

Guide to the Realization of the ITS-90

Platinum Resistance Thermometry

APPENDIX 2: Typical resistance ratios and sensitivity factors for SPRTs in the ITS-90, as well as the propagation of uncertainty from the triple point of water



Consultative Committee for Thermometry
under the auspices of the
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Appendix 2

Typical resistance ratios and sensitivity factors for SPRTs in the ITS-90, as well as the propagation of uncertainty from the triple point of water

A	B	C	D	E	F ^{Note 1}	G	H	I ^{Note 1}	J	K	L ^{Note 1}	M ^{Note 2}
Fixed Point	T_{90} / K	t_{90} / °C	$W_r(T_{90})$ (approx.)	Sensitivity of $W_r(T_{90})$		$R(T_{90})$ Ω	Sensitivity of $R(T_{90})$		Relative sensitivity % or ppm of R or W_r		T_{90} equivalent of 1 ppm in R or W in mK	TPW propagation factor
				dW_r/dT_{90} K ⁻¹	dT_{90}/dW_r K		dR/dT_{90} Ω / K	dT_{90}/dR K / Ω	% / K	ppm / mK		
TP H ₂	13.8033	-259.3467	0.00119	0.000241	4155	0.0297	0.0060	166.2	20.22	202.2	0.005	0.020
BP H ₂	~17.035	~256.115	0.00230	0.000458	2183	0.0574	0.0114	87.3	19.94	199.4	0.005	0.020
BP H ₂	~20.27	~252.88	0.00424	0.000752	1330	0.1059	0.0188	53.2	17.76	177.6	0.006	0.022
TP Ne	24.5561	-248.5939	0.00845	0.001227	815	0.2112	0.0307	32.6	14.52	145.2	0.007	0.027
TP O ₂	54.3584	-218.7916	0.09172	0.003903	256.2	2.293	0.098	10.2	4.255	42.55	0.023	0.094
TP Ar	83.8058	-189.3442	0.21586	0.004342	230.3	5.396	0.109	9.2	2.011	20.11	0.050	0.198
TP Hg	234.3156	-38.8344	0.84414	0.004037	247.7	21.104	0.101	9.9	0.4782	4.782	0.209	0.834
TPW	273.16	0.01	1.00000	0.003989	250.7	25.000	0.100	10.0	0.3989	3.989	0.251	1.000
MP Ga	302.9146	29.7646	1.11814	0.003965	252.2	27.953	0.099	10.1	0.3546	3.546	0.282	1.125
FP In	429.7485	156.5985	1.60980	0.003803	262.9	40.245	0.095	10.5	0.2363	2.363	0.423	1.688
FP Sn	505.078	231.928	1.89280	0.003713	269.3	47.320	0.093	10.8	0.1962	1.962	0.510	2.033
FP Zn	692.677	419.527	2.56892	0.003495	286.1	64.223	0.087	11.4	0.1361	1.361	0.735	2.931
FP Al	933.473	660.323	3.37601	0.003205	312.0	84.400	0.080	12.5	0.0949	0.949	1.053	4.202
FP Ag	1234.93	961.78	4.28642	0.002823	354.2	1.07161	0.00071	1417	0.0659	0.659	1.518	6.056
			$W(T_{90}) = R(T_{90}) / R(\text{TPW})$ from ITS-90 reference functions			for $R(\text{TPW}) = 25 \Omega$ (0.25Ω for FP Ag)			100 F	1000 F		
									$F = (d\ln R/dT_{90})$ or $(d\ln W_r/dT_{90})$			

Notes

- Columns F, I and L are sensitivity factors for converting increments (or uncertainties) in resistance ratio, resistance and relative resistance, to the temperature equivalents in K or mK (ppm stands for parts per million).
- Column M shows how the relative errors and uncertainties in $R(\text{TPW})$, expressed as the temperature equivalent, propagate to other temperatures, in inverse proportion to $d\ln W_r/dT_{90}$ (as in Column L). For example, at the zinc point the factor is $(0.735/0.251) = 2.93$.

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