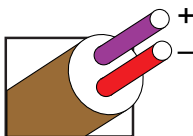
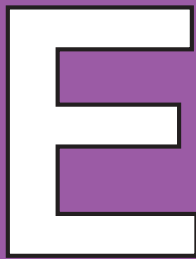


# Revised Thermocouple Reference Tables

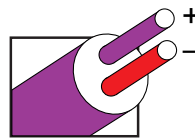
## TYPE E

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



Thermocouple Grade

Nickel-Chromium  
VS.  
Copper-Nickel



Extension Grade

MAXIMUM TEMPERATURE RANGE

Thermocouple Grade

- 328 to 1652°F  
- 200 to 900°C

Extension Grade

32 to 392°F  
0 to 200°C

LIMITS OF ERROR

(whichever is greater)

Standard: 1.7°C or 0.5% Above 0°C  
1.7°C or 1.0°C Below 0°C

Special: 1.0°C or 0.4%

COMMENTS, BARE WIRE ENVIRONMENT:  
Oxidizing or Inert; Limited Use in Vacuum or Reducing; Highest EMF Change per Degree

TEMPERATURE IN DEGREES °F  
REFERENCE JUNCTION AT 32°F

Thermoelectric Voltage in Millivolts

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F	°F	0	1	2	3	4	5	6	7	8	9	10	°F	
-450								-9.835	-9.834	-9.833	-9.832	-9.830	-450	100	2.281	2.316	2.351	2.385	2.420	2.454	2.489	2.524	2.558	2.593	2.628	100
-440	-9.830	-9.829	-9.827	-9.825	-9.823	-9.821	-9.819	-9.817	-9.814	-9.812	-9.809	-440	110	2.628	2.663	2.698	2.733	2.767	2.802	2.837	2.872	2.907	2.942	2.977	110	
-430	-9.809	-9.806	-9.803	-9.800	-9.797	-9.793	-9.790	-9.786	-9.782	-9.779	-9.775	-430	120	2.977	3.012	3.048	3.083	3.118	3.153	3.188	3.224	3.259	3.294	3.330	120	
-420	-9.775	-9.771	-9.766	-9.762	-9.758	-9.753	-9.749	-9.744	-9.739	-9.734	-9.729	-420	130	3.330	3.365	3.400	3.436	3.471	3.507	3.542	3.578	3.613	3.649	3.685	130	
-410	-9.729	-9.724	-9.718	-9.713	-9.707	-9.702	-9.696	-9.690	-9.684	-9.678	-9.672	-410	140	3.685	3.720	3.756	3.792	3.827	3.863	3.899	3.935	3.970	4.006	4.042	140	
-400	-9.672	-9.666	-9.659	-9.653	-9.646	-9.639	-9.632	-9.625	-9.618	-9.611	-9.604	-400	150	4.042	4.078	4.114	4.150	4.186	4.222	4.258	4.294	4.330	4.366	4.403	150	
-390	-9.604	-9.597	-9.589	-9.581	-9.574	-9.566	-9.558	-9.550	-9.542	-9.534	-9.525	-390	160	4.403	4.439	4.475	4.511	4.547	4.584	4.620	4.656	4.693	4.729	4.766	160	
-380	-9.525	-9.517	-9.508	-9.500	-9.491	-9.482	-9.473	-9.464	-9.455	-9.446	-9.436	-380	170	4.766	4.802	4.839	4.875	4.912	4.948	4.985	5.021	5.058	5.095	5.131	170	
-370	-9.436	-9.427	-9.417	-9.408	-9.398	-9.388	-9.378	-9.368	-9.358	-9.348	-9.338	-370	180	5.131	5.168	5.205	5.242	5.278	5.315	5.352	5.389	5.426	5.463	5.500	180	
-360	-9.338	-9.327	-9.317	-9.306	-9.295	-9.285	-9.274	-9.263	-9.252	-9.241	-9.229	-360	190	5.500	5.537	5.574	5.611	5.648	5.685	5.722	5.759	5.796	5.833	5.871	190	
-350	-9.229	-9.218	-9.207	-9.195	-9.184	-9.172	-9.160	-9.148	-9.136	-9.124	-9.112	-350	200	5.871	5.908	5.945	5.982	6.020	6.057	6.094	6.132	6.169	6.207	6.244	200	
-340	-9.112	-9.100	-9.088	-9.075	-9.063	-9.050	-9.038	-9.025	-9.012	-8.999	-8.986	-340	210	6.244	6.281	6.319	6.356	6.394	6.432	6.469	6.507	6.544	6.582	6.620	210	
-330	-8.986	-8.973	-8.960	-8.947	-8.934	-8.920	-8.907	-8.893	-8.880	-8.866	-8.852	-330	220	6.624	6.662	6.699	6.733	6.771	6.809	6.847	6.884	6.922	6.960	6.998	220	
-320	-8.852	-8.839	-8.825	-8.811	-8.797	-8.782	-8.768	-8.754	-8.739	-8.725	-8.710	-320	230	6.998	7.036	7.074	7.112	7.150	7.188	7.226	7.264	7.302	7.341	7.379	230	
-310	-8.710	-8.696	-8.681	-8.666	-8.651	-8.636	-8.622	-8.607	-8.591	-8.576	-8.561	-310	240	7.379	7.417	7.455	7.493	7.532	7.570	7.608	7.647	7.685	7.723	7.762	240	
-300	-8.561	-8.546	-8.530	-8.515	-8.499	-8.483	-8.468	-8.452	-8.436	-8.420	-8.404	-300	250	7.762	7.800	7.839	7.877	7.916	7.954	7.993	8.031	8.070	8.108	8.147	250	
-290	-8.404	-8.388	-8.372	-8.356	-8.339	-8.323	-8.307	-8.290	-8.273	-8.257	-8.240	-290	260	8.147	8.186	8.224	8.263	8.302	8.340	8.379	8.418	8.457	8.496	8.535	260	
-280	-8.240	-8.223	-8.206	-8.189	-8.173	-8.155	-8.138	-8.121	-8.104	-8.087	-8.069	-280	270	8.535	8.573	8.612	8.651	8.690	8.729	8.768	8.807	8.846	8.885	8.924	270	
-270	-8.069	-8.052	-8.034	-8.017	-7.999	-7.981	-7.963	-7.945	-7.928	-7.910	-7.891	-270	280	8.924	8.963	9.002	9.041	9.080	9.120	9.159	9.198	9.237	9.277	9.316	280	
-260	-7.891	-7.873	-7.855	-7.837	-7.819	-7.800	-7.782	-7.763	-7.745	-7.726	-7.707	-260	290	9.316	9.355	9.395	9.434	9.473	9.513	9.552	9.591	9.631	9.670	9.710	290	
-250	-7.707	-7.688	-7.670	-7.651	-7.632	-7.613	-7.593	-7.574	-7.555	-7.536	-7.516	-250	300	9.710	9.749	9.789	9.828	9.868	9.907	9.947	9.987	10.026	10.066	10.106	300	
-240	-7.516	-7.497	-7.478	-7.458	-7.438	-7.419	-7.399	-7.379	-7.359	-7.339	-7.319	-240	310	10.106	10.145	10.185	10.225	10.265	10.304	10.344	10.384	10.424	10.464	10.503	310	
-230	-7.319	-7.299	-7.279	-7.259	-7.239	-7.219	-7.198	-7.178	-7.157	-7.137	-7.116	-230	320	10.503	10.543	10.583	10.623	10.663	10.703	10.743	10.783	10.823	10.863	10.903	320	
-220	-7.116	-7.096	-7.075	-7.054	-7.033	-7.013	-6.992	-6.971	-6.950	-6.929	-6.907	-220	330	10.903	10.943	10.983	11.024	11.064	11.104	11.144	11.184	11.224	11.265	11.305	330	
-210	-6.907	-6.886	-6.865	-6.843	-6.822	-6.801	-6.779	-6.757	-6.736	-6.714	-6.692	-210	340	11.305	11.345	11.385	11.426	11.466	11.506	11.547	11.587	11.627	11.668	11.708	340	
-200	-6.692	-6.671	-6.649	-6.627	-6.605	-6.583	-6.561	-6.539	-6.516	-6.494	-6.472	-200	350	11.708	11.749	11.789	11.830	11.870	11.911	11.951	11.992	12.032	12.073	12.113	350	
-190	-6.472	-6.449	-6.427	-6.405	-6.382	-6.359	-6.337	-6.314	-6.291	-6.269	-6.246	-190	360	12.113	12.154	12.195	12.235	12.276	12.317	12.357	12.398	12.439	12.480	12.520	360	
-180	-6.246	-6.223	-6.200	-6.177	-6.154	-6.130	-6.107	-6.084	-6.061	-6.037	-6.014	-180	370	12.516	12.557	12.598	12.643	12.684	12.724	12.765	12.806	12.847	12.888	12.929	370	
-170	-6.014	-5.991	-5.967	-5.943	-5.920	-5.896	-5.872	-5.849	-5.825	-5.801	-5.777	-170	380	12.929	12.970	13.011	13.052	13.093	13.134	13.175	13.216	13.257	13.298	13.339	380	
-160	-5.777	-5.753	-5.729	-5.705	-5.681	-5.656	-5.632	-5.608	-5.584	-5.559	-5.535	-160	390	13.339	13.380	13.421	13.462	13.503	13.545	13.586	13.627	13.668	13.709	13.751	390	
-150	-5.535	-5.510	-5.486	-5.461	-5.436	-5.412	-5.387	-5.362	-5.337	-5.312	-5.287	-150	400	13.751	13.792	13.833	13.875	13.916	13.957	13.999	14.040	14.081	14.123	14.164	400	
-140	-5.287	-5.262	-5.237	-5.212	-5.187	-5.162	-5.136	-5.111	-5.086	-5.060	-5.035	-140	410	14.164	14.205	14.247	14.288	14.330	14.371	14.413	14.454	14.496	14.537	14.579	410	
-130	-5.035	-5.009	-4.984	-4.958	-4.932	-4.907	-4.881	-4.855	-4.829	-4.803	-4.777	-130	420	14.579	14.620	14.662	14.704	14.745	14.787	14.828	14.870	14.912	14.953	14.995	420	
-120	-4.777	-4.751	-4.725	-4.699	-4.673	-4.647	-4.621	-4.594	-4.568	-4.542	-4.515	-120	430	14.995	15.037	15.078	15.120	15.162	15.204	15.245	15.287	15.329	15.371	15.413	430	
-110	-4.515	-4.489	-4.462	-4.436	-4.409	-4.382	-4.355	-4.329	-4.302	-4.275	-4.248	-110	440	15.413	15.454	15.496	15.538	15.580	15.622	15.664	15.706	15.748	15.790	15.831	440	
-100	-4.248	-4.221	-4.194	-4.167	-4.140	-4.113	-4.086	-4.058	-4.031	-4.004	-3.976	-100	450	15.831	15.873	15.915	15.957	15.999	16.041	16.083	16.125	16.168	16.210	16.252	450	
-90	-3.976	-3.949	-3.922	-3.894	-3.867	-3.839	-3.811	-3.784	-3.756	-3.728	-3.700	-90	460	16.252	16.294	16.336	16.378	16.420	16.462	16.504	16.547	16.589	16.631	16.673	460	
-80	-3.700	-3.672	-3.645	-3.617	-3.589	-3.561	-3.532	-3.504	-3.476	-3.448	-3.420	-80	470	16.673	16.715	16.758	16.800	16.842	16.884	16.927	16.969	17.011	17.054	17.096	470	
-70	-3.420	-3.391	-3.363	-3.335	-3.306	-3.278	-3.249	-3.221	-3.192	-3.163	-3.135	-70	480	17.096	17.138	17.181	17.223	17.265	17.308	17.350	17.392	17.435	17.477	17.520	480	
-60	-3.135	-3.106	-3.077	-3.048	-3.020	-2.991	-2.962	-2.933	-2.904	-2.875	-2.846	-60	490	17.520	17.562	17.605	17.647	17.690	17.732	17.775	17.817	17.860	17.902	17.945	490	
-50	-2.846	-2.816	-2.787	-2.758	-2.729	-2.699	-2.670	-2.641	-2.611	-2.582	-2.552	-50	500	17.945	17.987	18.030	18.073	18.115	18.158	18.200	18.243	18.286	18.328	18.371	500	
-40	-2.552	-2.523	-2.493	-2.463	-2.434	-2.404	-2.374	-2.344	-2.315	-2.285	-2.255	-40	510	18.371	18.414	18.456	18.499	18.542	18.585							

MAXIMUM TEMPERATURE RANGE

Thermocouple Grade

- 328 to 1652°F
- 200 to 900°C

Extension Grade

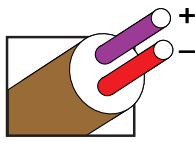
32 to 392°F
0 to 200°C

LIMITS OF ERROR

(whichever is greater)
Standard: 1.7°C or 0.5% Above 0°C
1.7°C or 1.0°C Below 0°C
Special: 1.0°C or 0.4%

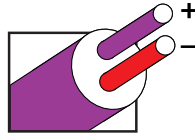
COMMENTS, BARE WIRE ENVIRONMENT:
Oxidizing or Inert; Limited Use in Vacuum or Reducing; Highest EMF Change per Degree

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F



Thermocouple Grade

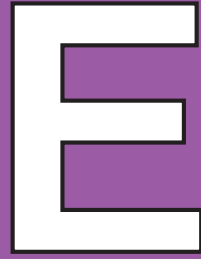
Nickel-Chromium vs. Copper-Nickel



Extension Grade

Revised Thermocouple Reference Tables

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



Z

Thermoelectric Voltage in Millivolts

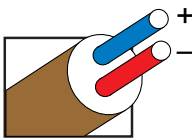
Table with 11 columns (0-10 °F) and 24 rows of thermoelectric voltage data for Nickel-Chromium vs. Copper-Nickel thermocouples.

Table with 11 columns (0-10 °F) and 24 rows of thermoelectric voltage data for Nickel-Chromium vs. Copper-Nickel thermocouples.

# Revised Thermocouple Reference Tables

## TYPE T

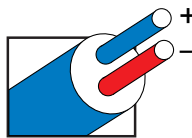
Reference Tables  
N.I.S.T.  
Monograph 175  
Revised to ITS-90



Thermocouple Grade

Copper vs. Copper-Nickel

Extension Grade



### MAXIMUM TEMPERATURE RANGE

#### Thermocouple Grade

- 328 to 662°F
- 200 to 350°C

#### Extension Grade

- 76 to 212°F
- 60 to 100°C

#### LIMITS OF ERROR (whichever is greater)

- Standard: 1.0°C or 0.75% Above 0°C
- 1.0°C or 1.5% Below 0°C
- Special: 0.5°C or 0.4%

COMMENTS, BARE WIRE ENVIRONMENT:  
Mild Oxidizing, Reducing Vacuum or Inert; Good Where Moisture Is Present; Low Temperature and Cryogenic Applications

### TEMPERATURE IN DEGREES °F REFERENCE JUNCTION AT 32°F

Thermoelectric Voltage in Millivolts

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F	°F	0	1	2	3	4	5	6	7	8	9	10	°F
-450							-6.258	-6.257	-6.256	-6.255	-6.254	-450	150	2.712	2.737	2.761	2.786	2.810	2.835	2.860	2.884	2.909	2.934	2.958	150
-440	-6.254	-6.253	-6.252	-6.251	-6.250	-6.248	-6.247	-6.245	-6.243	-6.242	-6.240	-440	160	2.958	2.983	3.008	3.033	3.058	3.082	3.107	3.132	3.157	3.182	3.207	160
-430	-6.240	-6.238	-6.236	-6.234	-6.232	-6.230	-6.227	-6.225	-6.222	-6.220	-6.217	-430	170	3.207	3.232	3.257	3.282	3.307	3.333	3.358	3.383	3.408	3.433	3.459	170
-420	-6.217	-6.215	-6.212	-6.209	-6.206	-6.203	-6.200	-6.197	-6.194	-6.191	-6.187	-420	180	3.459	3.484	3.509	3.534	3.560	3.585	3.610	3.636	3.661	3.687	3.712	180
-410	-6.187	-6.184	-6.180	-6.177	-6.173	-6.166	-6.162	-6.158	-6.154	-6.150	-410	190	3.712	3.738	3.763	3.789	3.814	3.840	3.866	3.891	3.917	3.943	3.968	190	
-400	-6.150	-6.146	-6.141	-6.137	-6.133	-6.128	-6.124	-6.119	-6.115	-6.110	-6.105	-400	200	3.968	3.994	4.020	4.046	4.071	4.097	4.123	4.149	4.175	4.201	4.227	200
-390	-6.105	-6.100	-6.095	-6.090	-6.085	-6.080	-6.075	-6.069	-6.064	-6.059	-6.053	-390	210	4.227	4.253	4.279	4.305	4.331	4.357	4.383	4.409	4.435	4.461	4.487	210
-380	-6.053	-6.047	-6.042	-6.036	-6.030	-6.025	-6.019	-6.013	-6.007	-6.001	-5.994	-380	220	4.487	4.513	4.540	4.566	4.592	4.618	4.645	4.671	4.697	4.724	4.750	220
-370	-5.994	-5.988	-5.982	-5.976	-5.969	-5.963	-5.956	-5.950	-5.943	-5.937	-5.930	-370	230	4.750	4.776	4.803	4.829	4.856	4.882	4.909	4.935	4.962	4.988	5.015	230
-360	-5.930	-5.923	-5.916	-5.909	-5.902	-5.896	-5.888	-5.881	-5.874	-5.867	-5.860	-360	240	5.015	5.042	5.068	5.095	5.122	5.148	5.175	5.202	5.228	5.255	5.282	240
-350	-5.860	-5.853	-5.845	-5.838	-5.830	-5.823	-5.815	-5.808	-5.800	-5.792	-5.785	-350	250	5.282	5.309	5.336	5.363	5.389	5.416	5.443	5.470	5.497	5.524	5.551	250
-340	-5.785	-5.777	-5.769	-5.761	-5.753	-5.745	-5.737	-5.729	-5.721	-5.713	-5.705	-340	260	5.551	5.578	5.605	5.632	5.660	5.687	5.714	5.741	5.768	5.795	5.823	260
-330	-5.705	-5.697	-5.688	-5.680	-5.672	-5.663	-5.655	-5.646	-5.638	-5.629	-5.620	-330	270	5.823	5.850	5.877	5.904	5.932	5.959	5.986	6.014	6.041	6.068	6.096	270
-320	-5.620	-5.612	-5.603	-5.594	-5.585	-5.577	-5.568	-5.559	-5.550	-5.541	-5.532	-320	280	6.096	6.123	6.151	6.178	6.206	6.233	6.261	6.288	6.316	6.343	6.371	280
-310	-5.532	-5.523	-5.513	-5.504	-5.495	-5.486	-5.476	-5.467	-5.458	-5.448	-5.439	-310	290	6.371	6.399	6.426	6.454	6.482	6.510	6.537	6.565	6.593	6.621	6.648	290
-300	-5.439	-5.429	-5.420	-5.410	-5.400	-5.391	-5.381	-5.371	-5.361	-5.351	-5.341	-300	300	6.648	6.676	6.704	6.732	6.760	6.788	6.816	6.844	6.872	6.900	6.928	300
-290	-5.341	-5.332	-5.322	-5.312	-5.302	-5.291	-5.281	-5.271	-5.261	-5.250	-5.240	-290	310	6.928	6.956	6.984	7.012	7.040	7.068	7.096	7.124	7.152	7.180	7.209	310
-280	-5.240	-5.230	-5.219	-5.209	-5.198	-5.188	-5.177	-5.167	-5.156	-5.145	-5.135	-280	320	7.209	7.237	7.265	7.294	7.322	7.350	7.378	7.407	7.435	7.463	7.492	320
-270	-5.135	-5.124	-5.113	-5.102	-5.091	-5.081	-5.070	-5.059	-5.048	-5.036	-5.025	-270	330	7.492	7.520	7.549	7.577	7.606	7.634	7.663	7.691	7.720	7.748	7.777	330
-260	-5.025	-5.014	-5.003	-4.992	-4.980	-4.969	-4.958	-4.946	-4.935	-4.923	-4.912	-260	340	7.777	7.805	7.834	7.863	7.891	7.920	7.949	7.977	8.006	8.035	8.064	340
-250	-4.912	-4.900	-4.889	-4.877	-4.865	-4.854	-4.842	-4.830	-4.818	-4.806	-4.794	-250	350	8.064	8.092	8.121	8.150	8.179	8.208	8.237	8.266	8.294	8.323	8.352	350
-240	-4.794	-4.783	-4.771	-4.759	-4.746	-4.734	-4.722	-4.710	-4.698	-4.685	-4.673	-240	360	8.352	8.381	8.410	8.439	8.468	8.497	8.526	8.555	8.585	8.614	8.643	360
-230	-4.673	-4.661	-4.648	-4.636	-4.624	-4.611	-4.599	-4.586	-4.573	-4.561	-4.548	-230	370	8.643	8.672	8.701	8.730	8.759	8.789	8.818	8.847	8.876	8.906	8.935	370
-220	-4.548	-4.535	-4.523	-4.510	-4.497	-4.484	-4.471	-4.458	-4.445	-4.432	-4.419	-220	380	8.935	8.964	8.994	9.023	9.052	9.082	9.111	9.141	9.170	9.200	9.229	380
-210	-4.419	-4.406	-4.393	-4.380	-4.367	-4.353	-4.340	-4.326	-4.313	-4.300	-4.286	-210	390	9.229	9.259	9.288	9.318	9.347	9.377	9.406	9.436	9.466	9.495	9.525	390
-200	-4.286	-4.273	-4.259	-4.246	-4.232	-4.218	-4.205	-4.191	-4.177	-4.163	-4.149	-200	400	9.525	9.555	9.584	9.614	9.644	9.673	9.703	9.733	9.763	9.793	9.822	400
-190	-4.149	-4.136	-4.122	-4.108	-4.094	-4.080	-4.066	-4.052	-4.037	-4.023	-4.009	-190	410	9.822	9.852	9.882	9.912	9.942	9.972	10.002	10.032	10.062	10.092	10.122	410
-180	-4.009	-3.995	-3.980	-3.966	-3.952	-3.937	-3.923	-3.908	-3.894	-3.879	-3.865	-180	420	10.122	10.152	10.182	10.212	10.242	10.272	10.302	10.332	10.362	10.392	10.423	420
-170	-3.865	-3.850	-3.836	-3.821	-3.806	-3.791	-3.777	-3.762	-3.747	-3.732	-3.717	-170	430	10.423	10.453	10.483	10.513	10.543	10.574	10.604	10.634	10.664	10.695	10.725	430
-160	-3.717	-3.702	-3.687	-3.672	-3.657	-3.642	-3.626	-3.611	-3.596	-3.581	-3.565	-160	440	10.725	10.755	10.786	10.816	10.847	10.877	10.907	10.938	10.968	10.999	11.029	440
-150	-3.565	-3.550	-3.535	-3.519	-3.504	-3.488	-3.473	-3.457	-3.441	-3.426	-3.410	-150	450	11.029	11.060	11.090	11.121	11.151	11.182	11.213	11.243	11.274	11.304	11.335	450
-140	-3.410	-3.394	-3.379	-3.363	-3.347	-3.331	-3.315	-3.299	-3.283	-3.267	-3.251	-140	460	11.335	11.366	11.396	11.427	11.458	11.489	11.519	11.550	11.581	11.612	11.643	460
-130	-3.251	-3.235	-3.219	-3.203	-3.187	-3.171	-3.154	-3.138	-3.122	-3.105	-3.089	-130	470	11.643	11.673	11.704	11.735	11.766	11.797	11.828	11.859	11.890	11.920	11.951	470
-120	-3.089	-3.072	-3.056	-3.040	-3.023	-3.006	-2.990	-2.973	-2.956	-2.940	-2.923	-120	480	11.951	11.982	12.013	12.044	12.075	12.106	12.138	12.169	12.200	12.231	12.262	480
-110	-2.923	-2.906	-2.889	-2.873	-2.856	-2.839	-2.822	-2.805	-2.788	-2.771	-2.754	-110	490	12.262	12.293	12.324	12.355	12.386	12.418	12.449	12.480	12.511	12.543	12.574	490
-100	-2.754	-2.737	-2.719	-2.702	-2.685	-2.668	-2.651	-2.633	-2.616	-2.598	-2.581	-100	500	12.574	12.605	12.636	12.668	12.699	12.730	12.762	12.793	12.824	12.856	12.887	500
-90	-2.581	-2.564	-2.546	-2.529	-2.511	-2.493	-2.476	-2.458	-2.440	-2.423	-2.405	-90	510	12.887	12.919	12.950	12.982	13.013	13.045	13.076	13.108	13.139	13.171	13.202	510
-80	-2.405	-2.387	-2.369	-2.351	-2.334	-2.316	-2.298	-2.280	-2.262	-2.244	-2.225	-80	520	13.202	13.234	13.265	13.297	13.328	13.360	13.392	13.423	13.455	13.487	13.518	520
-70	-2.225	-2.207	-2.189	-2.171	-2.153	-2.134	-2.116	-2.098	-2.079	-2.061	-2.043	-70	530	13.518	13.550	13.582	13.614	13.646	13.677	13.709	13.741	13.772	13.804</		

**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%

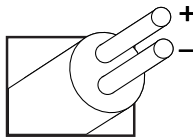
**Special:** 0.6°C or 0.1%

**COMMENTS, BARE WIRE ENVIRONMENT:**

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

**TEMPERATURE IN DEGREES °F**

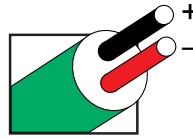
**REFERENCE JUNCTION AT 32°F**



**Platinum-10% Rhodium  
vs.  
Platinum**

**Thermocouple  
Grade**

**NONE  
ESTABLISHED**



**Extension  
Grade**

**Revised Thermocouple  
Reference Tables**

**TYPE**

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



**Z**

**Thermoelectric Voltage in Millivolts**

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F	°F	0	1	2	3	4	5	6	7	8	9	10	°F
-50			-0.236	-0.233	-0.231	-0.229	-0.227	-0.224	-0.222	-0.220	-0.218	-50	400	1.478	1.483	1.488	1.493	1.497	1.502	1.507	1.512	1.516	1.521	1.526	400
													410	1.526	1.531	1.535	1.540	1.545	1.550	1.554	1.559	1.564	1.569	1.573	410
													420	1.573	1.578	1.583	1.588	1.592	1.597	1.602	1.607	1.612	1.616	1.621	420
													430	1.621	1.626	1.631	1.636	1.640	1.645	1.650	1.655	1.660	1.664	1.669	430
													440	1.669	1.674	1.679	1.684	1.689	1.693	1.698	1.703	1.708	1.713	1.718	440
-40	-0.218	-0.215	-0.213	-0.211	-0.208	-0.206	-0.204	-0.201	-0.199	-0.197	-0.194	-40	450	1.718	1.722	1.727	1.732	1.737	1.742	1.747	1.752	1.756	1.761	1.766	450
-30	-0.194	-0.192	-0.190	-0.187	-0.185	-0.182	-0.180	-0.178	-0.175	-0.173	-0.170	-30	460	1.766	1.771	1.776	1.781	1.786	1.790	1.795	1.800	1.805	1.810	1.815	460
-20	-0.170	-0.168	-0.165	-0.163	-0.160	-0.158	-0.155	-0.153	-0.150	-0.148	-0.145	-20	470	1.815	1.820	1.825	1.829	1.834	1.839	1.844	1.849	1.854	1.859	1.864	470
-10	-0.145	-0.142	-0.140	-0.137	-0.135	-0.132	-0.129	-0.127	-0.124	-0.122	-0.119	-10	480	1.864	1.869	1.874	1.878	1.883	1.888	1.893	1.898	1.903	1.908	1.913	480
0	-0.119	-0.116	-0.114	-0.111	-0.108	-0.106	-0.103	-0.100	-0.097	-0.095	-0.092	0	490	1.913	1.918	1.923	1.928	1.933	1.938	1.942	1.947	1.952	1.957	1.962	490
0	-0.092	-0.089	-0.086	-0.084	-0.081	-0.078	-0.075	-0.073	-0.070	-0.067	-0.064	0	500	1.962	1.967	1.972	1.977	1.982	1.987	1.992	1.997	2.002	2.007	2.012	500
10	-0.064	-0.061	-0.058	-0.056	-0.053	-0.050	-0.047	-0.044	-0.041	-0.038	-0.035	10	510	2.012	2.017	2.022	2.027	2.032	2.037	2.042	2.047	2.052	2.057	2.062	510
20	-0.035	-0.033	-0.030	-0.027	-0.024	-0.021	-0.018	-0.015	-0.012	-0.009	-0.006	20	520	2.062	2.067	2.072	2.076	2.081	2.086	2.091	2.096	2.101	2.106	2.111	520
30	-0.006	-0.003	0.000	0.003	0.006	0.009	0.012	0.015	0.018	0.021	0.024	30	530	2.111	2.116	2.121	2.126	2.131	2.136	2.141	2.147	2.152	2.157	2.162	530
40	0.024	0.027	0.030	0.033	0.036	0.040	0.043	0.046	0.049	0.052	0.055	40	540	2.162	2.167	2.172	2.177	2.182	2.187	2.192	2.197	2.202	2.207	2.212	540
50	0.055	0.058	0.062	0.065	0.068	0.071	0.074	0.077	0.081	0.084	0.087	50	550	2.212	2.217	2.222	2.227	2.232	2.237	2.242	2.247	2.252	2.257	2.262	550
60	0.087	0.090	0.093	0.097	0.100	0.103	0.106	0.110	0.113	0.116	0.119	60	560	2.262	2.267	2.272	2.277	2.283	2.288	2.293	2.298	2.303	2.308	2.313	560
70	0.119	0.123	0.126	0.129	0.133	0.136	0.139	0.143	0.146	0.149	0.153	70	570	2.313	2.318	2.323	2.328	2.333	2.338	2.343	2.348	2.354	2.359	2.364	570
80	0.153	0.156	0.159	0.163	0.166	0.169	0.173	0.176	0.180	0.183	0.186	80	580	2.364	2.369	2.374	2.379	2.384	2.389	2.394	2.399	2.404	2.409	2.415	580
90	0.186	0.190	0.193	0.197	0.200	0.204	0.207	0.210	0.214	0.217	0.221	90	590	2.415	2.420	2.425	2.430	2.435	2.440	2.445	2.450	2.455	2.461	2.466	590
100	0.221	0.224	0.228	0.231	0.235	0.238	0.242	0.245	0.249	0.252	0.256	100	600	2.466	2.471	2.476	2.481	2.486	2.491	2.496	2.502	2.507	2.512	2.517	600
110	0.256	0.260	0.263	0.267	0.270	0.274	0.277	0.281	0.285	0.288	0.292	110	610	2.517	2.522	2.527	2.532	2.537	2.543	2.548	2.553	2.558	2.563	2.568	610
120	0.292	0.295	0.299	0.303	0.306	0.310	0.313	0.317	0.321	0.324	0.328	120	620	2.568	2.574	2.579	2.584	2.589	2.594	2.599	2.604	2.610	2.615	2.620	620
130	0.328	0.332	0.335	0.339	0.343	0.346	0.350	0.354	0.357	0.361	0.365	130	630	2.620	2.625	2.630	2.635	2.641	2.646	2.651	2.656	2.661	2.666	2.672	630
140	0.365	0.369	0.372	0.376	0.380	0.384	0.387	0.391	0.395	0.399	0.402	140	640	2.672	2.677	2.682	2.687	2.692	2.697	2.703	2.708	2.713	2.718	2.723	640
150	0.402	0.406	0.410	0.414	0.417	0.421	0.425	0.429	0.433	0.436	0.440	150	650	2.723	2.729	2.734	2.739	2.744	2.749	2.755	2.760	2.765	2.770	2.775	650
160	0.440	0.444	0.448	0.452	0.456	0.459	0.463	0.467	0.471	0.475	0.479	160	660	2.775	2.781	2.786	2.791	2.796	2.801	2.807	2.812	2.817	2.822	2.827	660
170	0.479	0.483	0.487	0.490	0.494	0.498	0.502	0.506	0.510	0.514	0.518	170	670	2.827	2.833	2.838	2.843	2.848	2.854	2.859	2.864	2.869	2.874	2.880	670
180	0.518	0.522	0.526	0.530	0.534	0.538	0.541	0.545	0.549	0.553	0.557	180	680	2.880	2.885	2.890	2.895	2.901	2.906	2.911	2.916	2.922	2.927	2.932	680
190	0.557	0.561	0.565	0.569	0.573	0.577	0.581	0.585	0.589	0.593	0.597	190	690	2.932	2.937	2.943	2.948	2.953	2.958	2.964	2.969	2.974	2.979	2.985	690
200	0.597	0.601	0.605	0.609	0.613	0.617	0.622	0.626	0.630	0.634	0.638	200	700	2.985	2.990	2.995	3.000	3.006	3.011	3.016	3.021	3.027	3.032	3.037	700
210	0.638	0.642	0.646	0.650	0.654	0.658	0.662	0.666	0.670	0.675	0.679	210	710	3.037	3.042	3.048	3.053	3.058	3.063	3.069	3.074	3.079	3.085	3.090	710
220	0.679	0.683	0.687	0.691	0.695	0.699	0.703	0.708	0.712	0.716	0.720	220	720	3.090	3.095	3.100	3.106	3.111	3.116	3.122	3.127	3.132	3.137	3.143	720
230	0.720	0.724	0.728	0.732	0.737	0.741	0.745	0.749	0.753	0.758	0.762	230	730	3.143	3.148	3.153	3.159	3.164	3.169	3.174	3.180	3.185	3.190	3.196	730
240	0.762	0.766	0.770	0.774	0.779	0.783	0.787	0.791	0.795	0.800	0.804	240	740	3.196	3.201	3.206	3.212	3.217	3.222	3.227	3.233	3.238	3.243	3.249	740
250	0.804	0.808	0.812	0.817	0.821	0.825	0.829	0.834	0.838	0.842	0.847	250	750	3.249	3.254	3.259	3.265	3.270	3.275	3.281	3.286	3.291	3.297	3.302	750
260	0.847	0.851	0.855	0.859	0.864	0.868	0.872	0.877	0.881	0.885	0.889	260	760	3.302	3.307	3.313	3.318	3.323	3.329	3.334	3.339	3.345	3.350	3.355	760
270	0.889	0.894	0.898	0.902	0.907	0.911	0.915	0.920	0.924	0.928	0.933	270	770	3.355	3.361	3.366	3.371	3.377	3.382	3.387	3.393	3.398	3.403	3.409	770
280	0.933	0.937	0.942	0.946	0.950	0.955	0.959	0.963	0.968	0.972	0.977	280	780	3.409	3.414	3.419	3.425	3.430	3.435	3.441	3.446	3.451	3.457	3.462	780
290	0.977	0.981	0.985	0.990	0.994	0.998	1.003	1.007	1.012	1.016															