Nickel base Outokumpu Ultra Alloy 825

ONS 2018

Peter Bamforth

outokumpu

Content

outokumpu

“A world that lasts forever.”

We believe in a world that is durable, sustainable, efficient, and designed to last forever.

The world deserves innovations that can stand the test of time and are ready to be born again at the end of their life cycle. Our materials are vital in enabling a sustainable world with economic prosperity.

outokumpu

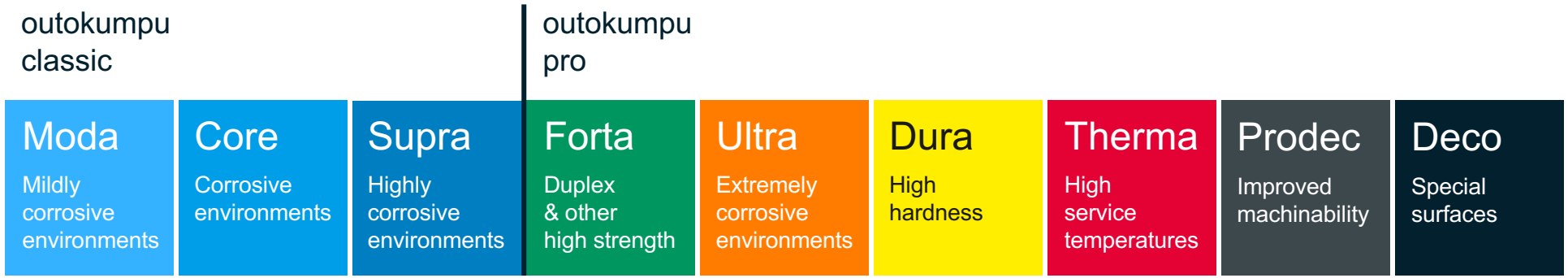
Operations

- Integrated melt shop, hot and cold rolling
- Other mills
- Mine
- Service center

outokumpu

Portfolio overview

- By grouping our products into ranges based on performance, we aim to make choosing the best product for your application easier.



Portfolio overview

- By grouping our products into ranges based on performance, we aim to make choosing the best product for your application easier.

Outokumpu Ultra Alloy 825

With Outokumpu as a supplier, the market now has access to cold rolled material up to 1,500 mm down to 0.4 mm!

outokumpu

Key benefits of Outokumpu Ultra Alloy 825

1

Wide coils means that pipe and tube manufacturers can improve their productivity compared with alternative manufacturing routes.

We provide cold rolled coils up to 1,500 mm wide in weights up to 12 tonnes or more.

2

Coil produced products have improved tolerances compared to plate produced products

3

We use our melt shop in Avesta, Sweden for continues casting of high quality slabs.

We can offer large quantities with competitive lead-times for project business

outokumpu


Product properties
outokumpu

Chemical composition

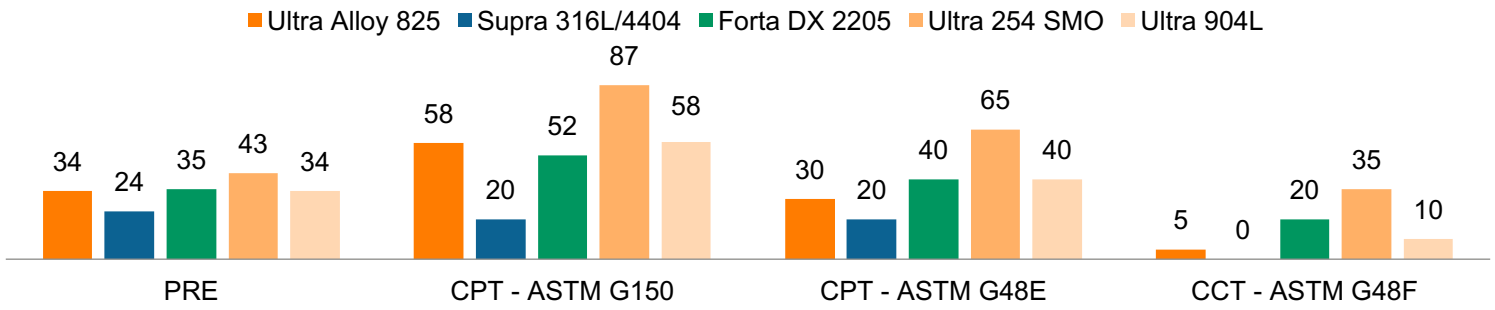
Typical chemical composition, % by mass

Outokumpu name	EN	UNS	PRE	C	Cr	Ni	Mo	N	Others
Ultra 904L	1.4539	N08904	34	0.01	19.8	24.2	4.3	–	Cu
Ultra 254 SMO	1.4547	S31254	43	0.01	20.0	18	6.1	0.20	Cu
Ultra Alloy 825	2.4858	N08825	34	0.01	23.0	39.5	3.2	–	Cu, Ti
Supra 316L/4404	1.4404	S31603	24	0.02	17.2	10.1	2.1	–	–
Forta DX 2205	1.4462	S32205	35	0.02	22.4	5.7	3.1	0.17	–

Note: PRE calculation = % Cr + 3.3 x % Mo + 16 x % N

outokumpu

Corrosion resistance



- Localized corrosion: on par with (or slightly inferior to) Ultra 904L
- Uniform corrosion: typically good resistance in e.g. sulphuric and phosphoric acids where Cr with high Ni, Mo and Cu alloying are beneficial in reducing or weakly oxidizing environments.
- Stress corrosion cracking: very high resistance due to its high nickel content
- In accordance with ISO 15156-3 (NACE MR0175)
- If the partial pressure of hydrogen sulphide (pH_2S) does not exceed 2 bar (30 psi) there will be no limits on chloride concentration and in situ pH up to 232°C
- If the temperature does not exceed 132°C, the material is acceptable for use without restriction on partial pressure.

Mechanical properties

Mechnical properties	Product form	Yield strength $R_{p0.2}$ (MPa)	Tensile strength R_m (MPa)	Elongation A [1] / A_{50} [2] (%)
Typical	Cold rolled (2 mm)	280	620	50 [1]
ISO 6208 (min values)	cold rolled (C) hot rolled (H)	240	590	30 [1, 2]
ASTM B424 (min values)	cold rolled (C) hot rolled (H)	241	586	30 [2]

Applications for Ultra Alloy 825

Typical Applications

- Components in sour gas service
- Offshore oil and gas piping systems
- Equipment in petroleum refineries
- Heating coils
- Heat exchangers
- Tanks
- Scrubbers
- Chemical processing equipment
- Food process equipment
- Nuclear industry equipment

outokumpu

Ultra Alloy 825 for clad & lined riser pipes

With Outokumpu as a supplier, the market now has access to cold rolled material wider than 1,219 mm down to 0.4 mm!

Lined pipes: The inner an outer pipe are expanded together with water pressure and welded at the ends.

Ultra Alloy 825

Customer need
Highly corrosion resistant alloy to resist sour (high sulfur) oil and gas service (off and on-shore pipelines).

Solution
Inner pipe Ultra Alloy 825 (outer pipe carbon steel).

Outokumpu has supplied test material from coil to be evaluated by demanding pipe manufacturers. Our material met all their expectations and requirements.

outokumpu

Welding strip

Typical weld strip: 0.5 x 40 mm

Weld overlay process at ESAB

Ultra Alloy 825

Customer need

Thin strip for weld overlay cladding of for example large vessels in chemical and O&G industry.

Solution

Weld strip in Ultra Alloy 825 with the required product properties supplied by Outokumpu.

So far Outokumpu has sold ~1,000 t Ultra Alloy 825 to this application.

outokumpu

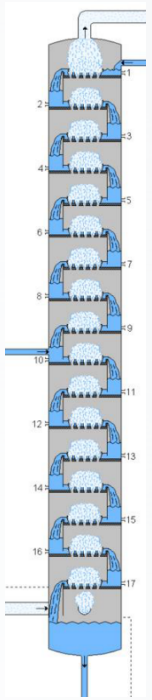
Fraction trays

Ultra Alloy 825

Customer need
High corrosion resistance of fraction trays in fractionating (distillation).

Solution
Fraction trays in Ultra Alloy 825.

Fractionating columns are widely used in the chemical process industries (e.g. refineries) where large quantities of liquids have to be distilled (separated).



Source: Wikipedia

outokumpu

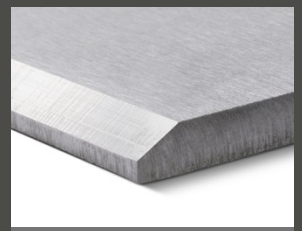
Product program

Hot rolled black strip

Thickness [mm]	Width [mm]
8.00 – 6.00	1,500 – 1,100

Cold rolled strip

5.99 – 3.00	1,500 – 1,100
3.00 – 2.50	1,300 – 48
2.49 – 1.50	1,300 – 36
1.49 – 0.40	1,300 – 25

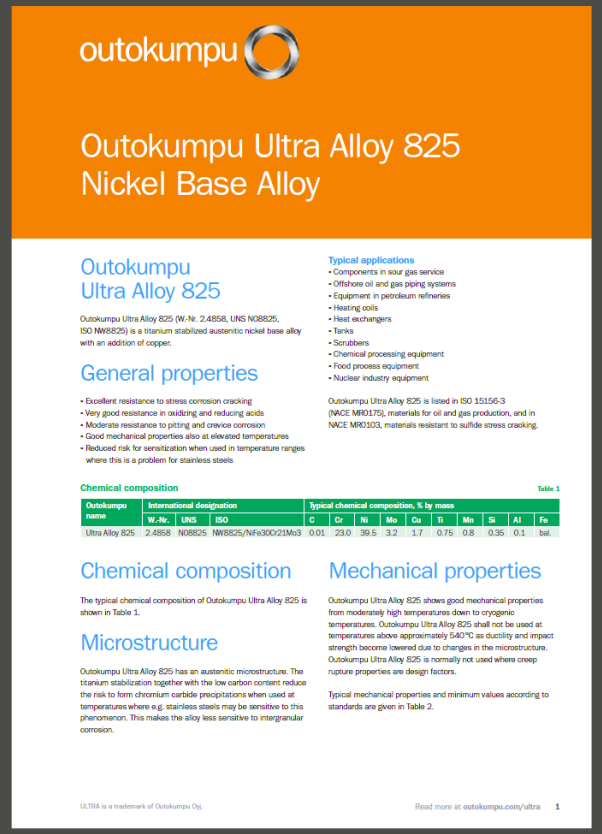


Quarto plate

Hot rolled plate under development

outokumpu

More product information in data sheet



outokumpu

Outokumpu Ultra Alloy 825
Nickel Base Alloy

Outokumpu Ultra Alloy 825

Outokumpu Ultra Alloy 825 (W.-Nr. 2.4858, UNS N08825, ISO NW8825) is a titanium stabilized austenitic nickel base alloy with an addition of copper.

General properties

- Excellent resistance to stress corrosion cracking
- Very good resistance in oxidizing and reducing acids
- Moderate resistance to pitting and crevice corrosion
- Good mechanical properties also at elevated temperatures
- Reduced risk for sensitization when used in temperature ranges where this is a problem for stainless steels

Typical applications

- Components in sour gas service
- Offshore oil and gas piping systems
- Equipment in petroleum refineries
- Heating coils
- Heat exchangers
- Tanks
- Scrubbers
- Chemical processing equipment
- Food process equipment
- Nuclear industry equipment

Outokumpu Ultra Alloy 825 is listed in ISO 15156-3 (NACE MR0175), materials for oil and gas production, and in NACE MR0103, materials resistant to sulfide stress cracking.

Chemical composition Table 1

Outokumpu name	International designation			Typical chemical composition, % by mass								
	W.-Nr.	UNS	ISO	C	Cr	Ni	Mo	Cu	Ti	Mn	Si	Al	Fe
Ultra Alloy 825	2.4858	N08825	NW8825/NiFe30Cr21Mo3	0.01	23.0	39.5	3.2	1.7	0.75	0.8	0.35	0.1	bal.

Chemical composition

The typical chemical composition of Outokumpu Ultra Alloy 825 is shown in Table 1.

Microstructure

Outokumpu Ultra Alloy 825 has an austenitic microstructure. The titanium stabilization together with the low carbon content reduce the risk to form chromium carbide precipitations when used at temperatures where e.g. stainless steels may be sensitive to this phenomenon. This makes the alloy less sensitive to intergranular corrosion.

Mechanical properties

Outokumpu Ultra Alloy 825 shows good mechanical properties from moderately high temperatures down to cryogenic temperatures. Outokumpu Ultra Alloy 825 shall not be used at temperatures above approximately 540 °C as ductility and impact strength become lowered due to changes in the microstructure. Outokumpu Ultra Alloy 825 is normally not used where creep rupture properties are design factors.

Typical mechanical properties and minimum values according to standards are given in Table 2.

ULTRA is a trademark of Outokumpu Oyj. Read more at outokumpu.com/ultra 1

www.outokumpu.com/campaigns/ultra-alloy-825

outokumpu

Customer cases

Separations technology

Koch-Glitsch

Ultra Alloy 825

Customer need

The YORK-EVENFLOW vane inlet device from Koch-Glitsch, manufactured with Outokumpu's Ultra Alloy 825, will be used in a gas processing application. An established and reliable supplier of high performance stainless steel.

Solution

Prompt delivery from feed stock to local service centers.

"Ultra Alloy 825 was selected due to a corrosive environment created by the presence of H_2S and high temperature."

Koch-Glitsch

outokumpu

PuGuang gas field

Sinopec Group

Ultra Alloy 825

Customer need

PuGuang gas field has a naturally high Sulphur content in combination with chlorides.

Solution

Ultra Alloy 825 gave sufficient corrosion protection and was delivered in cold rolled coils for increased productivity compared to production from plate.

“For the Clad Pipe and Pipe Fitting for this project we choose Outokumpu Ultra Alloy 825. Outokumpu showed they could comply with all our requirements in the specification.”

Sinopec Group

outokumpu


Fabrication
outokumpu

Fabrication information

Formability

- Outokumpu Ultra Alloy 825 has good ductility and can be formed using conventional methods.

Heat treatment

- **Post fabrication annealing is done at 950 °C followed by rapid air cooling or water quenching.**

Machining

- **Conventional techniques can be used also with Outokumpu Ultra Alloy 825. The material work hardens during machining.**

Fabrication information

Welding

Outokumpu Ultra Alloy 825 is readily weldable with conventional welding methods such as:

- Shielded metal arc welding (SMAW, MMA)
- Gas tungsten arc welding (GTAW, TIG)
- Gas metal arc welding (GMAW, MIG/MAG)
- Submerged arc welding (SAW)

Preheating before welding is not necessary.

Filler

Outokumpu Ultra Alloy 825 can be welded using matching filler. For e.g. SMAW, covered electrodes of the type 2.4621 or 2.4652 can be used.

Standards

Typical material standards for nickel base Alloy 825

Standard	Compliance	Content/Scope
ISO 6208	X	Nickel and nickel alloy plate, sheet and strip
ISO 9722		Nickel and nickel alloys – Composition and forms of wrought products
ASTM B424	X	Standard specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS NO8825, UNS NO8221, and UNS NO6845) plate, sheet and strip
ASTM B906	X	Standard specification for General Requirements for Flat-Rolled Nickel and Nickel Alloys plate, sheet and strip. (Tolerances)
ASME Boiler & Pressure Vessel Code, Sections I, IID, III, IX + Code cases 1936 and N-188-1	X	ASME boiler & pressure vessel design
NACE MR 0175 / ISO 15156	X	Petroleum and natural gas industries – Materials for use in H2S-containing environments in oil and gas production – Part:3 Cracking-resistant CRA's (corrosion resistant alloys) and other alloys
NACE MR 0103	X	Standard Material Requirements. Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments
VDTÜV 432 *)	(X)	
DIN 17744 + 17750		Plate, sheet and strip

*) We meet the requirements, but not officially on the list

outokumpu

Thank you for listening!

outokumpu.com

outokumpu