Ammonia Refrigeration

Reference Material

January 2010

Conversion Factors

Energy

$$1\,HP = 2{,}545\,\frac{Btu}{hr}$$

$$1\,ton = 12{,}000\,\frac{Btu}{hr}$$

$$1\,ton = 200\,\frac{Btu}{min}$$

$$1\,HP = 0.746\,kW$$

$$1\,kWh = 3{,}413\,Btu$$

Mass

$$1\,kg = 2.204\,lb$$

Length

$$1\,m = 3.281\,ft$$

Temperature

$$1\,°F = \left(°C \cdot \frac{9}{5}\right) + 32$$

$$1\,°C = \left(°F - 32\right) \cdot \frac{5}{9}$$

Pressure

$$psia = psig + P_{atm}$$

$$1\,in.\,Hg = 0.491\,psi$$

Useful Formulas

Evaporator Capacity

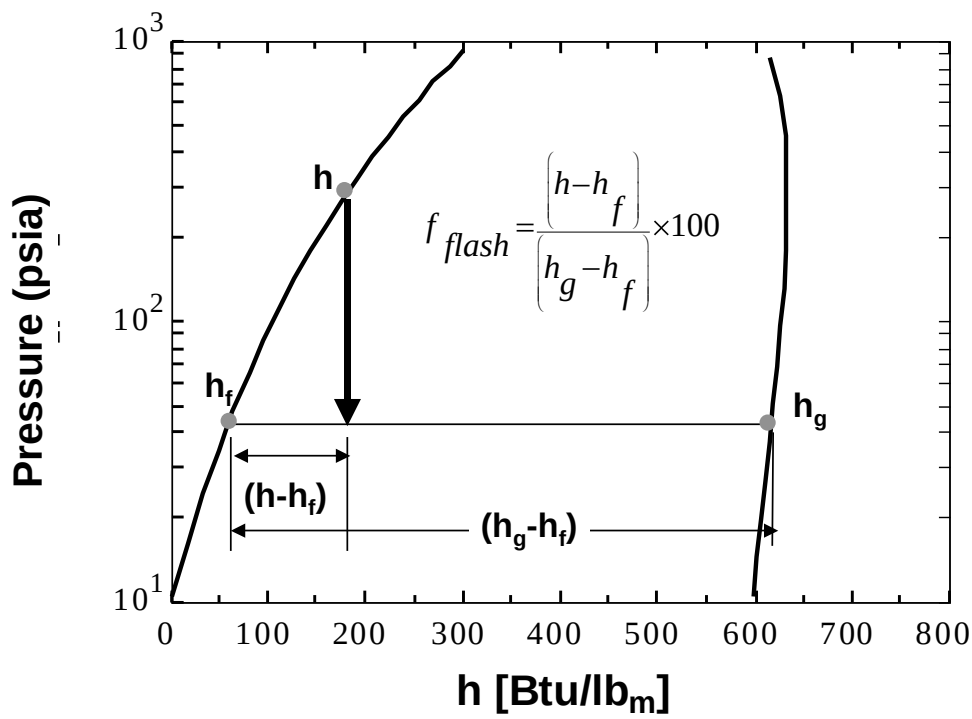
$$Q_{evaporator} = \dot{m}_{refrigerant} \cdot \left(h_{outlet} - h_{inlet}\right)_{evaporator}$$

where $Q_{evaporator}$ is the evaporator capacity in (Btu/hr), $\dot{m}_{refrigerant}$ is the mass flow of refrigerant (lb/hr), h_{outlet} is the enthalpy of refrigerant leaving the evaporator (Btu/lb) and h_{inlet} is the enthalpy of the refrigerant entering the evaporator (Btu/lb).

Flash Gas

$$f_{flash} = \frac{\left(h - h_f\right)}{\left(h_g - h_f\right)}$$

where f_{flash} is the fraction of refrigerant flashing to vapor, h is the enthalpy of refrigerant entering the expansion valve (Btu/lb), h_f is the enthalpy of saturated liquid refrigerant downstream of the valve (Btu/lb), h_g is the enthalpy of saturated vapor refrigerant downstream of the valve (Btu/lb). The figure below illustrates the state points on a pressure-enthalpy diagram.



Anhydrous Ammonia Properties

The following pages provide the properties of ammonia at saturation conditions. Included are saturation temperatures, corresponding pressures (both gauge and absolute), and enthalpy of both saturated liquid and vapor. In cases where the pressure is below atmospheric, the gauge pressure is italicized and expressed in inches of mercury vacuum.

Temperature-Pressure Properties of Ammonia at Saturation

Temp	Press	*Gage Press*	Enthalpy [Btu/lb]	
[F]	[psia]	*[in. hg vac]*	Liquid	Vapor
-69	4.08	*-21.62*	-30.31	585.71
-68	4.22	*-21.32*	-29.27	586.13
-67	4.37	*-21.02*	-28.24	586.55
-66	4.53	*-20.71*	-27.20	586.96
-65	4.68	*-20.39*	-26.17	587.38
-64	4.85	*-20.06*	-25.13	587.80
-63	5.01	*-19.72*	-24.09	588.21
-62	5.19	*-19.37*	-23.05	588.62
-61	5.36	*-19.01*	-22.01	589.03
-60	5.54	*-18.64*	-20.97	589.44
-59	5.73	*-18.26*	-19.93	589.85
-58	5.92	*-17.86*	-18.89	590.26
-57	6.12	*-17.46*	-17.84	590.67
-56	6.32	*-17.05*	-16.80	591.07
-55	6.53	*-16.63*	-15.75	591.48
-54	6.75	*-16.19*	-14.71	591.88
-53	6.97	*-15.74*	-13.66	592.28
-52	7.19	*-15.29*	-12.62	592.68
-51	7.42	*-14.81*	-11.57	593.08
-50	7.66	*-14.33*	-10.52	593.48
-49	7.90	*-13.83*	-9.47	593.88
-48	8.15	*-13.33*	-8.42	594.27
-47	8.41	*-12.80*	-7.37	594.67
-46	8.67	*-12.27*	-6.32	595.06
-45	8.94	*-11.72*	-5.27	595.45
-44	9.22	*-11.15*	-4.22	595.84
-43	9.50	*-10.58*	-3.16	596.23
-42	9.79	*-9.99*	-2.11	596.62
-41	10.09	*-9.38*	-1.06	597.01
-40	10.40	*-8.76*	0.00	597.39

Temp	Press	*Gage Press*	Enthalpy [Btu/lb]	
[F]	[psia]	*[in. hg] [psig]*	Liquid	Vapor
-39	10.71	*-8.12*	1.06	597.77
-38	11.03	*-7.47*	2.11	598.16
-37	11.36	*-6.80*	3.17	598.54
-36	11.70	*-6.11*	4.23	598.92
-35	12.04	*-5.41*	5.29	599.30
-34	12.39	*-4.69*	6.35	599.67
-33	12.76	*-3.96*	7.41	600.05
-32	13.13	*-3.21*	8.47	600.42
-31	13.50	*-2.44*	9.53	600.79
-30	13.89	*-1.65*	10.59	601.17
-29	14.29	*-0.84*	11.65	601.54
-28	14.69	*-0.02*	12.72	601.90
-27	15.11	0.11	13.78	602.27
-26	15.53	0.53	14.85	602.63
-25	15.96	0.96	15.91	603.00
-24	16.41	1.41	16.98	603.36
-23	16.86	1.86	18.05	603.72
-22	17.32	2.32	19.12	604.08
-21	17.80	2.80	20.18	604.44
-20	18.28	3.28	21.25	604.79
-19	18.77	3.77	22.32	605.15
-18	19.28	4.28	23.39	605.50
-17	19.79	4.79	24.46	605.85
-16	20.32	5.32	25.54	606.20
-15	20.86	5.86	26.61	606.55
-14	21.41	6.41	27.68	606.89
-13	21.97	6.97	28.76	607.24
-12	22.54	7.54	29.83	607.58
-11	23.13	8.13	30.91	607.92
-10	23.72	8.72	31.98	608.26

Temp	Press	Gage Press	Enthalpy [Btu/lb]	
[F]	[psia]	[psig]	Liquid	Vapor
-9	24.33	9.33	33.06	608.60
-8	24.95	9.95	34.14	608.93
-7	25.59	10.59	35.21	609.27
-6	26.24	11.24	36.29	609.60
-5	26.90	11.90	37.37	609.93
-4	27.57	12.57	38.45	610.26
-3	28.26	13.26	39.53	610.59
-2	28.96	13.96	40.61	610.91
-1	29.67	14.67	41.70	611.24
0	30.40	15.40	42.78	611.56
1	31.14	16.14	43.86	611.88
2	31.90	16.90	44.95	612.20
3	32.67	17.67	46.03	612.51
4	33.45	18.45	47.12	612.83
5	34.25	19.25	48.20	613.14
6	35.07	20.07	49.29	613.45
7	35.90	20.90	50.38	613.76
8	36.75	21.75	51.47	614.06
9	37.61	22.61	52.55	614.37
10	38.49	23.49	53.64	614.67
11	39.38	24.38	54.73	614.97
12	40.29	25.29	55.83	615.27
13	41.22	26.22	56.92	615.57
14	42.17	27.17	58.01	615.86
15	43.13	28.13	59.10	616.16
16	44.10	29.10	60.20	616.45
17	45.10	30.10	61.29	616.74
18	46.11	31.11	62.39	617.03
19	47.15	32.15	63.48	617.31
20	48.19	33.19	64.58	617.59

Temperature-Pressure Properties of Ammonia at Saturation

Temp	Press	Gage Press	Enthalpy [Btu/lb]	
[F]	[psia]	[psig]	Liquid	Vapor
21	49.26	34.26	65.68	617.87
22	50.35	35.35	66.77	618.15
23	51.45	36.45	67.87	618.43
24	52.58	37.58	68.97	618.70
25	53.72	38.72	70.07	618.98
26	54.88	39.88	71.17	619.25
27	56.07	41.07	72.28	619.52
28	57.27	42.27	73.38	619.78
29	58.49	43.49	74.48	620.05
30	59.73	44.73	75.59	620.31
31	60.99	45.99	76.69	620.57
32	62.28	47.28	77.80	620.83
33	63.58	48.58	78.90	621.08
34	64.91	49.91	80.01	621.33
35	66.26	51.26	81.12	621.59
36	67.62	52.62	82.22	621.83
37	69.02	54.02	83.33	622.08
38	70.43	55.43	84.44	622.33
39	71.86	56.86	85.55	622.57
40	73.32	58.32	86.67	622.81
41	74.80	59.80	87.78	623.04
42	76.31	61.31	88.89	623.28
43	77.84	62.84	90.01	623.51
44	79.39	64.39	91.12	623.74
45	80.96	65.96	92.24	623.97
46	82.56	67.56	93.35	624.20
47	84.19	69.19	94.47	624.42
48	85.83	70.83	95.59	624.64
49	87.51	72.51	96.71	624.86
50	89.21	74.21	97.83	625.07

Temp	Press	Gage Press	Enthalpy [Btu/lb]	
[F]	[psia]	[psig]	Liquid	Vapor
51	90.93	75.93	98.95	625.29
52	92.68	77.68	100.10	625.50
53	94.45	79.45	101.20	625.71
54	96.26	81.26	102.30	625.91
55	98.08	83.08	103.40	626.12
56	99.94	84.94	104.60	626.32
57	101.82	86.82	105.70	626.52
58	103.73	88.73	106.80	626.71
59	105.66	90.66	107.90	626.91
60	107.63	92.63	109.10	627.10
61	109.62	94.62	110.20	627.29
62	111.64	96.64	111.30	627.47
63	113.69	98.69	112.50	627.66
64	115.77	100.77	113.60	627.84
65	117.87	102.87	114.70	628.02
66	120.01	105.01	115.90	628.19
67	122.17	107.17	117.00	628.37
68	124.37	109.37	118.10	628.54
69	126.59	111.59	119.30	628.70
70	128.85	113.85	120.40	628.87
71	131.13	116.13	121.60	629.03
72	133.45	118.45	122.70	629.19
73	135.80	120.80	123.80	629.35
74	138.18	123.18	125.00	629.50
75	140.59	125.59	126.10	629.65
76	143.03	128.03	127.30	629.80
77	145.51	130.51	128.40	629.94
78	148.02	133.02	129.60	630.09
79	150.56	135.56	130.70	630.23
80	153.13	138.13	131.90	630.36

Temp	Press	Gage Press	Enthalpy [Btu/lb]	
[F]	[psia]	[psig]	Liquid	Vapor
81	155.74	140.74	133.00	630.50
82	158.38	143.38	134.20	630.63
83	161.06	146.06	135.30	630.76
84	163.77	148.77	136.50	630.88
85	166.51	151.51	137.60	631.00
86	169.29	154.29	138.80	631.12
87	172.10	157.10	139.90	631.24
88	174.95	159.95	141.10	631.35
89	177.84	162.84	142.30	631.46
90	180.76	165.76	143.40	631.57
91	183.72	168.72	144.60	631.67
92	186.71	171.71	145.70	631.77
93	189.74	174.74	146.90	631.87
94	192.81	177.81	148.10	631.96
95	195.91	180.91	149.20	632.06
96	199.06	184.06	150.40	632.14
97	202.24	187.24	151.60	632.23
98	205.46	190.46	152.80	632.31
99	208.72	193.72	153.90	632.39
100	212.01	197.01	155.10	632.46
101	215.35	200.35	156.30	632.53
102	218.73	203.73	157.50	632.60
103	222.14	207.14	158.60	632.67
104	225.60	210.60	159.80	632.73
105	229.09	214.09	161.00	632.79
106	232.63	217.63	162.20	632.84
107	236.21	221.21	163.40	632.89
108	239.83	224.83	164.50	632.94
109	243.49	228.49	165.70	632.99
110	247.19	232.19	166.90	633.03

The following pages provide the properties of ammonia at saturation conditions. Whereas the previous tables provided saturation properties given temperature, these tables present the saturation properties in equal increments of absolute pressure.

Pressure-Temperature Properties of Ammonia at Saturation

Press	*Gage Press.*	Temp.	Enthalpy	[Btu/lb]
[psia]	[in.hg vac],[psig]	[F]	Liquid	Vapor
1	*-27.885*	-105.00	-67.00	570.00
2	*-25.849*	-88.21	-50.03	577.50
3	*-23.814*	-77.55	-39.12	582.10
4	*-21.779*	-69.55	-30.88	585.50
5	*-19.743*	-63.08	-24.17	588.20
6	*-17.708*	-57.61	-18.47	590.40
7	*-15.672*	-52.84	-13.50	592.30
8	*-13.637*	-48.61	-9.06	594.00
9	*-11.602*	-44.79	-5.05	595.50
10	*-9.566*	-41.31	-1.38	596.89
11	*-7.531*	-38.10	2.01	598.12
12	*-5.496*	-35.12	5.16	599.25
13	*-3.460*	-32.33	8.11	600.30
14	*-1.425*	-29.72	10.89	601.27
15	0.0	-27.25	13.51	602.18
16	1.0	-24.91	16.01	603.03
17	2.0	-22.69	18.38	603.83
18	3.0	-20.57	20.64	604.59
19	4.0	-18.55	22.81	605.31
20	5.0	-16.61	24.89	605.99
21	6.0	-14.74	26.89	606.64
22	7.0	-12.95	28.82	607.26
23	8.0	-11.21	30.68	607.85
24	9.0	-9.54	32.47	608.41
25	10.0	-7.93	34.22	608.96
26	11.0	-6.36	35.90	609.48
27	12.0	-4.84	37.54	609.98
28	13.0	-3.37	39.13	610.47
29	14.0	-1.94	40.68	610.93
30	15.0	-0.54	42.19	611.38

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
31	16.3	1.30	43.66	611.82
32	17.3	2.30	45.09	612.24
33	18.3	3.30	46.49	612.65
34	19.3	4.30	47.86	613.04
35	20.3	5.30	49.20	613.42
36	21.3	6.30	50.51	613.79
37	22.3	7.30	51.79	614.15
38	23.3	8.30	53.04	614.50
39	24.3	9.30	54.27	614.85
40	25.3	10.30	55.48	615.18
41	26.3	11.30	56.66	615.50
42	27.3	12.30	57.82	615.81
43	28.3	13.30	58.96	616.12
44	29.3	14.30	60.08	616.42
45	30.3	15.30	61.18	616.71
46	31.3	16.30	62.26	616.99
47	32.3	17.30	63.33	617.27
48	33.3	18.30	64.38	617.54
49	34.3	19.30	65.41	617.81
50	35.3	20.30	66.42	618.06
51	36.3	21.30	67.42	618.32
52	37.3	22.30	68.41	618.56
53	38.3	23.30	69.38	618.81
54	39.3	24.30	70.34	619.04
55	40.3	25.30	71.28	619.27
56	41.3	26.30	72.22	619.50
57	42.3	27.30	73.13	619.72
58	43.3	28.30	74.04	619.94
59	44.3	29.30	74.94	620.15
60	45.3	30.30	75.82	620.36

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
61	46.0	31.01	76.70	620.57
62	47.0	31.79	77.56	620.77
63	48.0	32.56	78.41	620.97
64	49.0	33.32	79.25	621.16
65	50.0	34.07	80.08	621.35
66	51.0	34.81	80.91	621.54
67	52.0	35.55	81.72	621.72
68	53.0	36.27	82.53	621.90
69	54.0	36.99	83.32	622.08
70	55.0	37.70	84.11	622.25
71	56.0	38.40	84.89	622.42
72	57.0	39.09	85.66	622.59
73	58.0	39.78	86.42	622.75
74	59.0	40.46	87.18	622.92
75	60.0	41.13	87.93	623.07
76	61.0	41.80	88.67	623.23
77	62.0	42.46	89.40	623.38
78	63.0	43.11	90.13	623.54
79	64.0	43.75	90.85	623.68
80	65.0	44.39	91.56	623.83
81	66.0	45.02	92.26	623.98
82	67.0	45.65	92.96	624.12
83	68.0	46.27	93.66	624.26
84	69.0	46.89	94.34	624.39
85	70.0	47.50	95.03	624.53
86	71.0	48.10	95.70	624.66
87	72.0	48.70	96.37	624.79
88	73.0	49.29	97.04	624.92
89	74.0	49.88	97.69	625.05
90	75.0	50.46	98.35	625.17

Pressure-Temperature Properties of Ammonia at Saturation

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
91	76.0	51.04	99.00	625.30
92	77.0	51.61	99.64	625.42
93	78.0	52.18	100.28	625.54
94	79.0	52.75	100.91	625.66
95	80.0	53.30	101.54	625.77
96	81.0	53.86	102.16	625.89
97	82.0	54.41	102.78	626.00
98	83.0	54.95	103.39	626.11
99	84.0	55.50	104.00	626.22
100	85.0	56.03	104.60	626.33
101	86.0	56.57	105.20	626.43
102	87.0	57.10	105.80	626.54
103	88.0	57.62	106.39	626.64
104	89.0	58.14	106.98	626.74
105	90.0	58.66	107.56	626.84
106	91.0	59.17	108.14	626.94
107	92.0	59.68	108.72	627.04
108	93.0	60.19	109.29	627.14
109	94.0	60.69	109.86	627.23
110	95.0	61.19	110.42	627.32
111	96.0	61.68	110.98	627.42
112	97.0	62.18	111.54	627.51
113	98.0	62.67	112.09	627.60
114	99.0	63.15	112.64	627.68
115	100.0	63.63	113.19	627.77
116	101.0	64.11	113.73	627.86
117	102.0	64.59	114.27	627.94
118	103.0	65.06	114.80	628.03
119	104.0	65.53	115.34	628.11
120	105.0	66.00	115.87	628.19

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
121	106.0	66.46	116.39	628.27
122	107.0	66.92	116.92	628.35
123	108.0	67.38	117.44	628.43
124	109.0	67.83	117.95	628.51
125	110.0	68.29	118.47	628.58
126	111.0	68.74	118.98	628.66
127	112.0	69.18	119.49	628.73
128	113.0	69.63	119.99	628.81
129	114.0	70.07	120.49	628.88
130	115.0	70.51	120.99	628.95
131	116.0	70.94	121.49	629.02
132	117.0	71.38	121.99	629.09
133	118.0	71.81	122.48	629.16
134	119.0	72.24	122.97	629.23
135	120.0	72.66	123.45	629.29
136	121.0	73.09	123.94	629.36
137	122.0	73.51	124.42	629.42
138	123.0	73.93	124.90	629.49
139	124.0	74.34	125.37	629.55
140	125.0	74.76	125.85	629.61
141	126.0	75.17	126.32	629.67
142	127.0	75.58	126.79	629.74
143	128.0	75.99	127.26	629.80
144	129.0	76.39	127.72	629.86
145	130.0	76.80	128.18	629.91
146	131.0	77.20	128.64	629.97
147	132.0	77.60	129.10	630.03
148	133.0	77.99	129.56	630.08
149	134.0	78.39	130.01	630.14
150	135.0	78.78	130.46	630.19

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
151	136.0	79.17	130.91	630.25
152	137.0	79.56	131.36	630.30
153	138.0	79.95	131.80	630.36
154	139.0	80.33	132.25	630.41
155	140.0	80.72	132.69	630.46
156	141.0	81.10	133.13	630.51
157	142.0	81.48	133.56	630.56
158	143.0	81.86	134.00	630.61
159	144.0	82.23	134.43	630.66
160	145.0	82.61	134.86	630.70
161	146.0	82.98	135.29	630.75
162	147.0	83.35	135.72	630.80
163	148.0	83.72	136.14	630.84
164	149.0	84.09	136.57	630.89
165	150.0	84.45	136.99	630.94
166	151.0	84.82	137.41	630.98
167	152.0	85.18	137.83	631.02
168	153.0	85.54	138.25	631.07
169	154.0	85.90	138.66	631.11
170	155.0	86.25	139.07	631.15
171	156.0	86.61	139.49	631.19
172	157.0	86.96	139.90	631.23
173	158.0	87.32	140.30	631.27
174	159.0	87.67	140.71	631.31
175	160.0	88.02	141.12	631.35
176	161.0	88.36	141.52	631.39
177	162.0	88.71	141.92	631.43
178	163.0	89.06	142.32	631.47
179	164.0	89.40	142.72	631.50
180	165.0	89.74	143.12	631.54

Pressure-Temperature Properties of Ammonia at Saturation

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
181	166.0	90.08	143.51	631.58
182	167.0	90.42	143.91	631.61
183	168.0	90.76	144.30	631.65
184	169.0	91.10	144.69	631.68
185	170.0	91.43	145.08	631.71
186	171.0	91.76	145.47	631.75
187	172.0	92.10	145.86	631.78
188	173.0	92.43	146.24	631.81
189	174.0	92.76	146.62	631.85
190	175.0	93.09	147.01	631.88
191	176.0	93.41	147.39	631.91
192	177.0	93.74	147.77	631.94
193	178.0	94.06	148.15	631.97
194	179.0	94.39	148.52	632.00
195	180.0	94.71	148.90	632.03
196	181.0	95.03	149.27	632.06
197	182.0	95.35	149.65	632.09
198	183.0	95.67	150.02	632.11
199	184.0	95.98	150.39	632.14
200	185.0	96.30	150.76	632.17
201	186.0	96.61	151.13	632.20
202	187.0	96.93	151.49	632.22
203	188.0	97.24	151.86	632.25
204	189.0	97.55	152.22	632.27
205	190.0	97.86	152.59	632.30
206	191.0	98.17	152.95	632.32
207	192.0	98.48	153.31	632.35
208	193.0	98.78	153.67	632.37
209	194.0	99.09	154.03	632.39
210	195.0	99.39	154.38	632.42

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
211	196.0	99.69	154.74	632.44
212	197.0	100.00	155.09	632.46
213	198.0	100.30	155.45	632.48
214	199.0	100.60	155.80	632.51
215	200.0	100.90	156.15	632.53
216	201.0	101.19	156.50	632.55
217	202.0	101.49	156.85	632.57
218	203.0	101.79	157.20	632.59
219	204.0	102.08	157.55	632.61
220	205.0	102.37	157.89	632.63
221	206.0	102.67	158.24	632.65
222	207.0	102.96	158.58	632.67
223	208.0	103.25	158.92	632.68
224	209.0	103.54	159.27	632.70
225	210.0	103.83	159.61	632.72
226	211.0	104.12	159.95	632.74
227	212.0	104.40	160.29	632.75
228	213.0	104.69	160.62	632.77
229	214.0	104.97	160.96	632.79
230	215.0	105.26	161.30	632.80
231	216.0	105.54	161.63	632.82
232	217.0	105.82	161.96	632.83
233	218.0	106.10	162.30	632.85
234	219.0	106.38	162.63	632.86
235	220.0	106.66	162.96	632.88
236	221.0	106.94	163.29	632.89
237	222.0	107.22	163.62	632.91
238	223.0	107.50	163.95	632.92
239	224.0	107.77	164.27	632.93
240	225.0	108.05	164.60	632.94

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
241	226.0	108.32	164.93	632.96
242	227.0	108.60	165.25	632.97
243	228.0	108.87	165.57	632.98
244	229.0	109.14	165.90	632.99
245	230.0	109.41	166.22	633.00
246	231.0	109.68	166.54	633.01
247	232.0	109.95	166.86	633.03
248	233.0	110.22	167.18	633.04
249	234.0	110.48	167.50	633.05
250	235.0	110.75	167.81	633.06
251	236.0	111.02	168.13	633.07
252	237.0	111.28	168.45	633.07
253	238.0	111.55	168.76	633.08
254	239.0	111.81	169.07	633.09
255	240.0	112.07	169.39	633.10
256	241.0	112.33	169.70	633.11
257	242.0	112.60	170.01	633.12
258	243.0	112.86	170.32	633.12
259	244.0	113.12	170.63	633.13
260	245.0	113.37	170.94	633.14
261	246.0	113.63	171.25	633.15
262	247.0	113.89	171.56	633.15
263	248.0	114.15	171.87	633.16
264	249.0	114.40	172.17	633.16
265	250.0	114.66	172.48	633.17
266	251.0	114.91	172.78	633.18
267	252.0	115.17	173.09	633.18
268	253.0	115.42	173.39	633.19
269	254.0	115.67	173.69	633.19
270	255.0	115.92	173.99	633.20

Pressure-Temperature Properties of Ammonia at Saturation

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
271	256.0	116.17	174.29	633.20
272	257.0	116.42	174.59	633.20
273	258.0	116.67	174.89	633.21
274	259.0	116.92	175.19	633.21
275	260.0	117.17	175.49	633.21
276	261.0	117.42	175.79	633.22
277	262.0	117.66	176.08	633.22
278	263.0	117.91	176.38	633.22
279	264.0	118.16	176.68	633.22
280	265.0	118.40	176.97	633.23
281	266.0	118.65	177.26	633.23
282	267.0	118.89	177.56	633.23
283	268.0	119.13	177.85	633.23
284	269.0	119.37	178.14	633.23
285	270.0	119.62	178.43	633.23
286	271.0	119.86	178.72	633.23
287	272.0	120.10	179.01	633.24
288	273.0	120.34	179.30	633.24
289	274.0	120.58	179.59	633.24
290	275.0	120.81	179.88	633.24
291	276.0	121.05	180.17	633.23
292	277.0	121.29	180.45	633.23
293	278.0	121.53	180.74	633.23
294	279.0	121.76	181.02	633.23
295	280.0	122.00	181.31	633.23
296	281.0	122.23	181.59	633.23
297	282.0	122.47	181.88	633.23
298	283.0	122.70	182.16	633.23
299	284.0	122.93	182.44	633.22
300	285.0	123.17	182.72	633.22

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
301	286.0	123.40	183.00	633.22
302	287.0	123.63	183.28	633.22
303	288.0	123.86	183.56	633.21
304	289.0	124.09	183.84	633.21
305	290.0	124.32	184.12	633.21
306	291.0	124.55	184.40	633.20
307	292.0	124.78	184.68	633.20
308	293.0	125.00	184.95	633.20
309	294.0	125.23	185.23	633.19
310	295.0	125.46	185.51	633.19
311	296.0	125.68	185.78	633.18
312	297.0	125.91	186.06	633.18
313	298.0	126.13	186.33	633.17
314	299.0	126.36	186.60	633.17
315	300.0	126.58	186.88	633.16
316	301.0	126.81	187.15	633.16
317	302.0	127.03	187.42	633.15
318	303.0	127.25	187.69	633.15
319	304.0	127.47	187.96	633.14
320	305.0	127.70	188.23	633.13
321	306.0	127.92	188.50	633.13
322	307.0	128.14	188.77	633.12
323	308.0	128.36	189.04	633.11
324	309.0	128.58	189.31	633.11
325	310.0	128.80	189.58	633.10
326	311.0	129.01	189.84	633.09
327	312.0	129.23	190.11	633.08
328	313.0	129.45	190.38	633.08
329	314.0	129.67	190.64	633.07
330	315.0	129.88	190.91	633.06

Press	Gage Press.	Temp.	Enthalpy	[Btu/lb]
[psia]	[psig]	[F]	Liquid	Vapor
331	316.0	130.10	191.17	633.05
332	317.0	130.31	191.43	633.04
333	318.0	130.53	191.70	633.03
334	319.0	130.74	191.96	633.03
335	320.0	130.96	192.22	633.02
336	321.0	131.17	192.48	633.01
337	322.0	131.38	192.75	633.00
338	323.0	131.60	193.01	632.99
339	324.0	131.81	193.27	632.98
340	325.0	132.02	193.53	632.97
341	326.0	132.23	193.79	632.96
342	327.0	132.44	194.05	632.95
343	328.0	132.65	194.30	632.94
344	329.0	132.86	194.56	632.93
345	330.0	133.07	194.82	632.92
346	331.0	133.28	195.08	632.91
347	332.0	133.49	195.33	632.90
348	333.0	133.70	195.59	632.88
349	334.0	133.90	195.85	632.87
350	335.0	134.11	196.10	632.86
351	336.0	134.32	196.36	632.85
352	337.0	134.52	196.61	632.84
353	338.0	134.73	196.86	632.83
354	339.0	134.93	197.12	632.81
355	340.0	135.14	197.37	632.80
356	341.0	135.34	197.62	632.79
357	342.0	135.55	197.88	632.78
358	343.0	135.75	198.13	632.76
359	344.0	135.95	198.38	632.75
360	345.0	136.16	198.63	632.74

The following pages provide the properties of ammonia in the subcooled and superheat region. Each table has been prepared for a fixed absolute pressure. Included in the table is the refrigerant enthalpy over a range of temperatures for the fixed pressure.

Anhydrous Ammonia Properties in the Subcooled & Superheat Regions

P=10 psia [-9.57 in hg.]

Temp [F]	Pressure [psia]	Enthalpy [Btu/lb]
-50	10	-10.51
-45	10	-5.27
-40	10	597.59
-35	10	600.25
-30	10	602.89
-25	10	605.53
-20	10	608.15
-15	10	610.76
-10	10	613.36
-5	10	615.95
0	10	618.54
5	10	621.12
10	10	623.69
15	10	626.26
20	10	628.82
25	10	631.39
30	10	633.95
35	10	636.50
40	10	639.06
45	10	641.61
50	10	644.17
55	10	646.72
60	10	649.28
65	10	651.83
70	10	654.39
75	10	656.94
80	10	659.50
85	10	662.06
90	10	664.63
95	10	667.19
100	10	669.76
105	10	672.33
110	10	674.90
115	10	677.48
120	10	680.06
125	10	682.64
130	10	685.23
135	10	687.82
140	10	690.41
145	10	693.01
150	10	695.61

P=25 psia [10 psig]

Temp [F]	Pressure [psia]	Enthalpy [Btu/lb]
-50	25	-10.48
-45	25	-5.23
-40	25	0.04
-35	25	5.32
-30	25	10.62
-25	25	15.94
-20	25	21.27
-15	25	26.62
-10	25	31.99
-5	25	610.63
0	25	613.47
5	25	616.29
10	25	619.08
15	25	621.85
20	25	624.61
25	25	627.35
30	25	630.08
35	25	632.79
40	25	635.49
45	25	638.18
50	25	640.87
55	25	643.54
60	25	646.21
65	25	648.87
70	25	651.53
75	25	654.19
80	25	656.84
85	25	659.48
90	25	662.13
95	25	664.77
100	25	667.41
105	25	670.05
110	25	672.69
115	25	675.33
120	25	677.98
125	25	680.62
130	25	683.26
135	25	685.90
140	25	688.55
145	25	691.20
150	25	693.85

P=30 psia [15 psig]

Temp [F]	Pressure [psia]	Enthalpy [Btu/lb]
-50	30	-10.46
-45	30	-5.21
-40	30	0.05
-35	30	5.33
-30	30	10.63
-25	30	15.95
-20	30	21.28
-15	30	26.63
-10	30	32.00
-5	30	37.38
0	30	611.60
5	30	614.50
10	30	617.30
15	30	620.20
20	30	623.00
25	30	625.80
30	30	628.60
35	30	631.40
40	30	634.20
45	30	636.90
50	30	639.60
55	30	642.40
60	30	645.10
65	30	647.80
70	30	650.50
75	30	653.20
80	30	655.90
85	30	658.50
90	30	661.20
95	30	663.90
100	30	666.60
105	30	669.20
110	30	671.90
115	30	674.60
120	30	677.20
125	30	679.90
130	30	682.50
135	30	685.20
140	30	687.90
145	30	690.50
150	30	693.20

P=60 psia [45. psig]

Temp [F]	Pressure [psia]	Enthalpy [Btu/lb]
-50	60	-10.39
-45	60	-5.14
-40	60	0.13
-35	60	5.41
-30	60	10.71
-25	60	16.02
-20	60	21.35
-15	60	26.70
-10	60	32.07
-5	60	37.45
0	60	42.84
5	60	48.26
10	60	53.69
15	60	59.14
20	60	64.60
25	60	70.08
30	60	75.59
35	60	623.50
40	60	626.60
45	60	629.70
50	60	632.70
55	60	635.70
60	60	638.70
65	60	641.60
70	60	644.60
75	60	647.50
80	60	650.40
85	60	653.20
90	60	656.10
95	60	658.90
100	60	661.80
105	60	664.60
110	60	667.40
115	60	670.20
120	60	673.00
125	60	675.80
130	60	678.60
135	60	681.40
140	60	684.10
145	60	686.90
150	60	689.70

Anhydrous Ammonia Properties in the Subcooled & Superheat Regions

P=166 psia [151 psig]

Temp [F]	Pressure [psia]	Enthalpy [Btu/lb]
0	166	43.08
5	166	48.49
10	166	53.92
15	166	59.36
20	166	64.82
25	166	70.30
30	166	75.79
35	166	81.30
40	166	86.83
45	166	92.39
50	166	97.96
55	166	103.60
60	166	109.20
65	166	114.80
70	166	120.50
75	166	126.20
80	166	131.90
85	166	137.60
90	166	634.80
95	166	638.60
100	166	642.20
105	166	645.80
110	166	649.30
115	166	652.80
120	166	656.20
125	166	659.60
130	166	662.90
135	166	666.20
140	166	669.40
145	166	672.70
150	166	675.90
155	166	679.00
160	166	682.20
165	166	685.30
170	166	688.40
175	166	691.50
180	166	694.60
185	166	697.60
190	166	700.70
195	166	703.70
200	166	706.70

P=175 psia [160 psig]

Temp [F]	Pressure [psia]	Enthalpy [Btu/lb]
0	175	43.10
5	175	48.51
10	175	53.94
15	175	59.38
20	175	64.84
25	175	70.31
30	175	75.81
35	175	81.32
40	175	86.85
45	175	92.40
50	175	97.97
55	175	103.56
60	175	109.18
65	175	114.82
70	175	120.48
75	175	126.17
80	175	131.89
85	175	137.63
90	175	632.90
95	175	636.73
100	175	640.47
105	175	644.13
110	175	647.72
115	175	651.26
120	175	654.73
125	175	658.16
130	175	661.54
135	175	664.88
140	175	668.18
145	175	671.45
150	175	674.68
155	175	677.89
160	175	681.08
165	175	684.24
170	175	687.38
175	175	690.50
180	175	693.60
185	175	696.69
190	175	699.76
195	175	702.82
200	175	705.86

P=195 psia [180 psig]

T [F]	P [psia]	h [Btu/lb]
50	195	98.01
55	195	103.60
60	195	109.20
65	195	114.80
70	195	120.50
75	195	126.20
80	195	131.90
85	195	137.70
90	195	143.40
95	195	632.10
100	195	636.00
105	195	639.90
110	195	643.70
115	195	647.40
120	195	651.10
125	195	654.60
130	195	658.10
135	195	661.60
140	195	665.00
145	195	668.40
150	195	671.80
155	195	675.10
160	195	678.30
165	195	681.60
170	195	684.80
175	195	688.00
180	195	691.20
185	195	694.30
190	195	697.50
195	195	700.60
200	195	703.70
205	195.9	706.80
210	195.9	709.90
215	195.9	712.90
220	195.9	716.00
225	195.9	719.10
230	195.9	722.10
235	195.9	725.10
240	195.9	728.20
245	195.9	731.20
250	195.9	734.20

P=200 psia [185 psig]

Temp [F]	Pressure [psia]	Enthalpy [Btu/lb]
50	200	98.01
55	200	103.60
60	200	109.22
65	200	114.85
70	200	120.51
75	200	126.20
80	200	131.91
85	200	137.66
90	200	143.43
95	200	149.24
100	200	635.14
105	200	639.06
110	200	642.89
115	200	646.64
120	200	650.32
125	200	653.92
130	200	657.47
135	200	660.97
140	200	664.41
145	200	667.82
150	200	671.18
155	200	674.51
160	200	677.80
165	200	681.07
170	200	684.31
175	200	687.52
180	200	690.71
185	200	693.88
190	200	697.03
195	200	700.16
200	200	703.28

ASHRAE PSYCHROMETRIC CHART NO.1

NORMAL TEMPERATURE SEA LEVEL

BAROMETRIC PRESSURE: 29.921 in. MERCURY

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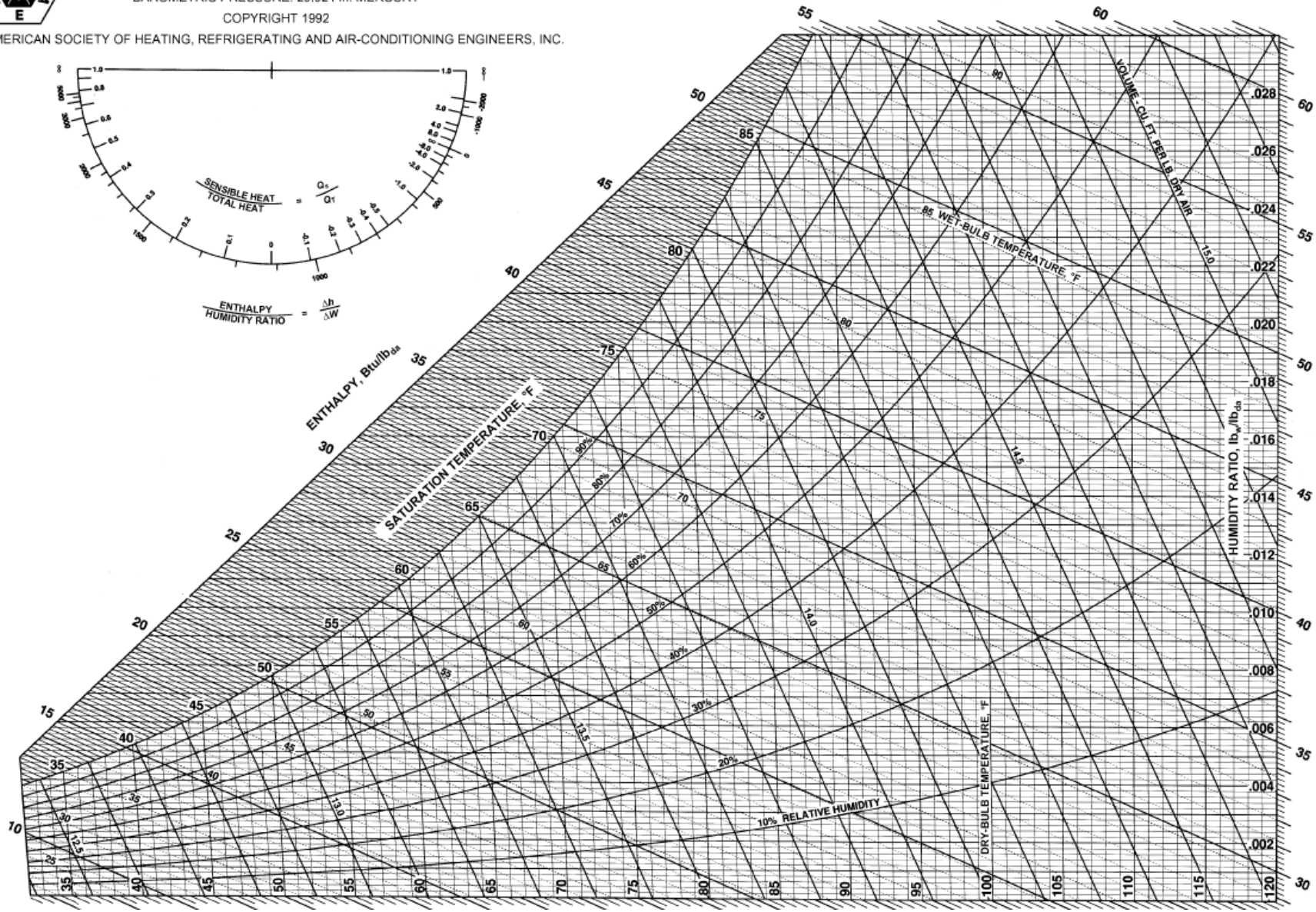
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