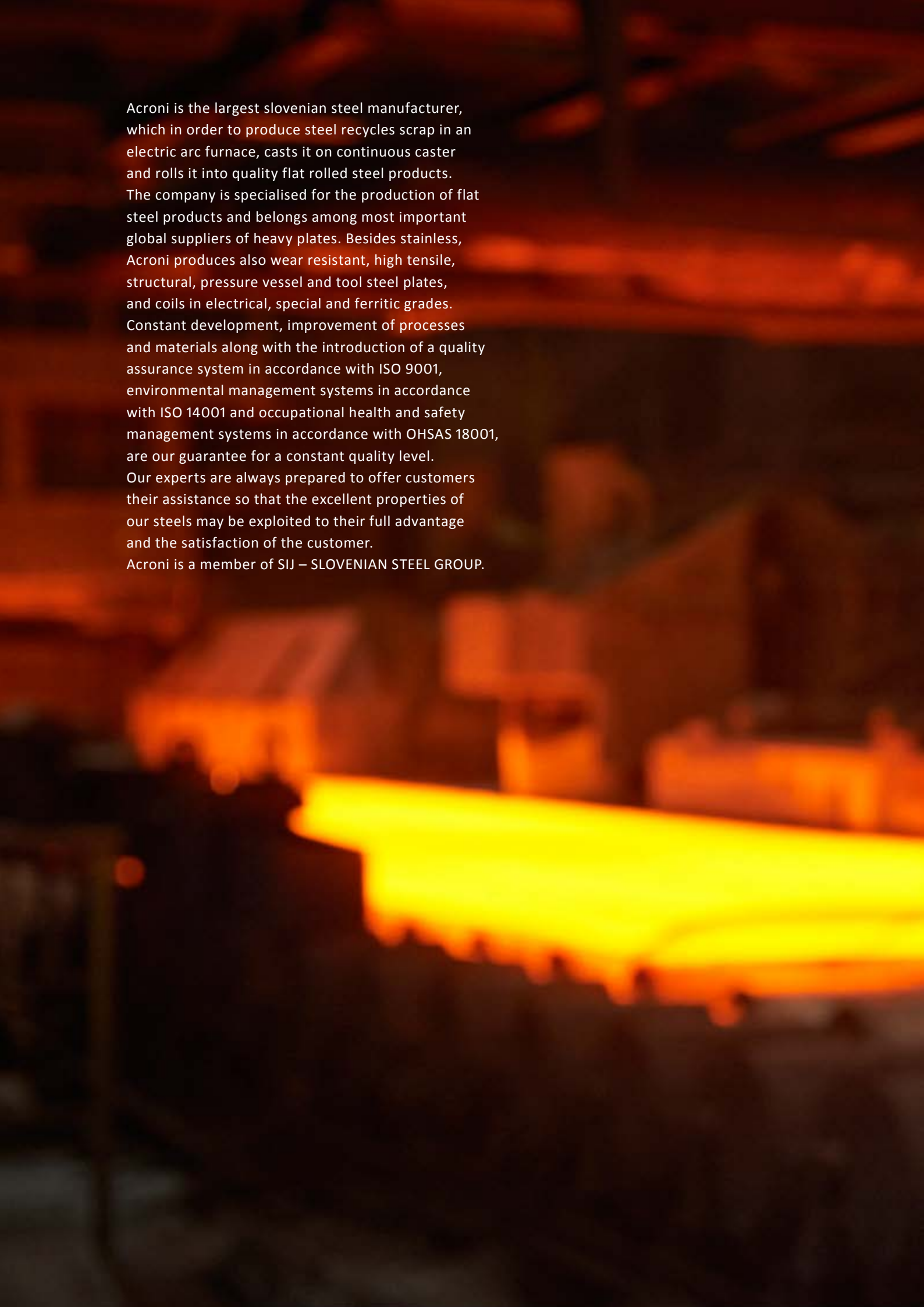


Born from fire,
made to endure

NICKEL ALLOYS



sij | acroni



Acroni is the largest slovenian steel manufacturer, which in order to produce steel recycles scrap in an electric arc furnace, casts it on continuous caster and rolls it into quality flat rolled steel products. The company is specialised for the production of flat steel products and belongs among most important global suppliers of heavy plates. Besides stainless, Acroni produces also wear resistant, high tensile, structural, pressure vessel and tool steel plates, and coils in electrical, special and ferritic grades. Constant development, improvement of processes and materials along with the introduction of a quality assurance system in accordance with ISO 9001, environmental management systems in accordance with ISO 14001 and occupational health and safety management systems in accordance with OHSAS 18001, are our guarantee for a constant quality level. Our experts are always prepared to offer customers their assistance so that the excellent properties of our steels may be exploited to their full advantage and the satisfaction of the customer. Acroni is a member of SIJ – SLOVENIAN STEEL GROUP.

NICKEL ALLOYS

Nickel and nickel alloys are the most important materials for the process industry because of their excellent corrosion resistance in a very aggressive corrosion environments, where high temperatures and stresses are present. Similar as stainless steels, nickel alloys are covering a wide range of corrosion resistance. Because of the better solubility of different alloying elements in nickel (chromium, molybdenum, tungsten,..), compared to iron, nickel alloys can be used even in more aggressive environments as stainless steels.

WE PRODUCE NICKEL ALLOYS AS:

- QUARTO PLATES



NICKEL ALLOYS MATERIAL SELECTION

NICKEL ALLOYS FOR HIGH TEMPERATURE APPLICATIONS

Nickel alloys for high temperature applications, based on the nickel-chromium-iron alloying system, with addition of aluminum and titanium. The most common used in the temperature region between 925 °C to even as high as 1150 °C. Microstructure is austenitic.

ALLOY 800H – NICKEL-IRON-CHROMIUM ALLOY (1.4876/1.4958, UNS N08810)

Alloy 800H is nickel-iron-chromium alloy that provide high strength and excellent resistance to oxidation and carburization at high temperatures. It also has good resistance to many nitriding atmospheres. High creep strength is attained through control over crystal grains-via high temperature heat treatment, together with fine control over carbon, titanium, and aluminum content.

APPLICATIONS

- Industrial Heating Industry - radiant tubes, return bends, muffles, retorts and fixtures for heat treating furnances
- Petrochemical furnace tubes
- Hydrocarbon Processing Industry - catalyst tubing, convection tubing, outlet manifolds and quenching system piping
- Power Generation Industry - steam super-heaters, high temperature heat exchangers, piping systems

AVAILABLE SPECIFICATIONS

Alloy 800H is designated as UNS N08810 and Werkstoff Numbers 1.4876 and 1.4958.

- ASTM A 240/A 480 & ASME SA 240/SA 480
- ASTM B 409/B 906 & ASME SB 409/SB 906
- Vd TÜV 412 & 434
- EN 10028-7 & EN 10095 & EN 10302 & EN 10088-1
- ISO 6208

CHEMICAL COMPOSITION

Typical values (wt. %)														
	C	Mn	P	S	Si	Cr	Ni	Al	Ti	Nb	N	Cu	Co	Fe ^A
Min.	0,06					19,00	30,00	0,20	0,20					39,5
Max	0,08	1,50	0,015	0,010	0,70	22,00	32,50	0,50	0,50	0,10	0,03	0,50	0,50	

Al + Ti ≤ 0,70

Ni + Co: 30,00 – 32,50

A Iron is determined arithmetically by difference.

PHYSICAL PROPERTIES

Density	Specific Heat	Modulus of Elasticity	Thermal Conductivity	Electrical Resistivity
7,937 g/cm ³	460 J/kgK*	200 GPa*	12 W/mK*	0,99 Ωmm/m*

* values at 20 °C according to EN 10088-1

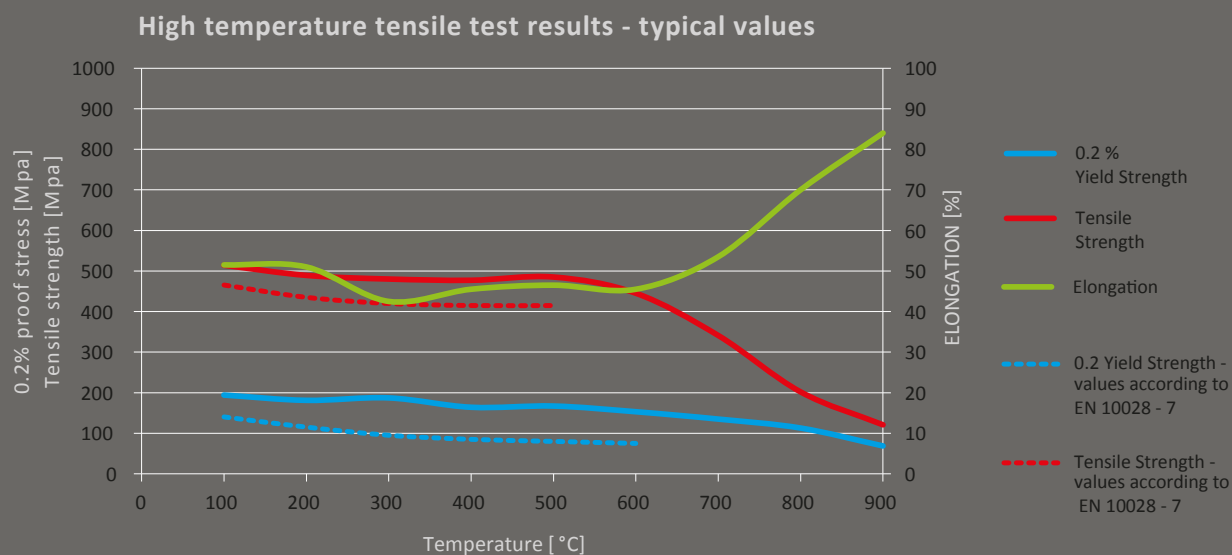
MECHANICAL PROPERTIES

Minimum guaranteed values of mechanical test requirements, for the specified thickness range.

Thickness [mm]	0,2 % Yield Strength min. [MPa]	Tensile Strength min. [MPa]	Elongation min. [%]	Hardness [HB]*	Impact Charpy V, 20°C [J]*
8 - 80	170	500	30	145	250 - 300

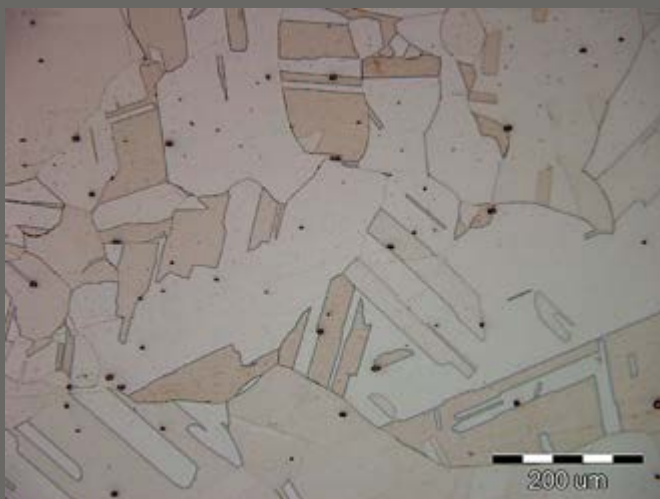
* typical value

HIGH TEMPERATURE STRENGTH



MICROSTRUCTURE

Microstructure of Alloy 800H is austenitic, with grain size No. 4 or coarser, according to ASTM E112, DIN EN ISO 643. Typical microstructure with average grain size No. 3,5 is shown on a below figure.



Magnification: 100X

CORROSION RESISTANCE

Alloy 800H offers good corrosion resistance in oxidizing corrosive environments such as nitric acid or nitric acid-sulfuric acid. Likewise, they perform well in sodium salt and other molten salt environments, with stress corrosion cracking resistance surpassing standard austenitic stainless steels. Following corrosion tests according to EN ISO 3651-2 and ASTM A262-10 are guaranteed.

EN ISO 3651-2 **Method A:** the 16 % sulfuric acid/copper sulfate test (Monypenny Strauss test) (90° bend)
Method C: the 40 % sulfuric acid/ferric sulfate test (90° bend)

ASTM A262-10 **Practice E:** cooper-copper sulfate – 16 % sulfuric acid test (180° bend)

HOT FORMING

The hot forming temperature range is between 870 – 1200 °C (1600 – 2200 °F). No working should be done between 540 – 760 °C (1000 – 1400 °F) – carbide precipitation temperature range. The rate of cooling following hot forming is not usually critical for this alloy with respect to thermal cracking.

HEAT TREATMENT

These alloys are designed for high-temperature service. Optimum resistance to time-dependent deformation (creep) at elevated temperatures is obtained by heating to a temperature to cause grain growth. The temperature normally used is 1150 – 1200 °C (2100 – 2200 °F). Depending on the size and furnace characteristics, the time at temperature is adjusted to achieve a grain size of ASTM No. 4 or coarser. After solution treatment rapid (water) cooling is applied.

PICKLING

Plates are supplied in the pickled condition (bright surface).

DIMENSIONS

Alloy 800H is supplied in plates of dimensions:

- thickness range: from 8,0 mm (0.315 in.) up to 80,0 mm (3.149 in.),
- length up to 12000 mm (472.4 in.),
- width up to 2000 mm (78.74 in.),
- thickness range: from 12,7 mm (0.5 in.) up to 80,0 mm (3.149 in.),
- length up to 12000 mm (472.4 in.),
- width up to 2500 mm (98.43 in.),

DIMENSIONS OF QUARTO PLATES

Thickness (mm)	8-80	12,7-80
Width (mm)	1000 – 2000	1000 - 2500
Length (mm)	2000 – 12000	2000 - 12000
Weight (kg)	max. 9600	max. 9600

TYPE OF PROCESS ROUTE AND SURFACE FINISH OF THE PRODUCTS ¹⁾ (EN 10028-7)

Symbol	Type of condition	Surface finish	Notes
1D	Hot rolled, heat treated, pickled	Free of scale	Usually standard for most steel grades; also common finish for further processing

