

# EXTEND YOUR POSSIBILITIES INTRODUCING SANICRO® 825 BAR AND HOLLOW BAR

SANDVIK GROWS ITS NICKEL ALLOY SANICRO® FAMILY WITH NEW GRADE AND FORMATS FOR TOUGH ACIDIC AND SEAWATER CONDITIONS.

Despite these turbulent times, general industry continues to make progress in overcoming many of the roadblocks to higher productivity. Whether it's in energy, chemical processing or other sectors, the challenge is often battling extreme conditions – acids, seawater, elevated heat and pressure that may jeopardize performance. Since its founding in 1862, Sandvik, the Sweden-based high-tech global engineering group, has worked closely with industrial customers to innovate new materials to meet these challenges. Now it is extending its Sanicro® family of nickel-based alloys to offer a broader range of high-performance options.





Bar and hollow bar for components exposed to acids and seawater in challenging environments.

In 2021, in response to customer requests, the company is now introducing Sanicro® 825 (UNS N08825), its first-ever nickel-iron-chromium alloy in bar and hollow bar formats. The material will be available in a selected stock assortment, or made to order, ranging from 20 to 260 millimeters (0.787 – 10.24 inches) in three to seven-meter lengths (118.11– 257.6 inches), depending on the diameter.

**Building on a legacy**

Broadly classified as corrosion-resistant alloys (CRAs), the new grade and formats build on Sandvik’s 60-year legacy of making premium, high-alloy Sanicro® products (mainly tubing) for corrosive, high-temperature environments.

**Backlog of requests**

“We’re very excited to offer this new grade and have already built up a backlog of requests,” says Marcus Hillbom, Technical Marketing and Sales, at Sandvik. “At elevated temperatures and in corrosive conditions, Sanicro® 825 offers clear advantages to standard stainless steel or duplex grades. It is also more cost-efficient than superalloys like Alloy 625 and Alloy 718.”

**70 years of nickel alloy expertise**

To be sure, Sandvik is no newcomer to the field of high alloy steels. For more than 70 years, the company has been a world-leader in pioneering stainless steels and special alloys for demanding industries such as the oil and gas, nuclear and other sectors.



Marcus Hillbom, Sandvik

**What is the Sanicro® family?**

So what is the so-called Sanicro® family and where does Sanicro® 825 fit in? According to Marcus Hillbom, Sanicro® is a registered Sandvik trademark that dates back to 1964. The name was first used (and still is) to brand the company’s family of nickel alloys and high-alloy austenitic stainless steels.

**Stamp of excellence**

“Within the Sanicro® range, we naturally adhere to all EN, UNS and ASTM standards. At the same time, we wanted to let our customers know that Sandvik metallurgists have put their own stamp of excellence on the chemical composition,” says Hillbom.

**Tight tolerances – consistently**

“We like to say that we strive to set a ‘standard within the standard,’ which means consistently adhering to even tighter tolerances on the chemical composition than what is technically required, batch after batch. This is very true for Sanicro® 825 (UNS N08825), which we’ve further tailored and optimized to find the high-performance sweet spot for bar and hollow bar.”

**Sanicro® 825 –**

**Chemical composition (nominal) %**

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Al	Ti
<0.03	0.4	0.7	<0.03	<0.03	22.5	40.5*	3.4	2.0	0.15	0.8

\*Ni>40

Typical industries served	Examples of components and installations
<ul style="list-style-type: none"> <li>• Oil and gas</li> <li>• Chemicals</li> <li>• Petrochemicals</li> <li>• Pulp and paper industry</li> <li>• Pickling equipment</li> <li>• Nuclear fuel reprocessing</li> <li>• Food</li> </ul>	<ul style="list-style-type: none"> <li>• Flanges</li> <li>• Valves and discs</li> <li>• Fittings</li> <li>• Couplings</li> <li>• Rings and seals</li> <li>• Bolts and nuts</li> <li>• Shafts</li> <li>• Forgings</li> <li>• Waste heat recovery exchangers</li> <li>• Heat exchangers</li> <li>• Evaporators</li> <li>• Off-shore piping systems</li> </ul>



Subsea valves and flanges require strong, corrosion-resistant materials that meet the relevant standards.

“ Sanicro® 825 is more cost-efficient than Alloy 625 and Alloy 718 – and hollow bar drives down machining costs. ”



Sanicro® 825 Bar  
Peeled/Polished



Sanicro® 825 Hollow Bar  
Extruded

**Versatile applications and benefits**

A well-known material for many years, Alloy 825 is a reliable, high-performing workhorse with key cost-performance benefits in sulfuric and phosphoric acid as well as seawater and other applications.

The recent addition of Sanicro® 825 in bar and hollow bar formats further extends these possibilities. Sandvik says key benefits are:

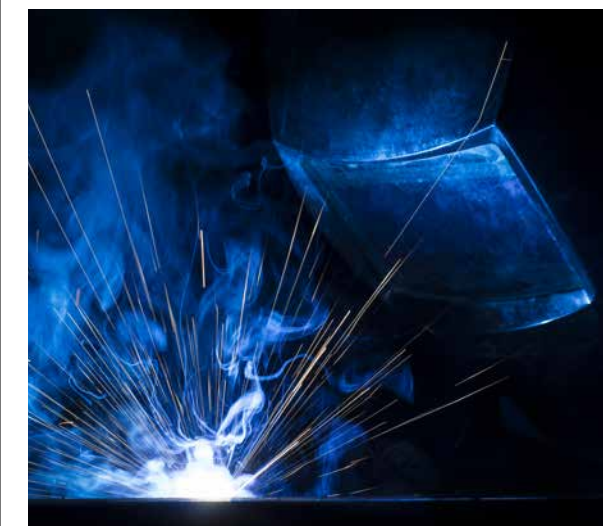
- Very high resistance to general corrosion, pitting and crevice corrosion
- Excellent resistance to corrosion in environments containing hydrogen sulfide
- Very high resistance to stress corrosion cracking (SCC) in chloride-bearing environments
- High mechanical strength and excellent toughness
- Ease of welding and machining (e.g. hollow bar advantage)

What’s more, Sanicro® 825 bar and hollow bar can be safely used in cryogenic conditions (-196°C) or at elevated temperatures (540°C).

**High resistance to general corrosion**

Sanicro® 825 offers excellent resistance to most types of corrosion and outperforms many other standard alloyed austenitic grades. For example, it is far superior to molybdenum alloyed stainless steels such as AISI 316L, particularly when exposed to non-oxidizing media such as sulfuric acid or phosphoric acid. Also, its corrosion resistance in nitric acid is more favorable than with AISI 316L, and it is superior to 904L in sodium hydroxide.

“ The corrosion resistance and mechanical properties are outstanding. ”



Tungsten arc welding (TIG/GTAW) is recommended for Sanicro® 825.





Corrosion test boiling (Huey).

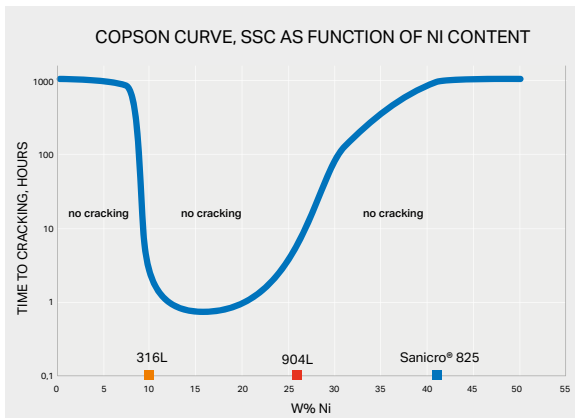


Figure 1: Stress Corrosion Cracking (SCC) materials comparison.



Visual inspection and marking.

**Avoiding stress corrosion cracking**

“Clearly, the nickel content was another key consideration,” says Magnus Brink, Technical Marketing Specialist at Sandvik. The trick is not to have too little and not too much as to increase costs. We always have slightly above 40% to ensure excellent resistance to stress corrosion cracking (SCC) induced by chlorides and alkalis. Sanicro® 825 is virtually immune to SCC compared to both AISI 316L and AISI 904L, also in sour environments, as shown in Figure 1.”



Magnus Brink, Sandvik

**NiDI testing in sour environments**

Independent tests by the Nickel Development Institute (NiDI) concluded that Sanicro® 825 can be used in sour environments up to 260°C with H<sub>2</sub>S contents, corresponding to a partial pressure of up to 10,000 psi in the absence of elementary sulfur. The material also shows some immunity to all concentrations of CO<sub>2</sub>. Sanicro® 825 is used in the oil and gas industry and, according to ISO 15156/NACE MR0175, it is acceptable for use in the cold worked and annealed condition, with no environmental limits on partial pressures of H<sub>2</sub>S or elemental sulfur. Compared to AISI 904L, with a similar Cr, Mo and Cu content, it is also much more resistant to SCC, due to its high Ni-content.

**PRE beating the industry standard**

Corrosion tests carried out on Sanicro® 825 in sodium chloride solutions indicate superior pitting and crevice corrosion to that of AISI 316, largely due to its higher chromium and molybdenum content. The material has a Pitting Resistance Equivalent Number of PRE >32.8, which is higher than the industry standard.

**Comprehensive quality control**

According to Magnus Brink, Sandvik has a long-time commitment to safety (zero accidents policy), sustainability (UN Climate goals) and some of the most rigorous quality control standards in the industry. “We control the entire manufacturing process – from the initial melt of recycled steel to the final product,” he says. “This means that, if needed, we can trace every single product back to the initial batch number.”

“*Sanicro® 825 has its stamp of excellence by Sandvik metallurgists – our R&D team has tailored the chemistry for optimized performance.*”

**Meeting international standards**

Sanicro® 825 meets the ASTM B425 and ASME SB 425 standards and is approved by the American Society of Mechanical Engineers (ASME) for use in accordance with ASME Boiler and Pressure Vessel Code, Section I and Section VIII, div. 1. It also has NACE approvals MR0175/ISO15156 and MR0103/ISO17945. Manufacturing approvals include AMS2750 and API 6A. Pre-approval for PMA for PED 2014/68/EU is pending.

**Welding – free of intergranular corrosion**

Sanicro® 825 was designed with high structural stability in mind to avoid the risk of intermetallic phases during welding at elevated temperatures. Even in the heaviest sizes, it can be welded without the risk of carbide precipitation causing intergranular corrosion. This is due, in part, to its low carbon content, but also the fact that it is titanium stabilized.

**Less machining, more corrosion resistance**

“The addition of hollow bar in Alloy 825 is a first for us, meaning that machining costs can be greatly reduced. This gives higher productivity and allows fabricators to come closer to net shape faster,” says Brink. The new grade is expected to provide a welcome range of new options for fabricators of heat

exchangers, evaporators, offshore piping systems and other engineering installations where flanges, valves and discs, fittings and couplings must resist highly corrosive acids or chloride-containing seawater.

**50% reduction in machining costs**

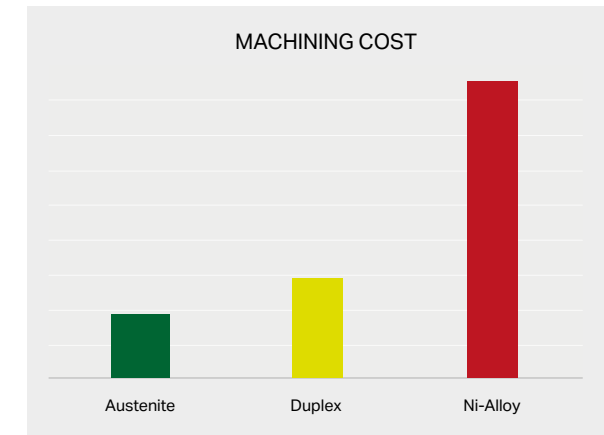
“Compared with solid bar, the time and cost of producing a complete component from Sanicro® 825 hollow bar is reduced by at least 50%,” says Brink. “This is due to the reduced need for drilling, boring and other fabrication steps.” He adds that Sandvik can also provide recommendations for optimal cutting tools and speeds through Sandvik Coromant, its world-renowned machining business area.

**New grades in the pipeline**

To sum up, and looking ahead, Sandvik’s introduction of Sanicro® 825 bar and hollow bar is just the first step in a series of new nickel-based alloy products that will extend customers’ possibilities for handling extreme situations. Over the medium and long-term, the company plans to increase its stock material portfolio with high alloy nickel grades such as Sanicro® 625, Sanicro® 925, and Sanicro® 718. The new grades, to be introduced shortly, are expected to be particularly useful for critical downhole applications in the oil and gas industry, among other industries.



Machining of Sanicro® 825 nickel alloy bar using Sandvik Coromant carbide cutting tool.



Sanicro® 825 hollow bar helps reduce machining costs, which are traditionally higher for nickel alloys than other grades.

“*The arrivals of Sanicro® 625, Sanicro® 925 and Sanicro® 718 will be great news for critical downhole applications.*”

Article by Henrik Zettergren, Global Product Manager, Sandvik, based on interviews and independent research from the Nickel Development Institute.

“I’m very proud to see the development and integration of new nickel grades into our bar portfolio. Not only does this give us a broader offer, it brings even greater value to our customers. From a Sandvik Bar perspective, we’ve never introduced such an extensive range of new grades to the market in such a short time – something that will make my work as Global Product Manager even more exciting.”

