

ASTM A182 F1 Specification

ASTM A182 F1 is a **low-alloy forged steel grade** with 1/2% chromium and molybdenum, designed for service under high pressure and temperature (typically up to 500° C or 933° F).

This grade offers a combination of toughness, resistance to high-temperature creeping, and resistance to corrosion — especially in steam, oil, and power plant applications.

1. Standard:

✔ ASTM A182 — Standard Specification for Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

2. Material Grade:

- ASTM A182 F1 — Low-alloy chromium-molybdenum steel (1/2 Cr - 1/2 Mo)
- UNS K12822

3. Chemical Composition:

Element	Min	Max
Carbon (C)	—	0.15
Manganese (Mn)	0.30	0.60
Phosphorus (P)	—	0.030
Sulfur (S)	—	0.030
Silicon (Si)	0.50	0.80
Chromium (Cr)	0.5	0.7
Molybdenum (Mo)	0.44	0.65
Iron (Fe)	Balance	

4. Mechanical Properties:

Property	Requirement
Tensile Strength	minimum 380 MPa (55 ksi)
Yield Strength (0.2% offset)	minimum 205 MPa (30 ksi)
Elongation in 50 mm	minimum 30%
Hardness (Brinell)	maximum 163 HB

5. Heat Treatment:

➔ **Normalizing** (typically 900° C/1650° F) — followed by **tempering** (typically 650° C/1200° F) to achieve desirable mechanical properties.

6. Product Types:

ASTM A182 F1 is used for forged components for high-temperature service, including:

- ✓ Flanges (weld neck, slip-on, blind, threaded, lap joint)
- ✓ Valves
- ✓ Fittings (elbows, tees, crosses)
- ✓ Pressure Vessel Parts
- ✓ Tube Sheets

7. Inspection and Quality Control:

- ✓ Chemical Analysis (Spectrometric)
- ✓ Hardness Testing (Brinell)
- ✓ Tensile and Yield Strength Tests

- ✔ **Ultrasonic Inspection** (for internal defects)
- ✔ **Dimensional Inspection** against applicable ASME standards
- ✔ **Material Traceability** (with Mill Test Report)

16Mo3, designated with steel number 1.5415, is an European (DIN EN) steel grade for alloy steels. The 16Mo3 material can be furnished in different product forms in accordance with relative EN standards. Generally speaking, 16Mo3 is a Cr-Mo alloy steel. The addition of molybdenum(Mo) not only improves the resistance to pitting corrosion but also significantly enhances creep strength at elevated temperatures. The chromium(Cr) improves the resistance to high-temperature hydrogen attack and graphitization.

Chemical composition % of steel 16Mo3 (1.5415): EN 10028-2-2003

C	Si	Mn	Ni	P	S	Cr	Mo	N	Cu
0.12 - 0.2	max 0.35	0.4 - 0.9	max 0.3	max 0.025	max 0.01	max 0.3	0.25 - 0.35	max 0.012	max 0.3