BS EN 62460:2008

BSI Standards Publication

Temperature — Electromotive force (EMF) tables for pure-element thermocouple combinations

National foreword

This British Standard is the UK implementation of EN 62460:2008. It is identical to IEC 62460:2008.

The UK participation in its preparation was entrusted by Technical Committee GEL/65, Measurement and control, to Subcommittee GEL/65/2, Elements of systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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English version

Temperature - Electromotive force (EMF) tables for pure-element thermocouple combinations
(IEC 62460:2008)

Tableaux température - Force électromotrice (F.É.M.) pour les combinaisons de couples thermoélectriques à éléments purs (CEI 62460:2008)

Temperatur - Tabellen der elektromotorischen Kraft (EMK) für Kombinationen von Reinelement-Thermoelementen (IEC 62460:2008)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 65B/665/FDIS, future edition 1 of IEC 62460, prepared by SC 65B, Devices & process analysis, of IEC TC 65, Industrial-process measurement, control and automation, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62460 on 2008-08-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2009-05-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2011-08-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62460:2008 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60584-1	-[1)]	Thermocouples - Part 1: Reference tables	EN 60584-1	1995[2)]

[1)] Undated reference.

[2)] Valid edition at date of issue.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TEMPERATURE – ELECTROMOTIVE FORCE (EMF) TABLES FOR PURE-ELEMENT THERMOCOUPLE COMBINATIONS

FOREWORD

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International Standard IEC 62460 has been prepared by subcommittee 65B: Devices and process analysis, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this standard is based on the following documents:

FDIS	Report on voting
65B/665/FDIS	65B/684/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

TEMPERATURE – ELECTROMOTIVE FORCE (EMF) TABLES FOR PURE-ELEMENT THERMOCOUPLE COMBINATIONS

1 Scope

This International Standard specifies the equations and reference tables relating temperature to EMF (electro-motive force) for Gold versus Platinum and Platinum versus Palladium thermocouples. For information and convenience of use it also provides the approximate equations for temperature as functions of EMF.

The tables and equations in this standard are intended for use with thermocouples made from elements of purity not less than 99.999 % for Platinum and Gold and of 99.99 % for Palladium, by weight.

Tolerances on initial values of EMF versus temperature have not been established for the thermocouples in this standard. Where required, these tolerances should be agreed between the wire manufacturer and the user.

Temperatures in this standard are based on the International Temperature Scale of 1990 (ITS-90). They are expressed in degrees Celsius, symbol t_{90}. Values of EMF, symbol E/μV, are given in microvolts.

This standard does not cover extension or compensating wires for use with the pure-element thermocouples. The questions of their use shall be agreed between the manufacturer and the user.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60584-1, *Thermocouples – Reference tables*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60584-1 apply, as well as the following.

3.1
thermocouple types
the following thermocouple wire types are covered by this standard:

- Gold versus Platinum (Au/Pt or Gold/Platinum)
- Platinum versus Palladium (Pt/Pd or Platinum/Palladium)

Following international convention, as in IEC 60584-1, when identifying thermocouples the positive element/wire is given first.

3.2 thermoelectric values at the ITS-90 fixed points

values are given for the defining triple points (TP), melting points (MP) and freezing points (FP) in the temperature range of the corresponding tables. The Seebeck coefficient *S* is the first derivative of the EMF with respect to temperature.

4 Information on tables and equations

The following tables are included in this standard:

- Gold versus Platinum: EMF at intervals of 1 °C
- Gold versus Platinum: temperatures at intervals of 10μV
- Gold versus Platinum: thermoelectric values at the fixed points of the ITS-90
- Platinum versus Palladium: EMF at intervals of 1 °C
- Platinum versus Palladium: temperatures at intervals of 10μV
- Platinum versus Palladium: thermoelectric values at the fixed points of the ITS-90

For the tables in this document, the reference temperature is 0 °C.

The definitive equations of EMF, E/μV, as functions of temperature, t_{90}/°C, which are used to generate the tables, are given in Annex A for Gold/Platinum thermocouples and Annex B for Platinum/Palladium thermocouples.

For information and convenience in use, approximate equations are also given, expressing t_{90}/°C as functions of E/μV for the respective thermocouples within the stated error limits.

5 Tables for Gold versus Platinum thermocouples

5.1 Gold versus Platinum: EMF at intervals of 1 °C

t_{90} / °C	0	1	2	3	4	5	6	7	8	9	t_{90} / °C
						E/μV					
0	0.0	6.1	12.1	18.3	24.5	30.7	36.9	43.2	49.5	55.9	0
10	62.3	68.7	75.2	81.7	88.2	94.8	101.4	108.1	114.8	121.5	10
20	128.3	135.1	141.9	148.8	155.7	162.7	169.7	176.7	183.7	190.8	20
30	197.9	205.1	212.3	219.5	226.8	234.1	241.4	248.8	256.2	263.6	30
40	271.1	278.6	286.1	293.7	301.3	308.9	316.6	324.3	332.1	339.8	40
50	347.6	355.5	363.3	371.2	379.2	387.1	395.1	403.2	411.2	419.3	50
60	427.5	435.6	443.8	452.1	460.3	468.6	476.9	485.3	493.6	502.1	60
70	510.5	519.0	527.5	536.0	544.6	553.2	561.8	570.5	579.2	587.9	70
80	596.6	605.4	614.2	623.1	632.0	640.9	649.8	658.7	667.7	676.8	80
90	685.8	694.9	704.0	713.1	722.3	731.5	740.7	750.0	759.2	768.6	90
100	777.9	787.3	796.7	806.1	815.5	825.0	834.5	844.1	853.6	863.2	100
110	872.8	882.5	892.2	901.9	911.6	921.4	931.2	941.0	950.8	960.7	110
120	970.6	980.5	990.5	1000.4	1010.4	1020.5	1030.5	1040.6	1050.7	1060.9	120
130	1071.0	1081.2	1091.4	1101.7	1112.0	1122.3	1132.6	1142.9	1153.3	1163.7	130
140	1174.1	1184.6	1195.1	1205.6	1216.1	1226.7	1237.2	1247.8	1258.5	1269.1	140
150	1279.8	1290.5	1301.3	1312.0	1322.8	1333.6	1344.4	1355.3	1366.2	1377.1	150
160	1388.0	1399.0	1410.0	1421.0	1432.0	1443.1	1454.1	1465.3	1476.4	1487.5	160
170	1498.7	1509.9	1521.1	1532.4	1543.7	1555.0	1566.3	1577.6	1589.0	1600.4	170
180	1611.8	1623.3	1634.7	1646.2	1657.7	1669.3	1680.8	1692.4	1704.0	1715.6	180
190	1727.3	1739.0	1750.7	1762.4	1774.1	1785.9	1797.7	1809.5	1821.3	1833.2	190
200	1845.1	1857.0	1868.9	1880.9	1892.8	1904.8	1916.8	1928.9	1941.0	1953.0	200
210	1965.1	1977.3	1989.4	2001.6	2013.8	2026.0	2038.3	2050.5	2062.8	2075.1	210
220	2087.4	2099.8	2112.2	2124.6	2137.0	2149.4	2161.9	2174.4	2186.9	2199.4	220
230	2211.9	2224.5	2237.1	2249.7	2262.3	2275.0	2287.7	2300.4	2313.1	2325.8	230
240	2338.6	2351.4	2364.2	2377.0	2389.8	2402.7	2415.6	2428.5	2441.4	2454.4	240
250	2467.3	2480.3	2493.3	2506.4	2519.4	2532.5	2545.6	2558.7	2571.9	2585.0	250
260	2598.2	2611.4	2624.6	2637.8	2651.1	2664.4	2677.7	2691.0	2704.3	2717.7	260
270	2731.1	2744.5	2757.9	2771.3	2784.8	2798.3	2811.8	2825.3	2838.9	2852.4	270
280	2866.0	2879.6	2893.2	2906.9	2920.5	2934.2	2947.9	2961.6	2975.4	2989.1	280
290	3002.9	3016.7	3030.5	3044.4	3058.2	3072.1	3086.0	3099.9	3113.8	3127.8	290
300	3141.8	3155.8	3169.8	3183.8	3197.9	3211.9	3226.0	3240.1	3254.3	3268.4	300
310	3282.6	3296.8	3311.0	3325.2	3339.4	3353.7	3368.0	3382.3	3396.6	3410.9	310
320	3425.3	3439.7	3454.1	3468.5	3482.9	3497.4	3511.8	3526.3	3540.8	3555.4	320
330	3569.9	3584.5	3599.1	3613.7	3628.3	3642.9	3657.6	3672.2	3686.9	3701.7	330
340	3716.4	3731.1	3745.9	3760.7	3775.5	3790.3	3805.2	3820.0	3834.9	3849.8	340
350	3864.7	3879.6	3894.6	3909.6	3924.6	3939.6	3954.6	3969.6	3984.7	3999.8	350
360	4014.9	4030.0	4045.1	4060.3	4075.4	4090.6	4105.8	4121.0	4136.3	4151.5	360
370	4166.8	4182.1	4197.4	4212.8	4228.1	4243.5	4258.9	4274.3	4289.7	4305.1	370
380	4320.6	4336.1	4351.6	4367.1	4382.6	4398.1	4413.7	4429.3	4444.9	4460.5	380
390	4476.1	4491.8	4507.4	4523.1	4538.8	4554.6	4570.3	4586.1	4601.8	4617.6	390

Gold versus Platinum
EMF at intervals of 1 °C *(continued)*

t_{90} / °C	0	1	2	3	4	5	6	7	8	9	t_{90} / °C
						E/μV					
400	4633.4	4649.3	4665.1	4681.0	4696.8	4712.7	4728.6	4744.6	4760.5	4776.5	400
410	4792.5	4808.5	4824.5	4840.5	4856.6	4872.7	4888.7	4904.9	4921.0	4937.1	410
420	4953.3	4969.4	4985.6	5001.8	5018.1	5034.3	5050.6	5066.9	5083.1	5099.5	420
430	5115.8	5132.1	5148.5	5164.9	5181.3	5197.7	5214.1	5230.6	5247.0	5263.5	430
440	5280.0	5296.5	5313.1	5329.6	5346.2	5362.8	5379.4	5396.0	5412.6	5429.3	440
450	5446.0	5462.6	5479.4	5496.1	5512.8	5529.6	5546.3	5563.1	5579.9	5596.8	450
460	5613.6	5630.5	5647.3	5664.2	5681.1	5698.0	5715.0	5731.9	5748.9	5765.9	460
470	5782.9	5799.9	5817.0	5834.0	5851.1	5868.2	5885.3	5902.4	5919.6	5936.8	470
480	5953.9	5971.1	5988.3	6005.6	6022.8	6040.1	6057.3	6074.6	6091.9	6109.3	480
490	6126.6	6144.0	6161.3	6178.7	6196.1	6213.6	6231.0	6248.5	6265.9	6283.4	490
500	6301.0	6318.5	6336.0	6353.6	6371.2	6388.7	6406.4	6424.0	6441.6	6459.3	500
510	6477.0	6494.7	6512.4	6530.1	6547.8	6565.6	6583.4	6601.1	6619.0	6636.8	510
520	6654.6	6672.5	6690.4	6708.2	6726.2	6744.1	6762.0	6780.0	6797.9	6815.9	520
530	6833.9	6852.0	6870.0	6888.1	6906.1	6924.2	6942.3	6960.4	6978.6	6996.7	530
540	7014.9	7033.1	7051.3	7069.5	7087.7	7106.0	7124.3	7142.6	7160.9	7179.2	540
550	7197.5	7215.9	7234.2	7252.6	7271.0	7289.4	7307.9	7326.3	7344.8	7363.3	550
560	7381.8	7400.3	7418.8	7437.4	7455.9	7474.5	7493.1	7511.7	7530.3	7549.0	560
570	7567.6	7586.3	7605.0	7623.7	7642.5	7661.2	7680.0	7698.7	7717.5	7736.3	570
580	7755.2	7774.0	7792.9	7811.7	7830.6	7849.5	7868.5	7887.4	7906.4	7925.3	580
590	7944.3	7963.3	7982.3	8001.4	8020.4	8039.5	8058.6	8077.7	8096.8	8115.9	590
600	8135.1	8154.3	8173.4	8192.6	8211.9	8231.1	8250.3	8269.6	8288.9	8308.2	600
610	8327.5	8346.8	8366.2	8385.5	8404.9	8424.3	8443.7	8463.2	8482.6	8502.1	610
620	8521.5	8541.0	8560.5	8580.1	8599.6	8619.2	8638.7	8658.3	8677.9	8697.6	620
630	8717.2	8736.9	8756.5	8776.2	8795.9	8815.6	8835.4	8855.1	8874.9	8894.7	630
640	8914.5	8934.3	8954.1	8974.0	8993.9	9013.7	9033.6	9053.6	9073.5	9093.4	640
650	9113.4	9133.4	9153.4	9173.4	9193.4	9213.5	9233.5	9253.6	9273.7	9293.8	650
660	9313.9	9334.1	9354.2	9374.4	9394.6	9414.8	9435.0	9455.3	9475.5	9495.8	660
670	9516.1	9536.4	9556.7	9577.0	9597.4	9617.8	9638.2	9658.6	9679.0	9699.4	670
680	9719.9	9740.3	9760.8	9781.3	9801.8	9822.3	9842.9	9863.5	9884.0	9904.6	680
690	9925.2	9945.9	9966.5	9987.2	10007.9	10028.5	10049.3	10070.0	10090.7	10111.5	690
700	10132.2	10153.0	10173.8	10194.7	10215.5	10236.4	10257.2	10278.1	10299.0	10319.9	700
710	10340.9	10361.8	10382.8	10403.8	10424.8	10445.8	10466.8	10487.9	10508.9	10530.0	710
720	10551.1	10572.2	10593.3	10614.5	10635.6	10656.8	10678.0	10699.2	10720.4	10741.7	720
730	10762.9	10784.2	10805.5	10826.8	10848.1	10869.5	10890.8	10912.2	10933.6	10955.0	730
740	10976.4	10997.8	11019.3	11040.8	11062.2	11083.7	11105.3	11126.8	11148.3	11169.9	740
750	11191.5	11213.1	11234.7	11256.3	11277.9	11299.6	11321.3	11343.0	11364.7	11386.4	750
760	11408.1	11429.9	11451.7	11473.5	11495.3	11517.1	11538.9	11560.8	11582.6	11604.5	760
770	11626.4	11648.3	11670.3	11692.2	11714.2	11736.2	11758.2	11780.2	11802.2	11824.3	770
780	11846.3	11868.4	11890.5	11912.6	11934.7	11956.9	11979.0	12001.2	12023.4	12045.6	780
790	12067.8	12090.0	12112.3	12134.6	12156.8	12179.1	12201.5	12223.8	12246.1	12268.5	790

Gold versus Platinum
EMF at intervals of 1 °C *(continued)*

t_{90} / °C	0	1	2	3	4	5	6	7	8	9	t_{90} / °C
						E/μV					
800	12290.9	12313.3	12335.7	12358.1	12380.6	12403.0	12425.5	12448.0	12470.5	12493.0	800
810	12515.6	12538.1	12560.7	12583.3	12605.9	12628.5	12651.2	12673.8	12696.5	12719.2	810
820	12741.9	12764.6	12787.3	12810.1	12832.8	12855.6	12878.4	12901.2	12924.0	12946.9	820
830	12969.7	12992.6	13015.5	13038.4	13061.3	13084.3	13107.2	13130.2	13153.2	13176.2	830
840	13199.2	13222.2	13245.3	13268.4	13291.4	13314.5	13337.7	13360.8	13383.9	13407.1	840
850	13430.3	13453.5	13476.7	13499.9	13523.1	13546.4	13569.7	13593.0	13616.3	13639.6	850
860	13662.9	13686.3	13709.6	13733.0	13756.4	13779.8	13803.3	13826.7	13850.2	13873.6	860
870	13897.1	13920.7	13944.2	13967.7	13991.3	14014.9	14038.4	14062.0	14085.7	14109.3	870
880	14133.0	14156.6	14180.3	14204.0	14227.7	14251.5	14275.2	14299.0	14322.7	14346.5	880
890	14370.3	14394.2	14418.0	14441.9	14465.7	14489.6	14513.5	14537.5	14561.4	14585.3	890
900	14609.3	14633.3	14657.3	14681.3	14705.3	14729.4	14753.4	14777.5	14801.6	14825.7	900
910	14849.9	14874.0	14898.2	14922.3	14946.5	14970.7	14994.9	15019.2	15043.4	15067.7	910
920	15092.0	15116.3	15140.6	15164.9	15189.3	15213.6	15238.0	15262.4	15286.8	15311.2	920
930	15335.7	15360.1	15384.6	15409.1	15433.6	15458.1	15482.6	15507.2	15531.7	15556.3	930
940	15580.9	15605.5	15630.1	15654.8	15679.4	15704.1	15728.8	15753.5	15778.2	15803.0	940
950	15827.7	15852.5	15877.3	15902.1	15926.9	15951.7	15976.6	16001.4	16026.3	16051.2	950
960	16076.1	16101.0	16126.0	16150.9	16175.9	16200.9	16225.9	16250.9	16276.0	16301.0	960
970	16326.1	16351.2	16376.2	16401.4	16426.5	16451.6	16476.8	16502.0	16527.2	16552.4	970
980	16577.6	16602.8	16628.1	16653.3	16678.6	16703.9	16729.2	16754.6	16779.9	16805.3	980
990	16830.7	16856.1	16881.5	16906.9	16932.3	16957.8	16983.3	17008.8	17034.3	17059.8	990
1000	17085.3										1000

5.2 Gold versus Platinum: Temperature at intervals of 10 μV

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
0	0.00	1.65	3.28	4.89	6.49	8.07	9.64	11.20	12.74	14.27	0
100	15.78	17.28	18.77	20.25	21.72	23.17	24.62	26.05	27.47	28.89	100
200	30.29	31.68	33.07	34.44	35.81	37.17	38.52	39.86	41.19	42.51	200
300	43.83	45.14	46.44	47.74	49.02	50.30	51.58	52.84	54.10	55.36	300
400	56.60	57.84	59.08	60.31	61.53	62.75	63.96	65.17	66.37	67.56	400
500	68.75	69.94	71.12	72.29	73.46	74.63	75.79	76.94	78.09	79.24	500
600	80.38	81.52	82.65	83.78	84.90	86.02	87.14	88.25	89.36	90.46	600
700	91.56	92.66	93.75	94.84	95.92	97.01	98.08	99.16	100.23	101.29	700
800	102.36	103.42	104.47	105.53	106.58	107.62	108.67	109.71	110.74	111.78	800
900	112.81	113.84	114.86	115.88	116.90	117.92	118.93	119.94	120.95	121.95	900
1000	122.96	123.96	124.95	125.95	126.94	127.93	128.91	129.90	130.88	131.86	1000
1100	132.83	133.81	134.78	135.75	136.72	137.68	138.64	139.60	140.56	141.52	1100
1200	142.47	143.42	144.37	145.31	146.26	147.20	148.14	149.08	150.02	150.95	1200
1300	151.88	152.81	153.74	154.67	155.59	156.51	157.43	158.35	159.27	160.18	1300
1400	161.09	162.00	162.91	163.82	164.72	165.63	166.53	167.43	168.33	169.22	1400
1500	170.12	171.01	171.90	172.79	173.68	174.56	175.45	176.33	177.21	178.09	1500
1600	178.97	179.84	180.72	181.59	182.46	183.33	184.20	185.06	185.93	186.79	1600
1700	187.65	188.52	189.37	190.23	191.09	191.94	192.80	193.65	194.50	195.35	1700
1800	196.19	197.04	197.89	198.73	199.57	200.41	201.25	202.09	202.93	203.76	1800
1900	204.60	205.43	206.26	207.09	207.92	208.75	209.58	210.40	211.22	212.05	1900
2000	212.87	213.69	214.51	215.32	216.14	216.96	217.77	218.58	219.40	220.21	2000
2100	221.02	221.82	222.63	223.44	224.24	225.05	225.85	226.65	227.45	228.25	2100
2200	229.05	229.84	230.64	231.44	232.23	233.02	233.81	234.61	235.39	236.18	2200
2300	236.97	237.76	238.54	239.33	240.11	240.89	241.67	242.46	243.23	244.01	2300
2400	244.79	245.57	246.34	247.12	247.89	248.66	249.43	250.20	250.97	251.74	2400
2500	252.51	253.28	254.04	254.81	255.57	256.34	257.10	257.86	258.62	259.38	2500
2600	260.14	260.90	261.65	262.41	263.16	263.92	264.67	265.42	266.18	266.93	2600
2700	267.68	268.42	269.17	269.92	270.67	271.41	272.16	272.90	273.64	274.39	2700
2800	275.13	275.87	276.61	277.35	278.09	278.82	279.56	280.30	281.03	281.76	2800
2900	282.50	283.23	283.96	284.69	285.42	286.15	286.88	287.61	288.34	289.06	2900
3000	289.79	290.52	291.24	291.96	292.69	293.41	294.13	294.85	295.57	296.29	3000
3100	297.01	297.73	298.44	299.16	299.87	300.59	301.30	302.02	302.73	303.44	3100
3200	304.15	304.86	305.57	306.28	306.99	307.70	308.41	309.11	309.82	310.52	3200
3300	311.23	311.93	312.64	313.34	314.04	314.74	315.44	316.14	316.84	317.54	3300
3400	318.24	318.93	319.63	320.33	321.02	321.72	322.41	323.11	323.80	324.49	3400
3500	325.18	325.87	326.56	327.25	327.94	328.63	329.32	330.01	330.69	331.38	3500
3600	332.06	332.75	333.43	334.12	334.80	335.48	336.17	336.85	337.53	338.21	3600
3700	338.89	339.57	340.24	340.92	341.60	342.28	342.95	343.63	344.30	344.98	3700
3800	345.65	346.33	347.00	347.67	348.34	349.01	349.68	350.35	351.02	351.69	3800
3900	352.36	353.03	353.70	354.36	355.03	355.69	356.36	357.02	357.69	358.35	3900

Gold versus Platinum
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
4000	359.01	359.68	360.34	361.00	361.66	362.32	362.98	363.64	364.30	364.96	4000
4100	365.62	366.27	366.93	367.59	368.24	368.90	369.55	370.21	370.86	371.51	4100
4200	372.17	372.82	373.47	374.12	374.77	375.42	376.07	376.72	377.37	378.02	4200
4300	378.67	379.31	379.96	380.61	381.25	381.90	382.54	383.19	383.83	384.48	4300
4400	385.12	385.76	386.40	387.05	387.69	388.33	388.97	389.61	390.25	390.89	4400
4500	391.52	392.16	392.80	393.44	394.07	394.71	395.35	395.98	396.62	397.25	4500
4600	397.88	398.52	399.15	399.78	400.42	401.05	401.68	402.31	402.94	403.57	4600
4700	404.20	404.83	405.46	406.08	406.71	407.34	407.97	408.59	409.22	409.85	4700
4800	410.47	411.10	411.72	412.34	412.97	413.59	414.21	414.83	415.46	416.08	4800
4900	416.70	417.32	417.94	418.56	419.18	419.80	420.42	421.03	421.65	422.27	4900
5000	422.89	423.50	424.12	424.73	425.35	425.97	426.58	427.19	427.81	428.42	5000
5100	429.03	429.65	430.26	430.87	431.48	432.09	432.70	433.31	433.92	434.53	5100
5200	435.14	435.75	436.36	436.97	437.57	438.18	438.79	439.39	440.00	440.60	5200
5300	441.21	441.81	442.42	443.02	443.63	444.23	444.83	445.44	446.04	446.64	5300
5400	447.24	447.84	448.44	449.04	449.64	450.24	450.84	451.44	452.04	452.64	5400
5500	453.24	453.83	454.43	455.03	455.62	456.22	456.81	457.41	458.00	458.60	5500
5600	459.19	459.79	460.38	460.97	461.57	462.16	462.75	463.34	463.93	464.53	5600
5700	465.12	465.71	466.30	466.89	467.48	468.06	468.65	469.24	469.83	470.42	5700
5800	471.00	471.59	472.18	472.76	473.35	473.93	474.52	475.10	475.69	476.27	5800
5900	476.86	477.44	478.02	478.61	479.19	479.77	480.35	480.94	481.52	482.10	5900
6000	482.68	483.26	483.84	484.42	485.00	485.58	486.15	486.73	487.31	487.89	6000
6100	488.47	489.04	489.62	490.20	490.77	491.35	491.92	492.50	493.07	493.65	6100
6200	494.22	494.80	495.37	495.94	496.51	497.09	497.66	498.23	498.80	499.37	6200
6300	499.95	500.52	501.09	501.66	502.23	502.80	503.37	503.93	504.50	505.07	6300
6400	505.64	506.21	506.77	507.34	507.91	508.47	509.04	509.61	510.17	510.74	6400
6500	511.30	511.87	512.43	513.00	513.56	514.12	514.69	515.25	515.81	516.37	6500
6600	516.94	517.50	518.06	518.62	519.18	519.74	520.30	520.86	521.42	521.98	6600
6700	522.54	523.10	523.66	524.21	524.77	525.33	525.89	526.44	527.00	527.56	6700
6800	528.11	528.67	529.23	529.78	530.34	530.89	531.45	532.00	532.55	533.11	6800
6900	533.66	534.21	534.77	535.32	535.87	536.42	536.98	537.53	538.08	538.63	6900
7000	539.18	539.73	540.28	540.83	541.38	541.93	542.48	543.03	543.57	544.12	7000
7100	544.67	545.22	545.77	546.31	546.86	547.41	547.95	548.50	549.04	549.59	7100
7200	550.14	550.68	551.22	551.77	552.31	552.86	553.40	553.94	554.49	555.03	7200
7300	555.57	556.12	556.66	557.20	557.74	558.28	558.82	559.36	559.90	560.44	7300
7400	560.98	561.52	562.06	562.60	563.14	563.68	564.22	564.76	565.30	565.83	7400
7500	566.37	566.91	567.44	567.98	568.52	569.05	569.59	570.13	570.66	571.20	7500
7600	571.73	572.27	572.80	573.33	573.87	574.40	574.94	575.47	576.00	576.53	7600
7700	577.07	577.60	578.13	578.66	579.19	579.73	580.26	580.79	581.32	581.85	7700
7800	582.38	582.91	583.44	583.97	584.50	585.02	585.55	586.08	586.61	587.14	7800
7900	587.66	588.19	588.72	589.25	589.77	590.30	590.83	591.35	591.88	592.40	7900

Gold versus Platinum
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
8000	592.93	593.45	593.98	594.50	595.03	595.55	596.07	596.60	597.12	597.64	8000
8100	598.17	598.69	599.21	599.73	600.26	600.78	601.30	601.82	602.34	602.86	8100
8200	603.38	603.90	604.42	604.94	605.46	605.98	606.50	607.02	607.54	608.06	8200
8300	608.58	609.09	609.61	610.13	610.65	611.16	611.68	612.20	612.71	613.23	8300
8400	613.75	614.26	614.78	615.29	615.81	616.32	616.84	617.35	617.87	618.38	8400
8500	618.89	619.41	619.92	620.43	620.95	621.46	621.97	622.48	623.00	623.51	8500
8600	624.02	624.53	625.04	625.55	626.06	626.57	627.09	627.60	628.11	628.61	8600
8700	629.12	629.63	630.14	630.65	631.16	631.67	632.18	632.68	633.19	633.70	8700
8800	634.21	634.71	635.22	635.73	636.23	636.74	637.25	637.75	638.26	638.76	8800
8900	639.27	639.77	640.28	640.78	641.29	641.79	642.30	642.80	643.30	643.81	8900
9000	644.31	644.81	645.31	645.82	646.32	646.82	647.32	647.83	648.33	648.83	9000
9100	649.33	649.83	650.33	650.83	651.33	651.83	652.33	652.83	653.33	653.83	9100
9200	654.33	654.83	655.33	655.82	656.32	656.82	657.32	657.82	658.31	658.81	9200
9300	659.31	659.81	660.30	660.80	661.29	661.79	662.29	662.78	663.28	663.77	9300
9400	664.27	664.76	665.26	665.75	666.25	666.74	667.23	667.73	668.22	668.71	9400
9500	669.21	669.70	670.19	670.69	671.18	671.67	672.16	672.65	673.15	673.64	9500
9600	674.13	674.62	675.11	675.60	676.09	676.58	677.07	677.56	678.05	678.54	9600
9700	679.03	679.52	680.01	680.50	680.98	681.47	681.96	682.45	682.94	683.42	9700
9800	683.91	684.40	684.89	685.37	685.86	686.35	686.83	687.32	687.80	688.29	9800
9900	688.78	689.26	689.75	690.23	690.72	691.20	691.68	692.17	692.65	693.14	9900
10000	693.62	694.10	694.59	695.07	695.55	696.04	696.52	697.00	697.48	697.97	10000
10100	698.45	698.93	699.41	699.89	700.37	700.85	701.33	701.82	702.30	702.78	10100
10200	703.26	703.74	704.22	704.70	705.17	705.65	706.13	706.61	707.09	707.57	10200
10300	708.05	708.53	709.00	709.48	709.96	710.44	710.91	711.39	711.87	712.34	10300
10400	712.82	713.30	713.77	714.25	714.72	715.20	715.68	716.15	716.63	717.10	10400
10500	717.58	718.05	718.53	719.00	719.47	719.95	720.42	720.89	721.37	721.84	10500
10600	722.31	722.79	723.26	723.73	724.21	724.68	725.15	725.62	726.09	726.56	10600
10700	727.04	727.51	727.98	728.45	728.92	729.39	729.86	730.33	730.80	731.27	10700
10800	731.74	732.21	732.68	733.15	733.62	734.09	734.56	735.02	735.49	735.96	10800
10900	736.43	736.90	737.36	737.83	738.30	738.77	739.23	739.70	740.17	740.63	10900
11000	741.10	741.57	742.03	742.50	742.96	743.43	743.90	744.36	744.83	745.29	11000
11100	745.76	746.22	746.68	747.15	747.61	748.08	748.54	749.00	749.47	749.93	11100
11200	750.39	750.86	751.32	751.78	752.25	752.71	753.17	753.63	754.09	754.56	11200
11300	755.02	755.48	755.94	756.40	756.86	757.32	757.78	758.24	758.70	759.16	11300
11400	759.62	760.08	760.54	761.00	761.46	761.92	762.38	762.84	763.30	763.76	11400
11500	764.22	764.67	765.13	765.59	766.05	766.51	766.96	767.42	767.88	768.34	11500
11600	768.79	769.25	769.71	770.16	770.62	771.08	771.53	771.99	772.44	772.90	11600
11700	773.35	773.81	774.26	774.72	775.17	775.63	776.08	776.54	776.99	777.45	11700
11800	777.90	778.35	778.81	779.26	779.71	780.17	780.62	781.07	781.53	781.98	11800
11900	782.43	782.88	783.33	783.79	784.24	784.69	785.14	785.59	786.04	786.50	11900

Gold versus Platinum
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
12000	786.95	787.40	787.85	788.30	788.75	789.20	789.65	790.10	790.55	791.00	12000
12100	791.45	791.90	792.35	792.80	793.24	793.69	794.14	794.59	795.04	795.49	12100
12200	795.93	796.38	796.83	797.28	797.73	798.17	798.62	799.07	799.51	799.96	12200
12300	800.41	800.85	801.30	801.75	802.19	802.64	803.08	803.53	803.97	804.42	12300
12400	804.87	805.31	805.76	806.20	806.64	807.09	807.53	807.98	808.42	808.87	12400
12500	809.31	809.75	810.20	810.64	811.08	811.53	811.97	812.41	812.85	813.30	12500
12600	813.74	814.18	814.62	815.07	815.51	815.95	816.39	816.83	817.27	817.71	12600
12700	818.16	818.60	819.04	819.48	819.92	820.36	820.80	821.24	821.68	822.12	12700
12800	822.56	823.00	823.44	823.88	824.32	824.75	825.19	825.63	826.07	826.51	12800
12900	826.95	827.39	827.82	828.26	828.70	829.14	829.57	830.01	830.45	830.89	12900
13000	831.32	831.76	832.20	832.63	833.07	833.51	833.94	834.38	834.81	835.25	13000
13100	835.69	836.12	836.56	836.99	837.43	837.86	838.30	838.73	839.17	839.60	13100
13200	840.03	840.47	840.90	841.34	841.77	842.20	842.64	843.07	843.50	843.94	13200
13300	844.37	844.80	845.24	845.67	846.10	846.53	846.97	847.40	847.83	848.26	13300
13400	848.69	849.13	849.56	849.99	850.42	850.85	851.28	851.71	852.14	852.57	13400
13500	853.00	853.44	853.87	854.30	854.73	855.16	855.58	856.01	856.44	856.87	13500
13600	857.30	857.73	858.16	858.59	859.02	859.45	859.88	860.30	860.73	861.16	13600
13700	861.59	862.02	862.44	862.87	863.30	863.73	864.15	864.58	865.01	865.43	13700
13800	865.86	866.29	866.71	867.14	867.57	867.99	868.42	868.84	869.27	869.70	13800
13900	870.12	870.55	870.97	871.40	871.82	872.25	872.67	873.10	873.52	873.95	13900
14000	874.37	874.79	875.22	875.64	876.07	876.49	876.91	877.34	877.76	878.18	14000
14100	878.61	879.03	879.45	879.87	880.30	880.72	881.14	881.56	881.99	882.41	14100
14200	882.83	883.25	883.67	884.10	884.52	884.94	885.36	885.78	886.20	886.62	14200
14300	887.04	887.46	887.88	888.30	888.72	889.15	889.57	889.99	890.40	890.82	14300
14400	891.24	891.66	892.08	892.50	892.92	893.34	893.76	894.18	894.60	895.01	14400
14500	895.43	895.85	896.27	896.69	897.11	897.52	897.94	898.36	898.78	899.19	14500
14600	899.61	900.03	900.45	900.86	901.28	901.70	902.11	902.53	902.94	903.36	14600
14700	903.78	904.19	904.61	905.03	905.44	905.86	906.27	906.69	907.10	907.52	14700
14800	907.93	908.35	908.76	909.18	909.59	910.01	910.42	910.83	911.25	911.66	14800
14900	912.08	912.49	912.90	913.32	913.73	914.14	914.56	914.97	915.38	915.80	14900
15000	916.21	916.62	917.03	917.45	917.86	918.27	918.68	919.10	919.51	919.92	15000
15100	920.33	920.74	921.15	921.56	921.98	922.39	922.80	923.21	923.62	924.03	15100
15200	924.44	924.85	925.26	925.67	926.08	926.49	926.90	927.31	927.72	928.13	15200
15300	928.54	928.95	929.36	929.77	930.18	930.59	931.00	931.40	931.81	932.22	15300
15400	932.63	933.04	933.45	933.85	934.26	934.67	935.08	935.49	935.89	936.30	15400
15500	936.71	937.12	937.52	937.93	938.34	938.74	939.15	939.56	939.96	940.37	15500
15600	940.78	941.18	941.59	941.99	942.40	942.81	943.21	943.62	944.02	944.43	15600
15700	944.83	945.24	945.64	946.05	946.45	946.86	947.26	947.67	948.07	948.48	15700
15800	948.88	949.28	949.69	950.09	950.50	950.90	951.30	951.71	952.11	952.51	15800
15900	952.92	953.32	953.72	954.13	954.53	954.93	955.33	955.74	956.14	956.54	15900

Gold versus Platinum
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						T_{90}/°C					
16000	956.94	957.34	957.75	958.15	958.55	958.95	959.35	959.75	960.16	960.56	16000
16100	960.96	961.36	961.76	962.16	962.56	962.96	963.36	963.76	964.16	964.56	16100
16200	964.96	965.36	965.76	966.16	966.56	966.96	967.36	967.76	968.16	968.56	16200
16300	968.96	969.36	969.76	970.16	970.56	970.95	971.35	971.75	972.15	972.55	16300
16400	972.95	973.34	973.74	974.14	974.54	974.93	975.33	975.73	976.13	976.52	16400
16500	976.92	977.32	977.72	978.11	978.51	978.91	979.30	979.70	980.10	980.49	16500
16600	980.89	981.28	981.68	982.08	982.47	982.87	983.26	983.66	984.05	984.45	16600
16700	984.84	985.24	985.63	986.03	986.42	986.82	987.21	987.61	988.00	988.40	16700
16800	988.79	989.19	989.58	989.97	990.37	990.76	991.15	991.55	991.94	992.34	16800
16900	992.73	993.12	993.51	993.91	994.30	994.69	995.09	995.48	995.87	996.26	16900
17000	996.66	997.05	997.44	997.83	998.23	998.62	999.01	959.75	999.79	1000.19	17000

5.3 Thermoelectric values at the defining fixed points of the ITS-90 for Au/Pt thermocouples (informative)

Fixed point	t_{90} / °C	*E*/μV	*S*/(μV/°C)
Water TP	0.01	0.06	6.037
Gallium MP	29.7646	196.25	7.133
Indium FP	156.5985	1350.94	10.861
Tin FP	231.928	2236.18	12.599
Zinc FP	419.527	4945.63	16.157
Aluminum FP	660.323	9320.44	20.139
Silver FP	961.78	16120.49	24.945

6 Tables for Platinum versus Palladium thermocouples

6.1 Platinum versus Palladium: EMF at intervals of 1 °C

t_{90} / °C	0	1	2	3	4	5	6	7	8	9	t_{90} / °C
						E/μV					
0	0.0	5.3	10.6	15.9	21.3	26.6	31.9	37.3	42.7	48.0	0
10	53.4	58.8	64.2	69.6	75.0	80.5	85.9	91.3	96.8	102.2	10
20	107.7	113.2	118.7	124.2	129.7	135.2	140.7	146.2	151.7	157.3	20
30	162.8	168.4	173.9	179.5	185.1	190.7	196.3	201.9	207.5	213.1	30
40	218.7	224.3	230.0	235.6	241.3	246.9	252.6	258.3	264.0	269.7	40
50	275.4	281.1	286.8	292.5	298.2	303.9	309.7	315.4	321.2	326.9	50
60	332.7	338.5	344.3	350.1	355.9	361.7	367.5	373.3	379.1	384.9	60
70	390.8	396.6	402.5	408.3	414.2	420.1	425.9	431.8	437.7	443.6	70
80	449.5	455.4	461.3	467.3	473.2	479.1	485.1	491.0	497.0	502.9	80
90	508.9	514.9	520.9	526.9	532.9	538.9	544.9	550.9	556.9	562.9	90
100	569.0	575.0	581.1	587.1	593.2	599.3	605.3	611.4	617.5	623.6	100
110	629.7	635.8	641.9	648.1	654.2	660.3	666.5	672.6	678.8	684.9	110
120	691.1	697.3	703.5	709.7	715.9	722.1	728.3	734.5	740.7	746.9	120
130	753.2	759.4	765.7	771.9	778.2	784.5	790.7	797.0	803.3	809.6	130
140	815.9	822.2	828.6	834.9	841.2	847.6	853.9	860.3	866.6	873.0	140
150	879.4	885.8	892.2	898.6	905.0	911.4	917.8	924.2	930.7	937.1	150
160	943.6	950.0	956.5	962.9	969.4	975.9	982.4	988.9	995.4	1001.9	160
170	1008.5	1015.0	1021.5	1028.1	1034.6	1041.2	1047.8	1054.4	1060.9	1067.5	170
180	1074.1	1080.7	1087.4	1094.0	1100.6	1107.3	1113.9	1120.6	1127.2	1133.9	180
190	1140.6	1147.3	1154.0	1160.7	1167.4	1174.1	1180.9	1187.6	1194.4	1201.1	190
200	1207.9	1214.7	1221.4	1228.2	1235.0	1241.8	1248.7	1255.5	1262.3	1269.2	200
210	1276.0	1282.9	1289.7	1296.6	1303.5	1310.4	1317.3	1324.2	1331.2	1338.1	210
220	1345.0	1352.0	1358.9	1365.9	1372.9	1379.9	1386.9	1393.9	1400.9	1407.9	220
230	1415.0	1422.0	1429.1	1436.1	1443.2	1450.3	1457.4	1464.5	1471.6	1478.7	230
240	1485.9	1493.0	1500.2	1507.3	1514.5	1521.7	1528.9	1536.1	1543.3	1550.5	240
250	1557.7	1565.0	1572.2	1579.5	1586.8	1594.1	1601.4	1608.7	1616.0	1623.3	250
260	1630.7	1638.0	1645.4	1652.7	1660.1	1667.5	1674.9	1682.3	1689.7	1697.2	260
270	1704.6	1712.1	1719.6	1727.0	1734.5	1742.0	1749.5	1757.1	1764.6	1772.2	270
280	1779.7	1787.3	1794.9	1802.5	1810.1	1817.7	1825.3	1833.0	1840.6	1848.3	280
290	1856.0	1863.6	1871.3	1879.1	1886.8	1894.5	1902.3	1910.0	1917.8	1925.6	290
300	1933.4	1941.2	1949.0	1956.8	1964.7	1972.5	1980.4	1988.3	1996.2	2004.1	300
310	2012.0	2019.9	2027.9	2035.9	2043.8	2051.8	2059.8	2067.8	2075.8	2083.9	310
320	2091.9	2100.0	2108.1	2116.2	2124.3	2132.4	2140.5	2148.6	2156.8	2165.0	320
330	2173.1	2181.3	2189.5	2197.8	2206.0	2214.2	2222.5	2230.8	2239.1	2247.4	330
340	2255.7	2264.0	2272.4	2280.7	2289.1	2297.5	2305.9	2314.3	2322.7	2331.2	340
350	2339.6	2348.1	2356.6	2365.1	2373.6	2382.1	2390.7	2399.2	2407.8	2416.4	350
360	2425.0	2433.6	2442.2	2450.9	2459.5	2468.2	2476.9	2485.6	2494.3	2503.1	360
370	2511.8	2520.6	2529.3	2538.1	2546.9	2555.8	2564.6	2573.5	2582.3	2591.2	370
380	2600.1	2609.0	2617.9	2626.9	2635.8	2644.8	2653.8	2662.8	2671.8	2680.9	380
390	2689.9	2699.0	2708.1	2717.2	2726.3	2735.4	2744.6	2753.7	2762.9	2772.1	390

Platinum versus Palladium
EMF at intervals of 1 °C *(continued)*

t_{90} / °C	0	1	2	3	4	5	6	7	8	9	t_{90} / °C
						E/μV					
400	2781.3	2790.5	2799.8	2809.0	2818.3	2827.6	2836.9	2846.2	2855.6	2864.9	400
410	2874.3	2883.7	2893.1	2902.5	2911.9	2921.4	2930.8	2940.3	2949.8	2959.3	410
420	2968.9	2978.4	2988.0	2997.6	3007.2	3016.8	3026.4	3036.0	3045.7	3055.4	420
430	3065.1	3074.8	3084.5	3094.3	3104.1	3113.8	3123.6	3133.5	3143.3	3153.1	430
440	3163.0	3172.9	3182.8	3192.7	3202.6	3212.6	3222.6	3232.5	3242.6	3252.6	440
450	3262.6	3272.7	3282.7	3292.8	3302.9	3313.1	3323.2	3333.4	3343.5	3353.7	450
460	3363.9	3374.2	3384.4	3394.7	3405.0	3415.3	3425.6	3435.9	3446.3	3456.6	460
470	3467.0	3477.4	3487.9	3498.3	3508.8	3519.2	3529.7	3540.2	3550.8	3561.3	470
480	3571.9	3582.5	3593.1	3603.7	3614.3	3625.0	3635.7	3646.4	3657.1	3667.8	480
490	3678.5	3689.3	3700.1	3710.9	3721.7	3732.5	3743.4	3754.3	3765.2	3776.1	490
500	3787.0	3797.9	3808.9	3819.9	3830.9	3841.9	3853.0	3864.0	3875.1	3886.2	500
510	3897.3	3908.4	3919.6	3930.7	3941.9	3953.1	3964.3	3975.6	3986.8	3998.1	510
520	4009.4	4020.7	4032.1	4043.4	4054.8	4066.2	4077.6	4089.0	4100.5	4111.9	520
530	4123.4	4134.9	4146.4	4158.0	4169.5	4181.1	4192.7	4204.3	4215.9	4227.6	530
540	4239.3	4250.9	4262.7	4274.4	4286.1	4297.9	4309.7	4321.5	4333.3	4345.1	540
550	4357.0	4368.9	4380.8	4392.7	4404.6	4416.6	4428.5	4440.5	4452.5	4464.6	550
560	4476.6	4488.7	4500.8	4512.9	4525.0	4537.1	4549.3	4561.5	4573.7	4585.9	560
570	4598.1	4610.4	4622.7	4635.0	4647.3	4659.6	4672.0	4684.3	4696.7	4709.1	570
580	4721.6	4734.0	4746.5	4759.0	4771.5	4784.0	4796.5	4809.1	4821.7	4834.3	580
590	4846.9	4859.5	4872.2	4884.9	4897.6	4910.3	4923.0	4935.8	4948.5	4961.3	590
600	4974.1	4987.0	4999.8	5012.7	5025.6	5038.5	5051.4	5064.4	5077.3	5090.3	600
610	5103.3	5116.3	5129.4	5142.4	5155.5	5168.6	5181.7	5194.9	5208.0	5221.2	610
620	5234.4	5247.6	5260.8	5274.1	5287.4	5300.6	5314.0	5327.3	5340.6	5354.0	620
630	5367.4	5380.8	5394.2	5407.7	5421.1	5434.6	5448.1	5461.6	5475.2	5488.7	630
640	5502.3	5515.9	5529.5	5543.1	5556.8	5570.5	5584.2	5597.9	5611.6	5625.4	640
650	5639.1	5652.9	5666.7	5680.6	5694.4	5708.3	5722.1	5736.0	5750.0	5763.9	650
660	5777.9	5791.8	5805.8	5819.9	5833.9	5848.0	5862.0	5876.1	5890.2	5904.4	660
670	5918.5	5932.7	5946.9	5961.1	5975.3	5989.5	6003.8	6018.1	6032.4	6046.7	670
680	6061.1	6075.4	6089.8	6104.2	6118.6	6133.0	6147.5	6162.0	6176.4	6191.0	680
690	6205.5	6220.0	6234.6	6249.2	6263.8	6278.4	6293.1	6307.7	6322.4	6337.1	690
700	6351.8	6366.5	6381.3	6396.1	6410.9	6425.7	6440.5	6455.3	6470.2	6485.1	700
710	6500.0	6514.9	6529.9	6544.8	6559.8	6574.8	6589.8	6604.9	6619.9	6635.0	710
720	6650.1	6665.2	6680.3	6695.5	6710.6	6725.8	6741.0	6756.2	6771.5	6786.7	720
730	6802.0	6817.3	6832.6	6847.9	6863.3	6878.7	6894.0	6909.4	6924.9	6940.3	730
740	6955.8	6971.2	6986.7	7002.3	7017.8	7033.3	7048.9	7064.5	7080.1	7095.7	740
750	7111.4	7127.0	7142.7	7158.4	7174.1	7189.9	7205.6	7221.4	7237.2	7253.0	750
760	7268.8	7284.7	7300.5	7316.4	7332.3	7348.2	7364.2	7380.1	7396.1	7412.1	760
770	7428.1	7444.1	7460.1	7476.2	7492.3	7508.4	7524.5	7540.6	7556.8	7572.9	770
780	7589.1	7605.3	7621.5	7637.8	7654.0	7670.3	7686.6	7702.9	7719.3	7735.6	780
790	7752.0	7768.3	7784.7	7801.2	7817.6	7834.0	7850.5	7867.0	7883.5	7900.0	790

Platinum versus Palladium
EMF at intervals of 1 °C *(continued)*

t_{90} / °C	0	1	2	3	4	5	6	7	8	9	t_{90} / °C
						E/μV					
800	7916.6	7933.1	7949.7	7966.3	7982.9	7999.5	8016.2	8032.9	8049.5	8066.2	800
810	8082.9	8099.7	8116.4	8133.2	8150.0	8166.8	8183.6	8200.4	8217.3	8234.2	810
820	8251.1	8268.0	8284.9	8301.8	8318.8	8335.8	8352.8	8369.8	8386.8	8403.8	820
830	8420.9	8438.0	8455.1	8472.2	8489.3	8506.5	8523.6	8540.8	8558.0	8575.2	830
840	8592.5	8609.7	8627.0	8644.3	8661.6	8678.9	8696.2	8713.6	8730.9	8748.3	840
850	8765.7	8783.1	8800.6	8818.0	8835.5	8853.0	8870.5	8888.0	8905.5	8923.1	850
860	8940.7	8958.3	8975.9	8993.5	9011.1	9028.8	9046.4	9064.1	9081.8	9099.5	860
870	9117.3	9135.0	9152.8	9170.6	9188.4	9206.2	9224.0	9241.9	9259.7	9277.6	870
880	9295.5	9313.4	9331.4	9349.3	9367.3	9385.3	9403.3	9421.3	9439.3	9457.4	880
890	9475.4	9493.5	9511.6	9529.7	9547.8	9566.0	9584.1	9602.3	9620.5	9638.7	890
900	9656.9	9675.2	9693.4	9711.7	9730.0	9748.3	9766.6	9784.9	9803.3	9821.6	900
910	9840.0	9858.4	9876.8	9895.3	9913.7	9932.2	9950.7	9969.1	9987.7	10006.2	910
920	10024.7	10043.3	10061.8	10080.4	10099.0	10117.7	10136.3	10154.9	10173.6	10192.3	920
930	10211.0	10229.7	10248.4	10267.2	10285.9	10304.7	10323.5	10342.3	10361.1	10379.9	930
940	10398.8	10417.6	10436.5	10455.4	10474.3	10493.3	10512.2	10531.2	10550.1	10569.1	940
950	10588.1	10607.1	10626.2	10645.2	10664.3	10683.3	10702.4	10721.5	10740.7	10759.8	950
960	10779.0	10798.1	10817.3	10836.5	10855.7	10874.9	10894.2	10913.4	10932.7	10952.0	960
970	10971.3	10990.6	11010.0	11029.3	11048.7	11068.0	11087.4	11106.8	11126.3	11145.7	970
980	11165.1	11184.6	11204.1	11223.6	11243.1	11262.6	11282.1	11301.7	11321.3	11340.8	980
990	11360.4	11380.0	11399.7	11419.3	11439.0	11458.6	11478.3	11498.0	11517.7	11537.4	990
1000	11557.2	11576.9	11596.7	11616.5	11636.3	11656.1	11675.9	11695.7	11715.6	11735.5	1000
1010	11755.3	11775.2	11795.1	11815.1	11835.0	11855.0	11874.9	11894.9	11914.9	11934.9	1010
1020	11954.9	11975.0	11995.0	12015.1	12035.2	12055.2	12075.3	12095.5	12115.6	12135.7	1020
1030	12155.9	12176.1	12196.3	12216.5	12236.7	12256.9	12277.2	12297.4	12317.7	12338.0	1030
1040	12358.3	12378.6	12398.9	12419.3	12439.6	12460.0	12480.3	12500.7	12521.2	12541.6	1040
1050	12562.0	12582.5	12602.9	12623.4	12643.9	12664.4	12684.9	12705.4	12726.0	12746.5	1050
1060	12767.1	12787.7	12808.3	12828.9	12849.5	12870.1	12890.8	12911.4	12932.1	12952.8	1060
1070	12973.5	12994.2	13014.9	13035.7	13056.4	13077.2	13098.0	13118.8	13139.6	13160.4	1070
1080	13181.2	13202.1	13222.9	13243.8	13264.7	13285.6	13306.5	13327.4	13348.4	13369.3	1080
1090	13390.3	13411.2	13432.2	13453.2	13474.2	13495.3	13516.3	13537.4	13558.4	13579.5	1090
1100	13600.6	13621.7	13642.8	13663.9	13685.1	13706.2	13727.4	13748.6	13769.8	13791.0	1100
1110	13812.2	13833.4	13854.7	13875.9	13897.2	13918.5	13939.8	13961.1	13982.4	14003.7	1110
1120	14025.1	14046.4	14067.8	14089.2	14110.6	14132.0	14153.4	14174.8	14196.3	14217.7	1120
1130	14239.2	14260.6	14282.1	14303.6	14325.2	14346.7	14368.2	14389.8	14411.3	14432.9	1130
1140	14454.5	14476.1	14497.7	14519.3	14541.0	14562.6	14584.3	14606.0	14627.7	14649.4	1140
1150	14671.1	14692.8	14714.5	14736.3	14758.0	14779.8	14801.6	14823.4	14845.2	14867.0	1150
1160	14888.8	14910.7	14932.5	14954.4	14976.3	14998.2	15020.1	15042.0	15063.9	15085.8	1160
1170	15107.8	15129.7	15151.7	15173.7	15195.7	15217.7	15239.7	15261.8	15283.8	15305.9	1170
1180	15327.9	15350.0	15372.1	15394.2	15416.3	15438.4	15460.6	15482.7	15504.9	15527.0	1180
1190	15549.2	15571.4	15593.6	15615.8	15638.1	15660.3	15682.6	15704.8	15727.1	15749.4	1190

Platinum versus Palladium
EMF at intervals of 1 °C *(continued)*

t_{90} / °C	0	1	2	3	4	5	6	7	8	9	t_{90} / °C
						E/μV					
1200	15771.7	15794.0	15816.3	15838.6	15861.0	15883.3	15905.7	15928.1	15950.5	15972.9	1200
1210	15995.3	16017.7	16040.1	16062.6	16085.0	16107.5	16130.0	16152.5	16175.0	16197.5	1210
1220	16220.0	16242.5	16265.1	16287.6	16310.2	16332.8	16355.4	16378.0	16400.6	16423.2	1220
1230	16445.9	16468.5	16491.2	16513.8	16536.5	16559.2	16581.9	16604.6	16627.3	16650.1	1230
1240	16672.8	16695.6	16718.3	16741.1	16763.9	16786.7	16809.5	16832.3	16855.2	16878.0	1240
1250	16900.9	16923.7	16946.6	16969.5	16992.4	17015.3	17038.2	17061.2	17084.1	17107.0	1250
1260	17130.0	17153.0	17176.0	17199.0	17222.0	17245.0	17268.0	17291.0	17314.1	17337.2	1260
1270	17360.2	17383.3	17406.4	17429.5	17452.6	17475.7	17498.9	17522.0	17545.2	17568.3	1270
1280	17591.5	17614.7	17637.9	17661.1	17684.3	17707.6	17730.8	17754.0	17777.3	17800.6	1280
1290	17823.9	17847.1	17870.4	17893.8	17917.1	17940.4	17963.8	17987.1	18010.5	18033.9	1290
1300	18057.2	18080.6	18104.0	18127.5	18150.9	18174.3	18197.8	18221.2	18244.7	18268.2	1300
1310	18291.7	18315.2	18338.7	18362.2	18385.7	18409.3	18432.8	18456.4	18480.0	18503.5	1310
1320	18527.1	18550.7	18574.3	18598.0	18621.6	18645.2	18668.9	18692.6	18716.2	18739.9	1320
1330	18763.6	18787.3	18811.0	18834.7	18858.5	18882.2	18906.0	18929.7	18953.5	18977.3	1330
1340	19001.1	19024.9	19048.7	19072.5	19096.4	19120.2	19144.1	19167.9	19191.8	19215.7	1340
1350	19239.6	19263.5	19287.4	19311.3	19335.3	19359.2	19383.2	19407.1	19431.1	19455.1	1350
1360	19479.1	19503.1	19527.1	19551.1	19575.1	19599.2	19623.2	19647.3	19671.4	19695.5	1360
1370	19719.5	19743.6	19767.8	19791.9	19816.0	19840.1	19864.3	19888.5	19912.6	19936.8	1370
1380	19961.0	19985.2	20009.4	20033.6	20057.8	20082.1	20106.3	20130.6	20154.8	20179.1	1380
1390	20203.4	20227.7	20252.0	20276.3	20300.6	20325.0	20349.3	20373.7	20398.0	20422.4	1390
1400	20446.8	20471.2	20495.6	20520.0	20544.4	20568.8	20593.3	20617.7	20642.2	20666.6	1400
1410	20691.1	20715.6	20740.1	20764.6	20789.1	20813.6	20838.2	20862.7	20887.3	20911.8	1410
1420	20936.4	20961.0	20985.6	21010.2	21034.8	21059.4	21084.0	21108.6	21133.3	21157.9	1420
1430	21182.6	21207.3	21232.0	21256.7	21281.4	21306.1	21330.8	21355.5	21380.2	21405.0	1430
1440	21429.7	21454.5	21479.3	21504.1	21528.9	21553.7	21578.5	21603.3	21628.1	21653.0	1440
1450	21677.8	21702.7	21727.5	21752.4	21777.3	21802.2	21827.1	21852.0	21876.9	21901.8	1450
1460	21926.8	21951.7	21976.7	22001.7	22026.6	22051.6	22076.6	22101.6	22126.6	22151.6	1460
1470	22176.7	22201.7	22226.8	22251.8	22276.9	22301.9	22327.0	22352.1	22377.2	22402.3	1470
1480	22427.4	22452.6	22477.7	22502.9	22528.0	22553.2	22578.3	22603.5	22628.7	22653.9	1480
1490	22679.1	22704.3	22729.6	22754.8	22780.0	22805.3	22830.5	22855.8	22881.1	22906.4	1490
1500	22931.7										1500

6.2 Platinum versus Palladium: Temperature at intervals of 10 μV

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
0	0.00	1.88	3.76	5.63	7.50	9.36	11.22	13.07	14.91	16.75	0
100	18.59	20.42	22.24	24.06	25.87	27.68	29.49	31.29	33.09	34.88	100
200	36.67	38.45	40.23	42.00	43.77	45.54	47.30	49.06	50.82	52.57	200
300	54.31	56.06	57.80	59.53	61.26	62.99	64.72	66.44	68.16	69.87	300
400	71.58	73.29	74.99	76.69	78.39	80.09	81.78	83.46	85.15	86.83	400
500	88.51	90.18	91.86	93.52	95.19	96.85	98.51	100.17	101.82	103.47	500
600	105.12	106.77	108.41	110.05	111.68	113.32	114.95	116.57	118.20	119.82	600
700	121.44	123.06	124.67	126.28	127.89	129.49	131.09	132.69	134.29	135.88	700
800	137.47	139.06	140.64	142.23	143.81	145.38	146.96	148.53	150.10	151.66	800
900	153.22	154.78	156.34	157.90	159.45	161.00	162.54	164.09	165.63	167.17	900
1000	168.70	170.23	171.76	173.29	174.82	176.34	177.86	179.37	180.89	182.40	1000
1100	183.91	185.41	186.91	188.41	189.91	191.40	192.90	194.38	195.87	197.35	1100
1200	198.83	200.31	201.79	203.26	204.73	206.20	207.66	209.12	210.58	212.04	1200
1300	213.49	214.94	216.39	217.83	219.28	220.71	222.15	223.59	225.02	226.45	1300
1400	227.87	229.29	230.71	232.13	233.55	234.96	236.37	237.77	239.18	240.58	1400
1500	241.98	243.37	244.77	246.16	247.55	248.93	250.31	251.69	253.07	254.44	1500
1600	255.81	257.18	258.55	259.91	261.27	262.63	263.99	265.34	266.69	268.03	1600
1700	269.38	270.72	272.06	273.40	274.73	276.06	277.39	278.71	280.04	281.36	1700
1800	282.68	283.99	285.30	286.61	287.92	289.23	290.53	291.83	293.12	294.42	1800
1900	295.71	297.00	298.28	299.57	300.85	302.13	303.40	304.68	305.95	307.22	1900
2000	308.48	309.75	311.01	312.26	313.52	314.77	316.02	317.27	318.52	319.76	2000
2100	321.00	322.24	323.48	324.71	325.94	327.17	328.39	329.62	330.84	332.06	2100
2200	333.27	334.48	335.70	336.90	338.11	339.31	340.52	341.72	342.91	344.11	2200
2300	345.30	346.49	347.68	348.86	350.04	351.22	352.40	353.58	354.75	355.92	2300
2400	357.09	358.26	359.42	360.58	361.74	362.90	364.05	365.21	366.36	367.50	2400
2500	368.65	369.79	370.93	372.07	373.21	374.35	375.48	376.61	377.74	378.86	2500
2600	379.99	381.11	382.23	383.35	384.46	385.58	386.69	387.80	388.90	390.01	2600
2700	391.11	392.21	393.31	394.41	395.50	396.59	397.68	398.77	399.86	400.94	2700
2800	402.02	403.10	404.18	405.26	406.33	407.41	408.48	409.54	410.61	411.67	2800
2900	412.74	413.80	414.86	415.91	416.97	418.02	419.07	420.12	421.17	422.21	2900
3000	423.25	424.30	425.34	426.37	427.41	428.44	429.48	430.51	431.53	432.56	3000
3100	433.59	434.61	435.63	436.65	437.67	438.68	439.70	440.71	441.72	442.73	3100
3200	443.73	444.74	445.74	446.75	447.75	448.74	449.74	450.74	451.73	452.72	3200
3300	453.71	454.70	455.68	456.67	457.65	458.63	459.61	460.59	461.57	462.54	3300
3400	463.52	464.49	465.46	466.43	467.39	468.36	469.32	470.29	471.25	472.21	3400
3500	473.16	474.12	475.07	476.03	476.98	477.93	478.87	479.82	480.77	481.71	3500
3600	482.65	483.59	484.53	485.47	486.41	487.34	488.27	489.21	490.14	491.06	3600
3700	491.99	492.92	493.84	494.77	495.69	496.61	497.53	498.44	499.36	500.27	3700
3800	501.19	502.10	503.01	503.92	504.83	505.73	506.64	507.54	508.44	509.34	3800
3900	510.24	511.14	512.04	512.93	513.83	514.72	515.61	516.50	517.39	518.28	3900

Platinum versus Palladium
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
4000	519.17	520.05	520.93	521.82	522.70	523.58	524.46	525.33	526.21	527.09	4000
4100	527.96	528.83	529.70	530.57	531.44	532.31	533.18	534.04	534.90	535.77	4100
4200	536.63	537.49	538.35	539.21	540.06	540.92	541.77	542.63	543.48	544.33	4200
4300	545.18	546.03	546.87	547.72	548.57	549.41	550.25	551.09	551.93	552.77	4300
4400	553.61	554.45	555.29	556.12	556.95	557.79	558.62	559.45	560.28	561.11	4400
4500	561.94	562.76	563.59	564.41	565.23	566.06	566.88	567.70	568.52	569.33	4500
4600	570.15	570.97	571.78	572.60	573.41	574.22	575.03	575.84	576.65	577.46	4600
4700	578.26	579.07	579.87	580.68	581.48	582.28	583.08	583.88	584.68	585.48	4700
4800	586.28	587.07	587.87	588.66	589.45	590.25	591.04	591.83	592.62	593.41	4800
4900	594.19	594.98	595.76	596.55	597.33	598.12	598.90	599.68	600.46	601.24	4900
5000	602.01	602.79	603.57	604.34	605.12	605.89	606.66	607.44	608.21	608.98	5000
5100	609.75	610.52	611.28	612.05	612.82	613.58	614.34	615.11	615.87	616.63	5100
5200	617.39	618.15	618.91	619.67	620.43	621.18	621.94	622.69	623.45	624.20	5200
5300	624.95	625.70	626.45	627.20	627.95	628.70	629.45	630.20	630.94	631.69	5300
5400	632.43	633.17	633.92	634.66	635.40	636.14	636.88	637.62	638.36	639.09	5400
5500	639.83	640.57	641.30	642.03	642.77	643.50	644.23	644.96	645.69	646.42	5500
5600	647.15	647.88	648.61	649.34	650.06	650.79	651.51	652.24	652.96	653.68	5600
5700	654.40	655.12	655.84	656.56	657.28	658.00	658.72	659.43	660.15	660.87	5700
5800	661.58	662.30	663.01	663.72	664.43	665.15	665.86	666.57	667.27	667.98	5800
5900	668.69	669.40	670.10	670.81	671.51	672.22	672.92	673.63	674.33	675.03	5900
6000	675.73	676.43	677.13	677.83	678.53	679.23	679.92	680.62	681.32	682.01	6000
6100	682.71	683.40	684.09	684.79	685.48	686.17	686.86	687.55	688.24	688.93	6100
6200	689.62	690.31	690.99	691.68	692.37	693.05	693.74	694.42	695.11	695.79	6200
6300	696.47	697.15	697.83	698.52	699.20	699.87	700.55	701.23	701.91	702.59	6300
6400	703.26	703.94	704.61	705.29	705.96	706.64	707.31	707.98	708.66	709.33	6400
6500	710.00	710.67	711.34	712.01	712.68	713.34	714.01	714.68	715.34	716.01	6500
6600	716.68	717.34	718.00	718.67	719.33	719.99	720.66	721.32	721.98	722.64	6600
6700	723.30	723.96	724.62	725.28	725.93	726.59	727.25	727.90	728.56	729.21	6700
6800	729.87	730.52	731.18	731.83	732.48	733.13	733.79	734.44	735.09	735.74	6800
6900	736.39	737.04	737.68	738.33	738.98	739.63	740.27	740.92	741.57	742.21	6900
7000	742.85	743.50	744.14	744.79	745.43	746.07	746.71	747.35	747.99	748.63	7000
7100	749.27	749.91	750.55	751.19	751.83	752.46	753.10	753.74	754.37	755.01	7100
7200	755.64	756.28	756.91	757.55	758.18	758.81	759.44	760.08	760.71	761.34	7200
7300	761.97	762.60	763.23	763.86	764.49	765.11	765.74	766.37	767.00	767.62	7300
7400	768.25	768.87	769.50	770.12	770.75	771.37	771.99	772.62	773.24	773.86	7400
7500	774.48	775.10	775.72	776.34	776.96	777.58	778.20	778.82	779.44	780.06	7500
7600	780.67	781.29	781.91	782.52	783.14	783.75	784.37	784.98	785.60	786.21	7600
7700	786.82	787.44	788.05	788.66	789.27	789.88	790.49	791.10	791.71	792.32	7700
7800	792.93	793.54	794.15	794.76	795.36	795.97	796.58	797.18	797.79	798.39	7800
7900	799.00	799.60	800.21	800.81	801.42	802.02	802.62	803.22	803.83	804.43	7900

Platinum versus Palladium
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
8000	805.03	805.63	806.23	806.83	807.43	808.03	808.63	809.23	809.83	810.42	8000
8100	811.02	811.62	812.21	812.81	813.41	814.00	814.60	815.19	815.79	816.38	8100
8200	816.98	817.57	818.16	818.75	819.35	819.94	820.53	821.12	821.71	822.30	8200
8300	822.89	823.48	824.07	824.66	825.25	825.84	826.43	827.01	827.60	828.19	8300
8400	828.78	829.36	829.95	830.53	831.12	831.70	832.29	832.87	833.46	834.04	8400
8500	834.62	835.21	835.79	836.37	836.95	837.53	838.12	838.70	839.28	839.86	8500
8600	840.44	841.02	841.60	842.17	842.75	843.33	843.91	844.49	845.06	845.64	8600
8700	846.22	846.79	847.37	847.95	848.52	849.10	849.67	850.25	850.82	851.39	8700
8800	851.97	852.54	853.11	853.68	854.26	854.83	855.40	855.97	856.54	857.11	8800
8900	857.68	858.25	858.82	859.39	859.96	860.53	861.10	861.67	862.23	862.80	8900
9000	863.37	863.94	864.50	865.07	865.64	866.20	866.77	867.33	867.90	868.46	9000
9100	869.03	869.59	870.15	870.72	871.28	871.84	872.40	872.97	873.53	874.09	9100
9200	874.65	875.21	875.77	876.33	876.89	877.45	878.01	878.57	879.13	879.69	9200
9300	880.25	880.81	881.36	881.92	882.48	883.04	883.59	884.15	884.71	885.26	9300
9400	885.82	886.37	886.93	887.48	888.04	888.59	889.14	889.70	890.25	890.81	9400
9500	891.36	891.91	892.46	893.01	893.57	894.12	894.67	895.22	895.77	896.32	9500
9600	896.87	897.42	897.97	898.52	899.07	899.62	900.17	900.72	901.26	901.81	9600
9700	902.36	902.91	903.45	904.00	904.55	905.09	905.64	906.18	906.73	907.27	9700
9800	907.82	908.36	908.91	909.45	910.00	910.54	911.08	911.63	912.17	912.71	9800
9900	913.25	913.80	914.34	914.88	915.42	915.96	916.50	917.04	917.58	918.12	9900
10000	918.66	919.20	919.74	920.28	920.82	921.36	921.90	922.44	922.98	923.51	10000
10100	924.05	924.59	925.12	925.66	926.20	926.73	927.27	927.81	928.34	928.88	10100
10200	929.41	929.95	930.48	931.02	931.55	932.08	932.62	933.15	933.68	934.22	10200
10300	934.75	935.28	935.81	936.35	936.88	937.41	937.94	938.47	939.00	939.53	10300
10400	940.06	940.59	941.12	941.65	942.18	942.71	943.24	943.77	944.30	944.83	10400
10500	945.35	945.88	946.41	946.94	947.47	947.99	948.52	949.05	949.57	950.10	10500
10600	950.62	951.15	951.68	952.20	952.73	953.25	953.77	954.30	954.82	955.35	10600
10700	955.87	956.39	956.92	957.44	957.96	958.49	959.01	959.53	960.05	960.58	10700
10800	961.10	961.62	962.14	962.66	963.18	963.70	964.22	964.74	965.26	965.78	10800
10900	966.30	966.82	967.34	967.86	968.38	968.90	969.41	969.93	970.45	970.97	10900
11000	971.48	972.00	972.52	973.04	973.55	974.07	974.58	975.10	975.62	976.13	11000
11100	976.65	977.16	977.68	978.19	978.71	979.22	979.74	980.25	980.76	981.28	11100
11200	981.79	982.30	982.82	983.33	983.84	984.35	984.87	985.38	985.89	986.40	11200
11300	986.91	987.43	987.94	988.45	988.96	989.47	989.98	990.49	991.00	991.51	11300
11400	992.02	992.53	993.04	993.54	994.05	994.56	995.07	995.58	996.09	996.59	11400
11500	997.10	997.61	998.12	998.62	999.13	999.64	1000.14	1000.65	1001.16	1001.66	11500
11600	1002.17	1002.67	1003.18	1003.68	1004.19	1004.69	1005.20	1005.70	1006.21	1006.71	11600
11700	1007.22	1007.72	1008.22	1008.73	1009.23	1009.73	1010.24	1010.74	1011.24	1011.74	11700
11800	1012.24	1012.75	1013.25	1013.75	1014.25	1014.75	1015.25	1015.75	1016.26	1016.76	11800
11900	1017.26	1017.76	1018.26	1018.76	1019.26	1019.76	1020.25	1020.75	1021.25	1021.75	11900

Platinum versus Palladium
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
12000	1022.25	1022.75	1023.25	1023.74	1024.24	1024.74	1025.24	1025.74	1026.23	1026.73	12000
12100	1027.23	1027.72	1028.22	1028.72	1029.21	1029.71	1030.20	1030.70	1031.20	1031.69	12100
12200	1032.19	1032.68	1033.18	1033.67	1034.17	1034.66	1035.15	1035.65	1036.14	1036.64	12200
12300	1037.13	1037.62	1038.12	1038.61	1039.10	1039.59	1040.09	1040.58	1041.07	1041.56	12300
12400	1042.06	1042.55	1043.04	1043.53	1044.02	1044.51	1045.00	1045.49	1045.98	1046.47	12400
12500	1046.97	1047.46	1047.95	1048.44	1048.92	1049.41	1049.90	1050.39	1050.88	1051.37	12500
12600	1051.86	1052.35	1052.84	1053.32	1053.81	1054.30	1054.79	1055.28	1055.76	1056.25	12600
12700	1056.74	1057.22	1057.71	1058.20	1058.68	1059.17	1059.66	1060.14	1060.63	1061.11	12700
12800	1061.60	1062.09	1062.57	1063.06	1063.54	1064.03	1064.51	1065.00	1065.48	1065.96	12800
12900	1066.45	1066.93	1067.42	1067.90	1068.38	1068.87	1069.35	1069.83	1070.32	1070.80	12900
13000	1071.28	1071.76	1072.25	1072.73	1073.21	1073.69	1074.17	1074.65	1075.14	1075.62	13000
13100	1076.10	1076.58	1077.06	1077.54	1078.02	1078.50	1078.98	1079.46	1079.94	1080.42	13100
13200	1080.90	1081.38	1081.86	1082.34	1082.82	1083.30	1083.78	1084.26	1084.73	1085.21	13200
13300	1085.69	1086.17	1086.65	1087.12	1087.60	1088.08	1088.56	1089.03	1089.51	1089.99	13300
13400	1090.46	1090.94	1091.42	1091.89	1092.37	1092.85	1093.32	1093.80	1094.27	1094.75	13400
13500	1095.23	1095.70	1096.18	1096.65	1097.13	1097.60	1098.08	1098.55	1099.02	1099.50	13500
13600	1099.97	1100.45	1100.92	1101.39	1101.87	1102.34	1102.81	1103.29	1103.76	1104.23	13600
13700	1104.71	1105.18	1105.65	1106.12	1106.60	1107.07	1107.54	1108.01	1108.48	1108.95	13700
13800	1109.43	1109.90	1110.37	1110.84	1111.31	1111.78	1112.25	1112.72	1113.19	1113.66	13800
13900	1114.13	1114.60	1115.07	1115.54	1116.01	1116.48	1116.95	1117.42	1117.89	1118.36	13900
14000	1118.83	1119.29	1119.76	1120.23	1120.70	1121.17	1121.64	1122.10	1122.57	1123.04	14000
14100	1123.51	1123.97	1124.44	1124.91	1125.38	1125.84	1126.31	1126.78	1127.24	1127.71	14100
14200	1128.17	1128.64	1129.11	1129.57	1130.04	1130.50	1130.97	1131.43	1131.90	1132.37	14200
14300	1132.83	1133.30	1133.76	1134.22	1134.69	1135.15	1135.62	1136.08	1136.55	1137.01	14300
14400	1137.47	1137.94	1138.40	1138.86	1139.33	1139.79	1140.25	1140.72	1141.18	1141.64	14400
14500	1142.10	1142.57	1143.03	1143.49	1143.95	1144.42	1144.88	1145.34	1145.80	1146.26	14500
14600	1146.72	1147.18	1147.65	1148.11	1148.57	1149.03	1149.49	1149.95	1150.41	1150.87	14600
14700	1151.33	1151.79	1152.25	1152.71	1153.17	1153.63	1154.09	1154.55	1155.01	1155.47	14700
14800	1155.93	1156.39	1156.84	1157.30	1157.76	1158.22	1158.68	1159.14	1159.59	1160.05	14800
14900	1160.51	1160.97	1161.43	1161.88	1162.34	1162.80	1163.26	1163.71	1164.17	1164.63	14900
15000	1165.08	1165.54	1166.00	1166.45	1166.91	1167.36	1167.82	1168.28	1168.73	1169.19	15000
15100	1169.64	1170.10	1170.55	1171.01	1171.47	1171.92	1172.38	1172.83	1173.28	1173.74	15100
15200	1174.19	1174.65	1175.10	1175.56	1176.01	1176.46	1176.92	1177.37	1177.83	1178.28	15200
15300	1178.73	1179.19	1179.64	1180.09	1180.55	1181.00	1181.45	1181.90	1182.36	1182.81	15300
15400	1183.26	1183.71	1184.17	1184.62	1185.07	1185.52	1185.97	1186.42	1186.88	1187.33	15400
15500	1187.78	1188.23	1188.68	1189.13	1189.58	1190.03	1190.48	1190.93	1191.39	1191.84	15500
15600	1192.29	1192.74	1193.19	1193.64	1194.09	1194.54	1194.98	1195.43	1195.88	1196.33	15600
15700	1196.78	1197.23	1197.68	1198.13	1198.58	1199.03	1199.47	1199.92	1200.37	1200.82	15700
15800	1201.27	1201.72	1202.16	1202.61	1203.06	1203.51	1203.95	1204.40	1204.85	1205.30	15800
15900	1205.74	1206.19	1206.64	1207.08	1207.53	1207.98	1208.42	1208.87	1209.32	1209.76	15900

Platinum versus Palladium
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
16000	1210.21	1210.66	1211.10	1211.55	1211.99	1212.44	1212.88	1213.33	1213.77	1214.22	16000
16100	1214.67	1215.11	1215.56	1216.00	1216.44	1216.89	1217.33	1217.78	1218.22	1218.67	16100
16200	1219.11	1219.55	1220.00	1220.44	1220.89	1221.33	1221.77	1222.22	1222.66	1223.10	16200
16300	1223.55	1223.99	1224.43	1224.88	1225.32	1225.76	1226.20	1226.65	1227.09	1227.53	16300
16400	1227.97	1228.41	1228.86	1229.30	1229.74	1230.18	1230.62	1231.07	1231.51	1231.95	16400
16500	1232.39	1232.83	1233.27	1233.71	1234.15	1234.59	1235.03	1235.48	1235.92	1236.36	16500
16600	1236.80	1237.24	1237.68	1238.12	1238.56	1239.00	1239.44	1239.88	1240.32	1240.75	16600
16700	1241.19	1241.63	1242.07	1242.51	1242.95	1243.39	1243.83	1244.27	1244.71	1245.14	16700
16800	1245.58	1246.02	1246.46	1246.90	1247.34	1247.77	1248.21	1248.65	1249.09	1249.52	16800
16900	1249.96	1250.40	1250.84	1251.27	1251.71	1252.15	1252.59	1253.02	1253.46	1253.90	16900
17000	1254.33	1254.77	1255.21	1255.64	1256.08	1256.51	1256.95	1257.39	1257.82	1258.26	17000
17100	1258.69	1259.13	1259.56	1260.00	1260.44	1260.87	1261.31	1261.74	1262.18	1262.61	17100
17200	1263.05	1263.48	1263.91	1264.35	1264.78	1265.22	1265.65	1266.09	1266.52	1266.96	17200
17300	1267.39	1267.82	1268.26	1268.69	1269.12	1269.56	1269.99	1270.42	1270.86	1271.29	17300
17400	1271.72	1272.16	1272.59	1273.02	1273.46	1273.89	1274.32	1274.75	1275.19	1275.62	17400
17500	1276.05	1276.48	1276.91	1277.35	1277.78	1278.21	1278.64	1279.07	1279.50	1279.94	17500
17600	1280.37	1280.80	1281.23	1281.66	1282.09	1282.52	1282.95	1283.38	1283.81	1284.25	17600
17700	1284.68	1285.11	1285.54	1285.97	1286.40	1286.83	1287.26	1287.69	1288.12	1288.55	17700
17800	1288.98	1289.41	1289.84	1290.27	1290.69	1291.12	1291.55	1291.98	1292.41	1292.84	17800
17900	1293.27	1293.70	1294.13	1294.55	1294.98	1295.41	1295.84	1296.27	1296.70	1297.12	17900
18000	1297.55	1297.98	1298.41	1298.84	1299.26	1299.69	1300.12	1300.55	1300.97	1301.40	18000
18100	1301.83	1302.26	1302.68	1303.11	1303.54	1303.96	1304.39	1304.82	1305.24	1305.67	18100
18200	1306.10	1306.52	1306.95	1307.37	1307.80	1308.23	1308.65	1309.08	1309.50	1309.93	18200
18300	1310.36	1310.78	1311.21	1311.63	1312.06	1312.48	1312.91	1313.33	1313.76	1314.18	18300
18400	1314.61	1315.03	1315.46	1315.88	1316.31	1316.73	1317.15	1317.58	1318.00	1318.43	18400
18500	1318.85	1319.28	1319.70	1320.12	1320.55	1320.97	1321.39	1321.82	1322.24	1322.66	18500
18600	1323.09	1323.51	1323.93	1324.36	1324.78	1325.20	1325.63	1326.05	1326.47	1326.89	18600
18700	1327.32	1327.74	1328.16	1328.58	1329.00	1329.43	1329.85	1330.27	1330.69	1331.11	18700
18800	1331.54	1331.96	1332.38	1332.80	1333.22	1333.64	1334.07	1334.49	1334.91	1335.33	18800
18900	1335.75	1336.17	1336.59	1337.01	1337.43	1337.85	1338.27	1338.69	1339.11	1339.53	18900
19000	1339.96	1340.38	1340.80	1341.22	1341.64	1342.05	1342.47	1342.89	1343.31	1343.73	19000
19100	1344.15	1344.57	1344.99	1345.41	1345.83	1346.25	1346.67	1347.09	1347.51	1347.93	19100
19200	1348.34	1348.76	1349.18	1349.60	1350.02	1350.44	1350.85	1351.27	1351.69	1352.11	19200
19300	1352.53	1352.95	1353.36	1353.78	1354.20	1354.62	1355.03	1355.45	1355.87	1356.29	19300
19400	1356.70	1357.12	1357.54	1357.95	1358.37	1358.79	1359.21	1359.62	1360.04	1360.46	19400
19500	1360.87	1361.29	1361.71	1362.12	1362.54	1362.95	1363.37	1363.79	1364.20	1364.62	19500
19600	1365.03	1365.45	1365.87	1366.28	1366.70	1367.11	1367.53	1367.94	1368.36	1368.77	19600
19700	1369.19	1369.60	1370.02	1370.43	1370.85	1371.26	1371.68	1372.09	1372.51	1372.92	19700
19800	1373.34	1373.75	1374.17	1374.58	1374.99	1375.41	1375.82	1376.24	1376.65	1377.06	19800
19900	1377.48	1377.89	1378.30	1378.72	1379.13	1379.55	1379.96	1380.37	1380.78	1381.20	19900

Platinum versus Palladium
Temperature at intervals of 10 μV *(continued)*

E/μV	0	10	20	30	40	50	60	70	80	90	*E*/μV
						t_{90} / °C					
20000	1381.61	1382.02	1382.44	1382.85	1383.26	1383.68	1384.09	1384.50	1384.91	1385.33	20000
20100	1385.74	1386.15	1386.56	1386.98	1387.39	1387.80	1388.21	1388.62	1389.04	1389.45	20100
20200	1389.86	1390.27	1390.68	1391.09	1391.50	1391.92	1392.33	1392.74	1393.15	1393.56	20200
20300	1393.97	1394.38	1394.79	1395.21	1395.62	1396.03	1396.44	1396.85	1397.26	1397.67	20300
20400	1398.08	1398.49	1398.90	1399.31	1399.72	1400.13	1400.54	1400.95	1401.36	1401.77	20400
20500	1402.18	1402.59	1403.00	1403.41	1403.82	1404.23	1404.64	1405.05	1405.46	1405.86	20500
20600	1406.27	1406.68	1407.09	1407.50	1407.91	1408.32	1408.73	1409.14	1409.54	1409.95	20600
20700	1410.36	1410.77	1411.18	1411.59	1411.99	1412.40	1412.81	1413.22	1413.63	1414.03	20700
20800	1414.44	1414.85	1415.26	1415.67	1416.07	1416.48	1416.89	1417.30	1417.70	1418.11	20800
20900	1418.52	1418.92	1419.33	1419.74	1420.15	1420.55	1420.96	1421.37	1421.77	1422.18	20900
21000	1422.59	1422.99	1423.40	1423.80	1424.21	1424.62	1425.02	1425.43	1425.84	1426.24	21000
21100	1426.65	1427.05	1427.46	1427.87	1428.27	1428.68	1429.08	1429.49	1429.89	1430.30	21100
21200	1430.70	1431.11	1431.51	1431.92	1432.32	1432.73	1433.13	1433.54	1433.94	1434.35	21200
21300	1434.75	1435.16	1435.56	1435.97	1436.37	1436.78	1437.18	1437.58	1437.99	1438.39	21300
21400	1438.80	1439.20	1439.61	1440.01	1440.41	1440.82	1441.22	1441.62	1442.03	1442.43	21400
21500	1442.84	1443.24	1443.64	1444.05	1444.45	1444.85	1445.25	1445.66	1446.06	1446.46	21500
21600	1446.87	1447.27	1447.67	1448.08	1448.48	1448.88	1449.28	1449.69	1450.09	1450.49	21600
21700	1450.89	1451.29	1451.70	1452.10	1452.50	1452.90	1453.31	1453.71	1454.11	1454.51	21700
21800	1454.91	1455.31	1455.72	1456.12	1456.52	1456.92	1457.32	1457.72	1458.12	1458.53	21800
21900	1458.93	1459.33	1459.73	1460.13	1460.53	1460.93	1461.33	1461.73	1462.13	1462.53	21900
22000	1462.93	1463.34	1463.74	1464.14	1464.54	1464.94	1465.34	1465.74	1466.14	1466.54	22000
22100	1466.94	1467.34	1467.74	1468.14	1468.54	1468.94	1469.34	1469.74	1470.13	1470.53	22100
22200	1470.93	1471.33	1471.73	1472.13	1472.53	1472.93	1473.33	1473.73	1474.13	1474.53	22200
22300	1474.92	1475.32	1475.72	1476.12	1476.52	1476.92	1477.32	1477.71	1478.11	1478.51	22300
22400	1478.91	1479.31	1479.71	1480.10	1480.50	1480.90	1481.30	1481.70	1482.09	1482.49	22400
22500	1482.89	1483.29	1483.68	1484.08	1484.48	1484.88	1485.27	1485.67	1486.07	1486.47	22500
22600	1486.86	1487.26	1487.66	1488.05	1488.45	1488.85	1489.24	1489.64	1490.04	1490.43	22600
22700	1490.83	1491.23	1491.62	1492.02	1492.42	1492.81	1493.21	1493.60	1494.00	1494.40	22700
22800	1494.79	1495.19	1495.58	1495.98	1496.38	1496.77	1497.17	1497.56	1497.96	1498.35	22800
22900	1498.75	1499.14	1499.54	1499.93	1500.33						22900

6.3 Thermoelectric values at the defining fixed points of the ITS-90 for Pt/Pd thermocouples (informative)

Fixed point	t_{90} / °C	E/μV	S/(μV/°C)
Water TP	0.01	0.05	5.297
Gallium MP	29.7646	161.52	5.549
Indium FP	156.5985	921.65	6.429
Tin FP	231.928	1428.56	7.059
Zinc FP	419.527	2964.35	9.533
Aluminum FP	660.323	5782.38	13.975
Silver FP	961.78	10813.09	19.187
Gold FP	1064.18	12853.21	20.631
Copper FP	1084.62	13277.65	20.899

Annex A

Gold versus Platinum coefficients

A.1 (normative) Coefficients of the reference function for Au/Pt thermocouples

The form of the function for the temperature range 0 °C to 1 000 °C is:

$$E\ /\ \mu\mathrm{V}\ = \sum_{i=0}^{9} a_i \left(t_{90}\ /\ ^\circ C\right)^i$$

The function gives EMF, E/μV, in microvolts as a function of temperature, t_{90}, in the stated range.

Temperature range	0 °C to 1 000 °C
EMF range	0 µV to 17085.3 µV
a_0 =	0.000 000 00
a_1 =	6.036 198 61
a_2 =	1.936 729 74E–02
a_3 =	–2.229 986 14E–05
a_4 =	3.287 118 59E–08
a_5 =	–4.242 061 93E–11
a_6 =	4.569 270 38E–14
a_7 =	–3.394 302 59E–17
a_8 =	1.429 815 90E–20
a_9 =	–2.516 727 87E–24

A.2 (informative) **Coefficients of an approximate inverse function for Au/Pt thermocouples**

The form of the inverse function for the temperature range 0 °C to 209 °C is:

$$t_{90}\ /\,°C = \sum_{i=0}^{8} b_i \left(E\ /\,\mu\mathrm{V}\ \right)^i$$

The form of the inverse function for the temperature range 209 °C to 1 000 °C is:

$$t_{90}\ /\,°C = \sum_{i=0}^{11} b_i \left(\left(E\ /\,\mu\mathrm{V}\ -9645\ \right)/\,7620\ \right)^i$$

The function is used to calculate approximate values of temperature, t_{90}, in degrees Celsius as a function of the EMF, $E/\mu\mathrm{V}$, in microvolts in the stated ranges.

Temperature range	**0 °C to 209 °C**	**209 °C to 1 000 °C**
EMF range	**0 µV to 1953 µV**	**1953 µV to 17085 µV**
b_0 =	0.000 000	6.763 360E+02
b_1 =	1.654 390 3E−01	3.735 504E+02
b_2 =	−8.409 883 5E−05	−5.537 363E+01
b_3 =	8.416 613 2E−08	1.701 900E+01
b_4 =	−7.517 469 1E−11	−6.098 761E+00
b_5 =	4.849 553 6E−14	2.457 162E+00
b_6 =	−2.013 876 0E−17	−3.385 575E+00
b_7 =	4.747 562 6E−21	3.853 735E+00
b_8 =	−4.797 308 2E−25	1.178 891E+00
b_9 =		−2.702 558E+00
b_{10} =		−1.686 158E+00
b_{11} =		1.876 968E+00
Error range	–5 mK to 3 mK	–2 mK to 2 mK

Annex B

Platinum versus Palladium Coefficients

B.1 (normative) Coefficients of the reference function for Pt/Pd thermocouples

The form of the function for both temperature ranges is:

$$E\ /\ \mu\mathrm{V} = \sum_{i=0}^{n} a_i \left(t_{90}\ /\ ^\circ C\right)^i$$

The function gives the EMF, *E/* μV, in microvolts as a function of the temperature, t_{90}, in degrees Celsius in the stated ranges.

Temperature range	0 °C to 660.323 °C	660.323 °C to 1 500 °C
EMF range	0 μV to 5782.4 μV	5782.4 μV to 22 932 μV
a_0 =	0.000 000	−4.977 137 0E+02
a_1 =	5.296 958	1.018 254 5E+01
a_2 =	4.610 494E−03	−1.579 351 5E−02
a_3 =	−9.602 271E−06	3.636 170 0E−05
a_4 =	2.992 243E−08	−2.690 150 9E−08
a_5 =	−2.012 523E−11	9.562 736 6E−12
a_6 =	−1.268 514E−14	−1.357 073 7E−15
a_7 =	2.257 823E−17	
a_8 =	−8.510 068E−21	

B.2 (informative) **Coefficients of an approximate inverse function for Pt/Pd thermocouples**

The form of the inverse function for the temperature ranges 0 °C to 660.323 °C and 660.323 °C to 1 500 °C is:

$$t_{90} / °C = \sum_{i=0}^{n} b_i \left(E / \mu V\right)^i$$

The function gives temperature, t_{90}, in degrees Celsius as a function of the EMF, $E/\mu V$, in microvolts in the stated ranges.

Temperature range	**0 °C to 660.323 °C**	**660.323 °C to 1 500 °C**
EMF range	**0 µV to 5782.4 µV**	**5782.4 µV to 22 932 µV**
b_0 =	1.128 648 1E−03	1.681 398 72E+01
b_1 =	1.886 785 0E−01	1.831 741 63E-01
b_2 =	−3.001 252 1E−05	−2.091 790 74E-05
b_3 =	1.846 873 7E−08	2.142 812 41E-09
b_4 =	−1.249 860 8E−11	−1.518 770 21E-13
b_5 =	5.241 650 9E−15	7.212 177 60E-18
b_6 =	−1.391 528 6E−18	−2.185 981 64E-22
b_7 =	2.387 290 8E−22	3.815 100 60E-27
b_8 =	−2.580 243 6E−26	−2.912 944 07E-32
b_9 =	1.601 881 9E−30	
b_{10} =	−4.360 816 6E−35	
Error range	−3 mK to 2 mK	−2.7 mK to 2.0 mK

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