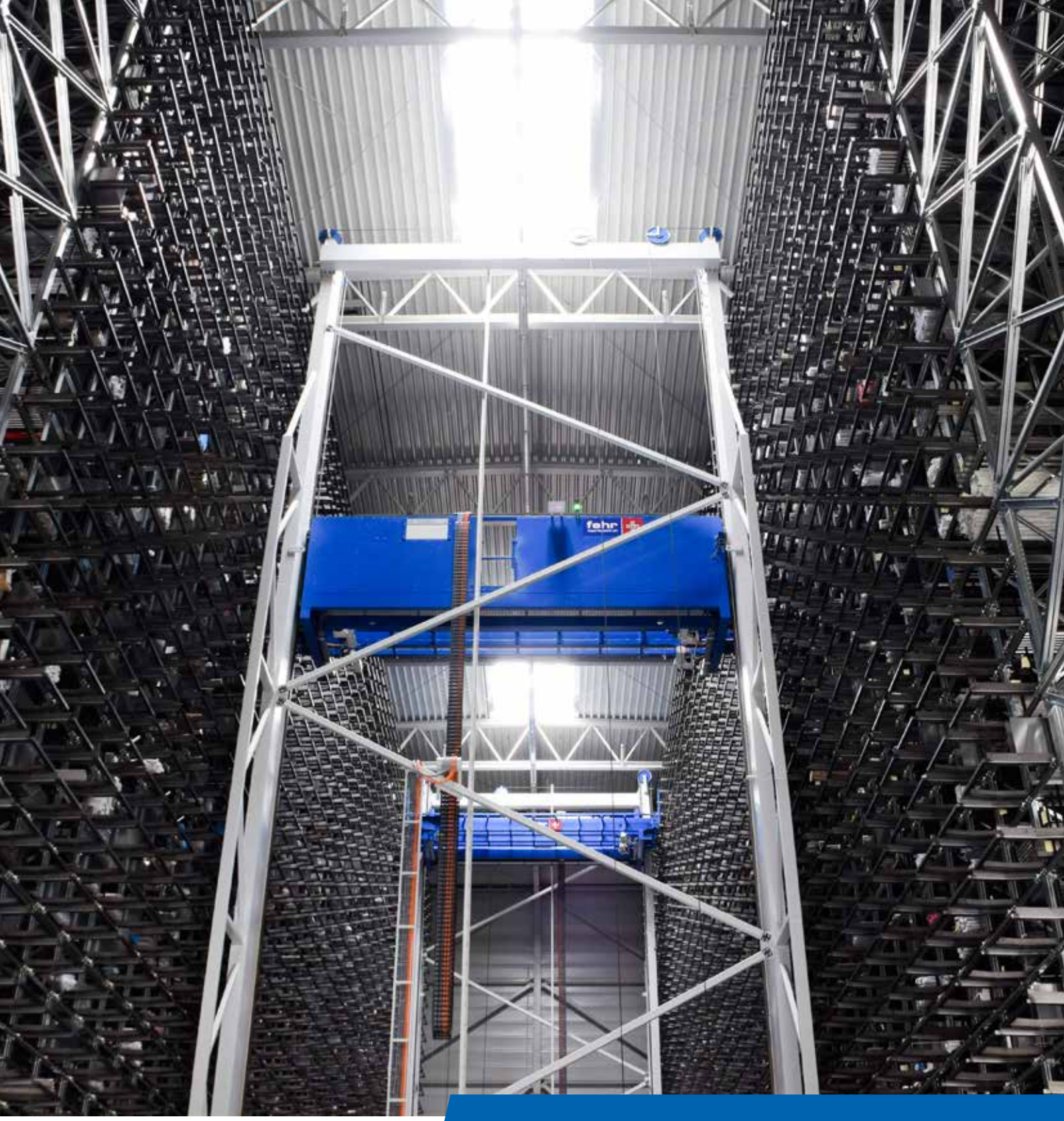


BIBUS METALS GROUP

Leading European and Asian Stockholder
for High Performance Alloys

BIBUS METALS
SUPPORTING YOUR SUCCESS

S+D METALS
SUPPORTING YOUR SUCCESS

„BIBUS METALS Group, for sure, is the right partner for the high-tech industries globally“ - Philipp Bachmann, CEO

„In 2017 when BIBUS HOLDING AG acquired the majority shares in S+D METALS GmbH the synergies and benefits that would result from the merger were clear to all. The combined stock ranges, specialist knowledge and experience in the field of high performance materials creates a unique offering to our customers.“

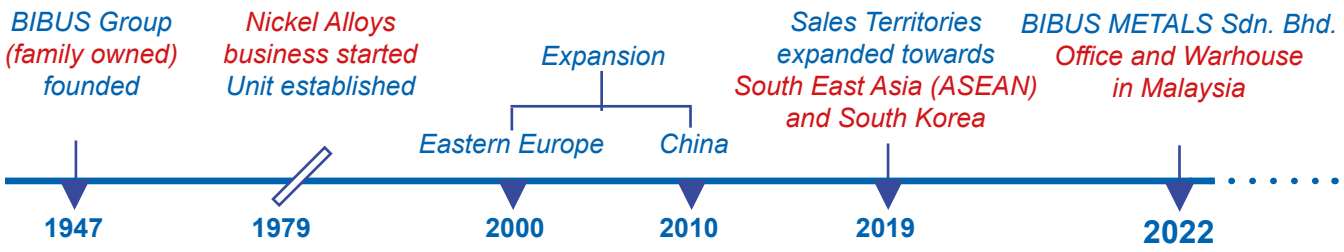
ABOUT BIBUS METALS GROUP

Leading stockists in EUROPE and ASIA for semi-finished & high performance materials:

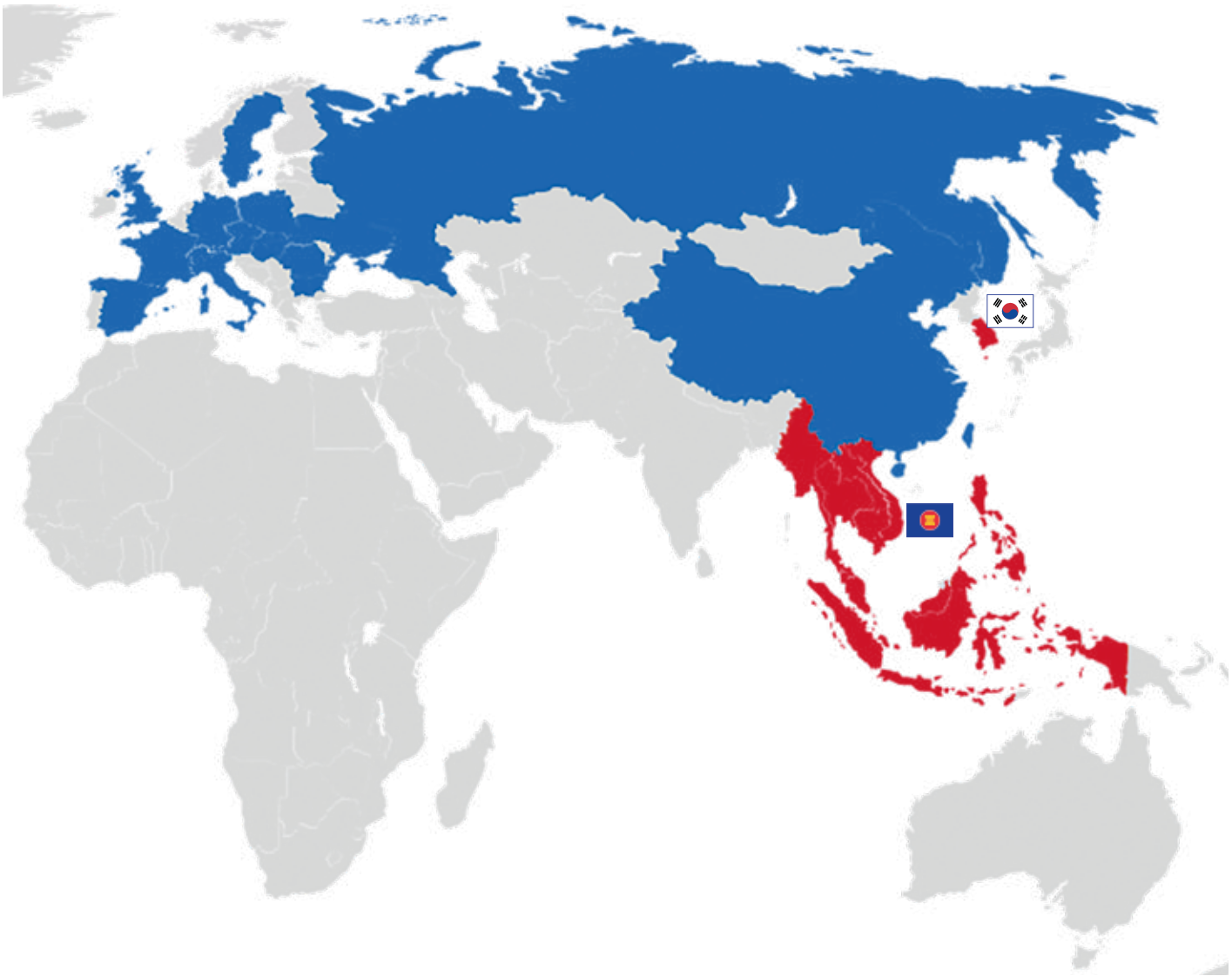
Titanium and Titanium Alloys

Nickel and Nickel Alloys

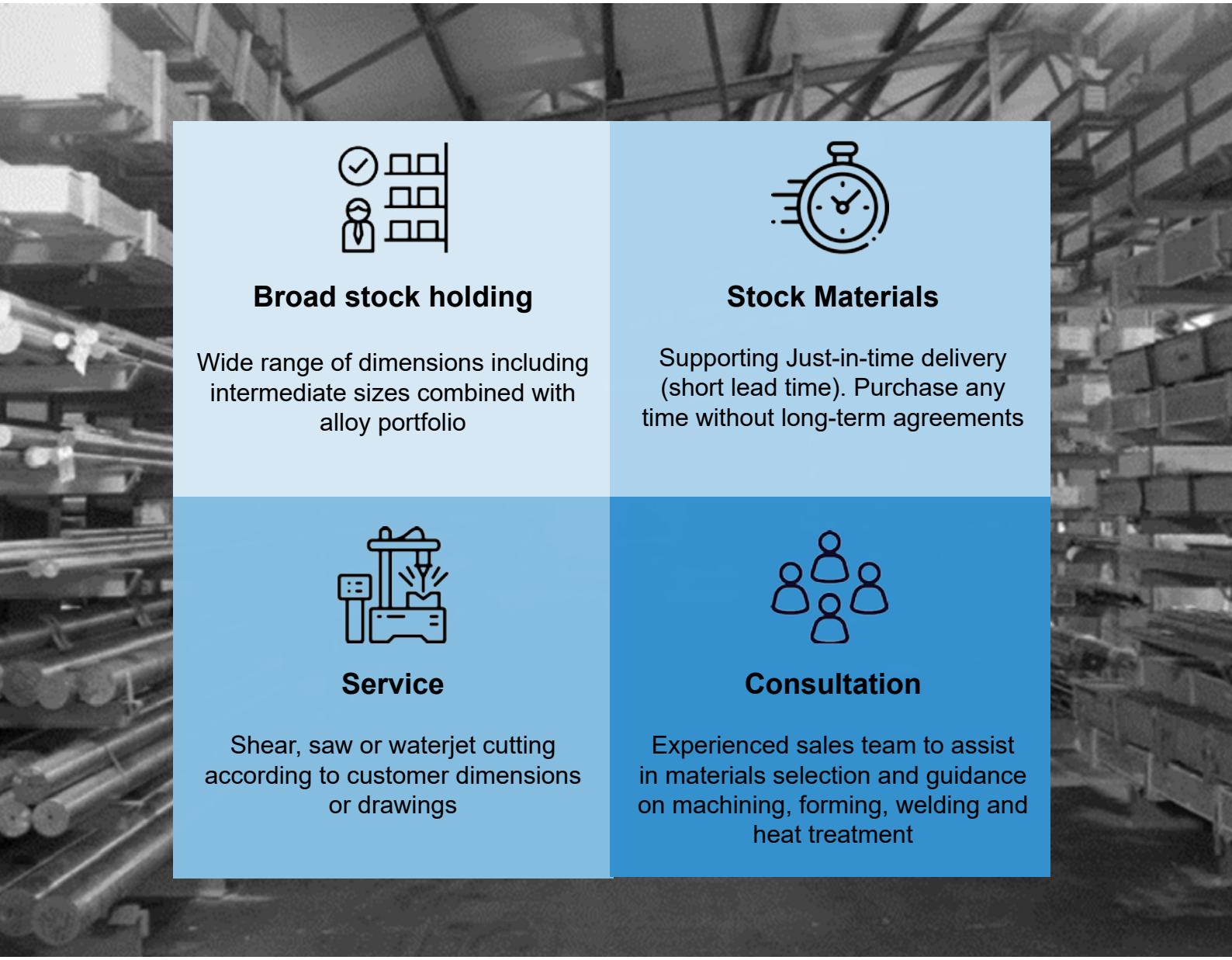
Stainless Steel for Aerospace



GLOBAL AND LOCAL



WHY OUR CUSTOMERS LOVE US



Broad stock holding

Wide range of dimensions including intermediate sizes combined with alloy portfolio

Stock Materials

Supporting Just-in-time delivery (short lead time). Purchase any time without long-term agreements

Service

Shear, saw or waterjet cutting according to customer dimensions or drawings

Consultation

Experienced sales team to assist in materials selection and guidance on machining, forming, welding and heat treatment

ISO 9001:2015, ISO 14001 & AS/EN 9120 certified and focused on providing world-class customer services

Stock Program Europe & Asia

ROUND BAR

ALLOY	GRADE	MAIN SPECIFICATION	SIZE RANGE (in random lengh of 2.00 - 6.00 m)
Nickel Alloy	Nilo® K/Kovar	ASTM F15	Dia. 10 mm - 30 mm
	Nilo® 36	SEW 385	Dia. 6 mm - 70 mm
	42	SEW 385	Dia. 8 mm - 30 mm
	75	BS HR5	Dia. 6.35 mm - 35 mm
	80A	ASTM B637	Dia. 10 mm - 80 mm
	90	SAE AMS 5829	Dia. 10.2 mm - 32 mm
	200/201	ASTM B160	Dia. 6 mm - 101.6 mm
	400	ASTM B164	Dia. 6 mm - 200 mm
	230	AMS 5891	Dia. 20 mm - 30.0 mm
	C-263	AMS 5886, MSRR 7035	Dia. 40 mm
	C-22	ASTM B574	Dia. 6.35 mm - 140.0 mm
	C-276	ASTM B574, AMS 5750	Dia. 6 mm - 101.6 mm
	600	ASTM B166, AMS 5665	Dia. 0.8 mm - 200 mm
	601	ASTM B166	Dia. 2 mm - 60 mm
	617	ASTM B166, AMS 5887	Dia. 12.7 mm - 152.4 mm
	625	ASTM B446, AMS 5666	Dia. 6 mm - 152.4 mm
	718	ASTM B637, AMS 5662, AMS 5663	Dia. 5.5 mm - 187.32 mm
	HX	ASTM B572, AMS 5754	Dia. 6.35 mm - 152.4 mm
	X-750	ASTM B637	Dia. 15 mm - 25.4 mm
	800H/HT	ASTM B408	Dia. 8 mm - 100 mm
	825	ASTM B425	Dia. 8 mm - 80 mm
	Waspaloy	AMS 5708, AMS 5709	Dia. 5.0 mm - 70 mm
	DS	BS 3076	Dia. 3 mm - 90 mm
Titanium Alloy	Titanium Gr. 2	ASTM B348, ASTM F67	Dia. 0.7 mm - 300 mm
	Titanium Gr. 4	ASTM B348, ASTM F67	Dia. 2 mm - 127 mm
	Titanium Gr. 5	AMS 4928, ABS 5453	Dia. 1 mm - 304.8 mm
	Titanium Gr. 5 Eli	ASTM F136, ISO 5832-3	Dia. 1 mm - 100 mm
	Titanium 6Al7Nb	ASTM F1295, ISO 5832-11	Dia. 5 mm - 17 mm
Cobalt Alloy	L-605	AMS 5759	Dia. 16 mm - 50.8 mm
	188	AMS 5772	Dia. 20.0 mm - 40.0 mm
	MP159	AMS 5842	Dia. 6.8 mm - 35.3 mm
	MP35N	AMS 5844	Dia. 6.8 mm - 38.6 mm
Stainless Steel	13-8Mo	AMS 5629 Cond. A & H 1050	Dia. 10 mm - 254 mm
	15-5PH	AMS 5659 Cond. A & H 1025	Dia. 6 mm - 250 mm
	17-4PH	AMS 5622, AMS 5643 Cond. A & H 1025	Dia. 6 mm - 250 mm
	A-286	AMS 5731, AMS 5732, AMS 5737, AMS 5853	Dia. 4.7 mm - 120 mm
	4330M	AMS 6411	Dia. 40 mm - 100 mm
	410	AMS 5613, ASTM A276	Dia. 20 mm - 70 mm
	440C	AMS 5630	Dia. 9.53 mm
	Custom 465	AMS 5936, ASTM F899	Dia. 6.0 mm - 47 mm
	1.4044.6	SAE 51431	Dia. 12 mm - 120 mm
	AISI 347	AMS 5646	Dia. 8 mm - 80 mm

Stock Program Europe & Asia

SHEET/PLATE

ALLOY	GRADE	MAIN SPECIFICATION	SIZE RANGE (depending on stock and grades, max. width 2400 mm and max. length 6000 mm)
Nickel Alloy	Nilo® 36	ASTM F1684-06	Thk. 12.7 mm - 50 mm
	75	BS HR203	Thk. 1.5 mm - 12 mm
	90	BS HR202	Thk. 1.6 mm - 3.56 mm
	200/201	ASTM B162	Thk. 0.5 mm - 40 mm
	330	ASTM B536	Thk. 2 mm - 25 mm
	400	ASTM B127	Thk. 0.5 mm - 6 mm
	C-22	ASTM B575	Thk. 1.5 mm - 25.4 mm
	C-276	ASTM B575	Thk. 0.5 mm - 6 mm
	600	ASTM B168, ASTM B164	Thk. 0.4 mm - 25 mm
	601	ASTM B168	Thk. 0.5 mm - 12 mm
	L-605	AMS 5537	Thk. 0.4 mm - 4.76 mm
	617	ASTM B168, AMS 5889	Thk. 0.86 mm - 25.4 mm
	625	ASTM B443, AMS 5599	Thk. 0.4 mm - 38.1 mm
	625LCF	ASTM B443	Thk. 0.5 mm - 2 mm
	626	ASTM B443	Thk. 0.5 mm - 2 mm
	718	ASTM B670, AMS 5596	Thk. 0.5 mm - 50.8 mm
	HX	ASTM B435, AMS 5536	Thk. 0.5 mm - 6.35 mm
	800H/HT	ASTM B409	Thk. 0.5 mm - 30 mm
	825	ASTM B424	Thk. 0.4 mm - 5 mm
	WASPALOY	AMS 5544	Thk. 0.4 mm - 12.7 mm
Titanium Alloy	Titanium Gr. 1	ASTM B265, ASTM F67	Thk. 0.5 mm - 30 mm
	Titanium Gr. 2	ASTM B265	Thk. 0.5 mm - 63.5 mm
	Titanium Gr. 3	AMS 4900	Thk. 0.635 mm
	Titanium Gr. 4	ASTM B265	Thk. 0.5 mm - 3 mm
	Titanium Gr. 5	AMS 4911	Thk. 0.4 mm - 155 mm
	Titanium Gr. 5 ELI	ASTM F136, ISO 5832-3	Thk. 0.6 mm - 10 mm
Stainless Steel	Main 17-7PH	AMS 5528	Thk. 0.6 mm - 1.27 mm

STRIP IN COIL

ALLOY	GRADE	MAIN SPECIFICATION	SIZE RANGE
Nickel Alloy	Nilo® 36	BS HR202	Thk. 0.2 mm - 3 mm
	625	ASTM B443	Thk. 0.152 mm - 0.3 mm

Stock Program Europe & Asia

SHEET IN COIL

ALLOY	GRADE	MAIN SPECIFICATION	SIZE RANGE
Nickel Alloy	201	ASTM B162	Thk. 0.5 mm - 1.5 mm
	625	AMS 5599, AMS 5879	Thk. 0.5 mm - 2 mm
Titanium Alloy	Titanium Gr. 1	ASTM B265, ASTM F67	Thk. 0.3 mm - 3 mm
	Titanium Gr. 2	ASTM B265, ASTM F67	Thk. 0.5 mm - 3 mm
	KS 1,2 ASN	based on ASTM B338	Thk. 0.7 mm - 1.5 mm

TUBE/PIPE

ALLOY	GRADE	MAIN SPECIFICATION	SIZE RANGE (in random length of 2.00 - 6.00 m)
Nickel Alloy	C-22	ASTM B162	Dia. 5 mm - 219.0 mm
	200/201	ASTM B161	Dia. 13.7 mm - 219.0 mm
	400	ASTM B165	Dia. 10 mm - 114.3 mm
	600	ASTM B167	Dia. 5 mm - 219.0 mm
	601	ASTM B167	Dia. 6 mm - 88.9 mm
	625	ASTM B444	Dia. 6 mm - 88.9 mm
	690	ASTM B167	Dia. 8 mm
	800HT	ASTM B407	Dia. 21.3 mm - 114.3 mm
	825	ASTM B423	Dia. 6 mm - 88.9 mm
Titanium Alloy	Titanium Gr. 2	ASTM B338	Dia. 5 mm - 219.0 mm

WIRE

ALLOY	GRADE	MAIN SPECIFICATION	SIZE RANGE
Nickel Alloy	90	BS HR501-503, SAE AMS 5829, cold drawn	Dia. 1.4 mm - 5 mm
Titanium Alloy	Titanium Gr. 3	ASTM B348, ASTM B863	Dia. 1.5 mm - 5 mm
	Titanium Gr. 4	ASTM B863, ASTM B348, ASTM F67	Dia. 2 mm - 16 mm
	Titanium Gr. 5	AMS 4967	Dia. 4.1 mm - 8.1 mm
	Ti-45Cb	AMS 4982	Dia. 2.5 mm - 10 mm
Stainless Steel	17-7PH	AMS 5678	Dia. 0.8 mm - 2.28 mm

Please contact your sales representative to inquire about other grades, sizes, specification, or forms of material upon request.

Subject to sales and change of product range.

AEROSPACE INDUSTRY

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

HIGH PERFORMANCE ALLOYS

The wide range of applications found in the aerospace industry calls for a wide range of alloys to meet the differing operating environments. Applications range from landing gear systems where high strength and toughness are critical, to materials used in the hot section of the aero engine such as combustor chambers and exhaust systems where high temperature strength and resistance to oxidation are required. Materials with high creep strength are required for high temperature fasteners and corrosion and oxidation resistance are also key requirements for this application as well as for turbine casings, rings and seals.

BIBUS METALS Groups extensive stock portfolio includes nickel-based, cobalt-based and titanium alloys and precipitation hardened steels which are used in these critical applications and we hope to introduce you to just a few key grades here. For more information please contact us via info@bibusmetals.com.

ALLOY PROPERTIES

	Composition (%)	Key attributes	Application
Alloy 75 N06675/2.4951	76Ni – 20Cr – 4Fe	Good high temperature strength and outstanding oxidation resistance	Casings, rings and seals
Alloy 80A N07080/2.4952	76Ni – 19.5Cr – 3Fe – 1.4Al – 2.4Ti	Excellent high temperature strength for service at temperatures up to ~815 °C	Fasteners, casings, rings and seals
Alloy 90 N07090/2.4632	60Ni–19.5Cr – 16Co – 10Mo – 1.5Al – 2.5Ti	Excellent creep resistance and cyclic oxidation resistance for service up to ~ 920 °C	Fasteners, turbine blades and vanes
Alloy 263 N07263/2.4650	51Ni – 20Cr – 20Co – 5.8Mo – 0.5Al – 2.2Ti	Excellent strength, ductility and corrosion resistance to 850 °C	Combustors, ducting, exhaust systems
Alloy 625 N06625/2.4856	61Ni – 21.5Cr – 9Mo – 3.6Nb – 2.5Fe	Resistant to corrosive environments and high strength from cryogenic to 815 °C.	Shroud rings, expansion joints and exhausts
Alloy 617 N06617/2.4663	52Ni –22Cr–1.5Fe – 9.5Mo–12.5Co–1.2Al	Exceptional high temperature strength and oxidation resistance up to 980 ºC	Combustion cans, liners and transition ducts
Alloy 718 N07718/2.4668	54Ni – 18Cr – 18.5Co – 3Mo – 5Nb	Combines high strength at temperatures up to 700 °C with excellent corrosion resistance.	Shafts, fasteners, pylon components
Alloy HX N06002/2.4665	47Ni – 22Cr – 18Fe – 1.5Co – 9.0Mo	Excellent strength and oxidation resistance up to 1200 °C	Casings, rings and seals, sheet fabrications
Alloy 230 N06230	57Ni – 22Cr – 14W – 5Co – 3Fe	Excellent high temperature strength and oxidation resistance up to 1150 ºC	Combustion cans, transition ducts
Alloy L605 R30605	50Co – 20.5Cr – 15W – 10Ni – 3Fe – 1.5Mn	Good oxidation resistance up to 980 ºC and good resistance to wear and galling	Rings, blades and combustion chambers
Alloy 188 R30188	38Co – 22Ni – 22Cr – 14W – 3Fe – 1.2Mn	High temperature strength, good oxidation and sulphidation resistance up to 1090 ºC	Combustors, liners and transition ducts
Ti6-4 (Gd5) R56400/3.7164	Ti – 6Al – 4V	High strength-to-weight ratio used up to a maximum temperature of ~ 500 ºC	Blades and vanes in the compressor sector
17-4 PH S17400/1.4542	17Cr – 4Ni – 4Cu – Bal Fe	Capable of achieving high toughness and maintaining high strength up to 316 ºC	Landing gear locking and retraction systems
15-5 PH S15500/1.4545	15Cr – 5Ni – 4Cu – Bal Fe	As 17-4PH but with enhanced toughness, ductility and corrosion resistance.	Landing gear main fitting, actuators, lock pins

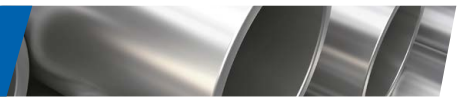
Approx maximum operating temperatures depending on load and environmental conditions.

SPACE & SATELLITES

www.sd-metals.com

S+D METALS
SUPPORTING YOUR SUCCESS

HIGH PERFORMANCE ALLOYS



Even today, nickel-based alloys developed decades ago are proving essential in space applications and enabling humanity to grow beyond the boundaries of earth. From cutting edge rocket engineering to precision components in satellites, antenna and radio telescopes the unique properties of titanium, nickel-based alloys and precipitation hardened steel grades can provide solutions to the most challenging engineering questions.

The high strength-to-weight ratio of titanium alloys allows for considerable weight savings to be made – essential for maximising payload capacity. Precipitation hardened stainless steels offer varied combinations of high strength, hardness, excellent corrosion resistance and ease of fabrication making them highly versatile for a range of machined components. For modern rocket engines high temperature high strength materials are required but they must also be able to withstand the cryogenic temperatures associated with the liquid oxygen fuel systems. Nickel-based alloys can be utilised at both ends of the broad temperature ranges found in the rocket engine system from fuel injectors to exhaust systems and many applications in between.

Our extensive stock portfolio includes nickel-based, cobalt-based and titanium alloys and precipitation hardened steels which are used in these critical applications and we hope to introduce you to just a few key grades here.

ALLOY PROPERTIES

	Specifications	Key attributes	Application
ALLOY 625 **N06625** **2.4856**	Bar: AMS 5666, ASTM B446 Sheet/plate: AMS 5599, 5879	A Ni-Cr-Mo alloy with good oxidation resistance and high strength from cryogenic temperatures to 815 °C.	Fuel injectors, bellows, ducting and exhaust systems
ALLOY 718 **N07718** **2.4668**	Bar: AMS 5662, AMS5663, ASTM B637 Sheet/plate:AMS 5596, ASTM B670	Combines high strength at temperatures up to 700 °C with excellent corrosion resistance.	Thrust chamber components, outer casing, turbopump components
ALLOY X **N06002** **2.4665**	Bar: AMS 5754, ASTM B572	Excellent strength and oxidation resistance up to 1200 °C	Engine manifold, rings and seals
ALLOY L605 **R30605**	Bar: AMS 5759, DMD415-22, ASTM F90	A high strength cobalt-based alloy with good oxidation resistance at temperatures up to 980 ºC	Power system technologies
ALLOY 36 **K93603** **1.3912**	Bar: ASTM F-1684 Sheet/plate: ASTM F1684	A binary iron-nickel (36% Ni) alloy which has a very low coefficient of thermal expansion.	Satellite, antenna and telescope components
Ti-6-4 (Gd5) **R56400** **3.7164**	Bar: AMS 4928, ABS 5453 Sheet/plate: AMS 4911, ASTM B265, ABS 5326C, ABS 5125A	High strength-to-weight ratio used up to a maximum temperature of 500 ºC	Rocket casing, blades and casing for propellant turbo pump
17-4PH **S17400** **1.4548**	Bar: AMS 5622, AMS 5643	A highly versatile grade offering high strength and good corrosion resistance	Rocket wing, tail and structural parts, motor casing, turbo pump assembly impeller, shafts and fasteners
15-5PH **S15500** **1.4545**	Bar: AMS 5659	Very similar to its predecessor (17-4PH) but with enhanced toughness and ductility	
13-8Mo **S13800** **1.4534**	Bar: AMS 5629	Good resistance to stress corrosion cracking combined with high level mechanical properties	Rocket engine mounts, hold down clamps and fasteners

Approximate maximum operating temperatures depending on load and environmental conditions.

MEDICAL APPLICATIONS

S+D METALS
SUPPORTING YOUR SUCCESS

ALLOYS FOR DENTAL AND MEDICAL APPLICATIONS

Titanium is a natural choice for dental and medical implant applications as it is considered non-toxic and biocompatibility, immune to corrosion by the fluids in the body and has a high strength-to-weight ratio and good fatigue properties. Titanium is also non-ferromagnetic meaning that people with titanium implants can still use magnetic medical devices such as MRIs.

The use of titanium and its alloys for dental and medical implants and instruments began in the 1940s. Dental devices such as implants, bridges, crowns and prosthesis components such as screws are made of the commercially pure (CP) **Titanium grades 1, 2 and 4**. The CP grades have good strength and corrosion resistance and are highly formable. Titanium grade 4 is the strongest of the unalloyed grades. Dental implants that interface with the bone of the skull or jaw and facial prosthesis specifically require CP titanium grades. Special stainless steels such as **316LVM** are also used for bone screws and some dental implants.

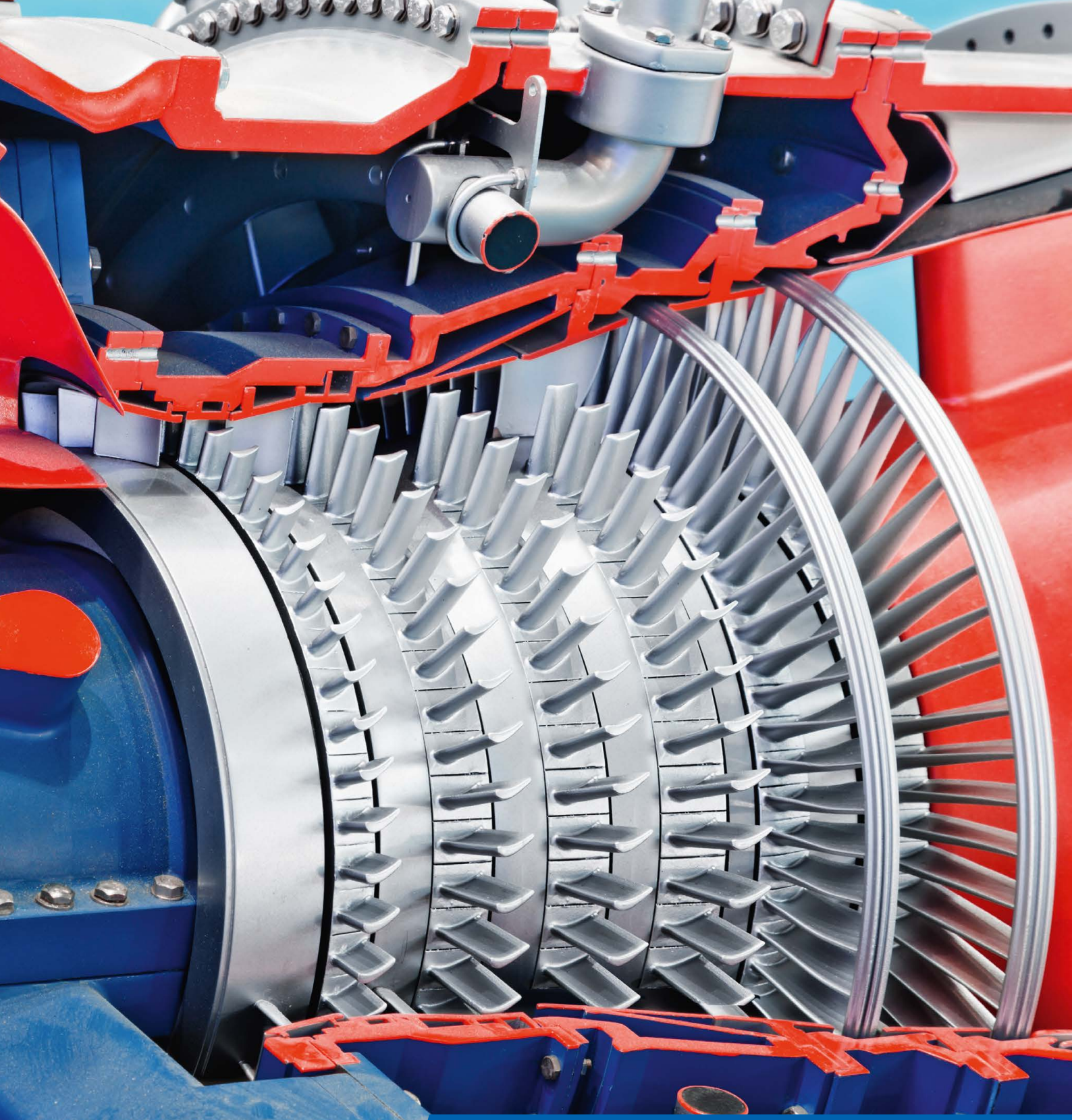
The use of titanium in hip and knees replacements is well known and demand continues to increase as people are more physically active in later life. Complex reconstructive surgeries following serious road traffic and other accidents is possible due to the high strength and biocompatibility of titanium and its alloys. **Ti-6Al-4V (Gr5)** and **Ti-6Al-4V ELI (Gr23)** which is a higher purity grade of Ti-6Al-4V with lower oxygen, carbon and iron contents for improved ductility and fracture resistance are widely used for medical implants. Another grade routinely used in these applications is **Ti-6Al-7Nb** where niobium provides strength comparable to Ti-6Al-4V ELI but with improved biocompatibility. These grades are used in the medical device industry for orthopaedic applications such as hip and knee joint replacement systems, fracture fixation plates and screws and spinal devices and fixation systems. They are also used for external prostheses such as artificial limbs and both temporary and long-term external fixations and orthotic callipers due to their high strength-to-weight ratio and toughness.

Titanium is non-magnetic and is regularly used in cardiovascular devices for pacemaker cases, lead wires and for vascular stents. Titanium can be anodised to produce a non-reflective surface which is a useful characteristic for use in surgical instruments as it prevents glare under operating lights. It is durable and can withstand repeated sterilisation treatment without degrading the surface condition and retaining the sharp edge.

The unique properties of titanium and its alloys will allow for future development of bioactive implants, prostheses and instrumentation

ALLOY PROPERTIES

	Composition (%)	Key attributes
Titanium Gr 1 3.7025	Commercially pure	The CP titanium grades have excellent corrosion resistance combined with good ductility and are highly formable. They find application as dental implants, bridges, crowns, orthodontic anchors and screws. They are also used for maxillofacial and craniofacial implants and have allowed for unprecedented advances in reconstructive surgery
Titanium Gr 2 3.7035	Commercially pure	
Titanium Gr 4 3.7065	Commercially pure	
Titanium Gr 5 (Ti-6Al-4V) 3.7165	90Ti – 6Al – 4V	High strength and fatigue resistance with excellent corrosion resistance
Titanium Gr 23 (Ti-6Al-4V ELI)	90Ti – 6Al – 4V – 0.08O – 0.25Fe	Tight control of interstitial elements C, O and N – high purity for maximum biocompatibility and improved ductility and toughness
Titanium 6Al-7Nb	87Ti – 6Al – 7Nb	The replacement of V with Nb provides strength comparable strength to Ti-6-4ELI with improved biocompatibility
316LVM 1.4441	18Cr – 14Ni – 3Mo – Fe bal	Low C and vacuum melted to achieve high levels of purity, cleanliness and superior surface finish. Excellent resistance to corrosion.



LAND-BASED GAS TURBINES

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

USES OF HIGH TEMPERATURE ALLOYS

Materials used in the hot section of gas turbines are subject to very high temperatures and require high strength and excellent creep resistance as well as oxidation and corrosion resistance. Nickel-based and cobalt-based superalloys are the most used materials in gas turbines because of their high strength, creep properties and high temperature corrosion resistance.

The cobalt-based grades **Alloy L-605** and **Alloy 188** find application in the hot section of the turbine and combustion chamber liners and ducts. **Alloy L-605** has high strength and is resistant to oxidation and scaling at temperatures up to 980 ºC. This grade also has good wear and galling properties. **Alloy 188** has excellent high temperature strength and oxidation at temperatures up to approximately 1090 ºC and is also particularly resistant to sulphidation.

The nickel-based grades **Alloy 617, Alloy HX and Alloy 263** have high strength, excellent high temperature corrosion resistance and are highly formable making them especially suitable for casings and sheet fabrications such as combustors and ducting. In very high temperature operating environments **Alloy 230** with its exceptional strength and long-term resistance to oxidation at temperatures up to 1150 ºC can be used.

Materials with high creep strength are required for high temperature fasteners and **Alloys 80A and 90** are often used in these applications. These grades have good resistance to corrosion and oxidation combined with excellent high temperature mechanical properties and creep resistance and can be used up to 815°C-920°C. These alloys along with **Alloy 75** also find application in the turbine casing, rings and seals. For more information please contact us via info@bibusmetals.com.

ALLOY PROPERTIES

	Composition (%)	Key attributes	Application
Alloy 75 N06075 2.4951	76Ni – 20Cr – 4Fe	Moderate high temperature strength and good oxidation resistance	Casings, rings and seals
Alloy 80A N07080 2.4952	76Ni – 19.5Cr – 3Fe – 1.4Al – 2.4Ti	Highly alloyed, age hardenable alloy with excellent high temperature strength for service at temperatures up to ~815 °C	High temperature fasteners, casings, rings and seals
Alloy 90 N07090 2.4632	60Ni – 19.5Cr – 16Co – 10Mo – 1.5Al – 2.5Ti	Excellent creep resistance and cyclic oxidation resistance for service up to ~920 °C	High temperature fasteners, turbine blades and vanes
Alloy 263 N07263 2.4650	51Ni – 20Cr – 20Co – 5.8Mo – 0.5Al – 2.2Ti	Excellent strength, ductility and corrosion resistance to 850 °C	Combustors, ducting, exhaust systems
Alloy 617 N06617 2.4663	52Ni – 22Cr – 1.5Fe – 9.5Mo – 12.5Co – 1.2Al	Exceptional high temperature strength, stability and oxidation resistance at temperatures up to 980 ºC	Combustion cans, liners and transition ducts
Alloy HX N06002 2.4665	47Ni – 22Cr – 18Fe – 1.5Co – 9.0Mo	Excellent strength and oxidation resistance up to 1200 °C	Casings, rings and seals, sheet fabrications
Alloy 230 N06230 2.4733	57Ni – 22Cr – 14W – 5Co – 3Fe	Excellent high temperature strength and oxidation resistance at temperatures up to 1150 ºC	Combustion cans and transition ducts
Alloy L-605 R30605 2.4964	50Co – 20.5Cr – 15W – 10Ni – 3Fe – 1.5Mn	A high strength cobalt-based alloy with good oxidation resistance at temperatures up to 980 ºC and good resistance to wear and galling	Rings, blades and combustion chamber parts, bearings
Alloy 188 R30188 2.4683	38Co – 22Ni – 22Cr – 14W – 3Fe – 1.2Mn	A cobalt-based alloy with good high temperature strength and good oxidation and sulphidation resistance up to 1090 ºC	Gas turbine combustors, liners and transition ducts

Approx maximum operating temperatures depending on load and environmental conditions.

AUTOMOTIVE INDUSTRY

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

APPLICATIONS OF NICKEL ALLOY

High performance nickel alloys are used widely in automotive applications from manifolds and exhaust pipes to high temperature fasteners. The drive for more fuel-efficient engines and the associated increases in operating temperatures is pushing designers to look beyond traditional steel grades. Nickel alloys which can offer high temperature strength, resistance to thermal fatigue, hot salt corrosion and stress corrosion cracking resistance as well as resistance to the hot combustion gases are the solution. Here we look at just some of the automotive alloys and their application.

Flexible couplings and bellows must resist high temperatures, fatigue, corrosion by road salts and offer a long life – a combination of factors that is beyond stainless steels. **Alloy 625 LCF/625HP** is the premier material for use in flexible couplings in the automotive industry. Thanks to the high nickel content the alloy has excellent resistance to hot salt stress corrosion cracking and the chromium and molybdenum additions provide a high level of pitting and crevice corrosion resistance. Combined with excellent fatigue resistance – critical to the endurance of flexible coupling bellows and its deep drawing capability this alloy is an ideal candidate for automotive exhaust systems.

Alloys 800 and 601 find application in exhaust systems where their resistance to oxide spalling is essential to maintain a protective surface for a long operating life. This is of importance in the manifold where some of the highest temperatures are experienced and stainless grades can experience rapid and severe oxidation resulting in failure of the base metal. In addition to corrosive attack from hot combustion gases the exhaust system is also exposed to road salt resulting in hot salt corrosion failures in inadequately alloyed materials. In addition to excellent oxidation resistance **Alloys 601** and **800** have good resistance to intergranular oxidation and chloride stress corrosion cracking.

The shaft connecting the turbine and compressor in a turbo charger is exposed to hot exhaust gases at 750-860 °C so a material that retains its mechanical properties at elevated temperatures and can resist corrosion by the exhaust gases is required. **Alloys 80A, 90 and 625** are often used in this application due to their excellent high temperature mechanical properties.

High temperature fasteners are required as part of the exhaust system and **Alloy 80A** is used in critical applications where high stress rupture strength is required. The alloy also finds application as exhaust valves in high performance diesel and petrol engines where material is exposed to high temperatures and high pressures thus alloys with excellent elevated temperature properties and good hot corrosion resistance are required. For enhanced hot corrosion resistance **Alloy 81** can be considered. It is comparable in mechanical properties and formability to Alloy 80A but has enhanced high temperature corrosion resistance due to the high chromium content. For more information please contact us via info@bibusmetals.com

ALLOY PROPERTIES

	Composition (%)	Key attributes	Application
Alloy 625LCF/HP N06626	61Ni – 21.5Cr – 2.5Fe – 9.0 Mo – 3.6Nb	Excellent resistance to oxidation and corrosion in a range of environments. Highly formable and readily welded.	Flexible couplings and bellows
Alloy 800 N08800 1.4876	32.5Ni – 21Cr – 46Fe	Resistant to high temperature oxidation, carburisation and nitridation	Exhaust manifolds and piping
Alloy 601 N06601 2.4851	60.5Ni – 23Cr – 14Fe – 1.4Al	Good mechanical properties and outstanding oxidation resistance	Bellows expansion joints, exhaust manifolds and piping, catalytic converters, fuel sensors
Alloy 80A N07080 2.4952	76Ni – 19.5Cr – 1.4Al – 2.4Ti	Highly alloyed, age hardenable alloy with excellent high temperature strength	High temperature fasteners, turbo charger shafts and exhaust valves
Alloy 81	66Ni – 30Cr – 2Ti – 1.1Al	Mechanical properties comparable to Alloy 80A but with enhanced hot corrosion resistance due to the high chromium content	High temperature fasteners and exhaust valves

CHEMICAL PROCESSING INDUSTRY

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

CORROSION RESISTANT ALLOYS

In the chemical processing industry many aggressive chemicals are produced and handled. In order to do this in a safe and reliable way selection of the appropriate material is critical. Chemical processing presents some of the most challenging high temperature and corrosive environments and calls for a range of material solutions.

The commercially pure titanium grades have excellent sea water resistance and are also very resistant to many chemical environments over a range of concentrations and temperatures. This can be enhanced through minor additions of palladium. Nickel alloys offer a combination of excellent corrosion resistance in a wide range of process media, high temperature strength and are readily fabricated and welded.

Nickel, titanium and their alloys have extensive and varied uses in chemical plant construction. Applications include pressure vessels, heat exchangers and condensers, mixers, reactor vessels, distillation columns, agitators, piping systems, pumps and valves and instrumentation and flow control tubing. Alloy selection is dependent on the operating conditions.

ALLOY PROPERTIES

	Composition (%)	Key attributes
CP Grade 2 **R50400** **3.7035**	Commercially pure, unalloyed titanium	Excellent resistance to sea water, wet chlorine, alkaline solutions, oxidising acids and organic acids. Resistance to crevice corrosion at temperatures below 80°C
200/201 **N02200** **2.4060**	99.6 Ni	Commercially pure nickel with outstanding resistance to caustic environments. Nickel 201 (with maximum 0.02%C) is used at temperatures above 315°C
800H/HT **N08810/N08811** **1.4958/1.4959**	32Ni – 21Cr – 46Fe – C controlled – Al+Ti 1.2max	Excellent resistance to oxidation and carburisation and good high temperature strength. Alloy 800H/HT has close control of Al and Ti for enhanced creep rupture strength
Alloy 400 **N04400** **2.4360**	65Ni – 32Cu – 1.6Fe	High strength, excellent corrosion resistance in a range of media including sea water, alkalis/caustic solutions, sulphuric acid and hydrofluoric acid
Alloy 600 **N06600** **2.4816**	76Ni – 15Cr – 8Fe	Good high temperature strength and oxidation resistance, resistant to caustic and also phosphoric acid up to 85% concentration at room temperature.
Alloy 601 **N06601** **2.4851**	60Ni – 23Cr – 14Fe – 1.4 Al	Addition of aluminium for enhanced resistance to high temperature carburisation and oxidation. High mechanical properties at elevated temperatures
Alloy 625 **N06625** **2.4856**	61Ni – 21Cr – 2Fe – 9Mo – 3Nb	A highly versatile grade which is resistant to pitting and crevice corrosion in a wide range of severe environments with high strength up to 815 °C
Alloy 825 **N08825** **2.4858**	42Ni – 21Cr – 28 – 3Mo – 0.6Ti	Excellent resistance to both reducing and oxidising acids, sulphuric and phosphoric acid, stress corrosion cracking and pitting and crevice corrosion.
Alloy 22 **N06022** **2.4602**	57Ni – 21Cr – 13Mo – 4Fe – 3.5W	Excellent resistance to oxidising and reducing acids and also good resistance to mixed acids. Particularly resistant to localised attack in acidic halide environments.
Alloy C-276 **N10276** **2.4819**	57Ni – 16Cr – 5Fe – 16Mo – 4W	Outstanding resistance to sulphuric and phosphoric acid and highly resistant to pitting and crevice corrosion. Ideal for service in hot, aggressive environments

OIL AND GAS EXTRACTION

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

NICKEL ALLOYS FOR DEMANDING APPLICATIONS

Stainless steels and nickel-based alloys have long found application in the oil and gas industry for exploitation of sour crudes. Due to the combination of increasing pressures, temperatures and quantities of chlorides and hydrogen-sulphide extensive use is now being made of the speciality Ni-Cr-Mo alloys for extremely severe corrosive applications. High temperature strength, corrosion resistance and ease of fabrication are all important considerations. Materials for oil and gas extraction span a wide range of grades and compositions. In nickel alloys the primary factors for corrosion resistance are the levels of nickel, chromium and molybdenum. Additions of small amounts of other elements such as copper, niobium, titanium, aluminium and tungsten can have significant effects on corrosion resistance or strength. **Alloys 400 and K-500** have excellent resistance to sea water and with their high nickel content are immune to chloride induced stress corrosion cracking making them ideally suited for use as pump and valve components. **Alloys 825 and 625** are widely used in this sector due to their combination of excellent general corrosion resistance and mechanical properties. Their applications range from sea water piping and heat exchangers to bellows and expansion joints. For resistance to hydrogen sulphide stress corrosion cracking in down hole applications **Alloy C-276** can be considered. The combination of its high nickel, molybdenum and chromium contents makes it one of the most corrosion resistant grades on the market.

If you would like to know more about these alloys and availability please contact us via info@bibusmetals.com.

ALLOY PROPERTIES

	Composition (%)	Key attributes	Application
Alloy 400 N04400 2.4360	65Ni – 32Cu – 1.6Fe – 1.1Mn	A solid solution strengthened Ni-Cu alloy. Its sea water corrosion resistance and mechanical properties make it an ideal material for marine applications	Bolting, valves, pump shafts, bellows expansion joints and heat exchangers
Alloy K-500 N05500 2.4375	65Ni – 30Cu – 2.7Al – 1Fe – 0.6Ti	A precipitation hardened alloy combining the corrosion resistance of Alloy 400 with increased strength	Pump and propeller shafts, valves and fasteners
Alloy 800H/HT N08810/N08811 1.4958 / 1.4959	46Fe – 32.5Ni – 21Cr – 0.85-1.2 Al+Ti	As Alloy 800 but with improved creep and stress-rupture properties for applications above 650 °C. Resistant to high temperature oxidation, carburisation and nitridation	Flare stacks, heat exchangers
Alloy 825 N08825 2.4858	42Ni – 28Fe – 21Cr – 3Mo – 2Cu – 1Ti	A Ni-Fe-Cr alloy with additions of Mo and Cu developed for use in aggressively corrosive environments. Resists a wide range of general and localised corrosion, chloride ion stress corrosion cracking, pitting and intergranular corrosion	Sea water cooled heat exchangers, offshore piping systems, valves and fittings
Alloy 625 N06625 2.4856	61Ni – 21.5Cr – 9Mo – 3.6Nb – 2.5Fe	A Ni-Cr-Mo alloy with resistance to severely corrosive environments and with high strength from cryogenic temperatures to 815 °C	Bellows expansion joints, fittings, valves, instrument tubing, sea water piping and heat exchangers
Alloy C-276 N10276 2.4819	57Ni – 16Mo – 16Cr – 5Fe – 4W	An alloy with excellent resistance to reducing and mildly oxidising environments. Resistant to localised attack and H_2S stress corrosion cracking	Downhole tubing and couplings

BELLOWS / COUPLINGS

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

NICKEL ALLOY SOLUTIONS

Metal bellows are very versatile and can be made from alloys with different mechanical properties and corrosion resistance. BIBUS Metals can supply a range of alloys for bellows manufacture that fit the size, pressure, temperature and corrosion resistance requirements to fulfil the application needs in a wide variety of industry sectors from automotive and aerospace to oil and gas and chemical processing. Nickel alloys are utilised where the aggressive nature of the environment is beyond the capabilities of conventional steel grades.

Alloy 625 LCF/625HP is the premier material for use in flexible couplings for the automotive industry. The alloy has excellent resistance to hot salt stress corrosion cracking due to the high nickel content and the chromium and molybdenum additions provide a high level of pitting and crevice corrosion resistance. Combined with its deep drawing capability and excellent fatigue resistance – critical to the endurance of flexible coupling bellows this alloy is an ideal candidate for automotive exhaust systems.

Titanium is used for bellows in applications which require a light weight construction and high strength, titanium having a higher strength/density ratio than nickel-based alloys. Commercially pure (CP) titanium also has excellent corrosion resistance and is particularly suited to the bleaching concentrations in the pulp and paper industry where titanium bellows can provide a significantly longer service life when compared to conventional stainless steel grades.

BIBUS Metals stocks a wide range of sheet product for manufacture of couplings and bellows. Below we review just a few of the most utilised grades. For more information please contact us via info@bibusmetals.com.

ALLOY PROPERTIES

	Composition (%)	Key attributes
4 0 0 **N04400** **2.4360**	65Ni – 32Cu – 1.6Fe – 1.1Mn	Excellent resistance to corrosion in a range of aggressive media. The alloy also exhibits very low corrosion rates in flowing sea water and resists stress corrosion cracking and pitting in most fresh and industrial waters.
6 0 0 **N06600** **2.4816**	76Ni – 15Cr – 8Fe	The high nickel content imparts good resistance under reducing conditions and to alkalis such as caustic solutions. It resists chloride ion stress corrosion cracking and corrosion by high purity water.
6 2 5 L C F / H P **N06626** **2.4856**	61Ni – 21.5Cr – 9.0Mo – 3.6Nb – 2.5Fe	A solid solution strengthened alloy with excellent resistance to oxidation and corrosion in a range of environments at temperatures up to ~ 650 °C. Highly formable and readily welded.
8 2 5 **N08825** **2.4858**	42Ni – 28Fe – 21Cr – 3Mo – 2Cu – 1Ti	A Ni-Fe-Cr alloy with additions of Mo and Cu developed for use in aggressively corrosive environments. Resists chloride ion SCC, pitting and intergranular corrosion.
C - 2 7 6 **N10276** **2.4819**	57Ni – 16Mo – 16Cr – 5Fe – 4W	Ni-Cr-Mo alloy with the addition of W for enhanced corrosion resistance in a range of very corrosive environments and excellent localised corrosion resistance.
7 1 8 **N07718** **2.4668**	54Ni – 18Cr – 18.5Co – 3Mo – 5Nb	Combines high strength at temperatures up to 700 °C with excellent corrosion resistance.
A l l o y H X **N06002** **2.4665**	47Ni – 22Cr – 18Fe – 1.5Co – 9.0Mo	Outstanding strength and oxidation resistance up to 1200 °C. Readily fabricated and welded.
T i t a n i u m **R50250**	Grade 1 - Commercially pure	Excellent corrosion resistance, good formability and weldability

HIGH PERFORMANCE FASTENERS

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

NICKEL ALLOY SOLUTIONS

For critical applications and severe environments high performance, high strength fasteners are essential. Materials with good creep strength along with excellent oxidation and corrosion resistance, depending on the operating environment, are required for high temperature fasteners.

When exposed to elevated temperatures conventional steel fasteners will lose their strength and prolonged heat exposure may cause problems as standard fastener materials have relatively poor creep characteristics. Another challenge is oxidation which can result in failure of the fastener or the oxidation products can make it difficult to disassemble components – an issue in the repair market.

BIBUS METALS stocks a wide range of bar diameters and tolerances to support the fastener industry. Below we review just a few of the key fastener grades. For more information please contact us via info@bibusmetals.com.

ALLOY PROPERTIES

	Composition (%)	Key attributes	Application
Alloy 400 N04400 2.4360	65Ni – 32Cu – 1.6Fe – 1.1Mn	High strength and resistance to hydrofluoric and sulphuric acids, alkalis and sea water.	Marine / offshore oil and gas, chemical processing
Alloy K-500 N05500 2.4375	65Ni – 30Cu – 2.7Al – 1.0Fe – 0.6Ti	Made age-hardenable by addition of Al and Ti – high strengths can be achieved. Excellent corrosion resistance.	Marine / offshore oil and gas, chemical processing
Alloy C-276 N10276 2.4819	57Ni – 16Cr – 5Fe – 16Mo – 4W	Ni-Cr-Mo alloy with the addition of W for enhanced corrosion resistance in a range of very corrosive environments and excellent localised corrosion resistance.	Marine, chemical processing
Alloy 80A N07080 2.4952	76Ni – 19.5Cr – 3Fe – 1.4Al – 2.4Ti	Ni-Cr alloy with additions of Al and Ti for their strengthening effect. Alloy 80A has good corrosion and oxidation resistance and excellent tensile and creep rupture properties for service at temperatures up to ~815 °C	Automotive, aerospace, industrial gas turbines
Alloy 90 N07090 2.4632	60Ni – 19.5Cr – 16Co – 10Mo – 1.5Fe – 1.5Al – 2.5Ti	High stress rupture strength, creep resistance and cyclic oxidation resistance for service up to ~ 920 °C	Automotive, aerospace, industrial gas turbines
Alloy 718 N07718 2.4668	54Ni – 18Cr – 18Fe – 3Mo – 5Nb – 0.2Al – 1.8Ti	High strength age hardenable alloy which combines strength and excellent corrosion resistance. The alloy has excellent creep rupture strength at temperatures up to 700 °C.	Automotive, aerospace, industrial gas turbines, oil and gas
Alloy HX N06002 2.4665	47Ni – 22Cr – 18Fe – 9Mo – 1.5Co	A highly alloyed grade with excellent strength and oxidation resistance up to 1100 °C	Automotive, aerospace, industrial gas turbines, thermal processing

GASKETS AND SEALING SYSTEMS

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

NICKEL ALLOYS FOR CRITICAL APPLICATIONS

Corrosion damage to flanges and gaskets causes problems in many industries. For critical applications and severe environments high performance gaskets are essential. Materials with high corrosion resistance are required where temperatures, aggressive species, pressure and flow rates are beyond the capability of traditional gasket materials.

Nickel alloys also find application in metal-to-glass sealing systems. KOVAR/NILO K alloys have a thermal expansion coefficient that matches that of borosilicate glasses and alumina ceramics making them ideally suited for this application.

In addition we offer electrodeposited nickel foil in thicknesses from 6 - 150 microns for a range of applications including gaskets. The foil is made from high purity nickel (99.97%) and is electrodeposited as opposed to rolled by conventional techniques meaning that a thinner foil can be produced and in greater widths.

Gaskets are commonly produced by cutting from sheet materials and BIBUS METALS stocks a wide range of sheet product to support the gasket manufacturing industry. Below we review just a few of the key grades. For more information please contact us via info@bibusmetals.com

ALLOY PROPERTIES

	Composition (%)	Key attributes
Alloy 400 **N04400** **2.4360**	65Ni – 32Cu – 1.6Fe – 1.1Mn	Excellent resistance to corrosion in a range of media. The alloy also exhibits very low corrosion rates in flowing sea water and resists localised corrosion in most fresh and industrial waters.
Alloy 600 **N06600** **2.4816**	76Ni – 15Cr – 8Fe	The high nickel content imparts good resistance under reducing conditions and to alkalis such as caustic solutions. It resists chloride ion stress corrosion cracking and corrosion by high purity water.
Alloy 625 **N06625** **2.4856**	61Ni – 21.5Cr – 9Mo – 3.6Nb – 2.5Fe	The combination of nickel, chromium and molybdenum gives resistance to a wide range of severely corrosive environments and is especially resistant to pitting and crevice corrosion.
Alloy 718 **N07718** **2.4668**	54Ni – 18Cr – 18.5Co – 3Mo – 5Nb	Excellent corrosion resistance in a wide range of conditions. Good resistance in many inorganic and organic compounds (except strongly oxidising) and the addition of molybdenum contributes to pitting resistance in many media.
Alloy 825 **N08825** **2.4858**	42Ni – 28Fe – 21Cr – 3Mo – 2Cu – 1Ti	A Ni-Fe-Cr alloy with additions of molybdenum and copper developed for use in aggressively corrosive environments. Resists chloride ion SCC, pitting and intergranular corrosion.
Alloy C-276 **N10276** **2.4819**	57Ni – 16Mo – 16Cr – 5Fe – 4W	Ni-Cr-Mo alloy with the addition of tungsten for enhanced corrosion resistance in a range of very corrosive environments and excellent localised corrosion resistance.
KOVAR **K94610** **1.3981**	29Ni – 53Fe – 17Co	Controlled expansion alloy containing 29% nickel. Its coefficient of expansion matches that of borosilicate glass and is used for glass-to-metal sealing systems.
Nickel foil	99.97 Ni	Electrodeposited high purity nickel foil with excellent corrosion resistance to various reducing chemicals and caustic alkalis.

THERMAL PROCESSING INDUSTRY

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

HIGH TEMPERATURE NICKEL ALLOYS

For the demanding environments encountered in the thermal processing industry alloys require high temperature strength, excellent resistance to corrosion by furnace atmospheres and thermal fatigue resistance. Uses include baskets, shrouds, fixtures, radiant tubes, muffles, belts and hearths and heater element sheathing tubes.

Anchor pins which affix the refractory lining to the furnace wall are subjected to high temperatures, must withstand aggressive corrosive environments and retain their mechanical properties and increasingly nickel alloys are replacing stainless steel grades as operating environments become more severe.

Alloys 800HT and 600 both have excellent resistance to oxidising and reducing atmospheres and can withstand repeated thermal cycling. They are ideal for use in applications where high creep rupture and strength are required at elevated temperatures such as heater element sheathing tubes and refractory anchors.

The content of aluminium in **Alloy 601** gives outstanding resistance to oxidation. The protective oxide layer that forms is tightly adherent and resists spalling even through repeated thermal cycling. This combined with high mechanical properties at elevated temperatures makes the alloy ideal for use in heat treating equipment. **Alloy 617** also benefits from additions of aluminium plus cobalt and molybdenum for exceptional high temperature strength and oxidation resistance.

INCOTHERM® Alloy TD was specifically developed for thermocouple sheathing where high-temperature strength and corrosion resistance in a range of environments is required. The alloy has outstanding oxidation resistance at temperatures up to 1250 °C and can withstand thermal cycling. Conventional thermocouple sheathing alloys can suffer embrittlement due to nitridation resulting in failure – INCOTHERM alloy TD has excellent resistance to nitridation. Careful control of the composition particularly with respect to aluminium and manganese – elements which can diffuse through the insulator material and contaminate the thermocouple element wires – giving excellent long-term performance of INCOTHERM Alloy TD sheathed thermocouples. For more information please contact us via info@bibusmetals.com

ALLOY PROPERTIES

	Composition (%)	Key attributes	Application
Alloy 800HT N08811 1.4876	32.5Ni – 21Cr – 46Fe	Resistant to high temperature oxidation, carburisation and nitridation	Element sheathing tubes, refractory anchors
Alloy 600 N06600 2.4816	76Ni – 15Cr – 8Fe	Good high temperature strength and oxidation resistance	Element sheathing tubes, refractory anchors
Alloy 601 N06601 2.4851	60.5Ni – 23Cr – 14Fe – 1.4Al	Good high temperature mechanical properties and outstanding oxidation resistance	Sheathing tubes, furnace furniture, refractory anchors
Alloy 617 N06617 2.4663	52Ni – 22Cr – 1.5Fe – 9.5Mo – 12.5Co – 1.2Al	Exceptional high temperature strength, stability and oxidation resistance	Heat treating equipment, refractory anchors
INCOTHERM Alloy TD	72Ni – 22Cr – 1.0Fe – 3.0Mo – 0.1Al + rare earth elements	High temperature strength, corrosion resistance and thermal cycling resistance	Thermocouple sheathing

FERTILISER PRODUCTION

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

CORROSION RESISTANT NICKEL ALLOYS

There are many types of primary and compound fertilisers. Primary fertilisers include substances derived from nitrogen, phosphorous and potassium and the extraction process results in aggressively corrosive environments which require the use of nickel-based alloys for production equipment.

Potassium chloride is a primary component of caustic potash. For resistance to caustic corrosion the nickel content of the material is critical. Hence the commercially pure **Nickel 200 and 201** grades are often used and are the best metals for resisting caustic corrosion. **Nickel 201** is a carbon-controlled version of 200 for use at temperatures above 315 °C. **Alloy 400** and **Alloy 600** have high nickel contents and so provide good caustic corrosion resistance and also offer higher strength than Nickel 200/201.

Production of the phosphorous fertiliser component involves the use of both sulphuric and phosphoric acids. Sulphuric acid is one of the most important industrial chemicals. The most common nickel alloys used in sulphuric acid service are the Ni-Cr-Mo and Ni-Mo alloys. At low temperatures and concentrations **Alloy 400, Alloy 825 and Alloy 625** find application. **Alloy C-276**, a Ni-Cr-Mo alloy, is used in the most aggressive environments (concentrated acid at elevated temperatures) and can be used for pipes, vessels, valves, pumps and structural components. The most commonly used nickel alloy in processes containing pure phosphoric acid is **Alloy 825**. Commercial phosphoric acid, however, usually contains impurities such as fluorides and chlorides that increase its corrosivity. In impure phosphoric acid **Alloy 600** can be used at room temperature in all concentrations. In moderate to severe environments **Alloy 625** is often selected and as with sulphuric acid production for the most aggressive, hot phosphoric acid environments the highly alloyed **Alloy C-276** is utilised.

Metal dusting failures have been reported in ammonia and fertilizer plants also in methanol reforming plants and in other industries such as refining and heat treating where carbon-rich process gases are cooled through the temperature range 400-800 °C. This is usually a localised form of attack which is very rapid and unpredictable. Alloys which form a protective alumina scale, such as **Alloy 601**, offer resistance to this type of attack. The alloy also has good mechanical properties at elevated temperatures.

ALLOY PROPERTIES

	Composition (%)	Key attributes
NICKEL 200/201 N02200 2.4060	99.6 Ni	Outstanding resistance to caustic environments. 201 used at temperatures above 315°C
Alloy 400 N04400 2.4360	65Ni – 32Cu – 1.6Fe	High strength, excellent corrosion resistance in a range of media including alkalis/caustic solutions and sulphuric acid
Alloy 600 N06600 2.4816	76Ni – 15Cr – 8Fe	Good high temperature strength, resistant to caustic and also phosphoric acid up to 85% concentration at room temperature.
Alloy 601 N06601 2.4851	60Ni – 23CR – 14Fe – 1.4 Al	Addition of aluminium for enhanced resistance to carburisation and oxidation. High mechanical properties at elevated temperatures
Alloy 625 N06625 2.4856	61Ni – 21Cr – 2Fe – 9Mo – 3Nb	Resistant to pitting and crevice corrosion in severe environments with high strength up to 815 °C
Alloy 800H/HT N08810/N08811 1.4876/1.4959	32Ni – 21Cr – 46Fe – C controlled	A high strength, corrosion resistant alloy with resistance to oxidation, carburisation and high temperature creep.
Alloy 825 N08825 2.4858	42Ni – 21Cr – 28 – 3Mo – 0.6Ti	Excellent resistance to sulphuric and phosphoric acids, stress corrosion cracking and pitting
Alloy C-276 N10276 2.4819	57Ni – 16Cr – 5Fe – 16Mo – 4W	Excellent resistance to sulphuric and phosphoric acid – used in hot, aggressive environments

ELECTRONIC APPLICATIONS

www.bibusmetals.com

BIBUS METALS
SUPPORTING YOUR SUCCESS

NICKEL ALLOYS WITH HIGH ELECTRICAL CONDUCTIVITY

Commercially pure nickel is available in several grades with slightly different compositions to meet special needs. Electronic grade alloys have excellent mechanical properties, generally have high thermal and electrical conductivity and are highly resistant to corrosion. These alloys are often used for electronic applications in anodes, lead wires, fuel cells, battery casings, packaging and lids.

Commercially pure nickel contains only traces of minor elements, has good mechanical properties and excellent resistance to many corrosive environments. More importantly for electronic applications nickel has high thermal and electrical conductivities.

Alloy 36 is a binary nickel-iron alloy which has a very low room temperature thermal expansion coefficient making it very useful in precision components in electronic systems such as can be found in telescopes and laser applications.

If you would like to know more about these and other alloys for electronic applications, please contact us via info@bibusmetals.com.

ALLOY PROPERTIES

	Composition (%)	Key attributes	Application
Alloy 200 N02200 2.4060	99.6Ni – 0.04 C	A general purpose grade with good strength and toughness at elevated and sub zero temperatures	Used for leads and terminals, support wires and in magnetostrictive devices such as transducers. Also used in fuel cells and battery plates
Alloy 201 N02201 2.4061	99.6Ni – 0.02C max	A low carbon variant of Nickel 200 with a low work hardening rate	As above. Ideally suited to forming by deep drawing, etching and spinning
Alloy 270 N02270 2.4050	99.97Ni	A very high purity (99.97 % Ni) grade of nickel made by a powder metallurgy process. High purity results in lower coefficient of expansion and electrical resistivity and is also very ductile.	Used for electrical resistance thermometers due to its high temperature coefficient of resistance and as a substrate for precious metal cladding (spatter targets)
Alloy 36 K93600 1.3912	36Ni – 64Fe	A binary nickel-iron alloy with a very low room temperature thermal expansion coefficient	Finds application in electronic and optical support systems in telescopes and for laser components

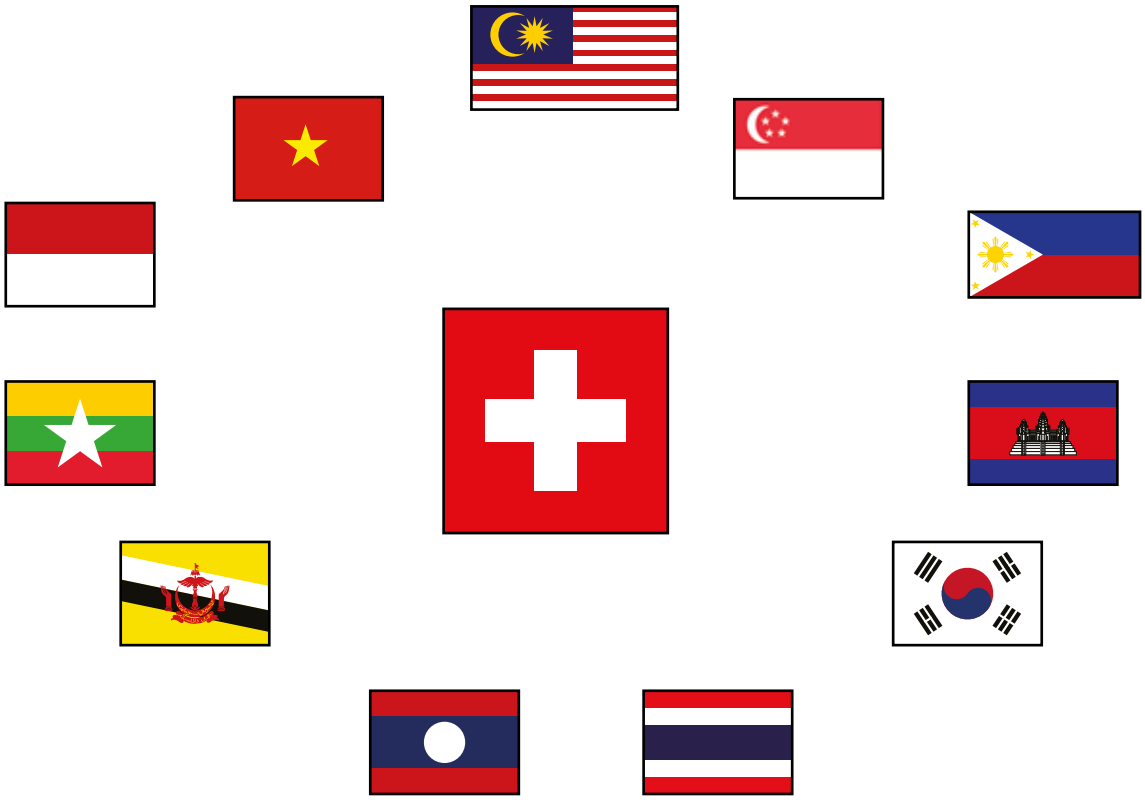
BIBUS METALS
SUPPORTING YOUR SUCCESS

HEAD OFFICE

BIBUS METALS AG	Switzerland	Fehraltorf	info@bibusmetals.ch	www.bibusmetals.ch

LOCATION ASEAN & KR

BIBUS METALS Sdn. Bhd.	Malaysia	Klang	info@bibusmetals.my	www.bibusmetals.my



BIBUS METALS Group
Allmendstrasse 26
8320 Fehraltorf
Switzerland
+41 44 877 54 11
info@bibusmetals.com
www.bibusmetals.com
www.linkedin.com/company/bibus-metals-group