

## KANTHAL® A-1

# RESISTANCE HEATING WIRE AND RESISTANCE WIRE

### DATASHEET

Kanthal® A-1 is a ferritic iron-chromium-aluminium alloy (FeCrAl alloy) for use at temperatures up to 1400°C (2550°F). The alloy is characterized by high resistivity and very good oxidation resistance.

Typical applications for Kanthal® A-1 are electrical heating elements in high-temperature furnaces for heat treatment, ceramics, glass, steel, and electronics industries.

#### CHEMICAL COMPOSITION

	C %	Si %	Mn %	Cr %	Al %	Fe %
†Nominal composition					5.8	Bal.
Min	-	-	-	20.5	-	
Max	0.08	0.7	0.4	23.5	-	

†Note: Composition listed is nominal. Actual composition may vary to meet standard electrical resistance and dimensional tolerances.

#### MECHANICAL PROPERTIES

Wire size	Yield strength	Tensile strength	Elongation	Hardness
∅	R <sub>p0.2</sub>	R <sub>m</sub>	A	
mm (in)	MPa (ksi)	MPa (ksi)	%	Hv
1.0 (0.04)	545 (79)	760 (110)	20	240
4.0 (0.16)	475 (69)	680 (99)	18	230

#### MECHANICAL PROPERTIES AT ELEVATED TEMPERATURE

Temperature °C	900	1000	1100	1200	1300
Temperature °F	1652	1832	2012	2192	2372
MPa	34	18	10	6	4
ksi	4.9	2.6	1.5	0.9	0.6

Ultimate tensile strength - deformation rate  $6.2 \times 10^{-2}$ /min

#### CREEP STRENGTH - 1% ELONGATION IN 1000 H

Temperature °C	800	1000
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Temperature °F	1472	1832
MPa	1.2	0.5
psi	170	73

## PHYSICAL PROPERTIES

Density g/cm <sup>3</sup> (lb/in <sup>3</sup> )	7.10 (0.257)
Electrical resistivity at 20°C Ω mm <sup>2</sup> /m (Ω circ. mil/ft)	1.45 (872)
Poisson's ratio	0.30

## YOUNG'S MODULUS

Temperature °C	20	100	200	400	600	800	1000
Temperature °F	68	212	392	752	1112	1472	1832
GPa	220	210	205	190	170	150	130
Msi	32	30	30	28	25	22	19

## TEMPERATURE FACTOR OF RESISTIVITY

Temp. °C	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
Temp. °F	212	392	572	752	932	1112	1292	1472	1652	1832	2012	2192	2372	2552
Ct	1.00	1.00	1.00	1.00	1.01	1.02	1.02	1.03	1.03	1.04	1.04	1.04	1.04	1.05

## COEFFICIENT OF THERMAL EXPANSION

Temperature °C (°F)	Thermal Expansion x 10 <sup>-6</sup> /K (10 <sup>-6</sup> /°F)
20 - 250 (68-482)	11 (6.1)
20 - 500 (68-932)	12 (6.7)
20 - 750 (68-1382)	14 (7.8)
20 - 1000 (68-1832)	15 (8.3)

## THERMAL CONDUCTIVITY

Temperature °C	50	600	800	1000	1200	1400
Temperature °F	122	1112	1472	1832	2192	2552
W m <sup>-1</sup> K <sup>-1</sup>	11	20	22	26	27	35
Btu h <sup>-1</sup> ft <sup>-1</sup> °F <sup>-1</sup>	6.4	11.6	12.7	15.0	15.6	20.2

## SPECIFIC HEAT CAPACITY

Temperature °C	20	200	400	600	800	1000	1200	1400
Temperature °F	68	392	752	1112	1472	1832	2192	2552
kJ kg <sup>-1</sup> K <sup>-1</sup>	0.46	0.56	0.63	0.75	0.71	0.72	0.74	0.80

SPECIFIC HEAT CAPACITY

Temperature °C	20	200	400	600	800	1000	1200	1400
Temperature °F	68	392	752	1112	1472	1832	2192	2552
Btu lb <sup>-1</sup> °F <sup>-1</sup>	0.11	0.13	0.15	0.18	0.17	0.17	0.18	0.19
Melting point °C (°F)	1500 (2732)							
Max continuous operating temperature in air °C (°F)	1400 (2552)							
Magnetic properties	The material is magnetic up to approximately 600°C (1112°F) [Curie point].							
Emissivity - fully oxidized material	0.70							

Disclaimer: Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice. This datasheet is only valid for materials under the trademark Kanthal®.