



# Opteon™ XP40

## Refrigerant

### Thermodynamic Properties of Opteon™ XP40 (R-449A) SI Units

#### Physical Properties

Molecular Weight	87.2 g/mol
Boiling Point at One Atmosphere	-45.7 °C
Critical Temperature	82.1 °C
Critical Pressure	4499.7 kPa
Critical Density	479.4 kg/m <sup>3</sup>
Critical Volume	0.0021 m <sup>3</sup> /kg
Ozone Depletion Potential	0
Global Warming Potential AR4	1397
ASHRAE Standard 34 Safety Rating	A1

#### Units and Factors

t	= temperature in °C
P	= pressure in kiloPascals absolute (kPa [abs])
v <sub>f</sub>	= volume of saturated liquid in m <sup>3</sup> /kg
v <sub>g</sub>	= volume of saturated vapor in m <sup>3</sup> /kg
V	= volume of superheated vapor in m <sup>3</sup> /kg
d <sub>f</sub>	= 1/v <sub>f</sub> = density of saturated liquid in kg/m <sup>3</sup>
d <sub>g</sub>	= 1/v <sub>g</sub> = density of saturated vapor in kg/m <sup>3</sup>
h <sub>f</sub>	= enthalpy of saturated liquid in kJ/kg
h <sub>fg</sub>	= enthalpy of vaporization in kJ/kg
h <sub>g</sub>	= enthalpy of saturated vapor in kJ/kg
H	= enthalpy of superheated vapor in kJ/kg
s <sub>f</sub>	= entropy of saturated liquid in kJ/(kg) (K)
s <sub>g</sub>	= entropy of saturated vapor in kJ/(kg) (K)
S	= entropy of superheated vapor in kJ/(kg) (K)

One atmosphere = 101.325 kPa

Reference point for enthalpy and entropy:

h<sub>f</sub> = 200 kJ/kg at 0°C

s<sub>f</sub> = 1 kJ/kg·K at 0°C

This information is based on NIST Standard Database 23, Version 10 (Lemmon, E.W.; Huber, M.L.; McLinden, M.O.; REFPROP Reference Fluid Thermodynamic and Transport Properties - National Institute of Standards and Technology, 2013).

Opteon™ XP40 (R-449A)

Saturation Properties - Temperature Table

Temp °C	Pressure [kPa]		Volume [m <sup>3</sup> /kg]		Density [kg/m <sup>3</sup> ]		Enthalpy [kJ/kg]			Entropy [kJ/kg-K]		Temp °C
	Liquid P <sub>f</sub>	Vapor P <sub>g</sub>	Liquid v <sub>f</sub>	Vapor v <sub>g</sub>	Liquid ρ <sub>f</sub>	Vapor ρ <sub>g</sub>	Liquid h <sub>f</sub>	Latent h <sub>fg</sub>	Vapor h <sub>g</sub>	Liquid s <sub>f</sub>	Vapor s <sub>g</sub>	
-60	48.086	34.149	0.000719	0.5831	1390.8	1.715	119.9	245.0	364.9	0.671	1.839	-60
-59	50.854	36.269	0.000720	0.5511	1387.9	1.815	121.2	244.4	365.6	0.677	1.836	-59
-58	53.748	38.495	0.000722	0.5212	1385.0	1.919	122.5	243.7	366.2	0.683	1.833	-58
-57	56.774	40.830	0.000724	0.4932	1382.1	2.028	123.7	243.0	366.8	0.689	1.831	-57
-56	59.935	43.279	0.000725	0.4670	1379.2	2.141	125.0	242.3	367.4	0.695	1.828	-56
-55	63.235	45.844	0.000727	0.4425	1376.2	2.260	126.3	241.7	368.0	0.701	1.826	-55
-54	66.678	48.531	0.000728	0.4195	1373.3	2.384	127.6	241.0	368.6	0.707	1.823	-54
-53	70.270	51.343	0.000730	0.3979	1370.3	2.513	128.9	240.3	369.2	0.713	1.820	-53
-52	74.015	54.285	0.000731	0.3777	1367.4	2.648	130.2	239.6	369.8	0.719	1.818	-52
-51	77.917	57.360	0.000733	0.3586	1364.4	2.788	131.4	238.9	370.4	0.724	1.816	-51
-50	81.981	60.574	0.000735	0.3408	1361.4	2.935	132.7	238.3	371.0	0.730	1.813	-50
-49	86.212	63.930	0.000736	0.3239	1358.4	3.087	134.0	237.6	371.6	0.736	1.811	-49
-48	90.614	67.434	0.000738	0.3081	1355.4	3.246	135.3	236.9	372.2	0.742	1.809	-48
-47	95.193	71.089	0.000739	0.2932	1352.4	3.410	136.6	236.2	372.8	0.747	1.807	-47
-46	99.952	74.901	0.000741	0.2792	1349.4	3.582	137.9	235.5	373.4	0.753	1.804	-46
-45	104.898	78.873	0.000743	0.2660	1346.4	3.760	139.2	234.8	374.0	0.759	1.802	-45
-44	110.035	83.012	0.000744	0.2535	1343.3	3.945	140.5	234.1	374.6	0.764	1.800	-44
-43	115.369	87.322	0.000746	0.2417	1340.3	4.137	141.8	233.4	375.2	0.770	1.798	-43
-42	120.904	91.807	0.000748	0.2306	1337.3	4.337	143.1	232.7	375.8	0.776	1.796	-42
-41	126.645	96.473	0.000750	0.2201	1334.2	4.544	144.4	231.9	376.3	0.781	1.794	-41
-40	132.599	101.325	0.000751	0.2101	1331.1	4.759	145.7	231.2	376.9	0.787	1.792	-40
-39	138.770	106.368	0.000753	0.2007	1328.0	4.982	147.0	230.5	377.5	0.792	1.790	-39
-38	145.163	111.607	0.000755	0.1918	1324.9	5.213	148.3	229.8	378.1	0.798	1.788	-38
-37	151.785	117.048	0.000757	0.1834	1321.8	5.452	149.6	229.0	378.7	0.804	1.786	-37
-36	158.641	122.695	0.000758	0.1754	1318.7	5.700	151.0	228.3	379.3	0.809	1.785	-36
-35	165.735	128.555	0.000760	0.1679	1315.6	5.956	152.3	227.6	379.9	0.815	1.783	-35
-34	173.075	134.633	0.000762	0.1607	1312.5	6.222	153.6	226.8	380.4	0.820	1.781	-34
-33	180.666	140.935	0.000764	0.1539	1309.3	6.497	154.9	226.1	381.0	0.826	1.779	-33
-32	188.512	147.465	0.000766	0.1475	1306.2	6.781	156.2	225.3	381.6	0.831	1.778	-32
-31	196.621	154.230	0.000767	0.1413	1303.0	7.075	157.6	224.6	382.2	0.836	1.776	-31
-30	204.998	161.236	0.000769	0.1355	1299.8	7.379	158.9	223.8	382.7	0.842	1.774	-30
-29	213.649	168.488	0.000771	0.1300	1296.6	7.694	160.2	223.1	383.3	0.847	1.773	-29
-28	222.579	175.992	0.000773	0.1247	1293.4	8.018	161.5	222.3	383.9	0.853	1.771	-28
-27	231.796	183.755	0.000775	0.1197	1290.2	8.354	162.9	221.5	384.4	0.858	1.770	-27
-26	241.304	191.782	0.000777	0.1149	1287.0	8.700	164.2	220.8	385.0	0.864	1.768	-26
-25	251.110	200.079	0.000779	0.1104	1283.7	9.058	165.6	220.0	385.5	0.869	1.766	-25
-24	261.221	208.653	0.000781	0.1061	1280.5	9.427	166.9	219.2	386.1	0.874	1.765	-24
-23	271.641	217.509	0.000783	0.1020	1277.2	9.808	168.2	218.4	386.7	0.880	1.764	-23
-22	282.379	226.654	0.000785	0.0980	1273.9	10.201	169.6	217.6	387.2	0.885	1.762	-22
-21	293.439	236.095	0.000787	0.0943	1270.6	10.606	170.9	216.8	387.8	0.890	1.761	-21
-20	304.828	245.837	0.000789	0.0907	1267.3	11.024	172.3	216.0	388.3	0.896	1.759	-20
-19	316.553	255.888	0.000791	0.0873	1264.0	11.455	173.7	215.2	388.9	0.901	1.758	-19
-18	328.619	266.253	0.000793	0.0840	1260.7	11.899	175.0	214.4	389.4	0.906	1.757	-18
-17	341.035	276.940	0.000795	0.0809	1257.3	12.356	176.4	213.6	390.0	0.912	1.755	-17
-16	353.805	287.954	0.000797	0.0780	1253.9	12.828	177.7	212.8	390.5	0.917	1.754	-16
-15	366.936	299.304	0.000800	0.0751	1250.5	13.313	179.1	211.9	391.0	0.922	1.753	-15
-14	380.436	310.994	0.000802	0.0724	1247.1	13.813	180.5	211.1	391.6	0.927	1.751	-14
-13	394.310	323.033	0.000804	0.0698	1243.7	14.328	181.8	210.2	392.1	0.933	1.750	-13
-12	408.566	335.427	0.000806	0.0673	1240.3	14.859	183.2	209.4	392.6	0.938	1.749	-12
-11	423.209	348.183	0.000809	0.0649	1236.8	15.404	184.6	208.5	393.1	0.943	1.748	-11
-10	438.248	361.307	0.000811	0.0626	1233.4	15.966	186.0	207.7	393.7	0.948	1.746	-10
-9	453.688	374.808	0.000813	0.0604	1229.9	16.544	187.4	206.8	394.2	0.953	1.745	-9
-8	469.536	388.693	0.000815	0.0583	1226.4	17.138	188.8	205.9	394.7	0.959	1.744	-8
-7	485.800	402.967	0.000818	0.0563	1222.8	17.750	190.2	205.1	395.2	0.964	1.743	-7
-6	502.486	417.640	0.000820	0.0544	1219.3	18.379	191.5	204.2	395.7	0.969	1.742	-6
-5	519.601	432.717	0.000823	0.0526	1215.7	19.026	192.9	203.3	396.2	0.974	1.741	-5
-4	537.152	448.206	0.000825	0.0508	1212.1	19.691	194.4	202.4	396.7	0.979	1.740	-4

**Opteon™ XP40 (R-449A)**  
**Saturation Properties - Temperature Table**

Temp °C	Pressure [kPa]		Volume [m <sup>3</sup> /kg]		Density [kg/m <sup>3</sup> ]		Enthalpy [kJ/kg]			Entropy [kJ/kg-K]		Temp °C
	Liquid P <sub>f</sub>	Vapor P <sub>g</sub>	Liquid v <sub>f</sub>	Vapor v <sub>g</sub>	Liquid d <sub>f</sub>	Vapor d <sub>g</sub>	Liquid h <sub>f</sub>	Latent h <sub>fg</sub>	Vapor h <sub>g</sub>	Liquid s <sub>f</sub>	Vapor s <sub>g</sub>	
-3	555.146	464.116	0.000827	0.0491	1208.5	20.375	195.8	201.5	397.2	0.985	1.738	-3
-2	573.591	480.453	0.000830	0.0474	1204.9	21.078	197.2	200.5	397.7	0.990	1.737	-2
-1	592.492	497.224	0.000832	0.0459	1201.3	21.800	198.6	199.6	398.2	0.995	1.736	-1
0	611.859	514.438	0.000835	0.0444	1197.6	22.543	200.0	198.7	398.7	1.000	1.735	0
1	631.696	532.102	0.000838	0.0429	1193.9	23.306	201.4	197.8	399.2	1.005	1.734	1
2	652.013	550.224	0.000840	0.0415	1190.2	24.090	202.8	196.8	399.7	1.010	1.733	2
3	672.815	568.812	0.000843	0.0402	1186.4	24.896	204.3	195.8	400.1	1.015	1.732	3
4	694.111	587.873	0.000846	0.0389	1182.7	25.723	205.7	194.9	400.6	1.021	1.731	4
5	715.907	607.416	0.000848	0.0376	1178.9	26.573	207.1	193.9	401.1	1.026	1.730	5
6	738.211	627.449	0.000851	0.0364	1175.1	27.447	208.6	192.9	401.5	1.031	1.729	6
7	761.030	647.979	0.000854	0.0353	1171.3	28.344	210.0	191.9	402.0	1.036	1.728	7
8	784.372	669.015	0.000857	0.0342	1167.4	29.265	211.5	190.9	402.4	1.041	1.727	8
9	808.244	690.566	0.000859	0.0331	1163.5	30.212	212.9	189.9	402.9	1.046	1.726	9
10	832.654	712.638	0.000862	0.0321	1159.6	31.183	214.4	188.9	403.3	1.051	1.725	10
11	857.609	735.242	0.000865	0.0311	1155.6	32.181	215.9	187.9	403.8	1.056	1.724	11
12	883.117	758.385	0.000868	0.0301	1151.7	33.206	217.3	186.9	404.2	1.061	1.723	12
13	909.185	782.076	0.000871	0.0292	1147.7	34.259	218.8	185.8	404.6	1.066	1.722	13
14	935.821	806.324	0.000874	0.0283	1143.6	35.339	220.3	184.7	405.0	1.071	1.721	14
15	963.032	831.136	0.000878	0.0274	1139.6	36.449	221.8	183.7	405.4	1.076	1.720	15
16	990.827	856.523	0.000881	0.0266	1135.5	37.588	223.3	182.6	405.9	1.082	1.719	16
17	1019.213	882.493	0.000884	0.0258	1131.4	38.758	224.7	181.5	406.3	1.087	1.718	17
18	1048.197	909.055	0.000887	0.0250	1127.2	39.959	226.2	180.4	406.7	1.092	1.717	18
19	1077.789	936.218	0.000890	0.0243	1123.0	41.193	227.8	179.3	407.0	1.097	1.716	19
20	1107.994	963.992	0.000894	0.0236	1118.8	42.460	229.3	178.2	407.4	1.102	1.715	20
21	1138.823	992.385	0.000897	0.0229	1114.5	43.761	230.8	177.0	407.8	1.107	1.715	21
22	1170.281	1021.407	0.000901	0.0222	1110.2	45.096	232.3	175.9	408.2	1.112	1.714	22
23	1202.378	1051.067	0.000904	0.0215	1105.9	46.468	233.8	174.7	408.5	1.117	1.713	23
24	1235.121	1081.376	0.000908	0.0209	1101.5	47.877	235.4	173.5	408.9	1.122	1.712	24
25	1268.519	1112.342	0.000912	0.0203	1097.1	49.325	236.9	172.4	409.2	1.127	1.711	25
26	1302.579	1143.976	0.000915	0.0197	1092.6	50.811	238.4	171.1	409.6	1.132	1.710	26
27	1337.310	1176.288	0.000919	0.0191	1088.1	52.338	240.0	169.9	409.9	1.137	1.709	27
28	1372.719	1209.288	0.000923	0.0186	1083.5	53.907	241.5	168.7	410.2	1.142	1.708	28
29	1408.816	1242.985	0.000927	0.0180	1079.0	55.519	243.1	167.5	410.6	1.147	1.707	29
30	1445.608	1277.391	0.000931	0.0175	1074.3	57.175	244.7	166.2	410.9	1.153	1.706	30
31	1483.104	1312.516	0.000935	0.0170	1069.6	58.877	246.3	164.9	411.2	1.158	1.705	31
32	1521.312	1348.371	0.000939	0.0165	1064.9	60.627	247.8	163.6	411.5	1.163	1.704	32
33	1560.240	1384.966	0.000943	0.0160	1060.1	62.426	249.4	162.3	411.7	1.168	1.703	33
34	1599.898	1422.313	0.000948	0.0156	1055.3	64.275	251.0	161.0	412.0	1.173	1.702	34
35	1640.293	1460.422	0.000952	0.0151	1050.4	66.177	252.6	159.6	412.3	1.178	1.701	35
36	1681.434	1499.306	0.000957	0.0147	1045.4	68.133	254.3	158.3	412.5	1.183	1.700	36
37	1723.331	1538.975	0.000961	0.0143	1040.4	70.145	255.9	156.9	412.8	1.188	1.698	37
38	1765.991	1579.442	0.000966	0.0138	1035.3	72.215	257.5	155.5	413.0	1.193	1.697	38
39	1809.423	1620.718	0.000971	0.0135	1030.2	74.346	259.2	154.0	413.2	1.198	1.696	39
40	1853.637	1662.816	0.000976	0.0131	1025.0	76.539	260.8	152.6	413.4	1.204	1.695	40
41	1898.641	1705.748	0.000981	0.0127	1019.7	78.798	262.5	151.1	413.6	1.209	1.694	41
42	1944.444	1749.528	0.000986	0.0123	1014.4	81.124	264.1	149.6	413.8	1.214	1.693	42
43	1991.055	1794.167	0.000991	0.0120	1009.0	83.521	265.8	148.1	413.9	1.219	1.692	43
44	2038.484	1839.680	0.000997	0.0116	1003.5	85.992	267.5	146.6	414.1	1.224	1.690	44
45	2086.739	1886.080	0.001002	0.0113	997.9	88.539	269.2	145.0	414.2	1.229	1.689	45
46	2135.831	1933.382	0.001008	0.0110	992.3	91.167	270.9	143.4	414.3	1.235	1.688	46
47	2185.767	1981.598	0.001014	0.0107	986.5	93.878	272.6	141.8	414.4	1.240	1.687	47
48	2236.558	2030.745	0.001020	0.0103	980.7	96.676	274.4	140.2	414.5	1.245	1.685	48
49	2288.213	2080.837	0.001026	0.0100	974.7	99.566	276.1	138.5	414.6	1.250	1.684	49
50	2340.742	2131.891	0.001032	0.0098	968.7	102.553	277.9	136.8	414.7	1.256	1.682	50
51	2394.155	2183.921	0.001039	0.0095	962.6	105.641	279.7	135.0	414.7	1.261	1.681	51
52	2448.460	2236.946	0.001046	0.0092	956.3	108.835	281.4	133.3	414.7	1.266	1.679	52
53	2503.669	2290.981	0.001053	0.0089	949.9	112.142	283.3	131.4	414.7	1.272	1.678	53

**Opteon™ XP40 (R-449A)**  
**Saturation Properties - Temperature Table**

Temp °C	Pressure [kPa]		Volume [m <sup>3</sup> /kg]		Density [kg/m <sup>3</sup> ]		Enthalpy [kJ/kg]			Entropy [kJ/kg-K]		Temp °C
	Liquid p <sub>f</sub>	Vapor p <sub>g</sub>	Liquid v <sub>f</sub>	Vapor v <sub>g</sub>	Liquid d <sub>f</sub>	Vapor d <sub>g</sub>	Liquid h <sub>f</sub>	Latent h <sub>fg</sub>	Vapor h <sub>g</sub>	Liquid s <sub>f</sub>	Vapor s <sub>g</sub>	
54	2559.791	2346.046	0.001060	0.0087	943.4	115.567	285.1	129.6	414.7	1.277	1.676	54
55	2616.835	2402.158	0.001068	0.0084	936.7	119.117	286.9	127.7	414.6	1.283	1.675	55
56	2674.813	2459.338	0.001075	0.0081	930.0	122.800	288.8	125.8	414.5	1.288	1.673	56
57	2733.733	2517.604	0.001083	0.0079	923.0	126.624	290.6	123.8	414.4	1.294	1.671	57
58	2793.607	2576.980	0.001092	0.0077	915.9	130.599	292.5	121.8	414.3	1.299	1.670	58
59	2854.445	2637.486	0.001101	0.0074	908.6	134.734	294.5	119.7	414.2	1.305	1.668	59
60	2916.256	2699.147	0.001110	0.0072	901.1	139.041	296.4	117.6	414.0	1.310	1.666	60
61	2979.051	2761.988	0.001119	0.0070	893.5	143.533	298.4	115.4	413.7	1.316	1.664	61
62	3042.840	2826.034	0.001129	0.0067	885.6	148.223	300.3	113.1	413.5	1.322	1.662	62
63	3107.633	2891.314	0.001140	0.0065	877.4	153.127	302.4	110.8	413.2	1.327	1.660	63
64	3173.440	2957.859	0.001151	0.0063	869.0	158.266	304.4	108.4	412.8	1.333	1.657	64
65	3240.270	3025.701	0.001162	0.0061	860.3	163.658	306.5	106.0	412.5	1.339	1.655	65
66	3308.133	3094.876	0.001175	0.0059	851.3	169.329	308.6	103.4	412.0	1.345	1.652	66
67	3377.036	3165.422	0.001188	0.0057	842.0	175.306	310.8	100.8	411.5	1.351	1.650	67
68	3446.987	3237.382	0.001202	0.0055	832.3	181.624	313.0	98.0	411.0	1.358	1.647	68
69	3517.992	3310.804	0.001216	0.0053	822.1	188.322	315.2	95.2	410.4	1.364	1.644	69
70	3590.057	3385.741	0.001232	0.0051	811.5	195.447	317.5	92.2	409.7	1.370	1.641	70
71	3663.181	3462.253	0.001250	0.0049	800.3	203.059	319.9	89.0	408.9	1.377	1.637	71
72	3737.365	3540.412	0.001268	0.0047	788.4	211.228	322.3	85.7	408.0	1.384	1.634	72
73	3812.599	3620.299	0.001289	0.0045	775.8	220.047	324.9	82.2	407.0	1.391	1.630	73
74	3888.869	3702.015	0.001312	0.0044	762.3	229.634	327.5	78.4	405.9	1.398	1.626	74
75	3966.147	3785.683	0.001338	0.0042	747.6	240.149	330.2	74.4	404.6	1.406	1.621	75
76	4044.382	3871.463	0.001367	0.0040	731.6	251.812	333.1	70.0	403.2	1.414	1.616	76
77	4123.488	3959.567	0.001401	0.0038	713.8	264.941	336.3	65.2	401.5	1.422	1.610	77
78	4203.311	4050.304	0.001442	0.0036	693.6	280.037	339.6	59.8	399.4	1.432	1.603	78
79	4283.537	4144.158	0.001493	0.0034	669.8	297.942	343.4	53.5	396.9	1.442	1.595	79
80	4363.464	4242.014	0.001563	0.0031	639.9	320.329	347.9	45.7	393.7	1.455	1.585	80

Opteon™ XP40 (R-449A)

Superheated Vapor - Constant Pressure Tables

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	10			20			30			40			Temp °C
	-78.17 °C			-68.41 °C			-62.11 °C			-57.35 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	1.8428	353.8	1.900	0.9624	359.8	1.864	0.0007	96.9	0.559	0.0007	96.9	0.559	
-75	1.8740	356.0	1.911										-75
-70	1.9229	359.3	1.928										-70
-65	1.9717	362.7	1.944	0.9794	362.2	1.876							-65
-60	2.0203	366.2	1.961	1.0042	365.7	1.893	0.6654	365.2	1.852				-60
-55	2.0688	369.7	1.977	1.0289	369.2	1.909	0.6822	368.8	1.869	0.5088	368.3	1.840	-55
-50	2.1173	373.2	1.993	1.0535	372.8	1.925	0.6989	372.4	1.885	0.5215	371.9	1.856	-50
-45	2.1656	376.8	2.009	1.0780	376.4	1.941	0.7155	376.0	1.901	0.5342	375.6	1.872	-45
-40	2.2139	380.4	2.024	1.1025	380.0	1.957	0.7320	379.7	1.917	0.5467	379.3	1.888	-40
-35	2.2621	384.0	2.040	1.1269	383.7	1.973	0.7484	383.4	1.933	0.5592	383.0	1.904	-35
-30	2.3103	387.7	2.055	1.1512	387.4	1.988	0.7648	387.1	1.948	0.5716	386.8	1.920	-30
-25	2.3584	391.5	2.070	1.1755	391.2	2.003	0.7812	390.9	1.964	0.5840	390.6	1.935	-25
-20	2.4065	395.3	2.085	1.1997	395.0	2.018	0.7975	394.7	1.979	0.5964	394.4	1.951	-20
-15	2.4545	399.1	2.100	1.2240	398.8	2.033	0.8138	398.6	1.994	0.6087	398.3	1.966	-15
-10	2.5025	402.9	2.115	1.2481	402.7	2.048	0.8300	402.5	2.009	0.6209	402.2	1.981	-10
-5	2.5505	406.8	2.130	1.2723	406.6	2.063	0.8462	406.4	2.024	0.6332	406.2	1.996	-5
0	2.5985	410.8	2.144	1.2964	410.6	2.078	0.8624	410.4	2.038	0.6454	410.1	2.010	0
5	2.6464	414.8	2.159	1.3205	414.6	2.092	0.8786	414.4	2.053	0.6576	414.2	2.025	5
10	2.6943	418.8	2.173	1.3446	418.6	2.107	0.8947	418.4	2.067	0.6698	418.2	2.040	10
15	2.7422	422.9	2.187	1.3687	422.7	2.121	0.9108	422.5	2.082	0.6819	422.3	2.054	15
20	2.7901	427.0	2.202	1.3927	426.8	2.135	0.9269	426.7	2.096	0.6940	426.5	2.068	20
25	2.8380	431.2	2.216	1.4168	431.0	2.149	0.9430	430.8	2.110	0.7062	430.7	2.082	25
30	2.8859	435.4	2.230	1.4408	435.2	2.163	0.9591	435.0	2.124	0.7183	434.9	2.096	30
35	2.9337	439.6	2.243	1.4648	439.4	2.177	0.9752	439.3	2.138	0.7304	439.2	2.110	35
40	2.9815	443.9	2.257	1.4888	443.7	2.191	0.9912	443.6	2.152	0.7425	443.5	2.124	40
45	3.0294	448.2	2.271	1.5128	448.1	2.205	1.0073	447.9	2.166	0.7545	447.8	2.138	45
50	3.0772	452.6	2.285	1.5368	452.4	2.218	1.0233	452.3	2.179	0.7666	452.2	2.152	50
55	3.1250	457.0	2.298	1.5608	456.9	2.232	1.0394	456.7	2.193	0.7787	456.6	2.165	55
60	3.1728	461.4	2.312	1.5847	461.3	2.245	1.0554	461.2	2.206	0.7907	461.1	2.179	60
65	3.2206	465.9	2.325	1.6087	465.8	2.259	1.0714	465.7	2.220	0.8027	465.6	2.192	65
70	3.2684	470.4	2.338	1.6326	470.3	2.272	1.0874	470.2	2.233	0.8148	470.1	2.205	70

  

ABSOLUTE PRESSURE, kPa													
Temp °C	50			60			70			80			Temp °C
	-53.47 °C			-50.18 °C			-47.29 °C			-44.72 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.4079	368.9	1.822	0.3438	370.9	1.814	0.0007	128.3	0.710	0.0007	128.3	0.710	
-50	0.4151	371.5	1.833	0.3441	371.0	1.814							-50
-45	0.4254	375.2	1.850	0.3528	374.8	1.831	0.3010	374.4	1.815				-45
-40	0.4355	378.9	1.866	0.3614	378.6	1.847	0.3084	378.2	1.831	0.2687	377.8	1.817	-40
-35	0.4457	382.7	1.882	0.3699	382.3	1.863	0.3159	382.0	1.848	0.2753	381.6	1.834	-35
-30	0.4557	386.5	1.898	0.3784	386.2	1.879	0.3232	385.8	1.864	0.2818	385.5	1.850	-30
-25	0.4657	390.3	1.913	0.3868	390.0	1.895	0.3305	389.7	1.879	0.2882	389.4	1.866	-25
-20	0.4757	394.2	1.929	0.3952	393.9	1.910	0.3377	393.6	1.895	0.2946	393.3	1.881	-20
-15	0.4856	398.1	1.944	0.4035	397.8	1.926	0.3449	397.5	1.910	0.3010	397.3	1.897	-15
-10	0.4955	402.0	1.959	0.4118	401.7	1.941	0.3521	401.5	1.925	0.3073	401.2	1.912	-10
-5	0.5053	405.9	1.974	0.4201	405.7	1.956	0.3592	405.5	1.940	0.3136	405.3	1.927	-5
0	0.5152	409.9	1.989	0.4284	409.7	1.971	0.3663	409.5	1.955	0.3198	409.3	1.942	0
5	0.5250	414.0	2.003	0.4366	413.8	1.985	0.3734	413.6	1.970	0.3261	413.4	1.957	5
10	0.5348	418.0	2.018	0.4448	417.9	2.000	0.3805	417.7	1.985	0.3323	417.5	1.971	10
15	0.5445	422.2	2.032	0.4530	422.0	2.014	0.3876	421.8	1.999	0.3385	421.6	1.986	15
20	0.5543	426.3	2.046	0.4611	426.1	2.029	0.3946	426.0	2.014	0.3447	425.8	2.000	20
25	0.5640	430.5	2.061	0.4693	430.3	2.043	0.4016	430.2	2.028	0.3508	430.0	2.015	25
30	0.5738	434.7	2.075	0.4774	434.6	2.057	0.4086	434.4	2.042	0.3570	434.3	2.029	30
35	0.5835	439.0	2.089	0.4855	438.9	2.071	0.4156	438.7	2.056	0.3631	438.6	2.043	35
40	0.5932	443.3	2.103	0.4937	443.2	2.085	0.4226	443.0	2.070	0.3693	442.9	2.057	40
45	0.6029	447.7	2.116	0.5018	447.5	2.099	0.4295	447.4	2.084	0.3754	447.3	2.071	45
50	0.6126	452.1	2.130	0.5099	451.9	2.112	0.4365	451.8	2.097	0.3815	451.7	2.084	50
55	0.6222	456.5	2.144	0.5179	456.4	2.126	0.4435	456.2	2.111	0.3876	456.1	2.098	55
60	0.6319	460.9	2.157	0.5260	460.8	2.139	0.4504	460.7	2.125	0.3937	460.6	2.112	60
65	0.6416	465.5	2.171	0.5341	465.3	2.153	0.4573	465.2	2.138	0.3998	465.1	2.125	65
70	0.6512	470.0	2.184	0.5422	469.9	2.166	0.4643	469.8	2.151	0.4058	469.7	2.138	70
75	0.6609	474.6	2.197	0.5502	474.5	2.180	0.4712	474.4	2.165	0.4119	474.3	2.152	75
80	0.6705	479.2	2.210	0.5583	479.1	2.193	0.4781	479.0	2.178	0.4180	478.9	2.165	80
85	0.6801	483.9	2.223	0.5663	483.8	2.206	0.4850	483.7	2.191	0.4240	483.6	2.178	85
90	0.6898	488.6	2.237	0.5744	488.5	2.219	0.4919	488.4	2.204	0.4301	488.3	2.191	90
95	0.6994	493.3	2.250	0.5824	493.2	2.232	0.4988	493.2	2.217	0.4362	493.1	2.204	95

Opteon™ XP40 (R-449A)

Superheated Vapor - Constant Pressure Tables

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	90			100			101.325			110			Temp °C
	-42.40 °C			-40.27 °C			-40.00 °C			-38.30 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.2349	375.5	1.797	0.2127	376.8	1.793	0.1331	289.2	1.414	0.0676	222.4	1.120	
-40	0.2378	377.4	1.805	0.2130	377.0	1.794							-40
-35	0.2437	381.3	1.821	0.2184	380.9	1.810	0.2155	380.9	1.809	0.1978	380.6	1.800	-35
-30	0.2495	385.2	1.838	0.2238	384.9	1.827	0.2207	384.8	1.825	0.2027	384.5	1.816	-30
-25	0.2553	389.1	1.854	0.2290	388.8	1.843	0.2259	388.8	1.841	0.2075	388.5	1.833	-25
-20	0.2611	393.0	1.869	0.2342	392.8	1.858	0.2311	392.7	1.857	0.2123	392.5	1.848	-20
-15	0.2668	397.0	1.885	0.2394	396.7	1.874	0.2362	396.7	1.873	0.2170	396.5	1.864	-15
-10	0.2724	401.0	1.900	0.2445	400.8	1.889	0.2413	400.7	1.888	0.2217	400.5	1.880	-10
-5	0.2781	405.0	1.915	0.2496	404.8	1.905	0.2463	404.8	1.903	0.2264	404.6	1.895	-5
0	0.2837	409.1	1.930	0.2547	408.9	1.920	0.2513	408.8	1.918	0.2310	408.6	1.910	0
5	0.2892	413.2	1.945	0.2598	413.0	1.934	0.2563	412.9	1.933	0.2356	412.7	1.925	5
10	0.2948	417.3	1.960	0.2648	417.1	1.949	0.2613	417.1	1.948	0.2402	416.9	1.940	10
15	0.3003	421.4	1.974	0.2698	421.2	1.964	0.2662	421.2	1.962	0.2448	421.1	1.954	15
20	0.3059	425.6	1.989	0.2748	425.4	1.978	0.2711	425.4	1.977	0.2494	425.3	1.969	20
25	0.3114	429.8	2.003	0.2798	429.7	1.993	0.2761	429.7	1.991	0.2539	429.5	1.983	25
30	0.3169	434.1	2.017	0.2847	434.0	2.007	0.2810	433.9	2.005	0.2585	433.8	1.997	30
35	0.3223	438.4	2.031	0.2897	438.3	2.021	0.2858	438.2	2.020	0.2630	438.1	2.011	35
40	0.3278	442.7	2.045	0.2946	442.6	2.035	0.2907	442.6	2.033	0.2675	442.5	2.025	40
45	0.3333	447.1	2.059	0.2995	447.0	2.049	0.2956	447.0	2.047	0.2720	446.8	2.039	45
50	0.3387	451.5	2.073	0.3045	451.4	2.062	0.3004	451.4	2.061	0.2765	451.3	2.053	50
55	0.3441	456.0	2.086	0.3094	455.9	2.076	0.3053	455.8	2.075	0.2809	455.7	2.067	55
60	0.3496	460.5	2.100	0.3143	460.4	2.090	0.3101	460.3	2.088	0.2854	460.2	2.080	60
65	0.3550	465.0	2.114	0.3192	464.9	2.103	0.3150	464.9	2.102	0.2899	464.8	2.094	65
70	0.3604	469.6	2.127	0.3241	469.5	2.117	0.3198	469.4	2.115	0.2943	469.3	2.107	70
75	0.3658	474.2	2.140	0.3289	474.1	2.130	0.3246	474.0	2.129	0.2988	474.0	2.121	75
80	0.3712	478.8	2.153	0.3338	478.7	2.143	0.3294	478.7	2.142	0.3032	478.6	2.134	80
85	0.3766	483.5	2.167	0.3387	483.4	2.156	0.3342	483.4	2.155	0.3076	483.3	2.147	85
90	0.3820	488.2	2.180	0.3435	488.1	2.169	0.3390	488.1	2.168	0.3121	488.0	2.160	90
95	0.3874	493.0	2.193	0.3484	492.9	2.183	0.3438	492.9	2.181	0.3165	492.8	2.173	95
100	0.3928	497.8	2.206	0.3533	497.7	2.195	0.3486	497.7	2.194	0.3209	497.6	2.186	100
105	0.3982	502.6	2.219	0.3581	502.5	2.208	0.3534	502.5	2.207	0.3253	502.4	2.199	105

  

ABSOLUTE PRESSURE, kPa													
Temp °C	120			130			140			150			Temp °C
	-36.47 °C			-34.76 °C			-33.15 °C			-31.62 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.1792	379.0	1.785	0.1661	380.0	1.782	0.0736	257.7	1.262	0.0271	191.7	0.981	
-35	0.1805	380.2	1.790										-35
-30	0.1851	384.2	1.807	0.1702	383.8	1.798	0.1574	383.5	1.790	0.1463	383.1	1.782	-30
-25	0.1895	388.2	1.823	0.1744	387.9	1.815	0.1613	387.5	1.807	0.1500	387.2	1.799	-25
-20	0.1940	392.2	1.839	0.1785	391.9	1.831	0.1652	391.6	1.823	0.1537	391.3	1.815	-20
-15	0.1984	396.2	1.855	0.1826	395.9	1.847	0.1690	395.7	1.839	0.1573	395.4	1.831	-15
-10	0.2027	400.3	1.871	0.1866	400.0	1.862	0.1728	399.8	1.854	0.1608	399.5	1.847	-10
-5	0.2070	404.3	1.886	0.1906	404.1	1.878	0.1765	403.9	1.870	0.1644	403.6	1.863	-5
0	0.2113	408.4	1.901	0.1946	408.2	1.893	0.1803	408.0	1.885	0.1679	407.8	1.878	0
5	0.2156	412.5	1.916	0.1985	412.3	1.908	0.1840	412.1	1.900	0.1713	411.9	1.893	5
10	0.2198	416.7	1.931	0.2025	416.5	1.923	0.1876	416.3	1.915	0.1748	416.1	1.908	10
15	0.2240	420.9	1.945	0.2064	420.7	1.937	0.1913	420.5	1.930	0.1782	420.3	1.923	15
20	0.2282	425.1	1.960	0.2103	424.9	1.952	0.1949	424.7	1.944	0.1816	424.6	1.937	20
25	0.2324	429.3	1.974	0.2142	429.2	1.966	0.1985	429.0	1.959	0.1850	428.8	1.952	25
30	0.2366	433.6	1.989	0.2180	433.5	1.981	0.2021	433.3	1.973	0.1884	433.2	1.966	30
35	0.2407	438.0	2.003	0.2219	437.8	1.995	0.2057	437.7	1.987	0.1917	437.5	1.980	35
40	0.2449	442.3	2.017	0.2257	442.2	2.009	0.2093	442.0	2.001	0.1951	441.9	1.994	40
45	0.2490	446.7	2.031	0.2295	446.6	2.023	0.2129	446.4	2.015	0.1984	446.3	2.008	45
50	0.2531	451.1	2.044	0.2334	451.0	2.037	0.2164	450.9	2.029	0.2018	450.7	2.022	50
55	0.2572	455.6	2.058	0.2372	455.5	2.050	0.2200	455.4	2.043	0.2051	455.2	2.036	55
60	0.2613	460.1	2.072	0.2410	460.0	2.064	0.2235	459.9	2.057	0.2084	459.7	2.050	60
65	0.2654	464.7	2.085	0.2448	464.5	2.077	0.2271	464.4	2.070	0.2117	464.3	2.063	65
70	0.2695	469.2	2.099	0.2486	469.1	2.091	0.2306	469.0	2.084	0.2150	468.9	2.077	70
75	0.2736	473.8	2.112	0.2523	473.7	2.104	0.2341	473.6	2.097	0.2183	473.5	2.090	75
80	0.2777	478.5	2.125	0.2561	478.4	2.118	0.2376	478.3	2.110	0.2216	478.2	2.104	80
85	0.2818	483.2	2.139	0.2599	483.1	2.131	0.2411	483.0	2.124	0.2249	482.9	2.117	85
90	0.2858	487.9	2.152	0.2637	487.8	2.144	0.2446	487.7	2.137	0.2281	487.6	2.130	90
95	0.2899	492.7	2.165	0.2674	492.6	2.157	0.2481	492.5	2.150	0.2314	492.4	2.143	95
100	0.2940	497.5	2.178	0.2712	497.4	2.170	0.2516	497.3	2.163	0.2347	497.2	2.156	100
105	0.2980	502.3	2.191	0.2749	502.2	2.183	0.2551	502.2	2.176	0.2379	502.1	2.169	105
110	0.3021	507.2	2.203	0.2787	507.1	2.196	0.2586	507.0	2.188	0.2412	507.0	2.182	110

Opteon™ XP40 (R-449A)

Superheated Vapor - Constant Pressure Tables

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	160			170			180			190			Temp °C
	-30.17 °C			-28.80 °C			-27.48 °C			-26.22 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.1365	382.6	1.775	0.1289	383.4	1.772	0.0700	285.7	1.367	0.0410	236.2	1.161	
-30	0.1366	382.8	1.775										-30
-25	0.1401	386.9	1.792	0.1314	386.6	1.785	0.1237	386.2	1.779	0.1167	385.9	1.772	-25
-20	0.1436	391.0	1.808	0.1347	390.7	1.802	0.1268	390.4	1.795	0.1197	390.1	1.789	-20
-15	0.1470	395.1	1.824	0.1379	394.8	1.818	0.1299	394.6	1.812	0.1227	394.3	1.806	-15
-10	0.1504	399.2	1.840	0.1411	399.0	1.834	0.1329	398.7	1.828	0.1256	398.5	1.822	-10
-5	0.1537	403.4	1.856	0.1443	403.1	1.849	0.1359	402.9	1.843	0.1284	402.7	1.837	-5
0	0.1570	407.5	1.871	0.1474	407.3	1.865	0.1389	407.1	1.859	0.1313	406.9	1.853	0
5	0.1603	411.7	1.886	0.1505	411.5	1.880	0.1418	411.3	1.874	0.1341	411.1	1.868	5
10	0.1635	415.9	1.901	0.1536	415.7	1.895	0.1448	415.5	1.889	0.1369	415.3	1.883	10
15	0.1667	420.1	1.916	0.1566	419.9	1.910	0.1477	419.8	1.904	0.1396	419.6	1.898	15
20	0.1700	424.4	1.931	0.1597	424.2	1.925	0.1505	424.0	1.919	0.1424	423.9	1.913	20
25	0.1731	428.7	1.945	0.1627	428.5	1.939	0.1534	428.3	1.933	0.1451	428.2	1.928	25
30	0.1763	433.0	1.960	0.1657	432.8	1.953	0.1562	432.7	1.948	0.1478	432.5	1.942	30
35	0.1795	437.4	1.974	0.1687	437.2	1.968	0.1591	437.0	1.962	0.1505	436.9	1.956	35
40	0.1826	441.7	1.988	0.1717	441.6	1.982	0.1619	441.4	1.976	0.1532	441.3	1.971	40
45	0.1858	446.2	2.002	0.1746	446.0	1.996	0.1647	445.9	1.990	0.1558	445.7	1.985	45
50	0.1889	450.6	2.016	0.1776	450.5	2.010	0.1675	450.3	2.004	0.1585	450.2	1.999	50
55	0.1920	455.1	2.030	0.1805	455.0	2.024	0.1703	454.8	2.018	0.1612	454.7	2.012	55
60	0.1952	459.6	2.043	0.1835	459.5	2.037	0.1731	459.4	2.032	0.1638	459.3	2.026	60
65	0.1983	464.2	2.057	0.1864	464.1	2.051	0.1759	464.0	2.045	0.1664	463.8	2.040	65
70	0.2014	468.8	2.070	0.1893	468.7	2.064	0.1786	468.6	2.059	0.1691	468.4	2.053	70
75	0.2045	473.4	2.084	0.1923	473.3	2.078	0.1814	473.2	2.072	0.1717	473.1	2.067	75
80	0.2076	478.1	2.097	0.1952	478.0	2.091	0.1842	477.9	2.085	0.1743	477.8	2.080	80
85	0.2106	482.8	2.110	0.1981	482.7	2.104	0.1869	482.6	2.099	0.1769	482.5	2.093	85
90	0.2137	487.5	2.124	0.2010	487.4	2.118	0.1897	487.3	2.112	0.1795	487.2	2.107	90
95	0.2168	492.3	2.137	0.2039	492.2	2.131	0.1924	492.1	2.125	0.1821	492.0	2.120	95
100	0.2199	497.1	2.150	0.2068	497.0	2.144	0.1952	497.0	2.138	0.1847	496.9	2.133	100
105	0.2229	502.0	2.163	0.2097	501.9	2.157	0.1979	501.8	2.151	0.1873	501.7	2.146	105
110	0.2260	506.9	2.175	0.2126	506.8	2.169	0.2006	506.7	2.164	0.1899	506.6	2.159	110
115	0.2290	511.8	2.188	0.2154	511.7	2.182	0.2033	511.6	2.177	0.1925	511.6	2.171	115

  

ABSOLUTE PRESSURE, kPa													
Temp °C	200			210			220			230			Temp °C
	-36.47 °C			-34.76 °C			-33.15 °C			-31.62 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.1104	385.5	1.767	0.1054	386.2	1.765	0.0641	303.9	1.431	0.0437	263.3	1.265	
-25	0.1104	385.6	1.767										-25
-20	0.1133	389.8	1.783	0.1076	389.5	1.778	0.1023	389.2	1.772	0.0975	388.8	1.767	-20
-15	0.1162	394.0	1.800	0.1103	393.7	1.794	0.1049	393.4	1.789	0.1001	393.1	1.784	-15
-10	0.1189	398.2	1.816	0.1130	397.9	1.811	0.1075	397.7	1.805	0.1025	397.4	1.800	-10
-5	0.1217	402.4	1.832	0.1156	402.2	1.827	0.1100	401.9	1.821	0.1050	401.7	1.816	-5
0	0.1244	406.6	1.847	0.1182	406.4	1.842	0.1125	406.2	1.837	0.1074	405.9	1.832	0
5	0.1271	410.9	1.863	0.1208	410.6	1.858	0.1150	410.4	1.853	0.1098	410.2	1.848	5
10	0.1297	415.1	1.878	0.1233	414.9	1.873	0.1175	414.7	1.868	0.1121	414.5	1.863	10
15	0.1324	419.4	1.893	0.1258	419.2	1.888	0.1199	419.0	1.883	0.1144	418.8	1.878	15
20	0.1350	423.7	1.908	0.1283	423.5	1.903	0.1223	423.3	1.898	0.1167	423.1	1.893	20
25	0.1376	428.0	1.922	0.1308	427.8	1.917	0.1247	427.7	1.912	0.1190	427.5	1.908	25
30	0.1402	432.4	1.937	0.1333	432.2	1.932	0.1270	432.0	1.927	0.1213	431.9	1.922	30
35	0.1428	436.7	1.951	0.1358	436.6	1.946	0.1294	436.4	1.941	0.1236	436.3	1.937	35
40	0.1453	441.2	1.965	0.1382	441.0	1.960	0.1317	440.9	1.956	0.1258	440.7	1.951	40
45	0.1479	445.6	1.979	0.1406	445.5	1.974	0.1341	445.3	1.970	0.1281	445.2	1.965	45
50	0.1504	450.1	1.993	0.1431	449.9	1.988	0.1364	449.8	1.984	0.1303	449.7	1.979	50
55	0.1529	454.6	2.007	0.1455	454.5	2.002	0.1387	454.3	1.998	0.1325	454.2	1.993	55
60	0.1555	459.1	2.021	0.1479	459.0	2.016	0.1410	458.9	2.011	0.1347	458.8	2.007	60
65	0.1580	463.7	2.035	0.1503	463.6	2.030	0.1433	463.5	2.025	0.1369	463.4	2.021	65
70	0.1605	468.3	2.048	0.1527	468.2	2.043	0.1456	468.1	2.039	0.1391	468.0	2.034	70
75	0.1630	473.0	2.062	0.1551	472.9	2.057	0.1479	472.8	2.052	0.1413	472.7	2.048	75
80	0.1655	477.7	2.075	0.1574	477.6	2.070	0.1502	477.5	2.066	0.1435	477.4	2.061	80
85	0.1680	482.4	2.088	0.1598	482.3	2.083	0.1524	482.2	2.079	0.1457	482.1	2.074	85
90	0.1704	487.1	2.101	0.1622	487.0	2.097	0.1547	487.0	2.092	0.1479	486.9	2.088	90
95	0.1729	491.9	2.115	0.1646	491.8	2.110	0.1570	491.8	2.105	0.1500	491.7	2.101	95
100	0.1754	496.8	2.128	0.1669	496.7	2.123	0.1592	496.6	2.118	0.1522	496.5	2.114	100
105	0.1779	501.6	2.141	0.1693	501.5	2.136	0.1615	501.5	2.131	0.1543	501.4	2.127	105
110	0.1803	506.5	2.153	0.1716	506.5	2.149	0.1637	506.4	2.144	0.1565	506.3	2.140	110
115	0.1828	511.5	2.166	0.1740	511.4	2.161	0.1660	511.3	2.157	0.1586	511.2	2.152	115
120	0.1852	516.4	2.179	0.1763	516.4	2.174	0.1682	516.3	2.170	0.1608	516.2	2.165	120

Opteon™ XP40 (R-449A)

Superheated Vapor - Constant Pressure Tables

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	240			250			260			270			Temp °C
	-20.60 °C			-19.58 °C			-18.60 °C			-17.65 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0928	388.0	1.760	0.0893	388.5	1.759	0.0583	317.0	1.473	0.0430	282.0	1.333	
-20	0.0931	388.5	1.762										-20
-15	0.0956	392.8	1.779	0.0914	392.5	1.774	0.0876	392.2	1.770	0.0841	391.9	1.765	-15
-10	0.0980	397.1	1.796	0.0938	396.9	1.791	0.0899	396.6	1.786	0.0863	396.3	1.782	-10
-5	0.1003	401.4	1.812	0.0961	401.2	1.807	0.0921	400.9	1.803	0.0884	400.7	1.798	-5
0	0.1026	405.7	1.828	0.0983	405.5	1.823	0.0943	405.2	1.819	0.0906	405.0	1.814	0
5	0.1049	410.0	1.843	0.1005	409.8	1.839	0.0964	409.6	1.834	0.0926	409.3	1.830	5
10	0.1072	414.3	1.858	0.1027	414.1	1.854	0.0985	413.9	1.850	0.0947	413.7	1.846	10
15	0.1095	418.6	1.874	0.1049	418.4	1.869	0.1006	418.2	1.865	0.0967	418.0	1.861	15
20	0.1117	423.0	1.888	0.1070	422.8	1.884	0.1027	422.6	1.880	0.0987	422.4	1.876	20
25	0.1139	427.3	1.903	0.1091	427.1	1.899	0.1048	427.0	1.895	0.1007	426.8	1.891	25
30	0.1161	431.7	1.918	0.1113	431.5	1.914	0.1068	431.4	1.909	0.1027	431.2	1.905	30
35	0.1183	436.1	1.932	0.1134	436.0	1.928	0.1088	435.8	1.924	0.1046	435.7	1.920	35
40	0.1204	440.6	1.947	0.1154	440.4	1.942	0.1108	440.3	1.938	0.1066	440.1	1.934	40
45	0.1226	445.0	1.961	0.1175	444.9	1.957	0.1128	444.8	1.952	0.1085	444.6	1.949	45
50	0.1247	449.5	1.975	0.1196	449.4	1.971	0.1148	449.3	1.967	0.1104	449.1	1.963	50
55	0.1268	454.1	1.989	0.1216	453.9	1.985	0.1168	453.8	1.981	0.1124	453.7	1.977	55
60	0.1290	458.6	2.003	0.1237	458.5	1.998	0.1188	458.4	1.994	0.1143	458.3	1.991	60
65	0.1311	463.2	2.016	0.1257	463.1	2.012	0.1208	463.0	2.008	0.1162	462.9	2.004	65
70	0.1332	467.9	2.030	0.1277	467.8	2.026	0.1227	467.7	2.022	0.1180	467.5	2.018	70
75	0.1353	472.5	2.043	0.1298	472.4	2.039	0.1247	472.3	2.035	0.1199	472.2	2.031	75
80	0.1374	477.2	2.057	0.1318	477.1	2.053	0.1266	477.0	2.049	0.1218	476.9	2.045	80
85	0.1395	482.0	2.070	0.1338	481.9	2.066	0.1285	481.8	2.062	0.1237	481.7	2.058	85
90	0.1416	486.8	2.083	0.1358	486.7	2.079	0.1305	486.6	2.075	0.1255	486.5	2.072	90
95	0.1437	491.6	2.096	0.1378	491.5	2.092	0.1324	491.4	2.088	0.1274	491.3	2.085	95
100	0.1457	496.4	2.110	0.1398	496.3	2.105	0.1343	496.2	2.102	0.1293	496.1	2.098	100
105	0.1478	501.3	2.123	0.1418	501.2	2.118	0.1363	501.1	2.115	0.1311	501.0	2.111	105
110	0.1499	506.2	2.135	0.1438	506.1	2.131	0.1382	506.0	2.127	0.1330	505.9	2.124	110
115	0.1519	511.1	2.148	0.1458	511.1	2.144	0.1401	511.0	2.140	0.1348	510.9	2.137	115
120	0.1540	516.1	2.161	0.1478	516.0	2.157	0.1420	516.0	2.153	0.1367	515.9	2.149	120
125	0.1561	521.1	2.174	0.1497	521.1	2.170	0.1439	521.0	2.166	0.1385	520.9	2.162	125

  

ABSOLUTE PRESSURE, kPa													
Temp °C	280			290			300			310			Temp °C
	-16.72 °C			-15.82 °C			-14.94 °C			-14.08 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0801	390.1	1.755	0.0774	390.6	1.754	0.0533	327.0	1.504	0.0413	296.1	1.381	
-15	0.0808	391.6	1.761	0.0778	391.3	1.757							-15
-10	0.0830	396.0	1.778	0.0799	395.7	1.774	0.0770	395.5	1.769	0.0742	395.2	1.766	-10
-5	0.0851	400.4	1.794	0.0819	400.1	1.790	0.0789	399.9	1.786	0.0762	399.6	1.782	-5
0	0.0871	404.8	1.810	0.0839	404.5	1.806	0.0809	404.3	1.802	0.0781	404.0	1.799	0
5	0.0891	409.1	1.826	0.0858	408.9	1.822	0.0828	408.7	1.818	0.0799	408.4	1.815	5
10	0.0911	413.5	1.842	0.0878	413.3	1.838	0.0847	413.0	1.834	0.0817	412.8	1.830	10
15	0.0931	417.8	1.857	0.0897	417.6	1.853	0.0865	417.4	1.849	0.0836	417.2	1.846	15
20	0.0950	422.2	1.872	0.0916	422.0	1.868	0.0883	421.8	1.864	0.0853	421.7	1.861	20
25	0.0969	426.6	1.887	0.0934	426.4	1.883	0.0902	426.3	1.879	0.0871	426.1	1.876	25
30	0.0989	431.0	1.902	0.0953	430.9	1.898	0.0920	430.7	1.894	0.0888	430.5	1.891	30
35	0.1007	435.5	1.916	0.0971	435.3	1.912	0.0937	435.2	1.909	0.0906	435.0	1.905	35
40	0.1026	440.0	1.931	0.0990	439.8	1.927	0.0955	439.7	1.923	0.0923	439.5	1.920	40
45	0.1045	444.5	1.945	0.1008	444.3	1.941	0.0973	444.2	1.938	0.0940	444.0	1.934	45
50	0.1064	449.0	1.959	0.1026	448.9	1.955	0.0990	448.7	1.952	0.0957	448.6	1.948	50
55	0.1082	453.6	1.973	0.1044	453.4	1.969	0.1008	453.3	1.966	0.0974	453.2	1.962	55
60	0.1101	458.1	1.987	0.1061	458.0	1.983	0.1025	457.9	1.980	0.0991	457.8	1.976	60
65	0.1119	462.8	2.001	0.1079	462.7	1.997	0.1042	462.5	1.993	0.1007	462.4	1.990	65
70	0.1137	467.4	2.014	0.1097	467.3	2.011	0.1059	467.2	2.007	0.1024	467.1	2.004	70
75	0.1155	472.1	2.028	0.1115	472.0	2.024	0.1076	471.9	2.021	0.1041	471.8	2.017	75
80	0.1174	476.8	2.041	0.1132	476.7	2.038	0.1093	476.6	2.034	0.1057	476.5	2.031	80
85	0.1192	481.6	2.055	0.1150	481.5	2.051	0.1110	481.4	2.048	0.1074	481.3	2.044	85
90	0.1210	486.4	2.068	0.1167	486.3	2.064	0.1127	486.2	2.061	0.1090	486.1	2.058	90
95	0.1228	491.2	2.081	0.1184	491.1	2.078	0.1144	491.0	2.074	0.1106	490.9	2.071	95
100	0.1246	496.0	2.094	0.1202	495.9	2.091	0.1161	495.9	2.087	0.1123	495.8	2.084	100
105	0.1263	500.9	2.107	0.1219	500.8	2.104	0.1178	500.8	2.100	0.1139	500.7	2.097	105
110	0.1281	505.9	2.120	0.1236	505.8	2.117	0.1194	505.7	2.113	0.1155	505.6	2.110	110
115	0.1299	510.8	2.133	0.1254	510.7	2.129	0.1211	510.6	2.126	0.1171	510.6	2.123	115
120	0.1317	515.8	2.146	0.1271	515.7	2.142	0.1228	515.6	2.139	0.1187	515.6	2.136	120
125	0.1335	520.8	2.158	0.1288	520.8	2.155	0.1244	520.7	2.152	0.1203	520.6	2.148	125
130	0.1352	525.9	2.171	0.1305	525.8	2.168	0.1261	525.7	2.164	0.1220	525.7	2.161	130



Opteon™ XP40 (R-449A)

Superheated Vapor - Constant Pressure Tables

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	320			330			340			350			Temp °C
	-13.25 °C			-12.43 °C			-11.64 °C			-10.86 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0704	392.0	1.750	0.0684	392.4	1.749	0.0489	395.0	1.527	0.0392	307.2	1.418	
-10	0.0717	394.9	1.762	0.0693	394.6	1.758	0.0670	394.3	1.754	0.0649	394.0	1.751	-10
-5	0.0736	399.4	1.778	0.0711	399.1	1.775	0.0688	398.8	1.771	0.0667	398.5	1.768	-5
0	0.0754	403.8	1.795	0.0729	403.5	1.791	0.0706	403.3	1.788	0.0684	403.0	1.784	0
5	0.0772	408.2	1.811	0.0747	408.0	1.807	0.0723	407.7	1.804	0.0701	407.5	1.800	5
10	0.0790	412.6	1.827	0.0765	412.4	1.823	0.0740	412.2	1.820	0.0718	412.0	1.816	10
15	0.0808	417.0	1.842	0.0782	416.8	1.839	0.0757	416.6	1.835	0.0734	416.4	1.832	15
20	0.0825	421.5	1.857	0.0799	421.3	1.854	0.0774	421.1	1.851	0.0750	420.9	1.847	20
25	0.0842	425.9	1.872	0.0815	425.7	1.869	0.0790	425.6	1.866	0.0766	425.4	1.862	25
30	0.0859	430.4	1.887	0.0832	430.2	1.884	0.0806	430.0	1.881	0.0782	429.9	1.877	30
35	0.0876	434.9	1.902	0.0848	434.7	1.899	0.0822	434.5	1.895	0.0797	434.4	1.892	35
40	0.0893	439.4	1.916	0.0865	439.2	1.913	0.0838	439.1	1.910	0.0813	438.9	1.907	40
45	0.0909	443.9	1.931	0.0881	443.8	1.927	0.0854	443.6	1.924	0.0828	443.5	1.921	45
50	0.0926	448.5	1.945	0.0897	448.3	1.942	0.0869	448.2	1.939	0.0843	448.0	1.935	50
55	0.0942	453.0	1.959	0.0913	452.9	1.956	0.0885	452.8	1.953	0.0859	452.6	1.950	55
60	0.0959	457.6	1.973	0.0929	457.5	1.970	0.0900	457.4	1.967	0.0874	457.3	1.964	60
65	0.0975	462.3	1.987	0.0944	462.2	1.984	0.0916	462.1	1.980	0.0889	461.9	1.977	65
70	0.0991	467.0	2.000	0.0960	466.8	1.997	0.0931	466.7	1.994	0.0903	466.6	1.991	70
75	0.1007	471.7	2.014	0.0976	471.6	2.011	0.0946	471.4	2.008	0.0918	471.3	2.005	75
80	0.1023	476.4	2.028	0.0991	476.3	2.024	0.0961	476.2	2.021	0.0933	476.1	2.018	80
85	0.1039	481.2	2.041	0.1007	481.1	2.038	0.0976	481.0	2.035	0.0948	480.9	2.032	85
90	0.1055	486.0	2.054	0.1022	485.9	2.051	0.0991	485.8	2.048	0.0962	485.7	2.045	90
95	0.1071	490.8	2.068	0.1038	490.7	2.064	0.1006	490.6	2.061	0.0977	490.5	2.058	95
100	0.1087	495.7	2.081	0.1053	495.6	2.078	0.1021	495.5	2.075	0.0991	495.4	2.072	100
105	0.1102	500.6	2.094	0.1068	500.5	2.091	0.1036	500.4	2.088	0.1006	500.3	2.085	105
110	0.1118	505.5	2.107	0.1084	505.4	2.104	0.1051	505.3	2.101	0.1020	505.3	2.098	110
115	0.1134	510.5	2.120	0.1099	510.4	2.116	0.1066	510.3	2.113	0.1035	510.2	2.111	115
120	0.1150	515.5	2.132	0.1114	515.4	2.129	0.1081	515.3	2.126	0.1049	515.2	2.123	120
125	0.1165	520.5	2.145	0.1129	520.4	2.142	0.1095	520.4	2.139	0.1064	520.3	2.136	125
130	0.1181	525.6	2.158	0.1144	525.5	2.155	0.1110	525.4	2.152	0.1078	525.4	2.149	130
135	0.1196	530.7	2.170	0.1160	530.6	2.167	0.1125	530.6	2.164	0.1092	530.5	2.161	135

  

ABSOLUTE PRESSURE, kPa													
Temp °C	360			370			380			390			Temp °C
	-10.10 °C			-9.35 °C			-8.62 °C			-7.91 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0629	393.6	1.747	0.0612	394.0	1.746	0.0451	341.6	1.545	0.0370	316.2	1.447	
-10	0.0629	393.7	1.747										-10
-5	0.0646	398.3	1.764	0.0627	398.0	1.761	0.0609	397.7	1.757	0.0591	397.4	1.754	-5
0	0.0663	402.8	1.781	0.0644	402.5	1.778	0.0625	402.3	1.774	0.0607	402.0	1.771	0
5	0.0680	407.3	1.797	0.0660	407.1	1.794	0.0641	406.8	1.791	0.0623	406.6	1.788	5
10	0.0696	411.8	1.813	0.0676	411.6	1.810	0.0656	411.3	1.807	0.0638	411.1	1.804	10
15	0.0712	416.2	1.829	0.0691	416.0	1.826	0.0672	415.8	1.823	0.0653	415.6	1.820	15
20	0.0728	420.7	1.844	0.0707	420.5	1.841	0.0687	420.3	1.838	0.0668	420.1	1.835	20
25	0.0743	425.2	1.859	0.0722	425.0	1.856	0.0702	424.8	1.853	0.0682	424.7	1.850	25
30	0.0759	429.7	1.874	0.0737	429.5	1.871	0.0716	429.4	1.868	0.0697	429.2	1.865	30
35	0.0774	434.2	1.889	0.0752	434.1	1.886	0.0731	433.9	1.883	0.0711	433.7	1.880	35
40	0.0789	438.8	1.904	0.0767	438.6	1.901	0.0745	438.5	1.898	0.0725	438.3	1.895	40
45	0.0804	443.3	1.918	0.0781	443.2	1.915	0.0760	443.0	1.912	0.0739	442.9	1.910	45
50	0.0819	447.9	1.932	0.0796	447.8	1.930	0.0774	447.6	1.927	0.0753	447.5	1.924	50
55	0.0834	452.5	1.947	0.0810	452.4	1.944	0.0788	452.2	1.941	0.0767	452.1	1.938	55
60	0.0848	457.1	1.961	0.0824	457.0	1.958	0.0802	456.9	1.955	0.0780	456.8	1.952	60
65	0.0863	461.8	1.975	0.0839	461.7	1.972	0.0816	461.6	1.969	0.0794	461.4	1.966	65
70	0.0877	466.5	1.988	0.0853	466.4	1.985	0.0830	466.3	1.983	0.0807	466.2	1.980	70
75	0.0892	471.2	2.002	0.0867	471.1	1.999	0.0843	471.0	1.996	0.0821	470.9	1.994	75
80	0.0906	476.0	2.016	0.0881	475.9	2.013	0.0857	475.8	2.010	0.0834	475.7	2.007	80
85	0.0921	480.8	2.029	0.0895	480.7	2.026	0.0871	480.6	2.023	0.0848	480.5	2.021	85
90	0.0935	485.6	2.042	0.0909	485.5	2.040	0.0884	485.4	2.037	0.0861	485.3	2.034	90
95	0.0949	490.4	2.056	0.0923	490.3	2.053	0.0898	490.2	2.050	0.0874	490.1	2.047	95
100	0.0963	495.3	2.069	0.0936	495.2	2.066	0.0911	495.1	2.063	0.0887	495.0	2.061	100
105	0.0977	500.2	2.082	0.0950	500.1	2.079	0.0925	500.0	2.076	0.0900	500.0	2.074	105
110	0.0991	505.2	2.095	0.0964	505.1	2.092	0.0938	505.0	2.089	0.0913	504.9	2.087	110
115	0.1005	510.1	2.108	0.0978	510.1	2.105	0.0951	510.0	2.102	0.0926	509.9	2.100	115
120	0.1019	515.2	2.121	0.0991	515.1	2.118	0.0965	515.0	2.115	0.0939	514.9	2.112	120
125	0.1033	520.2	2.133	0.1005	520.1	2.131	0.0978	520.1	2.128	0.0952	520.0	2.125	125
130	0.1047	525.3	2.146	0.1018	525.2	2.143	0.0991	525.1	2.141	0.0965	525.1	2.138	130
135	0.1061	530.4	2.159	0.1032	530.3	2.156	0.1004	530.3	2.153	0.0978	530.2	2.151	135

**Opteon™ XP40 (R-449A)**  
**Superheated Vapor - Constant Pressure Tables**

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	400			425			450			475			Temp °C
	-7.21 °C			-5.51 °C			-3.89 °C			-2.33 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0567	395.1	1.743	0.0535	396.0	1.741	0.0219	276.1	1.289	0.0058	211.2	1.043	
-5	0.0575	397.2	1.751	0.0536	396.4	1.743							-5
0	0.0590	401.8	1.768	0.0552	401.1	1.760	0.0517	400.5	1.753	0.0486	399.8	1.746	0
5	0.0606	406.3	1.785	0.0566	405.7	1.777	0.0531	405.1	1.770	0.0500	404.5	1.763	5
10	0.0621	410.9	1.801	0.0581	410.3	1.793	0.0545	409.8	1.787	0.0513	409.2	1.780	10
15	0.0635	415.4	1.817	0.0595	414.9	1.809	0.0559	414.4	1.803	0.0526	413.9	1.796	15
20	0.0650	420.0	1.832	0.0609	419.5	1.825	0.0572	419.0	1.818	0.0539	418.5	1.812	20
25	0.0664	424.5	1.848	0.0622	424.0	1.841	0.0585	423.6	1.834	0.0551	423.1	1.828	25
30	0.0678	429.0	1.863	0.0636	428.6	1.856	0.0598	428.2	1.849	0.0564	427.7	1.843	30
35	0.0692	433.6	1.878	0.0649	433.2	1.871	0.0610	432.8	1.864	0.0576	432.3	1.858	35
40	0.0706	438.2	1.892	0.0662	437.8	1.886	0.0623	437.4	1.879	0.0588	437.0	1.873	40
45	0.0720	442.7	1.907	0.0675	442.4	1.900	0.0635	442.0	1.894	0.0600	441.6	1.888	45
50	0.0733	447.3	1.921	0.0688	447.0	1.915	0.0647	446.6	1.908	0.0611	446.3	1.902	50
55	0.0747	452.0	1.935	0.0701	451.6	1.929	0.0660	451.3	1.923	0.0623	451.0	1.917	55
60	0.0760	456.6	1.949	0.0713	456.3	1.943	0.0672	456.0	1.937	0.0634	455.7	1.931	60
65	0.0773	461.3	1.963	0.0726	461.0	1.957	0.0684	460.7	1.951	0.0646	460.4	1.945	65
70	0.0786	466.0	1.977	0.0738	465.7	1.971	0.0695	465.5	1.965	0.0657	465.2	1.959	70
75	0.0800	470.8	1.991	0.0751	470.5	1.985	0.0707	470.2	1.979	0.0668	469.9	1.973	75
80	0.0813	475.5	2.005	0.0763	475.3	1.998	0.0719	475.0	1.992	0.0680	474.7	1.987	80
85	0.0826	480.3	2.018	0.0775	480.1	2.012	0.0731	479.8	2.006	0.0691	479.6	2.000	85
90	0.0839	485.2	2.031	0.0788	484.9	2.025	0.0742	484.7	2.019	0.0702	484.4	2.014	90
95	0.0851	490.0	2.045	0.0800	489.8	2.039	0.0754	489.6	2.033	0.0713	489.3	2.027	95
100	0.0864	494.9	2.058	0.0812	494.7	2.052	0.0765	494.5	2.046	0.0724	494.2	2.040	100
105	0.0877	499.9	2.071	0.0824	499.6	2.065	0.0777	499.4	2.059	0.0735	499.2	2.053	105
110	0.0890	504.8	2.084	0.0836	504.6	2.078	0.0788	504.4	2.072	0.0746	504.2	2.066	110
115	0.0903	509.8	2.097	0.0848	509.6	2.091	0.0800	509.4	2.085	0.0756	509.2	2.079	115
120	0.0915	514.8	2.110	0.0860	514.6	2.104	0.0811	514.4	2.098	0.0767	514.2	2.092	120
125	0.0928	519.9	2.123	0.0872	519.7	2.117	0.0822	519.5	2.111	0.0778	519.3	2.105	125
130	0.0941	525.0	2.135	0.0884	524.8	2.129	0.0834	524.6	2.123	0.0789	524.4	2.118	130
135	0.0953	530.1	2.148	0.0896	529.9	2.142	0.0845	529.7	2.136	0.0800	529.6	2.131	135
140	0.0966	535.3	2.161	0.0908	535.1	2.155	0.0856	534.9	2.149	0.0810	534.7	2.143	140

  

ABSOLUTE PRESSURE, kPa													
Temp °C	500			525			550			575			Temp °C
	-0.84 °C			0.60 °C			1.99 °C			3.33 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0456	398.3	1.736	0.0435	399.0	1.735	0.0214	298.5	1.364	0.0102	246.4	1.171	
0	0.0458	399.1	1.739										0
5	0.0472	403.9	1.757	0.0446	403.3	1.750	0.0423	402.6	1.744	0.0401	401.9	1.738	5
10	0.0485	408.6	1.773	0.0459	408.0	1.767	0.0435	407.4	1.761	0.0413	406.8	1.755	10
15	0.0497	413.3	1.790	0.0471	412.8	1.784	0.0447	412.2	1.778	0.0425	411.7	1.772	15
20	0.0509	418.0	1.806	0.0483	417.5	1.800	0.0458	417.0	1.794	0.0436	416.4	1.789	20
25	0.0521	422.6	1.822	0.0494	422.2	1.816	0.0469	421.7	1.810	0.0447	421.2	1.805	25
30	0.0533	427.3	1.837	0.0505	426.8	1.831	0.0480	426.4	1.826	0.0457	425.9	1.820	30
35	0.0545	431.9	1.852	0.0517	431.5	1.847	0.0491	431.1	1.841	0.0468	430.7	1.836	35
40	0.0556	436.6	1.867	0.0528	436.2	1.862	0.0502	435.8	1.856	0.0478	435.4	1.851	40
45	0.0568	441.3	1.882	0.0539	440.9	1.877	0.0512	440.5	1.871	0.0488	440.1	1.866	45
50	0.0579	445.9	1.897	0.0549	445.6	1.891	0.0523	445.2	1.886	0.0498	444.9	1.881	50
55	0.0590	450.6	1.911	0.0560	450.3	1.906	0.0533	450.0	1.900	0.0508	449.6	1.895	55
60	0.0601	455.4	1.925	0.0571	455.0	1.920	0.0543	454.7	1.915	0.0518	454.4	1.910	60
65	0.0612	460.1	1.939	0.0581	459.8	1.934	0.0553	459.5	1.929	0.0528	459.2	1.924	65
70	0.0623	464.9	1.953	0.0591	464.6	1.948	0.0563	464.3	1.943	0.0537	464.0	1.938	70
75	0.0633	469.7	1.967	0.0602	469.4	1.962	0.0573	469.1	1.957	0.0547	468.8	1.952	75
80	0.0644	474.5	1.981	0.0612	474.2	1.976	0.0583	473.9	1.971	0.0556	473.6	1.966	80
85	0.0655	479.3	1.995	0.0622	479.0	1.989	0.0593	478.8	1.985	0.0566	478.5	1.980	85
90	0.0665	484.2	2.008	0.0632	483.9	2.003	0.0602	483.7	1.998	0.0575	483.4	1.993	90
95	0.0676	489.1	2.022	0.0642	488.8	2.016	0.0612	488.6	2.012	0.0584	488.3	2.007	95
100	0.0686	494.0	2.035	0.0652	493.8	2.030	0.0622	493.5	2.025	0.0593	493.3	2.020	100
105	0.0697	499.0	2.048	0.0662	498.7	2.043	0.0631	498.5	2.038	0.0603	498.3	2.033	105
110	0.0707	504.0	2.061	0.0672	503.7	2.056	0.0641	503.5	2.051	0.0612	503.3	2.047	110
115	0.0718	509.0	2.074	0.0682	508.8	2.069	0.0650	508.6	2.064	0.0621	508.3	2.060	115
120	0.0728	514.0	2.087	0.0692	513.8	2.082	0.0660	513.6	2.077	0.0630	513.4	2.073	120
125	0.0738	519.1	2.100	0.0702	518.9	2.095	0.0669	518.7	2.090	0.0639	518.5	2.086	125
130	0.0748	524.2	2.113	0.0712	524.0	2.108	0.0678	523.8	2.103	0.0648	523.7	2.098	130
135	0.0759	529.4	2.125	0.0721	529.2	2.120	0.0688	529.0	2.116	0.0657	528.8	2.111	135
140	0.0769	534.6	2.138	0.0731	534.4	2.133	0.0697	534.2	2.128	0.0666	534.0	2.124	140
145	0.0779	539.8	2.151	0.0741	539.6	2.146	0.0706	539.4	2.141	0.0675	539.2	2.136	145

**Opteon™ XP40 (R-449A)**  
**Superheated Vapor - Constant Pressure Tables**

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	600			625			650			675			Temp °C
	4.62 °C			5.88 °C			7.10 °C			8.28 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0381	400.9	1.730	0.0366	401.5	1.729	0.0201	314.4	1.414	0.0118	270.1	1.253	
5	0.0382	401.3	1.732										5
10	0.0393	406.2	1.750	0.0375	405.6	1.744	0.0358	405.0	1.738	0.0342	404.3	1.733	10
15	0.0405	411.1	1.767	0.0386	410.5	1.761	0.0369	409.9	1.756	0.0353	409.4	1.751	15
20	0.0415	415.9	1.783	0.0396	415.4	1.778	0.0379	414.9	1.773	0.0363	414.3	1.768	20
25	0.0426	420.7	1.799	0.0407	420.2	1.794	0.0389	419.7	1.789	0.0373	419.2	1.784	25
30	0.0436	425.5	1.815	0.0417	425.0	1.810	0.0399	424.6	1.805	0.0382	424.1	1.801	30
35	0.0446	430.2	1.831	0.0427	429.8	1.826	0.0408	429.4	1.821	0.0392	428.9	1.816	35
40	0.0456	435.0	1.846	0.0436	434.6	1.841	0.0418	434.2	1.836	0.0401	433.8	1.832	40
45	0.0466	439.7	1.861	0.0446	439.4	1.856	0.0427	439.0	1.852	0.0410	438.6	1.847	45
50	0.0476	444.5	1.876	0.0455	444.1	1.871	0.0436	443.8	1.867	0.0418	443.4	1.862	50
55	0.0485	449.3	1.891	0.0464	448.9	1.886	0.0445	448.6	1.881	0.0427	448.2	1.877	55
60	0.0495	454.1	1.905	0.0474	453.7	1.900	0.0454	453.4	1.896	0.0436	453.1	1.892	60
65	0.0504	458.9	1.919	0.0483	458.5	1.915	0.0463	458.2	1.910	0.0444	457.9	1.906	65
70	0.0513	463.7	1.934	0.0492	463.4	1.929	0.0471	463.1	1.925	0.0453	462.8	1.920	70
75	0.0523	468.5	1.948	0.0500	468.2	1.943	0.0480	467.9	1.939	0.0461	467.6	1.934	75
80	0.0532	473.4	1.961	0.0509	473.1	1.957	0.0489	472.8	1.953	0.0469	472.5	1.948	80
85	0.0541	478.3	1.975	0.0518	478.0	1.971	0.0497	477.7	1.966	0.0477	477.5	1.962	85
90	0.0550	483.2	1.989	0.0527	482.9	1.984	0.0505	482.7	1.980	0.0486	482.4	1.976	90
95	0.0559	488.1	2.002	0.0535	487.9	1.998	0.0514	487.6	1.994	0.0494	487.4	1.990	95
100	0.0568	493.1	2.016	0.0544	492.8	2.011	0.0522	492.6	2.007	0.0502	492.4	2.003	100
105	0.0577	498.1	2.029	0.0552	497.8	2.025	0.0530	497.6	2.020	0.0510	497.4	2.016	105
110	0.0585	503.1	2.042	0.0561	502.9	2.038	0.0538	502.6	2.034	0.0518	502.4	2.030	110
115	0.0594	508.1	2.055	0.0569	507.9	2.051	0.0547	507.7	2.047	0.0526	507.5	2.043	115
120	0.0603	513.2	2.068	0.0578	513.0	2.064	0.0555	512.8	2.060	0.0533	512.6	2.056	120
125	0.0612	518.3	2.081	0.0586	518.1	2.077	0.0563	517.9	2.073	0.0541	517.7	2.069	125
130	0.0620	523.5	2.094	0.0595	523.3	2.090	0.0571	523.1	2.086	0.0549	522.9	2.082	130
135	0.0629	528.6	2.107	0.0603	528.4	2.102	0.0579	528.3	2.098	0.0557	528.1	2.094	135
140	0.0637	533.8	2.119	0.0611	533.6	2.115	0.0587	533.5	2.111	0.0564	533.3	2.107	140
145	0.0646	539.1	2.132	0.0619	538.9	2.128	0.0595	538.7	2.124	0.0572	538.5	2.120	145
150	0.0655	544.3	2.144	0.0628	544.2	2.140	0.0603	544.0	2.136	0.0580	543.8	2.132	150

  

ABSOLUTE PRESSURE, kPa													
Temp °C	700			725			750			775			Temp °C
	9.43 °C			10.55 °C			11.64 °C			12.70 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0327	403.1	1.726	0.0315	403.6	1.725	0.0186	326.3	1.450	0.0122	287.6	1.311	
10	0.0328	403.7	1.728										10
15	0.0338	408.8	1.746	0.0324	408.2	1.741	0.0311	407.5	1.736	0.0299	406.9	1.731	15
20	0.0348	413.8	1.763	0.0334	413.2	1.758	0.0321	412.6	1.753	0.0308	412.1	1.749	20
25	0.0357	418.7	1.780	0.0343	418.2	1.775	0.0330	417.7	1.770	0.0317	417.1	1.766	25
30	0.0367	423.6	1.796	0.0352	423.1	1.791	0.0339	422.6	1.787	0.0326	422.2	1.783	30
35	0.0376	428.5	1.812	0.0361	428.0	1.807	0.0348	427.6	1.803	0.0335	427.1	1.799	35
40	0.0385	433.3	1.827	0.0370	432.9	1.823	0.0356	432.5	1.819	0.0343	432.1	1.815	40
45	0.0393	438.2	1.843	0.0378	437.8	1.839	0.0364	437.4	1.834	0.0351	437.0	1.830	45
50	0.0402	443.0	1.858	0.0387	442.6	1.854	0.0373	442.3	1.850	0.0359	441.9	1.846	50
55	0.0411	447.9	1.873	0.0395	447.5	1.869	0.0381	447.2	1.865	0.0367	446.8	1.861	55
60	0.0419	452.7	1.887	0.0403	452.4	1.883	0.0389	452.0	1.879	0.0375	451.7	1.875	60
65	0.0427	457.6	1.902	0.0411	457.3	1.898	0.0396	456.9	1.894	0.0382	456.6	1.890	65
70	0.0435	462.5	1.916	0.0419	462.1	1.912	0.0404	461.8	1.908	0.0390	461.5	1.905	70
75	0.0443	467.3	1.930	0.0427	467.1	1.926	0.0412	466.8	1.923	0.0397	466.5	1.919	75
80	0.0451	472.3	1.944	0.0435	472.0	1.940	0.0419	471.7	1.937	0.0405	471.4	1.933	80
85	0.0459	477.2	1.958	0.0443	476.9	1.954	0.0427	476.6	1.951	0.0412	476.4	1.947	85
90	0.0467	482.1	1.972	0.0450	481.9	1.968	0.0434	481.6	1.964	0.0419	481.4	1.961	90
95	0.0475	487.1	1.986	0.0458	486.9	1.982	0.0442	486.6	1.978	0.0426	486.4	1.974	95
100	0.0483	492.1	1.999	0.0465	491.9	1.995	0.0449	491.6	1.992	0.0434	491.4	1.988	100
105	0.0491	497.1	2.012	0.0473	496.9	2.009	0.0456	496.7	2.005	0.0441	496.5	2.001	105
110	0.0498	502.2	2.026	0.0480	502.0	2.022	0.0463	501.8	2.018	0.0448	501.5	2.015	110
115	0.0506	507.3	2.039	0.0488	507.1	2.035	0.0471	506.8	2.032	0.0455	506.6	2.028	115
120	0.0514	512.4	2.052	0.0495	512.2	2.048	0.0478	512.0	2.045	0.0462	511.8	2.041	120
125	0.0521	517.5	2.065	0.0502	517.3	2.061	0.0485	517.1	2.058	0.0469	516.9	2.054	125
130	0.0529	522.7	2.078	0.0510	522.5	2.074	0.0492	522.3	2.071	0.0475	522.1	2.067	130
135	0.0536	527.9	2.091	0.0517	527.7	2.087	0.0499	527.5	2.083	0.0482	527.3	2.080	135
140	0.0544	533.1	2.103	0.0524	532.9	2.100	0.0506	532.7	2.096	0.0489	532.6	2.093	140
145	0.0551	538.4	2.116	0.0531	538.2	2.112	0.0513	538.0	2.109	0.0496	537.8	2.105	145
150	0.0558	543.6	2.129	0.0539	543.5	2.125	0.0520	543.3	2.121	0.0503	543.1	2.118	150
155	0.0566	549.0	2.141	0.0546	548.8	2.137	0.0527	548.6	2.134	0.0509	548.5	2.131	155

Opteon™ XP40 (R-449A)

Superheated Vapor - Constant Pressure Tables

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	800			900			1000			1100			Temp °C
	13.74 °C			17.66 °C			21.26 °C			24.60 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0285	404.9	1.721	0.0253	406.5	1.718	0.0009	219.9	1.070	0.0009	219.9	1.070	
15	0.0288	406.3	1.726										15
20	0.0297	411.5	1.744	0.0257	409.1	1.726							20
25	0.0306	416.6	1.761	0.0265	414.4	1.744	0.0233	412.1	1.728	0.0206	409.6	1.713	25
30	0.0314	421.7	1.778	0.0273	419.6	1.762	0.0241	417.5	1.746	0.0213	415.2	1.731	30
35	0.0323	426.7	1.795	0.0281	424.8	1.779	0.0248	422.8	1.764	0.0220	420.7	1.749	35
40	0.0331	431.6	1.811	0.0289	429.9	1.795	0.0255	428.0	1.781	0.0227	426.1	1.767	40
45	0.0339	436.6	1.826	0.0296	434.9	1.811	0.0262	432.2	1.797	0.0234	431.4	1.784	45
50	0.0347	441.5	1.842	0.0303	439.9	1.827	0.0269	438.3	1.813	0.0240	436.7	1.800	50
55	0.0354	446.4	1.857	0.0311	445.0	1.842	0.0275	443.4	1.829	0.0247	441.9	1.816	55
60	0.0362	451.4	1.872	0.0317	450.0	1.857	0.0282	448.5	1.844	0.0253	447.1	1.832	60
65	0.0369	456.3	1.886	0.0324	455.0	1.872	0.0288	453.6	1.859	0.0259	452.2	1.847	65
70	0.0377	461.2	1.901	0.0331	460.0	1.887	0.0294	458.7	1.874	0.0264	457.4	1.862	70
75	0.0384	466.2	1.915	0.0338	465.0	1.901	0.0301	463.7	1.889	0.0270	462.5	1.877	75
80	0.0391	471.1	1.929	0.0344	470.0	1.916	0.0307	468.8	1.903	0.0276	467.6	1.892	80
85	0.0398	476.1	1.943	0.0351	475.0	1.930	0.0313	473.9	1.917	0.0281	472.8	1.906	85
90	0.0405	481.1	1.957	0.0357	480.0	1.944	0.0319	479.0	1.932	0.0287	477.9	1.920	90
95	0.0412	486.1	1.971	0.0363	485.1	1.958	0.0324	484.1	1.946	0.0292	483.0	1.934	95
100	0.0419	491.2	1.984	0.0370	490.2	1.971	0.0330	489.2	1.959	0.0298	488.2	1.948	100
105	0.0426	496.2	1.998	0.0376	495.3	1.985	0.0336	494.3	1.973	0.0303	493.4	1.962	105
110	0.0433	501.3	2.011	0.0382	500.4	1.998	0.0342	499.5	1.987	0.0308	498.6	1.976	110
115	0.0440	506.4	2.025	0.0388	505.5	2.012	0.0347	504.7	2.000	0.0313	503.8	1.989	115
120	0.0447	511.6	2.038	0.0394	510.7	2.025	0.0353	509.9	2.013	0.0319	509.0	2.003	120
125	0.0453	516.7	2.051	0.0400	515.9	2.038	0.0358	515.1	2.026	0.0324	514.3	2.016	125
130	0.0460	521.9	2.064	0.0407	521.1	2.051	0.0364	520.3	2.040	0.0329	519.5	2.029	130
135	0.0467	527.1	2.077	0.0413	526.4	2.064	0.0369	525.6	2.053	0.0334	524.8	2.042	135
140	0.0473	532.4	2.089	0.0419	531.6	2.077	0.0375	530.9	2.065	0.0339	530.2	2.055	140
145	0.0480	537.6	2.102	0.0424	536.9	2.090	0.0380	536.2	2.078	0.0344	535.5	2.068	145
150	0.0486	543.0	2.115	0.0430	542.3	2.102	0.0386	541.6	2.091	0.0349	540.9	2.081	150
155	0.0493	548.3	2.127	0.0436	547.6	2.115	0.0391	546.9	2.104	0.0354	546.3	2.093	155
160	0.0499	553.6	2.140	0.0442	553.0	2.127	0.0396	552.3	2.116	0.0359	551.7	2.106	160

  

ABSOLUTE PRESSURE, kPa													
Temp °C	1200			1300			1400			1500			Temp °C
	27.72 °C			30.65 °C			33.40 °C			36.02 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0187	410.2	1.708	0.0172	411.1	1.705	0.0009	241.1	1.141	0.0009	241.1	1.140	
30	0.0190	412.8	1.717										30
35	0.0197	418.6	1.736	0.0178	416.3	1.722	0.0160	413.8	1.709				35
40	0.0204	424.1	1.754	0.0184	422.1	1.741	0.0167	419.9	1.728	0.0152	417.5	1.716	40
45	0.0210	429.6	1.771	0.0190	427.7	1.759	0.0173	425.7	1.747	0.0158	423.6	1.735	45
50	0.0217	435.0	1.788	0.0196	433.2	1.776	0.0179	431.4	1.764	0.0164	429.5	1.753	50
55	0.0223	440.3	1.804	0.0202	438.7	1.793	0.0184	437.0	1.781	0.0169	435.2	1.771	55
60	0.0228	445.6	1.820	0.0208	444.0	1.809	0.0190	442.4	1.798	0.0174	440.8	1.788	60
65	0.0234	450.8	1.836	0.0213	449.4	1.825	0.0195	447.9	1.814	0.0179	446.4	1.804	65
70	0.0239	456.0	1.851	0.0218	454.7	1.840	0.0200	453.3	1.830	0.0184	451.8	1.820	70
75	0.0245	461.2	1.866	0.0223	459.9	1.855	0.0205	458.6	1.846	0.0189	457.3	1.836	75
80	0.0250	466.4	1.881	0.0228	465.2	1.870	0.0210	463.9	1.861	0.0193	462.7	1.851	80
85	0.0255	471.6	1.895	0.0233	470.4	1.885	0.0214	469.3	1.876	0.0198	468.0	1.867	85
90	0.0261	476.8	1.910	0.0238	475.7	1.900	0.0219	474.6	1.890	0.0202	473.4	1.881	90
95	0.0266	482.0	1.924	0.0243	480.9	1.914	0.0224	479.9	1.905	0.0207	478.8	1.896	95
100	0.0271	487.2	1.938	0.0248	486.2	1.928	0.0228	485.2	1.919	0.0211	484.1	1.910	100
105	0.0276	492.4	1.952	0.0252	491.4	1.942	0.0232	490.5	1.933	0.0215	489.5	1.925	105
110	0.0280	497.6	1.966	0.0257	496.7	1.956	0.0237	495.8	1.947	0.0219	494.8	1.939	110
115	0.0285	502.9	1.979	0.0262	502.0	1.970	0.0241	501.1	1.961	0.0223	500.2	1.953	115
120	0.0290	508.2	1.993	0.0266	507.3	1.983	0.0245	506.4	1.975	0.0227	505.5	1.966	120
125	0.0295	513.4	2.006	0.0271	512.6	1.997	0.0250	511.8	1.988	0.0231	510.9	1.980	125
130	0.0300	518.7	2.019	0.0275	517.9	2.010	0.0254	517.1	2.002	0.0235	516.3	1.993	130
135	0.0304	524.1	2.032	0.0279	523.3	2.023	0.0258	522.5	2.015	0.0239	521.7	2.007	135
140	0.0309	529.4	2.045	0.0284	528.7	2.036	0.0262	527.9	2.028	0.0243	527.1	2.020	140
145	0.0314	534.8	2.058	0.0288	534.0	2.049	0.0266	533.3	2.041	0.0247	532.6	2.033	145
150	0.0318	540.2	2.071	0.0292	539.5	2.062	0.0270	538.8	2.054	0.0251	538.0	2.046	150
155	0.0323	545.6	2.084	0.0297	544.9	2.075	0.0274	544.2	2.067	0.0255	543.5	2.059	155
160	0.0327	551.0	2.096	0.0301	550.4	2.088	0.0278	549.7	2.079	0.0259	549.0	2.072	160
165	0.0332	556.5	2.109	0.0305	555.8	2.100	0.0282	555.2	2.092	0.0262	554.6	2.084	165
170	0.0336	562.0	2.121	0.0309	561.4	2.113	0.0286	560.7	2.105	0.0266	560.1	2.097	170
175	0.0341	567.5	2.134	0.0314	566.9	2.125	0.0290	566.3	2.117	0.0270	565.7	2.110	175

## Opteon™ XP40 (R-449A)

### Superheated Vapor - Constant Pressure Tables

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

ABSOLUTE PRESSURE, kPa													
Temp °C	1600			1700			1800			2000			Temp °C
	38.50 °C			40.87 °C			43.13 °C			47.38 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0136	413.1	1.697	0.0127	413.6	1.694	0.0010	258.3	1.196	0.0010	258.2	1.195	
40	0.0138	415.1	1.703										40
45	0.0144	421.4	1.723	0.0132	419.1	1.711	0.0122	416.5	1.700				45
50	0.0150	427.5	1.742	0.0138	425.4	1.731	0.0127	423.2	1.720	0.0108	418.3	1.698	50
55	0.0155	433.4	1.760	0.0143	431.5	1.750	0.0133	429.5	1.740	0.0114	425.2	1.719	55
60	0.0161	439.1	1.778	0.0148	437.4	1.768	0.0138	435.6	1.758	0.0119	431.7	1.739	60
65	0.0165	444.8	1.794	0.0153	443.2	1.785	0.0142	441.5	1.776	0.0124	438.0	1.757	65
70	0.0170	450.4	1.811	0.0158	448.9	1.802	0.0147	447.3	1.793	0.0128	444.1	1.775	70
75	0.0175	455.9	1.827	0.0162	454.5	1.818	0.0151	453.0	1.809	0.0132	450.0	1.793	75
80	0.0179	461.4	1.842	0.0167	460.0	1.834	0.0155	458.7	1.825	0.0136	455.9	1.809	80
85	0.0184	466.8	1.858	0.0171	465.6	1.849	0.0159	464.3	1.841	0.0140	461.7	1.825	85
90	0.0188	472.2	1.873	0.0175	471.1	1.865	0.0163	469.8	1.857	0.0144	467.4	1.841	90
95	0.0192	477.6	1.888	0.0179	476.5	1.880	0.0167	475.4	1.872	0.0148	473.0	1.857	95
100	0.0196	483.0	1.902	0.0183	482.0	1.894	0.0171	480.9	1.887	0.0151	478.7	1.872	100
105	0.0200	488.4	1.917	0.0187	487.4	1.909	0.0175	486.4	1.901	0.0155	484.3	1.887	105
110	0.0204	493.8	1.931	0.0191	492.9	1.923	0.0178	491.9	1.916	0.0158	489.8	1.902	110
115	0.0208	499.2	1.945	0.0194	498.3	1.937	0.0182	497.3	1.930	0.0161	495.4	1.916	115
120	0.0212	504.6	1.959	0.0198	503.7	1.951	0.0186	502.8	1.944	0.0165	501.0	1.930	120
125	0.0216	510.0	1.972	0.0202	509.2	1.965	0.0189	508.3	1.958	0.0168	506.5	1.944	125
130	0.0219	515.5	1.986	0.0205	514.6	1.978	0.0193	513.8	1.971	0.0171	512.1	1.958	130
135	0.0223	520.9	1.999	0.0209	520.1	1.992	0.0196	519.3	1.985	0.0174	517.7	1.972	135
140	0.0227	526.4	2.012	0.0212	525.6	2.005	0.0199	524.8	1.998	0.0177	523.2	1.985	140
145	0.0230	531.8	2.026	0.0216	531.1	2.018	0.0203	530.3	2.012	0.0181	528.8	1.999	145
150	0.0234	537.3	2.039	0.0219	536.6	2.032	0.0206	535.9	2.025	0.0184	534.4	2.012	150
155	0.0238	542.8	2.052	0.0223	542.1	2.045	0.0209	541.4	2.038	0.0187	540.0	2.025	155
160	0.0241	548.4	2.064	0.0226	547.7	2.057	0.0213	547.0	2.051	0.0190	545.6	2.038	160
165	0.0245	553.9	2.077	0.0229	553.2	2.070	0.0216	552.6	2.064	0.0193	551.3	2.051	165
170	0.0248	559.5	2.090	0.0233	558.8	2.083	0.0219	558.2	2.076	0.0196	556.9	2.064	170
175	0.0252	565.1	2.102	0.0236	564.4	2.096	0.0222	563.8	2.089	0.0198	562.6	2.077	175
180	0.0255	570.7	2.115	0.0239	570.1	2.108	0.0225	569.5	2.102	0.0201	568.3	2.090	180
185	0.0259	576.3	2.127	0.0243	575.7	2.120	0.0228	575.2	2.114	0.0204	574.0	2.102	185

  

ABSOLUTE PRESSURE, kPa													
Temp °C	2000			2100			2200			2300			Temp °C
	49.38 °C			51.31 °C			53.17 °C			54.96 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0099	414.6	1.683	0.0094	414.7	1.681	0.0014	282.4	1.270	0.0010	276.7	1.252	
50	0.0100	415.6	1.686										50
55	0.0106	422.9	1.709	0.0098	420.4	1.698	0.0091	417.7	1.687	0.0084	414.7	1.675	55
60	0.0111	429.6	1.729	0.0103	427.5	1.719	0.0096	425.2	1.709	0.0090	422.7	1.699	60
65	0.0115	436.1	1.748	0.0108	434.2	1.739	0.0101	432.2	1.730	0.0095	430.0	1.721	65
70	0.0120	442.4	1.767	0.0112	440.6	1.758	0.0105	438.8	1.750	0.0099	436.9	1.741	70
75	0.0124	448.5	1.784	0.0116	446.9	1.776	0.0109	445.2	1.768	0.0103	443.5	1.760	75
80	0.0128	454.4	1.801	0.0120	452.9	1.794	0.0113	451.4	1.786	0.0107	449.8	1.778	80
85	0.0132	460.3	1.818	0.0124	458.9	1.810	0.0117	457.5	1.803	0.0111	456.0	1.796	85
90	0.0135	466.1	1.834	0.0128	464.8	1.827	0.0121	463.5	1.820	0.0114	462.1	1.813	90
95	0.0139	471.8	1.850	0.0131	470.6	1.843	0.0124	469.4	1.836	0.0118	468.1	1.829	95
100	0.0142	477.5	1.865	0.0135	476.4	1.858	0.0127	475.2	1.852	0.0121	474.0	1.845	100
105	0.0146	483.2	1.880	0.0138	482.1	1.873	0.0131	481.0	1.867	0.0124	479.8	1.861	105
110	0.0149	488.8	1.895	0.0141	487.8	1.888	0.0134	486.7	1.882	0.0127	485.7	1.876	110
115	0.0152	494.4	1.909	0.0144	493.4	1.903	0.0137	492.4	1.897	0.0130	491.4	1.891	115
120	0.0156	500.0	1.924	0.0148	499.1	1.918	0.0140	498.1	1.911	0.0133	497.2	1.906	120
125	0.0159	505.6	1.938	0.0151	504.7	1.932	0.0143	503.8	1.926	0.0136	502.9	1.920	125
130	0.0162	511.2	1.952	0.0154	510.4	1.946	0.0146	509.5	1.940	0.0139	508.6	1.934	130
135	0.0165	516.8	1.966	0.0157	516.0	1.960	0.0149	515.2	1.954	0.0142	514.3	1.948	135
140	0.0168	522.4	1.979	0.0159	521.6	1.973	0.0152	520.8	1.968	0.0144	520.0	1.962	140
145	0.0171	528.0	1.993	0.0162	527.3	1.987	0.0154	526.5	1.981	0.0147	525.7	1.976	145
150	0.0174	533.7	2.006	0.0165	532.9	2.000	0.0157	532.2	1.995	0.0150	531.4	1.989	150
155	0.0177	539.3	2.019	0.0168	538.6	2.014	0.0160	537.9	2.008	0.0153	537.1	2.003	155
160	0.0180	544.9	2.033	0.0171	544.2	2.027	0.0163	543.6	2.021	0.0155	542.9	2.016	160
165	0.0183	550.6	2.046	0.0174	549.9	2.040	0.0165	549.3	2.035	0.0158	548.6	2.029	165
170	0.0185	556.3	2.058	0.0176	555.6	2.053	0.0168	555.0	2.048	0.0160	554.3	2.042	170
175	0.0188	562.0	2.071	0.0179	561.3	2.066	0.0171	560.7	2.060	0.0163	560.1	2.055	175
180	0.0191	567.7	2.084	0.0182	567.1	2.078	0.0173	566.4	2.073	0.0165	565.8	2.068	180
185	0.0194	573.4	2.096	0.0184	572.8	2.091	0.0176	572.2	2.086	0.0168	571.6	2.081	185
190	0.0197	579.1	2.109	0.0187	578.6	2.104	0.0178	578.0	2.098	0.0170	577.4	2.093	190
195	0.0199	584.9	2.121	0.0190	584.3	2.116	0.0181	583.8	2.111	0.0173	583.2	2.106	195

**Opteon™ XP40 (R-449A)**  
**Superheated Vapor - Constant Pressure Tables**

V = Volume in m<sup>3</sup>/kg

H = Enthalpy in kJ/kg

S = Entropy in kJ/kg-K

Saturation Properties in Light Blue

Temp °C	ABSOLUTE PRESSURE, kPa												Temp °C
	2500			3000			3500			4000			
	56.70 °C			64.62 °C			71.49 °C			77.45 °C			
	V	H	S	V	H	S	V	H	S	V	H	S	
	0.0080	414.5	1.672	0.0062	412.6	1.656	0.0011	288.6	1.285	0.0010	287.8	1.281	
60	0.0083	420.1	1.689										60
65	0.0089	427.8	1.712	0.0062	413.4	1.658							65
70	0.0093	434.9	1.733	0.0068	423.2	1.687							70
75	0.0097	441.7	1.752	0.0073	431.5	1.711	0.0053	417.6	1.662				75
80	0.0101	448.2	1.771	0.0077	439.2	1.733	0.0058	427.9	1.691	0.0041	410.8	1.636	80
85	0.0105	454.5	1.789	0.0081	446.4	1.753	0.0062	436.7	1.716	0.0047	424.0	1.673	85
90	0.0108	460.7	1.806	0.0084	453.3	1.772	0.0066	444.7	1.738	0.0052	434.2	1.701	90
95	0.0112	466.8	1.822	0.0087	459.9	1.790	0.0069	452.1	1.759	0.0055	443.1	1.726	95
100	0.0115	472.8	1.839	0.0090	466.4	1.808	0.0072	459.3	1.778	0.0059	451.2	1.748	100
105	0.0118	478.7	1.854	0.0093	472.7	1.825	0.0075	466.1	1.796	0.0062	458.9	1.768	105
110	0.0121	484.6	1.870	0.0096	478.9	1.841	0.0078	472.8	1.814	0.0064	466.2	1.787	110
115	0.0124	490.4	1.885	0.0099	485.1	1.857	0.0081	479.4	1.831	0.0067	473.2	1.805	115
120	0.0127	496.2	1.900	0.0101	491.1	1.872	0.0083	485.8	1.847	0.0069	480.0	1.823	120
125	0.0130	502.0	1.914	0.0104	497.2	1.888	0.0086	492.1	1.863	0.0072	486.7	1.840	125
130	0.0132	507.7	1.929	0.0107	503.1	1.903	0.0088	498.3	1.879	0.0074	493.3	1.856	130
135	0.0135	513.5	1.943	0.0109	509.1	1.917	0.0090	504.5	1.894	0.0076	499.7	1.872	135
140	0.0138	519.2	1.957	0.0111	515.0	1.932	0.0092	510.7	1.909	0.0078	506.1	1.888	140
145	0.0141	524.9	1.971	0.0114	520.9	1.946	0.0095	516.8	1.924	0.0080	512.5	1.903	145
150	0.0143	530.7	1.984	0.0116	526.8	1.960	0.0097	522.8	1.938	0.0082	518.7	1.918	150
155	0.0146	536.4	1.998	0.0118	532.7	1.974	0.0099	528.9	1.952	0.0084	525.0	1.932	155
160	0.0148	542.1	2.011	0.0121	538.6	1.987	0.0101	534.9	1.966	0.0086	531.2	1.947	160
165	0.0151	547.9	2.024	0.0123	544.5	2.001	0.0103	540.9	1.980	0.0088	537.3	1.961	165
170	0.0153	553.7	2.037	0.0125	550.3	2.014	0.0105	546.9	1.994	0.0090	543.5	1.975	170
175	0.0156	559.4	2.050	0.0127	556.2	2.027	0.0107	552.9	2.007	0.0092	549.6	1.989	175
180	0.0158	565.2	2.063	0.0129	562.1	2.041	0.0109	559.0	2.020	0.0093	555.7	2.002	180
185	0.0161	571.0	2.076	0.0131	568.0	2.053	0.0111	565.0	2.034	0.0095	561.9	2.016	185
190	0.0163	576.8	2.088	0.0134	573.9	2.066	0.0112	571.0	2.047	0.0097	568.0	2.029	190
195	0.0165	582.7	2.101	0.0136	579.8	2.079	0.0114	577.0	2.060	0.0098	574.1	2.042	195
200	0.0168	588.5	2.113	0.0138	585.8	2.092	0.0116	583.0	2.072	0.0100	580.2	2.055	200
205	0.0170	594.4	2.126	0.0140	591.7	2.104	0.0118	589.0	2.085	0.0102	586.3	2.068	205
210	0.0172	600.3	2.138	0.0142	597.7	2.117	0.0120	595.1	2.098	0.0103	592.4	2.081	210
215	0.0175	606.2	2.150	0.0144	603.7	2.129	0.0122	601.1	2.110	0.0105	598.6	2.093	215
220	0.0177	612.1	2.162	0.0146	609.7	2.141	0.0123	607.2	2.122	0.0107	604.7	2.106	220
225	0.0179	618.1	2.174	0.0148	615.7	2.153	0.0125	613.3	2.135	0.0108	610.9	2.118	225
230	0.0181	624.0	2.186	0.0150	621.7	2.165	0.0127	619.4	2.147	0.0110	617.0	2.131	230
235	0.0184	630.0	2.198	0.0152	627.8	2.177	0.0128	625.5	2.159	0.0111	623.2	2.143	235
240	0.0186	636.0	2.210	0.0153	633.8	2.189	0.0130	631.6	2.171	0.0113	629.4	2.155	240
245	0.0188	642.1	2.222	0.0155	639.9	2.201	0.0132	637.8	2.183	0.0114	635.6	2.167	245
250	0.0190	648.1	2.233	0.0157	646.0	2.213	0.0134	643.9	2.195	0.0116	641.8	2.179	250
255	0.0193	654.2	2.245	0.0159	652.2	2.224	0.0135	650.1	2.207	0.0117	648.1	2.191	255
260	0.0195	660.3	2.256	0.0161	658.3	2.236	0.0137	656.3	2.218	0.0119	654.3	2.203	260
265	0.0197	666.4	2.268	0.0163	664.5	2.247	0.0139	662.5	2.230	0.0120	660.6	2.214	265
270	0.0199	672.6	2.279	0.0165	670.7	2.259	0.0140	668.8	2.241	0.0122	666.9	2.226	270
275	0.0201	678.7	2.290	0.0167	676.9	2.270	0.0142	675.0	2.253	0.0123	673.2	2.237	275
280	0.0204	684.9	2.302	0.0169	683.1	2.282	0.0143	681.3	2.264	0.0125	679.5	2.249	280
285	0.0206	691.1	2.313	0.0170	689.4	2.293	0.0145	687.6	2.276	0.0126	685.8	2.260	285
290	0.0208	697.4	2.324	0.0172	695.6	2.304	0.0147	693.9	2.287	0.0128	692.2	2.272	290
295	0.0210	703.6	2.335	0.0174	701.9	2.315	0.0148	700.2	2.298	0.0129	698.5	2.283	295
300	0.0212	709.9	2.346	0.0176	708.3	2.326	0.0150	706.6	2.309	0.0130	704.9	2.294	300
305	0.0214	716.2	2.357	0.0178	714.6	2.337	0.0152	713.0	2.320	0.0132	711.4	2.305	305

---

For more information on the Opteon™ family of refrigerants, or other refrigerants products, visit [opteon.com](http://opteon.com) or call (800) 235-7882.

The information set forth herein is furnished free of charge and based on technical data that Chemours believes to be reliable. It is intended for use by persons having technical skill, at their own risk. Because conditions of use are outside our control, Chemours makes no warranties, expressed or implied, and assumes no liability in connection with any use of this information. Nothing herein is to be taken as a license to operate under, or a recommendation to infringe, any patents or patent applications.

© 2023 The Chemours Company FC, LLC. Opteon™ and any associated logos are trademarks or copyrights of The Chemours Company FC, LLC. Chemours™ and the Chemours Logo are trademarks of The Chemours Company.

C-10320 (8/23)