



Opteon™ XL41

Refrigerant

Transport Properties of Opteon™ XL41 (R-454B) SI Units

Physical Properties

Molecular Weight	62.6 g/mol
Boiling Point at	
One Atmosphere	-50.5 °C
Critical Temperature	78.1 °C
Critical Pressure	5266.9 kPa
Critical Density	443.0 kg/m ³
Critical Volume	0.0023 m ³ /kg
Ozone Depletion Potential	0
Global Warming Potential AR4	466
ASHRAE Standard 34 Safety Rating	A2L

Units and Factors

t	= temperature in °C
P	= pressure in kiloPascals absolute (kPa [abs])
C _p	= Heat capacity at constant pressure in kJ/(kg-K)
C _v	= Heat capacity at constant volume in kJ/(kg-K)
C _p /C _v	= Heat capacity ratio (dimensionless)
μ	= Viscosity in μPa-sec
v	= Kinematic viscosity in cm ² /sec
k	= Thermal conductivity in mW/m-K
c	= Velocity of sound in m/sec
γ	= Surface Tension in mN/m
h _f	= enthalpy of saturated liquid in kJ/kg
s _f	= entropy of saturated liquid in kJ/(kg) (K)

One atmosphere = 101.325 kPa

Reference point for enthalpy and entropy:

h_f = 200 kJ/kg at 0°C

s_f = 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™ XL41 (R-454B)

Saturation Properties - Transport Properties Table

Temp °C	Heat Capacity, c_p [kJ/kg-K]		c_p/c_v	Viscosity [μ Pa-sec]		Kinematic Viscosity [cm ² /sec]		Thermal Conductivity [mW/m-K]		Vel. of Sound [m/sec]		Surface Tension [mN/m]
	Liquid	Vapor	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
-40	1.4886	0.8904	1.2778	244.0	9.643	0.0020	0.0177	148.74	9.038	830.4	187.0	17.22
-39	1.4907	0.8955	1.2791	241.0	9.691	0.0020	0.0170	148.04	9.095	825.6	187.1	17.04
-38	1.4929	0.9008	1.2804	238.1	9.740	0.0020	0.0164	147.35	9.153	820.8	187.2	16.85
-37	1.4951	0.9060	1.2818	235.3	9.788	0.0020	0.0158	146.65	9.210	816.0	187.4	16.66
-36	1.4973	0.9113	1.2833	232.4	9.837	0.0019	0.0152	145.96	9.269	811.2	187.5	16.48
-35	1.4997	0.9167	1.2848	229.7	9.885	0.0019	0.0147	145.26	9.328	806.4	187.6	16.29
-34	1.5020	0.9221	1.2863	226.9	9.933	0.0019	0.0142	144.57	9.388	801.6	187.7	16.11
-33	1.5045	0.9275	1.2879	224.2	9.981	0.0019	0.0137	143.88	9.448	796.7	187.8	15.92
-32	1.5070	0.9331	1.2896	221.6	10.029	0.0019	0.0132	143.19	9.509	791.9	187.9	15.74
-31	1.5095	0.9386	1.2913	218.9	10.077	0.0019	0.0127	142.49	9.571	787.0	188.0	15.56
-30	1.5121	0.9443	1.2930	216.4	10.125	0.0018	0.0123	141.80	9.633	782.2	188.1	15.37
-29	1.5148	0.9500	1.2948	213.8	10.173	0.0018	0.0119	141.11	9.696	777.3	188.1	15.19
-28	1.5175	0.9557	1.2967	211.3	10.221	0.0018	0.0115	140.42	9.759	772.4	188.2	15.01
-27	1.5203	0.9615	1.2986	208.8	10.268	0.0018	0.0111	139.73	9.824	767.5	188.3	14.83
-26	1.5231	0.9674	1.3005	206.4	10.316	0.0018	0.0107	139.04	9.889	762.6	188.3	14.64
-25	1.5261	0.9733	1.3026	204.0	10.364	0.0018	0.0104	138.35	9.954	757.7	188.4	14.46
-24	1.5290	0.9794	1.3047	201.6	10.411	0.0017	0.0101	137.67	10.021	752.7	188.4	14.28
-23	1.5321	0.9854	1.3068	199.3	10.458	0.0017	0.0097	136.98	10.088	747.8	188.4	14.10
-22	1.5352	0.9916	1.3090	196.9	10.506	0.0017	0.0094	136.30	10.156	742.9	188.5	13.92
-21	1.5383	0.9978	1.3113	194.7	10.553	0.0017	0.0091	135.61	10.225	737.9	188.5	13.74
-20	1.5416	1.0040	1.3137	192.4	10.600	0.0017	0.0088	134.93	10.295	732.9	188.5	13.56
-19	1.5449	1.0104	1.3161	190.2	10.647	0.0017	0.0086	134.25	10.366	728.0	188.5	13.39
-18	1.5482	1.0168	1.3186	188.0	10.694	0.0016	0.0083	133.56	10.437	723.0	188.5	13.21
-17	1.5517	1.0233	1.3212	185.8	10.741	0.0016	0.0080	132.88	10.510	718.0	188.5	13.03
-16	1.5552	1.0299	1.3238	183.7	10.788	0.0016	0.0078	132.20	10.583	713.0	188.4	12.85
-15	1.5588	1.0366	1.3265	181.6	10.835	0.0016	0.0075	131.53	10.658	708.0	188.4	12.68
-14	1.5624	1.0434	1.3293	179.5	10.882	0.0016	0.0073	130.85	10.733	702.9	188.4	12.50
-13	1.5662	1.0502	1.3322	177.5	10.929	0.0016	0.0071	130.17	10.810	697.9	188.3	12.33
-12	1.5700	1.0572	1.3352	175.5	10.975	0.0016	0.0069	129.50	10.887	692.9	188.3	12.15
-11	1.5739	1.0642	1.3383	173.5	11.022	0.0016	0.0067	128.82	10.966	687.8	188.2	11.98
-10	1.5779	1.0713	1.3414	171.5	11.068	0.0015	0.0065	128.15	11.046	682.7	188.1	11.80
-9	1.5820	1.0786	1.3447	169.5	11.115	0.0015	0.0063	127.48	11.127	677.7	188.1	11.63
-8	1.5861	1.0859	1.3480	167.6	11.161	0.0015	0.0061	126.81	11.209	672.6	188.0	11.46
-7	1.5904	1.0934	1.3515	165.7	11.208	0.0015	0.0059	126.14	11.293	667.5	187.9	11.29
-6	1.5947	1.1010	1.3550	163.8	11.254	0.0015	0.0058	125.47	11.378	662.4	187.8	11.11
-5	1.5991	1.1087	1.3587	162.0	11.300	0.0015	0.0056	124.81	11.464	657.3	187.7	10.94
-4	1.6037	1.1165	1.3625	160.1	11.346	0.0015	0.0054	124.14	11.552	652.1	187.6	10.77
-3	1.6083	1.1244	1.3664	158.3	11.392	0.0014	0.0053	123.48	11.642	647.0	187.4	10.60
-2	1.6131	1.1325	1.3704	156.5	11.438	0.0014	0.0051	122.82	11.732	641.8	187.3	10.43
-1	1.6179	1.1407	1.3745	154.8	11.484	0.0014	0.0050	122.16	11.825	636.7	187.2	10.27
0	1.6229	1.1491	1.3788	153.0	11.530	0.0014	0.0049	121.50	11.919	631.5	187.0	10.10
1	1.6279	1.1576	1.3832	151.3	11.576	0.0014	0.0047	120.84	12.015	626.3	186.9	9.93
2	1.6331	1.1663	1.3878	149.6	11.622	0.0014	0.0046	120.18	12.113	621.1	186.7	9.76
3	1.6384	1.1752	1.3925	147.9	11.668	0.0014	0.0045	119.53	12.212	615.9	186.5	9.60
4	1.6439	1.1842	1.3973	146.2	11.713	0.0014	0.0043	118.87	12.314	610.7	186.3	9.43
5	1.6495	1.1934	1.4023	144.5	11.759	0.0014	0.0042	118.22	12.417	605.4	186.1	9.27
6	1.6552	1.2028	1.4075	142.9	11.805	0.0013	0.0041	117.57	12.523	600.2	185.9	9.10
7	1.6610	1.2125	1.4128	141.3	11.850	0.0013	0.0040	116.92	12.631	594.9	185.7	8.94
8	1.6670	1.2223	1.4183	139.7	11.897	0.0013	0.0039	116.27	12.741	589.6	185.5	8.77
9	1.6732	1.2323	1.4240	138.1	11.947	0.0013	0.0038	115.63	12.853	584.3	185.3	8.61
10	1.6795	1.2426	1.4299	136.5	11.996	0.0013	0.0037	114.98	12.968	579.0	185.0	8.45
11	1.6860	1.2531	1.4360	135.0	12.045	0.0013	0.0036	114.34	13.086	573.7	184.8	8.29
12	1.6926	1.2638	1.4423	133.4	12.095	0.0013	0.0035	113.69	13.206	568.4	184.5	8.13
13	1.6995	1.2749	1.4488	131.9	12.145	0.0013	0.0034	113.05	13.329	563.0	184.2	7.97
14	1.7065	1.2862	1.4555	130.4	12.195	0.0013	0.0033	112.41	13.455	557.6	183.9	7.81
15	1.7137	1.2977	1.4625	128.9	12.245	0.0013	0.0032	111.77	13.584	552.3	183.7	7.65
16	1.7211	1.3096	1.4698	127.4	12.296	0.0012	0.0032	111.14	13.716	546.9	183.4	7.49
17	1.7288	1.3219	1.4773	125.9	12.346	0.0012	0.0031	110.50	13.852	541.4	183.0	7.34

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Saturation Properties - Transport Properties Table

Temp °C	Heat Capacity, c_p [kJ/kg-K]		c_p/c_v	Viscosity [μ Pa-sec]		Kinematic Viscosity [cm ² /sec]		Thermal Conductivity [mW/m-K]		Vel. of Sound [m/sec]		Surface Tension [mN/m]
	Liquid	Vapor	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
18	1.7366	1.3344	1.4850	124.5	12.397	0.0012	0.0030	109.87	13.991	536.0	182.7	7.18
19	1.7447	1.3473	1.4931	123.0	12.449	0.0012	0.0029	109.23	14.134	530.5	182.4	7.03
20	1.7531	1.3606	1.5015	121.6	12.500	0.0012	0.0029	108.60	14.281	525.1	182.0	6.87
21	1.7617	1.3743	1.5101	120.2	12.552	0.0012	0.0028	107.97	14.432	519.6	181.7	6.72
22	1.7706	1.3883	1.5191	118.8	12.607	0.0012	0.0027	107.34	14.586	514.1	181.3	6.56
23	1.7797	1.4029	1.5285	117.4	12.672	0.0012	0.0026	106.71	14.746	508.5	181.0	6.41
24	1.7892	1.4178	1.5382	116.0	12.736	0.0012	0.0026	106.09	14.909	503.0	180.6	6.26
25	1.7990	1.4333	1.5484	114.6	12.801	0.0012	0.0025	105.46	15.078	497.4	180.2	6.11
26	1.8092	1.4493	1.5589	113.3	12.867	0.0012	0.0025	104.83	15.251	491.8	179.8	5.96
27	1.8197	1.4658	1.5699	111.9	12.933	0.0011	0.0024	104.21	15.430	486.2	179.3	5.81
28	1.8306	1.4829	1.5813	110.6	12.999	0.0011	0.0023	103.59	15.615	480.6	178.9	5.66
29	1.8419	1.5006	1.5932	109.2	13.067	0.0011	0.0023	102.97	15.806	474.9	178.5	5.51
30	1.8536	1.5189	1.6057	107.9	13.135	0.0011	0.0022	102.35	16.002	469.3	178.0	5.37
31	1.8658	1.5379	1.6187	106.6	13.204	0.0011	0.0022	101.73	16.206	463.6	177.5	5.22
32	1.8785	1.5577	1.6322	105.3	13.274	0.0011	0.0021	101.11	16.417	457.8	177.1	5.08
33	1.8917	1.5782	1.6464	104.0	13.345	0.0011	0.0021	100.49	16.637	452.1	176.6	4.93
34	1.9055	1.5996	1.6613	102.7	13.417	0.0011	0.0020	99.87	16.865	446.3	176.1	4.79
35	1.9199	1.6219	1.6769	101.4	13.490	0.0011	0.0020	99.26	17.101	440.5	175.5	4.65
36	1.9349	1.6451	1.6932	100.1	13.565	0.0011	0.0019	98.64	17.346	434.6	175.0	4.51
37	1.9506	1.6693	1.7103	98.9	13.641	0.0011	0.0019	98.03	17.600	428.8	174.5	4.37
38	1.9670	1.6946	1.7284	97.6	13.719	0.0011	0.0019	97.41	17.865	422.9	173.9	4.23
39	1.9842	1.7211	1.7473	96.4	13.798	0.0010	0.0018	96.80	18.140	416.9	173.3	4.09
40	2.0023	1.7488	1.7673	95.1	13.880	0.0010	0.0018	96.19	18.426	411.0	172.7	3.95
41	2.0214	1.7779	1.7883	93.9	13.963	0.0010	0.0017	95.57	18.724	404.9	172.1	3.82
42	2.0414	1.8085	1.8105	92.6	14.048	0.0010	0.0017	94.96	19.035	398.9	171.5	3.68
43	2.0625	1.8406	1.8340	91.4	14.135	0.0010	0.0017	94.35	19.359	392.8	170.9	3.55
44	2.0848	1.8746	1.8589	90.2	14.224	0.0010	0.0016	93.74	19.698	386.7	170.3	3.41
45	2.1084	1.9104	1.8853	88.9	14.316	0.0010	0.0016	93.12	20.051	380.5	169.6	3.28
46	2.1334	1.9482	1.9133	87.7	14.410	0.0010	0.0015	92.51	20.422	374.3	168.9	3.14
47	2.1600	1.9883	1.9431	86.5	14.507	0.0010	0.0015	91.90	20.810	368.0	168.2	3.01
48	2.1883	2.0309	1.9749	85.3	14.607	0.0010	0.0015	91.29	21.216	361.7	167.5	2.88
49	2.2184	2.0763	2.0088	84.0	14.711	0.0010	0.0014	90.68	21.643	355.3	166.8	2.75
50	2.2506	2.1246	2.0451	82.8	14.817	0.0010	0.0014	90.07	22.092	348.8	166.0	2.62
51	2.2851	2.1763	2.0841	81.6	14.927	0.0010	0.0014	89.46	22.564	342.3	165.3	2.50
52	2.3221	2.2317	2.1260	80.4	15.042	0.0009	0.0013	88.84	23.062	335.8	164.5	2.37
53	2.3621	2.2912	2.1712	79.1	15.160	0.0009	0.0013	88.23	23.587	329.2	163.7	2.25
54	2.4052	2.3554	2.2200	77.9	15.283	0.0009	0.0013	87.62	24.142	322.5	162.9	2.12
55	2.4519	2.4249	2.2730	76.7	15.411	0.0009	0.0013	87.01	24.729	315.8	162.0	2.00
56	2.5028	2.5003	2.3307	75.4	15.545	0.0009	0.0012	86.40	25.352	308.9	161.2	1.88
57	2.5583	2.5825	2.3937	74.2	15.684	0.0009	0.0012	85.79	26.014	302.1	160.3	1.77
58	2.6192	2.6725	2.4627	72.9	15.830	0.0009	0.0012	85.18	26.718	295.1	159.4	1.65
59	2.6864	2.7714	2.5388	71.7	15.983	0.0009	0.0011	84.57	27.469	288.1	158.5	1.54
60	2.7608	2.8807	2.6230	70.4	16.145	0.0009	0.0011	83.96	28.273	281.0	157.5	1.43
61	2.8437	3.0022	2.7168	69.1	16.314	0.0009	0.0011	83.36	29.134	273.8	156.5	1.32
62	2.9367	3.1380	2.8217	67.9	16.494	0.0009	0.0011	82.76	30.061	266.6	155.5	1.21
63	3.0418	3.2911	2.9400	66.5	16.684	0.0009	0.0010	82.17	31.060	259.3	154.5	1.11
64	3.1615	3.4648	3.0744	65.2	16.887	0.0009	0.0010	81.59	32.143	251.8	153.4	1.01
65	3.2993	3.6639	3.2284	63.9	17.104	0.0009	0.0010	81.01	33.320	244.3	152.3	0.91
66	3.4595	3.8944	3.4066	62.5	17.337	0.0008	0.0010	80.46	34.607	236.7	151.2	0.81
67	3.6482	4.1646	3.6155	61.1	17.589	0.0008	0.0009	79.92	36.022	229.0	150.0	0.72
68	3.8740	4.4857	3.8635	59.7	17.863	0.0008	0.0009	79.42	37.588	221.2	148.8	0.63
69	4.1491	4.8740	4.1631	58.2	18.162	0.0008	0.0009	78.95	39.337	213.3	147.5	0.54
70	4.4921	5.3534	4.5324	56.7	18.494	0.0008	0.0009	78.55	41.308	205.2	146.2	0.46
71	4.9321	5.9606	4.9992	55.1	18.864	0.0008	0.0009	78.24	43.561	196.9	144.9	0.38
72	5.5177	6.7554	5.6085	53.4	19.283	0.0008	0.0008	78.07	46.179	188.5	143.4	0.31
73	6.3371	7.8417	6.4384	51.6	19.768	0.0008	0.0008	78.09	49.293	179.8	141.9	0.24
74	7.5668	9.4179	7.6379	49.7	20.343	0.0008	0.0008	78.42	53.122	170.9	140.2	0.17
75	9.6173	11.9166	9.5296	47.6	21.052	0.0008	0.0008	79.29	58.073	161.5	138.4	0.11

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Saturation Properties - Transport Properties Table

Temp °C	Heat Capacity, c_p [kJ/kg-K]		c_p/c_v Vapor	Viscosity [μ Pa-sec]		Kinematic Viscosity [cm ² /sec]		Thermal Conductivity [mW/m-K]		Vel. of Sound [m/sec]		Surface Tension [mN/m]
	Liquid	Vapor		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
76	13.6928	16.4891	12.9699	45.2	21.987	0.0008	0.0007	81.24	65.044	151.7	136.4	0.06

Opteon™ XL41 (R-454B)
Superheated Vapor - Viscosity Table

Viscosity in $\mu\text{Pa}\cdot\text{sec}$

Saturation Properties in Light Blue

Temp °C	ABSOLUTE PRESSURE, kPa												
	50	101.325	200	300	400	500	600	800	1000	1500	2000	2500	3000
	-62.7	-49.5	-34.8	-25.0	-17.5	-11.3	-6.0	2.9	10.2	24.6	35.7	44.8	52.6
	8.518	9.178	9.892	10.363	10.719	11.009	11.256	11.664	12.008	12.776	13.542	14.300	15.117
-60	8.654												
-55	8.904												
-50	9.152												
-45	9.399	9.399											
-40	9.643	9.643											
-35	9.885	9.885											
-30	10.125	10.125	10.125										
-25	10.364	10.364	10.364	10.364									
-20	10.600	10.600	10.600	10.600									
-15	10.835	10.835	10.835	10.835	10.835								
-10	11.068	11.068	11.068	11.068	11.068	11.068							
-5	11.300	11.300	11.300	11.300	11.300	11.300	11.300						
0	11.530	11.530	11.530	11.530	11.530	11.530	11.530						
5	11.759	11.759	11.759	11.759	11.759	11.759	11.759	11.759					
10	11.986	11.986	11.986	11.986	11.986	11.986	11.986	11.986					
15	12.212	12.212	12.212	12.212	12.212	12.212	12.212	12.212	12.227				
20	12.436	12.436	12.436	12.436	12.436	12.436	12.436	12.442	12.457				
25	12.659	12.659	12.659	12.659	12.659	12.659	12.659	12.661	12.670	12.685	12.794		
30	12.881	12.881	12.881	12.881	12.881	12.883	12.886	12.896	12.911	13.032			
35	13.101	13.101	13.101	13.102	13.104	13.107	13.110	13.121	13.137	13.265			
40	13.321	13.321	13.322	13.323	13.325	13.329	13.333	13.344	13.374	13.495	13.719		
45	13.539	13.539	13.541	13.543	13.546	13.549	13.554	13.574	13.605	13.723	13.929	14.305	
50	13.756	13.757	13.759	13.761	13.764	13.769	13.778	13.802	13.833	13.948	14.141	14.467	
55	13.972	13.973	13.975	13.978	13.983	13.992	14.002	14.027	14.058	14.172	14.354	14.646	15.150
60	14.186	14.188	14.190	14.195	14.203	14.213	14.223	14.249	14.281	14.393	14.568	14.834	15.261
65	14.400	14.401	14.405	14.412	14.421	14.431	14.443	14.469	14.502	14.614	14.781	15.028	15.402
70	14.612	14.614	14.620	14.628	14.638	14.648	14.660	14.688	14.721	14.832	14.994	15.226	15.562
75	14.824	14.826	14.833	14.842	14.852	14.863	14.876	14.904	14.938	15.049	15.206	15.426	15.733
80	15.034	15.037	15.045	15.055	15.066	15.077	15.090	15.120	15.154	15.265	15.418	15.627	15.912
85	15.243	15.247	15.256	15.266	15.277	15.290	15.303	15.333	15.368	15.479	15.629	15.829	16.096
90	15.452	15.456	15.466	15.476	15.488	15.501	15.515	15.546	15.581	15.691	15.839	16.032	16.283
95	15.659	15.664	15.674	15.685	15.697	15.711	15.725	15.757	15.792	15.903	16.048	16.234	16.473
100	15.866	15.871	15.881	15.893	15.906	15.919	15.934	15.966	16.003	16.113	16.256	16.437	16.665
105	16.071	16.076	16.087	16.100	16.113	16.127	16.142	16.175	16.211	16.322	16.462	16.639	16.858
110	16.275	16.281	16.293	16.305	16.319	16.333	16.349	16.382	16.419	16.529	16.668	16.840	17.052
115	16.479	16.485	16.497	16.510	16.524	16.538	16.554	16.588	16.625	16.736	16.873	17.041	17.246
120	16.681	16.687	16.700	16.713	16.728	16.743	16.759	16.793	16.831	16.941	17.077	17.242	17.440
125	16.883	16.889	16.902	16.916	16.930	16.946	16.962	16.997	17.035	17.145	17.280	17.441	17.634
130	17.084	17.090	17.103	17.117	17.132	17.148	17.164	17.199	17.238	17.348	17.481	17.640	17.828
135	17.284	17.290	17.304	17.318	17.333	17.349	17.366	17.401	17.440	17.550	17.682	17.838	18.022
140	17.483	17.489	17.503	17.518	17.533	17.549	17.566	17.602	17.641	17.751	17.882	18.036	18.215
145	17.681	17.688	17.702	17.717	17.732	17.748	17.765	17.802	17.840	17.951	18.081	18.232	18.408
150	17.878	17.885	17.899	17.915	17.930	17.947	17.964	18.000	18.039	18.149	18.278	18.428	18.600
155	18.075	18.082	18.096	18.112	18.128	18.144	18.161	18.198	18.237	18.347	18.475	18.623	18.792
160	18.271	18.278	18.292	18.308	18.324	18.341	18.358	18.395	18.434	18.544	18.671	18.817	18.983
165	18.465	18.473	18.488	18.503	18.520	18.536	18.554	18.591	18.630	18.740	18.866	19.010	19.174
170	18.660	18.667	18.682	18.698	18.714	18.731	18.749	18.786	18.825	18.935	19.060	19.203	19.364
175	18.853	18.861	18.876	18.892	18.908	18.925	18.943	18.980	19.020	19.129	19.254	19.395	19.553
180	19.046	19.053	19.069	19.085	19.101	19.119	19.136	19.174	19.213	19.322	19.446	19.586	19.742
185	19.238	19.245	19.261	19.277	19.294	19.311	19.329	19.366	19.406	19.514	19.638	19.776	19.930
190	19.429	19.437	19.452	19.468	19.485	19.503	19.521	19.558	19.598	19.706	19.828	19.965	20.118
195	19.620	19.627	19.643	19.659	19.676	19.694	19.712	19.749	19.789	19.897	20.018	20.154	20.304
200	19.809	19.817	19.833	19.849	19.866	19.884	19.902	19.939	19.979	20.087	20.207	20.342	20.491
205	19.999	20.007	20.022	20.039	20.056	20.073	20.091	20.129	20.168	20.276	20.396	20.529	20.676
210	20.187	20.195	20.211	20.227	20.244	20.262	20.280	20.318	20.357	20.464	20.584	20.716	20.861
215	20.375	20.383	20.399	20.415	20.433	20.450	20.468	20.506	20.545	20.652	20.770	20.901	21.045
220	20.562	20.570	20.586	20.603	20.620	20.637	20.656	20.693	20.732	20.839	20.957	21.086	21.229
225	20.749	20.757	20.773	20.789	20.807	20.824	20.842	20.880	20.919	21.025	21.142	21.271	21.411
230	20.935	20.943	20.959	20.976	20.993	21.010	21.028	21.066	21.105	21.210	21.327	21.455	21.594
235	21.120	21.128	21.144	21.161	21.178	21.196	21.214	21.251	21.290	21.395	21.511	21.638	21.775
240	21.305	21.313	21.329	21.346	21.363	21.381	21.399	21.436	21.475	21.579	21.695	21.820	21.956
245	21.489	21.497	21.513	21.530	21.547	21.565	21.583	21.620	21.659	21.763	21.877	22.002	22.137
250	21.673	21.681	21.697	21.714	21.731	21.748	21.766	21.803	21.842	21.946	22.060	22.183	22.317
255	21.856	21.864	21.880	21.897	21.914	21.931	21.949	21.986	22.025	22.128	22.241	22.364	22.496
260	22.039	22.047	22.063	22.079	22.096	22.114	22.132	22.169	22.207	22.310	22.422	22.544	22.675
265	22.221	22.229	22.245	22.261	22.278	22.296	22.314	22.350	22.389	22.491	22.603	22.723	22.853
270	22.402	22.410	22.426	22.443	22.460	22.477	22.495	22.532	22.570	22.672	22.782	22.902	23.031
275	22.583	22.591	22.607	22.623	22.640	22.658	22.676	22.712	22.750	22.851	22.962	23.080	23.208

Opteon™ XL41 (R-454B)
Superheated Vapor - Heat Capacity Table

Heat Capacity, C_p , in kJ/kg-K

Saturation Properties in Light Blue

Temp °C	ABSOLUTE PRESSURE, kPa												
	50	101.325	200	300	400	500	600	800	1000	1500	2000	2500	3000
	-62.7	-49.5	-34.8	-25.0	-17.5	-11.3	-6.0	2.9	10.2	24.6	35.7	44.8	52.6
	0.787	0.844	0.918	0.973	1.020	1.062	1.101	1.174	1.245	1.427	1.638	1.904	2.269
-60	0.7827												
-55	0.7785												
-50	0.7774												
-45	0.7781	0.8321											
-40	0.7803	0.8246											
-35	0.7834	0.8208											
-30	0.7872	0.8195	0.8973										
-25	0.7917	0.8199	0.8842	0.9731									
-20	0.7966	0.8215	0.8762	0.9466									
-15	0.8020	0.8241	0.8715	0.9294	1.0029								
-10	0.8078	0.8276	0.8692	0.9182	0.9773	1.0516							
-5	0.8139	0.8316	0.8685	0.9108	0.9601	1.0192	1.0922						
0	0.8202	0.8362	0.8692	0.9063	0.9483	0.9971	1.0549						
5	0.8268	0.8413	0.8709	0.9038	0.9403	0.9816	1.0291	1.1517					
10	0.8336	0.8468	0.8735	0.9029	0.9350	0.9708	1.0109						
15	0.8406	0.8526	0.8768	0.9032	0.9318	0.9632	0.9978	1.0802	1.1889				
20	0.8477	0.8587	0.8807	0.9046	0.9303	0.9580	0.9883	1.0586	1.1473				
25	0.8550	0.8650	0.8852	0.9069	0.9300	0.9548	0.9816	1.0426	1.1170	1.4188			
30	0.8624	0.8716	0.8901	0.9098	0.9308	0.9532	0.9771	1.0307	1.0944	1.3323			
35	0.8699	0.8784	0.8953	0.9134	0.9325	0.9528	0.9743	1.0219	1.0774	1.2720			
40	0.8775	0.8853	0.9009	0.9176	0.9350	0.9534	0.9729	1.0156	1.0644	1.2280	1.5166		
45	0.8851	0.8924	0.9068	0.9221	0.9382	0.9550	0.9727	1.0112	1.0546	1.1949	1.4206	1.8942	
50	0.8929	0.8996	0.9130	0.9271	0.9419	0.9573	0.9735	1.0084	1.0473	1.1694	1.3529	1.6827	
55	0.9007	0.9070	0.9194	0.9324	0.9460	0.9602	0.9751	1.0069	1.0420	1.1497	1.3030	1.5512	2.0712
60	0.9085	0.9144	0.9259	0.9380	0.9506	0.9637	0.9774	1.0065	1.0384	1.1342	1.2650	1.4613	1.8095
65	0.9164	0.9219	0.9326	0.9439	0.9556	0.9677	0.9803	1.0071	1.0362	1.1221	1.2355	1.3962	1.6519
70	0.9244	0.9295	0.9395	0.9500	0.9609	0.9721	0.9838	1.0085	1.0351	1.1127	1.2123	1.3472	1.5461
75	0.9323	0.9371	0.9465	0.9563	0.9664	0.9769	0.9877	1.0105	1.0351	1.1055	1.1938	1.3094	1.4702
80	0.9403	0.9447	0.9536	0.9628	0.9722	0.9820	0.9921	1.0132	1.0359	1.1002	1.1792	1.2796	1.4133
85	0.9482	0.9524	0.9607	0.9694	0.9782	0.9874	0.9968	1.0164	1.0374	1.0964	1.1676	1.2559	1.3695
90	0.9562	0.9602	0.9680	0.9761	0.9844	0.9930	1.0017	1.0201	1.0395	1.0939	1.1584	1.2368	1.3349
95	0.9641	0.9679	0.9753	0.9829	0.9907	0.9988	1.0070	1.0241	1.0423	1.0925	1.1513	1.2215	1.3074
100	0.9721	0.9757	0.9826	0.9898	0.9972	1.0047	1.0125	1.0285	1.0454	1.0920	1.1459	1.2093	1.2852
105	0.9800	0.9834	0.9900	0.9968	1.0037	1.0109	1.0181	1.0332	1.0491	1.0923	1.1419	1.1994	1.2672
110	0.9880	0.9912	0.9974	1.0038	1.0104	1.0171	1.0240	1.0382	1.0530	1.0934	1.1392	1.1917	1.2526
115	0.9959	0.9989	1.0048	1.0109	1.0171	1.0235	1.0300	1.0433	1.0573	1.0950	1.1375	1.1856	1.2408
120	1.0037	1.0066	1.0122	1.0180	1.0239	1.0299	1.0361	1.0487	1.0618	1.0972	1.1367	1.1810	1.2313
125	1.0116	1.0143	1.0197	1.0252	1.0308	1.0365	1.0423	1.0542	1.0666	1.0999	1.1367	1.1777	1.2237
130	1.0194	1.0220	1.0271	1.0323	1.0377	1.0431	1.0486	1.0599	1.0716	1.1029	1.1373	1.1754	1.2177
135	1.0272	1.0297	1.0345	1.0395	1.0446	1.0497	1.0550	1.0657	1.0768	1.1063	1.1386	1.1740	1.2131
140	1.0349	1.0373	1.0419	1.0467	1.0515	1.0564	1.0614	1.0716	1.0822	1.1100	1.1403	1.1734	1.2096
145	1.0426	1.0449	1.0493	1.0539	1.0585	1.0632	1.0679	1.0776	1.0876	1.1140	1.1426	1.1735	1.2072
150	1.0503	1.0524	1.0567	1.0610	1.0654	1.0699	1.0744	1.0837	1.0932	1.1182	1.1452	1.1742	1.2057
155	1.0579	1.0600	1.0640	1.0682	1.0724	1.0767	1.0810	1.0898	1.0989	1.1227	1.1481	1.1755	1.2049
160	1.0654	1.0674	1.0713	1.0753	1.0794	1.0834	1.0876	1.0960	1.1047	1.1273	1.1514	1.1772	1.2048
165	1.0729	1.0749	1.0786	1.0824	1.0863	1.0902	1.0942	1.1023	1.1105	1.1321	1.1549	1.1793	1.2053
170	1.0804	1.0822	1.0858	1.0895	1.0932	1.0970	1.1008	1.1085	1.1164	1.1370	1.1587	1.1818	1.2062
175	1.0878	1.0896	1.0930	1.0966	1.1001	1.1037	1.1074	1.1148	1.1224	1.1420	1.1627	1.1846	1.2077
180	1.0951	1.0969	1.1002	1.1036	1.1070	1.1105	1.1140	1.1211	1.1283	1.1471	1.1668	1.1876	1.2095
185	1.1024	1.1041	1.1073	1.1106	1.1139	1.1172	1.1206	1.1274	1.1344	1.1523	1.1712	1.1909	1.2117
190	1.1097	1.1113	1.1144	1.1175	1.1207	1.1239	1.1271	1.1337	1.1404	1.1576	1.1756	1.1944	1.2141
195	1.1169	1.1184	1.1214	1.1244	1.1275	1.1306	1.1337	1.1400	1.1464	1.1630	1.1802	1.1982	1.2169
200	1.1240	1.1255	1.1283	1.1313	1.1342	1.1372	1.1402	1.1463	1.1525	1.1684	1.1849	1.2020	1.2199
205	1.1311	1.1325	1.1353	1.1381	1.1410	1.1438	1.1467	1.1526	1.1585	1.1738	1.1896	1.2061	1.2231
210	1.1381	1.1395	1.1421	1.1449	1.1476	1.1504	1.1532	1.1589	1.1646	1.1793	1.1945	1.2102	1.2265
215	1.1450	1.1464	1.1490	1.1516	1.1543	1.1570	1.1597	1.1651	1.1707	1.1848	1.1994	1.2145	1.2300
220	1.1519	1.1532	1.1557	1.1583	1.1609	1.1635	1.1661	1.1713	1.1767	1.1903	1.2044	1.2188	1.2338
225	1.1587	1.1600	1.1624	1.1649	1.1674	1.1699	1.1725	1.1776	1.1827	1.1959	1.2094	1.2233	1.2376
230	1.1655	1.1667	1.1691	1.1715	1.1739	1.1763	1.1788	1.1837	1.1887	1.2014	1.2144	1.2278	1.2416
235	1.1722	1.1734	1.1757	1.1780	1.1804	1.1827	1.1851	1.1899	1.1947	1.2070	1.2195	1.2324	1.2456
240	1.1789	1.1800	1.1822	1.1845	1.1868	1.1891	1.1914	1.1960	1.2006	1.2125	1.2246	1.2371	1.2498
245	1.1855	1.1866	1.1887	1.1909	1.1931	1.1954	1.1976	1.2021	1.2066	1.2180	1.2298	1.2417	1.2540
250	1.1920	1.1931	1.1952	1.1973	1.1994	1.2016	1.2038	1.2081	1.2125	1.2236	1.2349	1.2465	1.2583
255	1.1985	1.1995	1.2016	1.2036	1.2057	1.2078	1.2099	1.2141	1.2184	1.2291	1.2401	1.2512	1.2626
260	1.2049	1.2059	1.2079	1.2099	1.2119	1.2139	1.2160	1.2201	1.2242	1.2346	1.2452	1.2560	1.2670
265	1.2112	1.2122	1.2142	1.2161	1.2181	1.2200	1.2220	1.2260	1.2300	1.2401	1.2504	1.2608	1.2714
270	1.2175	1.2185	1.2204	1.2223	1.2242	1.2261	1.2280	1.2319	1.2358	1.2456	1.2555	1.2657	1.2759
275	1.2238	1.2247	1.2265	1.2284	1.2302	1.2321	1.2340	1.2377	1.2415	1.2510	1.2607	1.2705	1.2804

Opteon™ XL41 (R-454B)
Superheated Vapor - Heat Capacity Ratio Table

Heat Capacity Ratio, C_p/C_v

Saturation Properties in Light Blue

Temp °C	ABSOLUTE PRESSURE, kPa												
	50	101.325	200	300	400	500	600	800	1000	1500	2000	2500	3000
	-62.7	-49.5	-34.8	-25.0	-17.5	-11.3	-6.0	2.9	10.2	24.6	35.7	44.8	52.6
	1.258	1.267	1.285	1.303	1.320	1.337	1.355	1.392	1.431	1.544	1.688	1.881	2.154
-60	1.2547												
-55	1.2487												
-50	1.2434												
-45	1.2384	1.2600											
-40	1.2339	1.2528											
-35	1.2296	1.2465											
-30	1.2256	1.2407	1.2745										
-25	1.2218	1.2354	1.2652	1.3025									
-20	1.2182	1.2305	1.2570	1.2891									
-15	1.2148	1.2259	1.2497	1.2778	1.3117								
-10	1.2115	1.2216	1.2431	1.2680	1.2973	1.3324							
-5	1.2084	1.2176	1.2370	1.2593	1.2850	1.3150	1.3508						
0	1.2053	1.2138	1.2315	1.2516	1.2743	1.3004	1.3307						
5	1.2024	1.2102	1.2264	1.2445	1.2649	1.2878	1.3140	1.3803					
10	1.1996	1.2068	1.2216	1.2381	1.2564	1.2768	1.2998	1.3559					
15	1.1969	1.2036	1.2172	1.2323	1.2488	1.2671	1.2874	1.3359	1.3996				
20	1.1943	1.2004	1.2130	1.2268	1.2419	1.2583	1.2765	1.3189	1.3728				
25	1.1917	1.1975	1.2091	1.2218	1.2355	1.2505	1.2668	1.3043	1.3506	1.5393			
30	1.1893	1.1946	1.2054	1.2171	1.2297	1.2433	1.2580	1.2915	1.3319	1.4852			
35	1.1869	1.1918	1.2019	1.2127	1.2243	1.2367	1.2501	1.2802	1.3159	1.4440			
40	1.1845	1.1892	1.1985	1.2086	1.2193	1.2307	1.2429	1.2701	1.3019	1.4112	1.6082		
45	1.1823	1.1866	1.1953	1.2047	1.2146	1.2251	1.2363	1.2611	1.2895	1.3842	1.5410	1.8739	
50	1.1801	1.1841	1.1923	1.2010	1.2102	1.2199	1.2303	1.2528	1.2785	1.3616	1.4905	1.7270	
55	1.1779	1.1818	1.1894	1.1975	1.2061	1.2151	1.2246	1.2453	1.2686	1.3422	1.4508	1.6311	2.0134
60	1.1758	1.1795	1.1866	1.1942	1.2022	1.2106	1.2194	1.2385	1.2597	1.3254	1.4184	1.5621	1.8218
65	1.1738	1.1772	1.1840	1.1911	1.1985	1.2064	1.2145	1.2321	1.2516	1.3107	1.3915	1.5097	1.7019
70	1.1719	1.1751	1.1814	1.1881	1.1951	1.2024	1.2100	1.2263	1.2442	1.2977	1.3687	1.4680	1.6181
75	1.1699	1.1730	1.1789	1.1852	1.1918	1.1986	1.2057	1.2208	1.2373	1.2860	1.3491	1.4341	1.5555
80	1.1681	1.1709	1.1766	1.1825	1.1887	1.1950	1.2017	1.2158	1.2311	1.2756	1.3319	1.4057	1.5065
85	1.1663	1.1690	1.1743	1.1799	1.1857	1.1917	1.1979	1.2110	1.2252	1.2661	1.3168	1.3816	1.4670
90	1.1645	1.1670	1.1721	1.1774	1.1828	1.1885	1.1943	1.2066	1.2198	1.2574	1.3034	1.3608	1.4343
95	1.1628	1.1652	1.1700	1.1750	1.1801	1.1854	1.1909	1.2024	1.2148	1.2496	1.2914	1.3427	1.4068
100	1.1611	1.1634	1.1679	1.1726	1.1775	1.1825	1.1877	1.1985	1.2100	1.2423	1.2806	1.3267	1.3832
105	1.1594	1.1616	1.1659	1.1704	1.1750	1.1798	1.1846	1.1948	1.2056	1.2356	1.2708	1.3126	1.3628
110	1.1578	1.1599	1.1640	1.1683	1.1726	1.1771	1.1817	1.1913	1.2015	1.2294	1.2619	1.2999	1.3449
115	1.1563	1.1583	1.1622	1.1662	1.1704	1.1746	1.1790	1.1880	1.1975	1.2237	1.2537	1.2885	1.3290
120	1.1548	1.1567	1.1604	1.1642	1.1682	1.1722	1.1763	1.1849	1.1938	1.2183	1.2462	1.2781	1.3149
125	1.1533	1.1551	1.1586	1.1623	1.1660	1.1699	1.1738	1.1819	1.1903	1.2133	1.2393	1.2687	1.3022
130	1.1519	1.1536	1.1570	1.1604	1.1640	1.1676	1.1714	1.1790	1.1870	1.2086	1.2328	1.2600	1.2908
135	1.1505	1.1521	1.1553	1.1587	1.1620	1.1655	1.1690	1.1763	1.1839	1.2042	1.2269	1.2521	1.2804
140	1.1491	1.1507	1.1537	1.1569	1.1602	1.1634	1.1668	1.1737	1.1809	1.2001	1.2213	1.2448	1.2709
145	1.1478	1.1493	1.1522	1.1552	1.1583	1.1615	1.1647	1.1712	1.1780	1.1962	1.2161	1.2381	1.2622
150	1.1465	1.1479	1.1507	1.1536	1.1566	1.1596	1.1626	1.1689	1.1753	1.1925	1.2113	1.2318	1.2542
155	1.1452	1.1466	1.1493	1.1521	1.1549	1.1577	1.1606	1.1666	1.1727	1.1890	1.2067	1.2259	1.2469
160	1.1440	1.1453	1.1479	1.1505	1.1532	1.1560	1.1587	1.1644	1.1703	1.1857	1.2024	1.2205	1.2400
165	1.1428	1.1440	1.1465	1.1491	1.1516	1.1542	1.1569	1.1623	1.1679	1.1826	1.1984	1.2154	1.2337
170	1.1416	1.1428	1.1452	1.1476	1.1501	1.1526	1.1551	1.1603	1.1656	1.1796	1.1946	1.2106	1.2278
175	1.1404	1.1416	1.1439	1.1462	1.1486	1.1510	1.1534	1.1584	1.1635	1.1768	1.1910	1.2061	1.2223
180	1.1393	1.1404	1.1426	1.1449	1.1472	1.1495	1.1518	1.1565	1.1614	1.1741	1.1875	1.2019	1.2171
185	1.1382	1.1393	1.1414	1.1436	1.1458	1.1480	1.1502	1.1547	1.1594	1.1715	1.1843	1.1979	1.2122
190	1.1372	1.1382	1.1402	1.1423	1.1444	1.1465	1.1487	1.1530	1.1575	1.1690	1.1812	1.1941	1.2077
195	1.1361	1.1371	1.1391	1.1411	1.1431	1.1451	1.1472	1.1514	1.1556	1.1667	1.1783	1.1905	1.2034
200	1.1351	1.1361	1.1379	1.1399	1.1418	1.1438	1.1457	1.1498	1.1538	1.1644	1.1755	1.1871	1.1993
205	1.1341	1.1350	1.1369	1.1387	1.1406	1.1424	1.1443	1.1482	1.1521	1.1622	1.1728	1.1839	1.1955
210	1.1331	1.1340	1.1358	1.1376	1.1394	1.1412	1.1430	1.1467	1.1505	1.1602	1.1703	1.1808	1.1919
215	1.1322	1.1331	1.1347	1.1365	1.1382	1.1399	1.1417	1.1453	1.1489	1.1582	1.1679	1.1779	1.1884
220	1.1313	1.1321	1.1337	1.1354	1.1371	1.1387	1.1404	1.1439	1.1473	1.1563	1.1655	1.1752	1.1851
225	1.1304	1.1312	1.1327	1.1343	1.1359	1.1376	1.1392	1.1425	1.1458	1.1544	1.1633	1.1725	1.1820
230	1.1295	1.1303	1.1318	1.1333	1.1349	1.1364	1.1380	1.1412	1.1444	1.1526	1.1612	1.1700	1.1791
235	1.1286	1.1294	1.1308	1.1323	1.1338	1.1353	1.1368	1.1399	1.1430	1.1509	1.1591	1.1676	1.1762
240	1.1278	1.1285	1.1299	1.1314	1.1328	1.1343	1.1357	1.1387	1.1417	1.1493	1.1571	1.1652	1.1736
245	1.1270	1.1277	1.1290	1.1304	1.1318	1.1332	1.1346	1.1375	1.1404	1.1477	1.1553	1.1630	1.1710
250	1.1262	1.1268	1.1282	1.1295	1.1308	1.1322	1.1336	1.1363	1.1391	1.1462	1.1534	1.1609	1.1685
255	1.1254	1.1260	1.1273	1.1286	1.1299	1.1312	1.1325	1.1352	1.1379	1.1447	1.1517	1.1588	1.1662
260	1.1246	1.1252	1.1265	1.1277	1.1290	1.1303	1.1315	1.1341	1.1367	1.1433	1.1500	1.1569	1.1639
265	1.1238	1.1245	1.1257	1.1269	1.1281	1.1293	1.1305	1.1330	1.1355	1.1419	1.1484	1.1550	1.1617
270	1.1231	1.1237	1.1249	1.1260	1.1272	1.1284	1.1296	1.1320	1.1344	1.1405	1.1468	1.1532	1.1597
275	1.1224	1.1230	1.1241	1.1252	1.1264	1.1275	1.1287	1.1310	1.1333	1.1392	1.1453	1.1514	1.1577

Opteon™ XL41 (R-454B)
Superheated Vapor - Thermal Conductivity Table

Thermal Conductivity in mW/m-K

Saturation Properties in Light Blue

Temp °C	ABSOLUTE PRESSURE, kPa												
	50	101.325	200	300	400	500	600	800	1000	1500	2000	2500	3000
	-62.7	-49.5	-34.8	-25.0	-17.5	-11.3	-6.0	2.9	10.2	24.6	35.7	44.8	52.6
	7.880	8.525	9.337	9.953	10.475	10.944	11.382	12.204	12.996	15.011	17.269	19.988	23.393
-60	7.998												
-55	8.226												
-50	8.461												
-45	8.704	8.741											
-40	8.955	8.989											
-35	9.214	9.246											
-30	9.482	9.511	9.587										
-25	9.757	9.784	9.854	9.954									
-20	10.040	10.066	10.130	10.220									
-15	10.332	10.355	10.415	10.497	10.607								
-10	10.631	10.653	10.708	10.783	10.882	11.011							
-5	10.938	10.958	11.009	11.078	11.168	11.283	11.431						
0	11.253	11.272	11.319	11.383	11.464	11.568	11.699						
5	11.576	11.594	11.638	11.696	11.771	11.865	11.982	12.304					
10	11.907	11.924	11.964	12.018	12.087	12.172	12.278	12.562					
15	12.246	12.261	12.299	12.349	12.412	12.490	12.586	12.840	13.206				
20	12.593	12.607	12.642	12.688	12.746	12.817	12.905	13.133	13.455				
25	12.948	12.961	12.993	13.035	13.089	13.155	13.234	13.441	13.727	15.015			
30	13.311	13.323	13.352	13.391	13.440	13.501	13.574	13.762	14.018	15.118			
35	13.681	13.692	13.719	13.755	13.801	13.856	13.923	14.095	14.326	15.283			
40	14.060	14.070	14.095	14.128	14.169	14.221	14.282	14.439	14.649	15.493	17.145		
45	14.447	14.456	14.478	14.508	14.547	14.594	14.650	14.794	14.985	15.741	17.135	19.962	
50	14.841	14.849	14.870	14.897	14.932	14.976	15.027	15.160	15.335	16.017	17.220	19.432	
55	15.244	15.251	15.269	15.295	15.327	15.367	15.416	15.538	15.699	16.317	17.371	19.186	22.690
60	15.654	15.661	15.678	15.702	15.732	15.769	15.814	15.927	16.076	16.638	17.573	19.107	21.775
65	16.073	16.079	16.095	16.117	16.145	16.180	16.221	16.326	16.464	16.978	17.814	19.138	21.288
70	16.500	16.506	16.521	16.542	16.568	16.600	16.639	16.736	16.863	17.335	18.088	19.247	21.041
75	16.935	16.941	16.955	16.975	17.000	17.030	17.066	17.157	17.274	17.708	18.390	19.416	20.948
80	17.378	17.384	17.398	17.417	17.440	17.469	17.502	17.587	17.696	18.096	18.716	19.633	20.963
85	17.829	17.834	17.848	17.867	17.889	17.916	17.948	18.027	18.129	18.498	19.065	19.888	21.058
90	18.287	18.293	18.307	18.325	18.347	18.372	18.403	18.477	18.572	18.914	19.433	20.177	21.216
95	18.754	18.760	18.774	18.791	18.812	18.837	18.866	18.936	19.026	19.342	19.819	20.496	21.425
100	19.229	19.235	19.249	19.266	19.286	19.310	19.338	19.405	19.489	19.784	20.223	20.839	21.676
105	19.712	19.718	19.731	19.748	19.768	19.791	19.818	19.882	19.961	20.237	20.642	21.206	21.963
110	20.202	20.209	20.223	20.239	20.258	20.281	20.307	20.368	20.443	20.701	21.077	21.594	22.281
115	20.701	20.708	20.723	20.738	20.756	20.778	20.803	20.862	20.934	21.177	21.525	22.001	22.628
120	21.207	21.215	21.231	21.247	21.264	21.284	21.308	21.365	21.433	21.662	21.987	22.426	22.999
125	21.722	21.730	21.747	21.764	21.781	21.799	21.821	21.876	21.942	22.159	22.462	22.868	23.393
130	22.244	22.253	22.270	22.288	22.307	22.325	22.345	22.396	22.459	22.665	22.949	23.325	23.808
135	22.774	22.784	22.802	22.821	22.840	22.859	22.879	22.924	22.984	23.180	23.447	23.797	24.243
140	23.312	23.322	23.341	23.361	23.381	23.401	23.422	23.464	23.518	23.705	23.957	24.283	24.695
145	23.858	23.868	23.888	23.909	23.929	23.950	23.972	24.015	24.061	24.239	24.477	24.782	25.163
150	24.412	24.423	24.443	24.465	24.486	24.508	24.530	24.575	24.621	24.783	25.007	25.293	25.648
155	24.974	24.985	25.006	25.028	25.050	25.073	25.096	25.142	25.189	25.335	25.548	25.816	26.147
160	25.543	25.555	25.577	25.600	25.623	25.646	25.669	25.717	25.765	25.896	26.098	26.351	26.659
165	26.121	26.133	26.156	26.179	26.203	26.227	26.251	26.299	26.349	26.477	26.659	26.897	27.185
170	26.706	26.718	26.742	26.766	26.791	26.815	26.840	26.890	26.941	27.071	27.228	27.453	27.724
175	27.299	27.312	27.336	27.361	27.387	27.412	27.437	27.488	27.540	27.672	27.810	28.020	28.274
180	27.900	27.914	27.939	27.964	27.990	28.016	28.042	28.094	28.147	28.282	28.420	28.597	28.836
185	28.510	28.523	28.549	28.575	28.602	28.628	28.655	28.708	28.762	28.899	29.039	29.184	29.410
190	29.126	29.140	29.167	29.194	29.221	29.248	29.275	29.330	29.385	29.524	29.666	29.811	29.994
195	29.751	29.765	29.793	29.820	29.848	29.876	29.903	29.959	30.015	30.157	30.300	30.446	30.596
200	30.384	30.398	30.426	30.455	30.483	30.511	30.540	30.596	30.654	30.797	30.942	31.089	31.239
205	31.025	31.039	31.068	31.097	31.126	31.155	31.184	31.242	31.300	31.445	31.592	31.740	31.890
210	31.673	31.688	31.717	31.747	31.776	31.806	31.835	31.894	31.953	32.101	32.250	32.399	32.550
215	32.329	32.345	32.375	32.405	32.435	32.465	32.495	32.555	32.615	32.765	32.915	33.066	33.217
220	32.994	33.010	33.040	33.071	33.101	33.132	33.162	33.224	33.285	33.437	33.589	33.740	33.892
225	33.666	33.682	33.713	33.744	33.775	33.807	33.838	33.900	33.962	34.116	34.270	34.423	34.575
230	34.346	34.362	34.394	34.426	34.458	34.489	34.521	34.584	34.647	34.803	34.958	35.112	35.266
235	35.034	35.051	35.083	35.115	35.147	35.180	35.212	35.276	35.340	35.498	35.655	35.810	35.964
240	35.730	35.747	35.779	35.812	35.845	35.878	35.911	35.976	36.040	36.201	36.359	36.516	36.671
245	36.434	36.451	36.484	36.517	36.551	36.584	36.617	36.683	36.749	36.911	37.071	37.229	37.384
250	37.145	37.163	37.196	37.230	37.264	37.298	37.332	37.399	37.465	37.629	37.791	37.950	38.106
255	37.865	37.882	37.917	37.951	37.986	38.020	38.054	38.122	38.189	38.355	38.518	38.677	38.834
260	38.592	38.610	38.645	38.680	38.715	38.749	38.784	38.853	38.921	39.088	39.252	39.412	39.569
265	39.327	39.346	39.381	39.416	39.452	39.487	39.522	39.592	39.661	39.830	39.996	40.158	40.316
270	40.071	40.089	40.125	40.161	40.197	40.232	40.268	40.339	40.408	40.580	40.748	40.911	41.071
275	40.822	40.841	40.877	40.913	40.950	40.986	41.022	41.093	41.164	41.338	41.507	41.673	41.834

Opteon™ XL41 (R-454B)
Superheated Vapor - Velocity of Sound Table

Velocity of Sound in m/sec

Saturation Properties in Light Blue

Temp °C	ABSOLUTE PRESSURE, kPa												
	50	101.325	200	300	400	500	600	800	1000	1500	2000	2500	3000
	-62.7	-49.5	-34.8	-25.0	-17.5	-11.3	-6.0	2.9	10.2	24.6	35.7	44.8	52.6
	182.266	185.354	187.616	188.359	188.466	188.233	187.791	186.525	184.951	180.327	175.176	169.712	163.994
-60	183.49												
-55	185.72												
-50	187.88												
-45	189.97	187.48											
-40	192.03	189.74											
-35	194.03	191.93											
-30	196.00	194.05	190.05										
-25	197.93	196.12	192.45	188.37									
-20	199.83	198.14	194.74	191.03									
-15	201.70	200.12	196.95	193.55	189.88								
-10	203.54	202.06	199.10	195.95	192.60	189.01							
-5	205.36	203.96	201.19	198.26	195.17	191.90	188.40						
0	207.15	205.83	203.23	200.49	197.63	194.62	191.45						
5	208.91	207.67	205.22	202.65	199.99	197.21	194.29	187.96					
10	210.65	209.48	207.17	204.76	202.26	199.68	196.99	191.22					
15	212.37	211.26	209.08	206.81	204.47	202.05	199.55	194.25	188.44				
20	214.08	213.02	210.96	208.81	206.61	204.35	202.01	197.11	191.80				
25	215.76	214.75	212.80	210.77	208.70	206.57	204.39	199.82	194.94	180.69			
30	217.42	216.47	214.61	212.69	210.73	208.73	206.68	202.42	197.90	185.06			
35	219.06	218.16	216.40	214.58	212.72	210.83	208.90	204.91	200.71	189.00			
40	220.69	219.83	218.15	216.43	214.67	212.88	211.06	207.31	203.39	192.63	179.76		
45	222.30	221.48	219.89	218.25	216.58	214.89	213.17	209.63	205.96	196.01	184.47	169.95	
50	223.90	223.12	221.60	220.04	218.45	216.85	215.22	211.88	208.43	199.18	188.71	176.19	
55	225.48	224.74	223.29	221.80	220.29	218.77	217.23	214.07	210.82	202.19	192.60	181.53	167.76
60	227.05	226.34	224.95	223.54	222.11	220.66	219.19	216.20	213.14	205.05	196.21	186.26	174.54
65	228.60	227.92	226.60	225.25	223.89	222.51	221.12	218.28	215.38	207.79	199.59	190.55	180.27
70	230.15	229.49	228.23	226.94	225.64	224.33	223.00	220.31	217.57	210.42	202.78	194.50	185.31
75	231.67	231.05	229.84	228.61	227.37	226.12	224.86	222.30	219.70	212.95	205.81	198.17	189.86
80	233.19	232.59	231.44	230.26	229.08	227.88	226.68	224.25	221.77	215.40	208.70	201.61	194.02
85	234.69	234.12	233.02	231.89	230.76	229.62	228.47	226.16	223.81	217.77	211.47	204.87	197.88
90	236.19	235.64	234.58	233.51	232.42	231.33	230.24	228.03	225.79	220.07	214.14	207.96	201.49
95	237.67	237.14	236.13	235.10	234.07	233.02	231.98	229.87	227.74	222.31	216.70	210.91	204.89
100	239.14	238.64	237.67	236.68	235.69	234.69	233.69	231.68	229.65	224.49	219.19	213.74	208.12
105	240.60	240.12	239.19	238.24	237.30	236.34	235.39	233.46	231.53	226.61	221.59	216.46	211.19
110	242.05	241.59	240.70	239.79	238.88	237.97	237.06	235.22	233.37	228.69	223.93	219.08	214.13
115	243.49	243.05	242.19	241.33	240.46	239.58	238.71	236.95	235.18	230.72	226.20	221.61	216.96
120	244.93	244.50	243.68	242.85	242.01	241.18	240.34	238.66	236.97	232.71	228.41	224.06	219.67
125	246.35	245.94	245.15	244.35	243.55	242.75	241.95	240.34	238.73	234.67	230.57	226.45	222.30
130	247.76	247.37	246.61	245.85	245.08	244.31	243.54	242.00	240.46	236.58	232.68	228.76	224.83
135	249.17	248.79	248.07	247.33	246.60	245.86	245.12	243.65	242.17	238.46	234.74	231.02	227.29
140	250.56	250.20	249.51	248.80	248.10	247.39	246.68	245.27	243.85	240.31	236.76	233.22	229.68
145	251.95	251.60	250.94	250.26	249.58	248.91	248.23	246.87	245.52	242.13	238.74	235.37	232.01
150	253.33	253.00	252.36	251.71	251.06	250.41	249.76	248.46	247.16	243.92	240.69	237.47	234.27
155	254.70	254.38	253.77	253.15	252.52	251.90	251.28	250.03	248.79	245.68	242.59	239.53	236.48
160	256.07	255.76	255.17	254.57	253.97	253.38	252.78	251.59	250.39	247.42	244.47	241.54	238.64
165	257.43	257.13	256.56	255.99	255.42	254.84	254.27	253.12	251.98	249.14	246.31	243.52	240.75
170	258.78	258.49	257.95	257.40	256.85	256.30	255.75	254.65	253.55	250.83	248.13	245.46	242.82
175	260.12	259.85	259.32	258.79	258.27	257.74	257.21	256.16	255.11	252.50	249.91	247.36	244.85
180	261.45	261.19	260.69	260.18	259.68	259.17	258.66	257.65	256.65	254.15	251.67	249.23	246.84
185	262.78	262.53	262.05	261.56	261.08	260.59	260.10	259.14	258.17	255.78	253.41	251.08	248.79
190	264.10	263.86	263.40	262.93	262.47	262.00	261.53	260.61	259.68	257.39	255.12	252.89	250.70
195	265.42	265.19	264.74	264.30	263.85	263.40	262.95	262.06	261.18	258.98	256.81	254.68	252.59
200	266.73	266.51	266.08	265.65	265.22	264.79	264.36	263.51	262.66	260.55	258.48	256.44	254.44
205	268.03	267.82	267.41	267.00	266.58	266.17	265.76	264.94	264.13	262.11	260.12	258.17	256.26
210	269.33	269.12	268.73	268.33	267.94	267.54	267.15	266.37	265.59	263.65	261.75	259.88	258.06
215	270.62	270.42	270.04	269.66	269.29	268.91	268.53	267.78	267.03	265.18	263.36	261.57	259.83
220	271.90	271.71	271.35	270.99	270.62	270.26	270.00	269.26	268.51	266.69	264.95	263.24	261.57
225	273.18	273.00	272.65	272.30	271.96	271.61	271.26	270.57	269.88	268.19	266.52	264.89	263.29
230	274.45	274.28	273.95	273.61	273.28	272.95	272.61	271.95	271.30	269.67	268.07	266.51	264.99
235	275.71	275.55	275.23	274.91	274.59	274.28	273.96	273.32	272.70	271.14	269.61	268.12	266.67
240	276.97	276.82	276.51	276.21	275.90	275.60	275.29	274.69	274.08	272.60	271.14	269.71	268.32
245	278.23	278.08	277.79	277.50	277.20	276.91	276.62	276.04	275.46	274.04	272.65	271.28	269.95
250	279.48	279.33	279.06	278.78	278.50	278.22	277.94	277.38	276.83	275.47	274.14	272.84	271.57
255	280.72	280.58	280.32	280.05	279.78	279.52	279.25	278.72	278.19	276.89	275.62	274.38	273.17
260	281.96	281.83	281.57	281.32	281.06	280.81	280.55	280.05	279.55	278.30	277.09	275.90	274.74
265	283.19	283.07	282.83	282.58	282.34	282.09	281.85	281.37	280.89	279.70	278.54	277.41	276.31
270	284.42	284.30	284.07	283.84	283.60	283.37	283.14	282.68	282.22	281.09	279.98	278.90	277.85
275	285.64	285.53	285.31	285.09	284.86	284.64	284.42	283.98	283.54	282.47	281.41	280.38	279.38

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