

INCOLOY® 020

UNS N08020 · W.Nr. 2.4660

Ni–Fe–Cr–Mo–Cu–Nb alloy

Sulfuric-acid resistant alloy balancing nickel, chromium, molybdenum and copper.

01 PRODUCT INTRODUCTION

INCOLOY alloy 020, also known as Alloy 20, is a nickel-iron-chromium alloy developed primarily for sulfuric-acid service. Copper and molybdenum support resistance in reducing acid environments, chromium contributes resistance to oxidizing conditions, and niobium stabilization helps control intergranular corrosion after welding. The alloy is widely used for chemical vessels, piping, heat exchangers, pumps, valves and pickling equipment where conventional stainless steels may suffer rapid attack. The final engineering choice should consider product form, heat-treatment condition, design temperature, loading mode, joining method and the applicable ASTM, AMS, ASME or NACE requirement.

02 ENGINEERING POSITION

Core advantage	Sulfuric acid, mixed chemical process streams and environments beyond common stainless-steel capability
Applications	Sulfuric-acid equipment · chemical vessels · heat exchangers · pumps · valves · pickling systems
Material class	Ni–Fe–Cr–Mo–Cu–Nb alloy

SELECTION NOTE Confirm product form, heat treatment, design code, temperature and actual process chemistry before specification.

03 COMMON INDUSTRY USE

Industry focus	Sulfuric-acid equipment · chemical vessels · heat exchangers · pumps · valves · pickling systems
Identity	INCOLOY® 020 · UNS N08020

Composition & Physical Data

Official limiting composition and typical physical constants.

04 CHEMICAL COMPOSITION

WEIGHT %

Ni	32–38%	Cr	19–21%
Fe	Balance	Cu	3–4%
Mo	2–3%	Nb + Ta	8×C–1.0%
C	≤ 0.07%	Mn	≤ 2.0%

SOURCE CONTROL

Use the applicable ASTM, AMS, ASME or NACE product specification and certified MTR for acceptance.

05 TYPICAL PHYSICAL PROPERTIES

ROOM TEMPERATURE

Density	8.08 g/cm³	Melting range	Approx. 1357–1400°C
Specific heat	Approx. 435–450 J/kg·°C	Condition	Annealed / aged
Magnetism	Low permeability	Data status	Typical reference

06 MATERIAL IDENTITY

Common name	INCOLOY® alloy 020
UNS / W.Nr.	N08020 / 2.4660
Alloy family	Ni–Fe–Cr–Mo–Cu–Nb alloy
Product standard	ASTM B463 · B468 · B471 · B472 · B473 · B729 · B366

ACCEPTANCE RULE

Physical and chemistry references do not replace the certified material test report.

Mechanical & Service Performance

Condition-dependent strength and service-selection guidance.

07 MECHANICAL PROPERTIES

Mechanical acceptance values depend on product form and the governing ASTM specification.

08 SERVICE PERFORMANCE

Primary service	Sulfuric acid, mixed chemical process streams and environments beyond common stainless-steel capability
Oxidation / hot corrosion	Assess atmosphere, carburization, nitriding, sulfidation and thermal cycling for hot service.
Aqueous corrosion	Review chlorides, reducing acids, oxidizing salts and intergranular-corrosion condition.
Creep / rupture	Use code-approved allowable stresses and grade-specific long-term data at temperature.
Welded service	Verify filler metal, heat input, post-weld condition and service environment.

09 TYPICAL APPLICATIONS

Industries	Sulfuric-acid equipment · chemical vessels · heat exchangers · pumps · valves · pickling systems
Critical review	Review stress state, thermal cycling, galvanic coupling and environmental contaminants.

IMPORTANT Official bulletin values are representative. Critical service requires code compliance, certified material data and suitable testing.

Fabrication, Welding & Heat Treatment

Practical controls for maintaining alloy performance.

10 FORMING & MACHINING

Cold forming	Use nickel-alloy tooling practice and account for work hardening where applicable.
Hot working	Use grade-specific temperature windows and avoid prolonged reheating.
Machining	Rigid setup, sharp tooling, positive feed and adequate coolant are recommended.

11 WELDING GUIDANCE

Processes	GTAW, GMAW and SMAW may be used with qualified procedures.
Filler metal	Select grade-compatible filler metal and verify service compatibility.
Heat input	Control interpass temperature, dilution and unnecessary reheating.
Cleanliness	Remove oil, grease, oxides and iron contamination before welding.

12 HEAT TREATMENT

Normally supplied solution annealed; niobium stabilization supports welded corrosion resistance.

QUALITY CONTROL Confirm WPS/PQR, filler metal, NDE, heat-treatment records and traceability.

Product Forms, Standards & Procurement

A practical specification and quotation checklist.

13 REFERENCE STANDARDS

ASTM B463 · B468 · B471 · B472 · B473 · B729 · B366

14 COMMON PRODUCT FORMS

Forms	Plate · sheet · strip · bar · wire · pipe · tube · fittings · forgings
Condition	Annealed, solution treated or age hardened by grade and specification

15 RFQ INFORMATION

Material	INCOLOY® 020 · UNS N08020 · governing ASTM/AMS/ASME specification
Dimensions	Form, OD/ID, wall or thickness, tolerances, length and quantity
Testing	Chemistry, tensile, hardness, PMI, NDE and customer-specific tests
Documents	EN 10204 3.1 MTR, heat traceability and compliance certificates

16 TECHNICAL DISCLAIMER

Values shown are typical or specification-level references and may vary by product form, thickness, heat treatment and governing standard. They do not replace engineering design calculations, corrosion review, applicable codes or the certified material test report.

Source basis	Special Metals technical literature and applicable ASTM / ASME / NACE requirements
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