

NTC SMD Thermistors

NC 12 – NC 20 (PdPtAg Termination)



Chip thermistors are a high quality and low cost device especially developed for surface mounting applications. They are widely used for temperature compensation but can also achieve temperature control of printed circuits. Its silver -

palladium - platinum metallization provides a high degree of resistance to dewetting of the terminations during soldering (typically 260°C / 15 s). Parts are suitable for hybrid assembly process, not suitable for lead free soldering.

Types	NC 12 IEC SIZE : 0805	NC 20 IEC SIZE : 1206
DIMENSIONS: millimeters (inches)		
Terminations	Silver – palladium – platinum metallization	
Marking	On packaging only	
Climatic category	40/125/56	
Operating temperature	-55°C to +150°C	
Tolerance on R _n (25°C)	±3%*, ±5%, ±10%, ±20%	
Maximum dissipation at 25°C	0.12 W	0.24 W
Thermal dissipation factor	2 mW/°C	4 mW/°C
Thermal time constant	5 s	7 s

Resistance - Temperature characteristics: pages 29 to 33.

FEATURES

- Fast thermal response
- Commercial, Industrial and Automotive Applications
- PdPtAg Termination
- Suitable for hybrid assembly
- AEC-Q200 qualified

APPLICATIONS

- LCD compensation
- Battery packs
- Mobile phones
- CD players
- Heating systems
- Air-conditioning systems
- Refrigeration
- Temperature control of Switch Mode Power Supplies
- Compensation of pressure sensors
- Protection of power transistors in various electronic circuits and more



HOW TO ORDER

NC 20	K 0	0103	M	BA
Type	Material Code	Resistance	Tolerance	Suffix: Packaging
NC12 (0805) NC20 (1206)	K (See tables pages 15)	10,000 Ω (See tables page 15)	H (±3%)* J (±5%) K (±10%) M (±20%)	--: Bulk (5000 pcs/reel) NC20 BA: Plastic tape (180mm diam. reel, 3000 pcs/reel) BE: Plastic tape (1/2 reel, 1500 pcs/reel) BC: Plastic tape (330mm diam. reel), 10,000 pcs/reel) NC12 BB: Cardboard tape (180mm diam. reel, 4000 pcs/reel) BF: Cardboard tape (1/2 reel, 2000 pcs/reel) BD: Cardboard tape (330mm diam. reel, 10,000 pcs/reel)

* Optional tolerance, please contact factory

NTC SMD Thermistors

NC 12 – NC 20 (PdPtAg Termination)



TABLE OF VALUES

NC 12 IEC SIZE : 0805				
Types	Rn at 25°C (Ω)	Material Code	B (K) ($\Delta B/B$ (1) $\pm 5\%$ (2) $\pm 3\%$)	α at 25°C (%/°C)
NC 12 KC 0 180 NC 12 KC 0 220 NC 12 KC 0 270 NC 12 KC 0 330 NC 12 KC 0 390 NC 12 KC 0 470 NC 12 KC 0 560 NC 12 KC 0 680 NC 12 KC 0 820 NC 12 KC 0 101	18 22 27 33 39 47 56 68 82 100	KC	3470 $\pm$ 5%	- 3.9
NC 12 MC 0 121 NC 12 MC 0 151 NC 12 MC 0 181 NC 12 MC 0 221 NC 12 MC 0 271 NC 12 MC 0 331 NC 12 MC 0 391 NC 12 MC 0 471 NC 12 MC 0 561 NC 12 MC 0 681 NC 12 MC 0 821 NC 12 MC 0 102 NC 12 MC 0 122 NC 12 MC 0 152 NC 12 MC 0 182 NC 12 MC 0 222 NC 12 MC 0 272 NC 12 MC 0 332	120 150 180 220 270 330 390 470 560 680 820 1,000 1,200 1,500 1,800 2,200 2,700 3,300	MC	3910 $\pm$ 3%	- 4.4
NC 12 J 0 0332 NC 12 J 0 0392 NC 12 J 0 0472 NC 12 J 0 0562	3,300 3,900 4,700 5,600	J	3480 $\pm$ 3%	- 3.9
NC 12 K 0 0682 NC 12 K 0 0822 NC 12 K 0 0103 NC 12 K 0 0123	6,800 8,200 10,000 12,000	K	3630 $\pm$ 3%	- 4.0
NC 12 L 0 0153 NC 12 L 0 0183	15,000 18,000	L	3790 $\pm$ 3%	- 4.2
NC 12 M 0 0223 NC 12 M 0 0273 NC 12 M 0 0333 NC 12 M 0 0393	22,000 27,000 33,000 39,000	M	3950 $\pm$ 3%	- 4.4
NC 12 N 0 0473 NC 12 N 0 0563	47,000 56,000	N	4080 $\pm$ 3%	- 4.6
NC 12 L 2 0683	68,000	L2	3805 $\pm$ 3%	- 4.1
NC 12 N 0 0823	82,000	N	4080 $\pm$ 3%	- 4.6
NC 12 P 0 0104 NC 12 P 0 0124 NC 12 P 0 0154 NC 12 P 0 0184	100,000 120,000 150,000 180,000	P	4220 $\pm$ 3%	- 4.7
NC 12 Q 0 0224	220,000	Q	4300 $\pm$ 3%	-4.7

NC 20 IEC SIZE : 1206				
Types	Rn at 25°C (Ω)	Material Code	B (K) ($\Delta B/B$ (1) $\pm 5\%$ (2) $\pm 3\%$)	α at 25°C (%/°C)
NC 20 KC 0 100 NC 20 KC 0 120 NC 20 KC 0 150 NC 20 KC 0 180 NC 20 KC 0 220 NC 20 KC 0 270 NC 20 KC 0 330 NC 20 KC 0 390 NC 20 KC 0 470 NC 20 KC 0 560 NC 20 KC 0 680 NC 20 KC 0 820 NC 20 KC 0 101	10 12 15 18 22 27 33 39 47 56 68 82 100	KC	3470 $\pm$ 5%	- 3.9
NC 20 MC 0 121 NC 20 MC 0 151 NC 20 MC 0 181 NC 20 MC 0 221 NC 20 MC 0 271 NC 20 MC 0 331 NC 20 MC 0 391 NC 20 MC 0 471 NC 20 MC 0 561 NC 20 MC 0 681 NC 20 MC 0 821 NC 20 MC 0 102 NC 20 MC 0 122 NC 20 MC 0 152	120 150 180 220 270 330 390 470 560 680 820 1,000 1,200 1,500	MC	3910 $\pm$ 3%	- 4.4
NC 20 I 0 0182 NC 20 I 0 0222 NC 20 I 0 0272 NC 20 I 0 0332	1,800 2,200 2,700 3,300	I	3250 $\pm$ 5%	- 3.7
NC 20 J 0 0392 NC 20 J 0 0472 NC 20 J 0 0562 NC 20 J 0 0682	3,900 4,700 5,600 6,800	J	3480 $\pm$ 3%	- 3.9
NC 20 K 0 0822 NC 20 K 0 0103 NC 20 K 0 0123 NC 20 K 0 0153	8,200 10,000 12,000 15,000	K	3630 $\pm$ 3%	- 4.0
NC 20 L 0 0183 NC 20 L 0 0223	18,000 22,000	L	3790 $\pm$ 3%	- 4.2
NC 20 M 0 0273 NC 20 M 0 0333 NC 20 M 0 0393 NC 20 M 0 0473	27,000 33,000 39,000 47,000	M	3950 $\pm$ 3%	- 4.4
NC 20 N 0 0563 NC 20 N 0 0683 NC 20 N 0 0823 NC 20 N 0 0104	56,000 68,000 82,000 100,000	N	4080 $\pm$ 3%	- 4.6
NC 20 P 0 0124 NC 20 P 0 0154 NC 20 P 0 0184 NC 20 P 0 0224	120,000 150,000 180,000 220,000	P	4220 $\pm$ 3%	- 4.7
NC 20 Q 0 0274 NC 20 Q 0 0334 NC 20 Q 0 0394 NC 20 Q 0 0474	270,000 330,000 390,000 470,000	Q	4300 $\pm$ 3%	- 4.7
NC 20 R 0 0564 NC 20 R 0 0684 NC 20 R 0 0824 NC 20 R 0 0105	560,000 680,000 820,000 1,000,000	R	4400 $\pm$ 3%	- 4.8

Packaging for Automatic Insertion

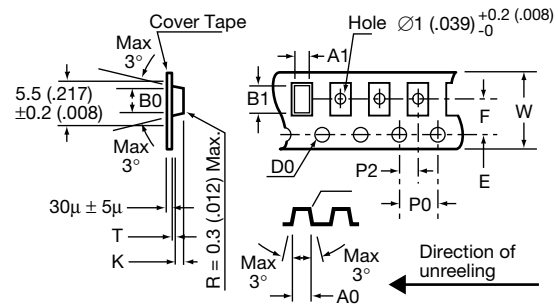
NTC Chip Thermistors / NC/NB Series



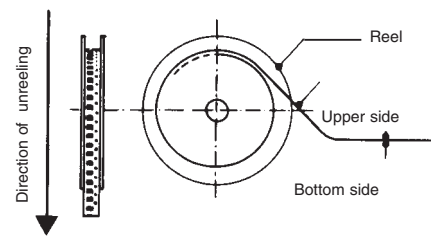
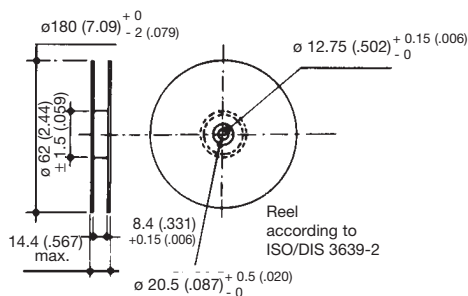
AUTOMATIC INSERTION

Super 8 Plastic Tape Packaging:

The mechanical and dimensional reel characteristics are in accordance with the IEC publication 286-3.



Designation	Symbol	Value	Tolerance
Tape width	W	8	±0.2
Tape thickness	T	0.4 max.	
Pitch of the sprocket holes	P0	4	±0.1
Diameter of the sprocket holes	D0	1.5 -0	±0.1
Distance	E	1.75	±0.1
Distance (center to center)	F	3.5	±0.05
Distance (center to center)	P2	2	±0.1
Sizes of the cavities NC 12 (0805)	A0	1.5	±0.1
	B0	2.4	±0.1
	K	1.4 max.	K ±0.1 (size is adjustable) (K = t1 +0.2)
	A0	1.95	±0.1
	B0	3.55	±0.1
	K	1.5 max.	K ±0.1 (size is adjustable) (K = t1 +0.2)
NC 20 (1206)			



QUANTITY PER REEL

Type	Suffix	Description	Qty Per Reel
NB20 NC20	BA	Plastic tape (180mm diam. reel)	3,000 pcs
	BE	Plastic tape (1/2 reel)	1,500 pcs
	BC	Plastic tape (330mm diam. reel)	10,000 pcs

Packaging for Automatic Insertion

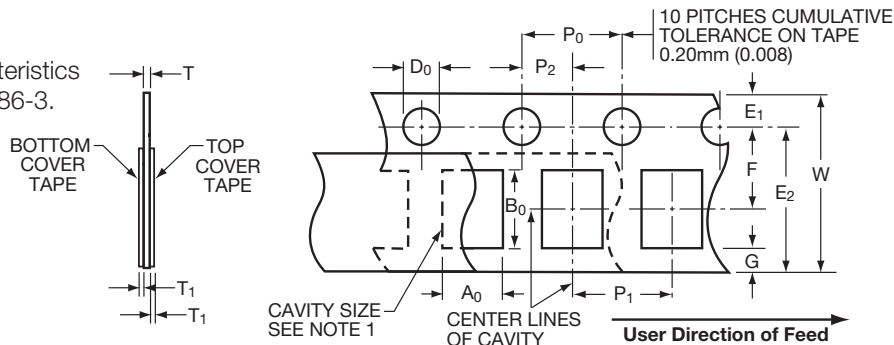
NTC Chip Thermistors / NC/NB Series



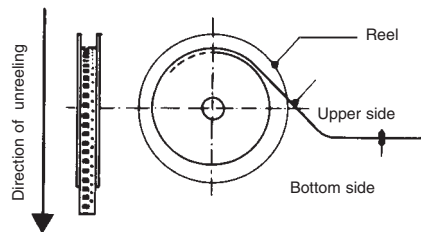
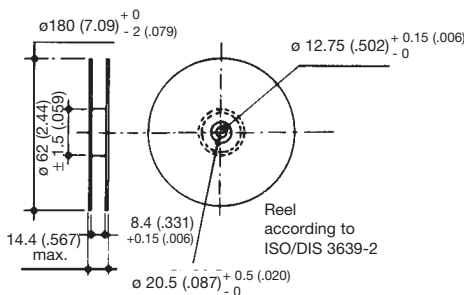
AUTOMATIC INSERTION

8mm Paper Tape Packaging:

The mechanical and dimensional reel characteristics are in accordance with the IEC publication 286-3.



Designation	Symbol	Value	Tolerance
Tape width	W	8	-0.1/+0.3
Tape thickness	T	1.1 max.	
Pitch of the sprocket holes	P ₀	4	±0.1
Diameter of the sprocket holes	D ₀	1.5 -0/+0.1	±0.1
Distance	E ₁	1.75	±0.1
Distance (center to center)	F	3.5	±0.05
Distance (center to center)	P ₂	2	±0.05
Cover tape thickness	T ₁	0.10 max.	
Distance	E ₂	6.25 min.	
Distance	G	0.75 min.	
Component pitch	P ₁	4	±0.1
0805/0603 0402		2	±0.1



QUANTITY PER REEL

Type	Suffix	Description	Qty Per Reel
NB12	BB	Cardboard tape (180mm diam. reel)	4,000 pcs
NC12	BF	Cardboard tape (1/2 reel)	2,000 pcs
NB21	BD	Cardboard tape (330mm diam. reel)	10,000 pcs

Surface Mounting Guide

Chip Thermistor – Application Notes



STORAGE

Good solderability is maintained for at least twelve months, provided the components are stored in their “as received” packaging at less than 40°C and 70% RH.

SOLDERABILITY / LEACHING

Terminations to be well soldered after immersion in a 60/40 tin/lead solder bath at $235 \pm 5^\circ\text{C}$ for 2 ± 1 seconds.

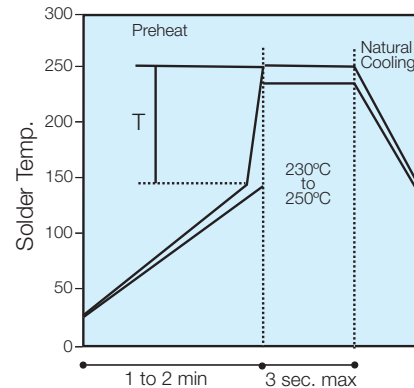
Terminations will resist leaching for at least the immersion times and conditions recommendations shown below.

P/N	Termination Type	Solder Tin/Lead	Solder Temp °C	Immersion Time Seconds
NC	AgPdPt	60/40	260 ± 5	15 max
NB	Nickel Barrier	60/40	260 ± 5	30 ± 1

NB products are compatible with a wide range of soldering conditions consistent with good manufacturing practice for surface mount components. This includes Pb free reflow processes with peak temperatures up to 270°C . Recommended profiles for reflow and wave soldering are shown below for reference.

NC products are recommended for lead soldering application or gluing techniques.

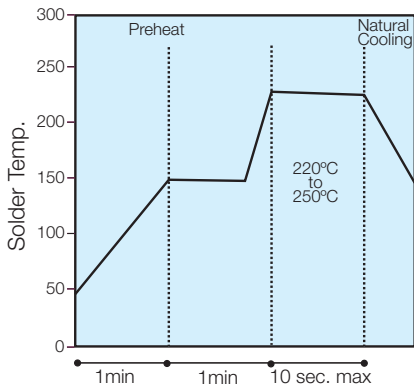
Wave



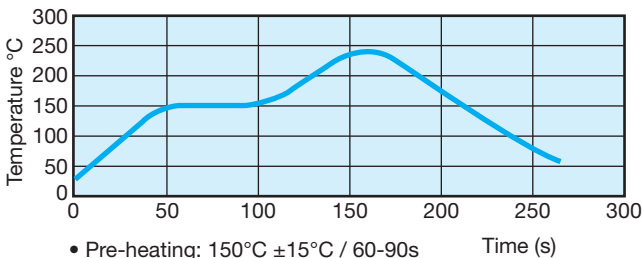
(Preheat chips before soldering)
T/maximum 150°C

- The visual standards used for evaluation of solder joints will need to be modified as lead free joints are not as bright as with tin-lead pastes and the fillet may not be as large.
- Resin color may darken slightly due to the increase in temperature required for the new pastes.
- Lead-free solder pastes do not allow the same self alignment as lead containing systems. Standard mounting pads are acceptable, but machine set up may need to be modified.

Reflow



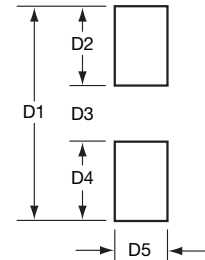
(Minimize soldering time)



- Pre-heating: $150^\circ\text{C} \pm 15^\circ\text{C}$ / 60-90s
- Max. Peak Gradient: 2.5°C/s
- Peak Temperature: $245^\circ\text{C} \pm 5^\circ\text{C}$
- Time at $>230^\circ\text{C}$: 40s Max.

RECOMMENDED SOLDERING PAD LAYOUT

Dimensions in mm (inches)



REFLOW SOLDERING

Case Size	P/N	D1	D2	D3	D4	D5
0402	NB23	1.70 (.067)	0.60 (.024)	0.50 (.020)	0.60 (.024)	0.50 (.020)
0603	NB21	2.30 (.091)	0.80 (.031)	0.70 (.028)	0.80 (.031)	0.75 (.030)
0805	NB12	3.00 (.118)	1.00 (.039)	1.00 (.039)	1.00 (.039)	1.25 (.049)
1206	NB20	4.00 (.157)	1.00 (.039)	2.00 (.079)	1.00 (.039)	2.50 (.098)

WAVE SOLDERING

Case Size	P/N	D1	D2	D3	D4	D5
0603	NB21	3.10 (.122)	1.20 (.047)	0.70 (.028)	1.20 (.047)	0.75 (.030)
0805	NB12	4.00 (.157)	1.50 (.059)	1.00 (.039)	1.50 (.059)	1.25 (.049)
1206	NB20	5.00 (.197)	1.50 (.059)	2.00 (.079)	1.50 (.059)	1.60 (.063)

Tables of Resistance vs Temperature

T (°C)	Material B(K)		
	I 3250		
	R(T) / R25	TF (%)	α (%/°C)
-55	42.35	21.9	-5.98
-50	31.48	20.0	-5.78
-45	23.63	18.1	-5.59
-40	17.91	16.3	-5.41
-35	13.70	14.6	-5.23
-30	10.58	13.1	-5.06
-25	8.232	11.6	-4.90
-20	6.460	10.1	-4.74
-15	5.110	8.8	-4.59
-10	4.072	7.5	-4.45
-5	3.268	6.3	-4.31
0	2.641	5.1	-4.18
5	2.148	4.0	-4.05
10	1.759	2.9	-3.92
15	1.449	1.9	-3.81
20	1.200	0.9	-3.69
25	1.000	0.0	-3.58
30	0.8377	0.9	-3.48
35	0.7054	1.8	-3.38
40	0.5969	2.6	-3.28
45	0.5076	3.5	-3.19
50	0.4336	4.3	-3.10
55	0.3720	5.1	-3.01
60	0.3206	5.9	-2.93
65	0.2774	6.6	-2.85
70	0.2410	7.4	-2.77
75	0.2102	8.1	-2.70
80	0.1839	8.8	-2.63
85	0.1616	9.5	-2.56
90	0.1424	10.2	-2.49
95	0.1259	10.9	-2.43
100	0.1117	11.5	-2.36
105	0.09938	12.2	-2.30
110	0.08869	12.8	-2.25
115	0.07938	13.4	-2.19
120	0.07124	14.0	-2.14
125	0.06410	14.6	-2.08
130	0.05783	15.2	-2.03
135	0.05230	15.7	-1.98
140	0.04741	16.3	-1.94
145	0.04308	16.8	-1.89
150	0.03924	17.4	-1.85

T (°C)	Material B(K)		
	J-J5 3480		
	R(T) / R25	TF (%)	α (%/°C)
-55	51.75	20.5	-6.23
-50	37.98	17.7	-6.03
-45	28.15	15.2	-5.84
-40	21.07	13.0	-5.65
-35	15.91	11.0	-5.48
-30	12.13	9.3	-5.31
-25	9.321	7.8	-5.15
-20	7.222	6.4	-4.99
-15	5.640	5.2	-4.84
-10	4.438	4.2	-4.69
-5	3.517	3.3	-4.55
0	2.807	2.5	-4.42
5	2.255	1.8	-4.29
10	1.824	1.2	-4.17
15	1.484	0.7	-4.05
20	1.215	0.3	-3.93
25	1.0000	0.0	-3.82
30	0.8278	0.3	-3.71
35	0.6889	0.7	-3.61
40	0.5763	1.1	-3.51
45	0.4845	1.5	-3.41
50	0.4092	2.0	-3.32
55	0.3472	2.5	-3.23
60	0.2960	3.0	-3.15
65	0.2533	3.5	-3.06
70	0.2177	4.1	-2.98
75	0.1879	4.7	-2.90
80	0.1628	5.3	-2.83
85	0.1415	5.9	-2.76
90	0.12349	6.5	-2.69
95	0.10813	7.1	-2.62
100	0.09499	7.7	-2.55
105	0.08372	8.4	-2.49
110	0.07402	9.0	-2.43
115	0.06564	9.7	-2.37
120	0.05837	10.3	-2.31
125	0.05206	11.0	-2.26
130	0.04656	11.6	-2.21
135	0.04175	12.3	-2.15
140	0.03753	13.0	-2.10
145	0.03382	13.6	-2.06
150	0.03055	14.3	-2.01

T (°C)	Material B(K)		
	K 3630		
	R(T) / R25	TF (%)	α (%/°C)
-55	56.27	21.4	-6.25
-50	41.22	18.5	-6.06
-45	30.48	15.9	-5.89
-40	22.74	13.6	-5.71
-35	17.11	11.5	-5.55
-30	12.98	9.7	-5.39
-25	9.931	8.1	-5.24
-20	7.655	6.7	-5.09
-15	5.945	5.4	-4.95
-10	4.651	4.4	-4.81
-5	3.663	3.4	-4.67
0	2.905	2.6	-4.54
5	2.319	1.9	-4.42
10	1.862	1.3	-4.30
15	1.505	0.8	-4.18
20	1.223	0.3	-4.07
25	1.0000	0.0	-3.96
30	0.8219	0.3	-3.85
35	0.6792	0.7	-3.75
40	0.5641	1.1	-3.65
45	0.4708	1.6	-3.55
50	0.3949	2.1	-3.46
55	0.3327	2.6	-3.37
60	0.2816	3.1	-3.28
65	0.2393	3.7	-3.20
70	0.2043	4.3	-3.12
75	0.1751	4.9	-3.04
80	0.1506	5.5	-2.96
85	0.1301	6.1	-2.89
90	0.1128	6.8	-2.82
95	0.09811	7.4	-2.75
100	0.08564	8.1	-2.68
105	0.07501	8.7	-2.61
110	0.06591	9.4	-2.55
115	0.05809	10.1	-2.49
120	0.05136	10.8	-2.43
125	0.04554	11.5	-2.37
130	0.04049	12.2	-2.32
135	0.03611	12.8	-2.26
140	0.03228	13.5	-2.21
145	0.02893	14.2	-2.16
150	0.02600	14.9	-2.11

T (°C)	Material B(K)		
	KA 3625		
	R(T) / R25	TF (%)	α (%/°C)
-55	61.22	7.1	-6.55
-50	44.25	6.1	-6.33
-45	32.34	5.3	-6.12
-40	23.88	4.5	-5.92
-35	17.81	3.8	-5.73
-30	13.41	3.2	-5.54
-25	10.19	2.7	-5.37
-20	7.815	2.2	-5.20
-15	6.041	1.8	-5.04
-10	4.707	1.5	-4.89
-5	3.696	1.1	-4.74
0	2.923	0.9	-4.60
5	2.329	0.6	-4.46
10	1.867	0.4	-4.33
15	1.507	0.3	-4.21
20	1.224	0.1	-4.09
25	1.0000	0.0	-3.97
30	0.8217	0.1	-3.86
35	0.6788	0.2	-3.75
40	0.5638	0.4	-3.65
45	0.4707	0.5	-3.55
50	0.3948	0.7	-3.46
55	0.3328	0.9	-3.37
60	0.2817	1.0	-3.28
65	0.2396	1.2	-3.19
70	0.2046	1.4	-3.11
75	0.1754	1.6	-3.03
80	0.1510	1.8	-2.96
85	0.1305	2.0	-2.88
90	0.1131	2.3	-2.81
95	0.09844	2.5	-2.74
100	0.08596	2.7	-2.68
105	0.07530	2.9	-2.61
110	0.06618	3.1	-2.55
115	0.05833	3.4	-2.49
120	0.05157	3.6	-2.43
125	0.04573	3.8	-2.38
130	0.04065	4.0	-2.32
135	0.03624	4.3	-2.27
140	0.03239	4.5	-2.22
145	0.02902	4.7	-2.17
150	0.02607	5.0	-2.12

T (°C)	Material B(K)		
	KC 3470		
	R(T) / R25	TF (%)	α (%/°C)
-55	60.08	34.0	-7.00
-50	43.19	29.4	-6.71
-45	31.42	25.3	-6.44
-40	23.13	21.6	-6.18
-35	17.22	18.4	-5.94
-30	12.95	15.5	-5.71
-25	9.842	12.9	-5.49
-20	7.550	10.7	-5.29
-15	5.845	8.7	-5.10
-10	4.564	6.9	-4.91
-5	3.594	5.4	-4.74
0	2.853	4.1	-4.58
5	2.281	3.0	-4.42
10	1.838	2.0	-4.27
15	1.491	1.2	-4.13
20	1.217	0.5	-4.00
25	1.0000	0.0	-3.90
30	0.8267	0.5	-3.74
35	0.6873	1.1	-3.63
40	0.5747	1.8	-3.52
45	0.4830	2.5	-3.41
50	0.4081	3.3	-3.31
55	0.3465	4.1	-3.21
60	0.2955	5.0	-3.12
65	0.2532	5.9	-3.03
70	0.2179	6.8	-2.94
75	0.1883	7.8	-2.86
80	0.1634	8.7	-2.78
85	0.1423	9.7	-2.71
90	0.1244	10.8	-2.63
95	0.10915	11.8	-2.56
100	0.09608	12.9	-2.50
105	0.08486	13.9	-2.43
110	0.07519	15.0	-2.37
115	0.06683	16.1	-2.31
120	0.05957	17.2	-2.25
125	0.05325	18.3	-2.20
130	0.04774	19.4	-2.14
135	0.04290	20.5	-2.09
140	0.03866	21.6	-2.04
145	0.03492	22.7	-1.99
150	0.03162	23.8	-1.95

T (°C)	Material B(K)		
	L 3790		
	R(T) / R25	TF (%)	α (%/°C)
-55	82.54	22.3	-7.12
-50	58.03	19.3	-6.87
-45	41.31	16.6	-6.63
-40	29.75	14.2	-6.40
-35	21.68	12.0	-6.18
-30	15.97	10.1	-5.98
-25	11.88	8.5	-5.78
-20	8.931	7.0	-5.59
-15	6.777	5.7	-5.40
-10	5.188	4.5	-5.23
-5	4.007	3.6	-5.06
0	3.120	2.7	-4.90
5	2.449	2.0	-4.75
10	1.937	1.3	-4.60
15	1.543	0.8	-4.46
20	1.238	0.4	-4.33
25	1.0000	0.0	-4.20
30	0.8128	0.3	-4.07
35	0.6648	0.7	-3.95
40	0.5469	1.2	-3.84
45	0.4525	1.6	-3.73
50	0.3764	2.2	-3.62
55	0.3148	2.7	-3.52
60	0.2646	3.3	-3.42
65	0.2235	3.8	-3.33
70	0.1896	4.5	-3.24
75	0.1616	5.1	-3.15
80	0.1383	5.7	-3.07
85	0.1189	6.4	-2.98
90	0.1026	7.1	-2.91
95	0.08888	7.7	-2.83
100	0.07728	8.4	-2.76
105	0.06744	9.1	-2.69
110	0.05905	9.8	-2.62
115	0.05188	10.5	-2.56
120	0.04572	11.3	-2.49
125	0.04042	12.0	-2.43
130	0.03585	12.7	-2.37
135	0.03188	13.4	-2.32
140	0.02843	14.1	-2.26
145	0.02542	14.8	-2.21
150	0.02279	15.6	-2.16

Tables of Resistance vs Temperature

T (°C)	Material B(K)		
	L2 3805		
	R(T) / R25	TF (%)	α (%/°C)
-55	62.45	22.4	-6.41
-50	45.40	19.3	-6.22
-45	33.33	16.6	-6.03
-40	24.70	14.2	-5.85
-35	18.47	12.1	-5.68
-30	13.92	10.2	-5.52
-25	10.58	8.5	-5.36
-20	8.110	7.0	-5.21
-15	6.260	5.7	-5.07
-10	4.867	4.6	-4.93
-5	3.810	3.6	-4.80
0	3.003	2.7	-4.67
5	2.382	2.0	-4.55
10	1.901	1.3	-4.43
15	1.526	0.8	-4.31
20	1.232	0.4	-4.20
25	1.0000	0.0	-4.10
30	0.8161	0.3	-4.00
35	0.6694	0.7	-3.90
40	0.5518	1.2	-3.80
45	0.4570	1.7	-3.71
50	0.3802	2.2	-3.62
55	0.3178	2.7	-3.53
60	0.2667	3.3	-3.45
65	0.2248	3.9	-3.37
70	0.1902	4.5	-3.29
75	0.1615	5.1	-3.22
80	0.1377	5.8	-3.14
85	0.1179	6.4	-3.07
90	0.1012	7.1	-3.00
95	0.08721	7.8	-2.94
100	0.07539	8.5	-2.87
105	0.06538	9.2	-2.81
110	0.05688	9.9	-2.75
115	0.04963	10.6	-2.69
120	0.04343	11.3	-2.63
125	0.03812	12.0	-2.58
130	0.03354	12.7	-2.53
135	0.02960	13.5	-2.47
140	0.02618	14.2	-2.42
145	0.02322	14.9	-2.37
150	0.02064	15.6	-2.33

T (°C)	Material B(K)		
	M 3950		
	R(T) / R25	TF (%)	α (%/°C)
-55	99.59	23.2	-7.42
-50	68.97	20.1	-7.16
-45	48.40	17.3	-6.91
-40	34.38	14.8	-6.67
-35	24.71	12.5	-6.45
-30	17.97	10.6	-6.23
-25	13.20	8.8	-6.02
-20	9.804	7.3	-5.82
-15	7.352	5.9	-5.63
-10	5.565	4.7	-5.45
-5	4.251	3.7	-5.28
0	3.275	2.8	-5.11
5	2.544	2.0	-4.95
10	1.992	1.4	-4.80
15	1.572	0.8	-4.65
20	1.249	0.4	-4.51
25	1.0000	0.0	-4.38
30	0.8057	0.4	-4.25
35	0.6534	0.8	-4.12
40	0.5331	1.2	-4.00
45	0.4376	1.7	-3.89
50	0.3612	2.2	-3.77
55	0.2998	2.8	-3.67
60	0.2501	3.4	-3.57
65	0.2097	4.0	-3.47
70	0.1767	4.6	-3.37
75	0.1496	5.3	-3.28
80	0.1272	6.0	-3.19
85	0.1087	6.7	-3.11
90	0.09320	7.4	-3.03
95	0.08025	8.1	-2.95
100	0.06937	8.8	-2.87
105	0.06019	9.5	-2.80
110	0.05242	10.2	-2.73
115	0.04580	11.0	-2.66
120	0.04016	11.7	-2.60
125	0.03532	12.5	-2.53
130	0.03117	13.2	-2.47
135	0.02758	14.0	-2.41
140	0.02448	14.7	-2.36
145	0.02179	15.5	-2.30
150	0.01945	16.2	-2.25

T (°C)	Material B(K)		
	MA 3965		
	R(T) / R25	TF (%)	α (%/°C)
-55	101.1	3.9	-7.49
-50	69.81	3.4	-7.22
-45	48.87	2.9	-6.96
-40	34.65	2.5	-6.71
-35	24.87	2.1	-6.48
-30	18.06	1.8	-6.26
-25	13.26	1.5	-6.05
-20	9.837	1.2	-5.84
-15	7.372	1.0	-5.65
-10	5.578	0.8	-5.47
-5	4.259	0.6	-5.29
0	3.280	0.5	-5.12
5	2.548	0.3	-4.96
10	1.994	0.2	-4.81
15	1.573	0.1	-4.66
20	1.250	0.1	-4.52
25	1.0000	0.0	-4.38
30	0.8054	0.1	-4.25
35	0.6528	0.1	-4.13
40	0.5324	0.2	-4.01
45	0.4368	0.3	-3.90
50	0.3603	0.4	-3.79
55	0.2989	0.5	-3.68
60	0.2492	0.6	-3.58
65	0.2088	0.7	-3.48
70	0.1758	0.8	-3.39
75	0.1487	0.9	-3.30
80	0.1263	1.0	-3.21
85	0.1078	1.1	-3.13
90	0.09233	1.2	-3.05
95	0.07941	1.3	-2.97
100	0.06857	1.5	-2.90
105	0.05942	1.6	-2.83
110	0.05167	1.7	-2.76
115	0.04509	1.8	-2.69
120	0.03948	2.0	-2.62
125	0.03467	2.1	-2.56
130	0.03055	2.2	-2.50
135	0.02699	2.3	-2.44
140	0.02392	2.5	-2.39
145	0.02125	2.6	-2.33
150	0.01894	2.7	-2.28

T (°C)	Material B(K)		
	MC 3910		
	R(T) / R25	TF (%)	α (%/°C)
-55	100.6	23.0	-7.56
-50	69.29	19.9	-7.27
-45	48.40	17.1	-7.00
-40	34.27	14.6	-6.75
-35	24.57	12.4	-6.50
-30	17.83	10.5	-6.27
-25	13.09	8.7	-6.05
-20	9.71	7.2	-5.84
-15	7.282	5.9	-5.64
-10	5.514	4.7	-5.45
-5	4.215	3.7	-5.27
0	3.250	2.8	-5.10
5	2.528	2.0	-4.93
10	1.982	1.4	-4.77
15	1.567	0.8	-4.62
20	1.247	0.4	-4.48
25	1.0000	0.0	-4.34
30	0.8072	0.4	-4.21
35	0.6559	0.8	-4.08
40	0.5362	1.2	-3.96
45	0.4410	1.7	-3.85
50	0.3647	2.2	-3.74
55	0.3033	2.8	-3.63
60	0.2535	3.4	-3.53
65	0.2130	4.0	-3.43
70	0.1798	4.6	-3.34
75	0.1525	5.2	-3.25
80	0.1300	5.9	-3.16
85	0.1112	6.6	-3.08
90	0.09552	7.3	-2.99
95	0.08239	8.0	-2.92
100	0.07133	8.7	-2.84
105	0.06199	9.4	-2.77
110	0.05406	10.1	-2.70
115	0.04731	10.9	-2.63
120	0.04153	11.6	-2.57
125	0.03658	12.3	-2.51
130	0.03231	13.1	-2.45
135	0.02863	13.8	-2.39
140	0.02544	14.6	-2.33
145	0.02267	15.3	-2.28
150	0.02025	16.1	-2.23

T (°C)	Material B(K)		
	N 4080		
	R(T) / R25	TF (%)	α (%/°C)
-55	110.1	24.0	-7.50
-50	75.89	20.7	-7.25
-45	52.97	17.8	-7.01
-40	37.42	15.2	-6.78
-35	26.75	12.9	-6.56
-30	19.33	10.9	-6.35
-25	14.11	9.1	-6.14
-20	10.41	7.5	-5.95
-15	7.758	6.1	-5.76
-10	5.834	4.9	-5.58
-5	4.426	3.8	-5.41
0	3.387	2.9	-5.24
5	2.614	2.1	-5.08
10	2.033	1.4	-4.93
15	1.593	0.9	-4.78
20	1.258	0.4	-4.64
25	1.0000	0.0	-4.51
30	0.8004	0.4	-4.37
35	0.6449	0.8	-4.25
40	0.5228	1.3	-4.13
45	0.4264	1.8	-4.01
50	0.3497	2.3	-3.90
55	0.2885	2.9	-3.79
60	0.2392	3.5	-3.68
65	0.1994	4.1	-3.58
70	0.1671	4.8	-3.49
75	0.1406	5.5	-3.39
80	0.1189	6.2	-3.30
85	0.1010	6.9	-3.22
90	0.08616	7.6	-3.13
95	0.07381	8.3	-3.05
100	0.06347	9.1	-2.97
105	0.05480	9.8	-2.90
110	0.04748	10.6	-2.83
115	0.04129	11.3	-2.76
120	0.03603	12.1	-2.69
125	0.03155	12.9	-2.62
130	0.02771	13.7	-2.56
135	0.02442	14.4	-2.50
140	0.02158	15.2	-2.44
145	0.01913	16.0	-2.38
150	0.01700	16.8	-2.33

T (°C)	Material B(K)		
	NA 4100		
	R(T) / R25	TF (%)	α (%/°C)
-55	109.5	8.0	-7.53
-50	75.44	6.9	-7.27
-45	52.64	6.0	-7.02
-40	37.19	5.1	-6.78
-35	26.59	4.3	-6.56
-30	19.22	3.7	-6.34
-25	14.05	3.1	-6.14
-20	10.37	2.5	-5.94
-15	7.730	2.1	-5.75
-10	5.817	1.6	-5.57
-5	4.417	1.3	-5.40
0	3.382	1.0	-5.23
5	2.611	0.7	-5.08
10	2.032	0.5	-4.92
15	1.593	0.3	-4.78
20	1.258	0.1	-4.64
25	1.0000	0.0	-4.51
30	0.8003	0.1	-4.38
35	0.6446	0.3	-4.25
40	0.5224	0.4	-4.14
45	0.4258	0.6	-4.02
50	0.3490	0.8	-3.91
55	0.2877	1.0	-3.81
60	0.2383	1.2	-3.71
65	0.1984	1.4	-3.61
70	0.1660	1.6	-3.51
75	0.1395	1.8	-3.42
80	0.1178	2.1	-3.34
85	0.09989	2.3	-3.25
90	0.08506	2.5	-3.17
95	0.07271	2.8	-3.09
100	0.06240	3.0	-3.02
105	0.05375	3.3	-2.94
110	0.04647	3.5	-2.87
115	0.04032	3.8	-2.81
120	0.03509	4.1	-2.74
125	0.03065	4.3	-2.68
130	0.02685	4.6	-2.61
135	0.02359	4.8	-2.55
140	0.02079	5.1	-2.50
145	0.01837	5.4	-2.44
150	0.01628	5.6	-2.39

Tables of Resistance vs Temperature

T (°C)	Material B(K)		
	NC 4080		
	R(T) / R25	TF (%)	α (%/°C)
-55	105.4	24.0	-7.45
-50	72.89	20.7	-7.20
-45	51.04	17.8	-6.95
-40	36.18	15.2	-6.72
-35	25.94	12.9	-6.50
-30	18.81	10.9	-6.29
-25	13.78	9.1	-6.08
-20	10.20	7.5	-5.89
-15	7.621	6.1	-5.71
-10	5.748	4.9	-5.53
-5	4.373	3.8	-5.36
0	3.355	2.9	-5.20
5	2.595	2.1	-5.04
10	2.023	1.4	-4.89
15	1.588	0.9	-4.75
20	1.256	0.4	-4.61
25	1.0000	0.0	-4.48
30	0.8014	0.4	-4.35
35	0.6463	0.8	-4.23
40	0.5243	1.3	-4.11
45	0.4278	1.8	-4.00
50	0.3510	2.3	-3.89
55	0.2896	2.9	-3.79
60	0.2401	3.5	-3.69
65	0.2001	4.1	-3.59
70	0.1675	4.8	-3.50
75	0.1409	5.5	-3.41
80	0.1190	6.2	-3.32
85	0.1010	6.9	-3.24
90	0.08605	7.6	-3.16
95	0.07360	8.3	-3.08
100	0.06319	9.1	-3.01
105	0.05446	9.8	-2.94
110	0.04710	10.6	-2.87
115	0.04087	11.3	-2.80
120	0.03559	12.1	-2.73
125	0.03109	12.9	-2.67
130	0.02724	13.7	-2.61
135	0.02394	14.4	-2.55
140	0.02111	15.2	-2.49
145	0.01866	16.0	-2.44
150	0.01654	16.8	-2.38

T (°C)	Material B(K)		
	NE 4100		
	R(T) / R25	TF (%)	α (%/°C)
-55	97.27	24.1	-7.2
-50	67.99	20.8	-7.0
-45	48.08	17.9	-6.8
-40	34.39	15.3	-6.5
-35	24.85	13.0	-6.3
-30	18.15	11.0	-6.1
-25	13.38	9.2	-6.0
-20	9.960	7.6	-5.8
-15	7.479	6.2	-5.6
-10	5.664	4.9	-5.4
-5	4.325	3.8	-5.3
0	3.328	2.9	-5.1
5	2.581	2.1	-5.0
10	2.016	1.4	-4.9
15	1.585	0.9	-4.7
20	1.255	0.4	-4.6
25	1.0000	0.0	-4.5
30	0.8017	0.4	-4.3
35	0.6466	0.8	-4.2
40	0.5245	1.3	-4.1
45	0.4278	1.8	-4.0
50	0.3508	2.3	-3.9
55	0.2891	2.9	-3.8
60	0.2394	3.5	-3.7
65	0.1992	4.2	-3.6
70	0.1666	4.8	-3.5
75	0.1399	5.5	-3.4
80	0.11794	6.2	-3.4
85	0.09987	6.9	-3.3
90	0.08491	7.6	-3.2
95	0.07246	8.4	-3.1
100	0.06207	9.1	-3.1
105	0.05336	9.9	-3.0
110	0.04604	10.6	-2.9
115	0.03985	11.4	-2.8
120	0.03461	12.2	-2.8
125	0.03015	12.9	-2.7
130	0.02635	13.7	-2.7
135	0.02309	14.5	-2.6
140	0.0203	15.3	-2.5
145	0.01789	16.1	-2.5
150	0.01581	16.8	-2.4

T (°C)	Material B(K)		
	N5 4160		
	R(T) / R25	TF (%)	α (%/°C)
-55	115.8	16.3	-7.52
-50	79.72	14.1	-7.28
-45	55.54	12.1	-7.04
-40	39.15	10.4	-6.82
-35	27.91	8.8	-6.61
-30	20.11	7.4	-6.40
-25	14.64	6.2	-6.20
-20	10.77	5.1	-6.01
-15	7.996	4.2	-5.83
-10	5.991	3.3	-5.65
-5	4.529	2.6	-5.48
0	3.454	2.0	-5.31
5	2.655	1.4	-5.16
10	2.057	1.0	-5.00
15	1.606	0.6	-4.86
20	1.263	0.3	-4.72
25	1.0000	0.0	-4.58
30	0.7973	0.3	-4.45
35	0.6398	0.5	-4.32
40	0.5167	0.9	-4.20
45	0.4198	1.2	-4.09
50	0.3430	1.6	-3.97
55	0.2819	2.0	-3.86
60	0.2329	2.4	-3.76
65	0.1934	2.8	-3.66
70	0.1614	3.3	-3.56
75	0.1354	3.7	-3.46
80	0.1141	4.2	-3.37
85	0.09658	4.7	-3.29
90	0.08211	5.2	-3.20
95	0.07010	5.7	-3.12
100	0.06009	6.2	-3.04
105	0.05171	6.7	-2.96
110	0.04467	7.2	-2.89
115	0.03872	7.7	-2.82
120	0.03369	8.2	-2.75
125	0.02941	8.8	-2.68
130	0.02576	9.3	-2.62
135	0.02263	9.8	-2.55
140	0.01995	10.3	-2.49
145	0.01763	10.9	-2.44
150	0.01563	11.4	-2.38

T (°C)	Material B(K)		
	P 4220		
	R(T) / R25	TF (%)	α (%/°C)
-55	121.4	24.8	-7.56
-50	83.35	21.5	-7.32
-45	57.92	18.4	-7.09
-40	40.72	15.8	-6.87
-35	28.95	13.4	-6.66
-30	20.80	11.3	-6.45
-25	15.10	9.4	-6.26
-20	11.07	7.8	-6.07
-15	8.197	6.3	-5.89
-10	6.123	5.1	-5.71
-5	4.615	4.0	-5.54
0	3.508	3.0	-5.38
5	2.688	2.2	-5.22
10	2.076	1.5	-5.07
15	1.616	0.9	-4.92
20	1.267	0.4	-4.78
25	1.0000	0.0	-4.64
30	0.7949	0.4	-4.51
35	0.6359	0.8	-4.38
40	0.5120	1.3	-4.26
45	0.4148	1.8	-4.14
50	0.3379	2.4	-4.03
55	0.2769	3.0	-3.92
60	0.2281	3.6	-3.81
65	0.1890	4.3	-3.71
70	0.1573	5.0	-3.61
75	0.1316	5.7	-3.52
80	0.1106	6.4	-3.42
85	0.09337	7.1	-3.34
90	0.07918	7.9	-3.25
95	0.06743	8.6	-3.17
100	0.05766	9.4	-3.09
105	0.04950	10.2	-3.01
110	0.04266	10.9	-2.93
115	0.03691	11.7	-2.86
120	0.03204	12.5	-2.79
125	0.02791	13.3	-2.72
130	0.02439	14.1	-2.66
135	0.02139	14.9	-2.59
140	0.01881	15.7	-2.53
145	0.01660	16.5	-2.47
150	0.01469	17.3	-2.42

T (°C)	Material B(K)		
	PA 4235		
	R(T) / R25	TF (%)	α (%/°C)
-55	123.39	8.3	-7.68
-50	84.33	7.2	-7.42
-45	58.39	6.2	-7.17
-40	40.93	5.3	-6.93
-35	29.04	4.5	-6.71
-30	20.83	3.8	-6.49
-25	15.11	3.2	-6.29
-20	11.07	2.6	-6.09
-15	8.190	2.1	-5.90
-10	6.117	1.7	-5.72
-5	4.610	1.3	-5.54
0	3.505	1.0	-5.38
5	2.686	0.7	-5.22
10	2.075	0.5	-5.07
15	1.615	0.3	-4.92
20	1.267	0.1	-4.78
25	1.0000	0.0	-4.64
30	0.7949	0.1	-4.51
35	0.6359	0.3	-4.39
40	0.5119	0.4	-4.27
45	0.4145	0.6	-4.15
50	0.3376	0.8	-4.04
55	0.2764	1.0	-3.93
60	0.2276	1.2	-3.83
65	0.1883	1.4	-3.73
70	0.1566	1.7	-3.63
75	0.1308	1.9	-3.54
80	0.1098	2.1	-3.45
85	0.09257	2.4	-3.37
90	0.07836	2.6	-3.28
95	0.06661	2.9	-3.20
100	0.05685	3.1	-3.13
105	0.04870	3.4	-3.05
110	0.04188	3.7	-2.98
115	0.03614	3.9	-2.91
120	0.03129	4.2	-2.84
125	0.02719	4.5	-2.78
130	0.02370	4.7	-2.71
135	0.02072	5.0	-2.65
140	0.01817	5.3	-2.59
145	0.01598	5.5	-2.54
150	0.01409	5.8	-2.48

T (°C)	Material B(K)		
	Q 4300		
	R(T) / R25	TF (%)	α (%/°C)
-55	98.04	25.3	-6.87
-50	69.53	21.9	-6.70
-45	49.73	18.8	-6.53
-40	35.87	16.1	-6.37
-35	26.08	13.6	-6.22
-30	19.12	11.5	-6.07
-25	14.12	9.6	-5.92
-20	10.51	7.9	-5.78
-15	7.877	6.5	-5.64
-10	5.947	5.2	-5.50
-5	4.521	4.0	-5.37
0	3.460	3.1	-5.24
5	2.666	2.2	-5.11
10	2.067	1.5	-4.99
15	1.613	0.9	-4.87
20	1.266	0.4	-4.75
25	1.0000	0.0	-4.63
30	0.7944	0.4	-4.52
35	0.6347	0.8	-4.41
40	0.5099	1.3	-4.30
45	0.4119	1.9	-4.20
50	0.3344	2.4	-4.09
55	0.2730	3.1	-3.99
60	0.2239	3.7	-3.90
65	0.1846	4.4	-3.80
70	0.1529	5.1	-3.71
75	0.1272	5.8	-3.62
80	0.1063	6.5	-3.53
85	0.08927	7.2	-3.44
90	0.07526	8.0	-3.36
95	0.06372	8.8	-3.28
100	0.05417	9.6	-3.20
105	0.04622	10.4	-3.13
110	0.03960	11.2	-3.05
115	0.03405	12.0	-2.98
120	0.02938	12.8	-2.91
125	0.02545	13.6	-2.84
130	0.02211	14.4	-2.77
135	0.01928	15.2	-2.71
140	0.01686	16.0	-2.64
145	0.01479	16.8	-2.58
150	0.01302	17.7	-2.52

Tables of Resistance vs Temperature

T (°C)	Material B(K)		
	QA 4250		
	R(T) / R25	TF (%)	α (%/°C)
-55	99.06	8.3	-7.09
-50	69.60	7.2	-6.88
-45	49.42	6.2	-6.68
-40	35.45	5.3	-6.49
-35	25.67	4.5	-6.30
-30	18.77	3.8	-6.13
-25	13.84	3.2	-5.96
-20	10.29	2.6	-5.79
-15	7.719	2.1	-5.64
-10	5.834	1.7	-5.49
-5	4.442	1.3	-5.34
0	3.407	1.0	-5.20
5	2.632	0.7	-5.07
10	2.047	0.5	-4.94
15	1.602	0.3	-4.81
20	1.262	0.1	-4.69
25	1.0000	0.0	-4.57
30	0.7971	0.1	-4.46
35	0.6389	0.3	-4.35
40	0.5149	0.4	-4.24
45	0.4172	0.6	-4.14
50	0.3397	0.8	-4.04
55	0.2780	1.0	-3.95
60	0.2286	1.2	-3.85
65	0.1888	1.4	-3.76
70	0.1567	1.7	-3.68
75	0.1306	1.9	-3.59
80	0.1093	2.1	-3.51
85	0.09179	2.4	-3.43
90	0.07743	2.6	-3.36
95	0.06556	2.9	-3.28
100	0.05571	3.2	-3.21
105	0.04752	3.4	-3.14
110	0.04067	3.7	-3.07
115	0.03492	3.9	-3.01
120	0.03008	4.2	-2.94
125	0.02600	4.5	-2.88
130	0.02254	4.7	-2.82
135	0.01960	5.0	-2.76
140	0.01709	5.3	-2.71
145	0.01495	5.5	-2.65
150	0.01311	5.8	-2.60

T (°C)	Material B(K)		
	R 4400		
	R(T) / R25	TF (%)	α (%/°C)
-55	113.9	25.9	-7.13
-50	79.71	22.4	-6.95
-45	56.30	19.2	-6.77
-40	40.13	16.4	-6.60
-35	28.85	14.0	-6.44
-30	20.92	11.8	-6.28
-25	15.29	9.8	-6.12
-20	11.27	8.1	-5.97
-15	8.368	6.6	-5.82
-10	6.261	5.3	-5.68
-5	4.719	4.1	-5.53
0	3.583	3.1	-5.40
5	2.739	2.3	-5.26
10	2.108	1.5	-5.13
15	1.634	0.9	-5.00
20	1.274	0.4	-4.88
25	1.0000	0.0	-4.75
30	0.7897	0.4	-4.64
35	0.6273	0.9	-4.52
40	0.5012	1.4	-4.41
45	0.4028	1.9	-4.30
50	0.3255	2.5	-4.19
55	0.2644	3.1	-4.09
60	0.2159	3.8	-3.98
65	0.1772	4.5	-3.89
70	0.1462	5.2	-3.79
75	0.1212	5.9	-3.70
80	0.1009	6.7	-3.60
85	0.08440	7.4	-3.52
90	0.07092	8.2	-3.43
95	0.05984	9.0	-3.35
100	0.05071	9.8	-3.26
105	0.04314	10.6	-3.19
110	0.03685	11.4	-3.11
115	0.03160	12.2	-3.03
120	0.02719	13.1	-2.96
125	0.02349	13.9	-2.89
130	0.02036	14.7	-2.82
135	0.01770	15.6	-2.76
140	0.01545	16.4	-2.69
145	0.01352	17.2	-2.63
150	0.01187	18.1	-2.57

T (°C)	Material B(K)		
	RA 4380		
	R(T) / R25	TF (%)	α (%/°C)
-55	110.76	8.6	-7.24
-50	77.24	7.4	-7.03
-45	54.44	6.4	-6.83
-40	38.76	5.5	-6.63
-35	27.87	4.6	-6.45
-30	20.22	3.9	-6.27
-25	14.81	3.3	-6.10
-20	10.94	2.7	-5.93
-15	8.144	2.2	-5.78
-10	6.112	1.8	-5.62
-5	4.623	1.4	-5.48
0	3.522	1.0	-5.34
5	2.702	0.8	-5.20
10	2.087	0.5	-5.07
15	1.623	0.3	-4.94
20	1.270	0.1	-4.82
25	1.0000	0.0	-4.70
30	0.7920	0.1	-4.59
35	0.6308	0.3	-4.47
40	0.5052	0.5	-4.37
45	0.4068	0.6	-4.26
50	0.3292	0.8	-4.16
55	0.2678	1.0	-4.07
60	0.2189	1.3	-3.97
65	0.1797	1.5	-3.88
70	0.1482	1.7	-3.79
75	0.1228	2.0	-3.71
80	0.1022	2.2	-3.63
85	0.08536	2.5	-3.55
90	0.07159	2.7	-3.47
95	0.06028	3.0	-3.39
100	0.05095	3.2	-3.32
105	0.04322	3.5	-3.25
110	0.03679	3.8	-3.18
115	0.03142	4.1	-3.11
120	0.02693	4.3	-3.05
125	0.02315	4.6	-2.98
130	0.01997	4.9	-2.92
135	0.01728	5.2	-2.86
140	0.01499	5.4	-2.80
145	0.01304	5.7	-2.75
150	0.01138	6.0	-2.69

T (°C)	Material B(K)		
	RC 4340		
	R(T) / R25	TF (%)	α (%/°C)
-55	105.68	25.5	-7.15
-50	74.01	22.1	-6.95
-45	52.37	19.0	-6.75
-40	37.43	16.2	-6.56
-35	27.01	13.8	-6.38
-30	19.66	11.6	-6.20
-25	14.44	9.7	-6.04
-20	10.70	8.0	-5.87
-15	7.990	6.5	-5.72
-10	6.013	5.2	-5.57
-5	4.559	4.1	-5.42
0	3.482	3.1	-5.29
5	2.678	2.2	-5.15
10	2.074	1.5	-5.02
15	1.616	0.9	-4.90
20	1.267	0.4	-4.77
25	1.0000	0.0	-4.66
30	0.7936	0.4	-4.54
35	0.6334	0.8	-4.43
40	0.5083	1.3	-4.33
45	0.4100	1.9	-4.23
50	0.3325	2.5	-4.13
55	0.2709	3.1	-4.03
60	0.2218	3.7	-3.94
65	0.1825	4.4	-3.85
70	0.1508	5.1	-3.76
75	0.1251	5.8	-3.67
80	0.1043	6.6	-3.59
85	0.08727	7.3	-3.51
90	0.07332	8.1	-3.43
95	0.06184	8.9	-3.36
100	0.05235	9.7	-3.29
105	0.04448	10.5	-3.22
110	0.03793	11.3	-3.15
115	0.03245	12.1	-3.08
120	0.02785	12.9	-3.01
125	0.02399	13.7	-2.95
130	0.02072	14.5	-2.89
135	0.01796	15.4	-2.83
140	0.01561	16.2	-2.77
145	0.01360	17.0	-2.72
150	0.01189	17.8	-2.66

T (°C)	Material B(K)		
	S 4520		
	R(T) / R25	TF (%)	α (%/°C)
-55	126.1	26.6	-7.25
-50	87.75	23.0	-7.07
-45	61.60	19.8	-6.90
-40	43.63	16.9	-6.73
-35	31.17	14.3	-6.56
-30	22.46	12.1	-6.40
-25	16.31	10.1	-6.25
-20	11.94	8.3	-6.10
-15	8.809	6.8	-5.95
-10	6.549	5.4	-5.80
-5	4.904	4.2	-5.66
0	3.699	3.2	-5.52
5	2.810	2.3	-5.39
10	2.149	1.6	-5.26
15	1.654	1.0	-5.13
20	1.282	0.4	-5.00
25	1.0000	0.0	-4.88
30	0.7848	0.4	-4.76
35	0.6196	0.9	-4.64
40	0.4921	1.4	-4.52
45	0.3931	2.0	-4.41
50	0.3158	2.6	-4.30
55	0.2551	3.2	-4.20
60	0.2072	3.9	-4.09
65	0.1691	4.6	-3.99
70	0.1387	5.3	-3.89
75	0.1144	6.1	-3.80
80	0.0948	6.8	-3.71
85	0.0789	7.6	-3.61
90	0.06594	8.4	-3.53
95	0.05538	9.2	-3.44
100	0.04671	10.1	-3.36
105	0.03956	10.9	-3.28
110	0.03364	11.7	-3.20
115	0.02872	12.6	-3.12
120	0.02461	13.4	-3.04
125	0.02117	14.3	-2.97
130	0.01827	15.1	-2.90
135	0.01583	16.0	-2.83
140	0.01376	16.8	-2.77
145	0.01200	17.7	-2.70
150	0.01050	18.6	-2.64

T (°C)	Material B(K)		
	SC 4500		
	R(T) / R25	TF (%)	α (%/°C)
-55	129.77	26.5	-7.51
-50	89.31	22.9	-7.29
-45	62.15	19.7	-7.07
-40	43.72	16.8	-6.87
-35	31.07	14.3	-6.68
-30	22.29	12.0	-6.49
-25	16.15	10.0	-6.31
-20	11.80	8.3	-6.14
-15	8.703	6.8	-5.97
-10	6.470	5.4	-5.81
-5	4.849	4.2	-5.66
0	3.662	3.2	-5.51
5	2.786	2.3	-5.36
10	2.135	1.6	-5.23
15	1.647	0.9	-5.09
20	1.279	0.4	-4.96
25	1.0000	0.0	-4.84
30	0.7865	0.4	-4.72
35	0.6223	0.9	-4.60
40	0.4953	1.4	-4.49
45	0.3963	2.0	-4.38
50	0.3189	2.6	-4.28
55	0.2579	3.2	-4.18
60	0.2096	3.9	-4.08
65	0.1712	4.6	-3.99
70	0.1405	5.3	-3.89
75	0.1159	6.0	-3.80
80	0.09595	6.8	-3.72
85	0.07980	7.6	-3.63
90	0.06664	8.4	-3.55
95	0.05588	9.2	-3.47
100	0.04704	10.0	-3.40
105	0.03975	10.8	-3.32
110	0.03371	11.7	-3.25
115	0.02869	12.5	-3.18
120	0.02450	13.4	-3.12
125	0.02100	14.2	-3.05
130	0.01805	15.1	-2.99
135	0.01557	15.9	-2.92
140	0.01347	16.8	-2.86
145	0.01169	17.6	-2.80
150	0.01017	18.5	-2.75

Tables of Resistance vs Temperature

T (°C)	Material B(K)		
	T 4630		
	R(T) / R25	TF (%)	α (%/°C)
-55	137.06	27.2	-7.33
-50	94.94	23.5	-7.15
-45	66.35	20.2	-6.98
-40	46.78	17.3	-6.82
-35	33.25	14.7	-6.66
-30	23.84	12.4	-6.50
-25	17.23	10.3	-6.35
-20	12.54	8.5	-6.20
-15	9.206	6.9	-6.05
-10	6.807	5.6	-5.91
-5	5.070	4.3	-5.77
0	3.803	3.3	-5.63
5	2.873	2.4	-5.50
10	2.185	1.6	-5.36
15	1.673	1.0	-5.23
20	1.289	0.4	-5.11
25	1.0000	0.0	-4.99
30	0.7805	0.4	-4.86
35	0.6129	0.9	-4.75
40	0.4841	1.4	-4.63
45	0.3847	2.0	-4.52
50	0.3074	2.6	-4.41
55	0.2470	3.3	-4.30
60	0.1996	4.0	-4.19
65	0.1621	4.7	-4.09
70	0.1323	5.4	-3.99
75	0.1086	6.2	-3.89
80	0.08951	7.0	-3.80
85	0.07416	7.8	-3.71
90	0.06172	8.6	-3.62
95	0.05160	9.5	-3.53
100	0.04333	10.3	-3.44
105	0.03655	11.2	-3.36
110	0.03095	12.0	-3.28
115	0.02632	12.9	-3.20
120	0.02246	13.7	-3.12
125	0.01925	14.6	-3.05
130	0.01656	15.5	-2.97
135	0.01429	16.4	-2.90
140	0.01238	17.3	-2.83
145	0.01076	18.1	-2.77
150	0.009383	19.0	-2.70

T (°C)	Material B(K)		
	U 4840		
	R(T) / R25	TF (%)	α (%/°C)
-55	173.74	28.5	-7.69
-50	118.20	24.6	-7.50
-45	81.18	21.2	-7.32
-40	56.26	18.1	-7.15
-35	39.34	15.4	-6.98
-30	27.75	12.9	-6.82
-25	19.74	10.8	-6.66
-20	14.15	8.9	-6.50
-15	10.23	7.3	-6.34
-10	7.457	5.8	-6.19
-5	5.476	4.5	-6.04
0	4.051	3.4	-5.90
5	3.020	2.5	-5.76
10	2.267	1.7	-5.62
15	1.714	1.0	-5.48
20	1.305	0.5	-5.35
25	1.0000	0.0	-5.22
30	0.7715	0.4	-5.09
35	0.5991	0.9	-4.97
40	0.4681	1.5	-4.84
45	0.3680	2.1	-4.72
50	0.2911	2.8	-4.61
55	0.2316	3.4	-4.49
60	0.1853	4.2	-4.38
65	0.1491	4.9	-4.28
70	0.1206	5.7	-4.17
75	0.09812	6.5	-4.07
80	0.08022	7.3	-3.97
85	0.06591	8.2	-3.87
90	0.05442	9.0	-3.77
95	0.04515	9.9	-3.68
100	0.03763	10.8	-3.59
105	0.03150	11.7	-3.50
110	0.02649	12.6	-3.42
115	0.02237	13.5	-3.33
120	0.01897	14.4	-3.25
125	0.01615	15.3	-3.17
130	0.01380	16.2	-3.10
135	0.01184	17.1	-3.02
140	0.01020	18.0	-2.95
145	0.008814	19.0	-2.88
150	0.007643	19.9	-2.81