

R-1234yf (Solstice® yf)

2,3,3,3-tetrafluoroprop-1-ene (CH₂=CF₃)

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

◆ Main applications

Solstice® yf is a fluorinated gas from the HFO family. This product has a very low GWP figure and is suitable for automotive air conditioning applications.

It may also be suitable as a R-134a replacement in other applications.

R-1234yf is mildly flammable, so please ensure it is handled accordingly.

◆ Commercial specifications

Purity: ≥ 99.5 % weight.

Water content: ≤ 20 ppm weight.

Chloride ion test: negative.

Acidity (HCl): ≤ 1 ppm weight.

Non-condensables (gas phase): ≤ 1.5 % volume.

◆ Oils

Use a poly alkylene glycol (PAG) oil for automotive air conditioning applications. For all other applications use a polyol ester (POE) oil.

Check with **Climalife** regarding the viscosity of the oil selected for your application, and the miscibility with the fluid under consideration.

◆ Regulation

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

The recovery of R-1234yf is mandatory under EU Regulation n° 517/2014.

(Refer to regulations enforced in each country).

Thermodynamic properties of R-1234yf - Saturated state

Absolute pressure	LIQUID					VAPOUR					Latent heat
	Bubble point	Volume	Density	Enthalpy	Entropy	Dew point	Volume	Density	Enthalpy	Entropy	
P	t ^l	v ^l	ρ ^l	h ^l	s ^l	t ^v	v ^v	ρ ^v	h ^v	s ^v	Lv
(bar)	(°C)	(dm ³ /kg)	(kg/dm ³)	(kJ/kg)	(kJ/kg.K)	(°C)	(m ³ /kg)	(kg/m ³)	(kJ/kg)	(kJ/kg.K)	(kJ/kg)
0.374	-50	0.758	1.318	139.633	0.757	-50.0	0.425	2.355	329.850	1.610	190.217
0.486	-45	0.766	1.305	145.313	0.782	-45.0	0.333	3.007	333.209	1.606	187.896
0.624	-40	0.774	1.292	151.069	0.807	-40.0	0.264	3.795	336.577	1.603	185.509
0.790	-35	0.782	1.278	156.901	0.832	-35.0	0.211	4.737	339.950	1.601	183.049
0.991	-30	0.791	1.265	162.811	0.857	-30.0	0.171	5.855	343.323	1.599	180.512
1.013	-29.49	0.792	1.263	163.417	0.859	-29.49	0.167	5.980	343.666	1.599	180.249
1.229	-25	0.800	1.251	168.800	0.881	-25.0	0.139	7.171	346.691	1.598	177.891
1.509	-20	0.809	1.236	174.871	0.905	-20.0	0.115	8.709	350.050	1.597	175.179
1.837	-15	0.818	1.222	181.024	0.929	-15.0	0.095	10.496	353.395	1.597	172.371
2.218	-10	0.829	1.207	187.262	0.953	-10.0	0.080	12.559	356.721	1.597	169.459
2.656	-5	0.839	1.192	193.587	0.976	-5.0	0.067	14.931	360.022	1.597	166.435
3.158	0	0.850	1.176	200.000	1.000	0.0	0.057	17.647	363.291	1.598	163.291
3.729	5	0.862	1.160	206.504	1.023	5.0	0.048	20.744	366.521	1.599	160.017
4.375	10	0.874	1.144	213.103	1.047	10.0	0.041	24.267	369.704	1.600	156.601
5.103	15	0.887	1.127	219.799	1.070	15.0	0.035	28.266	372.831	1.601	153.031
5.917	20	0.901	1.110	226.597	1.093	20.0	0.030	32.796	375.889	1.602	149.293
6.826	25	0.916	1.092	233.500	1.116	25.0	0.026	37.925	378.867	1.604	145.368
7.835	30	0.932	1.073	240.513	1.139	30.0	0.023	43.729	381.751	1.605	141.238
8.952	35	0.949	1.054	247.644	1.162	35.0	0.020	50.301	384.524	1.606	136.880
10.184	40	0.967	1.034	254.902	1.185	40.0	0.017	57.753	387.169	1.608	132.267
11.538	45	0.988	1.013	262.298	1.208	45.0	0.015	66.223	389.663	1.608	127.365
13.023	50	1.010	0.990	269.851	1.231	50.0	0.013	75.884	391.980	1.609	122.129
14.647	55	1.034	0.967	277.583	1.254	55.0	0.011	86.961	394.084	1.610	116.501
16.419	60	1.062	0.941	285.526	1.278	60.0	0.010	99.754	395.930	1.609	110.404
18.348	65	1.094	0.914	293.720	1.302	65.0	0.009	114.676	397.455	1.609	103.735
20.445	70	1.132	0.883	302.221	1.326	70.0	0.008	132.332	398.569	1.607	96.348
22.723	75	1.178	0.849	311.114	1.351	75.0	0.007	153.671	399.131	1.604	88.017
25.194	80	1.236	0.809	320.544	1.377	80.0	0.006	180.333	398.903	1.599	78.359
27.879	85	1.315	0.760	330.814	1.405	85.0	0.005	215.673	397.405	1.591	66.591
30.803	90	1.441	0.694	342.791	1.437	90.0	0.004	269.099	393.323	1.576	50.532

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

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-50	0.374	424.718	435.052	445.336	455.576	465.776	475.939	486.069	496.169	506.242	516.291	526.317	536.324	546.312	556.283	566.239	576.182	586.112	596.030	605.938	615.837	625.726
-45	0.486	332.591	340.641	348.645	356.607	364.532	372.422	380.283	388.115	395.923	403.708	411.473	419.219	426.948	434.662	442.361	450.048	457.724	465.389	473.044	480.690	488.328
-40	0.624	263.537	269.899	276.218	282.498	288.743	294.956	301.141	307.301	313.437	319.553	325.649	331.728	337.792	343.841	349.878	355.902	361.916	367.920	373.915	379.902	385.881
-35	0.790	211.097	216.194	221.250	226.270	231.257	236.215	241.146	246.053	250.939	255.806	260.655	265.488	270.306	275.111	279.905	284.687	289.459	294.223	298.977	303.724	308.464
-30	0.991	170.787	174.922	179.020	183.083	187.116	191.121	195.101	199.060	202.998	206.918	210.822	214.711	218.586	222.449	226.301	230.143	233.975	237.799	241.615	245.424	249.226
-29.49	1.013	167.228	171.280	175.293	179.273	183.222	187.143	191.040	194.916	198.771	202.608	206.429	210.235	214.028	217.809	221.578	225.338	229.088	232.829	236.563	240.290	244.010
-25	1.229	139.446	142.843	146.204	149.532	152.832	156.105	159.356	162.586	165.797	168.991	172.170	175.335	178.487	181.628	184.759	187.880	190.992	194.096	197.193	200.283	203.367
-20	1.509	114.820	117.642	120.430	123.187	125.917	128.623	131.307	133.971	136.618	139.249	141.865	144.469	147.061	149.642	152.213	154.775	157.329	159.875	162.415	164.948	167.475
-15	1.837	95.277	97.648	99.985	102.294	104.576	106.836	109.075	111.296	113.500	115.689	117.865	120.028	122.180	124.323	126.455	128.580	130.697	132.806	134.910	137.007	139.098
-10	2.218	79.623	81.635	83.615	85.568	87.496	89.402	91.288	93.157	95.011	96.850	98.677	100.491	102.296	104.091	105.877	107.655	109.426	111.190	112.948	114.700	116.447
-5	2.656	66.974	68.698	70.393	72.060	73.704	75.327	76.932	78.520	80.093	81.652	83.200	84.736	86.262	87.779	89.288	90.790	92.284	93.772	95.255	96.732	98.203
0	3.158	56.668	58.161	59.624	61.062	62.477	63.872	65.248	66.609	67.956	69.290	70.612	71.924	73.226	74.519	75.805	77.083	78.355	79.621	80.881	82.136	83.386
5	3.729	48.207	49.511	50.787	52.037	53.265	54.474	55.666	56.842	58.005	59.155	60.294	61.423	62.543	63.655	64.759	65.856	66.947	68.032	69.112	70.187	71.257
10	4.375	41.208	42.358	43.480	44.577	45.653	46.710	47.750	48.775	49.786	50.786	51.775	52.754	53.725	54.687	55.643	56.592	57.534	58.471	59.403	60.331	61.254
15	5.103	35.379	36.403	37.398	38.369	39.319	40.250	41.164	42.064	42.951	43.827	44.692	45.548	46.395	47.235	48.067	48.893	49.714	50.529	51.339	52.145	52.946
20	5.917	30.491	31.411	32.302	33.169	34.014	34.841	35.651	36.447	37.231	38.003	38.765	39.518	40.263	41.000	41.731	42.455	43.174	43.888	44.597	45.301	46.001
25	6.826	26.368	27.202	28.007	28.786	29.544	30.284	31.007	31.716	32.413	33.099	33.775	34.442	35.101	35.753	36.398	37.037	37.671	38.300	38.924	39.544	40.160
30	7.835	22.868	23.632	24.364	25.071	25.756	26.423	27.073	27.709	28.333	28.946	29.549	30.144	30.730	31.310	31.884	32.451	33.014	33.571	34.124	34.673	35.217
35	8.952	19.880	20.586	21.259	21.905	22.529	23.133	23.722	24.296	24.858	25.410	25.951	26.485	27.012	27.529	28.042	28.548	29.050	29.547	30.039	30.528	31.013
40	10.184	17.315	17.974	18.597	19.192	19.764	20.317	20.853	21.374	21.884	22.383	22.871	23.354	23.827	24.294	24.755	25.210	25.660	26.105	26.546	26.983	27.417
45	11.538	15.101	15.722	16.305	16.857	17.385	17.893	18.384	18.862	19.326	19.781	20.225	20.662	21.091	21.513	21.929	22.340	22.746	23.147	23.544	23.937	24.326
50	13.023	13.178	13.771	14.320	14.837	15.328	15.798	16.252	16.690	17.117	17.532	17.939	18.337	18.727	19.111	19.489	19.861	20.229	20.592	20.951	21.306	21.658
55	14.647	11.499	12.071	12.594	13.081	13.541	13.980	14.401	14.806	15.200	15.582	15.955	16.320	16.677	17.028	17.372	17.712	18.046	18.376	18.703	19.025	19.344
60	16.419	10.025	10.584	11.087	11.550	11.984	12.395	12.788	13.165	13.530	13.883	14.227	14.563	14.891	15.213	15.529	15.840	16.145	16.447	16.744	17.038	17.328
65	18.348	8.720	9.277	9.765	10.209	10.621	11.009	11.377	11.730	12.070	12.398	12.717	13.027	13.330	13.627	13.917	14.203	14.483	14.760	15.032	15.301	15.566
70	20.445	7.557	8.120	8.600	9.029	9.423	9.791	10.139	10.471	10.789	11.095	11.392	11.680	11.961	12.235	12.503	12.766	13.025	13.279	13.529	13.776	14.019
75	22.723	6.507	7.093	7.570	7.989	8.368	8.719	9.049	9.362	9.660	9.947	10.224	10.493	10.754	11.008	11.257	11.501	11.739	11.974	12.205	12.432	12.656
80	25.194	5.545	6.174	6.656	7.067	7.434	7.771	8.085	8.382	8.663	8.933	9.193	9.444	9.687	9.924	10.155	10.381	10.603	10.820	11.033	11.243	11.450
85	27.879	4.637	5.347	5.840	6.247	6.605	6.930	7.230	7.512	7.778	8.033	8.277	8.512	8.740	8.961	9.176	9.386	9.592	9.794	9.991	10.186	10.377
90	30.803	3.716	4.596	5.109	5.515	5.865	6.179	6.467	6.735	6.988	7.228	7.458	7.679	7.893	8.100	8.301	8.497	8.688	8.876	9.059	9.240	9.417

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

Sat. Temp. °C	Sat. Pressure bar	Superheat (°C)																				
		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-50	0.374	329.850	333.608	337.417	341.278	345.190	349.152	353.165	357.228	361.342	365.504	369.716	373.977	378.286	382.644	387.049	391.502	396.002	400.549	405.142	409.780	414.465
-45	0.486	333.209	337.043	340.927	344.859	348.841	352.872	356.952	361.080	365.257	369.482	373.754	378.075	382.443	386.857	391.319	395.827	400.381	404.981	409.627	414.317	419.052
-40	0.624	336.577	340.490	344.449	348.455	352.509	356.609	360.756	364.951	369.192	373.479	377.813	382.194	386.621	391.093	395.611	400.175	404.784	409.437	414.135	418.877	423.662
-35	0.790	339.950	343.943	347.980	352.061	356.188	360.359	364.575	368.836	373.142	377.494	381.890	386.331	390.817	395.348	399.923	404.543	409.206	413.913	418.664	423.457	428.294
-30	0.991	343.323	347.398	351.515	355.674	359.875	364.118	368.404	372.733	377.106	381.521	385.981	390.483	395.029	399.618	404.251	408.927	413.645	418.406	423.210	428.056	432.943
-29.49	1.013	343.666	347.750	351.876	356.042	360.251	364.501	368.795	373.131	377.510	381.932	386.398	390.907	395.459	400.054	404.693	409.374	414.098	418.865	423.674	428.525	433.418
-25	1.229	346.691	350.852	355.051	359.289	363.566	367.883	372.240	376.638	381.078	385.559	390.082	394.646	399.253	403.901	408.592	413.324	418.098	422.914	427.771	432.669	437.607
-20	1.509	350.050	354.300	358.583	362.902	367.257	371.649	376.079	380.548	385.055	389.603	394.190	398.817	403.485	408.194	412.943	417.732	422.562	427.432	432.343	437.294	442.284
-15	1.837	353.395	357.736	362.107	366.509	370.944	375.413	379.917	384.457	389.034	393.649	398.302	402.993	407.723	412.492	417.300	422.147	427.034	431.959	436.924	441.927	446.970
-10	2.218	356.721	361.157	365.617	370.105	374.622	379.169	383.749	388.363	393.011	397.694	402.414	407.170	411.963	416.793	421.661	426.566	431.510	436.491	441.510	446.567	451.662
-5	2.656	360.022	364.556	369.109	373.685	378.286	382.915	387.573	392.261	396.982	401.735	406.522	411.344	416.201	421.093	426.022	430.986	435.987	441.025	446.100	451.210	456.358
0	3.158	363.291	367.927	372.577	377.245	381.933	386.645	391.383	396.148	400.942	405.767	410.623	415.512	420.434	425.389	430.379	435.404	440.464	445.558	450.689	455.854	461.055
5	3.729	366.521	371.265	376.015	380.778	385.557	390.355	395.175	400.019	404.889	409.787	414.714	419.671	424.659	429.679	434.731	439.817	444.930	450.088	455.275	460.495	465.750
10	4.375	369.704	374.561	379.417	384.279	389.152	394.039	398.944	403.870	408.818	413.791	418.790	423.816	428.872	433.957	439.073	444.221	449.400	454.611	459.855	465.131	470.440
15	5.103	372.831	377.807	382.775	387.742	392.713	397.693	402.686	407.696	412.724	417.774	422.847	427.945	433.070	438.222	443.403	448.613	453.854	459.125	464.426	469.759	475.124
20	5.917	375.889	380.995	386.082	391.160	396.234	401.312	406.397	411.493	416.604	421.733	426.883	432.054	437.249	442.470	447.717	452.991	458.294	463.626	468.986	474.377	479.798
25	6.826	378.867	384.114	389.330	394.525	399.709	404.889	410.069	415.256	420.453	425.664	430.892	436.139	441.407	446.697	452.012	457.352	462.718	468.112	473.532	478.982	484.459
30	7.835	381.751	387.154	392.509	397.831	403.131	408.418	413.699	418.980	424.266	429.562	434.871	440.196	445.538	450.901	456.285	461.692	467.123	472.580	478.062	483.570	489.106
35	8.952	384.524	390.102	395.611	401.069	406.493	411.894	417.280	422.660	428.039	433.423	438.816	444.221	449.640	455.077	460.532	466.008	471.506	477.027	482.572	488.141	493.736
40	10.184	387.169	392.945	398.623	404.230	409.787	415.308	420.806	426.290	431.767	437.243	442.723	448.211	453.710	459.223	464.751	470.298	475.864	481.451	487.060	492.691	498.346
45	11.538	389.663	395.666	401.533	407.303	413.004	418.654	424.271	429.864	435.443	441.016	446.587	452.161	457.743	463.335	468.939	474.558	480.195	485.849	491.523	497.218	502.935
50	13.023	391.980	398.247	404.327	410.277	416.134	421.924	427.667	433.377	439.064	444.738	450.404	456.069	461.736	467.409	473.092	478.786	484.495	490.219	495.960	501.720	507.499
55	14.647	394.084	400.665	406.989	413.138	419.167	425.108	430.987	436.821	442.623	448.404	454.170	459.929	465.685	471.443	477.207	482.979	488.762	494.557	500.368	506.194	512.038
60	16.419	394.084	402.863	409.988	415.873	422.092	428.199	434.225	440.192	446.116	452.009	457.880	463.737	469.587	475.433	481.281	487.133	492.993	498.864	504.744	510.638	516.548
65	18.348	397.455	404.894	411.832	418.465	424.896	431.185	437.371	443.481	449.535	455.548	461.530	467.491	473.438	479.377	485.312	491.247	497.186	503.131	509.086	515.051	521.028
70	20.445	398.569	406.624	413.965	420.897	427.567	434.057	440.418	446.683	452.876	459.016	465.116	471.186	477.235	483.269	489.295	495.316	501.338	507.362	513.391	519.429	525.476
75	22.723	399.313	408.033	415.866	423.148	430.090	436.804	443.356	449.789	456.132	462.408	468.632	474.817	480.972	487.107	493.228	499.339	505.445	511.550	517.658	523.770	529.889
80	25.194	398.903	409.042	417.498	425.194	432.448	439.414	446.176	452.791	459.296	465.716	472.072	478.378	484.646	490.886	497.105	503.310	509.504	515.694	521.881	528.070	534.263
85	27.879	397.405	409.555	418.815	427.008	434.621	441.868	448.864	455.678	462.356	468.931	475.427	481.862	488.248	494.599	500.921	507.222	513.509	519.786	526.056	532.325	538.594
90	30.803	393.323	409.438	419.758	428.550	436.578	444.143	451.396	458.427	465.294	472.036	478.682	485.253	491.765	498.231	504.662	511.065	517.448	523.815	530.172	536.523	542.871

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

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