

## Nimonic 80A, Alloy 80A, UNS N07080, 2.4952 - Steels of Blade for Steam and Gas Turbine Datasheet

NIMONIC® alloy [80A](#), UNS N07080, 2.4952, 2.4631 is a wrought, age-hardenable nickel-chromium alloy (are primarily composed of nickel and chromium.). Alloy 80A is similar to alloy 75 but made precipitation hardenable by additions of aluminium and titanium. Alloy 80A has good corrosion and oxidation resistance and high tensile and creep-rupture properties at temperatures to 815°C (1500°F). Alloy 80A is used for gas-turbine components (blades, rings, discs), bolts, tube supports in nuclear generators, exhaust valves in internal combustion engines and has many other offshore/marine, automotive and electrical applications.

### Chemical Composition

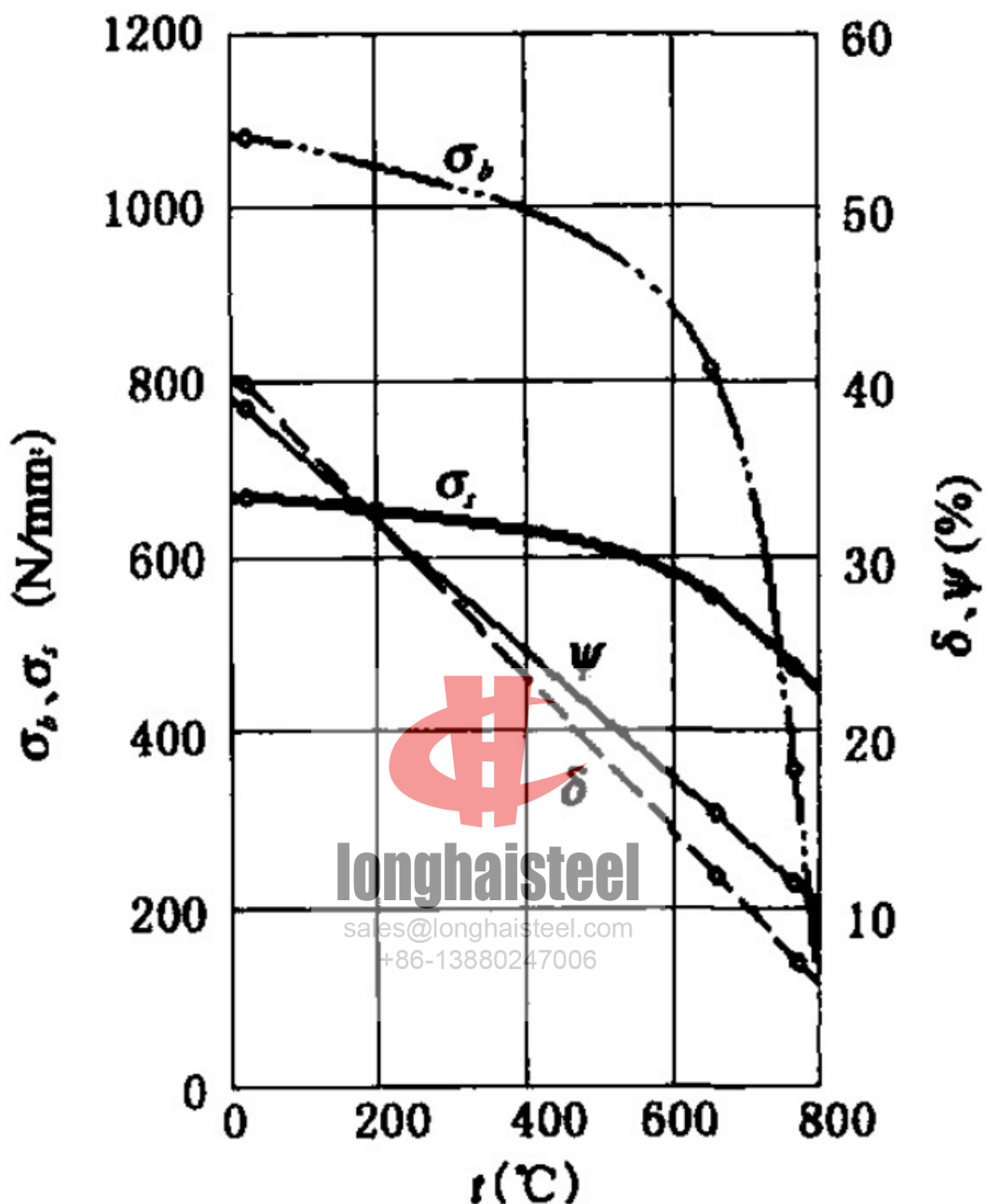
Grade	Chemical composition WT %													
	C	Si	Mn	P	S	Cr	Ni	Ti	Al	Cu	Fe	Co	B	Zr
Nickel Alloy 80A	0.10	1.0	1.0	0.005	0.015	18-21	Bal	1.8-2.7	1.0-1.8	0.2	3.0	2.0	0.008	0.15
Nimonic 80A	0.04-0.1	0.10	1.0	0.005	0.005	18-21	min 65	1.8-2.7	1.0-1.8	0.2	1.5	1.0	0.008	-
UNS N07080	0.1	1.0	1.0	0.045	0.015	18-21	Bal	1.8-2.7	1.0-1.8	0.2	3.0	2.0	0.008	
AFNOR NF NC 20TA	0.04-0.10	1.0	1.0	0.02	0.015	18-21	Bal	1.8-2.7	1.0-1.8	0.2	3.0	2.0	0.008	
2.4952, NiCr 20 TiAl	0.04-0.10	1.0	1.0	0.02	0.015	18-21	min 65	1.8-2.7	1.0-1.8	0.2	1.5	1.0	0.008	
HEV 5							Bal							

### Mechanical Properties

#### Nimonic 80A Mechanical properties

- Tensile strength  $R_m$  MPa: 1000-1300
- Yield Strength  $R_p$  MPa: Min 600
- A %: 12
- Hardness, HB 310-400
- Impact Charpy, min 20 J

#### Tensile diagram for Nimonic 80A



## Physical Properties

- Density
  - g/cm<sup>3</sup>: 8.19
  - lb/in<sup>3</sup>: 0.296
- Melting Range: 1320-1365°C / 2410-2490°F
- Magnetic Properties
  - Mass Susceptibility: 5.85 x 10<sup>-6</sup> at 1000 gauss

- Volume Susceptibility:  $4.78 \times 10^{-5}$  at 1000 gauss
- Magnetic Permeability: 1.000601 for 200-2000 oersted

## Heat Treatment

- Solution annealing:  $1050^{\circ}\text{C} - 1080^{\circ}\text{C} / 8\text{h} / \text{air}$
- Stabilization:  $845^{\circ}\text{C} \pm 10^{\circ}\text{C} / 24\text{h} / \text{air}$
- Precipitation hardening:  $700^{\circ}\text{C} \pm 10^{\circ}\text{C} / 16\text{h} / \text{air}$

### Nimonic 80A Bolt Heat Treatment

- Step 1: The hot-rolled or forged bars of Nimonic 80A alloy to be manufactured bolts are subjected to solution heat treatment at  $1080^{\circ}\text{C} \sim 1100^{\circ}\text{C}$ , and the holding time is: bars with a diameter of less than 60mm are kept for 2 to 5 hours, and air is cooled to room temperature; The bar is kept warm for 5-8 hours, and the oil is cooled to room temperature;
- Step 2: After the bar in step 1 is processed into finished bolts that meet the specification requirements, vacuumize the closed workpiece chamber until the vacuum degree is not lower than  $1 \times 10^{-5}\text{Pa}$ , and then pass  $\text{AlCl}_3$  gas into the workpiece chamber to make the workpiece. The pressure in the chamber is not lower than 0.4MPa. Finally, place the bolts in an  $\text{AlCl}_3$  atmosphere and heat them to  $750^{\circ}\text{C} \sim 760^{\circ}\text{C}$  for chemical-aging heat treatment. The holding time is: 4~6 hours for bolts with a diameter smaller than 60mm, and bolts with a diameter larger than 60mm. The bolts are kept warm for 6~8 hours; high-purity argon is used to cool to room temperature; the  $\text{AlCl}_3$  atmosphere is a mixed gas composed of  $\text{AlCl}$ ,  $\text{AlCl}_2$  and  $\text{AlCl}_3$ , which is made by pure aluminum powder and ammonium chloride powder according to 1: (2~6) Prepared by heating to  $650^{\circ}\text{C}$  after mixing the mass ratio

A Nimonic 80A alloy bolt heat treatment process according to claim 1, characterized in that, in step 2, the purity of high-purity argon is not less than 99.99%, and the cooling rate is not less than  $10^{\circ}\text{C}/\text{min}$  by controlling the flow rate .

The bolt heat treatment process of a kind of Nimonic 80A alloy material according to claim 1 or 2, is characterized in that, this heat treatment process can obtain the aluminum content that the mass ratio is not less than 15% in the depth of 2  $\mu\text{m}$  on the surface of the bolt, and the hardness is not less than 320HB ; The yield strength at room temperature is not less than 740MPa; the thickness of the oxide film at  $850^{\circ}\text{C}/100\text{h}$  in static air is not more than 0.1 $\mu\text{m}$ , reaching the complete anti-oxidation level.

## Welding Properties

Nimonic 80A alloy can be welded using conventional welding techniques such as gas-tungsten arc welding, shielded metal-arc welding and submerged-arc welding.

## Machining Properties

Nimonic 80A alloy can be machined using conventional machining techniques used for iron-based alloys. This alloy work-hardens during machining.

## Similar or Equivalents Steel Grade



Nimonic 80A, Alloy 80A, UNS N07080, 2.4952

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Nimonic 80A, Alloy 80A, UNS N07080, 2.4952, UNS N07080, BS 3076, HR1, HR401, HR601, HR201, ASTM B637, DIN 17742, DIN17754, NC 20 TA, NiCr 20 TiAl, 2.4952

