

Physical and mechanical properties

	Kanthal APM™	Kanthal® A-1	Kanthal A	Kanthal AF	Kanthal AE	Kanthal D	Alkrothal®	Nikrothal® 80	Nikrothal TE	Nikrothal 70	Nikrothal 60	Nikrothal 40	Nikrothal 20	Nifethal™ 70	Nifethal 52	
Max continuous operating temp. °C (element temperature in air) (°F)	1425 (2600)	1400 (2550)	1350 (2460)	1300 (2370)	1300 (2370)	1300 (2370)	1100 (2010)	1200 (2190)	1200 (2190)	1250 (2280)	1150 (2100)	1100 (2010)	1050 (1920)	600 (1110)	600 (1110)	
Nominal composition, %	Cr	22	22	22	22	22	15	20	22	30	16	20	24	-	-	
	Al	5.8	5.8	5.3	5.3	5.3	4.3	-	-	-	-	-	-	-	-	
	Fe	balance	balance	balance	balance	balance	balance	-	9	-	balance	balance	balance	balance	balance	
	Ni	-	-	-	-	-	-	80	balance	70	60	35	20	72	52	
Density ρ	g/cm³ (lb/in³)	7.10 (0.256)	7.10 (0.256)	7.15 (0.258)	7.15 (0.258)	7.15 (0.258)	7.25 (0.262)	7.28 (0.263)	8.30 (0.300)	8.10 (0.293)	8.10 (0.293)	8.20 (0.296)	7.90 (0.285)	7.80 (0.281)	8.45 (0.305)	8.20 (0.296)
Resistivity at 20°C at 68°F	Ω mm²/m (Ω/cmft)	1.45 (872)	1.45 (872)	1.39 (836)	1.39 (836)	1.39 (836)	1.35 (812)	1.25 (744)	1.09 (655)	1.19 (716)	1.18 (709)	1.11 (668)	1.04 (626)	0.95 (572)	0.20 (120)	0.37 ^{¶)} (220)
Temperature factor of the resistivity, C _t																
250°C (480°F)	1.00	1.00	1.01	1.01	1.01	1.01	1.02	1.02	1.04	1.02	1.04	1.04	1.08	1.12	2.19	1.93
500°C (930°F)	1.01	1.01	1.03	1.03	1.03	1.03	1.05	1.05	1.06	1.05	1.08	1.08	1.15	1.21	3.66	2.77
800°C (1470°F)	1.03	1.03	1.05	1.05	1.05	1.05	1.10	1.04	1.06	1.04	1.10	1.10	1.21	1.28	-	-
1000°C (1830°F)	1.04	1.04	1.06	1.06	1.06	1.06	1.11	1.05	1.07	1.05	1.11	1.11	1.23	1.32	-	-
1200°C (2190°F)	1.05	1.04	1.06	1.06	1.06	1.06	-	1.07	1.07	1.06	-	-	-	-	-	-
Linear thermal expansion coefficient α, ×10 ⁻⁶ /K																
20–100°C (68–210°F)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
20–250°C (68–480°F)	11	11	11	11	11	11	11	15	14	14	16	16	16	-	-	
20–500°C (68–930°F)	12	12	12	12	12	12	12	16	15	15	17	17	17	13	-	
20–750°C (68–1380°F)	14	14	14	14	14	14	14	17	16	16	18	18	18	-	-	
20–1000°C (68–1840°F)	15	15	15	15	15	15	15	18	17	17	18	19	19	15	-	
Thermal conductivity λ at 50°C at 122°F	W/mK (Btu in/ft²h°F)	11 (76)	11 (76)	11 (76)	11 (76)	11 (76)	11 (76)	16 (110)	15 (104)	14 (97)	14 (97)	14 (97)	13 (90)	13 (90)	17 (120)	17 (120)
Specific heat capacity at 20°C at 68°F	kJ/kg K (Btu/lb°F)	0.46 (0.110)	0.46 (0.110)	0.46 (0.110)	0.46 (0.110)	0.46 (0.110)	0.46 (0.110)	0.46 (0.110)	0.46 (0.110)	0.46 (0.110)	0.46 (0.110)	0.50 (0.119)	0.50 (0.119)	0.52 (0.120)	0.52 (0.120)	
Melting point (approx.)	°C (°F)	1500 (2730)	1500 (2730)	1500 (2730)	1500 (2730)	1500 (2730)	1500 (2730)	1400 (2550)	1380 (2515)	1380 (2515)	1390 (2535)	1390 (2535)	1380 (2515)	1430 (2610)	1435 (2620)	
Mechanical properties* (approx.)																
Tensile strength	N/mm² (psi)	680 (98600**)	680 (98600)	725 (105200)	700 (101500)	720 (104400)	670 (97200)	630 (91400)	810 (117500)	800 (116000)	820 (118900)	730 (105900)	675 (97900)	675 (97500)	640 (92800)	610 (88500)
Yield point	N/mm² (psi)	470 (68200**)	545 (79000)	550 (79800)	500 (72500)	520 (74500)	485 (70300)	455 (66000)	420 (60900)	390 (56600)	430 (62400)	370 (53700)	340 (49300)	335 (48600)	340 (49300)	340 (49300)
Hardness	Hv	230	240	230	230	230	230	220	180	190	185	180	180	160	-	-
Elongation at rupture	%	20**	20	22	23	20	22	22	30	30	30	35	35	30	-	30
Tensile strength at 900°C at 1650°F	N/mm² (psi)	40 (5800)	34 (4900)	34 (4900)	37 (5400)	34 (4900)	34 (4900)	30 (4300)	100 (14500)	-	120 (17400)	100 (14500)	120 (17400)	120 (17400)	-	-
Creep strength***																
at 800°C	N/mm² (psi)	8.2 (1190)	1.2 (170)	1.2 (170)	-	1.2 (170)	1.2 (170)	1.2 (170)	15 (2160)	15 (2160)	-	15 (2160)	20 (2900)	20 (2900)	-	-
at 1470°F	N/mm² (psi)	-	0.5 (70)	0.5 (70)	-	-	0.5 (70)	0.5 (70)	4 (560)	4 (560)	-	4 (560)	4 (560)	4 (560)	-	-
at 1000°C	N/mm² (psi)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
at 1830°F	N/mm² (psi)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
at 1100°C	N/mm² (psi)	-	-	-	0.7 (100)	-	-	-	-	-	-	-	-	-	-	-
at 2010°F	N/mm² (psi)	-	-	-	0.3 (40)	-	-	-	-	-	-	-	-	-	-	-
at 1200°C	N/mm² (psi)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
at 2190°F	N/mm² (psi)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnetic properties		1)	1)	1)	1)	1)	1)	2)	2)	2)	2)	2)	2)	2)	2)	2)
Emissivity, fully oxidized condition		0.70	0.70	0.70	0.70	0.70	0.70	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88

* The values given apply for sizes of approx. 1.0 mm diameter (0.039 in)

** 4.0 mm (0.157 in) Thinner gauges have higher strength and hardness values while the corresponding values are lower for thicker gauge

*** Calculated from observed elongation in a Kanthal standard furnace test. 1% elongation after 1000 hours

1) Magnetic (Curie point approx. 600°C (1100°F))

2) Non-magnetic

3) Slightly magnetic

4) Magnetic up to 610°C (1130°F) (Curie point)

5) Magnetic up to 530°C (990°F) (Curie point)

6) ± 10%