

# Stainless steels for corrosive environments

Outokumpu Core range

outokumpu  
high performance stainless steel



[outokumpu.com/core](https://outokumpu.com/core)

# 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](https://outokumpu.com/newsletter)

## The inside view

For multi-purpose use – indoor and mild outdoor conditions (PRE 17 to 22).

Outokumpu's legacy of innovation and consistent quality means we have the right product for every application. By grouping our products into ranges based on performance, rather than stainless steel type, we aim to make choosing the best product for your application easier.

Core range products are designed for applications in corrosive environments, calculated with a Pitting Resistance Equivalent (PRE) value of 17 to 22. This range contains our workhorse products Core 304/4301 and Core 304L/4307, as well as several alternatives and low-nickel and nickel-free options.

Outokumpu austenitics are highly formable and weldable, making them suitable for a wide range of applications from cutlery to storage tanks. Many of our magnetic ferritic stainless steels also have good formability, especially with regards to deep drawing, and are widely used in architectural applications and by appliance makers.

“ You can depend on Outokumpu stainless steels to reliably and consistently meet the specifications that your application demands.

All Core range products are readily available around the globe and are delivered from mills that are well known for their quality and on-time delivery accuracy. You can depend on Outokumpu stainless steels to reliably and consistently meet the specifications that your application demands.

Our customers also rely on us to deliver the best material selection advice, and we can often find more cost-effective solutions that help you to avoid over-specifying.

Contact us at [outokumpu.com/contacts](https://outokumpu.com/contacts) to find out which of our products is right for your next project.



Enrique Zaldivar, Outokumpu



The Pitting Resistance Equivalent (PRE) number can be used to compare the resistance of different stainless steels to pitting corrosion. It takes into account the effect of the most important alloying elements.

# Choosing the right product

Choosing the right stainless steel for the application is key to ensuring both the cost effectiveness and success of your project. Take a look at the individual Core range products – and the applications they are best suited for – to get an idea of your options.

## Key products

### Core 304/4301

Core 304/4301 is a classic 18% chromium, 8% nickel austenitic stainless steel. It's an all-purpose product with good corrosion resistance and is suitable for a wide variety of applications that require good formability and weldability. Core 304/4301 can be delivered with a variety of surface finishes.

#### Typical applications

- Household appliances and consumer goods
- Kitchen equipment
- Indoor and outdoor cladding, handrails, and window frames
- Food and beverage industry equipment
- Storage tanks
- Flanges and valves

#### Product forms

C, H, P, B, R, S, T

### Core 304L/4307

Core 304L/4307 is a low-carbon alternative to Core 304/4301. The lower carbon content minimizes carbide precipitation as a result of heat input, for example during welding, giving improved resistance against intergranular corrosion. It's suitable for a wide variety of applications that require good formability and weldability, and can be delivered with a variety of surface finishes.

#### Typical applications

- Food and beverage industry equipment
- Chemical and pharmaceutical industry equipment
- Heat exchangers
- Storage tanks and containers
- Pipes
- Flanges and valves

#### Product forms

C, H, P, B, R, S, T

## Product forms



**C**  
Cold rolled  
coil and sheet



**H**  
Hot rolled  
coil and sheet



**P**  
Quarto plate



**B**  
Bar



**R**  
Wire rod



**S**  
Semifinished  
(bloom, billet, ingot & slab)



**T**  
Pipe

## Core range applications

- Household appliances and consumer goods
- Kitchen utensils, tableware, cutlery, pots and pans
- Sinks and countertops
- Indoor and outdoor cladding, handrails, and window frames
- Rebar in concrete
- Automotive applications, such as mufflers, trims, and filters
- Food and beverage industry equipment
- Chemical and pharmaceutical industry equipment (mild to medium corrosive environments)
- Heat exchangers (oil and water)
- Storage tanks
- Tank containers
- Pipes



If you need steels for highly corrosive environments (PRE 22 to 26) such as those in the pulp and paper and chemical industries, check Supra 316/4401, or other products from the Supra range.

Contact us at [outokumpu.com/contacts](https://outokumpu.com/contacts) to find out which of our products is right for your next project.

# Alternatives

In addition to Core 304/4301 and Core 304L/4307, we also offer several alternatives designed for a more specific range of applications.

Outokumpu name	Typical applications	Product forms
<p><b>Core 304LN/4311</b> A low-carbon, higher nickel and nitrogen alloyed alternative to Core 304/4301 with improved strength and low-temperature toughness. Suitable for applications that require high tensile strength.</p>	<ul style="list-style-type: none"> <li>Railroad cars</li> <li>Pressure vessels</li> <li>Chemical plant equipment (mild to medium corrosive environments)</li> <li>Flanges and valves</li> </ul>	C, H, P, R, S
<p><b>Core 304L/4306</b> A higher nickel alternative to Core 304L/4307 with improved formability and deep drawability.</p>	<ul style="list-style-type: none"> <li>Chemical and pharmaceutical plant equipment (mild to medium corrosive environments)</li> <li>Flanges and valves</li> </ul>	C, H, P, B, R, S, T
<p><b>Core 305/4303</b> A high-nickel alternative to Core 304/4301 with reduced strain hardening and excellent cold forming properties. Ideal for parts that require high deformation degrees.</p>	<ul style="list-style-type: none"> <li>Industrial parts with complex shapes</li> <li>Sinks and other deep-drawn products</li> <li>Complex stamping processes</li> <li>Re-rollers producing very thin-gauge coils</li> </ul>	C, H, R, S
<p><b>Core 321/4541</b> A titanium-stabilized austenitic stainless steel with improved intergranular corrosion resistance for an extended temperature range.</p>	<ul style="list-style-type: none"> <li>Annealing covers</li> <li>Stack liners</li> <li>Automotive exhaust systems</li> <li>Welded pressure vessels</li> <li>Flanges and valves</li> </ul>	C, H, P, B, R, S, T
<p><b>Core 347/4550</b> Core 347/4550 is a niobium stabilized alternative Core 321/4541 with improved intergranular corrosion resistance and good mechanical properties at high temperatures. Core 347/4550 is particularly useful in applications with intermittent heating in the range 400–900 °C/750–1650 °F.</p>	<ul style="list-style-type: none"> <li>High temperature gaskets</li> <li>Rocket engine parts</li> <li>Expansion joints</li> <li>Aircraft collector rings</li> <li>Exhaust manifolds</li> <li>Chemical production equipment</li> <li>Flanges and valves</li> </ul>	C, H, P, B, R, S, T

Outokumpu name	Typical applications	Product forms
<p><b>Core 301LN/4318</b> A low-carbon, nitrogen alloyed alternative to Core 301/4310 with elevated strength, making it particularly suitable for lightweight construction. Temper rolled Core 301LN/4318 is used for applications that require increased hardness and strength.</p>	<ul style="list-style-type: none"> <li>Automotive applications, especially vehicle chassis</li> <li>Railroad cars</li> </ul>	C, H, S
<p><b>Core 301/4310</b> A lower chromium and nickel alternative to Core 304/4301 with high work hardening capacity, this is a good choice for applications subjected to high mechanical loading.</p>	<ul style="list-style-type: none"> <li>Springs</li> <li>Press plates</li> <li>Conveyor chains</li> <li>Mixer blades</li> <li>Sinks</li> </ul>	C, H, B, R, S

## Low-nickel stainless steels


Our low-nickel stainless steels offer better price stability than standard products. We use a minimum of 3.5% nickel in all our low-nickel steels to ensure that we meet ASTM standards.

Outokumpu name	Typical applications	Product forms
<p><b>Core 201/4372</b> This low-nickel stainless steel has properties approaching Core 301/4310 but with a higher work hardening coefficient.</p>	<ul style="list-style-type: none"> <li>Household appliances</li> <li>Kitchen utensils</li> <li>Sinks</li> <li>Doors and windows</li> <li>Railroad cars</li> </ul>	C, H, S
<p><b>Core 201LN/4372</b> This low-nickel stainless steel also has properties approaching Core 301/4310, but has a higher strength than Core 201/4372. It hardens more quickly due to its higher work hardening coefficient.</p>	<ul style="list-style-type: none"> <li>Railroad freight cars</li> <li>Truck trailers</li> <li>Coal handling</li> <li>Bulk transport equipment</li> </ul>	C, H, S

# Nickel-free ferritic stainless steels

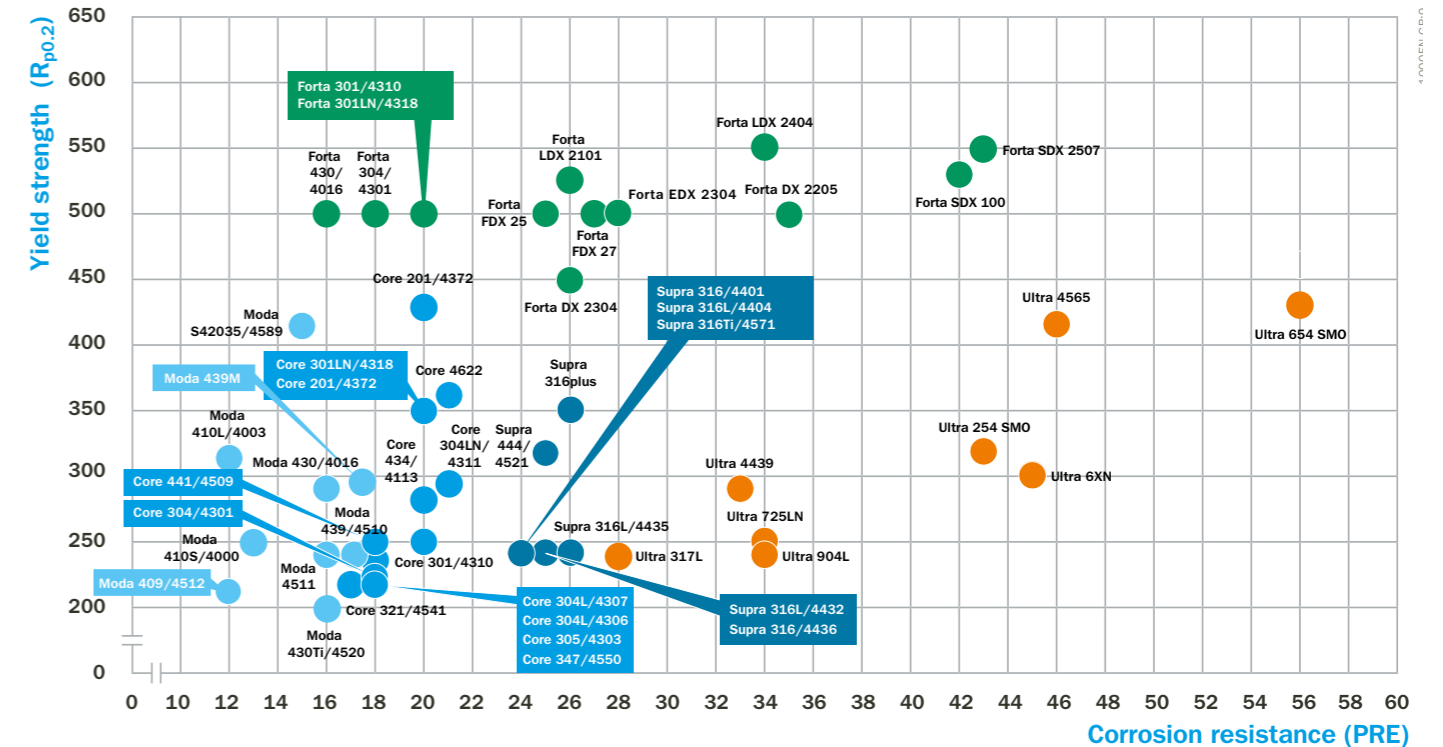
Nickel-free ferritic stainless steels offer good price stability along with good corrosion resistance and formability. Ferritic stainless steels are magnetic.

Outokumpu name	Typical applications	Product forms
<p><b>Core 441/4509</b> A nickel-free 17% chromium ferritic stainless steel originally designed for exhaust systems, with good corrosion resistance and high-temperature strength. Core 441/4509 is available with a single (niobium) or dual (niobium and titanium) stabilizer. Due to good formability and weldability, it is often a suitable replacement for Core 301/4310.</p>	<ul style="list-style-type: none"> <li>Indoor claddings</li> <li>Restaurant equipment and appliances</li> <li>Tubes</li> <li>Heat exchangers</li> </ul>	C, H, S
<p><b>Core 4622</b> A nickel-free, high-chromium (21Cr) ferritic stainless steel with equal corrosion resistance to Core 304/4301. Core 4622 has excellent deep drawability and is almost ridging free, meaning it is easier to polish and has a lower overall production cost.</p>	<ul style="list-style-type: none"> <li>Household, catering and architectural applications (indoor and outdoor)</li> <li>Tubular products for automotive and process industries</li> <li>Tanks and process equipment</li> </ul>	C, H
<p><b>Core 434/4113</b> A molybdenum-alloyed ferritic stainless steel that offers improved corrosion resistance.</p>	<ul style="list-style-type: none"> <li>Automotive trim fittings</li> </ul>	C, H, S

  
Outokumpu Moda 430/4016 can be successfully used in place of Core 304/4301 in many indoor and mild corrosive outdoor environments.

# Product performance comparison

## Strength vs. corrosion resistance



- Moda – Mildly corrosive environments (PRE up to 17)
- Core – Corrosive environments (PRE 17 to 22)
- Supra – Highly corrosive environments (PRE 22 to 27)
- Forta – Duplex and other high strength (PRE 18 to 43)
- Ultra – Extremely corrosive environments (PRE > 27)

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

Note: PRE values shown are Outokumpu typical values. Yield strength (Rp0.2) according to EN 10088-2 minimum values for cold rolled strip. For specific values by product, please see [steelfinder.outokumpu.com](http://steelfinder.outokumpu.com)

  
Learn more at [outokumpu.com/core](http://outokumpu.com/core)

# Product properties

## Core range

Corrosive environments (PRE 17 to 22)

Steel designations				Performance					Typical chemical composition, % by mass					
Outokumpu name	EN	ASTM Type	UNS	PRE	A <sub>80</sub> %	R <sub>p0.2</sub> MPa	R <sub>m</sub> MPa	Grade family	C	Cr	Ni	Mo	N	Others
Core 304/4301	1.4301	304	S30400	18	45	230	540	A	0.04	18.1	8.1	-	-	-
Core 304L/4307	1.4307	304L	S30403	18	45	220	520	A	0.02	18.1	8.1	-	-	-
<b>Alternatives</b>														
Core 304LN/4311	1.4311	304LN	S30453	21	40	290	550	A	0.02	18.5	9.2	-	0.14	-
Core 304L/4306	1.4306	304L	S30403	18	45	220	520	A	0.02	18.2	10.1	-	-	-
Core 305/4303	1.4303	305	S30500	18	45	220	500	A	0.04	17.7	12.5	-	-	-
Core 321/4541	1.4541	321	S32100	17	40	220	520	A	0.04	17.3	9.1	-	-	Ti
Core 347/4550	1.4550	347	S34700	18	40	220	520	A	0.05	17.5	9.5	-	-	Nb
Core 301LN/4318	1.4318	301LN	S30153	20	35	350	650	A	0.02	17.7	6.5	-	0.14	-
Core 301/4310	1.4310	301	S30100	20	40	250	600	A	0.1	17.0	7.0	-	-	-
<b>Low-Ni alternatives</b>														
Core 201/4372	1.4372	201	S20100	20	45	350	680	A	0.05	17.0	4.0	-	0.2	7Mn
Core 201LN/4372	1.4372	201LN	S20153	19	45	350	-	A	0.03	16.2	4.0	0.2	0.2	Cu 6.6Mn
<b>Ni-free alternatives</b>														
Core 441/4509	1.4509	-	S43940	18	18	250	430	F	0.02	18.0	-	-	-	Ti Nb
Core 4622	1.4622	-	S44330	21	30	360	430	F	0.02	21.0	-	-	-	Ti Nb Cu
Core 434/4113	1.4113	434	S43400	20	18	280	480	F	0.045	16.5	-	1.0	-	-

Note: figures shown are EN 10088-2 cold rolled minimum values for elongation (A<sub>80</sub>), tensile strength (R<sub>m</sub>), and yield strength (R<sub>p0.2</sub>). Chemical compositions are Outokumpu typical values. For specific values by product, please see [steelfinder.outokumpu.com](http://steelfinder.outokumpu.com)

Core range products are available with the following surface finishes: 1, 2B, 2D, 2E, and our Deco range includes Deco BA/2R, ground, polished, brushed, patterned, and special surfaces.

## Stainless steel types

**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.

**Ferritic stainless steels** have good resistance to corrosion, especially stress-corrosion cracking. Their lower carbon and nitrogen content, together with niobium and/or titanium stabilization, improve both weldability and toughness. Ferritic stainless steels are magnetic.

## Core 4622 in mine rescue chambers

HEAT-IT Oy from Rovaniemi, Finland selected Outokumpu's high-chromium ferritic stainless steel Core 4622 as the material for their RESPETRA rescue chamber.

The RESPETRA rescue chamber is a stainless steel cabin used in mines. It provides protection for miners, for example in case of fire, for up to four days.

Core 4622 has a good combination of strength and toughness so can handle pressure relief well. The walls of the rescue chamber are curved to provide protection against pressure and gases.

“ We chose Outokumpu Core 4622 as it offers the required technical properties at a lower cost. I am very pleased with the cooperation with Outokumpu.

-Pekka Kilpeläinen, CEO of HEAT-IT Oy



Looking for expert help to choose the best product for your next project? Contact us at [outokumpu.com/contacts](http://outokumpu.com/contacts)

# 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.

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

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