The Blue Handbook

Thermodynamic properties of refrigerants

climalife®

HCFC | HFC | HFC/HFO | HFO | HC | CO_2/NH_3

Developing innovative, sustainable solutions for climate control systems

Refrigerants

Oils

Cleaning

Analysis

Secondary refrigerant / Heat transfer fluids

Equipment

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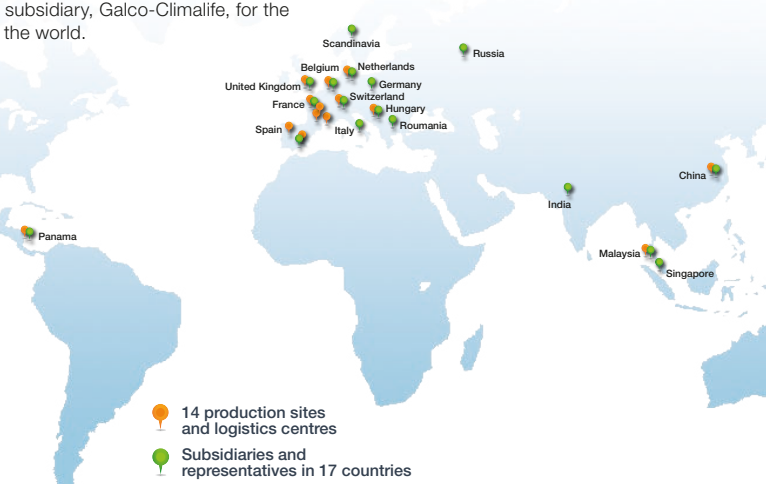
All our industrial sites have the necessary licences for recovery, reclaim and treatment of refrigerants.
Our commercial teams are at your disposal for any thermodynamic modelings you may require or for your tailor-made reclaim needs.



Contact us for the whole range of refrigerants.

“Information contained in this document is the result of our experience. It is given in good faith but cannot be considered as a guarantee, nor imply liability, especially where it may affect third party's rights, or where users do not meet the legal requirements concerning our products”.

We refer you to our regularly updated product data sheets for information concerning the commercial specifications of our refrigerants.

NOTE
The information given in this document was copied from the software programme Refprop 9.1 edited by the NIST (National Institute of Standards and Technology)..

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R-22

CHLORODIFLUOROMETHANE - CHF_2Cl

Molecular weight (g/mol)	86.47
Melting point (°C)	-157.42
Boiling point (at 1.013 bar)	-40.82
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	96.1
Critical pressure (bar absolute)	49.90
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.257
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.6620
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.185
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.164
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	8.11
Classification NF-EN 378	A1
GWP (IPCC 4)	1810

Main applications

R-22 is a "hydrochlorofluorocarbon (HCFC)" refrigerant with high latent heat of vaporisation, was used in domestic, commercial and industrial air conditioning systems. Used at low temperatures (down to -40° C), R-22 was also suited for refrigeration and deep freezing.

Commercial specifications

Purity: ≥ 99.5 % weight.
Chloride ion test: negative.
Water content: ≤ 10 ppm weight.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a mineral (MO) or an alkyl benzene (AB) oil at low vaporisation temperatures.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

Using R-22 is governed by European regulation n° 1005/2009 of September 16, 2009:
- using R-22, recycled or reclaimed was completely prohibited in Europe after 01.01.2015. For use in other countries please check local regulations that will apply.
In Europe, R-22 recovery is mandatory as per regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-22 - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.020	-100	0.636	1.571	90.705	0.505	-100.0	8.266	0.121	358.967	2.054	268.262
0.032	-95	0.642	1.558	96.011	0.535	-95.0	5.413	0.185	361.403	2.025	265.392
0.048	-90	0.647	1.545	101.318	0.565	-90.0	3.645	0.274	363.852	1.998	262.534
0.072	-85	0.653	1.532	106.626	0.593	-85.0	2.517	0.397	366.310	1.973	259.685
0.104	-80	0.659	1.518	111.937	0.621	-80.0	1.778	0.562	368.774	1.951	256.837
0.147	-75	0.665	1.505	117.253	0.648	-75.0	1.283	0.779	371.239	1.930	253.985
0.205	-70	0.671	1.491	122.578	0.675	-70.0	0.943	1.060	373.700	1.911	251.121
0.279	-65	0.677	1.477	127.915	0.701	-65.0	0.706	1.416	376.153	1.893	248.238
0.375	-60	0.683	1.464	133.266	0.726	-60.0	0.537	1.863	378.593	1.877	245.328
0.496	-55	0.690	1.450	138.635	0.751	-55.0	0.414	2.414	381.016	1.862	242.382
0.645	-50	0.697	1.436	144.025	0.775	-50.0	0.324	3.088	383.416	1.848	239.391
0.829	-45	0.704	1.421	149.441	0.799	-45.0	0.256	3.901	385.789	1.835	236.348
1.013	-40.82	0.710	1.409	153.996	0.819	-40.82	0.213	4.703	387.750	1.825	233.754
1.052	-40	0.711	1.407	154.887	0.823	-40.0	0.205	4.873	388.129	1.823	233.242
1.320	-35	0.718	1.392	160.366	0.846	-35.0	0.166	6.025	390.432	1.812	230.066
1.639	-30	0.726	1.377	165.882	0.869	-30.0	0.136	7.379	392.692	1.802	226.810
2.014	-25	0.734	1.362	171.440	0.891	-25.0	0.112	8.958	394.904	1.792	223.464
2.453	-20	0.743	1.347	177.044	0.913	-20.0	0.093	10.790	397.063	1.783	220.019
2.962	-15	0.751	1.331	182.697	0.935	-15.0	0.078	12.901	399.163	1.774	216.466
3.548	-10	0.761	1.315	188.404	0.957	-10.0	0.065	15.322	401.198	1.766	212.793
4.218	-5	0.770	1.298	194.171	0.979	-5.0	0.055	18.086	403.162	1.758	208.991
4.980	0	0.780	1.282	200.000	1.000	0.0	0.047	21.229	405.048	1.751	205.048
5.841	5	0.791	1.264	205.898	1.021	5.0	0.040	24.792	406.849	1.744	200.952
6.809	10	0.802	1.247	211.869	1.042	10.0	0.035	28.820	408.558	1.737	196.688
7.893	15	0.814	1.229	217.920	1.063	15.0	0.030	33.362	410.164	1.730	192.244
9.100	20	0.827	1.210	224.058	1.084	20.0	0.026	38.477	411.658	1.724	187.600
10.439	25	0.840	1.191	230.289	1.105	25.0	0.023	44.232	413.029	1.717	182.739
11.919	30	0.854	1.171	236.624	1.125	30.0	0.020	50.705	414.262	1.711	177.638
13.548	35	0.870	1.150	243.072	1.146	35.0	0.017	57.988	415.341	1.705	172.269
15.336	40	0.886	1.129	249.647	1.166	40.0	0.015	66.193	416.246	1.698	166.600
17.292	45	0.904	1.106	256.364	1.187	45.0	0.013	75.457	416.955	1.692	160.590
19.427	50	0.924	1.082	263.245	1.208	50.0	0.012	85.952	417.435	1.685	154.190
21.751	55	0.946	1.057	270.316	1.229	55.0	0.010	97.899	417.651	1.678	147.334
24.275	60	0.971	1.030	277.613	1.250	60.0	0.009	111.591	417.549	1.670	139.937
27.012	65	0.999	1.001	285.183	1.272	65.0	0.008	127.430	417.063	1.662	131.880
29.974	70	1.031	0.970	293.096	1.295	70.0	0.007	145.991	416.094	1.653	122.998
33.177	75	1.070	0.934	301.457	1.318	75.0	0.006	168.158	414.492	1.642	113.035
36.638	80	1.119	0.894	310.440	1.342	80.0	0.005	195.404	412.013	1.630	101.573
40.378	85	1.184	0.845	320.379	1.369	85.0	0.004	230.560	408.186	1.614	87.807
44.423	90	1.282	0.780	332.086	1.400	90.0	0.004	280.625	401.868	1.592	69.782
48.824	95	1.509	0.663	349.557	1.446	95.0	0.003	382.037	387.280	1.549	37.723

Thermodynamic properties of R-22 - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.020	8265.965	8506.386	8746.680	8986.861	9226.943	9466.938	9706.855	9946.705	10186.494	10426.229	10665.916	10905.560	11145.166	11384.737	11624.278	11863.791	12103.279	12342.744	12582.189	12821.615	13061.025
-95	0.032	5413.232	5566.715	5720.085	5873.356	6026.539	6179.645	6332.683	6485.660	6638.583	6791.458	6944.290	7097.084	7249.843	7402.571	7555.272	7707.947	7860.600	8013.232	8165.846	8318.443	8471.024
-90	0.048	3644.758	3745.662	3846.467	3947.183	4047.822	4148.393	4248.902	4349.357	4449.764	4550.128	4650.453	4750.744	4851.004	4951.236	5051.443	5151.627	5251.791	5351.936	5452.064	5552.177	5652.276
-85	0.072	2516.712	2584.862	2652.923	2720.907	2788.821	2856.674	2924.473	2992.223	3059.930	3127.598	3195.232	3262.834	3330.409	3397.958	3465.485	3532.991	3600.478	3667.948	3735.403	3802.844	3870.272
-80	0.104	1778.150	1825.334	1872.439	1919.474	1966.447	2013.366	2060.236	2107.062	2153.850	2200.602	2247.323	2294.016	2340.684	2387.329	2433.953	2480.559	2527.147	2573.720	2620.279	2666.825	2713.359
-75	0.147	1282.894	1316.317	1349.670	1382.961	1416.196	1449.382	1482.523	1515.626	1548.693	1581.729	1614.737	1647.719	1680.678	1713.616	1746.535	1779.437	1812.324	1845.197	1878.056	1910.904	1943.740
-70	0.205	943.421	967.604	991.722	1015.785	1039.797	1063.765	1087.693	1111.586	1135.447	1159.279	1183.085	1206.869	1230.631	1254.374	1278.101	1301.811	1325.507	1349.190	1372.861	1396.522	1420.172
-65	0.279	705.986	723.829	741.614	759.348	777.036	794.685	812.297	829.877	847.428	864.953	882.455	899.935	917.396	934.840	952.268	969.681	987.082	1004.470	1021.848	1039.215	1056.573
-60	0.375	536.802	550.209	563.564	576.872	590.138	603.368	616.565	629.733	642.874	655.992	669.088	682.165	695.224	708.267	721.295	734.310	747.313	760.306	773.287	786.260	799.224
-55	0.496	414.165	424.411	434.609	444.765	454.883	464.967	475.022	485.049	495.052	505.033	514.995	524.939	534.866	544.779	554.679	564.566	574.442	584.308	594.164	604.012	613.851
-50	0.645	323.847	331.803	339.715	347.587	355.425	363.232	371.011	378.765	386.497	394.209	401.903	409.581	417.243	424.892	432.528	440.153	447.768	455.373	462.970	470.558	478.139
-45	0.829	256.348	262.618	268.847	275.040	281.200	287.332	293.438	299.522	305.584	311.629	317.656	323.668	329.666	335.652	341.626	347.590	353.544	359.489	365.426	371.355	377.278
-40.82	1.013	212.644	217.837	222.990	228.109	233.199	238.261	243.299	248.316	253.314	258.294	263.258	268.208	273.145	278.070	282.984	287.888	292.783	297.670	302.549	307.421	312.286
-40	1.052	205.213	210.224	215.196	220.134	225.042	229.924	234.782	239.619	244.437	249.237	254.022	258.793	263.551	268.297	273.032	277.758	282.474	287.183	291.883	296.577	301.264
-35	1.320	165.982	170.039	174.059	178.048	182.010	185.946	189.860	193.754	197.631	201.491	205.337	209.170	212.991	216.801	220.600	224.391	228.173	231.947	235.715	239.475	243.230
-30	1.639	135.529	138.854	142.145	145.407	148.642	151.854	155.045	158.218	161.374	164.515	167.642	170.757	173.861	176.954	180.038	183.114	186.181	189.242	192.295	195.343	198.384
-25	2.014	111.629	114.387	117.112	119.809	122.482	125.132	127.763	130.377	132.974	135.558	138.129	140.688	143.237	145.776	148.306	150.829	153.343	155.851	158.353	160.848	163.339
-20	2.453	92.681	94.993	97.275	99.529	101.761	103.971	106.163	108.338	110.499	112.646	114.782	116.906	119.020	121.125	123.222	125.312	127.394	129.470	131.539	133.604	135.663
-15	2.962	77.514	79.474	81.404	83.308	85.189	87.051	88.896	90.724	92.539	94.341	96.132	97.912	99.683	101.445	103.199	104.946	106.687	108.421	110.150	111.873	113.592
-10	3.548	65.266	66.943	68.592	70.216	71.818	73.401	74.968	76.519	78.057	79.584	81.099	82.605	84.101	85.589	87.070	88.544	90.012	91.474	92.930	94.382	95.829
-5	4.218	55.291	56.741	58.163	59.560	60.937	62.295	63.638	64.966	66.281	67.585	68.879	70.163	71.438	72.706	73.967	75.221	76.469	77.711	78.949	80.182	81.410
0	4.980	47.105	48.369	49.606	50.820	52.013	53.189	54.349	55.495	56.629	57.752	58.865	59.970	61.066	62.154	63.236	64.311	65.381	66.445	67.505	68.560	69.611
5	5.841	40.335	41.448	42.534	43.596	44.639	45.665	46.676	47.673	48.659	49.634	50.599	51.556	52.505	53.447	54.382	55.311	56.235	57.153	58.067	58.977	59.882
10	6.809	34.699	35.687	36.648	37.586	38.505	39.407	40.294	41.168	42.031	42.884	43.727	44.562	45.390	46.210	47.025	47.833	48.636	49.435	50.229	51.018	51.804
15	7.893	29.974	30.859	31.716	32.551	33.367	34.166	34.951	35.723	36.484	37.235	37.977	38.710	39.437	40.157	40.871	41.579	42.282	42.981	43.675	44.365	45.051
20	9.100	25.989	26.788	27.559	28.308	29.037	29.750	30.449	31.136	31.811	32.477	33.134	33.784	34.426	35.061	35.691	36.316	36.935	37.550	38.161	38.768	39.371
25	10.439	22.608	23.335	24.034	24.710	25.367	26.008	26.635	27.249	27.853	28.447	29.033	29.611	30.182	30.747	31.306	31.860	32.409	32.953	33.494	34.031	34.564
30	11.919	19.722	20.390	21.028	21.644	22.240	22.819	23.385	23.939	24.481	25.015	25.540	26.058	26.568	27.073	27.572	28.066	28.556	29.041	29.522	29.999	30.473
35	13.548	17.245	17.863	18.451	19.015	19.560	20.087	20.601	21.103	21.594	22.076	22.549	23.016	23.475	23.929	24.377	24.820	25.258	25.693	26.123	26.550	26.974
40	15.336	15.107	15.685	16.231	16.751	17.252	17.736	18.205	18.663	19.109	19.547	19.976	20.399	20.814	21.224	21.628	22.028	22.423	22.814	23.201	23.585	23.965
45	17.292	13.253	13.797	14.308	14.792	15.255	15.701	16.133	16.552	16.961	17.361	17.752	18.136	18.514	18.886	19.253	19.615	19.972	20.326	20.676	21.022	21.366
50	19.427	11.634	12.153	12.635	13.088	13.520	13.934	14.333	14.720	15.096	15.462	15.821	16.172	16.517	16.857	17.191	17.520	17.845	18.167	18.484	18.798	19.110
55	21.751	10.215	10.714	11.172	11.600	12.005	12.392	12.763	13.121	13.469	13.807	14.137	14.460	14.777	15.088	15.393	15.694	15.991	16.284	16.574	16.860	17.144
60	24.275	8.961	9.448	9.888	10.295	10.678	11.040	11.387	11.721	12.044	12.358	12.663	12.961	13.253	13.539	13.820	14.096	14.368	14.637	14.902	15.164	15.423
65	27.012	7.847	8.329	8.756	9.146	9.510	9.852	10.178	10.491	10.792	11.084	11.368	11.644	11.914	12.178	12.437	12.692	12.943	13.189	13.433	13.673	13.911
70	29.974	6.850	7.335	7.754	8.131	8.478	8.803	9.111	9.405	9.688	9.961	10.225	10.482	10.733	10.978	11.218	11.453	11.685	11.913	12.137	12.358	12.577
75	33.177	5.947	6.447	6.863	7.230	7.564	7.875	8.167	8.445	8.711	8.966	9.214	9.454	9.687	9.915	10.138	10.357	10.571	10.782	10.990	11.194	11.396
80	36.638	5.118	5.649	6.067	6.428	6.751	7.049	7.328	7.591	7.843	8.083	8.316	8.540	8.759	8.972	9.179	9.383	9.582	9.778	9.970	10.160	10.347
85	40.378	4.337	4.927	5.355	5.712	6.027	6.314	6.581	6.831	7.069	7.296	7.515	7.726	7.931	8.130	8.324	8.514	8.700	8.882	9.061	9.237	9.410
90	44.423	3.563	4.272	4.714	5.070	5.379	5.656	5.912	6.151	6.377	6.592	6.798	6.997	7.190	7.376	7.558	7.735	7.909	8.079	8.246	8.409	8.571
95	48.824	2.618	3.672	4.136	4.492	4.795	5.064	5.309	5.538	5.753	5.957	6.152	6.339	6.520	6.695	6.866	7.032	7.194	7.353	7.508	7.661	7.811

Thermodynamic properties of R-22 - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
-100	0.020	358.967	361.469	364.001	366.564	369.158	371.783	374.438	377.125	379.843	382.591	385.371	388.181	391.022	393.894	396.797	399.730	402.694	405.688	408.713	411.768	414.854	
-95	0.032	361.403	363.940	366.508	369.106	371.734	374.393	377.083	379.803	382.554	385.336	388.149	390.992	393.865	396.770	399.704	402.669	405.665	408.691	411.747	414.834	417.950	
-90	0.048	363.852	366.426	369.030	371.663	374.327	377.022	379.746	382.501	385.286	388.101	390.947	393.823	396.730	399.667	402.634	405.631	408.659	411.717	414.805	417.922	421.070	
-85	0.072	366.310	368.922	371.564	374.234	376.935	379.665	382.425	385.215	388.034	390.884	393.764	396.674	399.614	402.584	405.584	408.614	411.674	414.764	417.883	421.032	424.211	
-80	0.104	368.774	371.426	374.106	376.815	379.553	382.320	385.116	387.942	390.797	393.682	396.597	399.541	402.515	405.518	408.552	411.615	414.707	417.829	420.981	424.162	427.373	
-75	0.147	371.239	373.932	376.653	379.401	382.178	384.983	387.817	390.680	393.571	396.492	399.442	402.421	405.429	408.467	411.534	414.631	417.757	420.912	424.096	427.309	430.552	
-70	0.205	373.700	376.436	379.199	381.989	384.806	387.651	390.524	393.424	396.353	399.311	402.297	405.312	408.355	411.428	414.530	417.660	420.820	424.008	427.225	430.471	433.745	
-65	0.279	376.153	378.935	381.742	384.575	387.434	390.319	393.232	396.172	399.139	402.135	405.158	408.210	411.290	414.398	417.534	420.700	423.893	427.115	430.366	433.645	436.952	
-60	0.375	378.593	381.423	384.276	387.154	390.057	392.985	395.939	398.919	401.927	404.961	408.023	411.112	414.229	417.373	420.546	423.746	426.975	430.231	433.516	436.828	440.169	
-55	0.496	381.016	383.896	386.798	389.722	392.670	395.643	398.640	401.662	404.711	407.785	410.886	414.014	417.169	420.351	423.560	426.797	430.061	433.353	436.672	440.018	443.392	
-50	0.645	383.416	386.349	389.302	392.276	395.271	398.289	401.331	404.398	407.488	410.605	413.746	416.914	420.108	423.328	426.575	429.849	433.149	436.477	439.831	443.212	446.620	
-45	0.829	385.789	388.778	391.784	394.809	397.854	400.921	404.009	407.121	410.256	413.415	416.599	419.807	423.042	426.301	429.587	432.898	436.236	439.600	442.990	446.407	449.850	
-40.82	1.013	387.750	390.788	393.841	396.911	400.000	403.108	406.237	409.388	412.561	415.758	418.977	422.222	425.490	428.784	432.102	435.446	438.816	442.211	445.632	449.079	452.551	
-40	1.052	388.129	391.177	394.240	397.319	400.416	403.533	406.670	409.829	413.009	416.213	419.440	422.691	425.967	429.267	432.592	435.942	439.318	442.719	446.146	449.599	453.078	
-35	1.320	390.432	393.543	396.665	399.801	402.953	406.122	409.309	412.517	415.745	418.995	422.267	425.562	428.880	432.222	435.588	438.978	442.393	445.832	449.297	452.786	456.301	
-30	1.639	392.692	395.869	399.054	402.250	405.459	408.683	411.923	415.182	418.459	421.757	425.076	428.416	431.778	435.162	438.570	442.002	445.457	448.935	452.438	455.966	459.517	
-25	2.014	394.904	398.152	401.403	404.662	407.931	411.212	414.508	417.820	421.149	424.496	427.863	431.249	434.657	438.086	441.537	445.010	448.506	452.026	455.568	459.134	462.723	
-20	2.453	397.063	400.385	403.707	407.032	410.364	413.706	417.060	420.427	423.809	427.208	430.624	434.059	437.514	440.989	444.484	448.001	451.539	455.100	458.683	462.288	465.916	
-15	2.962	399.163	402.565	405.961	409.357	412.755	416.160	419.574	422.999	426.437	429.889	433.358	436.843	440.346	443.868	447.409	450.971	454.553	458.155	461.780	465.425	469.093	
-10	3.548	401.198	404.685	408.161	411.630	415.099	418.570	422.047	425.532	429.028	432.537	436.059	439.596	443.149	446.720	450.309	453.916	457.543	461.189	464.856	468.543	472.252	
-5	4.218	403.162	406.741	410.300	413.849	417.391	420.932	424.475	428.024	431.580	435.146	438.724	442.315	445.921	449.542	453.179	456.834	460.507	464.198	467.909	471.639	475.388	
0	4.980	405.048	408.725	412.375	416.006	419.626	423.241	426.854	430.469	434.088	437.715	441.351	444.998	448.657	452.330	456.018	459.722	463.442	467.180	470.935	474.709	478.501	
5	5.841	406.849	410.632	414.378	418.098	421.801	425.493	429.179	432.863	436.549	440.239	443.935	447.640	451.355	455.082	458.822	462.577	466.346	470.131	473.933	477.751	481.588	
10	6.809	408.558	412.454	416.303	420.118	423.909	427.683	431.446	435.203	438.958	442.714	446.473	450.239	454.012	457.795	461.589	465.395	469.215	473.049	476.898	480.763	484.645	
15	7.893	410.164	414.185	418.145	422.061	425.946	429.806	433.651	437.485	441.312	445.137	448.962	452.790	456.624	460.465	464.315	468.175	472.047	475.932	479.830	483.742	487.670	
20	9.100	411.658	415.814	419.895	423.921	427.905	431.858	435.789	439.703	443.607	447.504	451.397	455.291	459.188	463.089	466.997	470.913	474.839	478.776	482.724	486.686	490.661	
25	10.439	413.029	417.334	421.546	425.689	429.780	433.832	437.854	441.854	445.838	449.811	453.776	457.739	461.700	465.664	469.632	473.606	477.588	481.579	485.579	489.591	493.615	
30	11.919	414.262	418.732	423.088	427.359	431.566	435.723	439.842	443.932	448.001	452.053	456.094	460.128	464.158	468.187	472.218	476.252	480.291	484.338	488.392	492.456	496.531	
35	13.548	415.341	419.996	424.511	428.922	433.253	437.524	441.747	445.933	450.091	454.228	458.348	462.457	466.558	470.655	474.751	478.847	482.946	487.050	491.161	495.278	499.405	
40	15.336	416.246	421.112	425.804	430.368	434.835	439.228	443.563	447.851	452.104	456.330	460.533	464.721	468.897	473.064	477.228	481.389	485.550	489.714	493.882	498.055	502.235	
45	17.292	416.955	422.062	426.953	431.687	436.303	440.828	445.282	449.681	454.035	458.354	462.645	466.916	471.169	475.412	479.645	483.874	488.100	492.326	496.553	500.784	505.019	
50	19.427	417.435	422.825	427.942	432.866	437.646	442.316	446.899	451.415	455.877	460.296	464.680	469.037	473.373	477.693	482.001	486.299	490.593	494.883	499.172	503.462	507.755	
55	21.751	417.651	423.376	428.754	433.892	438.854	443.682	448.406	453.048	457.625	462.150	466.633	471.082	475.504	479.905	484.290	488.662	493.025	497.382	501.735	506.087	510.439	
60	24.275	417.549	423.683	429.367	434.749	439.914	444.916	449.793	454.572	459.273	463.911	468.499	473.045	477.558	482.045	486.510	490.959	495.395	499.821	504.241	508.657	513.070	
65	27.012	417.063	423.709	429.756	435.419	440.813	446.008	451.053	455.981	460.815	465.574	470.273	474.922	479.531	484.107	488.657	493.186	497.698	502.197	506.686	511.168	515.645	
70	29.974	416.094	423.404	429.892	435.882	441.535	446.946	452.176	457.265	462.243	467.132	471.949	476.707	481.418	486.089	490.728	495.340	499.932	504.506	509.067	513.618	518.161	
75	33.177	414.492	422.705	429.739	436.114	442.065	447.718	453.151	458.416	463.549	468.578	473.521	478.396	483.213	487.984	492.717	497.417	502.092	506.745	511.381	516.003	520.615	
80	36.638	412.013	421.532	429.255	436.091	442.383	448.308	453.967	459.424	464.726	469.905	474.984	479.981	484.913	489.789	494.619	499.412	504.173	508.909	513.623	518.319	523.002	
85	40.378	408.186	419.776	428.395	435.783	442.471	448.702	454.610	460.279	465.764	471.104	476.327	481.457	486.508	491.495	496.429	501.319	506.171	510.992	515.788	520.562	525.319	
90	44.423	401.868	417.302	427.101	435.157	442.303	448.880	455.065	460.965	466.648	472.162	477.541	482.810	487.989	493.094	498.137	503.128	508.076	512.987	517.868	522.723	527.557	
95	48.824	387.280	413.922	425.290	434.153	441.829	448.797	455.291	461.446	467.345	473.048	478.593	484.013	489.328	494.559	499.717	504.816	509.865	514.871	519.842	524.782	529.696	

Thermodynamic properties of R-22 - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.020	2.054	2.069	2.083	2.096	2.110	2.123	2.137	2.150	2.163	2.175	2.188	2.200	2.213	2.225	2.237	2.249	2.261	2.272	2.284	2.296	2.307
-95	0.032	2.025	2.039	2.053	2.066	2.080	2.093	2.106	2.119	2.132	2.144	2.157	2.169	2.181	2.194	2.205	2.217	2.229	2.241	2.252	2.264	2.275
-90	0.048	1.998	2.012	2.026	2.039	2.052	2.065	2.078	2.091	2.104	2.116	2.129	2.141	2.153	2.165	2.177	2.188	2.200	2.211	2.223	2.234	2.245
-85	0.072	1.973	1.987	2.001	2.014	2.027	2.040	2.053	2.065	2.078	2.090	2.102	2.115	2.127	2.138	2.150	2.162	2.173	2.185	2.196	2.207	2.218
-80	0.104	1.951	1.964	1.978	1.991	2.004	2.017	2.029	2.042	2.054	2.066	2.079	2.091	2.102	2.114	2.126	2.137	2.149	2.160	2.171	2.182	2.194
-75	0.147	1.930	1.943	1.957	1.970	1.983	1.995	2.008	2.020	2.033	2.045	2.057	2.069	2.080	2.092	2.104	2.115	2.126	2.138	2.149	2.160	2.171
-70	0.205	1.911	1.924	1.937	1.950	1.963	1.976	1.988	2.000	2.013	2.025	2.036	2.048	2.060	2.072	2.083	2.094	2.106	2.117	2.128	2.139	2.150
-65	0.279	1.893	1.906	1.919	1.932	1.945	1.957	1.970	1.982	1.994	2.006	2.018	2.030	2.041	2.053	2.064	2.075	2.087	2.098	2.109	2.120	2.130
-60	0.375	1.877	1.890	1.903	1.916	1.928	1.941	1.953	1.965	1.977	1.989	2.001	2.012	2.024	2.035	2.047	2.058	2.069	2.080	2.091	2.102	2.113
-55	0.496	1.862	1.875	1.888	1.901	1.913	1.925	1.938	1.950	1.962	1.973	1.985	1.997	2.008	2.019	2.031	2.042	2.053	2.064	2.075	2.085	2.096
-50	0.645	1.848	1.861	1.874	1.886	1.899	1.911	1.923	1.935	1.947	1.959	1.971	1.982	1.993	2.005	2.016	2.027	2.038	2.049	2.060	2.070	2.081
-45	0.829	1.835	1.848	1.861	1.873	1.886	1.898	1.910	1.922	1.934	1.946	1.957	1.969	1.980	1.991	2.002	2.013	2.024	2.035	2.046	2.056	2.067
-40.82	1.013	1.825	1.838	1.851	1.863	1.876	1.888	1.900	1.912	1.923	1.935	1.947	1.958	1.969	1.980	1.992	2.003	2.013	2.024	2.035	2.045	2.056
-40	1.052	1.823	1.836	1.849	1.861	1.874	1.886	1.898	1.910	1.922	1.933	1.945	1.956	1.967	1.978	1.990	2.001	2.011	2.022	2.033	2.043	2.054
-35	1.320	1.812	1.825	1.838	1.850	1.862	1.875	1.887	1.898	1.910	1.922	1.933	1.945	1.956	1.967	1.978	1.989	2.000	2.010	2.021	2.032	2.042
-30	1.639	1.802	1.814	1.827	1.840	1.852	1.864	1.876	1.888	1.900	1.911	1.923	1.934	1.945	1.956	1.967	1.978	1.989	1.999	2.010	2.021	2.031
-25	2.014	1.792	1.805	1.817	1.830	1.842	1.854	1.866	1.878	1.890	1.901	1.913	1.924	1.935	1.946	1.957	1.968	1.979	1.989	2.000	2.010	2.021
-20	2.453	1.783	1.796	1.808	1.821	1.833	1.845	1.857	1.869	1.881	1.892	1.904	1.915	1.926	1.937	1.948	1.959	1.969	1.980	1.990	2.001	2.011
-15	2.962	1.774	1.787	1.800	1.812	1.825	1.837	1.849	1.861	1.872	1.884	1.895	1.906	1.917	1.928	1.939	1.950	1.961	1.971	1.982	1.992	2.002
-10	3.548	1.766	1.779	1.792	1.804	1.817	1.829	1.841	1.853	1.864	1.876	1.887	1.898	1.909	1.920	1.931	1.942	1.953	1.963	1.974	1.984	1.994
-5	4.218	1.758	1.771	1.784	1.797	1.809	1.821	1.833	1.845	1.857	1.868	1.880	1.891	1.902	1.913	1.924	1.934	1.945	1.956	1.966	1.976	1.987
0	4.980	1.751	1.764	1.777	1.790	1.802	1.814	1.826	1.838	1.850	1.861	1.873	1.884	1.895	1.906	1.917	1.927	1.938	1.949	1.959	1.969	1.980
5	5.841	1.744	1.757	1.770	1.783	1.796	1.808	1.820	1.832	1.843	1.855	1.866	1.877	1.889	1.899	1.910	1.921	1.932	1.942	1.952	1.963	1.973
10	6.809	1.737	1.750	1.764	1.777	1.789	1.802	1.814	1.826	1.837	1.849	1.860	1.871	1.882	1.893	1.904	1.915	1.926	1.936	1.946	1.957	1.967
15	7.893	1.730	1.744	1.757	1.770	1.783	1.796	1.808	1.820	1.831	1.843	1.854	1.866	1.877	1.888	1.899	1.909	1.920	1.930	1.941	1.951	1.961
20	9.100	1.724	1.738	1.751	1.765	1.777	1.790	1.802	1.814	1.826	1.838	1.849	1.860	1.871	1.882	1.893	1.904	1.915	1.925	1.935	1.946	1.956
25	10.439	1.717	1.732	1.746	1.759	1.772	1.784	1.797	1.809	1.821	1.832	1.844	1.855	1.866	1.877	1.888	1.899	1.910	1.920	1.930	1.941	1.951
30	11.919	1.711	1.726	1.740	1.753	1.766	1.779	1.792	1.804	1.816	1.828	1.839	1.850	1.862	1.873	1.883	1.894	1.905	1.915	1.926	1.936	1.946
35	13.548	1.705	1.720	1.734	1.748	1.761	1.774	1.787	1.799	1.811	1.823	1.834	1.846	1.857	1.868	1.879	1.890	1.900	1.911	1.921	1.932	1.942
40	15.336	1.698	1.714	1.729	1.743	1.756	1.769	1.782	1.794	1.806	1.818	1.830	1.841	1.853	1.864	1.875	1.885	1.896	1.907	1.917	1.927	1.938
45	17.292	1.692	1.708	1.723	1.737	1.751	1.764	1.777	1.790	1.802	1.814	1.826	1.837	1.848	1.860	1.871	1.881	1.892	1.903	1.913	1.923	1.934
50	19.427	1.685	1.702	1.717	1.732	1.746	1.759	1.772	1.785	1.798	1.810	1.821	1.833	1.844	1.856	1.867	1.878	1.888	1.899	1.909	1.920	1.930
55	21.751	1.678	1.695	1.711	1.726	1.741	1.755	1.768	1.781	1.793	1.805	1.817	1.829	1.841	1.852	1.863	1.874	1.885	1.895	1.906	1.916	1.926
60	24.275	1.670	1.689	1.705	1.721	1.736	1.750	1.763	1.776	1.789	1.801	1.813	1.825	1.837	1.848	1.859	1.870	1.881	1.892	1.902	1.913	1.923
65	27.012	1.662	1.682	1.699	1.715	1.730	1.745	1.759	1.772	1.785	1.797	1.810	1.821	1.833	1.845	1.856	1.867	1.878	1.888	1.899	1.909	1.920
70	29.974	1.653	1.674	1.693	1.709	1.725	1.740	1.754	1.768	1.781	1.793	1.806	1.818	1.829	1.841	1.852	1.863	1.874	1.885	1.896	1.906	1.916
75	33.177	1.642	1.666	1.686	1.703	1.720	1.735	1.749	1.763	1.776	1.789	1.802	1.814	1.826	1.837	1.849	1.860	1.871	1.882	1.892	1.903	1.913
80	36.638	1.630	1.657	1.678	1.697	1.714	1.730	1.744	1.759	1.772	1.785	1.798	1.810	1.822	1.834	1.845	1.857	1.868	1.879	1.889	1.900	1.910
85	40.378	1.614	1.646	1.670	1.690	1.708	1.724	1.739	1.754	1.768	1.781	1.794	1.806	1.819	1.830	1.842	1.853	1.864	1.875	1.886	1.897	1.907
90	44.423	1.592	1.634	1.661	1.682	1.701	1.718	1.734	1.749	1.763	1.777	1.790	1.803	1.815	1.827	1.839	1.850	1.861	1.872	1.883	1.894	1.904
95	48.824	1.549	1.621	1.651	1.674	1.694	1.712	1.728	1.744	1.758	1.772	1.786	1.798	1.811	1.823	1.835	1.846	1.858	1.869	1.880	1.891	1.901

R-23

TRIFLUOROMETHANE - CHF_3

Molecular weight (g/mol)	70.01
Melting point (°C)	-155.13
Boiling point (at 1.013 bar)	-82.0
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	26,14
Critical pressure (bar absolute)	48.32
Specific heat (liquid) at + 25°C (kJ/kg.K)	18.871
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.737
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.201
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.044
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	0.04
Classification NF-EN 378	A1
GWP (IPCC 4)	14800

Main applications

R-23 is a hydrofluorocarbon (HFC) suited for very low temperature systems (-60°C to -100°C) fitted with piston or rotary compressors.
This refrigerant is suited for use in the second stage of a cascade refrigeration system. The first stage of such a system is often R-448A or R-407F which are replacement refrigerants for R-404A and R-507A (temperature conditioning cabinets, freeze-drying systems).

Commercial specifications

Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
Acidity (HCl): ≤ 1 ppm weight.
Chloride ion test: negative
High boiling residue: ≤ 0.01 % volume.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-23 are governed by EU Regulation n° 517/2014.
The recovery of R-23 is mandatory under EU Regulation n°517/2014.

(Refer to the regulations in each country).

Thermodynamic properties of R-23 - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.006	-140	0.605	1.652	14.530	0.075	-140.0	26.330	0.038	296.646	2.193	282.115
0.011	-135	0.612	1.635	20.505	0.119	-135.0	14.346	0.070	299.106	2.135	278.601
0.021	-130	0.618	1.618	26.480	0.161	-130.0	8.219	0.122	301.564	2.083	275.084
0.036	-125	0.625	1.601	32.461	0.202	-125.0	4.924	0.203	304.014	2.035	271.553
0.059	-120	0.632	1.583	38.450	0.242	-120.0	3.070	0.326	306.453	1.992	268.003
0.094	-115	0.639	1.566	44.452	0.281	-115.0	1.983	0.504	308.875	1.952	264.423
0.145	-110	0.646	1.548	50.468	0.318	-110.0	1.322	0.757	311.274	1.917	260.806
0.217	-105	0.653	1.530	56.503	0.354	-105.0	0.907	1.103	313.645	1.884	257.142
0.316	-100	0.661	1.512	62.561	0.390	-100.0	0.638	1.567	315.979	1.853	253.419
0.449	-95	0.669	1.494	68.644	0.424	-95.0	0.459	2.177	318.271	1.826	249.627
0.624	-90	0.678	1.476	74.759	0.458	-90.0	0.338	2.962	320.512	1.800	245.752
0.850	-85	0.686	1.457	80.911	0.491	-85.0	0.253	3.955	322.693	1.776	241.782
1.013	-82.02	0.692	1.446	84.594	0.511	-82.02	0.215	4.662	323.961	1.763	239.366
1.137	-80	0.695	1.438	87.104	0.524	-80.0	0.192	5.195	324.807	1.754	237.702
1.495	-75	0.705	1.419	93.345	0.555	-75.0	0.149	6.723	326.844	1.734	233.498
1.937	-70	0.715	1.399	99.641	0.587	-70.0	0.117	8.582	328.794	1.715	229.153
2.474	-65	0.725	1.379	105.999	0.617	-65.0	0.092	10.824	330.649	1.697	224.650
3.119	-60	0.736	1.358	112.426	0.648	-60.0	0.074	13.503	332.396	1.680	219.969
3.886	-55	0.748	1.337	118.932	0.678	-55.0	0.060	16.682	334.023	1.664	215.091
4.789	-50	0.760	1.315	125.526	0.707	-50.0	0.049	20.430	335.517	1.648	209.991
5.844	-45	0.773	1.293	132.219	0.736	-45.0	0.040	24.830	336.863	1.633	204.644
7.065	-40	0.788	1.270	139.024	0.766	-40.0	0.033	29.972	338.043	1.619	199.019
8.470	-35	0.803	1.246	145.954	0.794	-35.0	0.028	35.969	339.036	1.605	193.082
10.074	-30	0.819	1.221	153.026	0.823	-30.0	0.023	42.950	339.817	1.592	186.790
11.896	-25	0.837	1.194	160.261	0.852	-25.0	0.020	51.079	340.356	1.578	180.095
13.953	-20	0.857	1.167	167.682	0.881	-20.0	0.017	60.556	340.616	1.564	172.933
16.265	-15	0.879	1.137	175.320	0.910	-15.0	0.014	71.639	340.548	1.550	165.228
18.853	-10	0.904	1.106	183.214	0.940	-10.0	0.012	84.672	340.092	1.536	156.878
21.739	-5	0.933	1.072	191.416	0.969	-5.0	0.010	100.124	339.163	1.520	147.747
24.947	0	0.966	1.035	200.000	1.000	-0.0	0.008	118.669	337.643	1.504	137.643
28.503	5	1.006	0.994	209.079	1.032	5.0	0.007	141.340	335.356	1.486	126.276
32.438	10	1.056	0.947	218.840	1.065	10.0	0.006	169.865	332.010	1.465	113.170
36.791	15	1.123	0.890	229.637	1.101	15.0	0.005	207.577	327.059	1.439	97.421
41.610	20	1.225	0.816	242.364	1.143	20.0	0.004	262.790	319.169	1.405	76.805
46.986	25	1.470	0.680	261.942	1.207	25.0	0.003	379.913	301.549	1.340	39.607

Thermodynamic properties of R-23 - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-140	0.006	26330.359	27331.084	28329.033	29325.078	30319.794	31313.562	32306.644	33299.220	34291.418	35283.327	36275.016	37266.530	38257.908	39249.175	40240.354	41231.460	42222.505	43213.500	44204.453	45195.369	46186.255
-135	0.011	14346.267	14874.332	15400.468	15925.259	16449.094	16972.237	17494.872	18017.126	18539.091	19060.833	19582.402	20103.833	20625.154	21146.385	21667.544	22188.642	22709.690	23230.695	23751.664	24272.602	24793.513
-130	0.021	8219.365	8513.125	8805.514	9096.932	9387.650	9677.854	9967.674	10257.202	10546.507	10835.636	11124.628	11413.508	11702.300	11991.018	12279.675	12568.282	12856.846	13145.374	13433.872	13722.342	14010.790
-125	0.036	4924.030	5095.360	5265.695	5435.314	5604.410	5773.117	5941.528	6109.714	6277.723	6445.592	6613.351	6781.019	6948.614	7116.148	7283.631	7451.072	7618.476	7785.850	7953.196	8120.520	8287.823
-120	0.059	3069.511	3173.776	3277.303	3380.292	3482.883	3585.173	3687.233	3789.115	3890.855	3992.483	4094.021	4195.484	4296.886	4398.237	4499.545	4600.816	4702.057	4803.271	4904.461	5005.632	5106.784
-115	0.094	1982.587	2048.522	2113.897	2178.860	2243.514	2307.932	2372.168	2436.261	2500.239	2564.126	2627.937	2691.687	2755.385	2819.040	2882.659	2946.246	3009.806	3073.343	3136.859	3200.358	3263.841
-110	0.145	1321.852	1365.023	1407.761	1450.178	1492.350	1534.334	1576.172	1617.892	1659.519	1701.070	1742.558	1783.994	1825.387	1866.742	1908.066	1949.363	1990.637	2031.890	2073.125	2114.344	2155.549
-105	0.217	906.745	935.920	964.753	993.330	1021.711	1049.940	1078.048	1106.061	1133.995	1161.866	1189.683	1217.456	1245.192	1272.896	1300.573	1328.226	1355.858	1383.472	1411.070	1438.655	1466.226
-100	0.316	638.070	658.363	678.382	698.193	717.844	737.370	756.797	776.142	795.423	814.649	833.830	852.972	872.083	891.165	910.224	929.262	948.281	967.285	986.274	1005.251	1024.216
-95	0.449	459.413	473.905	488.174	502.272	516.237	530.098	543.875	557.584	571.236	584.843	598.410	611.945	625.451	638.933	652.393	665.835	679.261	692.673	706.071	719.459	732.836
-90	0.624	337.662	348.267	358.685	368.960	379.124	389.200	399.204	409.150	419.047	428.905	438.728	448.522	458.292	468.040	477.769	487.482	497.180	506.865	516.539	526.202	535.856
-85	0.850	252.819	260.753	268.530	276.187	283.748	291.233	298.657	306.031	313.362	320.658	327.925	335.165	342.384	349.583	356.766	363.934	371.088	378.231	385.364	392.487	399.602
-82.02	1.013	214.511	221.253	227.852	234.341	240.743	247.075	253.350	259.579	265.769	271.926	278.056	284.162	290.247	296.314	302.365	308.402	314.427	320.441	326.445	332.440	338.427
-80	1.137	192.476	198.536	204.462	210.284	216.024	221.698	227.318	232.895	238.434	243.942	249.424	254.883	260.322	265.744	271.150	276.544	281.925	287.296	292.657	298.009	303.354
-75	1.495	148.751	153.470	158.072	162.583	167.022	171.403	175.738	180.033	184.295	188.530	192.741	196.932	201.104	205.261	209.405	213.536	217.656	221.767	225.869	229.962	234.049
-70	1.937	116.522	120.262	123.899	127.456	130.949	134.391	137.791	141.157	144.492	147.803	151.093	154.364	157.619	160.859	164.087	167.304	170.511	173.709	176.899	180.082	183.258
-65	2.474	92.390	95.404	98.326	101.177	103.970	106.718	109.428	112.107	114.759	117.388	119.998	122.591	125.169	127.734	130.288	132.832	135.366	137.892	140.410	142.922	145.427
-60	3.119	74.059	76.526	78.910	81.229	83.497	85.724	87.916	90.079	92.218	94.337	96.438	98.523	100.595	102.654	104.703	106.743	108.774	110.797	112.814	114.824	116.828
-55	3.886	59.946	61.996	63.969	65.883	67.751	69.580	71.378	73.150	74.899	76.629	78.343	80.042	81.729	83.405	85.071	86.728	88.377	90.019	91.654	93.284	94.908
-50	4.789	48.947	50.673	52.329	53.931	55.489	57.012	58.505	59.975	61.423	62.854	64.270	65.673	67.063	68.444	69.815	71.177	72.533	73.881	75.224	76.560	77.892
-45	5.844	40.275	41.749	43.157	44.514	45.831	47.114	48.370	49.603	50.817	52.015	53.198	54.369	55.529	56.679	57.820	58.954	60.080	61.201	62.315	63.424	64.528
-40	7.065	33.364	34.640	35.852	37.016	38.141	39.236	40.304	41.351	42.380	43.394	44.394	45.382	46.359	47.328	48.288	49.241	50.188	51.128	52.063	52.992	53.918
-35	8.470	27.802	28.920	29.977	30.986	31.959	32.903	33.822	34.720	35.601	36.468	37.322	38.164	38.997	39.821	40.637	41.446	42.249	43.046	43.838	44.625	45.407
-30	10.074	23.283	24.275	25.207	26.093	26.944	27.765	28.564	29.343	30.105	30.853	31.589	32.314	33.030	33.737	34.438	35.131	35.818	36.500	37.177	37.849	38.517
-25	11.896	19.578	20.470	21.301	22.088	22.839	23.562	24.262	24.944	25.610	26.262	26.902	27.532	28.153	28.765	29.371	29.971	30.564	31.152	31.736	32.315	32.890
-20	13.953	16.514	17.327	18.077	18.783	19.453	20.095	20.716	21.318	21.904	22.477	23.039	23.590	24.134	24.669	25.197	25.720	26.236	26.748	27.255	27.758	28.257
-15	16.265	13.959	14.710	15.396	16.035	16.639	17.215	17.770	18.306	18.826	19.334	19.831	20.318	20.797	21.268	21.733	22.191	22.644	23.093	23.536	23.976	24.412
-10	18.853	11.810	12.515	13.150	13.735	14.284	14.806	15.305	15.787	16.253	16.706	17.149	17.582	18.007	18.425	18.836	19.242	19.642	20.038	20.429	20.816	21.200
-5	21.739	9.988	10.660	11.255	11.797	12.301	12.777	13.231	13.666	14.087	14.495	14.892	15.280	15.660	16.033	16.399	16.760	17.116	17.467	17.814	18.157	18.497
0	24.947	8.427	9.082	9.646	10.153	10.621	11.059	11.474	11.871	12.253	12.622	12.981	13.331	13.672	14.007	14.336	14.659	14.977	15.291	15.600	15.906	16.208
5	28.503	7.075	7.729	8.272	8.752	9.189	9.595	9.978	10.342	10.691	11.027	11.353	11.670	11.979	12.282	12.578	12.869	13.155	13.436	13.714	13.988	14.259
10	32.438	5.887	6.560	7.092	7.551	7.963	8.342	8.697	9.033	9.354	9.662	9.959	10.248	10.529	10.804	11.072	11.335	11.593	11.847	12.098	12.344	12.588
15	36.791	4.817	5.544	6.073	6.516	6.907	7.263	7.594	7.906	8.202	8.486	8.759	9.023	9.280	9.530	9.774	10.013	10.247	10.477	10.704	10.927	11.147
20	41.610	3.805	4.652	5.188	5.619	5.993	6.329	6.639	6.930	7.204	7.466	7.717	7.960	8.195	8.424	8.647	8.865	9.078	9.287	9.493	9.695	9.895
25	46.986	2.632	3.862	4.412	4.835	5.193	5.512	5.803	6.074	6.329	6.572	6.804	7.027	7.243	7.453	7.657	7.856	8.051	8.241	8.429	8.613	8.794

Thermodynamic properties of R-23 - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-140	0.006	296.646	299.256	301.876	304.511	307.167	309.846	312.550	315.282	318.042	320.832	323.653	326.505	329.389	332.306	335.257	338.241	341.259	344.311	347.398	350.520	353.677
-135	0.011	299.106	301.761	304.421	307.095	309.788	312.502	315.241	318.008	320.803	323.627	326.482	329.369	332.289	335.241	338.226	341.245	344.299	347.387	350.510	353.668	356.861
-130	0.021	301.564	304.267	306.973	309.688	312.420	315.173	317.950	320.753	323.584	326.444	329.336	332.258	335.213	338.201	341.223	344.278	347.368	350.492	353.651	356.845	360.075
-125	0.036	304.014	306.771	309.525	312.286	315.061	317.855	320.671	323.513	326.382	329.281	332.209	335.169	338.161	341.186	344.244	347.336	350.463	353.624	356.820	360.052	363.318
-120	0.059	306.453	309.269	312.075	314.885	317.706	320.544	323.402	326.285	329.194	332.132	335.100	338.098	341.128	344.191	347.288	350.418	353.582	356.781	360.014	363.284	366.588
-115	0.094	308.875	311.754	314.618	317.480	320.350	323.235	326.138	329.064	332.016	334.995	338.003	341.042	344.112	347.214	350.349	353.518	356.721	359.959	363.231	366.539	369.881
-110	0.145	311.274	314.221	317.146	320.065	322.988	325.923	328.874	331.846	334.842	337.864	340.915	343.996	347.107	350.250	353.426	356.635	359.877	363.155	366.466	369.813	373.195
-105	0.217	313.645	316.664	319.655	322.635	325.614	328.602	331.604	334.624	337.667	340.735	343.831	346.955	350.109	353.294	356.512	359.762	363.046	366.364	369.716	373.103	376.525
-100	0.316	315.979	319.077	322.138	325.183	328.222	331.266	334.322	337.394	340.486	343.602	346.744	349.914	353.113	356.343	359.604	362.897	366.223	369.583	372.977	376.405	379.868
-95	0.449	318.271	321.451	324.588	327.701	330.805	333.909	337.022	340.148	343.293	346.459	349.651	352.868	356.114	359.389	362.695	366.033	369.403	372.806	376.243	379.714	383.219
-90	0.624	320.512	323.781	326.998	330.185	333.356	336.524	339.697	342.881	346.081	349.301	352.543	355.811	359.106	362.429	365.782	369.166	372.581	376.029	379.510	383.024	386.572
-85	0.850	322.693	326.057	329.360	332.625	335.869	339.104	342.341	345.586	348.844	352.120	355.416	358.736	362.082	365.455	368.857	372.289	375.752	379.246	382.773	386.332	389.925
-82.02	1.013	323.961	327.384	330.740	334.054	337.344	340.622	343.898	347.181	350.475	353.785	357.116	360.468	363.846	367.250	370.682	374.143	377.634	381.157	384.712	388.299	391.918
-80	1.137	324.807	328.272	331.666	335.014	338.335	341.643	344.947	348.256	351.576	354.910	358.264	361.639	365.038	368.463	371.916	375.398	378.910	382.452	386.026	389.632	393.270
-75	1.495	326.844	330.417	333.908	337.345	340.748	344.132	347.508	350.885	354.269	357.666	361.079	364.512	367.967	371.447	374.953	378.487	382.049	385.641	389.264	392.918	396.604
-70	1.937	328.794	332.484	336.079	339.610	343.100	346.565	350.017	353.465	356.918	360.380	363.856	367.349	370.863	374.400	377.962	381.549	385.165	388.809	392.482	396.186	399.921
-65	2.474	330.649	334.463	338.169	341.801	345.383	348.933	352.466	355.990	359.515	363.046	366.588	370.145	373.720	377.317	380.936	384.580	388.251	391.949	395.675	399.431	403.216
-60	3.119	332.396	336.344	340.169	343.908	347.589	351.230	354.848	358.453	362.054	365.657	369.269	372.893	376.532	380.191	383.871	387.574	391.302	395.056	398.837	402.646	406.484
-55	3.886	334.023	338.116	342.069	345.923	349.709	353.448	357.156	360.846	364.527	368.207	371.892	375.586	379.293	383.018	386.761	390.525	394.313	398.125	401.963	405.828	409.721
-50	4.789	335.517	339.768	343.859	347.837	351.736	355.578	359.382	363.162	366.928	370.689	374.451	378.219	381.997	385.790	389.600	393.428	397.278	401.151	405.048	408.971	412.920
-45	5.844	336.863	341.286	345.527	349.639	353.658	357.611	361.518	365.394	369.250	373.096	376.939	380.785	384.638	388.503	392.382	396.277	400.193	404.129	408.088	412.070	416.078
-40	7.065	338.043	342.656	347.062	351.318	355.467	359.539	363.555	367.533	371.485	375.422	379.351	383.278	387.210	391.150	395.101	399.068	403.051	407.053	411.076	415.121	419.189
-35	8.470	339.036	343.862	348.448	352.862	357.152	361.351	365.485	369.572	373.626	377.658	381.678	385.692	389.707	393.726	397.754	401.793	405.848	409.919	414.009	418.119	422.251
-30	10.074	339.817	344.882	349.669	354.257	358.701	363.038	367.298	371.502	375.664	379.799	383.915	388.020	392.122	396.225	400.333	404.449	408.578	412.721	416.881	421.059	425.257
-25	11.896	340.356	345.696	350.708	355.489	360.100	364.589	368.985	373.314	377.593	381.836	386.054	390.257	394.450	398.641	402.833	407.031	411.238	415.456	419.689	423.937	428.203
-20	13.953	340.616	346.276	351.545	356.540	361.337	365.990	370.535	374.998	379.402	383.761	388.089	392.394	396.685	400.968	405.249	409.532	413.821	418.118	422.427	426.749	431.087
-15	16.265	340.548	346.589	352.153	357.391	362.396	367.230	371.936	376.546	381.084	385.568	390.011	394.426	398.820	403.202	407.576	411.949	416.323	420.703	425.092	429.491	433.903
-10	18.853	340.092	346.596	352.507	358.022	363.259	368.293	373.176	377.946	382.629	387.247	391.815	396.346	400.850	405.335	409.808	414.275	418.740	423.206	427.678	432.158	436.648
-5	21.739	339.163	346.247	352.572	358.408	363.908	369.165	374.244	379.187	384.028	388.790	393.491	398.146	402.767	407.362	411.940	416.506	421.066	425.623	430.182	434.746	439.317
0	24.947	337.643	345.481	352.309	358.521	364.321	369.830	375.124	380.258	385.270	390.187	395.032	399.820	404.565	409.277	413.965	418.636	423.296	427.949	432.600	437.251	441.907
5	28.503	335.356	344.219	351.672	358.331	364.476	370.268	375.803	381.147	386.345	391.431	396.430	401.360	406.237	411.074	415.879	420.660	425.425	430.179	434.925	439.669	444.413
10	32.438	332.010	342.356	350.607	357.801	364.348	370.461	376.264	381.839	387.241	392.510	397.674	402.757	407.776	412.744	417.673	422.572	427.447	432.306	437.153	441.994	446.831
15	36.791	327.059	339.754	349.048	356.892	363.907	370.385	376.488	382.319	387.943	393.410	398.754	404.000	409.170	414.279	419.339	424.361	429.354	434.324	439.277	444.218	449.152
20	41.610	319.169	336.224	346.912	355.551	363.114	370.009	376.448	382.561	388.430	394.112	399.649	405.072	410.403	415.661	420.861	426.015	431.131	436.218	441.283	446.330	451.366
25	46.986	301.549	331.470	344.056	353.676	361.886	369.260	376.080	382.508	388.647	394.566	400.314	405.928	411.434	416.853	422.203	427.497	432.745	437.956	443.139	448.299	453.442

Thermodynamic properties of R-23 - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-140	0.006	2.193	2.213	2.231	2.249	2.267	2.284	2.301	2.318	2.334	2.350	2.365	2.381	2.396	2.411	2.425	2.440	2.454	2.468	2.482	2.496	2.510
-135	0.011	2.135	2.154	2.172	2.190	2.208	2.224	2.241	2.257	2.273	2.289	2.304	2.319	2.334	2.349	2.363	2.378	2.392	2.406	2.420	2.433	2.447
-130	0.021	2.083	2.101	2.119	2.137	2.154	2.170	2.187	2.203	2.218	2.234	2.249	2.264	2.279	2.293	2.307	2.322	2.336	2.349	2.363	2.377	2.390
-125	0.036	2.035	2.053	2.071	2.088	2.105	2.121	2.138	2.153	2.169	2.184	2.199	2.214	2.228	2.243	2.257	2.271	2.285	2.298	2.312	2.325	2.339
-120	0.059	1.992	2.010	2.027	2.044	2.061	2.077	2.093	2.108	2.124	2.139	2.154	2.168	2.183	2.197	2.211	2.225	2.238	2.252	2.265	2.279	2.292
-115	0.094	1.952	1.970	1.988	2.004	2.021	2.037	2.052	2.068	2.083	2.098	2.112	2.127	2.141	2.155	2.169	2.183	2.196	2.210	2.223	2.236	2.249
-110	0.145	1.917	1.934	1.951	1.968	1.984	2.000	2.016	2.031	2.046	2.060	2.075	2.089	2.103	2.117	2.131	2.145	2.158	2.171	2.185	2.198	2.211
-105	0.217	1.884	1.901	1.918	1.935	1.951	1.967	1.982	1.997	2.012	2.026	2.041	2.055	2.069	2.083	2.096	2.110	2.123	2.136	2.149	2.162	2.175
-100	0.316	1.853	1.871	1.888	1.904	1.920	1.936	1.951	1.966	1.981	1.995	2.009	2.023	2.037	2.051	2.065	2.078	2.091	2.104	2.117	2.130	2.143
-95	0.449	1.826	1.843	1.860	1.876	1.892	1.908	1.923	1.938	1.952	1.967	1.981	1.995	2.009	2.022	2.036	2.049	2.062	2.075	2.088	2.101	2.114
-90	0.624	1.800	1.818	1.834	1.851	1.867	1.882	1.897	1.912	1.926	1.941	1.955	1.969	1.982	1.996	2.009	2.022	2.035	2.048	2.061	2.074	2.087
-85	0.850	1.776	1.794	1.811	1.827	1.843	1.858	1.873	1.888	1.902	1.917	1.931	1.944	1.958	1.971	1.985	1.998	2.011	2.024	2.037	2.049	2.062
-82.02	1.013	1.763	1.781	1.798	1.814	1.830	1.845	1.860	1.875	1.889	1.903	1.917	1.931	1.945	1.958	1.971	1.984	1.997	2.010	2.023	2.036	2.048
-80	1.137	1.754	1.772	1.789	1.805	1.821	1.836	1.851	1.866	1.880	1.894	1.908	1.922	1.936	1.949	1.962	1.975	1.988	2.001	2.014	2.027	2.039
-75	1.495	1.734	1.752	1.769	1.785	1.801	1.816	1.831	1.846	1.860	1.874	1.888	1.902	1.915	1.929	1.942	1.955	1.968	1.981	1.993	2.006	2.018
-70	1.937	1.715	1.733	1.750	1.766	1.782	1.797	1.812	1.827	1.841	1.855	1.869	1.883	1.896	1.910	1.923	1.936	1.949	1.961	1.974	1.987	1.999
-65	2.474	1.697	1.715	1.732	1.748	1.764	1.780	1.795	1.809	1.824	1.838	1.852	1.865	1.879	1.892	1.905	1.918	1.931	1.944	1.956	1.969	1.981
-60	3.119	1.680	1.698	1.715	1.732	1.748	1.763	1.778	1.793	1.807	1.821	1.835	1.849	1.862	1.876	1.889	1.902	1.915	1.927	1.940	1.952	1.965
-55	3.886	1.664	1.682	1.700	1.716	1.732	1.748	1.763	1.778	1.792	1.806	1.820	1.834	1.847	1.860	1.874	1.887	1.899	1.912	1.925	1.937	1.949
-50	4.789	1.648	1.667	1.685	1.702	1.718	1.733	1.749	1.763	1.778	1.792	1.806	1.820	1.833	1.846	1.859	1.872	1.885	1.898	1.910	1.923	1.935
-45	5.844	1.633	1.653	1.671	1.688	1.704	1.720	1.735	1.750	1.764	1.779	1.793	1.806	1.820	1.833	1.846	1.859	1.872	1.885	1.897	1.910	1.922
-40	7.065	1.619	1.639	1.657	1.674	1.691	1.707	1.722	1.737	1.752	1.766	1.780	1.794	1.807	1.821	1.834	1.847	1.860	1.872	1.885	1.897	1.910
-35	8.470	1.605	1.625	1.644	1.662	1.678	1.694	1.710	1.725	1.740	1.754	1.768	1.782	1.796	1.809	1.822	1.835	1.848	1.861	1.873	1.886	1.898
-30	10.074	1.592	1.612	1.631	1.649	1.666	1.683	1.698	1.714	1.728	1.743	1.757	1.771	1.785	1.798	1.811	1.824	1.837	1.850	1.862	1.875	1.887
-25	11.896	1.578	1.599	1.619	1.637	1.655	1.671	1.687	1.702	1.717	1.732	1.746	1.760	1.774	1.787	1.801	1.814	1.827	1.840	1.852	1.865	1.877
-20	13.953	1.564	1.586	1.607	1.625	1.643	1.660	1.676	1.692	1.707	1.722	1.736	1.750	1.764	1.778	1.791	1.804	1.817	1.830	1.842	1.855	1.867
-15	16.265	1.550	1.573	1.594	1.614	1.632	1.649	1.666	1.681	1.697	1.712	1.726	1.740	1.754	1.768	1.781	1.795	1.808	1.821	1.833	1.846	1.858
-10	18.853	1.536	1.560	1.582	1.602	1.621	1.638	1.655	1.671	1.687	1.702	1.717	1.731	1.745	1.759	1.772	1.786	1.799	1.812	1.824	1.837	1.849
-5	21.739	1.520	1.547	1.570	1.590	1.610	1.628	1.645	1.661	1.677	1.692	1.707	1.722	1.736	1.750	1.764	1.777	1.790	1.803	1.816	1.829	1.841
0	24.947	1.504	1.532	1.557	1.578	1.598	1.617	1.635	1.651	1.668	1.683	1.698	1.713	1.727	1.741	1.755	1.769	1.782	1.795	1.808	1.821	1.833
5	28.503	1.486	1.517	1.543	1.566	1.587	1.606	1.624	1.642	1.658	1.674	1.689	1.704	1.719	1.733	1.747	1.760	1.774	1.787	1.800	1.813	1.825
10	32.438	1.465	1.501	1.529	1.554	1.575	1.595	1.614	1.632	1.649	1.665	1.680	1.696	1.710	1.725	1.739	1.753	1.766	1.779	1.792	1.805	1.818
15	36.791	1.439	1.483	1.514	1.540	1.563	1.584	1.604	1.622	1.639	1.656	1.672	1.687	1.702	1.716	1.731	1.745	1.758	1.772	1.785	1.798	1.811
20	41.610	1.405	1.463	1.498	1.527	1.551	1.573	1.593	1.612	1.629	1.646	1.663	1.678	1.693	1.708	1.723	1.737	1.751	1.764	1.777	1.790	1.803
25	46.986	1.340	1.439	1.481	1.511	1.538	1.561	1.581	1.601	1.619	1.637	1.653	1.669	1.685	1.700	1.714	1.729	1.743	1.756	1.770	1.783	1.796

R-32

DIFLUOROMETHANE - CH_2F_2

Molecular weight (g/mol)	52.02
Melting point (°C)	-136.81
Boiling point (at 1.013 bar)	-51.66
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	78.1
Critical pressure (bar absolute)	57.82
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.937
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.848
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.252
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.114
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.79
Classification NF-EN 378	A2L
GWP (IPCC 4)	675

Main applications

R-32 is a low GWP "hydrofluorocarbon" (HFC). It is an A2L Refrigerant meaning it is mildly flammable. It is used in small split Air Conditioning systems where the charge size complies with the requirements of EN378. It is not a retrofit option for other AC systems running on other refrigerants. It is also used as a component in both HFC and HFO blends.

Commercial specifications

Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
Acidity (HCl): ≤ 1 ppm weight.
Chloride ion test: negative
High boiling residue: ≤ 0.01 % volume.

Oils

Use a polyol ester (POE) oil suitable for R-32. Standard POE is not miscible. Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-32 are governed by EU Regulation n° 517/2014.
The recovery of R-32 is mandatory under EU Regulation n° 517/2014.

(Refer to the regulations enforced in each country).

Thermodynamic properties of R-32 - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.038	-100	0.747	1.339	38.826	0.271	-100.0	7.222	0.138	468.306	2.751	429.480
0.059	-95	0.754	1.327	46.624	0.315	-95.0	4.798	0.208	471.481	2.700	424.858
0.089	-90	0.761	1.314	54.418	0.359	-90.0	3.272	0.306	474.614	2.653	420.196
0.130	-85	0.769	1.301	62.214	0.401	-85.0	2.286	0.438	477.697	2.609	415.483
0.187	-80	0.776	1.288	70.016	0.442	-80.0	1.632	0.613	480.723	2.568	410.707
0.262	-75	0.784	1.275	77.828	0.481	-75.0	1.188	0.842	483.684	2.530	405.856
0.361	-70	0.792	1.262	85.656	0.520	-70.0	0.881	1.135	486.573	2.494	400.917
0.488	-65	0.801	1.249	93.504	0.558	-65.0	0.664	1.507	489.384	2.460	395.880
0.650	-60	0.809	1.236	101.376	0.596	-60.0	0.508	1.969	492.109	2.429	390.732
0.852	-55	0.818	1.222	109.279	0.632	-55.0	0.394	2.538	494.741	2.399	385.462
1.013	-51.66	0.824	1.213	114.584	0.656	-51.66	0.335	2.987	496.447	2.380	381.863
1.101	-50	0.828	1.208	117.218	0.668	-50.0	0.309	3.232	497.275	2.371	380.057
1.406	-45	0.837	1.194	125.198	0.704	-45.0	0.246	4.067	499.703	2.345	374.504
1.774	-40	0.847	1.180	133.226	0.738	-40.0	0.197	5.065	502.017	2.320	368.792
2.214	-35	0.858	1.166	141.307	0.772	-35.0	0.160	6.248	504.211	2.296	362.904
2.734	-30	0.869	1.151	149.448	0.806	-30.0	0.131	7.639	506.274	2.273	356.827
3.346	-25	0.880	1.136	157.656	0.839	-25.0	0.108	9.266	508.199	2.252	350.542
4.058	-20	0.892	1.121	165.940	0.872	-20.0	0.090	11.157	509.972	2.231	344.033
4.881	-15	0.905	1.105	174.306	0.904	-15.0	0.075	13.346	511.584	2.211	337.278
5.826	-10	0.918	1.089	182.765	0.937	-10.0	0.063	15.870	513.020	2.192	330.255
6.906	-5	0.933	1.072	191.326	0.968	-5.0	0.053	18.769	514.264	2.173	322.938
8.131	0	0.948	1.055	200.000	1.000	0.0	0.045	22.091	515.299	2.154	315.299
9.514	5	0.964	1.038	208.801	1.031	5.0	0.039	25.891	516.106	2.136	307.305
11.069	10	0.981	1.020	217.742	1.063	10.0	0.033	30.232	516.660	2.118	298.917
12.808	15	0.999	1.001	226.842	1.094	15.0	0.028	35.190	516.934	2.101	290.092
14.746	20	1.019	0.981	236.121	1.125	20.0	0.024	40.856	516.897	2.083	280.777
16.896	25	1.041	0.961	245.602	1.157	25.0	0.021	47.339	516.510	2.065	270.908
19.275	30	1.064	0.940	255.317	1.188	30.0	0.018	54.776	515.725	2.047	260.408
21.898	35	1.090	0.917	265.303	1.220	35.0	0.016	63.343	514.482	2.028	249.179
24.783	40	1.120	0.893	275.611	1.252	40.0	0.014	73.268	512.706	2.009	237.094
27.948	45	1.153	0.867	286.308	1.285	45.0	0.012	84.859	510.294	1.989	223.986
31.412	50	1.192	0.839	297.486	1.318	50.0	0.010	98.550	507.104	1.967	209.618
35.199	55	1.237	0.808	309.286	1.353	55.0	0.009	114.989	502.930	1.943	193.644
39.332	60	1.293	0.773	321.927	1.390	60.0	0.007	135.213	497.441	1.917	175.514
43.843	65	1.366	0.732	335.800	1.429	65.0	0.006	161.092	490.054	1.885	154.254
48.768	70	1.469	0.681	351.734	1.474	70.0	0.005	196.688	479.518	1.846	127.784
54.168	75	1.650	0.606	372.391	1.531	75.0	0.004	255.587	461.723	1.788	89.333

Thermodynamic properties of R-32 - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.038	7222.039	7435.607	7648.525	7860.933	8072.931	8284.592	8495.974	8707.124	8918.079	9128.868	9339.517	9550.046	9760.472	9970.809	10181.070	10391.263	10601.399	10811.483	11021.522	11231.522	11441.487
-95	0.059	4797.698	4936.671	5075.093	5213.084	5350.728	5488.089	5625.215	5762.143	5898.905	6035.525	6172.026	6308.422	6444.730	6580.961	6717.124	6853.230	6989.284	7125.293	7261.263	7397.198	7533.101
-90	0.089	3272.109	3365.182	3457.783	3550.016	3641.956	3733.654	3825.152	3916.482	4007.669	4098.735	4189.697	4280.570	4371.365	4462.093	4552.763	4643.381	4733.954	4824.488	4914.986	5005.453	5095.893
-85	0.130	2285.584	2349.590	2413.187	2476.470	2539.501	2602.326	2664.979	2727.487	2789.873	2852.154	2914.345	2976.458	3038.504	3100.491	3162.426	3224.316	3286.167	3347.982	3409.766	3471.522	3533.253
-80	0.187	1631.561	1676.665	1721.414	1765.892	1810.153	1854.236	1898.171	1941.981	1985.685	2029.297	2072.832	2116.298	2159.705	2203.060	2246.370	2289.640	2332.875	2376.078	2419.253	2462.403	2505.531
-75	0.262	1187.965	1220.474	1252.674	1284.637	1316.412	1348.033	1379.526	1410.910	1442.202	1473.414	1504.557	1535.641	1566.673	1597.658	1628.604	1659.514	1690.392	1721.242	1752.067	1782.870	1813.653
-70	0.361	880.723	904.649	928.303	951.750	975.033	998.181	1021.218	1044.160	1067.021	1089.812	1112.542	1135.220	1157.851	1180.442	1202.997	1225.520	1248.015	1270.485	1292.932	1315.359	1337.767
-65	0.488	663.783	681.735	699.448	716.978	734.365	751.634	768.805	785.892	802.908	819.862	836.763	853.617	870.430	887.206	903.951	920.667	937.357	954.025	970.673	987.302	1003.914
-60	0.650	507.860	521.574	535.075	548.417	561.631	574.741	587.765	600.714	613.601	626.433	639.217	651.959	664.665	677.338	689.983	702.601	715.197	727.772	740.329	752.869	765.394
-55	0.852	393.941	404.593	415.056	425.378	435.586	445.703	455.742	465.716	475.633	485.502	495.328	505.117	514.873	524.599	534.300	543.977	553.633	563.271	572.892	582.497	592.089
-51.66	1.013	334.760	343.834	352.734	361.503	370.168	378.747	387.254	395.701	404.096	412.445	420.755	429.029	437.273	445.490	453.682	461.853	470.004	478.137	486.255	494.358	502.448
-50	1.101	309.440	317.842	326.077	334.186	342.194	350.119	357.976	365.774	373.522	381.226	388.892	396.524	404.126	411.702	419.254	426.785	434.297	441.792	449.272	456.737	464.190
-45	1.406	245.874	252.599	259.174	265.635	272.007	278.305	284.541	290.724	296.862	302.960	309.024	315.058	321.064	327.046	333.007	338.949	344.873	350.782	356.676	362.557	368.427
-40	1.774	197.430	202.885	208.206	213.424	218.562	223.633	228.648	233.616	238.543	243.433	248.293	253.124	257.932	262.717	267.482	272.230	276.961	281.679	286.383	291.076	295.757
-35	2.214	160.061	164.542	168.903	173.171	177.366	181.500	185.584	189.624	193.627	197.598	201.539	205.456	209.349	213.223	217.079	220.918	224.742	228.554	232.353	236.141	239.919
-30	2.734	130.908	134.634	138.250	141.783	145.248	148.658	152.022	155.347	158.637	161.897	165.131	168.342	171.531	174.703	177.857	180.997	184.123	187.236	190.339	193.431	196.514
-25	3.346	107.925	111.059	114.091	117.047	119.942	122.786	125.588	128.353	131.086	133.792	136.474	139.134	141.775	144.399	147.007	149.602	152.183	154.754	157.314	159.864	162.405
-20	4.058	89.628	92.291	94.862	97.362	99.805	102.202	104.559	106.883	109.177	111.446	113.692	115.919	118.127	120.320	122.498	124.663	126.816	128.958	131.091	133.215	135.330
-15	4.881	74.927	77.214	79.415	81.551	83.634	85.673	87.676	89.648	91.592	93.512	95.412	97.293	99.157	101.006	102.842	104.665	106.478	108.280	110.073	111.858	113.635
-10	5.826	63.013	64.996	66.900	68.741	70.534	72.286	74.003	75.691	77.354	78.994	80.615	82.218	83.805	85.379	86.940	88.489	90.028	91.557	93.078	94.591	96.096
-5	6.906	53.280	55.016	56.677	58.280	59.837	61.355	62.840	64.298	65.732	67.145	68.540	69.918	71.281	72.631	73.969	75.296	76.613	77.922	79.222	80.514	81.800
0	8.131	45.267	46.802	48.264	49.672	51.035	52.361	53.657	54.927	56.174	57.401	58.610	59.804	60.984	62.151	63.307	64.453	65.589	66.717	67.837	68.950	70.056
5	9.514	38.624	39.992	41.291	42.537	43.741	44.910	46.049	47.164	48.256	49.330	50.387	51.429	52.457	53.474	54.480	55.476	56.464	57.443	58.415	59.380	60.339
10	11.069	33.077	34.309	35.473	36.585	37.657	38.694	39.704	40.689	41.654	42.600	43.530	44.446	45.349	46.241	47.123	47.995	48.859	49.715	50.564	51.406	52.243
15	12.808	28.417	29.535	30.587	31.588	32.549	33.478	34.378	35.256	36.113	36.953	37.777	38.587	39.386	40.173	40.951	41.720	42.480	43.233	43.980	44.720	45.454
20	14.746	24.476	25.502	26.460	27.368	28.237	29.073	29.882	30.669	31.436	32.186	32.921	33.643	34.353	35.052	35.743	36.424	37.098	37.764	38.425	39.079	39.727
25	16.896	21.124	22.074	22.954	23.784	24.575	25.333	26.065	26.775	27.465	28.140	28.799	29.446	30.081	30.706	31.323	31.930	32.531	33.124	33.711	34.292	34.869
30	19.275	18.256	19.143	19.960	20.724	21.449	22.141	22.808	23.452	24.078	24.687	25.282	25.865	26.437	26.999	27.551	28.096	28.634	29.165	29.690	30.210	30.724
35	21.898	15.787	16.626	17.389	18.098	18.767	19.404	20.014	20.603	21.173	21.727	22.267	22.794	23.312	23.819	24.318	24.809	25.293	25.771	26.242	26.709	27.170
40	24.783	13.649	14.451	15.171	15.835	16.456	17.045	17.607	18.148	18.670	19.176	19.669	20.149	20.619	21.080	21.532	21.977	22.414	22.846	23.272	23.692	24.108
45	27.948	11.784	12.562	13.248	13.874	14.456	15.003	15.524	16.023	16.504	16.969	17.420	17.860	18.289	18.709	19.121	19.525	19.923	20.314	20.701	21.082	21.458
50	31.412	10.147	10.913	11.574	12.168	12.716	13.229	13.714	14.177	14.622	15.051	15.466	15.870	16.264	16.648	17.025	17.394	17.757	18.114	18.465	18.812	19.154
55	35.199	8.697	9.466	10.109	10.679	11.198	11.681	12.135	12.567	12.980	13.377	13.761	14.134	14.496	14.849	15.195	15.533	15.866	16.192	16.513	16.830	17.142
60	39.332	7.396	8.188	8.823	9.373	9.868	10.325	10.752	11.156	11.542	11.911	12.267	12.612	12.947	13.273	13.591	13.902	14.207	14.507	14.801	15.091	15.377
65	43.843	6.208	7.054	7.688	8.223	8.699	9.133	9.536	9.916	10.277	10.621	10.953	11.273	11.583	11.885	12.179	12.466	12.747	13.023	13.294	13.560	13.822
70	48.768	5.084	6.041	6.683	7.208	7.666	8.080	8.463	8.821	9.159	9.482	9.791	10.089	10.377	10.657	10.929	11.195	11.455	11.709	11.959	12.204	12.445
75	54.168	3.913	5.129	5.788	6.305	6.748	7.145	7.508	7.846	8.165	8.467	8.756	9.034	9.303	9.563	9.816	10.062	10.302	10.537	10.768	10.994	11.216

Thermodynamic properties of R-32 - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.038	468.306	471.821	475.341	478.869	482.408	485.962	489.532	493.121	496.729	500.359	504.012	507.688	511.390	515.118	518.874	522.658	526.471	530.314	534.189	538.095	542.034
-95	0.059	471.481	475.046	478.610	482.179	485.758	489.350	492.957	496.581	500.224	503.889	507.576	511.287	515.023	518.786	522.576	526.395	530.243	534.122	538.033	541.976	545.952
-90	0.089	474.614	478.235	481.849	485.465	489.088	492.721	496.368	500.032	503.713	507.415	511.139	514.887	518.660	522.460	526.287	530.142	534.028	537.944	541.892	545.873	549.887
-85	0.130	477.697	481.381	485.052	488.720	492.392	496.071	499.762	503.468	507.191	510.933	514.697	518.485	522.297	526.135	530.001	533.896	537.821	541.776	545.764	549.784	553.838
-80	0.187	480.723	484.478	488.212	491.938	495.663	499.392	503.132	506.884	510.652	514.438	518.245	522.075	525.929	529.809	533.716	537.652	541.618	545.614	549.643	553.704	557.799
-75	0.262	483.684	487.519	491.323	495.112	498.895	502.680	506.472	510.274	514.091	517.924	521.777	525.652	529.551	533.475	537.426	541.405	545.414	549.454	553.526	557.630	561.768
-70	0.361	486.573	490.495	494.376	498.234	502.082	505.927	509.776	513.632	517.502	521.386	525.289	529.212	533.158	537.129	541.126	545.152	549.206	553.291	557.408	561.557	565.740
-65	0.488	489.384	493.401	497.366	501.300	505.217	509.127	513.038	516.953	520.879	524.818	528.773	532.748	536.745	540.766	544.812	548.886	552.988	557.121	561.284	565.481	569.710
-60	0.650	492.109	496.230	500.286	504.302	508.294	512.275	516.251	520.230	524.216	528.213	532.225	536.255	540.306	544.379	548.477	552.602	556.755	560.937	565.151	569.396	573.674
-55	0.852	494.741	498.975	503.128	507.232	511.306	515.362	519.410	523.456	527.507	531.566	535.639	539.727	543.835	547.964	552.117	556.296	560.502	564.736	569.001	573.298	577.626
-51.66	1.013	496.447	500.760	504.983	509.150	513.281	517.390	521.488	525.582	529.679	533.782	537.897	542.027	546.175	550.343	554.534	558.750	562.993	567.264	571.565	575.897	580.261
-50	1.101	497.275	501.628	505.887	510.086	514.246	518.383	522.507	526.626	530.745	534.871	539.008	543.159	547.327	551.515	555.726	559.961	564.222	568.512	572.831	577.181	581.562
-45	1.406	499.703	504.184	508.555	512.855	517.108	521.331	525.536	529.732	533.925	538.122	542.327	546.543	550.775	555.026	559.297	563.592	567.912	572.259	576.634	581.040	585.476
-40	1.774	502.017	506.634	511.124	515.532	519.884	524.200	528.491	532.769	537.041	541.312	545.589	549.875	554.174	558.491	562.826	567.183	571.565	575.972	580.406	584.870	589.364
-35	2.214	504.211	508.971	513.588	518.111	522.569	526.982	531.365	535.730	540.084	544.435	548.788	553.148	557.518	561.904	566.307	570.730	575.175	579.645	584.141	588.666	593.219
-30	2.734	506.274	511.187	515.939	520.583	525.153	529.670	534.151	538.608	543.050	547.485	551.918	556.356	560.801	565.259	569.733	574.225	578.738	583.273	587.834	592.421	597.037
-25	3.346	508.199	513.272	518.168	522.941	527.630	532.258	536.842	541.397	545.932	550.455	554.973	559.492	564.017	568.552	573.099	577.663	582.247	586.851	591.479	596.132	600.812
-20	4.058	509.972	515.218	520.265	525.177	529.992	534.737	539.431	544.089	548.722	553.339	557.947	562.552	567.160	571.775	576.400	581.040	585.697	590.373	595.071	599.793	604.540
-15	4.881	511.584	517.012	522.222	527.280	532.230	537.099	541.910	546.678	551.415	556.131	560.833	565.529	570.224	574.923	579.630	584.349	589.083	593.834	598.605	603.399	608.216
-10	5.826	513.020	518.644	524.028	529.243	534.336	539.338	544.272	549.156	554.003	558.823	563.625	568.416	573.203	577.991	582.783	587.585	592.399	597.229	602.076	606.944	611.834
-5	6.906	514.264	520.101	525.671	531.054	536.299	541.443	546.509	551.516	556.479	561.409	566.316	571.208	576.092	580.972	585.854	590.743	595.641	600.553	605.479	610.425	615.390
0	8.131	515.299	521.367	527.139	532.702	538.112	543.406	548.611	553.749	558.836	563.883	568.901	573.899	578.883	583.861	588.838	593.817	598.803	603.800	608.810	613.835	618.879
5	9.514	516.106	522.426	528.417	534.175	539.761	545.217	550.572	555.849	561.066	566.236	571.372	576.481	581.573	586.653	591.728	596.802	601.880	606.966	612.062	617.172	622.297
10	11.069	516.660	523.259	529.491	535.461	541.237	546.866	552.381	557.807	563.162	568.463	573.722	578.950	584.153	589.341	594.520	599.693	604.868	610.046	615.232	620.429	625.640
15	12.808	516.934	523.846	530.343	536.544	542.527	548.343	554.029	559.613	565.117	570.556	575.946	581.298	586.620	591.921	597.208	602.486	607.760	613.035	618.315	623.604	628.902
20	14.746	516.897	524.162	530.953	537.409	543.617	549.635	555.506	561.260	566.921	572.508	578.037	583.519	588.966	594.386	599.786	605.174	610.553	615.930	621.308	626.690	632.081
25	16.896	516.510	524.179	531.302	538.039	544.493	550.731	556.801	562.737	568.566	574.311	579.986	585.608	591.186	596.731	602.251	607.752	613.242	618.724	624.204	629.685	635.172
30	19.275	515.725	523.864	531.362	538.414	545.140	551.618	557.903	564.035	570.045	575.956	581.788	587.557	593.274	598.950	604.596	610.217	615.821	621.414	627.001	632.585	638.170
35	21.898	514.482	523.179	531.108	538.513	545.540	552.280	558.799	565.143	571.347	577.437	583.435	589.359	595.223	601.038	606.815	612.563	618.287	623.996	629.693	635.384	641.073
40	24.783	512.706	522.074	530.505	538.312	545.674	552.704	559.478	566.051	572.463	578.744	584.919	591.008	597.027	602.989	608.905	614.784	620.635	626.464	632.277	638.080	643.876
45	27.948	510.294	520.494	529.515	537.782	545.521	552.872	559.925	566.747	573.383	579.869	586.233	592.497	598.680	604.796	610.858	616.876	622.859	628.814	634.748	640.667	646.575
50	31.412	507.104	518.365	528.095	536.893	545.058	552.765	560.126	567.218	574.096	580.802	587.367	593.818	600.175	606.454	612.669	618.833	624.954	631.041	637.101	643.141	649.166
55	35.199	502.930	515.595	526.191	535.611	544.260	552.365	560.064	567.451	574.590	581.532	588.314	594.963	601.504	607.955	614.332	620.648	626.914	633.139	639.331	645.497	651.643
60	39.332	497.441	512.067	523.741	533.894	543.098	551.649	559.721	567.430	574.853	582.049	589.061	595.921	602.657	609.290	615.838	622.314	628.732	635.102	641.431	647.729	654.001
65	43.843	490.054	507.624	520.670	531.697	541.539	550.591	559.076	567.137	574.868	582.337	589.595	596.681	603.624	610.449	617.177	623.822	630.399	636.920	643.393	649.828	656.231
70	48.768	479.518	502.063	516.887	528.963	539.539	549.155	558.099	566.545	574.610	582.374	589.897	597.222	604.386	611.415	618.332	625.155	631.900	638.579	645.202	651.781	658.321
75	54.168	461.723	495.093	512.260	525.598	537.025	547.279	556.732	565.603	574.032	582.115	589.922	597.505	604.904	612.150	619.269	626.280	633.202	640.048	646.830	653.559	660.243

Thermodynamic properties of R-32 - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.038	2.751	2.772	2.791	2.810	2.829	2.847	2.865	2.882	2.899	2.916	2.932	2.949	2.965	2.981	2.996	3.012	3.027	3.042	3.057	3.071	3.086
-95	0.059	2.700	2.720	2.739	2.758	2.776	2.794	2.812	2.829	2.846	2.862	2.879	2.895	2.911	2.926	2.942	2.957	2.972	2.987	3.002	3.016	3.031
-90	0.089	2.653	2.672	2.691	2.710	2.728	2.746	2.763	2.780	2.797	2.813	2.829	2.845	2.861	2.876	2.891	2.907	2.921	2.936	2.951	2.965	2.979
-85	0.130	2.609	2.628	2.647	2.665	2.683	2.701	2.718	2.734	2.751	2.767	2.783	2.799	2.814	2.830	2.845	2.860	2.875	2.889	2.904	2.918	2.932
-80	0.187	2.568	2.587	2.606	2.624	2.641	2.659	2.676	2.692	2.709	2.725	2.741	2.756	2.772	2.787	2.802	2.817	2.831	2.846	2.860	2.874	2.888
-75	0.262	2.530	2.549	2.567	2.585	2.603	2.620	2.637	2.653	2.669	2.685	2.701	2.716	2.732	2.747	2.762	2.776	2.791	2.805	2.820	2.834	2.848
-70	0.361	2.494	2.513	2.531	2.549	2.567	2.584	2.600	2.617	2.633	2.649	2.664	2.680	2.695	2.710	2.724	2.739	2.754	2.768	2.782	2.796	2.810
-65	0.488	2.460	2.479	2.498	2.516	2.533	2.550	2.567	2.583	2.599	2.615	2.630	2.645	2.660	2.675	2.690	2.704	2.719	2.733	2.747	2.761	2.775
-60	0.650	2.429	2.448	2.466	2.484	2.502	2.518	2.535	2.551	2.567	2.583	2.598	2.613	2.628	2.643	2.658	2.672	2.686	2.700	2.714	2.728	2.742
-55	0.852	2.399	2.419	2.437	2.455	2.472	2.489	2.505	2.521	2.537	2.553	2.568	2.583	2.598	2.613	2.628	2.642	2.656	2.670	2.684	2.698	2.712
-51.66	1.013	2.380	2.400	2.418	2.436	2.453	2.470	2.487	2.503	2.519	2.534	2.549	2.564	2.579	2.594	2.608	2.623	2.637	2.651	2.665	2.679	2.692
-50	1.101	2.371	2.391	2.409	2.427	2.444	2.461	2.478	2.494	2.509	2.525	2.540	2.555	2.570	2.585	2.599	2.614	2.628	2.642	2.656	2.670	2.683
-45	1.406	2.345	2.364	2.383	2.401	2.418	2.435	2.451	2.468	2.483	2.499	2.514	2.529	2.544	2.559	2.573	2.587	2.601	2.615	2.629	2.643	2.657
-40	1.774	2.320	2.340	2.358	2.376	2.394	2.410	2.427	2.443	2.459	2.474	2.490	2.505	2.519	2.534	2.548	2.563	2.577	2.591	2.604	2.618	2.632
-35	2.214	2.296	2.316	2.335	2.353	2.370	2.387	2.404	2.420	2.436	2.451	2.466	2.481	2.496	2.511	2.525	2.539	2.553	2.567	2.581	2.595	2.608
-30	2.734	2.273	2.293	2.312	2.331	2.348	2.365	2.382	2.398	2.414	2.429	2.444	2.459	2.474	2.489	2.503	2.518	2.532	2.546	2.559	2.573	2.587
-25	3.346	2.252	2.272	2.291	2.310	2.327	2.344	2.361	2.377	2.393	2.409	2.424	2.439	2.454	2.468	2.483	2.497	2.511	2.525	2.539	2.552	2.566
-20	4.058	2.231	2.251	2.271	2.289	2.307	2.324	2.341	2.357	2.373	2.389	2.404	2.419	2.434	2.449	2.463	2.477	2.492	2.505	2.519	2.533	2.546
-15	4.881	2.211	2.232	2.251	2.270	2.288	2.305	2.322	2.339	2.355	2.370	2.386	2.401	2.416	2.430	2.445	2.459	2.473	2.487	2.501	2.515	2.528
-10	5.826	2.192	2.213	2.233	2.252	2.270	2.287	2.304	2.321	2.337	2.353	2.368	2.383	2.398	2.413	2.427	2.442	2.456	2.470	2.484	2.497	2.511
-5	6.906	2.173	2.194	2.214	2.234	2.252	2.270	2.287	2.304	2.320	2.336	2.351	2.366	2.381	2.396	2.411	2.425	2.439	2.453	2.467	2.481	2.494
0	8.131	2.154	2.176	2.197	2.216	2.235	2.253	2.270	2.287	2.303	2.319	2.335	2.350	2.365	2.380	2.395	2.409	2.424	2.438	2.451	2.465	2.479
5	9.514	2.136	2.159	2.180	2.200	2.218	2.237	2.254	2.271	2.288	2.304	2.320	2.335	2.350	2.365	2.380	2.394	2.409	2.423	2.437	2.450	2.464
10	11.069	2.118	2.142	2.163	2.183	2.202	2.221	2.239	2.256	2.272	2.289	2.305	2.320	2.336	2.351	2.365	2.380	2.394	2.408	2.422	2.436	2.450
15	12.808	2.101	2.125	2.147	2.167	2.187	2.205	2.223	2.241	2.258	2.274	2.290	2.306	2.321	2.337	2.351	2.366	2.380	2.395	2.409	2.423	2.436
20	14.746	2.083	2.108	2.130	2.151	2.171	2.190	2.209	2.226	2.244	2.260	2.276	2.292	2.308	2.323	2.338	2.353	2.367	2.382	2.396	2.410	2.423
25	16.896	2.065	2.091	2.114	2.136	2.156	2.176	2.194	2.212	2.230	2.246	2.263	2.279	2.295	2.310	2.325	2.340	2.355	2.369	2.383	2.397	2.411
30	19.275	2.047	2.074	2.098	2.120	2.141	2.161	2.180	2.198	2.216	2.233	2.250	2.266	2.282	2.297	2.313	2.328	2.342	2.357	2.371	2.385	2.399
35	21.898	2.028	2.056	2.082	2.105	2.126	2.147	2.166	2.185	2.203	2.220	2.237	2.253	2.269	2.285	2.300	2.315	2.330	2.345	2.359	2.374	2.388
40	24.783	2.009	2.039	2.065	2.089	2.111	2.132	2.152	2.171	2.189	2.207	2.224	2.241	2.257	2.273	2.289	2.304	2.319	2.334	2.348	2.362	2.376
45	27.948	1.989	2.021	2.048	2.073	2.096	2.118	2.138	2.158	2.176	2.194	2.212	2.229	2.245	2.261	2.277	2.292	2.308	2.322	2.337	2.351	2.366
50	31.412	1.967	2.002	2.031	2.057	2.081	2.103	2.124	2.144	2.164	2.182	2.200	2.217	2.233	2.250	2.266	2.281	2.296	2.311	2.326	2.341	2.355
55	35.199	1.943	1.982	2.013	2.041	2.066	2.089	2.111	2.131	2.151	2.169	2.187	2.205	2.222	2.238	2.254	2.270	2.286	2.301	2.316	2.330	2.345
60	39.332	1.917	1.960	1.994	2.024	2.050	2.074	2.097	2.118	2.138	2.157	2.175	2.193	2.210	2.227	2.243	2.259	2.275	2.290	2.305	2.320	2.335
65	43.843	1.885	1.937	1.975	2.006	2.034	2.059	2.082	2.104	2.125	2.144	2.163	2.181	2.199	2.216	2.232	2.249	2.264	2.280	2.295	2.310	2.325
70	48.768	1.846	1.912	1.954	1.988	2.017	2.044	2.068	2.090	2.111	2.132	2.151	2.169	2.187	2.205	2.221	2.238	2.254	2.270	2.285	2.300	2.315
75	54.168	1.788	1.883	1.932	1.969	2.000	2.027	2.053	2.076	2.098	2.118	2.138	2.157	2.175	2.193	2.210	2.227	2.243	2.259	2.275	2.290	2.305

R-134a

1,1,1,2 - TETRAFLUOROETHANE CH_2F-CF_3

Molecular weight (g/mol)	102.03
Melting point (°C)	-103.3
Boiling point (at 1.013 bar)	-26.08
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	101.1
Critical pressure (bar absolute)	40.59
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.425
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.851
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.120
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.195
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	8.03
Classification NF-EN 378	A1
GWP (IPCC 4)	1430

Main applications

R-134a is a hydrofluorocarbon (HFC) which can be used for domestic, commercial, and industrial refrigerated applications, as well as for air conditioning, fluid cooling, and heat pump applications. R-134a was the fluid of choice of automotive and agricultural air-conditioning system manufacturers. New cars now use R-1234yf.
This fluid could also replace R-12 in existing systems by following the correct conversion procedure.

Commercial specifications

Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.
Acidity (HCl): ≤ 1 ppm weight.
Chloride ion test: negative.

Oils

Use a polyol ester (POE) oil.
For car air conditioning we recommend to take the advise of the constructor as PAG oils are normally used.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-134a are governed by EU Regulation n° 517/2014.
The recovery of R-134a is mandatory under EU Regulation n° 517/2014.

(Refer to the regulations in each country).

Thermodynamic properties of R-134a - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.006	-100	0.632	1.582	75.362	0.435	-100.0	25.193	0.040	336.852	1.946	261.490
0.009	-95	0.637	1.569	81.288	0.469	-95.0	15.435	0.065	339.784	1.920	258.497
0.015	-90	0.643	1.556	87.226	0.502	-90.0	9.770	0.102	342.759	1.897	255.534
0.024	-85	0.648	1.542	93.182	0.534	-85.0	6.371	0.157	345.774	1.877	252.592
0.037	-80	0.654	1.529	99.161	0.565	-80.0	4.268	0.234	348.826	1.858	249.665
0.055	-75	0.660	1.515	105.165	0.596	-75.0	2.931	0.341	351.909	1.841	246.744
0.080	-70	0.666	1.502	111.199	0.626	-70.0	2.059	0.486	355.021	1.826	243.822
0.114	-65	0.672	1.488	117.265	0.656	-65.0	1.476	0.677	358.157	1.813	240.892
0.159	-60	0.678	1.474	123.364	0.685	-60.0	1.079	0.927	361.310	1.801	237.946
0.218	-55	0.685	1.460	129.500	0.713	-55.0	0.802	1.246	364.477	1.790	234.978
0.295	-50	0.691	1.446	135.674	0.741	-50.0	0.606	1.650	367.652	1.781	231.978
0.391	-45	0.698	1.432	141.888	0.769	-45.0	0.465	2.152	370.829	1.772	228.941
0.512	-40	0.705	1.418	148.144	0.796	-40.0	0.361	2.769	374.003	1.764	225.859
0.661	-35	0.713	1.403	154.445	0.822	-35.0	0.284	3.521	377.168	1.758	222.723
0.844	-30	0.720	1.388	160.792	0.849	-30.0	0.226	4.426	380.319	1.751	219.527
1.013	-26.08	0.726	1.377	165.803	0.869	-26.08	0.190	5.257	382.775	1.747	216.972
1.064	-25	0.728	1.373	167.188	0.875	-25.0	0.182	5.506	383.449	1.746	216.261
1.327	-20	0.736	1.358	173.636	0.900	-20.0	0.147	6.784	386.554	1.741	212.919
1.639	-15	0.745	1.343	180.138	0.926	-15.0	0.121	8.287	389.628	1.737	209.491
2.006	-10	0.754	1.327	186.697	0.951	-10.0	0.100	10.041	392.665	1.733	205.968
2.433	-5	0.763	1.311	193.316	0.975	-5.0	0.083	12.077	395.659	1.730	202.343
2.928	0	0.772	1.295	200.000	1.000	0.0	0.069	14.428	398.603	1.727	198.603
3.497	5	0.782	1.278	206.752	1.024	5.0	0.058	17.131	401.492	1.724	194.740
4.146	10	0.793	1.261	213.577	1.048	10.0	0.049	20.226	404.318	1.722	190.741
4.884	15	0.804	1.243	220.480	1.072	15.0	0.042	23.758	407.073	1.720	186.593
5.717	20	0.816	1.225	227.468	1.096	20.0	0.036	27.780	409.748	1.718	182.281
6.654	25	0.829	1.207	234.546	1.120	25.0	0.031	32.350	412.334	1.716	177.788
7.702	30	0.842	1.187	241.722	1.144	30.0	0.027	37.535	414.819	1.714	173.096
8.870	35	0.857	1.168	249.007	1.167	35.0	0.023	43.416	417.189	1.713	168.182
10.166	40	0.872	1.147	256.409	1.190	40.0	0.020	50.085	419.429	1.711	163.019
11.599	45	0.889	1.125	263.943	1.214	45.0	0.017	57.657	421.519	1.709	157.576
13.179	50	0.907	1.102	271.623	1.237	50.0	0.015	66.272	423.437	1.707	151.814
14.915	55	0.927	1.078	279.469	1.261	55.0	0.013	76.104	425.153	1.705	145.684
16.818	60	0.950	1.053	287.505	1.285	60.0	0.011	87.379	426.630	1.702	139.125
18.898	65	0.975	1.026	295.762	1.309	65.0	0.010	100.398	427.818	1.699	132.056
21.168	70	1.004	0.996	304.282	1.333	70.0	0.009	115.572	428.650	1.696	124.367
23.641	75	1.037	0.964	313.128	1.358	75.0	0.007	133.494	429.030	1.691	115.902
26.332	80	1.077	0.928	322.390	1.384	80.0	0.006	155.078	428.814	1.685	106.423
29.258	85	1.127	0.887	332.224	1.410	85.0	0.005	181.853	427.760	1.677	95.536
32.442	90	1.194	0.838	342.928	1.439	90.0	0.005	216.761	425.416	1.666	82.487
35.912	95	1.294	0.773	355.246	1.472	95.0	0.004	267.139	420.670	1.649	65.423
39.724	100	1.536	0.651	373.298	1.519	100.0	0.003	373.011	407.683	1.611	34.385

Thermodynamic properties of R-134a - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.006	25193.019	25925.423	26656.959	27387.861	28118.292	28848.368	29578.171	30307.762	31037.184	31766.471	32495.647	33224.733	33953.741	34682.685	35411.574	36140.414	36869.214	37597.976	38326.706	39055.408	39784.084
-95	0.009	15434.503	15871.610	16308.078	16744.073	17179.711	17615.076	18050.228	18485.212	18920.059	19354.797	19789.442	20224.011	20658.516	21092.965	21527.366	21961.725	22396.048	22830.339	23264.601	23698.837	24133.051
-90	0.015	9769.819	10039.721	10309.145	10578.210	10847.000	11115.576	11383.983	11652.253	11920.413	12188.482	12456.473	12724.400	12992.271	13260.094	13527.876	13795.621	14063.334	14331.018	14598.676	14866.312	15133.927
-85	0.024	6370.662	6542.598	6714.169	6885.462	7056.539	7227.446	7398.216	7568.875	7739.442	7909.932	8080.357	8250.726	8421.048	8591.327	8761.570	8931.781	9101.963	9272.119	9442.252	9612.365	9782.458
-80	0.037	4268.197	4380.909	4493.336	4605.545	4717.580	4829.478	4941.264	5052.957	5164.573	5276.124	5387.618	5499.065	5610.470	5721.838	5833.174	5944.481	6055.762	6167.020	6278.258	6389.476	6500.678
-75	0.055	2931.165	3007.030	3082.669	3158.131	3233.453	3308.661	3383.777	3458.814	3533.785	3608.701	3683.568	3758.393	3833.181	3907.937	3982.664	4057.365	4132.043	4206.700	4281.339	4355.960	4430.566
-70	0.080	2058.959	2111.284	2163.426	2215.424	2267.305	2319.091	2370.799	2422.440	2474.024	2525.560	2577.053	2628.510	2679.933	2731.328	2782.697	2834.043	2885.368	2936.674	2987.963	3039.237	3090.496
-65	0.114	1476.493	1513.409	1550.173	1586.816	1623.362	1659.827	1696.224	1732.565	1768.856	1805.104	1841.315	1877.493	1913.642	1949.765	1985.864	2021.943	2058.003	2094.046	2130.073	2166.086	2202.086
-60	0.159	1079.033	1105.631	1132.101	1158.469	1184.753	1210.967	1237.123	1263.230	1289.292	1315.317	1341.309	1367.272	1393.208	1419.121	1445.013	1470.886	1496.741	1522.581	1548.407	1574.220	1600.021
-55	0.218	802.362	821.907	841.340	860.685	879.958	899.170	918.331	937.448	956.527	975.571	994.587	1013.575	1032.540	1051.484	1070.409	1089.316	1108.208	1127.085	1145.949	1164.801	1183.642
-50	0.295	606.198	620.824	635.354	649.806	664.195	678.530	692.820	707.070	721.287	735.473	749.632	763.767	777.881	791.975	806.052	820.113	834.160	848.194	862.215	876.225	890.226
-45	0.391	464.726	475.861	486.911	497.892	508.816	519.693	530.530	541.330	552.100	562.843	573.561	584.258	594.935	605.594	616.238	626.866	637.482	648.085	658.677	669.259	679.831
-40	0.512	361.076	369.691	378.230	386.706	395.132	403.515	411.861	420.176	428.462	436.723	444.963	453.182	461.383	469.568	477.739	485.896	494.040	502.173	510.296	518.410	526.515
-35	0.661	284.018	290.784	297.482	304.123	310.718	317.275	323.798	330.291	336.760	343.205	349.630	356.037	362.427	368.802	375.164	381.513	387.851	394.178	400.495	406.804	413.105
-30	0.844	225.945	231.336	236.663	241.940	247.174	252.373	257.541	262.683	267.800	272.897	277.975	283.036	288.082	293.114	298.134	303.141	308.139	313.126	318.105	323.075	328.037
-26.08	1.013	190.229	194.783	199.277	203.723	208.130	212.504	216.848	221.168	225.466	229.744	234.004	238.248	242.478	246.694	250.899	255.093	259.276	263.451	267.617	271.775	275.926
-25	1.064	181.623	185.976	190.270	194.518	198.727	202.903	207.050	211.173	215.275	219.356	223.421	227.469	231.504	235.526	239.535	243.534	247.523	251.503	255.475	259.439	263.396
-20	1.327	147.395	150.955	154.460	157.922	161.348	164.744	168.113	171.459	174.785	178.093	181.385	184.662	187.926	191.178	194.419	197.649	200.871	204.084	207.289	210.487	213.678
-15	1.639	120.671	123.617	126.513	129.367	132.189	134.981	137.750	140.496	143.224	145.935	148.631	151.313	153.983	156.641	159.289	161.928	164.558	167.180	169.794	172.402	175.004
-10	2.006	99.590	102.057	104.475	106.856	109.204	111.526	113.825	116.104	118.365	120.611	122.842	125.060	127.266	129.462	131.648	133.826	135.995	138.156	140.311	142.459	144.601
-5	2.433	82.801	84.888	86.930	88.936	90.911	92.862	94.791	96.701	98.594	100.472	102.337	104.190	106.031	107.863	109.685	111.499	113.305	115.104	116.897	118.683	120.464
0	2.928	69.309	71.093	72.835	74.542	76.220	77.875	79.509	81.125	82.725	84.311	85.884	87.446	88.997	90.539	92.072	93.597	95.115	96.626	98.131	99.630	101.123
5	3.497	58.374	59.915	61.415	62.881	64.321	65.737	67.135	68.514	69.879	71.230	72.569	73.897	75.216	76.525	77.826	79.119	80.405	81.685	82.959	84.228	85.491
10	4.146	49.442	50.785	52.089	53.360	54.606	55.830	57.034	58.223	59.397	60.558	61.707	62.846	63.975	65.096	66.209	67.315	68.414	69.507	70.594	71.676	72.753
15	4.884	42.090	43.272	44.415	45.528	46.615	47.681	48.728	49.760	50.778	51.784	52.778	53.763	54.738	55.705	56.664	57.617	58.563	59.503	60.438	61.368	62.294
20	5.717	35.997	37.046	38.057	39.038	39.995	40.931	41.849	42.752	43.642	44.520	45.387	46.244	47.092	47.933	48.766	49.593	50.413	51.228	52.038	52.843	53.643
25	6.654	30.912	31.852	32.754	33.626	34.475	35.303	36.114	36.911	37.694	38.465	39.227	39.978	40.722	41.458	42.186	42.909	43.625	44.336	45.042	45.744	46.441
30	7.702	26.642	27.491	28.302	29.084	29.843	30.582	31.303	32.010	32.705	33.388	34.061	34.724	35.380	36.028	36.670	37.305	37.935	38.559	39.179	39.794	40.405
35	8.870	23.033	23.807	24.543	25.250	25.933	26.596	27.243	27.875	28.495	29.104	29.702	30.292	30.875	31.449	32.018	32.580	33.137	33.688	34.235	34.778	35.317
40	10.166	19.966	20.678	21.351	21.994	22.614	23.214	23.797	24.366	24.923	25.469	26.005	26.533	27.053	27.565	28.072	28.572	29.068	29.558	30.044	30.525	31.003
45	11.599	17.344	18.005	18.625	19.216	19.782	20.328	20.858	21.373	21.877	22.369	22.852	23.327	23.794	24.254	24.707	25.155	25.598	26.037	26.470	26.900	27.326
50	13.179	15.089	15.709	16.286	16.832	17.353	17.853	18.337	18.807	19.265	19.712	20.150	20.579	21.000	21.415	21.824	22.227	22.626	23.019	23.409	23.794	24.176
55	14.915	13.140	13.726	14.268	14.776	15.259	15.721	16.166	16.597	17.016	17.424	17.822	18.212	18.595	18.971	19.342	19.706	20.066	20.421	20.772	21.120	21.463
60	16.818	11.444	12.006	12.519	12.996	13.447	13.876	14.287	14.685	15.070	15.444	15.809	16.165	16.515	16.857	17.194	17.526	17.852	18.174	18.493	18.807	19.118
65	18.898	9.960	10.506	10.996	11.447	11.871	12.272	12.655	13.023	13.379	13.724	14.059	14.387	14.707	15.021	15.329	15.631	15.929	16.222	16.512	16.798	17.080
70	21.168	8.653	9.190	9.663	10.094	10.495	10.872	11.230	11.573	11.904	12.223	12.534	12.836	13.130	13.419	13.701	13.979	14.251	14.520	14.784	15.045	15.302
75	23.641	7.491	8.030	8.492	8.907	9.288	9.645	9.982	10.304	10.612	10.909	11.197	11.477	11.750	12.016	12.276	12.531	12.782	13.028	13.270	13.509	13.745
80	26.332	6.448	7.001	7.459	7.861	8.227	8.566	8.885	9.187	9.477	9.754	10.023	10.283	10.535	10.782	11.023	11.258	11.489	11.716	11.939	12.159	12.375
85	29.258	5.499	6.084	6.543	6.937	7.290	7.614	7.917	8.203	8.475	8.735	8.986	9.228	9.464	9.693	9.916	10.134	10.348	10.558	10.764	10.966	11.165
90	32.442	4.613	5.261	5.728	6.117	6.460	6.771	7.060	7.330	7.587	7.832	8.067	8.294	8.514	8.727	8.935	9.138	9.336	9.530	9.720	9.908	10.092
95	35.912	3.743	4.518	5.001	5.387	5.721	6.021	6.297	6.554	6.797	7.028	7.249	7.462	7.667	7.866	8.060	8.249	8.433	8.613	8.790	8.963	9.134
100	39.724	2.681	3.841	4.345	4.731	5.057	5.347	5.611	5.856	6.086	6.304	6.512	6.712	6.905	7.091	7.272	7.448	7.619	7.787	7.951	8.112	8.270

Thermodynamic properties of R-134a - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.006	336.852	339.842	342.882	345.971	349.110	352.301	355.541	358.832	362.174	365.565	369.006	372.496	376.035	379.623	383.259	386.943	390.675	394.453	398.279	402.151	406.070
-95	0.009	339.784	342.834	345.930	349.076	352.271	355.515	358.809	362.153	365.546	368.989	372.480	376.021	379.610	383.247	386.931	390.664	394.443	398.269	402.142	406.061	410.026
-90	0.015	342.759	345.868	349.023	352.225	355.475	358.773	362.121	365.517	368.962	372.456	375.998	379.589	383.227	386.913	390.647	394.427	398.254	402.128	406.048	410.013	414.024
-85	0.024	345.774	348.943	352.155	355.414	358.719	362.072	365.473	368.922	372.420	375.965	379.558	383.198	386.886	390.621	394.403	398.232	402.107	406.028	409.994	414.006	418.064
-80	0.037	348.826	352.054	355.325	358.641	362.002	365.410	368.865	372.367	375.916	379.512	383.156	386.847	390.584	394.369	398.199	402.076	405.998	409.967	413.980	418.039	422.142
-75	0.055	351.909	355.199	358.529	361.902	365.319	368.782	372.291	375.846	379.448	383.096	386.791	390.532	394.319	398.153	402.032	405.957	409.927	413.943	418.003	422.108	426.258
-70	0.080	355.021	358.372	361.762	365.193	368.668	372.186	375.750	379.358	383.013	386.713	390.459	394.251	398.089	401.971	405.900	409.873	413.891	417.954	422.062	426.213	430.409
-65	0.114	358.157	361.570	365.021	368.511	372.043	375.618	379.236	382.900	386.607	390.360	394.158	398.001	401.889	405.822	409.799	413.821	417.888	421.998	426.153	430.351	434.594
-60	0.159	361.310	364.788	368.300	371.851	375.441	379.073	382.748	386.466	390.228	394.034	397.884	401.779	405.718	409.701	413.728	417.799	421.914	426.072	430.275	434.520	438.809
-55	0.218	364.477	368.021	371.596	375.208	378.858	382.549	386.280	390.054	393.871	397.731	401.634	405.581	409.571	413.605	417.682	421.803	425.967	430.174	434.424	438.717	443.052
-50	0.295	367.652	371.263	374.904	378.578	382.290	386.039	389.829	393.660	397.533	401.447	405.404	409.404	413.447	417.532	421.660	425.830	430.044	434.300	438.598	442.939	447.322
-45	0.391	370.829	374.510	378.218	381.957	385.731	389.541	393.391	397.280	401.209	405.180	409.191	413.245	417.340	421.478	425.657	429.878	434.142	438.447	442.794	447.183	451.614
-40	0.512	374.003	377.757	381.534	385.339	389.177	393.050	396.960	400.909	404.896	408.924	412.991	417.100	421.249	425.439	429.671	433.944	438.258	442.613	447.010	451.447	455.926
-35	0.661	377.168	380.997	384.846	388.720	392.624	396.562	400.534	404.543	408.590	412.676	416.800	420.965	425.169	429.413	433.698	438.023	442.388	446.794	451.241	455.728	460.256
-30	0.844	380.319	384.227	388.150	392.095	396.068	400.071	404.108	408.180	412.287	416.432	420.615	424.836	429.097	433.396	437.735	442.113	446.531	450.988	455.486	460.023	464.600
-26.08	1.013	382.775	386.748	390.731	394.734	398.762	402.819	406.907	411.029	415.186	419.379	423.608	427.875	432.180	436.523	440.905	445.325	449.785	454.284	458.821	463.399	468.015
-25	1.064	383.449	387.440	391.440	395.459	399.503	403.575	407.677	411.813	415.983	420.189	424.432	428.712	433.029	437.384	441.778	446.210	450.681	455.191	459.741	464.329	468.956
-20	1.327	386.554	390.631	394.712	398.808	402.925	407.067	411.238	415.440	419.675	423.943	428.247	432.586	436.962	441.375	445.825	450.312	454.837	459.401	464.003	468.643	473.321
-15	1.639	389.628	393.795	397.961	402.136	406.329	410.545	414.786	419.056	423.357	427.690	432.056	436.457	440.893	445.364	449.871	454.415	458.996	463.614	468.269	472.962	477.692
-10	2.006	392.665	396.927	401.181	405.440	409.712	414.003	418.317	422.658	427.027	431.426	435.857	440.320	444.817	449.349	453.915	458.516	463.154	467.827	472.537	477.283	482.066
-5	2.433	395.659	400.021	404.367	408.713	413.067	417.437	421.827	426.240	430.680	435.147	439.645	444.173	448.733	453.326	457.952	462.612	467.307	472.037	476.803	481.604	486.441
0	2.928	398.603	403.071	407.514	411.951	416.391	420.843	425.312	429.800	434.313	438.851	443.416	448.011	452.636	457.292	461.980	466.700	471.455	476.242	481.065	485.921	490.813
5	3.497	401.492	406.071	410.617	415.149	419.679	424.217	428.767	433.334	437.921	442.532	447.168	451.831	456.523	461.244	465.995	470.778	475.592	480.439	485.319	490.233	495.181
10	4.146	404.318	409.015	413.669	418.302	422.926	427.553	432.188	436.836	441.502	446.188	450.897	455.631	460.391	465.178	469.995	474.841	479.717	484.625	489.565	494.536	499.541
15	4.884	407.073	411.896	416.665	421.403	426.127	430.847	435.570	440.303	445.051	449.815	454.599	459.406	464.236	469.093	473.976	478.887	483.827	488.797	493.797	498.829	503.892
20	5.717	409.748	414.706	419.597	424.448	429.276	434.094	438.910	443.732	448.563	453.409	458.271	463.153	468.056	472.984	477.935	482.913	487.919	492.952	498.015	503.107	508.230
25	6.654	412.334	417.437	422.459	427.429	432.367	437.288	442.202	447.116	452.036	456.965	461.909	466.869	471.848	476.848	481.870	486.917	491.990	497.089	502.215	507.370	512.554
30	7.702	414.819	420.080	425.242	430.339	435.395	440.425	445.442	450.452	455.464	460.481	465.509	470.550	475.607	480.682	485.778	490.896	496.037	501.203	506.395	511.614	516.860
35	8.870	417.189	422.624	427.938	433.172	438.353	443.499	448.623	453.735	458.843	463.952	469.067	474.192	479.330	484.484	489.655	494.846	500.059	505.294	510.553	515.837	521.148
40	10.166	419.429	425.055	430.536	435.918	441.233	446.502	451.740	456.960	462.169	467.374	472.581	477.793	483.015	488.249	493.499	498.765	504.051	509.357	514.686	520.037	525.414
45	11.599	421.519	427.361	433.025	438.568	444.027	449.428	454.788	460.121	465.437	470.743	476.045	481.348	486.658	491.976	497.306	502.650	508.012	513.391	518.791	524.212	529.655
50	13.179	423.437	429.524	435.391	441.111	446.727	452.270	457.760	463.213	468.641	474.053	479.455	484.854	490.254	495.660	501.073	506.499	511.938	517.393	522.866	528.358	533.871
55	14.915	425.153	431.523	437.620	443.536	449.323	455.019	460.648	466.230	471.777	477.300	482.808	488.306	493.801	499.297	504.798	510.307	515.827	521.360	526.908	532.474	538.058
60	16.818	426.630	433.333	439.694	445.828	451.804	457.666	463.446	469.165	474.838	480.479	486.098	491.701	497.295	502.886	508.477	514.073	519.676	525.290	530.916	536.557	542.215
65	18.898	427.818	434.925	441.591	447.972	454.157	460.202	466.144	472.010	477.819	483.585	489.320	495.033	500.731	506.421	512.106	517.792	523.482	529.179	534.886	540.605	546.338
70	21.168	428.650	436.260	443.286	449.950	456.370	462.616	468.735	474.759	480.713	486.612	492.471	498.299	504.106	509.899	515.682	521.462	527.242	533.025	538.815	544.615	550.426
75	23.641	429.030	437.289	444.750	451.742	458.426	464.895	471.207	477.404	483.512	489.553	495.543	501.493	507.415	513.315	519.201	525.078	530.951	536.824	542.701	548.583	554.475
80	26.332	428.814	437.950	445.948	453.324	460.309	467.026	473.551	479.934	486.209	492.401	498.530	504.610	510.652	516.665	522.658	528.637	534.608	540.573	546.539	552.507	558.482
85	29.258	427.760	438.162	446.837	454.670	461.999	468.995	475.754	482.340	488.795	495.149	501.426	507.642	513.811	519.943	526.048	532.134	538.205	544.267	550.325	556.382	562.442
90	32.442	425.416	437.817	447.366	455.747	463.475	470.783	477.801	484.608	491.257	497.785	504.220	510.580	516.883	523.141	529.364	535.560	541.736	547.899	554.053	560.202	566.351
95	35.912	420.670	436.771	447.475	456.518	464.705	472.365	479.670	486.719	493.579	500.294	506.897	513.411	519.856	526.245	532.591	538.904	545.191	551.458	557.712	563.958	570.198
100	39.724	407.683	434.809	447.059	456.906	465.628	473.688	481.312	488.629	495.718	502.636	509.420	516.099	522.695	529.225	535.702	542.138	548.541	554.919	561.278	567.623	573.960

Thermodynamic properties of R-134a - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.006	1.946	1.963	1.979	1.996	2.013	2.029	2.045	2.061	2.077	2.093	2.108	2.124	2.139	2.154	2.169	2.184	2.199	2.214	2.229	2.243	2.258
-95	0.009	1.920	1.937	1.954	1.970	1.987	2.003	2.019	2.035	2.050	2.066	2.081	2.097	2.112	2.127	2.142	2.157	2.172	2.186	2.201	2.216	2.230
-90	0.015	1.897	1.914	1.931	1.947	1.963	1.979	1.995	2.011	2.026	2.042	2.057	2.072	2.088	2.103	2.117	2.132	2.147	2.162	2.176	2.190	2.205
-85	0.024	1.877	1.893	1.910	1.926	1.942	1.958	1.974	1.989	2.005	2.020	2.035	2.051	2.066	2.080	2.095	2.110	2.124	2.139	2.153	2.168	2.182
-80	0.037	1.858	1.875	1.891	1.907	1.923	1.939	1.954	1.970	1.985	2.001	2.016	2.031	2.046	2.060	2.075	2.090	2.104	2.119	2.133	2.147	2.161
-75	0.055	1.841	1.858	1.874	1.890	1.906	1.922	1.937	1.952	1.968	1.983	1.998	2.013	2.028	2.042	2.057	2.072	2.086	2.100	2.114	2.129	2.143
-70	0.080	1.826	1.843	1.859	1.875	1.890	1.906	1.921	1.937	1.952	1.967	1.982	1.997	2.012	2.026	2.041	2.055	2.069	2.084	2.098	2.112	2.126
-65	0.114	1.813	1.829	1.845	1.861	1.877	1.892	1.908	1.923	1.938	1.953	1.968	1.982	1.997	2.012	2.026	2.040	2.055	2.069	2.083	2.097	2.111
-60	0.159	1.801	1.817	1.833	1.849	1.864	1.880	1.895	1.910	1.925	1.940	1.955	1.969	1.984	1.998	2.013	2.027	2.041	2.055	2.069	2.083	2.097
-55	0.218	1.790	1.806	1.822	1.838	1.853	1.869	1.884	1.899	1.914	1.929	1.943	1.958	1.972	1.987	2.001	2.015	2.029	2.043	2.057	2.071	2.085
-50	0.295	1.781	1.797	1.812	1.828	1.843	1.859	1.874	1.889	1.904	1.918	1.933	1.947	1.962	1.976	1.990	2.004	2.019	2.032	2.046	2.060	2.074
-45	0.391	1.772	1.788	1.804	1.819	1.835	1.850	1.865	1.880	1.895	1.909	1.924	1.938	1.953	1.967	1.981	1.995	2.009	2.023	2.037	2.050	2.064
-40	0.512	1.764	1.780	1.796	1.811	1.827	1.842	1.857	1.872	1.887	1.901	1.916	1.930	1.944	1.958	1.973	1.987	2.000	2.014	2.028	2.042	2.055
-35	0.661	1.758	1.773	1.789	1.805	1.820	1.835	1.850	1.865	1.879	1.894	1.908	1.923	1.937	1.951	1.965	1.979	1.993	2.007	2.020	2.034	2.047
-30	0.844	1.751	1.767	1.783	1.798	1.814	1.829	1.844	1.858	1.873	1.888	1.902	1.916	1.930	1.945	1.958	1.972	1.986	2.000	2.013	2.027	2.040
-26.08	1.013	1.747	1.763	1.779	1.794	1.809	1.824	1.839	1.854	1.869	1.883	1.898	1.912	1.926	1.940	1.954	1.968	1.981	1.995	2.009	2.022	2.036
-25	1.064	1.746	1.762	1.778	1.793	1.808	1.823	1.838	1.853	1.868	1.882	1.896	1.911	1.925	1.939	1.953	1.967	1.980	1.994	2.007	2.021	2.034
-20	1.327	1.741	1.757	1.773	1.788	1.804	1.819	1.833	1.848	1.863	1.877	1.891	1.906	1.920	1.934	1.948	1.961	1.975	1.989	2.002	2.016	2.029
-15	1.639	1.737	1.753	1.769	1.784	1.799	1.814	1.829	1.844	1.859	1.873	1.887	1.901	1.915	1.929	1.943	1.957	1.971	1.984	1.998	2.011	2.024
-10	2.006	1.733	1.749	1.765	1.781	1.796	1.811	1.826	1.840	1.855	1.869	1.884	1.898	1.912	1.926	1.939	1.953	1.967	1.980	1.994	2.007	2.020
-5	2.433	1.730	1.746	1.762	1.777	1.793	1.808	1.823	1.837	1.852	1.866	1.880	1.894	1.908	1.922	1.936	1.950	1.963	1.977	1.990	2.004	2.017
0	2.928	1.727	1.743	1.759	1.775	1.790	1.805	1.820	1.835	1.849	1.863	1.878	1.892	1.906	1.920	1.933	1.947	1.961	1.974	1.987	2.001	2.014
5	3.497	1.724	1.741	1.757	1.772	1.788	1.803	1.818	1.832	1.847	1.861	1.875	1.890	1.904	1.917	1.931	1.945	1.958	1.972	1.985	1.998	2.012
10	4.146	1.722	1.739	1.755	1.770	1.786	1.801	1.816	1.830	1.845	1.859	1.874	1.888	1.902	1.916	1.929	1.943	1.956	1.970	1.983	1.996	2.010
15	4.884	1.720	1.737	1.753	1.768	1.784	1.799	1.814	1.829	1.843	1.858	1.872	1.886	1.900	1.914	1.928	1.941	1.955	1.968	1.982	1.995	2.008
20	5.717	1.718	1.735	1.751	1.767	1.782	1.798	1.813	1.828	1.842	1.857	1.871	1.885	1.899	1.913	1.927	1.940	1.954	1.967	1.980	1.994	2.007
25	6.654	1.716	1.733	1.750	1.766	1.781	1.797	1.812	1.827	1.841	1.856	1.870	1.884	1.898	1.912	1.926	1.939	1.953	1.966	1.980	1.993	2.006
30	7.702	1.714	1.732	1.748	1.764	1.780	1.796	1.811	1.826	1.840	1.855	1.869	1.884	1.898	1.911	1.925	1.939	1.952	1.966	1.979	1.992	2.005
35	8.870	1.713	1.730	1.747	1.763	1.779	1.795	1.810	1.825	1.840	1.855	1.869	1.883	1.897	1.911	1.925	1.938	1.952	1.965	1.979	1.992	2.005
40	10.166	1.711	1.729	1.746	1.763	1.779	1.794	1.810	1.825	1.840	1.854	1.869	1.883	1.897	1.911	1.925	1.938	1.952	1.965	1.979	1.992	2.005
45	11.599	1.709	1.727	1.745	1.762	1.778	1.794	1.809	1.824	1.839	1.854	1.869	1.883	1.897	1.911	1.925	1.939	1.952	1.966	1.979	1.992	2.005
50	13.179	1.707	1.726	1.744	1.761	1.777	1.793	1.809	1.824	1.839	1.854	1.869	1.883	1.897	1.911	1.925	1.939	1.952	1.966	1.979	1.992	2.005
55	14.915	1.705	1.724	1.742	1.760	1.777	1.793	1.809	1.824	1.839	1.854	1.869	1.883	1.898	1.912	1.926	1.939	1.953	1.966	1.980	1.993	2.006
60	16.818	1.702	1.722	1.741	1.759	1.776	1.792	1.808	1.824	1.839	1.854	1.869	1.884	1.898	1.912	1.926	1.940	1.953	1.967	1.980	1.994	2.007
65	18.898	1.699	1.720	1.740	1.758	1.775	1.792	1.808	1.824	1.839	1.855	1.869	1.884	1.898	1.913	1.927	1.941	1.954	1.968	1.981	1.994	2.008
70	21.168	1.696	1.718	1.738	1.756	1.774	1.791	1.808	1.824	1.839	1.855	1.870	1.885	1.899	1.913	1.927	1.941	1.955	1.969	1.982	1.995	2.009
75	23.641	1.691	1.715	1.735	1.755	1.773	1.791	1.807	1.824	1.840	1.855	1.870	1.885	1.900	1.914	1.928	1.942	1.956	1.970	1.983	1.996	2.010
80	26.332	1.685	1.711	1.733	1.753	1.772	1.790	1.807	1.823	1.840	1.855	1.870	1.885	1.900	1.915	1.929	1.943	1.957	1.970	1.984	1.997	2.011
85	29.258	1.677	1.706	1.730	1.751	1.770	1.789	1.806	1.823	1.839	1.855	1.871	1.886	1.901	1.915	1.930	1.944	1.958	1.971	1.985	1.999	2.012
90	32.442	1.666	1.700	1.726	1.748	1.768	1.787	1.805	1.823	1.839	1.855	1.871	1.886	1.901	1.916	1.930	1.945	1.959	1.972	1.986	2.000	2.013
95	35.912	1.649	1.693	1.721	1.745	1.766	1.786	1.804	1.822	1.839	1.855	1.871	1.887	1.902	1.917	1.931	1.945	1.960	1.973	1.987	2.001	2.014
100	39.724	1.611	1.683	1.715	1.741	1.763	1.784	1.803	1.821	1.838	1.855	1.871	1.887	1.902	1.917	1.932	1.946	1.960	1.974	1.988	2.002	2.015

R-227ea

1,1,1,2,3,3,3 - HEPTAFLUOROPROPANE CF_3-CHF-CF_3

Molecular weight (g/mol)	170.03
Melting point (°C)	-126.8
Boiling point (at 1.013 bar)	-16.35
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	101.8
Critical pressure (bar absolute)	29.25
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.182
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.813
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.075
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.239
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	7.04
Classification NF-EN 378	A1
GWP (IPCC 4)	3220

Main applications

R-227ea is a hydrofluorocarbon (HFC) which can in some applications replace R-114 (CFC) whose production was stopped in the European Union on 31.12.1994.
It is particularly suitable for air conditioning systems which work in high temperature environments, high temperature heat pumps, and thermal collectors. Today, it is replaced in some applications in new installations by R-1234ze. R-227ea is also used as an extinguishing agent replacing "bromofluorocarbon" compound R-13B1 whose production was stopped in the European Union as of 31.12.1993.

Commercial specifications

Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Total acidity (HCl): ≤ 1 ppm weight.
High-boiling residues: ≤ 0.01 % volume.
Non-condensable content (gas phase): ≤ 1.5 % volume.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-227ea are governed by EU Regulation n° 517/2014.
The recovery of R-227ea is mandatory under EU Regulation n° 517/2014.

(Refer to the regulations enforced in each country).

Thermodynamic properties of R-227ea - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.003	-100	0.555	1.803	97.440	0.536	-100.0	29.301	0.034	261.702	1.484	164.262
0.005	-95	0.559	1.789	102.218	0.563	-95.0	17.531	0.057	264.564	1.474	162.346
0.008	-90	0.563	1.775	107.027	0.590	-90.0	10.857	0.092	267.472	1.466	160.445
0.013	-85	0.568	1.760	111.870	0.616	-85.0	6.938	0.144	270.425	1.458	158.555
0.021	-80	0.573	1.746	116.746	0.641	-80.0	4.562	0.219	273.419	1.452	156.673
0.031	-75	0.578	1.731	121.656	0.666	-75.0	3.079	0.325	276.451	1.447	154.795
0.046	-70	0.583	1.716	126.599	0.691	-70.0	2.129	0.470	279.518	1.444	152.919
0.067	-65	0.588	1.701	131.578	0.715	-65.0	1.504	0.665	282.617	1.441	151.039
0.095	-60	0.593	1.686	136.592	0.739	-60.0	1.084	0.922	285.746	1.439	149.154
0.132	-55	0.599	1.670	141.643	0.762	-55.0	0.796	1.256	288.900	1.437	147.257
0.181	-50	0.604	1.655	146.731	0.785	-50.0	0.595	1.682	292.077	1.437	145.346
0.243	-45	0.610	1.639	151.859	0.808	-45.0	0.451	2.218	295.274	1.437	143.416
0.321	-40	0.616	1.623	157.026	0.830	-40.0	0.347	2.882	298.488	1.437	141.463
0.419	-35	0.622	1.607	162.234	0.853	-35.0	0.270	3.698	301.716	1.438	139.482
0.540	-30	0.629	1.591	167.485	0.874	-30.0	0.213	4.687	304.955	1.440	137.470
0.686	-25	0.635	1.574	172.781	0.896	-25.0	0.170	5.875	308.202	1.442	135.421
0.863	-20	0.642	1.557	178.124	0.917	-20.0	0.137	7.290	311.454	1.444	133.330
1.013	-16.35	0.648	1.544	182.058	0.933	-16.35	0.118	8.484	313.830	1.446	131.773
1.073	-15	0.649	1.540	183.515	0.938	-15.0	0.112	8.961	314.706	1.446	131.192
1.322	-10	0.657	1.522	188.956	0.959	-10.0	0.092	10.921	317.957	1.449	129.001
1.614	-5	0.665	1.504	194.450	0.980	-5.0	0.076	13.205	321.201	1.452	126.751
1.954	0	0.673	1.486	200.000	1.000	-0.0	0.063	15.853	324.435	1.456	124.435
2.346	5	0.682	1.467	205.608	1.020	5.0	0.053	18.905	327.655	1.459	122.047
2.796	10	0.691	1.448	211.277	1.040	10.0	0.045	22.411	330.855	1.463	119.578
3.309	15	0.700	1.429	217.010	1.060	15.0	0.038	26.421	334.031	1.466	117.021
3.891	20	0.710	1.408	222.812	1.080	20.0	0.032	30.996	337.177	1.470	114.366
4.547	25	0.721	1.388	228.685	1.100	25.0	0.028	36.202	340.287	1.474	111.601
5.284	30	0.732	1.366	234.636	1.119	30.0	0.024	42.118	343.353	1.478	108.716
6.108	35	0.744	1.344	240.670	1.139	35.0	0.020	48.833	346.366	1.482	105.696
7.025	40	0.757	1.321	246.793	1.158	40.0	0.018	56.454	349.316	1.486	102.523
8.041	45	0.771	1.297	253.011	1.178	45.0	0.015	65.109	352.191	1.490	99.179
9.164	50	0.787	1.271	259.336	1.197	50.0	0.013	74.956	354.975	1.493	95.639
10.401	55	0.803	1.245	265.777	1.217	55.0	0.012	86.189	357.651	1.497	91.874
11.759	60	0.822	1.216	272.349	1.236	60.0	0.010	99.062	360.195	1.500	87.846
13.247	65	0.843	1.186	279.071	1.256	65.0	0.009	113.904	362.577	1.503	83.506
14.874	70	0.867	1.154	285.966	1.276	70.0	0.008	131.169	364.755	1.505	78.789
16.649	75	0.895	1.118	293.071	1.296	75.0	0.007	151.500	366.675	1.507	73.603
18.583	80	0.927	1.078	300.439	1.316	80.0	0.006	175.865	368.252	1.509	67.813
20.688	85	0.968	1.033	308.161	1.338	85.0	0.005	205.839	369.357	1.509	61.196
22.981	90	1.022	0.979	316.407	1.360	90.0	0.004	244.309	369.755	1.507	53.348
25.479	95	1.102	0.908	325.589	1.384	95.0	0.003	298.003	368.902	1.502	43.313
28.216	100	1.271	0.787	337.515	1.416	100.0	0.003	397.240	364.317	1.487	26.802

Thermodynamic properties of R-227ea - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.003	29300.882	30148.920	30996.826	31844.614	32692.297	33539.883	34387.383	35234.805	36082.156	36929.443	37776.672	38623.849	39470.979	40318.066	41165.114	42012.128	42859.111	43706.065	44552.994	45399.901	46246.786
-95	0.005	17531.225	18025.002	18518.660	19012.213	19505.669	19999.039	20492.330	20985.551	21478.707	21971.806	22464.852	22957.850	23450.807	23943.724	24436.607	24929.459	25422.283	25915.081	26407.856	26900.611	27393.347
-90	0.008	10856.718	11154.685	11452.545	11750.308	12047.985	12345.583	12643.110	12940.573	13237.978	13535.331	13832.636	14129.898	14427.122	14724.311	15021.469	15318.599	15615.704	15912.785	16209.846	16506.888	16803.913
-85	0.013	6937.531	7123.325	7309.022	7494.631	7680.162	7865.622	8051.017	8236.354	8421.639	8606.876	8792.070	8977.226	9162.347	9347.437	9532.498	9717.534	9902.547	10087.539	10272.513	10457.470	10642.411
-80	0.021	4561.793	4681.184	4800.487	4919.711	5038.863	5157.951	5276.980	5395.957	5514.886	5633.772	5752.619	5871.431	5990.213	6108.965	6227.693	6346.397	6465.081	6583.746	6702.393	6821.026	6939.645
-75	0.031	3079.042	3157.921	3236.721	3315.449	3394.112	3472.715	3551.266	3629.769	3708.229	3786.651	3865.037	3943.391	4021.718	4100.019	4178.296	4256.553	4334.791	4413.013	4491.218	4569.410	4647.590
-70	0.046	2128.512	2181.980	2235.375	2288.705	2341.976	2395.193	2448.362	2501.488	2554.574	2607.626	2660.646	2713.637	2766.603	2819.546	2872.467	2925.370	2978.256	3031.127	3083.984	3136.828	3189.660
-65	0.067	1503.977	1541.091	1578.139	1615.127	1652.061	1688.947	1725.789	1762.591	1799.358	1836.094	1872.800	1909.481	1946.139	1982.775	2019.393	2055.994	2092.579	2129.150	2165.709	2202.256	2238.793
-60	0.095	1084.220	1110.556	1136.833	1163.054	1189.226	1215.354	1241.443	1267.495	1293.516	1319.507	1345.473	1371.415	1397.336	1423.238	1449.123	1474.993	1500.848	1526.691	1552.522	1578.342	1604.153
-55	0.132	796.130	815.206	834.227	853.197	872.123	891.009	909.858	928.675	947.462	966.223	984.961	1003.677	1022.375	1041.054	1059.719	1078.369	1097.006	1115.632	1134.247	1152.853	1171.450
-50	0.181	594.547	608.631	622.663	636.650	650.596	664.505	678.382	692.228	706.048	719.844	733.619	747.374	761.111	774.833	788.541	802.236	815.919	829.591	843.254	856.908	870.554
-45	0.243	450.947	461.532	472.070	482.567	493.025	503.450	513.845	524.213	534.556	544.878	555.180	565.464	575.733	585.987	596.228	606.457	616.675	626.884	637.084	647.276	657.460
-40	0.321	346.942	355.031	363.078	371.085	379.059	387.001	394.915	402.805	410.673	418.521	426.350	434.164	441.963	449.749	457.522	465.285	473.038	480.783	488.519	496.247	503.969
-35	0.419	270.445	276.725	282.965	289.169	295.342	301.486	307.605	313.700	319.776	325.833	331.874	337.900	343.912	349.912	355.901	361.881	367.851	373.813	379.767	385.715	391.656
-30	0.540	213.371	218.318	223.228	228.106	232.953	237.775	242.573	247.350	252.109	256.850	261.576	266.289	270.989	275.678	280.357	285.027	289.688	294.342	298.988	303.629	308.263
-25	0.686	170.217	174.169	178.086	181.973	185.832	189.667	193.481	197.274	201.051	204.812	208.559	212.293	216.016	219.728	223.431	227.125	230.812	234.492	238.165	241.832	245.494
-20	0.863	137.181	140.379	143.545	146.683	149.794	152.884	155.953	159.004	162.039	165.059	168.066	171.062	174.047	177.022	179.988	182.947	185.898	188.843	191.782	194.715	197.643
-16.35	1.013	117.873	120.635	123.366	126.069	128.749	131.406	134.045	136.667	139.273	141.865	144.445	147.014	149.572	152.122	154.663	157.197	159.723	162.244	164.759	167.268	169.773
-15	1.073	111.596	114.217	116.807	119.371	121.910	124.429	126.928	129.411	131.879	134.333	136.774	139.205	141.626	144.038	146.442	148.839	151.229	153.612	155.990	158.363	160.731
-10	1.322	91.567	93.740	95.884	98.003	100.099	102.175	104.234	106.277	108.305	110.321	112.326	114.320	116.305	118.282	120.251	122.213	124.169	126.119	128.064	130.004	131.939
-5	1.614	75.727	77.549	79.344	81.114	82.863	84.594	86.307	88.006	89.691	91.365	93.027	94.680	96.325	97.961	99.590	101.213	102.830	104.442	106.048	107.650	109.247
0	1.954	63.081	64.626	66.144	67.639	69.113	70.570	72.010	73.437	74.851	76.254	77.647	79.030	80.405	81.773	83.135	84.490	85.839	87.183	88.523	89.858	91.189
5	2.346	52.895	54.218	55.515	56.790	58.045	59.283	60.506	61.716	62.914	64.100	65.278	66.446	67.607	68.761	69.909	71.050	72.187	73.318	74.445	75.568	76.687
10	2.796	44.622	45.766	46.885	47.983	49.062	50.124	51.171	52.206	53.230	54.243	55.247	56.243	57.231	58.213	59.188	60.159	61.124	62.084	63.040	63.992	64.941
15	3.309	37.848	38.848	39.823	40.777	41.712	42.631	43.537	44.430	45.312	46.184	47.047	47.903	48.751	49.593	50.430	51.261	52.087	52.909	53.726	54.540	55.351
20	3.891	32.262	33.144	34.001	34.837	35.655	36.457	37.246	38.023	38.789	39.546	40.295	41.036	41.770	42.498	43.220	43.937	44.650	45.358	46.063	46.764	47.461
25	4.547	27.622	28.407	29.167	29.906	30.628	31.334	32.027	32.708	33.379	34.041	34.695	35.341	35.981	36.615	37.244	37.867	38.486	39.102	39.713	40.321	40.925
30	5.284	23.743	24.448	25.128	25.787	26.429	27.055	27.668	28.270	28.862	29.445	30.020	30.588	31.150	31.706	32.256	32.802	33.344	33.882	34.416	34.947	35.474
35	6.108	20.478	21.117	21.731	22.324	22.899	23.458	24.005	24.541	25.067	25.584	26.094	26.596	27.092	27.583	28.069	28.550	29.027	29.500	29.970	30.436	30.900
40	7.025	17.714	18.299	18.858	19.395	19.914	20.418	20.910	21.390	21.860	22.322	22.776	23.224	23.665	24.101	24.532	24.959	25.381	25.800	26.216	26.628	27.037
45	8.041	15.359	15.900	16.413	16.904	17.377	17.834	18.278	18.712	19.135	19.550	19.958	20.359	20.754	21.144	21.529	21.909	22.286	22.659	23.028	23.395	23.758
50	9.164	13.341	13.846	14.322	14.774	15.208	15.626	16.031	16.424	16.808	17.183	17.551	17.913	18.268	18.619	18.964	19.306	19.643	19.977	20.307	20.635	20.960
55	10.401	11.602	12.079	12.524	12.944	13.345	13.730	14.101	14.460	14.810	15.152	15.486	15.814	16.135	16.452	16.764	17.072	17.376	17.676	17.973	18.268	18.559
60	11.759	10.095	10.550	10.971	11.364	11.737	12.094	12.436	12.767	13.088	13.400	13.705	14.004	14.297	14.584	14.867	15.146	15.421	15.693	15.962	16.227	16.490
65	13.247	8.779	9.221	9.622	9.994	10.344	10.676	10.994	11.300	11.596	11.883	12.163	12.437	12.704	12.967	13.225	13.479	13.729	13.976	14.220	14.461	14.699
70	14.874	7.624	8.058	8.445	8.799	9.130	9.442	9.739	10.024	10.298	10.564	10.822	11.074	11.320	11.561	11.797	12.029	12.258	12.483	12.705	12.925	13.141
75	16.649	6.601	7.035	7.413	7.754	8.069	8.364	8.643	8.909	9.165	9.412	9.651	9.884	10.111	10.332	10.550	10.763	10.973	11.179	11.382	11.583	11.781
80	18.583	5.686	6.131	6.505	6.836	7.138	7.418	7.682	7.932	8.172	8.402	8.624	8.840	9.051	9.256	9.456	9.653	9.846	10.035	10.222	10.406	10.588
85	20.688	4.858	5.327	5.701	6.026	6.317	6.585	6.836	7.072	7.297	7.513	7.721	7.922	8.118	8.308	8.494	8.675	8.854	9.029	9.201	9.370	9.537
90	22.981	4.093	4.607	4.989	5.309	5.592	5.850	6.089	6.313	6.525	6.728	6.923	7.111	7.293	7.470	7.643	7.811	7.976	8.138	8.297	8.454	8.608
95	25.479	3.356	3.960	4.354	4.673	4.949	5.198	5.426	5.639	5.840	6.031	6.214	6.391	6.561	6.726	6.887	7.044	7.197	7.347	7.495	7.639	7.782
100	28.216	2.517	3.372	3.785	4.104	4.375	4.615	4.834	5.037	5.228	5.408	5.581	5.746	5.906	6.060	6.210	6.356	6.499	6.638	6.775	6.909	7.041

Thermodynamic properties of R-227ea - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.003	261.702	264.577	267.504	270.483	273.511	276.589	279.715	282.889	286.110	289.378	292.693	296.053	299.460	302.911	306.407	309.948	313.534	317.164	320.837	324.554	328.314
-95	0.005	264.564	267.492	270.471	273.500	276.579	279.705	282.880	286.102	289.371	292.686	296.047	299.453	302.905	306.402	309.943	313.529	317.159	320.833	324.550	328.310	332.114
-90	0.008	267.472	270.453	273.483	276.563	279.691	282.866	286.089	289.359	292.675	296.036	299.444	302.896	306.393	309.935	313.522	317.152	320.826	324.544	328.304	332.108	335.954
-85	0.013	270.425	273.457	276.539	279.668	282.846	286.070	289.341	292.658	296.021	299.429	302.882	306.380	309.923	313.510	317.141	320.816	324.534	328.295	332.100	335.946	339.835
-80	0.021	273.419	276.503	279.635	282.814	286.041	289.314	292.632	295.997	299.407	302.862	306.361	309.905	313.493	317.125	320.801	324.520	328.282	332.087	335.934	339.824	343.755
-75	0.031	276.451	279.587	282.769	285.999	289.274	292.596	295.963	299.375	302.832	306.333	309.879	313.469	317.102	320.779	324.499	328.263	332.069	335.917	339.807	343.739	347.713
-70	0.046	279.518	282.706	285.939	289.219	292.544	295.915	299.330	302.790	306.294	309.842	313.434	317.070	320.749	324.471	328.235	332.043	335.892	339.784	343.717	347.692	351.707
-65	0.067	282.617	285.857	289.143	292.473	295.848	299.268	302.732	306.239	309.791	313.386	317.025	320.706	324.431	328.198	332.007	335.859	339.752	343.687	347.663	351.680	355.737
-60	0.095	285.746	289.039	292.376	295.758	299.183	302.653	306.166	309.722	313.321	316.964	320.649	324.377	328.147	331.959	335.813	339.709	343.646	347.624	351.642	355.701	359.801
-55	0.132	288.900	292.247	295.637	299.071	302.548	306.068	309.630	313.235	316.883	320.573	324.305	328.079	331.895	335.752	339.651	343.591	347.572	351.593	355.654	359.755	363.896
-50	0.181	292.077	295.479	298.924	302.410	305.939	309.510	313.122	316.777	320.473	324.211	327.990	331.811	335.673	339.576	343.520	347.504	351.528	355.593	359.697	363.840	368.022
-45	0.243	295.274	298.733	302.232	305.772	309.354	312.976	316.640	320.344	324.090	327.876	331.703	335.571	339.479	343.428	347.417	351.445	355.513	359.621	363.767	367.953	372.176
-40	0.321	298.488	302.004	305.560	309.155	312.790	316.466	320.181	323.936	327.731	331.566	335.441	339.357	343.312	347.306	351.340	355.413	359.525	363.676	367.865	372.092	376.357
-35	0.419	301.716	305.292	308.905	312.556	316.246	319.975	323.742	327.549	331.394	335.279	339.203	343.165	347.167	351.208	355.287	359.405	363.561	367.755	371.987	376.256	380.562
-30	0.540	304.955	308.591	312.263	315.972	319.718	323.501	327.322	331.180	335.077	339.011	342.984	346.995	351.044	355.131	359.256	363.419	367.619	371.856	376.131	380.442	384.789
-25	0.686	308.202	311.901	315.633	319.400	323.203	327.042	330.917	334.828	338.776	342.762	346.784	350.844	354.940	359.074	363.245	367.453	371.697	375.978	380.295	384.648	389.037
-20	0.863	311.454	315.216	319.011	322.838	326.699	330.595	334.525	338.490	342.491	346.527	350.600	354.708	358.853	363.034	367.251	371.504	375.793	380.117	384.477	388.872	393.302
-16.35	1.013	313.830	317.641	321.482	325.355	329.259	333.197	337.167	341.173	345.212	349.286	353.396	357.541	361.721	365.936	370.187	374.474	378.795	383.151	387.543	391.969	396.429
-15	1.073	314.706	318.535	322.394	326.283	330.204	334.157	338.143	342.163	346.217	350.305	354.428	358.586	362.780	367.008	371.271	375.570	379.904	384.272	388.675	393.112	397.584
-10	1.322	317.957	321.854	325.779	329.731	333.713	337.725	341.769	345.844	349.952	354.093	358.268	362.476	366.718	370.994	375.305	379.649	384.028	388.440	392.886	397.366	401.879
-5	1.614	321.201	325.170	329.162	333.180	337.224	341.297	345.399	349.531	353.694	357.889	362.115	366.374	370.666	374.990	379.348	383.739	388.162	392.619	397.109	401.631	406.186
0	1.954	324.435	328.478	332.540	336.625	340.734	344.869	349.031	353.221	357.440	361.689	365.968	370.278	374.620	378.994	383.399	387.836	392.305	396.807	401.340	405.905	410.502
5	2.346	327.655	331.775	335.910	340.065	344.241	348.439	352.662	356.911	361.187	365.491	369.824	374.186	378.579	383.001	387.455	391.939	396.455	401.001	405.578	410.186	414.825
10	2.796	330.855	335.056	339.268	343.495	347.739	352.003	356.288	360.597	364.932	369.292	373.679	378.095	382.539	387.012	391.514	396.046	400.607	405.199	409.820	414.472	419.153
15	3.309	334.031	338.317	342.609	346.911	351.226	355.557	359.907	364.278	368.672	373.089	377.532	382.002	386.498	391.021	395.573	400.153	404.762	409.399	414.065	418.760	423.484
20	3.891	337.177	341.554	345.929	350.309	354.697	359.098	363.514	367.949	372.404	376.880	381.380	385.904	390.453	395.028	399.630	404.259	408.915	413.599	418.310	423.049	427.815
25	4.547	340.287	344.759	349.223	353.684	358.149	362.622	367.107	371.607	376.125	380.661	385.219	389.799	394.402	399.030	403.683	408.361	413.065	417.796	422.552	427.336	432.146
30	5.284	343.353	347.928	352.485	357.032	361.577	366.126	370.682	375.249	379.831	384.430	389.047	393.684	398.343	403.024	407.728	412.457	417.210	421.988	426.791	431.619	436.473
35	6.108	346.366	351.052	355.708	360.347	364.976	369.604	374.234	378.871	383.520	388.182	392.860	397.556	402.272	407.007	411.765	416.544	421.347	426.173	431.023	435.897	440.795
40	7.025	349.316	354.123	358.887	363.623	368.342	373.051	377.759	382.470	387.187	391.916	396.657	401.413	406.186	410.978	415.789	420.621	425.474	430.349	435.246	440.167	445.110
45	8.041	352.191	357.132	362.013	366.853	371.667	376.464	381.253	386.040	390.830	395.626	400.432	405.251	410.084	414.932	419.799	424.684	429.589	434.514	439.460	444.427	449.416
50	9.164	354.975	360.067	365.077	370.030	374.946	379.837	384.712	389.579	394.444	399.311	404.185	409.067	413.961	418.869	423.792	428.732	433.689	438.665	443.660	448.675	453.711
55	10.401	357.651	362.914	368.068	373.146	378.173	383.163	388.130	393.081	398.025	402.966	407.910	412.859	417.817	422.785	427.766	432.762	437.773	442.801	447.846	452.910	457.992
60	11.759	360.195	365.659	370.975	376.192	381.339	386.437	391.501	396.542	401.569	406.588	411.605	416.623	421.646	426.677	431.718	436.771	441.837	446.919	452.015	457.129	462.260
65	13.247	362.577	368.280	373.784	379.156	384.436	389.651	394.820	399.957	405.072	410.173	415.266	420.356	425.447	430.543	435.646	440.758	445.881	451.017	456.166	461.330	466.510
70	14.874	364.755	370.754	376.478	382.026	387.455	392.798	398.081	403.320	408.529	413.716	418.889	424.054	429.217	434.380	439.546	444.719	449.901	455.092	460.296	465.512	470.742
75	16.649	366.675	373.050	379.038	384.790	390.385	395.870	401.277	406.626	411.934	417.213	422.471	427.715	432.951	438.184	443.417	448.653	453.895	459.144	464.402	469.672	474.953
80	18.583	368.252	375.130	381.442	387.432	393.216	398.858	404.400	409.869	415.284	420.659	426.006	431.333	436.647	441.953	447.254	452.556	457.859	463.168	468.483	473.807	479.141
85	20.688	369.357	376.945	383.662	389.934	395.934	401.752	407.443	413.041	418.570	424.050	429.491	434.906	440.300	445.682	451.055	456.424	461.792	467.162	472.536	477.916	483.304
90	22.981	369.755	378.432	385.669	392.278	398.526	404.542	410.396	416.135	421.788	427.378	432.920	438.426	443.906	449.367	454.815	460.254	465.688	471.122	476.556	481.994	487.437
95	25.479	368.902	379.510	387.428	394.442	400.977	407.214	413.249	419.141	424.928	430.636	436.284	441.888	447.457	453.002	458.527	464.039	469.543	475.042	480.539	486.036	491.537
100	28.216	364.317	380.055	388.887	396.391	403.257	409.744	415.979	422.039	427.970	433.806	439.568	445.275	450.940	456.572	462.179	467.768	473.344	478.911	484.473	490.032	495.592

Thermodynamic properties of R-227ea - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.003	1.484	1.501	1.517	1.533	1.549	1.565	1.580	1.596	1.611	1.626	1.641	1.656	1.671	1.685	1.700	1.714	1.729	1.743	1.757	1.771	1.785
-95	0.005	1.474	1.490	1.506	1.522	1.538	1.554	1.569	1.584	1.600	1.615	1.629	1.644	1.659	1.673	1.688	1.702	1.716	1.730	1.744	1.758	1.772
-90	0.008	1.466	1.482	1.498	1.513	1.529	1.544	1.560	1.575	1.590	1.605	1.619	1.634	1.649	1.663	1.677	1.692	1.706	1.720	1.734	1.747	1.761
-85	0.013	1.458	1.474	1.490	1.506	1.521	1.536	1.551	1.567	1.581	1.596	1.611	1.625	1.640	1.654	1.668	1.682	1.696	1.710	1.724	1.738	1.751
-80	0.021	1.452	1.468	1.484	1.499	1.514	1.530	1.545	1.560	1.574	1.589	1.604	1.618	1.632	1.647	1.661	1.675	1.689	1.702	1.716	1.730	1.743
-75	0.031	1.447	1.463	1.479	1.494	1.509	1.524	1.539	1.554	1.569	1.583	1.598	1.612	1.626	1.640	1.654	1.668	1.682	1.696	1.709	1.723	1.736
-70	0.046	1.444	1.459	1.475	1.490	1.505	1.520	1.535	1.549	1.564	1.578	1.593	1.607	1.621	1.635	1.649	1.663	1.676	1.690	1.703	1.717	1.730
-65	0.067	1.441	1.456	1.471	1.486	1.501	1.516	1.531	1.546	1.560	1.574	1.589	1.603	1.617	1.631	1.644	1.658	1.672	1.685	1.699	1.712	1.725
-60	0.095	1.439	1.454	1.469	1.484	1.499	1.514	1.528	1.543	1.557	1.571	1.585	1.599	1.613	1.627	1.641	1.655	1.668	1.682	1.695	1.708	1.721
-55	0.132	1.437	1.453	1.468	1.482	1.497	1.512	1.526	1.541	1.555	1.569	1.583	1.597	1.611	1.625	1.638	1.652	1.665	1.679	1.692	1.705	1.718
-50	0.181	1.437	1.452	1.467	1.482	1.496	1.511	1.525	1.539	1.554	1.568	1.582	1.596	1.609	1.623	1.636	1.650	1.663	1.677	1.690	1.703	1.716
-45	0.243	1.437	1.452	1.467	1.481	1.496	1.510	1.525	1.539	1.553	1.567	1.581	1.595	1.608	1.622	1.635	1.649	1.662	1.675	1.688	1.701	1.714
-40	0.321	1.437	1.452	1.467	1.482	1.496	1.510	1.525	1.539	1.553	1.567	1.581	1.594	1.608	1.621	1.635	1.648	1.661	1.675	1.688	1.701	1.713
-35	0.419	1.438	1.453	1.468	1.482	1.497	1.511	1.525	1.539	1.553	1.567	1.581	1.595	1.608	1.621	1.635	1.648	1.661	1.674	1.687	1.700	1.713
-30	0.540	1.440	1.455	1.469	1.484	1.498	1.512	1.526	1.540	1.554	1.568	1.582	1.595	1.609	1.622	1.635	1.649	1.662	1.675	1.688	1.700	1.713
-25	0.686	1.442	1.456	1.471	1.485	1.500	1.514	1.528	1.542	1.556	1.569	1.583	1.597	1.610	1.623	1.636	1.650	1.663	1.676	1.688	1.701	1.714
-20	0.863	1.444	1.459	1.473	1.487	1.502	1.516	1.530	1.544	1.558	1.571	1.585	1.598	1.612	1.625	1.638	1.651	1.664	1.677	1.690	1.702	1.715
-16.35	1.013	1.446	1.460	1.475	1.489	1.503	1.518	1.532	1.545	1.559	1.573	1.586	1.600	1.613	1.626	1.639	1.652	1.665	1.678	1.691	1.703	1.716
-15	1.073	1.446	1.461	1.476	1.490	1.504	1.518	1.532	1.546	1.560	1.573	1.587	1.600	1.614	1.627	1.640	1.653	1.666	1.679	1.691	1.704	1.716
-10	1.322	1.449	1.464	1.478	1.493	1.507	1.521	1.535	1.549	1.562	1.576	1.589	1.603	1.616	1.629	1.642	1.655	1.668	1.681	1.693	1.706	1.718
-5	1.614	1.452	1.467	1.481	1.496	1.510	1.524	1.538	1.552	1.565	1.579	1.592	1.605	1.618	1.632	1.645	1.657	1.670	1.683	1.696	1.708	1.721
0	1.954	1.456	1.470	1.485	1.499	1.513	1.527	1.541	1.555	1.568	1.582	1.595	1.608	1.621	1.634	1.647	1.660	1.673	1.686	1.698	1.711	1.723
5	2.346	1.459	1.474	1.488	1.502	1.517	1.531	1.544	1.558	1.572	1.585	1.598	1.612	1.625	1.638	1.650	1.663	1.676	1.689	1.701	1.714	1.726
10	2.796	1.463	1.477	1.492	1.506	1.520	1.534	1.548	1.562	1.575	1.589	1.602	1.615	1.628	1.641	1.654	1.667	1.679	1.692	1.704	1.717	1.729
15	3.309	1.466	1.481	1.496	1.510	1.524	1.538	1.552	1.565	1.579	1.592	1.606	1.619	1.632	1.645	1.657	1.670	1.683	1.695	1.708	1.720	1.732
20	3.891	1.470	1.485	1.500	1.514	1.528	1.542	1.556	1.569	1.583	1.596	1.609	1.622	1.635	1.648	1.661	1.674	1.686	1.699	1.711	1.723	1.736
25	4.547	1.474	1.489	1.504	1.518	1.532	1.546	1.560	1.573	1.587	1.600	1.613	1.626	1.639	1.652	1.665	1.678	1.690	1.703	1.715	1.727	1.739
30	5.284	1.478	1.493	1.508	1.522	1.536	1.550	1.564	1.578	1.591	1.604	1.618	1.631	1.644	1.656	1.669	1.682	1.694	1.706	1.719	1.731	1.743
35	6.108	1.482	1.497	1.512	1.526	1.540	1.554	1.568	1.582	1.595	1.609	1.622	1.635	1.648	1.660	1.673	1.686	1.698	1.711	1.723	1.735	1.747
40	7.025	1.486	1.501	1.516	1.530	1.545	1.559	1.573	1.586	1.600	1.613	1.626	1.639	1.652	1.665	1.677	1.690	1.702	1.715	1.727	1.739	1.751
45	8.041	1.490	1.505	1.520	1.535	1.549	1.563	1.577	1.591	1.604	1.617	1.631	1.644	1.656	1.669	1.682	1.694	1.707	1.719	1.731	1.743	1.755
50	9.164	1.493	1.509	1.524	1.539	1.553	1.567	1.581	1.595	1.609	1.622	1.635	1.648	1.661	1.674	1.686	1.699	1.711	1.723	1.735	1.748	1.759
55	10.401	1.497	1.513	1.528	1.543	1.558	1.572	1.586	1.599	1.613	1.626	1.639	1.652	1.665	1.678	1.691	1.703	1.715	1.728	1.740	1.752	1.764
60	11.759	1.500	1.516	1.532	1.547	1.562	1.576	1.590	1.604	1.617	1.631	1.644	1.657	1.670	1.683	1.695	1.708	1.720	1.732	1.744	1.756	1.768
65	13.247	1.503	1.520	1.536	1.551	1.566	1.580	1.594	1.608	1.622	1.635	1.649	1.662	1.674	1.687	1.700	1.712	1.724	1.737	1.749	1.761	1.773
70	14.874	1.505	1.523	1.539	1.555	1.570	1.584	1.599	1.613	1.626	1.640	1.653	1.666	1.679	1.692	1.704	1.717	1.729	1.741	1.753	1.765	1.777
75	16.649	1.507	1.526	1.542	1.558	1.574	1.588	1.603	1.617	1.631	1.644	1.657	1.671	1.683	1.696	1.709	1.721	1.734	1.746	1.758	1.770	1.782
80	18.583	1.509	1.528	1.545	1.562	1.577	1.592	1.607	1.621	1.635	1.649	1.662	1.675	1.688	1.701	1.713	1.726	1.738	1.750	1.762	1.774	1.786
85	20.688	1.509	1.530	1.548	1.565	1.581	1.596	1.611	1.625	1.639	1.653	1.666	1.679	1.692	1.705	1.718	1.730	1.743	1.755	1.767	1.779	1.791
90	22.981	1.507	1.531	1.550	1.568	1.584	1.600	1.615	1.629	1.643	1.657	1.671	1.684	1.697	1.710	1.722	1.735	1.747	1.759	1.771	1.783	1.795
95	25.479	1.502	1.531	1.552	1.570	1.587	1.603	1.618	1.633	1.647	1.661	1.675	1.688	1.701	1.714	1.727	1.739	1.752	1.764	1.776	1.788	1.800
100	28.216	1.487	1.529	1.553	1.572	1.590	1.606	1.622	1.636	1.651	1.665	1.679	1.692	1.705	1.718	1.731	1.743	1.756	1.768	1.780	1.792	1.804

R-236fa

1,1,1,3,3,3 - HEXAFLUOROPROPANE CF_3-CH_2-CF_3

Molecular weight (g/mol)	152.04
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-1.49
Temperature glide at 1.013 bar (K)	0.00
Critical temperature (°C)	124.9
Critical pressure (bar absolute)	32.00
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.238
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.838
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.084
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.285
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	9.59
Classification NF-EN 378	A1
GWP (IPCC 4)	9810

Main applications

R-236fa is a hydrofluorocarbon (HFC) used mainly in air-conditioning systems replacing R-114 and R-124, such as military seaborne equipment water coolers.
It can also be used for rolling bridge / crane air-conditioning. Today, the R-1234ze can be considered as a replacement for new installations in certain applications.

Commercial specifications

Guaranteed purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Non-condensable content (gas phase): ≤ 1.5 % volume.
Chloride ion test : negative.
High-boiling residues: ≤ 0.01 % volume.
Total acidity (HCl): ≤ 1 ppm weight.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-236fa are governed by EU Regulation n° 517/2014.
The recovery of R-236fa is mandatory under EU Regulation n° 517/2014.

(Refer to the regulations enforced in each country).

Thermodynamic properties of R-236fa - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.002	-90	0.589	1.699	94.457	0.532	-90.0	41.718	0.024	297.761	1.642	203.304
0.004	-85	0.593	1.685	100.403	0.564	-85.0	25.067	0.040	300.948	1.629	200.545
0.007	-80	0.598	1.672	106.315	0.595	-80.0	15.577	0.064	304.168	1.619	197.853
0.011	-75	0.603	1.658	112.196	0.625	-75.0	9.982	0.100	307.420	1.610	195.224
0.017	-70	0.608	1.644	118.053	0.654	-70.0	6.578	0.152	310.702	1.602	192.649
0.026	-65	0.613	1.631	123.891	0.682	-65.0	4.447	0.225	314.014	1.596	190.123
0.038	-60	0.619	1.617	129.715	0.710	-60.0	3.078	0.325	317.353	1.590	187.638
0.055	-55	0.624	1.603	135.530	0.737	-55.0	2.177	0.459	320.718	1.586	185.188
0.077	-50	0.629	1.589	141.339	0.763	-50.0	1.570	0.637	324.106	1.582	182.767
0.107	-45	0.635	1.575	147.147	0.789	-45.0	1.153	0.867	327.514	1.579	180.367
0.146	-40	0.641	1.561	152.959	0.814	-40.0	0.861	1.162	330.940	1.577	177.982
0.197	-35	0.647	1.546	158.777	0.839	-35.0	0.653	1.532	334.381	1.576	175.604
0.260	-30	0.653	1.532	164.606	0.863	-30.0	0.502	1.992	337.835	1.575	173.229
0.340	-25	0.659	1.517	170.449	0.887	-25.0	0.391	2.557	341.297	1.575	170.848
0.438	-20	0.666	1.502	176.310	0.910	-20.0	0.308	3.244	344.765	1.576	168.455
0.557	-15	0.672	1.487	182.193	0.933	-15.0	0.246	4.069	348.237	1.576	166.044
0.701	-10	0.679	1.472	188.099	0.956	-10.0	0.198	5.053	351.708	1.577	163.609
0.873	-5	0.686	1.457	194.034	0.978	-5.0	0.161	6.216	355.176	1.579	161.142
1.013	-1.49	0.692	1.446	198.214	0.993	-1.49	0.140	7.151	357.604	1.580	159.390
1.078	0	0.694	1.441	200.000	1.000	0.0	0.132	7.582	358.637	1.581	158.637
1.317	5	0.701	1.426	206.000	1.022	5.0	0.109	9.175	362.088	1.583	156.088
1.597	10	0.709	1.410	212.038	1.043	10.0	0.091	11.021	365.526	1.585	153.487
1.921	15	0.718	1.393	218.117	1.064	15.0	0.076	13.150	368.945	1.588	150.828
2.294	20	0.726	1.377	224.241	1.085	20.0	0.064	15.593	372.344	1.591	148.103
2.719	25	0.735	1.360	230.413	1.106	25.0	0.054	18.387	375.715	1.593	145.303
3.204	30	0.745	1.342	236.636	1.127	30.0	0.046	21.570	379.055	1.596	142.419
3.751	35	0.755	1.325	242.916	1.147	35.0	0.040	25.186	382.357	1.600	139.441
4.367	40	0.765	1.307	249.257	1.167	40.0	0.034	29.284	385.615	1.603	136.358
5.057	45	0.777	1.288	255.663	1.187	45.0	0.029	33.922	388.820	1.606	133.157
5.827	50	0.788	1.269	262.139	1.207	50.0	0.026	39.163	391.964	1.609	129.825
6.683	55	0.801	1.249	268.693	1.227	55.0	0.022	45.083	395.038	1.612	126.345
7.630	60	0.814	1.228	275.331	1.247	60.0	0.019	51.770	398.030	1.616	122.699
8.676	65	0.829	1.207	282.061	1.267	65.0	0.017	59.331	400.929	1.619	118.868
9.826	70	0.844	1.184	288.893	1.287	70.0	0.015	67.894	403.718	1.621	114.825
11.088	75	0.862	1.161	295.839	1.307	75.0	0.013	77.618	406.380	1.624	110.541
12.470	80	0.880	1.136	302.914	1.326	80.0	0.011	88.706	408.890	1.627	105.976
13.978	85	0.901	1.109	310.136	1.346	85	0.010	101.418	411.217	1.629	101.080
15.623	90	0.925	1.081	317.532	1.366	90.0	0.009	116.107	413.319	1.630	95.788
17.413	95	0.952	1.050	325.135	1.387	95.0	0.008	133.263	415.140	1.631	90.005
19.358	100	0.984	1.016	332.998	1.407	100	0.007	153.608	416.595	1.632	83.597
21.471	105	1.022	0.978	341.199	1.429	105.0	0.006	178.274	417.556	1.631	76.357
23.765	110	1.071	0.934	349.874	1.451	110.0	0.005	209.221	417.805	1.628	67.931
26.258	115	1.138	0.879	359.293	1.475	115.0	0.004	250.420	416.915	1.623	57.622
28.974	120	1.245	0.803	370.188	1.502	120.0	0.003	312.738	413.758	1.613	43.570

Thermodynamic properties of R-236fa - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-90	0.002	41717.612	42858.144	43998.589	45138.955	46279.248	47419.475	48559.640	49699.748	50839.804	51979.812	53119.775	54259.697	55399.580	56539.429	57679.245	58819.031	59958.790	61098.523	62238.233	63377.922	64517.591
-85	0.004	25066.710	25734.357	26401.925	27069.420	27736.848	28404.214	29071.524	29738.781	30405.990	31073.154	31740.277	32407.361	33074.411	33741.428	34408.415	35075.375	35742.310	36409.221	37076.110	37742.980	38409.832
-80	0.007	15577.275	15981.911	16386.475	16790.971	17195.406	17599.784	18004.109	18408.386	18812.618	19216.809	19620.961	20025.079	20429.164	20833.219	21237.246	21641.249	22045.227	22449.185	22853.122	23257.042	23660.944
-75	0.011	9981.786	10234.947	10488.041	10741.073	10994.048	11246.971	11499.845	11752.674	12005.462	12258.211	12510.926	12763.608	13016.260	13268.884	13521.483	13774.059	14026.613	14279.147	14531.663	14784.162	15036.646
-70	0.017	6577.913	6741.000	6904.026	7066.994	7229.910	7392.777	7555.599	7718.379	7881.121	8043.828	8206.503	8369.147	8531.764	8694.355	8856.923	9019.469	9181.996	9344.504	9506.995	9669.471	9831.933
-65	0.026	4447.219	4555.148	4663.019	4770.837	4878.606	4986.330	5094.013	5201.657	5309.266	5416.842	5524.388	5631.906	5739.399	5846.868	5954.316	6061.744	6169.153	6276.546	6383.923	6491.286	6598.636
-60	0.038	3078.007	3151.230	3224.400	3297.521	3370.597	3443.631	3516.626	3589.586	3662.513	3735.409	3808.278	3881.122	3953.942	4026.740	4099.518	4172.278	4245.022	4317.749	4390.462	4463.162	4535.850
-55	0.055	2176.613	2227.449	2278.234	2328.974	2379.672	2430.331	2480.954	2531.544	2582.104	2632.636	2683.143	2733.626	2784.087	2834.528	2884.950	2935.356	2985.746	3036.122	3086.484	3136.835	3187.174
-50	0.077	1569.834	1605.889	1641.897	1677.863	1713.790	1749.681	1785.538	1821.365	1857.164	1892.937	1928.687	1964.414	2000.122	2035.811	2071.483	2107.139	2142.781	2178.409	2214.026	2249.631	2285.225
-45	0.107	1152.890	1178.976	1205.018	1231.020	1256.986	1282.919	1308.820	1334.694	1360.541	1386.365	1412.166	1437.947	1463.710	1489.456	1515.186	1540.901	1566.603	1592.292	1617.971	1643.639	1669.297
-40	0.146	860.891	880.116	899.301	918.450	937.564	956.648	975.702	994.731	1013.735	1032.717	1051.678	1070.621	1089.547	1108.457	1127.352	1146.234	1165.103	1183.961	1202.808	1221.646	1240.475
-35	0.197	652.761	667.178	681.558	695.904	710.217	724.502	738.760	752.993	767.205	781.395	795.567	809.721	823.859	837.982	852.092	866.190	880.276	894.351	908.417	922.473	936.521
-30	0.260	501.970	512.958	523.912	534.833	545.725	556.589	567.429	578.245	589.041	599.818	610.577	621.320	632.049	642.763	653.465	664.155	674.835	685.504	696.165	706.817	717.461
-25	0.340	391.052	399.556	408.026	416.467	424.880	433.267	441.631	449.974	458.298	466.603	474.892	483.166	491.427	499.674	507.910	516.135	524.350	532.556	540.753	548.943	557.125
-20	0.438	308.306	314.981	321.626	328.242	334.832	341.398	347.943	354.468	360.974	367.464	373.939	380.399	386.847	393.283	399.707	406.122	412.527	418.924	425.313	431.694	438.068
-15	0.557	245.760	251.072	256.354	261.610	266.841	272.050	277.238	282.408	287.561	292.698	297.820	302.930	308.028	313.114	318.190	323.257	328.315	333.364	338.407	343.442	348.471
-10	0.701	197.903	202.183	206.436	210.664	214.868	219.051	223.215	227.362	231.493	235.609	239.711	243.801	247.880	251.948	256.007	260.057	264.099	268.133	272.160	276.180	280.195
-5	0.873	160.863	164.355	167.820	171.261	174.680	178.079	181.460	184.825	188.174	191.510	194.833	198.145	201.445	204.736	208.018	211.292	214.558	217.816	221.068	224.314	227.555
-1.49	1.013	139.833	142.880	145.902	148.901	151.878	154.837	157.778	160.703	163.613	166.511	169.396	172.270	175.134	177.988	180.834	183.672	186.502	189.325	192.142	194.954	197.759
0	1.078	131.889	134.769	137.624	140.457	143.268	146.061	148.837	151.597	154.343	157.075	159.796	162.506	165.206	167.896	170.578	173.252	175.919	178.579	181.233	183.881	186.524
5	1.317	108.996	111.398	113.776	116.133	118.469	120.788	123.090	125.378	127.652	129.914	132.164	134.404	136.634	138.856	141.070	143.276	145.475	147.668	149.855	152.036	154.213
10	1.597	90.738	92.762	94.763	96.744	98.705	100.649	102.578	104.493	106.394	108.284	110.164	112.033	113.893	115.745	117.590	119.427	121.258	123.082	124.901	126.715	128.524
15	1.921	76.047	77.771	79.471	81.152	82.814	84.460	86.091	87.708	89.313	90.907	92.491	94.065	95.631	97.188	98.738	100.282	101.819	103.351	104.877	106.399	107.915
20	2.294	64.130	65.611	67.069	68.509	69.930	71.336	72.728	74.106	75.473	76.829	78.175	79.512	80.841	82.162	83.476	84.784	86.086	87.382	88.674	89.960	91.242
25	2.719	54.386	55.670	56.933	58.177	59.404	60.615	61.812	62.997	64.170	65.333	66.487	67.632	68.769	69.899	71.022	72.138	73.250	74.356	75.457	76.553	77.645
30	3.204	46.361	47.485	48.588	49.672	50.739	51.791	52.830	53.857	54.872	55.878	56.874	57.862	58.842	59.816	60.783	61.744	62.699	63.650	64.595	65.537	66.474
35	3.751	39.705	40.697	41.669	42.621	43.558	44.479	45.388	46.284	47.169	48.045	48.912	49.771	50.623	51.467	52.306	53.139	53.966	54.789	55.607	56.421	57.231
40	4.367	34.148	35.032	35.895	36.739	37.567	38.380	39.180	39.969	40.747	41.515	42.275	43.027	43.771	44.510	45.242	45.969	46.690	47.407	48.120	48.828	49.533
45	5.057	29.480	30.274	31.047	31.801	32.539	33.262	33.972	34.670	35.358	36.037	36.707	37.370	38.026	38.675	39.319	39.957	40.590	41.219	41.843	42.464	43.081
50	5.827	25.534	26.255	26.953	27.632	28.294	28.941	29.576	30.198	30.811	31.415	32.010	32.598	33.179	33.754	34.323	34.887	35.446	36.000	36.551	37.098	37.641
55	6.683	22.181	22.840	23.476	24.092	24.690	25.274	25.845	26.404	26.953	27.493	28.025	28.550	29.068	29.579	30.086	30.587	31.083	31.576	32.064	32.549	33.030
60	7.630	19.316	19.924	20.508	21.070	21.615	22.145	22.662	23.167	23.663	24.149	24.627	25.098	25.562	26.021	26.474	26.922	27.365	27.804	28.239	28.671	29.100
65	8.676	16.855	17.421	17.961	18.479	18.978	19.463	19.934	20.393	20.842	21.283	21.715	22.140	22.559	22.972	23.379	23.781	24.180	24.573	24.964	25.350	25.733
70	9.826	14.729	15.261	15.765	16.245	16.707	17.152	17.584	18.004	18.414	18.815	19.208	19.594	19.973	20.347	20.715	21.079	21.438	21.793	22.144	22.492	22.837
75	11.088	12.884	13.389	13.863	14.312	14.741	15.153	15.552	15.938	16.314	16.682	17.041	17.393	17.738	18.078	18.413	18.742	19.068	19.389	19.707	20.022	20.333
80	12.470	11.273	11.759	12.209	12.631	13.033	13.417	13.787	14.144	14.491	14.829	15.159	15.481	15.798	16.108	16.414	16.714	17.010	17.303	17.592	17.877	18.160
85	13.978	9.860	10.332	10.763	11.164	11.542	11.902	12.247	12.580	12.902	13.214	13.518	13.815	14.106	14.391	14.671	14.946	15.217	15.484	15.748	16.008	16.265
90	15.623	8.613	9.078	9.494	9.878	10.237	10.576	10.900	11.211	11.511	11.801	12.083	12.358	12.626	12.889	13.146	13.399	13.648	13.893	14.134	14.372	14.607
95	17.413	7.504	7.969	8.377	8.747	9.090	9.412	9.717	10.009	10.290	10.561	10.823	11.078	11.327	11.570	11.808	12.041	12.270	12.495	12.717	12.936	13.151
100	19.358	6.510	6.985	7.389	7.748	8.078	8.385	8.675	8.950	9.214	9.468	9.713	9.951	10.182	10.407	10.628	10.844	11.055	11.263	11.468	11.669	11.868
105	21.471	5.609	6.107	6.511	6.864	7.183	7.477	7.753	8.014	8.263	8.501	8.731	8.954	9.169	9.379	9.584	9.785	9.981	10.174	10.363	10.549	10.732
110	23.765	4.780	5.319	5.729	6.078	6.388	6.672	6.936	7.184	7.419	7.644	7.860	8.069	8.271	8.467	8.658	8.845	9.027	9.206	9.381	9.554	9.723
115	26.258	3.993	4.608	5.031	5.378	5.681	5.956	6.209	6.445	6.669	6.881	7.085	7.281	7.471	7.654	7.833	8.007	8.177	8.343	8.506	8.666	8.823
120	28.974	3.198	3.964	4.404	4.751	5.049	5.315	5.559	5.785	5.997	6.199	6.391	6.576	6.754	6.926	7.093	7.256	7.414	7.569	7.721	7.870	8.016

Thermodynamic properties of R-236fa - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
-90	0.002	297.761	300.958	304.192	307.464	310.774	314.123	317.511	320.938	324.405	327.913	331.461	335.049	338.677	342.347	346.057	349.807	353.599	357.431	361.304	365.217	369.172	
-85	0.004	300.948	304.183	307.455	310.765	314.115	317.503	320.931	324.399	327.907	331.455	335.043	338.672	342.342	346.052	349.803	353.594	357.427	361.300	365.214	369.168	373.164	
-80	0.007	304.168	307.441	310.752	314.102	317.491	320.920	324.388	327.896	331.445	335.034	338.663	342.333	346.044	349.795	353.587	357.420	361.293	365.208	369.163	373.158	377.195	
-75	0.011	307.420	310.732	314.083	317.473	320.903	324.372	327.881	331.431	335.020	338.650	342.321	346.032	349.784	353.577	357.410	361.284	365.199	369.154	373.150	377.187	381.265	
-70	0.017	310.702	314.055	317.446	320.877	324.348	327.858	331.409	335.000	338.631	342.303	346.015	349.768	353.561	357.395	361.270	365.185	369.141	373.138	377.176	381.254	385.373	
-65	0.026	314.014	317.408	320.841	324.313	327.826	331.378	334.970	338.603	342.276	345.990	349.744	353.538	357.374	361.249	365.166	369.123	373.120	377.159	381.238	385.358	389.519	
-60	0.038	317.353	320.789	324.264	327.779	331.334	334.929	338.564	342.239	345.954	349.710	353.507	357.343	361.220	365.138	369.097	373.095	377.135	381.215	385.336	389.498	393.701	
-55	0.055	320.718	324.197	327.716	331.274	334.872	338.510	342.188	345.906	349.664	353.463	357.302	361.181	365.100	369.061	373.061	377.102	381.184	385.307	389.470	393.674	397.918	
-50	0.077	324.106	327.629	331.192	334.794	338.436	342.118	345.840	349.601	353.403	357.245	361.127	365.049	369.012	373.015	377.058	381.142	385.266	389.431	393.637	397.883	402.170	
-45	0.107	327.514	331.083	334.691	338.339	342.025	345.752	349.518	353.324	357.170	361.056	364.982	368.947	372.953	377.000	381.086	385.213	389.380	393.588	397.836	402.125	406.455	
-40	0.146	330.940	334.556	338.211	341.904	345.637	349.409	353.221	357.072	360.963	364.893	368.863	372.873	376.923	381.013	385.143	389.313	393.524	397.775	402.066	406.399	410.771	
-35	0.197	334.381	338.045	341.748	345.489	349.269	353.088	356.945	360.842	364.779	368.754	372.770	376.824	380.919	385.053	389.227	393.442	397.696	401.991	406.326	410.702	415.118	
-30	0.260	337.835	341.548	345.300	349.090	352.918	356.785	360.690	364.634	368.616	372.638	376.699	380.799	384.939	389.118	393.338	397.597	401.896	406.235	410.614	415.034	419.494	
-25	0.340	341.297	345.062	348.865	352.705	356.582	360.498	364.451	368.443	372.473	376.542	380.649	384.796	388.982	393.207	397.472	401.776	406.120	410.504	414.928	419.392	423.897	
-20	0.438	344.765	348.584	352.439	356.330	360.259	364.224	368.227	372.268	376.347	380.463	384.619	388.812	393.045	397.317	401.627	405.978	410.367	414.797	419.266	423.776	428.326	
-15	0.557	348.237	352.110	356.019	359.964	363.945	367.962	372.016	376.107	380.235	384.401	388.604	392.846	397.127	401.445	405.803	410.200	414.636	419.112	423.628	428.183	432.779	
-10	0.701	351.708	355.639	359.604	363.604	367.638	371.708	375.814	379.957	384.136	388.351	392.605	396.896	401.225	405.592	409.997	414.442	418.925	423.448	428.010	432.612	437.254	
-5	0.873	355.176	359.166	363.189	367.246	371.336	375.460	379.620	383.815	388.046	392.313	396.617	400.958	405.337	409.753	414.207	418.700	423.232	427.802	432.412	437.061	441.750	
-1.49	1.013	357.604	361.637	365.702	369.799	373.930	378.093	382.291	386.524	390.793	395.096	399.437	403.813	408.227	412.679	417.168	421.695	426.261	430.865	435.508	440.191	444.913	
0	1.078	358.637	362.689	366.772	370.887	375.035	379.216	383.431	387.680	391.964	396.284	400.640	405.032	409.461	413.928	418.432	422.974	427.554	432.173	436.831	441.528	446.264	
5	1.317	362.088	366.205	370.350	374.526	378.733	382.972	387.243	391.548	395.887	400.261	404.670	409.115	413.596	418.113	422.668	427.260	431.890	436.559	441.266	446.012	450.796	
10	1.597	365.526	369.709	373.920	378.159	382.427	386.726	391.056	395.418	399.814	404.243	408.706	413.204	417.738	422.308	426.915	431.558	436.239	440.958	445.715	450.510	455.344	
15	1.921	368.945	373.199	377.478	381.782	386.114	390.475	394.865	399.287	403.740	408.226	412.745	417.299	421.887	426.510	431.170	435.865	440.598	445.368	450.176	455.022	459.906	
20	2.294	372.344	376.671	381.020	385.392	389.790	394.215	398.669	403.151	407.664	412.209	416.785	421.395	426.039	430.717	435.431	440.180	444.966	449.788	454.647	459.545	464.480	
25	2.719	375.715	380.120	384.543	388.987	393.453	397.945	402.463	407.009	411.584	416.188	420.824	425.492	430.193	434.927	439.696	444.500	449.340	454.215	459.128	464.077	469.064	
30	3.204	379.055	383.541	388.042	392.560	397.099	401.661	406.246	410.857	415.496	420.163	424.859	429.587	434.346	439.138	443.964	448.824	453.718	458.649	463.615	468.618	473.658	
35	3.751	382.357	386.930	391.513	396.110	400.725	405.359	410.014	414.693	419.398	424.129	428.889	433.678	438.497	443.348	448.232	453.149	458.100	463.086	468.108	473.165	478.259	
40	4.367	385.615	390.280	394.951	399.631	404.325	409.036	413.764	418.514	423.287	428.085	432.909	437.762	442.643	447.555	452.498	457.474	462.483	467.526	472.604	477.717	482.866	
45	5.057	388.820	393.585	398.350	403.120	407.898	412.688	417.493	422.317	427.161	432.028	436.919	441.836	446.782	451.756	456.761	461.797	466.865	471.967	477.102	482.272	487.477	
50	5.827	391.964	396.839	401.705	406.570	411.437	416.311	421.197	426.098	431.016	435.954	440.915	445.900	450.911	455.950	461.018	466.116	471.245	476.406	481.600	486.828	492.091	
55	6.683	395.038	400.034	405.010	409.976	414.938	419.902	424.872	429.853	434.849	439.862	444.894	449.949	455.029	460.134	465.267	470.428	475.620	480.842	486.097	491.385	496.706	
60	7.630	398.030	403.161	408.258	413.334	418.397	423.455	428.515	433.580	438.657	443.747	448.855	453.983	459.132	464.306	469.506	474.733	479.989	485.274	490.591	495.939	501.321	
65	8.676	400.929	406.210	411.440	416.635	421.807	426.966	432.120	437.274	442.436	447.607	452.793	457.997	463.220	468.464	473.733	479.028	484.350	489.700	495.080	500.491	505.934	
70	9.826	403.718	409.171	414.548	419.873	425.162	430.429	435.683	440.932	446.182	451.439	456.707	461.989	467.288	472.606	477.947	483.311	488.701	494.118	499.563	505.038	510.544	
75	11.088	406.380	412.029	417.571	423.038	428.455	433.837	439.199	444.548	449.893	455.240	460.593	465.957	471.335	476.730	482.144	487.580	493.041	498.526	504.038	509.579	515.149	
80	12.470	408.890	414.768	420.496	426.121	431.678	437.186	442.662	448.118	453.564	459.005	464.448	469.897	475.358	480.832	486.323	491.834	497.367	502.923	508.504	514.112	519.749	
85	13.978	411.217	417.367	423.308	429.112	434.822	440.467	446.068	451.638	457.190	462.731	468.268	473.808	479.354	484.911	490.482	496.070	501.678	507.307	512.959	518.637	524.341	
90	15.623	413.319	419.802	425.992	431.997	437.878	443.673	449.409	455.102	460.767	466.414	472.051	477.685	483.322	488.965	494.619	500.287	505.971	511.676	517.401	523.150	528.924	
95	17.413	415.140	422.040	428.525	434.762	440.835	446.796	452.679	458.505	464.291	470.051	475.793	481.526	487.257	492.990	498.730	504.481	510.246	516.028	521.829	527.652	533.498	
100	19.358	416.595	424.042	430.886	437.391	443.682	449.828	455.870	461.840	467.757	473.636	479.490	485.328	491.157	496.984	502.814	508.651	514.499	520.362	526.241	532.139	538.059	
105	21.471	417.556	425.757	433.046	439.868	446.407	452.757	458.977	465.102	471.158	477.166	483.138	489.086	495.019	500.944	506.868	512.795	518.729	524.674	530.634	536.610	542.606	
110	23.765	417.805	427.121	434.973	442.171	448.994	455.575	461.989	468.283	474.490	480.634	486.732	492.796	498.838	504.867	510.888	516.908	522.931	528.963	535.005	541.062	547.136	
115	26.258	416.915	428.052	436.631	444.280	451.430	458.269	464.896	471.375	477.744	484.034	490.265	496.452	502.609	508.745	514.868	520.986	527.102	533.223	539.351	545.492	551.646	
120	28.974	413.758	428.451	437.980	446.168	453.693	460.820	467.684	474.363	480.908	487.354	493.726	500.044	506.322	512.571	518.801	525.020	531.233	537.446	543.664	549.891	556.129	

Thermodynamic properties of R-236fa - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-90	0.002	1.642	1.659	1.676	1.693	1.709	1.725	1.741	1.757	1.773	1.789	1.804	1.819	1.834	1.849	1.864	1.879	1.893	1.908	1.922	1.936	1.950
-85	0.004	1.629	1.646	1.663	1.680	1.696	1.712	1.728	1.744	1.759	1.775	1.790	1.805	1.820	1.835	1.849	1.864	1.878	1.893	1.907	1.921	1.935
-80	0.007	1.619	1.636	1.652	1.668	1.685	1.700	1.716	1.732	1.747	1.762	1.777	1.792	1.807	1.822	1.836	1.851	1.865	1.879	1.893	1.907	1.921
-75	0.011	1.610	1.626	1.643	1.659	1.675	1.690	1.706	1.721	1.737	1.752	1.767	1.781	1.796	1.811	1.825	1.839	1.854	1.868	1.882	1.896	1.909
-70	0.017	1.602	1.618	1.635	1.650	1.666	1.682	1.697	1.712	1.727	1.742	1.757	1.772	1.786	1.801	1.815	1.829	1.844	1.858	1.871	1.885	1.899
-65	0.026	1.596	1.612	1.628	1.643	1.659	1.674	1.690	1.705	1.720	1.734	1.749	1.764	1.778	1.792	1.807	1.821	1.835	1.849	1.862	1.876	1.890
-60	0.038	1.590	1.606	1.622	1.637	1.653	1.668	1.683	1.698	1.713	1.728	1.742	1.757	1.771	1.785	1.799	1.813	1.827	1.841	1.855	1.868	1.882
-55	0.055	1.586	1.602	1.617	1.633	1.648	1.663	1.678	1.693	1.707	1.722	1.736	1.751	1.765	1.779	1.793	1.807	1.821	1.835	1.848	1.862	1.875
-50	0.077	1.582	1.598	1.613	1.629	1.644	1.659	1.674	1.688	1.703	1.717	1.732	1.746	1.760	1.774	1.788	1.802	1.815	1.829	1.843	1.856	1.869
-45	0.107	1.579	1.595	1.610	1.625	1.640	1.655	1.670	1.685	1.699	1.713	1.728	1.742	1.756	1.770	1.784	1.797	1.811	1.825	1.838	1.851	1.865
-40	0.146	1.577	1.593	1.608	1.623	1.638	1.653	1.667	1.682	1.696	1.710	1.725	1.739	1.753	1.766	1.780	1.794	1.807	1.821	1.834	1.847	1.861
-35	0.197	1.576	1.591	1.606	1.621	1.636	1.651	1.665	1.680	1.694	1.708	1.722	1.736	1.750	1.764	1.777	1.791	1.804	1.818	1.831	1.844	1.858
-30	0.260	1.575	1.591	1.606	1.620	1.635	1.650	1.664	1.678	1.693	1.707	1.721	1.734	1.748	1.762	1.775	1.789	1.802	1.816	1.829	1.842	1.855
-25	0.340	1.575	1.590	1.605	1.620	1.634	1.649	1.663	1.677	1.692	1.706	1.719	1.733	1.747	1.761	1.774	1.788	1.801	1.814	1.827	1.840	1.853
-20	0.438	1.576	1.590	1.605	1.620	1.634	1.649	1.663	1.677	1.691	1.705	1.719	1.733	1.746	1.760	1.773	1.787	1.800	1.813	1.826	1.839	1.852
-15	0.557	1.576	1.591	1.606	1.620	1.635	1.649	1.663	1.677	1.691	1.705	1.719	1.733	1.746	1.760	1.773	1.786	1.800	1.813	1.826	1.839	1.852
-10	0.701	1.577	1.592	1.607	1.621	1.636	1.650	1.664	1.678	1.692	1.706	1.720	1.733	1.747	1.760	1.773	1.787	1.800	1.813	1.826	1.839	1.852
-5	0.873	1.579	1.594	1.608	1.623	1.637	1.651	1.665	1.679	1.693	1.707	1.720	1.734	1.747	1.761	1.774	1.787	1.800	1.813	1.826	1.839	1.852
-1.49	1.013	1.580	1.595	1.609	1.624	1.638	1.652	1.666	1.680	1.694	1.708	1.721	1.735	1.748	1.762	1.775	1.788	1.801	1.814	1.827	1.840	1.853
0	1.078	1.581	1.595	1.610	1.624	1.639	1.653	1.667	1.681	1.695	1.708	1.722	1.735	1.749	1.762	1.775	1.788	1.801	1.814	1.827	1.840	1.853
5	1.317	1.583	1.598	1.612	1.626	1.641	1.655	1.669	1.683	1.696	1.710	1.724	1.737	1.750	1.764	1.777	1.790	1.803	1.816	1.829	1.841	1.854
10	1.597	1.585	1.600	1.614	1.629	1.643	1.657	1.671	1.685	1.698	1.712	1.726	1.739	1.752	1.765	1.779	1.792	1.805	1.818	1.830	1.843	1.856
15	1.921	1.588	1.602	1.617	1.631	1.645	1.659	1.673	1.687	1.701	1.714	1.728	1.741	1.754	1.768	1.781	1.794	1.807	1.820	1.832	1.845	1.858
20	2.294	1.591	1.605	1.620	1.634	1.648	1.662	1.676	1.690	1.703	1.717	1.730	1.744	1.757	1.770	1.783	1.796	1.809	1.822	1.835	1.847	1.860
25	2.719	1.593	1.608	1.623	1.637	1.651	1.665	1.679	1.693	1.706	1.720	1.733	1.747	1.760	1.773	1.786	1.799	1.812	1.825	1.837	1.850	1.863
30	3.204	1.596	1.611	1.626	1.640	1.654	1.668	1.682	1.696	1.709	1.723	1.736	1.750	1.763	1.776	1.789	1.802	1.815	1.827	1.840	1.853	1.865
35	3.751	1.600	1.614	1.629	1.643	1.657	1.671	1.685	1.699	1.713	1.726	1.739	1.753	1.766	1.779	1.792	1.805	1.818	1.831	1.843	1.856	1.868
40	4.367	1.603	1.618	1.632	1.647	1.661	1.675	1.689	1.702	1.716	1.729	1.743	1.756	1.769	1.782	1.795	1.808	1.821	1.834	1.846	1.859	1.872
45	5.057	1.606	1.621	1.636	1.650	1.664	1.678	1.692	1.706	1.720	1.733	1.746	1.760	1.773	1.786	1.799	1.812	1.825	1.837	1.850	1.863	1.875
50	5.827	1.609	1.624	1.639	1.653	1.668	1.682	1.696	1.710	1.723	1.737	1.750	1.763	1.776	1.790	1.803	1.815	1.828	1.841	1.854	1.866	1.879
55	6.683	1.612	1.628	1.642	1.657	1.671	1.685	1.699	1.713	1.727	1.740	1.754	1.767	1.780	1.793	1.806	1.819	1.832	1.845	1.857	1.870	1.882
60	7.630	1.616	1.631	1.646	1.660	1.675	1.689	1.703	1.717	1.731	1.744	1.758	1.771	1.784	1.797	1.810	1.823	1.836	1.849	1.861	1.874	1.886
65	8.676	1.619	1.634	1.649	1.664	1.679	1.693	1.707	1.721	1.735	1.748	1.762	1.775	1.788	1.801	1.814	1.827	1.840	1.853	1.865	1.878	1.890
70	9.826	1.621	1.637	1.653	1.668	1.682	1.697	1.711	1.725	1.739	1.752	1.766	1.779	1.792	1.805	1.818	1.831	1.844	1.857	1.869	1.882	1.894
75	11.088	1.624	1.640	1.656	1.671	1.686	1.700	1.715	1.729	1.742	1.756	1.770	1.783	1.796	1.809	1.823	1.835	1.848	1.861	1.874	1.886	1.899
80	12.470	1.627	1.643	1.659	1.674	1.689	1.704	1.718	1.733	1.746	1.760	1.774	1.787	1.801	1.814	1.827	1.840	1.853	1.865	1.878	1.891	1.903
85	13.978	1.629	1.646	1.662	1.678	1.693	1.708	1.722	1.736	1.750	1.764	1.778	1.791	1.805	1.818	1.831	1.844	1.857	1.870	1.882	1.895	1.907
90	15.623	1.630	1.648	1.665	1.681	1.696	1.711	1.726	1.740	1.754	1.768	1.782	1.796	1.809	1.822	1.835	1.848	1.861	1.874	1.887	1.899	1.912
95	17.413	1.631	1.650	1.667	1.684	1.699	1.715	1.729	1.744	1.758	1.772	1.786	1.800	1.813	1.826	1.840	1.853	1.866	1.878	1.891	1.904	1.916
100	19.358	1.632	1.651	1.669	1.686	1.702	1.718	1.733	1.748	1.762	1.776	1.790	1.804	1.817	1.831	1.844	1.857	1.870	1.883	1.896	1.908	1.921
105	21.471	1.631	1.652	1.671	1.689	1.705	1.721	1.736	1.751	1.766	1.780	1.794	1.808	1.822	1.835	1.848	1.861	1.874	1.887	1.900	1.913	1.925
110	23.765	1.628	1.652	1.672	1.691	1.708	1.724	1.740	1.755	1.769	1.784	1.798	1.812	1.826	1.839	1.853	1.866	1.879	1.892	1.905	1.917	1.930
115	26.258	1.623	1.652	1.673	1.692	1.710	1.727	1.743	1.758	1.773	1.788	1.802	1.816	1.830	1.843	1.857	1.870	1.883	1.896	1.909	1.922	1.935
120	28.974	1.613	1.650	1.673	1.694	1.712	1.729	1.745	1.761	1.776	1.791	1.806	1.820	1.834	1.847	1.861	1.874	1.887	1.901	1.913	1.926	1.939

R-245fa

1,1,1,3,3 - PENTAFLUOROPROPANE CF_3-CH_2-CHF_2

Molecular weight (g/mol)	134.05
Melting point (°C)	-102.1
Boiling point (at 1.013 bar)	15.13
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	154.0
Critical pressure (bar absolute)	36.51
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.322
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.920
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.101
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.401
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	13.63
Classification NF-EN 378	B1
GWP (IPCC 4)	1030

Main applications

R-245fa is a hydrofluorocarbon (HFC). It is used for new installations as a specialist refrigerant in industrial air conditioning, air conditioning in buildings, Organic Rankine Cycle (ORC) heat recovery systems and for energy recovery systems at high ambients. It can also be used in high power installations equipped with centrifugal compressors (one or more stages) and can replace HCFC R-123. R-1233zd is an alternative to R-245fa and R-123 in a new installation only.

Commercial specifications

Purity: ≥ 99.5 % weight.
Water content: ≤ 20 ppm weight.
Non-condensable content (gas phase): ≤ 1.5 % volume.
Chlorine ion test (silver nitrate test): negative.
High boiling residues: ≤ 0.01 % volume.
Total Acidity (HCL): ≤ 1 ppm weight.

Oils

Use a polyol ester (POE) oil.
Consult **Climalife** regarding the viscosity of the oil selected for your application and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-245fa are governed by the European Regulation No 517/2014.
The recovery of R-245fa is mandatory under the European Regulation No 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-245fa - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t''	v''	p''	h''	s''	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.000	-100	0.609	1.643	78.244	0.446	-100.0	638.636	0.002	335.895	1.934	257.651
0.000	-95	0.613	1.631	84.238	0.481	-95.0	336.318	0.003	338.985	1.910	254.747
0.001	-90	0.618	1.619	90.218	0.514	-90.0	184.844	0.005	342.121	1.889	251.903
0.001	-85	0.622	1.607	96.189	0.546	-85.0	105.629	0.009	345.300	1.870	249.111
0.002	-80	0.627	1.596	102.156	0.577	-80.0	62.549	0.016	348.523	1.853	246.367
0.003	-75	0.631	1.584	108.125	0.608	-75.0	38.265	0.026	351.788	1.837	243.663
0.005	-70	0.636	1.572	114.099	0.637	-70.0	24.118	0.041	355.094	1.824	240.995
0.008	-65	0.641	1.560	120.081	0.666	-65.0	15.624	0.064	358.438	1.812	238.357
0.013	-60	0.646	1.549	126.076	0.695	-60.0	10.380	0.096	361.819	1.801	235.743
0.019	-55	0.651	1.537	132.087	0.723	-55.0	7.059	0.142	365.235	1.792	233.148
0.028	-50	0.656	1.525	138.117	0.750	-50.0	4.904	0.204	368.684	1.783	230.567
0.040	-45	0.661	1.513	144.169	0.777	-45.0	3.475	0.288	372.163	1.776	227.995
0.057	-40	0.666	1.502	150.244	0.803	-40.0	2.508	0.399	375.671	1.770	225.427
0.079	-35	0.671	1.490	156.347	0.829	-35.0	1.841	0.543	379.204	1.765	222.858
0.109	-30	0.677	1.478	162.478	0.855	-30.0	1.373	0.729	382.761	1.761	220.283
0.146	-25	0.682	1.466	168.641	0.880	-25.0	1.038	0.963	386.339	1.757	217.698
0.194	-20	0.688	1.454	174.837	0.904	-20.0	0.796	1.256	389.936	1.754	215.098
0.254	-15	0.694	1.441	181.069	0.929	-15.0	0.618	1.617	393.549	1.752	212.480
0.328	-10	0.700	1.429	187.339	0.953	-10.0	0.486	2.058	397.177	1.750	209.838
0.419	-5	0.706	1.417	193.649	0.977	-5.0	0.386	2.592	400.817	1.749	207.168
0.529	0	0.712	1.404	200.000	1.000	0.0	0.310	3.230	404.467	1.749	204.467
0.662	5	0.719	1.391	206.395	1.023	5.0	0.251	3.989	408.124	1.748	201.729
0.820	10	0.726	1.378	212.836	1.046	10.0	0.205	4.884	411.786	1.749	198.950
1.008	15	0.732	1.365	219.325	1.069	15.0	0.169	5.930	415.451	1.749	196.125
1.013	15.13	0.733	1.365	219.499	1.069	15.13	0.168	5.960	415.548	1.749	196.050
1.227	20	0.740	1.352	225.865	1.091	20.0	0.140	7.147	419.115	1.750	193.251
1.482	25	0.747	1.339	232.456	1.113	25.0	0.117	8.553	422.777	1.752	190.320
1.778	30	0.755	1.325	239.103	1.135	30.0	0.098	10.169	426.432	1.753	187.329
2.117	35	0.763	1.311	245.807	1.157	35.0	0.083	12.018	430.079	1.755	184.272
2.505	40	0.771	1.297	252.571	1.179	40.0	0.071	14.124	433.713	1.757	181.142
2.945	45	0.780	1.282	259.397	1.201	45.0	0.061	16.513	437.330	1.760	177.932
3.442	50	0.789	1.267	266.290	1.222	50.0	0.052	19.213	440.926	1.762	174.636
4.001	55	0.799	1.252	273.251	1.243	55.0	0.045	22.257	444.496	1.765	171.245
4.626	60	0.809	1.237	280.286	1.264	60.0	0.039	25.679	448.036	1.768	167.750
5.323	65	0.819	1.221	287.397	1.285	65.0	0.034	29.519	451.538	1.771	164.141
6.096	70	0.830	1.204	294.589	1.306	70.0	0.030	33.820	454.996	1.774	160.407
6.951	75	0.842	1.188	301.867	1.327	75.0	0.026	38.632	458.401	1.777	156.534
7.893	80	0.855	1.170	309.237	1.348	80.0	0.023	44.013	461.745	1.780	152.508
8.928	85	0.868	1.152	316.706	1.369	85.0	0.020	50.030	465.017	1.783	148.312
10.061	90	0.882	1.133	324.280	1.389	90.0	0.018	56.763	468.204	1.786	143.924
11.298	95	0.898	1.114	331.969	1.410	95.0	0.016	64.306	471.291	1.788	139.322
12.646	100	0.915	1.093	339.784	1.431	100.0	0.014	72.777	474.259	1.791	134.475
14.110	105	0.933	1.072	347.737	1.452	105.0	0.012	82.319	477.086	1.794	129.349
15.698	110	0.953	1.049	355.846	1.473	110.0	0.011	93.117	479.743	1.796	123.897
17.417	115	0.976	1.025	364.131	1.494	115.0	0.009	105.411	482.192	1.798	118.061
19.275	120	1.001	0.999	372.620	1.515	120.0	0.008	119.528	484.386	1.799	111.765
21.280	125	1.030	0.971	381.353	1.536	125.0	0.007	135.925	486.254	1.800	104.901
23.442	130	1.063	0.940	390.387	1.558	130.0	0.006	155.281	487.699	1.800	97.312
25.773	135	1.104	0.906	399.814	1.581	135.0	0.006	178.676	488.566	1.798	88.752

Thermodynamic properties of R-245fa - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.000	638654.394	657114.546	675571.950	694027.172	712480.649	730932.723	749383.661	767833.674	786282.930	804731.563	823179.682	841627.372	860074.705	878521.738	896968.518	915415.086	933861.472	952307.703	970753.802	989199.788	1007645.676
-95	0.000	336317.983	345771.843	355223.518	364673.447	374121.972	383569.360	393015.822	402461.528	411906.610	421351.178	430795.317	440239.098	449682.580	459125.809	468568.825	478011.660	487454.340	496896.888	506339.322	515781.658	525223.910
-90	0.001	184843.992	189902.342	194958.943	200014.138	205068.195	210121.326	215173.699	220225.449	225276.683	230327.489	235377.937	240428.085	245477.981	250527.663	255577.164	260626.510	265675.724	270724.825	275773.827	280822.745	285871.590
-85	0.001	105629.275	108446.370	111262.055	114076.600	116890.218	119703.076	122515.311	125327.029	128138.319	130949.250	133759.882	136570.261	139380.426	142190.410	145000.240	147809.937	150619.520	153429.005	156238.406	159047.734	161856.997
-80	0.002	62548.870	64176.437	65802.861	67428.354	69053.087	70677.195	72300.785	73923.947	75546.750	77169.253	78791.502	80413.538	82035.393	83657.093	85278.660	86900.114	88521.470	90142.741	91763.938	93385.072	95006.150
-75	0.003	38264.764	39237.362	40209.027	41179.928	42150.202	43119.958	44089.283	45058.250	46026.915	46995.328	47963.526	48931.542	49899.404	50867.133	51834.749	52802.266	53769.699	54737.058	55704.353	56671.593	57638.783
-70	0.005	24118.294	24717.859	25316.657	25914.824	26512.471	27109.686	27706.541	28303.095	28899.394	29495.479	30091.382	30687.130	31282.746	31878.247	32473.650	33068.969	33664.214	34259.395	34854.520	35449.596	36044.630
-65	0.008	15624.421	16004.801	16384.547	16763.769	17142.557	17520.984	17899.107	18276.976	18654.630	19032.102	19409.417	19786.600	20163.669	20540.640	20917.526	21294.338	21671.086	22047.778	22424.421	22801.022	23177.584
-60	0.013	10380.456	10628.287	10875.589	11122.454	11368.955	11615.152	11861.092	12106.817	12352.358	12597.743	12842.995	13088.133	13333.172	13578.126	13823.007	14067.823	14312.583	14557.294	14801.962	15046.592	15291.189
-55	0.019	7058.635	7224.141	7389.204	7553.901	7718.290	7882.421	8046.335	8210.065	8373.638	8537.077	8700.402	8863.627	9026.768	9189.834	9352.836	9515.782	9678.679	9841.532	10004.348	10167.130	10329.883
-50	0.028	4903.812	5016.906	5129.628	5242.039	5354.190	5466.121	5577.867	5689.455	5800.908	5912.246	6023.485	6134.638	6245.717	6356.732	6467.690	6578.599	6689.464	6800.292	6911.086	7021.850	7132.588
-45	0.040	3474.915	3553.864	3632.498	3710.869	3789.017	3866.978	3944.779	4022.445	4099.994	4177.444	4254.808	4332.096	4409.321	4486.488	4563.606	4640.681	4717.718	4794.721	4871.694	4948.640	5025.563
-40	0.057	2507.861	2564.085	2620.040	2675.770	2731.309	2786.687	2841.928	2897.052	2952.075	3007.011	3061.871	3116.667	3171.406	3226.095	3280.741	3335.348	3389.921	3444.465	3498.982	3553.475	3607.947
-35	0.079	1840.857	1881.650	1922.213	1962.582	2002.786	2042.852	2082.799	2122.643	2162.400	2202.082	2241.697	2281.256	2320.764	2360.228	2399.654	2439.046	2478.408	2517.743	2557.055	2596.345	2635.616
-30	0.109	1372.628	1402.746	1432.665	1462.416	1492.026	1521.514	1550.900	1580.196	1609.416	1638.569	1667.664	1696.709	1725.710	1754.672	1783.599	1812.497	1841.368	1870.214	1899.040	1927.847	1956.636
-25	0.146	1038.498	1061.100	1083.530	1105.815	1127.976	1150.031	1171.996	1193.883	1215.703	1237.464	1259.174	1280.839	1302.466	1324.058	1345.619	1367.154	1388.664	1410.153	1431.623	1453.076	1474.513
-20	0.194	796.385	813.609	830.683	847.630	864.469	881.215	897.882	914.480	931.018	947.505	963.947	980.349	996.716	1013.053	1029.362	1045.647	1061.911	1078.155	1094.382	1110.594	1126.791
-15	0.254	618.424	631.740	644.924	657.997	670.975	683.871	696.697	709.462	722.174	734.841	747.467	760.059	772.619	785.151	797.659	810.145	822.612	835.061	847.495	859.915	872.323
-10	0.328	485.858	496.293	506.612	516.832	526.968	537.032	547.034	556.982	566.883	576.743	586.567	596.360	606.124	615.864	625.582	635.280	644.961	654.626	664.277	673.915	683.541
-5	0.419	385.865	394.147	402.327	410.418	418.435	426.388	434.286	442.135	449.942	457.713	465.451	473.161	480.846	488.509	496.152	503.777	511.386	518.980	526.562	534.132	541.692
0	0.529	309.554	316.207	322.768	329.251	335.667	342.026	348.336	354.602	360.831	367.027	373.193	379.334	385.453	391.551	397.631	403.695	409.744	415.781	421.805	427.819	433.824
5	0.662	250.671	256.077	261.400	266.653	271.846	276.987	282.084	287.142	292.167	297.161	302.129	307.074	311.999	316.904	321.794	326.669	331.531	336.380	341.219	346.048	350.869
10	0.820	204.766	209.205	213.570	217.872	222.119	226.321	230.482	234.607	238.702	242.770	246.814	250.838	254.842	258.829	262.802	266.761	270.708	274.644	278.570	282.487	286.396
15	1.008	168.629	172.312	175.927	179.486	182.995	186.462	189.893	193.292	196.662	200.008	203.333	206.638	209.926	213.198	216.457	219.703	222.939	226.164	229.380	232.588	235.788
15.13	1.013	167.778	171.443	175.040	178.581	182.073	185.523	188.937	192.318	195.672	199.001	202.309	205.597	208.868	212.124	215.366	218.596	221.814	225.023	228.222	231.413	234.597
20	1.227	139.921	143.006	146.030	149.001	151.928	154.817	157.672	160.498	163.298	166.076	168.834	171.575	174.299	177.010	179.708	182.394	185.070	187.737	190.396	193.047	195.690
25	1.482	116.917	119.525	122.077	124.581	127.045	129.473	131.870	134.241	136.588	138.915	141.224	143.516	145.793	148.058	150.311	152.553	154.786	157.010	159.227	161.436	163.639
30	1.778	98.334	100.558	102.730	104.859	106.950	109.009	111.039	113.045	115.029	116.994	118.943	120.876	122.796	124.703	126.600	128.487	130.366	132.236	134.099	135.955	137.805
35	2.117	83.206	85.119	86.984	88.808	90.598	92.357	94.091	95.802	97.492	99.165	100.823	102.466	104.097	105.717	107.326	108.927	110.519	112.104	113.682	115.254	116.820
40	2.505	70.801	72.459	74.073	75.649	77.193	78.709	80.200	81.671	83.122	84.557	85.978	87.386	88.782	90.167	91.543	92.911	94.270	95.623	96.970	98.310	99.645
45	2.945	60.559	62.008	63.415	64.787	66.129	67.444	68.737	70.010	71.266	72.506	73.732	74.946	76.150	77.343	78.528	79.705	80.874	82.037	83.194	84.345	85.492
50	3.442	52.047	53.323	54.559	55.762	56.937	58.086	59.215	60.325	61.418	62.497	63.563	64.618	65.663	66.698	67.725	68.744	69.757	70.763	71.764	72.759	73.750
55	4.001	44.929	46.061	47.155	48.217	49.252	50.264	51.256	52.230	53.189	54.134	55.067	55.989	56.902	57.805	58.701	59.590	60.472	61.349	62.220	63.086	63.947
60	4.626	38.942	39.953	40.928	41.872	42.791	43.687	44.565	45.425	46.271	47.104	47.926	48.737	49.539	50.333	51.120	51.899	52.673	53.441	54.203	54.962	55.715
65	5.323	33.877	34.786	35.661	36.506	37.327	38.126	38.908	39.673	40.424	41.163	41.891	42.609	43.318	44.019	44.714	45.402	46.084	46.760	47.432	48.100	48.763
70	6.096	29.569	30.393	31.183	31.945	32.682	33.400	34.099	34.784	35.455	36.114	36.762	37.402	38.032	38.656	39.272	39.883	40.488	41.087	41.682	42.273	42.860
75	6.951	25.885	26.638	27.356	28.047	28.714	29.362	29.992	30.608	31.211	31.802	32.383	32.955	33.520	34.076	34.627	35.171	35.711	36.245	36.775	37.300	37.822
80	7.893	22.721	23.412	24.070	24.700	25.307	25.895	26.467	27.024	27.568	28.102	28.625	29.140	29.648	30.148	30.642	31.130	31.613	32.092	32.566	33.036	33.502
85	8.928	19.988	20.628	21.234	21.813	22.369	22.906	23.427	23.934	24.428	24.912	25.386	25.852	26.311	26.762	27.208	27.648	28.083	28.513	28.939	29.362	29.781
90	10.061	17.617	18.214	18.777	19.312	19.824	20.318	20.795	21.258	21.710	22.151	22.582	23.006	23.422	23.832	24.235	24.634	25.027	25.416	25.801	26.183	26.561
95	11.298	15.551	16.112	16.637	17.135	17.610	18.066	18.506	18.932	19.346	19.750	20.145	20.532	20.911	21.285	21.652	22.015	22.372	22.725	23.075	23.420	23.763
100	12.646	13.741	14.273	14.768	15.233	15.676	16.100	16.507	16.901	17.283	17.655	18.018	18.373	18.720	19.062	19.398	19.729	20.056	20.378	20.696	21.011	21.322
105	14.110	12.148	12.657	13.126	13.565	13.980	14.376	14.755	15.121	15.475	15.819	16.154	16.481	16.801	17.116	17.424	17.728	18.027	18.322	18.613	18.900	19.185
110	15.698	10.739	11.231	11.680	12.096	12.488	12.860	13.215	13.556	13.886	14.205	14.516	14.818	15.114	15.404	15.689	15.968	16.243	16.514	16.782	17.046	17.307
115	17.417	9.487	9.967	10.400	10.798	11.170	11.521	11.855	12.175	12.483	12.781	13.070	13.352	13.626	13.895	14.158	14.416	14.670	14.920	15.167	15.410	15.650
120	19.275	8.366	8.842	9.263	9.646	10.001	10.335	10.651	10.952	11.241	11.520	11.791	12.053	12.309	12.559	12.803	13.043	13.278	13.510	13.737	13.962	14.183
125	21.280	7.357	7.835	8.249	8.621	8.962	9.280	9.580	9.866	10.138	10.401	10.654	10.900	11.139	11.372	11.600	11.823	12.042	12.257	12.468	12.676	12.881
130	23.442	6.440	6.930	7.342	7.705	8.035	8.340	8.627	8.898	9.156	9.403	9.642	9.873	10.097	10.315	10.528	10.736	10.940	11.140	11.337	11.530	11.721
135	25.773	5.597	6.112	6.526	6.884	7.205	7.500	7.774	8.032	8.277	8.512	8.737	8.955	9.166	9.370	9.570	9.765	9.955	10.142	10.326	10.506	10.683

Thermodynamic properties of R-245fa - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.000	335.895	338.994	342.142	345.339	348.584	351.879	355.224	358.619	362.065	365.561	369.107	372.703	376.349	380.046	383.792	387.588	391.433	395.328	399.271	403.263	407.303
-95	0.000	338.985	342.134	345.332	348.579	351.875	355.220	358.616	362.062	365.558	369.104	372.701	376.347	380.044	383.791	387.587	391.432	395.327	399.270	403.262	407.302	411.391
-90	0.001	342.121	345.320	348.569	351.866	355.213	358.610	362.056	365.553	369.100	372.697	376.344	380.041	383.788	387.584	391.430	395.325	399.269	403.261	407.301	411.389	415.525
-85	0.001	345.300	348.552	351.851	355.200	358.599	362.047	365.545	369.093	372.690	376.338	380.036	383.783	387.580	391.426	395.322	399.265	403.258	407.298	411.387	415.523	419.706
-80	0.002	348.523	351.827	355.179	358.580	362.031	365.531	369.080	372.680	376.329	380.028	383.776	387.574	391.420	395.316	399.261	403.253	407.294	411.383	415.520	419.703	423.934
-75	0.003	351.788	355.146	358.551	362.006	365.509	369.061	372.663	376.314	380.014	383.764	387.563	391.411	395.307	399.253	403.246	407.288	411.377	415.514	419.698	423.929	428.207
-70	0.005	355.094	358.506	361.966	365.474	369.031	372.636	376.290	379.993	383.745	387.546	391.396	395.294	399.240	403.235	407.278	411.368	415.506	419.690	423.922	428.200	432.524
-65	0.008	358.438	361.907	365.422	368.985	372.596	376.255	379.962	383.717	387.521	391.373	395.273	399.222	403.218	407.262	411.354	415.493	419.678	423.911	428.190	432.515	436.886
-60	0.013	361.819	365.346	368.918	372.537	376.202	379.915	383.675	387.483	391.339	395.243	399.194	403.193	407.240	411.333	415.474	419.661	423.895	428.175	432.501	436.873	441.290
-55	0.019	365.235	368.821	372.451	376.127	379.848	383.616	387.430	391.291	395.200	399.155	403.158	407.207	411.303	415.446	419.636	423.872	428.153	432.481	436.854	441.273	445.737
-50	0.028	368.684	372.331	376.020	379.753	383.531	387.354	391.223	395.138	399.100	403.107	407.161	411.261	415.408	419.600	423.839	428.123	432.453	436.828	441.249	445.714	450.224
-45	0.040	372.163	375.872	379.622	383.414	387.250	391.130	395.054	399.023	403.038	407.098	411.204	415.355	419.552	423.794	428.082	432.415	436.793	441.215	445.683	450.195	454.751
-40	0.057	375.671	379.444	383.256	387.108	391.002	394.939	398.919	402.944	407.012	411.125	415.283	419.486	423.733	428.025	432.362	436.744	441.170	445.641	450.155	454.714	459.317
-35	0.079	379.204	383.043	386.918	390.832	394.786	398.781	402.818	406.898	411.021	415.187	419.398	423.652	427.950	432.293	436.679	441.110	445.585	450.103	454.665	459.270	463.920
-30	0.109	382.761	386.667	390.607	394.583	398.598	402.652	406.747	410.883	415.062	419.282	423.546	427.852	432.202	436.595	441.031	445.511	450.034	454.600	459.210	463.862	468.558
-25	0.146	386.339	390.314	394.320	398.361	402.438	406.552	410.705	414.899	419.133	423.408	427.725	432.084	436.485	440.929	445.416	449.945	454.516	459.131	463.788	468.488	473.230
-20	0.194	389.936	393.982	398.056	402.162	406.302	410.477	414.690	418.941	423.232	427.562	431.933	436.345	440.799	445.294	449.831	454.410	459.031	463.694	468.398	473.145	477.934
-15	0.254	393.549	397.668	401.811	405.984	410.188	414.426	418.699	423.009	427.357	431.743	436.169	440.635	445.141	449.688	454.276	458.904	463.575	468.286	473.039	477.834	482.669
-10	0.328	397.177	401.370	405.585	409.825	414.095	418.396	422.731	427.100	431.506	435.949	440.430	444.950	449.509	454.108	458.747	463.427	468.147	472.907	477.708	482.551	487.434
-5	0.419	400.817	405.086	409.373	413.683	418.020	422.385	426.782	431.212	435.677	440.177	444.714	449.289	453.902	458.553	463.244	467.974	472.744	477.554	482.404	487.295	492.225
0	0.529	404.467	408.813	413.175	417.556	421.960	426.391	430.852	435.343	439.867	444.425	449.019	453.649	458.316	463.021	467.764	472.546	477.366	482.226	487.125	492.064	497.042
5	0.662	408.124	412.550	416.987	421.440	425.914	430.412	434.937	439.490	444.075	448.692	453.343	458.029	462.751	467.510	472.306	477.139	482.011	486.920	491.869	496.856	501.883
10	0.820	411.786	416.294	420.808	425.335	429.879	434.445	439.035	443.652	448.298	452.975	457.684	462.427	467.204	472.017	476.866	481.752	486.675	491.635	496.634	501.670	506.745
15	1.008	415.451	420.042	424.635	429.237	433.853	438.488	443.144	447.826	452.534	457.271	462.040	466.840	471.674	476.541	481.444	486.383	491.358	496.369	501.418	506.504	511.627
15.13	1.013	415.548	420.142	424.737	429.341	433.959	438.596	443.254	447.937	452.647	457.386	462.156	466.958	471.793	476.662	481.566	486.506	491.483	496.495	501.545	506.633	511.757
20	1.227	419.115	423.792	428.466	433.144	437.834	442.539	447.263	452.009	456.781	461.580	466.408	471.266	476.157	481.080	486.037	491.029	496.057	501.120	506.219	511.355	516.528
25	1.482	422.777	427.541	432.297	437.054	441.819	446.595	451.388	456.201	461.037	465.898	470.786	475.704	480.652	485.631	490.644	495.690	500.770	505.885	511.036	516.222	521.444
30	1.778	426.432	431.286	436.127	440.964	445.805	450.654	455.517	460.397	465.298	470.223	475.173	480.150	485.156	490.193	495.261	500.362	505.496	510.663	515.865	521.103	526.375
35	2.117	430.079	435.025	439.952	444.871	449.790	454.714	459.648	464.597	469.564	474.553	479.565	484.603	489.669	494.763	499.888	505.044	510.232	515.452	520.707	525.995	531.318
40	2.505	433.713	438.753	443.770	448.773	453.771	458.771	463.778	468.797	473.832	478.886	483.961	489.061	494.186	499.339	504.521	509.733	514.976	520.251	525.558	530.898	536.272
45	2.945	437.330	442.468	447.576	452.666	457.745	462.823	467.904	472.995	478.098	483.219	488.359	493.521	498.707	503.920	509.160	514.428	519.727	525.056	530.416	535.809	541.235
50	3.442	440.926	446.166	451.368	456.546	461.709	466.867	472.024	477.187	482.361	487.550	492.755	497.981	503.229	508.502	513.801	519.127	524.482	529.866	535.281	540.727	546.205
55	4.001	444.496	449.842	455.142	460.411	465.661	470.899	476.135	481.373	486.618	491.876	497.148	502.439	507.750	513.084	518.442	523.827	529.239	534.679	540.149	545.648	551.179
60	4.626	448.036	453.491	458.893	464.256	469.595	474.917	480.233	485.547	490.866	496.194	501.535	506.892	512.267	517.663	523.083	528.526	533.996	539.493	545.018	550.572	556.157
65	5.323	451.538	457.108	462.616	468.078	473.508	478.918	484.315	489.708	495.102	500.502	505.913	511.337	516.778	522.238	527.719	533.223	538.751	544.306	549.887	555.497	561.135
70	6.096	454.996	460.688	466.306	471.871	477.396	482.896	488.378	493.852	499.323	504.798	510.280	515.773	521.280	526.805	532.349	537.914	543.503	549.116	554.755	560.420	566.113
75	6.951	458.401	464.223	469.958	475.630	481.255	486.848	492.418	497.976	503.526	509.077	514.632	520.196	525.771	531.362	536.971	542.599	548.248	553.920	559.617	565.340	571.089
80	7.893	461.745	467.706	473.565	479.350	485.080	490.770	496.431	502.075	507.708	513.337	518.967	524.603	530.249	535.907	541.581	547.273	552.985	558.718	564.474	570.254	576.060
85	8.928	465.017	471.127	477.120	483.025	488.864	494.656	500.413	506.146	511.864	517.574	523.282	528.993	534.710	540.438	546.179	551.936	557.711	563.506	569.322	575.161	581.024
90	10.061	468.204	474.478	480.614	486.647	492.603	498.502	504.359	510.185	515.992	521.785	527.573	533.361	539.152	544.951	550.761	556.584	562.424	568.282	574.160	580.059	585.981
95	11.298	471.291	477.747	484.039	490.209	496.290	502.302	508.263	514.188	520.086	525.967	531.838	537.704	543.571	549.444	555.324	561.216	567.122	573.045	578.985	584.946	590.927
100	12.646	474.259	480.918	487.382	493.703	499.916	506.049	512.121	518.148	524.143	530.115	536.071	542.020	547.966	553.913	559.866	565.829	571.803	577.791	583.796	589.819	595.861
105	14.110	477.086	483.978	490.633	497.118	503.475	509.737	515.927	522.062	528.158	534.224	540.271	546.304	552.331	558.357	564.385	570.420	576.463	582.519	588.590	594.676	600.781
110	15.698	479.743	486.905	493.777	500.442	506.957	513.358	519.673	525.924	532.126	538.292	544.432	550.554	556.665	562.771	568.877	574.986	581.101	587.227	593.364	599.516	605.684
115	17.417	482.192	489.676	496.796	503.665	510.352	516.904	523.354	529.728	536.042	542.313	548.551	554.765	560.964	567.154	573.339	579.525	585.714	591.911	598.118	604.336	610.570
120	19.275	484.386	492.262	499.671	506.770	513.649	520.366	526.962	533.466	539.900	546.281	552.622	558.933	565.224	571.500	577.768	584.033	590.299	596.569	602.847	609.134	615.434
125	21.280	486.254	494.626	502.379	509.742	516.834	523.733	530.487	537.133	543.694	550.192	556.642	563.054	569.440	575.807	582.161	588.508	594.852	601.198	607.549	613.907	620.275
130	23.442	487.699	496.720	504.892	512.560	519.895	526.995	533.922	540.719	547.418	554.040	560.604	567.123	573.608	580.069	586.513	592.945	599.371	605.795	612.221	618.652	625.090
135	25.773	488.566	498.485	507.176	515.205	522.815	530.139	537.255	544.217	551.062	557.817	564.502	571.133	577.724	584.283	590.820	597.340	603.851	610.356	616.859	623.365	629.876

Thermodynamic properties of R-245fa - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.000	1.934	1.952	1.970	1.987	2.004	2.021	2.037	2.054	2.070	2.086	2.102	2.118	2.134	2.150	2.165	2.181	2.196	2.211	2.227	2.242	2.257
-95	0.000	1.910	1.928	1.945	1.962	1.979	1.996	2.012	2.029	2.045	2.061	2.077	2.093	2.108	2.124	2.139	2.155	2.170	2.185	2.200	2.215	2.230
-90	0.001	1.889	1.906	1.923	1.940	1.957	1.973	1.990	2.006	2.022	2.038	2.054	2.069	2.085	2.100	2.116	2.131	2.146	2.161	2.176	2.191	2.206
-85	0.001	1.870	1.887	1.904	1.920	1.937	1.953	1.970	1.986	2.002	2.017	2.033	2.049	2.064	2.079	2.095	2.110	2.125	2.140	2.155	2.169	2.184
-80	0.002	1.853	1.870	1.886	1.903	1.919	1.935	1.951	1.967	1.983	1.999	2.015	2.030	2.045	2.061	2.076	2.091	2.106	2.120	2.135	2.150	2.164
-75	0.003	1.837	1.854	1.871	1.887	1.903	1.919	1.935	1.951	1.967	1.982	1.998	2.013	2.028	2.044	2.059	2.074	2.088	2.103	2.118	2.132	2.147
-70	0.005	1.824	1.840	1.857	1.873	1.889	1.905	1.921	1.937	1.952	1.968	1.983	1.998	2.013	2.028	2.043	2.058	2.073	2.088	2.102	2.117	2.131
-65	0.008	1.812	1.828	1.844	1.861	1.877	1.892	1.908	1.924	1.939	1.955	1.970	1.985	2.000	2.015	2.030	2.045	2.059	2.074	2.088	2.103	2.117
-60	0.013	1.801	1.817	1.833	1.850	1.865	1.881	1.897	1.912	1.928	1.943	1.958	1.973	1.988	2.003	2.018	2.032	2.047	2.061	2.076	2.090	2.104
-55	0.019	1.792	1.808	1.824	1.840	1.856	1.871	1.887	1.902	1.918	1.933	1.948	1.963	1.978	1.992	2.007	2.022	2.036	2.050	2.065	2.079	2.093
-50	0.028	1.783	1.800	1.816	1.831	1.847	1.863	1.878	1.893	1.909	1.924	1.939	1.954	1.968	1.983	1.998	2.012	2.026	2.041	2.055	2.069	2.083
-45	0.040	1.776	1.792	1.808	1.824	1.840	1.855	1.870	1.886	1.901	1.916	1.931	1.945	1.960	1.975	1.989	2.004	2.018	2.032	2.046	2.060	2.074
-40	0.057	1.770	1.786	1.802	1.818	1.833	1.849	1.864	1.879	1.894	1.909	1.924	1.939	1.953	1.968	1.982	1.996	2.011	2.025	2.039	2.053	2.067
-35	0.079	1.765	1.781	1.797	1.812	1.828	1.843	1.858	1.873	1.888	1.903	1.918	1.933	1.947	1.962	1.976	1.990	2.004	2.018	2.032	2.046	2.060
-30	0.109	1.761	1.777	1.792	1.808	1.823	1.838	1.854	1.869	1.883	1.898	1.913	1.927	1.942	1.956	1.971	1.985	1.999	2.013	2.027	2.041	2.055
-25	0.146	1.757	1.773	1.789	1.804	1.819	1.835	1.850	1.865	1.879	1.894	1.909	1.923	1.938	1.952	1.966	1.980	1.994	2.008	2.022	2.036	2.050
-20	0.194	1.754	1.770	1.786	1.801	1.816	1.831	1.846	1.861	1.876	1.891	1.905	1.920	1.934	1.948	1.962	1.977	1.991	2.004	2.018	2.032	2.046
-15	0.254	1.752	1.768	1.783	1.799	1.814	1.829	1.844	1.859	1.874	1.888	1.903	1.917	1.931	1.945	1.960	1.974	1.987	2.001	2.015	2.029	2.042
-10	0.328	1.750	1.766	1.782	1.797	1.812	1.827	1.842	1.857	1.872	1.886	1.901	1.915	1.929	1.943	1.957	1.971	1.985	1.999	2.013	2.026	2.040
-5	0.419	1.749	1.765	1.780	1.796	1.811	1.826	1.841	1.856	1.870	1.885	1.899	1.913	1.928	1.942	1.956	1.969	1.983	1.997	2.011	2.024	2.038
0	0.529	1.749	1.764	1.780	1.795	1.810	1.825	1.840	1.855	1.869	1.884	1.898	1.912	1.927	1.941	1.954	1.968	1.982	1.996	2.009	2.023	2.036
5	0.662	1.748	1.764	1.780	1.795	1.810	1.825	1.840	1.855	1.869	1.884	1.898	1.912	1.926	1.940	1.954	1.968	1.981	1.995	2.009	2.022	2.035
10	0.820	1.749	1.764	1.780	1.795	1.810	1.825	1.840	1.855	1.869	1.884	1.898	1.912	1.926	1.940	1.954	1.968	1.981	1.995	2.008	2.022	2.035
15	1.008	1.749	1.765	1.781	1.796	1.811	1.826	1.841	1.855	1.870	1.884	1.898	1.912	1.926	1.940	1.954	1.968	1.981	1.995	2.008	2.022	2.035
15.13	1.013	1.749	1.765	1.781	1.796	1.811	1.826	1.841	1.855	1.870	1.884	1.898	1.912	1.926	1.940	1.954	1.968	1.981	1.995	2.008	2.022	2.035
20	1.227	1.750	1.766	1.782	1.797	1.812	1.827	1.842	1.856	1.871	1.885	1.899	1.913	1.927	1.941	1.955	1.969	1.982	1.996	2.009	2.022	2.036
25	1.482	1.752	1.768	1.783	1.798	1.814	1.828	1.843	1.858	1.872	1.886	1.901	1.915	1.929	1.942	1.956	1.970	1.983	1.997	2.010	2.023	2.036
30	1.778	1.753	1.769	1.785	1.800	1.815	1.830	1.845	1.859	1.874	1.888	1.902	1.916	1.930	1.944	1.957	1.971	1.985	1.998	2.011	2.025	2.038
35	2.117	1.755	1.771	1.787	1.802	1.817	1.832	1.847	1.861	1.876	1.890	1.904	1.918	1.932	1.946	1.959	1.973	1.986	2.000	2.013	2.026	2.039
40	2.505	1.757	1.773	1.789	1.804	1.820	1.834	1.849	1.864	1.878	1.892	1.906	1.920	1.934	1.948	1.961	1.975	1.988	2.002	2.015	2.028	2.041
45	2.945	1.760	1.776	1.791	1.807	1.822	1.837	1.852	1.866	1.880	1.895	1.909	1.923	1.936	1.950	1.964	1.977	1.991	2.004	2.017	2.030	2.043
50	3.442	1.762	1.778	1.794	1.810	1.825	1.840	1.854	1.869	1.883	1.897	1.911	1.925	1.939	1.953	1.966	1.980	1.993	2.006	2.020	2.033	2.046
55	4.001	1.765	1.781	1.797	1.812	1.828	1.843	1.857	1.872	1.886	1.900	1.914	1.928	1.942	1.956	1.969	1.983	1.996	2.009	2.022	2.035	2.048
60	4.626	1.768	1.784	1.800	1.815	1.831	1.846	1.860	1.875	1.889	1.903	1.917	1.931	1.945	1.959	1.972	1.986	1.999	2.012	2.025	2.038	2.051
65	5.323	1.771	1.787	1.803	1.819	1.834	1.849	1.864	1.878	1.892	1.907	1.921	1.935	1.948	1.962	1.975	1.989	2.002	2.015	2.028	2.042	2.054
70	6.096	1.774	1.790	1.806	1.822	1.837	1.852	1.867	1.881	1.896	1.910	1.924	1.938	1.952	1.965	1.979	1.992	2.006	2.019	2.032	2.045	2.058
75	6.951	1.777	1.793	1.809	1.825	1.840	1.856	1.870	1.885	1.899	1.914	1.928	1.942	1.955	1.969	1.982	1.996	2.009	2.022	2.035	2.048	2.061
80	7.893	1.780	1.796	1.813	1.829	1.844	1.859	1.874	1.889	1.903	1.917	1.931	1.945	1.959	1.973	1.986	1.999	2.013	2.026	2.039	2.052	2.065
85	8.928	1.783	1.800	1.816	1.832	1.847	1.863	1.878	1.892	1.907	1.921	1.935	1.949	1.963	1.976	1.990	2.003	2.016	2.030	2.043	2.056	2.068
90	10.061	1.786	1.803	1.819	1.835	1.851	1.866	1.881	1.896	1.911	1.925	1.939	1.953	1.967	1.980	1.994	2.007	2.020	2.033	2.047	2.059	2.072
95	11.298	1.788	1.806	1.823	1.839	1.855	1.870	1.885	1.900	1.914	1.929	1.943	1.957	1.971	1.984	1.998	2.011	2.024	2.037	2.051	2.063	2.076
100	12.646	1.791	1.809	1.826	1.842	1.858	1.874	1.889	1.904	1.918	1.933	1.947	1.961	1.975	1.988	2.002	2.015	2.028	2.042	2.055	2.067	2.080
105	14.110	1.794	1.812	1.829	1.846	1.862	1.877	1.893	1.908	1.922	1.937	1.951	1.965	1.979	1.992	2.006	2.019	2.033	2.046	2.059	2.072	2.084
110	15.698	1.796	1.814	1.832	1.849	1.865	1.881	1.896	1.911	1.926	1.941	1.955	1.969	1.983	1.996	2.010	2.023	2.037	2.050	2.063	2.076	2.089
115	17.417	1.798	1.817	1.835	1.852	1.869	1.884	1.900	1.915	1.930	1.945	1.959	1.973	1.987	2.001	2.014	2.028	2.041	2.054	2.067	2.080	2.093
120	19.275	1.799	1.819	1.838	1.855	1.872	1.888	1.904	1.919	1.934	1.948	1.963	1.977	1.991	2.005	2.018	2.032	2.045	2.058	2.071	2.084	2.097
125	21.280	1.800	1.821	1.840	1.858	1.875	1.891	1.907	1.923	1.938	1.952	1.967	1.981	1.995	2.009	2.023	2.036	2.049	2.063	2.076	2.089	2.101
130	23.442	1.800	1.822	1.842	1.860	1.878	1.894	1.911	1.926	1.941	1.956	1.971	1.985	1.999	2.013	2.027	2.040	2.054	2.067	2.080	2.093	2.106
135	25.773	1.798	1.823	1.843	1.863	1.880	1.897	1.914	1.930	1.945	1.960	1.975	1.989	2.003	2.017	2.031	2.044	2.058	2.071	2.084	2.097	2.110

R-404A

Zeotropic blend (52 % R-143a - 44 % R-125 - 4 % R-134a)

Molecular weight (g/mol)	97.60
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-46.23
Temperature glide at 1.013 bar (K)	0.75
Critical temperature (°C)	72.0
Critical pressure (bar absolute)	37.29
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.542
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.877
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.118
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.128
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	4.49
Classification NF-EN 378	A1
GWP (IPCC 4)	3922

Main applications

R-404A is a "near azeotropic" HFC replacement blend, specially developed for commercial, industrial and transport refrigeration. R-404A was mainly used in new refrigeration units in supermarkets, refrigerated storage rooms, food refrigerating systems, cold cabinets for the storage of refrigerated food and for refrigerated vehicles.
R-448A and R-407F are simple alternatives to R-404A in direct expansion systems.

Commercial specifications

Composition: (52 % R-143a - 44 % R-125 - 4 % R-134a) (±1 % / ±2 % / ± 2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-404A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm³/kg)	(kg/dm³)	(kJ/kg)	(kJ/kg.K)	(°C)	(m³/kg)	(kg/m³)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.143	-80	0.711	1.407	97.807	0.561	-78.97	1.143	0.875	319.791	1.708	221.984
0.201	-75	0.718	1.392	103.881	0.592	-74.02	0.831	1.203	322.813	1.695	218.932
0.277	-70	0.726	1.378	109.968	0.622	-69.07	0.616	1.623	325.846	1.683	215.879
0.374	-65	0.734	1.363	116.076	0.652	-64.11	0.464	2.153	328.885	1.673	212.809
0.498	-60	0.742	1.348	122.212	0.681	-59.15	0.355	2.813	331.924	1.664	209.712
0.652	-55	0.750	1.333	128.383	0.710	-54.19	0.276	3.624	334.957	1.655	206.574
0.842	-50	0.759	1.318	134.593	0.738	-49.22	0.217	4.608	337.978	1.648	203.385
1.013	-46.23	0.766	1.306	139.308	0.759	-45.48	0.182	5.481	340.246	1.643	200.938
1.074	-45	0.768	1.302	140.847	0.765	-44.26	0.173	5.792	340.981	1.642	200.134
1.353	-40	0.777	1.287	147.152	0.793	-39.29	0.139	7.202	343.960	1.636	196.808
1.685	-35	0.787	1.271	153.511	0.819	-34.32	0.113	8.868	346.909	1.631	193.398
2.078	-30	0.797	1.255	159.930	0.846	-29.34	0.092	10.824	349.820	1.626	189.890
2.537	-25	0.807	1.239	166.413	0.872	-24.37	0.076	13.105	352.688	1.622	186.275
3.071	-20	0.818	1.222	172.966	0.898	-19.4	0.063	15.752	355.504	1.619	182.537
3.686	-15	0.830	1.205	179.595	0.924	-14.42	0.053	18.807	358.260	1.615	178.665
4.391	-10	0.842	1.187	186.305	0.949	-9.44	0.045	22.323	360.948	1.613	174.642
5.194	-5	0.856	1.169	193.105	0.975	-4.47	0.038	26.355	363.557	1.610	170.452
6.102	0	0.870	1.150	200.000	1.000	0.51	0.032	30.969	366.075	1.608	166.075
7.125	5	0.884	1.131	207.001	1.025	5.49	0.028	36.243	368.487	1.605	161.486
8.271	10	0.901	1.110	214.117	1.050	10.47	0.024	42.266	370.777	1.603	156.659
9.550	15	0.918	1.089	221.362	1.075	15.45	0.020	49.148	372.924	1.601	151.562
10.972	20	0.937	1.067	228.749	1.100	20.43	0.018	57.023	374.904	1.598	146.155
12.546	25	0.958	1.044	236.297	1.125	25.4	0.015	66.055	376.691	1.596	140.394
14.283	30	0.981	1.019	244.029	1.150	30.38	0.013	76.458	378.249	1.593	134.220
16.195	35	1.007	0.993	251.974	1.176	35.36	0.011	88.510	379.533	1.589	127.558
18.294	40	1.037	0.965	260.172	1.201	40.34	0.010	102.591	380.482	1.585	120.311
20.593	45	1.071	0.934	268.677	1.227	45.31	0.008	119.244	381.012	1.580	112.335
23.106	50	1.112	0.899	277.573	1.254	50.28	0.007	139.291	380.993	1.574	103.420
25.851	55	1.163	0.860	286.992	1.282	55.25	0.006	164.092	380.212	1.566	93.220
28.849	60	1.230	0.813	297.181	1.312	60.22	0.005	196.197	378.278	1.555	81.097
32.126	65	1.328	0.753	308.712	1.345	65.18	0.004	241.607	374.283	1.539	65.572
35.725	70	1.526	0.655	323.957	1.388	70.11	0.003	324.822	364.663	1.507	40.706

Thermodynamic properties of R-404A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-80	0.133	1224.686	1258.080	1291.323	1324.433	1357.426	1390.317	1423.122	1455.850	1488.513	1521.119	1553.675	1586.188	1618.664	1651.107	1683.521	1715.909	1748.274	1780.619	1812.946	1845.257	1877.553
-75	0.188	884.114	907.894	931.550	955.096	978.544	1001.907	1025.196	1048.420	1071.588	1094.707	1117.783	1140.822	1163.828	1186.804	1209.755	1232.683	1255.591	1278.480	1301.354	1324.212	1347.058
-70	0.261	650.955	668.270	685.480	702.597	719.632	736.594	753.494	770.337	787.132	803.885	820.599	837.281	853.934	870.561	887.165	903.749	920.315	936.864	953.399	969.920	986.430
-65	0.355	487.920	500.788	513.567	526.266	538.895	551.462	563.973	576.437	588.858	601.242	613.592	625.914	638.210	650.483	662.735	674.969	687.187	699.390	711.579	723.757	735.924
-60	0.475	371.691	381.438	391.107	400.708	410.246	419.731	429.168	438.563	447.920	457.245	466.540	475.809	485.055	494.281	503.488	512.679	521.854	531.017	540.167	549.307	558.436
-55	0.625	287.346	294.861	302.307	309.692	317.023	324.306	331.547	338.751	345.922	353.063	360.178	367.270	374.341	381.394	388.430	395.451	402.458	409.454	416.438	423.412	430.377
-50	0.810	225.131	231.022	236.850	242.623	248.349	254.032	259.678	265.290	270.873	276.429	281.962	287.473	292.966	298.443	303.904	309.351	314.786	320.210	325.624	331.029	336.425
-45.48	1.013	182.439	187.228	191.959	196.641	201.279	205.878	210.443	214.978	219.486	223.970	228.432	232.875	237.301	241.712	246.109	250.493	254.865	259.227	263.580	267.924	272.261
-45	1.036	178.546	183.234	187.866	192.449	196.989	201.490	205.957	210.394	214.805	219.192	223.557	227.904	232.233	236.547	240.848	245.135	249.412	253.678	257.935	262.183	266.424
-40	1.310	143.175	146.962	150.696	154.385	158.035	161.650	165.235	168.792	172.324	175.835	179.327	182.801	186.260	189.705	193.137	196.557	199.967	203.367	206.759	210.143	213.520
-35	1.636	115.973	119.073	122.124	125.134	128.107	131.049	133.962	136.850	139.716	142.563	145.391	148.203	151.002	153.787	156.560	159.323	162.076	164.820	167.556	170.285	173.007
-30	2.022	94.802	97.373	99.898	102.384	104.836	107.259	109.656	112.030	114.383	116.718	119.036	121.340	123.630	125.909	128.176	130.434	132.682	134.923	137.155	139.381	141.601
-25	2.475	78.143	80.301	82.415	84.493	86.539	88.558	90.553	92.526	94.480	96.417	98.338	100.246	102.142	104.026	105.900	107.765	109.622	111.471	113.312	115.148	116.977
-20	3.002	64.897	66.730	68.521	70.277	72.003	73.704	75.381	77.039	78.679	80.303	81.912	83.509	85.094	86.669	88.234	89.790	91.338	92.880	94.414	95.943	97.465
-15	3.610	54.265	55.838	57.371	58.871	60.343	61.791	63.216	64.623	66.013	67.388	68.749	70.099	71.437	72.766	74.085	75.396	76.700	77.997	79.288	80.573	81.852
-10	4.308	45.652	47.018	48.344	49.639	50.906	52.150	53.373	54.579	55.768	56.943	58.105	59.256	60.396	61.527	62.650	63.765	64.872	65.974	67.069	68.159	69.243
-5	5.103	38.617	39.814	40.973	42.101	43.203	44.282	45.342	46.384	47.411	48.424	49.425	50.415	51.395	52.366	53.329	54.285	55.234	56.177	57.114	58.046	58.973
0	6.003	32.824	33.885	34.908	35.900	36.867	37.811	38.737	39.645	40.539	41.420	42.289	43.148	43.997	44.838	45.671	46.497	47.316	48.130	48.938	49.741	50.540
5	7.019	28.018	28.967	29.879	30.760	31.615	32.449	33.264	34.063	34.848	35.620	36.380	37.131	37.873	38.606	39.332	40.051	40.764	41.471	42.173	42.871	43.564
10	8.157	24.001	24.860	25.680	26.469	27.233	27.975	28.699	29.407	30.101	30.783	31.453	32.114	32.766	33.410	34.048	34.678	35.303	35.922	36.536	37.146	37.751
15	9.429	20.622	21.407	22.151	22.865	23.552	24.218	24.866	25.498	26.116	26.722	27.318	27.904	28.481	29.051	29.614	30.171	30.721	31.267	31.808	32.344	32.877
20	10.844	17.760	18.485	19.168	19.818	20.442	21.044	21.628	22.196	22.751	23.293	23.826	24.349	24.863	25.371	25.871	26.366	26.854	27.338	27.817	28.292	28.763
25	12.412	15.320	15.997	16.630	17.228	17.798	18.347	18.877	19.391	19.892	20.381	20.860	21.330	21.791	22.245	22.693	23.135	23.571	24.003	24.430	24.853	25.272
30	14.144	13.227	13.867	14.459	15.013	15.540	16.043	16.527	16.996	17.451	17.894	18.328	18.752	19.168	19.577	19.980	20.377	20.769	21.156	21.538	21.917	22.292
35	16.051	11.418	12.033	12.592	13.111	13.599	14.064	14.510	14.940	15.356	15.760	16.154	16.540	16.917	17.288	17.652	18.011	18.364	18.713	19.057	19.398	19.735
40	18.146	9.846	10.444	10.978	11.468	11.925	12.357	12.770	13.166	13.549	13.920	14.280	14.632	14.976	15.313	15.644	15.970	16.290	16.606	16.918	17.226	17.530
45	20.443	8.466	9.060	9.575	10.042	10.473	10.878	11.263	11.630	11.984	12.325	12.657	12.980	13.295	13.603	13.905	14.202	14.494	14.781	15.064	15.344	15.620
50	22.957	7.244	7.846	8.351	8.799	9.209	9.591	9.951	10.293	10.622	10.938	11.244	11.542	11.832	12.115	12.392	12.664	12.930	13.193	13.451	13.706	13.957
55	25.705	6.147	6.775	7.277	7.712	8.104	8.465	8.804	9.125	9.432	9.726	10.010	10.285	10.553	10.814	11.069	11.318	11.563	11.804	12.041	12.274	12.503
60	28.711	5.140	5.824	6.330	6.756	7.133	7.478	7.798	8.100	8.387	8.662	8.926	9.182	9.430	9.671	9.906	10.136	10.362	10.583	10.801	11.014	11.225
65	32.004	4.173	4.973	5.491	5.911	6.276	6.606	6.910	7.195	7.464	7.722	7.968	8.206	8.437	8.661	8.879	9.091	9.299	9.503	9.704	9.900	10.094
70	35.640	3.107	4.202	4.740	5.157	5.511	5.828	6.117	6.387	6.641	6.882	7.113	7.335	7.549	7.757	7.960	8.157	8.349	8.538	8.722	8.904	9.082

Thermodynamic properties of R-404A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-80	0.133	319.163	322.555	325.987	329.462	332.979	336.540	340.146	343.797	347.493	351.236	355.025	358.861	362.744	366.673	370.649	374.672	378.742	382.858	387.020	391.228	395.482
-75	0.188	322.214	325.677	329.179	332.721	336.305	339.930	343.598	347.310	351.067	354.868	358.715	362.607	366.545	370.529	374.559	378.635	382.757	386.924	391.138	395.396	399.700
-70	0.261	325.275	328.811	332.384	335.996	339.646	343.337	347.069	350.843	354.660	358.522	362.427	366.376	370.371	374.410	378.494	382.624	386.799	391.018	395.283	399.592	403.946
-65	0.355	328.341	331.952	335.598	339.280	342.999	346.757	350.554	354.392	358.271	362.193	366.157	370.165	374.217	378.312	382.452	386.635	390.863	395.135	399.452	403.812	408.216
-60	0.475	331.405	335.094	338.815	342.569	346.359	350.185	354.049	357.952	361.894	365.878	369.903	373.970	378.079	382.232	386.427	390.666	394.948	399.273	403.641	408.053	412.508
-55	0.625	334.462	338.232	342.030	345.859	349.721	353.618	357.550	361.519	365.526	369.573	373.659	377.786	381.955	386.165	390.417	394.711	399.048	403.427	407.848	412.312	416.819
-50	0.810	337.507	341.360	345.239	349.145	353.081	357.050	361.052	365.089	369.162	373.273	377.422	381.611	385.839	390.108	394.418	398.768	403.160	407.594	412.069	416.586	421.144
-45.48	1.013	340.246	344.178	348.132	352.110	356.116	360.151	364.218	368.317	372.452	376.622	380.830	385.075	389.358	393.681	398.044	402.446	406.889	411.373	415.897	420.462	425.068
-45	1.036	340.533	344.474	348.435	352.421	356.434	360.477	364.550	368.657	372.798	376.975	381.188	385.439	389.729	394.057	398.425	402.834	407.282	411.771	416.300	420.870	425.481
-40	1.310	343.535	347.566	351.614	355.683	359.775	363.894	368.041	372.219	376.429	380.673	384.952	389.267	393.619	398.009	402.437	406.903	411.409	415.954	420.538	425.162	429.826
-35	1.636	346.505	350.633	354.771	358.925	363.099	367.296	371.519	375.771	380.052	384.365	388.711	393.091	397.507	401.959	406.447	410.973	415.537	420.139	424.779	429.458	434.176
-30	2.022	349.439	353.666	357.898	362.141	366.400	370.679	374.980	379.307	383.661	388.045	392.460	396.907	401.388	405.903	410.454	415.040	419.663	424.323	429.020	433.755	438.527
-25	2.475	352.327	356.660	360.991	365.327	369.674	374.037	378.419	382.824	387.253	391.710	396.195	400.711	405.258	409.838	414.452	419.101	423.784	428.503	433.258	438.049	442.877
-20	3.002	355.164	359.609	364.043	368.476	372.915	377.365	381.831	386.316	390.823	395.355	399.913	404.499	409.114	413.761	418.439	423.151	427.896	432.675	437.489	442.337	447.222
-15	3.610	357.942	362.505	367.048	371.582	376.117	380.658	385.211	389.780	394.367	398.975	403.608	408.266	412.952	417.666	422.411	427.187	431.995	436.835	441.709	446.617	451.558
-10	4.308	360.651	365.340	369.997	374.639	379.274	383.911	388.554	393.209	397.879	402.567	407.277	412.009	416.767	421.552	426.364	431.206	436.078	440.981	445.916	450.884	455.884
-5	5.103	363.281	368.104	372.884	377.639	382.380	387.116	391.854	396.599	401.355	406.126	410.915	415.725	420.556	425.413	430.295	435.204	440.142	445.109	450.107	455.135	460.195
0	6.003	365.820	370.788	375.700	380.575	385.428	390.269	395.106	399.945	404.791	409.648	414.519	419.407	424.316	429.246	434.199	439.178	444.183	449.216	454.278	459.368	464.488
5	7.019	368.255	373.381	378.433	383.437	388.410	393.362	398.304	403.241	408.181	413.127	418.083	423.054	428.041	433.047	438.074	443.124	448.199	453.299	458.425	463.579	468.762
10	8.157	370.567	375.867	381.075	386.218	391.319	396.389	401.441	406.483	411.520	416.559	421.604	426.659	431.728	436.812	441.915	447.039	452.184	457.353	462.547	467.766	473.012
15	9.429	372.737	378.234	383.612	388.908	394.146	399.343	404.512	409.663	414.803	419.939	425.076	430.220	435.373	440.538	445.720	450.918	456.137	461.377	466.639	471.925	477.236
20	10.844	374.742	380.463	386.032	391.496	396.883	402.216	407.509	412.775	418.024	423.261	428.495	433.730	438.971	444.221	449.483	454.760	460.053	465.366	470.699	476.053	481.430
25	12.412	376.554	382.535	388.320	393.969	399.520	404.999	410.426	415.814	421.177	426.521	431.856	437.187	442.519	447.856	453.202	458.559	463.930	469.317	474.723	480.148	485.593
30	14.144	378.138	384.427	390.460	396.316	402.046	407.684	413.253	418.773	424.256	429.713	435.154	440.585	446.012	451.439	456.872	462.312	467.764	473.228	478.708	484.206	489.721
35	16.051	379.450	386.112	392.431	398.521	404.449	410.260	415.983	421.643	427.254	432.831	438.383	443.919	449.445	454.967	460.490	466.016	471.551	477.095	482.652	488.224	493.811
40	18.146	380.430	387.553	394.210	400.566	406.715	412.716	418.607	424.416	430.165	435.868	441.538	447.184	452.814	458.435	464.051	469.667	475.288	480.915	486.551	492.199	497.861
45	20.443	380.993	388.708	395.769	402.433	408.830	415.040	421.114	427.085	432.980	438.818	444.612	450.374	456.113	461.837	467.551	473.261	478.970	484.683	490.401	496.129	501.867
50	22.957	381.012	389.519	397.075	404.097	410.776	417.219	423.492	429.640	435.693	441.673	447.599	453.484	459.338	465.170	470.986	476.793	482.594	488.395	494.199	500.008	505.825
55	25.705	380.276	389.909	398.087	405.533	412.534	419.237	425.730	432.069	438.291	444.426	450.492	456.506	462.481	468.426	474.349	480.257	486.155	492.048	497.940	503.833	509.731
60	28.711	378.397	389.774	398.753	406.707	414.079	421.076	427.812	434.359	440.765	447.063	453.279	459.431	465.533	471.597	477.633	483.646	489.645	495.633	501.616	507.597	513.580
65	32.004	374.482	388.973	399.008	407.577	415.379	422.707	429.712	436.488	443.093	449.569	455.945	462.243	468.481	474.670	480.823	486.948	493.052	499.140	505.218	511.290	517.360
70	35.640	365.041	387.277	398.737	408.059	416.366	424.071	431.379	438.408	445.232	451.901	458.450	464.906	471.288	477.612	483.890	490.132	496.347	502.540	508.719	514.886	521.047

Thermodynamic properties of R-404A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-80	0.133	1.711	1.729	1.746	1.763	1.779	1.796	1.812	1.828	1.844	1.860	1.876	1.892	1.907	1.922	1.938	1.953	1.968	1.983	1.998	2.012	2.027
-75	0.188	1.698	1.715	1.732	1.749	1.765	1.782	1.798	1.814	1.830	1.846	1.862	1.877	1.892	1.908	1.923	1.938	1.953	1.968	1.983	1.997	2.012
-70	0.261	1.685	1.703	1.720	1.736	1.753	1.769	1.785	1.801	1.817	1.833	1.849	1.864	1.879	1.895	1.910	1.925	1.940	1.954	1.969	1.984	1.998
-65	0.355	1.675	1.692	1.709	1.725	1.742	1.758	1.774	1.790	1.806	1.822	1.837	1.853	1.868	1.883	1.898	1.913	1.928	1.942	1.957	1.971	1.986
-60	0.475	1.665	1.682	1.699	1.716	1.732	1.748	1.764	1.780	1.796	1.812	1.827	1.842	1.858	1.873	1.888	1.902	1.917	1.932	1.946	1.961	1.975
-55	0.625	1.657	1.674	1.691	1.707	1.724	1.740	1.756	1.772	1.787	1.803	1.818	1.833	1.849	1.864	1.878	1.893	1.908	1.922	1.937	1.951	1.966
-50	0.810	1.649	1.666	1.683	1.700	1.716	1.732	1.748	1.764	1.779	1.795	1.810	1.825	1.841	1.855	1.870	1.885	1.900	1.914	1.929	1.943	1.957
-45.48	1.013	1.643	1.660	1.677	1.693	1.710	1.726	1.742	1.758	1.773	1.789	1.804	1.819	1.834	1.849	1.864	1.878	1.893	1.908	1.922	1.936	1.950
-45	1.036	1.642	1.660	1.676	1.693	1.709	1.725	1.741	1.757	1.773	1.788	1.803	1.819	1.834	1.848	1.863	1.878	1.892	1.907	1.921	1.935	1.950
-40	1.310	1.637	1.654	1.670	1.687	1.703	1.719	1.735	1.751	1.767	1.782	1.797	1.812	1.827	1.842	1.857	1.872	1.886	1.900	1.915	1.929	1.943
-35	1.636	1.631	1.648	1.665	1.682	1.698	1.714	1.730	1.746	1.761	1.777	1.792	1.807	1.822	1.837	1.852	1.866	1.881	1.895	1.909	1.923	1.937
-30	2.022	1.627	1.644	1.661	1.677	1.694	1.710	1.726	1.741	1.757	1.772	1.788	1.803	1.817	1.832	1.847	1.861	1.876	1.890	1.904	1.918	1.932
-25	2.475	1.623	1.640	1.657	1.674	1.690	1.706	1.722	1.738	1.753	1.768	1.784	1.799	1.814	1.828	1.843	1.857	1.872	1.886	1.900	1.914	1.928
-20	3.002	1.619	1.636	1.653	1.670	1.687	1.703	1.719	1.734	1.750	1.765	1.780	1.795	1.810	1.825	1.839	1.854	1.868	1.882	1.897	1.911	1.925
-15	3.610	1.616	1.633	1.650	1.667	1.684	1.700	1.716	1.731	1.747	1.762	1.777	1.792	1.807	1.822	1.837	1.851	1.865	1.880	1.894	1.908	1.922
-10	4.308	1.613	1.631	1.648	1.665	1.681	1.697	1.713	1.729	1.745	1.760	1.775	1.790	1.805	1.820	1.834	1.849	1.863	1.877	1.891	1.905	1.919
-5	5.103	1.610	1.628	1.645	1.662	1.679	1.695	1.711	1.727	1.743	1.758	1.773	1.788	1.803	1.818	1.832	1.847	1.861	1.875	1.889	1.903	1.917
0	6.003	1.608	1.626	1.643	1.660	1.677	1.693	1.710	1.725	1.741	1.756	1.772	1.787	1.801	1.816	1.831	1.845	1.859	1.873	1.887	1.901	1.915
5	7.019	1.605	1.624	1.641	1.659	1.675	1.692	1.708	1.724	1.740	1.755	1.770	1.785	1.800	1.815	1.829	1.844	1.858	1.872	1.886	1.900	1.914
10	8.157	1.603	1.622	1.640	1.657	1.674	1.691	1.707	1.723	1.739	1.754	1.769	1.784	1.799	1.814	1.828	1.843	1.857	1.871	1.885	1.899	1.913
15	9.429	1.601	1.620	1.638	1.656	1.673	1.689	1.706	1.722	1.738	1.753	1.769	1.784	1.799	1.813	1.828	1.842	1.857	1.871	1.885	1.899	1.912
20	10.844	1.598	1.618	1.636	1.654	1.672	1.688	1.705	1.721	1.737	1.753	1.768	1.783	1.798	1.813	1.827	1.842	1.856	1.870	1.884	1.898	1.912
25	12.412	1.596	1.616	1.635	1.653	1.670	1.688	1.704	1.720	1.736	1.752	1.768	1.783	1.798	1.813	1.827	1.842	1.856	1.870	1.884	1.898	1.912
30	14.144	1.593	1.613	1.633	1.651	1.669	1.687	1.703	1.720	1.736	1.752	1.767	1.783	1.798	1.812	1.827	1.842	1.856	1.870	1.884	1.898	1.912
35	16.051	1.590	1.611	1.631	1.650	1.668	1.686	1.703	1.719	1.736	1.752	1.767	1.783	1.798	1.813	1.827	1.842	1.856	1.870	1.884	1.898	1.912
40	18.146	1.586	1.608	1.629	1.648	1.667	1.685	1.702	1.719	1.735	1.751	1.767	1.783	1.798	1.813	1.827	1.842	1.856	1.871	1.885	1.899	1.912
45	20.443	1.581	1.605	1.626	1.647	1.666	1.684	1.701	1.718	1.735	1.751	1.767	1.783	1.798	1.813	1.828	1.842	1.857	1.871	1.885	1.899	1.913
50	22.957	1.575	1.601	1.624	1.645	1.664	1.683	1.701	1.718	1.735	1.751	1.767	1.783	1.798	1.813	1.828	1.843	1.857	1.872	1.886	1.900	1.914
55	25.705	1.567	1.596	1.620	1.642	1.662	1.681	1.700	1.717	1.734	1.751	1.767	1.783	1.798	1.814	1.828	1.843	1.858	1.872	1.886	1.900	1.914
60	28.711	1.556	1.590	1.616	1.639	1.660	1.680	1.699	1.716	1.734	1.751	1.767	1.783	1.798	1.814	1.829	1.844	1.858	1.873	1.887	1.901	1.915
65	32.004	1.540	1.582	1.611	1.636	1.658	1.678	1.697	1.715	1.733	1.750	1.767	1.783	1.798	1.814	1.829	1.844	1.859	1.873	1.887	1.902	1.915
70	35.640	1.508	1.573	1.605	1.631	1.654	1.676	1.695	1.714	1.732	1.749	1.766	1.782	1.798	1.814	1.829	1.844	1.859	1.873	1.888	1.902	1.916

R-407A

Zeotropic blend (20 % R-32, 40 % R-125, 40 % R-134a)

Molecular weight (g/mol)	90.11
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-45.01
Temperature glide at 1.013 bar (K)	6.41
Critical temperature (°C)	82.26
Critical pressure (bar absolute)	45.15
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.520
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.829
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.138
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.151
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.38
Classification NF-EN 378	A1
GWP (IPCC 4)	2107

Main applications

R-407A is a “non azeotropic” HFC blend. It can be used in medium and low temperature commercial refrigeration applications where R-22 or R-404A may have traditionally been used. It can be replaced by R-448A.

Commercial specifications

Composition: (20 % R-32 - 40 % R-125 - 40 % R-134a) (±2 % / ±2 % / ± 2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Non-condensables (gas phase): ≤ 1.5 % volume.
Acidity (HCl): ≤ 1 ppm weight.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-407A are governed by EU Regulation n° 517/2014.
The recovery of R-407A is mandatory under EU Regulation n° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-407A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg-K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg-K)	(kJ/kg)
0.025	-100	0.637	1.570	70.383	0.413	-92.68	6.568	0.152	343.257	1.960	272.874
0.040	-95	0.643	1.555	76.728	0.449	-87.76	4.308	0.232	346.193	1.935	269.465
0.060	-90	0.649	1.540	83.043	0.484	-82.84	2.904	0.344	349.144	1.912	266.101
0.089	-85	0.656	1.525	89.340	0.518	-77.92	2.008	0.498	352.107	1.891	262.767
0.129	-80	0.662	1.510	95.628	0.551	-73.0	1.420	0.704	355.075	1.873	259.448
0.182	-75	0.669	1.495	101.915	0.583	-68.09	1.025	0.976	358.044	1.856	256.128
0.253	-70	0.676	1.480	108.210	0.614	-63.17	0.754	1.326	361.007	1.840	252.797
0.344	-65	0.683	1.465	114.518	0.645	-58.25	0.564	1.772	363.960	1.826	249.442
0.461	-60	0.690	1.450	120.845	0.675	-53.33	0.429	2.330	366.896	1.813	246.051
0.608	-55	0.697	1.435	127.196	0.705	-48.41	0.331	3.020	369.810	1.802	242.614
0.790	-50	0.705	1.419	133.575	0.733	-43.5	0.259	3.864	372.697	1.791	239.122
1.013	-45.01	0.713	1.403	139.972	0.762	-38.6	0.205	4.881	375.543	1.781	235.571
1.014	-45	0.713	1.403	139.988	0.762	-38.59	0.205	4.884	375.550	1.781	235.562
1.284	-40	0.721	1.387	146.440	0.790	-33.67	0.164	6.106	378.365	1.772	231.925
1.608	-35	0.729	1.371	152.933	0.817	-28.76	0.132	7.556	381.135	1.764	228.201
1.993	-30	0.738	1.355	159.474	0.844	-23.86	0.108	9.264	383.853	1.756	224.380
2.446	-25	0.747	1.338	166.067	0.871	-18.95	0.089	11.263	386.515	1.749	220.448
2.974	-20	0.757	1.321	172.716	0.897	-14.05	0.074	13.589	389.113	1.743	216.397
3.586	-15	0.767	1.304	179.428	0.923	-9.15	0.061	16.278	391.639	1.737	212.211
4.290	-10	0.778	1.286	186.208	0.949	-4.26	0.052	19.376	394.087	1.731	207.879
5.094	-5	0.789	1.268	193.063	0.975	0.63	0.044	22.930	396.447	1.726	203.384
6.007	0	0.801	1.249	200.000	1.000	5.52	0.037	26.994	398.710	1.721	198.710
7.038	5	0.813	1.230	207.026	1.025	10.4	0.032	31.629	400.862	1.716	193.836
8.196	10	0.827	1.210	214.151	1.050	15.27	0.027	36.907	402.891	1.711	188.740
9.491	15	0.841	1.189	221.385	1.075	20.14	0.023	42.912	404.780	1.706	183.396
10.932	20	0.857	1.168	228.738	1.100	24.99	0.020	49.740	406.510	1.702	177.772
12.531	25	0.873	1.145	236.227	1.125	29.84	0.017	57.510	408.058	1.697	171.832
14.296	30	0.892	1.122	243.865	1.150	34.68	0.015	66.367	409.398	1.692	165.533
16.238	35	0.912	1.097	251.673	1.175	39.5	0.013	76.488	410.497	1.687	158.824
18.370	40	0.934	1.071	259.676	1.200	44.31	0.011	88.104	411.315	1.681	151.639
20.701	45	0.959	1.043	267.905	1.225	49.1	0.010	101.518	411.800	1.675	143.895
23.244	50	0.988	1.013	276.403	1.251	53.87	0.009	117.141	411.879	1.668	135.476
26.011	55	1.021	0.980	285.233	1.277	58.61	0.007	135.566	411.453	1.660	126.220
29.017	60	1.060	0.943	294.490	1.304	63.32	0.006	157.691	410.368	1.650	115.878
32.274	65	1.110	0.901	304.339	1.333	67.98	0.005	185.003	408.373	1.639	104.034
35.796	70	1.175	0.851	315.092	1.363	72.57	0.005	220.296	405.004	1.624	89.912
39.590	75	1.274	0.785	327.495	1.398	77.04	0.004	270.118	399.192	1.603	71.698

Thermodynamic properties of R-407A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.012	13015.077	13394.418	13773.287	14151.786	14529.993	14907.965	15285.746	15663.370	16040.862	16418.245	16795.535	17172.745	17549.888	17926.971	18304.004	18680.992	19057.941	19434.856	19811.740	20188.598	20565.431
-95	0.020	8092.689	8322.776	8552.487	8781.901	9011.079	9240.064	9468.891	9697.587	9926.172	10154.664	10383.077	10611.421	10839.707	11067.942	11296.132	11524.283	11752.400	11980.486	12208.545	12436.580	12664.594
-90	0.032	5199.403	5343.868	5488.027	5631.945	5775.667	5919.231	6062.662	6205.982	6349.208	6492.355	6635.434	6778.454	6921.422	7064.346	7207.231	7350.081	7492.901	7635.694	7778.463	7921.210	8063.937
-85	0.050	3441.013	3534.629	3627.994	3721.159	3814.162	3907.030	3999.787	4092.450	4185.032	4277.546	4370.001	4462.405	4554.763	4647.083	4739.368	4831.622	4923.849	5016.052	5108.234	5200.396	5292.541
-80	0.076	2339.336	2401.785	2464.024	2526.095	2588.029	2649.849	2711.575	2773.219	2834.795	2896.311	2957.775	3019.194	3080.574	3141.919	3203.234	3264.521	3325.785	3387.026	3448.248	3509.453	3570.642
-75	0.111	1629.674	1672.458	1715.063	1757.526	1799.872	1842.121	1884.287	1926.384	1968.421	2010.406	2052.345	2094.245	2136.110	2177.945	2219.752	2261.534	2303.295	2345.037	2386.761	2428.469	2470.163
-70	0.160	1160.774	1190.815	1220.703	1250.468	1280.132	1309.712	1339.221	1368.669	1398.064	1427.414	1456.723	1485.998	1515.242	1544.458	1573.650	1602.820	1631.970	1661.103	1690.220	1719.322	1748.412
-65	0.224	843.661	865.239	886.684	908.023	929.274	950.451	971.566	992.628	1013.643	1034.618	1055.557	1076.465	1097.346	1118.202	1139.035	1159.850	1180.646	1201.427	1222.193	1242.946	1263.687
-60	0.309	624.568	640.398	656.111	671.730	687.272	702.749	718.172	733.547	748.881	764.180	779.446	794.685	809.899	825.090	840.262	855.416	870.554	885.677	900.787	915.886	930.973
-55	0.418	470.194	482.037	493.775	505.430	517.018	528.548	540.029	551.468	562.870	574.241	585.582	596.899	608.193	619.468	630.724	641.964	653.189	664.401	675.601	686.791	697.970
-50	0.557	359.437	368.458	377.387	386.242	395.036	403.779	412.479	421.141	429.769	438.369	446.943	455.494	464.025	472.538	481.035	489.516	497.985	506.441	514.886	523.321	531.747
-45	0.731	278.634	285.625	292.532	299.373	306.159	312.899	319.600	326.266	332.903	339.514	346.102	352.668	359.217	365.748	372.265	378.768	385.259	391.739	398.209	404.669	411.121
-40	0.945	218.770	224.273	229.701	235.068	240.386	245.663	250.904	256.114	261.297	266.456	271.594	276.713	281.815	286.902	291.975	297.036	302.086	307.125	312.154	317.176	322.189
-38.6	1.013	204.864	210.025	215.111	220.139	225.119	230.059	234.964	239.838	244.687	249.512	254.316	259.102	263.872	268.627	273.368	278.097	282.815	287.523	292.222	296.912	301.595
-35	1.206	173.780	178.177	182.506	186.779	191.008	195.198	199.356	203.486	207.591	211.675	215.739	219.786	223.817	227.834	231.838	235.831	239.814	243.787	247.751	251.708	255.657
-30	1.521	139.520	143.082	146.581	150.030	153.438	156.812	160.155	163.473	166.768	170.042	173.299	176.540	179.767	182.981	186.183	189.374	192.556	195.729	198.893	202.051	205.201
-25	1.898	113.107	116.031	118.897	121.717	124.498	127.248	129.970	132.669	135.346	138.005	140.648	143.276	145.890	148.492	151.084	153.665	156.238	158.802	161.359	163.908	166.452
-20	2.343	92.510	94.940	97.316	99.650	101.948	104.216	106.459	108.680	110.881	113.065	115.234	117.388	119.531	121.662	123.783	125.895	127.999	130.094	132.183	134.265	136.341
-15	2.866	76.278	78.321	80.314	82.266	84.186	86.078	87.947	89.795	91.624	93.438	95.237	97.023	98.798	100.562	102.317	104.063	105.801	107.532	109.256	110.974	112.686
-10	3.474	63.357	65.094	66.783	68.435	70.056	71.652	73.224	74.778	76.315	77.836	79.344	80.840	82.325	83.800	85.266	86.724	88.174	89.618	91.055	92.486	93.913
-5	4.177	52.976	54.468	55.915	57.327	58.710	60.069	61.406	62.725	64.028	65.317	66.593	67.857	69.112	70.356	71.593	72.822	74.043	75.258	76.468	77.671	78.870
0	4.983	44.562	45.857	47.110	48.328	49.520	50.687	51.835	52.966	54.081	55.182	56.272	57.351	58.419	59.480	60.532	61.576	62.614	63.646	64.672	65.693	66.709
5	5.904	37.686	38.822	39.916	40.978	42.014	43.027	44.021	44.998	45.961	46.911	47.849	48.777	49.696	50.606	51.508	52.404	53.293	54.176	55.054	55.927	56.796
10	6.948	32.024	33.029	33.995	34.928	35.837	36.723	37.591	38.444	39.282	40.107	40.922	41.727	42.522	43.310	44.091	44.864	45.632	46.394	47.151	47.903	48.651
15	8.128	27.327	28.225	29.084	29.913	30.716	31.499	32.263	33.012	33.747	34.471	35.183	35.887	36.581	37.268	37.948	38.621	39.289	39.951	40.608	41.261	41.909
20	9.452	23.402	24.213	24.985	25.726	26.443	27.139	27.817	28.480	29.130	29.769	30.397	31.016	31.626	32.229	32.826	33.416	34.000	34.580	35.154	35.725	36.291
25	10.934	20.101	20.840	21.540	22.209	22.853	23.477	24.084	24.675	25.254	25.821	26.379	26.927	27.467	28.001	28.527	29.048	29.563	30.073	30.579	31.080	31.578
30	12.586	17.306	17.987	18.627	19.236	19.820	20.383	20.930	21.461	21.980	22.487	22.985	23.474	23.956	24.430	24.898	25.360	25.816	26.268	26.716	27.160	27.599
35	14.420	14.925	15.558	16.149	16.708	17.242	17.754	18.250	18.730	19.198	19.655	20.103	20.542	20.973	21.397	21.815	22.228	22.635	23.038	23.436	23.831	24.222
40	16.451	12.883	13.480	14.030	14.547	15.038	15.508	15.960	16.398	16.823	17.237	17.641	18.037	18.426	18.808	19.183	19.554	19.919	20.280	20.636	20.989	21.338
45	18.693	11.121	11.689	12.208	12.690	13.145	13.579	13.994	14.395	14.783	15.160	15.528	15.887	16.239	16.585	16.924	17.258	17.587	17.912	18.233	18.550	18.864
50	21.165	9.589	10.139	10.632	11.086	11.511	11.913	12.298	12.667	13.023	13.368	13.705	14.032	14.353	14.667	14.975	15.278	15.576	15.870	16.160	16.446	16.729
55	23.884	8.247	8.787	9.261	9.693	10.093	10.469	10.826	11.168	11.497	11.815	12.124	12.424	12.717	13.004	13.285	13.561	13.832	14.099	14.362	14.621	14.878
60	26.873	7.059	7.601	8.063	8.476	8.855	9.209	9.543	9.862	10.167	10.461	10.746	11.023	11.292	11.555	11.812	12.064	12.312	12.556	12.795	13.031	13.264
65	30.160	5.994	6.552	7.008	7.408	7.770	8.105	8.419	8.717	9.002	9.275	9.539	9.795	10.043	10.285	10.522	10.753	10.980	11.203	11.422	11.638	11.850
70	33.784	5.019	5.615	6.073	6.463	6.812	7.131	7.428	7.708	7.974	8.229	8.475	8.712	8.942	9.165	9.383	9.596	9.805	10.009	10.210	10.408	10.602
75	37.806	4.089	4.766	5.234	5.620	5.957	6.262	6.545	6.809	7.059	7.298	7.526	7.747	7.960	8.167	8.369	8.565	8.757	8.946	9.130	9.312	9.490

Thermodynamic properties of R-407A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.012	338.933	341.973	345.054	348.176	351.340	354.546	357.794	361.085	364.418	367.794	371.212	374.672	378.175	381.721	385.308	388.938	392.610	396.324	400.079	403.877	407.716
-95	0.020	341.883	344.976	348.108	351.279	354.492	357.746	361.041	364.379	367.758	371.179	374.642	378.148	381.695	385.284	388.916	392.589	396.304	400.061	403.859	407.700	411.581
-90	0.032	344.857	348.004	351.188	354.411	357.673	360.976	364.319	367.703	371.129	374.596	378.105	381.656	385.248	388.882	392.557	396.274	400.033	403.833	407.675	411.558	415.482
-85	0.050	347.849	351.052	354.290	357.565	360.878	364.231	367.623	371.056	374.529	378.043	381.598	385.194	388.832	392.511	396.231	399.992	403.795	407.639	411.524	415.450	419.417
-80	0.076	350.856	354.117	357.410	360.739	364.105	367.508	370.951	374.433	377.954	381.516	385.118	388.761	392.444	396.168	399.934	403.740	407.587	411.475	415.404	419.373	423.384
-75	0.111	353.871	357.192	360.543	363.928	367.347	370.804	374.297	377.830	381.401	385.011	388.661	392.351	396.081	399.852	403.663	407.514	411.406	415.339	419.312	423.325	427.379
-70	0.160	356.888	360.273	363.684	367.126	370.602	374.112	377.659	381.243	384.865	388.525	392.224	395.962	399.740	403.558	407.415	411.313	415.250	419.228	423.246	427.304	431.402
-65	0.224	359.903	363.354	366.828	370.330	373.863	377.430	381.031	384.668	388.342	392.053	395.803	399.590	403.417	407.282	411.187	415.132	419.115	423.139	427.202	431.305	435.448
-60	0.309	362.910	366.430	369.969	373.534	377.127	380.752	384.409	388.101	391.829	395.593	399.393	403.232	407.108	411.023	414.976	418.968	422.999	427.069	431.178	435.327	439.515
-55	0.418	365.901	369.494	373.103	376.732	380.388	384.073	387.789	391.538	395.320	399.138	402.992	406.882	410.810	414.774	418.777	422.818	426.897	431.014	435.171	439.365	443.599
-50	0.557	368.873	372.543	376.223	379.921	383.642	387.389	391.165	394.973	398.813	402.686	406.594	410.538	414.518	418.534	422.587	426.678	430.806	434.972	439.176	443.418	447.698
-45	0.731	371.819	375.569	379.325	383.094	386.882	390.695	394.534	398.402	402.301	406.232	410.196	414.195	418.228	422.297	426.402	430.544	434.722	438.937	443.190	447.480	451.808
-40	0.945	374.733	378.568	382.402	386.246	390.105	393.985	397.889	401.821	405.781	409.771	413.793	417.849	421.937	426.060	430.219	434.412	438.642	442.908	447.210	451.549	455.925
-38.6	1.013	375.543	379.403	383.260	387.125	391.005	394.904	398.827	402.776	406.754	410.762	414.800	418.872	422.976	427.115	431.288	435.497	439.741	444.021	448.337	452.690	457.080
-35	1.206	377.609	381.534	385.451	389.372	393.305	397.256	401.228	405.224	409.248	413.300	417.382	421.495	425.641	429.820	434.032	438.280	442.562	446.879	451.232	455.621	460.046
-30	1.521	380.442	384.461	388.464	392.467	396.477	400.501	404.544	408.608	412.697	416.813	420.956	425.130	429.334	433.571	437.839	442.142	446.478	450.848	455.253	459.693	464.168
-25	1.898	383.224	387.342	391.437	395.525	399.616	403.717	407.833	411.968	416.125	420.306	424.514	428.749	433.014	437.310	441.636	445.995	450.386	454.810	459.269	463.761	468.287
-20	2.343	385.951	390.173	394.364	398.541	402.717	406.897	411.090	415.298	419.526	423.775	428.049	432.349	436.677	441.033	445.419	449.835	454.283	458.763	463.276	467.821	472.400
-15	2.866	388.614	392.947	397.239	401.510	405.773	410.038	414.310	418.595	422.896	427.216	431.559	435.925	440.317	444.736	449.183	453.659	458.165	462.702	467.271	471.871	476.504
-10	3.474	391.206	395.656	400.055	404.425	408.781	413.133	417.488	421.852	426.230	430.624	435.038	439.473	443.931	448.415	452.925	457.463	462.029	466.624	471.250	475.907	480.594
-5	4.177	393.720	398.294	402.805	407.279	411.733	416.176	420.619	425.066	429.524	433.994	438.482	442.988	447.516	452.066	456.641	461.242	465.870	470.526	475.211	479.925	484.669
0	4.983	396.146	400.851	405.483	410.067	414.623	419.163	423.697	428.232	432.772	437.323	441.886	446.467	451.066	455.686	460.328	464.994	469.686	474.404	479.149	483.922	488.723
5	5.904	398.474	403.320	408.079	412.780	417.444	422.087	426.717	431.343	435.970	440.604	445.248	449.905	454.578	459.270	463.981	468.715	473.472	478.254	483.061	487.895	492.756
10	6.948	400.691	405.689	410.584	415.410	420.190	424.941	429.672	434.394	439.113	443.833	448.560	453.298	458.048	462.814	467.597	472.401	477.226	482.073	486.944	491.840	496.762
15	8.128	402.782	407.946	412.989	417.949	422.852	427.717	432.557	437.380	442.194	447.006	451.820	456.641	461.471	466.314	471.172	476.048	480.942	485.857	490.794	495.755	500.739
20	9.452	404.729	410.076	415.280	420.386	425.422	430.410	435.364	440.294	445.209	450.117	455.022	459.929	464.843	469.766	474.702	479.652	484.619	489.604	494.609	499.635	504.684
25	10.934	406.512	412.064	417.446	422.711	427.891	433.010	438.086	443.129	448.151	453.160	458.160	463.159	468.160	473.166	478.182	483.209	488.251	493.309	498.384	503.478	508.594
30	12.586	408.106	413.890	419.472	424.911	430.248	435.509	440.715	445.880	451.015	456.129	461.230	466.324	471.416	476.509	481.608	486.716	491.835	496.968	502.116	507.281	512.464
35	14.420	409.480	415.534	421.340	426.974	432.482	437.897	443.243	448.537	453.792	459.018	464.225	469.419	474.606	479.791	484.977	490.168	495.368	500.578	505.801	511.039	516.293
40	16.451	410.596	416.968	423.031	428.882	434.580	440.163	445.660	451.092	456.475	461.821	467.139	472.439	477.725	483.005	488.282	493.561	498.844	504.135	509.436	514.748	520.075
45	18.693	411.407	418.160	424.522	430.619	436.526	442.294	447.955	453.536	459.056	464.528	469.965	475.376	480.768	486.147	491.520	496.889	502.259	507.634	513.015	518.406	523.808
50	21.165	411.848	419.071	425.785	432.162	438.305	444.275	450.116	455.858	461.525	467.133	472.695	478.224	483.727	489.211	494.683	500.147	505.609	511.070	516.536	522.007	527.488
55	23.884	411.828	419.648	426.782	433.485	439.893	446.089	452.127	458.045	463.870	469.623	475.320	480.974	486.594	492.189	497.765	503.329	508.886	514.438	519.991	525.547	531.108
60	26.873	411.210	419.819	427.469	434.554	441.266	447.715	453.971	460.081	466.078	471.987	477.828	483.615	489.359	495.071	500.758	506.427	512.083	517.731	523.374	529.018	534.663
65	30.160	409.772	419.484	427.784	435.326	442.389	449.125	455.623	461.944	468.129	474.208	480.203	486.133	492.010	497.846	503.649	509.429	515.189	520.937	526.676	532.411	538.144
70	33.784	407.107	418.491	427.639	435.737	443.213	450.277	457.049	463.605	469.996	476.260	482.423	488.506	494.525	500.494	506.422	512.318	518.189	524.042	529.882	535.712	541.537
75	37.806	402.298	416.584	426.887	435.683	443.654	451.101	458.185	465.006	471.628	478.096	484.443	490.694	496.868	502.979	509.040	515.062	521.052	527.017	532.963	538.895	544.817

Thermodynamic properties of R-407A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.012	2.002	2.019	2.037	2.053	2.070	2.086	2.103	2.119	2.134	2.150	2.165	2.181	2.196	2.211	2.226	2.241	2.255	2.270	2.284	2.299	2.313
-95	0.020	1.973	1.990	2.007	2.023	2.040	2.056	2.072	2.088	2.103	2.119	2.134	2.150	2.165	2.179	2.194	2.209	2.223	2.238	2.252	2.266	2.280
-90	0.032	1.946	1.963	1.980	1.996	2.012	2.028	2.044	2.060	2.076	2.091	2.106	2.121	2.136	2.151	2.166	2.180	2.195	2.209	2.223	2.237	2.251
-85	0.050	1.922	1.939	1.955	1.972	1.988	2.004	2.019	2.035	2.050	2.065	2.081	2.095	2.110	2.125	2.140	2.154	2.168	2.182	2.197	2.211	2.224
-80	0.076	1.900	1.917	1.933	1.949	1.965	1.981	1.997	2.012	2.027	2.042	2.057	2.072	2.087	2.101	2.116	2.130	2.144	2.159	2.173	2.186	2.200
-75	0.111	1.880	1.897	1.913	1.929	1.945	1.961	1.976	1.991	2.007	2.022	2.036	2.051	2.066	2.080	2.095	2.109	2.123	2.137	2.151	2.165	2.178
-70	0.160	1.862	1.879	1.895	1.911	1.927	1.942	1.957	1.973	1.988	2.003	2.017	2.032	2.046	2.061	2.075	2.089	2.103	2.117	2.131	2.145	2.158
-65	0.224	1.846	1.862	1.878	1.894	1.910	1.925	1.941	1.956	1.971	1.985	2.000	2.015	2.029	2.043	2.058	2.072	2.086	2.099	2.113	2.127	2.140
-60	0.309	1.831	1.847	1.863	1.879	1.895	1.910	1.925	1.940	1.955	1.970	1.985	1.999	2.013	2.028	2.042	2.056	2.069	2.083	2.097	2.110	2.124
-55	0.418	1.818	1.834	1.850	1.866	1.881	1.896	1.911	1.926	1.941	1.956	1.970	1.985	1.999	2.013	2.027	2.041	2.055	2.069	2.082	2.096	2.109
-50	0.557	1.805	1.821	1.837	1.853	1.869	1.884	1.899	1.914	1.929	1.943	1.958	1.972	1.986	2.000	2.014	2.028	2.042	2.055	2.069	2.082	2.096
-45	0.731	1.794	1.810	1.826	1.842	1.857	1.873	1.888	1.902	1.917	1.932	1.946	1.960	1.974	1.988	2.002	2.016	2.030	2.043	2.057	2.070	2.083
-40	0.945	1.784	1.800	1.816	1.832	1.847	1.862	1.877	1.892	1.907	1.921	1.935	1.950	1.964	1.978	1.991	2.005	2.019	2.032	2.046	2.059	2.072
-38.6	1.013	1.781	1.797	1.813	1.829	1.844	1.859	1.874	1.889	1.904	1.918	1.933	1.947	1.961	1.975	1.989	2.002	2.016	2.029	2.043	2.056	2.069
-35	1.206	1.774	1.791	1.807	1.822	1.838	1.853	1.868	1.883	1.897	1.912	1.926	1.940	1.954	1.968	1.982	1.995	2.009	2.022	2.036	2.049	2.062
-30	1.521	1.766	1.782	1.798	1.814	1.829	1.844	1.859	1.874	1.889	1.903	1.917	1.931	1.945	1.959	1.973	1.987	2.000	2.014	2.027	2.040	2.053
-25	1.898	1.758	1.774	1.790	1.806	1.821	1.837	1.852	1.866	1.881	1.895	1.909	1.924	1.938	1.951	1.965	1.979	1.992	2.006	2.019	2.032	2.045
-20	2.343	1.751	1.767	1.783	1.799	1.814	1.830	1.845	1.859	1.874	1.888	1.902	1.916	1.930	1.944	1.958	1.971	1.985	1.998	2.011	2.025	2.038
-15	2.866	1.744	1.761	1.777	1.793	1.808	1.823	1.838	1.853	1.867	1.882	1.896	1.910	1.924	1.938	1.951	1.965	1.978	1.992	2.005	2.018	2.031
-10	3.474	1.738	1.754	1.771	1.787	1.802	1.817	1.832	1.847	1.862	1.876	1.890	1.904	1.918	1.932	1.946	1.959	1.973	1.986	1.999	2.012	2.025
-5	4.177	1.732	1.749	1.765	1.781	1.797	1.812	1.827	1.842	1.856	1.871	1.885	1.899	1.913	1.927	1.940	1.954	1.967	1.980	1.994	2.007	2.020
0	4.983	1.726	1.743	1.760	1.776	1.792	1.807	1.822	1.837	1.852	1.866	1.880	1.894	1.908	1.922	1.936	1.949	1.962	1.976	1.989	2.002	2.015
5	5.904	1.721	1.738	1.755	1.771	1.787	1.802	1.818	1.832	1.847	1.862	1.876	1.890	1.904	1.918	1.931	1.945	1.958	1.971	1.985	1.998	2.011
10	6.948	1.716	1.734	1.750	1.767	1.783	1.798	1.813	1.828	1.843	1.858	1.872	1.886	1.900	1.914	1.927	1.941	1.954	1.968	1.981	1.994	2.007
15	8.128	1.711	1.729	1.746	1.763	1.779	1.794	1.810	1.825	1.839	1.854	1.868	1.882	1.896	1.910	1.924	1.937	1.951	1.964	1.977	1.990	2.003
20	9.452	1.706	1.725	1.742	1.759	1.775	1.791	1.806	1.821	1.836	1.851	1.865	1.879	1.893	1.907	1.921	1.934	1.948	1.961	1.974	1.987	2.000
25	10.934	1.702	1.720	1.738	1.755	1.771	1.787	1.803	1.818	1.833	1.847	1.862	1.876	1.890	1.904	1.918	1.931	1.945	1.958	1.971	1.984	1.997
30	12.586	1.697	1.716	1.734	1.751	1.767	1.784	1.799	1.815	1.830	1.845	1.859	1.873	1.888	1.901	1.915	1.929	1.942	1.956	1.969	1.982	1.995
35	14.420	1.692	1.711	1.729	1.747	1.764	1.780	1.796	1.812	1.827	1.842	1.856	1.871	1.885	1.899	1.913	1.926	1.940	1.953	1.967	1.980	1.993
40	16.451	1.686	1.706	1.725	1.743	1.760	1.777	1.793	1.809	1.824	1.839	1.854	1.868	1.883	1.897	1.911	1.924	1.938	1.951	1.964	1.978	1.991
45	18.693	1.680	1.701	1.721	1.739	1.757	1.774	1.790	1.806	1.821	1.837	1.852	1.866	1.880	1.895	1.909	1.922	1.936	1.949	1.963	1.976	1.989
50	21.165	1.674	1.696	1.716	1.735	1.753	1.770	1.787	1.803	1.819	1.834	1.849	1.864	1.878	1.893	1.907	1.920	1.934	1.947	1.961	1.974	1.987
55	23.884	1.666	1.690	1.711	1.731	1.749	1.767	1.784	1.800	1.816	1.832	1.847	1.862	1.876	1.891	1.905	1.919	1.932	1.946	1.959	1.972	1.985
60	26.873	1.657	1.683	1.705	1.726	1.745	1.763	1.781	1.797	1.813	1.829	1.844	1.859	1.874	1.889	1.903	1.917	1.931	1.944	1.958	1.971	1.984
65	30.160	1.647	1.675	1.699	1.721	1.741	1.759	1.777	1.794	1.810	1.826	1.842	1.857	1.872	1.887	1.901	1.915	1.929	1.943	1.956	1.969	1.982
70	33.784	1.633	1.666	1.692	1.715	1.735	1.755	1.773	1.791	1.807	1.824	1.839	1.855	1.870	1.884	1.899	1.913	1.927	1.941	1.954	1.968	1.981
75	37.806	1.614	1.655	1.684	1.708	1.730	1.750	1.769	1.787	1.804	1.820	1.836	1.852	1.867	1.882	1.897	1.911	1.925	1.939	1.953	1.966	1.979

R-407C

Zeotropic blend (23 % R-32 - 25 % R-125 - 52 % R-134a)

Molecular weight (g/mol)	86.20
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-43.63
Temperature glide at 1.013 bar (K)	7.00
Critical temperature (°C)	86.0
Critical pressure (bar absolute)	46.29
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.535
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.837
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.144
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.154
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.94
Classification NF-EN 378	A1
GWP (IPCC 4)	1774

Main applications

R-407C is a "non azeotropic" HFC blend. It is mainly used in air conditioning applications where R-22 would have previously been used.

Commercial specifications

Composition: (23 % R-32 - 25 % R-125 - 52 % R-134a) (±2 % / ±2 % / ± 2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Non-condensables (gas phase): ≤ 1.5 % volume.
Acidity (HCl): ≤ 1 ppm weight.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-407C - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.023	-100	0.647	1.546	67.910	0.402	-92.09	7.441	0.134	356.288	2.031	288.378
0.037	-95	0.653	1.532	74.365	0.438	-87.17	4.879	0.205	359.260	2.004	284.895
0.056	-90	0.659	1.517	80.794	0.474	-82.25	3.288	0.304	362.247	1.980	281.453
0.083	-85	0.665	1.503	87.209	0.509	-77.32	2.271	0.440	365.245	1.958	278.036
0.119	-80	0.672	1.488	93.618	0.542	-72.4	1.605	0.623	368.248	1.937	274.630
0.169	-75	0.678	1.474	100.030	0.575	-67.48	1.158	0.864	371.252	1.919	271.222
0.235	-70	0.685	1.459	106.450	0.607	-62.56	0.851	1.175	374.250	1.902	267.800
0.321	-65	0.692	1.445	112.885	0.638	-57.64	0.636	1.572	377.237	1.887	264.352
0.430	-60	0.699	1.430	119.340	0.669	-52.72	0.483	2.069	380.208	1.873	260.868
0.567	-55	0.707	1.415	125.819	0.699	-47.81	0.373	2.684	383.157	1.860	257.337
0.738	-50	0.714	1.400	132.328	0.728	-42.89	0.291	3.438	386.077	1.848	253.749
0.948	-45	0.722	1.385	138.870	0.757	-37.98	0.230	4.350	388.964	1.837	250.093
1.013	-43.63	0.724	1.381	140.667	0.765	-36.63	0.216	4.630	389.747	1.834	249.080
1.203	-40	0.730	1.370	145.450	0.786	-33.07	0.184	5.443	391.811	1.827	246.360
1.508	-35	0.739	1.354	152.073	0.814	-28.16	0.148	6.741	394.612	1.818	242.540
1.871	-30	0.747	1.338	158.741	0.841	-23.25	0.121	8.273	397.362	1.809	238.621
2.299	-25	0.756	1.322	165.460	0.868	-18.34	0.099	10.066	400.054	1.802	234.594
2.799	-20	0.766	1.306	172.235	0.895	-13.44	0.082	12.152	402.682	1.794	230.447
3.379	-15	0.776	1.289	179.071	0.922	-8.54	0.069	14.567	405.238	1.787	226.167
4.047	-10	0.786	1.272	185.973	0.948	-3.65	0.058	17.349	407.714	1.781	221.741
4.810	-5	0.797	1.254	192.947	0.974	1.24	0.049	20.540	410.103	1.775	217.156
5.679	0	0.809	1.236	200.000	1.000	6.12	0.041	24.188	412.394	1.769	212.394
6.660	5	0.821	1.218	207.139	1.026	11.0	0.035	28.347	414.577	1.764	207.438
7.764	10	0.834	1.199	214.372	1.051	15.87	0.030	33.078	416.639	1.758	202.267
9.000	15	0.848	1.179	221.709	1.076	20.74	0.026	38.454	418.565	1.753	196.855
10.376	20	0.863	1.159	229.161	1.102	25.59	0.022	44.557	420.338	1.748	191.177
11.903	25	0.879	1.137	236.740	1.127	30.44	0.019	51.486	421.938	1.742	185.198
13.591	30	0.897	1.115	244.460	1.152	35.27	0.017	59.361	423.341	1.737	178.880
15.450	35	0.916	1.092	252.340	1.177	40.09	0.015	68.329	424.518	1.731	172.178
17.490	40	0.937	1.068	260.402	1.203	44.9	0.013	78.573	425.435	1.726	165.034
19.723	45	0.960	1.042	268.671	1.228	49.68	0.011	90.330	426.046	1.719	157.375
22.160	50	0.986	1.014	277.185	1.254	54.45	0.010	103.915	426.292	1.712	149.107
24.812	55	1.016	0.984	285.992	1.280	59.19	0.008	119.760	426.092	1.704	140.100
27.692	60	1.051	0.951	295.163	1.307	63.9	0.007	138.494	425.330	1.695	130.167
30.814	65	1.094	0.914	304.809	1.335	68.58	0.006	161.086	423.829	1.685	119.020
34.189	70	1.147	0.872	315.121	1.364	73.19	0.005	189.172	421.292	1.672	106.171
37.830	75	1.218	0.821	326.477	1.395	77.72	0.004	225.942	417.151	1.655	90.674
41.738	80	1.331	0.752	339.836	1.432	82.1	0.004	279.480	409.993	1.630	70.157

Thermodynamic properties of R-407C - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.011	15622.632	16077.744	16532.296	16986.415	17440.192	17893.699	18346.986	18800.093	19253.052	19705.887	20158.618	20611.260	21063.827	21516.329	21968.775	22421.171	22873.525	23325.841	23778.124	24230.377	24682.604
-95	0.018	9680.709	9955.739	10230.328	10504.573	10778.543	11052.293	11325.863	11599.283	11872.580	12145.772	12418.876	12691.904	12964.867	13237.774	13510.631	13783.446	14056.223	14328.966	14601.680	14874.368	15147.033
-90	0.028	6198.055	6370.082	6541.754	6713.149	6884.320	7055.309	7226.148	7396.863	7567.473	7737.995	7908.440	8078.820	8249.144	8419.419	8589.650	8759.844	8930.004	9100.135	9270.240	9440.321	9610.381
-85	0.044	4087.673	4198.717	4309.473	4420.000	4530.342	4640.533	4750.598	4860.558	4970.428	5080.222	5189.951	5299.623	5409.246	5518.826	5628.368	5737.877	5847.356	5956.809	6066.238	6175.646	6285.035
-80	0.067	2769.412	2843.195	2916.739	2990.092	3063.291	3136.362	3209.327	3282.202	3355.000	3427.732	3500.407	3573.033	3645.615	3718.160	3790.671	3863.153	3935.608	4008.039	4080.450	4152.841	4225.216
-75	0.099	1922.783	1973.131	2023.277	2073.263	2123.118	2172.864	2222.519	2272.096	2321.607	2371.061	2420.465	2469.825	2519.148	2568.437	2617.696	2666.928	2716.137	2765.325	2814.493	2863.645	2912.781
-70	0.142	1365.060	1400.271	1435.310	1470.212	1505.001	1539.697	1574.314	1608.864	1643.356	1677.798	1712.196	1746.556	1780.882	1815.178	1849.447	1883.693	1917.917	1952.122	1986.310	2020.483	2054.641
-65	0.200	988.993	1014.185	1039.228	1064.152	1088.979	1113.724	1138.401	1163.019	1187.586	1212.109	1236.594	1261.044	1285.464	1309.857	1334.226	1358.574	1382.903	1407.214	1431.510	1455.792	1480.061
-60	0.277	729.929	748.336	766.613	784.786	802.875	820.892	838.849	856.754	874.614	892.435	910.221	927.977	945.705	963.410	981.093	998.757	1016.404	1034.035	1051.651	1069.255	1086.847
-55	0.376	547.913	561.629	575.230	588.740	602.174	615.546	628.865	642.137	655.369	668.567	681.733	694.872	707.987	721.080	734.154	747.210	760.250	773.276	786.289	799.290	812.281
-50	0.502	417.686	428.095	438.401	448.626	458.784	468.887	478.941	488.955	498.933	508.879	518.797	528.691	538.563	548.415	558.249	568.068	577.872	587.663	597.442	607.210	616.968
-45	0.661	322.939	330.973	338.915	346.784	354.594	362.354	370.071	377.750	385.398	393.017	400.611	408.183	415.735	423.268	430.786	438.289	445.779	453.256	460.723	468.180	475.628
-40	0.857	252.927	259.227	265.445	271.597	277.695	283.748	289.762	295.743	301.695	307.620	313.523	319.406	325.270	331.118	336.951	342.771	348.578	354.375	360.161	365.938	371.707
-36.63	1.013	216.004	221.398	226.716	231.971	237.176	242.339	247.466	252.561	257.629	262.673	267.695	272.698	277.684	282.654	287.610	292.553	297.485	302.407	307.319	312.222	317.117
-35	1.097	200.445	205.460	210.400	215.280	220.111	224.901	229.656	234.381	239.079	243.754	248.407	253.042	257.660	262.263	266.853	271.430	275.996	280.551	285.097	289.635	294.165
-30	1.387	160.577	164.625	168.604	172.528	176.408	180.251	184.061	187.844	191.602	195.338	199.056	202.756	206.440	210.111	213.769	217.416	221.052	224.679	228.297	231.907	235.510
-25	1.735	129.914	133.225	136.472	139.669	142.825	145.946	149.038	152.105	155.149	158.172	161.179	164.169	167.145	170.108	173.060	176.000	178.932	181.854	184.768	187.675	190.575
-20	2.147	106.059	108.800	111.482	114.118	116.716	119.282	121.821	124.337	126.831	129.307	131.766	134.211	136.642	139.062	141.470	143.869	146.258	148.640	151.014	153.380	155.741
-15	2.632	87.299	89.595	91.837	94.035	96.199	98.332	100.440	102.526	104.593	106.642	108.676	110.697	112.705	114.701	116.688	118.665	120.634	122.595	124.549	126.496	128.438
-10	3.198	72.399	74.344	76.237	78.091	79.911	81.704	83.473	85.221	86.951	88.665	90.365	92.051	93.726	95.391	97.046	98.692	100.331	101.962	103.586	105.204	106.817
-5	3.853	60.453	62.117	63.734	65.313	66.860	68.382	69.881	71.360	72.823	74.270	75.704	77.126	78.536	79.937	81.329	82.713	84.089	85.458	86.821	88.178	89.529
0	4.607	50.790	52.230	53.623	54.981	56.310	57.614	58.896	60.160	61.408	62.641	63.862	65.071	66.270	67.459	68.640	69.813	70.979	72.139	73.292	74.440	75.583
5	5.469	42.910	44.167	45.380	46.559	47.710	48.837	49.944	51.034	52.108	53.168	54.216	55.253	56.281	57.299	58.310	59.313	60.309	61.299	62.283	63.262	64.236
10	6.449	36.434	37.542	38.608	39.641	40.646	41.629	42.593	43.540	44.472	45.391	46.298	47.195	48.083	48.962	49.833	50.697	51.555	52.407	53.254	54.095	54.932
15	7.557	31.071	32.057	33.002	33.915	34.802	35.666	36.512	37.341	38.157	38.960	39.751	40.533	41.305	42.070	42.827	43.577	44.321	45.059	45.792	46.521	47.245
20	8.803	26.600	27.485	28.331	29.144	29.932	30.699	31.447	32.179	32.898	33.604	34.300	34.986	35.663	36.332	36.995	37.650	38.300	38.945	39.584	40.219	40.850
25	10.200	22.847	23.650	24.412	25.143	25.849	26.534	27.200	27.852	28.490	29.116	29.731	30.337	30.935	31.525	32.109	32.686	33.257	33.823	34.385	34.942	35.495
30	11.759	19.676	20.411	21.105	21.768	22.405	23.021	23.619	24.202	24.772	25.331	25.879	26.418	26.949	27.473	27.990	28.501	29.007	29.507	30.003	30.494	30.982
35	13.492	16.980	17.660	18.297	18.902	19.482	20.040	20.581	21.107	21.619	22.121	22.612	23.095	23.569	24.037	24.498	24.953	25.403	25.848	26.288	26.725	27.157
40	15.413	14.674	15.309	15.900	16.457	16.988	17.497	17.989	18.466	18.931	19.384	19.827	20.261	20.688	21.107	21.521	21.928	22.331	22.729	23.122	23.511	23.897
45	17.536	12.689	13.289	13.841	14.358	14.848	15.317	15.767	16.203	16.625	17.037	17.439	17.832	18.218	18.596	18.969	19.336	19.698	20.055	20.408	20.758	21.103
50	19.878	10.969	11.543	12.064	12.548	13.004	13.437	13.852	14.252	14.639	15.015	15.382	15.740	16.090	16.433	16.771	17.103	17.430	17.753	18.071	18.386	18.697
55	22.454	9.468	10.025	10.522	10.979	11.406	11.810	12.194	12.564	12.920	13.265	13.601	13.928	14.248	14.561	14.868	15.170	15.467	15.759	16.048	16.333	16.614
60	25.287	8.148	8.697	9.177	9.612	10.015	10.393	10.751	11.094	11.424	11.743	12.052	12.352	12.645	12.932	13.213	13.488	13.759	14.025	14.288	14.546	14.802
65	28.400	6.974	7.527	7.996	8.414	8.797	9.153	9.490	9.810	10.116	10.412	10.697	10.974	11.244	11.508	11.765	12.018	12.265	12.509	12.748	12.984	13.217
70	31.823	5.916	6.489	6.953	7.359	7.725	8.063	8.380	8.680	8.966	9.241	9.506	9.763	10.012	10.255	10.492	10.724	10.952	11.175	11.394	11.610	11.823
75	35.601	4.940	5.557	6.025	6.421	6.774	7.097	7.397	7.680	7.948	8.205	8.452	8.690	8.921	9.146	9.365	9.579	9.788	9.993	10.195	10.393	10.588
80	39.808	3.993	4.705	5.186	5.579	5.921	6.231	6.516	6.783	7.036	7.276	7.507	7.729	7.943	8.152	8.354	8.552	8.745	8.934	9.120	9.302	9.481

Thermodynamic properties of R-407C - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.011	351.561	354.633	357.744	360.896	364.089	367.325	370.602	373.923	377.285	380.690	384.138	387.628	391.161	394.736	398.353	402.013	405.715	409.459	413.246	417.074	420.945
-95	0.018	354.543	357.667	360.829	364.030	367.273	370.556	373.881	377.247	380.656	384.106	387.599	391.134	394.711	398.330	401.992	405.695	409.441	413.228	417.058	420.930	424.843
-90	0.028	357.549	360.726	363.941	367.193	370.485	373.817	377.190	380.603	384.059	387.555	391.093	394.674	398.296	401.959	405.665	409.413	413.202	417.033	420.906	424.821	428.778
-85	0.044	360.574	363.807	367.075	370.380	373.723	377.104	380.526	383.988	387.490	391.034	394.618	398.244	401.912	405.620	409.371	413.163	416.996	420.872	424.788	428.747	432.746
-80	0.067	363.613	366.905	370.228	373.587	376.982	380.415	383.886	387.397	390.948	394.539	398.171	401.843	405.557	409.311	413.107	416.944	420.822	424.741	428.702	432.704	436.748
-75	0.099	366.662	370.014	373.395	376.809	380.258	383.743	387.266	390.827	394.427	398.067	401.747	405.467	409.227	413.028	416.870	420.752	424.676	428.640	432.645	436.692	440.779
-70	0.142	369.715	373.129	376.570	380.042	383.546	387.086	390.661	394.274	397.925	401.615	405.344	409.112	412.920	416.768	420.657	424.586	428.555	432.565	436.615	440.706	444.838
-65	0.200	372.765	376.245	379.749	383.280	386.843	390.438	394.068	397.734	401.438	405.178	408.957	412.775	416.632	420.528	424.464	428.440	432.456	436.512	440.608	444.745	448.921
-60	0.277	375.807	379.357	382.926	386.520	390.142	393.795	397.482	401.203	404.960	408.753	412.584	416.452	420.359	424.305	428.289	432.313	436.376	440.479	444.622	448.804	453.027
-55	0.376	378.836	382.458	386.096	389.754	393.439	397.153	400.897	404.675	408.487	412.335	416.219	420.139	424.097	428.093	432.127	436.200	440.312	444.463	448.653	452.882	457.150
-50	0.502	381.845	385.544	389.253	392.979	396.729	400.505	404.310	408.147	412.016	415.920	419.858	423.832	427.843	431.890	435.975	440.098	444.259	448.459	452.697	456.974	461.289
-45	0.661	384.828	388.608	392.392	396.190	400.007	403.848	407.716	411.613	415.542	419.503	423.497	427.527	431.591	435.692	439.829	444.003	448.215	452.464	456.751	461.076	465.440
-40	0.857	387.780	391.645	395.508	399.379	403.267	407.176	411.109	415.070	419.059	423.080	427.133	431.219	435.339	439.494	443.685	447.911	452.175	456.475	460.812	465.187	469.599
-36.63	1.013	389.747	393.671	397.589	401.513	405.450	409.406	413.385	417.389	421.421	425.483	429.576	433.701	437.859	442.052	446.280	450.542	454.841	459.176	463.548	467.956	472.402
-35	1.097	390.695	394.648	398.594	402.544	406.505	410.484	414.486	418.512	422.565	426.647	430.759	434.904	439.081	443.293	447.538	451.819	456.135	460.487	464.876	469.301	473.763
-30	1.387	393.565	397.613	401.646	405.677	409.715	413.768	417.840	421.934	426.053	430.199	434.373	438.578	442.815	447.084	451.386	455.722	460.092	464.498	468.939	473.416	477.929
-25	1.735	396.387	400.534	404.657	408.774	412.893	417.022	421.168	425.332	429.519	433.731	437.970	442.238	446.535	450.863	455.223	459.616	464.043	468.503	472.998	477.527	482.092
-20	2.147	399.152	403.403	407.623	411.828	416.032	420.242	424.463	428.702	432.960	437.240	441.545	445.877	450.237	454.627	459.047	463.498	467.982	472.498	477.048	481.632	486.250
-15	2.632	401.854	406.215	410.536	414.836	419.128	423.421	427.723	432.037	436.369	440.721	445.095	449.493	453.918	458.371	462.853	467.364	471.907	476.481	481.087	485.726	490.398
-10	3.198	404.485	408.964	413.391	417.789	422.174	426.555	430.940	435.334	439.743	444.168	448.614	453.081	457.574	462.092	466.637	471.210	475.813	480.447	485.111	489.807	494.535
-5	3.853	407.039	411.641	416.181	420.683	425.165	429.638	434.110	438.588	443.076	447.578	452.098	456.637	461.199	465.784	470.395	475.033	479.698	484.392	489.116	493.870	498.655
0	4.607	409.506	414.239	418.898	423.511	428.095	432.664	437.228	441.793	446.364	450.946	455.543	460.157	464.790	469.445	474.124	478.827	483.557	488.314	493.099	497.913	502.756
5	5.469	411.876	416.750	421.535	426.264	430.957	435.628	440.288	444.944	449.602	454.268	458.944	463.635	468.343	473.071	477.819	482.591	487.386	492.208	497.056	501.931	506.835
10	6.449	414.138	419.163	424.084	428.937	433.744	438.523	443.283	448.035	452.784	457.537	462.297	467.069	471.854	476.656	481.477	486.319	491.183	496.071	500.984	505.922	510.888
15	7.557	416.279	421.467	426.534	431.519	436.449	441.341	446.208	451.061	455.906	460.750	465.597	470.452	475.318	480.198	485.094	490.008	494.943	499.899	504.879	509.883	514.912
20	8.803	418.282	423.649	428.874	434.002	439.063	444.076	449.057	454.016	458.961	463.900	468.839	473.781	478.731	483.691	488.665	493.655	498.662	503.690	508.738	513.809	518.904
25	10.200	420.130	425.695	431.093	436.376	441.577	446.720	451.821	456.892	461.944	466.984	472.017	477.051	482.088	487.132	492.187	497.254	502.338	507.438	512.558	517.698	522.860
30	11.759	421.801	427.587	433.177	438.629	443.983	449.264	454.493	459.684	464.848	469.993	475.127	480.256	485.384	490.516	495.654	500.803	505.965	511.141	516.334	521.546	526.777
35	13.492	423.268	429.307	435.110	440.748	446.267	451.699	457.066	462.384	467.666	472.923	478.162	483.391	488.615	493.838	499.064	504.297	509.540	514.794	520.064	525.349	530.652
40	15.413	424.498	430.829	436.873	442.718	448.419	454.014	459.528	464.982	470.391	475.766	481.117	486.451	491.774	497.093	502.410	507.731	513.058	518.394	523.742	529.104	534.480
45	17.536	425.452	432.126	438.446	444.523	450.424	456.196	461.871	467.471	473.015	478.515	483.984	489.428	494.857	500.275	505.688	511.101	516.516	521.936	527.366	532.806	538.259
50	19.878	426.074	433.163	439.802	446.141	452.266	458.233	464.082	469.840	475.528	481.162	486.755	492.317	497.856	503.380	508.893	514.400	519.907	525.416	530.930	536.452	541.985
55	22.454	426.293	433.893	440.910	447.549	453.925	460.108	466.147	472.075	477.919	483.696	489.422	495.109	500.765	506.398	512.016	517.624	523.226	528.827	534.429	540.036	545.651
60	25.287	426.005	434.257	441.729	448.717	455.377	461.801	468.049	474.164	480.176	486.107	491.975	497.793	503.573	509.323	515.052	520.765	526.467	532.163	537.858	543.553	549.253
65	28.400	425.054	434.176	442.208	449.607	456.593	463.287	469.768	476.088	482.282	488.379	494.400	500.359	506.270	512.144	517.989	523.812	529.620	535.416	541.207	546.994	552.783
70	31.823	423.179	433.531	442.275	450.169	457.533	464.535	471.276	477.821	484.216	490.493	496.678	502.788	508.840	514.846	520.814	526.754	532.672	538.574	544.465	550.349	556.231
75	35.601	419.890	432.146	441.825	450.327	458.138	465.495	472.530	479.327	485.943	492.418	498.781	505.055	511.258	517.404	523.504	529.568	535.603	541.617	547.614	553.600	559.579
80	39.808	414.014	429.701	440.675	449.947	458.300	466.074	473.448	480.532	487.396	494.091	500.651	507.105	513.473	519.772	526.014	532.212	538.373	544.506	550.616	556.710	562.792

Thermodynamic properties of R-407C - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.011	2.080	2.097	2.115	2.132	2.148	2.165	2.181	2.197	2.213	2.229	2.245	2.260	2.276	2.291	2.306	2.321	2.335	2.350	2.365	2.379	2.393
-95	0.018	2.048	2.066	2.083	2.099	2.116	2.132	2.148	2.164	2.180	2.196	2.211	2.227	2.242	2.257	2.272	2.287	2.301	2.316	2.330	2.344	2.359
-90	0.028	2.019	2.037	2.053	2.070	2.086	2.103	2.119	2.134	2.150	2.166	2.181	2.196	2.211	2.226	2.241	2.256	2.270	2.285	2.299	2.313	2.327
-85	0.044	1.993	2.010	2.027	2.043	2.060	2.076	2.092	2.107	2.123	2.138	2.153	2.168	2.183	2.198	2.213	2.227	2.242	2.256	2.270	2.284	2.298
-80	0.067	1.969	1.986	2.003	2.019	2.035	2.051	2.067	2.083	2.098	2.113	2.128	2.143	2.158	2.173	2.187	2.202	2.216	2.230	2.244	2.258	2.272
-75	0.099	1.948	1.965	1.981	1.997	2.013	2.029	2.045	2.060	2.075	2.090	2.105	2.120	2.135	2.150	2.164	2.178	2.193	2.207	2.221	2.235	2.249
-70	0.142	1.928	1.945	1.961	1.977	1.993	2.009	2.024	2.040	2.055	2.070	2.085	2.099	2.114	2.129	2.143	2.157	2.171	2.185	2.199	2.213	2.227
-65	0.200	1.910	1.927	1.943	1.959	1.975	1.990	2.006	2.021	2.036	2.051	2.066	2.081	2.095	2.109	2.124	2.138	2.152	2.166	2.180	2.194	2.207
-60	0.277	1.894	1.910	1.927	1.943	1.958	1.974	1.989	2.004	2.019	2.034	2.049	2.063	2.078	2.092	2.106	2.120	2.134	2.148	2.162	2.176	2.189
-55	0.376	1.879	1.895	1.912	1.927	1.943	1.959	1.974	1.989	2.004	2.019	2.033	2.048	2.062	2.076	2.090	2.104	2.118	2.132	2.146	2.159	2.173
-50	0.502	1.865	1.882	1.898	1.914	1.929	1.945	1.960	1.975	1.990	2.004	2.019	2.033	2.048	2.062	2.076	2.090	2.104	2.117	2.131	2.145	2.158
-45	0.661	1.853	1.869	1.885	1.901	1.917	1.932	1.947	1.962	1.977	1.992	2.006	2.020	2.035	2.049	2.063	2.077	2.090	2.104	2.118	2.131	2.145
-40	0.857	1.842	1.858	1.874	1.890	1.905	1.921	1.936	1.951	1.965	1.980	1.994	2.009	2.023	2.037	2.051	2.065	2.078	2.092	2.105	2.119	2.132
-36.63	1.013	1.834	1.851	1.867	1.883	1.898	1.913	1.928	1.943	1.958	1.973	1.987	2.001	2.015	2.029	2.043	2.057	2.071	2.084	2.098	2.111	2.125
-35	1.097	1.831	1.847	1.864	1.879	1.895	1.910	1.925	1.940	1.955	1.969	1.984	1.998	2.012	2.026	2.040	2.054	2.067	2.081	2.094	2.108	2.121
-30	1.387	1.821	1.838	1.854	1.870	1.885	1.900	1.915	1.930	1.945	1.960	1.974	1.988	2.002	2.016	2.030	2.044	2.057	2.071	2.084	2.098	2.111
-25	1.735	1.812	1.829	1.845	1.861	1.876	1.892	1.907	1.922	1.936	1.951	1.965	1.979	1.993	2.007	2.021	2.035	2.048	2.062	2.075	2.088	2.102
-20	2.147	1.804	1.821	1.837	1.853	1.868	1.884	1.899	1.914	1.928	1.943	1.957	1.971	1.985	1.999	2.013	2.027	2.040	2.054	2.067	2.080	2.093
-15	2.632	1.797	1.813	1.830	1.845	1.861	1.876	1.891	1.906	1.921	1.935	1.950	1.964	1.978	1.992	2.005	2.019	2.033	2.046	2.059	2.073	2.086
-10	3.198	1.789	1.806	1.823	1.839	1.854	1.870	1.885	1.899	1.914	1.929	1.943	1.957	1.971	1.985	1.999	2.012	2.026	2.039	2.053	2.066	2.079
-5	3.853	1.783	1.800	1.816	1.832	1.848	1.863	1.878	1.893	1.908	1.922	1.937	1.951	1.965	1.979	1.993	2.006	2.020	2.033	2.046	2.060	2.073
0	4.607	1.776	1.794	1.810	1.826	1.842	1.858	1.873	1.888	1.902	1.917	1.931	1.945	1.959	1.973	1.987	2.001	2.014	2.027	2.041	2.054	2.067
5	5.469	1.770	1.788	1.805	1.821	1.837	1.852	1.867	1.882	1.897	1.912	1.926	1.940	1.954	1.968	1.982	1.996	2.009	2.022	2.036	2.049	2.062
10	6.449	1.765	1.782	1.799	1.816	1.832	1.847	1.863	1.878	1.892	1.907	1.921	1.936	1.950	1.964	1.977	1.991	2.004	2.018	2.031	2.044	2.057
15	7.557	1.759	1.777	1.794	1.811	1.827	1.843	1.858	1.873	1.888	1.903	1.917	1.931	1.945	1.959	1.973	1.987	2.000	2.014	2.027	2.040	2.053
20	8.803	1.754	1.772	1.789	1.806	1.822	1.838	1.854	1.869	1.884	1.899	1.913	1.927	1.942	1.955	1.969	1.983	1.996	2.010	2.023	2.036	2.049
25	10.200	1.748	1.767	1.784	1.801	1.818	1.834	1.850	1.865	1.880	1.895	1.909	1.924	1.938	1.952	1.966	1.979	1.993	2.006	2.020	2.033	2.046
30	11.759	1.743	1.762	1.780	1.797	1.814	1.830	1.846	1.861	1.876	1.891	1.906	1.920	1.935	1.949	1.963	1.976	1.990	2.003	2.016	2.030	2.043
35	13.492	1.737	1.757	1.775	1.793	1.810	1.826	1.842	1.858	1.873	1.888	1.903	1.917	1.932	1.946	1.960	1.973	1.987	2.000	2.014	2.027	2.040
40	15.413	1.732	1.752	1.770	1.788	1.806	1.822	1.838	1.854	1.870	1.885	1.900	1.914	1.929	1.943	1.957	1.971	1.984	1.998	2.011	2.024	2.037
45	17.536	1.725	1.746	1.766	1.784	1.802	1.819	1.835	1.851	1.866	1.882	1.897	1.911	1.926	1.940	1.954	1.968	1.982	1.995	2.009	2.022	2.035
50	19.878	1.719	1.740	1.761	1.779	1.797	1.815	1.831	1.848	1.863	1.879	1.894	1.909	1.923	1.938	1.952	1.966	1.979	1.993	2.006	2.020	2.033
55	22.454	1.711	1.734	1.755	1.775	1.793	1.811	1.828	1.844	1.860	1.876	1.891	1.906	1.921	1.935	1.949	1.963	1.977	1.991	2.004	2.018	2.031
60	25.287	1.703	1.728	1.749	1.770	1.789	1.807	1.824	1.841	1.857	1.873	1.888	1.903	1.918	1.933	1.947	1.961	1.975	1.989	2.002	2.016	2.029
65	28.400	1.693	1.720	1.743	1.764	1.784	1.802	1.820	1.837	1.854	1.870	1.885	1.901	1.916	1.930	1.945	1.959	1.973	1.987	2.000	2.014	2.027
70	31.823	1.681	1.711	1.736	1.758	1.779	1.798	1.816	1.833	1.850	1.866	1.882	1.898	1.913	1.928	1.942	1.957	1.971	1.984	1.998	2.012	2.025
75	35.601	1.666	1.701	1.728	1.751	1.773	1.793	1.811	1.829	1.846	1.863	1.879	1.895	1.910	1.925	1.940	1.954	1.968	1.982	1.996	2.010	2.023
80	39.808	1.644	1.688	1.718	1.744	1.766	1.787	1.806	1.825	1.842	1.859	1.875	1.891	1.907	1.922	1.937	1.951	1.966	1.980	1.994	2.007	2.021

R-407F (Performax® LT)

Zeotropic blend (30 % R-32 - 30 % R-125 - 40 % R-134a)

Molecular weight (g/mol)	82.06
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-46.06
Temperature glide at 1.013 bar (K)	6.4
Critical temperature (°C)	82.7
Critical pressure (bar absolute)	47.55
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.575
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.834
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.152
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.145
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.63
Classification NF-EN 378	A1
GWP (IPCC 4)	1825

Main applications

Performax® LT is a "non azeotropic" HFC blend, designed for commercial and direct expansion industrial refrigeration applications. It can be used for new or existing systems as a replacement for R-404A. R-407F is mainly used in new refrigeration units in supermarkets, cold stores, food preservation storage units, cooling display cabinets and for refrigerated transport.

Commercial specifications

Composition: 30 % R-32 -30 % R-125 - 40 % R-134a (±2 % / ±2 % / ± 2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative
Non-condensables (gas phase): ≤ 1.5 % volume.
Acidity (HCl): ≤ 1 ppm weight.
High boiling residue: ≤ 0.01% volume.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of Performax® LT are governed by EU Regulation n° 517/2014. The recovery of Performax® LT is mandatory under EU Regulation n° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-407F (Performax® LT) - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.027	-100	0.653	1.531	65.841	0.393	-92.68	6.715	0.149	362.053	2.073	296.212
0.042	-95	0.659	1.517	72.391	0.430	-87.77	4.417	0.226	365.017	2.045	292.626
0.064	-90	0.666	1.502	78.916	0.466	-82.86	2.986	0.335	367.991	2.018	289.074
0.095	-85	0.672	1.488	85.428	0.501	-77.95	2.069	0.483	370.969	1.995	285.541
0.137	-80	0.679	1.474	91.936	0.535	-73.03	1.466	0.682	373.946	1.973	282.011
0.193	-75	0.685	1.459	98.445	0.568	-68.12	1.060	0.943	376.916	1.953	278.471
0.268	-70	0.692	1.444	104.964	0.601	-63.2	0.781	1.280	379.874	1.935	274.910
0.364	-65	0.699	1.430	111.497	0.633	-58.28	0.586	1.708	382.813	1.918	271.316
0.487	-60	0.707	1.415	118.050	0.664	-53.37	0.446	2.243	385.728	1.903	267.677
0.641	-55	0.714	1.400	124.628	0.694	-48.45	0.344	2.904	388.612	1.888	263.983
0.833	-50	0.722	1.385	131.236	0.724	-43.54	0.269	3.712	391.460	1.875	260.224
1.013	-46.06	0.729	1.372	136.461	0.747	-39.67	0.224	4.465	393.672	1.866	257.211
1.067	-45	0.730	1.369	137.878	0.753	-38.62	0.213	4.688	394.266	1.863	256.388
1.350	-40	0.739	1.354	144.558	0.782	-33.71	0.171	5.856	397.023	1.852	252.465
1.690	-35	0.747	1.338	151.282	0.811	-28.79	0.138	7.242	399.727	1.842	248.445
2.093	-30	0.757	1.322	158.053	0.839	-23.88	0.113	8.875	402.370	1.832	244.316
2.567	-25	0.766	1.305	164.878	0.866	-18.98	0.093	10.785	404.945	1.823	240.067
3.120	-20	0.776	1.289	171.761	0.894	-14.07	0.077	13.006	407.446	1.815	235.685
3.760	-15	0.786	1.272	178.709	0.921	-9.17	0.064	15.575	409.865	1.807	231.157
4.496	-10	0.797	1.254	185.726	0.947	-4.27	0.054	18.534	412.194	1.799	226.468
5.336	-5	0.809	1.237	192.821	0.974	0.63	0.046	21.928	414.422	1.792	221.602
6.291	0	0.821	1.218	200.000	1.000	5.52	0.039	25.809	416.540	1.785	216.540
7.368	5	0.834	1.199	207.272	1.026	10.4	0.033	30.237	418.534	1.779	211.262
8.579	10	0.848	1.180	214.647	1.052	15.28	0.028	35.278	420.390	1.772	205.743
9.933	15	0.862	1.160	222.136	1.078	20.15	0.024	41.014	422.091	1.766	199.955
11.440	20	0.878	1.139	229.750	1.104	25.01	0.021	47.536	423.616	1.760	193.866
13.110	25	0.895	1.117	237.505	1.129	29.86	0.018	54.958	424.943	1.753	187.438
14.955	30	0.914	1.094	245.418	1.155	34.71	0.016	63.416	426.042	1.747	180.624
16.986	35	0.935	1.070	253.510	1.181	39.53	0.014	73.080	426.880	1.740	173.370
19.214	40	0.957	1.044	261.807	1.207	44.35	0.012	84.170	427.414	1.732	165.606
21.651	45	0.983	1.017	270.344	1.233	49.14	0.010	96.970	427.586	1.724	157.243
24.310	50	1.012	0.988	279.164	1.260	53.91	0.009	111.869	427.324	1.716	148.160
27.203	55	1.046	0.956	288.334	1.287	58.66	0.008	129.423	426.518	1.706	138.184
30.346	60	1.086	0.921	297.955	1.315	63.37	0.007	150.470	425.011	1.695	127.056
33.751	65	1.136	0.880	308.194	1.345	68.04	0.006	176.383	422.542	1.681	114.349
37.433	70	1.202	0.832	319.372	1.376	72.63	0.005	209.708	418.638	1.664	99.266
41.401	75	1.299	0.770	332.234	1.412	77.11	0.004	256.275	412.231	1.641	79.997
45.616	80	1.498	0.668	349.694	1.460	81.3	0.003	338.233	399.397	1.601	49.703

Thermodynamic properties of R-407F (Performax® LT) - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.013	13258.297	13645.036	14031.251	14417.058	14802.539	15187.758	15572.764	15957.593	16342.275	16726.834	17111.289	17495.655	17879.945	18264.170	18648.337	19032.455	19416.530	19800.567	20184.570	20568.544	20952.491
-95	0.022	8264.723	8499.958	8734.773	8969.258	9203.479	9437.483	9671.311	9904.991	10138.548	10372.000	10605.363	10838.650	11071.872	11305.036	11538.151	11771.223	12004.256	12237.256	12470.226	12703.170	12936.090
-90	0.035	5322.477	5470.575	5618.331	5765.817	5913.083	6060.171	6207.110	6353.925	6500.635	6647.256	6793.801	6940.279	7086.701	7233.073	7379.402	7525.692	7671.949	7818.176	7964.376	8110.553	8256.708
-85	0.054	3530.229	3626.452	3722.392	3818.107	3913.639	4009.020	4104.277	4199.427	4294.488	4389.472	4484.390	4579.251	4674.062	4768.829	4863.558	4958.254	5052.919	5147.558	5242.173	5336.767	5431.342
-80	0.081	2404.912	2469.263	2533.377	2597.300	2661.069	2724.711	2788.246	2851.690	2915.056	2978.356	3041.599	3104.792	3167.941	3231.051	3294.128	3357.175	3420.195	3483.191	3546.166	3609.122	3672.061
-75	0.118	1678.542	1722.738	1766.730	1810.561	1854.260	1897.850	1941.347	1984.767	2028.119	2071.413	2114.657	2157.857	2201.018	2244.145	2287.242	2330.313	2373.359	2416.385	2459.391	2502.379	2545.353
-70	0.170	1197.682	1228.788	1259.719	1290.510	1321.188	1351.771	1382.274	1412.709	1443.085	1473.411	1503.692	1533.934	1564.142	1594.320	1624.471	1654.597	1684.703	1714.789	1744.858	1774.911	1804.951
-65	0.238	871.893	894.289	916.530	938.651	960.672	982.611	1004.481	1026.290	1048.048	1069.761	1091.434	1113.073	1134.682	1156.263	1177.821	1199.357	1220.873	1242.372	1263.856	1285.325	1306.781
-60	0.328	646.429	662.894	679.224	695.448	711.585	727.649	743.652	759.602	775.507	791.371	807.201	822.999	838.770	854.517	870.243	885.948	901.637	917.309	932.967	948.613	964.246
-55	0.443	487.313	499.656	511.880	524.010	536.062	548.050	559.984	571.871	583.717	595.527	607.307	619.058	630.785	642.490	654.175	665.843	677.494	689.132	700.756	712.369	723.970
-50	0.589	372.985	382.408	391.723	400.955	410.118	419.223	428.280	437.295	446.274	455.220	464.138	473.032	481.903	490.754	499.587	508.404	517.207	525.997	534.774	543.541	552.298
-45	0.771	289.464	296.779	303.998	311.142	318.223	325.254	332.240	339.189	346.105	352.993	359.854	366.693	373.512	380.313	387.097	393.867	400.623	407.367	414.101	420.824	427.538
-40	0.996	227.506	233.275	238.957	244.571	250.129	255.641	261.113	266.551	271.960	277.342	282.700	288.039	293.358	298.661	303.950	309.224	314.487	319.738	324.980	330.212	335.435
-39.67	1.013	223.980	229.661	235.257	240.784	246.256	251.682	257.069	262.421	267.744	273.041	278.315	283.569	288.804	294.022	299.226	304.417	309.595	314.762	319.919	325.067	330.206
-35	1.270	180.888	185.505	190.043	194.519	198.945	203.328	207.675	211.991	216.280	220.546	224.789	229.014	233.222	237.415	241.594	245.761	249.916	254.062	258.197	262.325	266.444
-30	1.601	145.348	149.094	152.768	156.386	159.957	163.490	166.990	170.461	173.907	177.332	180.737	184.124	187.496	190.854	194.199	197.533	200.856	204.170	207.475	210.772	214.062
-25	1.995	117.921	121.000	124.013	126.974	129.893	132.776	135.629	138.455	141.259	144.042	146.807	149.557	152.291	155.013	157.723	160.423	163.112	165.793	168.466	171.131	173.789
-20	2.462	96.513	99.075	101.576	104.029	106.443	108.823	111.176	113.504	115.811	118.100	120.371	122.628	124.872	127.103	129.323	131.533	133.734	135.927	138.113	140.291	142.463
-15	3.008	79.626	81.783	83.883	85.937	87.956	89.944	91.905	93.844	95.764	97.665	99.552	101.424	103.284	105.132	106.970	108.799	110.620	112.432	114.238	116.037	117.830
-10	3.644	66.174	68.009	69.791	71.531	73.237	74.914	76.566	78.198	79.811	81.408	82.990	84.559	86.116	87.663	89.200	90.728	92.248	93.761	95.267	96.767	98.262
-5	4.379	55.357	56.935	58.463	59.952	61.408	62.837	64.243	65.629	66.998	68.352	69.691	71.019	72.335	73.641	74.938	76.227	77.508	78.783	80.051	81.313	82.570
0	5.222	46.585	47.955	49.279	50.564	51.819	53.049	54.256	55.445	56.617	57.775	58.919	60.052	61.175	62.287	63.392	64.488	65.578	66.660	67.737	68.808	69.874
5	6.184	39.412	40.614	41.771	42.892	43.983	45.050	46.097	47.125	48.137	49.136	50.122	51.097	52.062	53.018	53.966	54.907	55.840	56.768	57.690	58.606	59.518
10	7.275	33.501	34.566	35.587	36.573	37.530	38.465	39.379	40.276	41.157	42.026	42.882	43.728	44.565	45.393	46.213	47.026	47.832	48.632	49.427	50.217	51.003
15	8.506	28.595	29.547	30.456	31.331	32.178	33.003	33.808	34.597	35.371	36.132	36.881	37.621	38.351	39.073	39.788	40.496	41.197	41.893	42.584	43.269	43.951
20	9.889	24.495	25.354	26.170	26.953	27.709	28.443	29.158	29.856	30.541	31.212	31.873	32.524	33.166	33.801	34.428	35.048	35.663	36.272	36.876	37.475	38.070
25	11.435	21.045	21.828	22.568	23.274	23.954	24.612	25.251	25.874	26.483	27.080	27.667	28.244	28.812	29.373	29.927	30.474	31.016	31.553	32.084	32.611	33.134
30	13.159	18.123	18.844	19.520	20.163	20.779	21.373	21.949	22.508	23.055	23.589	24.113	24.628	25.134	25.633	26.125	26.611	27.091	27.567	28.038	28.504	28.966
35	15.073	15.633	16.303	16.928	17.517	18.080	18.620	19.142	19.648	20.141	20.622	21.093	21.555	22.008	22.455	22.895	23.329	23.757	24.181	24.600	25.015	25.426
40	17.193	13.498	14.128	14.709	15.255	15.772	16.267	16.743	17.204	17.651	18.087	18.513	18.929	19.338	19.740	20.135	20.525	20.909	21.289	21.664	22.035	22.403
45	19.533	11.654	12.255	12.801	13.310	13.789	14.245	14.683	15.104	15.513	15.910	16.297	16.675	17.045	17.409	17.766	18.117	18.464	18.806	19.143	19.477	19.807
50	22.112	10.052	10.631	11.151	11.629	12.076	12.499	12.904	13.292	13.667	14.031	14.384	14.729	15.066	15.397	15.721	16.040	16.353	16.662	16.967	17.269	17.566
55	24.950	8.649	9.216	9.715	10.168	10.589	10.985	11.361	11.720	12.066	12.401	12.726	13.042	13.350	13.652	13.947	14.238	14.523	14.804	15.080	15.353	15.623
60	28.070	7.408	7.975	8.460	8.893	9.292	9.664	10.015	10.350	10.671	10.980	11.280	11.571	11.854	12.131	12.401	12.666	12.927	13.183	13.435	13.684	13.929
65	31.501	6.296	6.877	7.355	7.774	8.154	8.506	8.836	9.149	9.448	9.735	10.013	10.281	10.543	10.797	11.046	11.289	11.528	11.762	11.993	12.220	12.444
70	35.282	5.279	5.897	6.375	6.784	7.149	7.484	7.796	8.090	8.370	8.637	8.895	9.144	9.386	9.621	9.850	10.074	10.294	10.509	10.720	10.928	11.133
75	39.476	4.314	5.010	5.497	5.900	6.253	6.573	6.869	7.147	7.409	7.660	7.900	8.132	8.356	8.574	8.785	8.992	9.194	9.392	9.586	9.777	9.965
80	44.224	3.292	4.179	4.688	5.089	5.434	5.741	6.023	6.286	6.533	6.768	6.993	7.208	7.417	7.618	7.814	8.005	8.192	8.374	8.552	8.728	8.900

Thermodynamic properties of R-407F (Performax® LT) - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
-100	0.013	357.666	360.767	363.905	367.080	370.295	373.549	376.842	380.175	383.549	386.963	390.417	393.912	397.447	401.023	404.640	408.297	411.996	415.735	419.515	423.335	427.197	
-95	0.022	360.660	363.812	367.000	370.224	373.485	376.785	380.124	383.503	386.921	390.378	393.876	397.415	400.993	404.612	408.271	411.971	415.712	419.493	423.316	427.178	431.082	
-90	0.035	363.671	366.877	370.115	373.389	376.699	380.047	383.433	386.857	390.320	393.823	397.365	400.948	404.570	408.232	411.935	415.678	419.461	423.285	427.150	431.055	435.001	
-85	0.054	366.694	369.955	373.247	376.573	379.933	383.330	386.763	390.235	393.745	397.293	400.881	404.508	408.175	411.881	415.628	419.414	423.241	427.109	431.016	434.964	438.952	
-80	0.081	369.724	373.043	376.391	379.770	383.182	386.630	390.113	393.633	397.190	400.786	404.420	408.093	411.805	415.556	419.347	423.178	427.049	430.960	434.911	438.902	442.934	
-75	0.118	372.754	376.135	379.541	382.976	386.443	389.942	393.476	397.046	400.653	404.297	407.978	411.698	415.457	419.254	423.091	426.967	430.882	434.837	438.832	442.867	446.942	
-70	0.170	375.779	379.225	382.692	386.186	389.708	393.263	396.850	400.471	404.129	407.822	411.553	415.321	419.127	422.971	426.854	430.776	434.737	438.737	442.777	446.857	450.976	
-65	0.238	378.793	382.308	385.839	389.394	392.975	396.586	400.228	403.904	407.613	411.358	415.139	418.956	422.811	426.703	430.634	434.603	438.610	442.657	446.742	450.867	455.031	
-60	0.328	381.790	385.377	388.976	392.595	396.238	399.908	403.607	407.338	411.102	414.899	418.732	422.601	426.505	430.447	434.426	438.443	442.498	446.592	450.724	454.894	459.104	
-55	0.443	384.763	388.427	392.098	395.784	399.491	403.223	406.982	410.770	414.590	418.443	422.329	426.250	430.206	434.199	438.228	442.294	446.398	450.539	454.719	458.936	463.192	
-50	0.589	387.707	391.452	395.199	398.955	402.730	406.525	410.346	414.195	418.073	421.983	425.924	429.900	433.909	437.954	442.035	446.151	450.305	454.495	458.723	462.989	467.292	
-45	0.771	390.616	394.447	398.272	402.103	405.948	409.811	413.697	417.608	421.547	425.515	429.514	433.546	437.610	441.709	445.842	450.011	454.215	458.456	462.733	467.048	471.399	
-40	0.996	393.483	397.405	401.314	405.223	409.141	413.075	417.028	421.004	425.006	429.035	433.094	437.183	441.304	445.458	449.646	453.868	458.125	462.417	466.746	471.110	475.511	
-39.67	1.013	393.672	397.601	401.515	405.430	409.353	413.291	417.249	421.230	425.236	429.269	433.332	437.425	441.550	445.708	449.899	454.125	458.385	462.681	467.013	471.381	475.785	
-35	1.270	396.303	400.321	404.317	408.308	412.304	416.311	420.335	424.378	428.446	432.538	436.659	440.808	444.988	449.199	453.443	457.720	462.030	466.376	470.756	475.172	479.623	
-30	1.601	399.069	403.188	407.277	411.354	415.430	419.514	423.612	427.726	431.861	436.020	440.204	444.416	448.656	452.926	457.228	461.561	465.928	470.327	474.761	479.229	483.732	
-25	1.995	401.774	406.000	410.187	414.354	418.516	422.680	426.854	431.042	435.248	439.475	443.726	448.002	452.304	456.636	460.997	465.389	469.812	474.268	478.756	483.279	487.835	
-20	2.462	404.413	408.752	413.041	417.303	421.554	425.803	430.057	434.322	438.602	442.900	447.219	451.562	455.929	460.324	464.746	469.198	473.680	478.194	482.739	487.316	491.926	
-15	3.008	406.978	411.435	415.833	420.195	424.539	428.877	433.215	437.560	441.916	446.288	450.679	455.091	459.526	463.986	468.472	472.986	477.528	482.101	486.704	491.338	496.004	
-10	3.644	409.460	414.044	418.555	423.024	427.466	431.896	436.322	440.751	445.187	449.637	454.102	458.585	463.090	467.617	472.169	476.747	481.352	485.985	490.648	495.340	500.063	
-5	4.379	411.852	416.569	421.202	425.782	430.328	434.855	439.373	443.889	448.410	452.940	457.482	462.041	466.617	471.214	475.834	480.478	485.148	489.844	494.568	499.320	504.102	
0	5.222	414.142	419.003	423.765	428.462	433.118	437.747	442.362	446.971	451.579	456.193	460.816	465.452	470.103	474.773	479.463	484.175	488.911	493.672	498.459	503.273	508.115	
5	6.184	416.321	421.335	426.234	431.057	435.829	440.567	445.284	449.989	454.689	459.390	464.097	468.814	473.544	478.289	483.052	487.835	492.639	497.467	502.319	507.197	512.101	
10	7.275	418.375	423.554	428.601	433.558	438.453	443.306	448.131	452.937	457.734	462.527	467.322	472.123	476.934	481.757	486.596	491.452	496.327	501.224	506.143	511.087	516.055	
15	8.506	420.287	425.647	430.854	435.955	440.982	445.958	450.897	455.811	460.709	465.599	470.486	475.375	480.270	485.174	490.091	495.023	499.972	504.940	509.929	514.939	519.973	
20	9.889	422.041	427.600	432.981	438.238	443.408	448.514	453.574	458.602	463.607	468.598	473.582	478.563	483.546	488.535	493.534	498.544	503.569	508.611	513.671	518.752	523.853	
25	11.435	423.613	429.395	434.968	440.396	445.719	450.966	456.156	461.304	466.423	471.521	476.605	481.682	486.758	491.835	496.918	502.011	507.115	512.233	517.368	522.520	527.691	
30	13.159	424.977	431.011	436.799	442.415	447.905	453.304	458.633	463.910	469.148	474.359	479.550	484.728	489.900	495.070	500.241	505.419	510.605	515.803	521.014	526.240	531.484	
35	15.073	426.101	432.427	438.457	444.281	449.954	455.517	460.996	466.410	471.777	477.107	482.410	487.695	492.968	498.234	503.498	508.764	514.035	519.315	524.605	529.909	535.227	
40	17.193	426.946	433.615	439.920	445.977	451.852	457.594	463.234	468.797	474.299	479.756	485.179	490.575	495.954	501.321	506.682	512.040	517.401	522.766	528.139	533.522	538.917	
45	19.533	427.460	434.538	441.164	447.483	453.583	459.522	465.337	471.059	476.707	482.299	487.848	493.363	498.854	504.327	509.789	515.244	520.697	526.151	531.609	537.075	542.551	
50	22.112	427.574	435.156	442.157	448.776	455.128	461.283	467.291	473.185	478.990	484.727	490.409	496.050	501.659	507.244	512.812	518.368	523.917	529.464	535.012	540.564	546.122	
55	24.950	427.192	435.411	442.861	449.828	456.464	462.861	469.079	475.160	481.135	487.027	492.853	498.627	504.361	510.064	515.743	521.405	527.056	532.700	538.341	543.982	549.626	
60	28.070	426.171	435.228	443.228	450.602	457.563	464.231	470.682	476.969	483.128	489.187	495.166	501.083	506.950	512.777	518.574	524.348	530.105	535.850	541.588	547.322	553.056	
65	31.501	424.279	434.500	443.190	451.052	458.388	465.363	472.074	478.587	484.947	491.187	497.332	503.402	509.410	515.370	521.292	527.183	533.052	538.903	544.743	550.575	556.403	
70	35.282	421.098	433.068	442.656	451.111	458.888	466.214	473.218	479.983	486.564	493.002	499.327	505.560	511.721	517.823	523.877	529.893	535.880	541.844	547.791	553.725	559.651	
75	39.476	415.713	430.667	441.473	450.670	458.975	466.711	474.050	481.098	487.926	494.583	501.105	507.517	513.843	520.097	526.294	532.445	538.558	544.641	550.701	556.744	562.774	
80	44.224	404.954	426.673	439.272	449.450	458.421	466.655	474.393	481.774	488.888	495.796	502.540	509.155	515.665	522.090	528.445	534.743	540.995	547.209	553.393	559.554	565.696	

Thermodynamic properties of R-407F (Performax® LT) - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.013	2.121	2.139	2.156	2.173	2.190	2.207	2.223	2.239	2.255	2.271	2.287	2.302	2.318	2.333	2.348	2.363	2.378	2.392	2.407	2.421	2.435
-95	0.022	2.088	2.105	2.122	2.139	2.156	2.172	2.189	2.205	2.220	2.236	2.252	2.267	2.282	2.297	2.312	2.327	2.342	2.356	2.370	2.385	2.399
-90	0.035	2.057	2.075	2.092	2.108	2.125	2.141	2.157	2.173	2.189	2.204	2.220	2.235	2.250	2.265	2.279	2.294	2.309	2.323	2.337	2.351	2.366
-85	0.054	2.030	2.047	2.063	2.080	2.096	2.113	2.128	2.144	2.160	2.175	2.190	2.205	2.220	2.235	2.250	2.264	2.279	2.293	2.307	2.321	2.335
-80	0.081	2.004	2.021	2.038	2.054	2.071	2.087	2.102	2.118	2.133	2.149	2.164	2.179	2.194	2.208	2.223	2.237	2.251	2.266	2.280	2.294	2.308
-75	0.118	1.981	1.998	2.015	2.031	2.047	2.063	2.079	2.094	2.109	2.125	2.140	2.154	2.169	2.184	2.198	2.212	2.227	2.241	2.255	2.269	2.282
-70	0.170	1.960	1.977	1.994	2.010	2.026	2.042	2.057	2.072	2.088	2.103	2.118	2.132	2.147	2.161	2.176	2.190	2.204	2.218	2.232	2.246	2.259
-65	0.238	1.941	1.958	1.974	1.990	2.006	2.022	2.037	2.053	2.068	2.083	2.097	2.112	2.127	2.141	2.155	2.169	2.183	2.197	2.211	2.225	2.239
-60	0.328	1.924	1.940	1.957	1.973	1.988	2.004	2.019	2.035	2.050	2.064	2.079	2.094	2.108	2.122	2.137	2.151	2.165	2.178	2.192	2.206	2.219
-55	0.443	1.908	1.924	1.940	1.956	1.972	1.988	2.003	2.018	2.033	2.048	2.062	2.077	2.091	2.105	2.120	2.134	2.147	2.161	2.175	2.188	2.202
-50	0.589	1.893	1.909	1.926	1.942	1.957	1.973	1.988	2.003	2.018	2.033	2.047	2.062	2.076	2.090	2.104	2.118	2.132	2.146	2.159	2.173	2.186
-45	0.771	1.879	1.896	1.912	1.928	1.944	1.959	1.974	1.989	2.004	2.019	2.033	2.048	2.062	2.076	2.090	2.104	2.118	2.131	2.145	2.158	2.172
-40	0.996	1.867	1.883	1.900	1.915	1.931	1.946	1.962	1.977	1.991	2.006	2.020	2.035	2.049	2.063	2.077	2.091	2.104	2.118	2.132	2.145	2.158
-39.67	1.013	1.866	1.882	1.899	1.915	1.930	1.946	1.961	1.976	1.991	2.005	2.020	2.034	2.048	2.062	2.076	2.090	2.104	2.117	2.131	2.144	2.157
-35	1.270	1.855	1.872	1.888	1.904	1.920	1.935	1.950	1.965	1.980	1.994	2.009	2.023	2.037	2.051	2.065	2.079	2.093	2.106	2.120	2.133	2.146
-30	1.601	1.844	1.861	1.877	1.893	1.909	1.924	1.940	1.954	1.969	1.984	1.998	2.012	2.026	2.040	2.054	2.068	2.082	2.095	2.109	2.122	2.135
-25	1.995	1.834	1.851	1.868	1.884	1.899	1.915	1.930	1.945	1.959	1.974	1.988	2.003	2.017	2.031	2.044	2.058	2.072	2.085	2.099	2.112	2.125
-20	2.462	1.825	1.842	1.859	1.875	1.890	1.906	1.921	1.936	1.951	1.965	1.979	1.994	2.008	2.022	2.035	2.049	2.063	2.076	2.089	2.103	2.116
-15	3.008	1.816	1.834	1.850	1.866	1.882	1.897	1.913	1.928	1.942	1.957	1.971	1.985	1.999	2.013	2.027	2.041	2.054	2.068	2.081	2.094	2.107
-10	3.644	1.808	1.826	1.842	1.858	1.874	1.890	1.905	1.920	1.935	1.949	1.964	1.978	1.992	2.006	2.020	2.033	2.047	2.060	2.073	2.087	2.100
-5	4.379	1.801	1.818	1.835	1.851	1.867	1.883	1.898	1.913	1.928	1.942	1.957	1.971	1.985	1.999	2.013	2.026	2.040	2.053	2.066	2.080	2.093
0	5.222	1.793	1.811	1.828	1.844	1.860	1.876	1.891	1.906	1.921	1.936	1.950	1.964	1.979	1.992	2.006	2.020	2.033	2.047	2.060	2.073	2.086
5	6.184	1.786	1.804	1.821	1.838	1.854	1.870	1.885	1.900	1.915	1.930	1.944	1.959	1.973	1.987	2.000	2.014	2.027	2.041	2.054	2.067	2.080
10	7.275	1.779	1.798	1.815	1.832	1.848	1.864	1.879	1.895	1.910	1.924	1.939	1.953	1.967	1.981	1.995	2.009	2.022	2.035	2.049	2.062	2.075
15	8.506	1.773	1.791	1.809	1.826	1.842	1.858	1.874	1.889	1.904	1.919	1.934	1.948	1.962	1.976	1.990	2.004	2.017	2.031	2.044	2.057	2.070
20	9.889	1.766	1.785	1.803	1.820	1.837	1.853	1.869	1.884	1.899	1.914	1.929	1.943	1.957	1.971	1.985	1.999	2.013	2.026	2.039	2.052	2.065
25	11.435	1.760	1.779	1.797	1.815	1.831	1.848	1.864	1.879	1.895	1.910	1.924	1.939	1.953	1.967	1.981	1.995	2.008	2.022	2.035	2.048	2.061
30	13.159	1.753	1.773	1.791	1.809	1.826	1.843	1.859	1.875	1.890	1.905	1.920	1.935	1.949	1.963	1.977	1.991	2.004	2.018	2.031	2.044	2.057
35	15.073	1.746	1.766	1.786	1.804	1.821	1.838	1.854	1.870	1.886	1.901	1.916	1.931	1.945	1.959	1.973	1.987	2.001	2.014	2.028	2.041	2.054
40	17.193	1.739	1.760	1.780	1.798	1.816	1.833	1.850	1.866	1.882	1.897	1.912	1.927	1.941	1.955	1.970	1.983	1.997	2.011	2.024	2.037	2.051
45	19.533	1.731	1.753	1.774	1.793	1.811	1.828	1.845	1.862	1.877	1.893	1.908	1.923	1.938	1.952	1.966	1.980	1.994	2.008	2.021	2.034	2.047
50	22.112	1.723	1.746	1.767	1.787	1.806	1.824	1.841	1.857	1.873	1.889	1.904	1.919	1.934	1.949	1.963	1.977	1.991	2.004	2.018	2.031	2.045
55	24.950	1.714	1.738	1.761	1.781	1.800	1.819	1.836	1.853	1.869	1.885	1.901	1.916	1.931	1.945	1.960	1.974	1.988	2.001	2.015	2.028	2.042
60	28.070	1.703	1.730	1.753	1.775	1.795	1.813	1.831	1.848	1.865	1.881	1.897	1.912	1.927	1.942	1.956	1.971	1.985	1.999	2.012	2.026	2.039
65	31.501	1.690	1.720	1.746	1.768	1.789	1.808	1.826	1.844	1.861	1.877	1.893	1.909	1.924	1.939	1.953	1.968	1.982	1.996	2.009	2.023	2.036
70	35.282	1.675	1.709	1.737	1.760	1.782	1.802	1.821	1.839	1.856	1.873	1.889	1.905	1.920	1.935	1.950	1.964	1.979	1.993	2.007	2.020	2.034
75	39.476	1.653	1.696	1.726	1.752	1.775	1.795	1.815	1.833	1.851	1.868	1.885	1.901	1.916	1.932	1.946	1.961	1.975	1.990	2.003	2.017	2.031
80	44.224	1.617	1.679	1.714	1.741	1.766	1.787	1.808	1.827	1.845	1.863	1.879	1.896	1.912	1.927	1.942	1.957	1.972	1.986	2.000	2.014	2.027

R-410A

Zeotropic blend (50 % R-32 - 50 % R-125)

Molecular weight (g/mol)	72.59
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-51.45
Temperature glide at 1.013 bar (K)	0.08
Critical temperature (°C)	71.3
Critical pressure (bar absolute)	49.01
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.708
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.823
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.176
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.118
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	5.32
Classification NF-EN 378	A1
GWP (IPCC 4)	2088

Main applications

R-410A is a "near azeotropic" HFC blend. It is mainly used in air conditioning and industrial refrigeration applications.

Commercial specifications

Composition: (50 % R-32 - 50 % R-125) (+0.5 % -1.5 % / +1.5 % -0.5 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-410A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.037	-100	0.669	1.495	60.715	0.370	-99.89	5.315	0.188	371.819	2.167	311.104
0.058	-95	0.676	1.480	67.452	0.409	-94.9	3.518	0.284	374.776	2.133	307.324
0.087	-90	0.682	1.466	74.178	0.446	-89.9	2.392	0.418	377.721	2.103	303.543
0.128	-85	0.689	1.451	80.900	0.482	-84.91	1.666	0.600	380.646	2.075	299.746
0.184	-80	0.696	1.436	87.625	0.517	-79.91	1.187	0.842	383.546	2.049	295.921
0.258	-75	0.703	1.422	94.358	0.552	-74.92	0.863	1.159	386.414	2.025	292.056
0.356	-70	0.711	1.407	101.105	0.585	-69.92	0.639	1.566	389.243	2.003	288.138
0.482	-65	0.719	1.392	107.870	0.618	-64.92	0.481	2.079	392.027	1.983	284.157
0.642	-60	0.727	1.376	114.658	0.650	-59.92	0.368	2.720	394.761	1.964	280.103
0.843	-55	0.735	1.361	121.475	0.682	-54.92	0.285	3.510	397.439	1.947	275.965
1.013	-51.45	0.741	1.350	126.337	0.704	-51.37	0.240	4.173	399.305	1.935	272.968
1.090	-50	0.743	1.345	128.325	0.713	-49.92	0.224	4.471	400.056	1.930	271.732
1.391	-45	0.752	1.329	135.213	0.743	-44.92	0.178	5.629	402.606	1.915	267.393
1.755	-40	0.762	1.313	142.146	0.773	-39.92	0.143	7.013	405.083	1.901	262.937
2.189	-35	0.771	1.297	149.128	0.803	-34.92	0.116	8.653	407.480	1.887	258.352
2.703	-30	0.781	1.280	156.166	0.832	-29.91	0.094	10.583	409.791	1.875	253.625
3.305	-25	0.792	1.263	163.267	0.861	-24.91	0.078	12.841	412.008	1.863	248.741
4.007	-20	0.803	1.245	170.438	0.889	-19.91	0.065	15.467	414.122	1.851	243.684
4.816	-15	0.815	1.227	177.687	0.917	-14.91	0.054	18.507	416.124	1.840	238.437
5.746	-10	0.827	1.209	185.024	0.945	-9.9	0.045	22.015	418.003	1.830	232.979
6.805	-5	0.841	1.190	192.458	0.973	-4.9	0.038	26.049	419.746	1.820	227.288
8.007	0	0.855	1.170	200.000	1.000	0.1	0.033	30.679	421.337	1.810	221.337
9.362	5	0.870	1.150	207.664	1.027	5.11	0.028	35.984	422.758	1.801	215.094
10.884	10	0.886	1.128	215.464	1.055	10.11	0.024	42.061	423.985	1.791	208.521
12.584	15	0.904	1.106	223.417	1.082	15.11	0.020	49.024	424.991	1.781	201.574
14.476	20	0.923	1.083	231.542	1.109	20.12	0.018	57.013	425.742	1.772	194.200
16.574	25	0.945	1.059	239.863	1.137	25.12	0.015	66.205	426.199	1.762	186.336
18.893	30	0.968	1.033	248.409	1.165	30.12	0.013	76.825	426.312	1.751	177.903
21.449	35	0.995	1.005	257.216	1.193	35.12	0.011	89.169	426.018	1.740	168.803
24.256	40	1.025	0.975	266.335	1.221	40.12	0.010	103.645	425.235	1.728	158.900
27.335	45	1.061	0.943	275.839	1.250	45.12	0.008	120.837	423.842	1.715	148.003
30.706	50	1.103	0.907	285.847	1.280	50.11	0.007	141.641	421.658	1.700	135.811
34.391	55	1.155	0.865	296.567	1.312	55.1	0.006	167.562	418.381	1.683	121.814
38.418	60	1.226	0.815	308.414	1.346	60.09	0.005	201.485	413.436	1.661	105.023
42.824	65	1.336	0.748	322.432	1.386	65.07	0.004	250.452	405.451	1.632	83.018
47.653	70	1.612	0.620	344.096	1.448	70.04	0.003	347.672	388.198	1.576	44.102

Thermodynamic properties of R-410A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.037	5366.424	5525.028	5683.165	5840.941	5998.425	6155.672	6312.721	6469.604	6626.348	6782.973	6939.497	7095.934	7252.296	7408.593	7564.834	7721.026	7877.174	8033.285	8189.362	8345.410	8501.431
-95	0.057	3546.900	3649.604	3751.906	3853.899	3955.644	4057.187	4158.562	4259.796	4360.910	4461.922	4562.847	4663.696	4764.481	4865.209	4965.887	5066.523	5167.120	5267.684	5368.219	5468.727	5569.212
-90	0.086	2408.988	2477.510	2545.681	2613.587	2681.280	2748.799	2816.175	2883.429	2950.581	3017.644	3084.632	3151.554	3218.420	3285.236	3352.008	3418.743	3485.444	3552.115	3618.760	3685.381	3751.982
-85	0.127	1676.973	1723.961	1770.641	1817.091	1863.356	1909.473	1955.465	2001.352	2047.150	2092.872	2138.527	2184.126	2229.674	2275.180	2320.646	2366.080	2411.483	2456.860	2502.213	2547.546	2592.859
-80	0.183	1193.791	1226.836	1259.611	1292.184	1324.597	1356.880	1389.054	1421.138	1453.145	1485.084	1516.966	1548.797	1580.585	1612.334	1644.049	1675.735	1707.393	1739.028	1770.642	1802.237	1833.815
-75	0.257	867.267	891.055	914.604	937.975	961.206	984.323	1007.346	1030.290	1053.165	1075.982	1098.748	1121.470	1144.153	1166.801	1189.420	1212.012	1234.580	1257.126	1279.654	1302.165	1324.660
-70	0.354	641.797	659.294	676.579	693.706	710.710	727.615	744.436	761.187	777.879	794.518	811.113	827.668	844.189	860.679	877.143	893.582	910.000	926.399	942.781	959.147	975.499
-65	0.480	483.002	496.131	509.071	521.871	534.562	547.164	559.694	572.161	584.576	596.944	609.272	621.566	633.828	646.063	658.274	670.464	682.634	694.787	706.924	719.048	731.158
-60	0.640	369.111	379.146	389.012	398.754	408.398	417.964	427.465	436.910	446.309	455.666	464.988	474.278	483.540	492.778	501.995	511.191	520.370	529.534	538.683	547.820	556.945
-55	0.839	286.046	293.849	301.501	309.040	316.493	323.876	331.201	338.477	345.710	352.906	360.071	367.207	374.318	381.406	388.475	395.527	402.562	409.583	416.592	423.588	430.574
-51.37	1.013	239.625	246.191	252.616	258.938	265.180	271.357	277.481	283.559	289.597	295.602	301.576	307.525	313.450	319.354	325.240	331.110	336.965	342.806	348.635	354.453	360.261
-50	1.086	224.520	230.685	236.713	242.641	248.492	254.279	260.014	265.705	271.357	276.977	282.567	288.132	293.674	299.197	304.701	310.189	315.662	321.123	326.571	332.009	337.437
-45	1.386	178.291	183.234	188.054	192.784	197.444	202.046	206.602	211.117	215.598	220.049	224.474	228.875	233.256	237.618	241.964	246.295	250.613	254.919	259.214	263.499	267.774
-40	1.749	143.093	147.111	151.019	154.844	158.607	162.317	165.985	169.616	173.216	176.788	180.336	183.864	187.372	190.863	194.340	197.803	201.253	204.693	208.122	211.542	214.954
-35	2.181	115.961	119.271	122.480	125.614	128.691	131.720	134.710	137.667	140.595	143.498	146.379	149.241	152.085	154.914	157.729	160.531	163.322	166.103	168.874	171.637	174.392
-30	2.693	94.808	97.566	100.234	102.833	105.379	107.882	110.349	112.785	115.195	117.582	119.949	122.297	124.630	126.948	129.253	131.547	133.830	136.103	138.368	140.625	142.875
-25	3.294	78.138	80.464	82.707	84.887	87.018	89.109	91.167	93.197	95.202	97.186	99.151	101.100	103.033	104.953	106.862	108.759	110.647	112.525	114.396	116.259	118.115
-20	3.993	64.870	66.854	68.760	70.608	72.411	74.177	75.912	77.620	79.306	80.972	82.621	84.254	85.873	87.480	89.075	90.660	92.236	93.804	95.364	96.917	98.464
-15	4.800	54.212	55.921	57.558	59.141	60.681	62.187	63.664	65.117	66.548	67.961	69.357	70.739	72.108	73.465	74.811	76.148	77.477	78.797	80.111	81.417	82.718
-10	5.727	45.574	47.062	48.481	49.850	51.180	52.476	53.746	54.992	56.219	57.428	58.621	59.801	60.968	62.125	63.271	64.409	65.538	66.660	67.776	68.885	69.988
-5	6.783	38.517	39.824	41.067	42.262	43.420	44.546	45.648	46.727	47.787	48.830	49.859	50.875	51.879	52.873	53.857	54.833	55.801	56.763	57.717	58.666	59.610
0	7.981	32.705	33.865	34.964	36.017	37.034	38.021	38.984	39.926	40.850	41.758	42.653	43.534	44.405	45.266	46.118	46.961	47.798	48.628	49.451	50.269	51.082
5	9.332	27.884	28.923	29.904	30.839	31.741	32.613	33.462	34.291	35.103	35.899	36.683	37.454	38.214	38.966	39.708	40.443	41.171	41.893	42.608	43.319	44.024
10	10.848	23.856	24.797	25.679	26.518	27.324	28.101	28.856	29.591	30.309	31.013	31.703	32.383	33.052	33.712	34.364	35.008	35.646	36.278	36.904	37.525	38.142
15	12.543	20.469	21.329	22.130	22.889	23.614	24.312	24.988	25.644	26.284	26.910	27.524	28.126	28.719	29.303	29.879	30.448	31.011	31.567	32.119	32.665	33.207
20	14.430	17.601	18.396	19.131	19.823	20.481	21.112	21.721	22.312	22.886	23.446	23.995	24.533	25.061	25.581	26.093	26.598	27.098	27.591	28.080	28.563	29.043
25	16.522	15.158	15.900	16.581	17.217	17.819	18.394	18.947	19.481	20.000	20.505	20.998	21.481	21.955	22.420	22.878	23.330	23.775	24.216	24.651	25.081	25.507
30	18.835	13.063	13.765	14.401	14.991	15.546	16.073	16.578	17.065	17.536	17.994	18.440	18.876	19.304	19.723	20.135	20.540	20.940	21.334	21.724	22.109	22.490
35	21.385	11.255	11.928	12.528	13.080	13.595	14.082	14.546	14.992	15.423	15.840	16.246	16.642	17.029	17.408	17.781	18.147	18.507	18.863	19.213	19.560	19.902
40	24.187	9.683	10.338	10.911	11.431	11.912	12.365	12.794	13.205	13.601	13.983	14.354	14.715	15.068	15.413	15.751	16.083	16.410	16.732	17.049	17.362	17.671
45	27.261	8.305	8.955	9.507	10.001	10.454	10.878	11.277	11.658	12.023	12.375	12.716	13.047	13.370	13.685	13.994	14.296	14.593	14.886	15.174	15.457	15.738
50	30.628	7.085	7.743	8.283	8.757	9.186	9.584	9.958	10.312	10.651	10.977	11.291	11.596	11.892	12.182	12.464	12.741	13.012	13.279	13.542	13.800	14.055
55	34.313	5.989	6.676	7.210	7.668	8.078	8.454	8.805	9.137	9.452	9.755	10.046	10.328	10.601	10.867	11.127	11.381	11.630	11.874	12.115	12.351	12.584
60	38.344	4.980	5.730	6.266	6.712	7.105	7.463	7.794	8.105	8.400	8.682	8.953	9.214	9.467	9.713	9.953	10.187	10.416	10.640	10.861	11.077	11.290
65	42.760	4.007	4.885	5.431	5.869	6.248	6.589	6.903	7.196	7.473	7.736	7.989	8.232	8.467	8.694	8.916	9.132	9.343	9.550	9.753	9.952	10.147
70	47.617	2.887	4.129	4.689	5.121	5.487	5.814	6.112	6.389	6.649	6.896	7.132	7.358	7.576	7.788	7.993	8.193	8.388	8.579	8.766	8.949	9.129

Thermodynamic properties of R-410A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.037	371.753	374.957	378.185	381.439	384.721	388.032	391.373	394.746	398.150	401.588	405.058	408.562	412.101	415.674	419.283	422.927	426.607	430.323	434.075	437.865	441.691
-95	0.057	374.715	377.975	381.254	384.556	387.885	391.241	394.626	398.042	401.489	404.968	408.480	412.025	415.604	419.218	422.867	426.550	430.270	434.026	437.818	441.647	445.513
-90	0.086	377.664	380.984	384.318	387.673	391.051	394.455	397.887	401.348	404.839	408.361	411.916	415.504	419.125	422.780	426.470	430.195	433.955	437.752	441.585	445.454	449.361
-85	0.127	380.593	383.979	387.373	390.783	394.214	397.669	401.150	404.658	408.196	411.764	415.363	418.994	422.659	426.357	430.089	433.857	437.659	441.498	445.372	449.283	453.231
-80	0.183	383.496	386.953	390.412	393.882	397.369	400.878	404.410	407.968	411.555	415.170	418.816	422.493	426.203	429.945	433.722	437.533	441.379	445.260	449.177	453.131	457.121
-75	0.257	386.366	389.901	393.429	396.963	400.510	404.076	407.663	411.274	414.911	418.576	422.271	425.996	429.752	433.541	437.363	441.219	445.109	449.035	452.996	456.993	461.026
-70	0.354	389.197	392.816	396.419	400.021	403.632	407.258	410.903	414.569	418.260	421.978	425.723	429.498	433.303	437.140	441.009	444.912	448.848	452.819	456.826	460.867	464.945
-65	0.480	391.983	395.692	399.375	403.051	406.730	410.420	414.125	417.850	421.597	425.369	429.168	432.995	436.851	440.737	444.656	448.607	452.591	456.609	460.662	464.749	468.872
-60	0.640	394.718	398.525	402.293	406.046	409.797	413.555	417.324	421.111	424.918	428.747	432.601	436.482	440.391	444.330	448.299	452.300	456.333	460.400	464.500	468.635	472.805
-55	0.839	397.398	401.307	405.167	409.002	412.829	416.658	420.496	424.347	428.216	432.105	436.018	439.955	443.919	447.912	451.934	455.986	460.071	464.187	468.337	472.521	476.739
-51.37	1.013	399.305	403.294	407.222	411.120	415.005	418.889	422.778	426.678	430.594	434.529	438.485	442.465	446.471	450.504	454.566	458.657	462.780	466.934	471.120	475.340	479.594
-50	1.086	400.015	404.034	407.990	411.912	415.820	419.724	423.634	427.553	431.487	435.439	439.413	443.409	447.431	451.479	455.556	459.663	463.800	467.968	472.169	476.402	480.670
-45	1.386	402.566	406.700	410.758	414.772	418.765	422.749	426.733	430.724	434.726	438.744	442.781	446.839	450.921	455.028	459.162	463.324	467.515	471.737	475.991	480.276	484.594
-40	1.749	405.043	409.299	413.464	417.576	421.658	425.725	429.788	433.854	437.929	442.016	446.119	450.241	454.385	458.553	462.746	466.966	471.214	475.491	479.798	484.137	488.507
-35	2.181	407.441	411.825	416.103	420.317	424.493	428.649	432.795	436.939	441.089	445.248	449.421	453.610	457.819	462.050	466.304	470.584	474.890	479.225	483.588	487.982	492.406
-30	2.693	409.753	414.271	418.668	422.990	427.266	431.514	435.747	439.974	444.202	448.437	452.682	456.941	461.218	465.514	469.832	474.174	478.541	482.934	487.356	491.806	496.286
-25	3.294	411.970	416.630	421.153	425.588	429.969	434.314	438.639	442.953	447.263	451.576	455.897	460.229	464.576	468.941	473.325	477.731	482.161	486.616	491.097	495.606	500.142
-20	3.993	414.085	418.895	423.550	428.106	432.596	437.044	441.465	445.870	450.267	454.662	459.062	463.471	467.891	472.326	476.780	481.252	485.747	490.265	494.808	499.377	503.973
-15	4.800	416.088	421.057	425.853	430.535	435.142	439.698	444.220	448.720	453.207	457.689	462.172	466.660	471.157	475.666	480.191	484.733	489.295	493.878	498.485	503.116	507.773
-10	5.727	417.968	423.107	428.052	432.868	437.598	442.268	446.896	451.497	456.080	460.652	465.222	469.792	474.369	478.955	483.554	488.168	492.800	497.451	502.124	506.819	511.539
-5	6.783	419.712	425.033	430.137	435.097	439.957	444.748	449.489	454.195	458.878	463.546	468.206	472.864	477.523	482.190	486.866	491.555	496.259	500.980	505.721	510.483	515.267
0	7.981	421.306	426.823	432.098	437.211	442.211	447.130	451.991	456.809	461.598	466.366	471.120	475.869	480.616	485.365	490.122	494.888	499.667	504.462	509.273	514.104	518.955
5	9.332	422.729	428.461	433.922	439.200	444.349	449.406	454.394	459.332	464.232	469.105	473.960	478.803	483.641	488.478	493.318	498.165	503.022	507.892	512.776	517.677	522.597
10	10.848	423.960	429.930	435.594	441.052	446.364	451.568	456.693	461.756	466.775	471.759	476.719	481.662	486.594	491.522	496.449	501.380	506.318	511.266	516.226	521.201	526.192
15	12.543	424.971	431.209	437.100	442.756	448.244	453.608	458.878	464.077	469.220	474.322	479.392	484.440	489.472	494.494	499.513	504.531	509.553	514.582	519.621	524.671	529.736
20	14.430	425.728	432.276	438.423	444.298	449.980	455.516	460.943	466.286	471.562	476.788	481.974	487.132	492.269	497.391	502.504	507.613	512.723	517.836	522.956	528.085	533.226
25	16.522	426.192	433.103	439.543	445.664	451.558	457.283	462.879	468.375	473.794	479.151	484.461	489.734	494.980	500.206	505.418	510.622	515.823	521.023	526.228	531.438	536.658
30	18.835	426.314	433.662	440.439	446.837	452.967	458.897	464.676	470.338	475.908	481.405	486.845	492.240	497.601	502.936	508.252	513.555	518.850	524.142	529.434	534.729	540.030
35	21.385	426.031	433.914	441.087	447.800	454.192	460.348	466.326	472.166	477.897	483.543	489.121	494.645	500.127	505.576	511.001	516.407	521.801	527.188	532.570	537.953	543.338
40	24.187	425.260	433.815	441.457	448.531	455.217	461.622	467.816	473.849	479.753	485.558	491.282	496.943	502.552	508.122	513.660	519.175	524.672	530.156	535.633	541.107	546.580
45	27.261	423.882	433.310	441.517	449.008	456.024	462.705	469.136	475.377	481.468	487.442	493.322	499.127	504.871	510.567	516.225	521.852	527.457	533.044	538.620	544.187	549.751
50	30.628	421.716	432.323	441.223	449.201	456.593	463.580	470.271	476.738	483.031	489.187	495.233	501.190	507.077	512.906	518.689	524.435	530.152	535.847	541.524	547.190	552.847
55	34.313	418.461	430.757	440.525	449.077	456.899	464.228	471.206	477.919	484.430	490.780	497.003	503.124	509.161	515.131	521.046	526.916	532.750	538.557	544.341	550.108	555.864
60	38.344	413.544	428.484	439.360	448.597	456.911	464.625	471.919	478.902	485.648	492.209	498.622	504.916	511.113	517.231	523.285	529.285	535.243	541.167	547.062	552.936	558.793
65	42.760	405.597	425.338	437.655	447.712	456.592	464.739	472.384	479.663	486.666	493.453	500.070	506.549	512.916	519.191	525.392	531.530	537.618	543.664	549.676	555.660	561.623
70	47.617	388.431	421.121	435.314	446.351	455.885	464.521	472.557	480.162	487.445	494.478	501.314	507.992	514.541	520.985	527.341	533.625	539.850	546.025	552.160	558.261	564.335

Thermodynamic properties of R-410A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.037	2.167	2.186	2.203	2.221	2.238	2.255	2.272	2.288	2.304	2.320	2.336	2.351	2.367	2.382	2.397	2.412	2.427	2.441	2.455	2.470	2.484
-95	0.057	2.134	2.152	2.170	2.187	2.204	2.221	2.237	2.253	2.269	2.285	2.301	2.316	2.331	2.346	2.361	2.376	2.390	2.405	2.419	2.433	2.447
-90	0.086	2.103	2.121	2.139	2.156	2.173	2.189	2.206	2.222	2.237	2.253	2.269	2.284	2.299	2.314	2.328	2.343	2.357	2.372	2.386	2.400	2.414
-85	0.127	2.075	2.093	2.110	2.127	2.144	2.161	2.177	2.193	2.208	2.224	2.239	2.254	2.269	2.284	2.298	2.313	2.327	2.341	2.355	2.369	2.383
-80	0.183	2.050	2.067	2.084	2.101	2.118	2.134	2.150	2.166	2.181	2.197	2.212	2.227	2.242	2.256	2.271	2.285	2.299	2.314	2.327	2.341	2.355
-75	0.257	2.026	2.043	2.061	2.077	2.094	2.110	2.126	2.141	2.157	2.172	2.187	2.202	2.217	2.231	2.246	2.260	2.274	2.288	2.302	2.316	2.329
-70	0.354	2.004	2.021	2.038	2.055	2.072	2.088	2.103	2.119	2.134	2.149	2.164	2.179	2.194	2.208	2.222	2.237	2.251	2.265	2.278	2.292	2.306
-65	0.480	1.983	2.001	2.018	2.035	2.051	2.067	2.083	2.098	2.114	2.129	2.143	2.158	2.173	2.187	2.201	2.215	2.229	2.243	2.257	2.270	2.284
-60	0.640	1.965	1.982	1.999	2.016	2.032	2.048	2.064	2.079	2.094	2.109	2.124	2.139	2.153	2.167	2.182	2.196	2.210	2.223	2.237	2.250	2.264
-55	0.839	1.947	1.965	1.982	1.998	2.015	2.031	2.046	2.062	2.077	2.092	2.106	2.121	2.135	2.150	2.164	2.178	2.191	2.205	2.219	2.232	2.245
-51.37	1.013	1.935	1.953	1.970	1.987	2.003	2.019	2.034	2.050	2.065	2.080	2.094	2.109	2.123	2.137	2.151	2.165	2.179	2.193	2.206	2.220	2.233
-50	1.086	1.931	1.948	1.966	1.982	1.998	2.014	2.030	2.045	2.060	2.075	2.090	2.104	2.119	2.133	2.147	2.161	2.175	2.188	2.202	2.215	2.229
-45	1.386	1.915	1.933	1.950	1.967	1.983	1.999	2.015	2.030	2.045	2.060	2.075	2.089	2.104	2.118	2.132	2.145	2.159	2.173	2.186	2.200	2.213
-40	1.749	1.901	1.919	1.936	1.953	1.969	1.985	2.001	2.016	2.031	2.046	2.061	2.075	2.089	2.104	2.117	2.131	2.145	2.158	2.172	2.185	2.198
-35	2.181	1.888	1.906	1.923	1.940	1.956	1.972	1.988	2.003	2.018	2.033	2.048	2.062	2.076	2.090	2.104	2.118	2.132	2.145	2.159	2.172	2.185
-30	2.693	1.875	1.893	1.911	1.928	1.944	1.960	1.976	1.991	2.006	2.021	2.036	2.050	2.064	2.078	2.092	2.106	2.120	2.133	2.146	2.160	2.173
-25	3.294	1.863	1.882	1.899	1.916	1.933	1.949	1.964	1.980	1.995	2.010	2.024	2.039	2.053	2.067	2.081	2.095	2.108	2.122	2.135	2.148	2.161
-20	3.993	1.852	1.870	1.888	1.905	1.922	1.938	1.954	1.969	1.984	1.999	2.014	2.028	2.043	2.057	2.071	2.084	2.098	2.111	2.125	2.138	2.151
-15	4.800	1.841	1.860	1.878	1.895	1.912	1.928	1.944	1.959	1.975	1.989	2.004	2.019	2.033	2.047	2.061	2.075	2.088	2.102	2.115	2.128	2.141
-10	5.727	1.830	1.850	1.868	1.885	1.902	1.919	1.934	1.950	1.965	1.980	1.995	2.009	2.024	2.038	2.052	2.065	2.079	2.092	2.106	2.119	2.132
-5	6.783	1.820	1.840	1.858	1.876	1.893	1.910	1.926	1.941	1.957	1.972	1.986	2.001	2.015	2.029	2.043	2.057	2.071	2.084	2.097	2.111	2.124
0	7.981	1.810	1.830	1.849	1.867	1.884	1.901	1.917	1.933	1.948	1.963	1.978	1.993	2.007	2.021	2.035	2.049	2.063	2.076	2.090	2.103	2.116
5	9.332	1.801	1.821	1.840	1.858	1.876	1.893	1.909	1.925	1.940	1.956	1.971	1.985	2.000	2.014	2.028	2.042	2.055	2.069	2.082	2.095	2.108
10	10.848	1.791	1.812	1.832	1.850	1.868	1.885	1.901	1.917	1.933	1.948	1.963	1.978	1.992	2.007	2.021	2.035	2.048	2.062	2.075	2.088	2.102
15	12.543	1.782	1.803	1.823	1.842	1.860	1.877	1.894	1.910	1.926	1.941	1.956	1.971	1.986	2.000	2.014	2.028	2.042	2.055	2.069	2.082	2.095
20	14.430	1.772	1.794	1.815	1.834	1.852	1.870	1.887	1.903	1.919	1.934	1.950	1.965	1.979	1.994	2.008	2.022	2.036	2.049	2.063	2.076	2.089
25	16.522	1.762	1.785	1.806	1.826	1.844	1.862	1.879	1.896	1.912	1.928	1.943	1.958	1.973	1.988	2.002	2.016	2.030	2.043	2.057	2.070	2.083
30	18.835	1.752	1.776	1.797	1.818	1.837	1.855	1.872	1.889	1.906	1.922	1.937	1.952	1.967	1.982	1.996	2.010	2.024	2.038	2.051	2.065	2.078
35	21.385	1.740	1.766	1.789	1.810	1.829	1.848	1.866	1.883	1.899	1.915	1.931	1.946	1.961	1.976	1.991	2.005	2.019	2.033	2.046	2.060	2.073
40	24.187	1.729	1.756	1.780	1.801	1.821	1.841	1.859	1.876	1.893	1.909	1.925	1.941	1.956	1.971	1.985	2.000	2.014	2.027	2.041	2.055	2.068
45	27.261	1.715	1.745	1.770	1.793	1.814	1.833	1.852	1.870	1.887	1.903	1.919	1.935	1.950	1.965	1.980	1.994	2.009	2.023	2.036	2.050	2.063
50	30.628	1.701	1.733	1.760	1.784	1.806	1.826	1.845	1.863	1.881	1.897	1.914	1.930	1.945	1.960	1.975	1.990	2.004	2.018	2.032	2.045	2.059
55	34.313	1.683	1.721	1.750	1.775	1.797	1.818	1.838	1.857	1.874	1.891	1.908	1.924	1.940	1.955	1.970	1.985	1.999	2.013	2.027	2.041	2.054
60	38.344	1.662	1.706	1.738	1.765	1.789	1.810	1.831	1.850	1.868	1.885	1.902	1.919	1.934	1.950	1.965	1.980	1.994	2.009	2.023	2.036	2.050
65	42.760	1.632	1.690	1.726	1.755	1.780	1.802	1.823	1.843	1.861	1.879	1.896	1.913	1.929	1.945	1.960	1.975	1.990	2.004	2.018	2.032	2.046
70	47.617	1.577	1.672	1.712	1.743	1.770	1.793	1.815	1.835	1.854	1.873	1.890	1.907	1.923	1.939	1.955	1.970	1.985	1.999	2.013	2.027	2.041

R-417A (Freon™ MO59)

Zeotropic blend (46.6 % R-125 - 50 % R-134a - 3.4 % R-600)

Molecular weight (g/mol)	106.75
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-39.07
Temperature glide at 1.013 bar (K)	4.99
Critical temperature (°C)	87.1
Critical pressure (bar absolute)	40.35
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.444
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.855
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.111
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.165
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.48
Classification NF-EN 378	A1
GWP (IPCC 4)	2346

Main applications

R-417A (Freon™ MO59) is a non azeotropic HFC blend intended as a "direct replacement" for R-22 (HCFC) in direct expansion small air-conditioning applications.
Note: for water chiller applications R-422D (Freon™ MO29) is recommended.

Commercial specifications

Composition: (50 % R-134a - 46.6 % R-125 - 3.4 % R-600) (±1 % / ±1.1 % / +0.1 % -0.4 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative
Acidity (HCl): ≤ 1 ppm weight.
High boiling residue: ≤ 1.5 % volume.
Résidus haute ébullition: ≤ 0.01 % volume.

Oils

Use a mineral (MO), an alkyl benzene (AB) or a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-417A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.018	-100	0.640	1.562	75.876	0.438	-93.42	7.823	0.128	313.370	1.783	237.494
0.028	-95	0.646	1.547	81.943	0.472	-88.55	5.095	0.196	316.329	1.764	234.387
0.043	-90	0.653	1.532	87.975	0.506	-83.67	3.412	0.293	319.319	1.747	231.344
0.064	-85	0.659	1.518	93.987	0.538	-78.8	2.343	0.427	322.336	1.732	228.349
0.093	-80	0.665	1.503	99.991	0.570	-73.93	1.647	0.607	325.375	1.718	225.384
0.133	-75	0.672	1.488	105.996	0.600	-69.06	1.182	0.846	328.433	1.706	222.437
0.186	-70	0.679	1.474	112.010	0.630	-64.19	0.865	1.156	331.503	1.695	219.494
0.254	-65	0.685	1.459	118.040	0.659	-59.32	0.645	1.551	334.583	1.686	216.544
0.342	-60	0.692	1.444	124.091	0.688	-54.45	0.488	2.050	337.667	1.677	213.577
0.453	-55	0.700	1.429	130.168	0.716	-49.59	0.375	2.668	340.750	1.670	210.582
0.592	-50	0.707	1.414	136.277	0.744	-44.72	0.292	3.427	343.828	1.663	207.551
0.763	-45	0.715	1.399	142.421	0.771	-39.85	0.230	4.347	346.894	1.657	204.473
0.970	-40	0.723	1.384	148.605	0.798	-34.99	0.183	5.452	349.945	1.652	201.340
1.013	-39.07	0.724	1.381	149.758	0.803	-34.08	0.176	5.680	350.509	1.651	200.751
1.220	-35	0.731	1.368	154.833	0.824	-30.12	0.148	6.768	352.975	1.648	198.142
1.517	-30	0.740	1.352	161.109	0.850	-25.25	0.120	8.321	355.978	1.644	194.870
1.868	-25	0.748	1.336	167.436	0.876	-20.38	0.099	10.142	358.950	1.640	191.514
2.279	-20	0.758	1.320	173.819	0.901	-15.52	0.082	12.263	361.885	1.637	188.066
2.757	-15	0.768	1.303	180.262	0.926	-10.65	0.068	14.721	364.776	1.635	184.514
3.308	-10	0.778	1.286	186.770	0.951	-5.78	0.057	17.554	367.618	1.633	180.849
3.939	-5	0.788	1.268	193.347	0.976	-0.92	0.048	20.806	370.404	1.631	177.057
4.658	0	0.800	1.250	200.000	1.000	3.95	0.041	24.526	373.126	1.629	173.126
5.471	5	0.812	1.232	206.734	1.024	8.82	0.035	28.771	375.774	1.628	169.040
6.388	10	0.825	1.213	213.556	1.048	13.68	0.030	33.603	378.338	1.626	164.782
7.415	15	0.838	1.193	220.474	1.072	18.54	0.026	39.097	380.805	1.625	160.331
8.561	20	0.853	1.173	227.497	1.096	23.41	0.022	45.339	383.160	1.624	155.663
9.835	25	0.869	1.151	234.635	1.120	28.27	0.019	52.433	385.387	1.623	150.752
11.246	30	0.886	1.129	241.902	1.144	33.12	0.017	60.503	387.465	1.621	145.563
12.802	35	0.904	1.106	249.312	1.167	37.98	0.014	69.704	389.370	1.620	140.058
14.513	40	0.925	1.081	256.884	1.191	42.83	0.012	80.227	391.073	1.618	134.188
16.389	45	0.948	1.055	264.643	1.215	47.67	0.011	92.324	392.536	1.615	127.893
18.441	50	0.974	1.026	272.620	1.239	52.51	0.009	106.328	393.711	1.613	121.091
20.679	55	1.004	0.996	280.859	1.264	57.33	0.008	122.701	394.530	1.609	113.671
23.117	60	1.039	0.962	289.423	1.289	62.15	0.007	142.117	394.895	1.605	105.472
25.767	65	1.082	0.925	298.408	1.315	66.95	0.006	165.628	394.653	1.599	96.244
28.645	70	1.135	0.881	307.980	1.342	71.72	0.005	195.041	393.546	1.591	85.565
31.766	75	1.208	0.828	318.468	1.372	76.45	0.004	233.969	391.064	1.580	72.596
35.147	80	1.324	0.755	330.751	1.405	81.1	0.003	292.042	385.884	1.561	55.133
38.724	85	1.697	0.589	351.971	1.464	85.33	0.002	442.845	368.542	1.510	16.571

Thermodynamic properties of R-417A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.009	14653.710	15079.830	15505.537	15930.927	16356.072	16781.023	17205.818	17630.487	18055.050	18479.526	18903.929	19328.268	19752.553	20176.791	20600.989	21025.150	21449.279	21873.380	22297.456	22721.509	23145.542
-95	0.015	9046.555	9302.937	9559.001	9814.818	10070.441	10325.907	10581.245	10836.479	11091.625	11346.697	11601.707	11856.661	12111.569	12366.436	12621.266	12876.065	13130.836	13385.581	13640.303	13895.006	14149.690
-90	0.025	5772.589	5932.283	6091.727	6250.975	6410.066	6569.028	6727.886	6886.655	7045.350	7203.982	7362.560	7521.090	7679.579	7838.032	7996.453	8154.846	8313.214	8471.559	8629.883	8788.189	8946.479
-85	0.038	3795.601	3898.275	4000.748	4103.062	4205.247	4307.326	4409.317	4511.232	4613.085	4714.883	4816.633	4918.343	5020.016	5121.657	5223.269	5324.857	5426.422	5527.966	5629.492	5731.001	5832.496
-80	0.058	2564.617	2632.578	2700.376	2768.043	2835.602	2903.072	2970.467	3037.798	3105.074	3172.303	3239.490	3306.641	3373.760	3440.850	3507.915	3574.957	3641.979	3708.982	3775.969	3842.940	3909.898
-75	0.086	1776.439	1822.647	1868.719	1914.682	1960.553	2006.349	2052.080	2097.756	2143.384	2188.970	2234.520	2280.037	2325.526	2370.989	2416.430	2461.850	2507.251	2552.636	2598.006	2643.362	2688.705
-70	0.125	1258.597	1290.800	1322.890	1354.886	1386.805	1418.658	1450.455	1482.203	1513.910	1545.580	1577.217	1608.825	1640.408	1671.968	1703.507	1735.028	1766.532	1798.020	1829.495	1860.958	1892.409
-65	0.176	910.275	933.239	956.105	978.891	1001.609	1024.271	1046.883	1069.452	1091.984	1114.484	1136.954	1159.399	1181.820	1204.221	1226.603	1248.968	1271.318	1293.654	1315.978	1338.289	1360.591
-60	0.244	670.850	687.577	704.219	720.791	737.304	753.767	770.186	786.567	802.915	819.234	835.526	851.795	868.043	884.273	900.485	916.682	932.865	949.036	965.194	981.343	997.481
-55	0.331	502.963	515.391	527.744	540.035	552.273	564.467	576.622	588.743	600.834	612.898	624.939	636.959	648.960	660.943	672.911	684.865	696.807	708.736	720.655	732.564	744.464
-50	0.443	383.055	392.460	401.799	411.082	420.318	429.514	438.675	447.806	456.909	465.989	475.047	484.086	493.107	502.113	511.104	520.083	529.049	538.005	546.952	555.889	564.817
-45	0.583	295.947	303.188	310.370	317.501	324.590	331.643	338.664	345.658	352.627	359.574	366.501	373.411	380.304	387.184	394.050	400.904	407.748	414.581	421.405	428.221	435.030
-40	0.757	231.666	237.332	242.943	248.509	254.037	259.532	264.998	270.438	275.856	281.254	286.634	291.997	297.346	302.682	308.005	313.317	318.620	323.913	329.197	334.474	339.744
-35	0.969	183.535	188.035	192.486	196.896	201.270	205.614	209.932	214.226	218.499	222.754	226.992	231.215	235.425	239.622	243.808	247.984	252.151	256.308	260.458	264.601	268.737
-34.08	1.013	176.067	180.388	184.660	188.891	193.088	197.255	201.396	205.514	209.611	213.690	217.753	221.800	225.835	229.857	233.868	237.869	241.861	245.844	249.820	253.788	257.750
-30	1.226	147.006	150.633	154.213	157.755	161.265	164.747	168.204	171.640	175.057	178.456	181.840	185.210	188.567	191.913	195.248	198.574	201.891	205.200	208.502	211.797	215.085
-25	1.534	118.934	121.896	124.814	127.697	130.550	133.377	136.182	138.966	141.732	144.482	147.218	149.941	152.652	155.353	158.043	160.725	163.398	166.064	168.723	171.375	174.022
-20	1.898	97.108	99.557	101.966	104.342	106.690	109.013	111.315	113.598	115.865	118.117	120.355	122.581	124.796	127.001	129.196	131.383	133.563	135.735	137.901	140.061	142.215
-15	2.327	79.952	82.002	84.014	85.995	87.949	89.881	91.792	93.686	95.564	97.428	99.280	101.120	102.949	104.769	106.580	108.384	110.180	111.969	113.752	115.530	117.302
-10	2.826	66.330	68.066	69.765	71.435	73.080	74.703	76.308	77.895	79.468	81.027	82.575	84.111	85.638	87.156	88.665	90.167	91.662	93.151	94.634	96.112	97.584
-5	3.404	55.411	56.896	58.347	59.770	61.169	62.547	63.907	65.252	66.582	67.899	69.206	70.501	71.788	73.066	74.336	75.599	76.855	78.106	79.351	80.590	81.825
0	4.067	46.579	47.864	49.116	50.340	51.542	52.724	53.888	55.038	56.173	57.297	58.410	59.513	60.607	61.692	62.771	63.842	64.908	65.967	67.022	68.071	69.116
5	4.825	39.377	40.499	41.590	42.654	43.696	44.719	45.725	46.716	47.695	48.662	49.618	50.565	51.503	52.434	53.357	54.274	55.185	56.091	56.991	57.887	58.778
10	5.685	33.455	34.446	35.406	36.339	37.251	38.144	39.021	39.884	40.734	41.573	42.402	43.221	44.033	44.837	45.634	46.425	47.210	47.990	48.765	49.535	50.302
15	6.655	28.551	29.434	30.286	31.113	31.918	32.704	33.475	34.232	34.977	35.711	36.435	37.150	37.857	38.557	39.250	39.938	40.619	41.296	41.968	42.636	43.300
20	7.746	24.459	25.255	26.018	26.757	27.474	28.172	28.855	29.525	30.182	30.829	31.466	32.094	32.715	33.329	33.936	34.538	35.134	35.726	36.312	36.895	37.474
25	8.965	21.023	21.746	22.437	23.103	23.746	24.372	24.982	25.578	26.163	26.737	27.301	27.858	28.406	28.948	29.484	30.014	30.539	31.059	31.575	32.087	32.595
30	10.323	18.117	18.782	19.413	20.018	20.601	21.165	21.714	22.249	22.772	23.285	23.789	24.285	24.773	25.255	25.730	26.200	26.666	27.126	27.582	28.035	28.483
35	11.830	15.645	16.263	16.845	17.399	17.930	18.443	18.941	19.424	19.896	20.358	20.810	21.255	21.692	22.122	22.547	22.967	23.381	23.791	24.197	24.599	24.998
40	13.496	13.528	14.108	14.650	15.162	15.651	16.121	16.574	17.014	17.443	17.860	18.269	18.670	19.064	19.451	19.833	20.209	20.581	20.948	21.311	21.670	22.026
45	15.333	11.704	12.256	12.765	13.243	13.696	14.129	14.545	14.948	15.339	15.719	16.091	16.455	16.811	17.162	17.506	17.846	18.180	18.511	18.837	19.160	19.480
50	17.354	10.121	10.653	11.137	11.586	12.009	12.411	12.796	13.167	13.526	13.875	14.214	14.546	14.870	15.189	15.502	15.809	16.112	16.411	16.706	16.998	17.286
55	19.572	8.738	9.259	9.724	10.150	10.548	10.923	11.282	11.625	11.956	12.277	12.589	12.893	13.190	13.481	13.766	14.047	14.322	14.594	14.862	15.126	15.387
60	22.002	7.518	8.038	8.490	8.898	9.275	9.629	9.964	10.284	10.591	10.888	11.176	11.456	11.729	11.996	12.257	12.514	12.765	13.013	13.257	13.498	13.735
65	24.664	6.431	6.962	7.408	7.802	8.162	8.497	8.812	9.112	9.399	9.675	9.941	10.200	10.452	10.698	10.938	11.174	11.405	11.632	11.855	12.075	12.292
70	27.578	5.448	6.007	6.452	6.837	7.183	7.502	7.800	8.082	8.351	8.609	8.857	9.097	9.331	9.558	9.780	9.996	10.209	10.418	10.623	10.824	11.023
75	30.777	4.533	5.151	5.604	5.983	6.318	6.623	6.906	7.173	7.425	7.667	7.899	8.122	8.339	8.550	8.755	8.956	9.152	9.344	9.533	9.718	9.901
80	34.314	3.633	4.373	4.842	5.218	5.545	5.838	6.108	6.361	6.599	6.825	7.042	7.251	7.453	7.649	7.840	8.025	8.207	8.384	8.558	8.729	8.897
85	38.382	2.453	3.621	4.120	4.499	4.819	5.103	5.361	5.601	5.826	6.039	6.243	6.438	6.626	6.808	6.985	7.157	7.324	7.488	7.649	7.806	7.961

Thermodynamic properties of R-417A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.009	309.432	312.476	315.570	318.712	321.904	325.145	328.436	331.776	335.164	338.602	342.088	345.622	349.204	352.834	356.511	360.236	364.008	367.826	371.691	375.602	379.559
-95	0.015	312.418	315.520	318.668	321.865	325.111	328.405	331.747	335.138	338.578	342.066	345.602	349.185	352.816	356.495	360.221	363.993	367.812	371.678	375.590	379.547	383.550
-90	0.025	315.443	318.601	321.806	325.058	328.357	331.704	335.099	338.542	342.032	345.571	349.156	352.790	356.470	360.197	363.971	367.791	371.658	375.571	379.530	383.534	387.583
-85	0.038	318.502	321.718	324.979	328.287	331.640	335.041	338.488	341.983	345.525	349.114	352.750	356.433	360.162	363.938	367.761	371.629	375.543	379.504	383.509	387.560	391.656
-80	0.058	321.591	324.866	328.185	331.548	334.956	338.411	341.912	345.459	349.053	352.693	356.379	360.112	363.891	367.716	371.587	375.504	379.466	383.473	387.526	391.623	395.765
-75	0.086	324.705	328.041	331.418	334.838	338.302	341.812	345.366	348.966	352.612	356.304	360.042	363.825	367.654	371.528	375.448	379.413	383.423	387.478	391.578	395.722	399.911
-70	0.125	327.841	331.237	334.674	338.152	341.673	345.238	348.848	352.502	356.201	359.945	363.734	367.568	371.447	375.372	379.341	383.355	387.413	391.516	395.663	399.854	404.089
-65	0.176	330.992	334.452	337.949	341.487	345.066	348.688	352.353	356.062	359.814	363.611	367.453	371.338	375.269	379.243	383.262	387.325	391.432	395.583	399.778	404.017	408.299
-60	0.244	334.154	337.678	341.239	344.837	348.476	352.155	355.877	359.642	363.449	367.300	371.194	375.132	379.114	383.140	387.209	391.322	395.478	399.678	403.921	408.207	412.536
-55	0.331	337.322	340.913	344.537	348.198	351.898	355.637	359.417	363.238	367.101	371.007	374.955	378.947	382.981	387.058	391.178	395.341	399.547	403.796	408.088	412.422	416.799
-50	0.443	340.489	344.149	347.840	351.566	355.328	359.128	362.967	366.847	370.767	374.729	378.732	382.778	386.865	390.995	395.167	399.381	403.637	407.936	412.276	416.659	421.084
-45	0.583	343.651	347.383	351.143	354.935	358.761	362.624	366.524	370.464	374.442	378.461	382.521	386.622	390.763	394.946	399.171	403.437	407.744	412.093	416.484	420.915	425.389
-40	0.757	346.802	350.609	354.440	358.301	362.194	366.121	370.084	374.085	378.123	382.201	386.318	390.475	394.672	398.909	403.187	407.506	411.865	416.265	420.706	425.188	429.710
-35	0.969	349.936	353.821	357.727	361.659	365.620	369.614	373.642	377.706	381.806	385.943	390.119	394.334	398.587	402.880	407.212	411.584	415.997	420.449	424.941	429.473	434.045
-34.08	1.013	350.509	354.409	358.329	362.274	366.248	370.255	374.295	378.370	382.482	386.631	390.817	395.042	399.306	403.609	407.952	412.334	416.756	421.218	425.719	430.261	434.842
-30	1.226	353.048	357.014	360.998	365.004	369.037	373.099	377.194	381.322	385.486	389.685	393.921	398.194	402.505	406.855	411.243	415.670	420.136	424.640	429.185	433.768	438.390
-25	1.534	356.132	360.184	364.248	368.331	372.438	376.572	380.735	384.931	389.159	393.422	397.720	402.053	406.424	410.831	415.276	419.758	424.279	428.837	433.434	438.070	442.743
-20	1.898	359.183	363.324	367.472	371.636	375.819	380.027	384.262	388.527	392.822	397.150	401.511	405.907	410.338	414.804	419.307	423.847	428.423	433.036	437.687	442.375	447.101
-15	2.327	362.194	366.429	370.666	374.913	379.177	383.461	387.770	392.106	396.470	400.865	405.292	409.751	414.244	418.772	423.334	427.932	432.565	437.234	441.940	446.682	451.460
-10	2.826	365.158	369.493	373.823	378.157	382.504	386.869	391.254	395.664	400.100	404.564	409.058	413.583	418.140	422.730	427.353	432.010	436.701	441.428	446.189	450.986	455.819
-5	3.404	368.070	372.510	376.937	381.364	385.798	390.245	394.710	399.197	403.707	408.243	412.806	417.399	422.021	426.675	431.360	436.078	440.829	445.614	450.433	455.285	460.173
0	4.067	370.922	375.472	380.002	384.525	389.051	393.585	398.134	402.700	407.287	411.897	416.532	421.194	425.885	430.604	435.353	440.134	444.946	449.790	454.667	459.577	464.520
5	4.825	373.704	378.373	383.012	387.637	392.258	396.884	401.519	406.169	410.836	415.523	420.233	424.966	429.726	434.513	439.329	444.173	449.048	453.953	458.889	463.858	468.858
10	5.685	376.407	381.202	385.958	390.691	395.414	400.136	404.862	409.599	414.349	419.116	423.903	428.711	433.543	438.400	443.283	448.193	453.132	458.100	463.097	468.125	473.184
15	6.655	379.018	383.950	388.831	393.680	398.511	403.334	408.157	412.985	417.822	422.673	427.540	432.425	437.331	442.260	447.213	452.191	457.195	462.227	467.287	472.376	477.495
20	7.746	381.523	386.606	391.623	396.596	401.543	406.474	411.399	416.323	421.251	426.189	431.139	436.104	441.087	446.090	451.115	456.162	461.235	466.333	471.457	476.609	481.788
25	8.965	383.906	389.156	394.322	399.431	404.502	409.549	414.581	419.606	424.630	429.659	434.695	439.744	444.807	449.887	454.986	460.105	465.248	470.413	475.603	480.819	486.061
30	10.323	386.147	391.586	396.917	402.175	407.381	412.551	417.697	422.829	427.954	433.078	438.206	443.341	448.487	453.646	458.822	464.016	469.230	474.466	479.723	485.005	490.311
35	11.830	388.223	393.879	399.396	404.817	410.169	415.472	420.741	425.987	431.218	436.442	441.665	446.890	452.122	457.365	462.621	467.892	473.180	478.487	483.815	489.164	494.536
40	13.496	390.106	396.014	401.742	407.345	412.858	418.305	423.705	429.072	434.416	439.745	445.068	450.388	455.710	461.039	466.377	471.728	477.093	482.474	487.874	493.293	498.733
45	15.333	391.761	397.969	403.939	409.745	415.435	421.039	426.580	432.077	437.541	442.982	448.409	453.829	459.245	464.664	470.089	475.522	480.966	486.424	491.898	497.389	502.898
50	17.354	393.142	399.713	405.965	412.002	417.888	423.663	429.358	434.994	440.586	446.146	451.684	457.207	462.723	468.236	473.750	479.269	484.796	490.333	495.883	501.448	507.029
55	19.572	394.184	401.208	407.794	414.095	420.201	426.166	432.028	437.814	443.543	449.229	454.885	460.519	466.138	471.749	477.357	482.965	488.578	494.198	499.827	505.468	511.123
60	22.002	394.796	402.406	409.395	416.003	422.358	428.533	434.579	440.527	446.403	452.225	458.005	463.756	469.484	475.199	480.904	486.606	492.308	498.013	503.724	509.445	515.176
65	24.664	394.837	403.240	410.727	417.697	424.336	430.747	436.995	443.121	449.156	455.123	461.036	466.910	472.754	478.577	484.386	490.185	495.979	501.773	507.570	513.372	519.183
70	27.578	394.069	403.618	411.738	419.142	426.109	432.787	439.258	445.580	451.788	457.910	463.966	469.972	475.938	481.876	487.792	493.693	499.585	505.472	511.357	517.245	523.137
75	30.777	392.026	403.403	412.357	420.288	427.640	434.620	441.343	447.879	454.276	460.568	466.777	472.923	479.020	485.079	491.110	497.119	503.112	509.096	515.074	521.051	527.028
80	34.314	387.522	402.368	412.462	421.050	428.860	436.190	443.197	449.974	456.580	463.057	469.433	475.731	481.968	488.158	494.310	500.433	506.535	512.621	518.697	524.767	530.834
85	38.382	372.768	399.723	411.574	421.061	429.462	437.230	444.584	451.649	458.501	465.194	471.763	478.235	484.632	490.968	497.257	503.508	509.730	515.930	522.114	528.286	534.451

Thermodynamic properties of R-417A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.009	1.812	1.830	1.847	1.864	1.880	1.897	1.913	1.930	1.946	1.962	1.977	1.993	2.009	2.024	2.039	2.054	2.070	2.084	2.099	2.114	2.129
-95	0.015	1.790	1.807	1.824	1.841	1.857	1.874	1.890	1.906	1.922	1.938	1.953	1.969	1.984	2.000	2.015	2.030	2.045	2.060	2.074	2.089	2.103
-90	0.025	1.769	1.786	1.803	1.820	1.836	1.853	1.869	1.885	1.900	1.916	1.932	1.947	1.962	1.978	1.993	2.008	2.022	2.037	2.052	2.066	2.081
-85	0.038	1.751	1.768	1.785	1.801	1.818	1.834	1.850	1.866	1.881	1.897	1.912	1.928	1.943	1.958	1.973	1.988	2.002	2.017	2.032	2.046	2.060
-80	0.058	1.735	1.752	1.768	1.785	1.801	1.817	1.833	1.849	1.864	1.880	1.895	1.910	1.925	1.940	1.955	1.970	1.984	1.999	2.013	2.028	2.042
-75	0.086	1.721	1.737	1.754	1.770	1.786	1.802	1.818	1.833	1.849	1.864	1.880	1.895	1.910	1.924	1.939	1.954	1.968	1.983	1.997	2.011	2.026
-70	0.125	1.708	1.725	1.741	1.757	1.773	1.789	1.805	1.820	1.835	1.851	1.866	1.881	1.896	1.910	1.925	1.940	1.954	1.968	1.983	1.997	2.011
-65	0.176	1.697	1.713	1.729	1.746	1.761	1.777	1.793	1.808	1.823	1.838	1.853	1.868	1.883	1.898	1.912	1.927	1.941	1.956	1.970	1.984	1.998
-60	0.244	1.687	1.703	1.719	1.735	1.751	1.767	1.782	1.797	1.813	1.828	1.843	1.857	1.872	1.887	1.901	1.916	1.930	1.944	1.958	1.972	1.986
-55	0.331	1.678	1.694	1.710	1.726	1.742	1.757	1.773	1.788	1.803	1.818	1.833	1.848	1.862	1.877	1.891	1.906	1.920	1.934	1.948	1.962	1.976
-50	0.443	1.670	1.686	1.702	1.718	1.734	1.749	1.765	1.780	1.795	1.810	1.825	1.839	1.854	1.868	1.883	1.897	1.911	1.925	1.939	1.953	1.967
-45	0.583	1.663	1.680	1.695	1.711	1.727	1.742	1.757	1.773	1.788	1.802	1.817	1.832	1.846	1.861	1.875	1.889	1.903	1.917	1.931	1.945	1.959
-40	0.757	1.657	1.674	1.689	1.705	1.721	1.736	1.751	1.766	1.781	1.796	1.811	1.825	1.840	1.854	1.868	1.882	1.896	1.910	1.924	1.938	1.952
-35	0.969	1.652	1.668	1.684	1.700	1.715	1.731	1.746	1.761	1.776	1.790	1.805	1.820	1.834	1.848	1.862	1.876	1.890	1.904	1.918	1.932	1.945
-34.08	1.013	1.651	1.667	1.683	1.699	1.714	1.730	1.745	1.760	1.775	1.790	1.804	1.819	1.833	1.847	1.861	1.876	1.889	1.903	1.917	1.931	1.944
-30	1.226	1.648	1.664	1.680	1.695	1.711	1.726	1.741	1.756	1.771	1.786	1.800	1.815	1.829	1.843	1.857	1.871	1.885	1.899	1.913	1.927	1.940
-25	1.534	1.644	1.660	1.676	1.691	1.707	1.722	1.737	1.752	1.767	1.782	1.796	1.811	1.825	1.839	1.853	1.867	1.881	1.895	1.908	1.922	1.936
-20	1.898	1.640	1.656	1.672	1.688	1.703	1.719	1.734	1.749	1.763	1.778	1.793	1.807	1.821	1.835	1.849	1.863	1.877	1.891	1.905	1.918	1.932
-15	2.327	1.637	1.653	1.669	1.685	1.701	1.716	1.731	1.746	1.761	1.775	1.790	1.804	1.818	1.832	1.846	1.860	1.874	1.888	1.901	1.915	1.928
-10	2.826	1.635	1.651	1.667	1.683	1.698	1.713	1.729	1.743	1.758	1.773	1.787	1.802	1.816	1.830	1.844	1.858	1.872	1.885	1.899	1.912	1.926
-5	3.404	1.632	1.649	1.665	1.681	1.696	1.711	1.727	1.742	1.756	1.771	1.785	1.800	1.814	1.828	1.842	1.856	1.869	1.883	1.897	1.910	1.923
0	4.067	1.631	1.647	1.663	1.679	1.695	1.710	1.725	1.740	1.755	1.769	1.784	1.798	1.812	1.826	1.840	1.854	1.868	1.881	1.895	1.908	1.922
5	4.825	1.629	1.645	1.662	1.678	1.693	1.709	1.724	1.739	1.754	1.768	1.783	1.797	1.811	1.825	1.839	1.853	1.867	1.880	1.894	1.907	1.920
10	5.685	1.627	1.644	1.661	1.677	1.692	1.708	1.723	1.738	1.753	1.767	1.782	1.796	1.810	1.824	1.838	1.852	1.866	1.879	1.893	1.906	1.920
15	6.655	1.626	1.643	1.660	1.676	1.691	1.707	1.722	1.737	1.752	1.767	1.781	1.796	1.810	1.824	1.838	1.852	1.865	1.879	1.892	1.906	1.919
20	7.746	1.625	1.642	1.659	1.675	1.691	1.706	1.722	1.737	1.752	1.767	1.781	1.795	1.810	1.824	1.838	1.851	1.865	1.879	1.892	1.906	1.919
25	8.965	1.623	1.641	1.658	1.674	1.690	1.706	1.722	1.737	1.752	1.766	1.781	1.795	1.810	1.824	1.838	1.851	1.865	1.879	1.892	1.906	1.919
30	10.323	1.622	1.640	1.657	1.674	1.690	1.706	1.721	1.737	1.752	1.767	1.781	1.796	1.810	1.824	1.838	1.852	1.865	1.879	1.893	1.906	1.919
35	11.830	1.621	1.639	1.656	1.673	1.690	1.706	1.721	1.737	1.752	1.767	1.781	1.796	1.810	1.824	1.838	1.852	1.866	1.880	1.893	1.906	1.920
40	13.496	1.619	1.638	1.655	1.673	1.689	1.706	1.721	1.737	1.752	1.767	1.782	1.796	1.811	1.825	1.839	1.853	1.867	1.880	1.894	1.907	1.920
45	15.333	1.617	1.636	1.654	1.672	1.689	1.705	1.721	1.737	1.753	1.768	1.782	1.797	1.811	1.826	1.840	1.854	1.867	1.881	1.895	1.908	1.921
50	17.354	1.614	1.634	1.653	1.671	1.689	1.705	1.722	1.737	1.753	1.768	1.783	1.798	1.812	1.827	1.841	1.855	1.868	1.882	1.896	1.909	1.922
55	19.572	1.611	1.632	1.652	1.670	1.688	1.705	1.722	1.738	1.753	1.769	1.784	1.798	1.813	1.827	1.842	1.856	1.869	1.883	1.897	1.910	1.923
60	22.002	1.607	1.630	1.650	1.669	1.687	1.705	1.721	1.738	1.754	1.769	1.784	1.799	1.814	1.828	1.843	1.857	1.870	1.884	1.898	1.911	1.925
65	24.664	1.602	1.626	1.648	1.668	1.686	1.704	1.721	1.738	1.754	1.770	1.785	1.800	1.815	1.829	1.844	1.858	1.872	1.885	1.899	1.912	1.926
70	27.578	1.594	1.622	1.645	1.666	1.685	1.703	1.721	1.738	1.754	1.770	1.785	1.801	1.815	1.830	1.844	1.859	1.873	1.887	1.900	1.914	1.927
75	30.777	1.584	1.616	1.641	1.663	1.683	1.702	1.720	1.737	1.754	1.770	1.786	1.801	1.816	1.831	1.845	1.860	1.874	1.888	1.901	1.915	1.928
80	34.314	1.567	1.609	1.637	1.660	1.681	1.701	1.719	1.737	1.753	1.770	1.786	1.801	1.816	1.831	1.846	1.860	1.875	1.889	1.902	1.916	1.929
85	38.382	1.522	1.597	1.629	1.655	1.677	1.697	1.717	1.735	1.752	1.769	1.785	1.801	1.816	1.831	1.846	1.860	1.875	1.889	1.903	1.916	1.930

R-422A (Freon™ MO79)

Zeotropic blend (85.1 % R-125 - 11.5 % R-134a - 3.4 % R-600a)

Molecular weight (g/mol)	113.60
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-46.50
Temperature glide at 1.013 bar (K)	2.46
Critical temperature (°C)	71.7
Critical pressure (bar absolute)	37.45
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.446
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.833
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.105
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.143
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	4.53
Classification NF-EN 378	A1
GWP (IPCC 4)	3143

Main applications

R-422A (Freon™ MO79) is a non azeotropic HFC blend intended as a "direct replacement" for R-502, R-408A and other similar R-22 based blends used in direct expansion commercial and industrial refrigeration applications.

Commercial specifications

Composition: (85.1 % R-125 - 11.5 % R-134a - 3.4 % R-600a) (±1 % / ±1 % / +0.1% -0.4%).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a mineral (MO), an alkyl benzene (AB) or a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-422A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.029	-100	0.628	1.593	82.420	0.469	-96.11	4.432	0.226	288.550	1.651	206.130
0.045	-95	0.634	1.578	87.930	0.501	-91.29	2.930	0.341	291.385	1.635	203.454
0.068	-90	0.640	1.562	93.454	0.531	-86.45	1.991	0.502	294.252	1.621	200.797
0.100	-85	0.646	1.547	98.998	0.561	-81.61	1.386	0.722	297.147	1.608	198.149
0.144	-80	0.653	1.531	104.565	0.590	-76.75	0.987	1.013	300.065	1.597	195.500
0.203	-75	0.660	1.516	110.162	0.619	-71.89	0.717	1.394	303.001	1.587	192.839
0.279	-70	0.667	1.500	115.791	0.647	-67.02	0.531	1.883	305.951	1.578	190.159
0.378	-65	0.674	1.484	121.457	0.674	-62.14	0.400	2.501	308.908	1.570	187.451
0.503	-60	0.681	1.468	127.163	0.701	-57.25	0.306	3.271	311.868	1.564	184.705
0.660	-55	0.689	1.452	132.912	0.728	-52.36	0.237	4.217	314.826	1.558	181.913
0.853	-50	0.696	1.436	138.708	0.754	-47.47	0.186	5.367	317.775	1.553	179.068
1.013	-46.5	0.702	1.424	142.793	0.772	-44.04	0.158	6.309	319.832	1.550	177.039
1.088	-45	0.705	1.419	144.553	0.780	-42.57	0.148	6.751	320.712	1.549	176.159
1.372	-40	0.713	1.402	150.450	0.806	-37.66	0.119	8.401	323.630	1.545	173.179
1.710	-35	0.722	1.385	156.404	0.831	-32.75	0.097	10.352	326.523	1.542	170.119
2.109	-30	0.731	1.368	162.418	0.856	-27.84	0.079	12.642	329.387	1.540	166.969
2.577	-25	0.741	1.350	168.495	0.880	-22.92	0.065	15.314	332.215	1.538	163.720
3.120	-20	0.751	1.331	174.640	0.905	-18.0	0.054	18.414	335.001	1.536	160.361
3.746	-15	0.762	1.312	180.857	0.929	-13.08	0.045	21.993	337.737	1.535	156.880
4.464	-10	0.773	1.293	187.152	0.953	-8.16	0.038	26.111	340.417	1.533	153.264
5.281	-5	0.785	1.273	193.531	0.976	-3.23	0.032	30.834	343.028	1.532	149.497
6.205	0	0.798	1.253	200.000	1.000	1.69	0.028	36.238	345.559	1.531	145.559
7.246	5	0.812	1.231	206.567	1.024	6.62	0.024	42.415	347.995	1.531	141.428
8.412	10	0.827	1.209	213.243	1.047	11.55	0.020	49.472	350.320	1.530	137.077
9.712	15	0.843	1.186	220.037	1.070	16.48	0.017	57.536	352.513	1.529	132.476
11.157	20	0.861	1.161	226.963	1.094	21.41	0.015	66.767	354.551	1.528	127.589
12.757	25	0.881	1.136	234.037	1.117	26.33	0.013	77.359	356.411	1.527	122.373
14.521	30	0.902	1.108	241.282	1.141	31.26	0.011	89.565	358.058	1.525	116.776
16.461	35	0.927	1.079	248.724	1.165	36.18	0.010	103.717	359.453	1.523	110.728
18.589	40	0.955	1.047	256.402	1.189	41.1	0.008	120.272	360.539	1.521	104.137
20.918	45	0.987	1.013	264.369	1.213	46.01	0.007	139.891	361.236	1.517	96.867
23.462	50	1.027	0.974	272.708	1.238	50.92	0.006	163.597	361.418	1.513	88.710
26.237	55	1.076	0.929	281.559	1.265	55.82	0.005	193.134	360.869	1.506	79.310
29.263	60	1.142	0.876	291.193	1.293	60.7	0.004	231.953	359.166	1.497	67.972
32.566	65	1.245	0.804	302.312	1.325	65.54	0.003	289.029	355.222	1.481	52.910
36.168	70	1.526	0.655	319.596	1.374	70.23	0.002	421.741	342.453	1.441	22.857

Thermodynamic properties of R-422A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.020	6323.309	6507.654	6691.828	6875.861	7059.778	7243.597	7427.332	7610.996	7794.597	7978.145	8161.646	8345.106	8528.529	8711.919	8895.281	9078.617	9261.931	9445.223	9628.497	9811.754	9994.996
-95	0.032	4017.148	4131.428	4245.566	4359.587	4473.510	4587.348	4701.114	4814.818	4928.468	5042.071	5155.633	5269.157	5382.650	5496.114	5609.552	5722.967	5836.361	5949.736	6063.095	6176.438	6289.768
-90	0.051	2636.268	2709.595	2782.803	2855.911	2928.934	3001.885	3074.774	3147.608	3220.394	3293.139	3365.848	3438.524	3511.171	3583.792	3656.390	3728.967	3801.526	3874.068	3946.594	4019.107	4091.607
-85	0.077	1781.285	1829.831	1878.275	1926.633	1974.918	2023.140	2071.307	2119.427	2167.504	2215.545	2263.553	2311.532	2359.486	2407.416	2455.325	2503.215	2551.089	2598.947	2646.791	2694.622	2742.442
-80	0.113	1235.637	1268.708	1301.690	1334.599	1367.443	1400.232	1432.973	1465.672	1498.333	1530.962	1563.561	1596.134	1628.684	1661.213	1693.723	1726.217	1758.694	1791.158	1823.609	1856.049	1888.478
-75	0.163	877.684	900.808	923.857	946.840	969.767	992.644	1015.480	1038.277	1061.042	1083.776	1106.485	1129.170	1151.834	1174.479	1197.107	1219.720	1242.318	1264.904	1287.478	1310.041	1332.595
-70	0.230	636.932	653.495	669.991	686.430	702.818	719.163	735.470	751.743	767.986	784.203	800.396	816.567	832.720	848.855	864.975	881.081	897.173	913.254	929.325	945.385	961.437
-65	0.317	471.267	483.397	495.466	507.484	519.457	531.391	543.291	555.161	567.004	578.822	590.619	602.397	614.158	625.902	637.632	649.350	661.055	672.750	684.435	696.111	707.779
-60	0.429	354.872	363.937	372.949	381.915	390.841	399.731	408.590	417.422	426.230	435.015	443.781	452.529	461.261	469.979	478.684	487.377	496.059	504.731	513.394	522.049	530.696
-55	0.571	271.516	278.422	285.279	292.094	298.873	305.619	312.338	319.031	325.703	332.354	338.987	345.604	352.206	358.795	365.372	371.939	378.495	385.041	391.580	398.111	404.634
-50	0.748	210.767	216.121	221.430	226.701	231.939	237.148	242.331	247.491	252.631	257.752	262.857	267.946	273.023	278.087	283.139	288.182	293.215	298.240	303.257	308.267	313.270
-45	0.966	165.774	169.993	174.172	178.316	182.429	186.515	190.577	194.619	198.641	202.647	206.637	210.613	214.577	218.529	222.472	226.404	230.328	234.244	238.153	242.055	245.951
-44.04	1.013	158.499	162.536	166.534	170.497	174.429	178.336	182.219	186.081	189.924	193.751	197.562	201.360	205.146	208.921	212.685	216.440	220.186	223.925	227.656	231.381	235.100
-40	1.230	131.952	135.328	138.668	141.975	145.253	148.507	151.738	154.951	158.145	161.324	164.489	167.640	170.781	173.910	177.030	180.141	183.244	186.340	189.429	192.511	195.588
-35	1.548	106.176	108.918	111.624	114.301	116.951	119.578	122.185	124.773	127.345	129.902	132.446	134.979	137.500	140.011	142.513	145.007	147.494	149.973	152.447	154.914	157.376
-30	1.926	86.281	88.538	90.761	92.957	95.127	97.276	99.406	101.519	103.616	105.700	107.771	109.831	111.881	113.921	115.953	117.977	119.994	122.005	124.010	126.009	128.002
-25	2.370	70.744	72.625	74.475	76.298	78.098	79.878	81.639	83.385	85.116	86.834	88.540	90.236	91.922	93.599	95.268	96.930	98.586	100.235	101.878	103.516	105.149
-20	2.890	58.476	60.064	61.621	63.153	64.663	66.154	67.628	69.086	70.531	71.963	73.385	74.796	76.198	77.592	78.979	80.358	81.731	83.098	84.460	85.816	87.169
-15	3.492	48.690	50.045	51.372	52.674	53.955	55.218	56.464	57.696	58.915	60.122	61.318	62.505	63.683	64.853	66.016	67.173	68.323	69.468	70.608	71.742	72.873
-10	4.184	40.809	41.979	43.121	44.240	45.338	46.419	47.484	48.535	49.573	50.600	51.617	52.625	53.625	54.617	55.602	56.581	57.553	58.521	59.484	60.442	61.396
-5	4.976	34.404	35.425	36.419	37.390	38.342	39.276	40.195	41.100	41.993	42.876	43.748	44.612	45.468	46.316	47.158	47.994	48.824	49.649	50.470	51.286	52.098
0	5.875	29.155	30.056	30.930	31.782	32.614	33.429	34.230	35.017	35.792	36.557	37.312	38.058	38.797	39.529	40.255	40.975	41.689	42.398	43.103	43.804	44.501
5	6.890	24.818	25.622	26.399	27.153	27.888	28.606	29.309	29.999	30.678	31.346	32.005	32.656	33.299	33.936	34.566	35.191	35.810	36.425	37.035	37.642	38.245
10	8.031	21.208	21.933	22.630	23.305	23.960	24.598	25.221	25.831	26.430	27.019	27.598	28.170	28.734	29.292	29.843	30.389	30.931	31.467	32.000	32.528	33.053
15	9.308	18.180	18.842	19.475	20.084	20.673	21.244	21.801	22.345	22.877	23.400	23.913	24.419	24.917	25.409	25.896	26.376	26.853	27.324	27.792	28.256	28.716
20	10.730	15.624	16.235	16.815	17.370	17.904	18.420	18.922	19.410	19.887	20.354	20.812	21.262	21.706	22.143	22.574	23.001	23.422	23.839	24.253	24.662	25.069
25	12.308	13.450	14.022	14.559	15.070	15.558	16.028	16.483	16.924	17.354	17.775	18.186	18.590	18.987	19.378	19.763	20.143	20.519	20.890	21.258	21.622	21.982
30	14.054	11.590	12.132	12.635	13.109	13.559	13.990	14.405	14.808	15.198	15.579	15.951	16.315	16.673	17.024	17.370	17.711	18.048	18.380	18.709	19.034	19.356
35	15.979	9.988	10.508	10.984	11.428	11.846	12.245	12.627	12.995	13.352	13.699	14.037	14.368	14.692	15.010	15.322	15.630	15.933	16.232	16.528	16.820	17.109
40	18.097	8.596	9.104	9.560	9.980	10.372	10.742	11.096	11.436	11.764	12.082	12.391	12.693	12.988	13.277	13.561	13.839	14.114	14.385	14.651	14.915	15.176
45	20.420	7.377	7.884	8.325	8.725	9.096	9.443	9.773	10.088	10.391	10.684	10.968	11.245	11.515	11.779	12.038	12.292	12.542	12.787	13.030	13.269	13.505
50	22.967	6.299	6.814	7.249	7.634	7.986	8.314	8.623	8.917	9.199	9.470	9.733	9.987	10.236	10.478	10.715	10.947	11.176	11.400	11.621	11.838	12.053
55	25.756	5.328	5.871	6.304	6.679	7.017	7.328	7.619	7.895	8.158	8.410	8.654	8.890	9.119	9.342	9.560	9.774	9.983	10.188	10.390	10.589	10.785
60	28.814	4.432	5.032	5.471	5.840	6.165	6.463	6.738	6.998	7.245	7.480	7.707	7.926	8.138	8.345	8.546	8.742	8.935	9.124	9.309	9.491	9.671
65	32.182	3.557	4.277	4.730	5.095	5.412	5.697	5.959	6.204	6.436	6.657	6.869	7.073	7.270	7.461	7.647	7.829	8.007	8.180	8.351	8.519	8.683
70	35.971	2.462	3.574	4.052	4.417	4.726	5.000	5.250	5.483	5.701	5.909	6.107	6.297	6.481	6.658	6.831	6.999	7.163	7.323	7.480	7.634	7.786

Thermodynamic properties of R-422A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.020	286.289	289.273	292.306	295.386	298.515	301.693	304.918	308.191	311.512	314.880	318.295	321.757	325.265	328.819	332.419	336.065	339.757	343.493	347.275	351.101	354.972
-95	0.032	289.202	292.242	295.328	298.462	301.644	304.873	308.150	311.473	314.844	318.261	321.725	325.235	328.791	332.393	336.041	339.734	343.472	347.254	351.082	354.953	358.869
-90	0.051	292.147	295.242	298.384	301.572	304.807	308.088	311.416	314.791	318.212	321.679	325.192	328.751	332.355	336.005	339.700	343.439	347.224	351.053	354.926	358.843	362.804
-85	0.077	295.118	298.270	301.468	304.711	308.000	311.335	314.715	318.141	321.613	325.130	328.692	332.300	335.953	339.651	343.393	347.180	351.011	354.886	358.805	362.768	366.774
-80	0.113	298.111	301.322	304.577	307.876	311.220	314.608	318.041	321.519	325.042	328.610	332.223	335.880	339.582	343.328	347.118	350.952	354.831	358.752	362.718	366.726	370.777
-75	0.163	301.121	304.392	307.706	311.062	314.461	317.905	321.392	324.923	328.498	332.117	335.781	339.488	343.239	347.034	350.873	354.755	358.680	362.649	366.660	370.715	374.812
-70	0.230	304.143	307.476	310.850	314.265	317.722	321.221	324.763	328.348	331.976	335.648	339.362	343.120	346.921	350.766	354.653	358.584	362.557	366.573	370.631	374.732	378.874
-65	0.317	307.173	310.570	314.005	317.480	320.995	324.552	328.150	331.790	335.472	339.197	342.964	346.774	350.626	354.520	358.457	362.436	366.457	370.521	374.626	378.774	382.962
-60	0.429	310.204	313.667	317.166	320.703	324.278	327.894	331.549	335.246	338.983	342.762	346.582	350.444	354.348	358.293	362.280	366.309	370.379	374.491	378.644	382.838	387.073
-55	0.571	313.231	316.763	320.328	323.928	327.566	331.242	334.957	338.711	342.505	346.339	350.214	354.129	358.085	362.082	366.120	370.199	374.319	378.479	382.680	386.922	391.204
-50	0.748	316.250	319.852	323.486	327.153	330.855	334.593	338.368	342.181	346.033	349.924	353.854	357.824	361.834	365.883	369.973	374.103	378.273	382.483	386.733	391.023	395.352
-45	0.966	319.255	322.931	326.636	330.371	334.139	337.941	341.779	345.653	349.564	353.513	357.500	361.526	365.590	369.694	373.836	378.018	382.238	386.499	390.798	395.137	399.514
-44.04	1.013	319.832	323.523	327.241	330.990	334.771	338.586	342.436	346.322	350.245	354.205	358.204	362.240	366.315	370.429	374.581	378.773	383.004	387.274	391.583	395.931	400.318
-40	1.230	322.241	325.994	329.772	333.578	337.415	341.284	345.186	349.123	353.095	357.103	361.149	365.231	369.351	373.509	377.705	381.940	386.212	390.524	394.873	399.261	403.687
-35	1.548	325.201	329.035	332.890	336.770	340.678	344.615	348.584	352.585	356.620	360.690	364.795	368.936	373.113	377.327	381.578	385.866	390.192	394.555	398.955	403.393	407.869
-30	1.926	328.131	332.049	335.985	339.942	343.923	347.932	351.969	356.037	360.137	364.269	368.436	372.637	376.872	381.143	385.450	389.794	394.173	398.589	403.041	407.530	412.056
-25	2.370	331.025	335.032	339.052	343.089	347.147	351.229	355.338	359.474	363.641	367.838	372.068	376.330	380.626	384.955	389.320	393.719	398.153	402.623	407.128	411.669	416.245
-20	2.890	333.876	337.977	342.084	346.205	350.343	354.502	358.684	362.893	367.128	371.392	375.687	380.012	384.370	388.760	393.183	397.639	402.129	406.654	411.213	415.806	420.434
-15	3.492	336.678	340.877	345.077	349.286	353.507	357.746	362.005	366.287	370.595	374.928	379.290	383.681	388.101	392.553	397.036	401.551	406.098	410.679	415.292	419.939	424.620
-10	4.184	339.422	343.726	348.024	352.324	356.633	360.956	365.295	369.655	374.036	378.442	382.873	387.331	391.817	396.331	400.876	405.451	410.057	414.695	419.364	424.066	428.800
-5	4.976	342.100	346.515	350.916	355.314	359.716	364.126	368.550	372.990	377.449	381.929	386.432	390.959	395.512	400.092	404.700	409.337	414.003	418.699	423.426	428.183	432.972
0	5.875	344.699	349.233	353.745	358.248	362.748	367.252	371.764	376.289	380.829	385.386	389.964	394.563	399.185	403.832	408.505	413.205	417.933	422.689	427.474	432.288	437.133
5	6.890	347.206	351.870	356.502	361.117	365.723	370.326	374.933	379.546	384.171	388.809	393.464	398.137	402.832	407.548	412.288	417.053	421.844	426.661	431.506	436.379	441.280
10	8.031	349.603	354.411	359.177	363.915	368.634	373.344	378.050	382.758	387.471	392.194	396.929	401.680	406.448	411.236	416.045	420.877	425.733	430.613	435.519	440.452	445.411
15	9.308	351.870	356.844	361.759	366.632	371.475	376.299	381.111	385.917	390.724	395.535	400.354	405.186	410.031	414.893	419.774	424.674	429.597	434.542	439.511	444.504	449.523
20	10.730	353.987	359.153	364.236	369.258	374.236	379.183	384.108	389.020	393.925	398.829	403.736	408.651	413.577	418.515	423.470	428.442	433.433	438.445	443.478	448.534	453.614
25	12.308	355.927	361.319	366.594	371.784	376.910	381.990	387.036	392.060	397.069	402.070	407.070	412.072	417.081	422.100	427.131	432.176	437.239	442.319	447.419	452.539	457.681
30	14.054	357.659	363.322	368.820	374.197	379.487	384.711	389.888	395.031	400.150	405.254	410.351	415.445	420.540	425.642	430.753	435.875	441.010	446.161	451.329	456.516	461.722
35	15.979	359.144	365.138	370.895	376.485	381.955	387.337	392.655	397.925	403.162	408.376	413.574	418.764	423.951	429.139	434.332	439.533	444.745	449.969	455.208	460.462	465.735
40	18.097	360.327	366.735	372.798	378.631	384.303	389.859	395.329	400.737	406.099	411.429	416.735	422.026	427.308	432.587	437.866	443.149	448.439	453.739	459.051	464.375	469.715
45	20.420	361.130	368.072	374.504	380.617	386.516	392.264	397.901	403.457	408.954	414.407	419.827	425.225	430.607	435.980	441.349	446.718	452.090	457.468	462.855	468.252	473.662
50	22.967	361.431	369.094	375.979	382.421	388.578	394.538	400.359	406.077	411.718	417.302	422.844	428.355	433.843	439.315	444.778	450.236	455.693	461.152	466.617	472.089	477.571
55	25.756	361.026	369.725	377.182	384.014	390.467	396.667	402.689	408.583	414.381	420.107	425.778	431.408	437.007	442.584	448.145	453.697	459.242	464.786	470.331	475.881	481.437
60	28.814	359.507	369.853	378.057	385.360	392.155	398.626	404.874	410.961	416.928	422.807	428.616	434.374	440.091	445.778	451.443	457.091	462.730	468.361	473.991	479.621	485.254
65	32.182	355.851	369.309	378.518	386.400	393.599	400.379	406.879	413.179	419.333	425.377	431.336	437.230	443.073	448.877	454.651	460.403	466.139	471.863	477.581	483.295	489.009
70	35.971	344.086	367.671	378.326	386.954	394.646	401.795	408.588	415.134	421.499	427.728	433.854	439.899	445.880	451.812	457.706	463.569	469.410	475.233	481.045	486.849	492.649

Thermodynamic properties of R-422A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.020	1.666	1.683	1.699	1.716	1.733	1.749	1.765	1.781	1.797	1.812	1.828	1.843	1.858	1.873	1.888	1.903	1.918	1.932	1.947	1.961	1.976
-95	0.032	1.647	1.664	1.681	1.697	1.713	1.729	1.745	1.761	1.777	1.792	1.808	1.823	1.838	1.853	1.868	1.882	1.897	1.912	1.926	1.940	1.955
-90	0.051	1.631	1.648	1.664	1.680	1.696	1.712	1.728	1.744	1.759	1.775	1.790	1.805	1.820	1.835	1.850	1.864	1.879	1.893	1.908	1.922	1.936
-85	0.077	1.617	1.633	1.649	1.666	1.682	1.697	1.713	1.729	1.744	1.759	1.774	1.789	1.804	1.819	1.834	1.848	1.863	1.877	1.891	1.905	1.919
-80	0.113	1.604	1.620	1.637	1.653	1.668	1.684	1.700	1.715	1.730	1.746	1.761	1.775	1.790	1.805	1.819	1.834	1.848	1.862	1.877	1.891	1.905
-75	0.163	1.593	1.609	1.625	1.641	1.657	1.673	1.688	1.703	1.719	1.734	1.748	1.763	1.778	1.793	1.807	1.821	1.836	1.850	1.864	1.878	1.892
-70	0.230	1.583	1.599	1.615	1.631	1.647	1.662	1.678	1.693	1.708	1.723	1.738	1.753	1.767	1.782	1.796	1.810	1.824	1.838	1.852	1.866	1.880
-65	0.317	1.575	1.591	1.607	1.623	1.638	1.654	1.669	1.684	1.699	1.714	1.729	1.743	1.758	1.772	1.786	1.801	1.815	1.829	1.842	1.856	1.870
-60	0.429	1.567	1.584	1.599	1.615	1.631	1.646	1.661	1.676	1.691	1.706	1.721	1.735	1.749	1.764	1.778	1.792	1.806	1.820	1.834	1.848	1.861
-55	0.571	1.561	1.577	1.593	1.609	1.624	1.639	1.654	1.669	1.684	1.699	1.714	1.728	1.742	1.757	1.771	1.785	1.799	1.813	1.826	1.840	1.854
-50	0.748	1.556	1.572	1.587	1.603	1.618	1.634	1.649	1.664	1.678	1.693	1.708	1.722	1.736	1.750	1.764	1.778	1.792	1.806	1.820	1.833	1.847
-45	0.966	1.551	1.567	1.583	1.598	1.614	1.629	1.644	1.659	1.673	1.688	1.702	1.717	1.731	1.745	1.759	1.773	1.787	1.801	1.814	1.828	1.841
-44.04	1.013	1.550	1.566	1.582	1.597	1.613	1.628	1.643	1.658	1.672	1.687	1.702	1.716	1.730	1.744	1.758	1.772	1.786	1.800	1.813	1.827	1.840
-40	1.230	1.547	1.563	1.579	1.594	1.610	1.625	1.640	1.654	1.669	1.684	1.698	1.712	1.727	1.741	1.755	1.768	1.782	1.796	1.809	1.823	1.836
-35	1.548	1.544	1.560	1.575	1.591	1.606	1.621	1.636	1.651	1.666	1.680	1.694	1.709	1.723	1.737	1.751	1.765	1.778	1.792	1.805	1.819	1.832
-30	1.926	1.541	1.557	1.573	1.588	1.603	1.618	1.633	1.648	1.663	1.677	1.691	1.706	1.720	1.734	1.748	1.761	1.775	1.789	1.802	1.815	1.829
-25	2.370	1.539	1.555	1.570	1.586	1.601	1.616	1.631	1.646	1.660	1.675	1.689	1.703	1.717	1.731	1.745	1.759	1.772	1.786	1.799	1.813	1.826
-20	2.890	1.537	1.553	1.568	1.584	1.599	1.614	1.629	1.644	1.659	1.673	1.687	1.701	1.715	1.729	1.743	1.757	1.770	1.784	1.797	1.811	1.824
-15	3.492	1.535	1.551	1.567	1.583	1.598	1.613	1.628	1.643	1.657	1.672	1.686	1.700	1.714	1.728	1.742	1.755	1.769	1.782	1.796	1.809	1.822
-10	4.184	1.534	1.550	1.566	1.581	1.597	1.612	1.627	1.642	1.656	1.671	1.685	1.699	1.713	1.727	1.741	1.754	1.768	1.781	1.794	1.808	1.821
-5	4.976	1.533	1.549	1.565	1.581	1.596	1.611	1.626	1.641	1.656	1.670	1.684	1.698	1.712	1.726	1.740	1.754	1.767	1.780	1.794	1.807	1.820
0	5.875	1.532	1.548	1.564	1.580	1.596	1.611	1.626	1.641	1.655	1.670	1.684	1.698	1.712	1.726	1.740	1.753	1.767	1.780	1.793	1.806	1.820
5	6.890	1.531	1.548	1.564	1.580	1.595	1.611	1.626	1.640	1.655	1.670	1.684	1.698	1.712	1.726	1.740	1.753	1.767	1.780	1.793	1.806	1.819
10	8.031	1.530	1.547	1.563	1.579	1.595	1.611	1.626	1.641	1.655	1.670	1.684	1.698	1.712	1.726	1.740	1.753	1.767	1.780	1.793	1.807	1.820
15	9.308	1.529	1.546	1.563	1.579	1.595	1.611	1.626	1.641	1.656	1.670	1.685	1.699	1.713	1.727	1.740	1.754	1.767	1.781	1.794	1.807	1.820
20	10.730	1.528	1.546	1.563	1.579	1.595	1.611	1.626	1.641	1.656	1.671	1.685	1.699	1.713	1.727	1.741	1.755	1.768	1.781	1.795	1.808	1.821
25	12.308	1.527	1.545	1.562	1.579	1.595	1.611	1.627	1.642	1.657	1.671	1.686	1.700	1.714	1.728	1.742	1.756	1.769	1.782	1.796	1.809	1.822
30	14.054	1.526	1.544	1.562	1.579	1.595	1.612	1.627	1.643	1.658	1.672	1.687	1.701	1.715	1.729	1.743	1.757	1.770	1.784	1.797	1.810	1.823
35	15.979	1.524	1.543	1.561	1.579	1.596	1.612	1.628	1.643	1.658	1.673	1.688	1.702	1.716	1.730	1.744	1.758	1.771	1.785	1.798	1.811	1.824
40	18.097	1.521	1.542	1.561	1.578	1.596	1.612	1.628	1.644	1.659	1.674	1.689	1.703	1.718	1.732	1.745	1.759	1.773	1.786	1.799	1.813	1.826
45	20.420	1.518	1.540	1.559	1.578	1.595	1.612	1.629	1.644	1.660	1.675	1.690	1.704	1.719	1.733	1.747	1.761	1.774	1.788	1.801	1.814	1.827
50	22.967	1.514	1.537	1.558	1.577	1.595	1.612	1.629	1.645	1.661	1.676	1.691	1.706	1.720	1.734	1.748	1.762	1.776	1.789	1.802	1.816	1.829
55	25.756	1.507	1.534	1.556	1.576	1.595	1.612	1.629	1.646	1.661	1.677	1.692	1.707	1.721	1.736	1.750	1.763	1.777	1.791	1.804	1.817	1.830
60	28.814	1.498	1.529	1.553	1.574	1.594	1.612	1.629	1.646	1.662	1.678	1.693	1.708	1.722	1.737	1.751	1.765	1.779	1.792	1.806	1.819	1.832
65	32.182	1.483	1.523	1.550	1.572	1.592	1.611	1.629	1.646	1.662	1.678	1.694	1.709	1.723	1.738	1.752	1.766	1.780	1.794	1.807	1.820	1.833
70	35.971	1.445	1.514	1.544	1.569	1.590	1.609	1.628	1.645	1.662	1.678	1.694	1.709	1.724	1.739	1.753	1.767	1.781	1.795	1.808	1.821	1.835

R-422D (Freon™ MO29)

Zeotropic blend (65.1 % R-125 - 31.5 % R-134a - 3.4 % R-600a)

Molecular weight (g/mol)	109.94
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-43.21
Temperature glide at 1.013 bar (K)	4.86
Critical temperature (°C)	79.6
Critical pressure (bar absolute)	39.05
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.443
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.844
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.108
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.155
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	5.51
Classification NF-EN 378	A1
GWP (IPCC 4)	2729

Main applications

R-422D (Freon™ MO29) is a "non azeotropic" HFC blend intended as a "direct replacement" for R-22 in refrigeration, air-conditioning, and chiller applications.

Commercial specifications

Composition: (65.1 % R-125 – 31.5 % R-134a – 3.4 % R-600a)
(+0.9 %-1.1 % / +2%-0%/+0.1% - 0.4%)
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a mineral (MO), an alkyl benzene (AB) or a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-422D - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.024	-100	0.634	1.576	78.935	0.452	-93.19	5.617	0.178	301.992	1.719	223.057
0.038	-95	0.641	1.561	84.752	0.486	-88.38	3.707	0.270	304.873	1.701	220.121
0.057	-90	0.647	1.546	90.554	0.518	-83.57	2.512	0.398	307.784	1.686	217.229
0.084	-85	0.653	1.531	96.354	0.549	-78.75	1.744	0.573	310.721	1.672	214.368
0.121	-80	0.660	1.516	102.159	0.579	-73.92	1.238	0.808	313.680	1.660	211.522
0.170	-75	0.666	1.500	107.976	0.609	-69.1	0.897	1.115	316.657	1.649	208.681
0.235	-70	0.673	1.485	113.813	0.638	-64.27	0.662	1.510	319.645	1.639	205.833
0.319	-65	0.680	1.470	119.673	0.667	-59.43	0.497	2.012	322.641	1.630	202.968
0.426	-60	0.687	1.455	125.563	0.695	-54.6	0.379	2.639	325.639	1.623	200.076
0.561	-55	0.695	1.439	131.487	0.722	-49.76	0.293	3.412	328.635	1.616	197.148
0.727	-50	0.703	1.423	137.448	0.749	-44.92	0.230	4.355	331.623	1.610	194.175
0.930	-45	0.710	1.408	143.450	0.775	-40.08	0.182	5.493	334.598	1.605	191.148
1.013	-43.21	0.713	1.402	145.614	0.785	-38.35	0.168	5.954	335.661	1.604	190.047
1.176	-40	0.719	1.391	149.498	0.802	-35.24	0.146	6.854	337.555	1.601	188.057
1.470	-35	0.727	1.375	155.595	0.827	-30.4	0.118	8.466	340.489	1.597	184.894
1.818	-30	0.736	1.358	161.745	0.853	-25.55	0.097	10.363	343.394	1.594	181.649
2.227	-25	0.745	1.341	167.952	0.878	-20.7	0.080	12.579	346.265	1.591	178.313
2.704	-20	0.755	1.324	174.220	0.903	-15.85	0.066	15.153	349.096	1.589	174.876
3.256	-15	0.765	1.306	180.553	0.927	-11.0	0.055	18.128	351.880	1.586	171.327
3.889	-10	0.776	1.288	186.958	0.952	-6.15	0.046	21.551	354.611	1.585	167.654
4.612	-5	0.788	1.270	193.438	0.976	-1.29	0.039	25.477	357.281	1.583	163.843
5.431	0	0.800	1.250	200.000	1.000	3.56	0.033	29.965	359.879	1.582	159.879
6.357	5	0.813	1.231	206.651	1.024	8.42	0.029	35.085	362.395	1.581	155.744
7.395	10	0.826	1.210	213.399	1.048	13.27	0.024	40.920	364.814	1.579	151.415
8.556	15	0.841	1.189	220.254	1.071	18.13	0.021	47.565	367.122	1.578	146.868
9.847	20	0.857	1.167	227.225	1.095	22.99	0.018	55.136	369.299	1.577	142.074
11.279	25	0.875	1.143	234.327	1.118	27.84	0.016	63.771	371.324	1.576	136.998
12.860	30	0.894	1.119	241.574	1.142	32.69	0.014	73.645	373.174	1.574	131.600
14.601	35	0.915	1.093	248.988	1.166	37.54	0.012	84.976	374.816	1.573	125.828
16.512	40	0.939	1.065	256.594	1.190	42.38	0.010	98.053	376.213	1.570	119.618
18.604	45	0.966	1.036	264.427	1.214	47.22	0.009	113.263	377.310	1.568	112.883
20.889	50	0.997	1.003	272.536	1.239	52.05	0.008	131.154	378.036	1.564	105.500
23.379	55	1.034	0.967	280.991	1.264	56.87	0.007	152.548	378.278	1.559	97.287
26.090	60	1.080	0.926	289.909	1.290	61.67	0.006	178.774	377.859	1.553	87.950
29.037	65	1.139	0.878	299.495	1.317	66.45	0.005	212.255	376.456	1.545	76.961
32.238	70	1.224	0.817	310.204	1.348	71.18	0.004	258.355	373.365	1.531	63.161
35.710	75	1.378	0.725	323.601	1.385	75.79	0.003	335.324	366.263	1.508	42.661

Thermodynamic properties of R-422D - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.012	10645.396	10955.128	11264.577	11573.804	11882.855	12191.762	12500.551	12809.242	13117.851	13426.389	13734.868	14043.294	14351.675	14660.017	14968.324	15276.600	15584.849	15893.073	16201.275	16509.458	16817.623
-95	0.020	6614.611	6802.244	6989.654	7176.886	7363.973	7550.942	7737.813	7924.601	8111.319	8297.977	8484.582	8671.143	8857.663	9044.149	9230.604	9417.031	9603.434	9789.815	9976.177	10162.520	10348.848
-90	0.032	4249.327	4367.050	4484.592	4601.988	4719.266	4836.444	4953.540	5070.564	5187.529	5304.441	5421.308	5538.135	5654.927	5771.689	5888.422	6005.132	6121.819	6238.486	6355.136	6471.770	6588.389
-85	0.050	2813.055	2889.309	2965.415	3041.400	3117.286	3193.087	3268.818	3344.488	3420.105	3495.677	3571.209	3646.706	3722.172	3797.610	3873.024	3948.415	4023.787	4099.141	4174.479	4249.802	4325.112
-80	0.076	1913.645	1964.504	2015.239	2065.873	2116.422	2166.899	2217.315	2267.678	2317.996	2368.273	2418.515	2468.726	2518.909	2569.068	2619.204	2669.321	2719.419	2769.502	2819.570	2869.624	2919.666
-75	0.111	1334.378	1369.224	1403.965	1438.620	1473.202	1507.721	1542.188	1576.608	1610.987	1645.331	1679.644	1713.929	1748.189	1782.427	1816.645	1850.845	1885.028	1919.197	1953.353	1987.496	2021.629
-70	0.160	951.594	976.068	1000.452	1024.761	1049.007	1073.199	1097.344	1121.448	1145.516	1169.552	1193.560	1217.544	1241.505	1265.446	1289.369	1313.275	1337.167	1361.045	1384.911	1408.766	1432.611
-65	0.224	692.623	710.211	727.721	745.166	762.555	779.896	797.195	814.458	831.689	848.891	866.068	883.223	900.358	917.474	934.574	951.659	968.730	985.789	1002.837	1019.875	1036.903
-60	0.308	513.593	526.505	539.347	552.131	564.866	577.559	590.214	602.836	615.430	627.999	640.544	653.069	665.575	678.065	690.540	703.002	715.451	727.888	740.316	752.733	765.143
-55	0.416	387.346	397.013	406.619	416.172	425.682	435.153	444.591	454.000	463.382	472.742	482.080	491.400	500.703	509.991	519.266	528.527	537.778	547.017	556.248	565.469	574.683
-50	0.553	296.677	304.049	311.366	318.637	325.867	333.063	340.229	347.368	354.483	361.577	368.652	375.711	382.753	389.782	396.798	403.803	410.797	417.781	424.757	431.724	438.684
-45	0.724	230.453	236.173	241.842	247.469	253.060	258.620	264.151	269.659	275.144	280.611	286.060	291.493	296.912	302.318	307.712	313.096	318.470	323.835	329.192	334.542	339.884
-40	0.934	181.325	185.834	190.297	194.722	199.113	203.476	207.813	212.128	216.423	220.699	224.960	229.207	233.440	237.661	241.872	246.072	250.264	254.447	258.623	262.791	266.953
-38.35	1.013	167.944	172.126	176.264	180.363	184.431	188.471	192.485	196.478	200.452	204.408	208.349	212.275	216.189	220.091	223.982	227.864	231.737	235.601	239.459	243.309	247.153
-35	1.189	144.350	147.959	151.525	155.056	158.557	162.030	165.480	168.910	172.321	175.715	179.095	182.461	185.815	189.158	192.491	195.814	199.129	202.436	205.737	209.030	212.318
-30	1.496	116.148	119.078	121.968	124.825	127.654	130.457	133.240	136.002	138.748	141.478	144.195	146.899	149.591	152.273	154.946	157.610	160.266	162.915	165.557	168.193	170.823
-25	1.861	94.370	96.780	99.153	101.495	103.811	106.103	108.375	110.629	112.868	115.091	117.302	119.501	121.689	123.868	126.037	128.199	130.353	132.500	134.641	136.777	138.906
-20	2.292	77.357	79.365	81.338	83.282	85.201	87.098	88.976	90.837	92.683	94.515	96.335	98.145	99.944	101.734	103.515	105.289	107.056	108.817	110.571	112.320	114.064
-15	2.795	63.923	65.616	67.276	68.908	70.517	72.105	73.675	75.229	76.768	78.295	79.810	81.315	82.810	84.297	85.776	87.247	88.712	90.170	91.624	93.071	94.514
-10	3.379	53.209	54.653	56.065	57.451	58.814	60.158	61.484	62.795	64.093	65.378	66.653	67.917	69.173	70.420	71.660	72.892	74.119	75.340	76.555	77.765	78.971
-5	4.051	44.583	45.828	47.042	48.231	49.399	50.547	51.680	52.797	53.902	54.995	56.077	57.150	58.214	59.270	60.320	61.362	62.399	63.430	64.456	65.477	66.494
0	4.820	37.576	38.661	39.716	40.747	41.757	42.749	43.724	44.686	45.635	46.573	47.501	48.419	49.330	50.232	51.128	52.018	52.902	53.780	54.654	55.523	56.388
5	5.694	31.837	32.792	33.719	34.622	35.503	36.368	37.216	38.051	38.874	39.686	40.488	41.281	42.067	42.845	43.616	44.382	45.142	45.896	46.647	47.392	48.134
10	6.682	27.098	27.949	28.771	29.569	30.346	31.106	31.851	32.582	33.301	34.010	34.709	35.400	36.083	36.759	37.428	38.092	38.751	39.404	40.053	40.698	41.339
15	7.793	23.157	23.923	24.659	25.371	26.062	26.736	27.395	28.041	28.675	29.298	29.912	30.518	31.117	31.708	32.294	32.874	33.449	34.019	34.584	35.146	35.704
20	9.037	19.855	20.551	21.217	21.858	22.479	23.082	23.669	24.244	24.807	25.360	25.903	26.439	26.967	27.489	28.004	28.514	29.020	29.520	30.016	30.509	30.998
25	10.424	17.070	17.710	18.319	18.901	19.463	20.006	20.534	21.050	21.553	22.047	22.531	23.008	23.477	23.940	24.397	24.849	25.296	25.738	26.177	26.611	27.042
30	11.964	14.705	15.301	15.862	16.396	16.908	17.402	17.881	18.346	18.799	19.243	19.678	20.104	20.524	20.938	21.345	21.748	22.146	22.539	22.929	23.315	23.697
35	13.669	12.683	13.244	13.767	14.262	14.733	15.185	15.621	16.044	16.455	16.857	17.249	17.634	18.012	18.383	18.749	19.110	19.466	19.818	20.166	20.510	20.851
40	15.550	10.943	11.479	11.972	12.433	12.870	13.287	13.687	14.074	14.450	14.815	15.171	15.520	15.862	16.198	16.528	16.853	17.174	17.490	17.803	18.112	18.418
45	17.621	9.435	9.954	10.423	10.858	11.266	11.653	12.024	12.380	12.724	13.059	13.385	13.702	14.013	14.318	14.618	14.912	15.202	15.488	15.771	16.049	16.325
50	19.894	8.118	8.629	9.081	9.494	9.879	10.241	10.585	10.916	11.234	11.541	11.840	12.132	12.416	12.694	12.967	13.235	13.499	13.759	14.015	14.267	14.517
55	22.387	6.956	7.470	7.912	8.308	8.673	9.014	9.336	9.644	9.939	10.224	10.500	10.768	11.029	11.284	11.534	11.779	12.020	12.257	12.490	12.720	12.946
60	25.119	5.918	6.449	6.887	7.271	7.619	7.942	8.246	8.534	8.809	9.074	9.330	9.577	9.818	10.053	10.283	10.508	10.729	10.945	11.159	11.368	11.575
65	28.115	4.973	5.543	5.983	6.358	6.694	7.002	7.289	7.560	7.818	8.065	8.303	8.533	8.756	8.973	9.185	9.392	9.595	9.794	9.990	10.182	10.372
70	31.411	4.080	4.729	5.179	5.550	5.876	6.171	6.444	6.700	6.942	7.174	7.396	7.610	7.817	8.018	8.214	8.405	8.593	8.776	8.956	9.132	9.306
75	35.081	3.152	3.983	4.454	4.824	5.141	5.425	5.685	5.928	6.156	6.373	6.581	6.781	6.973	7.160	7.342	7.519	7.692	7.861	8.027	8.189	8.349

Thermodynamic properties of R-422D - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.012	297.974	300.980	304.035	307.139	310.293	313.496	316.748	320.048	323.398	326.795	330.241	333.735	337.276	340.864	344.500	348.182	351.910	355.685	359.506	363.372	367.284
-95	0.020	300.919	303.982	307.092	310.250	313.457	316.713	320.016	323.368	326.768	330.216	333.711	337.254	340.844	344.480	348.164	351.893	355.669	359.490	363.358	367.270	371.228
-90	0.032	303.901	307.020	310.186	313.399	316.660	319.968	323.324	326.727	330.178	333.676	337.221	340.813	344.451	348.136	351.867	355.645	359.467	363.336	367.249	371.208	375.211
-85	0.050	306.914	310.091	313.313	316.582	319.897	323.258	326.667	330.122	333.624	337.172	340.767	344.409	348.096	351.830	355.609	359.434	363.304	367.219	371.179	375.184	379.233
-80	0.076	309.955	313.190	316.470	319.795	323.164	326.580	330.042	333.549	337.103	340.702	344.348	348.039	351.776	355.558	359.385	363.258	367.176	371.138	375.145	379.196	383.291
-75	0.111	313.018	316.313	319.652	323.033	326.459	329.929	333.445	337.005	340.611	344.262	347.959	351.700	355.487	359.318	363.194	367.115	371.081	375.090	379.144	383.241	387.383
-70	0.160	316.098	319.455	322.853	326.293	329.776	333.302	336.873	340.487	344.146	347.849	351.597	355.390	359.226	363.108	367.033	371.002	375.016	379.073	383.174	387.318	391.505
-65	0.224	319.191	322.611	326.071	329.571	333.112	336.695	340.321	343.991	347.703	351.460	355.260	359.104	362.991	366.923	370.898	374.916	378.978	383.083	387.232	391.423	395.657
-60	0.308	322.290	325.776	329.299	332.860	336.461	340.103	343.786	347.511	351.279	355.090	358.943	362.839	366.778	370.761	374.786	378.854	382.965	387.118	391.315	395.553	399.834
-55	0.416	325.392	328.945	332.533	336.157	339.819	343.521	347.263	351.045	354.869	358.735	362.642	366.592	370.584	374.618	378.694	382.812	386.973	391.175	395.420	399.706	404.034
-50	0.553	328.489	332.112	335.768	339.457	343.182	346.946	350.747	354.589	358.470	362.392	366.355	370.359	374.404	378.490	382.618	386.788	390.998	395.251	399.544	403.879	408.255
-45	0.724	331.577	335.273	338.998	342.755	346.546	350.372	354.236	358.137	362.077	366.057	370.076	374.135	378.235	382.375	386.556	390.777	395.039	399.341	403.684	408.068	412.492
-40	0.934	334.649	338.422	342.219	346.046	349.904	353.796	357.723	361.687	365.687	369.726	373.803	377.919	382.074	386.268	390.503	394.777	399.090	403.444	407.837	412.271	416.744
-38.35	1.013	335.661	339.459	343.282	347.132	351.013	354.927	358.876	362.860	366.881	370.939	375.036	379.171	383.344	387.557	391.809	396.101	400.432	404.803	409.213	413.663	418.152
-35	1.189	337.701	341.553	345.426	349.325	353.253	357.213	361.206	365.233	369.295	373.395	377.531	381.705	385.917	390.167	394.456	398.783	403.150	407.555	412.000	416.484	421.006
-30	1.496	340.727	344.662	348.614	352.588	356.589	360.618	364.678	368.771	372.898	377.059	381.256	385.490	389.760	394.067	398.411	402.794	407.214	411.673	416.169	420.704	425.277
-25	1.861	343.721	347.742	351.777	355.830	359.905	364.007	368.138	372.298	376.491	380.716	384.976	389.270	393.599	397.965	402.367	406.805	411.280	415.792	420.342	424.928	429.552
-20	2.292	346.676	350.789	354.910	359.045	363.199	367.376	371.579	375.809	380.070	384.361	388.685	393.042	397.432	401.858	406.318	410.813	415.344	419.911	424.514	429.154	433.830
-15	2.795	349.587	353.797	358.008	362.228	366.464	370.719	374.997	379.300	383.631	387.991	392.381	396.802	401.255	405.741	410.261	414.815	419.403	424.026	428.684	433.378	438.106
-10	3.379	352.447	356.758	361.064	365.374	369.695	374.032	378.388	382.767	387.170	391.600	396.059	400.546	405.064	409.613	414.194	418.808	423.454	428.135	432.849	437.597	442.379
-5	4.051	355.247	359.666	364.072	368.477	372.887	377.309	381.747	386.204	390.683	395.186	399.715	404.271	408.855	413.469	418.113	422.788	427.495	432.233	437.004	441.808	446.646
0	4.820	357.980	362.513	367.025	371.529	376.034	380.545	385.069	389.608	394.166	398.745	403.347	407.973	412.626	417.306	422.015	426.753	431.520	436.319	441.148	446.010	450.903
5	5.694	360.633	365.289	369.915	374.525	379.129	383.735	388.349	392.974	397.614	402.271	406.949	411.649	416.372	421.121	425.896	430.698	435.529	440.389	445.278	450.198	455.148
10	6.682	363.194	367.983	372.732	377.456	382.167	386.873	391.582	396.297	401.022	405.762	410.518	415.294	420.090	424.910	429.753	434.622	439.517	444.440	449.391	454.370	459.378
15	7.793	365.648	370.584	375.467	380.314	385.139	389.953	394.761	399.571	404.387	409.212	414.051	418.905	423.777	428.669	433.583	438.521	443.482	448.470	453.483	458.524	463.592
20	9.037	367.977	373.078	378.108	383.090	388.039	392.967	397.882	402.792	407.702	412.617	417.541	422.477	427.428	432.396	437.383	442.391	447.421	452.475	457.552	462.656	467.785
25	10.424	370.159	375.449	380.645	385.775	390.858	395.909	400.938	405.954	410.964	415.973	420.986	426.007	431.040	436.086	441.149	446.230	451.330	456.452	461.596	466.764	471.956
30	11.964	372.172	377.680	383.063	388.358	393.588	398.771	403.922	409.051	414.166	419.274	424.381	429.491	434.608	439.736	444.877	450.033	455.207	460.399	465.611	470.845	476.101
35	13.669	373.984	379.751	385.348	390.826	396.217	401.545	406.826	412.075	417.302	422.514	427.720	432.923	438.129	443.342	448.564	453.799	459.047	464.312	469.595	474.896	480.219
40	15.550	375.559	381.636	387.482	393.167	398.736	404.221	409.643	415.021	420.366	425.689	430.998	436.300	441.599	446.900	452.207	457.522	462.848	468.188	473.543	478.915	484.306
45	17.621	376.848	383.306	389.443	395.363	401.131	406.788	412.363	417.879	423.351	428.792	434.211	439.615	445.012	450.405	455.800	461.199	466.607	472.024	477.454	482.899	488.359
50	19.894	377.779	384.721	391.204	397.396	403.386	409.234	414.977	420.642	426.250	431.816	437.351	442.864	448.363	453.853	459.340	464.827	470.318	475.817	481.324	486.843	492.375
55	22.387	378.251	385.827	392.734	399.241	405.485	411.544	417.471	423.299	429.054	434.753	440.411	446.040	451.646	457.238	462.821	468.400	473.979	479.561	485.148	490.745	496.352
60	25.119	378.096	386.555	393.990	400.872	407.405	413.702	419.832	425.837	431.750	437.593	443.384	449.134	454.854	460.553	466.237	471.912	477.582	483.251	488.922	494.598	500.282
65	28.115	377.016	386.800	394.916	402.249	409.119	415.685	422.040	428.240	434.325	440.324	446.255	452.135	457.977	463.789	469.579	475.354	481.119	486.879	492.637	498.397	504.161
70	31.411	374.368	386.406	395.432	403.317	410.582	417.457	424.064	430.480	436.754	442.921	449.005	455.025	460.995	466.927	472.830	478.711	484.576	490.431	496.280	502.127	507.974
75	35.081	368.086	385.076	395.374	403.959	411.700	418.934	425.832	432.492	438.976	445.329	451.580	457.752	463.862	469.924	475.948	481.942	487.915	493.871	499.817	505.755	511.690

Thermodynamic properties of R-422D - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.012	1.747	1.764	1.781	1.798	1.814	1.831	1.847	1.863	1.879	1.895	1.910	1.926	1.941	1.956	1.972	1.986	2.001	2.016	2.031	2.045	2.060
-95	0.020	1.726	1.743	1.760	1.776	1.793	1.809	1.825	1.841	1.857	1.872	1.888	1.903	1.918	1.933	1.948	1.963	1.978	1.993	2.007	2.022	2.036
-90	0.032	1.707	1.724	1.740	1.757	1.773	1.789	1.805	1.821	1.837	1.852	1.867	1.883	1.898	1.913	1.928	1.942	1.957	1.972	1.986	2.001	2.015
-85	0.050	1.690	1.707	1.723	1.740	1.756	1.772	1.788	1.803	1.819	1.834	1.849	1.865	1.880	1.894	1.909	1.924	1.938	1.953	1.967	1.982	1.996
-80	0.076	1.675	1.692	1.708	1.724	1.740	1.756	1.772	1.788	1.803	1.818	1.833	1.848	1.863	1.878	1.893	1.907	1.922	1.936	1.950	1.965	1.979
-75	0.111	1.662	1.679	1.695	1.711	1.727	1.743	1.758	1.774	1.789	1.804	1.819	1.834	1.849	1.864	1.878	1.893	1.907	1.921	1.935	1.950	1.964
-70	0.160	1.651	1.667	1.683	1.699	1.715	1.730	1.746	1.761	1.776	1.792	1.806	1.821	1.836	1.851	1.865	1.880	1.894	1.908	1.922	1.936	1.950
-65	0.224	1.640	1.657	1.673	1.688	1.704	1.720	1.735	1.750	1.765	1.780	1.795	1.810	1.825	1.839	1.854	1.868	1.882	1.896	1.910	1.924	1.938
-60	0.308	1.631	1.647	1.663	1.679	1.695	1.710	1.726	1.741	1.756	1.771	1.786	1.800	1.815	1.829	1.844	1.858	1.872	1.886	1.900	1.914	1.928
-55	0.416	1.623	1.640	1.655	1.671	1.687	1.702	1.717	1.732	1.747	1.762	1.777	1.791	1.806	1.820	1.835	1.849	1.863	1.877	1.891	1.905	1.918
-50	0.553	1.616	1.633	1.648	1.664	1.680	1.695	1.710	1.725	1.740	1.755	1.769	1.784	1.798	1.813	1.827	1.841	1.855	1.869	1.883	1.896	1.910
-45	0.724	1.610	1.626	1.642	1.658	1.673	1.689	1.704	1.719	1.734	1.748	1.763	1.777	1.792	1.806	1.820	1.834	1.848	1.862	1.876	1.889	1.903
-40	0.934	1.605	1.621	1.637	1.653	1.668	1.683	1.698	1.713	1.728	1.743	1.757	1.772	1.786	1.800	1.814	1.828	1.842	1.856	1.869	1.883	1.897
-38.35	1.013	1.604	1.620	1.635	1.651	1.666	1.682	1.697	1.712	1.726	1.741	1.755	1.770	1.784	1.798	1.812	1.826	1.840	1.854	1.868	1.881	1.895
-35	1.189	1.601	1.617	1.632	1.648	1.663	1.679	1.694	1.708	1.723	1.738	1.752	1.767	1.781	1.795	1.809	1.823	1.837	1.851	1.864	1.878	1.891
-30	1.496	1.597	1.613	1.629	1.644	1.659	1.675	1.690	1.704	1.719	1.734	1.748	1.763	1.777	1.791	1.805	1.819	1.832	1.846	1.860	1.873	1.887
-25	1.861	1.593	1.609	1.625	1.641	1.656	1.671	1.686	1.701	1.716	1.730	1.745	1.759	1.773	1.787	1.801	1.815	1.829	1.842	1.856	1.869	1.883
-20	2.292	1.591	1.607	1.622	1.638	1.653	1.669	1.684	1.698	1.713	1.727	1.742	1.756	1.770	1.784	1.798	1.812	1.826	1.839	1.853	1.866	1.880
-15	2.795	1.588	1.604	1.620	1.636	1.651	1.666	1.681	1.696	1.711	1.725	1.740	1.754	1.768	1.782	1.796	1.810	1.823	1.837	1.850	1.864	1.877
-10	3.379	1.586	1.602	1.618	1.634	1.649	1.664	1.679	1.694	1.709	1.723	1.738	1.752	1.766	1.780	1.794	1.808	1.821	1.835	1.848	1.862	1.875
-5	4.051	1.584	1.601	1.617	1.632	1.648	1.663	1.678	1.693	1.707	1.722	1.736	1.750	1.765	1.779	1.792	1.806	1.820	1.833	1.847	1.860	1.873
0	4.820	1.583	1.599	1.615	1.631	1.647	1.662	1.677	1.692	1.706	1.721	1.735	1.749	1.764	1.777	1.791	1.805	1.819	1.832	1.845	1.859	1.872
5	5.694	1.581	1.598	1.614	1.630	1.646	1.661	1.676	1.691	1.706	1.720	1.735	1.749	1.763	1.777	1.791	1.804	1.818	1.831	1.845	1.858	1.871
10	6.682	1.580	1.597	1.613	1.629	1.645	1.660	1.676	1.690	1.705	1.720	1.734	1.748	1.762	1.776	1.790	1.804	1.817	1.831	1.844	1.858	1.871
15	7.793	1.579	1.596	1.613	1.629	1.644	1.660	1.675	1.690	1.705	1.720	1.734	1.748	1.762	1.776	1.790	1.804	1.817	1.831	1.844	1.857	1.871
20	9.037	1.578	1.595	1.612	1.628	1.644	1.660	1.675	1.690	1.705	1.720	1.734	1.748	1.763	1.776	1.790	1.804	1.818	1.831	1.844	1.858	1.871
25	10.424	1.577	1.594	1.611	1.628	1.644	1.660	1.675	1.690	1.705	1.720	1.734	1.749	1.763	1.777	1.791	1.804	1.818	1.831	1.845	1.858	1.871
30	11.964	1.575	1.593	1.611	1.627	1.644	1.660	1.675	1.690	1.705	1.720	1.735	1.749	1.763	1.777	1.791	1.805	1.819	1.832	1.845	1.859	1.872
35	13.669	1.574	1.592	1.610	1.627	1.644	1.660	1.675	1.691	1.706	1.721	1.735	1.750	1.764	1.778	1.792	1.806	1.819	1.833	1.846	1.859	1.873
40	15.550	1.572	1.591	1.609	1.626	1.643	1.660	1.676	1.691	1.706	1.721	1.736	1.751	1.765	1.779	1.793	1.807	1.820	1.834	1.847	1.860	1.874
45	17.621	1.569	1.589	1.608	1.626	1.643	1.660	1.676	1.691	1.707	1.722	1.737	1.751	1.766	1.780	1.794	1.808	1.821	1.835	1.848	1.862	1.875
50	19.894	1.566	1.587	1.607	1.625	1.643	1.660	1.676	1.692	1.707	1.723	1.738	1.752	1.767	1.781	1.795	1.809	1.823	1.836	1.849	1.863	1.876
55	22.387	1.561	1.584	1.605	1.624	1.642	1.659	1.676	1.692	1.708	1.723	1.738	1.753	1.768	1.782	1.796	1.810	1.824	1.837	1.851	1.864	1.877
60	25.119	1.556	1.581	1.603	1.623	1.641	1.659	1.676	1.692	1.708	1.724	1.739	1.754	1.769	1.783	1.797	1.811	1.825	1.839	1.852	1.865	1.879
65	28.115	1.547	1.576	1.600	1.621	1.640	1.658	1.676	1.692	1.708	1.724	1.740	1.755	1.769	1.784	1.798	1.812	1.826	1.840	1.853	1.867	1.880
70	31.411	1.535	1.570	1.596	1.618	1.638	1.657	1.675	1.692	1.708	1.724	1.740	1.755	1.770	1.785	1.799	1.813	1.827	1.841	1.855	1.868	1.881
75	35.081	1.513	1.562	1.591	1.615	1.636	1.655	1.674	1.691	1.708	1.724	1.740	1.755	1.771	1.785	1.800	1.814	1.828	1.842	1.856	1.869	1.882

R-423A (Freon™ 39TC)

Zeotropic blend (52.5 % R-134a – 47.5 % R-227ea)

Molecular weight (g/mol)	125.96
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-24.18
Temperature glide at 1.013 bar (K)	0.67
Critical temperature (°C)	99.1
Critical pressure (bar absolute)	35.63
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.313
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.833
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.098
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.204
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	7.44
Classification NF-EN 378	A1
GWP (IPCC 4)	2280

Main applications

R-423A (Freon™ 39TC) is a "near azeotropic" HFC blend intended to replace the R-12 in centrifugal chiller compressors.

Commercial specifications

Composition: 52.5 % R-134a – 47.5 % R-227ea (±1 % / ±1 %)
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a polyol ester (POE).
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-423A are governed by EU Regulation n° 517/2014.
The recovery of R-423A is mandatory under EU Regulation n° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-423A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.005	-100	0.596	1.677	86.045	0.484	-99.36	22.546	0.044	299.495	1.715	213.450
0.009	-95	0.601	1.663	91.404	0.515	-94.36	13.795	0.072	302.396	1.697	210.992
0.014	-90	0.606	1.649	96.786	0.544	-89.37	8.721	0.115	305.342	1.681	208.556
0.022	-85	0.612	1.635	102.194	0.574	-84.37	5.681	0.176	308.329	1.668	206.135
0.034	-80	0.617	1.621	107.631	0.602	-79.37	3.802	0.263	311.355	1.655	203.724
0.050	-75	0.622	1.607	113.099	0.630	-74.37	2.608	0.383	314.415	1.645	201.316
0.073	-70	0.628	1.593	118.600	0.657	-69.37	1.831	0.546	317.507	1.635	198.907
0.104	-65	0.634	1.578	124.135	0.684	-64.37	1.312	0.762	320.625	1.627	196.490
0.146	-60	0.640	1.564	129.706	0.711	-59.37	0.958	1.044	323.766	1.620	194.059
0.200	-55	0.646	1.549	135.315	0.737	-54.36	0.712	1.405	326.925	1.614	191.610
0.270	-50	0.652	1.534	140.962	0.762	-49.36	0.538	1.860	330.098	1.609	189.135
0.359	-45	0.658	1.519	146.651	0.787	-44.36	0.412	2.428	333.280	1.604	186.630
0.470	-40	0.665	1.504	152.381	0.812	-39.35	0.320	3.126	336.468	1.601	184.087
0.607	-35	0.672	1.488	158.156	0.837	-34.35	0.252	3.975	339.656	1.598	181.500
0.774	-30	0.679	1.473	163.977	0.861	-29.34	0.200	4.999	342.841	1.596	178.864
0.976	-25	0.686	1.457	169.846	0.885	-24.34	0.161	6.220	346.017	1.594	176.171
1.013	-24.18	0.688	1.454	170.809	0.889	-23.52	0.155	6.440	346.534	1.594	175.725
1.218	-20	0.694	1.441	175.766	0.908	-19.33	0.130	7.666	349.180	1.592	173.414
1.505	-15	0.702	1.424	181.738	0.932	-14.33	0.107	9.365	352.326	1.592	170.587
1.841	-10	0.710	1.407	187.766	0.955	-9.32	0.088	11.349	355.448	1.591	167.682
2.234	-5	0.719	1.390	193.852	0.977	-4.32	0.073	13.652	358.543	1.591	164.691
2.688	0	0.728	1.373	200.000	1.000	0.69	0.061	16.311	361.604	1.591	161.604
3.209	5	0.738	1.355	206.213	1.022	5.69	0.052	19.368	364.626	1.591	158.413
3.805	10	0.748	1.337	212.495	1.045	10.69	0.044	22.870	367.602	1.592	155.107
4.482	15	0.759	1.318	218.852	1.067	15.69	0.037	26.867	370.526	1.592	151.674
5.246	20	0.770	1.299	225.287	1.089	20.69	0.032	31.419	373.388	1.593	148.102
6.104	25	0.782	1.279	231.806	1.110	25.69	0.027	36.593	376.182	1.594	144.375
7.065	30	0.795	1.258	238.418	1.132	30.69	0.024	42.467	378.895	1.595	140.477
8.135	35	0.809	1.237	245.128	1.154	35.68	0.020	49.132	381.516	1.596	136.388
9.321	40	0.824	1.214	251.947	1.176	40.68	0.018	56.698	384.030	1.597	132.083
10.633	45	0.840	1.191	258.886	1.197	45.67	0.015	65.297	386.420	1.598	127.533
12.078	50	0.857	1.166	265.959	1.219	50.65	0.013	75.094	388.663	1.598	122.705
13.666	55	0.877	1.140	273.182	1.241	55.64	0.012	86.297	390.734	1.598	117.552
15.405	60	0.899	1.113	280.576	1.262	60.62	0.010	99.177	392.596	1.598	112.020
17.306	65	0.923	1.083	288.172	1.285	65.59	0.009	114.098	394.204	1.598	106.032
19.380	70	0.952	1.051	296.009	1.307	70.57	0.008	131.568	395.493	1.597	99.485
21.637	75	0.985	1.015	304.144	1.330	75.53	0.007	152.335	396.372	1.595	92.228
24.093	80	1.026	0.975	312.671	1.354	80.49	0.006	177.577	396.698	1.591	84.026
26.762	85	1.077	0.928	321.752	1.378	85.43	0.005	209.347	396.227	1.586	74.475
29.664	90	1.149	0.871	331.727	1.405	90.36	0.004	251.894	394.464	1.578	62.737
32.824	95	1.269	0.788	343.625	1.437	95.26	0.003	317.938	389.941	1.562	46.316

Thermodynamic properties of R-423A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.005	24072.955	24771.663	25469.827	26167.584	26865.032	27562.240	28259.258	28956.124	29652.866	30349.506	31046.060	31742.541	32438.959	33135.324	33831.642	34527.920	35224.161	35920.370	36616.550	37312.705	38008.838
-95	0.008	14656.924	15071.212	15485.091	15898.659	16311.986	16725.124	17138.109	17550.970	17963.728	18376.400	18788.999	19201.536	19614.019	20026.455	20438.850	20851.209	21263.536	21675.835	22088.108	22500.359	22912.588
-90	0.013	9226.351	9480.673	9734.682	9988.448	10242.023	10495.445	10748.743	11001.938	11255.047	11508.082	11761.055	12013.975	12266.847	12519.678	12772.473	13025.236	13277.971	13530.680	13783.366	14036.032	14288.679
-85	0.021	5986.595	6147.759	6308.678	6469.404	6629.976	6790.423	6950.766	7111.023	7271.207	7431.328	7591.395	7751.415	7911.394	8071.337	8231.247	8391.129	8550.986	8710.819	8870.633	9030.427	9190.205
-80	0.032	3993.163	4098.317	4203.276	4308.078	4412.753	4517.325	4621.809	4726.220	4830.568	4934.861	5039.108	5143.313	5247.482	5351.618	5455.726	5559.809	5663.869	5767.908	5871.928	5975.932	6079.921
-75	0.048	2731.442	2801.922	2872.242	2942.432	3012.517	3082.514	3152.437	3222.297	3292.102	3361.859	3431.575	3501.255	3570.902	3640.521	3710.114	3779.684	3849.234	3918.765	3988.279	4057.778	4127.263
-70	0.070	1911.864	1960.290	2008.584	2056.769	2104.865	2152.886	2200.842	2248.744	2296.598	2344.410	2392.185	2439.928	2487.642	2535.330	2582.996	2630.640	2678.266	2725.875	2773.469	2821.049	2868.617
-65	0.100	1366.648	1400.697	1434.632	1468.476	1502.242	1535.944	1569.589	1603.186	1636.741	1670.259	1703.744	1737.201	1770.631	1804.038	1837.425	1870.793	1904.144	1937.479	1970.801	2004.110	2037.407
-60	0.140	995.905	1020.361	1044.720	1068.999	1093.211	1117.367	1141.472	1165.536	1189.561	1213.554	1237.518	1261.455	1285.369	1309.263	1333.137	1356.994	1380.836	1404.664	1428.479	1452.283	1476.076
-55	0.192	738.649	756.569	774.403	792.167	809.872	827.527	845.138	862.711	880.251	897.761	915.244	932.704	950.143	967.563	984.966	1002.353	1019.726	1037.087	1054.435	1071.773	1089.101
-50	0.260	556.776	570.152	583.452	596.690	609.876	623.016	636.118	649.185	662.222	675.233	688.219	701.184	714.130	727.059	739.972	752.871	765.756	778.631	791.494	804.348	817.192
-45	0.346	425.955	436.114	446.205	456.241	466.229	476.177	486.090	495.971	505.826	515.656	525.464	535.253	545.025	554.780	564.522	574.250	583.966	593.672	603.367	613.054	622.732
-40	0.454	330.338	338.180	345.961	353.691	361.379	369.030	376.650	384.241	391.807	399.351	406.875	414.382	421.872	429.348	436.810	444.261	451.700	459.130	466.550	473.962	481.366
-35	0.587	259.406	265.553	271.644	277.689	283.695	289.667	295.611	301.528	307.423	313.298	319.154	324.994	330.819	336.631	342.431	348.219	353.997	359.766	365.527	371.280	377.025
-30	0.750	206.056	210.943	215.780	220.574	225.332	230.060	234.760	239.438	244.094	248.731	253.352	257.957	262.549	267.128	271.696	276.254	280.802	285.342	289.874	294.398	298.916
-25	0.947	165.412	169.351	173.243	177.096	180.915	184.707	188.473	192.218	195.943	199.651	203.343	207.021	210.687	214.341	217.984	221.618	225.243	228.861	232.470	236.073	239.670
-23.52	1.013	155.284	158.988	162.647	166.267	169.855	173.414	176.950	180.464	183.960	187.438	190.901	194.350	197.787	201.212	204.628	208.034	211.431	214.820	218.202	221.578	224.947
-20	1.183	134.076	137.291	140.463	143.598	146.703	149.781	152.836	155.871	158.887	161.888	164.874	167.847	170.808	173.758	176.698	179.630	182.553	185.469	188.378	191.280	194.177
-15	1.463	109.645	112.302	114.918	117.500	120.053	122.581	125.088	127.575	130.046	132.502	134.944	137.373	139.792	142.201	144.600	146.992	149.375	151.751	154.121	156.485	158.843
-10	1.793	90.400	92.621	94.803	96.952	99.075	101.174	103.254	105.315	107.360	109.391	111.410	113.417	115.414	117.401	119.379	121.350	123.313	125.270	127.221	129.166	131.105
-5	2.177	75.091	76.967	78.807	80.616	82.400	84.161	85.904	87.629	89.340	91.037	92.722	94.396	96.061	97.716	99.364	101.004	102.637	104.264	105.885	107.501	109.112
0	2.621	62.801	64.403	65.971	67.509	69.022	70.515	71.989	73.448	74.892	76.324	77.744	79.154	80.555	81.947	83.331	84.709	86.080	87.445	88.804	90.159	91.509
5	3.133	52.851	54.233	55.581	56.901	58.198	59.475	60.734	61.978	63.209	64.427	65.635	66.833	68.022	69.203	70.377	71.544	72.705	73.860	75.010	76.155	77.296
10	3.718	44.729	45.933	47.104	48.248	49.369	50.471	51.556	52.626	53.684	54.730	55.766	56.792	57.810	58.820	59.824	60.820	61.811	62.797	63.778	64.754	65.726
15	4.383	38.051	39.109	40.135	41.135	42.112	43.071	44.014	44.943	45.859	46.765	47.660	48.547	49.425	50.296	51.160	52.018	52.871	53.718	54.561	55.399	56.233
20	5.134	32.518	33.457	34.364	35.246	36.106	36.947	37.773	38.586	39.386	40.175	40.955	41.727	42.490	43.247	43.997	44.741	45.480	46.214	46.943	47.668	48.390
25	5.980	27.904	28.745	29.554	30.338	31.100	31.844	32.574	33.289	33.993	34.687	35.372	36.048	36.716	37.378	38.034	38.684	39.328	39.968	40.604	41.235	41.863
30	6.926	24.032	24.791	25.519	26.221	26.902	27.566	28.214	28.849	29.473	30.087	30.692	31.289	31.878	32.461	33.038	33.609	34.175	34.737	35.295	35.848	36.398
35	7.981	20.760	21.453	22.113	22.747	23.361	23.956	24.537	25.105	25.662	26.209	26.746	27.277	27.800	28.316	28.827	29.332	29.833	30.329	30.821	31.309	31.794
40	9.153	17.981	18.618	19.222	19.799	20.356	20.895	21.418	21.929	22.429	22.920	23.401	23.875	24.342	24.802	25.257	25.707	26.152	26.593	27.029	27.462	27.892
45	10.450	15.605	16.197	16.754	17.284	17.793	18.283	18.759	19.222	19.674	20.116	20.549	20.976	21.395	21.808	22.215	22.618	23.016	23.409	23.799	24.185	24.568
50	11.881	13.562	14.118	14.636	15.127	15.595	16.045	16.480	16.901	17.312	17.714	18.106	18.492	18.870	19.243	19.610	19.972	20.329	20.683	21.033	21.379	21.722
55	13.454	11.796	12.323	12.810	13.267	13.701	14.117	14.517	14.904	15.279	15.645	16.003	16.353	16.697	17.035	17.367	17.694	18.017	18.336	18.652	18.963	19.272
60	15.181	10.259	10.766	11.227	11.657	12.063	12.448	12.819	13.175	13.521	13.857	14.184	14.504	14.818	15.125	15.428	15.725	16.018	16.307	16.593	16.875	17.154
65	17.070	8.913	9.406	9.849	10.256	10.638	10.999	11.343	11.674	11.994	12.303	12.605	12.898	13.186	13.467	13.743	14.015	14.282	14.545	14.805	15.062	15.315
70	19.135	7.726	8.214	8.643	9.032	9.394	9.733	10.056	10.364	10.661	10.948	11.227	11.498	11.762	12.021	12.274	12.523	12.768	13.009	13.246	13.480	13.711
75	21.387	6.670	7.162	7.583	7.958	8.303	8.625	8.928	9.218	9.495	9.762	10.020	10.271	10.516	10.754	10.988	11.217	11.441	11.662	11.880	12.094	12.306
80	23.843	5.719	6.229	6.646	7.012	7.343	7.650	7.937	8.209	8.469	8.719	8.959	9.193	9.420	9.641	9.856	10.068	10.275	10.478	10.678	10.875	11.069
85	26.520	4.849	5.395	5.816	6.175	6.495	6.788	7.061	7.319	7.563	7.798	8.023	8.240	8.451	8.657	8.857	9.053	9.244	9.432	9.617	9.798	9.977
90	29.442	4.029	4.645	5.076	5.431	5.743	6.025	6.285	6.529	6.760	6.980	7.192	7.395	7.592	7.783	7.969	8.151	8.329	8.503	8.673	8.841	9.006
95	32.646	3.193	3.964	4.412	4.766	5.071	5.343	5.592	5.824	6.042	6.250	6.449	6.639	6.824	7.002	7.175	7.344	7.509	7.671	7.829	7.984	8.137

Thermodynamic properties of R-423A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.005	299.126	302.061	305.047	308.083	311.170	314.306	317.492	320.728	324.012	327.345	330.726	334.155	337.631	341.154	344.723	348.340	352.002	355.710	359.463	363.261	367.105
-95	0.008	302.024	305.015	308.056	311.146	314.285	317.474	320.711	323.997	327.331	330.713	334.143	337.620	341.143	344.714	348.331	351.993	355.702	359.456	363.254	367.098	370.986
-90	0.013	304.967	308.014	311.109	314.253	317.445	320.685	323.973	327.309	330.693	334.124	337.603	341.128	344.699	348.317	351.980	355.689	359.444	363.244	367.088	370.977	374.909
-85	0.021	307.951	311.054	314.204	317.401	320.645	323.937	327.277	330.663	334.097	337.577	341.104	344.677	348.296	351.961	355.671	359.427	363.227	367.072	370.962	374.896	378.873
-80	0.032	310.973	314.132	317.337	320.588	323.885	327.229	330.619	334.056	337.539	341.069	344.644	348.265	351.932	355.644	359.401	363.203	367.050	370.941	374.875	378.854	382.875
-75	0.048	314.029	317.245	320.505	323.810	327.160	330.556	333.998	337.486	341.019	344.598	348.222	351.891	355.606	359.365	363.169	367.018	370.910	374.846	378.826	382.849	386.915
-70	0.070	317.116	320.389	323.705	327.065	330.469	333.917	337.411	340.949	344.533	348.161	351.835	355.553	359.315	363.122	366.973	370.868	374.806	378.788	382.813	386.880	390.991
-65	0.100	320.230	323.562	326.934	330.349	333.807	337.308	340.854	344.444	348.078	351.757	355.480	359.246	363.057	366.912	370.810	374.751	378.736	382.763	386.833	390.946	395.100
-60	0.140	323.367	326.757	330.187	333.658	337.171	340.727	344.326	347.968	351.653	355.382	359.155	362.971	366.830	370.732	374.678	378.666	382.697	386.770	390.885	395.043	399.242
-55	0.192	326.522	329.973	333.462	336.990	340.559	344.169	347.821	351.516	355.254	359.034	362.857	366.722	370.630	374.581	378.574	382.609	386.687	390.806	394.967	399.169	403.413
-50	0.260	329.691	333.204	336.753	340.340	343.966	347.632	351.339	355.087	358.877	362.709	366.583	370.498	374.456	378.455	382.497	386.579	390.704	394.869	399.076	403.323	407.611
-45	0.346	332.870	336.447	340.058	343.704	347.388	351.111	354.874	358.677	362.520	366.405	370.330	374.296	378.304	382.353	386.442	390.573	394.745	398.957	403.209	407.502	411.835
-40	0.454	336.054	339.697	343.371	347.079	350.823	354.604	358.424	362.282	366.180	370.118	374.096	378.113	382.172	386.270	390.409	394.588	398.807	403.066	407.365	411.703	416.081
-35	0.587	339.240	342.951	346.691	350.462	354.267	358.107	361.985	365.900	369.853	373.845	377.876	381.946	386.056	390.205	394.393	398.621	402.888	407.194	411.540	415.924	420.347
-30	0.750	342.422	346.204	350.011	353.847	357.715	361.617	365.554	369.527	373.536	377.584	381.669	385.792	389.953	394.153	398.392	402.669	406.985	411.339	415.732	420.163	424.632
-25	0.947	345.596	349.452	353.329	357.232	361.165	365.129	369.127	373.159	377.226	381.330	385.470	389.647	393.862	398.114	402.403	406.730	411.095	415.498	419.938	424.416	428.931
-23.52	1.013	346.534	350.412	354.310	358.234	362.186	366.169	370.185	374.235	378.320	382.441	386.597	390.791	395.021	399.289	403.593	407.935	412.315	416.732	421.186	425.678	430.207
-20	1.183	348.758	352.690	356.640	360.612	364.612	368.640	372.701	376.793	380.920	385.081	389.277	393.510	397.778	402.082	406.424	410.802	415.216	419.668	424.156	428.681	433.243
-15	1.463	351.903	355.915	359.940	363.984	368.052	372.147	376.272	380.427	384.614	388.834	393.087	397.375	401.698	406.057	410.450	414.880	419.345	423.846	428.383	432.956	437.565
-10	1.793	355.026	359.121	363.224	367.343	371.483	375.646	379.836	384.055	388.304	392.584	396.897	401.242	405.621	410.034	414.481	418.962	423.479	428.030	432.617	437.238	441.895
-5	2.177	358.122	362.304	366.489	370.685	374.899	379.133	383.391	387.676	391.988	396.330	400.703	405.106	409.542	414.010	418.512	423.047	427.615	432.218	436.854	441.525	446.229
0	2.621	361.186	365.459	369.730	374.007	378.297	382.604	386.933	391.285	395.663	400.068	404.501	408.965	413.459	417.984	422.541	427.130	431.751	436.405	441.093	445.813	450.567
5	3.133	364.211	368.582	372.942	377.303	381.672	386.056	390.457	394.879	399.324	403.794	408.290	412.815	417.368	421.951	426.565	431.209	435.884	440.591	445.330	450.101	454.904
10	3.718	367.193	371.665	376.120	380.569	385.021	389.484	393.960	398.454	402.968	407.505	412.066	416.654	421.268	425.910	430.581	435.281	440.012	444.772	449.564	454.386	459.240
15	4.383	370.123	374.704	379.258	383.800	388.339	392.883	397.438	402.006	406.592	411.198	415.826	420.477	425.154	429.857	434.587	439.345	444.131	448.947	453.791	458.666	463.571
20	5.134	372.995	377.692	382.351	386.991	391.621	396.251	400.886	405.532	410.192	414.869	419.566	424.283	429.024	433.789	438.579	443.396	448.240	453.111	458.010	462.938	467.895
25	5.980	375.799	380.621	385.393	390.135	394.861	399.581	404.301	409.027	413.764	418.515	423.282	428.068	432.875	437.704	442.556	447.433	452.335	457.263	462.218	467.200	472.210
30	6.926	378.526	383.482	388.375	393.227	398.054	402.868	407.678	412.488	417.305	422.132	426.973	431.829	436.704	441.598	446.514	451.452	456.414	461.401	466.413	471.450	476.514
35	7.981	381.163	386.267	391.290	396.259	401.195	406.109	411.011	415.910	420.810	425.716	430.633	435.562	440.507	445.469	450.450	455.452	460.475	465.521	470.591	475.685	480.805
40	9.153	383.696	388.963	394.128	399.225	404.275	409.295	414.296	419.287	424.275	429.264	434.259	439.264	444.281	449.313	454.362	459.428	464.515	469.622	474.752	479.904	485.079
45	10.450	386.108	391.558	396.880	402.114	407.289	412.422	417.528	422.616	427.695	432.771	437.849	442.932	448.024	453.128	458.246	463.380	468.531	473.701	478.891	484.103	489.336
50	11.881	388.378	394.037	399.533	404.918	410.227	415.482	420.699	425.891	431.066	436.233	441.397	446.562	451.732	456.910	462.100	467.303	472.521	477.756	483.008	488.280	493.573
55	13.454	390.479	396.379	402.072	407.626	413.081	418.467	423.804	429.106	434.383	439.646	444.899	450.149	455.401	460.657	465.921	471.195	476.482	481.783	487.100	492.434	497.787
60	15.181	392.377	398.564	404.483	410.224	415.841	421.370	426.835	432.254	437.640	443.003	448.352	453.691	459.027	464.364	469.705	475.053	480.411	485.780	491.163	496.562	501.976
65	17.070	394.027	400.562	406.744	412.698	418.495	424.181	429.785	435.330	440.832	446.302	451.750	457.183	462.607	468.028	473.449	478.874	484.305	489.745	495.196	500.660	506.139
70	19.135	395.365	402.338	408.833	415.032	421.031	426.889	432.645	438.326	443.951	449.535	455.088	460.620	466.137	471.645	477.149	482.654	488.161	493.674	499.196	504.728	510.272
75	21.387	396.301	403.847	410.722	417.206	423.433	429.484	435.406	441.234	446.992	452.696	458.361	463.997	469.611	475.211	480.802	486.389	491.975	497.564	503.159	508.760	514.372
80	23.843	396.696	405.030	412.378	419.197	425.686	431.951	438.057	444.045	449.945	455.779	461.563	467.308	473.025	478.721	484.403	490.076	495.744	501.411	507.081	512.755	518.436
85	26.520	396.309	405.808	413.758	420.979	427.770	434.276	440.584	446.747	452.802	458.775	464.684	470.546	476.371	482.168	487.945	493.708	499.461	505.210	510.957	516.706	522.459
90	29.442	394.658	406.074	414.814	422.521	429.660	436.439	442.972	449.326	455.548	461.670	467.715	473.700	479.639	485.542	491.419	497.276	503.119	508.952	514.780	520.607	526.434
95	32.646	390.323	405.667	415.469	423.769	431.317	438.406	445.189	451.755	458.159	464.443	470.632	476.750	482.810	488.826	494.808	500.764	506.701	512.623	518.536	524.443	530.348

Thermodynamic properties of R-423A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.005	1.717	1.734	1.751	1.767	1.783	1.799	1.815	1.831	1.846	1.862	1.877	1.892	1.907	1.922	1.937	1.952	1.967	1.981	1.995	2.010	2.024
-95	0.008	1.699	1.716	1.732	1.748	1.765	1.780	1.796	1.812	1.827	1.843	1.858	1.873	1.888	1.903	1.917	1.932	1.946	1.961	1.975	1.989	2.003
-90	0.013	1.683	1.700	1.716	1.732	1.748	1.764	1.779	1.795	1.810	1.825	1.840	1.855	1.870	1.885	1.900	1.914	1.928	1.943	1.957	1.971	1.985
-85	0.021	1.669	1.685	1.702	1.718	1.733	1.749	1.764	1.780	1.795	1.810	1.825	1.840	1.855	1.869	1.884	1.898	1.912	1.927	1.941	1.955	1.969
-80	0.032	1.657	1.673	1.689	1.705	1.720	1.736	1.751	1.766	1.782	1.797	1.811	1.826	1.841	1.855	1.870	1.884	1.898	1.912	1.926	1.940	1.954
-75	0.048	1.646	1.662	1.678	1.693	1.709	1.724	1.740	1.755	1.770	1.785	1.799	1.814	1.828	1.843	1.857	1.871	1.886	1.900	1.914	1.927	1.941
-70	0.070	1.636	1.652	1.668	1.684	1.699	1.714	1.729	1.744	1.759	1.774	1.789	1.803	1.818	1.832	1.846	1.860	1.874	1.888	1.902	1.916	1.930
-65	0.100	1.628	1.644	1.659	1.675	1.690	1.705	1.720	1.735	1.750	1.765	1.779	1.794	1.808	1.822	1.837	1.851	1.865	1.878	1.892	1.906	1.919
-60	0.140	1.621	1.637	1.652	1.667	1.683	1.698	1.713	1.728	1.742	1.757	1.771	1.786	1.800	1.814	1.828	1.842	1.856	1.870	1.883	1.897	1.911
-55	0.192	1.615	1.630	1.646	1.661	1.676	1.691	1.706	1.721	1.735	1.750	1.764	1.779	1.793	1.807	1.821	1.835	1.848	1.862	1.876	1.889	1.903
-50	0.260	1.609	1.625	1.640	1.656	1.671	1.686	1.700	1.715	1.730	1.744	1.758	1.772	1.787	1.801	1.814	1.828	1.842	1.856	1.869	1.883	1.896
-45	0.346	1.605	1.620	1.636	1.651	1.666	1.681	1.696	1.710	1.725	1.739	1.753	1.767	1.781	1.795	1.809	1.823	1.836	1.850	1.864	1.877	1.890
-40	0.454	1.601	1.617	1.632	1.647	1.662	1.677	1.691	1.706	1.720	1.735	1.749	1.763	1.777	1.791	1.805	1.818	1.832	1.845	1.859	1.872	1.885
-35	0.587	1.598	1.614	1.629	1.644	1.659	1.674	1.688	1.703	1.717	1.731	1.745	1.759	1.773	1.787	1.801	1.814	1.828	1.841	1.855	1.868	1.881
-30	0.750	1.596	1.611	1.626	1.641	1.656	1.671	1.686	1.700	1.714	1.728	1.742	1.756	1.770	1.784	1.798	1.811	1.825	1.838	1.851	1.865	1.878
-25	0.947	1.594	1.609	1.625	1.640	1.654	1.669	1.683	1.698	1.712	1.726	1.740	1.754	1.768	1.782	1.795	1.809	1.822	1.835	1.849	1.862	1.875
-23.52	1.013	1.594	1.609	1.624	1.639	1.654	1.669	1.683	1.697	1.712	1.726	1.740	1.754	1.767	1.781	1.795	1.808	1.821	1.835	1.848	1.861	1.874
-20	1.183	1.593	1.608	1.623	1.638	1.653	1.668	1.682	1.696	1.711	1.725	1.739	1.752	1.766	1.780	1.793	1.807	1.820	1.833	1.847	1.860	1.873
-15	1.463	1.592	1.607	1.622	1.637	1.652	1.667	1.681	1.695	1.709	1.723	1.737	1.751	1.765	1.778	1.792	1.805	1.819	1.832	1.845	1.858	1.871
-10	1.793	1.591	1.607	1.622	1.637	1.651	1.666	1.680	1.695	1.709	1.723	1.737	1.750	1.764	1.778	1.791	1.804	1.818	1.831	1.844	1.857	1.870
-5	2.177	1.591	1.606	1.622	1.636	1.651	1.666	1.680	1.694	1.709	1.723	1.736	1.750	1.764	1.777	1.791	1.804	1.817	1.830	1.843	1.856	1.869
0	2.621	1.591	1.606	1.622	1.637	1.651	1.666	1.680	1.695	1.709	1.723	1.736	1.750	1.764	1.777	1.791	1.804	1.817	1.830	1.843	1.856	1.869
5	3.133	1.591	1.607	1.622	1.637	1.652	1.666	1.681	1.695	1.709	1.723	1.737	1.751	1.764	1.778	1.791	1.804	1.817	1.830	1.843	1.856	1.869
10	3.718	1.592	1.607	1.623	1.638	1.653	1.667	1.682	1.696	1.710	1.724	1.738	1.751	1.765	1.778	1.792	1.805	1.818	1.831	1.844	1.857	1.869
15	4.383	1.592	1.608	1.624	1.639	1.654	1.668	1.683	1.697	1.711	1.725	1.739	1.752	1.766	1.779	1.793	1.806	1.819	1.832	1.845	1.857	1.870
20	5.134	1.593	1.609	1.625	1.640	1.655	1.669	1.684	1.698	1.712	1.726	1.740	1.753	1.767	1.780	1.794	1.807	1.820	1.833	1.846	1.859	1.871
25	5.980	1.594	1.610	1.626	1.641	1.656	1.671	1.685	1.699	1.714	1.728	1.741	1.755	1.768	1.782	1.795	1.808	1.821	1.834	1.847	1.860	1.873
30	6.926	1.595	1.611	1.627	1.642	1.657	1.672	1.687	1.701	1.715	1.729	1.743	1.757	1.770	1.783	1.797	1.810	1.823	1.836	1.849	1.861	1.874
35	7.981	1.596	1.612	1.628	1.644	1.659	1.674	1.688	1.703	1.717	1.731	1.745	1.758	1.772	1.785	1.799	1.812	1.825	1.838	1.850	1.863	1.876
40	9.153	1.597	1.613	1.630	1.645	1.660	1.675	1.690	1.705	1.719	1.733	1.747	1.760	1.774	1.787	1.801	1.814	1.827	1.840	1.852	1.865	1.878
45	10.450	1.598	1.615	1.631	1.647	1.662	1.677	1.692	1.706	1.721	1.735	1.749	1.762	1.776	1.789	1.803	1.816	1.829	1.842	1.855	1.867	1.880
50	11.881	1.598	1.615	1.632	1.648	1.664	1.679	1.694	1.708	1.723	1.737	1.751	1.765	1.778	1.792	1.805	1.818	1.831	1.844	1.857	1.869	1.882
55	13.454	1.598	1.616	1.633	1.650	1.665	1.681	1.696	1.710	1.725	1.739	1.753	1.767	1.780	1.794	1.807	1.820	1.833	1.846	1.859	1.872	1.884
60	15.181	1.598	1.617	1.634	1.651	1.667	1.682	1.698	1.712	1.727	1.741	1.755	1.769	1.783	1.796	1.810	1.823	1.836	1.849	1.862	1.874	1.887
65	17.070	1.598	1.617	1.635	1.652	1.668	1.684	1.699	1.714	1.729	1.743	1.758	1.771	1.785	1.799	1.812	1.825	1.838	1.851	1.864	1.877	1.889
70	19.135	1.597	1.617	1.636	1.653	1.670	1.686	1.701	1.716	1.731	1.746	1.760	1.774	1.788	1.801	1.815	1.828	1.841	1.854	1.867	1.879	1.892
75	21.387	1.595	1.616	1.636	1.654	1.671	1.687	1.703	1.718	1.733	1.748	1.762	1.776	1.790	1.804	1.817	1.830	1.843	1.856	1.869	1.882	1.895
80	23.843	1.592	1.615	1.636	1.654	1.672	1.688	1.704	1.720	1.735	1.750	1.764	1.778	1.792	1.806	1.820	1.833	1.846	1.859	1.872	1.885	1.897
85	26.520	1.587	1.613	1.635	1.654	1.672	1.689	1.706	1.722	1.737	1.752	1.766	1.781	1.795	1.808	1.822	1.835	1.849	1.862	1.875	1.887	1.900
90	29.442	1.579	1.610	1.633	1.654	1.673	1.690	1.707	1.723	1.738	1.754	1.768	1.783	1.797	1.811	1.824	1.838	1.851	1.864	1.877	1.890	1.903
95	32.646	1.563	1.605	1.631	1.653	1.672	1.691	1.708	1.724	1.740	1.755	1.770	1.785	1.799	1.813	1.827	1.840	1.853	1.867	1.880	1.892	1.905

R-427A (Forane® FX100)

Zeotropic blend (15 % R-32 - 25 % R-125 - 10 % R-143a - 50 % R-134a)

Molecular weight (g/mol)	90.44
Melting point (°C)	N/A
Boiling point (at 1,013 bar)	-42.97
Temperature glide at 1,013 bar (K)	6.76
Critical temperature (°C)	85.3
Critical pressure (bar absolute)	43.92
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.517
Specific heat (vapour) at 1,013 bar and + 25°C (kJ/kg.K)	0.847
Thermal capacity ratio (Cp/Cv) at + 25°C and 1,013 bar	1.135
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.154
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.61
Classification NF-EN 378	A1
GWP (IPCC 4)	2138

Main applications

R-427A (Forane® FX100) is a "non azeotropic" HFC blend designed to replace R-22 (HCFC) as a conversion fluid. It can be used in direct expansion refrigeration and air conditioning systems.

Commercial specifications

Composition: (50 % R-134a – 25 % R-125 – 15 % R-32 – 10 % R-143a) (±2 % / ± 2% / ±2 % / ±2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.

Oils

Use a polyol ester oil (POE).
A residual amount of the original mineral oil (MO) or alkyl benzene (AB) is acceptable following the conversion procedure.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-427A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.023	-100	0.651	1.537	69.555	0.409	-92.07	7.199	0.139	344.770	1.963	275.215
0.036	-95	0.657	1.522	75.963	0.446	-87.17	4.729	0.211	347.733	1.938	271.770
0.055	-90	0.663	1.507	82.332	0.481	-82.27	3.192	0.313	350.715	1.916	268.382
0.081	-85	0.670	1.493	88.678	0.515	-77.37	2.209	0.453	353.712	1.896	265.034
0.117	-80	0.676	1.478	95.012	0.548	-72.47	1.563	0.640	356.719	1.877	261.707
0.165	-75	0.683	1.464	101.342	0.581	-67.57	1.129	0.885	359.732	1.861	258.390
0.229	-70	0.690	1.449	107.678	0.612	-62.67	0.831	1.203	362.745	1.846	255.067
0.312	-65	0.697	1.435	114.026	0.643	-57.77	0.623	1.606	365.753	1.832	251.726
0.418	-60	0.704	1.420	120.393	0.673	-52.88	0.473	2.112	368.750	1.819	248.357
0.551	-55	0.712	1.405	126.783	0.703	-47.98	0.365	2.737	371.732	1.808	244.948
0.716	-50	0.719	1.390	133.203	0.732	-43.09	0.286	3.502	374.692	1.798	241.489
0.919	-45	0.727	1.375	139.655	0.760	-38.2	0.226	4.426	377.625	1.788	237.970
1.013	-42.97	0.730	1.369	142.292	0.772	-36.21	0.206	4.853	378.810	1.784	236.517
1.164	-40	0.735	1.360	146.146	0.788	-33.31	0.181	5.533	380.525	1.779	234.379
1.458	-35	0.744	1.344	152.680	0.816	-28.42	0.146	6.847	383.387	1.772	230.707
1.808	-30	0.753	1.329	159.260	0.843	-23.53	0.119	8.396	386.204	1.764	226.944
2.220	-25	0.762	1.313	165.892	0.870	-18.64	0.098	10.208	388.970	1.758	223.078
2.700	-20	0.771	1.296	172.580	0.897	-13.76	0.081	12.315	391.678	1.752	219.099
3.258	-15	0.782	1.280	179.329	0.923	-8.88	0.068	14.753	394.322	1.746	214.994
3.899	-10	0.792	1.263	186.145	0.949	-4.0	0.057	17.560	396.895	1.741	210.750
4.632	-5	0.803	1.245	193.033	0.975	0.88	0.048	20.778	399.387	1.736	206.354
5.464	0	0.815	1.227	200.000	1.000	5.75	0.041	24.457	401.789	1.731	201.789
6.406	5	0.827	1.209	207.053	1.025	10.61	0.035	28.651	404.091	1.727	197.038
7.464	10	0.840	1.190	214.200	1.050	15.48	0.030	33.421	406.281	1.722	192.081
8.648	15	0.854	1.170	221.451	1.075	20.33	0.026	38.841	408.344	1.718	186.893
9.967	20	0.870	1.150	228.815	1.100	25.18	0.022	44.995	410.263	1.714	181.448
11.429	25	0.886	1.129	236.305	1.125	30.02	0.019	51.984	412.018	1.710	175.714
13.046	30	0.904	1.107	243.935	1.150	34.85	0.017	59.930	413.587	1.705	169.652
14.826	35	0.923	1.084	251.723	1.175	39.67	0.014	68.983	414.942	1.701	163.218
16.781	40	0.944	1.059	259.691	1.200	44.48	0.013	79.333	416.046	1.696	156.355
18.919	45	0.968	1.033	267.866	1.225	49.27	0.011	91.223	416.857	1.691	148.991
21.253	50	0.995	1.005	276.283	1.251	54.04	0.010	104.982	417.316	1.685	141.032
23.794	55	1.026	0.975	284.993	1.277	58.8	0.008	121.060	417.341	1.678	132.348
26.555	60	1.062	0.942	294.067	1.304	63.52	0.007	140.119	416.816	1.670	122.749
29.547	65	1.105	0.905	303.617	1.331	68.21	0.006	163.189	415.561	1.661	111.944
32.786	70	1.161	0.862	313.840	1.360	72.85	0.005	192.036	413.271	1.649	99.431
36.282	75	1.236	0.809	325.126	1.391	77.41	0.004	230.188	409.346	1.632	84.220
40.038	80	1.357	0.737	338.525	1.428	81.81	0.003	287.067	402.224	1.608	63.699

Thermodynamic properties of R-427A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.010	15138.421	15579.532	16020.083	16460.199	16899.973	17339.474	17778.755	18217.856	18656.809	19095.639	19534.365	19973.003	20411.567	20850.067	21288.511	21726.907	22165.261	22603.577	23041.862	23480.117	23918.347
-95	0.017	9380.677	9647.253	9913.391	10179.187	10444.711	10710.014	10975.137	11240.112	11504.964	11769.712	12034.372	12298.958	12563.480	12827.946	13092.364	13356.739	13621.078	13885.384	14149.662	14413.914	14678.142
-90	0.028	6006.464	6173.216	6339.622	6505.753	6671.664	6837.396	7002.978	7168.438	7333.793	7499.061	7664.254	7829.383	7994.456	8159.481	8324.464	8489.410	8654.324	8819.208	8984.067	9148.903	9313.718
-85	0.043	3961.857	4069.508	4176.880	4284.029	4390.997	4497.816	4604.511	4711.103	4817.607	4924.035	5030.400	5136.708	5242.969	5349.187	5455.368	5561.517	5667.637	5773.731	5879.802	5985.852	6091.884
-80	0.066	2684.725	2756.263	2827.573	2898.699	2969.674	3040.526	3111.272	3181.931	3252.515	3323.034	3393.497	3463.912	3534.284	3604.620	3674.922	3745.196	3815.444	3885.669	3955.873	4026.059	4096.228
-75	0.097	1864.474	1913.297	1961.930	2010.410	2058.764	2107.012	2155.171	2203.254	2251.273	2299.236	2347.150	2395.022	2442.856	2490.658	2538.430	2586.177	2633.901	2681.604	2729.289	2776.956	2824.609
-70	0.140	1324.078	1358.228	1392.217	1426.077	1459.829	1493.490	1527.076	1560.596	1594.060	1627.475	1660.847	1694.182	1727.484	1760.757	1794.003	1827.227	1860.430	1893.614	1926.782	1959.934	1993.073
-65	0.197	959.644	984.080	1008.379	1032.566	1056.660	1080.677	1104.627	1128.520	1152.365	1176.166	1199.929	1223.659	1247.360	1271.035	1294.687	1318.317	1341.929	1365.525	1389.105	1412.671	1436.225
-60	0.272	708.547	726.405	744.144	761.785	779.346	796.840	814.275	831.660	849.002	866.306	883.576	900.816	918.031	935.222	952.392	969.543	986.677	1003.796	1020.901	1037.994	1055.075
-55	0.369	532.091	545.399	558.603	571.722	584.770	597.759	610.696	623.589	636.444	649.264	662.055	674.819	687.559	700.278	712.979	725.662	738.330	750.984	763.625	776.255	788.875
-50	0.493	405.809	415.910	425.918	435.851	445.721	455.538	465.310	475.042	484.740	494.407	504.047	513.663	523.258	532.834	542.393	551.936	561.465	570.982	580.486	589.980	599.465
-45	0.648	313.905	321.702	329.417	337.065	344.656	352.201	359.704	367.172	374.609	382.019	389.404	396.767	404.111	411.438	418.749	426.045	433.329	440.601	447.863	455.114	462.357
-40	0.839	245.972	252.088	258.130	264.111	270.042	275.930	281.781	287.600	293.391	299.157	304.900	310.625	316.331	322.021	327.697	333.360	339.012	344.652	350.282	355.904	361.517
-36.21	1.013	206.058	211.197	216.266	221.279	226.244	231.171	236.062	240.925	245.761	250.573	255.365	260.139	264.896	269.638	274.366	279.083	283.788	288.483	293.168	297.845	302.515
-35	1.074	195.031	199.901	204.702	209.449	214.150	218.812	223.441	228.040	232.614	237.165	241.696	246.209	250.706	255.188	259.656	264.113	268.559	272.994	277.421	281.839	286.250
-30	1.357	156.319	160.251	164.120	167.939	171.716	175.458	179.170	182.854	186.515	190.155	193.777	197.382	200.972	204.548	208.113	211.666	215.209	218.742	222.267	225.785	229.295
-25	1.697	126.533	129.750	132.909	136.022	139.096	142.138	145.151	148.140	151.107	154.055	156.986	159.901	162.803	165.692	168.569	171.437	174.294	177.144	179.985	182.819	185.646
-20	2.099	103.351	106.015	108.626	111.194	113.726	116.229	118.705	121.158	123.591	126.006	128.406	130.791	133.163	135.523	137.873	140.213	142.545	144.868	147.184	149.493	151.796
-15	2.571	85.112	87.345	89.529	91.672	93.781	95.863	97.920	99.956	101.974	103.974	105.960	107.933	109.893	111.842	113.782	115.712	117.635	119.549	121.457	123.358	125.254
-10	3.122	70.620	72.512	74.358	76.166	77.942	79.693	81.420	83.128	84.818	86.492	88.152	89.800	91.437	93.063	94.680	96.289	97.889	99.483	101.070	102.651	104.226
-5	3.760	58.994	60.615	62.192	63.733	65.245	66.731	68.196	69.643	71.072	72.487	73.889	75.279	76.659	78.028	79.389	80.742	82.087	83.426	84.759	86.085	87.407
0	4.492	49.587	50.990	52.351	53.677	54.976	56.250	57.505	58.741	59.962	61.169	62.363	63.546	64.719	65.883	67.039	68.187	69.328	70.462	71.591	72.714	73.832
5	5.330	41.912	43.138	44.323	45.476	46.602	47.705	48.788	49.855	50.906	51.945	52.971	53.987	54.993	55.990	56.980	57.962	58.937	59.907	60.871	61.829	62.783
10	6.280	35.600	36.682	37.724	38.735	39.720	40.683	41.627	42.555	43.468	44.369	45.258	46.137	47.007	47.868	48.722	49.569	50.410	51.245	52.074	52.899	53.719
15	7.355	30.371	31.335	32.260	33.154	34.023	34.871	35.700	36.514	37.313	38.101	38.877	39.644	40.401	41.151	41.894	42.629	43.359	44.083	44.803	45.517	46.227
20	8.563	26.009	26.876	27.704	28.502	29.275	30.027	30.761	31.480	32.186	32.879	33.562	34.235	34.900	35.557	36.207	36.851	37.489	38.122	38.749	39.373	39.992
25	9.915	22.345	23.132	23.881	24.599	25.292	25.964	26.619	27.259	27.886	28.501	29.106	29.701	30.289	30.868	31.442	32.009	32.570	33.126	33.677	34.225	34.768
30	11.423	19.248	19.970	20.652	21.303	21.930	22.536	23.124	23.698	24.258	24.808	25.347	25.877	26.399	26.914	27.422	27.925	28.422	28.914	29.401	29.884	30.364
35	13.099	16.613	17.282	17.909	18.505	19.076	19.625	20.158	20.675	21.180	21.674	22.157	22.632	23.100	23.560	24.013	24.461	24.904	25.341	25.775	26.204	26.630
40	14.955	14.358	14.984	15.566	16.116	16.639	17.142	17.627	18.097	18.554	19.000	19.437	19.865	20.285	20.698	21.105	21.507	21.903	22.295	22.682	23.066	23.445
45	17.004	12.415	13.008	13.554	14.065	14.548	15.011	15.455	15.885	16.302	16.708	17.104	17.491	17.872	18.245	18.612	18.974	19.331	19.683	20.031	20.375	20.716
50	19.263	10.730	11.299	11.816	12.295	12.745	13.173	13.583	13.978	14.360	14.732	15.093	15.446	15.792	16.131	16.464	16.791	17.114	17.432	17.746	18.057	18.364
55	21.746	9.259	9.813	10.306	10.759	11.182	11.581	11.962	12.327	12.679	13.020	13.352	13.675	13.991	14.300	14.603	14.901	15.194	15.483	15.768	16.049	16.327
60	24.475	7.962	8.511	8.989	9.421	9.820	10.195	10.550	10.890	11.216	11.531	11.837	12.134	12.423	12.707	12.984	13.256	13.524	13.787	14.046	14.302	14.554
65	27.470	6.808	7.364	7.832	8.248	8.628	8.982	9.315	9.633	9.936	10.229	10.511	10.786	11.053	11.313	11.568	11.817	12.062	12.303	12.540	12.773	13.003
70	30.763	5.765	6.344	6.810	7.214	7.579	7.915	8.229	8.527	8.811	9.083	9.346	9.600	9.847	10.087	10.322	10.552	10.777	10.998	11.215	11.428	11.639
75	34.395	4.797	5.429	5.899	6.296	6.648	6.969	7.267	7.548	7.814	8.069	8.313	8.550	8.779	9.001	9.218	9.430	9.637	9.841	10.040	10.236	10.429
80	38.439	3.849	4.591	5.076	5.470	5.812	6.120	6.404	6.669	6.920	7.158	7.387	7.607	7.820	8.027	8.227	8.423	8.615	8.802	8.986	9.166	9.343

Thermodynamic properties of R-427A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.010	340.036	343.101	346.209	349.362	352.559	355.800	359.087	362.420	365.798	369.220	372.689	376.202	379.760	383.363	387.011	390.704	394.441	398.222	402.047	405.917	409.830
-95	0.017	343.014	346.134	349.296	352.501	355.750	359.042	362.379	365.761	369.187	372.658	376.174	379.735	383.340	386.989	390.683	394.422	398.204	402.031	405.901	409.815	413.773
-90	0.028	346.020	349.197	352.414	355.673	358.974	362.318	365.705	369.137	372.612	376.132	379.696	383.304	386.956	390.652	394.392	398.177	402.005	405.877	409.792	413.751	417.754
-85	0.043	349.050	352.285	355.559	358.872	362.226	365.623	369.062	372.544	376.069	379.638	383.250	386.906	390.606	394.350	398.137	401.967	405.841	409.759	413.720	417.724	421.771
-80	0.066	352.099	355.395	358.726	362.095	365.504	368.954	372.446	375.979	379.555	383.174	386.835	390.540	394.288	398.079	401.913	405.791	409.711	413.675	417.681	421.730	425.822
-75	0.097	355.163	358.520	361.911	365.338	368.804	372.308	375.853	379.439	383.066	386.736	390.447	394.202	397.998	401.837	405.719	409.644	413.611	417.621	421.673	425.768	429.906
-70	0.140	358.236	361.657	365.110	368.596	372.119	375.680	379.280	382.919	386.599	390.321	394.083	397.887	401.733	405.622	409.552	413.524	417.539	421.595	425.694	429.835	434.018
-65	0.197	361.312	364.800	368.317	371.865	375.447	379.065	382.721	386.416	390.150	393.924	397.738	401.594	405.490	409.428	413.407	417.428	421.491	425.595	429.741	433.928	438.157
-60	0.272	364.387	367.944	371.527	375.138	378.782	382.460	386.174	389.925	393.714	397.542	401.410	405.317	409.265	413.253	417.283	421.353	425.464	429.616	433.810	438.044	442.320
-55	0.369	367.453	371.084	374.735	378.412	382.119	385.858	389.632	393.441	397.287	401.171	405.093	409.054	413.054	417.094	421.174	425.294	429.455	433.656	437.898	442.180	446.502
-50	0.493	370.506	374.213	377.935	381.681	385.454	389.257	393.092	396.961	400.865	404.806	408.783	412.799	416.853	420.946	425.078	429.249	433.460	437.711	442.001	446.332	450.702
-45	0.648	373.540	377.326	381.123	384.940	388.781	392.649	396.548	400.479	404.443	408.442	412.477	416.549	420.658	424.805	428.990	433.213	437.476	441.777	446.117	450.497	454.916
-40	0.839	376.548	380.417	384.293	388.184	392.095	396.032	399.996	403.991	408.017	412.077	416.171	420.300	424.465	428.667	432.907	437.183	441.498	445.851	450.242	454.672	459.140
-36.21	1.013	378.810	382.744	386.682	390.631	394.598	398.588	402.604	406.648	410.723	414.830	418.969	423.143	427.352	431.597	435.878	440.196	444.552	448.944	453.375	457.843	462.350
-35	1.074	379.525	383.481	387.439	391.407	395.392	399.400	403.432	407.493	411.583	415.705	419.859	424.048	428.271	432.529	436.824	441.155	445.524	449.929	454.372	458.853	463.372
-30	1.357	382.465	386.513	390.556	394.604	398.666	402.747	406.850	410.979	415.135	419.321	423.538	427.788	432.070	436.387	440.739	445.126	449.549	454.008	458.504	463.037	467.606
-25	1.697	385.360	389.505	393.637	397.770	401.912	406.070	410.246	414.445	418.670	422.922	427.204	431.516	435.860	440.236	444.646	449.090	453.569	458.084	462.633	467.219	471.841
-20	2.099	388.206	392.452	396.679	400.900	405.125	409.362	413.615	417.887	422.183	426.504	430.851	435.228	439.635	444.073	448.543	453.046	457.582	462.153	466.758	471.398	476.073
-15	2.571	390.995	395.348	399.674	403.987	408.300	412.619	416.951	421.300	425.669	430.061	434.477	438.920	443.392	447.893	452.425	456.988	461.583	466.211	470.873	475.569	480.298
-10	3.122	393.719	398.186	402.616	407.026	411.430	415.836	420.251	424.679	429.124	433.589	438.076	442.589	447.127	451.693	456.288	460.913	465.569	470.256	474.976	479.728	484.513
-5	3.760	396.372	400.959	405.498	410.011	414.511	419.007	423.508	428.018	432.543	437.084	441.645	446.228	450.836	455.469	460.130	464.818	469.536	474.284	479.063	483.873	488.715
0	4.492	398.944	403.659	408.315	412.935	417.535	422.127	426.718	431.314	435.921	440.541	445.179	449.836	454.515	459.217	463.945	468.699	473.481	478.291	483.131	488.000	492.901
5	5.330	401.426	406.277	411.057	415.791	420.497	425.189	429.874	434.561	439.253	443.956	448.673	453.406	458.159	462.933	467.730	472.552	477.399	482.274	487.176	492.107	497.067
10	6.280	403.806	408.804	413.716	418.571	423.390	428.187	432.972	437.753	442.535	447.324	452.123	456.936	461.765	466.613	471.482	476.373	481.288	486.229	491.195	496.188	501.210
15	7.355	406.072	411.229	416.283	421.268	426.207	431.115	436.005	440.885	445.761	450.640	455.525	460.420	465.329	470.253	475.196	480.159	485.144	490.152	495.185	500.243	505.327
20	8.563	408.207	413.538	418.747	423.871	428.938	433.966	438.966	443.950	448.926	453.898	458.873	463.854	468.845	473.850	478.869	483.907	488.963	494.041	499.142	504.266	509.415
25	9.915	410.194	415.718	421.096	426.372	431.577	436.731	441.850	446.944	452.023	457.094	462.163	467.233	472.311	477.397	482.497	487.611	492.742	497.892	503.063	508.255	513.471
30	11.423	412.011	417.752	423.317	428.758	434.112	439.402	444.647	449.858	455.047	460.222	465.389	470.553	475.720	480.893	486.075	491.269	496.477	501.702	506.944	512.207	517.491
35	13.099	413.633	419.621	425.394	431.018	436.534	441.971	447.350	452.686	457.991	463.275	468.546	473.808	479.068	484.331	489.599	494.875	500.163	505.465	510.783	516.118	521.472
40	14.955	415.026	421.300	427.310	433.137	438.830	444.427	449.950	455.420	460.848	466.248	471.627	476.993	482.351	487.707	493.064	498.427	503.798	509.180	514.575	519.984	525.411
45	17.004	416.150	422.763	429.044	435.097	440.987	446.757	452.437	458.050	463.610	469.132	474.627	480.101	485.562	491.015	496.466	501.919	507.376	512.840	518.315	523.803	529.304
50	19.263	416.952	423.975	430.570	436.880	442.989	448.950	454.800	460.566	466.268	471.921	477.537	483.126	488.695	494.251	499.800	505.346	510.892	516.443	522.001	527.569	533.148
55	21.746	417.359	424.889	431.857	438.463	444.817	450.989	457.025	462.958	468.811	474.604	480.350	486.060	491.743	497.407	503.058	508.702	514.342	519.982	525.627	531.277	536.937
60	24.475	417.266	425.448	432.866	439.815	446.448	452.855	459.096	465.210	471.228	477.171	483.055	488.894	494.698	500.476	506.235	511.980	517.718	523.452	529.186	534.923	540.666
65	27.470	416.511	425.571	433.546	440.901	447.853	454.526	460.993	467.307	473.503	479.608	485.640	491.616	497.548	503.447	509.319	515.172	521.013	526.845	532.672	538.499	544.329
70	30.763	414.826	425.145	433.829	441.672	448.997	455.970	462.691	469.225	475.616	481.896	488.088	494.211	500.280	506.306	512.298	518.265	524.213	530.148	536.074	541.995	547.915
75	34.395	411.689	423.991	433.614	442.057	449.821	457.141	464.149	470.928	477.533	484.005	490.370	496.653	502.868	509.031	515.151	521.239	527.301	533.344	539.373	545.393	551.407
80	38.439	405.787	421.788	432.716	441.923	450.218	457.946	465.284	472.342	479.189	485.873	492.431	498.887	505.262	511.573	517.832	524.049	530.233	536.392	542.531	548.656	554.771

Thermodynamic properties of R-427A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.010	2.009	2.026	2.043	2.060	2.077	2.094	2.110	2.126	2.142	2.158	2.174	2.189	2.205	2.220	2.235	2.250	2.265	2.280	2.295	2.309	2.324
-95	0.017	1.979	1.996	2.013	2.030	2.047	2.063	2.079	2.096	2.111	2.127	2.143	2.158	2.173	2.189	2.204	2.219	2.233	2.248	2.263	2.277	2.291
-90	0.028	1.952	1.970	1.986	2.003	2.020	2.036	2.052	2.068	2.084	2.099	2.115	2.130	2.145	2.160	2.175	2.190	2.205	2.219	2.234	2.248	2.262
-85	0.043	1.928	1.945	1.962	1.979	1.995	2.011	2.027	2.043	2.058	2.074	2.089	2.104	2.119	2.134	2.149	2.164	2.178	2.193	2.207	2.222	2.236
-80	0.066	1.906	1.923	1.940	1.956	1.973	1.989	2.004	2.020	2.035	2.051	2.066	2.081	2.096	2.111	2.126	2.140	2.155	2.169	2.183	2.198	2.212
-75	0.097	1.887	1.903	1.920	1.936	1.952	1.968	1.984	1.999	2.015	2.030	2.045	2.060	2.075	2.090	2.104	2.119	2.133	2.148	2.162	2.176	2.190
-70	0.140	1.869	1.885	1.902	1.918	1.934	1.950	1.965	1.981	1.996	2.011	2.026	2.041	2.056	2.071	2.085	2.099	2.114	2.128	2.142	2.156	2.170
-65	0.197	1.853	1.869	1.885	1.902	1.917	1.933	1.949	1.964	1.979	1.994	2.009	2.024	2.039	2.053	2.068	2.082	2.096	2.110	2.124	2.138	2.152
-60	0.272	1.838	1.854	1.871	1.887	1.902	1.918	1.933	1.949	1.964	1.979	1.994	2.008	2.023	2.037	2.052	2.066	2.080	2.094	2.108	2.122	2.136
-55	0.369	1.825	1.841	1.857	1.873	1.889	1.904	1.920	1.935	1.950	1.965	1.980	1.994	2.009	2.023	2.038	2.052	2.066	2.080	2.094	2.107	2.121
-50	0.493	1.812	1.829	1.845	1.861	1.877	1.892	1.907	1.923	1.938	1.952	1.967	1.982	1.996	2.010	2.025	2.039	2.053	2.067	2.080	2.094	2.108
-45	0.648	1.801	1.818	1.834	1.850	1.866	1.881	1.896	1.911	1.926	1.941	1.956	1.970	1.985	1.999	2.013	2.027	2.041	2.055	2.069	2.082	2.096
-40	0.839	1.791	1.808	1.824	1.840	1.855	1.871	1.886	1.901	1.916	1.931	1.945	1.960	1.974	1.988	2.002	2.016	2.030	2.044	2.058	2.071	2.085
-36.21	1.013	1.784	1.801	1.817	1.833	1.848	1.864	1.879	1.894	1.909	1.924	1.938	1.953	1.967	1.981	1.995	2.009	2.023	2.037	2.050	2.064	2.077
-35	1.074	1.782	1.799	1.815	1.831	1.846	1.862	1.877	1.892	1.907	1.921	1.936	1.950	1.965	1.979	1.993	2.007	2.021	2.034	2.048	2.062	2.075
-30	1.357	1.774	1.791	1.807	1.823	1.838	1.853	1.869	1.884	1.898	1.913	1.928	1.942	1.956	1.970	1.984	1.998	2.012	2.026	2.039	2.053	2.066
-25	1.697	1.766	1.783	1.799	1.815	1.831	1.846	1.861	1.876	1.891	1.906	1.920	1.934	1.949	1.963	1.977	1.990	2.004	2.018	2.031	2.045	2.058
-20	2.099	1.760	1.776	1.792	1.808	1.824	1.839	1.854	1.869	1.884	1.899	1.913	1.927	1.942	1.956	1.970	1.984	1.997	2.011	2.024	2.038	2.051
-15	2.571	1.753	1.770	1.786	1.802	1.818	1.833	1.848	1.863	1.878	1.893	1.907	1.921	1.935	1.950	1.963	1.977	1.991	2.005	2.018	2.031	2.045
-10	3.122	1.747	1.764	1.780	1.796	1.812	1.827	1.843	1.858	1.872	1.887	1.902	1.916	1.930	1.944	1.958	1.972	1.985	1.999	2.012	2.026	2.039
-5	3.760	1.742	1.759	1.775	1.791	1.807	1.822	1.838	1.853	1.867	1.882	1.897	1.911	1.925	1.939	1.953	1.967	1.980	1.994	2.007	2.021	2.034
0	4.492	1.737	1.754	1.770	1.786	1.802	1.818	1.833	1.848	1.863	1.878	1.892	1.906	1.921	1.935	1.948	1.962	1.976	1.989	2.003	2.016	2.029
5	5.330	1.732	1.749	1.766	1.782	1.798	1.814	1.829	1.844	1.859	1.874	1.888	1.902	1.917	1.931	1.944	1.958	1.972	1.985	1.999	2.012	2.025
10	6.280	1.727	1.745	1.762	1.778	1.794	1.810	1.825	1.840	1.855	1.870	1.884	1.899	1.913	1.927	1.941	1.955	1.968	1.982	1.995	2.008	2.022
15	7.355	1.723	1.740	1.758	1.774	1.790	1.806	1.822	1.837	1.852	1.867	1.881	1.895	1.910	1.924	1.938	1.951	1.965	1.979	1.992	2.005	2.018
20	8.563	1.718	1.736	1.754	1.771	1.787	1.803	1.818	1.834	1.849	1.864	1.878	1.893	1.907	1.921	1.935	1.949	1.962	1.976	1.989	2.002	2.016
25	9.915	1.714	1.732	1.750	1.767	1.784	1.800	1.815	1.831	1.846	1.861	1.875	1.890	1.904	1.918	1.932	1.946	1.960	1.973	1.987	2.000	2.013
30	11.423	1.710	1.729	1.746	1.764	1.780	1.797	1.813	1.828	1.843	1.858	1.873	1.887	1.902	1.916	1.930	1.944	1.957	1.971	1.984	1.998	2.011
35	13.099	1.705	1.725	1.743	1.760	1.777	1.794	1.810	1.825	1.841	1.856	1.871	1.885	1.900	1.914	1.928	1.942	1.955	1.969	1.982	1.996	2.009
40	14.955	1.701	1.720	1.739	1.757	1.774	1.791	1.807	1.823	1.838	1.854	1.869	1.883	1.898	1.912	1.926	1.940	1.954	1.967	1.981	1.994	2.007
45	17.004	1.695	1.716	1.735	1.754	1.771	1.788	1.805	1.821	1.836	1.852	1.867	1.881	1.896	1.910	1.924	1.938	1.952	1.966	1.979	1.993	2.006
50	19.263	1.690	1.711	1.731	1.750	1.768	1.785	1.802	1.818	1.834	1.849	1.865	1.879	1.894	1.909	1.923	1.937	1.951	1.964	1.978	1.991	2.004
55	21.746	1.683	1.706	1.727	1.746	1.765	1.782	1.799	1.816	1.832	1.847	1.863	1.878	1.892	1.907	1.921	1.935	1.949	1.963	1.977	1.990	2.003
60	24.475	1.676	1.700	1.722	1.742	1.761	1.779	1.797	1.813	1.830	1.845	1.861	1.876	1.891	1.905	1.920	1.934	1.948	1.962	1.975	1.989	2.002
65	27.470	1.667	1.694	1.717	1.738	1.757	1.776	1.794	1.811	1.827	1.843	1.859	1.874	1.889	1.904	1.918	1.933	1.947	1.961	1.974	1.988	2.001
70	30.763	1.656	1.686	1.711	1.733	1.753	1.772	1.790	1.808	1.825	1.841	1.857	1.872	1.887	1.902	1.917	1.931	1.945	1.959	1.973	1.987	2.000
75	34.395	1.642	1.677	1.704	1.727	1.748	1.768	1.787	1.805	1.822	1.838	1.854	1.870	1.885	1.900	1.915	1.930	1.944	1.958	1.972	1.985	1.999
80	38.439	1.620	1.665	1.695	1.720	1.743	1.763	1.783	1.801	1.818	1.835	1.852	1.868	1.883	1.898	1.913	1.928	1.942	1.956	1.970	1.984	1.998

R-437A (Freon™ MO49+)

Zeotropic blend (19.5 % R-125 - 78.5 % R-134a - 1.4 % R-600 - 0.6 % R-601)

Molecular weight (g/mol)	103.71
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-32.33
Temperature glide at 1.013 bar (K)	4.27
Critical temperature (°C)	96.3
Critical pressure (bar absolute)	40.87
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.436
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.858
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.116
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.183
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	7.54
Classification NF-EN 378	A1
GWP (IPCC 4)	1805

Main applications

R-437A (Freon™ MO49+) is a "non azeotropic" HFC blend, developed to replace R-12 (CFC) and HCFC blends with R-22 (R-409A, R-401A). It can also be used instead of R-413A (HFC). R-437A is a direct replacement and retrofit solution in existing systems such as, domestic refrigerators, chill and freezer cold rooms, refrigerated basements, refrigerated cabinets, refrigerated transport and car air conditioning.
It should not be used in systems equipped with a flooded evaporator or in centrifugal units.

Commercial specifications

Composition: 78.5 % R-134a (+1.5 %-0.7 %) 19.5 % R-125 (+0.5 % -1.8 %) 1.4 % R-600 (+0.1 %-0.2 %) 0.6 % R-601 (+0.1 %-0.2 %)
Purity: ≥ 99.5 % weight.
Chloride ion test: negative
Water content: ≤ 10 ppm weight.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01% volume.

Oils

Use a mineral (MO), an alkyl benzene (AB) or a polyol ester (POE) oil.
For car air-conditioning, a poly alkylene glycol (PAG) may also be used.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-437A are governed by EU Regulation n° 517/2014.
The recovery of R-437A is mandatory under EU Regulation n° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-437A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm3/kg)	(kg/dm³)	(kJ/kg)	(kJ/kg.K)	(°C)	(m³/kg)	(kg/m³)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.011	-100	0.639	1.565	74.194	0.430	-94.43	13.325	0.075	329.023	1.874	254.829
0.017	-95	0.645	1.551	80.347	0.465	-89.53	8.503	0.118	331.987	1.852	251.639
0.027	-90	0.651	1.537	86.471	0.499	-84.62	5.586	0.179	334.988	1.833	248.517
0.041	-85	0.657	1.523	92.577	0.531	-79.72	3.768	0.265	338.022	1.815	245.445
0.061	-80	0.663	1.509	98.677	0.563	-74.81	2.604	0.384	341.087	1.800	242.410
0.088	-75	0.669	1.495	104.779	0.595	-69.91	1.840	0.543	344.176	1.786	239.398
0.125	-70	0.675	1.481	110.891	0.625	-65.0	1.327	0.754	347.287	1.773	236.397
0.173	-65	0.682	1.467	117.018	0.655	-60.1	0.974	1.026	350.414	1.762	233.397
0.236	-60	0.688	1.453	123.166	0.684	-55.2	0.728	1.374	353.553	1.752	230.387
0.317	-55	0.695	1.438	129.339	0.713	-50.29	0.552	1.811	356.698	1.743	227.358
0.420	-50	0.702	1.424	135.542	0.741	-45.39	0.425	2.352	359.844	1.735	224.301
0.547	-45	0.710	1.409	141.779	0.768	-40.48	0.331	3.017	362.986	1.728	221.207
0.704	-40	0.717	1.395	148.052	0.795	-35.58	0.262	3.823	366.118	1.721	218.066
0.895	-35	0.725	1.380	154.367	0.822	-30.67	0.209	4.790	369.236	1.716	214.870
1.013	-32.33	0.729	1.372	157.761	0.836	-28.05	0.186	5.382	370.896	1.713	213.135
1.125	-30	0.733	1.365	160.725	0.849	-25.77	0.168	5.942	372.334	1.711	211.610
1.399	-25	0.741	1.350	167.130	0.874	-20.87	0.137	7.302	375.407	1.707	208.277
1.723	-20	0.750	1.334	173.587	0.900	-15.96	0.112	8.897	378.449	1.703	204.862
2.103	-15	0.759	1.318	180.098	0.926	-11.06	0.093	10.756	381.455	1.699	201.357
2.545	-10	0.768	1.302	186.668	0.951	-6.16	0.077	12.909	384.418	1.697	197.750
3.054	-5	0.778	1.286	193.300	0.975	-1.26	0.065	15.391	387.333	1.694	194.032
3.639	0	0.788	1.269	200.000	1.000	3.64	0.055	18.240	390.192	1.692	190.192
4.306	5	0.799	1.252	206.772	1.024	8.54	0.047	21.498	392.989	1.690	186.217
5.062	10	0.810	1.234	213.621	1.049	13.43	0.040	25.212	395.715	1.688	182.094
5.915	15	0.822	1.216	220.555	1.073	18.33	0.034	29.437	398.362	1.686	177.807
6.871	20	0.835	1.197	227.579	1.096	23.22	0.029	34.233	400.917	1.685	173.338
7.940	25	0.849	1.178	234.702	1.120	28.11	0.025	39.671	403.370	1.683	168.668
9.129	30	0.864	1.158	241.933	1.144	33.0	0.022	45.836	405.705	1.682	163.771
10.446	35	0.880	1.137	249.284	1.168	37.89	0.019	52.827	407.905	1.680	158.621
11.901	40	0.897	1.115	256.766	1.191	42.77	0.016	60.765	409.951	1.678	153.185
13.503	45	0.916	1.092	264.397	1.215	47.65	0.014	69.797	411.817	1.677	147.420
15.260	50	0.937	1.067	272.196	1.239	52.52	0.012	80.111	413.474	1.674	141.278
17.183	55	0.960	1.042	280.187	1.263	57.39	0.011	91.950	414.881	1.672	134.694
19.283	60	0.986	1.014	288.404	1.287	62.25	0.009	105.635	415.987	1.669	127.583
21.570	65	1.016	0.984	296.892	1.312	67.1	0.008	121.615	416.721	1.665	119.830
24.057	70	1.051	0.951	305.715	1.337	71.94	0.007	140.542	416.981	1.660	111.266
26.757	75	1.094	0.914	314.973	1.363	76.76	0.006	163.426	416.608	1.654	101.635
29.686	80	1.147	0.871	324.837	1.390	81.56	0.005	191.998	415.339	1.646	90.502
32.860	85	1.220	0.820	335.641	1.419	86.32	0.004	229.680	412.657	1.634	77.016
36.296	90	1.335	0.749	348.279	1.453	91.01	0.004	285.489	407.235	1.615	58.957

Thermodynamic properties of R-437A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.006	23088.058	23758.835	24428.950	25098.576	25767.832	26436.804	27105.554	27774.129	28442.561	29110.879	29779.100	30447.242	31115.316	31783.332	32451.298	33119.221	33787.105	34454.957	35122.778	35790.573	36458.344
-95	0.010	14069.183	14467.355	14865.034	15262.341	15659.364	16056.164	16452.788	16849.270	17245.637	17641.907	18038.098	18434.221	18830.286	19226.301	19622.272	20018.206	20414.105	20809.975	21205.819	21601.639	21997.437
-90	0.017	8868.418	9113.256	9357.719	9601.894	9845.847	10089.622	10333.255	10576.772	10820.194	11063.534	11306.807	11550.022	11793.187	12036.309	12279.392	12522.442	12765.461	13008.455	13251.424	13494.373	13737.302
-85	0.026	5764.004	5919.474	6074.652	6229.605	6384.380	6539.011	6693.526	6847.944	7002.282	7156.552	7310.764	7464.925	7619.043	7773.123	7927.169	8081.185	8235.175	8389.141	8543.085	8697.011	8850.918
-80	0.040	3851.920	3953.590	4055.029	4156.288	4257.402	4358.398	4459.298	4560.116	4660.866	4761.558	4862.199	4962.797	5063.356	5163.882	5264.377	5364.846	5465.292	5565.715	5666.120	5766.507	5866.879
-75	0.060	2640.078	2708.388	2776.512	2844.488	2912.346	2980.105	3047.782	3115.391	3182.940	3250.440	3317.895	3385.312	3452.695	3520.048	3587.374	3654.676	3721.957	3789.219	3856.463	3923.692	3990.906
-70	0.087	1851.698	1898.753	1945.655	1992.435	2039.115	2085.712	2132.239	2178.707	2225.123	2271.496	2317.830	2364.130	2410.400	2456.643	2502.862	2549.060	2595.238	2641.399	2687.543	2733.674	2779.791
-65	0.125	1326.367	1359.537	1392.579	1425.518	1458.372	1491.155	1523.878	1556.549	1589.176	1621.763	1654.317	1686.839	1719.335	1751.807	1784.258	1816.688	1849.102	1881.499	1913.881	1946.251	1978.608
-60	0.174	968.522	992.411	1016.190	1039.881	1063.499	1087.055	1110.559	1134.017	1157.436	1180.820	1204.173	1227.500	1250.802	1274.082	1297.343	1320.586	1343.813	1367.025	1390.224	1413.411	1436.587
-55	0.239	719.772	737.323	754.779	772.158	789.472	806.733	823.948	841.122	858.261	875.369	892.450	909.506	926.540	943.554	960.551	977.531	994.497	1011.450	1028.390	1045.319	1062.237
-50	0.323	543.594	556.729	569.782	582.767	595.695	608.575	621.414	634.217	646.989	659.732	672.451	685.148	697.824	710.483	723.125	735.752	748.366	760.968	773.559	786.139	798.709
-45	0.429	416.639	426.643	436.573	446.442	456.261	466.037	475.776	485.482	495.160	504.813	514.443	524.052	533.644	543.219	552.779	562.326	571.860	581.383	590.895	600.398	609.892
-40	0.561	323.682	331.425	339.102	346.724	354.301	361.839	369.344	376.819	384.269	391.695	399.101	406.488	413.858	421.213	428.555	435.884	443.201	450.508	457.805	465.093	472.374
-35	0.725	254.601	260.687	266.712	272.688	278.623	284.523	290.392	296.234	302.052	307.849	313.628	319.389	325.135	330.866	336.585	342.293	347.990	353.677	359.355	365.024	370.687
-30	0.924	202.553	207.405	212.202	216.954	221.668	226.350	231.004	235.633	240.240	244.828	249.398	253.952	258.492	263.019	267.535	272.039	276.534	281.019	285.496	289.965	294.428
-28.05	1.013	185.815	190.274	194.680	199.041	203.366	207.660	211.927	216.169	220.391	224.593	228.779	232.949	237.105	241.249	245.381	249.502	253.614	257.718	261.813	265.900	269.981
-25	1.165	162.835	166.756	170.627	174.456	178.250	182.014	185.752	189.467	193.162	196.839	200.500	204.146	207.779	211.400	215.010	218.610	222.200	225.782	229.356	232.923	236.483
-20	1.453	132.162	135.372	138.535	141.659	144.750	147.814	150.854	153.872	156.872	159.855	162.822	165.776	168.718	171.648	174.568	177.479	180.381	183.275	186.161	189.041	191.915
-15	1.793	108.212	110.871	113.487	116.066	118.614	121.137	123.637	126.118	128.580	131.028	133.460	135.881	138.289	140.687	143.075	145.455	147.826	150.189	152.546	154.897	157.241
-10	2.193	89.316	91.544	93.732	95.885	98.009	100.109	102.188	104.249	106.293	108.322	110.337	112.341	114.334	116.316	118.290	120.255	122.213	124.163	126.107	128.045	129.978
-5	2.659	74.262	76.151	78.000	79.816	81.606	83.372	85.119	86.848	88.561	90.261	91.947	93.623	95.288	96.943	98.590	100.230	101.861	103.486	105.105	106.719	108.327
0	3.198	62.161	63.778	65.357	66.905	68.428	69.928	71.410	72.875	74.325	75.762	77.187	78.601	80.005	81.400	82.788	84.167	85.540	86.906	88.267	89.622	90.972
5	3.816	52.350	53.748	55.110	56.442	57.750	59.037	60.305	61.558	62.796	64.022	65.237	66.441	67.636	68.822	70.000	71.172	72.336	73.495	74.648	75.796	76.939
10	4.522	44.331	45.552	46.738	47.895	49.029	50.142	51.238	52.318	53.385	54.440	55.484	56.518	57.543	58.559	59.569	60.571	61.568	62.558	63.544	64.524	65.499
15	5.324	37.728	38.804	39.846	40.860	41.851	42.823	43.777	44.717	45.644	46.558	47.463	48.358	49.244	50.123	50.994	51.859	52.718	53.571	54.419	55.263	56.102
20	6.229	32.251	33.208	34.132	35.029	35.902	36.757	37.595	38.419	39.230	40.030	40.820	41.600	42.372	43.137	43.895	44.646	45.392	46.132	46.868	47.599	48.325
25	7.246	27.677	28.537	29.363	30.162	30.939	31.697	32.439	33.167	33.882	34.586	35.281	35.966	36.644	37.314	37.977	38.635	39.287	39.934	40.576	41.213	41.847
30	8.384	23.833	24.612	25.357	26.076	26.772	27.449	28.110	28.758	29.393	30.018	30.632	31.239	31.837	32.429	33.014	33.593	34.166	34.735	35.299	35.859	36.415
35	9.652	20.581	21.294	21.972	22.623	23.251	23.861	24.455	25.035	25.603	26.161	26.709	27.249	27.781	28.306	28.825	29.338	29.846	30.349	30.848	31.342	31.833
40	11.058	17.814	18.473	19.095	19.690	20.261	20.814	21.351	21.874	22.386	22.887	23.378	23.862	24.337	24.807	25.270	25.727	26.180	26.627	27.071	27.510	27.946
45	12.614	15.445	16.060	16.636	17.184	17.707	18.212	18.701	19.176	19.639	20.092	20.536	20.971	21.399	21.821	22.236	22.646	23.052	23.452	23.849	24.241	24.630
50	14.330	13.405	13.985	14.524	15.032	15.515	15.979	16.427	16.861	17.283	17.695	18.098	18.492	18.879	19.260	19.635	20.005	20.369	20.730	21.086	21.438	21.787
55	16.217	11.638	12.191	12.699	13.175	13.624	14.054	14.467	14.866	15.252	15.629	15.996	16.356	16.708	17.053	17.393	17.728	18.058	18.384	18.705	19.023	19.338
60	18.287	10.097	10.632	11.116	11.564	11.986	12.386	12.769	13.137	13.494	13.840	14.177	14.506	14.827	15.143	15.453	15.757	16.057	16.353	16.644	16.932	17.217
65	20.554	8.744	9.268	9.735	10.161	10.559	10.934	11.292	11.634	11.964	12.284	12.594	12.897	13.192	13.481	13.765	14.043	14.317	14.586	14.852	15.114	15.373
70	23.033	7.545	8.070	8.524	8.934	9.312	9.666	10.001	10.321	10.628	10.925	11.212	11.492	11.764	12.030	12.290	12.546	12.797	13.043	13.286	13.525	13.762
75	25.743	6.472	7.009	7.457	7.854	8.216	8.552	8.868	9.169	9.456	9.733	10.000	10.259	10.511	10.757	10.997	11.232	11.463	11.689	11.912	12.131	12.348
80	28.704	5.498	6.063	6.513	6.901	7.249	7.570	7.870	8.153	8.423	8.682	8.931	9.172	9.406	9.634	9.856	10.073	10.286	10.495	10.700	10.902	11.100
85	31.948	4.589	5.214	5.671	6.054	6.392	6.699	6.985	7.253	7.507	7.750	7.983	8.208	8.426	8.638	8.844	9.045	9.242	9.435	9.624	9.810	9.993
90	35.525	3.693	4.439	4.913	5.294	5.624	5.920	6.193	6.447	6.688	6.916	7.135	7.345	7.549	7.746	7.938	8.125	8.307	8.486	8.661	8.833	9.001

Thermodynamic properties of R-437A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.006	325.704	328.733	331.812	334.941	338.120	341.349	344.629	347.959	351.339	354.768	358.247	361.776	365.352	368.978	372.651	376.373	380.142	383.958	387.822	391.732	395.689
-95	0.010	328.680	331.767	334.903	338.087	341.320	344.603	347.936	351.318	354.750	358.230	361.760	365.338	368.964	372.639	376.361	380.131	383.948	387.812	391.723	395.680	399.683
-90	0.017	331.698	334.844	338.036	341.276	344.564	347.900	351.286	354.720	358.203	361.735	365.315	368.943	372.619	376.343	380.114	383.932	387.797	391.708	395.666	399.670	403.720
-85	0.026	334.755	337.959	341.208	344.504	347.847	351.238	354.677	358.163	361.698	365.281	368.911	372.590	376.315	380.088	383.907	387.774	391.687	395.646	399.651	403.701	407.797
-80	0.040	337.847	341.110	344.417	347.769	351.168	354.613	358.105	361.644	365.231	368.865	372.547	376.275	380.050	383.872	387.740	391.655	395.616	399.622	403.674	407.772	411.915
-75	0.060	340.970	344.293	347.659	351.068	354.522	358.022	361.568	365.161	368.800	372.485	376.218	379.996	383.821	387.693	391.610	395.573	399.582	403.636	407.736	411.880	416.069
-70	0.087	344.119	347.503	350.928	354.395	357.906	361.462	365.062	368.708	372.400	376.138	379.922	383.751	387.627	391.548	395.514	399.526	403.583	407.685	411.832	416.023	420.259
-65	0.125	347.290	350.737	354.222	357.748	361.316	364.928	368.584	372.284	376.030	379.820	383.656	387.537	391.463	395.434	399.450	403.511	407.617	411.767	415.961	420.200	424.482
-60	0.174	350.478	353.989	357.536	361.122	364.748	368.417	372.130	375.885	379.685	383.529	387.417	391.350	395.327	399.349	403.415	407.525	411.680	415.878	420.120	424.406	428.736
-55	0.239	353.678	357.254	360.864	364.512	368.198	371.926	375.695	379.507	383.361	387.260	391.201	395.187	399.216	403.289	407.405	411.565	415.769	420.017	424.307	428.641	433.018
-50	0.323	356.884	360.528	364.203	367.913	371.661	375.448	379.276	383.145	387.056	391.009	395.005	399.044	403.126	407.250	411.418	415.629	419.883	424.179	428.519	432.901	437.326
-45	0.429	360.091	363.805	367.547	371.322	375.133	378.981	382.869	386.796	390.765	394.774	398.825	402.918	407.053	411.231	415.451	419.713	424.017	428.363	432.752	437.183	441.656
-40	0.561	363.294	367.080	370.892	374.734	378.609	382.520	386.469	390.456	394.483	398.550	402.658	406.806	410.995	415.226	419.499	423.813	428.168	432.565	437.004	441.484	446.006
-35	0.725	366.486	370.348	374.231	378.142	382.085	386.061	390.072	394.121	398.208	402.334	406.498	410.703	414.948	419.234	423.560	427.927	432.334	436.783	441.272	445.802	450.373
-30	0.924	369.663	373.603	377.562	381.544	385.555	389.598	393.675	397.786	401.935	406.120	410.344	414.607	418.908	423.249	427.630	432.051	436.511	441.012	445.552	450.133	454.754
-28.05	1.013	370.896	374.868	378.856	382.867	386.905	390.975	395.077	399.214	403.387	407.596	411.843	416.129	420.453	424.816	429.218	433.660	438.141	442.662	447.223	451.824	456.464
-25	1.165	372.819	376.841	380.877	384.934	389.016	393.128	397.271	401.448	405.660	409.907	414.191	418.513	422.872	427.270	431.706	436.181	440.696	445.249	449.842	454.474	459.146
-20	1.453	375.948	380.056	384.173	388.307	392.463	396.646	400.858	405.102	409.379	413.689	418.035	422.417	426.836	431.292	435.785	440.316	444.885	449.493	454.139	458.823	463.546
-15	1.793	379.044	383.242	387.444	391.658	395.891	400.148	404.432	408.744	413.088	417.464	421.873	426.317	430.796	435.311	439.863	444.451	449.076	453.738	458.438	463.176	467.952
-10	2.193	382.101	386.394	390.684	394.983	399.296	403.629	407.986	412.370	416.783	421.226	425.701	430.208	434.750	439.326	443.936	448.583	453.265	457.984	462.739	467.531	472.359
-5	2.659	385.113	389.506	393.890	398.275	402.672	407.085	411.518	415.976	420.460	424.972	429.514	434.088	438.693	443.331	448.003	452.709	457.449	462.225	467.037	471.884	476.767
0	3.198	388.074	392.572	397.053	401.531	406.014	410.510	415.024	419.558	424.115	428.699	433.311	437.951	442.622	447.324	452.058	456.825	461.626	466.460	471.329	476.232	481.171
5	3.816	390.976	395.586	400.170	404.744	409.318	413.901	418.497	423.110	427.745	432.403	437.086	441.796	446.534	451.302	456.100	460.930	465.791	470.686	475.613	480.574	485.569
10	4.522	393.812	398.540	403.233	407.909	412.579	417.252	421.934	426.630	431.344	436.078	440.835	445.617	450.425	455.261	460.125	465.019	469.943	474.899	479.886	484.905	489.958
15	5.324	396.571	401.427	406.235	411.018	415.789	420.557	425.330	430.112	434.909	439.723	444.556	449.412	454.292	459.197	464.129	469.089	474.078	479.096	484.145	489.224	494.336
20	6.229	399.245	404.237	409.169	414.067	418.944	423.812	428.679	433.552	438.435	443.331	448.244	453.177	458.131	463.108	468.110	473.137	478.192	483.275	488.387	493.528	498.699
25	7.246	401.821	406.961	412.027	417.046	422.036	427.010	431.977	436.945	441.917	446.900	451.896	456.908	461.938	466.990	472.063	477.161	482.284	487.433	492.609	497.813	503.046
30	8.384	404.285	409.587	414.797	419.948	425.059	430.146	435.218	440.285	445.352	450.424	455.506	460.601	465.711	470.839	475.987	481.157	486.349	491.566	496.809	502.078	507.374
35	9.652	406.622	412.103	417.472	422.764	428.005	433.211	438.396	443.567	448.733	453.900	459.071	464.252	469.445	474.652	479.877	485.121	490.386	495.673	500.984	506.319	511.680
40	11.058	408.810	414.493	420.037	425.485	430.866	436.200	441.503	446.786	452.056	457.322	462.587	467.857	473.136	478.426	483.730	489.051	494.390	499.750	505.130	510.534	515.961
45	12.614	410.827	416.741	422.480	428.098	433.631	439.104	444.534	449.934	455.315	460.684	466.048	471.412	476.780	482.156	487.543	492.943	498.359	503.793	509.246	514.720	520.215
50	14.330	412.644	418.825	424.784	430.592	436.292	441.914	447.480	453.006	458.504	463.983	469.450	474.912	480.373	485.839	491.311	496.794	502.290	507.800	513.328	518.874	524.440
55	16.217	414.224	420.720	426.932	432.951	438.835	444.620	450.333	455.994	461.616	467.211	472.787	478.352	483.911	489.470	495.032	500.600	506.178	511.768	517.373	522.993	528.631
60	18.287	415.516	422.394	428.900	435.160	441.247	447.211	453.084	458.889	464.644	470.362	476.053	481.727	487.389	493.045	498.699	504.357	510.020	515.693	521.377	527.074	532.787
65	20.554	416.454	423.808	430.662	437.196	443.513	449.674	455.721	461.682	467.580	473.429	479.243	485.030	490.800	496.558	502.310	508.060	513.813	519.571	525.337	531.114	536.904
70	23.033	416.942	424.910	432.184	439.038	445.614	451.995	458.232	464.364	470.414	476.404	482.348	488.256	494.139	500.005	505.858	511.706	517.551	523.397	529.249	535.108	540.977
75	25.743	416.832	425.630	433.424	440.656	447.529	454.155	460.604	466.920	473.137	479.277	485.359	491.396	497.399	503.377	509.338	515.286	521.228	527.167	533.107	539.052	545.003
80	28.704	415.875	425.874	434.330	442.014	449.230	456.134	462.816	469.336	475.732	482.035	488.265	494.439	500.569	506.666	512.739	518.794	524.836	530.872	536.904	542.938	548.974
85	31.948	413.597	425.503	434.829	443.063	450.681	457.900	464.844	471.587	478.181	484.659	491.048	497.368	503.634	509.857	516.048	522.215	528.363	534.500	540.629	546.755	552.880
90	35.525	408.794	424.293	434.803	443.721	451.814	459.398	466.638	473.631	480.441	487.112	493.674	500.152	506.563	512.921	519.238	525.523	531.784	538.027	544.258	550.481	556.700

Thermodynamic properties of R-437A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.006	1.902	1.919	1.936	1.953	1.970	1.986	2.002	2.019	2.035	2.051	2.066	2.082	2.097	2.113	2.128	2.143	2.158	2.173	2.188	2.203	2.217
-95	0.010	1.877	1.894	1.911	1.927	1.944	1.960	1.977	1.993	2.009	2.024	2.040	2.055	2.071	2.086	2.101	2.116	2.131	2.146	2.161	2.175	2.190
-90	0.017	1.854	1.871	1.888	1.905	1.921	1.937	1.953	1.969	1.985	2.001	2.016	2.032	2.047	2.062	2.077	2.092	2.107	2.122	2.136	2.151	2.165
-85	0.026	1.834	1.851	1.868	1.884	1.900	1.917	1.933	1.948	1.964	1.980	1.995	2.010	2.025	2.040	2.055	2.070	2.085	2.100	2.114	2.129	2.143
-80	0.040	1.816	1.833	1.850	1.866	1.882	1.898	1.914	1.929	1.945	1.960	1.976	1.991	2.006	2.021	2.036	2.051	2.065	2.080	2.094	2.108	2.123
-75	0.060	1.800	1.817	1.833	1.849	1.865	1.881	1.897	1.913	1.928	1.943	1.959	1.974	1.989	2.003	2.018	2.033	2.047	2.062	2.076	2.090	2.105
-70	0.087	1.786	1.802	1.819	1.835	1.851	1.866	1.882	1.897	1.913	1.928	1.943	1.958	1.973	1.988	2.002	2.017	2.031	2.046	2.060	2.074	2.088
-65	0.125	1.773	1.789	1.806	1.822	1.837	1.853	1.869	1.884	1.899	1.914	1.929	1.944	1.959	1.974	1.988	2.003	2.017	2.031	2.046	2.060	2.074
-60	0.174	1.762	1.778	1.794	1.810	1.826	1.841	1.857	1.872	1.887	1.902	1.917	1.932	1.946	1.961	1.976	1.990	2.004	2.018	2.033	2.047	2.060
-55	0.239	1.751	1.768	1.784	1.799	1.815	1.831	1.846	1.861	1.876	1.891	1.906	1.921	1.935	1.950	1.964	1.979	1.993	2.007	2.021	2.035	2.049
-50	0.323	1.742	1.758	1.774	1.790	1.806	1.821	1.836	1.851	1.866	1.881	1.896	1.911	1.925	1.940	1.954	1.968	1.983	1.997	2.011	2.024	2.038
-45	0.429	1.734	1.750	1.766	1.782	1.797	1.813	1.828	1.843	1.858	1.873	1.887	1.902	1.917	1.931	1.945	1.959	1.973	1.987	2.001	2.015	2.029
-40	0.561	1.727	1.743	1.759	1.775	1.790	1.805	1.821	1.836	1.850	1.865	1.880	1.894	1.909	1.923	1.937	1.951	1.965	1.979	1.993	2.007	2.021
-35	0.725	1.721	1.737	1.753	1.768	1.784	1.799	1.814	1.829	1.844	1.858	1.873	1.887	1.902	1.916	1.930	1.944	1.958	1.972	1.986	2.000	2.013
-30	0.924	1.715	1.731	1.747	1.763	1.778	1.793	1.808	1.823	1.838	1.853	1.867	1.882	1.896	1.910	1.924	1.938	1.952	1.966	1.980	1.993	2.007
-28.05	1.013	1.713	1.729	1.745	1.761	1.776	1.791	1.806	1.821	1.836	1.850	1.865	1.879	1.894	1.908	1.922	1.936	1.950	1.964	1.977	1.991	2.005
-25	1.165	1.710	1.726	1.742	1.758	1.773	1.788	1.803	1.818	1.833	1.847	1.862	1.876	1.891	1.905	1.919	1.933	1.947	1.960	1.974	1.988	2.001
-20	1.453	1.706	1.722	1.738	1.753	1.769	1.784	1.799	1.814	1.828	1.843	1.857	1.872	1.886	1.900	1.914	1.928	1.942	1.956	1.969	1.983	1.996
-15	1.793	1.702	1.718	1.734	1.750	1.765	1.780	1.795	1.810	1.825	1.839	1.854	1.868	1.882	1.896	1.910	1.924	1.938	1.952	1.965	1.979	1.992
-10	2.193	1.699	1.715	1.731	1.746	1.762	1.777	1.792	1.807	1.821	1.836	1.850	1.865	1.879	1.893	1.907	1.921	1.934	1.948	1.962	1.975	1.988
-5	2.659	1.696	1.712	1.728	1.744	1.759	1.774	1.789	1.804	1.819	1.833	1.848	1.862	1.876	1.890	1.904	1.918	1.931	1.945	1.959	1.972	1.985
0	3.198	1.693	1.710	1.726	1.741	1.757	1.772	1.787	1.802	1.816	1.831	1.845	1.860	1.874	1.888	1.902	1.915	1.929	1.943	1.956	1.970	1.983
5	3.816	1.691	1.707	1.724	1.739	1.755	1.770	1.785	1.800	1.815	1.829	1.843	1.858	1.872	1.886	1.900	1.913	1.927	1.941	1.954	1.968	1.981
10	4.522	1.689	1.706	1.722	1.738	1.753	1.768	1.783	1.798	1.813	1.828	1.842	1.856	1.870	1.884	1.898	1.912	1.926	1.939	1.953	1.966	1.979
15	5.324	1.687	1.704	1.720	1.736	1.752	1.767	1.782	1.797	1.812	1.826	1.841	1.855	1.869	1.883	1.897	1.911	1.924	1.938	1.951	1.965	1.978
20	6.229	1.686	1.702	1.719	1.735	1.751	1.766	1.781	1.796	1.811	1.826	1.840	1.854	1.868	1.882	1.896	1.910	1.924	1.937	1.951	1.964	1.977
25	7.246	1.684	1.701	1.718	1.734	1.750	1.765	1.780	1.795	1.810	1.825	1.839	1.854	1.868	1.882	1.896	1.909	1.923	1.937	1.950	1.963	1.977
30	8.384	1.683	1.700	1.717	1.733	1.749	1.764	1.780	1.795	1.810	1.824	1.839	1.853	1.867	1.881	1.895	1.909	1.923	1.936	1.950	1.963	1.976
35	9.652	1.681	1.699	1.716	1.732	1.748	1.764	1.779	1.795	1.810	1.824	1.839	1.853	1.867	1.881	1.895	1.909	1.923	1.936	1.950	1.963	1.976
40	11.058	1.679	1.697	1.715	1.731	1.748	1.764	1.779	1.794	1.809	1.824	1.839	1.853	1.867	1.882	1.895	1.909	1.923	1.937	1.950	1.963	1.976
45	12.614	1.678	1.696	1.714	1.731	1.747	1.763	1.779	1.794	1.809	1.824	1.839	1.853	1.868	1.882	1.896	1.910	1.923	1.937	1.950	1.964	1.977
50	14.330	1.676	1.695	1.713	1.730	1.747	1.763	1.779	1.794	1.809	1.824	1.839	1.854	1.868	1.882	1.896	1.910	1.924	1.937	1.951	1.964	1.977
55	16.217	1.673	1.693	1.711	1.729	1.746	1.762	1.779	1.794	1.810	1.825	1.840	1.854	1.869	1.883	1.897	1.911	1.925	1.938	1.952	1.965	1.978
60	18.287	1.670	1.691	1.710	1.728	1.745	1.762	1.778	1.794	1.810	1.825	1.840	1.855	1.869	1.883	1.898	1.912	1.925	1.939	1.952	1.966	1.979
65	20.554	1.667	1.688	1.708	1.727	1.745	1.762	1.778	1.794	1.810	1.825	1.840	1.855	1.870	1.884	1.898	1.912	1.926	1.940	1.953	1.967	1.980
70	23.033	1.662	1.685	1.706	1.725	1.744	1.761	1.778	1.794	1.810	1.826	1.841	1.856	1.870	1.885	1.899	1.913	1.927	1.941	1.954	1.968	1.981
75	25.743	1.656	1.682	1.703	1.724	1.742	1.760	1.777	1.794	1.810	1.826	1.841	1.856	1.871	1.886	1.900	1.914	1.928	1.942	1.955	1.969	1.982
80	28.704	1.649	1.677	1.700	1.721	1.741	1.759	1.777	1.794	1.810	1.826	1.841	1.857	1.872	1.886	1.901	1.915	1.929	1.943	1.956	1.970	1.983
85	31.948	1.638	1.671	1.696	1.718	1.739	1.758	1.776	1.793	1.810	1.826	1.842	1.857	1.872	1.887	1.901	1.916	1.930	1.944	1.957	1.971	1.984
90	35.525	1.620	1.663	1.691	1.715	1.736	1.756	1.774	1.792	1.809	1.825	1.841	1.857	1.872	1.887	1.902	1.916	1.930	1.944	1.958	1.972	1.985

R-438A (Freon™ MO99)

Zeotropic blend (8.5 % R-32 - 45 % R-125 - 44.2 % R-134a - 1.7 % R-600 - 0.6 % R-601a)

Molecular weight (g/mol)	100.56
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-42.31
Temperature glide at 1.013 bar (K)	6.25
Critical temperature (°C)	83.7
Critical pressure (bar absolute)	42.16
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.454
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.826
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.123
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.162
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.28
Classification NF-EN 378	A1
GWP (IPCC 4)	2265

Main applications

R-438A (Freon™ MO99) is a "non azeotropic" HFC blend, which can replace R-22 (HCFC) in residential and commercial air conditioning applications, chillers and low & medium temperature direct expansion refrigeration systems.
Do not use in centrifugal chillers and check with us if they have a flooded evaporator.

Commercial specifications

Composition: 45 % R-125 – 44.2 % R-134a – 8.5 % R-32 – 1.7 % R-600 – 0.6 % R-601a (±1.5 % / ±1.5 %-1.7 % / ±0.5 %-1.5 % / ±0.1 %-0.2 % / ±0.1 %-0.2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01% volume.

Oils

Use a mineral oil (MO), alkylbenzene (AB) or polyol ester (POE). Climalife recommend using a POE oil for all HFCs. Check with Climalife regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-438A are governed by EU Regulation n° 517/2014.
The recovery of R-438A is mandatory under EU Regulation n° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-438A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.021	-100	0.621	1.611	75.183	0.435	-92.79	7.010	0.143	325.122	1.849	249.939
0.033	-95	0.627	1.595	81.316	0.469	-87.86	4.571	0.219	328.033	1.828	246.718
0.051	-90	0.633	1.580	87.410	0.503	-82.93	3.065	0.326	330.968	1.808	243.559
0.076	-85	0.639	1.564	93.479	0.536	-78.0	2.109	0.474	333.922	1.791	240.442
0.110	-80	0.646	1.549	99.537	0.568	-73.08	1.485	0.673	336.889	1.775	237.352
0.157	-75	0.652	1.534	105.591	0.599	-68.16	1.068	0.936	339.867	1.761	234.275
0.219	-70	0.659	1.518	111.651	0.629	-63.25	0.783	1.277	342.848	1.749	231.197
0.299	-65	0.665	1.503	117.723	0.658	-58.33	0.584	1.712	345.829	1.737	228.107
0.401	-60	0.672	1.488	123.812	0.687	-53.42	0.443	2.258	348.805	1.727	224.993
0.531	-55	0.679	1.472	129.925	0.715	-48.51	0.341	2.935	351.769	1.718	221.844
0.692	-50	0.687	1.456	136.066	0.743	-43.6	0.266	3.764	354.717	1.709	218.651
0.889	-45	0.694	1.440	142.239	0.771	-38.69	0.210	4.768	357.643	1.702	215.404
1.013	-42.31	0.698	1.432	145.578	0.785	-36.05	0.186	5.390	359.208	1.698	213.629
1.129	-40	0.702	1.424	148.449	0.797	-33.79	0.167	5.973	360.542	1.695	212.092
1.418	-35	0.710	1.408	154.701	0.824	-28.89	0.135	7.405	363.408	1.689	208.707
1.761	-30	0.719	1.391	160.998	0.850	-23.99	0.110	9.094	366.236	1.684	205.238
2.165	-25	0.728	1.374	167.346	0.876	-19.1	0.090	11.072	369.020	1.679	201.675
2.637	-20	0.737	1.357	173.747	0.901	-14.21	0.075	13.374	371.754	1.674	198.007
3.185	-15	0.746	1.340	180.208	0.926	-9.32	0.062	16.040	374.432	1.670	194.224
3.816	-10	0.757	1.322	186.733	0.951	-4.44	0.052	19.111	377.046	1.667	190.313
4.537	-5	0.767	1.303	193.329	0.976	0.44	0.044	22.635	379.589	1.663	186.260
5.358	0	0.779	1.284	200.000	1.000	5.32	0.038	26.665	382.052	1.660	182.052
6.285	5	0.790	1.265	206.754	1.024	10.19	0.032	31.263	384.424	1.657	177.670
7.329	10	0.803	1.245	213.599	1.048	15.05	0.027	36.496	386.694	1.654	173.095
8.496	15	0.817	1.224	220.543	1.072	19.91	0.024	42.447	388.846	1.651	168.303
9.797	20	0.831	1.203	227.597	1.096	24.76	0.020	49.211	390.865	1.649	163.268
11.241	25	0.847	1.180	234.772	1.120	29.61	0.018	56.901	392.730	1.646	157.958
12.837	30	0.865	1.157	242.083	1.144	34.44	0.015	65.656	394.420	1.643	152.337
14.594	35	0.883	1.132	249.546	1.168	39.26	0.013	75.647	395.906	1.640	146.359
16.524	40	0.904	1.106	257.183	1.192	44.08	0.011	87.092	397.154	1.636	139.971
18.637	45	0.928	1.078	265.020	1.216	48.87	0.010	100.274	398.121	1.632	133.102
20.944	50	0.954	1.048	273.093	1.241	53.65	0.009	115.576	398.749	1.627	125.656
23.456	55	0.985	1.015	281.454	1.266	58.41	0.007	133.537	398.956	1.622	117.502
26.186	60	1.021	0.979	290.179	1.291	63.14	0.006	154.961	398.621	1.615	108.443
29.148	65	1.066	0.938	299.389	1.318	67.84	0.006	181.138	397.551	1.607	98.162
32.355	70	1.123	0.890	309.307	1.346	72.49	0.005	214.383	395.404	1.596	86.097
35.820	75	1.205	0.830	320.416	1.377	77.04	0.004	259.682	391.454	1.580	71.038
39.535	80	1.351	0.740	334.261	1.415	81.41	0.003	332.854	383.473	1.554	49.212

Thermodynamic properties of R-438A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.010	13858.562	14261.942	14664.882	15067.484	15469.819	15871.943	16273.895	16675.707	17077.403	17479.001	17880.518	18281.964	18683.351	19084.685	19485.974	19887.224	20288.439	20689.623	21090.780	21491.913	21893.024
-95	0.017	8576.751	8820.141	9063.188	9305.966	9548.531	9790.924	10033.176	10275.312	10517.350	10759.306	11001.192	11243.018	11484.792	11726.520	11968.209	12209.863	12451.487	12693.083	12934.654	13176.204	13417.735
-90	0.028	5485.439	5637.462	5789.211	5940.744	6092.104	6243.322	6394.423	6545.426	6696.346	6847.196	6997.986	7148.724	7299.417	7450.070	7600.688	7751.275	7901.835	8052.370	8202.884	8353.378	8503.855
-85	0.043	3614.519	3712.525	3810.310	3907.917	4005.381	4102.727	4199.974	4297.138	4394.232	4491.265	4588.246	4685.182	4782.078	4878.939	4975.769	5072.571	5169.349	5266.106	5362.842	5459.561	5556.265
-80	0.065	2447.088	2512.131	2576.992	2641.706	2706.299	2770.793	2835.203	2899.542	2963.820	3028.045	3092.225	3156.365	3220.470	3284.544	3348.590	3412.612	3476.612	3540.593	3604.555	3668.502	3732.435
-75	0.096	1698.015	1742.351	1786.533	1830.592	1874.549	1918.421	1962.221	2005.960	2049.645	2093.285	2136.884	2180.449	2223.982	2267.487	2310.968	2354.427	2397.867	2441.288	2484.694	2528.085	2571.463
-70	0.138	1204.943	1235.919	1266.764	1297.503	1328.155	1358.734	1389.250	1419.713	1450.129	1480.504	1510.844	1541.153	1571.434	1601.691	1631.925	1662.140	1692.336	1722.517	1752.683	1782.836	1812.977
-65	0.195	872.692	894.833	916.861	938.797	960.658	982.455	1004.197	1025.892	1047.547	1069.165	1090.752	1112.310	1133.844	1155.356	1176.848	1198.321	1219.779	1241.222	1262.652	1284.070	1305.477
-60	0.269	643.937	660.101	676.167	692.153	708.072	723.935	739.750	755.524	771.260	786.965	802.642	818.293	833.923	849.532	865.123	880.697	896.257	911.804	927.339	942.862	958.376
-55	0.366	483.289	495.324	507.273	519.151	530.970	542.739	554.466	566.155	577.812	589.440	601.042	612.622	624.182	635.723	647.248	658.758	670.255	681.739	693.213	704.676	716.130
-50	0.488	368.393	377.520	386.570	395.556	404.490	413.380	422.231	431.049	439.837	448.600	457.339	466.058	474.759	483.443	492.112	500.767	509.410	518.042	526.664	535.276	543.880
-45	0.642	284.823	291.864	298.835	305.749	312.617	319.444	326.237	332.999	339.735	346.447	353.139	359.812	366.467	373.108	379.735	386.349	392.953	399.545	406.129	412.704	419.271
-40	0.833	223.083	228.602	234.058	239.463	244.825	250.151	255.445	260.711	265.954	271.175	276.377	281.561	286.731	291.886	297.029	302.160	307.281	312.392	317.494	322.589	327.676
-36.05	1.013	185.520	190.123	194.667	199.163	203.620	208.043	212.437	216.805	221.151	225.476	229.784	234.075	238.352	242.616	246.868	251.109	255.341	259.563	263.777	267.984	272.184
-35	1.066	176.809	181.201	185.535	189.822	194.070	198.285	202.472	206.633	210.772	214.891	218.993	223.079	227.150	231.209	235.256	239.293	243.320	247.337	251.347	255.350	259.345
-30	1.348	141.660	145.204	148.695	152.143	155.555	158.937	162.293	165.625	168.937	172.230	175.508	178.771	182.020	185.258	188.485	191.702	194.910	198.109	201.301	204.487	207.665
-25	1.685	114.627	117.525	120.374	123.184	125.960	128.709	131.432	134.135	136.818	139.485	142.136	144.774	147.400	150.014	152.619	155.214	157.801	160.380	162.952	165.518	168.077
-20	2.085	93.595	95.995	98.349	100.667	102.953	105.213	107.451	109.669	111.869	114.053	116.223	118.381	120.527	122.663	124.789	126.907	129.017	131.120	133.216	135.305	137.390
-15	2.556	77.055	79.066	81.034	82.967	84.872	86.753	88.612	90.452	92.276	94.085	95.881	97.665	99.438	101.202	102.957	104.703	106.443	108.175	109.901	111.622	113.337
-10	3.104	63.915	65.619	67.283	68.914	70.518	72.099	73.660	75.204	76.732	78.246	79.747	81.238	82.718	84.189	85.652	87.107	88.555	89.997	91.433	92.863	94.289
-5	3.738	53.379	54.838	56.260	57.650	59.015	60.358	61.682	62.989	64.282	65.562	66.830	68.087	69.334	70.573	71.804	73.028	74.245	75.456	76.662	77.862	79.058
0	4.468	44.854	46.118	47.345	48.542	49.715	50.866	52.000	53.118	54.222	55.314	56.394	57.464	58.525	59.578	60.623	61.662	62.694	63.720	64.741	65.757	66.769
5	5.301	37.901	39.005	40.074	41.115	42.132	43.129	44.109	45.074	46.025	46.964	47.893	48.812	49.722	50.624	51.519	52.408	53.290	54.167	55.039	55.906	56.769
10	6.247	32.183	33.158	34.099	35.012	35.903	36.773	37.627	38.467	39.293	40.108	40.913	41.708	42.495	43.275	44.048	44.814	45.575	46.330	47.080	47.826	48.568
15	7.316	27.447	28.316	29.152	29.960	30.747	31.514	32.264	33.001	33.725	34.437	35.140	35.834	36.520	37.198	37.870	38.536	39.197	39.852	40.503	41.149	41.791
20	8.518	23.495	24.278	25.027	25.750	26.450	27.131	27.796	28.447	29.086	29.714	30.332	30.942	31.544	32.139	32.728	33.310	33.888	34.460	35.028	35.592	36.152
25	9.864	20.176	20.888	21.566	22.217	22.846	23.455	24.049	24.629	25.197	25.754	26.302	26.842	27.374	27.899	28.418	28.931	29.440	29.943	30.442	30.937	31.429
30	11.365	17.370	18.025	18.644	19.235	19.804	20.354	20.888	21.408	21.917	22.415	22.903	23.384	23.857	24.324	24.784	25.239	25.689	26.135	26.576	27.014	27.448
35	13.032	14.982	15.590	16.161	16.703	17.222	17.721	18.205	18.675	19.133	19.581	20.020	20.451	20.874	21.291	21.703	22.108	22.509	22.906	23.298	23.687	24.072
40	14.877	12.938	13.509	14.040	14.541	15.018	15.475	15.916	16.344	16.759	17.165	17.561	17.949	18.330	18.705	19.074	19.438	19.798	20.152	20.503	20.851	21.194
45	16.916	11.176	11.719	12.218	12.685	13.127	13.548	13.953	14.344	14.723	15.092	15.452	15.804	16.149	16.488	16.821	17.149	17.473	17.792	18.108	18.419	18.728
50	19.162	9.646	10.170	10.645	11.084	11.496	11.887	12.261	12.621	12.969	13.306	13.635	13.956	14.270	14.578	14.880	15.177	15.470	15.759	16.043	16.325	16.603
55	21.632	8.309	8.823	9.278	9.694	10.082	10.447	10.795	11.128	11.449	11.760	12.062	12.356	12.643	12.924	13.199	13.470	13.736	13.998	14.256	14.511	14.763
60	24.345	7.129	7.642	8.085	8.483	8.850	9.194	9.519	9.829	10.127	10.414	10.693	10.963	11.227	11.484	11.736	11.984	12.227	12.465	12.701	12.932	13.161
65	27.325	6.075	6.600	7.037	7.422	7.772	8.097	8.403	8.693	8.971	9.237	9.495	9.745	9.988	10.225	10.457	10.684	10.906	11.125	11.340	11.552	11.760
70	30.602	5.116	5.673	6.110	6.486	6.823	7.132	7.421	7.694	7.953	8.202	8.442	8.674	8.899	9.117	9.331	9.540	9.744	9.945	10.142	10.336	10.527
75	34.222	4.216	4.837	5.283	5.653	5.979	6.275	6.550	6.807	7.051	7.284	7.507	7.723	7.932	8.135	8.332	8.525	8.713	8.898	9.079	9.257	9.432
80	38.279	3.299	4.066	4.530	4.899	5.217	5.502	5.763	6.007	6.237	6.455	6.664	6.865	7.059	7.247	7.430	7.609	7.783	7.953	8.120	8.283	8.444

Thermodynamic properties of R-438A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.010	320.916	323.894	326.916	329.984	333.097	336.256	339.460	342.710	346.005	349.346	352.732	356.162	359.637	363.157	366.721	370.329	373.980	377.675	381.414	385.196	389.020
-95	0.017	323.824	326.856	329.931	333.051	336.214	339.423	342.676	345.975	349.318	352.706	356.138	359.615	363.137	366.702	370.311	373.964	377.660	381.399	385.182	389.007	392.875
-90	0.028	326.764	329.851	332.980	336.151	339.366	342.625	345.928	349.276	352.667	356.103	359.582	363.106	366.673	370.284	373.938	377.636	381.377	385.161	388.987	392.856	396.768
-85	0.043	329.731	332.875	336.058	339.283	342.550	345.860	349.213	352.609	356.049	359.533	363.060	366.630	370.244	373.901	377.601	381.344	385.130	388.958	392.829	396.742	400.697
-80	0.065	332.722	335.923	339.162	342.441	345.761	349.122	352.526	355.973	359.462	362.994	366.569	370.187	373.848	377.551	381.297	385.085	388.916	392.789	396.704	400.661	404.659
-75	0.096	335.731	338.991	342.287	345.621	348.995	352.410	355.865	359.363	362.902	366.483	370.107	373.772	377.480	381.230	385.023	388.857	392.733	396.651	400.610	404.611	408.654
-70	0.138	338.754	342.074	345.429	348.820	352.249	355.718	359.226	362.775	366.365	369.997	373.669	377.383	381.139	384.937	388.776	392.656	396.578	400.541	404.545	408.591	412.677
-65	0.195	341.784	345.168	348.583	352.032	355.518	359.042	362.604	366.206	369.848	373.530	377.253	381.017	384.821	388.667	392.553	396.480	400.448	404.457	408.507	412.597	416.728
-60	0.269	344.817	348.266	351.744	355.254	358.798	362.378	365.996	369.652	373.347	377.081	380.855	384.669	388.523	392.417	396.351	400.326	404.341	408.396	412.492	416.627	420.803
-55	0.366	347.848	351.365	354.907	358.479	362.084	365.723	369.397	373.109	376.858	380.645	384.471	388.336	392.240	396.184	400.167	404.190	408.252	412.355	416.496	420.678	424.899
-50	0.488	350.870	354.458	358.067	361.704	365.371	369.070	372.803	376.571	380.376	384.218	388.097	392.014	395.970	399.964	403.997	408.069	412.180	416.330	420.518	424.746	429.013
-45	0.642	353.878	357.540	361.220	364.923	368.654	372.416	376.209	380.036	383.898	387.796	391.730	395.700	399.709	403.754	407.838	411.960	416.119	420.318	424.554	428.829	433.142
-40	0.833	356.867	360.606	364.359	368.132	371.930	375.755	379.611	383.499	387.419	391.374	395.364	399.390	403.452	407.550	411.686	415.858	420.068	424.315	428.600	432.923	437.283
-36.05	1.013	359.208	363.010	366.823	370.653	374.505	378.383	382.290	386.226	390.195	394.196	398.231	402.301	406.407	410.548	414.725	418.938	423.188	427.475	431.799	436.160	440.557
-35	1.066	359.830	363.650	367.479	371.325	375.192	379.084	383.004	386.954	390.936	394.950	398.997	403.079	407.196	411.349	415.537	419.761	424.022	428.320	432.654	437.025	441.433
-30	1.348	362.763	366.668	370.577	374.497	378.437	382.398	386.385	390.399	394.443	398.518	402.625	406.764	410.938	415.145	419.388	423.665	427.978	432.327	436.712	441.132	445.589
-25	1.685	365.658	369.653	373.645	377.645	381.659	385.692	389.748	393.829	397.937	402.075	406.242	410.442	414.673	418.937	423.235	427.567	431.933	436.334	440.770	445.241	449.747
-20	2.085	368.511	372.600	376.679	380.761	384.853	388.961	393.088	397.239	401.414	405.616	409.847	414.107	418.398	422.720	427.075	431.463	435.883	440.337	444.826	449.348	453.905
-15	2.556	371.315	375.502	379.673	383.841	388.015	392.200	396.402	400.624	404.869	409.138	413.433	417.757	422.109	426.491	430.904	435.349	439.825	444.334	448.876	453.450	458.059
-10	3.104	374.063	378.354	382.622	386.880	391.139	395.406	399.685	403.981	408.297	412.636	416.998	421.387	425.802	430.246	434.719	439.222	443.755	448.320	452.917	457.545	462.206
-5	3.738	376.748	381.149	385.519	389.872	394.220	398.571	402.931	407.305	411.696	416.106	420.538	424.993	429.474	433.981	438.516	443.079	447.671	452.293	456.945	461.629	466.343
0	4.468	379.361	383.880	388.356	392.809	397.251	401.692	406.136	410.591	415.059	419.544	424.048	428.573	433.121	437.693	442.291	446.916	451.568	456.249	460.959	465.698	470.467
5	5.301	381.893	386.537	391.128	395.687	400.228	404.761	409.295	413.834	418.383	422.945	427.524	432.121	436.738	441.378	446.042	450.730	455.444	460.185	464.954	469.751	474.576
10	6.247	384.334	389.112	393.825	398.496	403.142	407.775	412.401	417.029	421.662	426.306	430.962	435.633	440.323	445.032	449.763	454.517	459.295	464.098	468.927	473.783	478.666
15	7.316	386.669	391.593	396.438	401.230	405.988	410.725	415.450	420.171	424.893	429.620	434.357	439.107	443.871	448.653	453.453	458.275	463.118	467.985	472.876	477.792	482.734
20	8.518	388.884	393.968	398.956	403.878	408.757	413.605	418.435	423.254	428.069	432.885	437.706	442.536	447.378	452.235	457.108	461.999	466.910	471.842	476.797	481.776	486.778
25	9.864	390.960	396.223	401.368	406.433	411.441	416.409	421.350	426.273	431.186	436.094	441.004	445.918	450.841	455.775	460.722	465.686	470.667	475.667	480.688	485.730	490.795
30	11.365	392.874	398.340	403.661	408.882	414.031	419.127	424.187	429.220	434.237	439.243	444.245	449.247	454.254	459.269	464.294	469.332	474.385	479.455	484.544	489.652	494.781
35	13.032	394.603	400.302	405.821	411.215	416.517	421.752	426.939	432.090	437.216	442.325	447.424	452.519	457.613	462.712	467.818	472.934	478.062	483.204	488.363	493.538	498.733
40	14.877	396.112	402.085	407.830	413.417	418.888	424.274	429.598	434.874	440.117	445.335	450.536	455.728	460.914	466.101	471.291	476.487	481.693	486.910	492.141	497.387	502.649
45	16.916	397.363	403.663	409.669	415.472	421.131	426.682	432.154	437.565	442.932	448.265	453.575	458.868	464.152	469.430	474.707	479.988	485.274	490.569	495.874	501.193	506.525
50	19.162	398.302	405.001	411.312	417.363	423.230	428.963	434.596	440.153	445.652	451.109	456.533	461.934	467.319	472.694	478.063	483.431	488.801	494.176	499.560	504.953	510.358
55	21.632	398.855	406.057	412.731	419.067	425.169	431.103	436.912	442.627	448.270	453.858	459.404	464.919	470.411	475.887	481.352	486.811	492.269	497.728	503.192	508.663	514.143
60	24.345	398.912	406.770	413.887	420.555	426.925	433.083	439.087	444.973	450.771	456.501	462.177	467.813	473.419	479.001	484.567	490.122	495.671	501.218	506.766	512.317	517.875
65	27.325	398.302	407.061	414.730	421.794	428.471	434.883	441.102	447.177	453.143	459.025	464.841	470.606	476.332	482.027	487.700	493.356	499.001	504.639	510.274	515.909	521.547
70	30.602	396.721	406.812	415.192	422.734	429.771	436.470	442.930	449.214	455.365	461.412	467.379	473.282	479.136	484.951	490.737	496.499	502.245	507.979	513.705	519.428	525.151
75	34.222	393.539	405.834	415.169	423.302	430.765	437.797	444.530	451.048	457.401	463.630	469.760	475.814	481.806	487.749	493.655	499.530	505.383	511.218	517.041	522.857	528.668
80	38.279	386.891	403.751	414.443	423.339	431.323	438.751	445.803	452.587	459.172	465.604	471.916	478.135	484.279	490.363	496.399	502.397	508.365	514.309	520.236	526.150	532.056

Thermodynamic properties of R-438A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.010	1.885	1.902	1.918	1.935	1.951	1.967	1.983	1.999	2.015	2.030	2.046	2.061	2.076	2.091	2.106	2.120	2.135	2.149	2.164	2.178	2.192
-95	0.017	1.859	1.876	1.893	1.909	1.925	1.941	1.957	1.973	1.988	2.004	2.019	2.034	2.049	2.064	2.078	2.093	2.107	2.122	2.136	2.150	2.164
-90	0.028	1.837	1.853	1.870	1.886	1.902	1.918	1.933	1.949	1.964	1.980	1.995	2.010	2.024	2.039	2.054	2.068	2.083	2.097	2.111	2.125	2.139
-85	0.043	1.816	1.833	1.849	1.865	1.881	1.897	1.912	1.928	1.943	1.958	1.973	1.988	2.002	2.017	2.031	2.046	2.060	2.074	2.088	2.102	2.116
-80	0.065	1.798	1.814	1.830	1.846	1.862	1.878	1.893	1.908	1.923	1.938	1.953	1.968	1.983	1.997	2.011	2.026	2.040	2.054	2.068	2.082	2.095
-75	0.096	1.781	1.797	1.813	1.829	1.845	1.860	1.876	1.891	1.906	1.921	1.936	1.950	1.965	1.979	1.993	2.007	2.022	2.036	2.049	2.063	2.077
-70	0.138	1.766	1.782	1.798	1.814	1.830	1.845	1.860	1.875	1.890	1.905	1.920	1.934	1.949	1.963	1.977	1.991	2.005	2.019	2.033	2.046	2.060
-65	0.195	1.753	1.769	1.785	1.800	1.816	1.831	1.846	1.861	1.876	1.891	1.905	1.920	1.934	1.948	1.962	1.976	1.990	2.004	2.018	2.031	2.045
-60	0.269	1.741	1.757	1.773	1.788	1.804	1.819	1.834	1.849	1.863	1.878	1.893	1.907	1.921	1.935	1.949	1.963	1.977	1.991	2.004	2.018	2.031
-55	0.366	1.730	1.746	1.762	1.777	1.793	1.808	1.823	1.837	1.852	1.867	1.881	1.895	1.909	1.924	1.937	1.951	1.965	1.979	1.992	2.006	2.019
-50	0.488	1.720	1.736	1.752	1.767	1.783	1.798	1.813	1.827	1.842	1.856	1.871	1.885	1.899	1.913	1.927	1.941	1.954	1.968	1.981	1.995	2.008
-45	0.642	1.712	1.728	1.743	1.759	1.774	1.789	1.804	1.818	1.833	1.847	1.862	1.876	1.890	1.904	1.917	1.931	1.945	1.958	1.972	1.985	1.998
-40	0.833	1.704	1.720	1.735	1.751	1.766	1.781	1.796	1.810	1.825	1.839	1.853	1.867	1.881	1.895	1.909	1.923	1.936	1.950	1.963	1.976	1.989
-36.05	1.013	1.698	1.714	1.730	1.745	1.760	1.775	1.790	1.805	1.819	1.833	1.847	1.862	1.875	1.889	1.903	1.917	1.930	1.944	1.957	1.970	1.983
-35	1.066	1.697	1.713	1.728	1.744	1.759	1.774	1.788	1.803	1.818	1.832	1.846	1.860	1.874	1.888	1.901	1.915	1.929	1.942	1.955	1.969	1.982
-30	1.348	1.691	1.706	1.722	1.737	1.752	1.767	1.782	1.797	1.811	1.825	1.839	1.853	1.867	1.881	1.895	1.908	1.922	1.935	1.948	1.962	1.975
-25	1.685	1.685	1.701	1.716	1.732	1.747	1.762	1.776	1.791	1.805	1.820	1.834	1.848	1.862	1.875	1.889	1.902	1.916	1.929	1.942	1.955	1.969
-20	2.085	1.680	1.696	1.711	1.727	1.742	1.757	1.771	1.786	1.800	1.815	1.829	1.843	1.856	1.870	1.884	1.897	1.911	1.924	1.937	1.950	1.963
-15	2.556	1.675	1.691	1.707	1.722	1.737	1.752	1.767	1.782	1.796	1.810	1.824	1.838	1.852	1.866	1.879	1.893	1.906	1.919	1.932	1.945	1.958
-10	3.104	1.671	1.687	1.703	1.718	1.733	1.748	1.763	1.778	1.792	1.806	1.820	1.834	1.848	1.862	1.875	1.889	1.902	1.915	1.928	1.941	1.954
-5	3.738	1.667	1.683	1.699	1.715	1.730	1.745	1.760	1.774	1.789	1.803	1.817	1.831	1.844	1.858	1.872	1.885	1.898	1.911	1.925	1.938	1.950
0	4.468	1.664	1.680	1.696	1.712	1.727	1.742	1.757	1.771	1.786	1.800	1.814	1.828	1.841	1.855	1.869	1.882	1.895	1.908	1.921	1.934	1.947
5	5.301	1.660	1.677	1.693	1.709	1.724	1.739	1.754	1.768	1.783	1.797	1.811	1.825	1.839	1.852	1.866	1.879	1.893	1.906	1.919	1.932	1.945
10	6.247	1.657	1.674	1.690	1.706	1.721	1.737	1.751	1.766	1.781	1.795	1.809	1.823	1.837	1.850	1.864	1.877	1.890	1.903	1.917	1.929	1.942
15	7.316	1.654	1.671	1.688	1.704	1.719	1.734	1.749	1.764	1.779	1.793	1.807	1.821	1.835	1.848	1.862	1.875	1.888	1.902	1.915	1.928	1.940
20	8.518	1.651	1.669	1.685	1.701	1.717	1.732	1.747	1.762	1.777	1.791	1.805	1.819	1.833	1.847	1.860	1.874	1.887	1.900	1.913	1.926	1.939
25	9.864	1.649	1.666	1.683	1.699	1.715	1.731	1.746	1.761	1.775	1.790	1.804	1.818	1.832	1.845	1.859	1.872	1.886	1.899	1.912	1.925	1.937
30	11.365	1.646	1.663	1.681	1.697	1.713	1.729	1.744	1.759	1.774	1.788	1.803	1.817	1.831	1.844	1.858	1.871	1.885	1.898	1.911	1.924	1.936
35	13.032	1.642	1.661	1.678	1.695	1.711	1.727	1.743	1.758	1.773	1.787	1.802	1.816	1.830	1.843	1.857	1.870	1.884	1.897	1.910	1.923	1.936
40	14.877	1.639	1.658	1.676	1.693	1.710	1.726	1.741	1.757	1.771	1.786	1.801	1.815	1.829	1.843	1.856	1.870	1.883	1.896	1.909	1.922	1.935
45	16.916	1.635	1.655	1.673	1.691	1.708	1.724	1.740	1.755	1.770	1.785	1.800	1.814	1.828	1.842	1.856	1.869	1.882	1.896	1.909	1.922	1.935
50	19.162	1.631	1.651	1.671	1.689	1.706	1.722	1.738	1.754	1.769	1.784	1.799	1.813	1.827	1.841	1.855	1.869	1.882	1.895	1.908	1.921	1.934
55	21.632	1.626	1.648	1.667	1.686	1.704	1.721	1.737	1.753	1.768	1.783	1.798	1.813	1.827	1.841	1.855	1.868	1.882	1.895	1.908	1.921	1.934
60	24.345	1.620	1.643	1.664	1.683	1.701	1.719	1.735	1.751	1.767	1.782	1.797	1.812	1.826	1.840	1.854	1.868	1.881	1.895	1.908	1.921	1.934
65	27.325	1.612	1.638	1.660	1.680	1.699	1.717	1.734	1.750	1.766	1.781	1.796	1.811	1.826	1.840	1.854	1.868	1.881	1.895	1.908	1.921	1.934
70	30.602	1.602	1.631	1.655	1.676	1.696	1.714	1.732	1.748	1.764	1.780	1.795	1.810	1.825	1.839	1.853	1.867	1.881	1.894	1.908	1.921	1.934
75	34.222	1.588	1.623	1.649	1.672	1.692	1.711	1.729	1.746	1.763	1.779	1.794	1.809	1.824	1.838	1.853	1.867	1.880	1.894	1.907	1.921	1.934
80	38.279	1.565	1.612	1.642	1.666	1.688	1.707	1.726	1.743	1.760	1.777	1.792	1.808	1.823	1.837	1.852	1.866	1.880	1.893	1.907	1.920	1.933

R-507A

Azeotropic blend (50 % R-125 - 50 % R-143a)

Molecular weight (g/mol)	98.86
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-46.75
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	70.6
Critical pressure (bar absolute)	37.05
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.539
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.872
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.117
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.127
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	4.33
Classification NF-EN 378	A1
GWP (IPCC 4)	3985

Main applications

R-507A is an "near azeotropic" HFC blend. It is typically used in industrial refrigeration applications including those with flooded evaporators, such as ice skating rinks.

Commercial specifications

Composition: (50 % R-125 - 50 % R-143a) (+1.5% - 0.5% / +0.5% - 1.5%).
Purity: ≥ 99,5 % weight.
Water content: ≤ 10 ppm weight.
Chloride ion test: negative.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1,5 % volume.
High boiling residue: ≤ 0,01 % volume.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-507A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.030	-100	0.677	1.477	74.406	0.432	-99.95	4.909	0.204	303.932	1.758	229.526
0.046	-95	0.684	1.462	80.476	0.467	-94.96	3.244	0.308	306.875	1.738	226.399
0.069	-90	0.691	1.447	86.512	0.500	-89.97	2.204	0.454	309.846	1.720	223.334
0.102	-85	0.698	1.432	92.531	0.533	-84.98	1.535	0.651	312.840	1.704	220.309
0.147	-80	0.706	1.417	98.545	0.564	-79.99	1.094	0.914	315.854	1.689	217.309
0.206	-75	0.713	1.402	104.565	0.595	-74.99	0.796	1.256	318.881	1.677	214.316
0.284	-70	0.721	1.387	110.600	0.625	-70.0	0.590	1.695	321.918	1.665	211.318
0.384	-65	0.729	1.372	116.658	0.654	-65.0	0.445	2.248	324.959	1.655	208.301
0.511	-60	0.737	1.357	122.745	0.683	-60.0	0.341	2.936	327.998	1.646	205.254
0.669	-55	0.745	1.342	128.866	0.712	-55.0	0.264	3.782	331.031	1.638	202.165
0.864	-50	0.754	1.327	135.029	0.740	-50.0	0.208	4.808	334.051	1.631	199.022
1.013	-46.75	0.759	1.317	139.062	0.757	-46.75	0.179	5.585	336.006	1.627	196.943
1.101	-45	0.763	1.311	141.236	0.767	-45.0	0.166	6.041	337.051	1.625	195.815
1.387	-40	0.772	1.296	147.495	0.794	-40.0	0.133	7.510	340.027	1.620	192.533
1.727	-35	0.782	1.280	153.808	0.821	-35.0	0.108	9.246	342.972	1.615	189.163
2.129	-30	0.792	1.263	160.182	0.847	-29.99	0.089	11.283	345.878	1.611	185.696
2.599	-25	0.802	1.246	166.621	0.873	-24.99	0.073	13.659	348.740	1.607	182.119
3.145	-20	0.813	1.229	173.131	0.899	-19.99	0.061	16.415	351.550	1.604	178.419
3.775	-15	0.825	1.212	179.717	0.924	-14.99	0.051	19.598	354.299	1.601	174.582
4.495	-10	0.838	1.194	186.386	0.950	-9.98	0.043	23.261	356.979	1.598	170.593
5.316	-5	0.851	1.175	193.144	0.975	-4.98	0.036	27.462	359.579	1.596	166.435
6.244	0	0.865	1.156	200.000	1.000	0.02	0.031	32.273	362.086	1.593	162.086
7.289	5	0.880	1.136	206.963	1.025	5.02	0.026	37.774	364.484	1.591	157.522
8.460	10	0.896	1.116	214.043	1.050	10.03	0.023	44.061	366.757	1.589	152.714
9.766	15	0.914	1.094	221.254	1.075	15.03	0.020	51.252	368.883	1.587	147.630
11.218	20	0.933	1.072	228.610	1.099	20.03	0.017	59.490	370.838	1.585	142.228
12.826	25	0.954	1.048	236.130	1.124	25.03	0.015	68.954	372.592	1.582	136.462
14.600	30	0.978	1.023	243.840	1.149	30.03	0.013	79.875	374.109	1.579	130.269
16.553	35	1.005	0.995	251.769	1.175	35.04	0.011	92.561	375.341	1.576	123.571
18.696	40	1.035	0.966	259.962	1.200	40.04	0.009	107.433	376.223	1.572	116.261
21.044	45	1.071	0.934	268.478	1.227	45.04	0.008	125.104	376.662	1.567	108.185
23.612	50	1.114	0.898	277.409	1.254	50.03	0.007	146.524	376.513	1.560	99.104
26.419	55	1.168	0.856	286.910	1.282	55.03	0.006	173.313	375.531	1.552	88.621
29.486	60	1.241	0.806	297.281	1.312	60.03	0.005	208.680	373.236	1.540	75.956
32.847	65	1.353	0.739	309.297	1.347	65.02	0.004	261.006	368.403	1.521	59.106
36.562	70	1.668	0.600	328.324	1.401	70.01	0.003	385.806	353.378	1.474	25.053

Thermodynamic properties of R-507A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.029	4929.311	5074.758	5219.852	5364.645	5509.187	5653.517	5797.672	5941.678	6085.560	6229.337	6373.025	6516.637	6660.184	6803.676	6947.120	7090.522	7233.888	7377.222	7520.528	7663.810	7807.070
-95	0.046	3253.596	3347.504	3441.138	3534.536	3627.733	3720.760	3813.643	3906.403	3999.060	4091.629	4184.123	4276.552	4368.926	4461.252	4553.536	4645.784	4738.001	4830.189	4922.353	5014.495	5106.617
-90	0.069	2208.517	2270.998	2333.264	2395.341	2457.257	2519.033	2580.691	2642.247	2703.716	2765.111	2826.441	2887.717	2948.945	3010.132	3071.282	3132.400	3193.491	3254.557	3315.601	3376.625	3437.632
-85	0.102	1537.506	1580.233	1622.788	1665.192	1707.462	1749.618	1791.676	1833.648	1875.547	1917.382	1959.163	2000.896	2042.588	2084.243	2125.867	2167.463	2209.034	2250.583	2292.113	2333.625	2375.122
-80	0.146	1095.131	1125.093	1154.916	1184.614	1214.202	1243.695	1273.105	1302.443	1331.719	1360.940	1390.113	1419.246	1448.342	1477.407	1506.443	1535.455	1564.445	1593.416	1622.369	1651.306	1680.229
-75	0.206	796.376	817.879	839.266	860.549	881.741	902.852	923.892	944.871	965.796	986.675	1007.512	1028.313	1049.082	1069.824	1090.540	1111.235	1131.910	1152.567	1173.209	1193.837	1214.452
-70	0.284	590.121	605.886	621.553	637.133	652.634	668.067	683.439	698.759	714.031	729.263	744.459	759.623	774.759	789.870	804.960	820.029	835.081	850.117	865.139	880.148	895.146
-65	0.384	444.824	456.614	468.319	479.949	491.512	503.015	514.466	525.871	537.235	548.563	559.860	571.128	582.371	593.593	604.794	615.978	627.146	638.300	649.441	660.570	671.688
-60	0.511	340.556	349.537	358.443	367.284	376.066	384.796	393.480	402.124	410.732	419.308	427.856	436.379	444.880	453.360	461.823	470.270	478.703	487.122	495.530	503.927	512.315
-55	0.669	264.445	271.404	278.297	285.132	291.915	298.652	305.349	312.010	318.639	325.239	331.814	338.367	344.900	351.415	357.913	364.397	370.868	377.328	383.776	390.215	396.645
-50	0.864	208.007	213.487	218.907	224.275	229.597	234.878	240.122	245.335	250.518	255.677	260.812	265.928	271.025	276.106	281.172	286.225	291.266	296.296	301.316	306.328	311.331
-46.75	1.013	179.058	183.787	188.460	193.084	197.664	202.207	206.715	211.194	215.645	220.073	224.480	228.867	233.237	237.592	241.933	246.262	250.579	254.886	259.184	263.473	267.754
-45	1.101	165.545	169.926	174.252	178.530	182.767	186.967	191.134	195.272	199.385	203.474	207.542	211.592	215.626	219.644	223.650	227.643	231.625	235.597	239.560	243.515	247.462
-40	1.387	133.168	136.719	140.221	143.678	147.098	150.483	153.839	157.169	160.475	163.760	167.026	170.275	173.509	176.730	179.938	183.135	186.322	189.499	192.668	195.829	198.984
-35	1.727	108.170	111.088	113.959	116.790	119.585	122.350	125.087	127.800	130.491	133.163	135.818	138.457	141.082	143.695	146.296	148.887	151.468	154.041	156.606	159.163	161.714
-30	2.128	88.647	91.075	93.458	95.804	98.117	100.402	102.661	104.897	107.114	109.313	111.496	113.664	115.820	117.963	120.097	122.220	124.335	126.441	128.541	130.633	132.720
-25	2.598	73.233	75.278	77.280	79.247	81.182	83.092	84.977	86.842	88.688	90.517	92.332	94.133	95.922	97.700	99.468	101.227	102.978	104.722	106.458	108.188	109.913
-20	3.144	60.942	62.683	64.384	66.051	67.689	69.302	70.892	72.463	74.017	75.554	77.078	78.590	80.090	81.579	83.059	84.531	85.995	87.453	88.903	90.348	91.787
-15	3.773	51.048	52.548	54.008	55.436	56.836	58.212	59.567	60.904	62.224	63.529	64.821	66.102	67.371	68.631	69.882	71.125	72.361	73.590	74.813	76.031	77.243
-10	4.493	43.014	44.319	45.586	46.821	48.030	49.215	50.381	51.529	52.661	53.779	54.885	55.980	57.064	58.139	59.206	60.265	61.317	62.363	63.403	64.438	65.468
-5	5.312	36.436	37.583	38.693	39.772	40.825	41.856	42.868	43.863	44.842	45.809	46.763	47.707	48.641	49.566	50.483	51.393	52.296	53.194	54.085	54.972	55.854
0	6.240	31.007	32.026	33.008	33.959	34.886	35.790	36.676	37.545	38.400	39.242	40.072	40.893	41.703	42.506	43.301	44.089	44.870	45.646	46.417	47.182	47.943
5	7.284	26.493	27.408	28.285	29.132	29.954	30.754	31.536	32.302	33.054	33.793	34.521	35.239	35.948	36.650	37.344	38.031	38.712	39.388	40.058	40.724	41.386
10	8.453	22.714	23.543	24.334	25.095	25.830	26.544	27.240	27.920	28.586	29.240	29.883	30.517	31.142	31.759	32.369	32.973	33.570	34.163	34.751	35.334	35.913
15	9.758	19.528	20.288	21.009	21.698	22.361	23.003	23.627	24.235	24.830	25.412	25.984	26.547	27.101	27.648	28.188	28.722	29.250	29.773	30.291	30.805	31.315
20	11.209	16.825	17.530	18.192	18.822	19.425	20.007	20.570	21.118	21.652	22.175	22.687	23.190	23.684	24.172	24.653	25.127	25.597	26.061	26.521	26.977	27.428
25	12.815	14.516	15.177	15.792	16.373	16.926	17.457	17.969	18.466	18.949	19.421	19.882	20.334	20.779	21.216	21.647	22.071	22.491	22.906	23.316	23.722	24.125
30	14.587	12.532	13.160	13.737	14.277	14.788	15.276	15.745	16.198	16.638	17.066	17.484	17.893	18.295	18.689	19.077	19.459	19.836	20.209	20.577	20.941	21.301
35	16.538	10.815	11.420	11.967	12.473	12.949	13.400	13.833	14.249	14.651	15.043	15.424	15.796	16.160	16.518	16.869	17.215	17.555	17.891	18.223	18.551	18.876
40	18.680	9.318	9.910	10.435	10.914	11.360	11.781	12.182	12.566	12.937	13.296	13.645	13.985	14.318	14.643	14.963	15.277	15.586	15.891	16.191	16.488	16.782
45	21.027	8.002	8.593	9.102	9.559	9.981	10.376	10.750	11.107	11.450	11.781	12.102	12.415	12.720	13.018	13.310	13.597	13.878	14.156	14.429	14.699	14.965
50	23.593	6.833	7.437	7.937	8.378	8.779	9.152	9.502	9.836	10.155	10.462	10.759	11.047	11.328	11.602	11.870	12.133	12.391	12.644	12.894	13.140	13.383
55	26.399	5.777	6.415	6.914	7.343	7.727	8.081	8.411	8.724	9.022	9.308	9.584	9.851	10.110	10.363	10.610	10.851	11.088	11.321	11.550	11.775	11.997
60	29.467	4.798	5.507	6.012	6.432	6.803	7.140	7.453	7.747	8.027	8.294	8.551	8.799	9.039	9.273	9.501	9.724	9.943	10.157	10.367	10.574	10.778
65	32.829	3.836	4.692	5.212	5.627	5.986	6.309	6.606	6.884	7.147	7.397	7.637	7.868	8.092	8.309	8.520	8.726	8.928	9.126	9.319	9.510	9.697
70	36.553	2.597	3.953	4.494	4.906	5.255	5.565	5.848	6.111	6.359	6.593	6.818	7.034	7.242	7.443	7.640	7.831	8.017	8.200	8.379	8.554	8.727

Thermodynamic properties of R-507A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.029	303.904	307.016	310.175	313.381	316.635	319.938	323.291	326.692	330.143	333.644	337.194	340.794	344.443	348.141	351.889	355.685	359.530	363.423	367.364	371.352	375.389
-95	0.046	306.854	310.031	313.253	316.521	319.836	323.199	326.610	330.069	333.576	337.132	340.737	344.391	348.093	351.844	355.643	359.491	363.386	367.329	371.320	375.358	379.443
-90	0.069	309.830	313.073	316.360	319.692	323.069	326.492	329.962	333.479	337.043	340.656	344.316	348.024	351.779	355.583	359.435	363.334	367.280	371.274	375.314	379.402	383.536
-85	0.102	312.829	316.140	319.493	322.889	326.329	329.814	333.344	336.920	340.542	344.211	347.927	351.690	355.499	359.356	363.260	367.211	371.209	375.253	379.344	383.481	387.664
-80	0.146	315.846	319.226	322.646	326.108	329.613	333.160	336.751	340.387	344.068	347.795	351.567	355.385	359.250	363.161	367.118	371.121	375.170	379.265	383.406	387.593	391.825
-75	0.206	318.876	322.327	325.817	329.346	332.916	336.527	340.181	343.878	347.618	351.403	355.233	359.107	363.027	366.992	371.003	375.059	379.160	383.306	387.498	391.735	396.016
-70	0.284	321.915	325.439	328.999	332.597	336.234	339.911	343.628	347.387	351.188	355.032	358.920	362.852	366.828	370.848	374.913	379.022	383.176	387.374	391.617	395.904	400.235
-65	0.384	324.958	328.556	332.189	335.858	339.563	343.307	347.089	350.911	354.774	358.679	362.626	366.615	370.648	374.724	378.843	383.007	387.213	391.464	395.758	400.096	404.477
-60	0.511	327.998	331.674	335.382	339.123	342.899	346.710	350.559	354.446	358.372	362.338	366.345	370.394	374.484	378.617	382.792	387.010	391.270	395.574	399.920	404.309	408.741
-55	0.669	331.031	334.788	338.573	342.389	346.236	350.118	354.034	357.987	361.978	366.007	370.075	374.184	378.333	382.523	386.754	391.028	395.342	399.699	404.098	408.539	413.022
-50	0.864	334.051	337.891	341.756	345.649	349.571	353.524	357.510	361.531	365.587	369.680	373.811	377.981	382.190	386.438	390.727	395.056	399.426	403.838	408.290	412.783	417.317
-46.75	1.013	336.006	339.902	343.821	347.765	351.737	355.738	359.770	363.836	367.936	372.071	376.244	380.454	384.702	388.989	393.316	397.682	402.089	406.536	411.023	415.550	420.118
-45	1.101	337.051	340.978	344.927	348.899	352.897	356.924	360.982	365.072	369.196	373.354	377.549	381.781	386.051	390.359	394.706	399.093	403.519	407.985	412.491	417.037	421.623
-40	1.387	340.026	344.045	348.079	352.134	356.211	360.314	364.446	368.607	372.799	377.025	381.285	385.581	389.913	394.282	398.688	403.133	407.616	412.138	416.698	421.298	425.937
-35	1.727	342.970	347.084	351.208	355.348	359.507	363.689	367.896	372.130	376.394	380.689	385.016	389.376	393.771	398.202	402.669	407.173	411.714	416.292	420.909	425.563	430.256
-30	2.128	345.875	350.090	354.308	358.537	362.781	367.044	371.329	375.639	379.975	384.340	388.736	393.163	397.623	402.117	406.646	411.210	415.810	420.446	425.119	429.829	434.576
-25	2.598	348.736	353.056	357.373	361.695	366.027	370.374	374.740	379.127	383.538	387.976	392.442	396.937	401.464	406.022	410.614	415.240	419.900	424.595	429.325	434.091	438.893
-20	3.144	351.544	355.976	360.397	364.815	369.239	373.674	378.123	382.590	387.079	391.592	396.130	400.695	405.290	409.915	414.571	419.259	423.980	428.735	433.524	438.348	443.206
-15	3.773	354.292	358.843	363.372	367.893	372.412	376.938	381.474	386.024	390.593	395.183	399.795	404.433	409.097	413.790	418.512	423.264	428.048	432.864	437.713	442.595	447.510
-10	4.493	356.970	361.647	366.292	370.920	375.540	380.160	384.787	389.424	394.076	398.745	403.434	408.146	412.882	417.644	422.434	427.252	432.100	436.978	441.888	446.829	451.802
-5	5.312	359.569	364.381	369.148	373.889	378.616	383.336	388.057	392.785	397.522	402.274	407.043	411.831	416.641	421.475	426.334	431.219	436.133	441.075	446.046	451.048	456.081
0	6.240	362.075	367.032	371.932	376.794	381.632	386.458	391.279	396.101	400.928	405.765	410.616	415.484	420.370	425.277	430.207	435.162	440.142	445.150	450.185	455.248	460.341
5	7.284	364.473	369.590	374.632	379.624	384.583	389.521	394.446	399.367	404.288	409.214	414.151	419.100	424.064	429.047	434.051	439.076	444.126	449.200	454.300	459.427	464.582
10	8.453	366.745	372.039	377.238	382.372	387.460	392.517	397.553	402.577	407.597	412.616	417.641	422.675	427.721	432.782	437.861	442.960	448.080	453.222	458.389	463.581	468.799
15	9.758	368.871	374.366	379.739	385.027	390.254	395.439	400.593	405.727	410.849	415.966	421.083	426.205	431.335	436.477	441.634	446.808	452.001	457.214	462.449	467.707	472.989
20	11.209	370.826	376.551	382.120	387.578	392.958	398.279	403.559	408.809	414.039	419.258	424.472	429.685	434.903	440.129	445.367	450.618	455.886	461.171	466.477	471.803	477.151
25	12.815	372.581	378.576	384.367	390.015	395.560	401.029	406.443	411.817	417.162	422.488	427.802	433.112	438.421	443.734	449.055	454.387	459.731	465.092	470.469	475.865	481.281
30	14.587	374.099	380.416	386.462	392.323	398.050	403.681	409.239	414.744	420.211	425.650	431.070	436.479	441.884	447.287	452.695	458.109	463.534	468.971	474.423	479.891	485.377
35	16.538	375.333	382.043	388.387	394.487	400.417	406.223	411.937	417.583	423.179	428.737	434.269	439.784	445.287	450.785	456.283	461.783	467.291	472.807	478.335	483.877	489.435
40	18.680	376.218	383.420	390.116	396.491	402.646	408.645	414.528	420.326	426.059	431.745	437.395	443.019	448.627	454.223	459.814	465.404	470.997	476.596	482.203	487.822	493.453
45	21.027	376.661	384.500	391.621	398.313	404.723	410.935	417.003	422.964	428.845	434.666	440.440	446.181	451.898	457.597	463.286	468.969	474.650	480.334	486.023	491.720	497.427
50	23.593	376.517	385.224	392.868	399.932	406.631	413.080	419.350	425.489	431.528	437.493	443.400	449.263	455.094	460.901	466.692	472.472	478.246	484.017	489.791	495.569	501.354
55	26.399	375.541	385.511	393.816	401.321	408.350	415.064	421.557	427.888	434.099	440.217	446.265	452.258	458.210	464.130	470.027	475.908	481.778	487.641	493.502	499.364	505.230
60	29.467	373.256	385.252	394.412	402.446	409.856	416.868	423.607	430.149	436.544	442.828	449.025	455.156	461.235	467.275	473.283	479.270	485.239	491.198	497.150	503.099	509.049
65	32.829	368.438	384.299	394.592	403.265	411.115	418.464	425.476	432.248	438.844	445.305	451.663	457.941	464.155	470.320	476.446	482.543	488.618	494.676	500.722	506.762	512.799
70	36.553	353.473	382.413	394.227	403.681	412.048	419.781	427.100	434.128	440.945	447.600	454.132	460.568	466.927	473.226	479.478	485.692	491.878	498.041	504.188	510.323	516.450

Thermodynamic properties of R-507A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.029	1.758	1.776	1.793	1.810	1.827	1.844	1.861	1.878	1.894	1.910	1.926	1.942	1.958	1.974	1.989	2.005	2.020	2.035	2.050	2.066	2.080
-95	0.046	1.738	1.755	1.773	1.790	1.807	1.824	1.840	1.857	1.873	1.889	1.905	1.921	1.936	1.952	1.967	1.983	1.998	2.013	2.028	2.043	2.058
-90	0.069	1.720	1.737	1.754	1.771	1.788	1.805	1.821	1.838	1.854	1.870	1.886	1.901	1.917	1.933	1.948	1.963	1.978	1.993	2.008	2.023	2.038
-85	0.102	1.704	1.721	1.738	1.755	1.772	1.788	1.805	1.821	1.837	1.853	1.869	1.884	1.900	1.915	1.930	1.946	1.961	1.976	1.990	2.005	2.020
-80	0.146	1.689	1.707	1.724	1.740	1.757	1.774	1.790	1.806	1.822	1.838	1.853	1.869	1.884	1.900	1.915	1.930	1.945	1.960	1.974	1.989	2.004
-75	0.206	1.677	1.694	1.711	1.727	1.744	1.760	1.777	1.793	1.809	1.824	1.840	1.855	1.871	1.886	1.901	1.916	1.931	1.946	1.960	1.975	1.989
-70	0.284	1.665	1.682	1.699	1.716	1.732	1.749	1.765	1.781	1.797	1.812	1.828	1.843	1.858	1.874	1.889	1.903	1.918	1.933	1.948	1.962	1.976
-65	0.384	1.655	1.672	1.689	1.706	1.722	1.738	1.754	1.770	1.786	1.802	1.817	1.832	1.848	1.863	1.878	1.892	1.907	1.922	1.936	1.951	1.965
-60	0.511	1.646	1.663	1.680	1.697	1.713	1.729	1.745	1.761	1.777	1.792	1.808	1.823	1.838	1.853	1.868	1.883	1.897	1.912	1.926	1.941	1.955
-55	0.669	1.638	1.655	1.672	1.689	1.705	1.721	1.737	1.753	1.768	1.784	1.799	1.814	1.829	1.844	1.859	1.874	1.889	1.903	1.917	1.932	1.946
-50	0.864	1.631	1.648	1.665	1.682	1.698	1.714	1.730	1.746	1.761	1.777	1.792	1.807	1.822	1.837	1.852	1.866	1.881	1.895	1.910	1.924	1.938
-46.75	1.013	1.627	1.644	1.661	1.678	1.694	1.710	1.726	1.742	1.757	1.772	1.788	1.803	1.818	1.833	1.847	1.862	1.876	1.891	1.905	1.919	1.933
-45	1.101	1.625	1.642	1.659	1.675	1.692	1.708	1.724	1.739	1.755	1.770	1.786	1.801	1.816	1.830	1.845	1.860	1.874	1.889	1.903	1.917	1.931
-40	1.387	1.620	1.637	1.654	1.670	1.686	1.702	1.718	1.734	1.749	1.765	1.780	1.795	1.810	1.825	1.839	1.854	1.868	1.883	1.897	1.911	1.925
-35	1.727	1.615	1.632	1.649	1.665	1.682	1.698	1.714	1.729	1.745	1.760	1.775	1.790	1.805	1.820	1.834	1.849	1.863	1.877	1.892	1.906	1.920
-30	2.128	1.611	1.628	1.645	1.661	1.678	1.694	1.709	1.725	1.740	1.756	1.771	1.786	1.801	1.815	1.830	1.844	1.859	1.873	1.887	1.901	1.915
-25	2.598	1.607	1.624	1.641	1.658	1.674	1.690	1.706	1.722	1.737	1.752	1.767	1.782	1.797	1.812	1.826	1.841	1.855	1.869	1.883	1.897	1.911
-20	3.144	1.604	1.621	1.638	1.655	1.671	1.687	1.703	1.719	1.734	1.749	1.764	1.779	1.794	1.809	1.823	1.838	1.852	1.866	1.880	1.894	1.908
-15	3.773	1.601	1.618	1.635	1.652	1.668	1.684	1.700	1.716	1.731	1.747	1.762	1.777	1.791	1.806	1.821	1.835	1.849	1.863	1.877	1.891	1.905
-10	4.493	1.598	1.616	1.633	1.650	1.666	1.682	1.698	1.714	1.729	1.745	1.760	1.775	1.789	1.804	1.818	1.833	1.847	1.861	1.875	1.889	1.903
-5	5.312	1.596	1.613	1.631	1.648	1.664	1.680	1.696	1.712	1.728	1.743	1.758	1.773	1.788	1.802	1.817	1.831	1.845	1.859	1.873	1.887	1.901
0	6.240	1.593	1.611	1.629	1.646	1.662	1.679	1.695	1.711	1.726	1.741	1.757	1.772	1.786	1.801	1.815	1.830	1.844	1.858	1.872	1.886	1.900
5	7.284	1.591	1.609	1.627	1.644	1.661	1.677	1.694	1.709	1.725	1.740	1.756	1.771	1.785	1.800	1.814	1.829	1.843	1.857	1.871	1.885	1.899
10	8.453	1.589	1.608	1.626	1.643	1.660	1.676	1.693	1.708	1.724	1.740	1.755	1.770	1.785	1.799	1.814	1.828	1.842	1.856	1.870	1.884	1.898
15	9.758	1.587	1.606	1.624	1.642	1.659	1.675	1.692	1.708	1.723	1.739	1.754	1.769	1.784	1.799	1.813	1.828	1.842	1.856	1.870	1.884	1.897
20	11.209	1.585	1.604	1.623	1.640	1.658	1.675	1.691	1.707	1.723	1.739	1.754	1.769	1.784	1.798	1.813	1.827	1.842	1.856	1.870	1.883	1.897
25	12.815	1.582	1.602	1.621	1.639	1.657	1.674	1.690	1.707	1.723	1.738	1.754	1.769	1.784	1.798	1.813	1.827	1.842	1.856	1.870	1.883	1.897
30	14.587	1.579	1.600	1.619	1.638	1.656	1.673	1.690	1.706	1.722	1.738	1.753	1.769	1.784	1.798	1.813	1.827	1.842	1.856	1.870	1.884	1.897
35	16.538	1.576	1.597	1.617	1.637	1.655	1.672	1.689	1.706	1.722	1.738	1.753	1.769	1.784	1.799	1.813	1.828	1.842	1.856	1.870	1.884	1.898
40	18.680	1.572	1.595	1.615	1.635	1.654	1.671	1.689	1.706	1.722	1.738	1.754	1.769	1.784	1.799	1.814	1.828	1.842	1.857	1.871	1.884	1.898
45	21.027	1.567	1.591	1.613	1.633	1.652	1.671	1.688	1.705	1.722	1.738	1.754	1.769	1.784	1.799	1.814	1.829	1.843	1.857	1.871	1.885	1.899
50	23.593	1.560	1.587	1.610	1.631	1.651	1.670	1.687	1.705	1.721	1.738	1.754	1.769	1.785	1.800	1.815	1.829	1.844	1.858	1.872	1.886	1.899
55	26.399	1.552	1.582	1.607	1.629	1.649	1.668	1.687	1.704	1.721	1.738	1.754	1.769	1.785	1.800	1.815	1.830	1.844	1.858	1.873	1.886	1.900
60	29.467	1.540	1.576	1.603	1.626	1.647	1.667	1.686	1.703	1.721	1.737	1.754	1.770	1.785	1.800	1.815	1.830	1.845	1.859	1.873	1.887	1.901
65	32.829	1.521	1.568	1.598	1.623	1.645	1.665	1.684	1.702	1.720	1.737	1.754	1.770	1.785	1.801	1.816	1.831	1.845	1.860	1.874	1.888	1.902
70	36.553	1.474	1.558	1.592	1.618	1.641	1.663	1.682	1.701	1.719	1.736	1.753	1.769	1.785	1.801	1.816	1.831	1.846	1.860	1.874	1.888	1.902

R-508B

Azeotropic blend (46 % R-23 - 54 % R-116)

Molecular weight (g/mol)	95.39
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-87.60
Temperature glide at 1.013 bar (K)	0.44
Critical temperature (°C)	11.2
Critical pressure (bar absolute)	37.72
Specific heat (liquid) at + 25°C (kJ/kg.K)	N/A
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.757
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.136
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	N/A
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	N/A
Classification NF-EN 378	A1
GWP (IPCC 4)	13396

Main applications

R-508B is a HFC "near azeotropic" blend used for very low temperature refrigerating systems. It is used as a replacement for R-503.

Commercial specifications

Composition: (54 % R-116 - 46 % R-23) (± 2 %/± 2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
High boiling residue: ≤ 0.01 % volume.
Chloride ion test: negative.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use of HFCs are restricted by the European Union Regulation n° 517/2014.
Recovery of halogenated refrigerants is compulsory as defined by the European regulation n° 517/2014.

(For their use, pay attention to the regulation of your country).

Thermodynamic properties of R-508B - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t'	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.037	-130	0.588	1.701	44.396	0.256	-128.34	3.367	0.297	233.908	1.577	189.513
0.062	-125	0.595	1.681	49.403	0.291	-123.51	2.097	0.477	236.214	1.549	186.812
0.098	-120	0.602	1.662	54.435	0.324	-118.68	1.354	0.739	238.525	1.524	184.090
0.152	-115	0.609	1.642	59.498	0.357	-113.84	0.903	1.107	240.837	1.502	181.339
0.227	-110	0.616	1.622	64.593	0.388	-108.99	0.620	1.612	243.145	1.481	178.552
0.330	-105	0.624	1.602	69.726	0.419	-104.14	0.437	2.287	245.444	1.463	175.718
0.467	-100	0.632	1.582	74.900	0.450	-99.28	0.315	3.171	247.729	1.447	172.828
0.648	-95	0.641	1.561	80.120	0.479	-94.4	0.232	4.307	249.993	1.432	169.873
0.880	-90	0.649	1.540	85.389	0.508	-89.51	0.174	5.740	252.231	1.419	166.842
1.013	-87.6	0.654	1.530	87.935	0.522	-87.16	0.153	6.548	253.293	1.413	165.358
1.174	-85	0.659	1.518	90.714	0.537	-84.6	0.133	7.525	254.436	1.407	163.722
1.540	-80	0.668	1.497	96.098	0.565	-79.69	0.103	9.718	256.598	1.396	160.500
1.988	-75	0.678	1.474	101.549	0.593	-74.75	0.081	12.383	258.711	1.386	157.162
2.531	-70	0.689	1.451	107.071	0.620	-69.81	0.064	15.592	260.763	1.376	153.692
3.181	-65	0.701	1.427	112.672	0.647	-64.86	0.051	19.425	262.744	1.368	150.072
3.952	-60	0.713	1.403	118.360	0.674	-59.9	0.042	23.974	264.642	1.360	146.282
4.856	-55	0.726	1.378	124.143	0.700	-54.93	0.034	29.343	266.444	1.353	142.300
5.909	-50	0.740	1.352	130.032	0.727	-49.95	0.028	35.656	268.132	1.346	138.100
7.124	-45	0.755	1.325	136.038	0.753	-44.97	0.023	43.059	269.690	1.339	133.652
8.518	-40	0.772	1.296	142.176	0.779	-39.98	0.019	51.732	271.093	1.332	128.918
10.107	-35	0.790	1.266	148.462	0.805	-34.99	0.016	61.897	272.316	1.325	123.854
11.907	-30	0.810	1.234	154.918	0.831	-30.0	0.014	73.838	273.322	1.318	118.405
13.936	-25	0.833	1.201	161.571	0.858	-25.0	0.011	87.931	274.068	1.311	112.497
16.214	-20	0.859	1.164	168.460	0.885	-20.0	0.010	104.689	274.492	1.303	106.032
18.762	-15	0.889	1.124	175.635	0.912	-15.0	0.008	124.852	274.508	1.295	98.873
21.602	-10	0.926	1.080	183.177	0.940	-10.0	0.007	149.548	273.989	1.285	90.813
24.762	-5	0.971	1.030	191.215	0.969	-5.0	0.006	180.663	272.726	1.273	81.511
28.275	0	1.031	0.970	200.000	1.000	0.0	0.005	221.811	270.326	1.257	70.326
32.185	5	1.123	0.891	210.156	1.035	5.0	0.004	281.920	265.848	1.236	55.692
36.568	10	1.340	0.746	225.076	1.087	10.0	0.002	407.000	254.645	1.191	29.568

Thermodynamic properties of R-508B - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-130	0.031	3996.710	4139.547	4281.806	4423.646	4565.177	4706.476	4847.597	4988.580	5129.453	5270.239	5410.954	5551.611	5692.219	5832.787	5973.320	6113.825	6254.304	6394.761	6535.199	6675.621	6816.028
-125	0.053	2416.393	2500.537	2584.249	2667.643	2750.801	2833.777	2916.612	2999.337	3081.974	3164.538	3247.044	3329.502	3411.918	3494.301	3576.653	3658.981	3741.287	3823.573	3905.843	3988.099	4070.341
-120	0.087	1521.062	1572.837	1624.282	1675.482	1726.495	1777.364	1828.121	1878.787	1929.381	1979.915	2030.400	2080.844	2131.253	2181.633	2231.987	2282.320	2332.633	2382.930	2433.211	2483.480	2533.737
-115	0.137	992.684	1025.828	1058.713	1091.405	1123.947	1156.374	1188.708	1220.967	1253.167	1285.316	1317.424	1349.496	1381.539	1413.556	1445.551	1477.527	1509.486	1541.430	1573.361	1605.281	1637.190
-110	0.209	669.116	691.109	712.897	734.528	756.037	777.452	798.789	820.065	841.289	862.471	883.618	904.734	925.824	946.892	967.940	988.972	1009.988	1030.992	1051.983	1072.964	1093.936
-105	0.309	464.242	479.322	494.235	509.019	523.703	538.307	552.847	567.334	581.777	596.184	610.561	624.910	639.237	653.545	667.835	682.110	696.371	710.621	724.860	739.090	753.311
-100	0.445	330.537	341.191	351.706	362.114	372.438	382.693	392.894	403.050	413.168	423.255	433.314	443.350	453.367	463.365	473.349	483.319	493.276	503.224	513.161	523.090	533.011
-95	0.623	240.847	248.583	256.202	263.729	271.185	278.582	285.932	293.243	300.521	307.771	314.997	322.203	329.391	336.563	343.721	350.868	358.003	365.129	372.246	379.355	386.456
-90	0.855	179.158	184.918	190.577	196.157	201.675	207.143	212.569	217.961	223.324	228.662	233.978	239.277	244.559	249.827	255.083	260.328	265.563	270.789	276.007	281.218	286.422
-87.16	1.013	152.707	157.629	162.458	167.214	171.912	176.564	181.177	185.758	190.311	194.842	199.352	203.846	208.324	212.788	217.241	221.684	226.117	230.541	234.959	239.369	243.772
-85	1.148	135.748	140.136	144.436	148.668	152.845	156.977	161.073	165.139	169.178	173.195	177.194	181.175	185.142	189.097	193.040	196.973	200.897	204.813	208.721	212.623	216.518
-80	1.514	104.555	107.970	111.307	114.583	117.811	120.999	124.154	127.282	130.387	133.471	136.539	139.591	142.630	145.657	148.674	151.682	154.682	157.673	160.659	163.637	166.611
-75	1.963	81.711	84.421	87.061	89.646	92.188	94.694	97.171	99.623	102.053	104.465	106.862	109.244	111.615	113.975	116.325	118.667	121.001	123.328	125.649	127.964	130.273
-70	2.508	64.687	66.876	69.003	71.079	73.117	75.121	77.098	79.053	80.988	82.907	84.811	86.702	88.582	90.452	92.314	94.167	96.013	97.853	99.687	101.515	103.339
-65	3.161	51.796	53.595	55.337	57.033	58.692	60.321	61.925	63.508	65.074	66.623	68.160	69.684	71.198	72.703	74.199	75.688	77.171	78.647	80.118	81.583	83.044
-60	3.934	41.891	43.395	44.843	46.250	47.622	48.965	50.286	51.587	52.872	54.141	55.399	56.645	57.881	59.109	60.329	61.542	62.749	63.950	65.146	66.337	67.523
-55	4.842	34.179	35.454	36.678	37.860	39.011	40.135	41.238	42.321	43.390	44.444	45.487	46.519	47.542	48.557	49.564	50.565	51.560	52.549	53.534	54.514	55.490
-50	5.898	28.099	29.197	30.245	31.253	32.231	33.184	34.116	35.031	35.930	36.817	37.692	38.557	39.414	40.263	41.105	41.940	42.770	43.595	44.415	45.231	46.043
-45	7.116	23.251	24.210	25.119	25.991	26.833	27.651	28.448	29.229	29.995	30.749	31.492	32.226	32.951	33.669	34.381	35.086	35.786	36.481	37.172	37.858	38.541
-40	8.513	19.343	20.193	20.993	21.756	22.490	23.199	23.890	24.564	25.224	25.872	26.510	27.138	27.759	28.373	28.980	29.581	30.178	30.769	31.357	31.940	32.520
-35	10.104	16.161	16.926	17.639	18.315	18.962	19.585	20.189	20.777	21.351	21.914	22.467	23.011	23.547	24.077	24.600	25.118	25.630	26.139	26.643	27.143	27.640
-30	11.905	13.545	14.243	14.888	15.494	16.070	16.623	17.157	17.675	18.180	18.673	19.157	19.632	20.100	20.561	21.016	21.465	21.910	22.350	22.787	23.220	23.649
-25	13.936	11.373	12.021	12.612	13.162	13.681	14.177	14.653	15.114	15.562	15.998	16.425	16.844	17.255	17.659	18.058	18.452	18.841	19.225	19.606	19.983	20.357
-20	16.214	9.552	10.165	10.714	11.219	11.692	12.141	12.570	12.983	13.384	13.773	14.153	14.524	14.889	15.247	15.599	15.946	16.289	16.627	16.962	17.293	17.621
-15	18.761	8.010	8.602	9.119	9.589	10.024	10.434	10.824	11.198	11.559	11.909	12.249	12.582	12.907	13.225	13.539	13.847	14.151	14.451	14.747	15.040	15.330
-10	21.601	6.687	7.274	7.770	8.212	8.617	8.995	9.352	9.693	10.020	10.337	10.644	10.943	11.235	11.521	11.801	12.077	12.348	12.615	12.879	13.139	13.397
-5	24.760	5.536	6.138	6.621	7.042	7.421	7.773	8.102	8.415	8.715	9.003	9.281	9.552	9.816	10.074	10.326	10.574	10.817	11.056	11.292	11.525	11.755
0	28.272	4.509	5.156	5.636	6.041	6.400	6.729	7.035	7.324	7.599	7.863	8.117	8.364	8.603	8.837	9.065	9.288	9.508	9.723	9.936	10.145	10.351
5	32.182	3.548	4.301	4.787	5.180	5.523	5.832	6.118	6.386	6.639	6.882	7.115	7.340	7.558	7.771	7.978	8.181	8.379	8.574	8.766	8.955	9.140
10	36.567	2.457	3.548	4.048	4.433	4.760	5.052	5.320	5.569	5.804	6.027	6.241	6.448	6.647	6.841	7.030	7.214	7.394	7.571	7.744	7.915	8.083

Thermodynamic properties of R-508B - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-130	0.031	233.120	235.688	238.282	240.908	243.569	246.267	249.003	251.778	254.593	257.449	260.346	263.283	266.262	269.281	272.342	275.444	278.587	281.771	284.996	288.262	291.568
-125	0.053	235.503	238.130	240.781	243.461	246.174	248.922	251.706	254.529	257.392	260.293	263.236	266.218	269.241	272.305	275.409	278.555	281.741	284.967	288.235	291.542	294.891
-120	0.087	237.892	240.583	243.293	246.029	248.795	251.595	254.430	257.303	260.213	263.162	266.151	269.179	272.247	275.356	278.505	281.694	284.923	288.193	291.503	294.853	298.243
-115	0.137	240.283	243.039	245.812	248.606	251.429	254.283	257.170	260.093	263.053	266.050	269.086	272.162	275.276	278.430	281.624	284.857	288.131	291.444	294.797	298.190	301.623
-110	0.209	242.667	245.494	248.331	251.187	254.068	256.978	259.920	262.895	265.906	268.953	272.038	275.161	278.323	281.524	284.763	288.042	291.360	294.718	298.115	301.551	305.026
-105	0.309	245.038	247.939	250.845	253.766	256.708	259.676	262.674	265.703	268.767	271.866	275.001	278.173	281.383	284.631	287.918	291.243	294.607	298.009	301.450	304.930	308.449
-100	0.445	247.391	250.369	253.347	256.335	259.341	262.370	265.426	268.512	271.631	274.783	277.970	281.193	284.452	287.749	291.083	294.456	297.866	301.314	304.800	308.325	311.888
-95	0.623	249.716	252.777	255.830	258.889	261.962	265.055	268.172	271.317	274.492	277.699	280.939	284.214	287.525	290.872	294.255	297.676	301.133	304.628	308.161	311.731	315.338
-90	0.855	252.008	255.155	258.289	261.422	264.565	267.724	270.905	274.110	277.344	280.608	283.904	287.233	290.596	293.994	297.428	300.898	304.404	307.947	311.526	315.143	318.796
-87.16	1.013	253.293	256.491	259.671	262.849	266.033	269.231	272.449	275.690	278.958	282.256	285.584	288.944	292.338	295.766	299.230	302.728	306.262	309.833	313.439	317.082	320.762
-85	1.148	254.260	257.498	260.715	263.927	267.143	270.372	273.618	276.888	280.182	283.506	286.859	290.243	293.661	297.112	300.598	304.118	307.674	311.266	314.894	318.557	322.257
-80	1.514	256.462	259.797	263.103	266.397	269.690	272.992	276.308	279.643	283.001	286.386	289.798	293.241	296.714	300.220	303.759	307.332	310.939	314.581	318.258	321.970	325.717
-75	1.963	258.607	262.045	265.445	268.826	272.200	275.578	278.966	282.371	285.795	289.244	292.718	296.220	299.752	303.314	306.908	310.535	314.194	317.887	321.615	325.376	329.172
-70	2.508	260.686	264.234	267.734	271.206	274.666	278.124	281.588	285.065	288.559	292.073	295.612	299.176	302.767	306.388	310.039	313.721	317.435	321.181	324.960	328.772	332.617
-65	3.161	262.689	266.355	269.961	273.531	277.081	280.623	284.167	287.720	291.286	294.870	298.475	302.103	305.757	309.438	313.148	316.887	320.657	324.457	328.289	332.153	336.050
-60	3.934	264.604	268.397	272.118	275.791	279.437	283.069	286.697	290.329	293.971	297.627	301.302	304.997	308.716	312.459	316.230	320.028	323.855	327.712	331.599	335.517	339.465
-55	4.842	266.418	270.351	274.194	277.979	281.727	285.454	289.171	292.886	296.608	300.340	304.087	307.852	311.638	315.447	319.281	323.140	327.027	330.941	334.885	338.857	342.860
-50	5.898	268.116	272.202	276.180	280.085	283.942	287.770	291.581	295.386	299.191	303.002	306.825	310.664	314.520	318.396	322.295	326.218	330.166	334.141	338.142	342.172	346.229
-45	7.116	269.680	273.937	278.062	282.098	286.074	290.010	293.921	297.819	301.713	305.609	309.512	313.426	317.356	321.303	325.270	329.258	333.270	337.307	341.368	345.456	349.571
-40	8.513	271.089	275.539	279.828	284.007	288.111	292.164	296.183	300.181	304.168	308.153	312.140	316.134	320.140	324.161	328.199	332.256	336.334	340.435	344.559	348.707	352.881
-35	10.104	272.314	276.987	281.461	285.799	290.044	294.223	298.358	302.463	306.550	310.628	314.704	318.783	322.870	326.967	331.079	335.208	339.355	343.522	347.710	351.921	356.155
-30	11.905	273.322	278.257	282.943	287.459	291.859	296.177	300.437	304.657	308.851	313.029	317.198	321.366	325.538	329.716	333.906	338.109	342.327	346.563	350.819	355.094	359.391
-25	13.936	274.068	279.320	284.251	288.971	293.544	298.014	302.410	306.755	311.063	315.348	319.617	323.879	328.140	332.403	336.674	340.955	345.248	349.556	353.881	358.224	362.586
-20	16.214	274.492	280.138	285.362	290.314	295.083	299.722	304.268	308.748	313.179	317.578	321.954	326.316	330.671	335.024	339.379	343.742	348.113	352.496	356.893	361.306	365.735
-15	18.761	274.508	280.664	286.243	291.468	296.459	301.287	305.998	310.626	315.191	319.712	324.202	328.670	333.125	337.572	342.017	346.465	350.918	355.379	359.851	364.336	368.836
-10	21.601	273.990	280.838	286.858	292.407	297.654	302.695	307.590	312.379	317.089	321.743	326.354	330.936	335.496	340.043	344.583	349.120	353.659	358.202	362.752	367.313	371.885
-5	24.760	272.727	280.577	287.163	293.102	298.647	303.929	309.029	313.995	318.864	323.661	328.403	333.105	337.778	342.431	347.070	351.702	356.330	360.958	365.591	370.230	374.878
0	28.272	270.329	279.775	287.105	293.520	299.413	304.971	310.299	315.462	320.504	325.455	330.338	335.170	339.963	344.727	349.472	354.202	358.925	363.643	368.361	373.082	377.808
5	32.182	265.853	278.281	286.618	293.618	299.921	305.795	311.379	316.760	321.991	327.111	332.145	337.115	342.036	346.920	351.776	356.611	361.433	366.245	371.053	375.860	380.668
10	36.567	254.650	275.873	285.596	293.323	300.111	306.347	312.222	317.846	323.286	328.589	333.789	338.910	343.968	348.980	353.954	358.902	363.828	368.741	373.643	378.540	383.435

Thermodynamic properties of R-508B - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-130	0.031	1.588	1.605	1.623	1.639	1.656	1.672	1.688	1.704	1.720	1.735	1.750	1.765	1.780	1.795	1.809	1.824	1.838	1.852	1.866	1.880	1.894
-125	0.053	1.558	1.575	1.592	1.609	1.625	1.641	1.657	1.673	1.688	1.703	1.718	1.733	1.748	1.762	1.777	1.791	1.805	1.819	1.833	1.847	1.860
-120	0.087	1.531	1.548	1.565	1.581	1.598	1.614	1.629	1.645	1.660	1.675	1.690	1.705	1.719	1.734	1.748	1.762	1.776	1.790	1.804	1.817	1.831
-115	0.137	1.507	1.524	1.541	1.557	1.573	1.589	1.605	1.620	1.635	1.650	1.665	1.679	1.694	1.708	1.722	1.736	1.750	1.764	1.777	1.791	1.804
-110	0.209	1.485	1.502	1.519	1.535	1.551	1.567	1.582	1.598	1.613	1.627	1.642	1.657	1.671	1.685	1.699	1.713	1.727	1.741	1.754	1.768	1.781
-105	0.309	1.466	1.483	1.500	1.516	1.532	1.547	1.563	1.578	1.593	1.607	1.622	1.636	1.651	1.665	1.679	1.692	1.706	1.720	1.733	1.747	1.760
-100	0.445	1.449	1.466	1.483	1.499	1.514	1.530	1.545	1.560	1.575	1.590	1.604	1.618	1.632	1.646	1.660	1.674	1.688	1.701	1.715	1.728	1.741
-95	0.623	1.434	1.451	1.467	1.483	1.499	1.514	1.530	1.544	1.559	1.574	1.588	1.602	1.616	1.630	1.644	1.658	1.671	1.685	1.698	1.711	1.724
-90	0.855	1.420	1.437	1.453	1.469	1.485	1.500	1.516	1.530	1.545	1.560	1.574	1.588	1.602	1.616	1.629	1.643	1.656	1.670	1.683	1.696	1.709
-87.16	1.013	1.413	1.430	1.446	1.462	1.478	1.493	1.508	1.523	1.538	1.552	1.566	1.581	1.594	1.608	1.622	1.635	1.649	1.662	1.675	1.688	1.701
-85	1.148	1.408	1.425	1.441	1.457	1.473	1.488	1.503	1.518	1.532	1.547	1.561	1.575	1.589	1.603	1.616	1.630	1.643	1.657	1.670	1.683	1.696
-80	1.514	1.396	1.413	1.430	1.446	1.462	1.477	1.492	1.507	1.521	1.536	1.550	1.564	1.578	1.591	1.605	1.618	1.632	1.645	1.658	1.671	1.684
-75	1.963	1.386	1.403	1.420	1.436	1.451	1.467	1.482	1.497	1.511	1.525	1.540	1.554	1.567	1.581	1.595	1.608	1.621	1.634	1.647	1.660	1.673
-70	2.508	1.377	1.394	1.411	1.427	1.442	1.458	1.473	1.488	1.502	1.516	1.530	1.544	1.558	1.572	1.585	1.599	1.612	1.625	1.638	1.651	1.664
-65	3.161	1.368	1.386	1.402	1.418	1.434	1.450	1.465	1.479	1.494	1.508	1.522	1.536	1.550	1.564	1.577	1.590	1.604	1.617	1.630	1.642	1.655
-60	3.934	1.360	1.378	1.395	1.411	1.427	1.442	1.457	1.472	1.487	1.501	1.515	1.529	1.543	1.556	1.570	1.583	1.596	1.609	1.622	1.635	1.648
-55	4.842	1.353	1.371	1.388	1.404	1.420	1.435	1.451	1.465	1.480	1.494	1.508	1.522	1.536	1.550	1.563	1.576	1.589	1.602	1.615	1.628	1.641
-50	5.898	1.346	1.364	1.381	1.398	1.414	1.429	1.444	1.459	1.474	1.488	1.502	1.516	1.530	1.544	1.557	1.570	1.583	1.596	1.609	1.622	1.635
-45	7.116	1.339	1.357	1.375	1.391	1.408	1.423	1.439	1.454	1.468	1.483	1.497	1.511	1.525	1.538	1.552	1.565	1.578	1.591	1.604	1.617	1.629
-40	8.513	1.332	1.351	1.369	1.386	1.402	1.418	1.433	1.448	1.463	1.478	1.492	1.506	1.520	1.533	1.547	1.560	1.573	1.586	1.599	1.612	1.624
-35	10.104	1.325	1.345	1.363	1.380	1.397	1.413	1.428	1.444	1.458	1.473	1.487	1.501	1.515	1.529	1.542	1.555	1.569	1.582	1.594	1.607	1.620
-30	11.905	1.318	1.339	1.357	1.375	1.392	1.408	1.424	1.439	1.454	1.469	1.483	1.497	1.511	1.525	1.538	1.551	1.565	1.578	1.590	1.603	1.616
-25	13.936	1.311	1.332	1.351	1.370	1.387	1.403	1.419	1.435	1.450	1.465	1.479	1.493	1.507	1.521	1.534	1.548	1.561	1.574	1.587	1.600	1.612
-20	16.214	1.303	1.326	1.346	1.364	1.382	1.399	1.415	1.431	1.446	1.461	1.475	1.489	1.504	1.517	1.531	1.544	1.558	1.571	1.583	1.596	1.609
-15	18.761	1.295	1.318	1.339	1.359	1.377	1.394	1.411	1.426	1.442	1.457	1.472	1.486	1.500	1.514	1.528	1.541	1.554	1.567	1.580	1.593	1.606
-10	21.601	1.285	1.311	1.333	1.353	1.372	1.389	1.406	1.422	1.438	1.453	1.468	1.483	1.497	1.511	1.525	1.538	1.551	1.565	1.578	1.590	1.603
-5	24.760	1.273	1.302	1.326	1.347	1.366	1.384	1.402	1.418	1.434	1.450	1.465	1.479	1.494	1.508	1.522	1.535	1.549	1.562	1.575	1.588	1.600
0	28.272	1.257	1.292	1.318	1.340	1.361	1.379	1.397	1.414	1.430	1.446	1.461	1.476	1.491	1.505	1.519	1.532	1.546	1.559	1.572	1.585	1.598
5	32.182	1.236	1.280	1.309	1.333	1.354	1.374	1.392	1.410	1.426	1.442	1.458	1.473	1.487	1.502	1.516	1.529	1.543	1.556	1.570	1.583	1.595
10	36.567	1.191	1.265	1.299	1.325	1.348	1.368	1.387	1.405	1.422	1.438	1.454	1.469	1.484	1.498	1.513	1.526	1.540	1.554	1.567	1.580	1.593

R-448A (Solstice® N40)

Zeotropic blend (26 % R-32 - 26 % R-125 - 21 % R-134a - 20 % R-1234yf - 7 % R-1234ze)

Molecular weight (g/mol)	86.28
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-46.12
Temperature glide at 1.013 bar (K)	6.17
Critical temperature (°C)	83.7
Critical pressure (bar absolute)	46.84
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.555
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.850
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.141
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.139
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.63
Classification NF-EN 378	A1
GWP (IPCC 4)	1387

Main applications

R-448A is a "non azeotropic" blend containing HFO refrigerants. It has been designed to replace R-404A in new and existing installations, for medium and low temperature commercial and industrial refrigeration applications. It is suitable for supermarkets and hypermarkets including centralised pack systems, chill and frozen cold stores, and refrigerated transport.
It can be used as a replacement for R-22 in some Dx applications, but must be in accordance with conversion guidelines.

Commercial specifications

Composition: 26 % R-32 - 26 % R-125 - 21 % R-134a - 20 % R-1234yf – 7 % R-1234ze (±0.5 %-2 % / ±2 %-0.5 % / ±0.5 %-2 % / ±2 %-1 % / ±0.5 %-2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
TChlorine ion test (silver nitrate test): negative.
Total Acidity (HCL): ≤ 1 ppm weight.
Non-condensable content (gas phase): ≤ 1.5 % volume.

Oils

Use a polyol ester (POE) oil.
Consult **Climalife** regarding the viscosity of the oil selected for your application and the most suitable for your application.

Regulation

The use and implementation of R-448A are governed by the European Regulation N° 517/2014.
The recovery of R-448A is mandatory under the European Regulation N° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-448A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.028	-100	0.665	1.503	68.518	0.405	-93.3	6.213	0.161	346.470	1.985	277.952
0.043	-95	0.671	1.490	74.945	0.442	-88.35	4.095	0.244	349.487	1.959	274.542
0.065	-90	0.678	1.476	81.335	0.477	-83.41	2.774	0.360	352.519	1.936	271.185
0.097	-85	0.684	1.462	87.702	0.511	-78.46	1.927	0.519	355.562	1.914	267.860
0.139	-80	0.691	1.448	94.059	0.544	-73.51	1.368	0.731	358.610	1.895	264.551
0.196	-75	0.697	1.434	100.415	0.577	-68.56	0.992	1.008	361.658	1.877	261.243
0.271	-70	0.704	1.420	106.779	0.609	-63.61	0.733	1.365	364.699	1.861	257.921
0.368	-65	0.711	1.406	113.158	0.640	-58.65	0.550	1.817	367.729	1.847	254.571
0.491	-60	0.719	1.391	119.559	0.670	-53.7	0.420	2.382	370.742	1.834	251.183
0.645	-55	0.727	1.376	125.988	0.700	-48.75	0.325	3.078	373.732	1.821	247.744
0.836	-50	0.734	1.362	132.450	0.729	-43.79	0.255	3.926	376.694	1.810	244.244
1.013	-46.12	0.741	1.350	137.489	0.751	-39.95	0.213	4.703	378.968	1.802	241.479
1.069	-45	0.743	1.347	138.950	0.758	-38.84	0.202	4.949	379.621	1.800	240.671
1.351	-40	0.751	1.331	145.493	0.786	-33.89	0.162	6.171	382.509	1.791	237.016
1.688	-35	0.760	1.316	152.084	0.814	-28.94	0.131	7.619	385.351	1.782	233.266
2.087	-30	0.769	1.300	158.729	0.841	-23.99	0.107	9.321	388.141	1.775	229.412
2.556	-25	0.779	1.284	165.430	0.868	-19.04	0.088	11.309	390.872	1.767	225.442
3.102	-20	0.789	1.267	172.195	0.895	-14.1	0.073	13.617	393.538	1.761	221.343
3.733	-15	0.800	1.251	179.028	0.922	-9.16	0.061	16.282	396.130	1.754	217.102
4.457	-10	0.811	1.233	185.936	0.948	-4.22	0.052	19.347	398.641	1.748	212.705
5.282	-5	0.823	1.216	192.924	0.974	0.7	0.044	22.859	401.061	1.743	208.137
6.219	0	0.835	1.198	200.000	1.000	5.63	0.037	26.869	403.378	1.738	203.378
7.274	5	0.848	1.179	207.171	1.026	10.54	0.032	31.438	405.581	1.733	198.410
8.458	10	0.862	1.160	214.447	1.051	15.45	0.027	36.634	407.654	1.728	193.207
9.780	15	0.877	1.140	221.837	1.077	20.35	0.024	42.539	409.580	1.723	187.743
11.250	20	0.894	1.119	229.354	1.102	25.24	0.020	49.247	411.340	1.718	181.986
12.876	25	0.911	1.097	237.009	1.128	30.11	0.018	56.871	412.910	1.713	175.901
14.670	30	0.931	1.074	244.821	1.153	34.97	0.015	65.552	414.264	1.708	169.443
16.642	35	0.952	1.050	252.808	1.178	39.82	0.013	75.462	415.368	1.702	162.560
18.801	40	0.975	1.025	260.997	1.204	44.64	0.012	86.822	416.180	1.696	155.183
21.160	45	1.002	0.998	269.421	1.230	49.44	0.010	99.922	416.647	1.690	147.226
23.728	50	1.032	0.969	278.127	1.256	54.22	0.009	115.159	416.696	1.683	138.569
26.519	55	1.067	0.937	287.179	1.283	58.96	0.008	133.094	416.224	1.674	129.045
29.542	60	1.109	0.902	296.677	1.311	63.66	0.006	154.580	415.077	1.665	118.400
32.811	65	1.161	0.861	306.784	1.340	68.3	0.006	181.012	413.007	1.653	106.223
36.336	70	1.230	0.813	317.810	1.371	72.87	0.005	214.980	409.559	1.638	91.750
40.119	75	1.333	0.750	330.466	1.406	77.29	0.004	262.382	403.724	1.616	73.257
44.111	80	1.539	0.650	347.476	1.453	81.39	0.003	345.073	391.892	1.579	44.416

Thermodynamic properties of R-448A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.015	11477.954	11812.691	12147.028	12481.046	12814.806	13148.353	13481.725	13814.949	14148.049	14481.043	14813.947	15146.773	15479.532	15812.232	16144.882	16477.486	16810.051	17142.581	17475.080	17807.552	18139.999
-95	0.024	7220.992	7426.479	7631.638	7836.533	8041.214	8245.718	8450.074	8654.305	8858.430	9062.465	9266.421	9470.311	9674.141	9877.920	10081.655	10285.349	10489.009	10692.639	10896.240	11099.817	11303.372
-90	0.037	4690.780	4821.278	4951.503	5081.509	5211.335	5341.011	5470.561	5600.005	5729.357	5858.632	5987.839	6116.987	6246.084	6375.136	6504.148	6633.125	6762.071	6890.990	7019.884	7148.756	7277.609
-85	0.057	3136.672	3222.157	3307.411	3392.479	3477.394	3562.183	3646.863	3731.452	3815.962	3900.405	3984.788	4069.120	4153.406	4237.653	4321.865	4406.046	4490.199	4574.328	4658.435	4742.522	4826.591
-80	0.086	2153.166	2210.775	2268.188	2325.443	2382.567	2439.581	2496.502	2553.344	2610.117	2666.831	2723.494	2780.111	2836.688	2893.230	2949.741	3006.224	3062.683	3119.119	3175.535	3231.934	3288.317
-75	0.125	1513.584	1553.435	1593.115	1632.658	1672.089	1711.424	1750.679	1789.865	1828.991	1868.064	1907.092	1946.080	1985.032	2023.954	2062.847	2101.716	2140.562	2179.389	2218.197	2256.990	2295.768
-70	0.178	1087.190	1115.426	1143.513	1171.481	1199.351	1227.138	1254.854	1282.509	1310.112	1337.669	1365.185	1392.665	1420.115	1447.536	1474.932	1502.306	1529.660	1556.996	1584.315	1611.621	1638.912
-65	0.248	796.382	816.837	837.161	857.380	877.513	897.573	917.571	937.515	957.413	977.270	997.090	1016.879	1036.640	1056.376	1076.089	1095.782	1115.457	1135.116	1154.760	1174.391	1194.009
-60	0.339	593.865	608.989	623.999	638.915	653.755	668.531	683.252	697.925	712.556	727.151	741.714	756.248	770.757	785.243	799.709	814.157	828.588	843.005	857.408	871.799	886.179
-55	0.456	450.104	461.502	472.798	484.011	495.155	506.243	517.281	528.277	539.236	550.161	561.058	571.930	582.778	593.606	604.416	615.209	625.987	636.751	647.503	658.244	668.975
-50	0.603	346.238	354.980	363.631	372.208	380.724	389.188	397.609	405.991	414.340	422.659	430.952	439.222	447.471	455.702	463.916	472.115	480.300	488.472	496.634	504.785	512.927
-45	0.786	269.964	276.781	283.515	290.183	296.796	303.362	309.889	316.381	322.843	329.278	335.690	342.080	348.452	354.806	361.146	367.471	373.784	380.085	386.377	392.658	398.931
-40	1.010	213.107	218.504	223.827	229.089	234.301	239.472	244.607	249.710	254.786	259.837	264.867	269.877	274.871	279.848	284.812	289.763	294.702	299.631	304.550	309.461	314.363
-39.95	1.013	212.611	217.996	223.306	228.556	233.756	238.915	244.038	249.129	254.192	259.232	264.250	269.248	274.230	279.195	284.147	289.086	294.013	298.930	303.838	308.737	313.627
-35	1.283	170.130	174.465	178.731	182.943	187.110	191.239	195.335	199.402	203.444	207.464	211.464	215.446	219.412	223.364	227.304	231.231	235.148	239.055	242.953	246.843	250.726
-30	1.611	137.223	140.752	144.219	147.635	151.010	154.350	157.660	160.943	164.203	167.443	170.665	173.871	177.061	180.239	183.404	186.559	189.704	192.840	195.967	199.087	202.200
-25	2.000	111.725	114.634	117.486	120.291	123.059	125.794	128.501	131.184	133.846	136.489	139.115	141.726	144.323	146.908	149.482	152.045	154.600	157.146	159.685	162.216	164.741
-20	2.459	91.747	94.173	96.547	98.878	101.173	103.439	105.679	107.896	110.094	112.274	114.439	116.589	118.727	120.853	122.969	125.075	127.173	129.263	131.346	133.422	135.492
-15	2.996	75.930	77.977	79.975	81.933	83.858	85.755	87.629	89.481	91.315	93.132	94.935	96.725	98.502	100.269	102.027	103.775	105.516	107.249	108.975	110.695	112.409
-10	3.619	63.286	65.032	66.731	68.393	70.024	71.629	73.212	74.775	76.321	77.851	79.367	80.871	82.364	83.847	85.321	86.787	88.244	89.695	91.140	92.578	94.012
-5	4.336	53.086	54.590	56.051	57.476	58.872	60.243	61.593	62.924	64.239	65.540	66.827	68.103	69.368	70.624	71.871	73.111	74.343	75.569	76.788	78.002	79.211
0	5.158	44.789	46.097	47.364	48.597	49.803	50.985	52.148	53.292	54.421	55.536	56.639	57.730	58.812	59.885	60.949	62.007	63.057	64.101	65.139	66.172	67.200
5	6.093	37.983	39.133	40.243	41.320	42.371	43.399	44.408	45.400	46.378	47.342	48.294	49.236	50.169	51.092	52.008	52.917	53.820	54.716	55.607	56.493	57.374
10	7.151	32.360	33.380	34.360	35.310	36.234	37.136	38.019	38.886	39.739	40.579	41.408	42.227	43.037	43.839	44.633	45.420	46.202	46.977	47.747	48.513	49.274
15	8.344	27.680	28.593	29.467	30.311	31.130	31.928	32.707	33.471	34.221	34.959	35.686	36.403	37.112	37.813	38.506	39.193	39.874	40.550	41.220	41.886	42.548
20	9.681	23.758	24.583	25.370	26.126	26.858	27.569	28.262	28.940	29.604	30.257	30.899	31.532	32.156	32.772	33.382	33.986	34.583	35.176	35.763	36.347	36.926
25	11.175	20.450	21.203	21.917	22.601	23.260	23.898	24.519	25.124	25.717	26.298	26.869	27.431	27.984	28.530	29.070	29.603	30.131	30.654	31.172	31.686	32.196
30	12.837	17.641	18.335	18.989	19.613	20.211	20.788	21.348	21.893	22.425	22.946	23.456	23.958	24.452	24.939	25.419	25.894	26.363	26.827	27.286	27.742	28.193
35	14.681	15.243	15.889	16.494	17.066	17.613	18.138	18.647	19.140	19.621	20.091	20.551	21.002	21.445	21.881	22.311	22.735	23.154	23.569	23.978	24.384	24.786
40	16.720	13.181	13.790	14.353	14.883	15.387	15.869	16.334	16.784	17.221	17.647	18.063	18.471	18.871	19.264	19.651	20.032	20.409	20.780	21.148	21.511	21.871
45	18.970	11.398	11.978	12.509	13.004	13.471	13.916	14.344	14.756	15.155	15.544	15.923	16.293	16.656	17.012	17.362	17.707	18.046	18.382	18.712	19.040	19.363
50	21.448	9.845	10.405	10.910	11.376	11.813	12.227	12.622	13.002	13.370	13.726	14.072	14.411	14.741	15.065	15.384	15.696	16.004	16.308	16.607	16.903	17.195
55	24.172	8.481	9.032	9.517	9.959	10.371	10.758	11.126	11.478	11.818	12.146	12.465	12.775	13.078	13.374	13.665	13.950	14.230	14.506	14.778	15.047	15.312
60	27.165	7.273	7.824	8.297	8.720	9.110	9.475	9.819	10.148	10.463	10.767	11.061	11.347	11.626	11.897	12.164	12.425	12.681	12.933	13.181	13.425	13.667
65	30.456	6.189	6.754	7.221	7.631	8.003	8.348	8.672	8.980	9.274	9.557	9.829	10.094	10.351	10.601	10.846	11.086	11.321	11.551	11.778	12.002	12.222
70	34.084	5.195	5.797	6.265	6.665	7.023	7.352	7.659	7.948	8.224	8.487	8.741	8.986	9.224	9.456	9.681	9.902	10.118	10.330	10.539	10.744	10.945
75	38.109	4.250	4.928	5.406	5.801	6.148	6.463	6.754	7.027	7.286	7.533	7.770	7.998	8.219	8.433	8.642	8.846	9.045	9.240	9.432	9.620	9.805
80	42.678	3.248	4.110	4.610	5.005	5.344	5.647	5.925	6.184	6.427	6.659	6.880	7.093	7.298	7.497	7.690	7.879	8.063	8.242	8.419	8.592	8.762

Thermodynamic properties of R-448A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.015	342.413	345.534	348.696	351.901	355.148	358.439	361.774	365.151	368.572	372.037	375.545	379.096	382.690	386.327	390.007	393.730	397.496	401.305	405.156	409.050	412.986
-95	0.024	345.435	348.610	351.824	355.080	358.378	361.718	365.101	368.527	371.995	375.506	379.060	382.657	386.297	389.979	393.704	397.472	401.282	405.134	409.030	412.967	416.947
-90	0.037	348.479	351.709	354.978	358.286	361.636	365.026	368.458	371.932	375.449	379.007	382.608	386.251	389.937	393.664	397.435	401.247	405.102	408.999	412.938	416.919	420.942
-85	0.057	351.540	354.828	358.152	361.515	364.917	368.359	371.841	375.365	378.930	382.537	386.185	389.875	393.607	397.381	401.197	405.055	408.954	412.896	416.880	420.905	424.972
-80	0.086	354.613	357.961	361.343	364.761	368.217	371.712	375.246	378.820	382.435	386.091	389.788	393.526	397.305	401.126	404.988	408.891	412.837	416.823	420.852	424.921	429.033
-75	0.125	357.691	361.102	364.544	368.020	371.532	375.081	378.669	382.295	385.961	389.667	393.413	397.200	401.027	404.895	408.804	412.754	416.746	420.778	424.852	428.966	433.122
-70	0.178	360.770	364.247	367.751	371.287	374.857	378.463	382.105	385.785	389.503	393.260	397.057	400.893	404.769	408.686	412.643	416.640	420.678	424.757	428.876	433.037	437.238
-65	0.248	363.844	367.390	370.959	374.558	378.188	381.851	385.550	389.285	393.057	396.867	400.716	404.603	408.529	412.495	416.500	420.546	424.632	428.757	432.923	437.129	441.376
-60	0.339	366.907	370.525	374.163	377.826	381.519	385.243	389.000	392.792	396.619	400.483	404.385	408.324	412.302	416.318	420.373	424.468	428.602	432.775	436.988	441.241	445.534
-55	0.456	369.953	373.648	377.357	381.088	384.845	388.632	392.449	396.300	400.185	404.105	408.061	412.054	416.084	420.152	424.258	428.402	432.585	436.808	441.069	445.369	449.709
-50	0.603	372.978	376.752	380.536	384.338	388.163	392.014	395.894	399.805	403.749	407.727	411.739	415.787	419.871	423.991	428.150	432.345	436.579	440.851	445.161	449.510	453.897
-45	0.786	375.975	379.833	383.695	387.570	391.465	395.384	399.329	403.303	407.308	411.345	415.415	419.520	423.659	427.834	432.045	436.293	440.578	444.901	449.261	453.659	458.095
-40	1.010	378.939	382.884	386.828	390.781	394.749	398.738	402.750	406.790	410.857	414.956	419.085	423.248	427.444	431.675	435.941	440.242	444.580	448.954	453.365	457.814	462.299
-39.95	1.013	378.968	382.915	386.860	390.813	394.782	398.772	402.785	406.825	410.893	414.992	419.122	423.285	427.482	431.714	435.980	440.282	444.620	448.995	453.407	457.856	462.341
-35	1.283	381.864	385.902	389.931	393.964	398.008	402.070	406.152	410.259	414.392	418.554	422.745	426.967	431.222	435.510	439.832	444.189	448.580	453.007	457.471	461.970	466.506
-30	1.611	384.744	388.879	392.998	397.114	401.238	405.376	409.531	413.707	417.908	422.135	426.390	430.674	434.989	439.336	443.715	448.128	452.575	457.056	461.573	466.124	470.712
-25	2.000	387.574	391.810	396.023	400.227	404.434	408.650	412.881	417.130	421.400	425.695	430.015	434.363	438.741	443.148	447.587	452.057	456.561	461.098	465.668	470.273	474.913
-20	2.459	390.347	394.689	399.000	403.296	407.590	411.888	416.197	420.522	424.865	429.229	433.618	438.031	442.473	446.942	451.442	455.972	460.533	465.127	469.754	474.413	479.107
-15	2.996	393.057	397.511	401.924	406.316	410.700	415.084	419.475	423.878	428.296	432.733	437.192	441.674	446.181	450.715	455.277	459.868	464.489	469.141	473.825	478.541	483.289
-10	3.619	395.694	400.266	404.788	409.281	413.760	418.233	422.710	427.194	431.690	436.203	440.734	445.286	449.862	454.462	459.088	463.742	468.425	473.137	477.879	482.652	487.456
-5	4.336	398.252	402.949	407.585	412.184	416.762	421.330	425.895	430.464	435.042	439.633	444.239	448.865	453.510	458.179	462.872	467.591	472.336	477.110	481.912	486.744	491.605
0	5.158	400.721	405.550	410.307	415.019	419.701	424.367	429.025	433.684	438.346	443.019	447.703	452.404	457.123	461.862	466.624	471.409	476.220	481.056	485.920	490.812	495.733
5	6.093	403.089	408.060	412.946	417.776	422.569	427.339	432.096	436.847	441.598	446.355	451.122	455.901	460.695	465.508	470.340	475.194	480.071	484.973	489.901	494.854	499.836
10	7.151	405.343	410.468	415.492	420.449	425.359	430.239	435.099	439.948	444.792	449.638	454.489	459.350	464.223	469.111	474.017	478.942	483.888	488.857	493.849	498.867	503.910
15	8.344	407.469	412.760	417.934	423.027	428.063	433.060	438.029	442.981	447.923	452.861	457.801	462.746	467.701	472.668	477.649	482.648	487.665	492.703	497.763	502.846	507.953
20	9.681	409.448	414.924	420.261	425.502	430.673	435.793	440.879	445.939	450.984	456.019	461.052	466.086	471.125	476.173	481.234	486.308	491.399	496.509	501.638	506.788	511.961
25	11.175	411.258	416.941	422.459	427.861	433.177	438.432	443.640	448.816	453.969	459.107	464.236	469.363	474.491	479.624	484.766	489.919	495.087	500.270	505.470	510.690	515.930
30	12.837	412.876	418.794	424.514	430.092	435.567	440.965	446.306	451.604	456.871	462.117	467.349	472.572	477.793	483.015	488.242	493.477	498.723	503.982	509.257	514.548	519.858
35	14.681	414.271	420.460	426.407	432.181	437.829	443.383	448.866	454.295	459.684	465.044	470.383	475.708	481.026	486.340	491.656	496.976	502.304	507.643	512.994	518.359	523.741
40	16.720	415.404	421.913	428.118	434.112	439.950	445.674	451.310	456.880	462.399	467.880	473.332	478.765	484.184	489.595	495.004	500.413	505.826	511.246	516.677	522.119	527.574
45	18.970	416.228	423.119	429.624	435.864	441.915	447.824	453.627	459.348	465.006	470.616	476.189	481.735	487.261	492.774	498.279	503.781	509.283	514.789	520.301	525.823	531.355
50	21.448	416.676	424.036	430.893	437.416	443.704	449.819	455.804	461.689	467.497	473.245	478.946	484.612	490.251	495.871	501.477	507.076	512.670	518.265	523.863	529.466	535.078
55	24.172	416.657	424.611	431.889	438.740	445.297	451.641	457.826	463.889	469.858	475.754	481.592	487.385	493.144	498.876	504.590	510.290	515.981	521.668	527.355	533.044	538.739
60	27.165	416.035	424.771	432.565	439.800	446.664	453.265	459.672	465.931	472.076	478.131	484.116	490.045	495.930	501.782	507.608	513.415	519.208	524.992	530.771	536.550	542.330
65	30.456	414.591	424.412	432.855	440.550	447.771	454.664	461.318	467.793	474.129	480.358	486.501	492.576	498.596	504.575	510.520	516.439	522.339	528.225	534.101	539.973	545.842
70	34.084	411.928	423.380	432.669	440.926	448.566	455.794	462.727	469.443	475.991	482.408	488.722	494.954	501.121	507.234	513.306	519.344	525.357	531.350	537.329	543.299	549.262
75	38.109	407.180	421.414	431.854	440.817	448.961	456.581	463.835	470.822	477.606	484.233	490.735	497.139	503.463	509.723	515.931	522.097	528.231	534.338	540.426	546.499	552.561
80	42.678	397.386	417.894	430.037	439.941	448.724	456.824	464.462	471.769	478.828	485.695	492.413	499.010	505.511	511.934	518.294	524.602	530.868	537.101	543.307	549.492	555.662

Thermodynamic properties of R-448A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.015	2.025	2.042	2.060	2.077	2.094	2.111	2.128	2.144	2.160	2.176	2.192	2.208	2.224	2.239	2.254	2.270	2.285	2.299	2.314	2.329	2.343
-95	0.024	1.995	2.012	2.030	2.047	2.064	2.080	2.097	2.113	2.129	2.145	2.161	2.176	2.192	2.207	2.222	2.237	2.252	2.267	2.282	2.296	2.311
-90	0.037	1.968	1.985	2.002	2.019	2.036	2.052	2.069	2.085	2.101	2.116	2.132	2.147	2.163	2.178	2.193	2.208	2.223	2.237	2.252	2.266	2.281
-85	0.057	1.943	1.960	1.977	1.994	2.011	2.027	2.043	2.059	2.075	2.091	2.106	2.121	2.137	2.152	2.167	2.181	2.196	2.211	2.225	2.239	2.254
-80	0.086	1.921	1.938	1.955	1.971	1.988	2.004	2.020	2.036	2.052	2.067	2.082	2.098	2.113	2.128	2.143	2.157	2.172	2.186	2.201	2.215	2.229
-75	0.125	1.901	1.918	1.934	1.951	1.967	1.983	1.999	2.015	2.030	2.046	2.061	2.076	2.091	2.106	2.121	2.135	2.150	2.164	2.178	2.193	2.207
-70	0.178	1.882	1.899	1.916	1.932	1.949	1.965	1.980	1.996	2.011	2.027	2.042	2.057	2.072	2.086	2.101	2.116	2.130	2.144	2.158	2.172	2.186
-65	0.248	1.866	1.883	1.899	1.915	1.932	1.947	1.963	1.979	1.994	2.009	2.024	2.039	2.054	2.069	2.083	2.098	2.112	2.126	2.140	2.154	2.168
-60	0.339	1.851	1.867	1.884	1.900	1.916	1.932	1.948	1.963	1.978	1.993	2.008	2.023	2.038	2.053	2.067	2.081	2.096	2.110	2.124	2.138	2.151
-55	0.456	1.837	1.854	1.870	1.886	1.902	1.918	1.934	1.949	1.964	1.979	1.994	2.009	2.023	2.038	2.052	2.067	2.081	2.095	2.109	2.122	2.136
-50	0.603	1.824	1.841	1.858	1.874	1.890	1.905	1.921	1.936	1.951	1.966	1.981	1.996	2.010	2.025	2.039	2.053	2.067	2.081	2.095	2.109	2.123
-45	0.786	1.813	1.830	1.846	1.862	1.878	1.894	1.909	1.924	1.939	1.954	1.969	1.984	1.998	2.013	2.027	2.041	2.055	2.069	2.083	2.096	2.110
-40	1.010	1.803	1.819	1.836	1.852	1.868	1.883	1.899	1.914	1.929	1.944	1.958	1.973	1.987	2.002	2.016	2.030	2.044	2.058	2.072	2.085	2.099
-39.95	1.013	1.802	1.819	1.836	1.852	1.867	1.883	1.898	1.914	1.929	1.944	1.958	1.973	1.987	2.002	2.016	2.030	2.044	2.058	2.071	2.085	2.099
-35	1.283	1.793	1.810	1.826	1.842	1.858	1.874	1.889	1.904	1.919	1.934	1.949	1.963	1.978	1.992	2.006	2.020	2.034	2.048	2.061	2.075	2.089
-30	1.611	1.784	1.801	1.817	1.834	1.849	1.865	1.880	1.895	1.910	1.925	1.940	1.954	1.969	1.983	1.997	2.011	2.025	2.039	2.052	2.066	2.079
-25	2.000	1.776	1.793	1.809	1.826	1.841	1.857	1.872	1.887	1.902	1.917	1.932	1.946	1.961	1.975	1.989	2.003	2.017	2.030	2.044	2.057	2.071
-20	2.459	1.769	1.786	1.802	1.818	1.834	1.850	1.865	1.880	1.895	1.910	1.925	1.939	1.953	1.967	1.982	1.995	2.009	2.023	2.036	2.050	2.063
-15	2.996	1.762	1.779	1.795	1.812	1.828	1.843	1.859	1.874	1.889	1.903	1.918	1.932	1.947	1.961	1.975	1.989	2.003	2.016	2.030	2.043	2.057
-10	3.619	1.755	1.773	1.789	1.806	1.821	1.837	1.853	1.868	1.883	1.897	1.912	1.926	1.941	1.955	1.969	1.983	1.996	2.010	2.024	2.037	2.050
-5	4.336	1.749	1.767	1.783	1.800	1.816	1.832	1.847	1.862	1.877	1.892	1.907	1.921	1.935	1.949	1.963	1.977	1.991	2.005	2.018	2.031	2.045
0	5.158	1.744	1.761	1.778	1.795	1.811	1.826	1.842	1.857	1.872	1.887	1.902	1.916	1.930	1.944	1.958	1.972	1.986	2.000	2.013	2.026	2.040
5	6.093	1.738	1.756	1.773	1.790	1.806	1.822	1.837	1.853	1.868	1.883	1.897	1.912	1.926	1.940	1.954	1.968	1.982	1.995	2.009	2.022	2.035
10	7.151	1.733	1.751	1.768	1.785	1.801	1.817	1.833	1.848	1.863	1.878	1.893	1.908	1.922	1.936	1.950	1.964	1.978	1.991	2.005	2.018	2.031
15	8.344	1.728	1.746	1.764	1.781	1.797	1.813	1.829	1.844	1.860	1.875	1.889	1.904	1.918	1.932	1.946	1.960	1.974	1.987	2.001	2.014	2.028
20	9.681	1.723	1.742	1.759	1.776	1.793	1.809	1.825	1.841	1.856	1.871	1.886	1.900	1.915	1.929	1.943	1.957	1.971	1.984	1.998	2.011	2.024
25	11.175	1.718	1.737	1.755	1.772	1.789	1.806	1.822	1.837	1.853	1.868	1.883	1.897	1.912	1.926	1.940	1.954	1.968	1.981	1.995	2.008	2.021
30	12.837	1.713	1.732	1.751	1.768	1.785	1.802	1.818	1.834	1.849	1.865	1.880	1.894	1.909	1.923	1.937	1.951	1.965	1.978	1.992	2.005	2.019
35	14.681	1.708	1.728	1.746	1.764	1.782	1.799	1.815	1.831	1.846	1.862	1.877	1.891	1.906	1.920	1.934	1.948	1.962	1.976	1.989	2.003	2.016
40	16.720	1.702	1.723	1.742	1.760	1.778	1.795	1.812	1.828	1.843	1.859	1.874	1.889	1.903	1.918	1.932	1.946	1.960	1.974	1.987	2.001	2.014
45	18.970	1.696	1.717	1.737	1.756	1.774	1.792	1.808	1.825	1.841	1.856	1.871	1.886	1.901	1.916	1.930	1.944	1.958	1.972	1.985	1.999	2.012
50	21.448	1.689	1.712	1.732	1.752	1.770	1.788	1.805	1.822	1.838	1.853	1.869	1.884	1.899	1.913	1.928	1.942	1.956	1.970	1.983	1.997	2.010
55	24.172	1.681	1.705	1.727	1.747	1.766	1.784	1.802	1.818	1.835	1.851	1.866	1.881	1.896	1.911	1.926	1.940	1.954	1.968	1.981	1.995	2.008
60	27.165	1.672	1.698	1.721	1.742	1.762	1.780	1.798	1.815	1.832	1.848	1.864	1.879	1.894	1.909	1.923	1.938	1.952	1.966	1.979	1.993	2.006
65	30.456	1.661	1.690	1.715	1.737	1.757	1.776	1.794	1.812	1.829	1.845	1.861	1.876	1.892	1.907	1.921	1.936	1.950	1.964	1.978	1.991	2.005
70	34.084	1.648	1.681	1.707	1.730	1.752	1.771	1.790	1.808	1.825	1.842	1.858	1.874	1.889	1.904	1.919	1.934	1.948	1.962	1.976	1.990	2.003
75	38.109	1.628	1.669	1.698	1.723	1.746	1.766	1.785	1.804	1.821	1.838	1.855	1.871	1.886	1.902	1.916	1.931	1.946	1.960	1.974	1.987	2.001
80	42.678	1.596	1.653	1.687	1.714	1.738	1.759	1.779	1.798	1.816	1.834	1.851	1.867	1.883	1.898	1.913	1.928	1.943	1.957	1.971	1.985	1.999

R-449A

Zeotropic blend (24.3 % R-32 - 24.7 % R-125 - 25.3 % R-1234yf - 25.7 % R-134a)

Molecular weight (g/mol)	87.21
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-45.72
Temperature glide at 1.013 bar (K)	5.72
Critical temperature (°C)	83.9
Critical pressure (bar absolute)	46.62
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.550
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.851
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.139
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.139
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.59
Classification NF-EN 378	A1
GWP (IPCC 4)	1397

Main applications

R-449A (Opteon™ XP40) is a "non azeotropic" blend containing refrigerants from the hydrofluoro-olefin (HFO) family. It has been designed to replace R-404A in medium and low temperature commercial and industrial refrigeration applications. It is suitable for supermarkets and hypermarkets including centralised pack systems, chill and frozen cold stores, and refrigerated transport. It can be used as a replacement for R-22, but must be in accordance with conversion guidelines.

Commercial specifications

Composition: 25.7 % R-134a - 25.3 % R-1234yf - 24.7 % R-125 - 24.3 % R-32 (±1 %-0.2 % / ±0.2 %-1 % / ±1 %-0.2 % / ±0.2 %-1 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chlorine ion test (silver nitrate test): negative.
Total Acidity (HCL): ≤ 1 ppm weight.
Non-condensable content (gas phase): ≤ 1.5 % volume.

Oils

Use a polyol ester (POE) oil.
Consult **Climalife** regarding the viscosity of the oil selected for your application and the most suitable for your application.

Regulation

The use and implementation of R-448A are governed by the European Regulation N° 517/2014.
The recovery of R-448A is mandatory under the European Regulation N° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-449A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v»	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.027	-100	0.666	1.502	69.145	0.408	-93.81	6.296	0.159	344.304	1.973	275.159
0.042	-95	0.672	1.489	75.546	0.444	-88.86	4.146	0.241	347.306	1.947	271.760
0.064	-90	0.678	1.475	81.905	0.479	-83.91	2.806	0.356	350.324	1.924	268.419
0.094	-85	0.684	1.462	88.239	0.514	-78.95	1.947	0.514	353.354	1.903	265.115
0.136	-80	0.691	1.448	94.560	0.547	-73.99	1.382	0.724	356.389	1.884	261.829
0.192	-75	0.698	1.434	100.880	0.579	-69.04	1.001	0.999	359.425	1.867	258.546
0.265	-70	0.704	1.420	107.207	0.610	-64.08	0.739	1.353	362.457	1.851	255.250
0.360	-65	0.712	1.405	113.549	0.641	-59.12	0.555	1.802	365.478	1.836	251.929
0.481	-60	0.719	1.391	119.914	0.671	-54.16	0.423	2.363	368.484	1.823	248.570
0.632	-55	0.727	1.376	126.307	0.701	-49.2	0.327	3.055	371.468	1.811	245.161
0.820	-50	0.735	1.361	132.734	0.730	-44.25	0.256	3.899	374.426	1.801	241.692
1.013	-45.72	0.742	1.349	138.262	0.755	-40.01	0.210	4.758	376.930	1.792	238.667
1.049	-45	0.743	1.346	139.201	0.759	-39.29	0.203	4.917	377.351	1.791	238.150
1.326	-40	0.751	1.331	145.712	0.787	-34.33	0.163	6.133	380.238	1.782	234.526
1.657	-35	0.760	1.316	152.272	0.815	-29.38	0.132	7.574	383.080	1.773	230.809
2.050	-30	0.769	1.300	158.886	0.842	-24.42	0.108	9.270	385.873	1.766	226.987
2.511	-25	0.779	1.284	165.559	0.869	-19.47	0.089	11.250	388.609	1.759	223.050
3.048	-20	0.789	1.267	172.297	0.896	-14.52	0.074	13.550	391.281	1.752	218.985
3.669	-15	0.800	1.251	179.103	0.922	-9.58	0.062	16.207	393.882	1.746	214.779
4.382	-10	0.811	1.233	185.985	0.948	-4.64	0.052	19.263	396.403	1.740	210.418
5.196	-5	0.823	1.216	192.948	0.974	0.29	0.044	22.766	398.834	1.735	205.886
6.119	0	0.835	1.198	200.000	1.000	5.22	0.037	26.767	401.166	1.730	201.166
7.159	5	0.848	1.179	207.148	1.026	10.15	0.032	31.328	403.383	1.725	196.236
8.327	10	0.862	1.160	214.400	1.051	15.06	0.027	36.517	405.473	1.720	191.073
9.630	15	0.878	1.140	221.767	1.076	19.97	0.024	42.416	407.418	1.716	185.651
11.080	20	0.894	1.119	229.259	1.102	24.86	0.020	49.121	409.197	1.711	179.938
12.685	25	0.912	1.097	236.891	1.127	29.74	0.018	56.747	410.789	1.706	173.897
14.456	30	0.931	1.074	244.678	1.153	34.61	0.015	65.436	412.164	1.701	167.486
16.403	35	0.952	1.050	252.641	1.178	39.47	0.013	75.363	413.290	1.696	160.649
18.536	40	0.976	1.025	260.804	1.204	44.3	0.012	86.755	414.124	1.690	153.320
20.867	45	1.002	0.998	269.203	1.229	49.12	0.010	99.910	414.611	1.684	145.408
23.407	50	1.032	0.969	277.884	1.256	53.9	0.009	115.234	414.677	1.677	136.793
26.168	55	1.068	0.937	286.913	1.283	58.66	0.008	133.313	414.214	1.668	127.301
29.163	60	1.110	0.901	296.391	1.310	63.38	0.006	155.036	413.064	1.659	116.673
32.403	65	1.162	0.860	306.484	1.339	68.04	0.005	181.883	410.964	1.647	104.480
35.901	70	1.232	0.811	317.511	1.370	72.62	0.005	216.648	407.428	1.631	89.917
39.662	75	1.338	0.748	330.235	1.406	77.07	0.004	265.978	401.324	1.609	71.089
43.635	80	1.563	0.640	347.942	1.455	81.16	0.003	358.058	388.045	1.568	40.103

Thermodynamic properties of R-449A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.015	11074.200	11397.311	11720.010	12042.384	12364.494	12686.390	13008.108	13329.677	13651.122	13972.460	14293.708	14614.878	14935.980	15257.024	15578.016	15898.964	16219.872	16540.745	16861.588	17182.403	17503.193
-95	0.024	6988.951	7187.947	7386.607	7585.000	7783.175	7981.171	8179.018	8376.740	8574.354	8771.878	8969.324	9166.703	9364.022	9561.291	9758.514	9955.698	10152.847	10349.965	10547.056	10744.122	10941.166
-90	0.038	4552.842	4679.589	4806.057	4932.304	5058.368	5184.281	5310.068	5435.748	5561.337	5686.847	5812.289	5937.673	6063.005	6188.292	6313.540	6438.752	6563.934	6689.088	6814.218	6939.325	7064.413
-85	0.058	3052.089	3135.335	3218.348	3301.172	3383.843	3466.386	3548.820	3631.163	3713.426	3795.622	3877.758	3959.843	4041.883	4123.883	4205.848	4287.781	4369.688	4451.569	4533.429	4615.269	4697.091
-80	0.087	2099.796	2156.031	2212.067	2267.943	2323.687	2379.321	2434.862	2490.324	2545.716	2601.050	2656.331	2711.567	2766.763	2821.925	2877.054	2932.157	2987.234	3042.290	3097.325	3152.343	3207.345
-75	0.126	1479.011	1517.994	1556.806	1595.479	1634.039	1672.503	1710.886	1749.200	1787.454	1825.656	1863.812	1901.928	1940.009	1978.058	2016.080	2054.077	2092.051	2130.006	2167.942	2205.863	2243.769
-70	0.180	1064.243	1091.918	1119.443	1146.848	1174.154	1201.377	1228.529	1255.621	1282.659	1309.652	1336.603	1363.520	1390.405	1417.261	1444.093	1470.903	1497.692	1524.464	1551.219	1577.960	1604.687
-65	0.250	780.805	800.889	820.841	840.688	860.448	880.135	899.759	919.330	938.854	958.337	977.784	997.199	1016.586	1035.948	1055.288	1074.607	1093.908	1113.193	1132.464	1151.720	1170.965
-60	0.341	583.069	597.943	612.701	627.366	641.954	656.478	670.946	685.366	699.745	714.087	728.397	742.679	756.935	771.168	785.381	799.576	813.755	827.918	842.069	856.207	870.334
-55	0.458	442.477	453.703	464.826	475.865	486.836	497.750	508.614	519.436	530.220	540.972	551.694	562.391	573.065	583.719	594.354	604.973	615.576	626.166	636.744	647.311	657.867
-50	0.606	340.752	349.375	357.904	366.360	374.754	383.097	391.395	399.655	407.881	416.078	424.249	432.397	440.523	448.632	456.723	464.799	472.862	480.912	488.951	496.980	504.999
-45	0.789	265.954	272.685	279.333	285.915	292.441	298.920	305.360	311.765	318.140	324.488	330.812	337.115	343.399	349.666	355.918	362.156	368.381	374.595	380.799	386.993	393.178
-40.01	1.013	210.178	215.515	220.777	225.978	231.129	236.238	241.311	246.352	251.366	256.356	261.323	266.272	271.203	276.118	281.019	285.908	290.785	295.652	300.509	305.357	310.197
-40	1.013	210.129	215.465	220.726	225.926	231.076	236.183	241.255	246.295	251.308	256.296	261.262	266.210	271.139	276.054	280.954	285.841	290.717	295.583	300.439	305.286	310.125
-35	1.286	167.887	172.178	176.399	180.566	184.687	188.770	192.819	196.840	200.836	204.809	208.763	212.698	216.618	220.524	224.416	228.297	232.167	236.028	239.879	243.722	247.558
-30	1.612	135.512	139.008	142.441	145.824	149.165	152.471	155.747	158.996	162.222	165.427	168.615	171.785	174.941	178.084	181.215	184.335	187.445	190.546	193.639	196.724	199.802
-25	2.001	110.403	113.288	116.115	118.896	121.638	124.347	127.029	129.686	132.322	134.939	137.539	140.124	142.695	145.254	147.802	150.339	152.868	155.388	157.900	160.405	162.904
-20	2.458	90.713	93.122	95.477	97.790	100.066	102.313	104.533	106.731	108.909	111.070	113.214	115.345	117.463	119.569	121.665	123.752	125.830	127.900	129.963	132.019	134.069
-15	2.993	75.113	77.147	79.131	81.075	82.986	84.869	86.728	88.565	90.384	92.186	93.974	95.749	97.511	99.263	101.005	102.738	104.464	106.181	107.892	109.597	111.296
-10	3.613	62.634	64.370	66.059	67.711	69.331	70.925	72.497	74.048	75.582	77.101	78.606	80.098	81.580	83.051	84.513	85.966	87.412	88.851	90.284	91.710	93.132
-5	4.327	52.560	54.058	55.511	56.928	58.315	59.678	61.020	62.342	63.648	64.940	66.219	67.485	68.742	69.988	71.226	72.456	73.679	74.895	76.106	77.310	78.510
0	5.144	44.360	45.664	46.926	48.154	49.353	50.529	51.685	52.822	53.944	55.052	56.148	57.233	58.307	59.373	60.430	61.480	62.523	63.560	64.591	65.616	66.637
5	6.074	37.632	38.778	39.884	40.957	42.004	43.027	44.031	45.018	45.990	46.949	47.896	48.832	49.759	50.677	51.587	52.491	53.387	54.278	55.163	56.043	56.918
10	7.126	32.068	33.086	34.065	35.011	35.932	36.830	37.710	38.573	39.422	40.258	41.083	41.897	42.703	43.500	44.290	45.072	45.849	46.620	47.385	48.146	48.902
15	8.311	27.436	28.348	29.221	30.063	30.880	31.675	32.452	33.213	33.960	34.694	35.418	36.132	36.837	37.534	38.224	38.907	39.585	40.257	40.923	41.586	42.244
20	9.640	23.552	24.377	25.164	25.919	26.649	27.358	28.050	28.725	29.387	30.037	30.677	31.307	31.928	32.542	33.149	33.749	34.344	34.934	35.518	36.099	36.675
25	11.123	20.274	21.028	21.743	22.426	23.084	23.721	24.341	24.945	25.536	26.115	26.684	27.243	27.795	28.339	28.876	29.407	29.933	30.453	30.969	31.480	31.988
30	12.774	17.490	18.186	18.841	19.464	20.062	20.639	21.198	21.742	22.272	22.792	23.301	23.801	24.294	24.779	25.257	25.730	26.197	26.659	27.117	27.570	28.020
35	14.604	15.111	15.760	16.366	16.939	17.486	18.012	18.520	19.012	19.492	19.961	20.420	20.869	21.311	21.746	22.175	22.598	23.015	23.428	23.836	24.241	24.641
40	16.628	13.065	13.677	14.243	14.774	15.278	15.761	16.225	16.675	17.111	17.536	17.952	18.359	18.758	19.150	19.536	19.916	20.291	20.662	21.028	21.390	21.749
45	18.861	11.294	11.879	12.412	12.909	13.377	13.823	14.250	14.662	15.062	15.450	15.828	16.198	16.560	16.915	17.264	17.608	17.947	18.281	18.611	18.937	19.260
50	21.319	9.751	10.317	10.825	11.293	11.731	12.145	12.541	12.921	13.289	13.645	13.991	14.329	14.659	14.983	15.300	15.612	15.919	16.222	16.521	16.816	17.107
55	24.022	8.395	8.952	9.441	9.886	10.299	10.687	11.055	11.408	11.748	12.076	12.394	12.704	13.007	13.303	13.593	13.877	14.157	14.433	14.704	14.972	15.236
60	26.991	7.192	7.751	8.228	8.655	9.046	9.412	9.757	10.086	10.402	10.706	11.000	11.286	11.564	11.836	12.102	12.362	12.618	12.869	13.117	13.361	13.602
65	30.257	6.110	6.687	7.158	7.571	7.946	8.292	8.617	8.926	9.220	9.503	9.776	10.040	10.297	10.547	10.792	11.031	11.266	11.496	11.723	11.946	12.166
70	33.857	5.116	5.734	6.207	6.611	6.972	7.302	7.610	7.900	8.175	8.439	8.693	8.939	9.176	9.408	9.634	9.854	10.070	10.282	10.490	10.694	10.896
75	37.857	4.164	4.866	5.352	5.751	6.100	6.417	6.709	6.983	7.242	7.489	7.726	7.954	8.175	8.390	8.599	8.802	9.001	9.196	9.388	9.576	9.760
80	42.420	3.122	4.044	4.554	4.953	5.295	5.599	5.878	6.138	6.382	6.614	6.836	7.048	7.254	7.453	7.646	7.834	8.018	8.197	8.373	8.546	8.716

Thermodynamic properties of R-449A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.015	340.586	343.690	346.835	350.024	353.256	356.531	359.851	363.215	366.623	370.076	373.572	377.114	380.699	384.328	388.002	391.720	395.481	399.286	403.135	407.027	410.963
-95	0.024	343.589	346.747	349.946	353.186	356.469	359.795	363.164	366.577	370.033	373.533	377.078	380.666	384.298	387.973	391.693	395.456	399.263	403.113	407.007	410.944	414.924
-90	0.038	346.614	349.829	353.082	356.376	359.711	363.088	366.507	369.970	373.475	377.024	380.616	384.251	387.930	391.653	395.418	399.228	403.080	406.976	410.914	414.896	418.921
-85	0.058	349.657	352.930	356.239	359.588	362.977	366.406	369.877	373.390	376.946	380.544	384.184	387.868	391.595	395.364	399.177	403.032	406.931	410.872	414.856	418.883	422.952
-80	0.087	352.712	356.045	359.414	362.819	366.263	369.746	373.270	376.835	380.442	384.090	387.780	391.512	395.287	399.105	402.965	406.867	410.812	414.799	418.829	422.901	427.016
-75	0.126	355.773	359.171	362.600	366.064	369.565	373.104	376.682	380.300	383.959	387.658	391.399	395.181	399.005	402.871	406.779	410.729	414.721	418.755	422.831	426.949	431.109
-70	0.180	358.836	362.301	365.794	369.319	372.878	376.475	380.109	383.781	387.493	391.245	395.038	398.871	402.745	406.660	410.617	414.615	418.655	422.736	426.859	431.023	435.229
-65	0.250	361.895	365.429	368.989	372.577	376.198	379.854	383.545	387.274	391.041	394.847	398.692	402.577	406.502	410.468	414.474	418.522	422.610	426.739	430.909	435.120	439.373
-60	0.341	364.944	368.552	372.181	375.835	379.520	383.237	386.988	390.775	394.598	398.459	402.358	406.297	410.274	414.291	418.348	422.445	426.583	430.761	434.979	439.238	443.537
-55	0.458	367.978	371.663	375.364	379.088	382.838	386.619	390.431	394.278	398.160	402.078	406.033	410.025	414.056	418.126	422.235	426.383	430.570	434.798	439.065	443.372	447.719
-50	0.606	370.991	374.757	378.534	382.329	386.148	389.995	393.871	397.780	401.721	405.698	409.710	413.759	417.845	421.968	426.130	430.330	434.569	438.846	443.163	447.519	451.915
-45	0.789	373.978	377.829	381.685	385.555	389.446	393.360	397.303	401.275	405.279	409.316	413.387	417.493	421.635	425.814	430.029	434.283	438.574	442.903	447.270	451.676	456.121
-40.01	1.013	376.930	380.870	384.809	388.757	392.722	396.708	400.718	404.757	408.824	412.923	417.055	421.220	425.420	429.655	433.926	438.234	442.578	446.960	451.379	455.836	460.330
-40	1.013	376.933	380.873	384.812	388.760	392.725	396.711	400.722	404.760	408.828	412.927	417.059	421.224	425.424	429.659	433.930	438.238	442.582	446.964	451.383	455.840	460.334
-35	1.286	379.850	383.884	387.910	391.939	395.981	400.041	404.123	408.230	412.364	416.527	420.721	424.947	429.207	433.500	437.828	442.191	446.590	451.025	455.497	460.006	464.551
-30	1.612	382.725	386.856	390.972	395.087	399.210	403.346	407.502	411.680	415.882	420.112	424.370	428.659	432.979	437.332	441.718	446.138	450.593	455.083	459.609	464.171	468.768
-25	2.001	385.550	389.784	393.995	398.199	402.405	406.622	410.854	415.105	419.378	423.676	428.001	432.354	436.738	441.152	445.598	450.076	454.589	459.135	463.715	468.331	472.981
-20	2.458	388.320	392.661	396.972	401.268	405.562	409.862	414.173	418.501	422.847	427.216	431.610	436.030	440.478	444.955	449.462	454.001	458.572	463.175	467.812	472.483	477.188
-15	2.993	391.027	395.482	399.896	404.290	408.675	413.062	417.456	421.862	426.285	430.728	435.192	439.681	444.195	448.737	453.308	457.908	462.539	467.202	471.896	476.623	481.383
-10	3.613	393.664	398.238	402.762	407.258	411.739	416.216	420.696	425.185	429.687	434.205	438.743	443.303	447.886	452.495	457.131	461.795	466.487	471.210	475.964	480.748	485.565
-5	4.327	396.222	400.923	405.562	410.165	414.747	419.318	423.889	428.463	433.047	437.645	442.259	446.892	451.546	456.224	460.927	465.656	470.412	475.197	480.011	484.855	489.729
0	5.144	398.692	403.527	408.289	413.005	417.692	422.363	427.028	431.692	436.362	441.041	445.734	450.444	455.172	459.921	464.693	469.489	474.310	479.159	484.035	488.939	493.873
5	6.074	401.062	406.041	410.934	415.769	420.568	425.344	430.108	434.866	439.625	444.390	449.165	453.953	458.758	463.580	468.423	473.289	478.178	483.092	488.031	492.998	497.993
10	7.126	403.319	408.454	413.486	418.450	423.368	428.255	433.122	437.979	442.832	447.686	452.546	457.417	462.300	467.199	472.116	477.052	482.011	486.992	491.998	497.028	502.085
15	8.311	405.448	410.752	415.936	421.038	426.083	431.087	436.065	441.025	445.976	450.924	455.873	460.829	465.794	470.772	475.765	480.776	485.806	490.856	495.929	501.026	506.147
20	9.640	407.431	412.922	418.272	423.523	428.704	433.834	438.928	443.998	449.052	454.098	459.140	464.185	469.236	474.296	479.368	484.455	489.559	494.681	499.824	504.988	510.174
25	11.123	409.245	414.947	420.480	425.894	431.221	436.486	441.705	446.891	452.054	457.202	462.342	467.480	472.620	477.765	482.919	488.086	493.266	498.462	503.677	508.910	514.165
30	12.774	410.866	416.808	422.545	428.137	433.625	439.034	444.386	449.695	454.974	460.230	465.473	470.709	475.941	481.175	486.415	491.664	496.923	502.196	507.485	512.790	518.115
35	14.604	412.263	418.482	424.449	430.240	435.902	441.468	446.963	452.404	457.805	463.176	468.527	473.865	479.195	484.522	489.851	495.184	500.526	505.878	511.244	516.624	522.020
40	16.628	413.397	419.941	426.172	432.184	438.039	443.776	449.425	455.008	460.539	466.032	471.497	476.943	482.375	487.799	493.221	498.643	504.071	509.505	514.950	520.407	525.877
45	18.861	414.218	421.153	427.688	433.951	440.020	445.945	451.762	457.496	463.167	468.790	474.376	479.935	485.475	491.001	496.520	502.035	507.552	513.072	518.599	524.135	529.683
50	21.319	414.658	422.075	428.968	435.517	441.826	447.958	453.958	459.858	465.679	471.441	477.155	482.835	488.488	494.121	499.742	505.355	510.964	516.573	522.186	527.804	533.432
55	24.022	414.622	422.651	429.974	436.855	443.435	449.798	456.000	462.079	468.063	473.973	479.825	485.632	491.405	497.152	502.880	508.594	514.300	520.002	525.704	531.409	537.119
60	26.991	413.967	422.806	430.656	437.928	444.819	451.442	457.867	464.143	470.303	476.374	482.373	488.317	494.217	500.083	505.924	511.745	517.553	523.353	529.147	534.941	540.737
65	30.257	412.462	422.434	430.951	438.690	445.942	452.859	459.534	466.027	472.380	478.624	484.783	490.873	496.909	502.902	508.862	514.796	520.711	526.613	532.505	538.392	544.277
70	33.857	409.679	421.377	430.763	439.075	446.752	454.007	460.964	467.698	474.264	480.698	487.029	493.277	499.458	505.587	511.675	517.729	523.757	529.766	535.761	541.746	547.725
75	37.857	404.649	419.359	429.936	438.968	447.156	454.807	462.087	469.095	475.899	482.544	489.064	495.484	501.824	508.100	514.324	520.506	526.656	532.780	538.883	544.972	551.051
80	42.420	393.673	415.671	428.038	438.042	446.884	455.026	462.696	470.030	477.113	484.001	490.739	497.355	503.875	510.316	516.693	523.018	529.302	535.552	541.775	547.978	554.165

Thermodynamic properties of R-449A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.015	2.009	2.026	2.044	2.061	2.078	2.095	2.111	2.128	2.144	2.160	2.176	2.191	2.207	2.222	2.237	2.253	2.268	2.283	2.297	2.312	2.326
-95	0.024	1.979	1.997	2.014	2.031	2.048	2.064	2.081	2.097	2.113	2.129	2.145	2.160	2.176	2.191	2.206	2.221	2.236	2.251	2.265	2.280	2.294
-90	0.038	1.953	1.970	1.987	2.004	2.021	2.037	2.053	2.069	2.085	2.101	2.117	2.132	2.147	2.163	2.178	2.192	2.207	2.222	2.236	2.251	2.265
-85	0.058	1.929	1.946	1.963	1.980	1.996	2.013	2.029	2.045	2.060	2.076	2.091	2.107	2.122	2.137	2.152	2.167	2.181	2.196	2.210	2.225	2.239
-80	0.087	1.907	1.924	1.941	1.958	1.974	1.990	2.006	2.022	2.038	2.053	2.068	2.084	2.099	2.114	2.128	2.143	2.158	2.172	2.186	2.201	2.215
-75	0.126	1.888	1.905	1.921	1.938	1.954	1.970	1.986	2.001	2.017	2.032	2.048	2.063	2.078	2.093	2.107	2.122	2.136	2.151	2.165	2.179	2.193
-70	0.180	1.870	1.887	1.903	1.920	1.936	1.952	1.967	1.983	1.998	2.014	2.029	2.044	2.059	2.073	2.088	2.103	2.117	2.131	2.145	2.159	2.173
-65	0.250	1.854	1.870	1.887	1.903	1.919	1.935	1.951	1.966	1.982	1.997	2.012	2.027	2.041	2.056	2.071	2.085	2.099	2.114	2.128	2.142	2.156
-60	0.341	1.839	1.856	1.872	1.888	1.904	1.920	1.936	1.951	1.966	1.981	1.996	2.011	2.026	2.040	2.055	2.069	2.083	2.098	2.112	2.126	2.139
-55	0.458	1.826	1.842	1.859	1.875	1.891	1.906	1.922	1.937	1.952	1.967	1.982	1.997	2.012	2.026	2.041	2.055	2.069	2.083	2.097	2.111	2.125
-50	0.606	1.813	1.830	1.846	1.862	1.878	1.894	1.909	1.925	1.940	1.955	1.970	1.984	1.999	2.013	2.028	2.042	2.056	2.070	2.084	2.098	2.111
-45	0.789	1.802	1.819	1.835	1.851	1.867	1.883	1.898	1.913	1.929	1.943	1.958	1.973	1.987	2.002	2.016	2.030	2.044	2.058	2.072	2.086	2.099
-40.01	1.013	1.792	1.809	1.825	1.841	1.857	1.873	1.888	1.903	1.918	1.933	1.948	1.962	1.977	1.991	2.005	2.020	2.034	2.047	2.061	2.075	2.088
-40	1.013	1.792	1.809	1.825	1.841	1.857	1.873	1.888	1.903	1.918	1.933	1.948	1.962	1.977	1.991	2.005	2.020	2.034	2.047	2.061	2.075	2.088
-35	1.286	1.783	1.800	1.816	1.832	1.848	1.863	1.879	1.894	1.909	1.924	1.938	1.953	1.967	1.982	1.996	2.010	2.024	2.038	2.051	2.065	2.079
-30	1.612	1.774	1.791	1.808	1.824	1.839	1.855	1.870	1.886	1.901	1.915	1.930	1.944	1.959	1.973	1.987	2.001	2.015	2.029	2.043	2.056	2.070
-25	2.001	1.766	1.783	1.800	1.816	1.832	1.847	1.863	1.878	1.893	1.908	1.922	1.937	1.951	1.965	1.979	1.993	2.007	2.021	2.035	2.048	2.062
-20	2.458	1.759	1.776	1.793	1.809	1.825	1.840	1.856	1.871	1.886	1.901	1.915	1.930	1.944	1.958	1.972	1.986	2.000	2.014	2.027	2.041	2.054
-15	2.993	1.753	1.770	1.786	1.803	1.819	1.834	1.850	1.865	1.880	1.894	1.909	1.923	1.938	1.952	1.966	1.980	1.994	2.007	2.021	2.034	2.048
-10	3.613	1.746	1.764	1.780	1.797	1.813	1.828	1.844	1.859	1.874	1.889	1.903	1.918	1.932	1.946	1.960	1.974	1.988	2.002	2.015	2.029	2.042
-5	4.327	1.741	1.758	1.775	1.791	1.807	1.823	1.839	1.854	1.869	1.884	1.898	1.913	1.927	1.941	1.955	1.969	1.983	1.996	2.010	2.023	2.037
0	5.144	1.735	1.753	1.770	1.786	1.802	1.818	1.834	1.849	1.864	1.879	1.893	1.908	1.922	1.936	1.950	1.964	1.978	1.992	2.005	2.019	2.032
5	6.074	1.730	1.748	1.765	1.782	1.798	1.814	1.829	1.845	1.860	1.875	1.889	1.904	1.918	1.932	1.946	1.960	1.974	1.987	2.001	2.014	2.028
10	7.126	1.725	1.743	1.760	1.777	1.794	1.810	1.825	1.841	1.856	1.871	1.885	1.900	1.914	1.928	1.942	1.956	1.970	1.984	1.997	2.011	2.024
15	8.311	1.720	1.739	1.756	1.773	1.790	1.806	1.821	1.837	1.852	1.867	1.882	1.896	1.911	1.925	1.939	1.953	1.967	1.980	1.994	2.007	2.020
20	9.640	1.715	1.734	1.752	1.769	1.786	1.802	1.818	1.833	1.849	1.864	1.879	1.893	1.908	1.922	1.936	1.950	1.964	1.977	1.991	2.004	2.017
25	11.123	1.711	1.730	1.748	1.765	1.782	1.798	1.814	1.830	1.846	1.861	1.876	1.890	1.905	1.919	1.933	1.947	1.961	1.974	1.988	2.001	2.015
30	12.774	1.706	1.725	1.744	1.761	1.778	1.795	1.811	1.827	1.843	1.858	1.873	1.887	1.902	1.916	1.930	1.944	1.958	1.972	1.985	1.999	2.012
35	14.604	1.701	1.721	1.739	1.758	1.775	1.792	1.808	1.824	1.840	1.855	1.870	1.885	1.899	1.914	1.928	1.942	1.956	1.970	1.983	1.997	2.010
40	16.628	1.695	1.716	1.735	1.754	1.771	1.789	1.805	1.821	1.837	1.852	1.868	1.883	1.897	1.912	1.926	1.940	1.954	1.968	1.981	1.995	2.008
45	18.861	1.689	1.711	1.731	1.750	1.768	1.785	1.802	1.818	1.834	1.850	1.865	1.880	1.895	1.909	1.924	1.938	1.952	1.966	1.979	1.993	2.006
50	21.319	1.682	1.705	1.726	1.746	1.764	1.782	1.799	1.816	1.832	1.847	1.863	1.878	1.893	1.907	1.922	1.936	1.950	1.964	1.977	1.991	2.004
55	24.022	1.675	1.699	1.721	1.741	1.760	1.778	1.796	1.813	1.829	1.845	1.860	1.876	1.891	1.905	1.920	1.934	1.948	1.962	1.976	1.989	2.003
60	26.991	1.666	1.692	1.715	1.736	1.756	1.775	1.792	1.810	1.826	1.842	1.858	1.873	1.889	1.903	1.918	1.932	1.946	1.960	1.974	1.988	2.001
65	30.257	1.655	1.684	1.709	1.731	1.751	1.770	1.789	1.806	1.823	1.840	1.856	1.871	1.886	1.901	1.916	1.930	1.945	1.959	1.973	1.986	2.000
70	33.857	1.641	1.675	1.701	1.725	1.746	1.766	1.785	1.803	1.820	1.837	1.853	1.869	1.884	1.899	1.914	1.929	1.943	1.957	1.971	1.985	1.998
75	37.857	1.621	1.663	1.693	1.718	1.740	1.761	1.780	1.799	1.816	1.833	1.850	1.866	1.881	1.897	1.912	1.926	1.941	1.955	1.969	1.983	1.996
80	42.420	1.585	1.647	1.681	1.708	1.732	1.754	1.774	1.793	1.811	1.829	1.846	1.862	1.878	1.893	1.908	1.923	1.938	1.952	1.966	1.980	1.994

R-450A (Solstice® N13)

Zeotropic blend (42 % R-134a - 58 % R-1234ze)

Molecular weight (g/mol)	108.67
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-23.36
Temperature glide at 1.013 bar (K)	0.61
Critical temperature (°C)	105.6
Critical pressure (bar absolute)	39.13
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.403
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.873
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.109
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.195
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	8.65
Classification NF-EN 378	A1
GWP (IPCC 4)	605

Main applications

R-450A is a "near azeotropic" blend containing an HFO refrigerant, designed to replace R-134a in commercial and industrial refrigerators, as well as air conditioning and chillers.
With its atmospheric pressure temperature glide of less than 1k, it can be used in direct expansion or flooded evaporator systems.

Commercial specifications

Composition: (58 % R-1234ze – 42 % R-134a) (±2 % / ±2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chlorine ion test (silver nitrate test): negative.
Total Acidity (HCL): ≤ 1 ppm weight.
Non-condensable content (gas phase): ≤ 1.5 % volume.

Oils

Use a polyol ester (POE) oil.
Consult **Climalife** regarding the viscosity of the oil selected for your system and the most suitable for your application.

Regulation

The use and implementation of R-450A are governed by the European Regulation N° 517/2014.
The recovery of R-450A is mandatory under the European Regulation N° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-450A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.070	-70	0.687	1.455	111.484	0.627	-69.46	2.206	0.453	342.206	1.761	230.722
0.100	-65	0.693	1.442	117.578	0.657	-64.45	1.581	0.632	345.547	1.751	227.969
0.140	-60	0.700	1.429	123.698	0.686	-59.45	1.155	0.866	348.912	1.741	225.214
0.192	-55	0.706	1.416	129.844	0.714	-54.44	0.858	1.165	352.295	1.733	222.451
0.260	-50	0.713	1.403	136.021	0.742	-49.43	0.648	1.543	355.691	1.726	219.671
0.345	-45	0.720	1.389	142.230	0.770	-44.42	0.497	2.013	359.095	1.719	216.865
0.452	-40	0.727	1.375	148.474	0.797	-39.41	0.386	2.591	362.502	1.714	214.028
0.585	-35	0.734	1.362	154.755	0.823	-34.41	0.304	3.295	365.904	1.709	211.149
0.746	-30	0.742	1.348	161.077	0.850	-29.4	0.241	4.141	369.298	1.705	208.222
0.941	-25	0.750	1.334	167.440	0.876	-24.39	0.194	5.152	372.678	1.702	205.238
1.013	-23.36	0.752	1.329	169.532	0.884	-22.75	0.181	5.521	373.780	1.701	204.248
1.174	-20	0.758	1.319	173.850	0.901	-19.38	0.158	6.347	376.039	1.699	202.189
1.451	-15	0.766	1.305	180.307	0.926	-14.38	0.129	7.751	379.374	1.696	199.067
1.776	-10	0.775	1.290	186.816	0.951	-9.37	0.107	9.389	382.680	1.695	195.864
2.155	-5	0.784	1.275	193.379	0.976	-4.37	0.089	11.289	385.949	1.693	192.570
2.594	0	0.794	1.260	200.000	1.000	0.64	0.074	13.480	389.176	1.692	189.176
3.098	5	0.804	1.244	206.683	1.024	5.64	0.063	15.997	392.355	1.691	185.672
3.675	10	0.814	1.228	213.432	1.048	10.64	0.053	18.876	395.479	1.690	182.047
4.329	15	0.825	1.212	220.253	1.072	15.64	0.045	22.159	398.541	1.690	178.289
5.069	20	0.837	1.195	227.149	1.095	20.64	0.039	25.890	401.533	1.689	174.384
5.900	25	0.849	1.177	234.129	1.119	25.64	0.033	30.123	404.446	1.689	170.317
6.831	30	0.863	1.159	241.198	1.142	30.64	0.029	34.917	407.270	1.689	166.072
7.867	35	0.877	1.141	248.364	1.165	35.64	0.025	40.342	409.992	1.689	161.628
9.017	40	0.892	1.122	255.637	1.188	40.63	0.022	46.480	412.599	1.689	156.961
10.289	45	0.908	1.102	263.027	1.211	45.62	0.019	53.429	415.073	1.689	152.046
11.691	50	0.925	1.081	270.547	1.234	50.61	0.016	61.306	417.395	1.688	146.849
13.231	55	0.945	1.059	278.211	1.257	55.6	0.014	70.259	419.540	1.688	141.329
14.918	60	0.966	1.035	286.038	1.280	60.59	0.012	80.472	421.478	1.687	135.439
16.761	65	0.990	1.010	294.055	1.304	65.57	0.011	92.186	423.169	1.685	129.115
18.772	70	1.017	0.984	302.292	1.327	70.55	0.009	105.721	424.564	1.683	122.272
20.959	75	1.047	0.955	310.795	1.351	75.52	0.008	121.526	425.591	1.681	114.796
23.336	80	1.084	0.923	319.631	1.376	80.49	0.007	140.259	426.147	1.677	106.516
25.916	85	1.127	0.887	328.903	1.401	85.45	0.006	162.957	426.071	1.672	97.168
28.715	90	1.183	0.845	338.790	1.428	90.41	0.005	191.425	425.087	1.665	86.297
31.752	95	1.260	0.794	349.662	1.456	95.35	0.004	229.365	422.639	1.654	72.977
35.054	100	1.385	0.722	362.570	1.490	100.26	0.003	287.322	417.177	1.636	54.607

Thermodynamic properties of R-450A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-70	0.067	2289.876	2347.540	2405.091	2462.550	2519.933	2577.250	2634.512	2691.725	2748.896	2806.029	2863.129	2920.199	2977.242	3034.260	3091.257	3148.233	3205.191	3262.132	3319.058	3375.970	3432.869
-65	0.096	1638.124	1678.647	1719.074	1759.422	1799.703	1839.928	1880.104	1920.237	1960.331	2000.392	2040.423	2080.427	2120.407	2160.364	2200.301	2240.219	2280.121	2320.008	2359.880	2399.740	2439.587
-60	0.135	1194.602	1223.688	1252.691	1281.625	1310.501	1339.326	1368.108	1396.852	1425.561	1454.240	1482.892	1511.519	1540.123	1568.708	1597.274	1625.823	1654.356	1682.876	1711.382	1739.877	1768.360
-55	0.186	886.626	907.917	929.136	950.293	971.400	992.461	1013.483	1034.471	1055.427	1076.356	1097.261	1118.142	1139.003	1159.846	1180.672	1201.482	1222.278	1243.060	1263.831	1284.591	1305.340
-50	0.251	668.746	684.621	700.431	716.186	731.895	747.564	763.197	778.798	794.372	809.920	825.446	840.951	856.437	871.906	887.359	902.798	918.224	933.638	949.041	964.433	979.816
-45	0.334	511.925	523.965	535.947	547.880	559.771	571.625	583.447	595.240	607.008	618.752	630.475	642.180	653.867	665.538	677.195	688.838	700.469	712.089	723.699	735.299	746.890
-40	0.439	397.236	406.516	415.744	424.926	434.070	443.180	452.261	461.315	470.346	479.355	488.345	497.318	506.274	515.216	524.144	533.060	541.964	550.858	559.743	568.618	577.486
-35	0.567	312.110	319.371	326.584	333.756	340.892	347.997	355.075	362.128	369.160	376.172	383.166	390.143	397.106	404.055	410.992	417.917	424.831	431.736	438.632	445.519	452.399
-30	0.725	248.051	253.814	259.532	265.212	270.859	276.477	282.070	287.641	293.191	298.722	304.237	309.737	315.223	320.696	326.157	331.608	337.049	342.480	347.904	353.319	358.727
-25	0.915	199.227	203.862	208.456	213.013	217.541	222.041	226.518	230.973	235.410	239.829	244.233	248.623	253.000	257.365	261.718	266.062	270.397	274.723	279.041	283.352	287.656
-22.75	1.013	181.120	185.341	189.521	193.666	197.782	201.872	205.939	209.985	214.013	218.024	222.020	226.002	229.972	233.930	237.878	241.815	245.744	249.665	253.577	257.483	261.382
-20	1.144	161.568	165.344	169.080	172.783	176.457	180.107	183.733	187.341	190.930	194.503	198.062	201.607	205.140	208.662	212.174	215.676	219.170	222.656	226.134	229.605	233.070
-15	1.414	132.198	135.310	138.386	141.429	144.446	147.439	150.411	153.365	156.302	159.223	162.131	165.026	167.910	170.784	173.647	176.502	179.349	182.188	185.020	187.845	190.665
-10	1.733	109.053	111.648	114.208	116.737	119.242	121.723	124.185	126.630	129.058	131.472	133.874	136.263	138.641	141.010	143.369	145.721	148.064	150.400	152.730	155.053	157.371
-5	2.104	90.637	92.824	94.977	97.102	99.202	101.281	103.341	105.385	107.413	109.428	111.431	113.422	115.403	117.375	119.338	121.293	123.240	125.181	127.116	129.045	130.968
0	2.535	75.850	77.712	79.542	81.344	83.123	84.882	86.623	88.348	90.058	91.755	93.441	95.116	96.782	98.438	100.086	101.727	103.360	104.987	106.609	108.224	109.835
5	3.030	63.875	65.476	67.046	68.590	70.111	71.613	73.097	74.566	76.022	77.464	78.896	80.318	81.730	83.134	84.529	85.918	87.300	88.676	90.046	91.411	92.771
10	3.596	54.099	55.489	56.849	58.183	59.496	60.789	62.066	63.328	64.577	65.814	67.041	68.257	69.465	70.664	71.856	73.041	74.219	75.392	76.559	77.722	78.879
15	4.240	46.059	47.277	48.465	49.628	50.771	51.894	53.002	54.095	55.176	56.245	57.303	58.353	59.393	60.426	61.452	62.471	63.484	64.491	65.493	66.490	67.483
20	4.968	39.399	40.475	41.523	42.546	43.548	44.532	45.500	46.455	47.397	48.328	49.249	50.161	51.064	51.960	52.849	53.732	54.609	55.480	56.346	57.208	58.066
25	5.788	33.844	34.804	35.735	36.642	37.529	38.397	39.250	40.090	40.918	41.734	42.541	43.339	44.129	44.912	45.688	46.458	47.222	47.981	48.736	49.485	50.231
30	6.705	29.182	30.046	30.880	31.691	32.481	33.253	34.011	34.755	35.487	36.208	36.920	37.623	38.319	39.007	39.689	40.365	41.035	41.701	42.362	43.018	43.671
35	7.729	25.245	26.029	26.783	27.513	28.222	28.914	29.591	30.255	30.907	31.549	32.181	32.805	33.421	34.030	34.633	35.230	35.822	36.409	36.992	37.570	38.144
40	8.865	21.900	22.618	23.305	23.968	24.610	25.234	25.843	26.439	27.024	27.598	28.163	28.720	29.269	29.812	30.348	30.879	31.404	31.925	32.441	32.954	33.462
45	10.124	19.043	19.706	20.338	20.944	21.529	22.096	22.648	23.186	23.714	24.231	24.739	25.238	25.731	26.217	26.697	27.171	27.640	28.105	28.565	29.021	29.474
50	11.511	16.588	17.207	17.792	18.351	18.888	19.406	19.909	20.399	20.878	21.346	21.805	22.257	22.701	23.138	23.569	23.996	24.417	24.833	25.246	25.655	26.060
55	13.038	14.468	15.051	15.598	16.117	16.613	17.090	17.552	18.000	18.437	18.863	19.281	19.690	20.093	20.489	20.879	21.263	21.643	22.019	22.390	22.758	23.122
60	14.712	12.626	13.182	13.698	14.183	14.645	15.087	15.513	15.925	16.326	16.717	17.098	17.472	17.838	18.198	18.553	18.902	19.246	19.586	19.922	20.255	20.584
65	16.543	11.017	11.553	12.044	12.502	12.934	13.346	13.742	14.124	14.493	14.853	15.203	15.546	15.881	16.210	16.533	16.852	17.165	17.474	17.780	18.081	18.380
70	18.543	9.603	10.127	10.598	11.034	11.442	11.828	12.198	12.553	12.896	13.228	13.551	13.867	14.175	14.477	14.773	15.064	15.351	15.633	15.912	16.187	16.459
75	20.722	8.351	8.871	9.329	9.747	10.134	10.499	10.846	11.178	11.497	11.806	12.106	12.397	12.682	12.960	13.232	13.500	13.763	14.022	14.277	14.529	14.777
80	23.093	7.233	7.759	8.210	8.614	8.984	9.331	9.658	9.970	10.269	10.557	10.835	11.106	11.370	11.627	11.879	12.125	12.368	12.606	12.840	13.071	13.299
85	25.673	6.223	6.770	7.219	7.612	7.969	8.300	8.610	8.904	9.185	9.455	9.715	9.967	10.212	10.451	10.684	10.913	11.137	11.356	11.572	11.785	11.995
90	28.477	5.296	5.883	6.337	6.724	7.070	7.387	7.683	7.961	8.226	8.480	8.723	8.959	9.187	9.410	9.626	9.838	10.046	10.249	10.449	10.645	10.839
95	31.531	4.420	5.083	5.549	5.933	6.270	6.575	6.858	7.122	7.373	7.612	7.841	8.062	8.275	8.483	8.684	8.881	9.074	9.263	9.448	9.630	9.809
100	34.871	3.530	4.355	4.840	5.223	5.553	5.848	6.119	6.371	6.609	6.834	7.050	7.257	7.457	7.651	7.839	8.023	8.202	8.378	8.550	8.718	8.884

Thermodynamic properties of R-450A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-70	0.067	341.847	345.328	348.855	352.428	356.046	359.711	363.421	367.177	370.977	374.822	378.710	382.642	386.617	390.635	394.695	398.798	402.942	407.129	411.356	415.625	419.935
-65	0.096	345.181	348.720	352.304	355.932	359.604	363.321	367.083	370.889	374.738	378.631	382.568	386.547	390.568	394.632	398.737	402.885	407.074	411.304	415.575	419.887	424.239
-60	0.135	348.538	352.137	355.777	359.461	363.187	366.957	370.771	374.627	378.526	382.468	386.452	390.479	394.547	398.657	402.808	407.000	411.233	415.508	419.822	424.178	428.573
-55	0.186	351.915	355.573	359.271	363.010	366.792	370.615	374.481	378.388	382.337	386.329	390.361	394.435	398.550	402.707	406.904	411.141	415.420	419.738	424.097	428.496	432.935
-50	0.251	355.304	359.023	362.780	366.576	370.413	374.291	378.209	382.168	386.168	390.209	394.291	398.413	402.576	406.779	411.022	415.306	419.629	423.993	428.396	432.839	437.321
-45	0.334	358.702	362.483	366.300	370.154	374.047	377.980	381.951	385.963	390.015	394.106	398.238	402.409	406.620	410.870	415.161	419.490	423.860	428.269	432.717	437.204	441.731
-40	0.439	362.103	365.947	369.825	373.739	377.689	381.678	385.705	389.770	393.874	398.017	402.198	406.419	410.679	414.978	419.316	423.693	428.109	432.563	437.057	441.589	446.160
-35	0.567	365.501	369.411	373.352	377.326	381.336	385.382	389.464	393.584	397.741	401.937	406.170	410.442	414.751	419.099	423.485	427.910	432.373	436.874	441.413	445.991	450.607
-30	0.725	368.891	372.869	376.875	380.912	384.982	389.086	393.226	397.402	401.614	405.863	410.149	414.472	418.832	423.230	427.666	432.139	436.649	441.198	445.784	450.408	455.070
-25	0.915	372.269	376.316	380.389	384.491	388.623	392.788	396.987	401.220	405.489	409.792	414.132	418.508	422.920	427.368	431.854	436.376	440.936	445.532	450.166	454.836	459.544
-22.75	1.013	373.780	377.860	381.964	386.095	390.257	394.450	398.675	402.935	407.229	411.558	415.922	420.322	424.757	429.229	433.738	438.282	442.864	447.482	452.137	456.829	461.558
-20	1.144	375.627	379.748	383.890	388.059	392.256	396.483	400.743	405.035	409.361	413.721	418.115	422.545	427.010	431.511	436.047	440.620	445.229	449.874	454.556	459.274	464.029
-15	1.414	378.962	383.159	387.374	391.611	395.875	400.167	404.489	408.842	413.227	417.645	422.096	426.581	431.100	435.654	440.243	444.867	449.526	454.221	458.952	463.719	468.521
-10	1.733	382.267	386.544	390.834	395.144	399.477	403.836	408.223	412.638	417.084	421.561	426.070	430.612	435.187	439.795	444.437	449.114	453.825	458.570	463.351	468.167	473.018
-5	2.104	385.538	389.898	394.267	398.653	403.058	407.486	411.939	416.420	420.929	425.467	430.035	434.635	439.267	443.931	448.628	453.358	458.122	462.919	467.751	472.617	477.518
0	2.535	388.768	393.216	397.668	402.132	406.612	411.112	415.635	420.183	424.756	429.358	433.988	438.648	443.338	448.059	452.812	457.597	462.414	467.265	472.148	477.065	482.016
5	3.030	391.951	396.492	401.031	405.577	410.136	414.711	419.306	423.923	428.564	433.231	437.924	442.646	447.396	452.176	456.986	461.827	466.700	471.604	476.541	481.510	486.513
10	3.596	395.081	399.720	404.351	408.984	413.625	418.278	422.948	427.638	432.348	437.082	441.841	446.626	451.438	456.278	461.148	466.046	470.976	475.935	480.926	485.949	491.004
15	4.240	398.150	402.894	407.623	412.347	417.074	421.809	426.557	431.322	436.105	440.909	445.735	450.586	455.462	460.364	465.294	470.252	475.239	480.255	485.302	490.379	495.487
20	4.968	401.152	406.008	410.839	415.660	420.477	425.299	430.129	434.972	439.831	444.707	449.604	454.522	459.464	464.430	469.422	474.441	479.487	484.562	489.665	494.798	499.960
25	5.788	404.076	409.052	413.994	418.917	423.831	428.743	433.659	438.584	443.521	448.473	453.442	458.431	463.441	468.473	473.529	478.611	483.718	488.852	494.013	499.203	504.421
30	6.705	406.913	412.019	417.080	422.113	427.128	432.136	437.143	442.154	447.173	452.203	457.248	462.309	467.390	472.490	477.612	482.758	487.928	493.123	498.344	503.592	508.867
35	7.729	409.651	414.900	420.089	425.239	430.363	435.473	440.575	445.676	450.781	455.894	461.017	466.154	471.307	476.478	481.669	486.881	492.115	497.373	502.655	507.962	513.296
40	8.865	412.276	417.682	423.012	428.288	433.529	438.747	443.951	449.147	454.342	459.541	464.746	469.962	475.191	480.435	485.696	490.976	496.276	501.599	506.944	512.313	517.706
45	10.124	414.772	420.354	425.837	431.253	436.620	441.953	447.264	452.561	457.851	463.140	468.431	473.729	479.036	484.356	489.690	495.041	500.410	505.798	511.208	516.640	522.095
50	11.511	417.119	422.900	428.555	434.122	439.626	445.084	450.510	455.914	461.304	466.687	472.068	477.451	482.841	488.239	493.649	499.073	504.512	509.969	515.445	520.941	526.459
55	13.038	419.292	425.303	431.152	436.887	442.539	448.132	453.681	459.199	464.695	470.178	475.653	481.126	486.601	492.081	497.569	503.068	508.581	514.109	519.653	525.216	530.798
60	14.712	421.262	427.543	433.612	439.534	445.350	451.089	456.770	462.410	468.019	473.608	479.182	484.749	490.313	495.878	501.448	507.026	512.614	518.214	523.829	529.460	535.108
65	16.543	422.991	429.595	435.918	442.051	448.048	453.947	459.772	465.542	471.272	476.972	482.651	488.316	493.974	499.628	505.282	510.941	516.607	522.283	527.970	533.672	539.389
70	18.543	424.428	431.428	438.049	444.422	450.621	456.695	462.676	468.587	474.445	480.265	486.054	491.824	497.579	503.325	509.069	514.812	520.559	526.312	532.075	537.849	543.636
75	20.722	425.503	433.003	439.979	446.628	453.055	459.324	465.475	471.538	477.535	483.481	489.388	495.266	501.124	506.968	512.803	518.634	524.465	530.299	536.139	541.988	547.847
80	23.093	426.117	434.271	441.678	448.650	455.335	461.820	468.159	474.388	480.533	486.614	492.645	498.639	504.605	510.551	516.482	522.405	528.323	534.240	540.161	546.086	552.020
85	25.673	426.110	435.166	443.110	450.462	457.444	464.171	470.716	477.125	483.431	489.656	495.820	501.937	508.017	514.069	520.101	526.118	532.127	538.131	544.135	550.140	556.151
90	28.477	425.212	435.599	444.228	452.037	459.360	466.361	473.134	479.740	486.219	492.600	498.905	505.151	511.351	517.515	523.652	529.769	535.873	541.967	548.056	554.144	560.234
95	31.531	422.880	435.453	444.977	453.338	461.058	468.368	475.395	482.216	488.883	495.431	501.886	508.270	514.597	520.879	527.127	533.348	539.550	545.738	551.916	558.090	564.262
100	34.871	417.608	434.554	445.277	454.312	462.494	470.156	477.466	484.524	491.396	498.124	504.742	511.273	517.734	524.142	530.506	536.837	543.142	549.428	555.700	561.963	568.220

Thermodynamic properties of R-450A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-70	0.067	1.763	1.780	1.796	1.813	1.829	1.846	1.862	1.878	1.893	1.909	1.925	1.940	1.955	1.970	1.985	2.000	2.015	2.030	2.044	2.059	2.073
-65	0.096	1.752	1.769	1.785	1.802	1.818	1.834	1.850	1.866	1.881	1.897	1.912	1.928	1.943	1.958	1.973	1.987	2.002	2.017	2.031	2.045	2.060
-60	0.135	1.742	1.759	1.775	1.792	1.808	1.824	1.840	1.855	1.871	1.886	1.902	1.917	1.932	1.947	1.961	1.976	1.991	2.005	2.020	2.034	2.048
-55	0.186	1.734	1.750	1.767	1.783	1.799	1.815	1.831	1.846	1.862	1.877	1.892	1.907	1.922	1.937	1.952	1.966	1.981	1.995	2.009	2.023	2.037
-50	0.251	1.726	1.743	1.759	1.775	1.791	1.807	1.823	1.838	1.853	1.869	1.884	1.899	1.913	1.928	1.943	1.957	1.972	1.986	2.000	2.014	2.028
-45	0.334	1.720	1.736	1.752	1.768	1.784	1.800	1.816	1.831	1.846	1.861	1.876	1.891	1.906	1.921	1.935	1.949	1.964	1.978	1.992	2.006	2.020
-40	0.439	1.714	1.731	1.747	1.763	1.778	1.794	1.809	1.825	1.840	1.855	1.870	1.885	1.899	1.914	1.928	1.943	1.957	1.971	1.985	1.999	2.013
-35	0.567	1.710	1.726	1.742	1.758	1.773	1.789	1.804	1.819	1.835	1.849	1.864	1.879	1.894	1.908	1.922	1.937	1.951	1.965	1.979	1.993	2.006
-30	0.725	1.705	1.722	1.738	1.753	1.769	1.784	1.800	1.815	1.830	1.845	1.860	1.874	1.889	1.903	1.917	1.932	1.946	1.960	1.973	1.987	2.001
-25	0.915	1.702	1.718	1.734	1.750	1.765	1.781	1.796	1.811	1.826	1.841	1.855	1.870	1.884	1.899	1.913	1.927	1.941	1.955	1.969	1.983	1.996
-22.75	1.013	1.701	1.717	1.733	1.748	1.764	1.779	1.794	1.810	1.824	1.839	1.854	1.868	1.883	1.897	1.911	1.925	1.939	1.953	1.967	1.981	1.994
-20	1.144	1.699	1.715	1.731	1.747	1.762	1.778	1.793	1.808	1.823	1.837	1.852	1.867	1.881	1.895	1.909	1.923	1.937	1.951	1.965	1.979	1.992
-15	1.414	1.697	1.713	1.729	1.744	1.760	1.775	1.790	1.805	1.820	1.835	1.849	1.864	1.878	1.892	1.906	1.920	1.934	1.948	1.962	1.975	1.989
-10	1.733	1.695	1.711	1.727	1.742	1.758	1.773	1.788	1.803	1.818	1.832	1.847	1.861	1.876	1.890	1.904	1.918	1.932	1.945	1.959	1.973	1.986
-5	2.104	1.693	1.709	1.725	1.741	1.756	1.771	1.786	1.801	1.816	1.831	1.845	1.860	1.874	1.888	1.902	1.916	1.930	1.943	1.957	1.970	1.984
0	2.535	1.692	1.708	1.724	1.740	1.755	1.770	1.785	1.800	1.815	1.829	1.844	1.858	1.872	1.886	1.900	1.914	1.928	1.942	1.955	1.969	1.982
5	3.030	1.691	1.707	1.723	1.739	1.754	1.769	1.784	1.799	1.814	1.828	1.843	1.857	1.871	1.885	1.899	1.913	1.927	1.940	1.954	1.967	1.981
10	3.596	1.690	1.707	1.722	1.738	1.754	1.769	1.784	1.799	1.813	1.828	1.842	1.857	1.871	1.885	1.899	1.912	1.926	1.940	1.953	1.966	1.980
15	4.240	1.690	1.706	1.722	1.738	1.753	1.769	1.784	1.798	1.813	1.828	1.842	1.856	1.870	1.884	1.898	1.912	1.926	1.939	1.953	1.966	1.979
20	4.968	1.689	1.706	1.722	1.738	1.753	1.768	1.784	1.798	1.813	1.828	1.842	1.856	1.870	1.884	1.898	1.912	1.925	1.939	1.952	1.966	1.979
25	5.788	1.689	1.706	1.722	1.738	1.753	1.769	1.784	1.799	1.813	1.828	1.842	1.857	1.871	1.885	1.898	1.912	1.926	1.939	1.953	1.966	1.979
30	6.705	1.689	1.706	1.722	1.738	1.754	1.769	1.784	1.799	1.814	1.828	1.843	1.857	1.871	1.885	1.899	1.913	1.926	1.940	1.953	1.966	1.979
35	7.729	1.689	1.706	1.722	1.738	1.754	1.770	1.785	1.800	1.814	1.829	1.843	1.858	1.872	1.886	1.900	1.913	1.927	1.940	1.954	1.967	1.980
40	8.865	1.689	1.706	1.723	1.739	1.755	1.770	1.785	1.800	1.815	1.830	1.844	1.859	1.873	1.887	1.900	1.914	1.928	1.941	1.955	1.968	1.981
45	10.124	1.689	1.706	1.723	1.739	1.755	1.771	1.786	1.801	1.816	1.831	1.845	1.860	1.874	1.888	1.902	1.915	1.929	1.942	1.956	1.969	1.982
50	11.511	1.688	1.706	1.723	1.740	1.756	1.772	1.787	1.802	1.817	1.832	1.846	1.861	1.875	1.889	1.903	1.916	1.930	1.944	1.957	1.970	1.983
55	13.038	1.688	1.706	1.723	1.740	1.756	1.772	1.788	1.803	1.818	1.833	1.848	1.862	1.876	1.890	1.904	1.918	1.931	1.945	1.958	1.971	1.985
60	14.712	1.687	1.705	1.723	1.740	1.757	1.773	1.789	1.804	1.819	1.834	1.849	1.863	1.878	1.892	1.906	1.919	1.933	1.946	1.960	1.973	1.986
65	16.543	1.685	1.705	1.723	1.741	1.757	1.774	1.790	1.805	1.821	1.836	1.850	1.865	1.879	1.893	1.907	1.921	1.935	1.948	1.961	1.975	1.988
70	18.543	1.684	1.704	1.723	1.741	1.758	1.774	1.791	1.806	1.822	1.837	1.852	1.866	1.881	1.895	1.909	1.923	1.936	1.950	1.963	1.976	1.990
75	20.722	1.681	1.702	1.722	1.741	1.758	1.775	1.791	1.807	1.823	1.838	1.853	1.868	1.882	1.896	1.910	1.924	1.938	1.952	1.965	1.978	1.991
80	23.093	1.678	1.701	1.721	1.740	1.758	1.775	1.792	1.808	1.824	1.839	1.854	1.869	1.884	1.898	1.912	1.926	1.940	1.953	1.967	1.980	1.993
85	25.673	1.673	1.698	1.720	1.739	1.758	1.776	1.793	1.809	1.825	1.841	1.856	1.871	1.885	1.900	1.914	1.928	1.942	1.955	1.969	1.982	1.995
90	28.477	1.666	1.694	1.717	1.738	1.757	1.776	1.793	1.810	1.826	1.842	1.857	1.872	1.887	1.901	1.915	1.929	1.943	1.957	1.971	1.984	1.997
95	31.531	1.655	1.689	1.715	1.737	1.757	1.775	1.793	1.810	1.827	1.842	1.858	1.873	1.888	1.903	1.917	1.931	1.945	1.959	1.972	1.986	1.999
100	34.871	1.638	1.683	1.711	1.734	1.755	1.775	1.793	1.810	1.827	1.843	1.859	1.874	1.889	1.904	1.918	1.933	1.947	1.960	1.974	1.987	2.001

R-452A

Zeotropic blend (11 % R-32 - 59 % R-125 - 30 % R-1234yf)

Molecular weight (g/mol)	103.51
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-46.93
Temperature glide at 1.013 bar (K)	3.79
Critical temperature (°C)	75.6
Critical pressure (bar absolute)	40.67
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.471
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.835
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.117
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.136
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	5.10
Classification NF-EN 378	A1
GWP (IPCC 4)	2140

Main applications

R-452A is a "non azeotropic" blend containing refrigerants from the hydrofluoro-olefin (HFO) family, designed to replace R-404A in new or existing installations and especially in transport refrigeration.

Commercial specifications

Composition: (59 % R-125 – 30 % R-1234yf – 11 %R-32) (±1.8% / ±0.1%-1% / ±1.7%).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chlorine ion test (silver nitrate test): negative.
Total Acidity (HCL): ≤ 1 ppm weight.
Non-condensable content (gas phase): ≤ 1.5 % volume.

Oils

Use a polyol ester (POE) oil.
Consult **Climalife** regarding the viscosity of the oil selected for your system and the most suitable for your application.

Regulation

The use and implementation of R-452A are governed by the European Regulation N° 517/2014.
The recovery of R-452A is mandatory under the European Regulation N° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-452A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.029	-100	0.639	1.564	79.771	0.457	-96.81	4.882	0.205	304.775	1.747	225.004
0.045	-95	0.645	1.550	85.468	0.490	-91.74	3.215	0.311	307.754	1.728	222.287
0.068	-90	0.651	1.535	91.157	0.521	-86.66	2.177	0.459	310.756	1.711	219.599
0.101	-85	0.658	1.521	96.851	0.552	-81.6	1.512	0.661	313.775	1.696	216.925
0.145	-80	0.664	1.506	102.557	0.582	-76.53	1.074	0.931	316.808	1.683	214.251
0.205	-75	0.671	1.491	108.284	0.611	-71.47	0.779	1.283	319.848	1.671	211.564
0.283	-70	0.677	1.476	114.038	0.640	-66.42	0.576	1.736	322.892	1.660	208.854
0.384	-65	0.685	1.461	119.824	0.668	-61.37	0.433	2.308	325.933	1.651	206.109
0.512	-60	0.692	1.445	125.648	0.695	-56.32	0.331	3.021	328.968	1.642	203.320
0.672	-55	0.699	1.430	131.514	0.722	-51.28	0.256	3.899	331.991	1.635	200.476
0.870	-50	0.707	1.414	137.427	0.749	-46.23	0.201	4.967	334.997	1.628	197.570
1.013	-46.93	0.712	1.404	141.077	0.765	-43.15	0.175	5.728	336.829	1.624	195.752
1.112	-45	0.715	1.398	143.389	0.775	-41.2	0.160	6.253	337.980	1.622	194.591
1.403	-40	0.724	1.382	149.406	0.801	-36.17	0.128	7.787	340.936	1.617	191.530
1.751	-35	0.733	1.365	155.481	0.827	-31.14	0.104	9.600	343.859	1.613	188.378
2.161	-30	0.742	1.348	161.618	0.853	-26.11	0.085	11.730	346.743	1.609	185.125
2.643	-25	0.752	1.331	167.821	0.878	-21.1	0.070	14.213	349.582	1.605	181.761
3.202	-20	0.762	1.313	174.095	0.902	-16.08	0.058	17.094	352.369	1.602	178.274
3.847	-15	0.772	1.295	180.444	0.927	-11.08	0.049	20.419	355.096	1.599	174.652
4.586	-10	0.784	1.276	186.874	0.952	-6.08	0.041	24.241	357.756	1.597	170.881
5.427	-5	0.796	1.257	193.391	0.976	-1.09	0.035	28.619	360.337	1.594	166.946
6.379	0	0.808	1.237	200.000	1.000	3.9	0.030	33.623	362.827	1.592	162.827
7.451	5	0.822	1.216	206.710	1.024	8.87	0.025	39.330	365.211	1.590	158.501
8.650	10	0.837	1.195	213.528	1.048	13.84	0.022	45.833	367.472	1.588	153.944
9.987	15	0.853	1.173	220.465	1.072	18.79	0.019	53.244	369.591	1.586	149.126
11.471	20	0.870	1.150	227.532	1.096	23.72	0.016	61.693	371.545	1.584	144.013
13.111	25	0.889	1.125	234.744	1.120	28.65	0.014	71.345	373.308	1.582	138.564
14.918	30	0.909	1.100	242.118	1.144	33.56	0.012	82.404	374.850	1.579	132.732
16.901	35	0.932	1.073	249.678	1.168	38.44	0.011	95.133	376.132	1.576	126.454
19.071	40	0.958	1.043	257.458	1.192	43.31	0.009	109.886	377.104	1.572	119.646
21.440	45	0.988	1.012	265.500	1.217	48.15	0.008	127.149	377.695	1.568	112.195
24.018	50	1.024	0.977	273.870	1.242	52.96	0.007	147.638	377.805	1.562	103.935
26.817	55	1.067	0.938	282.667	1.268	57.72	0.006	172.480	377.273	1.555	94.606
29.851	60	1.121	0.892	292.068	1.296	62.44	0.005	203.639	375.822	1.546	83.753
33.131	65	1.196	0.836	302.444	1.326	67.06	0.004	245.140	372.891	1.533	70.447
36.659	70	1.321	0.757	314.847	1.361	71.53	0.003	308.173	366.968	1.512	52.121

Thermodynamic properties of R-452A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.022	6443.464	6631.632	6819.599	7007.398	7195.056	7382.594	7570.027	7757.371	7944.636	8131.834	8318.972	8506.058	8693.098	8880.097	9067.060	9253.991	9440.893	9627.770	9814.624	10001.457	10188.272
-95	0.034	4191.806	4311.312	4430.644	4549.831	4668.896	4787.856	4906.725	5025.517	5144.240	5262.903	5381.514	5500.079	5618.603	5737.091	5855.546	5973.973	6092.375	6210.753	6329.111	6447.451	6565.774
-90	0.052	2805.530	2883.771	2961.860	3039.824	3117.681	3195.447	3273.133	3350.751	3428.309	3505.815	3583.273	3660.691	3738.073	3815.423	3892.744	3970.039	4047.311	4124.563	4201.796	4279.012	4356.214
-85	0.078	1926.726	1979.400	2031.942	2084.373	2136.711	2188.969	2241.158	2293.286	2345.361	2397.389	2449.377	2501.327	2553.246	2605.136	2657.000	2708.841	2760.661	2812.463	2864.248	2916.018	2967.774
-80	0.113	1354.554	1390.939	1427.207	1463.378	1499.467	1535.486	1571.443	1607.346	1643.202	1679.017	1714.796	1750.541	1786.258	1821.949	1857.617	1893.264	1928.893	1964.505	2000.102	2035.684	2071.255
-75	0.162	972.814	998.551	1024.183	1049.730	1075.204	1100.616	1125.973	1151.282	1176.550	1201.781	1226.979	1252.147	1277.290	1302.410	1327.508	1352.588	1377.652	1402.699	1427.734	1452.755	1477.766
-70	0.226	712.357	730.965	749.481	767.921	786.295	804.614	822.885	841.112	859.303	877.460	895.588	913.690	931.768	949.826	967.864	985.886	1003.892	1021.884	1039.864	1057.832	1075.790
-65	0.309	530.956	544.687	558.335	571.915	585.436	598.909	612.337	625.728	639.084	652.412	665.712	678.989	692.245	705.481	718.701	731.905	745.096	758.273	771.439	784.595	797.741
-60	0.416	402.199	412.524	422.775	432.964	443.102	453.195	463.248	473.267	483.256	493.218	503.156	513.073	522.970	532.850	542.715	552.565	562.403	572.229	582.044	591.850	601.648
-55	0.551	309.199	317.101	324.936	332.715	340.448	348.140	355.797	363.423	371.021	378.595	386.147	393.679	401.194	408.694	416.179	423.651	431.111	438.561	446.001	453.433	460.856
-50	0.719	240.933	247.081	253.168	259.204	265.198	271.156	277.081	282.978	288.850	294.700	300.530	306.342	312.138	317.919	323.688	329.444	335.190	340.926	346.654	352.373	358.084
-45	0.925	190.070	194.927	199.728	204.484	209.201	213.884	218.538	223.166	227.772	232.357	236.923	241.474	246.010	250.532	255.042	259.542	264.031	268.512	272.984	277.449	281.906
-43.15	1.013	174.576	179.042	183.456	187.824	192.156	196.455	200.725	204.971	209.194	213.398	217.584	221.754	225.910	230.053	234.185	238.305	242.417	246.519	250.613	254.700	258.780
-40	1.176	151.646	155.538	159.380	163.180	166.944	170.678	174.385	178.068	181.730	185.373	189.000	192.611	196.209	199.795	203.370	206.934	210.489	214.036	217.575	221.107	224.633
-35	1.478	122.243	125.405	128.520	131.597	134.641	137.657	140.648	143.618	146.567	149.500	152.417	155.320	158.211	161.090	163.959	166.818	169.669	172.512	175.348	178.177	181.001
-30	1.838	99.473	102.075	104.633	107.156	109.649	112.115	114.558	116.981	119.386	121.775	124.150	126.512	128.862	131.201	133.531	135.852	138.165	140.471	142.770	145.063	147.350
-25	2.262	81.643	83.809	85.936	88.029	90.094	92.134	94.153	96.153	98.137	100.105	102.060	104.003	105.935	107.857	109.770	111.675	113.572	115.463	117.347	119.225	121.098
-20	2.758	67.535	69.360	71.147	72.903	74.633	76.339	78.026	79.695	81.348	82.988	84.614	86.230	87.835	89.430	91.018	92.597	94.169	95.735	97.296	98.850	100.400
-15	3.334	56.263	57.817	59.335	60.824	62.289	63.731	65.155	66.562	67.954	69.333	70.700	72.056	73.403	74.741	76.071	77.393	78.709	80.019	81.323	82.622	83.916
-10	3.998	47.175	48.512	49.815	51.091	52.343	53.574	54.788	55.985	57.169	58.340	59.500	60.649	61.790	62.922	64.046	65.164	66.275	67.380	68.480	69.576	70.666
-5	4.759	39.784	40.946	42.076	43.179	44.260	45.321	46.365	47.394	48.410	49.413	50.406	51.389	52.363	53.329	54.288	55.241	56.187	57.128	58.064	58.995	59.922
0	5.625	33.724	34.744	35.734	36.697	37.639	38.562	39.468	40.360	41.239	42.106	42.963	43.810	44.649	45.481	46.306	47.124	47.937	48.744	49.547	50.345	51.139
5	6.606	28.717	29.622	30.497	31.346	32.174	32.983	33.777	34.556	35.323	36.078	36.824	37.561	38.289	39.011	39.725	40.434	41.137	41.835	42.529	43.218	43.903
10	7.711	24.550	25.361	26.141	26.897	27.631	28.347	29.047	29.734	30.408	31.071	31.725	32.370	33.007	33.638	34.262	34.880	35.492	36.100	36.703	37.303	37.898
15	8.952	21.057	21.791	22.495	23.173	23.829	24.468	25.091	25.700	26.298	26.884	27.462	28.030	28.592	29.146	29.694	30.237	30.775	31.308	31.836	32.361	32.882
20	10.337	18.111	18.782	19.422	20.036	20.628	21.202	21.760	22.305	22.838	23.361	23.874	24.379	24.877	25.368	25.853	26.332	26.807	27.277	27.743	28.205	28.664
25	11.880	15.609	16.230	16.818	17.378	17.916	18.436	18.940	19.430	19.909	20.378	20.837	21.288	21.732	22.170	22.602	23.028	23.450	23.867	24.280	24.690	25.095
30	13.591	13.470	14.052	14.597	15.113	15.606	16.080	16.538	16.983	17.416	17.838	18.252	18.658	19.056	19.449	19.835	20.216	20.593	20.965	21.334	21.699	22.060
35	15.484	11.632	12.183	12.693	13.173	13.628	14.063	14.483	14.888	15.282	15.665	16.040	16.407	16.767	17.120	17.468	17.811	18.149	18.483	18.814	19.140	19.464
40	17.574	10.039	10.569	11.052	11.501	11.925	12.328	12.714	13.086	13.446	13.796	14.138	14.471	14.798	15.118	15.433	15.743	16.048	16.349	16.647	16.941	17.231
45	19.874	8.651	9.168	9.630	10.055	10.451	10.827	11.185	11.528	11.860	12.181	12.493	12.798	13.096	13.388	13.674	13.955	14.232	14.505	14.774	15.040	15.302
50	22.405	7.430	7.943	8.391	8.796	9.171	9.522	9.856	10.175	10.482	10.778	11.066	11.345	11.618	11.885	12.146	12.403	12.655	12.903	13.148	13.389	13.627
55	25.187	6.344	6.865	7.305	7.695	8.051	8.383	8.696	8.994	9.279	9.554	9.820	10.077	10.328	10.573	10.813	11.048	11.278	11.505	11.728	11.948	12.165
60	28.247	5.362	5.909	6.346	6.726	7.068	7.383	7.678	7.957	8.224	8.479	8.726	8.964	9.196	9.422	9.643	9.858	10.070	10.277	10.482	10.682	10.880
65	31.627	4.448	5.050	5.494	5.866	6.196	6.498	6.777	7.040	7.290	7.529	7.758	7.980	8.195	8.404	8.607	8.806	9.000	9.191	9.378	9.563	9.744
70	35.400	3.543	4.263	4.722	5.092	5.414	5.703	5.969	6.218	6.453	6.676	6.891	7.097	7.296	7.490	7.678	7.862	8.041	8.216	8.389	8.558	8.724

Thermodynamic properties of R-452A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.022	302.918	305.921	308.971	312.069	315.213	318.405	321.644	324.929	328.261	331.640	335.065	338.537	342.054	345.616	349.224	352.877	356.575	360.318	364.105	367.936	371.810
-95	0.034	305.835	308.893	311.998	315.149	318.346	321.589	324.879	328.215	331.597	335.026	338.500	342.019	345.584	349.194	352.849	356.549	360.293	364.081	367.913	371.789	375.709
-90	0.052	308.779	311.894	315.054	318.259	321.510	324.806	328.148	331.535	334.968	338.446	341.969	345.537	349.150	352.808	356.510	360.256	364.047	367.881	371.758	375.679	379.644
-85	0.078	311.745	314.919	318.136	321.397	324.703	328.052	331.447	334.886	338.370	341.898	345.471	349.088	352.749	356.455	360.205	363.998	367.835	371.715	375.638	379.604	383.613
-80	0.113	314.730	317.965	321.240	324.558	327.919	331.324	334.772	338.264	341.799	345.379	349.002	352.668	356.379	360.133	363.930	367.771	371.654	375.581	379.550	383.561	387.615
-75	0.162	317.729	321.026	324.362	327.738	331.157	334.617	338.120	341.665	345.253	348.884	352.559	356.276	360.036	363.838	367.684	371.572	375.503	379.476	383.491	387.548	391.647
-70	0.226	320.736	324.098	327.496	330.933	334.410	337.928	341.486	345.086	348.728	352.412	356.138	359.906	363.716	367.569	371.463	375.399	379.377	383.397	387.459	391.562	395.706
-65	0.309	323.746	327.176	330.639	334.138	337.676	341.252	344.868	348.524	352.221	355.958	359.737	363.557	367.418	371.320	375.264	379.249	383.275	387.342	391.451	395.600	399.789
-60	0.416	326.756	330.255	333.785	337.349	340.949	344.585	348.260	351.974	355.726	359.519	363.351	367.224	371.136	375.090	379.084	383.118	387.193	391.308	395.463	399.659	403.895
-55	0.551	329.760	333.332	336.931	340.561	344.225	347.924	351.659	355.431	359.241	363.090	366.977	370.903	374.869	378.874	382.919	387.003	391.127	395.291	399.494	403.737	408.019
-50	0.719	332.753	336.400	340.071	343.771	347.501	351.264	355.061	358.893	362.762	366.668	370.611	374.592	378.611	382.669	386.766	390.901	395.075	399.287	403.539	407.829	412.159
-45	0.925	335.730	339.456	343.202	346.972	350.771	354.600	358.461	362.355	366.284	370.249	374.249	378.286	382.361	386.472	390.621	394.808	399.032	403.295	407.596	411.934	416.311
-43.15	1.013	336.829	340.585	344.359	348.157	351.981	355.835	359.721	363.639	367.591	371.577	375.599	379.657	383.752	387.884	392.053	396.259	400.502	404.784	409.103	413.459	417.854
-40	1.176	338.686	342.494	346.318	350.162	354.031	357.928	361.855	365.813	369.804	373.829	377.888	381.983	386.113	390.279	394.481	398.721	402.997	407.310	411.661	416.048	420.473
-35	1.478	341.617	345.510	349.414	353.335	357.277	361.245	365.239	369.263	373.318	377.404	381.524	385.677	389.864	394.086	398.343	402.636	406.965	411.330	415.731	420.168	424.641
-30	1.838	344.515	348.498	352.485	356.486	360.504	364.545	368.610	372.701	376.821	380.971	385.152	389.365	393.611	397.890	402.203	406.551	410.933	415.350	419.802	424.290	428.813
-25	2.262	347.377	351.452	355.528	359.611	363.708	367.824	371.961	376.122	380.310	384.525	388.769	393.044	397.350	401.687	406.058	410.461	414.898	419.368	423.873	428.411	432.984
-20	2.758	350.195	354.368	358.535	362.704	366.883	371.077	375.289	379.523	383.780	388.062	392.372	396.710	401.077	405.474	409.903	414.363	418.856	423.380	427.938	432.529	437.153
-15	3.334	352.964	357.239	361.501	365.760	370.024	374.299	378.589	382.897	387.226	391.578	395.955	400.358	404.788	409.247	413.736	418.254	422.803	427.384	431.996	436.640	441.316
-10	3.998	355.675	360.058	364.420	368.773	373.126	377.486	381.856	386.242	390.645	395.069	399.515	403.985	408.481	413.003	417.552	422.131	426.738	431.375	436.042	440.740	445.469
-5	4.759	358.319	362.816	367.283	371.735	376.182	380.630	385.085	389.551	394.032	398.531	403.048	407.587	412.150	416.737	421.349	425.989	430.656	435.351	440.074	444.828	449.610
0	5.625	360.887	365.504	370.084	374.640	379.185	383.727	388.270	392.821	397.383	401.958	406.550	411.161	415.792	420.446	425.123	429.825	434.553	439.308	444.089	448.899	453.737
5	6.606	363.364	368.112	372.812	377.480	382.130	386.770	391.407	396.046	400.691	405.347	410.016	414.701	419.404	424.126	428.870	433.637	438.427	443.242	448.083	452.951	457.845
10	7.711	365.736	370.626	375.456	380.245	385.007	389.752	394.487	399.219	403.953	408.693	413.442	418.203	422.980	427.774	432.586	437.419	442.274	447.152	452.054	456.980	461.932
15	8.952	367.984	373.033	378.007	382.927	387.810	392.667	397.507	402.337	407.163	411.990	416.823	421.664	426.517	431.385	436.268	441.170	446.091	451.033	455.997	460.984	465.995
20	10.337	370.087	375.317	380.451	385.516	390.530	395.506	400.457	405.391	410.315	415.234	420.154	425.078	430.011	434.955	439.912	444.884	449.874	454.882	459.910	464.959	470.030
25	11.880	372.020	377.460	382.775	387.999	393.156	398.262	403.332	408.376	413.403	418.419	423.430	428.441	433.457	438.480	443.513	448.559	453.619	458.695	463.789	468.903	474.036
30	13.591	373.756	379.442	384.963	390.365	395.679	400.925	406.123	411.284	416.420	421.538	426.645	431.748	436.850	441.955	447.068	452.189	457.323	462.470	467.632	472.811	478.008
35	15.484	375.258	381.238	386.997	392.599	398.085	403.485	408.821	414.108	419.359	424.585	429.794	434.992	440.185	445.377	450.572	455.772	460.981	466.201	471.434	476.681	481.943
40	17.574	376.479	382.819	388.856	394.684	400.363	405.930	411.415	416.838	422.213	427.554	432.870	438.169	443.457	448.739	454.020	459.303	464.590	469.886	475.191	480.508	485.839
45	19.874	377.358	384.145	390.511	396.600	402.494	408.247	413.895	419.464	424.973	430.436	435.866	441.272	446.660	452.037	457.407	462.776	468.145	473.519	478.900	484.290	489.690
50	22.405	377.802	385.168	391.931	398.322	404.460	410.420	416.247	421.975	427.627	433.222	438.773	444.292	449.786	455.262	460.727	466.185	471.641	477.096	482.555	488.020	493.493
55	25.187	377.669	385.817	393.071	399.818	406.237	412.427	418.453	424.355	430.164	435.900	441.581	447.220	452.826	458.408	463.972	469.524	475.069	480.610	486.151	491.694	497.242
60	28.247	376.714	385.991	393.871	401.046	407.790	414.243	420.490	426.585	432.564	438.454	444.275	450.042	455.768	461.461	467.131	472.782	478.421	484.051	489.677	495.302	500.929
65	31.627	374.448	385.531	394.240	401.941	409.069	415.825	422.323	428.632	434.799	440.856	446.829	452.736	458.590	464.403	470.184	475.940	481.678	487.403	493.119	498.830	504.538
70	35.400	369.575	384.140	394.008	402.380	409.974	417.088	423.875	430.428	436.807	443.052	449.192	455.252	461.246	467.189	473.091	478.960	484.805	490.631	496.442	502.244	508.039

Thermodynamic properties of R-452A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.022	1.760	1.777	1.794	1.811	1.827	1.843	1.860	1.876	1.891	1.907	1.923	1.938	1.953	1.968	1.983	1.998	2.013	2.028	2.042	2.056	2.071
-95	0.034	1.740	1.757	1.774	1.790	1.806	1.823	1.839	1.854	1.870	1.886	1.901	1.916	1.931	1.946	1.961	1.976	1.991	2.005	2.020	2.034	2.048
-90	0.052	1.722	1.739	1.755	1.772	1.788	1.804	1.820	1.836	1.851	1.867	1.882	1.897	1.912	1.927	1.942	1.956	1.971	1.985	2.000	2.014	2.028
-85	0.078	1.706	1.723	1.739	1.755	1.771	1.787	1.803	1.819	1.834	1.849	1.865	1.880	1.894	1.909	1.924	1.938	1.953	1.967	1.981	1.996	2.010
-80	0.113	1.692	1.708	1.725	1.741	1.757	1.772	1.788	1.804	1.819	1.834	1.849	1.864	1.879	1.893	1.908	1.923	1.937	1.951	1.965	1.979	1.993
-75	0.162	1.679	1.695	1.712	1.728	1.743	1.759	1.775	1.790	1.805	1.820	1.835	1.850	1.865	1.879	1.894	1.908	1.922	1.937	1.951	1.965	1.979
-70	0.226	1.667	1.684	1.700	1.716	1.732	1.747	1.763	1.778	1.793	1.808	1.823	1.838	1.852	1.867	1.881	1.895	1.910	1.924	1.938	1.952	1.965
-65	0.309	1.657	1.674	1.690	1.705	1.721	1.737	1.752	1.767	1.782	1.797	1.812	1.827	1.841	1.856	1.870	1.884	1.898	1.912	1.926	1.940	1.954
-60	0.416	1.648	1.664	1.680	1.696	1.712	1.727	1.743	1.758	1.773	1.787	1.802	1.817	1.831	1.846	1.860	1.874	1.888	1.902	1.916	1.929	1.943
-55	0.551	1.640	1.656	1.672	1.688	1.704	1.719	1.734	1.749	1.764	1.779	1.793	1.808	1.822	1.837	1.851	1.865	1.879	1.893	1.906	1.920	1.934
-50	0.719	1.633	1.649	1.665	1.681	1.696	1.712	1.727	1.742	1.757	1.771	1.786	1.800	1.815	1.829	1.843	1.857	1.871	1.885	1.898	1.912	1.925
-45	0.925	1.627	1.643	1.659	1.674	1.690	1.705	1.720	1.735	1.750	1.765	1.779	1.793	1.808	1.822	1.836	1.850	1.864	1.877	1.891	1.905	1.918
-43.15	1.013	1.624	1.641	1.656	1.672	1.688	1.703	1.718	1.733	1.748	1.762	1.777	1.791	1.805	1.820	1.834	1.847	1.861	1.875	1.889	1.902	1.915
-40	1.176	1.621	1.637	1.653	1.669	1.684	1.699	1.714	1.729	1.744	1.759	1.773	1.787	1.802	1.816	1.830	1.844	1.857	1.871	1.885	1.898	1.911
-35	1.478	1.616	1.632	1.648	1.664	1.679	1.694	1.709	1.724	1.739	1.754	1.768	1.782	1.796	1.810	1.824	1.838	1.852	1.866	1.879	1.892	1.906
-30	1.838	1.612	1.628	1.644	1.659	1.675	1.690	1.705	1.720	1.735	1.749	1.763	1.778	1.792	1.806	1.820	1.834	1.847	1.861	1.874	1.888	1.901
-25	2.262	1.608	1.624	1.640	1.656	1.671	1.686	1.701	1.716	1.731	1.745	1.760	1.774	1.788	1.802	1.816	1.829	1.843	1.857	1.870	1.883	1.897
-20	2.758	1.604	1.621	1.637	1.652	1.668	1.683	1.698	1.713	1.727	1.742	1.756	1.770	1.785	1.798	1.812	1.826	1.840	1.853	1.866	1.880	1.893
-15	3.334	1.601	1.618	1.634	1.649	1.665	1.680	1.695	1.710	1.725	1.739	1.753	1.768	1.782	1.796	1.809	1.823	1.837	1.850	1.863	1.877	1.890
-10	3.998	1.599	1.615	1.631	1.647	1.662	1.678	1.693	1.708	1.722	1.737	1.751	1.765	1.779	1.793	1.807	1.821	1.834	1.847	1.861	1.874	1.887
-5	4.759	1.596	1.613	1.629	1.645	1.660	1.676	1.691	1.706	1.720	1.735	1.749	1.763	1.777	1.791	1.805	1.818	1.832	1.845	1.859	1.872	1.885
0	5.625	1.594	1.611	1.627	1.643	1.659	1.674	1.689	1.704	1.719	1.733	1.747	1.762	1.776	1.789	1.803	1.817	1.830	1.844	1.857	1.870	1.883
5	6.606	1.592	1.609	1.625	1.641	1.657	1.672	1.688	1.703	1.717	1.732	1.746	1.760	1.774	1.788	1.802	1.815	1.829	1.842	1.856	1.869	1.882
10	7.711	1.590	1.607	1.624	1.640	1.656	1.671	1.686	1.701	1.716	1.731	1.745	1.759	1.773	1.787	1.801	1.814	1.828	1.841	1.854	1.868	1.881
15	8.952	1.588	1.605	1.622	1.638	1.654	1.670	1.685	1.700	1.715	1.730	1.744	1.758	1.772	1.786	1.800	1.814	1.827	1.840	1.854	1.867	1.880
20	10.337	1.586	1.603	1.621	1.637	1.653	1.669	1.684	1.700	1.714	1.729	1.744	1.758	1.772	1.786	1.800	1.813	1.827	1.840	1.853	1.866	1.879
25	11.880	1.584	1.602	1.619	1.636	1.652	1.668	1.684	1.699	1.714	1.729	1.743	1.757	1.772	1.785	1.799	1.813	1.826	1.840	1.853	1.866	1.879
30	13.591	1.581	1.600	1.617	1.635	1.651	1.667	1.683	1.698	1.713	1.728	1.743	1.757	1.771	1.785	1.799	1.813	1.826	1.839	1.853	1.866	1.879
35	15.484	1.578	1.597	1.616	1.633	1.650	1.666	1.682	1.698	1.713	1.728	1.743	1.757	1.771	1.785	1.799	1.813	1.826	1.840	1.853	1.866	1.879
40	17.574	1.575	1.595	1.614	1.632	1.649	1.665	1.682	1.697	1.713	1.728	1.742	1.757	1.771	1.785	1.799	1.813	1.826	1.840	1.853	1.866	1.879
45	19.874	1.571	1.592	1.612	1.630	1.648	1.664	1.681	1.697	1.712	1.727	1.742	1.757	1.771	1.785	1.799	1.813	1.826	1.840	1.853	1.866	1.879
50	22.405	1.566	1.589	1.609	1.628	1.646	1.663	1.680	1.696	1.712	1.727	1.742	1.757	1.771	1.785	1.799	1.813	1.827	1.840	1.853	1.867	1.880
55	25.187	1.560	1.584	1.606	1.626	1.644	1.662	1.679	1.695	1.711	1.727	1.742	1.757	1.771	1.785	1.799	1.813	1.827	1.840	1.854	1.867	1.880
60	28.247	1.551	1.579	1.602	1.623	1.642	1.660	1.678	1.694	1.710	1.726	1.741	1.756	1.771	1.785	1.800	1.813	1.827	1.841	1.854	1.867	1.880
65	31.627	1.540	1.572	1.597	1.619	1.639	1.658	1.676	1.693	1.709	1.725	1.741	1.756	1.771	1.785	1.799	1.814	1.827	1.841	1.854	1.868	1.881
70	35.400	1.521	1.563	1.591	1.615	1.636	1.655	1.674	1.691	1.708	1.724	1.740	1.755	1.770	1.785	1.799	1.813	1.827	1.841	1.854	1.868	1.881

R-455A (Solstice® L40X)

Zeotropic blend (3 % R-744 - 21.5 % R-32 - 75.5 % R-1234yf)

Molecular weight (g/mol)	87.45
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-52.03
Temperature glide at 1.013 bar (K)	12.85
Critical temperature (°C)	87.5
Critical pressure (bar absolute)	48.22
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.567
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.890
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.131
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.127
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.99
Classification NF-EN 378	A2L
GWP (IPCC 4)	148

Main applications

R-455A is a mildly flammable, "non azeotropic" blend designed to serve as an alternative for low, medium and high temperature applications in new systems and has a GWP <150.
Its thermodynamic performance allows it to be used as a replacement for R-22 and R-404A in low and medium temperature refrigeration.

Commercial specifications

Composition: 75.5 % R-1234yf – 21.5 % R-32 – 3 % R-744 (±2.0 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chlorine ion test (silver nitrate test): negative.
Total Acidity (HCL): ≤ 1 ppm weight.
Non-condensable content (gas phase): ≤ 1.5 % volume.

Oils

Use a polyol ester (POE) oil.
Consult **Climalife** regarding the viscosity of the oil selected for your application and the most suitable for your application.

Regulation

The use and implementation of R-455A are governed by the European Regulation N° 517/2014.
The recovery of R-455A is mandatory under the European Regulation N° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-455A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.052	-100	0.708	1.413	68.885	0.407	-86.89	3.378	0.296	338.815	1.897	269.930
0.077	-95	0.714	1.401	75.370	0.444	-81.9	2.338	0.428	341.977	1.877	266.607
0.112	-90	0.720	1.389	81.767	0.480	-76.9	1.655	0.604	345.155	1.859	263.388
0.158	-85	0.726	1.377	88.106	0.514	-71.92	1.196	0.836	348.342	1.842	260.236
0.219	-80	0.733	1.364	94.411	0.547	-66.93	0.881	1.135	351.535	1.827	257.124
0.299	-75	0.740	1.351	100.701	0.579	-61.96	0.660	1.515	354.728	1.813	254.027
0.400	-70	0.747	1.338	106.993	0.610	-56.99	0.502	1.990	357.916	1.801	250.923
0.528	-65	0.755	1.325	113.298	0.641	-52.02	0.388	2.577	361.093	1.790	247.796
0.686	-60	0.762	1.312	119.627	0.671	-47.07	0.304	3.292	364.256	1.780	244.629
0.879	-55	0.770	1.298	125.991	0.700	-42.12	0.241	4.156	367.399	1.771	241.408
1.013	-52.03	0.775	1.290	129.790	0.717	-39.18	0.211	4.747	369.254	1.766	239.464
1.113	-50	0.779	1.284	132.396	0.729	-37.17	0.193	5.187	370.516	1.763	238.120
1.394	-45	0.787	1.270	138.849	0.758	-32.24	0.156	6.409	373.603	1.755	234.754
1.727	-40	0.796	1.256	145.357	0.786	-27.31	0.127	7.844	376.653	1.748	231.297
2.118	-35	0.806	1.241	151.925	0.813	-22.4	0.105	9.518	379.662	1.742	227.737
2.574	-30	0.816	1.226	158.558	0.841	-17.49	0.087	11.458	382.621	1.737	224.064
3.101	-25	0.826	1.211	165.261	0.868	-12.6	0.073	13.694	385.525	1.732	220.264
3.706	-20	0.837	1.195	172.039	0.895	-7.71	0.062	16.259	388.366	1.727	216.327
4.397	-15	0.848	1.179	178.897	0.921	-2.84	0.052	19.187	391.135	1.723	212.239
5.179	-10	0.860	1.163	185.839	0.948	2.02	0.044	22.517	393.823	1.719	207.984
6.061	-5	0.873	1.146	192.872	0.974	6.86	0.038	26.295	396.421	1.715	203.549
7.049	0	0.886	1.129	200.000	1.000	11.68	0.033	30.567	398.915	1.712	198.915
8.151	5	0.900	1.111	207.230	1.026	16.49	0.028	35.391	401.294	1.708	194.064
9.375	10	0.915	1.093	214.568	1.052	21.27	0.024	40.829	403.543	1.705	188.975
10.728	15	0.931	1.074	222.023	1.077	26.03	0.021	46.957	405.647	1.702	183.624
12.216	20	0.949	1.054	229.602	1.103	30.77	0.019	53.860	407.586	1.698	177.984
13.849	25	0.968	1.033	237.318	1.128	35.48	0.016	61.644	409.340	1.695	172.022
15.633	30	0.988	1.012	245.184	1.154	40.16	0.014	70.433	410.883	1.691	165.699
17.577	35	1.011	0.989	253.218	1.180	44.81	0.012	80.385	412.182	1.687	158.964
19.686	40	1.036	0.966	261.445	1.205	49.42	0.011	91.696	413.199	1.683	151.754
21.970	45	1.064	0.940	269.895	1.231	53.98	0.010	104.620	413.885	1.677	143.990
24.434	50	1.095	0.913	278.609	1.258	58.5	0.008	119.497	414.173	1.672	135.564
27.085	55	1.132	0.883	287.642	1.285	62.95	0.007	136.801	413.977	1.665	126.335
29.928	60	1.176	0.851	297.073	1.312	67.33	0.006	157.221	413.169	1.657	116.096
32.968	65	1.229	0.814	307.024	1.341	71.61	0.005	181.836	411.555	1.647	104.531
36.204	70	1.297	0.771	317.708	1.371	75.76	0.005	212.499	408.813	1.634	91.105
39.624	75	1.390	0.719	329.551	1.404	79.72	0.004	252.887	404.317	1.617	74.767
43.178	80	1.539	0.650	343.672	1.443	83.32	0.003	312.476	396.521	1.592	52.848

Thermodynamic properties of R-455A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.016	10032.078	10324.427	10616.514	10908.384	11200.069	11491.599	11782.994	12074.273	12365.453	12656.545	12947.562	13238.511	13529.403	13820.242	14111.037	14401.791	14692.509	14983.195	15273.853	15564.486	15855.096
-95	0.026	6474.050	6658.086	6841.899	7025.524	7208.992	7392.325	7575.541	7758.657	7941.686	8124.638	8307.524	8490.351	8673.127	8855.857	9038.547	9221.201	9403.823	9586.416	9768.985	9951.530	10134.056
-90	0.040	4299.315	4418.749	4537.990	4657.069	4776.012	4894.837	5013.562	5132.198	5250.759	5369.252	5487.687	5606.069	5724.407	5842.703	5960.964	6079.193	6197.394	6315.569	6433.722	6551.854	6669.968
-85	0.061	2930.417	3010.123	3089.661	3169.059	3248.338	3327.515	3406.603	3485.615	3564.559	3643.444	3722.277	3801.065	3879.812	3958.523	4037.202	4115.852	4194.477	4273.080	4351.661	4430.225	4508.772
-80	0.089	2045.290	2099.870	2154.303	2208.613	2262.819	2316.936	2370.974	2424.946	2478.857	2532.717	2586.530	2640.303	2694.040	2747.745	2801.421	2855.072	2908.700	2962.307	3015.896	3069.468	3123.025
-75	0.128	1458.705	1496.978	1535.122	1573.158	1611.101	1648.966	1686.763	1724.499	1762.183	1799.821	1837.418	1874.978	1912.507	1950.006	1987.480	2024.931	2062.362	2099.774	2137.169	2174.549	2211.915
-70	0.180	1061.086	1088.520	1115.840	1143.064	1170.207	1197.281	1224.293	1251.253	1278.166	1305.037	1331.872	1358.675	1385.449	1412.197	1438.921	1465.626	1492.311	1518.980	1545.634	1572.274	1598.902
-65	0.248	785.897	805.967	825.935	845.818	865.629	885.378	905.073	924.720	944.326	963.895	983.432	1002.939	1022.420	1041.878	1061.316	1080.734	1100.136	1119.522	1138.895	1158.255	1177.604
-60	0.336	591.760	606.722	621.594	636.390	651.121	665.798	680.426	695.011	709.559	724.075	738.560	753.020	767.456	781.871	796.267	810.647	825.011	839.361	853.699	868.025	882.340
-55	0.448	452.360	463.713	474.984	486.188	497.334	508.431	519.484	530.499	541.480	552.431	563.357	574.258	585.138	595.999	606.843	617.672	628.486	639.288	650.079	660.859	671.629
-50	0.588	350.616	359.372	368.055	376.677	385.248	393.774	402.260	410.712	419.134	427.529	435.900	444.250	452.580	460.893	469.190	477.473	485.744	494.003	502.251	510.489	518.719
-45	0.762	275.223	282.080	288.872	295.609	302.299	308.949	315.563	322.146	328.701	335.232	341.742	348.231	354.703	361.160	367.602	374.031	380.448	386.854	393.251	399.639	406.019
-40	0.974	218.566	224.015	229.403	234.742	240.038	245.298	250.525	255.724	260.898	266.050	271.181	276.295	281.393	286.476	291.546	296.604	301.651	306.689	311.717	316.737	321.750
-39.18	1.013	210.670	215.923	221.118	226.263	231.367	236.434	241.470	246.477	251.460	256.421	261.363	266.286	271.194	276.088	280.968	285.837	290.695	295.544	300.383	305.215	310.039
-35	1.231	175.432	179.819	184.152	188.439	192.688	196.903	201.088	205.248	209.385	213.501	217.599	221.681	225.747	229.801	233.842	237.872	241.893	245.904	249.907	253.902	257.890
-30	1.538	142.191	145.768	149.296	152.782	156.233	159.653	163.046	166.415	169.763	173.092	176.404	179.701	182.984	186.256	189.515	192.765	196.005	199.237	202.461	205.678	208.889
-25	1.903	116.282	119.235	122.141	125.010	127.845	130.652	133.434	136.194	138.935	141.658	144.366	147.060	149.741	152.410	155.069	157.719	160.359	162.992	165.618	168.237	170.850
-20	2.332	95.875	98.339	100.761	103.147	105.503	107.832	110.139	112.425	114.692	116.944	119.181	121.405	123.617	125.819	128.010	130.193	132.368	134.535	136.696	138.850	140.999
-15	2.832	79.642	81.720	83.760	85.766	87.743	89.696	91.628	93.540	95.436	97.317	99.183	101.038	102.882	104.715	106.540	108.356	110.164	111.966	113.761	115.550	117.334
-10	3.412	66.608	68.380	70.114	71.818	73.494	75.148	76.782	78.397	79.997	81.582	83.155	84.716	86.267	87.809	89.342	90.867	92.385	93.896	95.401	96.901	98.395
-5	4.079	56.052	57.577	59.067	60.527	61.962	63.376	64.770	66.147	67.509	68.858	70.195	71.521	72.837	74.145	75.444	76.735	78.020	79.299	80.572	81.840	83.103
0	4.842	47.433	48.758	50.049	51.313	52.552	53.771	54.971	56.156	57.326	58.483	59.629	60.765	61.891	63.009	64.119	65.222	66.319	67.410	68.495	69.576	70.651
5	5.710	40.340	41.502	42.632	43.735	44.815	45.875	46.917	47.944	48.957	49.958	50.948	51.929	52.900	53.864	54.820	55.769	56.713	57.650	58.583	59.510	60.433
10	6.692	34.461	35.490	36.487	37.458	38.406	39.335	40.248	41.145	42.029	42.902	43.764	44.617	45.461	46.298	47.127	47.950	48.768	49.579	50.386	51.188	51.986
15	7.798	29.555	30.474	31.361	32.223	33.063	33.884	34.688	35.478	36.256	37.022	37.778	38.525	39.264	39.995	40.720	41.438	42.151	42.859	43.562	44.260	44.955
20	9.037	25.433	26.261	27.058	27.829	28.578	29.309	30.023	30.724	31.412	32.090	32.758	33.416	34.067	34.711	35.349	35.980	36.606	37.227	37.843	38.455	39.063
25	10.422	21.948	22.701	23.422	24.118	24.791	25.446	26.086	26.712	27.325	27.928	28.522	29.106	29.684	30.254	30.818	31.376	31.929	32.477	33.021	33.560	34.096
30	11.964	18.984	19.675	20.333	20.965	21.575	22.167	22.743	23.306	23.856	24.396	24.927	25.449	25.964	26.472	26.974	27.471	27.962	28.448	28.931	29.409	29.883
35	13.675	16.447	17.088	17.694	18.273	18.829	19.367	19.890	20.398	20.895	21.382	21.859	22.329	22.791	23.246	23.695	24.139	24.578	25.012	25.442	25.868	26.291
40	15.568	14.264	14.863	15.426	15.960	16.472	16.964	17.441	17.904	18.355	18.797	19.229	19.652	20.069	20.479	20.883	21.282	21.676	22.066	22.451	22.833	23.211
45	17.660	12.373	12.940	13.467	13.964	14.438	14.892	15.329	15.753	16.166	16.568	16.960	17.345	17.723	18.094	18.460	18.820	19.176	19.527	19.874	20.217	20.557
50	19.966	10.725	11.268	11.767	12.233	12.674	13.095	13.500	13.890	14.268	14.637	14.996	15.347	15.691	16.029	16.361	16.688	17.010	17.328	17.642	17.952	18.259
55	22.506	9.279	9.806	10.282	10.723	11.137	11.530	11.906	12.268	12.617	12.956	13.286	13.608	13.923	14.231	14.534	14.832	15.125	15.414	15.699	15.980	16.259
60	25.303	7.999	8.519	8.979	9.400	9.791	10.161	10.512	10.848	11.172	11.486	11.790	12.086	12.376	12.659	12.936	13.208	13.476	13.740	13.999	14.256	14.509
65	28.386	6.855	7.378	7.828	8.233	8.606	8.955	9.285	9.600	9.902	10.193	10.475	10.749	11.015	11.276	11.531	11.781	12.026	12.267	12.505	12.739	12.970
70	31.793	5.817	6.356	6.803	7.197	7.555	7.887	8.199	8.495	8.777	9.048	9.310	9.564	9.811	10.052	10.286	10.516	10.742	10.963	11.181	11.396	11.607
75	35.585	4.850	5.429	5.881	6.268	6.614	6.931	7.227	7.506	7.771	8.025	8.269	8.505	8.734	8.957	9.174	9.386	9.594	9.798	9.998	10.195	10.388
80	39.881	3.900	4.564	5.030	5.415	5.753	6.058	6.340	6.604	6.854	7.092	7.320	7.540	7.753	7.959	8.160	8.356	8.548	8.735	8.919	9.100	9.278

Thermodynamic properties of R-455A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.016	330.642	333.821	337.050	340.328	343.657	347.036	350.466	353.946	357.477	361.057	364.688	368.369	372.099	375.878	379.707	383.585	387.511	391.486	395.509	399.579	403.697
-95	0.026	333.736	336.973	340.259	343.594	346.979	350.414	353.898	357.432	361.016	364.650	368.334	372.066	375.848	379.679	383.558	387.486	391.462	395.487	399.558	403.678	407.844
-90	0.040	336.861	340.157	343.502	346.895	350.337	353.827	357.367	360.956	364.595	368.282	372.018	375.803	379.637	383.519	387.450	391.428	395.454	399.528	403.649	407.817	412.031
-85	0.061	340.011	343.369	346.774	350.226	353.726	357.274	360.870	364.515	368.208	371.950	375.739	379.577	383.463	387.397	391.379	395.408	399.484	403.607	407.777	411.994	416.257
-80	0.089	343.182	346.604	350.071	353.584	357.144	360.750	364.404	368.105	371.854	375.650	379.494	383.385	387.324	391.310	395.343	399.423	403.549	407.722	411.942	416.207	420.518
-75	0.128	346.370	349.858	353.389	356.965	360.585	364.252	367.964	371.723	375.528	379.380	383.278	387.224	391.215	395.254	399.339	403.470	407.647	411.871	416.139	420.454	424.814
-70	0.180	349.569	353.126	356.724	360.364	364.047	367.774	371.546	375.364	379.227	383.135	387.089	391.089	395.135	399.227	403.364	407.547	411.775	416.049	420.368	424.731	429.140
-65	0.248	352.775	356.404	360.070	363.776	367.524	371.314	375.148	379.025	382.946	386.912	390.923	394.978	399.079	403.224	407.414	411.650	415.929	420.254	424.623	429.036	433.494
-60	0.336	355.984	359.686	363.423	367.198	371.012	374.867	378.763	382.701	386.683	390.707	394.775	398.887	403.043	407.243	411.487	415.775	420.107	424.483	428.903	433.366	437.873
-55	0.448	359.189	362.968	366.779	370.624	374.507	378.427	382.388	386.389	390.432	394.516	398.643	402.812	407.024	411.280	415.578	419.919	424.304	428.732	433.203	437.717	442.273
-50	0.588	362.386	366.245	370.132	374.050	378.003	381.992	386.019	390.084	394.189	398.335	402.521	406.749	411.019	415.330	419.683	424.079	428.517	432.998	437.520	442.085	446.692
-45	0.762	365.570	369.512	373.478	377.472	381.497	385.556	389.651	393.782	397.951	402.159	406.406	410.694	415.022	419.390	423.800	428.251	432.743	437.276	441.851	446.467	451.125
-40	0.974	368.736	372.765	376.812	380.884	384.984	389.115	393.279	397.478	401.712	405.984	410.294	414.642	419.029	423.456	427.923	432.430	436.977	441.564	446.192	450.860	455.569
-39.18	1.013	369.254	373.297	377.358	381.443	385.555	389.698	393.874	398.084	402.330	406.612	410.932	415.290	419.688	424.124	428.600	433.116	437.672	442.269	446.905	451.582	456.300
-35	1.231	371.879	375.997	380.129	384.281	388.458	392.663	396.899	401.167	405.469	409.807	414.180	418.590	423.038	427.524	432.049	436.612	441.215	445.857	450.539	455.260	460.021
-30	1.538	374.994	379.204	383.423	387.659	391.916	396.197	400.507	404.846	409.217	413.621	418.060	422.533	427.043	431.590	436.174	440.795	445.455	450.152	454.889	459.664	464.477
-25	1.903	378.074	382.380	386.690	391.012	395.351	399.711	404.097	408.509	412.951	417.424	421.929	426.468	431.041	435.649	440.293	444.974	449.691	454.445	459.237	464.066	468.933
-20	2.332	381.113	385.520	389.924	394.335	398.759	403.201	407.664	412.152	416.667	421.210	425.784	430.389	435.027	439.698	444.404	449.144	453.920	458.732	463.581	468.465	473.386
-15	2.832	384.105	388.616	393.118	397.621	402.134	406.660	411.204	415.770	420.359	424.975	429.619	434.292	438.996	443.732	448.501	453.303	458.139	463.010	467.915	472.856	477.832
-10	3.412	387.042	391.662	396.266	400.866	405.470	410.083	414.711	419.357	424.024	428.714	433.430	438.173	442.946	447.748	452.581	457.445	462.343	467.273	472.238	477.236	482.268
-5	4.079	389.916	394.650	399.362	404.062	408.761	413.465	418.180	422.909	427.655	432.423	437.213	442.028	446.870	451.740	456.639	461.568	466.528	471.520	476.543	481.600	486.689
0	4.842	392.717	397.573	402.396	407.203	412.001	416.800	421.604	426.419	431.249	436.095	440.962	445.852	450.765	455.705	460.671	465.666	470.690	475.745	480.829	485.946	491.093
5	5.710	395.435	400.419	405.362	410.280	415.183	420.081	424.979	429.883	434.798	439.727	444.673	449.639	454.627	459.638	464.674	469.736	474.826	479.944	485.092	490.269	495.476
10	6.692	398.058	403.180	408.250	413.285	418.299	423.300	428.297	433.294	438.298	443.313	448.341	453.386	458.449	463.534	468.642	473.774	478.931	484.115	489.326	494.566	499.834
15	7.798	400.571	405.843	411.049	416.211	421.341	426.451	431.551	436.646	441.743	446.846	451.959	457.086	462.229	467.390	472.571	477.775	483.001	488.253	493.529	498.833	504.163
20	9.037	402.958	408.395	413.749	419.045	424.300	429.526	434.734	439.932	445.126	450.322	455.524	460.735	465.960	471.200	476.457	481.734	487.032	492.353	497.697	503.066	508.460
25	10.422	405.203	410.821	416.336	421.778	427.166	432.515	437.838	443.144	448.440	453.733	459.027	464.328	469.637	474.959	480.295	485.648	491.020	496.412	501.826	507.262	512.722
30	11.964	407.282	413.103	418.796	424.396	429.927	435.408	440.854	446.274	451.678	457.073	462.464	467.857	473.255	478.662	484.080	489.512	494.960	500.426	505.911	511.417	516.944
35	13.675	409.169	415.221	421.112	426.885	432.572	438.195	443.772	449.314	454.832	460.334	465.828	471.317	476.808	482.303	487.806	493.320	498.847	504.389	509.948	515.525	521.122
40	15.568	410.833	417.150	423.262	429.228	435.086	440.863	446.580	452.253	457.893	463.509	469.110	474.701	480.289	485.877	491.469	497.068	502.677	508.298	513.933	519.584	525.252
45	17.660	412.230	418.857	425.224	431.405	437.452	443.398	449.268	455.081	460.850	466.588	472.303	478.002	483.691	489.376	495.061	500.749	506.443	512.146	517.861	523.588	529.330
50	19.966	413.306	420.306	426.966	433.393	439.650	445.782	451.819	457.784	463.694	469.561	475.397	481.210	487.007	492.794	498.575	504.356	510.139	515.928	521.725	527.531	533.350
55	22.506	413.987	421.446	428.454	435.162	441.658	447.997	454.218	460.348	466.409	472.416	478.381	484.315	490.226	496.120	502.004	507.883	513.759	519.637	525.519	531.408	537.306
60	25.303	414.167	422.210	429.640	436.678	443.446	450.018	456.443	462.755	468.980	475.137	481.241	487.305	493.337	499.346	505.337	511.318	517.292	523.263	529.235	535.210	541.191
65	28.386	413.686	422.508	430.461	437.893	444.977	451.814	458.467	464.980	471.385	477.706	483.960	490.163	496.324	502.454	508.561	514.650	520.726	526.796	532.861	538.926	544.994
70	31.793	412.278	422.203	430.827	438.739	446.196	453.338	460.250	466.988	473.593	480.093	486.511	492.864	499.165	505.425	511.654	517.858	524.044	530.217	536.381	542.541	548.699
75	35.585	409.433	421.065	430.592	439.107	447.014	454.515	461.725	468.720	475.549	482.249	488.847	495.365	501.818	508.219	514.580	520.908	527.211	533.494	539.764	546.024	552.278
80	39.881	403.889	418.625	429.454	438.767	447.243	455.182	462.749	470.044	477.133	484.063	490.866	497.570	504.193	510.751	517.258	523.722	530.153	536.558	542.943	549.312	555.670

Thermodynamic properties of R-455A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.016	1.962	1.980	1.998	2.015	2.033	2.050	2.067	2.084	2.101	2.117	2.134	2.150	2.166	2.182	2.198	2.214	2.230	2.245	2.261	2.276	2.291
-95	0.026	1.935	1.953	1.971	1.988	2.006	2.023	2.040	2.056	2.073	2.089	2.106	2.122	2.138	2.154	2.170	2.185	2.201	2.216	2.232	2.247	2.262
-90	0.040	1.911	1.929	1.946	1.964	1.981	1.998	2.015	2.031	2.048	2.064	2.080	2.096	2.112	2.128	2.144	2.159	2.175	2.190	2.205	2.221	2.236
-85	0.061	1.889	1.907	1.924	1.942	1.959	1.976	1.992	2.009	2.025	2.041	2.057	2.073	2.089	2.105	2.120	2.136	2.151	2.166	2.182	2.197	2.212
-80	0.089	1.870	1.887	1.905	1.922	1.939	1.955	1.972	1.988	2.004	2.021	2.037	2.052	2.068	2.084	2.099	2.115	2.130	2.145	2.160	2.175	2.190
-75	0.128	1.852	1.869	1.887	1.904	1.920	1.937	1.953	1.970	1.986	2.002	2.018	2.033	2.049	2.065	2.080	2.095	2.110	2.125	2.140	2.155	2.170
-70	0.180	1.836	1.853	1.870	1.887	1.904	1.920	1.937	1.953	1.969	1.985	2.001	2.016	2.032	2.047	2.063	2.078	2.093	2.108	2.123	2.137	2.152
-65	0.248	1.821	1.839	1.856	1.872	1.889	1.905	1.922	1.938	1.954	1.970	1.985	2.001	2.016	2.032	2.047	2.062	2.077	2.092	2.107	2.121	2.136
-60	0.336	1.808	1.825	1.842	1.859	1.876	1.892	1.908	1.924	1.940	1.956	1.971	1.987	2.002	2.018	2.033	2.048	2.063	2.077	2.092	2.107	2.121
-55	0.448	1.796	1.814	1.830	1.847	1.864	1.880	1.896	1.912	1.928	1.943	1.959	1.974	1.990	2.005	2.020	2.035	2.050	2.064	2.079	2.093	2.108
-50	0.588	1.786	1.803	1.820	1.836	1.853	1.869	1.885	1.901	1.917	1.932	1.948	1.963	1.978	1.993	2.008	2.023	2.038	2.053	2.067	2.082	2.096
-45	0.762	1.776	1.793	1.810	1.826	1.843	1.859	1.875	1.891	1.907	1.922	1.938	1.953	1.968	1.983	1.998	2.013	2.027	2.042	2.056	2.071	2.085
-40	0.974	1.767	1.784	1.801	1.818	1.834	1.850	1.866	1.882	1.898	1.913	1.928	1.944	1.959	1.974	1.989	2.003	2.018	2.032	2.047	2.061	2.075
-39.18	1.013	1.766	1.783	1.800	1.816	1.833	1.849	1.865	1.881	1.896	1.912	1.927	1.942	1.957	1.972	1.987	2.002	2.016	2.031	2.045	2.060	2.074
-35	1.231	1.759	1.776	1.793	1.810	1.826	1.842	1.858	1.874	1.889	1.905	1.920	1.935	1.950	1.965	1.980	1.995	2.009	2.024	2.038	2.053	2.067
-30	1.538	1.752	1.769	1.786	1.802	1.819	1.835	1.851	1.867	1.882	1.898	1.913	1.928	1.943	1.958	1.973	1.987	2.002	2.016	2.031	2.045	2.059
-25	1.903	1.745	1.763	1.779	1.796	1.812	1.828	1.844	1.860	1.876	1.891	1.906	1.921	1.936	1.951	1.966	1.981	1.995	2.009	2.024	2.038	2.052
-20	2.332	1.740	1.757	1.774	1.790	1.807	1.823	1.839	1.854	1.870	1.885	1.900	1.916	1.930	1.945	1.960	1.974	1.989	2.003	2.017	2.032	2.046
-15	2.832	1.734	1.751	1.768	1.785	1.801	1.818	1.833	1.849	1.865	1.880	1.895	1.910	1.925	1.940	1.955	1.969	1.984	1.998	2.012	2.026	2.040
-10	3.412	1.729	1.747	1.764	1.780	1.797	1.813	1.829	1.845	1.860	1.875	1.891	1.906	1.920	1.935	1.950	1.964	1.979	1.993	2.007	2.021	2.035
-5	4.079	1.725	1.742	1.759	1.776	1.793	1.809	1.825	1.840	1.856	1.871	1.886	1.901	1.916	1.931	1.946	1.960	1.974	1.989	2.003	2.017	2.031
0	4.842	1.721	1.738	1.755	1.772	1.789	1.805	1.821	1.837	1.852	1.868	1.883	1.898	1.913	1.927	1.942	1.956	1.971	1.985	1.999	2.013	2.027
5	5.710	1.717	1.734	1.752	1.769	1.785	1.802	1.818	1.833	1.849	1.864	1.879	1.894	1.909	1.924	1.939	1.953	1.967	1.982	1.996	2.010	2.023
10	6.692	1.713	1.731	1.748	1.765	1.782	1.798	1.814	1.830	1.846	1.861	1.877	1.892	1.906	1.921	1.936	1.950	1.964	1.979	1.993	2.007	2.020
15	7.798	1.709	1.728	1.745	1.762	1.779	1.796	1.812	1.828	1.843	1.859	1.874	1.889	1.904	1.919	1.933	1.948	1.962	1.976	1.990	2.004	2.018
20	9.037	1.706	1.724	1.742	1.759	1.776	1.793	1.809	1.825	1.841	1.856	1.872	1.887	1.902	1.916	1.931	1.945	1.960	1.974	1.988	2.002	2.016
25	10.422	1.702	1.721	1.739	1.757	1.774	1.790	1.807	1.823	1.839	1.854	1.870	1.885	1.900	1.914	1.929	1.943	1.958	1.972	1.986	2.000	2.014
30	11.964	1.699	1.718	1.736	1.754	1.771	1.788	1.805	1.821	1.837	1.852	1.868	1.883	1.898	1.913	1.927	1.942	1.956	1.970	1.984	1.998	2.012
35	13.675	1.695	1.715	1.733	1.751	1.769	1.786	1.802	1.819	1.835	1.850	1.866	1.881	1.896	1.911	1.926	1.940	1.954	1.969	1.983	1.997	2.010
40	15.568	1.691	1.711	1.730	1.749	1.766	1.784	1.800	1.817	1.833	1.849	1.864	1.879	1.895	1.909	1.924	1.939	1.953	1.967	1.981	1.995	2.009
45	17.660	1.687	1.708	1.727	1.746	1.764	1.781	1.798	1.815	1.831	1.847	1.863	1.878	1.893	1.908	1.923	1.937	1.952	1.966	1.980	1.994	2.008
50	19.966	1.682	1.703	1.724	1.743	1.761	1.779	1.796	1.813	1.829	1.845	1.861	1.876	1.892	1.907	1.922	1.936	1.951	1.965	1.979	1.993	2.007
55	22.506	1.676	1.699	1.720	1.739	1.758	1.776	1.794	1.811	1.827	1.844	1.859	1.875	1.890	1.905	1.920	1.935	1.949	1.964	1.978	1.992	2.006
60	25.303	1.670	1.693	1.715	1.736	1.755	1.773	1.791	1.809	1.825	1.842	1.858	1.873	1.889	1.904	1.919	1.934	1.948	1.963	1.977	1.991	2.005
65	28.386	1.661	1.687	1.710	1.731	1.751	1.770	1.788	1.806	1.823	1.840	1.856	1.872	1.887	1.903	1.918	1.933	1.947	1.962	1.976	1.990	2.004
70	31.793	1.651	1.680	1.704	1.726	1.747	1.767	1.785	1.803	1.821	1.837	1.854	1.870	1.886	1.901	1.916	1.931	1.946	1.960	1.975	1.989	2.003
75	35.585	1.637	1.670	1.697	1.720	1.742	1.762	1.781	1.800	1.817	1.835	1.851	1.868	1.884	1.899	1.914	1.929	1.944	1.959	1.973	1.987	2.001
80	39.881	1.616	1.657	1.687	1.713	1.735	1.757	1.776	1.795	1.814	1.831	1.848	1.865	1.881	1.896	1.912	1.927	1.942	1.957	1.971	1.986	2.000

R-513A

Azeotropic blend (56 % R-1234yf – 44 % R-134a)

Molecular weight (g/mol)	108.43
Melting point (°C)	N/A
Boiling point (at 1.013 bar)	-29.58
Temperature glide at 1.013 bar (K)	0.1
Critical temperature (°C)	97.7
Critical pressure (bar absolute)	38.55
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.412
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.881
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.107
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.167
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	7.22
Classification NF-EN 378	A1
GWP (IPCC 4)	631

Main applications

R-513A (Opteon™ XP10) is a "near azeotropic" blend containing refrigerants from the hydrofluoro-olefin (HFO) family, designed to replace R134a in domestic, commercial and industrial refrigeration applications as well as in air conditioning, liquid cooling and PAC (heat pumps). It can be used in direct expansion and flood systems.

Commercial specifications

Composition: 56 % R-1234yf – 44 % R-134a (±1 % -0.2 % / ±1 % -0.2 %).
Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Chlorine ion test (silver nitrate test): negative.
Total Acidity (HCL): ≤ 1 ppm weight.
Non-condensable content (gas phase): ≤ 1.5 % volume.

Oils

Use a polyol ester (POE) oil.
Consult **Climalife** regarding the viscosity of the oil selected for your system and the most suitable for your application.

Regulation

The use and implementation of R-513A are governed by the European Regulation N° 517/2014.
The recovery of R-513A is mandatory under the European Regulation N° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-513A - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm³/kg)	(kg/dm³)	(kJ/kg)	(kJ/kg.K)	(°C)	(m3/kg)	(kg/m³)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.035	-85	0.684	1.463	98.120	0.557	-84.42	4.121	0.243	321.807	1.744	223.686
0.052	-80	0.690	1.450	103.648	0.586	-79.49	2.839	0.352	324.884	1.730	221.235
0.076	-75	0.696	1.437	109.225	0.614	-74.55	2.000	0.500	327.998	1.717	218.774
0.108	-70	0.702	1.424	114.852	0.642	-69.61	1.438	0.695	331.146	1.706	216.294
0.150	-65	0.709	1.411	120.531	0.670	-64.66	1.053	0.949	334.322	1.696	213.791
0.205	-60	0.716	1.397	126.266	0.697	-59.71	0.785	1.274	337.522	1.687	211.256
0.277	-55	0.723	1.384	132.056	0.724	-54.75	0.594	1.683	340.740	1.680	208.684
0.367	-50	0.730	1.370	137.905	0.750	-49.79	0.456	2.192	343.972	1.673	206.067
0.480	-45	0.737	1.356	143.813	0.776	-44.82	0.355	2.817	347.212	1.668	203.399
0.619	-40	0.745	1.342	149.783	0.802	-39.85	0.280	3.576	350.455	1.663	200.672
0.789	-35	0.753	1.328	155.816	0.828	-34.87	0.223	4.489	353.696	1.659	197.880
0.994	-30	0.761	1.314	161.915	0.853	-29.9	0.179	5.578	356.931	1.655	195.016
1.013	-29.58	0.762	1.313	162.428	0.855	-29.48	0.176	5.677	357.201	1.655	194.773
1.239	-25	0.770	1.299	168.081	0.878	-24.92	0.146	6.865	360.153	1.652	192.073
1.529	-20	0.779	1.284	174.316	0.903	-19.93	0.119	8.375	363.359	1.650	189.043
1.869	-15	0.788	1.269	180.623	0.927	-14.95	0.099	10.137	366.542	1.648	185.919
2.266	-10	0.798	1.254	187.004	0.952	-9.96	0.082	12.179	369.696	1.646	182.692
2.724	-5	0.808	1.238	193.462	0.976	-4.97	0.069	14.536	372.816	1.645	179.354
3.251	0	0.818	1.222	200.000	1.000	0.02	0.058	17.242	375.895	1.644	175.895
3.851	5	0.830	1.205	206.622	1.024	5.01	0.049	20.338	378.926	1.643	172.305
4.533	10	0.841	1.188	213.331	1.048	10.01	0.042	23.870	381.901	1.643	168.570
5.303	15	0.854	1.171	220.132	1.071	15.0	0.036	27.888	384.809	1.643	164.677
6.168	20	0.867	1.153	227.030	1.095	20.0	0.031	32.452	387.641	1.642	160.611
7.135	25	0.882	1.134	234.031	1.118	25.0	0.027	37.629	390.384	1.642	156.353
8.211	30	0.897	1.115	241.143	1.141	30.0	0.023	43.499	393.025	1.642	151.882
9.405	35	0.913	1.095	248.373	1.165	35.0	0.020	50.157	395.547	1.642	147.174
10.725	40	0.931	1.074	255.733	1.188	40.0	0.017	57.718	397.931	1.642	142.198
12.178	45	0.951	1.052	263.235	1.211	45.0	0.015	66.324	400.154	1.642	136.919
13.775	50	0.972	1.028	270.899	1.235	50.01	0.013	76.153	402.188	1.641	131.289
15.524	55	0.996	1.004	278.747	1.258	55.01	0.011	87.437	403.995	1.640	125.247
17.435	60	1.023	0.977	286.812	1.282	60.01	0.010	100.484	405.527	1.638	118.715
19.519	65	1.054	0.949	295.136	1.306	65.01	0.009	115.719	406.717	1.636	111.581
21.788	70	1.090	0.917	303.780	1.331	70.01	0.007	133.767	407.470	1.633	103.689
24.256	75	1.134	0.882	312.837	1.356	75.02	0.006	155.597	407.637	1.629	94.801
26.939	80	1.189	0.841	322.463	1.383	80.02	0.005	182.882	406.970	1.622	84.507
29.856	85	1.265	0.791	332.978	1.411	85.02	0.005	218.998	404.973	1.612	71.994
33.037	90	1.384	0.723	345.267	1.444	90.01	0.004	273.217	400.311	1.596	55.044

Thermodynamic properties of R-513A - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-85	0.033	4312.720	4429.227	4545.536	4661.687	4777.711	4893.627	5009.455	5125.207	5240.893	5356.522	5472.101	5587.636	5703.133	5818.594	5934.025	6049.428	6164.806	6280.161	6395.496	6510.812	6626.112
-80	0.050	2947.544	3025.512	3103.317	3180.991	3258.557	3336.033	3413.432	3490.765	3568.041	3645.267	3722.448	3799.591	3876.699	3953.775	4030.824	4107.848	4184.849	4261.829	4338.792	4415.737	4492.667
-75	0.073	2062.610	2116.133	2169.520	2222.796	2275.981	2329.087	2382.127	2435.108	2488.040	2540.927	2593.774	2646.587	2699.368	2752.122	2804.850	2857.556	2910.241	2962.907	3015.557	3068.191	3120.812
-70	0.105	1474.709	1512.326	1549.827	1587.233	1624.559	1661.817	1699.016	1736.164	1773.267	1810.331	1847.359	1884.356	1921.325	1958.269	1995.189	2032.089	2068.971	2105.836	2142.685	2179.520	2216.342
-65	0.147	1075.246	1102.265	1129.184	1156.020	1182.786	1209.491	1236.145	1262.753	1289.321	1315.854	1342.355	1368.827	1395.274	1421.698	1448.101	1474.486	1500.853	1527.205	1553.543	1579.868	1606.182
-60	0.202	798.144	817.948	837.663	857.305	876.884	896.410	915.890	935.328	954.731	974.101	993.443	1012.759	1032.052	1051.324	1070.577	1089.813	1109.033	1128.239	1147.433	1166.614	1185.785
-55	0.273	602.229	617.019	631.730	646.376	660.966	675.508	690.008	704.471	718.901	733.302	747.678	762.030	776.360	790.672	804.966	819.245	833.509	847.761	862.000	876.229	890.447
-50	0.363	461.258	472.500	483.670	494.781	505.841	516.858	527.837	538.783	549.699	560.588	571.454	582.298	593.123	603.930	614.722	625.499	636.263	647.015	657.756	668.487	679.208
-45	0.475	358.165	366.850	375.470	384.037	392.557	401.038	409.485	417.900	426.289	434.653	442.996	451.319	459.624	467.913	476.188	484.449	492.698	500.936	509.164	517.382	525.592
-40	0.615	281.631	288.444	295.199	301.904	308.567	315.194	321.789	328.356	334.898	341.418	347.918	354.399	360.865	367.315	373.752	380.176	386.590	392.993	399.386	405.771	412.148
-35	0.784	224.018	229.441	234.809	240.132	245.417	250.668	255.889	261.085	266.258	271.410	276.543	281.660	286.762	291.849	296.925	301.989	307.042	312.086	317.121	322.148	327.168
-30	0.989	180.084	184.460	188.784	193.066	197.313	201.528	205.716	209.881	214.024	218.148	222.254	226.345	230.422	234.487	238.539	242.581	246.613	250.637	254.652	258.659	262.660
-29.48	1.013	176.137	180.418	184.650	188.839	192.993	197.116	201.212	205.284	209.336	213.368	217.383	221.383	225.368	229.341	233.303	237.254	241.195	245.127	249.051	252.968	256.878
-25	1.234	146.178	149.753	153.281	156.769	160.224	163.650	167.051	170.429	173.788	177.129	180.453	183.764	187.061	190.346	193.620	196.885	200.140	203.387	206.626	209.858	213.084
-20	1.525	119.715	122.672	125.584	128.459	131.304	134.121	136.914	139.686	142.440	145.178	147.900	150.608	153.305	155.990	158.665	161.331	163.988	166.637	169.279	171.915	174.544
-15	1.865	98.845	101.319	103.750	106.147	108.514	110.856	113.175	115.475	117.758	120.024	122.277	124.517	126.745	128.963	131.171	133.371	135.562	137.746	139.924	142.094	144.260
-10	2.262	82.225	84.317	86.369	88.388	90.379	92.346	94.292	96.219	98.130	100.026	101.909	103.779	105.639	107.489	109.330	111.163	112.988	114.806	116.617	118.423	120.223
-5	2.721	68.867	70.655	72.404	74.122	75.814	77.482	79.131	80.762	82.377	83.978	85.567	87.144	88.711	90.268	91.817	93.358	94.892	96.419	97.940	99.455	100.965
0	3.248	58.039	59.582	61.089	62.565	64.015	65.444	66.853	68.246	69.624	70.988	72.340	73.682	75.014	76.336	77.651	78.958	80.258	81.552	82.840	84.123	85.401
5	3.850	49.191	50.536	51.845	53.125	54.380	55.614	56.830	58.030	59.215	60.388	61.549	62.699	63.841	64.973	66.098	67.216	68.327	69.433	70.532	71.627	72.717
10	4.532	41.905	43.088	44.236	45.356	46.452	47.527	48.585	49.627	50.655	51.671	52.676	53.671	54.657	55.634	56.604	57.568	58.525	59.476	60.422	61.364	62.300
15	5.303	35.863	36.913	37.929	38.917	39.882	40.826	41.754	42.666	43.565	44.452	45.328	46.195	47.053	47.903	48.746	49.582	50.413	51.238	52.058	52.873	53.683
20	6.168	30.817	31.758	32.665	33.544	34.400	35.237	36.056	36.861	37.653	38.433	39.202	39.963	40.715	41.460	42.197	42.928	43.654	44.374	45.089	45.800	46.506
25	7.135	26.576	27.427	28.243	29.032	29.798	30.544	31.274	31.989	32.691	33.382	34.063	34.735	35.399	36.055	36.705	37.348	37.986	38.619	39.247	39.870	40.490
30	8.211	22.989	23.766	24.507	25.221	25.911	26.582	27.236	27.876	28.503	29.119	29.725	30.323	30.912	31.494	32.070	32.640	33.205	33.764	34.319	34.869	35.416
35	9.405	19.938	20.653	21.332	21.982	22.609	23.216	23.807	24.383	24.947	25.500	26.043	26.578	27.105	27.624	28.138	28.646	29.148	29.645	30.138	30.627	31.112
40	10.724	17.326	17.992	18.619	19.217	19.790	20.343	20.880	21.402	21.913	22.412	22.901	23.383	23.856	24.323	24.783	25.238	25.688	26.132	26.573	27.009	27.442
45	12.177	15.079	15.704	16.289	16.842	17.370	17.878	18.369	18.846	19.310	19.763	20.207	20.643	21.071	21.492	21.907	22.317	22.721	23.121	23.516	23.908	24.296
50	13.773	13.133	13.728	14.277	14.793	15.283	15.752	16.204	16.642	17.067	17.481	17.886	18.282	18.671	19.053	19.429	19.800	20.165	20.527	20.884	21.237	21.587
55	15.521	11.439	12.011	12.532	13.018	13.476	13.912	14.330	14.734	15.125	15.505	15.876	16.239	16.594	16.942	17.285	17.622	17.954	18.282	18.605	18.925	19.242
60	17.431	9.955	10.512	11.012	11.472	11.903	12.311	12.701	13.076	13.437	13.788	14.130	14.463	14.789	15.108	15.421	15.729	16.032	16.331	16.625	16.916	17.204
65	19.513	8.645	9.196	9.680	10.120	10.529	10.913	11.279	11.628	11.965	12.290	12.606	12.913	13.213	13.507	13.794	14.077	14.354	14.628	14.897	15.163	15.425
70	21.781	7.479	8.036	8.510	8.934	9.324	9.688	10.032	10.360	10.674	10.977	11.271	11.556	11.833	12.104	12.369	12.629	12.885	13.136	13.383	13.626	13.867
75	24.248	6.430	7.006	7.477	7.890	8.264	8.611	8.936	9.245	9.540	9.823	10.097	10.362	10.619	10.871	11.116	11.356	11.592	11.823	12.050	12.275	12.495
80	26.929	5.471	6.086	6.560	6.965	7.327	7.659	7.969	8.261	8.538	8.804	9.060	9.308	9.548	9.781	10.009	10.231	10.449	10.663	10.873	11.080	11.283
85	29.846	4.569	5.260	5.745	6.145	6.497	6.816	7.112	7.389	7.651	7.901	8.141	8.373	8.597	8.815	9.026	9.233	9.436	9.634	9.828	10.019	10.207
90	33.028	3.663	4.513	5.015	5.413	5.757	6.065	6.348	6.611	6.859	7.096	7.321	7.539	7.748	7.952	8.149	8.342	8.530	8.714	8.895	9.072	9.246

Thermodynamic properties of R-513A - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-85	0.033	321.447	324.676	327.958	331.293	334.681	338.123	341.619	345.168	348.770	352.425	356.133	359.892	363.703	367.566	371.479	375.443	379.456	383.519	387.631	391.792	396.001
-80	0.050	324.564	327.857	331.202	334.598	338.047	341.548	345.102	348.709	352.368	356.079	359.842	363.656	367.522	371.437	375.403	379.419	383.484	387.598	391.760	395.971	400.229
-75	0.073	327.715	331.073	334.481	337.940	341.450	345.011	348.624	352.289	356.005	359.773	363.591	367.460	371.380	375.349	379.367	383.435	387.551	391.716	395.928	400.188	404.496
-70	0.105	330.897	334.321	337.793	341.315	344.886	348.508	352.181	355.904	359.678	363.502	367.377	371.301	375.274	379.297	383.368	387.488	391.656	395.871	400.134	404.443	408.799
-65	0.147	334.105	337.596	341.133	344.719	348.353	352.036	355.769	359.552	363.384	367.265	371.195	375.175	379.203	383.279	387.403	391.575	395.794	400.061	404.374	408.733	413.138
-60	0.202	337.333	340.893	344.497	348.148	351.845	355.591	359.385	363.227	367.118	371.057	375.044	379.079	383.162	387.292	391.469	395.694	399.965	404.282	408.645	413.054	417.508
-55	0.273	340.577	344.207	347.880	351.597	355.360	359.169	363.024	366.927	370.877	374.874	378.919	383.010	387.148	391.333	395.564	399.841	404.164	408.533	412.946	417.405	421.908
-50	0.363	343.832	347.535	351.278	355.063	358.892	362.765	366.684	370.648	374.658	378.714	382.817	386.965	391.159	395.398	399.683	404.014	408.389	412.809	417.274	421.782	426.335
-45	0.475	347.093	350.871	354.686	358.541	362.437	366.376	370.359	374.386	378.457	382.573	386.734	390.940	395.190	399.485	403.825	408.209	412.637	417.109	421.624	426.183	430.786
-40	0.615	350.355	354.211	358.100	362.026	365.992	369.998	374.046	378.137	382.270	386.447	390.668	394.931	399.239	403.590	407.985	412.423	416.904	421.428	425.995	430.605	435.258
-35	0.784	353.613	357.549	361.515	365.515	369.551	373.626	377.741	381.897	386.094	390.333	394.613	398.937	403.302	407.710	412.160	416.653	421.188	425.765	430.384	435.045	439.748
-30	0.989	356.863	360.882	364.927	369.002	373.112	377.257	381.441	385.663	389.924	394.226	398.568	402.951	407.376	411.841	416.348	420.896	425.485	430.116	434.787	439.500	444.253
-29.48	1.013	357.201	361.229	365.282	369.365	373.483	377.636	381.826	386.055	390.323	394.632	398.981	403.370	407.800	412.272	416.784	421.338	425.933	430.569	435.246	439.964	444.723
-25	1.234	360.099	364.204	368.331	372.484	376.669	380.887	385.140	389.430	393.758	398.123	402.528	406.973	411.456	415.980	420.544	425.148	429.793	434.477	439.202	443.966	448.771
-20	1.525	363.316	367.510	371.722	375.956	380.218	384.511	388.836	393.195	397.590	402.021	406.490	410.996	415.541	420.124	424.746	429.407	434.107	438.846	443.625	448.442	453.298
-15	1.865	366.508	370.796	375.096	379.414	383.755	388.124	392.523	396.954	401.418	405.916	410.450	415.020	419.626	424.270	428.951	433.670	438.426	443.221	448.053	452.924	457.833
-10	2.262	369.671	374.057	378.447	382.852	387.276	391.724	396.198	400.702	405.237	409.804	414.404	419.039	423.709	428.414	433.155	437.932	442.746	447.597	452.485	457.409	462.371
-5	2.721	372.798	377.286	381.772	386.266	390.775	395.305	399.858	404.437	409.044	413.681	418.350	423.051	427.785	432.552	437.355	442.192	447.064	451.972	456.916	461.895	466.911
0	3.248	375.883	380.477	385.063	389.651	394.249	398.862	403.496	408.153	412.835	417.544	422.283	427.051	431.851	436.683	441.547	446.445	451.377	456.343	461.344	466.379	471.449
5	3.850	378.918	383.625	388.315	393.001	397.691	402.392	407.110	411.847	416.606	421.389	426.199	431.037	435.904	440.802	445.730	450.690	455.682	460.707	465.766	470.857	475.983
10	4.532	381.896	386.722	391.522	396.310	401.097	405.890	410.694	415.514	420.352	425.212	430.096	435.005	439.942	444.906	449.899	454.923	459.977	465.062	470.179	475.328	480.510
15	5.303	384.806	389.760	394.677	399.573	404.461	409.350	414.244	419.150	424.071	429.010	433.970	438.952	443.959	448.992	454.052	459.140	464.257	469.404	474.581	479.789	485.028
20	6.168	387.640	392.731	397.772	402.783	407.778	412.766	417.755	422.751	427.757	432.777	437.816	442.874	447.953	453.057	458.185	463.340	468.521	473.731	478.969	484.237	489.534
25	7.135	390.384	395.624	400.799	405.933	411.041	416.134	421.222	426.311	431.406	436.511	441.630	446.766	451.921	457.097	462.296	467.518	472.766	478.040	483.341	488.669	494.026
30	8.211	393.025	398.429	403.750	409.015	414.243	419.448	424.640	429.826	435.014	440.207	445.410	450.627	455.859	461.110	466.381	471.673	476.988	482.328	487.693	493.084	498.501
35	9.405	395.547	401.134	406.614	412.021	417.377	422.700	428.002	433.291	438.575	443.860	449.151	454.451	459.764	465.092	470.437	475.801	481.186	486.593	492.023	497.478	502.957
40	10.724	397.930	403.723	409.379	414.941	420.436	425.885	431.302	436.700	442.086	447.467	452.849	458.236	463.631	469.039	474.461	479.899	485.355	490.832	496.329	501.849	507.392
45	12.177	400.153	406.182	412.034	417.764	423.409	428.993	434.535	440.047	445.540	451.022	456.499	461.976	467.458	472.948	478.449	483.964	489.494	495.042	500.608	506.195	511.803
50	13.773	402.186	408.488	414.562	420.480	426.288	432.018	437.692	443.326	448.932	454.520	460.097	465.669	471.241	476.817	482.400	487.994	493.600	499.221	504.858	510.514	516.188
55	15.521	403.992	410.620	416.946	423.074	429.062	434.950	440.767	446.531	452.257	457.957	463.639	469.310	474.975	480.641	486.309	491.984	497.669	503.366	509.076	514.802	520.545
60	17.431	405.524	412.546	419.167	425.530	431.718	437.780	443.751	449.655	455.509	461.328	467.120	472.895	478.658	484.416	490.173	495.933	501.699	507.474	513.260	519.058	524.872
65	19.513	406.714	414.230	421.199	427.833	434.244	440.497	446.636	452.691	458.682	464.626	470.535	476.419	482.285	488.140	493.990	499.837	505.688	511.543	517.406	523.280	529.165
70	21.781	407.468	415.625	423.015	429.963	436.625	443.091	449.413	455.631	461.769	467.846	473.879	479.878	485.852	491.809	497.754	503.693	509.631	515.569	521.513	527.464	533.424
75	24.248	407.638	416.672	424.580	431.897	438.846	445.548	452.072	458.466	464.762	470.983	477.146	483.267	489.354	495.417	501.462	507.497	513.525	519.550	525.576	531.607	537.644
80	26.929	406.975	417.291	425.856	433.610	440.889	447.855	454.601	461.187	467.653	474.027	480.330	486.579	492.785	498.959	505.110	511.243	517.365	523.480	529.593	535.705	541.821
85	29.846	404.983	417.377	426.793	435.073	442.730	449.994	456.986	463.782	470.431	476.969	483.420	489.805	496.137	502.428	508.689	514.926	521.146	527.354	533.555	539.753	545.951
90	33.028	400.331	416.788	427.328	436.242	444.339	451.938	459.202	466.228	473.076	479.790	486.400	492.929	499.394	505.809	512.185	518.531	524.853	531.159	537.453	543.739	550.022

Thermodynamic properties of R-513A - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-85	0.033	1.746	1.763	1.779	1.796	1.813	1.829	1.845	1.861	1.877	1.893	1.909	1.924	1.940	1.955	1.971	1.986	2.001	2.016	2.031	2.046	2.060
-80	0.050	1.731	1.748	1.765	1.781	1.797	1.814	1.830	1.846	1.862	1.877	1.893	1.909	1.924	1.939	1.955	1.970	1.985	2.000	2.014	2.029	2.044
-75	0.073	1.718	1.735	1.751	1.768	1.784	1.800	1.816	1.832	1.848	1.864	1.879	1.895	1.910	1.925	1.940	1.955	1.970	1.985	2.000	2.015	2.029
-70	0.105	1.707	1.723	1.740	1.756	1.772	1.788	1.804	1.820	1.836	1.851	1.867	1.882	1.898	1.913	1.928	1.943	1.957	1.972	1.987	2.001	2.016
-65	0.147	1.697	1.713	1.730	1.746	1.762	1.778	1.794	1.810	1.825	1.841	1.856	1.871	1.887	1.902	1.917	1.931	1.946	1.961	1.975	1.990	2.004
-60	0.202	1.688	1.704	1.721	1.737	1.753	1.769	1.785	1.800	1.816	1.831	1.847	1.862	1.877	1.892	1.907	1.921	1.936	1.951	1.965	1.980	1.994
-55	0.273	1.680	1.697	1.713	1.729	1.745	1.761	1.777	1.792	1.808	1.823	1.838	1.853	1.868	1.883	1.898	1.913	1.927	1.942	1.956	1.971	1.985
-50	0.363	1.674	1.690	1.706	1.722	1.738	1.754	1.770	1.785	1.800	1.816	1.831	1.846	1.861	1.876	1.890	1.905	1.920	1.934	1.949	1.963	1.977
-45	0.475	1.668	1.684	1.700	1.716	1.732	1.748	1.764	1.779	1.794	1.810	1.825	1.840	1.854	1.869	1.884	1.899	1.913	1.927	1.942	1.956	1.970
-40	0.615	1.663	1.679	1.695	1.711	1.727	1.743	1.758	1.774	1.789	1.804	1.819	1.834	1.849	1.864	1.878	1.893	1.907	1.922	1.936	1.950	1.964
-35	0.784	1.659	1.675	1.691	1.707	1.723	1.738	1.754	1.769	1.785	1.800	1.815	1.830	1.844	1.859	1.874	1.888	1.902	1.917	1.931	1.945	1.959
-30	0.989	1.655	1.671	1.688	1.703	1.719	1.735	1.750	1.766	1.781	1.796	1.811	1.826	1.840	1.855	1.869	1.884	1.898	1.912	1.927	1.941	1.955
-29.48	1.013	1.655	1.671	1.687	1.703	1.719	1.735	1.750	1.765	1.780	1.796	1.810	1.825	1.840	1.855	1.869	1.883	1.898	1.912	1.926	1.940	1.954
-25	1.234	1.652	1.668	1.685	1.701	1.716	1.732	1.747	1.763	1.778	1.793	1.808	1.822	1.837	1.852	1.866	1.880	1.895	1.909	1.923	1.937	1.951
-20	1.525	1.650	1.666	1.682	1.698	1.714	1.729	1.745	1.760	1.775	1.790	1.805	1.820	1.834	1.849	1.863	1.878	1.892	1.906	1.920	1.934	1.948
-15	1.865	1.648	1.664	1.680	1.696	1.712	1.728	1.743	1.758	1.773	1.788	1.803	1.818	1.832	1.847	1.861	1.875	1.890	1.904	1.918	1.932	1.945
-10	2.262	1.646	1.663	1.679	1.695	1.711	1.726	1.741	1.757	1.772	1.787	1.802	1.816	1.831	1.845	1.860	1.874	1.888	1.902	1.916	1.930	1.944
-5	2.721	1.645	1.661	1.678	1.694	1.709	1.725	1.740	1.756	1.771	1.786	1.800	1.815	1.830	1.844	1.858	1.873	1.887	1.901	1.915	1.928	1.942
0	3.248	1.644	1.661	1.677	1.693	1.709	1.724	1.740	1.755	1.770	1.785	1.800	1.814	1.829	1.843	1.858	1.872	1.886	1.900	1.914	1.928	1.941
5	3.850	1.643	1.660	1.676	1.693	1.708	1.724	1.740	1.755	1.770	1.785	1.800	1.814	1.829	1.843	1.857	1.871	1.886	1.899	1.913	1.927	1.941
10	4.532	1.643	1.660	1.676	1.692	1.708	1.724	1.740	1.755	1.770	1.785	1.800	1.814	1.829	1.843	1.857	1.871	1.885	1.899	1.913	1.927	1.940
15	5.303	1.643	1.660	1.676	1.693	1.709	1.724	1.740	1.755	1.770	1.785	1.800	1.815	1.829	1.843	1.858	1.872	1.886	1.900	1.913	1.927	1.941
20	6.168	1.642	1.660	1.676	1.693	1.709	1.725	1.740	1.756	1.771	1.786	1.801	1.815	1.830	1.844	1.858	1.872	1.886	1.900	1.914	1.928	1.941
25	7.135	1.642	1.660	1.677	1.693	1.709	1.725	1.741	1.756	1.772	1.787	1.801	1.816	1.830	1.845	1.859	1.873	1.887	1.901	1.915	1.928	1.942
30	8.211	1.642	1.660	1.677	1.694	1.710	1.726	1.742	1.757	1.773	1.788	1.802	1.817	1.832	1.846	1.860	1.874	1.888	1.902	1.916	1.929	1.943
35	9.405	1.642	1.660	1.678	1.694	1.711	1.727	1.743	1.758	1.774	1.789	1.804	1.818	1.833	1.847	1.861	1.875	1.889	1.903	1.917	1.931	1.944
40	10.724	1.642	1.660	1.678	1.695	1.712	1.728	1.744	1.759	1.775	1.790	1.805	1.820	1.834	1.849	1.863	1.877	1.891	1.905	1.918	1.932	1.946
45	12.177	1.642	1.660	1.678	1.696	1.713	1.729	1.745	1.761	1.776	1.791	1.806	1.821	1.836	1.850	1.864	1.878	1.892	1.906	1.920	1.934	1.947
50	13.773	1.641	1.660	1.679	1.696	1.713	1.730	1.746	1.762	1.778	1.793	1.808	1.823	1.837	1.852	1.866	1.880	1.894	1.908	1.922	1.935	1.949
55	15.521	1.640	1.660	1.679	1.697	1.714	1.731	1.747	1.763	1.779	1.794	1.809	1.824	1.839	1.854	1.868	1.882	1.896	1.910	1.924	1.937	1.951
60	17.431	1.638	1.659	1.679	1.697	1.715	1.732	1.748	1.765	1.780	1.796	1.811	1.826	1.841	1.855	1.870	1.884	1.898	1.912	1.926	1.939	1.953
65	19.513	1.636	1.658	1.678	1.697	1.715	1.733	1.750	1.766	1.782	1.797	1.813	1.828	1.843	1.857	1.872	1.886	1.900	1.914	1.928	1.941	1.955
70	21.781	1.633	1.657	1.678	1.697	1.716	1.733	1.750	1.767	1.783	1.799	1.814	1.830	1.844	1.859	1.874	1.888	1.902	1.916	1.930	1.943	1.957
75	24.248	1.629	1.654	1.677	1.697	1.716	1.734	1.751	1.768	1.784	1.800	1.816	1.831	1.846	1.861	1.876	1.890	1.904	1.918	1.932	1.946	1.959
80	26.929	1.622	1.651	1.675	1.696	1.716	1.734	1.752	1.769	1.786	1.802	1.818	1.833	1.848	1.863	1.878	1.892	1.906	1.920	1.934	1.948	1.961
85	29.846	1.612	1.647	1.673	1.695	1.715	1.734	1.753	1.770	1.787	1.803	1.819	1.835	1.850	1.865	1.879	1.894	1.908	1.922	1.936	1.950	1.964
90	33.028	1.596	1.641	1.669	1.693	1.714	1.734	1.753	1.771	1.788	1.804	1.820	1.836	1.851	1.866	1.881	1.896	1.910	1.924	1.938	1.952	1.966

R-1233zd (Solstice® zd)

Trans-1-chloro-3,3,3-trifluoroprop-1-ene

Molecular weight (g/mol)	130.50
Melting point (°C)	-78
Boiling point (at 1.013 bar)	18.31
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	165.6
Critical pressure (bar absolute)	35.73
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.243
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.825
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.104
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.469
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	12.57
Classification NF-EN 378	A1
GWP (IPCC 4)	5

Main applications

R-1233zd is a fluorinated gas from the HFO family. This product has a very low GWP and low pressure. It is suitable for new industrial air conditioning applications and the cooling of buildings where cooling water or intermediate fluids are used in large systems with centrifugal compressors (one or more stages) where R-123 may have been used in the past.

Commercial specifications

Purity: ≥ 99.5 % weight.
Water content: ≤ 20 ppm weight.
Chlorine ion test (silver nitrate test): negative.
Total Acidity (HCL): ≤ 1 ppm weight.

Oils

Use a polyol ester (POE) oil.
Consult **Climalife** regarding the viscosity of the oil selected for your application and the most suitable for your application.

Regulation

The use and implementation of R-1233zd are governed by the European Regulation N° 517/2014.
The recovery of R-1233zd is mandatory under the European Regulation N° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-1233zd - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.003	-75	0.675	1.482	108.096	0.607	-75.0	37.407	0.027	352.276	1.839	244.181
0.005	-70	0.679	1.472	114.290	0.638	-70.0	23.877	0.042	355.636	1.826	241.346
0.008	-65	0.684	1.462	120.464	0.668	-65.0	15.660	0.064	359.028	1.814	238.564
0.013	-60	0.689	1.451	126.621	0.697	-60.0	10.531	0.095	362.449	1.803	235.828
0.019	-55	0.694	1.441	132.763	0.725	-55.0	7.245	0.138	365.897	1.794	233.134
0.028	-50	0.699	1.430	138.893	0.753	-50.0	5.092	0.196	369.370	1.786	230.476
0.040	-45	0.705	1.419	145.013	0.780	-45.0	3.649	0.274	372.864	1.779	227.851
0.056	-40	0.710	1.409	151.125	0.807	-40.0	2.662	0.376	376.378	1.773	225.253
0.076	-35	0.715	1.398	157.231	0.833	-35.0	1.975	0.506	379.908	1.768	222.677
0.103	-30	0.721	1.387	163.334	0.858	-30.0	1.488	0.672	383.452	1.763	220.119
0.138	-25	0.726	1.377	169.435	0.883	-25.0	1.137	0.880	387.008	1.760	217.573
0.181	-20	0.732	1.366	175.537	0.907	-20.0	0.880	1.136	390.573	1.757	215.036
0.235	-15	0.738	1.355	181.643	0.931	-15.0	0.690	1.449	394.144	1.754	212.502
0.301	-10	0.744	1.344	187.754	0.954	-10.0	0.547	1.828	397.719	1.752	209.966
0.382	-5	0.750	1.333	193.872	0.977	-5.0	0.438	2.282	401.295	1.751	207.424
0.479	0	0.757	1.321	200.000	1.000	0.0	0.355	2.820	404.870	1.750	204.870
0.594	5	0.763	1.310	206.140	1.022	5.0	0.289	3.455	408.441	1.750	202.301
0.731	10	0.770	1.298	212.295	1.044	10.0	0.238	4.196	412.005	1.749	199.710
0.892	15	0.777	1.287	218.467	1.066	15.0	0.198	5.058	415.560	1.750	197.094
1.013	18.31	0.782	1.279	222.559	1.080	18.31	0.175	5.699	417.905	1.750	195.346
1.080	20	0.784	1.275	224.657	1.087	20.0	0.165	6.052	419.104	1.750	194.446
1.296	25	0.792	1.263	230.870	1.108	25.0	0.139	7.192	422.632	1.751	191.762
1.546	30	0.800	1.251	237.107	1.129	30.0	0.118	8.495	426.144	1.752	189.037
1.831	35	0.808	1.238	243.370	1.149	35.0	0.100	9.975	429.635	1.753	186.264
2.155	40	0.816	1.226	249.664	1.169	40.0	0.086	11.650	433.102	1.755	183.438
2.521	45	0.825	1.213	255.990	1.189	45.0	0.074	13.540	436.542	1.757	180.552
2.933	50	0.834	1.200	262.351	1.209	50.0	0.064	15.664	439.952	1.758	177.601
3.395	55	0.843	1.186	268.751	1.228	55.0	0.055	18.044	443.326	1.760	174.576
3.909	60	0.853	1.173	275.193	1.248	60.0	0.048	20.706	446.662	1.762	171.469
4.481	65	0.863	1.159	281.680	1.267	65.0	0.042	23.676	449.953	1.765	168.274
5.113	70	0.874	1.145	288.217	1.286	70.0	0.037	26.983	453.196	1.767	164.979
5.811	75	0.885	1.130	294.807	1.305	75.0	0.033	30.663	456.383	1.769	161.575
6.577	80	0.897	1.115	301.456	1.324	80.0	0.029	34.752	459.507	1.771	158.051
7.418	85	0.910	1.099	308.169	1.342	85.0	0.025	39.294	462.562	1.773	154.393
8.336	90	0.923	1.083	314.951	1.361	90.0	0.023	44.340	465.539	1.776	150.588
9.336	95	0.937	1.067	321.810	1.379	95.0	0.020	49.947	468.427	1.778	146.617
10.424	100	0.953	1.050	328.753	1.398	100.0	0.018	56.184	471.214	1.780	142.461
11.604	105	0.969	1.032	335.790	1.416	105.0	0.016	63.135	473.887	1.781	138.097
12.882	110	0.987	1.013	342.932	1.435	110.0	0.014	70.898	476.428	1.783	133.497
14.262	115	1.007	0.993	350.192	1.453	115.0	0.013	79.599	478.817	1.785	128.625
15.751	120	1.028	0.972	357.587	1.472	120.0	0.011	89.393	481.027	1.786	123.439
17.355	125	1.052	0.950	365.140	1.490	125.0	0.010	100.485	483.024	1.786	117.884
19.081	130	1.079	0.927	372.878	1.509	130.0	0.009	113.145	484.764	1.787	111.886
20.935	135	1.110	0.901	380.841	1.528	135.0	0.008	127.751	486.186	1.786	105.346
22.926	140	1.146	0.873	389.085	1.548	140.0	0.007	144.852	487.204	1.785	98.120
25.063	145	1.189	0.841	397.695	1.568	145.0	0.006	165.299	487.685	1.783	89.989
27.357	150	1.243	0.805	406.818	1.589	150.0	0.005	190.539	487.406	1.779	80.589
29.822	155	1.315	0.761	416.735	1.612	155.0	0.004	223.414	485.944	1.773	69.209
32.478	160	1.426	0.701	428.182	1.637	160.0	0.004	271.280	482.225	1.762	54.042

Thermodynamic properties of R-1233zd - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-75	0.003	37406.989	38352.542	39298.013	40243.409	41188.735	42133.996	43079.197	44024.342	44969.435	45914.480	46859.482	47804.442	48749.365	49694.253	50639.109	51583.936	52528.735	53473.509	54418.259	55362.989	56307.698
-70	0.005	23877.336	24466.539	25055.667	25644.725	26233.717	26822.650	27411.526	28000.351	28589.128	29177.861	29766.553	30355.207	30943.827	31532.414	32120.972	32709.502	33298.007	33886.489	34474.950	35063.391	35651.814
-65	0.008	15660.437	16038.034	16415.560	16793.020	17170.421	17547.766	17925.059	18302.304	18679.504	19056.664	19433.786	19810.874	20187.929	20564.954	20941.952	21318.925	21695.875	22072.803	22449.712	22826.602	23203.476
-60	0.013	10530.573	10778.908	11027.178	11275.388	11523.541	11771.643	12019.697	12267.706	12515.674	12763.605	13011.500	13259.364	13507.198	13755.004	14002.785	14250.543	14498.280	14745.997	14993.695	15241.377	15489.043
-55	0.019	7245.467	7412.753	7579.977	7747.146	7914.262	8081.330	8248.354	8415.337	8582.281	8749.191	8916.069	9082.917	9249.737	9416.533	9583.305	9750.055	9916.786	10083.498	10250.194	10416.874	10583.540
-50	0.028	5091.708	5206.928	5322.092	5437.204	5552.267	5667.286	5782.263	5897.203	6012.107	6126.979	6241.821	6356.636	6471.426	6586.192	6700.937	6815.662	6930.368	7045.058	7159.732	7274.392	7389.038
-45	0.040	3648.637	3729.652	3810.615	3891.530	3972.400	4053.228	4134.018	4214.773	4295.496	4376.189	4456.854	4537.494	4618.110	4698.705	4779.280	4859.837	4940.377	5020.901	5101.411	5181.907	5262.391
-40	0.056	2662.063	2720.134	2778.156	2836.133	2894.068	2951.965	3009.827	3067.656	3125.455	3183.227	3240.973	3298.695	3356.396	3414.077	3471.740	3529.386	3587.016	3644.631	3702.233	3759.823	3817.401
-35	0.076	1974.846	2017.224	2059.556	2101.847	2144.099	2186.315	2228.498	2270.652	2312.777	2354.877	2396.954	2439.008	2481.043	2523.059	2565.058	2607.042	2649.010	2690.966	2732.909	2774.841	2816.762
-30	0.103	1487.759	1519.207	1550.614	1581.981	1613.312	1644.610	1675.878	1707.118	1738.332	1769.522	1800.690	1831.839	1862.969	1894.081	1925.178	1956.260	1987.329	2018.386	2049.430	2080.464	2111.489
-25	0.138	1136.891	1160.598	1184.266	1207.897	1231.494	1255.061	1278.600	1302.113	1325.602	1349.068	1372.515	1395.943	1419.354	1442.748	1466.129	1489.495	1512.849	1536.192	1559.524	1582.846	1606.158
-20	0.181	880.310	898.445	916.545	934.610	952.644	970.649	988.629	1006.584	1024.517	1042.429	1060.323	1078.199	1096.060	1113.905	1131.737	1149.556	1167.364	1185.161	1202.948	1220.726	1238.495
-15	0.235	690.021	704.088	718.121	732.122	746.094	760.039	773.960	787.859	801.737	815.596	829.437	843.262	857.073	870.869	884.653	898.426	912.187	925.938	939.680	953.413	967.139
-10	0.301	547.032	558.086	569.108	580.100	591.065	602.005	612.923	623.819	634.697	645.556	656.399	667.227	678.042	688.843	699.633	710.412	721.180	731.939	742.690	753.432	764.167
-5	0.382	438.259	447.052	455.815	464.550	473.260	481.947	490.613	499.259	507.886	516.498	525.094	533.676	542.245	550.802	559.349	567.884	576.411	584.928	593.438	601.939	610.434
0	0.479	354.557	361.634	368.681	375.703	382.701	389.678	396.634	403.572	410.493	417.399	424.291	431.169	438.035	444.890	451.735	458.570	465.396	472.214	479.024	485.827	492.623
5	0.594	289.452	295.209	300.939	306.645	312.329	317.992	323.636	329.263	334.875	340.472	346.055	351.626	357.186	362.735	368.275	373.805	379.327	384.842	390.349	395.849	401.343
10	0.731	238.298	243.030	247.737	252.421	257.084	261.728	266.354	270.965	275.560	280.141	284.711	289.268	293.815	298.351	302.879	307.398	311.909	316.413	320.910	325.401	329.886
15	0.892	197.721	201.650	205.554	209.437	213.300	217.145	220.973	224.786	228.585	232.372	236.146	239.909	243.662	247.406	251.141	254.869	258.588	262.301	266.008	269.708	273.402
18.31	1.013	175.461	178.952	182.421	185.868	189.296	192.707	196.101	199.481	202.847	206.201	209.544	212.876	216.198	219.512	222.817	226.114	229.404	232.687	235.964	239.235	242.501
20	1.080	165.248	168.540	171.809	175.057	178.287	181.499	184.696	187.878	191.047	194.204	197.350	200.485	203.611	206.728	209.837	212.938	216.032	219.119	222.201	225.276	228.347
25	1.296	139.041	141.824	144.585	147.326	150.050	152.757	155.450	158.129	160.795	163.449	166.093	168.728	171.353	173.969	176.578	179.180	181.775	184.364	186.947	189.524	192.097
30	1.546	117.723	120.095	122.447	124.781	127.097	129.397	131.684	133.957	136.218	138.468	140.709	142.940	145.162	147.376	149.583	151.783	153.977	156.165	158.347	160.524	162.696
35	1.831	100.252	102.292	104.311	106.313	108.298	110.268	112.225	114.169	116.102	118.024	119.937	121.841	123.736	125.624	127.505	129.379	131.248	133.110	134.967	136.820	138.667
40	2.155	85.834	87.601	89.348	91.079	92.793	94.493	96.180	97.855	99.519	101.173	102.818	104.455	106.083	107.704	109.319	110.927	112.530	114.126	115.718	117.305	118.888
45	2.521	73.856	75.398	76.921	78.428	79.919	81.396	82.861	84.315	85.758	87.191	88.616	90.032	91.441	92.842	94.238	95.627	97.010	98.389	99.762	101.131	102.496
50	2.933	63.841	65.197	66.534	67.855	69.162	70.455	71.736	73.006	74.265	75.515	76.757	77.991	79.217	80.437	81.651	82.859	84.061	85.259	86.451	87.640	88.824
55	3.395	55.419	56.619	57.801	58.968	60.120	61.259	62.386	63.503	64.609	65.707	66.796	67.878	68.953	70.021	71.083	72.139	73.191	74.237	75.279	76.317	77.351
60	3.909	48.295	49.365	50.418	51.454	52.477	53.487	54.485	55.473	56.451	57.421	58.382	59.336	60.283	61.224	62.159	63.089	64.013	64.933	65.849	66.760	67.668
65	4.481	42.237	43.198	44.141	45.068	45.982	46.883	47.772	48.651	49.521	50.382	51.236	52.082	52.922	53.755	54.583	55.406	56.223	57.036	57.845	58.650	59.452
70	5.113	37.060	37.928	38.778	39.613	40.434	41.242	42.039	42.826	43.604	44.374	45.136	45.890	46.639	47.381	48.118	48.850	49.577	50.299	51.018	51.732	52.444
75	5.811	32.613	33.402	34.174	34.930	35.672	36.402	37.120	37.829	38.528	39.220	39.903	40.580	41.251	41.915	42.575	43.229	43.878	44.524	45.165	45.803	46.437
80	6.577	28.775	29.498	30.203	30.891	31.566	32.229	32.880	33.521	34.154	34.778	35.395	36.005	36.608	37.207	37.799	38.387	38.971	39.550	40.125	40.697	41.265
85	7.418	25.449	26.115	26.762	27.394	28.011	28.616	29.209	29.793	30.367	30.934	31.493	32.045	32.592	33.132	33.668	34.199	34.725	35.247	35.765	36.280	36.791
90	8.336	22.553	23.171	23.770	24.352	24.919	25.474	26.018	26.551	27.076	27.593	28.102	28.605	29.102	29.593	30.079	30.560	31.037	31.510	31.979	32.444	32.906
95	9.336	20.021	20.598	21.155	21.695	22.220	22.732	23.233	23.723	24.205	24.678	25.144	25.604	26.057	26.505	26.948	27.386	27.820	28.250	28.677	29.099	29.519
100	10.424	17.799	18.342	18.863	19.367	19.855	20.330	20.793	21.246	21.690	22.125	22.554	22.976	23.392	23.802	24.207	24.608	25.005	25.397	25.786	26.172	26.554
105	11.604	15.839	16.354	16.846	17.318	17.775	18.217	18.648	19.068	19.479	19.882	20.278	20.667	21.050	21.427	21.799	22.167	22.531	22.891	23.247	23.600	23.950
110	12.882	14.105	14.597	15.063	15.509	15.939	16.353	16.756	17.148	17.530	17.904	18.271	18.631	18.985	19.333	19.677	20.016	20.351	20.681	21.009	21.333	21.654
115	14.262	12.563	13.037	13.483	13.907	14.313	14.703	15.081	15.448	15.805	16.154	16.495	16.830	17.158	17.481	17.799	18.113	18.422	18.727	19.029	19.328	19.624
120	15.751	11.187	11.648	12.077	12.483	12.868	13.238	13.595	13.939	14.275	14.601	14.920	15.232	15.537	15.838	16.133	16.424	16.711	16.994	17.273	17.550	17.823
125	17.355	9.952	10.405	10.823	11.213	11.582	11.933	12.271	12.597	12.912	13.219	13.517	13.809	14.095	14.376	14.651	14.922	15.188	15.451	15.711	15.967	16.220
130	19.081	8.838	9.290	9.699	10.077	10.431	10.768	11.089	11.398	11.696	11.985	12.266	12.540	12.808	13.070	13.328	13.581	13.829	14.074	14.316	14.554	14.789
135	20.935	7.828	8.284	8.689	9.058	9.401	9.724	10.031	10.324	10.607	10.881	11.146	11.404	11.656	11.902	12.144	12.380	12.613	12.842	13.067	13.289	13.509
140	22.926	6.904	7.374	7.778	8.141	8.474	8.786	9.080	9.361	9.630	9.890	10.141	10.385	10.622	10.854	11.081	11.303	11.521	11.735	11.946	12.154	12.359
145	25.063	6.050	6.545	6.954	7.313	7.639	7.941	8.225	8.494	8.751	8.998	9.236	9.467	9.691	9.910	10.124	10.333	10.538	10.739	10.937	11.131	11.323
150	27.357	5.248	5.788	6.207	6.565	6.885	7.179	7.453	7.711	7.957	8.193	8.419	8.638	8.851	9.058	9.259	9.457	9.650	9.839	10.025	10.208	10.388
155	29.822	4.476	5.092	5.526	5.886	6.202	6.488	6.754	7.003	7.238	7.463	7.680	7.888	8.090	8.286	8.476	8.663	8.845	9.023	9.198	9.370	9.539
160	32.478	3.686	4.449	4.905	5.268	5.580	5.861	6.118	6.358	6.585	6.800	7.006	7.205	7.397	7.582	7.763	7.939	8.111	8.280	8.445	8.607	8.766

Thermodynamic properties of R-1233zd - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-75	0.003	352.276	355.649	359.059	362.504	365.983	369.496	373.043	376.621	380.232	383.875	387.550	391.255	394.992	398.760	402.560	406.390	410.251	414.143	418.067	422.022	426.008
-70	0.005	355.636	359.046	362.492	365.972	369.486	373.033	376.612	380.223	383.867	387.542	391.248	394.985	398.753	402.553	406.383	410.245	414.138	418.062	422.017	426.003	430.021
-65	0.008	359.028	362.474	365.955	369.470	373.018	376.598	380.210	383.854	387.529	391.236	394.974	398.743	402.543	406.374	410.236	414.129	418.053	422.009	425.996	430.014	434.064
-60	0.013	362.449	365.931	369.447	372.996	376.577	380.190	383.835	387.512	391.219	394.958	398.728	402.528	406.360	410.223	414.116	418.041	421.997	425.985	430.004	434.054	438.136
-55	0.019	365.897	369.415	372.965	376.548	380.163	383.809	387.487	391.196	394.935	398.706	402.508	406.341	410.204	414.099	418.024	421.981	425.969	429.989	434.040	438.123	442.237
-50	0.028	369.370	372.922	376.507	380.124	383.772	387.452	391.162	394.904	398.676	402.479	406.313	410.178	414.074	418.001	421.959	425.948	429.968	434.020	438.104	442.219	446.366
-45	0.040	372.864	376.452	380.071	383.722	387.404	391.117	394.861	398.635	402.441	406.276	410.143	414.040	417.969	421.928	425.918	429.940	433.993	438.078	442.194	446.342	450.522
-40	0.056	376.378	380.001	383.655	387.341	391.057	394.804	398.581	402.388	406.227	410.096	413.995	417.925	421.887	425.879	429.902	433.957	438.043	442.161	446.310	450.491	454.704
-35	0.076	379.908	383.567	387.257	390.977	394.728	398.509	402.320	406.161	410.033	413.936	417.869	421.832	425.827	429.853	433.909	437.997	442.117	446.268	450.451	454.665	458.912
-30	0.103	383.452	387.148	390.874	394.630	398.415	402.231	406.077	409.953	413.859	417.795	421.762	425.760	429.788	433.848	437.938	442.060	446.213	450.398	454.615	458.863	463.144
-25	0.138	387.008	390.741	394.504	398.295	402.117	405.968	409.849	413.760	417.701	421.672	425.674	429.706	433.769	437.863	441.988	446.144	450.331	454.550	458.801	463.084	467.398
-20	0.181	390.573	394.344	398.144	401.973	405.831	409.718	413.635	417.582	421.559	425.565	429.602	433.669	437.767	441.896	446.056	450.247	454.469	458.723	463.008	467.325	471.674
-15	0.235	394.144	397.954	401.793	405.659	409.555	413.480	417.434	421.417	425.430	429.472	433.545	437.648	441.782	445.946	450.142	454.368	458.625	462.914	467.235	471.587	475.971
-10	0.301	397.719	401.569	405.447	409.353	413.287	417.250	421.242	425.262	429.312	433.392	437.502	441.641	445.811	450.012	454.243	458.505	462.798	467.123	471.479	475.866	480.285
-5	0.382	401.295	405.187	409.105	413.051	417.025	421.027	425.058	429.117	433.205	437.322	441.469	445.646	449.853	454.090	458.358	462.657	466.987	471.347	475.739	480.162	484.617
0	0.479	404.870	408.804	412.765	416.752	420.767	424.809	428.879	432.978	437.105	441.261	445.446	449.661	453.906	458.181	462.486	466.822	471.188	475.586	480.014	484.474	488.964
5	0.594	408.441	412.419	416.423	420.453	424.510	428.594	432.705	436.843	441.010	445.206	449.430	453.684	457.968	462.281	466.624	470.997	475.402	479.836	484.302	488.798	493.325
10	0.731	412.005	416.029	420.078	424.152	428.252	432.378	436.531	440.712	444.920	449.156	453.420	457.714	462.037	466.389	470.771	475.183	479.625	484.097	488.600	493.134	497.698
15	0.892	415.560	419.632	423.727	427.847	431.992	436.162	440.358	444.581	448.831	453.108	457.414	461.748	466.111	470.503	474.924	479.375	483.856	488.367	492.908	497.480	502.082
18.31	1.013	417.905	422.009	426.136	430.287	434.462	438.662	442.887	447.139	451.417	455.723	460.056	464.418	468.808	473.226	477.674	482.151	486.658	491.195	495.762	500.359	504.985
20	1.080	419.104	423.225	427.368	431.535	435.725	439.941	444.181	448.448	452.741	457.061	461.409	465.784	470.188	474.621	479.083	483.573	488.094	492.644	497.224	501.833	506.473
25	1.296	422.632	426.805	430.998	435.213	439.451	443.713	448.000	452.311	456.649	461.013	465.403	469.822	474.267	478.741	483.244	487.775	492.336	496.926	501.545	506.193	510.872
30	1.546	426.144	430.369	434.614	438.880	443.167	447.477	451.811	456.169	460.552	464.961	469.395	473.857	478.346	482.862	487.407	491.979	496.580	501.210	505.870	510.558	515.275
35	1.831	429.635	433.915	438.214	442.532	446.871	451.230	455.613	460.018	464.448	468.903	473.383	477.889	482.421	486.981	491.568	496.183	500.826	505.497	510.196	514.925	519.682
40	2.155	433.102	437.440	441.795	446.167	450.558	454.970	459.402	463.857	468.335	472.837	477.363	481.915	486.492	491.096	495.727	500.384	505.070	509.782	514.523	519.292	524.090
45	2.521	436.542	440.941	445.354	449.783	454.228	458.693	463.177	467.683	472.210	476.761	481.335	485.933	490.556	495.205	499.880	504.582	509.310	514.066	518.848	523.659	528.497
50	2.933	439.952	444.414	448.887	453.375	457.877	462.397	466.935	471.493	476.071	480.672	485.295	489.941	494.612	499.307	504.027	508.773	513.546	518.344	523.170	528.023	532.902
55	3.395	443.326	447.855	452.392	456.941	461.503	466.080	470.673	475.285	479.916	484.568	489.241	493.937	498.656	503.398	508.165	512.957	517.774	522.617	527.486	532.381	537.303
60	3.909	446.662	451.260	455.865	460.477	465.101	469.737	474.389	479.057	483.742	488.447	493.172	497.918	502.686	507.477	512.292	517.130	521.993	526.881	531.795	536.734	541.698
65	4.481	449.953	454.626	459.300	463.980	468.669	473.367	478.079	482.804	487.546	492.306	497.084	501.883	506.702	511.542	516.406	521.292	526.202	531.136	536.094	541.077	546.086
70	5.113	453.196	457.947	462.696	467.447	472.202	476.966	481.740	486.526	491.326	496.143	500.976	505.828	510.699	515.591	520.504	525.439	530.397	535.378	540.382	545.411	550.464
75	5.811	456.383	461.218	466.046	470.871	475.698	480.530	485.369	490.218	495.079	499.954	504.844	509.751	514.676	519.621	524.585	529.570	534.577	539.606	544.658	549.732	554.831
80	6.577	459.507	464.433	469.346	474.251	479.153	484.056	488.963	493.878	498.802	503.737	508.686	513.651	518.631	523.630	528.647	533.683	538.740	543.818	548.918	554.040	559.184
85	7.418	462.562	467.586	472.589	477.579	482.561	487.539	492.518	497.501	502.491	507.490	512.500	517.523	522.561	527.615	532.687	537.776	542.885	548.013	553.162	558.332	563.523
90	8.336	465.539	470.669	475.770	480.851	485.917	490.976	496.030	501.085	506.144	511.208	516.282	521.367	526.464	531.575	536.702	541.846	547.008	552.188	557.387	562.606	567.846
95	9.336	468.427	473.675	478.882	484.061	489.218	494.361	499.495	504.626	509.756	514.890	520.030	525.178	530.337	535.508	540.692	545.892	551.108	556.341	561.591	566.861	572.150
100	10.424	471.214	476.593	481.917	487.202	492.456	497.690	502.909	508.119	513.326	518.531	523.740	528.954	534.177	539.409	544.653	549.911	555.182	560.470	565.774	571.095	576.434
105	11.604	473.887	479.413	484.866	490.267	495.627	500.957	506.267	511.562	516.848	522.129	527.410	532.693	537.982	543.278	548.584	553.900	559.230	564.573	569.931	575.305	580.696
110	12.882	476.428	482.121	487.719	493.247	498.722	504.157	509.563	514.948	520.318	525.680	531.036	536.391	541.749	547.111	552.481	557.859	563.248	568.649	574.063	579.491	584.935
115	14.262	478.817	484.703	490.465	496.134	501.735	507.284	512.793	518.274	523.734	529.179	534.615	540.046	545.475	550.906	556.342	561.784	567.234	572.694	578.166	583.650	589.148
120	15.751	481.027	487.141	493.089	498.918	504.657	510.330	515.951	521.535	527.090	532.624	538.144	543.653	549.158	554.661	560.165	565.673	571.186	576.708	582.239	587.781	593.334
125	17.355	483.024	489.412	495.577	501.586	507.479	513.288	519.031	524.725	530.382	536.010	541.618	547.211	552.794	558.372	563.947	569.523	575.103	580.688	586.279	591.880	597.491
130	19.081	484.764	491.490	497.911	504.125	510.192	516.150	522.025	527.839	533.604	539.333	545.034	550.715	556.380	562.036	567.686	573.333	578.980	584.630	590.285	595.947	601.616
135	20.935	486.186	493.342	500.069	506.522	512.784	518.907	524.928	530.870	536.753	542.588	548.388	554.161	559.913	565.650	571.378	577.099	582.817	588.534	594.254	599.978	605.708
140	22.926	487.204	494.926	502.028	508.759	515.243	521.551	527.731	533.814	539.821	545.771	551.676	557.546	563.389	569.212	575.020	580.817	586.608	592.396	598.183	603.971	609.763
145	25.063	487.685	496.188	503.758	510.819	517.556	524.072	530.426	536.661	542.804	548.876	554.892	560.864	566.803	572.715	578.607	584.485	590.352	596.212	602.068	607.923	613.779
150	27.357	487.406	497.062	505.227	512.680	519.709	526.457	533.004	539.405	545.693	551.895	558.030	564.111	570.150	576.156	582.136	588.097	594.042	599.977	605.905	611.829	617.751
155	29.822	485.944	497.462	506.397	514.321	521.686	528.693	535.454	542.034	548.480	554.821	561.082	567.277	573.422	579.527	585.599	591.646	597.674	603.687	609.689	615.684	621.674
160	32.478	482.225	497.280	507.226	515.714	523.464	530.763	537.758	544.535	551.150	557.640	564.034	570.352	576.608	582.816	588.985	595.122	601.235	607.329	613.408	619.477	625.538

Thermodynamic properties of R-1233zd - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-75	0.003	1.839	1.856	1.872	1.889	1.905	1.921	1.936	1.952	1.967	1.982	1.997	2.012	2.027	2.041	2.056	2.070	2.084	2.098	2.111	2.125	2.138
-70	0.005	1.826	1.842	1.858	1.875	1.891	1.906	1.922	1.937	1.952	1.967	1.982	1.997	2.011	2.025	2.040	2.054	2.067	2.081	2.095	2.108	2.122
-65	0.008	1.814	1.830	1.846	1.862	1.878	1.893	1.909	1.924	1.939	1.954	1.968	1.983	1.997	2.011	2.025	2.039	2.053	2.066	2.080	2.093	2.106
-60	0.013	1.803	1.819	1.835	1.851	1.867	1.882	1.897	1.912	1.927	1.941	1.956	1.970	1.984	1.998	2.012	2.026	2.040	2.053	2.066	2.080	2.093
-55	0.019	1.794	1.810	1.826	1.841	1.857	1.872	1.887	1.901	1.916	1.931	1.945	1.959	1.973	1.987	2.001	2.014	2.028	2.041	2.054	2.067	2.081
-50	0.028	1.786	1.802	1.817	1.833	1.848	1.863	1.877	1.892	1.907	1.921	1.935	1.949	1.963	1.977	1.990	2.004	2.017	2.030	2.044	2.057	2.070
-45	0.040	1.779	1.794	1.810	1.825	1.840	1.855	1.869	1.884	1.898	1.912	1.926	1.940	1.954	1.968	1.981	1.995	2.008	2.021	2.034	2.047	2.060
-40	0.056	1.773	1.788	1.803	1.818	1.833	1.848	1.862	1.877	1.891	1.905	1.919	1.933	1.946	1.960	1.973	1.986	1.999	2.013	2.025	2.038	2.051
-35	0.076	1.768	1.783	1.798	1.813	1.827	1.842	1.856	1.870	1.884	1.898	1.912	1.926	1.939	1.953	1.966	1.979	1.992	2.005	2.018	2.031	2.043
-30	0.103	1.763	1.778	1.793	1.808	1.822	1.837	1.851	1.865	1.879	1.893	1.906	1.920	1.933	1.947	1.960	1.973	1.986	1.999	2.011	2.024	2.037
-25	0.138	1.760	1.774	1.789	1.804	1.818	1.832	1.846	1.860	1.874	1.888	1.901	1.915	1.928	1.941	1.954	1.967	1.980	1.993	2.006	2.018	2.031
-20	0.181	1.757	1.771	1.786	1.800	1.815	1.829	1.843	1.856	1.870	1.884	1.897	1.910	1.924	1.937	1.950	1.962	1.975	1.988	2.001	2.013	2.025
-15	0.235	1.754	1.769	1.783	1.797	1.812	1.826	1.839	1.853	1.867	1.880	1.893	1.907	1.920	1.933	1.946	1.958	1.971	1.984	1.996	2.009	2.021
-10	0.301	1.752	1.767	1.781	1.795	1.809	1.823	1.837	1.850	1.864	1.877	1.891	1.904	1.917	1.930	1.942	1.955	1.968	1.980	1.993	2.005	2.017
-5	0.382	1.751	1.765	1.780	1.794	1.807	1.821	1.835	1.848	1.862	1.875	1.888	1.901	1.914	1.927	1.940	1.952	1.965	1.977	1.990	2.002	2.014
0	0.479	1.750	1.764	1.778	1.792	1.806	1.820	1.833	1.847	1.860	1.873	1.886	1.899	1.912	1.925	1.937	1.950	1.962	1.975	1.987	1.999	2.011
5	0.594	1.750	1.764	1.778	1.792	1.805	1.819	1.832	1.846	1.859	1.872	1.885	1.898	1.911	1.923	1.936	1.948	1.961	1.973	1.985	1.997	2.009
10	0.731	1.749	1.764	1.777	1.791	1.805	1.818	1.832	1.845	1.858	1.871	1.884	1.897	1.910	1.922	1.935	1.947	1.959	1.972	1.984	1.996	2.008
15	0.892	1.750	1.764	1.778	1.791	1.805	1.818	1.832	1.845	1.858	1.871	1.884	1.896	1.909	1.921	1.934	1.946	1.958	1.971	1.983	1.995	2.007
18.31	1.013	1.750	1.764	1.778	1.791	1.805	1.818	1.832	1.845	1.858	1.871	1.883	1.896	1.909	1.921	1.934	1.946	1.958	1.970	1.982	1.994	2.006
20	1.080	1.750	1.764	1.778	1.792	1.805	1.818	1.832	1.845	1.858	1.871	1.883	1.896	1.909	1.921	1.933	1.946	1.958	1.970	1.982	1.994	2.006
25	1.296	1.751	1.765	1.779	1.792	1.806	1.819	1.832	1.845	1.858	1.871	1.884	1.896	1.909	1.921	1.933	1.946	1.958	1.970	1.982	1.994	2.006
30	1.546	1.752	1.766	1.780	1.793	1.807	1.820	1.833	1.846	1.859	1.871	1.884	1.897	1.909	1.921	1.934	1.946	1.958	1.970	1.982	1.994	2.006
35	1.831	1.753	1.767	1.781	1.794	1.808	1.821	1.834	1.847	1.860	1.872	1.885	1.897	1.910	1.922	1.934	1.946	1.959	1.970	1.982	1.994	2.006
40	2.155	1.755	1.769	1.782	1.796	1.809	1.822	1.835	1.848	1.861	1.873	1.886	1.898	1.911	1.923	1.935	1.947	1.959	1.971	1.983	1.995	2.006
45	2.521	1.757	1.770	1.784	1.797	1.811	1.824	1.837	1.849	1.862	1.875	1.887	1.900	1.912	1.924	1.936	1.948	1.960	1.972	1.984	1.996	2.007
50	2.933	1.758	1.772	1.786	1.799	1.812	1.825	1.838	1.851	1.864	1.876	1.889	1.901	1.913	1.926	1.938	1.950	1.962	1.973	1.985	1.997	2.009
55	3.395	1.760	1.774	1.788	1.801	1.814	1.827	1.840	1.853	1.866	1.878	1.891	1.903	1.915	1.927	1.939	1.951	1.963	1.975	1.987	1.998	2.010
60	3.909	1.762	1.776	1.790	1.803	1.816	1.829	1.842	1.855	1.868	1.880	1.892	1.905	1.917	1.929	1.941	1.953	1.965	1.977	1.988	2.000	2.011
65	4.481	1.765	1.778	1.792	1.805	1.818	1.831	1.844	1.857	1.870	1.882	1.895	1.907	1.919	1.931	1.943	1.955	1.967	1.978	1.990	2.002	2.013
70	5.113	1.767	1.780	1.794	1.807	1.821	1.834	1.846	1.859	1.872	1.884	1.897	1.909	1.921	1.933	1.945	1.957	1.969	1.980	1.992	2.004	2.015
75	5.811	1.769	1.783	1.796	1.810	1.823	1.836	1.849	1.862	1.874	1.887	1.899	1.911	1.923	1.935	1.947	1.959	1.971	1.983	1.994	2.006	2.017
80	6.577	1.771	1.785	1.799	1.812	1.825	1.838	1.851	1.864	1.877	1.889	1.901	1.914	1.926	1.938	1.950	1.962	1.973	1.985	1.997	2.008	2.019
85	7.418	1.773	1.787	1.801	1.814	1.828	1.841	1.854	1.866	1.879	1.892	1.904	1.916	1.928	1.940	1.952	1.964	1.976	1.987	1.999	2.010	2.022
90	8.336	1.776	1.790	1.803	1.817	1.830	1.843	1.856	1.869	1.882	1.894	1.906	1.919	1.931	1.943	1.955	1.967	1.978	1.990	2.001	2.013	2.024
95	9.336	1.778	1.792	1.806	1.819	1.833	1.846	1.859	1.872	1.884	1.897	1.909	1.921	1.933	1.945	1.957	1.969	1.981	1.992	2.004	2.015	2.027
100	10.424	1.780	1.794	1.808	1.822	1.835	1.848	1.861	1.874	1.887	1.899	1.912	1.924	1.936	1.948	1.960	1.972	1.984	1.995	2.007	2.018	2.029
105	11.604	1.781	1.796	1.810	1.824	1.837	1.851	1.864	1.877	1.889	1.902	1.914	1.927	1.939	1.951	1.963	1.975	1.986	1.998	2.009	2.021	2.032
110	12.882	1.783	1.798	1.812	1.826	1.840	1.853	1.866	1.879	1.892	1.905	1.917	1.929	1.942	1.954	1.966	1.977	1.989	2.001	2.012	2.024	2.035
115	14.262	1.785	1.800	1.814	1.828	1.842	1.856	1.869	1.882	1.895	1.907	1.920	1.932	1.944	1.956	1.968	1.980	1.992	2.003	2.015	2.026	2.038
120	15.751	1.786	1.801	1.816	1.830	1.844	1.858	1.871	1.884	1.897	1.910	1.923	1.935	1.947	1.959	1.971	1.983	1.995	2.006	2.018	2.029	2.041
125	17.355	1.786	1.802	1.818	1.832	1.846	1.860	1.874	1.887	1.900	1.913	1.925	1.938	1.950	1.962	1.974	1.986	1.998	2.009	2.021	2.032	2.043
130	19.081	1.787	1.803	1.819	1.834	1.848	1.862	1.876	1.889	1.902	1.915	1.928	1.940	1.953	1.965	1.977	1.989	2.000	2.012	2.024	2.035	2.046
135	20.935	1.786	1.804	1.820	1.835	1.850	1.864	1.878	1.892	1.905	1.918	1.930	1.943	1.955	1.968	1.980	1.992	2.003	2.015	2.026	2.038	2.049
140	22.926	1.785	1.804	1.821	1.837	1.852	1.866	1.880	1.894	1.907	1.920	1.933	1.946	1.958	1.970	1.982	1.994	2.006	2.018	2.029	2.041	2.052
145	25.063	1.783	1.803	1.821	1.838	1.853	1.868	1.882	1.896	1.909	1.923	1.936	1.948	1.961	1.973	1.985	1.997	2.009	2.021	2.032	2.044	2.055
150	27.357	1.779	1.802	1.821	1.838	1.854	1.869	1.884	1.898	1.912	1.925	1.938	1.951	1.963	1.976	1.988	2.000	2.012	2.023	2.035	2.047	2.058
155	29.822	1.773	1.800	1.820	1.838	1.855	1.871	1.885	1.900	1.913	1.927	1.940	1.953	1.966	1.978	1.990	2.002	2.014	2.026	2.038	2.049	2.061
160	32.478	1.762	1.797	1.819	1.838	1.855	1.871	1.887	1.901	1.915	1.929	1.942	1.955	1.968	1.981	1.993	2.005	2.017	2.029	2.040	2.052	2.063

R-1234yf (Solstice® yf)

2,3,3,3-tetrafluoroprop-1-ene (CH_2=$CFCF_3$)

Molecular weight (g/mol)	114.04
Melting point (°C)	-53.15
Boiling point (at 1.013 bar)	-29.49
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	94.7
Critical pressure (bar absolute)	33.82
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.392
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.905
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.099
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.154
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	6.17
Classification NF-EN 378	A2L
GWP (IPCC 4)	4

Main applications

Solstice® yf is a fluorinated gas from the HFO family. This product has a very low GWP figure and is suitable for automotive air conditioning applications.
It may also be suitable as a R-134a replacement in other applications.
R-1234yf is mildly flammable, so please ensure it is handled accordingly.

Commercial specifications

Purity: ≥ 99.5 % weight.
Water content: ≤ 20 ppm weight.
Chloride ion test: negative.
Acidity (HCl): ≤ 1 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.

Oils

Use a poly alkylene glycol (PAG) oil for automotive air conditioning applications. For all other applications use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-1234yf are governed by EU Regulation n° 517/2014.
The recovery of R-1234yf is mandatory under EU Regulation n° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-1234yf - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.374	-50	0.758	1.318	139.633	0.757	-50.0	0.425	2.355	329.850	1.610	190.217
0.486	-45	0.766	1.305	145.313	0.782	-45.0	0.333	3.007	333.209	1.606	187.896
0.624	-40	0.774	1.292	151.069	0.807	-40.0	0.264	3.795	336.577	1.603	185.509
0.790	-35	0.782	1.278	156.901	0.832	-35.0	0.211	4.737	339.950	1.601	183.049
0.991	-30	0.791	1.265	162.811	0.857	-30.0	0.171	5.855	343.323	1.599	180.512
1.013	-29.49	0.792	1.263	163.417	0.859	-29.49	0.167	5.980	343.666	1.599	180.249
1.229	-25	0.800	1.251	168.800	0.881	-25.0	0.139	7.171	346.691	1.598	177.891
1.509	-20	0.809	1.236	174.871	0.905	-20.0	0.115	8.709	350.050	1.597	175.179
1.837	-15	0.818	1.222	181.024	0.929	-15.0	0.095	10.496	353.395	1.597	172.371
2.218	-10	0.829	1.207	187.262	0.953	-10.0	0.080	12.559	356.721	1.597	169.459
2.656	-5	0.839	1.192	193.587	0.976	-5.0	0.067	14.931	360.022	1.597	166.435
3.158	0	0.850	1.176	200.000	1.000	0.0	0.057	17.647	363.291	1.598	163.291
3.729	5	0.862	1.160	206.504	1.023	5.0	0.048	20.744	366.521	1.599	160.017
4.375	10	0.874	1.144	213.103	1.047	10.0	0.041	24.267	369.704	1.600	156.601
5.103	15	0.887	1.127	219.799	1.070	15.0	0.035	28.266	372.831	1.601	153.031
5.917	20	0.901	1.110	226.597	1.093	20.0	0.030	32.796	375.889	1.602	149.293
6.826	25	0.916	1.092	233.500	1.116	25.0	0.026	37.925	378.867	1.604	145.368
7.835	30	0.932	1.073	240.513	1.139	30.0	0.023	43.729	381.751	1.605	141.238
8.952	35	0.949	1.054	247.644	1.162	35.0	0.020	50.301	384.524	1.606	136.880
10.184	40	0.967	1.034	254.902	1.185	40.0	0.017	57.753	387.169	1.608	132.267
11.538	45	0.988	1.013	262.298	1.208	45.0	0.015	66.223	389.663	1.608	127.365
13.023	50	1.010	0.990	269.851	1.231	50.0	0.013	75.884	391.980	1.609	122.129
14.647	55	1.034	0.967	277.583	1.254	55.0	0.011	86.961	394.084	1.610	116.501
16.419	60	1.062	0.941	285.526	1.278	60.0	0.010	99.754	395.930	1.609	110.404
18.348	65	1.094	0.914	293.720	1.302	65.0	0.009	114.676	397.455	1.609	103.735
20.445	70	1.132	0.883	302.221	1.326	70.0	0.008	132.332	398.569	1.607	96.348
22.723	75	1.178	0.849	311.114	1.351	75.0	0.007	153.671	399.131	1.604	88.017
25.194	80	1.236	0.809	320.544	1.377	80.0	0.006	180.333	398.903	1.599	78.359
27.879	85	1.315	0.760	330.814	1.405	85.0	0.005	215.673	397.405	1.591	66.591
30.803	90	1.441	0.694	342.791	1.437	90.0	0.004	269.099	393.323	1.576	50.532

Thermodynamic properties of R-1234yf - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-50	0.374	424.718	435.052	445.336	455.576	465.776	475.939	486.069	496.169	506.242	516.291	526.317	536.324	546.312	556.283	566.239	576.182	586.112	596.030	605.938	615.837	625.726
-45	0.486	332.591	340.641	348.645	356.607	364.532	372.422	380.283	388.115	395.923	403.708	411.473	419.219	426.948	434.662	442.361	450.048	457.724	465.389	473.044	480.690	488.328
-40	0.624	263.537	269.899	276.218	282.498	288.743	294.956	301.141	307.301	313.437	319.553	325.649	331.728	337.792	343.841	349.878	355.902	361.916	367.920	373.915	379.902	385.881
-35	0.790	211.097	216.194	221.250	226.270	231.257	236.215	241.146	246.053	250.939	255.806	260.655	265.488	270.306	275.111	279.905	284.687	289.459	294.223	298.977	303.724	308.464
-30	0.991	170.787	174.922	179.020	183.083	187.116	191.121	195.101	199.060	202.998	206.918	210.822	214.711	218.586	222.449	226.301	230.143	233.975	237.799	241.615	245.424	249.226
-29.49	1.013	167.228	171.280	175.293	179.273	183.222	187.143	191.040	194.916	198.771	202.608	206.429	210.235	214.028	217.809	221.578	225.338	229.088	232.829	236.563	240.290	244.010
-25	1.229	139.446	142.843	146.204	149.532	152.832	156.105	159.356	162.586	165.797	168.991	172.170	175.335	178.487	181.628	184.759	187.880	190.992	194.096	197.193	200.283	203.367
-20	1.509	114.820	117.642	120.430	123.187	125.917	128.623	131.307	133.971	136.618	139.249	141.865	144.469	147.061	149.642	152.213	154.775	157.329	159.875	162.415	164.948	167.475
-15	1.837	95.277	97.648	99.985	102.294	104.576	106.836	109.075	111.296	113.500	115.689	117.865	120.028	122.180	124.323	126.455	128.580	130.697	132.806	134.910	137.007	139.098
-10	2.218	79.623	81.635	83.615	85.568	87.496	89.402	91.288	93.157	95.011	96.850	98.677	100.491	102.296	104.091	105.877	107.655	109.426	111.190	112.948	114.700	116.447
-5	2.656	66.974	68.698	70.393	72.060	73.704	75.327	76.932	78.520	80.093	81.652	83.200	84.736	86.262	87.779	89.288	90.790	92.284	93.772	95.255	96.732	98.203
0	3.158	56.668	58.161	59.624	61.062	62.477	63.872	65.248	66.609	67.956	69.290	70.612	71.924	73.226	74.519	75.805	77.083	78.355	79.621	80.881	82.136	83.386
5	3.729	48.207	49.511	50.787	52.037	53.265	54.474	55.666	56.842	58.005	59.155	60.294	61.423	62.543	63.655	64.759	65.856	66.947	68.032	69.112	70.187	71.257
10	4.375	41.208	42.358	43.480	44.577	45.653	46.710	47.750	48.775	49.786	50.786	51.775	52.754	53.725	54.687	55.643	56.592	57.534	58.471	59.403	60.331	61.254
15	5.103	35.379	36.403	37.398	38.369	39.319	40.250	41.164	42.064	42.951	43.827	44.692	45.548	46.395	47.235	48.067	48.893	49.714	50.529	51.339	52.145	52.946
20	5.917	30.491	31.411	32.302	33.169	34.014	34.841	35.651	36.447	37.231	38.003	38.765	39.518	40.263	41.000	41.731	42.455	43.174	43.888	44.597	45.301	46.001
25	6.826	26.368	27.202	28.007	28.786	29.544	30.284	31.007	31.716	32.413	33.099	33.775	34.442	35.101	35.753	36.398	37.037	37.671	38.300	38.924	39.544	40.160
30	7.835	22.868	23.632	24.364	25.071	25.756	26.423	27.073	27.709	28.333	28.946	29.549	30.144	30.730	31.310	31.884	32.451	33.014	33.571	34.124	34.673	35.217
35	8.952	19.880	20.586	21.259	21.905	22.529	23.133	23.722	24.296	24.858	25.410	25.951	26.485	27.010	27.529	28.042	28.548	29.050	29.547	30.039	30.528	31.013
40	10.184	17.315	17.974	18.597	19.192	19.764	20.317	20.853	21.374	21.884	22.383	22.873	23.354	23.827	24.294	24.755	25.210	25.660	26.105	26.546	26.983	27.417
45	11.538	15.101	15.722	16.305	16.857	17.385	17.893	18.384	18.862	19.326	19.781	20.225	20.662	21.091	21.513	21.929	22.340	22.746	23.147	23.544	23.937	24.326
50	13.023	13.178	13.771	14.320	14.837	15.328	15.798	16.252	16.690	17.117	17.532	17.939	18.337	18.727	19.111	19.489	19.861	20.229	20.592	20.951	21.306	21.658
55	14.647	11.499	12.071	12.594	13.081	13.541	13.980	14.401	14.806	15.200	15.582	15.955	16.320	16.677	17.028	17.372	17.712	18.046	18.376	18.703	19.025	19.344
60	16.419	10.025	10.584	11.087	11.550	11.984	12.395	12.788	13.165	13.530	13.883	14.227	14.563	14.891	15.213	15.529	15.840	16.145	16.447	16.744	17.038	17.328
65	18.348	8.720	9.277	9.765	10.209	10.621	11.009	11.377	11.730	12.070	12.398	12.717	13.027	13.330	13.627	13.917	14.203	14.483	14.760	15.032	15.301	15.566
70	20.445	7.557	8.120	8.600	9.029	9.423	9.791	10.139	10.471	10.789	11.095	11.392	11.680	11.961	12.235	12.503	12.766	13.025	13.279	13.529	13.776	14.019
75	22.723	6.507	7.093	7.570	7.989	8.368	8.719	9.049	9.362	9.660	9.947	10.224	10.493	10.754	11.008	11.257	11.501	11.739	11.974	12.205	12.432	12.656
80	25.194	5.545	6.174	6.656	7.067	7.434	7.771	8.085	8.382	8.663	8.933	9.193	9.444	9.687	9.924	10.155	10.381	10.603	10.820	11.033	11.243	11.450
85	27.879	4.637	5.347	5.840	6.247	6.605	6.930	7.230	7.512	7.778	8.033	8.277	8.512	8.740	8.961	9.176	9.386	9.592	9.794	9.991	10.186	10.377
90	30.803	3.716	4.596	5.109	5.515	5.865	6.179	6.467	6.735	6.988	7.228	7.458	7.679	7.893	8.100	8.301	8.497	8.688	8.876	9.059	9.240	9.417

Thermodynamic properties of R-1234yf - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-50	0.374	329.850	333.608	337.417	341.278	345.190	349.152	353.165	357.228	361.342	365.504	369.716	373.977	378.286	382.644	387.049	391.502	396.002	400.549	405.142	409.780	414.465
-45	0.486	333.209	337.043	340.927	344.859	348.841	352.872	356.952	361.080	365.257	369.482	373.754	378.075	382.443	386.857	391.319	395.827	400.381	404.981	409.627	414.317	419.052
-40	0.624	336.577	340.490	344.449	348.455	352.509	356.609	360.756	364.951	369.192	373.479	377.813	382.194	386.621	391.093	395.611	400.175	404.784	409.437	414.135	418.877	423.662
-35	0.790	339.950	343.943	347.980	352.061	356.188	360.359	364.575	368.836	373.142	377.494	381.890	386.331	390.817	395.348	399.923	404.543	409.206	413.913	418.664	423.457	428.294
-30	0.991	343.323	347.398	351.515	355.674	359.875	364.118	368.404	372.733	377.106	381.521	385.981	390.483	395.029	399.618	404.251	408.927	413.645	418.406	423.210	428.056	432.943
-29.49	1.013	343.666	347.750	351.876	356.042	360.251	364.501	368.795	373.131	377.510	381.932	386.398	390.907	395.459	400.054	404.693	409.374	414.098	418.865	423.674	428.525	433.418
-25	1.229	346.691	350.852	355.051	359.289	363.566	367.883	372.240	376.638	381.078	385.559	390.082	394.646	399.253	403.901	408.592	413.324	418.098	422.914	427.771	432.669	437.607
-20	1.509	350.050	354.300	358.583	362.902	367.257	371.649	376.079	380.548	385.055	389.603	394.190	398.817	403.485	408.194	412.943	417.732	422.562	427.432	432.343	437.294	442.284
-15	1.837	353.395	357.736	362.107	366.509	370.944	375.413	379.917	384.457	389.034	393.649	398.302	402.993	407.723	412.492	417.300	422.147	427.034	431.959	436.924	441.927	446.970
-10	2.218	356.721	361.157	365.617	370.105	374.622	379.169	383.749	388.363	393.011	397.694	402.414	407.170	411.963	416.793	421.661	426.566	431.510	436.491	441.510	446.567	451.662
-5	2.656	360.022	364.556	369.109	373.685	378.286	382.915	387.573	392.261	396.982	401.735	406.522	411.344	416.201	421.093	426.022	430.986	435.987	441.025	446.100	451.210	456.358
0	3.158	363.291	367.927	372.577	377.245	381.933	386.645	391.383	396.148	400.942	405.767	410.623	415.512	420.434	425.389	430.379	435.404	440.464	445.558	450.689	455.854	461.055
5	3.729	366.521	371.265	376.015	380.778	385.557	390.355	395.175	400.019	404.889	409.787	414.714	419.671	424.659	429.679	434.731	439.817	444.935	450.088	455.275	460.495	465.750
10	4.375	369.704	374.561	379.417	384.279	389.152	394.039	398.944	403.870	408.818	413.791	418.790	423.816	428.872	433.957	439.073	444.221	449.400	454.611	459.855	465.131	470.440
15	5.103	372.831	377.807	382.775	387.742	392.713	397.693	402.686	407.696	412.724	417.774	422.847	427.945	433.070	438.222	443.403	448.613	453.854	459.125	464.426	469.759	475.124
20	5.917	375.889	380.995	386.082	391.160	396.234	401.312	406.397	411.493	416.604	421.733	426.883	432.054	437.249	442.470	447.717	452.991	458.294	463.626	468.986	474.377	479.798
25	6.826	378.867	384.114	389.330	394.525	399.709	404.889	410.069	415.256	420.453	425.664	430.892	436.139	441.407	446.697	452.012	457.352	462.718	468.112	473.532	478.982	484.459
30	7.835	381.751	387.154	392.509	397.831	403.131	408.418	413.699	418.980	424.266	429.562	434.871	440.196	445.538	450.901	456.285	461.692	467.123	472.580	478.062	483.570	489.106
35	8.952	384.524	390.102	395.611	401.069	406.493	411.894	417.280	422.660	428.039	433.423	438.816	444.221	449.640	455.077	460.532	466.008	471.506	477.027	482.572	488.141	493.736
40	10.184	387.169	392.945	398.623	404.230	409.787	415.308	420.806	426.290	431.767	437.243	442.723	448.211	453.710	459.223	464.751	470.298	475.864	481.451	487.060	492.691	498.346
45	11.538	389.663	395.666	401.533	407.303	413.004	418.654	424.271	429.864	435.443	441.016	446.587	452.161	457.743	463.335	468.939	474.558	480.195	485.849	491.523	497.218	502.935
50	13.023	391.980	398.247	404.327	410.277	416.134	421.924	427.667	433.377	439.064	444.738	450.404	456.069	461.736	467.409	473.092	478.786	484.495	490.219	495.960	501.720	507.499
55	14.647	394.084	400.665	406.989	413.138	419.167	425.108	430.987	436.821	442.623	448.404	454.170	459.929	465.685	471.443	477.207	482.979	488.762	494.557	500.368	506.194	512.038
60	16.419	395.930	402.893	409.498	415.873	422.092	428.199	434.225	440.192	446.116	452.009	457.880	463.737	469.587	475.433	481.281	487.133	492.993	498.862	504.744	510.638	516.548
65	18.348	397.455	404.894	411.832	418.465	424.896	431.185	437.371	443.481	449.535	455.548	461.530	467.491	473.438	479.377	485.312	491.247	497.186	503.131	509.086	515.051	521.028
70	20.445	398.569	406.626	413.965	420.897	427.567	434.057	440.418	446.683	452.876	459.016	465.116	471.186	477.235	483.269	489.295	495.316	501.338	507.362	513.391	519.429	525.476
75	22.723	399.131	408.033	415.866	423.148	430.090	436.804	443.356	449.789	456.132	462.408	468.632	474.817	480.972	487.107	493.228	499.339	505.445	511.550	517.658	523.770	529.889
80	25.194	398.903	409.042	417.498	425.194	432.448	439.414	446.176	452.791	459.296	465.716	472.072	478.378	484.646	490.886	497.105	503.310	509.504	515.694	521.881	528.070	534.263
85	27.879	397.405	409.555	418.815	427.008	434.621	441.868	448.864	455.678	462.356	468.931	475.427	481.862	488.248	494.599	500.921	507.222	513.509	519.786	526.056	532.325	538.594
90	30.803	393.323	409.438	419.758	428.550	436.578	444.143	451.396	458.427	465.294	472.036	478.682	485.253	491.765	498.231	504.662	511.065	517.448	523.815	530.172	536.523	542.871

Thermodynamic properties of R-1234yf - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-50	0.374	1.610	1.626	1.643	1.659	1.676	1.692	1.708	1.724	1.739	1.755	1.771	1.786	1.801	1.817	1.832	1.847	1.862	1.877	1.892	1.906	1.921
-45	0.486	1.606	1.623	1.639	1.655	1.672	1.688	1.704	1.720	1.735	1.751	1.766	1.782	1.797	1.812	1.827	1.842	1.857	1.872	1.887	1.901	1.916
-40	0.624	1.603	1.620	1.636	1.652	1.669	1.685	1.701	1.716	1.732	1.748	1.763	1.778	1.794	1.809	1.824	1.839	1.853	1.868	1.883	1.897	1.912
-35	0.790	1.601	1.617	1.634	1.650	1.666	1.682	1.698	1.714	1.729	1.745	1.760	1.776	1.791	1.806	1.821	1.836	1.850	1.865	1.880	1.894	1.909
-30	0.991	1.599	1.616	1.632	1.648	1.664	1.680	1.696	1.712	1.727	1.743	1.758	1.773	1.789	1.804	1.819	1.833	1.848	1.863	1.877	1.892	1.906
-29.49	1.013	1.599	1.615	1.632	1.648	1.664	1.680	1.696	1.712	1.727	1.743	1.758	1.773	1.788	1.803	1.818	1.833	1.848	1.862	1.877	1.891	1.906
-25	1.229	1.598	1.614	1.631	1.647	1.663	1.679	1.695	1.711	1.726	1.742	1.757	1.772	1.787	1.802	1.817	1.832	1.846	1.861	1.875	1.890	1.904
-20	1.509	1.597	1.614	1.630	1.646	1.662	1.678	1.694	1.710	1.725	1.741	1.756	1.771	1.786	1.801	1.816	1.831	1.845	1.860	1.874	1.888	1.903
-15	1.837	1.597	1.613	1.630	1.646	1.662	1.678	1.694	1.709	1.725	1.740	1.756	1.771	1.786	1.800	1.815	1.830	1.844	1.859	1.873	1.888	1.902
-10	2.218	1.597	1.613	1.630	1.646	1.662	1.678	1.694	1.710	1.725	1.740	1.756	1.771	1.786	1.800	1.815	1.830	1.844	1.859	1.873	1.887	1.901
-5	2.656	1.597	1.614	1.630	1.647	1.663	1.679	1.695	1.710	1.726	1.741	1.756	1.771	1.786	1.801	1.815	1.830	1.844	1.859	1.873	1.887	1.901
0	3.158	1.598	1.615	1.631	1.648	1.664	1.680	1.695	1.711	1.726	1.742	1.757	1.772	1.787	1.801	1.816	1.831	1.845	1.859	1.874	1.888	1.902
5	3.729	1.599	1.616	1.632	1.649	1.665	1.681	1.697	1.712	1.728	1.743	1.758	1.773	1.788	1.803	1.817	1.832	1.846	1.860	1.875	1.889	1.903
10	4.375	1.600	1.617	1.634	1.650	1.666	1.682	1.698	1.714	1.729	1.744	1.759	1.774	1.789	1.804	1.818	1.833	1.847	1.862	1.876	1.890	1.904
15	5.103	1.601	1.618	1.635	1.651	1.668	1.684	1.700	1.715	1.731	1.746	1.761	1.776	1.791	1.806	1.820	1.835	1.849	1.863	1.877	1.891	1.905
20	5.917	1.602	1.620	1.637	1.653	1.669	1.686	1.701	1.717	1.733	1.748	1.763	1.778	1.793	1.807	1.822	1.836	1.851	1.865	1.879	1.893	1.907
25	6.826	1.604	1.621	1.638	1.655	1.671	1.688	1.703	1.719	1.735	1.750	1.765	1.780	1.795	1.809	1.824	1.838	1.853	1.867	1.881	1.895	1.909
30	7.835	1.605	1.623	1.640	1.657	1.673	1.690	1.706	1.721	1.737	1.752	1.767	1.782	1.797	1.812	1.826	1.841	1.855	1.869	1.883	1.897	1.911
35	8.952	1.606	1.624	1.642	1.659	1.675	1.692	1.708	1.724	1.739	1.755	1.770	1.785	1.800	1.814	1.829	1.843	1.857	1.871	1.885	1.899	1.913
40	10.184	1.608	1.626	1.644	1.661	1.678	1.694	1.710	1.726	1.742	1.757	1.772	1.787	1.802	1.817	1.831	1.846	1.860	1.874	1.888	1.902	1.916
45	11.538	1.608	1.627	1.645	1.663	1.680	1.696	1.712	1.728	1.744	1.760	1.775	1.790	1.805	1.819	1.834	1.848	1.863	1.877	1.891	1.905	1.918
50	13.023	1.609	1.628	1.647	1.665	1.682	1.698	1.715	1.731	1.747	1.762	1.777	1.793	1.807	1.822	1.837	1.851	1.865	1.879	1.893	1.907	1.921
55	14.647	1.610	1.629	1.648	1.666	1.684	1.701	1.717	1.733	1.749	1.765	1.780	1.795	1.810	1.825	1.840	1.854	1.868	1.882	1.896	1.910	1.924
60	16.419	1.609	1.630	1.649	1.668	1.686	1.703	1.720	1.736	1.752	1.768	1.783	1.798	1.813	1.828	1.842	1.857	1.871	1.885	1.899	1.913	1.927
65	18.348	1.609	1.630	1.650	1.669	1.687	1.705	1.722	1.738	1.754	1.770	1.786	1.801	1.816	1.831	1.845	1.860	1.874	1.888	1.902	1.916	1.930
70	20.445	1.607	1.630	1.651	1.671	1.689	1.707	1.724	1.741	1.757	1.773	1.788	1.804	1.819	1.834	1.848	1.863	1.877	1.891	1.905	1.919	1.933
75	22.723	1.604	1.629	1.651	1.671	1.690	1.708	1.726	1.743	1.759	1.775	1.791	1.807	1.822	1.837	1.851	1.866	1.880	1.894	1.908	1.922	1.936
80	25.194	1.599	1.627	1.651	1.672	1.691	1.710	1.728	1.745	1.762	1.778	1.794	1.809	1.825	1.840	1.854	1.869	1.883	1.897	1.912	1.925	1.939
85	27.879	1.591	1.625	1.650	1.672	1.692	1.711	1.729	1.747	1.764	1.780	1.796	1.812	1.827	1.842	1.857	1.872	1.886	1.900	1.915	1.928	1.942
90	30.803	1.576	1.620	1.648	1.672	1.693	1.712	1.731	1.749	1.766	1.782	1.799	1.814	1.830	1.845	1.860	1.875	1.889	1.903	1.918	1.931	1.945

R-1234ze (Solstice® ze)

Trans-1,3,3,3-tetrafluoroprop-1-ene (CF_3 -CH=CHF)

Molecular weight (g/mol)	114.04
Melting point (°C)	-104.53
Boiling point (at 1.013 bar)	-18.98
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	109.4
Critical pressure (bar absolute)	36.35
Specific heat (liquid) at + 25°C (kJ/kg.K)	1.386
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.889
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.101
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.199
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	8.85
Classification NF-EN 378	A2L
GWP (IPCC 4)	7

Main applications

Solstice® ze is a fluorinated gas from the HFO family. This product has a very low GWP figure and is suitable for air conditioning applications. It can be used for chillers and heat pumps.

Commercial specifications

Purity: ≥ 99.5 % weight.
Water content: ≤ 10 ppm weight.
Non-condensables (gas phase): ≤ 1.5 % volume.
Chloride ion test: negative.
Acidity (HCl): ≤ 1 ppm weight.

Oils

Use a polyol ester (POE) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

The use and implementation of R-1234ze are governed by EU Regulation n° 517/2014.
The recovery of R-1234ze is mandatory under EU Regulation n° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-1234ze - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.010	-90	0.678	1.476	87.169	0.501	-90.0	13.092	0.076	321.201	1.779	234.032
0.016	-85	0.683	1.463	93.255	0.534	-85.0	8.454	0.118	324.516	1.763	231.261
0.025	-80	0.689	1.451	99.348	0.566	-80.0	5.614	0.178	327.879	1.749	228.531
0.038	-75	0.695	1.438	105.450	0.597	-75.0	3.825	0.261	331.287	1.737	225.836
0.055	-70	0.701	1.426	111.564	0.627	-70.0	2.668	0.375	334.733	1.726	223.169
0.079	-65	0.708	1.413	117.694	0.657	-65.0	1.900	0.526	338.213	1.717	220.519
0.112	-60	0.714	1.401	123.841	0.686	-60.0	1.381	0.724	341.722	1.708	217.881
0.154	-55	0.720	1.388	130.009	0.715	-55.0	1.021	0.979	345.254	1.702	215.246
0.209	-50	0.727	1.375	136.200	0.743	-50.0	0.768	1.303	348.805	1.696	212.605
0.279	-45	0.734	1.362	142.418	0.770	-45.0	0.586	1.707	352.369	1.691	209.951
0.367	-40	0.741	1.350	148.664	0.797	-40.0	0.453	2.206	355.941	1.687	207.277
0.477	-35	0.748	1.336	154.942	0.824	-35.0	0.355	2.814	359.515	1.683	204.573
0.611	-30	0.756	1.323	161.253	0.850	-30.0	0.282	3.549	363.086	1.680	201.833
0.774	-25	0.763	1.310	167.602	0.876	-25.0	0.226	4.428	366.651	1.678	199.048
0.969	-20	0.771	1.296	173.991	0.901	-20.0	0.183	5.470	370.202	1.677	196.211
1.013	-18.98	0.773	1.294	175.301	0.907	-18.98	0.175	5.705	370.926	1.676	195.624
1.201	-15	0.780	1.283	180.422	0.927	-15.0	0.149	6.696	373.736	1.675	193.314
1.474	-10	0.788	1.269	186.898	0.951	-10.0	0.123	8.129	377.247	1.675	190.349
1.794	-5	0.797	1.255	193.423	0.976	-5.0	0.102	9.793	380.730	1.674	187.307
2.166	0	0.806	1.240	200.000	1.000	0	0.085	11.714	384.180	1.674	184.180
2.593	5	0.816	1.225	206.632	1.024	5.0	0.072	13.923	387.591	1.675	180.959
3.084	10	0.826	1.210	213.323	1.048	10.0	0.061	16.450	390.957	1.675	177.634
3.642	15	0.837	1.195	220.078	1.071	15.0	0.052	19.332	394.271	1.676	174.193
4.273	20	0.848	1.179	226.902	1.094	20.0	0.044	22.607	397.528	1.676	170.626
4.985	25	0.860	1.163	233.799	1.118	25.0	0.038	26.321	400.719	1.677	166.919
5.783	30	0.872	1.146	240.778	1.141	30.0	0.033	30.523	403.835	1.678	163.057
6.674	35	0.886	1.129	247.843	1.163	35.0	0.028	35.272	406.867	1.679	159.024
7.665	40	0.900	1.112	255.003	1.186	40.0	0.025	40.636	409.803	1.680	154.800
8.761	45	0.915	1.093	262.266	1.209	45.0	0.021	46.693	412.629	1.681	150.363
9.972	50	0.931	1.074	269.642	1.231	50.0	0.019	53.538	415.328	1.682	145.686
11.304	55	0.949	1.054	277.143	1.254	55.0	0.016	61.286	417.881	1.683	140.739
12.766	60	0.969	1.033	284.783	1.277	60.0	0.014	70.078	420.265	1.683	135.482
14.365	65	0.990	1.010	292.579	1.300	65.0	0.012	80.093	422.449	1.684	129.870
16.110	70	1.014	0.986	300.556	1.322	70.0	0.011	91.563	424.399	1.683	123.843
18.011	75	1.041	0.961	308.744	1.346	75.0	0.010	104.797	426.065	1.683	117.321
20.077	80	1.072	0.933	317.186	1.369	80.0	0.008	120.226	427.382	1.681	110.196
22.321	85	1.109	0.902	325.946	1.393	85.0	0.007	138.484	428.252	1.679	102.307
24.755	90	1.153	0.867	335.123	1.418	90.0	0.006	160.570	428.523	1.675	93.401
27.395	95	1.209	0.827	344.889	1.444	95.0	0.005	188.222	427.933	1.669	83.045
30.260	100	1.287	0.777	355.594	1.471	100.0	0.004	225.006	425.953	1.660	70.358
33.378	105	1.412	0.708	368.232	1.504	105.0	0.004	281.016	421.116	1.644	52.884

Thermodynamic properties of R-1234ze - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-90	0.010	13092.016	13450.735	13809.396	14168.002	14526.558	14885.068	15243.533	15601.957	15960.344	16318.694	16677.011	17035.298	17393.555	17751.786	18109.991	18468.174	18826.335	19184.476	19542.598	19900.703	20258.792
-85	0.016	8454.191	8680.072	8905.899	9131.676	9357.405	9583.091	9808.735	10034.341	10259.912	10485.449	10710.955	10936.432	11161.882	11387.307	11612.709	11838.090	12063.450	12288.792	12514.117	12739.426	12964.720
-80	0.025	5614.443	5760.914	5907.333	6053.705	6200.034	6346.320	6492.569	6638.782	6784.961	6931.109	7077.228	7223.320	7369.387	7515.431	7661.454	7807.456	7953.440	8099.406	8245.357	8391.292	8537.214
-75	0.038	3825.063	3922.637	4020.164	4117.646	4215.086	4312.488	4409.854	4507.186	4604.488	4701.760	4799.005	4896.225	4993.421	5090.596	5187.751	5284.888	5382.007	5479.110	5576.198	5673.272	5770.334
-70	0.055	2667.501	2734.138	2800.731	2867.282	2933.794	3000.270	3066.712	3133.123	3199.505	3265.859	3332.188	3398.494	3464.778	3531.042	3597.288	3663.516	3729.727	3795.925	3862.108	3928.278	3994.437
-65	0.079	1900.362	1946.930	1993.455	2039.942	2086.392	2132.808	2179.193	2225.548	2271.876	2318.178	2364.457	2410.714	2456.951	2503.170	2549.370	2595.555	2641.725	2687.881	2734.024	2780.155	2826.275
-60	0.112	1380.541	1413.785	1446.989	1480.156	1513.289	1546.390	1579.461	1612.505	1645.523	1678.518	1711.491	1744.443	1777.376	1810.292	1843.192	1876.077	1908.947	1941.805	1974.651	2007.486	2040.310
-55	0.154	1021.018	1045.225	1069.394	1093.528	1117.631	1141.703	1165.747	1189.765	1213.760	1237.732	1261.684	1285.617	1309.532	1333.431	1357.315	1381.185	1405.042	1428.887	1452.721	1476.544	1500.358
-50	0.209	767.616	785.571	803.490	821.376	839.231	857.059	874.860	892.637	910.392	928.126	945.841	963.538	981.218	998.884	1016.535	1034.173	1051.799	1069.414	1087.018	1104.613	1122.199
-45	0.279	585.862	599.411	612.925	626.409	639.864	653.293	666.696	680.077	693.438	706.778	720.101	733.407	746.698	759.974	773.237	786.488	799.728	812.957	826.177	839.387	852.589
-40	0.367	453.371	463.761	474.119	484.447	494.748	505.024	515.277	525.509	535.721	545.915	556.091	566.253	576.400	586.533	596.654	606.764	616.863	626.952	637.032	647.104	657.168
-35	0.477	355.330	363.419	371.478	379.508	387.513	395.494	403.453	411.392	419.313	427.217	435.104	442.977	450.836	458.683	466.519	474.343	482.158	489.964	497.760	505.549	513.331
-30	0.611	281.764	288.152	294.510	300.842	307.150	313.435	319.700	325.945	332.173	338.385	344.582	350.765	356.936	363.095	369.243	375.380	381.509	387.629	393.740	399.845	405.942
-25	0.774	225.843	230.955	236.039	241.098	246.134	251.149	256.144	261.121	266.081	271.026	275.958	280.876	285.782	290.677	295.562	300.437	305.304	310.162	315.013	319.857	324.694
-20	0.969	182.818	186.961	191.078	195.170	199.241	203.291	207.323	211.337	215.336	219.320	223.292	227.250	231.198	235.135	239.062	242.980	246.891	250.793	254.688	258.577	262.459
-18.98	1.013	175.290	179.265	183.214	187.139	191.042	194.924	198.789	202.636	206.468	210.286	214.090	217.883	221.664	225.435	229.196	232.949	236.693	240.429	244.159	247.882	251.599
-15	1.201	149.341	152.740	156.113	159.462	162.791	166.100	169.392	172.667	175.928	179.174	182.408	185.631	188.842	192.044	195.237	198.421	201.597	204.766	207.929	211.085	214.235
-10	1.474	123.018	125.838	128.632	131.405	134.157	136.891	139.607	142.309	144.995	147.669	150.331	152.982	155.623	158.254	160.876	163.491	166.098	168.698	171.292	173.880	176.462
-5	1.794	102.116	104.481	106.821	109.140	111.440	113.721	115.987	118.237	120.474	122.698	124.911	127.113	129.306	131.490	133.665	135.833	137.994	140.148	142.296	144.438	146.575
0	2.166	85.365	87.369	89.349	91.308	93.248	95.172	97.079	98.972	100.852	102.720	104.577	106.424	108.262	110.091	111.912	113.726	115.534	117.335	119.130	120.920	122.705
5	2.593	71.825	73.539	75.231	76.902	78.555	80.191	81.812	83.419	85.013	86.596	88.169	89.732	91.286	92.831	94.370	95.901	97.426	98.945	100.458	101.966	103.469
10	3.084	60.790	62.271	63.730	65.169	66.589	67.994	69.383	70.760	72.124	73.477	74.819	76.153	77.478	78.795	80.105	81.408	82.705	83.997	85.283	86.564	87.840
15	3.642	51.729	53.020	54.289	55.539	56.771	57.986	59.188	60.376	61.553	62.718	63.874	65.021	66.160	67.291	68.416	69.533	70.645	71.752	72.853	73.949	75.042
20	4.273	44.234	45.370	46.484	47.579	48.655	49.717	50.764	51.798	52.821	53.833	54.836	55.830	56.816	57.795	58.767	59.733	60.693	61.648	62.598	63.543	64.484
25	4.985	37.993	39.001	39.987	40.954	41.903	42.836	43.756	44.663	45.559	46.444	47.320	48.188	49.048	49.901	50.748	51.588	52.423	53.253	54.078	54.898	55.715
30	5.783	32.762	33.665	34.545	35.405	36.248	37.076	37.889	38.690	39.481	40.261	41.032	41.794	42.550	43.298	44.040	44.776	45.507	46.232	46.954	47.671	48.384
35	6.674	28.351	29.166	29.958	30.730	31.484	32.223	32.948	33.661	34.363	35.054	35.737	36.412	37.080	37.740	38.395	39.044	39.687	40.326	40.961	41.591	42.217
40	7.665	24.609	25.351	26.070	26.768	27.448	28.112	28.763	29.401	30.029	30.646	31.255	31.856	32.449	33.036	33.617	34.192	34.763	35.328	35.890	36.447	37.001
45	8.761	21.417	22.099	22.756	23.392	24.010	24.612	25.199	25.775	26.339	26.894	27.440	27.978	28.509	29.033	29.552	30.065	30.573	31.076	31.576	32.071	32.563
50	9.972	18.678	19.312	19.918	20.502	21.067	21.615	22.149	22.671	23.182	23.683	24.176	24.660	25.138	25.609	26.074	26.534	26.990	27.440	27.887	28.330	28.769
55	11.304	16.317	16.910	17.474	18.014	18.535	19.038	19.527	20.003	20.468	20.923	21.370	21.809	22.241	22.666	23.086	23.501	23.911	24.316	24.718	25.115	25.510
60	12.766	14.270	14.831	15.361	15.864	16.346	16.811	17.261	17.698	18.124	18.540	18.947	19.347	19.739	20.126	20.506	20.882	21.253	21.619	21.982	22.341	22.696
65	14.365	12.485	13.023	13.524	13.997	14.447	14.879	15.296	15.699	16.091	16.473	16.846	17.212	17.570	17.923	18.270	18.611	18.948	19.281	19.610	19.935	20.257
70	16.110	10.921	11.442	11.921	12.369	12.792	13.196	13.584	13.959	14.321	14.674	15.017	15.353	15.682	16.005	16.322	16.634	16.942	17.245	17.545	17.841	18.134
75	18.011	9.542	10.054	10.516	10.944	11.344	11.725	12.088	12.437	12.774	13.101	13.419	13.729	14.032	14.329	14.620	14.907	15.188	15.466	15.740	16.011	16.278
80	20.077	8.318	8.829	9.280	9.691	10.073	10.433	10.775	11.102	11.417	11.721	12.016	12.304	12.584	12.858	13.127	13.391	13.650	13.905	14.156	14.405	14.650
85	22.321	7.221	7.741	8.187	8.586	8.952	9.295	9.618	9.926	10.222	10.506	10.782	11.049	11.309	11.563	11.812	12.056	12.295	12.530	12.762	12.990	13.215
90	24.755	6.228	6.771	7.217	7.607	7.961	8.289	8.597	8.888	9.166	9.433	9.691	9.940	10.183	10.419	10.650	10.876	11.097	11.315	11.529	11.739	11.947
95	27.395	5.313	5.901	6.352	6.738	7.082	7.397	7.691	7.967	8.230	8.481	8.723	8.957	9.183	9.404	9.618	9.828	10.034	10.236	10.434	10.629	10.821
100	30.260	4.444	5.114	5.579	5.963	6.299	6.603	6.884	7.147	7.396	7.634	7.861	8.081	8.293	8.499	8.699	8.895	9.086	9.274	9.458	9.639	9.817
105	33.378	3.559	4.400	4.885	5.269	5.598	5.893	6.163	6.414	6.650	6.875	7.089	7.296	7.495	7.688	7.875	8.058	8.236	8.411	8.582	8.750	8.915

Thermodynamic properties of R-1234ze - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
-90	0.010	321.201	324.544	327.946	331.404	334.917	338.483	342.100	345.767	349.483	353.246	357.056	360.911	364.810	368.753	372.739	376.767	380.836	384.947	389.098	393.290	397.522	
-85	0.016	324.516	327.919	331.378	334.892	338.459	342.078	345.746	349.463	353.227	357.038	360.893	364.793	368.737	372.723	376.752	380.822	384.934	389.086	393.278	397.510	401.782	
-80	0.025	327.879	331.341	334.856	338.425	342.045	345.715	349.433	353.199	357.011	360.867	364.769	368.713	372.701	376.731	380.802	384.914	389.067	393.260	397.493	401.766	406.078	
-75	0.038	331.287	334.805	338.376	341.998	345.670	349.391	353.158	356.972	360.831	364.734	368.680	372.669	376.700	380.773	384.886	389.040	393.235	397.469	401.743	406.056	410.408	
-70	0.055	334.733	338.307	341.933	345.608	349.331	353.101	356.918	360.779	364.684	368.633	372.624	376.657	380.732	384.847	389.003	393.199	397.435	401.710	406.024	410.378	414.770	
-65	0.079	338.213	341.843	345.522	349.249	353.024	356.844	360.708	364.617	368.569	372.563	376.599	380.676	384.794	388.952	393.150	397.388	401.665	405.981	410.336	414.730	419.163	
-60	0.112	341.722	345.407	349.140	352.919	356.744	360.613	364.526	368.482	372.480	376.520	380.601	384.722	388.883	393.084	397.325	401.605	405.924	410.281	414.677	419.112	423.584	
-55	0.154	345.254	348.994	352.781	356.612	360.488	364.406	368.368	372.371	376.416	380.501	384.627	388.793	392.998	397.242	401.525	405.848	410.208	414.607	419.044	423.520	428.033	
-50	0.209	348.805	352.600	356.440	360.324	364.251	368.219	372.230	376.281	380.372	384.504	388.675	392.885	397.134	401.422	405.749	410.114	414.516	418.957	423.436	427.953	432.507	
-45	0.279	352.369	356.220	360.114	364.051	368.029	372.048	376.108	380.207	384.346	388.524	392.741	396.997	401.291	405.623	409.993	414.400	418.846	423.329	427.850	432.408	437.003	
-40	0.367	355.941	359.848	363.798	367.788	371.819	375.889	379.999	384.147	388.334	392.560	396.823	401.124	405.463	409.840	414.254	418.705	423.194	427.720	432.283	436.883	441.521	
-35	0.477	359.515	363.481	367.486	371.531	375.615	379.738	383.898	388.097	392.333	396.606	400.917	405.265	409.650	414.072	418.530	423.026	427.559	432.128	436.734	441.377	446.056	
-30	0.611	363.086	367.112	371.175	375.276	379.415	383.590	387.803	392.052	396.338	400.661	405.020	409.415	413.847	418.315	422.819	427.360	431.937	436.550	441.200	445.886	450.608	
-25	0.774	366.651	370.737	374.859	379.018	383.213	387.443	391.709	396.011	400.348	404.720	409.129	413.572	418.052	422.567	427.118	431.704	436.326	440.984	445.678	450.407	455.173	
-20	0.969	370.202	374.352	378.535	382.754	387.006	391.292	395.613	399.968	404.358	408.782	413.240	417.734	422.262	426.825	431.423	436.056	440.724	445.427	450.166	454.940	459.749	
-18.98	1.013	370.926	375.089	379.285	383.516	387.780	392.078	396.410	400.777	405.177	409.612	414.081	418.584	423.122	427.695	432.303	436.946	441.623	446.336	451.084	455.867	460.686	
-15	1.201	373.736	377.951	382.198	386.478	390.790	395.134	399.511	403.921	408.365	412.841	417.352	421.896	426.474	431.086	435.732	440.412	445.127	449.877	454.661	459.480	464.334	
-10	1.474	377.247	381.531	385.844	390.187	394.560	398.965	403.400	407.867	412.366	416.897	421.460	426.056	430.685	435.347	440.042	444.771	449.534	454.331	459.162	464.027	468.926	
-5	1.794	380.730	385.085	389.467	393.876	398.314	402.780	407.276	411.801	416.357	420.944	425.561	430.211	434.892	439.605	444.351	449.130	453.941	458.786	463.665	468.576	473.522	
0	2.166	384.180	388.610	393.064	397.542	402.046	406.577	411.135	415.721	420.336	424.980	429.654	434.358	439.093	443.858	448.656	453.485	458.347	463.241	468.167	473.127	478.119	
5	2.593	387.591	392.100	396.629	401.180	405.753	410.351	414.974	419.623	424.298	429.002	433.733	438.494	443.284	448.104	452.954	457.835	462.748	467.692	472.668	477.676	482.716	
10	3.084	390.957	395.549	400.158	404.784	409.431	414.098	418.788	423.502	428.241	433.006	437.797	442.616	447.462	452.338	457.243	462.177	467.142	472.137	477.163	482.221	487.310	
15	3.642	394.271	398.953	403.645	408.351	413.074	417.815	422.575	427.357	432.161	436.989	441.842	446.721	451.626	456.558	461.519	466.508	471.526	476.574	481.651	486.759	491.898	
20	4.273	397.528	402.304	407.085	411.876	416.679	421.496	426.330	431.182	436.055	440.948	445.865	450.806	455.771	460.763	465.780	470.825	475.898	481.000	486.130	491.289	496.478	
25	4.985	400.719	405.596	410.472	415.352	420.240	425.138	430.048	434.975	439.918	444.880	449.863	454.868	459.896	464.947	470.024	475.127	480.256	485.412	490.596	495.808	501.049	
30	5.783	403.835	408.821	413.800	418.775	423.752	428.735	433.727	438.730	443.748	448.781	453.833	458.904	463.996	469.110	474.248	479.410	484.596	489.809	495.048	500.314	505.608	
35	6.674	406.867	411.972	417.060	422.137	427.210	432.283	437.360	442.445	447.540	452.648	457.771	462.911	468.070	473.248	478.449	483.671	488.917	494.188	499.483	504.804	510.152	
40	7.665	409.803	415.038	420.245	425.433	430.608	435.777	440.944	446.114	451.291	456.477	461.674	466.886	472.113	477.359	482.624	487.909	493.216	498.546	503.899	509.277	514.680	
45	8.761	412.629	418.009	423.346	428.653	433.939	439.210	444.474	449.735	454.997	460.264	465.539	470.825	476.124	481.439	486.771	492.121	497.491	502.881	508.294	513.730	519.189	
50	9.972	415.328	420.871	426.354	431.792	437.197	442.578	447.944	453.300	458.653	464.005	469.362	474.726	480.100	485.486	490.887	496.304	501.738	507.192	512.665	518.160	523.677	
55	11.304	417.881	423.611	429.257	434.839	440.374	445.874	451.349	456.807	462.255	467.697	473.139	478.584	484.036	489.497	494.969	500.455	505.956	511.475	517.011	522.567	528.143	
60	12.766	420.265	426.212	432.042	437.785	443.463	449.091	454.683	460.250	465.799	471.336	476.868	482.398	487.931	493.469	499.015	504.573	510.143	515.728	521.329	526.947	532.584	
65	14.365	422.449	428.654	434.696	440.619	446.453	452.221	457.941	463.623	469.280	474.918	480.544	486.163	491.780	497.399	503.023	508.654	514.296	519.949	525.616	531.299	536.999	
70	16.110	424.399	430.915	437.202	443.328	449.336	455.257	461.114	466.922	472.693	478.437	484.163	489.876	495.582	501.285	506.989	512.697	518.412	524.136	529.872	535.621	541.384	
75	18.011	426.065	432.966	439.541	445.897	452.100	458.190	464.196	470.139	476.033	481.891	487.722	493.533	499.332	505.123	510.910	516.698	522.489	528.287	534.093	539.909	545.739	
80	20.077	427.382	434.770	441.688	448.311	454.733	461.011	467.180	473.269	479.295	485.273	491.216	497.131	503.027	508.910	514.784	520.654	526.525	532.398	538.277	544.163	550.060	
85	22.321	428.252	436.280	443.616	450.551	457.223	463.709	470.058	476.305	482.473	488.580	494.641	500.666	506.664	512.642	518.607	524.564	530.516	536.467	542.421	548.380	554.346	
90	24.755	428.523	437.436	445.293	452.596	459.553	466.273	472.820	479.239	485.560	491.805	497.992	504.132	510.238	516.317	522.376	528.422	534.459	540.491	546.522	552.555	558.593	
95	27.395	427.933	438.158	446.678	454.421	461.708	468.690	475.457	482.064	488.549	494.942	501.261	507.524	513.743	519.927	526.085	532.224	538.349	544.465	550.577	556.686	562.798	
100	30.260	425.953	438.342	447.725	456.000	463.667	470.945	477.954	484.766	491.430	497.980	504.442	510.834	517.171	523.466	529.727	535.963	542.180	548.383	554.577	560.766	566.954	
105	33.378	421.116	437.853	448.378	457.294	465.402	473.014	480.291	487.327	494.184	500.904	507.517	514.046	520.510	526.921	533.290	539.627	545.940	552.234	558.514	564.785	571.051	

Thermodynamic properties of R-1234ze - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-90	0.010	1.779	1.797	1.815	1.832	1.850	1.867	1.884	1.901	1.918	1.935	1.951	1.968	1.984	2.000	2.016	2.032	2.047	2.063	2.078	2.093	2.108
-85	0.016	1.763	1.781	1.798	1.816	1.833	1.850	1.867	1.884	1.901	1.917	1.934	1.950	1.966	1.982	1.998	2.013	2.029	2.044	2.059	2.074	2.089
-80	0.025	1.749	1.767	1.784	1.801	1.819	1.836	1.852	1.869	1.886	1.902	1.918	1.934	1.950	1.966	1.982	1.997	2.012	2.028	2.043	2.058	2.072
-75	0.038	1.737	1.754	1.771	1.789	1.806	1.823	1.839	1.856	1.872	1.888	1.904	1.920	1.936	1.952	1.967	1.983	1.998	2.013	2.028	2.043	2.057
-70	0.055	1.726	1.743	1.760	1.777	1.794	1.811	1.828	1.844	1.860	1.876	1.892	1.908	1.924	1.939	1.954	1.970	1.985	2.000	2.015	2.029	2.044
-65	0.079	1.717	1.734	1.751	1.768	1.784	1.801	1.817	1.834	1.850	1.866	1.881	1.897	1.913	1.928	1.943	1.958	1.973	1.988	2.003	2.017	2.032
-60	0.112	1.708	1.726	1.742	1.759	1.776	1.792	1.808	1.825	1.841	1.856	1.872	1.887	1.903	1.918	1.933	1.948	1.963	1.978	1.992	2.007	2.021
-55	0.154	1.702	1.718	1.735	1.752	1.768	1.785	1.801	1.817	1.833	1.848	1.864	1.879	1.894	1.909	1.924	1.939	1.954	1.969	1.983	1.998	2.012
-50	0.209	1.696	1.712	1.729	1.746	1.762	1.778	1.794	1.810	1.826	1.841	1.857	1.872	1.887	1.902	1.917	1.932	1.946	1.961	1.975	1.990	2.004
-45	0.279	1.691	1.707	1.724	1.740	1.756	1.772	1.788	1.804	1.820	1.835	1.850	1.866	1.881	1.895	1.910	1.925	1.939	1.954	1.968	1.982	1.997
-40	0.367	1.687	1.703	1.719	1.736	1.752	1.768	1.784	1.799	1.815	1.830	1.845	1.860	1.875	1.890	1.905	1.919	1.934	1.948	1.962	1.976	1.990
-35	0.477	1.683	1.700	1.716	1.732	1.748	1.764	1.779	1.795	1.810	1.826	1.841	1.856	1.870	1.885	1.900	1.914	1.929	1.943	1.957	1.971	1.985
-30	0.611	1.680	1.697	1.713	1.729	1.745	1.761	1.776	1.792	1.807	1.822	1.837	1.852	1.867	1.881	1.896	1.910	1.924	1.939	1.953	1.967	1.980
-25	0.774	1.678	1.694	1.711	1.727	1.742	1.758	1.773	1.789	1.804	1.819	1.834	1.849	1.863	1.878	1.892	1.907	1.921	1.935	1.949	1.963	1.977
-20	0.969	1.677	1.693	1.709	1.725	1.740	1.756	1.771	1.787	1.802	1.817	1.832	1.846	1.861	1.875	1.890	1.904	1.918	1.932	1.946	1.960	1.973
-18.98	1.013	1.676	1.693	1.709	1.724	1.740	1.756	1.771	1.786	1.801	1.816	1.831	1.846	1.860	1.875	1.889	1.903	1.917	1.931	1.945	1.959	1.973
-15	1.201	1.675	1.692	1.708	1.723	1.739	1.755	1.770	1.785	1.800	1.815	1.830	1.844	1.859	1.873	1.887	1.902	1.916	1.930	1.943	1.957	1.971
-10	1.474	1.675	1.691	1.707	1.723	1.738	1.754	1.769	1.784	1.799	1.814	1.828	1.843	1.857	1.872	1.886	1.900	1.914	1.928	1.942	1.955	1.969
-5	1.794	1.674	1.690	1.706	1.722	1.738	1.753	1.768	1.783	1.798	1.813	1.827	1.842	1.856	1.871	1.885	1.899	1.913	1.927	1.940	1.954	1.967
0	2.166	1.674	1.690	1.706	1.722	1.737	1.753	1.768	1.783	1.798	1.812	1.827	1.841	1.856	1.870	1.884	1.898	1.912	1.926	1.939	1.953	1.966
5	2.593	1.675	1.691	1.706	1.722	1.738	1.753	1.768	1.783	1.798	1.812	1.827	1.841	1.856	1.870	1.884	1.898	1.912	1.925	1.939	1.952	1.966
10	3.084	1.675	1.691	1.707	1.723	1.738	1.753	1.768	1.783	1.798	1.813	1.827	1.842	1.856	1.870	1.884	1.898	1.912	1.925	1.939	1.952	1.966
15	3.642	1.676	1.692	1.708	1.723	1.739	1.754	1.769	1.784	1.799	1.813	1.828	1.842	1.856	1.870	1.884	1.898	1.912	1.925	1.939	1.952	1.966
20	4.273	1.676	1.693	1.709	1.724	1.740	1.755	1.770	1.785	1.800	1.814	1.829	1.843	1.857	1.871	1.885	1.899	1.913	1.926	1.940	1.953	1.966
25	4.985	1.677	1.694	1.710	1.725	1.741	1.756	1.771	1.786	1.801	1.815	1.830	1.844	1.858	1.872	1.886	1.900	1.913	1.927	1.940	1.954	1.967
30	5.783	1.678	1.695	1.711	1.726	1.742	1.757	1.772	1.787	1.802	1.817	1.831	1.845	1.859	1.873	1.887	1.901	1.915	1.928	1.942	1.955	1.968
35	6.674	1.679	1.696	1.712	1.728	1.743	1.759	1.774	1.789	1.804	1.818	1.833	1.847	1.861	1.875	1.889	1.902	1.916	1.930	1.943	1.956	1.969
40	7.665	1.680	1.697	1.713	1.729	1.745	1.760	1.775	1.790	1.805	1.820	1.834	1.848	1.863	1.876	1.890	1.904	1.918	1.931	1.944	1.958	1.971
45	8.761	1.681	1.698	1.715	1.731	1.746	1.762	1.777	1.792	1.807	1.822	1.836	1.850	1.864	1.878	1.892	1.906	1.919	1.933	1.946	1.959	1.973
50	9.972	1.682	1.699	1.716	1.732	1.748	1.764	1.779	1.794	1.809	1.823	1.838	1.852	1.866	1.880	1.894	1.908	1.921	1.935	1.948	1.961	1.974
55	11.304	1.683	1.700	1.717	1.734	1.750	1.765	1.781	1.796	1.811	1.825	1.840	1.854	1.868	1.882	1.896	1.910	1.923	1.937	1.950	1.963	1.976
60	12.766	1.683	1.701	1.718	1.735	1.751	1.767	1.782	1.798	1.813	1.827	1.842	1.856	1.870	1.884	1.898	1.912	1.926	1.939	1.952	1.965	1.979
65	14.365	1.684	1.702	1.719	1.736	1.753	1.769	1.784	1.800	1.815	1.829	1.844	1.858	1.873	1.887	1.901	1.914	1.928	1.941	1.955	1.968	1.981
70	16.110	1.683	1.702	1.720	1.737	1.754	1.770	1.786	1.802	1.817	1.832	1.846	1.861	1.875	1.889	1.903	1.917	1.930	1.944	1.957	1.970	1.983
75	18.011	1.683	1.702	1.721	1.738	1.755	1.772	1.788	1.803	1.819	1.834	1.848	1.863	1.877	1.891	1.905	1.919	1.933	1.946	1.959	1.973	1.986
80	20.077	1.681	1.702	1.721	1.739	1.757	1.773	1.789	1.805	1.821	1.836	1.851	1.865	1.880	1.894	1.908	1.921	1.935	1.949	1.962	1.975	1.988
85	22.321	1.679	1.701	1.721	1.740	1.757	1.774	1.791	1.807	1.823	1.838	1.853	1.867	1.882	1.896	1.910	1.924	1.938	1.951	1.964	1.978	1.991
90	24.755	1.675	1.699	1.720	1.740	1.758	1.776	1.792	1.809	1.824	1.840	1.855	1.870	1.884	1.898	1.912	1.926	1.940	1.954	1.967	1.980	1.993
95	27.395	1.669	1.697	1.719	1.740	1.759	1.777	1.794	1.810	1.826	1.842	1.857	1.872	1.886	1.901	1.915	1.929	1.943	1.956	1.970	1.983	1.996
100	30.260	1.660	1.693	1.718	1.739	1.759	1.777	1.795	1.811	1.828	1.843	1.859	1.874	1.889	1.903	1.917	1.931	1.945	1.959	1.972	1.985	1.998
105	33.378	1.644	1.688	1.715	1.738	1.758	1.777	1.795	1.813	1.829	1.845	1.861	1.876	1.891	1.905	1.919	1.933	1.947	1.961	1.974	1.988	2.001

R-290

Propane C_3H_8

Molecular weight (g/mol)	44.10
Melting point (°C)	-187.62
Boiling point (at 1.013 bar)	-42.12
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	96.7
Critical pressure (bar absolute)	42.51
Specific heat (liquid) at + 25°C (kJ/kg.K)	2.719
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	1.685
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.136
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.097
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	7.02
Classification NF-EN 378	A3
GWP (IPCC 4)	3

Main applications

Extremely pure propane (R-290) is a hydrocarbon (HC) which is used as refrigerant.

Commercial specifications

Propane: ≥ 99.5 % volume.
Isobutane: ≤ 0.44 % volume.
n-butane: ≤ 0.15 % volume.
Unsaturated C4: ≤ 0.01 % volume.
Smell: none.
Water content: ≤ 12 ppm weight.

Oils

Use a mineral oil (MN), alkylbenzene (AB) or polyalphaolefine (PAO).
Check with **Climalife** on the viscosity of the oils used for the purposes of your application and on the miscibility with the fluid under consideration.

Regulation

R-290 is classifed as an extremely flammable product (A3).
To be reported in accordance with the law of 14 february 2000 (ERP) which appeared in the O.J. on 21 March 2000.

Thermodynamic properties of R-290 - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.029	-100	1.553	0.644	-23.560	-0.008	-100.0	11.231	0.089	456.878	2.766	480.438
0.044	-95	1.566	0.639	-13.260	0.050	-95.0	7.642	0.131	462.708	2.722	475.967
0.064	-90	1.579	0.633	-2.897	0.108	-90.0	5.330	0.188	468.582	2.682	471.479
0.093	-85	1.592	0.628	7.530	0.164	-85.0	3.802	0.263	474.495	2.646	466.964
0.130	-80	1.606	0.623	18.028	0.219	-80.0	2.768	0.361	480.441	2.613	462.413
0.180	-75	1.620	0.617	28.600	0.273	-75.0	2.053	0.487	486.414	2.583	457.814
0.244	-70	1.634	0.612	39.251	0.326	-70.0	1.549	0.646	492.408	2.557	453.157
0.325	-65	1.649	0.607	49.986	0.378	-65.0	1.187	0.843	498.418	2.532	448.432
0.427	-60	1.664	0.601	60.811	0.429	-60.0	0.923	1.084	504.437	2.511	443.626
0.552	-55	1.679	0.596	71.731	0.480	-55.0	0.727	1.376	510.459	2.491	438.728
0.706	-50	1.695	0.590	82.753	0.530	-50.0	0.579	1.727	516.478	2.473	433.725
0.891	-45	1.712	0.584	93.881	0.579	-45.0	0.467	2.143	522.487	2.458	428.605
1.013	-42.12	1.721	0.581	100.344	0.607	-42.12	0.414	2.416	525.941	2.449	425.597
1.111	-40	1.729	0.578	105.123	0.628	-40.0	0.380	2.633	528.479	2.443	423.355
1.372	-35	1.746	0.573	116.486	0.676	-35.0	0.312	3.204	534.447	2.431	417.961
1.678	-30	1.765	0.567	127.975	0.723	-30.0	0.259	3.867	540.384	2.419	412.409
2.034	-25	1.784	0.561	139.598	0.770	-25.0	0.216	4.630	546.282	2.409	406.684
2.445	-20	1.804	0.554	151.363	0.817	-20.0	0.182	5.505	552.132	2.400	400.769
2.916	-15	1.824	0.548	163.277	0.863	-15.0	0.154	6.501	557.926	2.392	394.649
3.453	-10	1.846	0.542	175.348	0.909	-10.0	0.131	7.632	563.653	2.385	388.305
4.060	-5	1.868	0.535	187.586	0.955	-5.0	0.112	8.910	569.304	2.378	381.718
4.745	0	1.892	0.529	200.000	1.000	0.0	0.097	10.351	574.866	2.372	374.866
5.511	5	1.917	0.522	212.600	1.045	5.0	0.084	11.969	580.327	2.367	367.727
6.366	10	1.943	0.515	225.397	1.090	10.0	0.073	13.783	585.673	2.363	360.275
7.315	15	1.970	0.508	238.405	1.135	15.0	0.063	15.813	590.886	2.358	352.482
8.365	20	2.000	0.500	251.635	1.180	20.0	0.055	18.082	595.950	2.354	344.314
9.521	25	2.031	0.492	265.106	1.225	25.0	0.049	20.618	600.842	2.351	335.736
10.790	30	2.064	0.484	278.833	1.269	30.0	0.043	23.451	605.537	2.347	326.704
12.179	35	2.100	0.476	292.839	1.314	35.0	0.038	26.618	610.007	2.344	317.167
13.694	40	2.139	0.467	307.148	1.359	40.0	0.033	30.165	614.214	2.340	307.066
15.343	45	2.181	0.458	321.790	1.405	45.0	0.029	34.146	618.117	2.336	296.327
17.133	50	2.228	0.449	336.801	1.450	50.0	0.026	38.630	621.660	2.332	284.859
19.072	55	2.279	0.439	352.229	1.496	55.0	0.023	43.706	624.773	2.327	272.544
21.168	60	2.337	0.428	368.136	1.543	60.0	0.020	49.493	627.361	2.321	259.225
23.430	65	2.402	0.416	384.604	1.590	65.0	0.018	56.152	629.290	2.314	244.686
25.868	70	2.478	0.404	401.752	1.639	70.0	0.016	63.916	630.372	2.305	228.620
28.493	75	2.568	0.389	419.761	1.689	75.0	0.014	73.140	630.332	2.294	210.571
31.319	80	2.679	0.373	438.927	1.742	80.0	0.012	84.406	628.730	2.279	189.802
34.361	85	2.825	0.354	459.806	1.798	85.0	0.010	98.818	624.750	2.259	164.944
37.641	90	3.041	0.329	483.708	1.862	90.0	0.008	118.995	616.474	2.227	132.766
41.195	95	3.490	0.287	516.329	1.948	95.0	0.006	156.309	595.810	2.164	79.481

Thermodynamic properties of R-290 - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.029	11230.994	11557.969	11884.799	12211.496	12538.072	12864.537	13190.901	13517.170	13843.355	14169.463	14495.499	14821.472	15147.387	15473.248	15799.062	16124.832	16450.563	16776.257	17101.918	17427.550	17753.153
-95	0.044	7642.249	7859.186	8075.990	8292.672	8509.242	8725.709	8942.083	9158.372	9374.582	9590.722	9806.798	10022.815	10238.779	10454.696	10670.568	10886.401	11102.197	11317.961	11533.694	11749.399	11965.079
-90	0.064	5330.039	5477.805	5625.448	5772.978	5920.405	6067.738	6214.984	6362.153	6509.250	6656.283	6803.258	6950.179	7097.052	7243.881	7390.670	7537.422	7684.142	7830.831	7977.492	8124.128	8270.740
-85	0.093	3801.734	3904.845	4007.842	4110.735	4213.534	4316.245	4418.878	4521.439	4623.935	4726.372	4828.755	4931.090	5033.381	5135.632	5237.847	5340.028	5442.178	5544.301	5646.398	5748.471	5850.523
-80	0.130	2767.648	2841.217	2914.682	2988.050	3061.330	3134.531	3207.659	3280.722	3353.725	3426.675	3499.576	3572.432	3645.248	3718.027	3790.773	3863.488	3936.175	4008.836	4081.474	4154.090	4226.685
-75	0.180	2052.773	2106.354	2159.837	2213.231	2266.545	2319.785	2372.959	2426.073	2479.132	2532.142	2585.108	2638.033	2690.921	2743.775	2796.598	2849.393	2902.162	2954.907	3007.630	3060.334	3113.018
-70	0.244	1548.716	1588.487	1628.168	1667.767	1707.291	1746.749	1786.145	1825.486	1864.777	1904.023	1943.228	1982.395	2021.528	2060.631	2099.705	2138.752	2177.776	2216.778	2255.759	2294.721	2333.666
-65	0.325	1186.782	1216.828	1246.790	1276.676	1306.494	1336.249	1365.949	1395.597	1425.200	1454.761	1484.285	1513.774	1543.231	1572.660	1602.062	1631.440	1660.796	1690.132	1719.448	1748.747	1778.029
-60	0.427	922.501	945.574	968.570	991.495	1014.357	1037.161	1059.914	1082.621	1105.284	1127.910	1150.500	1173.059	1195.588	1218.091	1240.570	1263.025	1285.460	1307.876	1330.274	1352.656	1375.023
-55	0.552	726.507	744.498	762.417	780.271	798.066	815.808	833.503	851.154	868.766	886.342	903.886	921.400	938.887	956.350	973.789	991.208	1008.607	1025.988	1043.353	1060.702	1078.037
-50	0.706	579.053	593.283	607.446	621.548	635.595	649.594	663.547	677.461	691.339	705.183	718.997	732.783	746.544	760.282	773.999	787.696	801.375	815.037	828.683	842.315	855.933
-45	0.891	466.630	478.037	489.380	500.667	511.903	523.093	534.242	545.353	556.430	567.476	578.494	589.487	600.455	611.402	622.329	633.237	644.129	655.004	665.865	676.712	687.546
-42.12	1.013	413.979	424.079	434.117	444.102	454.037	463.928	473.779	483.595	493.377	503.130	512.856	522.556	532.234	541.891	551.529	561.148	570.752	580.339	589.913	599.474	609.022
-40	1.111	379.850	389.108	398.308	407.454	416.552	425.608	434.625	443.606	452.556	461.477	470.371	479.241	488.089	496.917	505.725	514.516	523.291	532.052	540.798	549.531	558.253
-35	1.372	312.088	319.692	327.240	334.739	342.192	349.605	356.982	364.325	371.639	378.925	386.187	393.425	400.642	407.841	415.021	422.185	429.333	436.468	443.589	450.699	457.797
-30	1.678	258.607	264.922	271.185	277.400	283.573	289.707	295.807	301.876	307.917	313.931	319.922	325.891	331.841	337.772	343.686	349.585	355.469	361.340	367.199	373.046	378.882
-25	2.034	215.972	221.273	226.523	231.729	236.894	242.022	247.118	252.184	257.224	262.238	267.231	272.202	277.155	282.090	287.010	291.914	296.805	301.683	306.549	311.404	316.249
-20	2.445	181.665	186.160	190.606	195.008	199.372	203.702	207.999	212.269	216.513	220.733	224.932	229.112	233.273	237.418	241.547	245.662	249.765	253.855	257.934	262.002	266.061
-15	2.916	153.817	157.665	161.465	165.224	168.945	172.633	176.291	179.922	183.528	187.112	190.675	194.219	197.746	201.257	204.753	208.236	211.707	215.166	218.614	222.052	225.481
-10	3.453	131.026	134.350	137.628	140.866	144.068	147.237	150.377	153.491	156.581	159.649	162.698	165.728	168.742	171.741	174.726	177.697	180.657	183.606	186.544	189.473	192.393
-5	4.060	112.229	115.127	117.979	120.792	123.569	126.315	129.033	131.725	134.394	137.042	139.671	142.283	144.879	147.460	150.027	152.582	155.126	157.659	160.182	162.696	165.201
0	4.745	96.613	99.161	101.664	104.128	106.556	108.955	111.325	113.671	115.994	118.297	120.581	122.848	125.100	127.338	129.563	131.776	133.977	136.169	138.350	140.523	142.688
5	5.511	83.552	85.810	88.024	90.199	92.340	94.450	96.533	98.592	100.629	102.645	104.644	106.627	108.594	110.548	112.489	114.419	116.337	118.246	120.146	122.037	123.920
10	6.366	72.555	74.574	76.548	78.483	80.384	82.254	84.098	85.917	87.715	89.494	91.255	93.000	94.730	96.447	98.151	99.845	101.528	103.201	104.865	106.522	108.170
15	7.315	63.240	65.060	66.834	68.568	70.268	71.937	73.580	75.199	76.796	78.375	79.936	81.482	83.013	84.532	86.038	87.533	89.018	90.494	91.961	93.421	94.872
20	8.365	55.303	56.957	58.563	60.128	61.659	63.159	64.632	66.082	67.511	68.921	70.314	71.691	73.055	74.405	75.744	77.072	78.391	79.700	81.001	82.294	83.579
25	9.521	48.502	50.017	51.482	52.906	54.293	55.650	56.980	58.287	59.572	60.839	62.089	63.323	64.544	65.753	66.949	68.136	69.312	70.480	71.640	72.791	73.936
30	10.790	42.643	44.042	45.389	46.693	47.959	49.194	50.402	51.587	52.750	53.895	55.022	56.135	57.234	58.321	59.397	60.462	61.518	62.565	63.604	64.635	65.660
35	12.179	37.568	38.873	40.120	41.322	42.485	43.617	44.721	45.800	46.859	47.899	48.922	49.931	50.925	51.908	52.879	53.841	54.792	55.736	56.671	57.599	58.521
40	13.694	33.151	34.377	35.541	36.657	37.733	38.776	39.790	40.780	41.749	42.699	43.632	44.550	45.455	46.348	47.229	48.101	48.963	49.817	50.663	51.502	52.335
45	15.343	29.286	30.449	31.545	32.588	33.589	34.556	35.494	36.406	37.297	38.169	39.024	39.864	40.691	41.506	42.310	43.104	43.888	44.665	45.434	46.196	46.951
50	17.133	25.887	27.001	28.040	29.023	29.961	30.862	31.734	32.579	33.403	34.207	34.994	35.767	36.526	37.273	38.009	38.735	39.452	40.161	40.863	41.557	42.245
55	19.072	22.880	23.960	24.954	25.887	26.771	27.616	28.430	29.218	29.983	30.728	31.456	32.170	32.869	33.557	34.234	34.901	35.559	36.209	36.851	37.487	38.116
60	21.168	20.205	21.265	22.226	23.116	23.955	24.753	25.517	26.254	26.968	27.662	28.339	29.000	29.647	30.283	30.908	31.523	32.129	32.727	33.318	33.902	34.479
65	23.430	17.809	18.865	19.802	20.661	21.461	22.218	22.940	23.633	24.302	24.950	25.581	26.197	26.798	27.388	27.967	28.536	29.096	29.649	30.194	30.732	31.264
70	25.868	15.645	16.718	17.642	18.475	19.244	19.966	20.651	21.305	21.935	22.544	23.134	23.709	24.270	24.819	25.358	25.886	26.406	26.917	27.421	27.919	28.411
75	28.493	13.672	14.786	15.709	16.524	17.268	17.959	18.612	19.233	19.828	20.401	20.956	21.495	22.020	22.532	23.034	23.526	24.010	24.485	24.953	25.415	25.870
80	31.319	11.847	13.039	13.972	14.776	15.499	16.166	16.790	17.381	17.945	18.487	19.010	19.516	20.009	20.489	20.958	21.418	21.869	22.312	22.747	23.176	23.600
85	34.361	10.120	11.450	12.406	13.205	13.912	14.557	15.157	15.721	16.258	16.771	17.265	17.743	18.206	18.657	19.097	19.527	19.949	20.362	20.769	21.169	21.563
90	37.641	8.404	9.997	10.990	11.789	12.483	13.110	13.687	14.227	14.739	15.226	15.694	16.146	16.582	17.007	17.420	17.823	18.218	18.605	18.985	19.359	19.727
95	41.195	6.398	8.659	9.702	10.505	11.189	11.798	12.355	12.874	13.362	13.826	14.270	14.697	15.109	15.509	15.898	16.277	16.647	17.010	17.366	17.715	18.059

Thermodynamic properties of R-290 - (superheated vapour) - Enthalpy (kJ/kg)

TSat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
-100	0.029	456.878	462.840	468.882	475.006	481.211	487.501	493.875	500.336	506.885	513.524	520.254	527.076	533.993	541.006	548.116	555.325	562.633	570.044	577.557	585.174	592.897	
-95	0.044	462.708	468.757	474.887	481.100	487.395	493.775	500.242	506.796	513.440	520.174	527.000	533.921	540.937	548.050	555.262	562.574	569.987	577.503	585.122	592.847	600.678	
-90	0.064	468.582	474.722	480.943	487.247	493.636	500.110	506.671	513.321	520.062	526.894	533.820	540.841	547.959	555.175	562.491	569.907	577.426	585.049	592.777	600.610	608.551	
-85	0.093	474.495	480.729	487.045	493.445	499.929	506.500	513.160	519.908	526.749	533.682	540.710	547.834	555.056	562.377	569.798	577.322	584.949	592.681	600.518	608.463	616.515	
-80	0.130	480.441	486.773	493.188	499.687	506.271	512.942	519.703	526.554	533.497	540.534	547.666	554.896	562.224	569.652	577.182	584.815	592.553	600.395	608.344	616.401	624.566	
-75	0.180	486.414	492.849	499.366	505.968	512.656	519.432	526.297	533.253	540.302	547.445	554.685	562.023	569.460	576.999	584.640	592.384	600.233	608.189	616.251	624.421	632.701	
-70	0.244	492.408	498.951	505.576	512.285	519.080	525.963	532.936	540.001	547.159	554.413	561.763	569.212	576.761	584.412	592.166	600.024	607.987	616.058	624.235	632.521	640.917	
-65	0.325	498.418	505.073	511.810	518.631	525.537	532.532	539.617	546.794	554.065	561.431	568.895	576.458	584.122	591.888	599.757	607.731	615.811	623.998	632.293	640.697	649.210	
-60	0.427	504.437	511.209	518.063	525.000	532.023	539.134	546.334	553.627	561.014	568.497	576.077	583.757	591.538	599.422	607.409	615.502	623.701	632.006	640.421	648.944	657.576	
-55	0.552	510.459	517.354	524.330	531.388	538.531	545.762	553.082	560.495	568.001	575.604	583.304	591.104	599.006	607.010	615.118	623.331	631.651	640.078	648.614	657.258	666.012	
-50	0.706	516.478	523.502	530.604	537.788	545.057	552.412	559.856	567.392	575.022	582.748	590.572	598.495	606.520	614.648	622.879	631.216	639.659	648.209	656.868	665.635	674.512	
-45	0.891	522.487	529.645	536.880	544.195	551.593	559.077	566.650	574.314	582.071	589.924	597.875	605.925	614.076	622.330	630.687	639.150	647.719	656.395	665.178	674.071	683.072	
-42.12	1.013	525.941	533.180	540.494	547.887	555.362	562.923	570.571	578.311	586.143	594.071	602.097	610.221	618.447	626.774	635.206	643.742	652.384	661.134	669.990	678.956	688.030	
-40	1.111	528.479	535.777	543.151	550.602	558.135	565.753	573.459	581.255	589.144	597.128	605.209	613.389	621.669	630.052	638.539	647.130	655.827	664.630	673.541	682.561	691.689	
-35	1.372	534.447	541.893	549.410	557.004	564.677	572.434	580.277	588.210	596.234	604.353	612.568	620.881	629.295	637.810	646.428	655.151	663.978	672.912	681.952	691.100	700.357	
-30	1.678	540.384	547.983	555.652	563.393	571.213	579.113	587.099	595.173	603.337	611.595	619.948	628.398	636.948	645.599	654.351	663.207	672.168	681.234	690.406	699.685	709.072	
-25	2.034	546.282	554.042	561.868	569.764	577.735	585.786	593.919	602.139	610.448	618.849	627.343	635.935	644.624	653.413	662.303	671.296	680.392	689.593	698.899	708.311	717.829	
-20	2.445	552.132	560.062	568.053	576.110	584.239	592.445	600.732	609.103	617.561	626.109	634.750	643.485	652.318	661.249	670.279	679.411	688.646	697.983	707.425	716.972	726.625	
-15	2.916	557.926	566.034	574.197	582.424	590.718	599.086	607.531	616.058	624.670	633.371	642.162	651.046	660.025	669.101	678.275	687.549	696.924	706.402	715.982	725.666	735.454	
-10	3.453	563.653	571.949	580.295	588.698	597.165	605.701	614.311	623.000	631.772	640.629	649.574	658.610	667.740	676.964	686.285	695.705	705.223	714.843	724.563	734.387	744.313	
-5	4.060	569.304	577.799	586.336	594.925	603.572	612.284	621.066	629.923	638.859	647.878	656.982	666.175	675.458	684.835	694.306	703.873	713.538	723.302	733.166	743.130	753.196	
0	4.745	574.866	583.573	592.313	601.097	609.933	618.828	627.789	636.820	645.926	655.112	664.380	673.733	683.175	692.707	702.331	712.050	721.864	731.775	741.784	751.893	762.101	
5	5.511	580.327	589.260	598.216	607.206	616.240	625.327	634.473	643.685	652.968	662.326	671.762	681.281	690.885	700.576	710.358	720.231	730.197	740.258	750.415	760.669	771.021	
10	6.366	585.673	594.848	604.033	613.241	622.484	631.772	641.112	650.512	659.977	669.513	679.124	688.813	698.583	708.438	718.380	728.410	738.532	748.745	759.053	769.455	779.954	
15	7.315	590.886	600.324	609.754	619.194	628.657	638.155	647.698	657.294	666.949	676.669	686.459	696.323	706.264	716.287	726.392	736.584	746.864	757.233	767.694	778.247	788.894	
20	8.365	595.950	605.672	615.366	625.052	634.749	644.469	654.224	664.023	673.875	683.786	693.761	703.805	713.923	724.117	734.391	744.748	755.189	765.717	776.334	787.040	797.838	
25	9.521	600.842	610.876	620.855	630.805	640.749	650.702	660.680	670.693	680.750	690.858	701.025	711.255	721.554	731.924	742.371	752.896	763.502	774.192	784.968	795.830	806.781	
30	10.790	605.537	615.915	626.204	636.438	646.645	656.847	667.058	677.294	687.564	697.878	708.243	718.666	729.151	739.703	750.326	761.024	771.799	782.654	793.591	804.613	815.720	
35	12.179	610.007	620.768	631.395	641.936	652.426	662.890	673.349	683.818	694.312	704.840	715.410	726.031	736.708	747.447	758.252	769.126	780.074	791.098	802.201	813.384	824.650	
40	13.694	614.214	625.407	636.408	647.283	658.076	668.820	679.540	690.256	700.983	711.734	722.518	733.345	744.220	755.151	766.142	777.198	788.323	799.520	810.791	822.139	833.567	
45	15.343	618.117	629.801	641.219	652.459	663.580	674.624	685.622	696.598	707.570	718.554	729.560	740.600	751.681	762.810	773.993	785.235	796.541	807.914	819.358	830.875	842.467	
50	17.133	621.660	633.913	645.800	657.443	668.920	680.287	691.581	702.832	714.062	725.290	736.528	747.789	759.082	770.416	781.797	793.231	804.723	816.277	827.897	839.585	851.346	
55	19.072	624.773	637.696	650.117	662.209	674.077	685.793	697.405	708.948	720.450	731.933	743.414	754.905	766.419	777.965	789.550	801.181	812.863	824.603	836.403	848.267	860.199	
60	21.168	627.361	641.091	654.131	666.729	679.030	691.125	703.077	714.932	726.723	738.475	750.209	761.941	773.684	785.448	797.244	809.078	820.957	832.886	844.871	856.915	869.022	
65	23.430	629.290	644.028	657.799	670.973	683.754	696.263	708.583	720.771	732.868	744.904	756.904	768.887	780.868	792.860	804.873	816.917	828.998	841.123	853.297	865.525	877.811	
70	25.868	630.372	646.419	661.067	674.904	688.221	701.186	713.905	726.451	738.873	751.209	763.489	775.735	787.964	800.192	812.431	824.691	836.980	849.306	861.674	874.091	886.560	
75	28.493	630.332	648.156	663.875	678.480	692.401	705.870	719.024	731.954	744.724	757.378	769.953	782.474	794.963	807.436	819.909	832.392	844.896	857.428	869.997	882.606	895.263	
80	31.319	628.730	649.097	666.147	681.653	696.261	710.289	723.918	737.264	750.405	763.398	776.283	789.093	801.853	814.583	827.298	840.013	852.738	865.483	878.257	891.064	903.913	
85	34.361	624.750	649.057	667.796	684.370	699.762	714.413	728.563	742.359	755.899	769.250	782.464	795.578	808.622	821.618	834.586	847.540	860.495	873.459	886.444	899.455	912.501	
90	37.641	616.474	647.791	668.717	686.566	702.857	718.203	732.925	747.209	761.176	774.911	788.473	801.907	815.248	828.522	841.753	854.956	868.148	881.340	894.542	907.764	921.012	
95	41.195	595.810	644.982	668.766	688.140	705.461	721.587	736.939	751.753	766.182	780.327	794.259	808.033	821.687	835.255	848.760	862.224	875.662	889.090	902.518	915.956	929.413	

Thermodynamic properties of R-290 - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.029	2.766	2.800	2.834	2.867	2.899	2.932	2.963	2.995	3.026	3.057	3.087	3.117	3.147	3.177	3.207	3.236	3.265	3.294	3.323	3.352	3.380
-95	0.044	2.722	2.756	2.789	2.821	2.853	2.885	2.917	2.948	2.979	3.009	3.039	3.069	3.099	3.129	3.158	3.187	3.216	3.245	3.274	3.302	3.331
-90	0.064	2.682	2.715	2.748	2.780	2.812	2.843	2.874	2.905	2.936	2.966	2.996	3.026	3.055	3.085	3.114	3.143	3.172	3.201	3.229	3.258	3.286
-85	0.093	2.646	2.678	2.711	2.743	2.774	2.805	2.836	2.867	2.897	2.927	2.957	2.987	3.016	3.045	3.074	3.103	3.132	3.160	3.189	3.217	3.245
-80	0.130	2.613	2.645	2.677	2.709	2.740	2.771	2.802	2.832	2.862	2.892	2.922	2.951	2.980	3.009	3.038	3.067	3.096	3.124	3.152	3.181	3.209
-75	0.180	2.583	2.615	2.647	2.678	2.709	2.740	2.771	2.801	2.831	2.860	2.890	2.919	2.948	2.977	3.006	3.034	3.063	3.091	3.120	3.148	3.176
-70	0.244	2.557	2.588	2.620	2.651	2.682	2.712	2.742	2.772	2.802	2.832	2.861	2.890	2.919	2.948	2.977	3.005	3.034	3.062	3.090	3.118	3.146
-65	0.325	2.532	2.564	2.595	2.626	2.657	2.687	2.717	2.747	2.777	2.806	2.835	2.864	2.893	2.922	2.950	2.979	3.007	3.035	3.063	3.091	3.119
-60	0.427	2.511	2.542	2.573	2.604	2.634	2.664	2.694	2.724	2.754	2.783	2.812	2.841	2.870	2.898	2.927	2.955	2.983	3.011	3.039	3.067	3.095
-55	0.552	2.491	2.522	2.553	2.584	2.614	2.644	2.674	2.704	2.733	2.762	2.791	2.820	2.849	2.877	2.905	2.934	2.962	2.990	3.018	3.046	3.073
-50	0.706	2.473	2.505	2.535	2.566	2.596	2.626	2.656	2.685	2.714	2.743	2.772	2.801	2.830	2.858	2.887	2.915	2.943	2.971	2.999	3.026	3.054
-45	0.891	2.458	2.489	2.519	2.550	2.580	2.610	2.639	2.669	2.698	2.727	2.756	2.784	2.813	2.841	2.870	2.898	2.926	2.954	2.982	3.009	3.037
-42.12	1.013	2.449	2.480	2.511	2.541	2.571	2.601	2.631	2.660	2.689	2.718	2.747	2.776	2.804	2.833	2.861	2.889	2.917	2.945	2.973	3.000	3.028
-40	1.111	2.443	2.474	2.505	2.535	2.565	2.595	2.625	2.654	2.683	2.712	2.741	2.770	2.798	2.826	2.855	2.883	2.911	2.939	2.966	2.994	3.022
-35	1.372	2.431	2.462	2.492	2.522	2.552	2.582	2.612	2.641	2.670	2.699	2.728	2.756	2.785	2.813	2.841	2.869	2.897	2.925	2.953	2.981	3.008
-30	1.678	2.419	2.450	2.481	2.511	2.541	2.571	2.600	2.630	2.659	2.688	2.716	2.745	2.773	2.802	2.830	2.858	2.886	2.914	2.941	2.969	2.997
-25	2.034	2.409	2.440	2.471	2.501	2.531	2.561	2.590	2.619	2.648	2.677	2.706	2.735	2.763	2.791	2.820	2.848	2.876	2.903	2.931	2.959	2.986
-20	2.445	2.400	2.431	2.462	2.492	2.522	2.552	2.581	2.611	2.640	2.669	2.697	2.726	2.754	2.783	2.811	2.839	2.867	2.895	2.922	2.950	2.977
-15	2.916	2.392	2.423	2.454	2.484	2.514	2.544	2.573	2.603	2.632	2.661	2.690	2.718	2.747	2.775	2.803	2.831	2.859	2.887	2.915	2.942	2.970
-10	3.453	2.385	2.416	2.447	2.477	2.507	2.537	2.567	2.596	2.625	2.654	2.683	2.712	2.740	2.769	2.797	2.825	2.853	2.881	2.908	2.936	2.963
-5	4.060	2.378	2.410	2.440	2.471	2.501	2.531	2.561	2.591	2.620	2.649	2.678	2.706	2.735	2.763	2.791	2.819	2.847	2.875	2.903	2.931	2.958
0	4.745	2.372	2.404	2.435	2.466	2.496	2.526	2.556	2.586	2.615	2.644	2.673	2.702	2.730	2.759	2.787	2.815	2.843	2.871	2.899	2.926	2.954
5	5.511	2.367	2.399	2.430	2.461	2.492	2.522	2.552	2.582	2.611	2.640	2.669	2.698	2.727	2.755	2.783	2.812	2.840	2.867	2.895	2.923	2.951
10	6.366	2.363	2.395	2.426	2.457	2.488	2.519	2.549	2.578	2.608	2.637	2.666	2.695	2.724	2.752	2.781	2.809	2.837	2.865	2.893	2.920	2.948
15	7.315	2.358	2.391	2.423	2.454	2.485	2.516	2.546	2.576	2.605	2.635	2.664	2.693	2.722	2.750	2.779	2.807	2.835	2.863	2.891	2.919	2.946
20	8.365	2.354	2.387	2.420	2.451	2.482	2.513	2.544	2.574	2.604	2.633	2.662	2.691	2.720	2.749	2.777	2.806	2.834	2.862	2.890	2.918	2.945
25	9.521	2.351	2.384	2.417	2.449	2.480	2.511	2.542	2.572	2.602	2.632	2.661	2.690	2.719	2.748	2.777	2.805	2.833	2.861	2.889	2.917	2.945
30	10.790	2.347	2.381	2.414	2.447	2.478	2.510	2.541	2.571	2.601	2.631	2.661	2.690	2.719	2.748	2.777	2.805	2.833	2.862	2.890	2.917	2.945
35	12.179	2.344	2.378	2.412	2.445	2.477	2.509	2.540	2.571	2.601	2.631	2.661	2.690	2.719	2.748	2.777	2.806	2.834	2.862	2.890	2.918	2.946
40	13.694	2.340	2.375	2.410	2.443	2.476	2.508	2.539	2.570	2.601	2.631	2.661	2.691	2.720	2.749	2.778	2.807	2.835	2.863	2.891	2.919	2.947
45	15.343	2.336	2.372	2.408	2.442	2.475	2.507	2.539	2.570	2.601	2.632	2.662	2.691	2.721	2.750	2.779	2.808	2.836	2.865	2.893	2.921	2.949
50	17.133	2.332	2.369	2.405	2.440	2.474	2.507	2.539	2.570	2.602	2.632	2.663	2.693	2.722	2.752	2.781	2.810	2.838	2.867	2.895	2.923	2.951
55	19.072	2.327	2.366	2.403	2.438	2.473	2.506	2.539	2.571	2.602	2.633	2.664	2.694	2.724	2.753	2.783	2.812	2.840	2.869	2.897	2.926	2.954
60	21.168	2.321	2.362	2.400	2.437	2.472	2.506	2.539	2.571	2.603	2.634	2.665	2.696	2.726	2.755	2.785	2.814	2.843	2.872	2.900	2.928	2.957
65	23.430	2.314	2.357	2.397	2.435	2.471	2.505	2.539	2.572	2.604	2.636	2.667	2.697	2.728	2.758	2.787	2.817	2.846	2.874	2.903	2.931	2.960
70	25.868	2.305	2.352	2.393	2.432	2.469	2.505	2.539	2.572	2.605	2.637	2.668	2.699	2.730	2.760	2.790	2.819	2.849	2.878	2.906	2.935	2.963
75	28.493	2.294	2.345	2.389	2.429	2.468	2.504	2.539	2.573	2.606	2.638	2.670	2.701	2.732	2.763	2.793	2.822	2.852	2.881	2.910	2.938	2.967
80	31.319	2.279	2.336	2.384	2.426	2.466	2.503	2.539	2.573	2.607	2.640	2.672	2.703	2.735	2.765	2.795	2.825	2.855	2.884	2.913	2.942	2.970
85	34.361	2.259	2.326	2.377	2.422	2.463	2.501	2.538	2.573	2.608	2.641	2.674	2.705	2.737	2.768	2.798	2.828	2.858	2.887	2.917	2.945	2.974
90	37.641	2.227	2.313	2.369	2.417	2.460	2.500	2.537	2.573	2.608	2.642	2.675	2.707	2.739	2.770	2.801	2.831	2.861	2.891	2.920	2.949	2.978
95	41.195	2.164	2.296	2.360	2.411	2.456	2.497	2.536	2.573	2.608	2.643	2.676	2.709	2.741	2.773	2.804	2.834	2.864	2.894	2.923	2.953	2.982

R-600a

Isobutane C_4H_{10}

Molecular weight (g/mol)	58.12
Melting point (°C)	-159.38
Boiling point (at 1.013 bar)	-11.76
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	134.7
Critical pressure (bar absolute)	36.29
Specific heat (liquid) at + 25°C (kJ/kg.K)	2.430
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	1.692
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.105
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.151
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	10.00
Classification NF-EN 378	A3
GWP (IPCC 4)	3

Main applications

Isobutane (R-600a) of very high purity is a hydrocarbon (HC) used for refrigeration.

Commercial specifications

Isobutane: ≥ 99.5 % volume.
Propane: ≤ 0.40 % volume.
n-butane: ≤ 0.25 % volume.
Unsaturated C4: ≤ 0.01 % volume.
Smell: none.
Water content: ≤ 12 ppm weight.

Oils

Use a mineral oil (MO), alkylbenzene (AB) or poly alpha olefin (PAO).
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

R-600a is classified as an extremely flammable product (A3)
Refer to the ERP of 14th February 2000 published in the O.J. of 21st March 2000.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-600a - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm³/kg)	(kg/dm³)	(kJ/kg)	(kJ/kg.K)	(°C)	(m³/kg)	(kg/m³)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.004	-100	1.462	0.684	-6.395	0.067	-100.0	65.234	0.015	428.190	2.577	434.585
0.006	-95	1.473	0.679	3.036	0.121	-95.0	41.078	0.024	433.861	2.539	430.825
0.010	-90	1.483	0.674	12.549	0.173	-90.0	26.648	0.038	439.620	2.505	427.072
0.015	-85	1.494	0.669	22.144	0.225	-85.0	17.764	0.056	445.465	2.475	423.321
0.023	-80	1.505	0.664	31.823	0.276	-80.0	12.140	0.082	451.392	2.448	419.569
0.033	-75	1.516	0.660	41.587	0.326	-75.0	8.487	0.118	457.397	2.424	415.810
0.048	-70	1.528	0.655	51.439	0.375	-70.0	6.059	0.165	463.479	2.403	412.040
0.067	-65	1.539	0.650	61.380	0.423	-65.0	4.410	0.227	469.633	2.385	408.253
0.093	-60	1.551	0.645	71.413	0.471	-60.0	3.266	0.306	475.855	2.368	404.442
0.126	-55	1.564	0.640	81.540	0.518	-55.0	2.459	0.407	482.142	2.354	400.602
0.168	-50	1.576	0.634	91.764	0.564	-50.0	1.879	0.532	488.489	2.342	396.726
0.221	-45	1.589	0.629	102.086	0.610	-45.0	1.456	0.687	494.893	2.331	392.807
0.287	-40	1.602	0.624	112.512	0.655	-40.0	1.143	0.875	501.349	2.323	388.837
0.368	-35	1.616	0.619	123.042	0.700	-35.0	0.907	1.102	507.853	2.315	384.811
0.466	-30	1.630	0.614	133.682	0.744	-30.0	0.728	1.373	514.400	2.309	380.719
0.584	-25	1.644	0.608	144.433	0.787	-25.0	0.591	1.693	520.987	2.305	376.554
0.725	-20	1.659	0.603	155.300	0.831	-20.0	0.483	2.069	527.607	2.301	372.307
0.891	-15	1.674	0.597	166.286	0.874	-15.0	0.399	2.506	534.257	2.299	367.972
1.013	-11.76	1.684	0.594	173.481	0.901	-11.76	0.354	2.826	538.587	2.298	365.106
1.085	-10	1.690	0.592	177.395	0.916	-10.0	0.332	3.012	540.933	2.297	363.537
1.310	-5	1.706	0.586	188.632	0.958	-5.0	0.278	3.593	547.628	2.297	358.996
1.570	0	1.722	0.581	200.000	1.000	0.0	0.235	4.257	554.337	2.297	354.337
1.867	5	1.740	0.575	211.504	1.042	5.0	0.200	5.012	561.056	2.298	349.552
2.206	10	1.758	0.569	223.149	1.083	10.0	0.170	5.867	567.778	2.300	344.629
2.590	15	1.776	0.563	234.940	1.124	15.0	0.146	6.831	574.497	2.302	339.558
3.022	20	1.796	0.557	246.881	1.165	20.0	0.126	7.913	581.207	2.305	334.326
3.507	25	1.816	0.551	258.980	1.205	25.0	0.110	9.126	587.901	2.309	328.921
4.047	30	1.837	0.544	271.241	1.246	30.0	0.095	10.480	594.570	2.312	323.329
4.648	35	1.859	0.538	283.672	1.286	35.0	0.083	11.988	601.207	2.317	317.535
5.312	40	1.883	0.531	296.280	1.326	40.0	0.073	13.666	607.802	2.321	311.522
6.044	45	1.907	0.524	309.073	1.366	45.0	0.064	15.529	614.344	2.326	305.271
6.849	50	1.933	0.517	322.060	1.406	50.0	0.057	17.595	620.823	2.331	298.763
7.730	55	1.960	0.510	335.251	1.446	55.0	0.050	19.886	627.223	2.336	291.972
8.692	60	1.989	0.503	348.657	1.486	60.0	0.045	22.426	633.528	2.341	284.872
9.739	65	2.020	0.495	362.291	1.526	65.0	0.040	25.242	639.718	2.347	277.427
10.875	70	2.053	0.487	376.169	1.566	70.0	0.035	28.369	645.766	2.352	269.597
12.107	75	2.089	0.479	390.309	1.607	75.0	0.031	31.846	651.643	2.357	261.334
13.438	80	2.128	0.470	404.732	1.647	80.0	0.028	35.721	657.313	2.362	252.582
14.874	85	2.170	0.461	419.464	1.687	85.0	0.025	40.057	662.735	2.367	243.270
16.420	90	2.217	0.451	434.540	1.728	90.0	0.022	44.927	667.857	2.371	233.318
18.081	95	2.269	0.441	450.001	1.770	95.0	0.020	50.430	672.618	2.374	222.618
19.865	100	2.328	0.430	465.904	1.811	100.0	0.018	56.697	676.937	2.377	211.032
21.778	105	2.395	0.418	482.329	1.854	105.0	0.016	63.910	680.699	2.378	198.370
23.826	110	2.473	0.404	499.389	1.897	110.0	0.014	72.331	683.741	2.379	184.352
26.019	115	2.568	0.389	517.263	1.942	115.0	0.012	82.372	685.808	2.377	168.544
28.366	120	2.688	0.372	536.259	1.989	120.0	0.011	94.741	686.459	2.371	150.200
30.880	125	2.852	0.351	557.006	2.040	125.0	0.009	110.866	684.814	2.361	127.808
33.578	130	3.115	0.321	581.255	2.099	130.0	0.007	134.723	678.439	2.340	97.184

Thermodynamic properties of R-600a - (superheated vapour) - Volume (dm^3/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.004	65234.428	67122.092	69009.465	70896.587	72783.489	74670.201	76556.744	78443.140	80329.405	82215.554	84101.600	85987.555	87873.427	89759.226	91644.958	93530.630	95416.247	97301.816	99187.340	101072.823	102958.268
-95	0.006	41078.104	42234.525	43390.694	44546.643	45702.400	46857.988	48013.429	49168.739	50323.934	51479.025	52634.024	53788.940	54943.783	56098.559	57253.276	58407.937	59562.550	60717.118	61871.645	63026.135	64180.590
-90	0.010	26648.454	27379.127	28109.581	28839.841	29569.933	30299.876	31029.689	31759.385	32488.978	33218.478	33947.896	34677.240	35406.518	36135.735	36864.898	37594.011	38323.080	39052.108	39781.098	40510.055	41238.980
-85	0.015	17763.977	18238.918	18713.666	19188.244	19662.673	20136.970	20611.151	21085.228	21559.213	22033.114	22506.942	22980.703	23454.404	23928.050	24401.646	24875.198	25348.709	25822.183	26295.622	26769.030	27242.409
-80	0.023	12139.727	12456.595	12773.292	13089.839	13406.253	13722.550	14038.743	14354.844	14670.861	14986.803	15302.679	15618.494	15934.255	16249.966	16565.632	16881.257	17196.845	17512.398	17827.920	18143.413	18458.880
-75	0.033	8487.367	8703.915	8920.312	9136.575	9352.720	9568.761	9784.708	10000.571	10216.360	10432.081	10647.742	10863.348	11078.904	11294.415	11509.884	11725.317	11940.715	12156.081	12371.419	12586.730	12802.017
-70	0.048	6059.201	6210.515	6361.694	6512.753	6663.707	6814.566	6965.342	7116.042	7266.674	7417.245	7567.761	7718.227	7868.648	8019.028	8169.370	8319.677	8469.953	8620.200	8770.420	8920.616	9070.789
-65	0.067	4409.577	4517.506	4625.314	4733.014	4840.620	4948.140	5055.585	5162.961	5270.276	5377.535	5484.744	5591.907	5699.029	5806.113	5913.163	6020.180	6127.169	6234.131	6341.068	6447.983	6554.876
-60	0.093	3266.233	3344.701	3423.059	3501.321	3579.497	3657.596	3735.626	3813.594	3891.506	3969.367	4047.182	4124.956	4202.691	4280.392	4358.060	4435.699	4513.312	4590.900	4668.465	4746.009	4823.533
-55	0.126	2458.989	2517.060	2575.032	2632.917	2690.724	2748.460	2806.134	2863.751	2921.317	2978.836	3036.313	3093.752	3151.155	3208.527	3265.869	3323.183	3380.474	3437.741	3494.987	3552.213	3609.421
-50	0.168	1879.188	1922.882	1966.486	2010.010	2053.463	2096.852	2140.183	2183.463	2226.695	2269.885	2313.035	2356.151	2399.234	2442.287	2485.313	2528.314	2571.291	2614.248	2657.184	2700.103	2743.004
-45	0.221	1456.068	1489.456	1522.762	1555.996	1589.164	1622.273	1655.330	1688.338	1721.303	1754.229	1787.119	1819.976	1852.803	1885.603	1918.377	1951.128	1983.857	2016.567	2049.258	2081.932	2114.590
-40	0.287	1142.688	1168.573	1194.384	1220.127	1245.810	1271.439	1297.019	1322.555	1348.050	1373.510	1398.936	1424.331	1449.699	1475.041	1500.359	1525.655	1550.932	1576.190	1601.431	1626.655	1651.865
-35	0.368	907.371	927.714	947.987	968.198	988.354	1008.460	1028.521	1048.540	1068.522	1088.471	1108.388	1128.277	1148.140	1167.979	1187.796	1207.592	1227.370	1247.131	1266.875	1286.604	1306.319
-30	0.466	728.391	744.583	760.711	776.781	792.800	808.772	824.702	840.593	856.450	872.276	888.072	903.842	919.587	935.311	951.013	966.697	982.362	998.012	1013.646	1029.266	1044.873
-25	0.584	590.623	603.667	616.651	629.581	642.463	655.302	668.101	680.864	693.596	706.297	718.971	731.621	744.248	756.853	769.440	782.008	794.560	807.096	819.618	832.126	844.623
-20	0.725	483.386	494.013	504.585	515.106	525.581	536.016	546.414	556.779	567.113	577.419	587.700	597.958	608.194	618.410	628.608	638.789	648.954	659.105	669.242	679.366	689.479
-15	0.891	399.037	407.789	416.488	425.139	433.748	442.319	450.855	459.359	467.834	476.284	484.709	493.112	501.495	509.859	518.206	526.537	534.853	543.156	551.445	559.723	567.989
-11.76	1.013	353.863	361.621	369.328	376.989	384.609	392.192	399.742	407.261	414.753	422.219	429.662	437.083	444.486	451.870	459.237	466.589	473.927	481.251	488.563	495.863	503.153
-10	1.085	332.039	339.320	346.551	353.736	360.882	367.991	375.067	382.113	389.133	396.127	403.099	410.049	416.981	423.895	430.792	437.674	444.543	451.398	458.241	465.073	471.894
-5	1.310	278.333	284.449	290.516	296.541	302.528	308.480	314.401	320.294	326.161	332.004	337.825	343.627	349.411	355.178	360.929	366.666	372.389	378.100	383.799	389.488	395.167
0	1.570	234.910	240.094	245.232	250.329	255.390	260.418	265.416	270.387	275.334	280.258	285.161	290.046	294.913	299.764	304.600	309.423	314.232	319.030	323.817	328.594	333.361
5	1.867	199.515	203.948	208.336	212.686	217.001	221.284	225.538	229.767	233.972	238.155	242.319	246.465	250.594	254.708	258.808	262.895	266.969	271.032	275.085	279.127	283.161
10	2.206	170.445	174.267	178.046	181.788	185.496	189.174	192.824	196.450	200.053	203.635	207.198	210.744	214.274	217.790	221.292	224.781	228.258	231.725	235.182	238.629	242.067
15	2.590	146.396	149.718	152.999	156.243	159.455	162.637	165.793	168.925	172.035	175.125	178.197	181.252	184.292	187.318	190.330	193.331	196.320	199.299	202.269	205.229	208.180
20	3.022	126.367	129.277	132.147	134.981	137.783	140.556	143.304	146.029	148.733	151.417	154.084	156.734	159.370	161.993	164.602	167.201	169.788	172.365	174.933	177.492	180.042
25	3.507	109.579	112.147	114.675	117.169	119.631	122.065	124.474	126.861	129.227	131.575	133.905	136.220	138.521	140.809	143.084	145.348	147.602	149.846	152.080	154.307	156.525
30	4.047	95.422	97.704	99.947	102.156	104.335	106.486	108.612	110.716	112.801	114.867	116.917	118.951	120.972	122.980	124.976	126.961	128.936	130.902	132.859	134.807	136.748
35	4.648	83.414	85.457	87.461	89.431	91.371	93.284	95.173	97.040	98.887	100.717	102.531	104.330	106.115	107.888	109.650	111.401	113.142	114.873	116.597	118.312	120.020
40	5.312	73.174	75.016	76.818	78.586	80.325	82.036	83.724	85.391	87.038	88.668	90.283	91.883	93.469	95.043	96.607	98.159	99.702	101.237	102.762	104.280	105.791
45	6.044	64.396	66.067	67.699	69.296	70.863	72.404	73.922	75.418	76.895	78.356	79.801	81.231	82.649	84.054	85.449	86.833	88.208	89.574	90.932	92.283	93.627
50	6.849	56.833	58.360	59.846	61.298	62.720	64.115	65.487	66.838	68.171	69.486	70.786	72.072	73.345	74.606	75.857	77.097	78.328	79.551	80.766	81.974	83.174
55	7.730	50.286	51.690	53.053	54.381	55.678	56.949	58.196	59.423	60.631	61.822	62.997	64.159	65.308	66.445	67.572	68.689	69.797	70.897	71.989	73.074	74.152
60	8.692	44.592	45.891	47.149	48.371	49.562	50.726	51.866	52.986	54.086	55.170	56.238	57.293	58.335	59.366	60.386	61.396	62.398	63.391	64.377	65.356	66.328
65	9.739	39.616	40.829	41.997	43.128	44.228	45.300	46.348	47.374	48.382	49.373	50.348	51.310	52.260	53.198	54.125	55.043	55.953	56.854	57.748	58.635	59.516
70	10.875	35.250	36.389	37.481	38.535	39.556	40.549	41.517	42.463	43.390	44.300	45.195	46.076	46.945	47.803	48.650	49.488	50.317	51.138	51.952	52.759	53.559
75	12.107	31.402	32.480	33.509	34.497	35.450	36.374	37.272	38.149	39.006	39.846	40.670	41.481	42.279	43.066	43.843	44.611	45.370	46.121	46.864	47.602	48.332
80	13.438	27.994	29.024	30.000	30.932	31.827	32.692	33.530	34.345	35.141	35.919	36.682	37.431	38.167	38.892	39.608	40.314	41.011	41.701	42.383	43.059	43.728
85	14.874	24.965	25.957	26.890	27.774	28.620	29.432	30.218	30.980	31.722	32.446	33.155	33.849	34.532	35.203	35.863	36.515	37.158	37.794	38.422	39.044	39.659
90	16.420	22.258	23.225	24.123	24.968	25.770	26.539	27.278	27.994	28.688	29.365	30.026	30.672	31.307	31.930	32.542	33.146	33.741	34.329	34.909	35.483	36.051
95	18.081	19.829	20.781	21.653	22.465	23.231	23.961	24.661	25.335	25.988	26.623	27.241	27.846	28.437	29.018	29.588	30.149	30.701	31.246	31.784	32.315	32.841
100	19.865	17.638	18.587	19.440	20.226	20.962	21.658	22.323	22.962	23.578	24.175	24.756	25.323	25.877	26.419	26.951	27.474	27.989	28.496	28.995	29.489	29.976
105	21.778	15.647	16.608	17.452	18.218	18.928	19.596	20.230	20.837	21.421	21.985	22.532	23.065	23.585	24.094	24.592	25.081	25.561	26.034	26.500	26.960	27.413
110	23.826	13.825	14.816	15.658	16.410	17.100	17.743	18.351	18.929	19.484	20.019	20.537	21.039	21.529	22.007	22.475	22.933	23.383	23.825	24.260	24.689	25.112
115	26.019	12.140	13.186	14.036	14.779	15.452	16.075	16.659	17.213	17.742	18.250	18.741	19.217	19.679	20.129	20.569	21.000	21.422	21.837	22.245	22.646	23.042
120	28.366	10.555	11.696	12.565	13.304	13.964	14.569	15.133	15.664	16.170	16.655	17.121	17.572	18.009	18.435	18.850	19.255	19.652	20.042	20.425	20.801	21.172
125	30.880	9.020	10.328	11.226	11.967	12.617	13.206	13.752	14.264	14.748	15.211	15.655	16.083	16.498	16.900	17.293	17.675	18.049	18.416	18.776	19.130	19.478
130	33.578	7.423	9.065	10.006	10.751	11.393	11.969	12.498	12.992	13.457	13.899	14.323	14.730	15.124	15.505	15.876	16.238	16.591	16.937	17.276	17.609	17.936

Thermodynamic properties of R-600a - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
-100	0.004	428.190	433.892	439.693	445.591	451.588	457.684	463.879	470.174	476.570	483.067	489.667	496.371	503.179	510.092	517.112	524.240	531.477	538.823	546.280	553.848	561.529	
-95	0.006	433.861	439.664	445.565	451.563	457.661	463.857	470.154	476.551	483.049	489.650	496.355	503.163	510.078	517.099	524.227	531.464	538.811	546.268	553.838	561.519	569.314	
-90	0.010	439.620	445.524	451.526	457.626	463.825	470.123	476.522	483.022	489.625	496.331	503.141	510.056	517.078	524.208	531.446	538.793	546.252	553.821	561.504	569.299	577.209	
-85	0.015	445.465	451.471	457.574	463.777	470.078	476.480	482.982	489.587	496.295	503.107	510.024	517.048	524.179	531.418	538.767	546.227	553.798	561.481	569.278	577.188	585.214	
-80	0.023	451.392	457.501	463.708	470.014	476.419	482.926	489.534	496.245	503.059	509.979	517.005	524.138	531.379	538.730	546.191	553.764	561.449	569.247	577.159	585.185	593.327	
-75	0.033	457.397	463.611	469.923	476.335	482.846	489.459	496.174	502.992	509.916	516.945	524.081	531.325	538.678	546.142	553.717	561.403	569.203	577.117	585.145	593.289	601.549	
-70	0.048	463.479	469.800	476.218	482.737	489.356	496.077	502.901	509.829	516.862	524.003	531.251	538.607	546.074	553.652	561.341	569.144	577.060	585.091	593.237	601.498	609.876	
-65	0.067	469.633	476.062	482.590	489.218	495.946	502.777	509.712	516.752	523.897	531.150	538.512	545.983	553.565	561.258	569.064	576.984	585.018	593.166	601.431	609.811	618.309	
-60	0.093	475.855	482.395	489.035	495.774	502.614	509.558	516.605	523.758	531.018	538.386	545.863	553.450	561.149	568.959	576.883	584.921	593.074	601.341	609.725	618.226	626.844	
-55	0.126	482.142	488.796	495.549	502.402	509.357	516.415	523.578	530.846	538.222	545.707	553.301	561.006	568.823	576.752	584.796	592.953	601.226	609.614	618.119	626.740	635.479	
-50	0.168	488.489	495.260	502.129	509.099	516.171	523.346	530.626	538.013	545.507	553.110	560.824	568.648	576.585	584.635	592.799	601.078	609.472	617.982	626.608	635.351	644.212	
-45	0.221	494.893	501.783	508.772	515.861	523.052	530.347	537.747	545.254	552.869	560.593	568.428	576.374	584.433	592.605	600.891	609.292	617.809	626.441	635.191	644.057	653.040	
-40	0.287	501.349	508.362	515.473	522.685	529.999	537.416	544.938	552.568	560.306	568.153	576.111	584.180	592.362	600.658	609.068	617.593	626.234	634.990	643.863	652.853	661.960	
-35	0.368	507.853	514.992	522.229	529.566	537.005	544.548	552.196	559.950	567.813	575.785	583.869	592.063	600.371	608.792	617.328	625.978	634.744	643.625	652.624	661.738	670.970	
-30	0.466	514.400	521.670	529.036	536.502	544.069	551.739	559.515	567.397	575.388	583.488	591.698	600.021	608.455	617.004	625.666	634.443	643.336	652.344	661.468	670.708	680.065	
-25	0.584	520.987	528.390	535.889	543.487	551.186	558.987	566.894	574.906	583.027	591.257	599.597	608.048	616.612	625.289	634.080	642.985	652.006	661.141	670.393	679.760	689.243	
-20	0.725	527.607	535.148	542.784	550.518	558.351	566.287	574.327	582.473	590.726	599.088	607.560	616.143	624.838	633.645	642.566	651.601	660.751	670.015	679.395	688.889	698.500	
-15	0.891	534.257	541.941	549.717	557.590	565.562	573.635	581.812	590.094	598.482	606.979	615.585	624.301	633.129	642.069	651.121	660.288	669.568	678.962	688.471	698.094	707.832	
-11.76	1.013	538.587	546.364	554.234	562.200	570.264	578.428	586.695	595.066	603.544	612.129	620.823	629.627	638.542	647.569	656.708	665.960	675.326	684.805	694.398	704.106	713.927	
-10	1.085	540.933	548.762	556.684	564.700	572.814	581.028	589.344	597.765	606.291	614.924	623.667	632.519	641.481	650.555	659.742	669.040	678.452	687.978	697.617	707.370	717.237	
-5	1.310	547.628	555.609	563.679	571.843	580.102	588.460	596.920	605.482	614.149	622.922	631.803	640.792	649.892	659.102	668.423	677.856	687.401	697.059	706.830	716.714	726.711	
0	1.570	554.337	562.474	570.699	579.014	587.423	595.929	604.534	613.241	622.052	630.967	639.989	649.119	658.357	667.704	677.162	686.731	696.411	706.203	716.106	726.122	736.250	
5	1.867	561.056	569.355	577.738	586.209	594.771	603.429	612.184	621.039	629.996	639.056	648.221	657.493	666.872	676.359	685.955	695.661	705.478	715.404	725.442	735.591	745.850	
10	2.206	567.778	576.244	584.791	593.423	602.143	610.956	619.864	628.871	637.977	647.185	656.496	665.912	675.434	685.063	694.799	704.644	714.598	724.661	734.834	745.117	755.509	
15	2.590	574.497	583.137	591.853	600.650	609.533	618.506	627.571	636.732	645.991	655.349	664.809	674.371	684.038	693.811	703.689	713.675	723.768	733.969	744.279	754.697	765.223	
20	3.022	581.207	590.027	598.918	607.887	616.937	626.074	635.300	644.619	654.033	663.545	673.156	682.867	692.682	702.600	712.622	722.750	732.984	743.325	753.772	764.326	774.988	
25	3.507	587.901	596.908	605.981	615.126	624.349	633.654	643.046	652.527	662.100	671.767	681.532	691.396	701.360	711.426	721.595	731.867	742.244	752.725	763.311	774.003	784.800	
30	4.047	594.570	603.773	613.035	622.363	631.764	641.243	650.803	660.450	670.185	680.012	689.934	699.952	710.069	720.285	730.602	741.021	751.542	762.165	772.892	783.723	794.657	
35	4.648	601.207	610.614	620.073	629.591	639.176	648.833	658.567	668.383	678.285	688.276	698.358	708.534	718.805	729.174	739.642	750.209	760.875	771.643	782.512	793.482	804.554	
40	5.312	607.802	617.424	627.088	636.803	646.578	656.419	666.332	676.322	686.395	696.552	706.798	717.135	727.565	738.089	748.709	759.426	770.240	781.153	792.166	803.277	814.489	
45	6.044	614.344	624.192	634.071	643.991	653.963	663.994	674.091	684.261	694.509	704.838	715.251	725.753	736.343	747.025	757.800	768.669	779.633	790.694	801.851	813.106	824.458	
50	6.849	620.823	630.909	641.013	651.147	661.323	671.551	681.839	692.194	702.622	713.127	723.713	734.382	745.136	755.979	766.911	777.934	789.050	800.260	811.564	822.963	834.458	
55	7.730	627.223	637.562	647.902	658.260	668.649	679.082	689.569	700.116	710.730	721.416	732.178	743.018	753.939	764.945	776.038	787.218	798.487	809.848	821.301	832.846	844.485	
60	8.692	633.528	644.137	654.727	665.320	675.933	686.581	697.274	708.021	718.827	729.699	740.640	751.656	762.748	773.921	785.176	796.515	807.941	819.455	831.059	842.752	854.536	
65	9.739	639.718	650.615	661.472	672.316	683.166	694.040	704.949	715.902	726.907	737.970	749.096	760.291	771.558	782.900	794.321	805.823	817.408	829.077	840.833	852.676	864.608	
70	10.875	645.766	656.978	668.124	679.236	690.338	701.450	712.584	723.752	734.962	746.223	757.539	768.918	780.363	791.879	803.469	815.136	826.883	838.711	850.621	862.616	874.697	
75	12.107	651.643	663.204	674.665	686.067	697.439	708.802	720.173	731.564	742.987	754.451	765.964	777.531	789.159	800.853	812.616	824.452	836.363	848.351	860.419	872.568	884.800	
80	13.438	657.313	669.267	681.077	692.796	704.457	716.087	727.706	739.330	750.974	762.649	774.363	786.125	797.942	809.818	821.758	833.765	845.844	857.996	870.223	882.529	894.913	
85	14.874	662.735	675.141	687.343	699.407	711.379	723.292	735.173	747.042	758.916	770.809	782.732	794.695	806.705	818.767	830.888	843.072	855.321	867.640	880.030	892.494	905.034	
90	16.420	667.857	680.793	693.438	705.883	718.191	730.406	742.563	754.689	766.803	778.924	791.064	803.234	815.443	827.698	840.004	852.367	864.791	877.280	889.835	902.461	915.158	
95	18.081	672.618	686.188	699.338	712.204	724.876	737.415	749.866	762.262	774.629	786.987	799.352	811.737	824.151	836.604	849.101	861.648	874.250	886.912	899.636	912.425	925.283	
100	19.865	676.937	691.277	705.010	718.347	731.417	744.305	757.068	769.751	782.383	794.990	807.590	820.197	832.824	845.480	858.172	870.908	883.693	896.532	909.428	922.384	935.405	
105	21.778	680.699	696.004	710.418	724.285	737.793	751.058	764.158	777.145	790.058	802.925	815.770	828.608	841.455	854.321	867.215	880.144	893.116	906.135	919.207	932.333	945.519	
110	23.826	683.741	700.295	715.518	729.987	743.982	757.660	771.121	784.433	797.642	810.784	823.884	836.964	850.038	863.121	876.222	889.350	902.514	915.718	928.968	942.269	955.623	
115	26.019	685.808	704.054	720.258	735.422	749.960	764.091	777.944	791.603	805.127	818.557	831.926	845.256	858.566	871.873	885.188	898.521	911.881	925.275	938.708	952.185	965.712	
120	28.366	686.459	707.160	724.580	740.552	755.703	770.332	784.610	798.642	812.500	826.235	839.884	853.475	867.032	880.570	894.106	907.649	921.211	934.799	948.419	962.077	975.779	
125	30.880	684.814	709.459	728.416	745.337	761.181	776.362	791.101	805.534	819.747	833.803	847.747	861.611	875.423	889.202	902.965	916.726	930.495	944.281	958.093	971.936	985.817	
130	33.578	678.439	710.759	731.688	749.729	766.358	782.149	797.391	812.254	826.846	841.241	855.494	869.644	883.722	897.750	911.749	925.734	939.716	953.707	967.715	981.748	995.812	

Thermodynamic properties of R-600a - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-100	0.004	2.577	2.609	2.642	2.673	2.705	2.736	2.767	2.797	2.828	2.858	2.888	2.918	2.947	2.976	3.006	3.035	3.063	3.092	3.121	3.149	3.178
-95	0.006	2.539	2.571	2.603	2.634	2.666	2.697	2.727	2.758	2.788	2.818	2.847	2.877	2.906	2.935	2.964	2.993	3.022	3.051	3.079	3.107	3.136
-90	0.010	2.505	2.537	2.569	2.600	2.631	2.661	2.692	2.722	2.752	2.781	2.811	2.840	2.869	2.898	2.927	2.956	2.985	3.013	3.042	3.070	3.098
-85	0.015	2.475	2.507	2.538	2.569	2.599	2.630	2.660	2.690	2.719	2.749	2.778	2.808	2.837	2.865	2.894	2.923	2.951	2.980	3.008	3.036	3.064
-80	0.023	2.448	2.479	2.510	2.541	2.571	2.602	2.631	2.661	2.691	2.720	2.749	2.778	2.807	2.836	2.865	2.893	2.922	2.950	2.978	3.006	3.034
-75	0.033	2.424	2.455	2.486	2.516	2.547	2.577	2.606	2.636	2.665	2.694	2.723	2.752	2.781	2.810	2.838	2.867	2.895	2.923	2.951	2.979	3.007
-70	0.048	2.403	2.434	2.464	2.495	2.525	2.554	2.584	2.613	2.643	2.672	2.701	2.729	2.758	2.786	2.815	2.843	2.871	2.900	2.928	2.955	2.983
-65	0.067	2.385	2.415	2.445	2.475	2.505	2.535	2.564	2.593	2.623	2.652	2.680	2.709	2.738	2.766	2.794	2.822	2.851	2.879	2.907	2.934	2.962
-60	0.093	2.368	2.399	2.429	2.459	2.488	2.518	2.547	2.576	2.605	2.634	2.663	2.691	2.720	2.748	2.776	2.804	2.832	2.860	2.888	2.916	2.944
-55	0.126	2.354	2.384	2.414	2.444	2.473	2.503	2.532	2.561	2.590	2.618	2.647	2.676	2.704	2.732	2.760	2.788	2.816	2.844	2.872	2.900	2.928
-50	0.168	2.342	2.372	2.402	2.431	2.461	2.490	2.519	2.548	2.577	2.605	2.634	2.662	2.690	2.719	2.747	2.775	2.803	2.830	2.858	2.886	2.913
-45	0.221	2.331	2.361	2.391	2.420	2.450	2.479	2.508	2.537	2.565	2.594	2.622	2.651	2.679	2.707	2.735	2.763	2.791	2.818	2.846	2.874	2.901
-40	0.287	2.323	2.352	2.382	2.411	2.441	2.470	2.498	2.527	2.556	2.584	2.613	2.641	2.669	2.697	2.725	2.753	2.781	2.808	2.836	2.864	2.891
-35	0.368	2.315	2.345	2.375	2.404	2.433	2.462	2.491	2.519	2.548	2.576	2.604	2.633	2.661	2.689	2.717	2.745	2.772	2.800	2.828	2.855	2.883
-30	0.466	2.309	2.339	2.368	2.398	2.427	2.456	2.484	2.513	2.541	2.570	2.598	2.626	2.654	2.682	2.710	2.738	2.766	2.793	2.821	2.848	2.876
-25	0.584	2.305	2.334	2.364	2.393	2.422	2.451	2.479	2.508	2.536	2.565	2.593	2.621	2.649	2.677	2.705	2.733	2.760	2.788	2.815	2.843	2.870
-20	0.725	2.301	2.331	2.360	2.389	2.418	2.447	2.476	2.504	2.533	2.561	2.589	2.617	2.645	2.673	2.701	2.729	2.756	2.784	2.811	2.839	2.866
-15	0.891	2.299	2.328	2.358	2.387	2.416	2.444	2.473	2.502	2.530	2.558	2.586	2.614	2.642	2.670	2.698	2.726	2.753	2.781	2.809	2.836	2.863
-11.76	1.013	2.298	2.327	2.357	2.386	2.415	2.443	2.472	2.500	2.529	2.557	2.585	2.613	2.641	2.669	2.697	2.725	2.752	2.780	2.807	2.835	2.862
-10	1.085	2.297	2.327	2.356	2.385	2.414	2.443	2.472	2.500	2.528	2.557	2.585	2.613	2.641	2.669	2.696	2.724	2.752	2.779	2.807	2.834	2.862
-5	1.310	2.297	2.326	2.356	2.385	2.414	2.442	2.471	2.500	2.528	2.556	2.584	2.612	2.640	2.668	2.696	2.724	2.751	2.779	2.806	2.834	2.861
0	1.570	2.297	2.327	2.356	2.385	2.414	2.443	2.471	2.500	2.528	2.557	2.585	2.613	2.641	2.669	2.696	2.724	2.752	2.779	2.807	2.834	2.861
5	1.867	2.298	2.328	2.357	2.386	2.415	2.444	2.473	2.501	2.530	2.558	2.586	2.614	2.642	2.670	2.698	2.725	2.753	2.780	2.808	2.835	2.863
10	2.206	2.300	2.330	2.359	2.388	2.417	2.446	2.475	2.503	2.532	2.560	2.588	2.616	2.644	2.672	2.700	2.727	2.755	2.783	2.810	2.837	2.865
15	2.590	2.302	2.332	2.361	2.391	2.420	2.449	2.477	2.506	2.534	2.563	2.591	2.619	2.647	2.675	2.703	2.730	2.758	2.785	2.813	2.840	2.868
20	3.022	2.305	2.335	2.365	2.394	2.423	2.452	2.481	2.509	2.538	2.566	2.594	2.622	2.650	2.678	2.706	2.734	2.761	2.789	2.816	2.844	2.871
25	3.507	2.309	2.338	2.368	2.398	2.427	2.456	2.485	2.513	2.542	2.570	2.599	2.627	2.655	2.683	2.710	2.738	2.766	2.793	2.821	2.848	2.875
30	4.047	2.312	2.342	2.372	2.402	2.431	2.460	2.489	2.518	2.546	2.575	2.603	2.631	2.659	2.687	2.715	2.743	2.771	2.798	2.826	2.853	2.880
35	4.648	2.317	2.347	2.377	2.406	2.436	2.465	2.494	2.523	2.552	2.580	2.608	2.637	2.665	2.693	2.721	2.748	2.776	2.804	2.831	2.858	2.886
40	5.312	2.321	2.352	2.382	2.412	2.441	2.470	2.500	2.528	2.557	2.586	2.614	2.642	2.671	2.699	2.726	2.754	2.782	2.809	2.837	2.864	2.892
45	6.044	2.326	2.357	2.387	2.417	2.447	2.476	2.505	2.534	2.563	2.592	2.620	2.649	2.677	2.705	2.733	2.761	2.788	2.816	2.843	2.871	2.898
50	6.849	2.331	2.362	2.392	2.423	2.453	2.482	2.511	2.541	2.569	2.598	2.627	2.655	2.683	2.712	2.740	2.767	2.795	2.823	2.850	2.878	2.905
55	7.730	2.336	2.367	2.398	2.429	2.459	2.488	2.518	2.547	2.576	2.605	2.634	2.662	2.690	2.719	2.747	2.775	2.802	2.830	2.858	2.885	2.912
60	8.692	2.341	2.373	2.404	2.435	2.465	2.495	2.525	2.554	2.583	2.612	2.641	2.669	2.698	2.726	2.754	2.782	2.810	2.838	2.865	2.893	2.920
65	9.739	2.347	2.379	2.410	2.441	2.472	2.502	2.532	2.561	2.590	2.619	2.648	2.677	2.705	2.734	2.762	2.790	2.818	2.846	2.873	2.901	2.928
70	10.875	2.352	2.384	2.416	2.448	2.478	2.509	2.539	2.568	2.598	2.627	2.656	2.685	2.713	2.742	2.770	2.798	2.826	2.854	2.881	2.909	2.936
75	12.107	2.357	2.390	2.422	2.454	2.485	2.516	2.546	2.576	2.606	2.635	2.664	2.693	2.722	2.750	2.778	2.806	2.834	2.862	2.890	2.918	2.945
80	13.438	2.362	2.396	2.428	2.461	2.492	2.523	2.553	2.584	2.613	2.643	2.672	2.701	2.730	2.758	2.787	2.815	2.843	2.871	2.899	2.926	2.954
85	14.874	2.367	2.401	2.434	2.467	2.499	2.530	2.561	2.591	2.621	2.651	2.680	2.710	2.738	2.767	2.796	2.824	2.852	2.880	2.908	2.935	2.963
90	16.420	2.371	2.406	2.440	2.473	2.506	2.537	2.569	2.599	2.629	2.659	2.689	2.718	2.747	2.776	2.805	2.833	2.861	2.889	2.917	2.945	2.972
95	18.081	2.374	2.411	2.446	2.480	2.513	2.545	2.576	2.607	2.638	2.668	2.697	2.727	2.756	2.785	2.814	2.842	2.870	2.898	2.926	2.954	2.982
100	19.865	2.377	2.415	2.451	2.486	2.519	2.552	2.584	2.615	2.646	2.676	2.706	2.736	2.765	2.794	2.823	2.851	2.880	2.908	2.936	2.964	2.991
105	21.778	2.378	2.419	2.456	2.492	2.526	2.559	2.591	2.623	2.654	2.684	2.715	2.744	2.774	2.803	2.832	2.861	2.889	2.917	2.945	2.973	3.001
110	23.826	2.379	2.421	2.460	2.497	2.532	2.566	2.598	2.630	2.662	2.693	2.723	2.753	2.783	2.812	2.841	2.870	2.899	2.927	2.955	2.983	3.011
115	26.019	2.377	2.423	2.464	2.502	2.538	2.572	2.606	2.638	2.670	2.701	2.732	2.762	2.792	2.821	2.851	2.880	2.908	2.937	2.965	2.993	3.021
120	28.366	2.371	2.424	2.467	2.507	2.543	2.579	2.613	2.646	2.678	2.709	2.740	2.771	2.801	2.831	2.860	2.889	2.918	2.946	2.975	3.003	3.031
125	30.880	2.361	2.423	2.469	2.511	2.549	2.585	2.619	2.653	2.685	2.717	2.749	2.779	2.810	2.840	2.869	2.898	2.927	2.956	2.985	3.013	3.041
130	33.578	2.340	2.419	2.470	2.514	2.553	2.590	2.626	2.660	2.693	2.725	2.757	2.788	2.819	2.849	2.878	2.908	2.937	2.966	2.994	3.023	3.051

R-717

Anhydrous ammonia NH_3

Molecular weight (g/mol)	17.03
Melting point (°C)	-77.65
Boiling point (at 1.013 bar)	-33.33
Temperature glide at 1.013 bar (K)	0
Critical temperature (°C)	132.3
Critical pressure (bar absolute)	113.33
Specific heat (liquid) at + 25°C (kJ/kg.K)	4.784
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	2.164
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.316
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.132
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	20.49
Classification NF-EN 378	B2L
GWP (IPCC 4)	0

Main applications

R-717 (ammonia) can be used both in absorption and in compression systems, mainly for industrial type setups with screw and reciprocating compressors.

Commercial specifications

Purity: ≥ 99.9 % weight.
Water content: ≤ 400 ppm weight.
Oil content: ≤ 20 ppm weight.

Oils

Use a mineral (MO) or polyalphaolefin (PAO) oil.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Regulation

Ammonia is a product classified as toxic and flammable.
Refer to the decree of July 16, 1997 published in O.J. of October 3, 1997.

(Check local country legislation for handling and use).

Thermodynamic properties of R-717 - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.075	-75	1.370	0.730	168.031	0.585	-75.0	12.824	0.078	1646.235	8.045	1478.204
0.109	-70	1.380	0.725	189.188	0.691	-70.0	9.008	0.111	1655.554	7.909	1466.366
0.156	-65	1.390	0.719	210.490	0.794	-65.0	6.452	0.155	1664.726	7.781	1454.237
0.219	-60	1.401	0.714	231.938	0.896	-60.0	4.706	0.213	1673.734	7.660	1441.796
0.301	-55	1.413	0.708	253.533	0.996	-55.0	3.490	0.287	1682.560	7.547	1429.027
0.408	-50	1.424	0.702	275.273	1.094	-50.0	2.628	0.381	1691.186	7.440	1415.914
0.545	-45	1.436	0.696	297.153	1.191	-45.0	2.007	0.498	1699.594	7.338	1402.441
0.717	-40	1.449	0.690	319.170	1.287	-40.0	1.553	0.644	1707.763	7.243	1388.593
0.931	-35	1.462	0.684	341.321	1.381	-35.0	1.217	0.822	1715.675	7.152	1374.354
1.013	-33.33	1.466	0.682	348.743	1.412	-33.33	1.124	0.889	1718.255	7.122	1369.513
1.194	-30	1.475	0.678	363.603	1.473	-30.0	0.964	1.037	1723.311	7.065	1359.709
1.515	-25	1.489	0.672	386.013	1.564	-25.0	0.772	1.296	1730.652	6.983	1344.639
1.901	-20	1.503	0.665	408.550	1.654	-20.0	0.624	1.603	1737.677	6.904	1329.126
2.362	-15	1.518	0.659	431.216	1.742	-15.0	0.509	1.966	1744.368	6.829	1313.152
2.907	-10	1.534	0.652	454.010	1.829	-10.0	0.418	2.391	1750.705	6.757	1296.695
3.548	-5	1.550	0.645	476.936	1.915	-5.0	0.347	2.885	1756.668	6.688	1279.732
4.294	0	1.566	0.639	500.000	2.000	-0.0	0.289	3.457	1762.238	6.621	1262.238
5.157	5	1.583	0.632	523.207	2.084	5.0	0.243	4.115	1767.393	6.557	1244.186
6.150	10	1.601	0.625	546.566	2.166	10.0	0.205	4.868	1772.114	6.495	1225.548
7.285	15	1.619	0.617	570.087	2.248	15.0	0.175	5.727	1776.376	6.434	1206.289
8.575	20	1.639	0.610	593.782	2.329	20.0	0.149	6.703	1780.157	6.376	1186.375
10.032	25	1.659	0.603	617.667	2.409	25.0	0.128	7.807	1783.431	6.319	1165.764
11.672	30	1.680	0.595	641.757	2.488	30.0	0.110	9.053	1786.169	6.263	1144.412
13.508	35	1.702	0.587	666.073	2.567	35.0	0.096	10.457	1788.340	6.209	1122.267
15.554	40	1.726	0.579	690.637	2.645	40.0	0.083	12.034	1789.908	6.155	1099.272
17.827	45	1.750	0.571	715.475	2.722	45.0	0.072	13.803	1790.835	6.102	1075.360
20.340	50	1.777	0.563	740.619	2.799	50.0	0.063	15.785	1791.074	6.050	1050.455
23.111	55	1.804	0.554	766.103	2.876	55.0	0.056	18.006	1790.572	5.998	1024.469
26.156	60	1.834	0.545	791.968	2.952	60.0	0.049	20.493	1789.267	5.946	997.299
29.491	65	1.866	0.536	818.262	3.029	65.0	0.043	23.280	1787.085	5.894	968.823
33.135	70	1.900	0.526	845.042	3.105	70.0	0.038	26.407	1783.940	5.842	938.898
37.105	75	1.937	0.516	872.375	3.182	75.0	0.033	29.923	1779.724	5.788	907.349
41.420	80	1.978	0.506	900.342	3.260	80.0	0.030	33.888	1774.309	5.734	873.966
46.100	85	2.022	0.495	929.044	3.338	85.0	0.026	38.376	1767.531	5.679	838.487
51.167	90	2.071	0.483	958.605	3.417	90.0	0.023	43.484	1759.186	5.621	800.580
56.643	95	2.127	0.470	989.187	3.497	95.0	0.020	49.340	1749.005	5.561	759.818
62.553	100	2.190	0.457	1021.003	3.580	100.0	0.018	56.117	1736.632	5.497	715.629
68.923	105	2.263	0.442	1054.352	3.665	105.0	0.016	64.063	1721.566	5.429	667.214
75.783	110	2.350	0.426	1089.683	3.753	110.0	0.014	73.550	1703.076	5.354	613.393
83.170	115	2.456	0.407	1127.736	3.847	115.0	0.012	85.182	1679.994	5.270	552.258
91.125	120	2.594	0.385	1169.923	3.950	120.0	0.010	100.068	1650.230	5.172	480.307
99.702	125	2.795	0.358	1219.684	4.070	125.0	0.008	120.728	1609.123	5.048	389.439
108.977	130	3.202	0.312	1292.018	4.244	130.0	0.006	156.766	1539.317	4.857	247.299

Thermodynamic properties of R-717 - (superheated vapour) - Volume (dm³/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-75	0.075	12824.122	13155.576	13486.161	13816.023	14145.280	14474.030	14802.349	15130.304	15457.948	15785.325	16112.472	16439.420	16766.196	17092.820	17419.313	17745.690	18071.964	18398.148	18724.251	19050.282	19376.249
-70	0.109	9007.864	9236.403	9464.212	9691.412	9918.098	10144.352	10370.238	10595.811	10821.115	11046.187	11271.060	11495.759	11720.307	11944.722	12169.020	12393.216	12617.320	12841.344	13065.296	13289.183	13513.012
-65	0.156	6452.225	6613.199	6773.555	6933.393	7092.792	7251.820	7410.532	7568.972	7727.179	7885.184	8043.014	8200.692	8358.237	8515.664	8672.988	8830.220	8987.371	9144.450	9301.464	9458.420	9615.324
-60	0.219	4705.729	4821.388	4936.521	5051.208	5165.519	5279.508	5393.223	5506.702	5619.977	5733.075	5846.019	5958.829	6071.521	6184.108	6296.604	6409.018	6521.359	6633.635	6745.853	6858.018	6970.136
-55	0.301	3489.548	3574.207	3658.411	3742.231	3825.723	3908.937	3991.910	4074.677	4157.265	4239.697	4321.993	4404.170	4486.241	4568.220	4650.117	4731.940	4813.698	4895.397	4977.044	5058.644	5140.200
-50	0.408	2627.750	2690.802	2753.460	2815.783	2877.821	2939.613	3001.195	3062.595	3123.836	3184.940	3245.923	3306.799	3367.582	3428.281	3488.907	3549.467	3609.967	3670.415	3730.815	3791.172	3851.490
-45	0.545	2007.084	2054.816	2102.202	2149.294	2196.135	2242.760	2289.198	2335.475	2381.612	2427.626	2473.532	2519.342	2565.069	2610.721	2656.306	2701.831	2747.304	2792.728	2838.108	2883.450	2928.756
-40	0.717	1553.282	1589.973	1626.358	1662.483	1698.385	1734.096	1769.641	1805.043	1840.318	1875.484	1910.553	1945.537	1980.444	2015.284	2050.064	2084.790	2119.467	2154.101	2188.694	2223.252	2257.778
-35	0.931	1216.781	1245.393	1273.733	1301.841	1329.750	1357.489	1385.079	1412.541	1439.890	1467.140	1494.302	1521.388	1548.404	1575.360	1602.260	1629.112	1655.919	1682.686	1709.417	1736.115	1762.783
-33.33	1.013	1124.425	1150.838	1176.990	1202.918	1228.655	1254.226	1279.655	1304.960	1330.156	1355.256	1380.271	1405.212	1430.087	1454.902	1479.664	1504.378	1529.050	1553.682	1578.279	1602.845	1627.381
-30	1.194	963.963	986.578	1008.950	1031.115	1053.101	1074.933	1096.632	1118.215	1139.697	1161.089	1182.401	1203.644	1224.825	1245.949	1267.024	1288.054	1309.043	1329.996	1350.915	1371.804	1392.666
-25	1.515	771.672	789.777	807.663	825.362	842.899	860.298	877.576	894.749	911.830	928.829	945.757	962.621	979.428	996.184	1012.894	1029.563	1046.195	1062.793	1079.361	1095.900	1112.414
-20	1.901	623.730	638.401	652.872	667.173	681.327	695.356	709.275	723.098	736.838	750.503	764.102	777.643	791.132	804.575	817.975	831.337	844.666	857.963	871.231	884.474	897.693
-15	2.362	508.679	520.703	532.545	544.230	555.782	567.219	578.556	589.805	600.977	612.082	623.126	634.116	645.059	655.959	666.819	677.645	688.440	699.205	709.944	720.660	731.353
-10	2.907	418.303	428.264	438.057	447.708	457.235	466.657	475.987	485.236	494.414	503.530	512.591	521.602	530.569	539.496	548.388	557.247	566.076	574.879	583.658	592.414	601.150
-5	3.548	346.635	354.972	363.154	371.203	379.140	386.978	394.732	402.411	410.025	417.581	425.086	432.545	439.964	447.345	454.693	462.011	469.302	476.568	483.812	491.034	498.237
0	4.294	289.297	296.343	303.244	310.022	316.695	323.277	329.781	336.216	342.590	348.911	355.184	361.415	367.607	373.765	379.893	385.992	392.066	398.117	404.146	410.156	416.148
5	5.157	243.039	249.049	254.923	260.682	266.343	271.920	277.423	282.862	288.245	293.578	298.867	304.116	309.329	314.511	319.664	324.790	329.893	334.974	340.035	345.077	350.103
10	6.150	205.426	210.597	215.640	220.575	225.419	230.184	234.880	239.515	244.099	248.635	253.130	257.588	262.013	266.408	270.776	275.119	279.440	283.740	288.022	292.286	296.535
15	7.285	174.614	179.101	183.467	187.731	191.909	196.012	200.051	204.033	207.966	211.855	215.705	219.520	223.305	227.061	230.791	234.499	238.185	241.852	245.502	249.135	252.753
20	8.575	149.198	153.122	156.932	160.645	164.276	167.836	171.336	174.783	178.182	181.541	184.863	188.152	191.412	194.645	197.854	201.042	204.209	207.359	210.491	213.609	216.712
25	10.032	128.092	131.552	134.901	138.158	141.337	144.449	147.503	150.508	153.467	156.388	159.274	162.130	164.957	167.759	170.539	173.298	176.038	178.761	181.468	184.161	186.841
30	11.672	110.457	113.529	116.495	119.372	122.175	124.914	127.598	130.234	132.829	135.386	137.910	140.405	142.873	145.318	147.741	150.145	152.530	154.900	157.254	159.595	161.923
35	13.508	95.632	98.381	101.026	103.585	106.073	108.500	110.874	113.202	115.490	117.743	119.965	122.159	124.327	126.473	128.598	130.705	132.795	134.869	136.929	138.976	141.011
40	15.554	83.101	85.576	87.951	90.243	92.466	94.630	96.743	98.812	100.842	102.839	104.806	106.747	108.663	110.558	112.433	114.290	116.132	117.958	119.771	121.571	123.360
45	17.827	72.450	74.695	76.842	78.908	80.906	82.846	84.738	86.588	88.401	90.181	91.933	93.659	95.362	97.044	98.708	100.354	101.986	103.603	105.206	106.798	108.379
50	20.340	63.350	65.401	67.354	69.227	71.034	72.785	74.489	76.152	77.779	79.375	80.944	82.487	84.009	85.511	86.995	88.462	89.915	91.354	92.780	94.195	95.600
55	23.111	55.537	57.424	59.211	60.920	62.564	64.153	65.696	67.199	68.668	70.106	71.518	72.906	74.272	75.620	76.950	78.264	79.564	80.851	82.127	83.391	84.644
60	26.156	48.797	50.544	52.191	53.759	55.263	56.713	58.118	59.484	60.816	62.119	63.396	64.650	65.883	67.098	68.296	69.479	70.648	71.805	72.950	74.084	75.209
65	29.491	42.955	44.584	46.111	47.559	48.942	50.273	51.558	52.806	54.020	55.206	56.366	57.505	58.623	59.723	60.807	61.877	62.933	63.977	65.010	66.033	67.046
70	33.135	37.868	39.398	40.823	42.168	43.447	44.674	45.857	47.001	48.114	49.198	50.258	51.296	52.314	53.315	54.300	55.272	56.230	57.176	58.112	59.038	59.954
75	37.105	33.419	34.866	36.205	37.461	38.651	39.788	40.881	41.936	42.960	43.956	44.928	45.878	46.810	47.724	48.624	49.509	50.382	51.244	52.095	52.936	53.768
80	41.420	29.509	30.890	32.156	33.336	34.449	35.508	36.523	37.500	38.446	39.365	40.260	41.134	41.989	42.828	43.652	44.463	45.261	46.048	46.825	47.593	48.352
85	46.100	26.058	27.387	28.592	29.707	30.753	31.745	32.691	33.601	34.479	35.330	36.157	36.964	37.753	38.525	39.283	40.028	40.760	41.482	42.194	42.897	43.592
90	51.167	22.997	24.288	25.444	26.504	27.493	28.425	29.312	30.162	30.980	31.771	32.539	33.287	34.016	34.730	35.430	36.116	36.791	37.455	38.110	38.756	39.393
95	56.643	20.268	21.536	22.653	23.667	24.606	25.487	26.321	27.118	27.884	28.622	29.337	30.032	30.710	31.372	32.020	32.655	33.278	33.892	34.496	35.091	35.678
100	62.553	17.820	19.082	20.170	21.146	22.042	22.878	23.667	24.417	25.135	25.827	26.495	27.144	27.775	28.390	28.992	29.582	30.160	30.728	31.286	31.837	32.379
105	68.923	15.610	16.884	17.953	18.898	19.758	20.555	21.303	22.012	22.688	23.338	23.965	24.572	25.161	25.736	26.296	26.845	27.382	27.910	28.428	28.938	29.441
110	75.783	13.596	14.907	15.968	16.889	17.718	18.480	19.192	19.864	20.504	21.116	21.705	22.275	22.827	23.364	23.888	24.399	24.900	25.391	25.874	26.348	26.815
115	83.170	11.740	13.121	14.184	15.087	15.890	16.622	17.302	17.941	18.547	19.125	19.681	20.216	20.735	21.239	21.729	22.208	22.676	23.134	23.584	24.025	24.460
120	91.125	9.993	11.501	12.578	13.468	14.248	14.954	15.605	16.214	16.789	17.337	17.861	18.367	18.855	19.328	19.788	20.236	20.675	21.103	21.523	21.936	22.341
125	99.702	8.283	10.025	11.126	12.008	12.769	13.450	14.075	14.657	15.204	15.724	16.220	16.697	17.157	17.603	18.035	18.456	18.867	19.269	19.662	20.048	20.426
130	108.977	6.379	8.674	9.811	10.688	11.431	12.090	12.691	13.247	13.768	14.262	14.732	15.184	15.618	16.038	16.445	16.841	17.226	17.603	17.972	18.333	18.687

Thermodynamic properties of R-717 - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																					
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
-75	0.075	1646.235	1656.562	1666.852	1677.113	1687.355	1697.584	1707.806	1718.027	1728.251	1738.481	1748.722	1758.976	1769.246	1779.535	1789.845	1800.178	1810.535	1820.920	1831.332	1841.774	1852.248	
-70	0.109	1655.554	1665.956	1676.313	1686.637	1696.937	1707.221	1717.495	1727.765	1738.037	1748.314	1758.600	1768.898	1779.212	1789.545	1799.898	1810.274	1820.675	1831.102	1841.558	1852.044	1862.561	
-65	0.156	1664.726	1675.216	1685.653	1696.051	1706.419	1716.767	1727.101	1737.429	1747.755	1758.085	1768.423	1778.772	1789.135	1799.516	1809.917	1820.340	1830.788	1841.263	1851.765	1862.298	1872.862	
-60	0.219	1673.734	1684.326	1694.856	1705.339	1715.786	1726.208	1736.612	1747.005	1757.394	1767.784	1778.180	1788.585	1799.003	1809.438	1819.892	1830.367	1840.867	1851.392	1861.946	1872.529	1883.143	
-55	0.301	1682.560	1693.269	1703.905	1714.486	1725.024	1735.530	1746.012	1756.480	1766.940	1777.398	1787.859	1798.327	1808.806	1819.300	1829.812	1840.344	1850.900	1861.481	1872.089	1882.726	1893.395	
-50	0.408	1691.186	1702.027	1712.785	1723.476	1734.116	1744.717	1755.289	1765.840	1776.380	1786.913	1797.446	1807.984	1818.531	1829.090	1839.666	1850.261	1860.877	1871.518	1882.185	1892.881	1903.607	
-45	0.545	1699.594	1710.583	1721.477	1732.292	1743.047	1753.754	1764.426	1775.071	1785.699	1796.316	1806.929	1817.544	1828.165	1838.796	1849.441	1860.104	1870.787	1881.493	1892.224	1902.983	1913.771	
-40	0.717	1707.763	1718.919	1729.964	1740.918	1751.800	1762.626	1773.408	1784.157	1794.882	1805.592	1816.294	1826.993	1837.696	1848.405	1859.127	1869.863	1880.618	1891.394	1902.194	1913.021	1923.875	
-35	0.931	1715.675	1727.016	1738.228	1749.336	1760.359	1771.316	1782.219	1793.083	1803.916	1814.728	1825.527	1836.319	1847.110	1857.905	1868.709	1879.525	1890.358	1901.210	1912.084	1922.983	1933.909	
-33.33	1.013	1718.255	1729.662	1740.934	1752.096	1763.170	1774.173	1785.120	1796.023	1806.895	1817.743	1828.576	1839.401	1850.223	1861.048	1871.881	1882.726	1893.586	1904.465	1915.365	1926.289	1937.240	
-30	1.194	1723.311	1734.856	1746.253	1757.529	1768.708	1779.808	1790.845	1801.834	1812.785	1823.708	1834.613	1845.505	1856.393	1867.281	1878.175	1889.078	1899.994	1910.928	1921.882	1932.859	1943.861	
-25	1.515	1730.652	1742.420	1754.019	1765.481	1776.829	1788.086	1799.270	1810.395	1821.474	1832.519	1843.538	1854.540	1865.533	1876.521	1887.511	1898.508	1909.515	1920.536	1931.575	1942.635	1953.719	
-20	1.901	1737.677	1749.690	1761.510	1773.173	1784.707	1796.135	1807.477	1818.750	1829.969	1841.145	1852.289	1863.410	1874.515	1885.612	1896.706	1907.803	1918.907	1930.022	1941.153	1952.302	1963.472	
-15	2.362	1744.368	1756.647	1768.708	1780.590	1792.324	1803.937	1815.451	1826.885	1838.255	1849.573	1860.851	1872.099	1883.326	1894.540	1905.746	1916.950	1928.158	1939.374	1950.603	1961.846	1973.109	
-10	2.907	1750.705	1763.273	1775.595	1787.714	1799.665	1811.478	1823.178	1834.785	1846.317	1857.788	1869.210	1880.596	1891.954	1903.292	1914.618	1925.937	1937.256	1948.580	1959.912	1971.257	1982.618	
-5	3.548	1756.668	1769.550	1782.154	1794.528	1806.714	1818.742	1830.642	1842.435	1854.141	1865.776	1877.353	1888.886	1900.383	1911.855	1923.309	1934.752	1946.189	1957.627	1969.070	1980.522	1991.988	
0	4.294	1762.238	1775.459	1788.367	1801.017	1813.454	1825.714	1837.828	1849.821	1861.713	1873.523	1885.266	1896.956	1908.603	1920.217	1931.807	1943.381	1954.945	1966.504	1978.065	1989.631	2001.207	
5	5.157	1767.393	1780.980	1794.216	1807.162	1819.869	1832.378	1844.721	1856.927	1869.019	1881.016	1892.936	1904.793	1916.599	1928.365	1940.101	1951.814	1963.511	1975.200	1986.885	1998.572	2010.265	
10	6.150	1772.114	1786.095	1799.683	1812.947	1825.944	1838.718	1851.306	1863.740	1876.045	1888.242	1900.350	1912.385	1924.360	1936.288	1948.177	1960.038	1971.877	1983.703	1995.520	2007.335	2019.152	
15	7.285	1776.376	1790.783	1804.750	1818.355	1831.661	1844.719	1857.569	1870.245	1882.776	1895.186	1907.494	1919.719	1931.873	1943.972	1956.025	1968.042	1980.031	1992.001	2003.958	2015.908	2027.855	
20	8.575	1780.157	1795.023	1809.397	1823.367	1837.004	1850.365	1863.493	1876.428	1889.200	1901.836	1914.356	1926.781	1939.127	1951.406	1963.632	1975.814	1987.963	2000.085	2012.189	2024.281	2036.367	
25	10.032	1783.431	1798.792	1813.603	1827.965	1841.956	1855.639	1869.065	1882.275	1895.303	1908.178	1920.923	1933.561	1946.107	1958.578	1970.987	1983.344	1995.660	2007.944	2020.203	2032.445	2044.675	
30	11.672	1786.169	1802.065	1817.347	1832.128	1846.498	1860.526	1874.268	1887.770	1901.069	1914.198	1927.182	1940.045	1952.804	1965.478	1978.079	1990.620	2003.113	2015.567	2027.989	2040.389	2052.771	
35	13.508	1788.340	1804.816	1820.605	1835.837	1850.612	1865.007	1879.086	1892.898	1906.486	1919.884	1933.120	1946.220	1959.205	1972.092	1984.896	1997.632	2010.311	2022.943	2035.538	2048.103	2060.645	
40	15.554	1789.908	1807.015	1823.352	1839.069	1854.277	1869.065	1883.502	1897.644	1911.538	1925.220	1938.724	1952.076	1965.298	1978.410	1991.429	2004.369	2017.244	2030.064	2042.839	2055.578	2068.289	
45	17.827	1790.835	1808.629	1825.560	1841.798	1857.472	1872.679	1887.498	1901.991	1916.209	1930.194	1943.980	1957.597	1971.070	1984.419	1997.664	2010.820	2023.901	2036.918	2049.883	2062.805	2075.691	
50	20.340	1791.074	1809.621	1827.198	1844.000	1860.173	1875.829	1891.056	1905.923	1920.485	1934.790	1948.875	1962.772	1976.510	1990.110	2003.592	2016.974	2030.272	2043.496	2056.660	2069.773	2082.845	
55	23.111	1790.572	1809.950	1828.231	1845.644	1862.356	1878.494	1894.156	1909.420	1924.348	1938.992	1953.394	1967.588	1981.604	1995.468	2009.201	2022.821	2036.346	2049.788	2063.161	2076.475	2089.740	
60	26.156	1789.267	1809.568	1828.622	1846.699	1863.992	1880.648	1896.776	1912.464	1927.782	1942.786	1957.522	1972.030	1986.341	2000.483	2014.479	2028.350	2042.114	2055.784	2069.376	2082.900	2096.368	
65	29.491	1787.085	1808.419	1828.326	1847.128	1865.053	1882.266	1898.894	1915.035	1930.768	1946.154	1961.245	1976.084	1990.706	2005.141	2019.415	2033.549	2047.564	2061.474	2075.296	2089.040	2102.720	
70	33.135	1783.940	1806.439	1827.294	1846.893	1865.504	1883.320	1900.486	1917.112	1933.286	1949.079	1964.546	1979.736	1994.686	2009.430	2023.996	2038.408	2052.686	2066.848	2080.910	2094.886	2108.787	
75	37.105	1779.724	1803.553	1825.470	1845.949	1865.310	1883.779	1901.524	1918.670	1935.317	1951.542	1967.409	1982.970	1998.267	2013.338	2028.211	2042.914	2057.469	2071.895	2086.210	2100.427	2114.560	
80	41.420	1774.309	1799.674	1822.789	1844.245	1864.430	1883.611	1901.981	1919.686	1936.838	1953.524	1969.816	1985.770	2001.435	2016.849	2032.047	2047.057	2061.902	2076.605	2091.184	2105.654	2120.030	
85	46.100	1767.531	1794.698	1819.177	1841.726	1862.820	1882.777	1901.826	1920.133	1937.826	1955.004	1971.748	1988.119	2004.173	2019.951	2035.490	2050.822	2065.974	2080.967	2095.823	2110.558	2125.188	
90	51.167	1759.186	1788.499	1814.550	1838.330	1860.431	1881.240	1901.025	1919.982	1938.256	1955.961	1973.185	1990.000	2006.465	2022.627	2038.526	2054.198	2069.671	2084.969	2100.116	2115.128	2130.024	
95	56.643	1749.005	1780.927	1808.810	1833.986	1857.210	1878.956	1899.544	1919.204	1938.103	1956.371	1974.108	1991.394	2008.294	2024.862	2041.141	2057.171	2072.981	2088.600	2104.050	2119.353	2134.526	
100	62.553	1736.632	1771.801	1801.843	1828.616	1853.098	1875.878	1897.344	1917.765	1937.338	1956.209	1974.493	1992.279	2009.642	2026.638	2043.319	2059.724	2075.890	2091.844	2107.614	2123.221	2138.685	
105	68.923	1721.566	1760.895	1793.520	1822.132	1848.029	1871.956	1894.383	1915.631	1935.929	1955.447	1974.315	1992.634	2010.486	2027.937	2045.041	2061.843	2078.381	2094.689	2110.793	2126.718	2142.486	
110	75.783	1703.076	1747.932	1783.691	1814.437	1841.934	1867.133	1890.614	1912.761	1933.842	1954.055	1973.547	1992.433	2010.805	2028.736	2046.286	2063.506	2080.437	2097.114	2113.570	2129.828	2145.914	
115	83.170	1679.994	1732.564	1772.184	1805.422	1834.733	1861.348	1885.986	1909.110	1931.037	1951.995	1972.154	1991.644	2010.568	2029.007	2047.029	2064.689	2082.033	2099.100	2115.923	2132.531	2148.949	
120	91.125	1650.230	1714.356	1758.801	1794.964	1826.334	1854.525	1880.435	1904.623	1927.464	1949.222	1970.094	1990.227	2009.737	2028.715	2047.235	2065.359	2083.138	2100.614	2117.823	2134.798	2151.564	
125	99.702	1609.123	1692.761	1743.313	1782.915	1816.624	1846.570	1873.876	1899.222	1923.050	1945.670	1967.305	1988.124	2008.257	2027.806	2046.854	2065.469	2083.706	2101.612	2119.228	2136.587	2153.718	
130	108.977	1539.317	1667.125	1725.441	1769.077	1805.440	1837.338	1866.180	1892.787	1917.685	1941.233	1963.687	1985.240	2006.037	2026.194	2045.803	2064.938	2083.660	2102.022	2120.066	2137.831	2155.347	

Thermodynamic properties of R-717 - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-75	0.075	8.045	8.097	8.147	8.195	8.243	8.289	8.335	8.379	8.422	8.465	8.507	8.547	8.588	8.627	8.666	8.704	8.742	8.779	8.815	8.851	8.886
-70	0.109	7.909	7.959	8.009	8.056	8.103	8.149	8.193	8.237	8.279	8.321	8.362	8.403	8.442	8.481	8.519	8.557	8.594	8.631	8.667	8.702	8.737
-65	0.156	7.781	7.830	7.879	7.926	7.972	8.017	8.061	8.104	8.146	8.187	8.227	8.267	8.306	8.344	8.382	8.419	8.456	8.492	8.527	8.562	8.597
-60	0.219	7.660	7.709	7.757	7.803	7.849	7.893	7.936	7.979	8.020	8.061	8.101	8.140	8.178	8.216	8.253	8.290	8.326	8.362	8.397	8.431	8.466
-55	0.301	7.547	7.595	7.642	7.688	7.733	7.777	7.819	7.861	7.902	7.942	7.981	8.020	8.058	8.096	8.132	8.169	8.204	8.240	8.274	8.308	8.342
-50	0.408	7.440	7.488	7.534	7.580	7.624	7.667	7.709	7.751	7.791	7.831	7.870	7.908	7.945	7.982	8.019	8.055	8.090	8.125	8.159	8.193	8.226
-45	0.545	7.338	7.386	7.432	7.477	7.521	7.564	7.605	7.646	7.686	7.726	7.764	7.802	7.839	7.876	7.912	7.947	7.982	8.017	8.051	8.084	8.117
-40	0.717	7.243	7.290	7.336	7.380	7.424	7.466	7.507	7.548	7.588	7.626	7.665	7.702	7.739	7.775	7.811	7.846	7.880	7.915	7.948	7.982	8.014
-35	0.931	7.152	7.199	7.244	7.289	7.332	7.374	7.415	7.455	7.494	7.533	7.571	7.608	7.644	7.680	7.716	7.750	7.785	7.818	7.852	7.885	7.917
-33.33	1.013	7.122	7.169	7.215	7.259	7.302	7.344	7.385	7.425	7.464	7.503	7.540	7.577	7.614	7.650	7.685	7.720	7.754	7.788	7.821	7.854	7.886
-30	1.194	7.065	7.112	7.158	7.202	7.245	7.286	7.327	7.367	7.406	7.444	7.482	7.519	7.555	7.590	7.626	7.660	7.694	7.728	7.761	7.794	7.826
-25	1.515	6.983	7.030	7.075	7.119	7.162	7.203	7.244	7.284	7.322	7.360	7.398	7.434	7.470	7.506	7.540	7.575	7.608	7.642	7.675	7.707	7.739
-20	1.901	6.904	6.951	6.996	7.040	7.083	7.124	7.165	7.204	7.243	7.281	7.318	7.354	7.390	7.425	7.460	7.494	7.527	7.560	7.593	7.625	7.657
-15	2.362	6.829	6.876	6.921	6.965	7.008	7.049	7.090	7.129	7.167	7.205	7.242	7.278	7.314	7.349	7.383	7.417	7.450	7.483	7.516	7.548	7.580
-10	2.907	6.757	6.804	6.850	6.894	6.936	6.978	7.018	7.057	7.095	7.133	7.170	7.206	7.241	7.276	7.310	7.344	7.377	7.410	7.442	7.474	7.506
-5	3.548	6.688	6.735	6.781	6.825	6.868	6.909	6.949	6.989	7.027	7.064	7.101	7.137	7.172	7.207	7.241	7.275	7.308	7.340	7.373	7.404	7.436
0	4.294	6.621	6.669	6.715	6.759	6.802	6.844	6.884	6.923	6.961	6.999	7.035	7.071	7.107	7.141	7.175	7.209	7.242	7.274	7.306	7.338	7.369
5	5.157	6.557	6.605	6.652	6.696	6.739	6.781	6.821	6.860	6.899	6.936	6.973	7.009	7.044	7.078	7.112	7.146	7.178	7.211	7.243	7.274	7.306
10	6.150	6.495	6.544	6.590	6.635	6.678	6.720	6.761	6.800	6.839	6.876	6.913	6.948	6.984	7.018	7.052	7.085	7.118	7.151	7.182	7.214	7.245
15	7.285	6.434	6.484	6.531	6.576	6.620	6.662	6.703	6.742	6.781	6.818	6.855	6.891	6.926	6.961	6.994	7.028	7.061	7.093	7.125	7.156	7.187
20	8.575	6.376	6.426	6.474	6.520	6.564	6.606	6.647	6.687	6.725	6.763	6.800	6.836	6.871	6.905	6.939	6.972	7.005	7.038	7.069	7.101	7.132
25	10.032	6.319	6.370	6.418	6.465	6.509	6.552	6.593	6.633	6.672	6.709	6.746	6.782	6.818	6.852	6.886	6.919	6.952	6.985	7.016	7.048	7.079
30	11.672	6.263	6.315	6.364	6.411	6.456	6.499	6.541	6.581	6.620	6.658	6.695	6.731	6.766	6.801	6.835	6.869	6.901	6.934	6.965	6.997	7.028
35	13.508	6.209	6.262	6.312	6.359	6.405	6.448	6.490	6.531	6.570	6.608	6.645	6.682	6.717	6.752	6.786	6.819	6.852	6.885	6.916	6.948	6.979
40	15.554	6.155	6.209	6.260	6.308	6.354	6.398	6.441	6.482	6.521	6.560	6.597	6.634	6.669	6.704	6.739	6.772	6.805	6.837	6.869	6.901	6.932
45	17.827	6.102	6.158	6.210	6.259	6.305	6.350	6.393	6.434	6.474	6.513	6.551	6.587	6.623	6.658	6.693	6.726	6.759	6.792	6.824	6.855	6.886
50	20.340	6.050	6.107	6.160	6.210	6.257	6.303	6.346	6.388	6.428	6.467	6.505	6.542	6.578	6.614	6.648	6.682	6.715	6.748	6.780	6.811	6.843
55	23.111	5.998	6.056	6.111	6.162	6.210	6.256	6.300	6.343	6.383	6.423	6.461	6.499	6.535	6.570	6.605	6.639	6.673	6.705	6.737	6.769	6.800
60	26.156	5.946	6.006	6.062	6.115	6.164	6.211	6.255	6.298	6.340	6.380	6.418	6.456	6.493	6.528	6.563	6.597	6.631	6.664	6.696	6.728	6.759
65	29.491	5.894	5.957	6.014	6.068	6.118	6.166	6.211	6.255	6.297	6.337	6.376	6.414	6.451	6.487	6.522	6.557	6.591	6.624	6.656	6.688	6.719
70	33.135	5.842	5.907	5.966	6.021	6.073	6.122	6.168	6.212	6.255	6.296	6.335	6.374	6.411	6.447	6.483	6.517	6.551	6.585	6.617	6.649	6.681
75	37.105	5.788	5.856	5.918	5.975	6.028	6.078	6.125	6.170	6.213	6.255	6.295	6.334	6.371	6.408	6.444	6.479	6.513	6.546	6.579	6.612	6.643
80	41.420	5.734	5.806	5.870	5.929	5.983	6.034	6.082	6.128	6.172	6.214	6.255	6.294	6.332	6.370	6.406	6.441	6.475	6.509	6.542	6.575	6.607
85	46.100	5.679	5.754	5.821	5.882	5.938	5.991	6.040	6.087	6.132	6.174	6.216	6.256	6.294	6.332	6.368	6.404	6.439	6.473	6.506	6.539	6.571
90	51.167	5.621	5.702	5.772	5.835	5.893	5.947	5.998	6.046	6.091	6.135	6.177	6.217	6.257	6.294	6.331	6.367	6.402	6.437	6.470	6.503	6.536
95	56.643	5.561	5.647	5.722	5.788	5.848	5.904	5.956	6.005	6.051	6.096	6.138	6.180	6.219	6.258	6.295	6.331	6.367	6.402	6.436	6.469	6.501
100	62.553	5.497	5.591	5.670	5.739	5.802	5.860	5.913	5.964	6.011	6.057	6.100	6.142	6.182	6.221	6.259	6.296	6.332	6.367	6.401	6.435	6.467
105	68.923	5.429	5.532	5.617	5.690	5.756	5.815	5.871	5.923	5.971	6.018	6.062	6.105	6.146	6.185	6.224	6.261	6.297	6.333	6.367	6.401	6.434
110	75.783	5.354	5.471	5.562	5.640	5.709	5.771	5.828	5.881	5.931	5.979	6.024	6.067	6.109	6.149	6.188	6.226	6.263	6.299	6.334	6.368	6.401
115	83.170	5.270	5.405	5.505	5.588	5.660	5.725	5.784	5.839	5.891	5.939	5.986	6.030	6.072	6.113	6.153	6.191	6.229	6.265	6.300	6.335	6.369
120	91.125	5.172	5.334	5.445	5.534	5.611	5.678	5.740	5.797	5.850	5.900	5.947	5.992	6.036	6.077	6.118	6.156	6.194	6.231	6.267	6.302	6.336
125	99.702	5.048	5.257	5.382	5.478	5.559	5.631	5.695	5.754	5.808	5.860	5.908	5.954	5.999	6.041	6.082	6.122	6.160	6.197	6.233	6.269	6.303
130	108.977	4.857	5.173	5.315	5.420	5.506	5.581	5.648	5.709	5.766	5.819	5.868	5.916	5.961	6.004	6.046	6.086	6.125	6.163	6.200	6.235	6.270

R-744

Carbon dioxide CO_2

Molecular weight (g/mol)	44.01
Melting point (°C)	-56.55
Sublimation temperature (at 1 atm) in °C	-78.46
Temperature glide at 1.013 bar (K)	N/A
Critical temperature (°C)	31.0
Critical pressure (bar absolute)	73.77
Specific heat (liquid) at + 25°C (kJ/kg.K)	6.467
Specific heat (vapour) at 1.013 bar and + 25°C (kJ/kg.K)	0.851
Thermal capacity ratio (Cp/Cv) at + 25°C and 1.013 bar	1.294
Viscosity (liquid) at + 25°C in Centipoise (10^{-3} Pa.s)	0.057
Surface tension at + 25°C in dyne per centimetre (10^{-3} N/m)	0.57
Classification NF-EN 378	A1
GWP (IPCC 4)	0

Main applications

R-744 (carbon dioxide) is a refrigerant designed for industrial and commercial refrigeration applications. It can be used in direct expansion systems, in cascade refrigeration (sub-critical) with HFC or NH_3 or HFO booster systems (trans-critical).

Commercial specifications

Purity: ≥ 99.9 % weight.
Water content: ≤ 5 ppm weight.

Oils

CO_2 has its own behaviour characteristics with oils, particularly in terms of miscibility and solubility. The selection of oils should be made depending on the application or system and those specified by the compressor manufacturer. Specialist polyolester miscible oils (POE), polyalphaolefin (PAO) and polyalkylene glycol (PAG) immiscible oils are available.
Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

Thermodynamic properties of R-744 - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t'	v'	p'	h'	s'	t"	v"	p"	h"	s"	Lv
(bar)	(°C)	(dm^3/kg)	(kg/dm^3)	(kJ/kg)	(kJ/kg.K)	(°C)	(m^3/kg)	(kg/m^3)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
5.540	-55	0.853	1.173	83.091	0.535	-55.0	0.068	14.673	430.987	2.130	347.896
6.823	-50	0.866	1.155	92.943	0.579	-50.0	0.056	17.925	432.676	2.102	339.733
8.318	-45	0.880	1.136	102.874	0.623	-45.0	0.046	21.717	434.128	2.075	331.255
10.045	-40	0.896	1.116	112.903	0.666	-40.0	0.038	26.121	435.322	2.049	322.419
12.024	-35	0.912	1.096	123.050	0.708	-35.0	0.032	31.216	436.230	2.023	313.180
14.278	-30	0.930	1.076	133.337	0.750	-30.0	0.027	37.098	436.820	1.998	303.483
16.827	-25	0.949	1.054	143.793	0.791	-25.0	0.023	43.880	437.055	1.973	293.262
19.696	-20	0.969	1.032	154.448	0.833	-20.0	0.019	51.700	436.891	1.949	282.443
22.908	-15	0.992	1.008	165.342	0.874	-15.0	0.016	60.728	436.274	1.924	270.932
26.487	-10	1.017	0.983	176.521	0.916	-10.0	0.014	71.185	435.135	1.898	258.615
30.459	-5	1.046	0.956	188.046	0.958	-5.0	0.012	83.359	433.384	1.872	245.338
34.851	0	1.078	0.927	200.000	1.000	0.0	0.010	97.647	430.893	1.845	230.893
39.695	5	1.116	0.896	212.502	1.043	5.0	0.009	114.621	427.485	1.816	214.983
45.022	10	1.161	0.861	225.730	1.088	10.0	0.007	135.156	422.884	1.785	197.154
50.871	15	1.218	0.821	239.989	1.136	15.0	0.006	160.730	416.636	1.749	176.646
57.291	20	1.293	0.773	255.869	1.188	20.0	0.005	194.202	407.865	1.706	151.997
64.342	25	1.407	0.711	274.784	1.248	25.0	0.004	242.732	394.429	1.650	119.645
72.137	30	1.685	0.593	304.553	1.343	30.0	0.003	345.102	365.129	1.543	60.575

Thermodynamic properties of R-744 - (superheated vapour) - Volume (dm^3/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-55	5.540	68.151	70.233	72.277	74.290	76.275	78.235	80.175	82.096	84.002	85.892	87.770	89.637	91.493	93.339	95.177	97.008	98.831	100.647	102.458	104.263	106.063
-50	6.823	55.789	57.534	59.243	60.920	62.571	64.200	65.808	67.398	68.974	70.535	72.084	73.623	75.151	76.671	78.183	79.687	81.184	82.676	84.161	85.642	87.117
-45	8.318	46.046	47.530	48.977	50.394	51.786	53.155	54.505	55.838	57.156	58.461	59.755	61.038	62.312	63.577	64.835	66.086	67.330	68.568	69.801	71.029	72.252
-40	10.045	38.284	39.561	40.803	42.016	43.202	44.367	45.514	46.644	47.760	48.864	49.956	51.038	52.112	53.177	54.235	55.286	56.331	57.370	58.404	59.433	60.458
-35	12.024	32.035	33.150	34.229	35.278	36.302	37.305	38.289	39.258	40.213	41.156	42.088	43.010	43.924	44.830	45.728	46.621	47.507	48.388	49.264	50.135	51.003
-30	14.278	26.956	27.942	28.890	29.809	30.702	31.574	32.429	33.268	34.093	34.907	35.710	36.504	37.289	38.067	38.838	39.602	40.361	41.115	41.864	42.608	43.349
-25	16.827	22.789	23.673	24.517	25.330	26.118	26.884	27.633	28.367	29.087	29.796	30.494	31.183	31.864	32.538	33.205	33.866	34.522	35.172	35.818	36.460	37.097
-20	19.696	19.343	20.144	20.904	21.632	22.333	23.014	23.676	24.324	24.958	25.581	26.193	26.797	27.393	27.982	28.564	29.140	29.711	30.277	30.838	31.395	31.949
-15	22.908	16.467	17.204	17.896	18.554	19.186	19.796	20.387	20.963	21.527	22.079	22.620	23.154	23.679	24.197	24.709	25.215	25.716	26.212	26.704	27.192	27.676
-10	26.487	14.048	14.736	15.374	15.975	16.549	17.100	17.633	18.151	18.655	19.148	19.631	20.105	20.571	21.031	21.484	21.932	22.375	22.813	23.247	23.677	24.103
-5	30.459	11.996	12.648	13.243	13.799	14.326	14.828	15.312	15.780	16.235	16.679	17.112	17.537	17.954	18.365	18.769	19.168	19.562	19.951	20.336	20.717	21.095
0	34.851	10.241	10.869	11.432	11.951	12.438	12.901	13.344	13.771	14.184	14.586	14.978	15.361	15.736	16.105	16.468	16.825	17.178	17.526	17.870	18.210	18.547
5	39.695	8.724	9.343	9.883	10.373	10.828	11.257	11.665	12.057	12.435	12.801	13.157	13.505	13.845	14.179	14.506	14.828	15.146	15.458	15.767	16.073	16.374
10	45.022	7.399	8.024	8.549	9.016	9.445	9.846	10.225	10.587	10.935	11.271	11.597	11.914	12.224	12.527	12.824	13.116	13.403	13.685	13.964	14.240	14.512
15	50.871	6.222	6.875	7.394	7.845	8.252	8.629	8.984	9.320	9.642	9.952	10.251	10.542	10.826	11.102	11.373	11.639	11.900	12.156	12.409	12.659	12.905
20	57.291	5.149	5.866	6.388	6.828	7.218	7.575	7.908	8.222	8.521	8.808	9.085	9.353	9.613	9.867	10.115	10.358	10.596	10.830	11.060	11.287	11.510
25	64.342	4.120	4.974	5.509	5.941	6.317	6.656	6.971	7.265	7.544	7.811	8.067	8.315	8.555	8.789	9.016	9.239	9.457	9.671	9.881	10.088	10.292
30	72.137	2.898	4.179	4.733	5.160	5.524	5.848	6.145	6.422	6.684	6.932	7.170	7.400	7.622	7.837	8.047	8.251	8.451	8.648	8.840	9.029	9.216

Thermodynamic properties of R-744 - (superheated vapour) - Enthalpy (kJ/kg)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-55	5.540	430.987	435.550	440.059	444.523	448.954	453.359	457.745	462.120	466.487	470.852	475.217	479.585	483.958	488.340	492.731	497.132	501.546	505.973	510.414	514.870	519.341
-50	6.823	432.676	437.397	442.050	446.645	451.195	455.711	460.201	464.672	469.130	473.580	478.026	482.472	486.919	491.371	495.829	500.296	504.771	509.258	513.757	518.268	522.793
-45	8.318	434.128	439.029	443.841	448.580	453.262	457.899	462.501	467.077	471.633	476.175	480.709	485.237	489.763	494.290	498.820	503.355	507.897	512.447	517.006	521.577	526.158
-40	10.045	435.322	440.425	445.416	450.315	455.141	459.910	464.634	469.323	473.985	478.627	483.255	487.871	492.482	497.089	501.695	506.304	510.915	515.533	520.157	524.789	529.430
-35	12.024	436.230	441.563	446.754	451.831	456.817	461.731	466.588	471.401	476.177	480.927	485.655	490.367	495.067	499.760	504.448	509.134	513.820	518.509	523.201	527.899	532.604
-30	14.278	436.820	442.418	447.836	453.112	458.274	463.348	468.351	473.297	478.198	483.064	487.900	492.714	497.512	502.296	507.071	511.840	516.605	521.369	526.134	530.902	535.674
-25	16.827	437.055	442.961	448.638	454.137	459.497	464.747	469.909	475.002	480.038	485.028	489.982	494.906	499.807	504.689	509.557	514.414	519.263	524.108	528.949	533.791	538.633
-20	19.696	436.891	443.160	449.134	454.886	460.466	465.911	471.249	476.502	481.685	486.811	491.891	496.934	501.945	506.932	511.899	516.850	521.789	526.718	531.642	536.561	541.478
-15	22.908	436.274	442.975	449.294	455.334	461.161	466.824	472.356	477.784	483.127	488.402	493.619	498.788	503.919	509.018	514.090	519.141	524.175	529.196	534.205	539.207	544.204
-10	26.487	435.135	442.359	449.083	455.453	461.561	467.467	473.215	478.836	484.355	489.790	495.154	500.462	505.721	510.939	516.125	521.283	526.418	531.534	536.635	541.725	546.805
-5	30.459	433.384	441.254	448.460	455.214	461.642	467.822	473.809	479.644	485.355	490.964	496.490	501.945	507.342	512.689	517.996	523.268	528.510	533.729	538.927	544.109	549.277
0	34.851	430.893	439.586	447.376	454.581	461.376	467.866	474.122	480.193	486.114	491.914	497.614	503.229	508.774	514.260	519.696	525.090	530.447	535.774	541.075	546.355	551.617
5	39.695	427.485	437.262	445.773	453.515	460.735	467.577	474.133	480.466	486.620	492.629	498.517	504.306	510.011	515.645	521.220	526.743	532.222	537.664	543.075	548.458	553.818
10	45.022	422.884	434.164	443.584	451.969	459.685	466.930	473.824	480.448	486.858	493.094	499.188	505.165	511.042	516.836	522.558	528.220	533.829	539.394	544.920	550.413	555.877
15	50.871	416.636	430.132	440.725	449.893	458.191	465.896	473.171	480.119	486.811	493.297	499.615	505.795	511.858	517.823	523.704	529.513	535.261	540.955	546.604	552.212	557.787
20	57.291	407.865	424.958	437.101	447.227	456.210	464.444	472.149	479.458	486.461	493.220	499.782	506.182	512.445	518.593	524.644	530.611	536.505	542.338	548.116	553.848	559.538
25	64.342	394.429	418.364	432.592	443.898	453.688	462.530	470.720	478.432	485.778	492.837	499.665	506.302	512.781	519.127	525.359	531.495	537.546	543.526	549.442	555.303	561.117
30	72.137	365.129	409.972	427.018	439.780	450.524	460.067	468.806	476.969	484.697	492.086	499.205	506.102	512.816	519.375	525.803	532.120	538.340	544.477	550.540	556.541	562.486

Thermodynamic properties of R-744 - (superheated vapour) - Entropy (kJ/kg.K)

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-55	5.540	2.130	2.151	2.171	2.190	2.209	2.227	2.245	2.262	2.280	2.296	2.313	2.329	2.345	2.360	2.376	2.391	2.406	2.420	2.435	2.449	2.464
-50	6.823	2.102	2.123	2.143	2.162	2.181	2.200	2.218	2.235	2.252	2.269	2.285	2.302	2.317	2.333	2.348	2.363	2.378	2.393	2.407	2.422	2.436
-45	8.318	2.075	2.096	2.116	2.136	2.155	2.174	2.192	2.209	2.226	2.243	2.260	2.276	2.292	2.307	2.322	2.338	2.352	2.367	2.382	2.396	2.410
-40	10.045	2.049	2.070	2.091	2.111	2.130	2.149	2.167	2.185	2.202	2.219	2.235	2.251	2.267	2.283	2.298	2.313	2.328	2.343	2.357	2.371	2.385
-35	12.024	2.023	2.045	2.066	2.087	2.106	2.125	2.143	2.161	2.178	2.195	2.212	2.228	2.244	2.259	2.275	2.290	2.305	2.319	2.334	2.348	2.362
-30	14.278	1.998	2.021	2.042	2.063	2.083	2.102	2.120	2.138	2.156	2.173	2.189	2.206	2.222	2.237	2.253	2.268	2.283	2.297	2.312	2.326	2.340
-25	16.827	1.973	1.997	2.019	2.040	2.060	2.080	2.098	2.117	2.134	2.151	2.168	2.184	2.201	2.216	2.232	2.247	2.262	2.276	2.291	2.305	2.319
-20	19.696	1.949	1.973	1.996	2.018	2.038	2.058	2.077	2.095	2.113	2.131	2.147	2.164	2.180	2.196	2.211	2.227	2.242	2.256	2.271	2.285	2.299
-15	22.908	1.924	1.949	1.973	1.996	2.017	2.037	2.056	2.075	2.093	2.111	2.128	2.144	2.160	2.176	2.192	2.207	2.222	2.237	2.251	2.266	2.280
-10	26.487	1.898	1.926	1.951	1.974	1.995	2.016	2.036	2.055	2.073	2.091	2.108	2.125	2.141	2.158	2.173	2.189	2.204	2.218	2.233	2.247	2.261
-5	30.459	1.872	1.902	1.928	1.952	1.974	1.996	2.016	2.035	2.054	2.072	2.089	2.106	2.123	2.139	2.155	2.171	2.186	2.201	2.215	2.230	2.244
0	34.851	1.845	1.877	1.905	1.930	1.953	1.975	1.996	2.016	2.035	2.053	2.071	2.088	2.105	2.121	2.137	2.153	2.168	2.183	2.198	2.212	2.227
5	39.695	1.816	1.851	1.881	1.908	1.932	1.955	1.976	1.997	2.016	2.035	2.053	2.070	2.087	2.104	2.120	2.136	2.151	2.166	2.181	2.196	2.210
10	45.022	1.785	1.824	1.857	1.885	1.911	1.934	1.957	1.978	1.998	2.017	2.035	2.053	2.070	2.087	2.103	2.119	2.135	2.150	2.165	2.179	2.194
15	50.871	1.749	1.795	1.831	1.862	1.889	1.914	1.937	1.958	1.979	1.999	2.017	2.036	2.053	2.070	2.087	2.103	2.118	2.134	2.149	2.164	2.178
20	57.291	1.706	1.764	1.804	1.838	1.867	1.893	1.917	1.939	1.960	1.980	2.000	2.018	2.036	2.053	2.070	2.086	2.102	2.118	2.133	2.148	2.162
25	64.342	1.650	1.729	1.776	1.812	1.843	1.871	1.896	1.920	1.941	1.962	1.982	2.001	2.019	2.037	2.054	2.070	2.086	2.102	2.117	2.132	2.147
30	72.137	1.543	1.690	1.745	1.786	1.819	1.849	1.875	1.899	1.922	1.943	1.964	1.983	2.002	2.020	2.037	2.054	2.070	2.086	2.102	2.117	2.132

Converting units of measurement

Length

1 inch (in)	0, 0254 m		
1 foot (ft)	12 inches	0,3048 m	
1 yard (yd)	3 feet	0,9143 m	
1 mile	1,760 yards	1609 m	
1 nautical mile	1852 m		
1 mètre (m)	39,37 inches	3,28084 feet	1,09361 yard

Mass

1 ounce (oz)	28,349 g	
1 livre (lb)	16 oz	0,4536 kg
1 quintal U.S.	100 lbs	
1 hundredweight	112 lbs	
1 short ton (U.S.)	2000 lbs	907,18 kg
1 long ton (G.B.)	2240 lbs	1016,04 kg
1 quintal (q)	100 kg	
1 tonne (t)	1000 kg	

Pressure

1 pouce de vide	25,4 mm Hg			
1 bar	100 kPa	750,06 Torr	1,0197 kg/cm^2	
1 atm	760 Torr	1,013 bar		
1 pound /Sq.Inc	0,0703 kg/cm^2	1 PSI	0,06895 bar	0,06805 atm

Surface

1 square inch	6,4516 cm^2	
1 square foot	0,0929 m^2	
1 square yard	0,8361 m^2	
1 mètre carré	1550 in^2	10,76391 ft^2

Volume

1 cubic inch (cu in)	16,387064 cm^3	
1 cubic foot (cu ft)	0,028317 m^3	28,31685 dm^3
1 cubic yard (cu yd)	0,76455 m^3	
1 pint	0,568 l	
1 gallon-imp	4,546 l	
1 gallon (US gal)	3,78541 l	
1 mètre cube (m^3)	35,31467 cu ft	
1 décimètre cube (dm^3)	0,26428 gal	
1 litre (l)	1 dm^3	

Density

1 pound /cu.ft	0,016 kg /dm^3

Energy - Heat measurement

1 cal	4,18 Joules	
1 B.T.U	0,252 kcal	1055 Joules
1 B.T.U/lb.° F	1 kcal / kg.° C	
1 kcal	1 milithermie	
1 Btu/hr	0,293 W	
1 fg/h	-1kcal/h	
1 kcal/h	1,163 W	
1 ton (U.S.)	3024 kcal / h	3512 W
1 ton (G.B.)	3340 Kcal/ h	3878 W
1 Watt (thermique)	0,86 kcal / h	

° Farenheit = °C x 9/5 + 32

° Celsius = (°F - 32) x 5/9

°Celsius = T (°Kelvin) - 273,15

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