outokumpu
high performance stainless steel

Core 305/4303

EN 1.4303, ASTM TYPE 305 / UNS S30500

General characteristics

Core 305/4303 is 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. Core 305/4303 is an austenitic stainless steel that belongs to the standard CrNi stainless steel family. It has 12.5 wt.-% nickel for improved formability.

The austenitic CrNi standard grades are the most widely used group of stainless steels. Their well-balanced material properties make them suitable for the fabrication of many products. Core 305/4303 is available in many product forms and dimensions. It can be supplied with a wide range of functional and aesthetic surface finishes.

Typical applications

- Industrial parts with complex shapes
- Sinks and other deep-drawn products
- Complex stamping processes
- Re-rollers producing very thin gauge coils

Products & dimensions

Cold rolled products, available dimensions (mm)

		Coil / Strip		Plate / Sheet	
Surface finish		Thickness	Width	Thickness	Width
2B	Cold rolled, heat treated, pickled, skin passed	0.30-6.35	30-1586	0.30-6.35	350-1586
2BB	Bright-pickled	0.30-3.50	30-1530	0.30-3.50	600-1530
2C	Cold rolled, heat treated	0.50-6.00	30-1530		
2D	Cold rolled, heat treated, pickled	0.30-6.00	30-1550	0.30-6.00	600-1530
2E	Cold rolled, heat treated, mech. desc. pickled	0.50-6.00	30-1530	0.50-6.00	600-1530
2G	Ground	0.30-3.00	30-1500	0.30-3.00	600-1500
2H	Work hardened	0.05-5.00	3-1500	0.40-5.00	600-1500
2J	Brushed or dull polished	0.30-3.00	30-1500	0.30-3.00	600-1500
2M	Patterned	0.30-3.50	30-1530	0.30-3.50	600-1530
2R	Cold rolled, bright annealed	0.05-3.50	3-1500	0.30-3.50	350-1500

Continous hot rolled products, available dimensions (mm)

Surface finish		Coil / Strip		Plate / Sheet	
		Thickness	Width	Thickness	Width
1C	Hot rolled, heat treated, not descaled	2.00-10.00	50-1550		
1D	Hot rolled, heat treated, pickled	2.50-8.00	50-1586	2.50-8.00	350-1586
1G	Ground	2.00-3.00	750-1350	2.00-3.00	750-1350
1M	Patterned	2.00-3.00	750-1350	2.00-3.00	750-1350
1U	Black hot rolled	2.00-10.00	50-1550		

Chemical composition

The typical chemical composition for this grade is given in the table below, together with composition limits given for the product according to different standards. The required standard will be fully met as specified on the order.

The chemical composition is given as % by mass.

	C	Mn	Cr	Ni	Mo	N	Other
Typical	**0.04**		**17.7**	**12.5**			
ASTM A240	≤0.12	≤2.00	17.0-19.0	10.5-13.0			
EN 10088-2	≤0.06	≤2.0	17.0-19.0	11.0-13.0		≤0.10	
EN 10088-3	≤0.06	≤2.00	17.0-19.0	11.0-13.0		≤0.10	

Corrosion resistance

Core 305/4303 has excellent corrosion resistance in solutions of many halogen-free organic and inorganic compounds over a wide temperature and concentration range. It can withstand many organic and sufficiently diluted mineral acids depending on the temperature of the solution. Core 305/4303 may suffer from uniform corrosion in mineral acids and hot strong alkaline solutions. Due to its increased nickel content, its uniform corrosion resistance usually matches or supersedes the corrosion resistance of basic austenitic CrNi standard grades 4301 and 4307. More detailed information on the corrosion properties of Core 305/4303 can be found in Outokumpu's Corrosion Tables published in the Outokumpu Corrosion Handbook and on www.outokumpu.com.

In aqueous solutions containing halogenides, e.g. chlorides or bromides, pitting and crevice corrosion may occur depending on halogenide concentration, temperature, pH-value, concentration of oxidizing compounds, or crevice geometry, if applicable. For a short period of time, for instance during cooking of food in stainless steel dishes, Core 305/4303 can tolerate even relatively high chloride concentrations. The presence of corrosion-inhibiting or accelerating compounds like transition metal ions or organic compounds may influence the corrosion behavior of Core 305/4303.

Core 305/4303 is prone to chloride-induced stress corrosion cracking at temperatures over about 50°C depending on the applied stress and the chloride concentration in the environment. Due to its high nickel content, it withstands, however, stress corrosion cracking slightly better than the other austenitic CrNi standard grades with lower nickel content. Prior cold deformation of the structure under load increases the risk of stress corrosion cracking.

Core 305/4303 can be used for indoor and outdoor applications in rural areas and urban environments where chloride contamination is low. The best material performance is usually reached with the help of adequate design, correct post-weld treatment, and regular cleaning during use (if applicable).

Pitting corrosion resistance		Crevice corrosion resistance
PRE	CPT	CCT
18	<10	<0

Pitting Resistance Equivalent (PRE) is calculated using the following formula: PRE = %Cr + 3.3 x %Mo + 16 x %N
Corrosion Pitting Temperature (CPT) as measured in the Avesta Cell (ASTM G 150), in a 1M NaCl solution (35,000 ppm or mg/l chloride ions).
Critical Crevice Corrosion Temperature (CCT) is obtained by laboratory tests according to ASTM G 48 Method F

For more information on corrosion resistance, please to the Outokumpu Corrosion Handbook or contact the Outokumpu corrosion experts.

Mechanical properties

The mechanical properties of the available products in soft annealed condition at room temperature are given in the table below. Moderate strengths can be reached at elevated temperatures (~550 °C/1022 °F). Temperatures for excessive scaling are close to 850 °C/1562 °F. This grade, along with other austenitic corrosion-resistant steels, exhibits very high ductility and high elongation to fracture. It is not susceptible to brittle fracture in the solution annealed condition.

Cold rolled coil and sheet	$R_{p0.2}$ MPa	$R_{p1.0}$ MPa	R_m MPa	Elongation[1)] %	Impact strength J	Rockwell	HB	HV
Typical (thickness 1 mm)	**260**	**280**	**570**	**70**				
ASTM A240	≥ 205		≥ 515			≤ 88HRB	≤ 183	
EN 10088-2	≥ 220	≥ 250	500 - 650					

Hot rolled coil and sheet	$R_{p0.2}$ MPa	$R_{p1.0}$ MPa	R_m MPa	Elongation[1)] %	Impact strength J	Rockwell	HB	HV
Typical (thickness 4 mm)	**300**	**340**	**570**	**57**			**77**	
ASTM A240	≥ 205		≥ 515				≤ 183	

Hot rolled quarto plate	$R_{p0.2}$ MPa	$R_{p1.0}$ MPa	R_m MPa	Elongation[1)] %	Impact strength J	Rockwell	HB	HV
Typical (thickness 15 mm)	**235**	**265**	**555**					
ASTM A240	≥ 205		≥ 515				≤ 183	

Semifinished (bloom, billet, ingot, slab)	$R_{p0.2}$ MPa	$R_{p1.0}$ MPa	R_m MPa	Elongation[1)] %	Impact strength J	Rockwell	HB	HV
Typical	**250**	**280**	**570**	**50**				

[1)]Elongation according to EN standard:
A_{80} for thickness below 3 mm.
A for thickness = 3 mm.
Elongation according to ASTM standard $A_{2"}$ or A_{50}.

Physical properties

Physical properties according to EN 10088 are given in the table below.

Density kg/dm^3	Modulus of elasticity GPa	Thermal exp. at 100 °C 10^{-6}/°C	Thermal conductivity W/m°C	Thermal capacity J/kg°C	Electrical resistance µΩm	Magnetizable
7.9	200	16,0	15	500	0.73	No

Fabrication

Cold forming

Core 305/4303 is excellent in cold forming applications like heading, drawing, and bending.

Welding

Austenitic Core 305/4303 has excellent weldability and is suitable for the full range of conventional welding methods (like MMA, MIG, MAG, TIG, SAW, LBW, or RSW), except gas welding. Core 305/4303 has about 50% higher thermal expansion and lower heat conductivity compared to carbon steels. This means that larger deformation and higher shrinkage stresses may result from welding.

In thin sections, autogenous welding may be used. In thicker section, the low-carbon Core 304L/4306 is preferred, and to ensure that the weld metal properties (e.g. strength, corrosion resistance) are equivalent to those of the parent metal, matching or slightly over-alloyed fillers should preferably be used.

The recommended filler metal is 19 9 L.

Post-weld heat treatment is generally not required. In special cases where there is high risk of stress corrosion cracking or fatigue, stress relief treatment may be considered.

In order to fully restore the corrosion resistance of the weld seam, the weld discoloration should be removed by pickling and passivation.

Because of the austenitic structure, the welded joints are tough down to low temperatures even in the as-welded condition.

More detailed information concerning welding procedures can be obtained from the Outokumpu Welding Handbook, available from our sales offices.

Standards & approvals

The most commonly used international product standards are given in the table below.

Standard	Designation
ASTM A240/A240M	TYPE 305 / UNS S30500
EN 10088-2	1.4303
EN 10088-3	1.4303

Contacts & Enquiries

Contact your nearest sales office

www.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.

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