ASTM A182 F51 Specification

ASTM A182 F51 or UNS S31803 is a forging material specification for 25% Chromium, 20% Nickel. ferritic-austenitic microstructure. It has high impact strength & excellent pitting resistance.

1. Chemical Composition (% by weight)

Element	Min	Max
Carbon (C)	—	0.03
Manganese (Mn)	—	2.00
Phosphorus (P)	—	0.03
Sulfur (S)	—	0.02
Silicon (Si)	—	1.00
Chromium (Cr)	21.0	23.0
Nickel (Ni)	4.5	6.5
Molybdenum (Mo)	2.5	3.5
Nitrogen (N)	0.08	0.20
Copper (Cu)	—	0.50
Iron (Fe)	Balance	

2. Mechanical Properties

Property	Requirement
Tensile Strength (UTS)	Minimum 620 MPa (90 ksi)
Yield Strength (0.2% offset)	Minimum 450 MPa (65 ksi)
Elongation in 50 mm	Minimum 25%
Impact Test (Charpy V-Notch)	Typically 27 J (20 ft-lbs) at -46°C (-50°F) (may be required by customer or code)

3. Hardness

- Maximum Brinell Hardness: **290 HBW** (typically)
- Rockwell Hardness (HRB or HRC) may also be used as per customer requirements.

4. Heat Treatment

- **Solution Annealed**:
  Heating between **1040° C and 1120° C (1900° F - 2050° F)** followed by rapid quenching (usually in water) to maintain the balanced duplex microstructure and optimize corrosion resistance and toughness.

5. Product Types

- Forged flanges (weld neck, slip-on, blind, threaded, socket weld, lap joint)
- Forged fittings (elbows, tees, reducers)
- Valves and pressure-containing parts

6. Test Requirements

- **Chemical Analysis**: Confirm compliance with specified chemical limits.
- **Mechanical Testing**:
  - Tensile test
  - Hardness test
  - Impact test (if specified)
- **Non-Destructive Testing (NDT)** (per customer or code requirements):
  - Ultrasonic Testing (UT)
  - Liquid Penetrant Testing (PT)
- **Microstructure examination** may be required to ensure proper ferrite/austenite balance.

7. Certification

- **Mill Test Reports (MTRs):**
  Includes results of all chemical, mechanical, and NDT tests, heat treatment records, heat number traceability, and compliance statement with ASTM A182 standard.
- Compliance with relevant international codes like **ASME Section II** and flange standards (ASME B16.5, B16.47).
- Certifications for material origin and quality assurance per buyer or project requirements.