



Activating Your Ideas

In Special Grades and Qualities of Stainless Steel

**OUTO
KUMPU**



Extreme Performance

The consumption of stainless steel — including duplex grades and special products — is growing faster than that of any other metal in the world. As a global leader in stainless steel, Outokumpu fuels this demand by supplying our customers with even better steels to meet their needs. Our special and duplex grade products are used in the most challenging environments, offering a combination of high strength, corrosion resistance, heat resistance, and cost savings for customers in a wide range of industries.

Outokumpu is an industry leader in the development of new stainless steels that meet extreme performance criteria, including elevated and cryogenic temperatures and high impact resistance. Outokumpu offers a full range of austenitic, ferritic, and duplex grades including our newest proprietary duplex grade LDX 2101® which combines low nickel content with high mechanical strength.

North American Production

We recognize the need to be close to our customers to ensure that the process of purchasing stainless steel is as simple as possible. We meet this need through a responsive supply chain that includes our New Castle, Indiana plate mill; our bar mill in Richburg, South Carolina; and our pipe mill in Wildwood, Florida.

Outokumpu quality and cost controls begin at our company-operated chromite mine and ferrochrome smelter in Europe. This quality is supported by our state-of-the-art melt shops that ensure superior control of product composition, structure, and inclusion pattern resulting in very clean steel. Computerized process control of our rolling mills, heat treatment facilities, and finishing lines ensure consistency and superior control of the targeted properties. Our effort to produce special grades in a more efficient manner (until they are as close to standard grades as possible) is never-ending. And

we are committed to continuing to develop new grades and finishes for specific customer needs.

Duplex Grades

Outokumpu, one of the world's largest producers of duplex stainless steels, offers a full range of grades and product forms (see Table 1) in this increasingly important family of corrosion resisting steels. Because of their lower nickel contents, our duplex stainless steels provide a particular level of pitting resistance at a cost lower than an equivalent austenitic grade.

LDX 2101®

Outokumpu's most recent innovation is a lean duplex, LDX 2101®. This low alloy, general purpose duplex has better resistance than 304 and in most cases performs as well as 316L with 2.5 min Mo. Its pitting corrosion resistance is similar to 316L, with superior corrosion cracking properties. LDX 2101 also boasts excellent machining properties (similar to

Product Forms for Special Grades

	Duplex				* 254 SMO
	LDX 2101®	Outokumpu 2304	2205 Code Plus Two®	Outokumpu 2507	
Plate	✓	✓	✓	✓	✓
Sheet	✓	✓	✓	✓	✓
Coil	✓	✓	✓	✓	✓
Strip		✓	✓		✓
Bar	✓		✓	✓	
Pipe	✓	✓	✓	✓	✓
Wire Rod			✓		✓
Billet			✓	✓	✓
Fittings	✓	✓	✓	✓	✓

* 654 SMO® and 153 MA® are available upon request.



PRODEC). The higher strength of LDX 2101 also translates into thinner gauges for material cost savings. LDX 2101 has been field-tested and is easy to weld. It is used in ethanol facilities and is approved under NSF Standard 61 for products used in drinking water applications.

Outokumpu 2304

This economical grade combines high strength with pitting and crevice corrosion resistance comparable to Type 316, and high chloride stress corrosion cracking resistance. Outokumpu 2304 duplex is used in hot water tanks and water heaters, cladding applications, offshore platform applications, and hydraulic piping.

2205 Code Plus Two®

The work horse grade in the duplex family of stainless steels, 2205 Code Plus Two® is an engineering solution for chloride stress corrosion cracking of Type 316 and 317L

which may occur in process industry tanks, reactors, and heat exchangers. 2205 Code Plus Two is the new grade for absorber towers in flue gas desulfurization (FGD) scrubbers. 2205 Code Plus Two sets the quality standard in the industry with special chemical composition and processing to ensure optimum welding results.

Outokumpu 2507

This super duplex provides exceptional strength and corrosion resistance for chemical process, petrochemical, and seawater applications. Its duplex structure also gives excellent chloride stress corrosion cracking resistance.

Corrosion-Resistant Austenitics

The corrosion-resistant austenitic special grades are designed for applications where resistance to localized corrosion is vital. They are the stainless steel solutions for applications where pitting, crevice attack, and chloride stress corrosion cracking are the problems. Our corrosion-resistant austenitics are available in a wide range of product forms (see Table 1).

654 SMO®

The world's most corrosion resistant stainless steel, 654 SMO® is the stainless solution for the most demanding chloride-containing environments, such as chlorinated seawater and hydrometallurgical leaching with saline water and FGD absorber vessel inlet ducts.

254 SMO®

Designed for excellent resistance to pitting and crevice corrosion, 254 SMO®'s high levels of chromium, molybdenum, and nitrogen — and its excellent formability and weldability — offer superior performance in high-chloride environments. 254 SMO also has excellent electro-polishing properties. Pulp and paper, food manufacturing, and oil and gas industries use this special grade in high chloride applications.

XM-19

Typical bar applications for XM-19 are valve shafts and fasteners in chemical and petrochemical equipment and boat shafting and marine hardware.

904L

Widely used in the chemical processing industry, 904L's combination of chromium, nickel, molybdenum, and copper make it resistant in a range of sulfuric acid environments. In addition, its high nickel and molybdenum contents provide good chloride stress corrosion cracking resistance.

317LMN

Versatile and cost-effective, 317LMN offers resistance to chloride pitting and crevice corrosion significantly better than Type 317L because of its higher molybdenum and nitrogen content. It has been used extensively for absorber towers in flue gas desulfurization (FGD) scrubbers.

Table 1

Corrosion-Resistant Austenitics				Heat-Resisting Austenitics	
XM-19	904L	317LMN	317L	353 MA®	253 MA® *
	✓	✓	✓	✓	
	✓	✓	✓	✓	✓
	✓	✓	✓		✓
	✓	✓		✓	
✓	✓	✓	✓	✓	
	✓	✓		✓	
	✓		✓		
	✓		✓		
	✓	✓			

317L

This special grade offers improved pitting and crevice corrosion resistance compared to 316L. It is especially useful in plants with recirculated process water such as pulp and paper mills.

Heat-Resisting Austenitics

Outokumpu heat-resisting austenitic grades offer a cost-effective solution for a full range of high temperature conditions, from medium to severe. These special grades are alloyed with silicon, nitrogen, and rare earth metals to help deliver overall structural stability as well as resistance to creep and oxidation. Our heat-resisting austenitics are available in a wide range of product forms (see Table 1).

353 MA®

For very high temperatures, around 2000°F and/or aggressive environments and cyclical conditions, 353 MA® is the most highly alloyed grade in the heat-resisting austenitic stainless steel family. 353 MA offers excellent resistance to oxidizing, carburizing, and alternating oxidizing/carburizing atmospheres. It has very high resistance to oxidation and cyclic oxidation environments. 353 MA is used in erosion prevention utility boilers (tube shields); calciners; methane reforming reactors; recuperators in the steel industry; and in oxyfuel environments.

253 MA®

For high to very high temperatures in the 1550-2000°F range, this heat-resisting grade provides improved creep rupture and oxidation resistance compared with Type 309S and Type 310S. Because its protective oxide layer is improved by the silicon and rare earth additions, 253 MA® offers improved performance in cyclic oxidation applications. Applications for 253 MA, a most versatile material, include extraction hoods and flue gas ducts in steel melting and continuous casting plants; expansion bellows and piping in blast furnace plants; and multiple uses in the cement production industry.

153 MA®

A general grade for medium-high temperatures in the 1100-1750°F range, with high nitrogen, chromium, and silicon contents and rare earth additions, 153 MA® provides good resistance to oxidation and creep. 153 MA is suitable for internal shells in bell type furnaces and radiant tubes in metals

manufacturing; refractory reinforcement in the chemicals and petroleum industry; and anchoring grids for refractory ceramics applications.

Special Products for Improved Machining**PRODEC®**

Made by an exclusive Outokumpu stainless steel production process, PRODEC® (which stands for PRODUCTION Economy) is available in stainless steel plate and bar, and is engineered to help manufacturers produce superior quality parts at a reduced cost. Produced using proprietary ladle injection metallurgy applied to 316L, 316, 304L, 304, 303, 2205, PRODEC is a special quality of austenitic stainless steel that is designed for improved machinability.

303 HST®

303 HST® stainless steel bar is engineered to optimize machine performance in high volume screw machines. It also delivers superior surface finish and product consistency. 303 HST is also PRODEC-treated, making it the most versatile premium machining product available. 303 HST is available in cold-drawn round bar and hex bar from 3/16" through 1" in diameter. It is chamfered and boxed. Round bar is centerless ground to 1/2 standard tolerance.

Technical Support

Choosing the right grade can offer substantial rewards. In this regard, our technical team assists users and fabricators in the selection, installation, operation, and maintenance of our stainless steel applications. We also offer end-users the opportunity to test materials on their own premises. This testing is supported by extensive testing in our state-of-the-art laboratory where our personnel can draw upon years of field experience with stainless steel to help customers make technically and economically correct materials decisions. Outokumpu is prepared to discuss individual applications and to provide data and experience as a basis for specific material selection and application. For assistance with technical questions, please call Outokumpu at 1.800.833.8703.

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Outokumpu is a global leader in stainless steel. Our vision is to be the undisputed number one in stainless, with success based on operational excellence. Customers in a wide range of industries use our stainless steel and services worldwide. Being fully recyclable, maintenance-free, as well as very strong and durable material, stainless steel is one of the key building blocks for sustainable future.

What makes Outokumpu special is total customer focus – all the way, from R&D to delivery. You have the idea. We offer world-class stainless steel, technical know-how and support. We activate your ideas.

OUTOKUMPU

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