INCONEL® 690

UNS N06690 · W.Nr. 2.4642

High-Cr Ni alloy

High chromium for oxidizing chemicals, high-temperature gases and nuclear steam-generator service.

01 PRODUCT INTRODUCTION

A high-chromium nickel alloy with excellent resistance to corrosive aqueous media and high-temperature atmospheres. Chromium drives resistance to oxidizing chemicals and gases; nickel supports resistance to chloride SCC and sodium hydroxide. The final engineering choice should also consider product form, heat-treatment condition, joining method, design temperature, loading mode and the governing ASTM, AMS or ASME requirement.

02 ENGINEERING POSITION

Core advantage	Nitric and nitric/HF solutions, caustic service, high-temperature water and oxidizing gases
Applications	Nuclear steam-generator tubing · nitric-acid equipment · pickling tanks · sulfur-bearing gas systems · waste vitrification
Material class	High-Cr Ni alloy

SELECTION NOTE

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

03 SOURCE BASIS

Primary source	Special Metals INCONEL® alloy 690 technical bulletin
Identity	UNS N06690 · W.Nr. 2.4642

Composition & Physical Data

Official limiting composition and typical physical constants.

04 CHEMICAL COMPOSITION

WEIGHT %

Ni	≥ 58.0%	Cr	27.0–31.0%
Fe	7.0–11.0%	C	≤ 0.05%
Si	≤ 0.50%	Mn	≤ 0.50%
Cu	≤ 0.50%	S	≤ 0.015%

SOURCE CONTROL Composition values are taken from the official Special Metals technical bulletin; use the governing ASTM/AMS specification for purchase acceptance.

05 TYPICAL PHYSICAL PROPERTIES

ROOM TEMPERATURE

Density	8.19 g/cm³	Melting range	1343–1377°C
Specific heat	450 J/kg·°C	Magnetism	Low permeability
Condition	Annealed / treated	Data status	Typical, not acceptance

06 MATERIAL IDENTITY

Common name	INCONEL® alloy 690
UNS / W.Nr.	N06690 / 2.4642
Alloy family	High-Cr Ni alloy
Product data	ASTM B166 · B564 · B163 · B167 · B168 · B829

ACCEPTANCE RULE Chemical and physical reference data do not replace the certified material test report or purchase specification.

Mechanical & Service Performance

Condition-dependent performance and service-selection guidance.

07 MECHANICAL PROPERTIES

Mechanical properties depend on product form and anneal; Young’s modulus is about 211 GPa at room temperature.

08 SERVICE PERFORMANCE

Primary service	Nitric and nitric/HF solutions, caustic service, high-temperature water and oxidizing gases
Corrosion basis	Nickel supports corrosion resistance; chromium supports oxidation; Mo/Nb/Al contributions depend on grade.
Temperature	Use grade-specific code allowables, creep data and heat-treatment condition.
Welded service	Review filler metal, heat input, post-weld condition and service environment.

09 TYPICAL APPLICATIONS

Industries	Nuclear steam-generator tubing · nitric-acid equipment · pickling tanks · sulfur-bearing gas systems · waste vitrification
Critical review	Verify chloride SCC, oxidation, carburization, sulfidation, fatigue and creep as relevant.

IMPORTANT

Official bulletin values are representative. Critical service requires code compliance, certified material data and, where appropriate, corrosion or qualification testing.

Fabrication, Welding & Heat Treatment

Process controls needed to preserve the intended alloy condition.

10 FORMING & MACHINING

Cold forming	Use nickel-alloy tooling practice and account for work hardening.
Hot working	Use the grade-specific hot-working window from the applicable technical bulletin.
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 the matching grade-specific filler 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 used annealed; nuclear specifications may apply tighter carbon and cobalt limits.

QUALITY CONTROL — **Confirm WPS/PQR, heat-treatment records, NDE, surface cleaning and full heat-number traceability.**

Product Forms, Standards & Procurement

A practical specification and quotation checklist.

13 REFERENCE STANDARDS

ASTM B166 · B564 · B163 · B167 · B168 · B829

14 COMMON PRODUCT FORMS

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

15 RFQ INFORMATION

Material	INCONEL® 690 · UNS N06690 · 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 from the cited official technical bulletin or are clearly identified as condition-dependent guidance. They may vary by product form, thickness and heat treatment. The purchase specification, applicable design code and certified material test report control final acceptance.

Official source	Special Metals technical bulletin: INCONEL® alloy 690