

MONEL 400

Monel nickel–copper alloy 400 (UNS N04400; W.Nr. 2.4360 and 2.4361) is a solid–solution alloy that can be hardened only by cold working. It has high strength and toughness over a wide temperature range and excellent resistance to many corrosive environments.

Monel 400 is widely used in many fields, especially marine and chemical processing. Typical applications are valves and pumps; pump and propeller shafts; marine fixtures and fasteners; electrical and electronic components; springs; chemical processing equipment; gasoline and fresh water tanks; crude petroleum stills, process vessels and piping; boiler feed water heaters and other heat exchangers; and deaerating heaters.

Chemical Composition

Limiting Chemical Composition, % by Weight

Nickel (plus Cobalt).....	63.0 min.
Carbon.....	0.3max.
Manganese.....	2.0 max.
Iron.....	2.5max.
Sulfur.....	0.024max.
Silicon.....	0.5max.
Copper.....	28.0 –34.0

Specifications

MONEL 400 is designated as UNS N04400 and Werkstoff Nr. 2.4360 and 2.4361. It is listed in NACE MR–01–75 for oil and gas service.

Available Product Forms:Pipe, tube, sheet, strip, plate, round bar, flat bar, forging stock, hexagon, wire

Plate, Sheet, and Strip:

- BS 3072NA13 (Sheet and Plate), BS 3073NA13 (Strip)
- ASTM B127, ASME SB127 (Plate, Sheet, and Strip)
- SAE AMS 4544 (Sheet, Strip, and Plate),
- DIN 17750 (Plate, Strip and Sheet)
- QQ-N-281 (Plate, Sheet, Strip, Bar, Rod, Wire, and Forgings)

Bar, Rod, Wire, and Forgings

- BS 3075NA13 (Wire), BS 3076NA13 (Bar)
- ASTM B164 (Rod, Bar, and Wire), ASTM B564 (Forgings) & ASME SB164 (Rod, Bar, and Wire), ASME SB564 (Forgings)
- AECMA PrEN 2305 (Wire for Rivets)
- SAE AMS 4675 (Bars and Forgings), SAE AMS 4730 (Wire), SAE AMS 4731 (Wire and Ribbon)
- DIN 17752 (Rod and Bar), DIN 17753 (Wire), DIN 17754 (Forgings)
- VdTÜV 263 (Sheet, Plate, Bar, and Tubing)
- QQ-N-281 (Plate, Sheet, Strip, Bar, Rod, Wire, and Forgings)

Pipe and Tube

- BS 3074NA13 (Tube)
- ASTM B163 (Condenser and Heat Exchanger Tube), ASTM B165 (Seamless Pipe and Tube), ASTM B725 (Welded Pipe), ASTM B730 (Welded Tube), ASTM B751 (Welded Tube), ASTM B775 (Welded Pipe), ASTM B829 (Seamless Pipe and Tube)
- ASME SB163 (Condenser and Heat Exchanger Tubes), ASME SB165 (Seamless Pipe and Tube), ASME SB725 (Welded Pipe), ASME SB730 (Welded Tube), ASME SB751 (Seamless and Welded Tube), ASME SB775 (Seamless and Welded Pipe), ASME SB829 (Seamless Pipe and Tube)
- SAE AMS 4574 (Seamless Tubing)
- DIN 17751 (Pipe and Tube)
- VdTÜV 263 (Sheet, Plate, Bar, and Tubing),

Welding Products

- MONEL Filler Metal 60-AWS A5.14/ERNiCu-7
- MONEL Welding Electrode 190-AWS A5.11/ENiCu-7.

Other Products

- ASTM B366, ASME SB366 (Welded Fittings)
- SAE AMS 7233 (Rivets)
- DIN 17743 (Chemical Composition)

特性

Monel 400合金具有較優良的耐還原性介質的腐蝕能力，在氫氟酸、鹼、海水、 H_2S 、 H_2SO_4 (濃度小於85%)、 H_3PO_4 、有機酸等許多腐蝕介質中穩定性較好，在海水中比銅基合金更具耐蝕性

Monel 400合金在氫氟酸、氟氣和鹼溶液中的穩定性更為突出，僅比白金、白銀遜色。合金有一定的SCC敏感性，工作溫度 $<200^{\circ}C$ 。Monel 400可耐 $585^{\circ}C$ 以下無水氨和氨化條件下的腐蝕。

Monel 400合金在多數水腐蝕情況下，不僅耐蝕性極佳，而且孔蝕、應力腐蝕等也很少發現，腐蝕速度小於 $0.025mm/a$ 。高溫腐蝕：蒙乃爾400在空氣在連續工作的最高溫度一般在 $600^{\circ}C$ 左右，在高溫蒸汽中，腐蝕速度小於 $0.026mm/a$ 。

該合金的一個重要特徵是一般不產生應力腐蝕裂紋，切削性能良好。

用途

產品套用：蒙乃爾400合金是一種多用途的材料，在許多工業領域都能套用：1.動力工廠中的無縫輸水管、蒸汽管 2.海水交換器和蒸發器 3.硫酸和鹽酸環境 4.原油蒸餾 5.深海水使用設備的泵軸和螺旋槳 6.核工業用於製造鈾提煉和同位素分離的設備 7.製造生產鹽酸設備使用的泵和閥 8.耐腐蝕構件、彈性敏感元件、耐蝕熱電偶保護管(工作溫度 $<500^{\circ}C$)。

Monel 400銅鎳合金在寬溫區（至 $1000F$ ）具有高強度。用Monel 400做的彈簧可用於溫度高達 $450F$ 的腐蝕性場合。該合金在高濃度的鹽水環境中表現極佳。腐蝕率在涌動的海水中不超過 1 mpy 。