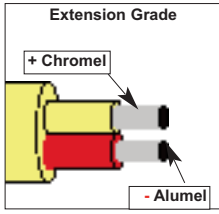
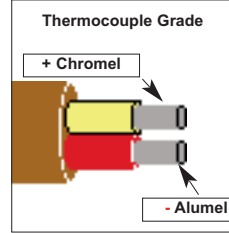


## Type K Thermocouple Chromel-Alumel



**Temperature Range**  
**Maximum Useful Temperature Range:**  
 Thermocouple Grade: -328 to 2282°F  
                                       -200 to 1250°C  
 Extension Grade: 32 to 392°F  
                                       0 to 200°C

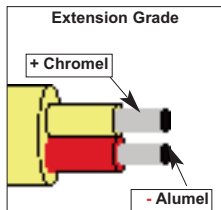
**Maximum Thermocouple Grade**  
**Temperature Range**  
 -454 to 2501°F  
 -270 to 1372°C  
**Accuracy:** Standard: 2.2°C or 0.75%  
                   Special: 1.1°C or 0.4%



**Recommended Applications:**

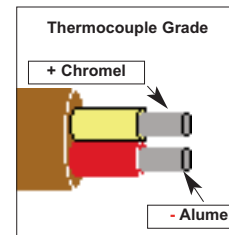
Clean Oxidizing and Inert Environments, Limited Use in Vacuum or Reducing Environment

Temp	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-270	-6.4577									
-260	-6.4411	-6.4437	-6.4460	-6.4482	-6.4501	-6.4518	-6.4534	-6.4548	-6.4559	-6.4569
-250	-6.4036	-6.4084	-6.4129	-6.4172	-6.4212	-6.4251	-6.4287	-6.4321	-6.4353	-6.4383
-240	-6.3438	-6.3508	-6.3576	-6.3641	-6.3704	-6.3765	-6.3824	-6.3880	-6.3935	-6.3986
-230	-6.2618	-6.2710	-6.2800	-6.2887	-6.2973	-6.3056	-6.3137	-6.3215	-6.3292	-6.3366
-220	-6.1584	-6.1697	-6.1808	-6.1916	-6.2023	-6.2128	-6.2230	-6.2330	-6.2428	-6.2524
-210	-6.0346	-6.0479	-6.0610	-6.0738	-6.0865	-6.0990	-6.1113	-6.1234	-6.1353	-6.1469
-200	-5.8914	-5.9066	-5.9216	-5.9363	-5.9510	-5.9654	-5.9796	-5.9936	-6.0075	-6.0211
-190	-5.7297	-5.7467	-5.7635	-5.7801	-5.7966	-5.8128	-5.8289	-5.8448	-5.8605	-5.8761
-180	-5.5504	-5.5691	-5.5876	-5.6060	-5.6242	-5.6422	-5.6601	-5.6777	-5.6952	-5.7126
-170	-5.3540	-5.3744	-5.3946	-5.4146	-5.4345	-5.4543	-5.4738	-5.4932	-5.5124	-5.5315
-160	-5.1412	-5.1632	-5.1851	-5.2067	-5.2283	-5.2496	-5.2708	-5.2918	-5.3127	-5.3334
-150	-4.9127	-4.9363	-4.9597	-4.9829	-5.0060	-5.0289	-5.0517	-5.0743	-5.0968	-5.1191
-140	-4.6690	-4.6940	-4.7189	-4.7437	-4.7683	-4.7927	-4.8170	-4.8412	-4.8652	-4.8890
-130	-4.4106	-4.4371	-4.4634	-4.4896	-4.5157	-4.5416	-4.5674	-4.5930	-4.6185	-4.6438
-120	-4.1382	-4.1661	-4.1938	-4.2214	-4.2488	-4.2761	-4.3033	-4.3303	-4.3572	-4.3840
-110	-3.8524	-3.8815	-3.9106	-3.9395	-3.9683	-3.9969	-4.0255	-4.0538	-4.0821	-4.1102
-100	-3.5536	-3.5841	-3.6144	-3.6446	-3.6746	-3.7046	-3.7344	-3.7641	-3.7936	-3.8230
-90	-3.2427	-3.2743	-3.3058	-3.3372	-3.3685	-3.3997	-3.4307	-3.4616	-3.4924	-3.5231
-80	-2.9201	-2.9529	-2.9855	-3.0181	-3.0505	-3.0828	-3.1150	-3.1471	-3.1791	-3.2109
-70	-2.5866	-2.6205	-2.6542	-2.6878	-2.7213	-2.7547	-2.7880	-2.8212	-2.8543	-2.8873
-60	-2.2428	-2.2777	-2.3124	-2.3470	-2.3815	-2.4160	-2.4503	-2.4845	-2.5187	-2.5527
-50	-1.8894	-1.9251	-1.9608	-1.9964	-2.0319	-2.0673	-2.1026	-2.1378	-2.1729	-2.2079
-40	-1.5270	-1.5636	-1.6001	-1.6366	-1.6730	-1.7093	-1.7455	-1.7816	-1.8176	-1.8535
-30	-1.1561	-1.1936	-1.2309	-1.2682	-1.3054	-1.3426	-1.3796	-1.4166	-1.4534	-1.4902
-20	-0.7775	-0.8157	-0.8539	-0.8919	-0.9299	-0.9678	-1.0056	-1.0433	-1.0810	-1.1186
-10	-0.3919	-0.4307	-0.4695	-0.5083	-0.5469	-0.5855	-0.6241	-0.6625	-0.7010	-0.7393
0	0.0000	-0.0394	-0.0788	-0.1181	-0.1574	-0.1966	-0.2358	-0.2749	-0.3139	-0.3529
Temp	0	1	2	3	4	5	6	7	8	9
0	0.0000	0.0395	0.0790	0.1186	0.1582	0.1979	0.2376	0.2773	0.3171	0.3570
10	0.3969	0.4368	0.4768	0.5168	0.5569	0.5970	0.6371	0.6773	0.7175	0.7578
20	0.7981	0.8385	0.8789	0.9193	0.9597	1.0002	1.0408	1.0814	1.1220	1.1626
30	1.2033	1.2440	1.2847	1.3255	1.3663	1.4072	1.4480	1.4889	1.5299	1.5708
40	1.6118	1.6528	1.6939	1.7349	1.7760	1.8171	1.8583	1.8994	1.9406	1.9818
50	2.0231	2.0643	2.1056	2.1469	2.1882	2.2296	2.2709	2.3123	2.3537	2.3951
60	2.4365	2.4779	2.5193	2.5608	2.6023	2.6437	2.6852	2.7267	2.7682	2.8097
70	2.8513	2.8928	2.9343	2.9758	3.0174	3.0589	3.1005	3.1420	3.1836	3.2251
80	3.2666	3.3082	3.3497	3.3913	3.4328	3.4743	3.5159	3.5574	3.5989	3.6404
90	3.6819	3.7234	3.7648	3.8063	3.8478	3.8892	3.9306	3.9721	4.0135	4.0549
100	4.0962	4.1376	4.1789	4.2203	4.2616	4.3029	4.3442	4.3854	4.4266	4.4679
110	4.5091	4.5502	4.5914	4.6325	4.6737	4.7148	4.7558	4.7969	4.8379	4.8789
120	4.9199	4.9608	5.0018	5.0427	5.0836	5.1244	5.1653	5.2061	5.2469	5.2877
130	5.3284	5.3691	5.4098	5.4505	5.4911	5.5318	5.5724	5.6129	5.6535	5.6940
140	5.7345	5.7750	5.8155	5.8559	5.8963	5.9367	5.9771	6.0174	6.0578	6.0981
150	6.1383	6.1786	6.2189	6.2591	6.2993	6.3395	6.3797	6.4198	6.4600	6.5001
160	6.5402	6.5803	6.6204	6.6605	6.7005	6.7406	6.7806	6.8206	6.8606	6.9006
170	6.9406	6.9806	7.0205	7.0605	7.1004	7.1404	7.1803	7.2203	7.2602	7.3001



**Temperature Range**  
**Maximum Useful Temperature Range:**  
 Thermocouple Grade: -328 to 2282°F  
   -200 to 1250°C  
 Extension Grade: 32 to 392°F  
   0 to 200°C

**Maximum Thermocouple Grade**  
**Temperature Range**  
 -454 to 2501°F  
 -270 to 1372°C  
**Accuracy:** Standard: 2.2°C or 0.75%  
                   Special: 1.1°C or 0.4%



### Temperature vs Millivolt Table Reference Junction 0°C

**Recommended Applications:**

Clean Oxidizing and Inert Environments, Limited Use in Vacuum or Reducing Environment

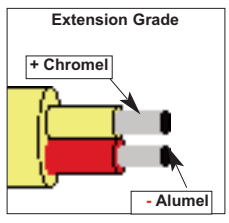
Temp	0	1	2	3	4	5	6	7	8	9
180	7.3400	7.3799	7.4199	7.4598	7.4997	7.5396	7.5795	7.6194	7.6593	7.6992
190	7.7391	7.7790	7.8190	7.8589	7.8988	7.9387	7.9787	8.0186	8.0586	8.0985
200	8.1385	8.1784	8.2184	8.2584	8.2984	8.3384	8.3784	8.4185	8.4585	8.4985
210	8.5386	8.5787	8.6187	8.6588	8.6990	8.7391	8.7792	8.8194	8.8595	8.8997
220	8.9399	8.9801	9.0203	9.0606	9.1008	9.1411	9.1814	9.2217	9.2620	9.3023
230	9.3427	9.3831	9.4234	9.4638	9.5043	9.5447	9.5852	9.6256	9.6661	9.7066
240	9.7472	9.7877	9.8283	9.8688	9.9094	9.9500	9.9907	10.0313	10.0720	10.1127
250	10.1534	10.1941	10.2348	10.2756	10.3163	10.3571	10.3979	10.4388	10.4796	10.5205
260	10.5613	10.6022	10.6431	10.6840	10.7250	10.7659	10.8069	10.8479	10.8889	10.9299
270	10.9709	11.0120	11.0531	11.0941	11.1352	11.1763	11.2175	11.2586	11.2998	11.3409
280	11.3821	11.4233	11.4645	11.5058	11.5470	11.5882	11.6295	11.6708	11.7121	11.7534
290	11.7947	11.8360	11.8774	11.9187	11.9601	12.0015	12.0429	12.0843	12.1257	12.1671
300	12.2086	12.2500	12.2915	12.3330	12.3744	12.4159	12.4574	12.4990	12.5405	12.5820
310	12.6236	12.6651	12.7067	12.7483	12.7899	12.8315	12.8731	12.9147	12.9563	12.9980
320	13.0396	13.0813	13.1230	13.1646	13.2063	13.2480	13.2897	13.3314	13.3731	13.4149
330	13.4566	13.4984	13.5401	13.5819	13.6237	13.6654	13.7072	13.7490	13.7908	13.8327
340	13.8745	13.9163	13.9582	14.0000	14.0419	14.0837	14.1256	14.1675	14.2094	14.2512
350	14.2931	14.3351	14.3770	14.4189	14.4608	14.5028	14.5447	14.5867	14.6286	14.6706
360	14.7126	14.7546	14.7965	14.8385	14.8806	14.9226	14.9646	15.0066	15.0486	15.0907
370	15.1327	15.1748	15.2168	15.2589	15.3010	15.3431	15.3851	15.4272	15.4693	15.5114
380	15.5536	15.5957	15.6378	15.6799	15.7221	15.7642	15.8064	15.8485	15.8907	15.9329
390	15.9750	16.0172	16.0594	16.1016	16.1438	16.1860	16.2282	16.2704	16.3127	16.3549
400	16.3971	16.4394	16.4816	16.5239	16.5662	16.6084	16.6507	16.6930	16.7353	16.7775
410	16.8198	16.8621	16.9044	16.9468	16.9891	17.0314	17.0737	17.1161	17.1584	17.2007
420	17.2431	17.2854	17.3278	17.3702	17.4125	17.4549	17.4973	17.5397	17.5821	17.6245
430	17.6669	17.7093	17.7517	17.7941	17.8365	17.8789	17.9214	17.9638	18.0062	18.0487
440	18.0911	18.1336	18.1760	18.2185	18.2609	18.3034	18.3459	18.3884	18.4308	18.4733
450	18.5158	18.5583	18.6008	18.6433	18.6858	18.7283	18.7708	18.8133	18.8559	18.8984
460	18.9409	18.9834	19.0260	19.0685	19.1110	19.1536	19.1961	19.2387	19.2812	19.3238
470	19.3663	19.4089	19.4515	19.4940	19.5366	19.5792	19.6218	19.6643	19.7069	19.7495
480	19.7921	19.8347	19.8773	19.9199	19.9625	20.0051	20.0477	20.0903	20.1329	20.1755
490	20.2181	20.2607	20.3033	20.3459	20.3885	20.4312	20.4738	20.5164	20.5590	20.6017
500	20.6443	20.6869	20.7295	20.7722	20.8148	20.8574	20.9001	20.9427	20.9854	21.0280
510	21.0706	21.1133	21.1559	21.1986	21.2412	21.2838	21.3265	21.3691	21.4118	21.4544
520	21.4971	21.5397	21.5824	21.6250	21.6677	21.7103	21.7530	21.7956	21.8383	21.8809
530	21.9236	21.9662	22.0089	22.0515	22.0942	22.1368	22.1794	22.2221	22.2647	22.3074
540	22.3500	22.3927	22.4353	22.4780	22.5206	22.5632	22.6059	22.6485	22.6912	22.7338
550	22.7764	22.8191	22.8617	22.9043	22.9470	22.9896	23.0322	23.0748	23.1175	23.1601
560	23.2027	23.2453	23.2879	23.3306	23.3732	23.4158	23.4584	23.5010	23.5436	23.5862
570	23.6288	23.6714	23.7140	23.7566	23.7992	23.8418	23.8843	23.9269	23.9695	24.0121
580	24.0547	24.0972	24.1398	24.1824	24.2249	24.2675	24.3100	24.3526	24.3951	24.4377
590	24.4802	24.5228	24.5653	24.6078	24.6504	24.6929	24.7354	24.7779	24.8204	24.8630
600	24.9055	24.9480	24.9905	25.0330	25.0755	25.1179	25.1604	25.2029	25.2454	25.2878
610	25.3303	25.3728	25.4152	25.4577	25.5001	25.5426	25.5850	25.6275	25.6699	25.7123
620	25.7547	25.7971	25.8395	25.8820	25.9244	25.9668	26.0091	26.0515	26.0939	26.1363
630	26.1786	26.2210	26.2634	26.3057	26.3481	26.3904	26.4328	26.4751	26.5174	26.5597
640	26.6020	26.6444	26.6867	26.7290	26.7712	26.8135	26.8558	26.8981	26.9403	26.9826
650	27.0249	27.0671	27.1094	27.1516	27.1938	27.2360	27.2783	27.3205	27.3627	27.4049



# Technical Information Data Bulletin

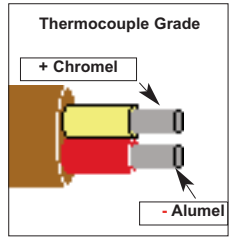
## Type K Thermocouple Chromel-Alumel

TEMPERATURE & PROCESS INSTRUMENTS - CON-



### Temperature vs Millivolt Table Reference Junction 0°C

<b>Temperature Range</b>	<b>Maximum Thermocouple Grade Temperature Range</b>
Maximum Useful Temperature Range: Thermocouple Grade: -328 to 2282°F -200 to 1250°C	-454 to 2501°F -270 to 1372°C
<b>Extension Grade:</b> 32 to 392°F 0 to 200°C	<b>Accuracy:</b> Standard: 2.2°C or 0.75% Special: 1.1°C or 0.4%



**Recommended Applications:**  
Clean Oxidizing and Inert Environments, Limited Use in Vacuum or Reducing Environment

Temp	0	1	2	3	4	5	6	7	8	9
660	27.4471	27.4893	27.5314	27.5736	27.6158	27.6579	27.7001	27.7422	27.7844	27.8265
670	27.8686	27.9107	27.9528	27.9949	28.0370	28.0791	28.1212	28.1633	28.2054	28.2474
680	28.2895	28.3315	28.3736	28.4156	28.4576	28.4996	28.5416	28.5836	28.6256	28.6676
690	28.7096	28.7516	28.7935	28.8355	28.8774	28.9194	28.9613	29.0032	29.0452	29.0871
700	29.1290	29.1709	29.2128	29.2546	29.2965	29.3384	29.3802	29.4221	29.4639	29.5057
710	29.5476	29.5894	29.6312	29.6730	29.7148	29.7565	29.7983	29.8401	29.8818	29.9236
720	29.9653	30.0070	30.0488	30.0905	30.1322	30.1739	30.2156	30.2573	30.2989	30.3406
730	30.3822	30.4239	30.4655	30.5071	30.5488	30.5904	30.6320	30.6736	30.7151	30.7567
740	30.7983	30.8398	30.8814	30.9229	30.9645	31.0060	31.0475	31.0890	31.1305	31.1720
750	31.2135	31.2549	31.2964	31.3378	31.3793	31.4207	31.4621	31.5035	31.5449	31.5863
760	31.6277	31.6691	31.7105	31.7518	31.7932	31.8345	31.8758	31.9171	31.9585	31.9998
770	32.0410	32.0823	32.1236	32.1649	32.2061	32.2474	32.2886	32.3298	32.3710	32.4122
780	32.4534	32.4946	32.5358	32.5770	32.6181	32.6593	32.7004	32.7416	32.7827	32.8238
790	32.8649	32.9060	32.9471	32.9881	33.0292	33.0703	33.1113	33.1523	33.1934	33.2344
800	33.2754	33.3164	33.3574	33.3983	33.4393	33.4803	33.5212	33.5621	33.6031	33.6440
810	33.6849	33.7258	33.7667	33.8076	33.8484	33.8893	33.9301	33.9710	34.0118	34.0526
820	34.0934	34.1342	34.1750	34.2158	34.2566	34.2973	34.3381	34.3788	34.4196	34.4603
830	34.5010	34.5417	34.5824	34.6231	34.6637	34.7044	34.7450	34.7857	34.8263	34.8669
840	34.9075	34.9481	34.9887	35.0293	35.0699	35.1104	35.1510	35.1915	35.2321	35.2726
850	35.3131	35.3536	35.3941	35.4346	35.4751	35.5155	35.5560	35.5964	35.6368	35.6773
860	35.7177	35.7581	35.7985	35.8388	35.8792	35.9196	35.9599	36.0003	36.0406	36.0809
870	36.1212	36.1615	36.2018	36.2421	36.2824	36.3226	36.3629	36.4031	36.4434	36.4836
880	36.5238	36.5640	36.6042	36.6444	36.6845	36.7247	36.7649	36.8050	36.8451	36.8853
890	36.9254	36.9655	37.0056	37.0456	37.0857	37.1258	37.1658	37.2059	37.2459	37.2859
900	37.3259	37.3659	37.4059	37.4459	37.4859	37.5258	37.5658	37.6057	37.6456	37.6856
910	37.7255	37.7654	37.8052	37.8451	37.8850	37.9249	37.9647	38.0045	38.0444	38.0842
920	38.1240	38.1638	38.2036	38.2434	38.2831	38.3229	38.3626	38.4024	38.4421	38.4818
930	38.5215	38.5612	38.6009	38.6406	38.6803	38.7199	38.7596	38.7992	38.8388	38.8784
940	38.9180	38.9576	38.9972	39.0368	39.0764	39.1159	39.1555	39.1950	39.2345	39.2740
950	39.3135	39.3530	39.3925	39.4320	39.4714	39.5109	39.5503	39.5898	39.6292	39.6686
960	39.7080	39.7474	39.7868	39.8262	39.8655	39.9049	39.9442	39.9835	40.0229	40.0622
970	40.1015	40.1407	40.1800	40.2193	40.2586	40.2978	40.3370	40.3763	40.4155	40.4547
980	40.4939	40.5331	40.5722	40.6114	40.6506	40.6897	40.7288	40.7680	40.8071	40.8462
990	40.8853	40.9243	40.9634	41.0025	41.0415	41.0806	41.1196	41.1586	41.1976	41.2366
1000	41.2756	41.3146	41.3535	41.3925	41.4314	41.4704	41.5093	41.5482	41.5871	41.6260
1010	41.6649	41.7038	41.7426	41.7815	41.8203	41.8591	41.8980	41.9368	41.9756	42.0143
1020	42.0531	42.0919	42.1306	42.1694	42.2081	42.2468	42.2855	42.3242	42.3629	42.4016
1030	42.4403	42.4789	42.5176	42.5562	42.5948	42.6334	42.6720	42.7106	42.7492	42.7877
1040	42.8263	42.8648	42.9034	42.9419	42.9804	43.0189	43.0574	43.0959	43.1343	43.1728
1050	43.2112	43.2497	43.2881	43.3265	43.3649	43.4033	43.4417	43.4800	43.5184	43.5567
1060	43.5951	43.6334	43.6717	43.7100	43.7483	43.7866	43.8248	43.8631	43.9013	43.9395
1070	43.9777	44.0160	44.0541	44.0923	44.1305	44.1687	44.2068	44.2449	44.2831	44.3212
1080	44.3593	44.3974	44.4354	44.4735	44.5115	44.5496	44.5876	44.6256	44.6636	44.7016
1090	44.7396	44.7776	44.8155	44.8535	44.8914	44.9293	44.9672	45.0051	45.0430	45.0809
1100	45.1187	45.1566	45.1944	45.2322	45.2700	45.3078	45.3456	45.3834	45.4212	45.4589
1110	45.4966	45.5344	45.5721	45.6098	45.6475	45.6851	45.7228	45.7604	45.7981	45.8357
1120	45.8733	45.9109	45.9485	45.9860	46.0236	46.0611	46.0987	46.1362	46.1737	46.2112
1130	46.2487	46.2861	46.3236	46.3610	46.3984	46.4359	46.4733	46.5106	46.5480	46.5854

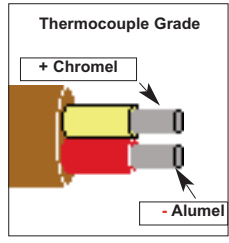
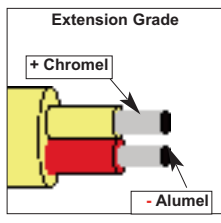


# Technical Information Data Bulletin

## Type K Thermocouple Chromel-Alumel

TEMPERATURE & PROCESS INSTRUMENTS - INC

### Temperature vs Millivolt Table Reference Junction 0°C



<b>Temperature Range</b> <b>Maximum Useful Temperature Range:</b> <b>Thermocouple Grade:</b> -328 to 2282°F -200 to 1250°C <b>Extension Grade:</b> 32 to 392°F 0 to 200°C	<b>Maximum Thermocouple Grade Temperature Range</b> -454 to 2501°F -270 to 1372°C <b>Accuracy:</b> Standard: 2.2°C or 0.75% Special: 1.1°C or 0.4%
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**Recommended Applications:**  
 Clean Oxidizing and Inert Environments, Limited Use in Vacuum or Reducing Environment

Temp	0	1	2	3	4	5	6	7	8	9
1140	46.6227	46.6601	46.6974	46.7347	46.7720	46.8093	46.8465	46.8838	46.9210	46.9583
1150	46.9955	47.0327	47.0699	47.1070	47.1442	47.1813	47.2185	47.2556	47.2927	47.3298
1160	47.3668	47.4039	47.4410	47.4780	47.5150	47.5520	47.5890	47.6260	47.6630	47.6999
1170	47.7368	47.7738	47.8107	47.8476	47.8844	47.9213	47.9582	47.9950	48.0318	48.0686
1180	48.1054	48.1422	48.1790	48.2157	48.2524	48.2892	48.3259	48.3626	48.3992	48.4359
1190	48.4726	48.5092	48.5458	48.5824	48.6190	48.6556	48.6921	48.7287	48.7652	48.8017
1200	48.8382	48.8747	48.9112	48.9477	48.9841	49.0205	49.0569	49.0933	49.1297	49.1661
1210	49.2024	49.2388	49.2751	49.3114	49.3477	49.3840	49.4202	49.4565	49.4927	49.5289
1220	49.5651	49.6013	49.6375	49.6736	49.7097	49.7459	49.7820	49.8181	49.8541	49.8902
1230	49.9263	49.9623	49.9983	50.0343	50.0703	50.1062	50.1422	50.1781	50.2141	50.2500
1240	50.2858	50.3217	50.3576	50.3934	50.4292	50.4651	50.5009	50.5366	50.5724	50.6081
1250	50.6439	50.6796	50.7153	50.7510	50.7867	50.8223	50.8579	50.8936	50.9292	50.9648
1260	51.0003	51.0359	51.0714	51.1070	51.1425	51.1780	51.2134	51.2489	51.2844	51.3198
1270	51.3552	51.3906	51.4260	51.4614	51.4967	51.5320	51.5674	51.6027	51.6380	51.6732
1280	51.7085	51.7437	51.7789	51.8142	51.8493	51.8845	51.9197	51.9548	51.9900	52.0251
1290	52.0602	52.0953	52.1303	52.1654	52.2004	52.2354	52.2704	52.3054	52.3404	52.3753
1300	52.4103	52.4452	52.4801	52.5150	52.5499	52.5847	52.6196	52.6544	52.6892	52.7240
1310	52.7588	52.7936	52.8283	52.8631	52.8978	52.9325	52.9672	53.0019	53.0365	53.0712
1320	53.1058	53.1404	53.1750	53.2096	53.2442	53.2787	53.3132	53.3478	53.3823	53.4168
1330	53.4512	53.4857	53.5202	53.5546	53.5890	53.6234	53.6578	53.6922	53.7265	53.7609
1340	53.7952	53.8295	53.8638	53.8981	53.9324	53.9666	54.0009	54.0351	54.0693	54.1035
1350	54.1377	54.1719	54.2060	54.2402	54.2743	54.3084	54.3425	54.3766	54.4107	54.4448
1360	54.4788	54.5128	54.5469	54.5809	54.6149	54.6489	54.6828	54.7168	54.7507	54.7847
1370	54.8186	54.8525	54.8864							