Langley Alloys

Ferralium® 255 (Pipe/Tube)

Super-Duplex

Specifications:

Alloy 255, UNS S32550, UNS S32520, ASTM A815, ASTM A790, Werkstoff No. 1.4507, NACE MR 1075 / ISO 15156

Ferralium® 255 is a super duplex stainless steel supplied in the cold finished and annealed condition. 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.

In its various product forms, Ferralium® 255 is listed in NACE MR 0175 for sour service and gained ASME Approval for Pressure Vessel applications. It has been tested to the highest degree using tests designed to guarantee that the trade-marked product possesses high integrity, a correct phase balance and the absence of sigma and other deleterious phases.

Key Features:

- 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
- Pitting Resistance Equivalent (PREN) >40, indicating outstanding resistance to pitting and crevice corrosion
- Higher copper content provides self-healing effect at sites of pitting to inhibit further growth
- Available as bars, plate, pipe and fittings with complementary weld wire

Typical Applications:

- Oil & Gas industry equipment
- Process industry equipment in sulphuric acid, nitric acid, phosphoric acid, PP / PVC/TiOx production, agrochemicals
- Pulp and paper applications such as black liquor heater tubes
- Water and sewage treatment, desalination, swimming pools
- Grain and vegetable processing plant

Physical Properties:

Density (Kg/m^3)	7810
Magnetic Permeability (20°C)	33
Young's Modulus (kN/mm^2)	199
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

Product Forms Available:

Bar	✓
Plate	✓
Tube	✓
Fittings	✓
Forgings	To order
Castings	To order

Chemical Composition:

	Cr	Ni	Mo	Co	Nb (+Ta)	Ti	V	W	Cu	C	Mn	N	Si	P	S	Fe	Al
Min	24.00	4.50	2.90						1.50			0.10					
Max	27.00	6.50	3.90						2.00	0.04	1.50	0.25	1.00	0.040	0.030	Bal	0.02

Notes: 1. PREN >40 (PREN = %Cr + 3.3 % Mo + 16 % N)

Mechanical Properties:

0.2% Proof Stress	550 N/mm^2	80 ksi
Tensile Strength	760 N/mm^2	110 ksi
Elongation, 5.65√S0 and 4D	15%	
Reduction of Area		
Hardness (Rockwell C)	28 HRC max	

Notes:
1. Testing shall be carried out in accordance with ASTM A370 or EN ISO 6892-1 (tensile), EN ISO 6506-1 (hardness)
2. Minimum properties quoted (tested at room temperature, mid-wall, in a longitudinal direction)
3. Testing performed on each melt of material per heat treatment batch
4. Hardness shall be in accordance with NACE MR 1075 with a maximum HRC value of 28 (270HB)
5. Additional tests routinely undertaken:
   - Flattening Test requirements of ASTM A999/A999M
   - Hydrostatic Pressure Test of ASTM A999/A999M
   - Non-Destructive Test of ASTM E213 or ASTM E309

Product Comparison:

Alloy Comparisons	Ferralium® 255	S17400 H1025	S32205	N07718	S31254
Pitting Resistance Equivalent number	>40	16	34	31	43
0.2% Proof Strength (N/mm^2)	550	1137	510	500	325
Corrosion Rate (mm/year) - Seawater	<0.01	~1	<0.10	<0.01	<0.01
Corrosion Rate (mm/year) - 10% sulphuric acid at 80°C	<0.15	10	0.4	<0.15	1.5
Corrosion Rate (mm/year) - Boiling 50% nitric acid	<0.15	<0.15	<0.15	<0.15	0.4
Wear Properties related to Hardness (HRC), maximum	28	38	25	20	20

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 Ferralium® 255 – SD50

Production Route:

Ferralium® 255 (tube) is produced through high-precision steelmaking processes to ensure cleanliness and consistency.

a) Solution treatment shall be carried out above 1040°C
b) This will be followed by immediate water or air quench
c) Tubes are straightened to achieve a chord height deviation of <0.2%
d) Visual inspection to confirm the absence of bursts, flakes, cracks, seams, laps or other undesirable defects
e) No weld repair is allowed

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 (25")
- 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

Unique metals for your demanding applications

UK
The Wharf I 504-506 Lowfield Dr I Newcastle Under Lyme
Staffordshire I ST5 0UU I UK
+44 (0)1782 610250
sales@langleyalloys.com

USA
102 Longview Street I Conroe
Houston I Texas 77301 I USA
+001 (281) 819 5588
usa@langleyalloys.com

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