NIMONIC® alloy 86 has been developed to provide a material with good workability, ductility and weldability, high creep strength and exceptionally good cyclic oxidation resistance at 1050°C. The alloy is of the solid solution type and it is intended principally for use in high temperature applications such as gas turbine combustion chambers, afterburner parts and heat-treatment furnace equipment.

Table 1 - Chemical Composition, %

Carbon	0.05
Chromium	25.0
Molybdenum	10.0
Magnesium	0.015
Cerium	0.03
Nickel	Balance*

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

Recommended Heat Treatments

Sheet	5-15 min/1150°C/AC
Bar	2-4 h/1150°C/AC

Physical Properties

Density*	8.54 Mg/m³ at room temperature
	0.309 lb/in³ at room temperature

*The exact density depends on compositional variation within the release specification.

Table 2 - Mean Coefficient of Linear Thermal Expansion*

°C	10^{-6}/°C
20-100	12.7
20-200	12.8
20-300	13.1
20-400	13.5
20-500	13.9
20-600	14.1
20-850	15.5
20-1050	16.8

*These values are for fully heat-treated material. A variation of ±5% can be expected for compositional changes within the release specification, processing history and form.

Available Products

NIMONIC alloy 86 is available principally in sheet form. Bars and billets for forging, rods and bars for machining, extruded section or bar, plate and sheet, filler wire are also available.

Table 3 - Dynamic Young's Modulus*

°C	GPa
20	210
100	206
200	201
300	195
400	189
500	183
600	176
850	155
1050	138

*These values were obtained on fully heat-treated cylindrical specimens from bar vibrated in the flexural mode.

Tensile Properties

The data given in Table 4 are for forged bar 12.5 mm diameter after the recommended heat treatment. The data given in Table 5 are for cold rolled sheet 0.7 to 2.0 mm thick after the recommended heat treatment. *Strain rate 0.005/min to proof stress (at room temperature), 0.002/min to proof stress (at elevated temperatures) and 0.1/min thereafter.*

Table 4 - Tensile Properties of Bar Heat treatment 4h/1150°C/AC

°C	0.2% Proof Stress, MPa	Tensile Strength, MPa	Elongation on 5.65√So, %
300	251	692	49
500	243	661	54
700	239	557	56
850	173	319	69

Table 5 - Tensile Properties of Sheet Heat treatment 5-15 min/1150°C/AC

°C	0.2% Proof Stress, MPa	Tensile Strength, MPa	Elongation on 50 mm, %
20	438	873	45
750	250	502	74
850	184	310	83
900	125	237	66
1050	44	98	50

Publication Number SMC-101

NIMONIC® alloy 86

Cyclic Oxidation Resistance

Figures 1, 2 and 3 give comparative results for NIMONIC alloys 86, 75 and INCONEL® alloy HX. Test conditions were 1050°C ±10°C for 15 minutes followed by cooling in air for 5 minutes.

Creep Properties

Figure 4 gives creep rupture properties for sheet after the recommended heat treatment. Creep-rupture properties are also shown for NIMONIC alloys 75 and INCONEL alloy HX (AMS 5536) for comparison. Larson-Miller curves should not be used for extrapolation much outside the test results shown.

Fabrication

NIMONIC alloy 86 has good formability and is readily fabricated by standard techniques. The alloy has been shown to have good weldability. Joints made by the tungsten-inert-gas process, using matching composition filler wire, exhibit properties which match those of the base material.

As with all the nickel-based alloys, material to be welded must be thoroughly cleaned. All foreign substances, such as shop dirt, oil, grease, marking crayon and paint, must be removed before welding is started.

Information on fabricating is available in the Special Metals publication "Fabricating" on the company website, www.yttzhj.com.

Dissimilar welds may be made using the standard range of INCONEL welding products.

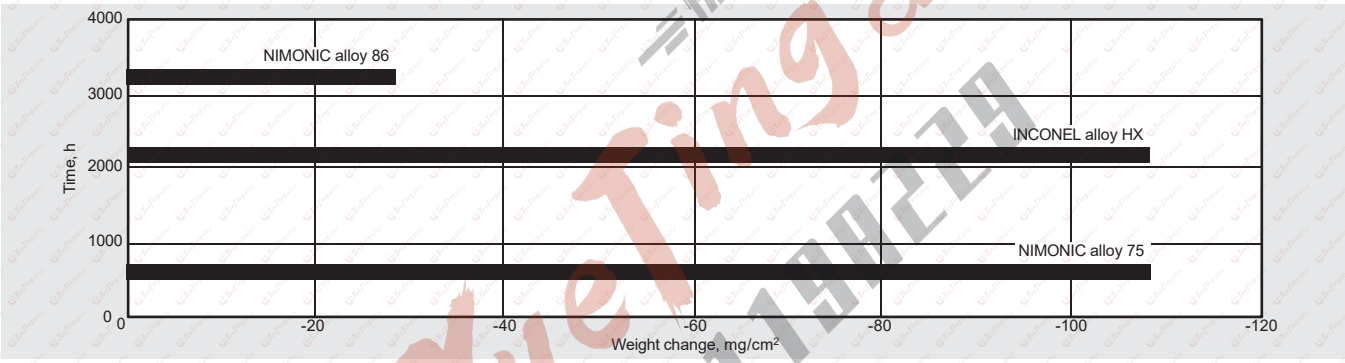

Figure 1.

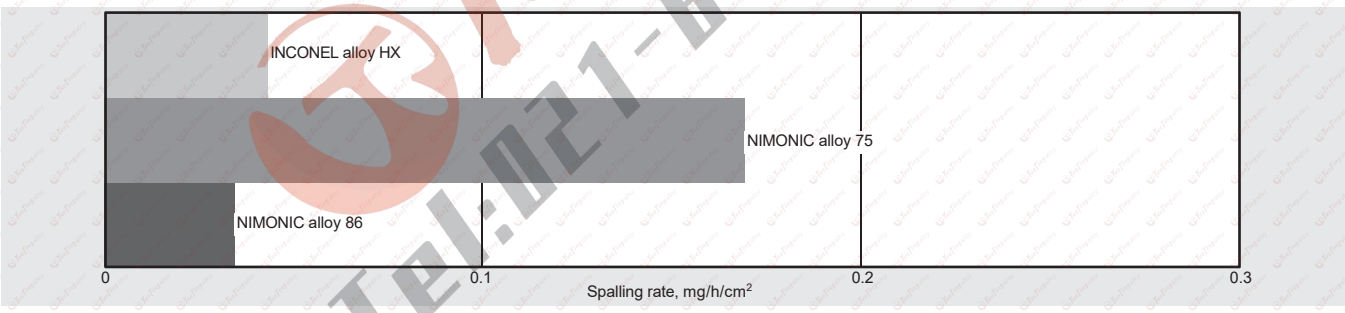

Figure 2.

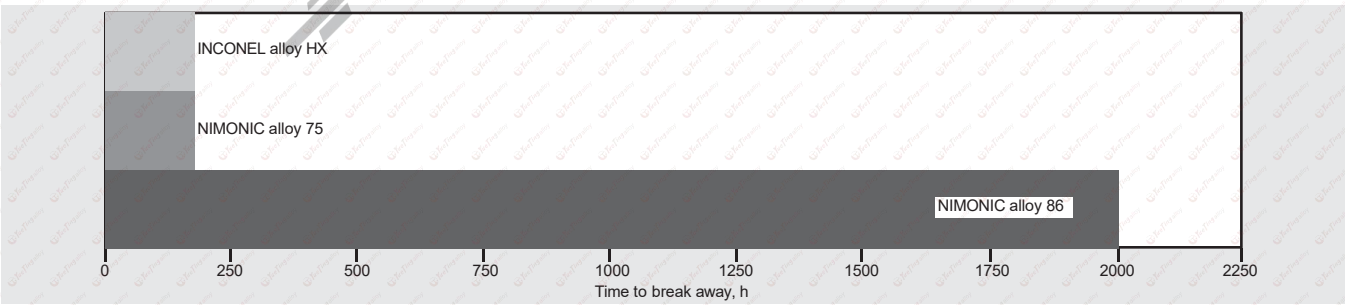

Figure 3.

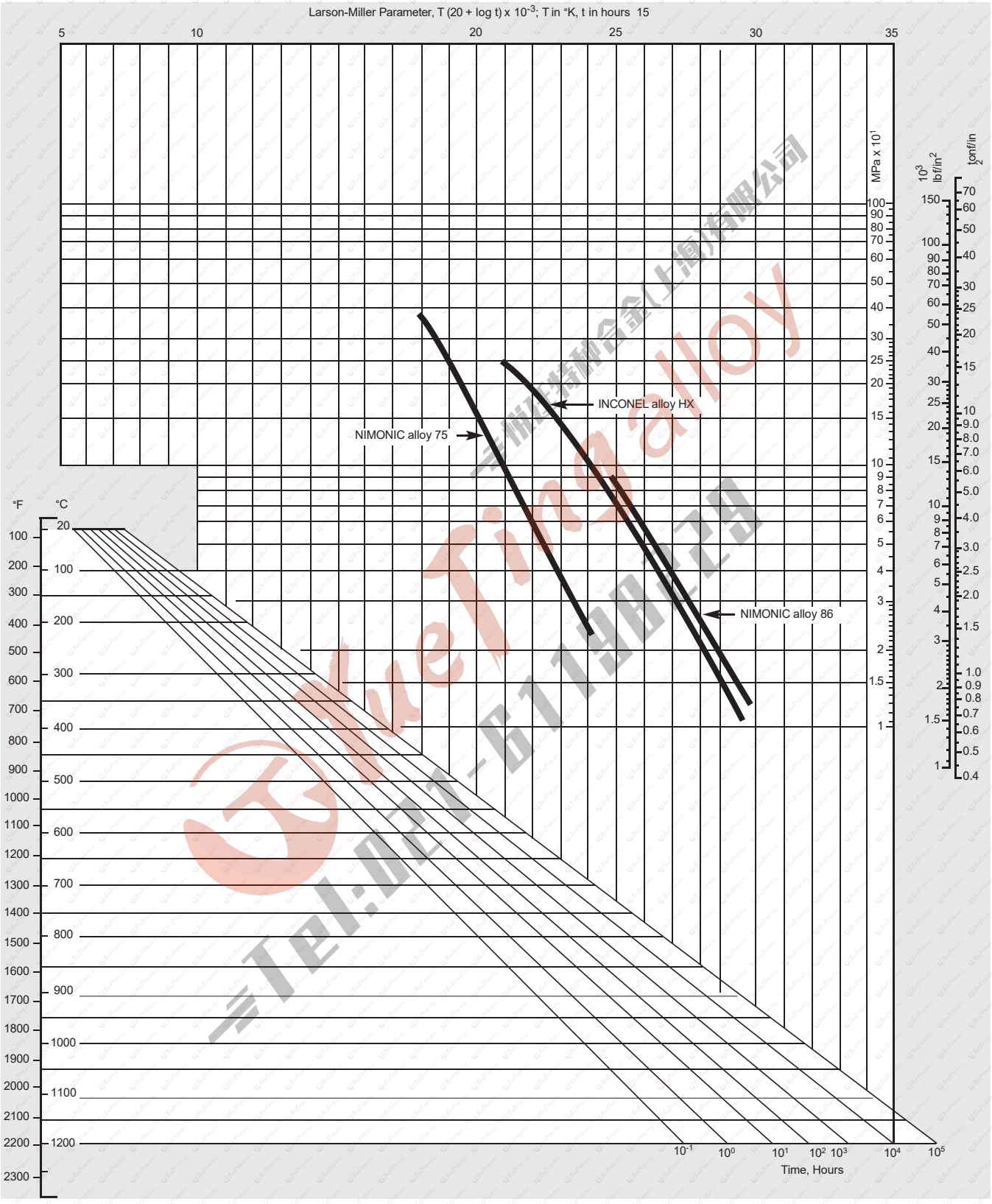

Figure 4. Creep-rupture properties of NIMONIC alloy 86 sheet.