

ASTM A105 Specification

ASTM A105 / A105M - Standard Specification for **Carbon Steel Forgings for Piping Applications**

This specification covers **forged carbon steel piping components** such as **flanges, fittings, valves, and similar parts** for **ambient- and higher-temperature service** in pressure systems. The forgings are typically used in **welded, threaded, or bolted** construction of piping systems.

Manufacturing & Heat Treatment

- Forgings may be produced by **open-die, closed-die, press, or rolled ring forging**.
- Heat treatment is **not mandatory**, but components may be **normalized, normalized and tempered, or quenched and tempered** upon request.
- For improved mechanical properties and grain refinement, **normalizing** is recommended for:
 - Flanges above Class 300
 - Flanges over 4 in. nominal size
 - Forgings used for high-temperature service

ASTM A105 Chemical Composition (%)

Element	Min	Max
Carbon (C)	—	0.35
Manganese (Mn)	0.60	1.05
Phosphorus (P)	—	0.035
Sulfur (S)	—	0.040
Silicon (Si)	0.10	0.35
Copper (Cu)	—	0.40
Nickel (Ni)	—	0.40
Chromium (Cr)	—	0.30
Molybdenum (Mo)	—	0.12
Vanadium (V)	—	0.08

ASTM A105 Mechanical Properties

Property	Requirement
Tensile Strength	≥ 485 MPa
Yield Strength	≥ 250 MPa
Elongation (in 2")	$\geq 22\%$
Reduction of Area	$\geq 30\%$
Brinell Hardness	≤ 187 HB (approx. 90 HRB)

ASTM A105 Testing Requirements

- **Tension test:** Required for each heat of steel.
- **Hardness test:** Required for each lot.
- **Nondestructive examination (NDE):** Optional, based on purchaser's requirements (e.g., ultrasonic or magnetic particle test).

ASTM A105 Common Product Forms

- **Flanges:** Weld Neck, Blind, Slip-On, Socket Weld, Threaded, Lap Joint
- **Forged Fittings:** Elbows, Tees, Couplings, Caps, Unions
- **Other Components:** Valve bodies, nozzles, forged bars, and discs

Typical Applications

- Oil & Gas pipelines
- Refinery & Petrochemical systems
- Power plants and boiler connections
- Shipbuilding and water treatment facilities

Equivalent Standards

Standard	Equivalent Material
ASME SA105	Pressure vessel quality equivalent
EN 10222-2	C22.8
DIN	C22.8
JIS	SF440A