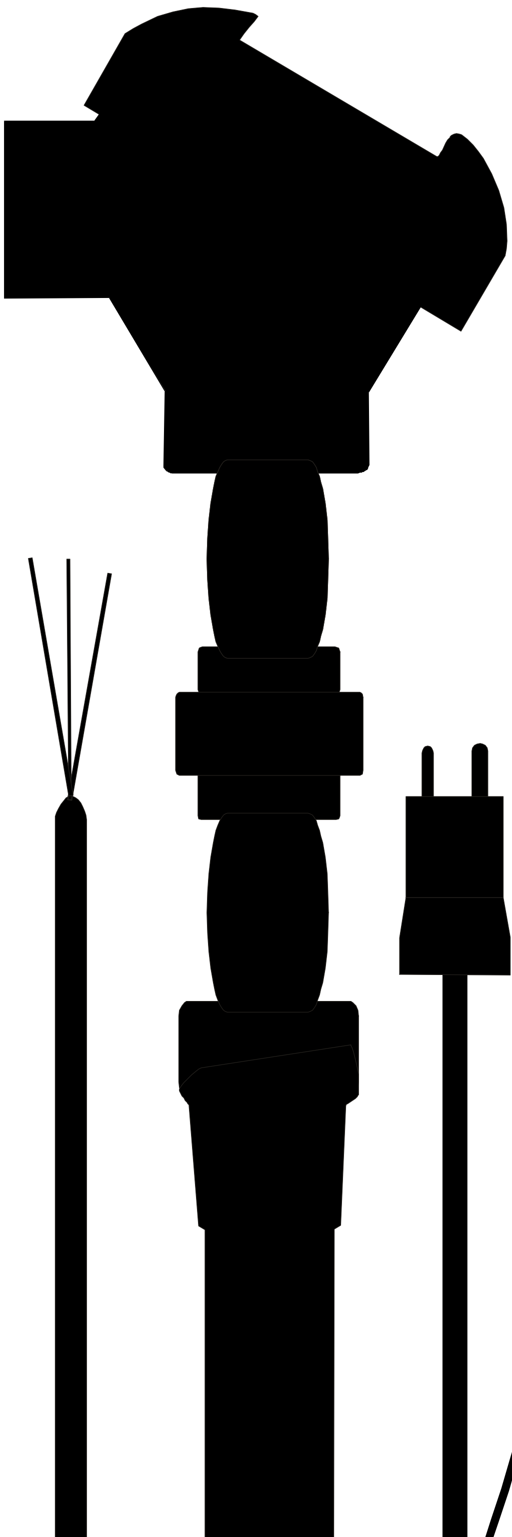
SMART SENSORS INC.



Technical Reference Manual

About this Manual

In today's plant environment, the hundreds of different sensors and technologies used in the process simply doesn't allow any one individual to be an expert on all of them. Too often, especially with temperature, there is a temptation to replace the sensor with the identical technology. After all, that sensor has been working well for the last five years, why change it? Lets put this in the proper perspective. Here are just a few changes that have occurred over the last few years.

1. A regime change in Iraq.
2. A currency change in Eastern Europe – the Euro now replaces the franc, lira etc.
3. A change in the tax you pay on the gains when you sell your primary residence - it is now zero.

Reviewing these changes one can determine that depending on where you sit the change can be good, bad or of no consequence. Unless you traveled to eastern Europe the currency change probably did not affect you. But if you ignored the change in the tax law - you would have missed a rare and generous gift that your government bestowed on those that kept their eyes open to change. While this manual probably won't change your life what it will do is to make you more aware of some of the more recent and significant changes in temperature sensor technology and how those changes can improve your process.

There are three significant areas in this manual and they deserve a summary discussion:

Sensor Theory & Specification
Nothing much has *changed* here! It is an excellent primer for gaining understanding on how thermocouples and resistance temperature detectors work.

Reference Tables
Thermocouple and RTD reference tables complete with all the latest *changes*.

New Techniques that Improve Accuracy
The *changes* in calibration that can help improve the accuracy of your temperature loops. This is important because *changes* that improve accuracy in the instruments that control, record or measure temperature are wasted if no *changes* are made to the primary device.

It would be difficult if not impossible to provide a manual that provided all the technical detail required for specifying and understanding Thermocouples and RTDs and how they apply to your process. We feel that this manual will give you a good start. We do encourage you to use it as a guide only and to call Smart Sensors for specific information and updates.

Finally, our success can be attributed to providing safe, accurate and reliable process temperature measurement solutions; while never forgetting our customer service obligations. Borrowing the words of speaker and author Tom Reilley:

"Customer service is a function of our performance relative to your expectations."

If we ever fail to live up to this motto, please do not hesitate to contact me.

James L. Baldanza
President

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THERMOCOUPLE & RTD SPECIFICATION

REFERENCE DATA

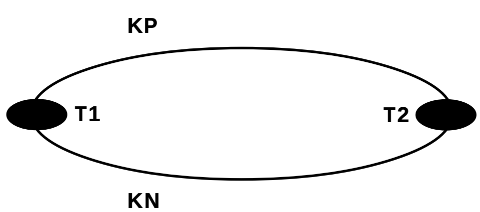
Temperature Sensor Theory

There are many different types of temperature sensors. We will deal with the two most common types, thermocouples and RTDs. Not because they are the most common, but because these two are the only two types Smart Sensors makes. (So if you are curious about other sensors, you will have to go elsewhere to find out how they work).

Thermocouples - How do they work?

In 1821 Thomas Seebeck, while making a pot of tea, discovered that when two dissimilar metals are joined together, a current flows, as long as the temperature at one of the junctions is at a higher temperature than the other junction. Little did he know, as he finished his tea, that he would be famous for discovering the current that flowed in this circuit and the EMF (Electro Motive Force) that produced this current would be forever called the Seebeck Effect.

Seebeck Effect

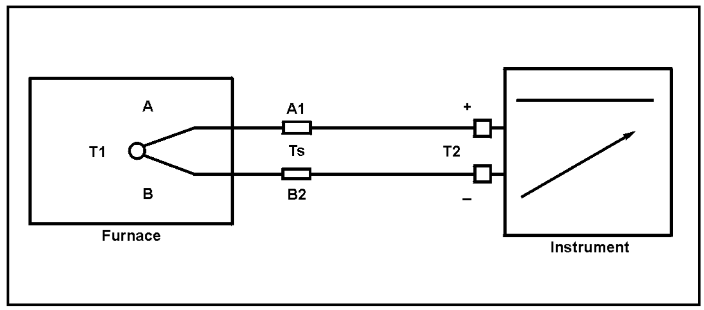


Seebeck circuit showing the positive (kp) and negative (kn) of a Chromel Alumel thermocouple. If the temperatures (T1 and T2) are different at the two junctions a current will flow in the circuit.

Seebeck was responsible for developing the most rugged and simplistic yet cost effective way of measuring temperature over a broad range. Copper Constantan, Chromel Alumel, Iron Constantan and Chromel Constantan, the standard thermocouple calibrations that are in use today, were derived from this research. They work the same way the scientist's theory said they would work. When you apply heat to T1 and T2 is at a different temperature the two dissimilar metals will produce a EMF. The EMF is different for different metals and unfortunately it is not linear, but it is accurate enough to handle most process applications. Accuracy improvements have been made primarily by closer control of the chemical composition; today thermocouples have accuracy as low as 1/2 degree Fahrenheit. There have been other calibrations introduced since then and many improvements to the way thermocouples are used; but the credit for developing thermocouples as we use them today goes to Thomas Seebeck.

A few years later, Jean Peltier made the second most important contribution to thermocouple theory. In essence he discovered that when heat flows across a thermoelectric junction, heat is either absorbed or liberated. The direction of the current flow dictates whether the heat is absorbed or liberated. If the current produced by the Seebeck Effect is at the hotter of the two junctions, heat is absorbed, while heat is liberated at the cooler or cold junction. He discovered this phenomena without drinking a single cup of tea.

These two guys really developed the rules for the proper use of thermocouples. First, and most important, is that the EMF developed by the joining (hot junction) of two dissimilar metals will report the temperature at that junction regardless of the temperature along the length of the wires. Second, and my personal favorite, is that the introduction of a third metal in the circuit can cause unwanted variances in the EMF unless the same temperature is maintained along the entire length where the third metal is introduced. This means that all you thermocouple users can not use cheap baling wire to make your connections to the instrument. Third, quite simply stated this rule allows the EMF signal to be brought back to a standard reference junction, usually 32°F, without maintaining intermediate reference junctions at a constant temperature.



The diagram above has three junctions. The hot or measuring junction T1 reports the furnace temperature. A and B are the primary positive and negative thermocouple elements. A secondary junction Ts is used to transition to thermocouple extension wire. This is done to reduce the cost of the thermocouple circuit. The cost of MI cable is several times more expensive than thermocouple extension wire. Certain applications require the flexibility that only thermocouple extension wire can bring. Finally T2 as the reference junction connects the thermocouple to the instrument. Seebeck and Peltier discovered that if T1 and T2 are at the same temperature there will be no current flow in the circuit.

Basic and Advanced Thermocouples

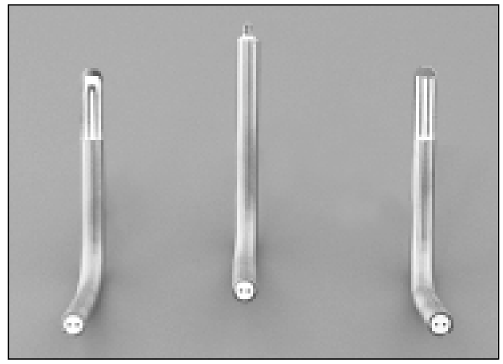
When it comes right down to it there are only two basic types of thermocouple constructions. One is the kind our old friends Peltier and Seebeck used: Two dissimilar wires with a junction and insulated from one another. This is the most rudimentary construction and it can work given the simplicity of the application. Second and let's get modern here; the mineral insulated cable design that SSi uses.

This type uses a high purity magnesium oxide (MgO) to insulate the thermocouple wires from each other and the sheath. This insulation possesses high insulation resistance and upper temperature limits that far exceed the usable range of standard grade thermocouples. It is densely packed within a metallic sheath to insure concentric positioning of the conductors and improved mechanical strength, even when exposed to mechanical pressures such as bending, twisting or flattening.

Thermocouple Specification Criteria

Now that you know how they work, it's time to get right down to specifying a thermocouple. There are a gazzilion parameters you could consider, however, 99.9999% of the time if you keep the following in mind your thermocouple will keep its little millivolt heart pumping away forever or until the next maintenance shutdown ***whichever*** occurs first.

Operating Environment: What is the operating temperature that the thermocouple will be used in? (Select from the tables provided in this section.) What is in the process that will affect the life or performance of the thermocouple?
Cost/Performance Ratio: How accurate do I want to be? Do I need Special Limits? How will the dynamics of the process affect the accuracy? Can I afford the accuracy want?
Environment: Do we protect the thermocouple by installing it in a well? What sheath material do we use on the thermocouple that will make it compatible with the environment?
Calibration: Since the ranges for calibrations tend to overlap there are other considerations in the selection criteria. The table below should help. *See pages 17-68 for the most common thermocouple and RTD reference tables or visit our web site www.smartsensors.com for all reference tables.*
Response Time: Typical response time for thermocouples range from a tenth of a second all the way up to 5 seconds, depending on the size of the thermocouple and the junction employed.
Longevity: Typically the larger the OD of the thermocouple the longer it will last. This criteria can be tricky. Take the cement contractor who wanted to measure the temperature of poured cement. The best thermocouple for him was a bare wire thermocouple where the junction was twisted together. He could care less what the temperature was or if the thermocouple was working once the cement became concrete. We don't do business with a lot of cement contractors. The data below may



Shown is Smart Sensors' Mineral Oxide insulated thermocouple cable with a cut away of the three most common junctions, (from left) ungrounded, exposed, and grounded.

help you decide which size thermocouple is best. Response time is in seconds and measures a 63.2% step change in temperature from ambient to boiling water.

Measuring Junction Typical Response Time

Sheath OD	Measuring Junction	Response Time*
. 063 (1/16")	Grounded	.09
	Ungrounded	.28
.125 (1/8")	Grounded	.34
	Ungrounded	1.6
.188 (3/16")	Grounded	.7
	Ungrounded	2.6
.250 (1/4")	Grounded	1.7
	Ungrounded	4.5
	Exposed loop	.09

*Sensors not in thermowell or protection tubes

Calibration Selection Guide

Calibration Type	Conductors Positive	Negative	Temperature Range °C	Limits of Error Standard	Special	Extension Wire Jacket Color	Color Coding
J	Iron (Magnetic)	Constantan (Non-magnetic)	0°C to 750°C	±2.2°C or ±0.75%	±1.1°C or ±0.4%	Black	White+ Red-
K	Chromel (Non-magnetic)	Alumel (Magnetic)	-200°C to 0°C	±2.2°C or ±2%	- -	Yellow	Yellow+ Red-
			0°C to 1250°C	±2.2°C or ±0.75%	±1.1°C or ±0.4%		
T	Copper (Non-Magnetic)	Constantan (Non-magnetic)	-200°C to 0°C	±1°C or ±.1.5%	- -	Blue	Blue+ Red-
			0°C to 350°C	±1°C or ±0.75%	±0.5°C or ±0.4%		
E	Chromel (Non-magnetic)	Constantan (Non-magnetic)	-200°C to 0°C	±1.7°C or ±1%	- -	Purple	Purple+ Red-
			0°C to 900°C	±1.7°C or ±0.5%	±1°C or ±0.4%		
N	Nicrosil (Non-magnetic)	Nisil (Non-magnetic)	0°C to 1260°C	±3/4%	±3/8%	Orange	Orange+ Red-
R	Platinum 13% Rhodium (Non-magnetic)	Pure Platinum (Non-magnetic)	0°C to 1450°C	±1.5°C or ±0.25%	N/A N/A	Green	Black+ Red-
S	Platinum 10% Rhodium (Non-magnetic)	Pure Platinum (Non-magnetic)	0°C to 1450°C	±1.5°C or ±0.25%	N/A N/A	Green	Black+ Red-
B	Platinum 30% Rhodium (Non-magnetic)	Platinum 6% Rhodium (Non-magnetic)	870°C to 1700°C	±0.5%	N/A N/A	Gray	Black+ Red-

Calibration Notes
J- Iron Constantan - *Reducing atmosphere recommended. Iron oxidizes rapidly at elevated temperatures. A larger gage size will extend the life of the iron wire.*
T- Copper Constantan - *Can be used in oxidizing or reducing atmospheres. Rust and corrosion resistant. Best for sub-zero temperatures.*
K- Chromel Alumel - *Oxidizing atmosphere recommended. Most commonly used base metal thermocouple. Cycling at high temperatures can cause calibration drift. Not recommended in sulfur environments.*
E- Chromel Constantan - *Oxidizing atmosphere recommended. Highest emf output of thermocouples commonly used. Good corrosion resistance*
S, R- *Use in oxidizing or inert atmospheres. Not recommended for reducing atmospheres. Granular precipitation from metal protection tubes can cause failure or calibration drift.*
N- *Use in oxidizing, reducing and inert atmospheres. Not recommended in sulfur environments. Improved resistance to drift and better stability over K and E at elevated temperatures.*

Thermocouple Construction Materials

The most basic thermocouple construction is the wire type consisting of two dissimilar metals homogeneously joined at one end to form the measuring junction. All wire-type thermocouples have an exposed junction. While wire-type thermocouples offer good response time, ruggedness, and high temperature use, they are susceptible to environmental conditions and therefore must be protected.

Mineral insulated thermocouples overcome the disadvantages of wire type construction by imbedding the thermocouple wires in ceramic insulation and protecting them with a metallic sheath. The mineral insulated cable (MI cable) design is based on small mass and high thermal conductivity which in turn promotes rapid heat transfer from the heat source to the measuring junction.

The sheaths are impervious to most liquids and gases and withstand high external pressures. The seamless design protects against moisture or other contaminants attacking the thermocouple elements. Since the only materials used to make the MI cable are the thermocouple conductors, the mineral oxide insulation and the metallic sheath, the cables are inherently fireproof thus providing the safest temperature measuring system.

Mineral Insulated Cable

M.I. cable is designed to meet the following specifications:

Sheath OD & Wall Thickness: Per ASTME-585
Accuracy: Per ASTME-230 (1993) & ANSI MC96.1 (1988)
Insulation Resistance @ Room Temperature: Per ASTME-585 (Table 2)
Formability: Per ASTME-585 (Can be formed around a mandrel equal to twice the outside diameter without sheath rupture or loss of IR.)
Fabrication: The cable can be welded, brazed or soldered without changing IR. (Care should be taken with smaller diameter sheaths)

See MI Cable Specification Tables on page 9.

Sheath Material

The table below shows just some of the many different materials which can be used to protect the mineral insulated thermocouple. Sheath materials used vary from standard stainless alloys like 304, 310, 316, 321, 347, 446 to the slightly more exotic alloy 600 or Hasteloy®.

These sheaths are selected based on the rigors of the application with corrosion and temperature being the leading factors in sheath selection. The atmospheric environmental parameters are oxidizing, reducing, neutral, and vacuum. For example, 304 Stainless Steel can be used in each type of atmosphere with a maximum operating temperature of 1650°F.

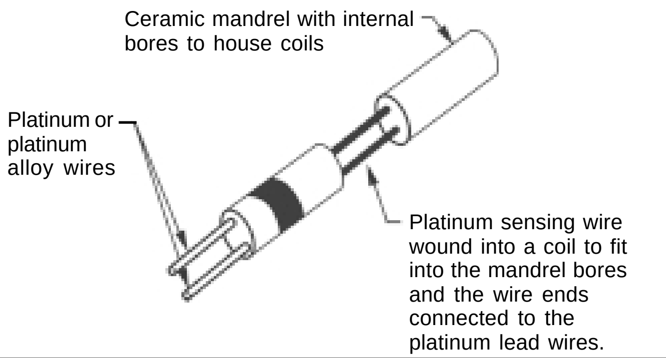
Sheath Material

			Recommended	
Material	**Melting Point °F**	**Max. Temp. in Air**	**OPR ATM ***	**Continuous Max. Temp. °F**
304SS	2560	1920	ORNV	1650
310 SS	2560	1960	ORNV	2100
316SS	2280	1760	ORNV	1650
321 SS	2580	1500	ORNV	1600
347SS	2600	1680	ORNV	1600
Inconel Alloy 600	2550	2000	ONV(c)	2100
Copper	1980	600	ORNV (b)	600
Aluminum	1220	800	ORNV	700
Platinum	3216	3000	ON(c)	3050
Molybdenum	4750	1000	VNR	4000
Tantalum	5440	750	V	4500
Titanium	3300	600	VN	2000

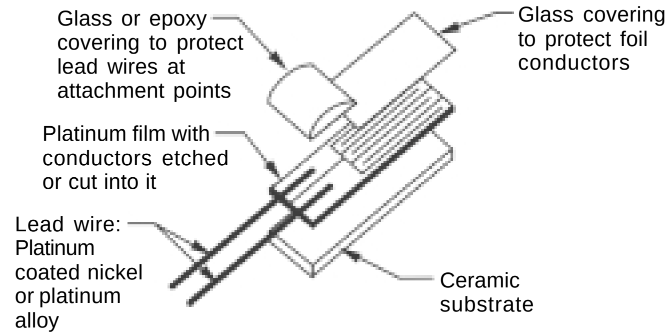
Key: O — Oxidizing
R — Reducing
N — Neutral
V — Vacuum
(b)— Scales readily in oxidizing atmosphere
(c)— Sensitive to sulphur corrosion

Specifying RTDs

Wire Wound Element Design



Film Style Element Design



A resistance temperature detector (RTD) operates on the principle that electrical resistance of metal changes as its temperature changes. The resistance of the sensing element increases as the temperature rises. There are two basic RTD designs wire wound and thin film. Wire wound design is a platinum sensing wire wound into a coil and housed in a ceramic mandrel to protect the coil. The thin film design consists of platinum deposited on a ceramic substrate and trimmed to achieve the desired alpha the construction is then covered with glass and epoxy to protect platinum film. Thin films are manufactured much in the same way as computer chips

The metal that is employed in a RTD must change resistance with respect to temperature and provide stability and a high output. The three metals that best exhibit these characteristics are:

Platinum

The stability and linearity of this metals' resistive output over a broad range makes it the best metal for process type RTD's. Platinum can withstand oxidation and is effective over a range of –200 to + 850 degrees C. The four basic ohm values of 100, 200, 500 and 1000 give the user different degrees of sensitivity within the sensor. The higher the ohm value the greater the sensitivity and resolution. See chart on page 8 for the resistance change per degree Celsius for the temperature coefficient of resistance (TCR) for the RTD you are using.

Copper

The greatest strength of this metal is its low cost. Copper performs poorly in oxidizing atmospheres and has a low output and thus an inability to perform in narrow measuring spans.

Nickel

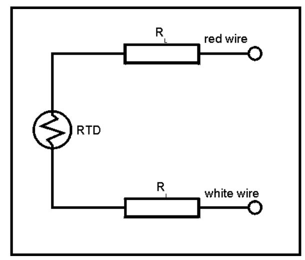
This metal is a good compromise between copper and platinum. It has a higher output and is slightly less expensive than platinum. It is extremely nonlinear above 300 degrees C.

RTDs are known for their excellent accuracy and linearity over a wide temperature range. Some RTDs have accuracies as high as 0.01 ohms (0.026°C) at 0°C. RTDs are also extremely stable devices. Common industrial RTDs drift less than 0.1°C/year. Manufacturing processes increasingly require precise process control. For this reason the number of RTDs installed annually continues to grow as a percentage of total temperature sensor sales.

Because an RTD is a passive resistive device, you must pass a current through the device to produce a measurable voltage. This current causes the RTD to internally heat, which appears as an error. You can minimize self-heating by using the smallest possible excitation current. The typical RTD receiving device uses 1mA to stimulate the RTD.

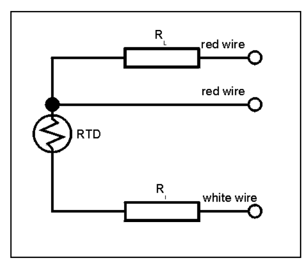
RTDs are available in two-, three-, and four-wire configurations. The number of lead wires directly affects such factors as accuracy, stability, installation budget and distance between sensor and receiver.

Two Wire



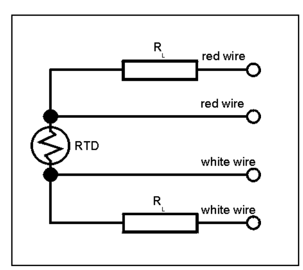
When accuracy is not critical, a two-wire RTD is the least expensive; offering. Using lead wires to place any distance between a two-wire RTD and a receiving device will further compromise its accuracy. The potential for poor accuracy from a two-wire RTD stems from its inability to compensate for lead length, resistance that changes the ohm value of the original signal. A two-wire RTD should be used only in applications where the receiving device connects directly to the sensor.

Three Wire RTD



Three-wire RTDs compensate for resistance resulting from length differences by adding a third lead to the RTD. To accomplish this requires that the wires match exactly. Any difference in resistance between the lead wires will cause an imbalance, which will compromise the accuracy of the RTD. Lead length variance, work hardening or corrosion, and manufacturing irregularities are errors to avoid. Quality manufacturing is critical to insure balance of all three leads.

Four Wire RTD



Errors caused by resistance imbalance between leads are cancelled out in a four-wire RTD circuit. Four-wire RTDs are used where superior accuracy is critical or if the sensor is installed far from the receiving device. In a four-wire RTD one pair of wires carries the current through the RTD the other pair senses the voltage across the RTD. 2- and three-wire RTDs require heavier lead wire because thicker wire, by creating less resistance to the measured signal, reduces measurement distortion. Therefore lighter gauge wire, less expensive, may be used in four-wire RTD applications.

RTDs are limited to temperatures of 1200 ° F and because of the construction of the sensing element, RTDs do not do well in high-vibration and severe mechanical shock environments. When selecting a temperature sensor for an application you should consult your temperature sensor manufacturer for recommendations.

RTD Characteristics

Stability: Defined as the ability of a sensor to maintain its stated accuracy over an extended period of time, usually one year, at its rated temperature. RTDs when used properly can maintain a stability of .25°

Repeatability: Defined as the ability to repeat the same output value at a given temperature point in a spanned temperature range. RTDs typically are repeatable to ±.14°C or .05%, whichever is greater.

Response Time: Measured as the time necessary for a sensor to report a 63.2% step change in temperature in water moving transverse to the sensor sheath at 3 fps.

Sheath Diameter	Response Time
1/8″	2 Seconds
3/16″	3 Seconds
1/4″	5 Seconds

Accuracy: The industry has standardized on two types of accuracy for Platinum 100 ohm RTD elements. They are Class B, the standard in the process industry and the higher accuracy Class A. The table below shows typical element accuracies per DIN 43760-1980 and ASTM E1137.

Platinum (100 ohm)

Temperature		Accuracy Class B Standard		Accuracy Class A High	
°C	°F	°C	°F	°C	°F
-100	-148	.8	1.44	.35	.63
0	32	.3	.54	.15	.27
100	212	.8	1.44	.35	.63
200	392	1.3	2.34	.55	.99
300	572	1.8	3.24	.75	1.35
400	752	2.3	4.14	.95	1.71
500	932	2.8	5.04	1.15	2.07

Standard Accuracy
Nickel (120 ohm)

Rt	Temperature		Tolerance		
(°C)	°C	°F	±°C	±°F	±ohms
70.83	-73	-100	1.25	2.25	.825
120.00	0	32	.83	1.50	.600
148.07	38	100	1.30	2.34	1.020
200.64	100	212	2.10	3.76	1.910
247.82	149	300	2.68	4.75	2.700
380.31	260	500	4.28	7.71	5.520

Optional High Accuracy
Nickel (120 ohm)

Rt	Temperature		Tolerance		
(°C)	°C	°F	±°C	±°F	±ohms
70.83	-73	-100	.84	1.52	.55
120.00	0	32	.56	1.00	.40
148.07	38	100	.88	1.58	.68
200.64	100	212	1.39	2.51	1.27
247.82	149	300	1.79	3.23	1.82
380.31	260	500	2.62	4.71	3.68

Standard Accuracy - Copper
(9.035 ohms @ 0 °C / 10 ohms @ 25 °C)

Rt	Temperature		Tolerance		
(°C)	°C	°F	±°C	±°F	±ohms
6.190	-73	-100	2.83	5.09	.112
9.035	0	32	1.14	2.05	.045
10.000	25	77	1.56	2.80	.056
10.490	38	100	2.12	3.82	.084
12.897	100	212	3.53	6.36	.196
14.780	149	300	4.94	8.90	.140
19.116	260	500	7.78	14.00	.308

Optional High Accuracy - Copper
(9.035 ohms @ 0 °C / 10 ohms @ 25 °C)

Rt	Temperature		Tolerance		
(°C)	°C	°F	±°C	±°F	±ohms
6.190	-73	-100	1.04	1.87	.040
9.035	0	32	.44	.73	.016
10.000	25	77	.56	.100	.020
10.490	38	100	.66	1.19	.030
12.897	100	212	1.25	2.25	.050
14.780	149	300	1.72	3.09	.070
19.116	260	500	2.74	4.94	.011

Temperature Coefficient of Resistance (TCR)

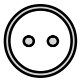
The temperature coefficient of a sensor is determined by the purity of the winding wire used in the manufacture of the sensor element. It is defined as the resistance change per ohm per degree C. Our standard RTDs use the following TCRs:

Platinum	=	Curve A = .00392 ohms/ohm/°C
		Curve B = .003850 ohms/ohm/°C
Nickel	=	.006720 ohms/ohm/°C
Copper	=	.004274 ohms/ohm/°C

Sensor Resistance Change per Degree at 0°C (32°F)

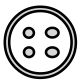
Sensor Resistance	°C	°F
100 ohm Platinum	.39 ohms	.22 ohms
200 ohm Platinum	.78 ohms	.44 ohms
400 ohm Platinum	1.56 ohms	.88 ohms
500 ohm Platinum	1.95 ohms	1.10 ohms
1000 ohm Platinum	3.90 ohms	2.20 ohms
120 ohm Nickel	.72 ohms	.40 ohms
10 ohm Copper	.039 ohms	.02 ohms
100 ohm Copper	.39 ohms	.22 ohms

Thermocouple and RTD MI Cable Specifications



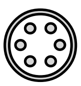
Single Thermocouple MI Cable Specifications

Cable Diameter	(inch)	**0.059**	**0.062**	**0.079**	**0.118**	**0.125**	**0.177**	**0.188**	**0.236**	**0.250**	**0.313**	**0.375**	**0.425**	**0.500**
	(mm)	**1.5**	**1.6**	**2.0**	**3.0**	**3.2**	**4.5**	**4.8**	**6.0**	**6.4**	**8.0**	**9.5**	**10.8**	**12.7**
Wire Diameter	(inch)	0.010	0.010	0.013	0.019	0.021	0.029	0.031	0.039	0.041	0.051	0.062	0.070	0.082
	(mm)	0.25	0.25	0.33	0.48	0.53	0.74	0.79	0.99	1.04	1.30	1.57	1.78	2.08
Gage Equivalent *(approximate)*		<30	>30	>28	>25	>24	>21	<20	<18	>18	>16	<14	<13	>12
Sheath Wall Thickness	(inch)	0.007	0.007	0.009	0.013	0.014	0.020	0.021	0.027	0.029	0.036	0.043	0.049	0.057
	(mm)	0.18	0.18	0.23	0.33	0.36	0.51	0.53	0.69	0.74	0.91	1.09	1.24	1.45



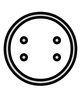
Duplex Thermocouple MI Cable Specifications

Cable Diameter	(inch)	**0.118**	**0.125**	**0.177**	**0.188**	**0.234**	**0.236**	**0.250**	**0.313**	**0.375**	**0.425**	**0.500**
	(mm)	**3.0**	**3.2**	**4.5**	**4.8**	**5.94**	**6.0**	**6.4**	**8.0**	**9.5**	**10.8**	**12.7**
Wire Diameter	(inch)	0.018	0.019	0.027	0.029	0.036	0.036	0.038	0.048	0.057	0.065	0.076
	(mm)	0.46	0.48	0.69	0.74	0.91	0.91	0.97	1.22	1.45	1.65	1.93
Gage Equivalent *(approximate)*		>25	<24	<21	>21	>19	>19	<18	>17	15	>14	>13
Sheath Wall Thickness	(inch)	0.013	0.014	0.020	0.021	0.027	0.027	0.029	0.036	0.043	0.049	0.057
	(mm)	0.33	0.36	0.51	0.53	0.69	0.69	0.74	0.91	1.09	1.24	1.45



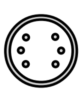
Triplex Thermocouple MI Cable Specifications

Cable Diameter	(inch)	**0.188**	**0.236**	**0.250**	**0.313**	**0.375**	**0.425**	**0.500**
	(mm)	**4.8**	**6.0**	**6.4**	**8.0**	**9.5**	**10.8**	**12.7**
Wire Diameter	(inch)	0.021	0.026	0.028	0.035	0.042	0.048	0.056
	(mm)	0.53	0.66	0.71	0.89	1.07	1.22	1.42
Gage Equivalent *(approximate)*		>24	>22	<21	<19	>18	<16	<15
Sheath Wall Thickness	(inch)	0.021	0.027	0.029	0.036	0.043	0.049	0.057
	(mm)	0.53	0.69	0.74	0.91	1.09	1.24	1.45



Three or Four Wire RTD MI Cable Specifications

Cable Diameter	(inch)	**0.090**	**0.118**	**0.125**	**0.177**	**0.188**	**0.236**	**0.250**	**0.313**	**0.375**	**0.425**	**0.500**
	(mm)	**2.3**	**3.0**	**3.2**	**4.5**	**4.8**	**6.0**	**6.4**	**8.0**	**9.5**	**10.8**	**12.7**
Wire Diameter	(inch)	0.010	0.013	0.014	0.020	0.021	0.026	0.028	0.035	0.042	0.047	0.055
	(mm)	0.25	0.33	0.36	0.51	0.53	0.66	0.71	0.89	1.07	1.19	1.40
Gage Equivalent *(approximate)*		>30	>28	27	24	>24	>22	<21	<19	>18	>17	<15
Sheath Wall Thickness	(inch)	0.008	0.010	0.011	0.015	0.016	0.020	0.021	0.027	0.032	0.036	0.043
	(mm)	0.19	0.25	0.28	0.38	0.41	0.51	0.53	0.69	0.81	0.91	1.09



Dual Three Wire RTD MI Cable Specifications

Cable Diameter	(inch)	**0.188**	**0.236**	**0.250**	**0.313**	**0.375**	**0.425**	**0.500**
	(mm)	**4.8**	**6.0**	**6.4**	**8.0**	**9.5**	**10.8**	**12.7**
Wire Diameter	(inch)	0.021	0.026	0.028	0.035	0.042	0.047	0.055
	(mm)	0.53	0.66	0.71	0.89	1.07	1.19	1.40
Gage Equivalent *(approximate)*		>24	>22	<21	<19	>18	>17	<15
Sheath Wall Thickness	(inch)	0.016	0.020	0.021	0.027	0.032	0.036	0.043
	(mm)	0.41	0.51	0.53	0.69	0.81	0.91	1.09

Note: *IR Test Voltage of 500 VDC applied to all above listed cables. Cable dimensions shown are nominal. Actual dimensions may vary within tolerance limits. Specifications subject to change without notice.*

Choosing the right sensor for the job

Criteria	Thermocouple vs. RTD	TC	RTD
Range	Although new and improved manufacturing techniques have increased the range of RTDs, this category belongs to thermocouples. Better than 95% of RTDs are used in temperatures below 1000° F. Thermocouples can be used up to 2700° F.	X	
Sensitivity	Grounded thermocouples are inherently tip sensitive; while RTD elements are isolated from their sheaths. A grounded thermocouple will respond to a 63% step change in temperature nearly three times faster than an RTD.	X	
Cost	Comparing a 12 inch, SS sheath .25″, Type J grounded thermocouple, with a 100 Ohm platinum RTD .00385 Alpha, prices the thermocouple at 2.5 to 3 times less than an RTD. Installed cost make up some of this difference since RTDs use inexpensive copper lead wire to transmit the signal back to the DCS.	X	
Accuracy	There are many factors to determine accuracy; linearity, stability, and repeatability to name a few that can affect accuracy. While a thermocouple's stand alone accuracy can approach that of an RTD, the superior advantages in these other areas make the RTD the choice.		X
Linearity	Temperature vs. resistance nearly plot a straight line for an RTD, while a thermocouple shows an almost "S" like curve.		X
Ruggedness	Thermocouples can essentially be one piece. RTD elements both thin film and wire wound must be connected to copper wire.	X	
Stability	Due to their linearity and virtually drift free output, RTDs are more stable than thermocouples.		X
Repeatability	The ability of a probe or instrument to give the same output or reading under repeated identical conditions.		X

Thermowell and Protection Tube Specification

Common Materials:

The following materials are the most common alloys used as thermowells or protection tubes. (Temperature ratings in the following guideline are expressed in °F)

Carbon Steel (A105, A350, CF2) - Commonly used in oxidizing environments. Its melting point is 2500° and maximum operating temperature is 1300°.

304 SS - Used in applications up to 1650°. This nickel based alloy has good corrosion resistance and can be used in both reducing and oxidizing atmospheres.

310 SS - Better than 304 in many high temperature applications. Good resistance to carburizing and reducing environments. Subject to carbide precipitation in the 900° to 1600° range. Continuous service to 2100°.

316 SS - Operating temperature is the same as 304 but has a higher corrosion resistance and creep strength. OK to use in both reducing and oxidizing atmospheres.

446 SS - Most commonly used ferritic stainless steel. Maximum operating temperature is 2000°. Selected for use in reducing, oxidizing, vacuum and neutral atmospheres.

Low Carbon Stainless Steels - Are available from SSi in 304L and 316L. The operating and melt temperatures of these alloys are the same as the standard 304 and 316SS. They are generally used to reduce the effect of carbide precipitation.

Alloy 600 - Maximum rating of 2100°. This alloy has excellent corrosion resistance at elevated temperatures. Not recommended in reducing or high sulfur environments.

Alloy 800 - Same elevated temperature resistance to oxidation as Alloy 600. Good sulfur and corrosion resistance. Same operating temperature as Alloy 600.

Hastelloy B - Can be used up to 1500° in inert atmospheres and 1500° in oxidizing environments. Excellent resistance to pitting, stress-corrosion cracking.

Hastelloy C - Excellent corrosion resistance to ferric and cupric chlorides, contaminated mineral acids, wet chlorine gas. Oxidation resistance to 1800°F. Continuous service to 2200°.

Monel - Good resistance to sea water and not subject to chloride stress cracking. Not recommended for oxidizing atmospheres. Upper temperature range is 1000°.

Nickel - Use in sulfur free environments and in oxidizing atmospheres. Operating temperature not to exceed 1400°.

Tantalum - Upper temperature range is 5000°. Most commonly used as a sheath material for stainless flanged wells. Has good resistance to corrosion to most chemicals and a high heat conductivity coefficient.

Design Considerations:

Material - Cost versus Corrosion
In general the most important consideration in selecting the proper thermowell is the material of construction. Given that pressure is not a consideration, the wrong material selection can cause premature failure due to corrosion. In a perfect world, tantalum would be the same price as carbon steel and consequently seldom would there be a cost versus corrosion consideration. But then, a perfect world would have eliminated the nice little corrosion chart guide on pages 69 and 70 of this manual. The high polish on all stainless steel and nickel alloys reduces the risk of corrosion.

Connection - The Process Decides
The industry has standardized on five different types of process connections. They are: Threaded, Flanged, Socket Weld, Weld-In, and Van Stone. *Threaded Wells* are provided in one piece construction (up to 36") and have an NPT connection. *Flanged Wells* (other than Van Stone) consist of a stem welded to an ANSI rated flange. The weld is commonly referred to as a double weld that eliminates crevice corrosion since no open joints are exposed. *Socket Weld Wells* fit all A.S.A. standard couplings and flanges, are easy to install and have a very tight fit. *Weld-In Wells* are more expensive to install and are used where flanges are not practical or desired. *Van Stone Wells* are a one-piece construction well installed with a lap joint flange.

Length - More than just a “U” dimension
The immersion length of a well typically referred to as the “U” dimension is measured from the bottom of the threads or flange to the tip of the well. Accuracy of the sensor can be affected by the immersion length of the well. Thermocouples, which are tip sensitive, are less likely to be affected by short “U” lengths; while RTD’s which are stem sensitive would require a longer “U” for the same process condition. A rule of thumb is to immerse a thermocouple at least 3" in gases and 1" in liquids. Add 2" to this rule for RTD’s.

Bore Size - Standardization is the Key
The standard bore size for all wells offered in this catalog is .260 with .385 available as an option. Delivery is not generally affected by the .385 Wide Bore (WB) option. These bore sizes will accommodate most sheathed thermocouples, RTD’s and thermometers.

Well Shank - Strength is the Key
Tapered wells provide greater protection against breaking in high velocity fluid applications. The higher strength to weight ratio makes tapered the choice over straight wells due to their natural higher frequency. Reduced tip or step down wells provide increased sensitivity.

Vibration - Sometimes very dangerous
Excess pressure, temperature and corrosion are the major causes of well failure. Vibration, although less common, is significantly more dangerous. A condition called the Von Karman Trail can be caused by fluid flowing by the well which forms a turbulent wake. This wake has a frequency which is based on the diameter of the well and the velocity of the fluid. If this wake frequency is the same as the natural frequency of the well, the resonance could cause the well to vibrate to the extent that the stem fractures and breaks. It is difficult to provide specific information in chart form to assist you in well selection when vibration is a consideration. Maximum allowable velocities will change depending on the “U” length, well material, temperature, type of fluid and well construction. For example a 316SS well with a 3-1/2" U can handle a maximum velocity of 100 feet per second in water at 200°F. The same well in 1000°F superheated steam allows 375 feet per second. Smart Sensors can perform the necessary calculations to assist you with design criteria in cases where vibration may be a factor. Smart Sensor assumes no responsibility other than repair or replacement of a well.

**The information contained herein acts as a guide and Smart Sensors Inc., distributors and representatives specifically deny warranty expressed or implied.*

Thermowells: Why They Fail

The following is the most common cause of failure for threaded or flanged bar stock thermowells:

- Improper process application
- Improper material selection
- Improper installation
- Higher than anticipated temperatures
- Ignoring velocity considerations

Generally there are warnings associated with the impending failure for all of the failure considerations except for velocity. This failure can result in the thermowell moving unrestricted to a most undesirable alternative location in the process.

This most catastrophic cause of failure comes from improper velocity considerations. When a well is installed in a pipe or vessel and as fluid flows past the well's tip it forms a turbulent wake, this wake is called the Von Karman Trail. This wake has a defined frequency based on the diameter of the well and the velocity of the fluid flowing past it. The well must posses sufficient stiffness so that it's frequency would never equal the wake frequency of the Von Karman Trail. If these frequencies are equal to one another it causes the well to vibrate to the point of breaking.

The following table provides the maximum velocity for a 1" NPT threaded well, tapered construction, either 304 or 316SS. The medium is water at 200 degrees F in a pressurized (2500 psi) vessel. The maximum velocity and corresponding U length should be used as a guide only.

The calculations for determining U length are sophisticated and complete. Never use a guide or guess when it comes to determining whether velocity can cause a catastrophic failure. Call Smart Sensors for complete calculations based on your specific criteria.

U Length in inches	Maximum velocity (fps)
3.5	109
6	64
8	47
10	38
12	31
18	18
24	10

Smart Sensors can perform the velocity calculations that will determine the maximum U length and type of well. To make this recommendation we will need the following information:

1) Design U length in inches
2) Maximum velocity in feet per second
3) Maximum temperature
4) Well material
5) Process fluid or gas

Ceramic and Metal Protection Tubes

These protection tubes are generally used in industrial furnace applications where the temperature prohibits use of a metal tube. The characteristics of Alumina, Mullite, Silicon Carbide and Metal Ceramic protection tubes are as different as the applications they perform well in. Selection of the type of tube is application dependent, the following is a broad definition of some of the successful applications:

Molten Metal	Molten Glass	Oil fired furnaces
Calcining kilns	Ethylene Crackers	Blast furnaces

Alumina
The chemical composition consists of greater than 99.6% of sintered Alumina Oxide. They are the toughest ceramic tube when compared to Mullite. Alumina is extremely versatile and can be used in all atmospheres with selected preference in oxidizing atmospheres where in general Mullite would be a better choice. This tube can be used with any thermocouple calibration including all noble metal calibrations.

Mullite
Silica/Alumina protection tubes are a low cost alternative to Alumina. They have a low tolerance to thermal shock and can only be used with J,K, and N thermocouples. It is recommended that the tubes are evenly heated to 800 degrees F prior to use.

Silicon Carbide
Silicon Carbide, Carbon and Silica comprise the majority of the chemical composition and provide a excellent resistance to shock. Resistance to corrosion and abrasion at temperatures above the range of nickel chrome alloys is a feature that allows use in the most demanding corrosive application – which includes molten salt. An inner alumina tube must be used when noble metal thermocouples are employed.

Metal Ceramic
Consisting of chromium and alumina oxide this tube holds its strength even under load conditions. In most applications it can be mounted horizontally without drooping. The conductivity of this composite is comparable to most stainless steels. Its' use in molten metal applications is recommended since it has good resistance to wetting.

KEY
E - Excellent
G - Good
A - Average
P - Poor
Y - Yes
N - No

	Temp Rating °C	Gas Tight	Corrosion Resistance	Resistance to Thermal Shock	Thermal Conductivity	Hardness	Droop	Water Absorption Resistance	Cost	Oxidizing Atmosphere
Alumina Oxide (99.7% Pure)	1950	Y	A	P	P	P	P	E	$$	N
Mullite (Silica/Alumina)	1750	Y	A	P	P	A	P	E	$	Y
Metal Ceramic (Chromium/ Aluminum Oxide)	1320	Y	G	E	E	G	E	E	$$$	N
Hexaloy (Silicon Carbide)	1650	Y	E	E	E	E	G	E	$$$$	Y

Specifying Temperature Sensors in Hazardous Areas

A great concern to those who specify instruments is the safety of the installation in hazardous areas. This guide will help the user define these locations and specify the proper sensor enclosure in accordance to nationally accepted standards.

The following list of acronyms are a sampling of the testing laboratories and standard institutes in North America that deal with standards and testing of materials used in hazardous areas.

ANSI	American National Standards Institute
CSA	Canadian Standards Association
FM	Factory Mutual Research Corporation
I. S.	Intrinsically Safe
ISA	Instrument Systems and Automation
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters Laboratories

This guide is not intended to define hazardous locations. However it will provide insight to sensor enclosures designed to function in hazardous areas. In North America the NEC divides flammable gases in to three classes:

- **Gases**
- **Dusts**
- **Fibers**

The *classes* are further divided into *groups.* The *groups* are organized by the explosive potential of the material within the group. The following table lists the class with an example of some of the materials in the group.

Class I: Flammable gases and vapors	**Group A:** Acetylene **Group B:** Hydrogen, butadiene, ethylene oxide, propylene oxide **Group C:** Ethylene, coke oven gas, diethyl ether, dimethyl ether **Group D:** Propane, acetone, alcohols, ammonia, benzene, butane, ethane, ethyl acetate, gasoline, heptanes, hexanes, methane, octanes, pentanes, toluene.
Class II: Combustible dusts	**Group E:** Metal dust **Group F:** Coal, coke dust **Group G:** Grain, plastic dust
Class III: Combustible flyings and fibers	Wood flyings, paper fibers, cotton fibers

The third and final consideration of the standards is the probability of the presence of the materials as identified by the groups that are incorporated into the three classes. This area is broken down into two separate Divisions. Division identification is thorough and complicated but basically subscribes to the following guidelines:

Division I: Areas where hazardous materials may be present under normal operating conditions

Division II: Areas where hazardous materials may become present due to leaks, process upsets or failures

In reviewing the two areas the probability of an explosion is more prevalent where explosive gases or dust are present in the process. Consequently Division I is defined as a hazardous location by standard institutions.

Today's instrumentation is more consistent and reliable than instruments used a decade ago, greatly reducing the chances of a spill or process upset. Also specifications that call for non redundant technologies to prevent process upsets like spills have reduced the possibility of catastrophic occurrences in Division II areas. Although Division II areas are classified as nonhazardous, for safety reasons many users prefer to use Division I products in Division II areas. In general because of the low energy produced, non passive devices such as thermocouples and RTDs should be safe in Division II areas.

In summary there are three methods of protection for temperature sensors in Division I areas. They are:

- **Explosion proof housings**
- **Intrinsically safe loops**
- **Purged or safe instrument air**

This guide has pretty much described the hazardous area and the following are the enclosures (heads) available from Smart Sensors along with the NEMA rating and the areas that we recommend their use:

Explosion Proof
For use in:

Class I
Division I
Groups B, C, and D

Class II
Division I
Groups E, F, and G

NEMA - 4

NEMA - 4X

NEMA Protection Ratings

In North America, Equipment can be classified per the National Electrical Manufacturer's Association (NEMA) Enclosure Classifications. NEMA is a nonprofit trade organization composed of mainly U.S. manufacturers of electrical apparatus. NEMA created voluntary standards for electrical enclosures. These classifications describe the environment in which the product can be used due to the protection the enclosure provides. ("Enclosure" includes electrical and mechanical connections and external adjustments.) Among others, NEMA classifies enclosures based on the effects of external icing, rust and corrosion, or contamination from oil and coolants.

Type 1	General Purpose	Indoor	accidental contact will not corrode
Type 2	Drip-proof	Indoor	limited amounts of falling water and dirt will not corrode
Type 3	Dust-tight, rain-tight	Outdoor	windblown dust, rain, sleet, and undamaged by external ice formation
Type3R	Dust-tight, rain-tight	Outdoor	same as type 3 above, plus diverts water from live parts, provision for drainage, will not corrode
Type 3S	Dust-tight, rain-tight	Outdoors	same as type 3 above, operation of external mechanism when ice laden, will not corrode
Type 4	Water-tight, dust-tight	Indoor/Outdoor	windblown dust and rain, splashing water, and hose directed water, undamaged by ice formation, will not corrode
Type 4X	Water-tight, dust-tight	Indoor/Outdoor	same as type 4 above, plus corrode resistant, will not corrode
Type 5	Dust-tight	Indoor	dust and falling dirt, will not corrode
Type 6	Water-tight/dust-tight	Indoor/Outdoor	temporary entry of water during limited submersion (6ft/2m for 30 Min), undamaged by formation of ice, will not corrode
Type 6P	Water-tight/dust-tight	Indoor/Outdoor	same as type 6 above plus prolonged submersion, will not corrode
Type 7	Explosion proof/Class I Groups A, B, C, D	Indoor	Hazardous Locations: Protection against corrosive effects of liquids and gases
Type 8	Explosion proof/Class I	Indoor/Outdoor	Hazardous Locations: protection against corrosive effects of liquids and gases; contacts or connections immersed in oil
Type 9	Explosion Proof/Class II Groups E or G	Indoor	Hazardous Locations: dust-tight, hazardous dust
Type 10	Hazardous Locations	Indoor	U.S. MSHA Mine Safety and Health Adm. per 30 C.F.R., Part 18
Type 11	Oil-tight/Corrode	Indoor	protection from corrosive effects of gases and liquid dripping, seepage and external condensation or corrosion, oil immersion
Type 12	Oil-tight/Dust-tight	Indoor	fibers, lint, dust and light splashing, seepage and dripping condensation or non-corrosive liquids
Type 12K		Indoor	same as type 12 above, enclosure has knockouts
Type 13	Oil-tight/Dust-tight	Indoor	dust, spraying of water, oil and corrosive coolant, oil resistant gaskets

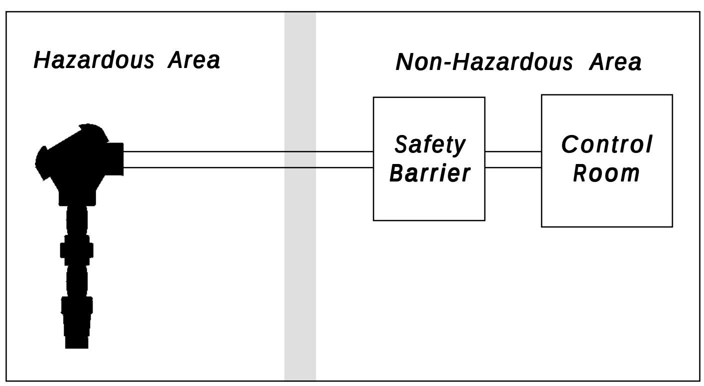
The final area for discussion regarding protection in hazardous areas is intrinsically safe loops.

Intrinsically safe equipment is defined as "equipment and wiring which is incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most easily ignited concentration." (ISA-RP12.6) This is achieved by limiting the amount of power available to the electrical equipment in the hazardous area to a level below that which will ignite the gases.

Since RTDs and thermocouples are low energy devices they lend themselves useful in intrinsically safe loops. By definition these sensors do not possess the energy to ignite a material that could cause an explosion. A temperature loop is determined to be intrinsically safe if it is incapable of ignition under four conditions:

Normal power levels
Faults in the control room
Faults in the signal wiring
Faults in the sensor

No explosion proof housings are required in intrinsically safe temperature loops, consequently this can result in a significant cost savings to the user, However since most receiving instruments are AC powered, they can release stray voltage through the instrument wire to the field sensor. The use of Zener barriers prevents explosions due to this scenario and certifies the loop as intrinsically safe.



Please visit our web site for other solutions to **Temperature Measurement.......the right way!!!!**

Improving Process Temperature Measurements

A common misconception when trying to improve temperature measurement is to focus on accuracy. In the case of thermocouples the knee jerk reaction is to change the accuracy from standard to special limits (while remaining with the initial calibration). Special limits cut the accuracy in half for non noble metal calibrations.

There are a few problems associated with this approach. First the measuring or controlling instrument may not be able to read or control the improved accuracy; consequently there may be a cost to upgrade the instrument part of the measurement loop. Second the cost for upgrading to special limits may be prohibitive. Third, the repeatability, which we will define as the ability of the thermocouple to reproduce a consistent output under the same process conditions, may provide the desired results at a lower cost.

The other option when considering accuracy only is to change the calibration. Thermocouple accuracy or inaccuracy is attributed to the inhomogeneities in alloy composition. The optimum thermocouple configuration is to match two pure element legs. Noble metal combinations of gold versus platinum and platinum versus palladium can provide accuracy improvements ten times greater than non noble metal configurations, but are extremely expensive.

What are the alternatives? First let's examine the special limits accuracy of the most commonly used sheathed thermocouple calibration.

Calibration: ANSI type K
Positive Conductor: Chromel
Negative Conductor: Alumel
Accuracy @ 500 degrees C
Special Tolerance: + or – 2 degrees C

In the above case we can assume that the millivolt out put of a type K thermocouple with special tolerance put in service at 500 degrees C will read no lower than 498 or no higher than 502 degrees Centigrade. This produces a four degree uncertainty. Cross Calibration is an option available to improve loop accuracy without incurring all the expense associated with special tolerance calibration. For the purpose of this examination we will assume that identical thermocouple calibrations are involved.

Two areas particularly warrant Cross Calibration consideration, they are:

1. Multiple identical thermocouples installed close to one another in the process or multiple thermocouples that share the same process environment

2. Multiple thermocouples located in the same protection tube commonly referred to as multi-point assemblies.

How does Cross Calibration work?

As stated earlier thermocouple accuracy is dependent on alloy composition. Consequently thermocouples made from the same alloy composition have identical inaccuracies. Identifying the error from a single alloy composition batch assures the user that all thermocouples made from that batch have a repeatable error. In many cases error compensation can be accomplished in the instrument that processes the millivolt signal from the thermocouple.

Why does Cross Calibration work?

Quite simply thermocouples can experience the same degradation when exposed to the same process conditions. This is particularly relevant in multi-point assemblies responsible for reporting reactor temperatures. In the case of sensors not in close proximity the use of analytic redundancy (see footnote) correlations may help the user to understand how to optimize accuracy.

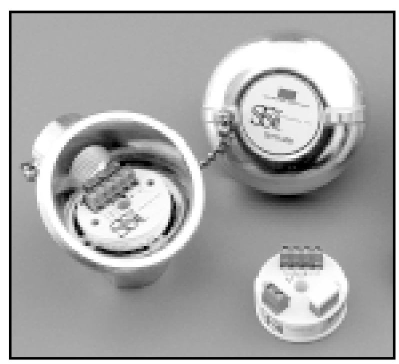
Of course the ability to measure the millivolt output of the thermocouple in a controlled environment is essential in order to employ Cross Calibration.

Contact Smart Sensors and inquire about our calibration lab. Measurement error of thermocouples in our lab can be up to 5 times greater than ANSI accuracies and is NIST traceable.

Analytic Redundancy
Yung, S.K. and Clarke, D.W. "Local Sensor Validation," Measurement and Control, Vol. 22, June 1989, pp. 122-130.

Improve Accuracy – Reduce Noise

Sensor accuracy can be affected by interference from common industrial noise sources. Thermocouple and RTD outputs are low level signals. The thermocouple produces output in millivolts, while the RTD produces a very weak resistance signal. Ungrounded thermocouples, where the conductors are insulated from the sheath can provide protection from some noise sources. The RTD is inherently isolated. But at times radio frequency and electro magnetic interference from walkie-talkies, transformers, motors and power wires can still cause erratic signals even if the sensor is ungrounded or isolated. Converting the output to 4-20 milli-amps by using a field temperature transmitter can reduce noise problems. Smart Sensors offers a transmitter that provides RFI and EMI protection. More importantly all of our field transmitters are isolated. Isolation protects against power surges or errors associated with ground loops.



For more information, Request Smart Bulletin PB-pt-1

Calibration

Verifying the accuracy of Thermocouples and RTDs is a difficult but exact science. It requires a system that has a stable temperature source, an accurate reference thermometer, repeatable measurement and control and finally a data processor. Each component of the system must be in concert with the other components in order to minimize system uncertainty. The components must have corresponding supportive characteristics for resolution, accuracy, linearity, traceability, stability and repeatability. Examples of how these specifications can affect system uncertainty are:

Resolution and Accuracy

If desired accuracy is .01 degrees C then the resolution or ability to read this accuracy must be at least .001 degree C.

Linearity

It is tempting to state linear accuracy at one temperature (usually 0 degrees C), while this is helpful (all thermocouples have zero

output at this temperature) it is important to know the measurement accuracy over the entire range of the readout. If the readout were perfectly linear, its accuracy specification would be the same across its entire range. However, all readout devices have some non-linearity component and are not perfectly linear

Stability

Readout stability is important, since most measurements are made in a wide variety of ambient conditions and over varying lengths of time. Consequently the temperature coefficient and long-term stability specifications are extremely important.

Calibration

Beware of "no calibration" claims. Latest ISO specifications require calibration at least once annually.

Traceability

A manufacturers' calibration tolerance is at best at a secondary standard level. It is important for the reference thermometer to have NIST traceable accuracy.

Now lets' put this all together. It all starts with the ability to maintain the desired calibration temperature. In order to provide the optimum stability two sources are necessary. This is due to the broad range of temperatures involved. In general if a RTD is being tested a temperature bath would be used. If the sensor is a thermocouple with a higher temperature range a furnace is used. Depending upon the source employed the stability ranges from .0001 degrees C to .5 degrees C. Achieving this type of stability requires a highly stable control sensing element, fast maximum stability, and a source design that minimizes and controls heat loss.

Since our calibration procedure employs the comparison method, the need for a highly accurate reference thermometer is essential. Our system uses a Standard Platinum Resistance Thermometer (SPRT) with accuracies of better than + or - .002 degrees C. This accuracy is achieved by abiding by the International Temperature Scale – ITS-90. The SPRT has accuracies traceable to NIST.

The final element, the processor allows the information to be formatted into a user defined report and can analytically address the tolerance and accuracy of the sensor. A good example is the Callendar Van Duesen (CVD) equation. The system uses CVD equations and applies associated uncertainties of a Platinum Resistance Detector over any point within its operating temperature range. The result is a report that provides a resistance limit of error function.The practical uses of this report are many, but one of the most useful is determining sensor resistance interchangeability as a function of temperature. Simply stated this allows the user to determine uncertainty within a predetermined range and correct for the error in the instrument.

Our ability to put together the high tech components that have the characteristics necessary to assure uncertainty data is an important element in our success. The system is fully integrated into our quality assurance program and is a testament to our motto…***Temperature measurement…the right way!***

Type J - Iron vs Constantan

EMF in Millivolts — Reference Junction 32°F

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°F
-340	-8.030	-8.041	-8.052	-8.063	-8.074	-8.085	-8.095					-340
-330	-7.915	-7.927	-7.938	-7.950	-7.962	-7.973	-7.985	-7.996	-8.008	-8.019	-8.030	-330
-320	-7.791	-7.804	-7.816	-7.829	-7.841	-7.854	-7.866	-7.878	-7.890	-7.903	-7.915	-320
-310	-7.659	-7.672	-7.686	-7.699	-7.713	-7.726	-7.739	-7.752	-7.765	-7.778	-7.791	-310
-300	-7.519	-7.534	-7.548	-7.562	-7.576	-7.590	-7.604	-7.618	-7.632	-7.645	-7.659	**-300**
-290	-7.373	-7.388	-7.403	-7.417	-7.432	-7.447	-7.462	-7.476	-7.491	-7.505	-7.519	-290
-280	-7.219	-7.234	-7.250	-7.265	-7.281	-7.296	-7.312	-7.327	-7.342	-7.357	-7.373	-280
-270	-7.058	-7.074	-7.090	-7.107	-7.123	-7.139	-7.155	-7.171	-7.187	-7.203	-7.219	-270
-260	-6.890	-6.907	-6.924	-6.941	-6.958	-6.975	-6.991	-7.008	-7.025	-7.041	-7.058	-260
-250	-6.716	-6.734	-6.752	-6.769	-6.787	-6.804	-6.821	-6.839	-6.856	-6.873	-6.890	**-250**
-240	-6.536	-6.555	-6.573	-6.591	-6.609	-6.627	-6.645	-6.663	-6.681	-6.699	-6.716	-240
-230	-6.351	-6.370	-6.388	-6.407	-6.426	-6.444	-6.463	-6.481	-6.500	-6.518	-6.536	-230
-220	-6.159	-6.179	-6.198	-6.217	-6.236	-6.256	-6.275	-6.294	-6.313	-6.332	-6.351	-220
-210	-5.962	-5.982	-6.002	-6.022	-6.042	-6.061	-6.081	-6.101	-6.120	-6.140	-6.159	-210
-200	-5.760	-5.781	-5.801	-5.821	-5.842	-5.862	-5.882	-5.902	-5.922	-5.942	-5.962	**-200**
-190	-5.553	-5.574	-5.595	-5.616	-5.637	-5.657	-5.678	-5.699	-5.719	-5.740	-5.760	-190
-180	-5.341	-5.363	-5.384	-5.405	-5.426	-5.448	-5.469	-5.490	-5.511	-5.532	-5.553	-180
-170	-5.125	-5.146	-5.168	-5.190	-5.212	-5.233	-5.255	-5.277	-5.298	-5.320	-5.341	-170
-160	-4.903	-4.926	-4.948	-4.970	-4.992	-5.015	-5.037	-5.059	-5.081	-5.103	-5.125	-160
-150	-4.678	-4.701	-4.724	-4.746	-4.769	-4.791	-4.814	-4.836	-4.859	-4.881	-4.903	**-150**
-140	-4.449	-4.472	-4.495	-4.518	-4.541	-4.564	-4.587	-4.610	-4.633	-4.655	-4.678	-140
-130	-4.215	-4.239	-4.262	-4.286	-4.309	-4.332	-4.356	-4.379	-4.402	-4.425	-4.449	-130
-120	-3.978	-4.002	-4.026	-4.050	-4.073	-4.097	-4.121	-4.144	-4.168	-4.192	-4.215	-120
-110	-3.737	-3.761	-3.786	-3.810	-3.834	-3.858	-3.882	-3.906	-3.930	-3.954	-3.978	-110
-100	-3.493	-3.517	-3.542	-3.566	-3.591	-3.615	-3.640	-3.664	-3.688	-3.713	-3.737	**-100**
-90	-3.245	-3.270	-3.295	-3.320	-3.344	-3.369	-3.394	-3.419	-3.443	-3.468	-3.493	-90
-80	-2.994	-3.019	-3.044	-3.070	-3.095	-3.120	-3.145	-3.170	-3.195	-3.220	-3.245	-80
-70	-2.740	-2.766	-2.791	-2.817	-2.842	-2.867	-2.893	-2.918	-2.943	-2.969	-2.994	-70
-60	-2.483	-2.509	-2.535	-2.560	-2.586	-2.612	-2.638	-2.663	-2.689	-2.714	-2.740	-60
-50	-2.223	-2.249	-2.275	-2.301	-2.327	-2.353	-2.379	-2.405	-2.431	-2.457	-2.483	**-50**
-40	-1.961	-1.987	-2.013	-2.040	-2.066	-2.092	-2.118	-2.145	-2.171	-2.197	-2.223	-40
-30	-1.695	-1.722	-1.749	-1.775	-1.802	-1.828	-1.855	-1.881	-1.908	-1.934	-1.961	-30
-20	-1.428	-1.455	-1.482	-1.508	-1.535	-1.562	-1.589	-1.615	-1.642	-1.669	-1.695	-20
-10	-1.158	-1.185	-1.212	-1.239	-1.266	-1.293	-1.320	-1.347	-1.374	-1.401	-1.428	-10
0	-0.886	-0.913	-0.940	-0.967	-0.995	-1.022	-1.049	-1.076	-1.104	-1.131	-1.158	**0**

°F	0	1	2	3	4	5	6	7	8	9	10	°F
0	-0.886	-0.858	-0.831	-0.803	-0.776	-0.749	-0.721	-0.694	-0.666	-0.639	-0.611	**0**
10	-0.611	-0.583	-0.556	-0.528	-0.501	-0.473	-0.445	-0.418	-0.390	-0.362	-0.334	10
20	-0.334	-0.307	-0.279	-0.251	-0.223	-0.195	-0.168	-0.140	-0.112	-0.084	-0.056	20
30	-0.056	-0.028	0.000	0.028	0.056	0.084	0.112	0.140	0.168	0.196	0.225	30
40	0.225	0.253	0.281	0.309	0.337	0.365	0.394	0.422	0.450	0.478	0.507	40
50	0.507	0.535	0.563	0.592	0.620	0.649	0.677	0.705	0.734	0.762	0.791	**50**
60	0.791	0.819	0.848	0.876	0.905	0.933	0.962	0.991	1.019	1.048	1.076	60
70	1.076	1.105	1.134	1.162	1.191	1.220	1.249	1.277	1.306	1.335	1.364	70
80	1.364	1.392	1.421	1.450	1.479	1.508	1.537	1.566	1.594	1.623	1.652	80
90	1.652	1.681	1.710	1.739	1.768	1.797	1.826	1.855	1.884	1.913	1.942	90
100	1.942	1.972	2.001	2.030	2.059	2.088	2.117	2.146	2.175	2.205	2.234	**100**
110	2.234	2.263	2.292	2.322	2.351	2.380	2.409	2.439	2.468	2.497	2.527	110
120	2.527	2.556	2.585	2.615	2.644	2.673	2.703	2.732	2.762	2.791	2.821	120
130	2.821	2.850	2.880	2.909	2.938	2.968	2.997	3.027	3.057	3.086	3.116	130
140	3.116	3.145	3.175	3.204	3.234	3.264	3.293	3.323	3.353	3.382	3.412	140
150	3.412	3.442	3.471	3.501	3.531	3.560	3.590	3.620	3.650	3.679	3.709	**150**
160	3.709	3.739	3.769	3.798	3.828	3.858	3.888	3.918	3.948	3.977	4.007	160
170	4.007	4.037	4.067	4.097	4.127	4.157	4.187	4.217	4.246	4.276	4.306	170
180	4.306	4.336	4.366	4.396	4.426	4.456	4.486	4.516	4.546	4.576	4.606	180
190	4.606	4.636	4.666	4.696	4.726	4.757	4.787	4.817	4.847	4.877	4.907	190

J

EMF in Millivolts — Reference Junctions 0 °C

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°C
-210	-8.095											-210
-200	-7.890	-7.912	-7.934	-7.955	-7.976	-7.996	-8.017	-8.037	-8.057	-8.076	-8.095	**-200**
-190	-7.659	-7.683	-7.707	-7.731	-7.755	-7.778	-7.801	-7.824	-7.846	-7.868	-7.890	-190
-180	-7.403	-7.429	-7.456	-7.482	-7.508	-7.534	-7.559	-7.585	-7.610	-7.634	-7.659	-180
-170	-7.123	-7.152	-7.181	-7.209	-7.237	-7.265	-7.293	-7.321	-7.348	-7.376	-7.403	-170
-160	-6.821	-6.853	-6.883	-6.914	-6.944	-6.975	-7.005	-7.035	-7.064	-7.094	-7.123	-160
-150	-6.500	-6.533	-6.566	-6.598	-6.631	-6.663	-6.695	-6.727	-6.759	-6.790	-6.821	**-150**
-140	-6.159	-6.194	-6.229	-6.263	-6.298	-6.332	-6.366	-6.400	-6.433	-6.467	-6.500	-140
-130	-5.801	-5.838	-5.874	-5.910	-5.946	-5.982	-6.018	-6.054	-6.089	-6.124	-6.159	-130
-120	-5.426	-5.465	-5.503	-5.541	-5.578	-5.616	-5.653	-5.690	-5.727	-5.764	-5.801	-120
-110	-5.037	-5.076	-5.116	-5.155	-5.194	-5.233	-5.272	-5.311	-5.350	-5.388	-5.426	-110
-100	-4.633	-4.674	-4.714	-4.755	-4.796	-4.836	-4.877	-4.917	-4.957	-4.997	-5.037	**-100**
-90	-4.215	-4.257	-4.300	-4.342	-4.384	-4.425	-4.467	-4.509	-4.550	-4.591	-4.633	-90
-80	-3.786	-3.829	-3.872	-3.916	-3.959	-4.002	-4.045	-4.088	-4.130	-4.173	-4.215	-80
-70	-3.344	-3.389	-3.434	-3.478	-3.522	-3.566	-3.610	-3.654	-3.698	-3.742	-3.786	-70
-60	-2.893	-2.938	-2.984	-3.029	-3.075	-3.120	-3.165	-3.210	-3.255	-3.300	-3.344	-60
-50	-2.431	-2.478	-2.524	-2.571	-2.617	-2.663	-2.709	-2.755	-2.801	-2.847	-2.893	**-50**
-40	-1.961	-2.008	-2.055	-2.103	-2.150	-2.197	-2.244	-2.291	-2.338	-2.385	-2.431	-40
-30	-1.482	-1.530	-1.578	-1.626	-1.674	-1.722	-1.770	-1.818	-1.865	-1.913	-1.961	-30
-20	-0.995	-1.044	-1.093	-1.142	-1.190	-1.239	-1.288	-1.336	-1.385	-1.433	-1.482	-20
-10	-0.501	-0.550	-0.600	-0.650	-0.699	-0.749	-0.798	-0.847	-0.896	-0.946	-0.995	-10
0	0.000	-0.050	-0.101	-0.151	-0.201	-0.251	-0.301	-0.351	-0.401	-0.451	-0.501	**0**

°C	0	1	2	3	4	5	6	7	8	9	10	°C
0	0.000	0.050	0.101	0.151	0.202	0.253	0.303	0.354	0.405	0.456	0.507	**0**
10	0.507	0.558	0.609	0.660	0.711	0.762	0.814	0.865	0.916	0.968	1.019	10
20	1.019	1.071	1.122	1.174	1.226	1.277	1.329	1.381	1.433	1.485	1.537	20
30	1.537	1.589	1.641	1.693	1.745	1.797	1.849	1.902	1.954	2.006	2.059	30
40	2.059	2.111	2.164	2.216	2.269	2.322	2.374	2.427	2.480	2.532	2.585	40
50	2.585	2.638	2.691	2.744	2.797	2.850	2.903	2.956	3.009	3.062	3.116	**50**
60	3.116	3.169	3.222	3.275	3.329	3.382	3.436	3.489	3.543	3.596	3.650	60
70	3.650	3.703	3.757	3.810	3.864	3.918	3.971	4.025	4.079	4.133	4.187	70
80	4.187	4.240	4.294	4.348	4.402	4.456	4.510	4.564	4.618	4.672	4.726	80
90	4.726	4.781	4.835	4.889	4.943	4.997	5.052	5.106	5.160	5.215	5.269	90

Type J - Iron vs Constantan

200 °F - 700 °F

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
200	4.907	4.937	4.967	4.997	5.028	5.058	5.088	5.118	5.148	5.178	5.209	**200**
210	5.209	5.239	5.269	5.299	5.329	5.360	5.390	5.420	5.450	5.480	5.511	210
220	5.511	5.541	5.571	5.602	5.632	5.662	5.692	5.723	5.753	5.783	5.814	220
230	5.814	5.844	5.874	5.905	5.935	5.965	5.996	6.026	6.056	6.087	6.117	230
240	6.117	6.147	6.178	6.208	6.239	6.269	6.299	6.330	6.360	6.391	6.421	240
250	6.421	6.452	6.482	6.512	6.543	6.573	6.604	6.634	6.665	6.695	6.726	**250**
260	6.726	6.756	6.787	6.817	6.848	6.878	6.909	6.939	6.970	7.000	7.031	260
270	7.031	7.061	7.092	7.122	7.153	7.184	7.214	7.245	7.275	7.306	7.336	270
280	7.336	7.367	7.398	7.428	7.459	7.489	7.520	7.550	7.581	7.612	7.642	280
290	7.642	7.673	7.704	7.734	7.765	7.795	7.826	7.857	7.887	7.918	7.949	290
300	7.949	7.979	8.010	8.041	8.071	8.102	8.133	8.163	8.194	8.225	8.255	**300**
310	8.255	8.286	8.317	8.347	8.378	8.409	8.439	8.470	8.501	8.532	8.562	310
320	8.562	8.593	8.624	8.654	8.685	8.716	8.747	8.777	8.808	8.839	8.869	320
330	8.869	8.900	8.931	8.962	8.992	9.023	9.054	9.085	9.115	9.146	9.177	330
340	9.177	9.208	9.238	9.269	9.300	9.331	9.362	9.392	9.423	9.454	9.485	340
350	9.485	9.515	9.546	9.577	9.608	9.639	9.669	9.700	9.731	9.762	9.793	**350**
360	9.793	9.823	9.854	9.885	9.916	9.947	9.977	10.008	10.039	10.070	10.101	360
370	10.101	10.131	10.162	10.193	10.224	10.255	10.285	10.316	10.347	10.378	10.409	370
380	10.409	10.440	10.470	10.501	10.532	10.563	10.594	10.625	10.655	10.686	10.717	380
390	10.717	10.748	10.779	10.810	10.840	10.871	10.902	10.933	10.964	10.995	11.025	390
400	11.025	11.056	11.087	11.118	11.149	11.180	11.211	11.241	11.272	11.303	11.334	**400**
410	11.334	11.365	11.396	11.426	11.457	11.488	11.519	11.550	11.581	11.612	11.642	410
420	11.642	11.673	11.704	11.735	11.766	11.797	11.828	11.858	11.889	11.920	11.951	420
430	11.951	11.982	12.013	12.044	12.074	12.105	12.136	12.167	12.198	12.229	12.260	430
440	12.260	12.290	12.321	12.352	12.383	12.414	12.445	12.476	12.506	12.537	12.568	440
450	12.568	12.599	12.630	12.661	12.691	12.722	12.753	12.784	12.815	12.846	12.877	**450**
460	12.877	12.907	12.938	12.969	13.000	13.031	13.062	13.093	13.123	13.154	13.185	460
470	13.185	13.216	13.247	13.278	13.308	13.339	13.370	13.401	13.432	13.463	13.494	470
480	13.494	13.524	13.555	13.586	13.617	13.648	13.679	13.709	13.740	13.771	13.802	480
490	13.802	13.833	13.864	13.894	13.925	13.956	13.987	14.018	14.049	14.079	14.110	490
500	14.110	14.141	14.172	14.203	14.233	14.264	14.295	14.326	14.357	14.388	14.418	**500**
510	14.418	14.449	14.480	14.511	14.542	14.573	14.603	14.634	14.665	14.696	14.727	510
520	14.727	14.757	14.788	14.819	14.850	14.881	14.911	14.942	14.973	15.004	15.035	520
530	15.035	15.065	15.096	15.127	15.158	15.189	15.219	15.250	15.281	15.312	15.343	530
540	15.343	15.373	15.404	15.435	15.466	15.496	15.527	15.558	15.589	15.620	15.650	540
550	15.650	15.681	15.712	15.743	15.773	15.804	15.835	15.866	15.897	15.927	15.958	**550**
560	15.958	15.989	16.020	16.050	16.081	16.112	16.143	16.173	16.204	16.235	16.266	560
570	16.266	16.296	16.327	16.358	16.389	16.419	16.450	16.481	16.512	16.542	16.573	570
580	16.573	16.604	16.635	16.665	16.696	16.727	16.758	16.788	16.819	16.850	16.881	580
590	16.881	16.911	16.942	16.973	17.003	17.034	17.065	17.096	17.126	17.157	17.188	590
600	17.188	17.219	17.249	17.280	17.311	17.341	17.372	17.403	17.434	17.464	17.495	**600**
610	17.495	17.526	17.556	17.587	17.618	17.649	17.679	17.710	17.741	17.771	17.802	610
620	17.802	17.833	17.863	17.894	17.925	17.955	17.986	18.017	18.048	18.078	18.109	620
630	18.109	18.140	18.170	18.201	18.232	18.262	18.293	18.324	18.354	18.385	18.416	630
640	18.416	18.446	18.477	18.508	18.538	18.569	18.600	18.630	18.661	18.692	18.722	640
650	18.722	18.753	18.784	18.814	18.845	18.876	18.906	18.937	18.968	18.998	19.029	**650**
660	19.029	19.060	19.090	19.121	19.152	19.182	19.213	19.244	19.274	19.305	19.336	660
670	19.336	19.366	19.397	19.428	19.458	19.489	19.520	19.550	19.581	19.612	19.642	670
680	19.642	19.673	19.704	19.734	19.765	19.795	19.826	19.857	19.887	19.918	19.949	680
690	19.949	19.979	20.010	20.041	20.071	20.102	20.132	20.163	20.194	20.224	20.255	690
°F	0	1	2	3	4	5	6	7	8	9	10	°F

J

100 °C - 400 °C

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
100	5.269	5.323	5.378	5.432	5.487	5.541	5.595	5.650	5.705	5.759	5.814	**100**
110	5.814	5.868	5.923	5.977	6.032	6.087	6.141	6.196	6.251	6.306	6.360	110
120	6.360	6.415	6.470	6.525	6.579	6.634	6.689	6.744	6.799	6.854	6.909	120
130	6.909	6.964	7.019	7.074	7.129	7.184	7.239	7.294	7.349	7.404	7.459	130
140	7.459	7.514	7.569	7.624	7.679	7.734	7.789	7.844	7.900	7.955	8.010	140
150	8.010	8.065	8.120	8.175	8.231	8.286	8.341	8.396	8.452	8.507	8.562	**150**
160	8.562	8.618	8.673	8.728	8.783	8.839	8.894	8.949	9.005	9.060	9.115	160
170	9.115	9.171	9.226	9.282	9.337	9.392	9.448	9.503	9.559	9.614	9.669	170
180	9.669	9.725	9.780	9.836	9.891	9.947	10.002	10.057	10.113	10.168	10.224	180
190	10.224	10.279	10.335	10.390	10.446	10.501	10.557	10.612	10.668	10.723	10.779	190
200	10.779	10.834	10.890	10.945	11.001	11.056	11.112	11.167	11.223	11.278	11.334	**200**
210	11.334	11.389	11.445	11.501	11.556	11.612	11.667	11.723	11.778	11.834	11.889	210
220	11.889	11.945	12.000	12.056	12.111	12.167	12.222	12.278	12.334	12.389	12.445	220
230	12.445	12.500	12.556	12.611	12.667	12.722	12.778	12.833	12.889	12.944	13.000	230
240	13.000	13.056	13.111	13.167	13.222	13.278	13.333	13.389	13.444	13.500	13.555	240
250	13.555	13.611	13.666	13.722	13.777	13.833	13.888	13.944	13.999	14.055	14.110	**250**
260	14.110	14.166	14.221	14.277	14.332	14.388	14.443	14.499	14.554	14.609	14.665	260
270	14.665	14.720	14.776	14.831	14.887	14.942	14.998	15.053	15.109	15.164	15.219	270
280	15.219	15.275	15.330	15.386	15.441	15.496	15.552	15.607	15.663	15.718	15.773	280
290	15.773	15.829	15.884	15.940	15.995	16.050	16.106	16.161	16.216	16.272	16.327	290
300	16.327	16.383	16.438	16.493	16.549	16.604	16.659	16.715	16.770	16.825	16.881	**300**
310	16.881	16.936	16.991	17.046	17.102	17.157	17.212	17.268	17.323	17.378	17.434	310
320	17.434	17.489	17.544	17.599	17.655	17.710	17.765	17.820	17.876	17.931	17.986	320
330	17.986	18.041	18.097	18.152	18.207	18.262	18.318	18.373	18.428	18.483	18.538	330
340	18.538	18.594	18.649	18.704	18.759	18.814	18.870	18.925	18.980	19.035	19.090	340
350	19.090	19.146	19.201	19.256	19.311	19.366	19.422	19.477	19.532	19.587	19.642	**350**
360	19.642	19.697	19.753	19.808	19.863	19.918	19.973	20.028	20.083	20.139	20.194	360
370	20.194	20.249	20.304	20.359	20.414	20.469	20.525	20.580	20.635	20.690	20.745	370
380	20.745	20.800	20.855	20.911	20.966	21.021	21.076	21.131	21.186	21.241	21.297	380
390	21.297	21.352	21.407	21.462	21.517	21.572	21.627	21.683	21.738	21.793	21.848	390
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type J - Iron vs Constantan

700 °F - 1200 °F

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
700	20.255	20.286	20.316	20.347	20.378	20.408	20.439	20.469	20.500	20.531	20.561	**700**
710	20.561	20.592	20.623	20.653	20.684	20.715	20.745	20.776	20.806	20.837	20.868	710
720	20.868	20.898	20.929	20.960	20.990	21.021	21.052	21.082	21.113	21.143	21.174	720
730	21.174	21.205	21.235	21.266	21.297	21.327	21.358	21.389	21.419	21.450	21.480	730
740	21.480	21.511	21.542	21.572	21.603	21.634	21.664	21.695	21.726	21.756	21.787	740
750	21.787	21.817	21.848	21.879	21.909	21.940	21.971	22.001	22.032	22.063	22.093	**750**
760	22.093	22.124	22.154	22.185	22.216	22.246	22.277	22.308	22.338	22.369	22.400	760
770	22.400	22.430	22.461	22.492	22.522	22.553	22.584	22.614	22.645	22.676	22.706	770
780	22.706	22.737	22.768	22.798	22.829	22.860	22.890	22.921	22.952	22.982	23.013	780
790	23.013	23.044	23.074	23.105	23.136	23.166	23.197	23.228	23.258	23.289	23.320	790
800	23.320	23.350	23.381	23.412	23.442	23.473	23.504	23.535	23.565	23.596	23.627	**800**
810	23.627	23.657	23.688	23.719	23.749	23.780	23.811	23.842	23.872	23.903	23.934	810
820	23.934	23.964	23.995	24.026	24.057	24.087	24.118	24.149	24.180	24.210	24.241	820
830	24.241	24.272	24.303	24.333	24.364	24.395	24.426	24.456	24.487	24.518	24.549	830
840	24.549	24.579	24.610	24.641	24.672	24.702	24.733	24.764	24.795	24.826	24.856	840
850	24.856	24.887	24.918	24.949	24.979	25.010	25.041	25.072	25.103	25.134	25.164	**850**
860	25.164	25.195	25.226	25.257	25.288	25.318	25.349	25.380	25.411	25.442	25.473	860
870	25.473	25.504	25.534	25.565	25.596	25.627	25.658	25.689	25.720	25.750	25.781	870
880	25.781	25.812	25.843	25.874	25.905	25.936	25.967	25.998	26.029	26.059	26.090	880
890	26.090	26.121	26.152	26.183	26.214	26.245	26.276	26.307	26.338	26.369	26.400	890
900	26.400	26.431	26.462	26.493	26.524	26.555	26.586	26.617	26.648	26.679	26.710	**900**
910	26.710	26.741	26.772	26.803	26.834	26.865	26.896	26.927	26.958	26.989	27.020	910
920	27.020	27.051	27.082	27.113	27.144	27.175	27.206	27.237	27.268	27.299	27.330	920
930	27.330	27.362	27.393	27.424	27.455	27.486	27.517	27.548	27.579	27.610	27.642	930
940	27.642	27.673	27.704	27.735	27.766	27.797	27.829	27.860	27.891	27.922	27.953	940
950	27.953	27.985	28.016	28.047	28.078	28.109	28.141	28.172	28.203	28.234	28.266	**950**
960	28.266	28.297	28.328	28.359	28.391	28.422	28.453	28.485	28.516	28.547	28.579	960
970	28.579	28.610	28.641	28.672	28.704	28.735	28.767	28.798	28.829	28.861	28.892	970
980	28.892	28.923	28.955	28.986	29.018	29.049	29.080	29.112	29.143	29.175	29.206	980
990	29.206	29.238	29.269	29.301	29.332	29.363	29.395	29.426	29.458	29.489	29.521	990
1000	29.521	29.552	29.584	29.616	29.647	29.679	29.710	29.742	29.773	29.805	29.836	**1000**
1010	29.836	29.868	29.900	29.931	29.963	29.995	30.026	30.058	30.089	30.121	30.153	1010
1020	30.153	30.184	30.216	30.248	30.279	30.311	30.343	30.375	30.406	30.438	30.470	1020
1030	30.470	30.502	30.533	30.565	30.597	30.629	30.660	30.692	30.724	30.756	30.788	1030
1040	30.788	30.819	30.851	30.883	30.915	30.947	30.979	31.011	31.043	31.074	31.106	1040
1050	31.106	31.138	31.170	31.202	31.234	31.266	31.298	31.330	31.362	31.394	31.426	**1050**
1060	31.426	31.458	31.490	31.522	31.554	31.586	31.618	31.650	31.682	31.714	31.746	1060
1070	31.746	31.778	31.811	31.843	31.875	31.907	31.939	31.971	32.003	32.035	32.068	1070
1080	32.068	32.100	32.132	32.164	32.196	32.229	32.261	32.293	32.325	32.358	32.390	1080
1090	32.390	32.422	32.455	32.487	32.519	32.551	32.584	32.616	32.648	32.681	32.713	1090
1100	32.713	32.746	32.778	32.810	32.843	32.875	32.908	32.940	32.973	33.005	33.037	**1100**
1110	33.037	33.070	33.102	33.135	33.167	33.200	33.232	33.265	33.298	33.330	33.363	1110
1120	33.363	33.395	33.428	33.460	33.493	33.526	33.558	33.591	33.624	33.656	33.689	1120
1130	33.689	33.722	33.754	33.787	33.820	33.853	33.885	33.918	33.951	33.984	34.016	1130
1140	34.016	34.049	34.082	34.115	34.148	34.180	34.213	34.246	34.279	34.312	34.345	1140
1150	34.345	34.378	34.411	34.444	34.476	34.509	34.542	34.575	34.608	34.641	34.674	**1150**
1160	34.674	34.707	34.740	34.773	34.806	34.840	34.873	34.906	34.939	34.972	35.005	1160
1170	35.005	35.038	35.071	35.104	35.138	35.171	35.204	35.237	35.270	35.304	35.337	1170
1180	35.337	35.370	35.403	35.437	35.470	35.503	35.536	35.570	35.603	35.636	35.670	1180
1190	35.670	35.703	35.736	35.770	35.803	35.837	35.870	35.903	35.937	35.970	36.004	1190
°F	0	1	2	3	4	5	6	7	8	9	10	°F

400 °C - 700 °C

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
400	21.848	21.903	21.958	22.014	22.069	22.124	22.179	22.234	22.289	22.345	22.400	**400**
410	22.400	22.455	22.510	22.565	22.620	22.676	22.731	22.786	22.841	22.896	22.952	410
420	22.952	23.007	23.062	23.117	23.172	23.228	23.283	23.338	23.393	23.449	23.504	420
430	23.504	23.559	23.614	23.670	23.725	23.780	23.835	23.891	23.946	24.001	24.057	430
440	24.057	24.112	24.167	24.223	24.278	24.333	24.389	24.444	24.499	24.555	24.610	440
450	24.610	24.665	24.721	24.776	24.832	24.887	24.943	24.998	25.053	25.109	25.164	**450**
460	25.164	25.220	25.275	25.331	25.386	25.442	25.497	25.553	25.608	25.664	25.720	460
470	25.720	25.775	25.831	25.886	25.942	25.998	26.053	26.109	26.165	26.220	26.276	470
480	26.276	26.332	26.387	26.443	26.499	26.555	26.610	26.666	26.722	26.778	26.834	480
490	26.834	26.889	26.945	27.001	27.057	27.113	27.169	27.225	27.281	27.337	27.393	490
500	27.393	27.449	27.505	27.561	27.617	27.673	27.729	27.785	27.841	27.897	27.953	**500**
510	27.953	28.010	28.066	28.122	28.178	28.234	28.291	28.347	28.403	28.460	28.516	510
520	28.516	28.572	28.629	28.685	28.741	28.798	28.854	28.911	28.967	29.024	29.080	520
530	29.080	29.137	29.194	29.250	29.307	29.363	29.420	29.477	29.534	29.590	29.647	530
540	29.647	29.704	29.761	29.818	29.874	29.931	29.988	30.045	30.102	30.159	30.216	540
550	30.216	30.273	30.330	30.387	30.444	30.502	30.559	30.616	30.673	30.730	30.788	**550**
560	30.788	30.845	30.902	30.960	31.017	31.074	31.132	31.189	31.247	31.304	31.362	560
570	31.362	31.419	31.477	31.535	31.592	31.650	31.708	31.766	31.823	31.881	31.939	570
580	31.939	31.997	32.055	32.113	32.171	32.229	32.287	32.345	32.403	32.461	32.519	580
590	32.519	32.577	32.636	32.694	32.752	32.810	32.869	32.927	32.985	33.044	33.102	590
600	33.102	33.161	33.219	33.278	33.337	33.395	33.454	33.513	33.571	33.630	33.689	**600**
610	33.689	33.748	33.807	33.866	33.925	33.984	34.043	34.102	34.161	34.220	34.279	610
620	34.279	34.338	34.397	34.457	34.516	34.575	34.635	34.694	34.754	34.813	34.873	620
630	34.873	34.932	34.992	35.051	35.111	35.171	35.230	35.290	35.350	35.410	35.470	630
640	35.470	35.530	35.590	35.650	35.710	35.770	35.830	35.890	35.950	36.010	36.071	640
650	36.071	36.131	36.191	36.252	36.312	36.373	36.433	36.494	36.554	36.615	36.675	**650**
660	36.675	36.736	36.797	36.858	36.918	36.979	37.040	37.101	37.162	37.223	37.284	660
670	37.284	37.345	37.406	37.467	37.528	37.590	37.651	37.712	37.773	37.835	37.896	670
680	37.896	37.958	38.019	38.081	38.142	38.204	38.265	38.327	38.389	38.450	38.512	680
690	38.512	38.574	38.636	38.698	38.760	38.822	38.884	38.946	39.008	39.070	39.132	690
°C	0	1	2	3	4	5	6	7	8	9	10	°C

J

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1200	36.004	36.037	36.071	36.104	36.138	36.171	36.205	36.238	36.272	36.305	36.339	**1200**
1210	36.339	36.373	36.406	36.440	36.473	36.507	36.541	36.574	36.608	36.642	36.675	1210
1220	36.675	36.709	36.743	36.777	36.810	36.844	36.878	36.912	36.945	36.979	37.013	1220
1230	37.013	37.047	37.081	37.114	37.148	37.182	37.216	37.250	37.284	37.318	37.352	1230
1240	37.352	37.386	37.420	37.454	37.488	37.522	37.556	37.590	37.624	37.658	37.692	1240
1250	37.692	37.726	37.760	37.794	37.828	37.862	37.896	37.930	37.964	37.999	38.033	**1250**
1260	38.033	38.067	38.101	38.135	38.169	38.204	38.238	38.272	38.306	38.341	38.375	1260
1270	38.375	38.409	38.444	38.478	38.512	38.546	38.581	38.615	38.650	38.684	38.718	1270
1280	38.718	38.753	38.787	38.822	38.856	38.890	38.925	38.959	38.994	39.028	39.063	1280
1290	39.063	39.097	39.132	39.166	39.201	39.235	39.270	39.305	39.339	39.374	39.408	1290
1300	39.408	39.443	39.478	39.512	39.547	39.582	39.616	39.651	39.686	39.720	39.755	**1300**
1310	39.755	39.790	39.825	39.859	39.894	39.929	39.964	39.998	40.033	40.068	40.103	1310
1320	40.103	40.138	40.173	40.207	40.242	40.277	40.312	40.347	40.382	40.417	40.452	1320
1330	40.452	40.487	40.522	40.556	40.591	40.626	40.661	40.696	40.731	40.766	40.801	1330
1340	40.801	40.836	40.872	40.907	40.942	40.977	41.012	41.047	41.082	41.117	41.152	1340
1350	41.152	41.187	41.222	41.258	41.293	41.328	41.363	41.398	41.433	41.469	41.504	**1350**
1360	41.504	41.539	41.574	41.610	41.645	41.680	41.715	41.751	41.786	41.821	41.856	1360
1370	41.856	41.892	41.927	41.962	41.998	42.033	42.068	42.104	42.139	42.174	42.210	1370
1380	42.210	42.245	42.281	42.316	42.351	42.387	42.422	42.458	42.493	42.528	42.564	1380
1390	42.564	42.599	42.635	42.670	42.706	42.741	42.777	42.812	42.848	42.883	42.919	1390
1400	42.919	42.954	42.990	43.025	43.061	43.096	43.132	43.167	43.203	43.239	43.274	**1400**
1410	43.274	43.310	43.346	43.381	43.417	43.452	43.488	43.524	43.559	43.595	43.631	1410
1420	43.631	43.667	43.702	43.738	43.774	43.809	43.845	43.881	43.917	43.953	43.988	1420
1430	43.988	44.024	44.060	44.096	44.131	44.167	44.203	44.239	44.275	44.310	44.346	1430
1440	44.346	44.382	44.418	44.454	44.490	44.525	44.561	44.597	44.633	44.669	44.705	1440
1450	44.705	44.741	44.777	44.812	44.848	44.884	44.920	44.956	44.992	45.028	45.064	**1450**
1460	45.064	45.099	45.135	45.171	45.207	45.243	45.279	45.315	45.351	45.387	45.423	1460
1470	45.423	45.458	45.494	45.530	45.566	45.602	45.638	45.674	45.710	45.746	45.782	1470
1480	45.782	45.818	45.853	45.889	45.925	45.961	45.997	46.033	46.069	46.105	46.141	1480
1490	46.141	46.177	46.212	46.248	46.284	46.320	46.356	46.392	46.428	46.464	46.500	1490
1500	46.500	46.535	46.571	46.607	46.643	46.679	46.715	46.751	46.786	46.822	46.858	**1500**
1510	46.858	46.894	46.930	46.966	47.001	47.037	47.073	47.109	47.145	47.181	47.216	1510
1520	47.216	47.252	47.288	47.324	47.359	47.395	47.431	47.467	47.503	47.538	47.574	1520
1530	47.574	47.610	47.646	47.681	47.717	47.753	47.788	47.824	47.860	47.896	47.931	1530
1540	47.931	47.967	48.003	48.038	48.074	48.110	48.145	48.181	48.217	48.252	48.288	1540
1550	48.288	48.324	48.359	48.395	48.430	48.466	48.502	48.537	48.573	48.608	48.644	**1550**
1560	48.644	48.679	48.715	48.750	48.786	48.822	48.857	48.893	48.928	48.964	48.999	1560
1570	48.999	49.034	49.070	49.105	49.141	49.176	49.212	49.247	49.283	49.318	49.353	1570
1580	49.353	49.389	49.424	49.460	49.495	49.530	49.566	49.601	49.636	49.672	49.707	1580
1590	49.707	49.742	49.778	49.813	49.848	49.883	49.919	49.954	49.989	50.024	50.060	1590
1600	50.060	50.095	50.130	50.165	50.200	50.235	50.271	50.306	50.341	50.376	50.411	**1600**
1610	50.411	50.446	50.481	50.517	50.552	50.587	50.622	50.657	50.692	50.727	50.762	1610
1620	50.762	50.797	50.832	50.867	50.902	50.937	50.972	51.007	51.042	51.077	51.112	1620
1630	51.112	51.147	51.181	51.216	51.251	51.286	51.321	51.356	51.391	51.425	51.460	1630
1640	51.460	51.495	51.530	51.565	51.599	51.634	51.669	51.704	51.738	51.773	51.808	1640
1650	51.808	51.843	51.877	51.912	51.947	51.981	52.016	52.051	52.085	52.120	52.154	**1650**
1660	52.154	52.189	52.224	52.258	52.293	52.327	52.362	52.396	52.431	52.465	52.500	1660
1670	52.500	52.534	52.569	52.603	52.638	52.672	52.707	52.741	52.776	52.810	52.844	1670
1680	52.844	52.879	52.913	52.947	52.982	53.016	53.050	53.085	53.119	53.153	53.188	1680
1690	53.188	53.222	53.256	53.290	53.325	53.359	53.393	53.427	53.462	53.496	53.530	1690
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
700	39.132	39.194	39.256	39.318	39.381	39.443	39.505	39.568	39.630	39.693	39.755	**700**
710	39.755	39.818	39.880	39.943	40.005	40.068	40.131	40.193	40.256	40.319	40.382	710
720	40.382	40.445	40.508	40.570	40.633	40.696	40.759	40.822	40.886	40.949	41.012	720
730	41.012	41.075	41.138	41.201	41.265	41.328	41.391	41.455	41.518	41.581	41.645	730
740	41.645	41.708	41.772	41.835	41.899	41.962	42.026	42.090	42.153	42.217	42.281	740
750	42.281	42.344	42.408	42.472	42.536	42.599	42.663	42.727	42.791	42.855	42.919	**750**
760	42.919	42.983	43.047	43.111	43.175	43.239	43.303	43.367	43.431	43.495	43.559	760
770	43.559	43.624	43.688	43.752	43.817	43.881	43.945	44.010	44.074	44.139	44.203	770
780	44.203	44.267	44.332	44.396	44.461	44.525	44.590	44.655	44.719	44.784	44.848	780
790	44.848	44.913	44.977	45.042	45.107	45.171	45.236	45.301	45.365	45.430	45.494	790
800	45.494	45.559	45.624	45.688	45.753	45.818	45.882	45.947	46.011	46.076	46.141	**800**
810	46.141	46.205	46.270	46.334	46.399	46.464	46.528	46.593	46.657	46.722	46.786	810
820	46.786	46.851	46.915	46.980	47.044	47.109	47.173	47.238	47.302	47.367	47.431	820
830	47.431	47.495	47.560	47.624	47.688	47.753	47.817	47.881	47.946	48.010	48.074	830
840	48.074	48.138	48.202	48.267	48.331	48.395	48.459	48.523	48.587	48.651	48.715	840
850	48.715	48.779	48.843	48.907	48.971	49.034	49.098	49.162	49.226	49.290	49.353	**850**
860	49.353	49.417	49.481	49.544	49.608	49.672	49.735	49.799	49.862	49.926	49.989	860
870	49.989	50.052	50.116	50.179	50.243	50.306	50.369	50.432	50.495	50.559	50.622	870
880	50.622	50.685	50.748	50.811	50.874	50.937	51.000	51.063	51.126	51.188	51.251	880
890	51.251	51.314	51.377	51.439	51.502	51.565	51.627	51.690	51.752	51.815	51.877	890
900	51.877	51.940	52.002	52.064	52.127	52.189	52.251	52.314	52.376	52.438	52.500	**900**
910	52.500	52.562	52.624	52.686	52.748	52.810	52.872	52.934	52.996	53.057	53.119	910
920	53.119	53.181	53.243	53.304	53.366	53.427	53.489	53.550	53.612	53.673	53.735	920
930	53.735	53.796	53.857	53.919	53.980	54.041	54.102	54.164	54.225	54.286	54.347	930
940	54.347	54.408	54.469	54.530	54.591	54.652	54.713	54.773	54.834	54.895	54.956	940
950	54.956	55.016	55.077	55.138	55.198	55.259	55.319	55.380	55.440	55.501	55.561	**950**
960	55.561	55.622	55.682	55.742	55.803	55.863	55.923	55.983	56.043	56.104	56.164	960
970	56.164	56.224	56.284	56.344	56.404	56.464	56.524	56.584	56.643	56.703	56.763	970
980	56.763	56.823	56.883	56.942	57.002	57.062	57.121	57.181	57.240	57.300	57.360	980
990	57.360	57.419	57.479	57.538	57.597	57.657	57.716	57.776	57.835	57.894	57.953	990
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type J - Iron vs Constantan

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1700	53.530	53.564	53.598	53.632	53.667	53.701	53.735	53.769	53.803	53.837	53.871	**1700**
1710	53.871	53.905	53.939	53.973	54.007	54.041	54.075	54.109	54.143	54.177	54.211	1710
1720	54.211	54.245	54.279	54.313	54.347	54.381	54.415	54.449	54.483	54.516	54.550	1720
1730	54.550	54.584	54.618	54.652	54.686	54.719	54.753	54.787	54.821	54.855	54.888	1730
1740	54.888	54.922	54.956	54.990	55.023	55.057	55.091	55.124	55.158	55.192	55.225	1740
1750	55.225	55.259	55.293	55.326	55.360	55.393	55.427	55.461	55.494	55.528	55.561	**1750**
1760	55.561	55.595	55.628	55.662	55.695	55.729	55.762	55.796	55.829	55.863	55.896	1760
1770	55.896	55.930	55.963	55.997	56.030	56.063	56.097	56.130	56.164	56.197	56.230	1770
1780	56.230	56.264	56.297	56.330	56.364	56.397	56.430	56.464	56.497	56.530	56.564	1780
1790	56.564	56.597	56.630	56.663	56.697	56.730	56.763	56.796	56.829	56.863	56.896	1790
1800	56.896	56.929	56.962	56.995	57.028	57.062	57.095	57.128	57.161	57.194	57.227	**1800**
1810	57.227	57.260	57.293	57.326	57.360	57.393	57.426	57.459	57.492	57.525	57.558	1810
1820	57.558	57.591	57.624	57.657	57.690	57.723	57.756	57.789	57.822	57.855	57.888	1820
1830	57.888	57.920	57.953	57.986	58.019	58.052	58.085	58.118	58.151	58.184	58.217	1830
1840	58.217	58.249	58.282	58.315	58.348	58.381	58.414	58.446	58.479	58.512	58.545	1840
1850	58.545	58.578	58.610	58.643	58.676	58.709	58.741	58.774	58.807	58.840	58.872	**1850**
1860	58.872	58.905	58.938	58.971	59.003	59.036	59.069	59.101	59.134	59.167	59.199	1860
1870	59.199	59.232	59.265	59.297	59.330	59.363	59.395	59.428	59.460	59.493	59.526	1870
1880	59.526	59.558	59.591	59.623	59.656	59.689	59.721	59.754	59.786	59.819	59.851	1880
1890	59.851	59.884	59.916	59.949	59.982	60.014	60.047	60.079	60.112	60.144	60.177	1890
1900	60.177	60.209	60.242	60.274	60.307	60.339	60.371	60.404	60.436	60.469	60.501	**1900**
1910	60.501	60.534	60.566	60.599	60.631	60.663	60.696	60.728	60.761	60.793	60.826	1910
1920	60.826	60.858	60.890	60.923	60.955	60.987	61.020	61.052	61.085	61.117	61.149	1920
1930	61.149	61.182	61.214	61.246	61.279	61.311	61.343	61.376	61.408	61.440	61.473	1930
1940	61.473	61.505	61.537	61.570	61.602	61.634	61.667	61.699	61.731	61.763	61.796	1940
1950	61.796	61.828	61.860	61.893	61.925	61.957	61.989	62.022	62.054	62.086	62.118	**1950**
1960	62.118	62.151	62.183	62.215	62.247	62.280	62.312	62.344	62.376	62.409	62.441	1960
1970	62.441	62.473	62.505	62.537	62.570	62.602	62.634	62.666	62.699	62.731	62.763	1970
1980	62.763	62.795	62.827	62.860	62.892	62.924	62.956	62.988	63.020	63.053	63.085	1980
1990	63.085	63.117	63.149	63.181	63.214	63.246	63.278	63.310	63.342	63.374	63.406	1990
2000	63.406	63.439	63.471	63.503	63.535	63.567	63.599	63.632	63.664	63.696	63.728	**2000**
2010	63.728	63.760	63.792	63.824	63.856	63.889	63.921	63.953	63.985	64.017	64.049	2010
2020	64.049	64.081	64.113	64.146	64.178	64.210	64.242	64.274	64.306	64.338	64.370	2020
2030	64.370	64.402	64.435	64.467	64.499	64.531	64.563	64.595	64.627	64.659	64.691	2030
2040	64.691	64.723	64.756	64.788	64.820	64.852	64.884	64.916	64.948	64.980	65.012	2040
2050	65.012	65.044	65.076	65.109	65.141	65.173	65.205	65.237	65.269	65.301	65.333	**2050**
2060	65.333	65.365	65.397	65.429	65.461	65.493	65.525	65.557	65.590	65.622	65.654	2060
2070	65.654	65.686	65.718	65.750	65.782	65.814	65.846	65.878	65.910	65.942	65.974	2070
2080	65.974	66.006	66.038	66.070	66.102	66.134	66.166	66.199	66.231	66.263	66.295	2080
2090	66.295	66.327	66.359	66.391	66.423	66.455	66.487	66.519	66.551	66.583	66.615	2090
2100	66.615	66.647	66.679	66.711	66.743	66.775	66.807	66.839	66.871	66.903	66.935	**2100**
2110	66.935	66.967	66.999	67.031	67.063	67.095	67.127	67.159	67.191	67.223	67.255	2110
2120	67.255	67.287	67.319	67.351	67.383	67.415	67.447	67.479	67.511	67.543	67.575	2120
2130	67.575	67.607	67.639	67.671	67.703	67.735	67.767	67.799	67.831	67.863	67.895	2130
2140	67.895	67.927	67.959	67.991	68.023	68.055	68.087	68.119	68.150	68.182	68.214	2140
2150	68.214	68.246	68.278	68.310	68.342	68.374	68.406	68.438	68.470	68.502	68.534	**2150**
2160	68.534	68.566	68.597	68.629	68.661	68.693	68.725	68.757	68.789	68.821	68.853	2160
2170	68.853	68.884	68.916	68.948	68.980	69.012	69.044	69.076	69.108	69.139	69.171	2170
2180	69.171	69.203	69.235	69.267	69.299	69.330	69.362	69.394	69.426	69.458	69.490	2180
2190	69.490	69.521	69.553									2190
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1000	57.953	58.013	58.072	58.131	58.190	58.249	58.309	58.368	58.427	58.486	58.545	**1000**
1010	58.545	58.604	58.663	58.722	58.781	58.840	58.899	58.957	59.016	59.075	59.134	1010
1020	59.134	59.193	59.252	59.310	59.369	59.428	59.487	59.545	59.604	59.663	59.721	1020
1030	59.721	59.780	59.838	59.897	59.956	60.014	60.073	60.131	60.190	60.248	60.307	1030
1040	60.307	60.365	60.423	60.482	60.540	60.599	60.657	60.715	60.774	60.832	60.890	1040
1050	60.890	60.949	61.007	61.065	61.123	61.182	61.240	61.298	61.356	61.415	61.473	**1050**
1060	61.473	61.531	61.589	61.647	61.705	61.763	61.822	61.880	61.938	61.996	62.054	1060
1070	62.054	62.112	62.170	62.228	62.286	62.344	62.402	62.460	62.518	62.576	62.634	1070
1080	62.634	62.692	62.750	62.808	62.866	62.924	62.982	63.040	63.098	63.156	63.214	1080
1090	63.214	63.271	63.329	63.387	63.445	63.503	63.561	63.619	63.677	63.734	63.792	1090
1100	63.792	63.850	63.908	63.966	64.024	64.081	64.139	64.197	64.255	64.313	64.370	**1100**
1110	64.370	64.428	64.486	64.544	64.602	64.659	64.717	64.775	64.833	64.890	64.948	1110
1120	64.948	65.006	65.064	65.121	65.179	65.237	65.295	65.352	65.410	65.468	65.525	1120
1130	65.525	65.583	65.641	65.699	65.756	65.814	65.872	65.929	65.987	66.045	66.102	1130
1140	66.102	66.160	66.218	66.275	66.333	66.391	66.448	66.506	66.564	66.621	66.679	1140
1150	66.679	66.737	66.794	66.852	66.910	66.967	67.025	67.082	67.140	67.198	67.255	**1150**
1160	67.255	67.313	67.370	67.428	67.486	67.543	67.601	67.658	67.716	67.773	67.831	1160
1170	67.831	67.888	67.946	68.003	68.061	68.119	68.176	68.234	68.291	68.348	68.406	1170
1180	68.406	68.463	68.521	68.578	68.636	68.693	68.751	68.808	68.865	68.923	68.980	1180
1190	68.980	69.037	69.095	69.152	69.209	69.267	69.324	69.381	69.439	69.496	69.553	1190
1200	69.553											**1200**
°C	0	1	2	3	4	5	6	7	8	9	10	°C

J

-450 °F - 50 °F Type K - Chromel vs Alumel -270 °C - 10 °C

EMF in Millivolts — Reference Junction 32°F

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°F
-450	-6.456	-6.456	-6.457	-6.457	-6.458							-450
-440	-6.446	-6.448	-6.449	-6.450	-6.451	-6.452	-6.453	-6.454	-6.454	-6.455	-6.456	-440
-430	-6.431	-6.433	-6.435	-6.436	-6.438	-6.440	-6.441	-6.443	-6.444	-6.445	-6.446	-430
-420	-6.409	-6.411	-6.414	-6.416	-6.419	-6.421	-6.423	-6.425	-6.427	-6.429	-6.431	-420
-410	-6.380	-6.383	-6.386	-6.389	-6.392	-6.395	-6.398	-6.401	-6.404	-6.406	-6.409	-410
-400	-6.344	-6.348	-6.352	-6.355	-6.359	-6.363	-6.366	-6.370	-6.373	-6.377	-6.380	-400
-390	-6.301	-6.306	-6.310	-6.315	-6.319	-6.323	-6.328	-6.332	-6.336	-6.340	-6.344	-390
-380	-6.251	-6.257	-6.262	-6.267	-6.272	-6.277	-6.282	-6.287	-6.292	-6.296	-6.301	-380
-370	-6.195	-6.201	-6.207	-6.213	-6.218	-6.224	-6.230	-6.235	-6.241	-6.246	-6.251	-370
-360	-6.133	-6.139	-6.146	-6.152	-6.158	-6.165	-6.171	-6.177	-6.183	-6.189	-6.195	-360
-350	-6.064	-6.071	-6.078	-6.085	-6.092	-6.099	-6.106	-6.113	-6.119	-6.126	-6.133	-350
-340	-5.989	-5.997	-6.004	-6.012	-6.020	-6.027	-6.035	-6.042	-6.049	-6.057	-6.064	-340
-330	-5.908	-5.917	-5.925	-5.933	-5.941	-5.949	-5.957	-5.965	-5.973	-5.981	-5.989	-330
-320	-5.822	-5.831	-5.840	-5.848	-5.857	-5.866	-5.874	-5.883	-5.891	-5.900	-5.908	-320
-310	-5.730	-5.739	-5.749	-5.758	-5.767	-5.776	-5.786	-5.795	-5.804	-5.813	-5.822	-310
-300	-5.632	-5.642	-5.652	-5.662	-5.672	-5.682	-5.691	-5.701	-5.711	-5.720	-5.730	-300
-290	-5.529	-5.540	-5.550	-5.561	-5.571	-5.581	-5.592	-5.602	-5.612	-5.622	-5.632	-290
-280	-5.421	-5.432	-5.443	-5.454	-5.465	-5.476	-5.487	-5.497	-5.508	-5.519	-5.529	-280
-270	-5.308	-5.320	-5.331	-5.343	-5.354	-5.365	-5.377	-5.388	-5.399	-5.410	-5.421	-270
-260	-5.190	-5.202	-5.214	-5.226	-5.238	-5.250	-5.261	-5.273	-5.285	-5.296	-5.308	-260
-250	-5.067	-5.079	-5.092	-5.104	-5.117	-5.129	-5.141	-5.153	-5.166	-5.178	-5.190	-250
-240	-4.939	-4.952	-4.965	-4.978	-4.991	-5.003	-5.016	-5.029	-5.042	-5.054	-5.067	-240
-230	-4.806	-4.820	-4.833	-4.847	-4.860	-4.873	-4.886	-4.900	-4.913	-4.926	-4.939	-230
-220	-4.669	-4.683	-4.697	-4.711	-4.724	-4.738	-4.752	-4.766	-4.779	-4.793	-4.806	-220
-210	-4.527	-4.542	-4.556	-4.570	-4.584	-4.599	-4.613	-4.627	-4.641	-4.655	-4.669	-210
-200	-4.381	-4.396	-4.411	-4.425	-4.440	-4.455	-4.469	-4.484	-4.498	-4.513	-4.527	-200
-190	-4.231	-4.246	-4.261	-4.276	-4.291	-4.306	-4.321	-4.336	-4.351	-4.366	-4.381	-190
-180	-4.076	-4.091	-4.107	-4.123	-4.138	-4.154	-4.169	-4.185	-4.200	-4.215	-4.231	-180
-170	-3.917	-3.933	-3.949	-3.965	-3.981	-3.997	-4.013	-4.029	-4.044	-4.060	-4.076	-170
-160	-3.754	-3.771	-3.787	-3.803	-3.820	-3.836	-3.852	-3.869	-3.885	-3.901	-3.917	-160
-150	-3.587	-3.604	-3.621	-3.638	-3.655	-3.671	-3.688	-3.705	-3.721	-3.738	-3.754	-150
-140	-3.417	-3.434	-3.451	-3.468	-3.486	-3.503	-3.520	-3.537	-3.554	-3.571	-3.587	-140
-130	-3.243	-3.260	-3.278	-3.295	-3.313	-3.330	-3.348	-3.365	-3.382	-3.400	-3.417	-130
-120	-3.065	-3.083	-3.101	-3.119	-3.136	-3.154	-3.172	-3.190	-3.207	-3.225	-3.243	-120
-110	-2.884	-2.902	-2.920	-2.938	-2.957	-2.975	-2.993	-3.011	-3.029	-3.047	-3.065	-110
-100	-2.699	-2.718	-2.736	-2.755	-2.773	-2.792	-2.810	-2.829	-2.847	-2.865	-2.884	-100
-90	-2.511	-2.530	-2.549	-2.568	-2.587	-2.605	-2.624	-2.643	-2.662	-2.680	-2.699	-90
-80	-2.320	-2.339	-2.359	-2.378	-2.397	-2.416	-2.435	-2.454	-2.473	-2.492	-2.511	-80
-70	-2.126	-2.146	-2.165	-2.185	-2.204	-2.223	-2.243	-2.262	-2.282	-2.301	-2.320	-70
-60	-1.929	-1.949	-1.969	-1.988	-2.008	-2.028	-2.048	-2.067	-2.087	-2.106	-2.126	-60
-50	-1.729	-1.749	-1.770	-1.790	-1.810	-1.830	-1.850	-1.869	-1.889	-1.909	-1.929	-50
-40	-1.527	-1.547	-1.568	-1.588	-1.608	-1.628	-1.649	-1.669	-1.689	-1.709	-1.729	-40
-30	-1.322	-1.343	-1.363	-1.384	-1.404	-1.425	-1.445	-1.466	-1.486	-1.507	-1.527	-30
-20	-1.114	-1.135	-1.156	-1.177	-1.198	-1.218	-1.239	-1.260	-1.281	-1.301	-1.322	-20
-10	-0.905	-0.926	-0.947	-0.968	-0.989	-1.010	-1.031	-1.052	-1.073	-1.094	-1.114	-10
0	-0.692	-0.714	-0.735	-0.756	-0.778	-0.799	-0.820	-0.841	-0.862	-0.883	-0.905	0

°F	0	1	2	3	4	5	6	7	8	9	10	°F
0	-0.692	-0.671	-0.650	-0.628	-0.607	-0.586	-0.564	-0.543	-0.521	-0.500	-0.478	0
10	-0.478	-0.457	-0.435	-0.413	-0.392	-0.370	-0.349	-0.327	-0.305	-0.284	-0.262	10
20	-0.262	-0.240	-0.218	-0.197	-0.175	-0.153	-0.131	-0.109	-0.088	-0.066	-0.044	20
30	-0.044	-0.022	0.000	0.022	0.044	0.066	0.088	0.110	0.132	0.154	0.176	30
40	0.176	0.198	0.220	0.242	0.264	0.286	0.308	0.330	0.353	0.375	0.397	40

K

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
-270	-6.458											-270
-260	-6.411	-6.444	-6.446	-6.448	-6.450	-6.452	-6.453	-6.455	-6.456	-6.457	-6.458	-260
-250	-6.404	-6.408	-6.413	-6.417	-6.421	-6.425	-6.429	-6.432	-6.435	-6.438	-6.441	-250
-240	-6.344	-6.351	-6.358	-6.364	-6.370	-6.377	-6.382	-6.388	-6.393	-6.399	-6.404	-240
-230	-6.262	-6.271	-6.280	-6.289	-6.297	-6.306	-6.314	-6.322	-6.329	-6.337	-6.344	-230
-220	-6.158	-6.170	-6.181	-6.192	-6.202	-6.213	-6.223	-6.233	-6.243	-6.252	-6.262	-220
-210	-6.035	-6.048	-6.061	-6.074	-6.087	-6.099	-6.111	-6.123	-6.135	-6.147	-6.158	-210
-200	-5.891	-5.907	-5.922	-5.936	-5.951	-5.965	-5.980	-5.994	-6.007	-6.021	-6.035	-200
-190	-5.730	-5.747	-5.763	-5.780	-5.797	-5.813	-5.829	-5.845	-5.861	-5.876	-5.891	-190
-180	-5.550	-5.569	-5.588	-5.606	-5.624	-5.642	-5.660	-5.678	-5.695	-5.713	-5.730	-180
-170	-5.354	-5.374	-5.395	-5.415	-5.435	-5.454	-5.474	-5.493	-5.512	-5.531	-5.550	-170
-160	-5.141	-5.163	-5.185	-5.207	-5.228	-5.250	-5.271	-5.292	-5.313	-5.333	-5.354	-160
-150	-4.913	-4.936	-4.960	-4.983	-5.006	-5.029	-5.052	-5.074	-5.097	-5.119	-5.141	-150
-140	-4.669	-4.694	-4.719	-4.744	-4.768	-4.793	-4.817	-4.841	-4.865	-4.889	-4.913	-140
-130	-4.411	-4.437	-4.463	-4.490	-4.516	-4.542	-4.567	-4.593	-4.618	-4.644	-4.669	-130
-120	-4.138	-4.166	-4.194	-4.221	-4.249	-4.276	-4.303	-4.330	-4.357	-4.384	-4.411	-120
-110	-3.852	-3.882	-3.911	-3.939	-3.968	-3.997	-4.025	-4.054	-4.082	-4.110	-4.138	-110
-100	-3.554	-3.584	-3.614	-3.645	-3.675	-3.705	-3.734	-3.764	-3.794	-3.823	-3.852	-100
-90	-3.243	-3.274	-3.306	-3.337	-3.368	-3.400	-3.431	-3.462	-3.492	-3.523	-3.554	-90
-80	-2.920	-2.953	-2.986	-3.018	-3.050	-3.083	-3.115	-3.147	-3.179	-3.211	-3.243	-80
-70	-2.587	-2.620	-2.654	-2.688	-2.721	-2.755	-2.788	-2.821	-2.854	-2.887	-2.920	-70
-60	-2.243	-2.278	-2.312	-2.347	-2.382	-2.416	-2.450	-2.485	-2.519	-2.553	-2.587	-60
-50	-1.889	-1.925	-1.961	-1.996	-2.032	-2.067	-2.103	-2.138	-2.173	-2.208	-2.243	-50
-40	-1.527	-1.564	-1.600	-1.637	-1.673	-1.709	-1.745	-1.782	-1.818	-1.854	-1.889	-40
-30	-1.156	-1.194	-1.231	-1.268	-1.305	-1.343	-1.380	-1.417	-1.453	-1.490	-1.527	-30
-20	-0.778	-0.816	-0.854	-0.892	-0.930	-0.968	-1.006	-1.043	-1.081	-1.119	-1.156	-20
-10	-0.392	-0.431	-0.470	-0.508	-0.547	-0.586	-0.624	-0.663	-0.701	-0.739	-0.778	-10
0	0.000	-0.039	-0.079	-0.118	-0.157	-0.197	-0.236	-0.275	-0.314	-0.353	-0.392	0
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
50	0.397	0.419	0.441	0.463	0.486	0.508	0.530	0.552	0.575	0.597	0.619	**50**
60	0.619	0.642	0.664	0.686	0.709	0.731	0.753	0.776	0.798	0.821	0.843	60
70	0.843	0.865	0.888	0.910	0.933	0.955	0.978	1.000	1.023	1.045	1.068	70
80	1.068	1.090	1.113	1.136	1.158	1.181	1.203	1.226	1.249	1.271	1.294	80
90	1.294	1.316	1.339	1.362	1.384	1.407	1.430	1.453	1.475	1.498	1.521	90
100	1.521	1.543	1.566	1.589	1.612	1.635	1.657	1.680	1.703	1.726	1.749	**100**
110	1.749	1.771	1.794	1.817	1.840	1.863	1.886	1.909	1.931	1.954	1.977	110
120	1.977	2.000	2.023	2.046	2.069	2.092	2.115	2.138	2.161	2.184	2.207	120
130	2.207	2.230	2.253	2.276	2.298	2.321	2.344	2.367	2.390	2.413	2.436	130
140	2.436	2.459	2.483	2.506	2.529	2.552	2.575	2.598	2.621	2.644	2.667	140
150	2.667	2.690	2.713	2.736	2.759	2.782	2.805	2.828	2.851	2.874	2.897	**150**
160	2.897	2.920	2.944	2.967	2.990	3.013	3.036	3.059	3.082	3.105	3.128	160
170	3.128	3.151	3.174	3.197	3.220	3.244	3.267	3.290	3.313	3.336	3.359	170
180	3.359	3.382	3.405	3.428	3.451	3.474	3.497	3.520	3.544	3.567	3.590	180
190	3.590	3.613	3.636	3.659	3.682	3.705	3.728	3.751	3.774	3.797	3.820	190
200	3.820	3.843	3.866	3.889	3.912	3.935	3.958	3.981	4.004	4.027	4.050	**200**
210	4.050	4.073	4.096	4.119	4.142	4.165	4.188	4.211	4.234	4.257	4.280	210
220	4.280	4.303	4.326	4.349	4.372	4.395	4.417	4.440	4.463	4.486	4.509	220
230	4.509	4.532	4.555	4.578	4.601	4.623	4.646	4.669	4.692	4.715	4.738	230
240	4.738	4.760	4.783	4.806	4.829	4.852	4.874	4.897	4.920	4.943	4.965	240
250	4.965	4.988	5.011	5.034	5.056	5.079	5.102	5.124	5.147	5.170	5.192	**250**
260	5.192	5.215	5.238	5.260	5.283	5.306	5.328	5.351	5.374	5.396	5.419	260
270	5.419	5.441	5.464	5.487	5.509	5.532	5.554	5.577	5.599	5.622	5.644	270
280	5.644	5.667	5.690	5.712	5.735	5.757	5.779	5.802	5.824	5.847	5.869	280
290	5.869	5.892	5.914	5.937	5.959	5.982	6.004	6.026	6.049	6.071	6.094	290
300	6.094	6.116	6.138	6.161	6.183	6.205	6.228	6.250	6.272	6.295	6.317	**300**
310	6.317	6.339	6.362	6.384	6.406	6.429	6.451	6.473	6.496	6.518	6.540	310
320	6.540	6.562	6.585	6.607	6.629	6.652	6.674	6.696	6.718	6.741	6.763	320
330	6.763	6.785	6.807	6.829	6.852	6.874	6.896	6.918	6.941	6.963	6.985	330
340	6.985	7.007	7.029	7.052	7.074	7.096	7.118	7.140	7.163	7.185	7.207	340
350	7.207	7.229	7.251	7.273	7.296	7.318	7.340	7.362	7.384	7.407	7.429	**350**
360	7.429	7.451	7.473	7.495	7.517	7.540	7.562	7.584	7.606	7.628	7.650	360
370	7.650	7.673	7.695	7.717	7.739	7.761	7.783	7.806	7.828	7.850	7.872	370
380	7.872	7.894	7.917	7.939	7.961	7.983	8.005	8.027	8.050	8.072	8.094	380
390	8.094	8.116	8.138	8.161	8.183	8.205	8.227	8.250	8.272	8.294	8.316	390
400	8.316	8.338	8.361	8.383	8.405	8.427	8.450	8.472	8.494	8.516	8.539	**400**
410	8.539	8.561	8.583	8.605	8.628	8.650	8.672	8.694	8.717	8.739	8.761	410
420	8.761	8.784	8.806	8.828	8.851	8.873	8.895	8.918	8.940	8.962	8.985	420
430	8.985	9.007	9.029	9.052	9.074	9.096	9.119	9.141	9.163	9.186	9.208	430
440	9.208	9.231	9.253	9.275	9.298	9.320	9.343	9.365	9.388	9.410	9.432	440
450	9.432	9.455	9.477	9.500	9.522	9.545	9.567	9.590	9.612	9.635	9.657	**450**
460	9.657	9.680	9.702	9.725	9.747	9.770	9.792	9.815	9.837	9.860	9.882	460
470	9.882	9.905	9.927	9.950	9.973	9.995	10.018	10.040	10.063	10.086	10.108	470
480	10.108	10.131	10.153	10.176	10.199	10.221	10.244	10.267	10.289	10.312	10.334	480
490	10.334	10.357	10.380	10.402	10.425	10.448	10.471	10.493	10.516	10.539	10.561	490
500	10.561	10.584	10.607	10.629	10.652	10.675	10.698	10.720	10.743	10.766	10.789	**500**
510	10.789	10.811	10.834	10.857	10.880	10.903	10.925	10.948	10.971	10.994	11.017	510
520	11.017	11.039	11.062	11.085	11.108	11.131	11.154	11.176	11.199	11.222	11.245	520
530	11.245	11.268	11.291	11.313	11.336	11.359	11.382	11.405	11.428	11.451	11.474	530
540	11.474	11.497	11.519	11.542	11.565	11.588	11.611	11.634	11.657	11.680	11.703	540
°F	0	1	2	3	4	5	6	7	8	9	10	°F

K

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
0	0.000	0.039	0.079	0.119	0.158	0.198	0.238	0.277	0.317	0.357	0.397	**0**
10	0.397	0.437	0.477	0.517	0.557	0.597	0.637	0.677	0.718	0.758	0.798	10
20	0.798	0.838	0.879	0.919	0.960	1.000	1.041	1.081	1.122	1.163	1.203	20
30	1.203	1.244	1.285	1.326	1.366	1.407	1.448	1.489	1.530	1.571	1.612	30
40	1.612	1.653	1.694	1.735	1.776	1.817	1.858	1.899	1.941	1.982	2.023	40
50	2.023	2.064	2.106	2.147	2.188	2.230	2.271	2.312	2.354	2.395	2.436	**50**
60	2.436	2.478	2.519	2.561	2.602	2.644	2.685	2.727	2.768	2.810	2.851	60
70	2.851	2.893	2.934	2.976	3.017	3.059	3.100	3.142	3.184	3.225	3.267	70
80	3.267	3.308	3.350	3.391	3.433	3.474	3.516	3.557	3.599	3.640	3.682	80
90	3.682	3.723	3.765	3.806	3.848	3.889	3.931	3.972	4.013	4.055	4.096	90
100	4.096	4.138	4.179	4.220	4.262	4.303	4.344	4.385	4.427	4.468	4.509	**100**
11 0	4.509	4.550	4.591	4.633	4.674	4.715	4.756	4.797	4.838	4.879	4.920	110
12 0	4.920	4.961	5.002	5.043	5.084	5.124	5.165	5.206	5.247	5.288	5.328	120
13 0	5.328	5.369	5.410	5.450	5.491	5.532	5.572	5.613	5.653	5.694	5.735	130
14 0	5.735	5.775	5.815	5.856	5.896	5.937	5.977	6.017	6.058	6.098	6.138	140
150	6.138	6.179	6.219	6.259	6.299	6.339	6.380	6.420	6.460	6.500	6.540	**150**
160	6.540	6.580	6.620	6.660	6.701	6.741	6.781	6.821	6.861	6.901	6.941	160
170	6.941	6.981	7.021	7.060	7.100	7.140	7.180	7.220	7.260	7.300	7.340	170
180	7.340	7.380	7.420	7.460	7.500	7.540	7.579	7.619	7.659	7.699	7.739	180
190	7.739	7.779	7.819	7.859	7.899	7.939	7.979	8.019	8.059	8.099	8.138	190
200	8.138	8.178	8.218	8.258	8.298	8.338	8.378	8.418	8.458	8.499	8.539	**200**
210	8.539	8.579	8.619	8.659	8.699	8.739	8.779	8.819	8.860	8.900	8.940	210
220	8.940	8.980	9.020	9.061	9.101	9.141	9.181	9.222	9.262	9.302	9.343	220
230	9.343	9.383	9.423	9.464	9.504	9.545	9.585	9.626	9.666	9.707	9.747	230
240	9.747	9.788	9.828	9.869	9.909	9.950	9.991	10.031	10.072	10.113	10.153	240
250	10.153	10.194	10.235	10.276	10.316	10.357	10.398	10.439	10.480	10.520	10.561	**250**
260	10.561	10.602	10.643	10.684	10.725	10.766	10.807	10.848	10.889	10.930	10.971	260
270	10.971	11.012	11.053	11.094	11.135	11.176	11.217	11.259	11.300	11.341	11.382	270
280	11.382	11.423	11.465	11.506	11.547	11.588	11.630	11.671	11.712	11.753	11.795	280
290	11.795	11.836	11.877	11.919	11.960	12.001	12.043	12.084	12.126	12.167	12.209	290
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type K - Chromel vs Alumel

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
550	11.703	11.726	11.749	11.772	11.795	11.818	11.841	11.864	11.887	11.910	11.933	**550**
560	11.933	11.956	11.978	12.001	12.024	12.047	12.070	12.093	12.116	12.140	12.163	560
570	12.163	12.186	12.209	12.232	12.255	12.278	12.301	12.324	12.347	12.370	12.393	570
580	12.393	12.416	12.439	12.462	12.485	12.508	12.531	12.554	12.577	12.600	12.624	580
590	12.624	12.647	12.670	12.693	12.716	12.739	12.762	12.785	12.808	12.831	12.855	590
600	12.855	12.878	12.901	12.924	12.947	12.970	12.993	13.016	13.040	13.063	13.086	**600**
610	13.086	13.109	13.132	13.155	13.179	13.202	13.225	13.248	13.271	13.294	13.318	610
620	13.318	13.341	13.364	13.387	13.410	13.433	13.457	13.480	13.503	13.526	13.549	620
630	13.549	13.573	13.596	13.619	13.642	13.665	13.689	13.712	13.735	13.758	13.782	630
640	13.782	13.805	13.828	13.851	13.874	13.898	13.921	13.944	13.967	13.991	14.014	640
650	14.014	14.037	14.060	14.084	14.107	14.130	14.154	14.177	14.200	14.223	14.247	**650**
660	14.247	14.270	14.293	14.316	14.340	14.363	14.386	14.410	14.433	14.456	14.479	660
670	14.479	14.503	14.526	14.549	14.573	14.596	14.619	14.643	14.666	14.689	14.713	670
680	14.713	14.736	14.759	14.783	14.806	14.829	14.853	14.876	14.899	14.923	14.946	680
690	14.946	14.969	14.993	15.016	15.039	15.063	15.086	15.109	15.133	15.156	15.179	690
700	15.179	15.203	15.226	15.250	15.273	15.296	15.320	15.343	15.366	15.390	15.413	**700**
710	15.413	15.437	15.460	15.483	15.507	15.530	15.554	15.577	15.600	15.624	15.647	710
720	15.647	15.671	15.694	15.717	15.741	15.764	15.788	15.811	15.834	15.858	15.881	720
730	15.881	15.905	15.928	15.952	15.975	15.998	16.022	16.045	16.069	16.092	16.116	730
740	16.116	16.139	16.163	16.186	16.209	16.233	16.256	16.280	16.303	16.327	16.350	740
750	16.350	16.374	16.397	16.421	16.444	16.468	16.491	16.515	16.538	16.561	16.585	**750**
760	16.585	16.608	16.632	16.655	16.679	16.702	16.726	16.749	16.773	16.796	16.820	760
770	16.820	16.843	16.867	16.890	16.914	16.937	16.961	16.984	17.008	17.031	17.055	770
780	17.055	17.078	17.102	17.125	17.149	17.173	17.196	17.220	17.243	17.267	17.290	780
790	17.290	17.314	17.337	17.361	17.384	17.408	17.431	17.455	17.478	17.502	17.526	790
800	17.526	17.549	17.573	17.596	17.620	17.643	17.667	17.690	17.714	17.738	17.761	**800**
810	17.761	17.785	17.808	17.832	17.855	17.879	17.902	17.926	17.950	17.973	17.997	810
820	17.997	18.020	18.044	18.068	18.091	18.115	18.138	18.162	18.185	18.209	18.233	820
830	18.233	18.256	18.280	18.303	18.327	18.351	18.374	18.398	18.421	18.445	18.469	830
840	18.469	18.492	18.516	18.539	18.563	18.587	18.610	18.634	18.657	18.681	18.705	840
850	18.705	18.728	18.752	18.776	18.799	18.823	18.846	18.870	18.894	18.917	18.941	**850**
860	18.941	18.965	18.988	19.012	19.035	19.059	19.083	19.106	19.130	19.154	19.177	860
870	19.177	19.201	19.224	19.248	19.272	19.295	19.319	19.343	19.366	19.390	19.414	870
880	19.414	19.437	19.461	19.485	19.508	19.532	19.556	19.579	19.603	19.626	19.650	880
890	19.650	19.674	19.697	19.721	19.745	19.768	19.792	19.816	19.839	19.863	19.887	890
900	19.887	19.910	19.934	19.958	19.981	20.005	20.029	20.052	20.076	20.100	20.123	**900**
910	20.123	20.147	20.171	20.194	20.218	20.242	20.265	20.289	20.313	20.336	20.360	910
920	20.360	20.384	20.407	20.431	20.455	20.479	20.502	20.526	20.550	20.573	20.597	920
930	20.597	20.621	20.644	20.668	20.692	20.715	20.739	20.763	20.786	20.810	20.834	930
940	20.834	20.857	20.881	20.905	20.929	20.952	20.976	21.000	21.023	21.047	21.071	940
950	21.071	21.094	21.118	21.142	21.165	21.189	21.213	21.236	21.260	21.284	21.308	**950**
960	21.308	21.331	21.355	21.379	21.402	21.426	21.450	21.473	21.497	21.521	21.544	960
970	21.544	21.568	21.592	21.616	21.639	21.663	21.687	21.710	21.734	21.758	21.781	970
980	21.781	21.805	21.829	21.852	21.876	21.900	21.924	21.947	21.971	21.995	22.018	980
990	22.018	22.042	22.066	22.089	22.113	22.137	22.160	22.184	22.208	22.232	22.255	990
1000	22.255	22.279	22.303	22.326	22.350	22.374	22.397	22.421	22.445	22.468	22.492	**1000**
1010	22.492	22.516	22.540	22.563	22.587	22.611	22.634	22.658	22.682	22.705	22.729	1010
1020	22.729	22.753	22.776	22.800	22.824	22.847	22.871	22.895	22.919	22.942	22.966	1020
1030	22.966	22.990	23.013	23.037	23.061	23.084	23.108	23.132	23.155	23.179	23.203	1030
1040	23.203	23.226	23.250	23.274	23.297	23.321	23.345	23.368	23.392	23.416	23.439	1040
°F	0	1	2	3	4	5	6	7	8	9	10	°F

K

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
300	12.209	12.250	12.291	12.333	12.374	12.416	12.457	12.499	12.540	12.582	12.624	**300**
310	12.624	12.665	12.707	12.748	12.790	12.831	12.873	12.915	12.956	12.998	13.040	310
320	13.040	13.081	13.123	13.165	13.206	13.248	13.290	13.331	13.373	13.415	13.457	320
330	13.457	13.498	13.540	13.582	13.624	13.665	13.707	13.749	13.791	13.833	13.874	330
340	13.874	13.916	13.958	14.000	14.042	14.084	14.126	14.167	14.209	14.251	14.293	340
350	14.293	14.335	14.377	14.419	14.461	14.503	14.545	14.587	14.629	14.671	14.713	**350**
360	14.713	14.755	14.797	14.839	14.881	14.923	14.965	15.007	15.049	15.091	15.133	360
370	15.133	15.175	15.217	15.259	15.301	15.343	15.385	15.427	15.469	15.511	15.554	370
380	15.554	15.596	15.638	15.680	15.722	15.764	15.806	15.849	15.891	15.933	15.975	380
390	15.975	16.017	16.059	16.102	16.144	16.186	16.228	16.270	16.313	16.355	16.397	390
400	16.397	16.439	16.482	16.524	16.566	16.608	16.651	16.693	16.735	16.778	16.820	**400**
410	16.820	16.862	16.904	16.947	16.989	17.031	17.074	17.116	17.158	17.201	17.243	410
420	17.243	17.285	17.328	17.370	17.413	17.455	17.497	17.540	17.582	17.624	17.667	420
430	17.667	17.709	17.752	17.794	17.837	17.879	17.921	17.964	18.006	18.049	18.091	430
440	18.091	18.134	18.176	18.218	18.261	18.303	18.346	18.388	18.431	18.473	18.516	440
450	18.516	18.558	18.601	18.643	18.686	18.728	18.771	18.813	18.856	18.898	18.941	**450**
460	18.941	18.983	19.026	19.068	19.111	19.154	19.196	19.239	19.281	19.324	19.366	460
470	19.366	19.409	19.451	19.494	19.537	19.579	19.622	19.664	19.707	19.750	19.792	470
480	19.792	19.835	19.877	19.920	19.962	20.005	20.048	20.090	20.133	20.175	20.218	480
490	20.218	20.261	20.303	20.346	20.389	20.431	20.474	20.516	20.559	20.602	20.644	490
500	20.644	20.687	20.730	20.772	20.815	20.857	20.900	20.943	20.985	21.028	21.071	**500**
510	21.071	21.113	21.156	21.199	21.241	21.284	21.326	21.369	21.412	21.454	21.497	510
520	21.497	21.540	21.582	21.625	21.668	21.710	21.753	21.796	21.838	21.881	21.924	520
530	21.924	21.966	22.009	22.052	22.094	22.137	22.179	22.222	22.265	22.307	22.350	530
540	22.350	22.393	22.435	22.478	22.521	22.563	22.606	22.649	22.691	22.734	22.776	540
550	22.776	22.819	22.862	22.904	22.947	22.990	23.032	23.075	23.117	23.160	23.203	**550**
560	23.203	23.245	23.288	23.331	23.373	23.416	23.458	23.501	23.544	23.586	23.629	560
570	23.629	23.671	23.714	23.757	23.799	23.842	23.884	23.927	23.970	24.012	24.055	570
580	24.055	24.097	24.140	24.182	24.225	24.267	24.310	24.353	24.395	24.438	24.480	580
590	24.480	24.523	24.565	24.608	24.650	24.693	24.735	24.778	24.820	24.863	24.905	590
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1050	23.439	23.463	23.487	23.510	23.534	23.558	23.581	23.605	23.629	23.652	23.676	**1050**
1060	23.676	23.700	23.723	23.747	23.771	23.794	23.818	23.842	23.865	23.889	23.913	1060
1070	23.913	23.936	23.960	23.984	24.007	24.031	24.055	24.078	24.102	24.126	24.149	1070
1080	24.149	24.173	24.197	24.220	24.244	24.267	24.291	24.315	24.338	24.362	24.386	1080
1090	24.386	24.409	24.433	24.457	24.480	24.504	24.527	24.551	24.575	24.598	24.622	1090
1100	24.622	24.646	24.669	24.693	24.717	24.740	24.764	24.787	24.811	24.835	24.858	**1100**
1110	24.858	24.882	24.905	24.929	24.953	24.976	25.000	25.024	25.047	25.071	25.094	1110
1120	25.094	25.118	25.142	25.165	25.189	25.212	25.236	25.260	25.283	25.307	25.330	1120
1130	25.330	25.354	25.377	25.401	25.425	25.448	25.472	25.495	25.519	25.543	25.566	1130
1140	25.566	25.590	25.613	25.637	25.660	25.684	25.708	25.731	25.755	25.778	25.802	1140
1150	25.802	25.825	25.849	25.873	25.896	25.920	25.943	25.967	25.990	26.014	26.037	**1150**
1160	26.037	26.061	26.084	26.108	26.132	26.155	26.179	26.202	26.226	26.249	26.273	1160
1170	26.273	26.296	26.320	26.343	26.367	26.390	26.414	26.437	26.461	26.484	26.508	1170
1180	26.508	26.532	26.555	26.579	26.602	26.626	26.649	26.673	26.696	26.720	26.743	1180
1190	26.743	26.767	26.790	26.814	26.837	26.861	26.884	26.907	26.931	26.954	26.978	1190
1200	26.978	27.001	27.025	27.048	27.072	27.095	27.119	27.142	27.166	27.189	27.213	1200
1210	27.213	27.236	27.260	27.283	27.306	27.330	27.353	27.377	27.400	27.424	27.447	1210
1220	27.447	27.471	27.494	27.517	27.541	27.564	27.588	27.611	27.635	27.658	27.681	1220
1230	27.681	27.705	27.728	27.752	27.775	27.798	27.822	27.845	27.869	27.892	27.915	1230
1240	27.915	27.939	27.962	27.986	28.009	28.032	28.056	28.079	28.103	28.126	28.149	1240
1250	28.149	28.173	28.196	28.219	28.243	28.266	28.289	28.313	28.336	28.360	28.383	**1250**
1260	28.383	28.406	28.430	28.453	28.476	28.500	28.523	28.546	28.570	28.593	28.616	1260
1270	28.616	28.640	28.663	28.686	28.710	28.733	28.756	28.780	28.803	28.826	28.849	1270
1280	28.849	28.873	28.896	28.919	28.943	28.966	28.989	29.013	29.036	29.059	29.082	1280
1290	29.082	29.106	29.129	29.152	29.176	29.199	29.222	29.245	29.269	29.292	29.315	1290
1300	29.315	29.338	29.362	29.385	29.408	29.431	29.455	29.478	29.501	29.524	29.548	**1300**
1310	29.548	29.571	29.594	29.617	29.640	29.664	29.687	29.710	29.733	29.757	29.780	1310
1320	29.780	29.803	29.826	29.849	29.873	29.896	29.919	29.942	29.965	29.989	30.012	1320
1330	30.012	30.035	30.058	30.081	30.104	30.128	30.151	30.174	30.197	30.220	30.243	1330
1340	30.243	30.267	30.290	30.313	30.336	30.359	30.382	30.405	30.429	30.452	30.475	1340
1350	30.475	30.498	30.521	30.544	30.567	30.590	30.613	30.637	30.660	30.683	30.706	**1350**
1360	30.706	30.729	30.752	30.775	30.798	30.821	30.844	30.868	30.891	30.914	30.937	1360
1370	30.937	30.960	30.983	31.006	31.029	31.052	31.075	31.098	31.121	31.144	31.167	1370
1380	31.167	31.190	31.213	31.236	31.260	31.283	31.306	31.329	31.352	31.375	31.398	1380
1390	31.398	31.421	31.444	31.467	31.490	31.513	31.536	31.559	31.582	31.605	31.628	1390
1400	31.628	31.651	31.674	31.697	31.720	31.743	31.766	31.789	31.812	31.834	31.857	**1400**
1410	31.857	31.880	31.903	31.926	31.949	31.972	31.995	32.018	32.041	32.064	32.087	1410
1420	32.087	32.110	32.133	32.156	32.179	32.202	32.224	32.247	32.270	32.293	32.316	1420
1430	32.316	32.339	32.362	32.385	32.408	32.431	32.453	32.476	32.499	32.522	32.545	1430
1440	32.545	32.568	32.591	32.614	32.636	32.659	32.682	32.705	32.728	32.751	32.774	1440
1450	32.774	32.796	32.819	32.842	32.865	32.888	32.911	32.933	32.956	32.979	33.002	**1450**
1460	33.002	33.025	33.047	33.070	33.093	33.116	33.139	33.161	33.184	33.207	33.230	1460
1470	33.230	33.253	33.275	33.298	33.321	33.344	33.366	33.389	33.412	33.435	33.458	1470
1480	33.458	33.480	33.503	33.526	33.548	33.571	33.594	33.617	33.639	33.662	33.685	1480
1490	33.685	33.708	33.730	33.753	33.776	33.798	33.821	33.844	33.867	33.889	33.912	1490
1500	33.912	33.935	33.957	33.980	34.003	34.025	34.048	34.071	34.093	34.116	34.139	**1500**
1510	34.139	34.161	34.184	34.207	34.229	34.252	34.275	34.297	34.320	34.343	34.365	1510
1520	34.365	34.388	34.410	34.433	34.456	34.478	34.501	34.524	34.546	34.569	34.591	1520
1530	34.591	34.614	34.637	34.659	34.682	34.704	34.727	34.750	34.772	34.795	34.817	1530
1540	34.817	34.840	34.862	34.885	34.908	34.930	34.953	34.975	34.998	35.020	35.043	1540
°F	0	1	2	3	4	5	6	7	8	9	10	°F

K

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
600	24.905	24.948	24.990	25.033	25.075	25.118	25.160	25.203	25.245	25.288	25.330	**600**
610	25.330	25.373	25.415	25.458	25.500	25.543	25.585	25.627	25.670	25.712	25.755	610
620	25.755	25.797	25.840	25.882	25.924	25.967	26.009	26.052	26.094	26.136	26.179	620
630	26.179	26.221	26.263	26.306	26.348	26.390	26.433	26.475	26.517	26.560	26.602	630
640	26.602	26.644	26.687	26.729	26.771	26.814	26.856	26.898	26.940	26.983	27.025	640
650	27.025	27.067	27.109	27.152	27.194	27.236	27.278	27.320	27.363	27.405	27.447	**650**
660	27.447	27.489	27.531	27.574	27.616	27.658	27.700	27.742	27.784	27.826	27.869	660
670	27.869	27.911	27.953	27.995	28.037	28.079	28.121	28.163	28.205	28.247	28.289	670
680	28.289	28.332	28.374	28.416	28.458	28.500	28.542	28.584	28.626	28.668	28.710	680
690	28.710	28.752	28.794	28.835	28.877	28.919	28.961	29.003	29.045	29.087	29.129	690
700	29.129	29.171	29.213	29.255	29.297	29.338	29.380	29.422	29.464	29.506	29.548	**700**
710	29.548	29.589	29.631	29.673	29.715	29.757	29.798	29.840	29.882	29.924	29.965	710
720	29.965	30.007	30.049	30.090	30.132	30.174	30.216	30.257	30.299	30.341	30.382	720
730	30.382	30.424	30.466	30.507	30.549	30.590	30.632	30.674	30.715	30.757	30.798	730
740	30.798	30.840	30.881	30.923	30.964	31.006	31.047	31.089	31.130	31.172	31.213	740
750	31.213	31.255	31.296	31.338	31.379	31.421	31.462	31.504	31.545	31.586	31.628	**750**
760	31.628	31.669	31.710	31.752	31.793	31.834	31.876	31.917	31.958	32.000	32.041	760
770	32.041	32.082	32.124	32.165	32.206	32.247	32.289	32.330	32.371	32.412	32.453	770
780	32.453	32.495	32.536	32.577	32.618	32.659	32.700	32.742	32.783	32.824	32.865	780
790	32.865	32.906	32.947	32.988	33.029	33.070	33.111	33.152	33.193	33.234	33.275	790
800	33.275	33.316	33.357	33.398	33.439	33.480	33.521	33.562	33.603	33.644	33.685	**800**
810	33.685	33.726	33.767	33.808	33.848	33.889	33.930	33.971	34.012	34.053	34.093	810
820	34.093	34.134	34.175	34.216	34.257	34.297	34.338	34.379	34.420	34.460	34.501	820
830	34.501	34.542	34.582	34.623	34.664	34.704	34.745	34.786	34.826	34.867	34.908	830
840	34.908	34.948	34.989	35.029	35.070	35.110	35.151	35.192	35.232	35.273	35.313	840
850	35.313	35.354	35.394	35.435	35.475	35.516	35.556	35.596	35.637	35.677	35.718	**850**
860	35.718	35.758	35.798	35.839	35.879	35.920	35.960	36.000	36.041	36.081	36.121	860
870	36.121	36.162	36.202	36.242	36.282	36.323	36.363	36.403	36.443	36.484	36.524	870
880	36.524	36.564	36.604	36.644	36.685	36.725	36.765	36.805	36.845	36.885	36.925	880
890	36.925	36.965	37.006	37.046	37.086	37.126	37.166	37.206	37.246	37.286	37.326	890
°C	0	1	2	3	4	5	6	7	8	9	10	°C

1550 °F - 2050 °F   Type K - Chromel vs Alumel   900 °C - 1200 °C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1550	35.043	35.065	35.088	35.110	35.133	35.156	35.178	35.201	35.223	35.246	35.268	**1550**
1560	35.268	35.291	35.313	35.336	35.358	35.381	35.403	35.426	35.448	35.471	35.493	1560
1570	35.493	35.516	35.538	35.560	35.583	35.605	35.628	35.650	35.673	35.695	35.718	1570
1580	35.718	35.740	35.763	35.785	35.807	35.830	35.852	35.875	35.897	35.920	35.942	1580
1590	35.942	35.964	35.987	36.009	36.032	36.054	36.076	36.099	36.121	36.144	36.166	1590
1600	36.166	36.188	36.211	36.233	36.256	36.278	36.300	36.323	36.345	36.367	36.390	**1600**
1610	36.390	36.412	36.434	36.457	36.479	36.501	36.524	36.546	36.568	36.591	36.613	1610
1620	36.613	36.635	36.658	36.680	36.702	36.725	36.747	36.769	36.792	36.814	36.836	1620
1630	36.836	36.859	36.881	36.903	36.925	36.948	36.970	36.992	37.014	37.037	37.059	1630
1640	37.059	37.081	37.104	37.126	37.148	37.170	37.193	37.215	37.237	37.259	37.281	1640
1650	37.281	37.304	37.326	37.348	37.370	37.393	37.415	37.437	37.459	37.481	37.504	**1650**
1660	37.504	37.526	37.548	37.570	37.592	37.615	37.637	37.659	37.681	37.703	37.725	1660
1670	37.725	37.748	37.770	37.792	37.814	37.836	37.858	37.881	37.903	37.925	37.947	1670
1680	37.947	37.969	37.991	38.013	38.036	38.058	38.080	38.102	38.124	38.146	38.168	1680
1690	38.168	38.190	38.212	38.235	38.257	38.279	38.301	38.323	38.345	38.367	38.389	1690
1700	38.389	38.411	38.433	38.455	38.477	38.499	38.522	38.544	38.566	38.588	38.610	**1700**
1710	38.610	38.632	38.654	38.676	38.698	38.720	38.742	38.764	38.786	38.808	38.830	1710
1720	38.830	38.852	38.874	38.896	38.918	38.940	38.962	38.984	39.006	39.028	39.050	1720
1730	39.050	39.072	39.094	39.116	39.138	39.160	39.182	39.204	39.226	39.248	39.270	1730
1740	39.270	39.292	39.314	39.335	39.357	39.379	39.401	39.423	39.445	39.467	39.489	1740
1750	39.489	39.511	39.533	39.555	39.577	39.599	39.620	39.642	39.664	39.686	39.708	**1750**
1760	39.708	39.730	39.752	39.774	39.796	39.817	39.839	39.861	39.883	39.905	39.927	1760
1770	39.927	39.949	39.970	39.992	40.014	40.036	40.058	40.080	40.101	40.123	40.145	1770
1780	40.145	40.167	40.189	40.211	40.232	40.254	40.276	40.298	40.320	40.341	40.363	1780
1790	40.363	40.385	40.407	40.429	40.450	40.472	40.494	40.516	40.537	40.559	40.581	1790
1800	40.581	40.603	40.624	40.646	40.668	40.690	40.711	40.733	40.755	40.777	40.798	**1800**
1810	40.798	40.820	40.842	40.864	40.885	40.907	40.929	40.950	40.972	40.994	41.015	1810
1820	41.015	41.037	41.059	41.081	41.102	41.124	41.146	41.167	41.189	41.211	41.232	1820
1830	41.232	41.254	41.276	41.297	41.319	41.341	41.362	41.384	41.405	41.427	41.449	1830
1840	41.449	41.470	41.492	41.514	41.535	41.557	41.578	41.600	41.622	41.643	41.665	1840
1850	41.665	41.686	41.708	41.730	41.751	41.773	41.794	41.816	41.838	41.859	41.881	**1850**
1860	41.881	41.902	41.924	41.945	41.967	41.988	42.010	42.032	42.053	42.075	42.096	1860
1870	42.096	42.118	42.139	42.161	42.182	42.204	42.225	42.247	42.268	42.290	42.311	1870
1880	42.311	42.333	42.354	42.376	42.397	42.419	42.440	42.462	42.483	42.505	42.526	1880
1890	42.526	42.548	42.569	42.591	42.612	42.633	42.655	42.676	42.698	42.719	42.741	1890
1900	42.741	42.762	42.783	42.805	42.826	42.848	42.869	42.891	42.912	42.933	42.955	**1900**
1910	42.955	42.976	42.998	43.019	43.040	43.062	43.083	43.104	43.126	43.147	43.169	1910
1920	43.169	43.190	43.211	43.233	43.254	43.275	43.297	43.318	43.339	43.361	43.382	1920
1930	43.382	43.403	43.425	43.446	43.467	43.489	43.510	43.531	43.552	43.574	43.595	1930
1940	43.595	43.616	43.638	43.659	43.680	43.701	43.723	43.744	43.765	43.787	43.808	1940
1950	43.808	43.829	43.850	43.872	43.893	43.914	43.935	43.957	43.978	43.999	44.020	**1950**
1960	44.020	44.041	44.063	44.084	44.105	44.126	44.147	44.169	44.190	44.211	44.232	1960
1970	44.232	44.253	44.275	44.296	44.317	44.338	44.359	44.380	44.402	44.423	44.444	1970
1980	44.444	44.465	44.486	44.507	44.528	44.550	44.571	44.592	44.613	44.634	44.655	1980
1990	44.655	44.676	44.697	44.719	44.740	44.761	44.782	44.803	44.824	44.845	44.866	1990
2000	44.866	44.887	44.908	44.929	44.950	44.971	44.992	45.014	45.035	45.056	45.077	**2000**
2010	45.077	45.098	45.119	45.140	45.161	45.182	45.203	45.224	45.245	45.266	45.287	2010
2020	45.287	45.308	45.329	45.350	45.371	45.392	45.413	45.434	45.455	45.476	45.497	2020
2030	45.497	45.518	45.539	45.560	45.580	45.601	45.622	45.643	45.664	45.685	45.706	2030
2040	45.706	45.727	45.748	45.769	45.790	45.811	45.832	45.852	45.873	45.894	45.915	2040
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
900	37.326	37.366	37.406	37.446	37.486	37.526	37.566	37.606	37.646	37.686	37.725	**900**
910	37.725	37.765	37.805	37.845	37.885	37.925	37.965	38.005	38.044	38.084	38.124	910
920	38.124	38.164	38.204	38.243	38.283	38.323	38.363	38.402	38.442	38.482	38.522	920
930	38.522	38.561	38.601	38.641	38.680	38.720	38.760	38.799	38.839	38.878	38.918	930
940	38.918	38.958	38.997	39.037	39.076	39.116	39.155	39.195	39.235	39.274	39.314	940
950	39.314	39.353	39.393	39.432	39.471	39.511	39.550	39.590	39.629	39.669	39.708	**950**
960	39.708	39.747	39.787	39.826	39.866	39.905	39.944	39.984	40.023	40.062	40.101	960
970	40.101	40.141	40.180	40.219	40.259	40.298	40.337	40.376	40.415	40.455	40.494	970
980	40.494	40.533	40.572	40.611	40.651	40.690	40.729	40.768	40.807	40.846	40.885	980
990	40.885	40.924	40.963	41.002	41.042	41.081	41.120	41.159	41.198	41.237	41.276	990
1000	41.276	41.315	41.354	41.393	41.431	41.470	41.509	41.548	41.587	41.626	41.665	**1000**
1010	41.665	41.704	41.743	41.781	41.820	41.859	41.898	41.937	41.976	42.014	42.053	1010
1020	42.053	42.092	42.131	42.169	42.208	42.247	42.286	42.324	42.363	42.402	42.440	1020
1030	42.440	42.479	42.518	42.556	42.595	42.633	42.672	42.711	42.749	42.788	42.826	1030
1040	42.826	42.865	42.903	42.942	42.980	43.019	43.057	43.096	43.134	43.173	43.211	1040
1050	43.211	43.250	43.288	43.327	43.365	43.403	43.442	43.480	43.518	43.557	43.595	**1050**
1060	43.595	43.633	43.672	43.710	43.748	43.787	43.825	43.863	43.901	43.940	43.978	1060
1070	43.978	44.016	44.054	44.092	44.130	44.169	44.207	44.245	44.283	44.321	44.359	1070
1080	44.359	44.397	44.435	44.473	44.512	44.550	44.588	44.626	44.664	44.702	44.740	1080
1090	44.740	44.778	44.816	44.853	44.891	44.929	44.967	45.005	45.043	45.081	45.119	1090
1100	45.119	45.157	45.194	45.232	45.270	45.308	45.346	45.383	45.421	45.459	45.497	**1100**
1110	45.497	45.534	45.572	45.610	45.647	45.685	45.723	45.760	45.798	45.836	45.873	1110
1120	45.873	45.911	45.948	45.986	46.024	46.061	46.099	46.136	46.174	46.211	46.249	1120
1130	46.249	46.286	46.324	46.361	46.398	46.436	46.473	46.511	46.548	46.585	46.623	1130
1140	46.623	46.660	46.697	46.735	46.772	46.809	46.847	46.884	46.921	46.958	46.995	1140
1150	46.995	47.033	47.070	47.107	47.144	47.181	47.218	47.256	47.293	47.330	47.367	**1150**
1160	47.367	47.404	47.441	47.478	47.515	47.552	47.589	47.626	47.663	47.700	47.737	1160
1170	47.737	47.774	47.811	47.848	47.884	47.921	47.958	47.995	48.032	48.069	48.105	1170
1180	48.105	48.142	48.179	48.216	48.252	48.289	48.326	48.363	48.399	48.436	48.473	1180
1190	48.473	48.509	48.546	48.582	48.619	48.656	48.692	48.729	48.765	48.802	48.838	1190
°C	0	1	2	3	4	5	6	7	8	9	10	°C

K

Type K - Chromel vs Alumel

2050 °F - 2500 °F

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2050	45.915	45.936	45.957	45.978	45.999	46.019	46.040	46.061	46.082	46.103	46.124	2050
2060	46.124	46.145	46.165	46.186	46.207	46.228	46.249	46.269	46.290	46.311	46.332	2060
2070	46.332	46.353	46.374	46.394	46.415	46.436	46.457	46.477	46.498	46.519	46.540	2070
2080	46.540	46.560	46.581	46.602	46.623	46.643	46.664	46.685	46.706	46.726	46.747	2080
2090	46.747	46.768	46.789	46.809	46.830	46.851	46.871	46.892	46.913	46.933	46.954	2090
2100	46.954	46.975	46.995	47.016	47.037	47.057	47.078	47.099	47.119	47.140	47.161	2100
2110	47.161	47.181	47.202	47.223	47.243	47.264	47.284	47.305	47.326	47.346	47.367	2110
2120	47.367	47.387	47.408	47.429	47.449	47.470	47.490	47.511	47.531	47.552	47.573	2120
2130	47.573	47.593	47.614	47.634	47.655	47.675	47.696	47.716	47.737	47.757	47.778	2130
2140	47.778	47.798	47.819	47.839	47.860	47.880	47.901	47.921	47.942	47.962	47.983	2140
2150	47.983	48.003	48.024	48.044	48.065	48.085	48.105	48.126	48.146	48.167	48.187	2150
2160	48.187	48.208	48.228	48.248	48.269	48.289	48.310	48.330	48.350	48.371	48.391	2160
2170	48.391	48.411	48.432	48.452	48.473	48.493	48.513	48.534	48.554	48.574	48.595	2170
2180	48.595	48.615	48.635	48.656	48.676	48.696	48.717	48.737	48.757	48.777	48.798	2180
2190	48.798	48.818	48.838	48.859	48.879	48.899	48.919	48.940	48.960	48.980	49.000	2190
2200	49.000	49.021	49.041	49.061	49.081	49.101	49.122	49.142	49.162	49.182	49.202	2200
2210	49.202	49.223	49.243	49.263	49.283	49.303	49.323	49.344	49.364	49.384	49.404	2210
2220	49.404	49.424	49.444	49.465	49.485	49.505	49.525	49.545	49.565	49.585	49.605	2220
2230	49.605	49.625	49.645	49.666	49.686	49.706	49.726	49.746	49.766	49.786	49.806	2230
2240	49.806	49.826	49.846	49.866	49.886	49.906	49.926	49.946	49.966	49.986	50.006	2240
2250	50.006	50.026	50.046	50.066	50.086	50.106	50.126	50.146	50.166	50.186	50.206	2250
2260	50.206	50.226	50.246	50.266	50.286	50.306	50.326	50.346	50.366	50.385	50.405	2260
2270	50.405	50.425	50.445	50.465	50.485	50.505	50.525	50.545	50.564	50.584	50.604	2270
2280	50.604	50.624	50.644	50.664	50.684	50.703	50.723	50.743	50.763	50.783	50.802	2280
2290	50.802	50.822	50.842	50.862	50.882	50.901	50.921	50.941	50.961	50.981	51.000	2290
2300	51.000	51.020	51.040	51.060	51.079	51.099	51.119	51.139	51.158	51.178	51.198	2300
2310	51.198	51.217	51.237	51.257	51.276	51.296	51.316	51.336	51.355	51.375	51.395	2310
2320	51.395	51.414	51.434	51.453	51.473	51.493	51.512	51.532	51.552	51.571	51.591	2320
2330	51.591	51.611	51.630	51.650	51.669	51.689	51.708	51.728	51.748	51.767	51.787	2330
2340	51.787	51.806	51.826	51.845	51.865	51.885	51.904	51.924	51.943	51.963	51.982	2340
2350	51.982	52.002	52.021	52.041	52.060	52.080	52.099	52.119	52.138	52.158	52.177	2350
2360	52.177	52.197	52.216	52.235	52.255	52.274	52.294	52.313	52.333	52.352	52.371	2360
2370	52.371	52.391	52.410	52.430	52.449	52.468	52.488	52.507	52.527	52.546	52.565	2370
2380	52.565	52.585	52.604	52.623	52.643	52.662	52.681	52.701	52.720	52.739	52.759	2380
2390	52.759	52.778	52.797	52.817	52.836	52.855	52.875	52.894	52.913	52.932	52.952	2390
2400	52.952	52.971	52.990	53.010	53.029	53.048	53.067	53.087	53.106	53.125	53.144	**2400**
2410	53.144	53.163	53.183	53.202	53.221	53.240	53.260	53.279	53.298	53.317	53.336	2410
2420	53.336	53.355	53.375	53.394	53.413	53.432	53.451	53.470	53.490	53.509	53.528	2420
2430	53.528	53.547	53.566	53.585	53.604	53.623	53.643	53.662	53.681	53.700	53.719	2430
2440	53.719	53.738	53.757	53.776	53.795	53.814	53.833	53.852	53.871	53.890	53.910	2440
2450	53.910	53.929	53.948	53.967	53.986	54.005	54.024	54.043	54.062	54.081	54.100	**2450**
2460	54.100	54.119	54.138	54.157	54.176	54.195	54.214	54.233	54.252	54.271	54.289	2460
2470	54.289	54.308	54.327	54.346	54.365	54.384	54.403	54.422	54.441	54.460	54.479	2470
2480	54.479	54.498	54.517	54.536	54.554	54.573	54.592	54.611	54.630	54.649	54.668	2480
2490	54.668	54.687	54.705	54.724	54.743	54.762	54.781	54.800	54.819	54.837	54.856	2490
2500	54.85											**2500**
°F	0	1	2	3	4	5	6	7	8	9	10	°F

1200 °C - 1372 °C

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1200	48.838	48.875	48.911	48.948	48.984	49.021	49.057	49.093	49.130	49.166	49.202	**1200**
1210	49.202	49.239	49.275	49.311	49.348	49.384	49.420	49.456	49.493	49.529	49.565	1210
1220	49.565	49.601	49.637	49.674	49.710	49.746	49.782	49.818	49.854	49.890	49.926	1220
1230	49.926	49.962	49.998	50.034	50.070	50.106	50.142	50.178	50.214	50.250	50.286	1230
1240	50.286	50.322	50.358	50.393	50.429	50.465	50.501	50.537	50.572	50.608	50.644	1240
1250	50.644	50.680	50.715	50.751	50.787	50.822	50.858	50.894	50.929	50.965	51.000	**1250**
1260	51.000	51.036	51.071	51.107	51.142	51.178	51.213	51.249	51.284	51.320	51.355	1260
1270	51.355	51.391	51.426	51.461	51.497	51.532	51.567	51.603	51.638	51.673	51.708	1270
1280	51.708	51.744	51.779	51.814	51.849	51.885	51.920	51.955	51.990	52.025	52.060	1280
1290	52.060	52.095	52.130	52.165	52.200	52.235	52.270	52.305	52.340	52.375	52.410	1290
1300	52.410	52.445	52.480	52.515	52.550	52.585	52.620	52.654	52.689	52.724	52.759	**1300**
1310	52.759	52.794	52.828	52.863	52.898	52.932	52.967	53.002	53.037	53.071	53.106	1310
1320	53.106	53.140	53.175	53.210	53.244	53.279	53.313	53.348	53.382	53.417	53.451	1320
1330	53.451	53.486	53.520	53.555	53.589	53.623	53.658	53.692	53.727	53.761	53.795	1330
1340	53.795	53.830	53.864	53.898	53.932	53.967	54.001	54.035	54.069	54.104	54.138	1340
1350	54.138	54.172	54.206	54.240	54.274	54.308	54.343	54.377	54.411	54.445	54.479	**1350**
1360	54.479	54.513	54.547	54.581	54.615	54.649	54.683	54.717	54.751	54.785	54.819	1360
1370	54.819	54.852	54.886									1370
°C	0	1	2	3	4	5	6	7	8	9	10	°C

K

Type T - Copper vs Constantan

EMF in Millivolts — Reference Junction 32°F

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°F
-450	-6.254	-6.255	-6.256	-6.257	-6.258							**-450**
-440	-6.240	-6.242	-6.243	-6.245	-6.247	-6.248	-6.250	-6.251	-6.252	-6.253	-6.254	-440
-430	-6.217	-6.220	-6.222	-6.225	-6.227	-6.230	-6.232	-6.234	-6.236	-6.238	-6.240	-430
-420	-6.187	-6.191	-6.194	-6.197	-6.200	-6.203	-6.206	-6.209	-6.212	-6.215	-6.217	-420
-410	-6.150	-6.154	-6.158	-6.162	-6.166	-6.170	-6.173	-6.177	-6.180	-6.184	-6.187	-410
-400	-6.105	-6.110	-6.115	-6.119	-6.124	-6.128	-6.133	-6.137	-6.141	-6.146	-6.150	**-400**
-390	-6.053	-6.059	-6.064	-6.069	-6.075	-6.080	-6.085	-6.090	-6.095	-6.100	-6.105	-390
-380	-5.994	-6.001	-6.007	-6.013	-6.019	-6.025	-6.030	-6.036	-6.042	-6.047	-6.053	-380
-370	-5.930	-5.937	-5.943	-5.950	-5.956	-5.963	-5.969	-5.976	-5.982	-5.988	-5.994	-370
-360	-5.860	-5.867	-5.874	-5.881	-5.888	-5.896	-5.902	-5.909	-5.916	-5.923	-5.930	-360
-350	-5.785	-5.792	-5.800	-5.808	-5.815	-5.823	-5.830	-5.838	-5.845	-5.853	-5.860	**-350**
-340	-5.705	-5.713	-5.721	-5.729	-5.737	-5.745	-5.753	-5.761	-5.769	-5.777	-5.785	-340
-330	-5.620	-5.629	-5.638	-5.646	-5.655	-5.663	-5.672	-5.680	-5.688	-5.697	-5.705	-330
-320	-5.532	-5.541	-5.550	-5.559	-5.568	-5.577	-5.585	-5.594	-5.603	-5.612	-5.620	-320
-310	-5.439	-5.448	-5.458	-5.467	-5.476	-5.486	-5.495	-5.504	-5.513	-5.523	-5.532	-310
-300	-5.341	-5.351	-5.361	-5.371	-5.381	-5.391	-5.400	-5.410	-5.420	-5.429	-5.439	**-300**
-290	-5.240	-5.250	-5.261	-5.271	-5.281	-5.291	-5.301	-5.312	-5.322	-5.332	-5.341	-290
-280	-5.135	-5.145	-5.156	-5.167	-5.177	-5.188	-5.198	-5.209	-5.219	-5.230	-5.240	-280
-270	-5.025	-5.036	-5.048	-5.059	-5.070	-5.081	-5.091	-5.102	-5.113	-5.124	-5.135	-270
-260	-4.912	-4.923	-4.935	-4.946	-4.958	-4.969	-4.980	-4.992	-5.003	-5.014	-5.025	-260
-250	-4.794	-4.806	-4.818	-4.830	-4.842	-4.854	-4.865	-4.877	-4.889	-4.900	-4.912	**-250**
-240	-4.673	-4.685	-4.698	-4.710	-4.722	-4.734	-4.746	-4.759	-4.771	-4.783	-4.794	-240
-230	-4.548	-4.561	-4.573	-4.586	-4.599	-4.611	-4.624	-4.636	-4.648	-4.661	-4.673	-230
-220	-4.419	-4.432	-4.445	-4.458	-4.471	-4.484	-4.497	-4.510	-4.523	-4.535	-4.548	-220
-210	-4.286	-4.300	-4.313	-4.326	-4.340	-4.353	-4.366	-4.380	-4.393	-4.406	-4.419	-210
-200	-4.149	-4.163	-4.177	-4.191	-4.205	-4.218	-4.232	-4.246	-4.259	-4.273	-4.286	**-200**
-190	-4.009	-4.023	-4.037	-4.052	-4.066	-4.080	-4.094	-4.108	-4.122	-4.136	-4.149	-190
-180	-3.865	-3.879	-3.894	-3.908	-3.923	-3.937	-3.952	-3.966	-3.980	-3.995	-4.009	-180
-170	-3.717	-3.732	-3.747	-3.762	-3.777	-3.791	-3.806	-3.821	-3.836	-3.850	-3.865	-170
-160	-3.565	-3.581	-3.596	-3.611	-3.626	-3.642	-3.657	-3.672	-3.687	-3.702	-3.717	-160
-150	-3.410	-3.426	-3.441	-3.457	-3.473	-3.488	-3.504	-3.519	-3.535	-3.550	-3.565	**-150**
-140	-3.251	-3.267	-3.283	-3.299	-3.315	-3.331	-3.347	-3.363	-3.379	-3.394	-3.410	-140
-130	-3.089	-3.105	-3.122	-3.138	-3.154	-3.171	-3.187	-3.203	-3.219	-3.235	-3.251	-130
-120	-2.923	-2.940	-2.956	-2.973	-2.990	-3.006	-3.023	-3.040	-3.056	-3.072	-3.089	-120
-110	-2.754	-2.771	-2.788	-2.805	-2.822	-2.839	-2.856	-2.873	-2.889	-2.906	-2.923	-110
-100	-2.581	-2.598	-2.616	-2.633	-2.651	-2.668	-2.685	-2.702	-2.719	-2.737	-2.754	**-100**
-90	-2.405	-2.423	-2.440	-2.458	-2.476	-2.493	-2.511	-2.529	-2.546	-2.564	-2.581	-90
-80	-2.225	-2.244	-2.262	-2.280	-2.298	-2.316	-2.334	-2.351	-2.369	-2.387	-2.405	-80
-70	-2.043	-2.061	-2.079	-2.098	-2.116	-2.134	-2.153	-2.171	-2.189	-2.207	-2.225	-70
-60	-1.857	-1.875	-1.894	-1.913	-1.931	-1.950	-1.969	-1.987	-2.006	-2.024	-2.043	-60
-50	-1.667	-1.686	-1.705	-1.724	-1.743	-1.762	-1.781	-1.800	-1.819	-1.838	-1.857	**-50**
-40	-1.475	-1.494	-1.514	-1.533	-1.552	-1.572	-1.591	-1.610	-1.629	-1.648	-1.667	-40
-30	-1.279	-1.299	-1.319	-1.338	-1.358	-1.378	-1.397	-1.417	-1.436	-1.456	-1.475	-30
-20	-1.081	-1.101	-1.121	-1.141	-1.161	-1.181	-1.200	-1.220	-1.240	-1.260	-1.279	-20
-10	-0.879	-0.900	-0.920	-0.940	-0.960	-0.980	-1.001	-1.021	-1.041	-1.061	-1.081	-10
0	-0.675	-0.695	-0.716	-0.736	-0.757	-0.777	-0.798	-0.818	-0.839	-0.859	-0.879	**0**

°F	0	1	2	3	4	5	6	7	8	9	10	°F
0	-0.675	-0.654	-0.633	-0.613	-0.592	-0.571	-0.550	-0.530	-0.509	-0.488	-0.467	**0**
10	-0.467	-0.446	-0.425	-0.404	-0.383	-0.362	-0.341	-0.320	-0.299	-0.278	-0.256	10
20	-0.256	-0.235	-0.214	-0.193	-0.171	-0.150	-0.129	-0.107	-0.086	-0.064	-0.043	20
30	-0.043	-0.022	0.000	0.022	0.043	0.065	0.086	0.108	0.130	0.151	0.173	30
40	0.173	0.195	0.216	0.238	0.260	0.282	0.303	0.325	0.347	0.369	0.391	40

EMF in Millivolts — Reference Junctions 0 °C

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°C
-270	-6.258											-270
-260	-6.232	-6.236	-6.239	-6.242	-6.245	-6.248	-6.251	-6.253	-6.255	-6.256	-6.258	-260
-250	-6.180	-6.187	-6.193	-6.198	-6.204	-6.209	-6.214	-6.219	-6.223	-6.228	-6.232	**-250**
-240	-6.105	-6.114	-6.122	-6.130	-6.138	-6.146	-6.153	-6.160	-6.167	-6.174	-6.180	-240
-230	-6.007	-6.017	-6.028	-6.038	-6.049	-6.059	-6.068	-6.078	-6.087	-6.096	-6.105	-230
-220	-5.888	-5.901	-5.914	-5.926	-5.938	-5.950	-5.962	-5.973	-5.985	-5.996	-6.007	-220
-210	-5.753	-5.767	-5.782	-5.795	-5.809	-5.823	-5.836	-5.850	-5.863	-5.876	-5.888	-210
-200	-5.603	-5.619	-5.634	-5.650	-5.665	-5.680	-5.695	-5.710	-5.724	-5.739	-5.753	**-200**
-190	-5.439	-5.456	-5.473	-5.489	-5.506	-5.523	-5.539	-5.555	-5.571	-5.587	-5.603	-190
-180	-5.261	-5.279	-5.297	-5.316	-5.334	-5.351	-5.369	-5.387	-5.404	-5.421	-5.439	-180
-170	-5.070	-5.089	-5.109	-5.128	-5.148	-5.167	-5.186	-5.205	-5.224	-5.242	-5.261	-170
-160	-4.865	-4.886	-4.907	-4.928	-4.949	-4.969	-4.989	-5.010	-5.030	-5.050	-5.070	-160
-150	-4.648	-4.671	-4.693	-4.715	-4.737	-4.759	-4.780	-4.802	-4.823	-4.844	-4.865	**-150**
-140	-4.419	-4.443	-4.466	-4.489	-4.512	-4.535	-4.558	-4.581	-4.604	-4.626	-4.648	-140
-130	-4.177	-4.202	-4.226	-4.251	-4.275	-4.300	-4.324	-4.348	-4.372	-4.395	-4.419	-130
-120	-3.923	-3.949	-3.975	-4.000	-4.026	-4.052	-4.077	-4.102	-4.127	-4.152	-4.177	-120
-110	-3.657	-3.684	-3.711	-3.738	-3.765	-3.791	-3.818	-3.844	-3.871	-3.897	-3.923	-110
-100	-3.379	-3.407	-3.435	-3.463	-3.491	-3.519	-3.547	-3.574	-3.602	-3.629	-3.657	**-100**
-90	-3.089	-3.118	-3.148	-3.177	-3.206	-3.235	-3.264	-3.293	-3.322	-3.350	-3.379	-90
-80	-2.788	-2.818	-2.849	-2.879	-2.910	-2.940	-2.970	-3.000	-3.030	-3.059	-3.089	-80
-70	-2.476	-2.507	-2.539	-2.571	-2.602	-2.633	-2.664	-2.695	-2.726	-2.757	-2.788	-70
-60	-2.153	-2.186	-2.218	-2.251	-2.283	-2.316	-2.348	-2.380	-2.412	-2.444	-2.476	-60
-50	-1.819	-1.853	-1.887	-1.920	-1.954	-1.987	-2.021	-2.054	-2.087	-2.120	-2.153	**-50**
-40	-1.475	-1.510	-1.545	-1.579	-1.614	-1.648	-1.683	-1.717	-1.751	-1.785	-1.819	-40
-30	-1.121	-1.157	-1.192	-1.228	-1.264	-1.299	-1.335	-1.370	-1.405	-1.440	-1.475	-30
-20	-0.757	-0.794	-0.830	-0.867	-0.904	-0.940	-0.976	-1.013	-1.049	-1.085	-1.121	-20
-10	-0.383	-0.421	-0.459	-0.496	-0.534	-0.571	-0.608	-0.646	-0.683	-0.720	-0.757	-10
0	0.000	-0.039	-0.077	-0.116	-0.154	-0.193	-0.231	-0.269	-0.307	-0.345	-0.383	**0**

°C	0	1	2	3	4	5	6	7	8	9	10	°C
0	0.000	0.039	0.078	0.117	0.156	0.195	0.234	0.273	0.312	0.352	0.391	**0**
10	0.391	0.431	0.470	0.510	0.549	0.589	0.629	0.669	0.709	0.749	0.790	10
20	0.790	0.830	0.870	0.911	0.951	0.992	1.033	1.074	1.114	1.155	1.196	20
30	1.196	1.238	1.279	1.320	1.362	1.403	1.445	1.486	1.528	1.570	1.612	30
40	1.612	1.654	1.696	1.738	1.780	1.823	1.865	1.908	1.950	1.993	2.036	40

Type T - Copper vs Constantan

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
50	0.391	0.413	0.435	0.457	0.479	0.501	0.523	0.545	0.567	0.589	0.611	**50**
60	0.611	0.634	0.656	0.678	0.700	0.723	0.745	0.767	0.790	0.812	0.834	60
70	0.834	0.857	0.879	0.902	0.924	0.947	0.969	0.992	1.015	1.037	1.060	70
80	1.060	1.083	1.105	1.128	1.151	1.174	1.196	1.219	1.242	1.265	1.288	80
90	1.288	1.311	1.334	1.357	1.380	1.403	1.426	1.449	1.472	1.496	1.519	90
100	1.519	1.542	1.565	1.588	1.612	1.635	1.658	1.682	1.705	1.729	1.752	**100**
110	1.752	1.776	1.799	1.823	1.846	1.870	1.893	1.917	1.941	1.964	1.988	110
120	1.988	2.012	2.036	2.060	2.083	2.107	2.131	2.155	2.179	2.203	2.227	120
130	2.227	2.251	2.275	2.299	2.323	2.347	2.371	2.395	2.420	2.444	2.468	130
140	2.468	2.492	2.517	2.541	2.565	2.590	2.614	2.639	2.663	2.687	2.712	140
150	2.712	2.737	2.761	2.786	2.810	2.835	2.860	2.884	2.909	2.934	2.958	**150**
160	2.958	2.983	3.008	3.033	3.058	3.082	3.107	3.132	3.157	3.182	3.207	160
170	3.207	3.232	3.257	3.282	3.307	3.333	3.358	3.383	3.408	3.433	3.459	170
180	3.459	3.484	3.509	3.534	3.560	3.585	3.610	3.636	3.661	3.687	3.712	180
190	3.712	3.738	3.763	3.789	3.814	3.840	3.866	3.891	3.917	3.943	3.968	190
200	3.968	3.994	4.020	4.046	4.071	4.097	4.123	4.149	4.175	4.201	4.227	**200**
210	4.227	4.253	4.279	4.305	4.331	4.357	4.383	4.409	4.435	4.461	4.487	210
220	4.487	4.513	4.540	4.566	4.592	4.618	4.645	4.671	4.697	4.724	4.750	220
230	4.750	4.776	4.803	4.829	4.856	4.882	4.909	4.935	4.962	4.988	5.015	230
240	5.015	5.042	5.068	5.095	5.122	5.148	5.175	5.202	5.228	5.255	5.282	240
250	5.282	5.309	5.336	5.363	5.389	5.416	5.443	5.470	5.497	5.524	5.551	**250**
260	5.551	5.578	5.605	5.632	5.660	5.687	5.714	5.741	5.768	5.795	5.823	260
270	5.823	5.850	5.877	5.904	5.932	5.959	5.986	6.014	6.041	6.068	6.096	270
280	6.096	6.123	6.151	6.178	6.206	6.233	6.261	6.288	6.316	6.343	6.371	280
290	6.371	6.399	6.426	6.454	6.482	6.510	6.537	6.565	6.593	6.621	6.648	290
300	6.648	6.676	6.704	6.732	6.760	6.788	6.816	6.844	6.872	6.900	6.928	**300**
310	6.928	6.956	6.984	7.012	7.040	7.068	7.096	7.124	7.152	7.181	7.209	310
320	7.209	7.237	7.265	7.294	7.322	7.350	7.378	7.407	7.435	7.463	7.492	320
330	7.492	7.520	7.549	7.577	7.606	7.634	7.663	7.691	7.720	7.748	7.777	330
340	7.777	7.805	7.834	7.863	7.891	7.920	7.949	7.977	8.006	8.035	8.064	340
350	8.064	8.092	8.121	8.150	8.179	8.208	8.237	8.266	8.294	8.323	8.352	**350**
360	8.352	8.381	8.410	8.439	8.468	8.497	8.526	8.555	8.585	8.614	8.643	360
370	8.643	8.672	8.701	8.730	8.759	8.789	8.818	8.847	8.876	8.906	8.935	370
380	8.935	8.964	8.994	9.023	9.052	9.082	9.111	9.141	9.170	9.200	9.229	380
390	9.229	9.259	9.288	9.318	9.347	9.377	9.406	9.436	9.466	9.495	9.525	390
400	9.525	9.555	9.584	9.614	9.644	9.673	9.703	9.733	9.763	9.793	9.822	**400**
410	9.822	9.852	9.882	9.912	9.942	9.972	10.002	10.032	10.062	10.092	10.122	410
420	10.122	10.152	10.182	10.212	10.242	10.272	10.302	10.332	10.362	10.392	10.423	420
430	10.423	10.453	10.483	10.513	10.543	10.574	10.604	10.634	10.664	10.695	10.725	430
440	10.725	10.755	10.786	10.816	10.847	10.877	10.907	10.938	10.968	10.999	11.029	440
450	11.029	11.060	11.090	11.121	11.151	11.182	11.213	11.243	11.274	11.304	11.335	**450**
460	11.335	11.366	11.396	11.427	11.458	11.489	11.519	11.550	11.581	11.612	11.643	460
470	11.643	11.673	11.704	11.735	11.766	11.797	11.828	11.859	11.890	11.920	11.951	470
480	11.951	11.982	12.013	12.044	12.075	12.106	12.138	12.169	12.200	12.231	12.262	480
490	12.262	12.293	12.324	12.355	12.386	12.418	12.449	12.480	12.511	12.543	12.574	490
500	12.574	12.605	12.636	12.668	12.699	12.730	12.762	12.793	12.824	12.856	12.887	**500**
510	12.887	12.919	12.950	12.982	13.013	13.045	13.076	13.108	13.139	13.171	13.202	510
520	13.202	13.234	13.265	13.297	13.328	13.360	13.392	13.423	13.455	13.487	13.518	520
530	13.518	13.550	13.582	13.614	13.645	13.677	13.709	13.741	13.772	13.804	13.836	530
540	13.836	13.868	13.900	13.932	13.964	13.995	14.027	14.059	14.091	14.123	14.155	540
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
50	2.036	2.079	2.122	2.165	2.208	2.251	2.294	2.338	2.381	2.425	2.468	**50**
60	2.468	2.512	2.556	2.600	2.643	2.687	2.732	2.776	2.820	2.864	2.909	60
70	2.909	2.953	2.998	3.043	3.087	3.132	3.177	3.222	3.267	3.312	3.358	70
80	3.358	3.403	3.448	3.494	3.539	3.585	3.631	3.677	3.722	3.768	3.814	80
90	3.814	3.860	3.907	3.953	3.999	4.046	4.092	4.138	4.185	4.232	4.279	90
100	4.279	4.325	4.372	4.419	4.466	4.513	4.561	4.608	4.655	4.702	4.750	**100**
110	4.750	4.798	4.845	4.893	4.941	4.988	5.036	5.084	5.132	5.180	5.228	110
120	5.228	5.277	5.325	5.373	5.422	5.470	5.519	5.567	5.616	5.665	5.714	120
130	5.714	5.763	5.812	5.861	5.910	5.959	6.008	6.057	6.107	6.156	6.206	130
140	6.206	6.255	6.305	6.355	6.404	6.454	6.504	6.554	6.604	6.654	6.704	140
150	6.704	6.754	6.805	6.855	6.905	6.956	7.006	7.057	7.107	7.158	7.209	**150**
160	7.209	7.260	7.310	7.361	7.412	7.463	7.515	7.566	7.617	7.668	7.720	160
170	7.720	7.771	7.823	7.874	7.926	7.977	8.029	8.081	8.133	8.185	8.237	170
180	8.237	8.289	8.341	8.393	8.445	8.497	8.550	8.602	8.654	8.707	8.759	180
190	8.759	8.812	8.865	8.917	8.970	9.023	9.076	9.129	9.182	9.235	9.288	190
200	9.288	9.341	9.395	9.448	9.501	9.555	9.608	9.662	9.715	9.769	9.822	**200**
210	9.822	9.876	9.930	9.984	10.038	10.092	10.146	10.200	10.254	10.308	10.362	210
220	10.362	10.417	10.471	10.525	10.580	10.634	10.689	10.743	10.798	10.853	10.907	220
230	10.907	10.962	11.017	11.072	11.127	11.182	11.237	11.292	11.347	11.403	11.458	230
240	11.458	11.513	11.569	11.624	11.680	11.735	11.791	11.846	11.902	11.958	12.013	240
250	12.013	12.069	12.125	12.181	12.237	12.293	12.349	12.405	12.461	12.518	12.574	**250**
260	12.574	12.630	12.687	12.743	12.799	12.856	12.912	12.969	13.026	13.082	13.139	260
270	13.139	13.196	13.253	13.310	13.366	13.423	13.480	13.537	13.595	13.652	13.709	270
280	13.709	13.766	13.823	13.881	13.938	13.995	14.053	14.110	14.168	14.226	14.283	280
290	14.283	14.341	14.399	14.456	14.514	14.572	14.630	14.688	14.746	14.804	14.862	290
300	14.862	14.920	14.978	15.036	15.095	15.153	15.211	15.270	15.328	15.386	15.445	**300**
310	15.445	15.503	15.562	15.621	15.679	15.738	15.797	15.856	15.914	15.973	16.032	310
320	16.032	16.091	16.150	16.209	16.268	16.327	16.387	16.446	16.505	16.564	16.624	320
330	16.624	16.683	16.742	16.802	16.861	16.921	16.980	17.040	17.100	17.159	17.219	330
340	17.219	17.279	17.339	17.399	17.458	17.518	17.578	17.638	17.698	17.759	17.819	340
°C	0	1	2	3	4	5	6	7	8	9	10	°C

T

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
550	14.155	14.187	14.219	14.251	14.283	14.315	14.347	14.379	14.411	14.444	14.476	**550**
560	14.476	14.508	14.540	14.572	14.604	14.636	14.669	14.701	14.733	14.765	14.797	560
570	14.797	14.830	14.862	14.894	14.926	14.959	14.991	15.023	15.056	15.088	15.121	570
580	15.121	15.153	15.185	15.218	15.250	15.283	15.315	15.347	15.380	15.412	15.445	580
590	15.445	15.477	15.510	15.543	15.575	15.608	15.640	15.673	15.705	15.738	15.771	590
600	15.771	15.803	15.836	15.869	15.901	15.934	15.967	15.999	16.032	16.065	16.098	**600**
610	16.098	16.130	16.163	16.196	16.229	16.262	16.295	16.327	16.360	16.393	16.426	610
620	16.426	16.459	16.492	16.525	16.558	16.591	16.624	16.657	16.690	16.723	16.756	620
630	16.756	16.789	16.822	16.855	16.888	16.921	16.954	16.987	17.020	17.053	17.086	630
640	17.086	17.120	17.153	17.186	17.219	17.252	17.286	17.319	17.352	17.385	17.418	640
650	17.418	17.452	17.485	17.518	17.552	17.585	17.618	17.652	17.685	17.718	17.752	**650**
660	17.752	17.785	17.819	17.852	17.886	17.919	17.952	17.986	18.019	18.053	18.086	660
670	18.086	18.120	18.154	18.187	18.221	18.254	18.288	18.321	18.355	18.389	18.422	670
680	18.422	18.456	18.490	18.523	18.557	18.591	18.624	18.658	18.692	18.725	18.759	680
690	18.759	18.793	18.827	18.861	18.894	18.928	18.962	18.996	19.030	19.064	19.097	690
700	19.097	19.131	19.165	19.199	19.233	19.267	19.301	19.335	19.369	19.403	19.437	**700**
710	19.437	19.471	19.505	19.539	19.573	19.607	19.641	19.675	19.709	19.743	19.777	710
720	19.777	19.811	19.845	19.879	19.913	19.947	19.982	20.016	20.050	20.084	20.118	720
730	20.118	20.152	20.187	20.221	20.255	20.289	20.323	20.358	20.392	20.426	20.460	730
740	20.460	20.495	20.529	20.563	20.597	20.632	20.666	20.700	20.735	20.769	20.803	740
750	20.803	20.838	20.872									**750**
°F	0	1	2	3	4	5	6	7	8	9	10	°F

T

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
350	17.819	17.879	17.939	17.999	18.060	18.120	18.180	18.241	18.301	18.362	18.422	**350**
360	18.422	18.483	18.543	18.604	18.665	18.725	18.786	18.847	18.908	18.969	19.030	360
370	19.030	19.091	19.152	19.213	19.274	19.335	19.396	19.457	19.518	19.579	19.641	370
380	19.641	19.702	19.763	19.825	19.886	19.947	20.009	20.070	20.132	20.193	20.255	380
390	20.255	20.317	20.378	20.440	20.502	20.563	20.625	20.687	20.748	20.810	20.872	390
400	20.872											**400**
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type E - Chromel vs Constantan

EMF in Millivolts — Reference Junction 32°F

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°F
-450	-9.830	-9.832	-9.833	-9.834	-9.835							**-450**
-440	-9.809	-9.812	-9.814	-9.817	-9.819	-9.821	-9.823	-9.825	-9.827	-9.829	-9.830	-440
-430	-9.775	-9.779	-9.782	-9.786	-9.790	-9.793	-9.797	-9.800	-9.803	-9.806	-9.809	-430
-420	-9.729	-9.734	-9.739	-9.744	-9.749	-9.753	-9.758	-9.762	-9.766	-9.771	-9.775	-420
-410	-9.672	-9.678	-9.684	-9.690	-9.696	-9.702	-9.707	-9.713	-9.718	-9.724	-9.729	-410
-400	-9.604	-9.611	-9.618	-9.625	-9.632	-9.639	-9.646	-9.653	-9.659	-9.666	-9.672	**-400**
-390	-9.525	-9.534	-9.542	-9.550	-9.558	-9.566	-9.574	-9.581	-9.589	-9.597	-9.604	-390
-380	-9.436	-9.446	-9.455	-9.464	-9.473	-9.482	-9.491	-9.500	-9.508	-9.517	-9.525	-380
-370	-9.338	-9.348	-9.358	-9.368	-9.378	-9.388	-9.398	-9.408	-9.417	-9.427	-9.436	-370
-360	-9.229	-9.241	-9.252	-9.263	-9.274	-9.285	-9.295	-9.306	-9.317	-9.327	-9.338	-360
-350	-9.112	-9.124	-9.136	-9.148	-9.160	-9.172	-9.184	-9.195	-9.207	-9.218	-9.229	**-350**
-340	-8.986	-8.999	-9.012	-9.025	-9.038	-9.050	-9.063	-9.075	-9.088	-9.100	-9.112	-340
-330	-8.852	-8.866	-8.880	-8.893	-8.907	-8.920	-8.934	-8.947	-8.960	-8.973	-8.986	-330
-320	-8.710	-8.725	-8.739	-8.754	-8.768	-8.782	-8.797	-8.811	-8.825	-8.839	-8.852	-320
-310	-8.561	-8.576	-8.591	-8.607	-8.622	-8.637	-8.652	-8.666	-8.681	-8.696	-8.710	-310
-300	-8.404	-8.420	-8.436	-8.452	-8.468	-8.483	-8.499	-8.515	-8.530	-8.546	-8.561	**-300**
-290	-8.240	-8.257	-8.273	-8.290	-8.307	-8.323	-8.339	-8.356	-8.372	-8.388	-8.404	-290
-280	-8.069	-8.087	-8.104	-8.121	-8.138	-8.155	-8.173	-8.189	-8.206	-8.223	-8.240	-280
-270	-7.891	-7.910	-7.928	-7.945	-7.963	-7.981	-7.999	-8.017	-8.034	-8.052	-8.069	-270
-260	-7.707	-7.726	-7.745	-7.763	-7.782	-7.800	-7.819	-7.837	-7.855	-7.873	-7.891	-260
-250	-7.516	-7.536	-7.555	-7.574	-7.593	-7.613	-7.632	-7.651	-7.670	-7.688	-7.707	**-250**
-240	-7.319	-7.339	-7.359	-7.379	-7.399	-7.419	-7.438	-7.458	-7.478	-7.497	-7.516	-240
-230	-7.116	-7.137	-7.157	-7.178	-7.198	-7.219	-7.239	-7.259	-7.279	-7.299	-7.319	-230
-220	-6.907	-6.928	-6.950	-6.971	-6.992	-7.013	-7.033	-7.054	-7.075	-7.096	-7.116	-220
-210	-6.692	-6.714	-6.736	-6.757	-6.779	-6.801	-6.822	-6.843	-6.865	-6.886	-6.907	-210
-200	-6.472	-6.494	-6.516	-6.539	-6.561	-6.583	-6.605	-6.627	-6.649	-6.671	-6.692	**-200**
-190	-6.246	-6.269	-6.291	-6.314	-6.337	-6.359	-6.382	-6.405	-6.427	-6.449	-6.472	-190
-180	-6.014	-6.037	-6.061	-6.084	-6.107	-6.130	-6.154	-6.177	-6.200	-6.223	-6.246	-180
-170	-5.777	-5.801	-5.825	-5.849	-5.872	-5.896	-5.920	-5.943	-5.967	-5.991	-6.014	-170
-160	-5.535	-5.559	-5.584	-5.608	-5.632	-5.656	-5.681	-5.705	-5.729	-5.753	-5.777	-160
-150	-5.287	-5.312	-5.337	-5.362	-5.387	-5.412	-5.436	-5.461	-5.486	-5.510	-5.535	**-150**
-140	-5.035	-5.060	-5.086	-5.111	-5.136	-5.162	-5.187	-5.212	-5.237	-5.262	-5.287	-140
-130	-4.777	-4.803	-4.829	-4.855	-4.881	-4.907	-4.932	-4.958	-4.984	-5.009	-5.035	-130
-120	-4.515	-4.542	-4.568	-4.594	-4.621	-4.647	-4.673	-4.699	-4.725	-4.751	-4.777	-120
-110	-4.248	-4.275	-4.302	-4.329	-4.355	-4.382	-4.409	-4.436	-4.462	-4.489	-4.515	-110
-100	-3.976	-4.004	-4.031	-4.058	-4.086	-4.113	-4.140	-4.167	-4.194	-4.221	-4.248	**-100**
-90	-3.700	-3.728	-3.756	-3.784	-3.811	-3.839	-3.867	-3.894	-3.922	-3.949	-3.976	-90
-80	-3.420	-3.448	-3.476	-3.504	-3.532	-3.561	-3.589	-3.617	-3.645	-3.672	-3.700	-80
-70	-3.135	-3.163	-3.192	-3.221	-3.249	-3.278	-3.306	-3.335	-3.363	-3.391	-3.420	-70
-60	-2.846	-2.875	-2.904	-2.933	-2.962	-2.991	-3.020	-3.048	-3.077	-3.106	-3.135	-60
-50	-2.552	-2.582	-2.611	-2.641	-2.670	-2.699	-2.729	-2.758	-2.787	-2.816	-2.846	**-50**
-40	-2.255	-2.285	-2.315	-2.344	-2.374	-2.404	-2.434	-2.463	-2.493	-2.523	-2.552	-40
-30	-1.953	-1.984	-2.014	-2.044	-2.074	-2.105	-2.135	-2.165	-2.195	-2.225	-2.255	-30
-20	-1.648	-1.679	-1.709	-1.740	-1.771	-1.801	-1.832	-1.862	-1.893	-1.923	-1.953	-20
-10	-1.339	-1.370	-1.401	-1.432	-1.463	-1.494	-1.525	-1.556	-1.587	-1.617	-1.648	-10
0	-1.026	-1.057	-1.089	-1.120	-1.152	-1.183	-1.214	-1.245	-1.277	-1.308	-1.339	0

°F	0	1	2	3	4	5	6	7	8	9	10	°F
0	-1.026	-0.994	-0.963	-0.931	-0.900	-0.868	-0.836	-0.805	-0.773	-0.741	-0.709	**0**
10	-0.709	-0.677	-0.645	-0.614	-0.582	-0.550	-0.517	-0.485	-0.453	-0.421	-0.389	10
20	-0.389	-0.357	-0.324	-0.292	-0.260	-0.227	-0.195	-0.163	-0.130	-0.098	-0.065	20
30	-0.065	-0.033	0.000	0.033	0.065	0.098	0.131	0.163	0.196	0.229	0.262	30
40	0.262	0.294	0.327	0.360	0.393	0.426	0.459	0.492	0.525	0.558	0.591	40

E

EMF in Millivolts — Reference Junctions 0 °C

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°C
-270	-9.835											-270
-260	-9.797	-9.802	-9.808	-9.813	-9.817	-9.821	-9.825	-9.828	-9.831	-9.833	-9.835	-260
-250	-9.718	-9.728	-9.737	-9.746	-9.754	-9.762	-9.770	-9.777	-9.784	-9.790	-9.797	**-250**
-240	-9.604	-9.617	-9.630	-9.642	-9.654	-9.666	-9.677	-9.688	-9.698	-9.709	-9.718	-240
-230	-9.455	-9.471	-9.487	-9.503	-9.519	-9.534	-9.548	-9.563	-9.577	-9.591	-9.604	-230
-220	-9.274	-9.293	-9.313	-9.331	-9.350	-9.368	-9.386	-9.404	-9.421	-9.438	-9.455	-220
-210	-9.063	-9.085	-9.107	-9.129	-9.151	-9.172	-9.193	-9.214	-9.234	-9.254	-9.274	-210
-200	-8.825	-8.850	-8.874	-8.899	-8.923	-8.947	-8.971	-8.994	-9.017	-9.040	-9.063	**-200**
-190	-8.561	-8.588	-8.616	-8.643	-8.669	-8.696	-8.722	-8.748	-8.774	-8.799	-8.825	-190
-180	-8.273	-8.303	-8.333	-8.362	-8.391	-8.420	-8.449	-8.477	-8.505	-8.533	-8.561	-180
-170	-7.963	-7.995	-8.027	-8.059	-8.090	-8.121	-8.152	-8.183	-8.213	-8.243	-8.273	-170
-160	-7.632	-7.666	-7.700	-7.733	-7.767	-7.800	-7.833	-7.866	-7.899	-7.931	-7.963	-160
-150	-7.279	-7.315	-7.351	-7.387	-7.423	-7.458	-7.493	-7.528	-7.563	-7.597	-7.632	**-150**
-140	-6.907	-6.945	-6.983	-7.021	-7.058	-7.096	-7.133	-7.170	-7.206	-7.243	-7.279	-140
-130	-6.516	-6.556	-6.596	-6.636	-6.675	-6.714	-6.753	-6.792	-6.831	-6.869	-6.907	-130
-120	-6.107	-6.149	-6.191	-6.232	-6.273	-6.314	-6.355	-6.396	-6.436	-6.476	-6.516	-120
-110	-5.681	-5.724	-5.767	-5.810	-5.853	-5.896	-5.939	-5.981	-6.023	-6.065	-6.107	-110
-100	-5.237	-5.282	-5.327	-5.372	-5.417	-5.461	-5.505	-5.549	-5.593	-5.637	-5.681	**-100**
-90	-4.777	-4.824	-4.871	-4.917	-4.963	-5.009	-5.055	-5.101	-5.147	-5.192	-5.237	-90
-80	-4.302	-4.350	-4.398	-4.446	-4.494	-4.542	-4.589	-4.636	-4.684	-4.731	-4.777	-80
-70	-3.811	-3.861	-3.911	-3.960	-4.009	-4.058	-4.107	-4.156	-4.205	-4.254	-4.302	-70
-60	-3.306	-3.357	-3.408	-3.459	-3.510	-3.561	-3.611	-3.661	-3.711	-3.761	-3.811	-60
-50	-2.787	-2.840	-2.892	-2.944	-2.996	-3.048	-3.100	-3.152	-3.204	-3.255	-3.306	**-50**
-40	-2.255	-2.309	-2.362	-2.416	-2.469	-2.523	-2.576	-2.629	-2.682	-2.735	-2.787	-40
-30	-1.709	-1.765	-1.820	-1.874	-1.929	-1.984	-2.038	-2.093	-2.147	-2.201	-2.255	-30
-20	-1.152	-1.208	-1.264	-1.320	-1.376	-1.432	-1.488	-1.543	-1.599	-1.654	-1.709	-20
-10	-0.582	-0.639	-0.697	-0.754	-0.811	-0.868	-0.925	-0.982	-1.039	-1.095	-1.152	-10
0	0.000	-0.059	-0.117	-0.176	-0.234	-0.292	-0.350	-0.408	-0.466	-0.524	-0.582	**0**

°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
50	0.591	0.624	0.657	0.691	0.724	0.757	0.790	0.824	0.857	0.890	0.924	**50**
60	0.924	0.957	0.990	1.024	1.057	1.091	1.124	1.158	1.192	1.225	1.259	60
70	1.259	1.292	1.326	1.360	1.394	1.427	1.461	1.495	1.529	1.563	1.597	70
80	1.597	1.631	1.665	1.699	1.733	1.767	1.801	1.835	1.869	1.904	1.938	80
90	1.938	1.972	2.006	2.041	2.075	2.109	2.144	2.178	2.212	2.247	2.281	90
100	2.281	2.316	2.351	2.385	2.420	2.454	2.489	2.524	2.558	2.593	2.628	**100**
110	2.628	2.663	2.698	2.733	2.767	2.802	2.837	2.872	2.907	2.942	2.977	110
120	2.977	3.012	3.048	3.083	3.118	3.153	3.188	3.224	3.259	3.294	3.330	120
130	3.330	3.365	3.400	3.436	3.471	3.507	3.542	3.578	3.613	3.649	3.685	130
140	3.685	3.720	3.756	3.792	3.827	3.863	3.899	3.935	3.970	4.006	4.042	140
150	4.042	4.078	4.114	4.150	4.186	4.222	4.258	4.294	4.330	4.366	4.403	**150**
160	4.403	4.439	4.475	4.511	4.547	4.584	4.620	4.656	4.693	4.729	4.766	160
170	4.766	4.802	4.839	4.875	4.912	4.948	4.985	5.021	5.058	5.095	5.131	170
180	5.131	5.168	5.205	5.242	5.278	5.315	5.352	5.389	5.426	5.463	5.500	180
190	5.500	5.537	5.574	5.611	5.648	5.685	5.722	5.759	5.796	5.833	5.871	190
200	5.871	5.908	5.945	5.982	6.020	6.057	6.094	6.132	6.169	6.207	6.244	**200**
210	6.244	6.281	6.319	6.356	6.394	6.432	6.469	6.507	6.544	6.582	6.620	210
220	6.620	6.658	6.695	6.733	6.771	6.809	6.847	6.884	6.922	6.960	6.998	220
230	6.998	7.036	7.074	7.112	7.150	7.188	7.226	7.264	7.302	7.341	7.379	230
240	7.379	7.417	7.455	7.493	7.532	7.570	7.608	7.647	7.685	7.723	7.762	240
250	7.762	7.800	7.839	7.877	7.916	7.954	7.993	8.031	8.070	8.108	8.147	**250**
260	8.147	8.186	8.224	8.263	8.302	8.340	8.379	8.418	8.457	8.496	8.535	260
270	8.535	8.573	8.612	8.651	8.690	8.729	8.768	8.807	8.846	8.885	8.924	270
280	8.924	8.963	9.002	9.041	9.081	9.120	9.159	9.198	9.237	9.277	9.316	280
290	9.316	9.355	9.395	9.434	9.473	9.513	9.552	9.591	9.631	9.670	9.710	290
300	9.710	9.749	9.789	9.828	9.868	9.907	9.947	9.987	10.026	10.066	10.106	**300**
310	10.106	10.145	10.185	10.225	10.265	10.304	10.344	10.384	10.424	10.464	10.503	310
320	10.503	10.543	10.583	10.623	10.663	10.703	10.743	10.783	10.823	10.863	10.903	320
330	10.903	10.943	10.983	11.024	11.064	11.104	11.144	11.184	11.224	11.265	11.305	330
340	11.305	11.345	11.385	11.426	11.466	11.506	11.547	11.587	11.627	11.668	11.708	340
350	11.708	11.749	11.789	11.830	11.870	11.911	11.951	11.992	12.032	12.073	12.113	**350**
360	12.113	12.154	12.195	12.235	12.276	12.317	12.357	12.398	12.439	12.480	12.520	360
370	12.520	12.561	12.602	12.643	12.684	12.724	12.765	12.806	12.847	12.888	12.929	370
380	12.929	12.970	13.011	13.052	13.093	13.134	13.175	13.216	13.257	13.298	13.339	380
390	13.339	13.380	13.421	13.462	13.504	13.545	13.586	13.627	13.668	13.710	13.751	390
400	13.751	13.792	13.833	13.875	13.916	13.957	13.999	14.040	14.081	14.123	14.164	**400**
410	14.164	14.205	14.247	14.288	14.330	14.371	14.413	14.454	14.496	14.537	14.579	410
420	14.579	14.620	14.662	14.704	14.745	14.787	14.828	14.870	14.912	14.953	14.995	420
430	14.995	15.037	15.078	15.120	15.162	15.204	15.245	15.287	15.329	15.371	15.413	430
440	15.413	15.454	15.496	15.538	15.580	15.622	15.664	15.706	15.748	15.790	15.831	440
450	15.831	15.873	15.915	15.957	15.999	16.041	16.083	16.125	16.168	16.210	16.252	**450**
460	16.252	16.294	16.336	16.378	16.420	16.462	16.504	16.547	16.589	16.631	16.673	460
470	16.673	16.715	16.758	16.800	16.842	16.884	16.927	16.969	17.011	17.054	17.096	470
480	17.096	17.138	17.181	17.223	17.265	17.308	17.350	17.392	17.435	17.477	17.520	480
490	17.520	17.562	17.605	17.647	17.690	17.732	17.775	17.817	17.860	17.902	17.945	490
500	17.945	17.987	18.030	18.073	18.115	18.158	18.200	18.243	18.286	18.328	18.371	**500**
510	18.371	18.414	18.456	18.499	18.542	18.585	18.627	18.670	18.713	18.756	18.798	510
520	18.798	18.841	18.884	18.927	18.969	19.012	19.055	19.098	19.141	19.184	19.227	520
530	19.227	19.269	19.312	19.355	19.398	19.441	19.484	19.527	19.570	19.613	19.656	530
540	19.656	19.699	19.742	19.785	19.828	19.871	19.914	19.957	20.000	20.043	20.086	540
°F	0	1	2	3	4	5	6	7	8	9	10	°F

E

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
0	0.000	0.059	0.118	0.176	0.235	0.294	0.354	0.413	0.472	0.532	0.591	**0**
10	0.591	0.651	0.711	0.770	0.830	0.890	0.950	1.010	1.071	1.131	1.192	10
20	1.192	1.252	1.313	1.373	1.434	1.495	1.556	1.617	1.678	1.740	1.801	20
30	1.801	1.862	1.924	1.986	2.047	2.109	2.171	2.233	2.295	2.357	2.420	30
40	2.420	2.482	2.545	2.607	2.670	2.733	2.795	2.858	2.921	2.984	3.048	40
50	3.048	3.111	3.174	3.238	3.301	3.365	3.429	3.492	3.556	3.620	3.685	**50**
60	3.685	3.749	3.813	3.877	3.942	4.006	4.071	4.136	4.200	4.265	4.330	60
70	4.330	4.395	4.460	4.526	4.591	4.656	4.722	4.788	4.853	4.919	4.985	70
80	4.985	5.051	5.117	5.183	5.249	5.315	5.382	5.448	5.514	5.581	5.648	80
90	5.648	5.714	5.781	5.848	5.915	5.982	6.049	6.117	6.184	6.251	6.319	90
100	6.319	6.386	6.454	6.522	6.590	6.658	6.725	6.794	6.862	6.930	6.998	**100**
110	6.998	7.066	7.135	7.203	7.272	7.341	7.409	7.478	7.547	7.616	7.685	110
120	7.685	7.754	7.823	7.892	7.962	8.031	8.101	8.170	8.240	8.309	8.379	120
130	8.379	8.449	8.519	8.589	8.659	8.729	8.799	8.869	8.940	9.010	9.081	130
140	9.081	9.151	9.222	9.292	9.363	9.434	9.505	9.576	9.647	9.718	9.789	140
150	9.789	9.860	9.931	10.003	10.074	10.145	10.217	10.288	10.360	10.432	10.503	**150**
160	10.503	10.575	10.647	10.719	10.791	10.863	10.935	11.007	11.080	11.152	11.224	160
170	11.224	11.297	11.369	11.442	11.514	11.587	11.660	11.733	11.805	11.878	11.951	170
180	11.951	12.024	12.097	12.170	12.243	12.317	12.390	12.463	12.537	12.610	12.684	180
190	12.684	12.757	12.831	12.904	12.978	13.052	13.126	13.199	13.273	13.347	13.421	190
200	13.421	13.495	13.569	13.644	13.718	13.792	13.866	13.941	14.015	14.090	14.164	**200**
210	14.164	14.239	14.313	14.388	14.463	14.537	14.612	14.687	14.762	14.837	14.912	210
220	14.912	14.987	15.062	15.137	15.212	15.287	15.362	15.438	15.513	15.588	15.664	220
230	15.664	15.739	15.815	15.890	15.966	16.041	16.117	16.193	16.269	16.344	16.420	230
240	16.420	16.496	16.572	16.648	16.724	16.800	16.876	16.952	17.028	17.104	17.181	240
250	17.181	17.257	17.333	17.409	17.486	17.562	17.639	17.715	17.792	17.868	17.945	**250**
260	17.945	18.021	18.098	18.175	18.252	18.328	18.405	18.482	18.559	18.636	18.713	260
270	18.713	18.790	18.867	18.944	19.021	19.098	19.175	19.252	19.330	19.407	19.484	270
280	19.484	19.561	19.639	19.716	19.794	19.871	19.948	20.026	20.103	20.181	20.259	280
290	20.259	20.336	20.414	20.492	20.569	20.647	20.725	20.803	20.880	20.958	21.036	290
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type E - Chromel vs Constantan

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
550	20.086	20.129	20.172	20.216	20.259	20.302	20.345	20.388	20.431	20.474	20.517	**550**
560	20.517	20.561	20.604	20.647	20.690	20.733	20.777	20.820	20.863	20.906	20.950	560
570	20.950	20.993	21.036	21.080	21.123	21.166	21.209	21.253	21.296	21.339	21.383	570
580	21.383	21.426	21.470	21.513	21.556	21.600	21.643	21.686	21.730	21.773	21.817	580
590	21.817	21.860	21.904	21.947	21.991	22.034	22.078	22.121	22.165	22.208	22.252	590
600	22.252	22.295	22.339	22.382	22.426	22.469	22.513	22.556	22.600	22.644	22.687	**600**
610	22.687	22.731	22.774	22.818	22.862	22.905	22.949	22.993	23.036	23.080	23.124	610
620	23.124	23.167	23.211	23.255	23.298	23.342	23.386	23.429	23.473	23.517	23.561	620
630	23.561	23.604	23.648	23.692	23.736	23.780	23.823	23.867	23.911	23.955	23.999	630
640	23.999	24.042	24.086	24.130	24.174	24.218	24.262	24.305	24.349	24.393	24.437	640
650	24.437	24.481	24.525	24.569	24.613	24.657	24.701	24.745	24.789	24.832	24.876	**650**
660	24.876	24.920	24.964	25.008	25.052	25.096	25.140	25.184	25.228	25.272	25.316	660
670	25.316	25.360	25.404	25.448	25.493	25.537	25.581	25.625	25.669	25.713	25.757	670
680	25.757	25.801	25.845	25.889	25.933	25.977	26.022	26.066	26.110	26.154	26.198	680
690	26.198	26.242	26.286	26.331	26.375	26.419	26.463	26.507	26.552	26.596	26.640	690
700	26.640	26.684	26.728	26.773	26.817	26.861	26.905	26.950	26.994	27.038	27.082	**700**
710	27.082	27.127	27.171	27.215	27.259	27.304	27.348	27.392	27.437	27.481	27.525	710
720	27.525	27.570	27.614	27.658	27.703	27.747	27.791	27.836	27.880	27.924	27.969	720
730	27.969	28.013	28.057	28.102	28.146	28.191	28.235	28.279	28.324	28.368	28.413	730
740	28.413	28.457	28.501	28.546	28.590	28.635	28.679	28.724	28.768	28.813	28.857	740
750	28.857	28.901	28.946	28.990	29.035	29.079	29.124	29.168	29.213	29.257	29.302	**750**
760	29.302	29.346	29.391	29.435	29.480	29.525	29.569	29.614	29.658	29.703	29.747	760
770	29.747	29.792	29.836	29.881	29.925	29.970	30.015	30.059	30.104	30.148	30.193	770
780	30.193	30.238	30.282	30.327	30.371	30.416	30.461	30.505	30.550	30.595	30.639	780
790	30.639	30.684	30.728	30.773	30.818	30.862	30.907	30.952	30.996	31.041	31.086	790
800	31.086	31.130	31.175	31.220	31.264	31.309	31.354	31.398	31.443	31.488	31.533	**800**
810	31.533	31.577	31.622	31.667	31.711	31.756	31.801	31.846	31.890	31.935	31.980	810
820	31.980	32.025	32.069	32.114	32.159	32.204	32.248	32.293	32.338	32.383	32.427	820
830	32.427	32.472	32.517	32.562	32.606	32.651	32.696	32.741	32.786	32.830	32.875	830
840	32.875	32.920	32.965	33.010	33.054	33.099	33.144	33.189	33.234	33.278	33.323	840
850	33.323	33.368	33.413	33.458	33.503	33.547	33.592	33.637	33.682	33.727	33.772	**850**
860	33.772	33.816	33.861	33.906	33.951	33.996	34.041	34.086	34.130	34.175	34.220	860
870	34.220	34.265	34.310	34.355	34.400	34.445	34.489	34.534	34.579	34.624	34.669	870
880	34.669	34.714	34.759	34.804	34.849	34.893	34.938	34.983	35.028	35.073	35.118	880
890	35.118	35.163	35.208	35.253	35.298	35.343	35.387	35.432	35.477	35.522	35.567	890
900	35.567	35.612	35.657	35.702	35.747	35.792	35.837	35.882	35.927	35.972	36.016	**900**
910	36.016	36.061	36.106	36.151	36.196	36.241	36.286	36.331	36.376	36.421	36.466	910
920	36.466	36.511	36.556	36.601	36.646	36.691	36.736	36.781	36.826	36.870	36.915	920
930	36.915	36.960	37.005	37.050	37.095	37.140	37.185	37.230	37.275	37.320	37.365	930
940	37.365	37.410	37.455	37.500	37.545	37.590	37.635	37.680	37.725	37.770	37.815	940
950	37.815	37.860	37.905	37.950	37.995	38.040	38.085	38.130	38.175	38.220	38.265	**950**
960	38.265	38.309	38.354	38.399	38.444	38.489	38.534	38.579	38.624	38.669	38.714	960
970	38.714	38.759	38.804	38.849	38.894	38.939	38.984	39.029	39.074	39.119	39.164	970
980	39.164	39.209	39.254	39.299	39.344	39.389	39.434	39.479	39.524	39.569	39.614	980
990	39.614	39.659	39.704	39.749	39.794	39.839	39.884	39.929	39.974	40.019	40.064	990
1000	40.064	40.109	40.154	40.199	40.243	40.288	40.333	40.378	40.423	40.468	40.513	**1000**
1010	40.513	40.558	40.603	40.648	40.693	40.738	40.783	40.828	40.873	40.918	40.963	1010
1020	40.963	41.008	41.053	41.098	41.143	41.188	41.233	41.278	41.323	41.368	41.412	1020
1030	41.412	41.457	41.502	41.547	41.592	41.637	41.682	41.727	41.772	41.817	41.862	1030
1040	41.862	41.907	41.952	41.997	42.042	42.087	42.132	42.176	42.221	42.266	42.311	1040
°F	0	1	2	3	4	5	6	7	8	9	10	°F

E

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
300	21.036	21.114	21.192	21.270	21.348	21.426	21.504	21.582	21.660	21.739	21.817	**300**
310	21.817	21.895	21.973	22.051	22.130	22.208	22.286	22.365	22.443	22.522	22.600	310
320	22.600	22.678	22.757	22.835	22.914	22.993	23.071	23.150	23.228	23.307	23.386	320
330	23.386	23.464	23.543	23.622	23.701	23.780	23.858	23.937	24.016	24.095	24.174	330
340	24.174	24.253	24.332	24.411	24.490	24.569	24.648	24.727	24.806	24.885	24.964	340
350	24.964	25.044	25.123	25.202	25.281	25.360	25.440	25.519	25.598	25.678	25.757	**350**
360	25.757	25.836	25.916	25.995	26.075	26.154	26.233	26.313	26.392	26.472	26.552	360
370	26.552	26.631	26.711	26.790	26.870	26.950	27.029	27.109	27.189	27.268	27.348	370
380	27.348	27.428	27.507	27.587	27.667	27.747	27.827	27.907	27.986	28.066	28.146	380
390	28.146	28.226	28.306	28.386	28.466	28.546	28.626	28.706	28.786	28.866	28.946	390
400	28.946	29.026	29.106	29.186	29.266	29.346	29.427	29.507	29.587	29.667	29.747	**400**
410	29.747	29.827	29.908	29.988	30.068	30.148	30.229	30.309	30.389	30.470	30.550	410
420	30.550	30.630	30.711	30.791	30.871	30.952	31.032	31.112	31.193	31.273	31.354	420
430	31.354	31.434	31.515	31.595	31.676	31.756	31.837	31.917	31.998	32.078	32.159	430
440	32.159	32.239	32.320	32.400	32.481	32.562	32.642	32.723	32.803	32.884	32.965	440
450	32.965	33.045	33.126	33.207	33.287	33.368	33.449	33.529	33.610	33.691	33.772	**450**
460	33.772	33.852	33.933	34.014	34.095	34.175	34.256	34.337	34.418	34.498	34.579	460
470	34.579	34.660	34.741	34.822	34.902	34.983	35.064	35.145	35.226	35.307	35.387	470
480	35.387	35.468	35.549	35.630	35.711	35.792	35.873	35.954	36.034	36.115	36.196	480
490	36.196	36.277	36.358	36.439	36.520	36.601	36.682	36.763	36.843	36.924	37.005	490
500	37.005	37.086	37.167	37.248	37.329	37.410	37.491	37.572	37.653	37.734	37.815	**500**
510	37.815	37.896	37.977	38.058	38.139	38.220	38.300	38.381	38.462	38.543	38.624	510
520	38.624	38.705	38.786	38.867	38.948	39.029	39.110	39.191	39.272	39.353	39.434	520
530	39.434	39.515	39.596	39.677	39.758	39.839	39.920	40.001	40.082	40.163	40.243	530
540	40.243	40.324	40.405	40.486	40.567	40.648	40.729	40.810	40.891	40.972	41.053	540
550	41.053	41.134	41.215	41.296	41.377	41.457	41.538	41.619	41.700	41.781	41.862	**550**
560	41.862	41.943	42.024	42.105	42.185	42.266	42.347	42.428	42.509	42.590	42.671	560
570	42.671	42.751	42.832	42.913	42.994	43.075	43.156	43.236	43.317	43.398	43.479	570
580	43.479	43.560	43.640	43.721	43.802	43.883	43.963	44.044	44.125	44.206	44.286	580
590	44.286	44.367	44.448	44.529	44.609	44.690	44.771	44.851	44.932	45.013	45.093	590
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type E - Chromel vs Constantan

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1050	42.311	42.356	42.401	42.446	42.491	42.536	42.581	42.626	42.671	42.715	42.760	**1050**
1060	42.760	42.805	42.850	42.895	42.940	42.985	43.030	43.075	43.120	43.165	43.209	1060
1070	43.209	43.254	43.299	43.344	43.389	43.434	43.479	43.524	43.569	43.613	43.658	1070
1080	43.658	43.703	43.748	43.793	43.838	43.883	43.928	43.972	44.017	44.062	44.107	1080
1090	44.107	44.152	44.197	44.242	44.286	44.331	44.376	44.421	44.466	44.511	44.555	1090
1100	44.555	44.600	44.645	44.690	44.735	44.780	44.824	44.869	44.914	44.959	45.004	**1100**
1110	45.004	45.049	45.093	45.138	45.183	45.228	45.273	45.317	45.362	45.407	45.452	1110
1120	45.452	45.497	45.541	45.586	45.631	45.676	45.720	45.765	45.810	45.855	45.900	1120
1130	45.900	45.944	45.989	46.034	46.079	46.123	46.168	46.213	46.258	46.302	46.347	1130
1140	46.347	46.392	46.437	46.481	46.526	46.571	46.616	46.660	46.705	46.750	46.794	1140
1150	46.794	46.839	46.884	46.929	46.973	47.018	47.063	47.107	47.152	47.197	47.241	**1150**
1160	47.241	47.286	47.331	47.375	47.420	47.465	47.509	47.554	47.599	47.643	47.688	1160
1170	47.688	47.733	47.777	47.822	47.867	47.911	47.956	48.001	48.045	48.090	48.135	1170
1180	48.135	48.179	48.224	48.268	48.313	48.358	48.402	48.447	48.492	48.536	48.581	1180
1190	48.581	48.625	48.670	48.715	48.759	48.804	48.848	48.893	48.937	48.982	49.027	1190
1200	49.027	49.071	49.116	49.160	49.205	49.249	49.294	49.338	49.383	49.428	49.472	**1200**
1210	49.472	49.517	49.561	49.606	49.650	49.695	49.739	49.784	49.828	49.873	49.917	1210
1220	49.917	49.962	50.006	50.051	50.095	50.140	50.184	50.229	50.273	50.318	50.362	1220
1230	50.362	50.407	50.451	50.495	50.540	50.584	50.629	50.673	50.718	50.762	50.807	1230
1240	50.807	50.851	50.895	50.940	50.984	51.029	51.073	51.118	51.162	51.206	51.251	1240
1250	51.251	51.295	51.340	51.384	51.428	51.473	51.517	51.561	51.606	51.650	51.695	**1250**
1260	51.695	51.739	51.783	51.828	51.872	51.916	51.961	52.005	52.049	52.094	52.138	1260
1270	52.138	52.182	52.227	52.271	52.315	52.360	52.404	52.448	52.493	52.537	52.581	1270
1280	52.581	52.625	52.670	52.714	52.758	52.803	52.847	52.891	52.935	52.980	53.024	1280
1290	53.024	53.068	53.112	53.157	53.201	53.245	53.289	53.334	53.378	53.422	53.466	1290
1300	53.466	53.510	53.555	53.599	53.643	53.687	53.732	53.776	53.820	53.864	53.908	**1300**
1310	53.908	53.952	53.997	54.041	54.085	54.129	54.173	54.218	54.262	54.306	54.350	1310
1320	54.350	54.394	54.438	54.482	54.527	54.571	54.615	54.659	54.703	54.747	54.791	1320
1330	54.791	54.835	54.879	54.924	54.968	55.012	55.056	55.100	55.144	55.188	55.232	1330
1340	55.232	55.276	55.320	55.364	55.408	55.453	55.497	55.541	55.585	55.629	55.673	1340
1350	55.673	55.717	55.761	55.805	55.849	55.893	55.937	55.981	56.025	56.069	56.113	**1350**
1360	56.113	56.157	56.201	56.245	56.289	56.333	56.377	56.421	56.465	56.509	56.553	1360
1370	56.553	56.597	56.641	56.685	56.729	56.773	56.816	56.860	56.904	56.948	56.992	1370
1380	56.992	57.036	57.080	57.124	57.168	57.212	57.256	57.300	57.344	57.387	57.431	1380
1390	57.431	57.475	57.519	57.563	57.607	57.651	57.695	57.738	57.782	57.826	57.870	1390
1400	57.870	57.914	57.958	58.002	58.045	58.089	58.133	58.177	58.221	58.265	58.308	**1400**
1410	58.308	58.352	58.396	58.440	58.484	58.527	58.571	58.615	58.659	58.702	58.746	1410
1420	58.746	58.790	58.834	58.878	58.921	58.965	59.009	59.053	59.096	59.140	59.184	1420
1430	59.184	59.228	59.271	59.315	59.359	59.402	59.446	59.490	59.534	59.577	59.621	1430
1440	59.621	59.665	59.708	59.752	59.796	59.839	59.883	59.927	59.970	60.014	60.058	1440
1450	60.058	60.101	60.145	60.189	60.232	60.276	60.320	60.363	60.407	60.451	60.494	**1450**
1460	60.494	60.538	60.581	60.625	60.669	60.712	60.756	60.799	60.843	60.887	60.930	1460
1470	60.930	60.974	61.017	61.061	61.105	61.148	61.192	61.235	61.279	61.322	61.366	1470
1480	61.366	61.409	61.453	61.496	61.540	61.583	61.627	61.671	61.714	61.758	61.801	1480
1490	61.801	61.845	61.888	61.932	61.975	62.018	62.062	62.105	62.149	62.192	62.236	1490
1500	62.236	62.279	62.323	62.366	62.410	62.453	62.496	62.540	62.583	62.627	62.670	**1500**
1510	62.670	62.714	62.757	62.800	62.844	62.887	62.931	62.974	63.017	63.061	63.104	1510
1520	63.104	63.148	63.191	63.234	63.278	63.321	63.364	63.408	63.451	63.494	63.538	1520
1530	63.538	63.581	63.624	63.668	63.711	63.754	63.798	63.841	63.884	63.927	63.971	1530
1540	63.971	64.014	64.057	64.101	64.144	64.187	64.230	64.274	64.317	64.360	64.403	1540
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
600	45.093	45.174	45.255	45.335	45.416	45.497	45.577	45.658	45.738	45.819	45.900	**600**
610	45.900	45.980	46.061	46.141	46.222	46.302	46.383	46.463	46.544	46.624	46.705	610
620	46.705	46.785	46.866	46.946	47.027	47.107	47.188	47.268	47.349	47.429	47.509	620
630	47.509	47.590	47.670	47.751	47.831	47.911	47.992	48.072	48.152	48.233	48.313	630
640	48.313	48.393	48.474	48.554	48.634	48.715	48.795	48.875	48.955	49.035	49.116	640
650	49.116	49.196	49.276	49.356	49.436	49.517	49.597	49.677	49.757	49.837	49.917	**650**
660	49.917	49.997	50.077	50.157	50.238	50.318	50.398	50.478	50.558	50.638	50.718	660
670	50.718	50.798	50.878	50.958	51.038	51.118	51.197	51.277	51.357	51.437	51.517	670
680	51.517	51.597	51.677	51.757	51.837	51.916	51.996	52.076	52.156	52.236	52.315	680
690	52.315	52.395	52.475	52.555	52.634	52.714	52.794	52.873	52.953	53.033	53.112	690
700	53.112	53.192	53.272	53.351	53.431	53.510	53.590	53.670	53.749	53.829	53.908	**700**
710	53.908	53.988	54.067	54.147	54.226	54.306	54.385	54.465	54.544	54.624	54.703	710
720	54.703	54.782	54.862	54.941	55.021	55.100	55.179	55.259	55.338	55.417	55.497	720
730	55.497	55.576	55.655	55.734	55.814	55.893	55.972	56.051	56.131	56.210	56.289	730
740	56.289	56.368	56.447	56.526	56.606	56.685	56.764	56.843	56.922	57.001	57.080	740
750	57.080	57.159	57.238	57.317	57.396	57.475	57.554	57.633	57.712	57.791	57.870	**750**
760	57.870	57.949	58.028	58.107	58.186	58.265	58.343	58.422	58.501	58.580	58.659	760
770	58.659	58.738	58.816	58.895	58.974	59.053	59.131	59.210	59.289	59.367	59.446	770
780	59.446	59.525	59.604	59.682	59.761	59.839	59.918	59.997	60.075	60.154	60.232	780
790	60.232	60.311	60.390	60.468	60.547	60.625	60.704	60.782	60.860	60.939	61.017	790
800	61.017	61.096	61.174	61.253	61.331	61.409	61.488	61.566	61.644	61.723	61.801	**800**
810	61.801	61.879	61.958	62.036	62.114	62.192	62.271	62.349	62.427	62.505	62.583	810
820	62.583	62.662	62.740	62.818	62.896	62.974	63.052	63.130	63.208	63.286	63.364	820
830	63.364	63.442	63.520	63.598	63.676	63.754	63.832	63.910	63.988	64.066	64.144	830
840	64.144	64.222	64.300	64.377	64.455	64.533	64.611	64.689	64.766	64.844	64.922	840
850	64.922	65.000	65.077	65.155	65.233	65.310	65.388	65.465	65.543	65.621	65.698	**850**
860	65.698	65.776	65.853	65.931	66.008	66.086	66.163	66.241	66.318	66.396	66.473	860
870	66.473	66.550	66.628	66.705	66.782	66.860	66.937	67.014	67.092	67.169	67.246	870
880	67.246	67.323	67.400	67.478	67.555	67.632	67.709	67.786	67.863	67.940	68.017	880
890	68.017	68.094	68.171	68.248	68.325	68.402	68.479	68.556	68.633	68.710	68.787	890
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1550	64.403	64.447	64.490	64.533	64.576	64.619	64.663	64.706	64.749	64.792	64.835	**1550**
1560	64.835	64.879	64.922	64.965	65.008	65.051	65.094	65.138	65.181	65.224	65.267	1560
1570	65.267	65.310	65.353	65.396	65.440	65.483	65.526	65.569	65.612	65.655	65.698	1570
1580	65.698	65.741	65.784	65.827	65.871	65.914	65.957	66.000	66.043	66.086	66.129	1580
1590	66.129	66.172	66.215	66.258	66.301	66.344	66.387	66.430	66.473	66.516	66.559	1590
1600	66.559	66.602	66.645	66.688	66.731	66.774	66.817	66.860	66.903	66.946	66.989	**1600**
1610	66.989	67.031	67.074	67.117	67.160	67.203	67.246	67.289	67.332	67.375	67.418	1610
1620	67.418	67.460	67.503	67.546	67.589	67.632	67.675	67.718	67.760	67.803	67.846	1620
1630	67.846	67.889	67.932	67.974	68.017	68.060	68.103	68.146	68.188	68.231	68.274	1630
1640	68.274	68.317	68.359	68.402	68.445	68.488	68.530	68.573	68.616	68.659	68.701	1640
1650	68.701	68.744	68.787	68.829	68.872	68.915	68.957	69.000	69.043	69.085	69.128	**1650**
1660	69.128	69.171	69.213	69.256	69.298	69.341	69.384	69.426	69.469	69.511	69.554	1660
1670	69.554	69.597	69.639	69.682	69.724	69.767	69.809	69.852	69.894	69.937	69.979	1670
1680	69.979	70.022	70.064	70.107	70.149	70.192	70.234	70.277	70.319	70.362	70.404	1680
1690	70.404	70.447	70.489	70.531	70.574	70.616	70.659	70.701	70.744	70.786	70.828	1690
1700	70.828	70.871	70.913	70.955	70.998	71.040	71.082	71.125	71.167	71.209	71.252	**1700**
1710	71.252	71.294	71.336	71.379	71.421	71.463	71.506	71.548	71.590	71.632	71.675	1710
1720	71.675	71.717	71.759	71.801	71.844	71.886	71.928	71.970	72.012	72.055	72.097	1720
1730	72.097	72.139	72.181	72.223	72.266	72.308	72.350	72.392	72.434	72.476	72.518	1730
1740	72.518	72.561	72.603	72.645	72.687	72.729	72.771	72.813	72.855	72.897	72.939	1740
1750	72.939	72.981	73.023	73.066	73.108	73.150	73.192	73.234	73.276	73.318	73.360	**1750**
1760	73.360	73.402	73.444	73.486	73.528	73.570	73.612	73.654	73.696	73.738	73.780	1760
1770	73.780	73.821	73.863	73.905	73.947	73.989	74.031	74.073	74.115	74.157	74.199	1770
1780	74.199	74.241	74.283	74.324	74.366	74.408	74.450	74.492	74.534	74.576	74.618	1780
1790	74.618	74.659	74.701	74.743	74.785	74.827	74.869	74.910	74.952	74.994	75.036	1790
1800	75.036	75.078	75.120	75.161	75.203	75.245	75.287	75.329	75.370	75.412	75.454	**1800**
1810	75.454	75.496	75.538	75.579	75.621	75.663	75.705	75.746	75.788	75.830	75.872	1810
1820	75.872	75.913	75.955	75.997	76.039	76.081	76.122	76.164	76.206	76.248	76.289	1820
1830	76.289	76.331	76.373									1830
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
900	68.787	68.863	68.940	69.017	69.094	69.171	69.247	69.324	69.401	69.477	69.554	**900**
910	69.554	69.631	69.707	69.784	69.860	69.937	70.013	70.090	70.166	70.243	70.319	910
920	70.319	70.396	70.472	70.548	70.625	70.701	70.777	70.854	70.930	71.006	71.082	920
930	71.082	71.159	71.235	71.311	71.387	71.463	71.539	71.615	71.692	71.768	71.844	930
940	71.844	71.920	71.996	72.072	72.147	72.223	72.299	72.375	72.451	72.527	72.603	940
950	72.603	72.678	72.754	72.830	72.906	72.981	73.057	73.133	73.208	73.284	73.360	**950**
960	73.360	73.435	73.511	73.586	73.662	73.738	73.813	73.889	73.964	74.040	74.115	960
970	74.115	74.190	74.266	74.341	74.417	74.492	74.567	74.643	74.718	74.793	74.869	970
980	74.869	74.944	75.019	75.095	75.170	75.245	75.320	75.395	75.471	75.546	75.621	980
990	75.621	75.696	75.771	75.847	75.922	75.997	76.072	76.147	76.223	76.298	76.373	990
1000	76.373											**1000**
°C	0	1	2	3	4	5	6	7	8	9	10	°C

E

Type N - Nicrosil vs Nisil

EMF in Millivolts — Reference Junction 32°F

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°F
-450	-4.344	-4.344	-4.345	-4.345	-4.345							**-450**
-440	-4.339	-4.340	-4.340	-4.341	-4.341	-4.342	-4.342	-4.343	-4.343	-4.344	-4.344	-440
-430	-4.330	-4.331	-4.332	-4.333	-4.334	-4.335	-4.336	-4.337	-4.337	-4.338	-4.339	-430
-420	-4.316	-4.318	-4.319	-4.321	-4.322	-4.324	-4.325	-4.326	-4.327	-4.329	-4.330	-420
-410	-4.299	-4.301	-4.303	-4.305	-4.306	-4.308	-4.310	-4.312	-4.313	-4.315	-4.316	-410
-400	-4.277	-4.279	-4.282	-4.284	-4.286	-4.288	-4.291	-4.293	-4.295	-4.297	-4.299	**-400**
-390	-4.251	-4.254	-4.256	-4.259	-4.262	-4.264	-4.267	-4.270	-4.272	-4.275	-4.277	-390
-380	-4.220	-4.223	-4.226	-4.230	-4.233	-4.236	-4.239	-4.242	-4.245	-4.248	-4.251	-380
-370	-4.185	-4.189	-4.192	-4.196	-4.199	-4.203	-4.206	-4.210	-4.213	-4.217	-4.220	-370
-360	-4.145	-4.150	-4.154	-4.158	-4.162	-4.166	-4.170	-4.174	-4.177	-4.181	-4.185	-360
-350	-4.102	-4.106	-4.111	-4.115	-4.120	-4.124	-4.128	-4.133	-4.137	-4.141	-4.145	**-350**
-340	-4.054	-4.059	-4.064	-4.068	-4.073	-4.078	-4.083	-4.088	-4.092	-4.097	-4.102	-340
-330	-4.001	-4.007	-4.012	-4.017	-4.023	-4.028	-4.033	-4.038	-4.043	-4.049	-4.054	-330
-320	-3.945	-3.951	-3.957	-3.962	-3.968	-3.974	-3.979	-3.985	-3.990	-3.996	-4.001	-320
-310	-3.884	-3.891	-3.897	-3.903	-3.909	-3.915	-3.921	-3.927	-3.933	-3.939	-3.945	-310
-300	-3.820	-3.827	-3.833	-3.840	-3.846	-3.853	-3.859	-3.866	-3.872	-3.878	-3.884	**-300**
-290	-3.752	-3.759	-3.766	-3.773	-3.779	-3.786	-3.793	-3.800	-3.807	-3.813	-3.820	-290
-280	-3.679	-3.687	-3.694	-3.702	-3.709	-3.716	-3.723	-3.730	-3.738	-3.745	-3.752	-280
-270	-3.604	-3.611	-3.619	-3.627	-3.634	-3.642	-3.650	-3.657	-3.665	-3.672	-3.679	-270
-260	-3.524	-3.532	-3.540	-3.548	-3.556	-3.564	-3.572	-3.580	-3.588	-3.596	-3.604	-260
-250	-3.441	-3.449	-3.458	-3.466	-3.474	-3.483	-3.491	-3.499	-3.508	-3.516	-3.524	**-250**
-240	-3.354	-3.363	-3.372	-3.380	-3.389	-3.398	-3.407	-3.415	-3.424	-3.432	-3.441	-240
-230	-3.264	-3.273	-3.282	-3.291	-3.300	-3.309	-3.318	-3.327	-3.336	-3.345	-3.354	-230
-220	-3.171	-3.180	-3.189	-3.199	-3.208	-3.218	-3.227	-3.236	-3.246	-3.255	-3.264	-220
-210	-3.074	-3.084	-3.093	-3.103	-3.113	-3.123	-3.132	-3.142	-3.151	-3.161	-3.171	-210
-200	-2.974	-2.984	-2.994	-3.004	-3.014	-3.024	-3.034	-3.044	-3.054	-3.064	-3.074	**-200**
-190	-2.871	-2.881	-2.892	-2.902	-2.912	-2.923	-2.933	-2.943	-2.954	-2.964	-2.974	-190
-180	-2.765	-2.776	-2.786	-2.797	-2.808	-2.818	-2.829	-2.839	-2.850	-2.860	-2.871	-180
-170	-2.656	-2.667	-2.678	-2.689	-2.700	-2.711	-2.722	-2.733	-2.743	-2.754	-2.765	-170
-160	-2.544	-2.556	-2.567	-2.578	-2.589	-2.601	-2.612	-2.623	-2.634	-2.645	-2.656	-160
-150	-2.430	-2.442	-2.453	-2.465	-2.476	-2.488	-2.499	-2.510	-2.522	-2.533	-2.544	**-150**
-140	-2.313	-2.325	-2.337	-2.348	-2.360	-2.372	-2.384	-2.395	-2.407	-2.418	-2.430	-140
-130	-2.193	-2.206	-2.218	-2.230	-2.242	-2.254	-2.265	-2.277	-2.289	-2.301	-2.313	-130
-120	-2.072	-2.084	-2.096	-2.108	-2.121	-2.133	-2.145	-2.157	-2.169	-2.181	-2.193	-120
-110	-1.947	-1.960	-1.972	-1.985	-1.997	-2.010	-2.022	-2.035	-2.047	-2.059	-2.072	-110
-100	-1.821	-1.834	-1.846	-1.859	-1.872	-1.884	-1.897	-1.910	-1.922	-1.935	-1.947	**-100**
-90	-1.692	-1.705	-1.718	-1.731	-1.744	-1.757	-1.770	-1.783	-1.795	-1.808	-1.821	-90
-80	-1.562	-1.575	-1.588	-1.601	-1.614	-1.627	-1.640	-1.653	-1.666	-1.679	-1.692	-80
-70	-1.430	-1.443	-1.456	-1.470	-1.483	-1.496	-1.509	-1.522	-1.536	-1.549	-1.562	-70
-60	-1.296	-1.309	-1.323	-1.336	-1.349	-1.363	-1.376	-1.390	-1.403	-1.416	-1.430	-60
-50	-1.160	-1.174	-1.187	-1.201	-1.214	-1.228	-1.242	-1.255	-1.269	-1.282	-1.296	**-50**
-40	-1.023	-1.037	-1.050	-1.064	-1.078	-1.092	-1.105	-1.119	-1.133	-1.146	-1.160	-40
-30	-0.884	-0.898	-0.912	-0.926	-0.940	-0.954	-0.967	-0.981	-0.995	-1.009	-1.023	-30
-20	-0.744	-0.758	-0.772	-0.786	-0.800	-0.814	-0.828	-0.842	-0.856	-0.870	-0.884	-20
-10	-0.603	-0.617	-0.632	-0.646	-0.660	-0.674	-0.688	-0.702	-0.716	-0.730	-0.744	-10
0	-0.461	-0.475	-0.490	-0.504	-0.518	-0.532	-0.546	-0.561	-0.575	-0.589	-0.603	**0**

°F	0	1	2	3	4	5	6	7	8	9	10	°F
0	-0.461	-0.447	-0.433	-0.418	-0.404	-0.390	-0.375	-0.361	-0.347	-0.332	-0.318	0
10	-0.318	-0.304	-0.289	-0.275	-0.260	-0.246	-0.232	-0.217	-0.203	-0.188	-0.174	10
20	-0.174	-0.159	-0.145	-0.131	-0.116	-0.102	-0.087	-0.073	-0.058	-0.044	-0.029	20
30	-0.029	-0.015	0.000	0.014	0.029	0.043	0.058	0.072	0.087	0.101	0.116	30
40	0.116	0.130	0.145	0.159	0.174	0.188	0.203	0.217	0.232	0.246	0.261	40

N

EMF in Millivolts — Reference Junctions 0 °C

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°C
-270	-4.345											-270
-260	-4.336	-4.337	-4.339	-4.340	-4.341	-4.342	-4.343	-4.344	-4.344	-4.345	-4.345	-260
-250	-4.313	-4.316	-4.319	-4.321	-4.324	-4.326	-4.328	-4.330	-4.332	-4.334	-4.336	**-250**
-240	-4.277	-4.281	-4.285	-4.289	-4.293	-4.297	-4.300	-4.304	-4.307	-4.310	-4.313	-240
-230	-4.226	-4.232	-4.238	-4.243	-4.248	-4.254	-4.258	-4.263	-4.268	-4.273	-4.277	-230
-220	-4.162	-4.169	-4.176	-4.183	-4.189	-4.196	-4.202	-4.209	-4.215	-4.221	-4.226	-220
-210	-4.083	-4.091	-4.100	-4.108	-4.116	-4.124	-4.132	-4.140	-4.147	-4.154	-4.162	-210
-200	-3.990	-4.000	-4.010	-4.020	-4.029	-4.038	-4.048	-4.057	-4.066	-4.074	-4.083	**-200**
-190	-3.884	-3.896	-3.907	-3.918	-3.928	-3.939	-3.950	-3.960	-3.970	-3.980	-3.990	-190
-180	-3.766	-3.778	-3.790	-3.803	-3.815	-3.827	-3.838	-3.850	-3.862	-3.873	-3.884	-180
-170	-3.634	-3.648	-3.662	-3.675	-3.688	-3.702	-3.715	-3.728	-3.740	-3.753	-3.766	-170
-160	-3.491	-3.506	-3.521	-3.535	-3.550	-3.564	-3.578	-3.593	-3.607	-3.621	-3.634	-160
-150	-3.336	-3.352	-3.368	-3.384	-3.400	-3.415	-3.431	-3.446	-3.461	-3.476	-3.491	**-150**
-140	-3.171	-3.188	-3.205	-3.221	-3.238	-3.255	-3.271	-3.288	-3.304	-3.320	-3.336	-140
-130	-2.994	-3.012	-3.030	-3.048	-3.066	-3.084	-3.101	-3.119	-3.136	-3.153	-3.171	-130
-120	-2.808	-2.827	-2.846	-2.865	-2.883	-2.902	-2.921	-2.939	-2.958	-2.976	-2.994	-120
-110	-2.612	-2.632	-2.652	-2.672	-2.691	-2.711	-2.730	-2.750	-2.769	-2.789	-2.808	-110
-100	-2.407	-2.428	-2.448	-2.469	-2.490	-2.510	-2.531	-2.551	-2.571	-2.592	-2.612	**-100**
-90	-2.193	-2.215	-2.237	-2.258	-2.280	-2.301	-2.322	-2.344	-2.365	-2.386	-2.407	-90
-80	-1.972	-1.995	-2.017	-2.039	-2.062	-2.084	-2.106	-2.128	-2.150	-2.172	-2.193	-80
-70	-1.744	-1.767	-1.790	-1.813	-1.836	-1.859	-1.882	-1.905	-1.927	-1.950	-1.972	-70
-60	-1.509	-1.533	-1.557	-1.580	-1.604	-1.627	-1.651	-1.674	-1.698	-1.721	-1.744	-60
-50	-1.269	-1.293	-1.317	-1.341	-1.366	-1.390	-1.414	-1.438	-1.462	-1.485	-1.509	**-50**
-40	-1.023	-1.048	-1.072	-1.097	-1.122	-1.146	-1.171	-1.195	-1.220	-1.244	-1.269	-40
-30	-0.772	-0.798	-0.823	-0.848	-0.873	-0.898	-0.923	-0.948	-0.973	-0.998	-1.023	-30
-20	-0.518	-0.544	-0.569	-0.595	-0.620	-0.646	-0.671	-0.696	-0.722	-0.747	-0.772	-20
-10	-0.260	-0.286	-0.312	-0.338	-0.364	-0.390	-0.415	-0.441	-0.467	-0.492	-0.518	-10
0	0.000	-0.026	-0.052	-0.078	-0.104	-0.131	-0.157	-0.183	-0.209	-0.234	-0.260	**0**

°C	0	1	2	3	4	5	6	7	8	9	10	°C
0	0.000	0.026	0.052	0.078	0.104	0.130	0.156	0.182	0.208	0.235	0.261	0
10	0.261	0.287	0.313	0.340	0.366	0.393	0.419	0.446	0.472	0.499	0.525	10
20	0.525	0.552	0.578	0.605	0.632	0.659	0.685	0.712	0.739	0.766	0.793	20
30	0.793	0.820	0.847	0.874	0.901	0.928	0.955	0.983	1.010	1.037	1.065	30
40	1.065	1.092	1.119	1.147	1.174	1.202	1.229	1.257	1.284	1.312	1.340	40

50 °F - 550 °F Type N - Nicrosil vs Nisil 50 °C - 350 °C

N

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
50	0.261	0.275	0.290	0.305	0.319	0.334	0.349	0.363	0.378	0.393	0.407	**50**
60	0.407	0.422	0.437	0.451	0.466	0.481	0.496	0.510	0.525	0.540	0.555	60
70	0.555	0.570	0.584	0.599	0.614	0.629	0.644	0.659	0.674	0.688	0.703	70
80	0.703	0.718	0.733	0.748	0.763	0.778	0.793	0.808	0.823	0.838	0.853	80
90	0.853	0.868	0.883	0.898	0.913	0.928	0.943	0.958	0.974	0.989	1.004	90
100	1.004	1.019	1.034	1.049	1.065	1.080	1.095	1.110	1.125	1.141	1.156	**100**
110	1.156	1.171	1.186	1.202	1.217	1.232	1.248	1.263	1.278	1.294	1.309	110
120	1.309	1.324	1.340	1.355	1.371	1.386	1.402	1.417	1.432	1.448	1.463	120
130	1.463	1.479	1.494	1.510	1.525	1.541	1.557	1.572	1.588	1.603	1.619	130
140	1.619	1.635	1.650	1.666	1.682	1.697	1.713	1.729	1.744	1.760	1.776	140
150	1.776	1.791	1.807	1.823	1.839	1.855	1.870	1.886	1.902	1.918	1.934	**150**
160	1.934	1.950	1.965	1.981	1.997	2.013	2.029	2.045	2.061	2.077	2.093	160
170	2.093	2.109	2.125	2.141	2.157	2.173	2.189	2.205	2.221	2.237	2.253	170
180	2.253	2.269	2.285	2.301	2.318	2.334	2.350	2.366	2.382	2.398	2.415	180
190	2.415	2.431	2.447	2.463	2.480	2.496	2.512	2.528	2.545	2.561	2.577	190
200	2.577	2.594	2.610	2.626	2.643	2.659	2.676	2.692	2.708	2.725	2.741	**200**
210	2.741	2.758	2.774	2.791	2.807	2.824	2.840	2.857	2.873	2.890	2.906	210
220	2.906	2.923	2.939	2.956	2.973	2.989	3.006	3.022	3.039	3.056	3.072	220
230	3.072	3.089	3.106	3.123	3.139	3.156	3.173	3.189	3.206	3.223	3.240	230
240	3.240	3.257	3.273	3.290	3.307	3.324	3.341	3.358	3.374	3.391	3.408	240
250	3.408	3.425	3.442	3.459	3.476	3.493	3.510	3.527	3.544	3.561	3.578	**250**
260	3.578	3.595	3.612	3.629	3.646	3.663	3.680	3.697	3.714	3.731	3.748	260
270	3.748	3.766	3.783	3.800	3.817	3.834	3.851	3.869	3.886	3.903	3.920	270
280	3.920	3.937	3.955	3.972	3.989	4.007	4.024	4.041	4.058	4.076	4.093	280
290	4.093	4.110	4.128	4.145	4.162	4.180	4.197	4.215	4.232	4.250	4.267	290
300	4.267	4.284	4.302	4.319	4.337	4.354	4.372	4.389	4.407	4.424	4.442	**300**
310	4.442	4.459	4.477	4.495	4.512	4.530	4.547	4.565	4.583	4.600	4.618	310
320	4.618	4.635	4.653	4.671	4.688	4.706	4.724	4.742	4.759	4.777	4.795	320
330	4.795	4.813	4.830	4.848	4.866	4.884	4.901	4.919	4.937	4.955	4.973	330
340	4.973	4.991	5.008	5.026	5.044	5.062	5.080	5.098	5.116	5.134	5.152	340
350	5.152	5.170	5.188	5.206	5.224	5.241	5.259	5.277	5.295	5.314	5.332	**350**
360	5.332	5.350	5.368	5.386	5.404	5.422	5.440	5.458	5.476	5.494	5.512	360
370	5.512	5.531	5.549	5.567	5.585	5.603	5.621	5.639	5.658	5.676	5.694	370
380	5.694	5.712	5.731	5.749	5.767	5.785	5.804	5.822	5.840	5.858	5.877	380
390	5.877	5.895	5.913	5.932	5.950	5.968	5.987	6.005	6.024	6.042	6.060	390
400	6.060	6.079	6.097	6.116	6.134	6.152	6.171	6.189	6.208	6.226	6.245	**400**
410	6.245	6.263	6.282	6.300	6.319	6.337	6.356	6.374	6.393	6.411	6.430	410
420	6.430	6.449	6.467	6.486	6.504	6.523	6.542	6.560	6.579	6.597	6.616	420
430	6.616	6.635	6.653	6.672	6.691	6.710	6.728	6.747	6.766	6.784	6.803	430
440	6.803	6.822	6.841	6.859	6.878	6.897	6.916	6.934	6.953	6.972	6.991	440
450	6.991	7.010	7.029	7.047	7.066	7.085	7.104	7.123	7.142	7.161	7.179	**450**
460	7.179	7.198	7.217	7.236	7.255	7.274	7.293	7.312	7.331	7.350	7.369	460
470	7.369	7.388	7.407	7.426	7.445	7.464	7.483	7.502	7.521	7.540	7.559	470
480	7.559	7.578	7.597	7.616	7.635	7.654	7.673	7.692	7.711	7.731	7.750	480
490	7.750	7.769	7.788	7.807	7.826	7.845	7.865	7.884	7.903	7.922	7.941	490
500	7.941	7.960	7.980	7.999	8.018	8.037	8.057	8.076	8.095	8.114	8.134	**500**
510	8.134	8.153	8.172	8.191	8.211	8.230	8.249	8.269	8.288	8.307	8.327	510
520	8.327	8.346	8.365	8.385	8.404	8.423	8.443	8.462	8.482	8.501	8.520	520
530	8.520	8.540	8.559	8.579	8.598	8.617	8.637	8.656	8.676	8.695	8.715	530
540	8.715	8.734	8.754	8.773	8.793	8.812	8.832	8.851	8.871	8.890	8.910	540
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
50	1.340	1.368	1.395	1.423	1.451	1.479	1.507	1.535	1.563	1.591	1.619	**50**
60	1.619	1.647	1.675	1.703	1.732	1.760	1.788	1.817	1.845	1.873	1.902	60
70	1.902	1.930	1.959	1.988	2.016	2.045	2.074	2.102	2.131	2.160	2.189	70
80	2.189	2.218	2.247	2.276	2.305	2.334	2.363	2.392	2.421	2.450	2.480	80
90	2.480	2.509	2.538	2.568	2.597	2.626	2.656	2.685	2.715	2.744	2.774	90
100	2.774	2.804	2.833	2.863	2.893	2.923	2.953	2.983	3.012	3.042	3.072	**100**
110	3.072	3.102	3.133	3.163	3.193	3.223	3.253	3.283	3.314	3.344	3.374	110
120	3.374	3.405	3.435	3.466	3.496	3.527	3.557	3.588	3.619	3.649	3.680	120
130	3.680	3.711	3.742	3.772	3.803	3.834	3.865	3.896	3.927	3.958	3.989	130
140	3.989	4.020	4.051	4.083	4.114	4.145	4.176	4.208	4.239	4.270	4.302	140
150	4.302	4.333	4.365	4.396	4.428	4.459	4.491	4.523	4.554	4.586	4.618	**150**
160	4.618	4.650	4.681	4.713	4.745	4.777	4.809	4.841	4.873	4.905	4.937	160
170	4.937	4.969	5.001	5.033	5.066	5.098	5.130	5.162	5.195	5.227	5.259	170
180	5.259	5.292	5.324	5.357	5.389	5.422	5.454	5.487	5.520	5.552	5.585	180
190	5.585	5.618	5.650	5.683	5.716	5.749	5.782	5.815	5.847	5.880	5.913	190
200	5.913	5.946	5.979	6.013	6.046	6.079	6.112	6.145	6.178	6.211	6.245	**200**
210	6.245	6.278	6.311	6.345	6.378	6.411	6.445	6.478	6.512	6.545	6.579	210
220	6.579	6.612	6.646	6.680	6.713	6.747	6.781	6.814	6.848	6.882	6.916	220
230	6.916	6.949	6.983	7.017	7.051	7.085	7.119	7.153	7.187	7.221	7.255	230
240	7.255	7.289	7.323	7.357	7.392	7.426	7.460	7.494	7.528	7.563	7.597	240
250	7.597	7.631	7.666	7.700	7.734	7.769	7.803	7.838	7.872	7.907	7.941	**250**
260	7.941	7.976	8.010	8.045	8.080	8.114	8.149	8.184	8.218	8.253	8.288	260
270	8.288	8.323	8.358	8.392	8.427	8.462	8.497	8.532	8.567	8.602	8.637	270
280	8.637	8.672	8.707	8.742	8.777	8.812	8.847	8.882	8.918	8.953	8.988	280
290	8.988	9.023	9.058	9.094	9.129	9.164	9.200	9.235	9.270	9.306	9.341	290
300	9.341	9.377	9.412	9.448	9.483	9.519	9.554	9.590	9.625	9.661	9.696	**300**
310	9.696	9.732	9.768	9.803	9.839	9.875	9.910	9.946	9.982	10.018	10.054	310
320	10.054	10.089	10.125	10.161	10.197	10.233	10.269	10.305	10.341	10.377	10.413	320
330	10.413	10.449	10.485	10.521	10.557	10.593	10.629	10.665	10.701	10.737	10.774	330
340	10.774	10.810	10.846	10.882	10.918	10.955	10.991	11.027	11.064	11.100	11.136	340
°C	0	1	2	3	4	5	6	7	8	9	10	°C

N

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
550	8.910	8.929	8.949	8.968	8.988	9.008	9.027	9.047	9.066	9.086	9.105	**550**
560	9.105	9.125	9.145	9.164	9.184	9.204	9.223	9.243	9.262	9.282	9.302	560
570	9.302	9.321	9.341	9.361	9.381	9.400	9.420	9.440	9.459	9.479	9.499	570
580	9.499	9.519	9.538	9.558	9.578	9.598	9.617	9.637	9.657	9.677	9.696	580
590	9.696	9.716	9.736	9.756	9.776	9.795	9.815	9.835	9.855	9.875	9.895	590
600	9.895	9.914	9.934	9.954	9.974	9.994	10.014	10.034	10.054	10.073	10.093	**600**
610	10.093	10.113	10.133	10.153	10.173	10.193	10.213	10.233	10.253	10.273	10.293	610
620	10.293	10.313	10.333	10.353	10.373	10.393	10.413	10.433	10.453	10.473	10.493	620
630	10.493	10.513	10.533	10.553	10.573	10.593	10.613	10.633	10.653	10.673	10.693	630
640	10.693	10.713	10.733	10.753	10.774	10.794	10.814	10.834	10.854	10.874	10.894	640
650	10.894	10.914	10.934	10.955	10.975	10.995	11.015	11.035	11.055	11.076	11.096	**650**
660	11.096	11.116	11.136	11.156	11.177	11.197	11.217	11.237	11.257	11.278	11.298	660
670	11.298	11.318	11.338	11.359	11.379	11.399	11.419	11.440	11.460	11.480	11.501	670
680	11.501	11.521	11.541	11.561	11.582	11.602	11.622	11.643	11.663	11.683	11.704	680
690	11.704	11.724	11.744	11.765	11.785	11.805	11.826	11.846	11.867	11.887	11.907	690
700	11.907	11.928	11.948	11.968	11.989	12.009	12.030	12.050	12.071	12.091	12.111	**700**
710	12.111	12.132	12.152	12.173	12.193	12.214	12.234	12.255	12.275	12.295	12.316	710
720	12.316	12.336	12.357	12.377	12.398	12.418	12.439	12.459	12.480	12.500	12.521	720
730	12.521	12.542	12.562	12.583	12.603	12.624	12.644	12.665	12.685	12.706	12.726	730
740	12.726	12.747	12.768	12.788	12.809	12.829	12.850	12.871	12.891	12.912	12.932	740
750	12.932	12.953	12.974	12.994	13.015	13.036	13.056	13.077	13.098	13.118	13.139	750
760	13.139	13.159	13.180	13.201	13.221	13.242	13.263	13.284	13.304	13.325	13.346	760
770	13.346	13.366	13.387	13.408	13.428	13.449	13.470	13.491	13.511	13.532	13.553	770
780	13.553	13.574	13.594	13.615	13.636	13.657	13.677	13.698	13.719	13.740	13.760	780
790	13.760	13.781	13.802	13.823	13.844	13.864	13.885	13.906	13.927	13.948	13.969	790
800	13.969	13.989	14.010	14.031	14.052	14.073	14.094	14.114	14.135	14.156	14.177	**800**
810	14.177	14.198	14.219	14.240	14.260	14.281	14.302	14.323	14.344	14.365	14.386	810
820	14.386	14.407	14.428	14.448	14.469	14.490	14.511	14.532	14.553	14.574	14.595	820
830	14.595	14.616	14.637	14.658	14.679	14.700	14.721	14.742	14.763	14.784	14.804	830
840	14.804	14.825	14.846	14.867	14.888	14.909	14.930	14.951	14.972	14.993	15.014	840
850	15.014	15.035	15.056	15.077	15.098	15.119	15.140	15.162	15.183	15.204	15.225	**850**
860	15.225	15.246	15.267	15.288	15.309	15.330	15.351	15.372	15.393	15.414	15.435	860
870	15.435	15.456	15.477	15.498	15.520	15.541	15.562	15.583	15.604	15.625	15.646	870
880	15.646	15.667	15.688	15.709	15.731	15.752	15.773	15.794	15.815	15.836	15.857	880
890	15.857	15.878	15.900	15.921	15.942	15.963	15.984	16.005	16.027	16.048	16.069	890
900	16.069	16.090	16.111	16.132	16.154	16.175	16.196	16.217	16.238	16.260	16.281	**900**
910	16.281	16.302	16.323	16.344	16.366	16.387	16.408	16.429	16.450	16.472	16.493	910
920	16.493	16.514	16.535	16.557	16.578	16.599	16.620	16.642	16.663	16.684	16.705	920
930	16.705	16.727	16.748	16.769	16.790	16.812	16.833	16.854	16.875	16.897	16.918	930
940	16.918	16.939	16.961	16.982	17.003	17.025	17.046	17.067	17.088	17.110	17.131	940
950	17.131	17.152	17.174	17.195	17.216	17.238	17.259	17.280	17.302	17.323	17.344	**950**
960	17.344	17.366	17.387	17.408	17.430	17.451	17.472	17.494	17.515	17.536	17.558	960
970	17.558	17.579	17.601	17.622	17.643	17.665	17.686	17.707	17.729	17.750	17.772	970
980	17.772	17.793	17.814	17.836	17.857	17.879	17.900	17.921	17.943	17.964	17.986	980
990	17.986	18.007	18.028	18.050	18.071	18.093	18.114	18.136	18.157	18.178	18.200	990
1000	18.200	18.221	18.243	18.264	18.286	18.307	18.328	18.350	18.371	18.393	18.414	**1000**
1010	18.414	18.436	18.457	18.479	18.500	18.522	18.543	18.565	18.586	18.608	18.629	1010
1020	18.629	18.650	18.672	18.693	18.715	18.736	18.758	18.779	18.801	18.822	18.844	1020
1030	18.844	18.865	18.887	18.908	18.930	18.951	18.973	18.994	19.016	19.037	19.059	1030
1040	19.059	19.081	19.102	19.124	19.145	19.167	19.188	19.210	19.231	19.253	19.274	1040
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
350	11.136	11.173	11.209	11.245	11.282	11.318	11.355	11.391	11.428	11.464	11.501	**350**
360	11.501	11.537	11.574	11.610	11.647	11.683	11.720	11.757	11.793	11.830	11.867	360
370	11.867	11.903	11.940	11.977	12.013	12.050	12.087	12.124	12.160	12.197	12.234	370
380	12.234	12.271	12.308	12.345	12.382	12.418	12.455	12.492	12.529	12.566	12.603	380
390	12.603	12.640	12.677	12.714	12.751	12.788	12.825	12.862	12.899	12.937	12.974	390
400	12.974	13.011	13.048	13.085	13.122	13.159	13.197	13.234	13.271	13.308	13.346	**400**
410	13.346	13.383	13.420	13.457	13.495	13.532	13.569	13.607	13.644	13.682	13.719	410
420	13.719	13.756	13.794	13.831	13.869	13.906	13.944	13.981	14.019	14.056	14.094	420
430	14.094	14.131	14.169	14.206	14.244	14.281	14.319	14.356	14.394	14.432	14.469	430
440	14.469	14.507	14.545	14.582	14.620	14.658	14.695	14.733	14.771	14.809	14.846	440
450	14.846	14.884	14.922	14.960	14.998	15.035	15.073	15.111	15.149	15.187	15.225	**450**
460	15.225	15.262	15.300	15.338	15.376	15.414	15.452	15.490	15.528	15.566	15.604	460
470	15.604	15.642	15.680	15.718	15.756	15.794	15.832	15.870	15.908	15.946	15.984	470
480	15.984	16.022	16.060	16.099	16.137	16.175	16.213	16.251	16.289	16.327	16.366	480
490	16.366	16.404	16.442	16.480	16.518	16.557	16.595	16.633	16.671	16.710	16.748	490
500	16.748	16.786	16.824	16.863	16.901	16.939	16.978	17.016	17.054	17.093	17.131	**500**
510	17.131	17.169	17.208	17.246	17.285	17.323	17.361	17.400	17.438	17.477	17.515	510
520	17.515	17.554	17.592	17.630	17.669	17.707	17.746	17.784	17.823	17.861	17.900	520
530	17.900	17.938	17.977	18.016	18.054	18.093	18.131	18.170	18.208	18.247	18.286	530
540	18.286	18.324	18.363	18.401	18.440	18.479	18.517	18.556	18.595	18.633	18.672	540
550	18.672	18.711	18.749	18.788	18.827	18.865	18.904	18.943	18.982	19.020	19.059	**550**
560	19.059	19.098	19.136	19.175	19.214	19.253	19.292	19.330	19.369	19.408	19.447	560
570	19.447	19.485	19.524	19.563	19.602	19.641	19.680	19.718	19.757	19.796	19.835	570
580	19.835	19.874	19.913	19.952	19.990	20.029	20.068	20.107	20.146	20.185	20.224	580
590	20.224	20.263	20.302	20.341	20.379	20.418	20.457	20.496	20.535	20.574	20.613	590
600	20.613	20.652	20.691	20.730	20.769	20.808	20.847	20.886	20.925	20.964	21.003	**600**
610	21.003	21.042	21.081	21.120	21.159	21.198	21.237	21.276	21.315	21.354	21.393	610
620	21.393	21.432	21.471	21.510	21.549	21.588	21.628	21.667	21.706	21.745	21.784	620
630	21.784	21.823	21.862	21.901	21.940	21.979	22.018	22.058	22.097	22.136	22.175	630
640	22.175	22.214	22.253	22.292	22.331	22.370	22.410	22.449	22.488	22.527	22.566	640
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type N - Nicrosil vs Nisil

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1050	19.274	19.296	19.317	19.339	19.360	19.382	19.404	19.425	19.447	19.468	19.490	**1050**
1060	19.490	19.511	19.533	19.554	19.576	19.598	19.619	19.641	19.662	19.684	19.705	1060
1070	19.705	19.727	19.749	19.770	19.792	19.813	19.835	19.857	19.878	19.900	19.921	1070
1080	19.921	19.943	19.964	19.986	20.008	20.029	20.051	20.072	20.094	20.116	20.137	1080
1090	20.137	20.159	20.181	20.202	20.224	20.245	20.267	20.289	20.310	20.332	20.353	1090
1100	20.353	20.375	20.397	20.418	20.440	20.462	20.483	20.505	20.527	20.548	20.570	**1100**
1110	20.570	20.591	20.613	20.635	20.656	20.678	20.700	20.721	20.743	20.765	20.786	1110
1120	20.786	20.808	20.830	20.851	20.873	20.895	20.916	20.938	20.960	20.981	21.003	1120
1130	21.003	21.025	21.046	21.068	21.090	21.111	21.133	21.155	21.176	21.198	21.220	1130
1140	21.220	21.241	21.263	21.285	21.306	21.328	21.350	21.371	21.393	21.415	21.437	1140
1150	21.437	21.458	21.480	21.502	21.523	21.545	21.567	21.588	21.610	21.632	21.654	**1150**
1160	21.654	21.675	21.697	21.719	21.740	21.762	21.784	21.806	21.827	21.849	21.871	1160
1170	21.871	21.892	21.914	21.936	21.958	21.979	22.001	22.023	22.044	22.066	22.088	1170
1180	22.088	22.110	22.131	22.153	22.175	22.197	22.218	22.240	22.262	22.284	22.305	1180
1190	22.305	22.327	22.349	22.370	22.392	22.414	22.436	22.457	22.479	22.501	22.523	1190
1200	22.523	22.544	22.566	22.588	22.610	22.631	22.653	22.675	22.697	22.718	22.740	**1200**
1210	22.740	22.762	22.784	22.805	22.827	22.849	22.871	22.893	22.914	22.936	22.958	1210
1220	22.958	22.980	23.001	23.023	23.045	23.067	23.088	23.110	23.132	23.154	23.176	1220
1230	23.176	23.197	23.219	23.241	23.263	23.284	23.306	23.328	23.350	23.372	23.393	1230
1240	23.393	23.415	23.437	23.459	23.480	23.502	23.524	23.546	23.568	23.589	23.611	1240
1250	23.611	23.633	23.655	23.676	23.698	23.720	23.742	23.764	23.785	23.807	23.829	**1250**
1260	23.829	23.851	23.873	23.894	23.916	23.938	23.960	23.982	24.003	24.025	24.047	1260
1270	24.047	24.069	24.091	24.112	24.134	24.156	24.178	24.200	24.221	24.243	24.265	1270
1280	24.265	24.287	24.309	24.330	24.352	24.374	24.396	24.418	24.439	24.461	24.483	1280
1290	24.483	24.505	24.527	24.548	24.570	24.592	24.614	24.636	24.658	24.679	24.701	1290
1300	24.701	24.723	24.745	24.767	24.788	24.810	24.832	24.854	24.876	24.897	24.919	**1300**
1310	24.919	24.941	24.963	24.985	25.007	25.028	25.050	25.072	25.094	25.116	25.137	1310
1320	25.137	25.159	25.181	25.203	25.225	25.247	25.268	25.290	25.312	25.334	25.356	1320
1330	25.356	25.377	25.399	25.421	25.443	25.465	25.487	25.508	25.530	25.552	25.574	1330
1340	25.574	25.596	25.618	25.639	25.661	25.683	25.705	25.727	25.748	25.770	25.792	1340
1350	25.792	25.814	25.836	25.858	25.879	25.901	25.923	25.945	25.967	25.989	26.010	**1350**
1360	26.010	26.032	26.054	26.076	26.098	26.119	26.141	26.163	26.185	26.207	26.229	1360
1370	26.229	26.250	26.272	26.294	26.316	26.338	26.360	26.381	26.403	26.425	26.447	1370
1380	26.447	26.469	26.491	26.512	26.534	26.556	26.578	26.600	26.622	26.643	26.665	1380
1390	26.665	26.687	26.709	26.731	26.752	26.774	26.796	26.818	26.840	26.862	26.883	1390
1400	26.883	26.905	26.927	26.949	26.971	26.993	27.014	27.036	27.058	27.080	27.102	**1400**
1410	27.102	27.124	27.145	27.167	27.189	27.211	27.233	27.254	27.276	27.298	27.320	1410
1420	27.320	27.342	27.364	27.385	27.407	27.429	27.451	27.473	27.495	27.516	27.538	1420
1430	27.538	27.560	27.582	27.604	27.625	27.647	27.669	27.691	27.713	27.735	27.756	1430
1440	27.756	27.778	27.800	27.822	27.844	27.866	27.887	27.909	27.931	27.953	27.975	1440
1450	27.975	27.996	28.018	28.040	28.062	28.084	28.105	28.127	28.149	28.171	28.193	**1450**
1460	28.193	28.215	28.236	28.258	28.280	28.302	28.324	28.345	28.367	28.389	28.411	1460
1470	28.411	28.433	28.455	28.476	28.498	28.520	28.542	28.564	28.585	28.607	28.629	1470
1480	28.629	28.651	28.673	28.694	28.716	28.738	28.760	28.782	28.803	28.825	28.847	1480
1490	28.847	28.869	28.891	28.912	28.934	28.956	28.978	29.000	29.021	29.043	29.065	1490
1500	29.065	29.087	29.109	29.130	29.152	29.174	29.196	29.218	29.239	29.261	29.283	**1500**
1510	29.283	29.305	29.327	29.348	29.370	29.392	29.414	29.436	29.457	29.479	29.501	1510
1520	29.501	29.523	29.545	29.566	29.588	29.610	29.632	29.653	29.675	29.697	29.719	1520
1530	29.719	29.741	29.762	29.784	29.806	29.828	29.850	29.871	29.893	29.915	29.937	1530
1540	29.937	29.958	29.980	30.002	30.024	30.046	30.067	30.089	30.111	30.133	30.154	1540
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
650	22.566	22.605	22.644	22.684	22.723	22.762	22.801	22.840	22.879	22.919	22.958	**650**
660	22.958	22.997	23.036	23.075	23.115	23.154	23.193	23.232	23.271	23.311	23.350	660
670	23.350	23.389	23.428	23.467	23.507	23.546	23.585	23.624	23.663	23.703	23.742	670
680	23.742	23.781	23.820	23.860	23.899	23.938	23.977	24.016	24.056	24.095	24.134	680
690	24.134	24.173	24.213	24.252	24.291	24.330	24.370	24.409	24.448	24.487	24.527	690
700	24.527	24.566	24.605	24.644	24.684	24.723	24.762	24.801	24.841	24.880	24.919	**700**
710	24.919	24.959	24.998	25.037	25.076	25.116	25.155	25.194	25.233	25.273	25.312	710
720	25.312	25.351	25.391	25.430	25.469	25.508	25.548	25.587	25.626	25.666	25.705	720
730	25.705	25.744	25.783	25.823	25.862	25.901	25.941	25.980	26.019	26.058	26.098	730
740	26.098	26.137	26.176	26.216	26.255	26.294	26.333	26.373	26.412	26.451	26.491	740
750	26.491	26.530	26.569	26.608	26.648	26.687	26.726	26.766	26.805	26.844	26.883	**750**
760	26.883	26.923	26.962	27.001	27.041	27.080	27.119	27.158	27.198	27.237	27.276	760
770	27.276	27.316	27.355	27.394	27.433	27.473	27.512	27.551	27.591	27.630	27.669	770
780	27.669	27.708	27.748	27.787	27.826	27.866	27.905	27.944	27.983	28.023	28.062	780
790	28.062	28.101	28.140	28.180	28.219	28.258	28.297	28.337	28.376	28.415	28.455	790
800	28.455	28.494	28.533	28.572	28.612	28.651	28.690	28.729	28.769	28.808	28.847	**800**
810	28.847	28.886	28.926	28.965	29.004	29.043	29.083	29.122	29.161	29.200	29.239	810
820	29.239	29.279	29.318	29.357	29.396	29.436	29.475	29.514	29.553	29.592	29.632	820
830	29.632	29.671	29.710	29.749	29.789	29.828	29.867	29.906	29.945	29.985	30.024	830
840	30.024	30.063	30.102	30.141	30.181	30.220	30.259	30.298	30.337	30.376	30.416	840
850	30.416	30.455	30.494	30.533	30.572	30.611	30.651	30.690	30.729	30.768	30.807	**850**
860	30.807	30.846	30.886	30.925	30.964	31.003	31.042	31.081	31.120	31.160	31.199	860
870	31.199	31.238	31.277	31.316	31.355	31.394	31.433	31.473	31.512	31.551	31.590	870
880	31.590	31.629	31.668	31.707	31.746	31.785	31.824	31.863	31.903	31.942	31.981	880
890	31.981	32.020	32.059	32.098	32.137	32.176	32.215	32.254	32.293	32.332	32.371	890
900	32.371	32.410	32.449	32.488	32.527	32.566	32.605	32.644	32.683	32.722	32.761	**900**
910	32.761	32.800	32.839	32.878	32.917	32.956	32.995	33.034	33.073	33.112	33.151	910
920	33.151	33.190	33.229	33.268	33.307	33.346	33.385	33.424	33.463	33.502	33.541	920
930	33.541	33.580	33.619	33.658	33.697	33.736	33.774	33.813	33.852	33.891	33.930	930
940	33.930	33.969	34.008	34.047	34.086	34.124	34.163	34.202	34.241	34.280	34.319	940
°C	0	1	2	3	4	5	6	7	8	9	10	°C

N

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1550	30.154	30.176	30.198	30.220	30.242	30.263	30.285	30.307	30.329	30.350	30.372	**1550**
1560	30.372	30.394	30.416	30.437	30.459	30.481	30.503	30.524	30.546	30.568	30.590	1560
1570	30.590	30.611	30.633	30.655	30.677	30.699	30.720	30.742	30.764	30.786	30.807	1570
1580	30.807	30.829	30.851	30.873	30.894	30.916	30.938	30.960	30.981	31.003	31.025	1580
1590	31.025	31.047	31.068	31.090	31.112	31.133	31.155	31.177	31.199	31.220	31.242	1590
1600	31.242	31.264	31.286	31.307	31.329	31.351	31.373	31.394	31.416	31.438	31.459	**1600**
1610	31.459	31.481	31.503	31.525	31.546	31.568	31.590	31.612	31.633	31.655	31.677	1610
1620	31.677	31.698	31.720	31.742	31.764	31.785	31.807	31.829	31.850	31.872	31.894	1620
1630	31.894	31.916	31.937	31.959	31.981	32.002	32.024	32.046	32.068	32.089	32.111	1630
1640	32.111	32.133	32.154	32.176	32.198	32.219	32.241	32.263	32.284	32.306	32.328	1640
1650	32.328	32.350	32.371	32.393	32.415	32.436	32.458	32.480	32.501	32.523	32.545	**1650**
1660	32.545	32.566	32.588	32.610	32.631	32.653	32.675	32.696	32.718	32.740	32.761	1660
1670	32.761	32.783	32.805	32.826	32.848	32.870	32.891	32.913	32.935	32.956	32.978	1670
1680	32.978	33.000	33.021	33.043	33.065	33.086	33.108	33.130	33.151	33.173	33.195	1680
1690	33.195	33.216	33.238	33.260	33.281	33.303	33.325	33.346	33.368	33.389	33.411	1690
1700	33.411	33.433	33.454	33.476	33.498	33.519	33.541	33.563	33.584	33.606	33.627	**1700**
1710	33.627	33.649	33.671	33.692	33.714	33.736	33.757	33.779	33.800	33.822	33.844	1710
1720	33.844	33.865	33.887	33.908	33.930	33.952	33.973	33.995	34.016	34.038	34.060	1720
1730	34.060	34.081	34.103	34.124	34.146	34.168	34.189	34.211	34.232	34.254	34.276	1730
1740	34.276	34.297	34.319	34.340	34.362	34.384	34.405	34.427	34.448	34.470	34.491	1740
1750	34.491	34.513	34.535	34.556	34.578	34.599	34.621	34.642	34.664	34.686	34.707	**1750**
1760	34.707	34.729	34.750	34.772	34.793	34.815	34.836	34.858	34.879	34.901	34.923	1760
1770	34.923	34.944	34.966	34.987	35.009	35.030	35.052	35.073	35.095	35.116	35.138	1770
1780	35.138	35.160	35.181	35.203	35.224	35.246	35.267	35.289	35.310	35.332	35.353	1780
1790	35.353	35.375	35.396	35.418	35.439	35.461	35.482	35.504	35.525	35.547	35.568	1790
1800	35.568	35.590	35.611	35.633	35.654	35.676	35.697	35.719	35.740	35.762	35.783	**1800**
1810	35.783	35.805	35.826	35.848	35.869	35.891	35.912	35.934	35.955	35.977	35.998	1810
1820	35.998	36.019	36.041	36.062	36.084	36.105	36.127	36.148	36.170	36.191	36.213	1820
1830	36.213	36.234	36.256	36.277	36.298	36.320	36.341	36.363	36.384	36.406	36.427	1830
1840	36.427	36.449	36.470	36.491	36.513	36.534	36.556	36.577	36.599	36.620	36.641	1840
1850	36.641	36.663	36.684	36.706	36.727	36.748	36.770	36.791	36.813	36.834	36.855	**1850**
1860	36.855	36.877	36.898	36.920	36.941	36.962	36.984	37.005	37.027	37.048	37.069	1860
1870	37.069	37.091	37.112	37.134	37.155	37.176	37.198	37.219	37.240	37.262	37.283	1870
1880	37.283	37.305	37.326	37.347	37.369	37.390	37.411	37.433	37.454	37.475	37.497	1880
1890	37.497	37.518	37.539	37.561	37.582	37.603	37.625	37.646	37.668	37.689	37.710	1890
1900	37.710	37.731	37.753	37.774	37.795	37.817	37.838	37.859	37.881	37.902	37.923	**1900**
1910	37.923	37.945	37.966	37.987	38.009	38.030	38.051	38.073	38.094	38.115	38.136	1910
1920	38.136	38.158	38.179	38.200	38.222	38.243	38.264	38.285	38.307	38.328	38.349	1920
1930	38.349	38.370	38.392	38.413	38.434	38.456	38.477	38.498	38.519	38.541	38.562	1930
1940	38.562	38.583	38.604	38.626	38.647	38.668	38.689	38.711	38.732	38.753	38.774	1940
1950	38.774	38.795	38.817	38.838	38.859	38.880	38.902	38.923	38.944	38.965	38.986	**1950**
1960	38.986	39.008	39.029	39.050	39.071	39.093	39.114	39.135	39.156	39.177	39.198	1960
1970	39.198	39.220	39.241	39.262	39.283	39.304	39.326	39.347	39.368	39.389	39.410	1970
1980	39.410	39.431	39.453	39.474	39.495	39.516	39.537	39.558	39.580	39.601	39.622	1980
1990	39.622	39.643	39.664	39.685	39.706	39.728	39.749	39.770	39.791	39.812	39.833	1990
2000	39.833	39.854	39.875	39.897	39.918	39.939	39.960	39.981	40.002	40.023	40.044	**2000**
2010	40.044	40.066	40.087	40.108	40.129	40.150	40.171	40.192	40.213	40.234	40.255	2010
2020	40.255	40.276	40.297	40.319	40.340	40.361	40.382	40.403	40.424	40.445	40.466	2020
2030	40.466	40.487	40.508	40.529	40.550	40.571	40.592	40.613	40.634	40.655	40.677	2030
2040	40.677	40.698	40.719	40.740	40.761	40.782	40.803	40.824	40.845	40.866	40.887	2040
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
950	34.319	34.358	34.396	34.435	34.474	34.513	34.552	34.591	34.629	34.668	34.707	**950**
960	34.707	34.746	34.785	34.823	34.862	34.901	34.940	34.979	35.017	35.056	35.095	960
970	35.095	35.134	35.172	35.211	35.250	35.289	35.327	35.366	35.405	35.444	35.482	970
980	35.482	35.521	35.560	35.598	35.637	35.676	35.714	35.753	35.792	35.831	35.869	980
990	35.869	35.908	35.946	35.985	36.024	36.062	36.101	36.140	36.178	36.217	36.256	990
1000	36.256	36.294	36.333	36.371	36.410	36.449	36.487	36.526	36.564	36.603	36.641	**1000**
1010	36.641	36.680	36.718	36.757	36.796	36.834	36.873	36.911	36.950	36.988	37.027	1010
1020	37.027	37.065	37.104	37.142	37.181	37.219	37.258	37.296	37.334	37.373	37.411	1020
1030	37.411	37.450	37.488	37.527	37.565	37.603	37.642	37.680	37.719	37.757	37.795	1030
1040	37.795	37.834	37.872	37.911	37.949	37.987	38.026	38.064	38.102	38.141	38.179	1040
1050	38.179	38.217	38.256	38.294	38.332	38.370	38.409	38.447	38.485	38.524	38.562	**1050**
1060	38.562	38.600	38.638	38.677	38.715	38.753	38.791	38.829	38.868	38.906	38.944	1060
1070	38.944	38.982	39.020	39.059	39.097	39.135	39.173	39.211	39.249	39.287	39.326	1070
1080	39.326	39.364	39.402	39.440	39.478	39.516	39.554	39.592	39.630	39.668	39.706	1080
1090	39.706	39.744	39.783	39.821	39.859	39.897	39.935	39.973	40.011	40.049	40.087	1090
1100	40.087	40.125	40.163	40.201	40.238	40.276	40.314	40.352	40.390	40.428	40.466	**1100**
1110	40.466	40.504	40.542	40.580	40.618	40.655	40.693	40.731	40.769	40.807	40.845	1110
1120	40.845	40.883	40.920	40.958	40.996	41.034	41.072	41.109	41.147	41.185	41.223	1120
1130	41.223	41.260	41.298	41.336	41.374	41.411	41.449	41.487	41.525	41.562	41.600	1130
1140	41.600	41.638	41.675	41.713	41.751	41.788	41.826	41.864	41.901	41.939	41.976	1140
1150	41.976	42.014	42.052	42.089	42.127	42.164	42.202	42.239	42.277	42.314	42.352	**1150**
1160	42.352	42.390	42.427	42.465	42.502	42.540	42.577	42.614	42.652	42.689	42.727	1160
1170	42.727	42.764	42.802	42.839	42.877	42.914	42.951	42.989	43.026	43.064	43.101	1170
1180	43.101	43.138	43.176	43.213	43.250	43.288	43.325	43.362	43.399	43.437	43.474	1180
1190	43.474	43.511	43.549	43.586	43.623	43.660	43.698	43.735	43.772	43.809	43.846	1190
1200	43.846	43.884	43.921	43.958	43.995	44.032	44.069	44.106	44.144	44.181	44.218	**1200**
1210	44.218	44.255	44.292	44.329	44.366	44.403	44.440	44.477	44.514	44.551	44.588	1210
1220	44.588	44.625	44.662	44.699	44.736	44.773	44.810	44.847	44.884	44.921	44.958	1220
1230	44.958	44.995	45.032	45.069	45.105	45.142	45.179	45.216	45.253	45.290	45.326	1230
1240	45.326	45.363	45.400	45.437	45.474	45.510	45.547	45.584	45.621	45.657	45.694	1240
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2050	40.887	40.908	40.929	40.950	40.971	40.992	41.013	41.034	41.055	41.076	41.097	**2050**
2060	41.097	41.118	41.139	41.160	41.181	41.202	41.223	41.244	41.265	41.286	41.307	2060
2070	41.307	41.328	41.349	41.370	41.390	41.411	41.432	41.453	41.474	41.495	41.516	2070
2080	41.516	41.537	41.558	41.579	41.600	41.621	41.642	41.663	41.684	41.705	41.725	2080
2090	41.725	41.746	41.767	41.788	41.809	41.830	41.851	41.872	41.893	41.914	41.935	2090
2100	41.935	41.955	41.976	41.997	42.018	42.039	42.060	42.081	42.102	42.123	42.143	**2100**
2110	42.143	42.164	42.185	42.206	42.227	42.248	42.269	42.289	42.310	42.331	42.352	2110
2120	42.352	42.373	42.394	42.415	42.435	42.456	42.477	42.498	42.519	42.540	42.560	2120
2130	42.560	42.581	42.602	42.623	42.644	42.664	42.685	42.706	42.727	42.748	42.768	2130
2140	42.768	42.789	42.810	42.831	42.852	42.872	42.893	42.914	42.935	42.956	42.976	2140
2150	42.976	42.997	43.018	43.039	43.059	43.080	43.101	43.122	43.142	43.163	43.184	**2150**
2160	43.184	43.205	43.225	43.246	43.267	43.288	43.308	43.329	43.350	43.370	43.391	2160
2170	43.391	43.412	43.433	43.453	43.474	43.495	43.515	43.536	43.557	43.578	43.598	2170
2180	43.598	43.619	43.640	43.660	43.681	43.702	43.722	43.743	43.764	43.784	43.805	2180
2190	43.805	43.826	43.846	43.867	43.888	43.908	43.929	43.950	43.970	43.991	44.012	2190
2200	44.012	44.032	44.053	44.073	44.094	44.115	44.135	44.156	44.177	44.197	44.218	**2200**
2210	44.218	44.238	44.259	44.280	44.300	44.321	44.341	44.362	44.383	44.403	44.424	2210
2220	44.424	44.444	44.465	44.485	44.506	44.527	44.547	44.568	44.588	44.609	44.629	2220
2230	44.629	44.650	44.671	44.691	44.712	44.732	44.753	44.773	44.794	44.814	44.835	2230
2240	44.835	44.855	44.876	44.896	44.917	44.937	44.958	44.978	44.999	45.019	45.040	2240
2250	45.040	45.060	45.081	45.101	45.122	45.142	45.163	45.183	45.204	45.224	45.245	**2250**
2260	45.245	45.265	45.286	45.306	45.326	45.347	45.367	45.388	45.408	45.429	45.449	2260
2270	45.449	45.469	45.490	45.510	45.531	45.551	45.572	45.592	45.612	45.633	45.653	2270
2280	45.653	45.674	45.694	45.714	45.735	45.755	45.775	45.796	45.816	45.837	45.857	2280
2290	45.857	45.877	45.898	45.918	45.938	45.959	45.979	45.999	46.020	46.040	46.060	2290
2300	46.060	46.081	46.101	46.121	46.142	46.162	46.182	46.202	46.223	46.243	46.263	**2300**
2310	46.263	46.284	46.304	46.324	46.344	46.365	46.385	46.405	46.425	46.446	46.466	2310
2320	46.466	46.486	46.506	46.527	46.547	46.567	46.587	46.608	46.628	46.648	46.668	2320
2330	46.668	46.688	46.709	46.729	46.749	46.769	46.789	46.810	46.830	46.850	46.870	2330
2340	46.870	46.890	46.910	46.931	46.951	46.971	46.991	47.011	47.031	47.051	47.071	2340
2350	47.071	47.092	47.112	47.132	47.152	47.172	47.192	47.212	47.232	47.252	47.272	**2350**
2360	47.272	47.292	47.312	47.333	47.353	47.373	47.393	47.413	47.433	47.453	47.473	2360
2370	47.473	47.493	47.513									2370
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1250	45.694	45.731	45.767	45.804	45.841	45.877	45.914	45.951	45.987	46.024	46.060	**1250**
1260	46.060	46.097	46.133	46.170	46.207	46.243	46.280	46.316	46.353	46.389	46.425	1260
1270	46.425	46.462	46.498	46.535	46.571	46.608	46.644	46.680	46.717	46.753	46.789	1270
1280	46.789	46.826	46.862	46.898	46.935	46.971	47.007	47.043	47.079	47.116	47.152	1280
1290	47.152	47.188	47.224	47.260	47.296	47.333	47.369	47.405	47.441	47.477	47.513	1290
1300	47.513											**1300**
°C	0	1	2	3	4	5	6	7	8	9	10	°C

N

Type R - PT 13% RH vs Platinum

-58 °F - 450 °F

EMF in Millivolts — Reference Junction 32°F

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°F
-50	-0.210	-0.212	-0.214	-0.216	-0.218	-0.220	-0.222	-0.224	-0.226			**-50**
-40	-0.188	-0.190	-0.192	-0.194	-0.197	-0.199	-0.201	-0.203	-0.205	-0.208	-0.210	-40
-30	-0.165	-0.167	-0.169	-0.172	-0.174	-0.176	-0.179	-0.181	-0.183	-0.185	-0.188	-30
-20	-0.141	-0.143	-0.145	-0.148	-0.150	-0.153	-0.155	-0.158	-0.160	-0.162	-0.165	-20
-10	-0.116	-0.118	-0.121	-0.123	-0.126	-0.128	-0.131	-0.133	-0.136	-0.138	-0.141	-10
0	-0.090	-0.092	-0.095	-0.097	-0.100	-0.103	-0.105	-0.108	-0.110	-0.113	-0.116	**0**
0	-0.090	-0.087	-0.084	-0.082	-0.079	-0.076	-0.073	-0.071	-0.068	-0.065	-0.063	**0**
10	-0.063	-0.060	-0.057	-0.054	-0.051	-0.049	-0.046	-0.043	-0.040	-0.037	-0.035	10
20	-0.035	-0.032	-0.029	-0.026	-0.023	-0.020	-0.017	-0.015	-0.012	-0.009	-0.006	20
30	-0.006	-0.003	0.000	0.003	0.006	0.009	0.012	0.015	0.018	0.021	0.024	30
40	0.024	0.027	0.030	0.033	0.036	0.039	0.042	0.045	0.048	0.051	0.054	40
50	0.054	0.057	0.060	0.064	0.067	0.070	0.073	0.076	0.079	0.082	0.086	**50**
60	0.086	0.089	0.092	0.095	0.098	0.102	0.105	0.108	0.111	0.114	0.118	60
70	0.118	0.121	0.124	0.127	0.131	0.134	0.137	0.141	0.144	0.147	0.151	70
80	0.151	0.154	0.157	0.161	0.164	0.167	0.171	0.174	0.177	0.181	0.184	80
90	0.184	0.188	0.191	0.194	0.198	0.201	0.205	0.208	0.212	0.215	0.218	90
100	0.218	0.222	0.225	0.229	0.232	0.236	0.239	0.243	0.246	0.250	0.254	**100**
110	0.254	0.257	0.261	0.264	0.268	0.271	0.275	0.278	0.282	0.286	0.289	110
120	0.289	0.293	0.296	0.300	0.304	0.307	0.311	0.315	0.318	0.322	0.326	120
130	0.326	0.329	0.333	0.337	0.340	0.344	0.348	0.352	0.355	0.359	0.363	130
140	0.363	0.366	0.370	0.374	0.378	0.382	0.385	0.389	0.393	0.397	0.400	140
150	0.400	0.404	0.408	0.412	0.416	0.420	0.423	0.427	0.431	0.435	0.439	**150**
160	0.439	0.443	0.447	0.450	0.454	0.458	0.462	0.466	0.470	0.474	0.478	160
170	0.478	0.482	0.486	0.489	0.493	0.497	0.501	0.505	0.509	0.513	0.517	170
180	0.517	0.521	0.525	0.529	0.533	0.537	0.541	0.545	0.549	0.553	0.557	180
190	0.557	0.561	0.565	0.569	0.573	0.578	0.582	0.586	0.590	0.594	0.598	190
200	0.598	0.602	0.606	0.610	0.614	0.618	0.623	0.627	0.631	0.635	0.639	**200**
210	0.639	0.643	0.647	0.652	0.656	0.660	0.664	0.668	0.672	0.677	0.681	210
220	0.681	0.685	0.689	0.693	0.698	0.702	0.706	0.710	0.715	0.719	0.723	220
230	0.723	0.727	0.732	0.736	0.740	0.744	0.749	0.753	0.757	0.761	0.766	230
240	0.766	0.770	0.774	0.779	0.783	0.787	0.792	0.796	0.800	0.805	0.809	240
250	0.809	0.813	0.818	0.822	0.826	0.831	0.835	0.839	0.844	0.848	0.853	**250**
260	0.853	0.857	0.861	0.866	0.870	0.875	0.879	0.883	0.888	0.892	0.897	260
270	0.897	0.901	0.906	0.910	0.915	0.919	0.923	0.928	0.932	0.937	0.941	270
280	0.941	0.946	0.950	0.955	0.959	0.964	0.968	0.973	0.977	0.982	0.986	280
290	0.986	0.991	0.995	1.000	1.005	1.009	1.014	1.018	1.023	1.027	1.032	290
300	1.032	1.036	1.041	1.046	1.050	1.055	1.059	1.064	1.069	1.073	1.078	**300**
310	1.078	1.082	1.087	1.092	1.096	1.101	1.105	1.110	1.115	1.119	1.124	310
320	1.124	1.129	1.133	1.138	1.143	1.147	1.152	1.157	1.161	1.166	1.171	320
330	1.171	1.175	1.180	1.185	1.190	1.194	1.199	1.204	1.208	1.213	1.218	330
340	1.218	1.223	1.227	1.232	1.237	1.242	1.246	1.251	1.256	1.261	1.265	340
350	1.265	1.270	1.275	1.280	1.284	1.289	1.294	1.299	1.304	1.308	1.313	**350**
360	1.313	1.318	1.323	1.328	1.332	1.337	1.342	1.347	1.352	1.356	1.361	360
370	1.361	1.366	1.371	1.376	1.381	1.386	1.390	1.395	1.400	1.405	1.410	370
380	1.410	1.415	1.420	1.425	1.429	1.434	1.439	1.444	1.449	1.454	1.459	380
390	1.459	1.464	1.469	1.473	1.478	1.483	1.488	1.493	1.498	1.503	1.508	390
400	1.508	1.513	1.518	1.523	1.528	1.533	1.538	1.543	1.548	1.553	1.558	**400**
410	1.558	1.563	1.568	1.572	1.577	1.582	1.587	1.592	1.597	1.602	1.607	410
420	1.607	1.612	1.617	1.622	1.627	1.632	1.638	1.643	1.648	1.653	1.658	420
430	1.658	1.663	1.668	1.673	1.678	1.683	1.688	1.693	1.698	1.703	1.708	430
440	1.708	1.713	1.718	1.723	1.728	1.733	1.739	1.744	1.749	1.754	1.759	440
°F	0	1	2	3	4	5	6	7	8	9	10	°F

R

-50 °C - 250 °C

EMF in Millivolts — Reference Junctions 0 °C

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°C
-50	-0.226											**-50**
-40	-0.188	-0.192	-0.196	-0.200	-0.204	-0.208	-0.211	-0.215	-0.219	-0.223	-0.226	-40
-30	-0.145	-0.150	-0.154	-0.158	-0.163	-0.167	-0.171	-0.175	-0.180	-0.184	-0.188	-30
-20	-0.100	-0.105	-0.109	-0.114	-0.119	-0.123	-0.128	-0.132	-0.137	-0.141	-0.145	-20
-10	-0.051	-0.056	-0.061	-0.066	-0.071	-0.076	-0.081	-0.086	-0.091	-0.095	-0.100	-10
0	0.000	-0.005	-0.011	-0.016	-0.021	-0.026	-0.031	-0.036	-0.041	-0.046	-0.051	**0**
0	0.000	0.005	0.011	0.016	0.021	0.027	0.032	0.038	0.043	0.049	0.054	**0**
10	0.054	0.060	0.065	0.071	0.077	0.082	0.088	0.094	0.100	0.105	0.111	10
20	0.111	0.117	0.123	0.129	0.135	0.141	0.147	0.153	0.159	0.165	0.171	20
30	0.171	0.177	0.183	0.189	0.195	0.201	0.207	0.214	0.220	0.226	0.232	30
40	0.232	0.239	0.245	0.251	0.258	0.264	0.271	0.277	0.284	0.290	0.296	40
50	0.296	0.303	0.310	0.316	0.323	0.329	0.336	0.343	0.349	0.356	0.363	**50**
60	0.363	0.369	0.376	0.383	0.390	0.397	0.403	0.410	0.417	0.424	0.431	60
70	0.431	0.438	0.445	0.452	0.459	0.466	0.473	0.480	0.487	0.494	0.501	70
80	0.501	0.508	0.516	0.523	0.530	0.537	0.544	0.552	0.559	0.566	0.573	80
90	0.573	0.581	0.588	0.595	0.603	0.610	0.618	0.625	0.632	0.640	0.647	90
100	0.647	0.655	0.662	0.670	0.677	0.685	0.693	0.700	0.708	0.715	0.723	**100**
110	0.723	0.731	0.738	0.746	0.754	0.761	0.769	0.777	0.785	0.792	0.800	110
120	0.800	0.808	0.816	0.824	0.832	0.839	0.847	0.855	0.863	0.871	0.879	120
130	0.879	0.887	0.895	0.903	0.911	0.919	0.927	0.935	0.943	0.951	0.959	130
140	0.959	0.967	0.976	0.984	0.992	1.000	1.008	1.016	1.025	1.033	1.041	140
150	1.041	1.049	1.058	1.066	1.074	1.082	1.091	1.099	1.107	1.116	1.124	**150**
160	1.124	1.132	1.141	1.149	1.158	1.166	1.175	1.183	1.191	1.200	1.208	160
170	1.208	1.217	1.225	1.234	1.242	1.251	1.260	1.268	1.277	1.285	1.294	170
180	1.294	1.303	1.311	1.320	1.329	1.337	1.346	1.355	1.363	1.372	1.381	180
190	1.381	1.389	1.398	1.407	1.416	1.425	1.433	1.442	1.451	1.460	1.469	190
200	1.469	1.477	1.486	1.495	1.504	1.513	1.522	1.531	1.540	1.549	1.558	**200**
210	1.558	1.567	1.575	1.584	1.593	1.602	1.611	1.620	1.629	1.639	1.648	210
220	1.648	1.657	1.666	1.675	1.684	1.693	1.702	1.711	1.720	1.729	1.739	220
230	1.739	1.748	1.757	1.766	1.775	1.784	1.794	1.803	1.812	1.821	1.831	230
240	1.831	1.840	1.849	1.858	1.868	1.877	1.886	1.895	1.905	1.914	1.923	240
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type R - PT 13% RH vs Platinum

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
450	1.759	1.764	1.769	1.774	1.779	1.784	1.790	1.795	1.800	1.805	1.810	**450**
460	1.810	1.815	1.820	1.825	1.831	1.836	1.841	1.846	1.851	1.856	1.861	460
470	1.861	1.867	1.872	1.877	1.882	1.887	1.892	1.898	1.903	1.908	1.913	470
480	1.913	1.918	1.923	1.929	1.934	1.939	1.944	1.949	1.955	1.960	1.965	480
490	1.965	1.970	1.975	1.981	1.986	1.991	1.996	2.002	2.007	2.012	2.017	490
500	2.017	2.022	2.028	2.033	2.038	2.043	2.049	2.054	2.059	2.064	2.070	**500**
510	2.070	2.075	2.080	2.085	2.091	2.096	2.101	2.107	2.112	2.117	2.122	510
520	2.122	2.128	2.133	2.138	2.144	2.149	2.154	2.159	2.165	2.170	2.175	520
530	2.175	2.181	2.186	2.191	2.197	2.202	2.207	2.213	2.218	2.223	2.229	530
540	2.229	2.234	2.239	2.245	2.250	2.255	2.261	2.266	2.271	2.277	2.282	540
550	2.282	2.287	2.293	2.298	2.304	2.309	2.314	2.320	2.325	2.330	2.336	**550**
560	2.336	2.341	2.347	2.352	2.357	2.363	2.368	2.374	2.379	2.384	2.390	560
570	2.390	2.395	2.401	2.406	2.411	2.417	2.422	2.428	2.433	2.438	2.444	570
580	2.444	2.449	2.455	2.460	2.466	2.471	2.477	2.482	2.487	2.493	2.498	580
590	2.498	2.504	2.509	2.515	2.520	2.526	2.531	2.537	2.542	2.547	2.553	590
600	2.553	2.558	2.564	2.569	2.575	2.580	2.586	2.591	2.597	2.602	2.608	**600**
610	2.608	2.613	2.619	2.624	2.630	2.635	2.641	2.646	2.652	2.657	2.663	610
620	2.663	2.668	2.674	2.679	2.685	2.690	2.696	2.701	2.707	2.713	2.718	620
630	2.718	2.724	2.729	2.735	2.740	2.746	2.751	2.757	2.762	2.768	2.773	630
640	2.773	2.779	2.785	2.790	2.796	2.801	2.807	2.812	2.818	2.824	2.829	640
650	2.829	2.835	2.840	2.846	2.851	2.857	2.863	2.868	2.874	2.879	2.885	**650**
660	2.885	2.891	2.896	2.902	2.907	2.913	2.919	2.924	2.930	2.935	2.941	660
670	2.941	2.947	2.952	2.958	2.964	2.969	2.975	2.980	2.986	2.992	2.997	670
680	2.997	3.003	3.009	3.014	3.020	3.026	3.031	3.037	3.042	3.048	3.054	680
690	3.054	3.059	3.065	3.071	3.076	3.082	3.088	3.093	3.099	3.105	3.110	690
700	3.110	3.116	3.122	3.127	3.133	3.139	3.144	3.150	3.156	3.161	3.167	**700**
710	3.167	3.173	3.179	3.184	3.190	3.196	3.201	3.207	3.213	3.218	3.224	710
720	3.224	3.230	3.236	3.241	3.247	3.253	3.258	3.264	3.270	3.276	3.281	720
730	3.281	3.287	3.293	3.298	3.304	3.310	3.316	3.321	3.327	3.333	3.339	730
740	3.339	3.344	3.350	3.356	3.362	3.367	3.373	3.379	3.385	3.390	3.396	740
750	3.396	3.402	3.408	3.413	3.419	3.425	3.431	3.437	3.442	3.448	3.454	**750**
760	3.454	3.460	3.465	3.471	3.477	3.483	3.489	3.494	3.500	3.506	3.512	760
770	3.512	3.517	3.523	3.529	3.535	3.541	3.546	3.552	3.558	3.564	3.570	770
780	3.570	3.576	3.581	3.587	3.593	3.599	3.605	3.610	3.616	3.622	3.628	780
790	3.628	3.634	3.640	3.645	3.651	3.657	3.663	3.669	3.675	3.680	3.686	790
800	3.686	3.692	3.698	3.704	3.710	3.716	3.721	3.727	3.733	3.739	3.745	**800**
810	3.745	3.751	3.757	3.762	3.768	3.774	3.780	3.786	3.792	3.798	3.803	810
820	3.803	3.809	3.815	3.821	3.827	3.833	3.839	3.845	3.851	3.856	3.862	820
830	3.862	3.868	3.874	3.880	3.886	3.892	3.898	3.904	3.909	3.915	3.921	830
840	3.921	3.927	3.933	3.939	3.945	3.951	3.957	3.963	3.969	3.975	3.980	840
850	3.980	3.986	3.992	3.998	4.004	4.010	4.016	4.022	4.028	4.034	4.040	**850**
860	4.040	4.046	4.052	4.058	4.064	4.069	4.075	4.081	4.087	4.093	4.099	860
870	4.099	4.105	4.111	4.117	4.123	4.129	4.135	4.141	4.147	4.153	4.159	870
880	4.159	4.165	4.171	4.177	4.183	4.189	4.195	4.201	4.207	4.213	4.219	880
890	4.219	4.225	4.231	4.237	4.243	4.249	4.255	4.261	4.267	4.273	4.279	890
900	4.279	4.285	4.291	4.297	4.303	4.309	4.315	4.321	4.327	4.333	4.339	**900**
910	4.339	4.345	4.351	4.357	4.363	4.369	4.375	4.381	4.387	4.393	4.399	910
920	4.399	4.405	4.411	4.417	4.423	4.429	4.435	4.441	4.447	4.453	4.459	920
930	4.459	4.465	4.471	4.477	4.483	4.489	4.495	4.502	4.508	4.514	4.520	930
940	4.520	4.526	4.532	4.538	4.544	4.550	4.556	4.562	4.568	4.574	4.580	940
°F	0	1	2	3	4	5	6	7	8	9	10	°F

R

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
250	1.923	1.933	1.942	1.951	1.961	1.970	1.980	1.989	1.998	2.008	2.017	**250**
260	2.017	2.027	2.036	2.046	2.055	2.064	2.074	2.083	2.093	2.102	2.112	260
270	2.112	2.121	2.131	2.140	2.150	2.159	2.169	2.179	2.188	2.198	2.207	270
280	2.207	2.217	2.226	2.236	2.246	2.255	2.265	2.275	2.284	2.294	2.304	280
290	2.304	2.313	2.323	2.333	2.342	2.352	2.362	2.371	2.381	2.391	2.401	290
300	2.401	2.410	2.420	2.430	2.440	2.449	2.459	2.469	2.479	2.488	2.498	**300**
310	2.498	2.508	2.518	2.528	2.538	2.547	2.557	2.567	2.577	2.587	2.597	310
320	2.597	2.607	2.617	2.626	2.636	2.646	2.656	2.666	2.676	2.686	2.696	320
330	2.696	2.706	2.716	2.726	2.736	2.746	2.756	2.766	2.776	2.786	2.796	330
340	2.796	2.806	2.816	2.826	2.836	2.846	2.856	2.866	2.876	2.886	2.896	340
350	2.896	2.906	2.916	2.926	2.937	2.947	2.957	2.967	2.977	2.987	2.997	**350**
360	2.997	3.007	3.018	3.028	3.038	3.048	3.058	3.068	3.079	3.089	3.099	360
370	3.099	3.109	3.119	3.130	3.140	3.150	3.160	3.171	3.181	3.191	3.201	370
380	3.201	3.212	3.222	3.232	3.242	3.253	3.263	3.273	3.284	3.294	3.304	380
390	3.304	3.315	3.325	3.335	3.346	3.356	3.366	3.377	3.387	3.397	3.408	390
400	3.408	3.418	3.428	3.439	3.449	3.460	3.470	3.480	3.491	3.501	3.512	**400**
410	3.512	3.522	3.533	3.543	3.553	3.564	3.574	3.585	3.595	3.606	3.616	410
420	3.616	3.627	3.637	3.648	3.658	3.669	3.679	3.690	3.700	3.711	3.721	420
430	3.721	3.732	3.742	3.753	3.764	3.774	3.785	3.795	3.806	3.816	3.827	430
440	3.827	3.838	3.848	3.859	3.869	3.880	3.891	3.901	3.912	3.922	3.933	440
450	3.933	3.944	3.954	3.965	3.976	3.986	3.997	4.008	4.018	4.029	4.040	**450**
460	4.040	4.050	4.061	4.072	4.083	4.093	4.104	4.115	4.125	4.136	4.147	460
470	4.147	4.158	4.168	4.179	4.190	4.201	4.211	4.222	4.233	4.244	4.255	470
480	4.255	4.265	4.276	4.287	4.298	4.309	4.319	4.330	4.341	4.352	4.363	480
490	4.363	4.373	4.384	4.395	4.406	4.417	4.428	4.439	4.449	4.460	4.471	490
500	4.471	4.482	4.493	4.504	4.515	4.526	4.537	4.548	4.558	4.569	4.580	**500**
510	4.580	4.591	4.602	4.613	4.624	4.635	4.646	4.657	4.668	4.679	4.690	510
520	4.690	4.701	4.712	4.723	4.734	4.745	4.756	4.767	4.778	4.789	4.800	520
530	4.800	4.811	4.822	4.833	4.844	4.855	4.866	4.877	4.888	4.899	4.910	530
540	4.910	4.922	4.933	4.944	4.955	4.966	4.977	4.988	4.999	5.010	5.021	540
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
950	4.580	4.586	4.593	4.599	4.605	4.611	4.617	4.623	4.629	4.635	4.641	**950**
960	4.641	4.647	4.653	4.659	4.666	4.672	4.678	4.684	4.690	4.696	4.702	960
970	4.702	4.708	4.714	4.720	4.727	4.733	4.739	4.745	4.751	4.757	4.763	970
980	4.763	4.769	4.775	4.782	4.788	4.794	4.800	4.806	4.812	4.818	4.824	980
990	4.824	4.831	4.837	4.843	4.849	4.855	4.861	4.867	4.874	4.880	4.886	990
1000	4.886	4.892	4.898	4.904	4.910	4.917	4.923	4.929	4.935	4.941	4.947	**1000**
1010	4.947	4.954	4.960	4.966	4.972	4.978	4.984	4.991	4.997	5.003	5.009	1010
1020	5.009	5.015	5.021	5.028	5.034	5.040	5.046	5.052	5.059	5.065	5.071	1020
1030	5.071	5.077	5.083	5.090	5.096	5.102	5.108	5.114	5.121	5.127	5.133	1030
1040	5.133	5.139	5.145	5.152	5.158	5.164	5.170	5.176	5.183	5.189	5.195	1040
1050	5.195	5.201	5.207	5.214	5.220	5.226	5.232	5.239	5.245	5.251	5.257	**1050**
1060	5.257	5.264	5.270	5.276	5.282	5.289	5.295	5.301	5.307	5.313	5.320	1060
1070	5.320	5.326	5.332	5.338	5.345	5.351	5.357	5.364	5.370	5.376	5.382	1070
1080	5.382	5.389	5.395	5.401	5.407	5.414	5.420	5.426	5.432	5.439	5.445	1080
1090	5.445	5.451	5.458	5.464	5.470	5.476	5.483	5.489	5.495	5.502	5.508	1090
1100	5.508	5.514	5.520	5.527	5.533	5.539	5.546	5.552	5.558	5.565	5.571	**1100**
1110	5.571	5.577	5.583	5.590	5.596	5.602	5.609	5.615	5.621	5.628	5.634	1110
1120	5.634	5.640	5.647	5.653	5.659	5.666	5.672	5.678	5.685	5.691	5.697	1120
1130	5.697	5.704	5.710	5.716	5.723	5.729	5.735	5.742	5.748	5.754	5.761	1130
1140	5.761	5.767	5.773	5.780	5.786	5.792	5.799	5.805	5.812	5.818	5.824	1140
1150	5.824	5.831	5.837	5.843	5.850	5.856	5.862	5.869	5.875	5.882	5.888	**1150**
1160	5.888	5.894	5.901	5.907	5.913	5.920	5.926	5.933	5.939	5.945	5.952	1160
1170	5.952	5.958	5.965	5.971	5.977	5.984	5.990	5.997	6.003	6.009	6.016	1170
1180	6.016	6.022	6.029	6.035	6.041	6.048	6.054	6.061	6.067	6.074	6.080	1180
1190	6.080	6.086	6.093	6.099	6.106	6.112	6.119	6.125	6.131	6.138	6.144	1190
1200	6.144	6.151	6.157	6.164	6.170	6.176	6.183	6.189	6.196	6.202	6.209	**1200**
1210	6.209	6.215	6.222	6.228	6.235	6.241	6.247	6.254	6.260	6.267	6.273	1210
1220	6.273	6.280	6.286	6.293	6.299	6.306	6.312	6.319	6.325	6.332	6.338	1220
1230	6.338	6.345	6.351	6.358	6.364	6.370	6.377	6.383	6.390	6.396	6.403	1230
1240	6.403	6.409	6.416	6.422	6.429	6.435	6.442	6.448	6.455	6.461	6.468	1240
1250	6.468	6.474	6.481	6.488	6.494	6.501	6.507	6.514	6.520	6.527	6.533	**1250**
1260	6.533	6.540	6.546	6.553	6.559	6.566	6.572	6.579	6.585	6.592	6.598	1260
1270	6.598	6.605	6.612	6.618	6.625	6.631	6.638	6.644	6.651	6.657	6.664	1270
1280	6.664	6.671	6.677	6.684	6.690	6.697	6.703	6.710	6.716	6.723	6.730	1280
1290	6.730	6.736	6.743	6.749	6.756	6.762	6.769	6.776	6.782	6.789	6.795	1290
1300	6.795	6.802	6.809	6.815	6.822	6.828	6.835	6.841	6.848	6.855	6.861	**1300**
1310	6.861	6.868	6.874	6.881	6.888	6.894	6.901	6.908	6.914	6.921	6.927	1310
1320	6.927	6.934	6.941	6.947	6.954	6.960	6.967	6.974	6.980	6.987	6.994	1320
1330	6.994	7.000	7.007	7.013	7.020	7.027	7.033	7.040	7.047	7.053	7.060	1330
1340	7.060	7.067	7.073	7.080	7.086	7.093	7.100	7.106	7.113	7.120	7.126	1340
1350	7.126	7.133	7.140	7.146	7.153	7.160	7.166	7.173	7.180	7.186	7.193	**1350**
1360	7.193	7.200	7.206	7.213	7.220	7.226	7.233	7.240	7.247	7.253	7.260	1360
1370	7.260	7.267	7.273	7.280	7.287	7.293	7.300	7.307	7.313	7.320	7.327	1370
1380	7.327	7.334	7.340	7.347	7.354	7.360	7.367	7.374	7.381	7.387	7.394	1380
1390	7.394	7.401	7.407	7.414	7.421	7.428	7.434	7.441	7.448	7.454	7.461	1390
1400	7.461	7.468	7.475	7.481	7.488	7.495	7.502	7.508	7.515	7.522	7.529	**1400**
1410	7.529	7.535	7.542	7.549	7.556	7.562	7.569	7.576	7.583	7.589	7.596	1410
1420	7.596	7.603	7.610	7.616	7.623	7.630	7.637	7.644	7.650	7.657	7.664	1420
1430	7.664	7.671	7.677	7.684	7.691	7.698	7.705	7.711	7.718	7.725	7.732	1430
1440	7.732	7.739	7.745	7.752	7.759	7.766	7.772	7.779	7.786	7.793	7.800	1440
°F	0	1	2	3	4	5	6	7	8	9	10	°F

R

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
550	5.021	5.033	5.044	5.055	5.066	5.077	5.088	5.099	5.111	5.122	5.133	**550**
560	5.133	5.144	5.155	5.166	5.178	5.189	5.200	5.211	5.222	5.234	5.245	560
570	5.245	5.256	5.267	5.279	5.290	5.301	5.312	5.323	5.335	5.346	5.357	570
580	5.357	5.369	5.380	5.391	5.402	5.414	5.425	5.436	5.448	5.459	5.470	580
590	5.470	5.481	5.493	5.504	5.515	5.527	5.538	5.549	5.561	5.572	5.583	590
600	5.583	5.595	5.606	5.618	5.629	5.640	5.652	5.663	5.674	5.686	5.697	**600**
610	5.697	5.709	5.720	5.731	5.743	5.754	5.766	5.777	5.789	5.800	5.812	610
620	5.812	5.823	5.834	5.846	5.857	5.869	5.880	5.892	5.903	5.915	5.926	620
630	5.926	5.938	5.949	5.961	5.972	5.984	5.995	6.007	6.018	6.030	6.041	630
640	6.041	6.053	6.065	6.076	6.088	6.099	6.111	6.122	6.134	6.146	6.157	640
650	6.157	6.169	6.180	6.192	6.204	6.215	6.227	6.238	6.250	6.262	6.273	**650**
660	6.273	6.285	6.297	6.308	6.320	6.332	6.343	6.355	6.367	6.378	6.390	660
670	6.390	6.402	6.413	6.425	6.437	6.448	6.460	6.472	6.484	6.495	6.507	670
680	6.507	6.519	6.531	6.542	6.554	6.566	6.578	6.589	6.601	6.613	6.625	680
690	6.625	6.636	6.648	6.660	6.672	6.684	6.695	6.707	6.719	6.731	6.743	690
700	6.743	6.755	6.766	6.778	6.790	6.802	6.814	6.826	6.838	6.849	6.861	**700**
710	6.861	6.873	6.885	6.897	6.909	6.921	6.933	6.945	6.956	6.968	6.980	710
720	6.980	6.992	7.004	7.016	7.028	7.040	7.052	7.064	7.076	7.088	7.100	720
730	7.100	7.112	7.124	7.136	7.148	7.160	7.172	7.184	7.196	7.208	7.220	730
740	7.220	7.232	7.244	7.256	7.268	7.280	7.292	7.304	7.316	7.328	7.340	740
750	7.340	7.352	7.364	7.376	7.389	7.401	7.413	7.425	7.437	7.449	7.461	**750**
760	7.461	7.473	7.485	7.498	7.510	7.522	7.534	7.546	7.558	7.570	7.583	760
770	7.583	7.595	7.607	7.619	7.631	7.644	7.656	7.668	7.680	7.692	7.705	770
780	7.705	7.717	7.729	7.741	7.753	7.766	7.778	7.790	7.802	7.815	7.827	780
790	7.827	7.839	7.851	7.864	7.876	7.888	7.901	7.913	7.925	7.938	7.950	790
800	7.950	7.962	7.974	7.987	7.999	8.011	8.024	8.036	8.048	8.061	8.073	**800**
810	8.073	8.086	8.098	8.110	8.123	8.135	8.147	8.160	8.172	8.185	8.197	810
820	8.197	8.209	8.222	8.234	8.247	8.259	8.272	8.284	8.296	8.309	8.321	820
830	8.321	8.334	8.346	8.359	8.371	8.384	8.396	8.409	8.421	8.434	8.446	830
840	8.446	8.459	8.471	8.484	8.496	8.509	8.521	8.534	8.546	8.559	8.571	840
°C	0	1	2	3	4	5	6	7	8	9	10	°C

R

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1450	7.800	7.807	7.813	7.820	7.827	7.834	7.841	7.847	7.854	7.861	7.868	**1450**
1460	7.868	7.875	7.882	7.888	7.895	7.902	7.909	7.916	7.922	7.929	7.936	1460
1470	7.936	7.943	7.950	7.957	7.964	7.970	7.977	7.984	7.991	7.998	8.005	1470
1480	8.005	8.011	8.018	8.025	8.032	8.039	8.046	8.053	8.059	8.066	8.073	1480
1490	8.073	8.080	8.087	8.094	8.101	8.108	8.114	8.121	8.128	8.135	8.142	1490
1500	8.142	8.149	8.156	8.163	8.169	8.176	8.183	8.190	8.197	8.204	8.211	**1500**
1510	8.211	8.218	8.225	8.232	8.238	8.245	8.252	8.259	8.266	8.273	8.280	1510
1520	8.280	8.287	8.294	8.301	8.308	8.314	8.321	8.328	8.335	8.342	8.349	1520
1530	8.349	8.356	8.363	8.370	8.377	8.384	8.391	8.398	8.405	8.411	8.418	1530
1540	8.418	8.425	8.432	8.439	8.446	8.453	8.460	8.467	8.474	8.481	8.488	1540
1550	8.488	8.495	8.502	8.509	8.516	8.523	8.530	8.537	8.544	8.551	8.557	**1550**
1560	8.557	8.564	8.571	8.578	8.585	8.592	8.599	8.606	8.613	8.620	8.627	1560
1570	8.627	8.634	8.641	8.648	8.655	8.662	8.669	8.676	8.683	8.690	8.697	1570
1580	8.697	8.704	8.711	8.718	8.725	8.732	8.739	8.746	8.753	8.760	8.767	1580
1590	8.767	8.774	8.781	8.788	8.795	8.802	8.809	8.816	8.823	8.830	8.837	1590
1600	8.837	8.844	8.852	8.859	8.866	8.873	8.880	8.887	8.894	8.901	8.908	**1600**
1610	8.908	8.915	8.922	8.929	8.936	8.943	8.950	8.957	8.964	8.971	8.978	1610
1620	8.978	8.985	8.992	8.999	9.007	9.014	9.021	9.028	9.035	9.042	9.049	1620
1630	9.049	9.056	9.063	9.070	9.077	9.084	9.091	9.098	9.106	9.113	9.120	1630
1640	9.120	9.127	9.134	9.141	9.148	9.155	9.162	9.169	9.176	9.184	9.191	1640
1650	9.191	9.198	9.205	9.212	9.219	9.226	9.233	9.240	9.248	9.255	9.262	**1650**
1660	9.262	9.269	9.276	9.283	9.290	9.297	9.304	9.312	9.319	9.326	9.333	1660
1670	9.333	9.340	9.347	9.354	9.361	9.369	9.376	9.383	9.390	9.397	9.404	1670
1680	9.404	9.411	9.419	9.426	9.433	9.440	9.447	9.454	9.461	9.469	9.476	1680
1690	9.476	9.483	9.490	9.497	9.504	9.512	9.519	9.526	9.533	9.540	9.547	1690
1700	9.547	9.555	9.562	9.569	9.576	9.583	9.590	9.598	9.605	9.612	9.619	**1700**
1710	9.619	9.626	9.634	9.641	9.648	9.655	9.662	9.670	9.677	9.684	9.691	1710
1720	9.691	9.698	9.706	9.713	9.720	9.727	9.734	9.742	9.749	9.756	9.763	1720
1730	9.763	9.770	9.778	9.785	9.792	9.799	9.806	9.814	9.821	9.828	9.835	1730
1740	9.835	9.843	9.850	9.857	9.864	9.872	9.879	9.886	9.893	9.900	9.908	1740
1750	9.908	9.915	9.922	9.929	9.937	9.944	9.951	9.958	9.966	9.973	9.980	**1750**
1760	9.980	9.987	9.995	10.002	10.009	10.016	10.024	10.031	10.038	10.046	10.053	1760
1770	10.053	10.060	10.067	10.075	10.082	10.089	10.096	10.104	10.111	10.118	10.126	1770
1780	10.126	10.133	10.140	10.147	10.155	10.162	10.169	10.177	10.184	10.191	10.198	1780
1790	10.198	10.206	10.213	10.220	10.228	10.235	10.242	10.250	10.257	10.264	10.271	1790
1800	10.271	10.279	10.286	10.293	10.301	10.308	10.315	10.323	10.330	10.337	10.345	**1800**
1810	10.345	10.352	10.359	10.367	10.374	10.381	10.389	10.396	10.403	10.411	10.418	1810
1820	10.418	10.425	10.433	10.440	10.447	10.455	10.462	10.469	10.477	10.484	10.491	1820
1830	10.491	10.499	10.506	10.513	10.521	10.528	10.535	10.543	10.550	10.557	10.565	1830
1840	10.565	10.572	10.580	10.587	10.594	10.602	10.609	10.616	10.624	10.631	10.638	1840
1850	10.638	10.646	10.653	10.661	10.668	10.675	10.683	10.690	10.698	10.705	10.712	**1850**
1860	10.712	10.720	10.727	10.734	10.742	10.749	10.757	10.764	10.771	10.779	10.786	1860
1870	10.786	10.794	10.801	10.808	10.816	10.823	10.831	10.838	10.845	10.853	10.860	1870
1880	10.860	10.868	10.875	10.883	10.890	10.897	10.905	10.912	10.920	10.927	10.934	1880
1890	10.934	10.942	10.949	10.957	10.964	10.972	10.979	10.986	10.994	11.001	11.009	1890
1900	11.009	11.016	11.024	11.031	11.039	11.046	11.053	11.061	11.068	11.076	11.083	**1900**
1910	11.083	11.091	11.098	11.106	11.113	11.121	11.128	11.135	11.143	11.150	11.158	1910
1920	11.158	11.165	11.173	11.180	11.188	11.195	11.203	11.210	11.218	11.225	11.233	1920
1930	11.233	11.240	11.247	11.255	11.262	11.270	11.277	11.285	11.292	11.300	11.307	1930
1940	11.307	11.315	11.322	11.330	11.337	11.345	11.352	11.360	11.367	11.375	11.382	1940
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
850	8.571	8.584	8.597	8.609	8.622	8.634	8.647	8.659	8.672	8.685	8.697	**850**
860	8.697	8.710	8.722	8.735	8.748	8.760	8.773	8.785	8.798	8.811	8.823	860
870	8.823	8.836	8.849	8.861	8.874	8.887	8.899	8.912	8.925	8.937	8.950	870
880	8.950	8.963	8.975	8.988	9.001	9.014	9.026	9.039	9.052	9.065	9.077	880
890	9.077	9.090	9.103	9.115	9.128	9.141	9.154	9.167	9.179	9.192	9.205	890
900	9.205	9.218	9.230	9.243	9.256	9.269	9.282	9.294	9.307	9.320	9.333	**900**
910	9.333	9.346	9.359	9.371	9.384	9.397	9.410	9.423	9.436	9.449	9.461	910
920	9.461	9.474	9.487	9.500	9.513	9.526	9.539	9.552	9.565	9.578	9.590	920
930	9.590	9.603	9.616	9.629	9.642	9.655	9.668	9.681	9.694	9.707	9.720	930
940	9.720	9.733	9.746	9.759	9.772	9.785	9.798	9.811	9.824	9.837	9.850	940
950	9.850	9.863	9.876	9.889	9.902	9.915	9.928	9.941	9.954	9.967	9.980	**950**
960	9.980	9.993	10.006	10.019	10.032	10.046	10.059	10.072	10.085	10.098	10.111	960
970	10.111	10.124	10.137	10.150	10.163	10.177	10.190	10.203	10.216	10.229	10.242	970
980	10.242	10.255	10.268	10.282	10.295	10.308	10.321	10.334	10.347	10.361	10.374	980
990	10.374	10.387	10.400	10.413	10.427	10.440	10.453	10.466	10.480	10.493	10.506	990
1000	10.506	10.519	10.532	10.546	10.559	10.572	10.585	10.599	10.612	10.625	10.638	**1000**
1010	10.638	10.652	10.665	10.678	10.692	10.705	10.718	10.731	10.745	10.758	10.771	1010
1020	10.771	10.785	10.798	10.811	10.825	10.838	10.851	10.865	10.878	10.891	10.905	1020
1030	10.905	10.918	10.932	10.945	10.958	10.972	10.985	10.998	11.012	11.025	11.039	1030
1040	11.039	11.052	11.065	11.079	11.092	11.106	11.119	11.132	11.146	11.159	11.173	1040
1050	11.173	11.186	11.200	11.213	11.227	11.240	11.253	11.267	11.280	11.294	11.307	**1050**
1060	11.307	11.321	11.334	11.348	11.361	11.375	11.388	11.402	11.415	11.429	11.442	1060
1070	11.442	11.456	11.469	11.483	11.496	11.510	11.524	11.537	11.551	11.564	11.578	1070
1080	11.578	11.591	11.605	11.618	11.632	11.646	11.659	11.673	11.686	11.700	11.714	1080
1090	11.714	11.727	11.741	11.754	11.768	11.782	11.795	11.809	11.822	11.836	11.850	1090
1100	11.850	11.863	11.877	11.891	11.904	11.918	11.931	11.945	11.959	11.972	11.986	**1100**
1110	11.986	12.000	12.013	12.027	12.041	12.054	12.068	12.082	12.096	12.109	12.123	1110
1120	12.123	12.137	12.150	12.164	12.178	12.191	12.205	12.219	12.233	12.246	12.260	1120
1130	12.260	12.274	12.288	12.301	12.315	12.329	12.342	12.356	12.370	12.384	12.397	1130
1140	12.397	12.411	12.425	12.439	12.453	12.466	12.480	12.494	12.508	12.521	12.535	1140
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type R - PT 13% RH vs Platinum

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1950	11.382	11.390	11.397	11.405	11.412	11.420	11.427	11.435	11.442	11.450	11.457	**1950**
1960	11.457	11.465	11.472	11.480	11.487	11.495	11.502	11.510	11.518	11.525	11.533	1960
1970	11.533	11.540	11.548	11.555	11.563	11.570	11.578	11.585	11.593	11.600	11.608	1970
1980	11.608	11.615	11.623	11.631	11.638	11.646	11.653	11.661	11.668	11.676	11.683	1980
1990	11.683	11.691	11.698	11.706	11.714	11.721	11.729	11.736	11.744	11.751	11.759	1990
2000	11.759	11.766	11.774	11.782	11.789	11.797	11.804	11.812	11.819	11.827	11.835	**2000**
2010	11.835	11.842	11.850	11.857	11.865	11.872	11.880	11.888	11.895	11.903	11.910	2010
2020	11.910	11.918	11.925	11.933	11.941	11.948	11.956	11.963	11.971	11.979	11.986	2020
2030	11.986	11.994	12.001	12.009	12.016	12.024	12.032	12.039	12.047	12.054	12.062	2030
2040	12.062	12.070	12.077	12.085	12.092	12.100	12.108	12.115	12.123	12.131	12.138	2040
2050	12.138	12.146	12.153	12.161	12.169	12.176	12.184	12.191	12.199	12.207	12.214	**2050**
2060	12.214	12.222	12.230	12.237	12.245	12.252	12.260	12.268	12.275	12.283	12.291	2060
2070	12.291	12.298	12.306	12.313	12.321	12.329	12.336	12.344	12.352	12.359	12.367	2070
2080	12.367	12.375	12.382	12.390	12.398	12.405	12.413	12.420	12.428	12.436	12.443	2080
2090	12.443	12.451	12.459	12.466	12.474	12.482	12.489	12.497	12.505	12.512	12.520	2090
2100	12.520	12.528	12.535	12.543	12.551	12.558	12.566	12.574	12.581	12.589	12.597	**2100**
2110	12.597	12.604	12.612	12.620	12.627	12.635	12.643	12.650	12.658	12.666	12.673	2110
2120	12.673	12.681	12.689	12.696	12.704	12.712	12.719	12.727	12.735	12.742	12.750	2120
2130	12.750	12.758	12.765	12.773	12.781	12.788	12.796	12.804	12.812	12.819	12.827	2130
2140	12.827	12.835	12.842	12.850	12.858	12.865	12.873	12.881	12.889	12.896	12.904	2140
2150	12.904	12.912	12.919	12.927	12.935	12.942	12.950	12.958	12.966	12.973	12.981	**2150**
2160	12.981	12.989	12.996	13.004	13.012	13.019	13.027	13.035	13.043	13.050	13.058	2160
2170	13.058	13.066	13.073	13.081	13.089	13.097	13.104	13.112	13.120	13.128	13.135	2170
2180	13.135	13.143	13.151	13.158	13.166	13.174	13.182	13.189	13.197	13.205	13.213	2180
2190	13.213	13.220	13.228	13.236	13.243	13.251	13.259	13.267	13.274	13.282	13.290	2190
2200	13.290	13.298	13.305	13.313	13.321	13.329	13.336	13.344	13.352	13.359	13.367	**2200**
2210	13.367	13.375	13.383	13.390	13.398	13.406	13.414	13.421	13.429	13.437	13.445	2210
2220	13.445	13.452	13.460	13.468	13.476	13.483	13.491	13.499	13.507	13.514	13.522	2220
2230	13.522	13.530	13.538	13.545	13.553	13.561	13.569	13.577	13.584	13.592	13.600	2230
2240	13.600	13.608	13.615	13.623	13.631	13.639	13.646	13.654	13.662	13.670	13.677	2240
2250	13.677	13.685	13.693	13.701	13.709	13.716	13.724	13.732	13.740	13.747	13.755	**2250**
2260	13.755	13.763	13.771	13.778	13.786	13.794	13.802	13.810	13.817	13.825	13.833	2260
2270	13.833	13.841	13.848	13.856	13.864	13.872	13.880	13.887	13.895	13.903	13.911	2270
2280	13.911	13.919	13.926	13.934	13.942	13.950	13.957	13.965	13.973	13.981	13.989	2280
2290	13.989	13.996	14.004	14.012	14.020	14.028	14.035	14.043	14.051	14.059	14.066	2290
2300	14.066	14.074	14.082	14.090	14.098	14.105	14.113	14.121	14.129	14.137	14.144	**2300**
2310	14.144	14.152	14.160	14.168	14.176	14.183	14.191	14.199	14.207	14.215	14.222	2310
2320	14.222	14.230	14.238	14.246	14.254	14.261	14.269	14.277	14.285	14.293	14.300	2320
2330	14.300	14.308	14.316	14.324	14.332	14.340	14.347	14.355	14.363	14.371	14.379	2330
2340	14.379	14.386	14.394	14.402	14.410	14.418	14.425	14.433	14.441	14.449	14.457	2340
2350	14.457	14.465	14.472	14.480	14.488	14.496	14.504	14.511	14.519	14.527	14.535	**2350**
2360	14.535	14.543	14.551	14.558	14.566	14.574	14.582	14.590	14.597	14.605	14.613	2360
2370	14.613	14.621	14.629	14.637	14.644	14.652	14.660	14.668	14.676	14.683	14.691	2370
2380	14.691	14.699	14.707	14.715	14.723	14.730	14.738	14.746	14.754	14.762	14.770	2380
2390	14.770	14.777	14.785	14.793	14.801	14.809	14.817	14.824	14.832	14.840	14.848	2390
2400	14.848	14.856	14.864	14.871	14.879	14.887	14.895	14.903	14.911	14.918	14.926	**2400**
2410	14.926	14.934	14.942	14.950	14.958	14.965	14.973	14.981	14.989	14.997	15.005	2410
2420	15.005	15.012	15.020	15.028	15.036	15.044	15.052	15.059	15.067	15.075	15.083	2420
2430	15.083	15.091	15.099	15.106	15.114	15.122	15.130	15.138	15.146	15.153	15.161	2430
2440	15.161	15.169	15.177	15.185	15.193	15.200	15.208	15.216	15.224	15.232	15.240	2440
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1150	12.535	12.549	12.563	12.577	12.590	12.604	12.618	12.632	12.646	12.659	12.673	**1150**
1160	12.673	12.687	12.701	12.715	12.729	12.742	12.756	12.770	12.784	12.798	12.812	1160
1170	12.812	12.825	12.839	12.853	12.867	12.881	12.895	12.909	12.922	12.936	12.950	1170
1180	12.950	12.964	12.978	12.992	13.006	13.019	13.033	13.047	13.061	13.075	13.089	1180
1190	13.089	13.103	13.117	13.131	13.145	13.158	13.172	13.186	13.200	13.214	13.228	1190
1200	13.228	13.242	13.256	13.270	13.284	13.298	13.311	13.325	13.339	13.353	13.367	**1200**
1210	13.367	13.381	13.395	13.409	13.423	13.437	13.451	13.465	13.479	13.493	13.507	1210
1220	13.507	13.521	13.535	13.549	13.563	13.577	13.590	13.604	13.618	13.632	13.646	1220
1230	13.646	13.660	13.674	13.688	13.702	13.716	13.730	13.744	13.758	13.772	13.786	1230
1240	13.786	13.800	13.814	13.828	13.842	13.856	13.870	13.884	13.898	13.912	13.926	1240
1250	13.926	13.940	13.954	13.968	13.982	13.996	14.010	14.024	14.038	14.052	14.066	**1250**
1260	14.066	14.081	14.095	14.109	14.123	14.137	14.151	14.165	14.179	14.193	14.207	1260
1270	14.207	14.221	14.235	14.249	14.263	14.277	14.291	14.305	14.319	14.333	14.347	1270
1280	14.347	14.361	14.375	14.390	14.404	14.418	14.432	14.446	14.460	14.474	14.488	1280
1290	14.488	14.502	14.516	14.530	14.544	14.558	14.572	14.586	14.601	14.615	14.629	1290
1300	14.629	14.643	14.657	14.671	14.685	14.699	14.713	14.727	14.741	14.755	14.770	**1300**
1310	14.770	14.784	14.798	14.812	14.826	14.840	14.854	14.868	14.882	14.896	14.911	1310
1320	14.911	14.925	14.939	14.953	14.967	14.981	14.995	15.009	15.023	15.037	15.052	1320
1330	15.052	15.066	15.080	15.094	15.108	15.122	15.136	15.150	15.164	15.179	15.193	1330
1340	15.193	15.207	15.221	15.235	15.249	15.263	15.277	15.291	15.306	15.320	15.334	1340
1350	15.334	15.348	15.362	15.376	15.390	15.404	15.419	15.433	15.447	15.461	15.475	**1350**
1360	15.475	15.489	15.503	15.517	15.531	15.546	15.560	15.574	15.588	15.602	15.616	1360
1370	15.616	15.630	15.645	15.659	15.673	15.687	15.701	15.715	15.729	15.743	15.758	1370
1380	15.758	15.772	15.786	15.800	15.814	15.828	15.842	15.856	15.871	15.885	15.899	1380
1390	15.899	15.913	15.927	15.941	15.955	15.969	15.984	15.998	16.012	16.026	16.040	1390
1400	16.040	16.054	16.068	16.082	16.097	16.111	16.125	16.139	16.153	16.167	16.181	**1400**
1410	16.181	16.196	16.210	16.224	16.238	16.252	16.266	16.280	16.294	16.309	16.323	1410
1420	16.323	16.337	16.351	16.365	16.379	16.393	16.407	16.422	16.436	16.450	16.464	1420
1430	16.464	16.478	16.492	16.506	16.520	16.534	16.549	16.563	16.577	16.591	16.605	1430
1440	16.605	16.619	16.633	16.647	16.662	16.676	16.690	16.704	16.718	16.732	16.746	1440
°C	0	1	2	3	4	5	6	7	8	9	10	°C

R

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2450	15.240	15.248	15.255	15.263	15.271	15.279	15.287	15.295	15.302	15.310	15.318	**2450**
2460	15.318	15.326	15.334	15.342	15.349	15.357	15.365	15.373	15.381	15.389	15.397	2460
2470	15.397	15.404	15.412	15.420	15.428	15.436	15.444	15.451	15.459	15.467	15.475	2470
2480	15.475	15.483	15.491	15.499	15.506	15.514	15.522	15.530	15.538	15.546	15.553	2480
2490	15.553	15.561	15.569	15.577	15.585	15.593	15.601	15.608	15.616	15.624	15.632	2490
2500	15.632	15.640	15.648	15.655	15.663	15.671	15.679	15.687	15.695	15.703	15.710	**2500**
2510	15.710	15.718	15.726	15.734	15.742	15.750	15.758	15.765	15.773	15.781	15.789	2510
2520	15.789	15.797	15.805	15.812	15.820	15.828	15.836	15.844	15.852	15.860	15.867	2520
2530	15.867	15.875	15.883	15.891	15.899	15.907	15.915	15.922	15.930	15.938	15.946	2530
2540	15.946	15.954	15.962	15.969	15.977	15.985	15.993	16.001	16.009	16.017	16.024	2540
2550	16.024	16.032	16.040	16.048	16.056	16.064	16.071	16.079	16.087	16.095	16.103	**2550**
2560	16.103	16.111	16.119	16.126	16.134	16.142	16.150	16.158	16.166	16.174	16.181	2560
2570	16.181	16.189	16.197	16.205	16.213	16.221	16.228	16.236	16.244	16.252	16.260	2570
2580	16.260	16.268	16.276	16.283	16.291	16.299	16.307	16.315	16.323	16.330	16.338	2580
2590	16.338	16.346	16.354	16.362	16.370	16.378	16.385	16.393	16.401	16.409	16.417	2590
2600	16.417	16.425	16.432	16.440	16.448	16.456	16.464	16.472	16.480	16.487	16.495	**2600**
2610	16.495	16.503	16.511	16.519	16.527	16.534	16.542	16.550	16.558	16.566	16.574	2610
2620	16.574	16.582	16.589	16.597	16.605	16.613	16.621	16.629	16.636	16.644	16.652	2620
2630	16.652	16.660	16.668	16.676	16.683	16.691	16.699	16.707	16.715	16.723	16.731	2630
2640	16.731	16.738	16.746	16.754	16.762	16.770	16.778	16.785	16.793	16.801	16.809	2640
2650	16.809	16.817	16.825	16.832	16.840	16.848	16.856	16.864	16.872	16.879	16.887	**2650**
2660	16.887	16.895	16.903	16.911	16.919	16.926	16.934	16.942	16.950	16.958	16.966	2660
2670	16.966	16.973	16.981	16.989	16.997	17.005	17.013	17.020	17.028	17.036	17.044	2670
2680	17.044	17.052	17.060	17.067	17.075	17.083	17.091	17.099	17.107	17.114	17.122	2680
2690	17.122	17.130	17.138	17.146	17.154	17.161	17.169	17.177	17.185	17.193	17.200	2690
2700	17.200	17.208	17.216	17.224	17.232	17.240	17.247	17.255	17.263	17.271	17.279	**2700**
2710	17.279	17.286	17.294	17.302	17.310	17.318	17.326	17.333	17.341	17.349	17.357	2710
2720	17.357	17.365	17.373	17.380	17.388	17.396	17.404	17.412	17.419	17.427	17.435	2720
2730	17.435	17.443	17.451	17.458	17.466	17.474	17.482	17.490	17.498	17.505	17.513	2730
2740	17.513	17.521	17.529	17.537	17.544	17.552	17.560	17.568	17.576	17.583	17.591	2740
2750	17.591	17.599	17.607	17.615	17.622	17.630	17.638	17.646	17.654	17.661	17.669	**2750**
2760	17.669	17.677	17.685	17.693	17.700	17.708	17.716	17.724	17.732	17.739	17.747	2760
2770	17.747	17.755	17.763	17.771	17.778	17.786	17.794	17.802	17.810	17.817	17.825	2770
2780	17.825	17.833	17.841	17.849	17.856	17.864	17.872	17.880	17.888	17.895	17.903	2780
2790	17.903	17.911	17.919	17.926	17.934	17.942	17.950	17.958	17.965	17.973	17.981	2790
2800	17.981	17.989	17.997	18.004	18.012	18.020	18.028	18.035	18.043	18.051	18.059	**2800**
2810	18.059	18.067	18.074	18.082	18.090	18.098	18.105	18.113	18.121	18.129	18.137	2810
2820	18.137	18.144	18.152	18.160	18.168	18.175	18.183	18.191	18.199	18.206	18.214	2820
2830	18.214	18.222	18.230	18.238	18.245	18.253	18.261	18.269	18.276	18.284	18.292	2830
2840	18.292	18.300	18.307	18.315	18.323	18.331	18.338	18.346	18.354	18.362	18.369	2840
2850	18.369	18.377	18.385	18.393	18.400	18.408	18.416	18.424	18.431	18.439	18.447	**2850**
2860	18.447	18.455	18.462	18.470	18.478	18.486	18.493	18.501	18.509	18.517	18.524	2860
2870	18.524	18.532	18.540	18.548	18.555	18.563	18.571	18.579	18.586	18.594	18.602	2870
2880	18.602	18.610	18.617	18.625	18.633	18.640	18.648	18.656	18.664	18.671	18.679	2880
2890	18.679	18.687	18.695	18.702	18.710	18.718	18.725	18.733	18.741	18.749	18.756	2890
2900	18.756	18.764	18.772	18.779	18.787	18.795	18.803	18.810	18.818	18.826	18.834	**2900**
2910	18.834	18.841	18.849	18.857	18.864	18.872	18.880	18.887	18.895	18.903	18.911	2910
2920	18.911	18.918	18.926	18.934	18.941	18.949	18.957	18.965	18.972	18.980	18.988	2920
2930	18.988	18.995	19.003	19.011	19.018	19.026	19.034	19.042	19.049	19.057	19.065	2930
2940	19.065	19.072	19.080	19.088	19.095	19.103	19.111	19.118	19.126	19.134	19.141	2940
°F	0	1	2	3	4	5	6	7	8	9	10	°F

R

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1450	16.746	16.760	16.774	16.789	16.803	16.817	16.831	16.845	16.859	16.873	16.887	**1450**
1460	16.887	16.901	16.915	16.930	16.944	16.958	16.972	16.986	17.000	17.014	17.028	1460
1470	17.028	17.042	17.056	17.071	17.085	17.099	17.113	17.127	17.141	17.155	17.169	1470
1480	17.169	17.183	17.197	17.211	17.225	17.240	17.254	17.268	17.282	17.296	17.310	1480
1490	17.310	17.324	17.338	17.352	17.366	17.380	17.394	17.408	17.423	17.437	17.451	1490
1500	17.451	17.465	17.479	17.493	17.507	17.521	17.535	17.549	17.563	17.577	17.591	**1500**
1510	17.591	17.605	17.619	17.633	17.647	17.661	17.676	17.690	17.704	17.718	17.732	1510
1520	17.732	17.746	17.760	17.774	17.788	17.802	17.816	17.830	17.844	17.858	17.872	1520
1530	17.872	17.886	17.900	17.914	17.928	17.942	17.956	17.970	17.984	17.998	18.012	1530
1540	18.012	18.026	18.040	18.054	18.068	18.082	18.096	18.110	18.124	18.138	18.152	1540
1550	18.152	18.166	18.180	18.194	18.208	18.222	18.236	18.250	18.264	18.278	18.292	**1550**
1560	18.292	18.306	18.320	18.334	18.348	18.362	18.376	18.390	18.404	18.417	18.431	1560
1570	18.431	18.445	18.459	18.473	18.487	18.501	18.515	18.529	18.543	18.557	18.571	1570
1580	18.571	18.585	18.599	18.613	18.627	18.640	18.654	18.668	18.682	18.696	18.710	1580
1590	18.710	18.724	18.738	18.752	18.766	18.779	18.793	18.807	18.821	18.835	18.849	1590
1600	18.849	18.863	18.877	18.891	18.904	18.918	18.932	18.946	18.960	18.974	18.988	**1600**
1610	18.988	19.002	19.015	19.029	19.043	19.057	19.071	19.085	19.098	19.112	19.126	1610
1620	19.126	19.140	19.154	19.168	19.181	19.195	19.209	19.223	19.237	19.250	19.264	1620
1630	19.264	19.278	19.292	19.306	19.319	19.333	19.347	19.361	19.375	19.388	19.402	1630
1640	19.402	19.416	19.430	19.444	19.457	19.471	19.485	19.499	19.512	19.526	19.540	1640
1650	19.540	19.554	19.567	19.581	19.595	19.609	19.622	19.636	19.650	19.663	19.677	**1650**
1660	19.677	19.691	19.705	19.718	19.732	19.746	19.759	19.773	19.787	19.800	19.814	1660
1670	19.814	19.828	19.841	19.855	19.869	19.882	19.896	19.910	19.923	19.937	19.951	1670
1680	19.951	19.964	19.978	19.992	20.005	20.019	20.032	20.046	20.060	20.073	20.087	1680
1690	20.087	20.100	20.114	20.127	20.141	20.154	20.168	20.181	20.195	20.208	20.222	1690
1700	20.222	20.235	20.249	20.262	20.275	20.289	20.302	20.316	20.329	20.342	20.356	**1700**
1710	20.356	20.369	20.382	20.396	20.409	20.422	20.436	20.449	20.462	20.475	20.488	1710
1720	20.488	20.502	20.515	20.528	20.541	20.554	20.567	20.581	20.594	20.607	20.620	1720
1730	20.620	20.633	20.646	20.659	20.672	20.685	20.698	20.711	20.724	20.736	20.749	1730
1740	20.749	20.762	20.775	20.788	20.801	20.813	20.826	20.839	20.852	20.864	20.877	1740
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type R - PT 13% RH vs Platinum

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2950	19.141	19.149	19.157	19.165	19.172	19.180	19.188	19.195	19.203	19.211	19.218	**2950**
2960	19.218	19.226	19.234	19.241	19.249	19.257	19.264	19.272	19.280	19.287	19.295	2960
2970	19.295	19.303	19.310	19.318	19.326	19.333	19.341	19.349	19.356	19.364	19.372	2970
2980	19.372	19.379	19.387	19.395	19.402	19.410	19.418	19.425	19.433	19.440	19.448	2980
2990	19.448	19.456	19.463	19.471	19.479	19.486	19.494	19.502	19.509	19.517	19.525	2990
3000	19.525	19.532	19.540	19.547	19.555	19.563	19.570	19.578	19.586	19.593	19.601	**3000**
3010	19.601	19.609	19.616	19.624	19.631	19.639	19.647	19.654	19.662	19.670	19.677	3010
3020	19.677	19.685	19.692	19.700	19.708	19.715	19.723	19.730	19.738	19.746	19.753	3020
3030	19.753	19.761	19.769	19.776	19.784	19.791	19.799	19.807	19.814	19.822	19.829	3030
3040	19.829	19.837	19.845	19.852	19.860	19.867	19.875	19.882	19.890	19.898	19.905	3040
3050	19.905	19.913	19.920	19.928	19.936	19.943	19.951	19.958	19.966	19.973	19.981	**3050**
3060	19.981	19.989	19.996	20.004	20.011	20.019	20.026	20.034	20.041	20.049	20.056	3060
3070	20.056	20.064	20.072	20.079	20.087	20.094	20.102	20.109	20.117	20.124	20.132	3070
3080	20.132	20.139	20.147	20.154	20.162	20.169	20.177	20.184	20.192	20.199	20.207	3080
3090	20.207	20.214	20.222	20.229	20.237	20.244	20.252	20.259	20.266	20.274	20.281	3090
3100	20.281	20.289	20.296	20.304	20.311	20.319	20.326	20.333	20.341	20.348	20.356	**3100**
3110	20.356	20.363	20.371	20.378	20.385	20.393	20.400	20.407	20.415	20.422	20.430	3110
3120	20.430	20.437	20.444	20.452	20.459	20.466	20.474	20.481	20.488	20.496	20.503	3120
3130	20.503	20.510	20.518	20.525	20.532	20.540	20.547	20.554	20.562	20.569	20.576	3130
3140	20.576	20.583	20.591	20.598	20.605	20.612	20.620	20.627	20.634	20.641	20.649	3140
3150	20.649	20.656	20.663	20.670	20.678	20.685	20.692	20.699	20.706	20.714	20.721	**3150**
3160	20.721	20.728	20.735	20.742	20.749	20.756	20.764	20.771	20.778	20.785	20.792	3160
3170	20.792	20.799	20.806	20.813	20.821	20.828	20.835	20.842	20.849	20.856	20.863	3170
3180	20.863	20.870	20.877	20.884	20.891	20.898	20.905	20.912	20.919	20.926	20.933	3180
3190	20.933	20.940	20.947	20.954	20.961	20.968	20.975	20.982	20.989	20.996	21.003	3190
3200	21.003	21.010	21.016	21.023	21.030	21.037	21.044	21.051	21.058	21.065	21.071	**3200**
3210	21.071	21.078	21.085	21.092	21.099							3210
°F	0	1	2	3	4	5	6	7	8	9	10	°F

R

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1750	20.877	20.890	20.902	20.915	20.928	20.940	20.953	20.965	20.978	20.990	21.003	**1750**
1760	21.003	21.015	21.027	21.040	21.052	21.065	21.077	21.089	21.101			1760
°C	0	1	2	3	4	5	6	7	8	9	10	°C

-58 °F - 450 °F Type S - PT 10% RH vs Platinum -50 °C - 250 °C

EMF in Millivolts — Reference Junction 32°F

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°F
-50	-0.218	-0.220	-0.222	-0.224	-0.227	-0.229	-0.231	-0.233	-0.236			**-50**
-40	-0.194	-0.197	-0.199	-0.201	-0.204	-0.206	-0.208	-0.211	-0.213	-0.215	-0.218	-40
-30	-0.170	-0.173	-0.175	-0.178	-0.180	-0.182	-0.185	-0.187	-0.190	-0.192	-0.194	-30
-20	-0.145	-0.148	-0.150	-0.153	-0.155	-0.158	-0.160	-0.163	-0.165	-0.168	-0.170	-20
-10	-0.119	-0.122	-0.124	-0.127	-0.129	-0.132	-0.135	-0.137	-0.140	-0.142	-0.145	-10
0	-0.092	-0.095	-0.097	-0.100	-0.103	-0.106	-0.108	-0.111	-0.114	-0.116	-0.119	**0**
0	-0.092	-0.089	-0.086	-0.084	-0.081	-0.078	-0.075	-0.073	-0.070	-0.067	-0.064	**0**
10	-0.064	-0.061	-0.058	-0.056	-0.053	-0.050	-0.047	-0.044	-0.041	-0.038	-0.035	10
20	-0.035	-0.033	-0.030	-0.027	-0.024	-0.021	-0.018	-0.015	-0.012	-0.009	-0.006	20
30	-0.006	-0.003	0.000	0.003	0.006	0.009	0.012	0.015	0.018	0.021	0.024	30
40	0.024	0.027	0.030	0.033	0.037	0.040	0.043	0.046	0.049	0.052	0.055	40
50	0.055	0.058	0.062	0.065	0.068	0.071	0.074	0.077	0.081	0.084	0.087	**-50**
60	0.087	0.090	0.093	0.097	0.100	0.103	0.106	0.110	0.113	0.116	0.119	60
70	0.119	0.123	0.126	0.129	0.133	0.136	0.139	0.143	0.146	0.149	0.153	70
80	0.153	0.156	0.159	0.163	0.166	0.169	0.173	0.176	0.180	0.183	0.186	80
90	0.186	0.190	0.193	0.197	0.200	0.204	0.207	0.210	0.214	0.217	0.221	90
100	0.221	0.224	0.228	0.231	0.235	0.238	0.242	0.245	0.249	0.252	0.256	**100**
110	0.256	0.260	0.263	0.267	0.270	0.274	0.277	0.281	0.285	0.288	0.292	110
120	0.292	0.295	0.299	0.303	0.306	0.310	0.313	0.317	0.321	0.324	0.328	120
130	0.328	0.332	0.335	0.339	0.343	0.346	0.350	0.354	0.357	0.361	0.365	130
140	0.365	0.369	0.372	0.376	0.380	0.384	0.387	0.391	0.395	0.399	0.402	140
150	0.402	0.406	0.410	0.414	0.417	0.421	0.425	0.429	0.433	0.436	0.440	**150**
160	0.440	0.444	0.448	0.452	0.456	0.459	0.463	0.467	0.471	0.475	0.479	160
170	0.479	0.483	0.487	0.490	0.494	0.498	0.502	0.506	0.510	0.514	0.518	170
180	0.518	0.522	0.526	0.530	0.534	0.538	0.541	0.545	0.549	0.553	0.557	180
190	0.557	0.561	0.565	0.569	0.573	0.577	0.581	0.585	0.589	0.593	0.597	190
200	0.597	0.601	0.605	0.609	0.613	0.617	0.622	0.626	0.630	0.634	0.638	**200**
210	0.638	0.642	0.646	0.650	0.654	0.658	0.662	0.666	0.670	0.675	0.679	210
220	0.679	0.683	0.687	0.691	0.695	0.699	0.703	0.708	0.712	0.716	0.720	220
230	0.720	0.724	0.728	0.732	0.737	0.741	0.745	0.749	0.753	0.758	0.762	230
240	0.762	0.766	0.770	0.774	0.779	0.783	0.787	0.791	0.795	0.800	0.804	240
250	0.804	0.808	0.812	0.817	0.821	0.825	0.829	0.834	0.838	0.842	0.847	**250**
260	0.847	0.851	0.855	0.859	0.864	0.868	0.872	0.877	0.881	0.885	0.889	260
270	0.889	0.894	0.898	0.902	0.907	0.911	0.915	0.920	0.924	0.928	0.933	270
280	0.933	0.937	0.942	0.946	0.950	0.955	0.959	0.963	0.968	0.972	0.977	280
290	0.977	0.981	0.985	0.990	0.994	0.998	1.003	1.007	1.012	1.016	1.021	290
300	1.021	1.025	1.029	1.034	1.038	1.043	1.047	1.052	1.056	1.061	1.065	**300**
310	1.065	1.069	1.074	1.078	1.083	1.087	1.092	1.096	1.101	1.105	1.110	310
320	1.110	1.114	1.119	1.123	1.128	1.132	1.137	1.141	1.146	1.150	1.155	320
330	1.155	1.159	1.164	1.168	1.173	1.177	1.182	1.186	1.191	1.196	1.200	330
340	1.200	1.205	1.209	1.214	1.218	1.223	1.227	1.232	1.237	1.241	1.246	340
350	1.246	1.250	1.255	1.260	1.264	1.269	1.273	1.278	1.283	1.287	1.292	**350**
360	1.292	1.296	1.301	1.306	1.310	1.315	1.319	1.324	1.329	1.333	1.338	360
370	1.338	1.343	1.347	1.352	1.357	1.361	1.366	1.371	1.375	1.380	1.385	370
380	1.385	1.389	1.394	1.399	1.403	1.408	1.413	1.417	1.422	1.427	1.431	380
390	1.431	1.436	1.441	1.445	1.450	1.455	1.460	1.464	1.469	1.474	1.478	390
400	1.478	1.483	1.488	1.493	1.497	1.502	1.507	1.512	1.516	1.521	1.526	**400**
410	1.526	1.531	1.535	1.540	1.545	1.550	1.554	1.559	1.564	1.569	1.573	410
420	1.573	1.578	1.583	1.588	1.592	1.597	1.602	1.607	1.612	1.616	1.621	420
430	1.621	1.626	1.631	1.636	1.640	1.645	1.650	1.655	1.660	1.664	1.669	430
440	1.669	1.674	1.679	1.684	1.689	1.693	1.698	1.703	1.708	1.713	1.718	440
°F	0	1	2	3	4	5	6	7	8	9	10	°F

S

EMF in Millivolts — Reference Junctions 0 °C

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°C
-50	-0.236											**-50**
40	-0.194	-0.199	-0.203	-0.207	-0.211	-0.215	-0.219	-0.224	-0.228	-0.232	-0.236	-40
-30	-0.150	-0.155	-0.159	-0.164	-0.168	-0.173	-0.177	-0.181	-0.186	-0.190	-0.194	-30
-20	-0.103	-0.108	-0.113	-0.117	-0.122	-0.127	-0.132	-0.136	-0.141	-0.146	-0.150	-20
-10	-0.053	-0.058	-0.063	-0.068	-0.073	-0.078	-0.083	-0.088	-0.093	-0.098	-0.103	-10
0	0.000	-0.005	-0.011	-0.016	-0.021	-0.027	-0.032	-0.037	-0.042	-0.048	-0.053	**0**
0	0.000	0.005	0.011	0.016	0.022	0.027	0.033	0.038	0.044	0.050	0.055	**0**
10	0.055	0.061	0.067	0.072	0.078	0.084	0.090	0.095	0.101	0.107	0.113	10
20	0.113	0.119	0.125	0.131	0.137	0.143	0.149	0.155	0.161	0.167	0.173	20
30	0.173	0.179	0.185	0.191	0.197	0.204	0.210	0.216	0.222	0.229	0.235	30
40	0.235	0.241	0.248	0.254	0.260	0.267	0.273	0.280	0.286	0.292	0.299	40
50	0.299	0.305	0.312	0.319	0.325	0.332	0.338	0.345	0.352	0.358	0.365	**50**
60	0.365	0.372	0.378	0.385	0.392	0.399	0.405	0.412	0.419	0.426	0.433	60
70	0.433	0.440	0.446	0.453	0.460	0.467	0.474	0.481	0.488	0.495	0.502	70
80	0.502	0.509	0.516	0.523	0.530	0.538	0.545	0.552	0.559	0.566	0.573	80
90	0.573	0.580	0.588	0.595	0.602	0.609	0.617	0.624	0.631	0.639	0.646	90
100	0.646	0.653	0.661	0.668	0.675	0.683	0.690	0.698	0.705	0.713	0.720	**100**
110	0.720	0.727	0.735	0.743	0.750	0.758	0.765	0.773	0.780	0.788	0.795	110
120	0.795	0.803	0.811	0.818	0.826	0.834	0.841	0.849	0.857	0.865	0.872	120
130	0.872	0.880	0.888	0.896	0.903	0.911	0.919	0.927	0.935	0.942	0.950	130
140	0.950	0.958	0.966	0.974	0.982	0.990	0.998	1.006	1.013	1.021	1.029	140
150	1.029	1.037	1.045	1.053	1.061	1.069	1.077	1.085	1.094	1.102	1.110	**150**
160	1.110	1.118	1.126	1.134	1.142	1.150	1.158	1.167	1.175	1.183	1.191	160
170	1.191	1.199	1.207	1.216	1.224	1.232	1.240	1.249	1.257	1.265	1.273	170
180	1.273	1.282	1.290	1.298	1.307	1.315	1.323	1.332	1.340	1.348	1.357	180
190	1.357	1.365	1.373	1.382	1.390	1.399	1.407	1.415	1.424	1.432	1.441	190
200	1.441	1.449	1.458	1.466	1.475	1.483	1.492	1.500	1.509	1.517	1.526	**200**
210	1.526	1.534	1.543	1.551	1.560	1.569	1.577	1.586	1.594	1.603	1.612	210
220	1.612	1.620	1.629	1.638	1.646	1.655	1.663	1.672	1.681	1.690	1.698	220
230	1.698	1.707	1.716	1.724	1.733	1.742	1.751	1.759	1.768	1.777	1.786	230
240	1.786	1.794	1.803	1.812	1.821	1.829	1.838	1.847	1.856	1.865	1.874	240
°C	0	1	2	3	4	5	6	7	8	9	10	°C

S

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
450	1.718	1.722	1.727	1.732	1.737	1.742	1.747	1.752	1.756	1.761	1.766	**450**
460	1.766	1.771	1.776	1.781	1.786	1.790	1.795	1.800	1.805	1.810	1.815	460
470	1.815	1.820	1.825	1.829	1.834	1.839	1.844	1.849	1.854	1.859	1.864	470
480	1.864	1.869	1.874	1.878	1.883	1.888	1.893	1.898	1.903	1.908	1.913	480
490	1.913	1.918	1.923	1.928	1.933	1.938	1.942	1.947	1.952	1.957	1.962	490
500	1.962	1.967	1.972	1.977	1.982	1.987	1.992	1.997	2.002	2.007	2.012	**500**
510	2.012	2.017	2.022	2.027	2.032	2.037	2.042	2.047	2.052	2.057	2.062	510
520	2.062	2.067	2.072	2.076	2.081	2.086	2.091	2.096	2.101	2.106	2.111	520
530	2.111	2.116	2.121	2.126	2.131	2.136	2.141	2.147	2.152	2.157	2.162	530
540	2.162	2.167	2.172	2.177	2.182	2.187	2.192	2.197	2.202	2.207	2.212	540
550	2.212	2.217	2.222	2.227	2.232	2.237	2.242	2.247	2.252	2.257	2.262	**550**
560	2.262	2.267	2.272	2.277	2.283	2.288	2.293	2.298	2.303	2.308	2.313	560
570	2.313	2.318	2.323	2.328	2.333	2.338	2.343	2.348	2.354	2.359	2.364	570
580	2.364	2.369	2.374	2.379	2.384	2.389	2.394	2.399	2.404	2.410	2.415	580
590	2.415	2.420	2.425	2.430	2.435	2.440	2.445	2.450	2.455	2.461	2.466	590
600	2.466	2.471	2.476	2.481	2.486	2.491	2.496	2.502	2.507	2.512	2.517	**600**
610	2.517	2.522	2.527	2.532	2.538	2.543	2.548	2.553	2.558	2.563	2.568	610
620	2.568	2.574	2.579	2.584	2.589	2.594	2.599	2.604	2.610	2.615	2.620	620
630	2.620	2.625	2.630	2.635	2.641	2.646	2.651	2.656	2.661	2.666	2.672	630
640	2.672	2.677	2.682	2.687	2.692	2.697	2.703	2.708	2.713	2.718	2.723	640
650	2.723	2.729	2.734	2.739	2.744	2.749	2.755	2.760	2.765	2.770	2.775	**650**
660	2.775	2.781	2.786	2.791	2.796	2.801	2.807	2.812	2.817	2.822	2.827	660
670	2.827	2.833	2.838	2.843	2.848	2.854	2.859	2.864	2.869	2.874	2.880	670
680	2.880	2.885	2.890	2.895	2.901	2.906	2.911	2.916	2.922	2.927	2.932	680
690	2.932	2.937	2.943	2.948	2.953	2.958	2.964	2.969	2.974	2.979	2.985	690
700	2.985	2.990	2.995	3.000	3.006	3.011	3.016	3.021	3.027	3.032	3.037	**700**
710	3.037	3.042	3.048	3.053	3.058	3.063	3.069	3.074	3.079	3.085	3.090	710
720	3.090	3.095	3.100	3.106	3.111	3.116	3.122	3.127	3.132	3.137	3.143	720
730	3.143	3.148	3.153	3.159	3.164	3.169	3.174	3.180	3.185	3.190	3.196	730
740	3.196	3.201	3.206	3.212	3.217	3.222	3.227	3.233	3.238	3.243	3.249	740
750	3.249	3.254	3.259	3.265	3.270	3.275	3.281	3.286	3.291	3.297	3.302	**750**
760	3.302	3.307	3.313	3.318	3.323	3.329	3.334	3.339	3.345	3.350	3.355	760
770	3.355	3.361	3.366	3.371	3.377	3.382	3.387	3.393	3.398	3.403	3.409	770
780	3.409	3.414	3.419	3.425	3.430	3.435	3.441	3.446	3.451	3.457	3.462	780
790	3.462	3.468	3.473	3.478	3.484	3.489	3.494	3.500	3.505	3.510	3.516	790
800	3.516	3.521	3.527	3.532	3.537	3.543	3.548	3.553	3.559	3.564	3.570	**800**
810	3.570	3.575	3.580	3.586	3.591	3.596	3.602	3.607	3.613	3.618	3.623	810
820	3.623	3.629	3.634	3.640	3.645	3.650	3.656	3.661	3.667	3.672	3.677	820
830	3.677	3.683	3.688	3.694	3.699	3.704	3.710	3.715	3.721	3.726	3.731	830
840	3.731	3.737	3.742	3.748	3.753	3.758	3.764	3.769	3.775	3.780	3.786	840
850	3.786	3.791	3.796	3.802	3.807	3.813	3.818	3.823	3.829	3.834	3.840	**850**
860	3.840	3.845	3.851	3.856	3.862	3.867	3.872	3.878	3.883	3.889	3.894	860
870	3.894	3.900	3.905	3.910	3.916	3.921	3.927	3.932	3.938	3.943	3.949	870
880	3.949	3.954	3.959	3.965	3.970	3.976	3.981	3.987	3.992	3.998	4.003	880
890	4.003	4.009	4.014	4.020	4.025	4.030	4.036	4.041	4.047	4.052	4.058	890
900	4.058	4.063	4.069	4.074	4.080	4.085	4.091	4.096	4.102	4.107	4.113	**900**
910	4.113	4.118	4.123	4.129	4.134	4.140	4.145	4.151	4.156	4.162	4.167	910
920	4.167	4.173	4.178	4.184	4.189	4.195	4.200	4.206	4.211	4.217	4.222	920
930	4.222	4.228	4.233	4.239	4.244	4.250	4.255	4.261	4.266	4.272	4.277	930
940	4.277	4.283	4.288	4.294	4.299	4.305	4.310	4.316	4.321	4.327	4.332	940
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
250	1.874	1.882	1.891	1.900	1.909	1.918	1.927	1.936	1.944	1.953	1.962	250
260	1.962	1.971	1.980	1.989	1.998	2.007	2.016	2.025	2.034	2.043	2.052	260
270	2.052	2.061	2.070	2.078	2.087	2.096	2.105	2.114	2.123	2.132	2.141	270
280	2.141	2.151	2.160	2.169	2.178	2.187	2.196	2.205	2.214	2.223	2.232	280
290	2.232	2.241	2.250	2.259	2.268	2.277	2.287	2.296	2.305	2.314	2.323	290
300	2.323	2.332	2.341	2.350	2.360	2.369	2.378	2.387	2.396	2.405	2.415	**300**
310	2.415	2.424	2.433	2.442	2.451	2.461	2.470	2.479	2.488	2.497	2.507	310
320	2.507	2.516	2.525	2.534	2.544	2.553	2.562	2.571	2.581	2.590	2.599	320
330	2.599	2.609	2.618	2.627	2.636	2.646	2.655	2.664	2.674	2.683	2.692	330
340	2.692	2.702	2.711	2.720	2.730	2.739	2.748	2.758	2.767	2.776	2.786	340
350	2.786	2.795	2.805	2.814	2.823	2.833	2.842	2.851	2.861	2.870	2.880	**350**
360	2.880	2.889	2.899	2.908	2.917	2.927	2.936	2.946	2.955	2.965	2.974	360
370	2.974	2.983	2.993	3.002	3.012	3.021	3.031	3.040	3.050	3.059	3.069	370
380	3.069	3.078	3.088	3.097	3.107	3.116	3.126	3.135	3.145	3.154	3.164	380
390	3.164	3.173	3.183	3.192	3.202	3.212	3.221	3.231	3.240	3.250	3.259	390
400	3.259	3.269	3.279	3.288	3.298	3.307	3.317	3.326	3.336	3.346	3.355	**400**
410	3.355	3.365	3.374	3.384	3.394	3.403	3.413	3.423	3.432	3.442	3.451	410
420	3.451	3.461	3.471	3.480	3.490	3.500	3.509	3.519	3.529	3.538	3.548	420
430	3.548	3.558	3.567	3.577	3.587	3.596	3.606	3.616	3.626	3.635	3.645	430
440	3.645	3.655	3.664	3.674	3.684	3.694	3.703	3.713	3.723	3.732	3.742	440
450	3.742	3.752	3.762	3.771	3.781	3.791	3.801	3.810	3.820	3.830	3.840	**450**
460	3.840	3.850	3.859	3.869	3.879	3.889	3.898	3.908	3.918	3.928	3.938	460
470	3.938	3.947	3.957	3.967	3.977	3.987	3.997	4.006	4.016	4.026	4.036	470
480	4.036	4.046	4.056	4.065	4.075	4.085	4.095	4.105	4.115	4.125	4.134	480
490	4.134	4.144	4.154	4.164	4.174	4.184	4.194	4.204	4.213	4.223	4.233	490
500	4.233	4.243	4.253	4.263	4.273	4.283	4.293	4.303	4.313	4.323	4.332	**500**
510	4.332	4.342	4.352	4.362	4.372	4.382	4.392	4.402	4.412	4.422	4.432	510
520	4.432	4.442	4.452	4.462	4.472	4.482	4.492	4.502	4.512	4.522	4.532	520
530	4.532	4.542	4.552	4.562	4.572	4.582	4.592	4.602	4.612	4.622	4.632	530
540	4.632	4.642	4.652	4.662	4.672	4.682	4.692	4.702	4.712	4.722	4.732	540
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
950	4.332	4.338	4.343	4.349	4.355	4.360	4.366	4.371	4.377	4.382	4.388	**950**
960	4.388	4.393	4.399	4.404	4.410	4.415	4.421	4.426	4.432	4.437	4.443	960
970	4.443	4.449	4.454	4.460	4.465	4.471	4.476	4.482	4.487	4.493	4.498	970
980	4.498	4.504	4.510	4.515	4.521	4.526	4.532	4.537	4.543	4.548	4.554	980
990	4.554	4.559	4.565	4.571	4.576	4.582	4.587	4.593	4.598	4.604	4.610	990
1000	4.610	4.615	4.621	4.626	4.632	4.637	4.643	4.648	4.654	4.660	4.665	**1000**
1010	4.665	4.671	4.676	4.682	4.688	4.693	4.699	4.704	4.710	4.715	4.721	1010
1020	4.721	4.727	4.732	4.738	4.743	4.749	4.755	4.760	4.766	4.771	4.777	1020
1030	4.777	4.782	4.788	4.794	4.799	4.805	4.810	4.816	4.822	4.827	4.833	1030
1040	4.833	4.838	4.844	4.850	4.855	4.861	4.866	4.872	4.878	4.883	4.889	1040
1050	4.889	4.895	4.900	4.906	4.911	4.917	4.923	4.928	4.934	4.939	4.945	**1050**
1060	4.945	4.951	4.956	4.962	4.968	4.973	4.979	4.984	4.990	4.996	5.001	1060
1070	5.001	5.007	5.013	5.018	5.024	5.030	5.035	5.041	5.046	5.052	5.058	1070
1080	5.058	5.063	5.069	5.075	5.080	5.086	5.092	5.097	5.103	5.109	5.114	1080
1090	5.114	5.120	5.125	5.131	5.137	5.142	5.148	5.154	5.159	5.165	5.171	1090
1100	5.171	5.176	5.182	5.188	5.193	5.199	5.205	5.210	5.216	5.222	5.227	**1100**
1110	5.227	5.233	5.239	5.244	5.250	5.256	5.261	5.267	5.273	5.278	5.284	1110
1120	5.284	5.290	5.295	5.301	5.307	5.312	5.318	5.324	5.330	5.335	5.341	1120
1130	5.341	5.347	5.352	5.358	5.364	5.369	5.375	5.381	5.386	5.392	5.398	1130
1140	5.398	5.404	5.409	5.415	5.421	5.426	5.432	5.438	5.443	5.449	5.455	1140
1150	5.455	5.461	5.466	5.472	5.478	5.483	5.489	5.495	5.501	5.506	5.512	**1150**
1160	5.512	5.518	5.523	5.529	5.535	5.541	5.546	5.552	5.558	5.563	5.569	1160
1170	5.569	5.575	5.581	5.586	5.592	5.598	5.604	5.609	5.615	5.621	5.627	1170
1180	5.627	5.632	5.638	5.644	5.649	5.655	5.661	5.667	5.672	5.678	5.684	1180
1190	5.684	5.690	5.695	5.701	5.707	5.713	5.718	5.724	5.730	5.736	5.741	1190
1200	5.741	5.747	5.753	5.759	5.764	5.770	5.776	5.782	5.788	5.793	5.799	**1200**
1210	5.799	5.805	5.811	5.816	5.822	5.828	5.834	5.839	5.845	5.851	5.857	1210
1220	5.857	5.863	5.868	5.874	5.880	5.886	5.891	5.897	5.903	5.909	5.915	1220
1230	5.915	5.920	5.926	5.932	5.938	5.944	5.949	5.955	5.961	5.967	5.972	1230
1240	5.972	5.978	5.984	5.990	5.996	6.001	6.007	6.013	6.019	6.025	6.030	1240
1250	6.030	6.036	6.042	6.048	6.054	6.060	6.065	6.071	6.077	6.083	6.089	**1250**
1260	6.089	6.094	6.100	6.106	6.112	6.118	6.124	6.129	6.135	6.141	6.147	1260
1270	6.147	6.153	6.158	6.164	6.170	6.176	6.182	6.188	6.193	6.199	6.205	1270
1280	6.205	6.211	6.217	6.223	6.228	6.234	6.240	6.246	6.252	6.258	6.264	1280
1290	6.264	6.269	6.275	6.281	6.287	6.293	6.299	6.305	6.310	6.316	6.322	1290
1300	6.322	6.328	6.334	6.340	6.346	6.351	6.357	6.363	6.369	6.375	6.381	**1300**
1310	6.381	6.387	6.392	6.398	6.404	6.410	6.416	6.422	6.428	6.434	6.439	1310
1320	6.439	6.445	6.451	6.457	6.463	6.469	6.475	6.481	6.486	6.492	6.498	1320
1330	6.498	6.504	6.510	6.516	6.522	6.528	6.534	6.539	6.545	6.551	6.557	1330
1340	6.557	6.563	6.569	6.575	6.581	6.587	6.593	6.598	6.604	6.610	6.616	1340
1350	6.616	6.622	6.628	6.634	6.640	6.646	6.652	6.658	6.664	6.669	6.675	**1350**
1360	6.675	6.681	6.687	6.693	6.699	6.705	6.711	6.717	6.723	6.729	6.735	1360
1370	6.735	6.741	6.746	6.752	6.758	6.764	6.770	6.776	6.782	6.788	6.794	1370
1380	6.794	6.800	6.806	6.812	6.818	6.824	6.830	6.836	6.842	6.847	6.853	1380
1390	6.853	6.859	6.865	6.871	6.877	6.883	6.889	6.895	6.901	6.907	6.913	1390
1400	6.913	6.919	6.925	6.931	6.937	6.943	6.949	6.955	6.961	6.967	6.973	**1400**
1410	6.973	6.979	6.985	6.991	6.997	7.003	7.008	7.014	7.020	7.026	7.032	1410
1420	7.032	7.038	7.044	7.050	7.056	7.062	7.068	7.074	7.080	7.086	7.092	1420
1430	7.092	7.098	7.104	7.110	7.116	7.122	7.128	7.134	7.140	7.146	7.152	1430
1440	7.152	7.158	7.164	7.170	7.176	7.182	7.188	7.194	7.200	7.206	7.212	1440
°F	0	1	2	3	4	5	6	7	8	9	10	°F

S

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
550	4.732	4.742	4.752	4.762	4.772	4.782	4.793	4.803	4.813	4.823	4.833	**550**
560	4.833	4.843	4.853	4.863	4.873	4.883	4.893	4.904	4.914	4.924	4.934	560
570	4.934	4.944	4.954	4.964	4.974	4.984	4.995	5.005	5.015	5.025	5.035	570
580	5.035	5.045	5.055	5.066	5.076	5.086	5.096	5.106	5.116	5.127	5.137	580
590	5.137	5.147	5.157	5.167	5.178	5.188	5.198	5.208	5.218	5.228	5.239	590
600	5.239	5.249	5.259	5.269	5.280	5.290	5.300	5.310	5.320	5.331	5.341	**600**
610	5.341	5.351	5.361	5.372	5.382	5.392	5.402	5.413	5.423	5.433	5.443	610
620	5.443	5.454	5.464	5.474	5.485	5.495	5.505	5.515	5.526	5.536	5.546	620
630	5.546	5.557	5.567	5.577	5.588	5.598	5.608	5.618	5.629	5.639	5.649	630
640	5.649	5.660	5.670	5.680	5.691	5.701	5.712	5.722	5.732	5.743	5.753	640
650	5.753	5.763	5.774	5.784	5.794	5.805	5.815	5.826	5.836	5.846	5.857	**650**
660	5.857	5.867	5.878	5.888	5.898	5.909	5.919	5.930	5.940	5.950	5.961	660
670	5.961	5.971	5.982	5.992	6.003	6.013	6.024	6.034	6.044	6.055	6.065	670
680	6.065	6.076	6.086	6.097	6.107	6.118	6.128	6.139	6.149	6.160	6.170	680
690	6.170	6.181	6.191	6.202	6.212	6.223	6.233	6.244	6.254	6.265	6.275	690
700	6.275	6.286	6.296	6.307	6.317	6.328	6.338	6.349	6.360	6.370	6.381	**700**
710	6.381	6.391	6.402	6.412	6.423	6.434	6.444	6.455	6.465	6.476	6.486	710
720	6.486	6.497	6.508	6.518	6.529	6.539	6.550	6.561	6.571	6.582	6.593	720
730	6.593	6.603	6.614	6.624	6.635	6.646	6.656	6.667	6.678	6.688	6.699	730
740	6.699	6.710	6.720	6.731	6.742	6.752	6.763	6.774	6.784	6.795	6.806	740
750	6.806	6.817	6.827	6.838	6.849	6.859	6.870	6.881	6.892	6.902	6.913	**750**
760	6.913	6.924	6.934	6.945	6.956	6.967	6.977	6.988	6.999	7.010	7.020	760
770	7.020	7.031	7.042	7.053	7.064	7.074	7.085	7.096	7.107	7.117	7.128	770
780	7.128	7.139	7.150	7.161	7.172	7.182	7.193	7.204	7.215	7.226	7.236	780
790	7.236	7.247	7.258	7.269	7.280	7.291	7.302	7.312	7.323	7.334	7.345	790
800	7.345	7.356	7.367	7.378	7.388	7.399	7.410	7.421	7.432	7.443	7.454	**800**
810	7.454	7.465	7.476	7.487	7.497	7.508	7.519	7.530	7.541	7.552	7.563	810
820	7.563	7.574	7.585	7.596	7.607	7.618	7.629	7.640	7.651	7.662	7.673	820
830	7.673	7.684	7.695	7.706	7.717	7.728	7.739	7.750	7.761	7.772	7.783	830
840	7.783	7.794	7.805	7.816	7.827	7.838	7.849	7.860	7.871	7.882	7.893	840
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1450	7.212	7.218	7.224	7.230	7.236	7.242	7.249	7.255	7.261	7.267	7.273	**1450**
1460	7.273	7.279	7.285	7.291	7.297	7.303	7.309	7.315	7.321	7.327	7.333	1460
1470	7.333	7.339	7.345	7.351	7.357	7.363	7.369	7.375	7.381	7.387	7.393	1470
1480	7.393	7.399	7.405	7.411	7.418	7.424	7.430	7.436	7.442	7.448	7.454	1480
1490	7.454	7.460	7.466	7.472	7.478	7.484	7.490	7.496	7.502	7.508	7.514	1490
1500	7.514	7.521	7.527	7.533	7.539	7.545	7.551	7.557	7.563	7.569	7.575	**1500**
1510	7.575	7.581	7.587	7.593	7.600	7.606	7.612	7.618	7.624	7.630	7.636	1510
1520	7.636	7.642	7.648	7.654	7.660	7.667	7.673	7.679	7.685	7.691	7.697	1520
1530	7.697	7.703	7.709	7.715	7.721	7.728	7.734	7.740	7.746	7.752	7.758	1530
1540	7.758	7.764	7.770	7.776	7.783	7.789	7.795	7.801	7.807	7.813	7.819	1540
1550	7.819	7.825	7.832	7.838	7.844	7.850	7.856	7.862	7.868	7.874	7.881	**1550**
1560	7.881	7.887	7.893	7.899	7.905	7.911	7.917	7.923	7.930	7.936	7.942	1560
1570	7.942	7.948	7.954	7.960	7.966	7.973	7.979	7.985	7.991	7.997	8.003	1570
1580	8.003	8.010	8.016	8.022	8.028	8.034	8.040	8.047	8.053	8.059	8.065	1580
1590	8.065	8.071	8.077	8.083	8.090	8.096	8.102	8.108	8.114	8.121	8.127	1590
1600	8.127	8.133	8.139	8.145	8.151	8.158	8.164	8.170	8.176	8.182	8.189	**1600**
1610	8.189	8.195	8.201	8.207	8.213	8.219	8.226	8.232	8.238	8.244	8.250	1610
1620	8.250	8.257	8.263	8.269	8.275	8.281	8.288	8.294	8.300	8.306	8.312	1620
1630	8.312	8.319	8.325	8.331	8.337	8.343	8.350	8.356	8.362	8.368	8.375	1630
1640	8.375	8.381	8.387	8.393	8.399	8.406	8.412	8.418	8.424	8.431	8.437	1640
1650	8.437	8.443	8.449	8.455	8.462	8.468	8.474	8.480	8.487	8.493	8.499	**1650**
1660	8.499	8.505	8.512	8.518	8.524	8.530	8.537	8.543	8.549	8.555	8.562	1660
1670	8.562	8.568	8.574	8.580	8.587	8.593	8.599	8.605	8.612	8.618	8.624	1670
1680	8.624	8.630	8.637	8.643	8.649	8.655	8.662	8.668	8.674	8.680	8.687	1680
1690	8.687	8.693	8.699	8.706	8.712	8.718	8.724	8.731	8.737	8.743	8.749	1690
1700	8.749	8.756	8.762	8.768	8.775	8.781	8.787	8.793	8.800	8.806	8.812	**1700**
1710	8.812	8.819	8.825	8.831	8.837	8.844	8.850	8.856	8.863	8.869	8.875	1710
1720	8.875	8.882	8.888	8.894	8.900	8.907	8.913	8.919	8.926	8.932	8.938	1720
1730	8.938	8.945	8.951	8.957	8.964	8.970	8.976	8.983	8.989	8.995	9.001	1730
1740	9.001	9.008	9.014	9.020	9.027	9.033	9.039	9.046	9.052	9.058	9.065	1740
1750	9.065	9.071	9.077	9.084	9.090	9.096	9.103	9.109	9.115	9.122	9.128	**1750**
1760	9.128	9.134	9.141	9.147	9.153	9.160	9.166	9.172	9.179	9.185	9.192	1760
1770	9.192	9.198	9.204	9.211	9.217	9.223	9.230	9.236	9.242	9.249	9.255	1770
1780	9.255	9.261	9.268	9.274	9.281	9.287	9.293	9.300	9.306	9.312	9.319	1780
1790	9.319	9.325	9.331	9.338	9.344	9.351	9.357	9.363	9.370	9.376	9.382	1790
1800	9.382	9.389	9.395	9.402	9.408	9.414	9.421	9.427	9.434	9.440	9.446	**1800**
1810	9.446	9.453	9.459	9.465	9.472	9.478	9.485	9.491	9.497	9.504	9.510	1810
1820	9.510	9.517	9.523	9.529	9.536	9.542	9.549	9.555	9.561	9.568	9.574	1820
1830	9.574	9.581	9.587	9.594	9.600	9.606	9.613	9.619	9.626	9.632	9.638	1830
1840	9.638	9.645	9.651	9.658	9.664	9.671	9.677	9.683	9.690	9.696	9.703	1840
1850	9.703	9.709	9.716	9.722	9.728	9.735	9.741	9.748	9.754	9.761	9.767	**1850**
1860	9.767	9.773	9.780	9.786	9.793	9.799	9.806	9.812	9.819	9.825	9.831	1860
1870	9.831	9.838	9.844	9.851	9.857	9.864	9.870	9.877	9.883	9.889	9.896	1870
1880	9.896	9.902	9.909	9.915	9.922	9.928	9.935	9.941	9.948	9.954	9.961	1880
1890	9.961	9.967	9.973	9.980	9.986	9.993	9.999	10.006	10.012	10.019	10.025	1890
1900	10.025	10.032	10.038	10.045	10.051	10.058	10.064	10.071	10.077	10.084	10.090	**1900**
1910	10.090	10.097	10.103	10.110	10.116	10.123	10.129	10.136	10.142	10.149	10.155	1910
1920	10.155	10.162	10.168	10.175	10.181	10.188	10.194	10.201	10.207	10.214	10.220	1920
1930	10.220	10.227	10.233	10.240	10.246	10.253	10.259	10.266	10.272	10.279	10.285	1930
1940	10.285	10.292	10.298	10.305	10.311	10.318	10.324	10.331	10.337	10.344	10.350	1940
°F	0	1	2	3	4	5	6	7	8	9	10	°F

S

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
850	7.893	7.904	7.915	7.926	7.937	7.948	7.959	7.970	7.981	7.992	8.003	**850**
860	8.003	8.014	8.026	8.037	8.048	8.059	8.070	8.081	8.092	8.103	8.114	860
870	8.114	8.125	8.137	8.148	8.159	8.170	8.181	8.192	8.203	8.214	8.226	870
880	8.226	8.237	8.248	8.259	8.270	8.281	8.293	8.304	8.315	8.326	8.337	880
890	8.337	8.348	8.360	8.371	8.382	8.393	8.404	8.416	8.427	8.438	8.449	890
900	8.449	8.460	8.472	8.483	8.494	8.505	8.517	8.528	8.539	8.550	8.562	**900**
910	8.562	8.573	8.584	8.595	8.607	8.618	8.629	8.640	8.652	8.663	8.674	910
920	8.674	8.685	8.697	8.708	8.719	8.731	8.742	8.753	8.765	8.776	8.787	920
930	8.787	8.798	8.810	8.821	8.832	8.844	8.855	8.866	8.878	8.889	8.900	930
940	8.900	8.912	8.923	8.935	8.946	8.957	8.969	8.980	8.991	9.003	9.014	940
950	9.014	9.025	9.037	9.048	9.060	9.071	9.082	9.094	9.105	9.117	9.128	**950**
960	9.128	9.139	9.151	9.162	9.174	9.185	9.197	9.208	9.219	9.231	9.242	960
970	9.242	9.254	9.265	9.277	9.288	9.300	9.311	9.323	9.334	9.345	9.357	970
980	9.357	9.368	9.380	9.391	9.403	9.414	9.426	9.437	9.449	9.460	9.472	980
990	9.472	9.483	9.495	9.506	9.518	9.529	9.541	9.552	9.564	9.576	9.587	990
1000	9.587	9.599	9.610	9.622	9.633	9.645	9.656	9.668	9.680	9.691	9.703	**1000**
1010	9.703	9.714	9.726	9.737	9.749	9.761	9.772	9.784	9.795	9.807	9.819	1010
1020	9.819	9.830	9.842	9.853	9.865	9.877	9.888	9.900	9.911	9.923	9.935	1020
1030	9.935	9.946	9.958	9.970	9.981	9.993	10.005	10.016	10.028	10.040	10.051	1030
1040	10.051	10.063	10.075	10.086	10.098	10.110	10.121	10.133	10.145	10.156	10.168	1040
1050	10.168	10.180	10.191	10.203	10.215	10.227	10.238	10.250	10.262	10.273	10.285	**1050**
1060	10.285	10.297	10.309	10.320	10.332	10.344	10.356	10.367	10.379	10.391	10.403	1060
1070	10.403	10.414	10.426	10.438	10.450	10.461	10.473	10.485	10.497	10.509	10.520	1070
1080	10.520	10.532	10.544	10.556	10.567	10.579	10.591	10.603	10.615	10.626	10.638	1080
1090	10.638	10.650	10.662	10.674	10.686	10.697	10.709	10.721	10.733	10.745	10.757	1090
1100	10.757	10.768	10.780	10.792	10.804	10.816	10.828	10.839	10.851	10.863	10.875	**1100**
1110	10.875	10.887	10.899	10.911	10.922	10.934	10.946	10.958	10.970	10.982	10.994	1110
1120	10.994	11.006	11.017	11.029	11.041	11.053	11.065	11.077	11.089	11.101	11.113	1120
1130	11.113	11.125	11.136	11.148	11.160	11.172	11.184	11.196	11.208	11.220	11.232	1130
1140	11.232	11.244	11.256	11.268	11.280	11.291	11.303	11.315	11.327	11.339	11.351	1140
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type S - PT 10% RH vs Platinum

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1950	10.350	10.357	10.363	10.370	10.376	10.383	10.390	10.396	10.403	10.409	10.416	**1950**
1960	10.416	10.422	10.429	10.435	10.442	10.448	10.455	10.461	10.468	10.475	10.481	1960
1970	10.481	10.488	10.494	10.501	10.507	10.514	10.520	10.527	10.533	10.540	10.547	1970
1980	10.547	10.553	10.560	10.566	10.573	10.579	10.586	10.592	10.599	10.606	10.612	1980
1990	10.612	10.619	10.625	10.632	10.638	10.645	10.651	10.658	10.665	10.671	10.678	1990
2000	10.678	10.684	10.691	10.697	10.704	10.711	10.717	10.724	10.730	10.737	10.743	**2000**
2010	10.743	10.750	10.757	10.763	10.770	10.776	10.783	10.789	10.796	10.803	10.809	2010
2020	10.809	10.816	10.822	10.829	10.836	10.842	10.849	10.855	10.862	10.868	10.875	2020
2030	10.875	10.882	10.888	10.895	10.901	10.908	10.915	10.921	10.928	10.934	10.941	2030
2040	10.941	10.948	10.954	10.961	10.967	10.974	10.981	10.987	10.994	11.000	11.007	2040
2050	11.007	11.014	11.020	11.027	11.033	11.040	11.047	11.053	11.060	11.066	11.073	**2050**
2060	11.073	11.080	11.086	11.093	11.099	11.106	11.113	11.119	11.126	11.132	11.139	2060
2070	11.139	11.146	11.152	11.159	11.166	11.172	11.179	11.185	11.192	11.199	11.205	2070
2080	11.205	11.212	11.219	11.225	11.232	11.238	11.245	11.252	11.258	11.265	11.272	2080
2090	11.272	11.278	11.285	11.291	11.298	11.305	11.311	11.318	11.325	11.331	11.338	2090
2100	11.338	11.345	11.351	11.358	11.364	11.371	11.378	11.384	11.391	11.398	11.404	**2100**
2110	11.404	11.411	11.418	11.424	11.431	11.437	11.444	11.451	11.457	11.464	11.471	2110
2120	11.471	11.477	11.484	11.491	11.497	11.504	11.511	11.517	11.524	11.531	11.537	2120
2130	11.537	11.544	11.550	11.557	11.564	11.570	11.577	11.584	11.590	11.597	11.604	2130
2140	11.604	11.610	11.617	11.624	11.630	11.637	11.644	11.650	11.657	11.664	11.670	2140
2150	11.670	11.677	11.684	11.690	11.697	11.704	11.710	11.717	11.724	11.730	11.737	**2150**
2160	11.737	11.744	11.750	11.757	11.764	11.770	11.777	11.784	11.790	11.797	11.804	2160
2170	11.804	11.810	11.817	11.824	11.830	11.837	11.844	11.850	11.857	11.864	11.870	2170
2180	11.870	11.877	11.884	11.890	11.897	11.904	11.910	11.917	11.924	11.931	11.937	2180
2190	11.937	11.944	11.951	11.957	11.964	11.971	11.977	11.984	11.991	11.997	12.004	2190
2200	12.004	12.011	12.017	12.024	12.031	12.037	12.044	12.051	12.058	12.064	12.071	**2200**
2210	12.071	12.078	12.084	12.091	12.098	12.104	12.111	12.118	12.124	12.131	12.138	2210
2220	12.138	12.145	12.151	12.158	12.165	12.171	12.178	12.185	12.191	12.198	12.205	2220
2230	12.205	12.211	12.218	12.225	12.232	12.238	12.245	12.252	12.258	12.265	12.272	2230
2240	12.272	12.278	12.285	12.292	12.299	12.305	12.312	12.319	12.325	12.332	12.339	2240
2250	12.339	12.346	12.352	12.359	12.366	12.372	12.379	12.386	12.392	12.399	12.406	**2250**
2260	12.406	12.413	12.419	12.426	12.433	12.439	12.446	12.453	12.460	12.466	12.473	2260
2270	12.473	12.480	12.486	12.493	12.500	12.507	12.513	12.520	12.527	12.533	12.540	2270
2280	12.540	12.547	12.554	12.560	12.567	12.574	12.580	12.587	12.594	12.601	12.607	2280
2290	12.607	12.614	12.621	12.627	12.634	12.641	12.648	12.654	12.661	12.668	12.675	2290
2300	12.675	12.681	12.688	12.695	12.701	12.708	12.715	12.722	12.728	12.735	12.742	**2300**
2310	12.742	12.748	12.755	12.762	12.769	12.775	12.782	12.789	12.796	12.802	12.809	2310
2320	12.809	12.816	12.822	12.829	12.836	12.843	12.849	12.856	12.863	12.870	12.876	2320
2330	12.876	12.883	12.890	12.896	12.903	12.910	12.917	12.923	12.930	12.937	12.944	2330
2340	12.944	12.950	12.957	12.964	12.971	12.977	12.984	12.991	12.997	13.004	13.011	2340
2350	13.011	13.018	13.024	13.031	13.038	13.045	13.051	13.058	13.065	13.072	13.078	**2350**
2360	13.078	13.085	13.092	13.098	13.105	13.112	13.119	13.125	13.132	13.139	13.146	2360
2370	13.146	13.152	13.159	13.166	13.173	13.179	13.186	13.193	13.199	13.206	13.213	2370
2380	13.213	13.220	13.226	13.233	13.240	13.247	13.253	13.260	13.267	13.274	13.280	2380
2390	13.280	13.287	13.294	13.301	13.307	13.314	13.321	13.328	13.334	13.341	13.348	2390
2400	13.348	13.354	13.361	13.368	13.375	13.381	13.388	13.395	13.402	13.408	13.415	**2400**
2410	13.415	13.422	13.429	13.435	13.442	13.449	13.456	13.462	13.469	13.476	13.483	2410
2420	13.483	13.489	13.496	13.503	13.510	13.516	13.523	13.530	13.537	13.543	13.550	2420
2430	13.550	13.557	13.563	13.570	13.577	13.584	13.590	13.597	13.604	13.611	13.617	2430
2440	13.617	13.624	13.631	13.638	13.644	13.651	13.658	13.665	13.671	13.678	13.685	2440
°F	0	1	2	3	4	5	6	7	8	9	10	°F

S

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1150	11.351	11.363	11.375	11.387	11.399	11.411	11.423	11.435	11.447	11.459	11.471	**1150**
1160	11.471	11.483	11.495	11.507	11.519	11.531	11.542	11.554	11.566	11.578	11.590	1160
1170	11.590	11.602	11.614	11.626	11.638	11.650	11.662	11.674	11.686	11.698	11.710	1170
1180	11.710	11.722	11.734	11.746	11.758	11.770	11.782	11.794	11.806	11.818	11.830	1180
1190	11.830	11.842	11.854	11.866	11.878	11.890	11.902	11.914	11.926	11.939	11.951	1190
1200	11.951	11.963	11.975	11.987	11.999	12.011	12.023	12.035	12.047	12.059	12.071	**1200**
1210	12.071	12.083	12.095	12.107	12.119	12.131	12.143	12.155	12.167	12.179	12.191	1210
1220	12.191	12.203	12.216	12.228	12.240	12.252	12.264	12.276	12.288	12.300	12.312	1220
1230	12.312	12.324	12.336	12.348	12.360	12.372	12.384	12.397	12.409	12.421	12.433	1230
1240	12.433	12.445	12.457	12.469	12.481	12.493	12.505	12.517	12.529	12.542	12.554	1240
1250	12.554	12.566	12.578	12.590	12.602	12.614	12.626	12.638	12.650	12.662	12.675	**1250**
1260	12.675	12.687	12.699	12.711	12.723	12.735	12.747	12.759	12.771	12.783	12.796	1260
1270	12.796	12.808	12.820	12.832	12.844	12.856	12.868	12.880	12.892	12.905	12.917	1270
1280	12.917	12.929	12.941	12.953	12.965	12.977	12.989	13.001	13.014	13.026	13.038	1280
1290	13.038	13.050	13.062	13.074	13.086	13.098	13.111	13.123	13.135	13.147	13.159	1290
1300	13.159	13.171	13.183	13.195	13.208	13.220	13.232	13.244	13.256	13.268	13.280	**1300**
1310	13.280	13.292	13.305	13.317	13.329	13.341	13.353	13.365	13.377	13.390	13.402	1310
1320	13.402	13.414	13.426	13.438	13.450	13.462	13.474	13.487	13.499	13.511	13.523	1320
1330	13.523	13.535	13.547	13.559	13.572	13.584	13.596	13.608	13.620	13.632	13.644	1330
1340	13.644	13.657	13.669	13.681	13.693	13.705	13.717	13.729	13.742	13.754	13.766	1340
1350	13.766	13.778	13.790	13.802	13.814	13.826	13.839	13.851	13.863	13.875	13.887	**1350**
1360	13.887	13.899	13.911	13.924	13.936	13.948	13.960	13.972	13.984	13.996	14.009	1360
1370	14.009	14.021	14.033	14.045	14.057	14.069	14.081	14.094	14.106	14.118	14.130	1370
1380	14.130	14.142	14.154	14.166	14.178	14.191	14.203	14.215	14.227	14.239	14.251	1380
1390	14.251	14.263	14.276	14.288	14.300	14.312	14.324	14.336	14.348	14.360	14.373	1390
1400	14.373	14.385	14.397	14.409	14.421	14.433	14.445	14.457	14.470	14.482	14.494	**1400**
1410	14.494	14.506	14.518	14.530	14.542	14.554	14.567	14.579	14.591	14.603	14.615	1410
1420	14.615	14.627	14.639	14.651	14.664	14.676	14.688	14.700	14.712	14.724	14.736	1420
1430	14.736	14.748	14.760	14.773	14.785	14.797	14.809	14.821	14.833	14.845	14.857	1430
1440	14.857	14.869	14.881	14.894	14.906	14.918	14.930	14.942	14.954	14.966	14.978	1440
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2450	13.685	13.692	13.698	13.705	13.712	13.719	13.725	13.732	13.739	13.746	13.752	**2450**
2460	13.752	13.759	13.766	13.773	13.779	13.786	13.793	13.800	13.806	13.813	13.820	2460
2470	13.820	13.826	13.833	13.840	13.847	13.853	13.860	13.867	13.874	13.880	13.887	2470
2480	13.887	13.894	13.901	13.907	13.914	13.921	13.928	13.934	13.941	13.948	13.955	2480
2490	13.955	13.961	13.968	13.975	13.982	13.988	13.995	14.002	14.009	14.015	14.022	2490
2500	14.022	14.029	14.036	14.042	14.049	14.056	14.063	14.069	14.076	14.083	14.089	**2500**
2510	14.089	14.096	14.103	14.110	14.116	14.123	14.130	14.137	14.143	14.150	14.157	2510
2520	14.157	14.164	14.170	14.177	14.184	14.191	14.197	14.204	14.211	14.218	14.224	2520
2530	14.224	14.231	14.238	14.245	14.251	14.258	14.265	14.272	14.278	14.285	14.292	2530
2540	14.292	14.298	14.305	14.312	14.319	14.325	14.332	14.339	14.346	14.352	14.359	2540
2550	14.359	14.366	14.373	14.379	14.386	14.393	14.400	14.406	14.413	14.420	14.426	**2550**
2560	14.426	14.433	14.440	14.447	14.453	14.460	14.467	14.474	14.480	14.487	14.494	2560
2570	14.494	14.501	14.507	14.514	14.521	14.528	14.534	14.541	14.548	14.554	14.561	2570
2580	14.561	14.568	14.575	14.581	14.588	14.595	14.602	14.608	14.615	14.622	14.629	2580
2590	14.629	14.635	14.642	14.649	14.655	14.662	14.669	14.676	14.682	14.689	14.696	2590
2600	14.696	14.703	14.709	14.716	14.723	14.729	14.736	14.743	14.750	14.756	14.763	**2600**
2610	14.763	14.770	14.777	14.783	14.790	14.797	14.803	14.810	14.817	14.824	14.830	2610
2620	14.830	14.837	14.844	14.851	14.857	14.864	14.871	14.877	14.884	14.891	14.898	2620
2630	14.898	14.904	14.911	14.918	14.925	14.931	14.938	14.945	14.951	14.958	14.965	2630
2640	14.965	14.972	14.978	14.985	14.992	14.998	15.005	15.012	15.019	15.025	15.032	2640
2650	15.032	15.039	15.045	15.052	15.059	15.066	15.072	15.079	15.086	15.092	15.099	**2650**
2660	15.099	15.106	15.113	15.119	15.126	15.133	15.139	15.146	15.153	15.160	15.166	2660
2670	15.166	15.173	15.180	15.186	15.193	15.200	15.207	15.213	15.220	15.227	15.233	2670
2680	15.233	15.240	15.247	15.254	15.260	15.267	15.274	15.280	15.287	15.294	15.300	2680
2690	15.300	15.307	15.314	15.321	15.327	15.334	15.341	15.347	15.354	15.361	15.367	2690
2700	15.367	15.374	15.381	15.388	15.394	15.401	15.408	15.414	15.421	15.428	15.434	**2700**
2710	15.434	15.441	15.448	15.455	15.461	15.468	15.475	15.481	15.488	15.495	15.501	2710
2720	15.501	15.508	15.515	15.521	15.528	15.535	15.542	15.548	15.555	15.562	15.568	2720
2730	15.568	15.575	15.582	15.588	15.595	15.602	15.608	15.615	15.622	15.628	15.635	2730
2740	15.635	15.642	15.649	15.655	15.662	15.669	15.675	15.682	15.689	15.695	15.702	2740
2750	15.702	15.709	15.715	15.722	15.729	15.735	15.742	15.749	15.755	15.762	15.769	**2750**
2760	15.769	15.775	15.782	15.789	15.795	15.802	15.809	15.815	15.822	15.829	15.835	2760
2770	15.835	15.842	15.849	15.855	15.862	15.869	15.875	15.882	15.889	15.895	15.902	2770
2780	15.902	15.909	15.915	15.922	15.929	15.935	15.942	15.949	15.955	15.962	15.969	2780
2790	15.969	15.975	15.982	15.989	15.995	16.002	16.009	16.015	16.022	16.029	16.035	2790
2800	16.035	16.042	16.049	16.055	16.062	16.069	16.075	16.082	16.089	16.095	16.102	**2800**
2810	16.102	16.108	16.115	16.122	16.128	16.135	16.142	16.148	16.155	16.162	16.168	2810
2820	16.168	16.175	16.182	16.188	16.195	16.202	16.208	16.215	16.221	16.228	16.235	2820
2830	16.235	16.241	16.248	16.255	16.261	16.268	16.275	16.281	16.288	16.294	16.301	2830
2840	16.301	16.308	16.314	16.321	16.328	16.334	16.341	16.347	16.354	16.361	16.367	2840
2850	16.367	16.374	16.381	16.387	16.394	16.400	16.407	16.414	16.420	16.427	16.434	**2850**
2860	16.434	16.440	16.447	16.453	16.460	16.467	16.473	16.480	16.486	16.493	16.500	2860
2870	16.500	16.506	16.513	16.520	16.526	16.533	16.539	16.546	16.553	16.559	16.566	2870
2880	16.566	16.572	16.579	16.586	16.592	16.599	16.605	16.612	16.619	16.625	16.632	2880
2890	16.632	16.638	16.645	16.652	16.658	16.665	16.671	16.678	16.685	16.691	16.698	2890
2900	16.698	16.704	16.711	16.718	16.724	16.731	16.737	16.744	16.751	16.757	16.764	**2900**
2910	16.764	16.770	16.777	16.783	16.790	16.797	16.803	16.810	16.816	16.823	16.829	2910
2920	16.829	16.836	16.843	16.849	16.856	16.862	16.869	16.876	16.882	16.889	16.895	2920
2930	16.895	16.902	16.908	16.915	16.922	16.928	16.935	16.941	16.948	16.954	16.961	2930
2940	16.961	16.967	16.974	16.981	16.987	16.994	17.000	17.007	17.013	17.020	17.026	2940
°F	0	1	2	3	4	5	6	7	8	9	10	°F

S

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1450	14.978	14.990	15.002	15.015	15.027	15.039	15.051	15.063	15.075	15.087	15.099	**1450**
1460	15.099	15.111	15.123	15.135	15.148	15.160	15.172	15.184	15.196	15.208	15.220	1460
1470	15.220	15.232	15.244	15.256	15.268	15.280	15.292	15.304	15.317	15.329	15.341	1470
1480	15.341	15.353	15.365	15.377	15.389	15.401	15.413	15.425	15.437	15.449	15.461	1480
1490	15.461	15.473	15.485	15.497	15.509	15.521	15.534	15.546	15.558	15.570	15.582	1490
1500	15.582	15.594	15.606	15.618	15.630	15.642	15.654	15.666	15.678	15.690	15.702	**1500**
1510	15.702	15.714	15.726	15.738	15.750	15.762	15.774	15.786	15.798	15.810	15.822	1510
1520	15.822	15.834	15.846	15.858	15.870	15.882	15.894	15.906	15.918	15.930	15.942	1520
1530	15.942	15.954	15.966	15.978	15.990	16.002	16.014	16.026	16.038	16.050	16.062	1530
1540	16.062	16.074	16.086	16.098	16.110	16.122	16.134	16.146	16.158	16.170	16.182	1540
1550	16.182	16.194	16.205	16.217	16.229	16.241	16.253	16.265	16.277	16.289	16.301	**1550**
1560	16.301	16.313	16.325	16.337	16.349	16.361	16.373	16.385	16.396	16.408	16.420	1560
1570	16.420	16.432	16.444	16.456	16.468	16.480	16.492	16.504	16.516	16.527	16.539	1570
1580	16.539	16.551	16.563	16.575	16.587	16.599	16.611	16.623	16.634	16.646	16.658	1580
1590	16.658	16.670	16.682	16.694	16.706	16.718	16.729	16.741	16.753	16.765	16.777	1590
1600	16.777	16.789	16.801	16.812	16.824	16.836	16.848	16.860	16.872	16.883	16.895	**1600**
1610	16.895	16.907	16.919	16.931	16.943	16.954	16.966	16.978	16.990	17.002	17.013	1610
1620	17.013	17.025	17.037	17.049	17.061	17.072	17.084	17.096	17.108	17.120	17.131	1620
1630	17.131	17.143	17.155	17.167	17.178	17.190	17.202	17.214	17.225	17.237	17.249	1630
1640	17.249	17.261	17.272	17.284	17.296	17.308	17.319	17.331	17.343	17.355	17.366	1640
1650	17.366	17.378	17.390	17.401	17.413	17.425	17.437	17.448	17.460	17.472	17.483	**1650**
1660	17.483	17.495	17.507	17.518	17.530	17.542	17.553	17.565	17.577	17.588	17.600	1660
1670	17.600	17.612	17.623	17.635	17.647	17.658	17.670	17.682	17.693	17.705	17.717	1670
1680	17.717	17.728	17.740	17.751	17.763	17.775	17.786	17.798	17.809	17.821	17.832	1680
1690	17.832	17.844	17.855	17.867	17.878	17.890	17.901	17.913	17.924	17.936	17.947	1690
1700	17.947	17.959	17.970	17.982	17.993	18.004	18.016	18.027	18.039	18.050	18.061	**1700**
1710	18.061	18.073	18.084	18.095	18.107	18.118	18.129	18.140	18.152	18.163	18.174	1710
1720	18.174	18.185	18.196	18.208	18.219	18.230	18.241	18.252	18.263	18.274	18.285	1720
1730	18.285	18.297	18.308	18.319	18.330	18.341	18.352	18.362	18.373	18.384	18.395	1730
1740	18.395	18.406	18.417	18.428	18.439	18.449	18.460	18.471	18.482	18.493	18.503	1740
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type S - PT 10% RH vs Platinum

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2950	17.026	17.033	17.040	17.046	17.053	17.059	17.066	17.072	17.079	17.085	17.092	**2950**
2960	17.092	17.099	17.105	17.112	17.118	17.125	17.131	17.138	17.144	17.151	17.157	2960
2970	17.157	17.164	17.171	17.177	17.184	17.190	17.197	17.203	17.210	17.216	17.223	2970
2980	17.223	17.229	17.236	17.242	17.249	17.255	17.262	17.268	17.275	17.282	17.288	2980
2990	17.288	17.295	17.301	17.308	17.314	17.321	17.327	17.334	17.340	17.347	17.353	2990
3000	17.353	17.360	17.366	17.373	17.379	17.386	17.392	17.399	17.405	17.412	17.418	**3000**
3010	17.418	17.425	17.431	17.438	17.444	17.451	17.457	17.464	17.470	17.477	17.483	3010
3020	17.483	17.490	17.496	17.503	17.509	17.516	17.522	17.529	17.535	17.542	17.548	3020
3030	17.548	17.555	17.561	17.568	17.574	17.581	17.587	17.594	17.600	17.607	17.613	3030
3040	17.613	17.620	17.626	17.633	17.639	17.645	17.652	17.658	17.665	17.671	17.678	3040
3050	17.678	17.684	17.691	17.697	17.704	17.710	17.717	17.723	17.729	17.736	17.742	**3050**
3060	17.742	17.749	17.755	17.762	17.768	17.775	17.781	17.787	17.794	17.800	17.807	3060
3070	17.807	17.813	17.819	17.826	17.832	17.839	17.845	17.852	17.858	17.864	17.871	3070
3080	17.871	17.877	17.884	17.890	17.896	17.903	17.909	17.915	17.922	17.928	17.935	3080
3090	17.935	17.941	17.947	17.954	17.960	17.966	17.973	17.979	17.985	17.992	17.998	3090
3100	17.998	18.004	18.011	18.017	18.023	18.030	18.036	18.042	18.049	18.055	18.061	**3100**
3110	18.061	18.068	18.074	18.080	18.086	18.093	18.099	18.105	18.112	18.118	18.124	3110
3120	18.124	18.130	18.137	18.143	18.149	18.155	18.162	18.168	18.174	18.180	18.187	3120
3130	18.187	18.193	18.199	18.205	18.211	18.218	18.224	18.230	18.236	18.242	18.249	3130
3140	18.249	18.255	18.261	18.267	18.273	18.279	18.285	18.292	18.298	18.304	18.310	3140
3150	18.310	18.316	18.322	18.328	18.334	18.341	18.347	18.353	18.359	18.365	18.371	**3150**
3160	18.371	18.377	18.383	18.389	18.395	18.401	18.407	18.413	18.419	18.425	18.431	3160
3170	18.431	18.437	18.443	18.449	18.455	18.461	18.467	18.473	18.479	18.485	18.491	3170
3180	18.491	18.497	18.503	18.509	18.515	18.521	18.527	18.533	18.539	18.545	18.551	3180
3190	18.551	18.557	18.562	18.568	18.574	18.580	18.586	18.592	18.598	18.603	18.609	3190
3200	18.609	18.615	18.621	18.627	18.633	18.638	18.644	18.650	18.656	18.661	18.667	**3200**
3210	18.667	18.673	18.679	18.684	18.690							3210
°F	0	1	2	3	4	5	6	7	8	9	10	°F

S

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1750	18.503	18.514	18.525	18.535	18.546	18.557	18.567	18.578	18.588	18.599	18.609	**1750**
1760	18.609	18.620	18.630	18.641	18.651	18.661	18.672	18.682	18.693			1760
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type B - PT 30% RH vs PT 6% RH

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
30			0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	30
40	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	40
50	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	**50**
60	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	60
70	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.002	-0.002	-0.002	-0.002	70
80	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	80
90	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	90
100	-0.001	-0.001	-0.001	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**100**
110	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	110
120	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	120
130	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.006	130
140	0.006	0.006	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.009	0.009	140
150	0.009	0.009	0.009	0.010	0.010	0.010	0.011	0.011	0.011	0.012	0.012	**150**
160	0.012	0.012	0.013	0.013	0.013	0.014	0.014	0.014	0.015	0.015	0.015	160
170	0.015	0.016	0.016	0.016	0.017	0.017	0.017	0.018	0.018	0.019	0.019	170
180	0.019	0.019	0.020	0.020	0.021	0.021	0.021	0.022	0.022	0.023	0.023	180
190	0.023	0.023	0.024	0.024	0.025	0.025	0.026	0.026	0.027	0.027	0.027	190
200	0.027	0.028	0.028	0.029	0.029	0.030	0.030	0.031	0.031	0.032	0.032	**200**
210	0.032	0.033	0.033	0.034	0.034	0.035	0.035	0.036	0.036	0.037	0.037	210
220	0.037	0.038	0.038	0.039	0.039	0.040	0.041	0.041	0.042	0.042	0.043	220
230	0.043	0.043	0.044	0.044	0.045	0.046	0.046	0.047	0.047	0.048	0.049	230
240	0.049	0.049	0.050	0.050	0.051	0.052	0.052	0.053	0.053	0.054	0.055	240
250	0.055	0.055	0.056	0.057	0.057	0.058	0.059	0.059	0.060	0.060	0.061	**250**
260	0.061	0.062	0.062	0.063	0.064	0.065	0.065	0.066	0.067	0.067	0.068	260
270	0.068	0.069	0.069	0.070	0.071	0.072	0.072	0.073	0.074	0.074	0.075	270
280	0.075	0.076	0.077	0.077	0.078	0.079	0.080	0.080	0.081	0.082	0.083	280
290	0.083	0.083	0.084	0.085	0.086	0.086	0.087	0.088	0.089	0.090	0.090	290
300	0.090	0.091	0.092	0.093	0.094	0.094	0.095	0.096	0.097	0.098	0.099	**300**
310	0.099	0.099	0.100	0.101	0.102	0.103	0.104	0.105	0.105	0.106	0.107	310
320	0.107	0.108	0.109	0.110	0.111	0.112	0.112	0.113	0.114	0.115	0.116	320
330	0.116	0.117	0.118	0.119	0.120	0.121	0.121	0.122	0.123	0.124	0.125	330
340	0.125	0.126	0.127	0.128	0.129	0.130	0.131	0.132	0.133	0.134	0.135	340
350	0.135	0.136	0.137	0.138	0.139	0.140	0.141	0.142	0.143	0.144	0.145	**350**
360	0.145	0.146	0.147	0.148	0.149	0.150	0.151	0.152	0.153	0.154	0.155	360
370	0.155	0.156	0.157	0.158	0.159	0.160	0.161	0.162	0.163	0.164	0.165	370
380	0.165	0.166	0.167	0.168	0.170	0.171	0.172	0.173	0.174	0.175	0.176	380
390	0.176	0.177	0.178	0.179	0.180	0.182	0.183	0.184	0.185	0.186	0.187	390
400	0.187	0.188	0.190	0.191	0.192	0.193	0.194	0.195	0.196	0.198	0.199	**400**
410	0.199	0.200	0.201	0.202	0.203	0.205	0.206	0.207	0.208	0.209	0.211	410
420	0.211	0.212	0.213	0.214	0.215	0.217	0.218	0.219	0.220	0.222	0.223	420
430	0.223	0.224	0.225	0.226	0.228	0.229	0.230	0.231	0.233	0.234	0.235	430
440	0.235	0.236	0.238	0.239	0.240	0.242	0.243	0.244	0.245	0.247	0.248	440
450	0.248	0.249	0.251	0.252	0.253	0.255	0.256	0.257	0.259	0.260	0.261	**450**
460	0.261	0.263	0.264	0.265	0.267	0.268	0.269	0.271	0.272	0.273	0.275	460
470	0.275	0.276	0.277	0.279	0.280	0.282	0.283	0.284	0.286	0.287	0.288	470
480	0.288	0.290	0.291	0.293	0.294	0.296	0.297	0.298	0.300	0.301	0.303	480
490	0.303	0.304	0.305	0.307	0.308	0.310	0.311	0.313	0.314	0.316	0.317	490
°F	0	1	2	3	4	5	6	7	8	9	10	°F

B

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
0	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	**0**
10	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003	10
20	-0.003	-0.003	-0.003	-0.003	-0.003	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	20
30	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	0.000	30
40	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.002	40
50	0.002	0.003	0.003	0.003	0.004	0.004	0.004	0.005	0.005	0.006	0.006	**50**
60	0.006	0.007	0.007	0.008	0.008	0.009	0.009	0.010	0.010	0.011	0.011	60
70	0.011	0.012	0.012	0.013	0.014	0.014	0.015	0.015	0.016	0.017	0.017	70
80	0.017	0.018	0.019	0.020	0.020	0.021	0.022	0.022	0.023	0.024	0.025	80
90	0.025	0.026	0.026	0.027	0.028	0.029	0.030	0.031	0.031	0.032	0.033	90
100	0.033	0.034	0.035	0.036	0.037	0.038	0.039	0.040	0.041	0.042	0.043	**100**
110	0.043	0.044	0.045	0.046	0.047	0.048	0.049	0.050	0.051	0.052	0.053	110
120	0.053	0.055	0.056	0.057	0.058	0.059	0.060	0.062	0.063	0.064	0.065	120
130	0.065	0.066	0.068	0.069	0.070	0.072	0.073	0.074	0.075	0.077	0.078	130
140	0.078	0.079	0.081	0.082	0.084	0.085	0.086	0.088	0.089	0.091	0.092	140
150	0.092	0.094	0.095	0.096	0.098	0.099	0.101	0.102	0.104	0.106	0.107	**150**
160	0.107	0.109	0.110	0.112	0.113	0.115	0.117	0.118	0.120	0.122	0.123	160
170	0.123	0.125	0.127	0.128	0.130	0.132	0.134	0.135	0.137	0.139	0.141	170
180	0.141	0.142	0.144	0.146	0.148	0.150	0.151	0.153	0.155	0.157	0.159	180
190	0.159	0.161	0.163	0.165	0.166	0.168	0.170	0.172	0.174	0.176	0.178	190
200	0.178	0.180	0.182	0.184	0.186	0.188	0.190	0.192	0.195	0.197	0.199	**200**
210	0.199	0.201	0.203	0.205	0.207	0.209	0.212	0.214	0.216	0.218	0.220	210
220	0.220	0.222	0.225	0.227	0.229	0.231	0.234	0.236	0.238	0.241	0.243	220
230	0.243	0.245	0.248	0.250	0.252	0.255	0.257	0.259	0.262	0.264	0.267	230
240	0.267	0.269	0.271	0.274	0.276	0.279	0.281	0.284	0.286	0.289	0.291	240
250	0.291	0.294	0.296	0.299	0.301	0.304	0.307	0.309	0.312	0.314	0.317	**250**
260	0.317	0.320	0.322	0.325	0.328	0.330	0.333	0.336	0.338	0.341	0.344	260
270	0.344	0.347	0.349	0.352	0.355	0.358	0.360	0.363	0.366	0.369	0.372	270
280	0.372	0.375	0.377	0.380	0.383	0.386	0.389	0.392	0.395	0.398	0.401	280
290	0.401	0.404	0.407	0.410	0.413	0.416	0.419	0.422	0.425	0.428	0.431	290
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
500	0.317	0.319	0.320	0.321	0.323	0.324	0.326	0.327	0.329	0.330	0.332	**500**
510	0.332	0.333	0.335	0.336	0.338	0.339	0.341	0.342	0.344	0.345	0.347	510
520	0.347	0.348	0.350	0.352	0.353	0.355	0.356	0.358	0.359	0.361	0.362	520
530	0.362	0.364	0.365	0.367	0.369	0.370	0.372	0.373	0.375	0.377	0.378	530
540	0.378	0.380	0.381	0.383	0.384	0.386	0.388	0.389	0.391	0.393	0.394	540
550	0.394	0.396	0.397	0.399	0.401	0.402	0.404	0.406	0.407	0.409	0.411	**550**
560	0.411	0.412	0.414	0.416	0.417	0.419	0.421	0.422	0.424	0.426	0.427	560
570	0.427	0.429	0.431	0.432	0.434	0.436	0.437	0.439	0.441	0.443	0.444	570
580	0.444	0.446	0.448	0.449	0.451	0.453	0.455	0.456	0.458	0.460	0.462	580
590	0.462	0.463	0.465	0.467	0.469	0.470	0.472	0.474	0.476	0.478	0.479	590
600	0.479	0.481	0.483	0.485	0.486	0.488	0.490	0.492	0.494	0.495	0.497	**600**
610	0.497	0.499	0.501	0.503	0.505	0.506	0.508	0.510	0.512	0.514	0.516	610
620	0.516	0.517	0.519	0.521	0.523	0.525	0.527	0.529	0.530	0.532	0.534	620
630	0.534	0.536	0.538	0.540	0.542	0.544	0.546	0.547	0.549	0.551	0.553	630
640	0.553	0.555	0.557	0.559	0.561	0.563	0.565	0.567	0.569	0.570	0.572	640
650	0.572	0.574	0.576	0.578	0.580	0.582	0.584	0.586	0.588	0.590	0.592	**650**
660	0.592	0.594	0.596	0.598	0.600	0.602	0.604	0.606	0.608	0.610	0.612	660
670	0.612	0.614	0.616	0.618	0.620	0.622	0.624	0.626	0.628	0.630	0.632	670
680	0.632	0.634	0.636	0.638	0.640	0.642	0.644	0.646	0.648	0.650	0.653	680
690	0.653	0.655	0.657	0.659	0.661	0.663	0.665	0.667	0.669	0.671	0.673	690
700	0.673	0.675	0.678	0.680	0.682	0.684	0.686	0.688	0.690	0.692	0.694	**700**
710	0.694	0.697	0.699	0.701	0.703	0.705	0.707	0.709	0.712	0.714	0.716	710
720	0.716	0.718	0.720	0.722	0.725	0.727	0.729	0.731	0.733	0.735	0.738	720
730	0.738	0.740	0.742	0.744	0.746	0.749	0.751	0.753	0.755	0.757	0.760	730
740	0.760	0.762	0.764	0.766	0.769	0.771	0.773	0.775	0.778	0.780	0.782	740
750	0.782	0.784	0.787	0.789	0.791	0.793	0.796	0.798	0.800	0.802	0.805	**750**
760	0.805	0.807	0.809	0.812	0.814	0.816	0.818	0.821	0.823	0.825	0.828	760
770	0.828	0.830	0.832	0.835	0.837	0.839	0.842	0.844	0.846	0.849	0.851	770
780	0.851	0.853	0.856	0.858	0.860	0.863	0.865	0.867	0.870	0.872	0.875	780
790	0.875	0.877	0.879	0.882	0.884	0.886	0.889	0.891	0.894	0.896	0.898	790
800	0.898	0.901	0.903	0.906	0.908	0.910	0.913	0.915	0.918	0.920	0.923	**800**
810	0.923	0.925	0.927	0.930	0.932	0.935	0.937	0.940	0.942	0.945	0.947	810
820	0.947	0.950	0.952	0.955	0.957	0.959	0.962	0.964	0.967	0.969	0.972	820
830	0.972	0.974	0.977	0.979	0.982	0.984	0.987	0.989	0.992	0.994	0.997	830
840	0.997	1.000	1.002	1.005	1.007	1.010	1.012	1.015	1.017	1.020	1.022	840
850	1.022	1.025	1.027	1.030	1.033	1.035	1.038	1.040	1.043	1.045	1.048	**850**
860	1.048	1.051	1.053	1.056	1.058	1.061	1.064	1.066	1.069	1.071	1.074	860
870	1.074	1.077	1.079	1.082	1.085	1.087	1.090	1.092	1.095	1.098	1.100	870
880	1.100	1.103	1.106	1.108	1.111	1.114	1.116	1.119	1.122	1.124	1.127	880
890	1.127	1.130	1.132	1.135	1.138	1.140	1.143	1.146	1.148	1.151	1.154	890
900	1.154	1.157	1.159	1.162	1.165	1.167	1.170	1.173	1.176	1.178	1.181	**900**
910	1.181	1.184	1.186	1.189	1.192	1.195	1.197	1.200	1.203	1.206	1.208	910
920	1.208	1.211	1.214	1.217	1.220	1.222	1.225	1.228	1.231	1.233	1.236	920
930	1.236	1.239	1.242	1.245	1.247	1.250	1.253	1.256	1.259	1.262	1.264	930
940	1.264	1.267	1.270	1.273	1.276	1.278	1.281	1.284	1.287	1.290	1.293	940
950	1.293	1.296	1.298	1.301	1.304	1.307	1.310	1.313	1.316	1.318	1.321	**950**
960	1.321	1.324	1.327	1.330	1.333	1.336	1.339	1.342	1.344	1.347	1.350	960
970	1.350	1.353	1.356	1.359	1.362	1.365	1.368	1.371	1.374	1.377	1.379	970
980	1.379	1.382	1.385	1.388	1.391	1.394	1.397	1.400	1.403	1.406	1.409	980
990	1.409	1.412	1.415	1.418	1.421	1.424	1.427	1.430	1.433	1.436	1.439	990
°F	0	1	2	3	4	5	6	7	8	9	10	°F

B

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
300	0.431	0.434	0.437	0.440	0.443	0.446	0.449	0.452	0.455	0.458	0.462	**300**
310	0.462	0.465	0.468	0.471	0.474	0.478	0.481	0.484	0.487	0.490	0.494	310
320	0.494	0.497	0.500	0.503	0.507	0.510	0.513	0.517	0.520	0.523	0.527	320
330	0.527	0.530	0.533	0.537	0.540	0.544	0.547	0.550	0.554	0.557	0.561	330
340	0.561	0.564	0.568	0.571	0.575	0.578	0.582	0.585	0.589	0.592	0.596	340
350	0.596	0.599	0.603	0.607	0.610	0.614	0.617	0.621	0.625	0.628	0.632	**350**
360	0.632	0.636	0.639	0.643	0.647	0.650	0.654	0.658	0.662	0.665	0.669	360
370	0.669	0.673	0.677	0.680	0.684	0.688	0.692	0.696	0.700	0.703	0.707	370
380	0.707	0.711	0.715	0.719	0.723	0.727	0.731	0.735	0.738	0.742	0.746	380
390	0.746	0.750	0.754	0.758	0.762	0.766	0.770	0.774	0.778	0.782	0.787	390
400	0.787	0.791	0.795	0.799	0.803	0.807	0.811	0.815	0.819	0.824	0.828	**400**
410	0.828	0.832	0.836	0.840	0.844	0.849	0.853	0.857	0.861	0.866	0.870	410
420	0.870	0.874	0.878	0.883	0.887	0.891	0.896	0.900	0.904	0.909	0.913	420
430	0.913	0.917	0.922	0.926	0.930	0.935	0.939	0.944	0.948	0.953	0.957	430
440	0.957	0.961	0.966	0.970	0.975	0.979	0.984	0.988	0.993	0.997	1.002	440
450	1.002	1.007	1.011	1.016	1.020	1.025	1.030	1.034	1.039	1.043	1.048	**450**
460	1.048	1.053	1.057	1.062	1.067	1.071	1.076	1.081	1.086	1.090	1.095	460
470	1.095	1.100	1.105	1.109	1.114	1.119	1.124	1.129	1.133	1.138	1.143	470
480	1.143	1.148	1.153	1.158	1.163	1.167	1.172	1.177	1.182	1.187	1.192	480
490	1.192	1.197	1.202	1.207	1.212	1.217	1.222	1.227	1.232	1.237	1.242	490
500	1.242	1.247	1.252	1.257	1.262	1.267	1.272	1.277	1.282	1.288	1.293	**500**
510	1.293	1.298	1.303	1.308	1.313	1.318	1.324	1.329	1.334	1.339	1.344	510
520	1.344	1.350	1.355	1.360	1.365	1.371	1.376	1.381	1.387	1.392	1.397	520
530	1.397	1.402	1.408	1.413	1.418	1.424	1.429	1.435	1.440	1.445	1.451	530
540	1.451	1.456	1.462	1.467	1.472	1.478	1.483	1.489	1.494	1.500	1.505	540
550	1.505	1.511	1.516	1.522	1.527	1.533	1.539	1.544	1.550	1.555	1.561	**550**
560	1.561	1.566	1.572	1.578	1.583	1.589	1.595	1.600	1.606	1.612	1.617	560
570	1.617	1.623	1.629	1.634	1.640	1.646	1.652	1.657	1.663	1.669	1.675	570
580	1.675	1.680	1.686	1.692	1.698	1.704	1.709	1.715	1.721	1.727	1.733	580
590	1.733	1.739	1.745	1.750	1.756	1.762	1.768	1.774	1.780	1.786	1.792	590
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type B - PT 30% RH vs PT 6% RH

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1000	1.439	1.442	1.445	1.448	1.451	1.454	1.457	1.460	1.463	1.466	1.469	**1000**
1010	1.469	1.472	1.475	1.478	1.481	1.484	1.487	1.490	1.493	1.496	1.499	1010
1020	1.499	1.502	1.505	1.508	1.511	1.515	1.518	1.521	1.524	1.527	1.530	1020
1030	1.530	1.533	1.536	1.539	1.542	1.545	1.548	1.552	1.555	1.558	1.561	1030
1040	1.561	1.564	1.567	1.570	1.573	1.576	1.580	1.583	1.586	1.589	1.592	1040
1050	1.592	1.595	1.598	1.601	1.605	1.608	1.611	1.614	1.617	1.620	1.624	**1050**
1060	1.624	1.627	1.630	1.633	1.636	1.639	1.643	1.646	1.649	1.652	1.655	1060
1070	1.655	1.659	1.662	1.665	1.668	1.671	1.675	1.678	1.681	1.684	1.687	1070
1080	1.687	1.691	1.694	1.697	1.700	1.704	1.707	1.710	1.713	1.716	1.720	1080
1090	1.720	1.723	1.726	1.729	1.733	1.736	1.739	1.743	1.746	1.749	1.752	1090
1100	1.752	1.756	1.759	1.762	1.765	1.769	1.772	1.775	1.779	1.782	1.785	**1100**
1110	1.785	1.789	1.792	1.795	1.798	1.802	1.805	1.808	1.812	1.815	1.818	1110
1120	1.818	1.822	1.825	1.828	1.832	1.835	1.838	1.842	1.845	1.849	1.852	1120
1130	1.852	1.855	1.859	1.862	1.865	1.869	1.872	1.875	1.879	1.882	1.886	1130
1140	1.886	1.889	1.892	1.896	1.899	1.903	1.906	1.909	1.913	1.916	1.920	1140
1150	1.920	1.923	1.926	1.930	1.933	1.937	1.940	1.944	1.947	1.950	1.954	**1150**
1160	1.954	1.957	1.961	1.964	1.968	1.971	1.975	1.978	1.981	1.985	1.988	1160
1170	1.988	1.992	1.995	1.999	2.002	2.006	2.009	2.013	2.016	2.020	2.023	1170
1180	2.023	2.027	2.030	2.034	2.037	2.041	2.044	2.048	2.051	2.055	2.058	1180
1190	2.058	2.062	2.065	2.069	2.072	2.076	2.079	2.083	2.086	2.090	2.094	1190
1200	2.094	2.097	2.101	2.104	2.108	2.111	2.115	2.118	2.122	2.126	2.129	**1200**
1210	2.129	2.133	2.136	2.140	2.143	2.147	2.151	2.154	2.158	2.161	2.165	1210
1220	2.165	2.169	2.172	2.176	2.179	2.183	2.187	2.190	2.194	2.197	2.201	1220
1230	2.201	2.205	2.208	2.212	2.216	2.219	2.223	2.226	2.230	2.234	2.237	1230
1240	2.237	2.241	2.245	2.248	2.252	2.256	2.259	2.263	2.267	2.270	2.274	1240
1250	2.274	2.278	2.281	2.285	2.289	2.292	2.296	2.300	2.303	2.307	2.311	**1250**
1260	2.311	2.315	2.318	2.322	2.326	2.329	2.333	2.337	2.341	2.344	2.348	1260
1270	2.348	2.352	2.355	2.359	2.363	2.367	2.370	2.374	2.378	2.382	2.385	1270
1280	2.385	2.389	2.393	2.397	2.400	2.404	2.408	2.412	2.416	2.419	2.423	1280
1290	2.423	2.427	2.431	2.434	2.438	2.442	2.446	2.450	2.453	2.457	2.461	1290
1300	2.461	2.465	2.469	2.472	2.476	2.480	2.484	2.488	2.492	2.495	2.499	**1300**
1310	2.499	2.503	2.507	2.511	2.515	2.518	2.522	2.526	2.530	2.534	2.538	1310
1320	2.538	2.541	2.545	2.549	2.553	2.557	2.561	2.565	2.569	2.572	2.576	1320
1330	2.576	2.580	2.584	2.588	2.592	2.596	2.600	2.604	2.607	2.611	2.615	1330
1340	2.615	2.619	2.623	2.627	2.631	2.635	2.639	2.643	2.647	2.651	2.654	1340
1350	2.654	2.658	2.662	2.666	2.670	2.674	2.678	2.682	2.686	2.690	2.694	**1350**
1360	2.694	2.698	2.702	2.706	2.710	2.714	2.718	2.722	2.726	2.730	2.734	1360
1370	2.734	2.738	2.742	2.746	2.750	2.754	2.758	2.762	2.766	2.770	2.774	1370
1380	2.774	2.778	2.782	2.786	2.790	2.794	2.798	2.802	2.806	2.810	2.814	1380
1390	2.814	2.818	2.822	2.826	2.830	2.834	2.838	2.842	2.846	2.850	2.854	1390
1400	2.854	2.859	2.863	2.867	2.871	2.875	2.879	2.883	2.887	2.891	2.895	**1400**
1410	2.895	2.899	2.903	2.908	2.912	2.916	2.920	2.924	2.928	2.932	2.936	1410
1420	2.936	2.940	2.944	2.949	2.953	2.957	2.961	2.965	2.969	2.973	2.978	1420
1430	2.978	2.982	2.986	2.990	2.994	2.998	3.002	3.007	3.011	3.015	3.019	1430
1440	3.019	3.023	3.027	3.032	3.036	3.040	3.044	3.048	3.052	3.057	3.061	1440
1450	3.061	3.065	3.069	3.073	3.078	3.082	3.086	3.090	3.094	3.099	3.103	**1450**
1460	3.103	3.107	3.111	3.116	3.120	3.124	3.128	3.132	3.137	3.141	3.145	1460
1470	3.145	3.149	3.154	3.158	3.162	3.166	3.171	3.175	3.179	3.183	3.188	1470
1480	3.188	3.192	3.196	3.200	3.205	3.209	3.213	3.218	3.222	3.226	3.230	1480
1490	3.230	3.235	3.239	3.243	3.248	3.252	3.256	3.261	3.265	3.269	3.273	1490
°F	0	1	2	3	4	5	6	7	8	9	10	°F

B

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
600	1.792	1.798	1.804	1.810	1.816	1.822	1.828	1.834	1.840	1.846	1.852	**600**
610	1.852	1.858	1.864	1.870	1.876	1.882	1.888	1.894	1.901	1.907	1.913	610
620	1.913	1.919	1.925	1.931	1.937	1.944	1.950	1.956	1.962	1.968	1.975	620
630	1.975	1.981	1.987	1.993	1.999	2.006	2.012	2.018	2.025	2.031	2.037	630
640	2.037	2.043	2.050	2.056	2.062	2.069	2.075	2.082	2.088	2.094	2.101	640
650	2.101	2.107	2.113	2.120	2.126	2.133	2.139	2.146	2.152	2.158	2.165	**650**
660	2.165	2.171	2.178	2.184	2.191	2.197	2.204	2.210	2.217	2.224	2.230	660
670	2.230	2.237	2.243	2.250	2.256	2.263	2.270	2.276	2.283	2.289	2.296	670
680	2.296	2.303	2.309	2.316	2.323	2.329	2.336	2.343	2.350	2.356	2.363	680
690	2.363	2.370	2.376	2.383	2.390	2.397	2.403	2.410	2.417	2.424	2.431	690
700	2.431	2.437	2.444	2.451	2.458	2.465	2.472	2.479	2.485	2.492	2.499	**700**
710	2.499	2.506	2.513	2.520	2.527	2.534	2.541	2.548	2.555	2.562	2.569	710
720	2.569	2.576	2.583	2.590	2.597	2.604	2.611	2.618	2.625	2.632	2.639	720
730	2.639	2.646	2.653	2.660	2.667	2.674	2.681	2.688	2.696	2.703	2.710	730
740	2.710	2.717	2.724	2.731	2.738	2.746	2.753	2.760	2.767	2.775	2.782	740
750	2.782	2.789	2.796	2.803	2.811	2.818	2.825	2.833	2.840	2.847	2.854	**750**
760	2.854	2.862	2.869	2.876	2.884	2.891	2.898	2.906	2.913	2.921	2.928	760
770	2.928	2.935	2.943	2.950	2.958	2.965	2.973	2.980	2.987	2.995	3.002	770
780	3.002	3.010	3.017	3.025	3.032	3.040	3.047	3.055	3.062	3.070	3.078	780
790	3.078	3.085	3.093	3.100	3.108	3.116	3.123	3.131	3.138	3.146	3.154	790
800	3.154	3.161	3.169	3.177	3.184	3.192	3.200	3.207	3.215	3.223	3.230	**800**
810	3.230	3.238	3.246	3.254	3.261	3.269	3.277	3.285	3.292	3.300	3.308	810
820	3.308	3.316	3.324	3.331	3.339	3.347	3.355	3.363	3.371	3.379	3.386	820
830	3.386	3.394	3.402	3.410	3.418	3.426	3.434	3.442	3.450	3.458	3.466	830
840	3.466	3.474	3.482	3.490	3.498	3.506	3.514	3.522	3.530	3.538	3.546	840
850	3.546	3.554	3.562	3.570	3.578	3.586	3.594	3.602	3.610	3.618	3.626	**850**
860	3.626	3.634	3.643	3.651	3.659	3.667	3.675	3.683	3.692	3.700	3.708	860
870	3.708	3.716	3.724	3.732	3.741	3.749	3.757	3.765	3.774	3.782	3.790	870
880	3.790	3.798	3.807	3.815	3.823	3.832	3.840	3.848	3.857	3.865	3.873	880
890	3.873	3.882	3.890	3.898	3.907	3.915	3.923	3.932	3.940	3.949	3.957	890
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type B - PT 30% RH vs PT 6% RH

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1500	3.273	3.278	3.282	3.286	3.291	3.295	3.299	3.304	3.308	3.312	3.317	**1500**
1510	3.317	3.321	3.325	3.330	3.334	3.338	3.343	3.347	3.352	3.356	3.360	1510
1520	3.360	3.365	3.369	3.373	3.378	3.382	3.386	3.391	3.395	3.400	3.404	1520
1530	3.404	3.408	3.413	3.417	3.422	3.426	3.430	3.435	3.439	3.444	3.448	1530
1540	3.448	3.452	3.457	3.461	3.466	3.470	3.474	3.479	3.483	3.488	3.492	1540
1550	3.492	3.497	3.501	3.506	3.510	3.514	3.519	3.523	3.528	3.532	3.537	**1550**
1560	3.537	3.541	3.546	3.550	3.555	3.559	3.563	3.568	3.572	3.577	3.581	1560
1570	3.581	3.586	3.590	3.595	3.599	3.604	3.608	3.613	3.617	3.622	3.626	1570
1580	3.626	3.631	3.635	3.640	3.644	3.649	3.653	3.658	3.662	3.667	3.672	1580
1590	3.672	3.676	3.681	3.685	3.690	3.694	3.699	3.703	3.708	3.712	3.717	1590
1600	3.717	3.722	3.726	3.731	3.735	3.740	3.744	3.749	3.753	3.758	3.763	**1600**
1610	3.763	3.767	3.772	3.776	3.781	3.786	3.790	3.795	3.799	3.804	3.809	1610
1620	3.809	3.813	3.818	3.822	3.827	3.832	3.836	3.841	3.845	3.850	3.855	1620
1630	3.855	3.859	3.864	3.869	3.873	3.878	3.882	3.887	3.892	3.896	3.901	1630
1640	3.901	3.906	3.910	3.915	3.920	3.924	3.929	3.934	3.938	3.943	3.948	1640
1650	3.948	3.952	3.957	3.962	3.966	3.971	3.976	3.980	3.985	3.990	3.994	**1650**
1660	3.994	3.999	4.004	4.009	4.013	4.018	4.023	4.027	4.032	4.037	4.041	1660
1670	4.041	4.046	4.051	4.056	4.060	4.065	4.070	4.075	4.079	4.084	4.089	1670
1680	4.089	4.093	4.098	4.103	4.108	4.112	4.117	4.122	4.127	4.131	4.136	1680
1690	4.136	4.141	4.146	4.151	4.155	4.160	4.165	4.170	4.174	4.179	4.184	1690
1700	4.184	4.189	4.194	4.198	4.203	4.208	4.213	4.217	4.222	4.227	4.232	**1700**
1710	4.232	4.237	4.242	4.246	4.251	4.256	4.261	4.266	4.270	4.275	4.280	1710
1720	4.280	4.285	4.290	4.295	4.299	4.304	4.309	4.314	4.319	4.324	4.328	1720
1730	4.328	4.333	4.338	4.343	4.348	4.353	4.358	4.362	4.367	4.372	4.377	1730
1740	4.377	4.382	4.387	4.392	4.397	4.401	4.406	4.411	4.416	4.421	4.426	1740
1750	4.426	4.431	4.436	4.441	4.445	4.450	4.455	4.460	4.465	4.470	4.475	**1750**
1760	4.475	4.480	4.485	4.490	4.495	4.500	4.504	4.509	4.514	4.519	4.524	1760
1770	4.524	4.529	4.534	4.539	4.544	4.549	4.554	4.559	4.564	4.569	4.574	1770
1780	4.574	4.579	4.584	4.589	4.593	4.598	4.603	4.608	4.613	4.618	4.623	1780
1790	4.623	4.628	4.633	4.638	4.643	4.648	4.653	4.658	4.663	4.668	4.673	1790
1800	4.673	4.678	4.683	4.688	4.693	4.698	4.703	4.708	4.713	4.718	4.723	**1800**
1810	4.723	4.728	4.733	4.738	4.743	4.748	4.754	4.759	4.764	4.769	4.774	1810
1820	4.774	4.779	4.784	4.789	4.794	4.799	4.804	4.809	4.814	4.819	4.824	1820
1830	4.824	4.829	4.834	4.839	4.844	4.850	4.855	4.860	4.865	4.870	4.875	1830
1840	4.875	4.880	4.885	4.890	4.895	4.900	4.905	4.911	4.916	4.921	4.926	1840
1850	4.926	4.931	4.936	4.941	4.946	4.951	4.957	4.962	4.967	4.972	4.977	**1850**
1860	4.977	4.982	4.987	4.992	4.998	5.003	5.008	5.013	5.018	5.023	5.028	1860
1870	5.028	5.034	5.039	5.044	5.049	5.054	5.059	5.065	5.070	5.075	5.080	1870
1880	5.080	5.085	5.090	5.096	5.101	5.106	5.111	5.116	5.121	5.127	5.132	1880
1890	5.132	5.137	5.142	5.147	5.153	5.158	5.163	5.168	5.173	5.179	5.184	1890
1900	5.184	5.189	5.194	5.199	5.205	5.210	5.215	5.220	5.225	5.231	5.236	**1900**
1910	5.236	5.241	5.246	5.252	5.257	5.262	5.267	5.273	5.278	5.283	5.288	1910
1920	5.288	5.294	5.299	5.304	5.309	5.315	5.320	5.325	5.330	5.336	5.341	1920
1930	5.341	5.346	5.351	5.357	5.362	5.367	5.373	5.378	5.383	5.388	5.394	1930
1940	5.394	5.399	5.404	5.410	5.415	5.420	5.425	5.431	5.436	5.441	5.447	1940
1950	5.447	5.452	5.457	5.463	5.468	5.473	5.479	5.484	5.489	5.495	5.500	**1950**
1960	5.500	5.505	5.511	5.516	5.521	5.527	5.532	5.537	5.543	5.548	5.553	1960
1970	5.553	5.559	5.564	5.569	5.575	5.580	5.585	5.591	5.596	5.601	5.607	1970
1980	5.607	5.612	5.618	5.623	5.628	5.634	5.639	5.644	5.650	5.655	5.661	1980
1990	5.661	5.666	5.671	5.677	5.682	5.688	5.693	5.698	5.704	5.709	5.715	1990
°F	0	1	2	3	4	5	6	7	8	9	10	°F

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
900	3.957	3.965	3.974	3.982	3.991	3.999	4.008	4.016	4.024	4.033	4.041	**900**
910	4.041	4.050	4.058	4.067	4.075	4.084	4.093	4.101	4.110	4.118	4.127	910
920	4.127	4.135	4.144	4.152	4.161	4.170	4.178	4.187	4.195	4.204	4.213	920
930	4.213	4.221	4.230	4.239	4.247	4.256	4.265	4.273	4.282	4.291	4.299	930
940	4.299	4.308	4.317	4.326	4.334	4.343	4.352	4.360	4.369	4.378	4.387	940
950	4.387	4.396	4.404	4.413	4.422	4.431	4.440	4.448	4.457	4.466	4.475	**950**
960	4.475	4.484	4.493	4.501	4.510	4.519	4.528	4.537	4.546	4.555	4.564	960
970	4.564	4.573	4.582	4.591	4.599	4.608	4.617	4.626	4.635	4.644	4.653	970
980	4.653	4.662	4.671	4.680	4.689	4.698	4.707	4.716	4.725	4.734	4.743	980
990	4.743	4.753	4.762	4.771	4.780	4.789	4.798	4.807	4.816	4.825	4.834	990
1000	4.834	4.843	4.853	4.862	4.871	4.880	4.889	4.898	4.908	4.917	4.926	**1000**
1010	4.926	4.935	4.944	4.954	4.963	4.972	4.981	4.990	5.000	5.009	5.018	1010
1020	5.018	5.027	5.037	5.046	5.055	5.065	5.074	5.083	5.092	5.102	5.111	1020
1030	5.111	5.120	5.130	5.139	5.148	5.158	5.167	5.176	5.186	5.195	5.205	1030
1040	5.205	5.214	5.223	5.233	5.242	5.252	5.261	5.270	5.280	5.289	5.299	1040
1050	5.299	5.308	5.318	5.327	5.337	5.346	5.356	5.365	5.375	5.384	5.394	**1050**
1060	5.394	5.403	5.413	5.422	5.432	5.441	5.451	5.460	5.470	5.480	5.489	1060
1070	5.489	5.499	5.508	5.518	5.528	5.537	5.547	5.556	5.566	5.576	5.585	1070
1080	5.585	5.595	5.605	5.614	5.624	5.634	5.643	5.653	5.663	5.672	5.682	1080
1090	5.682	5.692	5.702	5.711	5.721	5.731	5.740	5.750	5.760	5.770	5.780	1090
1100	5.780	5.789	5.799	5.809	5.819	5.828	5.838	5.848	5.858	5.868	5.878	**1100**
1110	5.878	5.887	5.897	5.907	5.917	5.927	5.937	5.947	5.956	5.966	5.976	1110
1120	5.976	5.986	5.996	6.006	6.016	6.026	6.036	6.046	6.055	6.065	6.075	1120
1130	6.075	6.085	6.095	6.105	6.115	6.125	6.135	6.145	6.155	6.165	6.175	1130
1140	6.175	6.185	6.195	6.205	6.215	6.225	6.235	6.245	6.256	6.266	6.276	1140
1150	6.276	6.286	6.296	6.306	6.316	6.326	6.336	6.346	6.356	6.367	6.377	**1150**
1160	6.377	6.387	6.397	6.407	6.417	6.427	6.438	6.448	6.458	6.468	6.478	1160
1170	6.478	6.488	6.499	6.509	6.519	6.529	6.539	6.550	6.560	6.570	6.580	1170
1180	6.580	6.591	6.601	6.611	6.621	6.632	6.642	6.652	6.663	6.673	6.683	1180
1190	6.683	6.693	6.704	6.714	6.724	6.735	6.745	6.755	6.766	6.776	6.786	1190
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type B - PT 30% RH vs PT 6% RH

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2000	5.715	5.720	5.725	5.731	5.736	5.742	5.747	5.752	5.758	5.763	5.769	**2000**
2010	5.769	5.774	5.780	5.785	5.790	5.796	5.801	5.807	5.812	5.818	5.823	2010
2020	5.823	5.828	5.834	5.839	5.845	5.850	5.856	5.861	5.867	5.872	5.878	2020
2030	5.878	5.883	5.888	5.894	5.899	5.905	5.910	5.916	5.921	5.927	5.932	2030
2040	5.932	5.938	5.943	5.949	5.954	5.960	5.965	5.971	5.976	5.982	5.987	2040
2050	5.987	5.993	5.998	6.004	6.009	6.015	6.020	6.026	6.031	6.037	6.042	**2050**
2060	6.042	6.048	6.053	6.059	6.064	6.070	6.075	6.081	6.086	6.092	6.098	2060
2070	6.098	6.103	6.109	6.114	6.120	6.125	6.131	6.136	6.142	6.147	6.153	2070
2080	6.153	6.159	6.164	6.170	6.175	6.181	6.186	6.192	6.197	6.203	6.209	2080
2090	6.209	6.214	6.220	6.225	6.231	6.237	6.242	6.248	6.253	6.259	6.264	2090
2100	6.264	6.270	6.276	6.281	6.287	6.292	6.298	6.304	6.309	6.315	6.320	**2100**
2110	6.320	6.326	6.332	6.337	6.343	6.349	6.354	6.360	6.365	6.371	6.377	2110
2120	6.377	6.382	6.388	6.394	6.399	6.405	6.410	6.416	6.422	6.427	6.433	2120
2130	6.433	6.439	6.444	6.450	6.456	6.461	6.467	6.473	6.478	6.484	6.490	2130
2140	6.490	6.495	6.501	6.507	6.512	6.518	6.524	6.529	6.535	6.541	6.546	2140
2150	6.546	6.552	6.558	6.563	6.569	6.575	6.580	6.586	6.592	6.597	6.603	**2150**
2160	6.603	6.609	6.615	6.620	6.626	6.632	6.637	6.643	6.649	6.655	6.660	2160
2170	6.660	6.666	6.672	6.677	6.683	6.689	6.695	6.700	6.706	6.712	6.718	2170
2180	6.718	6.723	6.729	6.735	6.740	6.746	6.752	6.758	6.763	6.769	6.775	2180
2190	6.775	6.781	6.786	6.792	6.798	6.804	6.809	6.815	6.821	6.827	6.833	2190
2200	6.833	6.838	6.844	6.850	6.856	6.861	6.867	6.873	6.879	6.884	6.890	**2200**
2210	6.890	6.896	6.902	6.908	6.913	6.919	6.925	6.931	6.937	6.942	6.948	2210
2220	6.948	6.954	6.960	6.966	6.971	6.977	6.983	6.989	6.995	7.000	7.006	2220
2230	7.006	7.012	7.018	7.024	7.030	7.035	7.041	7.047	7.053	7.059	7.065	2230
2240	7.065	7.070	7.076	7.082	7.088	7.094	7.100	7.105	7.111	7.117	7.123	2240
2250	7.123	7.129	7.135	7.141	7.146	7.152	7.158	7.164	7.170	7.176	7.182	**2250**
2260	7.182	7.187	7.193	7.199	7.205	7.211	7.217	7.223	7.229	7.234	7.240	2260
2270	7.240	7.246	7.252	7.258	7.264	7.270	7.276	7.281	7.287	7.293	7.299	2270
2280	7.299	7.305	7.311	7.317	7.323	7.329	7.335	7.340	7.346	7.352	7.358	2280
2290	7.358	7.364	7.370	7.376	7.382	7.388	7.394	7.400	7.406	7.412	7.417	2290
2300	7.417	7.423	7.429	7.435	7.441	7.447	7.453	7.459	7.465	7.471	7.477	**2300**
2310	7.477	7.483	7.489	7.495	7.501	7.507	7.512	7.518	7.524	7.530	7.536	2310
2320	7.536	7.542	7.548	7.554	7.560	7.566	7.572	7.578	7.584	7.590	7.596	2320
2330	7.596	7.602	7.608	7.614	7.620	7.626	7.632	7.638	7.644	7.650	7.656	2330
2340	7.656	7.662	7.668	7.674	7.680	7.686	7.692	7.698	7.704	7.710	7.716	2340
2350	7.716	7.722	7.728	7.734	7.740	7.746	7.752	7.758	7.764	7.770	7.776	**2350**
2360	7.776	7.782	7.788	7.794	7.800	7.806	7.812	7.818	7.824	7.830	7.836	2360
2370	7.836	7.842	7.848	7.854	7.860	7.866	7.872	7.878	7.884	7.891	7.897	2370
2380	7.897	7.903	7.909	7.915	7.921	7.927	7.933	7.939	7.945	7.951	7.957	2380
2390	7.957	7.963	7.969	7.975	7.981	7.987	7.994	8.000	8.006	8.012	8.018	2390
2400	8.018	8.024	8.030	8.036	8.042	8.048	8.054	8.060	8.066	8.073	8.079	**2400**
2410	8.079	8.085	8.091	8.097	8.103	8.109	8.115	8.121	8.127	8.134	8.140	2410
2420	8.140	8.146	8.152	8.158	8.164	8.170	8.176	8.182	8.188	8.195	8.201	2420
2430	8.201	8.207	8.213	8.219	8.225	8.231	8.237	8.244	8.250	8.256	8.262	2430
2440	8.262	8.268	8.274	8.280	8.286	8.293	8.299	8.305	8.311	8.317	8.323	2440
2450	8.323	8.329	8.336	8.342	8.348	8.354	8.360	8.366	8.372	8.379	8.385	**2450**
2460	8.385	8.391	8.397	8.403	8.409	8.416	8.422	8.428	8.434	8.440	8.446	2460
2470	8.446	8.453	8.459	8.465	8.471	8.477	8.483	8.490	8.496	8.502	8.508	2470
2480	8.508	8.514	8.521	8.527	8.533	8.539	8.545	8.551	8.558	8.564	8.570	2480
2490	8.570	8.576	8.582	8.589	8.595	8.601	8.607	8.613	8.620	8.626	8.632	2490
°F	0	1	2	3	4	5	6	7	8	9	10	°F

B

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1200	6.786	6.797	6.807	6.818	6.828	6.838	6.849	6.859	6.869	6.880	6.890	**1200**
1210	6.890	6.901	6.911	6.922	6.932	6.942	6.953	6.963	6.974	6.984	6.995	1210
1220	6.995	7.005	7.016	7.026	7.037	7.047	7.058	7.068	7.079	7.089	7.100	1220
1230	7.100	7.110	7.121	7.131	7.142	7.152	7.163	7.173	7.184	7.194	7.205	1230
1240	7.205	7.216	7.226	7.237	7.247	7.258	7.269	7.279	7.290	7.300	7.311	1240
1250	7.311	7.322	7.332	7.343	7.353	7.364	7.375	7.385	7.396	7.407	7.417	**1250**
1260	7.417	7.428	7.439	7.449	7.460	7.471	7.482	7.492	7.503	7.514	7.524	1260
1270	7.524	7.535	7.546	7.557	7.567	7.578	7.589	7.600	7.610	7.621	7.632	1270
1280	7.632	7.643	7.653	7.664	7.675	7.686	7.697	7.707	7.718	7.729	7.740	1280
1290	7.740	7.751	7.761	7.772	7.783	7.794	7.805	7.816	7.827	7.837	7.848	1290
1300	7.848	7.859	7.870	7.881	7.892	7.903	7.914	7.924	7.935	7.946	7.957	**1300**
1310	7.957	7.968	7.979	7.990	8.001	8.012	8.023	8.034	8.045	8.056	8.066	1310
1320	8.066	8.077	8.088	8.099	8.110	8.121	8.132	8.143	8.154	8.165	8.176	1320
1330	8.176	8.187	8.198	8.209	8.220	8.231	8.242	8.253	8.264	8.275	8.286	1330
1340	8.286	8.298	8.309	8.320	8.331	8.342	8.353	8.364	8.375	8.386	8.397	1340
1350	8.397	8.408	8.419	8.430	8.441	8.453	8.464	8.475	8.486	8.497	8.508	**1350**
1360	8.508	8.519	8.530	8.542	8.553	8.564	8.575	8.586	8.597	8.608	8.620	1360
1370	8.620	8.631	8.642	8.653	8.664	8.675	8.687	8.698	8.709	8.720	8.731	1370
1380	8.731	8.743	8.754	8.765	8.776	8.787	8.799	8.810	8.821	8.832	8.844	1380
1390	8.844	8.855	8.866	8.877	8.889	8.900	8.911	8.922	8.934	8.945	8.956	1390
1400	8.956	8.967	8.979	8.990	9.001	9.013	9.024	9.035	9.047	9.058	9.069	**1400**
1410	9.069	9.080	9.092	9.103	9.114	9.126	9.137	9.148	9.160	9.171	9.182	1410
1420	9.182	9.194	9.205	9.216	9.228	9.239	9.251	9.262	9.273	9.285	9.296	1420
1430	9.296	9.307	9.319	9.330	9.342	9.353	9.364	9.376	9.387	9.398	9.410	1430
1440	9.410	9.421	9.433	9.444	9.456	9.467	9.478	9.490	9.501	9.513	9.524	1440
1450	9.524	9.536	9.547	9.558	9.570	9.581	9.593	9.604	9.616	9.627	9.639	**1450**
1460	9.639	9.650	9.662	9.673	9.684	9.696	9.707	9.719	9.730	9.742	9.753	1460
1470	9.753	9.765	9.776	9.788	9.799	9.811	9.822	9.834	9.845	9.857	9.868	1470
1480	9.868	9.880	9.891	9.903	9.914	9.926	9.937	9.949	9.961	9.972	9.984	1480
1490	9.984	9.995	10.007	10.018	10.030	10.041	10.053	10.064	10.076	10.088	10.099	1490
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type B - PT 30% RH vs PT 6% RH

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2500	8.632	8.638	8.644	8.651	8.657	8.663	8.669	8.675	8.682	8.688	8.694	**2500**
2510	8.694	8.700	8.707	8.713	8.719	8.725	8.731	8.738	8.744	8.750	8.756	2510
2520	8.756	8.763	8.769	8.775	8.781	8.787	8.794	8.800	8.806	8.812	8.819	2520
2530	8.819	8.825	8.831	8.837	8.844	8.850	8.856	8.862	8.869	8.875	8.881	2530
2540	8.881	8.887	8.894	8.900	8.906	8.912	8.919	8.925	8.931	8.937	8.944	2540
2550	8.944	8.950	8.956	8.962	8.969	8.975	8.981	8.988	8.994	9.000	9.006	**2550**
2560	9.006	9.013	9.019	9.025	9.031	9.038	9.044	9.050	9.057	9.063	9.069	2560
2570	9.069	9.075	9.082	9.088	9.094	9.101	9.107	9.113	9.119	9.126	9.132	2570
2580	9.132	9.138	9.145	9.151	9.157	9.164	9.170	9.176	9.182	9.189	9.195	2580
2590	9.195	9.201	9.208	9.214	9.220	9.227	9.233	9.239	9.245	9.252	9.258	2590
2600	9.258	9.264	9.271	9.277	9.283	9.290	9.296	9.302	9.309	9.315	9.321	**2600**
2610	9.321	9.328	9.334	9.340	9.347	9.353	9.359	9.366	9.372	9.378	9.385	2610
2620	9.385	9.391	9.397	9.404	9.410	9.416	9.423	9.429	9.435	9.442	9.448	2620
2630	9.448	9.454	9.461	9.467	9.473	9.480	9.486	9.492	9.499	9.505	9.511	2630
2640	9.511	9.518	9.524	9.530	9.537	9.543	9.550	9.556	9.562	9.569	9.575	2640
2650	9.575	9.581	9.588	9.594	9.600	9.607	9.613	9.619	9.626	9.632	9.639	**2650**
2660	9.639	9.645	9.651	9.658	9.664	9.670	9.677	9.683	9.690	9.696	9.702	2660
2670	9.702	9.709	9.715	9.721	9.728	9.734	9.741	9.747	9.753	9.760	9.766	2670
2680	9.766	9.772	9.779	9.785	9.792	9.798	9.804	9.811	9.817	9.824	9.830	2680
2690	9.830	9.836	9.843	9.849	9.856	9.862	9.868	9.875	9.881	9.888	9.894	2690
2700	9.894	9.900	9.907	9.913	9.920	9.926	9.932	9.939	9.945	9.952	9.958	**2700**
2710	9.958	9.964	9.971	9.977	9.984	9.990	9.996	10.003	10.009	10.016	10.022	2710
2720	10.022	10.028	10.035	10.041	10.048	10.054	10.061	10.067	10.073	10.080	10.086	2720
2730	10.086	10.093	10.099	10.105	10.112	10.118	10.125	10.131	10.138	10.144	10.150	2730
2740	10.150	10.157	10.163	10.170	10.176	10.183	10.189	10.195	10.202	10.208	10.215	2740
2750	10.215	10.221	10.228	10.234	10.240	10.247	10.253	10.260	10.266	10.273	10.279	**2750**
2760	10.279	10.286	10.292	10.298	10.305	10.311	10.318	10.324	10.331	10.337	10.344	2760
2770	10.344	10.350	10.356	10.363	10.369	10.376	10.382	10.389	10.395	10.402	10.408	2770
2780	10.408	10.414	10.421	10.427	10.434	10.440	10.447	10.453	10.460	10.466	10.473	2780
2790	10.473	10.479	10.485	10.492	10.498	10.505	10.511	10.518	10.524	10.531	10.537	2790
2800	10.537	10.544	10.550	10.556	10.563	10.569	10.576	10.582	10.589	10.595	10.602	**2800**
2810	10.602	10.608	10.615	10.621	10.628	10.634	10.641	10.647	10.653	10.660	10.666	2810
2820	10.666	10.673	10.679	10.686	10.692	10.699	10.705	10.712	10.718	10.725	10.731	2820
2830	10.731	10.738	10.744	10.751	10.757	10.763	10.770	10.776	10.783	10.789	10.796	2830
2840	10.796	10.802	10.809	10.815	10.822	10.828	10.835	10.841	10.848	10.854	10.861	2840
2850	10.861	10.867	10.874	10.880	10.887	10.893	10.900	10.906	10.913	10.919	10.925	**2850**
2860	10.925	10.932	10.938	10.945	10.951	10.958	10.964	10.971	10.977	10.984	10.990	2860
2870	10.990	10.997	11.003	11.010	11.016	11.023	11.029	11.036	11.042	11.049	11.055	2870
2880	11.055	11.062	11.068	11.075	11.081	11.088	11.094	11.101	11.107	11.114	11.120	2880
2890	11.120	11.127	11.133	11.140	11.146	11.153	11.159	11.166	11.172	11.179	11.185	2890
2900	11.185	11.192	11.198	11.205	11.211	11.218	11.224	11.231	11.237	11.244	11.250	**2900**
2910	11.250	11.257	11.263	11.270	11.276	11.282	11.289	11.295	11.302	11.308	11.315	2910
2920	11.315	11.321	11.328	11.334	11.341	11.347	11.354	11.360	11.367	11.373	11.380	2920
2930	11.380	11.386	11.393	11.399	11.406	11.412	11.419	11.425	11.432	11.438	11.445	2930
2940	11.445	11.451	11.458	11.464	11.471	11.477	11.484	11.490	11.497	11.503	11.510	2940
2950	11.510	11.516	11.523	11.529	11.536	11.542	11.549	11.555	11.562	11.568	11.575	**2950**
2960	11.575	11.582	11.588	11.595	11.601	11.608	11.614	11.621	11.627	11.634	11.640	2960
2970	11.640	11.647	11.653	11.660	11.666	11.673	11.679	11.686	11.692	11.699	11.705	2970
2980	11.705	11.712	11.718	11.725	11.731	11.738	11.744	11.751	11.757	11.764	11.770	2980
2990	11.770	11.777	11.783	11.790	11.796	11.803	11.809	11.816	11.822	11.829	11.835	2990
°F	0	1	2	3	4	5	6	7	8	9	10	°F

B

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1500	10.099	10.111	10.122	10.134	10.145	10.157	10.168	10.180	10.192	10.203	10.215	**1500**
1510	10.215	10.226	10.238	10.249	10.261	10.273	10.284	10.296	10.307	10.319	10.331	1510
1520	10.331	10.342	10.354	10.365	10.377	10.389	10.400	10.412	10.423	10.435	10.447	1520
1530	10.447	10.458	10.470	10.482	10.493	10.505	10.516	10.528	10.540	10.551	10.563	1530
1540	10.563	10.575	10.586	10.598	10.609	10.621	10.633	10.644	10.656	10.668	10.679	1540
1550	10.679	10.691	10.703	10.714	10.726	10.738	10.749	10.761	10.773	10.784	10.796	**1550**
1560	10.796	10.808	10.819	10.831	10.843	10.854	10.866	10.877	10.889	10.901	10.913	1560
1570	10.913	10.924	10.936	10.948	10.959	10.971	10.983	10.994	11.006	11.018	11.029	1570
1580	11.029	11.041	11.053	11.064	11.076	11.088	11.099	11.111	11.123	11.134	11.146	1580
1590	11.146	11.158	11.169	11.181	11.193	11.205	11.216	11.228	11.240	11.251	11.263	1590
1600	11.263	11.275	11.286	11.298	11.310	11.321	11.333	11.345	11.357	11.368	11.380	**1600**
1610	11.380	11.392	11.403	11.415	11.427	11.438	11.450	11.462	11.474	11.485	11.497	1610
1620	11.497	11.509	11.520	11.532	11.544	11.555	11.567	11.579	11.591	11.602	11.614	1620
1630	11.614	11.626	11.637	11.649	11.661	11.673	11.684	11.696	11.708	11.719	11.731	1630
1640	11.731	11.743	11.754	11.766	11.778	11.790	11.801	11.813	11.825	11.836	11.848	1640
1650	11.848	11.860	11.871	11.883	11.895	11.907	11.918	11.930	11.942	11.953	11.965	**1650**
1660	11.965	11.977	11.988	12.000	12.012	12.024	12.035	12.047	12.059	12.070	12.082	1660
1670	12.082	12.094	12.105	12.117	12.129	12.141	12.152	12.164	12.176	12.187	12.199	1670
1680	12.199	12.211	12.222	12.234	12.246	12.257	12.269	12.281	12.292	12.304	12.316	1680
1690	12.316	12.327	12.339	12.351	12.363	12.374	12.386	12.398	12.409	12.421	12.433	1690
1700	12.433	12.444	12.456	12.468	12.479	12.491	12.503	12.514	12.526	12.538	12.549	**1700**
1710	12.549	12.561	12.572	12.584	12.596	12.607	12.619	12.631	12.642	12.654	12.666	1710
1720	12.666	12.677	12.689	12.701	12.712	12.724	12.736	12.747	12.759	12.770	12.782	1720
1730	12.782	12.794	12.805	12.817	12.829	12.840	12.852	12.863	12.875	12.887	12.898	1730
1740	12.898	12.910	12.921	12.933	12.945	12.956	12.968	12.980	12.991	13.003	13.014	1740
1750	13.014	13.026	13.037	13.049	13.061	13.072	13.084	13.095	13.107	13.119	13.130	**1750**
1760	13.130	13.142	13.153	13.165	13.176	13.188	13.200	13.211	13.223	13.234	13.246	1760
1770	13.246	13.257	13.269	13.280	13.292	13.304	13.315	13.327	13.338	13.350	13.361	1770
1780	13.361	13.373	13.384	13.396	13.407	13.419	13.430	13.442	13.453	13.465	13.476	1780
1790	13.476	13.488	13.499	13.511	13.522	13.534	13.545	13.557	13.568	13.580	13.591	1790
°C	0	1	2	3	4	5	6	7	8	9	10	°C

EMF in Millivolts — Reference Junction 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
3000	11.835	11.842	11.848	11.855	11.861	11.868	11.874	11.881	11.887	11.894	11.900	**3000**
3010	11.900	11.907	11.913	11.920	11.926	11.933	11.939	11.946	11.952	11.959	11.965	3010
3020	11.965	11.972	11.978	11.985	11.991	11.998	12.004	12.011	12.017	12.024	12.030	3020
3030	12.030	12.037	12.043	12.050	12.056	12.063	12.069	12.076	12.082	12.089	12.095	3030
3040	12.095	12.102	12.108	12.115	12.121	12.128	12.134	12.141	12.147	12.154	12.160	3040
3050	12.160	12.166	12.173	12.179	12.186	12.192	12.199	12.205	12.212	12.218	12.225	**3050**
3060	12.225	12.231	12.238	12.244	12.251	12.257	12.264	12.270	12.277	12.283	12.290	3060
3070	12.290	12.296	12.303	12.309	12.316	12.322	12.329	12.335	12.342	12.348	12.355	3070
3080	12.355	12.361	12.368	12.374	12.381	12.387	12.394	12.400	12.407	12.413	12.420	3080
3090	12.420	12.426	12.433	12.439	12.446	12.452	12.458	12.465	12.471	12.478	12.484	3090
3100	12.484	12.491	12.497	12.504	12.510	12.517	12.523	12.530	12.536	12.543	12.549	**3100**
3110	12.549	12.556	12.562	12.569	12.575	12.582	12.588	12.595	12.601	12.607	12.614	3110
3120	12.614	12.620	12.627	12.633	12.640	12.646	12.653	12.659	12.666	12.672	12.679	3120
3130	12.679	12.685	12.692	12.698	12.704	12.711	12.717	12.724	12.730	12.737	12.743	3130
3140	12.743	12.750	12.756	12.763	12.769	12.776	12.782	12.789	12.795	12.801	12.808	3140
3150	12.808	12.814	12.821	12.827	12.834	12.840	12.847	12.853	12.860	12.866	12.872	**3150**
3160	12.872	12.879	12.885	12.892	12.898	12.905	12.911	12.918	12.924	12.931	12.937	3160
3170	12.937	12.943	12.950	12.956	12.963	12.969	12.976	12.982	12.989	12.995	13.001	3170
3180	13.001	13.008	13.014	13.021	13.027	13.034	13.040	13.047	13.053	13.059	13.066	3180
3190	13.066	13.072	13.079	13.085	13.092	13.098	13.104	13.111	13.117	13.124	13.130	3190
3200	13.130	13.137	13.143	13.149	13.156	13.162	13.169	13.175	13.182	13.188	13.194	**3200**
3210	13.194	13.201	13.207	13.214	13.220	13.227	13.233	13.239	13.246	13.252	13.259	3210
3220	13.259	13.265	13.271	13.278	13.284	13.291	13.297	13.304	13.310	13.316	13.323	3220
3230	13.323	13.329	13.336	13.342	13.348	13.355	13.361	13.368	13.374	13.380	13.387	3230
3240	13.387	13.393	13.400	13.406	13.412	13.419	13.425	13.432	13.438	13.444	13.451	3240
3250	13.451	13.457	13.464	13.470	13.476	13.483	13.489	13.496	13.502	13.508	13.515	**3250**
3260	13.515	13.521	13.527	13.534	13.540	13.547	13.553	13.559	13.566	13.572	13.579	3260
3270	13.579	13.585	13.591	13.598	13.604	13.610	13.617	13.623	13.630	13.636	13.642	3270
3280	13.642	13.649	13.655	13.661	13.668	13.674	13.680	13.687	13.693	13.700	13.706	3280
3290	13.706	13.712	13.719	13.725	13.731	13.738	13.744	13.750	13.757	13.763	13.769	3290
3300	13.769	13.776	13.782	13.789	13.795	13.801	13.808	13.814	13.820			**3300**
°F	0	1	2	3	4	5	6	7	8	9	10	°F

B

EMF in Millivolts — Reference Junctions 0 °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1800	13.591	13.603	13.614	13.626	13.637	13.649	13.660	13.672	13.683	13.694	13.706	**1800**
1810	13.706	13.717	13.729	13.740	13.752	13.763	13.775	13.786	13.797	13.809	13.820	1810
1820	13.820											1820
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Resistance Temperature Table

Platinum Resistance at 0° C – 100 ohms | Temperature Coefficient – .00385 ohms/ohm °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
-200	18.52											**-200**
-190	22.83	22.40	21.97	21.54	21.11	20.68	20.25	19.82	19.38	18.95	18.52	-190
-180	27.10	26.67	26.24	25.82	25.39	24.97	24.54	24.11	23.68	23.25	22.83	-180
-170	31.34	30.91	30.49	30.07	29.64	29.22	28.80	28.37	27.95	27.52	27.10	-170
-160	35.54	35.12	34.70	34.28	33.86	33.44	33.02	32.60	32.18	31.76	31.34	-160
-150	39.72	39.31	38.89	38.47	38.05	37.64	37.22	36.80	36.38	35.96	35.54	**-150**
-140	43.88	43.46	43.05	42.63	42.22	41.80	41.39	40.97	40.56	40.14	39.72	-140
-130	48.00	47.59	47.18	46.77	46.36	45.94	45.53	45.12	44.70	44.29	43.88	-130
-120	52.11	51.70	51.29	50.88	50.47	50.06	49.65	49.24	48.83	48.42	48.00	-120
-110	56.19	55.79	55.38	54.97	54.56	54.15	53.75	53.34	52.93	52.52	52.11	-110
-100	60.26	59.85	59.44	59.04	58.63	58.23	57.82	57.41	57.01	56.60	56.19	**-100**
-90	64.30	63.90	63.49	63.09	62.68	62.28	61.88	61.47	61.07	60.66	60.26	-90
-80	68.33	67.92	67.52	67.12	66.72	66.31	65.91	65.51	65.11	64.70	64.30	-80
-70	72.33	71.93	71.53	71.13	70.73	70.33	69.93	69.53	69.13	68.73	68.33	-70
-60	76.33	75.93	75.53	75.13	74.73	74.33	73.93	73.53	73.13	72.73	72.33	-60
-50	80.31	79.91	79.51	79.11	78.72	78.32	77.92	77.52	77.12	76.73	76.33	**-50**
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70	80.31	-40
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67	84.27	-30
-20	92.16	91.77	91.37	90.98	90.59	90.19	89.80	89.40	89.01	88.62	88.22	-20
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55	92.16	-10
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48	96.09	**0**
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51	103.90	**0**
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40	107.79	10
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29	111.67	20
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15	115.54	30
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01	119.40	40
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86	123.24	**50**
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69	127.08	60
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52	130.90	70
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33	134.71	80
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13	138.51	90
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91	142.29	**100**
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69	146.07	110
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46	149.83	120
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21	153.58	130
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95	157.33	140
150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68	161.05	**150**
160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40	164.77	160
170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11	168.48	170
180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80	172.17	180
190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49	175.86	190
200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16	179.53	**200**
210	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82	183.19	210
220	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47	186.84	220
230	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11	190.47	230
240	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74	194.10	240
250	194.10	194.46	194.82	195.18	195.55	195.91	196.27	196.63	196.99	197.35	197.71	**250**
260	197.71	198.07	198.43	198.79	199.15	199.51	199.87	200.23	200.59	200.95	201.31	260
270	201.31	201.67	202.03	202.39	202.75	203.11	203.47	203.83	204.19	204.55	204.90	270
280	204.90	205.26	205.62	205.98	206.34	206.70	207.05	207.41	207.77	208.13	208.48	280
290	208.48	208.84	209.20	209.56	209.91	210.27	210.63	210.98	211.34	211.70	212.05	290
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Resistance Temperature Table

Platinum Resistance at 0° C – 100 ohms | Temperature Coefficient – .00385 ohms/ohm °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
300	212.05	212.41	212.76	213.12	213.48	213.83	214.19	214.54	214.90	215.25	215.61	**300**
310	215.61	215.96	216.32	216.67	217.03	217.38	217.74	218.09	218.44	218.80	219.15	310
320	219.15	219.51	219.86	220.21	220.57	220.92	221.27	221.63	221.98	222.33	222.68	320
330	222.68	223.04	223.39	223.74	224.09	224.45	224.80	225.15	225.50	225.85	226.21	330
340	226.21	226.56	226.91	227.26	227.61	227.96	228.31	228.66	229.02	229.37	229.72	340
350	229.72	230.07	230.42	230.77	231.12	231.47	231.82	232.17	232.52	232.87	233.21	**350**
360	233.21	233.56	233.91	234.26	234.61	234.96	235.31	235.66	236.00	236.35	236.70	360
370	236.70	237.05	237.40	237.74	238.09	238.44	238.79	239.13	239.48	239.83	240.18	370
380	240.18	240.52	240.87	241.22	241.56	241.91	242.26	242.60	242.95	243.29	243.64	380
390	243.64	243.99	244.33	244.68	245.02	245.37	245.71	246.06	246.40	246.75	247.09	390
400	247.09	247.44	247.78	248.13	248.47	248.81	249.16	249.50	249.85	250.19	250.53	**400**
410	250.53	250.88	251.22	251.56	251.91	252.25	252.59	252.93	253.28	253.62	253.96	410
420	253.96	254.30	254.65	254.99	255.33	255.67	256.01	256.35	256.70	257.04	257.38	420
430	257.38	257.72	258.06	258.40	258.74	259.08	259.42	259.76	260.10	260.44	260.78	430
440	260.78	261.12	261.46	261.80	262.14	262.48	262.82	263.16	263.50	263.84	264.18	440
450	264.18	264.52	264.86	265.20	265.53	265.87	266.21	266.55	266.89	267.22	267.56	**450**
460	267.56	267.90	268.24	268.57	268.91	269.25	269.59	269.92	270.26	270.60	270.93	460
470	270.93	271.27	271.61	271.94	272.28	272.61	272.95	273.29	273.62	273.96	274.29	470
480	274.29	274.63	274.96	275.30	275.63	275.97	276.30	276.64	276.97	277.31	277.64	480
490	277.64	277.98	278.31	278.64	278.98	279.31	279.64	279.98	280.31	280.64	280.98	490
500	280.98	281.31	281.64	281.98	282.31	282.64	282.97	283.31	283.64	283.97	284.30	**500**
510	284.30	284.63	284.97	285.30	285.63	285.96	286.29	286.62	286.95	287.29	287.62	510
520	287.62	287.95	288.28	288.61	288.94	289.27	289.60	289.93	290.26	290.59	290.92	520
530	290.92	291.25	291.58	291.91	292.24	292.56	292.89	293.22	293.55	293.88	294.21	530
540	294.21	294.54	294.86	295.19	295.52	295.85	296.18	296.50	296.83	297.16	297.49	540
550	297.49	297.81	298.14	298.47	298.80	299.12	299.45	299.78	300.10	300.43	300.75	**550**
560	300.75	301.08	301.41	301.73	302.06	302.38	302.71	303.03	303.36	303.69	304.01	560
570	304.01	304.34	304.66	304.98	305.31	305.63	305.96	306.28	306.61	306.93	307.25	570
580	307.25	307.58	307.90	308.23	308.55	308.87	309.20	309.52	309.84	310.16	310.49	580
590	310.49	310.81	311.13	311.45	311.78	312.10	312.42	312.74	313.06	313.39	313.71	590
600	313.71	314.03	314.35	314.67	314.99	315.31	315.64	315.96	316.28	316.60	316.92	**600**
610	316.92	317.24	317.56	317.88	318.20	318.52	318.84	319.16	319.48	319.80	320.12	610
620	320.12	320.43	320.75	321.07	321.39	321.71	322.03	322.35	322.67	322.98	323.30	620
630	323.30	323.62	323.94	324.26	324.57	324.89	325.21	325.53	325.84	326.16	326.48	630
640	326.48	326.79	327.11	327.43	327.74	328.06	328.38	328.69	329.01	329.32	329.64	640
650	329.64	329.96	330.27	330.59	330.90	331.22	331.53	331.85	332.16	332.48	332.79	**650**
660	332.79											660
°C	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**°C**

Resistance Temperature Table

Platinum Resistance at 0° C – 100 ohms | Temperature Coefficient – .003916 ohms/ohm °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
-200	17.14											**-200**
-190	21.46	21.03	20.59	20.16	19.73	19.29	18.86	18.43	18.00	17.57	17.14	-190
-180	25.80	25.37	24.93	24.50	24.07	23.63	23.20	22.76	22.33	21.90	21.46	-180
-170	30.12	29.69	29.26	28.83	28.40	27.97	27.53	27.10	26.67	26.24	25.80	-170
-160	34.42	33.99	33.56	33.13	32.70	32.28	31.85	31.42	30.99	30.56	30.12	-160
-150	38.68	38.26	37.83	37.41	36.98	36.55	36.13	35.70	35.27	34.85	34.42	**-150**
-140	42.91	42.49	42.07	41.64	41.22	40.80	40.38	39.95	39.53	39.10	38.68	-140
-130	47.11	46.69	46.27	45.85	45.43	45.01	44.59	44.17	43.75	43.33	42.91	-130
-120	51.29	50.87	50.45	50.04	49.62	49.20	48.78	48.37	47.95	47.53	47.11	-120
-110	55.44	55.02	54.61	54.19	53.78	53.36	52.95	52.53	52.12	51.70	51.29	-110
-100	59.57	59.16	58.74	58.33	57.92	57.50	57.09	56.68	56.26	55.85	55.44	**-100**
-90	63.68	63.27	62.86	62.45	62.04	61.63	61.21	60.80	60.39	59.98	59.57	-90
-80	67.77	67.36	66.96	66.55	66.14	65.73	65.32	64.91	64.50	64.09	63.68	-80
-70	71.85	71.44	71.04	70.63	70.22	69.81	69.41	69.00	68.59	68.18	67.77	-70
-60	75.91	75.51	75.10	74.70	74.29	73.88	73.48	73.07	72.66	72.26	71.85	-60
-50	79.96	79.56	79.15	78.75	78.34	77.94	77.53	77.13	76.72	76.32	75.91	-50
-40	83.99	83.59	83.19	82.79	82.38	81.98	81.58	81.17	80.77	80.36	76.96	-40
-30	88.01	87.61	87.21	86.81	86.41	86.01	85.60	85.20	84.80	84.40	83.99	-30
-20	92.01	91.62	91.22	90.82	90.42	90.02	89.62	89.22	88.82	88.42	88.01	-20
-10	96.02	95.62	95.22	94.82	94.42	94.02	93.62	93.22	92.82	92.42	92.02	-10
-0	100.00	99.60	99.20	98.81	98.41	98.01	97.61	97.21	96.81	96.42	96.02	**0**
0	100.00	100.40	100.80	101.19	101.59	101.99	102.38	102.78	103.18	103.57	103.97	**0**
10	103.97	104.37	104.76	105.16	105.56	105.95	106.35	106.74	107.14	107.53	107.93	10
20	107.93	108.32	108.72	109.11	109.51	109.90	110.30	110.69	111.09	111.48	111.88	20
30	111.88	112.27	112.66	113.06	113.45	113.84	114.24	114.63	115.02	115.42	115.81	30
40	115.81	116.20	116.59	116.99	117.38	117.77	118.16	118.56	118.95	119.34	119.73	40
50	119.73	120.12	120.51	120.91	121.30	121.69	122.08	122.47	122.86	123.25	123.64	**50**
60	123.64	124.03	124.42	124.81	125.20	125.59	125.98	126.37	126.76	127.15	127.54	60
70	127.54	127.93	128.32	128.71	129.09	129.48	129.87	130.26	130.65	131.04	131.42	70
80	131.42	131.81	132.20	132.59	132.98	133.36	133.75	134.14	134.52	134.91	135.30	80
90	135.30	135.68	136.07	136.46	136.84	137.23	137.62	138.00	138.39	138.77	139.16	90
100	139.16	139.55	139.93	140.32	104.70	141.09	141.47	141.86	142.24	142.63	143.01	**100**
110	143.01	143.39	143.78	144.16	144.55	144.93	145.31	145.70	146.08	146.46	146.85	110
120	146.85	147.23	147.61	148.00	148.38	148.76	149.15	149.53	149.91	150.29	150.67	120
130	150.67	151.06	151.44	151.82	152.20	152.58	152.96	153.35	153.73	154.11	154.49	130
140	154.49	154.87	155.25	155.63	156.01	156.39	156.77	157.15	157.53	157.91	158.29	140
150	158.29	158.67	159.05	159.43	159.81	160.19	160.57	160.95	161.33	161.70	162.08	**150**
160	162.08	162.46	162.84	163.22	163.60	163.97	164.35	164.73	165.11	165.48	165.86	160
170	165.86	166.24	166.62	166.99	167.37	167.75	168.12	168.50	168.88	169.25	169.63	170
180	169.63	170.00	170.38	170.76	171.13	171.51	171.88	172.26	172.63	173.01	173.38	180
190	173.38	173.76	174.13	174.51	174.88	175.26	175.63	176.01	176.38	176.75	177.13	190
200	177.13	177.50	177.88	178.25	178.62	179.00	179.37	179.74	180.12	180.49	180.86	**200**
210	180.86	181.23	181.61	181.98	182.35	182.72	183.09	183.47	183.84	184.21	184.58	210
220	184.58	184.95	185.32	185.70	186.07	186.44	186.81	187.18	187.55	187.92	188.29	220
230	188.29	188.66	189.03	189.40	189.77	190.14	190.51	190.88	191.25	191.62	191.99	230
240	191.99	192.36	192.73	193.09	193.46	193.83	194.20	194.57	194.94	195.31	195.67	240
°C	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**°C**

Resistance Temperature Table

Platinum Resistance at 0° C – 100 ohms | Temperature Coefficient – .003916 ohms/ohm °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
250	195.67	196.04	196.41	196.78	197.14	197.51	197.88	198.25	198.61	198.98	199.35	**250**
260	199.35	199.71	200.08	200.45	200.81	201.18	201.55	201.91	202.28	202.64	203.01	260
270	203.01	203.38	203.74	204.11	204.47	204.84	205.20	205.57	205.93	206.30	206.66	270
280	206.66	207.02	207.39	207.75	208.12	208.48	208.85	209.21	209.57	209.94	210.30	280
290	210.30	210.66	211.03	211.39	211.75	212.11	212.48	212.84	213.20	213.56	213.93	290
300	213.93	214.29	214.65	215.01	215.37	215.74	216.10	216.46	216.82	217.18	217.54	**300**
310	217.54	217.90	218.26	218.63	218.99	219.35	219.71	220.07	220.43	220.79	221.15	310
320	221.15	221.51	221.87	222.23	222.59	222.94	223.30	223.66	224.02	224.38	224.74	320
330	224.74	225.10	225.46	225.81	226.17	226.53	226.89	227.25	227.61	227.96	228.32	330
340	228.32	228.68	229.04	229.39	229.75	230.11	230.46	230.82	231.18	231.53	231.89	340
350	231.89	232.25	232.60	232.96	233.31	233.67	234.03	234.38	234.74	235.09	235.45	**350**
360	235.45	235.80	236.16	236.51	236.87	237.22	237.58	237.93	238.28	238.64	238.99	360
370	238.99	239.35	239.70	240.05	240.41	240.76	241.11	241.47	241.82	242.17	242.53	370
380	242.53	242.88	243.23	243.58	243.94	244.29	244.64	244.99	245.35	245.70	246.05	380
390	246.05	246.40	246.75	247.10	247.46	247.81	248.16	248.51	248.86	249.21	249.56	390
400	249.56	249.91	250.26	250.61	250.96	251.31	251.66	252.01	252.36	252.71	253.06	**400**
410	253.06	253.41	253.76	254.11	254.46	254.80	255.15	255.50	255.85	256.20	256.55	410
420	256.55	256.89	257.24	257.59	257.94	258.29	258.63	258.98	259.33	259.67	260.02	420
430	260.02	260.37	260.72	261.06	261.41	261.75	262.10	262.45	262.79	263.14	263.49	430
440	263.49	263.83	264.18	264.52	264.87	265.21	265.56	265.90	266.25	266.59	266.94	440
450	266.94	267.28	267.63	267.97	268.31	268.66	269.00	269.35	269.69	270.03	270.38	**450**
460	270.38	270.72	271.06	271.41	271.75	272.09	272.44	272.78	273.12	273.46	273.80	460
470	273.80	274.15	274.49	274.83	275.17	275.51	275.86	276.20	276.54	276.88	277.22	470
480	277.22	277.56	277.90	278.24	278.58	278.92	279.26	279.61	279.95	280.29	280.63	480
490	280.63	280.96	281.30	281.64	281.98	282.32	282.66	283.00	283.34	283.68	284.02	490
500	284.02	284.36	284.69	285.03	285.37	285.71	286.05	286.39	286.72	287.06	287.40	**500**
510	287.40	287.74	288.07	288.41	288.75	289.08	289.42	289.76	290.09	290.43	290.77	510
520	290.77	291.10	291.44	291.77	292.11	292.45	292.78	293.12	293.45	293.79	294.12	520
530	294.12	294.46	294.79	295.13	295.46	295.80	296.13	296.46	296.80	297.13	297.47	530
540	297.47	297.80	298.13	298.47	298.80	299.13	299.47	299.80	300.13	300.47	300.80	540
550	300.80	301.13	301.46	301.80	302.13	302.46	302.79	303.12	303.46	303.79	304.12	**550**
560	304.12	304.45	304.78	305.11	305.44	305.77	306.11	306.44	306.77	307.10	307.43	560
570	307.43	307.76	308.09	308.42	308.75	309.08	309.41	309.74	310.06	310.39	310.72	570
580	310.72	311.05	311.38	311.71	312.04	312.37	312.69	313.02	313.35	313.68	314.01	580
590	314.01	314.33	314.66	314.99	315.32	315.64	315.97	316.30	316.62	316.95	317.28	590
600	317.28	317.60	317.93	318.26	318.58	318.91	319.23	319.56	319.89	320.21	320.54	**600**
610	320.54	320.86	321.19	321.51	321.84	322.16	322.49	322.81	323.13	323.46	323.78	610
620	323.78	324.11	324.43	324.75	325.08	325.40	325.72	326.05	326.37	326.69		620
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Resistance Temperature Table

Platinum Resistance at 0° C – 100 ohms | Temperature Coefficient – .00392 ohms/ohm °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
-200	17.08											**-200**
-190	21.46	21.02	20.58	20.15	19.71	19.27	18.83	18.40	17.96	17.52	17.08	-190
-180	25.80	25.37	24.94	24.50	24.07	23.63	23.20	22.76	22.33	21.89	21.46	-180
-170	30.11	29.68	29.25	28.82	28.39	27.96	27.53	27.10	26.67	26.23	25.80	-170
-160	34.39	33.97	33.54	33.11	32.69	32.26	31.83	31.40	30.97	30.54	30.11	-160
-150	38.65	38.22	37.80	37.37	36.95	36.52	36.10	35.67	35.25	34.82	34.39	**-150**
-140	42.87	42.45	42.03	41.61	41.19	40.76	40.34	39.92	39.49	39.07	38.65	-140
-130	47.07	46.66	46.24	45.82	45.40	44.98	44.56	44.14	43.72	43.29	42.87	-130
-120	51.25	50.84	50.42	50.00	49.58	49.17	48.75	48.33	47.91	47.49	47.07	-120
-110	55.41	54.99	54.58	54.16	53.75	53.33	52.92	52.50	52.09	51.67	51.25	-110
-100	59.54	59.13	58.72	58.30	57.89	57.48	57.06	56.65	56.24	55.82	55.41	**-100**
-90	63.66	63.25	62.84	62.43	62.01	61.60	61.19	60.78	60.37	59.96	59.54	-90
-80	67.76	67.35	66.94	66.53	66.12	65.71	65.30	64.89	64.48	64.07	63.66	-80
-70	71.84	71.43	71.02	70.61	70.21	69.80	69.39	68.98	68.57	68.17	67.76	-70
-60	75.90	75.50	75.09	74.68	74.28	73.87	73.47	73.06	72.65	72.24	71.84	-60
-50	79.95	79.55	79.14	78.74	78.33	77.93	77.52	77.12	76.71	76.31	75.90	**-50**
-40	83.99	83.58	83.18	82.78	82.38	81.97	81.57	81.16	80.76	80.36	79.95	-40
-30	88.01	87.61	87.21	86.80	86.40	86.00	85.60	85.20	84.79	84.39	83.99	-30
-20	92.02	91.62	91.22	90.82	90.42	90.02	89.61	89.21	88.81	88.41	88.01	-20
-10	96.02	95.62	95.22	94.82	94.42	94.02	93.62	93.22	92.82	92.42	92.02	-10
0	100.00	99.60	99.20	98.81	98.41	98.01	97.61	97.21	96.81	96.41	96.02	**0**
0	100.00	100.40	100.80	101.19	101.59	101.99	102.39	102.78	103.18	103.58	103.97	**0**
10	103.97	104.37	104.77	105.16	105.56	105.95	106.35	106.75	107.14	107.54	107.93	10
20	107.93	108.33	108.72	109.12	109.52	109.91	110.30	110.70	111.09	111.49	111.88	20
30	111.88	112.28	112.67	113.07	113.46	113.85	114.25	114.64	115.03	115.43	115.82	30
40	115.82	116.21	116.61	117.00	117.39	117.79	118.18	118.57	118.96	119.35	119.75	40
50	119.75	120.14	120.53	120.92	121.31	121.71	122.10	122.49	122.88	123.27	123.66	**50**
60	123.66	124.05	124.44	124.83	125.22	125.61	126.00	126.39	126.78	127.17	127.56	60
70	127.56	127.95	128.34	128.73	129.12	129.51	129.90	130.29	130.68	131.07	131.45	70
80	131.45	131.84	132.23	132.62	133.01	133.39	133.78	134.17	134.56	134.95	135.33	80
90	135.33	135.72	136.11	136.49	136.88	137.27	137.65	138.04	138.43	138.81	139.20	90
100	139.20	139.59	139.97	140.36	140.74	141.13	141.51	141.90	142.29	142.67	143.06	**100**
110	143.06	143.44	143.83	144.21	144.59	144.98	145.36	145.75	146.13	146.52	146.90	110
120	146.90	147.28	147.67	148.05	148.43	148.82	149.20	149.58	149.97	150.35	150.73	120
130	150.73	151.11	151.50	151.88	152.26	152.64	153.02	153.41	153.79	154.17	154.55	130
140	154.55	154.93	155.31	155.70	156.08	156.46	156.84	157.22	157.60	157.98	158.36	140
150	158.36	158.74	159.12	159.50	159.88	160.26	160.64	161.02	161.40	161.78	162.16	**150**
160	162.16	162.54	162.91	163.29	163.67	164.05	164.43	164.81	165.19	165.56	165.94	160
170	165.94	166.32	166.70	167.07	167.45	167.83	168.21	168.58	168.96	169.34	169.71	170
180	169.71	170.09	170.47	170.84	171.22	171.60	171.97	172.35	172.73	173.10	173.48	180
190	173.48	173.85	174.23	174.60	174.98	175.35	175.73	176.10	176.48	176.85	177.23	190
200	177.23	177.60	177.97	178.35	178.72	179.10	179.47	179.84	180.22	180.59	180.96	**200**
210	180.96	181.34	181.71	182.08	182.46	182.83	183.20	183.57	183.95	184.32	184.69	210
220	184.69	185.06	185.43	185.81	186.18	186.55	186.92	187.29	187.66	188.03	188.41	220
230	188.41	188.78	189.15	189.52	189.89	190.26	190.63	191.00	191.37	191.74	192.11	230
240	192.11	192.48	192.85	193.22	193.59	193.96	194.32	194.69	195.06	195.43	195.80	240
250	195.80	196.17	196.54	196.90	197.27	197.64	198.01	198.38	198.74	199.11	199.48	**250**
260	199.48	199.85	200.21	200.58	200.95	201.31	201.68	202.05	202.41	202.78	203.15	260
270	203.15	203.51	203.88	204.24	204.61	204.98	205.34	205.71	206.07	206.44	206.80	270
280	206.80	207.17	207.53	207.90	208.26	208.63	208.99	209.35	209.72	210.08	210.45	280
290	210.45	210.81	211.17	211.54	211.90	212.26	212.63	212.99	213.35	213.72	214.08	290
°C	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**°C**

Resistance Temperature Table

Platinum Resistance at 0° C – 100 ohms | Temperature Coefficient – .00392 ohms/ohm °C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
300	214.08	214.44	214.80	215.17	215.53	215.89	216.25	216.61	216.98	217.34	217.70	**300**
310	217.70	218.06	218.42	218.78	219.14	219.51	219.87	220.23	220.59	220.95	221.31	310
320	221.31	221.67	222.03	222.39	222.75	223.11	223.47	223.83	224.19	224.55	224.91	320
330	224.91	225.26	225.62	225.98	226.34	226.70	227.06	227.42	227.78	228.13	228.49	330
340	228.49	228.85	229.21	229.56	229.92	230.28	230.64	230.99	231.35	231.71	232.07	340
350	232.07	232.42	232.78	233.13	233.49	233.85	234.20	234.56	234.92	235.27	235.63	**350**
360	235.63	235.98	236.34	236.69	237.05	237.40	237.76	238.11	238.47	238.82	239.18	360
370	239.18	239.53	239.89	240.24	240.59	240.95	241.30	241.66	242.01	242.36	242.72	370
380	242.72	243.07	243.42	243.78	244.13	244.48	244.83	245.19	245.54	245.89	246.24	380
390	246.24	246.59	246.95	247.30	247.65	248.00	248.35	248.70	249.06	249.41	249.76	390
400	249.76	250.11	250.46	250.81	251.16	251.51	251.86	252.21	252.56	252.91	253.26	**400**
410	253.26	253.61	253.96	254.31	254.66	255.01	255.36	255.71	256.06	256.40	256.75	410
420	256.75	257.10	257.45	257.80	258.15	258.49	258.84	259.19	259.54	259.89	260.23	420
430	260.23	260.58	260.93	261.27	261.62	261.97	262.31	262.66	263.01	263.35	263.70	430
440	263.70	264.05	264.39	264.74	265.08	265.43	265.78	266.12	266.47	266.81	267.16	440
450	267.16	267.50	267.85	268.19	268.54	268.88	269.23	269.57	269.91	270.26	270.60	**450**
460	270.60	270.95	271.29	271.63	271.98	272.32	272.66	273.01	273.35	273.69	274.03	460
470	274.03	274.38	274.72	275.06	275.40	275.75	276.09	276.43	276.77	277.11	277.46	470
480	277.46	277.80	278.14	278.48	278.82	279.16	279.50	279.84	280.18	280.52	280.87	480
490	280.87	281.21	281.55	281.89	282.23	282.57	282.91	283.24	283.58	283.92	284.26	490
500	284.26	284.60	284.94	285.28	285.62	285.96	286.30	286.63	286.97	287.31	287.65	**500**
510	287.65	287.99	288.32	288.66	289.00	289.34	289.67	290.01	290.35	290.69	291.02	510
520	291.02	291.36	291.70	292.03	292.37	292.71	293.04	293.38	293.71	294.05	294.39	520
530	294.39	294.72	295.06	295.39	295.73	296.06	296.40	296.73	297.07	297.40	297.74	530
540	297.74	298.07	298.41	298.74	299.07	299.41	299.74	300.07	300.41	300.74	301.08	540
550	301.08	301.41	301.74	302.07	302.41	302.74	303.07	303.41	303.74	304.07	304.40	**550**
560	304.40	304.73	305.07	305.40	305.73	306.06	306.39	306.72	307.06	307.39	307.72	560
570	307.72	308.05	308.38	308.71	309.04	309.37	309.70	310.03	310.36	310.69	311.02	570
580	311.02	311.35	311.68	312.01	312.34	312.67	313.00	313.33	313.66	313.99	314.31	580
590	314.31	314.64	314.97	315.30	315.63	315.96	316.28	316.61	316.94	317.27	317.59	590
600	317.59	317.92	318.25	318.58	318.90	319.23	319.56	319.88	320.21	320.54	320.86	**600**
610	320.86	321.19	321.52	321.84	322.17	322.49	322.82	323.14	323.47	323.79	324.12	610
620	324.12	324.44	324.77	325.09	325.42	325.74	326.07	326.39	326.72	327.04	327.36	620
630	327.36	327.69	328.01	328.34	328.66	328.98	329.31	329.63	329.95	330.28	330.60	630
640	330.60	330.92	331.24	331.57	331.89	332.21	332.53	332.85	333.18	333.50	333.82	640
650	333.82	334.14	334.46	334.78	335.11	335.43	335.75	336.07	336.39	336.71	337.03	**650**
660	337.03											660
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Chemical Resistance Chart

	Carbon Steel	Alloy 600	Monel	Nickel	304 SS	316 SS
Acetate Solvents, Crude	D	A	B	B	A	A
Acetate Solvents, Pure	C	A	A	A	A	A
Acetaldehyde, 100%	X	B	A	B	A	A
Acetic Acid, 95%	D	A	A	A	B	A
Acetic Acid Vapors, 100% Hot	B	B	B	B	D	B
Acetic Anhydride, Boiling	D	A	A	B	B	A
Acetone	B	A	A	A	A	A
Alcohols	B	A	A	A	A	A
Alum Potassium, 10%	D	B	B	B	B	A
Aluminum Chloride, 10%	D	B	B	B	D	C
Aluminum Chloride, 10%, Boiling	D	C	C	B	D	D
Aluminum Sulfate, 10%	D	A	A	A	C	B
Aluminum Sulfate, <10%, Boiling	D	B	B	B	D	B
Aluminum Sulfate, >10%, Boiling	D	B	B	B	D	B
Amines	B	A	A	A	A	A
Ammonia, Anhydrous	B	A	A	A	A	A
Ammonium Chloride, 10%	C	A	A	A	B	A
Ammonium Chloride, <10%, Boiling	D	B	B	B	D	C
Ammonium Chloride, >10%, Boiling	D	C	B	B	D	C
Ammonium Hydroxide, Hot	B	A	D	D	A	A
Ammonium Nitrate	B	A	C	C	A	A
Ammonium Persulfate 5%	D	A	D	D	A	A
Ammonium Phosphate, Didasic, 5%	D	A	B	C	A	A
Ammonium Sulfite, >10%	D	B	B	B	C	B
Ammonium Sulfite, >10%, Boiling	D	B	B	B	B	C
Ammonium Sulfite, Boiling	D	D	C	D	C	B
Aniline Hydrochloride	D	B	B	B	D	C
Antimony Trichloride	D	B	B	B	D	C
Asphalt	B	A	A	B	A	A
Barium Chloride, 5%	C	A	A	A	A	A
Barium Chloride, >5%, Hot	D	B	A	A	C	B
Barium Hydroxide	C	A	A	A	A	A
Barium Nitrate	C	B	C	C	A	A
Beer, 160°F	C	A	A	A	A	A
Beet Sugar Liquor, Hot	B	A	A	A	A	A
Benzene, Hot	B	A	A	A	A	A
Benzoic Acid	B	A	A	A	A	A
Blood	D	A	A	A	A	A
Borax, Hot	B	A	A	B	A	A
Boric Acid, 5% Hot	D	A	B	B	B	B
Bromine, Dry Gas	D	B	A	A	D	D
Bromine, Moist Gas	D	D	C	C	D	D
Buttermilk	D	A	A	A	A	A
Butyric Acid, Dilute	X	A	A	A	A	A
Butyric Acid, Hot, Concentrate	D	B	B	C	C	B
Calcium Bisulfite, Hot	D	D	D	D	C	B
Calcium Chloride, Dilute	C	A	A	A	B	A
Calcium Hydroxide, 10% Boiling	D	A	A	A	A	A
Calcium Hydroxide, 20% Boiling	D	A	A	A	A	A
Calcium Hydroxide, 30% Boiling	D	A	A	A	C	B
Calcium Hypochloride, <2%	C	B	C	C	C	B
Carbolic Acid, 90%	C	A	B	A	A	A
Carbon Dioxide, Dry	B	A	A	A	A	A
Carbon Disulfide	B	A	B	B	A	A
Carbon Tetrachloride, Dry, Hot	C	A	A	A	B	A
Carbonic Acid, Saturated	D	A	A	A	A	A
Chloracetic	D	B	B	B	D	C
Chloric Acid	D	C	C	C	D	C
Chlorinated Water, Saturated	D	C	C	C	D	C
Chlorine, Dry Gas	B	A	A	A	B	B
Chlorine, Moist Gas	D	D	C	C	D	C
Chlorosulfonis Acid, Dilute	D	B	B	A	D	B
Chromic Acid, Dilute	B	B	B	B	B	A

	Carbon Steel	Alloy 600	Monel	Nickel	304 SS	316 SS
Chromic Acid, <10%, Boiling	D	C	C	D	C	B
Chromic Acid, >10%, Boiling	D	C	D	D	D	C
Citric Acid, Dilute	D	A	A	B	A	A
Citric Acid, Hot, Concentrate	D	B	B	B	C	B
Copper Nitrate, Hot, Concentrate	D	C	D	D	A	A
Copper Sulfate, Hot, Concentrate	D	B	C	C	B	A
Creosote, Hot	B	A	A	A	A	A
Cupric Chloride, <2%	D	C	B	B	B	B
Cupric Chloride, 5%	D	D	D	C	D	C
Dichloroethane, Boiling	D	B	A	A	B	B
Ethyl Chloride	A	A	A	A	A	A
Ethylene Glycol	A	A	A	A	A	A
Fatty Acids, 145°F	C	A	A	A	B	A
Ferric Chloride, >1%	D	D	D	D	D	D
Ferric Chloride, <1%	D	D	D	D	D	D
Ferric Chloride, <1%, Boiling	D	D	D	D	D	D
Ferric Chloride, >1%, Boiling	D	D	D	D	D	D
Ferric Nitrate, 5%	D	C	D	D	B	A
Ferric Sulfate, 5%	D	B	C	C	B	A
Ferrous Sulfate, 10%	C	B	A	A	A	A
Fluorine, Dry Gas	C	A	A	A	C	B
Fluorine, Dry 300°F	D	B	A	A	D	C
Fluorine, Moist Gas	D	B	A	B	D	D
Formaldehyde, 40%	C	A	A	A	B	A
Formic Acid, <50%	D	A	B	B	B	A
Formic Acid, >50%	D	B	B	B	B	A
Formic Acid, <50%, Hot	D	B	B	B	B	A
Formic Acid, >50%, Hot	D	B	B	B	C	B
Freon, Wet	C	B	A	A	C	C
Fuel Oil, 14%F	A	A	B	B	A	A
Furfural	B	B	B	B	B	B
Gasoline, Refined	A	A	A	A	A	A
Glycerine	A	A	A	A	A	A
Hydrochloric Acid, <1%	D	B	B	B	D	B
Hydrochloric Acid, 1.20%	D	C	B	B	D	D
Hydrochloric Acid, >20%	D	D	D	C	D	D
Hydrochloric Acid, <1/2%, 175°F	D	C	B	B	D	D
Hydrochloric Acid, 1/2-2%, 175°F	D	D	C	C	D	D
Hydrochloric Acid, >2%, 175°F	D	D	D	D	D	D
Hydrochloric Acid, 1/4%, Boiling	D	C	B	B	D	D
Hydrochloric Acid, 1/4-1%, Boiling	D	C	C	C	D	D
Hydrochloric Acid, 1%, Boiling	D	D	D	D	D	D
Hydrofluoric Acid, <40%	C	C	B	B	D	D
Hydrofluoric Acid, >40%	C	C	B	C	D	D
Hydrofluoric Acid, Boiling	D	D	B	C	D	D
Hydrofluosilicic Acid	D	B	A	B	D	C
Hydrogen Chloride, Dry	B	A	A	A	D	C
Hydrogen Chloride, Moist	D	D	C	C	D	D
Hydrogen Fluoride, Dry	C	A	A	A	D	C
Hydrogen Peroxide, Boiling	D	B	B	B	C	B
Hydrogen Sulfide, Dry	B	A	A	A	A	A
Hydrogen Sulfide, Moist	C	A	B	B	B	A
Iodine, Dry	D	A	A	A	D	B
Kerosene	A	A	A	A	A	A
Lactic Acid, 5%	D	A	B	B	B	A
Lactic Acid, 10%	D	A	B	B	B	A
Lactic Acid, 5%, Boiling	D	B	C	C	C	B
Lactic Acid, 10%, Boiling	D	B	C	C	D	B
Lead Acetate, Hot	D	B	B	C	A	A
Magnesium Chloride, 5%, Hot	D	A	A	A	C	B
Magnesium Hydroxide	B	A	A	A	A	A
Magnesium Sulfate	B	B	A	B	A	A
Magnesium Sulfate, Boiling	C	C	A	B	A	A

*The information contained herein acts as a guide and Smart Sensors Inc., its' distributors and representatives specifically deny warranty expressed or implied.

Chemical Resistance Chart

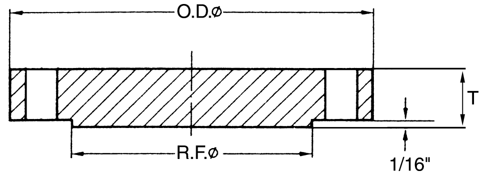
	Carbon Steel	Alloy 600	Monel	Nickel	304 SS	316 SS
Mercury	B	A	B[1]	A	A	A
Mercuric Chloride, <2%	D	D	D	D	D	D
Mercuric Chloride, <1/2%, Boiling	D	D	D	D	D	D
Mercuric Cyanide	D	B	D	B	B	B
Methyl Chloride, Dry	D	A	A	A	B	B
Milk	D	A	B	B	A	A
Molasses	B	A	A	A	A	A
Naptha	B	A	A	A	A	A
Nickel Chloride	D	B	B	B	C	B
Nickel Sulfate, Boiling	D	B	B	A	C	C
Nitric Acid, 20%	D	B	D	D	A	A
Nitric Acid, Fuming	D	B	D	D	B	B
Nitric Acid, 20%, Boiling	D	C	D	D	A	A
Nitric Acid, 65%, Boiling	D	D	D	D	B	B
Nitric Acid, Boiling, Concentrate	D	D	D	D	D	D
Nitrous Acid	D	B	C	C	B	B
Oxalic Acid, <10%	C	A	A	A	A	A
Oxalic Acid, 10%	C	A	A	A	A	A
Oxalic Acid, 10%, Boiling	D	A	A	B	D	C
Oxalic Acid, 50%, Boiling	D	B	B	C	D	C
Phosphoric Acid (Ortho), <10%	D	A	B	B	B	A
Phosphoric Acid (Ortho), 10-50%	D	A	B	C	C	A
Phosphoric Acid (Ortho), >50%	D	A	B	C	C	A
Phosphoric Acid (Ortho), <20%, 175°F	D	C	B	D	D	A
Phosphoric Acid (Ortho), >20%, 175°F	D	D	B	D	D	B
Phosphoric Acid (Ortho), <10%, Boiling	D	D	C	D	D	B
Phosphoric Acid (Ortho), 85%, Boiling	D	D	D	D	D	C
Picric Acid	C	D	D	D	A	A
Potassium Bromide	D	A	A	A	C	B
Potassium Carbonate	B	A	A	A	A	A
Potassium Chlorate	B	A	B	B	A	A
Potassium Chloride	D	A	A	B	A	A
Potassium Chloride, Hot	D	B	A	B	C	B
Potassium Cyanide	B	B	B	B	B	B
Potassium Dichromate, Concentrate	C	B	B	C	A	A
Potassium Ferricyanide, 5%	C	B	B	B	A	A
Potassium Ferrocyanide, 5%	C	X	B	B	A	A
Potassium Hydroxide, 50%	B	A	A	A	A	A
Potassium Hydroxide, 30%, 175°F	D	A	A	A	A	A
Potassium Hydroxide, 50%, 175°F	D	A	A	A	B	A
Potassium Hydroxide, 30%, Boiling	D	A	A	A	B	A
Potassium Hydroxide, 50%, Boiling	D	A	A	A	B	A
Potassium Hypochlorite, Dilute	D	X	D	C	C	B
Potassium Permanganate, Dilute	B	B	A	A	A	A
Potassium Sulfate, Dilute	B	A	A	A	A	A
Potassium Sulfate, Dilute, Boiling	D	B	B	B	B	B
Potassium Sulfate, Saturated	C	A	C	A	A	A
Propane, Liquid & Gas	B	A	A	A	A	A
Pyrogallic Acid	B	B	A	A	A	A
Salicylic Acid	D	B	B	B	B	B
Silver Bromide	D	C	B	C	B	A
Silver Chloride	D	C	B	C	D	D
Silver Nitrate	X	A	C	D	A	A
Sodium Acetate	C	A	A	A	A	A
Sodium Bisulfate	D	B	A	B	B	B
Sodium Bisulfate, 140°F	D	C	B	C	B	B
Sodium Bromide, Dilute	X	B	A	B	B	A
Sodium Carbonate, 5%, Hot	B	A	A	A	A	A
Sodium Chloride, Dilute	C	A	A	A	A	A
Sodium Chloride, Saturated, Boiling	D	A	A	A	C	B
Sodium Cyanide	B	B	A	B	B	B
Sodium Fluoride, 5%	D	B	A	A	B	A
Sodium Hydroxide, 50%	B	A	A	A	A	A

	Carbon Steel	Alloy 600	Monel	Nickel	304 SS	316 SS
Sodium Hydroxide, <40%, 175°F	D	A	A	A	A	A
Sodium Hydroxide, 40-80%, 175°F	D	A	A	A	A	A
Sodium Hydroxide, <30%, Boiling	D	A	B	A	A	A
Sodium Hydroxide, >30%, Boiling	D	A	B	A	C	B
Sodium Hydroxide, Molten	D	B	B	A	D	D
Sodium Hypochlorite (Still), 5%	D	C	C	C	C	B
Sodium Hyposulfite	D	B	A	A	B	A
Sodium Nitrate	B	A	B	A	B	A
Sodium Perborate	C	A	B	B	A	A
Sodium Peroxide	C	A	B	B	A	A
Sodium Phosphate, Tribasic	C	A	A	A	A	A
Sodium Silicate	B	A	B	B	A	A
Sodium Sulfate (All Concentrate)	B	B	A	A	B	A
Sodium Sulfate, Hot	D	B	A	B	C	B
Sodium Sulfide, Saturated	B	A	B	A	B	A
Sodium Sulfite, Hot	D	C	B	C	B	A
Sodium Thiosulfate	D	B	B	B	B	A
Stannic Chloride, <5%	D	D	B	B	D	D
Stannic Chloride, >5%	D	D	C	D	D	D
Stannic Chloride, SG 1.21, Boiling	D	D	D	D	D	D
Stannous Chloride, Saturated	D	B	B	B	D	B
Steam, 212°F	A	A	A	A	A	A
Steam, 600°F	C	A	A	A	A	A
Sulfite Liquors	D	D	D	D	C	B
Sulfur, Molten, 266°F	B	A	A	A	B	A
Sulfur Chloride	D	B	B	B	D	C
Sulfur Dioxide, 250°F, Dry	B	B	B	B	A	A
Sulfur Dioxide, Moist	D	D	D	D	B	A
Sulfuric Acid, <2%	D	B	B	B	C	B
Sulfuric Acid, 2-40%	D	B	B	B	D	D
Sulfuric Acid, 40%	D	B	B	B	D	D
Sulfuric Acid, Concentrate	B	B	D	D	B	B
Sulfuric Acid, <10%, Boiling	D	C	B	D	D	D
Sulfuric Acid, 10-80%, Boiling	D	D	C	D	D	D
Sulfuric Acid, Concentrate, Boiling	D	D	D	D	D	D
Sulfuric Acid, Saturated	D	D	D	D	B	B
Tannic Acid, 10%	D	B	A	A	A	A
Tar, Hot	B	A	B	B	A	A
Tartaric Acid, 120°F	D	A	A	A	B	A
Toluene	A	A	A	A	A	A
Trichlorethylene	B	A	A	A	A	A
Turpentine	B	A	A	A	A	A
Varnish, Hot	C	A	A	A	A	A
Vegetable Oils	B	A	B	B	A	A
Vinegar	D	A	A	A	A	A
Water, Acid Mine	D	A	C	C	A	A
Water, Boiler Feed	B	A	A	A	A	A
Water, Distilled	D	A	A	A	A	A
Water, Salt Sea	D	B	A	C	C	B
Whiskey, Boiling	D	A	C	B	A	A
Wine	D	A	C	B	A	A
Xylene, Boiling	X	A	A	B	A	A
Zinc Chloride, 5%	D	B	B	B	C	B
Zinc Chloride, 5%, Boiling	D	D	B	C	D	D
Zinc Sulfate, Boiling	D	B	A	B	A	A

GUIDE TO SELECTION

A Substantial Resistance — Preferred materials of construction.
B Moderate Resistance — Satisfactory. For use under most conditions; very slight swelling for elastomers.
C Questionable Resistance — Use with caution.
D Inadequate Resistance — Not recommended.
X No information available.

Standard Pipe Flanges



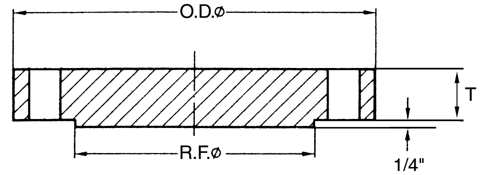
Note: *"T" includes the 1/16" raised face thickness.*

Blind Flange

150 lb/sq. in.		ANSI (ASA) b 16.5		
Pipe		Flange		Raised Face
Nominal Size NW	O.D. in. mm	O.D. in. mm	T in. mm	R.F. in. mm
1/2"	0.84 21,3	3 - 1/2 88,9	7/16 11,1	1- 3/8 34,9
3/4"	1.05 26,7	3 - 7/8 98,4	1/2 12,7	1 - 11/16 42,9
1"	1.315 33,4	4 - 1/4 107,9	9/16 14,3	2 50,8
1 - 1/4"	1.66 42,2	4 - 5/8 117.5	5/8 15,9	2 - 1/2 63,5
1 - 1/2"	1.90 48,3	5 127	11/16 17,5	2 - 7/8 73,0
2"	2.375 60,3	6 152,4	3/4 19,0	3 - 5/8 92,1
2 - 1/2"	2.875 73,0	7 177,8	7/8 22,2	4 - 1/8 104,8
3"	3.5 88,9	7 - 1/2 190,5	15/16 23,8	5 127
3 - 1/2"	4.00 101,6	8 - 1/2 215,9	15/16 23,8	5 - 1/2 139,7
4"	4.50 114,3	9 228,6	15/16 23,8	6 - 3/16 157,2
5"	5.563 141,3	10 254	15/16 23,8	7 - 5/16 185,7
6"	6.625 168,3	11 279,4	1 25,4	8 - 1/2 215,9
8"	8.625 219,1	13 - 1/2 342,9	1 - 1/8 28,6	10 - 5/8 269,9
10"	10.75 273	16 406,4	1 - 3/16 30,2	12 - 3/4 323,8
12"	12.75 323,8	19 482,6	1 - 1/4 31,7	15 381
14"	14.0 355,6	21 533,4	1 - 3/8 34,9	16 - 1/4 412,7
16"	16.0 406,4	23 - 1/2 596,9	1 - 7/16 36,5	18 - 1/2 469,9
18"	18.0 457,2	25 635	1 - 9/16 39,7	21 533,4
20"	20.0 508	27 - 1/2 698,5	1 - 11/16 42,9	23 584,2
24"	24.0 609,6	32 812,8	1 - 7/8 47,6	27 - 1/4 692,1

300 lb/sq. in.		ANSI (ASA) b 16.5		
Pipe		Flange		Raised Face
Nominal Size NW	O.D. in. mm	O.D. in. mm	T in. mm	R.F. in. mm
1/2"	0.84 21,3	3 - 3/4 95,2	9/16 14,3	1- 3/8 34,9
3/4"	1.05 26,7	4 - 5/8 117,5	5/8 15,9	1 - 11/16 42,9
1"	1.315 33,4	4 - 7/8 123,8	11/16 17,5	2 50,8
1 - 1/4"	1.66 42,2	5 - 1/4 133.3	3/4 19,0	2 - 1/2 63,5
1 - 1/2"	1.90 48,3	6 - 1/8 155,6	13/16 20,6	2 - 7/8 73,0
2"	2.375 60,3	6 - 1/2 165,1	7/8 22,2	3 - 5/8 92,1
2 - 1/2"	2.875 73,0	7 - 1/2 190,5	1 25,4	4 - 1/8 104,8
3"	3.5 88,9	8 - 1/4 209,5	1 - 1/8 28,6	5 127
3 - 1/2"	4.00 101,6	9 228,6	1 - 3/16 30,2	5 - 1/2 139,7
4"	4.50 114,3	10 254	1 - 1/4 31,7	6 - 3/16 157,2
5"	5.563 141,3	11 279,4	1 - 3/8 34,9	7 - 5/16 185,7
6"	6.625 168,3	12 - 1/2 317,5	1- 7/16 36,5	8 - 1/2 215,9
8"	8.625 219,1	15 381	1 - 5/8 41,3	10 - 5/8 269,9
10"	10.75 273	17 - 1/2 444,5	1 - 7/8 37,6	12 - 3/4 323,8
12"	12.75 323,8	20 - 1/2 520,7	2 50,8	15 381
14"	14.0 355,6	23 584,2	2 - 1/8 54,0	16 - 1/4 412,7
16"	16.0 406,4	25 - 1/2 647,7	2 - 1/4 57,2	18 - 1/2 469,9
18"	18.0 457,2	28 711,2	2 - 3/8 60,3	21 533,4
20"	20.0 508	30 - 1/2 774,7	2 - 1/2 63,5	23 584,2
24"	24.0 609,6	36 914,4	2 - 3/4 69,8	27 - 1/4 692,1

Standard Pipe Flanges

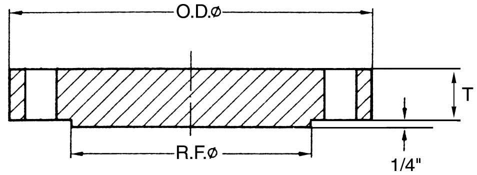


Blind Flange

600 lb/sq. in.				ANSI (ASA) b 16.5
Pipe		Flange		Raised Face
Nominal Size NW	O.D. in. mm	O.D. in. mm	T in. mm	R.F. in. mm
1/2"	0.84 21,3	3 - 3/4 95,2	9/16 14,3	1- 3/8 34,9
3/4"	1.05 26,7	4 - 5/8 117,5	5/8 15,9	1 - 11/16 42,9
1"	1.315 33,4	4 - 7/8 123,8	11/16 17,5	2 50,8
1 - 1/4"	1.66 42,2	5 - 1/4 133.3	3/4 19,0	2 - 1/2 63,5
1 - 1/2"	1.90 48,3	6 - 1/8 155,6	13/16 20,6	2 - 7/8 73,0
2"	2.375 60,3	6 - 1/2 165,1	7/8 22,2	3 - 5/8 92,1
2 - 1/2"	2.875 73,0	7 - 1/2 190,5	1 25,4	4 - 1/8 104,8
3"	3.50 88,9	8 - 1/4 209,5	1 - 1/8 28,6	5 127
3 - 1/2"	4.00 101,6	9 228,6	1 - 3/16 30,2	5 - 1/2 139,7
4"	4.50 114,3	10 - 3/4 273	1 - 1/2 38,1	6 - 3/16 157,2
5"	5.563 141,3	13 330,2	1 - 3/4 44,4	7 - 5/16 185,7
6"	6.625 168,3	14 355,6	1- 7/16 36,5	8 - 1/2 215,9
8"	8.625 219,1	16 - 1/2 419,1	2 - 3/16 55,6	10 - 5/8 269,9
10"	10.75 273	20 508	2 - 1/2 63,5	12 - 3/4 323,8
12"	12.75 323,8	22 558,8	2 - 5/8 66,7	15 381
14"	14.0 355,6	23 - 3/4 603.2	2 - 3/4 69.8	16 - 1/4 412,7
16"	16.0 406,4	27 685,8	3 76,2	18- 1/2 469,9
18"	18.0 457,2	29 - 1/4 742,9	3 - 1/4 82,5	21 533,4
20"	20.0 508	32 812,8	3 - 1/2 88,9	23 584,2
24"	24.0 609,6	37 939,8	4 101,6	27 - 1/4 692,1

900 lb/sq. in.				ANSI (ASA) b 16.5
Pipe		Flange		Raised Face
Nominal Size NW	O.D. in. mm	O.D. in. mm	T in. mm	R.F. in. mm
1/2"	0.84 21,3	4 - 3/4 120,6	7/8 22,2	1- 3/8 34,9
3/4"	1.05 26,7	5 - 1/8 130,2	1 25,4	1 - 11/16 42,9
1"	1.315 33,4	5 - 7/8 149,2	1 - 1/8 28,6	2 50,8
1 - 1/4"	1.66 42,2	6 - 1/4 158,7	1 - 1/8 28,6	2 - 1/2 63,5
1 - 1/2"	1.90 48,3	7 177,8	1 - 1/4 31,7	2 - 7/8 73,0
2"	2.375 60,3	8 - 1/2 215,9	1 - 1/2 38,1	3 - 5/8 92,1
2 - 1/2"	2.875 73,0	9 - 5/8 244,5	1 - 5/8 41,3	4 - 1/8 104,8
3"	3.50 88,9	9 - 1/2 241,3	1 - 1/2 38,1	5 127
4"	4.50 114,3	11 - 1/2 292,1	1 - 3/4 44,4	6 - 3/16 157,2
5"	5.563 141,3	13 - 3/4 349,2	2 50,8	7 - 5/16 185,7
6"	6.625 168,3	15 381	2 - 3/16 55,6	8 - 1/2 215,9
8"	8.625 219,1	18 - 1/2 469,9	2 - 1/2 63,5	10 - 5/8 269,9
10"	10.75 273	21 - 1/2 546,1	2 - 3/4 69,8	12 - 3/4 323,8
12"	12.75 323,8	24 609,6	2 - 5/8 79,4	15 381
14"	14.0 355,6	25 - 1/4 641,3	3 - 3/8 85,7	16 - 1/4 412,7
16"	16.0 406,4	27 - 3/4 704,8	3 - 1/2 88,9	18 - 1/2 469,9
18"	18.0 457,2	31 787,4	4 101,6	21 533,4
20"	20.0 508	33 - 3/4 857,2	4 - 1/4 107,9	23 584,2
24"	24.0 609,6	41 1041,4	5 - 1/2 139,7	27 - 1/2 692,1

Standard Pipe Flanges



Blind Flange

1500 lb/sq. in.		ANSI (ASA) b 16.5		
Pipe		Flange		Raised Face
Nominal Size NW	O.D. in. mm	O.D. in. mm	T in. mm	R.F. in. mm
1/2"	0.84 21,3	4 - 3/4 120,6	7/8 22,2	1- 3/8 34,9
3/4"	1.05 26,7	5 - 1/8 130,2	1 25,4	1 - 11/16 42,9
1"	1.315 33,4	5 - 7/8 149,2	1 - 1/8 28,6	2 50,8
1 - 1/4"	1.66 42,2	6 - 1/4 158,7	1 - 1/8 28,6	2 - 1/2 63,5
1 - 1/2"	1.90 48,3	7 177,8	1 - 1/4 31,7	2 - 7/8 73,0
2"	2.375 60,3	8 - 1/2 215,9	1 - 1/2 38,1	3 - 5/8 92,1
2 - 1/2"	2.875 73,0	9 - 5/8 244,5	1- 5/8 41,3	4 - 1/8 104,8
3"	3.50 88,9	10 - 1/2 266,7	1 - 1/8 47,6	5 127
4"	4.50 114,3	12 - 1/4 311.1	2 - 1/8 54,0	6 - 3/16 157,2
5"	5.563 141,3	14 - 3/4 374,6	2 - 7/8 73,0	7 - 5/16 185,7
6"	6.625 168,3	15 - 1/2 393,7	3 - 1/4 82,5	8 - 1/2 215,9
8"	8.625 219,1	19 482,6	3 - 5/8 92,1	10 - 5/8 269,9
10"	10.75 273	23 584,2	4 - 1/4 107,9	12 - 3/4 323,8
12"	12.75 323,8	26 - 1/2 673,1	4 - 7/8 123,8	15 381
14"	14.0 355,6	29 - 1/2 749.3	5 - 1/4 133,3	16 - 1/4 412,7
16"	16.0 406,4	32 - 1/2 825,5	5 - 3/4 146	18 - 1/2 469,9
18"	18.0 457,2	36 914,4	6 - 3/8 161,9	21 533,4
20"	20.0 508	38 - 3/4 984,2	7 177,8	23 584,2
24"	24.0 609,6	46 1168,4	4 203,6	27 - 1/4 692,1

2500 lb/sq. in.		ANSI (ASA) b 16.5		
Pipe		Flange		Raised Face
Nominal Size NW	O.D. in. mm	O.D. in. mm	T in. mm	R.F. in. mm
1/2"	0.84 21,3	5 - 1/4 133,3	1 - 3/16 30,2	1- 3/8 34,9
3/4"	1.05 26,7	5 - 1/2 139,7	1 - 1/4 31,7	1 - 11/16 42,9
1"	1.315 33,4	6 - 1/4 158,7	1 - 1/8 34,9	2 50,8
1 - 1/4"	1.66 42,2	7 - 1/4 184,1	1 - 1/2 38,8	2 - 1/2 63,5
1 - 1/2"	1.90 48,3	8 203,2	1 - 3/4 44,4	2 - 7/8 73,0
2"	2.375 60,3	9 - 1/4 234,9	2 50,8	3 - 5/8 92,1
2 - 1/2"	2.875 73,0	10 - 1/2 266,7	2 - 1/4 57,1	4 - 1/8 104,8
3"	3.50 88,9	12 304,8	2 - 5/8 66,7	5 127
4"	4.50 114,3	14 355,6	3 76,2	6 - 3/16 157,2
5"	5.563 141,3	16 - 1/2 419,1	3 - 5/8 92,1	7 - 5/16 185,7
6"	6.625 168,3	19 482,6	4 - 1/4 107,9	8 - 1/2 215,9
8"	8.625 219,1	21 - 3/4 552,4	5 127	10 - 5/8 269,9
10"	10.75 273	26 - 1/2 673,1	6 - 1/2 165,1	12 - 3/4 323,8
12"	12.75 323,8	30 762	7 - 1/4 184,1	15 381

Decimal Equivalents of Pipe Sizes

Dimensions in Inches – Wall Thickness of

Pipe Size	O.D.	Sch 40	Sch 80	Sch 120	Sch 160	Double Extra Heavy
1/8	.405	.068	.095			
1/4	.540	.088	.119			
3/8	.675	.091	.126			
1/2	.840	.109	.147		1.88	.294
3/4	1.050	.113	.154		.218	.308
1	1.315	.133	.179		.250	.358
1-1/4	1.660	.140	.191		.250	.382
1-1/2	1.900	.145	.200		.281	.400
2	2.375	.154	.218		.343	.436
2-1/2	2.875	.203	.276		.375	.552
3	3.500	.216	.300		.437	.600
3-1/2	4.000	.226	.318			.636
4	4.500	.237	.337	.437	.531	.674
4-1/2	5.000	.247	.355			.710
5	5.563	.258	.375	.500	.625	.750
6	6.625	.280	.432	.562	.718	.864
7	7.625	.301	.500			.875
8	8.625	.322	.500	.718	.906	.875
9	9.625	.342	.500			
10	10.750	.365	.500	.843	1.125	
11	11.750	.375	.500			
12	12.750	.375	.500	1.000	1.312	
14	14.000	.375	.500	1.093	1.406	
16	16.000	.375	.500	1.218	1.593	
18	18.000	.375	.500	1.375	1.781	
20	20.000	.375	.500	1.500	1.968	
24	24.000	.375	.500	1.812	2.343	

		Nominal Wall Thickness		Actual Inside Diameter	
Pipe Size	Pipe O.D.	Std Sch 40	Ex Hvy Sch 80	Std Sch 40	Ex Hvy Sch 80
1/8"	.405	.068	.095	.267	.215
1/4"	.540	.088	.119	.364	.302
3/8"	.675	.091	.126	.493	.423
1/2"	.840	.109	.147	.622	.546
3/4"	1.050	.113	.154	.824	.742
1"	1.315	.133	.179	1.049	.957
1-1/4"	1.660	.140	.191	1.380	1.278
1-1/2"	1.900	.145	.200	1.610	1.500
2"	2.375	.154	.218	2.067	1.939
2-1/2"	2.875	.203	.276	2.469	2.323
3"	3.500	.216	.300	3.068	2.900

Safe and Accurate Solutions for Difficult Process Applications

Industrial Thermocouples & RTDs

In most process applications the temperature sensor is inserted into a thermowell or protection tube. This protects the sensor from its environment and facilitates easy removal and replacement. These assemblies generally consist of a head, nipple-union-nipple and thermowell. Smart industrial thermocouples and RTDs are available in virtually any calibration and resistance temperature coefficient.

Thermowells

Proper temperature element protection starts with the selection of the thermowell or protection tube. Conditions that influence the selection, include the temperature, pressure, flow velocity, pipe size, insertion length and the process environment and medium. A variety of materials and process connections are available for both thermowells and protection tubes. All metallic wells are constructed in strict compliance with ASTM and ANSI specifications. For higher temperatures ceramic protection tubes are available. Fluid flowing by a thermowell forms a turbulent wake that has a defined frequency. The thermowell must have adequate stiffness so its natural frequency is greater than the wake frequency. Let Smart Sensors help you design your well around your process conditions. Free velocity calculations are a phone call away. Smart Sensors complete family of bar stock wells and protection tubes can provide safe and reliable protection for any process environment.

Heads

Smart Sensors can provide a head for virtually any process application. From our rugged explosion proof head used in hazardous locations to our water resistant head that provides a weather tight seal or our plastic design that can withstand caustic wash downs for CIP and sanitary applications. These heads are available in Cast Aluminum, Stainless Steel, Cast Iron and plastic. The conventional threaded type and the new flip-top threadless design are available for your convenience. All metal heads can accept either a sensor terminal block or a DIN size temperature transmitter.

Miniature Thermocouples & RTDs

Miniature thermocouples and RTDs are generally used where thermowells are not necessary and are commonly found in pilot plants, research and development, furnace, and OEM applications. Thermocouple constructions with diameters as small as .010 inches are available with grounded and ungrounded measuring junctions. All miniature calibrations can be provided with flexible leads and a variety of connector terminations.

Temperature Transmitters and Indicators

Transmitter can accept an input from thermocouples or RTDs and produce an analog or digital output. All outputs are linear with temperature. The instrument can be programmed using software (easily downloaded to your personal computer) or a common hand held programming device. A five year warranty is standard on all transmitters. Hand held and panel mountable digital thermocouple indicators have large displays and accuracies normally found in instruments three times more expensive.

Temperature Measurement...the Right Way! SSi SMART SENSORS INC

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