

# Refrigerating Engineers & Technicians Association



## IR-1 BOOK TEST REFERENCES

### Table of Contents

Commonly Used Refrigerants	2
Refrigerant Characteristics	2
Theoretical Discharge Temperatures of Refrigerants	3
Conditions of Ammonia at Various Operating Pressures	4
Volume Reference Table for Ammonia	4
Ammonia Saturated Properties Table	5
HCFC-22 Saturated Properties Table	13

Commonly Used Refrigerants		
Refrigerant Number	Name	Chemical Symbol
134-A	Tetrafluorethane	CH <sub>2</sub> FCF <sub>3</sub>
404-A	44% R125/52% 143a/ 4% 134a	
HCFC-22	Monochlorodifluoromethane	CHClF <sub>2</sub>
R-409a	73.8% R-12 /26.2% R-152a	CCl <sub>2</sub> F <sub>2</sub> + C <sub>2</sub> H <sub>4</sub> F <sub>2</sub>
R-507	50% R125/ 50% R143a	
R-744	Carbon Dioxide	CO <sub>2</sub>
R-717	Ammonia	NH <sub>3</sub>
R-718	Water	H <sub>2</sub> O

Refrigerant Characteristics							
10 °F Evaporator Temperature, 95 °F Condensing Temperature							
Refrigerant	Evaporator Pressure (psig)	Condensing Pressure (psig)	Theoretical Discharge Temperature (°F)	Refrigerating Effect (BTU/lb.)	Mass Flow Rate (lb./min/ton)	Specific volume Vapor (Cu. ft./lb.)	CFM/ton
R-507	46.2	226.4	107	45	4.44	.74	3.29
R-134-a	12	113.9	115	60	3.33	1.736	5.78
HCFC-22	32.8	181.8	145	67.74	2.9	1.129	3.33
R-404A	59.17	234.92	105	52	3.85	.7999	3.08
HCFC-502	41.1	199.7	100	43.51	4.60	.751	3.46
R-717	23.8	181.1	221	465.50	.43	7.304	3.14

\*inches of mercury vacuum

A Comparison of Theoretical Discharge Temperatures of Reciprocating Compressors at Various Evaporator Temperatures					
Evaporator Temperature in °F	Condensing Temperature 95°F	Temperature Difference in °F ( $\Delta T$ )	CFC-12 Discharge Temp. °F	HCFC-22 Discharge Temp. °F	R-717 Discharge Temp. °F
30	95	65	110	133	190
20	95	75	115	141	207
10	95	85	118	145	221
0	95	95	120	155	257

Theoretical Discharge temperatures (°F) for Ammonia at various operating pressures																
		Suction Pressures and Corresponding Saturation Temperatures														
Condensing Press./Temp	Psig °F	0 -28	2.5 -22	5 -17	7.5 -12	10 -8	12.5 -4.6	15 0	17.5 2.4	20 5.5	22.5 8.5	25 11.3	27.5 14	30 16.6	32.5 21.4	35 25.8
105 psig / 65.9°F		240	225	210	200	189	183	172	167	160	154	149	142	138	131	123
115 psig / 70.4°F		253	238	223	213	202	195	184	179	172	165	160	154	149	141	132
125 psig / 74.7°F		265	251	234	225	214	206	195	190	183	176	171	165	160	151	142
135 psig / 78.7°F		277	262	246	236	225	217	205	200	193	186	181	175	170	161	152
145 psig / 82.6°F		288	273	256	246	235	227	214	209	203	196	191	184	179	170	161
155 psig / 86.2°F		298	283	266	256	245	237	224	219	212	205	200	193	188	179	170
165 psig / 89.7°F		308	293	276	266	254	246	233	228	221	214	209	202	197	188	179
175 psig / 93.1°F		318	303	286	275	263	255	242	237	230	223	217	210	205	196	187
185 psig / 96.2°F		328	312	295	284	272	264	251	246	238	231	225	218	213	204	195
195 psig / 99.4°F		336	321	304	292	280	272	259	254	246	239	233	226	221	212	203
205 psig / 102.3°F		345	329	312	300	288	280	267	262	254	247	241	234	228	219	210
215 psig / 105.2°F		354	337	320	308	295	288	274	269	261	254	248	241	235	226	217
225 psig / 108 0°F		361	345	328	316	303	295	281	276	268	261	255	247	242	233	224

Volume Reference Table for Liquid Ammonia Storage		
Temperature °F	Pounds of Ammonia per ONE Cubic Foot (lb./ft <sup>3</sup> )	Cubic Feet in ONE Pound of Ammonia (ft <sup>3</sup> /lb.)
-40	43.08	0.0228
-35	42.86	0.0233
-30	42.65	0.0234
-25	42.44	0.0235
-20	42.22	0.0236
-15	42.00	0.0238
-10	41.78	0.0239
-5	41.56	0.0240
0	41.34	0.0241
5	41.11	0.0243
10	40.89	0.0244
15	40.66	0.0245
20	40.43	0.0247
25	40.20	0.0248
30	39.96	0.0250
35	39.72	0.0251
40	39.49	0.0253
45	39.24	0.0254
50	39.00	0.0256
55	38.75	0.0258
60	38.50	0.0259
65	38.25	0.0261
70	38.00	0.0263
75	37.74	0.0264
80	37.48	0.0266
85	37.21	0.0268
90	36.95	0.0270
95	36.67	0.0272
100	36.40	0.0274
105	36.12	0.0276
110	35.84	0.0279
115	35.55	0.0281
120	35.26	0.0283
125	34.96	0.0286

SOURCE: INTERNATIONAL INSTITUTE OF AMMONIA REFRIGERATION PROPERTIES BOOK  
TABLE -1

Refrigerant R717 (Ammonia)						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid ft <sup>3</sup> /lb.	Specific Volume Vapor ft <sup>3</sup> /lb.	Density Liquid lbs./ ft <sup>3</sup>	Density Vapor lbs./ ft <sup>3</sup>
-65	20.4" hg	4.69	0.0227	52.5619	44.15	0.0190
-64	20.0" hg	4.84	0.0227	50.8815	44.11	0.0197
-63	19.7" hg	5.02	0.0227	49.3229	44.07	0.0203
-62	19.4" hg	5.18	0.0227	47.7644	44.03	0.0209
-61	19.0" hg	5.37	0.0227	46.3175	43.99	0.0216
-60	18.6" hg	5.53	0.0228	44.8709	43.95	0.0223
-59	18.2" hg	5.72	0.0228	43.5023	43.90	0.0230
-58	17.8" hg	5.91	0.0228	42.1830	43.86	0.0237
-57	17.4" hg	6.11	0.0228	40.9108	43.82	0.0244
-56	17.0" hg	6.31	0.0228	39.6840	43.78	0.0252
-55	16.6" hg	6.52	0.0229	38.5006	43.74	0.0260
-54	16.2" hg	6.73	0.0229	37.3589	43.69	0.0268
-53	15.7" hg	6.95	0.0229	36.2572	43.65	0.0276
-52	15.3" hg	7.18	0.0229	35.1939	43.61	0.0284
-51	14.8" hg	7.41	0.0230	34.1675	43.57	0.0293
-50	14.3" hg	7.64	0.0230	33.1765	43.53	0.0301
-49	13.8" hg	7.89	0.0230	32.2196	43.48	0.0310
-48	13.3" hg	8.14	0.0230	31.2953	43.44	0.0320
-47	12.8" hg	8.39	0.0230	30.4025	43.40	0.0329
-46	12.2" hg	8.66	0.0230	29.5398	43.46	0.0339
-45	11.7" hg	8.92	0.0231	28.7062	43.32	0.0348
-44	11.1" hg	9.20	0.0231	27.9004	43.27	0.0358
-43	10.6" hg	9.48	0.0231	27.1216	43.23	0.0369
-42	10.0" hg	9.77	0.0232	26.3685	43.19	0.0379
-41	9.3" hg	10.07	0.0232	25.6402	43.15	0.0390
-40	8.7" hg	10.38	0.0232	24.9359	43.10	0.0401
-39	8.1" hg	10.69	0.0232	24.2545	43.06	0.0412
-38	7.4" hg	11.01	0.0232	23.5953	43.02	0.0424
-37	6.8" hg	11.34	0.0233	22.9574	42.97	0.0436
-36	6.1" hg	11.67	0.0233	22.3400	42.93	0.0448

Refrigerant R717 (Ammonia)						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid ft <sup>3</sup> /lb.	Specific Volume Vapor ft <sup>3</sup> /lb.	Density Liquid lbs./ ft <sup>3</sup>	Density Vapor lbs./ ft <sup>3</sup>
-35	5.4" hg	12.01	0.0233	21.7423	42.89	0.0460
-34	4.7" hg	12.37	0.0233	21.1637	42.85	0.0473
-33	3.9" hg	12.73	0.0234	20.6035	42.80	0.0485
-32	3.2" hg	13.10	0.0234	20.0609	42.76	0.0498
-31	2.4" hg	13.47	0.0234	19.5353	42.72	0.0512
-30	1.6" hg	13.86	0.0234	19.0262	42.67	0.0526
-29	.8" hg	14.25	0.0235	18.5328	42.63	0.0540
<b>-28</b>	<b>0 psig</b>	<b>14.66</b>	<b>0.0235</b>	<b>18.0548</b>	<b>42.59</b>	<b>0.0554</b>
-27	0.37	15.07	0.0235	17.5914	42.55	0.0568
-26	0.79	15.49	0.0235	17.1422	42.50	0.0583
-25	1.23	15.93	0.0236	16.7068	42.46	0.0599
-24	1.67	16.37	0.0236	16.2845	42.42	0.0614
-23	2.12	16.82	0.0236	15.8750	42.37	0.0630
-22	2.58	17.28	0.0236	15.4778	42.33	0.0646
-21	3.05	17.75	0.0236	15.0925	42.29	0.0663
-20	3.54	18.24	0.0237	14.7187	42.24	0.0679
-19	4.03	18.73	0.0237	14.3559	42.20	0.0697
-18	4.53	19.23	0.0237	14.0038	42.16	0.0714
-17	5.05	19.75	0.0237	13.6621	42.11	0.0732
-16	5.57	20.27	0.0238	13.3303	42.07	0.0750

Refrigerant R717 (Ammonia)						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid ft <sup>3</sup> /lb.	Specific Volume Vapor ft <sup>3</sup> /lb.	Density Liquid lbs./ ft <sup>3</sup>	Density Vapor lbs./ ft <sup>3</sup>
-15	6.11	20.81	0.0238	13.0082	42.02	0.0769
-14	6.66	21.36	0.0238	12.6954	41.98	0.0788
-13	7.22	21.92	0.0238	12.3917	41.94	0.0807
-12	7.79	22.49	0.0239	12.0966	41.89	0.0827
-11	8.37	23.07	0.0239	11.8100	41.85	0.0847
-10	8.96	23.66	0.0239	11.5315	41.81	0.0867
-9	9.57	24.27	0.0239	11.2608	41.76	0.0888
-8	10.19	24.89	0.0240	10.9978	41.72	0.0909
-7	10.82	25.52	0.0240	10.7422	41.67	0.0931
-6	11.47	26.17	0.0240	10.4937	41.63	0.0953
-5	12.13	26.83	0.0240	10.2521	41.59	0.0975
-4	12.80	27.50	0.0241	10.0172	41.54	0.0998
-3	13.48	28.18	0.0241	9.7887	41.50	0.1022
-2	14.18	28.88	0.0241	9.5665	41.45	0.1045
-1	14.89	29.59	0.0241	9.3503	41.41	0.1069
<b>0</b>	<b>15.62</b>	<b>30.32</b>	<b>0.0242</b>	<b>9.1401</b>	<b>41.36</b>	<b>0.1094</b>
1	16.36	31.06	0.0242	8.9355	41.32	0.1119
2	17.11	31.81	0.0242	8.7364	41.27	0.1145
3	17.88	32.58	0.0243	8.5426	41.23	0.1171
4	18.66	33.36	0.0243	8.3540	41.19	0.1197
5	19.46	34.16	0.0243	8.1704	41.14	0.1224
6	20.28	34.98	0.0243	7.9917	41.10	0.1251
7	21.10	35.80	0.0244	7.8177	41.05	0.1279
8	21.95	36.65	0.0244	7.6482	41.01	0.1307
9	22.81	37.51	0.0244	7.4831	40.96	0.1336
10	23.68	38.38	0.0244	7.3224	40.92	0.1366

Refrigerant R717 (Ammonia)						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid ft <sup>3</sup> /lb.	Specific Volume Vapor ft <sup>3</sup> /lb.	Density Liquid lbs./ ft <sup>3</sup>	Density Vapor lbs./ ft <sup>3</sup>
11	24.58	39.28	0.0245	7.1657	40.87	0.1396
12	25.48	40.18	0.0245	7.0132	40.82	0.1426
13	26.41	41.11	0.0245	6.8645	40.78	0.1457
14	27.35	42.05	0.0246	6.7196	40.73	0.1488
15	28.31	43.01	0.0246	6.5784	40.69	0.1520
16	29.28	43.98	0.0246	6.4408	40.64	0.1553
17	30.28	44.98	0.0246	6.3066	40.60	0.1586
18	31.29	45.99	0.0247	6.1758	40.55	0.1619
19	32.32	47.02	0.0247	6.0483	40.51	0.1653
20	33.36	48.06	0.0247	5.9240	40.46	0.1688
21	34.43	49.13	0.0247	5.8027	40.41	0.1723
22	35.51	50.21	0.0248	5.6844	40.37	0.1759
23	36.61	51.31	0.0248	5.5690	40.32	0.1796
24	37.73	52.43	0.0248	5.4564	40.27	0.1833
25	38.87	53.57	0.0249	5.3466	40.23	0.1870
26	40.03	54.73	0.0249	5.2395	40.18	0.1909
27	41.21	55.91	0.0249	5.1349	40.14	0.1947
28	42.41	57.11	0.0249	5.0328	40.09	0.1987
29	43.62	58.32	0.0250	4.9332	40.04	0.2027
30	44.86	59.56	0.0250	4.8360	40.00	0.2068
31	46.12	60.82	0.0250	4.7410	39.95	0.2109
32	47.40	62.10	0.0251	4.6483	39.90	0.2151
33	48.70	63.40	0.0251	4.5678	39.85	0.2189
34	50.02	64.72	0.0251	4.4695	39.81	0.2237
35	51.37	66.07	0.0252	4.3831	39.76	0.2281



Refrigerant R717 (Ammonia)						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid ft <sup>3</sup> /lb.	Specific Volume Vapor ft <sup>3</sup> /lb.	Density Liquid lbs./ ft <sup>3</sup>	Density Vapor lbs./ ft <sup>3</sup>
36	52.73	67.43	0.0252	4.2988	39.71	0.2326
37	54.12	68.82	0.0252	4.2165	39.67	0.2372
38	55.53	70.23	0.0252	4.1360	39.62	0.2418
39	56.96	71.66	0.0253	4.0574	39.57	0.2465
40	58.41	73.11	0.0253	3.9806	39.52	0.2512
41	59.89	74.59	0.0253	3.9055	39.47	0.2560
42	61.39	76.09	0.0254	3.8321	39.43	0.2610
43	62.91	77.61	0.0254	3.7604	39.38	0.2659
44	64.46	79.16	0.0254	3.6903	39.33	0.2710
45	67.03	81.73	0.0255	3.6218	39.28	0.2761
46	67.63	82.33	0.0255	3.5548	39.23	0.2813
47	69.25	83.95	0.0255	3.4893	39.18	0.2866
48	70.89	85.59	0.0255	3.4253	39.14	0.2919
49	72.56	87.26	0.0256	3.3626	39.09	0.2974
50	74.25	88.95	0.0256	3.3014	39.04	0.3029
51	75.97	90.67	0.0256	3.2415	38.99	0.3085
52	77.71	92.41	0.0257	3.1828	38.94	0.3142
53	79.48	94.18	0.0257	3.1255	38.89	0.3199
54	81.28	95.98	0.0257	3.0694	38.84	0.3258
55	83.10	97.80	0.0258	3.0145	38.79	0.3317
56	84.95	99.65	0.0258	2.9608	38.74	0.3377
57	86.83	101.53	0.0258	2.9082	38.69	0.3439
58	88.73	103.43	0.0259	2.8568	38.64	0.3500
59	90.66	105.36	0.0259	2.8064	38.59	0.3563
60	92.62	107.32	0.0259	2.7571	38.54	0.3627

Refrigerant R717 (Ammonia)						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid ft <sup>3</sup> /lb.	Specific Volume Vapor ft <sup>3</sup> /lb.	Density Liquid lbs./ ft <sup>3</sup>	Density Vapor lbs./ ft <sup>3</sup>
61	94.60	109.30	0.0260	2.7089	38.49	0.3692
62	96.62	111.32	0.0260	2.6616	38.44	0.3757
63	98.66	113.36	0.0260	2.6154	38.39	0.3824
64	100.73	115.43	0.0261	2.5701	38.34	0.3891
65	102.83	117.53	0.0261	2.5257	38.29	0.3959
66	104.96	119.66	0.0262	2.4823	38.24	0.4029
67	107.12	121.82	0.0262	2.4397	38.19	0.4099
68	109.31	124.01	0.0262	2.3981	38.14	0.4170
69	111.53	126.23	0.0263	2.3572	38.09	0.4242
70	113.78	128.48	0.0263	2.3173	38.04	0.4315
71	116.06	130.76	0.0263	2.2781	37.99	0.4390
72	118.37	133.07	0.0264	2.2397	37.93	0.4465
73	120.71	135.41	0.0264	2.2021	37.88	0.4541
74	123.08	137.78	0.0264	2.1652	37.83	0.4619
75	125.48	140.18	0.0265	2.1291	37.78	0.4697
76	127.92	142.62	0.0265	2.0936	37.73	0.4776
77	130.39	145.09	0.0265	2.0589	37.67	0.4857
78	132.89	147.59	0.0266	2.0249	37.62	0.4939
79	135.42	150.12	0.0266	1.9915	37.57	0.5021
80	137.99	152.69	0.0267	1.9588	37.52	0.5105
81	140.59	155.29	0.0267	1.9268	37.46	0.5190
82	143.22	157.92	0.0267	1.8953	37.41	0.5276
83	145.89	160.59	0.0268	1.8645	37.36	0.5363
84	148.59	163.29	0.0268	1.8342	37.31	0.5452
85	151.33	166.03	0.0268	1.8046	37.25	0.5541

Refrigerant R717 (Ammonia)						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid ft <sup>3</sup> /lb.	Specific Volume Vapor ft <sup>3</sup> /lb.	Density Liquid lbs./ ft <sup>3</sup>	Density Vapor lbs./ ft <sup>3</sup>
86	154.10	168.80	0.0269	1.7755	37.20	0.5632
87	156.90	171.60	0.0269	1.7470	37.14	0.5724
88	159.75	174.45	0.0270	1.7190	37.09	0.5817
89	162.62	177.32	0.0270	1.6915	37.04	0.5912
90	165.54	180.24	0.0270	1.6646	36.98	0.6007
91	168.48	183.18	0.0271	1.6381	36.93	0.6105
92	171.47	186.17	0.0271	1.6122	36.87	0.6203
93	174.49	189.19	0.0272	1.5867	36.82	0.6302
94	177.55	192.25	0.0272	1.5617	36.77	0.6403
95	180.65	195.35	0.0272	1.5372	36.71	0.6505
96	183.78	198.48	0.0273	1.5131	36.66	0.6609
97	186.95	201.65	0.0273	1.4895	36.60	0.6714
98	190.16	204.86	0.0274	1.4663	36.55	0.6820
99	193.41	208.11	0.0274	1.4436	36.49	0.6927
100	196.70	211.40	0.0274	1.4212	36.43	0.7036
101	200.02	214.72	0.0275	1.3993	36.38	0.7146
102	203.39	218.09	0.0275	1.3777	36.32	0.7258
103	206.80	221.50	0.0276	1.3565	36.27	0.7372
104	210.24	224.94	0.0276	1.3358	36.21	0.7486
105	213.73	228.43	0.0277	1.3153	36.15	0.7603
106	217.25	231.95	0.0277	1.2953	36.10	0.7720
107	220.82	235.52	0.0277	1.2756	36.04	0.7839
108	224.43	239.13	0.0278	1.2563	35.98	0.7960
109	228.08	242.78	0.0278	1.2373	35.93	0.8082
110	231.77	246.47	0.0279	1.2186	35.87	0.8206

Refrigerant R717 (Ammonia)						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid ft <sup>3</sup> /lb.	Specific Volume Vapor ft <sup>3</sup> /lb.	Density Liquid lbs./ ft <sup>3</sup>	Density Vapor lbs./ ft <sup>3</sup>
111	235.50	250.20	0.0279	1.2003	35.81	0.8331
112	239.28	253.98	0.0280	1.1822	35.75	0.8459
113	243.10	257.80	0.0280	1.1645	35.70	0.8587
114	246.96	261.66	0.0281	1.1471	35.64	0.8718
115	250.87	265.57	0.0281	1.1300	35.58	0.8850
116	255.40	269.52	0.0282	1.1132	35.52	0.8983
117	259.40	273.51	0.0282	1.0967	35.46	0.9118
118	263.50	277.55	0.0282	1.0805	35.41	0.9255
119	267.60	281.63	0.0283	1.0645	35.35	0.9394
120	271.70	285.76	0.0283	1.0488	35.29	0.9535
121	275.90	289.93	0.0284	1.0334	35.23	0.9677
122	280.10	294.15	0.0284	1.0183	35.17	0.9820
123	284.40	298.41	0.0285	1.0033	35.11	0.9967
124	288.70	302.72	0.0285	0.9887	35.05	1.0114
125	293.10	307.08	0.0286	0.9743	34.99	1.0264

SOURCE: INTERNATIONAL INSTITUTE OF AMMONIA REFRIGERATION PROPERTIES BOOK  
TABLE 2

Refrigerant HCFC-22						
Temp in Degrees Fahrenheit  (°f)	Gauge Pressure  psig *	Absolute Pressure  psia	Specific Volume liquid  cu.ft./lb.	Specific Volume Vapor  cu.ft./lb.	Density Liquid  lbs./cu.ft.	Density Vapor  lbs./cu.ft.
-65	14.4" hg	7.6	0.011053	6.29	90.47	0.15910
-64	13.9" hg	7.9	0.011065	6.11	90.38	0.16355
-63	13.5" hg	8.1	0.011077	5.95	90.28	0.16809
-62	13.0" hg	8.3	0.011089	5.79	90.18	0.17274
-61	12.5" hg	8.6	0.011101	5.63	90.08	0.17749
-60	12.0" hg	8.8	0.011111	5.48	90.00	0.18233
-59	11.4" hg	9.1	0.011125	5.34	89.89	0.18729
-58	10.9" hg	9.4	0.011137	5.20	89.79	0.19235
-57	10.4" hg	9.6	0.011149	5.06	89.69	0.19752
-56	9.8" hg	9.9	0.011161	5.06	89.60	0.19752
-55	9.2" hg	10.2	0.011174	4.80	89.49	0.20818
-54	8.6" hg	10.5	0.011186	4.68	89.40	0.21368
-53	8.0" hg	10.8	0.011198	4.56	89.30	0.21929
-52	7.4" hg	11.1	0.011211	4.44	89.20	0.22502
-51	6.8" hg	11.4	0.011223	4.33	89.10	0.23087
-50	6.2" hg	11.7	0.011235	4.22	89.01	0.23683
-49	5.5" hg	12.0	0.011248	4.12	88.90	0.24292
-48	4.8" hg	12.3	0.011261	4.01	88.80	0.24913
-47	4.1" hg	12.7	0.011273	3.91	88.71	0.25546
-46	3.4" hg	13.0	0.011286	3.82	88.61	0.26192
-45	2.7" hg	13.4	0.011298	3.72	88.51	0.26851
-46	2.0" hg	13.7	0.011311	3.63	88.41	0.27523
-44	1.3" hg	14.1	0.011324	3.55	88.31	0.28207
-43	0.5" hg	14.5	0.011337	3.46	88.21	0.28905
<b>-42</b>	<b>0.1 psig</b>	<b>14.8</b>	<b>0.011350</b>	<b>3.38</b>	<b>88.11</b>	<b>0.29617</b>
-41	0.5	15.2	0.011363	3.30	88.00	0.30342
-39	0.9	15.6	0.111376	3.22	8.98	0.31082
-38	1.3	16.0	0.011389	3.14	87.80	0.31835
-37	1.7	16.4	0.011402	3.07	87.70	0.32602
-36	2.2	16.9	0.011415	3.00	87.60	0.33384

Refrigerant HCFC-22						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid cu.ft./lb.	Specific Volume Vapor cu.ft./lb.	Density Liquid lbs./cu.ft.	Density Vapor lbs./cu.ft.
-35	2.5	17.2	0.011428	2.93	87.50	0.34181
-34	3.0	17.7	0.011442	2.86	87.40	0.34992
-33	3.5	18.2	0.011455	2.79	87.30	0.35818
-32	3.7	18.4	0.011469	2.73	87.19	0.36660
-31	4.4	19.1	0.011482	2.67	87.09	0.37517
-30	4.9	19.6	0.011495	2.60	86.99	0.38389
-29	5.4	20.1	0.011509	2.55	86.89	0.39278
-28	5.9	20.6	0.011523	2.49	86.78	0.40182
-27	6.5	21.2	0.011536	2.43	86.69	0.41103
-26	6.9	21.6	0.011550	2.38	86.58	0.42040
-25	7.4	22.1	0.011564	2.33	86.48	0.42993
-24	7.9	22.6	0.011578	2.27	86.37	0.43964
-23	8.5	23.2	0.011592	2.22	86.27	0.44951
-22	9.0	23.7	0.011606	2.18	86.16	0.45956
-21	9.6	24.3	0.011620	2.13	86.06	0.46978
-20	10.1	24.8	0.011634	2.08	85.95	0.48018
-19	10.7	25.4	0.011548	2.04	86.59	0.49075
-18	11.3	26.0	0.011662	1.99	85.75	0.50151
-17	11.9	26.6	0.011677	1.95	85.64	0.51245
-16	12.5	27.2	0.011691	1.91	85.54	0.52358
-15	13.2	27.9	0.011705	1.87	85.43	0.53489
-14	13.8	28.5	0.011720	1.83	85.32	0.54640
-13	14.5	29.2	0.011734	1.79	85.22	0.55810
-12	15.1	29.8	0.011749	1.75	85.11	0.56999
-11	15.8	30.5	0.011764	1.72	85.01	0.58207
-10	16.5	31.2	0.011778	1.68	84.90	0.59436
-9	17.5	32.2	0.011793	1.65	84.80	0.60685
-8	17.9	32.6	0.011808	1.61	84.69	0.61954
-7	18.6	33.3	0.011823	1.58	84.58	0.63244
-6	19.3	34.0	0.011838	1.55	84.47	0.64555
-5	20.1	34.8	0.011853	1.52	84.37	0.65887
-4	20.8	35.5	0.011868	1.49	84.26	0.67240
-3	21.6	36.3	0.011884	1.46	84.15	0.68615
-2	22.4	37.1	0.011899	1.43	84.04	0.70012
-1	23.2	37.9	0.011914	1.40	83.93	0.71431
<b>0</b>	<b>24.0</b>	<b>38.7</b>	<b>0.011930</b>	<b>1.37</b>	<b>83.82</b>	<b>0.72878</b>

Refrigerant HCFC-22						
Temp in Degrees Fahrenheit  (°f)	Gauge Pressure  psig *	Absolute Pressure  psia	Specific Volume liquid  cu.ft./lb.	Specific Volume Vapor  cu.ft./lb.	Density Liquid  lbs./cu.ft.	Density Vapor  lbs./cu.ft.
1	24.8	39.5	0.011945	1.35	83.72	0.74336
2	25.6	40.3	0.011961	1.32	83.61	0.75822
3	26.5	41.2	0.011976	1.29	83.50	0.77332
4	27.3	42.0	0.011992	1.27	83.39	0.78865
5	28.2	42.9	0.012008	1.24	83.28	0.80422
6	29.1	43.8	0.012024	1.22	83.17	0.82003
7	30.0	44.7	0.012040	1.20	83.06	0.83608
8	30.9	45.6	0.012056	1.17	82.95	0.85237
9	31.8	46.5	0.012072	1.15	82.84	0.86892
10	32.8	47.5	0.012088	1.13	82.73	0.88571
11	33.7	48.4	0.012105	1.11	82.61	0.90275
12	34.7	49.4	0.012121	1.09	82.50	0.92005
13	35.7	50.4	0.012138	1.07	82.39	0.93761
14	36.7	51.4	0.012154	1.05	82.28	0.95544
15	37.7	52.4	0.012171	1.03	82.16	0.97352
16	38.7	53.4	0.012188	1.01	82.05	0.99188
17	39.8	54.5	0.012204	0.990	81.94	1.0105
18	40.9	55.6	0.012221	0.971	81.83	1.0294
19	41.9	56.6	0.112238	0.954	81.91	1.0486
20	43.0	57.7	0.012255	0.936	81.60	1.0680
21	44.1	58.8	0.012290	0.910	81.37	1.0989
22	45.3	60.0	0.012290	0.903	81.37	1.1078
23	46.4	61.1	0.012307	0.886	81.25	1.1281
24	47.6	62.3	0.012325	0.871	81.14	1.1487
25	48.8	63.5	0.012342	0.855	81.02	1.1696
26	49.9	64.6	0.012360	0.840	80.91	1.1908
27	51.2	65.9	0.011238	0.825	88.99	1.2123
28	52.4	67.1	0.012395	0.810	80.68	1.2341
29	53.6	68.3	0.012413	0.796	80.56	1.2562
30	54.9	69.6	0.012431	0.782	80.44	1.2786
31	56.2	70.9	0.012450	0.768	80.32	1.3014
32	57.5	72.2	0.012468	0.755	80.21	1.3244
33	58.8	73.5	0.012486	0.742	80.09	1.3478
34	60.1	74.8	0.012505	0.729	79.97	1.3715
35	61.5	76.2	0.012523	0.717	79.85	1.3956

Refrigerant HCFC-22						
Temp in Degrees Fahrenheit  (°f)	Gauge Pressure  psig *	Absolute Pressure  psia	Specific Volume liquid  cu.ft./lb.	Specific Volume Vapor  cu.ft./lb.	Density Liquid  lbs./cu.ft.	Density Vapor  lbs./cu.ft.
36	62.8	77.5	0.012542	0.704	79.73	1.4199
37	64.2	78.9	0.012561	0.692	79.61	1.4447
38	65.6	80.3	0.012579	0.668	79.50	1.4967
39	67.1	81.8	0.012598	0.669	79.38	1.4951
40	68.5	83.2	0.012618	0.665	79.25	1.5028
41	70.0	84.7	0.012637	0.647	79.13	1.5469
42	71.5	86.2	0.012656	0.636	79.01	1.5734
43	73.0	87.7	0.012676	0.625	78.89	1.6002
44	74.5	89.2	0.012695	0.615	78.77	1.6274
45	76.0	90.7	0.012715	0.604	78.65	1.6549
46	77.6	92.3	0.012735	0.594	78.52	1.6829
47	79.2	93.9	0.012755	0.584	78.40	1.7112
48	80.8	95.5	0.012775	0.575	78.28	1.7398
49	82.4	97.1	0.012795	0.565	78.16	1.7689
50	84.0	98.7	0.012815	0.556	78.03	1.7998
51	85.7	100.4	0.012836	0.547	77.91	1.8282
52	87.4	102.1	0.012856	0.538	77.78	1.8585
53	89.1	103.8	0.012877	0.529	77.66	1.8891
54	90.8	105.5	0.012898	0.521	77.53	1.9202
55	92.6	107.3	0.012919	0.512	77.41	1.9517
56	94.3	109.0	0.012940	0.504	77.28	1.9836
57	96.1	110.8	0.012961	0.496	77.15	2.0159
58	97.9	112.6	0.012982	0.488	77.03	2.0486
59	99.8	114.5	0.013004	0.480	76.90	2.0818
61	103.5	118.2	0.013047	0.465	76.65	2.1495
62	105.4	120.1	0.013069	0.458	76.52	2.1840
63	107.3	122.0	0.013091	0.451	76.39	2.2190
64	109.3	124.0	0.013114	0.444	76.25	2.2544
65	111.2	125.9	0.013136	0.437	76.13	2.2903
66	113.2	127.9	0.013159	0.430	75.99	2.3266
67	115.2	129.9	0.013181	0.423	75.87	2.3635
68	117.3	132.0	0.013204	0.417	75.73	2.4008
69	119.3	134.0	0.013227	0.410	75.60	2.4386
70	121.4	136.1	0.013251	0.404	75.47	2.4769
71	123.5	138.2	0.013274	0.398	75.34	2.5157
72	125.7	140.4	0.013297	0.391	75.20	2.5550
73	127.8	142.5	0.013321	0.385	75.07	2.5948
74	130.0	144.7	0.013345	0.380	74.93	2.6351
75	132.2	146.9	0.013369	0.374	74.80	2.6760



Refrigerant HCFC-22						
Temp in Degrees Fahrenheit  (°f)	Gauge Pressure  psig *	Absolute Pressure  psia	Specific Volume liquid  cu.ft./lb.	Specific Volume Vapor  cu.ft./lb.	Density Liquid  lbs./cu.ft.	Density Vapor  lbs./cu.ft.
76	134.5	149.2	0.013393	0.368	74.67	2.7174
77	136.7	151.4	0.013418	0.364	74.53	2.7493
78	139.0	153.7	0.013442	0.357	74.39	2.8018
79	141.3	156.0	0.013467	0.352	74.26	2.8449
80	143.6	158.3	0.013492	0.346	74.12	2.8885
81	146.0	160.7	0.013492	0.341	74.12	2.9326
82	148.4	163.1	0.013518	0.336	73.98	2.9774
83	151.8	166.5	0.013569	0.332	73.70	3.0117
84	153.2	167.9	0.013594	0.326	73.56	3.0686
85	155.7	170.4	0.013620	0.321	73.42	3.1151
86	155.7	170.4	0.013647	0.316	73.28	3.1622
87	158.2	172.9	0.013673	0.312	73.14	3.2100
88	161.7	176.4	0.013700	0.307	72.99	3.2583
89	163.2	177.9	0.013727	0.302	72.85	3.3073
90	168.4	183.1	0.013754	0.298	72.71	3.3570
91	171.0	185.7	0.013781	0.294	72.56	3.4073
92	173.7	188.4	0.013809	0.289	72.42	3.4582
93	176.4	191.1	0.013836	0.285	72.28	3.5098
94	179.1	193.8	0.013864	0.281	72.13	3.5621
95	181.8	196.5	0.013893	0.277	71.98	3.6151
96	184.6	199.3	0.013921	2.726	71.83	0.3669
97	187.4	202.1	0.013950	0.269	71.68	3.7232
98	190.2	204.9	0.013979	0.265	71.54	3.7783
99	193.0	207.7	0.014008	0.261	71.39	3.8341
100	195.9	210.6	0.014038	0.257	71.24	3.8907
101	198.8	213.5	0.014068	0.253	71.08	3.9481
102	201.8	216.5	0.014098	0.250	70.93	4.0062
103	204.7	219.4	0.014128	0.246	70.78	4.0651
104	207.7	222.4	0.014159	0.242	70.63	4.1247
105	210.8	225.5	0.014190	0.239	70.47	4.1852
106	213.8	228.5	0.014221	0.231	70.32	4.3265
107	216.9	231.6	0.014253	0.232	70.16	4.3086
108	220.0	234.7	0.014285	0.229	70.00	4.3715
109	223.2	237.9	0.014317	0.226	69.85	4.4354
110	226.4	241.1	0.014350	0.222	69.69	4.5000

Refrigerant HCFC-22						
Temp in Degrees Fahrenheit  (°f)	Gauge Pressure  psig *	Absolute Pressure  psia	Specific Volume liquid  cu.ft./lb.	Specific Volume Vapor  cu.ft./lb.	Density Liquid  lbs./cu.ft.	Density Vapor  lbs./cu.ft.
111	229.6	244.3	0.014382	0.219	69.53	4.5656
112	232.8	247.5	0.014416	0.216	69.37	4.6321
113	236.1	250.8	0.014449	0.213	69.21	4.6994
114	239.4	254.1	0.014483	0.210	69.05	4.7677
115	242.7	257.4	0.014517	0.207	68.88	4.8370
116	246.1	260.8	0.014552	0.204	68.72	4.9072
117	249.5	264.2	0.014587	0.201	68.55	4.9784
118	252.9	267.6	0.014622	0.198	68.39	5.0506
119	256.4	271.1	0.014658	0.195	68.22	5.1238
120	259.9	274.6	0.014694	0.192	68.05	5.1981
121	259.9	274.6	0.014731	0.190	67.88	5.2734
122	263.4	278.1	0.014768	0.187	67.71	5.3498
123	267.0	281.7	0.014805	0.184	67.54	5.4272
124	270.6	285.3	0.014843	0.182	67.37	5.5058
125	277.9	292.6	0.014882	0.179	67.20	5.5856
126	281.6	296.3	0.014882	0.177	67.20	5.6665
127	285.4	300.1	0.014920	0.174	67.02	5.7486
128	289.1	303.8	0.014960	0.172	66.84	5.8319
129	296.0	310.7	0.015039	0.169	66.49	5.9164
130	296.8	311.5	0.015080	0.167	66.31	6.0022
131	300.7	315.4	0.015121	0.164	66.13	6.0893
132	304.6	319.3	0.015163	0.162	65.95	6.1777
133	308.6	323.3	0.015206	0.160	65.76	6.2674
134	312.5	327.2	0.015248	0.157	65.58	6.3585
135	316.6	331.3	0.015292	0.155	65.39	6.4510
136	320.6	335.3	0.015336	0.153	65.21	6.5450
137	324.7	339.4	0.015381	0.151	65.02	6.6405
138	328.9	343.6	0.015426	0.148	64.83	6.7374
139	333.0	347.7	0.015472	0.146	64.63	6.8359
140	337.3	352.0	0.015518	0.144	64.44	6.9360
141	341.5	356.2	0.015566	0.142	64.24	7.0377
142	345.8	360.5	0.015613	0.140	64.05	7.1410
143	350.1	364.8	0.015662	0.138	63.85	7.2461
144	354.5	369.2	0.015712	0.136	63.65	7.3529
145	358.9	373.6	0.015762	0.134	63.44	7.4615

Refrigerant HCFC-22						
Temp in Degrees Fahrenheit  (°f)	Gauge Pressure  psig *	Absolute Pressure  psia	Specific Volume liquid  cu.ft./lb.	Specific Volume Vapor  cu.ft./lb.	Density Liquid  lbs./cu.ft.	Density Vapor  lbs./cu.ft.
146	363.3	378.0	0.015813	0.132	63.24	7.5719
147	367.8	382.5	0.015865	0.130	63.03	7.6842
148	372.3	387.0	0.015917	0.128	62.83	7.7985
149	376.9	391.6	0.015971	0.126	62.61	7.9148
150	381.5	396.2	0.016025	0.123	62.40	8.1331
151	386.1	400.8	0.016080	0.123	62.19	8.1536
152	390.8	405.5	0.016137	0.122	61.97	8.1763
153	395.6	410.3	0.016194	0.119	61.75	8.4011
154	400.3	415.0	0.016252	0.117	61.53	8.5284
155	405.1	419.8	0.016312	0.116	61.30	8.6580
156	410.0	424.7	0.016372	0.114	61.08	8.7911
157	414.9	429.6	0.016434	0.112	60.85	8.9247
158	419.8	434.5	0.016497	0.110	60.62	9.0620
159	424.8	439.5	0.016561	0.109	60.38	9.2020
160	429.8	444.5	0.016627	0.107	60.14	9.3449
161	434.9	449.6	0.016693	0.105	59.91	9.4907
162	440.0	454.7	0.016762	0.104	59.66	9.6395
163	445.2	459.9	0.016831	0.102	59.41	9.7915
164	450.4	465.1	0.016902	0.106	59.16	9.3947
165	455.6	470.3	0.016975	0.0990	58.91	10.106
166	460.9	475.6	0.017050	0.0974	58.65	10.268
167	466.3	481.0	0.017126	0.0958	58.39	10.434
168	471.7	486.4	0.017204	0.0943	58.13	10.603
169	477.1	491.8	0.017285	0.0928	57.85	10.777
170	482.6	497.3	0.017367	0.0913	57.58	10.955
171	488.1	502.8	0.017451	0.0898	57.30	11.138
172	493.7	508.4	0.017538	0.0883	57.02	11.325
173	499.6	514.3	0.017627	0.0868	56.73	11.517
174	505.0	519.7	0.017719	0.0854	56.44	11.714
175	510.7	525.4	0.017813	0.0837	56.14	11.947
176	516.5	531.2	0.117910	0.0825	8.48	12.125
177	522.3	537.0	0.018011	0.0810	55.52	12.340
178	528.2	542.9	0.018114	0.0796	55.21	12.560
179	534.1	548.8	0.001822	0.0782	548.82	12.788
180	540.1	554.8	0.018332	0.0768	54.55	13.023

Refrigerant HCFC-22						
Temp in Degrees Fahrenheit (°f)	Gauge Pressure psig *	Absolute Pressure psia	Specific Volume liquid cu.ft./lb.	Specific Volume Vapor cu.ft./lb.	Density Liquid lbs./cu.ft.	Density Vapor lbs./cu.ft.
181	546.1	560.8	0.018447	0.0754	54.21	13.265
182	552.2	566.9	0.018566	0.0740	53.86	13.516
183	558.4	573.1	0.018690	0.0726	53.50	13.776
184	564.5	579.2	0.018820	0.0712	53.13	14.045
185	570.8	585.5	0.018954	0.0698	52.76	14.324
186	577.1	591.8	0.019095	0.0684	52.37	14.615
187	598.2	612.9	0.019243	0.0670	51.97	14.918
188	604.6	619.3	0.019397	0.0656	51.55	15.235
189	611.1	625.8	0.019561	0.0642	51.12	15.566
190	617.5	632.2	0.019733	0.0628	50.68	15.914
191	624.2	638.9	0.019915	0.0614	50.21	16.280
192	630.8	645.5	0.020110	0.0600	49.73	16.667
193	637.6	652.3	0.020647	0.0586	48.43	17.077
194	644.3	659.0	0.020540	0.0571	48.69	17.514
195	651.2	665.9	0.020782	0.0556	48.12	17.983
196	658.1	672.8	0.021045	0.0541	47.52	18.488
197	665.1	679.8	0.021334	0.0525	46.87	19.038
198	657.4	672.1	0.021655	0.0509	46.18	19.642
199	664.5	679.2	0.022048	0.0492	45.36	20.315
200	671.7	686.4	0.022436	0.0474	44.57	21.080