



Langley Alloys



Fermonic® 50 - High Strength / Extra-High Strength

Specifications:

UNS S20910, XM-19, ASTM479, ASTM A276, ASTM A182, ASTM A314, AMS 5764, NACE MR0175 / ISO15156-3, API 6A

Fermonic® 50 - HS/EHS is a Nitrogen-strengthened austenitic stainless steel that can be supplied in the cold worked or warm worked condition. Although very small diameter bars of Fermonic® 50 (<2.25") can be cold worked to achieve higher strength levels, larger section sizes can only achieve dramatically increased mechanical properties by deforming at raised temperatures. This results in a deformed and partly recrystallized microstructure that is 'stress free'; achieves high strengths with good ductility and consistent properties through the bar (unlike cold worked material). The superior properties of Fermonic® 50 HS/EHS are available up to 9" diameter bars.

This product maintains excellent ductility and toughness at both elevated and cryogenic temperatures, combined with improved abrasion and erosion resistance relative to other austenitic stainless steel grades, making it a useful and cost-effective alloy in a wide range of demanding applications. It can generally be formed and welded in the same way as other 3xx alloys, although machining may require slower speeds / more power due to its high work hardening rate. It achieves corrosion resistance equivalent or better than Alloy 317L in a wide range of environments, and is listed in NACE MR0175 for sour service given its ability to resist sulphide stress cracking.

Key Features:

- Higher strength and hardness than other austenitic stainless steels such as Alloy 304, Alloy 316L & Alloy 317L
- Excellent ductility and toughness at both elevated and cryogenic temperatures
- Non-magnetic, even after severe cold working, making it suitable for sensor applications
- Excellent corrosion resistance, including resistance to chloride and sulphide stress cracking
- Higher resistance to abrasion, erosion and cavitation erosion than Alloy 304, Alloy 316L & Alloy 317L austenitic stainless steels
- Listed in food handling standards (FDA) as an acceptable material for food contact surfaces
- Listed in MR0175 for sour service oilfield applications

Typical Applications:

- Oil & Gas industry downhole equipment
- Marine pumps, valves, masts, tie downs, fixtures and fittings
- Food processing equipment
- Process industry equipment in sulphuric acid, nitric acid, polythionic acid, urea production, organic & fatty acids
- Pulp and paper Industry valves and fittings

Physical Properties:

Density (Kg/m ³)	7880
Magnetic Permeability (20°C)	<1.02
Young's Modulus (kN/mm ²)	197
Specific Electrical Resistance, 20°C (μΩ-m)	0.82
Mean coefficient of thermal expansion, 20 - 100°C (m/m/°C)	17.9 x 10 ⁻⁶
Specific Heat, 20°C (J/kg.K)	475
Thermal conductivity, 20°C (W/m.K)	13.3

Product Forms Available:

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

Mechanical Properties:

	Fermonic® 50 - High Strength (cold worked condition, up to 1.5" /38mm diameter or section)		Fermonic® 50 - High Strength (cold worked condition, bars between 1.5"-2.25" /38mm - 57mm diameter or section)		Fermonic® 50 - High Strength (warm worked condition)		Fermonic® 50 - Extra High Strength	
0.2% Proof Stress	862 N/mm²	125 ksi	725 N/mm²	105 ksi	725 N/mm²	105 ksi	827 N/mm²	120 ksi
Tensile Strength	1000 N/mm²	145 ksi	827 N/mm²	125 ksi	896 N/mm²	125 ksi	930 N/mm²	135 ksi
Elongation, 5.65√S0 and 4D	12%		15%		20%		20%	
Reduction of Area	40%		45%		50%		40%	
Hardness	328 HBN max		328 HBN max		25-35HRC		25-35HRC	
Impact Strength (Room Temp)					135J		135J	
Impact Strength (-60°C)					40J		40J	

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 in a longitudinal direction)
3. Testing performed on each melt of material per heat treatment batch

Chemical Composition:

	Cr	Ni	Mo	Co	Nb (+Ta)	Ti	V	W	Cu	C	Mn	N	Si	P	S	Fe	Al
Min	20.50	11.50	1.50		0.10		0.10				4.00	0.20					
Max	23.50	13.50	3.00		0.30		0.30			0.06	6.00	0.40	1.00	0.045	0.030	Bal	

Product Comparison:

Alloy Comparisons	Fermonic® 50 HS	S32205	N07718 (Aged)	S31254	Ferralium® 255-SD50
Pitting Resistance equivalent number	34	34	31	43	>40
0.2% Proof Strength (N/mm²)	862	510	827	325	610
Corrosion Rate (mm/year) - Seawater	<0.01	<0.01	<0.18	<0.01	<0.01
Corrosion Rate (mm/year) - 10% sulphuric acid at 80°C	0.7	0.4	0.15	1.5	<0.15
Corrosion Rate (mm/year) - Boiling 50% nitric acid	0.18	<0.15	0.15	<0.4	<0.15
Wear Properties related to Hardness (HRC), typical	RC27	RC25	RC38	RC20	RC27

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	27 - 42 (90 - 140)	0.2 - 0.38 (0.008 - 0.015)	3 (0.125)
Turning - Finishing	35 - 60 (120 - 190)	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°		

Production Route:

Fermonic® 50 - HS/EHS is produced through high-precision steelmaking processes to ensure cleanliness and consistency.

- All material shall be refined by Argon Oxygen Decarburisation (AOD) and/or Electro Slag Remelting (ESR)
- The minimum forging ratio utilised is at least 4:1
- Solution treatment shall be carried out at a temperature between 1070 - 1120°C for one hour minimum
- This will be followed by immediate water quench
- Bars are supplied peeled and polished to a surface finish of 125CLA or better
- Each bar is ultrasonically tested and visually inspected

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

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