.3500	339.62	2.361	0.3072	151.63	342.4
0.6502	280.92	0.648	0.6049	45.97	94.0
0.6502	295.00	0.970	0.6049	71.31	140.6
0.6502	309.88	1.427	0.6049	98.10	207.0
0.6502	325.04	2.042	0.6049	125.38	296.2
0.6502	340.12	2.818	0.6049	152.53	408.7

Table 22. Near-Saturation (p,ρ,T) Data for R-143a/134a Mixtures from 280 to 343 K (45 to 158°F).

x(R-143a) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-143a) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.3500	282.63	0.522	1173.5	0.3072	49.05	75.7	73.19
0.3500	294.07	0.786	1131.7	0.3072	69.64	114.0	70.59
0.3500	294.07	0.798	1128.0	0.3072	69.63	115.7	70.36
0.3500	310.56	1.203	1059.1	0.3072	99.32	174.5	66.06
0.3500	324.99	1.709	994.8	0.3072	125.29	247.8	62.05
0.3500	339.67	2.361	915.5	0.3072	151.72	342.4	57.10
0.6502	280.22	0.648	1092.7	0.6049	44.71	94.0	68.15
0.6502	294.99	0.970	1038.1	0.6049	71.29	140.6	64.75
0.6502	310.05	1.427	976.6	0.6049	98.40	207.0	60.91
0.6502	325.23	2.042	902.5	0.6049	125.73	296.2	56.29
0.6502	340.17	2.818	803.3	0.6049	152.62	408.8	50.10

y(R-143a)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-143a)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.471	311.90	1.203	61.9	0.423	101.73	174.5	3.86
0.463	326.21	1.709	86.1	0.415	127.49	247.8	5.37
0.417	340.88	2.361	129.0	0.371	153.90	342.4	8.04
0.708	312.70	1.427	65.4	0.666	103.17	207.0	4.08
0.718	327.98	2.042	100.1	0.678	130.68	296.2	6.25
0.668	343.23	2.818	152.4	0.624	158.13	408.8	9.51

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 23. Vapor-Liquid Equilibrium Data for R-32/290 Mixtures from 280 to 341 K (44 to 154°F). ("LL" indicates possible liquid-liquid immiscibility)

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-32) Vapor Mole Fraction	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-32) Vapor Mass Fraction
0.000	280.00	0.580	0.000	0.000	44.31	84.1	0.000
0.097	279.97	0.970		0.112	44.25	140.7	
0.204	279.97	1.121		0.232	44.25	162.6	
0.366	280.25	1.260	0.643	0.405	44.78	182.7	0.680
0.348	280.66	1.255	0.655	0.386	45.51	181.9	0.691
LL	280.37	1.299	0.686	LL	44.99	188.4	0.720
LL	280.39	1.293	0.687	LL	45.03	187.5	0.721
LL	280.21	1.289	0.722	LL	44.71	186.9	0.754
LL	280.32	1.284	0.687	LL	44.90	186.2	0.721
LL	280.03	1.270	0.705	LL	44.38	184.2	0.738
LL	280.00	1.269	0.735	LL	44.33	184.0	0.766
0.755	279.96	1.246		0.784	44.24	180.7	
0.843	280.26	1.262	0.739	0.864	44.80	183.1	0.770
0.907	280.33	1.242	0.770	0.920	44.92	180.2	0.798
0.935	280.31	1.226	0.790	0.944	44.89	177.9	0.816
0.978	280.49	1.135	0.890	0.981	45.21	164.6	0.905
0.978	280.42	1.134	0.890	0.981	45.08	164.5	0.905
0.982	279.96	1.096		0.985	44.23	159.0	
1.000	280.00	1.006	1.000	1.000	44.31	145.9	1.000
0.000	294.80	0.873	0.000	0.000	70.95	126.6	0.000
0.084	294.96	1.413	0.300	0.098	71.23	205.0	0.336
0.135	295.93	1.533	0.437	0.156	73.01	222.4	0.478
0.180	294.95	1.670		0.206	71.23	242.2	
0.232	294.95	1.742		0.263	71.23	252.7	
0.337	294.46	1.767	0.622	0.375	70.37	256.2	0.6601
LL	294.70	1.883	0.700	LL	70.78	273.0	0.734
LL	294.80	1.884	0.703	LL	70.96	273.2	0.736
LL	294.52	1.879	0.692	LL	70.47	272.6	0.726
0.857	293.15	1.778	0.778	0.876	68.01	257.8	0.805
0.857	293.01	1.773	0.778	0.876	67.74	257.1	0.805
0.935	295.82	1.681	0.869	0.944	72.81	243.8	0.887
0.962	294.91	1.644		0.968	71.16	238.5	
1.000	295.48	1.575	1.000	1.000	72.18	228.4	1.000
0.000	309.49	1.259	0.000	0.000	97.39	182.6	0.000
0.112	310.81	1.916	0.337	0.130	99.79	277.9	0.375

Table 23. Vapor-Liquid Equilibrium Data for R-32/290 Mixtures from 280 to 341 K (44 to 154°F)
(continued). ("LL" indicates possible liquid-liquid immiscibility)

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-32) Vapor Mole Fraction	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-32) Vapor Mass Fraction
0.127	310.16	1.937	0.347	0.146	98.62	281.0	0.385
0.120	309.94	1.982		0.139	98.21	287.4	
0.026	309.94	1.498		0.031	98.21	217.3	
0.306	309.93	2.530		0.342	98.19	366.9	
0.306	310.25	2.448		0.342	98.78	355.1	
0.306	310.24	2.446		0.342	98.76	354.8	
0.395	309.93	2.641		0.435	98.18	383.1	
0.618	310.07	2.710	0.637	0.656	98.46	393.1	0.674
0.667	310.10	2.767	0.694	0.703	98.51	401.4	0.728
0.667	310.08	2.767	0.694	0.703	98.48	401.4	0.728
0.707	310.84	2.781	0.713	0.740	99.84	403.3	0.746
0.707	310.79	2.779	0.713	0.740	99.75	403.1	0.746
0.833	310.32	2.722	0.795	0.855	98.91	394.7	0.821
0.930	309.83	2.513	0.887	0.94	98.03	364.5	0.903
1.000	309.98	2.294	1.000	1.000	98.28	332.7	1.000
0.000	324.69	1.775	0.000	0.000	124.75	257.4	0.000
0.112	325.13	2.549	0.290	0.130	125.56	369.7	0.325
0.136	324.95	2.843		0.157	125.22	412.3	
0.219	324.95	3.204		0.249	125.23	464.7	
0.341	325.07	3.353	0.486	0.379	125.46	486.3	0.527
0.397	324.96	3.626		0.437	125.23	525.9	
0.449	324.95	3.706	0.535	0.490	125.23	537.6	0.576
0.559	324.39	3.724	0.604	0.599	124.23	540.2	0.643
0.808	324.76	3.794	0.761	0.832	124.90	550.3	0.790
0.914	325.22	3.634	0.860	0.926	125.73	527.1	0.879
0.914	325.23	3.638	0.860	0.926	125.74	527.6	0.879
1.000	324.98	3.279	1.000	1.000	125.28	475.6	1.000
0.000	341.17	2.493	0.000	0.000	154.42	361.5	0.000
0.163	340.31	3.660	0.302	0.187	152.89	530.9	0.338
0.202	340.09	3.884		0.230	152.49	563.4	
0.224	340.33	4.004	0.366	0.254	152.92	580.7	0.405
0.255	340.31	4.167	0.397	0.288	152.89	604.4	0.437
0.255	340.30	4.167	0.397	0.288	152.87	604.3	0.437
0.430	340.01	4.811		0.471	152.35	697.8	
0.493	339.97	4.583	0.574	0.534	152.25	664.7	0.614

Table 23. Vapor-Liquid Equilibrium Data for R-32/290 Mixtures from 280 to 341 K (44 to 154°F)
(continued). ("LL" indicates possible liquid-liquid immiscibility)

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-32) Vapor Mole Fraction	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-32) Vapor Mass Fraction
0.538	340.04	4.738		0.579	152.38	687.2	
0.873	339.62	5.140	0.801	0.890	151.65	745.5	0.826
0.918	339.74	4.953	0.876	0.930	151.86	718.3	0.893
0.971	340.00	4.731	0.958	0.975	152.32	686.1	0.964
1.000	339.96	4.561	1.000	1.000	152.24	661.5	1.000

Table 24. Near-Saturation (p,ρ,T) Data for R-32/290 Mixtures from 278 to 341 K (42 to 153°F).

x(R-32) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-32) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.843	278.55	1.262	849.5	0.864	41.70	183.1	52.99
0.907	278.53	1.242	886.4	0.920	41.66	180.2	55.29
0.935	278.48	1.226	908.5	0.944	41.57	177.8	56.67
0.978	279.32	1.134	983.6	0.981	43.09	164.5	61.35
0.997	279.65	1.120	999.6	0.997	43.69	162.4	62.35
0.857	291.75	1.773	855.7	0.876	65.46	257.1	53.37
0.135	293.76	1.533	532.8	0.156	69.08	222.4	33.23
0.337	292.99	1.767	590.6	0.375	67.69	256.2	36.84
0.445	294.04	1.846	615.6	0.486	69.58	267.8	38.39
0.935	293.83	1.681	900.7	0.944	69.21	243.8	56.18
0.112	310.51	1.916	488.9	0.130	99.24	277.9	30.49
0.127	310.17	1.937	492.4	0.147	98.62	281.0	30.71
0.306	310.33	2.448	529.5	0.342	98.91	355.1	33.03
0.618	310.33	2.710	596.4	0.656	98.91	393.1	37.20
0.833	310.49	2.722	753.4	0.855	99.19	394.7	46.99
0.667	310.36	2.767	628.1	0.703	98.96	401.4	39.18
0.707	310.54	2.779	658.8	0.740	99.28	403.1	41.09
0.930	307.25	2.513	848.3	0.940	93.37	364.5	52.91
0.112	325.04	2.549	458.7	0.130	125.39	369.7	28.61
0.341	325.04	3.353	489.7	0.379	125.39	486.3	30.54
0.559	324.91	3.724	540.4	0.599	125.16	540.2	33.70
0.808	325.25	3.794	650.6	0.832	125.77	550.3	40.58
0.914	325.40	3.634	734.6	0.926	126.03	527.1	45.82
0.163	340.33	3.660	421.0	0.187	152.91	530.9	26.26
0.163	339.70	3.660	421.0	0.187	151.76	530.9	26.26
0.202	339.77	3.884	421.7	0.230	151.91	563.4	26.30
0.224	340.35	4.004	423.3	0.254	152.94	580.7	26.40
0.255	340.33	4.167	423.2	0.288	152.91	604.4	26.39
0.255	339.72	4.167	423.1	0.288	151.81	604.3	26.39
0.430	339.80	4.811	430.1	0.471	151.95	697.7	26.83
0.517	339.33	5.109	441.2	0.558	151.10	741.0	27.52
0.711	339.36	5.239	474.7	0.744	151.15	759.9	29.61
0.873	339.49	5.140	551.5	0.890	151.39	745.5	34.40
0.918	339.51	4.953	618.8	0.930	151.43	718.3	38.59
0.918	339.78	4.953	618.6	0.930	151.92	718.3	38.58

Table 24. Near-Saturation (p,ρ,T) Data for R-32/290 Mixtures from 278 to 341 K (42 to 153°F) (continued).

y(R-32)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-32)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.848	296.04	1.681	50.5	0.868	73.19	243.8	3.15
0.600	310.73	2.722	81.3	0.639	99.63	394.7	5.07
0.625	310.73	2.767	82.2	0.663	99.63	401.3	5.13
0.760	311.71	2.779	81.8	0.789	101.40	403.1	5.10
0.881	310.13	2.513	73.0	0.897	98.55	364.5	4.55
0.263	326.03	2.549	64.2	0.296	127.17	369.7	4.00
0.599	325.90	3.724	119.5	0.638	126.93	540.2	7.46
0.755	326.11	3.794	126.1	0.784	127.31	550.3	7.87
0.869	326.24	3.634	118.1	0.887	127.54	527.1	7.37
0.302	340.33	3.660	105.2	0.338	152.91	530.9	6.56
0.362	340.35	4.004	122.7	0.401	152.94	580.7	7.65
0.391	340.33	4.167	128.6	0.431	152.91	604.4	8.02
0.595	340.64	5.109	222.4	0.634	153.47	741.0	13.87
0.850	340.65	5.140	217.8	0.870	153.48	745.5	13.58
0.876	340.65	4.953	198.5	0.893	153.48	718.3	12.38

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 25. Vapor-Liquid Equilibrium Data for R-125/290 Mixtures from 280 to 364 K (44 to 195°F).

x(R-125) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-125) Vapor Mole Fraction	x(R-125) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-125) Vapor Mass Fraction
0.000	280.47	0.590	0.000	0.000	45.16	85.6	0.000
0.154	280.07	0.845	0.345	0.331	44.44	122.6	0.589
0.195	279.92	0.881	0.387	0.397	44.18	127.8	0.633
0.204	280.83	0.916	0.413	0.411	45.82	132.9	0.657
0.293	280.82	0.979		0.530	45.80	142.0	
0.293	280.87	0.978		0.530	45.89	141.8	
0.316	279.98	0.943	0.473	0.557	44.27	136.8	0.710
0.407	280.75	0.995		0.651	45.68	144.3	
0.434	280.74	1.001		0.676	45.66	145.1	
0.648	280.05	1.003	0.631	0.834	44.40	145.5	0.823
0.772	279.98	0.979	0.711	0.902	44.28	142.0	0.870
1.000	280.29	0.830	1.000	1.000	44.83	120.4	1.000
0.000	294.80	0.873	0.000	0.000	70.95	126.6	0.000
0.175	294.96	1.286	0.340	0.366	71.24	186.5	0.584
0.219	294.74	1.306	0.389	0.433	70.87	189.4	0.634
0.219	294.64	1.299	0.389	0.433	70.67	188.4	0.634
0.347	293.92	1.345	0.478	0.591	69.38	195.1	0.714
0.347	293.21	1.333	0.478	0.591	68.12	193.3	0.714
0.470	293.82	1.398	0.520	0.707	69.20	202.8	0.747
0.568	293.23	1.410	0.599	0.782	68.14	204.5	0.803
0.644	294.95	1.492	0.638	0.802	71.22	216.4	0.828
0.725	294.95	1.487	0.694	0.878	71.22	215.7	0.861
0.767	294.96	1.468	0.723	0.900	71.23	212.9	0.877
1.000	295.23	1.272	1.000	1.000	71.73	184.5	1.000
0.000	309.49	1.259	0.000	0.000	97.39	182.6	0.000
0.186	309.79	1.797	0.317	0.383	97.93	260.6	0.558
0.263	310.74	1.898	0.397	0.493	99.66	275.2	0.642
0.263	310.74	1.897	0.397	0.493	99.66	275.1	0.642
0.294	310.83	1.990	0.438	0.531	99.83	288.7	0.680
0.376	311.62	2.106	0.470	0.621	101.25	305.4	0.707
0.376	311.82	2.105	0.470	0.621	101.61	305.3	0.707
0.472	309.76	2.101	0.548	0.709	97.90	304.8	0.767
0.529	309.83	2.095	0.575	0.754	98.03	303.9	0.786
0.604	310.22	2.140	0.620	0.806	98.73	310.4	0.816
0.641	309.99	2.148	0.643	0.829	98.29	311.5	0.831
0.722	309.94	2.129	0.697	0.876	98.20	308.8	0.863

Table 25. Vapor-Liquid Equilibrium Data for R-125/290 Mixtures from 280 to 364 K (44 to 195°F) (continued).

x(R-125) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-125) Vapor Mole Fraction	x(R-125) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-125) Vapor Mass Fraction
1.000	310.61	1.888	1.000	1.000	99.41	273.8	1.000
0.000	324.69	1.775	0.000	0.000	124.75	257.4	0.000
0.178	324.94	2.430	0.295	0.371	125.21	352.4	0.533
0.255	324.94	2.538	0.372	0.482	125.20	368.1	0.617
0.263	324.85	2.531	0.397	0.493	125.05	367.0	0.642
0.315	324.95	2.631	0.423	0.556	125.23	381.6	0.666
0.483	325.61	2.969	0.547	0.718	126.42	430.6	0.767
0.574	325.61	3.030	0.597	0.786	126.42	439.4	0.801
0.615	324.99	2.978	0.603	0.813	125.30	431.9	0.805
0.633	324.94	2.955	0.642	0.824	125.20	428.6	0.830
0.730	324.60	2.944	0.714	0.880	124.60	427.0	0.872
0.734	324.94	2.942	0.707	0.883	125.21	426.7	0.868
1.000	324.89	2.636	1.000	1.000	125.11	382.4	1.000
0.000	341.17	2.494	0.000	0.000	154.44	361.7	0.000
0.146	340.64	3.148	0.225	0.318	153.49	456.5	0.441
0.243	340.57	3.470	0.320	0.466	153.36	503.2	0.562
0.327	340.54	3.737	0.391	0.569	153.31	542.0	0.636
1.000	339.38	3.629	1.000	1.000	151.22	526.3	1.000
0.000	347.99	2.848	0.000	0.000	166.71	413.0	0.000
0.166	348.56	3.700	0.220	0.351	167.74	536.7	0.434
0.166	348.54	3.699	0.220	0.351	167.70	536.5	0.434
0.133	348.42	3.615	0.198	0.295	167.49	524.3	0.402
0.000	355.73	3.297	0.000	0.000	180.64	478.1	0.000
0.165	356.43	4.175	0.188	0.350	181.90	605.6	0.387
0.165	356.43	4.178	0.188	0.350	181.90	606.0	0.387
0.000	363.52	3.792	0.000	0.000	194.66	550.0	0.000
0.003	363.78	3.899	0.014	0.008	195.13	565.5	0.037

Table 26. Near-Saturation (p,ρ,T) Data for R-125/290 Mixtures from 280 to 326 K (44 to 128°F).

x(R-125) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-125) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.204	279.68	0.916	675.3	0.411	43.73	132.9	42.12
0.219	293.24	1.299	642.2	0.433	68.15	188.4	40.05
0.347	292.16	1.333	727.9	0.591	66.20	193.3	45.40
0.263	309.89	1.897	614.1	0.493	98.12	275.1	38.30
0.294	310.05	1.990	643.7	0.531	98.40	288.7	40.15
0.376	310.88	2.106	675.9	0.621	99.89	305.4	42.16
0.472	309.17	2.101	733.7	0.709	96.81	304.8	45.76
0.529	309.30	2.095	759.8	0.754	97.05	303.9	47.39
0.604	309.94	2.140	805.4	0.806	98.21	310.4	50.23
0.263	323.90	2.531	562.8	0.493	123.33	367.0	35.10
0.315	323.90	2.631	584.9	0.556	123.33	381.6	36.48
0.574	325.10	3.030	681.8	0.786	125.48	439.4	42.53
0.615	324.06	2.978	703.2	0.813	123.61	431.9	43.86
0.730	323.98	2.944	774.1	0.880	123.47	427.0	48.28

y(R-125)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-125)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.467	293.70	1.333	58.9	0.705	68.96	193.3	3.67
0.542	294.55	1.398	64.5	0.763	70.50	202.7	4.03
0.593	293.98	1.410	67.9	0.799	69.48	204.5	4.23
0.691	294.24	1.435	74.1	0.859	69.94	208.1	4.62
0.459	312.70	2.106	100.2	0.698	103.17	305.4	6.25
0.525	310.45	2.101	108.0	0.751	99.11	304.8	6.74
0.562	310.63	2.095	111.2	0.777	99.44	303.9	6.94
0.620	311.25	2.140	117.8	0.816	100.56	310.4	7.35
0.385	325.67	2.531	108.8	0.630	126.51	367.0	6.79
0.432	325.74	2.631	121.4	0.675	126.65	381.6	7.57
0.551	326.21	2.969	179.0	0.770	127.50	430.6	11.16
0.605	326.11	3.030	199.6	0.806	127.31	439.4	12.45

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 27. Vapor-Liquid Equilibrium Data for R-134a/290 Mixtures from 279 to 357 K (43 to 182°F). ("LL" indicates possible liquid-liquid immiscibility)

x(R-134a) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-134a) Vapor Mole Fraction	x(R-134a) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-134a) Vapor Mass Fraction
0.000	280.00	0.580	0.000	0.000	44.31	84.1	0.000
0.079	279.95	0.660	0.163	0.166	44.23	95.7	0.310
LL	279.54	0.716	0.342	LL	43.50	103.8	0.546
LL	279.88	0.717	0.358	LL	44.11	104.0	0.563
LL	279.85	0.717	0.358	LL	44.06	104.0	0.563
0.558	279.97	0.701	0.407	0.745	44.26	101.7	0.614
0.662	279.98	0.677	0.441	0.819	44.27	98.2	0.646
0.692	279.42	0.675	0.437	0.839	43.28	97.9	0.642
0.774	279.29	0.646	0.487	0.888	43.05	93.8	0.687
0.786	279.35	0.648	0.474	0.895	43.16	93.9	0.676
0.913	279.80	0.535	0.656	0.960	43.97	77.6	0.815
0.972	279.73	0.438	0.843	0.988	43.84	63.5	0.926
0.972	279.60	0.437	0.843	0.988	43.61	63.4	0.926
1.000	280.39	0.379	1.000	1.000	45.01	55.0	1.000
0.000	294.99	0.878	0.000	0.000	71.29	127.3	0.000
0.109	294.92	1.018	0.194	0.221	71.17	147.6	0.357
0.262	295.33	1.067	0.308	0.451	71.93	154.7	0.507
LL	295.33	1.063	0.354	LL	71.93	154.2	0.559
0.558	294.95	1.066	0.433	0.745	71.23	154.6	0.639
0.578	294.95	1.054	0.443	0.760	71.22	152.9	0.648
0.602	294.85	1.032	0.494	0.778	71.05	149.6	0.693
0.727	295.17	0.986	0.541	0.860	71.63	143.0	0.732
0.802	294.95	0.977	0.542	0.904	71.22	141.7	0.733
0.831	294.95	0.938		0.919	71.22	136.0	
1.000	294.70	0.596	1.000	1.000	70.77	86.5	1.000
0.000	309.99	1.274	0.000	0.000	98.29	184.8	0.000
0.112	309.96	1.468	0.209	0.227	98.25	212.9	0.380
0.197	309.96	1.532	0.259	0.362	98.24	222.2	0.448
0.200	310.70	1.534	0.267	0.367	99.59	222.5	0.457
0.273	309.96	1.568	0.312	0.465	98.24	227.4	0.512
0.337	310.58	1.575	0.351	0.540	99.38	228.4	0.556
0.354	309.96	1.579	0.357	0.559	98.23	229.0	0.562
0.450	310.63	1.563	0.423	0.654	99.47	226.6	0.629
0.570	310.85	1.536	0.434	0.754	99.86	222.7	0.640
0.748	310.84	1.453	0.578	0.873	99.84	210.7	0.760

Table 27. Vapor-Liquid Equilibrium Data for R-134a/290 Mixtures from 279 to 357 K (43 to 182°F)
(continued). ("LL" indicates possible liquid-liquid immiscibility)

x(R-134a) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-134a) Vapor Mole Fraction	x(R-134a) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-134a) Vapor Mass Fraction
0.671	310.76	1.498	0.518	0.825	99.70	217.2	0.713
1.000	309.31	0.910	1.000	1.000	97.07	132.0	1.000
0.000	324.99	1.786	0.000	0.000	125.29	259.1	0.000
0.134	326.09	2.076	0.190	0.264	127.28	301.2	0.352
0.354	325.01	2.204	0.361	0.559	125.33	319.7	0.567
0.364	325.14	2.229	0.380	0.570	125.57	323.2	0.586
0.446	325.01	2.188	0.414	0.651	125.33	317.3	0.621
0.504	325.51	2.201	0.444	0.702	126.24	319.3	0.649
0.552	325.02	2.150	0.477	0.741	125.35	311.8	0.679
0.603	325.93	2.138	0.480	0.779	127.00	310.0	0.681
0.688	325.01	2.071	0.566	0.836	125.33	300.4	0.751
0.720	326.04	2.069	0.589	0.856	127.19	300.1	0.768
1.000	324.50	1.364	1.000	1.000	124.41	197.9	1.000
0.000	339.98	2.435	0.000	0.000	152.28	353.2	0.000
0.068	339.95	2.659	0.135	0.144	152.23	385.7	0.265
0.213	340.89	2.955	0.258	0.385	153.94	428.6	0.446
0.290	341.17	3.000	0.311	0.486	154.44	435.1	0.511
0.375	340.46	3.002	0.377	0.581	153.16	435.4	0.583
0.457	340.37	3.021	0.437	0.661	153.00	438.1	0.642
0.546	339.99	2.992	0.487	0.736	152.29	434.0	0.687
0.589	339.94	2.961	0.518	0.769	152.21	429.5	0.713
0.610	340.71	2.872	0.555	0.784	153.61	416.5	0.743
0.706	340.51	2.786	0.611	0.847	153.25	404.1	0.784
1.000	340.16	1.984	1.000	1.000	152.60	287.7	1.000
0.000	354.98	3.251	0.000	0.000	179.28	471.5	0.000
0.026	356.23	3.421	0.025	0.058	181.54	496.1	0.056
0.175	356.21	3.948	0.209	0.329	181.50	572.6	0.379
0.685	354.96	3.775	0.638	0.835	179.23	547.5	0.803
0.717	356.48	3.814	0.660	0.854	181.99	553.2	0.818
0.778	356.52	3.693	0.720	0.890	182.06	535.6	0.856
0.827	356.46	3.608	0.755	0.917	181.95	523.3	0.877
0.841	354.93	3.415	0.763	0.925	179.19	495.3	0.882
0.842	356.47	3.609	0.754	0.925	181.97	523.4	0.876
0.897	356.45	3.351	0.837	0.953	181.94	486.0	0.922
0.937	354.97	3.064	0.839	0.972	179.25	444.4	0.924

Table 27. Vapor-Liquid Equilibrium Data for R-134a/290 Mixtures from 279 to 357 K (43 to 182°F)
(continued). ("L.L." indicates possible liquid-liquid immiscibility)

x(R-134a) Liquid Mole Fraction	Temperature K	Pressure MPa	y(R-134a) Vapor Mole Fraction	x(R-134a) Liquid Mass Fraction	Temperature °F	Pressure psia	y(R-134a) Vapor Mass Fraction
0.897	356.46	3.361	0.837	0.953	181.95	487.5	0.922
0.980	355.04	2.845	0.963	0.991	179.38	412.6	0.984
1.000	355.02	2.745	1.000	1.000	179.35	398.1	1.000

Table 28. Near-Saturation (p,p,T) Data for R-134a/290 Mixtures from 278 to 357 K (40 to 183°F).

x(R-134a) Liquid Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	x(R-134a) Liquid Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.692	277.86	0.675	937.7	0.839	40.46	97.9	58.49
0.774	277.94	0.646	1022.1	0.888	40.60	93.8	63.75
0.786	278.04	0.647	1019.5	0.895	40.78	93.9	63.59
0.913	278.22	0.535	1176.1	0.960	41.10	77.6	73.35
0.972	278.45	0.438	1240.9	0.988	41.52	63.5	77.40
0.262	293.81	1.067	654.4	0.451	69.17	154.7	40.82
0.602	293.76	1.032	871.6	0.778	69.08	149.6	54.37
0.727	293.91	0.986	982.4	0.860	69.35	143.0	61.28
0.872	291.85	0.788	1138.5	0.940	65.65	114.3	71.01
0.200	309.53	1.534	579.5	0.367	97.47	222.5	36.14
0.337	309.50	1.575	650.6	0.540	97.42	228.4	40.58
0.450	309.48	1.562	710.3	0.654	97.37	226.6	44.30
0.570	309.53	1.535	793.0	0.754	97.47	222.7	49.46
0.671	309.50	1.497	860.6	0.825	97.42	217.2	53.68
0.748	309.50	1.453	920.5	0.873	97.42	210.7	57.41
0.134	324.13	2.076	511.1	0.264	123.75	301.2	31.88
0.364	324.13	2.229	621.2	0.570	123.75	323.2	38.75
0.504	324.24	2.201	698.8	0.702	123.94	319.3	43.59
0.603	324.24	2.138	759.7	0.779	123.94	310.0	47.38
0.720	324.19	2.069	837.0	0.856	123.85	300.1	52.20
0.213	338.47	2.955	497.6	0.385	149.55	428.6	31.04
0.290	338.75	3.000	525.2	0.486	150.06	435.1	32.76
0.375	338.65	3.002	562.2	0.581	149.88	435.4	35.07
0.457	338.65	3.021	600.6	0.661	149.88	438.1	37.46
0.610	338.65	2.872	697.7	0.784	149.88	416.5	43.52
0.706	338.65	2.786	760.9	0.847	149.88	404.1	47.46
0.026	355.81	3.421	368.5	0.058	180.77	496.1	22.99
0.175	355.73	3.948	392.4	0.329	180.63	572.6	24.47
0.717	355.86	3.814	517.4	0.854	180.86	553.2	32.27
0.778	355.89	3.693	592.2	0.890	180.91	535.6	36.94
0.827	355.86	3.608	718.0	0.917	180.86	523.3	44.78
0.842	355.89	3.609	718.1	0.925	180.91	523.4	44.79
0.897	355.91	3.361	789.6	0.953	180.96	487.5	49.25

Table 28. Near-Saturation (p,ρ,T) Data for R-134a/290 Mixtures from 278 to 357 K (40 to 183°F) (continued).

y(R-134a)* Vapor Mole Fraction	Temperature K	Pressure MPa	Density kg/m ³	y(R-134a)* Vapor Mass Fraction	Temperature °F	Pressure psia	Density lb/ft ³
0.345	311.07	1.575	53.9	0.549	100.23	228.4	3.36
0.369	310.89	1.562	56.0	0.575	99.91	226.6	3.50
0.397	310.89	1.535	58.0	0.603	99.91	222.7	3.62
0.444	311.07	1.497	58.6	0.649	100.23	217.2	3.66
0.508	311.04	1.453	58.8	0.705	100.19	210.7	3.67
0.184	326.55	2.076	62.8	0.343	128.10	301.2	3.91
0.368	326.49	2.229	82.2	0.574	128.00	323.2	5.13
0.446	326.58	2.201	86.4	0.651	128.15	319.3	5.39
0.505	326.60	2.138	86.3	0.703	128.20	310.0	5.38
0.596	326.60	2.069	87.6	0.773	128.20	300.1	5.46
0.285	341.64	2.955	107.4	0.480	155.26	428.6	6.70
0.350	342.14	3.000	115.6	0.555	156.16	435.1	7.21
0.408	341.43	3.002	123.5	0.605	154.88	435.4	7.70
0.457	341.45	2.872	130.1	0.661	154.93	416.5	8.11
0.547	341.35	2.786	130.5	0.736	154.74	404.1	8.14
0.051	357.03	3.421	101.2	0.110	182.97	496.1	6.31
0.247	357.16	3.948	180.0	0.432	183.21	572.6	11.22
0.625	357.01	3.814	238.9	0.794	182.92	553.2	14.90
0.680	357.03	3.608	228.0	0.831	182.97	523.3	14.22

*Near-saturation vapor compositions are calculated from the vapor-liquid equilibrium data.

Table 29. Vapor Pressures for R-41 from 252 to 312 K (-6 to 102°F) Measured Using the Vapor-Liquid Equilibrium Apparatus.

Temperature K	Vapor Pressure MPa	Temperature °F	Vapor Pressure psia
251.86	1.096	-6.35	159.0
251.90	1.097	-6.28	159.1
251.96	1.099	-6.17	159.4
263.62	1.566	14.83	227.1
268.80	1.817	24.14	263.5
270.66	1.916	27.49	277.9
279.93	2.456	44.18	356.2
279.92	2.454	44.17	355.9
284.42	2.751	52.27	399.0
289.88	3.150	62.10	456.9
292.78	3.387	67.32	491.2
292.83	3.391	67.41	491.8
294.85	3.558	71.04	516.1
294.85	3.558	71.04	516.1
294.93	3.561	71.18	516.5
297.02	3.742	74.95	542.8
299.99	4.010	80.29	581.6
304.86	4.480	89.05	649.8
309.93	5.016	98.18	727.4
311.92	5.241	101.77	760.1

Table 30. Vapor Pressures for R-41 Using 170 to 317 K (-154 to 111°F)
Measured Using the Isochoric (p,ρ,T) Apparatus.

Temperature K	Vapor Pressure MPa	Temperature °F	Vapor Pressure psia
170.00	0.020646	-153.69	2.9945
175.00	0.029642	-144.69	4.2992
180.00	0.041581	-135.69	6.0308
185.00	0.057194	-126.69	8.2953
190.00	0.077194	-117.69	11.1961
195.00	0.10231	-108.69	14.8389
200.00	0.13348	-99.69	19.3597
205.00	0.17194	-90.69	24.9379
210.00	0.21855	-81.69	31.6981
215.00	0.27436	-72.69	39.7927
220.00	0.34027	-63.69	49.3522
225.00	0.41862	-54.69	60.7159
230.00	0.50925	-45.69	73.8607
235.00	0.61479	-36.69	89.1681
240.00	0.73545	-27.69	106.6684
245.00	0.87379	-18.69	126.7330
250.00	1.03005	-9.69	149.3966
255.00	1.2074	-0.69	175.1192
260.00	1.40572	8.31	203.8832
265.00	1.62797	17.31	236.1179
270.00	1.87591	26.31	272.0787
275.00	2.15015	35.31	311.8540
280.00	2.45422	44.31	355.9558
285.00	2.7885	53.31	404.4391
290.00	3.15708	62.31	457.8973
295.00	3.56141	71.31	516.5406
300.00	4.00546	80.31	580.9449
305.00	4.49047	89.31	651.2899
310.00	5.02212	98.31	728.3995
315.00	5.60592	107.31	813.0728
317.00	5.86166	110.91	850.1649

Table 31. Near-Saturation (p,ρ,T) Data for R-41 from 274 to 296 K (34 to 73°F)

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
274.38	2.195	675.6	34.20	318.4	42.14
278.42	2.460	662.2	41.47	356.8	41.30
280.06	2.564	656.2	44.42	371.9	40.93
281.65	2.681	650.1	47.28	388.9	40.55
282.94	2.775	645.4	49.60	402.5	40.25
284.66	2.906	638.8	52.70	421.5	39.84
286.58	3.053	631.4	56.16	442.7	39.38
288.28	3.186	624.5	59.22	462.1	38.95
290.44	3.349	615.3	63.10	485.8	38.37
292.21	3.497	606.9	66.29	507.1	37.85
293.86	3.644	599.5	69.26	528.5	37.39
294.89	3.728	595.1	71.11	540.7	37.12
278.32	2.339	50.0	41.29	339.3	3.12
280.14	2.460	53.3	44.56	356.8	3.33
281.76	2.564	56.7	47.48	371.9	3.53
283.40	2.681	60.7	50.43	388.9	3.79
284.71	2.775	63.2	52.79	402.5	3.94
286.46	2.906	66.8	55.94	421.5	4.17
288.36	3.053	71.0	59.36	442.7	4.43
290.12	3.186	76.7	62.53	462.1	4.78
292.07	3.349	81.5	66.04	485.8	5.09
294.11	3.497	88.5	69.71	507.1	5.52
295.35	3.644	97.4	71.94	528.5	6.07
295.89	3.728	106.4	72.91	540.7	6.64

Table 32. Comparisons of Critical Point Parameters for R-41.

	Critical Temperature	Critical Pressure	Critical Density
This Work	317.28 ± 0.08K (111.43 ± 0.14°F)	5.897 ± 0.01 MPa (855.3 ± 1.4 psia)	316.5 ± 1.5 kg/m ³ (19.74 ± 0.9 lb/ft ³)
Bominaar et al. [20]	317.38 K (111.61°F)	5.87 MPa (851 psia)	311.4 kg/m ³ (19.40 lb/ft ³)
Biswas et al. [21]	317.40 K (111.65°F)	5.875 MPa (852.1 psia)	312.3 kg/m ³ (19.48 lb/ft ³)

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
132.000	3.7947	1007.73	-222.09	550.4	62.911
132.999	5.9677	1007.38	-220.29	865.5	62.889
134.000	7.6985	1006.73	-218.49	1116.6	62.848
135.000	9.2786	1005.85	-216.69	1345.8	62.793
136.000	11.4361	1005.48	-214.89	1658.7	62.770
136.999	13.7673	1005.23	-213.09	1996.8	62.754
138.000	16.1748	1005.03	-211.29	2346.0	62.742
138.999	18.6070	1004.85	-209.49	2698.7	62.731
139.999	21.0494	1004.69	-207.69	3053.0	62.721
140.999	23.5062	1004.54	-205.89	3409.3	62.711
142.000	25.9595	1004.39	-204.09	3765.1	62.702
143.000	28.4095	1004.25	-202.29	4120.5	62.693
143.999	30.8687	1004.11	-200.49	4477.1	62.685
144.999	33.3136	1003.98	-198.69	4831.8	62.676
142.000	3.8165	989.01	-204.09	553.5	61.742
142.999	5.8434	988.68	-202.29	847.5	61.721
144.000	7.5402	988.11	-200.49	1093.6	61.686
144.999	8.9768	987.22	-198.69	1302.0	61.630
145.999	10.9159	986.82	-196.89	1583.2	61.605
146.999	13.0556	986.57	-195.09	1893.6	61.590
148.001	15.2637	986.37	-193.29	2213.8	61.577
149.000	17.5065	986.20	-191.49	2539.1	61.566
150.000	19.7567	986.04	-189.69	2865.5	61.556
151.000	22.0135	985.89	-187.89	3192.8	61.547
152.000	24.2862	985.74	-186.09	3522.4	61.538
153.000	26.5428	985.61	-184.29	3849.7	61.530
154.000	28.8015	985.48	-182.49	4177.3	61.522
155.000	31.0703	985.35	-180.69	4506.4	61.513
156.001	33.3213	985.22	-178.89	4832.9	61.505
154.000	3.8535	966.31	-182.49	558.9	60.325
155.000	5.7194	966.01	-180.69	829.5	60.306
155.999	7.3427	965.52	-178.89	1065.0	60.275
157.001	8.6648	964.63	-177.09	1256.7	60.220
157.999	10.3772	964.20	-175.29	1505.1	60.193
158.999	12.2980	963.94	-173.49	1783.7	60.177

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
159.999	14.3003	963.74	-171.69	2074.1	60.164
160.999	16.3194	963.57	-169.89	2366.9	60.154
161.999	18.3586	963.41	-168.09	2662.7	60.144
163.000	20.4124	963.27	-166.29	2960.6	60.135
163.999	22.4542	963.13	-164.49	3256.7	60.126
165.000	24.5189	963.00	-162.69	3556.2	60.118
165.999	26.5634	962.87	-160.89	3852.7	60.110
166.998	28.6067	962.75	-159.09	4149.1	60.103
168.000	30.6602	962.63	-157.29	4446.9	60.095
168.999	32.6986	962.51	-155.49	4742.5	60.088
170.000	34.7485	962.40	-153.69	5039.9	60.081
167.998	3.8483	939.30	-157.29	558.2	58.639
168.999	5.5291	939.03	-155.49	801.9	58.622
169.999	7.0744	938.63	-153.69	1026.1	58.597
170.998	8.3010	937.80	-151.89	1204.0	58.545
172.000	9.7689	937.29	-150.09	1416.9	58.513
173.000	11.4618	937.02	-148.29	1662.4	58.496
173.999	13.2224	936.82	-146.49	1917.8	58.484
174.999	15.0243	936.65	-144.69	2179.1	58.473
175.999	16.8417	936.49	-142.89	2442.7	58.463
176.999	18.6613	936.35	-141.09	2706.6	58.454
177.999	20.4950	936.22	-139.29	2972.6	58.446
179.000	22.3201	936.09	-137.49	3237.3	58.438
179.999	24.1515	935.97	-135.69	3502.9	58.431
180.998	25.9775	935.85	-133.89	3767.7	58.423
181.999	27.8011	935.74	-132.09	4032.2	58.416
182.999	29.6298	935.63	-130.29	4297.5	58.409
184.000	31.4503	935.52	-128.49	4561.5	58.403
184.999	33.2697	935.41	-126.69	4825.4	58.396
185.999	35.0874	935.30	-124.89	5089.0	58.389
184.000	3.8192	907.68	-128.49	553.9	56.665
185.000	5.3156	907.44	-126.69	771.0	56.650
186.000	6.7440	907.11	-124.89	978.1	56.629
187.000	7.9183	906.46	-123.09	1148.5	56.588
188.001	9.1419	905.80	-121.29	1325.9	56.547

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
189.001	10.5886	905.50	-119.49	1535.8	56.529
190.001	12.1260	905.29	-117.69	1758.7	56.515
191.001	13.6949	905.12	-115.89	1986.3	56.505
192.000	15.2734	904.97	-114.09	2215.2	56.495
193.000	16.8728	904.83	-112.29	2447.2	56.487
194.000	18.4663	904.70	-110.49	2678.3	56.479
195.001	20.0674	904.58	-108.69	2910.5	56.471
196.000	21.6675	904.47	-106.89	3142.6	56.464
197.000	23.2669	904.35	-105.09	3374.6	56.457
198.000	24.8753	904.24	-103.29	3607.9	56.450
198.999	26.4733	904.14	-101.49	3839.6	56.444
200.001	28.0748	904.03	-99.69	4071.9	56.437
201.000	29.6684	903.93	-97.89	4303.0	56.431
202.001	31.2603	903.83	-96.09	4533.9	56.424
203.000	32.8550	903.73	-94.29	4765.2	56.418
204.000	34.4410	903.63	-92.49	4995.3	56.412
200.000	3.7884	874.87	-99.69	549.5	54.616
201.000	5.1415	874.66	-97.89	745.7	54.603
202.000	6.4328	874.38	-96.09	933.0	54.586
203.001	7.5796	873.91	-94.29	1099.3	54.556
204.000	8.6144	873.17	-92.49	1249.4	54.510
205.000	9.8458	872.81	-90.69	1428.0	54.488
206.000	11.1682	872.58	-88.89	1619.8	54.473
207.001	12.5291	872.41	-87.09	1817.2	54.463
207.999	13.9092	872.26	-85.29	2017.4	54.453
209.001	15.2923	872.13	-83.49	2218.0	54.445
210.000	16.6913	872.00	-81.69	2420.9	54.437
211.999	19.4853	871.77	-78.09	2826.1	54.423
214.000	22.2776	871.56	-74.49	3231.1	54.410
216.001	25.0812	871.36	-70.89	3637.7	54.397
218.001	27.8685	871.17	-67.29	4042.0	54.385
220.002	30.6434	870.98	-63.68	4444.5	54.374
222.001	33.4180	870.80	-60.09	4846.9	54.362
220.002	3.6347	831.14	-63.68	527.2	51.886
221.000	4.7578	830.97	-61.89	690.1	51.876

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
222.001	5.8830	830.75	-60.09	853.3	51.862
222.999	6.9410	830.46	-58.29	1006.7	51.844
224.000	7.8843	829.90	-56.49	1143.5	51.809
224.999	8.8290	829.31	-54.69	1280.5	51.772
226.001	9.9027	829.02	-52.89	1436.3	51.754
227.001	11.0226	828.82	-51.09	1598.7	51.742
228.002	12.1643	828.67	-49.28	1764.3	51.732
229.001	13.3203	828.53	-47.49	1931.9	51.723
230.000	14.4766	828.41	-45.69	2099.7	51.716
232.000	16.8051	828.18	-42.09	2437.4	51.702
234.000	19.1419	827.98	-38.49	2776.3	51.689
236.001	21.4772	827.79	-34.89	3115.0	51.677
238.001	23.8124	827.61	-31.29	3453.7	51.666
239.999	26.1386	827.43	-27.69	3791.1	51.655
242.002	28.4583	827.26	-24.08	4127.5	51.644
244.002	30.7777	827.09	-20.48	4463.9	51.634
246.001	33.0881	826.92	-16.89	4799.0	51.623
248.002	35.4018	826.76	-13.28	5134.6	51.613
240.000	3.8003	783.97	-27.69	551.2	48.942
241.001	4.7476	783.82	-25.89	688.6	48.932
241.999	5.6800	783.64	-24.09	823.8	48.921
243.000	6.5951	783.41	-22.29	956.5	48.907
244.000	7.4483	783.06	-20.49	1080.3	48.885
245.000	8.2413	782.44	-18.69	1195.3	48.846
246.000	9.0950	782.04	-16.89	1319.1	48.821
247.000	10.0074	781.82	-15.09	1451.5	48.807
247.999	10.9381	781.65	-13.29	1586.4	48.797
249.000	11.8837	781.51	-11.49	1723.6	48.788
249.998	12.8368	781.39	-9.69	1861.8	48.781
252.001	14.7587	781.17	-6.09	2140.6	48.767
253.999	16.6777	780.97	-2.49	2418.9	48.754
255.998	18.5953	780.79	1.11	2697.0	48.743
258.000	20.5214	780.62	4.71	2976.4	48.733
260.000	22.4456	780.46	8.31	3255.5	48.723
261.999	24.3658	780.29	11.91	3534.0	48.712
264.000	26.2848	780.14	15.51	3812.3	48.703

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
265.999	28.2029	779.98	19.11	4090.5	48.693
268.002	30.1190	779.83	22.72	4368.4	48.683
270.002	32.0287	779.68	26.32	4645.4	48.674
271.999	33.9325	779.53	29.91	4921.5	48.664
260.000	3.8305	729.90	8.31	555.6	45.566
261.001	4.5921	729.77	10.11	666.0	45.558
261.998	5.3514	729.63	11.91	776.2	45.549
263.000	6.1075	729.46	13.71	885.8	45.539
263.999	6.8400	729.25	15.51	992.1	45.526
265.000	7.5401	728.91	17.31	1093.6	45.504
266.001	8.2129	728.37	19.11	1191.2	45.471
266.999	8.9132	728.01	20.91	1292.8	45.448
268.001	9.6499	727.79	22.71	1399.6	45.434
269.000	10.3986	727.63	24.51	1508.2	45.424
270.000	11.1601	727.50	26.31	1618.6	45.416
272.001	12.6898	727.28	29.91	1840.5	45.403
273.999	14.2226	727.09	33.51	2062.8	45.391
275.999	15.7612	726.92	37.11	2286.0	45.380
277.999	17.3033	726.75	40.71	2509.6	45.370
280.002	18.8483	726.60	44.32	2733.7	45.360
281.999	20.3912	726.45	47.91	2957.5	45.351
283.998	21.9356	726.30	51.51	3181.5	45.341
286.000	23.4783	726.16	55.11	3405.2	45.333
288.000	25.0172	726.01	58.71	3628.4	45.323
289.999	26.5552	725.88	62.31	3851.5	45.315
292.000	28.0941	725.74	65.91	4074.7	45.306
294.000	29.6266	725.60	69.51	4297.0	45.298
296.000	31.1562	725.47	73.11	4518.8	45.290
298.000	32.6880	725.34	76.71	4741.0	45.282
299.999	34.2158	725.20	80.31	4962.6	45.273
280.001	4.7980	669.23	44.31	695.9	41.779
281.000	5.3963	669.11	46.11	782.7	41.771
281.999	5.9836	668.97	47.91	867.8	41.762
283.002	6.5694	668.81	49.72	952.8	41.752
283.999	7.1428	668.60	51.51	1036.0	41.739

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
285.999	8.2455	667.81	55.11	1195.9	41.690
287.999	9.3867	667.31	58.71	1361.4	41.659
289.999	10.5647	667.04	62.31	1532.3	41.642
292.002	11.7576	666.84	65.92	1705.3	41.629
294.002	12.9527	666.66	69.52	1878.6	41.618
295.998	14.1466	666.50	73.11	2051.8	41.608
297.999	15.3500	666.35	76.71	2226.3	41.599
300.001	16.5543	666.21	80.31	2401.0	41.590
301.999	17.7579	666.07	83.91	2575.6	41.581
304.001	18.9619	665.94	87.51	2750.2	41.573
306.002	20.1678	665.81	91.12	2925.1	41.565
308.002	21.3725	665.68	94.72	3099.8	41.557
309.999	22.5758	665.55	98.31	3274.4	41.549
311.999	23.7842	665.43	101.91	3449.6	41.541
315.999	26.1888	665.19	109.11	3798.4	41.526
319.999	28.6007	664.94	116.31	4148.2	41.511
324.002	30.9990	664.70	123.52	4496.0	41.496
327.999	33.3941	664.47	130.71	4843.4	41.482
290.000	4.9719	631.25	62.31	721.1	39.408
291.000	5.4774	631.15	64.11	794.4	39.401
292.000	5.9816	631.02	65.91	867.6	39.393
293.001	6.4815	630.88	67.71	940.1	39.385
294.001	6.9806	630.71	69.51	1012.5	39.374
296.001	7.9414	630.10	73.11	1151.8	39.336
297.999	8.9106	629.50	76.71	1292.4	39.298
299.999	9.9103	629.20	80.31	1437.4	39.280
302.000	10.9257	629.00	83.91	1584.6	39.267
303.998	11.9428	628.82	87.51	1732.2	39.256
306.000	12.9682	628.66	91.11	1880.9	39.246
308.000	13.9931	628.52	94.71	2029.5	39.237
310.000	15.0194	628.38	98.31	2178.4	39.228
312.002	16.0497	628.25	101.92	2327.8	39.220
316.000	18.1104	628.00	109.11	2626.7	39.205
320.000	20.1735	627.76	116.31	2925.9	39.190
323.999	22.2349	627.52	123.51	3224.9	39.175
328.000	24.2980	627.29	130.71	3524.1	39.160

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
332.000	26.3637	627.07	137.91	3823.7	39.147
336.002	28.4230	626.84	145.12	4122.4	39.132
340.000	30.4830	626.62	152.31	4421.2	39.119
344.002	32.5415	626.40	159.52	4719.8	39.105
348.000	34.5921	626.18	166.71	5017.2	39.091
300.001	4.7418	576.77	80.31	687.7	36.007
300.999	5.1390	576.68	82.11	745.3	36.001
302.000	5.5349	576.59	83.91	802.8	35.995
303.000	5.9330	576.49	85.71	860.5	35.989
304.001	6.3276	576.38	87.51	917.7	35.982
306.001	7.1170	576.09	91.11	1032.2	35.964
308.000	7.8936	575.57	94.71	1144.9	35.932
310.002	8.6734	575.02	98.32	1258.0	35.897
312.000	9.4679	574.73	101.91	1373.2	35.879
314.000	10.2710	574.53	105.51	1489.7	35.867
315.999	11.0811	574.36	109.11	1607.2	35.856
317.999	11.8932	574.22	112.71	1725.0	35.847
319.999	12.7079	574.08	116.31	1843.1	35.839
324.001	14.3409	573.83	123.51	2080.0	35.823
328.001	15.9858	573.60	130.71	2318.6	35.809
331.999	17.6232	573.42	137.91	2556.0	35.797
336.000	19.2728	573.20	145.11	2795.3	35.784
340.000	20.9259	572.99	152.31	3035.1	35.771
344.002	22.5808	572.79	159.52	3275.1	35.758
348.001	24.2362	572.58	166.71	3515.2	35.745
352.000	25.8912	572.38	173.91	3755.2	35.733
356.000	27.5489	572.18	181.11	3995.6	35.720
360.000	29.2040	571.98	188.31	4235.7	35.708
363.999	30.8587	571.78	195.51	4475.7	35.695
367.999	32.5115	571.58	202.71	4715.4	35.683
372.000	34.1636	571.39	209.91	4955.0	35.671
310.000	5.1991	501.26	98.31	754.1	31.293
310.999	5.4742	501.19	100.11	794.0	31.288
311.998	5.7550	501.12	101.91	834.7	31.284
313.000	6.0360	501.04	103.71	875.5	31.279

Table 33. Isochoric (p,p,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
314.000	6.3180	500.96	105.51	916.3	31.274
316.001	6.8842	500.75	109.11	998.5	31.261
318.002	7.4523	500.47	112.72	1080.9	31.243
320.000	8.0197	500.00	116.31	1163.2	31.214
322.001	8.5905	499.60	119.91	1245.9	31.189
324.001	9.1656	499.37	123.51	1329.4	31.175
327.998	10.3330	499.06	130.71	1498.7	31.155
332.001	11.5146	498.82	137.91	1670.1	31.140
336.000	12.7046	498.60	145.11	1842.7	31.127
340.000	13.9017	498.39	152.31	2016.3	31.113
343.999	15.1044	498.20	159.51	2190.7	31.102
347.999	16.3116	498.01	166.71	2365.8	31.090
352.001	17.5233	497.83	173.91	2541.6	31.079
356.001	18.7375	497.65	181.11	2717.6	31.067
360.001	19.9543	497.47	188.31	2894.1	31.056
363.999	21.1726	497.29	195.51	3070.8	31.045
368.000	22.3931	497.12	202.71	3247.9	31.034
372.002	23.6127	496.95	209.92	3424.7	31.024
376.002	24.8337	496.78	217.12	3601.8	31.013
380.001	26.0567	496.60	224.31	3779.2	31.002
384.000	27.2806	496.43	231.51	3956.7	30.991
387.998	28.5023	496.26	238.71	4133.9	30.981
392.002	29.7240	496.09	245.92	4311.1	30.970
396.000	30.9428	495.92	253.11	4487.9	30.959
399.998	32.1613	495.75	260.31	4664.6	30.949
319.998	6.8061	446.36	116.31	987.1	27.865
321.000	7.0279	446.27	118.11	1019.3	27.860
322.001	7.2522	446.16	119.91	1051.8	27.853
322.998	7.4800	446.02	121.71	1084.9	27.844
323.999	7.7051	445.85	123.51	1117.5	27.834
325.999	8.1587	445.45	127.11	1183.3	27.809
327.998	8.6162	445.14	130.71	1249.7	27.789
330.000	9.0776	444.93	134.31	1316.6	27.776
332.000	9.5419	444.77	137.91	1383.9	27.766
334.002	10.0099	444.64	141.52	1451.8	27.758
335.999	10.4781	444.52	145.11	1519.7	27.750

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
340.001	11.4237	444.30	152.31	1656.9	27.737
344.000	12.3754	444.11	159.51	1794.9	27.725
347.999	13.3328	443.93	166.71	1933.8	27.714
351.998	14.2941	443.76	173.91	2073.2	27.703
356.000	15.2600	443.59	181.11	2213.3	27.692
360.001	16.2277	443.43	188.31	2353.6	27.682
364.001	17.1980	443.27	195.51	2494.4	27.672
368.002	18.1715	443.11	202.72	2635.6	27.662
372.000	19.1458	442.95	209.91	2776.9	27.652
376.000	20.1219	442.80	217.11	2918.4	27.643
379.999	21.0988	442.64	224.31	3060.1	27.633
384.000	22.0772	442.49	231.51	3202.0	27.624
387.999	23.0554	442.34	238.71	3343.9	27.614
391.999	24.0344	442.18	245.91	3485.9	27.604
395.999	25.0129	442.03	253.11	3627.8	27.595
399.999	25.9923	441.88	260.31	3769.9	27.586
320.001	6.3260	366.39	116.31	917.5	22.873
320.998	6.4852	366.34	118.11	940.6	22.870
321.998	6.6445	366.29	119.91	963.7	22.867
323.001	6.8068	366.23	121.71	987.2	22.863
323.999	6.9689	366.16	123.51	1010.8	22.859
326.000	7.2960	365.99	127.11	1058.2	22.848
328.000	7.6251	365.77	130.71	1105.9	22.834
330.000	7.9559	365.47	134.31	1153.9	22.816
332.002	8.2891	365.19	137.92	1202.2	22.798
335.999	8.9586	364.82	145.11	1299.3	22.775
339.999	9.6346	364.57	152.31	1397.4	22.759
343.999	10.3154	364.38	159.51	1496.1	22.748
348.000	10.9998	364.21	166.71	1595.4	22.737
351.998	11.6867	364.05	173.91	1695.0	22.727
356.001	12.3767	363.90	181.11	1795.1	22.718
360.002	13.0684	363.76	188.32	1895.4	22.709
363.999	13.7619	363.62	195.51	1996.0	22.700
368.002	14.4558	363.48	202.72	2096.6	22.691
372.000	15.1518	363.35	209.91	2197.6	22.683
376.001	15.8485	363.22	217.11	2298.6	22.675

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
379.998	16.5453	363.09	224.31	2399.7	22.667
383.999	17.2436	362.96	231.51	2501.0	22.659
388.000	17.9423	362.84	238.71	2602.3	22.651
392.001	18.6407	362.71	245.91	2703.6	22.643
395.999	19.3387	362.58	253.11	2804.9	22.635
399.999	20.0367	362.46	260.31	2906.1	22.628
320.002	6.2317	286.65	116.32	903.8	17.895
321.999	6.4775	286.58	119.91	939.5	17.891
324.000	6.7234	286.50	123.51	975.2	17.886
326.000	6.9691	286.40	127.11	1010.8	17.879
327.999	7.2144	286.29	130.71	1046.4	17.873
330.000	7.4597	286.14	134.31	1081.9	17.863
332.000	7.7045	285.95	137.91	1117.4	17.851
336.001	8.1936	285.51	145.11	1188.4	17.824
339.999	8.6829	285.18	152.31	1259.3	17.803
344.001	9.1724	284.96	159.51	1330.3	17.789
347.999	9.6620	284.79	166.71	1401.4	17.779
352.000	10.1518	284.64	173.91	1472.4	17.769
356.000	10.6405	284.49	181.11	1543.3	17.760
360.000	11.1298	284.36	188.31	1614.2	17.752
364.001	11.6195	284.25	195.51	1685.3	17.745
367.999	12.1082	284.14	202.71	1756.2	17.738
371.998	12.5965	284.03	209.91	1827.0	17.731
376.001	13.0847	283.92	217.11	1897.8	17.725
380.000	13.5727	283.82	224.31	1968.6	17.718
384.002	14.0606	283.71	231.52	2039.3	17.711
388.002	14.5475	283.61	238.72	2109.9	17.705
392.002	15.0340	283.51	245.92	2180.5	17.699
396.000	15.5201	283.41	253.11	2251.0	17.693
399.998	16.0054	283.31	260.31	2321.4	17.686
319.999	6.0003	193.24	116.31	870.3	12.064
321.998	6.1630	193.20	119.91	893.9	12.061
323.999	6.3243	193.15	123.51	917.3	12.058
325.999	6.4842	193.10	127.11	940.5	12.055
328.000	6.6433	193.05	130.71	963.5	12.052

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
330.000	6.8009	192.99	134.31	986.4	12.048
331.999	6.9578	192.93	137.91	1009.2	12.044
335.998	7.2690	192.79	145.11	1054.3	12.035
340.001	7.5768	192.59	152.31	1098.9	12.023
343.999	7.8812	192.33	159.51	1143.1	12.007
347.999	8.1832	192.06	166.71	1186.9	11.990
351.999	8.4835	191.84	173.91	1230.4	11.976
355.999	8.7831	191.67	181.11	1273.9	11.966
360.002	9.0816	191.53	188.32	1317.2	11.957
364.001	9.3782	191.42	195.51	1360.2	11.950
367.999	9.6739	191.31	202.71	1403.1	11.943
372.000	9.9686	191.22	209.91	1445.8	11.937
376.000	10.2623	191.13	217.11	1488.4	11.932
380.001	10.5551	191.04	224.31	1530.9	11.926
384.001	10.8468	190.96	231.51	1573.2	11.921
388.001	11.1377	190.88	238.71	1615.4	11.916
392.000	11.4275	190.80	245.91	1657.4	11.911
396.000	11.7165	190.72	253.11	1699.3	11.906
399.999	12.0047	190.65	260.31	1741.1	11.902
320.002	4.9891	110.22	116.32	723.6	6.881
322.001	5.0712	110.20	119.91	735.5	6.880
323.998	5.1527	110.18	123.51	747.3	6.878
326.000	5.2341	110.15	127.11	759.1	6.876
328.001	5.3149	110.13	130.71	770.9	6.875
330.000	5.3952	110.10	134.31	782.5	6.873
332.000	5.4752	110.08	137.91	794.1	6.872
336.000	5.6338	110.03	145.11	817.1	6.869
340.000	5.7910	109.97	152.31	839.9	6.865
344.001	5.9470	109.92	159.51	862.5	6.862
348.002	6.1017	109.87	166.72	885.0	6.859
352.000	6.2552	109.81	173.91	907.2	6.855
356.000	6.4073	109.75	181.11	929.3	6.851
360.000	6.5585	109.69	188.31	951.2	6.848
364.002	6.7082	109.62	195.52	973.0	6.843
368.002	6.8569	109.56	202.72	994.5	6.840

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
372.000	7.0042	109.48	209.91	1015.9	6.835
376.000	7.1510	109.40	217.11	1037.2	6.830
379.998	7.2966	109.31	224.31	1058.3	6.824
384.000	7.4407	109.22	231.51	1079.2	6.818
387.999	7.5835	109.11	238.71	1099.9	6.812
392.001	7.7250	108.98	245.91	1120.4	6.803
396.002	7.8648	108.84	253.12	1140.7	6.795
400.000	8.0044	108.71	260.31	1160.9	6.787
319.999	4.0606	76.13	116.31	588.9	4.753
322.001	4.1127	76.11	119.91	596.5	4.751
324.000	4.1646	76.10	123.51	604.0	4.751
326.000	4.2162	76.09	127.11	611.5	4.750
327.998	4.2676	76.07	130.71	619.0	4.749
329.998	4.3187	76.06	134.31	626.4	4.748
331.998	4.3695	76.04	137.91	633.7	4.747
336.000	4.4710	76.01	145.11	648.5	4.745
340.001	4.5714	75.98	152.31	663.0	4.743
344.000	4.6712	75.95	159.51	677.5	4.741
348.000	4.7703	75.92	166.71	691.9	4.740
352.001	4.8687	75.89	173.91	706.2	4.738
356.001	4.9663	75.86	181.11	720.3	4.736
360.000	5.0632	75.83	188.31	734.4	4.734
364.001	5.1589	75.80	195.51	748.2	4.732
368.001	5.2550	75.76	202.71	762.2	4.730
372.001	5.3504	75.73	209.91	776.0	4.728
376.001	5.4452	75.70	217.11	789.8	4.726
380.000	5.5397	75.66	224.31	803.5	4.723
384.000	5.6336	75.63	231.51	817.1	4.721
388.000	5.7272	75.60	238.71	830.7	4.720
392.000	5.8203	75.56	245.91	844.2	4.717
395.999	5.9130	75.52	253.11	857.6	4.715
400.000	6.0051	75.49	260.31	871.0	4.713
320.000	2.8997	47.14	116.31	420.6	2.943
321.999	2.9290	47.13	119.91	424.8	2.942
323.999	2.9581	47.12	123.51	429.0	2.942

Table 33. Isochoric (p,ρ,T) Data for R-41 from 132 to 400 K (-222 to 260°F) (continued).

Temperature K	Pressure MPa	Density kg/m ³	Temperature °F	Pressure psia	Density lb/ft ³
326.000	2.9871	47.11	127.11	433.2	2.941
327.999	3.0160	47.10	130.71	437.4	2.940
330.000	3.0448	47.10	134.31	441.6	2.940
332.000	3.0736	47.09	137.91	445.8	2.940
336.000	3.1307	47.07	145.11	454.1	2.938
340.000	3.1875	47.06	152.31	462.3	2.938
343.999	3.2440	47.04	159.51	470.5	2.937
348.000	3.3002	47.02	166.71	478.7	2.935
351.998	3.3560	47.01	173.91	486.8	2.935
355.999	3.4116	46.99	181.11	494.8	2.933
359.999	3.4668	46.97	188.31	502.8	2.932
363.998	3.5221	46.96	195.51	510.8	2.932
368.000	3.5769	46.94	202.71	518.8	2.930
371.998	3.6315	46.92	209.91	526.7	2.929
376.000	3.6858	46.90	217.11	534.6	2.928
379.998	3.7399	46.89	224.31	542.4	2.927
383.998	3.7939	46.87	231.51	550.3	2.926
388.001	3.8476	46.85	238.71	558.0	2.925
392.001	3.9011	46.83	245.91	565.8	2.924
395.998	3.9544	46.82	253.11	573.5	2.923
399.999	4.0076	46.80	260.31	581.3	2.922