

ภาคผนวก คุณสมบัติสารทำความเย็น R134a
ที่สภาวะของเหลวและไออิ่มตัว

Temp. (°C)	p_{sat} (bar)	Specific Volume		Enthalpy			Entropy		
		Liquid $v_f \times 10^3$ (m ³ /kg)	Vapour v_g (m ³ /kg)	h_f (kJ/kg)	h_{fg} (kJ/kg)	h_g (kJ/kg)	s_f (kJ/kg.K)	s_{fg} (kJ/kg.K)	s_g (kJ/kg.K)
-40	.517	.705	.3567	150.60	230.22	380.82	.8009	.9874	1.7882
-38	.573	.708	.3239	152.91	229.16	382.07	.8110	.9745	1.7855
-36	.633	.711	.2946	155.24	228.09	383.33	.8211	.9618	1.7828
-34	.699	.714	.2684	157.58	227.00	384.58	.8312	.9491	1.7803
-32	.771	.717	.2450	159.95	225.88	385.33	.8412	.9367	1.7779
-30	.848	.720	.2240	162.33	224.75	387.08	.8513	.9243	1.7766
-28	.931	.723	.2051	164.72	223.60	388.32	.8613	.9120	1.7734
-26	1.020	.726	.1881	167.13	222.42	389.55	.8714	.8999	1.7713
-24	1.117	.730	.1727	169.56	221.23	390.79	.8814	.8879	1.7692
-22	1.220	.733	.1589	172.01	220.01	392.02	.8913	.8760	1.7673
-20	1.330	.736	.1464	174.47	218.77	393.24	.9013	.8642	1.7655
-18	1.449	.739	.1350	176.95	217.51	394.46	.9113	.8525	1.7637
-16	1.575	.743	.1247	179.44	216.23	395.68	.9212	.8408	1.7620
-14	1.711	.746	.1153	181.96	214.93	396.89	.9311	.8293	1.7601
-12	1.855	.750	.1067	184.48	213.60	398.09	.9410	.8179	1.7589
-10	2.008	.753	.0989	187.03	212.26	399.28	.9509	.8066	1.7574
-8	2.171	.757	.0918	189.59	210.89	400.48	.9607	.7953	1.7561
-6	2.344	.761	.0853	192.17	209.49	401.66	.9706	.7841	1.7547
-4	2.528	.764	.0794	194.76	208.07	402.84	.9804	.7731	1.7535
-2	2.723	.768	.0739	197.37	206.63	404.01	.9902	.7620	1.7522
0	2.929	.772	.0689	200.00	205.17	405.17	1.0000	.7511	1.7511
2	3.147	.776	.0642	202.64	203.68	406.32	1.0098	.7402	1.7500
4	3.378	.780	.0600	205.31	202.16	407.47	1.0195	.7294	1.7489
6	3.621	.784	.0561	207.98	200.62	408.60	1.0293	.7187	1.7479
8	3.877	.788	.0525	210.68	199.05	409.73	1.0390	.7080	1.7470
10	4.147	.793	.0491	213.39	197.46	410.85	1.0487	.6973	1.7460
12	4.431	.797	.0460	216.13	195.84	411.96	1.0584	.6868	1.7452
14	4.730	.802	.0432	218.87	194.19	413.06	1.0681	.6762	1.7443
16	5.043	.806	.0405	221.64	192.51	414.15	1.0777	.6657	1.7435
18	5.372	.811	.0381	224.43	190.80	415.23	1.0874	.6553	1.7427
20	5.718	.816	.0358	227.23	189.06	416.29	1.0970	.6449	1.7419
22	6.080	.821	.0336	230.06	187.29	417.35	1.1067	.6345	1.7418
24	6.459	.826	.0317	232.90	185.49	418.39	1.1163	.6242	1.7405
26	6.855	.831	.0298	235.76	183.65	419.41	1.1259	.6139	1.7398
28	7.270	.836	.0281	238.65	181.78	420.43	1.1355	.6036	1.7391
30	7.703	.842	.0265	241.56	179.87	421.43	1.1451	.5933	1.7384
32	8.155	.847	.0250	244.48	177.93	422.41	1.1547	.5831	1.7377
34	8.627	.853	.0236	247.44	175.94	423.38	1.1643	.5728	1.7371

ภาคผนวก คุณสมบัติสารทำความเย็น R134a
ที่สภาวะของเหลวและไออิ่มตัว (ต่อ)

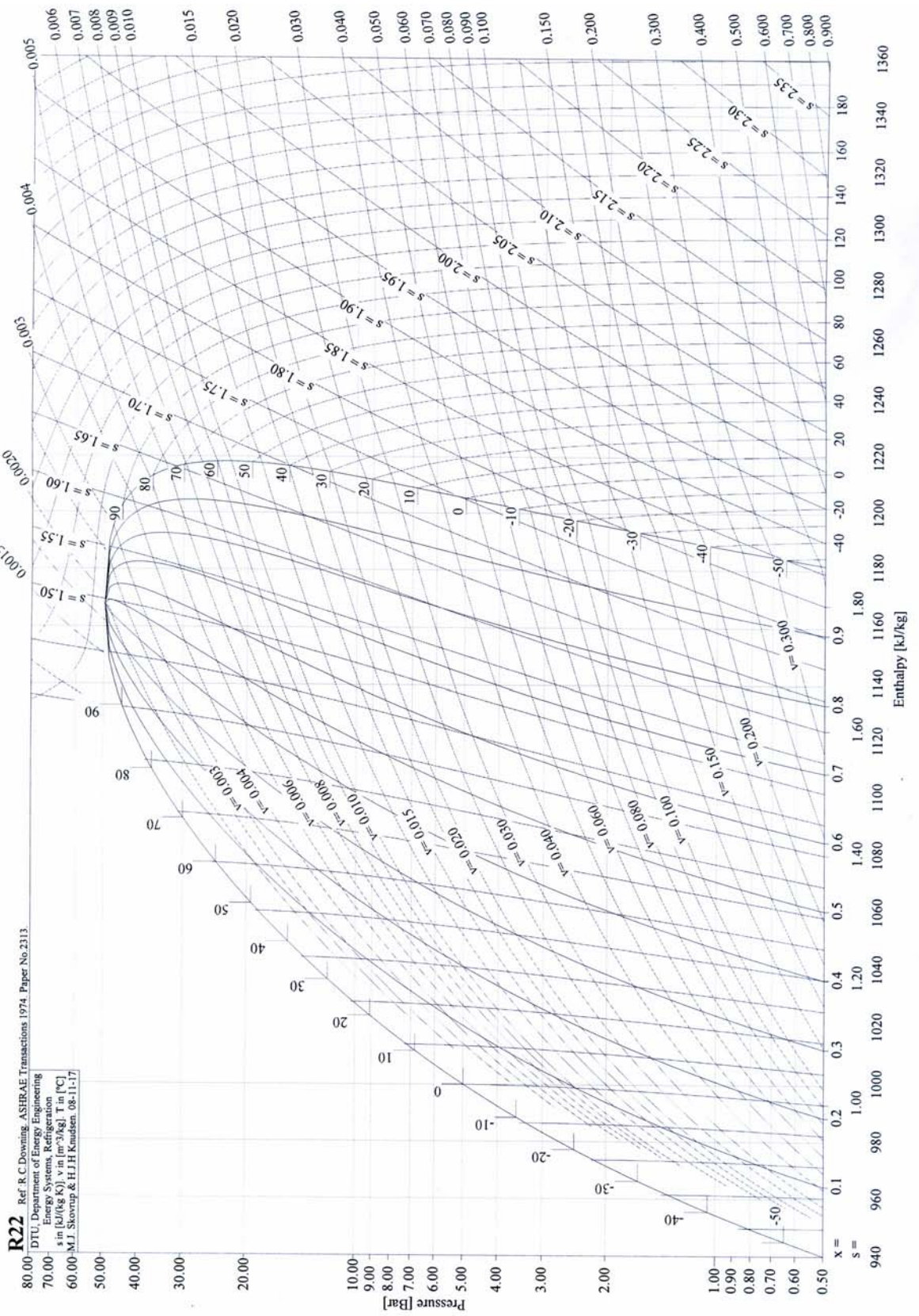
Temp. (°C)	p_{sat} (bar)	Specific Volume		Enthalpy			Entropy		
		Liquid $v_f \times 10^3$ (m ³ /kg)	Vapour v_g (m ³ /kg)	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
(kJ/kg.K)									
36	9.119	.859	.0222	250.41	173.92	242.33	1.1738	.5626	1.7364
38	9.632	.865	.0210	253.41	171.85	425.26	1.1834	.5523	1.7357
40	10.167	.871	.0199	256.43	169.74	426.17	1.1930	.5420	1.7350
42	10.723	.878	.0188	259.48	167.58	427.07	1.2026	.5317	1.7343
44	11.302	.885	.0177	262.56	165.38	427.94	1.2122	.5214	1.7336
46	11.904	.892	.0168	265.67	163.12	428.79	1.2218	.5111	1.7328
48	12.530	.899	.0159	268.80	160.81	429.61	1.2314	.5007	1.7321
50	13.180	.906	.0150	271.97	158.43	430.40	1.2410	.4903	1.7312
52	13.854	.914	.0142	275.17	156.00	431.17	1.2506	.4798	1.7304
54	14.555	.922	.0134	278.41	153.50	431.91	1.2603	.4692	1.7295
56	15.282	.931	.0127	281.68	150.94	432.61	1.2699	.4585	1.7285
58	16.036	.940	.0120	284.99	148.29	433.28	1.2796	.4478	1.7274
60	16.817	.949	.0114	288.34	145.57	433.91	1.2893	.4369	1.7263
62	17.627	.959	.0108	291.74	142.76	434.50	1.2991	.4260	1.7250
64	18.466	.969	.0102	295.19	139.86	435.05	1.3089	.4148	1.7237
66	19.336	.979	.0097	298.68	136.86	435.54	1.3187	.4035	1.7222
68	20.235	.991	.0091	302.23	133.74	435.98	1.3286	.3920	1.7206
70	21.167	.003	.0086	305.84	130.51	436.35	1.3386	.3803	1.7189

ภาคผนวก คุณสมบัติสารทำความเย็น R717 (AMMONIA)
ที่สภาวะของเหลวและไออิ่มตัว

Temp. (°C)	Pressure (bar)	Specific Volume (m ³ /kg)		Enthalpy (kJ/kg)		Entropy (kJ/kg.K)	
		$v_f \times 10^3$	v_g	h_f	h_g	s_f	s_g
-60	.2199	1.40	4.685	-69.5	1373.2	-0.1095	6.6592
-55	.3029	1.41	3.474	-47.5	1382.0	-0.0071	6.5454
-50	.4103	1.42	2.617	-25.4	1390.6	0.0926	6.4382
-45	.5474	1.43	2.000	-3.3	1399.0	0.1904	6.3369
-40	.7201	1.45	1.547	18.9	1407.2	0.2865	6.2410
-35	.9349	1.46	1.212	41.2	1415.2	0.3808	6.1501
-30	1.1990	1.48	.961	63.6	1422.8	0.4735	6.0636
-28	1.3202	1.48	.878	72.5	1425.8	0.5101	6.0302
-26	1.4511	1.48	.809	81.5	1428.7	0.5465	5.9974
-25	1.5216	1.49	.770	86.0	1430.2	0.5646	5.9813
-24	1.5922	1.49	.737	90.5	1431.6	0.5827	5.9652
-22	1.7441	1.49	.677	99.6	1434.4	0.6186	5.9336
-20	1.9074	1.50	.622	108.6	1437.2	0.6543	5.9025
-18	2.0826	1.50	.573	117.7	1439.9	0.6898	5.8720
-16	2.2704	1.51	.528	126.7	1442.6	0.7251	5.8420
-15	2.3709	1.52	.508	131.3	1443.9	0.7426	5.8223
-14	2.4714	1.52	.488	135.8	1445.2	0.7601	5.8125
-12	2.6863	1.53	.451	144.9	1447.7	0.7950	5.7835
-10	2.9157	1.53	.417	154.2	1450.2	0.8296	5.7550
-9	3.0360	1.53	.402	158.6	1451.4	0.8469	5.7409
-8	3.1602	1.54	.387	163.2	1452.6	0.8641	5.7269
-7	3.2884	1.54	.373	167.8	1453.8	0.8812	5.7131
-6	3.4207	1.54	.359	172.4	1455.0	0.8983	5.6993
-5	3.5571	1.55	.346	176.9	1456.1	0.9154	5.6856
-4	3.6977	1.55	.334	181.6	1457.2	0.9324	5.6721
-3	3.8426	1.55	.322	186.2	1458.4	0.9493	5.6586
-2	3.9920	1.56	.310	190.8	1459.5	0.9663	5.6453
-1	4.1458	1.56	.299	195.4	1460.6	0.9831	5.6320
0	4.3043	1.57	.289	200.0	1461.7	1.0000	5.6189
1	4.4674	1.57	.279	204.6	1462.7	1.0167	5.6058
2	4.6353	1.57	.269	209.3	1463.8	1.0335	5.5929
3	4.8081	1.57	.260	213.9	1464.8	1.0502	5.5800
4	4.9859	1.58	.251	218.5	1465.8	1.0669	5.5672
5	5.1687	1.58	.243	223.2	1466.8	1.0835	5.5545
6	5.3567	1.59	.235	227.8	1467.8	1.1001	5.5419
7	5.5500	1.59	.227	232.5	1468.8	1.1167	5.5294
8	5.7487	1.59	.219	237.1	1469.7	1.1332	5.5170
9	5.9528	1.60	.212	241.8	1470.7	1.1496	5.5046
10	6.1625	1.60	.205	246.5	1471.5	1.1661	5.4924

ภาคผนวก คุณสมบัติสารทำความเย็น R717 (AMMONIA)
ที่สภาวะของเหลว และ อิ่มตัว (ต่อ)

Temp. (°C)	Pressure (bar)	Specific Volume (m ³ /kg)		Enthalpy (kJ/kg)		Entropy (kJ/kg.K)	
		$v_f \times 10^3$	v_g	h_f	h_g	s_f	s_g
11	6.3778	1.60	.198	251.2	1472.5	1.1825	5.4802
12	6.5989	1.61	.192	255.9	1473.3	1.1988	5.4681
13	6.8259	1.61	.186	260.6	1474.2	1.2152	5.4561
14	7.0588	1.61	.180	265.3	1475.4	1.2314	5.4441
15	7.2979	1.62	.174	270.0	1475.9	1.2477	5.4322
16	7.5431	1.62	.169	274.8	1476.2	1.2639	5.4204
17	7.7946	1.62	.164	279.5	1477.5	1.2801	5.4087
18	8.0525	1.63	.158	284.8	1478.3	1.2963	5.3971
19	8.3169	1.63	.154	289.0	1479.0	1.3124	5.3855
20	8.5879	1.64	.149	293.8	1479.8	1.3285	5.3740
21	8.8657	1.64	.144	298.5	1480.5	1.3445	5.3626
22	9.1503	1.64	.140	303.3	1481.2	1.3606	5.3512
23	9.4418	1.65	.136	308.4	1481.9	1.3765	5.3399
24	9.7403	1.65	.132	312.9	1482.5	1.3925	5.3286
25	10.046	1.66	.128	317.7	1483.2	1.4084	5.3175
26	10.359	1.66	.124	322.5	1483.8	1.4243	5.3063
27	10.680	1.67	.128	327.3	1484.4	1.4402	5.2953
28	11.007	1.67	.117	332.1	1485.0	1.4560	5.2843
29	11.343	1.67	.114	336.9	1485.8	1.4718	5.2733
30	11.686	1.68	.110	341.8	1486.1	1.4876	5.2624
31	12.037	1.68	.107	346.6	1486.7	1.5033	5.2516
32	12.396	1.69	.104	351.5	1487.2	1.5191	5.2408
33	12.763	1.69	.101	356.3	1487.7	1.5348	5.2300
34	13.139	1.70	.098	361.2	1488.1	1.5504	5.2193
35	13.522	1.70	.096	366.1	1488.6	1.5660	5.2086
36	13.915	1.71	.092	370.9	1489.0	1.5816	5.1980
37	14.314	1.71	.090	375.9	1489.4	1.5972	5.1874
38	14.724	1.72	.088	380.8	1489.8	1.6128	5.1768
39	15.143	1.72	.085	385.7	1490.1	1.6283	5.1663
40	15.570	1.72	.083	390.6	1490.4	1.6437	5.1558
41	16.006	1.73	.080	395.5	1790.7	1.6592	5.1453
42	16.451	1.73	.078	400.4	1490.9	1.6747	5.1349
43	16.906	1.74	.076	405.4	1491.2	1.6901	5.1244
44	17.370	1.74	.074	410.4	1491.4	1.7055	5.1140
45	17.843	1.75	.072	415.4	1491.5	1.7209	5.1036
46	18.326	1.75	.070	420.4	1491.7	1.7363	5.0932
47	18.819	1.76	.068	425.4	1491.8	1.7517	5.0827
48	19.322	1.76	.066	430.4	1491.8	1.7671	5.0723
49	19.835	1.77	.065	435.4	1491.9	1.7825	5.0618
50	20.359	1.77	.063	440.5	1491.8	1.7979	5.0514
51	20.892	1.78	.061	445.6	1491.8	1.8134	5.0409
52	21.436	1.78	.060	450.7	1491.7	1.8289	5.0303
53	21.991	1.79	.058	455.9	1491.5	1.8444	5.0198
54	22.556	1.79	.056	461.1	1491.3	1.8600	5.0092
55	23.132	1.80	.055	466.3	1491.1	1.8757	4.9985



R22 Ref: R. C. Downing, ASHRAE Transactions 1974, Paper No. 2313
 DTU, Department of Energy Engineering
 Energy Systems, Refrigeration
 s in [kJ/(kg·K)] v in [m³/kg] T in [°C]
 60.00-M.T. Skovrup & H.J.H. Knudsen 08-11-17

