



alloy wire[®]
international

EXOTIC WIRE FOR SPRINGS

For spring manufacturing, critical components and high tensile strength and temperature resistance.

INCONEL[®], HASTELLOY, NIMONIC[®], MONEL[®], HAYNES, PHYNOX, MP35N[®] etc.

INCONEL, NIMONIC, MONEL alloys are a registered trademark of Special Metals Corporation. PHYNOX is a trade name of Aperam Alloys Imphy. HASTELLOY and HAYNES are a trade name of Haynes International. MP35N is a registered trademark of SPS Technologies.

As specialists in High Performance nickel alloys, one of our largest and most diverse markets globally is the spring manufacturing industry.

Spring makers produce compression springs, tension springs, torsion springs and formed parts from AWI's wire to perform in critically demanding places like aircraft engines, nuclear installations, valves and deep down oil wells – where other wire fails to perform.

Andrew Du Plessis
Technical Director

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5665 AMS 5687 ASTM B166 BS 3075 NA 14 BS 3076 NA 14 DTD 328A QQ-W-390 Designations W.Nr. 2.4816 UNS N06600 AWS 010	Good Oxidation Resistance Good Corrosion Resistance at high temperatures **High temperature static applications	Furnace Components Chemical Processing Food Processing Nuclear Engineering
Ni	72.00	-			
Cr	14.00	17.00			
Fe	6.00	10.00			
Mn	-	1.00			
C	-	0.10			
Cu	-	0.50			
Si	-	0.50			
S	-	0.015			
P	-	0.04			
Co	-	1.00			
Nb/Cb	-	1.00			
Ti	-	0.50			
Ta	-	0.05			
Al	-	0.35			

Density	8.47 g/cm ³	0.306 lb/in ³
Melting Point	1413°C	2575 °F
Coefficient of Expansion	13.3 µm/m °C (20 – 100 °C)	7.4 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	75.6 kN/mm ²	10965 ksi
Modulus of Elasticity	206 kN/mm ²	29878 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed or Spring Temper	Stress Relieve	460	860	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm ²	ksi	°C	°F
Annealed	<800	<116	-200 to +1000	-330 to +1830
Spring Temper	900 – 1450	131 – 210	-200 to +1000	-330 to +1830

Slight magnetism may occur below 120 °C (184 °F)

The above tensile strength ranges are typical. If you require different please ask.

**Static applications = still/fixed/motionless/rigid

HASTELLOY™ C-2000

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B574 ASTM B575 ASTM B619	Developed to resist corrosion in a wider range of media Resistant to an extensive range of corrosive chemicals including sulphuric, hydrochloric & hydrofluoric acids	Chemical processing
Cr	22.00	24.00			
Mo	15.00	17.00	Designations W.Nr. 2.4675 UNS N06200 AWS 055	Superior pitting resistance and crevice corrosion resistance to Hastelloy C-276 Excellent corrosion resistance to reducing media Good oxidising resistance	
Fe	-	3.00			
C	-	0.010			
Si	-	0.080			
Co	-	2.00			
Mn	-	0.50			
P	-	0.025			
S	-	0.010			
Cu	1.30	1.90			
Al	-	0.50			
Ni	BAL				

Density	8.5 g/cm ³	0.307 lb/in ³
Melting Point	1399 °C	2550 °F
Coefficient of Expansion	12.4 µm/m °C (20 – 100 °C)	6.9 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	79 kN/mm ²	11458 ksi
Modulus of Elasticity	206 kN/mm ²	29878 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed or Spring Temper	Stress Relieve	400 – 450	750 – 840	2	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	<1000	<145	-200 to +400	-330 to +750
Spring Temper	1300 – 1600	189 – 232	-200 to +400	-330 to +750

The above tensile strength ranges are typical. If you require different please ask.

NIMONIC[®] 80A



Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B637 BS 3076 NA 20 BS HR 1 BS HR 601 Designations W.Nr. 2.4952 W.Nr. 2.4631 UNS N07080 AWS 031	Largely superseded by Nimonic 90 & Inconel X-750 Still specified for nuclear applications due to low cobalt content Age hardenable ^^High temperature dynamic applications	Gas turbine components Nuclear industry Fasteners
C	0.04	0.10			
Si	-	1.00			
Mn	-	1.00			
S	-	0.015			
Ag	-	0.0005			
Al	1.00	1.80			
B	-	0.008			
Bi	-	0.0001			
Co	-	2.00			
Cr	18.00	21.00			
Cu	-	0.20			
Fe	-	1.50			
Pb	-	0.002			
Ti	1.8	2.70			
Ni	BAL				

Density	8.19 g/cm ³	0.296 lb/in ³
Melting Point	1365 °C	2490 °F
Coefficient of Expansion	12.7 µm/m °C (20 – 100 °C)	7.1 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	85 kN/mm ²	12328 ksi
Modulus of Elasticity	222 kN/mm ²	32199 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	Age Harden	700	1290	16	Air
Spring Temper	Age Harden	600	1110	16	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load^^ and environment	
	N/mm ²	ksi	°C	°F
Annealed	<1000	<145	-	-
Annealed + Aged	1200 – 1400	174 – 203	up to 550	up to 1020
Spring Temper	1300 – 1500	189 – 218	-	-
Spring Temper + Aged	1500 – 1800	218 – 261	up to 350	up to 660

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B865 BS 3075 NA 18 BS 3076 NA 18 ISO 15156-3 (NACE MR 0175) QQ-N-286 Designations W.Nr. 2.4375 UNS N05500 AWS 041	Corrosion resistance similar to Monel 400 but with higher strength and hardness Low permeability and is non-magnetic to temperatures as low as -101 °C (-150 °F) Age hardenable Good for sea water applications	Pump Shafts Fasteners Marine Propeller Shafts Oil Well Tools Instruments Springs
Ni	63.00	70.00			
Co	-	2.00			
Cu	27.00	33.00			
Fe	-	2.00			
Al	2.30	3.20			
C	-	0.25			
Si	-	1.00			
Mn	-	1.50			
Ti	0.35	0.85			
S	-	0.01			

Density	8.44 g/cm ³	0.305 lb/in ³
Melting Point	1350 °C	2460 °F
Coefficient of Expansion	13.7 µm/m °C (20 – 100 °C)	7.6 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	66 kN/mm ²	9573 ksi
Modulus of Elasticity	179 kN/mm ²	25962 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	Age Harden ^Δ	580 – 590	1075 – 1095	8 – 10	Air
Spring Temper	Age Harden ^Δ	530 – 540	985 – 1005	4 – 6	Air

^Δ Heat treating Monel K-500 in free air can have a detrimental effect on its corrosion resistant properties.

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	650 – 850	94 – 123	-100 to +260	-150 to +500
Annealed + Aged	950 – 1050	138 – 167	-100 to +260	-150 to +500
Spring Temper	1000 – 1300	145 – 189	-100 to +260	-150 to +500
Spring Temper + Aged	1200 – 1500	174 – 218	-100 to +260	-150 to +500

The above tensile strength ranges are typical. If you require different please ask.

HAYNES 25/L605



Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5796 AMS 5759 ASTM F90 BS HR 40 ISO 15156-3 (NACE MR 0175) Designations W.Nr. 2.4964 UNS R30605 AWS 060	Good resistance to oxidising environments at high temperatures for long exposures Excellent resistance to sulphidation **High temperature static applications	Parts for gas turbine engines and bearings
C	0.05	0.15			
Mn	1.00	2.00			
Si	-	0.40			
P	-	0.040			
S	-	0.030			
Cr	19.00	21.00			
Ni	9.00	11.00			
W	14.00	16.00			
Fe	-	3.00			
Co	BAL				

Density	9.13 g/cm ³	0.330 lb/in ³
Melting Point	1410°C	2570 °F
Coefficient of Expansion	12.3 µm/m °C (20 – 100°C)	6.8 x 10 ⁻⁶ in/in °F (70 – 212°F)
Modulus of Rigidity	98 kN/mm ²	14214 ksi
Modulus of Elasticity	225 kN/mm ²	32634 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed or Spring Temper	Stress Relieve	400 – 450	750 – 840	2	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm ²	ksi	°C	°F
Annealed	900 – 1500	131 – 218	-200 to +900	-330 to +1650
Spring Temper	1400 – 1800	203 – 261	-200 to +900	-330 to +1650

The above tensile strength ranges are typical. If you require different please ask.

Chemical Composition			Specifications	Key Features	Typical Applications	
Element	Min %	Max %	AMS 5833 AMS 5834 AMS 5876 ASTM F1058 ISO 5832-7 ISO 15156-3 (NACE MR 0175)	Combination of high strength, ductility and good mechanical properties at ambient temperatures Excellent fatigue life Excellent corrosion resistance in numerous environments Non magnetic Age hardenable (Spring Temper only) Good for sea water applications	Springs Seal components Medical devices Components for watches Aerospace applications Petrochemical applications Marine engineering	
C	-	0.15				
Mn	1.50	2.50				
Si	-	1.20				
P	-	0.015				
S	-	0.015				
Cr	19.00	21.00				Designations
Ni	14.00	16.00				W.Nr. 2.4711
Co	39.00	41.00				UNS R30003
Mo	6.00	8.00				UNS R30008
Be	-	0.10	AWS 100			
Fe	BAL					

Density	8.3 g/cm ³	0.300 lb/in ³
Melting Point	1427 °C	2600 °F
Coefficient of Expansion	12.5 µm/m °C (20 – 100 °C)	7.0 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	77 kN/mm ²	11168 ksi
Modulus of Elasticity	203.4 kN/mm ²	29501 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	-	-	-	-	-
Spring Temper	Age Harden	520	970	5	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	< 1100	< 160	-185 to +450	-300 to +840
Spring Temper	1400 – 1900	203 – 276	-185 to +450	-300 to +840
Spring Temper + Aged	1900 – 2200	276 – 319	-185 to +450	-300 to +840

The above tensile strength ranges are typical. If you require different please ask.

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5844 AMS 5845 ASTM F562 ISO 15156-3 (NACE MR 0175) ISO 5832-6	Combination of high strength, ductility and good mechanical properties at ambient temperatures Excellent corrosion resistance in hydrogen sulphide Excellent resistance to crevice and stress corrosion cracking in sea water Age hardenable (Spring Temper only)	Medical Devices Marine Engineering
C	-	0.025			
P	-	0.015			
Si	-	0.15			
Ni	33.00	37.00			
Co	BAL				
Mn	-	0.15			
S	-	0.01			
Cr	19.00	21.00			
Mo	9.00	10.50			
Ti	-	1.00			
Fe	-	1.00			
			Designations		
			W.Nr. 2.4999 UNS R30035 AWS 110		

Density	8.43 g/cm ³	0.304 lb/in ³
Melting Point	1440 °C	2625 °F
Coefficient of Expansion	12.8 µm/m °C (20 – 100°C)	7.1 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	80.7 kN/mm ²	11705 ksi
Modulus of Elasticity	234 kN/mm ²	33939 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	-	-	-	-	-
Spring Temper	Age Harden	650	1200	4	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	800 – 1000	116 – 145	-200 to +315	-330 to +600
Spring Temper	1400 – 1900	203 – 276	-200 to +315	-330 to +600
Spring Temper + Aged	1900 – 2200	276 – 319	-200 to +315	-330 to +600

The above tensile strength ranges are typical. If you require different please ask.

SPRING WIRE



The Spring industry

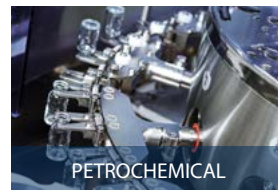
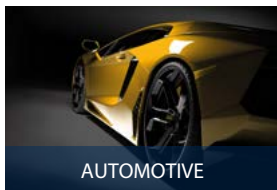
Wire for critically demanding places

Spring manufacturers produce compression springs, tension springs, torsion springs and formed parts from our wire to perform in critically demanding places like aircraft engines, nuclear installations, valves and deep down oil wells – where other wire fails to perform.

We understand exactly what the spring maker needs for precision coiling and supply exactly how they want it, guaranteeing consistency in temper and a dead cast, whether that is wire in coils with a soap coating, or clean on spools. There is even the option of straight bars.



Key sectors are the primary industries that use Alloy Wire for their safety critical components to withstand high temperatures and corrosive environments.



A global presence



Worldwide offices

AUSTRALIA
AUSTRIA
BANGLADESH
BELGIUM
BRAZIL
BULGARIA
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CHINA
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USA
VIETNAM

6 Key Advantages we deliver to you

Our knowledge and experience, combined with continual investment in R&D and technology, keeps us at the forefront of the wire industry and you receive an expert solution for your individual order specification.

We can manufacture wire to customer precise specification often with properties unique to client. Servicing a wide range of sectors and a vast variety of applications, Alloy Wire is an integral supporter of numerous high tech applications for sectors such as aerospace, nuclear, motor sport, chemical processing, electronics and oil & gas.



Size: 0.025 mm (.001")
to 21 mm (.827")



Order quantity:
3 metres to 3 tonnes



Delivery:
within 3 weeks



Wire, bars & rope
in over 60 alloys



Manufactured to
your specification



Emergency
Manufacturing Service

Manufacturers of wire, bars and wire rope in High Performance Exotic Alloys since 1946



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t +44 (0)1384 262 022 e sales@alloywire.com w alloywire.com 

Narrowboat Way, Hurst Business Park, Brierley Hill, West Midlands, DY5 1UF, UK

AS 9100



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ISO 13485



Medical

ISO 14001



Environmental

ISO 45001



Health & Safety