

**MAXIMUM TEMPERATURE RANGE**

**Thermocouple Grade**

32 to 2642°F  
0 to 1450°C

**Extension Grade**

32 to 300°F  
0 to 150°C

**LIMITS OF ERROR**

(whichever is greater)

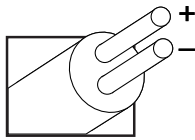
**Standard:** 1.5°C or 0.25%

**Special:** 0.6°C or 0.1%

**COMMENTS, BARE WIRE ENVIRONMENT:**

Oxidizing or Inert; Do Not Insert in Metal Tubes;  
Beware of Contamination; High Temperature

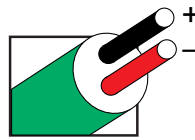
**TEMPERATURE IN DEGREES °C**  
**REFERENCE JUNCTION AT 0°C**



**Thermocouple Grade**

**NONE ESTABLISHED**

**Platinum-13% Rhodium vs. Platinum**



**Extension Grade**

**Revised Thermocouple Reference Tables**

**TYPE R**  
Reference Tables  
N.I.S.T.  
Monograph 175  
Revised to ITS-90



Z

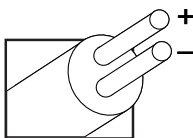
**Thermoelectric Voltage in Millivolts**

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C	50	50.2	50.4	50.6	50.8	51.0	51.2	51.4	51.6	51.8	52.0	52.2	52.4	52.6	52.8	53.0	53.2	53.4	53.6	53.8	54.0	54.2	54.4	54.6	54.8	55.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
-40	-0.226	-0.223	-0.219	-0.215	-0.211	-0.208	-0.204	-0.199	-0.196	-0.192	-0.188	-40	550	5.021	5.033	5.044	5.055	5.066	5.077	5.088	5.099	5.111	5.122	5.133	5.144	5.155	5.166	5.177	5.188	5.199	5.210	5.221	5.232	5.243	5.254	5.265	5.276	5.287	5.298	5.309	5.320	5.331	5.342	5.353	5.364	5.375	5.386	5.397	5.408	5.419	5.430	5.441	5.452	5.463	5.474	5.485	5.496	5.507	5.518	5.529	5.540	5.551	5.562	5.573	5.584	5.595	5.606	5.617	5.628	5.639	5.650	5.661	5.672	5.683	5.694	5.705	5.716	5.727	5.738	5.749	5.760	5.771	5.782	5.793	5.804	5.815	5.826	5.837	5.848	5.859	5.870	5.881	5.892	5.903	5.914	5.925	5.936	5.947	5.958	5.969	5.980	5.991	6.002	6.013	6.024	6.035	6.046	6.057	6.068	6.079	6.090	6.101	6.112	6.123	6.134	6.145	6.156	6.167	6.178	6.189	6.200	6.211	6.222	6.233	6.244	6.255	6.266	6.277	6.288	6.299	6.310	6.321	6.332	6.343	6.354	6.365	6.376	6.387	6.398	6.409	6.420	6.431	6.442	6.453	6.464	6.475	6.486	6.497	6.508	6.519	6.530	6.541	6.552	6.563	6.574	6.585	6.596	6.607	6.618	6.629	6.640	6.651	6.662	6.673	6.684	6.695	6.706	6.717	6.728	6.739	6.750	6.761	6.772	6.783	6.794	6.805	6.816	6.827	6.838	6.849	6.860	6.871	6.882	6.893	6.904	6.915	6.926	6.937	6.948	6.959	6.970	6.981	6.992	7.003	7.014	7.025	7.036	7.047	7.058	7.069	7.080	7.091	7.102	7.113	7.124	7.135	7.146	7.157	7.168	7.179	7.190	7.201	7.212	7.223	7.234	7.245	7.256	7.267	7.278	7.289	7.300	7.311	7.322	7.333	7.344	7.355	7.366	7.377	7.388	7.399	7.410	7.421	7.432	7.443	7.454	7.465	7.476	7.487	7.498	7.509	7.520	7.531	7.542	7.553	7.564	7.575	7.586	7.597	7.608	7.619	7.630	7.641	7.652	7.663	7.674	7.685	7.696	7.707	7.718	7.729	7.740	7.751	7.762	7.773	7.784	7.795	7.806	7.817	7.828	7.839	7.850	7.861	7.872	7.883	7.894	7.905	7.916	7.927	7.938	7.949	7.960	7.971	7.982	7.993	8.004	8.015	8.026	8.037	8.048	8.059	8.070	8.081	8.092	8.103	8.114	8.125	8.136	8.147	8.158	8.169	8.180	8.191	8.202	8.213	8.224	8.235	8.246	8.257	8.268	8.279	8.290	8.301	8.312	8.323	8.334	8.345	8.356	8.367	8.378	8.389	8.400	8.411	8.422	8.433	8.444	8.455	8.466	8.477	8.488	8.499	8.510	8.521	8.532	8.543	8.554	8.565	8.576	8.587	8.598	8.609	8.620	8.631	8.642	8.653	8.664	8.675	8.686	8.697	8.708	8.719	8.730	8.741	8.752	8.763	8.774	8.785	8.796	8.807	8.818	8.829	8.840	8.851	8.862	8.873	8.884	8.895	8.906	8.917	8.928	8.939	8.950	8.961	8.972	8.983	8.994	9.005	9.016	9.027	9.038	9.049	9.060	9.071	9.082	9.093	9.104	9.115	9.126	9.137	9.148	9.159	9.170	9.181	9.192	9.203	9.214	9.225	9.236	9.247	9.258	9.269	9.280	9.291	9.302	9.313	9.324	9.335	9.346	9.357	9.368	9.379	9.390	9.401	9.412	9.423	9.434	9.445	9.456	9.467	9.478	9.489	9.500	9.511	9.522	9.533	9.544	9.555	9.566	9.577	9.588	9.599	9.610	9.621	9.632	9.643	9.654	9.665	9.676	9.687	9.698	9.709	9.720	9.731	9.742	9.753	9.764	9.775	9.786	9.797	9.808	9.819	9.830	9.841	9.852	9.863	9.874	9.885	9.896	9.907	9.918	9.929	9.940	9.951	9.962	9.973	9.984	9.995	10.006	10.017	10.028	10.039	10.050	10.061	10.072	10.083	10.094	10.105	10.116	10.127	10.138	10.149	10.160	10.171	10.182	10.193	10.204	10.215	10.226	10.237	10.248	10.259	10.270	10.281	10.292	10.303	10.314	10.325	10.336	10.347	10.358	10.369	10.380	10.391	10.402	10.413	10.424	10.435	10.446	10.457	10.468	10.479	10.490	10.501	10.512	10.523	10.534	10.545	10.556	10.567	10.578	10.589	10.600	10.611	10.622	10.633	10.644	10.655	10.666	10.677	10.688	10.699	10.710	10.721	10.732	10.743	10.754	10.765	10.776	10.787	10.798	10.809	10.820	10.831	10.842	10.853	10.864	10.875	10.886	10.897	10.908	10.919	10.930	10.941	10.952	10.963	10.974	10.985	10.996	10.007	10.018	10.029	10.040	10.051	10.062	10.073	10.084	10.095	10.106	10.117	10.128	10.139	10.150	10.161	10.172	10.183	10.194	10.205	10.216	10.227	10.238	10.249	10.260	10.271	10.282	10.293	10.304	10.315	10.326	10.337	10.348	10.359	10.370	10.381	10.392	10.403	10.414	10.425	10.436	10.447	10.458	10.469	10.480	10.491	10.502	10.513	10.524	10.535	10.546	10.557	10.568	10.579	10.590	10.601	10.612	10.623	10.634	10.645	10.656	10.667	10.678	10.689	10.700	10.711	10.722	10.733	10.744	10.755	10.766	10.777	10.788	10.799	10.810	10.821	10.832	10.843	10.854	10.865	10.876	10.887	10.898	10.909	10.920	10.931	10.942	10.953	10.964	10.975	10.986	10.997	11.008	11.019	11.030	11.041	11.052	11.063	11.074	11.085	11.096	11.107	11.118	11.129	11.140	11.151	11.162	11.173	11.184	11.195	11.206	11.217	11.228	11.239	11.250	11.261	11.272	11.283	11.294	11.305	11.316	11.327	11.338	11.349	11.360	11.371	11.382	11.393	11.404	11.415	11.426	11.437	11.448	11.459	11.470	11.481	11.492	11.503	11.514	11.525	11.536	11.547	11.558	11.569	11.580	11.591	11.602	11.613	11.624	11.635	11.646	11.657	11.668	11.679	11.690	11.701	11.712	11.723	11.734	11.745	11.756	11.767	11.778	11.789	11.800	11.811	11.822	11.833	11.844	11.855	11.866	11.877	11.888	11.899	11.910	11.921	11.932	11.943	11.954	11.965	11.976	11.987	11.998	12.009	12.020	12.031	12.042	12.053	12.064	12.075	12.086	12.097	12.108	12.119	12.130	12.141	12.152	12.163	12.174	12.185	12.196	12.207	12.218	12.229	12.240	12.251	12.262	12.273	12.284	12.295	12.306	12.317	12.328	12.339	12.350	12.361	12.372	12.383	12.394	12.405	12.416	12.427	12.438	12.449	12.460	12.471	12.482	12.493	12.504	12.515	12.526	12.537	12.548	12.559	12.570	12.581	12.592	12.603	12.614	12.625	12.636	12.647	12.658	12.669	12.680	12.691	12.702	12.713	12.724	12.735	12.746	12.757	12.768	12.779	12.790	12.801	12.812	12.823	12.834	12.845	12.856	12.867	12.878	12.889	12.900	12.911	12.922	12.933	12.944	12.955	12.966	12.977	12.988	12.999	13.010	13.021	13.032	13.043	13.054	13.065	13.076	13.087	13.098	13.109	13.120	13.131	13.142	13.153	13.164	13.175	13.186	13.197	13.208	13.219	13.230	13.241	13.252	13.263	13.274	13.285	13.296	13.307	13.318	13.329	13.340	13.351	13.362	13.373	13.384	13.395	13.406	13.417	13.428	13.439	13.450	13.461	13.472	13.483	13.494	13.505	13.516	13.527	13.538	13.549	13.560	13.571	13.582	13.593	13.604	13.615	13.626	13.637	13.648	13.659	13.670	13.681	13.692	13.703	13.714	13.725	13.736	13.747	13.758	13.769	13.780	13.791	13.802	13.813	13.824	13.835	13.846	13.857	13.868	13.879	13.890	13.901	13.912	13.923	13.934	13.945	13.956	13.967	13.978	13.989	14.000	14.011	14.022	14.033	14.044	14.055	14.066	14.077	14.088	14.099	14.110	14.121	14.132	14.143	14.154	14.165	14.176	14.187	14.198	14.209	14.220	14.231	14.242	14.253	14.264	14.275	14.286	14.297	14.308	14.319	14.330	14.341	14.352	14.363	14.374	14.385	14.396	14.407	14.418	14.429	14.440	14.451	14.462	14.473	14.484	14.495	14.506	14.517	14.528	14.539	14.550	14.561	14.572	14.583	14.594	14.605	14.616	14.627	14.638	14.649	14.660	14.671	14.682	14.693	14.704	14.715	14.726	14.737	14.748	14.759	14.770	14.781	14.792	14.803	14.814	14.825	14.836	14.847	14.858	14.869	14.880	14.891	14.902	14.913	14.924	14.935	14.946	14.957	14.968	14.979	14.990	15.001	15.012	15.023	15.034	15.045	15.056	15.067	15.078	15.089	15.100	15.111	15.122	15.133	15.144	15.155	15.166	15.177	15.188	15.199</

# Revised Thermocouple Reference Tables

# TYPE R

Reference Tables  
N.I.S.T.  
Monograph 175  
Revised to  
ITS-90

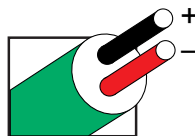


Thermocouple Grade

NONE ESTABLISHED

Platinum-13% Rhodium  
VS.  
Platinum

Extension Grade



MAXIMUM TEMPERATURE RANGE

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0 to 1450°C

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Beware of Contamination; High Temperature

TEMPERATURE IN DEGREES °C  
REFERENCE JUNCTION AT 0°C

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C	°C	0	1	2	3	4	5	6	7	8	9	10	°C
1150	12.535	12.549	12.563	12.577	12.590	12.604	12.618	12.632	12.646	12.659	12.673	1150	1500	17.451	17.465	17.479	17.493	17.507	17.521	17.535	17.549	17.563	17.577	17.591	1500
1160	12.673	12.687	12.701	12.715	12.729	12.742	12.756	12.770	12.784	12.798	12.812	1160	1510	17.591	17.605	17.619	17.633	17.647	17.661	17.676	17.690	17.704	17.718	17.732	1510
1170	12.812	12.825	12.839	12.853	12.867	12.881	12.895	12.909	12.922	12.936	12.950	1170	1520	17.732	17.746	17.760	17.774	17.788	17.802	17.816	17.830	17.844	17.858	17.872	1520
1180	12.950	12.964	12.978	12.992	13.006	13.019	13.033	13.047	13.061	13.075	13.089	1180	1530	17.872	17.886	17.900	17.914	17.928	17.942	17.956	17.970	17.984	17.998	18.012	1530
1190	13.089	13.103	13.117	13.131	13.145	13.158	13.172	13.186	13.200	13.214	13.228	1190	1540	18.012	18.026	18.040	18.054	18.068	18.082	18.096	18.110	18.124	18.138	18.152	1540
1200	13.228	13.242	13.256	13.270	13.284	13.298	13.311	13.325	13.339	13.353	13.367	1200	1550	18.152	18.166	18.180	18.194	18.208	18.222	18.236	18.250	18.264	18.278	18.292	1550
1210	13.367	13.381	13.395	13.409	13.423	13.437	13.451	13.465	13.479	13.493	13.507	1210	1560	18.292	18.306	18.320	18.334	18.348	18.362	18.376	18.390	18.404	18.417	18.431	1560
1220	13.507	13.521	13.535	13.549	13.563	13.577	13.590	13.604	13.618	13.632	13.646	1220	1570	18.431	18.445	18.459	18.473	18.487	18.501	18.515	18.529	18.543	18.557	18.571	1570
1230	13.646	13.660	13.674	13.688	13.702	13.716	13.730	13.744	13.758	13.772	13.786	1230	1580	18.571	18.585	18.599	18.613	18.627	18.640	18.654	18.668	18.682	18.696	18.710	1580
1240	13.786	13.800	13.814	13.828	13.842	13.856	13.870	13.884	13.898	13.912	13.926	1240	1590	18.710	18.724	18.738	18.752	18.766	18.779	18.793	18.807	18.821	18.835	18.849	1590
1250	13.926	13.940	13.954	13.968	13.982	13.996	14.010	14.024	14.038	14.052	14.066	1250	1600	18.849	18.863	18.877	18.891	18.904	18.918	18.932	18.946	18.960	18.974	18.988	1600
1260	14.066	14.081	14.095	14.109	14.123	14.137	14.151	14.165	14.179	14.193	14.207	1260	1610	18.988	19.002	19.015	19.029	19.043	19.057	19.071	19.085	19.098	19.112	19.126	1610
1270	14.207	14.221	14.235	14.249	14.263	14.277	14.291	14.305	14.319	14.333	14.347	1270	1620	19.126	19.140	19.154	19.168	19.181	19.195	19.209	19.223	19.237	19.250	19.264	1620
1280	14.347	14.361	14.375	14.390	14.404	14.418	14.432	14.446	14.460	14.474	14.488	1280	1630	19.264	19.278	19.292	19.306	19.319	19.333	19.347	19.361	19.375	19.388	19.402	1630
1290	14.488	14.502	14.516	14.530	14.544	14.558	14.572	14.586	14.601	14.615	14.629	1290	1640	19.402	19.416	19.430	19.444	19.457	19.471	19.485	19.499	19.512	19.526	19.540	1640
1300	14.629	14.643	14.657	14.671	14.685	14.699	14.713	14.727	14.741	14.755	14.770	1300	1650	19.540	19.554	19.567	19.581	19.595	19.609	19.622	19.636	19.650	19.663	19.677	1650
1310	14.770	14.784	14.798	14.812	14.826	14.840	14.854	14.868	14.882	14.896	14.911	1310	1660	19.677	19.691	19.705	19.718	19.732	19.746	19.759	19.773	19.787	19.800	19.814	1660
1320	14.911	14.925	14.939	14.953	14.967	14.981	14.995	15.009	15.023	15.037	15.052	1320	1670	19.814	19.828	19.841	19.855	19.869	19.882	19.896	19.910	19.923	19.937	19.951	1670
1330	15.052	15.066	15.080	15.094	15.108	15.122	15.136	15.150	15.164	15.179	15.193	1330	1680	19.951	19.964	19.978	19.992	20.005	20.019	20.032	20.046	20.060	20.073	20.087	1680
1340	15.193	15.207	15.221	15.235	15.249	15.263	15.277	15.291	15.306	15.320	15.334	1340	1690	20.087	20.100	20.114	20.127	20.141	20.154	20.168	20.181	20.195	20.208	20.222	1690
1350	15.334	15.348	15.362	15.376	15.390	15.404	15.419	15.433	15.447	15.461	15.475	1350	1700	20.222	20.235	20.249	20.262	20.275	20.289	20.302	20.316	20.329	20.342	20.356	1700
1360	15.475	15.489	15.503	15.517	15.531	15.546	15.560	15.574	15.588	15.602	15.616	1360	1710	20.356	20.369	20.382	20.396	20.409	20.422	20.436	20.449	20.462	20.475	20.488	1710
1370	15.616	15.630	15.645	15.659	15.673	15.687	15.701	15.715	15.729	15.743	15.758	1370	1720	20.488	20.502	20.515	20.528	20.541	20.554	20.567	20.581	20.594	20.607	20.620	1720
1380	15.758	15.772	15.786	15.800	15.814	15.828	15.842	15.856	15.871	15.885	15.899	1380	1730	20.620	20.633	20.646	20.659	20.672	20.685	20.698	20.711	20.724	20.736	20.749	1730
1390	15.899	15.913	15.927	15.941	15.955	15.969	15.984	15.998	16.012	16.026	16.040	1390	1740	20.749	20.762	20.775	20.788	20.801	20.813	20.826	20.839	20.852	20.864	20.877	1740
1400	16.040	16.054	16.068	16.082	16.097	16.111	16.125	16.139	16.153	16.167	16.181	1400	1750	20.877	20.890	20.902	20.915	20.928	20.940	20.953	20.965	20.978	20.990	21.003	1750
1410	16.181	16.196	16.210	16.224	16.238	16.252	16.266	16.280	16.294	16.309	16.323	1410	1760	21.003	21.015	21.027	21.040	21.052	21.065	21.077	21.089	21.101			1760
1420	16.323	16.337	16.351	16.365	16.379	16.393	16.407	16.422	16.436	16.450	16.464	1420													
1430	16.464	16.478	16.492	16.506	16.520	16.534	16.549	16.563	16.577	16.591	16.605	1430													
1440	16.605	16.619	16.633	16.647	16.662	16.676	16.690	16.704	16.718	16.732	16.746	1440													
1450	16.746	16.760	16.774	16.789	16.803	16.817	16.831	16.845	16.859	16.873	16.887	1450													
1460	16.887	16.901	16.915	16.930	16.944	16.958	16.972	16.986	17.000	17.014	17.028	1460													
1470	17.028	17.042	17.056	17.071	17.085	17.099	17.113	17.127	17.141	17.155	17.169	1470													
1480	17.169	17.183	17.197	17.211	17.225	17.240	17.254	17.268	17.282	17.296	17.310	1480													
1490	17.310	17.324	17.338	17.352	17.366	17.380	17.394	17.408	17.422	17.437	17.451	1490													