Stainless steels for improved machinability

Outokumpu Prodec range

outokumpu
high performance stainless steel

outokumpu.com/prodec

We believe in a world that lasts forever

Outokumpu is a global leader in the advanced materials business, creating stainless steels that are efficient, long lasting, and recyclable. A strong customer focus, sustainability, and technical excellence are at the heart of everything we do.

As an open and approachable company, our customers rely on our advice to help them select products that will deliver the best long-term performance for their needs.

With over a century of innovation behind us and some of the best minds in the business, we continue to develop pioneering materials to meet the demands of tomorrow.

The durability of stainless steel means that it is not only the best, but also the most economically sustainable choice for a wide range of applications. All of our products are made from an average of 85% recycled material and are fully recyclable at the end of their lifecycles.

Together with our customers and partners, we are building a world that lasts forever.

Stay up to date on our latest innovations, follow market trends, and get inspired by success stories – subscribe to our magazines and newsletters **outokumpu.com/newsletter**

The magic of the Prodec range

Stainless steel grades optimized for improved machinability with longer tool life and enhanced quality.

If you are looking to substantially lower your total cost for machined parts, Prodec range products deliver the higher productivity that makes it possible. They are designed specifically to give lower-cost machined parts with better final surface and dimensional tolerances.

- Faster machining
- Longer tool life
- Superior quality - tolerance and surface

Prodec range products have the same corrosion resistance, yield strength, tensile strength, elongation, hardness, and toughness as conventionally produced stainless steel. Outokumpu has developed the Prodec range quality through years of extensive product development from steel making to bar finishing. You can depend on Outokumpu stainless steels to reliably and consistently meet the specifications that your application demands.

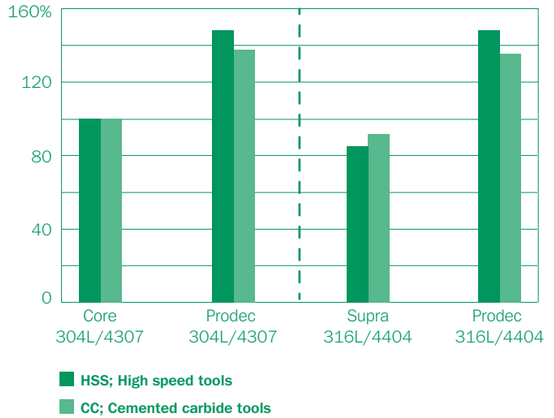
Contact us at **outokumpu.com/contacts** to find out what grade is right for your next project.

Cost saving example - Prodec vs. standard material

	Standard 316L	Prodec 316L/4404	Change +/-
Cutting speed (sfm)	300	450	**+67%**
RPM	145	215	**+67%**
Total time/component (mins)	16.93	7.73	**-54%**
Total machining cost/ component	$26.55	$12.05	**-55%**
Productivity increase %			**+54%**
Savings/component			**$14.50**

A cost saving example for machining a part from 6” diameter Prodec 316L/4404 peeled bar.

Relative machinability performance - Prodec vs. standard



The graph shows the machinability of Supra 316L/4404, Prodec 304L/4307 and Prodec 316L/4404 stainless steels in relation (%) to Core 304L/4307. A typical recommendation for Core 304L/4307 is estimated to 160 m/min for Cemented carbide (CC) set at 100% and 25 m/min for High Speed Steel (HSS) tools set at 100%.

Choosing the right product

Products

Outokumpu name	Typical applications	Product forms
Prodec 304L/4307 A version of Core 304L/4307 with improved machinability. Improves productivity with faster machining, longer tool life, better dimensional tolerances, superior machined surface quality, and improved yields compared to conventionally produced Core 304L/4307.	• Fasteners • Flanges and valves • Pressure fittings	P, B
Prodec 316L/4404 A version of Supra 316L/4404 with improved machinability. Improves productivity with faster machining, longer tool life, better dimensional tolerances, superior machined surface quality, and improved yields compared to conventionally produced Supra 316L/4404.	• Fasteners • Flanges and valves • Pressure fittings	P, B
Prodec 303/4305 For applications that use 303/1.4305. This product gives you faster machining, longer tool life, better tolerances, superior machined surface quality, and reduced scrap losses compared to conventionally produced 303/1.4305.	• Nuts, bolts, and screws • Gears • Shafts • Bearings • Machined parts for process equipment	P, B
Prodec 17-4PH A martensitic, precipitation hardening stainless steel for applications that use Dura 17-4PH. It improves productivity with faster machining, longer tool life, better dimensional tolerances, superior machined surface quality, and improved yields when compared to conventionally produced Dura 17-4PH.	• Fasteners • Flanges • Oil field valve equipment • Pressure fittings • Chemical process equipment • Paper mill equipment • Aircraft parts	B

Product forms: P = Quarto plate, B = Bar

Product properties

Prodec range

Stainless steel grades optimized for improved machinability with longer tool life and enhanced quality

Steel designations				Performance						Typical chemical composition, % by mass					
		ASTM			HRB [1]		CDB [2]								
Outokumpu name	EN	Type	UNS	PRE	A %	$R_{p0.2}$ MPa	A %	$R_{p\ 0.2}$ MPa	Grade family	C	Cr	Ni	Mo	N	Others
Prodec 304L/4307	1.4307	304L	S30403	20	45	175	45/25/30	175/400/175	A	0.02	18.1	8.1	–	–	–
Prodec 316L/4404	1.4404	316L	S31603	24	40	200	40/25/30	200/400/200	A	0.02	17.2	10.1	2.1	–	–
Prodec 303/4305	1.4305	303	S30300	19	35	190	35/15/20	190/400/190	A	0.05	17.2	8.1	–	–	0.3S
Prodec 17-4PH [3]	1.4542	630	S17400	–	10	520	10/10/12	600/600/520	PH	0.02	16.3	4.7	–	–	Nb 3.5Cu

[1] HRB = Hot rolled bar. [2] CDB = Cold drawn bar. Values are for diameter (d) ≤ 10mm & 10 < d ≤ 16mm & 16 < d ≤ 40mm. [3] Values for condition +P800.

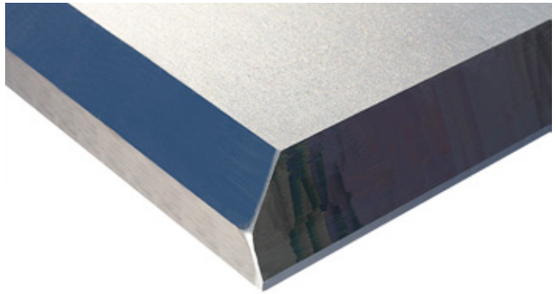
Note: Yield strength ($R_{P0.2}$) according to EN 10088-3 values for hot rolled bar.
Elongation (A) according to EN 10088-3 values for cold rolled bar
(≤ 10 mm/10 < d ≤ 16 mm/16 < d ≤ 40 mm).

For more values by product, please see **steelfinder.outokumpu.com**

Prodec stainless steel types

Martensitic stainless steels are characterized by high strength and high wear resistance. Corrosion resistance is limited and weldability decreases with increasing strength (i.e. increasing carbon content).

Austenitic stainless steels have good to excellent corrosion resistance combined with very good weldability and formability. The austenitic structure has good creep resistance and good oxidation resistance that makes these steels useful at elevated temperatures. They can also be used in cryogenic applications and are, in the annealed condition, the only non-magnetic steel group.



Customer view

Todd Rhodes
President, Plus Ten Stainless

Our customers require very close tolerances, and I'm always looking for ways to control our production process. They regularly achieve 25-30% faster machining speeds without any heat-affected zone around the perimeter when they use Prodec products. They also see their tools lasting longer – sometimes up to twice as long.

We recently had a project that called for 315 pieces of 304L plate with a water jet cut in the middle. The customer didn't want to pay the premium for our Prodec 304L. Because of price, we sold them 304 pieces of standard grade 304L. To avoid having to order a larger

> We regularly achieve 25-30% faster machining speeds. We also see our tools lasting longer, sometimes as much as twice as long.

> The Prodec pieces machined like butter.

volume of the standard grade, I made up the difference with 11 pieces of Prodec 304L that we had in stock.

We informed the customer that the 11 pieces were Prodec so they could track the results. When I called them later to see how their project turned out, they reported that the 11 Prodec pieces 'machined like butter' while the standard grade pieces were stressing the equipment so much so that they were still struggling to get a good part machined. I think they realized that the premium cost for Prodec represents real value once machining and tool life efficiencies are factored in.

I'm a big fan of Prodec and keep telling my customers that even though these products are enhanced to increase the life of their tool inserts, they still conform to all ASTM specifications and standards and can be certified as the standard grade.

The name Prodec comes from PRODuction EConomy and refers to the fact that these products are designed specifically for improved machinability.

Working towards forever.

We work with our customers and partners to create long lasting solutions for the tools of modern life and the world's most critical problems: clean energy, clean water, and efficient infrastructure. Because we believe in a world that lasts forever.

1556EN-GB:1. May 2015. Erweko Finland.

outokumpu classic			outokumpu pro					
Moda	Core	Supra	Forta	Ultra	Dura	Therma	Prodec	Deco
Mildly corrosive environments	Corrosive environments	Highly corrosive environments	Duplex & other high strength	Extremely corrosive environments	High hardness	High service temperatures	Improved machinability	Special surfaces

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