RARP
ENGINEERING & RECYCLING
(OPC) PRIVATE LIMITED
CIN : U28990GJ2020OPC117199

thermocouple wires

Noble metals and their alloys have long been recognised as the most reliable sensing elements for high temperature measurements. Among their outstanding properties are their high melting points, reproducibility, accuracy over a wide temperature range, resistance to corrosion and stability in calibration.

We manufacture thermocouple wires from a combination of Platinum and Rhodium-Platinum alloys of ultra high purity having only spectrographic traces of other elements. They give highly accurate and reproducible results.

The principal thermocouple wires in our range are listed below. The intrinsic value of rhodium-platinum alloys increases with rhodium content.

Platinum: 10% rhodium-platinum:
These thermocouple wires are widely used for the continuous measurement of temperatures upto 1500°C and for spot readings upto 1650°C.

Platinum: 13% rhodium-platinum:
These thermocouple wires are used over the same range as Pt: 10% Rh-Pt wires, these wires are often preferred as they produce slightly higher thermal e.m.f.

6% Rhodium-Platinum: 30% Rhodium-Platinum:
These thermocouple wires are the standard high temperature combination gaining international acceptance. They can be used continuously upto 1600°C and for intermittent spot readings upto 1750°C.

The thermocouple wires are matched so that the e.m.f. values of the made-up-thermocouples are in confirmation with the International Practical Temperature Scale of 1968 (IPTS 68) and the tolerances are within the specified limits.

The tables below give valuable information on the properties, tolerances and e.m.f. values in μV for the above combinations of thermocouple wires.

THERMOELECTRIC ALLOY PROPERTY DATA

PROPERTIES	Pt-10%Rh	Pt-13%Rh	Pt-30%Rh	Pt-6%Rh	Pt	Rh
Density at 20°C gm/cc	19.97	19.55	17.62	20.51	21.45	12.41
Melting Point °C	1830	1840	1910	1810	1769	1963
Resistivity at 20°C μΩ – cm.	19.2	19.6	19.4	18.5	10.6	4.68
Temperature coefficient of electrical resistance 1/°C	1.66×10^{-3}	1.56×10^{-3}	1.3×10^{-3}	2.0×10^{-3}	3.92×10^{-3}	4.63×10^{-3}
Linear coefficient of thermal expansion 1/°C 20 – 100°C	9×10^{-6}	9×10^{-6}	8.8×10^{-6}	9×10^{-6}	9×10^{-6}	8.3×10^{-6}
Specific heat at 0°C Cal/gm °C	0.035	0.036	0.040	0.034	0.031	0.059
Tensile Strength Kg/mm^2	32	34	55	21	14	77
Elongation %	35	32	30	34	30	35

TEMPERATURE RANGE OF THERMOCOUPLE WIRES:

Couples			Maximum Temperature of use °C		Sensitivity at μV/°C		
Positive element +	Negative element –	Code as per IPTS 68	Permanent Use	Temporary Use	1064°C	1400°C	1554°C
Pt–10% Rh	Pt	S	1500	1650	11.7	12.1	11.9
Pt–13% Rh	Pt	R	1500	1650	13.5	14.1	14.0
Pt–30% Rh	Pt–6% Rh	B	1600	1750	9.6	11.3	11.6

The temperatures presented in the above table are limit values of stress-relieved thermocouple wires in service in an oxidising or neutral atmosphere.

Tolerances:

Upto 1100°C	± 1°C
Upto 1400°C	± 2°C
Upto 1600°C	± 3°C

WEIGHT OF PLATINUM WIRE

Wire dia in mm	Wt. per meter in gms.	Wt. per foot in gms.
0.06	0.06	0.018
0.08	0.108	0.033
0.10	0.17	0.052
0.40	2.70	0.822
0.45	3.41	1.040
0.50	4.21	1.284
0.56	5.29	1.610

	Conversion Factors
Platinum – 10% Rhodium	**0.933**
Platinum – 13% Rhodium	**0.914**
Platinum – 6% Rhodium	**0.958**
Platinum – 30% Rhodium	**0.821**

To obtain the weights of the above alloys, multiply the weight of Platinum wires with the above corresponding factors.

Thermocouple Wires for Throw-away Tips:

We manufacture Pt-Pt/Rh thermocouple wires in the range of 0.10 mm to 0.06 mm for use as throw-away tips particularly in steel plants. These wires have life expectancy of less than a minute in molten steel at temperatures above 1500°C. These wires are manufactured on highly sophisticated electronically controlled wire drawing machines where special precautions are taken to maintain accuracy between the relation of temperature and e.m.f. within the standard tolerances.

Instructions for Hot Junction Formation:

The junction is formed by fusion in oxy-hydrogen or oxy-acetylene or oxy-coal gas flame. After the formation of hot junction, it is advisable to anneal the wires in air to remove any strain formation.

Reprocessing of used and unserviceable Wires:

Because of high intrinsic value, it is advisable to return the unserviceable thermocouple wires for replacement with new elements.

TEMPERATURE – EMF FOR TYPE S THERMOCOUPLES (PLATINUM – 10% RHODIUM PLATINUM)
TEMPERATURE IN DEGREES C (AS PER IPTS68) REFERENCE JUNCTION AT 0 DEGREE C

THERMOELECTRIC VOLTAGE IN ABSOLUTE MICROVOLTS

DEGC	0	10	20	30	40	50	60	70	80	90	100
0	0	55	113	173	235	299	365	432	502	573	645
100	645	719	795	872	950	1029	1109	1190	1273	1356	1440
200	1440	1525	1611	1698	1785	1873	1962	2051	2141	2232	2323
300	2323	2414	2506	2599	2692	2786	2880	2974	3069	3164	3260
400	3260	3356	3452	3549	3645	3743	3840	3938	4036	4135	4234
500	4234	4333	4432	4532	4632	4732	4832	4933	5034	5136	5237
600	5237	5339	5442	5544	5648	5751	5855	5960	6064	6169	6274
700	6274	6380	6486	6592	6699	6805	6913	7020	7128	7236	7345
800	7345	7454	7563	7672	7782	7892	8003	8114	8225	8336	8448
900	8448	8560	8673	8786	8899	9012	9126	9240	9355	9470	9585
1000	9585	9700	9816	9932	10048	10165	10282	10400	10517	10635	10754
1100	10754	10872	10991	11110	11229	11348	11467	11587	11707	11827	11947
1200	11947	12067	12188	12308	12429	12550	12671	12792	12913	13034	13155
1300	13155	13276	13397	13519	13640	13761	13883	14004	14125	14247	14368
1400	14368	14489	14610	14731	14852	14973	15094	15215	15336	15456	15576
1500	15576	15697	15817	15937	16057	16176	16296	16415	16534	16653	16771
1600	16771	16890	17008	17125	17243	17360	17477	17594	17711	17826	17942

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TEMPERATURE – EMF FOR TYPE 'R' THERMOCOUPLES (PLATINUM – 13% RHODIUM PLATINUM)
TEMPERATURE IN DEGREE C (AS PER IPTS 68) , REFERENCE JUNCTION AT 0 DEGREES C

THERMOELECTRIC VOLTAGE IN ABSOLUTE MICROVOLTS

DEGC	0	10	20	30	40	50	60	70	80	90	100
0	0	54	111	171	232	296	363	431	501	578	647
100	647	723	800	879	959	1041	1124	1208	1294	1380	1468
200	1468	1557	1647	1738	1830	1923	2017	2111	2207	2303	2400
300	2400	2498	2596	2695	2795	2896	2997	3099	3201	3304	3407
400	3407	3511	3616	3721	3826	3933	4039	4146	4254	4362	4471
500	4471	4580	4689	4799	4910	5021	5132	5244	5356	5469	5582
600	5582	5696	5810	5925	6040	6155	6272	6388	6505	6623	6741
700	6741	6860	6979	7098	7218	7339	7460	7582	7703	7826	7949
800	7949	8072	8196	8320	8445	8570	8696	8822	8949	9076	9203
900	9203	9331	9460	9589	9718	9848	9978	10109	10240	10371	10503
1000	10503	10636	10768	10902	11035	11170	11304	11439	11574	11710	11846
1100	11846	11983	12119	12257	12394	12532	12669	12808	12946	13085	13224
1200	13224	13363	13502	13642	13782	13922	14062	14202	14343	14483	14624
1300	14624	14765	14906	15047	15188	15329	15470	15611	15752	15893	16035
1400	16035	16176	16317	16458	16599	16741	16882	17022	17163	17304	17445
1500	17445	17585	17726	17866	18006	18146	18286	18425	18564	18703	18842
1600	18842	18981	19119	19257	19395	19533	19670	19807	19944	20080	20215

TEMPERATURE – EMF FOR TYPE 'B' THERMOCOUPLES (6% RHODIUM–PLATINUM – 30% RHODIUM–PLATINUM)
TEMPERATURE IN DEGREE C (AS PER IPTS 68) REFERENCE JUNCTION AT 0 DEGREES C

THERMOELECTRIC VOLTAGE IN ABSOLUTE MICROVOLTS

DEGC	0	10	20	30	40	50	60	70	80	90	100
0	0	−2	−3	−2	−0	2	6	11	17	25	33
100	33	43	53	65	78	92	107	123	140	159	178
200	178	199	220	243	266	291	317	344	372	401	431
300	431	462	494	527	561	596	632	669	707	746	786
400	786	827	870	913	957	1002	1048	1095	1143	1192	1241
500	1241	1292	1344	1397	1450	1505	1560	1617	1674	1732	1791
600	1791	1851	1912	1974	2036	2100	2164	2230	2296	2363	2430
700	2430	2499	2569	2639	2710	2782	2855	2928	3003	3078	3154
800	3154	3231	3308	3387	3466	3546	3626	3708	3790	3873	3957
900	3957	4041	4126	4212	4298	4386	4474	4562	4652	4742	4833
1000	4833	4924	5016	5109	5202	5297	5391	5487	5583	5680	5777
1100	5777	5875	5973	6073	6172	6273	6374	6475	6577	6680	6783
1200	6783	6887	6991	7096	7202	7308	7414	7521	7628	7736	7845
1300	7845	7953	8063	8172	8283	8393	8504	8616	8727	8839	8952
1400	8952	9065	9178	9291	9405	9519	9634	9748	9863	9979	10094
1500	10094	10210	10325	10441	10558	10674	10790	10907	11024	11141	11257
1600	11257	11374	11491	11608	11725	11842	11959	12076	12193	12310	12426
1700	12426	12543	12659	12776	12892	13008	13124	13239	13354	13470	13585