

INCONEL® alloy 601GC® is a nickel-chromium-iron alloy with additions of aluminum, zirconium and nitrogen. Chemical composition is given in Table 1. High levels of nickel and chromium give the alloy excellent strength and corrosion resistance at elevated temperatures. Oxidation resistance is further enhanced by the aluminum content.

INCONEL alloy 601GC is a grain-controlled version of INCONEL alloy 601 (UNS N06601). Zirconium and nitrogen in INCONEL alloy 601GC act to inhibit grain growth during exposure to high temperatures. Grain size stability is an important factor in obtaining optimum performance and service life at high temperatures.

The properties of INCONEL alloy 601GC are especially suitable for seam-welded roller tubes in roller-hearth furnaces used for the production of glazed ceramic tiles. The alloy has the strength and resistance to oxidation and corrosion needed for long, economical service in these continuous-duty tile-firing kilns.

**Table 1** - Limiting Chemical Composition, %

Nickel <sup>a</sup> .....	58.0-63.0
Chromium.....	23.0-25.0
Iron .....	Balance*
Aluminum .....	0.8-1.7
Zirconium .....	0.07-0.25
Nitrogen.....	0.02-0.07
Carbon .....	0.03-0.08
Manganese .....	1.0 max.
Silicon .....	1.0 max.
Copper.....	1.0 max.
Sulfur .....	0.015 max.

<sup>a</sup> plus Co.

\*Reference to the 'balance' of an alloy's composition does not guarantee this is exclusively of the element mentioned, but that it predominates and others are present only in minimal quantities.

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# INCONEL® alloy 601GC®

## Properties

Physical and mechanical properties of INCONEL alloy 601GC are essentially the same as those for INCONEL alloy 601. Some physical constants are listed in Table 2. Room-temperature tensile properties are given in Table 3. Stress-rupture properties at several temperatures are shown in Table 4.

Grain growth during high-temperature exposure adversely affects strength, especially resistance to low-cycle fatigue, and can shorten service life. As shown by Figure 1, INCONEL alloy 601GC exhibits stability of grain size.

The nickel, chromium and aluminum contents of INCONEL alloy 601GC provide outstanding oxidation resistance. Figures 2 and 3 show the result of oxidation tests at various temperatures.

**Table 2 - Physical Constants**

Density, Mg/m <sup>3</sup> .....	8.11
lb/in <sup>3</sup> .....	0.293
Melting Range, °C .....	1301-1368
°F .....	2374-2494
Specific Heat (20°C) J/kg °C .....	.448
(70°F) Btu/lb °F .....	.107
Permeability at 24°C (76°F) and 15.9 kA/m (200 oersted) .....	1.003
Curie Temperature, °C .....	< -196
°F .....	< -320

**Table 3 - Typical Room Temperature Tensile Property Ranges<sup>a</sup>**

Tensile Strength, MPa .....	585-690
ksi .....	85-100
Yield Strength (0.2% Offset), MPa .....	205-345
ksi .....	30-50
Elongation, % .....	55-35

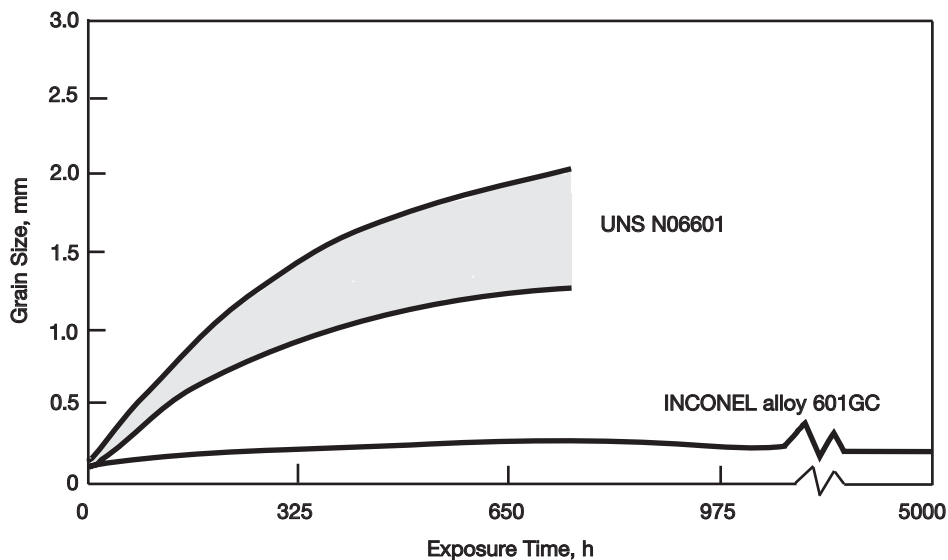
<sup>a</sup>Annealed temper

**Table 4 - Typical Stress-Rupture Properties**

Temperature		Stress		Rupture Life, h
°C	°F	MPa	psi	
980	1800	28	4000	40
1095	2000	14	2000	60
1175	2150	6.9	1000	40
1175	2150	5.5	800	70
1175	2150	4.1	600	160

## Availability

INCONEL alloy 601GC is available as pipe and tube in a wide range of sizes.



**Figure 1 - Effect of exposure to 1165°C (2130°F) on grain size of INCONEL alloy 601GC and conventional material for welded furnace tubes.**

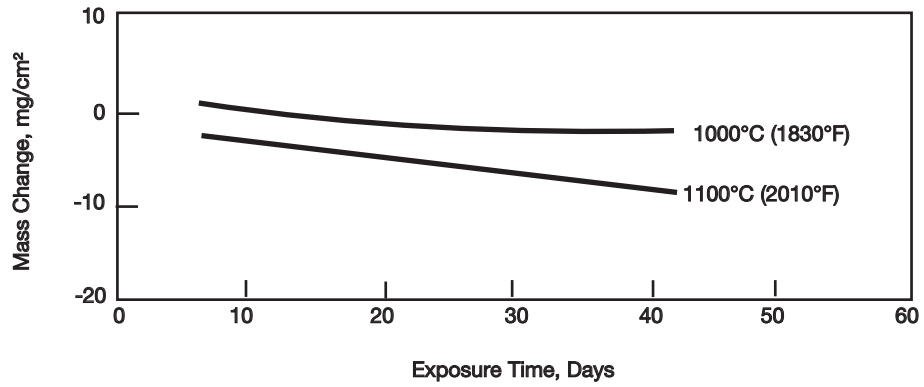


Figure 2 - Oxidation resistance of INCONEL alloy 601GC in air plus 5% water vapor.

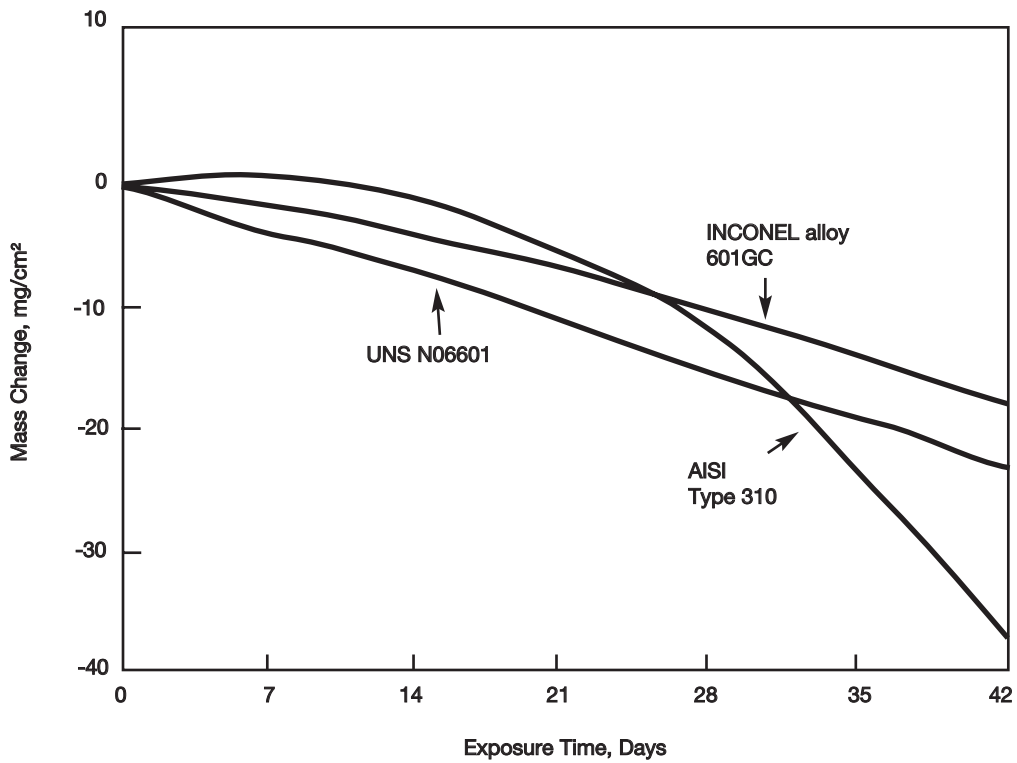


Figure 3 - Oxidation resistance at 1165°C (2130°F) in air. Specimens were cooled to room temperature at 7-day intervals.

## Fabricating / Joining / Machining

Additional information on INCONEL alloy 601GC is available in Special Metals publications “Fabricating”, “Joining” and “Machining” on the website, [www.specialmetals.com](http://www.specialmetals.com).



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