

TABLE A-13

Superheated refrigerant-134a

<i>T</i> °C	<i>v</i> m ³ /kg	<i>u</i> kJ/kg	<i>h</i> kJ/kg	<i>s</i> kJ/kg·K	<i>v</i> m ³ /kg	<i>u</i> kJ/kg	<i>h</i> kJ/kg	<i>s</i> kJ/kg·K	<i>v</i> m ³ /kg	<i>u</i> kJ/kg	<i>h</i> kJ/kg	<i>s</i> kJ/kg·K
<i>P</i> = 0.06 MPa (<i>T</i> _{sat} = -36.95°C)				<i>P</i> = 0.10 MPa (<i>T</i> _{sat} = -26.37°C)				<i>P</i> = 0.14 MPa (<i>T</i> _{sat} = -18.77°C)				
Sat.	0.31121	209.12	227.79	0.9644	0.19254	215.19	234.44	0.9518	0.14014	219.54	239.16	0.9446
-20	0.33608	220.60	240.76	1.0174	0.19841	219.66	239.50	0.9721				
-10	0.35048	227.55	248.58	1.0477	0.20743	226.75	247.49	1.0030	0.14605	225.91	246.36	0.9724
0	0.36476	234.66	256.54	1.0774	0.21630	233.95	255.58	1.0332	0.15263	233.23	254.60	1.0031
10	0.37893	241.92	264.66	1.1066	0.22506	241.30	263.81	1.0628	0.15908	240.66	262.93	1.0331
20	0.39302	249.35	272.94	1.1353	0.23373	248.79	272.17	1.0918	0.16544	248.22	271.38	1.0624
30	0.40705	256.95	281.37	1.1636	0.24233	256.44	280.68	1.1203	0.17172	255.93	279.97	1.0912
40	0.42102	264.71	289.97	1.1915	0.25088	264.25	289.34	1.1484	0.17794	263.79	288.70	1.1195
50	0.43495	272.64	298.74	1.2191	0.25937	272.22	298.16	1.1762	0.18412	271.79	297.57	1.1474
60	0.44883	280.73	307.66	1.2463	0.26783	280.35	307.13	1.2035	0.19025	279.96	306.59	1.1749
70	0.46269	288.99	316.75	1.2732	0.27626	288.64	316.26	1.2305	0.19635	288.28	315.77	1.2020
80	0.47651	297.41	326.00	1.2997	0.28465	297.08	325.55	1.2572	0.20242	296.75	325.09	1.2288
90	0.49032	306.00	335.42	1.3260	0.29303	305.69	334.99	1.2836	0.20847	305.38	334.57	1.2553
100	0.50410	314.74	344.99	1.3520	0.30138	314.46	344.60	1.3096	0.21449	314.17	344.20	1.2814
<i>P</i> = 0.18 MPa (<i>T</i> _{sat} = -12.73°C)				<i>P</i> = 0.20 MPa (<i>T</i> _{sat} = -10.09°C)				<i>P</i> = 0.24 MPa (<i>T</i> _{sat} = -5.38°C)				
Sat.	0.11041	222.99	242.86	0.9397	0.09987	224.48	244.46	0.9377	0.08390	227.14	247.28	0.9346
-10	0.11189	225.02	245.16	0.9484	0.09991	224.55	244.54	0.9380				
0	0.11722	232.48	253.58	0.9798	0.10481	232.09	253.05	0.9698	0.08617	231.29	251.97	0.9519
10	0.12240	240.00	262.04	1.0102	0.10955	239.67	261.58	1.0004	0.09026	238.98	260.65	0.9831
20	0.12748	247.64	270.59	1.0399	0.11418	247.35	270.18	1.0303	0.09423	246.74	269.36	1.0134
30	0.13248	255.41	279.25	1.0690	0.11874	255.14	278.89	1.0595	0.09812	254.61	278.16	1.0429
40	0.13741	263.31	288.05	1.0975	0.12322	263.08	287.72	1.0882	0.10193	262.59	287.06	1.0718
50	0.14230	271.36	296.98	1.1256	0.12766	271.15	296.68	1.1163	0.10570	270.71	296.08	1.1001
60	0.14715	279.56	306.05	1.1532	0.13206	279.37	305.78	1.1441	0.10942	278.97	305.23	1.1280
70	0.15196	287.91	315.27	1.1805	0.13641	287.73	315.01	1.1714	0.11310	287.36	314.51	1.1554
80	0.15673	296.42	324.63	1.2074	0.14074	296.25	324.40	1.1983	0.11675	295.91	323.93	1.1825
90	0.16149	305.07	334.14	1.2339	0.14504	304.92	333.93	1.2249	0.12038	304.60	333.49	1.2092
100	0.16622	313.88	343.80	1.2602	0.14933	313.74	343.60	1.2512	0.12398	313.44	343.20	1.2356
<i>P</i> = 0.28 MPa (<i>T</i> _{sat} = -1.25°C)				<i>P</i> = 0.32 MPa (<i>T</i> _{sat} = 2.46°C)				<i>P</i> = 0.40 MPa (<i>T</i> _{sat} = 8.91°C)				
Sat.	0.07235	229.46	249.72	0.9321	0.06360	231.52	251.88	0.9301	0.051201	235.07	255.55	0.9269
0	0.07282	230.44	250.83	0.9362								
10	0.07646	238.27	259.68	0.9680	0.06609	237.54	258.69	0.9544	0.051506	235.97	256.58	0.9305
20	0.07997	246.13	268.52	0.9987	0.06925	245.50	267.66	0.9856	0.054213	244.18	265.86	0.9628
30	0.08338	254.06	277.41	1.0285	0.07231	253.50	276.65	1.0157	0.056796	252.36	275.07	0.9937
40	0.08672	262.10	286.38	1.0576	0.07530	261.60	285.70	1.0451	0.059292	260.58	284.30	1.0236
50	0.09000	270.27	295.47	1.0862	0.07823	269.82	294.85	1.0739	0.061724	268.90	293.59	1.0528
60	0.09324	278.56	304.67	1.1142	0.08111	278.15	304.11	1.1021	0.064104	277.32	302.96	1.0814
70	0.09644	286.99	314.00	1.1418	0.08395	286.62	313.48	1.1298	0.066443	285.86	312.44	1.1094
80	0.09961	295.57	323.46	1.1690	0.08675	295.22	322.98	1.1571	0.068747	294.53	322.02	1.1369
90	0.10275	304.29	333.06	1.1958	0.08953	303.97	332.62	1.1840	0.071023	303.32	331.73	1.1640
100	0.10587	313.15	342.80	1.2222	0.09229	312.86	342.39	1.2105	0.073274	312.26	341.57	1.1907
110	0.10897	322.16	352.68	1.2483	0.09503	321.89	352.30	1.2367	0.075504	321.33	351.53	1.2171
120	0.11205	331.32	362.70	1.2742	0.09775	331.07	362.35	1.2626	0.077717	330.55	361.63	1.2431
130	0.11512	340.63	372.87	1.2997	0.10045	340.39	372.54	1.2882	0.079913	339.90	371.87	1.2688
140	0.11818	350.09	383.18	1.3250	0.10314	349.86	382.87	1.3135	0.082096	349.41	382.24	1.2942

TABLE A-13

Superheated refrigerant-134a (Continued)

T °C	v m ³ /kg	u kJ/kg	h kJ/kg	s kJ/kg·K	v m ³ /kg	u kJ/kg	h kJ/kg	s kJ/kg·K	v m ³ /kg	u kJ/kg	h kJ/kg	s kJ/kg·K
$P = 0.50 \text{ MPa } (T_{\text{sat}} = 15.71^\circ\text{C})$				$P = 0.60 \text{ MPa } (T_{\text{sat}} = 21.55^\circ\text{C})$				$P = 0.70 \text{ MPa } (T_{\text{sat}} = 26.69^\circ\text{C})$				
Sat.	0.041118	238.75	259.30	0.9240	0.034295	241.83	262.40	0.9218	0.029361	244.48	265.03	0.9199
20	0.042115	242.40	263.46	0.9383					0.029966	247.48	268.45	0.9313
30	0.044338	250.84	273.01	0.9703	0.035984	249.22	270.81	0.9499	0.031696	256.39	278.57	0.9641
40	0.046456	259.26	282.48	1.0011	0.037865	257.86	280.58	0.9816	0.033322	265.20	288.53	0.9954
50	0.048499	267.72	291.96	1.0309	0.039659	266.48	290.28	1.0121	0.034875	274.01	298.42	1.0256
60	0.050485	276.25	301.50	1.0599	0.041389	275.15	299.98	1.0417	0.036373	282.87	308.33	1.0549
70	0.052427	284.89	311.10	1.0883	0.043069	283.89	309.73	1.0705	0.037829	291.80	318.28	1.0835
80	0.054331	293.64	320.80	1.1162	0.044710	292.73	319.55	1.0987	0.039250	300.82	328.29	1.1114
90	0.056205	302.51	330.61	1.1436	0.046318	301.67	329.46	1.1264	0.040642	309.95	338.40	1.1389
100	0.058053	311.50	340.53	1.1705	0.047900	310.73	339.47	1.1536	0.042010	319.19	348.60	1.1658
110	0.059880	320.63	350.57	1.1971	0.049458	319.91	349.59	1.1803	0.043358	328.55	358.90	1.1924
120	0.061687	329.89	360.73	1.2233	0.050997	329.23	359.82	1.2067	0.044688	338.04	369.32	1.2186
130	0.063479	339.29	371.03	1.2491	0.052519	338.67	370.18	1.2327	0.046004	347.66	379.86	1.2444
140	0.065256	348.83	381.46	1.2747	0.054027	348.25	380.66	1.2584	0.047306	357.41	390.52	1.2699
150	0.067021	358.51	392.02	1.2999	0.055522	357.96	391.27	1.2838	0.048597	367.29	401.31	1.2951
160	0.068775	368.33	402.72	1.3249	0.057006	367.81	402.01	1.3088				
$P = 0.80 \text{ MPa } (T_{\text{sat}} = 31.31^\circ\text{C})$				$P = 0.90 \text{ MPa } (T_{\text{sat}} = 35.51^\circ\text{C})$				$P = 1.00 \text{ MPa } (T_{\text{sat}} = 39.37^\circ\text{C})$				
Sat.	0.025621	246.79	267.29	0.9183	0.022683	248.85	269.26	0.9169	0.020313	250.68	270.99	0.9156
40	0.027035	254.82	276.45	0.9480	0.023375	253.13	274.17	0.9327	0.020406	251.30	271.71	0.9179
50	0.028547	263.86	286.69	0.9802	0.024809	262.44	284.77	0.9660	0.021796	260.94	282.74	0.9525
60	0.029973	272.83	296.81	1.0110	0.026146	271.60	295.13	0.9976	0.023068	270.32	293.38	0.9850
70	0.031340	281.81	306.88	1.0408	0.027413	280.72	305.39	1.0280	0.024261	279.59	303.85	1.0160
80	0.032659	290.84	316.97	1.0698	0.028630	289.86	315.63	1.0574	0.025398	288.86	314.25	1.0458
90	0.033941	299.95	327.10	1.0981	0.029806	299.06	325.89	1.0860	0.026492	298.15	324.64	1.0748
100	0.035193	309.15	337.30	1.1258	0.030951	308.34	336.19	1.1140	0.027552	307.51	335.06	1.1031
110	0.036420	318.45	347.59	1.1530	0.032068	317.70	346.56	1.1414	0.028584	316.94	345.53	1.1308
120	0.037625	327.87	357.97	1.1798	0.033164	327.18	357.02	1.1684	0.029592	326.47	356.06	1.1580
130	0.038813	337.40	368.45	1.2061	0.034241	336.76	367.58	1.1949	0.030581	336.11	366.69	1.1846
140	0.039985	347.06	379.05	1.2321	0.035302	346.46	378.23	1.2210	0.031554	345.85	377.40	1.2109
150	0.041143	356.85	389.76	1.2577	0.036349	356.28	389.00	1.2467	0.032512	355.71	388.22	1.2368
160	0.042290	366.76	400.59	1.2830	0.037384	366.23	399.88	1.2721	0.033457	365.70	399.15	1.2623
170	0.043427	376.81	411.55	1.3080	0.038408	376.31	410.88	1.2972	0.034392	375.81	410.20	1.2875
180	0.044554	386.99	422.64	1.3327	0.039423	386.52	422.00	1.3221	0.035317	386.04	421.36	1.3124
$P = 1.20 \text{ MPa } (T_{\text{sat}} = 46.29^\circ\text{C})$				$P = 1.40 \text{ MPa } (T_{\text{sat}} = 52.40^\circ\text{C})$				$P = 1.60 \text{ MPa } (T_{\text{sat}} = 57.88^\circ\text{C})$				
Sat.	0.016715	253.81	273.87	0.9130	0.014107	256.37	276.12	0.9105	0.012123	258.47	277.86	0.9078
50	0.017201	257.63	278.27	0.9267					0.012372	260.89	280.69	0.9163
60	0.018404	267.56	289.64	0.9614	0.015005	264.46	285.47	0.9389	0.013430	271.76	293.25	0.9535
70	0.019502	277.21	300.61	0.9938	0.016060	274.62	297.10	0.9733	0.014362	282.09	305.07	0.9875
80	0.020529	286.75	311.39	1.0248	0.017023	284.51	308.34	1.0056	0.015215	292.17	316.52	1.0194
90	0.021506	296.26	322.07	1.0546	0.017923	294.28	319.37	1.0364	0.016014	302.14	327.76	1.0500
100	0.022442	305.80	332.73	1.0836	0.018778	304.01	330.30	1.0661	0.016773	312.07	338.91	1.0795
110	0.023348	315.38	343.40	1.1118	0.019597	313.76	341.19	1.0949	0.017500	322.02	350.02	1.1081
120	0.024228	325.03	354.11	1.1394	0.020388	323.55	352.09	1.1230	0.018201	332.00	361.12	1.1360
130	0.025086	334.77	364.88	1.1664	0.021155	333.41	363.02	1.1504	0.018882	342.05	372.26	1.1632
140	0.025927	344.61	375.72	1.1930	0.021904	343.34	374.01	1.1773	0.019545	352.17	383.44	1.1900
150	0.026753	354.56	386.66	1.2192	0.022636	353.37	385.07	1.2038	0.020194	362.38	394.69	1.2163
160	0.027566	364.61	397.69	1.2449	0.023355	363.51	396.20	1.2298	0.020830	372.69	406.02	1.2421
170	0.028367	374.78	408.82	1.2703	0.024061	373.75	407.43	1.2554	0.021456	383.11	417.44	1.2676
180	0.029158	385.08	420.07	1.2954	0.024757	384.10	418.76	1.2807				