

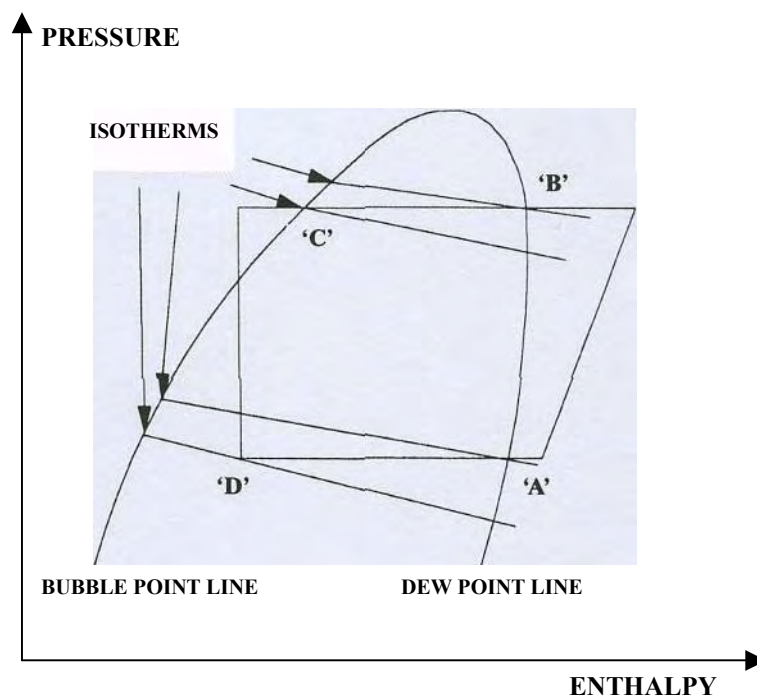
KLEA® 407C



Thermodynamic Property Data SI Units

SYSTEM PERFORMANCE WITH ZEOTROPIC REFRIGERANT BLENDS

- With a zeotropic refrigerant blend the composition of the vapour changes in the evaporator and the condenser.
- Evaporator inlet and outlet temperatures are different.
- Condenser inlet and outlet temperatures are different.
- At all other points in the system the fluid behaves as normal.
- System design path.
 - Use the saturation properties (table 1) and the superheated vapour properties (table 2) for other properties around the cycle.



Pressure-Enthalpy Diagram for zeotropic Refrigerant Blends

KLEA 407C

Saturated Liquid and
Saturated Vapour Properties

KLEA 407C Saturation Properties vs Pressure									Table 1 Sheet 1
Pressure (bara)	Saturated Temperature		Density		Enthalpy		Entropy		Pressure (bara)
	Dew Point (°C)	Bubble Point (°C)	Liquid (kg/m³)	Vapour (kg/m³)	Liquid (kJ/kg)	Vapour (kJ/kg)	Liquid (kJ/kg.K)	Vapour (kJ/kg.K)	
0.70	-44.10	-51.41	1403.3	3.238	28.8	285.9	0.713	1.855	0.70
0.75	-42.79	-50.06	1399.3	3.453	30.6	286.8	0.721	1.852	0.75
0.80	-41.54	-48.79	1395.5	3.668	32.4	287.6	0.729	1.849	0.80
0.85	-40.35	-47.58	1391.8	3.882	34.1	288.4	0.737	1.847	0.85
0.90	-39.22	-46.43	1388.3	4.095	35.7	289.1	0.744	1.844	0.90
0.95	-38.14	-45.32	1385.0	4.308	37.2	289.8	0.750	1.842	0.95
1.00	-37.10	-44.26	1381.7	4.520	38.7	290.4	0.757	1.840	1.00
1.05	-36.09	-43.24	1378.6	4.731	40.1	291.1	0.763	1.838	1.05
1.10	-35.13	-42.26	1375.6	4.942	41.4	291.7	0.769	1.837	1.10
1.15	-34.20	-41.31	1372.7	5.152	42.7	292.3	0.774	1.835	1.15
1.20	-33.30	-40.39	1369.9	5.362	44.0	292.8	0.780	1.833	1.20
1.25	-32.43	-39.51	1367.2	5.571	45.2	293.4	0.785	1.832	1.25
1.30	-31.59	-38.65	1364.5	5.779	46.4	293.9	0.790	1.830	1.30
1.35	-30.77	-37.81	1361.9	5.988	47.5	294.4	0.795	1.829	1.35
1.40	-29.97	-37.01	1359.4	6.196	48.6	294.9	0.800	1.828	1.40
1.45	-29.20	-36.22	1356.9	6.403	49.7	295.4	0.804	1.827	1.45
1.50	-28.45	-35.45	1354.5	6.611	50.8	295.9	0.809	1.825	1.50
1.55	-27.72	-34.70	1352.2	6.817	51.8	296.4	0.813	1.824	1.55
1.60	-27.00	-33.98	1349.9	7.024	52.8	296.8	0.817	1.823	1.60
1.65	-26.30	-33.27	1347.7	7.230	53.8	297.3	0.821	1.822	1.65
1.70	-25.62	-32.57	1345.5	7.436	54.7	297.7	0.825	1.821	1.70
1.75	-24.96	-31.89	1343.3	7.642	55.7	298.1	0.829	1.820	1.75
1.80	-24.30	-31.23	1341.2	7.848	56.6	298.5	0.833	1.819	1.80
1.85	-23.67	-30.58	1339.1	8.053	57.5	298.9	0.836	1.818	1.85
1.90	-23.04	-29.94	1337.1	8.258	58.3	299.3	0.840	1.817	1.90
1.95	-22.43	-29.32	1335.1	8.463	59.2	299.7	0.843	1.816	1.95
2.00	-21.83	-28.71	1333.2	8.667	60.0	300.0	0.847	1.815	2.00
2.10	-20.67	-27.52	1329.4	9.076	61.7	300.8	0.853	1.814	2.10
2.20	-19.54	-26.38	1325.7	9.484	63.2	301.4	0.860	1.812	2.20
2.30	-18.46	-25.27	1322.1	9.891	64.7	302.1	0.866	1.811	2.30
2.40	-17.41	-24.21	1318.6	10.298	66.2	302.7	0.872	1.809	2.40

KLEA 407C Saturation Properties vs Pressure									Table 1 Sheet 2
Pressure (bara)	Saturated Temperature		Density		Enthalpy		Entropy		Pressure (bara)
	Dew Point (°C)	Bubble Point (°C)	Liquid (kg/m³)	Vapour (kg/m³)	Liquid (kJ/kg)	Vapour (kJ/kg)	Liquid (kJ/kg.K)	Vapour (kJ/kg.K)	
2.50	-16.40	-23.17	1315.2	10.705	67.6	303.4	0.877	1.808	2.50
2.60	-15.41	-22.17	1311.9	11.110	69.0	304.0	0.883	1.807	2.60
2.70	-14.46	-21.20	1308.7	11.516	70.4	304.5	0.888	1.806	2.70
2.80	-13.53	-20.25	1305.6	11.921	71.7	305.1	0.893	1.804	2.80
2.90	-12.63	-19.33	1302.5	12.326	72.9	305.6	0.898	1.803	2.90
3.00	-11.75	-18.43	1299.5	12.730	74.2	306.2	0.903	1.802	3.00
3.10	-10.89	-17.56	1296.6	13.135	75.4	306.7	0.908	1.801	3.10
3.20	-10.05	-16.71	1293.8	13.539	76.6	307.2	0.912	1.800	3.20
3.30	-9.24	-15.88	1291.0	13.943	77.7	307.6	0.917	1.799	3.30
3.40	-8.44	-15.06	1288.2	14.346	78.8	308.1	0.921	1.799	3.40
3.50	-7.66	-14.27	1285.5	14.750	79.9	308.6	0.925	1.798	3.50
3.60	-6.90	-13.49	1282.9	15.154	81.0	309.0	0.930	1.797	3.60
3.70	-6.15	-12.73	1280.3	15.557	82.1	309.4	0.934	1.796	3.70
3.80	-5.42	-11.98	1277.7	15.961	83.1	309.9	0.938	1.795	3.80
3.90	-4.71	-11.25	1275.2	16.364	84.1	310.3	0.941	1.794	3.90
4.00	-4.00	-10.54	1272.7	16.768	85.1	310.7	0.945	1.794	4.00
4.10	-3.32	-9.83	1270.3	17.171	86.1	311.1	0.949	1.793	4.10
4.20	-2.64	-9.14	1267.9	17.575	87.1	311.5	0.953	1.792	4.20
4.30	-1.98	-8.47	1265.5	17.978	88.0	311.8	0.956	1.792	4.30
4.40	-1.32	-7.80	1263.2	18.382	89.0	312.2	0.960	1.791	4.40
4.50	-0.68	-7.15	1260.9	18.786	89.9	312.6	0.963	1.790	4.50
4.60	-0.05	-6.50	1258.6	19.190	90.8	312.9	0.966	1.790	4.60
4.70	0.57	-5.87	1256.4	19.594	91.7	313.3	0.970	1.789	4.70
4.80	1.18	-5.25	1254.1	19.998	92.6	313.6	0.973	1.788	4.80
4.90	1.78	-4.63	1252.0	20.403	93.4	313.9	0.976	1.788	4.90
5.00	2.37	-4.03	1249.8	20.808	94.3	314.3	0.979	1.787	5.00
5.10	2.95	-3.44	1247.7	21.212	95.1	314.6	0.982	1.787	5.10
5.20	3.52	-2.85	1245.6	21.617	95.9	314.9	0.985	1.786	5.20

KLEA 407C Saturation Properties vs Pressure									Table 1 Sheet 3
Pressure (bara)	Saturated Temperature		Density		Enthalpy		Entropy		Pressure (bara)
	Dew Point (°C)	Bubble Point (°C)	Liquid (kg/m³)	Vapour (kg/m³)	Liquid (kJ/kg)	Vapour (kJ/kg)	Liquid (kJ/kg.K)	Vapour (kJ/kg.K)	
5.30	4.09	-2.27	1243.5	22.023	96.8	315.2	0.988	1.786	5.30
5.40	4.64	-1.70	1241.4	22.428	97.6	315.5	0.991	1.785	5.40
5.50	5.19	-1.14	1239.4	22.834	98.4	315.8	0.994	1.784	5.50
5.60	5.73	-0.59	1237.4	23.240	99.2	316.1	0.997	1.784	5.60
5.70	6.26	-0.04	1235.4	23.646	99.9	316.4	1.000	1.783	5.70
5.80	6.79	0.49	1233.4	24.053	100.7	316.6	1.003	1.783	5.80
5.90	7.31	1.03	1231.5	24.460	101.5	316.9	1.005	1.782	5.90
6.00	7.82	1.55	1229.5	24.867	102.2	317.2	1.008	1.782	6.00
6.50	10.29	4.08	1220.1	26.908	105.8	318.5	1.021	1.780	6.50
7.00	12.62	6.47	1211.1	28.957	109.3	319.7	1.033	1.778	7.00
7.50	14.82	8.73	1202.4	31.017	112.6	320.8	1.045	1.776	7.50
8.00	16.92	10.87	1194.0	33.088	115.7	321.8	1.056	1.774	8.00
8.50	18.91	12.93	1185.9	35.171	118.8	322.7	1.066	1.772	8.50
9.00	20.82	14.89	1178.1	37.266	121.7	323.6	1.076	1.770	9.00
9.50	22.65	16.77	1170.4	39.375	124.5	324.4	1.086	1.768	9.50
10.00	24.40	18.58	1162.9	41.497	127.3	325.2	1.095	1.767	10.00
10.50	26.09	20.32	1155.6	43.635	129.9	325.9	1.104	1.765	10.50
11.00	27.72	22.00	1148.5	45.789	132.5	326.5	1.113	1.764	11.00
11.50	29.29	23.62	1141.5	47.958	135.0	327.1	1.121	1.762	11.50
12.00	30.81	25.19	1134.6	50.145	137.4	327.7	1.129	1.761	12.00
12.50	32.28	26.72	1127.8	52.349	139.8	328.3	1.137	1.759	12.50
13.00	33.71	28.19	1121.1	54.571	142.2	328.8	1.144	1.758	13.00
13.50	35.10	29.63	1114.5	56.812	144.5	329.2	1.152	1.757	13.50
14.00	36.44	31.03	1108.0	59.073	146.7	329.7	1.159	1.755	14.00
14.50	37.75	32.39	1101.5	61.354	148.9	330.1	1.166	1.754	14.50
15.00	39.03	33.71	1095.1	63.656	151.1	330.4	1.173	1.752	15.00
15.50	40.27	35.01	1088.8	65.979	153.3	330.8	1.180	1.751	15.50
16.00	41.48	36.27	1082.5	68.325	155.4	331.1	1.186	1.750	16.00
16.50	42.67	37.50	1076.3	70.693	157.4	331.4	1.193	1.748	16.50
17.00	43.82	38.71	1070.0	73.086	159.5	331.7	1.199	1.747	17.00

KLEA 407C Saturation Properties vs Pressure									Table 1 Sheet 4
Pressure (bara)	Saturated Temperature		Density		Enthalpy		Entropy		Pressure (bara)
	Dew Point (°C)	Bubble Point (°C)	Liquid (kg/m³)	Vapour (kg/m³)	Liquid (kJ/kg)	Vapour (kJ/kg)	Liquid (kJ/kg.K)	Vapour (kJ/kg.K)	
17.50	44.95	39.89	1063.9	75.503	161.5	331.9	1.206	1.746	17.50
18.00	46.05	41.04	1057.7	77.946	163.5	332.1	1.212	1.744	18.00
18.50	47.13	42.18	1051.5	80.414	165.5	332.3	1.218	1.743	18.50
19.00	48.19	43.28	1045.4	82.910	167.4	332.5	1.224	1.742	19.00
19.50	49.23	44.37	1039.2	85.433	169.3	332.6	1.230	1.740	19.50
20.00	50.24	45.44	1033.1	87.985	171.2	332.8	1.235	1.739	20.00
20.50	51.24	46.49	1026.9	90.568	173.1	332.9	1.241	1.737	20.50
21.00	52.21	47.52	1020.7	93.180	175.0	333.0	1.247	1.736	21.00
21.50	53.17	48.53	1014.5	95.825	176.9	333.0	1.253	1.735	21.50
22.00	54.11	49.52	1008.2	98.502	178.7	333.1	1.258	1.733	22.00
22.50	55.03	50.50	1001.9	101.214	180.6	333.1	1.264	1.732	22.50
23.00	55.94	51.46	995.5	103.961	182.4	333.1	1.269	1.730	23.00
23.50	56.83	52.40	989.1	106.744	184.2	333.1	1.274	1.729	23.50
24.00	57.71	53.34	982.6	109.565	186.0	333.1	1.280	1.727	24.00
24.50	58.57	54.25	976.0	112.425	187.8	333.0	1.285	1.726	24.50
25.00	59.42	55.16	969.3	115.326	189.6	332.9	1.290	1.724	25.00

KLEA 407C

Superheated Vapour Properties

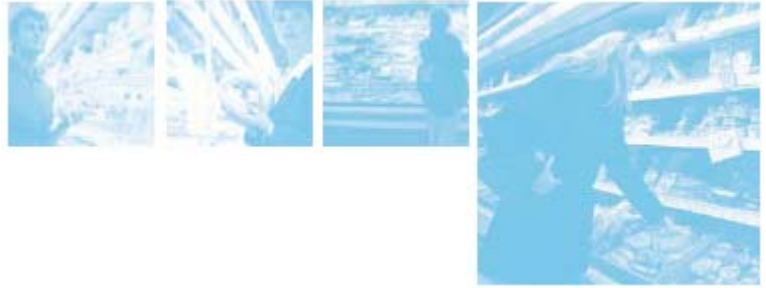
KLEA 407C Superheated Vapour Properties (D = Density in kg/m³, H = Enthalpy in kJ/kg, S = Entropy in kJ/kg.K) Table 2 Sheet 15

Temp (°C)	Absolute Pressure (Bara)																		Temp (°C)
	21.5			22.0			22.5			23.0			23.5			24.0			
	Dew Point 53.17C			Dew Point 54.11C			Dew Point 55.03C			Dew Point 55.94C			Dew Point 56.83C			Dew Point 57.71C			
	D	H	S	D	H	S	D	H	S	D	H	S	D	H	S	D	H	S	
55	94.227	335.2	1.741	97.671	334.1	1.736													55
60	90.296	341.0	1.759	93.425	340.1	1.754	96.651	339.1	1.750	99.982	338.1	1.745	103.429	337.0	1.741	107.001	336.0	1.736	60
65	86.871	346.7	1.776	89.755	345.8	1.771	92.713	344.9	1.767	95.751	344.0	1.763	98.875	343.1	1.759	102.091	342.1	1.754	65
70	83.838	352.3	1.792	86.524	351.5	1.788	89.269	350.6	1.784	92.077	349.8	1.780	94.951	348.9	1.776	97.895	348.1	1.772	70
75	81.118	357.8	1.808	83.640	357.1	1.804	86.211	356.3	1.800	88.831	355.5	1.796	91.505	354.7	1.793	94.234	353.9	1.789	75
80	78.655	363.3	1.824	81.038	362.6	1.820	83.462	361.9	1.816	85.926	361.1	1.812	88.434	360.4	1.809	90.987	359.7	1.805	80
85	76.406	368.8	1.839	78.670	368.1	1.835	80.968	367.4	1.832	83.301	366.7	1.828	85.669	366.1	1.825	88.075	365.3	1.821	85
90	74.339	374.2	1.854	76.500	373.6	1.851	78.689	373.0	1.847	80.907	372.3	1.844	83.156	371.7	1.840	85.436	371.0	1.837	90
95	72.429	379.7	1.869	74.498	379.1	1.866	76.591	378.4	1.862	78.710	377.8	1.859	80.854	377.2	1.855	83.025	376.6	1.852	95
100	70.654	385.1	1.884	72.642	384.5	1.880	74.650	383.9	1.877	76.680	383.3	1.874	78.733	382.7	1.870	80.808	382.2	1.867	100
105	68.998	390.5	1.898	70.912	390.0	1.895	72.845	389.4	1.892	74.797	388.9	1.888	76.767	388.3	1.885	78.758	387.7	1.882	105
110	67.449	396.0	1.913	69.297	395.5	1.909	71.161	394.9	1.906	73.041	394.4	1.903	74.939	393.9	1.900	76.854	393.3	1.897	110
115	65.993	401.4	1.927	67.781	400.9	1.923	69.583	400.4	1.920	71.400	399.9	1.917	73.231	399.4	1.914	75.078	398.9	1.911	115
120	64.622	406.9	1.941	66.354	406.4	1.937	68.100	405.9	1.934	69.858	405.4	1.931	71.630	404.9	1.928	73.415	404.4	1.925	120
125	63.326	412.3	1.954	65.008	411.9	1.951	66.702	411.4	1.948	68.407	411.0	1.945	70.124	410.5	1.942	71.852	410.0	1.939	125
130	62.099	417.8	1.968	63.734	417.4	1.965	65.380	416.9	1.962	67.036	416.5	1.959	68.702	416.0	1.956	70.379	415.6	1.953	130
135	60.934	423.3	1.982	62.526	422.9	1.979	64.127	422.4	1.976	65.738	422.0	1.973	67.358	421.6	1.970	68.987	421.1	1.967	135
140	59.826	428.8	1.995	61.378	428.4	1.992	62.937	428.0	1.989	64.506	427.5	1.986	66.083	427.1	1.983	67.668	426.7	1.980	140
145	58.770	434.3	2.008	60.284	433.9	2.005	61.805	433.5	2.002	63.334	433.1	2.000	64.871	432.7	1.997	66.415	432.3	1.994	145
150	57.761	439.8	2.021	59.240	439.4	2.018	60.725	439.1	2.016	62.217	438.7	2.013	63.717	438.3	2.010	65.223	437.9	2.007	150
155	56.796	445.4	2.034	58.242	445.0	2.032	59.694	444.6	2.029	61.152	444.2	2.026	62.616	443.9	2.023	64.087	443.5	2.020	155
160	55.873	450.9	2.047	57.287	450.6	2.044	58.707	450.2	2.042	60.132	449.8	2.039	61.564	449.5	2.036	63.001	449.1	2.033	160
165	54.986	456.5	2.060	56.371	456.2	2.057	57.761	455.8	2.054	59.156	455.5	2.052	60.557	455.1	2.049	61.962	454.8	2.046	165
170	54.135	462.1	2.073	55.492	461.8	2.070	56.854	461.4	2.067	58.220	461.1	2.065	59.591	460.8	2.062	60.968	460.4	2.059	170
175	53.317	467.7	2.085	54.647	467.4	2.083	55.982	467.1	2.080	57.321	466.7	2.077	58.665	466.4	2.075	60.013	466.1	2.072	175
180	52.529	473.4	2.098	53.834	473.1	2.095	55.144	472.7	2.092	56.457	472.4	2.090	57.775	472.1	2.087	59.096	471.8	2.085	180

KLEA 407C Superheated Vapour Properties (D = Density in kg/m³, H = Enthalpy in kJ/kg, S = Entropy in kJ/kg.K) Table 2 Sheet 16

Temp (°C)	Absolute Pressure (Bara)						Temp (°C)	
	24.5			25.0				
	Dew Point 58.57C			Dew Point 59.42C				
	D	H	S	D	H	S		
60	110.713	334.8	1.731	114.581	333.7	1.726		60
65	105.406	341.1	1.750	108.830	340.1	1.746		65
70	100.915	347.2	1.768	104.014	346.3	1.764		70
75	97.022	353.1	1.785	99.872	352.2	1.781		75
80	93.588	358.9	1.801	96.237	358.1	1.798		80
85	90.519	364.6	1.817	93.004	363.9	1.814		85
90	87.748	370.3	1.833	90.093	369.6	1.830		90
95	85.223	376.0	1.849	87.450	375.3	1.845		95
100	82.907	381.5	1.864	85.030	380.9	1.861		100
105	80.769	387.2	1.879	82.800	386.6	1.876		105
110	78.787	392.8	1.893	80.737	392.2	1.890		110
115	76.940	398.4	1.908	78.819	397.8	1.905		115
120	75.214	404.0	1.922	77.027	403.5	1.919		120
125	73.593	409.5	1.936	75.347	409.1	1.933		125
130	72.067	415.1	1.950	73.766	414.7	1.947		130
135	70.626	420.7	1.964	72.275	420.3	1.961		135
140	69.262	426.3	1.978	70.865	425.9	1.975		140
145	67.968	431.9	1.991	69.528	431.5	1.988		145
150	66.737	437.5	2.004	68.257	437.1	2.002		150
155	65.564	443.1	2.018	67.047	442.7	2.015		155
160	64.444	448.8	2.031	65.893	448.4	2.028		160
165	63.374	454.4	2.044	64.790	454.0	2.041		165
170	62.348	460.1	2.057	63.734	459.7	2.054		170
175	61.365	465.8	2.069	62.722	465.4	2.067		175
180	60.421	471.5	2.082	61.751	471.1	2.079		180

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