Properties of NiCr 60 Type 675 Alloy:	
• Density (weight per cubic inch:) 0.2979 lbs. • Specific gravity @ 68°F (20°C): 8.247 • Magnetic Attraction: Para • Thermal conductivity watts/cm/°C @ 100°C (212°F): 0.132 • Approximate melting point: 2462°F (1350°C) • Maximum operating temp: 1652°F (900°C)	**Resistivity factors:** Temperature 68°F (20°C), Factor 1.000 Temperature 212°F (100°C), Factor 1.019 Temperature 392°F (200°C), Factor 1.043 Temperature 572°F (300°C), Factor 1.065 Temperature 752°F (400°C), Factor 1.085 Temperature 932°F (500°C), Factor 1.093 Temperature 1112°F (600°C), Factor 1.110 Temperature 1292°F (700°C), Factor 1.114 Temperature 1472°F (800°C), Factor 1.123 Temperature 1652°F (900°C), Factor 1.132 Temperature 1832°F (1000°C), Factor 1.143

CURRENT TEMPERATURE CHARACTERISTICS OF NICHROME 60 STRAIGHT WIRE

Showing approximate amperes necessary to produce a given temperature. Applying only to straight wires stretched horizontally in free air.

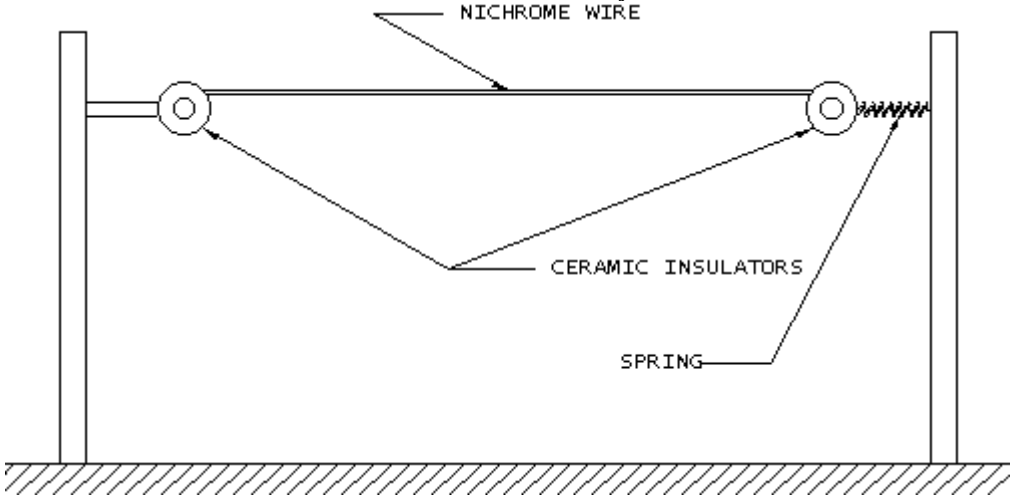
AWG (Gauge)	Dia."	Temp. 400F Temp. 204C	600 316	800 427	1000 538	1200 649	1400 760	1600 871	1800 982	2000F 1093C
16	.051	6.13	8.31	10.50	13.11	16.30	20.10	24.10	28.20	32.30
17	.045	5.31	7.18	9.13	11.30	13.90	16.90	20.30	23.60	27.00
18	.040	4.66	6.26	7.90	9.75	11.96	14.51	17.37	20.48	23.08
19	.036	4.09	5.46	6.84	8.41	10.30	12.45	14.87	17.78	19.73
20	.032	3.58	4.77	5.92	7.25	8.86	10.69	12.72	15.43	16.87
21	.0285	3.14	4.16	5.13	6.26	7.63	9.17	10.88	13.40	14.40
22	.0253	2.76	3.63	4.44	5.40	6.56	7.87	9.31	11.63	12.33
24	.020	2.12	2.76	3.32	4.01	4.86	5.80	6.82	8.76	9.01
25	0179	1.84	2.42	2.90	3.44	4.15	4.97	5.86	6.96	7.72

Size and Approximate Cold Resistances for Common Wattages

Watts at Operating Temperatures	NICHROME 60 Ohms at 75 Degrees		RECOMMENDED A.W.G. SIZES	
	110-120 Volts	220-240 Volts	110-120 Volts	220-240 Volts
200	59.050	236.20	Max. 25-29	Max. 28-32
250	47.240	188.96	24-28	27-31
300	39.366	157.46	24-28	27-31
350	33.742	134.97	23-27	26-30
400	29.525	118.10	22-26	25-29
450	26.244	104.98	20--24	23--27
500	23.620	94.479	20--24	23--27
550	21.472	85.889	19-23	22--26
600	19.683	79.730	19--23	22--26
650	18.170	72.679	19--23	22--26
700	16.871	67.486	18--22	21--25
750	15.745	62.982	18--22	21--25

800	14.762	59.055	18-22	21--25
850	13.894	55.577	17--21	20-24
900	13.122	52.487	17--21	20-24
950	12.431	49.726	17--21	20--24
1000	11.810	47.240	16--20	19--23
1050	11.247	44.989	16-20	19--23
1100	10.737	42.946	16-20	19--23
1150	10.270	41.078	15--19	18-22
1200	9.8418	39.367	15--19	18--22
1250	9.4479	37.792	14--18	17-21
1300	9.0845	36.338	14-18	17-21
1350	8.7480	35.992	13--17	16--20
1400	8.4356	34.743	13--17	16-20
1450	8.1449	32.579	12--16	15--19
1500	7.8732	31.493	12--16	15--19

Generic "Hot Wire" Layout



**** CAUTION: Hazard of Electrical Shock**

The nichrome wire is electrically live. Care must be taken to isolate the nichrome wire from any electrical conductor before power is applied. Never touch the nichrome wire while power is applied.

Electrical Calculations For "Hot-Wire" Applications:

The total amperage of the nichrome wire circuit must not exceed the total amperage of the variable voltage control that is supplying the circuit. As a rule-of-thumb do not exceed 80% of the total amperage rating of the variable voltage control.

Ohms Law:

V = I x R Voltage = Current x Resistance (Ohms)
I = V/R Current = Voltage/Resistance (Ohms)
R = V/I Resistance (Ohms) = Voltage/Current

Example #1:
Calculate the required "hot-wire" circuit resistance that will result in a full scale adjustment (0 to 100%) of a 120 volt, 15 amp, variable voltage control.

Maximum recommended circuit amperage = 15amp x .80 (80%) = 12 amps
Maximum control voltage = 120 volt
Using the resistance calculation given above R=V/I = 120volt / 12amps = 10 Ohms

Example #2:
Using the result from example #1, how much 21 gauge nichrome wire would be needed to meet the requirements?

From the specification table: 21gauge nichrome wire resistance = .831Ohms/ft
Required Nichrome Wire Length = (Required Circuit Resistance) / (Ohms/Ft Of Wire)
Required Nichrome Wire Length = 10ohms / .831ohms/ft = 12.034ft

Example #3:
From example #2, suppose that you only want to use 6ft of nichrome wire. What is the maximum controller scale adjustment that can be made without exceeding the 120 volt variable voltage controller's 15 amp rating?

Variable voltage controllers have a dial adjustment between 0 and 100% of the maximum control voltage. That is, a 50% setting on a 120 volt control will result in an output of 120 x .50 (50%) = 60 volts. A 30% setting on a 120 volt control will result in an output of 120 x .30 (30%) = 36 volts.

A 6ft piece of 21gauge nichrome wire will have a total resistance of .831ohms/ft x 6ft = 4.986 ohms.

Recall that the maximum recommended amperage is 15amp x .80(80%) = 12 amps
Using the voltage calculation from above V=IxR = 12amps x 4.986ohm = 59.832 volts

What percentage of the dial setting will result in a 59.832 volt output?
% Dial Setting = (Required Voltage / Maximum Control Voltage) x 100
% Dial Setting = (59.832volt/120volt) x 100 = 49.86%

The dial on the controller can be adjusted from 0 to 49.86% without exceeding the controller's amperage rating.

Example #4:
Based on the examples above what is the maximum estimated temperature that the 21gauge nichrome wire will achieve at 12 amps?

From the specification table:
A 21 gauge nichrome wire at 10.88amps will result in a wire temperature of 1600°F
A 21 gauge nichrome wire at 13.40amps will result in a wire temperature of 1800°F
Therefore, we can expect the wire temperature to fall between 1600°F and 1800°F.
We can estimate the temperature to be approximately 1700°F at 12 amps.