

## Thermocouples Reference Data (ITS90) mV v/s Temperature (Standard : ASTM E230-03)

Tolerance	Standard	TYPE 'T'	TYPE 'E'	TYPE 'J'	TYPE 'K'	TYPE 'N'	TYPE 'S'	TYPE 'R'	TYPE 'B'
		Cu-CuNi	NiCr-CuNi	Fe-CuNi	NiCr-NiAl	NiCrSi-NiSi	PtRh10%-Pt	PtRh13%-Pt	PtRh30%-PtRh6%
		±0.5°C or ±0.75%	±1.7°C or ±0.5%	±2.2°C or ±1.5%	±2.2°C or ±1.5%	±2.2°C or ±1.5%	±1.5°C or ±25%	±1.5°C or ±25%	±0.5°C Over 800°C
	Special	±0.5°C or ±0.4%	±1°C or ±0.4%	±1.1°C or ±0.4%	±1.1°C or ±0.4%	±1.1°C or ±0.4%	±6°C or ±0.1%	±6°C or ±0.1%	±0.25°C Over 800°C
TEMPERATURE °C	-100	-3.379	-5.237	-4.633	-3.554	-2.407	-	-	-
	0	0	0	0	0	0	0	0	0
	100	4.279	6.319	5.269	4.096	2.774	0.646	0.647	0.033
	200	9.228	13.421	10.799	8.138	5.913	1.441	1.469	0.178
	300	14.862	21.036	16.327	12.209	9.341	2.323	2.401	0.431
	400	20.872	28.946	21.848	16.397	12.974	3.259	3.408	0.787
	500		37.005	27.393	20.644	16.748	4.233	4.471	1.242
	600		45.093	33.102	24.905	20.613	5.239	5.583	1.792
	700			39.132	29.129	24.527	6.275	6.743	2.431
	800			45.494	33.275	28.455	7.345	7.95	3.154
	900				37.326	32.371	8.449	9.208	3.957
	1000				41.276	36.256	9.587	10.506	4.834
	1100				45.119	40.087	10.757	11.85	5.78
	1200				48.838	43.846	11.951	13.228	6.786
	1250				50.644	45.694	12.554	13.926	7.311
	1300				52.41	47.513	13.159	14.629	7.848
	1400						14.373	16.04	8.956
1500						15.582	17.451	10.099	
1600								11.263	
1700								12.433	

## Industrial Platinum Resistance Thermometer (R(0) = 100 OHMS, α = 3850)

°C ITS90	OHMS	°C ITS90	OHMS
-200	18.52	-150	39.72
-100	60.26	-50	80.31
0	100	50	119.40
100	138.51	150	157.33
200	175.86	250	194.10
300	212.05	350	229.72
400	247.09	450	264.18
500	280.98	550	297.49
600	313.71	650	329.64
700	345.28	750	360.64
800	375.70	850	390.48

## Tolerance Value of RTD Pt-100 (IEC-751:1983)

Temp. (°C)	1/10 Din (±°C)	1/5 Din (±°C)	1/3 Din (±°C)	Class A (±°C)	Class B (±°C)
-100	0.080	0.160	0.267	0.350	0.800
-50	0.055	0.110	0.183	0.250	0.550
0	0.030	0.060	0.100	0.150	0.300
50	0.055	0.110	0.183	0.250	0.550
100	0.080	0.160	0.267	0.350	0.800
150	0.105	0.210	0.350	0.450	1.050
200	0.130	0.260	0.433	0.550	1.300
250	0.155	0.310	0.517	0.650	1.550
300	0.180	0.360	0.600	0.750	1.800
350	0.205	0.410	0.683	0.850	2.050
400	0.230	0.460	0.767	0.950	2.300

Also Available in 1/2, 1/3, 1/5, 1/10 DIN Class B

## Wire Insulation Identification and Application Guide

INSULATION CODE	INSULATION	APPEARANCE OF CABLE	TEMP. RANGE INSULATION	ABRASION RESISTANCE	FLEXIBILITY	WATER SUBMERSION	RESISTANCE TO:	
							FLAME	HUMIDITY
P	Polyvinyl Chloride (PVC)		-40 to 105°C	GOOD	EXCELLENT	GOOD	GOOD	GOOD
S	Silicon		-40 to 200°C	GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT
EF	ETFE		-185 to 150°C	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	EXCELLENT
EF	FEP		-200 to 200°C	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	EXCELLENT
PEEK	Poly Ether Ether Ketone (Peek)		-60 to 260°C	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	EXCELLENT
T	PTFE		-267 to 260°C	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	EXCELLENT
PF	PFA		-260 to 260°C	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	EXCELLENT
K	Kapton		-267 to 310°C	EXCELLENT	GOOD	GOOD	EXCELLENT	EXCELLENT
F	Fiber Glass		-73 to 600°C	GOOD	GOOD	EXCELLENT	EXCELLENT	EXCELLENT
CF/SF	Ceramic Fiber/Silica		-72 to 800°C	POOR	GOOD	POOR	EXCELLENT	EXCELLENT
RF/NF/AL	Refrasil/Nextel Silica yarn/Alumina		-73 to 1200°C	POOR	GOOD	POOR	EXCELLENT	FAIR

## Conductor Size Equivalents (Diameter)

No	SWG		B & S(AWG)		No	SWG		B & S(AWG)	
	Inches	mm	Inches	mm		Inches	mm	Inches	mm
0	0.324	8.23	0.3249	8.25	26	0.018	0.457	0.0159	0.404
1	0.300	7.62	0.2893	7.35	27	0.0164	0.417	0.0142	0.361
2	0.276	7.01	0.2576	6.54	28	0.0148	0.376	0.0126	0.320
3	0.256	6.40	0.2294	5.83	29	0.0136	0.345	0.0113	0.287
4	0.232	5.89	0.2043	5.19	30	0.0124	0.315	0.0100	0.254
5	0.212	5.38	0.1819	4.62	31	0.0116	0.295	0.0089	0.226
6	0.192	4.88	0.1620	4.11	32	0.0108	0.274	0.0080	0.203
7	0.176	4.47	0.1443	3.67	33	0.0100	0.254	0.0071	0.180
8	0.160	4.06	0.1285	3.26	34	0.0092	0.234	0.0063	0.160
9	0.144	3.66	0.1144	2.91	35	0.0084	0.213	0.0056	0.142
10	0.128	3.25	0.1019	2.59	36	0.0076	0.193	0.0050	0.127
11	0.116	2.95	0.0907	2.3	37	0.0068	0.173	0.0045	0.114
12	0.104	2.64	0.0808	2.05	38	0.006	0.152	0.0040	0.102
13	0.092	2.34	0.0720	1.83	39	0.0052	0.132	0.0035	0.089
14	0.080	2.03	0.0641	1.63	40	0.0048	0.122	0.0031	0.079
15	0.072	1.83	0.0571	1.45	41	0.0044	0.112	0.0028	0.071
16	0.064	1.63	0.0508	1.29	42	0.0040	0.102	0.0025	0.064
17	0.056	1.42	0.0453	1.15	43	0.0036	0.091	0.0022	0.056
18	0.048	1.22	0.0403	1.02	44	0.0032	0.081	0.0020	0.051
19	0.040	1.02	0.0359	0.912	45	0.0028	0.071	0.0018	0.046
20	0.036	0.914	0.0320	0.813	46	0.0024	0.061		
21	0.32	0.813	0.0285	0.724	47	0.0020	0.051		
22	0.028	0.711	0.0253	0.643	48	0.0016	0.041		
23	0.024	0.610	0.0226	0.574	49	0.0012	0.030		
24	0.022	0.559	0.0201	0.511	50	0.0010	0.025		
25	0.020	0.508	0.0179	0.455					

SWG = (BRITISH) STANDARD WIRE GAUGE  
B&S = BROWN AND SHARPE  
AWG = AMERICAN WIRE GAUGE

## Emissivity of Various Material

Material	Spectral Range 0.7...1.5µm	Spectral Range 1.4...1.8µm	Spectral Range 2.0...2.5µm	Spectral Range 4.9...5.5µm	Spectral Range 8.0...14.0µm
Steel, Shiny	0.40 ... 0.45	0.30 ... 0.40	0.20 ... 0.35	0.10 ... 0.30	0.10 ... 0.30
Steel, Rolled	0.40 ... 0.55	0.35 ... 0.50	0.25 ... 0.40	0.20 ... 0.30	0.20 ... 0.30
Steel, Annealed	0.70 ... 0.80	0.70 ... 0.85	0.45 ... 0.70	0.30 ... 0.60	0.30 ... 0.60
Steel Oxidised	0.80 ... 0.90	0.80 ... 0.90	0.75 ... 0.85	0.70 ... 0.90	0.60 ... 0.80
Copper, Shiny	0.06 ... 0.20	0.06 ... 0.20	0.06 ... 0.10	0.05 ... 0.10	0.03 ... 0.10
Copper, Oxidised	0.50 ... 0.80	0.40 ... 0.80	0.40 ... 0.80	0.20 ... 0.70	0.20 ... 0.70
Aluminium, Shiny	0.05 ... 0.25	0.05 ... 0.25	0.04 ... 0.20	0.03 ... 0.15	0.02 ... 0.15
Aluminium, Anodised	0.20 ... 0.40	0.10 ... 0.40	0.10 ... 0.40	0.10 ... 0.40	0.95
NiCr, Shiny	0.20 ... 0.40	0.20 ... 0.40	0.20 ... 0.40	0.20 ... 0.40	0.10 ... 0.30
NiCr, Anodised	0.65 ... 0.90	0.65 ... 0.80	0.65 ... 0.80	0.65 ... 0.80	0.50 ... 0.80
Coal, Graphite	0.70 ... 0.95	0.70 ... 0.95	0.70 ... 0.95	0.70 ... 0.95	0.70 ... 0.95
Stone, Ground, Ceramic	0.40 ... 0.70	0.40 ... 0.70	0.40 ... 0.70	0.50 ... 0.80	0.60 ... 0.95
Varnish, Paint	----	----	----	0.60 ... 0.90	0.80 ... 0.95
Wood, Plastics, Paper	----	----	----	0.60 ... 0.90	0.75 ... 0.95
Tectile	----	0.70 ... 0.85	0.60 ... 0.85	0.70 ... 0.90	0.75 ... 0.95
Thin Glass	0.05 ... 0.10	0.05 ... 0.20	0.60 ... 0.85	0.70 ... 0.90	0.75 ... 0.95
Water, Snow, Ice	----	----	----	----	0.90 ... 0.95

## International Color Code & Tolerances of Compensating Cables & Thermocouples

THERMOCOUPLE CONDUCTOR COMBINATION TYPE	INTERNATIONAL COLOUR CODE TO IEC 5843:1989	AMERICAN TO ANSI/MC96.1	JAPANESE TO JIS C 1610-1981
K			
T			
J			
N			
E			
R			
S			
B			
C			

CONDUCTOR EXTENSION CABLE	COMPENSATING CABLE	TOLERANCE CLASS IEC 584.3		CABLE TEMPERATURE RANGE °C
		CLASS 1	CLASS 2	
KX	KCA	±1.5°C	±2.5°C	-25°C TO +200°C
		±1.5°C	±2.5°C	0°C TO +100°C
TX	KCB	±0.5°C	±1.0°C	-25°C TO +100°C
		±1.5°C	±2.5°C	-25°C TO +200°C
JX	RCA	±1.5°C	±2.5°C	-25°C TO +200°C
		±1.5°C	±2.5°C	-25°C TO +200°C
NX	RCB	±1.5°C	±2.5°C	-25°C TO +200°C
		±1.5°C	±2.5°C	-25°C TO +200°C
EX	SCA	±1.5°C	±2.5°C	-25°C TO +200°C
		±1.5°C	±2.5°C	-25°C TO +200°C
	SCB	-	±5.0°C	0°C TO +200°C
		-	±5.0°C	0°C TO +200°C
	BC	-	-	0°C TO +100°C
		-	-	0°C TO +100°C
	GC	-	±4.5°C	0°C TO +100°C
		-	±4.5°C	0°C TO +100°C
	DC	-	±4.5°C	0°C TO +100°C
		-	±4.5°C	0°C TO +100°C
	CC	-	±4.4°C	0°C TO +100°C
		-	±4.4°C	0°C TO +100°C

## ANSI B16.5 Flange Details

PIPE			FLANGE						
NOMINAL SIZE	O.D.	ib/sq.in	O.D.	R.F.	THICKNESS	RFT	NO. OF HOLES	HOLE DIA.	PCD
INCH	mm		mm	mm	mm	mm		mm	mm
1/2"	21.3	150	88.9	35.1	11.2	1.6	4	15.7	60.5
3/4"	26.7	150	98.6	42.9	12.7	1.6	4	15.7	69.9
1.0"	33.4	150	108.0	50					