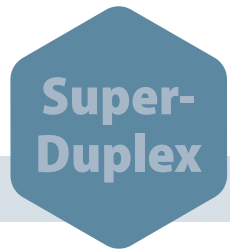




Langley Alloys



Ferralium® 255 - SD50 HS (Higher Strength) 110

Specifications:

UNS S32550, ASTM479, ASTM A276, ASTM A182 F61, EN 10088.3 1.4507, NACE MR0175 / ISO 15156

Ferralium® 255 - SD50 HS110 is a higher strength super duplex stainless steel supplied in the strain hardened condition (Condition S). By precise further processing, it achieves significantly raised yield and tensile strengths whilst still retaining good levels of impact strength. Typically offered in tubular form, the machined bar will serve as coupling material, suitable for subsequent processing to coupling stock, couplings and other tubular goods as outlined in API 5CRA / 5CT. It therefore provides a cost-effective alternative for applications that previously used higher cost alloys. The production route allows smaller quantities to be economically manufactured against competitive lead times.

As a 25% Chromium alloy, with significant additions of Copper, it offers excellent corrosion resistance in a wide variety of corrosive chemicals including sulphuric, nitric and phosphoric acid. In seawater and other chloride containing environments it also provides outstanding resistance to pitting and crevice corrosion, with Critical Pitting Temperature exceeding 50°C. Excellent ductility and impact strength at both ambient and sub-zero temperatures combine with a high resistance to abrasion, erosion and cavitation erosion.

Ferralium® 255 - SD50 HS110 builds upon the Ferralium® 255 - SD50 product which is listed in NACE MR0175 for sour service and has gained ASME Approval for Pressure Vessel applications. It is tested to the highest degree using tests designed to guarantee that our trade-marked product possesses high integrity, correct phase balance and the absence of sigma and other deleterious phases.

Key Features:

- Ferralium® was originally developed in 1960's, pioneering the addition of nitrogen, to create the first super duplex stainless steel
- Continuously developed through 1990's to extend PREN > 40, and more recently to increase mechanical properties
- Pitting Resistance Equivalent Number (PREN) >40, indicating outstanding resistance to pitting and crevice corrosion
- Very low levels of Sulphur minimise the likelihood of inclusions as sites for potential pitting corrosion
- Higher copper content provides self-healing effect at sites of pitting to inhibit further growth
- Now available in a high strength variant, achieving proof stress exceeding 110ksi (758N/mm²) in diameters up to 6½"

Typical Applications:

- Ferralium® 255 - SD50 is widely specified in the Oil & Gas industry for pumps, valves, wellhead and subsea equipment
- Ferralium® 255 - SD50 HS110 has been developed for applications currently only able to be supplied from tubular goods in more costly nickel alloys
- Coupling material for conversion to coupling stock, couplings, collars and associated components

Physical Properties:

Density (Kg/m ³)	7810
Magnetic Permeability (20°C)	33
Young's Modulus (kN/mm ²)	220
Specific Electrical Resistance, 20°C (Ω-m)	0.80 x 10 ⁻⁶
Mean coefficient of thermal expansion, 20 - 100°C (m/m/°C)	11.1 x 10 ⁻⁶
Specific Heat, 20°C (J/kg.K)	475
Thermal conductivity, 20°C (W/m.K)	14.2
Fracture Toughness, KQ (MPa/m ²)	98

Product Forms Available:

Bar	✓
Plate	n/a
Tube	n/a
Fittings	n/a
Forgings	n/a
Castings	n/a

Chemical Composition:

	Cr	Ni	Mo	Co	Nb (+Ta)	Ti	V	W	Cu	C	Mn	N	Si	P	S	Fe	Al
Min	24.50	5.50	3.10						1.50		0.80	0.20					
Max	26.50	6.50	3.80						2.00	0.025	1.20	0.25	0.70	0.025	0.005	Bal	

Mechanical Properties:

	Bars up to and including 6.5" diameter or section	
0.2% Proof Stress	758 - 965 N/mm ²	110-140 ksi
Tensile Strength	862 N/mm ²	125 ksi
Elongation, 5.65√S0 and 4D	16%	
Hardness (Rockwell C)	< 35	
Impact Strength (-10°C) Transverse	40J av (27J min)	30 ft.lb av (20 ft.lb min)

Notes:

- Testing shall be carried out in accordance with ASTM A370 or EN ISO 6892-1 (tensile), EN ISO 6506-1 (hardness)
- Minimum properties quoted (tested at room temperature in a longitudinal direction unless stated)
- Testing performed on each melt of material per heat treatment batch
- Additional tests routinely undertaken:
 - ASTM G48A corrosion test (at 50°C) - No pitting and < 0.8g/m² weight loss
 - Ferrite content - 35-55%
 - Microstructure certified free from grain boundary carbides, sigma, chi and laves phases
- Specification only applicable for nominal critical wall thickness ≤1" (25.4mm) after conversion of bar to tubular form

Product Comparison:

Alloy Comparisons	Ferrallium® 255 - SD50 HS110	S17400 H1025	S20910	N07718	N05500
Pitting Resistance Equivalent number	>40	16	34	31	n/a
0.2% Proof Strength (N/mm ²)	758 - 965	1137	420	500	690
Corrosion Rate (mm/year) - Seawater	<0.01	~1	<0.01	<0.01	0.18
Corrosion Rate (mm/year) - 10% sulphuric acid at 80°C	<0.15	10	0.7	<0.15	0.1
Corrosion Rate (mm/year) - Boiling 50% nitric acid	<0.15	<0.15	0.18	<0.15	<2.0
Wear Properties related to Hardness (HRC), maximum	28	38	27	20	24

Machining Advice:

Operation	Cutting Speed m/min (ft/min)	Feed Rate mm/rev (in/rev)	Depth of cut mm (in)
Milling	40 (130)	0.05-0.13 mm/tooth 0.02-0.005 in/tooth	0.5 -6.0 (0.02 - 0.25)
Drilling 6.4mm (1/4") dia	250 rpm	0.075 (0.003)	
Drilling 12.7mm (1/2") dia	250 rpm	0.125 (0.005)	
Drilling 25.4mm (1") dia	150 rpm	0.28 (0.011)	
Turning - Roughing	30 - 45 (100 - 150)	0.2 -0.38 (0.008-0.015)	3 (0.125)
Turning - Finishing	50 - 60 (165 - 200)	0.13 - 0.20 (0.005-0.008)	0.5 (0.02)
Tooling	Milling/Turning: Carbide (SANDVIK GC 235, SECO T25M) Drilling: HSS, point angle 118°, chisel angle 120°		

Notes: 1) Machining advice based upon Ferrallium® 255 - SD50

Production Route:

Ferrallium® 255 - SD50 HS is produced through high-precision steelmaking processes to ensure cleanliness and consistency.

- All material shall be refined by Vacuum Oxygen Decarburisation (VOD) or Argon Oxygen Decarburisation (AOD)
- Further refinement by Electric Slag Refining (ESR) is allowable if required for particular customer specifications.
- The minimum forging ratio utilised is at least 4:1, between 1050-1250°C.
- Solution treatment shall be carried out at a temperature between 1060-1120°C.
- This will be followed by immediate water quench
- Bars are subsequently cold worked by no more than 10% to achieve the desired higher strengths

- Each bar is ultrasonically tested and visually inspected
- Bars are usually supplied bored as coupling material, but may be supplied plain.

Further Processing:

- Order processing and stock control is facilitated by a fully-integrated computer system which links to item production and inspection.
- Automated band saws are available for accurate stock cutting up to a section size of 650mm.
- First-stage processing, including water jet cutting, turning, boring and grinding can be undertaken to help manage your overall supply chain.
- Additional documentation and certification can be supplied as required.

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UK

The Wharf | 504-506 Lowfield Dr | Newcastle Under Lyme
Staffordshire | ST5 0UU | UK
+44 (0)1782 610250

sales@langleyalloys.com

USA

102 Longview Street | Conroe
Houston | Texas 77301 | USA
+001 (281) 819 5588

usa@langleyalloys.com

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www.langleyalloys.com