

DARWINS



Materials Technology —
Providing components to industries with
the most demanding product requirements.



Materials Technology — We provide components to industries with the most demanding product requirements whether that's product shape, design, material or technical specification.

We also have a rigorous selection process for choosing only the best high quality raw materials from certified sources. Materials we work with include:

- Carbon and low alloy steels
- Austenitic and martensitic stainless steels
- Duplex and super-duplex steels
- Heat and wear-resistant steels
- Nickel-based alloys
- Super austenitic stainless steels

Carbon and low alloy steels

These materials are used for a wide range of applications from general engineering applications to creep resistant steels in power stations. The cheaper carbon steels can fulfill a wide range of roles where corrosion resistance is not essential.

The addition of small quantities of manganese results in acceptable low temperature properties down to - 46°C. Additions of small amounts of chromium, nickel and molybdenum result in alloy steels with increased strengths to 1000 MPa and good toughness following water quench heat treatment.

Air-cooled steels with chromium and molybdenum (typically 2.25% chromium, 1.0% molybdenum) are used extensively in the power generation industry for their creep properties.

Austenitic and martensitic stainless steels

The standard 304 and 316 type stainless steels offer similar strengths to those of the low carbon steels but with much improved corrosion resistance. The molybdenum containing 316 type has become the standard stainless for construction applications and sea water environments. 13% chromium and 13/4 (13% chrome with 4% nickel addition) types of stainless steel are significantly stronger and wear resistant but less corrosion resistant.

The 13/4 type is more commonly used as a casting than the straight 13% chrome because it is more ductile and has less propensity to cracking. The 13/4 steel is ideal for many pump parts, particularly impellers where a combination of corrosion and wear resistance, and strength are recognised.

Duplex and super-duplex steels

Where increased strength and corrosion resistance are needed, the duplex stainless steel range of materials may be considered. Their duplex austenite–ferrite structure provides approximately twice the proof strength of 316 stainless and far superior resistance to stress corrosion cracking. The type of duplex used generally depends upon the corrosive environment.

The 22% chrome duplex offers an improvement over 316 stainless in general pitting corrosion. The 25% chrome super duplex offers significantly higher pitting and crevice corrosion resistance in warmer, chloride (sea water) environments. Duplex stainless steels are therefore found in many pump parts and valves involved in handling such media.

Heat and wear-resistant steels

This range of alloys is for applications requiring strength and stability at high temperatures up to 1200°C. Common alloys include:

25% chrome, 12% nickel for use up to 1050°C in non-carburising conditions, through to 50% chrome, 50% nickel alloys used to withstand corrosion caused by fuel ash deposits at high temperature.

Nickel-based alloys

Although more expensive than stainless and duplex steels, these materials are necessary for a range of arduous environments which would attack the stainless, iron-based materials.

With 40% nickel and 20% chrome, alloy 825 offers high resistance to oxidising and non-oxidising, hot acid conditions and outstanding resistance to stress-corrosion cracking. It is resistant to pitting corrosion by all except strongly oxidising chloride solutions. With approximately 40% iron content, its material cost lies between that of duplex and the other main nickel-based alloys.

Hastelloy™ C type alloys (15% chrome, 15% molybdenum, nickel based) gives outstanding corrosion resistance in both reducing and oxidising media. It is widely used in the severest environments encountered in chemical processing, pollution control, pulp and paper production and other fields.

Hastelloy™ B type alloys (30% molybdenum, nickel based) were developed particularly for resistance to hot concentrated hydrochloric acid solutions and hydrogen chloride, particularly reducing conditions.

Alloy 625 (20% chrome, 9% molybdenum, nickel) has high fatigue and creep strength and excellent corrosion resistance. It is highly resistant to chloride ion stress corrosion cracking. It finds use in pumps and valves for handling acids at elevated temperatures in the food, chemical, mining and petrochemical industries.

Monel alloys (70% nickel, 30% copper) show good resistance to attack in reducing environments. It is widely used in handling sulphuric, hydrochloric and organic acids in the marine, plastics, steel and food processing industries.



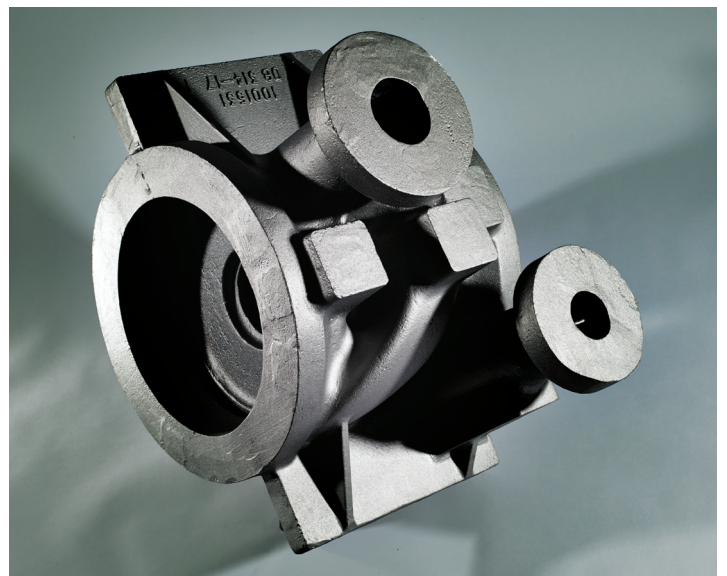
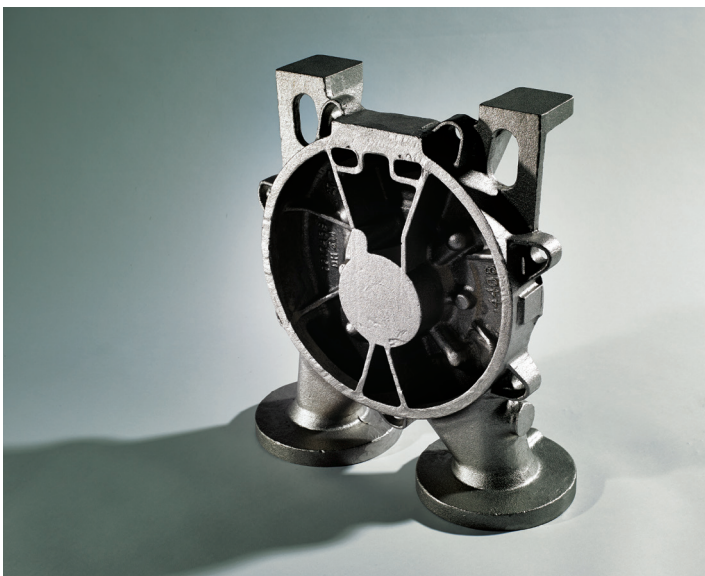


Super austenitic stainless steels

Super austenitic stainless steels such as cast grade CK3MCUN, (Cast S31254), have the same structure as conventional stainless but are more highly alloyed. In marine environments they offer superior corrosion resistance in natural sea water and in chlorinated conditions. They provide good cavitation, localized pitting and crevice corrosion resistance

with excellent erosion properties. They are considered for selection for pump applications where service life and corrosion resistance are factors in warmer conditions such as the Middle East.

Alloy such as CK3MCUN J93254 are also considered for sour service application with certain environmental restriction within NACE MR 175 and NACE MR103.



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