

# INCOLOY® 825

UNS N08825 · W.Nr. 2.4858

Ni–Fe–Cr–Mo–Cu–Ti alloy

Broad aqueous corrosion resistance across reducing and oxidizing chemical environments.

## 01 PRODUCT INTRODUCTION

INCOLOY 825 uses nickel, molybdenum and copper for reducing-acid resistance, chromium for oxidizing media, and titanium for stabilization against intergranular corrosion after suitable heat treatment. It is used in chemical processing, pollution control, oil and gas recovery, acid production, pickling, nuclear fuel reprocessing and radioactive-waste handling. The alloy is selected when general and localized corrosion resistance are both required. 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/phosphoric acids, chlorides, nitric acid and oxidizing salts                      |
| Applications   | Chemical processing · acid production · oil and gas · pickling · nuclear fuel reprocessing |
| Material class | Ni–Fe–Cr–Mo–Cu–Ti alloy                                                                    |

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

## 03 COMMON INDUSTRY USE

|                |                                                                                            |
|----------------|--------------------------------------------------------------------------------------------|
| Industry focus | Chemical processing · acid production · oil and gas · pickling · nuclear fuel reprocessing |
| Identity       | INCOLOY® 825 · UNS N08825                                                                  |

# Composition & Physical Data

Official limiting composition and typical physical constants.

## 04 CHEMICAL COMPOSITION

WEIGHT %

|    |            |    |          |
|----|------------|----|----------|
| Ni | 38–46%     | Fe | ≥ 22%    |
| Cr | 19.5–23.5% | Mo | 2.5–3.5% |
| Cu | 1.5–3.0%   | Ti | 0.6–1.2% |
| C  | ≤ 0.05%    | Si | ≤ 0.50%  |

SOURCE CONTROL

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

## 05 TYPICAL PHYSICAL PROPERTIES

ROOM TEMPERATURE

|               |                         |               |                   |
|---------------|-------------------------|---------------|-------------------|
| Density       | 8.14 g/cm <sup>3</sup>  | Melting range | 1370–1400°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 825                                  |
| UNS / W.Nr.      | N08825 / 2.4858                                     |
| Alloy family     | Ni–Fe–Cr–Mo–Cu–Ti alloy                             |
| Product standard | ASTM B163 · B423 · B424 · B425 · B564 · B704 · B705 |

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

Use product-form-specific mechanical requirements; heat treatment and stabilization condition affect acceptance values.

## 08 SERVICE PERFORMANCE

|                           |                                                                                               |
|---------------------------|-----------------------------------------------------------------------------------------------|
| Primary service           | Sulfuric/phosphoric acids, chlorides, nitric acid and oxidizing salts                         |
| 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      | Chemical processing · acid production · oil and gas · pickling · nuclear fuel reprocessing |
| 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

Titanium stabilization and the applicable anneal help control sensitization and intergranular corrosion.

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 B163 · B423 · B424 · B425 · B564 · B704 · B705

## 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® 825 · UNS N08825 · 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 |
|--------------|------------------------------------------------------------------------------------|