Specification for ASTM A105/A105M www.semetalgroup.com

1. Scope

This technical specification defines the requirements for carbon steel forgings conforming to ASTM A105/A105M. The material must meet the requirements of this specification and all relevant standards. The content described herein represents the minimum quality requirements for the material.

2. Process

This steel shall be produced by open - hearth, basic oxygen, electric - furnace, or other equivalent processes and fully killed. The melting process shall be controlled in accordance with the requirements specified in Section 4 of ASTM A105 for manufacturing.

3. Heat Treatment

In accordance with the heat treatment requirements in Section 5 of ASTM A105, forgings shall be supplied in the normalized, normalized and tempered, or quenched and tempered condition.

3.1 Normalizing

Normalizing shall be performed within the temperature range of 1616–1688 °F (900 °C \pm 20 °C). For each inch of maximum section thickness, the normalizing hold time shall be at least 0.5 hours (with a total normalizing time of at least 1 hour). Cooling shall be done in still air.

3.2 Quenching and Tempering

- Austenitizing: Conducted within the temperature range of 1616–1688 °F (900 °C ± 20 °C). For each inch of maximum section thickness, the austenitizing hold time shall be at least 0.5 hours (with a total austenitizing time of at least 1 hour).
- Quenching: Cooled in a suitable medium to below 500 °F (260 °C).
- **Tempering**: Tempered at a minimum temperature of 1100 °F (593 °C). For each inch of maximum section thickness, the tempering hold time shall be at least 0.5 hours (with a total tempering time of at least 1 hour), followed by furnace cooling.

4. Chemical Composition

The chemical composition shall comply with the requirements of ASTM A105/A105M. The values listed below are maximum values, and the analysis method shall be in accordance with ASTM A715.

Element	Maximum Content	Additional Notes
Carbon (C)	0.22%	
Manganese (Mn)	1.35% (0.60% min)	
Phosphorus (P)	0.035%	
Sulfur (S)	0.040%	
Silicon (Si)	0.35% (0.10% min)	
Copper (Cu)	0.40%	(a) Total of Ni, Cr, Cu, Mo, and V \leq

Element	Maximum Content	Additional Notes
		1.00%
Nickel (Ni)	0.40%	(a) Total of Ni, Cr, Cu, Mo, and V \leq 1.00%
Chromium (Cr)	0.30%	(b) Total of Cr and Mo \leq 0.32%
Molybdenum (Mo)	0.12%	(b) Total of Cr and Mo \leq 0.32%
Vanadium (V)	0.08%	

Carbon Equivalent (CE): The carbon equivalent before CE shall not exceed 0.43%. Formula: CE = C + (Mn/6) + (Cr + Mo + V)/5 + (Ni + Cu)/15

5. Mechanical Properties

Property	Minimum Requirement	Unit
Tensile Strength	485 Mpa	
Yield Strength	275 Mpa	
Elongation	22%	(in 2 inches)
Reduction of Area	30%	
Hardness (HB)	137–187	

6. Test Pieces

Test piece material shall be from the same heat lot as the material to be certified and shall undergo the same machining and heat - treatment processes. Test pieces shall comply with the requirements of API 6A 5.6. Tests shall be conducted in accordance with the requirements of API 6A, ASTM A105/A105M, and A370, and records shall be maintained as per this document. Hardness testing shall be performed in accordance with ASTM E10/E18 and API 6A 7.5.2.1.3 standards.

7. Marking

All forgings shall be clearly marked with the material specification, part number, and heat - treatment lot number.

8. Certification

Unless otherwise specified in the purchase order, the manufacturer shall provide Company with a certificate containing the following:

- 1. Purchase order number, part number, heat number, lot number, and quantity of parts.
- 2. Chemical analysis report.
- 3. Mechanical properties and hardness report.
- 4. Heat treatment process record.
- 5. Submission of test pieces from the same heat lot.
- 6. If required by the purchase order, a nondestructive testing report.