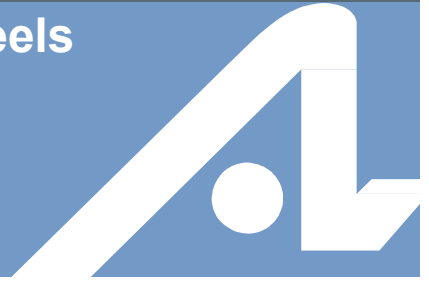


Conducting Business with Atlas Steels

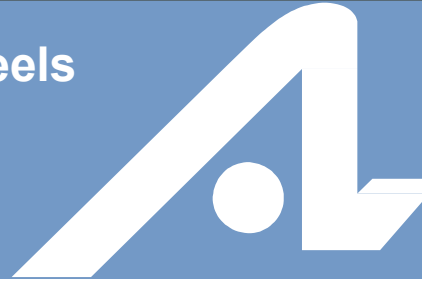


1 Conducting business with Atlas Steels



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www.atlassteels.com.au



Welcome to Atlas Steels, the leading stockist and distributor of stainless steels and special metals across Australia.

This Reference Manual provides information on the range and grades of stainless and special metals we distribute. It also contains general technical information that may be of interest to users and outlines the processing facilities and services provided to our customers.

Atlas Steels the Company

In 1918 Atlas Steels began the manufacturing of tool steels in Canada and by 1938 was the major producer of tool and specialty steels in the country. In the years since 1918 many of the businesses that Atlas started world-wide have been absorbed into other companies and today the only one still remaining and maintaining the Atlas name in the specialty metals industry is the Australian offshoot, which evolved from the Canadian parent when they established operations in Australia in 1939.

In many respects the Atlas of today with operations across Australia remains true to the vision of its forefathers and still retains its focus and strength in specialty metals but with a larger products base in stainless steels, alloy steels, aluminium and carbon steels in specialised applications.

The Atlas of today is a private company with a distribution and warehousing network across Australia's major cities and regional centres.

For more information about Atlas, please visit our website at www.atlassteels.com.au

Conducting Business with Atlas Steels

Atlas, over many years of participation in the specialty metals industry, has built a level of knowledge and expertise that has helped to build the company to be the largest in its market and offer superior customer service. We do this by providing:

- A comprehensive range of specialty metal products
- Locations across Australian capital cities and regional centres
- Personnel who can readily understand the specific needs of product users
- Nationally integrated, computer-based stocking and inventory control systems
- Extensive global product sourcing network from reputable mills
- Warehouse facilities, systems and procedures that cater to the needs of processing and handling specialty metals
- A company-wide quality system accredited to ISO9001
- Trained technical support personnel
- Project services dedicated to supplying products to major resource and infrastructure projects in any region of the world

There is limited production of specialty metals in Australia with the majority being imported from overseas mills. Because of this it is most important that users have a high level of confidence in the product and services supplied by specialty metals stockists/distributors.

Atlas has, through years of participation in the industry, established a network of reputable mill suppliers to service its customers. These mills have been chosen following a rigorous selection process based on Atlas criteria of mill adherence to strict quality standards, history of reliable supply and support for product in the field.

Atlas supports its customers and suppliers with experienced technical personnel and sales personnel trained extensively to understand the product qualities and applications associated with specialty metals.

Atlas Steels Website

The Atlas Steels website at www.atlassteels.com.au is the principle window into Atlas. In addition to profiling our products and the services we offer, the website includes the full contents of this Product Reference Manual in down-loadable PDF format.

A feature of the Atlas Steels website is the “Technical Library”. This includes:

- Technical Handbook of Stainless Steel
- Technical Notes covering frequently asked questions
- Datasheets on most grades handled by Atlas
- Calculation spreadsheets for PREN, Carbon Equivalent and product weight
- Tables to assist with unit conversions
- Pressure rating charts for pipe and tube

All these resources are available for free download.

If there is a Product Problem

At Atlas we strive to provide product that both complies with all appropriate specifications and meets the requirements of our customers. Despite this, occasionally there are real or perceived problems.

To help resolve the concern we ask that:

1. Contact Atlas as soon as it is apparent that there is a problem; do not wait until the full extent and severity are known.
2. Please tell us before trying to fix any serious problem. Claims for extra costs may be difficult to establish.
3. Maintain Atlas delivery and Trace/Heat Number.
4. Keep samples of the original product showing the problem and also if possible the original mill identification markings.
5. Retain details of manufacturing operations that revealed the problem. Sketches, photographs and drawings may be useful in understanding the problem.

Make use of Atlas’ technical assistance service at time of purchase of product; careful specification at this stage may avoid later problems.

Terms and Conditions of Sale

Refer to www.atlassteels.com.au

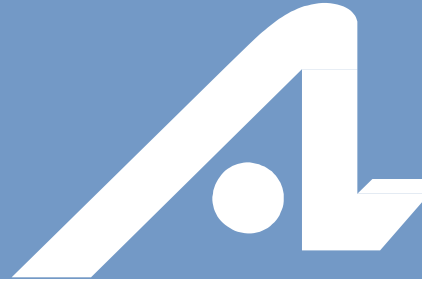
Limitation of Liability

The information contained in this manual is not intended to be an exhaustive statement of all relevant data applicable to special and general metal products. It has been designed as a guide for customers to the products and service Atlas Steels can offer. No responsibility is implied or accepted for or in conjunction with quality or standard of any product or its suitability for any purpose or use.

It is the responsibility of the user to ensure product specified is fit for the purpose intended.

All conditions, warranties, obligations and liabilities of any kind which are or may be implied or imposed to the contrary by any statute, rule or regulation or under the general law and whether arising from the negligence of the company, its servants or otherwise are hereby excluded except to the extent that the company may be prevented by any statute, rule or regulation from doing so.

The Grades and Properties of Stainless Steel



Introduction

The group of alloys which today make up the family of stainless steels had their beginnings in 1912 in Sheffield, England. Harry Brearley was testing a number of alloys for possible gun barrel steels and observed that samples cut from one of these trial heats did not rust. Upon investigation it was shown to contain 13% chromium and this discovery led to the development of stainless for use in cutlery, for which Sheffield became famous. Coincidentally, at about the same time, development work was also being carried out in France and Germany, which resulted in the production of the first austenitic stainless steel.

The Families of Stainless Steel

Stainless steels are iron-based alloys containing a minimum of about 10.5% chromium. The chromium forms a protective self-healing oxide film, which is the reason why this group of steels has its characteristic 'stainlessness' or corrosion resistance. The ability of the oxide layer to heal itself means that the steel is corrosion-resistant, no matter how much of the surface is removed.

Although all stainless steels depend on the presence of chromium, other alloying elements are often added to enhance their properties. The categorisation of stainless steels is unusual amongst metals in that it is based upon the nature of the metallurgical structure. Depending on the exact chemical composition of the steel the microstructure may be made up of the stable phases austenite or ferrite, a 'duplex' mix of these two, the phase martensite created when some steels are rapidly quenched from a high temperature, or a structure hardened by precipitated micro-constituents.

Austenitic Stainless Steels

This group contains at least 16% chromium and 6% nickel (the basic grade 304 is referred to as 18/8) and range through to the high alloys or 'super austenitics' such as 904L and 6% molybdenum grades.

Additional elements can be added such as molybdenum, titanium or copper, to modify or improve stainless properties, and making them suitable for many critical applications involving high temperature as well as corrosion resistance. This group of stainless steels is also suitable for cryogenic applications because the effect of the nickel content in making the steel austenitic avoids the problems of brittleness at low temperatures, which is a characteristic of other types of steel.

The characteristics of the austenitic stainless steels are:

- Good corrosion resistance
- Weldable using standard methods and equipment
- Excellent ductility
- Stable austenite structure at all temperatures
- Cannot be hardened by heat treatment
- Harden rapidly when cold worked
- Good strength and scaling resistance at high temperatures
- Excellent cryogenic properties, and
- Non-magnetic when annealed

Ferritic Stainless Steels

These are plain chromium (10.5 to 30%) grades such as grade 430 and 409. Their moderate corrosion resistance is improved in the higher alloyed grades (such as 444) and poor fabrication properties improved in the proprietary grade AtlasCR12.

The characteristics of the ferritic grades are:

- Good resistance to corrosion, but generally not as good as the austenitics
- Not as readily welded as austenitics
- Good ductility
- Cannot be hardened by heat treatment
- Can only be moderately hardened by cold work
- Fully magnetic
- Not suitable for use at very low temperatures
- Stable ferrite structure at all temperatures, and
- Immune from chloride stress corrosion cracking

Martensitic Stainless Steels

Martensitic stainless steels are also based on the addition of chromium as the major alloying element but with a higher carbon and generally lower chromium content than the ferritic type, e.g. 12% in grades 410 and 416. Grade 431 has a chromium content of about 16% but its microstructure is still martensite despite the chromium level due to the addition of 2% nickel in the composition. The martensitic grades are used in the hardened condition for high strength applications (e.g. pump shafts) and high hardness applications (e.g. knife blades).

The characteristics of martensitic stainless steels are:

- Hardenable by heat treatment (quenching and tempering)
- Magnetic, and
- Have moderate corrosion resistance

Precipitation Hardening Stainless Steels

These are chromium and nickel containing steels, which can develop very high tensile strengths. The most common grade in this group is '17-4PH', also known as grade 630, with the composition of 17% chromium, 4% nickel, 4% copper and 0.3% niobium. The major advantage of these steels is that they can be supplied in the solution-treated condition, which is machinable. Following machining, forming, etc. the steel can be hardened by fairly low temperature 'aging' heat treatments which do not cause distortion to the component. The most common applications are shafts and spindles.

The characteristics of the precipitation hardening steels are:

- Hardenable by heat treatment (solution treatment and ageing)
- Magnetic, and
- Have moderate corrosion resistance

Duplex Stainless Steels

Duplex stainless steels such as 2205 (designation indicates 22% chromium and 5% nickel but also contains 3% molybdenum and 0.15% nitrogen) have microstructures comprising a mixture of austenite and ferrite.

Duplex austenitic-ferritic steels combine some of the characteristics of each class.

- Resistant to stress corrosion cracking, albeit not quite as resistant as ferritic grades
- Toughness is superior to ferritics but inferior to that of austenitics
- Strength is greater than that of the annealed austenitic steels by a factor of two
- Corrosion resistance is high for most grades
- They do suffer from reduced toughness below -50°C and after exposure above 300°C, so are only used between these temperatures, and
- Highly resistant to chloride stress corrosion cracking

Standard Classifications

There are many different grades of stainless steel and the American Iron and Steel Institute (AISI) in the past designated some as standard compositions, resulting in the commonly used three-digit numbering system, e.g. 304, 316, etc. This role has now been taken over by the SAE and ASTM who allocate UNS numbers to new grades. The full range of these standard stainless steel grades is contained in the Iron and Steel Society (ISS) *Steel Products Manual for Stainless Steels* and in the SAE/ASTM handbook of *Metals and Alloys in the Unified Number System*.

Although the majority of stainless steel products sold in Australia are supplied to American ASTM specifications, we see some references to European “Euronorms”. These use different grade designations, both numbers and names, but the grades are actually almost identical.

ASTM Grade	304	304L	316	316L	430	2205
UNS No.	S30400	S30403	S31600	S31603	S43000	S32205
EN No.	1.4301	1.4307	1.4401	1.4404	1.4016	1.4462
EN Name	X5CrNi18-10	X2CrNi18-9	X5CrNiMo17-12-2	X2CrNiMo17-12-2	X8Cr17	X2CrNiMoN22-5-3

Certain other grades do not have standard numbers but instead are covered by other national and international specifications for specialised products or by proprietary designations.

More complete lists of equivalent grades are given in Atlas Technical Note 3, available for download from the Atlas Steels website.

Further Product and Technical Information

Further information on stainless steels is given in the *Atlas Steels Technical Handbook of Stainless Steels*, other information across the spectrum of the Atlas portfolio is given in *Technical Notes* and *Datasheets*. These are also available for download from www.atlassteels.com.au.