

Stainless Steel – Type 1.4003

Introduction

Type 1.4003 stainless steel is a utility ferritic stainless steel, often used in place of mild steel. It offers the benefits of more highly alloyed stainless steels such as strength, corrosion and abrasion resistance, durability and low maintenance. In addition type 1.4003 is weldable and formable allowing it to be fabricated using conventional techniques.

Benefits of using type 1.4003 stainless steel:

- ◆ 250 times greater corrosion resistance than mild steel
- ◆ Corrosion/abrasion resistance
- ◆ Economical - Low initial cost, low maintenance
- ◆ High Strength
- ◆ Excellent impact resistance
- ◆ Can be welded by conventional methods
- ◆ Can eliminate need for protective coating
- ◆ Can eliminate need for corrosion allowance
- ◆ Proven success in many applications across a wide range of industries
- ◆ Good performance at elevated temperatures
- ◆ Lower cost than austenitic stainless

This has led to the use of type 4003 stainless steel in many applications across a broad range of industries:

Applications

- ◆ Bulk wet materials handling
- ◆ Vehicle frames/chassis
- ◆ Rail car hoppers
- ◆ Sweeper and gritter vehicles
- ◆ Conveyors, chutes, screen, troughs
- ◆ Bunkers & hoppers
- ◆ Tanks & containers
- ◆ Chimneys & ducting
- ◆ Enclosures & cabinets
- ◆ Walkways, stairs & railings
- ◆ Cable trays

Industries

- ◆ Road & Rail Transport (Passenger & Freight)
- ◆ Bulk Handling
- ◆ Water
- ◆ Railway Infrastructure
- ◆ Power Generation
- ◆ Sugar Manufacture
- ◆ Agriculture
- ◆ Telecommunications & Electrical
- ◆ General Engineering
- ◆ Mining

Cost Benefit

Type 4003 is proven to offer lower life-cycle costs than traditional materials where service conditions involve corrosion and/or abrasion. As compared to traditional materials there are options to reduce initial cost through the elimination of protective coatings and corrosion allowances. In service cost savings come from reduced maintenance, improved productivity and significantly longer life. As type 4003 does not contain significant quantities of expensive alloying elements such as Nickel and Molybdenum, it is a lower cost material than austenitic stainless steel and can thus be considered as an option where these grades are not an economically viable choice.

Corrosion/Abrasion

The cycle of abrasive removal of a metal surface following surface corrosion rapidly erodes mild/carbon steels even when costly coatings are applied. In wet or damp conditions where abrasion is present type 4003 provides excellent performance by resisting corrosion attack and thus maintaining better flow and slideability compared to non-alloyed or low-alloy steels including abrasion resistant grades.

Weldability

Type 4003 has a fine-grained microstructure which reduces grain growth in the heat-affected zone (HAZ) and allow high integrity welds in section thicknesses up to 30mm. Suitable weld processes include SMAW, GTAW, FCAW, PAW, Laser, Spot and Seam. Design and welding procedure consideration must be taken to avoid sensitization occurring in service.

Strength & Stiffness

Type 4003 offers higher strength than, and equal structural stiffness to, mild steels such as BSEN10113 Grade Fe430A (ASTM A36). It also offers greater impact and energy resistance than aluminium. It behaves much like austenitic steel in that it gradually yields and does not show a definite yield point.



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Coating & Painting

Type 4003 provides good corrosion resistance and excellent abrasion resistance, hence does not need coating or painting systems to be applied for performance reasons. For aesthetic reasons it may be desirable in some applications to apply paint, especially as type 4003 will tend to discolour in corrosive conditions. Type 4003 has exceptional under-paint corrosion resistance and will continue to resist corrosion even where the paint coat has been damaged. Normal preparation is required, such as ensuring a clean surface free of grease and other contamination. A primer coat is recommended for cold-rolled material due to its smoother surface, but hot rolled 1D finish material may be suitably painted in a single coat.

Chemical Composition

Carbon 0.03% Max
 Silicon 1.00% Max
 Manganese 1.50% Max
 Phosphorus 0.040% Max
 Sulphur 0.015% Max
 Chromium 10.50 to 12.50%
 Nickel 0.30 to 1.00%
 Nitrogen 0.03% Max

Other Properties

Poisson's Ratio	0.32
Initial Shear Modulus	108 GPa
Limit of Proportionality	130 GPa (Tension)
Ultimate Shear Strength	245 MPa

Size Range

Sheet Size mm	Weight per Sheet kg
Cold Rolled 2B	
2000 x 1000 x 1.0	16.3
2500 x 1250 x 1.0	24.5
2000 x 1000 x 1.2	19.6
2500 x 1250 x 1.2	30.6
2000 x 1000 x 1.5	24.5
2500 x 1250 x 1.5	38.2
3000 x 1500 x 1.5	55.0
2000 x 1000 x 2.0	32.6
2500 x 1250 x 2.0	50.9
3000 x 1500 x 2.0	73.4
2000 x 1000 x 2.5	40.8
2500 x 1250 x 2.5	63.7
3000 x 1500 x 2.5	91.7
Hot Rolled 1D	
2500 x 1250 x 2.0	50.9
3000 x 1500 x 2.0	73.4
2000 x 1000 x 3.0	48.9
2500 x 1250 x 3.0	76.4
3000 x 1500 x 3.0	110
2500 x 1250 x 4.0	102
3000 x 1500 x 4.0	147
2500 x 1250 x 5.0	127
2500 x 1250 x 6.0	153

Physical Properties

Property	Range	Value
Density		7.74
Modulus of Elasticity	Tension	200 GPa
	Torsion	77 GPa
Specific Heat Capacity		478 J/kg.K
Thermal Conductivity	100 °C	30.5 W/m.K
	500 °C	40 W/m.K
Electrical Resistivity		67.8 µΩ /cm
Coefficient of Thermal Expansion	0 – 100 °C	11.1 µm/mK
	0 – 300 °C	11.7
	0 – 500 °C	12.3
Melting Range		1430 – 1510 °C
Relative Permeability		Ferromagnetic
Magnetic Permeability		700 - 1000



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Transverse Mechanical Properties (To BS EN 10088-2 at ambient temperatures)

Property	Thickness	Range	Typical	Certification Type 1.4003 stainless steel conforms to BS EN 10088-2: 1995, ASTM A240 UNS41003 and EN 10028-7: 2000 which covers stainless steels suitable for pressure purposes and includes minimum specified impact strength values. Certification is to EN 10204.
UTS N/mm ²	All	450-650	522	
Rp0.2% N/mm ²	Up to 6.0mm	320 Min	376	
	Over 6.0mm	280 Min	361	
Elongation	Up to 6.0mm	20% Min	23%	
	Over 6.0mm	18% Min	26%	
Hardness	Up to 12.0mm	220 Max	165	
	Over 12.0mm	250 Max	165	
Charpy	6.0 – 20.0mm	50J Min	85J	
	25mm & Above	To be agreed	-	

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