Technical Bulletin

Specialised Pipe and Fittings Australia

High Nickel Alloy Steels

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SPFA is now in forefront of supplying high nickel alloys to critical applications to various industry segments such as mining, oil & gas, chemical, salt, marine, power, food and pharmaceutical.

This bulletin outlines some of the properties of high nickel alloys SPFA supplies to various industries across Australia.

High Nickel Alloys are available in a range of Pipes, Fittings and Flanges

Alloy 600

	Ni	Cr	Fe	C	Mo	Co	Mn	Cu	Al	Si	Ti	P	S
Min	72.0	14.0	6.0										
Max		17.0	10.0	0.15			1.00	0.50		0.50			0.015

- Used in wide variety of applications from cryogenic temperatures to above 1095 degC, good mechanical strength throughout.
- Good resistance to many organic and inorganic compounds
- Good oxidation resistance in high temperatures or in corrosive solutions
- Virtually immune to chloride-ion stress corrosion cracking
- Copper extraction industry, heat treatment industry, engine and airframe components which must withstand high temperatures.

Alloy 625

	Ni	Cr	Fe	C	Mo	Co	Mn	Al	Si	Ti	P	S	Nb (plus Ta)
Min	58.0	20.0			8.0								3.15
Max		23.0	5.0	0.10	10.0	1.00	0.50	0.40	0.50	0.40	0.015	0.015	4.15

- Service temperatures from cryogenics to 982 degC
- High tensile, creep and rupture strength
- High corrosion fatigue strength
- Chloride-ion stress corrosion cracking
- Good oxidation and carburization resistance at high temperatures
- Chemical processing industry, submarine auxiliary propulsion motors, exhaust ducts for Navy utility boats, electric cable connectors, aircraft ducting system, heat exchanger tubes and combustion systems
- High mechanical properties – Yield 276 to 414 MPa, Tensile 689 to 827 MPa, % elongation 40 to 60 in solution treated conditions

Technical Bulletin

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Alloy 617

	Ni	Cr	Fe	C	Mo	Co	Mn	Cu	Al	Si	Ti	S	B
Min	44.5	20.0		0.05	8.0	10.00			0.80				
Max		24.0	3.0	0.15	10.0	15.00	1.00	0.50	1.50	1.00	0.60	0.015	0.006

- Combination of high strength and oxidation resistance over 980 degC
- Resistant to a variety of both reducing and oxidizing media
- Good oxidation resistance at high temperatures
- Cobalt and Molybdenum provided solid solution strengthening
- Applications include combustion cans, gas turbines, power plants, heat treatment furnace etc.

Alloy 31

	Ni	Cr	Fe	C	Mo	Mn	Cu	Al	Si	Ti	P	S	N
Min	30.0	26.0			6.0		1.00						0.15
Max	32.0	28.0	Bal	0.015	7.0	2.00	1.40		0.30		0.020	0.010	0.25

- Outstanding resistance to highly concentrated sulphuric acid at high temperatures. For example, Alloy 31 is used in many leaching processes in the mining industry (Lithium, Nickel, etc)
- Superior resistance to corrosion in halide media, both acidic and basic and phosphoric acid
- Excellent resistance to both reducing and oxidizing media
- Excellent resistance to stress corrosion cracking
- Applications include waste sulfuric acid recovery, high pressure acid leaching of metal ores, sulfuric and phosphoric acid production, evaporation and crystallization of salts, petrochemical refinery etc.

Alloy 800/H/HT

800	Ni	Cr	Fe	C	Mo	Mn	Cu	Al	Si	Ti	P	S	Al+Ti
Min	30.0	19.0	39.5					0.15		0.15			0.30
Max	35.0	23.0		0.10		1.50		0.60	1.00	0.60	0.045	0.015	1.20
800H	**Ni**	**Cr**	**Fe**	**C**	**Mo**	**Mn**	**Cu**	**Al**	**Si**	**Ti**	**P**	**S**	**Al+Ti**
Min	30.0	19.0	39.5	0.05				0.15		0.15			0.30
Max	35.0	23.0		0.10		1.50		0.60	1.00	0.60	0.045	0.015	1.20
800HT	**Ni**	**Cr**	**Fe**	**C**	**Mo**	**Mn**	**Cu**	**Al**	**Si**	**Ti**	**P**	**S**	**Al+Ti**
Min	30.0	19.0	39.5	0.06				0.25		0.25			0.85
Max	35.0	23.0		0.10		1.50		0.60	1.00	0.60	0.045	0.015	1.20

- Good creep rupture strength above 600 degC
- Good resistance to oxidation, carburizing, and nitriding conditions
- Good resistance to hydrogen embrittlement
- Applications include hydrocarbon cracking, chemical and petrochemical industry, super heater and re-heaters in power plants, heat treatment retorts etc.

Technical Bulletin

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Alloy 20

	Ni	Cr	Fe	C	Mo	Mn	Cu	Al	Si	Ti	P	S	Nb (plus Ta)
Min	32.0	19.0			2.0		3.00						8xC
Max	38.0	21.0	Bal	0.07	3.0	2.00	4.00		1.00		0.045	0.035	1.00

- Excellent corrosion resistance to sulphuric acid
- Good corrosion resistance to nitric acid, phosphoric acid, and chloride environments
- Good mechanical properties up to 500 degC
- Good intergranular, pitting and crevice corrosion
- Aqueous corrosion resistance same as Alloy 825
- Applications include sulfuric acid production, food processing equipment, pharmaceutical industry, heat exchangers etc.

Ni 200/201

Ni200	Ni	Cr	Fe	C	Mo	Mn	Cu	Al	Si	Ti	P	S	Nb
Min	99.0												
Max			0.40	0.15		0.35	0.25		0.35			0.010	

Ni201	Ni	Cr	Fe	C	Mo	Mn	Cu	Al	Si	Ti	P	S	Nb
Min	99.0												
Max			0.40	0.02		0.35	0.25		0.35			0.010	

- Can be offered as dual grade. Carbon content is the only difference. Ni200 can be used up to 315 degC.
- At higher temperatures low carbon version Ni201 to be used and it can be used up to 677 degC
- Both grades have excellent resistance to caustic soda and other alkalis
- Applications include chlor-alkali production, caustic soda and other alkalis, hydrofluoric acid, sulfuric acid, hydrochloric acid and phosphoric acid production, water treatment, food processing equipment etc.

Technical Bulletin

Specialised Pipe and Fittings Australia

Alloy 718

	Ni (plus Co)	Cr	Fe	C	Mo	Co	Mn	Cu	Al	Si	Ti	P	S	B	Nb (plus Ta)
Min	50.0	17.0			2.8				0.20		0.65				4.75
Max	55.0	21.0	Bal	0.08	3.3	1.00	0.35	0.30	0.80	0.35	1.15	0.015	0.015	0.006	5.50

- The age hardenable alloy comes with high strength up to 760 degC and oxidation resistance up to 982 degC. Depending upon the aging treatment, the material can achieve exceptionally high yield strength (1,035 MPa min) and high tensile strength (1,240 MPa min). It has excellent tensile and impact strength at cryogenic temperatures as well.
- Applications include Aircraft Turbines, Gas Turbines, high strength screws and springs, rocket drives, spacecraft etc.

Alloy 59

	Ni	Cr	Fe	C	Mo	Co	Mn	Cu	Al	Si	Ti	P	S
Min	59.0*	22.0			15.0				0.10				
Max	59.0*	24.0	1.5	0.01	16.5	0.30	0.50		0.40	0.10		0.015	0.005

* balance / close to

- The alloy comes with high mechanical strength (Yield strength – 310 MPa min and Tensile strength – 690 MPa min) and excellent corrosion resistance.
- Good resistance to both oxidizing and reducing media
- Very good resistance to chloride pitting and stress corrosion cracking
- Applications include flue gas scrubber components, sour gas handling equipment, sulphuric acid coolers, bleach plants, waste incinerators etc.

Alloy C-276

	Ni	Cr	Fe	C	Mo	Co	Mn	Cu	Si	P	S	W	V
Min	57.0*	14.5	4.0		15.0							3.00	
Max	57.0*	16.5	7.0	0.01	17.0	2.50	1.00	0.50	0.08	0.040	0.030	4.50	0.35

* balance / close to

- The alloy is resistant to general corrosion, stress corrosion cracking, pitting and crevice corrosion in a broad range of severe environments
- Excellent resistance to sulphuric acid, phosphoric acid, and hydrochloric acid
- Widely used in many severe chemical environments
- Good resistance to both oxidizing and reducing media
- Applications include flue gas desulphurization system, equipment and components of acid gas applications, high temperature superconductors, digestion and bleaching tanks in paper and pulp industry etc.

Technical Bulletin

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Alloy 400 [Monel 400]

	Ni (plus Co)	Cr	Fe	C	Mo	Co	Mn	Cu	Al	Si	Ti	P	S
Min	63.0							28.00					
Max			2.5	0.30			2.00	34.00		0.50			0.024

- Excellent resistance to chloride stress corrosion cracking
- High strength and toughness over a wide range of temperatures
- Extensively used in chemical processing and marine industry
- Applications include brine heaters or evaporators in desalination plants, chemical processing equipment – sulphuric acid, hydrochloric acid, caustic alkalis etc., uranium refining, ship building industry etc.

Please contact us for any other grade or hard to find alloys that may not be listed above.

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