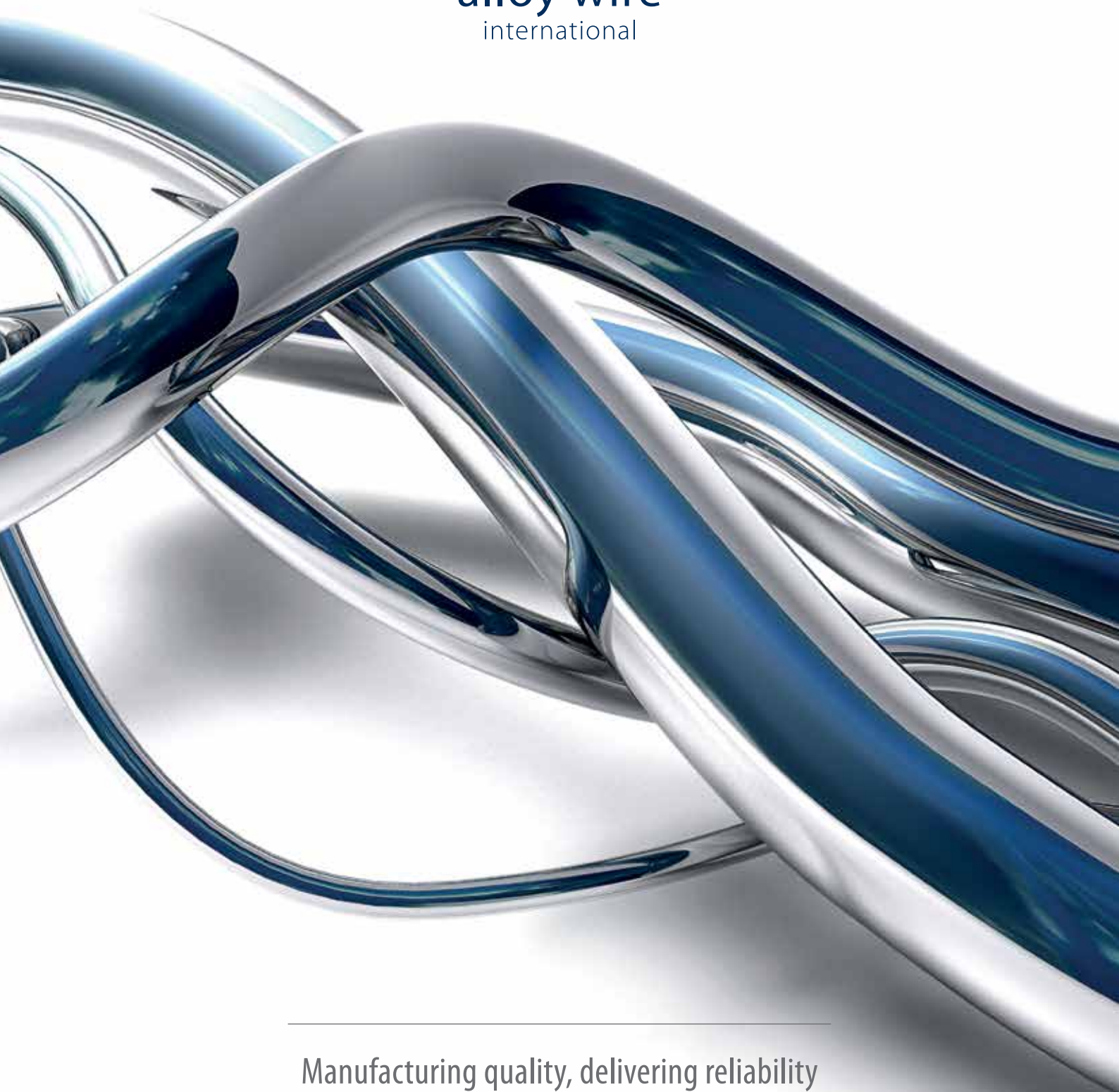




alloy wire[®]
international



Manufacturing quality, delivering reliability

World leader in the manufacture of precision cold drawn round wire,
cold rolled flat wire and profile wire in Exotic alloys

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Alloy Wire International – an employee owned company taking pride in customer satisfaction

> Alloys quick search

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Round wire & bars

Alloy Wire International (AWI) manufacture round wire and bars to your specification with very short lead times and, today, is one of the world's premier suppliers of 'High Performance' alloys.

We frequently discuss customers' individual requirements and, through a combination of new or existing material selection, manufacturing flexibility and our technical knowledge, we can offer a bespoke solution.

Available in:

- all alloys shown in this brochure
- 0.025 mm (.001") to 21 mm (.827")
- quantities from 3 metres to 3 tonnes
- spring temper, bright annealed, No. 1 temper, or your special temper condition
- coils, spools and bulk reels
- cut lengths of 3 mm to 3 metres



Bars with a ground surface finish also available

➤ "Our lead times are short because we stock in excess of 270 tonnes of more than 60 alloys."

Profile wire

 FLAT	 SQUARE	 DOUBLE D	 IRREGULAR	 ARC	 IRREGULAR	 D SHAPE	 HALF ROUND	 RAIL	 IRREGULAR
 CONVOLUTED	 IRREGULAR	 RECTANGLE	 IRREGULAR	 TRAPEZOIDAL	 ANGLED	 T-SHAPE	 IRREGULAR	 IRREGULAR	 ANGLED
 CHAMFERED	 IRREGULAR	 IRREGULAR	 ANGLED	 OVAL	 CHANNEL	 WEDGE	 ANGLED	 IRREGULAR	 IRREGULAR

Available in:

- all alloys shown in this brochure, plus other ferrous and non-ferrous materials
- 0.4 mm (.0157") to 10 mm (.394")
- quantities from 3 metres to 3 tonnes
- hard, bright annealed or your special temper condition
- coils, spools and bulk reels
- cut lengths of 50 mm to 3 metres



If you have a special material requirement or you have a specific shape, contact us for your quote

Flat wire – Ribbon / Foil / Tape



➤ Order quantities from 3 metres to 3 tonnes

Available in:

- all alloys shown in this brochure, plus other ferrous and non-ferrous materials not listed
- max. width 13 mm (.512")
- min. thickness 0.03 mm (.0015")
- max. ratio width: thickness = 50:1
- order quantities from 3 metres to 3 tonnes
- hard, bright annealed or special temper condition

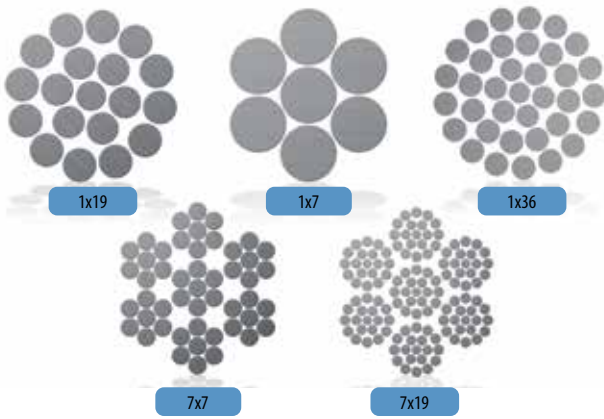
Wire rope & strand

Another product that AWI specialise in is wire rope and strand in High Performance alloys, for use in highly corrosive or high temperature environments.

Market sectors include Oil & Gas Technology, Metering Devices, Chemical Plants, Robotics and many more. Stranded wire provides strength, but also flexibility to the overall wire.

Available in:

- all alloys shown in this brochure
- diameters 0.6 mm (.024") to 12 mm (0.472")
- Order quantities from 50 metres to 3,000 metres



Available in all alloys
Monel, Hastelloy, MP35N,
Inconel, Phynox etc.

➤ Manufacturing sizes from 0.6 mm to 12 mm diameter



Supporting the spring manufacturer

At AWI we manufacture wire for spring makers worldwide, providing unrivalled technical support in the design of a successful end product.

Our knowledge and experience within this industry enables us to produce wire with the perfect properties required for precision coiling and – when you combine this with our 98% on time delivery performance – ensures our customers are able to deliver springs to schedule with

minimal waste. This allows them to save money and grow business through their own client satisfaction.

We regularly supply just enough wire to make 2 or 3 springs for critical repairs or for testing new products.

➤ *Wire made to your spring design requirements*

Manufacturing spring wire with:

- Soap Coating
- Dead Cast
- Consistent Temper



Flat wire for spring energiser seals

➤ *Precision rolled flat wire to exacting dimensional tolerances and specific hardnesses*

AWI manufactures precision rolled flat wire to exacting mechanical and dimensional tolerances for a multitude of industries.

Manufacturers of spring energisers around the world call on us to supply their flat wire to achieve all the strict design requirements of their customer – we don't just process wire, we make it to order!

- Phynox (UNS R30003)
- Alloy MP35N
- Hastelloy
- Inconel
- Stainless Steel



Wire for precision electronics

Alloy Wire International manufacture wire for precision electronics, where dimensional tolerances and surface finish are critical. The wire can also be made to differing levels of hardness and can be supplied as the finished straight pin.

Customers using our electrical resistance wire for precision wire wound resistors can specify their round or flat wire to linear resistance. It is available with a bright or oxidised surface finish.

Controlled Expansion Alloys

- NILO® 36 (Invar¹)
- NILO® 42
- NILO® 48
- NILO® 52
- NILO® K (Kovar)

Nickel Wire

- NICKEL® 200
- NICKEL® 201
- NICKEL® 205
- NICKEL® 212
- NICKEL® 270

Beryllium-Copper CB101



Glass to metal seals



Wire wound resistors

- 80/20 NiCr (Nichrome)
 - 45/55 NiCu (Constantan)
 - RW 135 Iron-Chrome-Aluminium
- Bright annealed wire and oxidised wire available.



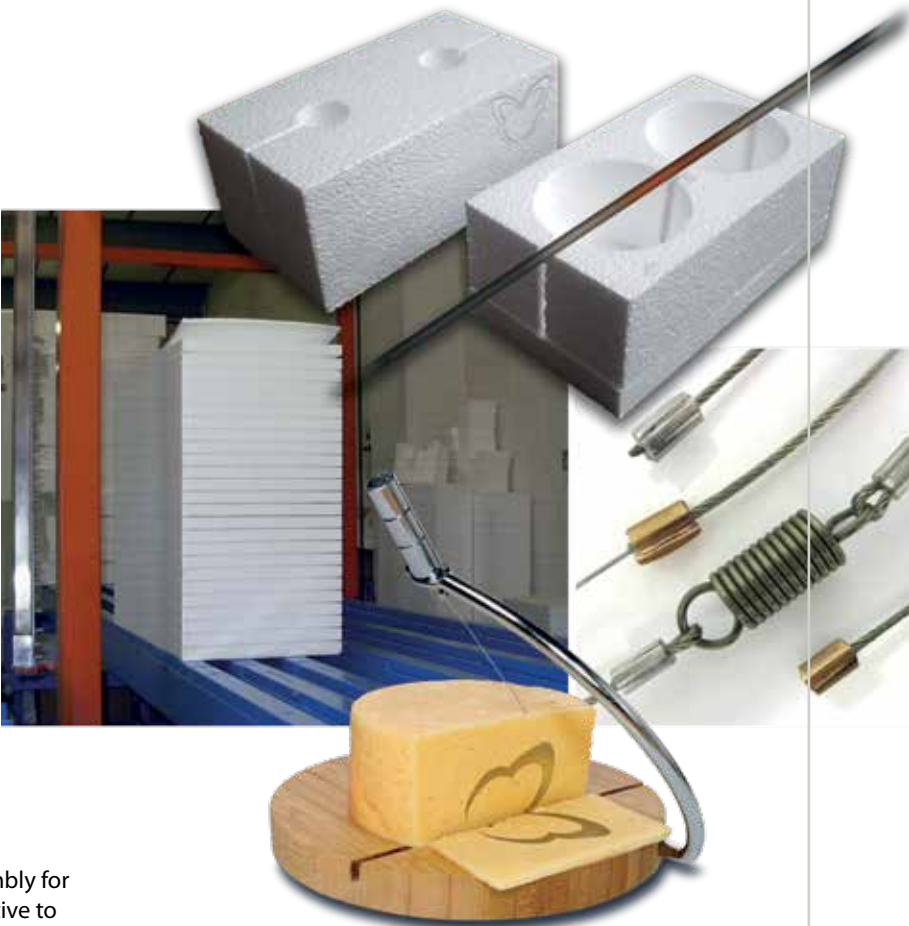
Hot & cold cutting wire



Alloy Wire manufacture wire for both hot and cold cutting applications. Wire choice is made depending upon the strength, ductility and corrosion resistance required of the wire.

Our 'High Strength' hot cutting wire range is used for the cutting of polystyrene (EPS)/Foam and boasts an excellent track record for working continuously on oscillating cutting frames. To achieve the best cut, adjust the temperature and cutting speed.

Our cold cutting wire, with its superior corrosion resistance and ductility, is used within the food industry for the cutting of numerous foods, including cheese.



Wire assemblies

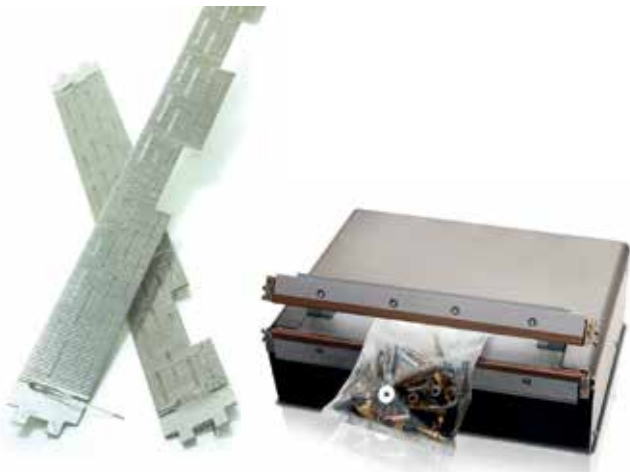
We can supply the complete 'hot cutting' wire assembly for Industrial Foam/EPS cutting machines as an alternative to the customer buying direct from the Original Equipment Manufacturer (OEM).

Our pre-assembled 'wire assemblies' are used for speed, convenience and reducing production downtime.

Electrical resistance wire

Electrical resistance wire for heating elements, resistors and packaging machines. Hot cutting wire for foam cutting.

80/20 Ni Cr	45/55 Ni Cu	RW 41	RW 118 - RW 122 - RW 70
Also known as			
RW80, Nichrome 80, Nichrome 5, Brightray C®, Gilphy 80, Tophet A, Nikrothal® 80, Cromaloy® 5, Cronix 80, Chromel® A	RW45, Advance, Ferry®, Eureka, Constantan, Hecnum™	Ultra High Strength Hot Cutting Wire, Foam / Polystyrene (EPS) Hot Cutting Wire	High Strength Hot Cutting Wires, Polystyrene (EPS) Hot Cutting Wires
Applications			
Heating Elements Band Heaters Resistors	Resistors Electronics	Hot Cutting Fabrication/Line Bending	



We manufacture and stock electrical resistance wire and flat wire for heating elements, resistors, hot wire cutting and bag sealing.

Not sure what wire to use?
Then buy an AWI 'TESTER PACK'

If you are unsure of the wire or ribbon size, or electrical resistance (Ohms/m) you require, you can buy a 'Tester Pack'. This provides you with a selection of different wire or ribbon stock sizes for you to try in your application.

Our resources have allowed us to develop wires for specific applications that perform even better than the standard product. Please ask us about alternatives that may be more cost-effective or durable in your application.

- Element wires for heat sealers & impulse sealers
- Vacuum sealing
- 'T' profile heat sealing & impulse sealing
- Plastic bag welding
- Wire for 'L' sealers
- Hot cutting wires for foam (EPS)
- Electric heating elements
- Electrical resistors



➤ Order quantities from 3 metres to 3 tonnes

Resistance & length – 80/20 Ni Cr Round Wire

SWG	AWG/B & S	inch	mm	ft/lb	Ohms/ft	m/kg	Ohms/m
5		0.212	5.385	7.9	0.014	5.3	0.047
	4	0.2043	5.189	8.5	0.016	5.7	0.051
6		0.192	4.880	9.6	0.018	6.4	0.058
	5	0.1819	4.620	10.7	0.020	7.2	0.064
7		0.176	4.470	11.4	0.021	7.7	0.069
	6	0.162	4.110	13.5	0.025	9.1	0.081
8		0.160	4.060	13.8	0.025	9.3	0.083
	7	0.1443	3.665	17.0	0.031	11.4	0.102
9		0.144	3.660	17.0	0.031	11.4	0.103
	8	0.1285	3.264	21.4	0.039	14.4	0.129
10		0.128	3.250	21.6	0.040	14.5	0.130
11		0.116	2.950	26.2	0.048	17.6	0.158
	9	0.1144	2.906	27.0	0.050	18.1	0.163
12		0.104	2.640	32.7	0.060	22.0	0.197
	10	0.1019	2.588	34.0	0.063	22.9	0.205
13		0.092	2.340	41.6	0.077	28.0	0.251
	11	0.0907	2.304	42.9	0.079	28.9	0.259
	12	0.0808	2.052	54.1	0.099	36.4	0.326
14		0.080	2.030	55.3	0.102	37.2	0.334
15	13	0.072	1.830	68.1	0.125	45.7	0.411
	14	0.0642	1.631	85.7	0.158	57.6	0.517
16		0.064	1.630	85.8	0.158	57.7	0.517
	15	0.0571	1.450	108.4	0.199	72.9	0.654
17		0.056	1.420	113.0	0.208	76.0	0.682
	16	0.0508	1.290	137.0	0.252	92.1	0.826
18		0.048	1.220	153.1	0.282	102.9	0.924
	17	0.0453	1.150	172.4	0.317	115.8	1.040
	18	0.0403	1.024	217.5	0.400	146.2	1.312
19		0.040	1.020	219.1	0.403	147.2	1.322
20		0.036	0.914	272.9	0.502	183.4	1.646
	19	0.0359	0.912	274.1	0.504	184.2	1.653
21	20	0.032	0.813	344.9	0.634	231.8	2.080
	21	0.0285	0.724	434.9	0.799	292.2	2.623
22		0.028	0.710	452.2	0.831	303.9	2.727
	22	0.0253	0.643	551.3	1.014	370.5	3.325
23		0.024	0.610	612.6	1.126	411.7	3.695
	23	0.0226	0.574	691.8	1.272	464.9	4.173
24		0.022	0.560	726.9	1.336	488.5	4.384
	24	0.0201	0.511	874.5	1.608	587.7	5.275
25		0.020	0.508	883.3	1.624	593.6	5.328
26		0.018	0.457	1091.4	2.007	733.5	6.583
	25	0.0179	0.455	1102.7	2.027	741.1	6.651
27		0.0164	0.417	1310.9	2.410	881.0	7.907
	26	0.0158	0.401	1415.3	2.602	951.1	8.537
28		0.0148	0.376	1612.3	2.964	1083.6	9.725

Resistance & length – 80/20 Ni Cr Round Wire

SWG	AWG/B & S	inch	mm	ft/lb	Ohms/ft	m/kg	Ohms/m
	27	0.0142	0.361	1749.1	3.216	1175.5	10.550
29		0.0136	0.345	1915.1	3.521	1287.0	11.552
	28	0.0126	0.320	2226.0	4.093	1496.0	13.427
30		0.0124	0.315	2297.3	4.223	1543.9	13.857
31		0.0116	0.295	2619.3	4.816	1760.3	15.799
	29	0.0113	0.287	2767.4	5.088	1859.8	16.692
32		0.0108	0.274	3036.2	5.582	2040.5	18.314
33	30	0.0100	0.254	3533.2	6.496	2374.4	21.311
34		0.0092	0.234	4162.9	7.654	2797.7	25.110
	31	0.00893	0.2268	4430.6	8.146	2977.5	26.724
35		0.0084	0.2130	5024.2	9.237	3376.5	30.305
	32	0.00795	0.2020	5586.3	10.270	3754.3	33.696
36		0.0076	0.1930	6119.5	11.251	4112.6	36.912
	33	0.00708	0.1798	7048.5	12.959	4736.9	42.515
37		0.0068	0.1730	7616.2	14.002	5118.4	45.939
	34	0.00630	0.1600	8904.1	16.370	5983.9	53.708
38		0.006	0.1520	9866.0	18.139	6630.4	59.510
	35	0.00561	0.1425	11226	20.640	7544.6	67.715
39		0.0052	0.1320	13082	24.052	8791.8	78.910
	36	0.00500	0.1270	14133	25.983	9497.7	85.245
40		0.0048	0.1220	15315	28.156	10292	92.376
	37	0.00445	0.1130	17842	32.802	11991	107.62
41		0.0044	0.1120	18172	33.408	12212	109.61
42		0.004	0.1020	21909	40.280	14724	132.15
	38	0.00397	0.1008	22417	41.214	15065	135.22
43		0.0036	0.0910	27526	50.607	18499	166.03
	39	0.00353	0.0897	28330	52.084	19039	170.88
44		0.0032	0.0813	34487	63.403	23176	208.02
	40	0.00315	0.0800	35616	65.481	23936	214.83
45	41	0.0028	0.0711	45091	82.900	30303	271.98
	42	0.00249	0.0632	56985	104.77	38297	343.73
46		0.0024	0.0610	61259	112.62	41169	369.50
	43	0.00222	0.0564	71690	131.80	48179	432.42
47		0.002	0.0508	88329	162.39	59361	532.78
	44	0.00198	0.0503	90122	165.69	60566	543.60
	45	0.00176	0.0447	114061	209.70	76654	687.99
48		0.0016	0.0406	138286	254.24	92934	834.11
	46	0.00157	0.0399	143339	263.53	96330	864.59
	47	0.0014	0.0356	179858	330.67	120872	1084.9
	48	0.00124	0.0315	229784	422.46	154425	1386.0
49		0.0012	0.0305	245036	450.50	164675	1478.0
	49	0.00111	0.0282	286759	527.20	192714	1729.7
50		0.001	0.0254	353315.7	649.57	237443	2131.1

These values are for bright annealed wire measured at room temperature.
You can also order to a specific size or electrical resistance.
For 45/55 Ni Cu, convert using the above Ohms/m or Ohms/ft x 0.454

Resistance & length – 80/20 Ni Cr Flat Wire / Ribbon / Foil / Tape (mm)

Width (mm)	Thickness (mm)	Ohms/m	Ohms/ft	m/kg	ft/lb
5.00	1.000	0.226	0.069	25	37
5.00	0.470	0.469	0.143	52	78
5.00	0.300	0.729	0.222	81	121
5.00	0.200	1.089	0.332	121	181
4.00	0.120	2.265	0.690	252	375
4.00	0.300	0.915	0.279	102	152
4.00	0.200	1.365	0.416	152	226
3.60	0.180	1.685	0.513	188	279
3.00	0.381	0.971	0.296	108	161
3.00	0.470	0.793	0.242	88	131
3.00	0.250	1.466	0.447	163	243
3.00	0.150	2.426	0.739	270	402
3.00	0.300	1.226	0.374	137	203
3.00	0.200	1.826	0.557	203	303
2.50	0.350	1.272	0.388	142	211
2.50	0.250	1.766	0.538	197	293
2.50	0.190	2.311	0.704	258	383
2.50	0.100	4.357	1.328	486	722
2.40	0.150	3.041	0.927	339	504
2.36	0.320	1.473	0.449	164	244
2.00	0.073	7.455	2.272	831	1236
2.00	0.150	3.659	1.115	408	607
2.00	0.050	10.858	3.310	1210	1800
2.00	0.200	2.759	0.841	307	457
2.00	0.100	5.458	1.664	608	905
1.80	0.150	4.073	1.241	454	675
1.80	0.090	6.739	2.054	751	1117
1.68	0.380	1.778	0.542	198	295
1.60	0.160	4.311	1.314	480	715
1.60	0.150	4.592	1.400	512	761
1.60	0.100	6.842	2.085	762	1134
1.50	0.150	4.905	1.495	547	813
1.50	0.400	1.909	0.582	213	316
1.10	0.090	11.104	3.384	1237	1841
1.02	0.076	14.158	4.315	1577	2347
1.00	0.125	8.877	2.706	989	1472
1.00	0.150	7.439	2.267	829	1233
0.90	0.200	6.300	1.920	702	1044
0.50	0.035	62.653	19.097	6981	10388

These values are for bright annealed wire measured at room temperature.
You can also order to a specific size or electrical resistance.
For 45/55 Ni Cu, convert using the above Ohms/m or Ohms/ft x 0.454

Resistance & length – 80/20 Ni Cr Flat Wire / Ribbon / Foil / Tape (inches)

Width (inch)	Thickness (inch)	Ohms/ft	Ohms/m	ft/lb	m/kg
1/4	.008	0.257	0.843	140	94
1/4	.004	0.512	1.680	278	187
3/16	.010	0.275	0.903	150	101
3/16	.006	0.457	1.498	248	167
3/16	.0035	0.781	2.561	425	285
5/32	.020	0.168	0.551	91	61
5/32	.010	0.331	1.086	180	121
5/32	.009	0.367	1.205	200	134
1/8	.020	0.211	0.693	115	77
1/8	.015	0.279	0.916	152	102
1/8	.010	0.415	1.363	226	152
1/8	.007	0.590	1.936	321	216
1/8	.006	0.687	2.255	374	251
1/8	.005	0.823	2.702	448	301
1/8	.004	1.028	3.371	559	376
1/8	.008	0.517	1.697	281	189
.100	.008	0.649	2.129	353	237
.100	.006	0.861	2.826	469	315
.100	.0056	0.922	3.026	502	337
.100	.005	1.032	3.384	561	377
.100	.004	1.287	4.221	700	470
3/32	.008	0.693	2.274	377	253
3/32	.006	0.920	3.017	500	336
3/32	.005	1.101	3.612	599	403
3/32	.004	1.373	4.505	747	502
1/16	.0025	3.294	10.81	1792	1204
1/16	.010	0.845	2.773	460	309
1/16	.008	1.049	3.442	571	384
1/16	.007	1.195	3.920	650	437
1/16	.006	1.389	4.558	756	508
1/16	.005	1.661	5.450	904	607
1/16	.004	2.069	6.789	1126	756
1/16	.003	2.750	9.021	1496	1005
1/16	.019	0.460	1.508	250	168
1/16	.009	0.936	3.071	509	342
.059	.0031	2.821	9.257	1535	1031
.050	.008	1.321	4.333	718	483
.050	.006	1.746	5.727	950	638
.050	.005	2.086	6.842	1134	762
.050	.004	2.596	8.516	1412	949
.050	.0035	2.960	9.711	1610	1082
.050	.0033	3.137	10.29	1706	1147
.050	.003	3.446	11.31	1874	1260
.050	.0028	3.689	12.10	2007	1348
1/32	.0025	6.645	21.80	3614	2429
1/32	.010	1.753	5.751	953	641
1/32	.009	1.933	6.343	1052	707
1/32	.006	2.838	9.311	1544	1037
1/32	.0049	3.448	11.31	1875	1260
1/32	.003	5.557	18.23	3023	2031
.025	.002	10.38	34.06	5648	3795
.025	.008	2.739	8.985	1490	1001
.025	.004	5.283	17.33	2874	1931
.025	.003	6.982	22.91	3798	2553
1/64	.0035	9.800	32.15	5331	3582

These values are for bright annealed wire measured at room temperature.
You can also order to a specific size or electrical resistance.
For 45/55 Ni Cu, convert using the above Ohms/m or Ohms/ft x 0.454

6

key advantages to you, our customer



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



Order quantity: 3 metres to 3 tonnes



Delivery: within 2 weeks



Wire, bars & rope in over 60 alloys



Manufactured to your specification



Emergency Manufacturing Service



Industries we serve:

- Aerospace
- Automotive
- Chemical Processing
- Electrics & Electronics
- Engineering
- Food
- Marine
- Medical
- Nuclear
- Oil and Gas
- Packaging
- Petrochemical
- Pharmaceutical
- Power Generation & Renewable Energy
- Rail
- Space
- Spring Wire
- Wire Additive Manufacturing

It's more than just wire manufacturing

Founded in 1946, Alloy Wire is the world's preferred manufacturer of nickel alloy wire, providing customers with the assurance of quality, delivery and accuracy – the fundamental reason behind our strapline...

"Manufacturing quality, delivering reliability"

We are a 100% employee owned company; an environment that creates interest, loyalty and commitment from every member of our staff.

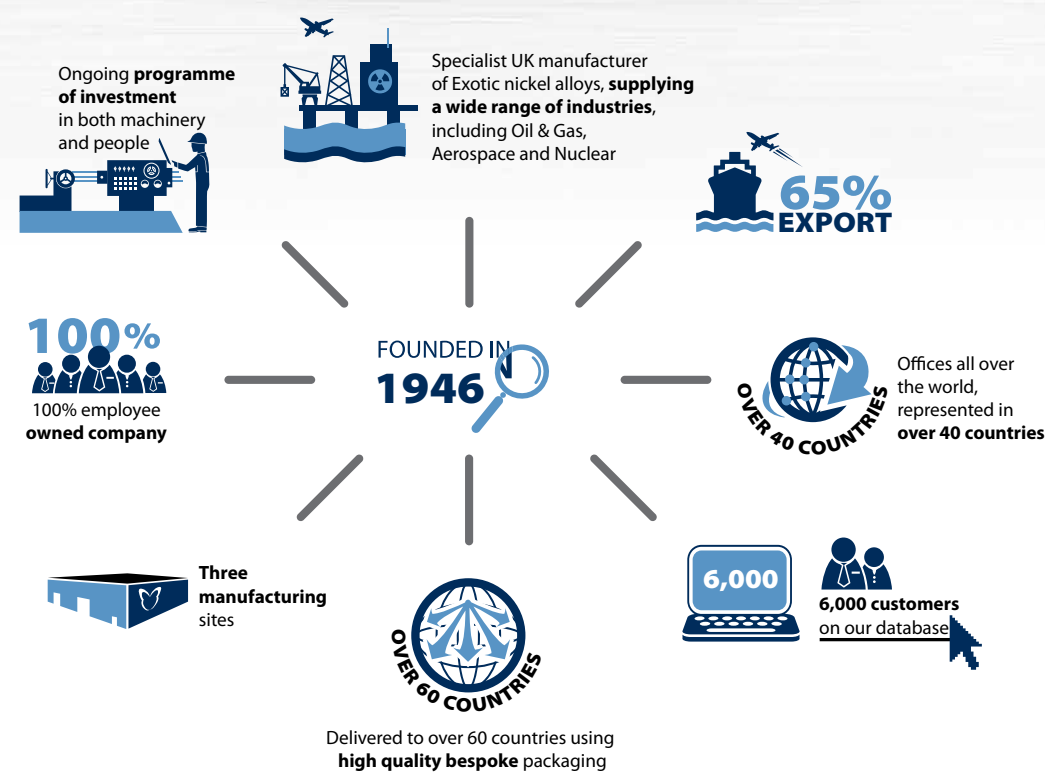
To remain a top supplier of nickel alloy wire, AWI's main priorities are in ongoing investment in new technology, equipment and training.

Our R&D facilities enable us to constantly explore new materials and processes, in order to expand our range of products and services. Customers regularly compliment us on the technical expertise and support we provide.



➤ Aerospace, nuclear, oil & gas – three industries that use Alloy Wire for their safety critical components to withstand high temperatures and corrosive environments

8 things about us



Alloy Wire International is a specialist manufacturer of precision cold drawn round wire, flat wire, shaped wire and wire rope in over 60 different High Performance ‘Exotic’ nickel alloys.

Why work with us?

Why is AWI such a successful nickel alloy wire specialist?

Firstly, we are completely owned by everyone that works here. This can be seen throughout the organisation when you walk around our factories, or you speak with any of our offices in four different continents. Smiles and knowledge are in abundance and each member of staff shares a desire to ensure their individual roles contribute to the positive experience of the customer.

The offer

We offer wire from 0.025 mm (.001”) to 21.0 mm (.827”) and currently work with 5000 customers in more than 15 sectors.

Our extensive stockholding of materials (EU/DFARS), ability to provide small batch quantities and 2 week lead times has seen us become a global leader, delivering our wire to more than 60 countries around the world.



“You need a certain culture to achieve employee ownership; one of transparency, trust and togetherness... almost like a family”

Mark Venables, Managing Director



A truly global presence

Representatives in over 40 countries



Worldwide offices

AUSTRALIA	CROATIA	ISRAEL	OMAN	SINGAPORE	THAILAND
AUSTRIA	CZECH REPUBLIC	ITALY	PHILIPPINES	SLOVAKIA	TURKEY
BANGLADESH	FRANCE	JAPAN	POLAND	SLOVENIA	UAE
BELGIUM	GERMANY	LUXEMBOURG	PORTUGAL	SOUTH AFRICA	UKRAINE
BRAZIL	HOLLAND	MALAYSIA	QATAR	SOUTH KOREA	UNITED KINGDOM
BULGARIA	HUNGARY	MEXICO	ROMANIA	SPAIN	USA
CANADA	INDIA	MOLDOVA	SAUDI ARABIA	SWITZERLAND	VIETNAM
CHINA	INDONESIA	NEW ZEALAND	SERBIA	TAIWAN	

See our website for full details of your local office

100% employee owned



Alloy Wire International is 100% owned by all its employees

This means they have an invested interest in the success of the business and, therefore, are committed to giving our customers a 'First Class' service. From the Annealing Technicians to the Maintenance Engineers and right through to the Shipping team, all staff are focused on completing your order on time and to specification.

An on-time quality product – with great service – helps our customers receive repeat business and creates another client loyal to Alloy Wire.

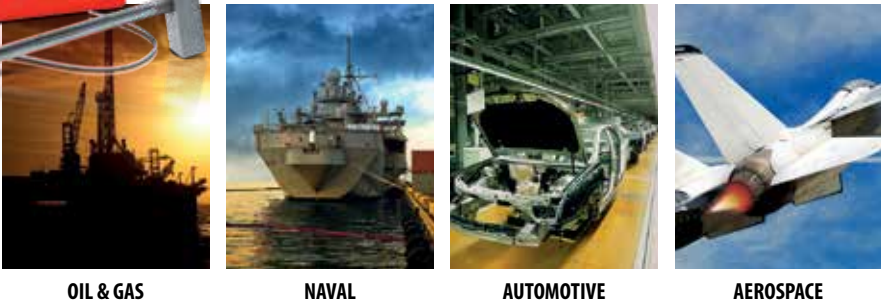
➤ *"...an on-time quality product – with great service – helps our customers receive repeat business and creates another client loyal to Alloy Wire"*

Emergency Manufacturing Service - E.M.S.



Wire required urgently?
If you have an emergency situation and require your wire even faster, ask for our Emergency Manufacturing Service (E.M.S.) This truly special service ensures your wire is manufactured within days and shipped to your door by the fastest route possible.

When you need your wire **manufactured fast!**



OIL & GAS NAVAL AUTOMOTIVE AEROSPACE

Processing your free issue material

If you have a special grade of material that you require processing to a smaller size and to a precise specification, we can help.

We will convert your free issue wire or bars to your exact requirements. Our expertise in manufacturing small order quantities means very little material is lost in the setting up process and that's why we are entrusted to process customers' high value materials, such as Silver-Palladium.

➤ *"... skill in manufacturing small order quantities means very little material is lost in the setting up process"*



Silver-Palladium

A full comprehensive service

Hands-on manufacturing

- Over 270 tonnes of stock
- A manufacturing lead time of 2 weeks
- Accepting orders from 3 metres to 3 tonnes

➤ *Listening to our customers and manufacturing to their needs*

On-site maintenance

- Self-sufficient maintenance
- Bespoke machinery made on site
- Round and shaped wire, produced on machinery specifically designed for Alloy Wire International



Bespoke manufacturing

- Emergency Manufacturing Service available (E.M.S.)
- Manufacturing in coils, on spools or straight bars
- Wire produced to your specification

Multiple size ranges

- **Wire diameters:**
0.025 mm (.001") to 21.0 mm (.827")
- **Shaped profile wire:**
widths from 0.4 mm (.0157") to 10 mm (.394")
thickness from 0.025 mm (.001") to 6.0 mm (.236")
- **Bars and ground lengths:**
3 mm (.118") to 3 m (10 ft)

Technical support

- Providing you with technical support before and after your order, giving you confidence in your purchase and product design



The complete service

- We can re-process your free issue material
- Regular customer visits to understand your needs
- Exhibiting internationally to promote new materials and processes

Shipping

- Positive Material Identification (XRF) done before shipping as part of our 100% final inspection
- High quality bespoke packaging for secure delivery worldwide

Technical support & service

As approved suppliers of nickel alloys into numerous high technology products, we have a wealth of knowledge and experience in the application of the wire and its specific processing to achieve the customer's design. AWI's proficiency of the craft and science behind wire manufacturing is of the very highest level.

We offer you technical support from inception to completion and can answer common questions, such as:

- How do I heat treat?
- What is my maximum operating temperature?
- What tensile strength do I need?
- What is the specification AMS 5699?
- Which alloy for my application?

➤ *Answering your technical questions gives you confidence in your product's success*



Sales team

Alloy Wire recognise that good business is all about people and service and it is this mind-set that has made us the preferred choice for nickel alloys. A first-class and consistent service is key to repeat business as well as the growth of new business.

Meet our global sales team:
www.alloywire.com/international



Angus Hogarth
R&D Director



Oliver Smith
Sales Executive



James Mander
Sales Executive



Stephen Olley
Sales Executive



Scott Smith
Despatch Executive



Paul Chatterley
Sales Executive

Be confident doing business with us

Highest industry standards achievable

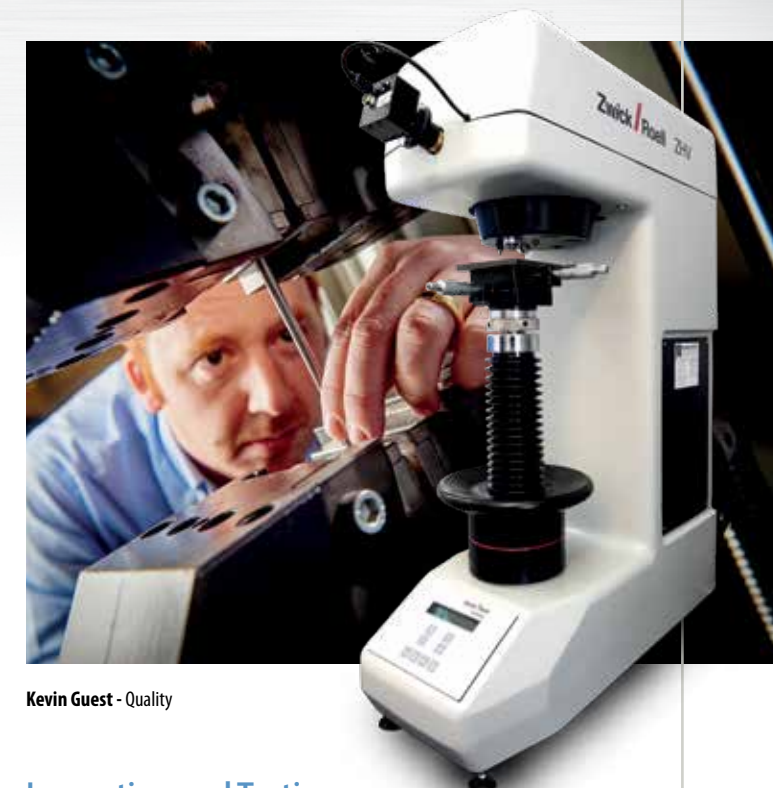
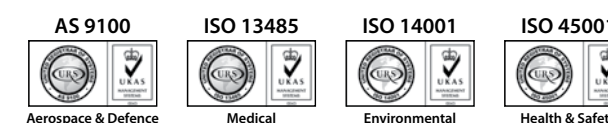
We've maintained quality approval ISO 9001 since 1991, and the aerospace quality standard AS 9100 since 2013. The approvals are in recognition that our manufacturing and processing techniques are defined to the highest possible industry standards.

Environmental

We are fully committed to the promotion and preservation of our environment and achieved approval to ISO 14001 in 2015. This demonstrates our commitment to exceed our moral environmental responsibility. In 2021, Alloy Wire became a carbon neutral business after partnering with Carbon Neutral Britain to measure and offset its carbon footprint. The business became certified as carbon neutral for a period of 12 months.

Health and safety

In 2019, we were awarded the NEW International Health & Safety approval ISO 45001 (replacing our BS OHSAS 18001 of 2015). This demonstrates the importance we place on exceeding our legal and moral obligations for the well-being and safety of all employees and visitors.



Kevin Guest - Quality

Inspection and Testing

All incoming materials are visually inspected and P.M.I. (Positive Material Identification) tested before processing begins. In-process inspection is carried out at every stage of production and full traceability maintained throughout.

Final Inspection on all finished material may include:

- | | |
|----------------------|---|
| ■ Dimensional Checks | ■ Wrap Test |
| ■ Surface Finish | ■ Bend Test |
| ■ Tensile Strength | ■ Torsion Test |
| ■ Proof Stress | ■ Post-Heat Treatment Tests |
| ■ Elongation | ■ Positive Material Identification (P.M.I.) |
| ■ Breaking Loads | ■ Grain size analysis |
| ■ Macro Examination | |
| ■ Hardness* | |

* All hardness tests are measured in Vickers and converted using conversion tables in ASTM E140.

➤ *Our wire is used for various component parts in aero engines – where quality and dependability is essential*

Our metallographic facilities allow for visual inspection of wire samples up to 1000x magnification using brand new digital imaging software, to help ensure the quality of the product supplied to our customers. We can also arrange for independent third party laboratory testing to be carried upon request.

Tolerances

Here are our standard tolerances.
If you require tighter tolerances, please ask.

Wire Diameter Tolerances					
mm			inch		
wire diameter	up to but excluding	tolerance	wire diameter	up to but excluding	tolerance
0.0254	0.203	± 0.0051	.001	.008	± .0002
0.203	0.376	± 0.0076	.008	.015	± .0003
0.376	0.813	± 0.0100	.015	.032	± .0004
0.813	1.220	± 0.0127	.032	.048	± .0005
1.220	2.030	± 0.0152	.048	.080	± .0006
2.030	3.250	± 0.0203	.080	.128	± .0008
3.250	4.470	± 0.0254	.128	.176	± .0010
4.470	5.890	± 0.0381	.176	.232	± .0015
5.890	8.000	± 0.0510	.232	.315	± .0020
8.000	10.00	± 0.0635	.315	.395	± .0025
10.00	21.00	± 0.0762	.395	.827	± .0030

Wire Ovality Tolerances					
mm			inch		
wire diameter	up to but excluding	tolerance	wire diameter	up to but excluding	tolerance
0.0254	0.0508	0.0051	.001	.002	.0002
0.0508	1.02	0.0076	.002	.040	.0003
1.02	2.03	0.0100	.040	.080	.0004
2.03	4.47	0.0127	.080	.176	.0005
4.47	8.00	0.0152	.176	.315	.0006
8.00	21.00	0.0203	.315	.827	.0008

Flat Wire Tolerances			
mm		inch	
dimensions	tolerance	dimensions	tolerance
Width	± 5%	Width	± 5%
Thickness ≤0.20	±.0100	Thickness ≤.008	± .0004
Thickness >0.20	± 5%	Thickness >.008	± 5%

Section Tolerances					
mm			inch		
from	up to but excluding	tolerance	from	up to but excluding	tolerance
-	2.0	± 0.04	-	.0787	± .0016
2.0	4.0	± 0.07	.0787	.157	± .0027
4.0	-	± 0.15	.157	-	± .0059

Straight Length Tolerances					
mm			inch		
diameter	length	tolerance	diameter	length	tolerance
up to 2.5	up to 1000	± 1.00	up to .098	up to 40	± .040
up to 2.5	1000 – 2000	± 2.00	up to .098	40 – 80	± .080
up to 2.5	2000 – 3000	± 2.50	up to .098	80 – 120	± .098
2.5 – 5.0	up to 1000	± 2.00	.098 – .197	up to 40	± .080
2.5 – 5.0	1000 – 2000	± 2.50	.098 – .197	40 – 80	± .098
2.5 – 5.0	2000 – 3000	± 3.00	.098 – .197	80 – 120	± .120
5.0 – 12.0	up to 1000	± 4.00	.197 – .472	up to 40	± .160
5.0 – 12.0	1000 – 2000	± 5.00	.197 – .472	40 – 80	± .200
5.0 – 12.0	2000 – 3000	± 6.00	.197 – .472	80 – 120	± .240

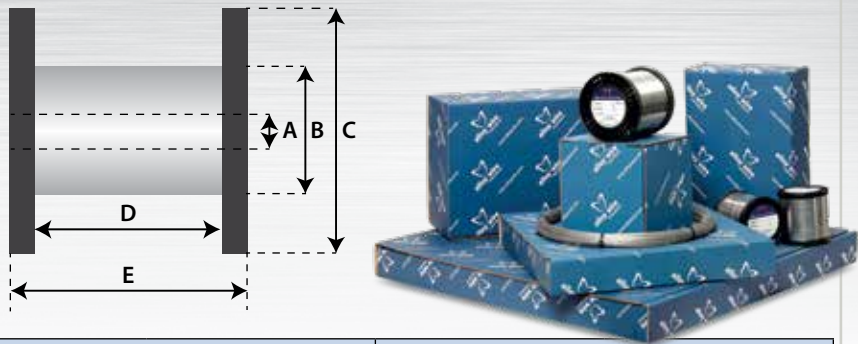
Electrical Resistance Tolerances					
mm			inch		
wire diameter	up to but excluding	tolerance	wire diameter	up to but excluding	tolerance
0.0254	0.0508	± 12%	.001	.002	± 12%
0.0508	0.076	± 10%	.002	.003	± 10%
0.076	0.15	± 7%	.003	.006	± 7%
0.15		± 5%	.006		± 5%
Flat wire		± 5%	Flat wire		± 5%

Mechanical results are achieved utilising the latest in-house computer aided testing equipment, giving high levels of accuracy and increased efficiency in our testing.



Packaging

To ensure your order arrives in perfect condition, we use specifically designed high quality packaging and proven reliable international couriers.



Coils

Wire Diameter		Coil Diameter		Maximum Coil Weights	
mm	inch	mm	inch	kg	lb
0.25 – 0.70	.010 – .0275	200	8	20	44
0.7 – 1.6	.0275 – .063	300	12	50	110
1.6 – 6.0	.063 – .236	600	24	100	220
6.0 – 10.0	.236 – .394	800	30	200	440
10.0 – 21.0	.394 – .827	1000	40	400	880

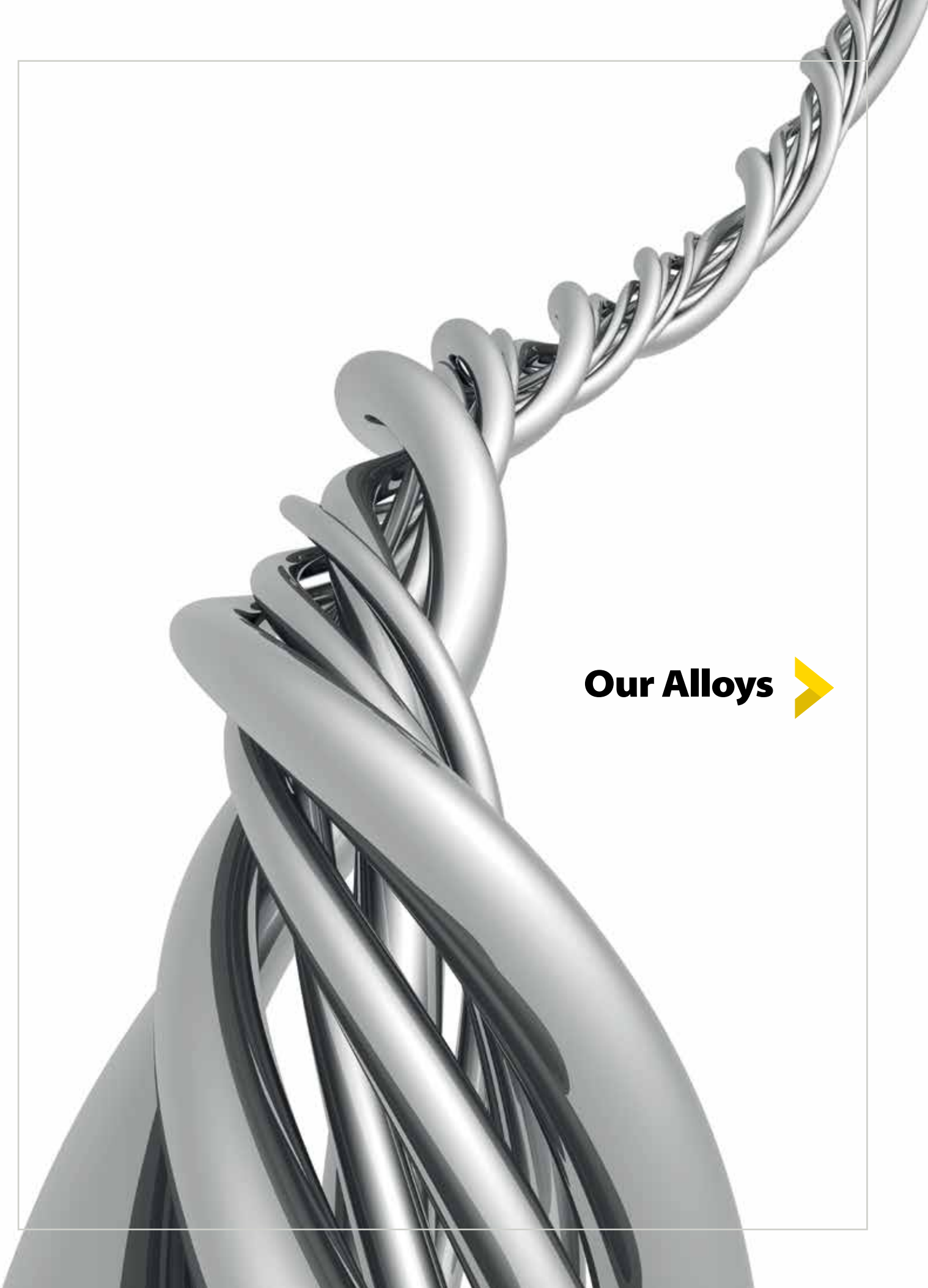
Spools

Spool Type	A	B	C	D	E	Wire Diameter Range	Max. Weight
DIN 80	16 mm	50 mm	80 mm	64 mm	80 mm	Up to 0.25 mm	0.800 kg
	.630"	2.00"	3.15"	2.50"	3.15"	Up to .010"	1.7 lb
DIN 100	16 mm	64 mm	100 mm	80 mm	100 mm	0.19 – 0.4 mm	1.500 kg
	.630"	2.50"	3.90"	3.15"	3.90"	.0076" – .016"	3.3 lb
DIN 125	16 mm	80 mm	125 mm	100 mm	125 mm	0.19 – 0.55 mm	3 kg
	.630"	3.15"	4.90"	3.90"	4.90"	.0076" – .022"	6.5 lb
DIN 160	22 mm	100 mm	160 mm	128 mm	160 mm	0.25 – 0.71 mm	5 kg
	.865"	3.90"	6.300"	5.040"	6.300"	.010" – .028"	11 lb
DIN 200	36 mm	125 mm	200 mm	160 mm	200 mm	0.4 – 0.81 mm	10 kg
	1.400"	4.920"	7.875"	6.300"	7.875"	.016" – .032"	22 lb
DIN 250	36 mm	160 mm	250 mm	160 mm	200 mm	0.4 – 1.5 mm	20 kg
	1.400"	6.300"	10.000"	6.300"	7.875"	.016" – .060"	44 lb
DIN 355	36 mm	225 mm	355 mm	162 mm	200 mm	1.0 – 3.0 mm	40 kg
	1.400"	8.75"	14.000"	6.25"	8"	.040" – .118"	88 lb
DIN 500	36 mm	316 mm	500 mm	180 mm	250 mm	1.2 – 3.0 mm	75 kg
	1.400"	12.440"	19.690"	7.090"	9.840"	.047" – .118"	165 lb
SK 460	305mm	318 mm	460 mm	91 mm	105 mm	0.25 – 1.8 mm	45 kg
	12.000"	12.520"	18.110"	3.580"	4.134"	.010" - .072"	95 lb
SK 255	216 mm	222 mm	253 mm	30 mm	36 mm	0.25 – 1.0 mm	1 kg
	8.500"	8.740"	10.000"	1.200"	1.420"	.010" - .040"	2.20 lb
Locking Reel	16 mm	70 mm	102 mm	38 mm	45 mm	0.25 – 1.0 mm	0.500 kg
	.630"	2.750"	4.000"	1.500"	1.770"	.010" – .040"	1.00 lb
¼ Cat	16 mm	43 mm	63 mm	51 mm	60mm	Up to 0.25 mm	0.300 kg
	.630"	1.700"	2.500"	2.000"	2.360"	Up to .010"	0.60 lb
½ Cat	16 mm	43 mm	63 mm	76 mm	86 mm	Up to 0.25 mm	0.500 kg
	.630"	1.700"	2.500"	3.000"	3.390"	Up to .010"	1.00 lb
Argon / Mig	52 mm	208 mm	300 mm	90 mm	102 mm	0.5 – 1.64 mm	12 kg
	2.050"	8.190"	11.810"	3.540"	4.020"	.020" – .064"	25 lb

Straight Lengths, Bars, or Pins

Dia mm	Dia inch	Length mm	Length inch	Surface finishes
0.3 – 12.0	.0118 – .472	3.0 – 4500	.118 – 177	Bright or ground or oxidised

If you require neutral labels or labels with your branding, let us know.



Our Alloys ➤

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	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	Designations		
Si	-	0.50	W.Nr. 2.4816 UNS N06600 AWS 010		
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/cm³	0.306 lb/in³
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/mm²	10965 ksi
Modulus of Elasticity	206 kN/mm²	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/mm²	ksi	°C	°F
Annealed	600 – 850	87 – 123	-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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B166	Outstanding resistance to oxidation & other forms of high temperature corrosion Higher mechanical properties at elevated temperatures than Inconel 600 **High temperature static applications	Petrochemical - Processing Industrial Furnaces Gas Turbine - Components Heat Treating - Equipment
Ni	58.00	63.00			
Cr	21.00	25.00	Designations		
S	-	0.015	W.Nr. 2.4851 UNS N06601 AWS 011		
Mn	-	1.00			
Al	1.00	1.70			
C	-	0.10			
Cu	-	1.00			
Si	-	0.50			
Fe	BAL				

Density	8.11 g/cm³	0.293 lb/in³
Melting Point	1411 °C	2571 °F
Coefficient of Expansion	13.75 µm/m °C (20 – 100°C)	7.6 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	81.2 kN/mm²	11777 ksi
Modulus of Elasticity	206.5 kN/mm²	29951 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	480 – 870	900 – 1600	1	Air
Temperature depends on composition and amount of cold work					

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm²	ksi	°C	°F
Annealed	700 – 900	102 – 131	-200 to +1000	-330 to +1830
Spring Temper	1200 – 1450	174 – 210	-200 to +1000	-330 to +1830

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

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B166 ASTM B168 AMS 5887 AMS 5889 ISO 9724 ISO 6208 DIN EN 17753 Designations UNS N06617 W.Nr. 2.4663 NiCr22Co12Mo9	Similar high temperature resistance to INCONEL® 600/601 with improved strength, while offering comparable corrosion resistance to INCONEL® 625 Exceptional combination of elevated temperature strength and corrosion resistance in oxidising and reducing environments **High temperature static applications	Aerospace Components Land Based Gas Turbines Power Generation Acid Processing Petro-Chemical Processing Springs
Ni	44.5	-			
Cr	20	24.00			
Co	10	15			
Mo	8	10			
Al	0.8	1.50			
C	0.05	0.15			
Fe	-	3			
Mn	-	1			
Si	-	1.00			
S	-	0.015			
Ti	-	0.6			
Cu	-	0.5			
B	-	0.006			

Density	8.36 g/cm³	0.302 lb/in³
Melting Point	1330 - 1380 °C	2430 - 2510 °F
Coefficient of Expansion	11.6 gm/m °C (20 - 100 °C)	7.0 x 10 ⁻⁶ in/in °F (70 - 212 °F)
Modulus of Rigidity	81 kN/mm²	11.8 ksi
Modulus of Elasticity	212.0 kN/mm²	30700 ksi

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm²	ksi	°C	°F
Annealed	<1000	<145	Up to 1100	Up to 2012
Spring Temper	1300 – 1600	190 – 230	Contact Alloy Wire Technical Department	

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

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5666 ASTM B446 BS 3076 NA 21 ISO 15156-3 (NACE MR 0175) Designations W.Nr. 2.4856 UNS N06625 AWS 012	Excellent corrosion resistance in a wide range of corrosive media Especially resistant to pitting and crevice corrosion Good for sea water applications	Marine Industries Aerospace Industries Chemical Processing Nuclear Reactors Pollution Control
C	-	0.10			
Mn	-	0.50			
Si	-	0.50			
P	-	0.015			
S	-	0.015			
Cr	20.00	23.00			
Co	-	1.00			
Mo	8.00	10.00			
Fe	-	5.00			
Al	-	0.40			
Ti	-	0.40			
Ni	58.00	-			
Nb/Cb	3.15	4.15			
Ta	-	0.05			
Cu	-	0.5			

Density	8.44 g/cm³	0.305 lb/in³
Melting Point	1350 °C	2460 °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	79 kN/mm²	11458 ksi
Modulus of Elasticity	205.8 kN/mm²	29849 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	260 – 370	500 – 700	0.5 – 1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Annealed	< 1050	< 152	-200 to + 340	-330 to + 645
Spring Temper	1300 – 1600	189 – 232	up to + 200	up to + 395

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5662 AMS 5663 AMS 5832 AMS 5962 ASTM B637 GE B5OTF14/15 GE B14H89 ISO 15156-3 (NACE MR 0175)	Good creep rupture strength at high temperatures Higher strength than Inconel X-750 Better mechanical properties at lower temperatures than Nimonic 90 and Inconel X-750 Age hardenable ^^High temperature dynamic applications	Gas Turbines Rocket Motors Space Craft Nuclear Reactors Pumps
C	-	0.08			
Mn	-	0.35			
Si	-	0.35			
P	-	0.015			
S	-	0.015			
Cr	17.00	21.00			
Ni	50.00	55.00			
Mo	2.80	3.30			
Nb/Cb	4.75	5.50			
			Designations		
Ti	0.65	1.15			
Al	0.20	0.80			
Co	-	1.00			
Ta	-	0.05			
B	-	0.006			
Cu	-	0.30			
Pb	-	0.0005			
Bi	-	0.00003			
Se	-	0.0003			
Fe	BAL				

Density	8.19 g/cm³	0.296 lb/in³
Melting Point	1336 °C	2437 °F
Coefficient of Expansion	13.0 µm/m °C (20 – 100 °C)	7.2 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	77.2 kN/mm²	11197 ksi
Modulus of Elasticity	204.9 kN/mm²	29719 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
No. 1 Temper or Spring Temper	Anneal Age Harden Total Age	980	1800	1	Air
		720	1330	8	Furnace
		620	1150	18	Air
No. 1 Temper or Spring Temper (for ISO 15156-3 / NACE MR 0175)	Anneal Age Harden	1010	1850	2	Air
		790	1455	6	Air
No. 1 Temper or Spring Temper	Age Harden Total Age	720	1330	8	Furnace
		620	1150	18	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load^^ and environment	
	N/mm²	ksi	°C	°F
Annealed	800 – 1000	116 – 145	-	-
No. 1 Temper	1000 – 1200	145 – 175	-	-
Spring Temper	1250 – 1550	180 – 225	-	-
No. 1 Temper + Annealed + Aged	1250 – 1450	181 – 210	-200 to +550	-330 to +1020
No. 1 Temper + Aged	1520 – 1720	220 – 250	Contact Alloy Wire Technical Dept.	
Spring Temper + Annealed + Aged	1250 – 1450	181 – 210	-200 to +550	-330 to +1020
Spring Temper + Aged	1700 – 1950	247 – 283	Contact Alloy Wire Technical Dept.	

The above tensile strength ranges are typical. If you require different please ask. ^^Dynamic applications = active/lively/changing

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5667 AMS 5671 AMS 5698 (No 1 Spring Temper) AMS 5699 (Spring Temper) ASTM B637 BS HR 505 GE B14H41 ISO 15156-3 (NACE MR 0175) Designations W.Nr. 2.4669 UNS N07750 AWS 014	Good creep rupture strength at high temperatures Not as strong as Nimonic 90 Very good at cryogenic temperatures Age hardenable ^^High temperature dynamic applications	Nuclear reactors Gas turbines Rocket engines Pressure vessels Aircraft structures
C	-	0.08			
Mn	-	1.00			
Si	-	0.50			
S	-	0.01			
Cr	14.00	17.00			
Ni	70.00	-			
Nb/Cb	0.70	1.20			
Ti	2.25	2.75			
Al	0.40	1.00			
Fe	5.00	9.00			
Co	-	1.00			
Ta	-	0.05			
Cu	-	0.50			

Density	8.28 g/cm³	0.299 lb/in³
Melting Point	1430 °C	2600 °F
Coefficient of Expansion	12.6 µm/m °C (20 – 100 °C)	7.0 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	75.8 kN/mm²	10994 ksi
Modulus of Elasticity (Spring Temper + Aged) (Spring Temper + 3 Part Heat Treated) (No.1 Spring Temper + Aged)	218.0 kN/mm² 212.4 kN/mm² 213.7 kN/mm²	31619 ksi 30806 ksi 30995 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Spring Temper	Age Harden	650	1200	4	Air
Spring Temper (3 Part)	Anneal Stabalize Age Harden	1150	2100	2 ★★	Air
		843	1550	24	Air
		704	1300	20	Air
No. 1 Temper	Age Harden	730	1350	16	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load^^ and environment	
	N/mm²	ksi	°C	°F
Annealed	800 – 1000	116 – 145	-	-
No. 1 Temper	900 – 1150	130 – 167	-	-
Spring Temper	1100 – 1500	160 – 218	-	-
No. 1 Temper + Aged	1300 – 1450	188 – 210	-200 to +550	-330 to +1020
Spring Temper + Aged	1350 – 1750	196 – 254	-200 to +370	-330 to +700
Spring Temper + 3 part heat treated	1100 – 1250	159 – 181	-200 to +550	-330 to +1020

The above tensile strength ranges are typical. If you require different please ask.
★★ for diameters below 1.00mm contact AWI Technical department ^^Dynamic applications = active/lively/changing

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	BS HR 5 BS HR 504	Good corrosion resistance Good heat resistance **High temperature static applications	Aerospace fasteners
C	0.08	0.15			
Si	-	0.30	Designations		
Mn	-	1.00	W.Nr. 2.4951 W.Nr. 2.4630 UNS N06075 AWS 032		
S	-	0.15			
Co	-	5.00			
Cr	19.00	21.00			
Cu	-	0.50			
Fe	-	5.00			
Pb	-	0.005			
Ti	0.2	0.50			
P	-	0.015			
Al	-	0.40			
Ni	BAL				

Density	8.37 g/cm ³	0.302 lb/in ³
Melting Point	1380 °C	2520 °F
Coefficient of Expansion	11.0 µm/m °C (20 – 100 °C)	6.1 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	450 – 470	840 – 880	0.5 – 1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm ²	ksi	°C	°F
Annealed	700 – 800	102 – 116	-200 to +1000	-330 to +1830
Spring Temper	1200 – 1500	174 – 218	-200 to +1000	-330 to +1830

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

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B637 BS 3076 NA 20 BS HR 1 BS HR 601	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			
			Designations		
Ag	-	0.0005	W.Nr. 2.4952 W.Nr. 2.4631 UNS N07080 AWS 031		
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	800 – 1000	116 – 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

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

^^Dynamic applications = active/lively/changing

Chemical Composition			Specifications	Key Features	Typical Applications		
Element	Min %	Max %	AMS 5829 BS HR 501 BS HR 502 BS HR 503 BS 3075 NA 19 ISO 15156-3 (NACE MR 0175) NCK 20TA	High stress rupture strength and high creep resistance at high temperatures Good resistance to high-temperature corrosion and oxidation Age hardenable ^^High temperature dynamic applications	Aerospace fasteners		
Ni	BAL						
Cr	18.00	21.00					
Fe	-	1.50					
Ti	2.00	3.00					
Mn	-	1.00					
Si	-	1.00					
C	-	0.13					
			Designations				
Al	1.00	2.00	W.Nr. 2.4632 W.Nr. 2.4969 UNS N07090 AWS 030				
Co	15.00	21.00					
S	-	0.015					
Cu	-	0.20					
B	-	0.02					
Pb	-	0.002					
Zr	-	0.15					
Ag	-	0.0005					
Bi	-	0.0001					

Density	8.18 g/cm³	0.296 lb/in³
Melting Point	1370 °C	2500 °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	82.5 kN/mm²	11966 ksi
Modulus of Elasticity (Annealed + Aged) (Spring Temper + Aged)	213 kN/mm² 227 / 240 kN/mm²	30894 ksi 32924 / 34810 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	Age Harden	750	1380	4	Air
Spring Temper	Age Harden	650	1200	4	Air
Spring Temper	Age Harden	600	1100	16	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load^^ and environment	
	N/mm²	ksi	°C	°F
Annealed	800 – 1000	116 – 145	-	-
Annealed + Aged	1200 – 1400	174 – 203	up to 550	up to 1020
Spring Temper	1200 – 1500	175-218	-	-
Spring Temper + Aged	1500 – 1800	218 – 261	up to 350	up to 660

The above tensile strength ranges are typical. If you require different please ask. ^^Dynamic applications = active/lively/changing

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	W.Nr. 2.4650 UNS N07263	Excellent fabrication characteristics in the annealed condition Age Hardenable **High temperature static applications	Parts in gas turbines Sealing rings
C	0.04	0.08	Designations AMS 5872 AMS 5886 BS HR 10 BS HR 206		
Si	-	0.40			
Mn	-	0.60			
S	-	0.007			
Ag	-	0.0005			
Al	0.30	0.60			
B	-	0.005			
Bi	-	0.0001			
Co	19.0	21.0			
Cr	19.0	21.0			
Cu	-	0.20			
Fe	-	0.70			
Mo	5.60	6.10			
Pb	-	0.002			
Ti	1.90	2.40			
Ti+Al	2.40	2.80			
Ni	Bal				

Density	8.36 g/cm³	0.302 lb/in³
Melting Point	1325 °C	2415 °F
Coefficient of Expansion	10.6 µm/m* °C (20 – 100 °C)	5.7 x 10 ⁻⁶ in/in* °F (70 – 212 °F)
Modulus of Elasticity	222.5 kN/mm²	32270 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	Age Harden	800	1475	8 hours	Air
Spring Temper	Anneal Age Harden	1040 - 1165 800	1900 - 2125 1475	Suited to diameter 8 Hours	Water or Air Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm²	ksi	°C	°F
Annealed	800 – 1000	116 – 145	up to 800	up to 1500
Annealed + Aged	1000 – 1200	145 – 174	up to 800	up to 1500
Spring Temper	1200 – 1500	174 – 217	up to 800	up to 1500
Spring Temper + Annealed + Aged	1000 – 1200	145 – 174	up to 800	up to 1500

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

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	BS 3075 NA15 BS 3076 NA15	Excellent resistance to oxidation and carburisation at high temperatures Corrosion resistant in many aqueous environments **High temperature static applications	Process Piping Heat Exchangers Carburising Equipment Heating Element Sheathing
Ni	30.00	35.00			
Co	-	2.00	Designations		
Cu	-	0.75	W.Nr. 1.4876 UNS N08800 AWS 020		
Cr	19.00	23.00			
Al	0.15	0.60			
C	-	0.10			
Si	-	1.00			
Mn	-	1.50			
Ti	0.15	0.60			
Fe	BAL				
S	-	0.015			

Density	7.94 g/cm³	0.287 lb/in³
Melting Point	1385 °C	2525 °F
Coefficient of Expansion	14.4 µm/m °C (20 – 100 °C)	7.9 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	78.9 kN/mm²	11444 ksi
Modulus of Elasticity	196.5 kN/mm²	28500 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	450 – 470	840 – 880	0.5 - 1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-200 to +815	-330 to +1500
Spring Temper	800 – 1100	116 – 159	-200 to +815	-330 to +1500

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

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	BS 3076 NA 15H	Higher creep rupture strength than Incoloy 800 due to close control of C, Al, Ti Excellent resistance to oxidation and carburisation at high temperatures Corrosion resistant in many aqueous environments **High temperature static applications	Chemical Processing Petrochemical Processing Industrial Furnaces Heat Treating Equipment
Ni	30.00	35.00			
Co	-	2.00	Designations		
Cu	-	0.75	W.Nr. 1.4958 W.Nr. 1.4959 UNS N08811 AWS 021		
Cr	19.00	23.00			
Al	0.15	0.60			
C	0.05	0.10			
Si	-	1.00			
Mn	-	1.50			
Ti	0.15	0.60			
Fe	BAL				
S	-	0.015			

Density	7.94 g/cm³	0.287 lb/in³
Melting Point	1385 °C	2525 °F
Coefficient of Expansion	14.4 µm/m °C (20 – 100 °C)	7.9 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	78.9 kN/mm²	11444 ksi
Modulus of Elasticity	196.5 kN/mm²	28500 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	450 – 470	840 – 880	0.5 - 1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-200 to +1000	-330 to +1830
Spring Temper	800 – 1100	116 – 159	-200 to +1000	-330 to +1830

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

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B425 BS 3075 NA 16 BS 3076 NA 16 ISO 15156-3 (NACE MR 0175)	Resistant to reducing environments such as those containing sulphuric and phosphoric acids	Chemical Processing Nuclear Fuel Reprocessing Acid Production Pickling Equipment
Ni	38.00	46.00		Resistant to a variety of oxidising substances such as nitric acid and nitrates	
Co	-	2.00			
Cu	1.50	3.00			
Cr	19.50	23.50	Designations	Resistant to chloride-ion stress corrosion cracking, pitting and crevice corrosion Good for chemical processing	
Mo	2.50	3.50	W.Nr. 2.4858 UNS N08825 AWS 022		
Al	-	0.20			
C	-	0.05			
Si	-	0.50			
Mn	-	1.00			
S	-	0.03			
Ti	0.60	1.20			
Fe	BAL				

Density	8.14 g/cm ³	0.294 lb/in ³
Melting Point	1400 °C	2550 °F
Coefficient of Expansion	14.0 µm/m °C (20 – 100 °C)	7.8 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	75.9 kN/mm ²	11009 ksi
Modulus of Elasticity	196 kN/mm ²	28428 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	450 – 470	840 – 880	0.5 – 1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-100 to +250	-145 to +480
Spring Temper	800 – 1100	116 – 159	-100 to +250	-145 to +480

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5731 AMS 5734 AMS 5737 AMS 5853 ASTM A453 BS HR 52 BS HR 650 ISO 15156-3 (NACE MR 0175) Designations W.Nr. 1.4944 W.Nr. 1.4980 UNS S66286 AWS 023	High strength and good corrosion resistance at high temperatures Age hardenable Good for high temperature fasteners **High temperature static applications	Jet Engines Super Chargers Afterburner Parts Fasteners
C	0.03	0.08			
Mn	1.00	2.00			
Si	-	0.50			
P	-	0.02			
S	-	0.015			
Cr	13.50	16.00			
Ni	24.00	27.00			
Mo	1.00	1.50			
Ti	1.90	2.30			
B	0.003	0.01			
V	0.10	0.50			
Co	-	1.00			
Al	-	0.35			
Cu	-	0.50			
Pb	-	0.005			

Density	7.94 g/cm ³	0.287 lb/in ³
Melting Point	1430 °C	2600 °F
Coefficient of Expansion	16.4 µm/m °C (20 – 100 °C)	9.1 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	71.5 kN/mm ²	10370 ksi
Modulus of Elasticity	205 kN/mm ²	29733 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed or Spring Temper	Age Harden	705 – 760	1300 – 1400	16	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm ²	ksi	°C	°F
Annealed	600 – 750	87 – 109	-200 to +400	-330 to +750
Annealed + Aged	1100 – 1300	159 – 188	-200 to +400	-330 to +750
Spring Temper	1050 – 1250	152 – 181	-200 to +400	-330 to +750
Spring Temper + Aged	1300 – 1500	188 – 218	-200 to +400	-330 to +750

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

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

HASTELLOY B-3

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B335 ASTM B619	Excellent corrosion resistance to hydrochloric acid at all concentrations and temperatures Withstands sulphuric, acetic, formic and phosphoric acids and other non-oxidising media	Chemical processing
Ni	65.00	-			
Cr	1.00	3.00	Designations W.Nr. 2.4600 UNS N10675 AWS 051	Excellent resistance to pitting corrosion and stress corrosion cracking	
Mo	27.00	32.00			
Fe	1.00	3.00			
W	-	3.00			
C	-	0.01			
Si	-	0.10			
Co	-	3.00			
Mn	-	3.00			
V	-	0.20			
P	-	0.030			
S	-	0.010			
Ti	-	0.20			
Cu	-	0.20			
Al	-	0.50			
Zr	-	0.10			
Nb/Cb	-	0.20			
Ta	-	0.20			
Ni+Mo	94.00	98.00			

Density	9.22 g/cm ³	0.333 lb/in ³
Melting Point	1418 °C	2585 °F
Coefficient of Expansion	10.6 µm/m °C (20 – 100 °C)	5.7 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	83 kN/mm ²	12038 ksi
Modulus of Elasticity	216 kN/mm ²	31329 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 – 1200	145 – 174	-200 to +400	-330 to +750
Spring Temper	1600 – 2000	232 – 290	-200 to +400	-330 to +750

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

HASTELLOY C-4

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B574 ASTM B575 ASTM B619	Excellent resistance to stress-corrosion cracking and to oxidizing atmospheres at high temperature Exceptional resistance to a wide variety of chemical process environments including, hot contaminated mineral acids, solvents, chlorine, formic and acetic acids and salt waters	Chemical processing
Cr	14.00	18.00			
Mo	14.00	17.00			
Fe	-	3.00			
C	-	0.015	Designations		
Si	-	0.08	W.Nr. 2.4610 UNS N06455 AWS 052		
Co	-	2.00			
Mn	-	1.00			
P	-	0.04			
S	-	0.03			
Ti	-	0.70			
Ni	BAL				

Density	8.64 g/cm ³	0.312 lb/in ³
Melting Point	1399 °C	2550 °F
Coefficient of Expansion	10.8 µm/m °C (20 – 100 °C)	6.0 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	81.2 kN/mm ²	11777 ksi
Modulus of Elasticity	212.4 kN/mm ²	30807 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	800 – 1100	116 – 159	-200 to +400	-330 to +750
Spring Temper	1300 – 1700	189 – 247	-200 to +400	-330 to +750

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B574 ASTM B575 ASTM B619 ISO 15156-3 (NACE MR 0175)	Better overall corrosion resistance than Hastelloy C-4 and C-276 and Inconel 625 Outstanding resistance to pitting, crevice corrosion and stress corrosion cracking	Chlorination systems Nuclear fuel reprocessing Pickling systems
Cr	20.00	22.50			
Mo	12.50	14.50			
Fe	2.00	6.00			
W	2.50	3.50	Designations	W.Nr. 2.4602 UNS N06022 AWS 053	
C	-	0.015			
Si	-	0.08			
Co	-	2.50			
Mn	-	0.50			
V	-	0.35			
P	-	0.02			
S	-	0.02			
Ni	BAL				

Density	8.69 g/cm ³	0.314 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	78.6 kN/mm ²	11400 ksi
Modulus of Elasticity	205.5 kN/mm ²	29806 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	800 – 1100	116 – 159	-200 to +400	-330 to +750
Spring Temper	1400 – 1700	203 – 247	-200 to +400	-330 to +750

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B574 ASTM B575 ASTM B619 ISO 15156-3 (NACE MR 0175)	Excellent corrosion resistance in a wide range of corrosive media including, sulphur compounds and chloride ions Excellent resistance to pitting, crevice corrosion and stress corrosion cracking Withstands the corrosive effects of wet chlorine gas, hypochlorite and chlorine dioxide Good for sea water applications	Chlorination systems Nuclear fuel reprocessing Pickling systems Chemical processing Marine industries
Mo	15.00	17.00			
Cr	14.50	16.50			
Fe	4.00	7.00			
W	3.00	4.50	Designations		
Co	-	2.50	W.Nr. 2.4819 UNS N10276 AWS 054		
C	-	0.010			
Si	-	0.08			
Mn	-	1.00			
V	-	0.35			
P	-	0.04			
S	-	0.03			
Ni	BAL				

Density	8.89 g/cm ³	0.321 lb/in ³
Melting Point	1370 °C	2500 °F
Coefficient of Expansion	11.2 µm/m °C (20 – 100°C)	6.2 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	78.6 kN/mm ²	11400 ksi
Modulus of Elasticity	205.5 kN/mm ²	29806 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	850 – 1050	123 – 152	-200 to +400	-330 to +750
Spring Temper	1300 – 1700	189 – 247	-200 to +400	-330 to +750

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

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 and hydrofluoric acids Superior pitting resistance and crevice corrosion resistance to Hastelloy C-276 Excellent corrosion resistance to reducing media Good oxidising resistance	Chemical processing
Cr	22.00	24.00			
Mo	15.00	17.00			
Fe	-	3.00			
C	-	0.010	Designations		
Si	-	0.080	W.Nr. 2.4675 UNS N06200 AWS 055		
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	700 – 1000	102 – 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.

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5754 AMS 5798 ASTM B619 GE B50A463 GE B50A655 ISO 15156-3 (NACE MR 0175)	Exceptional oxidation resistance Highly resistant to stress corrosion cracking in petrochemical applications	Gas turbine engines Industrial furnaces Chemical processing Petrochemical processing
Cr	20.50	23.00			
Mo	8.00	10.00			
Fe	17.00	20.00			
W	0.20	1.00			
C	0.05	0.15	Designations		
Si	-	1.00	W.Nr. 2.4665 UNS N06002 AWS 057		
Co	0.50	2.50			
Mn	-	1.00			
P	-	0.04			
S	-	0.03			
B	-	0.01			
Ni	BAL				

Density	8.22 g/cm ³	0.297 lb/in ³
Melting Point	1355 °C	2470 °F
Coefficient of Expansion	13.9 µm/m °C (20 – 100 °C)	7.7 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	77.6 kN/mm ²	11255 ksi
Modulus of Elasticity	205 kN/mm ²	29733 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	850 – 1050	123 – 152	-200 to +400	-330 to +750
Spring Temper	1350 – 1550	196 – 225	-200 to +400	-330 to +750

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

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)	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	Designations		
Cr	19.00	21.00	W.Nr. 2.4964 UNS R30605 AWS 060		
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/mm²	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 %	-	Resistance to oxidation that far exceeds most heat resistant alloys at temperatures of 955 °C (1750 °F) and above **High temperature static applications	Mesh belts Trays and fixtures for the firing of pottery and china, and the heat treatment of electronic devices and technical grade ceramics
Al	4.10	5.00			
B	-	0.004			
C	-	0.05	Designations		
Nb/Cb	-	0.15	W.Nr. 2.4646 UNS N07214 AWS 061		
Co	-	2.00			
Cr	15.00	17.00			
Fe	2.00	4.00			
Mg	-	0.01			
Mn	-	0.50			
Mo	-	0.50			
Ni	BAL				
P	-	0.015			
S	-	0.015			
Si	-	0.20			
Ti	-	0.50			
W	-	0.50			
Y	0.003	0.04			
Zr	-	0.02			

Density	8.05 g/cm ³	0.291 lb/in ³
Melting Point	1400 °C	2550 °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	84 kN/mm ²	12183 ksi
Modulus of Elasticity	217 kN/mm ²	31474 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 – 1200	131 – 174	-200 to +1100	-330 to +2010
Spring Temper	1300 – 1700	189 – 247	-200 to +1100	-330 to +2010

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 Petro-chemical applications Marine engineering
C	-	0.15			
Mn	1.50	2.50			
Si	-	1.20			
P	-	0.015			
S	-	0.015			
			Designations	W.Nr. 2.4711 UNS R30003 UNS R30008 AWS 100	
Cr	19.00	21.00			
Ni	14.00	16.00			
Co	39.00	41.00			
Mo	6.00	8.00			
Be	-	0.10			
Fe	BAL				

Density	8.27 g/cm ³	0.300 lb/in ³
Melting Point	1300 – 1375 °C	2370 – 2510 °F
Coefficient of Expansion	12.1 μm/m °C (20 – 100 °C)	6.7 x 10 ⁻⁶ in/in °F (70 – 212 °F)

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed or Spring Temper	Stablize	1010	1850	2	Air
	Age Harden	790	1450	8	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load** and environment	
	N/mm²	ksi	°C	°F
Annealed	800 – 1200	116 – 174	Contact AWI Technical department	
Spring Temper	1300 – 1600	190 – 232		
Spring Temper + Stabilised and Aged	1000 – 1300	145 – 190		

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		Designations		
Mn	-	0.15	W.Nr. 2.4999 UNS R30035 AWS 110		
S	-	0.01			
Cr	19.00	21.00			
Mo	9.00	10.50			
Ti	-	1.00			
Fe	-	1.00			

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	< 1100	< 160	-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.

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5545 AMS 5713 AMS 5800 AMS 5712 GE C50T71	Very high strength at elevated temperatures Good oxidation resistance Age hardenable ^^High temperature dynamic applications	After burner parts Turbine castings Bolts Other fasteners
C	-	0.12			
Mn	-	0.10			
Si	-	0.50			
S	-	0.015	Designations		
Cr	18.00	20.00	W.Nr. 2.4973 UNS N07041 AWS 120		
Co	10.00	12.00			
Mo	9.00	10.50			
Ti	3.00	3.30			
Al	1.40	1.60			
B	0.003	0.01			
Fe	-	5.00			
Ni	BAL				

Density	8.25 g/cm ³	0.298 lb/in ³
Melting Point	1345 °C	2450 °F
Coefficient of Expansion	13.6 µm/m °C (20 – 100 °C)	7.41 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	83.2 kN/mm ²	12067 ksi
Modulus of Elasticity	218.0 kN/mm ²	31619 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	Age Harden	760	1400	16	Air
Spring Temper	Solution Anneal Age Harden	1065 760	1950 1400	4 16	Air Air
Spring Temper	Age Harden	760	1400	16	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load^^ and environment	
	N/mm ²	ksi	°C	°F
Annealed	800 – 1100	116 – 159	-	-
Annealed + Aged	1350 – 1550	196 – 225	up to +550	up to +1020
Spring Temper	1400 – 1800	203 – 261	-	-
Spring Temper + Annealed + Aged	1350 – 1550	196 – 225	up to +550	up to +1020
Spring Temper + Aged	1600 – 2000	232 – 290	up to +550	up to +1020

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

^^Dynamic applications = active/lively/changing

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5544 AMS 5706 AMS 5708 AMS 5828 ASTM B637	Very high strength at elevated temperatures Strength is generally comparable to that of Rene 41 and generally superior to Inconel 718 Age hardenable ^^High temperature dynamic applications	Gas turbine engine parts Aerospace components Springs and fasteners
C	0.02	0.10			
Mn	-	0.10			
Si	-	0.10			
P	-	0.010	Designations		
S	-	0.010	W.Nr. 2.4654 UNS N07001 AWS 170		
Cr	18.00	21.00			
Co	12.00	15.00			
Mo	3.50	5.00			
Ti	2.75	3.50			
Al	1.20	1.60			
B	0.003	0.010			
Zr	-	0.04			
Fe	-	2.00			
Cu	-	0.10			
Ni	BAL				

Density	8.16 g/cm ³	0.295 lb/in ³
Melting Point	1330 °C	2425 °F
Coefficient of Expansion	12.2 µm/m °C (20 – 100 °C)	6.8 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	81 kN/mm ²	11750 ksi
Modulus of Elasticity	211.0 kN/mm ²	30600 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	Stabilize Age Harden	843	1550	4	Air
		760	1400	16	Air
Spring Temper	Anneal Stabilize Age Harden	1050	1920	4	Air
		843	1550	4	Air
		760	1400	16	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature depending on load^^ and environment	
	N/mm ²	ksi	°C	°F
Solution Annealed	800 – 1100	116 – 159	-	-
Solution Annealed + Aged	1300 – 1500	189 – 218	up to +550	up to +1020
Spring Temper	1300 – 1600	189 – 232	-	-
Spring Temper + Annealed + Aged	1300 – 1500	189 – 218	up to +550	up to +1020

The above tensile strength ranges are typical. If you require different please ask. ^^Dynamic applications = active/lively/changing

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5225 AMS 5221 HS 261	Outstanding controllable thermoelastic coefficient characteristics Can be processed to have constant modulus of elasticity from -45 to +65 °C (-50 to +150 °F) Good for springs in watches and weighing equipment Age hardenable	Springs in precise applications, such as watches and weighing machines Measuring instruments
C	-	0.06			
Mn	-	0.80			
Si	-	1.00			
P	-	0.04	Designations		
S	-	0.04	W.Nr. N09902 AWS 080		
Cr	4.90	5.75			
Ni+Co	41.00	43.50			
Ti	2.20	2.75			
Al	0.30	0.80			
Cr+ (Ti-4xC)	7.10	8.10			
Co	-	1.00			
Fe	BAL				

Density	8.05 g/cm ³	0.291 lb/in ³
Melting Point	1480 °C	2700 °F
Coefficient of Expansion	7.6 µm/m °C (20 – 100 °C)	4.2 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	62 – 69 kN/mm ²	8993 – 10008 ksi
Modulus of Elasticity	165 – 200 kN/mm ²	23932 – 29008 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Spring Temper - <i>for good all round properties</i>	Age Harden	650	1200	2	Air
Spring Temper - <i>for max stability</i>	Stress equalise Age Harden	400	750	2	Air
		650	1200	2	Air
Spring Temper - <i>for minimum hysteresis & low thermoelastic coefficient</i>	Stress equalise	400	750	2	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-45 to +65	-50 to +150
			(for constant modulus applications)	
Spring Temper	900 – 1100	131 – 159	-45 to +65	-50 to +150
			(for constant modulus applications)	
Spring Temper + Aged	1300 – 1500	189 – 218	-45 to +65	-50 to +150
			(for constant modulus applications)	

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

Beryllium Copper CB 101

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B196 ASTM B197 BS 2873 BS EN 12166	Good conductor of electricity Age hardenable Good mechanical properties	Springs Electrical connectors and switches Electronic components
Be	1.70	2.10			
Fe	-	0.20			
Ni	-	0.30			
Co	-	0.30	Designations	W.Nr. 2.1247 UNS C17200 AWS 140	
Cu	BAL				

Density	8.25 g/cm ³	0.298 lb/in ³
Melting Point	980 °C	1800 °F
Coefficient of Expansion	17.8 µm/m °C (20 – 100 °C)	9.9 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	47 kN/mm ²	6817 ksi
Modulus of Elasticity	123 kN/mm ²	17840 ksi

Heat Treatment of Finished Parts					
Condition as supplied by Alloy Wire	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
Annealed	Age Harden	315 – 320	600 – 610	3	Air
Spring Temper	Age Harden	315 – 320	600 – 610	2	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	400 – 600	58 – 87	up to +200	up to +390
Annealed + Aged	800 – 1200	116 – 174	up to +200	up to +390
Spring Temper	800 – 1200	116 – 174	up to +200	up to +390
Spring Temper + Aged	1200 – 1600	174 – 232	up to +200	up to +390

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

MONEL® 400

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 4730 ASTM B164 BS 3075 NA 13 BS 3076 NA 13 DTD 204B ISO 15156-3 (NACE MR 0175) QQ-N-281	Excellent corrosion resistance in a wide range of acidic & alkaline environments Especially suitable for reducing conditions Good ductility & thermal conductivity Good for sea water applications	Marine Engineering Chemical Processing Hydrocarbon Processing Heat Exchangers Valves Pumps
C	-	0.30			
Si	-	0.50			
Mn	-	2.00			
S	-	0.024	W.Nr. 2.4361 W.Nr. 2.4360 UNS N04400 AWS 040		
Cu	28.00	34.00			
Fe	-	2.50			
Ni+Co	63.00	70.00			
Co	-	2.0			

Density	8.8 g/cm ³	0.318 lb/in ³
Melting Point	1350 °C	2460 °F
Coefficient of Expansion	13.9 µm/m °C (20 – 100 °C)	7.7 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	65.3 kN/mm ²	9471 ksi
Modulus of Elasticity	173 kN/mm ²	25092 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	300 – 320	570 – 610	0.5 – 1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	400 – 600	58 – 87	-200 to +230	-330 to +445
Spring Temper	800 – 1100	116 – 160	-200 to +230	-330 to +445

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

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

^ΔHeat 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.

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	-	Low expansion alloy. Maintains near constant dimensions over the range of normal atmospheric temperatures	Standards of length (measurement reference)
Ni	35.00	38.00			Thermostat rods
Fe	BAL		Designations	Low coefficient of expansion from cryogenic temperatures to about 500 °C (930 °F)	Laser components
C	-	0.10	W.Nr. 1.3912 UNS K93600 UNS K93601 AWS 090	Retains strength and toughness at cryogenic temperatures	Tanks and piping for the storage and transportation of liquefied gasses
Mn	-	0.60			
P	-	0.025			
S	-	0.03			
Si	-	0.35			
Cr	-	0.50			
Mo	-	0.50			
Co	-	1.00			

Density	8.11 g/cm ³	0.293 lb/in ³
Melting Point	1430 °C	2610 °F
Inflection Point	220 °C	430 °F
Thermal conductivity	10.0 W/m• °C	69.3 btu•in/ft²•h °F
Coefficient of Expansion	1.5 µm/m °C (20 – 100 °C) 2.6 µm/m °C (20 – 200 °C)	0.83 x 10 ⁻⁶ in/in °F (70 – 212 °F) 1.4 x 10 ⁻⁶ in/in °F (70 – 392 °F)

Heat Treatment of Finished Parts					
<i>The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness.</i>					
	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
For highest dimensional stability	Anneal	850 – 1000	1560 – 1830	0.5	Air or water
		830 300 100	1525 570 212	0.5 1 48	Water Water Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	450 – 550	65 – 80	up to +500	up to +930
Hard Drawn	700 – 900	102 – 131	up to +500	up to +930

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM F30	Low and nominally constant coefficient of thermal expansion from room temperature to about 300 °C (570 °F)	Semiconductor lead frames Thermostat rods Various glass to metal seals
Ni	41.00 nominal				
Fe	BAL		Designations		
Mn	-	0.80	W.Nr. 1.3917 UNS K94100 AWS 091		
Si	-	0.30			
C	-	0.05			
Cr	-	0.25			
P	-	0.03			
S	-	0.03			
Al	-	0.10			

Density	8.11 g/cm ³	0.293 lb/in ³
Melting Point	1435 °C	2615 °F
Inflection Point	370 °C	700 °F
Thermal Conductivity	10.5 W/m• °C	72.8 btu•in/ft ² •h °F
Coefficient of Expansion	5.3 µm/m °C (20 – 100 °C) 4.5 – 6.5 µm/m °C (20 – 300 °C)	2.9 x 10 ⁻⁶ in/in °F (70 – 212 °F) 2.5 – 3.6 x 10 ⁻⁶ in/in °F (70 – 572 °F)

Heat Treatment of Finished Parts				
The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness.				
Type	Temperature		Time (Hr)	Cooling
	°C	°F		
Anneal	850 – 1000	1560 – 1830	0.5	Air or water

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	450 – 550	65 – 80	up to +300	up to +570
Hard Drawn	700 – 900	102 – 131	up to +300	up to +570

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM F30	Coefficient of thermal expansion designed to match that of soft lead and soda-lime glasses High inflection point	Industrial thermostats that operate at temperatures up to 450 °C (840 °F) Glass to metal seals
Ni	48.00 nominal				
Fe	BAL		Designations		
Mn	-	0.80	W.Nr. 1.3922 W.Nr. 1.3926 W.Nr. 1.3927 UNS K94800 AWS 092		
Si	-	0.30			
C	-	0.05			
Cr	-	0.25			
P	-	0.025			
S	-	0.03			
Al	-	0.10			

Density	8.2 g/cm ³	0.296 lb/in ³
Melting Point	1450 °C	2640 °F
Inflection Point	460 °C	860 °F
Thermal Conductivity	16.7 W/m• °C	116 btu•in/ft ² •h °F
Coefficient of Expansion	8.5 µm/m °C (20 – 100 °C) 8.3 – 9.3 µm/m °C (20 – 300 °C)	4.7 x 10 ⁻⁶ in/in °F (70 – 212 °F) 4.6 – 5.2 x 10 ⁻⁶ in/in °F (70 – 572 °F)

Heat Treatment of Finished Parts				
The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness.				
Type	Temperature		Time (Hr)	Cooling
	°C	°F		
Anneal	850 – 1000	1560 – 1830	0.5	Air or water

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	450 – 550	65 – 80	up to +450	up to +840
Hard Drawn	700 – 900	102 – 131	up to +450	up 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 %	ASTM F30	Designed for use with a variety of soft glasses Almost constant coefficient of thermal expansion up to approx. 565 °C (1050 °F)	Various glass to metal sealing applications with soft glass and ceramics
Ni	50.50 nominal				
Fe	BAL		Designations		
Mn	-	0.60	W.Nr. 2.4478 UNS N14052 AWS 093		
Si	-	0.30			
C	-	0.05			
Cr	-	0.25			
P	-	0.025			
S	-	0.03			
Al	-	0.10			

Density	8.3 g/cm ³	0.300 lb/in ³
Melting Point	1450 °C	2640 °F
Inflection Point	500 °C	930 °F
Thermal Conductivity	17 W/m• °C	118 btu•in/ft ² •h °F
Coefficient of Expansion	10.3 µm/m °C (20 – 100 °C)	5.7 x 10 ⁻⁶ in/in °F (70 – 212 °F)

Heat Treatment of Finished Parts				
The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness.				
Type	Temperature		Time (Hr)	Cooling
	°C	°F		
Anneal	850 – 1000	1560 – 1830	0.5	Air or water

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	450 – 550	65 – 80	up to +450	up to +840
Hard Drawn	700 – 900	102 – 131	up to +450	up 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 %	ASTM F15	Controlled coefficient of expansion (which decreases with rising temperature to the inflection point) Matches the expansion rate of borosilicate glasses and alumina ceramics	Glass to metal seals in applications requiring high reliability or resistance to thermal shock, ie. high power transmitting valves
Fe	53.00 nominal		Designations		
Ni	29.00 nominal				
Co	17.0 nominal		W.Nr. 1.3981 UNS K94610 AWS 094		
Mn	-	0.50			
Si	-	0.20			
C	-	0.04			
Al	-	0.10			
Mg	-	0.10			
Zr	-	0.10			
Ti	-	0.10			
Cu	-	0.20			
Cr	-	0.20			
Mo	-	0.20			

Density	8.16 g/cm ³	0.295 lb/in ³
Melting Point	1450 °C	2640 °F
Inflection Point	450 °C	840 °F
Thermal Conductivity	16.7 W/m• °C	116 btu•in/ft ² •h °F
Coefficient of Expansion	6.0 µm/m °C (20 – 100 °C) 4.6 – 5.2 µm/m °C (20 – 400 °C)	3.3 x 10 ⁻⁶ in/in °F (70 – 212 °F) 2.6 – 2.9 x 10 ⁻⁶ in/in °F (70 – 752 °F)

Heat Treatment of Finished Parts					
The Nilo alloys are usually supplied and used in the annealed condition (residual cold work distorts the coefficients of thermal expansion). Annealing times may vary due to section thickness. Oxidizing time and temperature to be selected depending on required oxide thickness.					
	Type	Temperature		Time (Hr)	Cooling
		°C	°F		
	Anneal	850 – 1000	1560 – 1830	0.5	Air or water
To prepare for glass to metal sealing	Decarburization	900 – 1050	1650 – 1920	1	Air or water
If a metal oxide interface is required (time and temperature depend on required oxide thickness)	Oxidize	600 – 1000	1110 – 1830	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	450 – 550	65 – 80	up to +400	up to +750
Hard Drawn	700 – 900	102 – 131	up to +400	up to +750

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B160 ASTM B162 BS 3075 NA11 BS 3076 NA11 Designations W.Nr. 2.4060 W.Nr. 2.4066 UNS N02200 AWS 070	Commercially pure nickel Resistant to various reducing chemicals and caustic alkalise Good magnetostrictive properties High electrical and thermal conductivity Good ductility and low work hardening rate Good weldability and solderability	Electronic components Electrical components Lead in wires for heating elements Battery connections/terminals Chemical processing Aerospace components Food processing Synthetic fibre processing
Ni	99.0	-			
Cu	-	0.25			
Fe	-	0.40			
C	-	0.15			
Si	-	0.35			
Mn	-	0.35			
Mg	-	0.20			
Ti	-	0.10			
S	-	0.01			
Co	-	2.00			

Density	8.89 g/cm³	0.321 lb/in³
Melting Point	1446 °C	2635 °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	81 kN/mm²	11748 ksi
Modulus of Elasticity	204 kN/mm²	29588 ksi

Electrical Resistivity	
9.6 µΩ • cm	58 ohm • circ mil/ft

Thermal Conductivity	
70.2 W/m • °C	487 btu • in/ft² • h • °F

Properties			
Condition	Approx. tensile strength		Approx. operating temperature
	N/mm²	ksi	
Annealed	400 – 500	58 – 73	Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.
Hard Drawn	700 – 900	102 – 131	

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM B160 ASTM B162 BS 3076 NA12 Designations W.Nr. 2.4061 W.Nr. 2.4068 UNS N02201 AWS 071	Low-carbon version of Nickel 200 Preferred to Nickel 200 for applications involving exposure to temperatures above 315 °C (600 °F) Resistant to various reducing chemicals and caustic alkalise Good magnetostrictive properties High electrical and thermal conductivity Good ductility and low work hardening rate Good weldability and solderability	Electronic components Electrical components Lead in wires for heating elements Battery connections/terminals Chemical processing Aerospace components Food processing Synthetic fibre processing
Ni	99.0	-			
Cu	-	0.25			
Fe	-	0.40			
C	-	0.02			
Si	-	0.35			
Mn	-	0.35			
Mg	-	0.20			
Ti	-	0.10			
S	-	0.01			
Co	-	2.00			

Density	8.89 g/cm³	0.321 lb/in³
Melting Point	1446 °C	2635 °F
Coefficient of Expansion	13.1 µm/m °C (20 – 100 °C)	7.3 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	82 kN/mm²	11893 ksi
Modulus of Elasticity	207 kN/mm²	30000 ksi

Electrical Resistivity	
8.5 µΩ • cm	51 ohm • circ mil/ft

Thermal Conductivity	
79.3 W/m • °C	550 btu • in/ft² • h • °F

Properties			
Condition	Approx. tensile strength		Approx. operating temperature
	N/mm²	ksi	
Annealed	400 – 500	58 – 73	Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.
Hard Drawn	700 – 900	102 – 131	

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	- Designations W.Nr. 2.4061 UNS N02205 AWS 072	Similar to Nickel 200 but has compositional adjustments to enhance its performance in electrical and electronic applications	Anodes and grids of electronic valves Lead wires Transistor Housings Magneto-strictive Transducers
Ni	99.0	-			
Mg	0.01	0.08			
Ti	0.01	0.05			
Cu	-	0.15			
Fe	-	0.20			
C	-	0.15			
Si	-	0.15			
S	-	0.008			
Mn	-	0.35			

Density	8.89 g/cm ³	0.321 lb/in ³
Melting Point	1446 °C	2635 °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	82 kN/mm ²	11893 ksi
Modulus of Elasticity	207 kN/mm ²	30000 ksi

Electrical Resistivity	
9.5 µΩ • cm	57 ohm • circ mil/ft

Thermal Conductivity	
75 W/m • °C	520 btu • in/ft ² • h • °F

Properties			
Condition	Approx. tensile strength		Approx. operating temperature
	N/mm ²	ksi	
Annealed	400 – 500	58 – 73	Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.
Hard Drawn	700 – 900	102 – 131	

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	- Designations W.Nr. 2.4110 AWS 073	Stronger than Nickel 200 due to the addition of manganese	Electrical Lead Wires Supporting components in Lamps and electronic valves Electrodes in Glow-discharge Lamps Sparking Contacts
Ni + Co	97.0	-			
Mn	1.50	2.50			
Fe	-	0.25			
C	-	0.10			
Cu	-	0.20			
Si	-	0.20			
Mg	-	0.20			
S	-	0.006			

Density	8.86 g/cm ³	0.320 lb/in ³
Melting Point	1446 °C	2635 °F
Coefficient of Expansion	12.9 µm/m °C (20 – 100 °C)	7.2 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	78 kN/mm ²	11313 ksi
Modulus of Elasticity	196 kN/mm ²	28400 ksi

Electrical Resistivity	
10.9 µΩ • cm	66 ohm • circ mil/ft

Thermal Conductivity	
44 W/m • °C	305 btu • in/ft ² • h • °F

Properties			
Condition	Approx. tensile strength		Approx. operating temperature
	N/mm ²	ksi	
Annealed	450 – 550	65 – 80	Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.
Hard Drawn	750 – 950	109 – 138	

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	- Designations W.Nr. 2.4050 UNS N02270 AWS 074	High purity grade of nickel that is made by powder metallurgy	Electrical Resistance Thermometers Components for hydrogen thyratrons Electrical and electronic components
Ni + Co	99.9	-			
Cu	-	0.01			
Fe	-	0.05			
Mn	-	0.003			
C	-	0.05			
S	-	0.003			
Mg	-	0.005			
Si	-	0.005			
Ti	-	0.005			

Density	8.89 g/cm³	0.321 lb/in³
Melting Point	1454 °C	2650 °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	82 kN/mm²	11893 ksi
Modulus of Elasticity	207 kN/mm²	30000 ksi

Electrical Resistivity	
7.5 µΩ • cm	45 ohm • circ mil/ft

Thermal Conductivity	
86 W/m • °C	595 btu • in/ft² • h • °F

Properties			
Condition	Approx. tensile strength		Approx. operating temperature
	N/mm²	ksi	
Annealed	300 – 450	44 – 65	Tensile strength and elongation drop significantly at temperatures above 315 °C (600 °F). Service temperature is dependent on environment, load and size range.
Hard Drawn	600 – 800	87 – 116	

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM A479 ISO 15156-3 (NACE MR 0175)	Greater corrosion resistance than stainless steel 300 series Greater pitting resistance and uniform corrosion resistance to stress corrosion cracking than Stainless Steel 300 series Good weldability	Chemical processing Oil and gas refining Marine environments Pollution control equipment
C	-	0.03			
Si	-	1.00	Designations		
Mn	-	2.00	W.Nr. 1.4462 UNS S31803 2205 AWS 167		
P	-	0.035			
S	-	0.015			
Cr	21.00	23.00			
Ni	4.50	6.50			
Mo	2.50	3.50			
N	0.10	0.22			
Fe	BAL				

Density	7.8 g/cm³	0.282 lb/in³
Melting Point	1470 °C	2680 °F
Coefficient of Expansion	13.7 µm/m °C (21 – 100 °C)	7.61 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	76.9 kN/mm²	11154 ksi
Modulus of Elasticity	200 kN/mm²	29008 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Solution Annealed	< 1000	< 145	-200 to +300	-330 to +570
Spring Temper	1300 – 1900	189 – 276	-200 to +300	-330 to +570

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

SUPER DUPLEX

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ISO 15156-3 (NACE MR 0175)	Excellent resistance to stress corrosion cracking in chloride-bearing environments Excellent resistance to pitting and crevice corrosion High resistance to general corrosion	Oil and gas exploration Marine application
C	-	0.03	Designations W.Nr. 1.4410 UNS S32750 2507 AWS 169		
Mn	-	1.2			
Si	-	0.80			
S	-	0.015			
P	-	0.035			
Cr	24.00	26.0			
Ni	6.0	8.0			
Mo	3.0	4.5			
N	0.24	0.35			
Cu	-	0.5			
Fe	BAL				

Density	7.8 g/cm³	0.28 lb/in³
Melting Point	1350 °C	2460 °F
Coefficient of Expansion	13.5 µm/m °C (25 – 100 °C)	7.5 x 10 ⁻⁶ in/in °F (70 – 200 °F)
Modulus of Rigidity	77 kN/mm²	11000 ksi
Modulus of Elasticity	200 kN/mm²	29000 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Solution Annealed	< 1000	< 145	-200 to +300	-330 to +570
Spring Temper	1300 – 1900	189 – 276	-200 to +300	-330 to +570

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

NITRONIC^{xx} 50

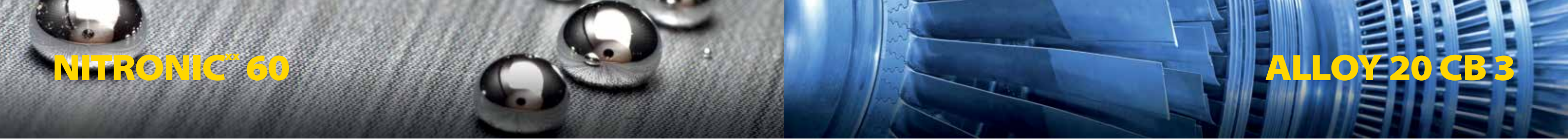
Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ISO 15156-3 (NACE MR0175)	Superior corrosion resistance to type 316 stainless steel	Components in processing environments like: - Marine - Petroleum - Petrochemical - Fertilizer - Pulp and Paper
C	-	0.06			
Si	-	1.00	Designations		
Mn	4.0	6.0	W.Nr. 1.3964 UNS S20910 AWS 165		
Ni	11.5	13.5			
Cr	20.5	23.5			
S	-	0.03			
P	-	0.04			
Mo	1.5	3.0			
N	0.20	0.40			
V	0.10	0.30			
Nb/Cb	0.10	0.30			
Fe	BAL				

Density	7.88 g/cm³	0.285 lb/in³
Melting Point	1415 – 1450 °C	2579 – 2642 °F
Coefficient of Expansion	16.2 µm/m °C (20 – 100 °C)	9.0 x 10 ⁻⁶ in/in °F (70 – 200 °F)
Modulus of Rigidity	78.9 kN/mm²	11444 ksi
Modulus of Elasticity	196.5 kN/mm²	28500 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Solution Annealed	700 – 1000	102 – 145	-200 to +300	-330 to +570
Spring Temper	1300 – 2200	189 – 319	-200 to +300	-330 to +570

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



NITRONIC™ 60

ALLOY 20 CB 3

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5848 ASTM A580	Anti galling Wear resistant	Valve Stems Pins Brushes Roller bearings Pump shafts and rings Thread inserts Fasteners
C	-	0.10			
Si	3.50	4.50	Designations		
Mn	7.00	9.00	UNS S21800 AWS 166		
Ni	8.00	9.00			
Cr	16.00	18.00			
S	-	0.03			
P	-	0.04			
Mo	-	0.75			
N	0.08	0.18			
Cu	-	0.75			
Fe	BAL				

Density	7.6 g/cm³	0.28 lb/in³
Melting Point	1375 °C	2500 °F
Coefficient of Expansion	15.8 µm/m °C (21 – 200 °C)	8.810 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	69 kN/mm²	10008 ksi
Modulus of Elasticity	181 kN/mm²	26200 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Solution Annealed	700 – 1000	102 – 145	-200 to +300	-330 to +570
Spring Temper	1300 – 1900	189 – 276	-200 to +300	-330 to +570

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

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ISO 15156-3 (NACE MR 0175)	Excellent resistance to hot sulphuric acid and many other aggressive environments that would attack ST/ST 316 Superior resistance to stress corrosion cracking in boiling 20 – 40% sulphuric acid	Chemical and allied industries Processing of synthetic rubber High-octane gasoline Solvents Pharmaceuticals Agrichemicals
C	-	0.07	Designations W.Nr. 2.4660 UNS N08020 AWS 130		
Si	-	1.00			
Mn	-	2.00			
P	-	0.045			
S	-	0.035			
Cr	19.00	21.00			
Mo	2.00	3.00			
Ni	32.00	38.00			
Cu	3.00	4.00			
Nb/Cb	8xC	1.00			
Fe	BAL				

Density	8.08 g/cm³	0.292 lb/in³
Melting Point	1425 °C	2600 °F
Coefficient of Expansion	14.69 µm/m °C (20 – 100 °C)	8.16 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	73.6 kN/mm²	10675 ksi
Modulus of Elasticity	193 kN/mm²	27993 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	250 – 530	480 – 990	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Solution Annealed	600 – 900	87 – 131	-200 to +300	-330 to +570
Spring Temper	1200 – 1800	174 – 261	-200 to +300	-330 to +570

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

STAINLESS STEEL 1.4310

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	BS EN 10088-3 DIN EN 10270-3	Good mechanical properties and corrosion resistance	Springs and high strength components
C	0.05	0.12			
Mn	-	2.00	Designations	Capable of high tensile strength following cold work	Engineered components
P	-	0.045			
S	-	0.015	W.Nr. 1.4310 UNS S30100 AWS 131	Magnetic following cold work	Chemical processing Electronic equipment
Si	-	2.00			
Cr	16.00	19.00			
Ni	6.00	9.50			
N	-	0.11			
Mo	-	0.80			
Fe	BAL				

Density	7.90 g/cm³	0.285 lb/in³
Melting Point	1420 °C	2590 °F
Coefficient of Expansion	17.6 µm/m °C (20 – 100 °C)	9.8 x 10 ⁻⁶ in/in °F (70 – 212°F)
Modulus of Rigidity	76 kN/mm²	11000 ksi
Modulus of Elasticity	190 kN/mm²	28000 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	250-400	480-750	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-200 to +300	-330 to +570
Spring Temper	1600 – 2200	189 – 319	-200 to +300	-330 to +570

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

STAINLESS STEEL 302

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	AMS 5688 ASTM A313 ASTM A580 BS 970 BS 2056	Good mechanical properties and corrosion resistance	Springs Engineered components Wire mesh Wire cloth Hose braiding
C	-	0.12			
Mn	-	2.00			
P	-	0.045			
S	-	0.03	Designations		
Si	-	1.00	W.Nr. 1.4310 UNS 30200 AWS 160		
Cr	17.00	19.00			
Ni	8.00	10.00			
Fe	BAL				

Density	8.0 g/cm³	0.289 lb/in³
Melting Point	1420 °C	2590 °F
Coefficient of Expansion	17.6 µm/m °C (20 – 100 °C)	9.8 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	70.3 kN/mm²	10196 ksi
Modulus of Elasticity	187.5 kN/mm²	27195 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-200 to +300	-330 to +570
Spring Temper	1300 – 2200	189 – 319	-200 to +300	-330 to +570

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

STAINLESS STEEL 304

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM A313 ASTM A580 BS 970 BS 2056	Good mechanical properties and corrosion resistance	Springs Engineered components Wire mesh Wire cloth Hose braiding
C	-	0.07			
Mn	-	2.00			
P	-	0.045			
S	-	0.030	Designations	W.Nr. 1.4301 W.Nr. 1.4307 UNS S30400 AWS 161	
Si	-	1.00			
Cr	17.50	19.50			
Ni	8.00	10.50			

Density	8.0 g/cm³	0.289 lb/in³
Melting Point	1454 °C	2650 °F
Coefficient of Expansion	18.2 µm/m °C (20 – 100 °C)	10.1 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	70.3 kN/mm²	10196 ksi
Modulus of Elasticity	187.5 kN/mm²	27195 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Solution Annealed	600 – 800	87 – 116	-200 to +300	-330 to +570
Spring Temper	1300 – 2200	189 – 319	-200 to +300	-330 to +570

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

STAINLESS STEEL 316

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM A313 ASTM A580 BS 970 BS 2056	Better corrosion resistance and non-magnetic properties than 302 & 304 stainless Better pitting and crevice corrosion resistance than 302 & 304 stainless	More suited to Marine, Food and Medical applications than 302 and 304 stainless Food processing Springs Engineered components Wire mesh Wire cloth Hose braiding
C	-	0.07			
Mn	-	2.00			
P	-	0.045	Designations		
S	-	0.03	W.Nr. 1.4401 W.Nr. 1.4404 UNS S31600 AWS 162		
Si	-	1.00			
Cr	16.00	18.50			
Ni	9.50	13.00			
Mo	2.00	2.50			

Density	8.0 g/cm³	0.289 lb/in³
Melting Point	1398 °C	2555 °F
Coefficient of Expansion	17.5 µm/m °C (20 – 100 °C)	9.7 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	70.3 kN/mm²	10196 ksi
Modulus of Elasticity	187.5 kN/mm²	27195 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-200 to +300	-330 to +570
Spring Temper	1300 – 2200	189 – 319	-200 to +300	-330 to +570

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

STAINLESS STEEL 316 LVM

Chemical Composition			Specifications	Key Features	Typical Applications	
Element	Min %	Max %	ASTM F138 BS 7252 Pt1 COMPOSITION D ISO 5832 - 1	Regarded as 'Medical Grade' stainless steel vacuum melted to achieve the extremely high levels of purity and 'cleanliness' required for surgical implants	Medical implants Machined parts	
C	-	0.03				
Si	-	1.00				
Mn	-	2.00	Designations	Good mechanical properties and corrosion resistance		
P	-	0.025	W.Nr. 1.4441 UNS S31673 AWS 163			Better pitting and crevice corrosion resistance than 302 and 304 stainless
S	-	0.010				
N	-	0.10				
Cr	17.00	19.00				
Mo	2.25	3.50				
Ni	13.00	15.00				
Cu	-	0.50				
Fe	BAL					

Density	8.0 g/cm³	0.289 lb/in³
Melting Point	1500 °C	2730 °F
Coefficient of Expansion	16.5 µm/m °C (20 – 100 °C)	9.2 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	70.3 kN/mm²	10196 ksi
Modulus of Elasticity	187.5 kN/mm²	27195 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-200 to +300	-330 to +570
Spring Temper	1300 – 2200	189 – 319	-200 to +300	-330 to +570

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

STAINLESS STEEL 316 Ti

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM A240 ISO 15156-3 (NACE MR0175) BS EN 10088-3	Better corrosion resistance at higher temperatures than 316 stainless	Chemical processing Springs Fasteners Thread inserts Wire mesh
C	-	0.08			
Si	-	1.00			
Mn	-	2.00	Designations		
P	-	0.045	W.Nr. 1.4571 UNS S31635 AWS 168		
S	-	0.03			
Cr	16.50	18.50			
Mo	2.00	2.50			
Ni	10.50	13.50			
Ti	5 x C	0.70			
Fe	BAL				

Density	7.9 g/cm³	0.285 lb/in³
Melting Point	1375 °C	2500 °F
Coefficient of Expansion	16.5 µm/m °C (21 – 100 °C)	9.11 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	74 kN/mm²	10730 ksi
Modulus of Elasticity	193 kN/mm²	27990 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	250	480	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm²	ksi	°C	°F
Annealed	600 – 750	87 – 109	-200 to +300	-330 to +570
Spring Temper	1300 – 1600	189 – 232	-200 to +300	-330 to +570

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

STAINLESS STEEL 321

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	ASTM A313 ASTM A240 ASTM A479 BS EN 10088-3:2014	Similar composition to 304 Stainless Steels but with addition of Titanium Good creep and oxidation resistance make this a cost effective material for a number of applications	Refinery Equipment Heat Exchangers Engineered components Food Processing Waste Treatment
C	-	0.08			
Mn	-	2.00			
P	-	0.04			
S	-	0.03	Designations		
Si	0.40	1.00	W.Nr. 1.4541 UNS S32100 AWS 133		
Cr	17.00	19.00			
Ni	9.50	12.00			
N	-	0.10			
Mo	-	0.50			
Ti	5 x C	0.70			
Fe	BAL				

Density	8.03 g/cm ³	0.29 lb/in ³
Melting Point	1370 °C	2500 °F
Coefficient of Expansion	16.6 µm/m °C (20 – 100 °C)	9.2 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	78 kN/mm ²	11300 ksi
Modulus of Elasticity	193 kN/mm ²	28000 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	450	840	1	Air

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-200 to +300	-330 to +570
Spring Temper	1300 – 2200	189 – 319	-200 to +300	-330 to +570

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

DTD 189A

Chemical Composition			Specifications	Key Features	Typical Applications
Element	Min %	Max %	DTD 189A	Corrosion resistant	Aircraft Locking wire General Locking wire
C	-	0.15	Designations AWS 164		
Si	0.20	-			
Mn	-	2.00			
Ni	7.00	10.00			
Cr	17.00	20.00			
Ni + Cr	25.00	-			
Ti or Nb/Cb	4 x C 8 x C	- -			
S	-	0.045			
P	-	0.045			
Fe	BAL				

Density	8.0 g/cm ³	0.289 lb/in ³
Melting Point	1398 °C	2550 °F
Coefficient of Expansion	17.5 µm/m °C (20 – 100 °C)	9.7 x 10 ⁻⁶ in/in °F (70 – 212 °F)
Modulus of Rigidity	70.3 kN/mm ²	10196 ksi
Modulus of Elasticity	187.5 kN/mm ²	27195 ksi

Properties				
Condition	Approx. tensile strength		Approx. operating temperature	
	N/mm ²	ksi	°C	°F
Annealed	600 – 800	87 – 116	-200 to +300	-330 to +570

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

80/20 Ni Cr Resistance Wire

45/55 Ni Cu Resistance Wire

Chemical Composition			Designations	Typical Applications
Element	Min %	Max %	W.Nr. 2.4869 UNS N06003 AWS 180	Heating elements in both domestic and industrial appliances and in control resistors
C	-	0.15		
Si	0.50	2.00		
Mn	-	1.00		
P	-	0.02		
S	-	0.015		
Cr	19.00	21.00		
Ni	75.00	-		
Al	-	0.30		
Cu	-	0.50		
Fe	-	1.00		

Density	8.31 g/cm ³	0.300 lb/in ³
Electrical Resistivity at 20 °C	108 microhm • cm	650 ohm • Circ • mil/ft
Maximum Operating Temperature	1200 °C 300 °C	2200 °F 572 °F
For use as a Heating Element For use in Hot Cutting, Fabrication – Line Bending		
Melting Point	1400 °C	2550 °F
Coefficient of Expansion	12.5 µm/m °C (20 – 100 °C)	7.0 x 10 ⁻⁶ in/in °F (70 – 212 °F)

Temperature-Resistance Factor (F) At:												
20 °C	100 °C	200 °C	300 °C	400 °C	500 °C	600 °C	700 °C	800 °C	900 °C	1000 °C	1100 °C	1200 °C
68 °F	212 °F	392 °F	572 °F	752 °F	932 °F	1112 °F	1292 °F	1472 °F	1652 °F	1832 °F	2012 °F	2192 °F
1.00	1.006	1.015	1.028	1.045	1.065	1.068	1.057	1.051	1.052	1.062	1.071	1.080

Chemical Composition			Designations	Typical Applications
Element	Min %	Max %	W.Nr. 2.0842 AWS 181	Power resistors, shunts, thermocouples and wire-wound precision resistors having operating temperatures up to 400 °C (750 °F)
C	-	0.10		
Si	-	0.50		
Mn	-	1.00		
Fe	-	1.00		
Cu	55.00 nominal			
Ni	BAL			

Density	8.89 g/cm ³	0.321 lb/in ³
Electrical Resistivity at 20 °C	49 microhm • cm	295 ohm • Circ • mil/ft
Maximum Operating Temperature	400 °C	750 °F
Melting Point	1270 °C	2320 °F
Coefficient of Expansion	14.7 µm/m °C (20 – 100 °C)	8.17 x 10 ⁻⁶ in/in °F (70 – 212 °F)

45/55 NiCu changes little in electrical resistance as temperature increases. It has a temperature-resistance factor of +0.00003/°C in the 20 – 100 °C range.

RW 41 Ultra High Strength Hot Cutting Wire

Key Features		Typical Applications
Exceptional strength at elevated temperatures and is the highest performing hot cutting wire we offer.		Production lines cutting foam polystyrene (EPS), thermal laminate materials etc. Excellent track record for working continuously and on oscillating cutting frames.
Density	8.25 g/cm ³	0.298 lb/in ³
Electrical Resistivity at 20 °C	131 microhm • cm	788 ohm • Circ • mil/ft
Maximum Operating Temperature	300 °C	572 °F
Melting Point	1345 °C	2450 °F
Coefficient of Expansion	13.6 µm/m °C (20 – 100 °C)	7.41 x 10 ⁻⁶ in/in °F (70 – 212 °F)

RW 118 / RW 122 / RW 70 High Strength Hot Cutting Wires

RW 118 Properties		
Density	8.18 g/cm ³	0.296 lb/in ³
Electrical Resistivity at 20 °C	118 microhm • cm	710 ohm • Circ • mil/ft
Maximum Operating Temperature	300 °C	572 °F
Melting Point	1370 °C	2500 °F
Coefficient of Expansion	12.7 µm/m °C (20 – 100 °C)	7.1 x 10 ⁻⁶ in/in °F (70 – 212 °F)

RW 122 Properties		
Density	8.28 g/cm ³	0.299 lb/in ²
Electrical Resistivity at 20 °C	122 microhm • cm	734 ohm • Circ • mil/ft
Maximum Operating Temperature	300 °C	572 °F
Melting Point	1430 °C	2600 °F
Coefficient of Expansion	12.6 µm/m °C (20 – 100 °C)	7 x 10 ⁻⁶ in/in °F (70 – 212 °F)

RW 70 Properties		
Density	8.00 g/cm ³	0.289 lb/in ²
Electrical Resistivity at 20 °C	70 microhm • cm	421 ohm • Circ • mil/ft
Maximum Operating Temperature	300 °C	572 °F
Melting Point	1375 °C	2500 °F
Coefficient of Expansion	17.6 µm/m °C (20 – 100 °C)	9.8 x 10 ⁻⁶ in/in °F (70 – 212 °F)

Alloy designation/specification summary

It may not be possible to fully release wire to some of the below specifications.
Please contact us for further information.

W.Nr	UNS No.	Material	AWS	AMS	ASTM	BS	Other	Page No.
1.3912	K93600	Nilo 36	090	-	-	-	-	59
1.3912	K93601	Nilo 36	090	-	-	-	-	59
1.3917	K94100	Nilo 42	091	-	F30	-	-	60
1.3922	K94800	Nilo 48	092	-	F30	-	-	61
1.3926	K94800	Nilo 48	092	-	F30	-	-	61
1.3927	K94800	Nilo 48	092	-	F30	-	-	61
1.3964	S20910	Nitronic 50	165	-	-	-	ISO 15156-3 (NACE MR 0175)	71
1.3981	K94610	Nilo K	094	-	F15	-	-	63
1.4301	S30400	Stainless Steel 304	161	-	A313 / A580	970 / 2056	-	76
1.4307	S30400	Stainless Steel 304	161	-	A313 / A580	970 / 2056	-	76
1.4310	S30200	Stainless Steel 302	160	5688	A313 / A580	970 / 2056	-	75
1.4401	S31600	Stainless Steel 316	162	-	A313 / A580	970 / 2056	-	77
1.4404	S31600	Stainless Steel 316	162	-	A313 / A580	970 / 2056	-	77
1.4410	S32750	Super Duplex	169	-	-	-	ISO 15156-3 (NACE MR 0175)	70
1.4441	S31673	Stainless Steel 316 LVM	163	-	F138	7252 Pt 1 Composition D	ISO 5832-1	78
1.4462	S31803	Duplex 2205	167	-	A479	-	ISO 15156-3 (NACE MR 0175)	69
1.4571	S31635	Stainless Steel 316 Ti	168	-	A240	EN 10088-3	ISO 15156-3 (NACE MR 0175)	79
1.4876	N08800	Incoloy 800	020	-	-	3075 NA 15 / 3076 NA 15	-	38
1.4944	S66286	Incoloy A-286	023	5731 / 5734 / 5737 / 5853	A453	HR 52 / HR 650	ISO 15156-3 (NACE MR 0175)	41
1.4958	N08811	Incoloy 800 HT	021	-	-	3076 NA 15H	-	39
1.4959	N08811	Incoloy 800 HT	021	-	-	3076 NA 15H	-	39
1.4980	S66286	Incoloy A-286	023	5731 / 5734 / 5737 / 5853	A453	HR 52 / HR 650	ISO 15156-3 (NACE MR 0175)	41
2.0842	-	45/55 Ni Cu Resistance Wire	181	-	-	-	-	83
2.1247	C17200	Beryllium Copper CB 101	140	-	B196 / B197	2873 / EN 12166	-	56
2.4050	N02270	Nickel 270	074	-	-	-	-	68
2.4060	N02200	Nickel 200	070	-	B160 / B162	3075 NA 11 / 3076 NA 11	-	64
2.4061	N02201	Nickel 201	071	-	B160 / B162	3076 NA 12	-	65
2.4061	N02205	Nickel 205	072	-	-	-	-	66
2.4066	N02200	Nickel 200	070	-	B160 / B162	3075 NA 11 / 3076 NA 11	-	64
2.4068	N02201	Nickel 201	071	-	B160 / B162	3076 NA 12	-	65
2.4110	-	Nickel 212	073	-	-	-	-	67
2.4360	N04400	Monel 400	040	4730	B164	3075 NA 13 / 3076 NA 13	ISO 15156-3 (NACE MR 0175) / DTD 204B / QQ-N-281	57
2.4361	N04400	Monel 400	040	4730	B164	3075 NA 13 / 3076 NA 13	ISO 15156-3 (NACE MR 0175) / DTD 204B / QQ-N-281	57
2.4375	N05500	Monel K-500	041	-	B865	3075 NA 18 / 3076 NA 18	ISO 15156-3 (NACE MR 0175) / QQ-N-286	58
2.4478	N14052	Nilo 52	093	-	F30	-	-	62
2.4600	N10675	Hastelloy B-3	051	-	B335 / B619	-	-	42

W.Nr	UNS No.	Material	AWS	AMS	ASTM	BS	Other	Page No.
2.4602	N06022	Hastelloy C-22	053	-	B574 / B575 / B619	-	ISO 15156-3 (NACE MR 0175)	44
2.4610	N06455	Hastelloy C-4	052	-	B574 / B575 / B619	-	-	43
2.4630	N06075	Nimonic 75	032	-	-	HR 5 / HR 504	-	34
2.4631	N07080	Nimonic 80A	031	-	B637	3076 NA 20 / HR 1 / HR 601	-	35
2.4632	N07090	Nimonic 90	030	5829	-	HR 501 / HR 502 / HR 503 / 3075 NA 19	ISO 15156-3 (NACE MR 0175) / NCK 207A	36
2.4646	N07214	Haynes 214	061	-	-	-	-	49
2.4654	N07001	Waspaloy	170	5544 / 5706 / 5708 / 5828	B637	-	-	54
2.4660	N08020	Alloy 20 CB 3	130	-	-	-	ISO 15156-3 (NACE MR 0175)	73
2.4665	N06002	Hastelloy X	057	5754 / 5798	B619	-	ISO 15156-3 (NACE MR 0175) / GE B50A463 / GE B50A655	47
2.4668	N07718	Inconel 718	013	5662 / 5663 / 5832 / 5962	B637	-	ISO 15156-3 (NACE MR 0175) / GE B50TF14/15 / GE B14H89	32
2.4669	N07750	Inconel X-750	014	5667 / 5671 / 5698 / 5699	B637	HR 505	ISO 15156-3 (NACE MR 0175) / GE B14H41	33
2.4675	N06200	Hastelloy C-2000	055	-	B574 / B575 / B619	-	-	46
2.4711	R30003	Phynox	100	5833 / 5834 / 5876	F1058	-	ISO 5832-7 / ISO 15156-3 (NACE MR 0175)	51
2.4711	R30008	Phynox	100	5833 / 5834 / 5876	F1058	-	ISO 5832-7 / ISO 15156-3 (NACE MR 0175)	51
2.4816	N06600	Inconel 600	010	5665 / 5687	B166	3075 NA 14 / 3076 NA 14	DTD 328A / QQ-W-390	28
2.4819	N10276	Hastelloy C-276	054	-	B574 / B575 / B619	-	ISO 15156-3 (NACE MR 0175)	45
2.4851	N06601	Inconel 601	011	-	B166	-	-	29
2.4856	N06625	Inconel 625	012	5666	B446	3076 NA 21	ISO15156-3 (NACE MR 0175)	31
2.4858	N08825	Incoloy 825	022	-	B425	3075 NA 16 / 3076 NA 16	ISO 15156-3 (NACE MR 0175)	40
2.4869	N06003	80/20 Ni Cr Resistance Wire	180	-	-	-	-	82
2.4951	N06075	Nimonic 75	032	-	-	HR 5 / HR 504	-	34
2.4952	N07080	Nimonic 80A	031	-	B637	3076 NA 20 / HR 1 / HR 601	-	35
2.4964	R30605	Haynes 25/L605	060	5796 / 5759	F90	HR 40	ISO 15156-3 (NACE MR 0175)	48
2.4969	N07090	Nimonic 90	030	5829	-	HR 501 / HR 502 / HR 503 / 3075 NA 19	ISO 15156-3 (NACE MR 0175) / NCK 207A	36
2.4973	N07041	Rene 41	120	5545 / 5713 / 5800 / 5712	-	-	GE C50T71	53
2.4999	R30035	MP35N	110	5844 / 5845	F562	-	ISO 15156-3 (NACE MR 0175) / ISO 5832-6	52
-	N07208	Haynes 282	062			-	-	50
-	-	DTD 189A	164			-	-	81
-	N09902	Ni-Span C-902	080	5225 / 5221	-	-	H261	55
-	S21800	Nitronic 60	166	5848	A580	-	-	71

Glossary of terms

Cold drawn
Reducing the cross-sectional area of a round wire diameter at ambient temperature.

Cold drawn - spring temper
A specific amount of reduction in cross-sectional area to achieve standard spring temper condition. Not a standard condition for all alloys.

Cold drawn - No. 1 temper
A specific amount of reduction in cross-sectional area to achieve standard No. 1 temper condition. Less than that of spring temper and not a standard condition for all alloys.

Cold drawn - special temper
A specific amount of reduction in cross-sectional area to achieve customer required mechanical properties different to spring temper or No.1 temper.

Hard drawn
An amount of reduction in cross-sectional area to increase mechanical properties to no defined standard.

Cold rolled flat wire
Round wire passed through top and bottom rollers at ambient temperature, resulting in an edge with a natural radius.

Cold rolled section
Round wire rolled on four or more surfaces at ambient temperature, to control width and thickness.

Coated
Surface coated with a dry lubricant (soap), generally applied to aid customers during auto coiling.

Clean
No surface coating applied onto the wire.

Annealed
Softened by heat treatment.

Age hardening
Increasing mechanical properties with heat treatment, usually on finished components.

Stress relieve
Heat treatment process carried out on finished components to remove internal stresses induced by forming. Not intended to affect mechanical properties.

Heat treatment – after forming
Standard heat treatments for finished components are stated in our tables as a guide only and resulting mechanical properties are typical values. Various mechanical properties are achievable through a combination of cold working and heat treatment, please contact us to discuss your specific requirements. We can carry out capability tests on samples to demonstrate our products ability to meet your specification after final heat treatment.

Tensile strength
The tensile strength ranges given are typical for each alloy for the specified standard condition of supply. Please be aware that as we manufacture these materials, tensile strength can be altered to suit customer requirements.

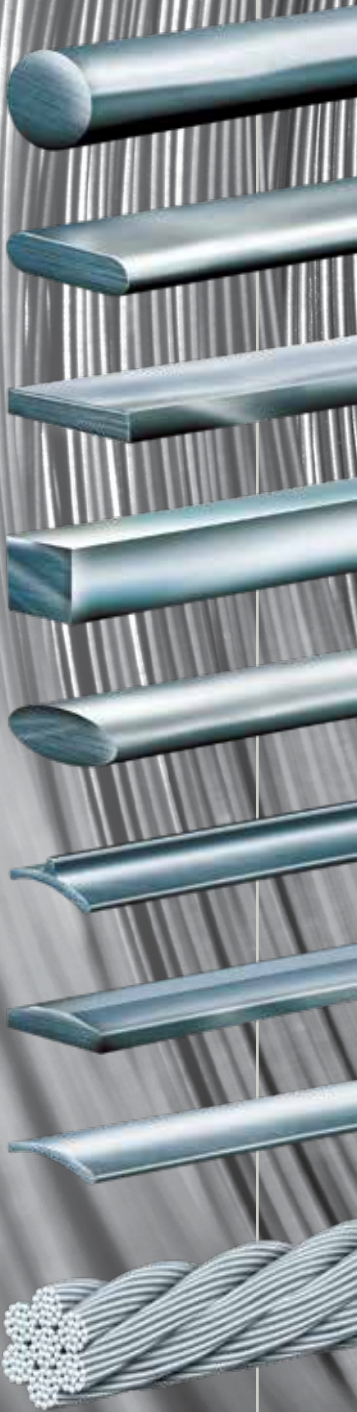
Please contact us to discuss if different mechanical properties are required.

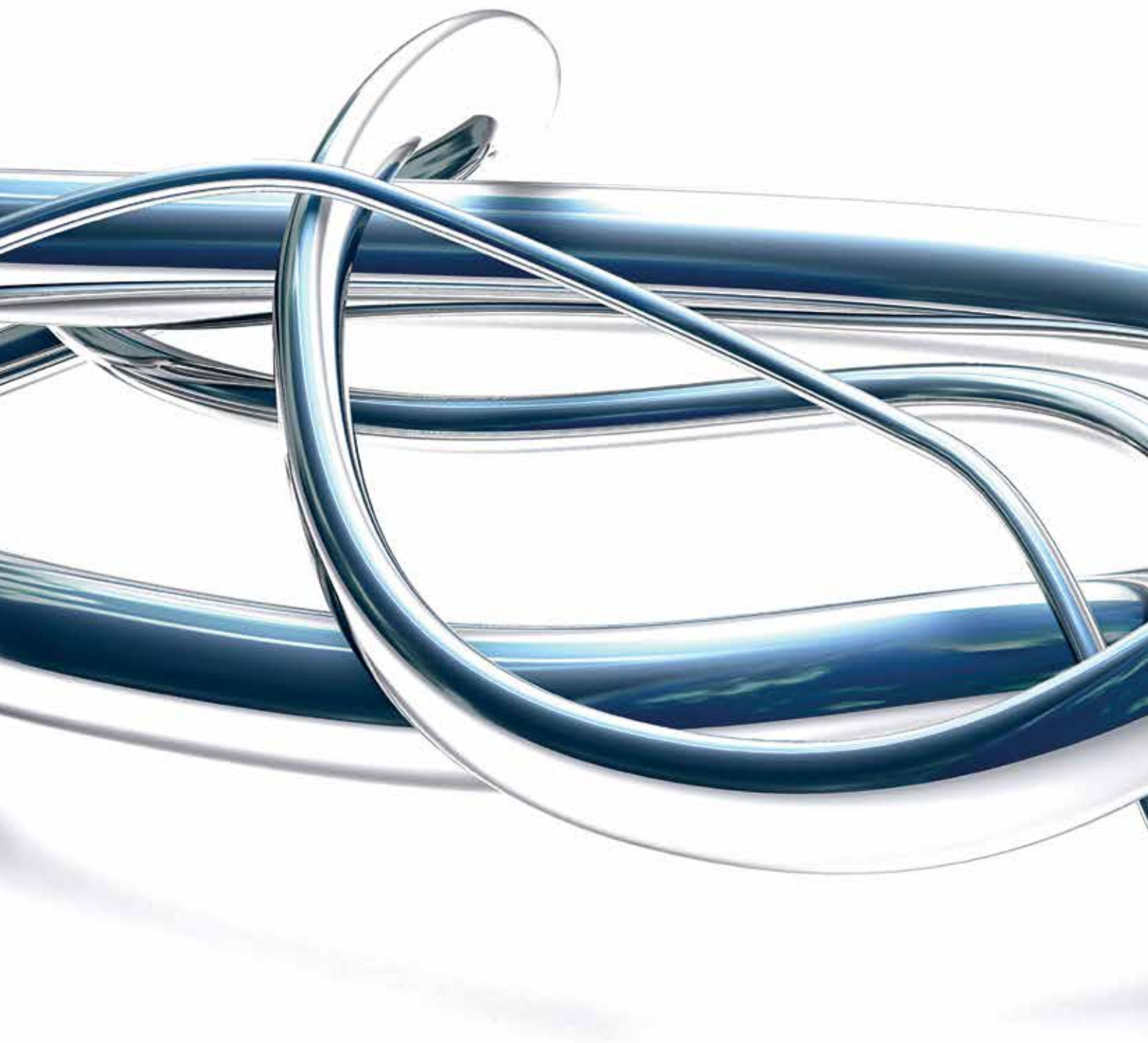


To the best of our knowledge, the information included in this literature is correct at the time of going to print. Due to continuous development, AWI reserve the right to change specifications without prior notice.

> Alloys quick search

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