

Reference Guide

- ✓ Properties of the sheath material
- ✓ Diameter and construction of thermocouple assembly

Temperature Range

OMEGACLAD® is a three-part system composed of compacted MgO insulation, thermocouple wire and metal sheath. Four factors determine the useful service temperature for OMEGACLAD® assemblies.

- ✓ Range for the thermocouple wire (see table of error)
- ✓ Maximum service temperature of insulation. In the case of MgO, this is in excess of 1650°C (3000°F)

Sheath Material Specifications

Material	Melting Point (°C/°F)	Continuous Maximum Temp. (°C/°F)	Tensile (PSI) Strength	
			@ 93°C (200°F)	@ 537°C (1000°F)
304 SS	1405/2560	900/1650	68,000	15,000
310 SS	1405/2560	1150/2100	75,000	27,500
316 SS	1370/2500	925/1700	75,000	23,000
321 SS	1400/2550	870/1600	70,000	17,000
Hastelloy X	1260/2300	1200/2200	55,100	35,500
Inconel*	1400/2550	1150/2100	39,000	5,000
SUPER XL	1400/2550	1204/2200	70,000	17,000

*Oxidizing, Vacuum or Inert atmosphere only

Conductor Size Equivalents

Gage No.	AWG		SWG		GAGE No.	AWG		SWG	
	inches	mm	inches	mm		inches	mm	inches	mm
0	0.3249	8.25	0.324	8.23	23	0.0226	0.574	0.024	0.610
1	0.2893	7.35	0.300	7.62	24	0.0201	0.511	0.022	0.559
2	0.2576	6.54	0.276	7.01	25	0.0179	0.455	0.020	0.508
3	0.2294	5.83	0.252	6.40	26	0.0159	0.404	0.0180	0.457
4	0.2043	5.19	0.232	5.89	27	0.0142	0.361	0.0164	0.417
5	0.1819	4.62	0.212	5.38	28	0.0126	0.320	0.0148	0.376
6	0.1620	4.11	0.192	4.88	29	0.0113	0.287	0.0136	0.345
7	0.1443	3.67	0.176	4.47	30	0.0100	0.254	0.0124	0.315
8	0.1285	3.26	0.160	4.06	31	0.0089	0.226	0.0116	0.295
9	0.1144	2.91	0.144	3.66	32	0.0080	0.203	0.0108	0.274
10	0.1019	2.59	0.128	3.25	33	0.0071	0.180	0.0100	0.254
11	0.0907	2.30	0.116	2.95	34	0.0063	0.160	0.0092	0.234
12	0.0808	2.05	0.104	2.64	35	0.0056	0.142	0.0084	0.213
13	0.0720	1.83	0.092	2.34	36	0.0050	0.127	0.0076	0.193
14	0.0641	1.63	0.080	2.03	37	0.0045	0.114	0.0068	0.173
15	0.0571	1.45	0.072	1.83	38	0.0040	0.102	0.0060	0.152
16	0.0508	1.29	0.064	1.63	39	0.0035	0.089	0.0052	0.132
17	0.0453	1.15	0.056	1.42	40	0.0031	0.079	0.0048	0.122
18	0.0403	1.02	0.048	1.22	41	0.0028	0.071	0.0044	0.112
19	0.0359	0.912	0.040	1.02	42	0.0025	0.064	0.0040	0.102
20	0.0320	0.813	0.036	0.914	43	0.0022	0.056	0.0036	0.091
21	0.0285	0.724	0.032	0.813	44	0.0020	0.051	0.0032	0.081
22	0.0253	0.643	0.028	0.711	45	0.0018	0.046	0.0028	0.071

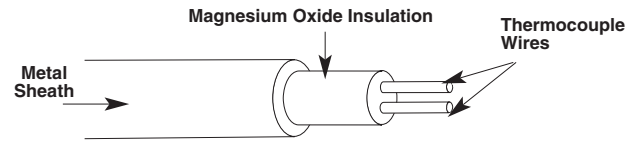
AWG = American Wire Gage
SWG = (British) Standard Wire Gage

To convert from AWG to SWG: Determine wire diameter in inches (mm) from appropriate AWG.
To convert 30 AWG to SWG, determine that 30 AWG is 0.0100", which is equivalent to 33 SWG

Upper Temperature Limit in °C (°F) of OMEGACLAD® Vs. Sheath Diameter

Sheath T/C Dia.	0.020" 0.5 mm	0.032" 0.8 mm	0.040" 1.0 mm	0.062" 1.6 mm	0.093" 2.4 mm	0.125" 3.2 mm	0.188" 4.8 mm	0.250" 6.3 mm
J	260 (500)	260 (500)	260 (500)	440 (825)	480 (900)	520 (970)	620 (1150)	720 (1300)
K & N	700 (1290)	700 (1290)	700 (1290)	920 (1690)	1000 (1830)	1070 (1960)	1150 (2100)	1150 (2100)
E	300 (570)	300 (570)	300 (570)	510 (950)	580 (1075)	650 (1200)	730 (1350)	820 (1510)
T	260 (500)	260 (500)	260 (500)	260 (500)	260 (500)	315 (600)	370 (700)	370 (700)

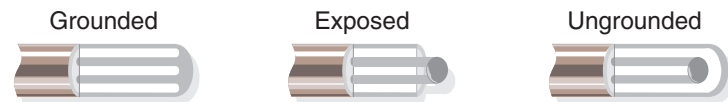
Bends Easily!



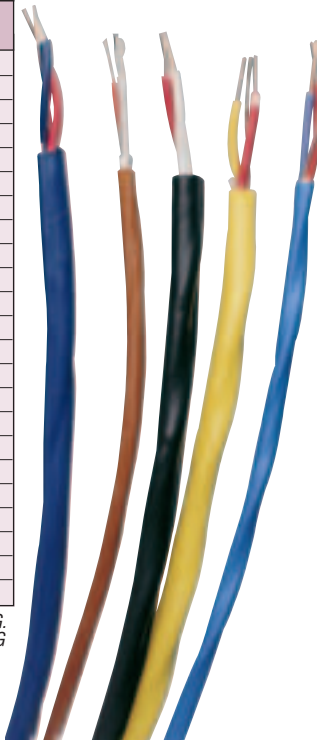
Upper Temperature Limit in °C (°F) of Protected Bare Wire Thermocouples Vs. Wire Diameter

T/C Type	Wire Size						
	8 AWG 0.128"	14 AWG 0.064"	20 AWG 0.032"	24 AWG 0.020"	28 AWG 0.013"	30 AWG 0.010"	36 AWG 0.005"
J	760 (1400)	590 (1100)	480 (900)	370 (700)	370 (700)	320 (600)	315 (590)
K	1260 (2300)	1090 (2000)	980 (1800)	870 (1600)	870 (1600)	760 (1400)	590 (1100)
E	870 (1600)	650 (1200)	540 (1000)	430 (800)	430 (800)	370 (700)	320 (600)
T	370 (700)	370 (700)	260 (500)	200 (400)	200 (400)	150 (300)	
RX/SX	200 (400)	200 (400)	200 (400)	200 (400)	200 (400)	150 (300)	
N	1260 (2300)	1090 (2000)	980 (1800)	980 (1800)	980 (1800)	870 (1600)	
CX	472 (800)	472 (800)	472 (800)	472 (800)	472 (800)	400 (752)	

Common Thermocouple Junctions



Twisted Shielded Wire



H-7



The combination of chemical and physical properties of Teflon®/Neoflon is a result of its true fluorocarbon structure. This unusual structure leads to a material which has an almost universal chemical inertness; complete insolubility in all known solvents below 300°C (572°F); excellent thermal stability; and unsurpassed electrical properties including low dielectric loss, low dielectric constant and high dielectric strength. Furthermore, Teflon/Neoflon does not embrittle at very low temperatures.

**NOW!
AVAILABLE
IN PRE-
SPOOLED
LENGTHS**



Properties of Teflon® Insulation

General Properties of Neoflon and Teflon®

	Neoflon/Teflon® FEP	Neoflon/Teflon® PFA
Chemical Resistance: hydrocarbons, ethylene glycol, battery acid, brake fluids, other chemicals	NO EFFECT	NO EFFECT
Resistance to weathering	NO EFFECT	NO EFFECT
Water absorption (ASTM D570)	0.1%	0.1%
Flammability (UL 83, Vertical Wire Flame Test)*	NO AFTER BURN	NO AFTER BURN
Melting Point °F	518°F	590°F
Melting Point °C	270°C	300°C
Upper Service Temperature °C (°F) 1500 to 2000 hrs. estimated 20,000 hrs. Cold bend @ -65°C 2.5 K V for 5 min.	200°C (392°F) 177°C (350°F) PASS	288°C (550°F) 260°C (500°F) PASS
Specific gravity	2.15	2.15

Mechanical and Electrical Properties

	Neoflon/Teflon FEP	Neoflon/Teflon PFA
Tensile strength, psi 23°C (73°F) ASTM D638	3,000	4,000
Elongation, % 23°C (73°F) ASTM D638	300	300
Flexural modulus, psi 23°C (73°F) ASTM D790	95,000	95,000
Flex life, MIT (7 to 9 mils) 82°C (180°F) Flexes	100,000	200,000
Impact Strength, ft.lb/in.: ASTM D256 Room temperature	NO BREAK	NO BREAK
-54°C (-65°F)	10	10
Coefficient of friction, 10 fpm, 100 psi	0.3	0.2
Dynamic cut-through (lb) Instron 1/16" radius blade moving at 0.2"/min. (0.0031" insulation thickness) 23°C	118	
75°C	73	
Dielectric constant, ASTM D50	2.1	2.1
Volume resistivity, ohm-cm ASTM D257	10 ¹⁸	10 ¹⁸
Dissipation Factor, ASTM D150, 10 ² - 10 ⁶ Hz	0.001	0.0004

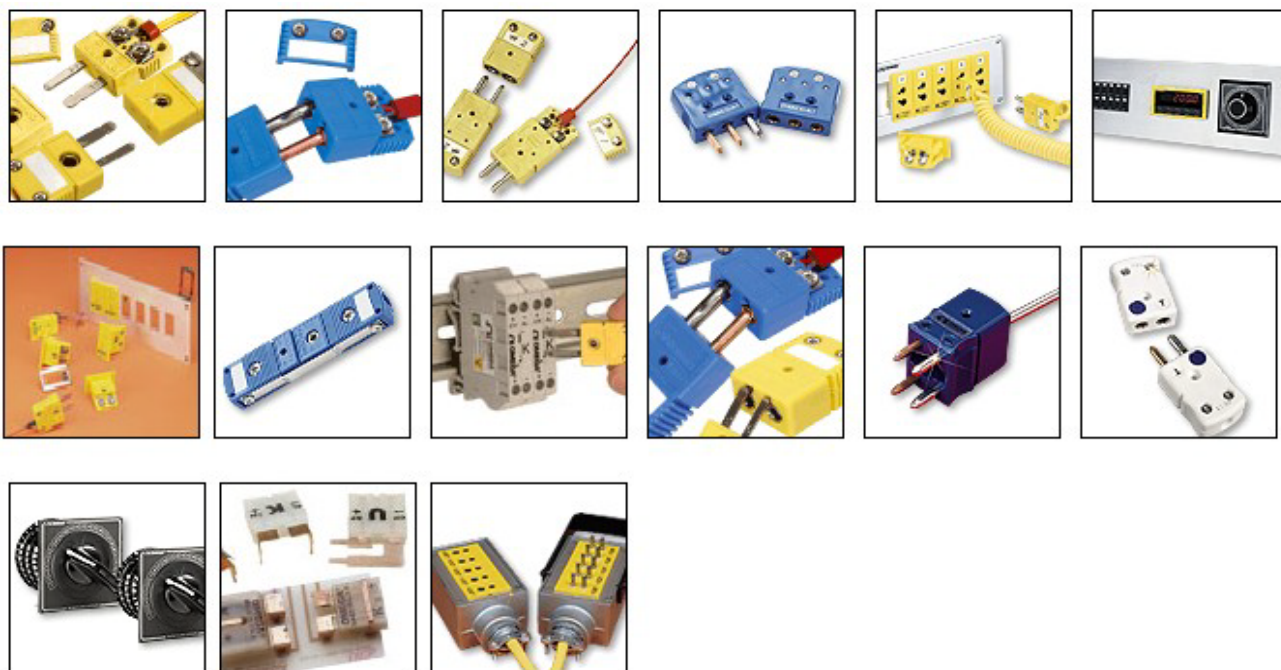
Resistance vs. Wire Diameter (Resistance in ohms per double foot @ 20°C [68°F])

AWG No.	Diameter inches	Diameter mm	Type K ^{††} CHROMEAL [®] /ALOMEGA [®]	Type J Iron/Constantan	Type T Copper/Constantan	Type E CHROMEAL [®] /Constantan	Type S Pt/Pt10%Rh	Type R Pt/Pt13%Rh	Type RX/SX Copper Alloy11**	Type C [†] W5%Re/W26%Re	Type CX Alloy 405/Alloy 426	Type G [†] W/W26%Re	Type D [†] W3%Re/W25%Re	Type BX Copper/Copper*
6	0.162	4.11	0.023	0.014	0.012	0.027	0.007	0.007	0.003	0.009	0.014	0.008	0.009	0.000790
8	0.128	3.25	0.037	0.022	0.019	0.044	0.011	0.011	0.004	0.015	0.023	0.012	0.015	0.001256
10	0.102	2.59	0.058	0.034	0.029	0.069	0.018	0.018	0.007	0.023	0.037	0.020	0.022	0.001998
12	0.081	2.06	0.091	0.054	0.046	0.109	0.028	0.029	0.011	0.037	0.058	0.031	0.035	0.00318
14	0.064	1.63	0.146	0.087	0.074	0.175	0.045	0.047	0.018	0.058	0.093	0.049	0.055	0.00505
16	0.051	1.30	0.230	0.137	0.117	0.276	0.071	0.073	0.028	0.092	0.146	0.078	0.088	0.00803
18	0.040	1.02	0.374	0.222	0.190	0.448	0.116	0.119	0.045	0.148	0.238	0.126	0.138	0.01277
20	0.032	0.81	0.586	0.357	0.298	0.707	0.185	0.190	0.071	0.235	0.371	0.200	0.220	0.02030
24	0.0201	0.51	1.490	0.878	0.7526	1.78	0.464	0.478	0.180	0.594	0.941	0.560	0.560	0.05134
26	0.0159	0.40	2.381	1.405	1.204	2.836	0.740	0.760	0.288	0.945	1.503	0.803	0.890	0.08162
30	0.0100	0.25	5.984	3.551	3.043	7.169	1.85	1.91	0.727	2.38	3.800	2.03	2.26	0.2064
32	0.0080	0.20	9.524	5.599	4.758	11.31	1.96	3.04	1.136	3.8	5.94	3.22	3.60	0.3282
34	0.0063	0.16	15.17	8.946	7.66	18.09	4.66	4.82	1.832	6.04	9.57	5.10	5.70	0.5218
36	0.0050	0.13	24.08	14.20	12.17	28.76	7.40	7.64	2.908	9.6	15.20	8.16	9.10	0.8296
38	0.0039	0.10	38.20	23.35	19.99	45.41	11.6	11.95	4.780	15.3	24.98	12.9	15.3	1.3192
40	0.00315	0.08	60.88	37.01	31.64	73.57	18.6	19.3	7.327	24.4	38.30	20.6	23.0	2.098
44	0.0020	0.051	149.6	88.78	76.09	179.20	74.0	76.5	18.18	60.2	95.00	51.1	56.9	5.134
50	0.0010	0.025	598.4	355.1	304.3	716.9	185	191	72.7	240	380.0	204	227	20.64
56	0.00049	0.012	2408	1420	1217	2816	740	764	302.8	1000	1583	850	945	86.38

* Increase the resistance by 19% for nickel plated, type RTD wire
† Not ANSI symbol

** Maximum Resistance of reviewed wire
†† Resistivity for N is 1.324 times type K values

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二: [Omega热电偶线及热电偶补偿导线](#)



三: [Omega热电偶](#)



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