

# HASTELLOY<sup>®</sup> N alloy

## Principle Features

HASTELLOY<sup>®</sup> N alloy (UNS N10003) is a nickel-base alloy that was invented at Oak Ridge National Laboratories as a container material for molten fluoride salts. It has good oxidation resistance to hot fluoride salts in the temperature range of 1300 to 1600°F (704 to 871°C).

In tests of over two years duration, corrosion attack on HASTELLOY<sup>®</sup> N alloy in molten fluoride salts at temperatures up to 1300°F (704°C), was less than one mil per year. It is expected that alloy N will be most useful in environments involving fluorides at high temperatures; however, the alloy compares favorably with other HASTELLOY<sup>®</sup> alloys in various corrosive media, as shown in the table of penetration rates. Corrosion test samples of the alloy are available from Haynes International locations. It is especially suggested that the alloy be tested in molten halides of zirconium, beryllium, lithium, sodium, potassium, thorium or uranium.

HASTELLOY<sup>®</sup> N alloy has good oxidation resistance in air. It shows promise for continuous operations at temperatures up to 1800°F (982°C). Intermittent use at temperatures up to 1900°F (1038°C) may also be possible. No discernible oxidation could be measured for the alloy at temperatures up to 1200°F (649°C).

Metallographic examinations have shown that the elements in alloy N remain in solid solution in the 1100 to 1600°F (593 to 871°C) range. Tensile tests have indicated no tendency toward embrittlement for prolonged periods at 1500°F (816°C). Alloy N has good weldability and can be readily forged. The hot working range is between 1600 and 2150°F (871 to 1177°C). It has been successfully extruded and further processed into high-quality seamless or manufactured as welded and drawn tubing.

Solution heat-treatment is recommended after hot or cold working of HASTELLOY<sup>®</sup> N alloy parts. For sheet and plate, this is accomplished by soaking at 2150°F (1177°C) [sections up to 1/4 inch thick] and then cooling rapidly in air, or at 2165°F (1185°C) [sections 1/4 inch and thicker] followed by waterquenching.

HASTELLOY<sup>®</sup> N alloy can be supplied, to order, in the forms of sheet, plate, and bar

HASTELLOY<sup>®</sup> N alloy sheet, plate, bar, rod, and welded and seamless wrought pipe and tubing have been approved for use in the construction of unfired pressure vessels in accordance with the requirements of the ASME Boiler and Pressure Vessel Code Section VIII under Case 1315 (Special Ruling). Alloy N is approved for use at temperatures up to 1300°F (704°C). Design data can be found [here](#).

The properties data listed are typical or average values and should not be interpreted as guaranteed values except where so stated.

---