

NIMONIC® alloy 115 (W. Nr. 2.4636) is a nickel-chromium-cobalt based alloy, strengthened with additions of molybdenum, aluminum and titanium. It was developed as a creep-resisting alloy for service at temperatures up to about 1010°C, as turbine blades for aircraft gas turbines.

Table 1 - Nominal Composition, %

Carbon	0.12-0.2
Silicon	1.0 max
Copper.....	0.2 max
Iron.....	1.0 max
Manganese	1.0 max
Chromium.....	14.0-16.0
Titanium.....	3.5-4.5
Aluminum	4.5-5.5
Cobalt.....	13.0-15.5
Molybdenum	3.0-5.0
Boron.....	0.01-0.025
Zirconium.....	0.15 max
Lead.....	0.0015 max
Sulfur	0.015 max
Nickel.....	Balance*

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

Available Products and Specifications

NIMONIC alloy 115 is available as rod and bar for forging, and as extruded and cold worked section for direct machining of turbine blades. Other forms may be produced against special order.

The alloy is designated W. Nr. 2.4636. Other specifications and designations include:

Billet, Bar, Forgings and Parts - BS HR 4, AECMA PrEn 2196 & 2197

Other - AICMA Ni-P102-HT,
DIN NiCo15Cr15MoAlTi, AFNOR NCK 15ATD

Heat Treatment

The heat treatment for NIMONIC alloy 115 (forged bar) is a two-stage process involving solution treatment followed by aging.

The recommended procedure is:

1½ h/1190°C/AC + 6h/1100°C/AC

Physical & Mechanical Properties

Density.....	7.85 g/cm ³ (dependent on processing variables)
.....	0.284 lb/in ³ (dependent on processing variables)
Melting range	1260-1315°C
Specific Heat.....	444 J/kg·°C (20°C)
Thermal Conductivity	10.6 W/m·°C (20°C)
Electrical Resistivity.....	139 µΩ cm (20°C)

Table 2 - Mean Coefficient of Linear Thermal Expansion

°C	10 ⁻⁶ /°K
20-100	12.0
20-200	12.6
20-300	13.0
20-400	13.2
20-500	13.5
20-600	13.8
20-700	14.3
20-800	14.9
20-900	15.7
20-1000	17.0

Data for fully heat-treated material. Figures subject to ±5% variation approximately, due to processing variables.

Table 3 - Dynamic Young's Modulus

°C	MPa x 10 ³
20	216
100	212
200	206
300	200
400	194
500	188
600	182
700	174
800	167
900	156
1000	141

Values obtained from fully heat-treated cylindrical specimens vibrated in the flexural mode.

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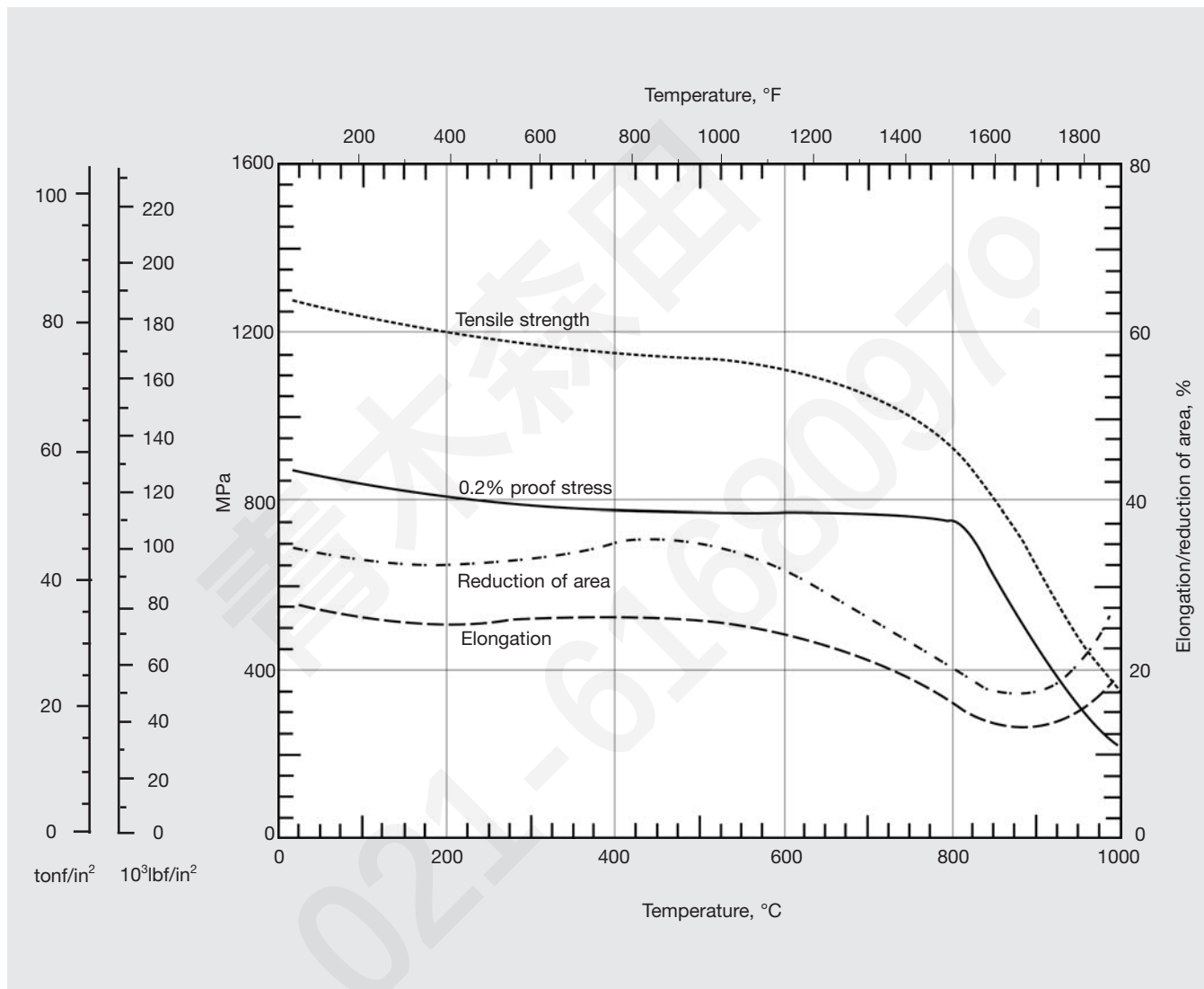


Figure 1. Tensile properties of forged bar. Heat treatment 1½ h/1190°C/AC + 6h/1100°C/AC

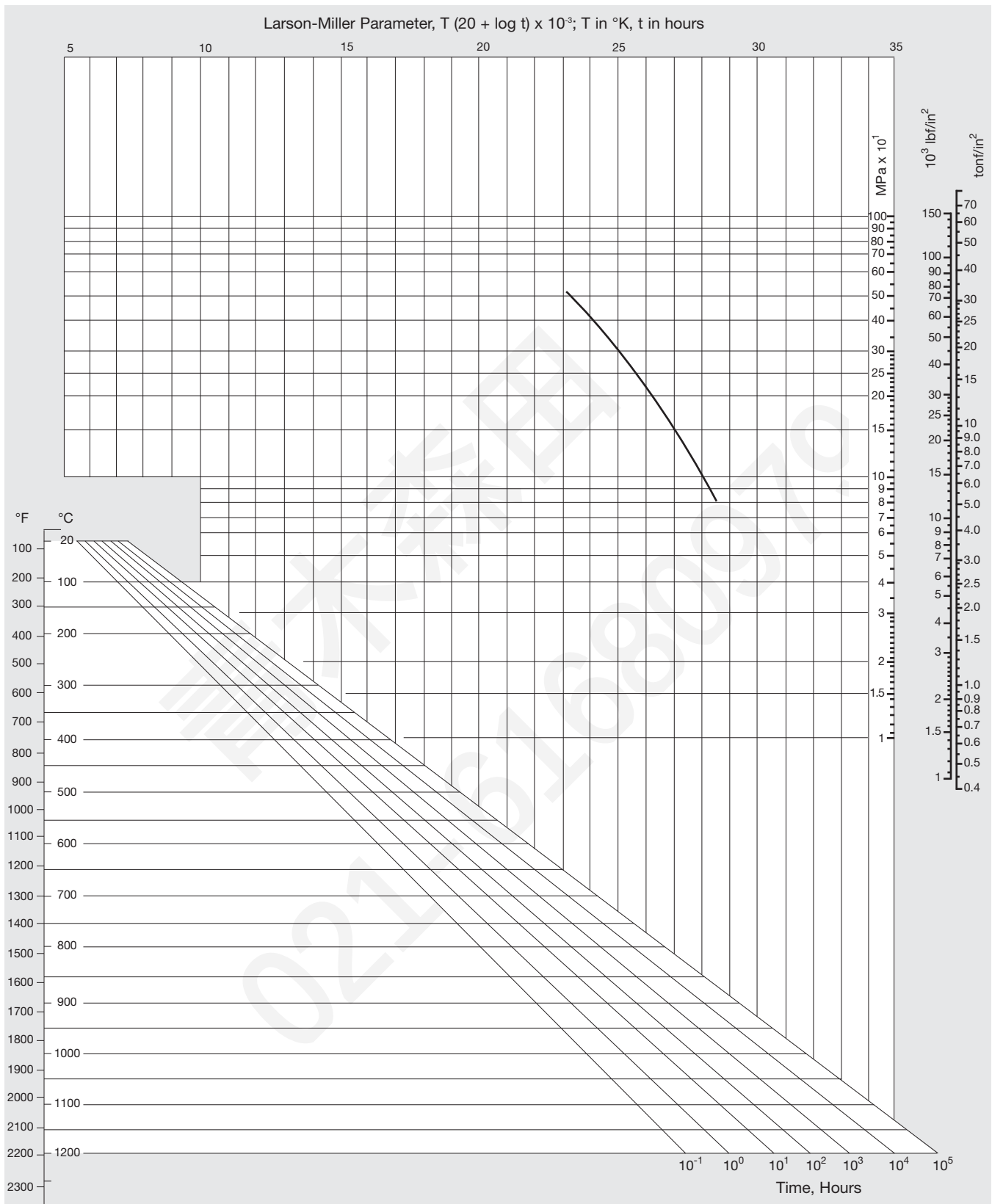


Figure 2. Creep-rupture properties of NIMONIC alloy 115 forged bar. Heat treatment 1.5 h/1190°C/AC+6h/1100°C/AC