

# NTC Disc Thermistors

ND 03/06/09 – NE 03/06/09 – NV 06/09



## APPLICATIONS

- ND or NE: Commercial, Industrial and Automotive Applications AEC-Q200 based Qual
- NV: Professional Applications
- Alarm and temperature measurement application
- Temperature regulation application
- Level detection application
- Compensation application and more

## TECHNOLOGY

- ND: epoxy-phenolic resin coating
- NE: epoxy resin coating (recommended for severe mounting conditions)
- NV: epoxy varnish coating
- Leads: Radial copper wire tinned
- Marking: on package only for ND03 & NE03  
ND/NE 06/09: Nominal resistance and tolerance for  $\pm 5\%$ ,  $\pm 10\%$   
NV06/09: Nominal resistance and tolerance
- Delivery Mode: Bulk, reeled or ammopacked

## PERFORMANCE CHARACTERISTICS

| Types                              | General purpose                                                         |                               |                               | Professional               |                            |
|------------------------------------|-------------------------------------------------------------------------|-------------------------------|-------------------------------|----------------------------|----------------------------|
|                                    | ND03 or NE03                                                            | ND06 or NE06                  | ND09 or NE09                  | NV06                       | NV09                       |
| Climatic category                  |                                                                         |                               |                               | 55/125/56-434              | 55/125/56-434              |
| Operating Temperature              | -55 to +150°C                                                           | -55 to +150°C                 | -55 to +150°C                 | -55 to +150°C              | -55 to +150°C              |
| Tolerance on R <sub>n</sub> (25°C) | 330Ω to 1MΩ : $\pm \pm 3^*$ , 5, 10, 20%<br>1500Ω to 150 kΩ : $\pm 3\%$ | $\pm 3^*$ , 5, 10, $\pm 20\%$ | $\pm 3^*$ , 5, 10, $\pm 20\%$ | $\pm 2$ , 3, 5, $\pm 10\%$ | $\pm 2$ , 3, 5, $\pm 10\%$ |
| Maximum dissipation at 25°C        | 0.25 W                                                                  | 0.71 W                        | 0.9 W                         | 0.69 W                     | 0.85 W                     |
| Thermal dissipation factor         | 5 mW/°C                                                                 | 7.1 mW/°C                     | 9 mW/°C                       | 6.9 mW/°C                  | 8.5 mW/°C                  |
| Thermal time constant              | 10 s                                                                    | 22 s                          | 30 s                          | 18 s                       | 30 s                       |
| Response time                      | < 3s                                                                    |                               |                               |                            |                            |

## STANDARDIZATION

NV range : approved by NFC 93271  
Type: TN115 A for NV06  
TN116 for NV09  
List: GAM-T1  
List: LNZ

\* Optional tolerance, please contact factory

## OPTIONS

Consult factory for availability of options:

- other nominal resistance values
- other tolerances
- alternative lead materials or lengths
- controlled dimensions

# NTC Disc Thermistors

## ND/NE 03



### HOW TO ORDER

#### ND06

##### Type

ND03  
NE03  
ND06  
NE06  
NV06

ND09  
NE09  
NV09

#### P0

##### Material Code

P  
(See tables  
page 23-25)

#### 0103

##### Resistance

10 kΩ  
(See tables  
page 22-24)

#### K

##### Tolerance

G (±2%) for NV  
H (±3%)\*  
J (±5%)  
K (±10%)  
M (±20%)

#### --

##### Packaging

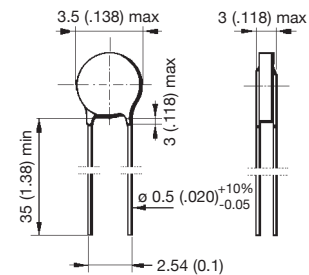
--: Bulk  
Ammopack  
(See table page 26)  
Tape and reel  
(See table page 26)

\* Optional tolerance, please contact factory

### TABLE OF VALUES

#### ND03/NE03 TYPE

#### ND03/NE03



| Part Number              | Rn at 25°C (Ω)     | Material Code | B (K)<br>(B/B)<br>(1) ± 5%<br>(2) ± 3% | α at 25°C (%/°C) |
|--------------------------|--------------------|---------------|----------------------------------------|------------------|
| N_03J00681<br>N_03J00102 | 680<br>1,000       | J             | 3480 (2)                               | - 3.9            |
| N_03K00152<br>N_03K00222 | 1,500<br>2,200     | K             | 3630 (2)                               | - 4.0            |
| N_03L00272<br>N_03L00332 | 2,700<br>3,300     | L             | 3790 (2)                               | - 4.2            |
| N_03M00472<br>N_03M00682 | 4,700<br>6,800     | M             | 3950 (2)                               | - 4.4            |
| N_03N00103<br>N_03N00153 | 10,000<br>15,000   | N             | 4080 (2)                               | - 4.6            |
| N_03P00223<br>N_03P00333 | 22,000<br>33,000   | P             | 4220 (2)                               | - 4.7            |
| N_03Q00473<br>N_03Q00683 | 47,000<br>68,000   | Q             | 4300 (2)                               | - 4.7            |
| N_03R00104<br>N_03R00154 | 100,000<br>150,000 | R             | 4400 (2)                               | - 4.8            |
| N_03S00224               | 220,000            | S             | 4520 (2)                               | - 5.0            |
| N_03T00334<br>N_03T00474 | 330,000<br>470,000 | T             | 4630 (2)                               | - 5.1            |
| N_03U00105               | 1,000,000          | U             | 4840 (2)                               | - 5.3            |

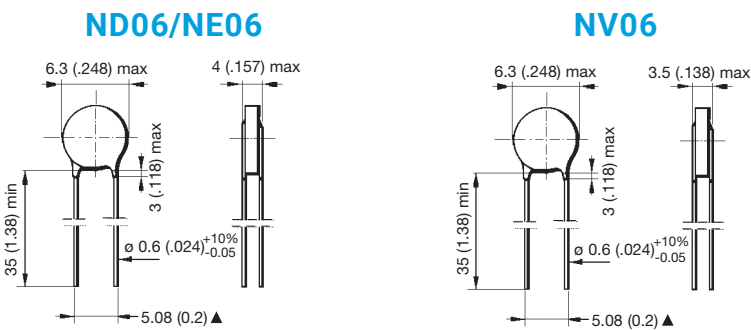
# NTC Disc Thermistors

ND/NE/NV 06



## TABLE OF VALUES

### ND06/NE06/NV06



| Part Number | Rn at 25°C (Ω) | Material Code | B (K)<br>(B/B (1) ± 5%<br>(2) ± 3%) | α at 25°C (%/°C) |
|-------------|----------------|---------------|-------------------------------------|------------------|
| N_06J00151  | 150            | J             | 3480 (2)                            | – 3.9            |
| N_06J00221  | 220            |               |                                     |                  |
| N_06K00331  | 330            |               |                                     |                  |
| N_06K00471  | 470            | K             | 3630 (2)                            | – 4.0            |
| N_06L00681  | 680            |               |                                     |                  |
| N_06L00102  | 1,000          |               |                                     |                  |
| N_06M00152  | 1,500          | M             | 3950 (2)                            | – 4.4            |
| N_06N00222  | 2,200          |               |                                     |                  |
| N_06N00332  | 3,300          |               |                                     |                  |
| N_06P00472  | 4,700          | P             | 4220 (2)                            | – 4.7            |
| N_06P00682  | 6,800          |               |                                     |                  |
| N_06P00103  | 10,000         |               |                                     |                  |
| N_06Q00153  | 15,000         | Q             | 4300 (2)                            | – 4.7            |
| N_06Q00223  | 22,000         |               |                                     |                  |
| N_06R00333  | 33,000         | R             | 4400 (2)                            | – 4.8            |
| N_06S00473  | 47,000         | S             | 4520 (2)                            | – 5.0            |
| N_06S00683  | 68,000         |               |                                     |                  |
| N_06T00104  | 100,000        | T             | 4630 (2)                            | – 5.1            |
| N_06U00154  | 150,000        | U             | 4840 (2)                            | – 5.3            |
| N_06U00224  | 220,000        |               |                                     |                  |
| N_06U00334  | 330,000        |               |                                     |                  |

For other resistance values, please consult us.

# NTC Disc Thermistors

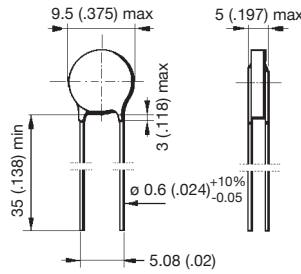
ND/NE/NV 09



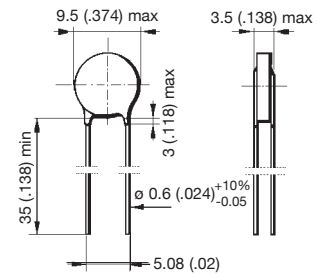
## TABLE OF VALUES

ND09/NE09/NV09

ND09/NE09



NV09



| Part Number                            | R <sub>n</sub> at 25°C (Ω)   | Material Code | B (K)<br>( <sup>(1)</sup> ± 5%<br>( <sup>(2)</sup> ± 3%) | α at 25°C (%/°C) |
|----------------------------------------|------------------------------|---------------|----------------------------------------------------------|------------------|
| N_09J00680<br>N_09J00101               | 68<br>100                    | J             | 3480 (2)                                                 | – 3.9            |
| N_09K00151<br>N_09K00221               | 150<br>220                   | K             | 3630 (2)                                                 | – 4.0            |
| N_09L00331                             | 330                          | L             | 3790 (2)                                                 | – 4.2            |
| N_09M00471<br>N_09M00681               | 470<br>680                   | M             | 3950 (2)                                                 | – 4.4            |
| N_09N00102<br>N_09N00152               | 1,000<br>1,500               | N             | 4080 (2)                                                 | – 4.6            |
| N_09P00222<br>N_09P00332               | 2,200<br>3,300               | P             | 4220 (2)                                                 | – 4.7            |
| N_09Q00472<br>N_09Q00682               | 4,700<br>6,800               | Q             | 4300 (2)                                                 | – 4.7            |
| N_09R00103<br>N_09R00153               | 10,000<br>15,000             | R             | 4400 (2)                                                 | – 4.8            |
| N_09S00223                             | 22,000                       | S             | 4520 (2)                                                 | – 5.0            |
| N_09T00333<br>N_09T00473               | 33,000<br>47,000             | T             | 4630 (2)                                                 | – 5.1            |
| N_09U00683<br>N_09U00104<br>N_09U00154 | 68,000<br>100,000<br>150,000 | U             | 4840 (2)                                                 | – 5.3            |

# NTC Disc Thermistors

## Packaging for Automatic Insertion



### PACKAGING AND KINK SUFFIXES

Tables below indicate the suffixes to specify when ordering to get the required kink and packaging. For devices on tape, it is necessary to specify the height (H or Ho) which is the distance between the tape axis (sprocket holes axis) and the seating plane on the printed circuit board. The following types can be ordered on tape either in AMMOPACK (fan folder) or on REEL in accordance with IEC 286-2.

#### – Straight leads:

H represents the distance between the sprocket holes axis and the bottom plane of component body (base of resin or base of stand off).

#### – Kinked leads and flat leads:

Ho represents the distance between the sprocket holes axis and the base on the knee (kinked leads) or the bottom of the flat part (flat leads).

### • Reel & Ammopack

millimeters (inches)

| Types          | Suffix | H or Ho                                 | Leads    | Quantity/Size | Packaging |
|----------------|--------|-----------------------------------------|----------|---------------|-----------|
| ND/NE03 & NJ28 | CA     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 3000          | AMMOPACK  |
|                | CB     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 3000          | REEL      |
|                | CC     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 3000          | AMMOPACK  |
|                | CD     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 3000          | REEL      |
| NP30           | CA     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 2000          | AMMOPACK  |
|                | CB     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 2000          | REEL      |
|                | CC     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 2000          | AMMOPACK  |
|                | CD     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 2000          | REEL      |
| ND/NE/NV 06/09 | DA     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 1500          | AMMOPACK  |
|                | DB     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 1500          | REEL      |
|                | DC     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 1500          | AMMOPACK  |
|                | DD     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 1500          | REEL      |
|                | DL     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Kinked   | 1500          | AMMOPACK  |
|                | DM     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Kinked   | 1500          | REEL      |
|                | DN     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Kinked   | 1500          | AMMOPACK  |
|                | DP     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Kinked   | 1500          | REEL      |

NTC

Type  
ND03  
NE03  
NJ28  
NP30



NTC

Types  
ND/NE/NV  
06/09



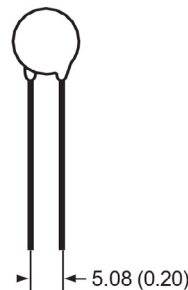
### • Bulk

| Type                         | Quantity/box |
|------------------------------|--------------|
| ND/NE03                      | 3000         |
| ND/NE06                      | 1500         |
| ND/NE09                      | 1500         |
| NV06                         | 100          |
| NV09                         | 100          |
| NI24<br>NJ28<br>NK20<br>NP30 | 1000         |

ND03 / NE03  
NJ28 / NP30



ND/NE/NV  
06/09



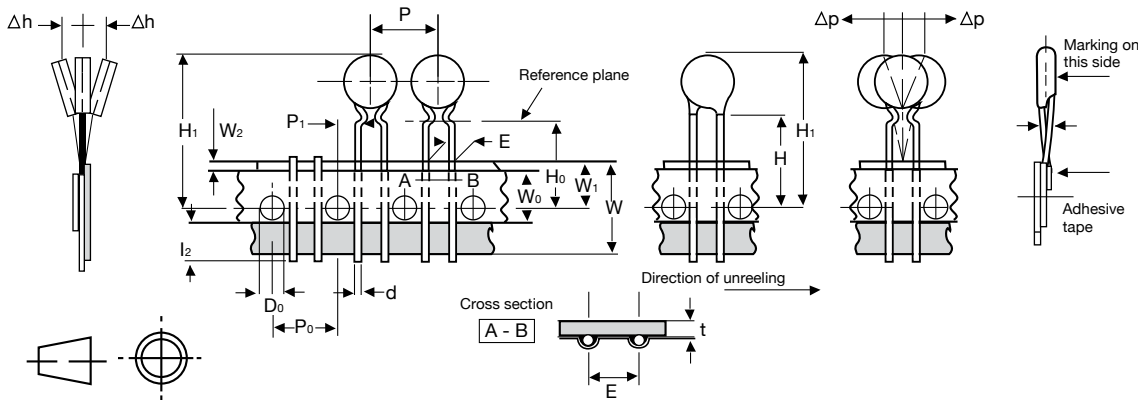
TAPING CHARACTERISTICS

Missing components

A maximum of 3 consecutive components may be missing from the bandolier, surrounded by at least 6 filled positions. The number of missing components may not exceed 0.5% of the total per packing module.

The beginning and the end of tape exhibit 8 or 9 blank positions.

DIMENSIONS: millimeters (inches)



| Value   | Tolerance    | Dimensions Characteristics |                                                                       |
|---------|--------------|----------------------------|-----------------------------------------------------------------------|
| 18      | +1 / -0.5    | W                          | Leading tape width                                                    |
| 6       | ±0.3         | W <sub>0</sub>             | Adhesive tape width                                                   |
| 9       | +0.75 / -0.5 | W <sub>1</sub>             | Sprocket hole position                                                |
| 3 max.  |              | W <sub>2</sub>             | Distance between the top of the tape and the adhesive                 |
| 4       | ±0.2         | D <sub>0</sub>             | Diameter of sprocket hole                                             |
| 16/19.5 | ±0.5         | H <sub>0</sub>             | Distance between the tape axis and the seating plane of the component |
|         |              | H <sub>1</sub>             | Distance between the tape axis and the top of component body          |

| Value     | Tolerance    | Dimensions Characteristics |                                                           |
|-----------|--------------|----------------------------|-----------------------------------------------------------|
| 12.7      | ±0.2         | P <sub>0</sub>             | Sprocket holes pitch                                      |
| 254       | ±1           | —                          | Distance between 21 consecutive holes 20 pitches          |
| 0.7       | ±0.2         | t                          | Total thickness of tape                                   |
| 2.54 5.08 | +0.6<br>-0.1 | E                          | Lead spacing                                              |
| 5.08 3.85 | ± 0.7        | P <sub>1</sub>             | Distance between the sprocket hole axis and the lead axis |
| 12.7      | ±1.0         | P                          | Spacing of components                                     |
| 0.5 0.6   | ±5%          | d                          | Lead diameter                                             |
| 0         | ±1.3         | <sup>3</sup> P             | Verticality of components                                 |
| 0         | ±2           | <sup>3</sup> h             | Alignment of components                                   |

# Tables of Resistance vs Temperature



| T<br>(°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<br>(°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<br>(°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<br>(°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<br>(°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<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | KC 3470       |        |          |
|           | 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<br>(°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<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | M 3950        |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 99.59         | 15.6   | -7.42    |
| -50       | 68.97         | 14.3   | -7.16    |
| -45       | 48.40         | 12.9   | -6.91    |
| -40       | 34.38         | 11.7   | -6.67    |
| -35       | 24.71         | 10.5   | -6.45    |
| -30       | 17.97         | 9.4    | -6.23    |
| -25       | 13.20         | 8.3    | -6.02    |
| -20       | 9.804         | 7.3    | -5.82    |
| -15       | 7.352         | 6.3    | -5.63    |
| -10       | 5.565         | 5.4    | -5.45    |
| -5        | 4.251         | 4.5    | -5.28    |
| 0         | 3.275         | 3.7    | -5.11    |
| 5         | 2.544         | 2.9    | -4.95    |
| 10        | 1.992         | 2.1    | -4.80    |
| 15        | 1.572         | 1.4    | -4.65    |
| 20        | 1.249         | 0.7    | -4.51    |
| 25        | 1.0000        | 0.0    | -4.38    |
| 30        | 0.8057        | 0.7    | -4.25    |
| 35        | 0.6534        | 1.3    | -4.12    |
| 40        | 0.5331        | 1.9    | -4.00    |
| 45        | 0.4376        | 2.5    | -3.89    |
| 50        | 0.3612        | 3.1    | -3.77    |
| 55        | 0.2998        | 3.7    | -3.67    |
| 60        | 0.2501        | 4.3    | -3.57    |
| 65        | 0.2097        | 4.8    | -3.47    |
| 70        | 0.1767        | 5.3    | -3.37    |
| 75        | 0.1496        | 5.9    | -3.28    |
| 80        | 0.1272        | 6.4    | -3.19    |
| 85        | 0.1087        | 6.9    | -3.11    |
| 90        | 0.09320       | 7.4    | -3.03    |
| 95        | 0.08025       | 7.8    | -2.95    |
| 100       | 0.06937       | 8.3    | -2.87    |
| 105       | 0.06019       | 8.8    | -2.80    |
| 110       | 0.05242       | 9.2    | -2.73    |
| 115       | 0.04580       | 9.6    | -2.66    |
| 120       | 0.04016       | 10.1   | -2.60    |
| 125       | 0.03532       | 10.5   | -2.53    |
| 130       | 0.03117       | 10.9   | -2.47    |
| 135       | 0.02758       | 11.3   | -2.41    |
| 140       | 0.02448       | 11.7   | -2.36    |
| 145       | 0.02179       | 12.1   | -2.30    |
| 150       | 0.01945       | 12.4   | -2.25    |

| T<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | MA 3965       |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 101.09        | 2.47   | -7.49    |
| -50       | 69.81         | 2.26   | -7.22    |
| -45       | 48.87         | 2.06   | -6.96    |
| -40       | 34.65         | 1.87   | -6.71    |
| -35       | 24.87         | 1.69   | -6.48    |
| -30       | 18.06         | 1.52   | -6.26    |
| -25       | 13.259        | 1.35   | -6.05    |
| -20       | 9.837         | 1.19   | -5.84    |
| -15       | 7.372         | 1.04   | -5.65    |
| -10       | 5.578         | 0.89   | -5.47    |
| -5        | 4.259         | 0.75   | -5.29    |
| 0         | 3.280         | 0.61   | -5.12    |
| 5         | 2.548         | 0.48   | -4.96    |
| 10        | 1.994         | 0.35   | -4.81    |
| 15        | 1.573         | 0.23   | -4.66    |
| 20        | 1.250         | 0.11   | -4.52    |
| 25        | 1.0000        | 0.00   | -4.38    |
| 30        | 0.8054        | 0.11   | -4.25    |
| 35        | 0.6528        | 0.22   | -4.13    |
| 40        | 0.5324        | 0.32   | -4.01    |
| 45        | 0.4368        | 0.42   | -3.90    |
| 50        | 0.3603        | 0.52   | -3.79    |
| 55        | 0.2989        | 0.61   | -3.68    |
| 60        | 0.2492        | 0.70   | -3.58    |
| 65        | 0.2088        | 0.79   | -3.48    |
| 70        | 0.1758        | 0.88   | -3.39    |
| 75        | 0.1487        | 0.96   | -3.30    |
| 80        | 0.1263        | 1.04   | -3.21    |
| 85        | 0.1078        | 1.12   | -3.13    |
| 90        | 0.0923        | 1.20   | -3.05    |
| 95        | 0.0794        | 1.27   | -2.97    |
| 100       | 0.06857       | 1.35   | -2.90    |
| 105       | 0.05942       | 1.42   | -2.83    |
| 110       | 0.05167       | 1.49   | -2.76    |
| 115       | 0.04509       | 1.55   | -2.69    |
| 120       | 0.03948       | 1.62   | -2.62    |
| 125       | 0.03467       | 1.68   | -2.56    |
| 130       | 0.03055       | 1.75   | -2.50    |
| 135       | 0.02699       | 1.81   | -2.44    |
| 140       | 0.02392       | 1.87   | -2.39    |
| 145       | 0.02125       | 1.93   | -2.33    |
| 150       | 0.01894       | 1.98   | -2.28    |

| T<br>(°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<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | ME 3975       |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 103.9         | 2.47   | -7.56    |
| -50       | 71.53         | 2.26   | -7.28    |
| -45       | 49.94         | 2.06   | -7.01    |
| -40       | 35.32         | 1.87   | -6.76    |
| -35       | 25.29         | 1.69   | -6.53    |
| -30       | 18.32         | 1.52   | -6.30    |
| -25       | 13.43         | 1.35   | -6.08    |
| -20       | 9.945         | 1.19   | -5.88    |
| -15       | 7.440         | 1.04   | -5.68    |
| -10       | 5.621         | 0.89   | -5.50    |
| -5        | 4.286         | 0.75   | -5.32    |
| 0         | 3.297         | 0.61   | -5.15    |
| 5         | 2.557         | 0.48   | -4.98    |
| 10        | 2.000         | 0.35   | -4.83    |
| 15        | 1.576         | 0.23   | -4.68    |
| 20        | 1.251         | 0.11   | -4.54    |
| 25        | 1.0000        | 0.00   | -4.40    |
| 30        | 0.8048        | 0.11   | -4.27    |
| 35        | 0.6519        | 0.22   | -4.14    |
| 40        | 0.5313        | 0.32   | -4.02    |
| 45        | 0.4356        | 0.42   | -3.91    |
| 50        | 0.3591        | 0.52   | -3.80    |
| 55        | 0.2977        | 0.61   | -3.69    |
| 60        | 0.2481        | 0.70   | -3.59    |
| 65        | 0.2078        | 0.79   | -3.49    |
| 70        | 0.1749        | 0.88   | -3.40    |
| 75        | 0.1479        | 0.96   | -3.31    |
| 80        | 0.1256        | 1.04   | -3.22    |
| 85        | 0.1071        | 1.12   | -3.14    |
| 90        | 0.09175       | 1.20   | -3.06    |
| 95        | 0.07890       | 1.27   | -2.98    |
| 100       | 0.06810       | 1.35   | -2.90    |
| 105       | 0.05900       | 1.42   | -2.83    |
| 110       | 0.05130       | 1.49   | -2.76    |
| 115       | 0.04476       | 1.55   | -2.69    |
| 120       | 0.03918       | 1.62   | -2.63    |
| 125       | 0.03441       | 1.68   | -2.57    |
| 130       | 0.03031       | 1.75   | -2.50    |
| 135       | 0.02678       | 1.81   | -2.45    |
| 140       | 0.02373       | 1.87   | -2.39    |
| 145       | 0.02108       | 1.93   | -2.34    |
| 150       | 0.01878       | 1.98   | -2.28    |

| T<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | M4 4400       |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 98.22         | 23.5   | -7.38    |
| -50       | 68.17         | 20.3   | -7.12    |
| -45       | 47.92         | 17.5   | -6.88    |
| -40       | 34.11         | 14.9   | -6.64    |
| -35       | 24.57         | 12.7   | -6.42    |
| -30       | 17.89         | 10.7   | -6.20    |
| -25       | 13.17         | 8.9    | -6.00    |
| -20       | 9.790         | 7.4    | -5.80    |
| -15       | 7.349         | 6.0    | -5.62    |
| -10       | 5.568         | 4.8    | -5.44    |
| -5        | 4.256         | 3.8    | -5.27    |
| 0         | 3.280         | 2.8    | -5.11    |
| 5         | 2.549         | 2.1    | -4.95    |
| 10        | 1.996         | 1.4    | -4.80    |
| 15        | 1.574         | 0.8    | -4.66    |
| 20        | 1.250         | 0.4    | -4.52    |
| 25        | 1.0000        | 0.0    | -4.39    |
| 30        | 0.8049        | 0.4    | -4.27    |
| 35        | 0.6519        | 0.8    | -4.15    |
| 40        | 0.5311        | 1.2    | -4.03    |
| 45        | 0.4352        | 1.7    | -3.92    |
| 50        | 0.3586        | 2.3    | -3.81    |
| 55        | 0.2970        | 2.8    | -3.71    |
| 60        | 0.2472        | 3.4    | -3.61    |
| 65        | 0.2068        | 4.1    | -3.52    |
| 70        | 0.1738        | 4.7    | -3.42    |
| 75        | 0.1468        | 5.4    | -3.34    |
| 80        | 0.1245        | 6.0    | -3.25    |
| 85        | 0.1060        | 6.7    | -3.17    |
| 90        | 0.09060       | 7.4    | -3.09    |
| 95        | 0.07776       | 8.2    | -3.01    |
| 100       | 0.06700       | 8.9    | -2.94    |
| 105       | 0.05793       | 9.6    | -2.87    |
| 110       | 0.05026       | 10.4   | -2.80    |
| 115       | 0.04376       | 11.1   | -2.74    |
| 120       | 0.03822       | 11.9   | -2.67    |
| 125       | 0.03349       | 12.6   | -2.61    |
| 130       | 0.02944       | 13.4   | -2.55    |
| 135       | 0.02595       | 14.1   | -2.49    |
| 140       | 0.02294       | 14.9   | -2.44    |
| 145       | 0.02033       | 15.6   | -2.38    |
| 150       | 0.01807       | 16.4   | -2.33    |

# Tables of Resistance vs Temperature



| T<br>(°C) | Material B(K)<br>MN 4077 |        |          |
|-----------|--------------------------|--------|----------|
|           | R(T) / R25               | TF (%) | α (%/°C) |
| -55       | 103.56                   | 2.54   | -7.39    |
| -50       | 71.79                    | 2.32   | -7.14    |
| -45       | 50.39                    | 2.12   | -6.90    |
| -40       | 35.79                    | 1.92   | -6.68    |
| -35       | 25.71                    | 1.74   | -6.46    |
| -30       | 18.67                    | 1.56   | -6.25    |
| -25       | 13.70                    | 1.39   | -6.06    |
| -20       | 10.15                    | 1.22   | -5.87    |
| -15       | 7.59                     | 1.06   | -5.68    |
| -10       | 5.73                     | 0.91   | -5.51    |
| -5        | 4.36                     | 0.77   | -5.34    |
| 0         | 3.35                     | 0.63   | -5.18    |
| 5         | 2.59                     | 0.49   | -5.03    |
| 10        | 2.02                     | 0.36   | -4.88    |
| 15        | 1.59                     | 0.24   | -4.74    |
| 20        | 1.26                     | 0.12   | -4.60    |
| 25        | 1.00                     | 0.00   | -4.47    |
| 30        | 0.80                     | 0.11   | -4.35    |
| 35        | 0.65                     | 0.22   | -4.23    |
| 40        | 0.52                     | 0.33   | -4.11    |
| 45        | 0.43                     | 0.43   | -4.00    |
| 50        | 0.35                     | 0.53   | -3.89    |
| 55        | 0.29                     | 0.63   | -3.79    |
| 60        | 0.24                     | 0.72   | -3.69    |
| 65        | 0.20                     | 0.81   | -3.59    |
| 70        | 0.17                     | 0.90   | -3.50    |
| 75        | 0.14                     | 0.99   | -3.41    |
| 80        | 0.12                     | 1.07   | -3.32    |
| 85        | 0.10                     | 1.15   | -3.24    |
| 90        | 0.09                     | 1.23   | -3.16    |
| 95        | 0.07                     | 1.31   | -3.08    |
| 100       | 0.06                     | 1.38   | -3.00    |
| 105       | 0.05                     | 1.46   | -2.93    |
| 110       | 0.05                     | 1.53   | -2.86    |
| 115       | 0.04                     | 1.60   | -2.79    |
| 120       | 0.04                     | 1.67   | -2.73    |
| 125       | 0.03                     | 1.73   | -2.66    |
| 130       | 0.03                     | 1.80   | -2.60    |
| 135       | 0.02                     | 1.86   | -2.54    |
| 140       | 0.02                     | 1.92   | -2.49    |
| 145       | 0.02                     | 1.98   | -2.43    |
| 150       | 0.02                     | 2.04   | -2.38    |

| T<br>(°C) | Material B(K)<br>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<br>(°C) | Material B(K)<br>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    |

| T<br>(°C) | Material B(K)<br>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<br>(°C) | Material B(K)<br>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<br>(°C) | Material B(K)<br>NS 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    |

# Tables of Resistance vs Temperature



| T<br>(°C) | Material B(K)<br>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<br>(°C) | Material B(K)<br>PA 4235 |        |          |
|-----------|--------------------------|--------|----------|
|           | R(T) / R25               | TF (%) | α (%/°C) |
| -55       | 123.40                   | 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<br>(°C) | Material B(K)<br>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    |

| T<br>(°C) | Material B(K)<br>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<br>(°C) | Material B(K)<br>R 4400 |        |          |
|-----------|-------------------------|--------|----------|
|           | R(T) / R25              | TF (%) | α (%/°C) |
| -55       | 113.90                  | 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<br>(°C) | Material B(K)<br>RA 4380 |        |          |
|-----------|--------------------------|--------|----------|
|           | R(T) / R25               | TF (%) | α (%/°C) |
| -55       | 110.80                   | 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    |

# Tables of Resistance vs Temperature



| T<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | RC 4340       |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 105.70        | 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<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | T 4630        |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 137.10        | 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<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | U 4840        |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 173.70        | 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    |

| T<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | S 4520        |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 126.10        | 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<br>(°C) | Material B(K) |        |          |
|-----------|---------------|--------|----------|
|           | SC 4500       |        |          |
|           | R(T) / R25    | TF (%) | α (%/°C) |
| -55       | 129.80        | 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    |

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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