

35NCD16 - Technical Specification

1. Product Description:-

The 35NCD16 is high-strength, low-alloy steel (Nickel-Chromium Molybdenum) used in aerospace and heavy-duty engineering. It offers excellent tensile strength, toughness, and fatigue resistance, making it ideal for parts like landing gear, automotive components, and structural elements. With a typical hardness of 50-54 HRC after heat treatment, it is known for its durability under stress and cyclic loading. The alloy's composition includes carbon (0.35%), nickel (3-3.5%), chromium (1.4-1.7%), and molybdenum (0.4-0.6%).

2. Chemical Composition (by weight):-

Elements	%C	%Si	%Mn	%P	%S	%Cr	%Mo	%Ni	%H	%O	%N	%Co	%Cu
Min.	0.30	0.15	0.30	-	-	1.60	0.25	3.50	-	-	-	-	-
Max.	0.40	0.40	0.60	0.025	0.020	2.00	0.60	4.20	2 ppm	30 ppm	80 ppm	-	-
Results	0.336	0.280	0.481	0.016	0.006	1.824	0.355	3.820	0.500	12	40	-	-

3. Mechanical Properties:-

Specified Values	0.2% Yield Strength (MPa)	Tensile Strength (MPa)	Elongation in 4D %	Reduction Area (%)	Hardness in HRC
Min.	1030	1230	8	40	39
Max.	-	1380	-	-	43
Results	1164.10	1332.22	15.38	45.06	40 - 41

4. Heat Treatment:-

The heat treatment process typically involves:

- **Annealing:** Heat to 830-850°C, then cool slowly to soften the material.
- **Hardening (Quenching):** Heat to 820-860°C, then quench in oil or water for increased hardness.
- **Tempering:** Reheat to 200-650°C to reduce brittleness and achieve the desired balance of strength and toughness.
- **Optional Stress Relieving:** Heat to 500-600°C to reduce residual stresses.

This process optimizes the steel's hardness, strength, and toughness.

5. Physical Properties:-

- Density: $\sim 7.85 \text{ g/cm}^3$
- Melting Point: $\sim 1425\text{-}1460^\circ\text{C}$ ($2597\text{-}2660^\circ\text{F}$)
- Thermal Conductivity: $\sim 34.5 \text{ W/m}\cdot\text{K}$ (at 20°C)
- Specific Heat Capacity: $\sim 460 \text{ J/kg}\cdot\text{K}$ (at 20°C)
- Young's Modulus (Elastic Modulus): $\sim 210 \text{ GPa}$
- Poisson's Ratio: ~ 0.3
- Electrical Resistivity: $\sim 0.21 \mu\Omega\cdot\text{m}$ (at 20°C)
- Thermal Expansion Coefficient: $11.1 \times 10^{-6} /\text{K}$ (from 20°C to 100°C)

6. Applications:-

35NCD16 steel is widely used in high-stress and high-performance environments due to its excellent strength, toughness, and fatigue resistance. Key applications include:

- Aerospace: Landing gear, shafts, and structural components requiring high strength and toughness.
- Automotive: Transmission gears, crankshafts, and other high-wear components.
- Heavy Machinery: Structural parts in construction and industrial machines.
- Pressure Vessels: Components that must withstand high pressures and stress.
- Tooling: Manufacturing of dies, molds, and tools requiring high wear resistance.
- Military Hardware: Armored vehicles and other defense equipment needing strength and durability.

7. Corrosion Resistance:-

35NCD16 steel has limited corrosion resistance. It can rust in humid or corrosive environments without protective coatings like **plating, galvanization, or oil coatings**. Suitable for applications requiring strength but not ideal for harsh conditions without treatment.